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Rubber and plastics hoses — Determination of volumetric expansion

Tuyaux en caoutchouc ou en plastique — Détermination de l'expansion volumique

ISO/CEN PARALLEL PROCESSING

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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).

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

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.

This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 218, *Rubber and plastics hoses and hose assemblies*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 6801:1983), which has been technically revised. It also incorporates the Amendment ISO 6801:1983/Amd.1:2011.

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

— deletion of alcohol as pressurizing fluid;

— addition of Clause 3.

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.

Introduction

When used for dispensing specific volumes of fluids, the volumetric capacity of a hose is often required to vary by only small amounts at the dispensing pressure. This document describes a method of checking that such requirements can be met.

Rubber and plastics hoses — Determination of volumetric expansion

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 a method for the determination of the volumetric expansion of rubber or plastics hoses under hydrostatic pressure.

This document does not specify the dimensions of the test piece and the test pressure(s) as each of which is specified in the appropriate specification.

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*

3 Terms and definitions

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

4 Apparatus

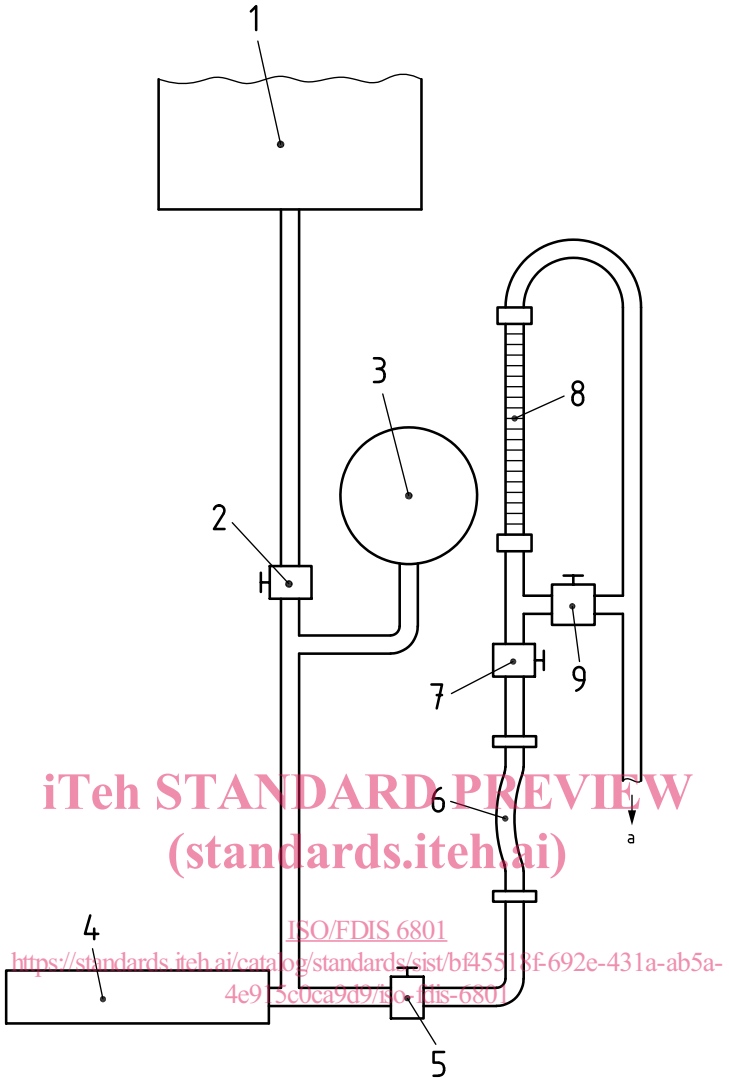
4.1 See Figure 1. The apparatus comprises a suitable source of fluid which can be maintained at the required pressure, together with pressure gauges, piping, valves and fittings, so that a vertical length of hose can be subjected to hydraulic pressure.

A graduated burette of sufficient accuracy is also required for measuring the volume of fluid corresponding to the expansion of the hose under pressure.

4.2 The bore of all piping and connections shall be smooth without recesses or off-sets, so that all air can be freely removed from the system before carrying out each test. The valves shall be of such design as to open and close with minimum displacement of fluid. The apparatus shall be capable of increasing the pressure in the test piece in accordance with ISO 1402. The rate of pressure increase shall be

a) between 0,075 MPa/s and 0,175 MPa/s for test pressures up to and including 12,5 MPa and

b) between 0,35 MPa/s and 1,0 MPa/s for higher test pressures.



