

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Radiation protection instrumentation – Measurement of personal dose equivalents for X, gamma, neutron and beta radiations – Active personal dosimeters

Instrumentation pour la radioprotection – Mesure des équivalents de dose individuels pour les rayonnements X, gamma, neutron et bêta – Dosimètres individuels actifs



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CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	10
2 Normative references	11
3 Terms and definitions	13
4 Units and symbols	21
4.1 Units	21
4.2 Symbols.....	21
5 Mechanical characteristics.....	23
5.1 Case	23
5.2 Switches	23
6 General characteristics.....	24
6.1 Storage of dose information	24
6.2 Indication	24
6.3 Dosimeter markings	24
6.4 Retention of radioactive contamination.....	24
6.5 Ranges for dose and dose rate	24
6.6 Rated range of an influence quantity.....	24
6.7 Effect of radiation not intended to be measured and use of more than one dosimeter.....	25
6.8 Intrinsic and environmental background of the instrument	25
6.9 Dose or dose rate alarms	25
6.9.1 General	25
6.9.2 Dose alarms	25
6.9.3 Dose rate alarms	25
6.9.4 Alarm output.....	26
6.10 Indication of malfunction	26
6.11 Assignment of the dose value to the dosimeter	26
6.12 Algorithm to evaluate the indicated value	26
7 General test procedures	26
7.1 Nature of tests	26
7.2 Reference conditions and standard test conditions.....	27
7.3 Tests for influence quantities of type F.....	28
7.4 Tests for influence quantities of type S	28
7.5 Phantom for testing.....	28
7.6 Position of detector assembly for the purpose of testing.....	28
7.7 Position of dosimeter during use	28
7.8 Minimum rated range of influence quantity	29
7.9 Low dose rates	29
7.10 Statistical fluctuations	29
7.11 Production of reference radiation	29
8 Additivity of indicated value	29
8.1 Requirements	29
8.2 Method of test.....	30
8.2.1 General	30
8.2.2 Preparation of the test	30

8.2.3	Practical test	31
8.3	Interpretation of the results	31
9	Radiation performance requirements and tests	31
9.1	General.....	31
9.2	Consideration of the uncertainty of the conventional quantity value.....	32
9.3	Constancy of the dose response, dose rate dependence and statistical fluctuations	32
9.3.1	General	32
9.3.2	Requirements	32
9.3.3	Method of test using sources	37
9.3.4	Interpretation of the results of the test using sources	38
9.3.5	Method of test for photon dosimeters using natural radiation	39
9.3.6	Interpretation of the results of the test using natural radiation.....	39
9.4	Variation of the response due to photon radiation energy and angle of incidence	40
9.4.1	Measurement quantity $H_p(0,07)$ or $\dot{H}_p(0,07)$	40
9.4.2	Measurement quantity $H_p(3)$ or $\dot{H}_p(3)$	40
9.4.3	Measurement quantity $H_p(10)$ or $\dot{H}_p(10)$	41
9.5	Variation of the response due to neutron radiation energy and angle of incidence	42
9.5.1	General	42
9.5.2	Measurement quantity $H_p(10)$ or $\dot{H}_p(10)$	42
9.6	Variation of the response due to beta radiation energy and angle of incidence	43
9.6.1	General	43
9.6.2	Measurement quantity $H_p(0,07)$ or $\dot{H}_p(0,07)$	43
9.6.3	Measurement quantity $H_p(3)$ or $\dot{H}_p(3)$	44
9.6.4	Measurement quantity $H_p(10)$ or $\dot{H}_p(10)$	45
9.7	Over indication due to radiation incident from the side of an $H_p(10)$, $H_p(3)$ or $H_p(0,07)$ dosimeter	45
9.7.1	Requirements	45
9.7.2	Method of test.....	45
9.7.3	Interpretation of the results	46
9.8	Retention of dose reading	46
9.8.1	General	46
9.8.2	Requirements	46
9.8.3	Method of test and interpretation of the results	46
9.9	Overload characteristics	46
9.9.1	General	46
9.9.2	Requirements	47
9.9.3	Method of test and interpretation of the results	47
9.10	Alarm	48
9.10.1	General	48
9.10.2	Response time for dose rate indication and alarm.....	48
9.10.3	Accuracy of dose alarm	49
9.10.4	Accuracy of dose rate alarm	49
9.11	Model function	50
10	Electrical and environmental performance requirements and tests.....	50

