INTERNATIONAL STANDARD

ISO 9236-1

Second edition
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Photography — Sensitometry of screen/film systems for medical radiography —

Part 1: Determination of sensitometric curve shape, speed and average gradient

Photographie — Sensitométrie des ensembles film/écran pour la radiographie médicale —

Partie 1: Détermination de la forme de la courbe sensitométrique, de la sensibilité et du contraste moyen

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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 9236-1 was prepared by Technical Committee ISO/TC 42, *Photography*.

This second edition cancels and replaces the first edition (ISO 9236-1:1996), which has been technically revised to incorporate the following technical and major editorial changes:

— a spherical ionization chamber, or an equivalent detector, is required for dosimetry;

— only high frequency or 12-pulse high-voltage generators are allowed, 6-pulse high-voltage generators are excluded;

— the allowed uncertainty for the density measurement has been increased in order to comply with the other parts of the ISO 9236 series;

— the exposure times for the determination of speed and sensitometric curve shape have been reduced to match the current state of the art;

— the phantom of Technique IV has been changed (leaving the beam quality unchanged) in order to reduce the air kerma rate;

— the distances between the focal spot of the x-ray tube and the screen-film combination when determining speed and average gradient may now be in the range from 1,5 m to 4,0 m;

— the use of a monitoring detector is no longer mandatory, because the precision of modern x-ray tubes and high-voltage generators is often superior to that of monitoring detectors;

— the total uncertainty which can be reached has been changed;

— an informative annex has been added in order to describe the background of speed and curve shape measurements, the choice of phantoms, and the energy dependence of speed values.

ISO 9236 consists of the following parts, under the general title Photography — Sensitometry of screen/film systems for medical radiography:

— *Part 1: Determination of sensitometric curve shape, speed and average gradient*

— *Part 3: Determination of sensitometric curve shape, speed and average gradient for mammography*

The following part is under preparation:

— *Part 2: Method for determining modulation transfer function (MTF)*

Introduction

This part of ISO 9236 provides methods for determining the sensitometric curve shape, the average gradient and the speed of radiographic screen/film/filmholder/processing systems used in medical radiography, except in mammography and dental radiography.

The sensitometric curve shape, which is also needed for the determination of other properties (as, for example, the modulation transfer function), is measured under low scatter conditions via intensity scale X-ray sensitometry, preferably using an inverse square sensitometer. For the determination of the sensitometric curve shape, as well as for a subsequent determination of the average gradient from the measured curve, but not for speed, the irradiation of the screen/film/filmholder combination need to be measured only in relative units.

Speed is measured in a separate way, under exposure conditions which simulate medical practice more closely, including realistic fractions of scattered radiation. Different types of medical exposures are simulated by using appropriate phantoms and X-ray tube voltages, and the screen/film/filmholder combination is exposed behind the respective phantom. The irradiation is measured in absolute units of air kerma (gray, Gy) in order to determine the speed.

Four different techniques are defined, differing in beam quality and fraction of scattered radiation, simulating the imaging of extremities, skull, lumbar spine and colon, and chest. Speed may be measured for each technique of interest. Owing to its dependence on X-ray energy and scatter, screen/film system speed varies widely in medical practice. The four measurement conditions described in this part of ISO 9236 provide values that are representative of those found under practical conditions.

Photography — Sensitometry of screen/film systems for medical radiography —

Part 1: Determination of sensitometric curve shape, speed and average gradient

1 Scope

This part of ISO 9236 specifies methods for the determination of the sensitometric curve shape, average gradient and speed of a single sample of a screen/film/filmholder/processing system for medical radiography. It is not applicable to special radiographic applications such as mammography, dental radiography and direct-exposing medical radiographic systems (see for example ISO 5799 [3]).

The filmholder can be any means that ensures close screen/film contact and prevents the film from being exposed to ambient light. In particular, the filmholder can be a light-tight vacuum bag, as often used in the laboratory, or a radiographic cassette as used in medical radiography.

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 5-2:2001, *Photography — Density measurements — Part 2: Geometric conditions for transmission density*

ISO 5-3:1995, *Photography — Density measurements — Part 3: Spectral conditions*

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*

IEC 60522:1999, *Determination of the permanent filtration of X-ray tube assemblies*

3 Terms and definitions

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

3.1
screen/film system
radiographic imaging system consisting of screen(s), film, filmholder and film processing

NOTE Hereafter, screen/film/filmholder combinations will be referred to as “combinations” and will be referred to as “systems” when the processing is included.