
**Non-destructive testing — Radiation
methods for computed tomography —**

**Part 4:
Qualification**

*Essais non destructifs — Méthodes par rayonnements pour la
tomographie informatisée —*

Partie 4: Qualification

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Qualification of the inspection	1
4.1 General.....	1
4.2 Qualification of defect testing.....	2
4.2.1 General.....	2
4.2.2 Quality feature.....	2
4.2.3 Feature detectability/test system/system parameterisation.....	2
4.2.4 Verification of suitability.....	3
4.2.5 Consistency check.....	3
4.2.6 Documentation.....	4
4.3 Qualification of dimensional testing.....	4
4.3.1 General.....	4
4.3.2 Test and measurement task.....	4
4.3.3 Dimensional testing/test system/system parameterisation.....	4
4.3.4 Degree of accuracy.....	5
4.3.5 Consistency check.....	5
4.3.6 Documentation.....	5
5 Qualification of the CT system	6
5.1 General.....	6
5.2 Integral overall system test.....	6
5.3 Checking the system components.....	6
5.3.1 General.....	6
5.3.2 Manipulation system.....	6
5.3.3 Image scale.....	6
5.3.4 Beam axis perpendicularity.....	6
5.3.5 Tube focal spot.....	7
5.3.6 Tube stability.....	7
5.3.7 Detector.....	7
5.3.8 Reconstruction.....	7
5.3.9 Visualization.....	7
5.4 Documentation.....	7
6 Example of CT system resolution evaluation methods	7
6.1 Pre-amble.....	7
6.2 Acquisition parameters.....	8
6.3 Recommendations for creating reference objects.....	8
6.4 Density resolution measurement method.....	9
6.4.1 General.....	9
6.4.2 High energy reference object.....	9
6.4.3 Low energy reference object.....	9
6.4.4 Experimental measurements.....	9
Bibliography	11

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html

This document was prepared by the European Committee for Standardization (CEN) (as EN 16016-4) and was adopted, under a special "fast-track procedure", by Technical Committee ISO/TC 135, *Non-destructive testing*, Subcommittee SC 5, *Radiographic testing*, in parallel with its approval by the national bodies of ISO.

It takes into consideration developments in computed tomography (CT) and computational power over the preceding decade.

A list of all parts in the ISO 15708 series can be found on the ISO website.

Non-destructive testing — Radiation methods for computed tomography —

Part 4: Qualification

1 Scope

This document specifies guidelines for the qualification of the performance of a CT system with respect to various inspection tasks.

It is applicable to *industrial* imaging (i.e. non-medical applications) and gives a consistent set of CT performance parameter definitions, including how those performance parameters relate to CT system specifications.

This document deals with computed axial tomography and excludes other types 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 15708-2, *Non-destructive testing — Radiation methods for computed tomography — Part 2: Operation and interpretation*

ISO 15708-4:2017

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3 Terms and definitions

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

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

4 Qualification of the inspection

4.1 General

CT is used in industry both for defect testing and dimensional testing and measurement. Since CT does not directly provide measurement of desired quantities such as, for example, pore size or wall thickness, these quantities must be derived from the X-ray linear attenuation data represented by the CT grey values. The detectability of features and the degree of accuracy required depend on the inspection task, the specification of the available test equipment and the analysis and evaluation methods used. When determination of such quantities is required, a special task-specific qualification test of the CT system is required. The qualification measures are described in 4.2 and 4.3. The qualification should be carried out by trained personnel. The trained personnel shall be able to prove they have undergone training and qualification in digital industrial radiography or radioscopy.

4.2 Qualification of defect testing

4.2.1 General

Under test qualification, the suitability of the CT inspection technique for measuring a quantity to the required precision should be verified. The following steps described are typical of those for the successful verification of the suitability of CT for industrial applications.

4.2.2 Quality feature

Typical quantities to be measured are the sizes of pores, cavities, cracks, inclusions, contaminants as well as studies of the material distribution and the assembly and installation position of components. Because the test sample and the type, position and size of the features to be detected determine the properties of a CT system to be used, information such as the following should be known:

- a) test object:
 - 1) dimensions;
 - 2) weight;
 - 3) materials;
 - 4) path length to be X-rayed in the material;
- b) test feature:
 - 1) type;
 - 2) position;
 - 3) size;
 - 4) distribution, frequency;
- c) feature detectability:
 - 1) limiting defect;
 - 2) limiting feature.

Since the feature detectability strongly influences the specification and therefore the cost of a CT system, special attention must be taken when defining the sensitivity of the tests required. If, due to missing information, no limiting values for features are defined, it is recommended that the best possible sensitivity is used for the specific method and CT system and the attained feature detectability is verified using, for example, destructive tests.

4.2.3 Feature detectability/test system/system parameterisation

The usability of the CT system and the selection of system parameters are determined by the requirements for feature detectability. Typical variables are:

- a) spatial resolution:
 - 1) overall spatial resolution of the CT image;
 - 2) scan geometry;
 - 3) detector spatial resolution;