INTERNATIONAL STANDARD

ISO 8469

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Small craft — Non-fire-resistant fuel hoses

Petits navires — Tuyaux souples non résistants au feu, pour carburant

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 8469 was prepared by Technical Committee ISO/TC 188, *Small craft*.

This second edition cancels and replaces the first edition (ISO 8469:1994), which has been technically revised.

Small craft — Non-fire-resistant fuel hoses

1 Scope

This International Standard specifies general requirements and physical tests for non-fire-resistant hoses for conveying petrol and diesel oil designed for a working pressure not exceeding 0,34 MPa for hoses with inner diameter up to and including 10 mm and 0,25 MPa for hoses up to 63 mm inner diameter in craft of hull length up to 24 m.

It applies to hoses for small craft with permanently installed fuel systems.

Specifications for fire-resistant hoses are laid down in ISO 7840.

2 Normative references

The following referenced documents are indispensable for the application 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 3:1973, *Preferred numbers — Series of preferred numbers*

ISO 1307:—[1)], *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 1817:2005, *Rubber, vulcanized — Determination of the effect of liquids*

ISO 7233:2006, *Rubber and plastics hoses and hose assemblies — Determination of resistance to vacuum*

ISO 7326:1991, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

3 General requirements

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

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 Hose inner diameter

Table 1 gives some of the inner diameters based on series R 10 of ISO 3:1973. Tolerances shall conform to ISO 1307.

1) To be published. (Revision of ISO 1307:1992.)

Table 1 — Inner diameters and tolerances

Dimensions in millimetres

Inner diameter, d	Tolerance
3,2 4 5	± 0,5
6,3 7 8 9,5 10 12,5 16 19 20	± 0,75
25 31,5 38	± 1,25
40 50 63	± 1,5

5 Physical tests on finished hose

New hoses or sample lengths of hoses are to be used for each of the tests below.

5.1 Pressure test

Fill three hoses or sample lengths from the hoses with test liquid C as specified by ISO 1817:2005 and store them for seven days in air at an ambient temperature of 23 °C ± 2 °C.

Empty the liquid out and fill the hoses or sample lengths with cold water; subject them to hydrostatic pressure as specified in ISO 1402.

The hose shall withstand a hydrostatic pressure of at least 1,4 MPa for hoses of 10 mm or smaller inner diameter and 1,0 MPa for hoses with inner diameter larger than 10 mm.

5.2 Vacuum collapse test

Carry out the test in accordance with ISO 7233:2006, method A using the test conditions specified in Table 2.

Table 2 — Pressure conditions for the vacuum collapse test

Inner diameter, d mm	**Vacuum** kPa
$d \leqslant 10$	80
$10 < d \leqslant 25$	35
$d > 25$	No test required

The test duration shall be 60 s and the diameter of the sphere 0,8 d (inner diameter of the hose). The sphere shall pass freely through the hose while under vacuum.

5.3 Volume change in liquid C

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

Place the sample lengths of hose in test liquid C at an ambient temperature of 23 °C ± 2 °C for 70 h ± 2 h.

If the hose is made of a homogeneous compound (with or without reinforcement), the swelling in test liquid C shall not exceed 35 % by volume as measured by displacement in water. For hose 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 test liquid C shall not exceed 35 % for the tube and 120 % for the cover.

5.4 Mass reduction in liquid C

Determine the reduction in mass of the hose by the procedure specified in ISO 1817. Fill three hoses or sample lengths from the hoses with test liquid C, as specified in ISO 1817:2005, and store them for seven days in air at an ambient temperature of 23 °C ± 2 °C.

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

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

5.5 Effect of ozone

The hose shall be tested in accordance with ISO 7326:1991, method 1. The sample shall show no visible cracks at ×2 magnification.

5.6 Fuel permeation

The permeation rate for the hoses shall be determined according to the method specified in Annex A or an equivalent test method. The hoses shall be classified in the following way and marked in accordance with Clause 6:

— Type 1: hoses with a permeation rate of 100 g/m^2 or less per 24 h.

— Type 2: hoses with a permeation rate of over 100 g/m^2 per 24 h, up to and including 300 g/m^2 per 24 h.

5.7 Cold flex test

For straight hose of 19 mm inner diameter and smaller, condition hose samples for 5 h at an ambient temperature of −20 °C ± 2 °C. Flex in the cold chamber through 180° from the centreline to a diameter of 10 times the maximum outside diameter of the hose. The flexing shall take place within 4 s and the hose shall not fracture or show any cracks, checks or breaks in the tube or cover.

