
Kakovost vode - Tehnecij Tc-99 - 1. del: Preskusna metoda s štetjem s tekočinskim scintilatorjem (ISO/DIS 22125-1:2026)

Water quality - Technetium-99- Part 1: Test method using liquid scintillation counting (ISO/DIS 22125-1:2026)

Wasserbeschaffenheit - Technetium 99 - Teil 1: Verfahren mit dem Flüssigszintillationszähler (ISO/DIS 22125-1:2026)

Qualité de l'eau - Technétium-99 - Partie 1: Méthode d'essai par comptage des scintillations en milieu liquide (ISO/DIS 22125-1:2026)

Ta slovenski standard je istoveten z: prEN ISO 22125-1

ICS:

13.060.50	Preiskava vode na kemične snovi	Examination of water for chemical substances
-----------	---------------------------------	--

oSIST prEN ISO 22125-1:2026

en,fr,de

Sample Document

get full document from standards.iteh.ai



DRAFT International Standard

ISO/DIS 22125-1

Water quality — Technetium-99 —

Part 1: Test method using liquid scintillation counting

Qualité de l'eau — Technétium-99 —

Partie 1: Méthode d'essai par comptage des scintillations en milieu liquide

ICS: 17.240; 13.060.60

ISO/TC 147/SC 3

Secretariat: **AFNOR**

Voting begins on:
2026-03-16

Voting terminates on:
2026-06-08

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 22125-1:2026(en)

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENTS AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

© ISO 2026

Sample Document

get full document from standards.iteh.ai



COPYRIGHT PROTECTED DOCUMENT

© ISO 2026

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

ISO/DIS 22125-1:2026(en)

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and symbols	2
4 Symbols	2
5 Principle	4
6 Sampling and storage	5
7 Procedure	6
8 Quality assurance and quality control program	6
8.1 General	6
8.2 Instrument verification	6
8.3 Contamination	6
8.4 Interference control	6
8.5 Method verification	6
8.6 Demonstration of analyst capability	7
9 Expression of results	7
9.1 General	7
9.2 Tracer activity added	7
9.2.1 ^{99m}Tc or ^{95m}Tc is used as a recovery tracer	7
9.2.2 Re is used as a recovery tracer	7
9.3 Count rate and net count rate	7
9.3.1 Net count rate when ^{95m}Tc or ^{99m}Tc tracer is used as recovery tracer	7
9.3.2 Net count rate when Re tracer is used as recovery tracer	8
9.4 Chemical recovery	8
9.4.1 ^{99m}Tc or ^{95m}Tc is used as a recovery tracer	8
9.4.2 Re is used as a recovery tracer	8
9.5 Efficiency	8
9.6 Activity concentration of ^{99}Tc	8
9.7 Combined uncertainties	9
9.7.1 ^{99m}Tc or ^{95m}Tc is used as a recovery tracer	9
9.7.2 Re is used as a recovery tracer	9
9.8 Decision threshold	9
9.9 Detection limit	10
9.10 Probabilistically symmetric coverage interval	10
9.10.1 Limits of the probabilistically symmetric coverage interval	10
9.10.2 The shortest coverage interval	10
10 Test report	11
Annex A (informative) Example of LSC spectrum	12
Annex B (normative) Liquid scintillation cocktail	13
Annex C (normative) Quench curve	14
Annex D (informative) Method 1 — Quaternary amine extraction chromatography resin	15
Annex E (informative) Method 2 — extraction chromatography resin containing CMPO dissolved in TBP resin	18
Annex F (informative) Method 3 — Anion exchange resin	21
Bibliography	24

ISO/DIS 22125-1:2026(en)

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).

Attention is drawn to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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 22125-1:2019), which has been technically revised.

The main changes are as follows:

- The format of the standard has been modified to align with the most recent ones;
- The most recent version of the introduction, sampling, quality assurance and quality control, and the test report sections have been added;
- The formulae and their symbols have been reviewed.

A list of all the parts in the ISO 22125 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.

