BS EN ISO 13163:2019

BSI Standards Publication

# Water quality - Lead-210 - Test method using liquid scintillation counting

# National foreword

This British Standard is the UK implementation of EN ISO 13163:2019. It is identical to ISO 13163:2013. It supersedes BS ISO 13163:2013, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EH/3/8, Radioactivity measurements methods.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.


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**Compliance with a British Standard cannot confer immunity from legal obligations.**

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| 31 August 2019 | This corrigendum renumbers BS ISO 13163:2013 as BS EN ISO 13163:2019 |

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN ISO 13163

June 2019

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English Version

# Water quality - Lead-210 - Test method using liquid scintillation counting (ISO 13163:2013)

Qualité de l'eau - Plomb 210 - Méthode d'essai par comptage des scintillations en milieu liquide (ISO 13163:2013)

Wasserbeschaffenheit - Blei-210 - Verfahren mit dem Flüssigszintillationszähler (ISO 13163:2013)

This European Standard was approved by CEN on 8 April 2001.

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# European foreword

The text of ISO 13163:2013 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 13163:2019 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of an identical text or by endorsement, at the latest by December 2019, and conflicting national standards shall be withdrawn at the latest by December 2019.

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**

The text of ISO 13163:2013 has been approved by CEN as EN ISO 13163:2019 without any modification.

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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. www.iso.org/directives

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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*.

# Introduction

Radioactivity from several naturally occurring and anthropogenic sources is present throughout the environment. Thus, water bodies (e.g. surface water, groundwater, seawater) can contain the following radionuclides of natural or human-made origins:

— natural radionuclides, including potassium-40, and those originating from the thorium and uranium decay series, particularly 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 the production and use of phosphate fertilizer);

— 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 a result of authorized routine releases into the environment in small quantities of the effluent discharged from nuclear fuel cycle facilities. They are also released into the environment following their use in unsealed form for medical and industrial applications. They are also found in the water as a result of past fallout contamination resulting from the explosion in the atmosphere of nuclear devices and accidents such as those that occurred in Chernobyl and Fukushima.

Drinking water may thus contain radionuclides at activity concentrations 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 required by some national authorities.

An International Standard on a test method for lead-210 activity concentrations in water samples is justified for test laboratories carrying out these measurements, required sometimes by national authorities, as laboratories may have to obtain a specific accreditation for radionuclide measurement in drinking water samples.

Lead-210 activity concentration can vary according to local geological and climatic characteristics and usually ranges from 2 $mBq \cdot l^{-1}$ to 300 $mBq \cdot l^{-1}$ (References [12][13]). The guidance level for lead-210 in drinking water, as recommended by WHO, is 100 $mBq \cdot l^{-1}$ (Reference [14]).

NOTE The guidance level is the activity concentration with an intake of 2 $l \cdot day^{-1}$ of drinking water for 1 year that results in an effective dose of 0,1 $mSv \cdot year^{-1}$ 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.

**INTERNATIONAL STANDARD** **ISO 13163:2013**

# Water quality - Lead-210 - Test method using liquid scintillation counting

**WARNING — Persons using ISO 13163 should be familiar with normal laboratory practice. ISO 13163 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 according to ISO 13163 be carried out by suitably trained staff.**

## 1 Scope

ISO 13163 specifies the determination of lead-210 ($^{210}$Pb) activity concentration in samples of all types of water using liquid scintillation counting (LSC). For raw and drinking water, the sample should be degassed in order to minimize the ingrowth of $^{210}$Pb from radon-222 ($^{222}$Rn).

Using currently available liquid scintillation counters, this test method can measure the $^{210}$Pb activity concentrations in the range of less than 20 mBq·l$^{-1}$ to 50 mBq·l$^{-1}$. These values can be achieved with a counting time between 180 min and 720 min for a sample volume from 0,5 l to 1,5 l.

Higher $^{210}$Pb activity concentrations can be measured by either diluting the sample or using smaller sample aliquots or both.

It is the laboratory's responsibility to ensure the suitability of this 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/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

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

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

ISO 11929, *Determination of the characteristic limits (decision threshold, detection limit and limits of the confidence interval) for measurements of ionizing radiation — Fundamentals and application*

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

## 3 Symbols

For the purposes of this document, the symbols and designations given in ISO 80000-10, ISO 11929, ISO/IEC Guide 98-3, and ISO/IEC Guide 99 and the following apply.