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

GB/T 38012-2019

**Footwear - Test methods for whole shoe - Impact shock
attenuating properties**

鞋类 整鞋试验方法 缓震性能

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1 Scope

China's national test method for the impact shock attenuation of whole footwear. It specifies the terms and definitions, the principle, the test equipment, the specimen and its conditioning, and the test procedure. The property measured is how much of a heel strike the shoe absorbs before it reaches the foot. Walking loads the body at each step with a force above body weight, and running with several times it, and the shoe is the only thing between that impulse and the skeleton. Attenuation is what a cushioned midsole provides, and it is the property most heavily marketed and least often measured honestly. Testing it on the whole shoe rather than on a midsole sample is the right approach, because the value depends on the whole construction - the outsole, the insole, the lasting board and the shape all change what reaches the foot. The conditioning requirement matters too: foam materials stiffen when cold and soften when warm, so a result without a stated temperature says little.

This Standard stipulates the test methods for whole shoe and shoe sole in impact shock attenuating property. This Standard is applicable to whole shoe and shoe sole with the footwear size of 235 and above.

2 Normative References

The following documents are indispensable to the application of this document. 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 22049-2019 Footwear - Standard Atmospheres for Conditioning and Testing of Footwear and Components for Footwear

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 Shock Attenuating Shock attenuating refers to the process of decreasing peak force with the increase of time.

3.2 Energy Energy refers to the ability of applying force and overcoming resistance, which is obtained through the integral calculation of force and the displacement generated by force. NOTE: it shall be expressed in (J).

3.3 Impact Energy Impact energy refers to the energy which acts on sample during the process that the sample is under impact compression. frequency of the force sensor shall at least be: 2,500 Hz.

5.1.6 Displacement sensor: measuring range: 0 mm ~ 60 mm, accurate to

0.01 mm. The sampling frequency of the displacement sensor shall at least be: 2,500 Hz.

5.1.7 Software acquisition system: the application of the program enables the record of the time, displacement and force value data during each impact process. In addition, it enables the presentation of a relevant curve graph of force value-time, displacement- time, force value-displacement during the impact process. In accordance with the recorded force value and displacement data, through an integral summation formula [in which, W signifies energy, expressed in (J); F signifies force value, expressed in (N); ds signifies displacement, expressed in (mm)]. The system can calculate the numerical value of energyimpact energy during the impact compression process; the numerical value of energyenergy return during the impact return process. The difference value between them is energy absorption.

5.1.8 The waveform during the impact process: the process of the equipment's force application can adopt triangular wave pattern for loading and unloading.

5.1.9 Loading and unloading time during the impact process: uniform time on the forefoot and the heel: loading time: 25 ms; unloading time: 40 ms. Or, in accordance with the actual demands (for example, motion state: quick start or jump to the ground), different loading and unloading time may be defined.

5.2 Thickness Measuring Instrument Measuring range: 0 mm ~ 50 mm, accurate to

0.01 mm. Compression diameter: (10 ± 0.5) mm; intensity of pressure: (29.3 ± 0.1) kPa.

6.1 Sample

6.1.1 Sample quantity Sample of whole shoe or shoe sole shall be not less than 1 pair.

6.1.2 Sample preparation

6.1.2.1 Pre-treatment In terms of shoe sole sample: pre-treatment is unnecessary. In terms of whole shoe sample: along the bottom line of the upper part, cut off the upper part of the shoe. If there is a movable inner sole, double-sided adhesive tape reference standard environment that complies with GB/T 22049-2019; adjust it for at least 4 h.

7 Test Procedures

7.1 Connect the central points of the test locations selected in 6.1.2.2, prolong it to intersect with both ends of the circle. Respectively measure-take the thickness of the test central location of the forefoot and the heel, and the thickness of the intersection part with the circle. Take the average value of the thickness of the three points as the original thickness B of the test part, accurate to

0.1 mm.

7.2 Fixate the shoe sole, so that the marked impact location is directly below the impact head. Make sure that the central point of the test location and the center of the impact head align with each other; pre-apply (10 ± 2) N of force to fixate the sample.

7.3 Select a suitable displacement impact pattern or force impact pattern; conduct pre-impact of the sample for once, then, check whether the impact force value can reach 2,300 N ~ 2,500 N.

7.4 In accordance with the pre-impact force, adjust the impact pattern, so that the maximum impact force that the sample receives can be between 2,300 N ~ 2,500 N. Impact adjustment shall not exceed 5 times, otherwise, the sample needs to be replaced, or, place the sample for 4 h, then, conduct the impact test.

7.5 After placing the sample still for 1 min, in accordance with the impact pattern adjusted in 7.4, conduct 30 times of cyclical impact on the sample; guarantee that the maximum impact force in the 30th time reaches $(2,300 \pm 200)$ N.

7.6 After the test is completed, take down the sample. Record the force value, displacement, time, impact energy, energy absorption, energy return and average stiffness during the 30th impact process. In addition, observe appearance variation of the sample.

8 Test Result

8.1 Record the maximum compression deformation value and the maximum impact force of the test location, which shall respectively be accurate to

0.1 mm and

0.1 N.

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