INTERNATIONAL STANDARD

ISO 14557

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Fire-fighting hoses — Rubber and plastics suction hoses and hose assemblies

Tuyaux de lutte contre l'incendie — Tuyaux d'aspiration et flexibles en caoutchouc et en plastique

Reference number
ISO 14557:2002(E)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 14557 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

Annexes A, B, C, D and E form a normative part of this International Standard. Annex F is for information only.

For the purposes of this International Standard, the CEN annex regarding fulfilment of European Council Directives has been removed.

Contents

Foreword

This document EN ISO 14557:2002 has been prepared by Technical Committee CEN/TC 192 "Fire service equipment", the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 45 "Equipment for fire protection and fire fighting".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2003, and conflicting national standards shall be withdrawn at the latest by June 2003.

Recommendations on the frequency at which tests specified in this standard should be carried out are given in annex F.

Users of this standard are advised to consider the desirability of independent certification of product conformity with this standard based on testing and continuing surveillance, which may be coupled with assessment of a supplier's quality systems against EN ISO 9001.

The annexes A to E and Z are normative. Annex F is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This European Standard is mainly concerned with fire service suction hoses for fire-fighting, used manually to supply unpressurized water to the pump.

1 Scope

This European Standard gives requirements and test methods for rubber and plastics suction hoses for fire-fighting purposes.

NOTE 1 All pressures are expressed in megapascals. 1 MPa = 10 bar.

Additional requirements are specified for hose assemblies, that is, hoses with couplings already fitted, where this is carried out by the hose manufacturer (see clause 8).

Type A (Rubber) hoses are intended for use at a minimum temperature of -20 °C and Type B (Thermoplastics) hoses are intended for use at a minimum temperature of -10 °C.

NOTE 2 Hoses for use at temperatures lower than those specified above can be supplied by agreement between the manufacturer and purchaser. In this case, the low temperature flexibility test (see 6.3) should be carried out at the specified temperature.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

ISO 176:1976, *Plastics — Determination of loss of plasticizers — Activated carbon method.*

ISO 1307, *Rubber and plastics hoses for general-purpose industrial applications — Bore diameters and tolerances, and tolerances on length.*

ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

ISO 1746, *Rubber or plastics hoses and tubing — Bending tests.*

ISO 4672:1997, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests.*

ISO 7233, *Rubber and plastics hoses and hose assemblies — Determination of suction resistance.*

ISO 7326:1991, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions.*

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary.*

ISO 8033, *Rubber and plastics hoses — Determination of adhesion between components.*

ISO 11758, *Rubber and plastics hoses — Exposure to a xenon arc lamp — Determination of changes in colour and appearance.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions for working pressure, proof pressure and burst pressure given in ISO 8330 apply.

4 Classification

4.1 Type (hose construction)

Type A hoses shall consist of:

a) a rubber lining uniform in thickness, reasonably concentric and free from holes, porosity and other defects;

b) a textile reinforcement applied uniformly by any suitable method;

c) an embedded wire helix or helices evenly and uniformly applied and made from metallic material that allows the hose to meet the specification requirements;

d) a rubber cover, ozone resistant, uniform in quality and thickness and free from defects.

Type B hoses shall consist of a flexible, thermoplastics material supported in its mass by a helix of rigid polymeric material. The reinforcement and flexible components of the hose wall shall be fixed and free from cracks, porosity, foreign inclusions or other defects.

4.2 Hose ends

The hose ends shall be compatible with suction hose couplings conforming to the relevant national standards.

NOTE Where soft ends or wire-free ends are used for type A hoses, they should have an additional rubberized textile reinforcement applied as a cuff over the wire-free portion and the first turn of the embedded wire helix.

The hose ends should be capped or sealed to prevent ingress of water.

Specifying the dimensions of the soft or wire-free ends may be the subject of an agreement between the manufacturer and the purchaser.

