



National Standards Authority of Ireland

IRISH STANDARD

I.S. EN ISO 10960:1997

ICS 23.040.70

**RUBBER AND PLASTICS HOSES -
ASSESSMENT OF OZONE RESISTANCE
UNDER DYNAMIC CONDITIONS (ISO
10960:1994)**

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Údarás um Chaighdeáin Náisiúnta na hÉireann

DECLARATION

OF

SPECIFICATION

ENTITLED

**RUBBER AND PLASTICS HOSES - ASSESSMENT OF OZONE RESISTANCE UNDER
DYNAMIC CONDITIONS (ISO 10960:1994)**

AS

THE IRISH STANDARD SPECIFICATION FOR

**RUBBER AND PLASTICS HOSES - ASSESSMENT OF OZONE RESISTANCE UNDER
DYNAMIC CONDITIONS (ISO 10960:1994)**

Forfás in exercise of the power conferred by section 20 (3) of the Industrial Research and Standards Act, 1961 (No. 20 of 1961) and the Industrial Development Act, 1993 (No. 19 of 1993), and with the consent of the Minister for Enterprise and Employment, hereby declares as follows:

1. This instrument may be cited as the Standard Specification (Rubber and plastics hoses - Assessment of ozone resistance under dynamic conditions (ISO 10960:1994)) Declaration, 1997.
2. (1) The Specification set forth in the Schedule to this declaration is hereby declared to be the standard specification for Rubber and plastics hoses - Assessment of ozone resistance under dynamic conditions (ISO 10960:1994). The Schedule comprises the text of EN ISO 10960 : 1996.

(2) The said standard specification may be cited as Irish Standard/EN ISO 10960 :1997 or as I.S./EN ISO 10960:1997.

EUROPEAN STANDARD

EN ISO 10960

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 1996

ICS 23.040.70

Descriptors: rubber products, plastics products, hoses, rubber hoses, plastics hoses, tests, cracking tests, determination, chemical resistance, ozone, testing conditions

English version

**Rubber and plastics hoses - Assessment of ozone
resistance under dynamic conditions
(ISO 10960:1994)**

Tuyaux en caoutchouc et en plastique -
Evaluation de la résistance à l'ozone dans des
conditions dynamiques (ISO 10960:1994)

Gummi- und Kunststoffschläuche - Beurteilung
der Ozonbeständigkeit unter dynamischen
Bedingungen (ISO 10960:1994)

This European Standard was approved by CEN on 1996-02-15. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

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EN ISO 10960:1996

Foreword

The text of the International Standard from Technical Committee ISO/TC 45 "Rubber and rubber products" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 218 "Rubber and plastics hoses and hose assemblies", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 1997, and conflicting national standards shall be withdrawn at the latest by February 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 10960:1994 has been approved by CEN as a European Standard without any modification.

INTERNATIONAL
STANDARD

ISO
10960

First edition
1994-12-01



**Rubber and plastics hoses — Assessment
of ozone resistance under dynamic
conditions**

*Tuyaux en caoutchouc et en plastique — Évaluation de la résistance à
l'ozone dans des conditions dynamiques*



Reference number
ISO 10960:1994(E)

ISO 10960:1994(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 10960 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

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Rubber and plastics hoses — Assessment of ozone resistance under dynamic conditions

1 Scope

This International Standard specifies a method of assessing the resistance of hoses to the deleterious effects of atmospheric ozone under dynamic conditions. It is applicable to hoses with bore diameters up to and including 25 mm.

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 471:—¹⁾, *Rubber — Times, temperatures and humidities for conditioning and testing*.

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

3 Principle

The cover of a hose in a crescent position during reverse bending is exposed to ozone and examined periodically for cracking.

4 Apparatus

4.1 Ozone cabinet, with apparatus for generating ozone and monitoring and controlling the ozone concentration as described in ISO 1431-1.

4.2 Test piece holder, as shown in figure 1, with means of carrying out flexing at the required frequency.

Details given in ISO 1431-1:1989, subclause 5.6, shall be followed.

All apparatus placed in the test cabinet shall be made from materials which do not absorb or decompose ozone.

5 Test pieces

5.1 Type of test piece

The test piece shall consist of a hose sample with a free length L calculated from the formula

$$L = 20 \times d$$

where d is the outside diameter of the hose under test.

5.2 Number of test pieces

Two test pieces shall be tested.

6 Conditioning of test pieces

No test shall be carried out within 24 h of manufacture.

1) To be published. (Revision of ISO 471:1983 and ISO 1826:1981).

