

Australian Standard™

Combination controls for gas



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Australian Standard™

Combination controls for gas

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PREFACE

This Standard was reviewed by the Standards Australia Committee, AG-011, Gas Components and Industrial Equipment, to supersede AG 209—1998, *Approval requirements for combination controls*. The Standard is republished without technical alterations.

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 combination controls for gas appliances.

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

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

CONTENTS

	<i>Page</i>
SECTION 1 SCOPE, CLASSIFICATION AND DEFINITIONS	
1.1 SCOPE	4
1.2 CLASSIFICATION	4
1.3 DEFINITIONS	5
SECTION 2 DESIGN AND CONSTRUCTION	
2.1 MATERIALS	8
2.2 CONSTRUCTION.....	8
2.3 DESIGN	10
2.4 MARKINGS.....	11
2.5 INSTRUCTIONS	12
SECTION 3 PERFORMANCE REQUIREMENTS	
3.1 GENERAL	13
3.2 GAS LEAKAGE	13
3.3 FLOW RATE	13
3.4 VOLTAGE VARIATION.....	14
3.5 MECHANICAL STRENGTH	14
3.6 THERMOELECTRIC FLAME SAFEGUARDS	14
3.7 PRESSURE REGULATORS.....	14
3.8 THERMOSTATS	15
3.9 AUTOMATIC SHUT OFF VALVES.....	15
3.10 OTHER FUNCTIONS.....	15
3.11 GAS/AIR RATIO CONTROLS.....	15
3.12 DURABILITY	15
APPENDICES	
A FIGURES A1 TO A3.....	17
B METHODS OF TEST.....	20
C LIST OF REFERENCED DOCUMENTS	54

STANDARDS AUSTRALIA

Australian Standard

Combination controls for gas

SECTION 1 SCOPE, CLASSIFICATION AND DEFINITIONS

1.1 SCOPE

These requirements apply to combination controls up to 50 mm size for use on natural gas (NG), simulated natural gas (SNG), town gas (TG), tempered liquefied petroleum gas (TLP) and liquefied petroleum gas (LPG), at pressures up to 1050 kPa.

Compliance of a combination control with these requirements does not imply that it is acceptable for use without supplemental tests in its intended application.

A combination control incorporating electrical components shall comply with the requirements of the appropriate electrical authority.

Requirements for independent manual shut off valves, appliance regulators, thermostats, thermoelectric flame safeguards, igniters, automatic shut off valves and electronic flame safeguards are published in AS 4617, AS 4618, AS 4619, AS 4620, AS 4621, AG 210(to be AS 4625) and AG 214(to be AS 4629) respectively.

1.2 CLASSIFICATION

1.2.1 Regulator function classified according to type, class, and grade

1.2.1.1 Regulator type

The regulator type for a combination control shall be one of the following:

- (a) Fixed outlet pressure regulator—A regulator having one non-adjustable nominal outlet pressure (P_n) as specified by the manufacturer.
- (b) Adjustable outlet pressure regulator—A regulator on which the outlet pressure can be adjusted between minimum and maximum nominal outlet pressure P_n (min) and P_n (max) as specified by the manufacturer.

1.2.1.2 Class

The range of flow rates for which a regulator readjustment is not necessary, as specified by the manufacturer.

The classes shall be as listed in Table 1.1.

TABLE 1.1
FLOW RATES

Class	Range of flow rate
1	0.025 Q_m — Q_m
2	0.1 Q_m — Q_m
3	0.5 Q_m — Q_m
4	Fixed rate

NOTE: Q_m is the maximum flow rate specified by the manufacturer.

1.2.1.3 Grade

The grade of a regulator within a combination control—

- (a) where it is the last control function shall be the maximum variation in the regulator outlet pressure specified by the manufacturer about the set pressure over the range of flow rates appropriate to its class and over the permissible inlet pressure range specified by the manufacturer; or
- (b) where it is not the last control function shall be the maximum variation in the combination control outlet pressure specified by the manufacturer at any flow rate appropriate to its class and over the permissible inlet pressure range specified by the manufacturer.