5 Dimensions, tolerances and maximum mass

5.1 Inside diameter and maximum mass

The dimensions of the hose and tolerances, when measured in accordance with ISO 4671, shall conform to the requirements given in Table 1. The mass per metre length of the hose shall be in accordance with Table 1.

Table 1 — Inside diameter, tolerances on inside diameter and maximum mass per unit length

Inside diameter mm	Tolerances for inside diameter mm	Mass per unit length kg/m	
		Type A	Type B
45	–0,2 to +1,0	2,0	1,0
50	–0,2 to +1,0	2,3	1,6
52	–0,2 to +1,0	2,3	1,6
65	–0,2 to +1,5	3,2	2,0
70	–0,2 to +1,5	3,7	2,6
75	–0,2 to +1,5	4,1	3,0
76	–0,2 to +1,5	4,1	3,0
90	–0,2 to +1,5	6,0	4,0
100	–0,2 to +1,5	6,7	4,5
102	–0,2 to +1,5	6,7	4,5
110	–0,2 to +1,5	7,0	4,7
125	–0,5 to +2,0	7,8	5,0
140	–0,5 to +2,0	8,9	6,0
150	–0,5 to +2,0	11,0	8,0

5.2 Length and tolerances on length

The total length of hose supplied shall be in accordance with the purchaser's requirements and shall be stated in metres. Tolerances on length shall be in accordance with ISO 1307. Tolerances for fixed hose lengths shall be specified by agreement between the purchaser and the manufacturer.

6 Performance requirements of finished hose

6.1 Hydrostatic requirements

NOTE The hydrostatic requirements given below are for suction hoses only. Hoses intended for use in discharge duties as well, require higher burst and proof pressures to be specified by agreement between the purchaser and the manufacturer.

6.1.1 Deformation under proof pressure

When tested in accordance with ISO 1402 at temperatures and pressures shown in Table 2, the hose shall not burst or show any evidence of leakage, cracking, abrupt distortion or other signs of failure.

Table 2 — Proof pressure and minimum burst pressure

	Test temperature (23 ± 2) °C		Test temperature (55 ± 2) °C	
	Type A	**Type B**	**Type A**	**Type B**
Proof pressure MPa	0,3	0,3	-	0,15
Minimum burst pressure MPa	0,6	0,6	-	0,3

6.1.2 Burst pressure

When tested in accordance with ISO 1402 at temperatures and pressures given in Table 2, the hose shall not burst. Three hose lengths each of 1 m shall be tested.

6.2 Adhesion (type A hoses only)

When tested in accordance with ISO 8033 the adhesion between lining and reinforcement and between cover and reinforcement shall be not less than 2,0 kN/m.

6.3 Low temperature flexibility

The test shall be carried out in accordance with clause 4 method B of ISO 4672:1997 at a temperature of −10 °C for thermoplastics hoses and −20 °C for rubber hoses.

NOTE Hoses supplied for use at temperatures lower than those specified above should be tested at the specified temperature.

6.4 Ozone resistance (type A hoses only)

When tested in accordance with method 3 of ISO 7326:1991 under ×2 magnification, the hose cover shall not show any signs of cracking.

6.5 Bending resistance

When tested in accordance with ISO 1746 using a minimum radius of curvature of 10 times the inside diameter, the hose shall not show any permanent deformation or any visible signs of cracking.

6.6 UV-resistance (xenon arc lamp) (type B hoses only)

NOTE A test for resistance to UV and requirements based on ISO 11578 will be added at the first revision of this standard, when more experience has been acquired.

6.7 Loss in mass on heating (type B hoses only)

When tested in accordance with method B of ISO 176:1976 the flexible thermoplastics material used in the construction shall show a loss in mass not greater than 4 %.

6.8 Vacuum resistance

When tested in accordance with ISO 7233, the hose shall show no visible evidence of delamination, indentation or collapse. The test piece shall be conditioned for 4 h prior to testing. During the test, the test piece shall be placed in a water bath at (23 ± 2) °C for all classes of hoses and also at (55 ± 2) °C for class 2 hoses. The internal pressure of the hose shall be reduced to 0,004 MPa absolute pressure (0,097 MPa below atmospheric pressure) and the vacuum shall be maintained for 10 min.

