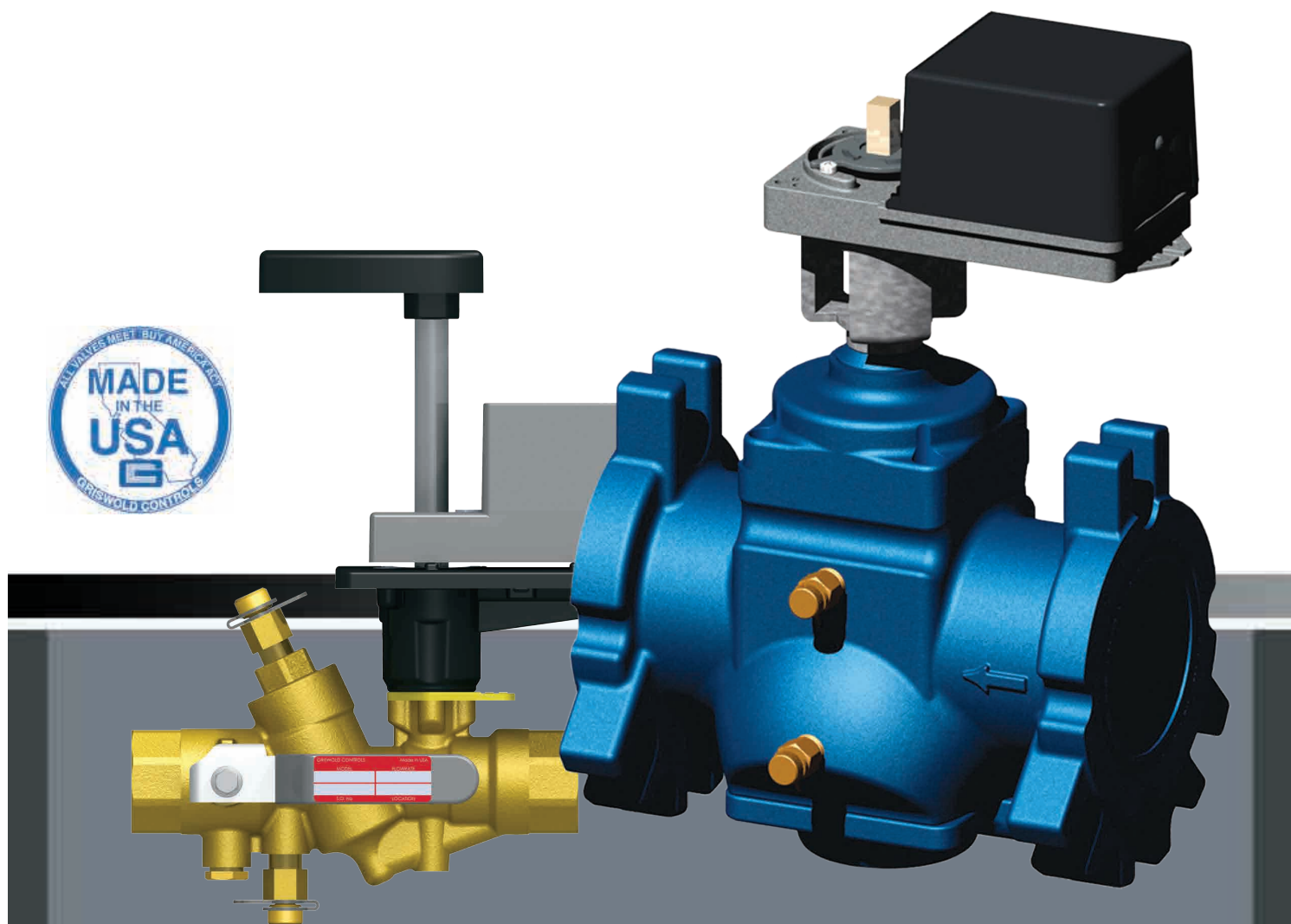


PIC-V[®], MVP[®] & PIM



Recommended Applications:

- Where balancing at reduced loads is needed, such as office buildings, schools or hotels
- Where temperature variance can not be risked, such as hospitals, laboratories or prisons
- Where longer actuator life is required
- Where the primary variable flow system needs to be optimized

Absolute Control. **Optimized Efficiency.**

Pressure Independent Control Valves

How Does Flow Change?

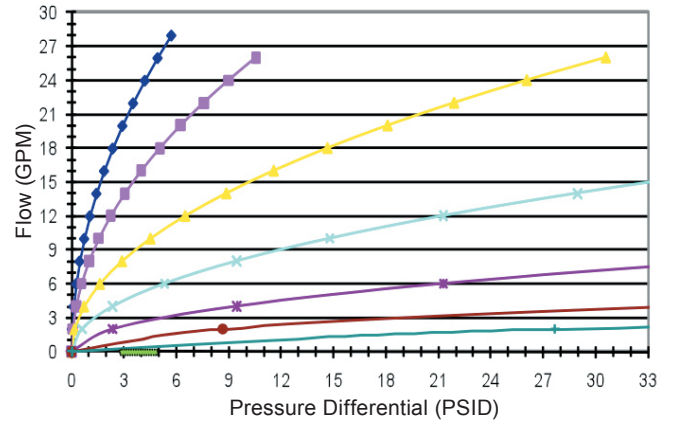
Flow (Q) changes as pressure (P) and/or open area (A) changes. This is represented with the simple formula:

