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Plastics hoses and hose assemblies for suction and low-pressure discharge of petroleum liquids — Specification

Tuyaux et flexibles en plastique pour aspiration et refoulement basse pression des liquides pétroliers — Spécifications

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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 third edition cancels and replaces the second edition (ISO 6808:1999), which has been technically revised with the following changes:

- Throughout the document: Nominal bore was changed to hose size.
- Throughout the document: ISO 1817 Oil No. 3 was changed to IRM 903 oil.
- ISO 471, ISO 1746, and ISO 4672 were replaced by ISO 23529, ISO 10619-1, and ISO 10619-2, respectively.
- Terms and definitions clause was added.
- Type 1 and Type 2 maximum working pressures at 45 °C were corrected.
- Hose construction for electrical bonding was updated.
- Tables 4 and 5: Note b was added.
- 7.2 and Table 5: Changed 55 °C to 45 °C.
- 9.3: Electrical bonding was redefined.
- 9.4: Added electrical wall resistance clause.
- Added frequency of testing clause.
- Added type tests clause.
- Added Annex A — Test frequency.
- Added Annex B — Production tests.

Introduction

This International Standard has been prepared to provide minimum acceptable requirements for the satisfactory performance of polymer-reinforced thermoplastics hoses for suction and discharge applications, conveying kerosene, heating oil, diesel fuel, and lubricating oils. These hoses are neither suitable for conveying automotive or aviation fuel nor suitable for metered delivery of any liquid.

The list of hose sizes given in Tables 1 and 2 is not intended to be restrictive and will not preclude the manufacture of sizes outside the preferred-number range (the basis of the tables) and which might be the subject of individual national standards.

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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 the requirements for two types of polymer-reinforced thermoplastics hose and hose assembly for suction and discharge applications with kerosene, heating oil, diesel fuel, and lubricating oils in the temperature range –10 °C to +45 °C.

NOTE The hoses can be stored in a static condition at –30 °C to +65 °C without damage by climatic conditions.

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

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

ISO 527-3, *Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets*

ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*

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

ISO 7751, *Rubber and plastics hoses and hose assemblies — Ratios of proof and burst pressure to maximum working pressure*

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

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*

ISO 10619-2:2011, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 2: Bending tests at sub-ambient temperatures*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Terms and definitions

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

4 Classification — Hose types

Two types of hose are specified, differentiated by the maximum working pressure as follows:

— Type 1: for light service, having a maximum working pressure of 0,3 MPa (3 bar) at 23 °C ± 2 °C and 0,07 MPa (0,7 bar) at 45 °C ± 2 °C;

— Type 2: for normal service, having a maximum working pressure of 0,55 MPa (5,5 bar) through hose size 25 and 0,4 MPa (4 bar) above hose size 25 through hose size 50 at 23 °C ± 2 °C. All sizes have a maximum working pressure of 0,15 MPa (1,5 bar) at 45 °C ± 2 °C.

5 Construction and materials — Requirements

The hoses shall be as uniform as commercially practicable in colour, opacity, and other physical properties. Flexible thermoplastics materials shall be supported inside the material by a helix of polymeric material of a similar molecular structure. The reinforcing and flexible components of the wall shall be fused and free from visible cracks, porosity, foreign inclusions, or other defects causing the hose to be unserviceable. Hose assemblies shall be electrically bonded between couplings. The hose construction shall include at least two flexible metallic bonding wires (with or without a metallic helix) incorporated in the hose between the cover and the lining and shall be bonded to the metal couplings. Refer to 9.3 for testing and requirements for electrical bonding.

The method of ensuring initial electrical continuity shall be the responsibility of the manufacturer and shall be carried out to the satisfaction of the user.

6 Dimensions and tolerances

6.1 Diameter

The hose size and the internal diameter and tolerances shall be in accordance with the values given in Tables 1 and 2, which are in accordance with ISO 1307.

Table 1 — Diameters and tolerances (Type 1 hoses)

Hose size	Inside diameter mm	Tolerance mm
12,5	12,5	±0,75
16	16	±0,75
19	19	±0,75
25	25	±1,25
31,5	31,5	±1,25
38	38	±1,25
50	50	±1,5
63	63	±2
80	80	±2
100	100	±2
125	125	±2

NOTE For smaller or larger diameters, it is recommended that values be chosen from ISO 1307.

Table 2 — Diameters and tolerances (Type 2 hoses)

Hose size	Inside diameter mm	Tolerance mm
12,5	12,5	±0,75
16	16	±0,75
19	19	±0,75
25	25	±1,25
31,5	31,5	±1,25
38	38	±1,25
50	50	±1,5

NOTE For smaller or larger diameters, it is recommended that values be chosen from ISO 1307.

6.2 Length

The tolerances on cut lengths of hose shall be as given in Table 3.

