INTERNATIONAL STANDARD

**ISO 9895**

Second edition
2008-10-15

# Paper and board — Compressive strength — Short-span test

*Papier et carton — Résistance à la compression — Essai à faible écartement*



Reference number
ISO 9895:2008(E)



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Published in Switzerland

 

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## Foreword

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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 9895 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 9895:1989), which has been revised to insert a grammage range in the scope of this International Standard. Compared to the first edition, some editorial changes have also been made.

## Introduction

This International Standard has been developed in order to specify the conditions for determining the compressive strength of paper and board used for the manufacture of containers and boxes.

In this International Standard, the same terminology and symbols are used as in general literature concerning materials physics and mechanics.

# Paper and board — Compressive strength — Short-span test

## 1 Scope

This International Standard specifies a method for determining the compressive strength in the machine and cross-directions of paper and board using a short-span compressive tester. It is intended for papers and boards used for the manufacture of containers and boxes.

This International Standard is recommended for papers and boards with a grammage from 100 g/m$^2$ to 400 g/m$^2$.

NOTE 1 The procedure specified in this International Standard should not be used for the determination of strain at break (see Annex B).

NOTE 2 For the determination of compressive strength of laboratory sheets, see instructions in ISO 5270[1].



## 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*

ISO 536, *Paper and board — Determination of grammage*

## 3 Terms and definitions

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

**3.1**
**compressive strength**
maximum compressive force per unit width that a test piece of paper or board can withstand until the onset of failure

NOTE The compressive strength is expressed in kilonewtons per metre.

**3.2**
**compressive index**
compressive strength divided by the grammage

NOTE The compressive index is expressed in kilonewton metres per kilogram.

## 4 Principle

A test piece, 15 mm wide, is clamped between two clamps, spaced 0,70 mm apart, which are forced towards each other until a compressive failure occurs. The maximum force is measured and the compressive strength is calculated.

## 5 Apparatus

**5.1 Compressive tester**, with two clamps (see Figure 1), for holding a test piece 15 mm wide. Each clamp includes a stationary jaw ($S_1$, $S_2$) and a movable jaw ($M_1$, $M_2$). The clamps ($C_1$ and $C_2$) shall be 30 mm long and have a high-friction surface. The clamps shall be able to hold the test piece (T) in position with a constant clamping force of 2 300 ± 500 N. The clamps shall be designed so that they grip the test piece firmly over its full width (see also Annex A).

The stationary jaws shall be in the same plane and on the same side of the test piece. The clamping surfaces of the movable jaws shall be in the same plane and parallel to those of the stationary jaws. For specifications, see Annex A.

At the start of the test, the free span between the clamps shall be 0,70 mm ± 0,05 mm. Once the test is started, the clamps shall move towards each other at a speed of 3 mm/min ± 1 mm/min.

The tester shall have a measuring and display system so that the maximum compressive force can be determined with an error of less than ± 1 % of the reading when this is within 10 % to 100 % of the full-scale range.

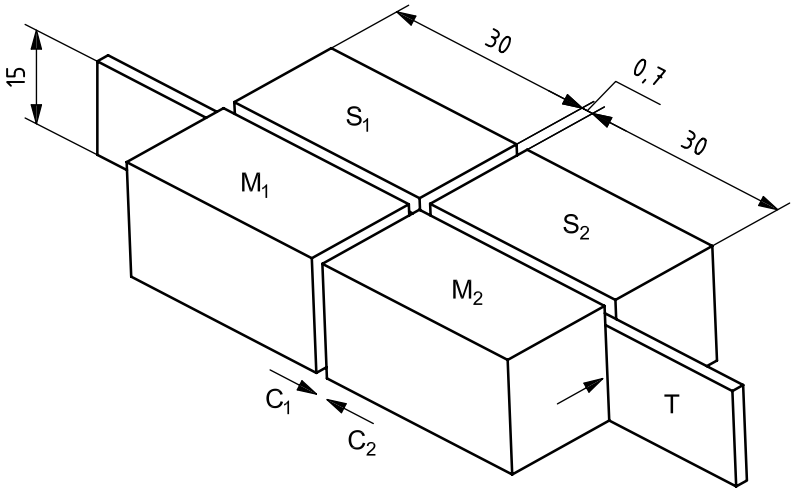


The tester shall be designed so that a device for calibrating the load cell using weights of known mass can be attached. Alternatively, calibrated strain gauges can be used.

The tester shall have a device showing the clamping force exerted by the jaws, expressed in newtons.



Dimensions in millimetres




**Key**

| | |
|---|---|
| $C_1$ and $C_2$ | clamps |
| $M_1$ and $M_2$ | movable jaws |
| $S_1$ and $S_2$ | stationary jaws |
| T | test piece |

**Figure 1 — Clamping arrangement**

**5.2 Cutting device**, designed to produce test pieces of the required dimensions with clean and parallel edges.

## 6 Calibration

Check the calibration of the compressive tester regularly using calibrated weights or strain gauges. Select calibration weights or strain gauges so that the entire measuring range is covered with checks at evenly spaced points. The error at any point shall not exceed ± 1 % of the reading within 10 % to 100 % of the full-scale range.

If the instrument is out of calibration, make adjustments as instructed by the manufacturer.

## 7 Sampling

If the tests are being performed to evaluate a lot, select the sample in accordance with ISO 186. If the tests are made on another type of sample, make sure that the test pieces used are representative of the sample received.

## 8 Conditioning

Condition the sample in accordance with ISO 187.



## 9 Preparation of test pieces

Prepare the test pieces in the same atmospheric conditions as used to condition the sample. From undamaged areas of the sample, cut test pieces in the form of strips of at least 70 mm in length and with a width of 15 mm ± 0,1 mm. Cut test pieces with the longer side parallel to the machine direction in order to determine the compressive strength in the machine direction. Cut test pieces with the longer side parallel to the cross-direction in order to determine the compressive strength in the cross-direction.

Cut a sufficient number of test pieces to allow at least 20 determinations in each required direction.

This test, like all other tests depending on resistance to compression, is very sensitive to change in the moisture content of the test piece. Handle the test pieces carefully and never touch the compressive zone with bare hands. Keep the test pieces away from moisture, heat, direct illumination, expiration air and other conditions that may change their moisture content. Ensure that the clamps are not exposed to heat from lamps, motors, etc.

The compressive strength is measured on a small area of 0,7 mm × 15 mm. In order to minimize the influence of local variations in the paper, at least 20 determinations are prescribed.

## 10 Procedure

Clamp the test piece in position in the jaws. Set the jaws in motion and read the maximum compressive force indicated. Test at least 20 test pieces in each required direction (machine direction and/or cross-direction).

If multiple tests are to be made on a single test piece, ensure that the test area is not a part of the test piece that has been in the clamping area during the previous test.

If required, determine the grammage of the conditioned sample (see Clause 8) in accordance with ISO 536.