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Standard Recommendation
S.R. CEN/TS 16190:2012

Sludge, treated biowaste and soil - Determination of dioxins and furans and dioxin-like polychlorinated biphenyls by gas chromatography with high resolution mass selective detection (HR GC-MS)

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TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

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CEN/TS 16190

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English Version

Sludge, treated biowaste and soil - Determination of dioxins and furans and dioxin-like polychlorinated biphenyls by gas chromatography with high resolution mass selective detection (HR GC-MS)

Boues, biodéchets traités et sols - Détermination des dioxines et furanes et polychlorobiphényles de type dioxine par chromatographie en phase gazeuse avec spectrométrie de masse à haute résolution (CG-SMHR)

Schlamm, behandelter Bioabfall und Boden - Bestimmung von Dioxinen und Furanen sowie Dioxin vergleichbaren polychlorierten Biphenylen mittels Gaschromatographie und hochauflösender massenspektrometrischer Detektion (HR GC-MS)

This Technical Specification (CEN/TS) was approved by CEN on 24 April 2011 for provisional application.

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Contents

Page

Foreword 4
Introduction 5
1 Scope 6
2 Normative references 7
3 Abbreviations 7
4 Principle 7
5 Reagents 8
5.1 Chemicals 8
5.2 Standards 8
6 Apparatus and materials 8
6.1 General 8
6.2 Equipment for sample preparation 8
6.3 Soxhlet extractor 8
6.4 Clean-up apparatus 8
6.5 Concentration apparatus 9
6.6 Other equipment 9
7 Sample storage and sample pretreatment 10
7.1 Sample storage 10
7.2 Sample pretreatment 10
8 Extraction and clean-up 10
8.1 General 10
8.2 Extraction 10
8.3 Clean-up 11
8.3.1 General 11
8.3.2 Gel permeation chromatography 12
8.3.3 Multilayer column 12
8.3.4 Sulfuric acid treatment 12
8.3.5 Activated carbon column 12
8.3.6 Aluminium oxide column 12
8.3.7 Removal of sulfur 12
8.4 Final concentration of cleaned sample extract 12
8.5 Addition of recovery standard 13
9 HRGC/HRMS analysis 13
9.1 General 13
9.2 Gas chromatographic analysis 13
9.3 Mass spectrometric detection 13
9.4 Minimum requirements for identification of PCDF/PCDD and PCB 15
9.5 Minimum requirements for quantification of PCDF/PCDD and PCB 16
9.6 Calibration of the HRGC/HRMS system 17
9.6.1 General 17
9.6.2 Calibration for 2,3,7,8-congeners 17
9.6.3 Calibration for sum of homologue groups 17
9.7 Quantification of HRGC/HRMS results 18
9.7.1 Quantification of concentrations of 2,3,7,8-congeners 18
9.7.2 Quantification of recovery rates of ^{13}C-labelled standards 19
9.7.3 Quantification of sum of homologue groups 19
9.7.4 Calculation of the toxic equivalent 19

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9.7.5 Calculation of the limit of detection and the limit of quantification 20

10 Precision 20

11 Test report 20

Annex A (informative) **Toxic equivalent factors** 21

Annex B (informative) **Repeatability and reproducibility data** 23
B.1 Materials used in the interlaboratory comparison study 23
B.2 Interlaboratory comparison results 24

Annex C (informative) **Examples of extraction and clean-up methods** 27
C.1 Example A 27
C.1.1 General 27
C.1.2 Chemicals 27
C.1.3 Procedure 28
C.2 Example B: Approved clean-up methods 33

Annex D (informative) **Examples of operation of GC/HRMS determination** 35
D.1 Example 35
D.1.1 General 35
D.1.2 Gas chromatographic analysis 35
D.1.3 Mass spectrometric detection 36

Bibliography 39

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Foreword

This document (CEN/TS 16190:2012) has been prepared by Technical Committee CEN/TC 400 “Project Committee - Horizontal standards in the fields of sludge, biowaste and soil”, the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The preparation of this document by CEN is based on a mandate by the European Commission (Mandate M/330), which assigned the development of standards on sampling and analytical methods for hygienic and biological parameters as well as inorganic and organic determinants, aiming to make these standards applicable to sludge, treated biowaste and soil as far as this is technically feasible.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

Two groups of related chlorinated aromatic ethers are known as polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs); they consist of a total of 210 individual substances (congeners): 75 PCDDs and 135 PCDFs.

