



Regulator for use with liquefied petroleum — Vapour phase



AS 4621:2019

This Australian Standard® was prepared by AG-013, Components used for Gas Appliances and Equipment. It was approved on behalf of the Council of Standards Australia on 5 April 2019.

This Standard was published on 14 May 2019.

The following are represented on Committee AG-013:

- Association of Accredited Certification Bodies
- Australian Industry Group
- Energy Networks Australia
- Engineers Australia
- Gas Appliance Manufacturers Association of Australia
- Gas Energy Australia
- Gas Technical Regulators Committee
- Master Plumbers and Mechanical Services Association of Australia (Victorian)
- Master Plumbers Association of QLD

This Standard was issued in draft form for comment as DR AS 4621:2018.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

ISBN 978 1 76072 453 5



Regulator for use with liquefied petroleum — Vapour phase

Originated as AG 205—1979.
Revised as AG 205—1998.
Revised and redesignated as AS 4621—2004.
Second edition 2019.

COPYRIGHT

© Standards Australia Limited 2019

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Cth).

Preface

This Standard was prepared by the Standards Australia Committee AG-013, Components used for Gas Appliances and Equipment, to supersede AS 4621—2004, *Regulators for use with liquefied petroleum—Vapour phase*.

The objective of this Standard is to provide manufacturers, designers, regulatory authorities, testing laboratories and similar organizations with uniform minimum requirements for the safety, performance and use of regulators for use with liquefied petroleum gases (vapour phase).

This Standard should not be regarded as a design specification or as an instruction manual.

In its preparation, consideration has been given to —

- (a) continuity of satisfactory operation;
- (b) prevention of fire hazards, and explosions;
- (c) prevention of injury to persons or property;
- (d) gas rules and regulations now in force; and
- (e) relevant International Standards.

The major changes in this edition are as follows:

- (i) Updated to current drafting rules for Australian Standards.
- (ii) Review of the defined terms.
- (iii) Inclusion for an alternate ammonia based testing for stress corrosion cracking.
- (iv) Alignment, where possible, to equivalent international standards.

Figures in [Appendix A](#) relate to the relevant test methods in [Appendix B](#).

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

Contents

Preface	ii
Section 1 Scope, references, definitions and classification	1
1.1 Scope	1
1.2 Normative references	1
1.3 Terms and definitions	1
1.4 Classification	3
Section 2 Design and construction	4
2.1 Materials	4
2.1.1 Continuity of satisfactory operation	4
2.1.2 Suitability for the conditions of use	4
2.1.3 Materials in contact with gas	4
2.1.4 Melting point of metallic materials	4
2.1.5 Zinc alloy parts	4
2.1.6 Copper containing alloys	4
2.1.7 Component parts selected to appropriate Standards	4
2.2 Construction	4
2.2.1 Continued safe operation	4
2.2.2 Castings and hot pressings	4
2.2.3 Sealing of porous castings or cracks	4
2.2.4 Assembled regulator cleanliness	5
2.2.5 Parts secure against accidental displacement	5
2.2.6 Prevention of accidental shift after calibration	5
2.2.7 Attachment of knobs, handles, movable dials and pointers	5
2.2.8 Springs	5
2.2.9 Securing of parts together	5
2.2.10 Threaded connections with spanner flats	5
2.2.11 Threaded inlet connections	5
2.2.12 Sharp edges	5
2.2.13 Holes for assembly or mounting	5
2.2.14 Permanent sealing of non-functional holes	5
2.2.15 Self-tapping screws	6
2.3 Design	6
2.3.1 Accessibility for adjustment	6
2.3.2 Adjusting devices	6
2.3.3 Tightening of locking device	6
2.3.4 Design of adjustable regulator	6
2.3.5 Components requiring servicing	6
2.3.6 Venting	6
2.3.7 Pressure-relief discharge opening	6
2.3.8 Knobs and movable dials	6
2.3.9 Special purpose connections	7
2.3.10 Lock-up pressure type	7
2.4 Markings	7
2.4.1 General	7
2.4.2 Durability of markings	7
2.5 Instructions	7
Section 3 Performance requirements	9
3.1 General	9
3.1.1 Satisfactory performance in all declared mounting positions	9
3.1.2 Satisfactory performance over declared temperature range	9
3.1.3 Diaphragm stability	9
3.1.4 Weight of diaphragm material	9
3.1.5 Weight of valve seating material	9
3.1.6 Valve seat stability	9

