



BSI Standards Publication

Soil, waste, treated biowaste and sludge — Determination of total organic carbon (TOC) by dry combustion

National foreword

This British Standard is the UK implementation of [EN 15936:2022](#). It supersedes [BS EN 15936:2012](#), which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EH/4, Soil quality.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Amendments/corrigenda issued since publication

Date	Text affected
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English Version

Soil, waste, treated biowaste and sludge - Determination of total organic carbon (TOC) by dry combustion

Sols, déchets, biodéchets traités et boues - Dosage du carbone organique total (COT) par combustion sèche

Boden, Abfall, behandelter Bioabfall und Schlamm
- Bestimmung des gesamten organischen Kohlenstoffs (TOC) mittels trockener Verbrennung

This European Standard was approved by CEN on 19 December 2021.

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European foreword

This document ([EN 15936:2022](#)) has been prepared by Technical Committee CEN/TC 444 “Environmental characterization of solid matrices”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2022, and conflicting national standards shall be withdrawn at the latest by month August 2022.

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

This document supersedes [EN 15936:2012](#).

This document combines methods from [EN 15936:2012](#) and [EN 13137:2001](#).

The main changes compared to the previous edition are as follows:

- New composition of the substances in control mixture A ([6.10](#)) was defined and the recovery requirement ([9.3](#)) was adapted to the results of a lab trial;
- Annex C – “Determination of total organic carbon (TOC) in solid samples using the suspension method” was skipped;
- The text was editorially revised.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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Introduction

This document is applicable and validated for several types of matrices as indicated in [Table 1](#) (see also [Annex A](#) for the results of the validation). The results in this document are expressed in % C in relation to the dry mass (dm).

Table 1 — Matrices for which this document is applicable and validated

Matrix	Materials used for validation
Sludge	Municipal sludge
Biowaste	Compost, Fresh Compost
Soil	Sludge amended soil, Agricultural soil
Waste	Filter cake, Bottom ash, Electro-plating sludge, Dredged sludge, Rubble

WARNING — Persons using this document should be familiar with usual 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.

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

1 Scope

This document specifies two methods for the determination of total organic carbon (TOC) in sludge, treated biowaste, soil and waste samples containing more than 0,1 % carbon in relation to the dry mass (dm).

NOTE This method can also be applied to other environmental solid matrices, provided the user has verified the applicability.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

total carbon

TC

quantity of carbon present in the sample in the form of organic, inorganic and elemental carbon

3.2

total inorganic carbon

TIC

quantity of carbon that is liberated as carbon dioxide by acid treatment

NOTE Typically, the TIC represents the carbonates present in a sample.

3.3

total organic carbon

TOC

quantity of carbon that is converted into carbon dioxide by combustion and which is not liberated as carbon dioxide by acid treatment

4 Principle

4.1 Method A (indirect procedure)

In this procedure, the TOC is obtained by the difference between the results of the measurements of TC and TIC.

The total carbon (TC) present in the sample is converted into carbon dioxide by combustion in an oxygen-containing gas flow free of carbon dioxide. To ensure complete combustion, catalysts and/or modifiers can be used. The released amount of carbon dioxide is measured e.g. by infrared spectrometry, thermal conductivity detection, or other suitable techniques.

The TIC is determined separately from another sub-sample by means of acidification and purging of the released carbon dioxide. The carbon dioxide shall be measured by one of the techniques mentioned above.

4.2 Method B (direct procedure)

In this procedure, the TIC present in the sample are previously removed by treating the sample with acid. The carbon dioxide released by the following combustion step is measured by one of the techniques mentioned in [4.1](#) and indicates the TOC directly.

NOTE The quality of results of Method B is dependent on experience and practice, especially regarding the steps before the determination of TOC. Use of automatic dispensing units regarding removal of TIC prior to determination of TOC can improve the performance of Method B.

5 Interferences

Depending on the laboratory experience with samples containing high amounts of TIC, the procedures can lead to unreliable TOC results if the TIC to TOC ratio is very high (e.g. ≥ 10).

Depending on the detection method used, different interferences can occur, for instance:

- the presence of cyanide can interfere with the coulometric detection of TIC by modifying the pH value (dissolution of HCN);
- high content of halogenated compounds can lead to an overestimation of TOC when coulometric detection is used; in some cases the classical silver or copper trap can be insufficient to absorb all halides.

Method B can lead to incorrect results in the following cases:

- Volatile organic substances (e.g. volatile hydrocarbons from sludge of oil separators) can be lost during sample preparation especially during the acidification. If necessary, the carbon content resulting from volatile organic substances shall be determined separately.
- side reactions between the sample and the acid take place (e.g. decarboxylation, volatile reaction products).

When present, elemental carbon, carbides, cyanides, cyanates, isocyanates, isothiocyanates and thiocyanates are determined as organic carbon using the methods described in this document. An interpretation of the measured value can therefore be problematic in cases where the sample contains relevant levels of the above-mentioned components. If needed, these components shall be determined separately by means of a suitable validated method and be recorded in the test report.

6 Reagents

Use only reagents of recognized analytical grade, unless otherwise specified.

Hygroscopic substances shall be stored in a desiccator.

6.1 Calcium carbonate, CaCO_3 .

6.2 Sodium carbonate, Na_2CO_3 , anhydrous.

6.3 Tetrasodium ethylenediamine tetraacetate-tetra-hydrate, $\text{Na}_4\text{-EDTA} \cdot 4 \text{ H}_2\text{O}$ ($\text{C}_{10}\text{H}_{12}\text{N}_2\text{O}_8\text{Na}_4 \cdot 4 \text{ H}_2\text{O}$), heated at 80 °C for 2 h.

Other forms of $\text{Na}_4\text{-EDTA}$ hydrates may be used if the water content is exactly known. In these cases, the composition of the control mixtures shall be recalculated accordingly (see also [6.10](#) and [6.11](#)).

6.4 Potassium hydrogen phthalate, $\text{C}_8\text{H}_5\text{O}_4\text{K}$.

6.5 Acetanilide, $\text{C}_8\text{H}_9\text{NO}$.