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Rubber, vulcanized or thermoplastic—Determination of abrasion resistance—Part 1: Guide

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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 of establishing a Japanese Industrial Standard from The Japan Rubber Manufacturers Association (JRMA)/Japanese Standards Association (JSA), with a draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law. Consequently **JIS K 6264** is withdrawn and replaced by **JIS K 6264-1** and **JIS K 6264-2**.

This Standard has been made based on **ISO 23794:2003** *Rubber, vulcanized or thermoplastic—Abrasion testing—Guidance* for the purpose of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

JIS K 6264 consists of the following 2 parts under the general title “*Rubber, vulcanized or thermoplastic—Determination of abrasion resistance*”

Part 1: Guide

Part 2: Testing methods

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Rubber, vulcanized or thermoplastic— Determination of abrasion resistance— Part 1: Guide

Introduction This Japanese Industrial Standard has been prepared based on **ISO 23794** *Rubber, vulcanized or thermoplastic—Abrasion testing—Guidance* published in 2003 with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters in which the contents of the original International Standard have been modified. A list of modifications with the explanations is given in Annex 1 (informative).

1 Scope This part of **JIS K 6264** specifies the guide for determination of abrasion resistance of vulcanized rubber and thermoplastic rubber (hereafter referred to as “vulcanized rubber”).

- Remarks 1 The actual abrasion includes a lot of factors. Consequently, for the evaluation of the actual abrasion of product from the result of abrasion test carried out in laboratory, careful consideration is required.
- 2 The International Standard corresponding to this part of **JIS K 6264** is as follows.

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**.

ISO 23794:2003 *Rubber, vulcanized or thermoplastic—Abrasion testing—Guidance* (MOD)

2 Normative references The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply. The normative references without the indication of the year of coming into effect apply only to the most recent edition (including amendments).

JIS K 6200 *Rubber—Vocabulary*

JIS K 6250 *Rubber—General rules of physical testing methods*

Remarks : The following International Standards are equivalent to the said standard in the relevant items.

ISO 471:1995 *Rubber—Temperatures, humidities and times for conditioning and testing*

ISO 4648:1991 *Rubber, vulcanized or thermoplastic—Determination of dimensions of test pieces and products for test purposes*

ISO 4661-1:1993 *Rubber, vulcanized or thermoplastic—Preparation of samples and test pieces—Part 1: Physical tests*

JIS K 6264-2 Rubber, vulcanized or thermoplastic—Determination of abrasion resistance—Part 2: Testing methods

JIS K 6299 Rubber—Preparation of test pieces

JIS R 6111 Artificial abrasives

JIS R 6210 Vitrified grinding wheels

JIS R 6212 Resinoid grinding wheels

JIS R 6251 Abrasive cloths

JIS R 6252 Abrasive papers

ISO 4649:2002 Rubber, vulcanized or thermoplastic—Determination of abrasion resistance using a rotating cylindrical drum device

3 Definitions For the purposes of this Standard, the definitions given in **JIS K 6200** and those shown in the following table 1 apply.

Table 1 Definitions of terms

Number	Term	Definition
1	abrasion resistance	the characteristic of rubber expressed by volumetric wear rate, linear wear rate, specific wear rate, abradability value, abrasion resistance index
2	abrasion loss	percentage of wear amount to mass before abrasion
3	relative volume loss	relative volume loss expressed by volume (mm ³), when the test sample is abraded under the same test conditions as the standard sample used for adjustment by using the abrasive cloth adjusted so as to produce a definite abrasion mass to the standard sample (used in DIN abrasion test)
4	abradability	abrasion volume per abrasion energy (product of friction force multiplied by friction distance)
5	abrasion dust	the powdery, granular and film-shaped rubber dust produced, caused by the rubber worn from the abraded surface of rubber Fine abrasion dust is also called abrasion powder.
6	wear curve	a curve expressing wear amount to distance, number of revolution or time
7	abrasive wear	the wear produced when hard, sharp projections scrape the rubber surface
8	adhesive wear	when rubber is rubbed with comparatively smooth surface, micro destruction is generated in the inside of rubber material and adheres to the opposite surface It means the wear produced by this.
9	fatigue wear	the wear produced by the fatigue of surface when rubber is repeatedly subjected to contact deformation by smooth projection
10	wear by roll-formation	when rubber is rubbed at critical speed and critical pressure or over, the abrasion dust by roll-formation such as eraser is produced It means such wear.

