

ARMSTRONG



Circuit Balancing Valves

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► Circuit Balancing Valves - Introduction

Circuit balancing valves (CBVs) combine a double regulating valve with a primary measuring element for determining and adjusting hydronic fluid flow in an HVAC system. CBVs are an effective means of ensuring occupant comfort in buildings incorporating hydronic heating or cooling systems. Correct HVAC system operation requires that a specified minimum flow rate of heated or chilled fluid be delivered to every part of the building. Accurate circuit balancing assures this "design flow" is available to each terminal unit throughout the system, for all anticipated operating conditions.

Balancing Basics

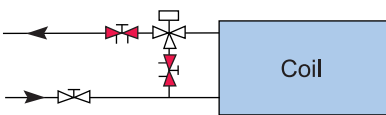
CBVs are installed in heating and cooling systems to obtain the design flow rates through each circuit in the building. Using the mechanical engineer's design drawings, the balancing contractor carefully adjusts each balancing valve throughout the HVAC system to ensure the engineer's design intent is met, and that the correct flow rate is achieved in each circuit. Performance curves correlate the pressure drop (ΔP) of the primary measuring element to the flow rate through the valve. Using these curves, the design flow is achieved by adjusting the CBV handwheel until the target ΔP , and thus flow rate, is reached.

What is a Circuit Balancing Valve?

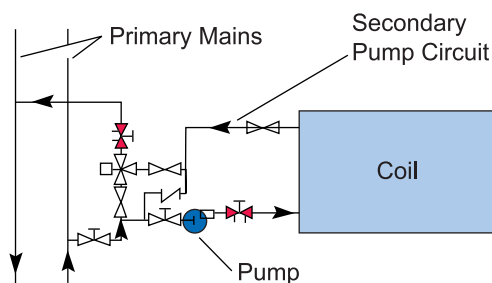
It is generally agreed that a quality balancing valve has the following characteristics:

- Multi-turn adjustment over the operating range for maximum control.
- Pressure/Temperature ports for measuring differential pressure to calculate flow.
- Positive shut off/isolation capability (according to ASHRAE guidelines).
- Memory setting feature (preferably hidden), to avoid inadvertent tampering with the set point.
- Micrometer-type handwheel with easy-to-read setting for precise adjustment.
- Measured vs. actual flow rate accuracy of $\pm 5\%$ across at least 95% of the operating range.

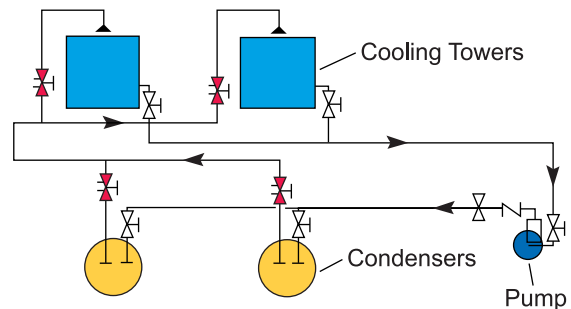
Typical Applications



Coil - CW or HW



Primary-Secondary Connections



Cooling Tower & Chiller Connections

 - Indicates CBV

Armstrong Circuit Balancing Valves

► Why Choose Armstrong Balancing Valves?

For decades, Armstrong has supplied top-quality balancing valves to the global HVAC industry. Our designs have always incorporated a multi-turn, 'Y' pattern, globe-style valve. Simply put, we provide the best valve design for optimizing both balancing control and Kv.

For applications ranging from 15 mm to 300 mm sizes, Armstrong CBVs have been used reliably in tens of thousands of installations around the world. Our industry-leading design innovations have made Armstrong CBVs a trusted brand of balancing valves for mechanical contractors, test and balance contractors, consultants, engineers, and building owners.

Design Innovations

15 mm to 50 mm valves:

- Flow characteristics ideally suited to line size installation
- Full 5 turn micrometer style handle for precise, repeatable adjustment
- Integral fixed Kv primary measuring element for:
 - Maximum differential pressure signal stability.
 - Optimum flow correlation accuracy.
 - Fast calibration speed.

