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ISO 27126

Second edition
2021-11

Thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for the transfer of hydrocarbons, solvents and chemicals — Specification

Tuyaux et flexibles multicouches (non vulcanisés) thermoplastiques pour le transfert des hydrocarbures, des solvants et des produits chimiques — Spécifications

Reference number
ISO 27126:2021(E)

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Foreword

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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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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*.

This second edition cancels and replaces the first edition (ISO 27126:2014), which has been technically revised, based on EN 13765:2018.

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

— the normative references have been updated and changed (Clause 2);

— lower minimum and/or higher maximum temperature have been added upon agreement with the manufacturer (Clause 4);

— some austenitic steel wire has been added (Clause 5);

— change in length and twist at proof pressure instead maximum working pressure have been modified (Clause 7);

— the electrical resistance requirement between end fittings has been modified (Clause 7);

— marking of the hose and assembly has been updated (Clause 10);

— in Annex D, thickness has been replaced by outside diameter (equals to the distance between the two plates) and tolerances on test force have been added;

— in Annex H, requirements have been added;

— in Annex K and Annex L, tests requirements have been updated.

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.

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Thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for the transfer of hydrocarbons, solvents and chemicals — Specification

WARNING — Persons using this document should be familiar with normal laboratory practice. This document does not purport to address all the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to determine the applicability of any other restrictions.

1 Scope

This document specifies requirements for four types of thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for carrying hydrocarbons, solvents and chemicals. It specifies bore sizes from 25 mm to 300 mm, working pressures from 0,4 MPa (4 bar) to 1,4 MPa (14 bar) and working temperatures from −30 °C to 150 °C, according to type.

Type 1 hoses are suitable for vapour applications. Types 2 to 4 hoses are suitable for liquid applications.

NOTE 1 See Annex A concerning the selection of the material for the inner wall of layers and any polymeric coating of the internal wire helix related to the chemical(s) to be conveyed by the hoses and/or hose assemblies.

NOTE 2 It is intended that the manufacturer be consulted where a polymeric coated internal wire is being considered for use with low conductivity hydrocarbons or chemicals.

This document does not apply to hoses and hose assemblies for:

— aircraft refuelling (see ISO 1825);

— fuel dispensing (see ISO 5772);

— oil burners (see ISO 6806);

— liquefied petroleum gas and liquefied natural gas (see ISO 27127);

— fire fighting (see ISO 14557);

— offshore liquefied natural gas (see EN 1474-2);

— refrigeration circuits.

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 209, *Aluminium and aluminium alloys — Chemical composition*

ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 1402:2021, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*

ISO 1817:2015, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2411, *Rubber- or plastics-coated fabrics — Determination of coating adhesion*

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ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of the dimensions of hoses and the lengths of hose assemblies*

ISO 7233:2021, *Rubber and plastics hoses and hose assemblies — Determination of resistance to vacuum*

ISO 7326:2016, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

ISO 8031:2020, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance and conductivity*

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

ISO 10619-1, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

ISO 10619-2, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 16143-3:2014, *Stainless steels for general purposes — Part 3: Wire*

EN 590, *Automotive fuels — Diesel — Requirements and test methods*

EN 10088-3:2014, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

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 Classification

Hoses shall be classified according to working pressure and working temperature range as given in Table 1.

Table 1 — Pressure and temperature range

	Type 1		Type 2		Type 3		Type 4	
	MPa	bar	MPa	bar	MPa	bar	MPa	bar
Maximum working pressure	0,4	4	1,0	10	1,4	14	1,4	14
Proof pressure	0,6	6	1,5	15	2,1	21	2,1	21
Minimum burst pressure	1,6	16	4	40	5,6	56	5,6	56
Vacuum rating	0,05	0,5	0,09	0,9	0,09	0,9	0,09	0,9
Working temperature range (°C)	−20 to +60		−30 to +80		−30 to +80		−30 to +150	
NOTE 1 bar = 0,1 MPa.								

Upon agreement with the manufacturer, lower minimum and/or higher maximum temperature are allowed depending on the materials used and the compatibility with the fluid conveyed at those temperatures. Other properties and requirements mentioned in this document shall be met.

