SLOVENSKI STANDARD
SIST EN 61262-7:1998

01-september-1998

Medical electrical equipment - Characteristics of electro-optical X-ray image intensifiers - Part 7: Determination of the modulation transfer function (IEC 61262-7:1995)

Medical electrical equipment - Characteristics of electro-optical X-ray image intensifiers -- Part 7: Determination of the modulation transfer function

Medizinische elektrische Geräte - Merkmale von elektronenoptischen Röntgenbildverstärkern -- Teil 7: Bestimmung der Modulationsübertragungsfunktion

Appareils électromédicaux - Caractéristiques des intensificateurs électro-optiques d'image radiologique -- Partie 7: Détermination de la fonction de transfert de modulation

Ta slovenski standard je istoveten z: **EN 61262-7:1995**

ICS:

11.040.50	Radiografska oprema	Radiographic equipment

SIST EN 61262-7:1998 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61262-7

November 1995

ICS 11.040.50

Descriptors: Medical electrical equipment, radiology apparatus, X-ray apparatus, image intensifiers, transfer functions, modulation

English version

Medical electrical equipment
Characteristics of electro-optical X-ray image intensifiers
Part 7: Determination of the modulation transfer function
(IEC 1262-7:1995)

Appareils électromédicaux
Caractéristiques des intensificateurs électro-optiques d'image radiologique
Partie 7: Détermination de la fonction de transfert de modulation
(CEI 1262-7:1995)

Medizinische elektrische Geräte
Merkmale von elektronenoptischen Röntgenbildverstärkern
Teil 7: Bestimmung der Modulationsübertragungsfunktion
(IEC 1262-7:1995)

This European Standard was approved by CENELEC on 1995-09-20. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 62B/250/DIS, future edition 1 of IEC 1262-7, prepared by SC 62B, Diagnostic imaging equipment, of IEC TC 62, Electrical equipment in medical practice, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61262-7 on 1995-09-20.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1996-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1996-07-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annex ZA is normative and annexes A, B, C and D are informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 1262-7:1995 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 336	1993	X-ray tube assemblies for medical diagnosis Characteristics of focal spots	EN 60336	1995
IEC 788	1984	Medical radiology Terminology	HD 501 S1	1988
IEC 1262-4	1994	Medical electrical equipment Characteristics of electro-optical X-ray image intensifiers Part 4: Determination of the image distortion	EN 61262-4	1994
ISO/DIS 9334	-	Optics and optical instruments Optical transfer function Definitions and mathematical relationships	-	-

NORME INTERNATIONALE
INTERNATIONAL STANDARD

CEI
IEC
1262-7

Première édition
First edition
1995-09

Appareils électromédicaux – Caractéristiques des intensificateurs électro-optiques d'image radiologique –

Partie 7: Détermination de la fonction de transfert de modulation

Medical electrical equipment – Characteristics of electro-optical X-ray image intensifiers –

Part 7: Determination of the modulation transfer function

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE Q

Pour prix, voir catalogue en vigueur
For price, see current catalogue

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FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters, prepared by technical committees on which all the National Committees having interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subject dealt with.

3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, the IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC standard and the corresponding national or regional standard shall be clearly indicated in the latter.

International Standard IEC 1262-7 has been prepared by sub-committee 62B: Diagnostic imaging equipment, of IEC technical committee 62: Electrical equipment in medical practice.

The text of this standard is based on the following documents:

DIS	Report on voting
62B/250/DIS	62B/269/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annexes A, B, C and D are for information only.

In this standard, the following print types are used:

- Requirements, compliance with which can be tested, and definitions: in roman type;
- Explanations, advice, introductions, general statements, and exceptions: in smaller type;
- *Test specifications: in italic type;*
- TERMS USED THROUGHOUT THIS STANDARD WHICH HAVE BEEN DEFINED IN 3.1 AND IN ANNEX A: SMALL CAPITALS.

INTRODUCTION

Imaging systems are often being evaluated using subjective measures of performance, such as limiting resolution. These methods do not necessarily describe the performance appropriately in imaging tasks that are relevant to the intended use of the system, and are susceptible to the variability of human observers.

Linear shift-invariant imaging systems can be conveniently analysed in terms of their TRANSFER functions. The signal TRANSFER of such systems can be specified by the OPTICAL TRANSFER FUNCTION (OTF), which shows the response of the system to sine waves as a function of their spatial frequency. The MODULATION TRANSFER FUNCTION (MTF), the modulus of the OTF, is sufficient for describing the signal TRANSFER of X-RAY IMAGE INTENSIFIERS. Systems are called shift-invariant when the POINT SPREAD FUNCTION does not vary with position. Note that X-RAY IMAGE INTENSIFIERS generally are shift-invariant over a limited area only: the isoplanatic region.

The MODULATION TRANSFER FUNCTION can be determined in several ways (see, for example [1] of annex D):

- from square wave responses;
- from the Fourier transform of the LINE SPREAD FUNCTION;
- from the Hankel transform of the POINT SPREAD FUNCTION;
- from scanning a slit image with a spatial filter.

Any method is acceptable if performed correctly. For the purpose of simplicity, this standard elaborates on two methods: the Fourier transform of the LINE SPREAD FUNCTION, referred to as the LSF method, and the spatial filter method. Accurate determination of the MODULATION TRANSFER FUNCTION requires specialized EQUIPMENT and does not generally lend itself to be performed at field installations.

This standard only specifies methods for measurement of the MODULATION TRANSFER FUNCTION of X-RAY IMAGE INTENSIFIERS near the CENTRE OF THE ENTRANCE FIELD.

MEDICAL ELECTRICAL EQUIPMENT –

CHARACTERISTICS OF ELECTRO-OPTICAL X-RAY IMAGE INTENSIFIERS –

Part 7: Determination of the modulation transfer function

1 Scope

This International Standard applies to ELECTRO-OPTICAL X-RAY IMAGE INTENSIFIERS for medical use, as components of diagnostic X-RAY EQUIPMENT.

This International Standard describes a method of determining the MODULATION TRANSFER FUNCTION of X-RAY IMAGE INTENSIFIERS.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 336: 1993, *X-ray tube assemblies for medical diagnosis – Characteristics of focal spots*

IEC 788: 1984, *Medical radiology – Terminology*

IEC 1262-4: 1994, *Medical electrical equipment – Characteristics of electro-optical X-ray image intensifiers – Part 4: Determination of the image distortion –*

ISO/DIS 9334, *Optics and optical instruments – Optical transfer function – Definitions and mathematical relationships*

3 Terminology

3.1 *Definitions*

For the purposes of this International Standard, the following definitions apply together with those given in IEC 788. The definitions given below take preference over those given in IEC 788 when differences occur.

3.1.1 *XRII:* An abbreviation for ELECTRO-OPTICAL X-RAY IMAGE INTENSIFIER.

3.1.2 *ENTRANCE PLANE:* The plane perpendicular to the axis of symmetry of the XRII and grazing the part of the XRII, including its housing, that protrudes most in the direction of the RADIATION SOURCE.