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Water quality - Radon-222 - Part 1: General principles (ISO 13164-1:2013)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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Water quality - Radon-222 - Part 1: General principles (ISO 13164-1:2013, Correction version 2013-11-15)

Qualité de l'eau - Radon 222 - Partie 1: Principes généraux (ISO 13164-1:2013, Version corrigée 2013-11-15)

Wasserbeschaffenheit - Radon 222 - Teil 1: Grundlagen (ISO 13164-1:2013, korrigierte Fassung 2013-11-15)

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EN ISO 13164-1:2020 (E)

Contents	Page
European foreword.....	3

European foreword

The text of ISO 13164-1:2013, Corrected version 2013-11-15 has been prepared by Technical Committee ISO/TC 147 "Water quality" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 13164-1:2020 by Technical Committee CEN/TC 230 "Water analysis" the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2020, and conflicting national standards shall be withdrawn at the latest by August 2020.

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Endorsement notice

The text of ISO 13164-1:2013, Corrected version 2013-11-15 has been approved by CEN as EN ISO 13164-1:2020 without any modification.

INTERNATIONAL STANDARD

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Water quality — Radon-222 —

Part 1: General principles

Qualité de l'eau — Radon 222 —

Partie 1: Principes généraux



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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions, and symbols	2
3.1 Terms and definitions.....	2
3.2 Symbols.....	4
4 Principle of the measurement method	5
5 Sampling	6
6 Transportation and storage	6
7 Test sample preparation	8
7.1 Degassing techniques.....	8
7.2 Permeation technique.....	9
7.3 Liquid extraction technique.....	9
8 Detection techniques	9
8.1 Gamma-spectrometry.....	9
8.2 Silver-activated zinc sulfide ZnS(Ag) scintillation.....	9
8.3 Air ionization.....	9
8.4 Semiconductor (alpha-detection).....	10
8.5 Liquid scintillation.....	10
9 Measurement methods	10
9.1 General.....	10
9.2 Gamma-spectrometry method.....	10
9.3 Emanometric method.....	10
9.4 Liquid scintillation counting methods (LSC).....	12
9.5 Permeation method.....	12
10 Calibration	12
11 Quality assurance and quality control programme	12
11.1 General.....	12
11.2 Influence quantities.....	12
11.3 Instrument verification.....	13
11.4 Method verification.....	13
11.5 Demonstration of analyst capability.....	13
12 Expression of results	13
13 Test report	13
Annex A (informative) Radon and its decay products in water	15
Annex B (informative) Examples of data record forms	19
Bibliography	23

ISO 13164-1:2013(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2, www.iso.org/directives.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received, www.iso.org/patents.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The committee responsible for this document is ISO/TC 147, *Water quality*, Subcommittee SC 3, *Radioactivity measurements*.

ISO 13164 consists of the following parts, under the general title *Water quality — Radon-222*:

- *Part 1: General principles*
- *Part 2: Test method using gamma-ray spectrometry*
- *Part 3: Test method using emanometry*

The following part is under preparation:

- *Part 4: Test method using two-phase liquid scintillation counting*

This corrected version of ISO 13164-1:2013 incorporates the following corrections:

- Table 2: The check marks which printed out incorrectly in the last two columns have been changed to X's. The X's from the cells "Gamma spectrometry – On-site" and "Liquid scintillation – On-site" have been removed.
- [Annex B](#): The examples of data record forms for B.2 and B.3 were inversed. They are now in the right places.

Introduction

Radioactivity from several naturally occurring and human-made sources is present throughout the environment. Thus, water bodies (surface waters, groundwaters, sea waters) can contain radionuclides of natural and human-made origin.

