INTERNATIONAL STANDARD

ISO 9184-7

First edition
1994-08-01

Paper, board and pulps — Fibre furnish analysis —

Part 7:
Determination of weight factor

Papier, carton et pâtes — Détermination de la composition fibreuse — Partie 7: Détermination du facteur-poids

Reference number
ISO 9184-7:1994(E)

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.

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.

International Standard ISO 9184-7 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5, *Test methods and quality specifications for pulp*.

ISO 9184 consists of the following parts, under the general title *Paper, board and pulps — Fibre furnish analysis*:

— *Part 1: General method*

— *Part 2: Staining guide*

— *Part 3: Herzberg staining test*

— *Part 4: Graff "C" staining test*

— *Part 5: Lofton-Merritt staining test (modification of Wisbar)*

— *Part 6: Determination of fibre coarseness*

— *Part 7: Determination of weight factor*

Part 1 gives general instructions for the performance of fibre furnish analysis. It should be used in conjunction with the staining guide (see part 2) and the staining tests (see parts 3 to 5).

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Printed in Switzerland

Additional parts of this International Standard will be published if required by the development of new kinds of fibres or new staining tests.

Annex A of this part of ISO 9184 is for information only.

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Paper, board and pulps — Fibre furnish analysis —

Part 7:
Determination of weight factor

1 Scope

This part of ISO 9184 specifies two methods for determining the weight factor of fibres used in the fibre furnish analysis of paper, board and pulp. In this part of ISO 9184, the weight factor is obtained either by a comparison method or by calculating from the fibre coarseness.

This part of ISO 9184 is applicable to all kinds of fibres of pulps from unmixed wood species. In this context, it means pulps which do not contain more than 5 % of other fibres with an essentially different weight factor (see ISO 9184-1:1990, annex A).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9184. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9184 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9184-1:1990, *Paper, board and pulps — Fibre furnish analysis — Part 1: General method.*

ISO 9184-2:1990, *Paper, board and pulps — Fibre furnish analysis — Part 2: Staining guide.*

ISO 9184-6:1994, *Paper, board and pulps — Fibre furnish analysis — Part 6: Determination of fibre coarseness.*

3 Definition

For the purposes of this part of ISO 9184, the following definition applies.

3.1 weight factor: A specific dimensionless quantity for each kind of fibre. It is the ratio of the mass per unit length of a particular kind of fibre to that of a reference fibre with a mass per unit length of 0,180 mg/m.

NOTE 1 Originally rag (staple cotton) fibre was selected as the standard fibre with which all other fibres were compared. The weight factor or rag was taken as 1,00 and its average fibre coarseness was found to be 0,180 mg/m.[1)]

1) The references cited in annex A may be useful in this respect.

4 Principle

4.1 Comparison method

The sample to be tested is mixed in slush form with the reference pulp (see note 2), in a known ratio of masses, to form a homogeneous mixture. The numbers of fibres of both pulps are counted under the microscope and the weight factor of the sample is calculated.

NOTE 2 The reference pulp may be any pulp that contains only one type of well-defined fibre (mechanical pulps and beaten pulps are unsuitable), and whose weight factor is known or has been determined from fibre coarseness (see 9.2).

The Finnish Pulp and Paper Research Institute (FPPRI) keeps in stock a selected uniform batch of cotton linters. The fibre coarseness of the fibres from this batch has been carefully determined at FPPRI and at STFI, Stockholm, Sweden. Samples of this batch, with the assigned value of fibre coarseness, can be ordered from FPPRI (address: PO Box 70, SF-02151 Espoo, Finland) or from STFI (address: PO Box 5604, S-11 486 Stockholm, Sweden).

4.2 Fibre coarseness method

The weight factor is calculated from the fibre coarseness as described in 9.2. (See ISO 9184-6 for determination of fibre coarseness).

5 Reagents, apparatus and reference pulp

Use the reagents and the apparatus described in ISO 9184-1.

