



# SLOVENSKI STANDARD

## oSIST prEN ISO 4080:2023

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Nadomešča:  
SIST EN ISO 4080:2010

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### Gumene in polimerne cevi in cevovodi ter njihovi priključki - Ugotavljanje prepustnosti za pline (ISO/DIS 4080:2023)

Rubber and plastics hoses and tubing, and their assemblies - Determination of permeability to gas (ISO/DIS 4080:2023)

Gummi- und Kunststoffschläuche und Schlauchleitungen - Bestimmung der Gasdurchlässigkeit (ISO/DIS 4080:2023)

Tuyaux et flexibles en caoutchouc et en plastique - Détermination de la perméabilité au gaz (ISO/DIS 4080:2023)

Ta slovenski standard je istoveten z: **prEN ISO 4080**

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#### **ICS:**

83.140.40      Gumene cevi      Hoses

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# DRAFT INTERNATIONAL STANDARD

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

ICS: 23.040.70

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## ISO/DIS 4080:2023(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.

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](http://www.iso.org/directives)).

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For an explanation of 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 [www.iso.org/iso/foreword.html](http://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 fifth edition cancels and replaces the fourth edition, which has been technically revised.

The main changes compared to the previous edition are as follows:

- revised gas permeation test as a whole;

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](http://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 for the determination of 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:

For determining the volume of gas diffusing through the complete hose or length of tubing, excluding end fittings in a specified time. This method is suitable for textile reinforced hose with either pricked cover or textile cover or both, although this method is not suitable for textile reinforced hose with unpricked cover. The permeability is calculated with respect to the length of the hose or tubing and to the surface area of the hose lining or the tubing.

### Method 2:

For determining the volume of gas diffusing at the hose and fitting interface. This method is used when determining the permeability characteristics of textile reinforced hoses with an unpricked cover, when the gas usually issues from the textile reinforcement at the cut ends. The permeability is calculated with respect to the length of the hose and to the surface area of the hose lining.

### Method 3:

For precisely determining the volume of gas diffusing through the complete hose or length of tubing including end fittings in a specified time. This method is not suitable for textile reinforced hose with unpricked cover. The permeability is calculated with respect to the length of the hose or tubing and to the surface area of the hose lining or the tubing.

NOTE 1 Guidance on test methods are provided in [Annex C, Table C.1](#).

NOTE 2 Explanation of permeability is provided in [Annex A](#), where the concept of trapped air and permeation is explained in [Figure A.1](#).

## 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.

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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 includes attached matching part to facilitate the test, if necessary.

## 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  $1\text{ m} \pm 0,01\text{ m}$ . When textile reinforced hose is tested, the cover of a test piece shall be pricked as a finished hose. Pricking shall not be done for test purpose.

### 4.2 Method 2

The test piece shall be a length of hose or tubing fitted with end fittings. It shall have a length of  $1\text{ m} \pm 0,01\text{ m}$  between the end fittings.

NOTE The type of coupling used and the method by which the fittings are fixed to the test piece can affect the results of permeability 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 0,5 m of test length with  $\pm 1\%$  tolerance between the end fittings. Test length of  $1\text{ m} \pm 0,01\text{ m}$  between the end fittings may be used when comparison of test result among 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 results of permeability obtained using this method.

## 5 Apparatus

**5.1** Schematic layouts of the test arrangements for the test methods (Method 1, 2, and 3) are shown in [Figure 1](#) to [Figure 3](#).

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

**5.3 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.

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

**5.5 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.

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

**5.6 Barometer**, to record the barometric pressure during the test.

**5.7 Two thermometers**, to record the water temperature and air temperature at the gas-collection point.

## 6 Conditions for the test

### 6.1 Test pieces

No test shall be carried out within 24 h of manufacture on rubber or plastics hoses or length of tubing. Before testing, the test pieces shall be conditioned, in accordance with ISO 23529, for at least 3 h at the specified temperature and humidity.

Conditioning of test pieces are excluded for routine test or maintenance inspection.

### 6.2 Test temperature

Unless otherwise specified in the product standard, the test shall be carried out at a temperature of  $23\text{ °C} \pm 2\text{ °C}$ . If there is an agreement between the interested parties, test may be carried out at any temperature.

This test temperature is excluded for routine test or maintenance inspection.

### 6.3 Test gas

Use test gas specified in the product standard. Other test gases may be used if agreed upon between the interested parties.

Water soluble gas cannot be quantified.

### 6.4 Test pressure

Unless otherwise specified in the product standard, the test shall be carried out at a gas pressure of 1 MPa. If there is an agreement between interested parties, the test may be carried out at other test pressures.

## 7 Procedure

### 7.1 General

The following procedures are common for conducting each method.

