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Oförstörande provning – Radiografisk inspektion av korrosion och inneslutningar i rör med X- och gammastrålning – Del 1:Tangentiell radiografisk inspektion (ISO 20769-1:2018)

Non-destructive testing – Radiographic inspection of corrosion and deposits in pipes by X – and gamma rays – Part 1: Tangential radiographic inspection (ISO 20769-1:2018)

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Europastandarden EN ISO 20769-1:2018 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 20769-1:2018.

Denna standard ersätter SS-EN 16407-1:2014, utgåva 1

The European Standard EN ISO 20769-1:2018 has the status of a Swedish Standard. This document contains the official version of EN ISO 20769-1:2018.

This standard supersedes the SS-EN 16407-1:2014, edition 1

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), telephone +46 8 555 520 00. Standards may be ordered from SIS, who can also provide general information about Swedish and foreign standards.

Denna standard är framtagen av kommittén för Oförstörande provning, SIS/TK 125.

Har du synpunkter på innehållet i den här standarden, vill du delta i ett kommande revideringsarbete eller vara med och ta fram andra standarder inom området? Gå in på www.sis.se - där hittar du mer information.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 20769-1

October 2018

ICS 19.100

Supersedes EN 16407-1:2014

English Version

Non-destructive testing - Radiographic inspection of corrosion and deposits in pipes by X - and gamma rays - Part 1: Tangential radiographic inspection (ISO 20769-1:2018)

Essais non destructifs - Examen radiographique de la corrosion et des dépôts dans les canalisations, par rayons X et rayons gamma - Partie 1: Examen radiographique tangentiel (ISO 20769-1:2018)

Zerstörungsfreie Prüfung - Durchstrahlungsprüfung auf Korrosion und Ablagerungen in Rohren mit Röntgen- und Gammastrahlen - Teil 1: Tangentiale Durchstrahlungsprüfung (ISO 20769-1:2018)

This European Standard was approved by CEN on 5 August 2018.

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.

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 CEN-CENELEC Management Centre has the same status as the official versions.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN ISO 20769-1:2018: E

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European foreword

This document (EN ISO 20769-1:2018) has been prepared by Technical Committee ISO/TC 135 "Non-destructive testing" in collaboration with Technical Committee CEN/TC 138 “Non-destructive testing” the secretariat of which is held by AFNOR.

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 2019, and conflicting national standards shall be withdrawn at the latest by April 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 16407-1:2014.

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Endorsement notice

The text of ISO 20769-1:2018 has been approved by CEN as EN ISO 20769-1:2018 without any modification.

Non-destructive testing — Radiographic inspection of corrosion and deposits in pipes by X- and gamma rays —

Part 1: Tangential radiographic inspection

1 Scope

This document specifies fundamental techniques of film and digital radiography with the object of enabling satisfactory and repeatable results to be obtained economically. The techniques are based on generally recognized practice and fundamental theory of the subject.

This document applies to the radiographic examination of steel pipes for service induced flaws such as corrosion pitting, generalized corrosion and erosion. Besides its conventional meaning, "pipe" as used in this document is understood to cover other cylindrical bodies such as tubes, penstocks, boiler drums and pressure vessels.

Weld inspection for typical welding process induced flaws is not covered, but weld inspection is included for corrosion/erosion type flaws.

The pipes can be insulated or not, and can be assessed where loss of material due, for example, to corrosion or erosion is suspected either internally or externally.

This document covers the tangential inspection technique for detection and through-wall sizing of wall loss, including with the source:

a) on the pipe centre line; and

b) offset from pipe centre line by the pipe radius.

ISO 20769-2 covers double wall radiography, and note that the double wall double image technique is often combined with tangential radiography with the source on the pipe centre line.