The grades shall be as listed in Table 1.2

TABLE 1.2
MAXIMUM PRESSURE VARIATION

Grade	Max pressure variation as a percentage of set pressure
10	±10
20	±20

1.2.2 Automatic shut off valve function classification

The automatic shut off valve function of a combination control shall be classified as follows:

- (a) Class 1 An automatic shut off valve having the tightest shut off with respect to closure against reverse flow conditions.
- (b) Class 2 As Class 1 but with a lower shut off requirement with respect to closure against reverse flow conditions.
- (c) Class 3 As Class 1 but with no closure requirements against reverse flow conditions.

1.3 DEFINITIONS

For the purposes of this Standard, the following definitions apply:

1.3.1 Authority

Means the authority having jurisdiction or such authority as delegated. (Technical Regulator).

1.3.2 Certified

Assessed by a certifying body, and having a certificate number to demonstrate compliance with a Standard.

1.3.3 Certifying body

A body acceptable to the Technical Regulator that provides assurance of compliance of appliances and components with nominated standards or other accepted safety criteria.

1.3.4 Combination gas control

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

1.3.5 Flame safeguard

A safety device that automatically cuts off the gas supply if the actuating flame is extinguished.

1.3.6 Gas

A combustible fuel gas which may be one of the following:

1.3.6.1 Natural gas (NG)

A hydrocarbon gas, consisting mainly of methane.

1.3.6.2 Simulated natural gas (SNG)

A gas comprising a mixture of LPG and air, in the approximate proportions of 55% gas and 45% air for commercial propane.

1.3.6.3 Town gas (TG)

A gas manufactured from coal or petroleum feedstocks.

1.3.6.4 Tempered liquefied petroleum gas (TLP)

A gas comprising a mixture of LPG and air, in the approximate proportions of 27% gas and 73% air for commercial propane.

1.3.6.5 Liquefied petroleum gas (LPG)

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

1.3.7 Gas, high pressure

Gas supplied at pressures of over 200 kPa.

1.3.8 Gas, low pressure

Gas supplied at pressures of 7 kPa or less.

1.3.9 Gas, medium pressure

Gas supplied at pressures of over 7 kPa and up to 200 kPa.

1.3.10 Heating value, gross (at constant pressure)

The number of megajoules liberated when one cubic metre of dry gas, at standard conditions of temperature (15°C) and absolute pressure (101.325 kPa), is completely burnt in air with all the water formed by the combustion process in the liquid state and with the products of combustion at standard conditions.

NOTE: Calculation of heating value is based upon ISO 6976 as given in AS 4646.

1.3.11 Over-temperature cut-out device

A manual reset or non-resetting device that functions to shut off the gas supply to a burner or burners to prevent temperature exceeding a pre-determined level.

1.3.12 Rated working pressure

The maximum allowable inlet pressure specified by the manufacturer.

1.3.13 Regulator

A device which automatically regulates the outlet pressure or the outlet volume of gas passing through it to a pre-determined value. Regulators may be adjustable (usually spring-loaded) or non-adjustable (usually weight-loaded).

1.3.14 Relative density

The density of a known volume of dry gas relative to that of the same volume of dry air under the same conditions of temperature and pressure.

1.3.15 Relay valve

A diaphragm operated valve with a controlled weep flow rate that governs the action of the valve.

1.3.16 Safety shut off valve

An automatic shut off valve used to shut off gas supply to an appliance when a signal is generated indicating that a dangerous condition has developed.

1.3.17 Thermostat

A device which automatically maintains a pre-determined temperature in an appliance or component.

1.3.18 Valve

A device for the purpose of controlling or shutting off flow.

SECTION 2 DESIGN AND CONSTRUCTION

2.1 MATERIALS

2.1.1 Continuity of satisfactory operation

Materials used in the construction shall be such that continuity of satisfactory operation can be expected during normal usage within the manufacturer's specification.

2.1.2 Suitability of materials for conditions of use

Materials and finishes, including dressings and lubricants, used in the construction, shall be suitable for the conditions of use (e.g. 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 all gases.

2.1.4 Melting point of materials

The combination control body(s), valve plugs, related structural components and retaining devices shall be made of metallic materials with a melting point not less than 430°C.

2.1.5 Parts in contact with water

All parts that are in contact with water e.g. a thermostat, shall have a corrosion resistance not inferior to alpha inhibited brass. (Refer to AS 2345).

