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(JRMA/JSA)

**Rubber, vulcanized or thermoplastic—
Determination of hardness—
Part 2: IRHD method (hardness
between 10 IRHD and 100 IRHD)**

ICS 83.060

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In the event of any doubts arising as to the contents,
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Contents

	Page
Introduction.....	1
1 Scope.....	1
2 Normative references	1
3 Terms and definitions	2
4 Principle	2
5 Types of hardness test	3
5.1 General.....	3
5.2 Methods of hardness test on flat surface.....	3
5.3 Methods of hardness test on cylindrical surface	4
6 Apparatus	4
6.1 Calibration and verification	4
6.2 Method N, method H, method L and method M.....	4
6.3 Method CN, method CH, method CL and method CM.....	9
7 Test pieces	11
7.1 Sampling and preparation of test pieces	11
7.2 Method N, method H, method L and method M.....	11
8 Conditioning of sample or test pieces	13
8.1 Time interval between vulcanization and testing	13
8.2 Conditioning of test pieces	13
9 Test method.....	13
9.1 Test conditions	13
9.2 Procedure	13
10 Expression of test results.....	14
11 Precision	14
12 Test report	14
Annex A (normative) Empirical relationship between international rubber hardness degrees (IRHD) and indentation	16
Annex B (informative) Precision results of IRHD from interlaboratory test programmes	19
Annex JA (informative) Comparison table between JIS and corresponding International Standard	24

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by the Japan Rubber Manufacturers Association (JRMA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

Consequently, **JIS K 6253**:2006 has been withdrawn and partially replaced with this Standard.

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Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

JIS K 6253 series consists of the following 5 parts under the general title “*Rubber, vulcanized or thermoplastic—Determination of hardness*”:

Part 1: General guidance

Part 2: IRHD method (hardness between 10 IRHD and 100 IRHD)

Part 3: Durometer method

Part 4: IRHD pocket meter method

Part 5: Calibration and verification of hardness testers

Rubber, vulcanized or thermoplastic— Determination of hardness—Part 2: IRHD method (hardness between 10 IRHD and 100 IRHD)

Introduction

This Japanese Industrial Standard has been prepared based on the fifth edition of **ISO 48** published in 2010 with some modifications of the technical contents.

The portions given continuous sidelines or dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with the explanations is given in Annex JA.

1 Scope

This Standard specifies the methods for determination of international rubber hardness degrees (IRHD) of vulcanized or thermoplastic rubbers.

The specified methods in this Standard cover the hardness range from 10 IRHD to 100 IRHD. This Standard does not specify a method for the determination of IRHD by an IRHD pocket hardness meter.

NOTE 1 The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 48:2010 *Rubber, vulcanized or thermoplastic—Determination of hardness (hardness between 10 IRHD and 100 IRHD)* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21-1**.

NOTE 2 Determination of IRHD pocket hardness is described in **JIS K 6253-4** (see literature [1] in Bibliography).

WARNING : Persons using this Standard should be familiar with normal laboratory practice. This Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS K 6200 *Rubber—Vocabulary*

JIS K 6250 *Rubber—General procedures for preparing and conditioning test pieces for physical test methods*

NOTE : Corresponding International Standard: ISO 23529 *Rubber—General procedures for preparing and conditioning test pieces for physical test methods* (MOD)

JIS K 6253-1 *Rubber, vulcanized or thermoplastic—Determination of hardness—Part 1: General guidance*

NOTE : Corresponding International Standard: ISO 18517 *Rubber, vulcanized or thermoplastic—Hardness testing—Introduction and guide* (MOD)

JIS K 6253-5 *Rubber, vulcanized or thermoplastic—Determination of hardness—Part 5: Calibration and verification of hardness testers*

NOTE : Corresponding International Standard: ISO 18898 *Rubber—Calibration and verification of hardness testers* (MOD)

JIS Z 8401 *Guide to the rounding of numbers*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS K 6200** and **JIS K 6253-1** apply.

4 Principle

A plunger having a rigid ball or spherical surface is pressed against the surface of rubber test piece under a small contact force as given in table 1. The slight indentation made on the test piece as a result of this is referred to as the indentation depth by the contact force (see figure 1). The indentation depth made under a large contact force as given in table 1 is referred to as the indentation depth by the total indenting force (see figure 2). Difference between the indentation depth of the plunger by the total indenting force and that by the contact force is determined. From this difference, the hardness in IRHD is obtained by using table 2, table 3, and table 4.

In method M, the differential indentation in table 2 is multiplied by 1/6. Graphs based on table 2, table 3 and table 4 or an indentation-measuring instrument capable of reading directly in IRHD may be used. Table 2, table 3 and table 4 are derived from Annex A.

