

Accreditation Scheme
Laboratory Analyses for
Environmental Soil Investigation

SIKB – Protocol 3010

Basic Package



**This document, SIKB-Protocol 3010 Version 2,
was presented on December 9, 2004 by the
Accreditation Council for Soil Management, affiliated to the
Foundation Infrastructure for Quality Assurance of Soil
Management (SIKB), Gouda (NL)**

SIKB/documents/05.7454

Copyright/Right of ownership

This document was drawn up and published by the Foundation Infrastructure for Quality Assurance of Soil Management (SIKB), Postal Box 420, NL-2800 AK Gouda, Netherlands. The contents of this documents are managed by the Accreditation Council for Soil Management, affiliated to the SIKB, Gouda (NL). The most recent version of the Accreditation Scheme can be located in the website of the SIKB and is electronically protected against undesirable alterations. It is not permitted to modify the original texts that have been approved and established by the Accreditation Council for Soil Management, with the aim of deriving rights thereof.

Safeguarding

Except in case of intent or gross neglect, the SIKB is not liable for any damage incurred to the Accreditation Institution or third parties by the application of this Accreditation Scheme and the use of this Accreditation Regulation.

© 2004 Copyright SIKB

Ordering Options

This document may be obtained in digital form and free of charge via the website of the SIKB: www.sikb.nl. A bound version of the document can be ordered at cost price from the SIKB, Postal Box 420, NL-2800 AK Gouda, Netherlands, e-mail: info@sikb.nl, fax: +31 (0)182 540676.

Update service

Alterations presented in this document by the Accreditation Council for Soil Management can be obtained from the SIKB, by logging in via www.sikb.nl. Requests for the forwarding by post of the regular newsletter can also be directed at the SIKB: info@sikb.nl

Helpdesk / User's Manual

Any questions regarding content and application can be directed at your accrediting institution or at the SIKB. Regarding points of difference, see the Chapter 'Complaints' in this document.



Table of Contents

1 PLACE OF THIS PROTOCOL IN AS SIKB 3000	4
1.1 TECHNICAL DESCRIPTION AND QUALITY ASSURANCE OF THE RELATED PERFORMANCES	5
1.2 PERFORMANCE SHEETS	6
1.2.1 Performance sheet Determination of pH-CaCl₂ in soil	6
1.2.2 Performance sheet Determination of dry matter content in soil.....	7
1.2.3 Performance sheet Supporting performance determination of free iron	8
1.2.4 Performance sheet Supporting performance determination of calcite.	9
1.2.5 Performance sheet Supporting performance determination of	
electrical conductivity in water.....	10
1.2.6 Performance sheet Determination of the content of clay in soil.....	11
1.2.7 Performance sheet Determination of the content of organic matter in	
soil.....	12
1.2.8 Performance sheet Determination of elements in soil.....	13
1.2.9 Performance sheet Determination of Polycyclic Aromatic	
Hydrocarbons (PAH) in soil.....	14
1.2.10 Performance sheet Determination of extractable organohalogen	
compounds (EOX) in soil.....	15
1.2.11 Performance sheet Determination of mineral oil in soil.....	16
LITERATURE	17
INORGANIC PARAMETERS	17
ORGANIC PARAMETERS.....	19
GENERAL.....	20



1 Place of this Protocol in AS SIKB 3000

SIKB-Protocol 3010 presented here, belongs to a group of protocols that have been specifically written for the laboratory work for the environmental investigation of soil samples. At the time of writing, this group consists of the following protocols:

- Protocol 3001: Preservation methods and preservation period of environmental samples
- Protocol 3010: Basic package, determination of clay, DS, OS, As, Ba, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Sn, Se, V, Zn, EOX, mineral oil, PAH and pH-CaCl₂.
- Protocol 3020: Additional I determination of OCP, PCB and chlorobenzenes (tri- (optional), tetra-, penta-, en hexachlorobenzenes).
- Protocol 3030: Additional II, determination of benzene, toluene, ethylbenzene, (o/m/p) xylene, volatile halogenated hydrocarbons and chlorobenzenes (mono-, di- en trichlorobenzenes (optional)).
- Protocol 3040: Additional III, determination of bromide, chloride, sulphate and cyanide.
- Protocol 3050: Additional IV, determination of Ag, Be, Te and Tl

Protocol 3090, Additional V, determination of elements in soil that have not been described in other protocols – has been planned, but not yet written



