

Australian Standard[®]

**Hydraulically operated automatic
control valves for waterworks purposes**



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 - Australian Electrical and Electronic Manufacturers Association
 - Australian Industry Group
 - Australian Stainless Steel Development Association
 - Australian Water Association
 - Engineers Australia
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 - New Zealand Water & Waste Association
 - Plastics Industry Pipe Association of Australia
 - Water Industry Alliance
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-

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STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 5081—2008

Hydraulically operated automatic control valves for waterworks purposes

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NOTES

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PREFACE

This Australian Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS-022, Valves for Waterworks Purposes, in response to a request from Water Services Association of Australia (WSAA) to provide a suitable product Standard for automatic control valves.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to provide material requirements and performance tests for metallic-bodied hydraulically operated automatic control valves for waterworks purposes, together with default compliance requirements for use by manufacturers and certification bodies.

Support and contribution is acknowledged from the Water Services Association of Australia (WSAA), consultants and manufacturers.

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

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.

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STANDARDS AUSTRALIA

Australian Standard**Hydraulically operated automatic control valves for waterworks purposes**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for metallic-bodied PN 16, PN 21 and PN 35 hydraulically operated, diaphragm or piston-actuated, globe or piston-style, automatic control valves for waterworks purposes and valve sizes DN 40 to DN 900 (inclusive), suitable for, but not limited to, drinking water and recycled water, with a maximum operating temperature of 40°C.

This Standard applies to automatic control valves that operate by pressure in water mains, and controlled by hydraulic or solenoid pilot valves. Where control valves incorporate solenoid pilots, limit switches or position transmitters, low-voltage electrical power supply is required for these components.

This Standard covers the following types of automatic control valves:

- (a) Fixed-outlet pressure-reducing valve.
- (b) Variable-outlet pressure-reducing valve.
- (c) Pressure-sustaining/relief valve.
- (d) Surge-anticipating valve.
- (e) Altitude valve.
- (f) Float valve.
- (g) Rate-of-flow control valve.
- (h) Non-return valve.
- (i) Solenoid-control valve.

The valves are designed for installation in a horizontal or vertical position depending on the manufacturer's requirements, above-ground or below-ground in a drained chamber.

NOTE: Purchasing guidelines are given in Appendix B.

1.2 APPLICATION

Means for demonstrating compliance with this Standard are given in Appendix A.

1.3 NORMATIVE REFERENCES

The documents referred to in this Standard for normative purposes are listed in Appendix C.

1.4 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.4.1 Allowable operating pressure

The allowable internal pressure, excluding surge, which a component can safely withstand in service.

1.4.2 Allowable site test pressure

The maximum internal hydrostatic pressure that can be applied on site to a component in a newly installed pipeline.

1.4.3 Bulkhead test

A test where the testing machine provides external restraint to make a watertight joint at each end of the valve.

1.4.4 Cavitation

Condition that occurs when the valve is subjected to excessive pressure drop across it, which can cause damage to valve body and trim, and shorten valve life.

1.4.5 Coating

A corrosion-inhibiting medium applied to the surfaces of a valve.

1.4.6 Coating defect

A detectable weakness or discontinuity in a coating, which deems it to be suspect in its ability to protect the substrate from corrosion during its normal service life.

1.4.7 Cover chamber

Space above the operating mechanism in which the water pressure is applied to close the valve or relieved to open the valve.

1.4.8 Distortion

Any permanent deformation.

1.4.9 Face-to-face dimension

The distance between the valve mating faces measured along the valve axis.

1.4.10 Free end test

A test where the valve ends are blanked off so that the axial hydraulic force is not externally restrained. This simulates a valve in a terminal position held rigidly at one end only.

1.4.11 Hydraulically operated automatic control valve

A valve that operates by means of water pressure. The pressure, flow and level control functions of the valve are via externally plumbed hydraulic or solenoid pilot valves and can have an orifice plate for flow control.

