BS EN 12580:2013

BSI Standards Publication

Soil improvers and growing media — Determination of a quantity

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National foreword

This British Standard is the UK implementation of EN 12580:2013. It supersedes BS EN 12580:2000 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AW/20, Top soil, other growing media and turf.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Amendements organiques et supports de culture - Détermination de la quantité

Bodenverbesserungsmittel und Kultursubstrate - Bestimmung der Menge

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Foreword

This document (EN 12580:2013) has been prepared by Technical Committee CEN/TC 223 “Soil improvers and growing media”, the secretariat of which is held by ASI.

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of an identical text or by endorsement, at the latest by April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.

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 document supersedes EN 12580:1999.

The main changes are listed below:

— it reflects the provisions of EN 15238 and EN 15761;

— more detail is provided on how to carry out the density determination of the product;

— it includes a method to calibrate the measure.

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Introduction

Soil improvers and growing media are generally traded by volume as the weight of the product can be greatly affected by the moisture content. It is important for both consumers and traders to know the volume of product being traded. Furthermore, for the cultivation of plants, it is the volume of the product, and not the weight, that is generally important. The volume is calculated from knowing the weight and bulk density of the product, the latter being determined from weighing a known reference volume of product. For those materials traded by reference to its mass, this document recognises the effects the moisture content can have on the quantity declared. Therefore the principle is that for such transactions any weight should be accompanied by the moisture content so that the solid matter content can be calculated.

As some soil improvers and growing media are compressible (and some may be presented in compressed blocks or bales), it is important that this aspect be addressed in the method of determining the bulk density. A suitably competent person should undertake this testing.

Even for materials traded by volume, the moisture content can have an effect as high moisture levels increase agglomerations, can reduce the ability to decompress or reconstitute materials, reduce their flow characteristics and give higher apparent bulk densities and lower volumes.

The preparation and sampling of all materials prior to quantity determination is covered in EN 12579.

Quantity determination will be performed as soon as possible after preparation and sampling.

1 Scope

This European Standard specifies methods for the determination of a quantity of soil improvers and growing media in bulk and in packages. This is a reference method, which is designed with an appropriate precision level so that it can be used to validate any quantity declaration made.

This standard is applicable to material that is in solid form, reconstituted if necessary, but not to blocks sold as such by dimension; for these, see EN 15761. This method is not applicable for material with more than 10 % (V/V) of particles greater than 60 mm in size; for these, see EN 15238.

The requirements of this standard may differ from the national legal requirements for the declaration of the products concerned.

Where there is no legal requirement to use this method, for example in quantity control of packaged product, then it is permissible for any other methods to be used so long as these other methods can be demonstrated to be comparable with this standard method in giving the same quantity with the same precision.

Material which has become excessively wet and which cannot be easily broken down into a flowable material will not be suitable for the determination of quantity and may not give a representative result. However, because of the diverse nature and bulk density of these materials, it is not possible to quantify what is ‘excessive’.

This standard is intended to be used by manufacturers, buyers and enforcement agencies in verifying claims made for these products. It is not intended that it should necessarily be used for the purpose of manufacturing control.

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 12579:2013, *Soil improvers and growing media — Sampling*

EN 13040, *Soil improvers and growing media — Sample preparation for chemical and physical tests, determination of dry matter content, moisture content and laboratory compacted bulk density*

EN 45501, *Metrological aspects of non-automatic weighing instruments*

3 Terms and definitions

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

3.1
batch
lot
quantity of goods manufactured by the same process under the same conditions and labelled in the same manner and assumed to have the same characteristics

3.2
bulk material
material that is not packaged

3.3
container
container in which material is delivered, including a lorry, ship, boat and package

3.4
bulk density
apparent density of material as received or reconstituted

Note 1 to entry: The reconstitution is in accordance with the manufacturer's instructions or as required by EN 12579:2013, 6.4.4, as determined by the method specified in this standard.

Note 2 to entry: 'Bulk density' in this standard refers to the apparent density in air (based on conventional mass) and not the density in vacuum.

3.5
package
container in which the goods are delivered and which remains with them after delivery

Note 1 to entry: A package may be a loose-filled sack typically up to 100 l, a compressed block or bale and even a 'big bale', typically of 4 m^3 or more.

3.6
strike
transparent sheet of flat material, normally glass, which is easily large enough to cover the top of the measure

4 Symbols and abbreviated terms

D bulk density of material, as determined by the method specified in this standard

V volume of material, in litres

m_x mass of an item, in grams

5 Principle

5.1 For each batch of material, whether for delivery in bulk or in packages, the quantity of material is determined and reported either by volume or by weight.

The unit of measurement (weight or volume) used for the quantity declaration needs to comply with national regulations where they exist.

5.2 Where the quantity declared is by volume then the material is weighed and then sampled and its bulk density is determined. From this information, the volume is then calculated. Clauses 6 to 11 of the standard apply.

