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Rubber hoses and hose assemblies for use in oil burners — Specification

Tuyaux et flexibles en caoutchouc pour brûleurs à fuel — Spécifications

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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 document 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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This document was prepared by Technical Committee Technical Committee ISO/TC 45, *Rubber and rubber products, Subcommittee*, Subcommittee SC 1, *Rubber and plastics hoses and hose assemblies,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 218, *Rubber and plastics hoses and hose assemblies,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fifth edition cancels and replaces the fourth edition (ISO 6806:2017), which has been technically revised.

The main changes are as follows:

— the normative reference has been updated (Clause 2);

— the normative reference has been updated (7.4);

— the ozone resistance requirement has been modified (7.6);

— the marking has been changed to the nominal size and add example (Clause 10);

— the internal diameter has been changed to the inside diameter (Annex C and Annex D);

— the value of the water pressure has been changed (Annex E);

— the external diameter has been changed to the outside diameter (Annex F).

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.

Rubber hoses and hose assemblies for use in oil burners — Specification

1 Scope

This document specifies the minimum requirements for rubber hoses and hose assemblies for use in oil burners.

The following two types of hose assembly are specified:

— Type 1: Hose assemblies for flux and reflux, but not for insertion between the oil burner pump and the atomizing connection; maximum working pressure 1,0 MPa (10 bar); maximum oil temperature 100 °C;

— Type 2: Hose assemblies for insertion between the oil burner pump and the atomizing connection; maximum working pressure 4,0 MPa (40 bar); maximum oil temperature 100 °C.

The hose assemblies specified in this document are not intended to be used, without special assessment, for purposes other than oil burner installations.

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 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

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

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

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

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

ISO 10619-2:2021, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

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 Construction

Hoses in accordance with this document shall consist of either:

a) an internally smooth rubber lining and an external corrosion-resistant metal braid, or;

b) an internally smooth rubber lining, a reinforcement consisting of one or more layers of textile or corrosion-resistant metal braid and a rubber outer cover.

The hoses shall be fitted with permanently attached couplings.

Both the couplings and the metal braid shall be provided with suitable corrosion protection. The metals used shall not have any deleterious effects on the rubber components.

5 Dimensions and tolerances

5.1 Inside diameter

The inside diameter of the hose shall be in accordance with the dimensions and tolerances given in Table 1, which is in accordance with ISO 1307.

Table 1 — Nominal size

Nominal size	Inside diameter mm	Tolerance mm
5	5	±0,5
6,3 8 10 12,5 16 20	6,3 8 10 12,5 16 20	±0,75
25	25	±1,25

5.2 Bend radii

The hoses shall not be used at bend radii, measured at the inside of the bend, smaller than the minimum bend radii specified in Table 2.

Table 2 — Minimum bend radii

Nominal size	Minimum bend radius mm
5	50
6,3	60
8	75
10	80
12,5	105
16	120
20	145
25	165

5.3 Thickness of lining and cover

When measured in accordance with ISO 4671, the minimum thickness of the lining and cover shall be not less than 1,7 mm and 1,3 mm, respectively.

6 Physical requirements for lining and cover

When tested in accordance with the methods of test indicated, the lining and cover shall conform with the requirements of Table 3.

Table 3 — Physical requirements for lining and cover

Property	Requirement	Method of test
Oil resistance:		ISO 1817
Volume change:		$\left(72^{\ 0}_{-2}\right)$ h in oil No. 3
— lining	−5 % to +15 %	at 70 °C ± 1 °C for type 1
— cover	−5 % to +60 %	at 125 °C ± 2 °C for type 2
Hardness change after resistance test:[a]		
— lining	±10 IRHD	ISO 48-2

[a] No initial hardness is specified, but a limit on hardness change after oil immersion is included to ensure that a lining with adequate oil resistance is employed.

7 Physical requirements for hoses and hose assemblies

7.1 Hydrostatic tests

7.1.1 Proof pressure test

The test shall be carried out in accordance with the method specified ISO 1402 to the proof test pressure specified in Table 4. The hose assembly shall show no signs of leakage or distortion or movement of the couplings.

7.1.2 Burst pressure test

The test shall be carried out in accordance with the method specified ISO 1402. The hose assembly shall show no signs of leakage or failure before the minimum burst pressure specified in Table 4 has been attained.