1.4.12 Low-flow bypass

Auxiliary valve operated hydraulically and installed in parallel with the main valve, used to provide stable control under low flow condition.

1.4.13 Manual override valve

Auxiliary valve operated manually, used to open or close the main valve whilst the main valve is operating in automatic mode.

1.4.14 Maximum allowable operating pressure

The allowable internal pressure, including surge, which a component can safely withstand in service.

1.4.15 Nominal size (DN)

An alphanumeric designation of size for components of a pipework system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number, which is indirectly related to the physical size, in millimetres, of the bore or in some cases the outside diameter of the end connections.

1.4.16 Operating mechanism

Device (diaphragm or piston), which translates the change in operating pressure in the valve cover chamber to the motion of the seal disc.

1.4.17 Pilot valve

Auxiliary valve operated hydraulically or electrically, used to activate the main valve.

1.4.18 Pressure class (PN)

The allowable operating pressure of the valve expressed in hundreds of kilopascals.

1.4.19 Type test

A once only set of tests carried out to prove performance and compliance with this Standard.

1.4.20 Valve opening

Percentage of valve stem travel from 0% (fully closed) to 100% (fully open).

1.5 TYPES AND FUNCTIONS

1.5.1 General

Valves may be configured for operation as the types described in Clauses 1.5.2 to 1.5.16 or a combination thereof.

1.5.2 Fixed-outlet pressure-reducing valve

A valve that reduces high pressure at the valve inlet to a lower pressure at the valve outlet by means of a pressure-reducing pilot. The valve maintains the outlet pressure set-point irrespective of any variation of pressure (see Note) or flow through the valve. When the inlet or outlet pressure is lower than the set-point, the valve moves towards open. When the outlet pressure is higher than the set-point, the valve moves towards closed.

NOTE: This valve can only maintain the outlet pressure set-point when the inlet pressure remains above the set-point.

1.5.3 Variable-outlet pressure-reducing valve

A valve that reduces high pressure at the valve inlet to a lower pressure at the valve outlet, with the outlet pressure set-point increasing automatically as flow through the valve increases. Variation of the outlet pressure set-point can be provided by a motorized pilot, an electro-hydraulically actuated pilot in conjunction with a proprietary type of electronic controller, double-solenoid pilots in conjunction with an electronic controller, or a flow-modulated hydraulic pilot in conjunction with an orifice plate.

1.5.4 Pressure-sustaining/relief valve

A valve that sustains a minimum set pressure at the valve inlet by means of a pressure sustaining/relief pilot. The valve maintains the inlet pressure set-point irrespective of any variation of outlet pressure or flow through the valve. When the inlet pressure is higher than the set-point the valve moves towards open. When the inlet pressure is lower than the set-point, the valve moves towards closed.

1.5.5 Surge-anticipating valve

A special type of pressure-relief valve, used to protect pumping stations and pipelines under a sudden pump stopping condition (e.g., due to power failure). The valve provides pressure-relief function by means of a low-pressure pilot or solenoid, and a high-pressure pilot. The valve remains closed when the inlet pressure is between the low-pressure set-point and the high-pressure set-point. The valve opens when the inlet pressure drops below the low-pressure set-point (due to a negative pressure surge), and closes when the inlet pressure rises above the low-pressure set-point. The valve re-opens when the inlet pressure rises above the high-pressure set-point (due to a positive pressure surge), and re-closes when the inlet pressure drops below the high-pressure set-point.

1.5.6 Altitude valve

A valve that controls flow into a reservoir by means of an altitude pilot, in order to maintain the water level within a set range. The valve opens when the reservoir water level drops to the 'open' set-point, and closes when the reservoir water level rises to the 'close' set-point. The valve can be configured to control flow in forward direction only (one-way flow) or to control flow in both forward and reverse directions (two-way flow). The valve can also be set up to start opening at variable low levels of the reservoir (valve with delayed opening).

