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Rubber hoses for steam — Test methods

Tuyaux en caoutchouc pour la vapeur — Méthodes d'essai

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4023 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Sub-Committee SC 1, *Hoses (rubber and plastics)*.

This third edition cancels and replaces the second edition (ISO 4023:1981), of which it constitutes a technical revision.

[ISO 4023:1991](#)

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Rubber hoses for steam — Test methods

1 Scope

This International Standard specifies test methods in which the bore of a rubber hose test piece is exposed to saturated steam, so simulating service conditions.

Four methods are specified, namely:

- Method A: Vertical rack method
- Method B: Horizontal rack method
- Method C: Flexing test, vertical arrangement
- Method D: Flexing test, horizontal arrangement

CAUTION — All necessary safety devices shall be provided to ensure safe working conditions for the operators.

2 Method A: Vertical rack method

2.1 Principle

A length of hose is held in a fixed vertical position and saturated steam is passed through it.

NOTE 1 The temperature or pressure of the steam and the time of exposure should be stated in the relevant hose

specification. The relevant hose specification should also state which, if any, physical properties are to be checked for hose deterioration as well as the permitted changes in these properties. Properties commonly specified are bursting strength, tensile strength and elongation at break of the lining and/or cover and adhesion between layers. Visually assessed test criteria may also be specified, for example rupture of reinforcement, cracking of cover to a specified depth and pitting or blistering of the lining. Sometimes the time of exposure until the hose fails may be specified as the test criterion.

2.2 Apparatus (see figure 1)

Two fixed horizontal steam manifolds having suitable connections for attaching test pieces are placed one above the other at such a distance that the test pieces will just fit between the connections in a vertical position without distortion. Dry saturated steam at the required pressure is supplied to the test pieces through the upper manifold, which is equipped with a pressure-regulating valve, a recording gauge and suitable indicating gauge(s). The lower manifold is connected to a steam trap. Shut-off valves are provided at each opening in each manifold.

Should the apparatus be confined within an enclosure as a safety precaution, such an enclosure shall be so designed that the ambient temperature measured 25 mm from the outer surface of the hose is not greater than 11 °C above room temperature.

