BS EN 60846-1:2014

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

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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 It supersedes BS EN 60846:2004 which is withdrawn.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 [C〉 〈C].

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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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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)

This European Standard was approved by CENELEC on 2014-07-28. 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, 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: Avenue Marnix 17, B-1000 Brussels

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- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2017-07-28

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”.

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

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 dosemeters 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 dosemeters 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 dosemeters and doserate meters and for determining their response as a function of photon energy Part 3: Calibration of area and personal dosemeters 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 dosemeters and doserate meters and for determining their response as a function of photon energy Part 4: Calibration of area and personal dosemeters 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 dosemeters and the determination of their response as a function of beta radiation energy and angle of incidence	-	-

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CONTENTS

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 μSv 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;