

Rubber - General procedures for
preparing and conditioning test pieces for
physical test methods
(ISO 23529:2004, IDT)

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- ISO 23529:2004, IDT

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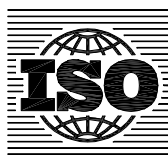
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**Rubber — General procedures for
preparing and conditioning test pieces
for physical test methods**

*Caoutchouc — Procédures générales pour la préparation et le
conditionnement des éprouvettes pour les méthodes d'essais
physiques*

Preview



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 23529 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Testing and analyses*.

It cancels and replaces ISO 471:1995, ISO 3383:1985, ISO 4648:1991 and ISO 4661-1:1993, of which it constitutes a technical revision.

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

WARNING — Persons using this International 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 and to ensure compliance with any national regulatory conditions.

1 Scope

This International Standard specifies general procedures for the preparation, measurement, marking, storage and conditioning of rubber test pieces for use in physical tests specified in other International Standards, and the preferred conditions to be used during the 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.

This International Standard also specifies the requirements for the time-interval to be observed between forming and testing of rubber test pieces and products. Such requirements are necessary to obtain reproducible test results and to minimize disagreements between customer and supplier.

2 Identification and record keeping

Records shall be kept of the identity of each test piece so that it is identifiable with the sample supplied and such that all the relevant details of preparation, storage, conditioning and measurement are traceable to each individual test piece.

Each sample or test piece shall be 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 test piece or sample remains identifiable until discarded. Where grain effects may be significant, the direction of the grain shall be identified on each sample or test piece.

The method of marking shall not affect the properties of the sample or test piece and shall avoid significant surfaces, i.e. surfaces which are to be directly tested (as in e.g. abrasion tests) or surfaces at which a fracture will terminate during the test (as in e.g. tear or tensile tests).

3 Standard laboratory conditions

3.1 Standard laboratory temperature

The standard laboratory temperature shall be either $(23 \pm 2) ^\circ\text{C}$ or $(27 \pm 2) ^\circ\text{C}$ in accordance with national practice.

If a closer tolerance is required, it shall be $\pm 1 ^\circ\text{C}$.

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

3.2 Standard laboratory humidity

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

Table 1 — Preferred relative humidity

Temperature	Relative humidity	Tolerance on humidity
°C	%	%
23	50	± 10 ^a
27	65	
^a If a tighter tolerance is needed, ± 5 % can be specified.		

3.3 Other conditions

When control of temperature and humidity is not necessary, the prevailing ambient temperature and humidity shall be used.

4 Storage of sample and test pieces

4.1 Samples awaiting the 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, for example cross-contamination from other samples.

4.2 For all tests, the minimum time between forming the material and testing shall be 16 h. When test pieces are cut from products or where whole products, e.g. bridge bearings, are tested, considerably more than 16 h may be necessary. In these cases, the minimum time shall be as given in the product specification and/or relevant test method.

4.3 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.

4.4 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.

4.5 These requirements relate only to initial rubber material tests and to product tests at both the initial and delivery stage. Special tests for other purposes may 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.

4.6 In the case of unvulcanized compound, batches shall be conditioned for between 2 h and 24 h at one of the standard laboratory temperatures specified in 3.1, 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 $(50 \pm 5) \%$.

5 Preparation of test pieces

5.1 Test piece thickness

The test piece thickness shall be as specified in the relevant test method. However, it is recommended that the test piece thicknesses given in Table 2 be used for specially moulded test sheets for all tests unless, for technical reasons, other thicknesses are necessary.

Table 2 — Preferred test piece thicknesses

Test piece thickness mm	Tolerance mm
1	$\pm 0,1$
2	$\pm 0,2$
4	$\pm 0,2$
6,3	$\pm 0,3$
12,5	$\pm 0,5$

5.2 Thickness adjustment

5.2.1 General

Material requiring testing, particularly products, may not be available in the thickness specified in 5.1, in which case procedures will be required to adjust the thickness to within the prescribed limits. Recommended procedures are given in 5.2.2. In most cases, the thickness adjustments should be made on the material before the cutting of the test pieces.

5.2.2 Techniques

5.2.2.1 Removal of textiles combined with the rubber

The separation should preferably avoid the use of a liquid, which causes swelling. If this is not possible, a non-toxic liquid of low boiling point, such as isooctane, may be used to wet the contacting surfaces. Care shall be taken to avoid excessive stretching of the rubber during the separation by separating a little at a time while the rubber is gripped near the point of separation. 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 cut and tested.

5.2.2.2 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, cutting equipment such as that described in 5.2.3.1 and 5.2.3.2 shall be used.

5.2.2.3 Abrading techniques

When it is necessary to remove surface unevenness, such as fabric impressions or corrugations caused by contact with fabric components or with cloth wrappings used for vulcanization, or unevenness caused by cutting, this shall be done using the equipment described in 5.2.3.3 or that described in 5.2.3.4.

5.2.3 Equipment for test piece preparation

5.2.3.1 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 should preferably be lubricated with a dilute aqueous detergent solution to ease the cutting operation.

5.2.3.2 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. Provision shall be made for maintaining the cutting edge in a sharp condition. Attachments are available for splitting and cutting sections from cable sheathing.

5.2.3.3 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 may be equipped with a slow-feed mechanism so that very light cuts may 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 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 ISO 525), 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, cutting equipment as described in 5.2.3.1 or 5.2.3.2 shall be used.

5.2.3.4 Flexible abrasive belts

The apparatus shall consist either of 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 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 in the range of 20 m/s $\pm$ 5 m/s has been found suitable.

With this apparatus, cuts removing several tenths of a millimetre of rubber are practicable as much less heat is produced than with the equipment described in 5.2.3.3. Abrasion may be carried out against the drum, against one of the pulleys or against the taut belt between the pulleys.

5.3 Test piece cutters

5.3.1 Design of cutters

The design and type of cutter or die employed will depend 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 described in 5.3.2, 5.3.3 or 5.3.4. For thicker materials, usually above 4 mm, a rotary cutting technique as described in 5.3.4 is desirable to reduce the degree of dishing of the cut edge resulting from compression of the rubber during cutting. For cutters which do not have replaceable blades, a suitable design of cutting edge is shown in Figure 1.

5.3.2 Fixed-blade cutters

These shall be made from high-quality tool steel and may be of either one-piece (solid metal) or two-piece construction. They may 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 should 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

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