



Air valves for water supply



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- Australian Chamber of Commerce and Industry
 - Australian Industry Group
 - Australian Stainless Steel Development Association
 - Australian Water Association
 - Casting Technology New Zealand
 - Engineers Australia
 - Institute of Instrumentation, Control and Automation, Australia
 - Master Plumbers Australia
 - Plastics Industry Pipe Association of Australia
 - Plumbing Products Industry Group
 - Water Industry Alliance
 - Water Services Association of Australia
-

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Australian Standard[®]

Air valves for water supply

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WS-022, Valves for Waterworks Purposes, to supersede AS 4956—2008.

This Standard incorporates Amendment No. 1 (June 2018). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

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 materials requirements and performance tests for air valves in water supply systems, together with default conformance requirements for use by manufacturers and certification bodies.

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 appendices 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
Air valves for water supply

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for metallic and plastics bodied PN 10, 12, 16, 25, 35 and 40 air valves for water supply. This Standard is applicable to valve sizes DN 15 to DN 250 that are suitable for, but not limited to, use in drinking water supplies, with a maximum operating temperature of 60°C (see Note 2).

This Standard covers the following types of valves:

- (a) Large-orifice air valves.
- (b) Small-orifice air valves.
- (c) Double-orifice air valves.
- (d) Anti-slam air valves.
- (e) Anti-vacuum valves.

NOTES:

- 1 Purchasing guidelines are given in Appendix B.
- 2 Based upon a maximum water temperature of 40°C within the main and the air valve being located above ground exposed to sunlight.
- 3 Alternative pressure classes are available and may be specified.

1.2 DEMONSTRATION OF CONFORMITY WITH THIS STANDARD

Conformity with this Standard shall be demonstrated in accordance with Appendix A. See Table A3.3(A) for type tests and Table A3.3(B) for production tests, on minimum sampling and frequency plan.

NOTE: The information that should be supplied by the purchaser, or by the manufacturer, is given in the purchasing guidelines set out in Appendix B.

1.3 NORMATIVE REFERENCES

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

1.4 DEFINITIONS

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

1.4.1 Allowable operating pressure (AOP)

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

1.4.2 Allowable site test pressure (ASTP)

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

1.4.3 Anti-slam switch point

The maximum air discharge rate and differential air pressure at which the anti-slam obturator of a switching disc type anti-slam device switches position to restrict the large orifice air discharge rate.

1.4.4 Coating

A corrosion-inhibiting medium applied to the surfaces of non-corrosive resistant parts of valves.

1.4.5 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.

1.4.6 Discharge coefficient

A characteristic non-dimensional factor of the valve, which is used to calculate the discharge flow rate.

1.4.7 Distortion

Any permanent deformation.

1.4.8 Equivalent pressure cycle

The change in internal pressure which occurs during a transient event (normally a pump status change), which is by convention doubled to account for logarithmic decrement.

NOTE: For the purpose of this Standard, the internal cyclic pressure range is 0 kPa to $0.8 \times \text{AOP}$.

1.4.9 Intake coefficient

A characteristic non-dimensional factor of the valve, which is used to calculate the intake flow rate.

1.4.10 Isolating valve

A valve used to isolate the air valve from the pipeline for operation and maintenance purposes.

1.4.11 Maximum allowable operating pressure (MAOP)

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

1.4.12 Nominal size (DN)

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

1.4.13 Obturator

An object used to close an opening, including a float, disc or other internal moving component.

1.4.14 Pitting resistance equivalent number (PREN)

For ferritic and martensitic stainless steel grades, $\text{PREN} = \% \text{Cr} + 3.3(\% \text{Mo})$ where the concentrations are in weight (%).

For austenitic and duplex stainless steel grades, $\text{PREN} = \% \text{Cr} + 3.3(\% \text{Mo}) + x (\% \text{N})$ where—

- (a) $x = 16$ for duplex stainless steels; and
- (b) $x = 30$ for austenitic stainless steels.

