

ICS 81.040.01

CCS Q 30



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

**GB/T 44752-2024**

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**Test method for bending fatigue of flexible glass**

柔性玻璃弯曲疲劳试验方法

**Issued on: October 26, 2024**

**Implemented on: May 1, 2025**

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**Issued by: State Administration for Market Regulation;  
Standardization Administration of the PRC**

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### 1 Scope

GB/T 44752-2024 gives the bending fatigue test method for flexible glass - the ultra-thin glass, tens of micrometres thick, used as the cover of folding phones and rollable displays. Its whole value proposition is that it can be folded a few hundred thousand times without failing, and glass fails from surface flaws under tension, so the number of cycles a sample survives at a given bend radius is the property being bought. The standard describes the test principle and specifies the test equipment, the specimens, the test procedure and the test report, for the planar unidirectional two-point bending fatigue test under defined conditions. It takes effect on 1 May 2025.

This document describes the test principle of bending fatigue test of flexible glass and specifies the requirements for test equipment, specimens, test procedures, and test report. This document applies to planar unidirectional two-point bending fatigue test of flexible glass under set conditions.

### 2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 38686-2020 Test Method for Flexibility of Ultrathin Glass - Two Point Bending Method

### 3 Terms and Definitions

The following terms and definitions are applicable to this document.

**3.1 unidirectional bending fatigue** To evaluate the performance degradation, failure and durability of a specimen under the action of bending loads, it is subjected only to bending forces resulting from unidirectional reciprocating compression and extension.

**3.2 maximum distance between the plates** The maximum distance between the fixed and moving plates during the bending fatigue test.

**3.3 minimum distance between the plates** The minimum distance between the fixed and moving plates during the bending fatigue test.

**3.4 number of bending fatigue cycles** The cumulative number of bending fatigue cycles performed on the specimen. NOTE. after the specimen is fixed, the cyclic process from the initial bending state corresponding to the maximum distance between the plates, to the bending state corresponding to the minimum distance between the plates, and then back to the initial bending state is called a bending fatigue cycle. Each bending fatigue cycle is counted as one bending fatigue.

**3.5 maximum value of bending fatigue curvature radius  $R_{max}$**  During the bending fatigue test, when the fixed and moving plates are at the maximum distance between the plates, the bending curvature radius of the specimen around the apex of the curve.

**3.6 minimum value of bending fatigue curvature radius  $R_{min}$**  During the bending fatigue test, when the fixed and moving plates are at the minimum distance between the plates, the bending curvature radius of the specimen around the apex of the curve.

## 4 Test Principle

The two-point bending method is used to fix the flexible glass specimen at both ends respectively to the inner sides of a fixed plate and a moving plate. The moving plate reciprocates, and under given minimum value of bending fatigue curvature radius, maximum value of bending fatigue curvature radius, and bending frequency conditions, subject the specimen to multiple unidirectional bending fatigue actions. The obtained number of unidirectional bending fatigue cycles and the changes in the specimen's appearance or performance after bending fatigue are used to evaluate the specimen's resistance to bending fatigue.

## 5 Test Equipment

**5.1 Bending Fatigue Testing Machine** The bending fatigue testing machine includes a main testing unit and a control system. The main testing unit includes a drive motor, a fixed plate and a moving plate, as shown in Figure

1. The bending fatigue testing machine meets the following requirements.

a) The fixed plate and the moving plate shall be rigid plates of the same specifications, with a width not less than the specimen width and not less than 100 mm, a height not less than 150 mm, and a thickness not less than 8 mm. During the bending fatigue test, the working surfaces of the fixed plate and the moving plate shall be parallel to each other, with a parallelism error not exceeding

0.02 mm. The surfaces in contact with the specimen shall be flat, with a surface roughness  $R_a$  not exceeding 0.8  $\mu\text{m}$ . The apex of the specimen's deflection curve shall be lower than the upper edges of both the fixed and moving plates.

b) Unidirectional bending fatigue shall be used for loading, with the moving plate moving in a reciprocating motion. 9

---lifting adjustment device; H

---height of moving and fixed plates; D

---thickness of moving and fixed plates; F

---loading force;  $L_g$

---fixed width of adhesive tape. Figure 1 -- Schematic Diagram of the Structure of Bending Fatigue Testing Machine

5.2 Bending Curvature Radius Characterization Device It consists of a digital camera and image recognition and processing software and shall meet the requirements of Chapter 5 in GB/T 38686-2020.

## 6 Specimens

6.1 Specimen Preparation Specimens may be products or samples prepared under the same process conditions as products. Specimen size specifications. length (L) should be 100 mm ~ 200 mm, width (B) should be 20 mm ~ 150 mm, and other specimen sizes shall meet the applicable range of the test equipment. The surface and edges of the specimens shall be free from visible scratches, damage and other defects.

6.2 Specimen Quantity The quantity of specimens shall not be less than 18, of which at least 3 specimens are required for the bending fatigue test, and at least 15 specimens are required for determining the critical radius of curvature.

## 7 Test Procedures

7.1 Test Environment Conditions Unless otherwise specified, the test shall be conducted under the following environmental conditions.

---Ambient temperature. 20  $^{\circ}\text{C}$   $\pm$  5  $^{\circ}\text{C}$ ;

---Relative humidity. 40% ~ 80%.