

Diagnostic X-ray imaging equipment — Characteristics of general purpose and mammographic anti-scatter grids

The European Standard EN 60627:2001 has the status of a
British Standard

ICS 11.040.50; 11.040.55

National foreword

This British Standard is the official English language version of EN 60627:2001, including Corrigendum August 2002. It is identical with IEC 60627:2001. It supersedes BS 5913:1980 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CH/73, X-ray equipment components, protection and utilization, which has the responsibility to:

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- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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English version

**Diagnostic X-ray imaging equipment -
Characteristics of general purpose and mammographic anti-scatter grids
(IEC 60627:2001)**

Equipements de diagnostic par imagerie
à rayonnement X -
Caractéristiques des grilles antidiffusantes
d'usage général et de mammographie
(CEI 60627:2001)

Bildgebende Geräte
für die Röntgendiagnostik -
Kenngrößen von Streustrahlenrastern
für die allgemeine Anwendung
und für die Mammographie
(IEC 60627:2001)

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European Committee for Electrotechnical Standardization
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Foreword

The text of document 62B/436A/FDIS, future edition 2 of IEC 60627, 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 60627 on 2001-11-01. This European Standard supersedes EN 61953:1998.

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) 2002-08-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2004-11-01

Annexes designated "normative" are part of the body of the standard.

In this standard, annexes A, B and ZA are normative.

Annex ZA has been added by CENELEC.

In this standard, the following print types are used:

- requirements, compliance with which can be tested, and definitions: in roman type;
- explanations, advice, notes, general statements, exceptions and references: in smaller roman type;
- *test specifications: in italic type;*
- TERMS DEFINED IN EN 60601-1, IN EN 60788, IN CLAUSE 3 OF THIS STANDARD OR IN OTHER IEC PUBLICATIONS REFERENCED IN ANNEX B: IN SMALL CAPITALS.

Endorsement notice

The text of the International Standard IEC 60627:2001 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

The first edition of IEC 60627 was intended for ANTI-SCATTER GRIDS used in general radiography and is not appropriate for ANTI-SCATTER GRIDS used in mammography. As a consequence, a complementary standard IEC 61953 was published. During the preparation of this latter standard, it became clear that a revision of IEC 60627 itself was necessary, and it was decided to merge together the two standards covering ANTI-SCATTER GRIDS. Wherever possible, a harmonized approach has been used. Where there are differences in this standard between general purpose ANTI-SCATTER GRIDS and MAMMOGRAPHIC ANTI-SCATTER GRIDS, these are listed as items a) and b) respectively.

Some of the differences for general purpose ANTI-SCATTER GRIDS between this second edition and the first edition of IEC 60627 are outlined below:

- some definitions have been modified and others added to improve clarity, harmonization or generality;
- the concept of a reference ANTI-SCATTER GRID is now omitted. It was found that such ANTI-SCATTER GRIDS were little used. It should be sufficient to define unambiguously the RADIATION DETECTOR and the measuring procedure;
- the same PHANTOM is used for measurements of TRANSMISSION OF PRIMARY RADIATION and TRANSMISSION OF SCATTERED RADIATION;
- the RADIATION QUALITIES used for the measurement have been changed and are now qualities specified in IEC 61267;
- a lower energy X-RAY SPECTRUM than before is used to measure the performance of general purpose ANTI-SCATTER GRIDS. This was considered to be more appropriate than the spectrum previously used;
- where a general purpose ANTI-SCATTER GRID is specified for low-energy use, additional measurements have now to be made with appropriate, specified RADIATION QUALITIES;
- the diameter of the measuring field is reduced;
- the TRANSMISSION OF PRIMARY RADIATION is now given on the ANTI-SCATTER GRID or in the ACCOMPANYING DOCUMENTS;
- information on the nature of the material used for the grid interspace and on the nature of the grid covers is now given in the ACCOMPANYING DOCUMENTS;
- application limits are now given for PARALLEL GRIDS;
- the position of the grid centre is now indicated.

