



**International
Standard**

ISO 20766-19

**Road vehicles — Liquefied
petroleum gas (LPG) fuel system
components —**

**Part 19:
Gas-tube pressure relief valves**

*Véhicules routiers — Équipements pour véhicules utilisant le gaz
de pétrole liquéfié (GPL) comme combustible —*

Partie 19: Soupape de sécurité à tube de gaz

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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.

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 document 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).

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For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 41, *Specific aspects for gaseous fuels*.

A list of all parts in the ISO 20766 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Road vehicles — Liquefied petroleum gas (LPG) fuel system components —

Part 19: Gas-tube pressure relief valves

1 Scope

This document specifies general requirements and definitions of liquefied petroleum gas fuel (LPG) components, intended for use on the types of motor vehicles as defined in ISO 3833. It also provides general design principles and specifies requirements for instructions and marking.

This document is applicable to vehicles (mono-fuel, bi-fuel or dual-fuel applications) that use gaseous fuels in accordance with ISO 9162. It is not applicable to:

- fuel containers;
- stationary gas engines;
- container mounting hardware;
- electronic fuel management;
- refuelling receptacles.

Miscellaneous components not specifically addressed in this document can be examined for conformity with the criteria of any applicable part of the ISO 20766 series, including testing to the appropriate functional tests.

All references to pressure in this document are considered gauge pressures unless otherwise specified.

This document applies to devices that have a service pressure in the range of 110 kPa (butane rich at 20 °C) and 840 kPa (propane at 20 °C). Other service pressures can be accommodated by adjusting the pressure by the appropriate factor (ratio).

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 20766-1, *Road vehicles — Liquefied petroleum gas (LPG) fuel systems components — Part 1: General requirements and definitions*

ISO 20766-2:2018, *Road vehicles — Liquefied petroleum gas (LPG) fuel systems components — Part 2: Performance and general test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20766-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

3.1

discharge pressure

pressure at which the pressure relief valve opens to release the pressure

3.2

flow capacity

relieving capacity of a gas-tube pressure relief valve measured at the flow-rating pressure

Note 1 to entry: Flow capacity is expressed in m³/min of air at a temperature of 15 °C and at a pressure of 100 kPa.

4 Markings

Marking of the component shall provide sufficient information to trace:

- a) the manufacturer or agent's name, trademark or symbol;
- b) the model designation (part number);
- c) the discharge pressure or discharge pressure and temperature range;
- d) the flow capacity;
- e) the direction of flow (when necessary for correct installation).

The following additional markings are recommended:

- the type of fuel;
- electrical ratings (if applicable);
- the symbol of the certification agency;
- the type approval number;
- the serial number or date code;
- a reference to this document.

NOTE This information can be provided by a suitable identification code on at least one part of the component when it consists of more than one part.

5 Construction and assembly

The gas-tube pressure relief valve is a device used to prevent the build-up of pressure in the tubes above a pre-set value. The gas-tube pressure relief valve shall comply with the applicable provisions of ISO 20766-1 and ISO 20766-2, and with the tests specified in [Clause 6](#) of this document.

General provisions for the gas-tube pressure relief valve are:

- mounting location shall ensure the unrestricted discharge flow and shall not impinge on enclosed areas, other vehicles, exterior-mounted systems with air intake (i.e. air-conditioning systems), engine intakes, or engine exhaust;
- gas-tube pressure relief valves shall have the following discharge pressures:
 - 3,200 ± 100 kPa if the working pressure (WP) is <3 MPa;

- 1,07 WP of the pipe ± 100 kPa if the working pressure is >3 MPa;
- gas-tube pressure relief valves shall not have leakage up to:
 - 3,000 kPa if the working pressure is <3 MPa;
 - working pressure of the pipe if the working pressure is >3 MPa.

6 Tests

6.1 Applicability

[Table 1](#) indicates the tests that shall be carried out.

Table 1 — Applicable tests

Test	Applicable	Test procedure as required by ISO 20766-2	Specific test requirements of this document
Hydrostatic strength	X	X	X (see 6.2)
Leakage	X	X	X (see 6.3)
Excess torque resistance	X	X	
Bending moment	X	X	
Continued operation (endurance)	X		X (see 6.4)
Corrosion resistance	X	X	
Operational test	X		X (see 6.5)
Vibration resistance	X	X	
Brass material compatibility	X	X	
Oxygen ageing	X	X	
Non-metallic material immersion	X	X	
Ozone ageing	X	X	
Resistance to dry-heat	X	X	
Temperature cycle test	X	X	
Flow capacity test	X		X (see 6.5.4)
Creep test	X		X (see 6.6)

6.2 Hydrostatic strength

Test the gas-tube pressure relief valve in accordance with the procedure for testing hydrostatic strength specified in ISO 20766-2:2018, Clause 5. The test pressure shall be 2,25 times the working pressure.

The purpose of this test is to check the strength of the body of the gas-tube pressure relief valve. If necessary, the moving part should be blocked to achieve the 2,25 times working pressure.

6.3 Leakage

Test the gas-tube pressure relief valve at the temperatures and pressures given in [Table 2](#).

Table 2 — Test temperatures and pressures

Temperature °C (±5 °C)	Pressure Factor × working pressure (WP)	
	First test	Second test
-40 or -20	1 × WP	0,025 × WP
20	0,025 × WP	1 × WP
85 or 120	0,05 × WP	

6.4 Continued operation (endurance)

The gas-tube pressure relief valve shall be capable of withstanding 200 cycles when tested in accordance with the provisions of the continued operation test procedure given in ISO 20766-2:2018, Clause 9 and the following.

