SWEDISH STANDARDS INSTITUTE

SVENSK STANDARD
SS-EN 14540:2004+A1:2007

Fastställd 2007-04-17
Utgåva 1

Brand och räddning – Brandslangar – Flatrullade tryckslangar för inomhusbrandposter

Fire-fighting hoses – Non-percolating layflat hoses for fixed systems

ICS 13.220.10; 23.040.70
Språk: engelska
Publicerad: juni 2007

Europastandarden EN 14540:2004+A1:2007 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 14540:2004+A1:2007.

Denna standard ersätter SS-EN 14540:2004, utgåva 1.

The European Standard EN 14540:2004+A1:2007 has the status of a Swedish Standard. This document contains the official English version of EN 14540:2004+A1:2007.

This standard supersedes the Swedish Standard SS-EN 14540:2004, edition 1.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 14540:2004+A1

April 2007

ICS 13.220.10; 23.040.70

Supersedes EN 14540:2004

English Version

Fire-fighting hoses - Non-percolating layflat hoses for fixed systems

Tuyaux de lutte contre l'incendie - Tuyaux aplatissables étanches pour systèmes fixes

Feuerlöschschläuche - Flachschläuche für Wandhydranten

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Contents

Foreword

This document (EN 14540:2004+A1:2007) has been prepared by Technical Committee CEN/TC 192 "Fire service equipment", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by October 2007 and conflicting national standards shall be withdrawn at the latest by October 2007.

This document includes Amendment 1, approved by CEN on 2007-03-12.

This document supersedes EN 14540:2004.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟨A1⟩ ⟨A1⟩

The standard is based on recommendations from CEN/TC 191 "Fixed fire fighting systems" and should be read in conjunction with EN 671-2.

⟨A1⟩ *deleted text* ⟨A1⟩

At present there is no existing ISO standard on the same subject.

⟨A1⟩ *deleted text* ⟨A1⟩.

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

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

Introduction

A fixed system is a manually operated unit installed in a building in order to make it possible for the occupants to control and extinguish a small fire. The system consists of fixed units mounted on walls or in cabinets permanently connected to a water supply. The fixed units are composed of a coupling, a valve with a pressure indicator, a layflat water filled hose with its support and a nozzle.

1 Scope

This European Standard specifies the requirements and test methods for non-percolating layflat hoses for fixed systems. The hoses are intended for use at a maximum working pressure of 1,5 MPa over a range of inside diameters from 25 mm to 52 mm.

The standard applies exclusively to hoses for fire-fighting purposes intended for use at a minimum ambient temperature of -20 °C in normal conditions, and a minimum temperature of -30 °C in colder climatic conditions.

Hoses conforming to this standard should be used with fire hose couplings conforming to the relevant national standards for couplings.

〈A1〉 Hoses in marine applications and/or aggressive environments to be used with wall hydrants as specified in EN 671-2 can conform to the requirements of this standard. 〈A1〉

NOTE All pressures are gauge pressures and are expressed in megapascals[1].

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).

EN 28033, *Rubber and plastics hoses — Determination of adhesion between components (ISO 8033:1991).*

EN ISO 1307, *Rubber and plastics hoses for general purpose industrial applications — Bore diameters and tolerances, and tolerances on length (ISO 1307:1992).*

EN ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing (ISO 1402:1994).*

EN ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of dimensions (ISO 4671:1999).*

EN ISO 8330:2000, *Rubber and plastics hoses and hose assemblies - Vocabulary (ISO 8330:1998).*

ISO 188, *Rubber, vulcanised or thermoplastic — Accelerated ageing or heat resistance tests.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 8330:2000 and the following apply.

---

[1] 1 MPa = 10 bar

3.1
layflat hose
hose with a soft wall which, when unpressurized internally, collapses to such an extent that the inner faces of the inside diameter make contact and the hose takes up a flat cross-sectional appearance

3.2
jacket
circular woven seamless reinforcement

4 Materials and construction of hose

The hose shall be uncovered. It shall consist of the following:

an impermeable rubber or plastics lining;

a synthetic fibre jacket.

NOTE 1 The hose jacket can be dyed or pigmented.

NOTE 2 The hose manufacturer should weave the jacket and assemble the jacket and lining.

NOTE 3 The lining should be as smooth as possible so as to minimize friction.

5 Dimensions, tolerances and maximum mass

5.1 Inside diameter and maximum mass

The inside diameter of the hose and tolerances when measured in accordance with EN ISO 4671 shall conform to the requirements given in Table 1. The mass per metre length for a length of hose of at least 2 m, without couplings fitted, shall not exceed the value given in 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 max.
25	-0,5 to +1,0	0,18
38	-0,5 to +1,5	0,24
40/42/45		0,29
50/51/52		0,35

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 EN ISO 1307.