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5 Materials and construction

5.1 General

Hoses shall be constructed as shown in Figure 1 and shall consist of the following:

— an internal wire helix (see 5.2);

— a multi-ply wall of layers of films and fabrics made of thermoplastics that in combination give the required properties and provide a complete seal (see also Annex A);

— a cover consisting of a fabric with abrasion resistant polymeric coating;

— an external wire helix (see 5.2).

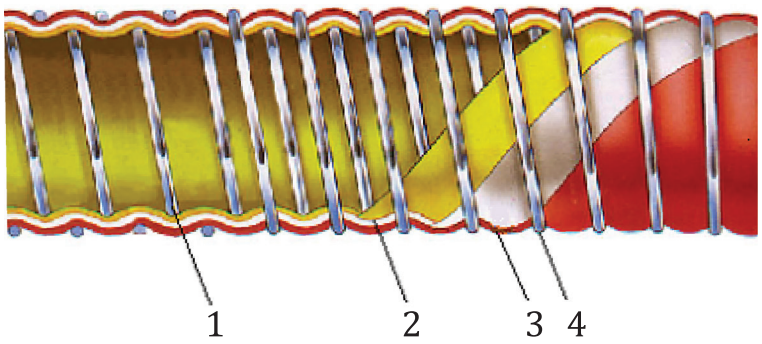
5.2 Internal and external wire

Wire shall be chosen in accordance with its chemical resistance from one of the following materials:

— austenitic stainless-steel wire conforming to EN 10088-3:2014, Table 2, numbers 1.4306, 1.4401, 1.4404 or 1.4436 (X3CrNiMo17-13-3) or ISO 16143-3:2014, Table 1: X2CrNi19-11, X5CrNiMo17-12-2, X2CrNiMo17-12-2;

— carbon steel wire conforming to Annex B and either galvanised in accordance with Annex C or sheathed in a polymeric material of a minimum wall thickness of 0,5 mm, resistant to liquid hydrocarbon or liquid chemicals as agreed between purchaser and manufacturer (see Annex A);

— aluminium wire conforming to ISO 209.



Key

1 internal wire
2 film
3 fabric
4 external wire

Figure 1 — Section of a typical thermoplastic multi-layer hose

6 Dimensions

6.1 Inside diameters, with tolerances and minimum bend radii

When measured in accordance with ISO 4671, the value of the inside diameter of the hose shall conform to Table 2. When tested by the method specified in ISO 10619-1 the value of the minimum bend radius shall be as given in Table 2. The hose shall show no sign of permanent deformation of the cross-section i.e. kinking.

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Table 2 — Dimensions and minimum bend radii

Dimensions in millimetres, except where specified as "inch"

Inside diameter		Tolerance	Minimum bend radii			
			Type 1	Type 2	Type 3	Type 4
mm	inch					
25	1	±1	125	125	200	200
32	1 1/4	±1	150	150	200	200
38	1 1/2	±1	150	150	200	200
40	1 1/2	±1	150	150	200	200
50	2	±1	200	200	225	225
65	2 1/2	±2	200	200	225	225
75	3	±2	280	280	300	300
80	3	±2	300	300	350	350
100	4	±2	400	400	400	400
125	5	±2	500	500	500	—
150	6	±2	575	575	575	—
200	8	±3	800	800	800	—
250	10	±3	1 000	1 000	1 000	—
300	12	±3	1 200	1 200	1 200	—

6.2 Tolerance on length

When tested in accordance with ISO 4671, the tolerance on the measured length of delivered hose assemblies shall be +2 % to –1 %.

7 Performance requirements of hoses and hose assemblies

7.1 Cover

When tested in accordance with ISO 2411, the adhesion between the fabric used for the outer cover and its abrasion resistant coating shall be not less than 1,5 kN/m.

7.2 Hoses

When tested in accordance with the methods given in Table 3, the physical properties of the hoses shall conform to Table 3.

