

© Copyright SEK Svensk Elstandard. Reproduction in any form without permission is prohibited.

Kärnteknisk mätutrustning – Mätutrustning för strålskyddsändamål – Handhållna instrument för detektering och identifiering av radionuklider och för indikering av miljödosekvivalentrat från gammastrålning

*Radiation protection instrumentation –
Hand-held instruments for the detection and identification of radionuclides
and for the estimation of ambient dose equivalent rate from photon radiation*

Som svensk standard gäller europastandarden EN IEC 62327:2019. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 62327:2019.

Nationellt förord

Europastandarden EN IEC 62327:2019

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62327, Second edition, 2017 - Radiation protection instrumentation - Hand-held instruments for the detection and identification of radionuclides and for the estimation of ambient dose equivalent rate from photon radiation**

utarbetad inom International Electrotechnical Commission, IEC.

Tidigare fastställd svensk standard SS-EN 62327, utgåva 1, 2013, gäller ej fr o m 2022-10-07.

ICS 13.280.00

Denna standard är fastställd av SEK Svensk Elstandard, som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: Box 1284, 164 29 KISTA
Telefon: 08 - 444 14 00.
E-post: sek@elstandard.se. Internet: www.elstandard.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English Version

Radiation protection instrumentation - Hand-held instruments for
the detection and identification of radionuclides and for the
estimation of ambient dose equivalent rate from photon radiation
(IEC 62327:2017)

Instrumentation pour la radioprotection ζ Instruments
portables pour la détection et l'identification des
radionucléides et pour l'estimation du débit d'équivalent de
dose ambiant pour le rayonnement de photons
(IEC 62327:2017)

To be completed
(IEC 62327:2017)

This European Standard was approved by CENELEC on 2019-10-07. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 45B/882/FDIS, future edition 2 of IEC 62327, prepared by SC 45B "Radiation protection instrumentation" of IEC/TC 45 "Nuclear instrumentation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62327:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-07-07
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-10-07

This document supersedes EN 62327:2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62327:2017 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60086-1:2015 NOTE Harmonized as EN 60086-1:2015 (not modified)

IEC 60721-3-7 NOTE Harmonized as EN 60721-3-7

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-395	2014	International Electrotechnical Vocabulary -- Part 395: Nuclear instrumentation: Physical phenomena, basic concepts, instruments, systems, equipment and detectors		-
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	-EN 60068-2-1	-
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Test B: Dry heat	-EN 60068-2-2	-
IEC 60068-2-11	-	Basic environmental testing procedures - Part 2-11: Tests - Test Ka: Salt mist	-EN 60068-2-11	-
IEC 60068-2-14	-	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	-EN 60068-2-14	-
IEC 60068-2-18	-		EN 60068-2-18	-
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	-EN 60068-2-27	2009
IEC 60068-2-64	-	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance	-EN 60068-2-64	-
IEC 60068-2-66	-	Environmental testing - Part 2: Test methods - Test Cx: Damp heat, steady state (unsaturated pressurized vapour)	EN 60068-2-66	-
IEC 60068-2-68	-	Environmental testing - Part 2-68: Tests - Test L: Dust and sand	-EN 60068-2-68	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)		-
IEC 60846-1 (mod)	-	Radiation protection instrumentation - Ambient and/or directional dose equivalent (rate) meters and/or monitors for beta, X and gamma radiation - Part 1: Portable workplace and environmental meters and monitors	-EN 60846-1	-
IEC 60846-2 (mod)	-	Radiation protection instrumentation - Ambient and/or directional dose equivalent (rate) meters and/or monitors for beta, X and gamma radiation - Part 2: High range beta and photon dose and dose rate portable instruments for emergency radiation protection purposes	-EN 60846-2	-

EN IEC 62327:2019 (E)

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-2	2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
IEC 61000-4-6	2013	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	2014
IEC 61000-4-8	2009	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8	2010
IEC 61005 (mod)	-		EN 61005	-
IEC 61187 (mod)	-	Electrical and electronic measuring equipment - Documentation	EN 61187	-
			+EN 61187:1994/corrigendum Mar. 1995	1995
IEC 62706	-	Radiation protection instrumentation -- Environmental, electromagnetic and mechanical performance requirements		-
IEC 62755	-	Radiation protection instrumentation - Data-format for radiation instruments used in the detection of illicit trafficking of radioactive materials		-

