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Rubber hoses and hose assemblies for dispensing liquefied petroleum gases (LPGs) — Specification

Tuyaux et flexibles en caoutchouc destinés à la fourniture de gaz de pétrole liquéfiés (GPL) — Spécifications

Reference number
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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 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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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 11759:1999), which has been technically revised with the following changes:

— Clause 2: ISO 1746 and ISO 4672 are deleted, and replaced with ISO 10619-1 and ISO 10619-2 and inclusion of ISO 4671;

— Clause 4, Clause 5 and Table 4, addition of Type 3 for conductive hoses;

— Annex B on test frequency and Annex C on production test were added.

Rubber hoses and hose assemblies for dispensing liquefied petroleum gases (LPGs) — Specification

WARNING — Persons using this document should be familiar with normal laboratory practice. This document 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 document specifies the requirements for flexible rubber hoses and hose assemblies used for the transfer of metered quantities of liquefied petroleum gases (LPGs) from dispensing equipment to motor vehicles.

The hoses and hose assemblies specified in this document are intended for use "wet", i.e. permanently filled with liquid, in the temperature range from –40 °C to +60 °C.

The maximum working pressure is 2 MPa (20 bar).

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 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 4080, *Rubber and plastics hoses and hose assemblies — Determination of permeability to gas*

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

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

ISO 10619-1, *Rubber and plastics hoses and tubing — Measurement of flexibility and stiffness — Part 1: Bending tests at ambient temperature*

ISO 10619-2, *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 terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Classification

Three types of hose are specified, as follows.

Type 1: Electrically bonded hoses with textile reinforcement, incorporating a metallic bonding element, suitable for reeling on a drum or draping in a single loop.

Type 2: Electrically bonded hoses with a fine wire reinforcement, suitable for reeling on a drum or draping in a single loop.

Type 3: Electrically conductive hoses with textile reinforcement and conductive rubber layer, suitable for reeling on a drum or draping in a single loop.

5 Materials and construction

Hoses shall consist of the following:

— a smooth, fuel-resistant lining of rubber;

— one or more layers of textile or corrosion-resistant wires, for example, stainless steel or tinned copper;

— an electrically conductive element (Type 1) typically consisting of not less than two bonding wires of a braided construction each containing a minimum of nine strands of corrosion-resistant metal or conductive rubber layer (Type 3);

— an abrasion and weather-resistant rubber cover.

The hose cover can be pricked to release trapped gases.

6 Hydrostatic requirements

When the hose or hose assembly is tested in accordance with ISO 1402, the pressure rating shall comply with the values given in Table 1.

Table 1 — Pressure ratings

Property	Pressure rating MPa	Pressure rating bar[a]
Maximum working pressure	2	20
Proof test pressure	4	40
Minimum burst pressure	10	100

[a] 1 bar = 0,1 MPa

7 Dimensions and tolerances

7.1 When measured by the method described in ISO 4671, the inside and outside diameters of the hose shall comply with the dimensions and tolerances given in Table 2.

7.2 The tolerances on cut lengths shall be as specified in ISO 1307.

Table 2 — Hose sizes and inside and outside diameters and tolerances

Hose size	Inside diameter mm	Tolerance mm	Outside diameter mm	Tolerance mm
9	9,7	±0,5	19,5	±1,0
12	12,7	±0,5	22,7	±1,0
16	16	±0,6	26	±1,0
19 × 5	19	±0,6	29	±1,0
19 × 6	19	±0,6	31	±1,0
25 × 5	25	±0,7	35	±1,0
25 × 6,5	25	±0,7	38	±1,0

7.3 Lining and cover thickness

When measured by the method described in ISO 4671, the minimum thickness of the lining shall be 1,6 mm and that of the cover 1,0 mm.

8 Physical properties of materials

The values of physical properties of the materials used for the manufacture of hoses shall be as given in Table 3.

Table 3 — Physical properties of materials

Property	Unit	Requirement	Test piece	Method of test
Accelerated ageing: change for lining and cover			Test piece cut from hose or from test sheet	ISO 188, 72 h at 100 °C
Tensile strength max.	%	−25		
Elongation at break max.	%	−50		
Resistance of lining to liquids: change in tensile strength and elongation at break		Not less than 65 % of original values	Test piece cut from hose lining or from test sheet	ISO 1817, 72 h at 23 °C, immersion in *n*-hexane

9 Performance requirements for hoses and hose assemblies

The values of physical properties of hoses and hose assemblies shall be as given in Table 4.

Table 4 — Physical properties of hoses and hose assemblies

Property	Unit	Requirement	Test piece	Method of test
Proof test pressure	—	No leakage or other signs of weakness	Full length of hose or hose assembly	ISO 1402
Burst pressure min.	MPa (bar)	10 (100)	Short length cut from hose	ISO 1402
Change in length at proof pressure max.	%	±7	Hydrostatic proof test piece cut from hose	ISO 1402
Volumetric expansion max.	%	+6	Test piece cut from hose	ISO 6801: test pressure 10 bar

Table 4 *(continued)*

Property	Unit	Requirement	Test piece	Method of test
Flexibility at ambient temperature	—	$T/D > 0{,}8$	Short length cut from hose	ISO 10619-1:2011, method A, using 10× the internal diameter as the value for diameter *C*
Low-temperature flexibility	—	No cracks or breaks	Short length cut from hose	ISO 10619-2:2011, method B, −40 °C
Ozone resistance of cover	—	No cracks under ×2 magnification	Short length cut from hose	ISO 7326:2006, method 1
Adhesion between components min.	kN/m	2	Short length cut from hose	ISO 8033
Electrical conductivity and resistance of hose assembly (fitting to fitting)		Type 1 and Type 2: Not more than 10^2 Ω/assembly Type 3: Not more than 10^6 Ω/assembly	Length of hose assembly	ISO 8031
Flexibility test under reverse bending	—	>50 000 cycles, no failure or increase in electrical resistance to a value higher than that specified	Hose assembly	Annex A
LPG permeability max	$cm^3/(m \times h)$	400	Short length cut from hose	ISO 4080

10 Frequency of testing

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

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 finished hose.

Production tests are those tests carried out per batch, see schedule given in Annex C is for guidance only.

11 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 a maximum of every five years or whenever a change in the method of manufacture or materials occurs.

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

12 Marking

Hoses shall be clearly and durably marked, at least every metre, with at least the following information:

a) the manufacturer's name or identification;

b) the manufacturer's product identification (optional);

c) the number of this document, i.e. ISO 11759:2016;

d) the type of hose;

e) the hose size;

f) the maximum working pressure, in MPa and bar;

g) for hoses the quarter and year of manufacture (i.e. 2Q16) and for assemblies the month and year of assembly (i.e. 07.16)

EXAMPLE XXX ISO 11759:2016 Type 1 - 16 - 20 MPa (20 bar) - 2Q16