NOTE The coil or flake size, and the test procedures to determine these can, if considered necessary, be agreed between the manufacturer and purchaser.

6 Performance requirements of finished hose

6.1 Hydrostatic requirements

6.1.1 Deformation under normal working pressure

The dimensional stability of the hose when tested in accordance with EN ISO 1402, shall conform to the requirements of Tables 2 and 3.

The initial test pressure shall be 0,07 MPa, and the final test pressure shall be 1,0 MPa.

The twisting line shall be clockwise.

Table 2 — Change in length and external diameter

	Tolerances %
Change in length	0,0 to +5,0
Change in external diameter	0,0 to +5,0

Table 3 — Twisting line

Inside diameter mm	**Maximum twist** °/m
25	120
38 to 52 inclusive	100

6.1.2 Deformation under proof pressure

A proof pressure hold test shall be carried out on three hose lengths each of 1 m in accordance with EN ISO 1402. The proof pressure shall be as given in Table 4 and on examination during the test, the test pieces shall not show any evidence of leakage, cracking, abrupt distortion or other signs of failure.

Table 4 — Working pressures, proof pressure and minimum burst pressure

	Pressure MPa
Normal working pressure	1,0
Maximum working pressure[a]	1,5
Proof pressure[b]	2,25
Minimum burst pressure	4,5

[a] To accommodate pump close down pressures, the maximum working pressure may be exceeded by a maximum of 0,2 MPa for short periods only.

[b] A statistically based sampling plan may be used to provide evidence that hoses in a given batch conform to the proof pressure requirement.

6.1.3 Minimum burst pressure

Three test pieces of length 1 m shall be subjected to the burst pressure test as specified in EN ISO 1402.

A1 NOTE It is not necessary to increase the pressure above the minimum burst value to burst the hose. It is sufficient to increase the pressure to the required minimum burst pressure stated in Table 4 in order to pass this test requirement. This should be stated in the Test Report. A1

No individual test piece shall burst at less than the burst pressure given in Table 4.

6.1.4 Kink pressure

When tested in accordance with annex A, the test piece shall neither burst nor show any signs of defect when examined visually before or after being subjected to the proof pressure given in Table 4.

6.2 Adhesion

When tested in accordance with type 1 of EN 28033 the adhesion between the lining and jacket shall be not less than 1,0 kN/m.

The test piece shall be of length (25 ± 0,5) mm cut at right angles to the longitudinal axis of the hose. The ring shall be cut transversely and opened out to form a strip and the adhesion determined with the rate of travel of the power driven grips such that a rate of ply separation of (50 ± 5) mm/min is obtained.

If an adhesion result is not possible because of tearing due to high adhesion, this shall be accepted as a pass. All adhesions shall be attempted and the results recorded.

6.3 Accelerated ageing

When tested in accordance with annex B, the three flaked test pieces subjected to the burst pressure test shall conform to the requirements of 6.1.3. The mean of the burst pressure test results shall not decrease by more than 25 % from the initial mean burst pressure value determined from the results obtained in 6.1.3.

The adhesion between lining and jacket of the coiled test piece shall be not less than 0,9 kN/m.

NOTE There is no limitation on the increase in value of these properties.

6.4 Low temperature flexibility

When tested in accordance with annex C, the inner lining of the hose shall not crack or become loose from the jacket after 15 cycles. The test temperatures shall be as specified below:

Standard test temperature	(-20 ± 2) °C
Special test temperature	(-30 ± 2) °C

NOTE The special test temperature requirement is for hoses for use in the colder climatic conditions of Northern Europe.

6.5 Hot surface resistance

When tested in accordance with annex D at a test temperature of (200 ± 10) °C, in none of the four tests shall the test piece show signs of leakage within 120 s from the application of the filament rod or on removal of the filament rod after this period.

6.6 Resistance to kinking

When tested in accordance with annex E and using a bending radius 10 times its inside diameter, the hose shall not show any kinks when examined visually.

7 A1 Frequency of testing

Type tests and Production tests shall be carried out as detailed in Annex F.

