

STN	Prístroje na ochranu pred žiarením Pasívne integračné dozimetrické systémy na monitorovanie osôb, pracovísk a prostredia fotónového a beta žiarenia	STN EN IEC 62387 35 6607
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Radiation protection instrumentation - Dosimetry systems with integrating passive detectors for individual, workplace and environmental monitoring of photon and beta radiation

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 12/22

Obsahuje: EN IEC 62387:2022, IEC 62387:2020

Oznámením tejto normy sa od 14.10.2025 ruší
STN EN 62387 (35 6607) z októbra 2016

136067

EUROPEAN STANDARD

EN IEC 62387

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2022

ICS 13.280

Supersedes EN 62387:2016

English Version

**Radiation protection instrumentation - Dosimetry systems with
integrating passive detectors for individual, workplace and
environmental monitoring of photon and beta radiation
(IEC 62387:2020)**

Instrumentation pour la radioprotection - Systèmes
dosimétriques avec détecteurs intégrés passifs pour le
contrôle radiologique individuel, du lieu de travail et de
l'environnement des rayonnements photoniques et bêta
(IEC 62387:2020)

Strahlenschutz-Messgeräte - Dosimetriesysteme mit
integrierenden passiven Detektoren zur Personen-,
Arbeitsplatz- und Umgebungsüberwachung auf Photonen-
und Betastrahlung
(IEC 62387:2020)

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Europäisches Komitee für Elektrotechnische Normung

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

EN IEC 62387:2022 (E)**European foreword**

This document (EN IEC 62387:2022) consists of the text of IEC 62387:2020 prepared by IEC/SC 45B, Radiation protection instrumentation, of IEC/TC 45, Nuclear instrumentation.

The following dates are fixed:

- latest date by which this document has to be (dop) 2023–04–14 implemented at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards (dow) 2025–10–14 conflicting with this document have to be withdrawn

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

IEC 60068-2-31	NOTE Harmonized as EN 60068-2-31
IEC 60359	NOTE Harmonized as EN 60359
IEC 60904-3	NOTE Harmonized as EN IEC 60904-3
IEC/TR 62461	NOTE Harmonized as CLC IEC/TR 62461
ISO 4037-1:2019	NOTE Harmonized as EN ISO 4037-1:2021
ISO 4037-2:2019	NOTE Harmonized as EN ISO 4037-2:2021
ISO 4037-4:2019	NOTE Harmonized as EN ISO 4037-4:2021
ISO 29661:2012/AMD1:2015	NOTE Harmonized as EN ISO 29661:2017

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 61000-4-2	-	Electromagnetic compatibility (EMC) - EN 61000-4-2 Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	-	-
IEC 61000-4-3	-	Electromagnetic compatibility (EMC) - EN IEC 61000-4-3 Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	-	-
IEC 61000-4-4	-	Electromagnetic compatibility (EMC) - EN 61000-4-4 Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	-	-
IEC 61000-4-5	-	Electromagnetic compatibility (EMC) - EN 61000-4-5 Part 4-5: Testing and measurement techniques - Surge immunity test	-	-
IEC 61000-4-6	-	Electromagnetic compatibility (EMC) - EN 61000-4-6 Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	-	-
IEC 61000-4-8	-	Electromagnetic compatibility (EMC) - EN 61000-4-8 Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	-	-
IEC 61000-4-11	-	Electromagnetic compatibility (EMC) - EN IEC 61000-4-11 Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase	-	-
IEC 61000-6-2	-	Electromagnetic compatibility (EMC) - EN IEC 61000-6-2 Part 6-2: Generic standards - Immunity standard for industrial environments	-	-

EN IEC 62387:2022 (E)

ISO 4037	series	Radiological protection - X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy	EN ISO 4037	series
ISO 4037-3	2019	Radiological protection - X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy - Part 3: Calibration of area and personal dosimeters and the measurement of their response as a function of energy and angle of incidence	EN ISO 4037-3	2021
ISO 6980	series	Nuclear energy - Reference beta-particle radiation	-	-
ISO 6980-3	-	Nuclear energy - Reference beta-particle radiation - Part 3: Calibration of area and personal dosimeters and the determination of their response as a function of beta radiation energy and angle of incidence	-	-
ISO 8529	series	Reference neutron radiations – Part 1: Characteristics and methods of production	-	-
ISO/IEC Guide 98–3	2008	Uncertainty of measurement - Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-



IEC 62387

Edition 2.0 2020-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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Instrumentation pour la radioprotection – Systèmes dosimétriques avec détecteurs intégrés passifs pour le contrôle radiologique individuel, du lieu de travail et de l'environnement des rayonnements photoniques et bêta

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Edition 2.0 2020-01

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ICS 13.280

ISBN 978-2-8322-7696-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RADIATION PROTECTION INSTRUMENTATION –
DOSIMETRY SYSTEMS WITH INTEGRATING PASSIVE DETECTORS
FOR INDIVIDUAL, WORKPLACE AND ENVIRONMENTAL MONITORING
OF PHOTON AND BETA RADIATION**

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International Standard IEC 62387 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 62387 published in 2012. This edition constitutes a technical revision.

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

- Modification of title.
- Addition of performance requirements for dosimeters to measure $H'(3)$ for both photon and beta radiation.
- Adoption of the cylinder instead of the slab phantom for the quantity $H_p(3)$.
- Correction and clarification of several subclauses to obtain a better applicability.

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

FDIS	Report on voting
45B/945/FDIS	45B/954/RVD

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- amended.

