

<b>STN</b>	<b>Kvalita pôdy. Skríning pôd na vybrané prvky pomocou energo-disperznej rontgenovej fluorescenčnej spektrometrie pomocou príručných alebo prenosných prístrojov (ISO 13196: 2013).</b>	<b>STN EN ISO 13196</b>  46 5201
------------	---	--

Soil quality - Screening soils for selected elements by energy-dispersive X-ray fluorescence spectrometry using a handheld or portable instrument (ISO 13196:2013)

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 12/15

Obsahuje: EN ISO 13196:2015, ISO 13196:2013

## 122001

---

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, 2016  
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

ICS 13.080.10

English Version

## Soil quality - Screening soils for selected elements by energy-dispersive X-ray fluorescence spectrometry using a handheld or portable instrument (ISO 13196:2013)

Qualité du sol - Analyse rapide d'une sélection d'éléments dans les sols à l'aide d'un spectromètre de fluorescence X à dispersion d'énergie portable ou portatif (ISO 13196:2013)

Bodenbeschaffenheit - Screening ausgewählter Elemente in Böden mit handhabbaren oder tragbaren Röntgenfluoreszenzspektrometern (ISO 13196:2013)

This European Standard was approved by CEN on 16 July 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

<b>Contents</b>	<b>Page</b>
European foreword.....	<b>3</b>

## **European foreword**

The text of ISO 13196:2013 has been prepared by Technical Committee ISO/TC 190 "Soil quality" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 13196:2015 by Technical Committee CEN/TC 345 "Characterization of soils" 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 January 2016, and conflicting national standards shall be withdrawn at the latest by January 2016.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, 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.

### **Endorsement notice**

The text of ISO 13196:2013 has been approved by CEN as EN ISO 13196:2015 without any modification.

---

---

**Soil quality — Screening soils  
for selected elements by energy-  
dispersive X-ray fluorescence  
spectrometry using a handheld or  
portable instrument**

*Qualité du sol — Analyse rapide d'une sélection d'éléments dans  
les sols à l'aide d'un spectromètre de fluorescence X à dispersion  
d'énergie portable ou portatif*





**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>2</b>
<b>5 Apparatus</b> .....	<b>2</b>
5.1 X-ray fluorescence spectrometer (XRF).....	2
5.2 Container for sampling and preparation.....	2
5.3 Spoon.....	2
5.4 Sieve (optional).....	2
5.5 Sample cup for portable XRF.....	2
5.6 Sample container for handheld XRF.....	2
5.7 Drying device (optional).....	2
<b>6 Procedure</b> .....	<b>3</b>
6.1 General.....	3
6.2 Performance check of instrument.....	3
6.3 Calibration.....	3
6.4 <i>In situ</i> measurement.....	3
6.5 Analysis of soil with sampling.....	4
<b>7 Quality control</b> .....	<b>4</b>
7.1 Performance test by standard reference material.....	4
7.2 Energy calibration.....	5
<b>8 Test report</b> .....	<b>5</b>
<b>Annex A (informative) Precision data</b> .....	<b>6</b>
<b>Bibliography</b> .....	<b>12</b>

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 13196 was prepared by Technical Committee ISO/TC 190, *Soil quality*, Subcommittee SC 3, *Chemical methods and soil characteristics*.



## Introduction

X-ray fluorescence spectrometry (XRF) is a quick method for determination of total elemental compositions of soil samples. Unlike analyses by atomic absorption spectroscopy and inductively coupled plasma spectroscopy, XRF needs no digestion step to prepare a test solution to be analysed. Factory pre-set calibrations can be used. Consequently XRF is suitable for the rapid on-site determination of selected elements, mainly heavy metals in screening processes. Typical elements that can be analysed are Cr, As, Se, Cd, Hg and Pb, depending on the instrument. For *in situ* or abbreviated preparation analyses at a site, a battery-powered handheld or portable XRF equipment is required.

When performing analyses at a site, it might be important to have information on the presence of an element and also obtain semiquantitative results. It is often impracticable to carry out calibration using reference materials at the site to be investigated. In these situations, factory pre-set calibrations should be used.

This International Standard describes rapid methods for the on-site analysis of selected elements, including heavy metals, using battery-powered handheld or portable energy-dispersive XRF (ED-XRF).

# Soil quality — Screening soils for selected elements by energy-dispersive X-ray fluorescence spectrometry using a handheld or portable instrument

**WARNING** — Soil samples may contain toxic contaminants. Avoid direct contact of soil samples with exposed parts of the body. Appropriate measures shall be taken to avoid ingestion and inhalation.

Exposure to X-rays may give rise to dermal and haematological diseases. X-ray fluorescence spectrometers shall comply with national regulations relevant to radiation protection. At least one person involved in X-ray fluorescence analysis shall qualify for managing or supervising the operation of X-ray apparatus according to national regulations.

## 1 Scope

This International Standard specifies the procedure for screening soils and soil-like materials for selected elements when handheld or portable energy-dispersive XRF spectrometers are used. This quick method is assumed to be applied on-site to obtain qualitative or semiquantitative data that assists decisions on further sampling strategy for assessing soil quality. The higher the efforts for pretreatment used on soil samples, the better the analytical results can be expected (see e.g. Reference<sup>[4]</sup>).

This International Standard does not explicitly specify elements for which it is applicable, since the applicability depends on the performance of the apparatus and the objective of the screening. The elements which can be determined are limited by the performance of the instruments used, the concentration of the element present in the soil, and the requirements of the investigation (e.g. guideline value).

For Hg, Cd, Co, Mo, V and Sb, a majority of instruments are not sensitive enough to reach sufficiently low limits of quantification (LOQ) to meet the requirements (limit or threshold values) set in the ordinances of different countries. In this case, other methods need to be employed to measure these low concentrations. Usually, wet chemical methods are used, based on *aqua regia* extracts, in combination with optical or mass spectrometric (MS) methods like atomic absorption spectrometry (AAS), inductively coupled plasma–optical emission spectrometry (ICP–OES) or ICP–MS.

## 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 12404, *Soil quality — Guidance on the selection and application of screening methods*

EN 15309, *Characterization of waste and soil — Determination of elemental composition by X-ray fluorescence*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**