INTERNATIONAL STANDARD

ISO 11759

First edition
1999-07-15

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
ISO 11759:1999(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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

International Standard ISO 11759 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

Annex A forms a normative part of this International Standard.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

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

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

The hoses and hose assemblies specified in this International Standard 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 20 bar (2 MPa).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 37:1994, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties.*

ISO 188:1998, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat-resistance tests.*

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 1746:1998, *Rubber or plastics hoses and tubing — Bending tests.*

ISO 1817:1999, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 4080:1991, *Rubber and plastics hoses and hose assemblies — Determination of permeability to gas.*

ISO 4672:1997, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests.*

ISO 6801:1983, *Rubber or plastics hoses — Determination of volumetric expansion.*

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

ISO 8031:1993, *Rubber and plastics hoses and hose assemblies — Determination of electrical resistance.*

ISO 8033:1991, *Rubber and plastics hoses — Determination of adhesion between components.*

ISO 8330: 1998, *Rubber and plastics hoses and hose assemblies — Vocabulary.*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions in ISO 8330:1998 apply.

4 Classification

Two types of hose are specified, as follows:

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

Type 2: Hoses with a fine wire reinforcement, 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;

— 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 bar[a]
Maximum working pressure	20
Proof test pressure	40
Minimum burst pressure	100

[a] 1 bar = 0,1 MPa

7 Dimensions and tolerances

7.1 When measured by the method described in ISO 4671, the internal 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 — Nominal bore and internal and outside diameters and tolerances

Nominal bore	Internal diameter mm	Tolerance mm	Outside diameter mm	Tolerance mm
16	16	± 0,8	26	± 1,0
19	19	± 0,8	29	± 1,0
20	20	± 0,8	30	± 1,0
25	25	± 1,25	35	± 1,25

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
Tensile strength				Test piece cut from hose or from test sheet	ISO 37 type 1 or type 2 dumb-bell
Lining	min.	MPa	7		
Cover	min.	MPa	7		
Elongation at break				Test piece cut from hose or from test sheet	ISO 37 type 1 or type 2 dumb-bell
Lining	min.	%	250		
Cover	min.	%	250		
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/hose assemblies

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

Table 4 — Physical properties of hoses/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.	bar	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
Flexibility at ambient temperature	—	$T/D \geqslant 0{,}8$	Short length cut from hose	ISO 1746:1998, 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 1746:1998, method B, – 40 °C
Ozone resistance of cover	—	No cracks under × 2 magnification	Short length cut from hose	ISO 7326:1991, method 1
Abrasion resistance of cover	g	< 1 g	Short length cut from hose	ISO 6945: vertical force 50 N ± 0,5 N
Adhesion between components min.	kN/m	2	Short length cut from hose	ISO 8033
Electrical continuity or resistance of hose or hose assembly (fitting to fitting)	Ω/m	Not more than 10 Ω/m or 10 Ω/assembly	Length of hose or 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	$cm^3/(m \cdot h)$	400	Short length cut from hose	ISO 4080

10 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 International Standard;

d) the type of hose;

e) the nominal bore;

f) the maximum working pressure, in bars;

g) for hoses the quarter and year of manufacture and for assemblies the date of assembly (e.g. 3Q98).

EXAMPLE Man ISO 11759 — Type 1 - 16 - 20 - 3Q98

11 Frequency of testing

The frequency of testing shall be in accordance with the requirements given in Table 5.

Table 5 — Frequency of testing

Test type	Approval tests[a]	Production/routine tests[b]
Compound tests		
Tensile strength	x	N.A.
Elongation at break	x	N.A.
Accelerated ageing: tensile	x	N.A.
Accelerated ageing: elongation	x	N.A.
Hose tests		
Tube/cover thickness	x	N.A.
Internal/outside diameters	x	x
Proof pressure	x	x
Burst pressure	x	N.A.
Change in length at proof pressure	x	N.A.
Volumetric expansion	x	N.A.
Flexibility at low temperature	x	N.A.
Ozone resistance of cover	x	N.A.
Adhesion tests	x	N.A.
Resistance of lining to liquids	x	N.A.
Electrical continuity	x	x
LPG permeability	x	N.A.
Assembly tests		
Electrical continuity	x	x
Flexibility under reverse bending	x	N.A.
Proof pressure	x	x

[a] Approval tests are those tests required for approval and consist of full tests that shall be carried out on all bore sizes and repeated at least every 3 years.

[b] Production/routine tests are carried out on every length of hose/every assembly produced.

x Test to be carried out
N.A. Not applicable

Annex A
(normative)

Flexibility test under reverse bending (flex test)

A.1 Apparatus and test specimen

The test rig shall be in accordance with Figure A.1.

If found necessary, the deadweight may be guided to prevent it swinging.

The length of the hose assembly shall be approximately 1 m.

A.2 Procedure

A.2.1 Fit the hose assembly to the test rig as shown in Figure A.1.

A.2.2 Attach a deadweight having a mass of 5 kg to the free end of the assembly.

A.2.3 Using water as the test medium, fill the rig and assembly to remove all air and apply a pressure of 2 bar.

A.2.4 Move the test rig to and fro at room temperature, thereby flexing the hose through 180° relative to the coupling. One complete cycle is two rotations through 180°.

A.2.5 The minimum flexing rate shall be two complete cycles per minute.

A.2.6 The number of cycles specified shall be completed (unless failure occurs prior to completion of the test).

A.3 Test report

The test report shall include the following information:

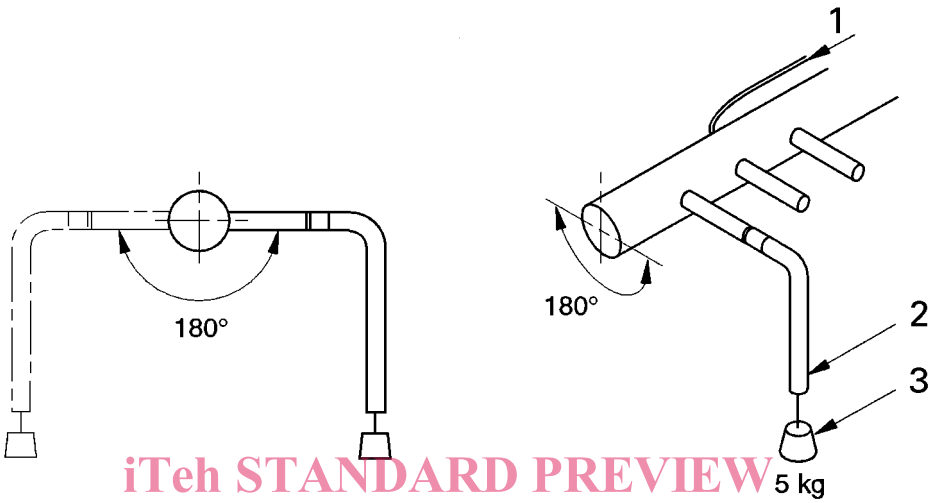
a) the number of cycles achieved;

b) any leakage between the hose and the end fitting;

c) any visible damage, such as splitting of the hose cover, bubbling of the cover, or separation of the cover, reinforcing plies or lining;

d) any loosening or movement of the end fitting from the hose;

e) any deviation outside the maximum permissible electrical resistance.



Key

1 Pressure
2 Hose assembly
3 5 kg deadweight

Figure A.1 — Test rig for flexibility test under reverse bending