- a) A test cycle consists of pressurizing the gas-tube pressure relief valve to the discharge pressure. This shall cause the gas-tube pressure relief valve to open and vent. Once the valve is venting, reduce the inlet pressure. The cycle is finished when the gas-tube pressure relief valve re-seats. Cycle time shall be within a period of $10 \text{ s} \pm 2 \text{ s}$.
- b) After 200 cycles, test the gas-tube pressure relief valve for leakage at $20 \text{ °C} \pm 5 \text{ °C}$ at its $1 \times$ working pressure.

6.5 Operational test

6.5.1 General

Verify the opening and re-seating pressures of the gas-tube pressure relief valve.

6.5.2 Test procedure

Three samples of each size, design and setting shall be used for start-to-discharge and resealing pressure tests. This same set of three valves shall be used for flow capacity tests for other observations indicated in the following paragraphs.

Not less than two successive start-to-discharge and resealing pressure observations shall be made on each of the three test valves under the tests outlined in [6.5.3](#) and [6.5.5](#).

6.5.3 Test No. 1: Start-to-discharge and resealing pressures of pressure relief valves

6.5.3.1 Before being subjected to a flow capacity test, the start-to-discharge pressure of each of three samples of a pressure relief valve of a specific size, design and setting shall be within +3 % of the average of the pressures. The start-to-discharge pressure of any of the three valves shall not be less than 95 % and no more than 105 % of the set pressure marked on the valve.

6.5.3.2 The resealing pressure of a pressure relief valve before being subjected to a flow capacity test shall not be less than 50 % of the initially observed start-to-discharge pressure.

6.5.3.3 A pressure relief valve shall be connected to an air or other aerostatic supply source that can maintain an effective pressure of at least 500 kPa above the marked set pressure of the valve being tested. A positive shut-off valve and a pressure gauge that have a pressure range of not less than 1,5 times nor more than 2 times the test pressure shall be installed in the pressure supply piping. The pressure gauge shall be installed in the piping between the valve being tested and the positive shut-off valve. Start-to-discharge and resealing pressure shall be observed through a water seal not over 100 mm in depth.

6.5.3.4 After recording the start-to-discharge pressure of the valve, the pressure shall be increased sufficiently above the start-to-discharge pressure to ensure unseating of the valve. The shut-off valve shall then be closed tightly and the water seal, as well as the pressure gauge, shall be observed closely. The pressure at which bubbles through the water seal cease shall be recorded as the resealing pressure of the valve.

6.5.4 Test No. 2: Flow capacity

6.5.4.1 The flow capacity of three samples of a pressure relief valve of each size, design and setting shall fall within a range of 10 % of the highest observed capacity.

6.5.4.2 During flow capacity tests on each valve, there shall be no evidence of chattering or other abnormal operating condition.

6.5.4.3 The blow-down pressure of each valve shall not be less than 65 % of the initially recorded start-to-discharge pressure.

6.5.4.4 A flow capacity test on a pressure relief valve shall be conducted at a flow rating pressure of 120 % of the maximum set pressure.

6.5.4.5 A flow capacity test on a pressure relief valve shall be conducted by utilizing a properly designed and calibrated orifice flowmeter of the flange type connected to a source of air supply of capacity and pressure not less than the set point and discharge capacity of the valve. Modifications of the flowmeter from that described in this document, and an aerostatic flow medium other than air, may be used provided the end results are the same.

6.5.4.6 The flowmeter shall be arranged according to manufacturer's specified minimum lengths of pipe both preceding and following the orifice, or other arrangements including straightening vanes, to assure no disturbance at the orifice place for the ratios of orifice to pipe diameters shall be employed.

Flanges between which the orifice plate is located and clamped shall be provided with pressure take-off lines connected to a manometer. This instrument indicates the pressure differential across the orifice plate. The reading is used in the flow calculation. A calibrated pressure gauge shall be installed in that portion of the meter pipe downstream of the orifice plate. This gauge indicates the flow pressure. The reading is also used in the flow calculation.

6.5.4.7 A temperature-indicating instrument shall be connected to the meter pipe downstream of the orifice plate to indicate the temperature of the air flowing to the safety valve. The reading of this instrument shall be integrated in the calculation to correct the temperature of the air flow to a 15 °C base temperature. A barometer shall be available for indicating the prevailing atmospheric pressure.

The reading of the barometer shall be added to the indicated air-flow gauge pressure. This absolute pressure shall be integrated in the flow calculation. The air pressure to the flowmeter shall be controlled by a suitable valve installed in the air-supply piping ahead of the flowmeter. The pressure relief valve under test shall be connected to the discharge end of the flowmeter.

6.5.4.8 After all preparations for flow capacity tests have been made, the valve in the air-supply line shall be opened slowly and the pressure to the valve under test shall be increased to the appropriate flow rating pressure. During this interval, the pressure at which the valve pops open shall be recorded as the popping pressure.

6.5.4.9 The predetermined flow rating pressure shall be maintained constant for a brief interval until the readings of the instruments become stabilized. Readings of the flow pressure gauge, pressure differential manometer and the flowing air temperature indicator shall be recorded simultaneously. The pressure shall then be decreased until there is no further discharge from the valve.

The pressure at which this occurs shall be recorded as the blow-down pressure of the valve.