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

GB/T 7997-2026

Replacing GB/T 7997-2014

Hardmetals - Vickers hardness test

硬质合金 维氏硬度试验方法

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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 7997-2014 "Test Method for Vickers Hardness of Cemented Carbide". Compared with GB/T 7997-2014, except for the structural... Aside from structural adjustments and editorial changes, the main technical changes are as follows:

- a) The scope has been changed (see Chapter 1, Chapter 1 of the.2014 edition);
- b) The symbol descriptions have been changed (see Chapter 4, Chapter 4 of the.2014 edition);
- c) The range of test forces applied by the room temperature Vickers hardness tester has been changed (see 6.1.1,
5.1 in the.2014 edition);
- d) The requirements for high-temperature Vickers hardness testers have been added (see 6.1.2);
- e) Increased requirements for the pressure head (see 6.2.2);
- f) The requirements for the measuring device have been changed (see 6.3,
5.3 in the.2014 edition);
- g) The requirements for the test specimens have been changed (see Chapter 7, Chapter 6 of the.2014 edition);
- h) Change the requirement for the room temperature Vickers hardness test temperature

(see 8.1.1,

7.1 in the 2014 edition);

i) The requirements for the room temperature Vickers hardness test force range have been changed (see 8.1.2,

5 Principles

A diamond indenter, a square pyramid with two opposite faces at a specified angle, is pressed into the sample surface with a certain test force, maintaining the specified pressure. After a certain time, the test force is removed, and the diagonal length of the indentation on the specimen surface is measured. The Vickers hardness value is positively proportional to the quotient of the test force divided by the indentation surface area. In contrast, the indentation is considered to be an ideal shape with a square base and the same angle as the indenter. A schematic diagram of the test principle is shown in Figure 1. (Vickers hardness indentation) (See Figure 1a for a schematic diagram; see Figure 1b for a schematic diagram of the pressure head.)

6.1 Hardness tester

6.1.1 Room temperature Vickers hardness tester The hardness tester shall comply with the relevant provisions of GB/T 4340.2, and the applied test force shall be in the range of 9.807N~980.7N (1kgf~100kgf).

6.1.2 High-Temperature Vickers Hardness Tester A high-temperature Vickers hardness tester should consist of a heating device, a gas purification and circulation system, and the hardness tester itself.

a) Heating device. - The heating device adopts a sealed structure and should ensure that the temperature fluctuation inside the furnace does not exceed $\pm 2^{\circ}\text{C}$ at the set test temperature; - The temperature range of the testing equipment should cover room temperature to 1000°C . The heating rate should not exceed $20^{\circ}\text{C}/\text{min}$; - During the heating and holding process of the sample, the indenter should be simultaneously heated and held at the same temperature within the heating device. The height of the sample's test surface should be lower than the holding surface. The lower surface of the heating cover is about 5mm high to ensure that the entire sample is heated inside the furnace.

b) Gas purification and circulation system. An internal circulation system within the chamber that provides an inert gas environment (argon recommended) and ensures gas purification throughout the testing process. The water and oxygen content are both below 0.0001%.

c) Hardness tester. The hardness tester shall comply with the relevant provisions of GB/T 4340.2, and the applied test force shall be in the range of 9.807N~980.7N. (1kgf~100kgf).

6.2 Indenter

6.2.1 The indenter shall be a diamond cone with a square base and comply with the relevant provisions of GB/T 4340.2.

6.2.2 The indenter should be periodically calibrated using a standard block and kept in good condition. Irregular indentation shapes indicate potential damage to the indenter. Upon inspection... It is indeed damaged and a new pressure head should be replaced.

6.3 Measuring Device The resolution of the device used to measure the diagonal length of the indentation should meet the requirements of Table 1.

7 Samples

7.1 The surface of the specimen shall be treated according to the sample preparation method in GB/T 3488.4, and the thickness of the surface layer removed from the specimen surface shall not be less than

0.2 mm.

7.2 The test surface should be free of foreign contaminants, especially lubricant; the test surface should be free of abrasion marks and polishing scratches, and particle shedding should be avoided. To avoid affecting the hardness measurement.

7.3 During the preparation of the test specimen, the influence of factors such as overheating or cold working on the hardness of the test surface should be minimized.

7.4 The thickness of the prepared specimen should not be less than 1 mm; the specimen should have sufficient thickness to withstand the test under the selected test force. It will not crack or deform.

7.5 When the sample surface is curved, a flat surface should be prepared on the curved surface before the test is carried out.

7.6 During room temperature testing, for specimens with small cross-sections or irregular shapes, some form of additional support measures should be taken, such as embedding in epoxy resin. In resin materials.

8.1 Room Temperature Vickers Hardness Test

8.1.1 The test should be carried out at 10°C~35°C. For tests with strict temperature requirements, the temperature should be 18°C~28°C.

8.1.2 The test force should be in the range of

9.807 N (1 kgf) to 980.7 N (100 kgf). The recommended test force is 294.2 N (30 kgf).

8.1.3 The specimen shall be placed securely on a rigid support platform so that it does not

move during the test.

8.1.4 Without impact or vibration, press the indenter vertically into the surface of the test sample until the applied test force reaches the specified value. The time from the start of applying the force to the completion of the full test force should be between 2 and 8 seconds, and the test force holding time should be between 10 and 15 seconds.

8.1.5 The test apparatus shall not be subjected to impacts or vibrations during the entire test.

8.1.6 Perform at least three hardness tests on a single specimen.

8.1.7 The minimum distance from the center of any indentation to the edge of the specimen shall not be less than

2.5 times the average diagonal length of the indentation. Two adjacent indentations... The center-to-center distance between indentations should be no less than three times the average diagonal length of the indentations. If two adjacent indentations are different sizes, the spacing should be greater than the larger indentation. The average value of the diagonal of the mark is used as the basis.

8.1.8 Measure the lengths of the two diagonals of the indentation and take the average value.

8.2 High-Temperature Vickers Hardness Test

8.2.1 The test shall be conducted at temperatures ranging from 35°C to 1000°C, with 200°C, 400°C, 600°C, 800°C, and 1000°C being the preferred temperatures for measurement. Temperature test. For tests with strict temperature requirements, the temperature fluctuation inside the furnace should not exceed $\pm 1^\circ\text{C}$. Hardness testing should be performed at the test temperature.

8.2.2 The test force shall be in the range of

9.807 N (1 kgf) to 980.7 N (100 kgf). The recommended test force is

98.07 N (10 kgf).

8.2.3 The specimen shall be placed securely on a rigid support platform so that it does not move during the test.

8.2.4 The recommended heat preservation time is 5 minutes, or the heat preservation time can be set according to the agreement between both parties.

8.2.5 Subsequent test procedures are the same as those in

9. Validity determination If the difference between the lengths of the two diagonals of the indentation exceeds 5% of the average diagonal length, the measurement data is considered invalid, and the measurement should be repeated. Analyze the cause of the