Dimensions in millimetres

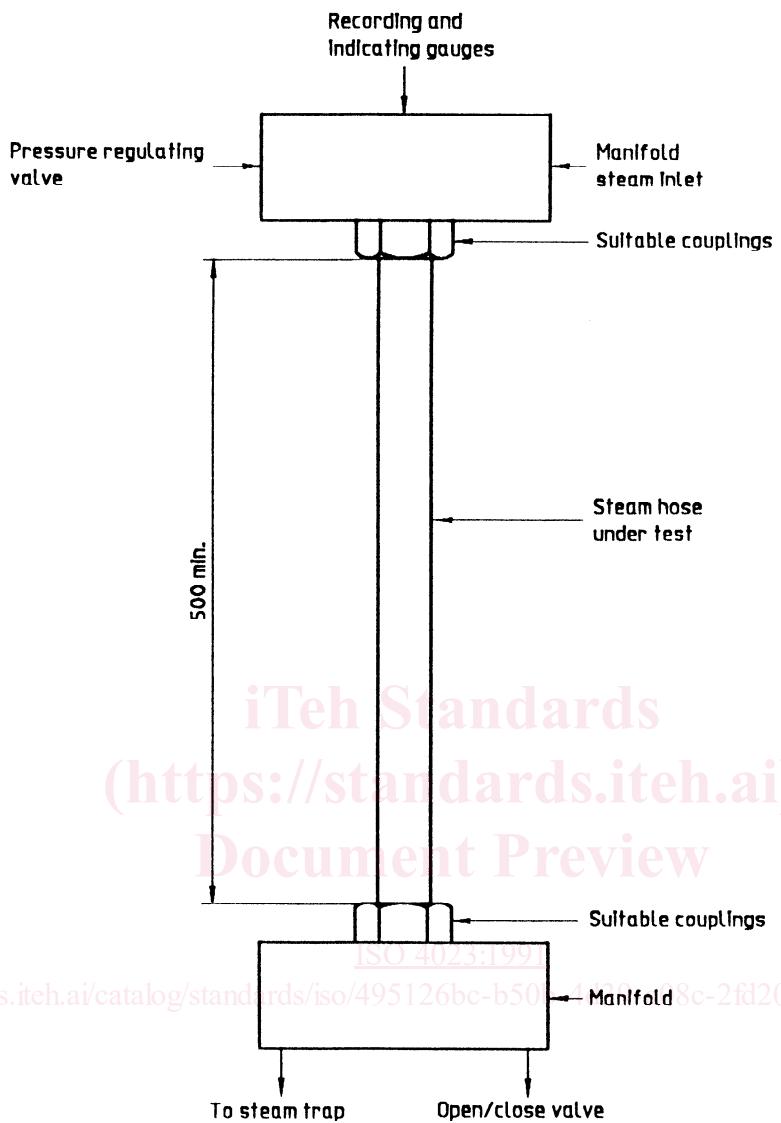


Figure 1 — Schematic diagram of arrangement for vertical steam rack test (method A)

2.3 Test piece

The test piece shall be a sample of hose, not less than 500 mm in length, and of a length sufficient to allow coupling removal after the steam test and recoupling the hose with an appropriate coupling for a burst test.

2.4 Procedure

Mount the test piece in the apparatus and subject it to the internal steam conditions specified. After ex-

posure for the specified time, release the pressure in the test piece, remove it from the apparatus, allow it to cool and hold it under atmospheric conditions for not less than 16 h and not more than 100 h.

After this time, examine the test piece visually and carry out the physical determinations specified; at the same time, determine the same properties on a length of the hose which has not been exposed. If so specified, the exposure shall be continued until the hose fails, as indicated by the specified criteria, and the time to failure noted.

2.5 Test report

The test report shall include the following particulars:

- a) a full description of the hose tested;
- b) a reference to this test method, i.e. ISO 4023, method A;
- c) a reference to the relevant specification in which the test criteria are given or details of such criteria;
- d) the visual assessment of the test piece after testing;
- e) the results of the physical tests specified in the relevant specification;
- f) any other expression of results required by the relevant specification;
- g) any special observations.

3 Method B: Horizontal rack method

3.1 Principle

A length of hose is held in a horizontal position in such a manner that it sags, enabling condensate to collect in part of it.

NOTES

2 The temperature or pressure of the steam and the time of exposure should be stated in the relevant hose specification. The extent to which changes in appearance and physical properties as a result of exposure are permitted should be stated in the relevant hose specification (see also 2.1, note 1).

3 This test is usually used to measure the tendency for the lining to blister or "chunk" out ("popcorning"), i.e. for portions of the lining to fracture and become detached.

3.2 Apparatus (see figure 2)

Two fixed horizontal steam manifolds having suitable connections for attaching test pieces are placed parallel to each other and in the same horizontal plane approximately 1 m from each other. Dry saturated steam at the required pressure is supplied to the test piece through one manifold, which is equipped with a pressure-regulating valve, a recording gauge and a suitable indicating gauge. The other manifold is connected to a steam trap. Shut-off valves are provided at each opening in each manifold.

Should the apparatus be confined within an enclosure as a safety precaution, such an enclosure shall be so designed that the ambient temperature measured 25 mm from the outer surface of the hose is not greater than 11 °C above room temperature.