$$Q = A \cdot \sqrt{\Delta P} \quad \text{Where:}$$

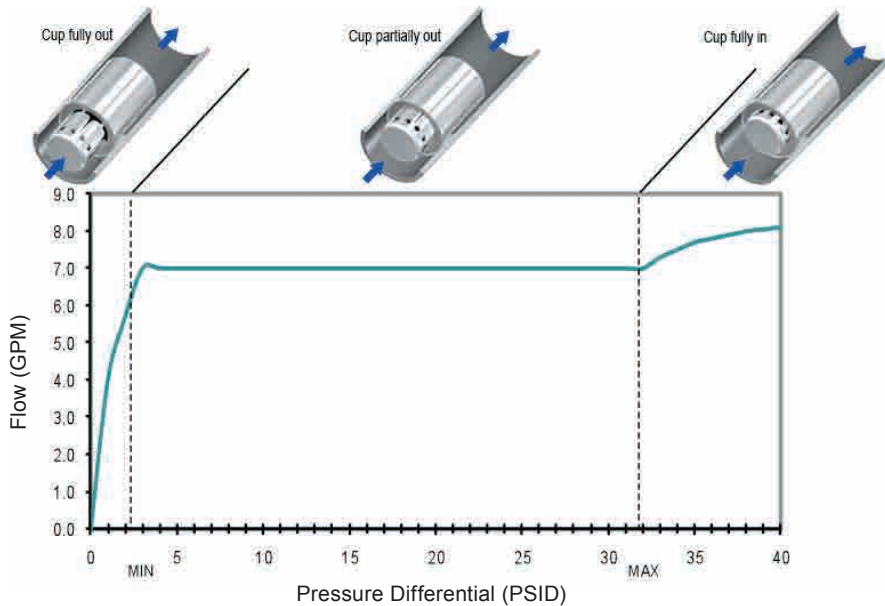
Q = Flowrate in gpm; A = Open Area; ΔP = Pressure Differential

Flow Change with a Traditional Actuated Valve

In a traditional Actuated Ball Valve or Actuated Globe Valve as the pressure (P) changes in the system the flowrate (Q) changes through the valve. If the zone was satisfied and now the flow changed the actuator now needs to respond to this change by opening or closing the valve. This leads to hunting and is a big reason occupants complain about the room temperature.



Different color curves represent different actuated valve positions



Flow Change with Flow Limiting and Actuated Valve

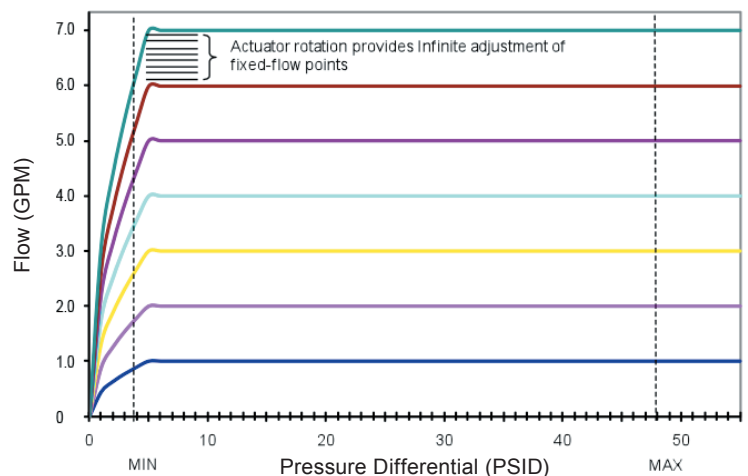
In a system with flow limiting cartridge as the pressure (P) drop increases, the open area (A) in the cup decreases so the result is no flow (Q) change. The only way to increase the flow is to modulate the control valve.

Flow Change with Pressure Independent Valve

If you maintain a constant pressure (P) drop AND a constant area (A) the flow (Q) remains unchanged.

$$Q = A \cdot \sqrt{\Delta P}$$

The actuator rotation moves the horizontal fixed flow line up or down to provide temperature control modulation. Simultaneously, flow control is maintained along the horizontal portion of the graph within the minimum & maximum differential pressure limits when the pressure in the system changes.



How Does Flow Affect ΔT ?

ΔT is the temperature difference across the chiller. If we can increase the water ΔT , we can maximize chiller capacity and reduce pumping requirements.

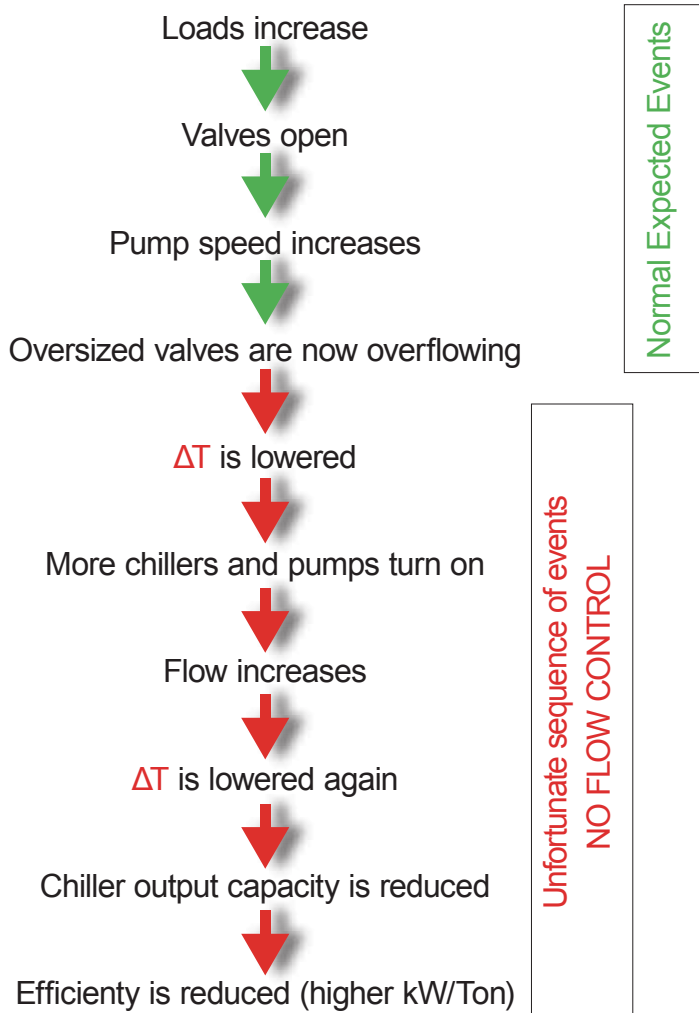
Increase your ΔT , reduce your flowrate, same heat transfer!

