

Soil quality — Gas chromatographic quantitative determination of volatile aromatic and halogenated hydrocarbons and selected ethers — Static headspace method

ICS 13.080.10

National foreword

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The UK participation in its preparation was entrusted to Technical Committee EH/4, Soil quality, which has the responsibility to:

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- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Summary of pages

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INTERNATIONAL STANDARD

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Soil quality — Gas chromatographic quantitative determination of volatile aromatic and halogenated hydrocarbons and selected ethers — Static headspace method

*Qualité du sol — Dosage des hydrocarbures aromatiques et halogénés
volatils et de certains éthers par chromatographie en phase gazeuse —
Méthode par espace de tête statique*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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ISO 22155 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.

Soil quality — Gas chromatographic quantitative determination of volatile aromatic and halogenated hydrocarbons and selected ethers — Static headspace method

1 Scope

This International Standard specifies a static headspace method for quantitative gas chromatographic determination of volatile aromatic and halogenated hydrocarbons and selected aliphatic ethers in soil.

This International Standard is applicable to all types of soil.

The limit of determination is dependent on the detection system used and the quality of the methanol grade used for the extraction of the soil sample.

Under the conditions specified in this International Standard, the following limits of determinations apply (expressed on the basis of dry matter):

- a) when using gas chromatography with a flame ionization detector (GC-FID), the typical limit of determination is 0,2 mg/kg for volatile aromatic hydrocarbons and 0,5 mg/kg for aliphatic ethers as methyl *tert*-butyl ether (MTBE) and *tert*-amyl methyl ether (TAME);
- b) when using gas chromatography with an electron capture detector (GC-ECD), the typical limit of determination is 0,01 mg/kg to 0,2 mg/kg for volatile halogenated hydrocarbons.

NOTE Lower limits of determination can be achieved by using mass spectrometry (MS) with selected ion detection.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 10381-1, *Soil quality — Sampling — Part 1: Guidance on the design of sampling programmes*

ISO 10381-2, *Soil quality — Sampling — Part 2: Guidance on the design of sampling techniques*

ISO 11465, *Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method*

ISO 15680, *Water quality — Gas-chromatographic determination of a number of monocyclic aromatic hydrocarbons, naphthalene and several chlorinated compounds using purge-and-trap and thermal desorption*

ISO 22892¹⁾, *Soil quality — Guidelines for the identification of target compounds by gas chromatography and mass spectrometry*

1) To be published.

3 Principle

Test samples are taken from an untreated field moist soil sample. To prevent losses of the volatiles, samples are taken as undisturbed as possible in the field and methanol is added immediately.

The test sample is extracted with methanol. An aliquot of the methanol extract is transferred into a headspace vial with a defined amount of water and sealed. The temperature of the vials is stabilized in a thermostatic system to a temperature within the range 50 °C to 80 °C to achieve specified equilibrium conditions. Gas chromatographic analysis of the volatile compounds in gaseous phase in equilibrium with the water in the vials is carried out by using headspace injection and an appropriate capillary column. Volatile organic compounds are detected with appropriate detectors such as, a mass spectrometric detector (MS), a flame ionization detector (FID), an electron capture detector (ECD), a photo-ionization detector (PID) or an electrolytic conductivity detector (ELCD).

Identification and quantification is made by comparison of retention times and peak heights (or peak areas) comparing to the internal standard added.

When using non-specific detectors such as FID and ECD, the confirmation of the identity of the detected compounds and their concentrations should be done by repeating the gas chromatographic analysis, using a column of different polarity. When using gas chromatography-mass spectrometry (GC-MS), the identity confirmation and the quantification can be done in a single run.

NOTE Other injection technique such as purge and trap followed by thermal desorption or solid phase micro-extraction (SPME) can be used, provided that their applicability is proven.

4 Reagents

All reagents shall be of recognised analytical grade. Verify whether the reagents are applicable for this specific purpose and are free of interfering compounds.

4.1 Water, free of volatile organic compounds, showing negligible interferences in comparison with the smallest concentration to be determined.

A sufficient amount of water from the same batch should be available to complete each batch of analyses, including all preparations.

4.2 Internal standard compounds, which do not interfere with the compounds present in the methanol extract.

For the determination of volatile aromatic hydrocarbons and volatile halogenated hydrocarbons, preferably two internal standards shall be selected.

4.2.1 Examples of suitable internal standards are:

- Toluene-D8 (CAS No. 2037-26-5)
- Ethylbenzene-D10 (CAS No. 25837-05-2)
- 2-Bromofluorobenzene (CAS No. 1072-85-1)

4.2.2 Examples of suitable internal standards are:

- 1,4-Dichlorobutane (CAS No. 110-56-5)
- α,α,α -Trifluorotoluene (CAS No. 98-08-8)
- 2-Bromofluorobenzene (CAS No. 1072-85-1)