- Natural radionuclides, including potassium-40, and those of the thorium and uranium decay series, in particular radium-226, radium-228, uranium-234, uranium-238, lead-210, can be found in water for natural reasons (e.g. desorption from the soil and wash-off by rain water) or releases from technological processes involving naturally occurring radioactive materials (e.g. the mining and processing of mineral sands or phosphate fertilizer production and use).
- Human-made radionuclides such as transuranium elements (americium, plutonium, neptunium, curium), tritium, carbon-14, strontium-90 and gamma-emitting radionuclides can also be found in natural waters as they can be authorized to be routinely released into the environment in small quantities in the effluent discharged from nuclear fuel cycle facilities and following their used in unsealed form in medicine or industry. They are also found in water due to the past fallout of the explosion in the atmosphere of nuclear devices and the accidents at Chernobyl and Fukushima.

Drinking-water can thus contain radionuclides at activity concentration which could present a risk to human health. In order to assess the quality of drinking-water (including mineral waters and spring waters) with respect to its radionuclide content and to provide guidance on reducing health risks by taking measures to decrease radionuclide activity concentrations, water resources (groundwater, river, lake, sea, etc.) and drinking water are monitor for their radioactivity content as recommended by the World Health Organization (WHO).

Standard test methods for radon-222 activity concentrations in water samples are needed by test laboratories carrying out such measurements in fulfillment of national authority requirements. Laboratories may have to obtain a specific accreditation for radionuclide measurement in drinking water samples.

The radon activity concentration in surface water is very low, usually below 1 Bq l⁻¹. In groundwater, the activity concentration varies from 1 Bq l⁻¹ up to 50 Bq l⁻¹ in sedimentary rock aquifers, from 10 Bq l⁻¹ up to 300 Bq l⁻¹ in wells, and from 100 Bq l⁻¹ up to 1 000 Bq l⁻¹ in crystalline rocks. The highest activity concentrations are normally measured in rocks with high concentration of uranium (Reference [30]).

High variations in the activity concentrations of radon in aquifers have been observed. Even in a region with relatively uniform rock types, some well water may exhibit radon activity concentration greatly higher than the average value for the same region. Significant seasonal variations have also been recorded (see [Annex A](#)).

Water may dissolve chemical substances as it passes from the soil surface to an aquifer or spring waters. The water may pass through or remain for some time in rock, some formations of which may contain a high concentration of natural radionuclides. Under favourable geochemical conditions, the water may selectively dissolve some of these natural radionuclides.

Guidance on radon in drinking-water supplies provided by WHO in 2008 suggests that controls should be implemented if the radon concentration of drinking-water for public water supplies exceeds 100 Bq l⁻¹. It also recommended that any new, especially public, drinking-water supply using groundwater should be tested prior to being used for general consumption and that if the radon concentration exceeds 100 Bq l⁻¹, treatment of the water source should be undertaken to reduce the radon levels to well below that level (Reference [41]).

This International Standard is one of a series dealing with the measurement of the activity concentration of radionuclides in water samples.

Water quality — Radon-222 —

Part 1: General principles

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is absolutely essential that tests conducted in accordance with this document be carried out by suitably qualified staff.

1 Scope

This part of ISO 13164 gives general guidelines for sampling, packaging, and transporting of all kinds of water samples, for the measurement of the activity concentration of radon-222.

The test methods fall into two categories:

- a) direct measurement of the water sample without any transfer of phase (see ISO 13164-2);
- b) indirect measurement involving the transfer of the radon-222 from the aqueous phase to another phase (see ISO 13164-3).

The test methods can be applied either in the laboratory or on site.

The laboratory is responsible for ensuring the suitability of the test method for the water samples tested.

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.

ISO 5667-1, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques*

ISO 5667-3, *Water quality — Sampling — Part 3: Preservation and handling of water samples*

ISO 10703, *Water quality — Determination of the activity concentration of radionuclides — Method by high resolution gamma-ray spectrometry*

ISO 13164-2, *Water quality — Radon-222 — Part 2: Test method using gamma-ray spectrometry*

ISO 13164-3, *Water quality — Radon-222 — Part 3: Test method using emanometry*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 80000-10, *Quantities and units — Part 10: Atomic and nuclear physics*

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