Select the reference pulp so that when stained as described in ISO 9184-2 it differs in colour from the unknown pulp. Cotton is suitable in the test mixtures with all kinds of wood fibre pulps (see note 2).

6 Preparation of sample

6.1 Air-dry pulp

Tear about 5 g of the sample and of the reference pulp into small pieces and place them in separate Petri dishes or similar dishes.

6.2 Slush pulp

Make a pad by filtering a sample of the slush pulp on a glass filter. Air-dry the pad and continue as described in 6.1 for a sample of air-dry pulp.

7 Preparation of fibre slides

7.1 Weighing of test mixtures

Condition the sample and the reference pulp in the open Petri dishes for not less than 4 h near the balance.

Prepare test mixtures containing about 20 %, 40 %, 60 % and 80 % by mass of the sample, the balance being the reference pulp.

7.2 Fibre slides

Disperse the mixtures and prepare the slides as specified for pulp samples in ISO 9184-1.

Prepare two slides for each mixture i.e. eight slides in all. Use an appropriate stain to differentiate the reference pulp from the sample (see ISO 9184-2).

8 Procedure

Use the procedure described in ISO 9184-1.

Identify and count under the microscope the fibres of the sample and of the reference pulp separately when they cross the centre mark of the eyepiece. Count approximately 300 fibres on each slide i.e. about 600 fibres for each mixture. Repeat the procedure with the remaining three mixtures.

9 Expression of results

9.1 Comparison method

Calculate the weight factor of the sample, f_x, for each mixture separately using the equation

$$f_x = f_r \frac{n_r m_x}{n_x m_r}$$

where

f_r is the weight factor of the reference pulp;

n_r is the number of reference pulp fibres counted;

n_x is the number of sample pulp fibres counted;

m_r is the weighed mass of the reference pulp;

m_x is the weighed mass of the sample.

Compare the values of f_x obtained for the four mixtures. If the minimum value exceeds 80 % of the maximum value, calculate the mean weight factor from the four results.

If the minimum value is less than 80 % of the maximum value, recount the number of fibres in the mixtures for which the extreme values are obtained, by preparing two new slides and repeating the procedure.

If the minimum value now exceeds 80 % of the maximum value, recalculate the mean using the new values. If the minimum value still is less than 80 % of the maximum value, discard the results and repeat the determination from the beginning.

Report the weight factor to two decimal places.

9.2 Fibre coarseness method

Calculate the weight factor, f, from the fibre coarseness, ϱ_l, using the equation[2)]

$$f = 5{,}55\varrho_l$$

where

ϱ_l is the fibre coarseness, expressed in milligrams per metre to three significant figures.

Report the weight factor as a dimensionless value to two decimal places.

9.3 Precision

The precision of the results depends both on the skill of the operator and on the number of fibres counted.

Chemical softwood pulps with weight factors in the range from 0,9 to 1,1 have been analysed for the repeatability of the comparison method at the Finnish Pulp and Paper Research Institute by several operators using several instruments. The difference between two test results did not, in 95 % of cases, exceed the values given in table 1.

Table 1 — Repeatability values obtained intralaboratory, r_w (weight factor range: 0,90 to 1,10)

Number of fibres counted	**Comparison method** r_w	**Fibre coarseness method** (in accordance with ISO 9184-6:1994, subclause 10.2) r_w
2 400	0,12	0,06
10 000	0,11	0,04

10 Test report

The test report shall include the following particulars:

a) reference to this part of ISO 9184 and the method in the determination;

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

c) the results;

d) the name, origin and weight factor of the reference pulp;

e) any unusual features observed in the course of the test;

f) any operations not specified in this part of ISO 9184 or regarded as optional, which might have affected the results.

2) The references cited in annex A may be useful in this respect.

Annex A
(informative)

Bibliography

[1] CLARK, J. d'A. Notes on Weight Factors for Fiber Microscopy. *Tappi* **34** (1951):7, pp. 317-318.

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[3] STRELIS, I. Improved Method of Fibre Analysis of Newsprint. *Pulp and Paper Mag. Can.* **70**, (1969):13, pp. 63-66.

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