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Dimensions in millimetres

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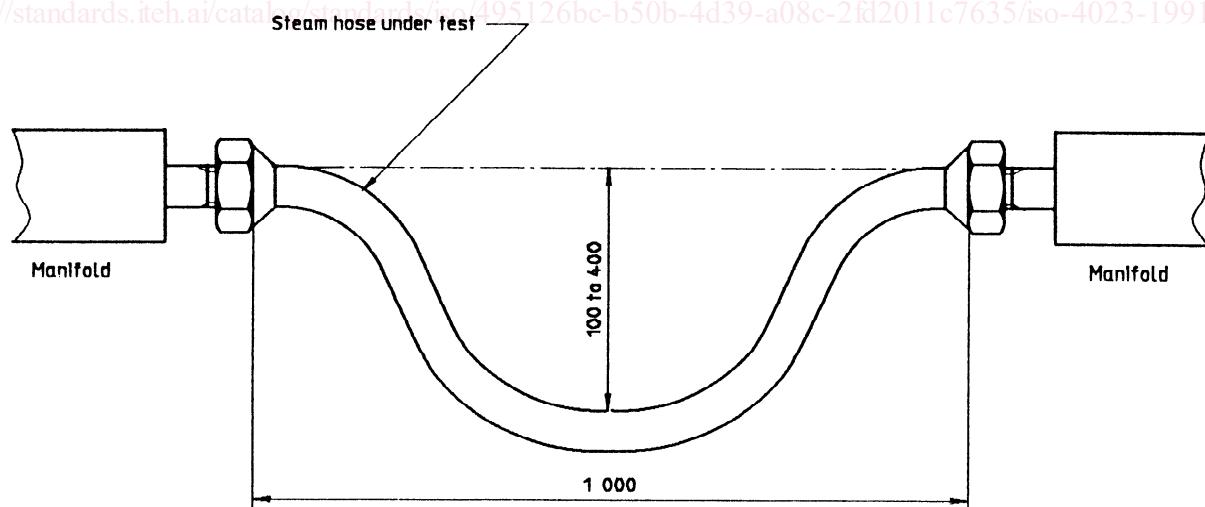


Figure 2 — Schematic diagram of arrangement for horizontal steam rack test (method B)

3.3 Test piece

The test piece shall be a sample of hose of suitable length to conform to figure 2.

3.4 Procedure

Mount the test piece in the apparatus so that there is a sag in the hose of 100 mm to 400 mm below the level of the hose at the manifolds. Subject the hose to the internal steam conditions specified. After 20 h, exhaust the hose within a time of 1 min or less, and allow the hose to cool to room temperature for 4 h. Repeat this cycle during the specified period or until failure occurs.

After exposure for the specified time, release the pressure in the test piece, remove it from the apparatus, allow it to cool, and hold it under atmospheric conditions for not less than 16 h and not more than 100 h.

After this time, examine the test piece visually and carry out the physical determinations specified; at the same time, determine the same properties on a length of the hose which has not been exposed. If so specified, the exposure shall be continued until the hose fails, as indicated by the specified criteria, and the time to failure noted.

3.5 Test report

The test report shall include the following particulars:

- a) a full description of the hose tested;
- b) a reference to this test method, i.e. ISO 4023, method B.
- c) a reference to the relevant specification in which the test criteria are given or details of such criteria;
- d) the visual assessment of the test piece after testing;

- e) the results of the physical tests specified in the relevant specification;
- f) any other expression of results required by the relevant specification;
- g) any special observations.

4 Method C: Flexing test, vertical arrangement

4.1 Principle

A length of hose in a vertical configuration is repeatedly flexed whilst saturated steam is passed through it.

This test is normally run for a specified number of hours, during which there shall be no failure. The hose may then be visually examined or tested for compliance with specified conditions.

NOTE 4 The temperature or pressure of the steam and the time of exposure should be stated in the relevant hose specification. The extent to which changes in appearance and physical properties as a result of exposure are permitted should be stated in the relevant hose specification (see also 2.1, note 1).

4.2 Apparatus (see figure 3)

Two horizontal steam manifolds having suitable connections for attaching test pieces are spaced one above the other, mounted so that one of the manifolds is capable of moving vertically a distance of 315 mm during testing. Dry saturated steam at the required pressure is supplied to the specimens through the upper manifold, which is equipped with a pressure-regulating valve, a recording gauge and suitable indicating gauges. The lower manifold is connected to a steam trap. Shut-off valves are provided at each opening in each manifold.

Should the apparatus be confined within an enclosure as a safety precaution, such an enclosure shall be so designed that the ambient temperature measured 25 mm from the outer surface of the hose is not greater than 11 °C above room temperature.