Special laboratory provisions and carefully controlled test conditions are needed for the measurements described here.

DIAGNOSTIC X-RAY IMAGING EQUIPMENT –

Characteristics of general purpose and mammographic anti-scatter grids

1 Scope and object

This International Standard deals with the definitions, determination and indication of characteristics of ANTI-SCATTER GRIDS used in diagnostic X-ray imaging equipment, in order to reduce the incidence of SCATTERED RADIATION, produced particularly in the body of the PATIENT, upon the IMAGE RECEPTION AREA and thus to improve the contrast of the X-RAY PATTERN.

In this standard only LINEAR GRIDS are considered.

Since at present only FOCUSED GRIDS are used in mammography, this standard is restricted to FOCUSED GRIDS for MAMMOGRAPHIC ANTI-SCATTER GRIDS.

This standard is not intended to be applied for ACCEPTANCE TESTS.

This standard does not cover the homogeneity of performance over the area of a grid.

This standard is intended to be applied for the demonstration of the characteristics of ANTI-SCATTER GRIDS under test conditions. These conditions are not usually available at the USER's site.

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.

IEC 60417 (all parts), *Graphical symbols for use on equipment*

IEC 60601-1, *Medical electrical equipment – Part 1: General requirements for safety*

IEC 60788, *Medical radiology – Terminology*

IEC 61223-1, *Evaluation and routine testing in medical imaging departments – Part 1: General aspects*

IEC 61267, *Medical diagnostic X-ray equipment – Radiation conditions for use in the determination of characteristics*

3 Terminology

3.1 Degree of requirements

In this standard, certain terms which are not printed in SMALL CAPITALS have particular meanings:

- "shall" indicates a requirement that is mandatory for compliance;
- "should" indicates a strong recommendation that is not mandatory for compliance;
- "may" indicates a permitted manner of complying with a requirement or of avoiding the need to comply;
- "specific" is used to indicate definitive information stated in this standard or referenced in other standards, usually concerning particular operating conditions, test arrangements or values connected with compliance;
- "specified" is used to indicate definitive information stated by the MANUFACTURER in ACCOMPANYING DOCUMENTS or in other documentation relating to the EQUIPMENT under consideration, usually concerning its intended purpose, or the parameters or conditions associated with its use or with testing to determine compliance.

3.2 Use of terms

In this standard, terms printed in SMALL CAPITALS are used as defined in IEC 60601-1, in IEC 60788, in 3.3 of this standard or in other IEC publications referenced in annex B.

NOTE Attention is drawn to the fact, that in cases where the concept addressed is not strongly confined to the definition given in one of the publications listed above a corresponding term is printed in lower-case letters.

An index of defined terms used in this standard is given in annex B.

3.3 Defined terms

For the purpose of this International Standard, the following definitions apply.

NOTE Some of the defined terms given in this standard deviate from those given in the current edition of IEC 60788.

3.3.1

ANTI-SCATTER GRID

device with a fixed periodic arrangement of materials with different X-ray ATTENUATION properties to be placed in front of the IMAGE RECEPTION AREA in order to reduce the incidence of SCATTERED RADIATION upon that area and thus increase the contrast in the X-RAY PATTERN

3.3.2

LINEAR GRID

ANTI-SCATTER GRID composed of highly absorbing strips and highly transmitting interspaces which are parallel in their longitudinal direction

3.3.3

PARALLEL GRID

LINEAR GRID in which the planes of the absorbing strips are parallel to each other and perpendicular to the incident face

3.3.4

FOCUSED GRID

LINEAR GRID in which the planes of the absorbing strips converge to a straight line at the FOCUSING DISTANCE

3.3.5

TAPERED GRID

LINEAR GRID in which the height of the absorbing strips decreases as the distance between the absorbing strips and the TRUE CENTRAL LINE increases. This decrease is symmetrical about the TRUE CENTRAL LINE

