SLOVENSKI STANDARD

SIST EN 60325:2005

julij 2005

Oprema za zaščito pred sevanjem – Merilniki in monitorji za nadzorovanje kontaminacije z alfa, beta in alfa/beta (energija beta > 60 keV)

Radiation protection instrumentation – Alpha, beta and alpha/beta (beta energy > 60 keV) contamination meters and monitors

ICS 13.280

Referenčna številka
SIST EN 60325:2005(en)

EUROPEAN STANDARD **EN 60325**

NORME EUROPÉENNE

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English version

Radiation protection instrumentation - Alpha, beta and alpha/beta (beta energy > 60 keV) contamination meters and monitors
(IEC 60325:2002, modified)

Instrumentation pour la radioprotection - Contaminamètres et moniteurs de contamination alpha, bêta et alpha/bêta (énergie des bêta > 60 keV) (CEI 60325:2002, modifiée)

Strahlenschutz-Messgeräte - Alpha-, Beta- und Alpha/Beta- (Betaenergie > 60 keV) Kontaminationsmessgeräte und -monitore (IEC 60325:2002, modifiziert)

This European Standard was approved by CENELEC on 2004-05-01. 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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

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Ref. No. EN 60325:2004 E

Foreword

The text of the International Standard IEC 60325:2002, prepared by SC 45B, Radiation protection instrumentation, of IEC TC 45, Nuclear instrumentation, together with the common modifications prepared by the CENELEC BTTF 111-3, Instrumentation for ionizing radiation measurement and protection, was submitted to the formal vote and was approved by CENELEC as EN 60325 on 2004-05-01.

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)	2005-05-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2007-05-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60325:2002 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

1 Scope and object

In line 4, **delete** "γ".

2 Normative references

Replace the text of Clause 2, Normative references, by:

NOTE Normative references to international publications are listed in Annex ZA (normative).

3 Terms and definitions

3.2 **Replace** by:

3.2
surface emission rate (of a source)
number of particles of a given type above a given energy emerging from face of the source or its window per unit time

3.3 **Replace** by:

3.3
source efficiency
largest of the two quotients, of the surface emission rate by the number of particles of the same type created or released per unit time either within the source thickness or within the source saturation layer

3.6 In the second line, **replace** "sensitive" by "active surface".

3.9 **Delete** the first note.

3.10 **Replace** "M_i" by "v" and "M_t" by "v_c".

3.11 **Replace** by:

3.11
response (of a radiation measuring assembly)
ratio, under specified conditions, given by the relation:

$$R = \frac{v}{v_c}$$

where v is the value of the quantity measured by the equipment or assembly under test and v_c is the conventionally true value of this quantity

3.12 **Replace** the formula by:

$$I(\%) = \frac{v - v_c}{v_c} \times 100$$

where v is the indicated value of a quantity and v_c is the conventionally true value of the quantity at the point of measurement.

3.15 **Replace** the explanation of the first variable for the formula by:

$S_{(nuclide)}$ is the surface emission rate response (see 3.6);

3.16 **Replace** by:

3.16
conventionally true value of a quantity
best estimate of the value of a quantity used for a given purpose

NOTE A conventionally true value is, in general, regarded as sufficiently close to the true value for the difference to be insignificant for the given purpose. For example, a value determined from a primary or secondary standard or by a reference instrument, may be taken as the conventionally true value.

7 General test procedures

7.2 **Replace** reference to “9.3.2” by reference to “9.4.2.2” in the first line.

8 Electrical characteristics

8.1 **Replace** the title of the subclause by:

8.1 Influence of statistical fluctuations

8.1.1 **Replace** the second paragraph by:

The coefficient of variation of the indication due to the statistical nature of the radiation detected shall be less than 0,2.

8.3 **Replace** the first paragraph by:

The response time and coefficient of variation of the statistical fluctuations are interdependent characteristics, acceptable limits of which are given in 8.1 and 8.2.

8.5.2 **Replace** the first sentence by:

For this test, a pulse generator set to give pulses of an amplitude just in excess of the threshold setting (between 1 and 1,1 times the value of the setting) of the assembly and of a rate within the range of the assembly as well as a high voltage meter to monitor the high voltage supply to the detector are required.