BTU/Hr = 500 x gpm x ΔT

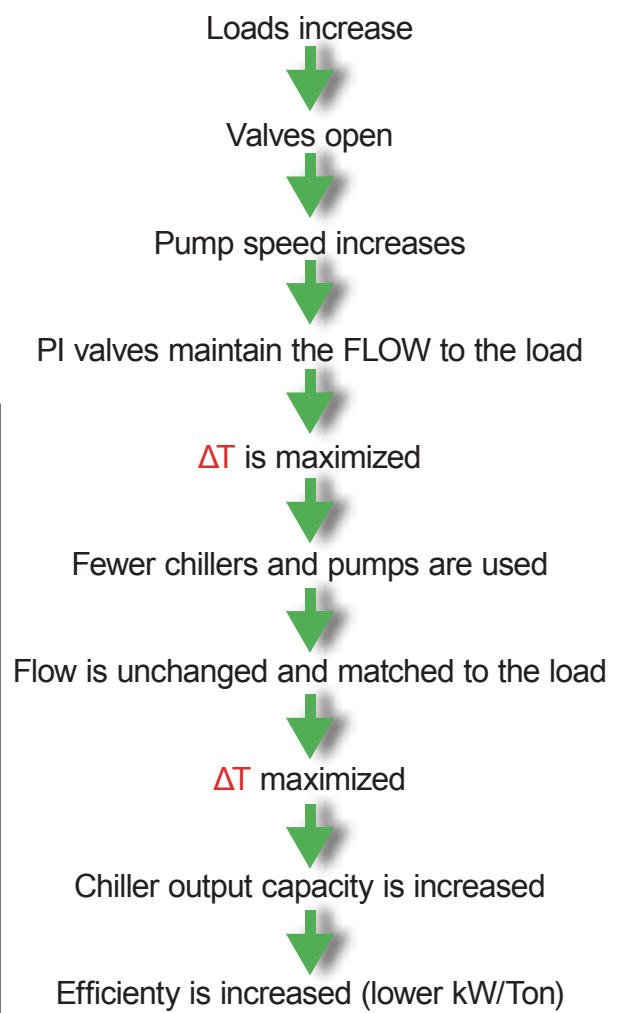
500,000

- = 500 x 500 x 2 (low ΔT)
- = 500 x 200 x 5 (low ΔT)
- = 500 x 100 x 10 (moderate ΔT)
- = 500 x 50 x 20 (good ΔT)
- = 500 x 33 x 30 (excellent ΔT)

What Causes Low ΔT ?



What prevents low ΔT ?



Pressure independent control valves do not allow a change in flow rate when the pressure differential across the valve changes.

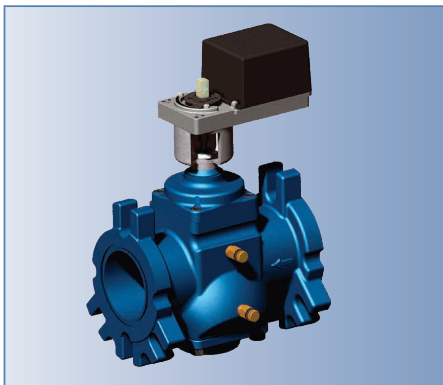
- Only a change in the load will cause a change in the flow rate
- A change in ΔP will not cause flow change
- Flow, coil output, and controlled temperature remain stable
- Pressure independent control valves “balance to the load”

Pressure Independent Control Valves

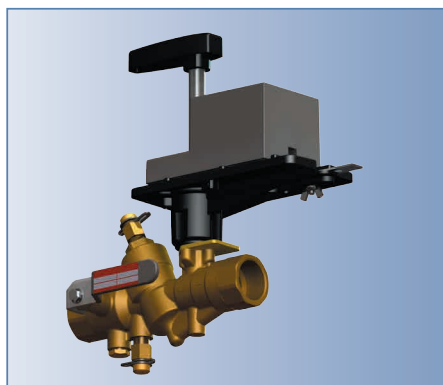
Features & Benefits

- Save valuable time by eliminating Cv selection in the valve selection process. Simply choose the smallest Pressure Independent Valve that satisfies the flow requirements and you will have valve authority.
- Control flow exactly—especially at reduced loads or loads less than design.
- Control flow exactly—no overflow or underflow at coils ever.
- Lower system energy costs through efficient heat transfer by providing relief from many causes of low ΔT at coils.
- Increase actuator life expectancy—less valve and actuator movement needed to maintain set point since pressure changes are compensated for by the diaphragm cartridge assembly instead of by actuator position changes.
- PIC-V®: Actuator uses full 90° stroke, eliminating installation error in field. MVP®: Actuator uses six full 360° rotations assuring flow accuracy.
- PIC-V®: Field repairable. Both actuated stem and cartridge can be changed without removing valve from line.
- Flow rate can be determined by reading valve position on top of actuator.
- MVP®: Valve position can be sent back to control system so flow can be automatically calculated.
- Simple retrofit—no need to know exact flow requirement.
- Simple retrofit—no balancing required with pressure independent flow control.
- Eliminates balancing valves.
- Provide more cooling from existing chillers as opposed to buying additional or new chillers.
- Multifunction housing reduces piping and installation time as well as number of components required.
- P/T test ports standard for checking and testing valve and coil temperature and pressure.
- Eliminate reverse return piping, oversized main piping, and undersized branch piping hydronic strategies.

