INTERNATIONAL STANDARD

ISO 536

Second edition
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Paper and board — Determination of grammage

Papier et carton — Détermination du grammage

Reference number
ISO 536:1995(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 536 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 536:1976), which has been technically revised.

Annex A forms an integral part of this International Standard. Annex B is for information only.

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Paper and board — Determination of grammage

1 Scope

This International Standard specifies a method of determining the grammage of paper and 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 186:1994, *Paper and board — Sampling to determine average quality.*

ISO 187:1990, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples.*

ISO 287:1985, *Paper and board — Determination of moisture content — Oven-drying method.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 grammage: Mass of a unit area of paper or board determined by a specific method of test.

Grammage is expressed in grams per square metre.

4 Principle

The area of the test pieces and their masses are determined and the grammage is calculated.

5 Apparatus

5.1 Cutting device, capable of repeatedly cleanly cutting test pieces of the same nominal size whose area falls within ± 1,0 % of a known area. This shall be checked frequently by measurement and, provided that the above accuracy is attained, the mean area obtained in these checks shall be used for calculating grammage.

With certain types of paper and board it will be found, after carrying out this determination of area, that test pieces cannot be cut with the accuracy just defined; in such instances the area of every test piece shall be determined individually.

5.2 Balance, sufficiently accurate, over the range of mass for which it is used, to measure to within 0,5 % of the actual mass. It shall be sensitive enough to detect a change of ± 0,2 % in the mass to be weighed and, if the balance is of the direct-reading type, it shall be graduated so that readings may be taken to this degree of accuracy.

Special sheet-weighing balances, designed to weigh test pieces of a given size and which indicate grammage directly, may be used provided that the above conditions are fulfilled and that the area of each test piece on a single weighing is not less than 500 cm^2 and not more than 1 000 cm^2 (see clause 8 and 9.2).

When in use, the balance shall be shielded from air currents.

6 Sampling

The selection of units and sheets and the taking of specimens shall be carried out in accordance with ISO 186. The number of specimens taken (at least five) shall be sufficient for at least 20 test pieces.

7 Conditioning

For determination of conditioned grammage, the specimens shall be conditioned in accordance with ISO 187.

If a determination is made in the "oven-dry" or "as-taken" condition (see annex A), or if any other conditioning atmosphere is used, the reported results shall be qualified by a statement indicating the condition of the test pieces at the time of weighing.

8 Procedure

For determination of conditioned grammage, prepare and weigh the test pieces in the same atmospheric conditions used to condition the specimens.

Using the cutting device (5.1), cut at least 20 test pieces in total from at least five specimens, if possible taking the same number from each specimen.

Whenever possible, each test piece shall have an area of not less than 500 cm^2 (preferably 200 mm × 250 mm) and not more than 1 000 cm^2; it may, if necessary, be composed of several smaller pieces.

Determine the area of each test piece by calculation from measurements taken to the nearest 0,5 mm.

Weigh each test piece on the balance (5.2) and express its mass to three significant figures.

NOTE 1 It is recommended, especially when dealing with small pieces, that contact of the test piece with bare hands be avoided.

9 Expression of results

9.1 If the procedure in clause 8 is followed, calculate the grammage g, expressed in grams per square metre, of each test piece, using the equation

$$g = \frac{m}{A} \times 10\,000$$

where

m is the mass, in grams, of the test piece;

A is the area, in square centimetres, of the test piece.

Alternatively, the grammage may be calculated using the equation

$$g = \frac{\overline{m}}{\overline{A}} \times 10\,000$$

where

$\overline{m}$ is the average mass, in grams, of the test pieces;

$\overline{A}$ is the average area, in square centimetres, of the test pieces.

9.2 If a special sheet-weighing balance as described in 5.2 is used, calculate the grammage g, expressed in grams per square metre, using the equation

$$g = \frac{A_1}{A} \times g_1$$

where

g_1 is the indicated grammage, in grams per square metre, of the test piece;

A_1 is the area, in square centimetres, of the test piece for which the balance is calibrated;

A is the area, in square centimetres, of the weighed test piece.

9.3 Calculate the mean of the results and the standard deviation and express them to three significant figures.

10 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) date and place of testing;

c) conditioning atmosphere used;

d) all information necessary for identification of the sample;

e) area of test piece used;

f) number of replicate tests;

g) mean and standard deviation of the results;

h) if specimens have been taken from more than one position across a reel or sheet and information on grammage variation is required, the details listed in c), d), e) and f) shall be reported for each position separately;

i) any departure from the procedure specified in this International Standard and any circumstances that may have influenced the results.

Annex A
(normative)

Determination of grammage on "oven-dry" and "as-taken" bases

A.1 Determination of grammage on an "oven-dry" basis

Determine the area of each test piece after conditioning in accordance with clause 7. Dry the test pieces in accordance with ISO 287 and determine their mass. Calculate the grammage according to 9.1.

A.2 Determination of grammage "as-taken"

This is based on the material in the condition pertaining at the time of sampling. Select specimens and cut and weigh test pieces from them as quickly as the need for accuracy will allow. When taking specimens from a roll, cut them out from such a depth that their moisture content has remained unaffected by the ambient atmosphere.

Annex B
(informative)

Limited area of sample

In cases where there is only a limited area of sample available and it is not possible to make up a test piece comprising several smaller pieces as specified in clause 8, a test area of not less than 100 cm^2 may be used.

In other respects the procedure given in clause 8 should be followed.

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