Table 3 — Physical properties of hoses

Property	Unit	Requirements	Method(s)
Proof pressure	MPa (bar)	No leakage or other signs of damage at pressure given in Table 1.	ISO 1402 with pressure increase not less than 0,17 MPa/min (1,7 bar/min)
Change in length at proof pressure (max.)	%	10	ISO 1402:2021, 8.2 with the initial length measured when the hose is pressurized to 0,07 MPa (0,7 bar) for 2 min
Twist at proof pressure (max.)	°/m	10	ISO 1402:2021, 8.2 with the initial reading taken when hose is pressurized to 0,07 MPa (0,7 bar) for 2 min

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Table 3 *(continued)*

Property	Unit	Requirements	Method(s)
Burst pressure	MPa (bar)	≥ values in Table 1	ISO 1402
Bend	—	No leakage or visible damage when the hose is bent to the radius given in Table 2 and subjected to proof pressure.	ISO 10619-1
Vacuum	MPa (bar)	No damage after 30 min when subjected to values in Table 1.	ISO 7233:2021, method B
Crush recovery (max.)	%	3	Annex D
Fuel resistance	MPa (bar)	No leakage at proof pressure	Annex E
Thermal ageing	—	No leakage at proof pressure given in Table 1.	Annex F
Flammability	—	See Annex G.	Annex G
Low temperature flexibility	—	Test at minimum temperature given in Table 1	ISO 10619-2
Ozone resistance 72 h at 40 °C (cover only)	—	No cracks observed at × 2 magnification	ISO 7326:2016, method 3

7.3 End fittings

End fittings shall be made from materials depending on their chemical resistance to the product conveyed.

For all types of end fittings, the part of the fitting that enters the hose and forms the means by which the fitting is connected to the hose shall be provided with scrolls or protrusions on the surface that correspond to the pitch of the internal helix wire of the hose.

7.4 Hose assemblies

Hose assemblies shall be fitted with end fittings as described in 7.3.

End fittings shall be attached to the hose by one of the following methods:

a) by the use of a seal and a metal ferrule which is swaged or crimped;

b) by the use of a thermoset resin or multi-components e.g. epoxy and a metal ferrule that is swaged or crimped.

When tested in accordance with the methods given in Table 4, the physical properties of hose assemblies shall conform to Table 4.

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Table 4 — Physical properties of hose assemblies

Property	Unit	Requirements	Method(s)
Proof pressure[a]	MPa (bar)	No leakage or other signs of weakness at pressure given in Table 1	ISO 1402 with pressure increase not less than 0,17 MPa/min (1,7 bar/min)
Bend	—	No leakage or visible damage when the hose is bent to the radius given in Table 2 and subjected to proof pressure	ISO 10619-1
Series of hydrostatic tests	MPa (bar) % °/m	≥ burst pressure given in Table 1 change in length given in Table 3 twist as given in Table 3	Annex H
Security of end fitting	MPa (bar)	No leakage at proof pressure given in Table 1	Annex I and ISO 1402
Electrical resistance between end fittings	Ω	< 100 Ω per assembly	ISO 8031:2020, 4.8.1
Burst pressure[b]	MPa (bar)	≥ value given in Table 1	ISO 1402
Leak tightness	—	No leakage of air when subjected to 0,35 MPa (3,5 bar) for 5 min	Annex J

[a] If the maximum working pressure of the fittings is lower than the maximum working pressure of the hose, the proof pressure of the hose assembly shall be reduced to 1,5 time of the maximum working pressure of the fittings.

[b] If the maximum working pressure of the fittings is lower than the maximum working pressure of the hose, the burst pressure of the hose assembly shall be reduced to 4 times of the maximum working pressure of the fittings.

7.5 Electrical continuity

There shall be electrical continuity between both internal and external wires and the end fittings. Where a wire is sheathed in polymeric material the sheath shall be stripped back for some of the length that engages with the fittings or the ferrule to ensure continuity.

Manufacturers shall demonstrate by testing or calculation that the measured overall electrical resistance of the hose assembly incorporates both internal and external wires being part of the circuit.

For the transfer of non conductive fluids the use of a hose with a non polymeric coated internal wire should be considered.

8 Test frequency

Routine tests shall be carried out on each hose assembly and in accordance with Annex K, Table K.1.

It is recommended that batch tests are carried out for every 10 000 m of manufacture or once a year, varying the sizes and types and in accordance with Annex L, Table L.1.

9 Type tests

Type tests are those tests carried out to determine that the hose assembly design, materials and methods of manufacture confirm that the hose or hose assembly meets all the requirements of this document.

Type tests shall be carried out on at least three sizes of hose including the smallest and the largest size of each type in the manufacturer's range.