Valve Operation



MVP®



PIC-V®

When conventional 2-way valves in variable flow systems open or close, it causes a pressure change to other valves in the system.

Pressure Independent Control Valves (the MVP®, PIM-V® and the PIC-V® valves) maintain the required flow rate regardless of these pressure changes.

The actuator modulates the Pressure Independent Control Valve to a required fixed flow based on load (or zone) requirements, independent of pressure. When the zone is satisfied the actuator stops rotating and the valve is now set at optimum flow. If the system pressure changes the internal diaphragm compensates for the pressure change and maintains constant flow rate without cycling by the actuator. The flow does not change until the control system tells the actuator to change the valve position based on load changes.

This stable flow means less work for the actuator, and actuator life is therefore increased.

Pressure Independent Control Valves can limit the flow rate to almost an infinite number of flow rates below the specified maximum, providing balancing at any point below and including the maximum flow rate.

PIC-V® Section View

Blow-Out-Safety-Retainer/ Replaceable Stem:

Actuated ball stem can be easily and safely replaced while the valve is installed in the pipe line. (Patent Pending)

Actuator and Plate Can Be Rotated After Mounting:

Valve can be installed in confined spaces. Makes wiring the actuator easier.

Union End Connection:

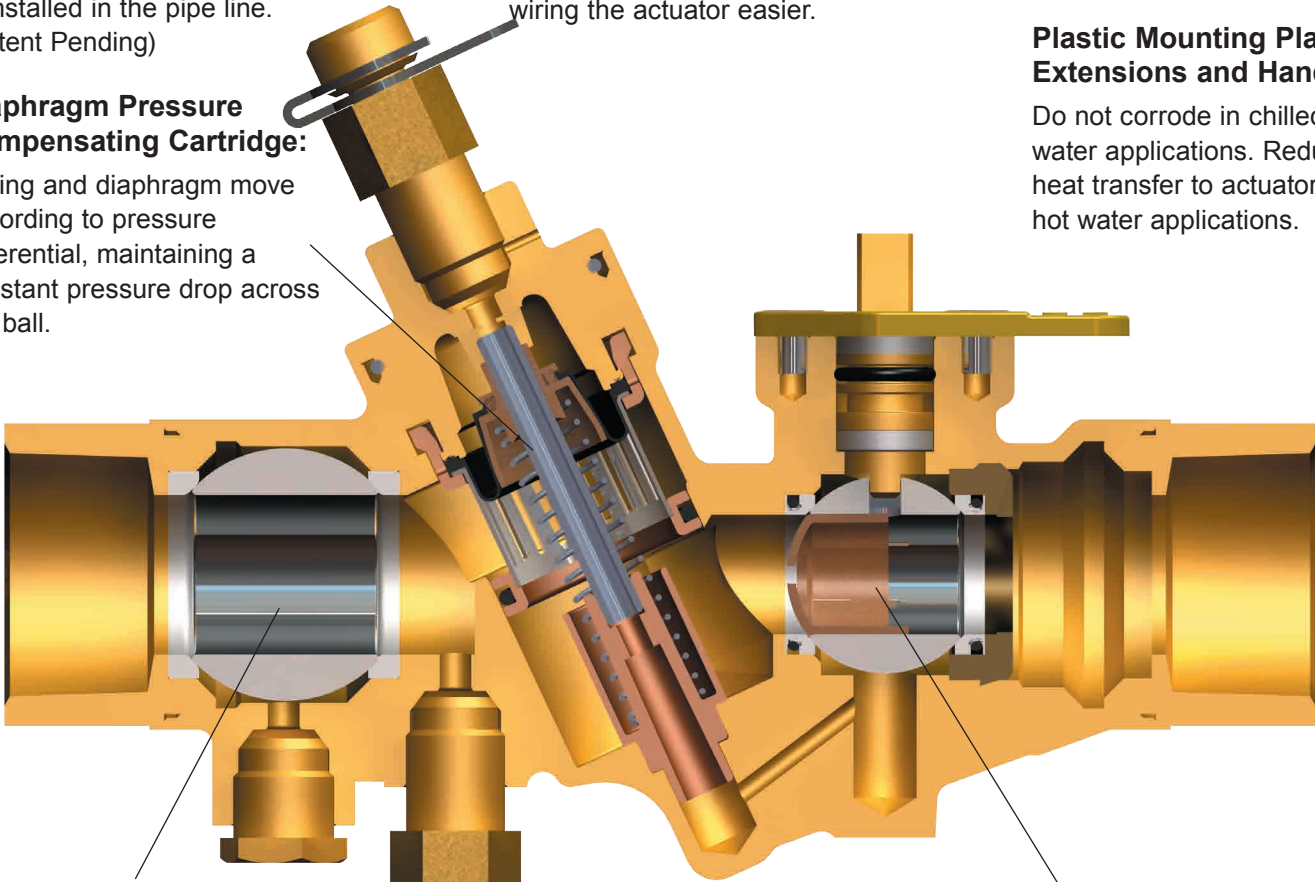
Available with Male, Female Threaded or Sweat.

