DRAFT INTERNATIONAL STANDARD

ISO/DIS 17190-3

ISO/TC **173**/SC **3** Secretariat: **SIS**

Voting begins on: **2019-08-15**

Voting terminates on: **2019-11-07**

Urine-absorbing aids for incontinence — Polyacrylate superabsorbent powders —

Part 3: Test method for determination of the particle size distribution by sieve fractionation

Aides pour absorption d'urine — Méthodes d'essai pour caractériser les matériaux absorbants à base de polymères —

Partie 3: Détermination de la distribution granulométrique des particules au moyen du fractionnement par tamisage

ICS: 11.180.20

This document is circulated as received from the committee secretariat.

Reference number
ISO/DIS 17190-3:2019(E)

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Published in Switzerland

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee *[or Project Committee]* ISO/TC *[or ISO/PC]* ###, *[name of committee]*, Subcommittee SC ##, *[name of subcommittee]*.

This second/third/... edition cancels and replaces the first/second/... edition (ISO #####:####), which has been technically revised.

The main changes compared to the previous edition are as follows:

— xxx xxxxxxx xxx xxxx

A list of all parts in the ISO ##### series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Urine-absorbing aids for incontinence — Polyacrylate superabsorbent powders —

Part 3: Test method for determination of the particle size distribution by sieve fractionation

1 Scope

This test method specifies a method for measuring particle size distributions up to 850 µm of cross-linked polyacrylate superabsorbent powders. It applies only to measurements made where sieve shaking is used for the separation. Tapping equipment is not expected to deliver the same results.

In general, this method is expected to be applicable to powdered polymeric superabsorbent materials that are free-flowing under the specified test conditions.

NOTE - This standard does not claim to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. It is expected that the person performing this test has been fully trained in all aspects of this procedure.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
sample
product or portion of a product taken from a production lot for testing purposes and identifiable and traceable back to its origin

3.2
specimen
specific portion of the identified sample upon which a test is performed

4 Principle

A defined amount of superabsorbent powder is split into specific particle size fractions upon passing through a sequence of standard sieves. Each fraction is weighed, and the value reported as a percentage of the total amount of material.

5 Reagents and Materials

None

6 Apparatus

6.1 Analytical balance, capable of weighing the entire sieve assembly, or each individual sieve, to an accuracy of ± 0.01 g.

6.2 Beaker, glass or plastic, having a capacity of 250 ml.

6.3 Sieve shaker, capable of holding standard sieves of 200 mm diameter, with bottom receiving pan, grounded to avoid static electricity.

Example Retsch AS 200 type or equivalent.

6.4 Stainless steel sieves of 200 mm diameter, certified to ISO or ASTM standards. Example hole sizes: 45, 106, 150, 300, 600 and 850 µm, with bottom receiving pan and top lid.

6.5 Brush made of camel's hair or vacuum cleaner with HEPA filter.

The brush/vacuum cleaner may only be used to clean powder from the standard sieves with hole sizes greater than 150 µm.

7 Conditioning

Samples shall be delivered in a closed container, to prevent absorption of atmospheric moisture. Allow the closed container to equilibrate to the laboratory conditions. The preferred test conditions are (23 ± 2) °C and (45 ± 15) % relative humidity. If these conditions are not available, test at ambient conditions and report the temperature and relative humidity. Measure these laboratory conditions in accordance with ISO 187.

8 Sampling

WARNING — Power Handling – The German MAK has provided a guideline value for long-term exposure to the respirable portion of superabsorbent polyacrylate dust of 0.05 mg.m-3. The respirable portion is defined as those particles of less than 10-µm diameter. Commercial superabsorbent polymers typically contain less than 0.1% of such particles. Precautions should be taken to avoid routine exposure to atmospheric respirable particles above this guideline MAK value.

8.1 Before taking a test portion out of the container to run the test, move the container five to ten times in a figure of eight motion, so as to obtain a homogeneous product. For that matter, sample bottles should not be filled more than 80% of their nominal capacity.

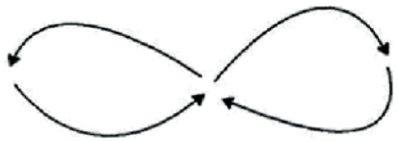

Figure 1 — Sense of motion of the container

8.2 Make sure the test portion is substantially free of lumps of size greater than 1 mm in diameter before proceeding with testing.

9 Procedure

9.1 Inspect a set of dry sieves by holding each one up to the light, and checking for damage and cleanliness. Discard any wet or damaged sieves

9.2 Weigh the bottom pan and each empty sieve to an accuracy ± 0.01 g. Record each mass, ms

9.3 Place the sieves in the correct order on the shaker (i.e. pan at the bottom and then finest to coarsest by increasing hole size above).

9.4 Place a beaker on the balance and add a 100.00 g +/- 1.00 g test portion of superabsorbent powder to the beaker. Tare the balance.