This document applies to tangential radiographic inspection using industrial radiographic film techniques, computed radiography (CR) and digital detector arrays (DDA).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 NDT personnel*

ISO 11699-1, *Non-destructive testing — Industrial radiographic film — Part 1: Classification of film systems for industrial radiography*

ISO 11699-2, *Non-destructive testing — Industrial radiographic films — Part 2: Control of film processing by means of reference values*

ISO 16371-1, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 1: Classification of systems*

ISO 19232-5, *Non-destructive testing — Image quality of radiographs — Part 5: Determination of the image unsharpness value using duplex wire-type image quality indicators*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
actual wall thickness
t_{act}
real thickness of the pipe wall which can differ from the nominal thickness

3.2
axial coverage
L_d
<on the detector> total axial extent of the evaluated section of the pipe radiograph measured on the *detector* (3.8)

3.3
axial coverage
L_p
<on the pipe central axis> total axial extent of the evaluated section of the pipe radiograph measured along the central axis of the pipe

3.4
basic spatial resolution
$SR_b^{detector}$
<digital detector> smallest geometrical detail, which can be resolved in a digital image at a magnification equal to 1; corresponds to half of the measured image unsharpness in a digital image; corresponds to the effective *pixel size* (3.19) of the magnified image; and is determined from the smallest number of the duplex wire pair, which is not separable by visual inspection or from the smallest number of the duplex wire pair with less than 20 % modulation depth in a linearized profile

Note 1 to entry: For this measurement, the duplex wire IQI is placed directly on the digital *detector* (3.8) array or imaging plate.

Note 2 to entry: The measurements of $SR_b^{detector}$ and unsharpness are described in ISO 19232-5. and ASTM E2002[17].

3.5
basic spatial resolution
SR_b^{image}
<digital image> smallest geometrical detail, which can be resolved in a digital image at a magnification >1; corresponds to half of the measured image unsharpness in a digital image; corresponds to the effective *pixel size* (3.19) of the magnified image; and is determined from the smallest number of the duplex wire pair, which is not separable by visual inspection or from the smallest number of the duplex wire pair with less than 20 % modulation depth in a linearized profile

Note 1 to entry: The measurements of SR_b^{image} and unsharpness are described in ISO 19232-5. and ASTM E2002[17].

3.6
comparator
C
reference object of defined dimension c and material for dimensional calibration of a radiographic image

3.7
computed radiography
CR
complete system comprising a *storage phosphor imaging plate (IP)* (3.23) and a corresponding read-out unit (scanner or reader), which converts the information from the IP into a digital image and the control software of the read-out unit

3.8
detector
D
detection device, consisting of a NDT film system (see ISO 11699-1) or a digital radiography system using a CR system or a DDA system

Note 1 to entry: Film systems and IPs can be used as flexible and curved detectors or in planar cassettes.

3.9
digital detector array
DDA
electronic device converting ionizing or penetrating radiation into a discrete array of analogue signals which are subsequently digitized and transferred to a computer for display as a digital image corresponding to the radiologic energy pattern imparted upon the input region of the device and the control software

3.10
imaged comparator dimension
c'
dimension of the *comparator* (3.6) measured on the *detector* (3.8)

3.11
imaged outside diameter
D_e'
nominal outside diameter of the pipe measured on the detector

3.12
maximum penetrated thickness
w_{max}
maximum thickness of material for a pipe which occurs for a tangent to the inner pipe surface

3.13
measured wall thickness
t_{meas}
thickness of the pipe wall as measured on the radiograph or digital image

3.14
nominal wall thickness
t
thickness of the pipe wall as given by the manufacturer, neglecting the manufacturing tolerances

3.15
normalized signal-to-noise ratio
SNR_N
ratio of signal-to-noise, normalized by the *basic spatial resolution,* SR_b^{image}, (3.5) as measured directly in the digital image and/or calculated from the measured $SNR_{measured}$, by:

$$SNR_N = SNR_{measured} \frac{88{,}6\ \mu m}{SR_b}$$

Note 1 to entry: SR_b^{image} can be substituted by $SR_b^{detector}$ (3.4) at magnification equal to 1.