6.9 Pressure impulse resistance (type B hoses only)

When tested in accordance with annex A, the test piece shall not leak or rupture before a minimum of 10 000 cycles. In the event of a failure within one diameter's length from either end of the test piece, the test shall be disregarded and a further test piece tested.

6.10 Reinforcement fracture resistance (type B hoses only)

When tested in accordance with annex B the polymer reinforcement shall undergo reverse bending without visible cracking.

6.11 Flexibility at ambient temperature

When tested in accordance with annex C the deflection at the centre of the hose assembly shall be not less than the appropriate value given in Table 3.

Table 3 — Minimum deflection for flexibility test

Inside diameter	Minimum deflection
mm	mm
45	450
50	450
52	450
65	400
70	380
75	380
76	380
90	380
100	380
102	380
110	380
125	330
140	330
150	330

6.12 Vacuum resistance with flexing

When tested in accordance with annex D the hose assembly shall have no visible damage or have any permanent distortion.

7 Marking

Each length of hose shall be legibly and permanently marked at least once per length with the following information:

a) the manufacturer's name and/or trademark;

b) the number and date of this standard;

c) the hose type and inside diameter;

d) the quarter and year of manufacture;

e) the low temperature flexibility test temperature if lower than that specified for type A or type B hoses;

f) the approval number and certifying body or its reference, where applicable.

EXAMPLE – Man - ISO 14557-2000 - A100 - 2Q/2000

8 Hose assemblies

NOTE 1 In some circumstances it is not the manufacturer who supplies the hose complete with couplings attached. In this case, the purchaser should be aware that this is outside the scope of this standard, and should ensure by other means that the security of the hose assembly has been tested.

Where the hose couplings are fitted by the hose manufacturer, the security of the hose assembly shall be tested in accordance with annex E by the manufacturer before delivery to the purchaser. There shall be no sign of leakage or movement of the hose from the coupling.

NOTE 2 The hose manufacturer should fit hose couplings which conform to any relevant national standards or legal requirements of the country of use.

Annex A
(normative)

Pressure impulse test

A.1 Test pieces

A minimum of three test pieces of hose with end fittings shall be tested. The clear distance between fittings shall be at least five times the inside diameter of the hose.

A.2 Apparatus

Circuit capable of applying an internal hydraulic pressure which can be released at a predetermined level, delayed by a fixed period of time and the impulse cycle then repeated. The impulse cycle shall conform to the pressure/time requirements of Figure A.1. A suitable circuit is shown in Figure A.2.

A.3 Test fluid

The test fluid shall be water which may be suitably dyed.

A.4 Conditioning

No test shall be carried out within 24 h of manufacture of the hose. Test pieces shall be conditioned at (23 ± 2) °C for at least 3 h before testing.

NOTE The 3 h of conditioning can be included in the 24 h period following manufacture.

A.5 Procedure

Connect the test piece in a straight condition to the apparatus and ensure that the temperature of both the test fluid and the ambient condition is (23 ± 2) °C. Expel all air from the test piece and apply 10 000 impulse cycles.

The maximum pressure of the test cycle (see Figure A.1) shall be 0,18 MPa.

NOTE Due to the length of this test, a short interruption is permitted. The test can be resumed from the point of interruption, but this should be stated in the test report.

A.6 Test report

The test report shall include the following information:

a) the numbers of cycles to failure of less than 10 000;

b) the position and mode of failure for each test piece;

c) the test fluid and dye used, if applicable.

