

# INTERNATIONAL STANDARD

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## **Paper — Determination of tearing resistance (Elmendorf method)**

*Papier — Détermination de la résistance au déchirement (Méthode  
Elmendorf)*



Reference number  
ISO 1974:1990(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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 1974 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

This third edition cancels and replaces the second edition (ISO 1974:1985), of which this constitutes a complete revision. In particular, this edition deals only with single tear testers, all references to double tear instruments having been deleted, and allows for the use of digital read-out variants. An alternative calibration procedure has been included.

Annexes A and B provide details of the apparatus and calibration procedures respectively. Annex C refers to units used with older apparatus.

Annexes A and B form an integral part of this International Standard. Annex C is for information only.

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# Paper — Determination of tearing resistance (Elmendorf method)

## 1 Scope

This International Standard specifies a method for determining the tearing resistance of paper. It can also be used for light boards if the tearing resistance is within the range of the instrument.

This International Standard does not apply to corrugated fibreboard, but it may be applied to the components of such boards. It is not suitable for determining the cross-direction tearing resistance of highly directional paper (or board).

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 186:1985, *Paper and board — Sampling to determine average quality*.

ISO 187:1977, *Paper and board — Conditioning of samples*.

ISO 536:1976, *Paper and board — Determination of grammage*.

## 3 Definitions

For the purposes of this International Standard, the following definitions apply.

**3.1 tearing resistance:** The mean force required to continue the tearing started by an initial cut in a single sheet of paper (or board). If the initial cut is

in the machine direction, the result is given as machine-direction tearing resistance; similarly, if the initial cut is in the cross direction, the result is given as cross-direction tearing resistance. The result is expressed in millinewtons (mN).

**3.2 tear index:** The tearing resistance of the paper (or board) divided by its grammage. The result is expressed in millinewton square metres per gram ( $\text{mN}\cdot\text{m}^2/\text{g}$ ).

## 4 Principle

A test piece of superimposed sheets (normally four), with a specified pre-cut slit, is torn through a fixed distance using a pendulum which applies the tearing force by moving in a plane perpendicular to the initial plane of the test piece. The work done in tearing the test piece is measured by the loss in potential energy of the pendulum.

The average tearing force (work done divided by the total distance torn) is indicated by a scale on the pendulum or a digital display.

The tearing resistance of the paper is determined from the average tearing force and the number of sheets comprising the test piece.

## 5 Apparatus

**5.1 Elmendorf-type tear tester,** of suitable capacity complying with the requirements specified in annex A.

### NOTES

1 Some apparatus may be equipped with digital indication of tearing resistance. Such apparatus normally replaces the friction pointer system with a transducer for sensing the angular movement of the pendulum. Transducer outputs are electrically processed to give a direct digital read-out of average tearing resistance. In other respects this type of apparatus conforms to the requirements of annex A.