INTERNATIONAL STANDARD

ISO 14436

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Pulps — Standard tap water for drainability measurements — Conductivity 40 mS/m to 150 mS/m

Pâtes — Eau du robinet normalisée pour mesurages de l'aptitude à l'égouttage — Conductivité comprise entre 40 mS/m et 150 mS/m

Reference number
ISO 14436:2010(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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14436 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5, *Test methods and quality specifications for pulps*.

Introduction

It is well known that even small amounts of electrolytes (salts) influence the drainability properties of a pulp suspension (References [2] and [3] in the Bibliography). The common practice in pulp testing has been to prepare pulp suspensions using distilled water. Since many pulps contain some electrolytes this practice results in salt concentrations in the pulp suspension that vary with the pulp under test. By using water containing a specified amount of electrolytes when preparing the pulp suspension, the influence from salts arriving with the pulp is greatly reduced, see Annex A. By raising the salt concentration to such a level that the electrical conductivity of the pulp suspension exceeds 40 mS/m, the influence from small variations in salt concentration becomes negligible. For that reason, a standard tap water based on a divalent ion (Mg^{2+}) and having a conductivity exceeding 40 mS/m has been chosen in this International Standard.

NOTE The physical properties of pulp are affected by the presence and type of cations (Reference [4] in the Bibliography) in standard tap water.

It is important to have reliable drainability results, since in the evaluation of pulp quality the physical properties of laboratory sheets are often plotted as a function of drainability (SR or CSF) and are often reported at a certain SR value (Schopper Riegler-value) or a certain CSF-value (Canadian Standard Freeness-value).

The standard tap water can be used in the disintegration, the beating, and for the measurement of drainability properties. It must, however, be stated in the relevant International Standard whether the standard tap water described in this International Standard must be used.

Pulps — Standard tap water for drainability measurements — Conductivity 40 mS/m to 150 mS/m

1 Scope

This International Standard describes the specification and preparation of standard tap water, of conductivity between 40 mS/m and 150 mS/m, for drainability measurements.

This International Standard is applicable to all kinds of pulps.

NOTE ISO 14487[1] describes the specification and preparation of standard distilled/deionized water.

2 Normative references

The following referenced documents are indispensable for the application 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 6587, *Paper, board and pulps — Determination of conductivity of aqueous extracts*

3 Terms and definitions

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

3.1
standard tap water
distilled, deionized or tap water, having a conductivity between 40 mS/m and 150 mS/m achieved by adding a magnesium salt to the water, and having concentrations of iron, manganese and/or aluminium not exceeding 1 mg/l

4 Principle

The standard tap water is prepared by adding magnesium sulfate to distilled water, deionized water or any other type of water that meets the requirements in this International Standard (see 5.1) until the specified electrical conductivity of the water is reached.

5 Reagents for preparation of standard tap water

5.1 Distilled, deionized or tap water, having a conductivity of $\leqslant$ 20 mS/m, measured in accordance with ISO 6587. If tap water is used, this shall be potable water of good quality, having concentrations of trivalent ions (such as iron, manganese and/or aluminium) not exceeding 1 mg/l.

NOTE In many locations having "clean" tap water, that water can be used for preparing the standard tap water.

5.2 Magnesium sulfate, $MgSO_4$, **or magnesium sulfate heptahydrate**, $MgSO_4 \cdot 7H_2O$, of such a grade (pro-analysis, technical or puriss) that the requirements regarding the trivalent ions given in 5.1 are met in the standard tap water after preparation.

6 Preparation of standard tap water

6.1 Requirements

The standard tap water shall have a conductivity of 40 mS/m to 150 mS/m. This can be achieved using a magnesium sulfate concentration of $c(MgSO_4)$ = 0,5 g/l.

6.2 Stock solution

Prepare a stock solution, e.g. 100 g/l of $MgSO_4$ (or 204 g/l of $MgSO_4 \cdot 7H_2O$), by dissolving a known amount of the magnesium sulfate (5.2) in a known amount of the water (5.1). The concentration of the solution may be chosen with regard to the procedure for preparation of the standard tap water as outlined in 6.3.

6.3 Standard tap water

From the stock solution (6.2), prepare the standard tap water, for example, by adding 5 ml of a 100 g/l stock solution per litre of water (5.1).

NOTE In laboratories where large volumes of standard tap water are used, it might be convenient to add the stock solution (6.2) by means of an automatic device. Such a device can be controlled using an on-line conductivity meter, in which case the actual concentration of magnesium sulfate is not critical.