Table 4 — Hydrostatic pressure requirements

Parameter	Pressure requirements			
	Type 1		Type 2	
	MPa	bar	MPa	bar
Maximum working pressure	1,0	10	4,0	40
Proof test pressure	2,0	20	8,0	80
Minimum burst pressure	4,0	40	16,0	160

7.2 Oil swell

The test shall be carried out in accordance with the method specified in Annex C. The reduction in the inside diameter of the hose shall not exceed 10 %.

7.3 External pressure test

The test shall be carried out in accordance with the method specified in Annex D. The reduction in the outside diameter of the hose shall not exceed 6 %.

7.4 Low-temperature flexibility

The test shall be carried out in accordance with ISO 10619-2:2021, method B at a temperature of (-40 ± 2) °C, the hose shall not crack and shall show no signs of leakage when proof pressure is subsequently tested in accordance with 7.1.1.

7.5 Flammability

The test shall be carried out in accordance with Annex E. The hose shall show no signs of leakage.

7.6 Ozone resistance (cover only)

The test shall be carried out on the hose itself in accordance with ISO 7326. Bend the hose with the minimum bend radius listed on Table 2 or wind the hose around a cylinder with twice a minimum bend radius. The test shall be carried out using an ozone concentration of (50 ± 5) mPa at (40 ± 2) °C for (72^{+0}_{-4}) h and there shall be no signs of cracking under ×2 magnification.

7.7 Impulse test

The test shall be in accordance with Annex F. The hose shall show no leakage or damage after completion of 30 000 cycles.

8 Frequency of testing

The minimum frequency of testing shall conform to the schedule given in Annex A.

Type tests are those tests carried out in order to verify that the hose meets all requirements of this document.

Routine tests are those tests carried out on each length of the finished hose.

Production tests are those tests carried out per batch (see schedule given in Annex B, which is for guidance only).

9 Type tests

Type testing is carried out in order to confirm that all the materials, construction and test requirements of this document have been met by the method of manufacture and hose design.

Type testing shall be repeated at least every 5 years or whenever a change in the method of manufacture or materials occurs.

Type testing shall be performed for all sizes, classes and types except those of same size and construction.

10 Marking

Hose assemblies complying with the requirements of this document shall be marked with the following information:

a) the number of this document, i.e. ISO 6806;

b) the nominal size e.g. 10;

c) the type e.g. Type 2;

d) the manufacturer's mark or reference e.g. MAN;

e) the quarter and year of manufacture e.g. 1Q23.

EXAMPLE ISO 6806 – 10 – Type 2 – MAN – 1Q23

For 10 a), hose manufacturer shall use the latest publication of this document, otherwise the year of publication shall be included in the marking.

NOTE Hoses (e.g. with metal braiding) can be marked by a metal identification plate.

Annex A
(normative)

Test frequency

Table A.1 gives the frequency of testing for type tests and routine tests (see Clauses 8 and 9 for description of these tests).

Table A.1 — Frequency of testing for type tests and routine tests

Property	Type tests	Routine tests
Compound tests		
Oil resistance test for cover	X	N/A
Oil resistance test for lining	X	N/A
Hose test		
Visual examination (inside and outside)	X	X
Measurement of inside diameter	X	X
Measurement of outside diameter	X	X
Measurement of outer cover thickness	X	N/A
Measurement of liner thickness	X	N/A
Proof pressure test	X	X
Burst test	X	N/A
Oil swell test	X	N/A
External pressure resistance test	X	N/A
Low temperature flexibility test	X	N/A
Flammability test	X	N/A
Ozone resistance test (cover only)	X	N/A
Impulse test	X	N/A
X = test carried out N/A = not applicable		

Annex B
(informative)

Production tests

Table B.1 gives the suggested frequency for production tests (see Clause 8), to be carried out per batch or per 10 batches as indicated in Table B.1.

A batch is defined as 3 000 m of hose.

Table B.1 — Recommended test frequency

Property	Production test	
	Per batch	Per 10 batches
Compound tests		
Oil resistance test for cover	N/A	N/A
Oil resistance test for lining	N/A	X
Hose test		
Visual examination (inside and outside)	X	X
Measurement of inside diameter	X	X
Measurement of outside diameter	X	X
Measurement of outer cover thickness	X	N/A
Measurement of liner thickness	X	X
Proof pressure test	X	X
Burst test	N/A	N/A
Oil swell test	N/A	X
External pressure resistance test	N/A	X
Low-temperature flexibility test	N/A	X
Flammability test	N/A	X
Ozone resistance test (cover only)	N/A	X
Impulse test	N/A	X
X = test carried out N/A = not applicable		

Annex C
(normative)

Determination of oil swell

Measure the inside diameter in accordance with ISO 4671 of a hose of length at least 500 mm. Fill the hose assembly with oil No. 3 as specified in ISO 1817 and condition it for 28 days at 100 °C with the ends sealed. At the end of this period, remeasure the inside diameter of the hose and express the result as a percentage change from the original.

