

INTERNATIONAL STANDARD

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9184-6

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Paper, board and pulps — Fibre furnish analysis —

Part 6:

Determination of fibre coarseness

*Papier, carton et pâtes — Détermination de la composition fibreuse —
Partie 6: Détermination de la masse linéique des fibres*



Reference number
ISO 9184-6:1994(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 9184-6 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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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 6: Determination of fibre coarseness

1 Scope

This part of ISO 9184 specifies a method for the determination of fibre coarseness, which is a fibre property characterizing pulp. The weight factor (determined in accordance with ISO 9184-7) used in the fibre furnish analysis of paper, board and pulp can be calculated from the fibre coarseness.

This method is applicable to pulps with relatively intact fibres, such as chemical and semichemical pulps. It does not apply to mechanical and chemimechanical pulps or highly beaten chemical or semichemical pulps.

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 638:1978, *Pulps — Determination of dry matter content*.

ISO 5269-1:1979, *Pulps — Preparation of laboratory sheets for physical testing — Part 1: Conventional sheet-former method*.

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

ISO 9184-7:1994, *Paper, board and pulps — Fibre furnish analysis — Part 7: Determination of weight factor*.

3 Definition

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

3.1 fibre coarseness: Mean mass (oven dry) per unit length of a particular kind of fibre.

NOTE 1 In this part of ISO 9184, the fibre coarseness is expressed in milligrams per metre.

4 Principle

A known mass of fibres is distributed evenly over a known area. The number of fibre crossings along a line of known length is counted on a microscope slide. The fibre coarseness is obtained by calculation.¹⁾

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

5 Reagents

5.1 Stain, aqueous solution, which gives a strong colour to the fibres.

Suitable stains for chemical wood pulps include Congo Blue solution, 10 g/l, and Victoria Blue solution, 10 g/l.

5.2 Sodium hydroxide, solution of about 10 g/l.

6 Apparatus

Usual laboratory apparatus, and, in particular, the following.

6.1 Microscope, with accessories as specified in ISO 9184-1:1990, clause 6, and equipped with a mechanical stage with free horizontal movement between 50 mm and 60 mm. The length of the movement is measured with an accuracy of $\pm 0,1$ mm.

6.2 Sheet-former, as described in ISO 5269-1.

6.3 Glass filter funnel, 200 ml capacity, with sintered disc, pore diameter between 15 μ m and 40 μ m.

6.4 Bottles, 100 ml capacity, with wide neck, containing about 250 glass beads of diameter 4 mm to 5 mm.

6.5 Paper filters, for qualitative analysis, cut to the same area as the wire of the sheet-former.

7 Preparation of sample

7.1 Air-dried pulp

Tear about 5 g of the sample into small pieces and place it in a Petri dish or a similar dish.

7.2 Slush pulp

Make a pad of the sample by filtering on a glass filter (6.3). Air-dry the pad and continue as above with the air-dried pulp (7.1).

8 Preparation of microscope slides

8.1 Weighing and staining of test portions

Condition the sample in an open Petri dish for not less than 4 h near the balance.

Take four test portions of 10 mg to 20 mg each weighed to the nearest 0,1 mg. Take about 10 mg when the sample contains fine fibres, for example from chemical hardwood pulps. For softwood pulp fibres, take about 20 mg. These values apply when the area of the wire in the sheet mould is 200 cm². If the area differs from this, the mass of the test portion should be changed proportionally. At the same time, take a separate portion of approximately 5 g, and determine its dry matter content as described in ISO 638.

Boil the test portions separately (for about 1 min) in a test tube with sodium hydroxide solution (5.2), filter, and wash with water on the glass filter funnel (6.3). Transfer the wet pad to a bottle (6.4). Add 50 ml of water and shake the bottle until the test portion is totally dispersed. Filter the suspension again on the same glass filter. Transfer the fibre pad to a test tube. Add 10 ml of the staining reagent (5.1) and stain by boiling for 1 min to 2 min while stirring continuously with a glass rod (see note 2). Pour the suspension back into the glass filter funnel and leave it there for about 5 min. Apply suction, filter and wash the pad with water until the filtrate is colourless. Transfer the stained pad to the bottle (6.4) and rinse all the remaining fibres from the glass filter with a small amount of water into the same bottle. Shake the bottle until the stained pad is totally dispersed.

NOTE 2 Staining by boiling in the test tube is not necessary if the colour of the fibres can be stained intensely at room temperature. In this case, staining can be performed in the glass filter funnel.

8.2 Sheet preparation

Place a sheet of filter paper (6.5) on the wetted wire screen of a sheet-former (6.2). Pour water into the stock container until it is half full. Pour and rinse all the stained fibres of the first test portion from the bottle into the stock container and fill it up to the mark with water. Stir and drain as described in the laboratory sheet forming procedure given in ISO 5269-1. When the water has drained off, lift the stock container and close the drainage valve. Remove the wet sheet from the wire, place it on a blotter and protect it from dust and draught. Filter all four test portions in the same way.

9 Procedure

Cut four to eight strips about 10 mm $\times$ 70 mm in size from each sheet. Place a strip on a wetted microscope slide. The strip shall remain wet during the counting. Place the slide on the stage of the microscope. Move the stage in such a way that the

centre mark of the eyepiece follows a line of known length, which shall be readable to the nearest 0,1 mm. Count each fibre as it passes the centre mark following the instructions given in ISO 9184-1:1990, subclause 9.2. Repeat the procedure with further strips until not less than 600 fibres have been counted.

Repeat the procedure with the remaining three sheets, which means counting at least 2 400 fibres.

10 Expression of results

10.1 Calculation

Calculate the fibre coarseness, ρ_l , in milligrams per metre, for each test portion separately, using the equation²⁾

$$\rho_l = \frac{2Xlm}{\pi An}$$

where

- X is the dry matter content of the sample, expressed as a percentage by mass;
- l is the total length of the counting lines, in centimetres;
- m is the mass of the portion, in milligrams;
- A is the area of the filter paper (6.5) covered by the stained fibres, in square centimetres;
- n is the total number of fibres counted.

Compare the fibre coarseness values obtained for the four test portions.

If the minimum value exceeds 85 % of the maximum value, calculate the mean fibre coarseness from the four results.

If the minimum is less than 85 % of the maximum value, count new strips from the sheets for which extreme results were obtained. If the minimum value is still less than 85 % of the maximum value, discard the results and carry out the determination from the beginning.

Report the fibre coarseness in milligrams per metre to three significant figures.

10.2 Precision

For pulps of clearly defined whole fibres, the precision of the result depends both on the skills of the operator and on the number of fibres counted. Chemical softwood pulps with fibre coarseness from 0,160 mg/m to 0,190 mg/m have been analysed for the repeatability of this method at the Finnish Pulp and Paper Research Institute by several operators using one instrument. The difference between two test results did not, in 95 % of cases, exceed the values given in the table below.

Table 1 — Repeatability values obtained intralaboratory, r_w (Fibre coarseness range: 0,160 mg/m to 0,190 mg/m)

Number of fibres counted	r_w mg/m
2 400	0,011
4 800	0,008
10 000	0,006

11 Test report

The test report shall include the following particulars:

- a) reference to this part of ISO 9184;
- b) all the indications necessary for complete identification of the sample;
- c) the results;
- d) number of fibres counted;
- 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

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