

BS EN 16502:2014



BSI Standards Publication

Test method for the determination of the degree of soil acidity according to Baumann-Gully

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National foreword

This British Standard is the UK implementation of EN 16502:2014.

In the UK the most authoritative guidance on assessing the aggressiveness of soils to concrete is BRE Special Digest 1:2005 entitled 'Concrete in aggressive ground'. It is the opinion of the UK committee that the recommendations of this document form the basis of the guidance in BS 8500-2 with respect to concrete properties and limiting values to resist chemical attack.

The UK participation in its preparation was entrusted by Technical Committee B/517, Concrete, to Subcommittee B/517/1, Concrete production and testing.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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EUROPEAN STANDARD
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EN 16502

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English Version

**Test method for the determination of the degree of soil acidity
according to Baumann-Gully**

Méthode d'essai pour la détermination du degré d'acidité
des sols selon Baumann-Gully

Prüfverfahren zur Bestimmung des Säuregrades eines
Bodens nach Baumann-Gully

This European Standard was approved by CEN on 18 July 2014.

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Foreword

This document (EN 16502:2014) has been prepared by Technical Committee CEN/TC 104 "Concrete and related products", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by February 2015 and conflicting national standards shall be withdrawn at the latest by February 2015.

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.

This European Standard is based on DIN 4030-2, *Assessment of water, soil and gases for their aggressiveness to concrete — Part 2: Sampling and analysis of water and soil samples*.

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1 Scope

This European Standard specifies the procedure for the determination of the degree of acidity of a soil to be used for evaluating its class of aggressiveness to EN 206. The degree of acidity according to Baumann-Gully is the result of the determination of exchangeable hydrogen ion concentration that humic particles of a soil release.

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 206, *Concrete — Specification, performance, production and conformity*

EN ISO 385, *Laboratory glassware — Burettes (ISO 385)*

EN ISO 1042, *Laboratory glassware — One-mark volumetric flasks (ISO 1042)*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 11074, *Soil quality — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11074 and the following apply.

3.1

soil acidity

SA_{BG}

indicates the hydrolytic acidic level of a soil, expressed as the volume of solution of sodium hydroxide, in millilitres (ml) used per kilogram (kg) of dried soil

3.2

undisturbed sample

bulk sample obtained from the soil using a method designed to preserve the soil structure

3.3

disturbed sample

bulk sample, obtained from the soil without any attempt to preserve the soil structure

3.4

laboratory sample

reduced sample derived from a bulk sample for laboratory inspection or testing

3.5

subsample

sample obtained from the laboratory sample by means of a sample reduction procedure

3.6

test sample

portion of material, resulting from the laboratory sample by means of an appropriate method of sample pre-treatment, and having the size necessary for the desired testing or analysis

3.7

check sample

subsample kept for future analysis

3.8

test portion

quantity of material, of proper size, for measurement of the concentration or other property of interest, removed from the test sample

3.9

constant mass

mass reached when, during the drying process, the difference between two successive weighings of the cooled sample, with an interval of 4 h between them, does not exceed 0,1 % (m/m) of the last determined mass

4 Principle

This European Standard is intended for the determination of soil acidity by the addition of sodium acetate solution to a prepared dried soil sample. Acetic acid is formed and the volume of sodium hydroxide solution needed to neutralize the acid is measured by volumetric titrimetry. The degree of acidity is expressed as the volume of solution of sodium hydroxide used per kilogram of air dried soil.

5 Apparatus

5.1 Standard laboratory glassware, Erlenmeyer narrow-neck flasks capacity 250 ml or beakers capacity 250 ml, tall form.

5.2 Plate sieve, of 2 mm aperture conforming to the requirements of ISO 3310-1, collecting pan.

5.3 Ventilated oven, thermostatically controlled to maintain a temperature $(40 \pm 5) ^\circ\text{C}$ and $(105 \pm 5) ^\circ\text{C}$.

5.4 Sample divider, of sufficient size to accommodate a sample of up to 2 kg.

5.5 Balances or scales, capable of weighing with a maximum permissible error of $\pm 0,01$ g using a balance of accuracy class II, category 2.

5.6 Desiccator, containing a drying agent, e.g. silica gel.

5.7 Stirrer, magnetic stirrer and magnetic stir bar coated with inert material, e.g. PTFE.

5.8 Volumetric glassware.

The volumetric glassware shall be of analytical accuracy, i.e. class A as defined in EN ISO 385 and EN ISO 1042.

5.9 Filter paper, folded qualitative filter papers of grade 2V having 150 mm of diameter.

6 Reagents

Use only reagents of recognized analytical quality. When used, distilled or deionized water shall have an electrical conductivity not greater than 0,1 mS/m.

6.1 Sodium acetate solution – approximately 1 mol/l

Dissolve 82,03 g of anhydrous sodium acetate in distilled or deionized water in a 1 000 ml volumetric flask and make up to volume with water.