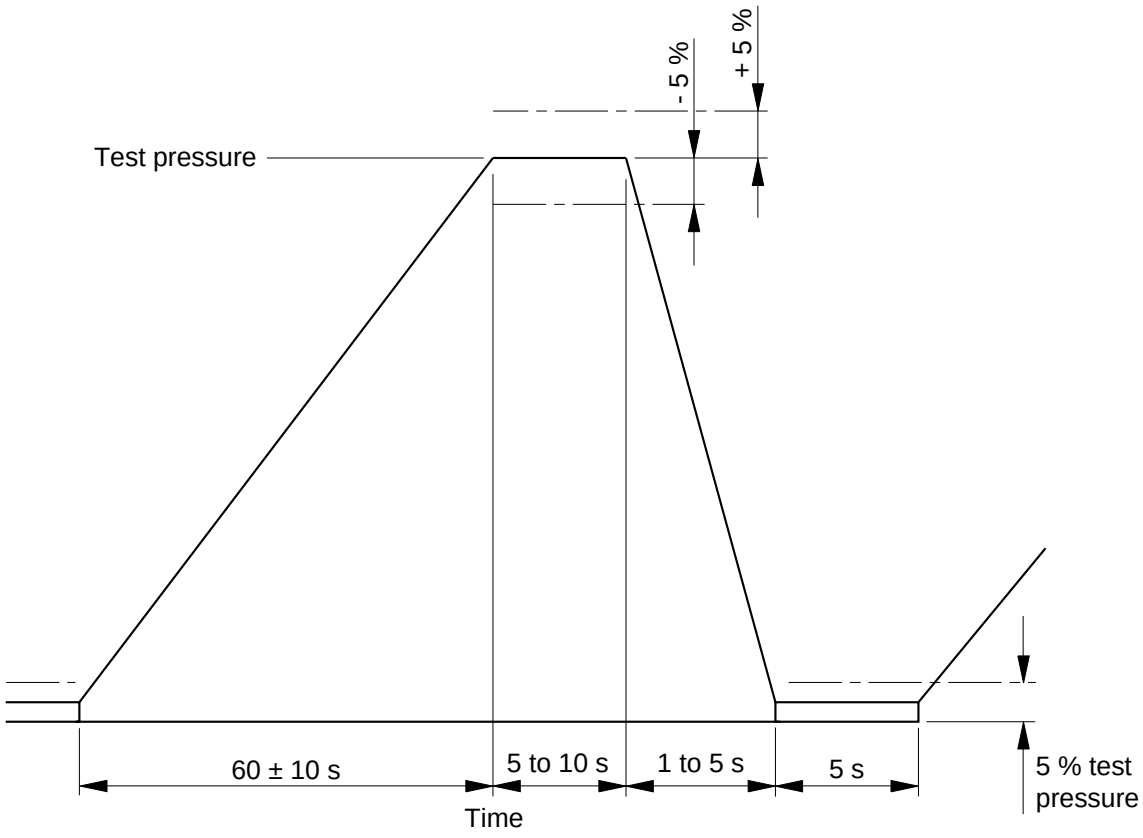
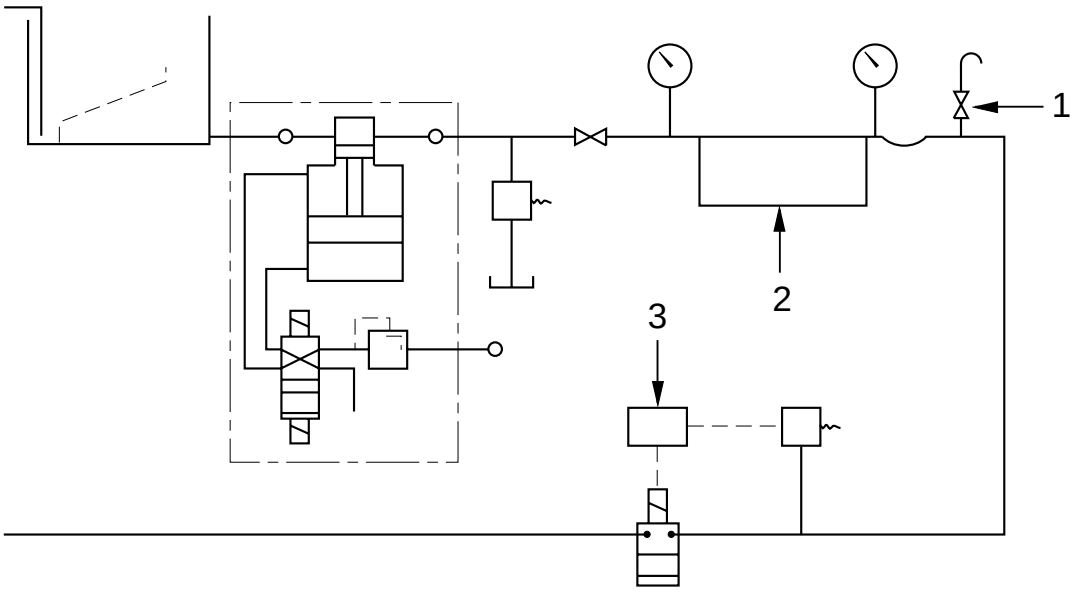