3.2	Leakage	9
3.2.1	Regulator parts subjected to pressure	9
3.2.2	Regulator parts not subjected to full inlet pressure and no pressure relief	10
3.2.3	Regulator parts not subjected to full inlet pressure incorporating pressure relief	10
3.3	Pressure relief valves	10
3.3.1	Discharge pressure	10
3.3.2	Discharge capacity	10
3.3.3	Over pressure protection	10
3.4	Operating characteristics	11
3.4.1	Variation of outlet pressure	11
3.4.2	Pressure variation with temperature changes	11
3.4.3	Lock-up pressure	11
3.5	Mechanical strength	11
3.5.1	Regulators capable of withstanding listed torque values	11
3.5.2	Regulators capable of withstanding listed bending moments	11
3.6	Resistance to hydrocarbons	12
3.7	Durability	12
3.7.1	Cycling test	12
Appendix A (normative) Figures for regulator testing		13
Appendix B (normative) Test methods		18
Appendix C (normative) Units of pressure measurement		46
Bibliography		47

Australian Standard®

Regulator for use with liquefied petroleum — Vapour phase

Section 1 Scope, references, definitions and classification

1.1 Scope

This Standard specifies the minimum safety and performance requirements for self-acting pressure regulators, installed independently or as part of a combination control, which are used to reduce the pressure of vapour phase liquefied petroleum gases to the maximum outlet pressures specified in [Clause 1.4](#).

NOTE Requirements for gas appliance regulators are published in AS 4618.

Where a device is designed to combine the functions of two or more components it shall conform with the Standard for each component.

NOTE Conformance of a regulator or combination gas control with these requirements does not imply that it is acceptable for use without supplemental tests on the regulator installed in its intended application.

1.2 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.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1881, *Zinc alloys — Casting ingots and castings — Quality requirement*

AS 2136, *Method for detecting the susceptibility of copper and its alloys to stress corrosion cracking using the mercurous nitrate test*

AS 2473.2, *Valves for compressed gas cylinders, Part 2: Outlet connections (threaded) and stem (inlet) threads*

AS/NZS 5601.1, *Gas installations, Part 1: General installations*

AS/NZS 5601.2, *Gas Installations, Part 2: LP Gas installations in caravans and boats for non-propulsive purposes*

ISO 6957, *Copper alloys — Ammonia test for stress corrosion resistance*

1.3 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply:

1.3.1

breather vent

orifice or opening designed to permit atmospheric pressure to act on one side of the diaphragm of a regulator

1.3.2

combination gas control

an assembly of two or more different control functions in a single body

Note 1 to entry: Requirements for combination gas controls can be found in AS 4624.

1.3.3**liquefied petroleum gas****LPG****gas**

gas composed predominantly of any of the following hydrocarbons, or any combination of them in the vapour phase: propane, propene (propylene), butane, butene (butylene)

1.3.4**lock-up pressure**

outlet pressure at which a regulator closes when the outlet of the regulator is sealed

Note 1 to entry: The increase in outlet pressure is expressed either in kilopascals or as a percentage.

1.3.5**may**

indicates the existence of an option

1.3.6**metric standard conditions****MSC**

absolute temperature of 288.15 K (15 °C) and an absolute pressure of 101.325 kPa

1.3.7**nominal outlet pressure**

outlet pressure or outlet pressure range of a regulator, as specified by the manufacturer

1.3.8**over pressure protection**

preventing downstream components from exposure to excessive pressure by shutting off gas flow or discharging gas

1.3.9**rated working pressure**

maximum allowable inlet pressure as specified by the manufacturer

1.3.10**regulator**

device which automatically regulates the outlet pressure or the outlet volume of gas passing through it to a predetermined value

Note 1 to entry: Regulators may be adjustable or non-adjustable.

1.3.11**regulator capacity**

maximum flow rate of the regulator as specified by the manufacturer

1.3.12**regulator range**

range of flow rate(s) for which the regulator is suitable, as specified by the manufacturer

1.3.13**shall**

indicates that a statement is mandatory

1.3.14**should**

indicates a recommendation

1.3.15**single stage reduction**

arrangement whereby prevailing cylinder pressure or tank pressure is reduced to a specified outlet pressure by means of a single regulator

1.3.16**two stage reduction**

arrangement whereby prevailing cylinder pressure or tank pressure is reduced to a specified pressure by means of two regulator stages

1.3.17**vent limiter**

device or fixed orifice intended to limit the open port area of any vent

1.4 Classification

Regulators shall be classified according to their pressure ranges as indicated in [Table 1](#).

