INTERNATIONAL STANDARD

ISO 9184-3

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Paper, board and pulps — Fibre furnish analysis —

Part 3:
Herzberg staining test

Papier, carton et pâtes — Détermination de la composition fibreuse — Partie 3: Coloration de Herzberg

Reference number
ISO 9184-3:1990(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 9184-3 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

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: Weight factors by fibre coarseness method*

— *Part 7: Weight factors by comparison method*

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).

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.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland
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Paper, board and pulps — Fibre furnish analysis —

Part 3:
Herzberg staining test

1 Scope

This part of ISO 9184 specifies the preparation, use and colour reactions of Herzberg stain in fibre furnish analysis. It should be used in conjunction with ISO 9184-1 and, if necessary, with other staining tests defined in ISO 9184-2.

The Herzberg staining test is applicable to the qualitative and quantitative differentiation between chemical, mechanical and rag pulps. The stain also permits the qualitative identification of semi-chemical pulp as well as the differentiation between regenerated cellulose fibres (viscose, etc.) and synthetic fibres.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 9184. At the time of publication, the edition indicated was 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 edition of the standard 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.*

3 Principle

Fibres are stained with Herzberg stain and examined under the microscope.

4 Reagents

CAUTION — Some of the components used in preparing this stain are toxic. The stain should be prepared and handled in keeping with safe laboratory practice.

Use only reagents of recognized analytical grade and distilled water or water of equivalent purity.

4.1 Zinc chloride solution, saturated at room temperature.

Add zinc chloride ($ZnCl_2$) to about 100 ml of warm water until an undissolved residue remains. Allow to cool to room temperature and check that some zinc chloride crystallizes. Store in a brown reagent bottle. The solution is stable.

4.2 Iodine solution.

Mix 2,1 g of potassium iodide (KI) and 0,1 g of iodine (I_2). Add 5 ml of water dropwise to the mixture by mean of a pipette, with constant stirring. Dissolution of the iodine into a minimum quantity of water is important, because potassium iodide is the solvent for iodine. If some iodine remains undissolved — probably because the water was added too rapidly — discard the solution.

4.3 Herzberg stain.

Mix 15 ml of the zinc chloride solution (4.1), 1 ml of water and the whole of the iodine solution (4.2). Allow to stand at least 6 h so that any precipitate formed settles. Decant the clear solution into a brown dropper bottle and add a flake of iodine. Keep in the dark when not in use. Fresh stain should be made every 2 months.

Before using the fresh stain, check it on known fibres. Cotton fibres should stain wine-red. A bluish

colour indicates that the solution is too strong and should be diluted with a very small portion of water.

Fibres of chemical pulp should stain blue to bluish-violet. A reddish colour is a sign that the zinc chloride concentration is too low. Adjust by adding a few crystals of zinc chloride.

5 Procedure

5.1 Staining

Stain the fibres by applying 2 to 3 drops of the Herzberg stain (4.3) on the fibre slide prepared in accordance with ISO 9184-1.

5.2 Determination

Place the stained fibre slide under the microscope and examine using a magnification of × 40 to × 120. Identify and count the fibres in accordance with ISO 9184-1, on the basis of the colour developed by the Herzberg stain (see table 1).

The shade of the blue colour obtained with chemical pulp fibres depends on the pulping process and the degree of delignification; incompletely delignified fibres have a yellow shade.

The colours obtained with Herzberg stain are unstable. The blue colour of chemical pulp fibres gradually becomes darker; the yellow colour of mechanical pulp fibres assumes a greyish hue.

NOTE 1 In addition to the main colours obtained, there are other features that may help in fibre furnish analysis. Herzberg stain may be used to indicate the presence of softwood sulfite fibres by virtue of the fact that the pitch content of ray cells is stained yellow.

6 Expression of results and test report

Express and report the results in accordance with ISO 9184-1.

Table 1 — Colour chart for Herzberg stain

Type of pulp	Colour
Chemical pulp (wood, straw, esparto, etc.)	Blue, bluish-violet[1)]
Mechanical pulp (wood, straw, jute, etc.)	Yellow
Rag pulp (cotton, linen, hemp, ramie, etc.)	Wine-red
Semi-chemical and chemi-mechanical pulp	Dull blue, dull yellow, mottled blue and yellow
Regenerated cellulose fibres (viscose etc.)	Dark bluish-violet
Cellulose acetate fibres	Yellow
Synthetic fibres	Colourless to brownish-yellow
1) Raw softwood kraft pulp at a yield of about 60 % shows a dark yellow colour.	

Annex A
(informative)

Bibliography

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[2] *Fiber analysis of paper and paperboard.* TAPPI Test Method T 401, om-88.

[3] GRAFF, J.H.: *A Color Atlas for Fiber Identification.* The Institute of Paper Chemistry, Appleton, WI, 1940, Plate 1.

[4] MADDOX, H.A.: *Pulp Paper Mag. Can.* **15** (1917): May 3, pp. 435-437.

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