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STANDARD

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**2930**

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**Rubber, raw natural — Determination  
of plasticity retention index (PRI)**

**iTeh STANDARD PREVIEW**  
*Caoutchouc naturel brut — Détermination de l'indice de rétention  
de plasticité (PRI)*  
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[ISO 2930:1995](https://standards.iteh.ai/catalog/standards/sist/703c0d5b-4640-482d-af97-ab06e17b97a1/iso-2930-1995)

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Reference number  
ISO 2930:1995(E)

## 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.

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.

International Standard ISO 2930 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 3, *Raw materials (including latex) for use in the rubber industry*. [ISO 2930:1995](https://standards.iteh.ai/catalog/standards/sist/703c0d5b-4640-482d-af97-4806e1f97a78/iso-2930-1995)

This third edition cancels and replaces the second edition (ISO 2930:1981), which has been technically revised.

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# Rubber, raw natural — Determination of plasticity retention index (PRI)

**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.**

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### 1 Scope

This International Standard specifies a method for determining the plasticity retention index (PRI) of raw natural rubber.

The PRI is a measure of the resistance of raw natural rubber to thermal oxidation. A high resistance to thermal oxidation is shown as a high value of the index.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1795:1992, *Rubber, raw, natural and synthetic — Sampling and further preparative procedures.*

ISO 2007:1991, *Rubber, unvulcanized — Determination of plasticity — Rapid-plastimeter method.*

ISO 2393:1994, *Rubber test mixes — Preparation, mixing and vulcanization — Equipment and procedures.*

### 3 Principle

The rapid plasticity numbers of unaged test pieces and test pieces aged by heating in an oven at 140 °C are determined using a parallel-plate plastimeter with a 10-mm-diameter platen and following the procedure specified in ISO 2007.

The PRI is the ratio of the rapid plasticity numbers after and before heating multiplied by 100.

### 4 Apparatus

**4.1 Parallel-plate plastimeter**, with a 10-mm-diameter platen, as specified in ISO 2007.

**4.2 Punch**, capable of compressing a portion of the material being tested to a thickness of approximately 3 mm and cutting out a disc of approximately 13 mm in diameter for preparation of test pieces, as specified in ISO 2007.

**4.3 Thickness gauge**, having a scale graduated in unit divisions of 0,01 mm, fitted with a flat contact of diameter 10 mm and operating with a pressure of 20 kPa  $\pm$  3 kPa.

**4.4 Laboratory mixing mill**, in conformity with the requirements of ISO 2393, but with the following characteristics:

Roll diameter:	150 mm to 250 mm
Linear speed of back (fast) roll:	14,6 m/min $\pm$ 0,5 m/min
Roll speed ratio:	1:1,4
Temperature:	27 °C $\pm$ 3 °C
Roll length between guides:	265 mm $\pm$ 15 mm

**4.5 Oven**, meeting the following requirements at 140 °C:

- The temperature in the vicinity of the test pieces shall be controllable to within  $\pm$  0,2 °C over a 30 min period. (Some ovens may not achieve this close temperature tolerance and may require a temperature tolerance of  $\pm$  0,5 °C. This wider tolerance may impair the accuracy of the test. If an oven of  $\pm$  0,5 °C tolerance is used, it shall be stated in the test report.)
- Following insertion of the tray plus dishes into the oven, the temperature of the oven shall recover, and that of the tray plus dishes increase, to within 1 °C of the set temperature within 2 min.
- The air shall be changed ten times per hour.

**4.6 Lightweight aluminium dishes and tray**, with a low thermal capacity. The total mass of the tray and dishes shall not exceed 35 g, and their volume shall not exceed 5 % of the volume of the oven chamber. Dishes of diameter 40 mm to 50 mm made of foil of thickness 0,2 mm have been found suitable.

**4.7 Tissue paper**, as described in ISO 2007:1991, subclause 4.3, or **cigarette paper**<sup>1)</sup> of about 22 g/m<sup>2</sup> cut in two equal pieces (approximately 30 mm  $\times$  45 mm).

