INTERNATIONAL STANDARD

ISO 17190-9

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Urine-absorbing aids for incontinence — Test methods for characterizing polymer-based absorbent materials —

Part 9: Gravimetric determination of density

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

Partie 9: Détermination gravimétrique de la masse volumique

Reference number
ISO 17190-9:2001(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 17190 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 17190-9 was prepared by Technical Committee ISO/TC 173, *Technical systems and aids for disabled or handicapped persons*, Subcommittee SC 3, *Aids for ostomy and incontinence*.

ISO 17190 consists of the following parts, under the general title *Urine-absorbing aids for incontinence — Test methods for characterizing polymer-based absorbent materials*:

— *Part 1: Determination of pH*

— *Part 2: Determination of amount of residual monomers*

— *Part 3: Determination of particle size distribution by sieve fractionation*

— *Part 4: Determination of moisture content by mass loss upon heating*

— *Part 5: Gravimetric determination of free swell capacity in saline solution*

— *Part 6: Gravimetric determination of fluid retention capacity in saline solution after centrifugation*

— *Part 7: Gravimetric determination of absorption under pressure*

— *Part 8: Gravimetric determination of flowrate*

— *Part 9: Gravimetric determination of density*

— *Part 10: Determination of extractable polymer content by potentiometric titration*

— *Part 11: Determination of content of respirable particles*

ISO 17190 is intended to be used in conjunction with ISO 17191, *Urine-absorbing aids for incontinence — Airborne polyacrylate superabsorbent material in the workplace — Determination of the content in respirable dust by sodium atomic absorption spectrometry*.

Annex A of this part of ISO 17190 is given for information only.

Introduction

ISO 17190 consists of a series of test methods originally developed by *European Disposables and Nonwovens Association (EDANA)*. These test methods have been incorporated without technical changes into one International Standard consisting of eleven parts.

These test methods have been in practical use for several years, and have proven to be reliable with respect to common criteria of quality of test methods (validity, repeatability, etc.). They are applicable to polyacrylate superabsorbent materials, which occur in hygiene products, including urine-absorbing aids for incontinent persons. The test methods are addressed to the *material* exclusively. They are not intended to be used, and are not applicable for use with finished manufactured urine-absorbing aids.

Urine-absorbing aids for incontinence — Test methods for characterizing polymer-based absorbent materials —

Part 9: Gravimetric determination of density

1 Scope

This part of ISO 17190 specifies a method for determining the apparent density of polyacrylate (PA) superabsorbent powders.

This method has been tested in the range 0,67 g/ml to 0,72 g/ml (see annex A), but it is expected to be applicable to a wider range.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 17190. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 17190 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

ISO/TR 15510, *Stainless steels — Chemical composition*

3 Term and definition

For the purposes of this part of ISO 17190, the following term and definition applies.

3.1
apparent density
mass of unit volume of the powder after free fall

NOTE Apparent density is expressed in grams per millilitre.

4 Principle

The apparent density of PA superabsorbent powders is determined by pouring a representative sample through a specified funnel into a density cup. The mass, expressed in grams, of the sample in the cup is divided by the volume, expressed in millilitres, of the density cup to calculate the apparent density of the polymer.

5 Apparatus

5.1 Density cup (see Figure 1), consisting of a stainless-steel cylinder, smoothly finished inside (steel designation X5CrNiMo17-12-3 specified in ISO/TR 15510), having the following characteristics:

- capacity (100 ± 0,5) ml
- internal diameter (45 ± 0,1) mm
- internal height (h) (63,1 ± 0,1) mm

5.2 Funnel with an orifice damper (see Figure 1), made of polished stainless steel (steel designation X5CrNiMo17-12-3 specified in ISO/TR 15510) having the following characteristics:

- orifice internal diameter (10 ± 0,01) mm
- inclination angle of cone generatrix 20°
- height (145 ± 0,5) mm.

5.3 Funnel brush.

5.4 Spatula, square-ended with a flat blade or spoon or V-shaped.

5.5 Analytical balance, capable of weighing to the nearest 0,01 g for test specimens with a mass of 100,00 g.

5.6 Utility tray, 40 cm × 25 cm × 6 cm.

5.7 Beaker, of 250 ml capacity.

5.8 Ring stand, capable of holding the funnel in the ring.

Dimensions in millimetres

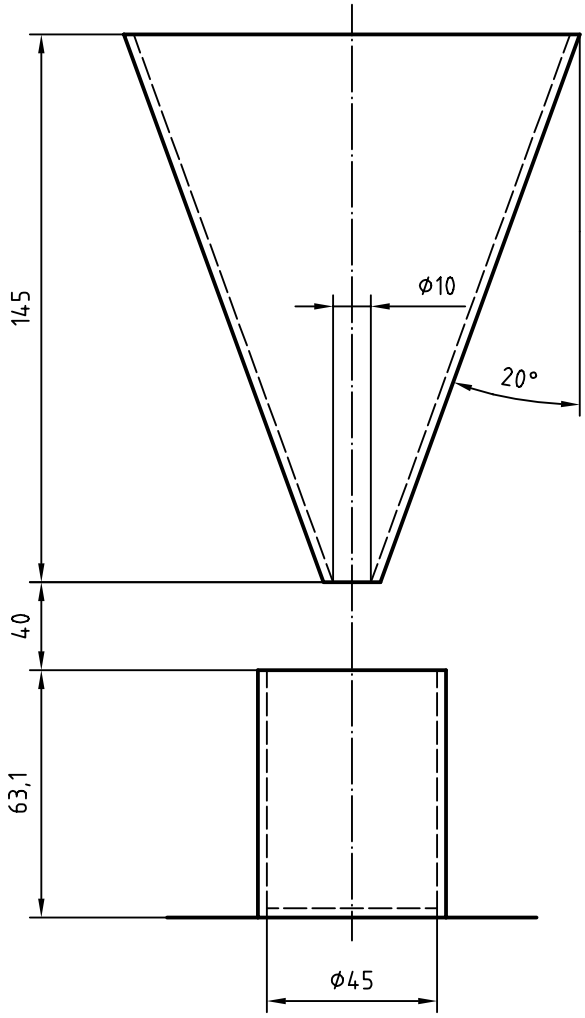

Figure 1 — Funnel and density cup

6 Sampling

CAUTION — Use respiratory protection, dust mask or fume hood, when handling sample amounts greater than 10 g.

