## INTERNATIONAL STANDARD

ISO 2928

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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 **iTeh** STphase liquide ou gazeuse et le gaz naturel jusqu'à 25 bar (2,5 MPa) — Spécifications **(standards.iteh.ai)** 

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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.

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. (standards.iteh.ai)

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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

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

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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.

### iTeh STANDARD PREVIEW

## Normative references (standards.iteh.ai)

The following referenced documents are indispensable for the application of this document. For dated references, only the dition cited applies: For undated references, the latest edition of the referenced document (including any amendments) applies: e93/iso-2928-2003

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  $\Omega$ ; DARD PREVIEW
- electrically discontinuous, incorporating a metallic wire connection to one end-fitting of the hose assembly only.

#### ISO 2928:2003 https://standards.iteh.ai/catalog/standards/sist/99646006-a689-4415-bf4d-Materials and construction 5eb7768cce93/iso-2928-2003

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.

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#### 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.

Nominal bore	Internal diameter	Tolerance	Outside diameter	Tolerance	Design minimum bend radius <sup>a</sup>	
	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			± 1,0	160	
25	25	± 0,5	38	± 1,0	200	
32	32	(standar	ds.it4sh.ai	± 1,0	250	
38	38	± 0,5	52	± 1,0	320	
50	https://standard	ls.iteh.aitatalog/stand	ards/sist/99646006	a689-44 <b>‡5<mark>1-12</mark>f4d</b> -	400	
51	51		/iso-292 <b>67</b> 2003	± 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.						
<sup>a</sup> The design minimum bend radius is measured to the surface of the hose on the inside of the bend.						

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

Nominal bore	Internal diameter   I olerance		Outside diameter Tolerance		Design minimum bend radius <sup>a</sup>	
	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	Teh± 56TAI	NDA2RD	PRE±V,6EW	720	
150	150	± 2,0	$dar^{174}$ s itch $ai^{12,0}$		1 000	
200	200	± 2,0	224	± 2,0	1 400	
250	254	± 2,0	<u>ISO 2<del>92</del>8:2003</u>		1 750	
300 $305$ https://standards.iteh.ai/catalog/standards/sist/99646006-a689-4415-b4d- $\pm 2.0$ $5eb7768cce93/iso-292812003$			<sup>4d-</sup> 2 100			
NOTE Nominal bores 250 and 300 apply to hoses with built-in couplings only.						
<sup>a</sup> 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

#### 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.

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 <sup>3</sup>	—	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 Soriginal value (max.)		ARE PR		/ISO 37
Elongation at break, change from original value (max.)	standaı	rds.jteh.	ai) <sub>-35</sub>	ISO 37
Effect of liquids		<u>2928:2003</u>		
https://standards.i Increase in mass (max.)	teh.ai/catalog/star 5eb/768cce	1dards/s1st/99646 93/iso-2928-200	006-a6 <u>89</u> -4415-1 3	ISO 1817, after 7 days immersed in <i>n</i> -pentane at +23 °C
Variation in hardness (max.)	IRHD	+10/-3	_	ISO 1817, after 7 days immersed in <i>n</i> -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 <i>n</i> -pentane at +23 °C and drying for 70 h at +40 °C

Table 3 — Physical properties of compounds