Batch tests as given in Annex G shall be carried to control the quality of the product. They are for guidance only. A1

8 Marking

Each length of hose shall be legibly and permanently marked with the following minimum information, at least twice per length, at both ends:

a) the manufacturer's name or trade mark (see note 2 to clause 4);

b) the number and date of this European Standard;

c) the inside diameter;

d) the maximum working pressure in MPa(bar);

e) the quarter and year of manufacture;

f) the test temperature if lower than -20 °C (see 6.4);

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

EXAMPLE Man - EN 14540: 2003 - 45 - 1,5(15) - 2Q/2003

Annex A
(normative)

Kink pressure test

A.1 Principle

This method tests the hose for leakage or damage in a kinked test piece held under pressure.

A.2 Test piece

The test piece shall be a 2,0 m length of hose.

A.3 Apparatus

A.3.1 Source of hydrostatic pressure, with water as the test medium, capable of maintaining the proof pressure as specified in Table 4.

A.4 Procedure

Connect the test piece to the pressure source and fill with water, expelling all air before securely clamping shut the free end of the hose. Maintain a pressure of 0,07 MPa in the test piece and then bend it through 180° at a point approximately midway along its length. Tie the free end of the hose back on itself, as close as possible to the secure end, so as to form a sharp kink, ensuring that the tie does not prevent subsequent expansion of the diameter of the test piece.

Raise the pressure in the test piece to the proof pressure specified in Table 4 over a period of 60 s. Maintain the pressure for 1 min. Examine the test piece for any sign of leakage or damage prior to releasing the pressure.

A.5 Test report

The test report shall include the following information:

a) a full description of the hose tested;

b) a reference to this European Standard;

c) any evidence of leakage or damage observed;

d) the date of the test.

Annex B
(normative)

Accelerated ageing test

B.1 Test piece

Four test pieces, each of 1 m length, shall be tested.

NOTE It is recommended that the test pieces should be taken from the hose adjacent to the original burst and adhesion test pieces.

B.2 Procedure

Bend three of the test pieces through 180 ° at a point approximately midway along their length and tie in this flaked position.

Loosely coil the remaining test piece.

Age all four test pieces in air for 14 days at a temperature of (70 ± 1) °C in a temperature controlled oven as specified in ISO 188.

After ageing, straighten out the three flaked test pieces and subject them to the burst pressure test as specified in 6.1.3.

Subject the remaining test piece to the adhesion test as given in 6.2.

B.3 Test report

The test report shall contain the following information:

a) a full description of the hose tested

b) a reference to this European Standard

c) the burst pressure after aging

d) adhesion test results after ageing

e) date of test

Annex C
(normative)

Low temperature flexibility test

C.1 Test piece

Two test pieces from each hose shall be tested, measuring 80 mm × 40 mm for a 25 mm inside diameter hose and 100 mm × 40 mm for all other hose inside diameters and taken circumferentially, that is, weft ways, from a 0,3 m length of hose.

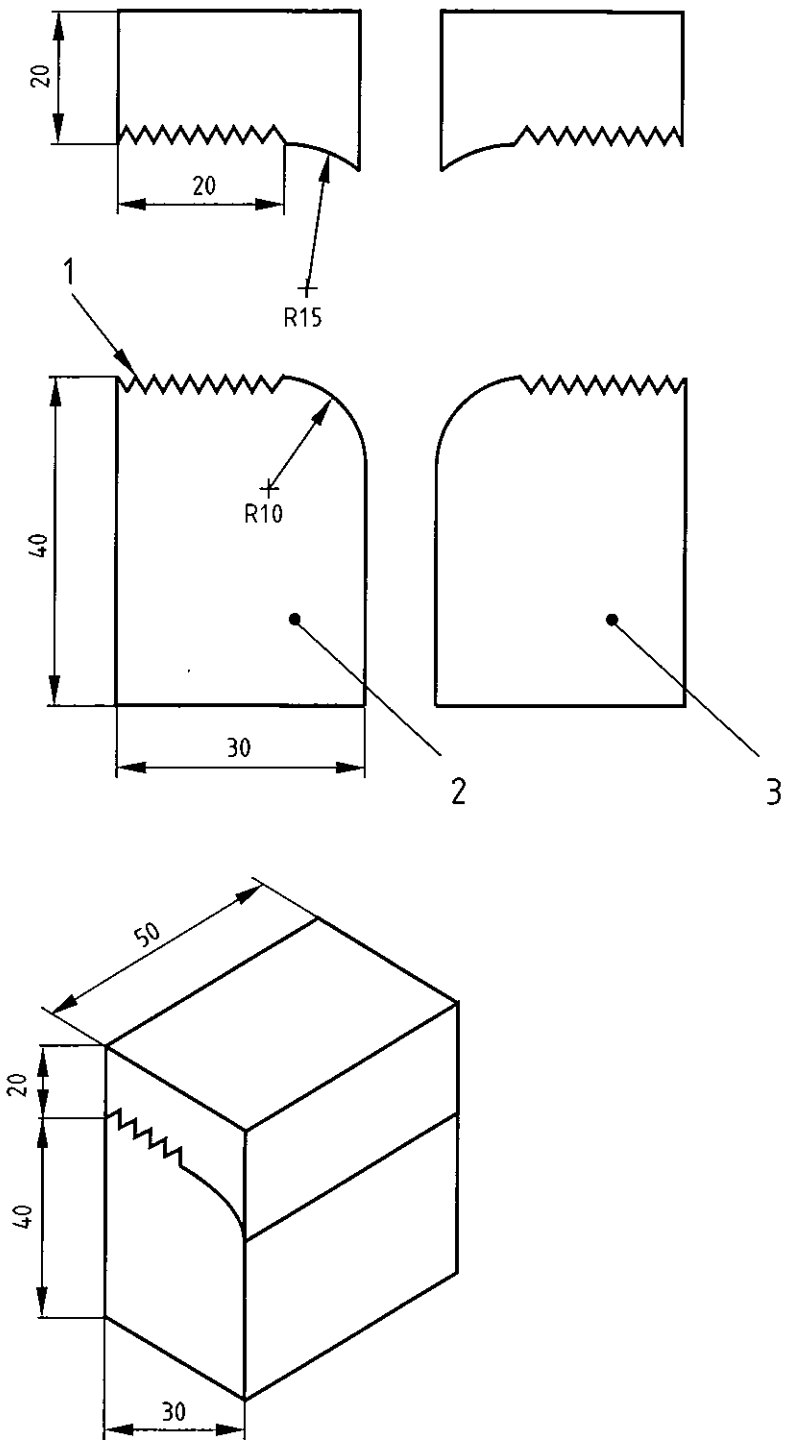
NOTE The test piece need not be conditioned.