Key

1	tank (vented at top)	6	test piece
2	valve A	7	valve C
3	pressure gauge	8	burette
4	pressure source	9	valve D
5	valve B		
a	To drain.		

Figure 1 — Schematic arrangement of test apparatus

5 Calibration of apparatus

5.1 Prior to testing the hose, the correction factor(s) for the apparatus, to allow for its increased capacity under the test pressure(s), shall be determined as described in 5.2.

5.2 Following the procedure as described in Clause 6, using a length of steel hydraulic tubing with external diameter 6,3 mm and minimum wall thickness 1,52 mm in place of the test pieces, determine the correction factor as the mean value of three expansions.

5.3 If the correction factor, determined at a pressure of 10,3 MPa, exceeds 0,08 cm^3, the apparatus is unsuitable.

6 Procedure

6.1 Carefully connect the test piece in position on the apparatus in such a way as to obtain a leak-proof seal, taking care to avoid twisting it. Maintain the test piece in a vertical position without being in tension while under pressure.

The free length of the test piece should be measured.

6.2 Fill the tank (1) with distilled water, taking care that it is free of air or dissolved gases. Open valve A (2) and fill the pressure source (4) with liquid. Open valve B (5) and partially open valve C (7) and allow the liquid to run from the tank through the burette (8) until no air bubbles are seen in the burette.

NOTE Removal of air bubbles can be facilitated by moving the test piece back and forth.

6.3 Close valve A (2), C (7) and D (9) and raise the pressure in the test piece (6) to the test pressure and maintain for 10 s. Check for leaks at the connections and release the pressure completely in the test piece by opening valve C (7), which shall then be closed before proceeding as described in 6.4.

6.4 Adjust the liquid level in the burette to the zero mark by means of valve D (9).

6.5 Increase the pressure at the rate specified in 4.2 until the pressure gauge (3) shows the test pressure. Maintain this pressure in the test piece by closing valve B (5). Then determine the expansion immediately by opening valve C (7) and allowing the liquid in the expanded test piece to rise in the burette. As soon as the liquid level has become constant, close valve C (7) and record the volume in the burette.

6.6 Release the pressure and open valve B (5). Repeat the procedure as described in 6.5 twice, so that the final reading on the burette is the total volume of the three expansions.

6.7 If the pressure in the test piece is inadvertently raised, just prior to reading the expansion, to a value above the test pressure but not exceeding 50 % of the specified minimum burst pressure for the hose, release the pressure completely, allow the test piece to recover for 15 min and repeat the procedure described in 6.4 to 6.6.

If the pressure in the test piece is allowed to exceed 50 % of the specified minimum burst pressure for the hose, discard the test piece and repeat the test using another test piece.

If, at any time during the test, an air bubble flows out of the test piece, repeat the test after allowing the test piece to recover for at least 5 min.

7 Expression of results

The volumetric expansion, E, expressed in cubic centimetres per metre (cm^3/m) of free length of the test piece, is given by Formula (1)

$$E = \frac{\frac{V}{3} - C}{l} \tag{1}$$

where

V is the total volume of the three expansions, in cubic centimetres (cm^3), read from the burette, rounded to the nearest 0,01 cm^3;

C is the correction factor, in cubic centimetres (cm^3), rounded to the nearest 0,01 cm^3 (see Clause 5);

l is the free length of the test piece in metres (m).

Report the result in cubic centimetres per metre (cm^3/m), rounded to the nearest 0,01 cm^3/m.

NOTE The result can be expressed as a percentage, if required, by determining the internal diameter and the free length of the hose assembly, and hence its volume, prior to testing.

8 Test report

The test report shall include at least the following information:

a) a reference to this document including its year of publication, i.e. ISO 6801:2021;

b) a full description of the hose and its origin;

c) the dimensions of the test piece;

d) the test pressure;

e) the correction factor for the apparatus;

f) the total volume of the three expansions;

g) the hose expansion, in cubic centimetres per metre (cm^3/m), calculated according to Clause 7;

h) the percentage volumetric expansion, if required;

i) any deviations from the procedure;

j) any unusual features observed;

k) the date of the test.