1.1 Technical Description and Quality Assurance of the related Performances

In the performance sheet presented below, for the described performances a distinction can be made between normal performances and supporting performances. For the normal performances, the quality assurance described in AS SIKB 3000 (Chapter 3), is valid. For the supporting performances, different requirements in respect of the quality assurance are in force. For the supporting performances, the laboratory does not have to participate in proficiency testing. With the start-up of a supporting performance, the laboratory has to prove that it has a sufficient control over the performance. In a number of cases, it is not necessary to establish the detection limit, e.g. for determining free-iron, as it concerns a determination which is only relevant for samples with a high level. The quality assurance is performed by means of (a) control chart(s). The determination of equivalence is performed by showing that the set performance characteristics are being complied with.

Only part of the elements mentioned in performance sheet 2.2.8 can be accredited under this protocol. These elements are: As, Ba, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Sn, Se, V and Zn. The remaining elements can be accredited under SIKB Protocol 3050.



1.2 Performance sheets

1.2.1 Performance sheet Determination of pH-CaCl₂ in soil

Principle

The analysis sample is extracted with CaCl₂-containing water in a ratio of 1 : 5 (v/v). The pH-CaCl₂ is measured with an electrical voltmeter with a high input resistance that has a pH-scale as well. The cell of which the source voltage is determined consists of an indication-electrode, the sample or the standard solution and a reference-electrode. The indication-electrode is the glass electrode. As reference-electrode a "saturated" calomel electrode, filled with a concentrated potassium chloride-solution, has to be employed.

PROCEDURE

Pretreatment	Draft-NEN 5709
Preservation	SIKB-Protocol 3001
Reference method	Draft-NEN 5750
Obligatory activities	- extraction with CaCl ₂ -containing water (composition of water and ratio sample : water) - pH-measurement with potentiometrical measurement
Attention points	- temperature correction - condition of the electrode - adjustment of the intercept and the slope

PERFORMANCE REQUIREMENTS

Detection limit	n/a
Water	The water used must have a conductivity of < 0,2 mS/m and pH > 5,6
Retrieval	n/a
(intralaboratory) reproducibility standard deviation S_w	pH < 7,00 < 0,15 7,00 < pH < 7,50 < 0,20 7,50 < pH < 8,00 < 0,30 pH > 8,00 < 0,40

Specific attention points

- Calibration: minimum of 1 pro measuring devise a day



1.2.2 Performance sheet Determination of dry matter content in soil

Principle

The analysis sample is dried for ca. 16 hours at a temperature of 105 °C to a constant mass. The mass difference before and after drying is a measurement for the percentage of moisture and thus also for the content of dry matter.

PROCEDURE

Pretreatment	Draft-NEN 5709
Preservation	SIKB-Protocol 3001
Reference method	NEN 5747 and NEN 5748

Obligatory activities	- none
Attention points	- drying at 105 °C ± 5°C - drying to a constant mass (see for a definition of constant mass ISO

11465)

PERFORMANCE REQUIREMENTS

Detection limit	n/a
Retrieval	90 - 110%
(intralaboratory) reproducibility standard deviation S_w	
20 - 50% m/m	< 5 % (relative)
50 - 80% m/m	< 2,5 % (m/m)
80 - 100% m/m	< 2,5 % (m/m)



1.2.3 Performance sheet Supporting performance determination of free iron

Principle

The analysis sample is shaken with a mixed complexing and reducing buffer solution of sodiumcitrate and sodiumdithionite. After filtration, the iron in the extract is determined with AAS, ICP-AES or ICP-MS.

Remark: This determination is only employed as a supportive performance for the determination of clay. Since measurements must be performed only at a high level, the detection limit of this method is not relevant. In the basic standard, a determination of the percentage of moisture is prescribed. Since the result of this performance is only relevant at a high level, it can also be performed wet.

PROCEDURE

Pretreatment

Draft-NEN 5709

Preservation

SIKB-protocol 3001

Reference method

NEN 5739

Related performance

Obligatory activities

Attention points

- shaking with the buffer solution referred to in the NEN 5739.

- filtration

- ratio extraction solution / free iron content

PERFORMANCE REQUIREMENTS

Detection limit

n/a

Retrieval

Fe₂O₃

80 - 110%

(intralaboratory) reproducibility variation coefficient VC_w

Fe₂O₃

< 10%



1.2.4 Performance sheet Supporting performance determination of calcite

Principle

Hydrochloric acid is added to the analysis sample, which causes the carbonates to decompose. The produced carbon dioxide is determined gravimetrically (NEN 5752) or volumetrically (NEN-EN-ISO 10693).

