INTERNATIONAL STANDARD

ISO 7840

Second edition
1994-12-15

Small craft — Fire-resistant fuel hoses

Navires de plaisance — Tuyaux souples résistants au feu, pour carburant

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Reference number
ISO 7840:1994(E)

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.

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.

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International Standard ISO 7840 was prepared by Technical Committee ISO/TC 188, *Small craft*.

This second edition cancels and replaces the first edition (ISO 7840:1985), of which it constitutes a technical revision.

Annexes A and B form an integral part of this International Standard.

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Small craft — Fire-resistant fuel hoses

1 Scope

This International Standard specifies general requirements and physical tests for fire-resistant hoses for conveying petrol and diesel oil at low pressure, designed for a working pressure not exceeding 0,34 MPa for hoses with nominal bore up to and including 10 mm, and 0,25 MPa for hoses with a larger bore.

It applies to hoses for small craft of up to 24 m length of hull with permanently installed inboard engines.

NOTE 1 Specifications for non-fire-resistant fuel hoses are laid down in ISO 8469.

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2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

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

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 7233:1991, *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 10088:1992, *Small craft — Permanently installed fuel systems and fixed fuel tanks.*

3 General requirements

Hoses complying with this International Standard shall present a smooth inner surface, free from pores, other defects and chemical contaminants.

The nominal bore shall be in accordance with ISO 1307. Hoses shall demonstrate suitability for marine use by complying with the requirements of the tests in clause 5. They shall be marked according to clause 6.

4 Nominal bore

Table 1 gives some nominal bores, based on the R 10 series in ISO 3 [1]. Tolerances shall be as indicated in table 1 or conform to ISO 1307.

1) ISO 3:1973, *Preferred numbers — Series of preferred numbers.*

Table 1 — Nominal bores and tolerances

Dimensions in millimetres

Nominal bore	Tolerance
3,2 4 5	± 0,5
6,3 8 10 12,5 16 20	± 0,75
25 31,5	± 1,25
40 50 63	± 1,5

5 Physical tests on finished hose

5.1 Bursting pressure

Fill three hoses or test pieces from the hoses with Test Liquid C, as specified in ISO 1817:1985, and store them for 7 days in air at standard laboratory temperature (23 °C).

Empty the liquid out and fill the hoses or test pieces with cold water; subject them to bursting pressure, as specified in ISO 1402.

The bursting pressure shall be at least 1,36 MPa for hoses of nominal bore up to and including 10 mm, and 1 MPa for hoses with a larger bore.

5.2 Suction resistance test

Carry out the test in accordance with ISO 7233:1991, method A, using the test conditions specified in table 2.

The time shall be 60 s and the diameter of the sphere used 0,8d.

5.3 Volume change in liquid C

Determine the change in volume of the hose (tube and cover) by the procedure described in ISO 1817.

Table 2 — Pressure conditions for suction resistance test

Nominal bore, d mm	Pressure below ambient kPa
$d \leqslant 10$	80
$10 < d \leqslant 25$	35
$d > 25$	No test required

Place the test pieces in liquid C at standard laboratory temperature (23 °C) for 70 h ± 2 h.

If the hose is made of a homogeneous compound (with or without reinforcements), the swelling in liquid C shall not exceed 30 % by volume. For hoses with an inner layer of fuel-resistant material and a cover of another material, mainly intended for weather and ozone resistance, the increase in volume in liquid C shall not exceed 30 % for the tube and 120 % for the cover.

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5.4 Mass reduction in liquid C

Determine the reduction in mass of the inner layer by the procedure described in ISO 1817. Treat the test pieces as specified in 5.1.

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The reduction in mass of the inner layer shall not exceed 8 % of the initial mass of the test pieces.

NOTE 2 A reduction in mass of 8 % corresponds to a decrease in volume of approximately 10 %.

5.5 Fire resistance

Test a sample of the hose in accordance with the method described in annex A.

5.6 Effect of ozone

The hose shall be tested as described in ISO 7326:1991, Method 1. The sample shall show no visible cracks at × 2 magnification.

5.7 Fuel permeation

A permeation rate shall be tested. When tested according to the method described in annex B or equivalent, the hoses shall be classified in the following way:

Class 1: hoses with a permeation rate of 4 g/(m²·h) or less;

Class 2: hoses with a permeation rate over 4 g/(m^2·h) up to and including 12 g/(m^2·h).

