
Kakovost vode - Radon Rn-222 - 4. del: Preskusna metoda s štetjem z dvofaznim tekočinskim scintilatorjem (ISO 13164-4:2015)

Water quality - Radon-222 - Part 4: Test method using two-phase liquid scintillation counting (ISO 13164-4:2015)

Wasserbeschaffenheit - Radon-222 - Teil 4: Verfahren mittels zweistufiger Flüssigszintillationszählung (ISO 13164-4:2015)

Qualité de l'eau - Radon 222 - Partie 4: Méthode d'essai par comptage des scintillations en Milieu liquide à deux phases (ISO 13164-4:2015)

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13.060.60	Preiskava fizikalnih lastnosti vode	Examination of physical properties of water
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Water quality - Radon-222 - Part 4: Test method using two-phase liquid scintillation counting (ISO 13164-4:2015)

Qualité de l'eau - Radon 222 - Partie 4: Méthode d'essai par comptage des scintillations en milieu liquide à deux phases (ISO 13164-4:2015)

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This European Standard was approved by CEN on 6 October 2019.

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European foreword

The text of ISO 13164-4:2015 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 13164-4:2020 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of an identical text or by endorsement, at the latest by August 2020, and conflicting national standards shall be withdrawn at the latest by August 2020.

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

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Endorsement notice

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Water quality — Radon-222 —

Part 4:

**Test method using two-phase liquid
scintillation counting**

Qualité de l'eau — Radon 222 —

*Partie 4: Méthode d'essai par comptage des scintillations en milieu
liquide à deux phases*

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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 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

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

Introduction

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

- Natural radionuclides, including potassium-40, and those originating from the thorium and uranium decay series, in particular radium-226, radium-228, uranium-234, uranium-238, and lead-210, can be found in water for natural reasons (e.g. desorption from the soil and wash-off by rain water) or can be released 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 some gamma-emitting radionuclides can also be found in natural waters as a result of authorized routine releases into the environment in small quantities in the effluent discharged from nuclear fuel cycle facilities. They are also released into the environment following their use in unsealed form in medicine or industrial applications. They are also found in the water as a result of past fallout resulting from explosion in the atmosphere of nuclear devices and accidents such as those that occurred in 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 monitored for their radioactivity content as recommended by the World Health Organization (WHO) and may be required by some national authorities.

Standard test methods for radon-222 activity concentrations in water samples are needed by test laboratories carrying out such measurements in fulfilment 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 (see Reference [9]).

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 can exhibit radon activity concentration greatly higher than the average value for the same region. Significant seasonal variations have also been recorded (see ISO 13164-1:2013, Annex A).

Water can dissolve chemical substances as it passes from the soil surface to an aquifer or spring waters. The water can pass through or remain for some time in rock, some formations of which can contain a high concentration of natural radionuclides. Under favourable geochemical conditions, the water can 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 is 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 (see Reference [10]).

This part of ISO 13164 is one of the series dealing with the measurement of the activity concentration of radionuclides in water samples.

The origin of radon-222 and its short-lived decay products in water and other measurement methods are described generally in ISO 13164-1.