2.1.6 Brass parts

Brass parts shall be resistant to season cracking when tested in accordance with AS 2136.

2.1.7 Component parts materials selected to appropriate Standards

Alloys used for component parts shall be selected from appropriate Australian Standards or their equivalent.

2.2 CONSTRUCTION

2.2.1 Continuity of satisfactory operation

Construction shall ensure the continued safe operation of the unit during usage within 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 and 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 not be sealed other than by an accepted method for the impregnation of castings e.g. vacuum impregnation.

2.2.4 Assembled control to be clean

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

2.2.5 Accidental displacement of parts

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

2.2.6 Calibration

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

Adhesives shall not be used for securing parts together without additional mechanical fixing means, except for labels.

2.2.10 Sharp edges

Constituent parts shall be free from sharp edges that may cause damage or injury.

2.2.11 Ignition means incorporated in combination control

Where a means of ignition is incorporated in a combination control, the control shall be sufficiently robust to prevent distortion or damage in performing this additional operation.

2.2.12 Means of limiting the travel of manual valves

The means of limiting the travel of a manual valve shall be so arranged that it cannot be displaced or damaged.

2.2.13 Holes for assembly or mounting

Holes for screws, pins, etc., intended for the assembly of parts or for mounting shall not open into gasways and 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 and shall not result in deformation or cracking of the component.

2.2.16 Application of sealant

Parts that require the addition of sealant to maintain gas tightness shall be capable of having the sealant added without dismantling the control.

2.2.17 Construction of parts not covered by this Standard

The construction of parts not covered by this Standard shall be in accordance with reasonable concepts of safety, substantiality and durability. The general assembly shall be of a neat and workmanlike character with all parts well fitted.

2.2.18 Tightening of a gland or any other adjustments

The tightening of a gland or any other adjustment will not destroy the ability of the control to meet this Standard.

2.3 DESIGN

2.3.1 Safety functions—‘Fail-safe’ type

All safety functions of a combination control shall be of the fail-safe type.

2.3.2 Safety device cannot be overridden

No means shall be incorporated to bypass, hold open or partly open any safety function when it should be closed.

2.3.3 Accessibility of integral parts

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

2.3.4 Adjusting devices

Adjusting devices shall be arranged to prevent movement other than manual adjustment.

2.3.5 Locking device

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

2.3.6 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.

2.3.7 Components requiring servicing

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

2.3.8 Special tools not required for servicing or replacement

Special tools beyond those normally carried by service personnel shall not be required for field servicing or replacement.

2.3.9 Venting

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

Where venting occurs through a vent limiter the orifice shall have a maximum diameter of 0.4 mm for LP gases and 0.7 mm for all other gases.

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

2.3.10 Knobs and movable dials

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

2.3.11 Valves

Self-latching and snap-acting manual valves shall be positive in their action, and easy to operate with one hand.

2.3.12 Connections

With the exception of a combination control supplied with special purpose fittings for a specific appliance, the connections shall be in accordance with an approved standard and, if threaded, shall be provided with spanner flats.

2.3.13 Pressure test points

Pressure test points shall accept 6 mm bore tubing and the orifice shall be no greater than 0.7 mm diameter.

2.3.14 Noise of operation

Combination controls shall not be unduly noisy in operation.

2.3.15 Manual shut off valves

Manual shut off valves shall close in a clockwise direction and have a positive stop at the 'off' position and where the manual shut off valve has three positions ('on-pilot-off') there shall be a positive stop or detent at the pilot position to prevent movement from 'off' to 'on' and/or 'on' to 'off' without stopping at the pilot position.

2.3.16 Ignition interlock

If an ignition interlock is incorporated, it shall permit ignition only with the gasway to the main burner closed.

2.3.17 Restart interlock

If a restart interlock is incorporated, it shall not be possible to reopen the gasway to the main burner(s) within the closing time of the flame safeguard.

