
**Corrugated fibreboard — Determination
of grammage of the component papers
after separation**

*Carton ondulé — Détermination du grammage des papiers composants
après leur séparation*

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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 3039 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*.

This second edition cancels and replaces the first edition (ISO 3039:1975), which has been technically revised to include precision data.

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Introduction

This International Standard describes a procedure where the separated component layers are allowed to dry freely, i.e. unrestrained. In 2008, an international round-robin was performed to compare precision data between the two drying procedures: free drying (which can involve shrinkage) and restraint drying (where the layers are prevented from shrinking). As no statistical provable difference in the repeatability and the reproducibility between the two drying procedures was observed, the faster and simpler procedure, i.e. the free drying method, was chosen for this International Standard. Precision data for free drying are given in Annex A.

There is an indication from test results that some of the adhesive enters and stays in the papers it comes in contact with, and is not or cannot be removed by the method we use. Thus, the results for layers will generally be greater than the initial values.

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Corrugated fibreboard — Determination of grammage of the component papers after separation

1 Scope

This International Standard specifies a method for determining the grammage of the component layers from which corrugated fibreboard has been made.

This International Standard is applicable to all types of corrugated fibreboard.

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 186, *Paper and board — Sampling to determine average quality*

ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

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3 Terms and definitions

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

3.1

grammage

mass per unit area

mass of a unit area of paper or board determined by a specific method of test

NOTE Grammage is expressed in grams per square metre.

[ISO 536:1995^[1], definition 3.1]

3.2

corrugated fibreboard

board consisting of one or more sheets of fluted paper glued to a flat sheet of board or between several sheets

[ISO 4046-4:2002^[2], definition 4.49]

3.3

layer

component that is a part of corrugated fibreboard, which normally comprises a fluted layer (fluting) and a flat layer (liner) on each side

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3.4

facing

linerboard (liner) used as the flat component of corrugated fibreboard

[ISO 4046-4:2002, definition 4.66]

3.5

fluting medium

corrugating medium

fluting paper or board intended for use in the manufacture of corrugated fibreboard

[ISO 4046-4:2002, definition 4.73]

3.6

linerboard

board used as the facing material in the production of combined corrugated fibreboard, solid fibreboard or "carton compact"

[ISO 4046-4:2002, definition 4.105]

4 Principle

Separation of the components of corrugated board specimens, to determine their grammage, by soaking in water so that the component layers can be separated. Drying and conditioning of the component layers. Determination of grammage of the individual layers.

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5 Reagents

5.1 **Tap water**, normally having a temperature of 20 °C to 30 °C but not exceeding 60 °C.

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6 Apparatus

Use ordinary laboratory apparatus and the following.

6.1 **Tank**, of sufficient size for immersion of the test specimen, to contain water at room temperature (20 °C to 30 °C) or hot water not exceeding 60 °C.

6.2 **Cutting device**, for cutting circular (diameter 112,8 mm ± 0,5 mm) or square (length 100 mm ± 0,5 mm) specimens from the corrugated fibreboard.

6.3 **Drying oven**, capable of maintaining the air temperature at 105 °C ± 2 °C, and suitably ventilated.

6.4 **Balance**, with an actual scale interval of 0,001 g which makes it possible to determine the grammage of the separate layers to three significant figures (including micro-flute with grammage < 100 g/m² for the separate layers). When in use, the balance shall be shielded from air currents.

7 Sampling

If the tests are being made to evaluate a lot, carry out the sampling in accordance with ISO 186. If the tests are made on another type of sample, make sure that the specimens taken are representative of the sample received.

The surfaces of the specimens taken from the corrugated fibreboard shall be free from any damage that may affect the test results.

The specimens should, if possible, be taken from non-printed and non-coated corrugated fibreboard.

8 Preparation of specimens

Using the cutting device (6.2), cut the specimens to an area of 10 000 mm² (100 cm²), corresponding to a diameter of 112,8 mm ± 0,5 mm or a square with sides of 100,0 mm ± 0,5 mm.

Cut enough specimens to enable the determination of grammage on five test pieces from each component layer.

9 Procedure

9.1 Separation of component layers

Using the tank (6.1), immerse the specimens in tap water (5.1) long enough to cause the component layers of the corrugated fibreboard to separate spontaneously or with an extremely light pull. Make sure that the corrugated fibreboard remains submerged in the water, placing weights on the top of it if needed. When separating the component layers, care shall be taken to ensure that minimal fibres are removed from one surface and adhere to the adjoining one.

In the case of water-resistant adhesive, the water (5.1) can be heated to a temperature not exceeding 60 °C to accelerate the process and to separate (corrugated fibreboard).

The suitable immersion time may vary from grade to grade. In most cases, a few minutes are sufficient, but for grades having highly water-resistant adhesive, the necessary immersion time may be several hours. If the immersion time is unknown, it is recommended that the suitable immersion time be evaluated before testing.

Blotters may be used to remove excess water, but not when drying.

9.2 Removal of the adhesive

By lightly scraping the surface, remove, while still wet, the adhesive showing on the surface of the component layer, which has not been absorbed by the sheet.

Complete removal of the absorbed adhesive cannot be expected. Removal of the fibres shall be avoided.

9.3 Drying of separated layers

Dry the separated layers, i.e. liners and fluting, in an oven at a temperature of 105 °C ± 2 °C (6.3) to constant mass.

Avoid using blotters during drying since components in the adhesive, e.g. starch, might adhere to the fibres.

9.4 Conditioning of separated layers

After drying, condition the separated layers in accordance with ISO 187.

9.5 Preparation of test pieces

After cleaning and conditioning, flatten the fluting medium and re-cut the test pieces to an area of 10 000 mm² (100 cm²) using the cutting device (6.2). It is not necessary to re-cut the liners.