NOTE 1 Transfer the sample portion from the sample bottle to the weighing vessel or laboratory paper in one spatula portion. Discard any excess material on the spatula. Do not return it to the sample bottle. Keep the sample container closed as much as possible during this process.

9.5 Transfer the weighed sample to the top sieve on the sieve tester.

9.6 Return the beaker to the balance and record the negative weight observed as an absolute value, m1.

9.7 Place the lid on the sieves and secure them in accordance with the manufacturer's instructions.

9.8 Make sure that the equipment has an electrical ground connection to avoid static electricity. Ground the sieve shaker and sieves.

NOTE 2 It is possible that the sieve shaker setting may need to be adjusted to produce the same conditions, for example:

Sieve shaker, Retsch AS 200 control "g" or equivalent

Set the Retsch sieve shaker amplitude at:

a. 1.00 mm for 60 Hz power supplies.

b. 1.44 mm for 50 Hz power supplies.

9.9 Vibrate / sift the sample for:

8.0 minutes for 60 Hz power supplies.

10.0 minutes for 50 Hz power supplies.

NOTE 3 It is possible to use different shaking equipment or even alternative particle measurement systems. These alternatives must be calibrated against the parameters described here if the EDANA standard is used as the reference procedure.

9.10 Start the shaker

9.11 After the required period of shaking, carefully remove and weigh the sieve assembly to the nearest 0.01 g, removing each sieve in turn and recording the weight of each sieve and the bottom pan individually, mn.

NOTE 4 It is possible to vary the form of instruction 9.11. The important point is to determine the weight of polymer on each sieve in order to measure the fractionation.

10 Calculation

Calculate the percentage of each fraction, w, as follows:

$$w = \frac{m_n - m_s}{m_1} 100$$

where

m_n Is the mass, expressed in grams, of each sieve plus retained fraction of absorbent polymer in grams

m_s Is the mass, expressed in grams, of each empty sieve

m_1 Is the mass, expressed in grams, of the starting sample

11 Report

In addition to the precise test results, the report shall include the following information:

a) Reference the test method used

b) Complete identification of all materials tested and method of sampling

c) Name and address of testing institution

d) The type of polymer-based absorbent materials, including all technical details and source information required for complete identification of the sample

e) The results for each particle size fraction remaining on the sieves and the bottom pan of each test portion, expressed as a mass fraction in percent of the weighed material to the nearest 0.1%.

f) Make and model of sieve shaker equipment

g) Laboratory testing conditions

h) Number of specimens tested

i) For computer processed data, identify the software used and the version

j) Deviation from the standard test procedure, if any

k) When calculated, the standard deviation or the coefficient of variation

l) Whether or not samples were conditioned prior to testing and, if so, for how long

m) Any unusual features noted during the determination or if the reproducibility and/or repeatability criteria were not met.

SI values are regarded as the official standard system of measurement for this standard test method. If other systems of measurement are used in place of SI units (including inch-pound) their values must be reported independently. Systems of measurement must not be combined in any way, but shall be regarded and reported separately.

12 Precision

Laboratory data was returned to EDANA and compiled and anonymised before analysis. A statistical summary was prepared and presented to the (former) SPACE Analytical & Industrial Hygiene Committee. The general form of the data was checked by the members and its validity confirmed. At the same time, it was agreed that only one round of outliers would be removed from the analyses.

Data distributions were evaluated and extreme outliers were removed before analysis of variance was performed. The data from the analysis of variance was used to calculate repeatability and reproducibility statistics for each test and for each of the samples tested.

It has been validated over the range of particle size distributions from 0 to 850 µm of cross-linked polyacrylate superabsorbent powders (see chapter Precision).

Table 1 — Repeatability (r) and Reproducibility (R) of the method

Test	Sample	N	Min	Max	Mean	r	R
PSD0	AJ224	174	0.00	0.23	0.08	0.17	0.18
	WR384	175	0.00	0.20	0.06	0.16	0.17
	XZ329	176	0.00	0.34	0.12	0.23	0.24
PSD45	AJ224	141	1.11	2.59	1.74	0.94	0.97
	WR384	176	0.00	2.80	1.22	1.40	1.53
	XZ329	149	0.78	3.22	1.99	1.61	1.66
PSD150	AJ224	163	11.15	20.35	15.58	5.10	5.28
	WR384	173	11.26	19.67	15.47	5.09	5.29
	XZ329	176	15.76	26.08	21.21	5.90	6.10
PSD300	AJ224	158	43.11	50.30	47.63	3.52	4.03
	WR384	172	43.25	51.41	47.75	3.65	4.03
	XZ329	176	66.06	76.56	70.70	6.09	6.30
PSD600	AJ224	159	28.44	40.63	34.51	7.10	7.54
	WR384	175	26.19	40.34	34.76	7.63	7.99
	XZ329	160	3.60	9.46	5.97	2.34	2.76
PSD850	AJ224	176	0.00	1.10	0.45	0.49	0.56
	WR384	176	0.00	0.90	0.38	0.47	0.53
	XZ329	163	0.00	0.08	0.01	0.05	0.05