1.4.15 Plastics bodied valves

A valve incorporating a plastic pressure containing component, not including the obturator.

1.4.16 Pressure class (PN)

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

1.4.17 Production batch

Schedule of products of the same type, nominal diameter and wall thickness with identical dimensional characteristics manufactured from the same material. The production batch is defined by the manufacturer.

1.4.18 Production test

A test performed by the manufacturer on a batch of components, which has to be satisfactorily completed before the batch can be released.

1.4.19 Sampling plan

A specific plan that indicates the number of units of components or assemblies to be inspected.

1.4.20 Type test

A test or series of tests directed toward approval of a design, conducted to determine if an item is capable of meeting the requirements of the product Standard and which is done once and repeated only after a change in design, materials, method or place of manufacture or as otherwise nominated in the product Standard.

NOTE: See Table A3.3(A), Appendix A.

1.5 TYPES AND FUNCTIONS

1.5.1 Anti-slam air valves

A valve with an anti-slam device that allows air to exhaust through a reduced orifice size, slowing down the air discharge rate to minimize excessive pressure surge that may occur when water enters the valve body during filling or column re-joining.

1.5.2 Anti-vacuum valve (or vacuum-relief valve or surge-control air valve)

A valve comprising a one-way-in check valve fitted with an auxiliary small-orifice air valve. When a vacuum occurs in the pipeline due to column separation, the check valve opens to allow a large volume of air to enter the pipeline, trapping the air inside the pipeline to provide cushioning effect when the water columns rejoin. The trapped air is released to atmosphere via the small-orifice air valve.

1.5.3 Double-orifice air valve (or combination air valve)

A valve with both large-orifice and small-orifice functions.

1.5.4 Full-port air valve

A valve where the large-orifice diameter is the same as the inlet diameter.

1.5.5 Large-orifice air valve (or air/vacuum valve)

A valve with a large orifice that admits a large volume of air into a pipeline during draining and discharges a large volume of air from the pipeline during filling.

1.5.6 Reduced-port air valve

A valve where the large-orifice diameter is smaller than the inlet diameter.

1.5.7 Small-orifice air valve (or air-release valve)

A valve with a small orifice that allows air accumulated in the pipeline to escape automatically into the atmosphere during normal operation while the pipeline is under pressure.

1.6 DESIGNATION SIZE

The sizes of large-orifice valves, double-orifice valves, anti-slam valves and anti-vacuum valves shall be designated by the nominal size of the inlet connection as follows:

- (a) DN 25.
- (b) DN 50.
- (c) DN 80.
- (d) DN 100.
- (e) DN 150.
- (f) DN 200.
- (g) DN 250.

The sizes of small-orifice valves shall be designated by the nominal size of the inlet connection as follows:

- (i) DN 15.
- (ii) DN 20.
- (iii) DN 25.
- (iv) DN 50.
- (v) DN 80.

1.7 ALLOWABLE PRESSURES

The allowable pressure ratings for the valves are shown in Table 1.7.

TABLE 1.7
ALLOWABLE PRESSURES

Class of valve	AOP	MAOP*	ASTP
	kPa	kPa	kPa
PN 10	1000	1200	1250
PN 12	1200	1440	1500
PN 16	1600	1920	2000
PN 25	2500	3000	3125
PN 35	3500	4200	4375
PN 40	4000	4800	5000

* Seat leakage may occur at maximum allowable operating pressures without structural damage.

NOTE: Alternative pressure classes are available and may be specified.

SECTION 2 MATERIALS AND COMPONENTS

2.1 GENERAL

The basic materials to be used for manufacturing valve components shall be in accordance with Table 2.5.

NOTE: The materials listed are of the minimum acceptable standard.

Alternative materials may be used, provided they are equivalent in performance, particularly with respect to strength, corrosion-resistance, valve operation and durability. Some alternative materials are given in Appendix D.

Non-metallic materials used in the componentry of valves shall be fit for the intended purpose and shall exhibit dimensional stability after extended periods of time immersed in water and recycled water.

