



# SLOVENSKI STANDARD SIST EN ISO 8299:2021

01-april-2021

---

**Tehnologija jedrskih goriv - Ugotavljanje deleža izotopov ter koncentracije jedrskih snovi elementarnega urana in plutonija v raztopinah dušikove kisline s termoionizacijsko masno spektrometrijo (ISO 8299:2019)**

Nuclear fuel technology - Determination of the isotopic and elemental uranium and plutonium concentrations of nuclear materials in nitric acid solutions by thermal-ionization mass spectrometry (ISO 8299:2019)

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

Technologie du combustible nucléaire - Détermination de la teneur isotopique et des concentrations en matériaux nucléaires de l'uranium et du plutonium dans une solution d'acide nitrique par spectrométrie de masse à thermoionisation (ISO 8299:2019)

**Ta slovenski standard je istoveten z: EN ISO 8299:2021**

---

**ICS:**

27.120.30	Cepljivi materiali in jedrska gorivna tehnologija	Fissile materials and nuclear fuel technology
-----------	---	---

**SIST EN ISO 8299:2021**

**en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN ISO 8299:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021>

EUROPEAN STANDARD

EN ISO 8299

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2021

ICS 27.120.30

English Version

## Nuclear fuel technology - Determination of the isotopic and elemental uranium and plutonium concentrations of nuclear materials in nitric acid solutions by thermal-ionization mass spectrometry (ISO 8299:2019)

Technologie du combustible nucléaire - Détermination de la teneur isotopique et des concentrations en matériaux nucléaires de l'uranium et du plutonium dans une solution d'acide nitrique par spectrométrie de masse à thermoionisation (ISO 8299:2019)

This European Standard was approved by CEN on 18 January 2021.

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 8299:2021](https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021)  
<https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021>

## European foreword

The text of ISO 8299:2019 has been prepared by Technical Committee ISO/TC 85 "Nuclear energy, nuclear technologies, and radiological protection" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 8299:2021 by Technical Committee CEN/TC 430 "Nuclear energy, nuclear technologies, and radiological protection" the secretariat of which is held by AFNOR.

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 2021, and conflicting national standards shall be withdrawn at the latest by August 2021.

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 8299:2019 has been approved by CEN as EN ISO 8299:2021 without any modification.

[SIST EN ISO 8299:2021](https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021)

<https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

[SIST EN ISO 8299:2021](#)

<https://standards.iteh.ai/catalog/standards/sist/1f1e8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021>

INTERNATIONAL  
STANDARDISO  
8299Third edition  
2019-01

---

---

**Nuclear fuel technology —  
Determination of the isotopic and  
elemental uranium and plutonium  
concentrations of nuclear materials  
in nitric acid solutions by thermal-  
ionization mass spectrometry**

iTeh STANDARD PREVIEW

(standards.iteh.ai)  
*Technologie du combustible nucléaire — Détermination de la  
teneur isotopique et des concentrations en matériaux nucléaires de  
l'uranium et du plutonium dans une solution d'acide nitrique par  
spectrométrie de masse à thermoionisation*

[https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-  
e20ecb82a4f7/sist-en-iso-8299-2021](https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021)

Reference number  
ISO 8299:2019(E)

© ISO 2019

## iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 8299:2021

<https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021>



### **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

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  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland



# Contents

Page

<b>Foreword</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>1</b>
<b>5 Reference materials and reagents</b> .....	<b>2</b>
5.1 Spikes and reference materials.....	2
5.2 Other chemical reagents.....	3
5.3 Resin, applicable for separation/purification of Pu and U.....	4
5.3.1 General.....	4
5.3.2 Preparation of resin.....	4
<b>6 Apparatus</b> .....	<b>5</b>
<b>7 Apparatus for mass spectrometry</b> .....	<b>6</b>
<b>8 Sample preparation</b> .....	<b>6</b>
8.1 Subsampling and spiking.....	6
8.1.1 Pellet or powder samples.....	7
8.1.2 Concentrated nuclear fuel solution samples (such as reprocessing solution).....	7
8.1.3 Plutonium nitrate solution samples (such as product solution from a reprocessing plant).....	7
8.1.4 Dried nitrate samples.....	8
8.2 Chemical valency adjustment.....	8
8.2.1 Valence adjustment with ferrous solution.....	8
8.2.2 Valence adjustment with hydrogen peroxide.....	8
8.3 Sample separation/purification.....	9
8.3.1 Ion exchange with anion-exchange resin.....	9
8.3.2 Purification with extraction separation resins (see 5.3.1.2).....	10
8.4 Replicate treatments.....	10
<b>9 Filaments preparation</b> .....	<b>10</b>
9.1 Degassing of filaments.....	10
9.2 Sample loading.....	10
9.2.1 Normal sample loading.....	10
9.2.2 Graphite loading technique.....	10
9.2.3 Resin-bead loading on single filaments for Pu samples.....	11
9.3 Filament mounting (filament assemblies preparation).....	11
<b>10 Instrument calibration</b> .....	<b>11</b>
10.1 Mass calibration.....	11
10.2 Gain calibration for Faraday multi-detectors.....	11
10.3 Faraday detector calibration.....	11
10.4 Mass discrimination calibration.....	12
<b>11 Isotopic mass spectrometric measurements</b> .....	<b>12</b>
11.1 Total evaporation measurements using a single or double filament assembly and a multi-Faraday collector system.....	12
11.2 Bias correction method using a double filament assembly and a multi-Faraday collector system.....	13
<b>12 Calculation of the results</b> .....	<b>13</b>
12.1 Calculation of ion current intensities.....	13
12.2 Calculation of mean, weighted mean and standard deviation on a set of ratios $x_i$ , ( $i = 1 \dots N$ ).....	14
12.3 Mass discrimination correction.....	14
12.4 Calculation of the atomic percent abundance $A_i$ .....	14

## ISO 8299:2019(E)

12.5	Calculation of the isotopic mass percent $W_j$ .....	15
12.6	Calculation of concentration .....	15
12.7	Isotope decay correction .....	16
<b>13</b>	<b>Blanks</b> .....	<b>16</b>
<b>14</b>	<b>Quality control</b> .....	<b>16</b>
<b>15</b>	<b>Measurement uncertainty</b> .....	<b>17</b>
15.1	Elemental assay .....	17
15.2	Isotopic analysis .....	17
<b>16</b>	<b>Interferences</b> .....	<b>18</b>
<b>Annex A (normative) Preparation and standardization of spike solutions</b> .....		<b>19</b>
<b>Bibliography</b> .....		<b>25</b>

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN ISO 8299:2021](https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021)

<https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021>

## 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)).

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 (see [www.iso.org/patents](http://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.

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

This document was prepared by ISO/TC 85, *Nuclear energy, nuclear technologies, and radiological protection*, Subcommittee SC 5, *Nuclear installations, processes and technologies*.

This third edition cancels and replaces the second edition (ISO 8299:2005), which has been technically revised.

The main changes compared to the previous edition are as follows:

- the procedure for the preparation of resin used for separation and purification of the samples has been added in [5.3](#);
- sample preparation procedure from pellet, powder and other material forms to the solution has been added in [8.1](#);
- uncertainty of the measurement is considered in [Clause 15](#) instead of repeatability and accuracy.

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).

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN ISO 8299:2021

<https://standards.iteh.ai/catalog/standards/sist/1fe8bcd-3fd2-46ab-ab2a-e20ecb82a4f7/sist-en-iso-8299-2021>