SLOVENSKI STANDARD
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Trdna gnojila - Sejalni preskus (ISO 8397:1988, modificiran)

Solid fertilizers - Test sieving (ISO 8397:1988 modified)

Feste Düngemittel - Siebanalyse (ISO 8397:1988 modifiziert)

Engrais solides - Tamisage de contrôle (ISO 8397:1988 modifiée)

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65.080 Gnojila Fertilizers

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Solid fertilizers - Test sieving (ISO 8397:1988 modified)

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Feste Düngemittel - Siebanalyse (ISO 8397:1988 modifiziert)

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

The text of the International Standard from ISO/TC 134 "Fertilizers and soil conditioners" of the International Organization for Standardization (ISO) has been taken over as a European Standard by the Technical Committee CEN/TC 260 "Fertilizers and liming materials".

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of an identical text or by endorsement, at the latest by December 1995, and conflicting national standards shall be withdrawn at the latest by December 1995.

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

Endorsement notice

The text of the International Standard ISO 8397:1988 was approved by CEN as a European Standard with agreed common modifications as given below :

- the words "soil conditioners" are deleted in the title and in the scope ;

- in the scope and field of application, two sentences have been added to introduce annexes ZA and ZB ;

- the normative reference to International Standards ISO 3963 and ISO 7410 has been deleted and the sampling method used has to be indicated in the test report ;

- the dates of publication of the standards indicated in the normative reference have been added ;

- a note has been added to table 1 ;

- an informative annex ZA has been added with an example for the expression of sieving test results ;

- an informative annex ZB "Bibliography" has been added.

The common modifications have been inserted in the text of the reference document and indicated by a vertical line in the left margin.

Table 1 : Recommended charges for test sieving

Nominal aperture size	Bulk volume of material*	
	Recommended volume of charge	Maximum volume of residue permitted on the sieve at the completion of sieving
	cm^3	cm^3
8,00 mm	500	250
5,60 mm	400	200
4,00 mm	350	175
2,80 mm	240	120
2,00 mm	200	100
1,40 mm	160	80
1,00 mm	140	70
710 µm	120	60
500 µm	100	50
355 µm	80	40
250 µm	70	35
180 µm	60	30
For non-friable and non-adhesive materials only		
125 µm	50	25
90 µm	40	20

* The mass of material can be calculated by multiplying the volume by the bulk density, determined by the method described in ISO 3944, of the material to be sieved.

NOTE : Recommended charge volumes for sieves from the supplementary list are found by interpolation.

8 Procedure

8.1 Select a maximum of seven test sieves from the range of principal sizes listed in ISO 565 to cover the range of particle size expected. Assemble the sieves in ascending order of aperture size on top of the receiver.

NOTE : Normally the principal sizes (R 20/3) should be used. In special cases, however, it may be necessary to use supplementary sizes (R 20).

8.2 Weigh the test portion to the nearest 0,1 g, place it on the top sieve and fit the cover.

8.3 Place the assembled nest of sieves on the mechanical shaker and shake for 10 min.

8.4 Remove the sieves from the nest and weigh the quantity retained on each sieve and in the receiver to the nearest 0,1 g. Particles caught in the mesh of the sieve may be removed by brushing the reverse side of the sieve.

8.5 Carry out at least two tests on separate test portions prepared from the same laboratory sample.

9 Expression of results

9.1 Sum the masses of the fractions retained on the sieves and in the receiver.

NOTE : The sum of these masses should not differ by more than 1 % from the original mass of the test portion.

9.2 Calculate each fraction mass as a percentage of the sum of these masses.

10 Precision

The statistical information given here is only intended as a guideline to what can be expected. The values are based on the evaluation of collaborative studies which have been carried out using sieves of nominal sizes of openings between 100 µm and 5,60 mm.

1 Scope and field of application

This International Standard specifies a method for the determination of the particle size distribution of solid fertilizers by test sieving.

NOTE : The applicability of the method has been tested with sieves of nominal sizes of openings between 100 µm and 5,60 mm.

Annex ZA gives further information on the expression of the results of test sieving.

Annex ZB lists the bibliography.

2 References

ISO 565:1990 Test sieves - Woven metal wire cloth, perforated plate and electroformed sheet - Nominal sizes of openings.

ISO 2395:1990 Test sieves and test sieving - Vocabulary.

ISO 2591:1988 Test sieving.

ISO 3310-1:1990 Test sieves - Technical requirements and testing - Part 1 : Test sieves of metal wire cloth.

ISO 3944:1992 Fertilizers - Determination of bulk density (loose) [1] .

3 Definitions

For the purpose of this International Standard, the definitions of ISO 2395 apply.

4 Principle

Dry sieving of a fertilizer sample with one or more test sieves using a mechanical sieving machine.

5 Apparatus

5.1 Balance, capable of weighing to the nearest 0,1 g.

5.2 Stainless steel woven wire test sieves, 200 mm diameter, complying with ISO 3310-1, with a lid and receiver for the sieves.

