



BSI Standards Publication

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

National foreword

This British Standard is the UK implementation of EN 60846-1:2014. It is derived from IEC 60846-1:2009. It supersedes BS EN 60846:2004 which is withdrawn.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags **Ⓒ** **Ⓒ**.

The UK participation in its preparation was entrusted to Technical Committee NCE/2, Radiation protection and measurement.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

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 60846-1:2009 , modified)

Instrumentation pour la radioprotection - Instruments pour la mesure et/ou la surveillance de l'équivalent de dose (ou du débit d'équivalent de dose) ambiant et/ou directionnel pour les rayonnements bêta, X et gamma - Partie 1: Instruments de mesure et de surveillance portables pour les postes de travail et l'environnement
(CEI 60846-1:2009 , modifiée)

Strahlenschutz-Messgeräte - Umgebungs- und/oder Richtungs-Äquivalentdosis(leistungs)-Messgeräte und/oder Monitore für Beta-, Röntgen- und Gammastrahlung - Teil 1: Tragbare Messgeräte und Monitore für den Arbeitsplatz und die Umgebung
(IEC 60846-1:2009 , modifiziert)

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

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Foreword

This document (EN 60846-1:2014) consists of the text of IEC 60846-1:2009 prepared by IEC/SC 45B "Radiation protection instrumentation" of IEC/TC 45 "Nuclear instrumentation", together with the common modifications prepared by CLC/TC 45B "Radiation protection instrumentation".

The following dates are fixed:

- latest date by which this document has to be implemented (dop) 2015-07-28
at national level by publication of an identical
national standard or by endorsement
- latest date by which the national standards conflicting (dow) 2017-07-28
with this document have to be withdrawn

This document supersedes EN 60846:2004.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60846-1:2009 are prefixed "Z".

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Endorsement notice

The text of the international Standard IEC 60846-1:2009 was approved by CENELEC as a European Standard with common modifications.

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

IEC 60325:2002 NOTE Harmonized as EN 60325:2004 (modified).

IEC 61005:2003 NOTE Harmonized as EN 61005:2004 (modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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.

Publication	Year	Title	EN/HD	Year
IEC 60050-151	2001	International Electrotechnical Vocabulary (IEV) Part 151: Electrical and magnetic devices	-	-
IEC 60050-393	2003	International Electrotechnology Vocabulary Part 393: Nuclear instrumentation - Physical phenomena and basic concepts	-	-
IEC 60050-394	2007	International Electrotechnical Vocabulary Part 394: Nuclear instrumentation - Instruments, systems, equipment and detectors	-	-
IEC 60068-2-31	2008	Environmental testing Part 2-31: Tests - Test Ec: Rough handling shocks, primarily for equipment-type specimens	EN 60068-2-31	2008
IEC 60086-1	2006	Primary batteries Part 1: General	EN 60086-1 ¹⁾	2007
IEC 60086-2 + corr. April	2006 2007	Primary batteries Part 2: Physical and electrical specifications	EN 60086-2 ²⁾	2007
IEC 60359	2001	Electrical and electronic measurement equipment - Expression of performance	EN 60359	2002
IEC 60529 + A1	1989 1999	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May + A1	1991 1993 2000
IEC 61000-4-2 + A1 + A2	1995 1998 2000	Electromagnetic compatibility (EMC) Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2 + A1 + A2 ³⁾	1995 1998 2001
IEC 61000-4-3 + A1	2006 2007	Electromagnetic compatibility (EMC) Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3 + A1	2006 2008
IEC 61000-4-6	2008	Electromagnetic compatibility (EMC) Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6 ⁴⁾	2009
IEC 61000-4-8 + A1	1993 2000	Electromagnetic compatibility (EMC) Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8 + A1 ⁵⁾	1993 2001

1) EN 60086-1 is superseded by EN 60086-1:2011, which is based on IEC 60086-1:2011.

2) EN 60086-2 is superseded by EN 60086-2:2011, which is based on IEC 60086-2:2011.

3) EN 61000-4-2 is superseded by EN 61000-4-2:2009, which is based on IEC 61000-4-2:2008.

4) EN 61000-4-6 is superseded by EN 61000-4-6:2014, which is based on IEC 61000-4-6:2013.

5) EN 61000-4-8 is superseded by EN 61000-4-8:2010, which is based on IEC 61000-4-8:2009.