A group of chlorinated aromatic compounds similar to polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) is known as polychlorinated biphenyls (PCBs) which consist of 209 individual substances.

PCDDs and PCDFs can form in the combustion of organic materials; they also occur as undesirable by-products in the manufacture or further processing of chlorinated organic chemicals. PCDDs/PCDFs enter the environment via these emission paths and through the use of contaminated materials. In fact, they are universally present at very small concentrations. The 2,3,7,8-substituted congeners are toxicologically significant. Toxicologically much less significant than the tetrachlorinated to octachlorinated dibenzo-p-dioxins/dibenzofurans are the 74 monochlorinated to trichlorinated dibenzo-p-dioxins/dibenzofurans.

PCBs have been produced over a period of approximately 50 years until the end of the 1990s for the purpose of different use in open and closed systems, e. g. as electrical insulators or dielectric fluids in capacitors and transformers, as specialised hydraulic fluids, as a plasticizer in sealing material. Worldwide more than one million tons of PCBs were produced.

PCDD/F as well as PCBs are emitted during thermal processes as e. g. waste incineration. In 1997 a group of experts of the World Health Organisation (WHO) fixed toxicity equivalent factors (TEF) for PCDD and twelve PCBs, known as dioxin-like PCBs (see Annex A). These twelve dioxin-like PCBs consist of four non-ortho PCBs and eight mono-ortho PCBs (no or only one chlorine atoms in 2-, 2'-, 6- and 6'-position), having a planar or mostly planar structure. Dioxin-like PCB can contribute considerably to the total WHO-TEQ.

Only skilled operators who are trained in handling highly toxic compounds should apply the method described in this Technical Specification.

This Technical Specification is applicable for several types of matrices and validated for municipal sludge (see also Annex B for the results of the validation).

WARNING — Persons using this Technical Specification should be familiar with usual laboratory practice. This Technical Specification 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.

IMPORTANT — It is absolutely essential that tests conducted according to this Technical Specification be carried out by suitably trained staff.

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1 Scope

This Technical Specification specifies a method for quantitative determination of 17 2,3,7,8-chlorine substituted dibenzo-p-dioxins and dibenzofurans and dioxin-like polychlorinated biphenyls in sludge, treated biowaste and soil using liquid column chromatographic clean-up methods and GC/HRMS.

The analytes to be determined with this Technical Specification are listed in Table 1.

Table 1 — Analytes and their abbreviations

Substance	Abbreviation
Tetrachlorodibenzo-p-dioxin	TCDD
Pentachlorodibenzo-p-dioxin	PeCDD
Hexachlorodibenzo-p-dioxin	HxCDD
Heptachlorodibenzo-p-dioxin	HpCDD
Octachlorodibenzo-p-dioxin	OCDD
Tetrachlorodibenzofuran	TCDF
Pentachlorodibenzofuran	PeCDF
Hexachlorodibenzofuran	HxCDF
Heptachlorodibenzofuran	HpCDF
Octachlorodibenzofuran	OCDF
Polychlorinated biphenyl	PCB
Trichlorobiphenyl	TCB
Tetrachlorobiphenyl	TeCB
Pentachlorobiphenyl	PeCB
Hexachlorobiphenyl	HxCB
Heptachlorobiphenyl	HpCB
Decachlorobiphenyl	DecaCB

The limit of detection depends on the kind of sample, the congener, the equipment used and the quality of chemicals used for extraction and clean-up. Under the conditions specified in this Technical Specification, limits of detection better than 1 ng/kg (expressed as dry matter) can be achieved.

This method is "performance based". It is permitted to modify the method if all performance criteria given in this method are met.

NOTE In principle this method can also be applied for sediments, mineral wastes and for vegetation. It is the responsibility of the user of this Technical Specification to validate the application for these matrices. For measurement in complex matrices like fly ashes adsorbed on vegetation it can be necessary to further improve the clean up. This can also apply to sediments and mineral wastes.

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