5.3 Where the quantity declared is by weight then the moisture content is also determined so that the dry matter weight can be determined and declared. Clauses 12 and 13 of the standard apply.

NOTE The structure of the material can change with time and handling and this can affect the volume of the material.

6 Apparatus

6.1 Measure, rigid, 20 l ± 0,4 l with a height to diameter ratio between 0,9:1 and 1:1.

The volume V_1 shall be known to the nearest 10 ml at 20 °C, with an uncertainty of measurement (k = 2) of no more than 50 ml.

A standard 300 mm internal diameter pipe of height 283 mm with an end cap can be suitable.

The apparent weight of 1 l of water at 20 °C is 997,15 g. Therefore no air buoyancy correction needs to be made.

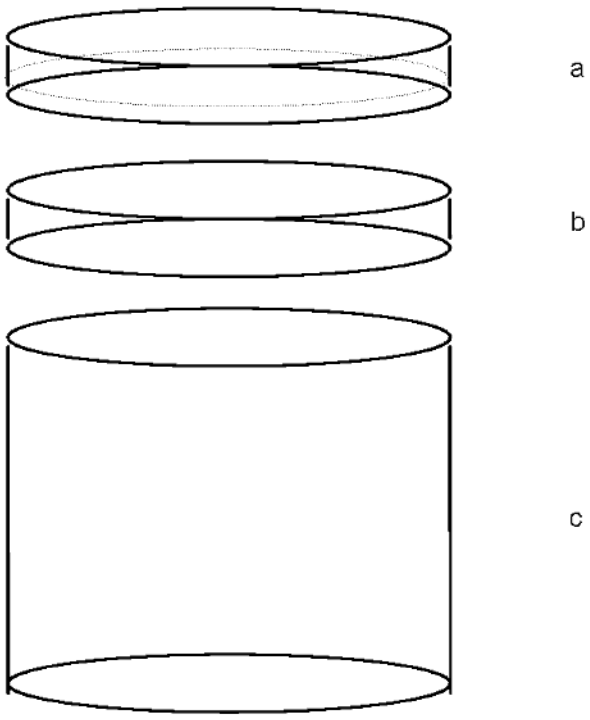
NOTE Information about the measurement and expression of uncertainty is given in the OIML Guide (G1) to the expression of uncertainty in measurement (sometimes referred to as GUM).

6.2 Collar, rigid, of the same diameter as the measuring cylinder (6.1) and with a height of 75 mm ± 2 mm.

6.3 Fall controller, of either 20 mm ± 0,6 mm or 40 mm ± 1,3 mm or 60 mm ± 2 mm mesh size as required (see 9.5), held not more than 50 mm above the collar, equipped with locating lugs to enable it to sit on the collar correctly without friction.

NOTE Wires crossing each other at right angles form the mesh with the appropriately sized square holes.

Ideally the fall controller should be separated from the measure to avoid jogging or vibrating material in the measure during the filling process.



Key

a is the Fall controller (6.3)

b is the Collar (6.2)

c is the Measuring cylinder (6.1)

NOTE 1 For convenience and ease of use it is advisable to have 3 handles on the cylinder and 2 on the filling collar and the fall controllers.

NOTE 2 For stability it is useful to have three short legs/feet on the base of the measuring cylinder.

Figure 1 — Diagrammatic representation of the way the apparatus as described in 6.1 to 6.3, the fall controller, filling collar and measuring cylinder, are assembled

6.4 Weighing instrument.

For packaged material, the weighing instrument shall conform to Table 1 with class III tolerances as specified in EN 45501, unless more restrictive provisions exist in national regulations.

For bulk material, the weighing instrument shall conform to class III of EN 45501.

NOTE National legislation is likely to require that the equipment be verified before use, and so it will be marked with the 'CE' mark and a green 'M' to show it is legal to use for trade purposes, as required by European Directive 2009/23/EC.

Table 1 — Maximum scale intervals for weighing instruments

Mass	Maximum scale interval for analogue scales	Maximum scale interval for digital scales
kg	g	g
> 1 to 2,5	10	5
> 2,5 to 5	20	10
> 5 to 10	50	20
> 10 to 40	100	50
> 40	200	100

6.5 Straight-edge, rigid, of rectangular cross section, of thickness not exceeding 5 mm, preferably with a sharp edge, and at least 500 mm long.

7 Calibration of the measure

To calibrate the measure, place the measure and sufficient distilled water together in a room so that the temperature of both stabilises. Determine the temperature, t. Weigh it empty together with a strike (3.6), mass m_e. Weighings shall be made in grams on a weighing instrument with no greater than 10 g divisions, which complies with EN 45501.