Table 1 — Outlet pressure range of regulator

Classification	High pressure		Low pressure		Integral (Two stage)
	First stage	Single stage	Second stage	Single stage	
Inlet pressure (kPa)	250–1 750	250–1 750	35–250	250–1 750	250–1 750
Outlet pressure (kPa)	35–250	> 7	≤ 7	≤ 7	< 7

Section 2 Design and construction

2.1 Materials

2.1.1 Continuity of satisfactory operation

Materials used in the construction of a regulator shall be such that continuity of safe and satisfactory operation can be expected during normal usage according to the manufacturer's specifications.

2.1.2 Suitability for the conditions of use

The materials and finishes, including dressings and lubricants, used in the construction of a regulator, shall be suitable for the conditions of use (taking into account, for example, corrosion, temperature, handling, etc.).

2.1.3 Materials in contact with gas

Materials in contact with the gas, including lubricants, dressings and jointing compounds, shall be suitable for use with LPG.

2.1.4 Melting point of metallic materials

The regulator and valve body castings and vent limiters shall be made of metallic materials with a melting point not less than 430 °C.

Conformance shall be assessed by testing in accordance with the method in [Clause B.4](#).

2.1.5 Zinc alloy parts

Zinc alloy parts shall be in accordance with AS 1881 or equivalent.

2.1.6 Copper containing alloys

Components made of copper containing alloys shall be resistant to stress corrosion cracking when tested in accordance with ISO 6957 or AS 2136.

2.1.7 Component parts selected to appropriate Standards

Alloys used for component parts should conform to relevant Australian Standards for metallic alloys or their equivalent.

2.2 Construction

2.2.1 Continued safe operation

Construction shall ensure the continued safe operation of the unit during usage in accordance with the manufacturer's specification.

2.2.2 Castings and hot pressings

All castings and hot pressings shall be clean and sound, free from laps, blow holes and pitting. All surfaces not machine finished shall be clean, smooth and free from sand.

2.2.3 Sealing of porous castings or cracks

Porous castings or cracks in gas-carrying parts shall be sealed by an accepted method for the impregnation of castings, such as vacuum impregnation.

2.2.4 Assembled regulator cleanliness

The assembled regulator shall not contain dirt, casting sand, swarf or other foreign matter. There shall be no excess diaphragm dressing or jointing compound in the regulator.

2.2.5 Parts secure against accidental displacement

Every part shall be secure against accidental displacement. Parts shall be constructed to maintain a fixed relationship between essential parts under normal and reasonable conditions of handling and usage to ensure continued conformance to this Standard.

2.2.6 Prevention of accidental shift after calibration

A means provided for factory calibration shall be factory sealed to prevent accidental shifting after calibration.

2.2.7 Attachment of knobs, handles, movable dials and pointers

Knobs, handles, movable dials and pointers, where supplied, shall be securely attached to their spindles.

2.2.8 Springs

Springs shall be resistant to corrosion. The ends of a helical spring shall be flat and in a plane perpendicular to the axis of the spring. The coils of a cylindrical helical spring shall not be able to overlap.

2.2.9 Securing of parts together

Adhesives shall not be used for securing parts together without a means of additional mechanical fixing. Adhesives may be used for labels.

2.2.10 Threaded connections with spanner flats

Threaded connections shall be provided with spanner flats.

2.2.11 Threaded inlet connections

A threaded inlet connection of a regulator shall be to an approved Standard for the intended application.

A threaded outlet connection of a regulator shall be as specified in AS/NZS 5601.1 and AS/NZS 5601.2 for the intended application.

2.2.12 Sharp edges

Any accessible part(s) shall be free from sharp edges that may cause damage or injury once installed or adjusted (if applicable).

2.2.13 Holes for assembly or mounting

Holes intended for the assembly of parts or for mounting shall not open into gasways. Holes shall provide a minimum wall thickness of 1 mm from gasways.

2.2.14 Permanent sealing of non-functional holes

Non-functional holes used for manufacture and which form a passage between gasways and the atmosphere shall be permanently sealed by mechanical means.

2.2.15 Self-tapping screws

Self-tapping screws, other than those that form a fully swaged machine type thread, shall not be used to secure together the external joint of a gas-carrying component that may be removed in servicing. The application of thread-forming screws shall be limited to malleable materials. The application of thread-forming screws shall not result in deformation or cracking of the component.

