INTERNATIONAL STANDARD

ISO 5772

Second edition
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Rubber and plastic hoses and hose assemblies for measured fuel dispensing systems — Specification

Tuyaux et flexibles en caoutchouc et en plastique pour distribution mesurée de carburants — Spécification

Reference number
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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is 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 5772:1998), which has been technically revised to include the following changes:

— working pressure is 16 bar (1,6 MPa) instead of 12 bar (1,2 MPa) but proof pressure and burst pressure remain the same;

— minimum tensile strength of lining and cover has been increased from 7 MPa to 9 MPa;

— extraction of the lining for low temp hoses has been added and the Low Temperature Bending test is to be done at 25 °C with the force to bend specified;

— hose fuel permeation, flammability, assembly flex test, and assembly leak test have been added.

All the annexes form an integral part of this International Standard.

Rubber and plastic hoses and hose assemblies for measured fuel dispensing systems — Specification

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This International Standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This International Standard specifies minimum requirements for three types of hoses in two categories and two classes of hose assemblies used for measured fuel dispensing, including oxygenated fuels (up to a maximum of 15 % oxygenated compounds).

The assemblies are intended for use at ambient temperatures between −30 °C and +55 °C for normal temperature class and −40 °C and +55 °C for low temperature class at a working pressure up to and including 16 bar (1,6 MPa).

NOTE 1 bar = 0,1 MPa.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 37, *Rubber, vulcanised or thermoplastic — Determination of tensile stress-strain properties*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

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 4649, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

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

ISO 6801, *Rubber or plastics hoses — Determination of volumetric expansion*

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

ISO 8031:2009, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance and conductivity*

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

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*

3 Terms and definitions

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

4 Classification

Hoses for this application shall be divided into the following three types:

a) type 1: textile reinforced;

b) type 2: textile and helical wire reinforced;

c) type 3: fine wire reinforced.

Each type of hose shall be divided into the following two temperature classes:

a) normal temperature class with an ambient working temperature of −30 °C to +55 °C;

b) low temperature class (LT) with an ambient working temperature of −40 °C to +55 °C.

Each type of hose for this application shall be divided into the following two categories:

a) category M: electrically bonded;

b) category Ω: electrically conductive.

Hoses for this application shall be divided into the following two temperature classes:

a) normal temperature class with an ambient working temperature of −30 °C to +55 °C;

b) low temperature class (LT) with an ambient working temperature of −40 °C to +55 °C.

5 Materials and construction

The hose shall consist of the following:

— smooth, fuel resistant lining of rubber or thermoplastic elastomer (TPE);

— suitable reinforcement; related to type;

— non-corrugated, fuel and weather-resistant rubber or TPE cover.

Hose assemblies shall be capable of conducting an electrical charge from coupling to coupling.

When this capability is provided by means of metallic bonding wires, not less than two (metallic) bonding wires shall be embedded in the hose and the metal used shall have a high resistance to fatigue and corrosion.

Hoses with metallic wires for electrical conductivity shall be designated “M” and those using conductive compounds shall be designated “Ω”, the relevant mark being branded on the hose (see Clause 12).

6 Pressure requirements

For all types of hoses, the following shall apply:

a) maximum working pressure: 16 bar (1,6 MPa);

b) proof pressure: 24 bar (2,4 MPa);

c) minimum bursting pressure: 48 bar (4,8 MPa).

7 Dimensions and tolerances

7.1 Internal diameters and bend radii

When measured in accordance with ISO 4671, the internal diameter of the hose shall comply with the values given in Table 1.

When measured in accordance with ISO 10619–1, the minimum bend radii for each diameter of hose shall comply with the values given in Table 1.

Table 1 — Nominal bore, internal diameter, tolerance, and bend radii

Nominal bore	Internal diameter mm	Tolerance mm	Bend radius mm
12	12		60
16	16	±0,8	80
19	19		100
21	21,0		130
25	25,0		150
32	32,0		175
35	35,0	±1,25	200
38	38,0		225
40	40,0		225
50	50,0		275

7.2 Minimum thickness of lining and cover

When measured in accordance with ISO 4671, the thickness of the lining shall not be less than 1,6 mm. The thickness of the cover shall not be less than 1,0 mm.

7.3 Concentricity

When determined in accordance with ISO 4671, the concentricity, based on a total indicator reading between the internal diameter and the outside surface of the cover, shall not exceed 1,0 mm.

7.4 Tolerance on cut lengths

For cut lengths, the tolerances on length shall be according to ISO 1307. The length of a hose assembly shall be measured from sealing face to sealing face of the end fittings with a tolerance from the nominal length of ±1 %.

8 Physical properties

8.1 Compounds

When tested in accordance with the methods in Table 2, the physical properties of the compounds used for the lining and cover shall comply with the values given in Table 2. Tests shall be carried out either on samples taken from the hose or from moulded vulcanised sheets at a thickness of 2 mm or moulded test pieces, vulcanised to the same cured state as the production hoses.

Table 2 — Physical properties of compounds

Property	Unit	Requirement		Test piece[a]	Test method
		Rubber	TPE		
Tensile strength Lining and cover, min.	MPa	9	12		ISO 37
Elongation at break Lining and cover, min.	%	250	350		
Accelerated ageing — Tensile strength change, max. Lining and cover	%	20	10		ISO 188 (air oven method) 14 days at (70 ± 1) °C
— Elongation at break change, max. Lining and cover	%	−35	−20		
Resistance to liquids					ISO 1817
Lining swell max.		+70		Test piece cut from hose or from test sheet	70 h at 40 °C in oxygenated fuel type 3
		+25			ISO 1817 70 h at 100 °C in oil No 3
Lining extracted matter Normal temperature class max.	%	+10			ISO 1817 70 h at 40 °C in oxygenated fuel type 3 then dry 24 h at 100 °C
Lining extracted matter Low temperature class max.		+15			
Cover swell max.		+100			ISO 1817 70 h at 23 °C in Liquid B
Low temperature resistance to lining and cover at −30 °C (or −40 °C if required)	—	No cracks under ×10 magnification			Annex A
Abrasion resistance Cover compound max.	mm^3	500		Test piece from moulded test sheet of cover compound	ISO 4649 Method A

[a] It is necessary that the test report indicated the source of the test piece.