Fill to the brim with water using the strike. When the water level is near the top of the measure, start to slide the strike onto the rim of the measure and pick up the meniscus of the water on its underside. Filling continues gradually, continuing to slide the strike over the surface of the measure so that no air bubbles are trapped under it. The measure is completely filled when the strike covers the top of the measure without any air being trapped under it.

Weigh the filled measure and strike in grams, mass, m_f. Calculate the mass of water:

$$m_w = m_f - m_e \quad (1)$$

Calculate the volume of water by multiplying by the factor given in the table below. This gives the volume of the measure, V_t, in litres, at the temperature, t, at which it has been calibrated.

Table 2 — Multiplication factor at various temperatures for the calculation of the volume of the measure

Temperature °C	10	11	12	13	14	15	16	17	18	19
Factor (l/kg)	1,001 35	1,001 45	1,001 55	1,001 67	1,001 81	1,001 96	1,002 11	1,002 29	1,002 47	1,002 66
Temperature °C	20	21	22	23	24	25	26	27	28	29
Factor (l/kg)	1,002 86	1,003 07	1,003 29	1,003 52	1,003 76	1,004 02	1,004 29	1,004 56	1,004 84	1,005 14

Calculate the volume of the measure in litres at 20°C using the formula:

$$V_1 = V_t \cdot (1 + E(20 - t)) \quad (2)$$

where

E is the coefficient of cubical expansion for the material from which the measure is made. For steel this is 0,000 033/°C and for polyethylene it is 0,000 200/°C. The volume should be rounded to the nearest 10 ml.

NOTE In some countries it can be a legal requirement to have the measure calibrated by an accredited calibration laboratory.

8 Sampling

Sampling shall be carried out in accordance with the method specified in EN 12579.

For bulk material, the final sample, of at least 30 l, shall be used for a bulk density determination.

For packaged material the content of a package shall be used, and if this is less than 30 l the content of the number of packages needed to give 30 l of material shall be used.

9 Procedure

9.1 Using the appropriate weighing instrument (6.4), determine the gross weight of the material and note the mass m_1. This and all subsequent weighings are recorded in grams.

9.2 Determine the tare weight (e.g. of the bags, containers, truck or train) and note the mass m_2. For packaged material where the quantity in each package of the final sample is being measured, weigh each package separately for both gross and tare weight. The net weight of the material is calculated as ($m_1 - m_2$). Alternatively the net weight of each product can be determined directly.

9.3 Weigh the measuring cylinder (6.1), note the mass m_3, and assemble the collar (6.2) on the cylinder. Place the equipment on a stable horizontal surface so that it does not rock.

9.4 Any material that has been compacted after sampling shall be treated in accordance with EN 12579:2013, 6.4.4.

9.5 Determine which fall controller (6.3) to use. Using some of the material, see which is the smallest mesh which will retain less than 10 % (V/V) of the material, after the material has been moved about. If more than 10 % (V/V) is retained on the 60 mm mesh this method is not suitable for the product.

9.6 The procedure as given in 9.7 to 9.10 inclusive shall be carried out without delay.

9.7 Tip a portion of not more than 5 l of the final sample over the fall controller and move the material (without degrading it) to allow it to pass through the fall controller. Where any material retained by the fall controller restricts the falling of material into the cylinder then it shall be gently emptied into the measure before adding the next portion. Further portions shall be treated in a similar manner until the measuring cylinder and collar are full and the top of the material is touching the mesh in the fall controller to ensure that there is sufficient material to level it off at the top of the collar.

9.8 Level off the material at the top of the collar and remove the collar. Using a light sawing action (to avoid compaction) work the straight-edge (6.5) through the middle of the product down one diameter of the measuring cylinder, to the top of the cylinder. Remove the surplus material by moving the straight edge to the edge of the measure. Care shall be taken not to drag fibrous or lumpy material from below the top of the measure. Repeat this operation in the opposite direction to remove the surplus material until the material is level with the top of the measure. In the case where hollows have been created, these shall be re-filled using some of the discarded material.

9.9 Weigh the measuring cylinder and its contents, and note the mass m_4.

9.10 Repeat the method with the other final samples taken for the quantity determination. See EN 12579:2013, 6.4.4 and Annex A.

10 Calculation and expression of results

10.1 Bulk density

Calculate the bulk density of the material (D), in grams per litre using the following formula;

$$D = \frac{(m_4 - m_3)}{V_1} \tag{3}$$

where:

m_3 is the mass in grams of the measuring cylinder (5.1);

m_4 is the mass in grams of the measuring cylinder (5.1) and its contents;

V_1 is the volume in litres of the measuring cylinder (5.1) determined to the nearest 10 ml.

10.2 Volume

Calculate the volume of the material (V_2) in litres, using the following formula:

$$V_2 = \frac{(m_1 - m_2)}{D_B} \tag{4}$$

where:

m_1 (gross weight) is the mass in grams of the sampled portion plus packaging/lorry;

m_2 (tare weight) is the mass in grams of the packaging/lorry;

D_B is the bulk density calculated in accordance with 10.1.