Diaphragm Pressure Compensating Cartridge:

Spring and diaphragm move according to pressure differential, maintaining a constant pressure drop across the ball.

Plastic Mounting Plate, Extensions and Handle:

Do not corrode in chilled water applications. Reduce heat transfer to actuator in hot water applications.



Isolation:

Manual Ball Valve to isolate coil or valve for maintenance

Combination Pressure/ Temperature Test Port/ Air Vent:

Enable easy pressure differential readings as well as air to be vented. (Patent Pending)

Patented Optimizer® Parabolic Flow Insert:

Provides Equal Percentage Control and limits the flow to zone set point with +/- 5% accuracy.

Positive Shut Off:

Accurate control of fluid through coils, no leak by even at low flow rates..

No Cv sizing is required. U.S. Patent #5,937,890.

Sizes available:

1/2" to 3"
Flow rate: 1.5 to 95 GPM

Patented Seal and O-Rings:

Reduce torque required to rotate ball (less than 35 in-lbs), reducing actuator size. U.S. Patent #6,948,699.

Universal Mounting Plate:

One mounting plate can be used with all manufacturers' actuators, including Griswold Controls' actuator.

Manual Operation:

Valve can be operated in the event of a power failure.

Ultimate flexibility...mix and match to meet your exact need!

PIM® Module

The Griswold Controls universal pressure regulator (PIM®) can be used with many different valves to provide pressure independent performance, from manual valves to actuated valves. The PIM® module can also be used to maintain a constant pressure differential across a branch or anything that needs to be independent of pressure changes.

Benefits:

- ✓ Maintain a constant pressure drop across any valve, branch or equipment including products already in service. Can also be combined with other valves from Griswold Controls.
- ✓ +/-5% accuracy through the entire pressure range
- ✓ Operates automatically off system pressure, no electronics required
- ✓ Available in 3", 4" and 6" size with Flanged or Grooved End connections
- ✓ Adjustable pressure drop range of 2-25 psi

PIM-V®

Use the PIM® Module with the Griswold Controls Unimizer - Actuated Ball Valve for a true Pressure Independent Valve.

Benefits:

- ✓ All the benefits of an actuated PI valve at a fraction of the price
- ✓ Maintain constant flow regardless of pressure changes in system
- ✓ Prevent over flow and under flow in system
- ✓ Improve system delta ΔT and therefore reduce flow required
- ✓ Extend actuator life
- ✓ Use any 1/4 turn LOW torque actuator
- ✓ No actuator to program or set up
- ✓ Control flow up to 165gpm with the 3" valve, 365 gpm with the 4" valve and 505 gpm with the 6" valve