10.1	General.....	50
10.2	Power supplies	50
10.2.1	General requirements	50
10.2.2	Specific primary batteries requirements	51
10.2.3	Specific secondary batteries requirements.....	51
10.2.4	Method of test and interpretation of the results (primary and secondary batteries)	51
10.3	Ambient temperature.....	52
10.3.1	Requirements	52
10.3.2	Method of test and interpretation of the results	53
10.4	Relative humidity	54
10.4.1	Requirements	54
10.4.2	Method of test and interpretation of the results	54
10.5	Atmospheric pressure	54
10.6	Sealing	54
10.7	Storage.....	54
10.8	Light exposure	54
10.8.1	General	54
10.8.2	Requirements	55
10.8.3	Interpretation of the results.....	55
10.9	Dose build-up, fading and self-irradiation (hybrid dosimeters).....	55
11	Electromagnetic performance requirements and tests.....	56
11.1	General.....	56
11.2	Electrostatic discharge.....	57
11.2.1	Requirements	57
11.2.2	Method of test and interpretation of the results	57
11.3	Radiated electromagnetic fields	58
11.3.1	Requirements	58
11.3.2	Method of test and interpretation of the results	58
11.4	Conducted disturbances induced by fast transients or bursts	58
11.4.1	Requirements	58
11.4.2	Method of test and interpretation of the results	58
11.5	Conducted disturbances induced by surges	59
11.5.1	Requirements	59
11.5.2	Method of test and interpretation of the results	59
11.6	Conducted disturbances induced by radio-frequencies.....	59
11.6.1	Requirements	59
11.6.2	Method of test and interpretation of the results	59
11.7	50 Hz/60 Hz magnetic field	59
11.7.1	Requirements	59
11.7.2	Method of test and interpretation of the results	59
11.8	Voltage dips and short interruptions.....	59
11.8.1	Requirements	59
11.8.2	Method of test and interpretation of the results	60
12	Mechanical performance, requirements and tests	60
12.1	General.....	60
12.2	Drop test.....	60
12.2.1	Requirements	60
12.2.2	Method of test and interpretation of the results	60

12.3	Vibration test	61
12.3.1	Requirements	61
12.3.2	Method of test and interpretation of the results	61
12.4	Microphonics test.....	61
12.4.1	Requirements	61
12.4.2	Method of test and interpretation of the results	61
13	Software.....	62
13.1	General.....	62
13.2	Design and structure of the software.....	63
13.2.1	Requirements	63
13.2.2	Method of test.....	63
13.3	Identification of the software	63
13.3.1	Requirements	63
13.3.2	Method of test.....	63
13.4	Authenticity of the software and the presentation of results.....	64
13.4.1	Requirements	64
13.4.2	Method of test.....	64
13.5	Alarm and stop of system operation under abnormal operating conditions.....	64
13.5.1	Requirements	64
13.5.2	Method of test.....	64
13.6	Control of instrument parameters	65
13.6.1	Requirements	65
13.6.2	Method of test.....	65
13.7	Storage of measurement data	65
13.7.1	Requirements	65
13.7.2	Method of test.....	65
13.8	Transmission of data.....	66
13.8.1	Requirements	66
13.8.2	Method of test.....	66
13.9	Hardware interfaces and software interfaces.....	66
13.9.1	Requirements	66
13.9.2	Method of test.....	67
13.10	Documentation for the software test.....	67
13.10.1	Requirements	67
13.10.2	Method of test.....	67
14	Uncertainty.....	68
15	Documentation	68
15.1	Type test report	68
15.2	Certificate	68
16	Operation and maintenance manual	69
Annex A (normative)	Statistical fluctuations	70
Annex B (normative)	Coverage intervals	72
B.1	General.....	72
B.2	Coverage interval for the mean, \bar{x}	73
B.3	Coverage interval for a combined quantity	73
Annex C (informative)	Causal connection between readout signals, indicated value and measured value	75

Annex D (informative) Procedure to determine the variation of the relative response due to radiation energy and angle of radiation incidence	76
Annex E (informative) Computational method of test for mixed irradiations	78
Bibliography.....	80
Figure B.1 – Test for coverage interval	72
Figure C.1 – Data evaluation in dosimetry systems	75
Figure E.1 – Flow chart of a computer program to perform tests according to 8.2	79
Table 1 – Symbols and abbreviated terms	21
Table 2 – Reference conditions and standard test conditions	27
Table 3 – Radiation characteristics of $H_p(0,07)$ dosimeters for X, gamma and beta radiation	33
Table 4 – Radiation characteristics of $H_p(3)$ dosimeters for X, gamma and beta radiation	34
Table 5 – Radiation characteristics of $H_p(10)$ dosimeters for X and gamma radiation	35
Table 6 – Radiation characteristics of $H_p(10)$ dosimeters for neutron radiation	36
Table 7 – Values of c_1 and c_2 for w different dose values and n indications for each dose value	39
Table 8 – Electrical and environmental characteristics of dosimeters	55
Table 9 – Electromagnetic disturbance characteristics of dosimeters	57
Table 10 – Mechanical disturbances characteristics of dosimeters.....	60
Table A.1 – Number of instrument readings required to detect true differences (95 % level of confidence) between two sets of instrument readings on the same instrument.....	71
Table B.1 – Student’s t -value for a double sided 95 % coverage interval.....	73
Table E.1 – Example of dosimeter response table and range limits.....	78

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RADIATION PROTECTION INSTRUMENTATION –
MEASUREMENT OF PERSONAL DOSE EQUIVALENTS FOR X,
GAMMA, NEUTRON AND BETA RADIATIONS –
ACTIVE PERSONAL DOSEMETERS**

FOREWORD

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IEC 61526 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2010. This edition constitutes a technical revision.