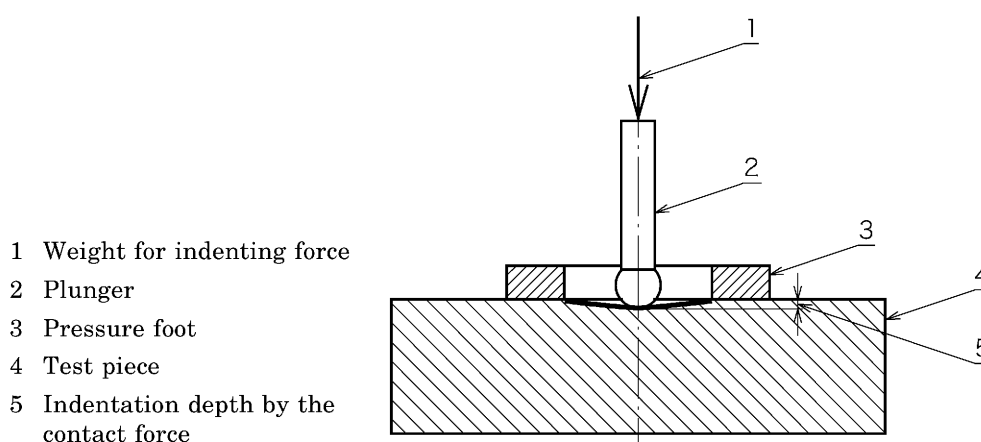


Figure 1 Principle of hardness measurement (indentation depth by the contact force)

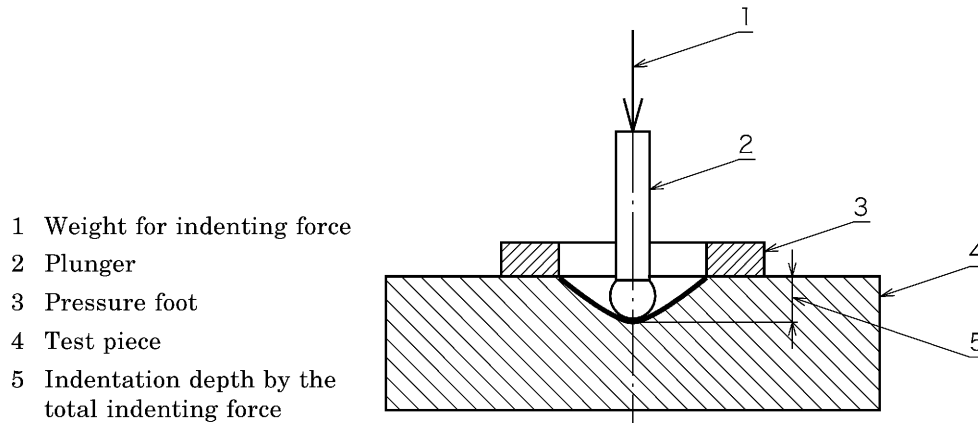


Figure 2 Principle of hardness measurement (indentation depth by the total indenting force)

5 Types of hardness test

5.1 General

These methods determine the hardness on flat surfaces and curved surfaces, and the hardness is expressed in IRHD. These methods cover the range from 10 IRHD to 100 IRHD. They differ primarily in the diameter of the indenting ball and the magnitude of the indenting force, depending on the hardness range of the test piece used (see table 1). The range of applicability of each method is indicated in **5.2 a)** to **d)** and in figure 3.

5.2 Methods of hardness test on flat surface

- a) **Method N**, covering the nominal range 35 IRHD to 85 IRHD. It can also be used for hardness in the ranges 30 IRHD to 35 IRHD and 85 IRHD to 95 IRHD ¹⁾ upon agreement between the purchaser and the supplier.
- b) **Method H**, covering the nominal range 85 IRHD to 100 IRHD.
- c) **Method L**, covering the nominal range 10 IRHD to 35 IRHD.
- d) **Method M**, covering the nominal range 35 IRHD to 85 IRHD. It can also be used for hardness in the ranges 30 IRHD to 35 IRHD and 85 IRHD to 95 IRHD upon agreement between the purchaser and the supplier ²⁾.

Notes ¹⁾ The value of the hardness obtained by method N within the ranges 85 IRHD to 95 IRHD and 30 IRHD to 35 IRHD might not agree precisely with that obtained using method H or method L, respectively.

²⁾ Method M is essentially a version of the normal test method N scaled down to about 1/6, permitting testing of thinner or smaller test pieces. Therefore the differential indentation of the plunger obtained in method M is 1/6 the differential indentation obtained in method N. For this reason, and because of various surface effects in the rubber and the possibility of slight surface roughness, method M might not always give results agreeing with those obtained by method N.

