BS EN 61577-2:2017

BSI Standards Publication

Radiation protection instrumentation - Radon and radon decay product measuring instruments

Part 2: Specific requirements for 222Rn and 220Rn measuring instruments

bsi.

National foreword

This British Standard is the UK implementation of EN 61577-2:2017. It is derived from IEC 61577-2:2014. It supersedes BS IEC 61577-2:2014, which is withdrawn.

The CENELEC common modifications to this document have been provided in their entirety in the European Endorsement Notice. BSI's policy of providing consolidated content remains unchanged; however, in the interest of expediency, in this instance BSI have chosen to collate the relevant content at the beginning of this document.

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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Date	Text affected
31 March 2018	This corrigendum renumbers BS IEC 61577-2:2014 as BS EN 61577-2:2017

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English Version

Radiation protection instrumentation - Radon and radon decay product measuring instruments - Part 2: Specific requirements for 222Rn and 220Rn measuring instruments (IEC 61577-2:2014 , modified)

Instrumentation pour la radioprotection - Instruments de mesure du radon et des descendants du radon - Partie 2: Exigences spécifiques pour les instruments de mesure du 222Rn et du 220Rn (IEC 61577-2:2014 , modifiée)

Strahlenschutz-Messgeräte - Geräte für die Messung von Radon und Radon-Folgeprodukten - Teil 2: Besondere Anforderungen für Messgeräte für Rn-222 und Rn-220 (IEC 61577-2:2014 , modifiziert)

This European Standard was approved by CENELEC on 2017-06-16. 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.

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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

European foreword

This document (EN 61577-2:2017) consists of the text of IEC 61577-2:2014 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) 2018-06-16
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2020-06-16

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 61577-2:2014 are prefixed “Z”.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard IEC 61577-2:2014 was approved by CENELEC as a European Standard with agreed common modifications.

COMMON MODIFICATIONS

Table 1 — Reference conditions and standard test conditions (unless otherwise indicated by the manufacturer)

In the line “Ambient temperature” ***replace*** “22 °C” with “24 °C”.

In the line “Relative humidity” **replace** “50 %” with “40 %.

In the line “Ambient dose equivalent” **replace** “< 0,20 μSv·h^{-1}” in the second column with “Negligible” and “0,20” in the third column with “0,25”.

Then the table looks like the following:

Quantity	Reference conditions	Standard test conditions
Warm-up time	10 min	≥ 10 min
Activity concentration of ^{222}Rn[b]	< 10 Bq· m^{-3}	< 10 Bq· m^{-3}
Activity concentration of ^{220}Rn[c]	< 10 Bq· m^{-3}	< 10 Bq· m^{-3}
Ambient temperature	20 °C	18 °C to 24 °C
Relative humidity	65 %	40 % to 75 %
Atmospheric pressure	101,3 kPa	90 kPa to 106 kPa[a]
Power supply voltage	Nominal supply voltage U_N	Nominal supply voltage U_N ± 0,5 %
AC power supply frequency	Nominal frequency	Nominal frequency ± 0,5 %
AC power supply waveform	Sinusoidal	Sinusoidal with a total harmonic distortion less than 5 %
Ambient dose equivalent rate	Negligible	< 0,25 μSv·h^{-1}
Electromagnetic field of external origin	Negligible	Negligible
Magnetic induction of external origin	Negligible	Negligible
Radio frequency	Negligible	Less than the lowest value that causes interference
Sampling flow-rate	Nominal flow-rate	Nominal flow-rate ± 0,5 %

[a] Where the detection technique is particularly sensitive to variation in atmospheric pressure, the conditions shall be limited to ± 0,5 % of the reference pressure.

[b] Only for instruments measuring of ^{220}Rn.

[c] Only for instruments measuring of ^{222}Rn.

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 60068-2-27	-	Environmental testing -- Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	-
IEC 61000-6-4	-	Electromagnetic compatibility (EMC) -- Part 6-4: Generic standards - Emission standard for industrial environments	EN 61000-6-4	-
IEC 61140	-	Protection against electric shock - Common aspects for installation and equipment	EN 61140	-
IEC 61187	-	Electrical and electronic measuring equipment - Documentation	EN 61187	-
IEC 61577-1	-	Radiation protection instrumentation - Radon and radon decay product measuring instruments - Part 1: General principles	-	-
ISO 11665-1	-		EN ISO 11665-1	-
ISO/IEC Guide 98-3	-	Uncertainty of measurement -- Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

RADIATION PROTECTION INSTRUMENTATION – RADON AND RADON DECAY PRODUCT MEASURING INSTRUMENTS –

Part 2: Specific requirements for ^{222}Rn and ^{220}Rn measuring instruments

FOREWORD

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International Standard IEC 61577-2 has been prepared by sub-committee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation.