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

- a) Modification of the title;
- b) Inclusion of the measurement quantity for the dose in the lens of the eye, $H_p(3)$;
- c) Inclusion of measurement quantity for dose in the skin and extremities, $H_p(0,07)$;

- d) Inclusion of dosimeters between active and passive: "hybrid dosimeters";
- e) Inclusion of software requirements;
- f) Harmonization of requirements for linearity to IEC 62387;
- g) Revised neutron energy response requirements.

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

Draft	Report on voting
45B/1047/FDIS	45B/1049/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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INTRODUCTION

This document applies to active, (direct reading or hybrid) personal dosimeters and monitors used for measuring personal dose equivalents $H_p(10)$, $H_p(3)$, and $H_p(0,07)$, for X, gamma, neutron, and beta radiations.

For personal dose equivalent $H_p(10)$ and for X and gamma radiation, two minimum rated ranges for the photon energy are given. The first from 20 keV to 150 keV is for workplaces where low energy X-rays are used, e.g., in diagnostic medicine, the second from 80 keV to 1,25 MeV is for workplaces where high energy X-rays and/or gamma sources are used, e.g., in industry. For neutron radiation the minimum rated range of neutron energy is from 0,025 eV (thermal neutrons) to 10 MeV. The rated ranges can be extended to all energies covered by the respective standards for reference radiation fields.

For personal dose equivalent $H_p(3)$ and for X and gamma radiation, a minimum rated range for photon energy from 30 keV to 250 keV is given. For personal dose equivalent $H_p(0,07)$ a range of 30 keV to 1250 keV or, for workplaces where low energy X-rays are used, 20 keV to 150 keV, is given. For beta radiation for both quantities, the minimal rated range is from 0,24 MeV to 0,8 MeV (mean beta particle energy). The rated ranges can be extended to all energies covered by the respective standards for reference radiation fields.

In some applications, for example, at a nuclear reactor installation where 6 MeV photon radiation is present, measurement of personal dose equivalent (rate) $H_p(10)$ for photon energies up to 10 MeV should be required. In some other applications, measurement of $H_p(10)$ down to 10 keV should be required.

For personal dosimeters, requirements for measuring the dose quantities $H_p(10)$, $H_p(3)$, and $H_p(0,07)$, and for monitoring of the respective dose rate quantities are given. The measurement of these dose rate quantities is an option for personal dosimeters.

Establishments in some countries may be permitted to use this type of personal dosimeter as the dosimeter to provide the dose of record by an approved dosimetry service.

RADIATION PROTECTION INSTRUMENTATION – MEASUREMENT OF PERSONAL DOSE EQUIVALENTS FOR X, GAMMA, NEUTRON AND BETA RADIATIONS – ACTIVE PERSONAL DOSEMETERS

1 Scope

This document applies to personal dosimeters with the following characteristics:

- a) They are worn on the trunk, close to the eye, or on the extremities.
- b) They measure the personal dose equivalents $H_p(10)$, $H_p(3)$, and $H_p(0,07)$, from external X and gamma, neutron (not for $H_p(3)$), and beta radiations, and may measure the respective personal dose equivalent rates for the same radiations (for alarming purposes).
- c) They have a digital indication. This indication may or may not be attached.
- d) They have alarm functions for the personal dose equivalents or personal dose equivalent rates except for hybrid dosimeters. For hybrid dosimeters an alarm function for the personal dose equivalents shall be implemented in the associated readout system.

NOTE 1 When reference is made in this document to "dose", this is meant to indicate personal dose equivalent, unless otherwise stated.

NOTE 2 When reference is made in this document to "dosimeter", this is meant to include all personal dosimeters, unless otherwise stated.

NOTE 3 This document does not cover neutron dosimeters for the $H_p(3)$ measurements up to now.

This document specifies requirements for the dosimeter and, if supplied, for its associated readout system.

Usually, a dosimeter is not able to measure all quantities given above. Thus, the dosimeter is only tested with regard to those quantities and types of radiation it is intended to be used for. Other types of radiation are considered as influence quantities which also may have requirements.

This document specifies, for the dosimeters described above, general characteristics, general test procedures, radiation characteristics as well as electrical, mechanical, safety and environmental characteristics. The only requirements specified for associated readout systems are those which affect its accuracy of readout of the personal dose equivalent and alarm settings, and those which concern the influence of the reader on the dosimeter.

This document does not cover special requirements for accident or emergency dosimetry, although the dosimeters may be used for this purpose.

This document does not apply to dosimeters used for measurement of pulsed radiation, such as radiation emanating from many medical diagnostic X-ray facilities, linear accelerators or similar equipment.

NOTE 4 Requirements and testing procedure for dosimeters used in pulsed field of ionizing radiation can be found in IEC TS 63050 or IEC TS 62743.

This document does not apply for dosimeters to measure ambient or directional dose equivalent.

NOTE 5 Requirements for ambient or directional dose equivalent meters can be found e.g. in: IEC 60846-1; IEC 62387, IEC 61017 or IEC 60532.