Table 3 — Tolerances on cut lengths

Hose size	Tolerance on cut length %
Up to and including 38	±1
Over 38	±2

7 Physical properties of finished hoses

7.1 Hydrostatic requirements at standard laboratory temperature

When tested at standard laboratory temperature as specified in ISO 23529 by the method specified in ISO 1402, the hose shall meet the requirements given in Table 4.

When examined at proof pressure (i.e. 50 % of minimum burst pressure), the hose shall show no evidence of leakage, cracking, abrupt distortion, or electrical continuity damage.

Table 4 — Hydrostatic requirements at standard temperature

Hose size	Maximum working pressure MPa (bar)		Minimum burst pressure MPa (bar)	
	Type 1	Type 2	Type 1[a]	Type 2[b]
Up to and including 25	0,3 (3)	0,55 (5,5)	1,2 (12)	2,8 (28)
From 31,5 up to and including 50	0,3 (3)	0,4 (4)	1,2 (12)	2 (20)
From 63 up to and including 125	0,3 (3)	—	1,2 (12)	—

[a] The burst ratio for Type 1 is 4:1 (in accordance with ISO 7751).

[b] The burst ratio for Type 2 is 5:1 (rounded to whole numbers).

7.2 Hydrostatic requirements at 45 °C

When tested at 45 °C ± 2 °C by the method specified in ISO 1402, the hose shall meet the requirements given in Table 5.

Table 5 — Hydrostatic requirements at 45 °C (all hose sizes)

Maximum working pressure MPa (bar)		Minimum burst pressure MPa (bar)	
Type 1	**Type 2**	**Type 1**[a]	**Type 2**[b]
0,07 (0,7)	0,15 (1,5)	0,3 (3)	0,8 (8)
[a] The burst ratio for Type 1 is 4:1 (in accordance with ISO 7751).			
[b] The burst ratio for Type 2 is 5:1 (rounded to whole numbers).			

7.3 Change in length (Type 2 only)

When tested at 23 °C ± 2 °C and 45 °C ± 2 °C by the method specified in ISO 1402, the length of the hose shall not change by more than 15 %.

NOTE Electrical continuity is also tested at this time (see 7.8).

7.4 Suction resistance

When tested at 23 °C ± 2 °C and 45 °C ± 2 °C in accordance with the method specified in ISO 7233, using an internal pressure (less than atmospheric pressure) of −65 kPa (−0,650 bar) for Type 1 and −80 kPa (−0,800 bar) for Type 2, the hose shall not fail due to collapse or fracture at any point that is more than one diameter distance from the coupling.

In the event of failure closer than one diameter distance to the coupling, the test shall be disregarded and a further test piece shall be tested.

7.5 Reinforcement fracture

7.5.1 When tested in accordance with the method specified in Annex C, extended over the appropriate-size extension block given in Table 6 for 4 mo for a type test, or 336 h ± 2 h for a control test, the helical reinforcement shall be capable of reverse bending without cracking.

7.5.2 When the hose is tested, after immersion in IRM 903 oil as defined in ISO 1817 for $\left(72\ {}^{0}_{-2}\right)$ h at 70 °C ± 1 °C, in accordance with the method specified in Annex C, over the appropriate-size extension piece given in Table 6 for 336 h, the helical reinforcement shall be capable of reverse bending without cracking.

Table 6 — Width of extension block used for reinforcement fracture test

Hose size	Block width, *W* mm
12,5	10
16	12
19	16
25	19
31,5	23
38	27
50	31
63	34
80	38
100	44
125	49

7.6 Minimum bend test

When tested in accordance with ISO 10619-1 at 23 °C ± 2 °C and 45 °C ± 2 °C, using a diameter of curvature *C* of six times the inside diameter, the hose shall not crack.

7.7 Cold bend test

7.7.1 When tested at −10 °C ± 2 °C in accordance with method B of ISO 10619-2:2011, having been conditioned for 5 h at that temperature and using a diameter of curvature of 20 times the inside diameter, the hose shall not crack.

7.7.2 When tested as in 7.7.1, but after immersion at 70 °C ± 1 °C in IRM 903 oil for $\left(72\ ^{0}_{-2}\right)$ h as specified in ISO 1817, the hose shall not crack.

7.8 Electrical continuity

During and after the hydrostatic tests described in 7.1, 7.2, and 7.3, the electrical continuity of each test piece shall be maintained from end to end of the hose.

8 Physical properties of the flexible thermoplastics material

8.1 Loss in mass on heating

When tested in accordance with method B of ISO 176:2005, the flexible thermoplastics material used in the construction shall not have a loss in mass greater than 4 %.

8.2 Tensile strength and elongation at break

When determined in accordance with ISO 527-3, the minimum tensile strength and elongation at break of the flexible thermoplastics material used in the construction shall be as given in Table 7.