NOTE: For further information on material equivalence, consult the Water Services Association of Australia (WSAA).

2.2 CORROSION-RESISTANT MATERIALS

For the purposes of this Standard, the following materials are deemed to be corrosion-resistant:

- (a) Copper alloys in accordance with AS 1565, AS/NZS 1567 or AS/NZS 1568 and in accordance with AS 2345.
- (b) Stainless steels with a pitting resistance equivalent number (PREN) of at least 22, in accordance with a recognized Standard for the relevant product form.
- (c) Elastomers (see Clause 2.3).
- (d) Plastics (see Clause 2.4).

Other materials may be considered based on published corrosion resistance data.

2.3 ELASTOMERIC COMPONENTS

Elastomeric components (e.g. O-rings, diaphragms) shall be made of a synthetic compound, with or without reinforcement, that is not injuriously affected by the fluid, temperature or environmental conditions to which the component will be subjected in service. Elastomeric components shall exhibit dimensional stability after extended periods of time immersed in drinking water and recycled water and shall be suitable for use in chlorinated and chloraminated water.

Reinforcement shall be of a non-wicking type. Components shall be manufactured from an elastomer that in accordance with AS 1646. The physical properties of the elastomeric material shall be selected by the valve manufacturer to suit particular applications (e.g. quick response, low flow stability, etc.) and to optimize performance and endurance under operating conditions.

2.4 PLASTICS COMPONENTS

Plastics components shall be made of a polymer, with or without reinforcement, that is not injuriously affected by the fluid, temperature or environmental conditions to which the component will be subjected in service. Reinforcement shall be of a non-wicking type.

Plastics materials shall be of a type recommended by the polymer manufacturer as suitable and appropriate for use in the manufacture of the valve component. Plastics components shall exhibit dimensional stability after extended periods of time immersed in drinking water and recycled water and shall be suitable for use in chlorinated and chloraminated water.

The physical properties of the plastics material shall be selected by the valve manufacturer to suit particular applications (e.g. operating temperature) and to optimize performance and endurance under operating conditions.

2.5 EFFECT ON WATER

A1

Valves shall be in accordance with the requirements of AS/NZS 4020. A scaling factor of 0.05 shall be applied.

TABLE 2.5
BASIC MATERIALS REQUIREMENTS

Component	Material specification		
	Type of material	Standard	Grade
Body and cover	Ductile cast iron (see Note 1)	AS 1831	500–7 or 400–15
	Stainless steel	ASTM A240 or ASTM A743M	316 or CF-8M
	Plastics	See Note 2	See Note 2
Obturator	Stainless steel	Relevant recognized Standard	PREN ≥22
	Plastics	See Note 2	See Note 2
Resilient seal	Synthetic elastomer	AS 1646 or AS 681.1	EPDM or NBR
Seat	Stainless steel	Relevant recognized Standard	PREN ≥22
	Leaded gunmetal	AS 1565	C83600
	Plastics	See Note 2	See Note 2
Levers, linkages and pins	Stainless steel	Relevant recognized Standard	PREN ≥22
	Plastics	See Note 2	See Note 2
Spring	Stainless steel	Relevant recognized Standard	PREN ≥22
O-rings	Synthetic elastomer	AS 1646, AS 681.1	EPDM or NBR (Buna-N)
Fasteners	Stainless steel	Relevant recognized Standard	PREN ≥22
Drain valve	Stainless steel	Relevant recognized Standard	PREN ≥22
External insect screen	Stainless steel	ASTM A240M	304

NOTES:

- 1 Coating required (see Section 4).
- 2 See Clause 2.4.

SECTION 3 DESIGN

3.1 GENERAL

Valves shall be designed to meet the performance requirements of this Standard.

All valve components and spare parts shall be interchangeable between the valves of the same size, type, model and manufacture.

All removable, wearing and moving components shall be replaceable in situ without the need for any special tools.

