

INTERNATIONAL  
STANDARD

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**Rubber — Temperatures, humidities  
and times for conditioning and testing**

*Caoutchouc — Températures, humidités et durées pour le  
conditionnement et l'essai*



Reference number  
ISO 471:1995(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 471 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Physical and degradation tests*.

This third edition cancels and replaces the second edition (ISO 471:1983), as well as ISO 1826:1981, which have been technically revised.

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# Rubber — Temperatures, humidities and times for conditioning and testing

## 1 Scope

This International Standard specifies the temperature, humidity and time conditions used for the conditioning and testing of all types of rubber test piece. 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. It 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 disagreement between customer and supplier.

### NOTES

1 The conditioning treatment required for each individual test should be stated in the relevant test method.

2 This International Standard takes account of ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*.

## 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 139:1973, *Textiles — Standard atmospheres for conditioning and testing*.

ISO 3383:1985, *Rubber — General directions for*

*achieving elevated or subnormal temperatures for test purposes.*

## 3 Definition

For the purposes of this International Standard, the following definition applies.

**3.1 conditioning:** Exposure of a rubber to a specified temperature and/or humidity for a stipulated period of time immediately before testing, in order to improve the reproducibility of test results.

## 4 Temperatures and humidities

**4.1 standard laboratory temperature:** The standard laboratory temperature shall be either 23 °C or 27 °C, in accordance with national practice.

NOTE 3 The temperature 23 °C is normally the standard laboratory temperature in temperate countries and 27 °C is normally the standard laboratory temperature in tropical and sub-tropical countries.

**4.2 standard laboratory humidity:** If control of both temperature and humidity is necessary, the standard laboratory humidity shall be 50 % relative humidity at 23 °C or 65 % relative humidity at 27 °C.

In certain cases, where there is a technical need due to the presence of a textile component, the combination of 20 °C and 65 % relative humidity may be used provided that this condition is clearly stated in the test report. (See ISO 139.)

### 4.3 Other conditions

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

**4.3.2** Unless otherwise directed for technical reasons, when a sub-normal or an elevated temperature is necessary, this temperature shall be selected from the following preferred values:

- a)  $-85\text{ °C}$ ;  $-70\text{ °C}$ ;  $-55\text{ °C}$ ;  $-40\text{ °C}$ ;  $-25\text{ °C}$ ;  $-10\text{ °C}$ ; or  $0\text{ °C}$ .
- b)  $40\text{ °C}$ ;  $55\text{ °C}$ ;  $70\text{ °C}$ ;  $85\text{ °C}$ ; or  $100\text{ °C}$ .
- c)  $125\text{ °C}$ ;  $150\text{ °C}$ ;  $175\text{ °C}$ ;  $200\text{ °C}$ ;  $225\text{ °C}$ ;  $250\text{ °C}$ ;  $275\text{ °C}$ ; or  $300\text{ °C}$ .

## 5 Duration of test

The period required to obtain any given degree of change in a test piece depends largely upon the type of rubber, its composition and state of cure, and the nature and severity of the test environment.

When an extensive investigation is required, changes are usually monitored by testing at set time-intervals. For control purposes, such a procedure is usually not necessary and a single test period may suffice.

In both cases, it is recommended that the test period(s) be selected from the following preferred values:

- a) 8 h; or 16 h.
- b) 24 h; 48 h; or 72 h.
- c) 168 h; or multiples of 7 days.

## 6 Tolerances

### 6.1 Temperature

**6.1.1** For the standard laboratory temperatures specified in 4.1, the normal tolerance shall be  $\pm 2\text{ °C}$ . If a closer tolerance is required, it shall be  $\pm 1\text{ °C}$ . The average temperature of the environment shall be as close as practicable to the specified temperature.

**6.1.2** For the temperatures specified in 4.3.2 a) and 4.3.2 c), the normal tolerance shall be  $\pm 2\text{ °C}$ , and for those specified in 4.3.2 b) the normal tolerance shall be  $\pm 1\text{ °C}$ . In all cases, the average temperature of the environment shall be as close as practicable to the specified temperature.

NOTE 4 Closer tolerances may be specified where they are shown to be necessary in order to obtain reproducible test results.

### 6.2 Relative humidity

For the standard relative humidities specified in 4.2, the normal tolerance shall be  $\pm 5\%$  relative humidity. If a closer tolerance is required, it shall be  $\pm 2\%$  relative humidity. The average relative humidity of the environment shall be as close as practicable to the specified relative humidity.

### 6.3 Duration of test

**6.3.1** For the test periods specified in 5a), the normal tolerance shall be  $\pm 0,25\text{ h}$ .

**6.3.2** For the test periods specified in 5b), the normal tolerance shall be  $+0\text{ h} - 2\text{ h}$ .

**6.3.3** For the test periods specified in 5c), the normal tolerance shall be  $\pm 2\text{ h}$ .

**6.3.4** In cases where, for technical reasons, closer tolerances are necessary, they shall be as stated in the test method.

## 7 Time interval between forming<sup>1)</sup> the material and testing

**7.1** For all test purposes, 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 times shall be as given in the product specification and/or relevant test method.

**7.2** 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, as far as possible, shall be carried out after the same time-interval.

**7.3** 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.

**7.4** These requirements relate only to the initial rubber material tests and product tests at both the initial and delivery stage. Special tests for other pur-

1) Forming also includes any thermal-treatment part of the manufacturing process following the actual forming procedure.

poses may be carried out at any time, e.g. process control, or to evaluate the influence of abnormal storage conditions on a product. In such instances, this shall be clearly stated in the test report.

## 8 Conditioning

**8.1** When both temperature and humidity are specified, the conditioning time shall be a period of not less than 16 h immediately before testing.

**8.2** When one of the standard laboratory temperatures is specified without the need to control the humidity, the conditioning time shall be a period of not less than 3 h immediately before testing.

**8.3** When a temperature other than the standard laboratory temperature is specified without the need to control the humidity, the conditioning time shall be a period sufficient for the rubber to reach temperature equilibrium with the environment, or a period required by the specification covering the material or product being tested. Guidance on the selection of conditioning times which will ensure that equilibrium is reached is given in ISO 3383.

**8.4** During the conditioning period, the rubber test pieces or product shall be positioned in such a manner that, as far as possible, the whole rubber surface is exposed without imposing any stress/strain on the rubber.

**8.5** Unless otherwise specified, condition the rubber test pieces or products in the absence of light.

## 9 Testing

Unless otherwise specified, testing shall be carried out at the same temperature and humidity at which the conditioning was performed.

NOTE 5 Test pieces conditioned at one of the standard laboratory temperatures and humidities specified in 4.1 and 4.2 may be tested, immediately after conditioning, at ambient conditions specified in 4.3.1 in cases where the resulting changes of temperature and moisture content do not affect the test results.

## 10 Test report

The test report shall include the following information:

- a) the temperature, or the temperature and relative humidity, used for conditioning;
- b) the tolerance on the temperature and relative humidity used for conditioning;
- c) the duration of conditioning;
- d) the time-interval between forming the material and testing;
- e) the temperature, or the temperature and relative humidity, used for testing;
- f) the tolerances on the temperature and relative humidity used for testing.

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