# Foodstuffs - Determination of elements and their chemical species -Determination of Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U and Zn in foodstuffs by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD



| | |
|---|---|
| See Eesti standard EVS-EN 17851:2023 sisaldab Euroopa standardi EN 17851:2023 ingliskeelset teksti. | This Estonian standard EVS-EN 17851:2023 consists of the English text of the European standard EN 17851:2023. |
| 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 and Accreditation. |
| Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 12.07.2023. | Date of Availability of the European standard is 12.07.2023. |
| Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest. | The standard is available from the Estonian Centre for Standardisation and Accreditation. |

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 67.050

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 17851

July 2023

ICS 67.050

English Version

# Foodstuffs - Determination of elements and their chemical species -Determination of Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U and Zn in foodstuffs by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion

Produits alimentaires - Détermination des éléments et de leurs espèces chimiques - Détermination des éléments Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U et Zn dans les produits alimentaires par spectrométrie de masse avec plasma à couplage inductif (ICP-MS) après digestion sous pression

Lebensmittel - Bestimmung von Elementen und ihren Verbindungen - Bestimmung von Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U und Zn mit induktiv gekoppelter Plasma-Massenspektrometrie (ICP-MS) nach Druckaufschluss

This European Standard was approved by CEN on 5 June 2023.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**



Ref. No. EN 17851:2023 E

# Contents

Page

## European foreword

This document (EN 17851:2023) has been prepared by Technical Committee CEN/TC 275 “Food analysis – Horizontal methods”, 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 January 2024, and conflicting national standards shall be withdrawn at the latest by January 2024.

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.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Türkiye and the United Kingdom.

# 1 Scope

This document specifies a procedure for the determination of Ag, As, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Tl, U and Zn in foodstuffs by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion.

The following foodstuffs were analysed for the elements listed in Table 1 in an interlaboratory study: Banana (deep-frozen), Cocoa powder, Wheat noodle powder, Currant nectar (deep-frozen), Milk powder, Oyster (dried), Celery (dried), Dogfish liver (dried), Liver (deep-frozen), Kale (dried).

**Table 1 — Validated range**[a]

| Element | Mass fraction mg/kg | |
|---|---|---|
| | Lower range | Upper range |
| Arsenic | 0,02 | 36,6 |
| Lead | 0,004 | 0,58 |
| Cadmium | 0,006 | 15,2 |
| Chromium | 0,06 | 5,71 |
| Cobalt | 0,03 | 7,49 |
| Copper | 0,71 | 74,0 |
| Manganese | 0,31 | 73,5 |
| Molybdenum | 0,05 | 1,88 |
| Nickel | 0,11 | 11,0 |
| Selenium | 0,06 | 8,70 |
| Silver | 0,011 | 1,98 |
| Thallium | 0,008 | 0,12 |
| Uranium | 0,003 | 0,26 |
| Zinc | 1,8 | 1 582 |

[a] Table 1 lists the ranges analysed in the interlaboratory study, indicating for each element the lowest and highest content found in the ten analysed food matrices (see Annex B, Table B.1 to Table B.14). The lower limit of the procedure's range varies depending on the food matrix and the food's water content. It is a laboratory-specific value and is specified by the laboratory for each element when calculating the limit of quantification (see 9.2).

## 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.

EN 13804, *Foodstuffs - Determination of elements and their chemical species - General considerations and specific requirements*

EN 13805, *Foodstuffs - Determination of trace elements - Pressure digestion*

EN 15765, *Foodstuffs - Determination of trace elements - Determination of tin by inductively coupled plasma mass spectrometry (ICP-MS) after pressure digestion*

EN 17264, *Foodstuffs - Determination of elements and their chemical species - Determination of aluminium by inductively coupled plasma mass spectrometry (ICP-MS)*

## 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:

— IEC Electropedia: available at https://www.electropedia.org/

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

## 4 Principle

The sample is digested. For the digestion the pressure digestion process in EN 13805 shall be used, in the case of foodstuffs with a low water content, after adding water. In the digestion solution, the elements silver, arsenic, cadmium, cobalt, chromium, copper, manganese, molybdenum, nickel, lead, selenium, thallium, uranium and zinc are quantified by ICP-MS. For this purpose, the digestion solution is nebulized and the aerosol is transferred to an inductively coupled argon plasma where the elements are ionized. The ions are transferred via a system of cones into a mass spectrometer, where they are separated according to mass-to-charge ratio and detected by pulse and/or analogue detector.

The respective content of the elements mentioned in Clause 1 is understood as the total content measured using this described procedure. It is expressed in mg/kg or mg/l, depending on the sample type.

For other elements not specified within the scope, other documents can be considered, e.g. EN 15763. For the determination of aluminium and tin in foodstuffs refer to EN 17264 and EN 15765.

## 5 Reagents

The chemicals, gases and water used shall be free enough from the elements to be determined to not affect the results. Unless otherwise specified, “solutions” are understood to be aqueous solutions.

**5.1 Nitric acid**, mass fraction of min. $\omega$ = 65 %, density $\rho \approx 1{,}4$ g/ml.

### 5.2 Stock solutions

A commercially available multi-element stock solution, for example with $\rho$ = 10 mg/l, can be used for silver, cadmium, cobalt, chromium, copper, manganese, molybdenum, nickel, lead, thallium, uranium and for example with $\rho$ = 100 mg/l for arsenic, selenium and zinc.