

This document is a review generated by EVS

Water quality - Radium-226 - Part 2: Test method using emanometry (ISO 13165-2:2014)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 13165-2:2020 sisaldab Euroopa standardi EN ISO 13165-2:2020 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 13165-2:2020 consists of the English text of the European standard EN ISO 13165-2:2020.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 12.02.2020.	Date of Availability of the European standard is 12.02.2020.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 13.060.60, 17.240

Standardite reproduutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:
Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 13165-2

February 2020

ICS 13.060.60; 17.240

English Version

Water quality - Radium-226 - Part 2: Test method using
emanometry (ISO 13165-2:2014)

Qualité de l'eau - Radium 226 - Partie 2: Méthode
d'essai par émanométrie (ISO 13165-2:2014)

Wasserbeschaffenheit - Radium 226 - Teil 2:
Untersuchungsverfahren mittels Emanometrie (ISO
13165-2:2014)

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

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

European foreword

The text of ISO 13165-2:2014 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 13165-2:2020 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.

Endorsement notice

The text of ISO 13165-2:2014 has been approved by CEN as EN ISO 13165-2:2020 without any modification.

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and symbols	1
3.1 Terms and definitions	1
3.2 Symbols	2
4 Principle	2
5 Reagents and equipment	3
5.1 Reagents	3
5.2 Equipment	3
6 Sampling and storage	4
6.1 Sampling	4
6.2 Sample storage	4
7 Procedures	4
7.1 Sample preparation	4
7.2 Measurement conditions	5
7.3 Counting procedure	5
8 Quality assurance and quality control programme	5
8.1 General	5
8.2 Influence parameters	5
8.3 Instrument verification and calibration	6
8.4 Method verification	6
8.5 Demonstration of analyst capability	6
9 Expression of results	6
9.1 Activity concentration of water-soluble ^{226}Ra	6
9.2 Standard uncertainty of activity concentration	7
9.3 Limits of the confidence interval	8
9.4 Example	8
10 Test report	8
Annex A (informative) Decay chains of uranium-238 and thorium-232	10
Annex B (informative) Bubbler	12
Annex C (informative) Glass scintillation cell	14
Bibliography	15

Introduction

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

Natural radionuclides, including potassium-40, and those of 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 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 some gamma emitters 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 discharge from nuclear fuel cycle facilities and following their use in unsealed form in medicine or industry. They are also found in the water due to the past fallout of the explosion in the atmosphere of nuclear devices and those following the Chernobyl and Fukushima accidents.

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).

The need of a standard on a test method of radium-226 activity concentrations in water samples is justified for test laboratories carrying out these measurements, required sometimes by national authorities, as they may have to obtain a specific accreditation for radionuclide measurement in drinking water samples.

Radium-226 activity concentration can vary widely according to local geological and climatic characteristics and ranges from 0,001 Bq l⁻¹ in surface waters up to 50 Bq l⁻¹ in natural groundwaters. The guidance level for radium-226 in drinking water as recommended by WHO is 1 Bq l⁻¹ (see Reference [11]).

NOTE The guidance level is the activity concentration (rounded to the nearest order of magnitude) with an intake of 2 l·d⁻¹ of drinking water for 1 year that results in an effective dose of 0,1 mSv·y⁻¹ for members of the public, an effective dose that represents a very low level of risk that is not expected to give rise to any detectable adverse health effect.

This International Standard is one of a series on determination of the activity concentration of radionuclides in water samples.

Water quality — Radium-226 —

Part 2: 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 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 13165 specifies the determination of radium-226 (^{226}Ra) activity concentration in all types of water by emanometry.

The method specified is suitable for the determination of the soluble, suspended, and total ^{226}Ra activity concentration in all types of water with soluble ^{226}Ra activity concentrations greater than 0,02 Bq l⁻¹.

In water containing high activity concentrations of ^{228}Th , interference from ^{220}Rn decay products can lead to overestimation of measured levels (see [Figure A.2](#)).

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

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*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 80000-10 and the following apply.

3.1.1

reference measurement standard

measurement standard designated for the calibration of other measurement standards for quantities of a given kind in a given organization or at a given location

3.1.2

working measurement standard

measurement standard that is used routinely to calibrate or verify measuring instruments or measuring systems

Note 1 to entry: A working measurement standard can be used as a solution of known activity concentration obtained by precise dilution or dissolution of a reference standard.