Figure A.1 — Pressure impulse cycle



Key
1 Air bleed valve
2 Test piece
3 Timer

Figure A.2 — Suitable impulse test circuit

Annex B
(normative)

Reinforcement fracture resistance test (type B hoses only)

B.1 Test pieces

Each test piece shall contain three helices of reinforcement and shall be split with a clean cut along its length. Three pieces shall be tested.

B.2 Apparatus

Lengths of hardwood or rectangular metal sections with a square cross-section conforming to the appropriate value given in Table B.1.

B.3 Conditioning

No test shall be carried out within 24 h of manufacture. Test pieces shall be conditioned at (23 ± 2) °C for at least 3 h before testing.

NOTE The 3 h of conditioning can be included in the 24 h period following manufacture.

B.4 Procedure

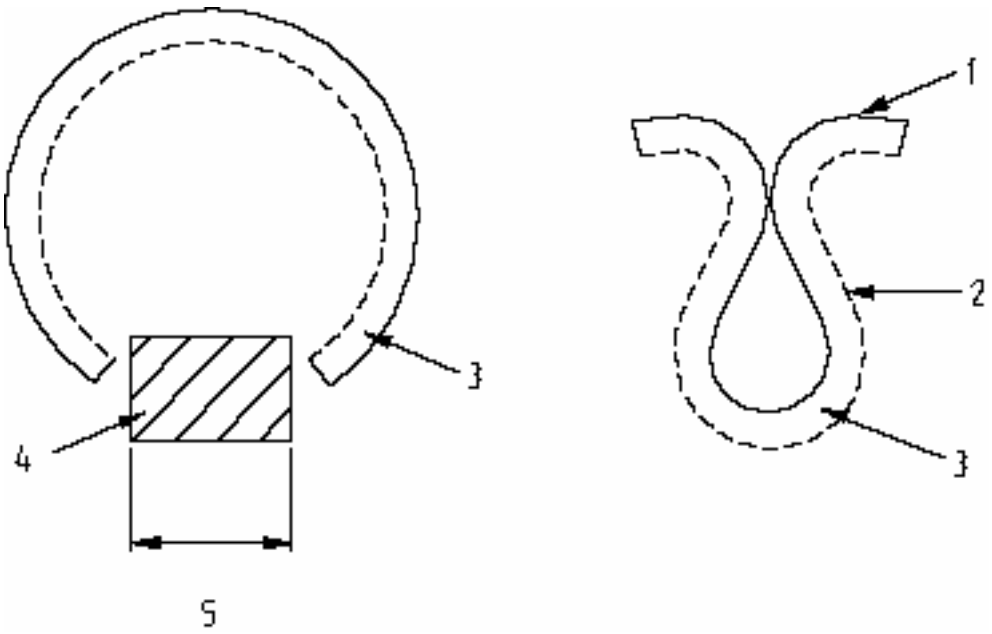
Open up the test piece and place it lengthways on a block extension appropriate to its inside diameter (see Table B.1) as indicated in Figure B.1. Leave in this condition for either 336 h (for a batch test) or 4 months (for a type test), as appropriate. Carry out the test at a temperature of (23 ± 2) °C. Reverse bend the test piece bringing the cut sides together until the outside surfaces touch and examine for cracking of the helix (see Figure B.1).

