

ICS 61.06
CCS Y78



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

GB/T 3903.1-2017

Footwear - Test methods for whole shoe - Flexing resistance

鞋类 整鞋试验方法 耐折性能

Issued on: December 29, 2017

Implemented on: July 1, 2018

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine;
Standardization Administration of the PRC**

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009. This Standard supersedes GB/T 3903.1-2008 Footwear -- General test methods -- Flexing resistance. Compared with GB/T 3903.1-2008, the main technical differences are as follows: - MODIFY the standard name; - MODIFY the scope of application of the standard; - MODIFY the description of the standard principle; - MODIFY the number of samples; - ADD the requirements for holders in the flexing resistance testers; - MODIFY the test procedures; - MODIFY the description of the test results. Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuing authority shall not be held responsible for identifying any or all such patent rights. This Standard was proposed by the China National Light Industry Council. This Standard shall be under the jurisdiction of National Technical Committee for Standardization of Shoemaking (SAC/TC 305). Drafting organizations of this Standard. China Leather and Footwear Industry Research Institute, Anta (China) Co., Ltd, Dezhou Xinhuarun Technology Co., Ltd, China Leather and Footwear Industry Research Institute (Jinjiang) Co., Ltd, Guangdong Wanlima Industry Co., Ltd. Main drafters of this Standard. Qin Xiaobo, Li Su, Li Yucai, Shi Yiwei, Shen Yimin, Ye Yahong. The previous released editions of this Standard are as follows: - GB 3904-1983. - GB/T 3903.1-1994, GB/T 3903.1-2008. Footwear -- Test methods for whole shoe -- Flexing resistance

1 Scope

China's national test method for the flexing resistance of whole footwear. It specifies the principle, the apparatus, the test piece, the test conditions and the procedure. The shoe is mounted in a machine that flexes it at the ball repeatedly, through an angle and at a rate representing walking, for tens or hundreds of thousands of cycles, and it is then examined for damage. What the test finds is the failure that ends most shoes: cracking of the outsole across the flex line, separation of the sole from the upper starting at the toe where the peel forces are highest, and cracking of the upper material itself at the vamp crease. Testing the whole shoe rather than its materials is the essential feature - a sole compound and an adhesive may each pass their own tests and fail together in the assembly, because the flex line is where the construction concentrates strain and where every material meets every other.

This Standard specifies the test methods for flexing resistance of whole shoes or soles. This Standard is applicable to whole shoes and soles. This Standard is not applicable to the whole shoes or soles with a height greater than 70mm, or a thickness of the sole flexion site greater than 25mm, or a bending angle less than 45° after rigidity is tested according to the provisions of

8.4.1 in GB/T 20991-2007. NOTE

1. The thickness of the sole flexion site includes the thickness of the insole. NOTE
2. The sole material (sheet) can be determined with reference to this Standard.

2 Normative references

The following documents are essential to the application of this document. For dated references, only the editions with the dates indicated are applicable to this document. For undated references, only the latest editions (including all the amendments) are applicable to this document.

GB/T 20991-2007 Personal protective equipment -- Test methods for footwear

GB/T 22049 Footwear -- Standard atmospheres for conditioning and testing of footwear and components for footwear

3 Principle

After a whole shoe or sole is conducted with the flexing test on a flexing resistance tester at a certain flexing angle and frequency, OBSERVE the changes in upper, sole, and upper-sole bonding site.

4.1 Flexing resistance tester

4.1.1 The flexing angle is adjustable from 0° to 55°.

4.1.2 The flexing frequency is adjustable within the range of 100 times / min to 300 times / min.

4.1.5 A device is provided for blasting the flexure of the test piece.

4.2 Flexible test last

4.2.1 A steel shaft in size of $\phi (5.5 \pm 0.5)\text{mm} \times (40 \pm 2)\text{mm}$ is fitted on the vertical line from the first metatarsophalangeal site to the axis of last bottom of the flexible test last. There is no bump on the surface of the steel shaft relative to the last bottom.

4.3 Vernier caliper At least accurate to 0.02mm.

4.4 Cutting knife The schematic diagram of the cutting knife is shown in Figure 1.

5 Test piece

Each set of test pieces shall not be less than one pair of whole shoes or soles. In addition, the adhesion of test pieces requires at least 24h.

6 Test conditions

6.1 The flexing angle of the flexing resistance tester is $(50 \pm 1)^\circ$ (in case of special requirements, it can be selected between 0° and 55°).

6.2 The flexing frequency of the flexing resistance tester is (230 ± 10) times / min (in case of special requirements, it can be selected within the range of 100 times / min to 300 times / min).

7 Test procedures

7.1 Before the test, in accordance with the provisions of GB/T 22049, the test pieces shall be placed at a standard ambient temperature of $(23 \pm 2)^\circ\text{C}$ for at least 4h.

7.4 BEND the test pieces. MARK the position of metatarsophalangeal flexion on both sides of the shoe. CONNECT these two positions to draw a flex line on the sole.

7.5 CLAMP the test pieces in the holder of the flexing resistance tester (4.1). The flex line on the sole, the steel shaft of the flexible test last, and the axis of the holder's movable shaft shall be at the same level.

7.6 PLACE the tester at the minimum flexing angle. ADJUST the tilt angle of the holder. OBSERVE the position of the heel so that the test piece is in a natural state without being bent in any direction.

7.7 ADJUST the eccentricity of the tester so that the flexing angle reaches the specified angle (6.1).

7.8 If cutting is required, SLICE a 5mm long cut in the middle of the flex line on the sole. In addition, CUT through the sole.

7.9 RESET the counter of the tester. PRESET the number of flexing to 40,000 times (in case of other requirements in the product standards, it shall be implemented according to the product standards). ACTIVATE the blower. Then TURN on the main unit.

8 Test results

8.1 RECORD the number of new cracks and the length of the longest new crack; and the de-bonding length of the upper-sole (including the foxing and outsole) bonding site.

8.2 If there is a pre-cut, RECORD the extended length of the cut on the sole, in millimeters. The result is retained to one decimal place.

8.4 The test results of each shoe (sole) are indicated separately.