65 mm to 300 mm valves:

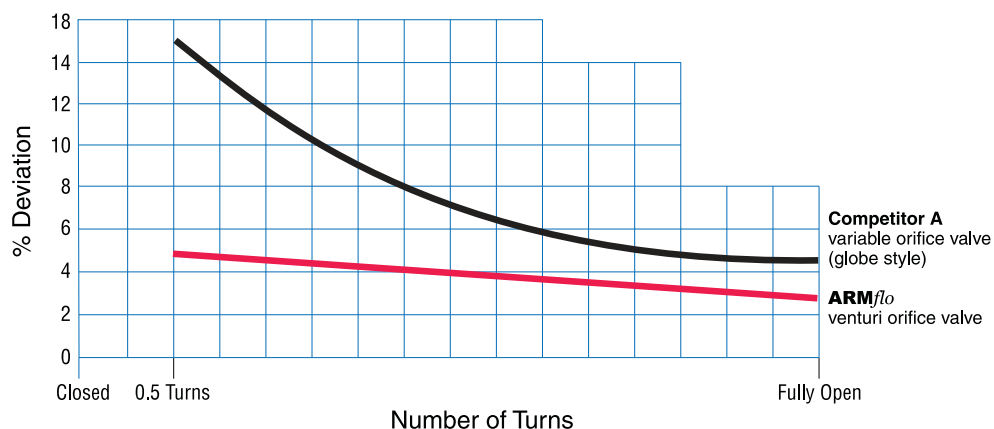
- Site configurable design, enables mechanical contractors to easily convert from straight to angled orientation, allowing unparalleled flexibility in valve installation.
- Fixed flanged models mate to industry standard flanges.
- Grooved system connections provide capital cost and installation labour economy.
- Grooved models with optional site-mounted flange adapters minimize inventory to satisfy either grooved or flanged connection requirements.

Armstrong Balancing Valves - Superior by Design

The competitors' valve designs fall short because:

- Traditional 'Y' pattern, globe-style valves typically provide only four turns of adjustment precision or less. These valves have pressure measurement ports upstream and downstream of the valve seat. When "variable orifice" valves are installed at line size, they are frequently throttled to less than half open, causing excess turbulence and an unstable pressure signal downstream of the valve seat. This can lead to significant deviation in flow measurement (see graph below) which leads to inaccurate balancing, reduced occupant comfort, and unnecessary energy consumption by the valves. This effect is most pronounced in smaller valves (i.e. 50 mm and less).
- Armstrong CBVs are designed to provide 1800° (five handle turns) of adjustment range and a fixed orifice primary measuring element, providing improved adjustment precision, superior differential pressure measurement stability, and higher flow correlation accuracy.

Armstrong Circuit Balancing Valves are designed to address these issues!



► DZR Brass CBVs - 15 mm to 50 mm

Accurate and Fast Balancing

- The patented design of Armstrong's fixed orifice balancing valves produces significantly higher balancing accuracy than with conventional balancing valves.
- Outstanding accuracy of ΔP measurement - from a minimum of 97% in the fully open position to 95% at nearly closed (1/2 turn open). Dramatically higher than the 84% published for competitive valves.
- The process of balancing is faster and easier. Since ΔP is measured across the valve's fixed orifice, flow rate through the valve is directly proportional to ΔP . With conventional valves, where pressure drop is measured across the entire valve, balancing contractors need to record both ΔP and handwheel position to determine flow rate.

Energy Saving Design

Precise HVAC system balancing assures the required design flow is available to each circuit, maximizing system efficiency by eliminating over-pumping and avoiding the occurrence of flow starved terminal units and resultant space thermostat adjustment that so commonly occurs.

Compact and Versatile Design

Armstrong balancing valves are designed to fit in the most compact installation space, enabling architects to devote more internal space to occupants, and less to the HVAC system.

All valves are equipped with a non-rising handle design so the overall valve height remains the same from fully open to fully closed.

Armstrong CBVs Can Be Installed At Line Size

Balancing valves are frequently selected based on the size of the line where they will be installed rather than by the design flow through those valves. This often results in oversized valves that need to be throttled severely during balancing. To solve this problem, Armstrong 15 mm to 50 mm balancing valves are designed to be selected based on line size and the ability to deliver an optimal combination of flow rate and pressure drop when used in systems designed according to ASHRAE guidelines.

