

Determination of certain substances in electrotechnical products - Part 3-4: Screening - Phthalates in polymers of electrotechnical products by high performance liquid chromatography with ultraviolet detector (HPLC-UV), thin layer chromatography (TLC) and thermal desorption mass spectrometry (TD-MS)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 62321-3-4:2023 sisaldab Euroopa standardi EN IEC 62321-3-4:2023 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 62321-3-4:2023 consists of the English text of the European standard EN IEC 62321-3-4:2023.
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Determination of certain substances in electrotechnical products
- Part 3-4: Screening - Phthalates in polymers of electrotechnical
products by high performance liquid chromatography with
ultraviolet detector (HPLC-UV), thin layer chromatography (TLC)
and thermal desorption mass spectrometry (TD-MS)
(IEC 62321-3-4:2023)

Détermination de certaines substances dans les produits
électrotechniques - Partie 3-4: Détection - Phtalates dans
les polymères des produits électrotechniques par
chromatographie en phase liquide à haute performance
avec détecteur d'ultraviolets (HPLC-UV), par
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spectrométrie de masse par désorption thermique (TD-MS)
(IEC 62321-3-4:2023)

Verfahren zur Bestimmung von bestimmten Substanzen in
Produkten der Elektrotechnik - Teil 3-4: Screening von
Phthalaten in Polymeren von Produkten der Elektrotechnik
durch Hochleistungs-Flüssigkeitschromatographie mit
Ultraviolett-detektor (HPLC-UV),
Dünnschichtchromatographie (TLC) und
Thermodesorptions-Massenspektroskopie (TD-MS)
(IEC 62321-3-4:2023)

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European foreword

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IEC 62321-8:2017 NOTE Approved as EN 62321-8:2017 (not modified)

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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avec détecteur d'ultraviolets (HPLC-UV), par chromatographie sur couche mince
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(CCM) et par spectrométrie de masse par désorption thermique (TD-MS)**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DETERMINATION OF CERTAIN SUBSTANCES
IN ELECTROTECHNICAL PRODUCTS –**
Part 3-4: Screening – Phthalates in polymers of electrotechnical products by high performance liquid chromatography with ultraviolet detector (HPLC-UV), thin layer chromatography (TLC) and thermal desorption mass spectrometry (TD-MS)

FOREWORD

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The text of this International Standard is based on the following documents:

Draft	Report on voting
111/695/FDIS	111/701/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62321 series, published under the general title *Determination of certain substances in electrotechnical products*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

The widespread use of electrotechnical products has drawn increased attention to their impact on the environment. In many countries all over the world, this has resulted in the adaptation of regulations affecting wastes, substances and energy use of electrotechnical products.

The use of certain substances (e.g. lead (Pb), cadmium (Cd), polybrominated diphenyl ethers (PBDEs) and specific phthalates) in electrotechnical products is a source of concern in current and proposed regional legislation.

The purpose of the IEC 62321 series is therefore to provide test methods that will allow the electrotechnical industry to determine the levels of certain substances of concern in electrotechnical products on a consistent global basis.

This first edition of IEC 62321-3-4 introduces a new part in the IEC 62321 series.

Appropriate test methods are required in order to facilitate the monitoring of the contents of certain substances in affected materials. Faced with the enormous task of testing a diversity of electronic and electric equipment, the industry adopted the concept of 'screening' in order to reduce the amount of testing. As defined in IEC 62321-1:2013, 3.1.10, "*...screening is an 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*". Executed as a predecessor to any other test analysis of the product, the main objective of screening is to quickly, expediently, inexpensively and preferably in a non-destructive manner, determine whether the screened product:

- contains a certain substance at a concentration significantly higher than its value accepted as criterion, and therefore can be rejected as being above the threshold;
- contains a certain substance at a concentration significantly lower than its value accepted as criterion, and therefore can be considered below the threshold;
- contains a certain substance at a concentration so close to the value accepted as criterion that when all possible errors of measurement and safety factors and measurement uncertainty are considered, no conclusive decision can be made about the absence or presence of substance and, therefore, a follow-up action can be required, such as another, more specific or more precise and accurate analysis.