For straight hose larger than 19 mm inner diameter and all pre-formed hose, prepare three specimens 100 mm × 6 mm from the whole hose wall. Cold condition as above in an unrestrained loop position between two jaws 50 mm wide and 64 mm apart. While in the cold chamber, bring the jaws together rapidly until they are 25 mm apart. The specimens shall not fracture or show any cracks, checks or breaks.

5.8 Abrasion test — 38 mm inner diameter and larger fuel fill hose with embedded wire reinforcement

Hose samples of 38 mm inner diameter shall be tested. Larger inner diameter hose sizes to be qualified by the test shall not have a cover thickness or construction less than those of the test samples.

Three identical 38 mm inner diameter hose samples shall be tested. Condition hose samples for at least 24 h at an ambient temperature of 23 °C ± 2 °C and 50 % ± 5 % relative humidity. The test hose shall be mandrel- (core-) supported and rotate at a constant speed of 80 rev/min ± 2 rev/min. Subject the hose to a laterally moving abrasive surface, i.e. 80 grit aluminium oxide (Al_2O_3) emery cloth, parallel to the longitudinal axis of the hose. The abrasive surface shall be (25 ± 5) mm × (75 ± 5) mm affixed to a hard surface which will cycle back and forth 75 mm ± 5 mm in each direction while loaded with a constant normal force of 45 ± 5 N. One test cycle shall equal one 360° rotation of the outside diameter of the hose and one back and forth movement of the abrasive surface. After 1 000 cycles, the three test samples shall have no helical wire reinforcement exposed at the point of contact with the abrasive surface.

5.9 Dry heat resistance test

After heat ageing for 70 h at an ambient temperature of 100 °C ± 2 °C, specimens taken from the cover material shall not have a reduction in tensile strength of more than 20 % or a reduction in elongation of more than 50 % of the original values of the unheated specimens.

5.10 Oil resistance test

After 70 h immersion in ISO 1817:2005 reference oil number 3 at an ambient temperature of 100 °C ± 2 °C, specimens taken from the cover shall not have a reduction of tensile strength or elongation exceeding 40 % or a volumetric change outside the range of −5 % to +25 % of the pre-immersion values. Specimens taken from the cover material shall not have a volumetric change outside the range of 0 to +100 %.

5.11 Adhesion test

The force required to separate a 25 mm width sample of bonded tube and cover material by tensile force on partially separated layers applied in opposite directions at 23 °C ± 2 °C shall be not less than 27 N.

6 Marking

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

— the name or trade mark of the manufacturer;

— the last two figures of the year of manufacture;

— inner diameter, in millimetres;

— “ISO 8469-B1” or “ISO 8469-B2”.

NOTE “B” is used to designate a non-fire-resistant type of fuel hose; “1” designates a fuel hose with a fuel permeation rate of 100 g/m^2 per 24 h or less; “2” designates a fuel hose with a permeation rate of 300 g/m^2 per 24 h or less.

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.

Annex A
(normative)

Fuel permeation test (or equivalent test method)

A.1 Principle

Sample lengths of the hose to be tested are first exposed to fuel for seven days before the test. After exposure to the fuel, the sample lengths are filled with test liquid and the liquid lost by permeation during time periods of 24 h shall be determined by weighing for 15 consecutive days or until a peak has been established.

A.2 Sampling

Three sample lengths of the hose shall be tested simultaneously. They shall be approximately 300 mm long.

A.3 Equipment

The test equipment shall be as shown in Figure A.1.

A well-ventilated, draught-free test chamber, at a controlled ambient temperature of 23 °C ± 2 °C, shall be used for the testing.

The glass pipes shown in Figure A.1 shall have a tight fit to the inner diameter 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.

A.4 Test procedure

Fill the sample lengths of hose with test liquid C as specified in ISO 1817:2005 and store them for seven days in air at standard laboratory temperature (23 °C ± 2 °C).

Empty the liquid out and assemble test hoses and glass pipes as shown in Figure A.1. Fill the sample lengths and pipes with test liquid C as specified in ISO 1817:2005 up to a level approximately 70 mm above the upper end of the hose. Fit the plug with the capillary pipe.

Weigh the assembly with 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 weight.

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 weight-loss values recorded. Calculate the permeation rate in $g/m^2/24$ h based on this average weight loss, the inner diameter of the hose and the effective length of the hose between the inner ends of the glass pipes.