In order to guarantee that a representative sample is taken from the bulk material contained in a large bag or a silo truck, remove the top layer (approximately 20 cm). Take the test sample with a scoop. Place it in an airtight container of adequate size within 3 min after sampling.

Keep the test samples in a closed container and allow them to equilibrate to the ambient laboratory temperature before removing a test portion to run the test. The preferred test conditions are (23 ± 2) °C and (50 ± 10) % 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.

Before taking a test portion out of the container to run the test, rotate the container three to five times so as to obtain a homogeneous product. Allow the container to sit 5 min before opening the lid and removing the test portion.

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

7 Procedure

7.1 Place the funnel (5.2) into the ring of the ring stand (5.8). Then place the ring stand holding the funnel into the utility tray (5.6) and the density cup directly beneath the orifice of the funnel. Adjust the height of the funnel outlet to (40 ± 1) mm above the top of the density cup.

7.2 Weigh the density cup to the nearest 0,01 g and record the mass as m_1.

7.3 Weigh, to the nearest 0,01 g, a 100,00 g test portion from the PA superabsorbent powder test sample into a 250 ml beaker.

7.4 Close the orifice damper located at the bottom of the funnel and pour the test portion along wall of the funnel to avoid settling.

7.5 Then completely open the orifice damper and allow the test portion to completely fill and overflow the density cup.

7.6 Gently rotate the funnel away from the density cup and allow the remainder of the sample to spill into the utility tray.

7.7 Using a spatula with the flat blade (5.4) held perpendicular to the top of the cup, level off the sample flush with the top of the cup to remove any excess PA superabsorbent powder. Tap the cup gently to settle the sample to avoid spilling during transfer to the balance.

7.8 Weigh the density cup containing the sample to the nearest 0,01 g and record the mass as m_2.

7.9 Carry out at least two determinations on the same well-mixed laboratory sample, in rapid succession by the same analyst.

7.10 Clean the density cup and the funnel using the funnel brush (5.3).

8 Calculation

The apparent density, ρ, expressed in grams per millilitre, of the PA superabsorbent powder is calculated as follows:

$$\rho = \frac{m_2 - m_1}{100}$$

where

m_1 is the mass, expressed in grams, of the density cup;

m_2 is the mass, expressed in grams, of the density cup containing the test portion;

100 is the volume, expressed in millilitres, of the density cup.

Report this value to the nearest 0,01 g/ml.

Calculate the average apparent density for the sample from the results obtained from the two or more test runs.

9 Precision

The data for the repeatability and reproducibility limits of this method are the result of interlaboratory tests carried out in 1997 by EDANA and are given in annex A.

The absolute difference between two single test results obtained under repeatability test conditions in accordance with ISO 5725-2 shall not exceed the repeatability limit r in more than 5 % of cases:

r = 0,02 g/ml

The absolute difference between two single test results obtained under reproducibility test conditions in accordance with ISO 5725-2 shall not exceed the reproducibility limit R in more than 5 % of cases:

R = 0,08 g/ml

If the repeatability and reproducibility test criteria are not met, the test shall be repeated twice, each in duplicate, after ensuring that the original sample is thoroughly mixed. If these criteria are still not met, report the results as unusual, then diagnose the source of error for example by verifying correct operation of the instruments and testing a portion of a material with a known value.

10 Test report

The test report shall include the following information:

a) the name and address of the testing institution;

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

c) a reference to this part of ISO 17190, i.e. ISO 17190-9;

d) whether or not lumps were present in the sample;

e) the results of the apparent density for each test portion, expressed in grams per millilitre (g/ml) to the nearest 0,1 g/ml, and the average value for duplicate determinations;

f) any unusual features noted during the determination or if the reproducibility and/or repeatability criteria were not met (see clause 9);

g) any deviation from the procedure, or any operations regarded as optional.

Annex A
(informative)

Statistical results of interlaboratory tests

Figures for the repeatability and reproducibility of this method are the result of collaborative studies carried out in 1997 by EDANA. The evaluation of the interlaboratory test was carried out in accordance with ISO 5725-2 and results as follows:

Sample identification	A	B	C
Number of participating laboratories	10	10	10
Number of laboratories whose results were accepted (excluding those whose results were discarded as outliers)	10	10	10
Number of accepted test results	40	40	40
Mean value (g/s)	10,94	10,62	11,93
Repeatability standard deviation (s_r)	0,12	0,17	0,15
Repeatability coefficient of variation	1,07 %	1,61 %	1,28 %
Repeatability limit (r) ($2{,}8 \times s_r$)	0,33	0,48	0,43
Reproducibility standard deviation of reproducibility (s_R)	1,87	1,82	1,73
Reproducibility coefficient of variation	17,07 %	17,18 %	14,46 %
Reproducibility limit (R) ($2{,}8 \times s_R$)	5,23	5,11	4,83

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