IEC 61000-6-2	2005	Electromagnetic compatibility (EMC) Part 6-2: Generic standards - Immunity for industrial environments	EN 61000-6-2 + corr. September	2005 2005
IEC 61187 (mod)	1993	Electrical and electronic measuring equipment - Documentation	EN 61187 + corr. March	1994 1995
IEC/TR 62461	2006	Radiation protection instrumentation - Determination of uncertainty in measurement	-	-
ISO/IEC Guide 98-3	2008	Uncertainty of measurement Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-
ISO/IEC Guide 99	2007	International vocabulary of metrology - Basic and general concepts and associated terms (VIM)	-	-
ISO 4037-1	1996	X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy Part 1: Radiation characteristics and production methods	-	-
ISO 4037-2	1997	X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy Part 2: Dosimetry for radiation protection over the energy ranges from 8 keV to 1,3 MeV and 4 MeV to 9 MeV	-	-
ISO 4037-3	1999	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	-	-
ISO 4037-4	2004	X and gamma reference radiation for calibrating dosimeters and doserate meters and for determining their response as a function of photon energy Part 4: Calibration of area and personal dosimeters in low energy X reference radiation fields	-	-
ISO 6980-1	2006	Nuclear energy - Reference beta-particle radiation Part 1: Methods of production	-	-
ISO 6980-2	2004	Nuclear energy - Reference beta-particle radiation Part 2: Calibration fundamentals related to basic quantities characterizing the radiation field	-	-
ISO 6980-3	2006	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	-	-

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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

1 Scope and object

This part of the IEC 60846 series applies to dose equivalent (rate) meters and/or monitors for the measurement of ambient dose equivalent (rate) and/or directional dose equivalent (rate) from external beta, X and gamma radiation, as recommended in ICRU, Report 47.

NOTE 1 If both quantities, ambient dose equivalent and directional dose equivalent are meant, the term dose equivalent may be used as an abbreviation.

This part of IEC 60846 series applies only to portable meters and monitors which are intended to be used in both the workplace and the environment. It applies to devices that measure the dose equivalent or dose equivalent rate from external beta and/or X and gamma radiation in the dose range between 0,01 μSv and 10 Sv and the dose rate range between 0,01 $\mu\text{Sv h}^{-1}$ and 10 Sv h^{-1} and in the energy ranges given in the following Table. All the energy values are mean energies with respect to the prevailing dose quantity.

Table 1 – Measuring quantities and energy ranges covered by the standard

Measuring quantity	Energy range for Photon radiation	Energy range for Beta-particle radiation
$H^*(10)$	12 keV to 10 MeV	—
$H'(0,07)$	8 keV to 250 keV	0,07 MeV ^a to 1,2 MeV almost equivalent to E_{max} from 225 keV to 3,54 MeV
^a For beta-particle radiation, an energy of 0,07 MeV is required to penetrate the dead layer of skin of 0,07 mm (almost equivalent to 0,07 mm of ICRU tissue) nominal depth.		

NOTE 2 Where a dose rate meter or monitor may be attached to a supplementary probe used to monitor contamination, the relevant standard for that probe is IEC 60325.

If national legislation requires the use of different measuring quantities, for example, air kerma or exposure, the standard may be used with the respective adjustments.

In this document, the expression "dose equivalent (rate)" is used when the provisions apply to both the measurement of dose equivalent and the measurement of dose equivalent rate.

NOTE 3 It does not apply to medical radiology which is within the scope of technical committee 62, where the conditions of radiation exposure may be extremely inhomogeneous, but precisely known.

NOTE 4 It does not apply to instruments intended to be worn by an individual for the purpose of estimating the radiation dose received by that individual.

The object of this standard is to specify the design requirements and the performance characteristics of dose equivalent (rate) meters intended for the determination of ambient dose equivalent (rate) and directional dose equivalent (rate) as defined in ICRU Report 47.

Accordingly, this standard specifies:

- a) general characteristics, the functions and performance characteristics of dose equivalent (rate) meters;

- b) the methods of test to be used to determine compliance with the requirements of this standard.

Some countries may wish to use this type of dose equivalent (rate) meter for measurements in the framework of legal metrology.

2 Normative references

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.