5.3 Methods of hardness test on cylindrical surface

For measurement of rubber test pieces having a cylindrical measuring surface and satisfying either of the followings, method CN, method CH, method CL and method CM, which are altered from method N, method H, method L, and method M, respectively, shall be applied.

- The test piece or sample is large, and the hardness testing instrument is mounted upon them for measurement.
- The test piece or sample has small surfaces and have to be mounted on the base of the hardness-measuring instrument for measurement, or the sample is placed on the flat specimen table integral with the instrument.

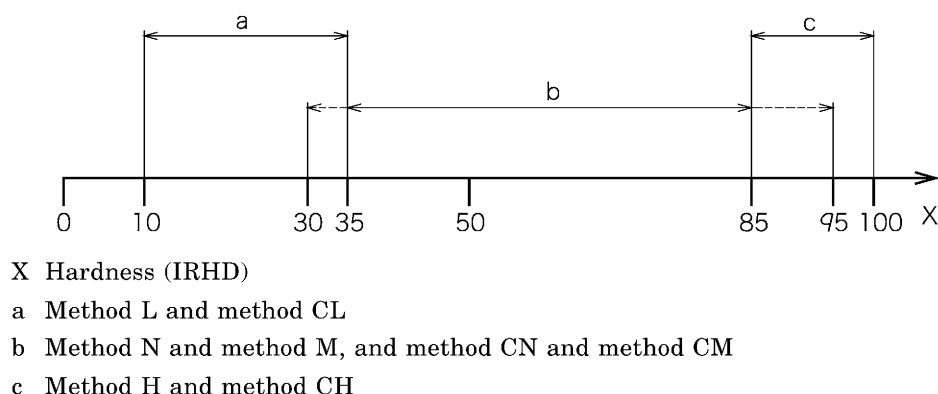


Figure 3 Range of applicability of IRHD measurement

6 Apparatus

6.1 Calibration and verification

Calibration and verification of the apparatus shall be performed in accordance with **JIS K 6253-5**.

6.2 Method N, method H, method L and method M

6.2.1 General

The apparatus shall consist of a test piece table for supporting the test piece, a flat annular foot for exerting pressure on the test piece surface, a plunger having a rigid ball or spherical surface on the lower end, provided at the centre of the hole of the foot, means for applying a contact force and an additional indenting force to the plunger, means for measuring the depth of indentation of the plunger caused by the indenting force (see figure 1 and figure 2 for conceptual diagram of apparatus), and desirably, means for gently vibrating the apparatus to overcome any slight friction. A chamber for the test piece, when tests are made at temperatures other than a standard laboratory temperature, may be provided. Dimensions of principle parts and definition of forces are shown in table 1.

Table 1 Principle dimensions and forces of apparatus

Type of test	Diameter of indenting ball mm	Pressure foot			Force on ball		
		Diameter mm	Hole diameter mm	Force on foot N	Contact ^{a)} N	Indenting ^{b)} N	Total N
Method N	2.50±0.01	20±1	6±1	8.3±1.5	0.30±0.02	5.40±0.01	5.70±0.03
Method H	1.00±0.01	20±1	6±1				
Method L	5.00±0.01	22±1	10±1				
Method M	0.395±0.005	3.35±0.15	1.00±0.15	(235±30)×10 ⁻³	(8.3±0.5)×10 ⁻³	(145±0.5)×10 ⁻³	(153.3±1.0)×10 ⁻³
Notes ^{a)} Contact force refers to the force under which the indenting ball of the plunger contacts the test piece surface. ^{b)} Indenting force refers to the force, after contact, pressing the indenting ball of the plunger further into the test piece.							

6.2.2 Plunger

The plunger shall have a rigid ball or spherical surface on the lower end as specified in table 1, and means for supporting the plunger vertically to the pressure-foot surface. The spherical tip of the plunger shall be kept slightly above the surface of the annular foot prior to applying the contact force.

6.2.3 Means for applying force

The means for applying force shall be capable of applying correctly the contact force and indenting force specified in table 1 to the indenting ball of the plunger.

6.2.4 Means for measuring the indentation depth

The means for measuring the indentation depth shall be capable of measuring the indentation depth made by the plunger when indenting force is applied to it, and shall be provided with the means for reading directly in the indentation depth or the IRHD. The gauge employed may be mechanical, optical or electrical. Conversion of the determined differential indentation depth to the IRHD value is made referring to table 2, table 3 and table 4, which are for method N, method H, and method L, respectively. For method M, conversion shall be made by the differential indentation value in table 2 multiplied by 1/6.