



BSI Standards Publication

Non-destructive testing — Radiation methods for computed tomography

Part 2: Principles, equipment and samples

National foreword

This British Standard is the UK implementation of EN ISO 15708-2:2025. It is identical to ISO 15708-2:2025. It supersedes BS EN ISO 15708-2:2019, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee WEE/46/5, Radiographic Testing.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

**Non-destructive testing - Radiation methods for computed tomography - Part 2: Principles, equipment and samples
(ISO 15708-2:2025)**

Essais non destructifs - Méthodes par rayonnements
pour la tomographie informatisée - Partie 2: Principes,
équipements et échantillons (ISO 15708-2:2025)

Zerstörungsfreie Prüfung - Durchstrahlungsverfahren
für Computertomographie - Teil 2: Grundlagen, Geräte
und Proben (ISO 15708-2:2025)

This European Standard was approved by CEN on 7 January 2025.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN ISO 15708-2:2025) 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of an identical text or by endorsement, at the latest by July 2025, and conflicting national standards shall be withdrawn at the latest by July 2025.

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 ISO 15708-2:2019.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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Endorsement notice

The text of ISO 15708-2:2025 has been approved by CEN as EN ISO 15708-2:2025 without any modification.

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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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 third edition cancels and replaces the second edition (ISO 15708-2:2017), which has been technically revised.

The main changes are as follows:

- addition of normative references;
- correction of the vacuum level for activating the turbo pump in A.1.1;
- addition of photon counting as an example under semiconductors in A.2.3;
- editorial changes.

A list of all parts in the ISO 15708 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.

Non-destructive testing — Radiation methods for computed tomography —

Part 2: Principles, equipment and samples

1 Scope

This document specifies the general principles of X-ray computed tomography (CT), the equipment used and basic considerations of sample, materials and geometry.

This document is applicable only to industrial imaging (i.e. non-medical applications) and provides a consistent set of definitions of CT performance parameters, including the relationship between these performance parameters and CT system specifications.

This document is applicable to industrial computed tomography.

This document does not apply to other techniques of tomography, such as translational tomography and tomosynthesis.

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 15708-1, *Non-destructive testing — Radiation methods for computed tomography — Part 1: Terminology*

ISO 15708-3, *Non-destructive testing — Radiation methods for computed tomography — Part 3: Operation and interpretation*

ISO 15708-4, *Non-destructive testing — Radiation methods for computed tomography — Part 4: Qualification*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15708-1 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/>

4 General principles

4.1 Basic principles

Computed tomography (CT) is a radiographic inspection method which delivers three-dimensional information on an object from a number of radiographic projections either over cross-sectional planes (CT

slices) or over the complete volume. Radiographic imaging is possible because different materials have different X-ray attenuation coefficients. In CT images, the linear X-ray attenuation coefficients are displayed as different CT grey values (or in false colour). For conventional radiography, the three-dimensional object is X-rayed from one direction and an X-ray projection is produced with the corresponding information aggregated over the ray path. In contrast, multiple X-ray-projections of an object are acquired at different projection angles during a CT scan. From these projection images, the actual slices or volumes are reconstructed. The fundamental advantage compared to radiography is the preservation of full volumetric information. The resulting CT image (2D-CT slice or 3D-CT volume), is a quantitative representation of the X-ray linear attenuation coefficient averaged over the finite volume of the corresponding volume element (voxel) at each position in the sample.

The linear attenuation coefficient characterizes the local instantaneous rate at which X-rays are attenuated as they propagate through the object during the scan. The attenuation of the X-rays as they interact with matter is the result of several different interaction mechanisms: Compton scattering and photoelectric absorption being the predominant ones for X-ray CT. The linear attenuation coefficient depends on the atomic numbers of the corresponding materials and is proportional to the material density. It also depends on the energy of the X-ray beam.

4.2 Advantages of CT

Among the radiographic techniques, CT can be an excellent examination technique whenever the primary goal is to locate and quantify volumetric details in three dimensions. In addition, since CT is X-ray based, it can be used on metallic and non-metallic samples, solid and fibrous materials and smooth and irregularly surfaced objects.

In contrast to conventional radiography, in which the internal features of a sample are projected onto a single image plane and thus are superposed on each other, in CT images the individual features of the sample appear separated from each other, preserving the full spatial information.

With proper calibration, dimensional inspections and material density determinations can also be carried out.

Complete three-dimensional representations of examined objects can be obtained either by reconstructing and assembling successive CT slices (2D-CT) or by direct 3D CT image (3D-CT) reconstruction. Computed tomography is therefore valuable in the industrial application areas of non-destructive testing, 2D and 3D metrology and reverse engineering.

CT has several advantages over conventional metrology methods:

- acquisition without contact;
- access to internal and external dimensional information;
- a direct input to 3D modelling especially of internal structures.

In some cases, dual energy (DE) CT acquisitions can help to obtain information on the material density and the average atomic number of certain materials. For known materials, the additional information can be used for improved discrimination or improved characterization.

4.3 Limitations of CT

CT is an indirect test procedure and absolute CT measurements (e.g. of the size of material inhomogeneities or of wall thicknesses) shall be based on a comparison with other absolute measurement procedures in accordance with ISO 15708-3. Another potential drawback of CT imaging is the possible occurrence of artefacts (see [4.5](#)) in the data. Artefacts limit the ability to quantitatively extract information from an image. Therefore, as with any examination technique, the user shall be able to recognize and discount common artefacts subjectively.

Like any imaging system, a CT system can never reproduce an exact image of the scanned object. The accuracy of the CT image is dictated largely by the competing influences of the imaging system, namely spatial resolution, statistical noise and artefacts. Each of these aspects is discussed in [4.4.1](#). See ISO 15708-3 for a more detailed description.