



# SLOVENSKI STANDARD SIST EN ISO 22125-2:2020

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## Kakovost vode - Tehnecij Tc-99 - 2. del: Preskusna metoda z masno spektrometrijo z induktivno sklopljeno plazmo (ICP-MS) (ISO 22125-2:2019)

Water quality - Technetium-99 - Part 2: Test method using inductively coupled plasma mass spectrometry (ICP-MS) (ISO 22125-2:2019)

Wasserbeschaffenheit - Technetium 99 - Teil 2: Verfahrens mittels Massenspektrometrie und induktiv gekoppeltem Plasma (ICP-MS) (ISO 22125-2:2019)

Qualité de l'eau - Technétium-99 - Partie 2: Méthode d'essai par spectrométrie de masse couplée à un plasma induit (ISO 22125-2:2019)

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### ICS:

13.060.50	Preiskava vode na kemične snovi	Examination of water for chemical substances
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## Water quality - Technetium-99 - Part 2: Test method using inductively coupled plasma mass spectrometry (ICP-MS) (ISO 22125-2:2019)

Qualité de l'eau - Technétium-99 - Partie 2: Méthode d'essai par spectrométrie de masse couplée à un plasma induit (ISO 22125-2:2019)

Wasserbeschaffenheit - Technetium 99 - Teil 2: Verfahrens mittels Massenspektrometrie und induktiv gekoppeltem Plasma (ICP-MS) (ISO 22125-2:2019)

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Contents	Page
European foreword.....	3

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[SIST EN ISO 22125-2:2020](https://standards.iteh.ai/catalog/standards/sist/4e1d9768-0130-4b47-bdf2-4aff648f9df5/sist-en-iso-22125-2-2020)  
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## European foreword

This document (EN ISO 22125-2:2019) has been prepared by Technical Committee ISO/TC 147 "Water quality" in collaboration with 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of an identical text or by endorsement, at the latest by May 2020, and conflicting national standards shall be withdrawn at the latest by May 2020.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.

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### Endorsement notice

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**Water quality — Technetium-99 —**

Part 2:

**Test method using inductively coupled  
plasma mass spectrometry (ICP-MS)**

*Qualité de l'eau — Technétium-99 —*

*Partie 2: Méthode d'essai par spectrométrie de masse couplée à un  
plasma induit (ICP-MS)*

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# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms, definitions and symbols</b> .....	<b>2</b>
<b>4 Principle</b> .....	<b>4</b>
<b>5 Sampling, handling and storage</b> .....	<b>4</b>
<b>6 Procedure</b> .....	<b>4</b>
6.1 Sample preparation for measurement.....	4
6.2 Sample measurement.....	5
<b>7 Quality assurance and quality control program</b> .....	<b>5</b>
7.1 General.....	5
7.2 Variables that could influence the measurement.....	5
7.3 Instrument verification.....	5
7.4 Contamination.....	5
7.5 Interference control.....	6
7.6 Method verification.....	6
7.7 Demonstration of analyst capability.....	6
<b>8 Expression of results</b> .....	<b>6</b>
8.1 Using Re, <sup>97</sup> Tc, or <sup>98</sup> Tc as a recovery tracer.....	6
8.1.1 Calculation of mass of tracer and analyte added.....	6
8.1.2 Measurement bias.....	7
8.1.3 Sample mass concentration.....	7
8.1.4 Detection limit.....	8
8.1.5 Limit of quantification.....	8
8.2 Using <sup>95m</sup> Tc, <sup>97m</sup> Tc or <sup>99m</sup> Tc as a recovery tracer.....	8
8.2.1 Calculation of activity of tracer, mass of analyte and mass of internal standard added.....	8
8.2.2 Purification step recovery.....	9
8.2.3 Measurement bias.....	9
8.2.4 Sample mass concentration.....	9
8.2.5 Detection limit.....	9
8.2.6 Limit of quantification.....	10
8.2.7 Conversion of mass concentration to activity concentration.....	10
8.2.8 Conversion of mass concentration to volume unit.....	10
8.3 Correction for the presence of <sup>99</sup> Tc in the tracer.....	11
<b>9 Test report</b> .....	<b>11</b>
<b>Annex A (informative) Method 1 — TEVA resin</b> .....	<b>12</b>
<b>Annex B (informative) Method 2 — TRU resin</b> .....	<b>15</b>
<b>Annex C (informative) Method 3 — Anion exchange resin</b> .....	<b>18</b>
<b>Bibliography</b> .....	<b>21</b>

## ISO 22125-2:2019(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 (see [www.iso.org/directives](http://www.iso.org/directives)).

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

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](http://www.iso.org/members.html).

## Introduction

Radioactivity from several naturally-occurring and anthropogenic sources is present throughout the environment. Thus, water bodies (such as surface waters, ground waters, sea waters) can contain radionuclides of natural, human-made, or both origin.