Annex D
(normative)

Determination of resistance to external pressure

Measure the free length, l, between the fittings of a hose assembly of length about 500 mm. Seal one end and attach the other end to a connector inside a pressure vessel. Connect the other end of the connector to a calibrated glass standpipe (see Figure D.1).

Close the pressure vessel, fill the hose assembly and standpipe with water, free from entrained air, and condition for 1 h at 70 °C. Apply a pressure of 0,06 MPa ± 0,005 MPa (0,6 bar ± 0,05 bar) within the pressure vessel and, after 5 min, read the change in the level of the meniscus, Δh, in the standpipe.

Calculate the reduction in the inside diameter of the hose assembly, expressed as a percentage, using Formula (D.1):

$$\frac{d_k^2 \times \Delta h}{d_s^2 \times l} \times 100 \qquad \text{(D.1)}$$

where

d_k is the inside diameter, in millimetres, of the standpipe;

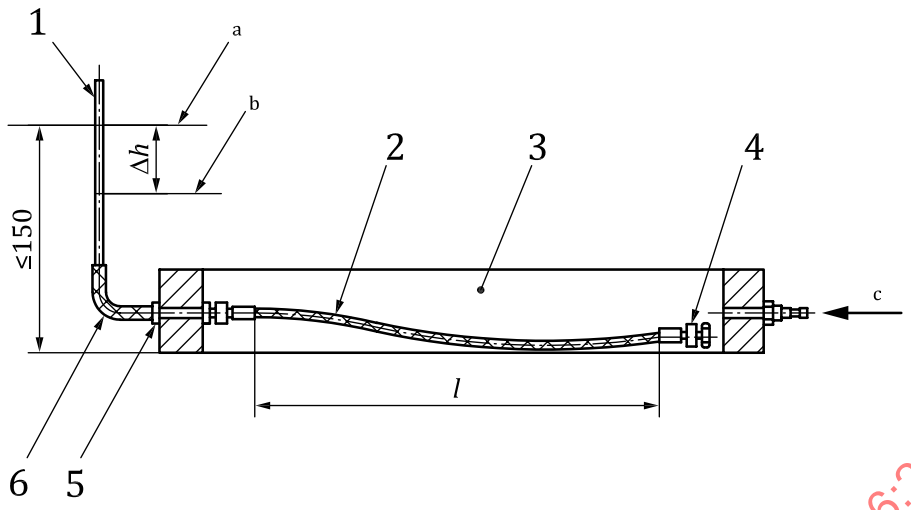
d_s is the inside diameter, in millimetres, of the hose;

Δh is the change in the level, in millimetres, of the meniscus;

l is the free length, in millimetres, of the hose.

The inside diameter of the standpipe shall be selected so that the meniscus does not rise by more than 150 mm above the lowest point of the hose assembly.

Dimensions in millimetres



Key

1 calibrated stand pipe
2 hose assembly filled with water
3 pressure vessel
4 sealed end
5 connecting olive
6 transparent hose
a Meniscus after test.
b Meniscus before test.
c Pressure connection.

Figure D.1 — Apparatus for determination of resistance to external pressure

Annex E
(normative)