Remark: This determination is employed as supporting performance for the determination of clay. Since measurements can only be performed at a high level, the detection limit of this method is not relevant.

In the basic standard a determination of the percentage of moisture is prescribed. Since the result of this performance is only relevant at a high level, it can also be performed wet.

PROCEDURE

Pretreatment	Draft-NEN 5709
Preservation	SIKB-Protocol 3001
Reference method	NEN 5752 and NEN-EN-ISO 10693
Related performance	
Obligatory activities	- the use of hydrochloric acid
Attention points	

PERFORMANCE REQUIREMENTS

Detection limit	n/a
Retrieval	
Carbonate	80 - 110%
(intralaboratory) reproducibility variation coefficient VC_w	
Carbonate	< 10%



1.2.5 Performance sheet Supporting performance determination of electrical conductivity in water

Principle

The conductivity is measured directly in a diluted solution by means of a conductivity electrode. The conductivity found is a measure for the content of salt present in the water.

Remark: This determination method is used as a supporting determination for the determination of clay, in order to check if the salts it contained, have been sufficiently removed.

PROCEDURE

Pretreatment

Preservation

Reference method	NEN-EN-ISO 7888
Obligatory activities	- none
Focus of attention	- temperature correction

PERFORMANCE REQUIREMENTS

Detection limit	n/a
Retrieval	n/a
(intralaboratory) reproducibility standard deviation S_w (expressed in mS/m)	
Conductivity	<5

Specific attention points

- Calibration: minimum of 1 pro measurement series with a maximum of 1 a day.



1.2.6 Performance sheet Determination of the content of clay in soil

Principle

Hydrogenperoxide is added to the analysis sample to oxidize the organic matter present. If $\text{pH-CaCl}_2 < 6.5$, the content of carbonates is negligible and a suspension may immediately be made. Otherwise, hydrochloric acid is added first, to remove the carbonated and tangled components present. A suspension is made of the sample, to which a peptisator (sodiumpyrophosphate solution) is added. The different fractions are determined by the pipetmethod.

PROCEDURE

Pretreatment	Draft-NEN 5709
Preservation	SIKB-Protocol 3001
Reference method	Draft-NEN 5753
Related performance	free iron pH (CaCl ₂ or H ₂ O) organic matter carbonates
Obligatory activities	- measuring on the basis of sedimentation
Attention points	- removal of organic matter with hydrogenperoxide - removal of carbonates with acid - removal of salts and controlling this step by measuring the conductivity of the above (clear) liquid - removal of iron oxid, if need be - adding sodiumpyrophosphate

PERFORMANCE REQUIREMENTS

Detection limit <1 % m/m

Retrieval
clay (<10 % m/m) 60 - 120 %
90 - 110%

(intralaboratory) reproducibility variation coefficient VC_w

clay < 15%

Specific points of attention

- During validation, test with certified reference material or with samples from a proficiency test.



1.2.7 Performance sheet Determination of the content of organic matter in soil

Principle

In the analysis sample, the content of parts smaller than or equal to 2 µm (determined according to ISO 11277) must be known. Also, the content of free iron is to be determined, if the probable content is larger than 5% (determined according to NEN 5739). The soil sample is, after drying with 105 °C, ignited at 550 °C. The loss of ignition is corrected for the water bound to clay minerals that is not lost at 105 °C.

If a sample contains more than 5% (m/m; 50 g/kg) free iron, expressed as Fe₂O₃, this has to be corrected for the water bound to free iron.

Remark: If no clay determination is performed, a correction has to be applied to the calculation of the organic matter content with the aid of the median value determined in an investigation of the data files of 5 environmental laboratories (clay content 5.4 %). This has to be mentioned in the report.