C.2 Apparatus

C.2.1 Two clamping jaws, with dimensions as shown in Figures C.1 and C.2 to retain the test piece in position. One of the clamping jaws is fixed, whereas the other is moveable. The space between the jaws in the closed position (figure C.2) shall be three times the hose thickness including ribs where applicable. The space between the jaws in the open position when the test piece is straightened out shall be 50 mm plus the longitudinal increase which results from the tensile force of 250 N exerted by the moveable jaw. The moveable jaw shall reciprocate with a speed of 10 mm/s. A typical apparatus is given in Figure C.3.

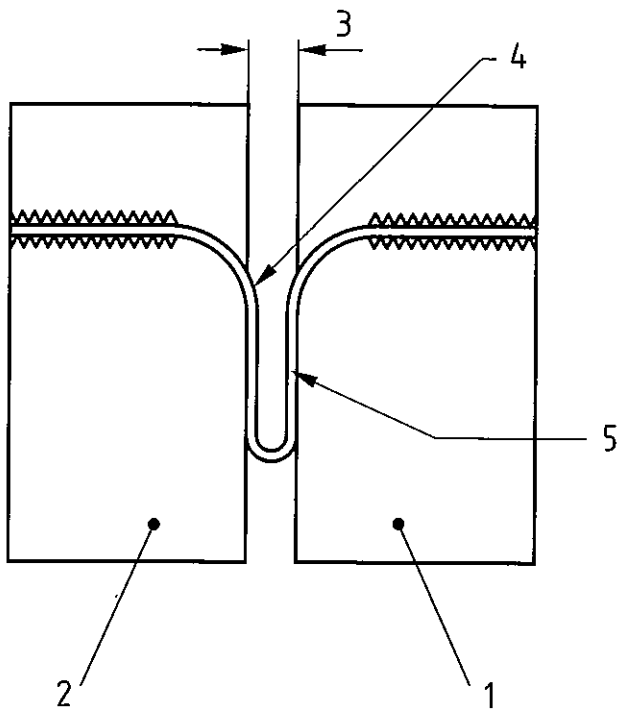
C.2.2 Freezer, capable of maintaining temperatures of (-20 ± 2) °C and (-30 ± 2) °C.

