INTERNATIONAL STANDARD

NORME INTERNATIONALE

IEC
CEI
60412

Second edition
Deuxième édition
2007-06

**Nuclear instrumentation –
Scintillation detectors –
Nomenclature (identification) –
Standard dimensions of scintillators**

**Instrumentation nucléaire –
Détecteurs à scintillation –
Nomenclature (identification) –
Dimensions normalisées des scintillateurs**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

NUCLEAR INSTRUMENTATION – SCINTILLATION DETECTORS – NOMENCLATURE (IDENTIFICATION) – STANDARD DIMENSIONS OF SCINTILLATORS

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International Standard IEC 60412 has been prepared by IEC technical committee 45: Nuclear instrumentation.

This second edition cancels and replaces the first edition published in 1973. It constitutes a technical revision.

The main changes with respect to the previous edition are as follows:

– addition of nomenclature of scintillation detectors.

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

FDIS	Report on voting
45/642/FDIS	45/644/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

Now the manufacturers of scintillation detectors carry out nomenclature of production at their own choosing emphasizing, first of all, trade marks as corresponding abbreviations. Nomenclature is complex enough and includes type of detector, scintillator material, geometry and dimensions scintillator, material of housing and window, type and dimensions of photomultiplier tube, presence of additional electronic units, presence of other special units. Moreover, various manufacturers have different order and contents of the mentioned sections of type numbering. It is difficult for a customer of scintillation detectors to understand such systems of nomenclature. The situation can be improved by the introduction of uniformity in type numbering system, thus preserving firms marks and abbreviations. Thus it is advisable to place sections of nomenclature in strict order, being guided by the principle of "expansion" of scintillation detector complication.

Following such order brings uniformity in nomenclature construction, facilitates its comprehension and promotes a correct choice of scintillation production by consumers.

NUCLEAR INSTRUMENTATION – SCINTILLATION DETECTORS – NOMENCLATURE (IDENTIFICATION) – STANDARD DIMENSIONS OF SCINTILLATORS

1 Scope and object

This International Standard gives guidelines for scintillation detectors nomenclature (identification) and standard dimensions of scintillators.

This Standard is applicable to all types of solid organic and inorganic scintillators used in detectors for scintillation counting and spectrometry.

The object of this standard is to define a standardized nomenclature for scintillation detectors in which most of the properties can be found.

The object of this standard is to standardize the dimensions of bare scintillators in order to facilitate interchangeability of non-encapsulated scintillators and to facilitate comparisons of measurements with encapsulated scintillators.

NOTE The identification label laid down in clause 2 of the present standard includes certain dimensions which may be expressed in millimetres or inches. The SI system recommends the use of millimetres rather than inches.

2 Scintillation detectors nomenclature (identification)

The identification of a detector is by a predefined sequence of specification items described below. Each specification item refers to a specific property of the detector material and/or construction.

If an item is not specifically defined, the item is entered as an “X” and the specification shall be defined by the manufacturer.

The general structure of an identification label is:

2.1 2.2 2.3 2.4 2.5 2.6/2.7 2.8 2.9 2.10

Where:

2.1 – Geometry of the scintillator

V – square;

R – rectangular;

S – spherical;

H – hexagonal;

C – cylindrical.

2.2 – Diameter of the scintillator in millimetres (specification in inches shall be marked as such, e.g. 2’’)

In the case of rectangular scintillator dimensions, the two measures are separated by the letter "x" (see Example 3, below). The most frequently found (standard) dimensions of scintillator diameters are listed in Table 1.

Table 1 – Diameters of scintillators

Diameter		Diameter	
mm	Inches	mm	Inches
3,2	0,125	44,5	1,750
4,0	0,157	50,8	2,000
6,3	0,250	63,0	2,480
10,0	0,394	63,5	2,500
12,7	0,500	76,2	3,000
16,0	0,630	100,0	3,937
19,0	0,750	101,6	4,000
25,0	0,984	127,0	5,000
25,4	1,000	152,4	6,000
31,8	1,250	160,0	6,299
38,1	1,500	203,2	8
40,0	1,575		

2.3 – Detector configuration

This definition is producer-specific, for example:

IMP – integrally mounted photomultiplier;

C – crystal without photomultiplier.

2.4 – Height of the scintillator in millimetres (specification in inches shall be marked as such, e.g. 4")

The most frequently found (standard) dimensions of scintillator heights are listed in Table 2.

Table 2 – Heights of scintillators

Height		Height	
mm	Inches	mm	Inches
0,5	0,020	38,1	1,500
1,0	0,039	40,0	1,575
2,0	0,078	44,5	1,750
3,2	0,125	50,8	2,000
4,0	0,157	63,0	2,480
6,3	0,250	63,5	2,500
10,0	0,394	76,2	3,000
12,7	0,500	100,0	3,937
16,0	0,630	101,6	4,000
19,0	0,750	127,0	5,000
25,0	0,984	152,4	6,000
25,4	1,000	160,0	6,299
31,8	1,250	400,0	16 (nominal)

2.5 – Scintillator material; doping elements are written in parentheses

N – NaI(Tl);
CT – CsI(Tl);
CN – CsI(Na);
C – CsI(pure);
LiI – LiI(Eu);
CaF – CaF_2(Eu);
BGO – $Bi_4Ge_3O_{12}$;
CWO – $CdWO_4$;
PWO – $PbWO_4$;
LC – $LaCl_3$(Ce);
LB – $LaBr_3$(Ce);
P – Plastic;
LSO – Lu_2SiO_5;
LYSO – $Lu_{1,8}Y_{0,8}SiO_5$;
GSO – Gd_2SiO_5.

Other materials as viable.

2.6 – Type of entrance window

A – aluminium window;
B – beryllium window;
K – carbon epoxy window;
M – polyethyleneterphthalate window;
S – steel window.

2.7 – Type of housing

S – steel housing (chrome plated or stainless);
C – copper housing;
St – standard aluminium 0,5 mm.

2.8 – Diameter of the photomultiplier tube (PMT) in millimetres (specification in inches shall be marked as such, e.g. 7")

In the case when a detector has several PMT, the diameters are separated by a slash (/).

2.9 – Extra features of PMT

M – external solid μ-metal shield;
E1 – built-in Voltage Divider (VD);
E2 – built-in voltage divider and preamplifier;
HV – built-in high voltage generator;
P – pure NaI used as light-guide;
Q – quartz glass used as light-guide;