IEC 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

IEC 60050-393:2003, *International Electrotechnical Vocabulary (IEV) – Part 393: Nuclear instrumentation – Physical phenomena and basic concepts*

IEC 60050-394:2007, *International Electrotechnical Vocabulary (IEV) – Part 394: Nuclear instrumentation – Instruments, systems, equipment and detectors*

IEC 60068-2-31:2008, *Environmental testing – Part 2-31: Tests – Test Ec: Rough handling shocks, primarily for equipment-type specimens*

IEC 60086-1:2006, *Primary batteries – Part 1: General*

IEC 60086-2:2006, *Primary batteries – Part 2: Physical and electrical specifications*

IEC 60359:2001, *Electrical and electronic measurement equipment – Expression of performance*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
Amendment 1 (1999)¹

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*
Amendment 1 (1998)
Amendment 2 (2000)²

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
Amendment 1 (2007)³

IEC 61000-4-6:2008, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*
Amendment 1 (2000)⁴

¹ There exists a consolidated edition (2.1) which includes IEC 60529 (1989) and its Amendment 1 (1999).

² There exists a consolidated edition (1.2) which includes IEC 61000-4-2 (1995), its Amendment 1 (1998) and its Amendment 2 (2000).

³ There exists a consolidated edition (3.1) which includes IEC 61000-4-3 (2006) and its Amendment 1 (2007).

⁴ There exists a consolidated edition (1.1) which includes IEC 61000-4-8 (1993) and its Amendment 1 (2000).

IEC 61000-6-2:2005, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61187:1993, *Electrical and electronic measuring equipment – Documentation*

IEC/TR 62461:2006, *Radiation protection instrumentation – Determination of uncertainty in measurement*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99:2007, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

ISO 4037-1:1996, *X and gamma reference radiation for calibrating dosimeters and dose rate meters and for determining their response as a function of photon energy – Part 1: Radiation characteristics and production methods*

ISO 4037-2:1997, *X and gamma reference radiation for calibrating dosimeters and dose rate meters and for determining their response as a function of photon energy – Part 2: Dosimetry for radiation protection over the energy ranges 8 keV to 1,3 MeV and 4 MeV to 9 MeV*

ISO 4037-3:1999, *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 4037-4:2004, *X and gamma reference radiation for calibrating dosimeters and dose rate meters and for determining their response as a function of photon energy – Part 4: Calibration of area and personal dosimeters in low energy X reference radiation fields*

ISO 6980-1:2006, *Nuclear energy – Reference beta-particle radiation – Part 1: Methods of production*

ISO 6980-2:2004, *Nuclear energy – Reference beta-particle radiation – Part 2: Calibration fundamentals related to basic quantities characterizing the radiation field*

ISO 6980-3:2006, *Nuclear energy – Reference beta-particle radiation – Part 3: Calibration of area and personal dosimeters and determination of their response as a function of beta radiation energy and angle of incidence*

3 Terms and definitions

For the purposes of this document, the definitions given in IEC 60050-393, IEC 60050-394 and IEC 60359, as well as the following terms and definitions apply.

3.1

acceptance test

a contractual test to prove to the customer that the device meets certain conditions of its specification

3.2

ambient dose equivalent

$H^*(10)$

dose equivalent at a point in a radiation field that would be produced by the corresponding expanded and aligned field in the ICRU sphere at a depth of 10 mm on the radius opposing the direction of the aligned field

NOTE 1 The SI unit of ambient dose equivalent is the sievert (Sv) or its decimal multiples or submultiples (e.g. mSv).

NOTE 2 The ambient dose equivalent (rate), used for the monitoring of strongly penetrating radiation, is not an appropriate quantity for any beta radiation even that which is nominally penetrating (ICRU Report 47, 1992).

NOTE 3 When the term dose equivalent alone is used in this standard, the quantities ambient dose equivalent and directional dose equivalent are implied.

3.3 ambient dose equivalent rate

$\dot{H}^*(10)$

ratio of $dH^*(10)$ by dt , where $dH^*(10)$ is the increment of ambient dose equivalent in the time interval dt

$$\dot{H}^*(10) = \frac{dH^*(10)}{dt}$$

NOTE The SI unit of ambient dose equivalent rate is the sievert per second (Sv s^{-1}). Units of ambient dose equivalent rate are any quotient of the sievert or its decimal multiples or submultiples by a suitable unit of time (e.g. mSv h^{-1}).

3.4 coefficient of variation

ν

ratio of the estimate of standard deviation s to the arithmetic mean $\bar{x}$ of a set of n measurements

$$\nu = \frac{s}{\bar{x}} = \frac{1}{\bar{x}} \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2}$$

3.5 (complete) result of a measurement

set of values attributed to a measurand, including a value, the corresponding uncertainty and the unit of the measurand

NOTE 1 The central value of the whole (set of values) can be selected as measured value M and a parameter characterizing the dispersion as uncertainty.

