

ARMSTRONG



1/2" - 12" Circuit Balancing Valves

FILE NO:	36.10
DATE:	July 9, 2008
SUPERSEDES:	36.10
DATE:	Jan. 25, 2008



► Balancing Basics

Circuit balancing valves (CBVs) have been used for many years as an effective means of ensuring occupant comfort in buildings. Heating and chilled water systems are designed to deliver the correct amount of heated or chilled fluid to every part of a building's HVAC system. However, this 'design flow' is frequently not achieved without the use of balancing valves.

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, or ΔP , across the valve to the flow rate through the same valve. Using these curves, the design flow is achieved by adjusting the CBV handwheel until the target ΔP , and thus flow rate, is reached.

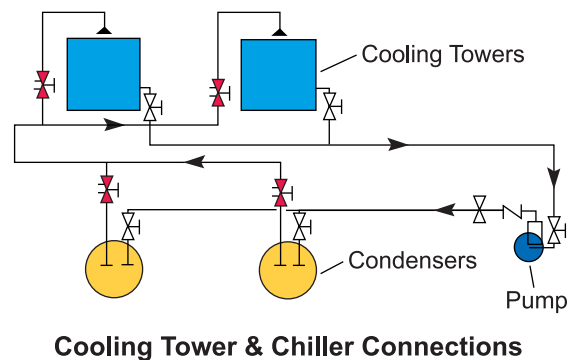
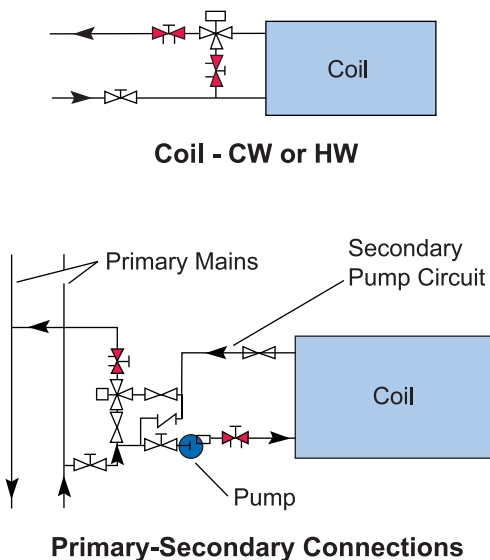
► What is a Circuit Balancing Valve?

Although several manufacturers claim their valves are CBVs, few perform as effectively as true balancing valves. It is generally agreed that a quality balancing valve has the following characteristics:

- Multi-turn adjustment range for maximum control.
- Pressure/Temperature ports for measuring differential pressure.
- 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 adjustment with easily readable settings.
- Measured vs. actual flow rate accuracy of at least 95% across the recommended operating range.

Most engineers specify that balancing valves be installed on the return side of each branch, downstream of the branch's terminal unit(s). Ideally, these CBVs are selected based on the design flow through them, rather than the size of the pipe in which they are to be installed. However, in many instances, balancing valves are installed 'at line size', which has historically posed problems for accurate balancing. Armstrong circuit balancing valves eliminate this problem for piping up to 2" in diameter.

► Typical Applications



 - Indicates CBV

1/2" - 12" Circuit Balancing Valves

► Why Choose Armstrong Balancing Valves?

For decades, Armstrong has been supplying 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 Cv.

For applications ranging from 1/2" to 12" 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 balancing contractors and engineers alike.

