Irish Standard
I.S. EN 61526:2013

Radiation protection instrumentation - Measurement of personal dose equivalents Hp(10) and Hp(0,07) for X, gamma, neutron and beta radiations - Direct reading personal dose equivalent meters (IEC 61526:2010 (MOD))

I.S. EN 61526:2013

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 61526

March 2013

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Supersedes EN 61526:2007

English version

Radiation protection instrumentation - Measurement of personal dose equivalents Hp(10) and Hp(0,07) for X, gamma, neutron and beta radiations - Direct reading personal dose equivalent meters

(IEC 61526:2010, modified)

Instrumentation pour la radioprotection - Mesure des équivalents de dose individuels Hp(10) et Hp(0,07) pour les rayonnements X, gamma, neutron et bêta - Appareils de mesure à lecture directe de l'équivalent de dose individuel (CEI 61526:2010, modifiée)

Strahlenschutz-Messgeräte - Messung der Tiefen- und der Oberflächen-Personendosis Hp(10) und Hp(0,07) für Röntgen-, Gamma-, Neutronen- und Betastrahlung - Direkt ablesbare Personendosimeter (IEC 61526:2010, modifiziert)

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CENELEC

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

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Ref. No. EN 61526:2013 E

Foreword

This document (EN 61526:2013) consists of the text of IEC 61526:2010 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)	2013-12-24
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2015-12-24

This document supersedes EN 61526:2007.

EN 61526:2013 includes the following significant technical changes with regard to the previous edition:

– inclusion of terms and definitions of ISO/IEC Guide 99:2007 (VIM:2008);

– full consistency with IEC/TR 62461:2006 “*Radiation protection instrumentation – Determination of uncertainty in measurement*”;

– improved determination of constancy of the dose response and statistical fluctuations;

– abolition of classes of personal doses equivalent meters in relation to retention of stored information;

– inclusion of usage categories of personal dosemeters in Annex C.

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.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 61526:2010 are prefixed “Z”.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61526:2010 was approved by CENELEC as a European Standard with agreed common modifications.

COMMON MODIFICATIONS

Introduction

In the third paragraph, **add** “mean beta particle energy” after “0,8 MeV”.

1 Scope and object

Add “for the same radiations (for alarming purposes)” at the end of list item b).

3 Terms and definitions

In the term and in the definition of 3.31, **replace** 'assembly' by 'detector assembly'.

6 General characteristics

6.6 Effective range of measurement

In the first paragraph, **add** “at least” between “$H_p(10)$ and” and “from 1 mSv”.

6.9 Indication due to instrument artefacts

Replace the title by “Indication due to the intrinsic background of the instrument”.

In the first paragraph, **replace** “$H_p(10)$” by “$H_p(10)$ and $H_p(0,07)$”.

9 Radiation performance requirements and tests

9.3.5 Method of test for photon dosemeters using natural radiation

In list item b), second sentence, **add** “mean” in front of “background dose rate” and **delete** “and "constant"”.

9.3.6 Interpretation of the results of the test using natural radiation

In the first paragraph and in the note, **replace** “inequation” by “inequality” (this modification refers to the English version only).

9.5.1.2 Method of test

In the third paragraph, first line, **delete** “above” in front of “requirements” and **add** “with the above mentioned reference radiations” after “cannot be met”.

In the beginning of the list items a), b) and c), **add** “relative” between “If the” and “response for”.

9.9.1 General

In the first sentence, **replace** “performed separately for $H_p(10)$ or $\dot{H}_p(10)$ and for $H_p(0,07)$ or $\dot{H}_p(0,07)$” by “performed for $H_p(10)$, $\dot{H}_p(10)$, $H_p(0,07)$ and $\dot{H}_p(0,07)$”.

At the end of the first sentence, **delete** “category, see Annex C”.

Annexes

Add the following new annex.

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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
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	2008	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009
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 61000-4-4 + corr. June	2004 2007	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2004

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.

IEC 61000-4-5 + corr. October	2005 2009	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2006
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	2009
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 61000-4-11	2004	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	EN 61000-4-11	2004
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 98-3 Suppl.1	2008 2008	Propagation of distributions using a Monte Carlo method and Corr.1 (2009)	-	-
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	-	-
ISO 8529-1	2001	Reference neutron radiations - Part 1: Characteristics and methods of production	-	-
ISO 8529-2	2000	Reference neutron radiations - Part 2: Calibration fundamentals of radiation protection devices related to the basic quantities characterizing the radiation field	-	-
ISO 8529-3	1998	Reference neutron radiations - Part 3: Calibration of area and personal dosimeters and determination of response as a function of energy and angle of incidence	-	-
ISO 12789-1	2008	Reference radiation fields - Simulated workplace neutron fields - Part 1: Characteristics and methods of production	-	-
ISO 12789-2	2008	Reference radiation fields - Simulated workplace neutron fields - Part 2: Calibration fundamentals related to the basic quantities	-	-
ICRU Report 51	1993	Quantities and units in radiation protection dosimetry	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIATION PROTECTION INSTRUMENTATION – MEASUREMENT OF PERSONAL DOSE EQUIVALENTS $H_p(10)$ AND $H_p(0,07)$ for X, GAMMA, NEUTRON AND BETA RADIATIONS – DIRECT READING PERSONAL DOSE EQUIVALENT METERS