2.3.18 Automatic shut off valve

An automatic shut off valve shall include all the components necessary for the normal function when used as specified by the manufacturer. The components shall be either factory assembled or planned for field assembly as a unit. Two or more sub-assemblies intended to be assembled in the field shall be capable of being so assembled without requiring any sub-assembly to be cut, drilled or otherwise modified. Two or more sub-assemblies that must bear a definite relation to each other, for the purposes of safe operation, shall be so constructed that assembly to each other is only possible in the correct relationship.

2.3.19 Location or enclosure of electrical parts

Electrical parts shall be located or enclosed so that accidental contact or shorting of live parts will be prevented.

2.3.20 Separation of operating parts from stowed wiring

Operating parts shall be separated from stowed wiring by barriers or by their physical location.

2.4 MARKINGS

2.4.1 General

Markings shall be provided and shall include:

- (a) Manufacturer's name or trademark.
- (b) Model designation.
- (c) Month and year of manufacture or serial number.
- (d) Rated working pressure in kPa.

- (e) Direction of flow, if necessary.
- (f) Temperature or other markings on adjustable dials.

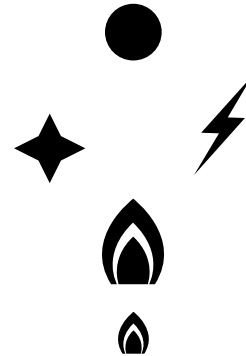
2.4.2 Marking of electrical connections

Electrical connections shall be clearly and durably marked and identified, if applicable.

2.4.3 Control knobs and buttons

Operating control knobs and buttons shall be provided with clear and durable markings. In particular 'on' and 'off' positions shall be readily recognized. If symbols are used, the following shall be marked in the appropriate positions.

Off:	Plain disc
Ignition:	Star or lightning flash
Full on:	Large stylized flame
Pilot reduced rate:	or Small stylized flame



2.4.4 Durability of markings

Markings shall remain legible, durable and permanently attached throughout the life of the control, e.g. to abrasion, humidity and temperature.

2.5 INSTRUCTIONS

2.5.1 General

Instructions in English shall be available, which shall include:

- (a) Model designation(s) and alternative forms.
- (b) Rated working pressure in kPa.
- (c) Flow rate in m³/h for a given pressure loss.
- (d) Bypass rate if applicable.
- (e) Temperature limitations in °C.
- (f) Mounting limitations.
- (g) Class of automatic shut off valve.
- (h) Class and grade of pressure regulator, range of outlet pressures and flow rates, and initial setting conditions.
- (i) Wiring diagram showing external connections.
- (j) Electrical ratings i.e. voltage, frequency, current.
- (k) Method of operation, adjustments and applications.
- (l) Fault diagnosis and servicing.
- (m) Thermocouples for connection to the combination control, if applicable, and maximum closing times.
- (n) Thread or flange specifications as applicable.
- (o) Type of lubricant and/or sealant as applicable.
- (p) Reference to the requirements of local authorities as applicable.

SECTION 3 PERFORMANCE REQUIREMENTS

3.1 GENERAL

3.1.1 Satisfactory performance in all mounting positions

The performance of the combination control shall be satisfactory in all mounting positions declared by the manufacturer. In particular, additional tests in mounting positions other than the vertical shall be carried out, where appropriate, to satisfy the requirements of Clauses 2.3.16, 3.2.1, 3.2.2, 3.3.1, 3.4.1, 3.6, 3.7, 3.8, 3.9, and 3.10.

3.1.2 Satisfactory performance over declared temperature range

The performance of the combination control shall be satisfactory over the manufacturer's declared temperature range which shall be at least 0—60°C.

3.1.3 Effort to open fully, close or reset valve

The manual effort required to open fully, close or reset a valve in a combination control shall not exceed the values in Table B1.

3.1.4 Torque or force to open or close valve

The maximum instantaneous torque or force at the initial opening or closing of the valve shall be no greater than 1.5 times the values given in Table B1.

3.2 GAS LEAKAGE

3.2.1 External leakage

The external leakage from the body of a combination control shall not exceed 1 mL/min at all internal air pressures up to 1.5 times the rated working pressure or 14.0 kPa, whichever is the greater, with each valve opened and closed.

3.2.2 Internal leakage—Forward flow

The leakage past each closed valve of a combination control shall not exceed the value specified in Table B2 at all inlet air pressures up to 1.5 times the rated working pressure or 14.0 kPa, whichever is the greater, and with the outlet open to atmospheric pressure.