Table B.1 — Block extension dimensions for reinforcement fracture resistance test

Inside diameter of hose mm	Block width mm
45	29
50	31
52	31
65	34
70	36
75	37
76	37
90	41
100	44
102	44
110	47
125	49
140	51
150	53

B.5 Test report

The test report shall state either no failure or the position and nature of failure for each test piece, as applicable.



Key
1 Outer surface
2 Inner surface
3 Test piece
4 Test block
5 Block width

Figure B.1 — Reinforcement fracture test

Annex C
(normative)

Test for flexibility at ambient temperature

C.1 Test piece

The test piece shall be a length of hose and suitable couplings, giving an overall hose assembly length of (2 500 ± 25) mm.

C.2 Apparatus

C.2.1 Vertical slings, to suspend the test piece at least 600 mm below a beam.

C.2.2 Straight edge, at least the length of the test piece.

C.2.3 Weight or force, capable of applying 450 N.

C.2.4 Rule or steel measuring tape.

C.3 Procedure

At a test temperature of (23 ± 2) °C, suspend the test piece with the slings around the couplings. Position the test piece so that when at rest it forms an arc, with the slings vertical throughout the test (see Figure C.1). In the case of hoses of inside diameter equal to or greater than 125 mm, add an appropriate weight to the middle of the test piece to apply a vertical downward force of 450 N, readjusting the slings as necessary.

NOTE No additional weight is added to hoses of smaller inside diameter.

Place a straight edge across the top of the couplings as a datum and measure the deflection at the vertical distance between the datum and the upper surface of the hose at the centre of the arc.

C.4 Test report

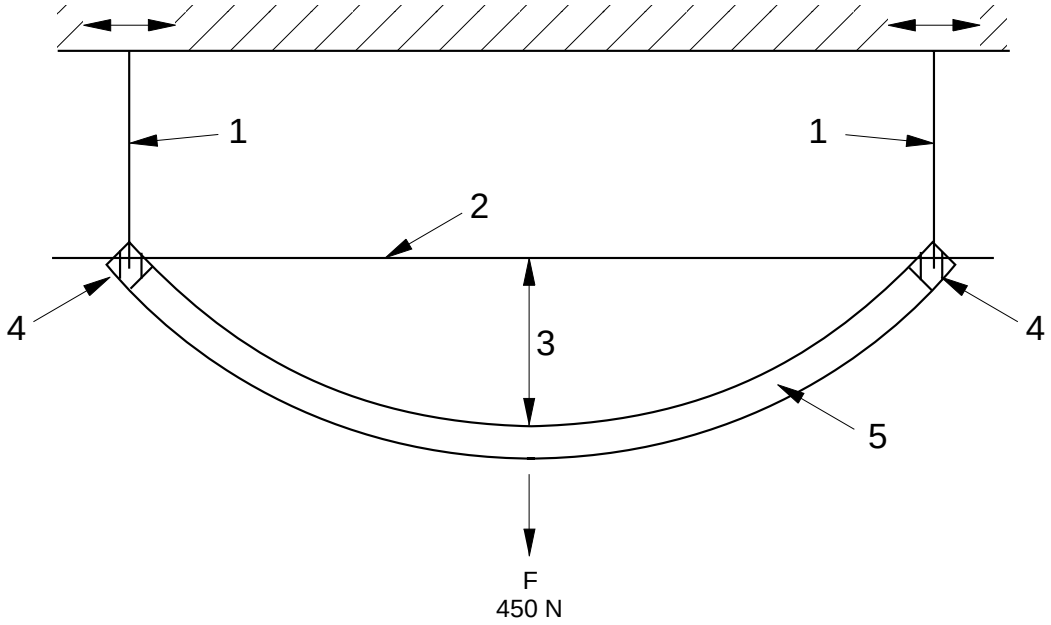
The test report shall include the following information:

a) a full description of the hose assembly;

b) the date of manufacture of the hose;

c) the amount of deflection and length of the assembly;

d) the date of the test.



