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**Kmetijski stroji – Vrtni trosilniki mineralnih gnojil – Varovanje okolja – 2. del:  
Preskusne metode**

Agricultural machinery - Solid fertilizer line-distributors - Environmental protection - Part  
2: Test methods

Landmaschinen - Reihen-Mineraldüngerstreuer - Teil 2: Prüfverfahren

Matériel agricole - Distributeurs d'engrais solides en lignes - Protection de  
l'environnement - Partie 2: Méthodes d'essai

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**ICS:**

13.020.99	Drugi standardi v zvezi z varstvom okolja	Other standards related to environmental protection
65.060.25	U]  ^ { aá aá   aã z ^ } b È ]   ä   æ [ Å Á æ à ^   b ç a } * } [ ã	Equipment for storage, preparation and distribution of fertilizers

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

EN 13740-2

April 2003

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English version

Agricultural machinery - Solid fertilizer line-distributors -  
Environmental protection - Part 2: Test methods

Matériel agricole - Distributeurs d'engrais solides en lignes -  
Protection de l'environnement - Partie 2: Méthodes d'essai

Landmaschinen - Reihen-Mineraldüngerstreuer -  
Umweltschutz - Teil 2: Prüfverfahren

This European Standard was approved by CEN on 28 February 2003.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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## Foreword

This document (EN 13740-2:2003) has been prepared by Technical Committee CEN/TC 144 "Tractors and machinery for agriculture and forestry", 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of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003. This standard consists of the following parts under the general title: Agricultural machinery – Solid fertilizer line-distributors – Environmental protection:

— *Part 1: Requirements*

— *Part 2: Test methods*

Annex A is normative and concerns the identification of the physical properties of fertilizer used in the test.

Annex B is informative and gives an example of the format for the test report.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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**EN 13740-2:2003 (E)****1 Scope**

This European Standard specifies methods to test mounted, trailed and self-propelled solid fertilizer line-distributors including such machines attached to a basic machine, used in agriculture and horticulture.

This European Standard does not apply to machines which are:

- equipment for distributing liquid fertilizer; or
- equipment for distributing liquid or granulated pesticides; or
- solid fertilizer broadcasters and full width distributors (which are dealt with in EN 13739-1:2003 and EN 13739-2:2003).

NOTE The standard is also applicable to drilling machines if it is stated by the machine manufacturer that the machine is suitable for fertilizer application.

If the term "machine" is used, it covers both drilling and spreading line-distributors.

**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 revision 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 (including amendments).

EN 1235, *Solid fertilizers – Test sieving* (ISO 8397:1988 modified).

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

EN 13299, *Fertilizers – Determination of flow rate*.

EN 13740-1:2003, *Agricultural machines – Solid fertilizer line-distributors – Environmental protection – Part 1: Requirements*.

**3 Terms and definitions**

For the purposes of this European Standard, the terms and definitions given in EN 13740-1:2003 apply.

**4 Test conditions****4.1 Machine for test**

During the tests the machine shall be used according to the instruction handbook.

Static tests (tests with the feed mechanism running but the machine is standing still) shall be performed corresponding to a forward speed of 8 km/h within the range of  $\pm 0,4$  km/h.

Mobile tests (tests with the feed mechanism and the machine running) shall be performed at a forward driving speed of 8 km/h within the range of  $\pm 0,4$  km/h if nothing else is stated in the test method specification.

If the machine is not designed to be used at a forward speed of 8 km/h, the forward test speed shall be the speed, nearest to this value, as recommended by the manufacturer.

In static and mobile tests the adjusted speed shall not vary by more than  $\pm 0,1$  km/h.

The forward speed, the ratio between the drive speed and the discs speed shall be stated in the test report.

The distributing mechanism shall be at the height above the collecting containers (the upper edge of the containers) equal to that recommended by the manufacturer for work above the ground or the crop. For drilling fertilizer distributors the coulters are allowed to be fixed to get the fertilizer outlet just above the upper edge of the containers.

The angle of the fertilizer tubes or any conduits shall remain equal to the angle in the actual working position.

## 4.2 Test materials

Unless the instruction handbook states otherwise, test materials shall be used from the following groups and as specified in 6.3 to 6.9:

- a) a granular fertilizer with bulk density  $> 0,9 \text{ kg/dm}^3$ ;
- b) a granular fertilizer with bulk density  $\leq 0,9 \text{ kg/dm}^3$ ;
- c) a prilled fertilizer with bulk density  $> 0,9 \text{ kg/dm}^3$ ;
- d) a prilled fertilizer bulk density  $\leq 0,9 \text{ kg/dm}^3$ ;
- e) a compacted fertilizer.

NOTE Crystalline fertilizers will be considered during the next revision when they have been used more regularly so that experts can agree on their physical properties.

The physical properties for the test material to be used shall be within the limits given in Table A.1.

The physical properties of the test material used shall be specified in the test report.