PROCEDURE

Pretreatment	Draft-NEN 5709
Preservation	SIKB-Protocol 3001
Reference method	Draft-NEN 5754
Related performance	free iron clay
Obligatory activities	- igniting at 550 °C ± 5°C - Correction clay and if the free iron content is larger than 5% for free iron
Attention points	- ignite for 3 hours - dry at 105 °C ± 5 °C prior to ignition

PERFORMANCE REQUIREMENTS

Detection limit	< 0,2%
Retrieval	90-110%
(intralaboratory) reproducibility standard deviation S_w	
0 - 5% m/m	< 1,0 % m/m
5 - 15% m/m	< 10 % (relative)
	< 8 % (relative)



1.2.8 Performance sheet Determination of elements in soil

Principle

The analysis sample is digested with nitric acid and hydrochloric acid (d-NEN 6961). Subsequently, the samples are analysed by means of a technique appropriate for the element. The method is non-applicable, if mercury total must (also) be determined.

The analytes to be determined

With the techniques, available for element analysis, usually several elements can be determined. An overview of these techniques is rendered in the umbrella standard for soil analyses (Draft-NEN 6950). In the table below, for the elements mentioned in NEN 5740 the target- and intervention values as well as the requirements set to the analytical limit are given.

name	CAS-number	soil/sediment (mg/kg.ds) target- value ¹⁾	intervention value ²⁾	AG _{r,eis}
Arsenic	7440-38-2	15,8	55	4
Cadmium	7440-43-9	0,54	12	0,17
Chromium	7440-47-3	50	380	15
Copper	7440-50-8	16,2	190	5
Mercury, non volatile	7439-92-1	0,20 ³⁾	10 ³⁾	0,05
Lead	7439-92-1	52	530	13
Nickel	7440-02-0	10	210	3
Zinc	7440-66-5	53	720	17
Antimony ⁴⁾	7440-36-0	3,0	15	1
Barium	7440-39-3	38,7	625	15
Cobalt	7789-43-7	4,44	240	1
Molybdeen ⁴⁾	7439-98-7	3	200	1,5
Seleen ⁴⁾	7782-49-2	0,70	100	10
Tin	7440-31-5	20	-	6
Vanadium ⁴⁾	7440-62-2	42	250	1

¹⁾ The target value is based on soil containing 2% organic matter and 0% clay

²⁾ The intervention value is based on soil containing 10% organic matter and 25% clay

³⁾ The given values apply to mercury; within the framework of the law, no distinction is made between mercury total and mercury non-volatile

⁴⁾ The target value is based on the temporary exemption regulations for requirements for soil and mudspecie, Gazette of February 27th, 2004, no. 40, page 25

PROCEDURE

Pretreatment Draft-NEN 5709

Preservation SIKB-Protocol 3001

Reference method Draft-NEN 6950 (umbrella standard soil); Draft-NEN 6961 (aqua regia digestion);
 Draft-NEN 6964 (GF-AAS); Draft-NEN 6965 (flame-AAS); Draft-NEN 6966 (ICP-AES); NEN-ISO 16772 (Hg); NEN 6426 (ICP), ISO 17294-2 (ICP-MS).

Related performance

Obligatory activities

Attention points

- digestion with aqua regia
- relation temperature and duration of the digestion
- with higher contents of organic matter the destruate should be prevented.
- ratio acid and absolute amount of organic matter

PERFORMANCE REQUIREMENTS

Detection limit < AG_{r,eis} (see "The analytes to be determined" above)

Retrieval

All elements 80 - 110%

(intralaboratory) reproducibility variation coefficient VC_w

Ba, V, Cr and Ni < 15 %

Remaining elements < 10 %



1.2.9 Performance sheet Determination of Polycyclic Aromatic Hydrocarbons (PAH) in soil

Principle

The analysis sample is extracted with acetone and can directly be measured according to o-NEN 5710. If NEN 5731 is employed, petroleum ether is added. Subsequently, acetone is removed from the extract by washing with water and the obtained extract is eluted over an aluminumoxide column and evaporated. The extract obtained in this way is subsequently analysed.

The analytes to be determined

name	CAS-number	soil (mg/kg.ds) target- value ¹⁾	intervention- value ²⁾	AG _{r,eis}
naphthalene	91-20-3	-	-	0,01
phenanthrene	85-01-8	-	-	0,01
anthracene	120-12-7	-	-	0,01
fluoranthene	206-44-0	-	-	0,01
benzo(a)anthracene	56-55-3	-	-	0,01
chrysene	218-01-9	-	-	0,01
benzo(k)fluoranthene	207-08-9	-	-	0,01
benzo(a)pyrene	50-32-8	-	-	0,01
benzo(ghi)perylene	191-24-2	-	-	0,01
indeno(1,2,3-cd)pyrene	193-39-5	-	-	0,01
PAH (sum 10)		0,2	40	

