

Australian Standard™

**Low pressure regulators for use in
industrial compressed gas reticulation
systems**



This Australian Standard was prepared by Committee ME-002, Gas Cylinders. It was approved on behalf of the Council of Standards Australia on 29 September 2000 and published on 31 January 2001.

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Australian Association of Certification Bodies
Australian Chamber of Commerce and Industry
Australian Gas Association
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee ME/2, Gas Cylinders to standardize the requirements of low pressure regulators for use with industrial gas reticulation systems that are operating at pressures up to 2100 kPa.

This Standard is the result of a consensus among representatives on the Joint Committee to produce it as an Australian Standard.

This Standard intends to eliminate the dangers of cross connection that may occur when high and low pressure regulators are used. AS 4267, *Pressure regulators for use with industrial compressed gas cylinders* caters for high pressure regulators, however, there is the danger that, because low pressure inlet connection sizes have not been covered by this Standard, these low pressure regulators may be inadvertently put into a high pressure reticulation system. This Standard, by specifying low pressure inlet connection details, will eliminate this problem for the compressed gas industry.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

Acknowledgment is given to the Compressed Gas Association (CGA) of the United States of America in using their details in Figures 1 and 2 from the CGA E-1 series of connections.

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STANDARDS AUSTRALIA

Australian Standard**Low pressure regulators for use in industrial compressed gas
reticulation systems****1 SCOPE**

This Standard specifies the requirements of low pressure regulators for use with industrial gas pipelines up to 2100 kPa. Pressure regulators for use with medical gas pipelines, together with fixed delivery pressure LPG regulators for domestic and recreational purposes are not covered by this Standard. Recommendations for regulators for use in beverage dispensing pipelines have been included for users in that industry.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 1349 Bourdon tube pressure and vacuum gauges
- 2473 Valves for compressed gas cylinders (threaded outlet)
- 2700 Colour standards for general purposes
- 4267 Pressure regulators for use with industrial compressed gas cylinders
- 4289 Oxygen and acetylene gas reticulation systems
- 4484 Industrial, medical and refrigerant compressed gas cylinder identification

CGA

- E-1 Standard connections for regulator outlets, torches and fitted hose for welding and cutting equipment
- G-4.1 Cleaning equipment for oxygen service

3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 4267 and those below apply.

3.1 Compressed gas pipeline regulator

A regulator intended for connection only to regulated pressure pipelines, fitted with inlet connections as specified in this Standard and used for reducing a nearly constant relatively low inlet pressure to an outlet pressure (to be as constant as possible) in connection with the flow rate which may be changed.

3.2 Maximum working pressure (MWP)

The maximum pressure at which a regulator is allowed to operate continuously and for which it has been designed. See AS 4289 for oxygen and acetylene pipeline pressures.

3.3 Pressure regulator

A device used for reducing the pressure of a gas from a variable inlet pressure to an outlet pressure that relates to the rate of flow of that gas.

3.4 Rated inlet pressure (p_1)

The maximum pipeline pressure specified for the intended gas.

3.5 Maximum outlet pressure (p_2)

The maximum outlet pressure that the regulator will deliver.

3.6 Stabilized outlet pressure (p_4)

The constant outlet pressure of the regulator after flow ceases.

3.7 Outlet pressure for standard discharge flow (p_5)

The outlet pressure of the regulator when it is delivering its standard discharge flow Q_1 at inlet pressure p_1 .

3.8 Standard discharge (Q_1)

Flow specified by the manufacturer for which the regulator has been designed to maintain the outlet pressure for standard discharge, p_5 , at an inlet pressure, p_1 .

3.9 Flashback arrester

A device which quenches a flame front (flashback or decomposition).

4 GENERAL DESIGN REQUIREMENTS

4.1 Maximum working pressure (MWP)

Compressed gas pipeline regulators shall be designed for one of the following maximum working pressures given in Table 1.

TABLE 1
REGULATOR'S MAXIMUM WORKING PRESSURE

Gases	Rated inlet pressure p_1 (see Note)	kilopascals Maximum working pressure (MWP) (see Note)
Oxygen	2100	2520
Inert gases and inert gas mixtures	2100	2520
Acetylene	150	1800
CO ₂ and CO ₂ mixtures	2100	2520
LPG and natural gas	400	2520
Hydrogen and other fuel gases	2100	2520

NOTE: The rated inlet pressure p_1 corresponds to the maximum pipeline pressure (see Clause 3.4). For some gases, these are limited for safety, regulatory or standardization reasons. A safety factor for the maximum working pressure is specified in AS 4289 (1.2 times for oxygen and 12 times for acetylene) and a similar figure specified for the other gases in Table 1.

4.2 Service temperature range

Regulators shall be designed to operate in the temperature range -10°C to 65°C .

4.3 Materials

Materials used shall be compatible with the gases with which they will come in contact, under the working conditions defined in this Standard. Unless a specific requirement is given in this Standard, the materials selected shall be suitable for the intended purpose on the basis of generally accepted technical practice, or shall be suitable on the basis of experience, and the scientific and technical knowledge at the time of manufacture. Care shall be undertaken to ensure that materials used with any oxygen service are compatible and safe for use with oxygen.