NOTE 2 The result of a measurement is related to the indicated value given by the instrument G and to the values of correction obtained by calibration and by the use of a model.

NOTE 3 The estimation of M can be based on one or more indicated values.

[IEV 311-01-01, modified]

3.6 conventional quantity value

H

quantity value attributed by agreement to a quantity for a given purpose

NOTE 1 The term “conventional true quantity value” is sometimes used for this concept, but its use is discouraged.

NOTE 2 Sometimes a conventional quantity value is an estimate of a true quantity value.

NOTE 3 A conventional quantity value is generally accepted as being associated with a suitably small measurement uncertainty, which might be zero.

NOTE 4 In this standard the quantity is the dose equivalent (rate).

[VIM 2.12]

3.7**deviation*****D***

difference between the indicated values for the same value of the measurand of a dose equivalent (rate) meter, when an influence quantity assumes, successively, two different values [IEV 311-07-03, modified]

$$D = G - G_r$$

where G is the indicated value under the effect of an influence quantity and G_r is the indicated value under reference conditions.

NOTE 1 The original term in IEV 311-07-03 reads “variation (due to an influence quantity)”. In order not to confuse variation (of the indicated value) and variation of the response, in this standard, the term is called “deviation”.

NOTE 2 The deviation can be positive or negative resulting in an increase or a decrease of the indicated value, respectively.

NOTE 3 The deviation is of special importance for influence quantities of Type S.

3.8**directional dose equivalent*****H'(0,07)***

dose equivalent at a point in a radiation field that would be produced by the corresponding expanded field in the ICRU sphere at a depth of 0,07 mm, on a radius in a specified direction

NOTE The SI unit of directional dose equivalent is the sievert (Sv) or its decimal multiples or submultiples (e.g. mSv).

3.9**directional dose equivalent rate*****H'(0,07)***

ratio of $dH'(0,07)$ by dt , where $dH'(0,07)$ is the increment of directional dose equivalent in the time interval dt

$$\dot{H}'(0,07) = \frac{dH'(0,07)}{dt}$$

NOTE The SI unit of directional dose equivalent rate is the sievert per second (Sv s^{-1}). Units of directional dose equivalent rate are any quotient of the sievert or its decimal multiples or submultiples by a suitable unit of time (e.g. mSv h^{-1}).

3.10**dose equivalent (rate) meter**

assembly intended to measure or evaluate the dose equivalent (rate)

3.11**effective range of measurement (of a dose equivalent (rate) meter)**

range of values of the quantity to be measured over which the performance of a dose equivalent (rate) meter meets the requirements of this standard

3.12**indicated value (for the purpose of this standard)*****G***

value given by the (digital) indication of the dosimeter in units of dose equivalent or dose equivalent rate

3.13**influence quantity**

quantity that is not the measurand but that effects the result of the measurement

NOTE 1 For example, temperature of a micrometer used to measure length.

[GUM B.2.10]

NOTE 2 If the effect on the result of a measurement of an influence quantity depends on another influence quantity, these influence quantities are treated as a single one. In this standard, this is the case for the influence quantities “radiation energy and angle of radiation incidence”.

3.14

influence quantity of type F

influence quantity whose effect on the indicated value is a change in response

NOTE 1 An example is radiation energy and angle of radiation incidence.

NOTE 2 “F” stands for factor: The indication due to radiation is multiplied by a factor due to the influence quantity.

3.15

influence quantity of type S

influence quantity whose effect on the indicated value is a deviation independent of the indicated value

NOTE 1 An example is the electromagnetic disturbance.

NOTE 2 All requirements for influence quantities of type S are given with respect to the value of the deviation D .

NOTE 3 “S” stands for sum. The indication is the sum of the indication due to radiation and due to the influence quantity, e.g., electromagnetic disturbance.

3.16

lower limit of effective range of measurement

H_0

lowest dose (rate) value included in the effective range of measurement

3.17

maximum dose equivalent rate (for dosimeters)

$\dot{H}_{\max}$

doserate, specified by the manufacturer, below which the effect of the dose rate on the dose reading is within specified limits

3.18

measured value

M

value that can be obtained from the indicated value G by applying the model function for the measurement

NOTE 1 The model function is necessary to evaluate the uncertainty of the measured value according to the GUM (see GUM 3.1.6, 3.4.1 and 4.1).