Dimensions in millimetres



Key
1 Grooves
2 Fixed jaw
3 Moveable jaw

Figure C.1 — Clamping jaws

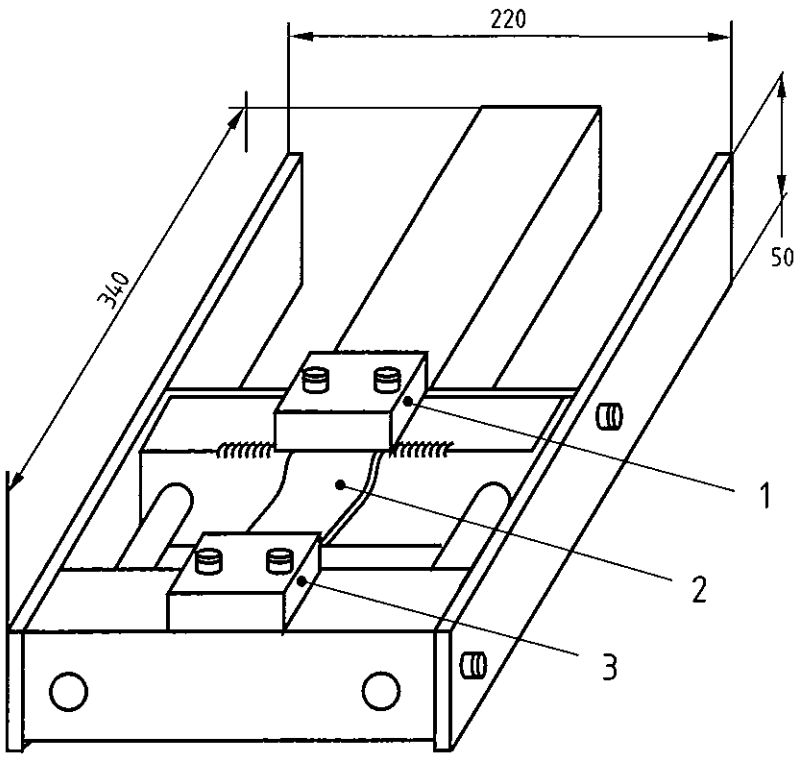


Key

1 Movable jaw
2 Fixed jaw
3 Dimension 3× hose thickness (including ribs if present)
4 Hose Lining inwards
5 Hose test piece

Figure C.2 — Test piece mounted between clamping jaws

Dimensions in millimetres



Key
1 Movable jaw 2 Test piece 3 Fixed jaw

Figure C.3 — Typical low temperature test apparatus

C.3 Procedure

Place the test piece and apparatus in the freezer (C.2.2) and carry out the test at the temperature specified in 6.4.

Clamp the test piece in position in the jaws with the hose lining as shown in Figure C.2 and in such a way that the free straight length between the jaws amounts to approximately 50 mm.

Immediately move the jaws to the closed position and leave for 10 min. Then cause the moveable jaw to carry out one test cycle with a speed of 10 mm/s and a force of 250 N.

One test cycle shall take 60 s according to the following:

Time to open jaws	5 s
Open position	10 s
Time to close jaws	5 s
Closed position	40 s

After 15 cycles examine the test piece for cracking or detachment of the lining from the jacket.

C.4 Test report

The test report shall include the following information:

a) a full description of the hose tested;

b) a reference to this European Standard;

c) whether cracks or delamination were observed;

d) the temperature at which the test was carried out;

e) the date of the test.

Annex D
(normative)

Hot surface resistance test

D.1 Test piece

The test piece shall be a sample of hose of length approximately 0,5 m. Mark the test piece in 4 places at approximately 90° intervals circumpherentially such that 2 of the marks are coincident with the flat edges of the hose.

NOTE This sampling procedure is designed to eliminate eccentric covers.

D.2 Apparatus

D.2.1 Filament rod, consisting of an electrically heated spiral resistance wire with a resistance of approximately 80 Ω wound around a ceramic tube of diameter 21 mm and enclosed in a tube of quartz glass containing at least 95 % m/m of SiO_2 (silicon dioxide). An example of the design is given in Figure D.1.

NOTE The filament rod can be obtained from Saint-Gobain Quartz GmbH, Hüttenstraße 10, D-65201 Weisbaden-Schierstein, Germany (laboratory immersion heater). This information is given for the convenience of users of this standard and does not constitute an endorsement by CEN of the product named. Equivalent products may be used if they can be shown to lead to the same results.

D.2.2 Temperature controller and recorder, capable of restoring the set temperature within 15 s of commencement of the test and maintaining the set temperature within the specified limits.

D.2.3 Thermocouple, type J or K, manufactured from wires of diameter (0,25 ± 0,025) mm, joined end-on (i.e. not twisted together), looped around the filament rod.

D.2.4 Loading weight, designed to press the filament rod (D.2.1) against the vertically mounted test piece with a force (*F*) equivalent to 4 N (see Figure D.2).

D.2.5 Cabinet or small enclosure, to eliminate local air movement in the vicinity of the test piece and filament rod.