6 Designation and marking

6.1 Designation

The following characters shall be used:

"A" is used to designate a fire-resistant type of fuel hose.

"1" is used to designate a fuel hose with a fuel permeation rate of 4 g/(m^2·h) or less.

"2" is used to designate a fuel hose with a fuel permeation rate over 4 g/(m^2·h) up to and including 12 g/(m^2·h).

6.2 Marking

To comply with this International Standard a hose shall be marked, at least every 0,3 m, with

— the name or trademark of the manufacturer or supplier;

— the last two figures of the year of manufacture;

— "ISO 7840 - A1" or "ISO 7840 - A2", as specified in 6.1.

The marking shall be in letters and figures at least 3 mm high and shall withstand washing with ordinary detergents.

Additional information may be included in the marking.

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Annex A
(normative)

Fire test

A.1 Principle and requirement

The hose filled with heptane is subjected to fire. The hose shall withstand the test for 2,5 min without leakage, after ignition of the fuel in the tray.

A.2 Sampling

At least three hose samples shall be tested in turn.

A.3 Equipment

The test shall be performed indoors in a sheltered area free from draught at a temperature of + 20 °C ± 5 °C. The test equipment shall be designed to conform to that as shown in figure A.1. The fuel tray shall be square, 350 mm × 350 mm, with vertical sides. Commercial heptane with a distillation interval of 80 °C to 110 °C is used as fuel. The fuel and water temperature shall be + 20 °C ± 2 °C.

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A.4 Test procedure

A.4.1 Preparation

Mount the test equipment to conform to figure A.1 without mounting any test object. Since non-measurable draught effects in the test chamber could influence the flame, the position of the fuel tray shall be adjusted to surround, as far as possible, the hose and one of its ends in the flame.

The hose end-connections to the test fixture (figure A.1) shall be made as specified in ISO 10088:1992, subclause 6.4.

A.4.2 Test

Fill the hose with fuel by opening the tank valve. Ensure that no air is left in the hose. Adjust the fuel level to 900 mm.

Pour 0,5 l of water and 1 l of heptane into the fuel tray and ignite the heptane. The fuel tray shall be placed so that two of the sides are parallel with the test object. Ensure that a stable flame is maintained and that the flame embraces the hose and one of its fittings for the duration of the test.

Allow the heptane to burn and record time to leakage.

The test is terminated when leakage occurs or when 2,5 min have elapsed.

If the flame is very unstable during the test and if it does not expose the test hose fully during at least 75 % of the test duration, or if the time to leakage in any test deviates more than 30 s from the determined mean value, another two hose samples shall be tested.

After each test the fuel lines and fuel tray shall be cooled to ambient temperature before a new test sample is mounted and water and fuel, respectively, are refilled.

WARNING — Large flames and burning waste fuel may occur at leakage: therefore the test shall be performed in a non-combustible environment and with personnel equipped with protective and fire-fighting equipment.