Design Innovations:

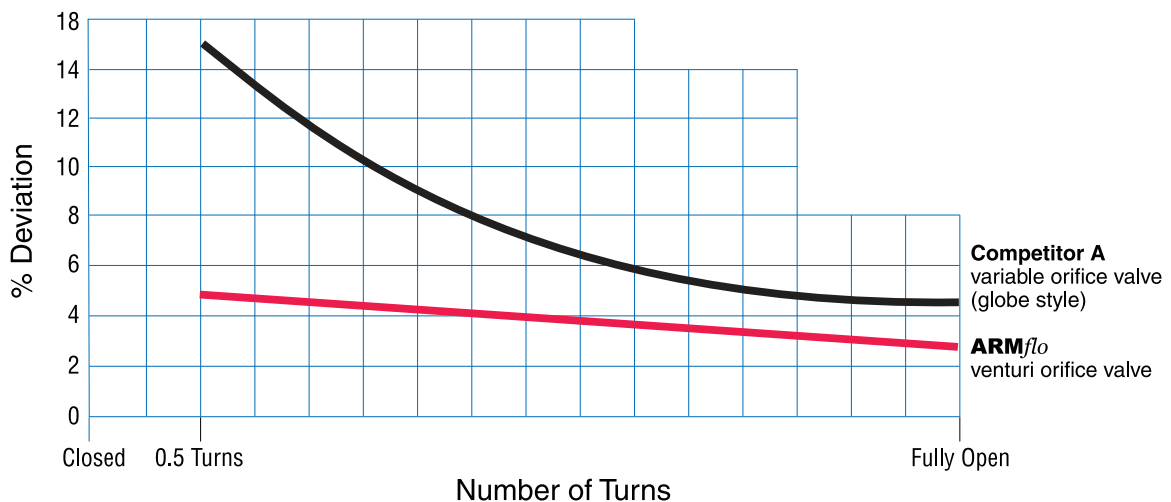
- Split case valves (2 1/2" to 12") that can be easily converted between straight and angled orientation, allowing mechanical contractors unparalleled flexibility in valve installation.
- Line sizing of valves (1/2" - 2" models) and a 95% flow accuracy that allows contractors to confidently install these CBVs at line size.
- Precision-machined venturi-style orifice provides ultra-stable pressure signal, resulting in significantly higher balancing accuracy than traditional CBVs.
- Flow straightening vanes (1/2" - 2" models) that allow contractors to reduce the number of pipe diameters downstream from CBV installation.

► Armstrong Balancing Valves – Superior by Design

Competitors' valve designs fall short due to the following:

- Quarter turn ball valves offer shut-off capability, but by design provide only 90° of adjustment range. Armstrong CBVs are designed to provide 1800° (five handle turns) of adjustment range.
- 'T' pattern globe-style CBVs, while compact in size, typically create excessive turbulence and pressure signal instability downstream of the valve seat.
- Traditional 'Y' pattern globe-style valves have pressure measurement ports upstream and downstream of the valve seat. When 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. 2" and smaller).

Armstrong Circuit Balancing Valves are designed to address all of these issues!



► Armstrong 1/2" – 2" Circuit Balancing Valves

Accurate and Fast Balancing

- ▶ The patent-pending design of Armstrong's venturi style 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 (venturi), 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.
- ▶ Innovative flow smoothing fins reduce turbulence of the fluid moving past the valve seat, lowering the total ΔP across the valve.

Energy Saving Design

Armstrong 1/2" to 2" balancing valves have five full 360° turns from open to closed, providing unparalleled flow control. That's 20 times the controllability of a 1/4" turn 'circuit-setter' valve. Better control means less overpumping, resulting in energy savings.

Compact and Versatile Design

ARMflo 1/2" to 2" balancing valves can be installed with the measuring ports facing up or down. The 'hidden' memory set screw is easy to adjust without having to remove the handle cap. Armstrong valves use a non-rising handle design, so the overall valve height remains the same from fully open to fully closed. In addition, 'triple-sealing' O-rings provide optimal leakage protection by creating a pressure gradient barrier through the stem.

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 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 1/2" to 2" balancing valves are designed to be selected based on line size, and to deliver an optimal combination of flow rate and pressure drop when used in systems designed according to ASHRAE guidelines.