1.5.7 Float valve

A valve that controls flow into a tank by means of a float-controlled pilot, in order to maintain the water level within a set range. The valve can be configured to operate as an on-off (fully open/fully closed) valve or as a modulating valve. When working as an on-off valve, the valve opens fully when the tank water level drops to the 'open' set-point, and closes when the tank water level rises to the 'close' set-point. When working as a modulating valve the valve regulates the flow to maintain a relatively constant water level in the tank.

1.5.8 Rate-of-flow control valve

A valve that maintains the flow set-point, irrespective of any variation of inlet or outlet pressure, by means of a rate-of-flow pilot. Rate of flow through the valve can be provided by sensing and maintaining the pressure differential across an orifice plate by the rate-of-flow pilot.

1.5.9 Non-return valves

A valve that allows flow in only one direction. The valve is open when inlet pressure is higher than outlet pressure. The valve is closed when outlet pressure is higher than inlet pressure.

1.5.10 Dual-solenoid control valves

A valve that is operated by two two-way solenoid pilots, one for directing the inlet pressure to the cover chamber to close the valve, and one for directing the cover chamber pressure to the outlet to open the valve. The solenoid pilots are controlled electronically, which pulses the solenoid pilots to open or close the main valve to maintain outlet pressure, inlet pressure, flow rate or reservoir water level at a set-point.

1.5.11 Single-solenoid control valve

A valve that is operated by a solenoid pilot. The valve can be either normally closed or normally open. For a normally closed valve, when the solenoid pilot is energized it directs the cover chamber pressure to the valve outlet or the atmosphere to open the valve, and when the solenoid pilot is de-energized it directs the inlet pressure to the cover chamber to close the valve.

1.5.12 Double-chamber arrangement

An arrangement with an additional chamber below the diaphragm, which isolates the downstream pressure from the underside of the diaphragm. The double-chamber arrangement is often used in situations where a very low operating pressure or pressure differential is available. The double-chamber arrangement is also useful in providing nearly constant opening/closing speeds for the entire valve travel.

1.5.13 Full port valve

Valve with the same flow area at the seat as the flow area at the inlet.

1.5.14 Reduced-port valve

Valve with flow area at the seat smaller than flow area at the inlet (flow area at the seat normally the same as flow area at the inlet for valve one size smaller).

1.5.15 V-port throttling plug

A specially designed plug that is fitted under the seal disc to produce a wider opening compared to the standard valve with a flat seal disc for the same flow through the valve, and which produces a more stable low-flow control than a flat seal disc. A valve fitted with a V-port throttling plug generally has lower flow capacity than a valve with a flat seal disc when fully open due to additional head loss of the throttling plug.

1.5.16 Anti-cavitation trim

A specially designed device comprising two cylinders with orifices on their walls—a stationary cylinder fitted to the valve seat ring and a sliding cylinder fitted to the seal disc. The orifices are designed to dissipate high inlet pressure effectively to avoid cavitation damage to valve internal parts. A valve fitted with anti-cavitation trim generally has lower flow capacity than a valve with a flat seal disc when fully open due to additional head loss of the anti-cavitation trim.

1.6 DESIGNATION OF SIZE

Valve size shall be designated by the nominal size as follows: DN 40, DN 50, DN 65, DN 80, DN 100, DN 150, DN 200, DN 250, DN 300, DN 350, DN 400, DN 450, DN 500, DN 600, DN 700, DN 750, DN 800 and DN 900.

1.7 ALLOWABLE PRESSURES

The allowable pressure ratings for the valves are given in Table 1.1.

TABLE 1.1
ALLOWABLE PRESSURES

Class of valve	Allowable operating pressure kPa	Maximum allowable operating pressure¹ kPa	Allowable site test pressure² kPa
PN 16	1 600	1 920	2 000
PN 21	2 100	2 520	2 625
PN 35	3 500	4 200	4 375

NOTES:

- 1 Seat leakage may occur at maximum allowable operating pressures without structural damage.
- 2 With valve cover chamber vented to atmosphere.