

ICS 13.030.01

English Version

**Sludge, treated biowaste and soil - Determination of elements in  
aqua regia and nitric acid digests - Flame atomic absorption  
spectrometry method (FAAS)**

Boues, biodéchets traités et sols - Détermination des  
éléments solubles dans l'eau régale et l'acide nitrique -  
Spectrométrie d'absorption atomique dans la flamme (SAA)

Schlamm, behandelter Bioabfall und Boden - Bestimmung  
von Elementen in Königswasser- und Salpetersäure-  
Aufschluslösungen - Flammen-  
Atomabsorptionsspektrometrie (FAAS)

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## Foreword

This document (CEN/TS 16188:2012) 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.

**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 the determination of metals in *aqua regia* and nitric acid digests of sludge, treated biowaste and soil samples, using flame atomic absorption spectrometry. The method is applicable for the determination of the following elements:

Chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), manganese (Mn), nickel (Ni), zinc (Zn).

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16173, *Sludge, treated biowaste and soil — Digestion of nitric acid soluble fractions of elements*

EN 16174, *Sludge, treated biowaste and soil — Digestion of aqua regia soluble fractions of elements*

EN ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3696)*

## 3 Principle

The method is based on the atomic absorption spectrometric measurement of the concentration of the elements in an *aqua regia* or nitric acid extract of the sample, prepared in accordance with EN 16173 or EN 16174, using the instrumental conditions given in Table 1.

**Table 1 — General conditions for flame atomic absorption spectrometry**

Element	Wavelength nm	Flame type	Lanthanum chloride	Main interference	Background correction
Chromium	357,9	reduced or neutral air/acetylene or acetylene/N <sub>2</sub> O (recommended)	Yes No	Fe, Si	Deuterium
Cobalt	240,7	Oxidizing air/acetylene	No		Deuterium
Copper	324,8	Oxidizing air/acetylene	No		Deuterium
Iron	248,3	Oxidizing air/acetylene	No	Co, Ni, Si	Deuterium
Manganese	279,5	Oxidizing air/acetylene or acetylene/N <sub>2</sub> O	Yes No	Fe, Si	Deuterium
Nickel	232,0	Oxidizing air/acetylene	No	Fe	Deuterium
Zinc	213,9	Oxidizing air/acetylene	No		Deuterium

**NOTE** The wavelengths given are the most sensitive. The use of less sensitive lines to avoid the dilution step before measurement is suitable especially for determination of Fe (e. g. 372,0 nm) and Mn (e. g. 403,1 nm) in soil extracts. Interferences are generally lower if the nitrous oxide (N<sub>2</sub>O) flame is used for the determination of chromium and manganese. Users should be aware that small changes in gas volume ratios can have significant effects on the intensity of the analytical signal, and can also change the linearity of the instrument response. Also difference in acid strength,