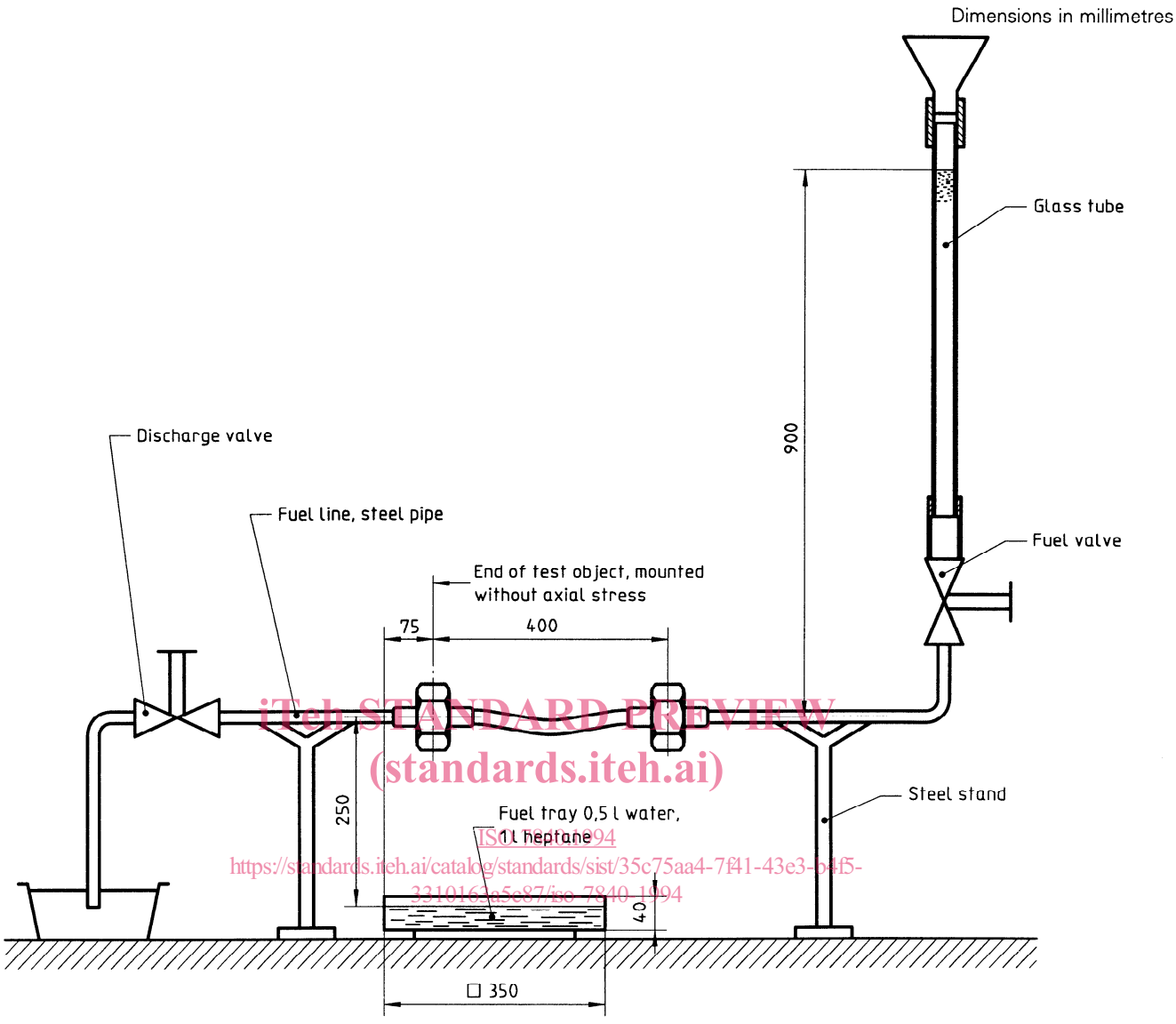

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Figure A.1

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Annex B
(normative)

Fuel permeation test

B.1 Principle

Pieces of the hose to be tested are first exposed to fuel for 7 days. Then the test pieces are filled with test liquid and the liquid lost by permeation during time periods of 24 h is determined by weighing for 15 consecutive days or until a peak has been established.

B.2 Sampling

Three test pieces of the hose shall be tested simultaneously. The test pieces shall be approximately 300 mm long.

B.3 Equipment

The test equipment shall be as shown in figure B.1.

A well-ventilated, draught-free test chamber, temperature controlled to standard laboratory temperature (23 °C), shall be used for the test.

The glass pipes shown in figure B.1 shall fit tightly to the inside of the tested hose. The pipe in the lower end of the hose shall be impermeably tight in its lower end. The plug in the upper end of the upper pipe shall have a capillary canal that minimizes ventilation but allows air to replace fuel lost by permeation during the test.

B.4 Test procedure

Fill the test hoses with Test Liquid C, as specified in ISO 1817, and store them for 7 days in air at standard laboratory temperature.

Empty the liquid out and assemble test hoses and glass pipes as shown in figure B.1. Refill the hoses and pipes with Test Liquid C, as specified in ISO 1817, up to a level approximately 70 mm above the upper end of the hose. Fit the plug with the capillary pipe.

Weigh the assembly to an accuracy of 0,01 g. Store the assembly in a vertical position for 24 h at standard laboratory temperature and weigh the assembly again. Record the loss of mass.

