INTERNATIONAL STANDARD

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Rubber hoses and hose assemblies for liquefied petroleum gas (LPG) in the liquid or gaseous phase and natural gas up to 25 bar (2,5 MPa) — Specification

Tuyaux et flexibles en caoutchouc pour gaz de pétrole liquéfié (GPL) en phase liquide ou gazeuse et le gaz naturel jusqu'à 25 bar (2,5 MPa) — Spécifications

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Contents

Page

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 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 2928 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

This third edition cancels and replaces the second edition (ISO 2928:1986), which has been technically revised.

Rubber hoses and hose assemblies for liquefied petroleum gas (LPG) in the liquid or gaseous phase and natural gas up to 25 bar (2,5 MPa) — 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 health and safety practices and to ensure compliance with any national regulatory conditions.

1 Scope

This International Standard specifies requirements for rubber hoses and rubber hose assemblies used for the transfer of liquefied petroleum gas (LPG) in the liquid or gaseous phase and natural gas and designed for use at working pressures ranging from vacuum to a maximum of 25 bar (2,5 MPa) within the temperature range −30 °C to +70 °C or, for low-temperature hoses (designated -LT), within the temperature range −50 °C to +70 °C.

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

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

ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*

ISO 1746, *Rubber or plastics hoses and tubing — Bending tests*

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

ISO 4649:2002, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 4671:1999, *Rubber and plastics hoses and hose assemblies — Methods of measurement of dimensions*

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

ISO 7233, *Rubber and plastics hoses and hose assemblies — Determination of suction resistance*

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

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

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

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

3 Terms and definitions

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

4 Classification

Hoses shall be one of the following types:

— type D: delivery hose;

— type D-LT: delivery hose, low-temperature;

— type SD: suction and delivery hose, helix-reinforced;

— type SD-LTR: suction and delivery hose, helix-reinforced, low-temperature (rough-bore).

— type SD-LTS: suction and delivery hose, helix-reinforced, low-temperature (smooth-bore);

All these types can be:

— electrically bonded, in which case the hose is additionally designated and marked with the symbol M;

— electrically conducting by virtue of a conducting rubber layer, in which case the hose is additionally designated and marked with the symbol Ω;

— electrically discontinuous, incorporating a metallic wire connection to one end-fitting of the hose assembly only.

5 Materials and construction

The hose shall consist of the following:

— a lining of rubber resistant to *n*-pentane;

— a reinforcement of layers of woven, braided or spirally wound textile material or braided or spirally wound wire;

— an embedded helical reinforcement (types SD, SD-LTR and SD-LTS only);

— two or more low-resistance electrical-bonding wires (for hoses designated M only);

— an outer cover of rubber, resistant to abrasion and outdoor exposure, the cover being pricked to allow gas permeation;

— an internal, non-embedded helical wire, suitable for use at −50 °C (type SD-LTR only).

Assemblies shall incorporate metallic fittings attached to the hose by the assembler.

Chlorinated materials shall not be used in contact with any stainless-steel materials.

6 Dimensions

6.1 Nominal bore, internal diameter, outside diameter, minimum bend radius

For hoses without built-in couplings, and when measured in accordance with method A of ISO 4671:1999, the internal diameter and outside diameter and their tolerances shall conform to the values given in Table 1 or Table 2, depending on the type.

For hoses with built-in couplings, the outside diameters of Table 1 and Table 2 shall not apply.

When tested by the method described in ISO 1746, the value of the minimum bend radius shall conform to the values given in Table 1 or Table 2, depending on the type.

