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

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

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision 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 applicable to the case of revision by the provision of Article 14. Consequently **JIS K 6250:2006** is 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.

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Rubber—General procedures for preparing and conditioning test pieces for physical test methods

Introduction

This Japanese Industrial Standard has been prepared based on **ISO 23529:2016**, Edition 3, with some modifications of the technical contents, by adding notes on the preparation methods of test pieces.

The vertical lines on both sides and dotted underlines indicate changes from the corresponding International Standard. A list of modifications with the explanations is given in Annex JB.

1 Scope

This Standard specifies the storage, conditioning and test conditions (temperature/humidity/time), and marking, preparation and dimension measurement methods of rubber test pieces for use in physical tests. Special conditions, applicable to a particular test or material or simulating a particular climatic environment, are not included, nor are special requirements for testing whole products.

In this Standard, rubber is used as a general term of vulcanized rubber, thermoplastic rubber, raw rubber and unvulcanized rubber (compound).

NOTE 1 Annex JA summarises test items, measuring items for evaluation and outline of test required in physical tests of rubber.

NOTE 2 The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows.

ISO 23529:2016 *Rubber—General procedures for preparing and conditioning test pieces for physical test methods* (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**.

WARNING 1 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 of this Standard to establish appropriate safety and health practices.

WARNING 2 Certain procedures specified in this Standard might involve the use or generation of substances, or the generation of waste, that could constitute a local environmental hazard. Ensure compliance with any national regulatory conditions on safe handling and disposal after use.

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 B 7507 *Vernier, dial and digital callipers*

JIS B 7512 *Steel tape measures*

JIS B 7516 *Metal rules*

JIS K 2201 *Gasoline for industrial purpose*

JIS K 6200 *Rubber—Vocabulary*

JIS K 6298 *Rubber, raw natural and raw synthetic—Sampling and further preparative procedures*

NOTE Corresponding International Standard: ISO 1795 *Rubber, raw natural and raw synthetic—Sampling and further preparative procedures*

JIS K 6299 *Rubber test mixes—Preparation, mixing and vulcanization—Equipment and procedures*

JIS Z 8000-1 *Quantities and units—Part 1: General*

JIS Z 8000-3 *Quantities and units—Part 3: Space and time*

JIS Z 8000-4 *Quantities and units—Part 4: Mechanics*

JIS Z 8000-5 *Quantities and units—Part 5: Thermodynamics*

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** apply.

4 General

The unit symbols are in accordance with **JIS Z 8000-1**, **JIS Z 8000-3**, **JIS Z 8000-4** and **JIS Z 8000-5**. The rounding method of numerals is in accordance with **JIS Z 8401**.

5 Identification of sample and test piece

Each sample or test piece shall be such that all the relevant details of sampling/preparation, storage, conditioning and measurement are traceable, and individually identifiable by marking or segregation at each stage of its preparation and testing.

Where marking is used as the method of identification, the markings shall be sufficiently durable to ensure that the sample or test piece remains identifiable until discarded. The method of marking shall not affect the properties of the sample or test piece and shall avoid surfaces which are to be directly tested.

Where grain effects can be significant, the direction of the grain shall be identified on each sample or test piece.

6 Standard laboratory conditions

6.1 Standard laboratory temperature

The standard laboratory temperature shall be $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$, or $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ if agreed between the interested parties. If required, the tolerance shall be $\pm 1\text{ }^{\circ}\text{C}$.

NOTE The temperature $23\text{ }^{\circ}\text{C}$ is normally the standard laboratory temperature in temperate countries and $27\text{ }^{\circ}\text{C}$ is normally the standard laboratory temperature in tropical and subtropical countries.

6.2 Standard laboratory humidity

If control of both temperature and humidity is necessary, they should be selected from Table 1.

Table 1 Preferred temperature and relative humidity

Temperature °C	Relative humidity %	Tolerance on relative humidity %
23	50	± 10 ^{a)}
27	65	
Note ^{a)} If a tighter tolerance is required, ± 5 % can be specified.		

7 Storage of samples and test pieces

Shall be as follows.

- Samples awaiting the sampling/preparation of test pieces and test pieces prior to conditioning shall be stored under conditions which minimize the possibility of degradation by ambient conditions, such as heat or light, or of contamination, e.g. cross-contamination from other samples.
- For all tests, the minimum time between forming the material and testing shall be 16 h.

When test pieces are cut from a product or where a whole product is tested, considerably more time than 16 h between forming the material and testing can be necessary. In these cases, the minimum time shall be as given in the product specification or relevant test method.

- For non-product tests, the maximum time between forming the material and testing shall be 4 weeks and, for evaluations intended to be comparable, the tests shall be carried out, as far as possible, after the same time interval.
- For product tests, whenever possible, the time between forming the product and testing shall not exceed 3 months. In other cases, tests shall be made within 2 months of the date of receipt of the product by the customer.
- Special tests for other purposes can be carried out at any time, e.g. for the purposes of process control or to evaluate the influence of abnormal storage conditions on a product. Such reasons shall be clearly stated in the test report.