8.2 Finished hose

When tested in accordance with the methods in Table 3, the physical properties of the finished hose shall comply with the values given in Table 3.

Table 3 — Physical properties of hoses

Property	Unit	Requirement	Test piece	Test method
Proof pressure at 24 bar	—	No leakage or other signs of weakness nor abrupt twisting	Full length of hose	ISO 1402 Proof test pressure
Burst pressure, min.	bar	48	Short length cut from hose	ISO 1402 Burst pressure
Volumetric expansion, max. — Type 1 and Type 2 — Type 3	%	2 1	At least 1 m cut from hose	ISO 6801 Test pressure 3 bar
Adhesion between components on — Un-aged hose, min. — Aged hose, min.	N/mm	2,4 1,8	Short length cut from hose	ISO 8033/Annex B
Ambient temperature bending	—	$T \geq 0{,}8$ D D No kinking or deformation greater than 20 % of the outside diameter	Short length cut from hose	ISO 10619–1 Nominal diameter C = 10 × nominal bore
Low temperature flexibility	—	No cracks or breaks Maximum bending force 180 N	Annex C, Reference hose with nominal bore 16, 19 or 21	Annex C
Change in length at proof pressure	%	0 to +5	Full length of hose	ISO 1402
Ozone resistance of cover	—	No cracks under ×2 magnification	Short length cut from hose	ISO 7326 168 h at 40 °C, 50 pphm, relative humidity (55 ± 10) % and elongation 20 %
Fuel permeation of hose max. Normal temperature class Low temperature class	ml/(m·day)	12 18	2 m test piece cut from hose Reference hose with nominal bore 16, 19 or 21	Annex D
Electrical resistance max. Category Ω Category M	Ω	1×10^6 1×10^2	Equivalent to the length of hose assembly	ISO 8031:2009, Method 4.5, 4.6, or 4.7 ISO 8031:2009
Flammability	—	*a) Burning with a naked flame to cease within 20 s of removal of the burner;* *b) no further glowing visible 2 min after removal of the burner;* *c) hose shall show no sign of leakage*	*Length of assembly to suit test rig*	Annex E

8.3 Hose assembly

When tested in accordance with the methods in Table 4, the physical properties of the hose assembly shall comply with the values given in Table 4.

Table 4 — Physical properties of hose assemblies

Property	Unit	Requirement	Test piece	Test method
Pull-off test	—	No movement of end fitting after removal of force	Short length of hose assembly	Annex F
Proof pressure at 24 bar	—	No leakage or other signs of weakness	Full length of hose assembly	ISO 1402 Proof test pressure
Electrical resistance max. Category M Category Ω	Ω/assembly	 1×10^2 1×10^6		ISO 8031:2009 ISO 8031:2009, Method 4.8
Leak test		No leakage		Annex H
Flex test	—	No defects after 18 000 cycles No leakage after 50 000 cycles max. The electrical resistance shall meet the requirements given above.		Annex G

9 End fittings

The following requirements shall be fulfilled:

— end fittings shall be designed for the pressure ratings according to Clause 6;

— end fittings shall be designed so that, where used for their intended purpose, they do not adversely affect in-service reliability of the hose due to sharp edges or burrs;

— parallel thread;

— end fittings with thread sealing (e.g. with PTFE-band) are not permitted;

— materials of the thread-bearing parts: corrosion-resistant metallic materials at the option of the manufacturer; control screw threads shall not be made from aluminium;

— surfaces that come into contact with the conductive layers of the fuel hose shall be metallically conductive; anodised surfaces and surfaces with insulating layer are not permitted; end fitting components that are in contact with the lining or the cover of the fuel hose shall have secure, electrically conductive, metallic contact when assembled.

There are two types of end fittings that may be used, re-usable and non-reusable.

10 Frequency of testing

Type testing and routine testing and the minimum frequency of such tests shall be as specified in Annex I.

Type tests are those tests carried out in order to obtain product approval.

Routine tests are those carried out on each length of hose or hose assembly.

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

11 Type tests

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

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

12 Marking

12.1 Hoses

The hose shall be marked legibly and indelibly during the manufacturing process. Marking shall be repeated at least at 2 m intervals, and shall at least include the following information:

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

b) reference to this International Standard, i.e. ISO 5772;

c) type of hose (1, 2, or 3);

d) category of hose, i.e. M or Ω;

e) temperature class e.g. LT (low temperature);

NOTE For hoses for normal temperature class, no special marking is required.

f) nominal bore, e.g. 19;

g) maximum working pressure, in bar or MPa or both, e.g. 16 bar (1,6 MPa);

h) quarter and year of manufacture, e.g. 3Q15.

EXAMPLE XYZ/ISO 5772/1/M/LT/19/16/3Q15

12.2 End fittings

The fittings shall be marked with the manufacturer's trademark and according to their purpose with the wording "reusable" (alternatively "R") or non "re-reusable" (alternatively "NR"), respectively.

12.3 Hose assemblies

The information detailed in 12.1 shall appear in full at least once on each hose assembly. The fitting shall be marked with the name or the trademark of the assembler and the date of the assembling, e.g. 3Q14. In case of re-assembly, the fitting shall be marked with the name or trademark of the re-assembler and date of the assembling, e.g. 3Q14.