
**Kakovost vode - Radon Rn-222 - 3. del: Preskusna metoda z emanometrijo
(ISO/DIS 13164-3:2026)**

Water quality - Radon-222 - Part 3: Test method using emanometry (ISO/DIS 13164-3:2026)

Wasserbeschaffenheit - Radon-222 - Teil 3: Verfahren mittels Emanometrie (ISO/DIS 13164-3:2026)

Qualité de l'eau - Radon 222 - Partie 3: Méthode d'essai par émanométrie (ISO/DIS 13164-3:2026)

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13.060.60	Preiskava fizikalnih lastnosti vode	Examination of physical properties of water
17.240	Merjenje sevanja	Radiation measurements

oSIST prEN ISO 13164-3:2026**en,fr,de**

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DRAFT International Standard

ISO/DIS 13164-3

Water quality — Radon-222 — Part 3: Test method using emanometry

*Qualité de l'eau — Radon 222 —
Partie 3: Méthode d'essai par émanométrie*

ICS: 17.240; 13.060.60; 13.280

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Foreword

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This document was prepared by Technical Committee ISO/TC 147, Water Quality, Subcommittee SC 3, *Radioactivity measurements*.

This second edition cancels and replaces the first edition (ISO 13164-3:2013), which has been technically revised.

The main changes are as follows:

- the introduction was updated
- the test report was updated
- a new informative annex was added: [Annex A](#) (informative) “Rn-222 Air to Water: Conversion Factor (ω)”
- the bibliography was updated

A list of all parts in the ISO 13164 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Radionuclides are present throughout the environment; thus, water bodies (e.g. surface waters, ground waters, sea waters) contain radionuclides, which can be of either natural or anthropogenic origin:

- naturally occurring radionuclides, including ^3H , ^{14}C , ^{40}K and those originating from the thorium and uranium decay series, in particular ^{210}Pb , ^{210}Po , ^{222}Rn , ^{226}Ra , ^{228}Ra , ^{227}Ac , ^{232}Th , ^{231}Pa , ^{234}U , and ^{238}U can be found in water bodies due to either natural processes (e.g., desorption from the soil, runoff by rain water) or released from technological processes involving naturally occurring radioactive materials (e.g. mining, mineral processing, oil, gas and production, water treatment and the production and the use of phosphate fertilisers);
- anthropogenic radionuclides such as ^3H , ^{14}C , ^{55}Fe , ^{59}Ni , ^{63}Ni , ^{90}Sr , ^{99}Tc , transuranic elements (Np, Pu, Am, and Cm) and some gamma emitting radionuclides such as ^{60}Co and ^{137}Cs can also be found in natural waters. Small quantities of anthropogenic radionuclides can be discharged from nuclear facilities to the environment as a result of authorized routine releases. The radionuclides present in liquid effluents are usually controlled before being discharged to the environment^[1] and water bodies. Anthropogenic radionuclides used in medical and industrial applications can be released to the environment after use. Anthropogenic radionuclides are also found in waters due to the contamination from fallout resulting above-ground nuclear detonations and accidents such as those that occurred at the Chornobyl and Fukushima nuclear facilities.

Radionuclide activity concentrations in water bodies can vary according to local geological characteristics and climatic conditions and can be locally and temporally enhanced by releases from nuclear facilities during planned, existing, and emergency exposure situations.^{[2][3]} Some drinking water sources can thus contain radionuclides at activity concentrations that could present a human health risk. The World Health Organization (WHO) recommends to routinely monitor radioactivity in drinking waters^[4] and to take proper actions when needed to minimize the health risk.

National regulations usually specify the activity concentration limits that are authorized in drinking waters, water bodies, and liquid effluents to be discharged to the environment. These limits can vary for planned, existing, and emergency exposure situations. The WHO does not have a current recommended specific activity concentration limit for radon in water as radon exposure through indoor air is considered a more pressing concern,^[4] while in Europe, the implementation of European Council Directive 2013/51/EURATOM, establishes a radon concentration limit of 100 Bq·l⁻¹. Compliance with such limits is assessed by measuring radioactivity in water samples and by comparing the results obtained, with their associated uncertainties, as specified by ISO/IEC Guide 98-3^[5] and ISO 5667-20^[6].

This document contains method to support laboratories which need to determine ^{222}Rn in water samples.

The method described in this document can be used for various types of waters (see [Clause 1](#)). Minor modifications such as sample volume and counting time can be made if needed to ensure that the characteristic limit, decision threshold, detection limit, and uncertainties are below the required limits. This can be done for several reasons such as emergency situations, lower national guidance limits, and operational requirements.

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Part 3: Test method using emanometry

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 determine the applicability of any other restrictions.

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 specifies a test method for the determination of ^{222}Rn activity concentration in a sample of water following its transfer from the aqueous phase to the gas phase by degassing and its detection. It gives recommendations for rapid measurements performed within less than 1 h.

The ^{222}Rn activity concentrations, which can be measured by this test method utilizing currently available instruments, range from $0,1 \text{ Bq}\cdot\text{l}^{-1}$ to several hundred thousand becquerels per litre for a 100 ml test sample.

This test method is used successfully with drinking water samples. The laboratory is responsible for ensuring the validity of this test method for water samples of untested matrices.

This test method can be applied on field sites or in the laboratory.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. 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 11929 (all parts), *Determination of the characteristic limits (decision threshold, detection limit and limits of the confidence interval) for measurements of ionizing radiation — Fundamentals and application*

ISO 13164-1, *Water quality — Radon-222 — Part 1: General principles*

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*

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

IEC 61577-2, *Radiation protection instrumentation — Radon and radon decay product measuring instruments — Part 2: Specific requirements for radon measuring instruments*