- f) In the case of unvulcanized rubber (compound), batches shall be conditioned for between 2 h and 24 h at one of the standard laboratory temperatures specified in **6.1**, preferably in a closed container to prevent absorption of moisture from the air, or in a room in which the relative humidity is controlled at $(50 \pm 5) \%$.

8 Sampling/preparation of test pieces

8.1 Test piece thickness

The test piece thickness shall be as specified in the relevant test method. If not specified, the test piece thickness should be selected from Table 2. However, the test piece thicknesses other than those in Table 2 may be specified where it is necessary to retain the original surface of the sample.

Table 2 Preferred test piece thicknesses and tolerances

Unit: mm

Test piece thickness	Tolerance
1.0	± 0.1
2.0	± 0.2
4.0	± 0.2
6.3	± 0.3
12.5	± 0.5

8.2 Thickness adjustment

8.2.1 General

When a test piece is sampled/prepared from products, but is not available in a thickness specified in **8.1**, procedures are required to adjust the thickness to within the prescribed limits. Thickness adjustments shall be made on the material before the cutting of the test pieces according to the procedures given in **8.2.2**.

8.2.2 Techniques

Shall be as follows.

- a) **Removal of textiles combined with the rubber** The separation shall preferably avoid the use of a liquid, which causes swelling. Cut out a sample of a suitable width as the textiles are stuck thereto, and slice off or peel off the textiles using a knife or other suitable tool so that little heat or tension is given to the rubber and smooth rubber surface can be obtained as far as possible. Care shall be taken to avoid excessive stretching of the rubber by separating a little at a time while the rubber is gripped near the point of separation. If this is not possible, a nontoxic liquid of low boiling point, such as isooctane (2,2,4-trimethylpentane) or rubber solvent (such as No. 2 gasoline for industrial purpose specified in **JIS K 2201**), can be used to wet the contacting surfaces. If a liquid is used, the rubber shall be placed so as to permit free evaporation of the liquid, and time shall be allowed for the complete evaporation of the liquid, preferably at least 16 h, before the test pieces are punched out and tested.

- b) **Cutting techniques** When it is necessary to remove a considerable thickness of rubber or to produce a number of slices from a thick piece of rubber, rotating-blade equipment specified in **8.2.3 a)** or skiving machines specified in **8.2.3 b)** shall be used. For the purpose of smooth slicing or grinding, lubricant such as a diluted neutral detergent having no influence on the sample may be used.
- c) **Abrading techniques** When it is necessary to adjust the thickness slightly, or remove unevenness of peeled-surface of sample from which textiles are removed or unevenness caused by cutting, grinding shall be carried out using a abrasive wheel or flexible abrasive belt so that heat is generated as little as possible.

8.2.3 Equipment for test piece preparation

Shall be as follows.

- a) **Rotating-blade equipment** This equipment is based on commercial slicing machines. The machine consists of a motor- or hand-driven disc cutter of suitable diameter with a movable cutting table which transports the sample to the cutting edge. An adjustable slow-feed mechanism fitted to the cutting table feeds the rubber forward to the line of cut, and controls the thickness of the slice. Clamping devices shall be available to secure the rubber. The blade shall preferably be lubricated with a dilute aqueous detergent solution to ease the cutting operation.
- b) **Skiving machines** This equipment is based on commercial leather-slitting machinery, and convenient types are available for cutting strips about 50 mm wide with thicknesses up to about 12 mm. Adjustment shall be possible to vary the thickness of cut, and feed rollers shall be provided to transport the material past the knife. Attachments are available for splitting and cutting sections from cable sheathing. Maintain the cutting edge in a sharp condition at all times.
- c) **Abrasive wheels** The abrading apparatus shall consist of an abrader with a motor-driven abrasive wheel. It is important that the wheel runs true without vibration, and that the abrasive surface, of aluminium oxide or silicon carbide, is true and sharp. The abrader can be equipped with a slow-feed mechanism so that very light cuts can be made to avoid overheating of the rubber. Suitable means shall be provided for securing the rubber to prevent excessive deformation and for controlled traversing of the rubber against the abrasive wheel.

NOTE Wheels of diameter 150 mm operating at a surface speed in the range of 10 m/s to 12 m/s, designated C-30-P-4-V for roughing and designated C-60-P-4-V for finishing (see **JIS R 6242** [1]), have been found suitable.

The depth of cut produced in the first pass shall not exceed 0.2 mm. Successive cuts shall be progressively less deep to avoid overheating. Buffing shall not be carried out beyond the point where unevenness in the thickness has been eliminated. For removal of greater thicknesses of rubber, rotating-blade equipment specified in **8.2.3 a)** or skiving machines specified in **8.2.3 b)** shall be used.

- d) **Flexible abrasive belts** The apparatus shall consist of either a motor-driven drum on which a helical strip of the abrasive belt is secured, or of two pulleys, one motor-driven and the other adjustable, to tension and align the belt. The abrasive belt shall be of textile or paper or a combination of the two, with the abrasive, of aluminium oxide and/or silicon carbide, bonded to the surface with a resin which is

unaffected by water. Equipment shall be provided for slow feeding of the material to the abrasive belt and for securing the material without excessive deformation.

