SLOVENSKI STANDARD
oSIST prEN ISO 17636-2:2011

01-april-2011

Neporušitvene preiskave zvarnih spojev - Radiografske preiskave - 2. del : X- in gama žarki z uporabo digitalnih detektorjev (ISO/DIS 17636-2:2010)

Non-destructive testing of welds - Radiographic testing - Part 2: X- and gamma-ray techniques with digital detectors (ISO/DIS 17636-2:2010)

Zerstörungsfreie Prüfung von Schweißverbindungen - Durchstrahlungsprüfung - Teil 2: Röntgen- und Gammastrahlungstechniken unter Anwendung digitaler Detektoren (ISO/DIS 17636-2:2010)

Contrôle non destructif des assemblages soudés - Contrôle par radiographie - Partie 2: Techniques par rayons X ou gamma à l'aide de détecteurs numériquess (ISO/DIS 17636 -2:2010)

Ta slovenski standard je istoveten z: **prEN ISO 17636-2**

ICS:

25.160.40	Varjeni spoji in vari	Welded joints

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EUROPEAN STANDARD

NORME EUROPÉENNE

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prEN ISO 17636-2

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Will supersede EN 1435:1997

English Version

Non-destructive testing of welds - Radiographic testing - Part 2: X- and gamma-ray techniques with digital detectors (ISO/DIS 17636-2:2010)

Contrôle non destructif des assemblages soudés - Contrôle par radiographie - Partie 2: Techniques par rayons X ou gamma à l'aide de détecteurs numériquess (ISO/DIS 17636-2:2010)

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This draft European Standard is submitted to CEN members for parallel enquiry. It has been drawn up by the Technical Committee CEN/TC 121.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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Foreword

This document (prEN ISO 17636-2:2010) has been prepared by Technical Committee CEN/TC 121 “Welding”, the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

This document is currently submitted to the parallel Enquiry.

This document will supersede EN 1435:1997.

DRAFT INTERNATIONAL STANDARD ISO/DIS 17636-2

ISO/TC **44**/SC **5** Secretariat: **ANSI**

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Non-destructive testing of welds — Radiographic testing —

Part 2:
X- and gamma-ray techniques with digital detectors

Contrôle non destructif des assemblages soudés — Contrôle par radiographie —

Partie 2: Techniques par rayons X ou gamma à l'aide de détecteurs numériques

ICS 25.160.40

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the European Committee for Standardization (CEN), and processed under the **CEN-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 17636-1 was prepared by Technical Committee CEN/TC 121, *Welding* and by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 5 in collaboration.

This second edition cancels and replaces the first edition ISO 17636: 2003 which has been technically revised.

The main changes are :

- normative references were updated;
- document was divided into two parts where the present part is applicable for radiographic testing with digital detectors;
- X-ray devices up to 1 000 kV were included;
- normative Annex C on determination of basic spatial resolution was added;
- normative Annex D on determination of minimum grey values for CR practice was introduced;
- informative Annex E with general remarks on grey values was added;
- document was editorially revised.

ISO 17636 consists of the following parts, under the general title *Non-destructive testing of welds — Radiographic testing*:

- *Part 1: X- and gamma ray techniques with film*
- *Part 2: X- and gamma ray techniques with digital detectors*

Introduction

This standard specifies fundamental techniques of 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, inspection of fusion welded joints with digital radiographic detectors.

Digital detectors provide a digital grey value image which can be viewed and evaluated with a computer only. The practice describes the recommended procedure for detector selection and radiographic practice. Selection of computer, software, monitor, printer and viewing conditions are important but not in the main focus of this standard.

The procedure specified in this standard, provides the minimum requirements and practice which permits to expose and acquire digital radiographs with equivalent sensitivity for detection of imperfections as film radiography, specified in part 1 of this standard.

Non-destructive testing of welds — Radiographic testing —

Part 2:
X- and gamma-ray techniques with digital detectors

1 Scope

This European Standard specifies fundamental techniques of 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 standard applies to the digital radiographic examination of fusion welded joints in metallic materials.

It applies to the joints of plates or pipes. Besides its conventional meaning, "pipe" as used in this standard should be understood to cover other cylindrical bodies such as tubes, penstocks, boiler drums and pressure vessels. This standard complies with EN 14784-2.

This Part of ISO 17636 specifies the requirements for digital radiographic X- and gamma ray testing by either computed radiography (CR) or radiography with digital detector arrays (DDA), of the welded joints of metallic tubes for the detection of imperfections.

Digital detectors provide a digital grey value image which can be viewed and evaluated on basis of a computer only. This practice describes the recommended procedure for detector selection and radiographic practice. Selection of computer, software, monitor, printer and viewing conditions are important but not in the main focus of this standard. The procedure specified in this standard, provides the minimum requirements and practice which permits to expose and acquire digital radiographs with equivalent sensitivity for detection of imperfections as film radiography and as specified in Part 1 of this standard.