Use one test piece for each method.

Measure ID of the test piece of hose or tubing if the result is expressed in an amount per surface area.

Connect one end of the test piece to the specified gas supply (5.2) with a suitable connector.

Purge the test piece with test gas for 30 s to expel the air before finally sealing the test piece by blanking off the other end.

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Adjust the temperature of the water bath (5.4) to the specified value.

Before conducting the permeation test, the test piece shall be immersed in water and checked for any leakage.

Each method is followed after the above procedures.

If the permeability is required to be determined at different pressures, test at the lowest pressure first and then at increasing pressure levels.

**NOTE** In order to avoid sticking of bubbles, wall surface of the collecting devices is washed with surface active agent or the like before the start of test.

## 7.2 Method 1

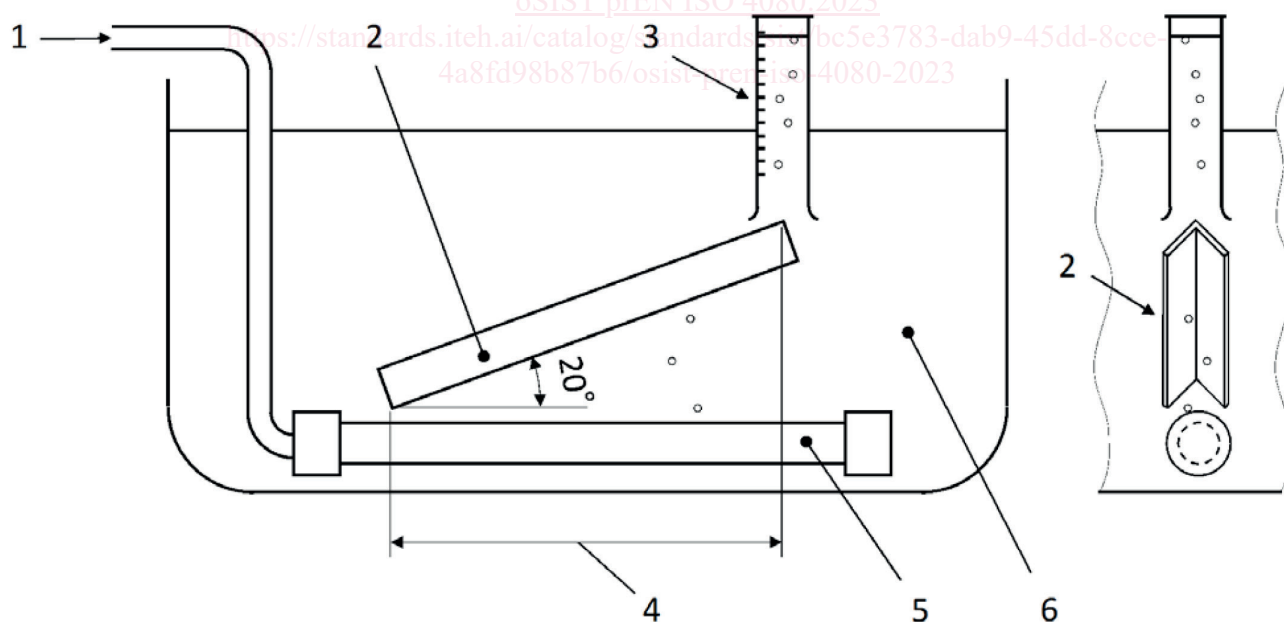
Immerse the test piece in the water bath and place the collecting trough so that it is inclined at approximately  $20^\circ$  to the horizontal (see Figure 1). The collecting trough should be such a size that it collects all the gas bubbles over the 1 m length.

Position the measuring cylinder as shown in Figure 1 so as to collect and measure any gas which diffusing through the complete hose or length of tubing.

Apply the gas pressure and, depending on the period to reach steady state, maintain at least 24 h. Collect the gas for 6 h or record the time to collect between  $450 \text{ cm}^3$  and  $500 \text{ cm}^3$  of gas per meter.

If the volume of gas collected after 6 h is less than  $3,0 \text{ cm}^3$  per meter, measure the volume of gas collected in a 24 h period. If the volume of gas collected after 24 h is more than  $1 \text{ cm}^3$ , then this can be taken as the reading.

Repeat the measurement until two successive gas volumes are within 5 % of each other. Use the average of these two successive readings for the calculation of the permeability.



### Key

- |   |   |
|---|---|
| 1 gas supply  | 4 $1 \text{ m} \pm 0,01 \text{ m}$ of test length |
| 2 collecting trough (horizontally projected length shall be equal to m) | 5 test piece                                      |
| 3 measuring cylinder  | 6 water bath                                      |

Figure 1 — Schematic apparatus for Method 1