5.3 Mechanical shaker (sieving machine), capable of imparting both horizontal and vertical motion to material inside a nest of sieves.

5.4 Stopwatch

5.5 Soft brush

6 Sampling

Carry out sampling by an appropriate method.

7 Preparation of the test portion

Reduce the sample (a method will form the subject of a future International Standard) to the quantity required for the sieving test. This quantity should be approximately that indicated in column 2 of table 1 for the sieve corresponding to the dominant size fraction of the sample, provided that the size distribution does not cause excess volume on any of the sieves in the set as indicated in column 3 of table 1.

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[1] Technically identical with EN 1236.

10.1 Repeatability, *r*

The difference $|x_1 - x_2|$ between two single results (x_1 and x_2) found on identical test material by one operator using the same apparatus within the shortest feasible time interval will exceed the repeatability value *r*, expressed as a percentage, given by equation (1) and with a maximum value of 2,5 %, 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.

$$r = 0{,}5\sqrt{\bar{x}} \qquad \text{... (1)}$$

where :

$\bar{x}$ is the mean value of the two results, expressed as a percentage by mass, of the fractions.

10.2 Reproductibility, *R*

Single results (x_1 and x_2) on identical test material reported by two laboratories will differ by more than the reproducibility value *R*, expressed as a percentage, given by equation (2) and with a maximum value of 12,5 %, 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 reproducibility value *R* is exceeded.

$$R = 2{,}5\sqrt{\bar{x}} \qquad \text{... (2)}$$

where :

$\bar{x}$ is as defined in 10.1.

10.3 Examples (see table 2)

Table 2 : Examples of precision data

$\bar{x}$	*r*	*R*	For *r*		For *R*	
			x_{min}*	x_{max}**	x_{min}*	x_{max}**
1	0,5	(2,5)	0,8	1,3	0	2
4	1	5	3,5	4,5	1,5	6,5
9	1,5	7,5	8,3	9,8	5,3	12,8
16	2	10	15	17	11	21
25	2,5	12,5	23,8	26,3	18,8	31,3
36	2,5	12,5	34,8	37,3	29,8	42,3

* x_{min} is the smaller of the two corresponding fractions *x*, expressed as a percentage by mass.
** x_{max} is the larger of the two corresponding fractions *x*, expressed as a percentage by mass.

11 Test report

The test report shall include the following information :

a) the reference of the method used ;

b) all information necessary for the complete identification of the sample ;

c) the nominal sizes of openings of the test sieves used ;

d) the mean values of the percentage by mass of material retained on each sieve ;

e) any operations not specified in this International Standard,or in the International Standards to which reference is made, or regarded as optional, together with any circumstances likely to have affected the results ;

f) method of sampling and sample preparation.

NOTE : Methods of recording results of test sieving in tabular form are shown in ISO 2591.

Annex ZA (informative)

Expression of sieving test results

A.1 Determination of the size distribution

In the following,index sieve numbers (n) increase with increasing sieve aperture, and index o refers to the receiver.

The percentage of material, by mass, retained in the receiver (x_0) and on each of the individual sieves (x_n) can be otained by the following formula :

$$x_n = \frac{m_n}{m_t} \cdot 100 \qquad (\%)$$

where :

m_0 is the mass retained in the receiver

m_n is the mass retained on sieve n

m_t $m_0 + m_i + \ldots + m_n$

x_n is the percentage, by mass, retained on sieve n

A.2 Definition of the cumulative undersize

The cumulative undersize is defined by the following formula :

$$c_n = x_0 + x_1 + \ldots + x_i + \ldots + x_{n-1} \qquad (\%)$$

where

c_n is the cumulative percentage, by mass, undersize for sieve n

x_0 is the percentage, by mass, retained in the receiver

x_i is the percentage, by mass, retained on sieve i

A.3 Calculation of the mass median diameter (d_{50})

The mass median particle size or d_{50} is that size such that 50 % of the particles, by mass, are larger than that size and 50 % are smaller.

This calculation of d_{50} assumes that there is a linear relationship between the sieve sizes z_n and z_{n+1}, and the cumulative undersizes, c_n and c_{n+1}.

The mass median diameter, d_{50}, can be obtained by the following formula :

$$d_{50} = z_n + \frac{(50 - c_n)}{(c_{n+1} - c_n)} \cdot (z_{n+1} - z_n) \quad \text{(mm)}$$

where :

z_n	is the nominal sieve mesh, in mm, for which the cumulative undersize is nearest to but below 50 % by mass
z_{n+1}	is the nominal sieve mesh, in mm, for which the cumulative undersize is nearest to but above 50 % by mass
c_n	is the cumulative percentage undersize for sieve n
c_{n+1}	is the cumulative percentage undersize for sieve n+1
$z_{n+1} - z_n$	should be of minimum value using both sieve series