Replace the third paragraph by:

Switch the assembly on and take readings of the assembly and the high voltage meter every 10 s from 60 s to 120 s after switching on. 15 min after switching on, take the final values. The values indicated by the meter up to 1 min and after shall be within ± 10 % of final value and those at 2 min shall be within ± 5 % of the final value. The reading of the high voltage meter shall be within ± 2 % of the final value after 1 min and ± 1 % of the final value after 2 min.

8.6.3 In the second sentence of the second paragraph, **replace** “a small reduction” by “a reduction of about 25 %”.

9 Radiation characteristics

9.2 **Replace** the title of the subclause by:

9.2 Surface emission rate response

Replace “instrument efficiency” by “surface emission rate response” in the text of whole subclause.

9.2.1 **Replace** the first sentence by:

The measurement of surface emission rate response (see 3.6) is a routine test and shall be performed on each production assembly.

9.3.2 In the first line, **replace** “near” by “nearly”.

In the fourth paragraph, **replace** “radius of this is 25 mm” by “diameter of this is 25 mm”.

9.4.1 In the first line, **replace** “E” by “I”.

9.4.2.3 **Replace** “I” by “C” and “i” by “c” as well as “E” by “I” in the text.

Replace the formula by:

$$I\ (\%) = \left(1 - \frac{cQ}{Cq}\right) \times 100$$

9.4.2.4 **Replace** reference to “9.4.2” by reference to “9.4.1” in two places.

Replace “E” by “I” in three places.

In the last line, **replace** “20 %” by “± 10 %”.

9.6.3 In the second line of last paragraph, **replace** “activity” by “surface emission rate”.

9.6.4 **Replace** the third paragraph by:

The response shall be given in counts per unit time per unit surface emission rate of the alpha emitter, or activity or activity per unit area per unit surface emission rate of the alpha emitter in the case of readouts in terms of activity or activity per unit area.

10 Environmental influences

10.4.1.2 **Replace** the title of the subclause by:

10.4.1.2 Method of test

10.4.2.2 **Replace** the second sentence by:

The electromagnetic field strength shall be 10 V/m and in the frequency range of 80 MHz to 1 GHz in steps of 1 % (severity level 3 as described in IEC 61000-4-3).

10.4.5.2 **Add** "of that document" after the reference to "6.5.2".

10.4.6.1 In the penultimate line, **replace** "GHz" by "1 GHz".

Replace the two first rows by:

Surface emission rate response	To be stated by manufacturer	9.2.3.1		9.2.3.2
Dependence of surface emission rate response on source position	To be stated by manufacturer and < 50 % of maximum	9.3.2		9.3.2

Replace the 7th row by:

Beta radiation	In the presence of a source of not less than 370 kBq at a distance of not more than 5 mm	Alpha meters, monitors and detectors: ± 25 % Dual purpose (alpha and beta meters and monitors to be stated by the manufacturer)	9.6.3		9.6.3

Replace the 11th row by:

Warm-up (portable assemblies)	1 min	± 25 %			8.5.1
		± 10 % and ± 2 % of high voltage		8.5.2	
	2 min	± 20 %			8.5.1
		± 5 % and ± 1 % of high voltage		8.5.2	

Replace the 12th row by:

Overload	Activity corresponding to 10 times the activity that would give full scale deflection on each range	To remain in excess of full scale for 5 min		8.7.2	8.7.2

In the 16th row (last page), **replace** the entry for "Conducted disturbances induced by fast transient/burst" by:

Conducted disturbances induced by bursts and radio frequencies	As in IEC 61000-4-4 and IEC 61000-4-6	10 % of count rate		10.4.3.2	10.4.3.2

Replace the 17th row (last page) by:

Radiated emissions	See 10.4.60	Less than 0,1 V/m from 1 kHz to 1 GHz		10.4.6.2	10.4.6.2