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions, abbreviated terms and symbols, quantities and units.....	9
3.1 Terms and definitions.....	9
3.2 Abbreviated terms and symbols	11
3.3 Quantities and units	12
4 General characteristics and requirements.....	12
4.1 General.....	12
4.2 Radiation detectors.....	12
4.3 Personal protection alarm	12
4.3.1 Requirements	12
4.3.2 Method of test.....	12
4.4 Stabilization time	13
4.4.1 Requirements	13
4.4.2 Method of test.....	13
4.5 Power supplies – battery.....	13
4.5.1 Requirements	13
4.5.2 Method of test.....	13
4.6 Markings.....	14
4.7 Communication interface.....	14
4.7.1 Requirements	14
4.7.2 Method of test.....	14
4.8 Data.....	14
4.8.1 Requirements	14
4.8.2 Method of test.....	15
5 General test procedures	15
5.1 Nature of test.....	15
5.2 Statistical fluctuations	15
5.3 Standard test conditions	15
5.4 Functionality test.....	16
5.4.1 General	16
5.4.2 Pre-test measurements.....	16
5.4.3 Intermediate measurements.....	16
5.4.4 Post-test measurements	16
6 Radiation detection requirements	17
6.1 Ambient dose equivalent rate.....	17
6.1.1 Requirements	17
6.1.2 Method of test.....	17
6.2 Gamma source localization	17
6.2.1 Requirements	17
6.2.2 Method of test.....	17
6.3 Over-range characteristics for ambient dose equivalent rate	18
6.3.1 Requirements	18
6.3.2 Method of test.....	18

6.4	Neutron detection	18
6.4.1	Requirements	18
6.4.2	Method of test.....	19
6.5	Neutron indication in the presence of photons.....	19
6.5.1	Requirements	19
6.5.2	Method of test.....	19
6.6	Radionuclide identification	20
6.6.1	Radionuclide identification library	20
6.6.2	Identification results	20
6.6.3	Radionuclide and radioactive material identification.....	21
6.6.4	Identification of mixed radioactive materials.....	22
7	Environmental requirements	23
7.1	General.....	23
7.2	Ambient temperature.....	23
7.2.1	Requirements	23
7.2.2	Method of test.....	23
7.3	Temperature shock.....	23
7.3.1	Requirements	23
7.3.2	Method of test.....	24
7.4	Relative humidity	24
7.4.1	Requirements	24
7.4.2	Method of test.....	24
7.5	Low/high temperature start-up	24
7.5.1	Requirements	24
7.5.2	Method of test.....	25
7.6	Moisture and dust protection	25
7.6.1	Requirements	25
7.6.2	Method of test – dust	25
7.6.3	Method of test – moisture	25
8	Mechanical requirements.....	26
8.1	General.....	26
8.2	Vibration	26
8.2.1	Requirements	26
8.2.2	Method of test.....	26
8.3	Mechanical shock	26
8.3.1	Requirements	26
8.3.2	Method of test.....	26
8.4	Impact (microphonics).....	26
8.4.1	Requirements	26
8.4.2	Method of test.....	27
9	Electromagnetic requirements	27
9.1	General.....	27
9.2	Electrostatic Discharge (ESD).....	27
9.2.1	Requirements	27
9.2.2	Method of test.....	27
9.3	Radio Frequency (RF).....	27
9.3.1	Requirements	27
9.3.2	Method of test.....	27
9.4	Radiated RF emissions	28

9.4.1	Requirements	28
9.4.2	Method of test.....	28
9.5	Conducted disturbances.....	28
9.5.1	Requirements	28
9.5.2	Method of test.....	29
9.6	Magnetic fields.....	29
9.6.1	Requirements	29
9.6.2	Method of test.....	29
10	Documentation	29
10.1	Operation and maintenance manual.....	29
10.2	Test certificate	30
10.3	Declaration of conformity	30
	Bibliography.....	33
	Table 1 – IEC standards concerning instruments for the detection of illicit trafficking of radioactive material	7
	Table 2 – Standard test conditions	15
	Table 3 – Test result analysis	17
	Table 4 – Radionuclide library.....	20
	Table 5 – Guidance regarding identification performance.....	22
	Table 6 – List of likely daughters and possible impurities	22
	Table 7 – Emission frequency limits	28
	Table 8 – Summary of performance requirements	31

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RADIATION PROTECTION INSTRUMENTATION –
HAND-HELD INSTRUMENTS FOR THE DETECTION AND IDENTIFICATION
OF RADIONUCLIDES AND FOR THE ESTIMATION OF AMBIENT DOSE
EQUIVALENT RATE FROM PHOTON RADIATION**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. 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 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 IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62327 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation.

This second edition cancels and replaces the first edition of IEC 62327, issued in 2006. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) addition of detailed methods of test;
- b) revised identification test acceptance criteria for environmental tests;
- c) changed format to match SC 45B template.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
45B/882/FDIS	45B/887/RVD

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Illicit and inadvertent movement of radioactive materials in the form of radiation sources and contaminated metallurgical scrap has become a problem of increasing importance. Radioactive sources out of regulatory control, so-called “orphan sources”, have frequently caused serious radiation exposures and widespread contamination. Although illicit trafficking in nuclear and other radioactive materials is not a new phenomenon, concern about a nuclear “black market” has increased in the last few years particularly in view of its terrorist potential.

