BS EN ISO 11274:2019

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# Soil quality – Determination of the water-retention characteristic – Laboratory methods (ISO 11274:2019)

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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 secretary.

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Published by BSI Standards Limited 2019

ISBN 978 0 580 89359 9

ICS 13.080.40

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2019.

**Amendments/corrigenda issued since publication**

| Date | Text affected |
|---|---|

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# EN ISO 11274

October 2019

ICS 13.080.40

Supersedes EN ISO 11274:2014

English Version

# Soil quality - Determination of the water-retention characteristic - Laboratory methods (ISO 11274:2019)

Qualité du sol - Détermination de la caractéristique de la rétention en eau - Méthodes de laboratoire (ISO 11274:2019)

Bodenbeschaffenheit - Bestimmung des Wasserrückhaltevermögens - Laborverfahren (ISO 11274:2019)

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## European foreword

This document (EN ISO 11274:2019) has been prepared by Technical Committee ISO/TC 190 "Soil quality" in collaboration with Technical Committee CEN/TC 444 “Test methods for 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of an identical text or by endorsement, at the latest by April 2020, and conflicting national standards shall be withdrawn at the latest by April 2020.

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INTERNATIONAL STANDARD

# ISO 11274

Second edition
2019-09

# Soil quality — Determination of the water-retention characteristic — Laboratory methods

*Qualité du sol — Détermination de la caractéristique de la rétention en eau — Méthodes de laboratoire*

Reference number
ISO 11274:2019(E)

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Published in Switzerland



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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 11274:1998), which has been technically revised. It also incorporates the Technical Corrigendum ISO 11274:1998/Cor. 1:2009.

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# Introduction

Soil water content and matric pressure are related to each other and determine the water-retention characteristics of a soil. Soil water which is in equilibrium with free water is at zero matric pressure (or suction) and the soil is saturated. As the soil dries, matric pressure decreases (i.e. becomes more negative), and the largest pores empty of water. Progressive decreases in matric pressure will continue to empty finer pores until eventually water is held in only the finest pores. Not only is water removed from soil pores, but the films of water held around soil particles are reduced in thickness. Therefore a decreasing matric pressure is associated with a decreasing soil water content[9][10]. Laboratory or field measurements of these two parameters can be made and the relationship plotted as a curve, called the soil water-retention characteristic. The relationship extends from saturated soil (approximately 0 kPa) to oven-dry soil (about $-10^6$ kPa).

The soil water-retention characteristic is different for each soil type. The shape and position of the curve relative to the axes depend on soil properties such as texture, density and hysteresis associated with the wetting and drying history. Individual points on the water-retention characteristic may be determined for specific purposes.

The results obtained using these methods can be used, for example:

— to provide an assessment of the equivalent pore size distribution (e.g. identification of macro- and micropores);

— to determine indices of plant-available water in the soil and to classify soil accordingly (e.g. for irrigation purposes);

— to determine the drainable pore space (e.g. for drainage design, pollution risk assessments);

— to monitor changes in the structure of a soil (caused by e.g. tillage, compaction or addition of organic matter or synthetic soil conditioners);

— to ascertain the relationship between the negative matric pressure and other soil physical properties (e.g. hydraulic conductivity, thermal conductivity);

— to determine water content at specific negative matric pressures (e.g. for microbiological degradation studies);

— to estimate other soil physical properties (e.g. hydraulic conductivity).


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# Soil quality — Determination of the water-retention characteristic — Laboratory methods

## 1 Scope

This document specifies laboratory methods for determination of the soil water-retention characteristic.

This document applies only to measurements of the drying or desorption curve.

Four methods are described to cover the complete range of soil water pressures as follows:

a) method using sand, kaolin or ceramic suction tables for determination of matric pressures from 0 kPa to −50 kPa;

b) method using a porous plate and burette apparatus for determination of matric pressures from 0 kPa to −20 kPa;

c) method using a pressurized gas and a pressure plate extractor for determination of matric pressures from −5 kPa to −1 500 kPa;

d) method using a pressurized gas and pressure membrane cells for determination of matric pressures from −33 kPa to −1 500 kPa.

Guidelines are given to select the most suitable method in a particular case.

## 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 http://www.electropedia.org/

**3.1**
**soil water-retention characteristic**
relation between soil water content and soil matric head of a given soil (sample)

**3.2**
**pressure**
pressure equivalent of soil water potential

**3.3**
**matric pressure**
amount of work done in order to transport, reversibly and isothermally, an infinitesimal quantity of water, identical in composition to the soil water, from a pool at the elevation and the external gas pressure of the point under consideration, to the soil water at the point under consideration, divided by the volume of water transported

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