



International
Standard

ISO 8124-5

Safety of toys —

Part 5:

**Determination of total
concentration of certain elements in
toys**

Sécurité des jouets —

*Partie 5: Détermination de la concentration totale de certains
éléments dans les jouets*

**Second edition
2026-08**

Sample Document

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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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.

This document was prepared by Technical Committee ISO/TC 181, *Safety of toys*.

This second edition cancels and replaces the first edition (ISO 8124-5:2015), which has been technically revised.

The main changes are as follows:

- The choice of digestion mixtures has been changed from being based on the final quantification instruments (ICP-MS or ICP-OES) to being based on the type of test part or sample material. A new digestion mixture (1:9 mixture of hydrochloric acid and nitric acid) has been introduced to replace the reverse aqua regia mixture.
- An energy dispersive X-ray fluorescence (EDXRF) method for screening the contents of eight elements in plastic materials in toys has been included as an informative annex.
- Certain elements of additional information contained in Annex A have been integrated into the main body of the text (e.g. Scope, 7.4).

A list of all parts in the ISO 8124 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.

Introduction

This document specifies a method for the determination of the total concentration of certain elements in toy materials. It can be used to decide whether there is a need to undertake migration testing in accordance with the method specified in ISO 8124-3 or other equivalent standards, e.g. EN 71-3 or ASTM F963.

NOTE 1 A material can be considered to conform to the requirements of ISO 8124-3 if the total concentration results are below the soluble limits as prescribed in ISO 8124-3:2020/Amd 1:2023, Table 1. If the soluble limits in ISO 8124-3:2020/Amd 1:2023, Table 1 are exceeded, migration testing in accordance with ISO 8124-3 is required for the determination of conformity.

This document presents a screening determination method for eight elements in plastics using the analytical technique of energy dispersive X-ray fluorescence (EDXRF) spectrometry as an option for quickly determining whether the screened part or section of a product requires quantitative analysis using the digestion method.

This document can be used when taking decisions on the conformity of material with regulatory requirements that impose restrictions on the total concentration of certain elements.

NOTE 2 Where legal conformity requires migration testing, this document can only be used to non-quantitatively confirm compliance with regulatory limits.

This document has been developed only for the eight elements listed in [Table 1](#). The method specified in this document can be used for other elements provided adequate analytical performance is demonstrated. Manufacturers are encouraged to apply the test methods of this document and the limits from ISO 8124-3 to raw materials used in the manufacture of toys to give increased certainty of conformity to the requirements of ISO 8124-3.

For further information on the background and rationale behind this document, see [Clause A.1](#).

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Safety of toys —

Part 5:

Determination of total concentration of certain elements in toys

1 Scope

1.1 This document specifies methods of sampling and analysing the total concentration of the elements antimony, arsenic, barium, cadmium, chromium, lead, mercury and selenium from toy materials and from parts of toys.

1.2 Digestion methods for the elements mentioned in [1.1](#) are specified for the following types of toy materials:

- coatings of paint, varnish, lacquer, printing ink, polymer and similar coatings;
- polymeric and similar materials, including laminates, whether textile-reinforced or not, but excluding other textiles;
- paper, paperboard and cardboard;
- natural or synthetic textiles;
- metallic materials, whether coated or not;
- other materials, whether mass-coloured or not (e.g. wood, fibreboard, hardboard, bone, and leather);
- materials intended to leave a trace (e.g. the graphite materials in pencils and liquid ink in pens);
- pliable modelling materials, including modelling clays and gels;
- paints to be used as such in the toy, including finger paints, varnishes, lacquers and similar materials in solid or liquid form;
- packaging materials that form part of the toy or have intended play value (e.g. boxes containing jigsaw puzzles or packaging on which the instructions are included in the case of games. Items such as blister packs containing simple instructions are not included in this category).

Digestion methods for glass, ceramic and other siliceous materials or fluorinated polymers or fluorinated polymer coatings are not described. These types of materials are outside the scope of this document.