In response to the technical policy of the International Atomic Energy Agency (IAEA), the World Customs Organization (WCO) and the International Criminal Police Organization (Interpol) related to the detection and identification of special nuclear materials and security trends, nuclear instrumentation companies are developing and manufacturing radiation instrumentation to assist in the detection of illicit movement of radioactive and special nuclear materials. This type of instrumentation is widely used for security purposes at nuclear facilities, border control checkpoints, and international seaports and airports. However, to ensure that measurement results made at different locations are consistent, it is imperative that radiation instrumentation be designed to rigorous specifications based upon agreed performance requirements stated in this document. IEC standards have also been developed to address personal radiation detectors, radiation portal monitors, highly sensitive gamma and neutron detection systems, spectrometric personal radiation detectors, and backpack-based radiation detection and identification systems. Table 1 below contains a list of those standards.

Table 1 – IEC standards concerning instruments for the detection of illicit trafficking of radioactive material

Type of instrumentation	IEC number	Title of the standard
Body-worn	62401	Radiation protection instrumentation – Alarming Personal Radiation Devices (PRDs) for the detection of illicit trafficking of radioactive material
	62618	Radiation protection instrumentation – Spectroscopy-Based Alarming Personal Radiation Devices (SPRD) for detection of illicit trafficking of radioactive material
	62694	Radiation protection instrumentation – Backpack-type radiation detector (BRD) for detection of illicit trafficking of radioactive material
Portable or hand-held	62327	Radiation protection instrumentation – Hand-held instruments for the detection and identification of radionuclides and for the estimation of ambient dose equivalent rate from photon radiation
	62533	Radiation protection instrumentation – Highly sensitive hand-held instruments for photon detection of radioactive material
	62534	Radiation protection instrumentation – Highly sensitive hand-held instruments for neutron detection of radioactive material
Portal	62244	Radiation protection instrumentation – Installed radiation portal monitors (RPMs) for the detection of illicit trafficking of radioactive and nuclear materials
	62484	Radiation protection instrumentation – Spectroscopy-based portal monitors used for the detection and identification of illicit trafficking of radioactive material
Data format	62755	Radiation protection instrumentation – Data format for radiation instruments used in the detection of illicit trafficking of radioactive materials

RADIATION PROTECTION INSTRUMENTATION – HAND-HELD INSTRUMENTS FOR THE DETECTION AND IDENTIFICATION OF RADIONUCLIDES AND FOR THE ESTIMATION OF AMBIENT DOSE EQUIVALENT RATE FROM PHOTON RADIATION

1 Scope

This document applies to hand-held instruments used to detect and identify radionuclides and radioactive material, to estimate ambient dose equivalent rate from photon radiation, and optionally, to detect neutron radiation. They are commonly known as radionuclide identification devices or RIDs.

This document specifies general characteristics, general test procedures, radiation characteristics, as well as electrical, mechanical, safety, and environmental characteristics.

This document does not cover laboratory type, high-resolution photon spectrometers, or instruments covered by IEC 60846-1 (Portable workplace and environmental meters and monitors), IEC 60846-2 (photon dose (rate) meters) or IEC 61005 (neutron dose equivalent (rate) meters).

Table 8 provides a summary of requirements and relevant clauses.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60050-395:2014, *International Electrotechnical Vocabulary (IEV) – Part 395: Nuclear instrumentation: physical phenomena, basic concepts, instruments, systems, equipment and detectors*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-11, *Basic environmental testing procedures – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-18, *Environmental testing – Part 2-18: Tests – Test R and guidance: Water*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-64, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

IEC 60068-2-66, *Environmental testing – Part 2-66: Test methods – Test Cx: Damp heat, steady state (unsaturated pressurized vapour)*

IEC 60068-2-68, *Environmental testing – Part 2-68: Tests – Test L: Dust and sand*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60846-1, *Radiation protection instrumentation – Ambient and/or directional dose equivalent (rate) meters and/or monitors for beta, X and gamma radiation – Part 1: Portable workplace and environmental meters and monitors*

IEC 60846-2, *Radiation protection instrumentation – Ambient and/or directional dose equivalent (rate) meters and/or monitors for beta, X and gamma radiation – Part 2: High range beta and photon dose and dose rate portable instruments for emergency radiation protection purposes*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61005, *Radiation protection instrumentation – Neutron ambient dose equivalent (rate) meters*

IEC 61187, *Electrical and electronic measuring equipment – Documentation*

IEC 62706, *Radiation protection instrumentation – Environmental, electromagnetic and mechanical performance requirements*

IEC 62755, *Radiation protection instrumentation – Data format for radiation instruments used in the detection of illicit trafficking of radioactive materials*