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## 4.3 Application rates

Unless the instruction handbook states otherwise, the following adjustments calculated for 8 km/h shall be used as selected in 6.3 to 6.9:

- rate 1: a flow rate corresponding to a minimum application rate for the test material depending on the nutrient content, according to Table 1;
- rate 2: a flow rate corresponding to a maximum application rate for the test material depending on the nutrient content, according to Table 1;
- rate 3: a flow rate in between, corresponding to  $(\text{rate 1} + \text{rate 2})/2$ .

The machine shall be adjusted to give the flow rate of the test material within  $\pm 5 \text{ kg/min}$  for flow rates  $< 100 \text{ kg/min}$  and  $\pm 5 \%$  for flow rates  $\geq 100 \text{ kg/min}$ . The flow rates are calculated from application rates and working widths at the forward driving speed determined in 4.1.

Table 1 — Minimum and maximum application rates depending on nutrient content

Nutrient	Application rate	
	kg/ha	
	minimum	maximum
N	20	120
P <sub>2</sub> O <sub>5</sub> (P)	30 (13)	150 (65)
K <sub>2</sub> O (K)	40 (33)	300 (249)
MgO (Mg)	25 (15)	100 (60)

NOTE The application rate (kg/ha) is calculated on the basis of the nitrogen (N) content for the test materials which include nitrogen and on the basis of the phosphor (P) content for test materials which include phosphor but no nitrogen.  
If there is no (N) or (P), the application rate shall be calculated on the basis of (K) or (K<sub>2</sub>O), and if no (K), on (Mg) or (MgO).

## 5 Test equipment

### 5.1 Accuracy in weighing measurements

The minimum accuracy for the weighing of the samples of test materials shall be:

- ± 0,1 g for the tests of 6.7;
- ± 1,0 g for the tests of 6.5.2; 6.6;
- ± 500 g for the tests of 6.2; 6.3; 6.5.1; 6.8; 6.9.

### 5.2 Devices for receiving test materials from transverse distribution of fertilizer outlets

For static tests the test material shall be collected in containers placed under either the feed mechanisms, the coulters or the fertilizer outlets, with one container placed under each fertilizer outlet. The size of the containers shall be chosen to collect all test material at each outlet without disturbances with the application rates according to 4.3.

The feed mechanism shall be operated by a device to correspond to the forward speed as specified in 4.1.

### 5.3 Test site

The tests shall be carried out on an even, horizontal and hard surface. The air velocity shall be less than 2 m/s during the tests. The air humidity shall be less than 65 % and the temperature 10 °C to 25 °C.

The actual values of air humidity, temperature and air velocity shall be stated in the test report. If tests are done outdoors, this shall also be stated in the test report.

Precautions shall be taken to eliminate ricochets from the ground into the collecting containers.

The test shall be fully described in the report.



## 5.4 Handling of test materials during the tests

It is important that the test materials are not exposed to the air more than necessary. The maximum exposure time before the test starts is 4 h.

All samples, for later analysis of physical properties, shall be immediately put under airtight storage.

## 6 Test methods

### 6.1 Contact with obstacles

For machines equipped with a boom and with a working width more than 10 m, the following test is performed:

An obstacle is placed along a horizontal test track. The machine is moved forward with the speed of 8 km/h. The boom shall hit the obstacle at 90 % to 100 % of the half boom width out measured from the middle of the track (see Figure 1 in EN 13740-1:2003).

The boom movement is observed during the test. After the test, the boom section is inspected for any damage and the location of damage is noted in the test report.

### 6.2 Estimation of hopper volume – Checking of the spillage

The volume of the hopper shall be estimated with one fertilizer of type a) with a bulk density  $D$  measured according to EN 1236. If not stated otherwise in the instruction handbook, when estimating the volume of the hopper the machine shall be placed horizontally. (standards.iteh.ai)

The hopper shall be filled between 10 % to 80 % of the basic-hopper volume. This shall be performed three times: one at the 10 % filling level, one at the 45 % filling level and one at the 80 % filling level, with the surface levelled according to the instruction handbook. 154c97ee8590/sist-en-13740-2-2004

At each time the mass  $M$  of fertiliser is measured. The volume  $V = M / D$  of the fertilizer put into the hopper shall be noted as well as the volume indicated by the hopper scale. The deviation in percent between the volume of fertilizer put into the hopper and the indicated volume shall be noted.

Check by inspection at 80 % filling level of the basic hopper that no spillage occur from the machine during transport when the feeding device is closed or disengaged.

### 6.3 Adjustment of flow rate (static test)

The obtained flow rate shall be measured with the spreader completely equipped and adjusted for field spreading.

If the machine has a manually controlled system for decrease or increase of the flow rate, then the system shall be tested at + 20 % and at – 20 % of flow rate 3. The test shall be performed with test material a).

For machines with central hoppers, the total sample size shall be at least 50 kg of the test material. For machines with individual hoppers, the total sample size per hopper shall be at least 4 kg of the test material.

The deviation of the obtained flow rate from the intended flow rate is calculated as a percentage of the intended flow rate. This value is noted in the test report.

NOTE The test could be performed during the test of flow rate in 6.8.

### 6.4 Reduced working width or throwing width

The possibilities to reduce the working width shall be checked with the hopper filled to at least 10 % of the basic hopper volume with a of the test material of type a), and the working width is reduced symmetrically from the tested working width to the smallest stated reduced working width.