1) The target value is based on soil containing 2% organic matter and 0% clay

2) The intervention value is based on soil containing 10% organic matter and 25% clay

PROCEDURE

Pretreatment:	Draft-NEN 5709
Preservation:	SIKB-Protocol 3001
Reference method:	NVN 5731, d-NVN 5710
Related performance	
Obligatory activities	- internal standard - acetone as digestive
Attention points	- ratio solvent / sample

Performance requirements:

Detection limit < AG_{r,eis} (see "The analytes to be determined" above)

Retrieval	
Naphthalene	60 - 110%
Phenanthrene	60 - 110%
Other	85 - 110%

(intralaboratory) reproducibility variation coefficient VC_w

Naphthalene	< 20%
Phenanthrene	< 20%
Other	< 20%

Components, the performance of which must be monitored by control charts

Naphthalene, phenanthrene, benzo(k)fluoranthene and indeno(1,2,3,cd)pyrene

Components for which blind testing or proficiency testing must be executed

Naphthalene, phenanthrene, benzo(k)fluoranthene and indeno(1,2,3,cd)pyrene

Periodical validation:

All components



1.2.10 Performance sheet Determination of extractable organohalogen compounds (EOX) in soil

Principle

The analysis sample is extracted with acetone and PE according to NEN 5735. After the removal of acetone with water, the obtained extract is evaporated and microcoulometrically determined.

The analytes to be determined

name	CAS-number	soil/sediment (mg/kg.ds) target- value ¹⁾	intervention- value ²⁾	AG _{r,eis}
EOX	(390-00-2)	0.3		0.3 ²

¹⁾ The target value is based on soil containing 2% organic matter and 0% clay

²⁾ The EOX determination has to be regarded as a trigger for the possible presence of chlorinated compounds. When the compound value from NEN 5740 (> 3) mg/kgDS) has been exceeded, the presence of chlorinated (and other halogenic) compounds has to be looked for. For the EOX no soiltype correction is needed.

PROCEDURE

Pretreatment:

Draft-NEN 5709

Preservation:

SIKB-protocol 3001

Reference method:

NEN 5735

Related performance
 Obligatory activities

- coulometric measurement
- acetone as digestive
- aldrin for the determination of the performance characteristics
- ratio solvent / soil
- temperature of the furnacetube
- removal of the interfering components with sulfuric acid
- addition of hexadecane
- the average R of Aldrin has to be 90%; individual observations may be lower
- for blank contents which can be higher than the detection limit, a multiple blank determination for each measurement series may be chosen. In this way it can be demonstrated that the blank is under control, so that a blank correction can be performed. The standard deviation of the blanks of one series should fall under the detection limit.

Attention points

Performance requirements:

Detection limit < AG_{r,eis} (see "The analytes to be determined" above)

Retrieval

EOX 80 - 110%

(intralaboratory) reproducibility variation coefficient VC_w

EOX < 20%



1.2.11 Performance sheet Determination of mineral oil in soil

Principle

The analysis sample is extracted with acetone and PE according to NEN 5733. After the removal of acetone with water, the obtained extract is treated with florisil and evaporate if need be. The mineral oil is determined with a gaschromatographically determined with a flame ionization detector (FID).

Explanatory note:

Definition of mineral oil: Compounds that can be isolated with petroleum ether under the circumstances of this standard and can be separated by chromatography with retention times in the range between the retention times of n-decane and n-tetraoctane.

The analytes to be determined

name	CAS-number	soil/sediment (mg/kg.ds)		AG _{r,eis}
		target-value ¹⁾	intervention-value ²⁾	
Mineral oil	-	10	5000	20 ³⁾

1) The target value is based on soil containing 2% organic matter and 0% clay

2) The intervention value is based on soil containing 10% organic matter and 25% clay

3) Regarding this component, for the reference method a lower detection limit is not possible.