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INTRODUCTION

A dosimetry system may consist of the following elements:

- a) a passive device, referred to herein as a *detector*, which, after the exposure to radiation, stores a signal for use in measuring one or more quantities of the incident radiation field;
- b) a “dosemeter”, that incorporates some means of identification and contains one or more detectors and may contain electronic components, e.g. for the readout (e.g., in a direct ion storage (DIS) dosimeter);
- c) a “reader” which is used to readout the stored information (signal) from the detector, in order to determine the radiation dose;
- d) a “computer” with appropriate “software” to control the reader, store the signals transmitted from the reader, calculate, display and store the evaluated dose in the form of an electronic file or paper copy;
- e) “additional equipment” and documented procedures (instruction manual) for performing associated processes such as deleting stored dose information, cleaning dosimeters, or those needed to ensure the effectiveness of the whole system.

RADIATION PROTECTION INSTRUMENTATION – DOSIMETRY SYSTEMS WITH INTEGRATING PASSIVE DETECTORS FOR INDIVIDUAL, WORKPLACE AND ENVIRONMENTAL MONITORING OF PHOTON AND BETA RADIATION

1 Scope

This document applies to all kinds of passive dosimetry systems that are used for measuring:

- the personal dose equivalent $H_p(10)$ (for individual whole body monitoring),
- the personal dose equivalent $H_p(3)$ (for individual eye lens monitoring),
- the personal dose equivalent $H_p(0,07)$ (for both individual whole body skin and local skin for extremity monitoring),
- the ambient dose equivalent $H^*(10)$ (for workplace and environmental monitoring),
- the directional dose equivalent $H'(3)$ (for workplace and environmental monitoring), or
- the directional dose equivalent $H'(0,07)$ (for workplace and environmental monitoring).

This document applies to dosimetry systems that measure external photon and/or beta radiation in the dose range between 0,01 mSv and 10 Sv and in the energy ranges given in Table 1. All the energy values are mean energies with respect to the fluence. The dosimetry systems usually use electronic devices for the data evaluation and thus are often computer controlled.

Table 1 – Mandatory and maximum energy ranges covered by this document

Measuring quantity	Mandatory mean energy range for photon radiation	Maximum mean energy range for testing photon radiation	Mandatory mean energy range for beta-particle radiation ^a	Maximum mean energy range for testing beta-particle radiation ^a
$H_p(10)$, $H^*(10)$	80 keV to 1,25 MeV ^b	12 keV to 7 MeV	–	–
$H_p(3)$, $H'(3)$	30 keV to 250 keV	8 keV to 7 MeV	0,8 MeV ^c	0,7 MeV ^c to 1,2 MeV
$H_p(0,07)$, $H'(0,07)$	30 keV to 250 keV	8 keV to 1,25 MeV ^b	0,24 MeV to 0,8 MeV	0,07 MeV ^d to 1,2 MeV ^e

^a The following beta radiation sources are suggested for the different mean energies: For 0,06 MeV: ¹⁴⁷Pm; for 0,8 MeV: ⁹⁰Sr/⁹⁰Y; for 1,2 MeV: ¹⁰⁶Ru/¹⁰⁶Rh.

^b 1,25 MeV is the mean energy of photon radiation from ⁶⁰Co.

^c For beta-particle radiation, an energy of 0,7 MeV is required to reach the radiation sensitive layers of the eye lens in a depth of about 3 mm (approximately 3 mm of ICRU tissue).

^d For beta-particle radiation, an energy of 0,07 MeV is required to penetrate the dead layer of skin of 0,07 mm (approximately 0,07 mm of ICRU tissue).

^e 0,07 MeV, 0,8 MeV and 1,2 MeV beta mean energy are almost equivalent to an E_{max} of 0,225 MeV, 2,27 MeV and 3,54 MeV, respectively.

NOTE 1 In this document, “dose” means dose equivalent, unless otherwise stated.

NOTE 2 For $H_p(10)$ and $H^*(10)$ no beta radiation is considered. Reasons:

- a) $H_p(10)$ and $H^*(10)$ are a conservative estimate for the effective dose which is not a suitable quantity for beta radiation.
- b) No conversion coefficients are available in ICRU 56, ICRU 57 or ISO 6980-3.

NOTE 3 The maximum energy ranges are the energy limits within which type tests according to this document are possible.

NOTE 4 Direct ion storage (DIS) dosimeters are covered in this document as they are often operated without an online display but a separate reader.

The test methods concerning the design (Clause 8), the instruction manual (Clause 9), the software (Clause 10), environmental influences (Clause 13), electromagnetic influences (Clause 14), mechanical influences (Clause 15), and the documentation (Clause 16) are independent of the type of radiation. Therefore, they can also be applied to other dosimetry systems, e.g. for neutrons, utilizing the corresponding type of radiation for testing.

This document is intended to be applied to dosimetry systems that are capable of evaluating doses in the required quantity and unit (Sv) from readout signals in any quantity and unit. The only correction that may be applied to the evaluated dose (indicated value) is the one resulting from natural background radiation using extra dosimeters.

NOTE 5 The correction due to natural background can be made before or after the dose calculation.

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

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

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

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

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

IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-6-2, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

ISO 4037 (all parts), *Radiological protection – X and gamma reference radiation for calibrating dosimeters and dose rate meters and for determining their response as a function of photon energy*

ISO 4037-3:2019, *Radiological protection – X and gamma reference radiation for calibrating dosimeters and dose rate meters and for determining their response as a function of photon energy – Part 3: Calibration of area and personal dosimeters and the measurement of their response as a function of energy and angle of incidence*

ISO 6980 (all parts), *Nuclear energy – Reference beta-particle radiation*

ISO 6980-3, *Nuclear energy – Reference beta-particle radiation – Part 3: Calibration of area and personal dosimeters and the determination of their response as a function of beta radiation energy and angle of incidence*

ISO 8529 (all parts), *Reference neutron radiations*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of*

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