2.3 Design

2.3.1 Accessibility for adjustment

Integral parts that may require adjustment shall be accessible for adjustment.

Regulators shall be able to be commissioned, serviced or replaced with tools and appropriate equipment common to the gasfitting trade.

2.3.2 Adjusting devices

Adjusting devices shall be arranged so as to prevent any movement other than the intended manual adjustment.

2.3.3 Tightening of locking device

The tightening of a locking device shall not alter the setting.

2.3.4 Design of adjustable regulator

The design of an adjustable regulator shall be such that at no point in the range of adjustment is it possible for the regulator to be rendered ineffective.

2.3.5 Components requiring servicing

Components requiring servicing during normal use shall be accessible and be manufactured so that parts cannot be incorrectly assembled.

2.3.6 Venting

The venting of the atmospheric pressure chamber of a regulator for the purpose of pressure relief shall occur through a vent limiter, or there shall be provision for connecting a vent line.

The vent limiter shall be so constructed and located that it cannot easily become blocked. It shall not be possible for a cleaning device inserted into the vent limiter to readily damage the diaphragm.

A breather vent shall be located on the atmospheric side of the diaphragm and allow free movement of the regulator diaphragm.

2.3.7 Pressure-relief discharge opening

Where a regulator is constructed with an integral pressure relief valve, the vent opening shall also serve as the pressure-relief discharge opening.

A regulator with a pressure-relief discharge opening shall have provision for connecting a vent line, except for regulators designed for direct connection to a gas cylinder.

2.3.8 Knobs and movable dials

Knobs and movable dials shall be designed to avoid accidental change of setting in service.

2.3.9 Special purpose connections

Regulators supplied with special purpose fittings for a specific appliance shall be suitable for the application.

Where a regulator is designed to be connected directly to a cylinder, the regulator inlet connection shall be in accordance with AS 2473.2 for that cylinder type and size.

2.3.10 Lock-up pressure type

Regulators shall close and prevent the flow of gas when the outlet is exposed to the lock-up pressure.

2.4 Markings

2.4.1 General

Markings shall be provided and include the following:

- (a) Manufacturer's name or trade mark.
- (b) Model designation.
- (c) Date of manufacture or serial number.
- (d) Rated working pressure marked in accordance with [Appendix C](#).
- (e) Direction of flow.
- (f) Outlet pressure/pressure range, in kPa.
- (g) Mounting position where necessary for correct operation.

Items (f) and (g) may be omitted if the model designation enables the information to be obtained from instructions supplied with the regulator.

2.4.2 Durability of markings

Markings shall remain legible, durable and permanently attached throughout the life of the regulator.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.5](#).

2.5 Instructions

Instructions in English shall be available, and include the following:

- (a) Model designation(s) and alternative forms.
- (b) Rated working pressure.
- (c) Temperature limitations in °C.
- (d) Mounting limitations.
- (e) Regulator classification.
- (f) Performance characteristics including range of outlet pressures and flow rates, regulator capacity and initial setting conditions.
- (g) Method of operation, adjustments and applications.
- (h) Fault diagnosis and servicing.

- (i) Thread or other connection specifications, as applicable.

Section 3 Performance requirements

3.1 General

3.1.1 Satisfactory performance in all declared mounting positions

The performance shall be satisfactory in all mounting positions declared by the manufacturer.

3.1.2 Satisfactory performance over declared temperature range

The performance shall be satisfactory over the manufacturer's declared temperature range, which shall be at least $-20\text{ }^{\circ}\text{C}$ to $60\text{ }^{\circ}\text{C}$.

3.1.3 Diaphragm stability

For a regulator with no pressure relief mechanism, bursting or pull out of the diaphragm shall not occur when a test pressure of 300 kPa for a low pressure regulator and 1 750 kPa for a high pressure regulator is applied to the regulator outlet.

Conformance shall be assessed by testing in accordance with the method in [Clause B.6](#).

3.1.4 Weight of diaphragm material

The diaphragm material shall not show a change in weight exceeding —

- (a) $\pm 20\%$ after immersion in n-pentane for 72 h; and
- (b) $\pm 10\%$ after a further 24 h drying in air.

Conformance shall be assessed by testing in accordance with the method in [Clause B.7](#).

3.1.5 Weight of valve seating material

The valve seating material(s) shall not show a change in weight exceeding—

- (a) $\pm 10\%$ after immersion in n-pentane for 72 h, and
- (b) $\pm 5\%$ after a further 24 h drying in air.

