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

*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)*





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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)

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International Dairy Federation  
Silver Building • Bd Auguste Reyers 70/B  
B-1030 Brussels  
Phone: +32 2 325 67 40  
Fax: +32 2 325 67 41  
Email: [info@fil-idf.org](mailto:info@fil-idf.org)  
Website: [www.fil-idf.org](http://www.fil-idf.org)

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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 (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)).

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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 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](http://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.

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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. Cruijssen (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<sup>[1]</sup>. The present method is an extension of ISO 20649 | IDF 235 (AOAC 2011.19<sup>[2]</sup>) 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 <sup>a</sup> , 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 <sup>a</sup> , in mg/100 g	1 280	1,2	20	110	1,0	800	2 000	850	18	0,16	0,05	0,10

<sup>a</sup> 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>