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Part 10: Polycyclic aromatic hydrocarbons (PAHs) in polymers and electronics by gas chromatography-mass spectrometry (GC-MS)

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



111/773/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER: IEC 62321-10 ED2	
DATE OF CIRCULATION: 2024-08-09	CLOSING DATE FOR COMMENTS: 2024-10-04
SUPERSEDES DOCUMENTS: 111/665/RR	

IEC TC 111 : ENVIRONMENTAL STANDARDIZATION FOR ELECTRICAL AND ELECTRONIC PRODUCTS AND SYSTEMS	
SECRETARIAT: Italy	SECRETARY: Mr Alfonso Sturchio
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 2,TC 9,TC 18,TC 20,TC 21,TC 23,TC 34,SC 34D,TC 59,TC 62,SC 65B,TC 80,TC 82,TC 88,TC 91,TC 100,TC 110,TC 121,SC 121A,SC 121B,TC 124,TC 125,PC 126,PC 127,CISPR,CIS/A,CIS/B,CIS/D,CIS/F,CIS/H,CIS/I,CIS/S,ACEA,ACEC,ACEE,ACOS,ACSEC,ACTAD,SyC AAL,SyC LVDC,SyC SM,SyC Smart Cities,SyC Smart Energy,SEG 8,SEG 9,SEG 10,SEG 11,ISO/IEC JTC 1/SC 25,ISO/IEC JTC 1/SC 41	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Environment	

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TITLE: Determination of certain substances in electrotechnical products - Part 10: Polycyclic aromatic hydrocarbons (PAHs) in polymers and electronics by gas chromatography-mass spectrometry (GC-MS)
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DETERMINATION OF CERTAIN SUBSTANCES
IN ELECTROTECHNICAL PRODUCTS –****Part 10: Polycyclic aromatic hydrocarbons (PAHs) in polymers and
electronics by gas chromatography-mass spectrometry (GC-MS)****FOREWORD**

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

FDIS	Report on voting
111/***/FDIS	111/***/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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.

115 The committee has decided that the contents of this document will remain unchanged until the
116 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
117 the specific document. At this date, the document will be

- 118 • reconfirmed,
- 119 • withdrawn,
- 120 • replaced by a revised edition, or
- 121 • amended.

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124

INTRODUCTION

125 The widespread use of electrotechnical products has drawn increased attention to their impact
126 on the environment. In many countries this has resulted in the adoption of regulations affecting
127 wastes, substances and energy use of electrotechnical products.

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

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

134 The second edition of IEC 62321-10 introduces the topics covering polycyclic aromatic
135 hydrocarbons (PAHs) in the IEC 62321 series.

136 The main purpose of revision was to consider the work safety risks of the extraction solvent
137 (dichloromethane) used in the first edition, and toluene was used in the second edition, and the
138 remaining test methods are the same as the first edition.

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

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DETERMINATION OF CERTAIN SUBSTANCES IN ELECTROTECHNICAL PRODUCTS –

Part 10: Polycyclic aromatic hydrocarbons (PAHs) in polymers and electronics by gas chromatography-mass spectrometry (GC-MS)

1 Scope

This part of IEC 62321 specifies one normative technique for the determination of polycyclic aromatic hydrocarbons (PAHs) in polymers including rubber of electrotechnical products. These PAHs can especially be found in the plastic and rubber parts of a wide range of consumer articles. They are present as impurities in some of the raw materials used in the production of such articles, in particular in extender oils and in carbon black. They are not added intentionally to the articles and do not perform any specific function as constituents of the plastic or rubber parts.

The gas chromatography-mass spectrometry (GC-MS) test method is suitable for the determination of polycyclic aromatic hydrocarbons (PAHs).

These test methods have been evaluated for use with plastics and rubbers. These test methods have been evaluated for use with high impact polystyrene (HIPS) containing individual PAH less than 0,5 mg/kg and rubbers containing individual PAH ranging from 8 mg/kg to 221 mg/kg.

WARNING – This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

This horizontal standard is primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 108.

One of the responsibilities of a technical committee is, wherever applicable, to make use of horizontal standards in the preparation of its publications. The contents of this horizontal standard will not apply unless specifically referred to or included in the relevant publications.

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

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

3 Terms, definitions and abbreviated terms

3.1 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 <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.2 Abbreviated terms

ACN	acrylonitrile
CCC	continuing calibration check standard
EPA	Environmental Protection Agency
EI	electron ionization
GC-MS	gas chromatography-mass spectrometry
HIPS	high impact polystyrene
IS	internal standard
IUPAC	International Union of Pure and Applied Chemistry
LOD	limit of detection
LOQ	limit of quantification
MDL	method detection limit
PAH	polycyclic aromatic hydrocarbon
PTFE	poly tetrafluoro ethylene
QC	quality control
RSD	relative standard deviation
SIM	selected ion monitoring
TICS	tentatively identified compounds
US EPA	United States Environmental Protection Agency
UV	ultraviolet

4 Principle

PAH compounds are quantitatively determined using ultrasonic extraction or Soxhlet extraction followed by gas chromatography-mass spectrometry (GC-MS) using single (or "selected") ion monitoring (SIM).

5 Reagents and materials

Use reagents of at least analytical quality. Use only reagents with negligibly low concentrations of PAH and verify by blank determinations and, if necessary, apply additional cleaning steps (for calibrants, see 8.4):

- Helium (purity of greater than a volume fraction of 99,999 %).
- Toluene (GC grade or higher).

NOTE 1 The standards are acceptable when using a quadrupole-type mass spectrometer. A high-resolution mass spectrometer will require the use of other suitable standard substances having a mass and elution time similar to that of the analyte (see 8.4). Other stock solution concentrations can be utilized providing the standard solution concentrations given in 8.4.3 Table 3 can be achieved.

- Internal standards:

internal standard (to correct for injection errors, according to 8.4.2 a)), (e.g. naphthalene-d₈, pyrene-d₁₀, anthracene-d₁₀, phenanthrene-d₁₀, benzo(a)pyrene-d₁₂, perylene-d₁₂);

NOTE 2 At least three internal standards are preferably used to be mixed with toluene as extraction agent.

6 Apparatus

The following items shall be used for the analysis:

- 0,45 µm poly tetrafluoro ethylene (PTFE) filter membrane.
- 1 ml, 5 ml, 10 ml, 100 ml volumetric flasks.
- Aluminium foil.
- Analytical balance capable of measuring accurately to 0,000 1 g.