3.2.3 Internal leakage—Reverse flow

The leakage past the closed valve of a Class 1 or Class 2 automatic shut off valve shall not exceed the value specified in Table B2 with the inlet open to atmospheric pressure and the outlet at an air pressure of—

- (a) 15 kPa for Class 1 valves below 50 mm connection size;
- (b) 10 kPa for Class 1 valves of 50 mm connection size; and
- (c) 5 kPa for Class 2 valves.

3.3 FLOW RATE

3.3.1 Flow rate for a given pressure

For a combination control which does not incorporate a pressure regulator, the flow rate(s) for a given pressure loss shall not be less than that declared by the manufacturer.

3.4 VOLTAGE VARIATION

3.4.1 Device functions fully and correctly above and below rated voltage range

All functions of a combination control shall open and close or operate correctly at +10% and –15% of the rated voltage.

3.5 MECHANICAL STRENGTH

3.5.1 Resistance to applied torque

A combination control shall withstand the torque specified in Table B3 without permanent deformation or leakage.

3.5.2 Resistance to applied bending moments

A combination control shall withstand the bending moment specified in Table B4 without permanent deformation or leakage.

3.6 THERMOELECTRIC FLAME SAFEGUARDS

3.6.1 Time to establish or reset flame safeguard

The time to establish or reset a thermoelectric flame safeguard in the proved position shall not exceed 30 s.

3.6.2 Time to trip from fully heated position

The time to trip from the fully heated condition shall not exceed the time specified by the manufacturer.

3.6.3 No gas to pass main outlet unless pilot or flame proved

A thermoelectric flame safeguard shall prevent gas passing to the main outlet unless a pilot or other flame is proved.

3.6.4 Weep line

A thermoelectric flame safeguard shall be first in the weep line if it controls the weep of a relay valve.

3.6.5 Time to trip when disconnected from heated thermocouple

A thermoelectric flame safeguard shall close within 2 s when disconnected from a heated thermocouple.

3.6.6 Time to trip after extended durability

After the durability test of Clause 3.12.1, the flame safeguard shall be maintained in the flame operating condition for 18 h after which it shall meet the requirements of Clause 3.6.2.

3.6.7 Manual reset

A thermoelectric flame safeguard shall require to be manually reset in order to open the valve or close electrical contacts.

3.7 PRESSURE REGULATORS

3.7.1 Operating characteristics

The outlet pressure of a pressure regulator shall remain within the limits specified for the grade of regulator for any set pressure within its nominal range and over the range of inlet pressures and flow rates for the class of regulator declared by the manufacturer.

If the minimum flow rate is less than that specified for the class of regulator, the outlet pressure shall remain within the limits specified for the grade of regulator at this flow rate, after readjustment, and the minimum inlet pressure in kPa is given by:

$$P_i(\text{min}) = P_o + 0.12 + 0.03N$$

where

P_o = fixed or set outlet pressure in kPa

N = number of additional functions in the combination control

3.8 THERMOSTATS

3.8.1 Maximum and minimum operating temperatures

The maximum and minimum operating temperatures of a thermostat, when set to the maximum mechanical adjustment and to the minimum adjustment as defined by the manufacturer, shall be within $\pm 10\%$ of the values specified by the manufacturer.

3.8.2 Operating temperature tolerances

The operating temperature of a thermostat, when set to the calibration point specified by the manufacturer, shall be within $\pm 5^\circ\text{C}$ when adjusted from above and below and checked twice in each direction.

3.8.3 Operating temperature tolerances after durability test

The operating temperature of a thermostat, when set to the calibration point specified by the manufacturer, shall not vary by more than $\pm 5^\circ\text{C}$ after the durability tests of Clauses 3.12.1 and 3.12.4.

3.9 AUTOMATIC SHUT OFF VALVES

3.9.1 Time to close—Class 1 and Class 2

Class 1 and Class 2 automatic shut off valves shall close in a maximum time of 1 s when the holding medium is cut off.

3.9.2 Time to close—Class 3

Class 3 automatic shut off valves shall close in a maximum time of 2 s when the holding medium is cut off.