## 5 Procedure

### 5.1 Preparation of test pieces

Homogenize the raw rubber as specified in ISO 1795. Take a test portion of 20 g  $\pm$  2 g from the homogenized piece and pass twice (doubling the sheet between passes) between the rolls of the mill (4.4) at 27 °C  $\pm$  3 °C, running with the nip adjusted so that the final sheet thickness is about 1,7 mm. (In order to obtain a smooth sheet from old rubber, three passes may be necessary, in which case this shall be stated in the test report.) Immediately double the sheet, which shall be uniform in texture and free from holes, and press the two halves smoothly together by hand, avoiding the formation of air bubbles.

Cut test pieces as specified in ISO 2007 from the doubled sheet with the punch (4.2), and measure their thickness with the gauge (4.3) until six pieces are obtained with a thickness of 3,4 mm  $\pm$  0,4 mm. Randomly divide these into sets of three, one set for testing before ageing and the other for testing after ageing.

The preparation of test pieces, as described above, shall be carried out with care, since the PRI is affected by the sheet thickness. The required nip setting shall be ascertained by a preliminary trial; it will vary with the rubber and with the mill. If six test pieces of the required thickness as above are not obtained, a fresh doubled sheet shall be prepared.

### 5.2 Ageing

Before ageing is started, check the temperature of the oven (4.5) to ensure that it has been stable for at least 5 min.

To ensure that all test pieces are aged at the correct temperature, the oven shall not be overloaded as this would cause a marked and prolonged decrease in temperature and upset temperature uniformity (see 4.5).

Quickly insert the tray (4.6), close the oven door and start timing. Care shall be taken that the dishes and tray are arranged within the calibrated region of the oven. Check that the correct temperature is quickly regained and maintained (see 4.5).

After 30 min  $\pm$  0,25 min, remove the tray from the oven and the dishes from the tray. Allow them to cool to standard laboratory temperature.

1) TST cigarette paper (orange cover) has been found to give satisfactory results. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

### 5.3 Determination of plasticity

Carry out in triplicate the rapid plasticity determination as specified in ISO 2007, using the equipment with a 10 mm platen specified in 4.1, first on the unaged test pieces and then on the aged test pieces.

These determinations shall normally be made at least 0,5 h and no more than 2 h after ageing, with the proviso that the test pieces have been allowed to cool to room temperature. Plasticity determinations on unaged and aged test pieces should preferably be made concurrently using the same type of paper. The rapid plasticity number shall be read to the nearest 0,5 unit (1 unit corresponds to 10  $\mu$ m).

## 6 Expression of results

Use the median values of the rapid plasticity numbers of the three unaged and three aged test pieces to calculate the PRI from the equation

$$\text{PRI} = \frac{\text{aged rapid plasticity number}}{\text{unaged rapid plasticity number}} \times 100$$

## 7 Repeatability of results

It has been found that the coefficient of variation (CV) is dependent upon the accuracy of the ageing temperature. For PRI values calculated as in clause 6 from the median plasticity numbers, CV is 3 % when

ageing is at 140 °C  $\pm$  0,2 °C and 6 % when ageing is at 140 °C  $\pm$  1 °C. Both values of CV are consistent with an accuracy of 3 % for single determinations of the rapid plasticity number.<sup>2)</sup>

## 8 Test report

The test report shall include the following particulars:

- a) a reference to this International Standard;
- b) all details necessary for identification of each sample tested;
- c) the median rapid plasticity number for the unaged test pieces and for the aged test pieces from each sample tested;
- d) the PRI for each sample tested;
- e) the type of oven used;
- f) the temperature tolerance of the oven used;
- g) the date of the test;
- h) operator identification;
- i) any operations not included in this International Standard or in the International Standards to which reference is made, and any operations regarded as optional.

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2) The work carried out to generate the precision data was initiated before the publication of ISO/TR 9272:1986, *Rubber and rubber products — Determination of precision for test method standards*. Consequently, the data are not expressed in the format recommended by this Technical Report.

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