► Flow Rate Ranges

Model	Size	Min. Flow	Max. Flow
CBV050VBCR-LF	15 mm (1/2")	0.016 (0.26)	0.14 (2.2)
CBV075VBCR-LF	20 mm (3/4")	0.025 (0.40)	0.21 (3.4)
CBV050VBCR	15 mm (1/2")	0.086 (1.4)	0.66 (10.4)
CBV075VBCR	20 mm (3/4")	0.13 (2.1)	0.85 (13.5)
CBV100VBCR	25 mm (1")	0.33 (5.2)	1.28 (20.2)
CBV125VBCR	32 mm (1.25")	0.52 (8.2)	2.24 (35.5)
CBV150VBCR	40 mm (1.5")	0.51 (8.1)	3.09 (48.9)
CBV200VBCR	50mm (2")	0.88 (14.0)	5.25 (83.3)

Notes: Flowrates are in L/s (USgpm)

► Design Information

Models 15 mm to 50 mm	
Max. Working Pressure	20 bar, PN20 (300 psi)
Operating Temperature	-20 to 150°C (4 to 300°F)
Materials of construction	Body and Bonnet Brass Alloy CW602N, (forged) dezincification resistant
	Stem and Disc Brass Alloy CW602N, (machined) dezincification resistant
	Elastomers EPDM
	Handwheel Reinforced Nylon; ABS

DZR Circuit Balancing Valves

► A CBV to Meet Everyone's Criteria

Engineers

- High performance, full featured Armstrong circuit balancing valves can be specified with confidence by engineers. Optimum balance of control and Kv ensures the engineer's design intent is met with a minimum of energy consumption.

Installing Contractors

- Armstrong CBVs can be installed at line size, without having to install costly reducers. Balancing accuracy will be a minimum of 95%, even down to 0.5 turns, due to the high-precision, fixed Kv, primary measuring element.

Balancing Contractors

- Since differential pressure is upstream of the valve seat, a stable ΔP signal as low as 80 mm of water can be achieved.
- As ΔP is measured across a fixed orifice rather than across the seat of the valve (where the valve opening can vary), the pressure drop is directly proportional to the flow rate through the valve. This results in a faster and more accurate balancing job.
- The stable signal achieved with Armstrong valves ensures that valves can be accurately balanced even at low valve openings.

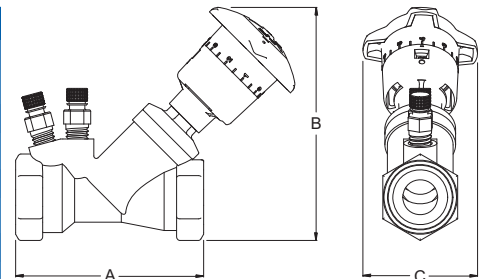
Building Owners

- More accurate balancing with Armstrong CBVs helps ensure that correct flow rates are achieved in each circuit, resulting in greater occupant comfort and improved tenant satisfaction.
- More precise balancing with Armstrong CBVs means the correct amount of fluid flows through each circuit. When the system is completely balanced, the impeller of the main system pump can be trimmed, thereby eliminating costly over-pumping.
- The triple-sealing, O-ring design of Armstrong CBVs produces a pressure gradient through the sealing area. Two O-rings handle the pressure across the seal, while a third actually does the sealing. This patented design ensures the longevity of these valves even in systems operating at up to 20 bar.

► Dimensions

Model	Pipe Size	A	B	C	Shipping Weight
CBV050VBCR-LF	DN15 (1/2")	76 (2.99)	117 (4.60)	70 (2.76)	0.49 (1.07)
CBV075VBCR-LF	DN20 (3/4")	83 (3.26)	125 (4.90)	70 (2.76)	0.55 (1.21)
CBV050VBCR	DN15 (1/2")	76 (2.99)	117 (4.60)	70 (2.76)	0.49 (1.07)
CBV075VBCR	DN20 (3/4")	83 (3.26)	125 (4.90)	70 (2.76)	0.55 (1.21)
CBV100VBCR	DN25 (1")	97 (3.80)	135 (5.29)	70 (2.76)	0.84 (1.86)
CBV125VBCR	DN32 (1 1/4")	110 (4.32)	143 (5.60)	70 (2.76)	1.06 (2.34)
CBV150VBCR	DN40 (1 1/2")	129 (5.07)	150 (5.90)	70 (2.76)	1.59 (3.49)
CBV200VBCR	DN50 (2")	153 (6.00)	170 (6.68)	70 (2.76)	2.46 (5.97)

Notes: All dimensions are in mm (inches) and weights in kg (lbs).



► Cast Iron CBVs - 65 mm to 300 mm

Innovative Convertible Design

Armstrong 65 mm through 300 mm CBV's are used with a separate orifice plate primary measuring element. The double regulating valve is supplied in the straight pattern, and can be conveniently changed to the angled pattern at the site using standard tools and without any additional parts. This is possible because the innovative valve body has been split on a 45° angle, and is secured by four bolts. Rotating one half of the body 180° produces a 90° change in flow direction.

