

JIS

مرکز پژوهش متالورژی رازی
بخش اطلاع رسانی



JAPANESE INDUSTRIAL STANDARD

Method of Rockwell Hardness Test for Plastics

JIS K 7202 -1982

Translated and Published

by

Japanese Standards Association

Printed in Japan

9 S

JAPANESE INDUSTRIAL STANDARD

JIS

Method of Rockwell Hardness Test for Plastics

K 7202-1982

1. Scope

This Japanese Industrial Standard specifies the testing method for Rockwell M, L, and R hardnesses of plastics. However, as a rule, M, L, and R hardnesses to be measured shall be in the range of from 50 to 115, respectively.

Plastic films and tapes and plastic foams shall be excluded from the application of this standard.

Remarks 1. The hardness obtained by this method is a kind of indentation hardness and is obtained based on the depth of indentation remaining after removal of the test load. Therefore, the values of durometer hardness specified in JIS K 7215, Barcol hardness, and the like, which are obtained from the depth of indentation produced by the application of a test load do not always have good correlation with the values of Rockwell hardness, even though they are similarly indentation hardnesses.

2. The units and numerical values shown in { } in this standard are based on the International System of Units (SI) and are appended for reference.

2. Definition

For the purposes of this standard the following definitions together with those specified in JIS K 6900 and JIS Z 8103 apply:

- (1) rockwell hardness Rockwell hardness is the value obtained from the difference h between the depths of penetration of the indenter under the first and second applications of the standard load when the standard load is first applied to the indenter, then the test load is applied, and then the load is returned to the standard load.

The types of indentors, standard load, test loads, and the formula used for calculation of hardness shall be as shown in Table below.

- (2) scales Hardness symbols shall be given to the respective combinations of the type of indenter, test load, and hardness calculation formula and such combinations shall be called the scales. The contents of the scales shall be as shown in the following Table:

Table

Scale	Symbol of Rockwell hardness	Indentor	Standard load kgf {N}	Test load kgf {N}	Hardness calculation formula
R	HRR	12.700 mm diameter steel ball	10 {98.07}	60 {588.4}	130 to 500 <i>h</i> where <i>h</i> is in mm unit.
L	HRL	6.350 mm diameter steel ball			
M	HRM			100 {980.7}	

Applicable Standards and Reference Standards: See page 14.

2
K 7202-1982

3. Conditioning of Specimen and Test Temperature and Humidity

3.1 Conditioning of Specimen As a rule, the specimen shall be conditioned at a temperature of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$ for not less than 88 hours⁽¹⁾ before they are tested.

Note ⁽¹⁾ If it can be confirmed that the measured values obtained by conditioning for not less than 88 hours and by conditioning for less than 88 hours do not differ from each other, the time for conditioning may be reduced.

3.2 Test Temperature and Humidity The test shall be performed, as a rule, in a room at a temperature of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$.

Remark: Care shall be taken because there are moisture absorbing materials whose Rockwell hardness values are influenced by moisture absorption.

4. Testing Machine

The Rockwell hardness testing machine used shall meet the following requirements:

- (1) The testing machine used for Rockwell hardness tests shall meet the requirements of Appendix 1.

- Remarks 1. When the main parts of the testing machine have been disassembled, reassembled, modified, or when the indenter has been replaced, it shall be reconfirmed that the precision of the testing machine satisfies the precision specified in Appendix 1.
2. Even where the preceding case does not apply, the indirect inspection specified in 3.5 of Appendix 1 shall be performed at fixed intervals to confirm that the overall error of the testing machine is within the permissible value.
3. Apart from the requirement of the preceding item, it is desirable to continuously perform hardness tests with a metal specimen and plastic specimen of suitable hardness and with a little dispersion in hardness, at shorter and suitable intervals to control the precision of the testing machine.

- (2) The testing machine shall be used on a sufficiently stable base with the indenter mounting axis directed vertically.

5. Specimen

The specimen used shall meet the following requirements:

- (1) The surface to be tested and the back surface of the specimen shall be plane and parallel to each other as a rule.

- (2) It is desirable that the specimen is sufficiently thick and such that no changes are observed on the opposite surface due to an indentation produced on the front surface.