Empty the liquid out. Repeat the 24 h permeation test 15 times or until a maximum permeation has been established.

Calculate the average value of the three highest mass loss values recorded. Calculate the permeation rate in grams per square metre hour based on this average mass loss, the inner diameter of the hose and the effective length of the hose between the inner ends of the glass pipes.

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Dimensions in millimetres

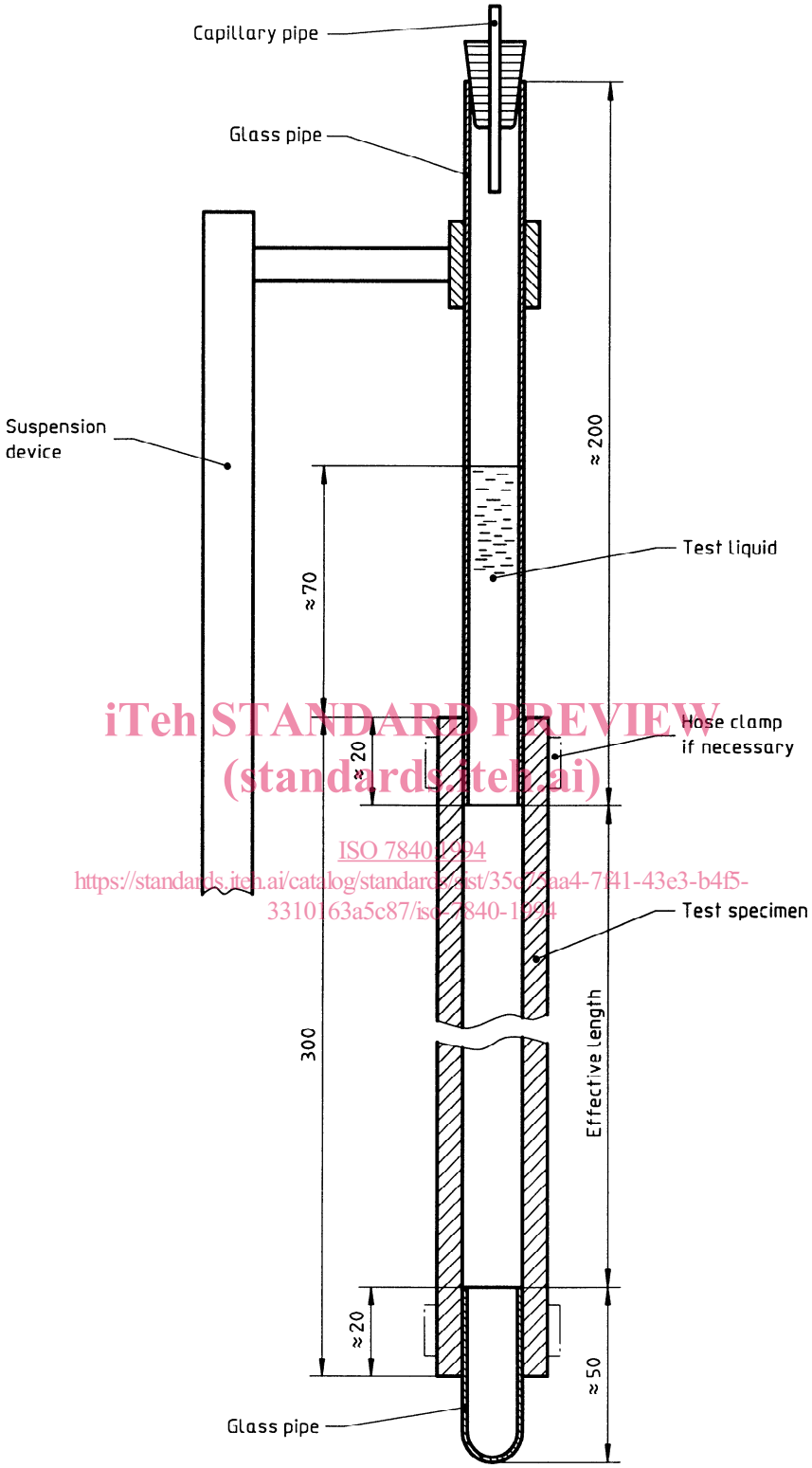

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Figure B.1