
Kakovost vode - Radon Rn-222 - 1. del: Splošna načela (ISO 13164-1:2013, popravljena izdaja 2013-11-15)

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

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

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2d48f1e7767a/sist-en-iso-13164-1-2020>

Ta slovenski standard je istoveten z: EN ISO 13164-1:2020

ICS:

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

SIST EN ISO 13164-1:2020

en,fr,de

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 13164-1:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020>

EUROPEAN STANDARD

EN ISO 13164-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2020

ICS 13.060.60; 17.240; 13.280

English Version

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)

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

This European Standard was corrected and reissued by the CEN-CENELEC Management Centre on 11 March 2020.

CEN 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 CEN 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 CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	3

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 13164-1:2020
<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020>

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.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

iTeh STANDARD PREVIEW Endorsement notice (standards.iteh.ai)

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.

<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 13164-1:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020>

INTERNATIONAL
STANDARD

ISO
13164-1

First edition
2013-09-01

Corrected version
2013-11-15

Water quality — Radon-222 —

**Part 1:
General principles**

Qualité de l'eau — Radon 222 —

Partie 1: Principes généraux

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN ISO 13164-1:2020](https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020)

<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020>



Reference number
ISO 13164-1:2013(E)

© ISO 2013

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 13164-1:2020

<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 13164-1:2020

<https://standards.iteh.ai/catalog/standards/sist/1f2c8a01-9c52-4d56-b3cf-2dcffdc7767a/sist-en-iso-13164-1-2020>