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

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 60038 (mod)	1983	IEC Standard voltages [1)]	HD 472 S1 + corr. February	1989 2002
IEC 60050-151	2001	International Electrotechnical Vocabulary (IEV) Part 151: Electrical and magnetic devices	-	-
IEC 60050-393	1996	Chapter 393: Nuclear instrumentation: Physical phenomena and basic concepts	-	-
IEC 60050-394	1995	Chapter 394: Nuclear instrumentation: Instruments	-	-
IEC 60068-2-27	1987	Basic environmental testing procedures Part 2-27: Tests – Test Ea and guidance: Shock	EN 60068-2-27	1993
IEC 61000-4-2	1995	Electromagnetic compatibility (EMC) Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	1995
IEC 61000-4-3 (mod)	1995	Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	1996 [2)]
IEC 61000-4-4	1995	Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	1995
IEC 61000-4-5	1995	Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	1995
IEC 61000-4-6	1996	Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	1996
IEC 61000-4-11	1994	Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	1994
IEC 61187 (mod)	1993	Electrical and electronic measuring equipment - Documentation	EN 61187 + corr. March	1994 1995
ISO 7503	series	Evaluation of surface contamination	-	-

1) The title of HD 472 S1 is: Nominal voltages for low voltage public electricity supply systems.

2) EN 61000-4-3:1996 is superseded by EN 61000-4-3:2002, which is based on IEC 61000-4-3:2002.

Publication	Year	Title	EN/HD	Year
ISO 8769	1988	Reference sources for the calibration of surface contamination monitors Beta-emitters (maximum beta energy greater than 0,15 MeV) and alpha-emitters	-	-
ISO 11929-1	2000	Determination of the detection limit and decision threshold for ionizing radiation measurements Part 1: Fundamentals and application to counting measurements without the influence of sample treatment	-	-

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Instrumentation pour la radioprotection – Contaminamètres et moniteurs de contamination alpha, bêta et alpha/bêta (énergie des bêta >60 keV)

Radiation protection instrumentation – Alpha, beta and alpha/beta (beta energy >60 keV) contamination meters and monitors

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIATION PROTECTION INSTRUMENTATION – ALPHA, BETA AND ALPHA/BETA (BETA ENERGY >60 keV) CONTAMINATION METERS AND MONITORS

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 co-operation 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 express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
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4) In order to promote international unification, 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.
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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60325 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation.

This third edition cancels and replaces the second edition published in 1981. This third edition constitutes a technical revision.

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

FDIS	Report on voting
45B/354/FDIS	45B/363/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 3.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

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

RADIATION PROTECTION INSTRUMENTATION – ALPHA, BETA AND ALPHA/BETA (BETA ENERGY >60 keV) CONTAMINATION METERS AND MONITORS

1 Scope and object

This International Standard is applicable to radiation meters and monitors designed for the direct measurement or the direct detection of surface contamination by alpha and/or beta radiation emitting nuclides and which comprise at least:

– a detection assembly (comprising γ counter tube, scintillation detector or semiconductor detector, etc), which may be connected either rigidly or by means of a flexible cable or incorporated into a single assembly.
– a measurement assembly.

Some meters and monitors consist of detection assemblies and measurement assemblies where it is possible to separate the detector assembly and use alternative detection assemblies. Conformity with the standard can either be achieved by:

All combinations of the detection assembly and the measurement assembly conforming to the requirements of this standard.

or

The detection assembly and the measurement assembly separately conforming to the relevant parts of this standard in isolation.

NOTE The use of the latter criteria verifies conformance with this standard but does not infer that calibration of a particular combination of instruments is interchangeable with any other combination.

The use of the latter criteria could allow a purchaser to use combinations of assemblies from different manufacturers with confidence.

The standard is applicable to:

– alpha surface contamination meters;
– alpha surface contamination monitors;
– beta surface contamination meters;
– beta surface contamination monitors;
– alpha/beta surface contamination meters;
– alpha/beta surface contamination monitors.

The latter two are equipment capable of determining alpha and beta contamination simultaneously and displaying the measurement of either:

– Alpha (beta, alpha/beta) surface contamination meter

  An assembly including one or more radiation detectors and associated assemblies or basic function units, designed to measure alpha (beta, alpha/beta) surface emission rate associated with the contamination of the surface under examination.

– Alpha (beta, alpha/beta) surface contamination monitor.

This standard is also applicable to special purpose assemblies and to assemblies specifically designed for a surface of a particular nature. However, some of the requirements may need to be amended or supplemented according to the particular requirements applicable to such assemblies.