Flow Rate Ranges

Valve Size	Min. Flow	Max. Flow
1/2" LF	0.26 (0.016)	2.2 (0.14)
3/4" LF	0.40 (0.025)	3.4 (0.21)
1/2"	1.4 (0.086)	10.4 (0.66)
3/4"	2.1 (0.13)	13.5 (0.85)
1"	5.2 (0.33)	20.2 (1.28)
1 1/4"	8.2 (0.52)	35.5 (2.24)
1 1/2"	8.1 (0.51)	48.9 (3.09)
2"	14.0 (0.88)	83.3 (5.25)

Note: Flow in USgpm (L/s)

Design Information

Models: CBV-VS (Solder), CBV-VT (NPT) and CBV-VB (BSP)		
Max. Working Pressure	300 psi/20 bar (PN20)	
Operating Temperature Range	-4°F to 300°F (-20°C to 150°C)	
Materials of Construction	Body, bonnet	Brass alloy CW617
	Stem and disk	Brass alloy B16
	Elastomers	EPDM
	Handwheel	Reinforced Nylon; ABS

► 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 Cv 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-venturi orifice.

Balancing Contractors

- Since differential pressure is upstream of the valve seat, a stable ΔP signal as low as 3" 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.

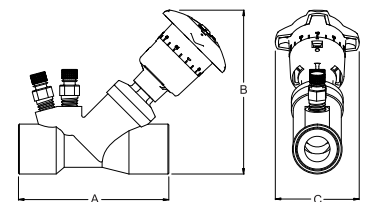
Building Owners

- 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 overpumping.
- 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 the third one actually does the sealing. This patent-pending design ensures the longevity of these valves even in systems operating at up to 300 psi.

► Dimensions

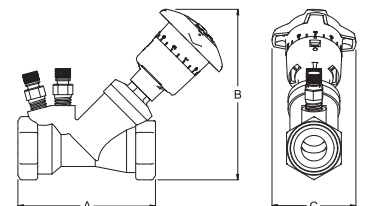
Model CBV-VS

Pipe Size	Model	A	B	C	Shipping Weight
1/2" (DN15) Low Flow	CBV050VS-LF	3.19 (81)	4.56 (116)	2.76 (70)	1.05 (0.48)
3/4" (DN20) Low Flow	CBV075VS-LF	3.64 (93)	4.65 (118)	2.76 (70)	1.09 (0.49)
1/2" (DN15)	CBV050VS	3.19 (81)	4.56 (116)	2.76 (70)	1.05 (0.48)
3/4" (DN20)	CBV075VS	3.64 (93)	4.65 (118)	2.76 (70)	1.09 (0.49)
1" (DN25)	CBV100VS	4.26 (108)	4.95 (126)	2.76 (70)	1.68 (0.76)
1 1/4" (DN32)	CBV125VS	4.94 (125)	5.40 (137)	2.76 (70)	2.26 (1.03)
1 1/2" (DN40)	CBV150VS	5.67 (144)	5.60 (142)	2.76 (70)	3.22 (1.46)
2" (DN50)	CBV200VS	7.03 (179)	6.36 (162)	2.76 (70)	5.40 (2.45)



Models CBV-VT and CBV-VB

Pipe Size	Model	A	B	C	Shipping Weight
1/2" (DN15) Low Flow	CBV050VT-LF/VB-LF	2.99 (76)	4.60 (117)	2.76 (70)	1.07 (0.49)
3/4" (DN20) Low Flow	CBV075VT-LF/VB-LF	3.26 (83)	4.90 (125)	2.76 (70)	1.21 (0.55)
1/2" (DN15)	CBV050VT/VB	2.99 (76)	4.60 (117)	2.76 (70)	1.07 (0.49)
3/4" (DN20)	CBV075VT/VB	3.26 (83)	4.90 (125)	2.76 (70)	1.21 (0.55)
1" (DN25)	CBV100VT/VB	3.80 (97)	5.29 (126)	2.76 (70)	1.86 (0.84)
1 1/4" (DN32)	CBV125VT/VB	4.32 (110)	5.60 (142)	2.76 (70)	2.34 (1.06)
1 1/2" (DN40)	CBV150VT/VB	5.07 (129)	5.90 (150)	2.76 (70)	3.49 (1.59)
2" (DN50)	CBV200VT/VB	6.00 (153)	6.68 (170)	2.76 (70)	5.97 (2.46)