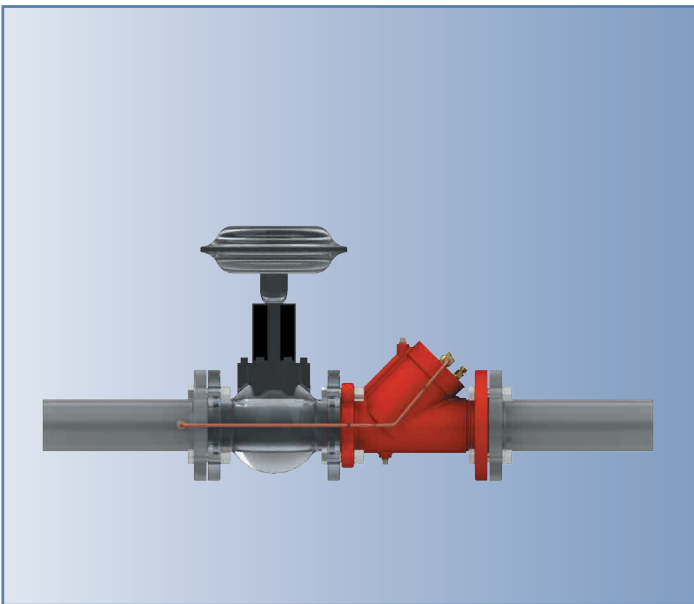


Figure 1 PIM® Module

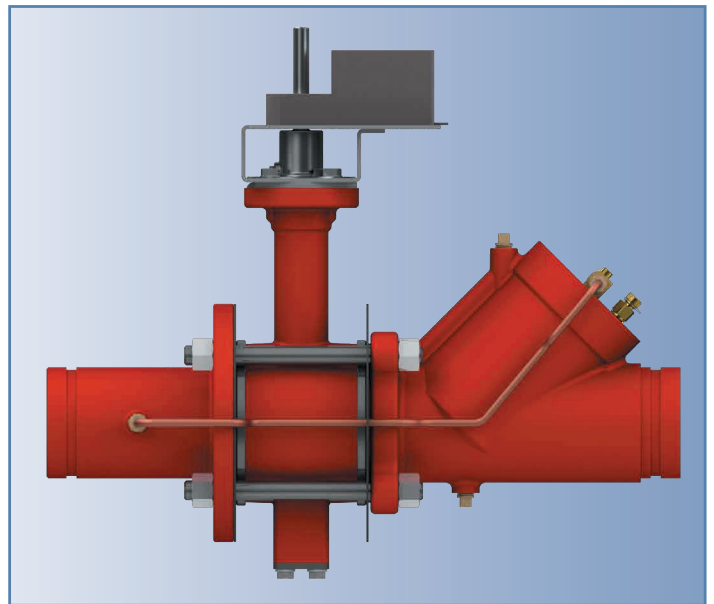
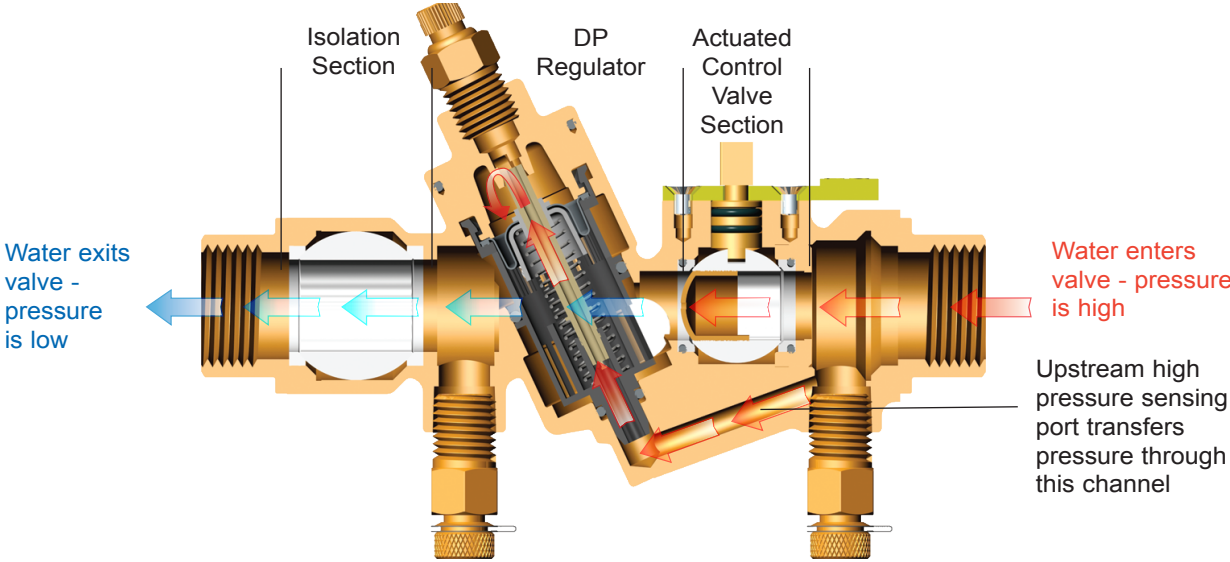


Figure 3 PIM-V®

PIC-V® Section View - Three Valves, One Body

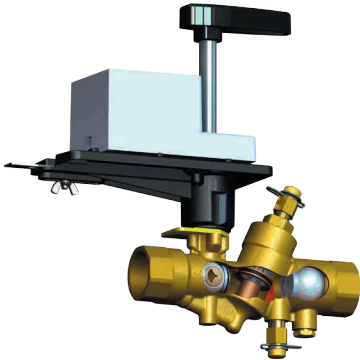
The Pressure Independent valves can be described as multiple valves in one housing. All Pressure Independent valves have a pressure regulating section of the valve that regulates the pressure differential across the Actuated Valve Section. The pressure differential is maintained by a diaphragm and a spring. The Actuated Valve section is a variable orifice device adjusted by the actuator during load condition changes. This is similar to a modulating control valve in a traditional system. The diaphragm and spring react to pressure changes in the system and regulate the pressure differential across the Actuated Valve Section so that flow is held constant.



When inlet pressure changes, the pressure at the top of the diaphragm also changes. This alters the low pressure area under the diaphragm so that the pressure drop across the ball remains constant. A constant PSID means a constant flow rate!

STEM	GPM								
100%	1.0	2.0	4.0	6.0	8.0	9.0	11.0	15.0	
95%	1.0	2.0	3.8	5.8	7.0	6.8	9.9	15.0	
90%	1.1	2.0	3.6	5.1	6.9	6.5	7.0	15.4	
85%	1.1	1.9	3.1	4.5	6.2	5.9	6.2	13.8	
80%	1.1	1.7	2.8	4.0	5.6	5.5	5.5	8.5	
75%	0.99	1.5	2.5	3.4	4.9	4.8	4.9	6.7	
70%	0.84	1.3	2.3	2.9	4.2	4.3	4.2	6.1	
65%	0.72	1.2	2.1	2.4	3.6	3.7	3.8	5.4	
60%	0.62	1.0	2.0	2.0	3.1	3.2	3.2	4.7	
55%	0.50	0.94	1.8	1.8	2.8	2.8	2.7	4.2	
50%	0.40	0.86	1.5	1.6	2.3	2.3	2.1	3.6	
45%	0.38	0.69	1.3	1.4	1.8	1.8	1.7	3.1	
40%	0.34	0.58	0.97	1.0	1.4	1.5	1.2	2.6	
35%	0.28	0.48	0.65	0.72	0.98	1.2	0.82	2.1	
30%	0.20	0.34	0.37	0.43	0.58	0.85	0.46	1.6	
25%	0.18	0.19	0.23	0.21	0.30	0.57	0.21	1.2	
20%	0.17	0.14	0.15	0.12	0.17	0.35	0.14	0.71	
15%	0.17	0.16	0.09	0.12	0.14	0.20	0.10	0.19	
10%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Closed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

To determine the PIC-V flowrate:



All PIC-V valves are installed with a 90° actuator. Using the chart supplied with every valve, the end user (or the control system) can determine the flow rate based on the actuator position. For a modulating actuator the actuator

position can be sent back to the control system so that flowrate can be determined.

This can be used for flow verification for LEED requirements or flow measurement during commissioning.