NOTE: The valves should be designed for a minimum operating life of 25 years and 1 500 000 *equivalent pressure cycles* (based on 4 transient events per hour) provided it is selected, installed and maintained in accordance with manufacturer's recommendations.

3.2 END CONNECTION

3.2.1 General

Valves may be supplied in flanged or threaded configuration.

The flanged connection is applicable to sizes DN 25–DN 400 inclusive.

The threaded connection is applicable to sizes DN 15–DN 80 inclusive.

3.2.2 Flanged connection

Flanged valves shall be suitable for connection to pipe and fitting flanges with dimensions in accordance with either AS 4087 or AS 2129 depending on the body material, pressure class and valve size.

The purchaser may specify alternative flange standards or dimensions, provided the flange is not rated less than the allowable operating pressure of the valve. The backs of all flanges shall be machined or spot-faced if the rake angle is greater than 2° in order to provide a satisfactory bearing for bolt heads and nuts.

3.2.3 Threaded connection

Threads shall be in accordance with AS ISO 7.1, Series RP, for an internal (parallel) thread and Series R for an external (taper) thread. NPT threads may also be used, in which case they shall be in accordance with ANSI/ASME B1.20.1.

The purchaser may specify alternative thread standards.

3.3 CASTINGS

Castings shall be sound and free from laps, blowholes and pitting. External and internal surfaces shall be clean and free from sand. Structural defects in ductile iron components shall not be repaired and the defective components shall be rejected.

3.4 COMPONENTS DESIGN

3.4.1 Cover

Each valve shall be supplied with an integral or removable cover(s), which shall be securely fixed above each orifice. The cover(s) shall be designed to prevent dirt or other material falling onto the obturator and seal area, and to shield the obturator from exposure to direct sunlight.

3.4.2 Double-orifice valve

The double-orifice valve shall include a small orifice and a large orifice, which may comprise a large-orifice valve fitted with a small-orifice valve or, alternatively, an integral unit incorporating the large and small orifice functions. The design of the double-orifice air valve shall include the design requirements of large-orifice air valve and small-orifice air valve.

3.4.3 Drain valve

A hole shall be drilled and tapped on the body of the large-orifice valve, and a screw- or lever-operated ball valve shall be connected to it. The position of the hole shall be below the obturator when the obturator is at its lowest position. If a lever-operated ball valve is specified, the lever shall not interfere with any other components of the air valve when the ball valve is operated through its full travel.

3.4.4 Fasteners

Bolts, nuts and washers shall conform to the dimensional requirements of AS 1111.1, AS 1112.3 and AS 1237.2 respectively, and threads to AS 1275.

3.4.5 Large-orifice valve

The obturator shall remain in the open position during pipeline filling when the air pressure inside the pipeline is not less than 20 kPa. The valve shall be drip-tight at a minimum water pressure within the range 10 kPa to 50 kPa as nominated by the manufacturer.

The large-orifice obturator shall be capable of withstanding the impact due to sudden closure without any deformation.

NOTE: Some moisture or damp air may be expelled just before valve closure and in some designs the valve may close slowly deliberately with some water ejected from the system before the valve shuts drip tight. Refer to the manufacturer's published data for further details.

3.4.6 Lifting devices

Valves exceeding 25 kg shall be provided with a means for lifting the total mass of the valve. Where provided, eyebolts shall be in accordance with AS 2317.

3.4.7 Small-orifice valve

The small-orifice obturator shall be in the open position when there is no water in the valve body, and shall remain open at any air pressure up to the allowable operating pressure. The obturator or resilient seal shall close when water causes the obturator to rise and effect a seal. The obturator shall be drip-tight at a minimum hydrostatic pressure within the range 10 kPa to 50 kPa, as nominated by the manufacturer. The obturator or resilient seal shall only open temporarily to discharge air to the atmosphere when the volume of air accumulated in the valve body is large enough so that the sum of the buoyancy force and the pressure force is less than the weight of the obturator.