Non destructive testing - Radiation methods - Computed Tomography - Part 3: Operation and interpretation

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E EVS-EN 16016-3:2011 E EN 16016-3:2011 S E S 30 0 2011 EVS E E 31 0 2011 S E	E EVS-EN 16016-3:2011 E E EN 16016-3:2011 E S 30 0 2011 E E 31 0 2011 E

ICS 1 100

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16016-3

August 2011

ICS 19.100

English Version

Non destructive testing - Radiation methods - Computed Tomography - Part 3: Operation and interpretation

Essais non destructifs - Méthodes par rayonnements - Tomographie numérisée - Partie 3: Fonctionnement et interprétation

Zerstörungsfreie Prüfung - Durchstrahlungsverfahren - Computertomographie - Teil 3: Durchführung und Auswertung

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Ref. No. EN 16016-3:2011: E

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Foreword

This document (EN 16016-3:2011) has been prepared by 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of an identical text or by endorsement, at the latest by February 2012, and conflicting national standards shall be withdrawn at the latest by February 2012.

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

EN 16016 consists of the following parts:

— *Non destructive testing — Radiation methods — Computed tomography — Part 1: Terminology*;

— *Non destructive testing — Radiation methods — Computed tomography — Part 2: Principle, equipment and samples*;

— *Non destructive testing — Radiation methods — Computed tomography — Part 3: Operation and interpretation*;

— *Non destructive testing — Radiation methods — Computed tomography — Part 4: Qualification*.

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Introduction

This document gives guidelines for the general principles of X-ray computed tomography (CT) applicable to industrial imaging (in the context of this standard, industrial means non-medical applications); it also gives a consistent set of CT performance parameter definitions, including how these 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.

1 Scope

This European Standard specifies an outline of the operation of a CT system, and the interpretation of the results in order to provide the user with technical information to select suitable parameters.

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 16016-1:2011, *Non destructive testing — Radiation method — Computed tomography — Part 1: Terminology*

EN 16016-2:2011, *Non destructive testing — Radiation method — Computed tomography — Part 2: Principle, equipment and samples*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16016-1:2011 apply.

4 Operational procedure

4.1 General

For target-oriented CT inspection procedures, the test and measurement tasks are defined in advance with regard to the size and type of features/defects to be verified; for example, through the specification of appropriate acceptance levels and geometry deviations. In the following, the process steps of a CT application are described and information on its implementation provided.

4.2 CT system set-up

4.2.1 General

The CT system set-up is oriented towards the requirements for the given task. The required spatial resolution (taking into account the tube focal spot size), contrast resolution, voxel size and the CT image quality can be derived from these requirements. The quality of the CT image is determined by different parameters, which under certain circumstances counteract each other.

In the following, system parameters are described and information is provided on setting up a CT system for inspection. Due to the interactions of the different system parameters, it may be necessary to run through the set-up steps several times in order to acquire optimal data.

The optimal energy is that which gives the best signal-to-noise ratio and not necessarily that which gives the clearest radiograph (the dependency of the detector efficiency on the energy is to be taken into account). However, in order to differentiate between materials of different chemical composition it may be necessary to adjust the accelerating voltage to maximise the difference in their linear attenuation coefficients.

4.2.2 Geometry

The source-detector and source-object distances and thus also the beam angle used should be specified. In order to achieve high resolutions, the projection can be magnified onto the detector. The magnification is equal to the ratio of the source-detector distance to the source-object distance. Increasing source-detector