3.3.6

CROSS-GRID

ANTI-SCATTER GRID composed of two LINEAR GRIDS built together in such a way that the directions of their absorbing strips form an angle

3.3.6.1

ORTHOGONAL CROSS-GRID

CROSS-GRID in which the directions of the absorbing strips form an angle of 90°

3.3.6.2

OBLIQUE CROSS-GRID

CROSS-GRID in which the directions of the absorbing strips form an angle other than 90°

3.3.7

STATIONARY GRID

ANTI-SCATTER GRID used in such a way that it does not move in relation to the RADIATION BEAM

3.3.8

MOVING GRID

ANTI-SCATTER GRID used in an ACCESSORY that enables the ANTI-SCATTER GRID to be moved, when irradiated by a RADIATION BEAM, in order to avoid the imaging of the absorbing strips and the consequent loss of information

3.3.9

MAMMOGRAPHIC ANTI-SCATTER GRID

FOCUSED GRID specially designed for mammography

NOTE In this standard the term "general purpose ANTI-SCATTER GRID" is used to describe any ANTI-SCATTER GRID not specially designed for mammography.

3.3.10

Geometric characteristics

3.3.10.1

GRID RATIO, r

ratio between the height of the absorbing strips and the distance between the absorbing strips in the centre of a LINEAR GRID

3.3.10.2

FOCUSING DISTANCE, f_0

distance between the incident face of a FOCUSED GRID and the line into which the planes of the absorbing strips of the grid converge (unit: cm)

NOTE Attention is drawn to the differences between "FOCUSING DISTANCE", "FOCAL SPOT to grid distance" and "FOCAL SPOT to film distance".

3.3.10.3**APPLICATION LIMITS, f_1 , f_2**

lower, f_1 , and upper, f_2 , limits of the distance from the FOCAL SPOT to the incident face of a FOCUSED GRID or a PARALLEL GRID between which the obtained radiological information can be considered acceptable for many purposes (unit: cm)

NOTE See annex A for details on the calculation of the APPLICATION LIMITS.

3.3.10.4**TRUE CENTRAL LINE**

- for a PARALLEL GRID: line on the incident face in the direction of the absorbing strips and passing through the centre of the grid area
- for a FOCUSED GRID: perpendicular projection onto the incident face of the grid, of the line into which the planes of the absorbing strips converge
- for a TAPERED GRID: line on the incident face in the direction of the absorbing strips and lying within a symmetry plane of the grid structure

NOTE A CROSS-GRID has two TRUE CENTRAL LINES.

3.3.10.5**CENTRAL LINE INDICATION**

marking on the incident face of a LINEAR GRID, which is intended to indicate the position and direction of the TRUE CENTRAL LINE

NOTE In most cases, this marking coincides with the geometric centre line of the grid's incident face.

3.3.10.6**STRIP FREQUENCY, N**

number of absorbing strips per unit length of a LINEAR GRID (unit: cm^{-1})

NOTE This term replaces the previous term "STRIPS PER CENTIMETRE".

3.3.11**Physical characteristics****3.3.11.1****TRANSMISSION OF PRIMARY RADIATION, T_p**

characteristic of an object, evaluated as the ratio of the MEASURED VALUE of the quantity or rate of PRIMARY RADIATION with the object placed in a RADIATION BEAM to that with the object removed from the beam, under specific measuring conditions

3.3.11.2**TRANSMISSION OF SCATTERED RADIATION, T_s**

characteristic of an object, evaluated as the ratio of the MEASURED VALUE of the quantity or rate of SCATTERED RADIATION with the object placed in a RADIATION BEAM to that with the object removed from the beam, under specific measuring conditions

3.3.11.3**TRANSMISSION OF TOTAL RADIATION, T_t**

characteristic of an object, evaluated as the ratio of the MEASURED VALUE of the quantity or rate of total RADIATION with the object placed in a RADIATION BEAM to that with the object removed from the beam, under specific measuring conditions