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DETERMINATION OF CERTAIN SUBSTANCES IN ELECTROTECHNICAL PRODUCTS –

Part 3-4: Screening – Phthalates in polymers of electrotechnical products by high performance liquid chromatography with ultraviolet detector (HPLC-UV), thin layer chromatography (TLC) and thermal desorption mass spectrometry (TD-MS)

1 Scope

This part of IEC 62321 specifies procedures for the screening of di-isobutyl phthalate (DIBP), di-n-butyl phthalate (DBP), benzyl butyl phthalate (BBP), di-(2-ethylhexyl) phthalate (DEHP) in polymers of electrotechnical products by using high performance liquid chromatography with ultraviolet detector (HPLC-UV), thin layer chromatography (TLC) and thermal desorption mass spectrometry (TD-MS).

High performance liquid chromatography with ultraviolet detector (HPLC-UV), thin layer chromatography (TLC) and thermal desorption mass spectrometry (TD-MS) techniques are described in the normative part of this document. Fourier transform infrared spectroscopy (FT-IR) is described in the informative annexes of this document.

The HPLC-UV and TLC techniques are suitable for screening and semi-quantitative analysis of DIBP, DBP, BBP and DEHP in polymers that are used as parts in electrotechnical products above 300 mg/kg.

The TD-MS technique is suitable for screening and semi-quantitative analysis of DIBP, DBP, BBP and DEHP in polymers that are used as parts in electrotechnical products above 300 mg/kg.

The FT-IR technique is suitable for preliminary screening of total phthalates (DIBP, DBP, BBP, DEHP and so forth) in polymers that are used as parts in electrotechnical products above 50 000 mg/kg.

These test methods have been evaluated by testing polyethylene (PE), polyvinyl chloride (PVC) materials containing individual phthalates between 500 mg/kg to 3 000 mg/kg as depicted in this document. The use of the methods described in this document for other polymer types, phthalate compounds or concentration ranges other than those specified above has not been specifically evaluated.

A flow chart is given as an example of how each method included in this document can be used for screening. The test methods in this document differ from those given in IEC 62321-8 [1]¹ in that not all phthalates in this scope are separated from each other. Detectable combinations are DIBP + DBP + BBP and DEHP for the HPLC-UV technique, DIBP + DBP, BBP and DEHP for the TLC technique and TD-MS technique, total phthalates for the FT-IR technique. FT-IR is a suitable analytical technique for preliminary screening in the first step of phthalates screening. These test methods are characterized by a shorter measuring time compared with IEC 62321-8 because all phthalates in this scope are not separated from each other.

NOTE See Annex F for commonly used phthalates in products.

This document has the status of a horizontal publication in accordance with IEC Guide 108 [2].

¹ Numbers in square brackets refer to the Bibliography.

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.

IEC 62321-1:2013, *Determination of certain substances in electrotechnical products – Part 1: Introduction and overview*

IEC 62321-2:2021, *Determination of certain substances in electrotechnical products – Part 2: Disassembly, disjointment and mechanical sample preparation*

3 Terms, definitions and abbreviated terms

3.1 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:

- IEC Electropedia: available at <https://www.electropedia.org/>
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3.1.1 screening

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

Note 1 to entry: If the screening method produces values that are not conclusive, then additional analysis or other follow-up actions may be necessary to make a final presence/absence decision.

[SOURCE: IEC 62321-1:2013, 3.1.10]

3.1.2 semi-quantitative

level of accuracy in a measurement amount where the relative uncertainty of the result is typically 30 % or better at a defined level of confidence of 68 %

[SOURCE: IEC 62321-6:2015, 3.1.1 [3]]

3.1.3 calibrant

calibration standard

substance in solid or liquid form with known and stable concentration(s) of the analyte(s) of interest used to establish instrument response (calibration curve) with respect to analyte(s) concentration(s)