Table 1 — Dimensions of hoses of types D and D-LT

Nominal bore	Internal diameter	Tolerance	Outside diameter	Tolerance	Design minimum bend radius [a]
	mm	mm	mm	mm	mm
12	12,7	± 0,5	22,7	± 1,0	100
15	15	± 0,5	25	± 1,0	120
16	15,9	± 0,5	25,9	± 1,0	125
19	19	± 0,5	31	± 1,0	160
25	25	± 0,5	38	± 1,0	200
32	32	± 0,5	45	± 1,0	250
38	38	± 0,5	52	± 1,0	320
50	50	± 0,6	66	± 1,2	400
51	51	± 0,6	67	± 1,2	400
63	63	± 0,6	81	± 1,2	550
75	75	± 0,6	93	± 1,2	650
76	76	± 0,6	94	± 1,2	650
80	80	± 0,6	98	± 1,2	725
100	100	± 1,6	120	± 1,6	800
150	150	± 2,0	174	± 2,0	1 200
200	200	± 2,0	224	± 2,0	1 600
250	254	± 2,0	—	—	2 000
300	305	± 2,0	—	—	2 500

NOTE Nominal bores 250 and 300 apply to hoses with built-in couplings only.

[a] The design minimum bend radius is measured to the surface of the hose on the inside of the bend.

Table 2 — Dimensions of hoses of types SD and SD-LT

Nominal bore	Internal diameter	Tolerance	Outside diameter	Tolerance	Design minimum bend radius [a]
	mm	mm	mm	mm	mm
12	12,7	± 0,5	22,7	± 1,0	90
15	15	± 0,5	25	± 1,0	95
16	15,9	± 0,5	25,9	± 1,0	95
19	19	± 0,5	31	± 1,0	100
25	25	± 0,5	38	± 1,0	150
32	32	± 0,5	45	± 1,0	200
38	38	± 0,5	52	± 1,0	280
50	50	± 0,6	66	± 1,2	350
51	51	± 0,6	67	± 1,2	350
63	63	± 0,6	81	± 1,2	480
75	75	± 0,6	93	± 1,2	550
76	76	± 0,6	94	± 1,2	550
80	80	± 0,6	98	± 1,2	680
100	100	± 1,6	120	± 1,6	720
150	150	± 2,0	174	± 2,0	1 000
200	200	± 2,0	224	± 2,0	1 400
250	254	± 2,0	—	—	1 750
300	305	± 2,0	—	—	2 100

NOTE Nominal bores 250 and 300 apply to hoses with built-in couplings only.

[a] The design minimum bend radius is measured to the surface of the hose on the inside of the bend.

6.2 Minimum thickness of lining and cover

When measured in accordance with ISO 4671, the minimum thickness of both the lining and the cover of all hoses shall be 1,6 mm.

7 Physical properties

7.1 Compounds

The physical properties of the compounds used for the lining and cover shall conform to the values given in Table 3, when determined by the methods listed in Table 3.

Tests shall be carried out on samples taken either from the hose or from separately vulcanized sheets, vulcanized to the same cured state as the production hoses.

Table 3 — Physical properties of compounds

Property	Unit	Requirements		Method of test
		Lining	Cover	
Tensile strength (min.)	MPa	10	10	ISO 37 (dumb-bell test piece)
Elongation at break (min.)	%	250	250	ISO 37 (dumb-bell test piece)
Abrasion resistance (max.)	mm^3	—	170	ISO 4649:2002, method A
Ageing				ISO 188:1998 (14 days at +70 °C, air-oven method)
Hardness, change from original value (max.)	IRHD	+10	+10	ISO 48
Tensile strength, change from original value (max.)	%	± 30	± 30	ISO 37
Elongation at break, change from original value (max.)	%	−35	−35	ISO 37
Effect of liquids				
Increase in mass (max.)	%	+10	—	ISO 1817, after 7 days immersed in *n*-pentane at +23 °C
Variation in hardness (max.)	IRHD	+10/−3	—	ISO 1817, after 7 days immersed in *n*-pentane at +23 °C and drying for 70 h at +40 °C
Reduction in mass (max.)	%	−5 −10 (-LT types)	—	ISO 1817, after 7 days immersed in *n*-pentane at +23 °C and drying for 70 h at +40 °C