

BS ISO 8791-2:2013



BSI Standards Publication

Paper and board — Determination of roughness/ smoothness (air leak methods)

Part 2: Bendtsen method

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National foreword

This British Standard is the UK implementation of ISO 8791-2:2013. It supersedes BS 4420:1990 (ISO 8791-2:1990) which is withdrawn.

This latest edition of BS ISO 8791-2 concerning Bendtsen roughness makes reference to both electronic and variable-area flow instrumentation for the first time. In doing so new material has been included to describe the electronic instrumentation. Parts of the standard related to the variable-area flow instruments were also updated, while other parts were used verbatim from previous editions.

With the paper industry constituting a global industry, the UK committee accepted that the standard should be available for use in the UK.

However, the committee's main concern is that in previous standards it was stipulated that samples of high surface roughness, sufficient to give values above 1 200 ml/min, were unsuitable for measurement using this method. In this edition an inconsistency now exists regarding roughness values. Whilst in the Scope the Bendtsen roughness values are between 5 ml/min and 3 000 ml/min, Clause 10.2.2 states that users should not use airflows above 1 200 ml/min, and thus maintains the previous edition's measurement parameters.

This foreword is aimed at highlighting this issue. In particular it is aimed at advising users that whilst the Scope suggests a change in what is permitted for variable-area flow instrumentation, this is not in practice carried through in the section relating to measurement parameters, which constitutes a continuation from the previous edition.

The UK participation in its preparation was entrusted to Technical Committee PAI/11, Methods of test for paper, board and pulps.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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2013-09-15

Paper and board — Determination of roughness/smoothness (air leak methods) —

Part 2: Bendtsen method

*Papier et carton — Détermination de la rugosité/du lissé (méthodes
du débit d'air) —*

Partie 2: Méthode Bendtsen



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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The committee responsible for this document is 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 8791-2:1990), which has been technically revised. In this second edition mainly editorial changes have been made to include the electronic version of the test apparatus and also precision data has been added as an informative Annex.

ISO 8791 consists of the following parts, under the general title *Paper and board — Determination of roughness/smoothness (air leak methods)*:

- *Part 1: General method*
- *Part 2: Bendtsen method*
- *Part 3: Sheffield method*
- *Part 4: Print-surf method*

NOTE *Part 1: General method* is considered to be redundant and will be withdrawn after Parts 2, 3 and 4 have been revised and published.

Paper and board — Determination of roughness/smoothness (air leak methods) —

Part 2: Bendtsen method

1 Scope

This part of ISO 8791 specifies a method for the determination of the roughness of paper and board using the Bendtsen apparatus.

This part of ISO 8791 is applicable to paper and board which have Bendtsen roughness values between about 5 ml/min and 3 000 ml/min when measured with variable-area type testers and between about 50 ml/min and 5 000 ml/min when measured with electronic type testers. It is not suitable for soft papers which allow the land to make a significant impression on the surface or for high-air-permeance papers which allow a significant flow of air to pass through the sheet, or for papers which will not lie flat under the measuring head.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

3 Terms and definitions

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

3.1

Bendtsen roughness

a measure of the rate at which air will pass between a flat circular land and a sheet of paper or board when tested under specified conditions and at operating pressure

Note 1 to entry: Bendtsen roughness is expressed in millilitres per minute.

4 Principle

Clamping a test piece between a flat plate and a circular metal land. Supplying air at a nominal pressure of 1,47 kPa to the space enclosed inside the land and measuring the rate of air flow between the land and the test piece.

5 Apparatus

5.1 Bendtsen tester (two types)

Bendtsen tester, which operates according to one of the following principles of measurement of air flow rate:

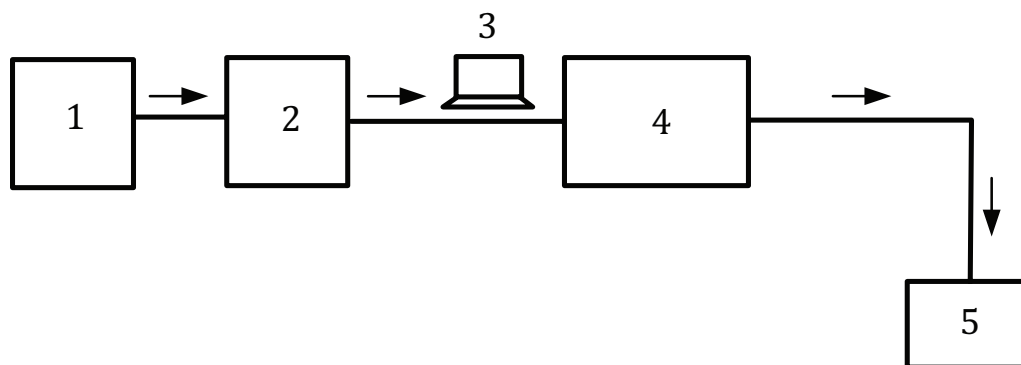
- variable-area flowmeter type (see 5.2).
- electronic flowmeter type (see 5.3).

For variable-area flowmeter type testers, the pressure between the flowmeter and the measuring head is known to decrease at high air flow rates (see 10.2.2) which can reduce the accuracy of the flowmeter reading. For electronic flowmeter type testers, the pressure between the flowmeter and the measuring head is automatically controlled.

5.2 Variable-area flowmeter type

A standard pressure difference is created across the measuring land and the air flow rate is measured on a variable-area flowmeter. The apparatus, see Figure 1, consists of a compressor (5.2.1) and pressure stabilizing reservoir (5.2.2) to supply air, a flowmeter (5.2.4) with a pressure controlling device (5.2.3), and a measuring head (5.2.5).

Annex A gives details of care and maintenance of this type of Bendtsen tester.



Key

- 1 compressor
- 2 pressure stabilizing reservoir
- 3 pressure controlling device
- 4 flowmeter
- 5 measuring head

Figure 1 — Circuit diagram of variable-area flowmeter type test apparatus

5.2.1 Compressor, capable of generating air at a pressure of about 127 kPa. If necessary, filters shall be provided to ensure that the air is clean and free from oil.

NOTE It is advisable to have the compressor located in a laboratory having the standard atmosphere for conditioning and testing.

5.2.2 Pressure stabilizing reservoir, having a volume of not less than 10 litres, installed between the compressor and the pressure controlling device.