ISO/DIS 22125-1:2026(en)

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 and runoff by rain water) or released from technological processes involving naturally occurring radioactive materials (e.g. mining, mineral processing, oil, gas and coal production, water treatment, and the production and use of phosphate fertilisers).
- Anthropogenic radionuclides such as ^{55}Fe , ^{59}Ni , ^{63}Ni , ^{90}Sr , ^{99}Tc , transuranic elements (e.g. Np, Pu, Am, 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^[4] and water bodies. Anthropogenic radionuclides used for medical and industrial applications can be released to the environment after use. Anthropogenic radionuclides are also found in waters due to contamination from fallout resulting from above-ground nuclear detonations and accidents such as those that have 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 can 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. As an example, during either a planned or existing situation, the WHO guidance level for ^{99}Tc in drinking water is $100 \text{ Bq}\cdot\text{l}^{-1}$ ^[4], see NOTES 1 and 2. Compliance with these 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 98-3:2008^[5] and ISO 5667-20:2008^[6].

NOTE 1 If the value is not specified in Annex 6 of Reference ^[4], the value has been calculated using the formula provided in Reference ^[4] and the dose coefficient data from References ^[7] and ^[8].

NOTE 2 The guidance level calculated in Reference ^[4] is the activity concentration that results in an effective dose of $0,1 \text{ mSv}\cdot\text{a}^{-1}$ to members of the public for an intake of $2 \text{ l}\cdot\text{d}^{-1}$ of drinking water for one year. This is an effective dose that represents a very low level of risk to human health and which is not expected to give rise to any detectable adverse health effects^[4].

This document contains method(s) to support laboratories, which need to determine ^{99}Tc in water samples. The method described in this document can be used for various types of waters (see [Clause 1](#)). For radiometric methods, minor modifications such as sample volume and counting time can be made if needed to ensure that the decision threshold, limit of detection, 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.

Sample Document

get full document from standards.iteh.ai

Water quality — Technetium-99 —

Part 1:

Test method using liquid scintillation counting

WARNING — Persons using this document should be familiar with normal laboratory practices. 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.

NOTE — It is absolutely essential that tests conducted according to this document be carried out by suitably trained staff.

1 Scope

WARNING — Persons using this document should be familiar with normal laboratory practices. 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 according to this document be carried out by suitably trained staff.

This document specifies methods to determine ^{99}Tc by liquid scintillation counting (LSC) in water supplies, drinking water, rainwater, surface and ground water, marine water, as well as cooling water, industrial water, domestic, and industrial wastewater after proper sampling, handling, and test sample preparation.

The detection limit depends on the sample volume, the instrument used, the background count rate, the detection efficiency, the counting time, and the chemical yield. The minimum detectable activity of the methods described in this document, using currently available LSC apparatus, is approximately $5 \text{ Bq}\cdot\text{l}^{-1}$ to $20 \text{ Bq}\cdot\text{l}^{-1}$, which is lower than the WHO criteria for safe consumption of drinking water ($100 \text{ Bq}\cdot\text{l}^{-1}$).^[4] These values can be achieved with a counting time of 60 min for a sample volume varying between 14 ml to 40 ml. The method presented in this document is not intended for the determination of ultra-trace activity concentrations of ^{99}Tc .

The method described in this document is applicable in the event of an emergency situation, but not if $^{99\text{m}}\text{Tc}$ is present at quantities that could cause interference and not if $^{99\text{m}}\text{Tc}$ is used as a recovery tracer.

Filtration of the test sample is necessary for the methods described in this document if suspended solids are present as the methods presented in this document can only be used to determine soluble ^{99}Tc . The analysis of ^{99}Tc adsorbed to suspended matter is not covered by this method. The analysis of the insoluble fraction requires a mineralization step that is not covered by this document. In this case, the measurement is made on the different phases obtained. The final activity is the sum of all the measured activity concentrations.

It is the user's responsibility to ensure the validity of this test method for the water samples tested.

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.