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Oförstörande provning – Radiografisk inspektion av korrosion och inneslutningar i rör med X- och gammastrålning – Del 2: Dubbelväggig radiografisk inspektion (ISO 20769-2:2018)

Non-destructive testing – Radiographic inspection of corrosion and deposits in pipes by X- and gamma rays – Part 2: Double wall radiographic inspection (ISO 20769-2:2018)

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Europastandarden EN ISO 20769-2:2018 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 20769-2:2018.

Denna standard ersätter SS-EN 16407-2:2014, utgåva 1

The European Standard EN ISO 20769-2:2018 has the status of a Swedish Standard. This document contains the official version of EN ISO 20769-2:2018.

This standard supersedes the SS-EN 16407-2:2014, 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 20769-2

October 2018

ICS 19.100

Supersedes EN 16407-2:2014

English Version

Non-destructive testing - Radiographic inspection of corrosion and deposits in pipes by X- and gamma rays - Part 2: Double wall radiographic inspection (ISO 20769-2:2018)

Essais non destructifs - Examen radiographique de la corrosion et des dépôts dans les canalisations, par rayons X et rayons gamma - Partie 2: Examen radiographique double paroi (ISO 20769-2:2018)

Zerstörungsfreie Prüfung - Durchstrahlungsprüfung auf Korrosion und Ablagerungen in Rohren mit Röntgen - und Gammastrahlen - Teil 2: Doppelwand-Durchstrahlungsprüfung (ISO 20769-2:2018)

This European Standard was approved by CEN on 9 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

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European foreword

This document (EN ISO 20769-2:2018) 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 16407-2:2014.

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

Endorsement notice

The text of ISO 20769-2:2018 has been approved by CEN as EN ISO 20769-2:2018 without any modification.

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

Part 2:
Double wall 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 pipes in metallic materials 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 double wall inspection techniques for detection of wall loss, including double wall single image (DWSI) and double wall double image (DWDI).

Note that the DWDI technique described in this document is often combined with the tangential technique covered in ISO 20769-1.

This document applies to in-service double wall radiographic inspection using industrial radiographic film techniques, computed digital 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 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 17636-2, *Non-destructive testing of welds — Radiographic testing — Part 2: X- and gamma-ray techniques with digital detectors*

ISO 19232-1, *Non-destructive testing — Image quality of radiographs — Part 1: Determination of the image quality value using wire-type image quality indicators*

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*

ISO 20769-1, *Non-destructive testing of welds — Radiographic inspection of corrosion and deposits in pipes by X- and gamma rays — Part 1: Tangential radiographic inspection*

EN 14784-1, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 1: Classification of systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20769-1 and the following 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
digital detector array system
DDA system
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

3.2
double wall double image technique
DWDI
technique where the radiation source is located outside and away from the pipe, with the detector on the opposite side of the pipe and where the radiograph shows details from both the pipe walls on the detector and source sides of the pipe

Note 1 to entry: See Figure 3.

3.3
double wall single image technique
DWSI
technique where the radiation source is located outside the pipe and close to the pipe wall, with the detector on the opposite side of the pipe and where the radiograph shows only detail from the pipe wall on the detector side

Note 1 to entry: See Figure 1.

3.4
object-to-detector distance
b
distance between the radiation side of the test object and the detector surface measured along the central axis of the radiation beam

3.5
penetrated thickness
w
thickness of material in the direction of the radiation beam calculated on the basis of the nominal thickness

Note 1 to entry: For double wall radiographic inspection of a pipe, the minimum value for w is twice the pipe wall thickness. For multiple wall techniques (pipes in pipe or liners), the penetrated thickness is calculated from the nominal wall thicknesses t.

3.6
source-to-object distance
f
distance between the source of radiation and the source side of the test object measured along the central axis of the radiation beam

3.7
total effective penetrated thickness
w_{tot}
total equivalent thickness of metallic material in the direction of the radiation beam calculated on the basis of the nominal thickness, with allowance for any liquid or other material present in the pipe and any insulation

4 Classification of radiographic techniques

The double wall radiographic techniques are divided into two classes:

— basic techniques DWA;

— improved techniques DWB.

The basic techniques are intended for double wall radiography of generalized and localized wall loss.

For the basic techniques, DWA, when using Ir 192 sources for pipes with penetrated thicknesses between 15 mm and 35 mm, the sensitivity for detection is high for imperfections, provided their diameters are greater than or equal to 2 mm and the material loss is typically greater than or equal to 5 % of the pipe penetrated thickness, in the absence of liquid or other products in the pipe. When using Se 75, the corresponding detection sensitivity is high for 2 mm diameter or larger imperfections with material loss greater than or equal to 4 % of the pipe penetrated thickness. The detection sensitivity is improved for flaws with larger diameters, whereas the presence of liquid or other products, and external insulation, can reduce the sensitivity for material loss depending on their properties. Different detection sensitivities may apply for penetrated thicknesses less than 15 mm and greater than 35 mm.

The presence of external corrosion product can reduce the techniques sensitivity to corrosion due to the increased radiation attenuation in the product, which can even exceed the reduced attenuation caused by the loss of steel. Build-up of internal solid material (e.g. scale) in pipes can similarly reduce sensitivity to internal degradation.

These techniques can also be used for detection of deposits inside the pipe.

The improved techniques should be used where higher sensitivity is required such as for radiography of fine, localized corrosion pitting.

Further improvements, beyond the improved techniques described herein, are possible and may be agreed between the contracting parties by specification of all appropriate test parameters.

The choice of radiographic technique shall be agreed between the concerned parties.

5 General

5.1 Protection against ionizing radiation

WARNING — Exposure of any part of the human body to X-rays or gamma-rays can be highly injurious to health. Wherever X-ray equipment or radioactive sources are in use, appropriate measures shall be taken to ensure the safety and health of personnel.

5.2 Personnel qualification

Testing shall be carried out by proficient, suitably trained and qualified personnel and, where applicable, shall be supervised by competent personnel nominated by the employer or, by delegation of the employer, the inspection company in charge of testing. To demonstrate appropriate qualification, it is recommended that personnel be certified according to ISO 9712 or an equivalent formalized system. Operating authorization for qualified persons shall be issued by the employer in accordance with a written procedure.