
INTERNATIONAL STANDARD



1431

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Vulcanized rubbers — Determination of resistance to ozone cracking under static conditions

First edition — 1972-03-15

UDC 678.01

Ref. No. ISO 1431-1972 (E)

Descriptors : cracks, cracking (fracturing), resistance, vulcanized elastomers, ozone.

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 1431 was drawn up by Technical Committee ISO/TC 45, *Rubber and rubber products*.

It was approved in January 1970 by the Member Bodies of the following countries:

Australia	Hungary	Poland
Austria	India	Spain
Brazil	Iran	Sweden
Canada	Israel	Switzerland
Czechoslovakia	Italy	Thailand
Egypt, Arab Rep. of	Japan	Turkey
France	Korea, Rep. of	United Kingdom
Germany	Netherlands	U.S.A.
Greece	New Zealand	U.S.S.R.

No Member Body expressed disapproval of the document.

Vulcanized rubbers — Determination of resistance to ozone cracking under static conditions

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for estimating the relative resistance of vulcanized rubbers to cracking when exposed, under static strain, to air containing ozone but in circumstances where the effects of direct sunlight are excluded.

2 PRINCIPLE

Exposure, in a closed chamber, of test pieces, held under static strain at a fixed temperature, to an atmosphere containing a fixed concentration of ozone; examination of the test pieces at intervals, to determine the time at which cracks first appear.

3 APPARATUS (See Figure 1)

3.1 Closed test chamber, thermostatically controlled to within $\pm 2^\circ \text{C}$ of the working temperature, lined with or constructed of material that does not readily decompose ozone and having a volume of at least 0.1 m^3 such that the ratio of the total exposed surface area (in cm^2) of test pieces, supporting clamps and rotating frame to the volume of the chamber (in cm^3) does not exceed 1 : 10, and preferably having a small window through which the surface of the test piece can be observed.

3.2 Source of ozonized air: this is either

- a) a silent discharge tube, or
- b) an ultra-violet lamp.

The ozonized air shall be free from nitrogen oxides, oil, dust and other contaminants and shall be brought to a relative humidity of not more than 65 % at the test temperature. From this source the ozonized air shall be fed into the chamber via a heat exchanger to adjust its temperature to the temperature required in the test chamber.

3.3 Means of adjusting the concentration of ozone produced by the ozonizer.

This means may be automatic but this is not essential. When an ultra-violet light source is used, control is obtained by adjusting the voltage applied to the tube or shielding part of the tube exposed to the air flow. When a silent discharge generator is used, the concentration is obtained by adjusting the voltage applied to the generator, the dimensions of the electrodes, and the air or oxygen metering device; a two-stage dilution of the ozonized air can also be used. The adjustment shall be such that it will maintain the concentration within

± 5 parts per hundred million of the working concentration when this is 50 parts per hundred million, or within ± 20 parts per hundred million when the working concentration is 200 parts per hundred million.

3.4 Means of sampling the ozonized air from the vicinity of the test pieces in the chamber and **means of estimating its content of ozone.**

The estimation of the ozone concentration should preferably be carried out using the method described in the Appendix. Other methods, such as the Brewer/Milford method¹⁾, may be used provided that they give results identical to those obtained using the preferred method, within the specified tolerances.

3.5 The use of a **mechanically rotated frame** mounted in the test chamber and upon which the clamps for holding the stretched pieces are mounted is considered desirable but not essential. When such a rotating frame is included it shall be perforated to provide a free flow of ozonized air and shall rotate at 2 rev/min. Where no rotating frame is included, provision shall be made to provide uniform ozone concentration throughout the chamber. Precautions shall be taken to avoid any slipping or tearing of the pieces in the grips.

The clamps for the test pieces shall be made of a material such that the surface absorption of ozone is kept to a minimum. The grips shall enable the test pieces to be fixed in such a way that both sides of them are in contact with the ozonized air and with their length in the direction of movement of the latter.

3.6 Means of adjusting the average velocity of flow of ozonized air in the test chamber to a value of not less than 8 mm/s calculated from the measured gas flow rate in the chamber divided by the effective cross-sectional area of the chamber normal to the gas flow.

4 TEST PIECE

Each test piece shall consist of a straight strip of width not less than 10 mm, thickness 2.0 ± 0.2 mm and length not less than 40 mm between grips before stretching. The part of the test piece held in the grips and the cut edges, including 1 mm on the upper and lower sides, shall be carefully coated, by dipping or brushing, with an ozone-resistant lacquer (such as one based on chlorosulphonated polyethylene). Silicone grease shall not be used.

1) Brewer, A.W. and Milford, J.R., (proc. Roy. Soc. A 1960, 256, No. 1287, 470).