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

► Armstrong 2½" – 12" Cast Iron Balancing Valves

► Features and Benefits

CBV-G (Straight) and CBV-A (Angle): sizes 2½" – 12"

Innovative Convertible Design

Armstrong 2½" through 12" CBV's are furnished in either angled or straight patterns, and can be conveniently changed to either configuration 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 body bolts. Rotating one half of the body 180° produces a 90° change in flow direction. All Armstrong valves in this size range are field-convertible to straight or 90° angle, regardless of how they were furnished originally and field conversion does not reduce valve accuracy. Valves are furnished with either industry standard grooved ends or flanges.

Flexible Installation

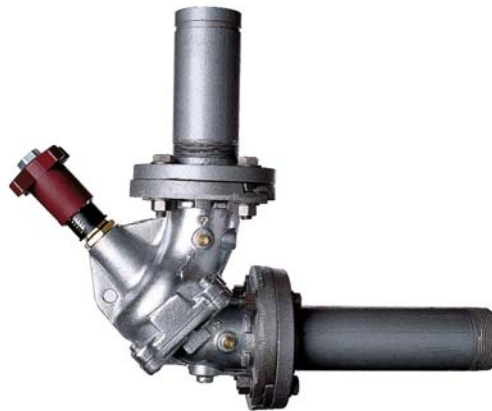
Armstrong CBVs can be used in either a conventional straight installation or to replace angles or elbows in the piping system. This flexibility ensures that the valve can be installed in the most cost effective and accessible position. The angle configuration eliminates a piping elbow and two welded joints, resulting in reduced installation costs.

Field-convertible from angled to straight.

Multi-turn flow adjustment capability from 5 turns in 2½" up to 14 turns in 12" models.



2½" – 12" Model CBV-G straight configuration.



Flanged Model CBV-FA showing 90° angle installation.

Model	CBV-FS (Straight) / CBV-FA (Angle)								CBV-G (Straight) / CBV-A (Angle)								
Connection Size ANSI 125# Flange	2½	3	4	5	6	8	10	12	2½	3	4	5	6	8	10	12	
Handwheel - No. of 360° turns	5	5	6	6	6	12	12	14	5	5	6	6	6	12	12	14	
Max. Working Pressure	250 psi (1725 kPa)								250 psi (1725 kPa) when used with Class 125/150 flange adapter 375 psi (2575 kPa) when used with Class 250/300 flange adapter								
Max. Working Temperature	230°F (110°C) ¹								230°F (110°C) ¹								
Materials of Construction	Body	Cast Iron ASTM A48 Class 30B								Ductile Iron ASTM A536 GR65-45-12							
	Disc	Bronze ASTM B584 C-84400								Bronze ASTM B584 C-84400							
	Seat	EPDM Elastomer								Ultra High Strength Engineered Resin							
	Stem	Brass ASTM B-16								Brass ASTM B-16				Stainless Steel ASTM A582 Type 416			
	Trim	Brass ASTM B283 C-37700								Brass C-37700							
O-ring	Buna & EPDM Elastomer								Buna								
Insulation	Optional ²								Optional ²								
Pressure Metering Ports ¼" (2)	NPT Brass Body with EPDM ³ Check and Gasketed Cap								NPT Brass Body with EPDM ³ Check and Gasketed Cap								
Drain Tappings ¼" (2) Brass Plug	Brass Plug																

Notes: 1. Optional Viton for 2½" to 6" sizes elastomers for temperatures up to 300°F (150°C).

2. Optional pre-formed insulation is available to meet ASTM D 1784/Class T4253-C, MEA #7-87, ASTM E-84 and ASTM E-136 with a flame spread rating of 25 or less and a smoke development rating of 50 or less.

