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International Standard

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Rubber and plastics hoses and tubing, and their assemblies — Determination of permeability to gas

Tuyaux et flexibles en caoutchouc et en plastique — Détermination de la perméabilité au gaz

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Foreword

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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 fifth edition cancels and replaces the fourth edition (ISO 4080:2009), which has been technically revised.

The main changes are as follows:

— revised gas permeability test as a whole;

— title changed;

— terms 3.1 and 3.2 added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Rubber and plastics hoses and tubing, and their assemblies — Determination of permeability to gas

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices.

1 Scope

This document specifies three methods to determine the permeability to gas by measuring the volume of gas diffusing through a rubber or plastics hose or length of tubing used for gas applications in a specified time.

— Method 1 is for determining the permeability of the complete hose wall or length of tubing wall, excluding end fittings, to the test gas.

— Method 2 is for determining the permeability at the hose and fitting interface to the test gas.

— Method 3 is for precisely determining the permeability of the complete hose or length of tubing, including end fittings.

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 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 purpose of this document, the terms and definitions given in ISO 8330 and the following apply.

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

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

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

3.1
end fitting
device attached to the end of a hose or tubing to facilitate connection to equipment constituting hose assembly

Note 1 to entry: End fitting can include an attached matching part to facilitate the test, if necessary.

3.2
permeability
property of a material of transmitting gases and liquids by passage through one surface and out at another surface by diffusion and sorption processes

Note 1 to entry: Not to confuse with “porosity”.

Note 2 to entry: The property of a permeability involves the diffusion of molecules, called the permeant, through a membrane or interface. The permeability property works through diffusion< the permeant will move from high concentration to low concentration across the interface.

Note 3 to entry: In a pressurized hose the permeant can pass from the inside of the hose to the outside through the hose lining and cover.

[SOURCE: ISO 8330:2022, 3.8.5]

4 Test pieces

4.1 Method 1

The test piece shall be a length of hose or tubing fitted with end fittings long enough to ensure that the length of the exposed hose or tubing under the gas-collecting trough is 1 m ± 0,01 m. The test piece shall be a pricked cover or a textile braid cover.

4.2 Method 2

The test piece shall be a length of hose fitted with end fittings. It shall have a length of 1 m ± 0,01 m between the end fittings. The test piece shall be a textile reinforced hose with an unpricked cover.

NOTE The type of coupling used and the method by which the fittings are fixed to the test piece can affect the permeability results obtained using this method.

4.3 Method 3

The test piece shall be a length of hose or tubing fitted with end fittings. It shall have a minimum test length of 0,5 m with ± 1 % tolerance between the end fittings. A test length of 1 m ± 0,01 m between the end fittings may be used when comparison of test result among the three methods are necessary.

NOTE The type of end fittings used and the method by which the end fittings are fixed to the test piece can affect the permeability results obtained using this method.

5 Apparatus

Schematic layouts of the test arrangements for the three test methods are shown in Figure 1 to Figure 3.

5.1 Gas supply, provided with a suitable pressure regulator gauge and emergency excess flow shutoff valves in case of test piece failure.

5.2 Calibrated pressure gauge or pressure transducer with digital readout, chosen for each test so that the test pressure is between 15 % and 85 % of the full-scale reading.

5.3 Water bath, capable of being maintained at a specified temperature and of sufficient length to accommodate the test piece.

5.4 Gas-collecting apparatus, comprising measuring cylinders and in some instances additional apparatus appropriate to each of the three methods, as illustrated in Figure 1 (collecting trough), Figure 2 (collecting funnels) and Figure 3 (collecting funnel and transparent glass tube), respectively. The capacity and accuracy of the measuring cylinders shall be selected in accordance with the volume of gas that is expected to be collected.

A transparent glass tube may be replaced with a tube made from acrylic, polycarbonate and similar materials, or with a transparent collecting trough large enough to cover the whole test piece to collect escaped gas.

5.5 Barometer, to record the barometric pressure during the test.