NOTE 2 An example of a model function is given here. It combines the indicated value G with the reference calibration factor N_0 , the correction for non-linear response r_n , the l deviations D_p ($p = 1..l$) for the influence quantities of type S, and the m relative response values r_q ($q = 1..m$) for the influence quantities of type F:

$$M = \frac{N_0}{r_n \prod_{q=1}^m r_q} \left[G - \sum_{p=1}^l D_p \right].$$

NOTE 3 The calculations according to such model function are usually not performed, only in the case that specific influence quantities are well known and an appropriate correction is applied.

NOTE 4 If necessary another model function closer to the design of a certain dosimeter may be used.

NOTE 5 With the calibration controls adjusted according to the manufacture's instructions, the reference calibration factor, the correction for non-linear response and all relative response values are set to one and the deviations are set to zero, these settings cause an uncertainty of measurement which can be determined from the measured variation of the response values and the measured deviations. For a dosimeter tested according to this standard, all these data are available.

3.19**minimal rated range (of use)**

smallest range being specified for an influence quantity or instrument parameter over which the dose equivalent (rate) meter shall operate within the specified limits of variation in order to comply with this standard

NOTE The minimal rated ranges of the influence quantities dealt with in this standard are given in the second column of [C] Tables 5 to 9 [C].

3.20**non-linearity**

variation of the value of the (relative) response with the dose (rate) being measured

3.21**point of test (of a dose equivalent (rate) meter)**

point at which the conventional quantity value is determined and at which the reference point of the dose equivalent (rate) meter is placed for calibration and test purposes

3.22**qualification tests**

tests which are performed in order to verify that the requirements of a specification are fulfilled. Qualification tests are sub-divided into type tests and routine tests as defined below

3.23**rated range (of use) (of a dose equivalent (rate) meter)**

range of values of an influence quantity or instrument parameter over which the dose equivalent (rate) meter will operate within the specified limits of variation. Its limits are the maximum and minimum rated values

3.24**reference orientation (of a dose equivalent (rate) meter)**

orientation of the dose equivalent (rate) meter with respect to the direction of the incident radiation during calibration

3.25**reference point (of a dose equivalent (rate) meter)**

physical mark or marks on the outside of the dose equivalent (rate) meter used to position it at the point of measurement or the point of test

3.26**reference response**

R_0

response for a reference value $H_{r,0}$ of the quantity to be measured under reference conditions

$$R_0 = \frac{G_{r,0}}{H_{r,0}}$$

where $G_{r,0}$ is the corresponding indicated value

NOTE 1 The reference response is the reciprocal of the reference calibration factor.

NOTE 2 The reference values for the dose (rate) are given in Table 4.

3.27**relative response**

r

quotient of the response R and the reference response R_0

$$r = \frac{R}{R_0}$$

3.28 response (of a radiation measuring assembly)

R

ratio, under specified conditions, given by the relation

$$R = \frac{G}{H}$$

where *G* is the indicated value of the quantity measured by the equipment or assembly under test (dosemeter) and

H is the conventional quantity value of this quantity

3.29 routine test

a test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria

3.30 standard test conditions

conditions representing the range of values of a set of influence quantities under which a calibration or a determination of response is carried out

NOTE 1 Ideally, calibrations should be carried out under reference conditions. As this is not always achievable (for example for ambient air pressure) or convenient (for example for ambient temperature), a (small) interval around the reference values may be used. The deviations of the calibration factor from its value under reference conditions caused by these deviations should in principle be corrected for.

NOTE 2 During type tests, all values of influence quantities which are not the subject of the test are fixed within the interval of the standard test conditions.

[ISO 4037-3, 3.2.3, modified]

3.31 standard test values

a value, values, or range of values of an influence quantity or instrument parameter, which are permitted when carrying out calibrations or tests on another influence quantity or instrument parameter

NOTE Under standard test conditions, influence quantities and instrument parameters have their standard test values.

3.32 supplementary tests

tests intended to provide supplementary information on certain characteristics of the dose equivalent (rate) meters

3.33 type test

conformity testing on the basis of one or more specimens of a product representative of the production

4 Units and list of symbols

4.1 Units

In the present standard, the units of the International System (SI) are used. The definition of radiation quantities and dosimetric terms are given in IEC 60050-393, IEC 60050-394 and ICRU report 51. Nevertheless, the following units may be acceptable in common usage:

- for energy: electron-volt (symbol eV). $1 \text{ eV} = 1,602 \times 10^{-19} \text{ J}$;