
**Rubber and plastics hoses and
tubing — Measurement of flexibility
and stiffness —**

**Part 2:
Bending tests at sub-ambient
temperatures**

*Tuyaux et tubes en caoutchouc et en plastique — Mesurage de la
flexibilité et de la rigidité —*

*Partie 2: Essais de courbure à des températures inférieures à
l'ambiante*

ISO 10619-2:2017

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 10619-2:2011), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- the unit used in the formula to calculate the flexural stiffness in 6.5 and 6.6 has been changed.

A list of all parts in the ISO 10619 series can be found on the ISO website.

Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness —

Part 2: Bending tests at sub-ambient temperatures

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 two methods for measuring the stiffness and one method for the determination of the flexibility of rubber and plastics hoses and tubing when they are bent to a specific radius at sub-ambient temperatures.

Method A is suitable for non-collapsible rubber and plastics hoses and tubing with a bore of up to and including 25 mm. This method provides a means of measuring the stiffness of the hose or tubing when the temperature is reduced from a standard laboratory temperature.

Method B is suitable for rubber and plastics hoses and tubing with a bore of up to 100 mm and provides a means of assessing the flexibility of the hose or tubing when bent around a mandrel at a specified sub-ambient temperature. It can also be used as a routine quality control test.

Method C is suitable for rubber and plastics hoses and tubing with a bore of 100 mm and greater. This method provides a means of measuring the stiffness of the hose and tubing at sub-ambient temperatures. This method is only suitable for hoses and tubing which are non-collapsible.

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 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic 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 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

bending

shaping or forcing something straight into a curve or angle at a specified temperature

3.2 flexibility

ease of *bending* (3.1) a hose without it being damaged by kinking, collapse, breaking or cracking

Note 1 to entry: A hose can be bent around a mandrel, for example.

3.3 stiffness

resistance of a hose to *bending* (3.1)

4 Method A

4.1 General

This method applies to non-collapsible hoses with a bore of up to and including 25 mm only.

4.2 Apparatus

4.2.1 Torque wheel, having a diameter equal to twice the minimum bend radius specified for the hose, provided with equipment for holding the hose tangential to the wheel, a suitable device to bend the hose around the wheel, and a strain gauge and graphical recorder to measure the torque with an accuracy of $\pm 3\%$ (see Figure 1). If the minimum bend radius is not specified, the torque wheel shall have a diameter equal to 12 times the nominal bore of the hose (see Figure 1).

4.2.2 Cooling container, equipped with an agitator, a temperature-measuring device and a roller having a diameter of 50 mm for guiding the hose (see Figure 1). The coolant shall not affect the hose under test and shall be used as prescribed in ISO 23529. A suitable coolant liquid is methanol or ethanol with crushed dry ice (solid carbon dioxide) added. Gaseous coolants may be employed when the design of the apparatus is such that the tests using such coolants give results equivalent to those obtained with liquid coolants.

4.3 Hose test piece

4.3.1 Type

The hose test pieces shall be cut from the hose under test and shall have a length equal to:

$$2(\pi R + d) \quad (1)$$

where

R is the minimum bend radius as specified in the relevant hose product standard;

d is the hose bore.

4.3.2 Number of hose test pieces

At least three hose test pieces shall be used for each test.

No test shall be carried out less than 24 h after manufacture of the hose.

4.4 Test temperature

The test shall be conducted at one of the following temperatures:

$0\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$