INTERNATIONAL STANDARD

ISO 20766-14

First edition
2022-01

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

Part 14: Vaporizer/pressure regulator

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

Partie 14: Régulateur de pression/vapeur

Reference number
ISO 20766-14:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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.

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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 14: Vaporizer/pressure regulator

1 Scope

This document specifies general requirements for the vaporizer/pressure regulator, a component of liquefied petroleum gas fuel, 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) using gaseous fuels in accordance with ISO 9162. It is not applicable to the following:

a) fuel containers;

b) stationary gas engines;

c) container mounting hardware;

d) electronic fuel management;

e) refuelling receptacles.

It is recognized that miscellaneous components not specifically addressed herein can be examined for compliance 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 which have a service pressure in the range of 110 kPa (butane rich at 20 °C) and 840 kPa (propane at 20 °C), hereinafter referred to in this document. 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, *Road vehicles — Liquefied petroleum gas (LPG) fuel systems components — Part 2: Performance and general test methods*

ISO 20766-12, *Road vehicles — Liquefied petroleum gas (LPG) fuel systems components — Part 12: Non-return valve*

3 Terms and definitions

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

4 Markings

Marking of the component shall provide sufficient information to allow the following to be traced:

a) the manufacturer's or agent's name, trademark or symbol;

b) the model designation (part number);

c) the working pressure or working pressure and temperature range; and

d) the direction of flow (when necessary for correct installation).

The following additional markings are recommended:

— the type of fuel;

— the electrical ratings (if applicable);

— the symbol of the certification agency;

— the type approval number;

— the serial number or date code; and

— 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 vaporizer/pressure regulator shall comply with the applicable provisions of ISO 20766-1 and ISO 20766-2, and in case the vaporizer/pressure regulator consist of a PRV then it shall be in accordance with ISO 20766-12 and with the tests specified in Clause 6.

6 Tests

6.1 Applicability

The tests required to be carried out are indicated in Table 1.

Table 1 — Applicable tests

Test	Applicable	Test procedure as required by ISO 20766-2	Specific test requirements of this document
Hydrostatic strength	X		X (see 6.2)
Leakage	X		X (see 6.3)
Excess torque resistance	X	X	
Bending moment	X[a]	X	
Continued operation	X		X (see 6.4)

[a] Only if applicable.

Table 1 *(continued)*

Test	Applicable	Test procedure as required by ISO 20766-2	Specific test requirements of this document
Corrosion resistance	X	X	
Vibration resistance	X	X	
Brass material compatibility	X	X	
Oxygen ageing	X	X	
Non-metallic material immersion	X	X	
Ozone ageing	X	X	
Creep	X	X	
Resistance to dry-heat	X	X	
Insulation resistance	X		X (see 6.5)
Minimum opening voltage	X		X (see 6.6)
Pressure impulse	X		X (see 6.7)
Water jacket freezing	X		X (see 6.8)
[a] Only if applicable.			

6.2 Hydrostatic strength

Test the vaporizer/pressure regulator according to the procedure for testing hydrostatic strength specified in ISO 20766-2. The test pressure shall be 2,25 times the working pressure.

6.3 Leakage

Test the vaporizer/pressure regulator 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) (WP)	
	First test	Second test
-40 or -20	0,75 × WP	0,025 × WP
20	0,025 × WP	2,25 × WP
85	0,05 × WP	

6.4 Continued operation

6.4.1 Requirements

The pressure regulator shall be able to withstand 50 000 cycles without any failure when tested according to the following procedure. Where the stages of pressure regulation are separate, the working pressure in a) to f) is considered to be the working pressure of the upstream stage.

a) Recycle the regulator for 95 % of the total number of cycles at room temperature and at the working pressure. Each cycle shall consist of flow until a stable outlet pressure has been obtained, after which the gas flow shall be shut off by a downstream valve within 1 s, until the downstream lock-up pressure has stabilized. Stabilized outlet pressures are defined as set pressure ±15 % for at

least 5 s. The regulator shall comply with 6.3 at room temperature at intervals of 20 %, 40 %, 60 %, 80 % and 100 % of room temperature cycles.

b) Cycle the inlet pressure of the regulator for 1 % of the total number of cycles at room temperature from 100 % to 50 % of the working pressure. The duration of each cycle shall be no less than 10 s.