Remark: It is desirable, although it depends on the hardness of the specimen, that the thickness of the specimen is 6 mm at the smallest and 10 mm or larger if possible, and the width is 12 mm or larger.

- (3) The surface to be tested and the opposite surface shall be smooth and clean.

6. Procedure

6.1 Preparation before Testing The following preparation shall be performed before performing the Rockwell hardness test:

- (1) A hardness scale shall be selected according to the hardness of the specimen, the purpose of the test, and the like. It is desirable to select the hardness scale so that the hardness value obtained is 100 or less as far as possible.
- (2) The steel ball attached to the steel ball indenter holder shall be in a condition to allow for rotation without resistance.
It shall be confirmed that the steel ball is free of flaws and clean.
- (3) The interface where the end surface of the indenter mounting axis and the load receiving surface of the steel ball indenter holder contact each other shall be clean.
- (4) The specimen supporting surface of the specimen supporting base shall be clean.
- (5) When the indenter, specimen supporting base, or the like, has been mounted or replaced, when the specimen supporting base has been raised or lowered over a wide range by operating the screw capstan, when a test is undertaken, and so forth, a preliminary procedure shall be performed 2 times or more in the same manner as in the measurement of hardness.

6.2 Test Procedure The Rockwell hardness test shall be carried out as follows:

- (1) The surface to be tested of the specimen shall be positioned perpendicular to the indenter mounting axis.
The back surface of the area where indentations are produced shall closely contact the surface of the specimen supporting base as far as possible.
- (2) It is desirable that the position of measuring hardness is $4d$ or more (d is the diameter of the indentation) apart from the center of any already existing indentation and $2.5d$ or more apart from the edges of the specimen.

Remark: Although it depends on the hardness of the specimen, it is desirable that the center of the indentation is positioned 6 mm or more apart from the edges of the specimen.

4
K 7202-1982

- (3) The position to which the indenter mounting axis is raised for applying the standard load shall be within ± 5 in hardness units from the prescribed position⁽²⁾. Then the pointer of the indicator shall be made agree with the set point (B 30) of the dial plate.

Note (2) This position is the position where the pointer of the indicator points right upward in the case of an ordinary testing machine using a dial gauge for indicator.

Remarks 1. When the indenter mounting axis is raised beyond the above range, the test shall be invalidated and performed once again at an unused position of the specimen.

2. In the case of a testing machine with a specified range of raising position, such specification shall be followed.

- (4) After completion of the procedure of (3), the increase of the load shall be started as quickly as possible and the test load applied in 2 to 4 seconds as a rule.

Remark: For adjusting the loading speed, it is recommended to make adjustment so that the loading operation takes 4 to 5 seconds when a 100 kgf { 980.7 N } test load is applied without the specimen in place.

- (5) The time duration for which the application of the test load is continued shall be 15 seconds from starting the increase of the load in the procedure of (4).
- (6) After completion of the procedure of (5), the load shall be reduced and returned to the standard load.
- (7) In 15 seconds after starting to decrease the load in the procedure of (6), the hardness value shall be read from the indicator to one decimal place.
- (8) During the loading operation, care shall be taken not to give impact or vibration to the indenter and the load shall be increased or decreased smoothly.
- (9) The measurement of hardness shall be performed at least 5 times, if possible 10 times, on the same specimen.

7. Calculation

Hardness shall be obtained by calculating, on each specimen, the sample mean value and the range or standard deviation according to JIS Z 9041. In this case, the mean value shall be rounded off to an integer according to JIS Z 8401.

8. Indication of Hardness

Scale symbols shall be attached to the hardness values.

Examples: HRM 83, HRL 64, HRR 76

9. Report

The following particulars shall be described in the report, as required.

- (1) Kind, class, and shape of material tested
- (2) Thickness, size and number of specimens
- (3) Preparation method for specimens
- (4) Temperature, humidity, and time used for conditioning of specimens
- (5) Temperature and humidity of testing room
- (6) Number of times of hardness measurement
- (7) Mean value
- (8) Range or standard deviation of measured values
- (9) Date of test
- (10) Other special matters