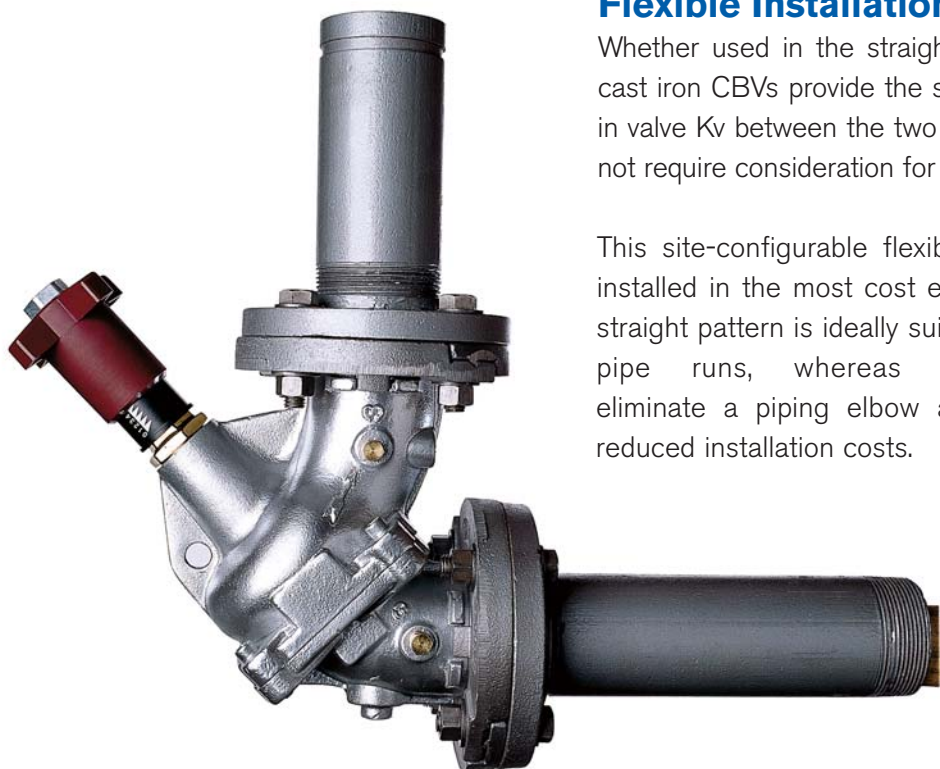
Valves are rated for PN25 applications and furnished with industry standard grooved connections. Flange adapters are available for all sizes from 65 mm to 300 mm, rated to either PN16 or PN25.



Flexible Installation

Whether used in the straight or angled configuration, Armstrong cast iron CBVs provide the same reliability and accuracy. The shift in valve Kv between the two configurations is so small that it does not require consideration for pump sizing.

This site-configurable flexibility ensures that the valve can be installed in the most cost effective and accessible position. The straight pattern is ideally suited for use in close proximity parallel pipe runs, whereas the angle configuration may eliminate a piping elbow and two welded joints, resulting in reduced installation costs.



Ultimate Adjustment Accuracy

The multi-turn micrometer style handle provides 5 full turns of adjustment for the 65 mm model, and up to 14 full turns for the 300 mm model. This level of precision enables a high degree of adjustment repeatability to achieve specified design flow rates.

High Precision Orifice Plates

Armstrong DN65 to DN300 fixed orifice flowmeters combine the economy of industry standard grooved connections with ARMgrip flange adapter application versatility. The AFO-G flowmeter may be close-coupled to ARMflo grooved CBVs for convenient flow adjustment feedback, or remote mounted with achievable accuracy to +/-1%.