Type tests shall be repeated and the results recorded at least once every five years or whenever a change in the materials and/or method of manufacture is made.

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10 Marking

10.1 Hose marking

Each hose shall be permanently marked at an interval of not greater than 1 m with lettering of a minimum height of 10 mm and with at least the following information:

a) manufacturer's name or identification mark, e.g. XXX;

b) number of this document, i.e. ISO 27126;

c) hose identification mark e.g. Type 2;

d) inside diameter, e.g. 40 mm;

e) maximum working pressure in MPa and bar e.g. 1 MPa (10 bar);

f) working temperature range, e.g. −30 to 80 °C (for −30 °C to 80 °C);

g) material of hose inner liquid barrier layer as referenced in ISO 1043-1, e.g. PP (for polypropylene), PTFE (for polytetrafluoroethylene) or PET (for polyethylene terephthalate);

h) quarter and year of hose manufacture, e.g. 2Q/21.

EXAMPLE

XXX — ISO 27126 — Type 2 — 40 — 1 MPa (10 bar) — −30 to 80 °C — PP — 2Q/21

For item b), the hose manufacturer shall use the latest edition of this document; otherwise, the year of publication shall be included in the marking.

10.2 Hose assembly marking

Each hose assembly shall be permanently marked on the ferrule at one end with the following information:

a) assembler's name or identification mark, e.g. XXX;

b) the hose assembly serial number;

c) maximum allowable working pressure for the assembly;

d) the test date of the hose assembly;

e) quarter and year of hose assembly manufacture. e.g. 2Q/21.

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Annex A
(informative)

Resistance to chemical(s) conveyed

It is the responsibility of the user, in consultation with the manufacturer, to ensure that the materials of the inner layers of the hoses or hose assemblies and any polymeric covering of the internal wire helix are suitable to be resistant to the chemical(s) to be conveyed.

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Annex B
(normative)

Carbon steel wire

B.1 Manufacture

B.1.1 Steel rod

The rod used for the manufacture of the wire shall be produced from steel made by any process, except the air or air/oxygen bottom blown processes.

The rod quality shall be of a grade typical of standard steel making and rod rolling practice.

Standard practice can mean the following according to the type of steel. For example:

a) *Low carbon steel (mild steel)*. This has an absence of pipe and an inclusion content commensurate with balanced or killed steels of low carbon content. The maximum surface defect depth in the rod should be generally not more than 3,5 % of the rod diameter.

b) *Carbon steel*. This has an absence of piping and an inclusion content commensurate with killed carbon steels. The maximum depth of partial decarburization and surface defects should be generally not more than 3 % of the rod diameter.

B.1.2 Steel composition

The ladle analysis of the steel shall show sulfur and phosphorus contents each not greater than 0,040 % (mass fractions).

B.1.3 Wire

The wire shall be cold drawn or rolled to the finished dimensions. The wire shall not be welded after the final sizing operation. Where appropriate for the tensile strength grade, an inter-process heat treatment shall be applied.

The wire shall have one of the following coatings:

a) zinc: in accordance with Annex C;

b) polymeric.

B.2 Condition of finished wire

The wire shall be free from rust and shall not be oiled.

The wire in coil shall be “dead cast”, i.e. when a complete turn of wire is removed from the coil without tension and placed on a smooth horizontal surface without restraint, the wire circle shall have a diameter approximately that of the coil and any corkscrew set, measured by the deviation of one cut end from the horizontal plane, shall not exceed 50 mm.

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B.3 Properties

B.3.1 Tensile strength

The tensile strength of the wire shall be between 650 N/mm^2 and 850 N/mm^2.

B.3.2 Ductility wrap

The wire shall withstand without sign of fracture the wrap of eight turns on the wire diameter and unwrap of seven turns.

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Annex C
(normative)

Galvanized zinc coating

C.1 Adhesion of coating

The adhesion shall be tested by wrapping the wire at least six close turns round a cylindrical mandrel using the following ratio of mandrel diameter to wire diameter:

up to and including 3,8 mm = 4 × wire diameter;

over 3,8 mm = 5 × wire diameter.

The zinc shall remain firmly adhered to the steel and shall not crack or flake to such an extent that any flakes of zinc can be removed by rubbing with bare fingers.

