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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

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*.

This second edition cancels and replaces the first edition (ISO 10960:1994), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

— Clause 2 has been updated: ISO 471 has been deleted and replaced by ISO 23529, and the latest edition of ISO 1431-1 has been cited;

— 5.2 and Clause 7 have been amended to cite the most recent pertinent standards.

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

1 Scope

This document 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 documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1431-1:2012, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8330 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

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

5 Apparatus

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

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

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

Details given in ISO 1431-1:2012, 5.6, shall be followed.

6 Test pieces

6.1 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.

6.2 Number of test pieces

Two test pieces shall be tested.

7 Conditioning of test pieces

No test shall be carried out within 24 h of manufacture. 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 23529 shall be followed for time between sample manufacture and testing.

The test pieces, mounted as described in 9.1, shall be conditioned for 48 h in a substantially ozone-free atmosphere at standard temperature in accordance with ISO 23529, in darkness or subdued light.

8 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 °C ± 2 °C for $(72\ ^{0}_{-2})$ h.

NOTE 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 can 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.

9 Procedure

9.1 Mount the test piece as shown in Figure 1 and place it in the ozone cabinet.

9.2 Carry out flexing at a frequency of 0,3 Hz ± 0,03 Hz and in the test conditions as described in Clause 8.

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 ± 2 mm (distance B in Figure 1). During the return stroke, the piston shall return to a position where the hose is completely unloaded.

9.3 Test pieces can be examined after periods of exposure of 2 h, 4 h, 24 h, 48 h and 72 h, while still mounted in the test apparatus, under x 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.