c) The regulator shall comply with 6.3 at room temperature at the completion of this test.

d) Repeat the cycling procedure of a) at 120 °C at the working pressure for 1 % of the total number of cycles.

e) Repeat the cycling procedure of b) at 120 °C at the working pressure for 1 % of the total number of cycles. The regulator shall comply with 6.3 at 120 °C at the completion of this test.

f) Repeat the cycling procedure of a) at −40 °C or −20 °C, as applicable and 50 % of working pressure for 1 % of the total number of cycles.

g) Repeat the cycling procedure of b) at −40 °C or −20 °C, as applicable and 50 % of working pressure for 1 % of the total number of cycles. The regulator shall comply with 6.3 at −40 °C or −20 °C, as applicable at the completion of this test.

h) At the completion of the cycles, the lock-up pressure downstream of the regulator shall not exceed the lock-up pressure specified by the manufacturer.

6.5 Insulation resistance

The insulation resistance test is designed to check for a potential failure of the insulation between the two-pin coil assembly and the pressure regulator casing.

Apply a test voltage of 500 V d.c. for a duration of 60 s between one pin of the coil and the pressure regulator casing; for coil assemblies with circuitry of 3,8 mm pitch or below, 100 V d.c. shall be used.

The minimum allowable resistance shall be >10 MΩ.

6.6 Minimum opening voltage

The minimum opening voltage at room temperature shall be ≤8 V for a 12 V system and ≤16 V for a 24 V system. The component shall be pressurized at 0,75 times the working pressure during the test.

6.7 Pressure impulse

6.7.1 Internal impulse

Conduct the following steps for the internal impulse test.

a) Subject the pressure regulator with its first stage valve locked in the open position to a sudden application of its working pressure at its inlet. The pressure regulator shall retain or release the pressure without any permanent deformation.

b) The lock-up pressure downstream of the regulator shall not exceed the lock-up pressure specified by the manufacturer.

NOTE This test was included in order to evaluate the performance of the components that may suffer from the effects of an instantaneous increase in pressure. In normal service, it is possible for this to happen, for example, when filling gas in an empty system or when a solenoid valve opens the flow of gas to an empty fuel line. Previous tests have revealed that certain designs cannot cope with these instantaneous pulses and the components tend to bend or jam.

6.7.2 External impulse

The pressure regulator shall withstand 100 inlet pressure pulses, as follows.

a) If the regulator has an integrated solenoid valve, it shall be opened by application of the rated voltage.

b) The outlet of the regulator shall be vented until the inlet fuel line is at atmospheric pressure and then closed.

c) The working pressure shall be instantaneously applied to the regulator inlet.

The pressure regulator shall contain or vent the pressure without any permanent deformation. The pressure regulator shall meet the requirements of the external leakage in accordance with 6.3, and the lock-up pressure shall not exceed the manufacturer's rated lock-up pressure after the 100 inlet pressure pulses.

The internal impulse test in 6.7.1 tests the reaction of the regulator under a pressure pulse that enters into the first stage chamber, for example, if the pressure regulator has no gas in it, the inlet valve is open and the cylinder valve opens instantaneously or the system is connected to a filling dispenser. The external impulse test in this subclause tests the resistance of the inlet valve to pulses on the high-pressure side, for example, a pressure regulator with normal working pressure inside but with no pressure in the fuel line and there is a sudden opening of the cylinder valve filled with service pressure.

6.8 Water jacket freezing

Conduct the following steps for the water jacket freezing test.

a) Attach 1-m sections of coolant hose to the coolant inlet and outlet of the regulator or water jacket. Fill the regulator or water jacket, which normally contains an antifreeze solution, with water, to normal capacity and expose it at −40 °C ± 2 °C or −20 °C ± 2 °C, as applicable, for 24 h.

b) Following the freezing conditioning, and after exposing the assembly to 20 °C ± 2 °C for a minimum of 24 h, conduct an external leakage test at room temperature according to 6.3.

A separate sample may be used for this test.

Bibliography

ISO 3833, *Road vehicles — Types — Terms and definitions*

ISO 9162, *Petroleum products — Fuels (class F) — Liquefied petroleum gases — Specifications*