

ICS 85.060
CCS Y 30



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 23144-2023

Replacing GB/T 23144-2008

**Paper and board - Determination of bending stiffness - General
principles for two-point, three-point and four-point methods
(English Translation)**

Issued on: December 28, 2023

Implemented on: July 1, 2024

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents" Drafting:

This document replaces GB/T 23144-2008 "General Principles for Determination of Static Bending Stiffness of Paper and Paperboard" and is consistent with GB/T 23144-Compared with:2008, in addition to structural adjustments and editorial changes, the main technical changes are as follows:

- a) Changed the scope of application (see Chapter 1, Chapter 1 of the:2008 edition);
- b) Changed the definition of bending stiffness (see 3.1, 3:1 of the:2008 edition);
- c) The principle has been changed (see Chapter 4, Chapter 4 of the:2008 edition);
- d) Added a two-point bending method (see 5.1);
- e) The applicable test objects of the two-point method, three-point method and four-point method have been changed (see 5.1:1, 5:2:1, 5:4:1, Chapter 4 of the:2008 edition);
- f) The calculation formula of the three-point method bending stiffness has been changed (see 5.3:1, 11:3 of the:2008 edition);
- g) Changed the restrictions on allowable deflection and bending angle by the two-point method and the three-point method (see 5.3:3, Chapter 6 of the:2008 edition);
- h) The measurement conditions of the four-point method have been changed (see 5.4:3, Chapter 6 of the:2008 edition);
- i) Added recommended dimensions for four-point method specimens (see 5.4:4);
- j) The test instrument requirements have been changed (see Chapter 6, Chapter 5 of the:2008 edition);
- k) The test procedures have been changed, and the method for measuring the thickness of corrugated board has been added (see Chapter 8, Chapter 10 of the:2008 edition);

l) Changed the result presentation (see Chapter 9, Chapter 11 of the:2008 edition);

m) Deleted the chapter on accuracy (Chapter 12 of the:2008 edition);

n) Changed the test report (see Chapter 10, Chapter 13 of the:2008 edition):

This document has been modified to adopt ISO 5628:2019 "Universal two-point, three-point and four-point methods for determination of bending stiffness of paper and paperboard:" principle":

Compared with ISO 5628:2019, this document has made the following structural adjustments:

---Deleted the symbol chapter, the structure numbering content starting from Chapter 4 and the structure numbering content starting from Chapter 5 of ISO 5628:2019 consistent:

The technical differences between this document and ISO 5628 and their reasons are as follows:

a) ISO 186 (see 7.1) was replaced with normatively cited GB/T 450 to adapt to my country's technical conditions;

b) ISO 534 (see 8.1) was replaced with normatively cited GB/T 451.3 to adapt to my country's technical conditions;

c) ISO 3034 (see 8.1) was replaced with normatively cited GB/T 6547 to adapt to my country's technical conditions;

d) Replaced ISO 187 (see 7.2) with normatively quoted GB/T 10739 to adapt to my country's technical conditions;

e) The definition of bending stiffness has been changed to be consistent with GB/T 4687-2007 (see Chapter 3):

The following editorial changes have been made to this document:

a) Changed the expression form of the scope in Chapter 1, and expressed the supplementary information in the scope in the form of notes;

b) Chapter 4 was deleted and the content was moved to the corresponding formula;

c) Deleted Note 3 in 6:4:4;

d) References deleted:

Please note that some content in this document may be subject to patents: The publisher of this document assumes no responsibility for identifying patents:

1 Scope

This document describes three test methods for determining the bending stiffness of paper and cardboard: According to the different loading methods, it is divided into two-point method, three-point method and four-point method:

Point method:

This document is applicable to the determination of bending stiffness of various papers and cardboards: The two-point method and the three-point method are suitable for paper and cardboard with smaller thickness: The four-point method is suitable for paper and cardboard with smaller thickness:

The dot method is suitable for corrugated cardboard and thicker cardboard:

Note 1: The prerequisite for measurement conditions is to ensure that the specimen will not undergo any obvious permanent deformation during the test, nor will it exceed the limit of the bending stiffness calculation formula:

Effective range:

Note 2: In these bending tests, the paper and cardboard specimens are considered "beams" for the scientific definition of material strength:

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, the dated quotations for undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document:

GB/T 450 Collection of paper and cardboard samples and determination of longitudinal, transverse, front and back sides of the sample (GB/T 450-2008, ISO 186:

2002,MOD)

GB/T 451.3 Determination of thickness of paper and cardboard (GB/T 451.3-2002, idtISO 534:1988) GB/T 6547 Determination of thickness of corrugated cardboard (GB/T 6547-1998, eqvISO 3034:1991) GB/T 10739 Standard atmospheric conditions for handling and testing of paper, paperboard and pulp samples (GB/T 10739-2023, ISO 187:

2022,MOD)

3 Terms and definitions

The following terms and definitions apply to this document:

bendingstiffness

The unit resistance moment produced when paper or cardboard of unit width is bent under elastic deformation:

Note: The principle of measuring bending stiffness is derived under the condition that the specimen is straight, but the specimen usually has curling, twisting, wrinkles or other effects on the test during the test:

There are some biases, but it is still a valid test:

[Source: GB/T 4687-2007,4:13]

4 Principles

For a homogeneous material beam such as paper or cardboard with the same thickness and constant elastic modulus, the bending stiffness can be determined by the elastic modulus E and the specimen the product of the moment of inertia I divided by the specimen width b is obtained, as shown in formula (1):