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## Bestämning av vissa ämnen i elektriska och elektroniska produkter – Del 3-4: Screening – Ftalater i polymerer i elektrotekniska produkter genom vätskekromatografi med UV-detektor (HPLC-UV), tunnskiktskromatografi (TLC) och masspektrometri med utrustning för termisk desorption (TD-MS)

*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)*

Som svensk standard gäller europastandarden EN IEC 62321-3-4:2023. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 62321-3-4:2023.

### Nationellt förord

Europastandarden EN IEC 62321-3-4:2023

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- **IEC 62321-3-4, First edition, 2023 - 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)**

utarbetad inom International Electrotechnical Commission, IEC.

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ICS 01.110.00; 13.020.00; 29.100.01

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English Version

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  
chromatographie sur couche mince (CCM) et par  
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 Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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

## **European foreword**

The text of document 111/695/FDIS, future edition 1 of IEC 62321-3-4, prepared by IEC/TC 111 "Environmental standardization for electrical and electronic products and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62321-3-4:2023.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2024-03-07 level by publication of an identical national standard or by endorsement
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## **Endorsement notice**

The text of the International Standard IEC 62321-3-4:2023 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standard indicated:

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

IEC 62321-6:2015 NOTE Approved as EN 62321-6:2015 (not modified)

ISO 3696 NOTE Approved as EN ISO 3696

ISO/IEC 17025 NOTE Approved as EN ISO/IEC 17025

**Annex A**  
(normative)

**Normative references to international publications  
with their corresponding European publications**

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62321-1	2013	Determination of certain substances in electrotechnical products - Part 1: Introduction and overview	EN 62321-1	2013
IEC 62321-2	2021	Determination of certain substances in electrotechnical products - Part 2: Disassembly, disjointment and mechanical sample preparation	EN IEC 62321-2	2021

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**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)**

**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 chromatographie sur couche mince  
(CCM) et par spectrométrie de masse par désorption thermique (TD-MS)**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
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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

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 62321-3-4 has been prepared IEC technical committee 111: Environmental standardization for electrical and electronic products and systems. It is an International Standard.

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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://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](http://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.

**WARNING** – Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

## 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]<sup>1</sup> 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].

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<sup>1</sup> 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*