Table 1 (concluded)

Number	Term	Definition
11	pattern abrasion	the abrasion form in which wear proceeds as producing a pattern on the rubber surface
12	oily wear	the abrasion form in which sticky rubber layer of low molecular weight is produced on the abrasion surface when rubber is rubbed by comparatively low load
13	abrasion pattern	the friction pattern which is produced approximately at a definite interval right-angled to sliding direction in abrasive wear
14	abrasives	the material to compose abrasive wheels, abrasive cloths, abrasive papers, etc. It is specified according to the quality of material, particle size, etc. It is specified as the artificial abrasives in JIS R 6111 .
15	abradants	the material or tool to abrade vulcanized rubber such as abrasive wheels, abrasive cloths, abrasive papers, metallic edges, metallic plates, crushed stone Abrasives are sometimes used as they are.
16	abrasive wheels	a disc-shaped grinding wheel It is specified as grinding wheel in JIS R 6210 and JIS R 6212 .
17	abrasive cloths	that which has a cloth backing and abrasives are dispersed and settled on cloth surface by using adhesives (See JIS R 6251)
18	abrasive papers	that which has a paper backing and abrasives are dispersed and settled on paper surface with using adhesive (See JIS R 6252)
19	dusting powder	the powder (talc, clay, etc.) to be introduced (fallen from above) on the surface to be abraded as the effective measure for preventing abradants from adhering or sticking of the abrasion dust produced by abrasion test
20	slip ratio	the percentage of difference between the surface speed of test piece and the surface speed of abradants
21	standard material	the sample (test piece) for the measurement of the abrasion capability of abradants, etc.
22	reference material	the sample (test piece) for the relative comparison of test result

4 Expression of abrasion resistance The expression of abrasion resistance used in this Standard shall be as follows:

a) **Volumetric wear rate**

$$K_V \propto \frac{V}{L} \dots\dots\dots (1)$$

where, K_V : volumetric wear rate
 V : wear volume
 L : friction distance

b) **Linear wear rate**

$$K_L \propto \frac{h}{L} \dots\dots\dots (2)$$

where, K_L : linear wear rate
 H : wear dimension
 L : friction distance

c) **Specific wear rate**

$$K \propto \frac{V}{L \times F} = \frac{K_V}{F} \dots\dots\dots (3)$$

where, K : specific wear rate
 V : wear volume
 L : friction distance
 F : load
 K_V : volumetric wear rate

d) **Abradability**

$$\gamma \propto \frac{V}{L \times F \times \mu} = \frac{K}{\mu} \dots\dots\dots (4)$$

where, γ : abrasability
 V : wear volume
 L : friction distance
 F : load (additional force)
 μ : coefficient of friction
 K : specific wear rate

e) **Wear index**

$$I \propto \frac{V_r}{V_t} \times 100 \dots\dots\dots (5)$$

where, I : wear index
 V_t : wear volume of test sample
 V_r : wear volume of reference sample

5 Wear mechanism The wear of rubber is generally classified according to the wear form as follows:

Moreover, for the wear, these various forms of wear occur in practical service (as a compounding) condition. The wear form is changed even depending on contact pressure, friction speed, temperature, condition of abrasants, etc., therefore care shall be taken when the correlation with the practical wear of product is discussed.

- a) Abrasive wear
- b) Adhesive wear