Pressure Independent Control Valves

PIC-V® Valve Flow Rates

MODEL NO	SIZE	PSID RANGE	CLOSE-OFF PSID	GPM
PICVO	1/2", 3/4", 1"	3-35	100	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0
	3/4", 1"	6-35		8.0, 9.0, 10.0, 11.0, 15.0
PICV1	1"L, 1-1/4", 1-1/2"	4-50		10, 15, 20
		5-50		25,30
	1-1/4", 1-1/2"	6.5-50		35
PICV2	1-1/2"L, 2", 2-1/2", 3"	4-58		25, 30, 35
		6-58		40, 45, 50
		7-58		55, 60, 65, 70, 75, 80, 85
	2", 2-1/2", 3"	11-58		95

MVP® Valve Flow Rates

MODEL NO	SIZE	CONTROL RANGE PSID	MAXIMUM FLOW GPM	LOWEST MAX SETTING GPM
MVP31	2" 2-1/2" 3"	4.5 – 87	113	40.7
MVP32	2" 2-1/2" 3"	5.1 – 87	157	56.3
MVP41	3" 4"	4.5 – 87	149	55.4
MVP42	3" 4"	5.1 – 87	225	75.0
MVP51	5" 6"	4.5 – 87	369	103
MVP52	5" 6"	5.1 – 87	468	113
MVP62	8" 10"	5.1 – 87	1220	146

¹ 2" valves require a 2" threaded adapter, purchased separately.

PIM-V® Valve Flow Rates

MODEL NO	SIZE	PSID RANGE	CLOSE-OFF PSID	GPM
PIM-V®	3"	6-60	60	127
		7-60		139
		8-60		165
	4"	7-60		230
		9-60		309
		12-60		365
	6"	4-60		350
		4.5-60		420
		3-60		505

All Griswold Pressure Independent Valves are easy to install without the use of cranes or other heavy equipment

SAVINGS

EXPENSE	MANUAL	PI VALVE or FLOW LIMITING
¾" Valve	\$139*	\$201
Manual:Balancing Labor/PI Valve: Verification Labor (@\$75/hr)	\$50 (40 min)	\$12 (10 min)
Installation Labor (@\$75/hour)	\$20 (15 min)	\$10 (7 min)
TOTAL INSTALLED COST	\$209	\$223
Only a 6% premium for PI technology!		
After the money is spent...		
Does your system maintain flow at full load??	?	YES
Will it limit flow when system pressure changes?	NO!	YES
Can it help improve chiller ΔT?	NO!	YES
Does it reduce operational energy costs?	NO!	YES
*Includes manual valve and modulating control valve		

CASE STUDY - NEW CONSTRUCTION

- David Braley Athletic Center, McMaster University (Hamilton, Ontario)
- 400 Tons total capacity
- 11 Pressure Independent Valves added
- Coils selected for design of 18°F
- System has been observed to run effectively at 24 gpm-10% design flow
- ΔT recorded as high as 31°F
- Booster pumps rarely used
- Annual Savings ~\$8,000USD



CASE STUDY - RETROFIT

- Vancouver International Airport:
- 2000 Tons total capacity (Primary/Secondary)
- Low ΔT @ 7°F
- Customer complaints about air temperature
- 25 Pressure Independent Valves added (AHU's)
- CHW Set Point changed from 43°F to 40°F
- Bypass Line - Bi-directional flow meter added
- Bypass Line - Check valve removed
- ΔT Increased to 21°F
- Pump flow reduced by 66%
- Standby chillers turned off
- Customer complaints eliminated
- Annual Savings ~\$39,500 USD



PIC-V® 1/2" to 3"

Standard Fields



Select a Valve Size: 0=1/2" to 1"; 1=1" L to 1-1/2"; 2=1 to 1/2" L to 3"

Select a PSID Control Range: 1=2.9 to 20; 2=2.9 to 60; 3=5.8 to 60

VALVE	FIXED END OR UNION END ¹		UNION END ONLY ¹
	FEMALE THREADED	FEMALE SWEAT	MALE THREADED
PIC0	1/2"=E; 3/4"=F; 1"=G ²	3/8"=K; 1/2"=L; 3/4"=M; 1"=N	1/2"=H, 3/4"=I, 1"=J
PIC1	1"=G, 1-1/4"=P, 1-1/2"=Q	1"=N, 1-1/4"=K, 1-1/2"=W	1/2"=H, 3/4"=I, 1"=J, 1-1/4"=S, 1-1/2"=T
PIC2	1"-1/4"=P ³ , 1-1/2"=Q, 2"=R ² 2-1/2"=S ⁵ , 3"=T ⁵	1-1/4"=K ³ ; 1-1/2"=W ⁴ ; 2"=Y	1"=J; 1-1/4"=S; 1-1/2"=T; 2"=U

For fixed end by fixed end fill in 2nd digit with an "X"

1 Select the fixed end first and the union end second.

2 Tailpiece not available for this size. Male tailpiece used with coupling.

3 Fixed end not available for this size. Union tailpiece only. A fixed end with sweat adapter can be used as a substitute.

4 Sweat Fixed end not available for this size. A fixed end with sweat adapter can be used as a substitute.

5 2-1/2" and 3" is available only with fixed ends.