Conformance shall be assessed by testing in accordance with the method in [Clause B.7](#).

3.1.6 Valve seat stability

The valve seat fitted in its housing shall show no evidence of being forced out of position after immersion in liquid propane for 72 h.

Conformance may be determined by visual inspection after immersion for 72 h.

3.2 Leakage

3.2.1 Regulator parts subjected to pressure

Those parts of a regulator subjected to full inlet pressure shall be leak tight at a pressure of 2.6 MPa for a first stage or single stage regulator and 375 kPa for a second stage regulator.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.8](#).

3.2.2 Regulator parts not subjected to full inlet pressure and no pressure relief

For a regulator that does not incorporate pressure relief, those parts that are not subjected to full inlet pressure shall be leak tight at 3 times the maximum outlet pressure or 1100 kPa, whichever is the lesser.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.9](#).

3.2.3 Regulator parts not subjected to full inlet pressure incorporating pressure relief

For a regulator that incorporates pressure relief, those parts that are not subjected to full inlet pressure shall be leak tight at 90 % of the minimum start-to-discharge pressure, as determined by [Clause 3.3.1](#).

Conformance shall be assessed by testing in accordance with the method given in [Clause B.10](#).

3.3 Pressure relief valves

3.3.1 Discharge pressure

Pressure relief valves incorporated in the regulator shall start to discharge between 1.7 times and 3 times the midpoint of the outlet pressure range for a low pressure regulator, and between 1.25 times and 2.5 times the midpoint of the outlet pressure range for a high pressure regulator.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.11](#).

3.3.2 Discharge capacity

The discharge capacity of a pressure relief valve at any inlet pressure between 7 kPa and 35 kPa above the start-to-discharge pressure setting of the relief valve shall be at least that calculated by the formula below:

$$Q = 6.5DP$$

where

Q = pressure relief valve discharge in L/h of air

D = diameter of regulator orifice in mm or 3, whichever is the greater

P = inlet pressure to relief valve in kPa above the start-to-discharge pressure setting of the relief valve

NOTE A pressure relief valve conforming with these requirements is intended to protect against excessive build-up of downstream pressure resulting from seat leakage which might occur due to some slight imperfection at the seating area. Such a valve does not necessarily safeguard against an excessive outlet pressure resulting from complete failure of the regulator to control the pressure.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.11](#).

3.3.3 Over pressure protection

Regulators designed to provide over pressure protection shall perform in accordance with the manufacturer's specifications.

Protection may be by way of —

- (a) pressure relief; and/or
- (b) shut-off device to shut off the flow of gas at the regulator outlet.

Once activated, a shut off device shall not permit flow until it has been manually reset.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.12](#) or [Clause B.13](#), as appropriate.

3.4 Operating characteristics

3.4.1 Variation of outlet pressure

The outlet pressure of the regulator over the regulator range of inlet pressures specified respectively in [Clause 1.4](#) and [Clause 2.5](#) shall remain within $\pm 25\%$ of the manufacturer's nominal outlet pressure setting.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.14](#).

3.4.2 Pressure variation with temperature changes

When the outlet pressure of the regulator is at the mechanical centre of the adjustment range and the temperature is varied between $-20\text{ }^{\circ}\text{C}$ and the maximum temperature declared by the manufacturer or $60\text{ }^{\circ}\text{C}$, whichever is higher, the outlet pressure shall not vary by more than $\pm 25\%$.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.15](#).

3.4.3 Lock-up pressure

The lock-up pressure shall not exceed 1 kPa above the declared outlet pressure for a low pressure regulator, and 30 % above the set pressure for a high pressure regulator.

Conformance shall be assessed by testing in accordance with the method given in [Clause B.16](#).

3.5 Mechanical strength

3.5.1 Regulators capable of withstanding listed torque values

The regulator shall be capable of withstanding, without loss of operation, permanent deformation or leakage, the torque values given in [Table 2](#), as applied to a pipe being connected to the regulator.

Conformance shall be assessed in accordance with the method given in [Clause B.17](#).

Table 2 — Torque values

Nominal size mm	Torque Nm
6	15
8	20
10	35
15	50
20	75
25	90
32	105
40	115
50	135

3.5.2 Regulators capable of withstanding listed bending moments

The regulator shall be capable of withstanding, without loss of operation, permanent deformation or leakage, the bending moments given in [Table 3](#), similar to those applied to a pipe connected to the regulator.