INTERNATIONAL STANDARD

ISO 14557

Second edition
2021-04

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 14557:2021(E)

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Published in Switzerland

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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 192, *Fire and Rescue Service Equipment,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 14557:2002), which has been technically revised. It also incorporates the Amendment ISO 14557:2002/Amd.1:2007.

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

— pressure units in bar were added throughout the document, as needed;

— Clause 2 (Normative references) was updated;

— UV resistance requirement was added in 6.7;

— Clause 7 on frequency of testing was added and all subsequent clauses were renumbered;

— Annexes A and B were added and all subsequent annexes were renumbered.

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.

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

1 Scope

This document establishes the requirements and test methods for rubber and plastics suction hoses for fire-fighting purposes. These hoses can also be used manually to supply unpressurized water to the pump or for water discharge.

NOTE All pressures are expressed in megapascals and in bar (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.

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 176:2005, *Plastics — Determination of loss of plasticizers — Activated carbon method*

ISO 1307, *Rubber and plastics hoses — Hose sizes, minimum and maximum inside diameters, and tolerances on cut-to-length hoses*

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

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

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

ISO 10619-1:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

ISO 10619-2:2017, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 30013:2011, *Rubber and plastics hoses — Methods of exposure to laboratory light sources — Determination of changes in colour, appearance and other physical properties*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

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.

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 of 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	Maximum 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

Table 1 *(continued)*

Inside diameter mm	Tolerances for inside diameter mm	Maximum mass per unit length kg/m	
		Type A	Type B
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 tolerance 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 or hose assembly

6.1 Visual examination

Check every finished hose for visual damage or defects, which are not allowed.

6.2 Hydrostatic requirements

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

6.2.1 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	0,3 MPa (3 bar)	0,3 MPa (3 bar)	-	0,15 MPa (1,5 bar)
Minimum burst pressure	0,6 MPa (6 bar)	0,6 MPa (6 bar)	-	0,3 MPa (3 bar)

6.2.2 Burst pressure

When tested in accordance with ISO 1402 at temperatures and pressures given in Table 2, the hose shall not burst or show any evidence of leakage, cracking, abrupt distortion or other signs of failure. Three hose lengths each 1 m long shall be tested.

6.3 Adhesion (type A hoses only)

Test samples shall be taken from the hose. 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.

6.4 Low temperature flexibility

The test shall be carried out in accordance with test methods B or C of ISO 10619-2:2017 (to be chosen according to the inside diameter of the hose) at a temperature of −10 °C for thermoplastics hoses and −20 °C for rubber hoses. Hoses supplied for use at temperatures lower than those specified above shall be tested at the specified lower temperature.

6.5 Ozone resistance (type A hoses only)

Test samples shall be taken from the hose. When tested in accordance with method 3 of ISO 7326:2016 under 2× magnification, the hose cover shall not show any signs of cracking.

6.6 Bending resistance at ambient temperature

When tested in accordance with methods A, B or C of ISO 10619-1:2017 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.

NOTE Method A is only suitable for hoses with an inside diameter up to 80 mm. Test method B is suitable for hoses with an inside diameter up to an including 100 mm. Test method C is for larger inside diameters.

6.7 UV resistance (type B hoses only)

Test samples shall be taken from the hose. When tested in accordance with ISO 30013:2011, 6.3 with fluorescent UV lamps, Method A, using a type 1A (UVA-340) bulb at 50 °C for 300 h (25 cycles of 12 h each), the hose shall

— show no cracking and crazing under 2× magnification,

— show no visual colour change, and

— pass the bending test according to 6.6,

after exposure.

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

Test samples shall be taken from the hose. When tested in accordance with method B of ISO 176:2005 the flexible thermoplastics material used in the construction shall show a loss in mass not greater than 4 %.

6.9 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 (0,04 bar) absolute pressure [0,1 MPa (1 bar) below atmospheric pressure] and the vacuum shall be maintained for 10 min.

6.10 Pressure impulse resistance (type B hoses only)

The test piece shall be taken from the hose. When tested in accordance with Annex C, 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.

6.11 Reinforcement fracture resistance (type B hoses only)

Test samples shall be taken from the hose. When tested in accordance with Annex D the polymer reinforcement shall undergo reverse bending without visible cracking.

6.12 Flexibility at ambient temperature

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

Table 3 — Physical properties of finished hose and hose assemblies

Inside diameter mm	Minimum deflection 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

6.13 Vacuum resistance with flexing

When tested in accordance with Annex F, the hose assembly shall have no visible damage or have any permanent distortion.

7 Frequency of testing

Type testing and routine testing shall be as specified in Annex A.

Type tests are those tests required to confirm that a particular hose or hose assembly design, manufactured by a particular method from particular materials, meets all the requirements of this document. The tests shall be repeated at a maximum of five-year intervals, or whenever a change in the method of manufacture or materials used occurs. They shall be performed as specified in Annex A. Type testing every five years is not mandatory when the manufacturer confirms that no changes in design, materials or manufacturing method have been made during this period.

Routine tests are those tests required to be carried out on each length of finished hose or hose assembly prior to warehousing or sale.

Production acceptance tests are those tests, specified in Annex B, which should preferably be carried out to control the quality of manufacture. The frequencies specified in Annex B are given as a guide only.

8 Marking

8.1 Hose 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, e.g. XXX;

b) the number and year of this document, i.e. ISO 14557:2021;

c) the hose type, e.g. A;

d) the inside diameter, e.g. 100;

e) the quarter and the last two digits of the year of manufacture, e.g. 4Q21 (other date-coding methods are allowed as long as they are clear to the user);

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

EXAMPLE XXX/ISO 14557:2021/A100/4Q21.

8.2 Hose assembly marking

Hose assemblies meeting the requirements of this document shall be permanently marked with at least the following information:

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

b) two digits indicating the last two digits of the year of assembly followed by a slash and the two digits indicating the month of assembly, e.g. 21/11 (monthly, daily and other date-coding methods are allowed as long as they are clear to the user).

EXAMPLE XXX/21/11.

NOTE Typical markings include, but are not limited to, stamping the coupling, embossing on a metal or plastic ring, etc.

In some circumstances it is not the manufacturer who supplies the hose complete with couplings attached. In this case, the purchaser shall be aware that this is outside the scope of this document and shall 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 G by the manufacturer before delivery to the purchaser. There shall be no sign of leakage or movement of the hose from the coupling.

The hose manufacturer shall fit hose couplings which conform to any relevant national standards or any requirements specific to the country of use (e.g. legal requirements).