NOTE The inspections could be done during the tests of 6.7 or 6.8. The test can be done during the test of 6.6.

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**6.5 Flow rate regulation system (when available)****6.5.1 Deviations of the flow rate (static test)**

Fill the basic hopper to at least 25 % of the basic hopper volume.

Set the machine with the automatic system and the test material a) and to the specified flow rate 3.

Find out which parameters can influence the regulation system and regulate the flow by using one parameter at a time according to:

- change in speed  $\pm 50$  % of average recommended speed; or
- change in application rate  $\pm 50$  % of the stated flow above.

After each change, set the machine to flow rate 3 and measure the deviation between the obtained flow rate and the intended flow rate.

For machines with central hoppers, the total sample size shall be at least 50 kg of the test material. For machines with individual hoppers, the total sample size per hopper shall be at least 4 kg of the test material. For each parameter tested two measurements shall be made.

Calculate and note in the test report the deviations in percent of the obtained flow rate from the intended flow rate.

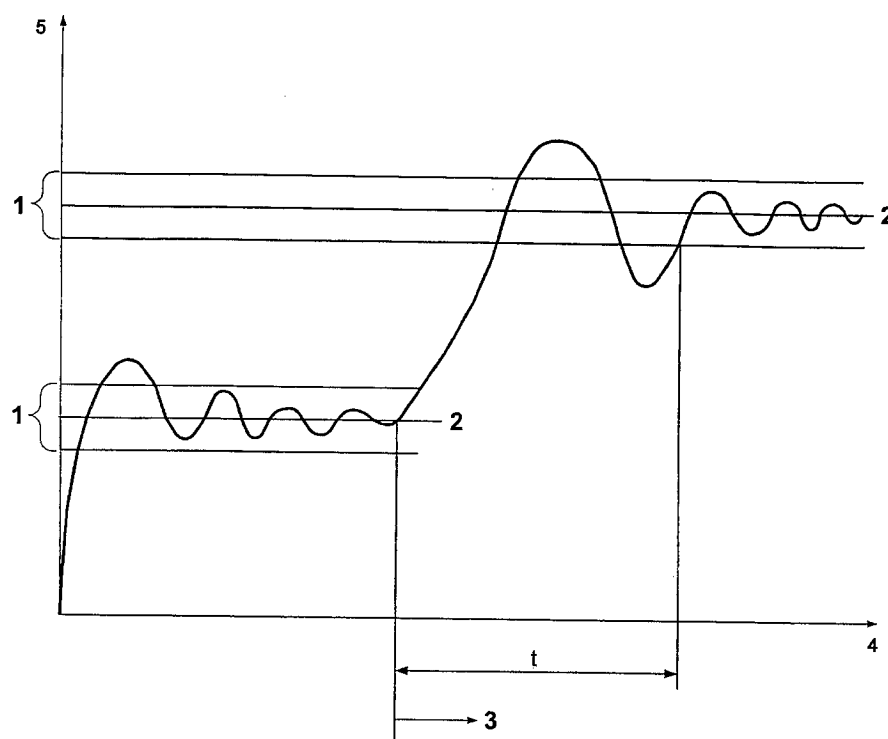
**6.5.2 Continuous mass flow measurements (static test)**

Set the machine with the automatic system and the test material of type a) to the specified flow rate 3.

Measure and note in the test report the time needed for the change in flow rate to the achievement of increased flow rate at (flow rate 3 + 50 %) from flow rate 3.

Measure and note in the test report the time needed for the change in flow rate to the achievement of decreased flow rate at (flow rate – 50 %) from flow rate 3.

The deviation of the obtained flow rate from the intended flow rate according to Table 1 has to be considered.

**Key**

- 1 Maximum permitted deviation
- 2 Preset value
- 3 Initiation

4 = t (s)  
5 = flow rate (kg/min)

**Figure 1 — Example of types of regulation**

## 6.6 Evenness of transversal distribution

### 6.6.1 Arrangement of the machine and the containers

The machine shall be arranged so that it will be possible to drive the feed mechanism at the speed specified in 4.1.

A collecting container is placed under each fertilizer outlet. Care shall be taken that the collecting container is placed in relation to the fertilizer outlet, at an average distance corresponding to that in actual operation.

### 6.6.2 Procedure on horizontal ground

Arrange and adjust the machine according to the manufacturers instructions. Carry out the test with the machine adjusted for a speed according to 4.1 and note the adjustments in the test report.

The hopper shall be filled to at least 25 % of the stated basic hopper volume, or to a minimum of 500 l during the whole test.

The tests shall be carried out with test materials of types a) and c) as specified in 4.2 at the three flow rates, as specified in 4.3. Tests shall also be performed for types b), d) and e) with flow rate 3.

For machines with central hoppers, the total sample size shall be at least 50 kg of the test material. For machines with individual hoppers, the total sample size per hopper shall be at least 4 kg of the test material.

Weigh the test material collected in each container and calculate the maximum deviation and for distributors with more than 12 outlets the coefficient of variation (CV) according to 7.1.3.

The test shall be carried out at the maximum stated working width.