Cast Iron Circuit Balancing Valves

► CBV Design Information

Model	CBV2.5-G	CBV3G	CBV4-G	CBV5-G	CBV6-G	CBV8-G	CBV10-G	CBV12-G
Size	DN65	DN80	DN100	DN125	DN150	DN200	DN250	DN300
Handle Turns	5	5	6	6	6	12	12	14
Max Pressure	Grooved Connections - 2575kPa (375 psi) PN16 Flange Adapters -1725kPa (250 psi) PN 25 Flange Adapters - 2575 kPa (375 psi)							
Max Temperature	110°C(230°F)							
Body	Ductile Iron ASTM A536 GR65-45-12							
Disc	Bronze ASTM B584 C-84400							
Seat	Ultra high strength engineered resin							
Trim	Brass ASTM B-16 / Stainless Steel ASTM A582 Type 416							
O-ring	Buna							
Drain Tappings	Qty 2 x 1/4" NPT, Brass Plug							
PT Ports	Qty 2 x 1/4" NPT, Brass body and cap with EPDM check and cap seal (not for oil service)							

► Orifice Plate Design Information

Model Size	AFO2.5-G	AFO3-G	AFO4-G	AFO5-G	AFO6-G	AFO8-G	AFO10-G	AFO12-G
Size	DN65	DN80	DN100	DN125	DN150	DN200	DN250	DN300
Kv	82	119	213	269	384	832	1152	1791
Body	Steel, with zinc plating							
Connections	Industry standard grooved, PN16 or PN25 flange adapter compatible							
Max Pressure	PN25 - 2575 kPa (375 psi)							
Max Temperature	120°C (250°F)							
PT Ports	Qty 2 x 1/8" NPT, Brass body and cap with Nordel check and cap seal (not for oil service)							
Extensions	Qty 2 x 1/8" NPT, Brass extension with shut-off valve							

► Accessories

Armstrong has a wide range of accessories to complement our selection of balancing valves.

PT ports

- Easy insertion of pressure/temperature instrument probes
- Quick-closing, reliable, double seals



PT port extensions

- Enable easy access through pipe wrap insulation
- Brass, available in 45 mm or 75 mm (1 3/4" or 2 3/4") lengths



Armstrong flange adapter

- Equipped with unique anti-rotation lugs to ensure a rigid flanged valve installation.



EPDM Flange Adapter Gasket



Armstrong Ductile Iron Flange Adapter

DPM 100 Digital

Manometer

- 0-7 bar (0-100 psi)
- Light and compact - fits in shirt pocket
- Selectable units: kPa, bar, mbar, mm Hg, in Hg, in H₂O, psi
- Comes with pressure hoses, PT Port probes, hard case
- CE compliant



Orifice plates

- 65 mm to 300 mm (2 1/2" to 12")
- Grooved connections
- Optional PN16 or PN25 flange adapters



► Typical Specifications for Armstrong 15 mm to 50 mm Valves

Furnish and install, as shown on plans and in accordance to manufacturer's installation instructions, Armstrong Circuit Balancing Valves.

The valves shall:

1. Be of the wye pattern, equal percentage globe-style and provide three functions:
 - Precise flow measurement
 - Precision flow balancing
 - Positive drip-tight shut-off
2. Be fabricated with an integral, precision machined fixed orifice primary measuring element.
3. Include two pressure/temperature metering ports (PT Ports) with check valves and gasketed caps.
4. Provide +/- 5% pressure drop to flow correlation accuracy over the operating range of .5 to 5 turns.
5. Incorporate a non-rising handle, providing five full 360° turns of adjustment with micrometer style indicator.
6. Include a hidden memory feature for returning the valve to the calibration setpoint after use for shut-off.
7. Provide optimum performance when "line sized" in circuits engineered for 0.7 to 1.3 m/sec flow velocity.
8. Be available in low flow models for both DN15 and DN20 pipe sizes, for flow velocities below 0.7 m/sec.

► Typical Specifications for Armstrong 65 mm to 300 mm Valves

Furnish and install, as shown on plans and in accordance to manufacturer's installation instructions, Armstrong Circuit Balancing Valves.

The valves shall:

1. Be of the wye pattern, equal percentage globe-style and provide three functions:
 - Precise flow measurement
 - Precision flow balancing
 - Positive drip-tight shut-off
2. Be constructed of ductile iron with grooved system connections, with optional flange adapters available.
3. Be of a split case design enabling conversion from straight to elbow configuration in the field.
4. Have the valve stem and disc plug constructed of bronze.
5. Include two pressure/temperature metering ports (PT Ports) with check valves and gasketed caps.
6. Provide reliable flow correlation based on the pressure drop across the valve seat.
7. Be optionally available with a high accuracy fixed orifice flowmeter for close or remote coupling.
8. Incorporate a non-rising multi-turn handwheel and micrometer style turns indicator.
9. Include a hidden memory feature for returning the valve to the calibration setpoint after use for shut-off.
10. Enable packing nut seal servicing with the valve under pressure, avoiding need to drain the system.

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