6.4 Checking of the required conductivity

Using the procedure specified in ISO 6587, check the conductivity of the water produced in 6.3 to establish that it meets the requirements for standard tap water. The conductivity shall be between 40 mS/m and 150 mS/m.

7 Reporting test results

When reporting test results [SR value (Schopper-Riegler value), CSF value (Canadian-Standard-Freeness value) and/or WRV (Water Retention Value)] obtained from pulp suspensions prepared using standard tap water, state clearly that standard tap water in accordance with ISO 14436 has been used.

Annex A
(informative)

Influence of the conductivity on drainability results for different pulps

A.1 Information about the study

This annex illustrates how the drainability results, in this case Schopper-Riegler values, vary when the conductivity of the pulp suspension is changed by adding magnesium sulfate heptahydrate, $MgSO_4 \cdot 7H_2O$ to the suspension. Two examples are given; one involves a pulp suspension containing an unbleached kraft pulp and the other involves a pulp suspension containing a bleached sulfate pulp. Both pulps are commercially available softwood pulps produced in Scandinavia.

A.2 Drainability results for unbleached kraft pulp

The unbleached kraft pulp was beaten in a PFI mill using 15 000 revolutions. Distilled water was used when preparing the pulp suspensions. The conductivity of the water was varied by adding magnesium sulfate heptahydrate (121,6 g/l). See Table A.1.

Table A.1 — Schopper-Riegler values at different conductivities (unbleached kraft pulp)

Added volume of $MgSO_4 \cdot 7H_2O$ ml/l	Conductivity of the water mS/m	Conductivity of the pulp suspension mS/m	Schopper-Riegler value SR
0	0,12	23,1	25,2
0,2	3,00	23,8	23,0
1,0	11,8	29,2	20,8
4,0	38,3	50,9	21,5
8,0	69,0	83,2	20,9

For the unbleached kraft pulp, the Schopper-Riegler value varies by approximately 5 SR units between the pulp suspension prepared using distilled water and the suspension prepared using the salted water. At a conductivity of about 30 mS/m, the Schopper-Riegler value becomes constant, i.e. there is no longer any influence of conductivity changes caused by the pulp.

A.3 Drainability results for bleached sulfate pulp

The fully bleached sulfate pulp was beaten in a PFI mill using 10 000 revolutions. Distilled water was used when preparing the pulp suspension. The conductivity of the water was varied by adding magnesium sulfate heptahydrate (121,6 g/l). See Table A.2.

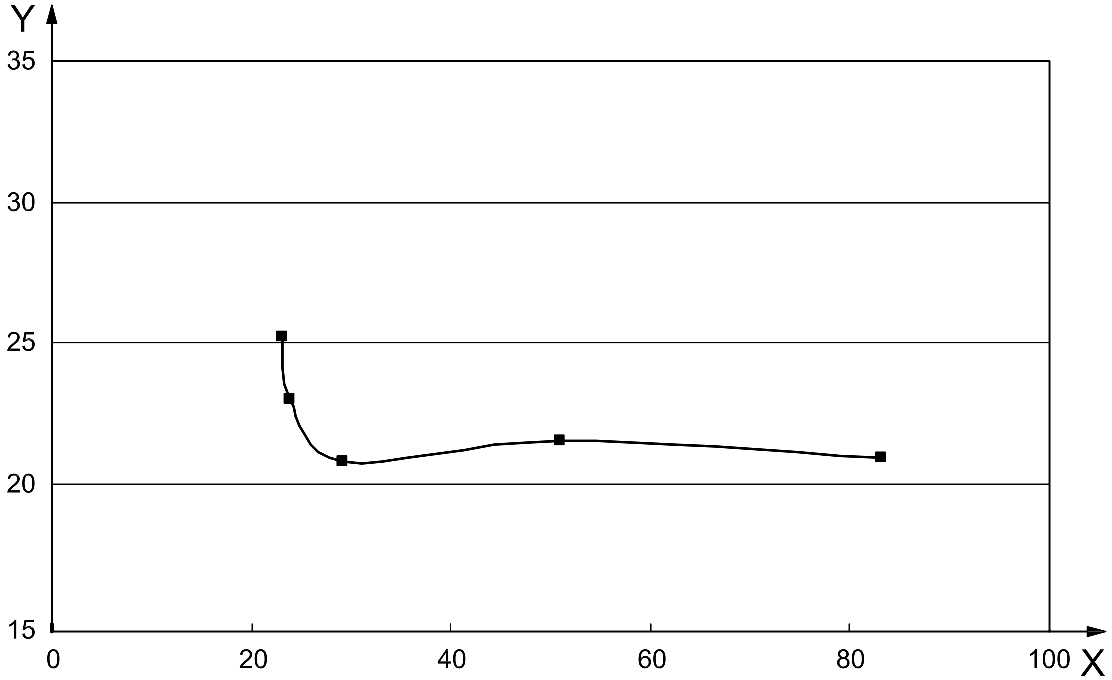
Table A.2 — Schopper-Riegler values at different conductivities (bleached sulfate pulp)