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

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision. This edition includes the following significant technical changes with regard to the previous edition:

– Inclusion of terms and definitions from ISO/IEC Guide 99:2007 (VIM:2008).
– Full consistency with IEC/TR 62461:2006 "*Radiation protection instrumentation – Determination of uncertainty in measurement*".
– Improved determination of constancy of the dose response and statistical fluctuations.
– Abolition of classes of personal dose equivalent meters in relation to retention of stored information.
– Inclusion of usage categories of personal dosemeters in Annex C.

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

FDIS	Report on voting
45B/648/FDIS	45B/666/RVD

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

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

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

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

INTRODUCTION

This International Standard applies to active, direct reading personal dose equivalent meters and monitors used for measuring the personal dose equivalents $H_p(10)$ and $H_p(0,07)$ for X, gamma, neutron and beta radiations.

For the personal dose equivalent $H_p(10)$ or the personal dose equivalent rate $\dot{H}_p(10)$ and for X and gamma radiations, 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 medical diagnostic, the second from 80 keV to 1,5 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 5 MeV. The rated ranges can be extended to all energies covered by the respective standards for reference radiation fields.

For the personal dose equivalent $H_p(0,07)$ and for X and gamma radiations, a minimum rated range for the photon energy from 20 keV to 150 keV is given and for beta radiation, the minimal rated range is from 0,2 MeV to 0,8 MeV. The rated ranges can be extended to all energies covered by the respective standards for reference radiation fields.

Examples of extended rated ranges are given in Annex C.

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 dose equivalent meters, requirements for measuring the dose quantities $H_p(10)$ and $H_p(0,07)$ and for monitoring of the dose rate quantities $\dot{H}_p(10)$ and $\dot{H}_p(0,07)$ are given. The measurement of these dose rate quantities is an option for personal dose equivalent meters.

Establishments in some countries may wish to use this type of personal dose equivalent meter as the dosemeter to provide the dose of record by an approved dosimetry service.

RADIATION PROTECTION INSTRUMENTATION – MEASUREMENT OF PERSONAL DOSE EQUIVALENTS $H_p(10)$ AND $H_p(0,07)$ for X, GAMMA, NEUTRON AND BETA RADIATIONS – DIRECT READING PERSONAL DOSE EQUIVALENT METERS

1 Scope and object

This International Standard applies to personal dose equivalent meters with the following characteristics:

a) They are worn on the trunk or the extremities of the body.

b) They measure the personal dose equivalents $H_p(10)$ and $H_p(0,07)$ from external X and gamma, neutron and beta radiations, and may measure the personal dose equivalent rates $\dot{H}_p(10)$ and $\dot{H}_p(0,07)$.

c) They have a digital indication.

d) They may have alarm functions for the personal dose equivalents or personal dose equivalent rates.

This standard is therefore applicable to the measurement of the following combinations of dose quantities (including the respective dose rates) and radiation

1) $H_p(10)$ and $H_p(0,07)$ from X and gamma radiations;

2) $H_p(10)$ and $H_p(0,07)$ from X, gamma and beta radiations;

3) $H_p(10)$ from X and gamma radiations;

4) $H_p(10)$ from neutron radiations;

5) $H_p(10)$ from X, gamma and neutron radiations;

6) $H_p(0,07)$ from X, gamma and beta radiations.

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

NOTE 2 When reference is made in this standard to ”dosemeter”, this is meant to include all personal dose equivalent meters, unless otherwise stated.

This standard specifies requirements for the dosemeter and, if supplied, for its associated readout system.

This standard specifies, for the dosemeters 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 dosemeter.

This standard also specifies in Annex C usage categories with respect to different measuring capabilities.

This standard does not cover special requirements for accident or emergency dosimetry although the dosemeters may be used for this purpose. The standard does not apply to dosemeters used for measurement of pulsed radiation, such as radiation emanating from most medical diagnostic X-ray facilities, linear accelerators or similar equipment.