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STANDARD

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**8789**

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**Rubber hoses and hose assemblies for  
liquefied petroleum gas in motor  
vehicles — Specification**

*Tuyaux et flexibles en caoutchouc pour circulation de gaz de pétrole  
liquéfié dans les véhicules à moteur — Spécifications*



Reference number  
ISO 8789:1994(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.

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 8789 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 1, *Hoses (rubber and plastics)*.

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# Rubber hoses and hose assemblies for liquefied petroleum gas in motor vehicles — Specification

## 1 Scope

This International Standard specifies the requirements for rubber hoses and hose assemblies, up to a maximum bore of 20 mm, for use in motor vehicles with liquefied petroleum gas (LPG) installations. The hoses are designed for use up to a maximum pressure of 2,5 MPa (25 bar) and a working temperature between  $-40\text{ }^{\circ}\text{C}$  and  $+80\text{ }^{\circ}\text{C}$ .

NOTE 1 If hoses are used at temperatures higher than  $80\text{ }^{\circ}\text{C}$ , i.e. in an engine compartment and/or as connecting hoses with exhaust-pins (used by air-cooled engines for the evaporation of the gas) it will have to be shown that these hoses can withstand the higher temperatures.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 188:1982, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 471:—<sup>1)</sup>, *Rubber — Times, temperatures and humidities for conditioning and testing.*

ISO 1402:—<sup>2)</sup>, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*

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

ISO 4672:1988, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests.*

ISO 6803:1994, *Rubber or plastics hoses and hose assemblies — Hydraulic-pressure impulse test without flexing.*

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

## 3 Bore diameters and tolerances

Bore diameters and tolerances shall comply with the requirements in table 1.

**Table 1 — Bore diameters and tolerances**

Dimensions in millimetres

Nominal bore	Tolerances	
	−	+
6,4	− 0,6	+0,2
9,5	− 0,6	+0,2
12,7	− 0,8	+0,4
15,8	− 0,8	+0,4
19,0	− 0,8	+0,8

1) To be published. (Revision of ISO 471:1983 and ISO 1826:1981)

2) To be published. (Revision of ISO 1402:1984)

## 4 Hose construction

**4.1** The hose shall consist of a smooth bore lining and cover of suitable rubber material, reinforced with one or more interlayers.

**4.2** The cover and lining shall be smooth and free from visible defects and contamination.

**4.3** If corrosion-resistant material (i.e. stainless steel) is used for the reinforcement, no cover is required.

**4.4** Reinforcement may be by cotton, synthetic fibre or corrosion-resistant material (i.e. stainless steel). Reinforcement materials which are not corrosion-resistant will require additional protection against the external environment.

NOTE 2 National safety regulations may define the type of reinforcement to be used.

**4.5** To avoid the formation of bubbles due to gas permeation, the cover shall be pin-pricked.

**4.6** The construction of the hose shall be such that it is not necessary to peel back the cover before mounting the fitting.

## 5 Requirements for lining and cover material

### 5.1 Preparation of test pieces

Test pieces shall be taken from the hose. No tests shall be carried out within 24 h after manufacture of the hose.

### 5.2 Physical requirements for the lining and the cover

When tested in accordance with the methods of test indicated in table 2, the lining and the cover shall comply with the requirements specified.

### 5.3 Resistance to *n*-pentane

When tested in accordance with the methods of test indicated in table 3, a test piece of the lining and cover, immersed in *n*-pentane for 72 h at standard temperature in accordance with ISO 471, shall comply with the requirements specified.

### 5.4 Ozone resistance

When tested in accordance with ISO 7326:1991, method 3, a test piece of the cover, or complete hose in the case of tubing reinforced with corrosion-resistant material, shall show no visible cracks.

**Table 2 — Physical requirements for lining and cover**

Property	Requirement	Method of test
Tensile strength (MPa)	7,0 min.	ISO 37
Elongation at break (%)	150 min.	ISO 37
Accelerated ageing: 72 h at 100 °C		ISO 188
Change in tensile strength (%)	–25 max.	ISO 37
Change in elongation at break (%)	(–50 to +10) max.	ISO 37

**Table 3 — Resistance to *n*-pentane**

Property	Requirement	Method of test
Change in tensile strength (%)	–35 max.	ISO 37
Change in elongation at break (%)	–35 max.	ISO 37
Change in volume (%)	(–10 to +30) max.	ISO 1817

## 6 Requirements for hoses

### 6.1 Permeability to gas

When tested in accordance with method 3 of ISO 4080:1991, the permeability to propane shall not exceed  $0,0528 \text{ cm}^3/\text{m}^2/\text{s}$ , calculated as permeation through the exposed lining area.

### 6.2 Low-temperature resistance

No cracks or ruptures shall be visible in the cover or lining when tested at  $-40 \text{ }^\circ\text{C}$  in accordance with method B of ISO 4672:1988.

### 6.3 Hydrostatic proof pressure and minimum burst pressure

**6.3.1** The hose shall be designed for a maximum working pressure of 2,5 MPa (25 bar).

**6.3.2** No leaks or signs of failure shall occur when a proof test pressure of 6,25 MPa (62,5 bar) is applied to the hose in accordance with ISO 1402, except that the proof pressure shall be held for a period of 10 min.

**6.3.3** When tested in accordance with ISO 1402, the minimum burst pressure shall not be less than 12,5 MPa (125 bar).

## 7 Requirements for fittings

**7.1** The fittings shall be made of stainless steel, brass or plated ferrous material to prevent corrosion.

**7.2** Fittings of the crimp-on type or the screw-together reusable type shall be used. The swivel nut shall be provided with a UNF thread, and sealing shall be by means of a  $45^\circ$  cone.

NOTE 3 Material specifications and type of fitting may be affected by national safety regulations.

## 8 Requirements for hose assemblies

### 8.1 Impulse testing

**8.1.1** After treatment in accordance with 8.1.2, the assembly shall withstand a proof test as described in 6.3.2.

**8.1.2** Subject the hose assembly to an impulse test in accordance with ISO 6803. The test shall be performed with circulating oil at  $93 \text{ }^\circ\text{C}$  and at a minimum pressure of 2,5 MPa (25 bar) for 150 000 impulses.

### 8.2 Gastightness

After application, using nitrogen gas, of an internal pressure of 3,0 MPa to the test assembly, the assembly shall not show any leak when submerged in water for 5 min.

## 9 Marking

**9.1** Hoses complying with this International Standard shall be legibly and indelibly marked, at intervals of not greater than 0,5 m, with the following:

- a) the manufacturer's name or trade-mark;
- b) the quarter and year of manufacture;
- c) the size and type of hose;
- d) the number of this International Standard;
- e) the identification "LPG".

**9.2** Hose assemblies shall bear the name or trade-mark of the assembling manufacturer, and the thread size.

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