Added volume of $MgSO_4 \cdot 7H_2O$ ml/l	Conductivity of the water mS/m	Conductivity of the pulp suspension mS/m	Schopper-Riegler value SR
0	0,24	0,79	47,6
0,2	3,19	3,46	40,5
1,0	13,3	14,1	35,0
2,0	20,3	20,7	35,6
4,0	38,2	40,3	32,6
8,0	70,1	70,3	32,2
12,0	97,4	98,4	32,9

For the fully bleached sulfate pulp, the Schopper-Riegler value varies by approximately 15 SR units between the pulp suspension prepared using distilled water and the suspension prepared using the salted water. At conductivities of about 40 mS/m, the Schopper-Riegler value becomes constant, i.e. there is no longer any influence of conductivity changes caused by the pulp.

A.4 Large influence on the SR value of small conductivity changes at low conductivity

Figures A.1 and A.2 illustrate the large changes in Schopper-Riegler values caused by small changes in conductivity at low conductivity values, i.e. the situation that may occur if distilled water is used and the amount of salt in the pulp is not stable from the time one specimen is taken to the time the next specimen is taken (drawing samples from a production unit). By using the standard tap water described in this International Standard, such variations in the SR value are eliminated.

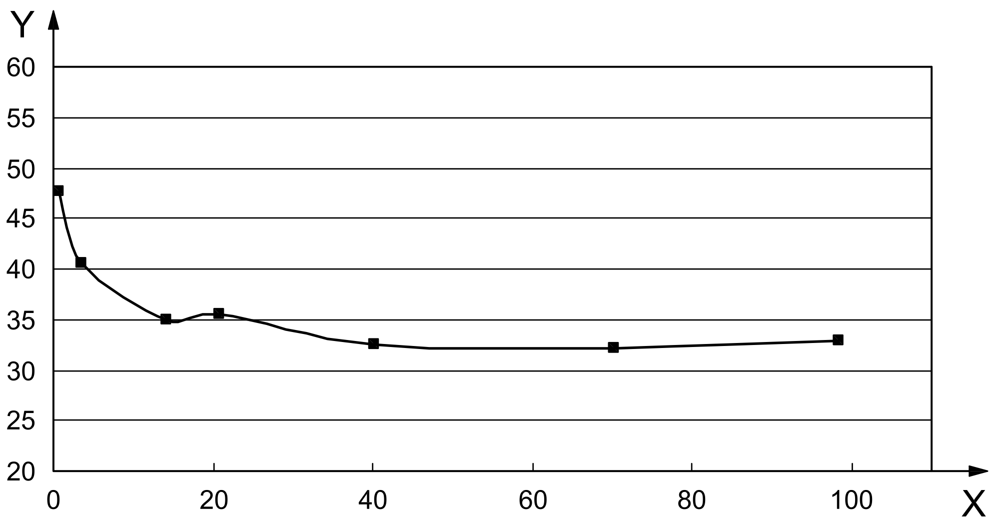


Key

X conductivity of pulp suspension, mS/m

Y Schopper-Riegler value, SR

Figure A.1 — Influence of the conductivity of a pulp suspension on the Schopper-Riegler value for an unbleached kraft pulp



Key

X conductivity of pulp suspension, mS/m

Y Schopper-Riegler value, SR

Figure A.2 — Influence of the conductivity of a pulp suspension on the Schopper-Riegler value for a bleached sulfate pulp

Bibliography

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[3] COHEN, W.E., FARRANT, G., WATSON, A.J. The Influence of Electrolytes on Pulp and Paper Properties. *APPITA Proc.* **3** (1949), pp. 72-104

[4] SCALLAN, A.M. and GRIGNON, J. *Svensk Papperstidning* **82**(2): 40 (1979)

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