NOTE A surface speed of the band of $20 \text{ m/s} \pm 5 \text{ m/s}$ has been found suitable.

8.3 Test piece cutters

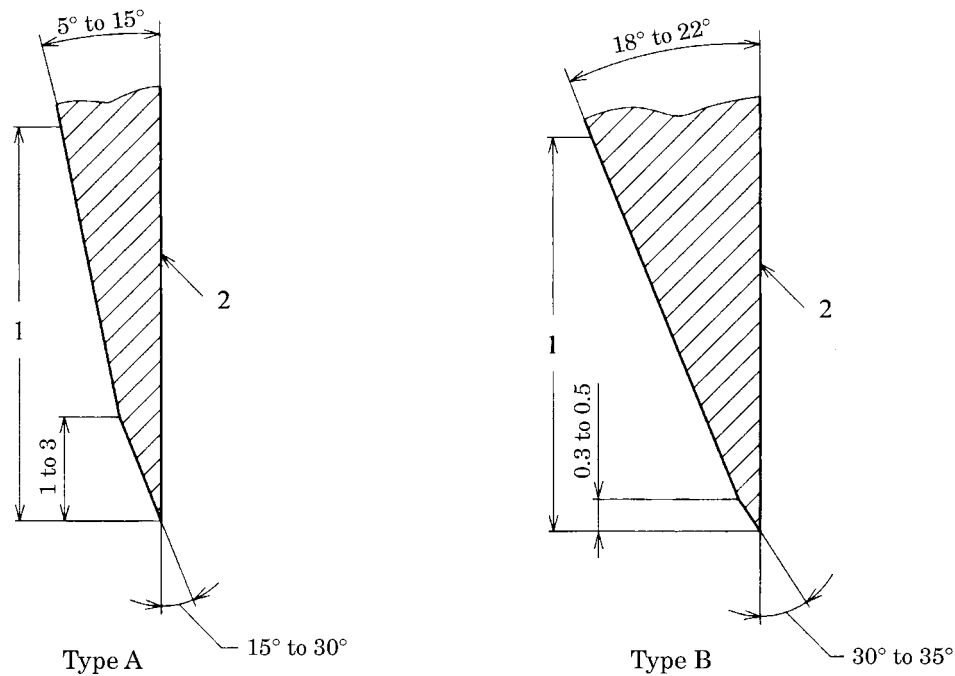
8.3.1 General

The design and type of cutter or die employed depends on the thickness and hardness of the material under test. In the case of thin materials, punching or rotary cutting techniques shall be used as specified in **8.3.2**, **8.3.3** or **8.3.4**. For thicker materials, usually above 4 mm, a rotary cutting technique as specified in **8.3.4** is desirable to reduce the degree of dishing of the cut edge resulting from compression of the rubber during cutting.

8.3.2 Fixed-blade (forged blade) cutters

An example of fixed-blade cutters is shown in Figure 1. These shall be made from high-quality tool steel and can be designed to punch out single or multiple test pieces. It is essential that the design ensures sufficient rigidity to prevent distortion of the cutting shape, and the cutter shall preferably be fitted with an ejection system to release the test piece. If fitted, such a system shall be designed to accommodate material up to the maximum thickness to be cut, normally 4.2 mm. If an ejection system is not fitted, access shall be available from the rear to permit release of the test piece by the operator without damaging the cutting edge. The cutting edge shall be kept sharp and free from nicks.

Unit: mm



Type A is an example of profile/dimension of cutting edge commonly used in Japan.

- 1 Cutting edge Approx. 6 mm
- 2 Inside surface of cutter (test piece side)

Figure 1 Example of profile/dimension of cutting edge of fixed-blade

8.3.3 Replaceable-blade cutters

These shall use sharpened, carbon-steel strips, such as single-edged razor blades, which are sufficiently flexible to conform to the shape of the cut required. The cutting edge shall be securely clamped between shaped metal spacers and shaped blocks which conform to the specified cut shape. The protrusion of blade shall be not more than 2.5 mm from the surface. The cutter should preferably be fitted with an ejection system to release the test piece. If fitted, such a system shall be designed to accommodate a sample of not more than 2.2 mm. If an ejection system is not fitted, access shall be available from the rear to permit release of the test piece by the operator without damaging the cutting edge. Checks shall be made to ensure that the blade is not significantly deformed during the cutting operation, particularly with rubbers of high hardness.

8.3.4 Rotary cutters

Either annular or arc-shaped knives or razor blades, held in a suitable adapter permitting them to be fitted in a drilling machine, shall be used. Means shall be provided for holding the rubber in place during the cutting operation. This can consist of a combination of a plunger with a presser foot incorporated in the adapter to secure the central portion of the rubber and a metal pressure plate having a central hole larger than the size of the test piece to be cut out, or it can consist of a vacuum-type holder which applies suction to the lower surface of the rubber. Means can be provided for lubricating the surface of the rubber during the cutting operation. To assist in obtaining a perpendicular cut, a second annular blade of larger diameter, working at the same time as the test piece cutting blade, has been found effective. The size of the blades and the