This second edition cancels and replaces the first edition issued in 2000. This edition constitutes a technical revision.

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

a) Addition of new requirements and tests concerning radiation detection performance.
b) Addition of new requirements and tests concerning environmental performance.

c) Harmonization of the requirements and tests concerning electrical and mechanical performance with other standards in the area of radon and radon decay product instrumentation.

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

FDIS	Report on voting
45B/793/FDIS	45B/798/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.

A list of all parts of IEC 61577 series, under the general title *Radiation protection instrumentation – Radon and radon decay product measuring instruments*, can be found on the IEC website.

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

Radon is a radioactive trace gas produced by the decay of ^{226}Ra, ^{223}Ra and ^{224}Ra, respectively decay products of ^{238}U, ^{235}U and ^{232}Th which are present in the earth's crust. By decay, radon isotopes (i.e. ^{222}Rn, ^{219}Rn, ^{220}Rn) produce three decay chains, each ending in a stable lead isotope. The radon isotope ^{220}Rn is generally known as thoron[1].

NOTE In normal conditions, due to the very short half-life of ^{219}Rn, its activity and the activity of its RnDP[2] are considered negligible compared to the activity of the other two series. Its health effects are therefore not important. Thus in this standard ^{219}Rn and its decay products are not considered.

In order to facilitate its use, the IEC 61577 series is divided into the following different parts:

IEC 61577-1: This part emphasizes the terminology and units used in the specific field of radon and radon decay products (RnDP) measurement techniques and describes briefly the concept of System for Test Atmospheres with Radon (STAR) used for test and calibration of radon and RnDP measuring devices.

IEC 61577-2: This part is dedicated to the tests of ^{222}Rn and ^{220}Rn measuring instruments.

IEC 61577-3: This part is dedicated to the tests of $RnDP_{222}$ and $RnDP_{220}$ measuring instruments.

IEC 61577-4: This part is dedicated to the construction of a STAR and its use for testing.

IEC/TR 61577-5 (informative): This is a technical report (to be developed) concerning special features of radon and/or RnDP measurement.

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1 The term *thoron* is not used in this standard. Instead, the term *radon* is used to denote the radionuclides ^{220}Rn and ^{222}Rn. In the case that one of these radionuclides is to be explicitly specified, the atomic mass number and the chemical symbol are given.

2 RnDP is the acronym for Radon Decay Products, which are sometimes called radon progeny. The term *Radon Decay Products* or its abbreviation (RnDP) denotes the whole set of short-lived decay products that becomes the focus of this standard. A particular isotope is indicated by its chemical symbol preceded by its mass number. The subscripts $_{222}$, $_{220}$ added to the symbol RnDP refer to the whole set of short-lived decay products of the corresponding radon isotope ($RnDP_{222}$: ^{218}Po, ^{214}Pb, ^{214}Bi, ^{214}Po, and $RnDP_{220}$: ^{216}Po, ^{212}Pb, ^{212}Bi, ^{212}Po, ^{208}Tl).

RADIATION PROTECTION INSTRUMENTATION – RADON AND RADON DECAY PRODUCT MEASURING INSTRUMENTS –

Part 2: Specific requirements for ^{222}Rn and ^{220}Rn measuring instruments

1 Scope

This part of IEC 61577 describes the specific requirements for instruments measuring the activity concentration of airborne ^{222}Rn and ^{220}Rn outdoors, in dwellings, and in workplaces including underground mines.

This standard applies practically to all types of electronic measuring instruments that are based on either spot or continuous measurements. The activity concentration can be measured by pumping or by diffusing the air containing ^{222}Rn and/or ^{220}Rn into the sensitive volume of the detection unit or at a particular moment by taking an air sample (grab sampling).

The different types of instrumentation used for measurements are stated in IEC 61577-1.

The standard does not apply to instruments using charcoal adsorption, electrets or solid state nuclear track detectors.

2 Normative references

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.

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 61000-6-4, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

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

IEC 61577-1, *Radiation protection instrumentation – Radon and radon decay product measuring instruments – Part 1: General principles*

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

ISO 11665-1, *Measurement of radioactivity in the environment – Air: radon-222 – Part 1: Origins of radon and its short-lived decay products and associated measurement methods*