Dimensions in millimetres

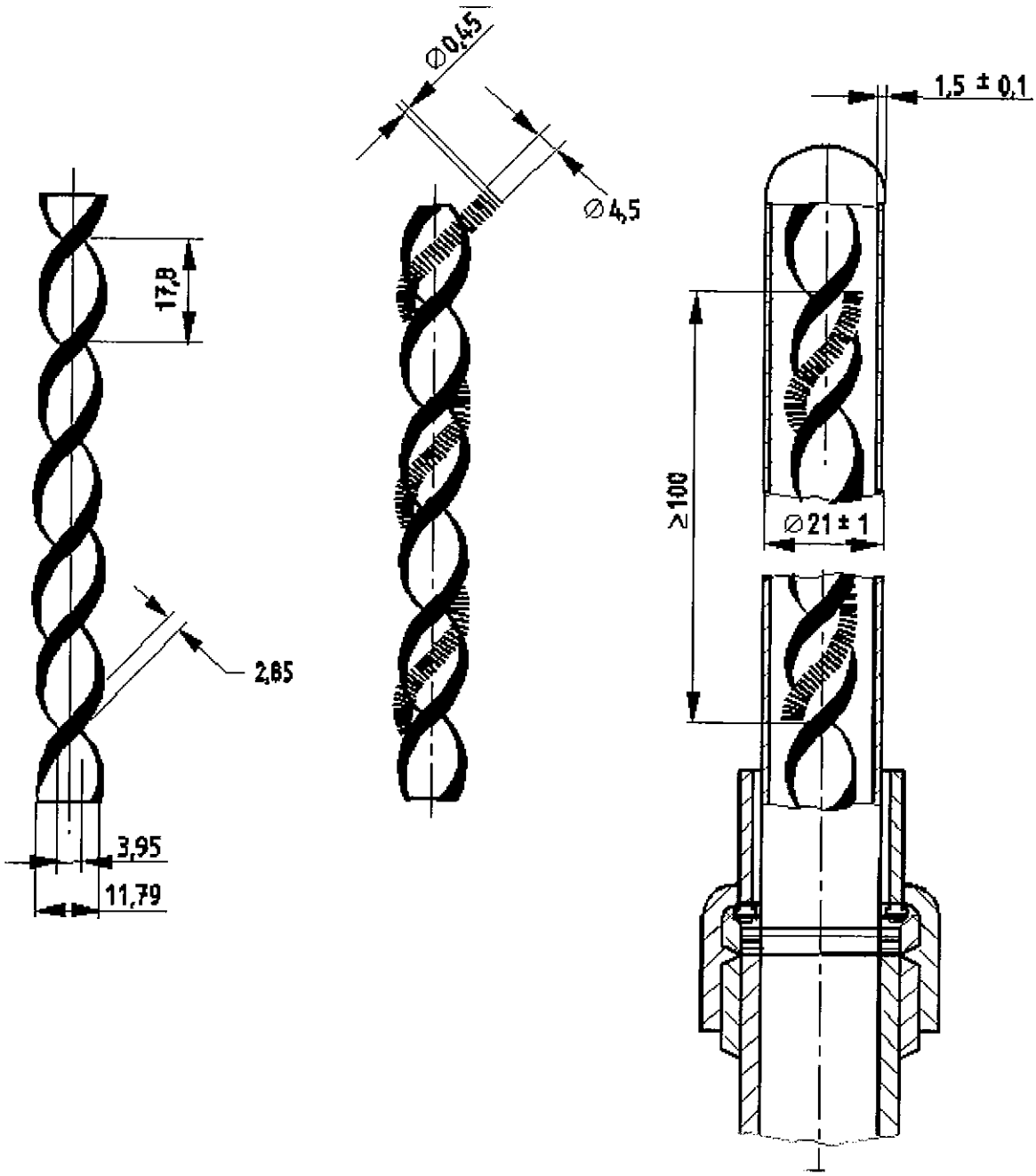
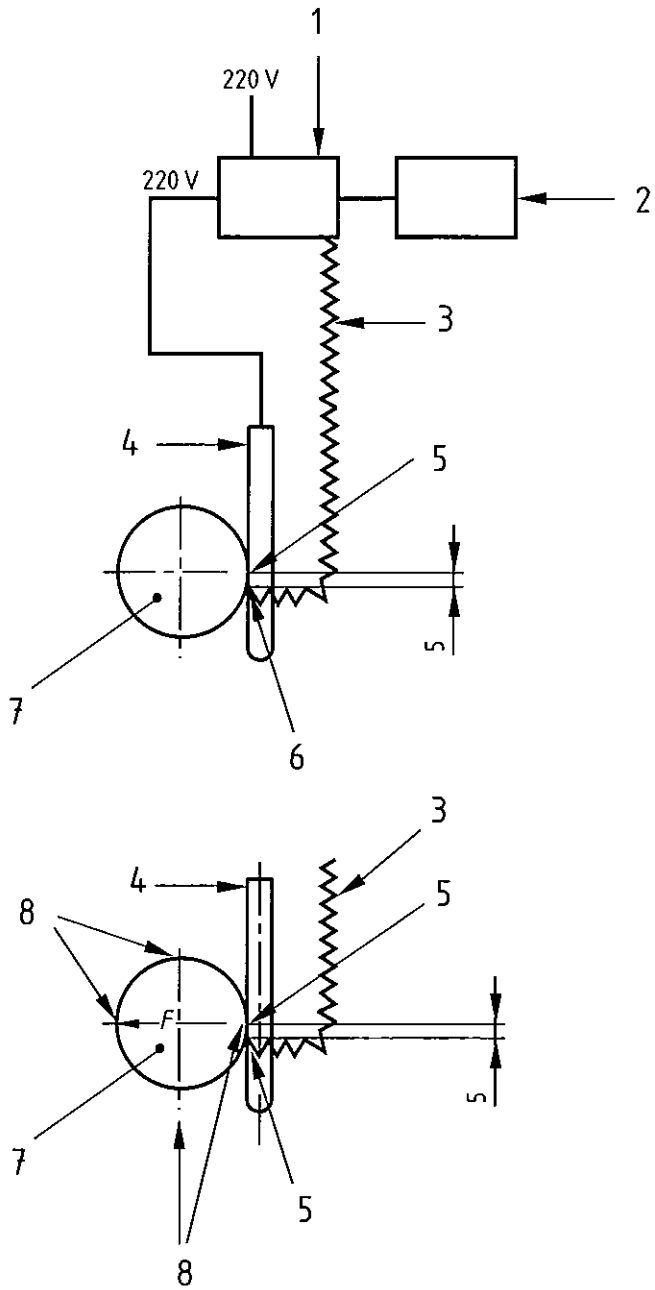