1.3 Screening determination (without the need for sample preparation and digestion) of the elements mentioned in [1.1](#) is specified for plastics using energy dispersive X-ray fluorescence (EDXRF) spectrometry (see [Annex B](#)).

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.

ISO 8124-1:2022, *Safety of toys — Part 1: Safety aspects related to mechanical and physical properties*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

base material

material upon which *coatings* (3.2) can be formed or deposited

[SOURCE: ISO 8124-3:2020, 3.1]

3.2

coating

layers of material formed or deposited on the *base material* (3.1) of a toy, including paints, varnishes, lacquers, inks, polymers, or other substances of a similar nature, whether they contain metallic particles or not, no matter how they have been applied to the toy, and which can be removed by *scraping* (3.8) with a sharp blade

Note 1 to entry: This definition includes metallic coatings deposited on a metal surface such as an electroplated coating. However, electroplating will only require testing if it can be removed by *scraping* (3.8); otherwise, it may be tested with the base material.

[SOURCE: ISO 8124-3:2020, 3.2, modified — Note 1 to entry has been added.]

3.3

complete digestion

complete breakdown of the original material leaving only insoluble residues

3.4

composite test portion

test portion (3.9) that is composed of more than one similar material type or colour of material

3.5

method detection limit

MDL

three times the standard deviation of the result obtained in the method blank by the laboratory carrying out the analysis

[SOURCE: ISO 8124-3:2020, 3.3]

3.6

laboratory sample

toy either in the form in which it is marketed, or in the form in which it is intended to be marketed

Note 1 to entry: The definition does not preclude the taking of raw materials used to manufacture the toy, provided they are representative of the final toy. See 1.1 and Clause B.1.

3.7

method blank

solution that has undergone the same digestion processes used for the digestion of *test portions* (3.9) and consists of all reagents excluding the test portion

3.8

scraping

mechanical process for removal of *coatings* (3.2) down to the *base material* (3.1)

[SOURCE: ISO 8124-3:2020, 3.7]

3.9

test portion

single material taken from an accessible part of a *laboratory sample* (3.6)

Note 1 to entry: This definition precludes the compositing of dissimilar materials, e.g. compositing textiles and paint coatings is not permitted.

3.10

screening determination

analytical procedure to determine the presence or absence of substances in the representative part or section of a product, relative to the value or values chosen as the criterion for presence, absence or further testing

4 Principle

The prepared test portion is digested in highly acidic conditions at high temperature using a hot plate digestion, a hot block digestion technique, or a microwave digestion system. Hot acid digestion destroys the material matrix allowing the elements of interest to be solubilized and quantified by a suitable analytical instrument (see 9.2).

NOTE The EDXRF screening determination (3.10) method is capable of directly analysing materials without the need for sample preparation and digestion. See Annex B.

5 Reagents and apparatus

5.1 Reagents

Only reagents of recognized analytical grade or equivalent shall be used. The concentration of the analyte or interfering substances in the reagents and water shall be negligible compared to the lowest concentration to be determined.

“Trace metal” grade or equivalent reagents shall be used for the calibration standards used for the final instrumentation quantification stage, as follows.

5.1.1 Nitric acid, concentrated, 1,40 g/ml, a mass fraction of 65 %, “analytical” grade.

5.1.2 Nitric acid, 1:9 dilution: Add 100 ml concentrated nitric acid (5.1.1) to 500 ml water (5.1.4). Dilute to 1 000 ml with water (5.1.4).

5.1.3 Hydrochloric acid, concentrated, 1,19 g/ml, a mass fraction of 37 %, “analytical” grade.

5.1.4 Water, of at least grade 3 purity, in accordance with ISO 3696.

5.1.5 Hydrogen peroxide, a mass fraction of 30 %.

NOTE Hydrogen peroxide which is not stabilized can be stored according to the instruction of the manufacturer.

5.1.6 Methylene chloride, “analytical” grade.

5.1.7 Acetone/ethanol solution, 1:1 mixture of absolute ethanol and acetone (“analytical” grades).