6.2 Sodium hydroxide solution – approximately 0,1 mol/l

Dissolve 4,00 g of anhydrous sodium hydroxide pellets in water in a 1 000 ml volumetric flask and make up to volume with water. This solution shall be prepared fresh every day or the titer determined each day prior to performing the analysis.

6.3 Phenolphthalein indicator solution

Dissolve 0,10 g of phenolphthalein in 100 ml ethylalcohol (min. 90 %).

7 Laboratory sample

For undisturbed soils, obtain a laboratory sample per identified layer weighing between 1 kg to 2 kg. Laboratory sample should be taken according EN ISO 22475-1.

For disturbed soils, the size and number of laboratory samples to be taken shall be agreed between the parties concerned. Laboratory sample should be taken according ISO 10381-2.

Immediately after sampling, place the laboratory sample in a suitable air-tight container, e.g. a jar equipped with a screw-cap fitted with a rubber ring.

8 Procedure

Remove the laboratory soil sample, taken in accordance with Clause 7, from the air-tight container, place it in a collecting pan and dry the sample in an oven kept at 40 °C until constant mass is achieved. If a constant mass at 40 °C is not achieved in 72 h, then the drying process should be completed at 105 °C until constant mass is achieved.

NOTE The drying process can be undertaken at 105 °C provided there are no irreversible changes to the sample caused by the drying at this temperature

Once dried to constant mass, crumble the laboratory sample gently, mix thoroughly and then divide it in two subsamples using, preferably, a sample divider. Retain one of them as a check sample and place it in air-tight storage container. Weigh and record the mass of the other subsample.

Using the plate sieve (5.2), sieve the subsample and reclaim and weigh the fraction passing through the sieve (test sample). Discard the material retained on the sieve.

Thoroughly mix the test sample and then take a test portion of (100 ± 1) g. Record the mass of the test sample m_{sample} , in kilograms (kg). Mix this portion with (200 ± 1) ml of the sodium acetate solution (6.1) and stir or shake continuously for at least 1 h or longer until the test sample is evenly dispersed.

Filter the suspension on a dry filter paper (5.9), without re-washing. Titrate an aliquot corresponding to half of the volume of filtrate by adding the sodium hydroxide solution (6.2), using the phenolphthalein indicator (6.3) or any equivalent titration method.

Record the volume V_1 in millilitres of sodium hydroxide solution (6.2) used to neutralize the acetic acid.

9 Calculation of soil acidity

Calculate the degree of soil acidity according to Baumann-Gully, expressed as SA_{BG} , in millilitres of sodium hydroxide solution per kilogram of dried soil (ml/kg), from the following equation:

$$SA_{BG} = 2 \times V_1 / m_{\text{sample}}$$

where

- V_1 is the volume of sodium hydroxide solution used for the titration of the aliquot, in millilitres;
- m_{sample} is the mass of the test portion, in kilograms.

10 Test report

The report shall include:

- a) a reference to this European Standard;
- b) location where sample(s) are obtained;
- c) description and identification of the each test specimen;
- d) type of sample (untouched or modified);
- e) date of test;
- f) location where test is performed;
- g) mass of subsample used for sieving, in kilograms;
- h) mass of portion passing through the 2 mm sieve (test sample), in kilograms;
- i) mass of test portion, in kilograms;
- j) method used to titrate the filtrate;
- k) volume of sodium hydroxide solution used to neutralize the acetic acid, in millilitres;
- l) degree of soil acidity (SA_{BG});
- m) any deviations from the standard method of testing;
- n) a declaration by the person responsible for the test that it has been carried out in accordance with the standard except as detailed in item m).

The report may include:

- o) mass of the original specimen, in kilograms;
- p) procedure used to collect the sample.

11 Precision

There is currently no precision data for this test.

Bibliography

- EN ISO 3696, *Water for analytical laboratory use — Specification and test methods (ISO 3696)*
- EN ISO 22475-1, *Geotechnical investigation and testing — Sampling methods and groundwater measurements — Part 1: Technical principles for execution (ISO 22475-1)*
- ISO 10381-2, *Soil quality — Sampling — Part 2: Guidance on sampling techniques*
- ISO 11275, *Soil quality — Determination of unsaturated hydraulic conductivity and water-retention characteristic — Wind's evaporation method*
- ISO 11465, *Soil quality — Determination of dry matter and water content on a mass basis — Gravimetric method*
- PANSU M., GAUTHEYROU J. *Handbook of Soil Analysis. Mineralogical, Organic and Inorganic Methods.* Springer-Verlag Berlin Heidelberg, New York, 2006
- DIN 4030-2, *Assessment of water, soil and gases for their aggressiveness to concrete — Part 2: Sampling and analysis of water and soil samples*

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