International Standard

ISO 14096-2

Non-destructive testing — Qualification of radiographic film digitisation systems —

Part 2: Minimum requirements

Essais non destructifs — Qualification des systèmes de numérisation des films radiographiques —

Partie 2: Exigences minimales

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 5, *Radiographic testing*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 138, *Non-destructive testing*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 14096-2:2005), which has been technically revised.

The main changes are as follows:

— terms 3.4 and 3.5 updated and terms “spatial frequency” and “modulation transfer function” removed;

— in 3.4, definition of term “basic spatial resolution” added;

— values in Table 1, Table 2 and Table 3 updated;

— editorial revisions.

A list of all parts in the ISO 14096 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Radiographic film systems are used for industrial inspection by X- and gamma rays. To apply modern means of computer support for analysis, transmission and storage, the information stored in the radiographic film should be converted into digital data (digitisation). This document specifies minimum requirements to ensure that the relevant information for evaluation of the digital data is preserved during the film digitisation process. For the application of this document, ISO 14096-1 provides definitions and measurement procedures.

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Non-destructive testing — Qualification of radiographic film digitisation systems —

Part 2:
Minimum requirements

1 Scope

This document specifies three film-digitisation quality classes for the requirements of non-destructive testing. The user specifies one of these quality classes for the respective film digitisation task. The digitisation parameters depend on the radiation energy, the material thickness penetrated and the quality level of the original radiographic film. This document does not address signal processing, display and storage of the digitised data.

For the application of this document, ISO 14096-1 provides definitions and measurement procedures.

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 5579, *Non-destructive testing — Radiographic testing of metallic materials using film and X- or gamma rays — Basic rules*

ISO 14096-1, *Non-destructive testing — Qualification of radiographic film digitisation systems — Part 1: Definitions, quantitative measurements of image quality parameters, standard reference film and qualitative control*

ISO 17636-1, *Non-destructive testing of welds — Radiographic testing — Part 1: X- and gamma-ray techniques with film*

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

EN 12681-1, *Founding — Radiographic examination – Part 1: Film techniques*

3 Terms and definitions

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

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

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

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

3.1
radiographic film digitisation system
digitiser
sequential application of the two functions below:

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a) detection of the diffuse transmittance of a small unit area of the film (pixel, picture element) by means of an optical detector, giving an electric output signal (geometrical digitisation);

b) conversion of the above electrical signal into a numerical value (densitometrical digitisation)

[SOURCE: ISO 14096-1:2026, 3.1]

3.2
pixel size
P
geometrical centre-to-centre distance between adjacent pixels in a row (horizontal pitch P_h) or column (vertical pitch P_v) of the scanned image

Note 1 to entry: The pixel size is the limiting value of the *basic spatial resolution of the digitisation system* (3.4) SR_b^D.

[SOURCE: ISO 14096-1:2026, 3.3, cross-reference adapted.]

3.3
optical density
D
logarithmic value to the base 10 of the diffuse light intensity ratio in front of (I_0) and behind (I_D) the radiographic film according to Formula (1):

$$D = \lg \frac{I_0}{I_D} \tag{1}$$

[SOURCE: ISO 14096-1:2026, 3.4]

3.4
basic spatial resolution of the digitisation system
SR_b^D
half of the measured digitiser unsharpness U_D measured in a row (horizontal) and in a column (vertical) of the scanned image, which corresponds to the effective pixel size and to the larger of both of the two measured values

Note 1 to entry: For the measurement of SR_b^D, a duplex wire IQI according to ISO 19232-5 is exposed directly on the film or a film print with sufficient resolution, can be used (see Figure 1 a and b for examples).

Note 2 to entry: The measurement of SR_b^D is described in ISO 19232-5:2018, as iSR_b^{image} measurement, illustrated in Figure B.1.

Note 3 to entry: See also ISO 14096-1:2026, 3.6, 5.2.4 and 5.2.5 for an alternative measurement using a sharp edge target and the 10 % value of the Modulation Transfer Function (ISO 14096-1:2026, 3.9) of this edge target ($MTF_{10\,\%}$), see ISO 14096-1:2026, Annexes A and B.

[SOURCE: ISO 14096-1:2026, 3.13, modified — cross-reference adapted.]

3.5
digital resolution
number of bits provided by the analogue-to-digital converter of the digitiser used for densitometrical digitisation

Note 1 to entry: A digital resolution of N bits corresponds to 2^N digital values.

[SOURCE: ISO 14096-1:2026, 3.12]

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