Figure D.1 — Example of suitable filament rod design



Key

1 Temperature controller
2 Recorder or computer
3 Thermocouple type J or K
4 Filament rod
5 Contact point
6 Point of measuring
7 Hose
8 Testing Areas
F Force

Figure D.2 — Point of contact of filament rod with hose (seen from above)

D.3 Procedure

Couple the test piece in a vertical position, fill it with water at a test temperature of (15 ± 5) °C, expelling all air and subject it to a pressure of 0,7 MPa.

At ambient temperature, adjust the test piece and filament rod such that the filament rod is in contact with one of the marks on the test piece and the thermocouple is at a distance of 5 mm along the filament rod from the contact point.

Swing the filament rod away from the test piece, switch on the temperature controller and adjust to the test temperature (see 6.5). Maintain and record the test temperature throughout the tests.

Press the filament rod against the mark on the test piece with a force of 4 N.

After 120 s, remove the rod and examine the test piece for leaks.

If a leak occurs in less than 120 s, stop the test and record the time to failure.

If no leak occurs, repeat the test at the further 3 marked test positions after ensuring that the filament rod contact area and the thermocouple are clean.

D.4 Test report

The test report shall include the following information:

a) a full description of the hose tested;

b) a reference to this European Standard;

c) all test results, in seconds;

d) the temperature at which the test was carried out;

e) the date of the test.

Annex E
(normative)