Determination of flammability

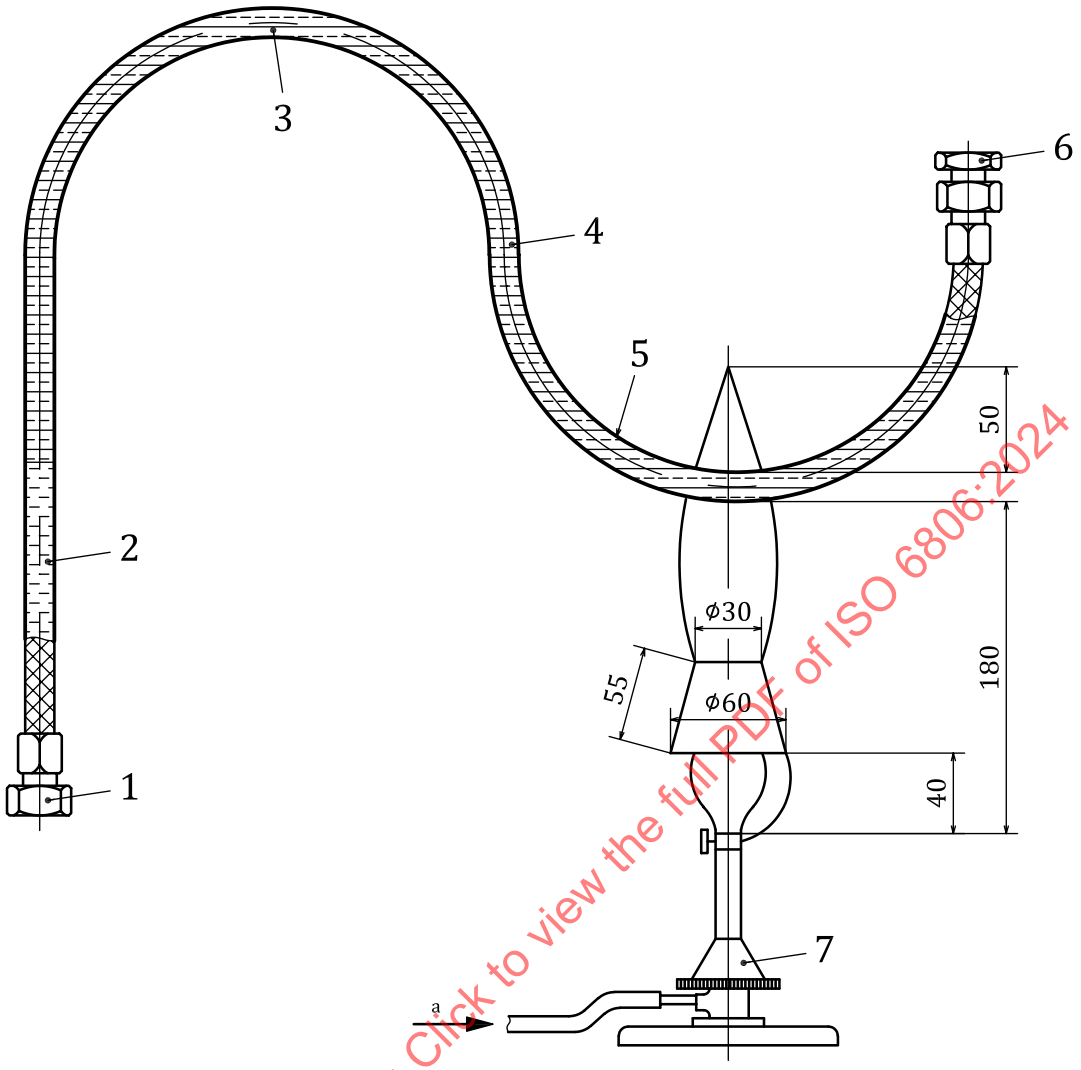
Seal one end of a hose assembly of length about 1 000 mm. Fill the assembly to about 90 % of its volume with oil No. 3 as specified in ISO 1817 and connect the assembly to a water pressure standpipe. Bend the assembly as shown in Figure E.1 and, using laboratory clamps, fix it in this position.

Apply internal water pressure to the assembly. The water pressure shall be 1 MPa (10 bar) for type 1 hose assemblies and 4,0 MPa (40 bar) for type 2 hose assemblies.

Expose the lowest bent portion of the hose assembly for 5 min to the flame of a Bunsen burner burning propane gas at a temperature of 675 °C ± 75 °C. The nominal inside diameter of the burner tube shall be 10 mm and the air inlet shall be closed. The pressure of the propane gas fed to the Bunsen burner shall be approximately 5 kPa (50 mbar). Use a burner tip of frustum shape to stabilize the flame.

WARNING — Attention is drawn to the potential fire hazard associated with hose failing to meet the requirements of this test. Adequate precautions shall be taken to restrict the spread of fire and to ensure the safety of personnel in the event of failure.

Dimensions in millimetres



Key

1 pressure connection
2 water
3 hose assembly filled with test oil
4 hose
5 bend radius (10 to 15) × ⌀ ext. of hose
6 sealed end
7 bunsen burner
a Propane gas (pressure about 5 kPa [50 mbar]).

Figure E.1 — Arrangement for flammability test