

INTERNATIONAL STANDARD

**ISO
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Third edition
2001-11-15

Board — Determination of bursting strength

Carton — Détermination de la résistance à l'éclatement

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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 2759 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 third edition cancels and replaces the second edition (ISO 2759:1983), which has been technically revised.

Annexes A, B, C and D form a normative part of this International Standard.

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Introduction

This International Standard is applicable to boards with bursting strengths between 350 kPa (or 250 kPa for the components of combined materials) and 5 500 kPa. All components of solid and corrugated fibreboard, irrespective of bursting strength, should be tested by this International Standard.

For materials with bursting strengths less than 1 400 kPa, an alternative method, based on similar principles, is specified in ISO 2758.

NOTE Due to differences in the specification of the apparatus, tests made on the same material using the procedures of ISO 2758 and this International Standard will not necessarily give the same results.

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Board — Determination of bursting strength

1 Scope

This International Standard specifies a method for measuring the bursting strength of board submitted to increasing hydraulic pressure. It is applicable to all types of board (including corrugated and solid fibreboard) having bursting strengths within the range 350 kPa to 5 500 kPa. It is also applicable to papers or boards having bursting strengths as low as 250 kPa if the paper or board is to be used to prepare a material of higher bursting strength, such as corrugated board. In such cases, the measurements will not necessarily have the accuracy or precision stated for this method and it is necessary to include a note in the test report stating that the test gave results that were below the minimum value required by the method.

In the absence of any commercial agreement as to which method should be used for materials with bursting strengths between 350 kPa and 1 400 kPa, all materials with bursting strengths below 600 kPa, except components of solid and corrugated fibreboard, should be tested by ISO 2758 and the remainder by this International Standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 186:—¹⁾, *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 536:1995, *Paper and board — Determination of grammage*.

3 Terms and definitions

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

3.1

bursting strength

maximum pressure developed by the hydraulic system in forcing an elastic diaphragm through a circular area of the board when the pressure is applied in the manner described in the method

NOTE The indicated bursting pressure includes the pressure required to extend the diaphragm during the test.

3.2

burst index

bursting strength of the board divided by the grammage of the board determined in accordance with ISO 536

1) To be published. (Revision of ISO 186:1994)

4 Principle

A test piece, placed over a circular elastic diaphragm, is rigidly clamped at the periphery but free to bulge with the diaphragm. Hydraulic fluid is pumped at a constant rate, bulging the diaphragm until the test piece ruptures. The bursting strength of the test piece is the maximum value of the applied hydraulic pressure.

5 Apparatus

The apparatus shall contain, as a minimum, the features described in 5.1 to 5.4.

5.1 Clamping system, for clamping the test piece firmly and uniformly between two annular, plane, parallel surfaces which shall be smooth (but not polished) and grooved as described in annex A, which also gives the dimensions of the clamping system.

One clamping plate shall be held in a swivel joint or similar device so as to ensure that the clamping pressure is distributed evenly.

Under the load used for testing, the circular openings in the two clamping plates shall be concentric to within 0,25 mm and the clamping surfaces shall be flat and parallel. The method of checking the clamps is given in annex B.

The clamping system shall be capable of applying a clamping pressure in the range 700 kPa to 1 200 kPa and shall be constructed in such a way that repeatable clamping pressures can be obtained in use (see annex C).

In calculating the clamping pressure, the reduction in area due to the grooves shall be ignored.

Any clamping-pressure-indicating device fitted should preferably be scaled to indicate the actual clamping pressure, not the pressure in the clamping system itself. The clamping pressure may be calculated from clamping-force and clamp-area information.

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5.2 Diaphragm, circular, of natural or synthetic rubber, free from filler or loading, clamped securely with its outer surface, when at rest, recessed about 5,5 mm relative to the outer plane of the diaphragm-mounting plate.

The material and construction of the diaphragm shall be such that the pressures required to bulge the diaphragm outside the outer plane of the diaphragm plate are as follows:

- bulge height: 10 mm \pm 0,2 mm, pressure range: 170 kPa to 220 kPa;
- bulge height: 18 mm \pm 0,2 mm, pressure range: 250 kPa to 350 kPa.

Diaphragms in use shall be regularly checked and changed if the bulge-height requirements are no longer met.

5.3 Hydraulic system, to apply an increasing hydraulic pressure to the inside of the diaphragm until the test piece bursts.

The pressure shall be generated by a motor-driven piston forcing a suitable liquid (e.g. pure glycerol, ethylene glycol containing corrosion inhibitor or low viscosity silicone oil) which is compatible with the diaphragm material against the inner surface of the diaphragm. The hydraulic system and the fluid used shall be free from air bubbles. The pumping rate shall be 170 ml/min \pm 15 ml/min.

5.4 Pressure-measuring system, to measure bursting strength.

It may employ any principle which produces a measurement and display accuracy equal to \pm 10 kPa or \pm 3 % of the measurement, whichever is the greater. The rate of response to the rising hydraulic pressure shall be such that the indicated maximum pressure is within \pm 3 % of the true peak pressure as determined by a calibration system of the type described in annex D.

6 Calibration

6.1 The apparatus should be fitted, or able to be fitted, with suitable test points to facilitate checking of the fluid pumping rate, calibration of the maximum pressure-measurement and display system and calibration of the clamping pressure-indicating device where fitted.

6.2 Calibration shall be carried out before initial use and at sufficiently frequent intervals to maintain the specified accuracy. Wherever possible, calibration of the pressure-sensing device should be carried out with it mounted in the same position it occupies on the apparatus and preferably on the apparatus itself. If a pressure sensor is accidentally subjected to pressure beyond its rated capacity, it shall be recalibrated before further use.

Aluminium foils of various thicknesses may be available for use as test pieces of known burst value. Such devices are a useful means of checking the overall function of an instrument but, since the behaviour of foil under stress is unlike that of paper, they should not be used as calibration standards.

7 Sampling and preparation of test pieces

The sampling procedure is not covered by this International Standard. Make sure that the test pieces taken for the determination are representative of the sample received. If the determination is to represent a lot of board, the sampling procedure shall be carried out in accordance with ISO 186. Where possible, test pieces shall not include areas containing watermarks, creases or visible damage.

Test pieces shall be conditioned in accordance with ISO 187.

The number of test pieces required depends on whether or not separate results are required for burst tests carried out with each surface in contact with the diaphragm.

8 Procedure

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Tests shall be carried out in the standard atmosphere, defined in ISO 187, used for the conditioning of test pieces in accordance with clause 7.

If required, determine the grammage in accordance with ISO 536.

Prepare the apparatus for use in accordance with the manufacturer's instructions and the requirements of this International Standard. Electronic instruments may require a "warm-up" period.

Where alternative measuring pressure ranges are available, select the most suitable range, if necessary by carrying out a preliminary test using the highest available range.

Adjust the clamping system to give the lowest clamping pressure within the range 700 kPa to 1 200 kPa which prevents slippage of the test piece. A guide to clamping pressures which have proved satisfactory for materials of various bursting strengths is given in Table 1.

Table 1

Bursting strength kPa	Clamping pressure kPa
up to 1 500	400
1 500 to 2 000	600
2 000 to 2 500	800
over 2 500	1 000