AS 1301.566:2019

Australian STANDARD

# Methods of test for pulp and paper

# Method 566: Tensile strength of paper and paperboard (constant rate of elongation method, 100 mm/min) (ISO 1924-3:2005, MOD)



STANDARDS Australia

AS 1301.566:2019

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Appita
Australian Institute of Packaging
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First published as AS 1301.566:2019.

# Preface

This Standard was prepared by the Australian members of Joint Standards Australia/Standards New Zealand Committee PK-019, Methods of Test for Pulp and Paper.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to specify a method for measuring the tensile strength, strain at break, tensile energy absorption and tensile stiffness, using a testing machine operating with a constant rate of elongation (100 mm/min). This Standard also specifies equations for calculating the tensile index, the tensile energy absorption index, the tensile stiffness index and the modulus of elasticity.

This Standard is an adoption with national modifications, and has been reproduced from, ISO 1924-3:2005, *Paper and board — Determination of tensile properties — Part 3: Constant rate of elongation method (100 mm/min)*. The modifications are additional requirements and are set out in Appendix ZZ, which has been added at the end of the source text.

Appendix ZZ lists the variations to ISO 1924-3:2005 for the application of this Standard in Australia.

As this document has been reproduced from an International Standard, the following applies:

(a) In the source text "this part of ISO 1924" should read "this Australian Standard".

(b) A full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms "normative" and "informative" are used in Standards to define the application of the appendices or annexes to which they apply. A "normative" appendix or annex is an integral part of a Standard, whereas an "informative" appendix or annex is only for information and guidance.

# Contents

# 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 1924-3 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*.

ISO 1924 consists of the following parts, under the general title *Paper and board — Determination of tensile properties*:

— *Part 2: Constant rate of elongation method* [1)]

— *Part 3: Constant rate of elongation method (100 mm/min)*

Part 1: *(Constant rate of loading method)* was withdrawn in 2004 as it was considered obsolete.

1) In Part 2, a constant rate of elongation of 20 mm/min is used.

# Introduction

This part of ISO 1924 has been developed in order to specify the conditions for determining the tensile properties of paper, including tensile stiffness and tensile stiffness index, using a higher rate of elongation than specified in ISO 1924-2, which is the most commonly used part where tensile strength, stretch at break, tensile energy absorption and modulus of elasticity are measured. In ISO 1924-2, the tensile properties are measured at a constant rate of elongation of 20 mm/min at a test span of 180 mm. For the measuring of tensile stiffness in this part of ISO 1924, a higher accuracy in the recording of elongation, compared to ISO 1924-2, is also required.

This part of ISO 1924 specifies the fastest of the two methods. In addition to the properties measured in ISO 1924-2, the tensile stiffness is also measured. The tensile properties are measured at a constant rate of elongation of 100 mm/min at a test span of 100 mm, and the elongation is recorded with a higher accuracy than the accuracy in ISO 1924-2.

This part of ISO 1924 differs from existing standards for testing tensile properties in that the test span, i.e. the distance between the clamping lines, is 100 mm irrespective of the kind of sample to be tested. The rate of elongation has been increased to 100 mm/min in order to reduce the testing time, thus making it possible to test a greater number of samples within a given time period.

NOTE The results of tensile tests depend on the rate of elongation applied and the test span. The rate dependence and the effect of test span may vary with paper grade and are different for tensile strength, strain at break, tensile energy absorption and tensile stiffness. In a study within SCAN-test, comparing the results achieved using ISO 1924-2 and this part, the tensile strength increased by 5 % to 15 % when the rate of elongation was increased from 20 mm/min (at a test span length of 180 mm) to 100 mm/min (at a test span length of 100 mm).

It is not possible to predict the exact relationship between the results for any particular paper whose tensile properties are determined using ISO 1924-2 and this part of ISO 1924. This relationship may only be determined by laboratory experimentation.

In this part of ISO 1924, the same terminology and symbols are used as in general literature concerning physics and mechanics of materials.

# Australian Standard®

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## 1 Scope

This part of ISO 1924 specifies a method for measuring the tensile strength, strain at break, tensile energy absorption and tensile stiffness, using a testing machine operating with a constant rate of elongation (100 mm/min). This part of ISO 1924 also specifies equations for calculating the tensile index, the tensile energy absorption index, the tensile stiffness index and the modulus of elasticity.

When tensile stiffness is to be determined, a greater accuracy is required in the elongation measurement than when the other tensile properties are to be determined. If the elongation is determined with the lower accuracy, the tensile stiffness value obtained is not in accordance with this part of ISO 1924.

This part of ISO 1924 is applicable to all papers and boards, including papers of high extensibility, such as creped papers and extensible sack papers, but with the exception of low-density papers such as tissue papers and tissue products for which ISO 12625-4[2] is recommended.

## 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 534, *Paper and board — Determination of thickness, density and specific volume*

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**
**tensile strength**
maximum tensile force per unit width that paper and board will withstand before breaking under the conditions defined in this standard test method

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

**3.3**
**elongation**
increase in length of a test piece

**3.4**
**strain**
ratio of the elongation of a test piece to the initial test length

Note 1 to entry: The initial test length of the test piece is the same as the initial span between the clamping lines.