3.10 OTHER FUNCTIONS

3.10.1 Compliance with other Standards

The performance of other functions shall comply with requirements of relevant codes and Standards.

3.11 GAS/AIR RATIO CONTROLS

3.11.1 Pneumatic types

Gas/air ratio controls shall comply with the generic requirements of this Standard and the performance requirements of EN 12067–1.

3.12 DURABILITY

3.12.1 Cycling test

A combination control shall withstand the following number of cycles without failure, impairment of operation, leakage, overheating, apparent damage or the development of excessive noise and comply with the Clauses listed. Half the cycles, with a maximum of

50 000 cycles shall be carried out at 60°C or the maximum declared working temperature, whichever is the higher, for a minimum period of 24 h. The remainder of the cycles shall be carried out at normal ambient temperature; or the minimum declared working temperature for a minimum period of 24 h, if declared below 0°C. The cycle period shall be no shorter than that declared by the manufacturer.

3.12.2 Electrical load connections

During the durability test the manufacturer's rated electrical load shall be connected to any switch contacts.

3.12.3 Electrically operated automatic shut off valves

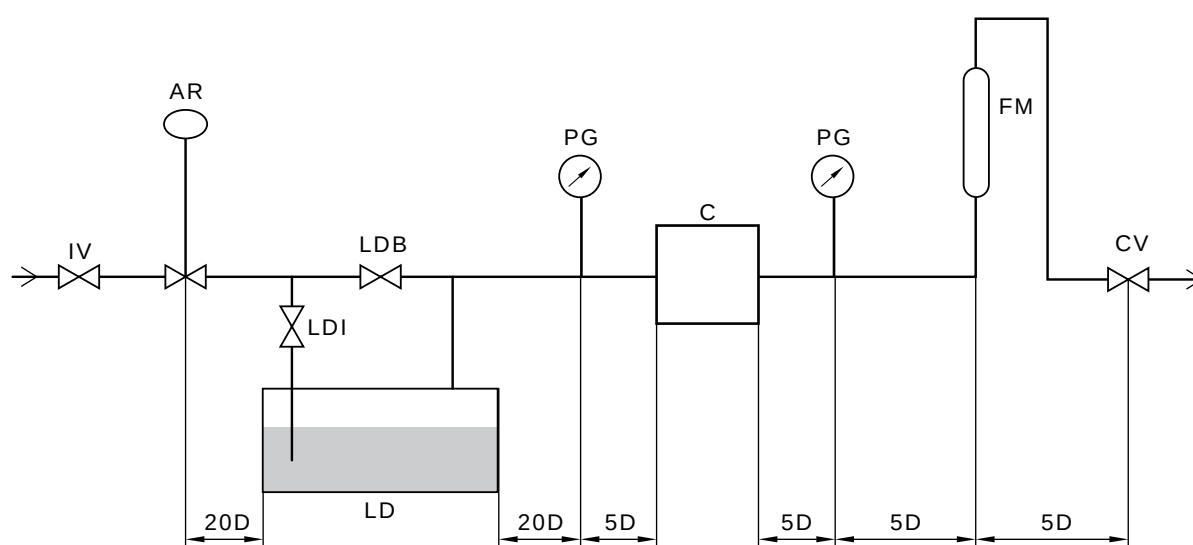
Electrically operated automatic shut off valves in a combination control shall show no evidence of mechanical failure or damage after being electrically energized for 72 h.

3.12.4 Thermostat—Heat resistance

A thermostat shall not leak, seize or fail in operation after the temperature-sensing element has been subjected for 2 h to a temperature of 20% above the maximum control temperature in °C.

APPENDIX A
FIGURES A1 TO A3
(Normative)

Figure	Description
A1	LEAKAGE TEST RIG
A2	BUBBLE LEAK DETECTOR
A3	FLOW RATE TEST RIG



LEGEND:

IV = Air inlet valve	PG = Pressure gauge
AR = Adjustable regulator	C = Combination control
LD = Leak detector	FM = Flow meter
LDI = Leak detector inlet valve	CV = Control valve
LDB = Leak detector bypass valve	D = Nominal pipe size

FIGURE A1 LEAKAGE TEST RIG