
**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*



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Published in Switzerland

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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 17636-2 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 44, *Welding and allied processes*, Subcommittee SC 5, *Testing and inspection of welds* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition, together with ISO 17636-1, cancels and replaces ISO 17636:2003, of which it constitutes a technical revision.

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*

The main changes are that:

- the normative references have been updated;
- the document has been divided into two parts — this part of ISO 17636 is applicable to radiographic testing with digital detectors;
- X-ray devices up to 1 000 kV have been included;
- Annex C on determination of basic spatial resolution has been added;
- Annex D on determination of minimum grey values for CR practice has been introduced;
- Annex E with general remarks on grey values has been added;
- the text has been editorially revised.

Requests for official interpretations of any aspect of this part of ISO 17636 should be directed to the Secretariat of ISO/TC 44/SC 5 via your national standards body. A complete listing of these bodies can be found at www.iso.org.

Introduction

This International 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 are not the main focus of this part of ISO 17636.

The procedure specified in this part of ISO 17636 provides the minimum requirements and practice which permits exposure and acquisition of digital radiographs with equivalent sensitivity for detection of imperfections as film radiography, specified in ISO 17636-1.

Non-destructive testing of welds — Radiographic testing —

Part 2:

X- and gamma-ray techniques with digital detectors

1 Scope

This part of ISO 17636 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 part of ISO 17636 applies to the digital radiographic examination of fusion welded joints in metallic materials. It applies to the joints of plates and pipes. Besides its conventional meaning, “pipe”, as used in this International Standard, covers other cylindrical bodies such as tubes, penstocks, boiler drums, and pressure vessels.

NOTE This part of ISO 17636 complies with EN 14784-2.[6]

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 plates and tubes for the detection of imperfections.

Digital detectors provide a digital grey value (GV) image which can be viewed and evaluated using a computer. This part of ISO 17636 specifies the recommended procedure for detector selection and radiographic practice. Selection of computer, software, monitor, printer and viewing conditions are important, but are not the main focus of this part of ISO 17636. The procedure specified in this part of ISO 17636 provides the minimum requirements for radiographic practice which permit exposure and acquisition of digital radiographs with equivalent sensitivity for detection of imperfections as film radiography, as specified in ISO 17636-1.

This part of ISO 17636 does not specify acceptance levels for any of the indications found on the digital radiographs.

If contracting parties apply lower test criteria, it is possible that the quality achieved is significantly lower than when this part of ISO 17636 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.

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

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

ISO 16371-1:2011, *Non-destructive testing — Industrial computed radiography with storage phosphor imaging plates — Part 1: Classification of systems*

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 19232-4, *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*

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*

3 Terms and definitions

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

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

3.2
storage phosphor imaging plate
IP
photostimulable luminescent material capable of storing a latent radiographic image of a material being examined and, upon stimulation by a source of red light of appropriate wavelength, generates 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 size or focal geometries, the IP is referred to as a detector, i.e. source-to-detector distance (SDD).

3.3
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

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

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

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