



SLOVENSKI STANDARD

SIST EN 13299:2002

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Fertilizers - Determination of flow rate

Düngemittel - Bestimmung der Fließkennzahl

Engrais - Détermination du taux d'écoulement

Ta slovenski standard je istoveten z: EN 13299:2000

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ICS:

65.080

Gnojila

Fertilizers

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EUROPEAN STANDARD

EN 13299

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 65.080

English version

Fertilizers – Determination of flow rate

Engrais – Détermination du taux d'écoulement

Düngemittel – Bestimmung der Fließkennzahl

This European Standard was approved by CEN on 12 December 1999.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 260, Fertilizers and liming materials, the Secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The flow rate of a fertilizer provides a measure of comparison for the mass flow when flowing out of containers or during spreading.

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1 Scope

This European Standard specifies a method for the determination of the flow rate of free flowing solid fertilizers. The method is not applicable to powder materials (< 0,5 mm) or liming materials.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1236, *Fertilizers - Determination of bulk density (loose) (ISO 3944:1992 modified)*.

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

3 Principle

Measurement of the time taken for 2 kg of fertilizer to flow from a calibrated funnel into a vessel placed on a balance.

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4 Apparatus

4.1 Balance, with a capacity of at least 3,5 kg and capable of weighing to an accuracy of ± 1 g.

4.2 Funnel, as specified in EN 1236 made of stainless steel.

The slide of this funnel shall be such that the orifice is completely clear when the slide is in the open position.

4.3 Collecting vessel, capable of holding at least 3 kg of fertilizer, for example.

4.4 Stop-watch, with an accuracy of 0,1 s.

4.5 Woven wire test sieves, conforming to ISO 3310-1 with aperture sizes 3,55 mm and 4,0 mm.

4.6 Glass balls, for calibration of the funnel, conforming to the following requirements:

- Diameter: 4 mm \pm 0,3 mm;
- Form: spherical;
- Material: glass of density 2,5 kg/dm³;
- Surface: polished.

Before use, sieve the glass balls using the 4,00 mm and 3,55 mm sieves (4.5) and use only those which pass the 4,00 mm sieve and remain on the 3,55 mm sieve.

5 Test portions

Weigh two representative test portions of about $3\text{ kg} \pm 100\text{ g}$ each, taken from the test sample.

6 Calibration of the funnel

6.1 Pour $3\text{ kg} \pm 100\text{ g}$ of the sieved glass balls (4.6) into the closed funnel (4.2). Place the balance (4.1) under the funnel and stand the collecting vessel (4.3) on it. Simultaneously, fully open the slide of the funnel and start the stop-watch.

6.2 Stop the stop-watch when the balance indicates 2 kg and close the slide at the same time. Record the time to the nearest $0,1\text{ s}$.

6.3 Weigh the actual amount of glass balls collected in the vessel to the nearest 1 g . The corrected flow time of exactly 2 kg of glass balls is calculated according to equation (1):

$$t_{b,2} = t_b \frac{2}{m_b} \quad (1)$$

where:

$t_{b,2}$ is the corrected flow time, in seconds, of 2 kg of glass balls;

t_b is the measured flow time, in seconds, of 2 kg of the glass balls;

m_b is the weighed mass, in kilograms, of the glass balls.

6.4 Completely empty the funnel into the collecting vessel. Close the funnel and return all the balls to the funnel.

6.5 Repeat the calibration process. Calculate the arithmetic mean (\bar{t}) of the two determinations of the time ($t_{b,2}$) taken for $2,0\text{ kg}$ of the glass balls to pass through the funnel.

7 Procedure

7.1 Repeat the procedure described in 6.1 and 6.2 using one of the test portions (clause 5) in place of the sieved glass balls.

7.2 Weigh the actual amount of fertilizer collected in the vessel to the nearest 1 g and calculate the time taken for exactly $2,0\text{ kg}$ to pass through the funnel.

7.3 Completely empty the funnel into the collecting vessel. Discard the contents.

7.4 Repeat the procedure described in 7.1 to 7.3 using the second of the two test portions.

8 Expression of results

8.1 Calculation of the calibration factor (c)

The calibration factor for the funnel is given by the equation:

$$c = \frac{10}{2 \frac{60}{t}} = \frac{t}{12} \quad (2)$$

where:

c is the calibration factor;

t is the measured flow time, in seconds;

10 is the assumed flow rate, in kilograms per minute, of the glass balls through a hypothetical standard funnel.

8.2 Calculation of the flow rate of the fertilizer

The flow rate of the fertilizer is given in kilograms per minute by the equation:

$$F = m_f \left(\frac{60}{t_f} \right) \times \bar{c} = \frac{120}{t_f} \times \bar{c} \quad (3)$$

where:

F is the flow rate, in kilograms per minute, of the fertilizer;

m_f is the weighed mass, in kilograms, of the fertilizer;

t_f is the measured flow time, in seconds, of the fertilizer;

\bar{c} is the mean calibration factor.

For $m_f = 2$ the simplified equation (4) can be used:

$$F = 10 \frac{\overline{t_{b,2}}}{t_{f,2}} \quad (4)$$

where:

$\overline{t_{b,2}}$ is the mean flow time, in seconds, of 2 kg glass balls to pass through the funnel;

$t_{f,2}$ is the flow time, in seconds of 2 kg fertilizers to pass through the funnel.

Take as the result the arithmetic mean of the two determinations if the requirement concerning repeatability (9.1) is satisfied. If not, repeat the whole test.

9 Precision

9.1 General

The statistical information given here is only intended as a guideline to what can be expected. The values are based on collaborative studies which have been carried out on urea and NPK complex fertilizers.

9.2 Repeatability

The difference between two single results found on identical test material by one operator using the same apparatus within a short time interval should exceed the repeatability limit, r , expressed as a percentage, given by the equation:

$$r = 0,015 F \quad (5)$$

where:

F is the arithmetic mean of the two results;

on average not more than once in 20 cases in the normal and correct operation of the method. Both results should be considered suspect if the repeatability value r is exceeded.

9.3 Reproducibility

The difference between two single and independent test results found by two operators working in different laboratories using identical test materials should exceed the reproducibility limit, R , given by the equation:

$$R = 0,15 F \quad (6)$$

where:

F is the arithmetic mean of the two test results;

on average not more than once in 20 cases in the normal and correct operation of the method.

10 Test report

The test report shall contain the following:

- identification of the sample;
- sampling method;
- sample preparation;
- reference to the method used;
- the test result;
- any unusual features observed in the course of the determination;
- any operations not specified in this European Standard or regarded as optional.