

AS/NZS 4356.7:1996
IEC 1262-7:1995

Australian/New Zealand Standard[®]

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

**Part 7: Determination of the
modulation transfer function**

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This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee HT/23, Medical Diagnostic Imaging Equipment. It was approved on behalf of the Council of Standards Australia on 2 September 1996 and on behalf of the Council of Standards New Zealand on 29 July 1996. It was published on 5 October 1996.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee HT/23 on Medical Diagnostic Imaging Equipment, as a Joint Standard.

This Standard is identical to and has been reproduced from IEC 1262-7:1995, *Medical electrical equipment—Characteristics of electro-optical X-ray image intensifiers, Part 7: Determination of the modulation transfer function*.

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For the purpose of this Standard, the IEC text should be modified as follows:

- (a) **Terminology** The words 'this Australian/New Zealand Standard' should replace the words 'this International Standard' wherever they appear.
- (b) **Decimal marker** Substitute a full point for a comma where it appears as a decimal marker.
- (c) **References** The references to International Standards should be replaced by references to the following Australian or Joint Australian/New Zealand Standards:

<i>Reference to International Standard or other publication</i>		<i>Australian/New Zealand Standard</i>	
IEC		AS/NZS	
366	X-ray tube assemblies for medical diagnosis—Characteristics of focal spots	—	
788	Medical radiology—Terminology	—	
1262	Medical electrical equipment—Characteristics of electro-optical X-ray image intensifiers	4356	Medical electrical equipment—Characteristics of electro-optical X-ray image intensifiers
1262-4	Part 4: Determination of the image distortion	4356.4	Part 4: Determination of the image distortion
ISO/DIS		—	
9334	Optics and optical instruments—Optical transfer function—Definitions and mathematical relationships		

The term 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance.

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AUSTRALIAN/NEW ZEALAND STANDARD

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.

3.1.3 ENTRANCE FIELD: For an XRII, the area in the ENTRANCE PLANE that can be used for the TRANSMISSION of an X-RAY PATTERN under specific conditions.

3.1.4 ENTRANCE FIELD SIZE: For an XRII, the diameter of the field in the ENTRANCE PLANE that can be used at a specified SED for the TRANSMISSION of an X-RAY PATTERN. For an XRII with more than one magnification mode, the ENTRANCE FIELD SIZE for each of the magnification modes shall correspond to the same diameter of the XRII OUTPUT IMAGE occurring with the largest ENTRANCE FIELD SIZE.

3.1.5 SOURCE TO ENTRANCE PLANE DISTANCE (abbreviation SED): The distance between the FOCAL SPOT of the X-RAY TUBE and the ENTRANCE PLANE of the XRII.

3.1.6 CENTRE OF THE OUTPUT IMAGE: The centre of the smallest circle circumscribing the OUTPUT IMAGE.

3.1.7 CENTRE OF THE ENTRANCE FIELD: That point in the ENTRANCE PLANE which is imaged at the CENTRE OF THE OUTPUT IMAGE.

3.1.8 CENTRAL AXIS: The line perpendicular to the ENTRANCE PLANE passing through the CENTRE OF THE ENTRANCE FIELD.

3.1.9 CENTRAL MAGNIFICATION: As a characteristic of XRIIs, the ratio of the length in the OUTPUT IMAGE to the actual length of a small object placed in the ENTRANCE PLANE symmetrically about the CENTRAL AXIS.

3.1.10 POINT SPREAD FUNCTION (abbreviation PSF): Normalized distribution of irradiance in the image of a point source, see ISO/DIS 9334.

3.1.11 ISOPLANATIC REGION: Region where the form of the POINT SPREAD FUNCTION is constant within specified accuracy.

3.1.12 LINEARITY: Property of an imaging system in that the image of a weighted sum of objects is identical to the similarly weighted sum of images of individual objects.

3.1.13 LINEAR RANGE: Range of input signals within which the imaging system exhibits LINEARITY within specified accuracy, see ISO/DIS 9334.

NOTE – The range of input signals indicating the LINEAR RANGE of the imaging system should be specified by minimum and maximum levels.

3.1.14 OPTICAL TRANSFER FUNCTION (abbreviation OTF): Two-dimensional Fourier transform of the imaging system's POINT SPREAD FUNCTION, see ISO/DIS 9334.

NOTE – For the OPTICAL TRANSFER FUNCTION to have significance, it is essential that the imaging system is working in its LINEAR RANGE, and that an ISOPLANATIC REGION is considered.

3.1.15 ONE-DIMENSIONAL OPTICAL TRANSFER FUNCTION (abbreviation 1-OTF): Section of the OPTICAL TRANSFER FUNCTION through the origin in a given orientation.