C.2 Minimum mass of coating

The minimum mass of coating shall be according to Table C.1.

Table C.1 — Minimum mass of coating

Diameter of coated wire d mm	Minimum mass of coating g/m^2
$2{,}15 \leq d < 2{,}80$	125
$2{,}80 \leq d < 4{,}40$	135
$4{,}40 \leq d < 8{,}00$	150

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Annex D
(normative)

Method of test for crush recovery

The following test shall be conducted at room temperature 23 °C ± 3 °C.

Place a test piece of length $l \geq 350$ mm on a rigid, flat base plate so that it is not taut.

Place a 100 mm square and 10 mm thick test plate centrally on the test piece. Measure the original outside diameter (d_1) (equals to the distance between two plates) (see Figure D.1).

Apply test force, F, (see Table D.1) to the test plate for a period of 3 min.

The hose outside diameter can be reduced ≤ 15 % at this stage.

Remove the test force, and after 5 min re-measure the final outside diameter (equals to the distance between the two plates), (d_2).

The reduction in diameter, d_r, shall be calculated and expressed as a percentage (%) according to Formula (D.1):

$$d_r = \frac{d_1 - d_2}{d_1} \times 100 \quad \text{(D.1)}$$

where

d_1 is the original outside diameter in millimetres (mm);

d_2 is the final outside diameter in millimetres (mm).

Table D.1 — Test force

Inside diameter mm	Test force F N
≤ 50	1 500 ± 10
> 50	2 000 ± 20

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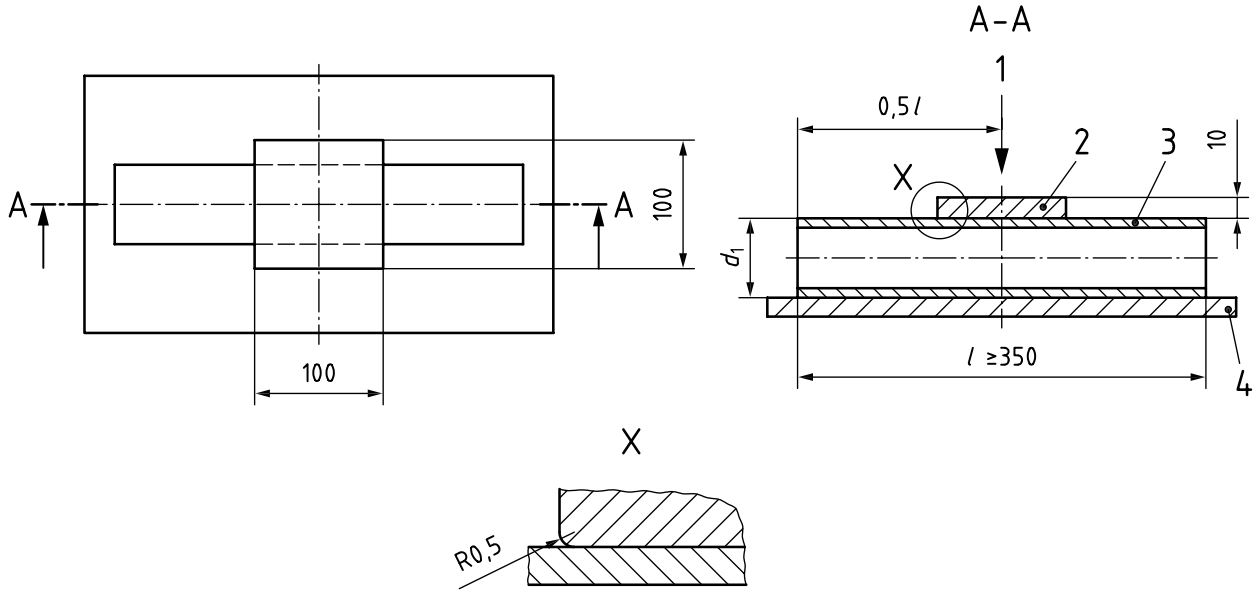
Dimensions in millimetres



Key

1 test force, *F*
2 test plate
3 test piece
4 baseplate

Figure D.1 — Arrangement for crush recovery test

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Annex E
(normative)

Method of test for fuel resistance

Fill a length of hose or a hose assembly with liquid B, as specified in ISO 1817:2015.