3. EPDM is not suitable for oil service.

► Accessories

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

PMP Ports

- Easy insertion of measurement programs.
- Quick-closing rubber seals.



PMP Extension Ports

- Provide convenient access to pressure measurement where wrapped pipe insulation is used.



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

Meters

- **CBDM 200**
- **DPM-15** – differential pressure meter [0 - 15 psi (0 - 100 kPa)].
- **CBDM 135/60**
- **DPM-100** – differential pressure meter [0 - 100 psi (0 - 700 kPa)].



Orifice Plates

- 1/2" to 2" NPT.
- 2 1/2" to 24" socket weld or flange.



Venturis

- 1/2" to 2" threaded.
- 2 1/2" to 20" butt welded.



► Typical Specifications for Armstrong 1/2" – 2" Valves

Furnish and install, as shown on plans and in accordance to manufacturer's installation instructions, Armstrong Circuit Balancing Valves. Valves are to be of the 'Y' pattern, equal percentage globe-style and provide three functions: 1) Precise flow measurement, 2) Precision flow balancing, 3) Positive drip-tight shut-off.

Valve shall provide multi-turn, 360° adjustment with micrometer type indicators located on the valve handwheel. Valves shall have a minimum of five full 360° handwheel turns. 90° 'circuit-setter' style ball valves are not acceptable. Valve handle shall have hidden memory feature, which will provide a means for locking the valve position after the system is balanced.

Valves shall be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi shall have two, 1/4" threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves shall be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug shall be brass. The handwheel shall be high-strength resin.

► Typical Specifications for Armstrong 2 1/2" – 12" Valves

Furnish and install, as shown on plans and in accordance to manufacturer's installation instructions, Armstrong Circuit Balancing Valves. Valves are to be of the 'Y' pattern, equal percentage globe-style and provide three functions: 1) Precise flow measurement, 2) Precision flow balancing, 3) Positive drip-tight shut-off.

Valve shall provide multi-turn, 360° adjustment with micrometer type indicators located on the valve handwheel. Valves shall have a minimum of five full 360° handwheel turns. 90° 'circuit-setter' style ball valves are not acceptable. Valve handle shall have hidden memory feature, which will provide a means for locking the valve position after the system is balanced.

Valve body shall be either cast iron with integrated cast iron flanges (2 1/2" to 12") or ductile iron with industrial standard grooved ends (2 1/2" to 12"). Valve stem and plug disc shall be bronze with ergonomically designed handwheel that permits multi-turn adjustments. Sizes 2 1/2" and 3" – 5 turns; sizes 4" to 6" – 6 turns; sizes 8" and 10" – 12 turns and size 12" – 14 turns. Armstrong flange adapters shall be supplied, to prevent rotation.

The valve shall be installed with flow in the direction of the arrow on the valve body and installed at least five pipe diameters downstream from any fitting, and at least ten pipe diameters downstream from any pump. Two pipe diameters downstream from the CBV should be free of any fittings. When installed, easy and unobstructed access to the valve handwheel and metering ports for adjustment and measurement are to be provided. Mounting of valve in piping must prevent sediment build-up in metering ports.

Consult your local ARMSTRONG Representative for literature corresponding to valves with "CR" in the model name or embossed on the valve body.

EXPERIENCE BUILDING...

S. A. Armstrong Limited
23 Bertrand Avenue
Toronto, Ontario
Canada, M1L 2P3
T: (416) 755-2291
F (Main): (416) 759-9101

Armstrong Pumps Inc.
93 East Avenue
North Tonawanda, New York
U.S.A., 14120-6594
T: (716) 693-8813
F: (716) 693-8970

Armstrong Holden Brooke Pullen
Wenlock Way
Manchester
United Kingdom, M12 5JL
T: +44 (0) 161 223 2223
F: +44 (0) 161 220 9660



© S.A. Armstrong Limited 2007

For Armstrong locations worldwide, please visit www.armstrongpumps.com