- Natural radionuclides, including  $^{40}\text{K}$ ,  $^3\text{H}$ ,  $^{14}\text{C}$ , and those originating from the thorium and uranium decay series, in particular  $^{226}\text{Ra}$ ,  $^{228}\text{Ra}$ ,  $^{234}\text{U}$ ,  $^{238}\text{U}$ ,  $^{210}\text{Po}$  and  $^{210}\text{Pb}$  can be found in water for natural reasons (such as desorption from the soil and washoff by rain water) or can be released from technological processes involving naturally occurring radioactive materials (such as the mining and processing of mineral sands or phosphate fertilizers production and use).
- Human-made radionuclides such as transuranium elements (americium, plutonium, neptunium, curium),  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{90}\text{Sr}$ , and gamma emitting radionuclides can also be found in natural waters. Small quantities of these radionuclides are discharged from nuclear fuel cycle facilities into the environment as a result of authorized routine releases. Some of these radionuclides used for medical and industrial applications are also released into the environment after use. Anthropogenic radionuclides are also found in waters as a result of past fallout contaminations resulting from the explosion in the atmosphere of nuclear devices and accidents such as those that occurred in Chernobyl and Fukushima.

Radionuclide activity concentration in water bodies can vary according to local geological characteristics and climatic conditions and can be locally and temporally enhanced by releases from nuclear installation during planned, existing, and emergency exposure situations<sup>[1]</sup>. Drinking water may thus contain radionuclides at activity concentrations which could present a risk to human health.

The radionuclides present in liquid effluents are usually controlled before being discharged into the environment<sup>[2]</sup> and water bodies. Drinking waters are monitored for their radioactivity as recommended by the World Health Organization (WHO)<sup>[3]</sup> so that proper actions can be taken to ensure that there is no adverse health effect to the public. Following these international recommendations, national regulations usually specify radionuclide authorized concentration limits for liquid effluent discharged to the environment and radionuclide guidance levels for waterbodies and drinking waters for planned, existing, and emergency exposure situations. Compliance with these limits can be assessed using measurement results with their associated uncertainties as specified by ISO/IEC Guide 98-3 and ISO 5667-20<sup>[4]</sup>.

Depending on the exposure situation, there are different limits and guidance levels that would result in an action to reduce health risk. As an example, during planned or existing situation, the WHO guidelines for guidance level in drinking water is  $100 \text{ Bq}\cdot\text{l}^{-1}$  for  $^{99}\text{Tc}$ <sup>[3]</sup> activity concentration.

NOTE 1 The guidance level is the activity concentration with an intake of 2 l/d of drinking water for one year that results in an effective dose of 0,1 mSv/a for members of the public. This is an effective dose that represents a very low level of risk and which is not expected to give rise to any detectable adverse health effects<sup>[3]</sup>.

In the event of a nuclear emergency, the WHO Codex Guideline Levels<sup>[5]</sup> mentioned that the activity concentration in contaminated food might not be greater than  $10\,000 \text{ Bq}\cdot\text{kg}^{-1}$  for  $^{99}\text{Tc}$ .

NOTE 2 The Codex guidelines levels (GLs) apply to radionuclides contained in foods destined for human consumption and traded internationally, which have been contaminated following a nuclear or radiological emergency. These GLs apply to food after reconstitution or as prepared for consumption, i.e. not to dried or concentrated foods, and are based on an intervention exemption level of 1 mSv in a year for members of the public (infant and adult)<sup>[5]</sup>.

Thus, the test method can be adapted so that the characteristic limits, decision threshold, detection limit and uncertainties ensure that the radionuclide activity concentrations test results can be verified to be below the guidance levels required by a national authority for either planned/existing situations or for an emergency situation<sup>[5][6][7]</sup>.

Usually, the test methods can be adjusted to measure the activity concentration of the radionuclide(s) in either wastewaters before storage or in liquid effluents before being discharged to the environment.

**ISO 22125-2:2019(E)**

The test results will enable the plant/installation operator to verify that, before their discharge, wastewaters/liquid effluent radioactive activity concentrations do not exceed authorized limits.

The test method(s) described in this document may be used during planned, existing and emergency exposure situations as well as for wastewaters and liquid effluents with specific modifications that could increase the overall uncertainty, detection limit, and threshold.

The test method(s) may be used for water samples after proper sampling, sample handling, and test sample preparation (see the relevant part of the ISO 5667 series).

This document has been developed to answer the need of test laboratories carrying out these measurements, that are sometimes required by national authorities, as they may have to obtain a specific accreditation for radionuclide measurement in drinking water samples.

This document is one of a set of International Standards on test methods dealing with the measurement of the activity concentration of radionuclides in water samples.

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