Key
1 Suspension sling
2 Straight edge
3 Deflection
4 Hose couplings
5 Test piece

Figure C.1 — Apparatus for flexibility test

Annex D
(normative)

Test for vacuum resistance with flexing

D.1 Test piece

The test piece shall be a length of hose and suitable couplings, giving an overall hose assembly length of (2 500 ± 25) mm.

D.2 Apparatus

D.2.1 Flat table, with one edge rounded to 25 mm radius.

D.2.2 Weight or force, equivalent to the mass of two test pieces.

D.2.3 Vacuum source.

D.3 Procedure

Weigh the test piece. Anchor one coupling to the Table (D.2.1) so that half the length of the test piece is hanging over the rounded edge of the table and the other half is lying horizontally. Attach the weight (D.2.2) or an equivalent force to the other coupling. With a temperature of (23 ± 2) °C, apply a vacuum of 0,097 MPa below atmospheric pressure, i.e. 0,004 MPa absolute for 5 min. Return the pressure to atmospheric, lay the test piece on a flat surface and examine for evidence of distortion or damage.

D.4 Test report

The test report shall include the following information:

a) a full description of the hose assembly;

b) the date of manufacture of the hose;

c) the weight/force attached to the hose assembly;

d) the date of the test;

e) observations on the hose at the end of the test.

Annex E
(normative)

Test for hose assemblies

E.1 Test piece

The assembled hose, complete with couplings, shall be used as the test piece.

E.2 Procedure

Raise the pressure to proof pressure as given in Table 2 and maintain for 1 min, examining during this time for any coupling movement or leaks.

Release the pressure and allow the assembly to relax for 1 min, then raise the pressure again to proof pressure as given in Table 2, maintain for a further 1 min and examine carefully for coupling movement or leaks.

Release the pressure and re-examine.

NOTE A statistically based sampling plan can be used to provide evidence that hoses in a given batch conform to this requirement.

Annex F
(informative)

Recommended minimum frequencies of testing

Table F.1 gives the recommended minimum frequencies for the tests specified in this standard.

Type approval tests are those tests carried out to determine that the hose design and methods of manufacture meet the full requirements of the standard. They should be repeated whenever the hose construction or the materials are modified, or every three years, whichever occurs first.

Batch tests are those test to be carried out on a hose or sample of hose from every batch manufactured.

Production tests are those tests to be carried out on every manufactured length of hose.

Table F.1 — Recommended minimum frequencies of testing

Dimension/property under test (with reference to relevant clause)	Type test	Batch test	Production test
Inside diameter (5.1)	✓	✓	✓
Tolerance on length (5.2)	✓	✓	✓
Maximum mass (5.1)	✓	✓	—
Proof pressure (6.1.1)	✓	✓	—
Burst pressure (6.1.2)	✓	✓	—
Adhesion (6.2)	✓	✓	—
Low temperature flexibility (6.3)	✓	✓	—
Ozone resistance (6.4)	✓	✓	—
Bending (6.5)	✓	✓	—
Loss in mass on heating (6.7)	✓	—	—
Vacuum resistance (6.8)	✓	✓	—
Pressure impulse (6.9)	✓	—	—
Reinforcement fracture resistance (6.10)	✓	✓	—
Flexibility at ambient temperature (6.11)	✓	✓	—
Vacuum resistance with flexing (6.12)	✓	—	—
Hose assembly (where applicable) (clause 8)	✓	✓	✓

Bibliography

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000).*

ICS 13.220.10; 83.140.40

Price based on 18 pages