PROCEDURE

Pretreatment:

Draft-NEN 5709

Preservation:

SIKB-Protocol 3001

Reference method:

NEN 5733

Related performance

Obligatory activities

- testing the effectiveness of clean-up
- acetone as digestive
- calibration with the aid of a RIVM standard.
- testing evaporation losses and discrimination of the gaschromatographic instrument
- blank correction
- measurement with the aid of FID

Attention points

- none

Performance requirements:

Detection limit

< AG_{r,eis} (see "The analytes to be determined" above)

Based on a gas- and engine oil mixture

Retrieval

70 - 110%

(intralaboratory) reproducibility variation coefficient VC_w

gas- and engine oil mixture < 20%



Literature

Inorganic parameters

NEN 5739	1996 Soil - Determination of free iron by atomic absorption spectrometry
Draft-NEN 5750	2004 Soil – Determination of pH in soil-, sediment-, sludge- and building material samples
NEN 5752	1995 Soil – Determination of carbonates in soil - Gravimetrically
NEN 5753	1994 Soil – Determination of clay content and particle size distribution of soil samples by sieve and pipet
Draft-NEN 5754	1992 Soil – Determination of organic mass content on a mass basis in soil as loss-on-ignition
NEN 6426	1995 Water – Determination of 40 elements by atomic emission spectrometry with inductively coupled plasma.
Draft-NEN 6950	2003 Soil – Umbrella standard for the determination of 30 selected elements in soil.
Draft-NEN 6961	2001 Digestion for the determination of 28 selected elements with aqua regia.
Draft-NEN 6964	2001 Analyses of 28 selected elements - Atomic absorption spectrometry (graphite furnace technique)
Draft-NEN 6965	2002 Analyses of 32 selected elements - Atomic absorption spectrometry (flame technique)
Draft-NEN 6966	2003 Analyses of 30 selected elements - Atomic emission spectrometry with inductively coupled plasma.
NEN-EN-ISO 7888	1994 Water quality - Determination of electrical conductivity
ISO 10390	2004 Soil quality - Determination of pH
NEN-EN-ISO 10693	2004 Soil quality - Determination of carbonate content – Volumetric method
ISO 11277	1998 Soil quality - Determination of particle size distribution in mineral soil material - Method by sieving and sedimentation



- NEN-ISO 16772 2004 Soil quality - Determination of mercury in aqua regia soil extracts with cold-vapour atomic spectrometry or cold-vapour atomic fluorescence spectrometry
- ISO 17294-2 2004 Water quality - Application of inductively coupled plasma mass spectrometry (ICP-MS) - Part 2: Determination of 62 elements



Organic parameters

Draft-NVN 5710	2003 Soil, building materials and sediment - Determination of the contents of (sixteen) ten polycyclic aromatic hydrocarbons (PAH) in soil by on-line purification and high pressure liquid chromatography (HPLC)
NVN 5731	1998 Soil - Determination of the contents of ten polycyclic aromatic hydrocarbons by high pressure liquid chromatography
NEN 5733	1997 Soil - Determination of mineral oil content in soil and sediments with gas chromatography
NEN 5735	1999 Soil - Determination of the halogen content originating from non-volatile, with acetone and petroleum ether extractable organohalogen compounds (EOX)
NPR 6405	1995 Gas chromatography – General guidelines.
NVN 7313	1995 Leaching characteristics of solid earthy and stony building and waste materials - Sample pretreatment - Sample pretreatment for leaching tests and the analysis of organic components
ISO 8466-2	1993 Water quality - Calibration and evaluation of analytical methods and estimation of performance characteristics - Part 2: Calibration strategy for non-linear second order calibration functions.
ISO 5725-1	1994 Accuracy (trueness and precision) of measurement methods and results. Part 1: General principles and definitions
ISO 5725-2	1994 Accuracy (trueness and precision) of measurement methods and results. Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method
ISO 11465	1993 Soil quality - Determination of dry matter and water content on a mass basis - Gravimetric method
NEN-EN-ISO 15009	2002 Soil quality - Gas chromatographic determination of the content of volatile aromatic hydrocarbons, naphthalene and volatile halogenated hydrocarbons - Purge-and-trap method with thermal desorption



General

Draft-NEN 5709	2004 Soil – Sample pretreatment for the determination of organic and inorganic parameters in soil.
NEN 5740	1999 Soil – Investigation strategy for exploratory survey.
NEN 5861	1999 Environment – Procedures for the transfer of samples.
NPR 6603	1988 Water and sludge – Guidelines for internal quality control by the aid of control charts for chemical analyses.
NEN 7777	2003 Environment – Performance characteristics of measurement methods.
NEN 7778	2003 Environment – Equivalence of measurement methods.
NEN-EN-ISO/IEC 17025	2000 General requirements for the competence of testing- and calibration laboratories.

