

Milk, milk products, infant formula and adult
nutritionals - Determination of minerals and trace
elements - Inductively coupled plasma mass
spectrometry (ICP-MS) method (ISO 21424:2018)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 21424:2020 sisaldab Euroopa standardi EN ISO 21424:2020 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 21424:2020 consists of the English text of the European standard EN ISO 21424:2020.
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 03.06.2020.	Date of Availability of the European standard is 03.06.2020.
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 67.100.10

Standardite reprodutseerimise 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

English Version

**Milk, milk products, infant formula and adult nutritionals -
Determination of minerals and trace elements -
Inductively coupled plasma mass spectrometry (ICP-MS)
method (ISO 21424:2018)**

Lait, produits laitiers, formules infantiles et produits
nutritionnels pour adultes - Détermination de la teneur
en minéraux et en oligo-éléments - Méthode par
spectrométrie de masse avec plasma à couplage
inductif (ICP-SM) (ISO 21424:2018)

Milch, Milcherzeugnisse, Säuglingsnahrung und
Nahrungsergänzungsmittel für Erwachsene -
Bestimmung von Mineralien und Spurenelementen -
Verfahren mit induktiv gekoppelter Plasma-
Massenspektrometrie (ICP-MS) (ISO 21424:2018)

This European Standard was approved by CEN on 10 May 2020.

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 21424:2018 has been prepared by Technical Committee ISO/TC 34 "Food products" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 21424:2020 by Technical Committee CEN/TC 302 "Milk and milk products - Methods of sampling and analysis" the secretariat of which is held by NEN.

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 2020, and conflicting national standards shall be withdrawn at the latest by December 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 21424:2018 has been approved by CEN as EN ISO 21424:2020 without any modification.

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	2
5 Reagents	2
6 Preparation of standards and solutions	3
6.1 Surfactant solution (optional, approximately 5 %)	3
6.2 Nitric acid rinse solution for autosampler rinse port, 2 %	3
6.3 P/A factor tuning working solution	3
6.4 Calibration blank (Cal Blk) and preparation blank (PB) solution	3
6.5 Calibration standard solution set	4
7 Apparatus	4
8 Preparation of test sample	5
9 Determination	6
10 Calculation	7
11 Precision data	8
11.1 General	8
11.2 Repeatability	8
11.3 Reproducibility	8
12 Test report	8
Annex A (informative) Precision data	9
Bibliography	31

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 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).

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 34, *Food products*, Subcommittee SC 5, *Milk and milk products* and the International Dairy Federation (IDF), in collaboration with AOAC INTERNATIONAL.

It is being published jointly by ISO and IDF and separately by AOAC INTERNATIONAL. The method described in this document is equivalent to the AOAC Official Method 2015.06: *Minerals and Trace Elements in Infant Formula*.

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.

IDF (the International Dairy Federation) is a non-profit private sector organization representing the interests of various stakeholders in dairying at the global level. IDF members are organized in National Committees, which are national associations composed of representatives of dairy-related national interest groups including dairy farmers, dairy processing industry, dairy suppliers, academics and governments/food control authorities.

ISO and IDF collaborate closely on all matters of standardization relating to methods of analysis and sampling for milk and milk products. Since 2001, ISO and IDF jointly publish their International Standards using the logos and reference numbers of both organizations.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. IDF 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).

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

This document was prepared by the IDF Standing Committee on Analytical Methods for Composition and ISO Technical Committee ISO/TC 34, *Food products*, Subcommittee SC 5, *Milk and milk products*, in collaboration with AOAC INTERNATIONAL.

It is being published jointly by ISO and IDF and separately by AOAC INTERNATIONAL. The method described in this document is equivalent to the AOAC Official Method 2015.06: *Minerals and Trace Elements in Infant Formula*. All work was carried out by the ISO/IDF Action Team on C40 of the Standing Committee on Analytical Methods for Composition under the aegis of its project leader, Mr. H. Crujisen (NL).

Milk, milk products, infant formula and adult nutritionals — Determination of minerals and trace elements — Inductively coupled plasma mass spectrometry (ICP-MS) method

1 Scope

This document specifies a method for the quantitative determination of calcium (Ca), copper (Cu), iron (Fe), magnesium (Mg), manganese (Mn), phosphorus (P), potassium (K), sodium (Na), zinc (Zn), chromium (Cr), molybdenum (Mo) and selenium (Se) using inductively coupled plasma and mass spectrometry (ICP-MS).

The method is applicable for the determination of all 12 elements in infant formula and adult nutritional products. The method is also applicable for milk, milk powder, whey powder, butter and cheese excluding the determination of Cr, because all Cr results were below the quantification limit and reproducibility could not be determined in these matrices^[1]. The present method is an extension of ISO 20649 | IDF 235 (AOAC 2011.19^[2]) which was validated only for Cr, Mo and Se in infant formula and adult nutritional products.

The ranges given in [Table 1](#) are in scope (see also [Table A.1](#)).

Table 1 — Analytical ranges

	Ca	Cu	Fe	Mg	Mn	P	K	Na	Zn	Cr	Se	Mo
Lower analytical range ^a , in mg/100 g	3	0,002	0,04	0,7	0,002	3	3	2	0,07	0,002	0,000 6	0,000 2
Upper analytical range ^a , in mg/100 g	1 280	1,2	20	110	1,0	800	2 000	850	18	0,16	0,05	0,10

^a Concentrations apply to

— milk and "ready-to-feed" liquid as-is, using a typical sample size of 1 g per final analytical solution volume of 50 ml, and

— reconstituted milk powder, reconstituted infant formula powder and reconstituted adult nutritional powder (25 g into 200 g of water), using a typical sample size of 1,8 g of the reconstituted slurry per final analytical solution volume of 50 ml.

Ranges for non-reconstituted dairy ingredients (butter, cheese, whey powder, whey protein concentrate) are adjusted proportionally upward from these values based upon the sample size used for the ingredient. For example, if 0,3 g of cheese is digested the ranges will be 1 g / 0,3 g = 3,3 × higher.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>