4.4 Pressure gauges

Bourdon tube pressure gauges used in pressure regulators shall comply with the requirements of AS 1349.

4.5 Pressure relief devices

Regulators may be fitted with safety devices to allow them to comply with the requirements of Clause 6.3 of this Standard, and to protect them against minor component failures. However, these devices shall not be considered safety devices for the protection of downstream equipment, nor for protecting the equipment to which they are attached.

4.6 Attachments

Attachments for compressed gas regulators, like flowmeters and pressure indicators, shall be designed with due regard to the maximum outlet pressures and other requirements of the regulator to which they will be attached. Flashback arresters shall be attached to the regulators in oxy-fuel applications (see AS 4289).

5 SPECIFIC DESIGN REQUIREMENTS

5.1 Acetylene regulators

Regulators intended for service with acetylene shall be designed in such a way that it shall not be possible to adjust them to an outlet pressure exceeding 150 kPa in the flowing condition. The stabilized outlet pressure may exceed 150 kPa as designated in Clause 7.2.

For the purpose of the above requirement, the stabilized pressure (when gas withdrawal is stopped) is not considered to be an outlet pressure.

5.2 Oxygen regulators

Oxygen regulators shall be designed, manufactured, stored and cleaned with proper consideration of any possible oxygen ignitions.

Non-metallic materials used on oxygen regulators shall comply with the minimum ignition temperature test of Appendix A.

5.3 LPG regulators

Non-metallic materials used on LPG regulators shall comply with the compatibility test in Appendix B.

5.4 CO₂ and CO₂ mixture regulators

Non-metallic materials used on CO₂ and CO₂ mixture regulators shall be chosen with due consideration of the properties of CO₂ (e.g. leaching of plasticizers, explosive decompression).

6 CONSTRUCTION REQUIREMENTS

6.1 Materials for acetylene regulators

The copper content of materials likely to come in contact with acetylene shall not exceed 70% by mass.

NOTE: Production tolerances should be included in the alloy contents.

Where brazing alloys are used, the filler material joint shall not exceed 0.3 mm thickness. The copper content of the alloy shall not exceed 37% and the silver content shall not exceed 46%.

6.2 Materials for oxygen regulators

The regulator body and bonnet shall not be manufactured from aluminium or ferrous alloys, or any materials not compatible with oxygen at these pressures.

6.3 Overpressure requirement

The high pressure side of a pressure regulator shall resist a hydrostatic test of 1.5 times its maximum working pressure without permanent deformation when tested in accordance with Appendix C.

The high pressure side of a pressure regulator shall resist a hydrostatic test of three times the maximum inlet pressure without rupture or separation of parts when tested in accordance with Appendix C.

For acetylene regulators, both tests shall be conducted at 1800 kPa to account for the overpressure generated by acetylene decomposition.

The low pressure side of a single-stage regulator, or the intermediate stage of a multi-stage regulator, shall retain or release, without rupture or disassembly of parts, its maximum working pressure when tested in accordance with Appendix D.

The high pressure side and low pressure side overpressure requirements shall be satisfied by type test only.

6.4 Inlet filter

An inlet filter shall be fitted upstream of the pressure-reduction mechanism.

The filter shall be made of a material compatible with the gases for which the regulator is designed to be used with and be capable of retaining particles of at least 50 µm.*

6.5 Pressure adjustment

Regulators shall be designed and manufactured in such a way that it is not possible for the pressure regulator valve to be held in the open position, for example, as a consequence of the spring being compressed to its solid length. If the dimensions of the pressure-adjusting screw are related to the prevention of the spring being compressed to its solid length, then the pressure-adjusting screw shall not be removable.

Should the regulator be intended to have a fixed output pressure, the pressure-regulating mechanism shall be adjustable only with special tools except where the regulator is intended for use in an installation to which access is limited.

NOTE: Within the CO₂ and CO₂ mixtures applications field it is common for operations and service personnel to re-adjust frequently preset regulators.

6.6 Inlet fittings

Inlet fittings for regulators intended to be readily detachable from the pipeline shall be as specified in Table 2 and Figures 1 and 2. If the regulator is not intended to be readily detachable from the pipeline, other connections may be used, e.g. pipe threads.

TABLE 2
INLET CONNECTIONS FOR PIPELINE REGULATORS

Gases	Inlet connection (Note)	Designation
Oxygen	CGA E-1 024 (refer Figure. 1)	.875-14 UNF 2A RH EXT
Inert gases and mixtures, and CO ₂ and CO ₂ mixtures	CGA E-1 034 (refer. Figure 2)	.875-14 UNF 2B RH INT
Fuel gases	CGA E-1 025 (refer. Figure 1)	.875-14 UNF 2A LH EXT

NOTE: The inlet fittings of pipeline gas regulators cannot be those of AS 2473 because cylinder inlet pressures can be much higher than those in Table 1. Regulators fitted with AS 2473 inlet connections have to be designed for the maximum pressure allowable for those fittings, i.e. the requirements of AS 4267 apply.

* µm = one millionth of a metre.