Maintain the filled test piece at 40 °C ± 1 °C for 7 days.

Empty the test piece and allow it to drain for 30 min.

Carry out the proof pressure test in accordance with Table 4.

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Annex F
(normative)

Method of test for thermal ageing

Fill a hose assembly with water or a silicone-based oil for Type 4 hose, excluding all air, and cap both ends.

Heat the test piece at the maximum working temperature appropriate to the type as given in Table 1 for 200 h.

Keeping the hose assembly at the maximum working temperature, raise the internal pressure to 1,5 times the maximum working pressure (as given in Table 1) for a period of 15 min.

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Annex G
(normative)

Method of test for flammability

Bend the hose test assembly into a U-shape of radius as indicated in Figure G.1.

Fill the test assembly with liquid F of ISO 1817:2015 (flash point 55 °C, heating power 42 MJ/kg).

Expose the test assembly to a naked flame from a Bunsen burner of approximately 10 mm pipe diameter for a period of 3 min, with the airflow to the burner shut off.

The distance between the burner and test piece shall be as indicated in Figure G.1.

The hose test assembly shall be deemed to be non-flammable if

a) it ceased to burn with a naked flame after 20 s of the removal of the burner, and

b) there is no further glowing visible 120 s after removing the burner flame.

On completion of the test the hose test piece shall be impervious to the test fluid when visually examined.

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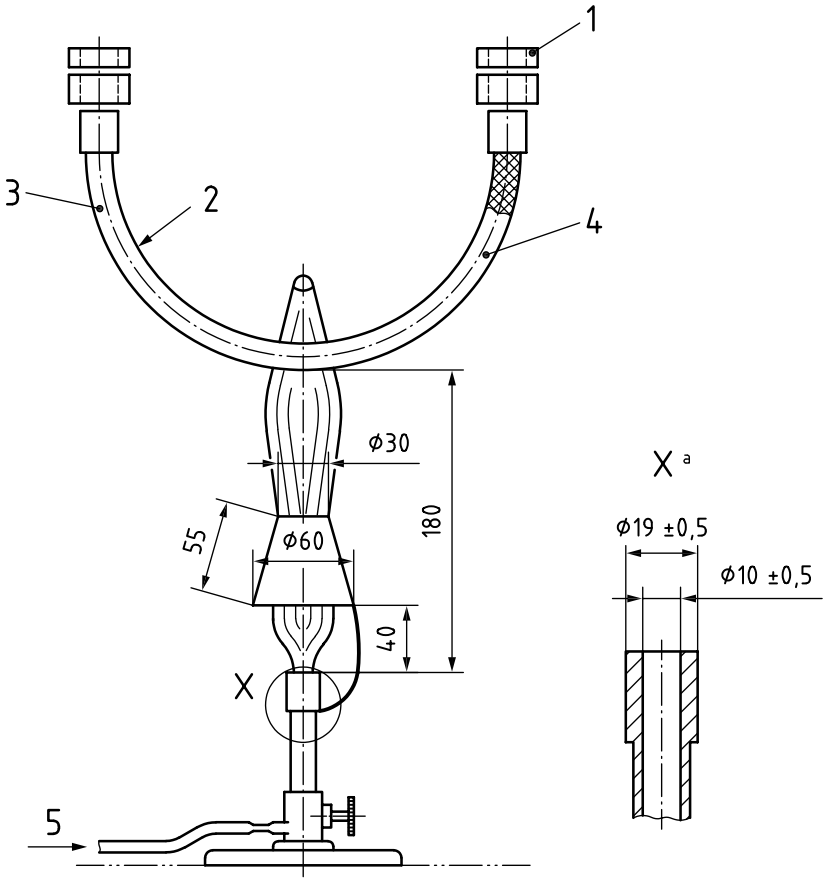
Dimensions in millimetres



Key

1 cap
2 bending radius is 10 times to 15 times outside diameter
3 hose assembly
4 liquid F in accordance with ISO 1817:2015
5 propane (LPG) ≈ 0,005 MPa (0,05 bar)
[a] Cross-section of detail.