This standard does not specify acceptance levels of the indications.

If contracting parties apply lower test criteria, the quality achieved may be significantly lower than when this standard is strictly applied.

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.

EN 462-1, Non-destructive testing. Image quality of radiogaphs. Part 1 : Image quality indicators (wire type), determination of image quality value.

EN 462-2, Non-destructive testing. Image quality of radiographs. Part 2 : Image quality indicators (step/hole type). Determination of image quality value.

EN 462-5, Non-destructive testing. Image quality of radiographs. Part 5 : Image quality indicators (duplex wire type), determination of image unsharpness value.

EN 473, *Non-destructive testing — Qualification and certification of NDT personnel — General principles*

EN 12543 (all parts), *Non-destructive testing — Characteristics of focal spots in industrial X-ray systems for use in non-destructive testing*

EN 12679, *Non-destructive testing — Determination of the size of industrial radiographic sources — Radiographic method*

EN 14784-1:2005, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 1: Classification of systems*

ISO 5576, *Non-destructive testing — Industrial X-ray and gamma-ray radiology — Vocabulary*

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

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

ISO 19232–2, *Non-destructive testing — Image quality of radiographs — Part 2: Image quality indicators (step/hole type) - Determination of image quality value*

ISO 19232–3, *Non-destructive testing — Image quality of radiographs — Part 3: Image quality classes for ferrous metals*

ISO 19232–4, *Non-destructive testing — Image quality of radiographs — Part 4: Experimental evaluation of image quality values and image quality tables*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5576:1997 and the following apply.

3.1
computed radiography
storage phosphor imaging plate system
complete system of a storage phosphor imaging plate (IP) and a corresponding read out unit (scanner or reader), which converts the information of the IP into a digital image

3.2
storage phosphor imaging plate
IP
photostimulable luminescent material that is capable of storing a latent radiographic image of a material being examined and, upon stimulation by a source of red spectrum light of appropriate wavelength, will generate luminescence proportional to radiation absorbed

NOTE When performing computed radiography, an IP is used in lieu of a film. When establishing techniques related to source focal geometries, the IP is referred to as a detector (i.e. source-to detector-distance or SDD).

3.3
digital detector array system
DDA system
electronic device that converts ionizing or penetrating radiation into a discrete array of analog signals which are subsequently digitised 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

3.4
structure noise of IP
structure due to inhomogeneties in the sensitive layer (graininess) and surface of an IP

NOTE 1 After scanning of the exposed imaging plate the inhomogeneties appear as overlaid fixed pattern noise in the digital image.

NOTE 2 This noise limits the maximum achievable image quality of digital IP images and can be compared with the graininess in film images.

3.5
structure noise of DDA
structure due to different properties of detector elements (pixels)

NOTE After read out of the exposed uncalibrated DDA. The inhomogeneties appear as overlaid fixed pattern noise in the digital image. All DDAs are typically applied after a software based calibration (software and guideline is provided by the manufacturer). A suitable calibration procedure reduces the structure noise.

3.6
grey value
numeric value of a pixel in a digital image

NOTE This is typically interchangeable with the term pixel value, detector response, analog-to-digital unit, and detector signal.

3.7
linearised grey value
numeric value of a pixel which is directly linearised proportional to the detector exposure dose and has the value *zero* if the detector was not exposed

NOTE This is typically interchangeable with the term linearised pixel value, and linearised detector signal.

3.8
signal-to-noise ratio
SNR
quotient of mean value of the linearised grey values and standard deviation of the linearised grey values (noise) in a given region of interest in a digital image

3.9
basic spatial resolution
SR_b
corresponds to ½ of the measured image unsharpness in a digital image and corresponds to the effective pixel size and indicates the smallest geometrical detail, which can be resolved in a digital image

NOTE The measurement of unsharpness is described in ISO 19232-5, see also ASTM E 1000.

3.10
normalized signal-to-noise ratio
SNR_N
SNR, normalized by the basic spatial resolution SR_b as measured directly in the digital image and/or calculated from measured $SNR_{measured}$ by

$$SNR_N = SNR_{measured} \times (88{,}6\,\mu m / SR_b)$$

3.11
contrast-to-noise ratio
CNR
quotient of the difference of the mean signal levels between two image areas and the averaged standard deviation of the signal levels

NOTE It describes a component of image quality and depends approximately on the product of radiographic attenuation coefficient and SNR. In addition to adequate CNR, a digital radiograph must also possess adequate unsharpness or basic spatial resolution to resolve desired features of interest.