NOTE 1 000 l = 1 m^3.

11 Precision

The repeatability and reproducibility of the bulk density determination in separately prepared sampled should be in accordance with Table A.1.

A summary of the results of an interlaboratory trial to determine the precision of the method in accordance with ISO 5725 (all parts) are given in Annex A.

NOTE The values derived from the interlaboratory trial are not applicable to concentrations and matrices other than those given.

12 Test report for declarations of volume

The test report shall include the following:

a) a complete identification of the sample; including a copy of the 'Sampling Report' (EN 12579:2013, Clause 8);

b) a reference to this European Standard;

c) the results expressed in accordance with Clause 10;

d) any unusual features noticed during the determination;

e) the calibration (Clause 7) of the volume of the measure (6.1);

f) the calibration of the weighing instrument using masses of class M1 or above accuracy level as given in EN 45501;

g) the identity of the person carrying out the volume determination;

h) the date and time of sampling, and the postal address of the place of sampling;

i) the date and time of measurement, and the postal address of the place of measurement;

j) any operation not included in this method, or that is regarded as optional.

13 Declaration of quantity by weight

Where the quantity of material is expressed in terms of weight, then:

— the net weight shall be determined (9.1) using class III weighing instruments as specified in 6.4, mass m_m in grams;

— the moisture content at the time of weighing shall be determined in accordance with EN 13040, moisture content w in percentage.

The dry matter content (m_d) is calculated from:

$$m_d = m_m \left(1 - \frac{w}{100}\right) \quad (5)$$

14 Test report for declarations of weight

The test report shall contain the following:

a) a complete identification of the sample;

b) a reference to this European Standard;

c) the results expressed in accordance with Clause 13;

d) any unusual features noticed during the determination;

e) the calibration (Clause 7) of the volume of the measure (6.1);

f) the calibration of the weighing instrument using masses of class M1 or above accuracy level as given in EN 45501;

g) the identity of the person carrying out the volume determination;

h) the date and time of sampling, and the postal address of the place of sampling;

i) the date and time of measurement, and the postal address of the place of measurement;

j) any operation not included in this method, or that is regarded as optional.

Annex A
(informative)

Results of an interlaboratory trial to determine bulk density

An interlaboratory trial was organised in 1998 under the auspices of the European Committee for Standardization, to test the procedures specified in this European Standard. In this trial the number of laboratories given in Table A.1 determined the bulk density in nine sample types.

Table A.1

Sample	1	2	3	4	5	6	7	8	9
Number of laboratories retained after eliminating outliers	12	12	12	12	12	10	10	10	7
Number of outliers (laboratories)	0	0	0	0	0	0	0	0	0
Mean value, g/l	395,9	149,3	337,2	317,5	682,1	130,5	90,6	234,6	268,8
Repeatability standard deviation, s_R, g/l	2,8	1,9	3,8	3,7	6,5	9,3	3,1	8,4	4,7
Repeatability relative standard deviation, %	0,71	1,27	1,13	1,17	0,95	7,13	3,42	3,58	1,75
Repeatability limit, r = 2,8 s_R, g/l	7,9	5,4	10,6	10,4	18,2	25,9	8,6	23,5	13,2
Reproducibility standard deviation, s_R, g/l	5,9	3,0	5,9	5,1	11,2	13,8	3,5	11,1	7,4
Reproducibility relative standard deviation, %	1,49	2,01	1,75	1,61	1,64	10,57	3,86	4,73	2,75
Reproducibility limit, R = 2,8 s_R, g/l	16,6	8,5	16,5	14,2	31,5	38,7	9,8	31,0	20,7

1 Frozen raised bog black peat (strongly decomposed GMC/SI) < 20 mm.
2 Raised bog white peat (weakly to moderately decomposed GMC/SI) 0 mm to 25 mm.
3 Mixture of white peat and clay (GM) < 20 mm.
4 Mixture of white peat, peat fibres, composted bark and clay (GM) 0 mm to 25 mm.
5 Composted biogenic waste (SI/GMC) 0 mm to 15 mm.
6 Perlite (GMC/SI) 1,5 mm to 7,5 mm.
7 Wood fibres (GMC) < 20 mm.
8 Bark (SI) 10 mm to 40 mm.
9 Bark (SI) 20 mm to 80 mm (60 mm fall controller used).

Bibliography

[1] EN 15238, *Soil improvers and growing media — Determination of quantity for materials with particle size greater than 60 mm*

[2] EN 15761, *Pre-shaped growing media — Determination of length, width, height, volume and bulk density*

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

[4] ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*

[5] Directive 2009/23/EC of the European Parliament and of the Council of 23 April 2009 on non-automatic weighing instruments

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