Australian Standard™

AS 1683.25

Methods of test for elastomers

Method 25: Determination of the resistance of vulcanized or thermoplastic rubbers to ozone cracking—Dynamic strain test

PREFACE

This Standard was prepared by the Standards Australia Committee RU-003, Analysis and Testing of Elastomers to supersede AS 1683.25—1984, *Methods of test for rubber,* Method 25: *Rubber—Vulcanized—Determination of resistance to ozone cracking—Dynamic strain test.*.

The objective of this Standard is to provide manufacturers and users of elastomeric materials with a method for determining the resistance of vulcanized or thermoplastic rubbers to cracking when exposed, under dynamic tensile strain, to air containing ozone.

This Standard is identical with and has been reproduced from ISO 1431-2:1994, *Rubber, vulcanized or thermoplastic—Resistance to ozone cracking* Part 2: *Dynamic strain test.*

The term 'informative' has been used in this Standard to define the application of the annex to which it applies. An 'informative' annex is only for information and guidance.

As this Standard is reproduced from an international Standard, the following applies:

(a) Its number appears on the cover and title page while the International Standard number appears only on the cover.

(b) In the source text, 'this part of ISO 1431' should read 'this Australian Standard'.

(c) A full point substitutes for a comma when referring to a decimal marker.

References to international Standards should be replaced by equivalent Australian Standards as follows:

Reference to International Standard		*Australian Standard*	
ISO		AS	
37	Rubber, vulcanized—Determination of tensile stress-strain properties	1683 1683.11	Methods of test for elastomers Method 11: Tension testing of vulcanized or thermoplastic rubber
471	Rubber—Standard temperatures, humidities and times for conditioning in testing of test pieces	1683.20	Method 20: Standard temperatures, humidities and times for conditioning and testing
1431 1431-1	Rubber, vulcanized or thermoplastic—Resistance to ozone cracking Part 1: Static strain test	1683.24	Method 24: Determination of the resistance of vulcanized or thermoplastic rubbers to ozone cracking—Static strain test

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ISO		AS
4661	Rubber, vulcanized or thermoplastic—Preparation of samples and test pieces	—
4661-1	Part 1: Physical test	—

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1 Scope

This part of ISO 1431 specifies a method intended for use in estimating the resistance of vulcanized or thermoplastic rubbers to cracking when exposed, under dynamic tensile strain, to air containing a definite concentration of ozone and at a definite temperature in circumstances that exclude the effects of direct light.

Great caution is necessary in attempting to relate standard test results to service performance since the relative ozone resistance of different rubbers can vary markedly depending on the conditions, especially ozone concentration and temperature. In addition, tests are carried out on thin test pieces deformed in tension and the significance of attack for articles in service may be quite different owing to the effects of size and of the type and magnitude of deformation. Explanatory notes on the nature of ozone cracking are given in informative annex A.

Methods for determining resistance to ozone cracking under static strain conditions are specified in ISO 1431-1. A reference method for estimating the ozone concentration will form the subject of ISO 1431-3.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 1431. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 1431 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 37:1977, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

ISO 471:1983, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

ISO 1431-1:1989, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static strain test.*

ISO 4661-1:1993, *Rubber, vulcanized or thermoplastic — Preparation of samples and test pieces — Part 1: Physical tests.*

3 Definition

For the purposes of this part of ISO 1431, the following definition applies.

3.1 dynamic strain: A strain (normally a tensile strain) with a sinusoidal nature varying with time at some selected repetition rate or frequency.

NOTE 1 The maximum strain and the repetition rate are used to describe the dynamic strain conditions.

4 Principle

Test pieces are exposed, either under continuous dynamic strain or under alternate periods of dynamic and

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static strain, in a closed chamber at a constant temperature, to an atmosphere containing a fixed concentration of ozone. The test pieces are examined periodically for cracking.

Two alternative evaluation procedures are described for selected values of ozone concentration and exposure temperature:

a) Determination of the presence or absence of cracks after exposure for a fixed period of time at a given dynamic strain or combination of dynamic and static strains.

b) Determination of the time to the first appearance of cracks at any given dynamic strain or combination of dynamic and static strains.

5 Apparatus (see figure 1)

WARNING — Attention is drawn to the highly toxic nature of ozone. Efforts should be made to minimize the exposure of workers at all times. In the absence of more stringent or contrary national safety regulations in member body countries, it is recommended that 10 parts of ozone per hundred million parts of air of the surrounding atmosphere by volume be regarded as an absolute maximum concentration whilst the maximum average concentration should be appreciably lower. Unless a totally enclosed system is being used, an exhaust vent to remove ozone-laden air is advised.

5.1 Test chamber.

This shall be a closed, non-illuminated chamber, thermostatically controlled to within ± 2 °C of the test temperature, lined with, or constructed of, a material (for example aluminium) that does not readily decompose ozone. Dimensions shall be such that the requirements of 5.5 are met. The chamber may be provided with a window through which the surface of the test pieces can be observed. A light to examine test pieces may be installed, but this shall remain switched off at all other times.

5.2 Source of ozonized air.

Either of the following items of apparatus may be used:

a) an ultra-violet lamp;

b) a silent-discharge tube.

The use of oxygen is necessary when using the discharge tube in order to avoid the formation of nitrogen oxides. The ozonized oxygen or air may be diluted with air to attain the required ozone concentration. Air used for generation of ozone or dilution shall first be purified by passing it over activated charcoal and shall be free from any contaminants likely to affect the ozone concentration, cracking or estimation of ozone.

The temperature of the source shall be kept constant to within ± 2 °C.

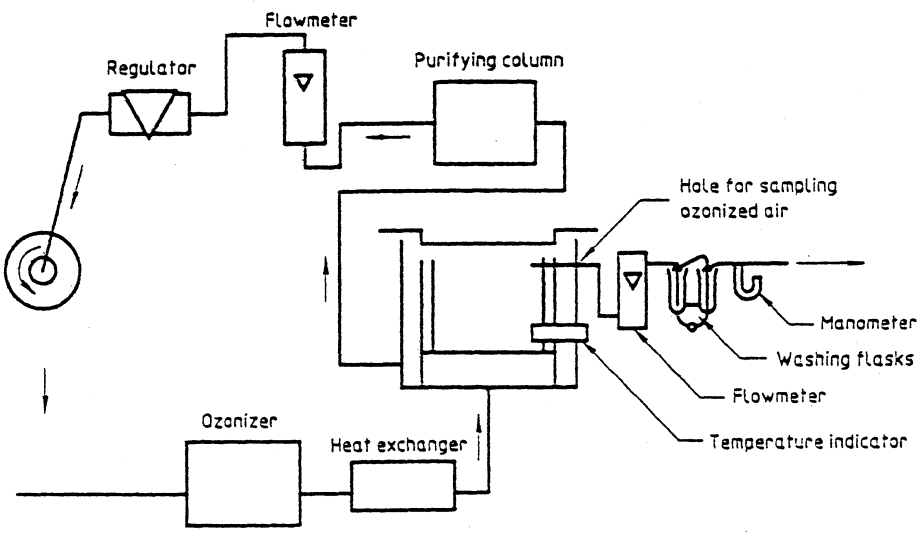

Figure 1 — Schematic diagram of the apparatus

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