Figure G.1 — Arrangement for flammability test

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Annex H
(normative)

Sequence of hydrostatic tests

The following sequence of tests shall be carried out on a hose assembly for type testing:

a) Measure the electrical resistance between end fittings in accordance with ISO 8031:2020, 4.8 (the hose assembly is empty). It shall meet the requirement specified in Table 4.

b) Fill the hose assembly with liquid and maintain the hose at a pressure of 0,07 MPa (0,7 bar) for the time given in ISO 1402:2021, 8.2.

c) Mark and measure the hose in accordance with ISO 1402:2021, 8.2.

d) Raise the pressure at a rate of at least 0,17 MPa/min (1,7 bar/min) to the proof pressure appropriate to the type of the hose, see Table 1.

e) Re-measure the marks in c) and determine the increase/decrease in length and the twist. They shall meet the requirement specified in Table 3.

f) Examine the assembly. No leakage, cracking, abrupt distortions or other signs of failure shall occur.

g) Release the pressure, bend the hose to the appropriate radius given in Table 2, and repeat e) above.

h) Release the bend in the hose and increase the temperature of the liquid to 60 °C ± 5 °C and increase the pressure over a period of at least 15 min to the appropriate minimum burst pressure for the type of hose and hold for a further 15 min; no leakage or failure of the hose assembly shall occur.

i) Raise the pressure further until the hose bursts and record the pressure value. It shall meet the requirement specified in Table 4.

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Annex I
(normative)

Method of test for fitting security

Use an assembly having at least 0,6 m of free hose clear of the spigot of the end fittings.

Fill the assembly, excluding all air, with automotive diesel fuel conforming to EN 590 (or equivalent ISO standard) and stand vertically with the top open to the atmosphere for 7 days.

Empty the assembly and measure the electrical resistance between end fittings in accordance with ISO 8031:2020, 4.8.

Fill the assembly with water, raise the pressure to the proof pressure and hold for 1 h.

Re-measure the electrical resistance and note any axial movement of either end fitting relative to the hose.

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Annex J
(normative)

Method of test for leak tightness

Apply a pneumatic pressure of 0,35 MPa (3,5 bar) to the hose assembly and either submerge the assembly in a water bath or apply a solution of soap and water over the entire surface.

Ignore any immediate evidence of bubbling.

Hold the pressure for 5 min and note any continuous evidence of bubbling.

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Annex K
(normative)

Type and routine tests for hoses and hose assemblies

Table K.1 — Type and routine tests for hoses and hose assemblies

Property	Type tests	Routine tests
Hose cover		
Adhesion	X	N/A
Hose		
Diameter	X	X
Crush recovery	X	N/A
Fuel resistance	X	N/A
Ozone	X	N/A
Thermal ageing	X	N/A
Flammability	X	N/A
Low temperature flexibility	X	N/A
Bend	X	N/A
Hose assemblies		
Proof pressure	X	X
Change in length	X	X
Burst pressure	X	N/A
Vacuum	X	N/A
Twist	X	X
Series of hydrostatic tests	X	N/A
Electrical resistance	X	X
Leak tightness	X	N/A
Security of end fittings	X	N/A
X = test carried out; N/A = test not applicable		

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Annex L
(informative)

Batch tests for hoses and hose assemblies

Table L.1 — Batch tests for hoses and hose assemblies

Property	Batch
Hose	
Bend	X
Hose assemblies	
Vacuum	X
Burst pressure	X
X = test carried out	

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Bibliography

[1] ISO 1825, *Rubber hoses and hose assemblies for aircraft ground fuelling and defuelling — Specification*

[2] ISO 5772, *Rubber and plastic hoses and hose assemblies for measured fuel dispensing systems — Specification*

[3] ISO 6806, *Rubber hoses and hose assemblies for use in oil burners — Specification*

[4] ISO 10619-3, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 3: Bending tests at high and low temperatures*

[5] ISO 14557, *Fire-fighting hoses — Rubber and plastics suction hoses and hose assemblies*

[6] ISO 27127, *Thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for the transfer of liquid petroleum gas and liquefied natural gas — Specification*

[7] EN 1474-2, *Installation and equipment for liquefied natural gas — Design and testing of marine transfer systems — Part 2: Design and testing of transfer hoses*

[8] EN 13765:2018, *Thermoplastic multi-layer (non-vulcanized) hoses and hose assemblies for the transfer of hydrocarbons, solvents and chemicals — Specification*

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