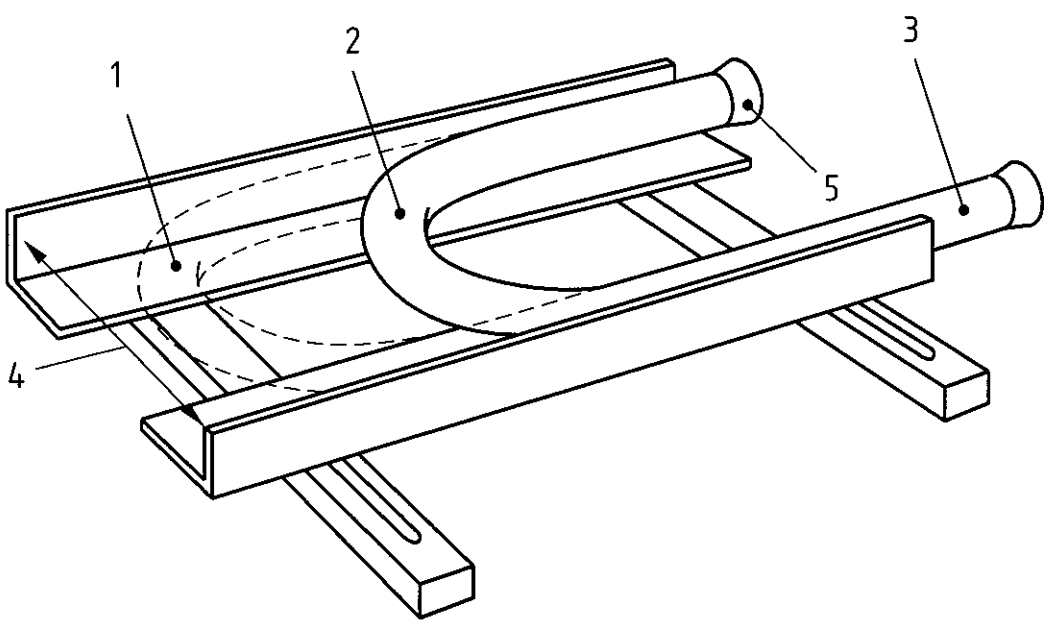
Test for resistance to kinking

E.1 Test piece

The test piece shall be a hose assembly with a minimum length of 15 m.

E.2 Apparatus

E.2.1 Device, consisting of two planks of wood or metal sheet which restrict the outward movement of the pressurized hose. One of the sides is fixed whereas the other can be moved and held at a given distance from the other (See Figure E.1 for a typical device.).



Key
1 Original position of hose
2 Test position of hose
3 Hose pulled when pressurized
4 Distance between planks of wood is 22× inside diameter of hose
5 Couplings

Figure E.1 — Typical apparatus for resistance to kinking test

E.3 Procedure

Position an unpressurized length of hose in the device (E.2) in a curved position with the distance between the restricting boards 22 times the inside diameter of the hose. Fill the hose with water, expelling the air, pressurize to 1,0 MPa and lightly mark it at the point of contact with each of the restricting boards.

NOTE This delineates the curved portion of the hose which may contain incipient kink points.

Pull the hose to align the original curved portion alongside a restricting board.

Finally check to determine whether visible kinks are obvious in the new curvature section of the hose.

E.4 Test report

The test report shall contain the following information:

a) a full description of the hose tested;

b) a reference to this European Standard;

c) whether kinks were observed or not;

d) the date of the test.

Annex F
(normative)
[A1] Frequencies of testing (type test and production test)

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

Type tests are those tests carried out to determine that the hose design and methods of manufacture meet the full requirements of the standard. They shall be repeated whenever the hose construction or the materials are modified. Repeat type tests shall be carried out every five years unless it can be confirmed by the manufacturer that no changes have been made during this period.

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

Table F.1 - Frequencies of testing

Dimension/property under test (with reference to relevant clause)	Type test	Production test
Inside diameter (5.1)	√	√
Maximum mass (5.1)	√	√
Change in length at maximum working pressure (6.1.1)	√	-
Change in external diameter at maximum working pressure (6.1.1)	√	-
Twist at normal working pressure (6.1.1)	√	-
Proof pressure (6.1.2)	√	-
Minimum burst pressure (6.1.3)	√	-
Kink pressure (6.1.4)	√	-
Adhesion (6.2)	√	-
Accelerated ageing (6.3)	√	-
Low temperature flexibility (6.4)	√	-
Hot surface resistance (6.5)	√	-
Non-kink properties (6.6)	√	-

[A1]

Annex G
(informative)
A1 Frequencies of testing (batch test)

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

Table G.1 - Frequencies of testing

Dimension/property under test (with reference to relevant clause)	Batch test
Inside diameter (5.1)	√
Maximum mass (5.1)	√
Change in length at maximum working pressure (6.1.1)	√
Change in external diameter at maximum working pressure (6.1.1)	√
Twist at normal working pressure (6.1.1)	√
Proof pressure (6.1.2)	√
Minimum burst pressure (6.1.3)	√
Kink pressure (6.1.4)	√
Adhesion (6.2)	√
Accelerated ageing (6.3)	-
Low temperature flexibility (6.4)	-
Hot surface resistance (6.5)	-
Non-kink properties (6.6)	-

A1

Bibliography

[1] EN 671-2, *Fixed firefighting systems — Hose systems — Part 2: Hose systems with lay-flat hose.*

〈A1〉 *deleted text* 〈A1〉

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