For evaluations which are intended to be comparable, the tests shall, as far as possible, be carried out after the same time interval after manufacture. ISO 471 shall be followed for time between sample manufacture and testing.

The test pieces, mounted as described in 8.1, shall be conditioned for 48 h in a substantially ozone-free atmosphere at standard temperature (see ISO 471), in darkness or subdued light.

7 Test conditions

Unless other conditions are specified in the relevant hose specification, the test pieces shall be exposed in the ozone cabinet to an ozone concentration of (50 ± 5) parts per hundred million (pphm) by volume at $40 \text{ °C} \pm 2 \text{ °C}$ for $(72 \pm 2) \text{ h}$.

NOTE 1 It has been found that differences in atmospheric pressure can influence ozone cracking when test pieces are exposed to constant ozone concentrations expressed in parts per hundred million. This effect may be taken into account by expressing the ozone content in the ozonized air in terms of partial pressure, i.e. in millipascals, and making comparisons at constant ozone partial pressure. At standard conditions of atmospheric pressure and temperature (101 kPa, 273 K), a concentration of 1 pphm is equivalent to a partial pressure of 1,01 mPa.

8 Procedure

8.1 Mount the test piece as shown in figure 1 and place it in the ozone cabinet.

8.2 Carry out flexing at a frequency of $0,3 \text{ Hz} \pm 0,03 \text{ Hz}$ and in the test conditions as described in clause 7.

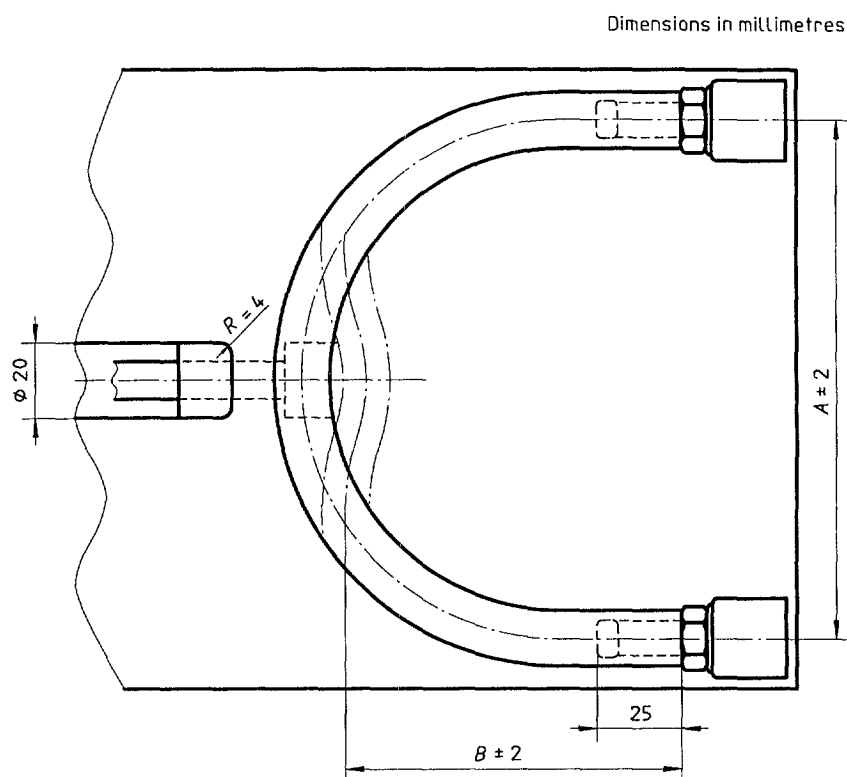
The maximum travel of the piston shall be such that the distance from the lower edge of the piston to the ends of the hose is five times the outside diameter of the hose $\pm 2 \text{ mm}$ (distance *B* in figure 1). During the return stroke, the piston shall return to a position where the hose is completely unloaded.

8.3 Test pieces may be examined after periods of exposure of 2 h, 4 h, 24 h, 48 h and 72 h, whilst still mounted in the test apparatus, under $\times 2$ magnification, ignoring the area adjacent to the fixing point. If cracks are discovered, record their nature and the time at which they were first observed.

9 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all details necessary for the identification of the hose tested;
- c) details of the test conditions, i.e. ozone concentration, temperature and exposure period;
- d) whether cracks were observed and, if so, their nature and the time the cracks were observed;
- e) the date of the test.



$$A = 10d$$

$$B = 5d$$

where d is the outside diameter of the hose under test

R = radius of curvature of piston end

Figure 1 — Mounted test piece

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