

PRE-RELEASE VERSION (FDIS)

**Determination of certain substances in electrotechnical products –
Part 9: Hexabromocyclododecane in polymers by gas chromatography-mass
spectrometry (GC-MS)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 13.020.01; 43.040.10

Warning! Make sure that you obtained this publication from an authorized distributor.



This is a preview - click here to buy the full publication

111/620/FDIS

FINAL DRAFT INTERNATIONAL STANDARD (FDIS)

PROJECT NUMBER:

IEC 62321-9 ED1

DATE OF CIRCULATION:

2021-04-30

CLOSING DATE FOR VOTING:

2021-06-11

SUPERSEDES DOCUMENTS:

111/535/CDV, 111/607/RVC

IEC TC 111 : ENVIRONMENTAL STANDARDIZATION FOR ELECTRICAL AND ELECTRONIC PRODUCTS AND SYSTEMS	
SECRETARIAT: Italy	SECRETARY: Mr Marco Iadevaia
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL STANDARD: <input checked="" type="checkbox"/>
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input checked="" type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Final Draft International Standard (FDIS) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

This document is a draft distributed for approval. It may not be referred to as an International Standard until published as such.

In addition to their evaluation as being acceptable for industrial, technological, commercial and user purposes, Final Draft International Standards may on occasion have to be considered in the light of their potential to become standards to which reference may be made in national regulations.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Determination of certain substances in electrotechnical products - Part 9: Hexabromocyclododecane in polymers by chromatography-mass spectrometry (GC-MS)

PROPOSED STABILITY DATE: 2022

NOTE FROM TC/SC OFFICERS:

Copyright © 2021 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

CONTENTS

FOREWORD	4
INTRODUCTION	6
1 Scope	7
2 Normative references	7
3 Terms, definitions and abbreviated terms	7
3.1 Terms and definitions	7
3.2 Abbreviated terms	8
4 Principle	8
5 Reagents and materials	8
6 Apparatus	9
7 Sampling	9
8 Procedure	10
8.1 General instructions for the analysis	10
8.2 Sample preparation	10
8.2.1 Stock solution	10
8.2.2 Pre-extraction of the Soxhlet extractors	10
8.2.3 Soxhlet extraction	10
8.2.4 Alternative extraction procedure for soluble polymers	11
8.2.5 Addition of the internal standard (IS)	11
8.3 Instrumental parameters	11
8.4 Calibrants	12
8.5 Calibration	12
8.5.1 General	12
8.5.2 Standard solutions	12
9 Calculation of HBCDD concentration	13
9.1 General	13
9.2 Calculation	13
10 Precision	15
11 Quality assurance and quality control	16
11.1 Performance	16
11.2 Internal control samples and blanks	17
11.3 Method detection limit and reporting limit	17
12 Test report	18
Annex A (informative) Determination of HBCDD in polymers by high-pressure liquid chromatography-mass spectrometry (HPLC-MS)	19
A.1 Principle	19
A.2 Reagents and materials	19
A.3 Apparatus	19
A.4 Sampling	20
A.5 Procedure	20
A.5.1 General instructions for the analysis	20
A.5.2 Sample preparation	20
A.5.3 Instrumental parameters	21
A.5.4 Calibrants	22

A.5.5	Calibration	22
A.6	Calculation of HBCDD concentration	23
A.6.1	General	23
A.6.2	Calculation	23
A.7	Precision.....	24
A.8	Quality assurance and quality control.....	25
A.8.1	Performance	25
A.8.2	Limit of detection (LOD) or method detection limit (MDL) and limit of quantification (LOQ)	25
A.9	Test report	26
Annex B (informative)	Examples of chromatograms at suggested conditions.....	27
Annex C (informative)	Results of international interlaboratory study (IIS 9)	29
Bibliography.....		31
Figure B.1	– Total ion chromatogram of HBCDD by GC-MS analysis.....	27
Figure B.2	– Mass spectrum of HBCDD by GC-MS analysis	27
Figure B.3	– Total ion chromatogram of HBCDD isomers (α -, β -, γ -HBCDD) by HPLC- MS analysis	28
Table 1	– Tested concentration ranges for HBCDD by GC-MS in various materials.....	7
Table 2	– Reference masses for the quantification of HBCDD	12
Table 3	– Commercially available HBCDD reference materials considered suitable for GC-MS analysis.....	12
Table 4	– Calibration solutions of HBCDD.....	13
Table 5	– IIS 9 repeatability and reproducibility.....	16
Table A.1	– HPLC-MS liquid phase	21
Table A.2	– Commercially available HBCDD reference materials considered suitable for HPLC-MS analysis.....	22
Table A.3	– Calibration solutions of HBCDD	23
Table A.4	– IIS 9 repeatability and reproducibility	25
Table C.1	– Mean results and recovery rates for HBCDD using GC-MS.....	29
Table C.2	– Statistical data for GC-MS	29
Table C.3	– Mean results and recovery rates for HBCDD using HPLC-MS	29
Table C.4	– Statistical data for HPLC-MS	30

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DETERMINATION OF CERTAIN SUBSTANCES IN ELECTROTECHNICAL PRODUCTS –

Part 9: Hexabromocyclododecane in polymers by gas chromatography-mass spectrometry (GC-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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62321-9 has been prepared by 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:

FDIS	Report on voting
111/XX/FDIS	111/XX/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/standardsdev/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 this has resulted in the adoption of regulations affecting wastes, substances and energy use of electrotechnical products.

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

The purpose of this document 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.

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 9: Hexabromocyclododecane in polymers by gas chromatography-mass spectrometry (GC-MS)

1 Scope

This part of IEC 62321 specifies two techniques for the determination of hexabromocyclododecane (HBCDD) in polymers of electrotechnical products.

The gas chromatography-mass spectrometry (GC-MS) test method is described in the normative part of this document. The GC-MS method is suitable for the determination of hexabromocyclododecane (HBCDD).

A method using high-pressure liquid chromatography-mass spectrometry (HPLC-MS) is given in informative Annex A.

These test methods have been evaluated for use with EPS (expanded polystyrene foam), XPS (extruded polystyrene foam) and ABS (acrylonitrile butadiene styrene) within the concentration ranges as specified in Table 1. The use of this method for other types of materials or concentration ranges outside those specified below has not been evaluated.

Table 1 – Tested concentration ranges for HBCDD by GC-MS in various materials

Substance or element	HBCDD		
Parameter	Unit of measurement mg/kg	Medium or material tested	
		EPS/XPS	ABS
Concentration range tested		6 080 to 11 940	1 000 to 10 000

This document has the status of a horizontal standard in accordance with IEC Guide 108.

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*