SIZE	MODEL NO	FLOWS
1/2", 3/4", 1"	PICV0	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0
3/4", 1"		8.0, 9.0, 10.0, 11.0, 15.0
1"L, 1-1/4", 1-1/2"	PICV1	10, 15, 20
1-1/4", 1-1/2"		25,30
1-1/2"L, 2", 2-1/2",3"	PICV2	25, 30, 35
		40, 45, 50
		55, 60, 65, 70, 75, 80, 85
		95

Insert Actuator Model Number. If Actuator is supplied by others, insert "1" for Neptronic, "2" for Johnson Controls, "3" for Invensys, "4" for Honeywell, "5" for Siemens, "6" for Belimo, "7" for KMC Controls, "8" for ELODrive

T= Optional
3" x 3" Aluminum Hanging ID Tag

MVP® 2-1/2" to 10"

Standard Fields



Select a Valve Size: 3=2-1/2"-3", 4=3"-4", 5=5"-6", 6=8"-10"

Select a PSID Control Range: 1=4.5 - 87 PSID (Not Available on 8"/10")
2=5.1 - 87 PSID 3=7.3 - 87 High Flow (3"/4" only)

Select Actuator: 1=Position Display (Non-Failsafe)
2=Failsafe & Position Display
5=BACnet Position Display (Non-Failsafe)
6=BACnet Failsafe & Position Display

PIM-V® 3" to 6"

Standard Fields
 P I M V

Select a Housing Size: : J=3", K=4", L=6"

Select End Connection Style: G=Grooved End x Grooved End; F=Flanged End x Flanged End

Insert Actuator Model Number. If Actuator is supplied by others, insert "4" for Honeywell and "5" for Siemens, "6" for Belimo and "7" for KMC Controls. 85 in-lb actuators are required for all sizes.

T= Optional 3" x 3" Aluminum Hanging ID Tag

SIZE	FLOWRANGE	
	MODEL NO	FLOWS
PIMVJ	6-60	A
PIMVJ	7-60	B
PIMVJ	8-60	C
PIMVK	7-60	D
PIMVK	9-60	E
PIMVK	12-60	F
PIMVL	4-60	G
PIMVL	4.5-60	H
PIMVL	3-60	J

Standard and Custom Coil Piping Packages

48 Hour Standard Coil Piping Packages

Griswold Controls' Coil Piping Package program includes over 900 standard packages. Engineers do not have to design or detail the various elements that are required at the supply and return end of each coil. They can just select one of Griswold Controls standard packages, which are available for both automatic and manual flow control applications. We also offer downsized components to the automatic temperature control as a standard package. Standard packages up to 2" ship within 48 hours after the order is received direct to the job site, preassembled and ready to install. If variations to the standard packages are necessary they can be readily accommodated, but they will affect the 48 hour ship time.

In addition, options such as hoses and extension kits can be easily added, but similarly this will increase the lead time.

Standard packages offer:

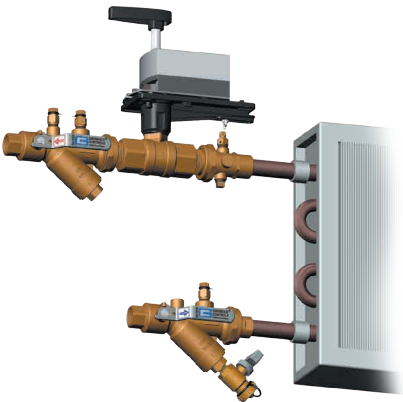
- Wide selection of preassembled, easy to order configurations
- Easy ordering: order by specific part numbers
- Timely delivery
- Variety of options available: downsized automatic temperature control, extra pressure / temperature ports, and the inclusion of Griswold Controls Automizer® and Unimizer® temperature control valves.

Custom Coil Piping Packages

Griswold Controls offers custom packages in line sizes from 2-1/2" thru 8". The components can be shipped loose or assembled and shipped on a skid—your choice. These packages are available with flange, weld or grooved end

connections and can include balancing valves, strainers, butterfly valves, control valves and reducers. A variety of options are also available for customized packages, including the addition of hoses and extension kits.

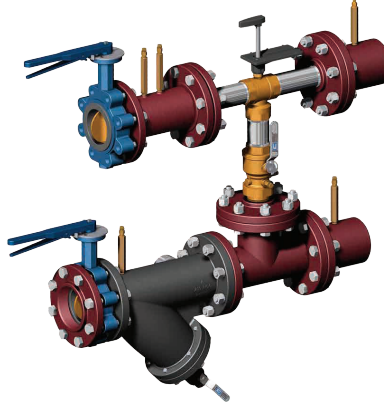
Terminal Units 1/2" to 2"



Standard 2-way IRIS Package with Unimizer®

- Isolator S with 20-mesh strainer, PT and drain valve
- Union with air vent
- 2-Way Unimizer (with any standard actuator)
- Isolator R with automatic flow control cartridge and two PT valves

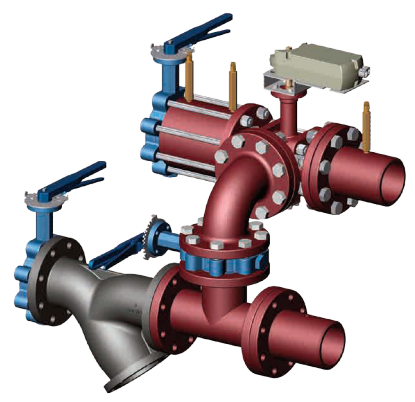
Air Handling Units 2" to 3"



Custom 3-way 3UF Package with Unimizer®

- Y-Strainer with butterfly and drain valve
- Tee connection
- 3-Way Unimizer
- Flanged Valve with butterfly valve
- Accessory Flanges with PTs

Equipment Rooms 4" to 8"



Custom 2-way 3WR Package with Unimizer®

- Y-Strainer with butterfly valve
- Tee connection
- Butterfly valve on bypass
- 3-Way Unimizer
- Wafer valve with butterfly valve
- Accessory flanges with PTs

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02/17
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