14-1345-6, Rev. F

P1000 Series Pressure Independent Valves

Installation Guide

Part No. 14-1345-6, Rev. F
Issued September 2019

Applications

P1000 Series Pressure Independent Valves are designed to regulate the flow of hot or chilled water and 60% glycol solutions in response to the demands of a controller in HVAC systems. The pressure independent valve eliminates the need for separate balancing valves. Available in sizes 1/2 through 2 in. (DN15 through DN50), this family of two-way valves can be factory- or field-mounted to Johnson Controls® VA2104 and VA2120 Series Non-Spring Return and VA2202, M2204, and VA2220 Series Spring Return Electric Actuators for floating or proportional control.

IMPORTANT: The P1000 Series Pressure Independent Valves are intended to control the flow of hot water, chilled water, and 60% glycol solution under normal equipment operating conditions. Where failure or malfunction of the P1000 Series Pressure Independent Valve could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the P1000 Series Pressure Independent Valve.

Installation

Install the P1000 Pressure Independent Valve with the actuator at or above the center of horizontal piping. To minimize heat transfer, wrap the valve and piping with insulation. Allow at least 3-1/2 in. (89 mm) of clearance above the valve to allow for actuator removal. On assemblies using the VA2104-AGA-2 with a FlowSetR™ base, avoid disconnecting the FlowSetR base from either the valve or the actuator.

IMPORTANT: Protect the actuator from dripping water, condensation, and other moisture. Water or moisture could result in an electrical short, which may damage or affect the operation of the actuator.

IMPORTANT: Prevent foreign material such as weld slag, thread burrs, metal chips, and scale from entering the piping system. This debris can damage or severely impede the operation of the valve by becoming embedded in the seats, scoring the valve, and ultimately resulting in seat leakage. If the debris becomes embedded, subsequent flushing and filtering of the piping system with the valve installed does not remedy the problem.

IMPORTANT: Do not cover the actuator with thermal insulating material. High ambient temperatures may damage the actuator, and a hot water pipe or other heat source may overheat it.

The P1000 Pressure Independent Valves are 100% open when the actuator is fully counterclockwise, and the valves are 100% closed when the actuator is fully clockwise. Figure 1 on page 2 shows the correct mounting sequence for installing the actuator on P1000 valve assemblies without a FlowSetR base (if actuator removal is necessary to install the valve).

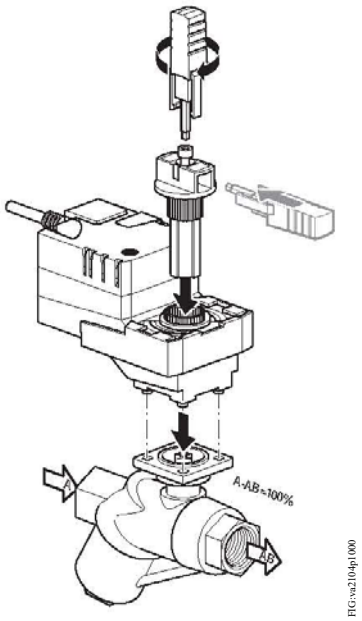


Figure 1: Installation of VA2104 Actuator on P1000 Valve

Installation of FlowSetR Base

P1000 Series Valves are sold as complete assemblies, but it may be necessary to remove the actuator, linkage, and FlowSetR base for installation. Use the following procedure to reassemble the FlowSetR base, linkage, and actuator.

Install the FlowSetR Base on Valve

1. Reset the separated FlowSetR base to the maximum scale position by turning the adjustment screw to the farthest possible plus (+) point on the scale using a hex tool, as described in *Setup of FlowSetR Base for Assemblies with VA2104-AGA-2 Actuators*.
2. Align the two straight marking lines on the FlowSetR base's natural-colored coupler (contained in the housing) with the two straight marking lines on the top of the valve stem. These lines indicate the valve's opening orientation. Slightly engage the coupler with the valve stem, but do not yet engage the small positioning pins.
3. Rotate the FlowSetR housing in the direction of the arrow on top (clockwise), with the coupler and valve stem engaged. Make one full (360 degree) clockwise rotation until the arrow points in the direction of the arrow on the valve body to correctly position the coupler and valve opening to fully open.
4. Engage the positioning pins and push down on the FlowSetR base.

Install Actuator on FlowSetR Base and Valve Assembly

1. Ensure that the actuator is in the fully open (counterclockwise) position. If not, press the manual override button and turn the handle fully counterclockwise.
2. Orient the actuator to the preferred position on the FlowSetR base. Any of the four possible 90 degree positions work.
3. Engage the coupler and positioning pins. Push the components together. The FlowSetR base must be set to the maximum scale position for proper alignment. See Step 1 of the *Install the FlowSetR Base on Valve* section for details.
4. Install the coupler screw through the handle and tighten it.
5. Proceed to *Setup of FlowSetR Base for Assemblies with VA2104-AGA-2 Actuators* to properly adjust the FlowSetR base.

Setup of FlowSetR Base for Assemblies with VA2104-AGA-2 Actuators

The factory setting corresponds to the ordered flow rate in the fully open position (fully counterclockwise). The range of adjustment is given in Table 1. To adjust the maximum flow value, proceed as follows:

1. Fully close the valve by using a control signal and the manual override. The valve should be in the fully clockwise position.
2. Use the integrated hex tool in the actuator manual adjustment handle or a 5/32 in. (4 mm) hex to turn the adjustment screw to the desired flow setting as displayed on the indicator scale on the FlowSetR base and as shown in Figure 2. Do not use any powered drivers to turn the adjustment screw.

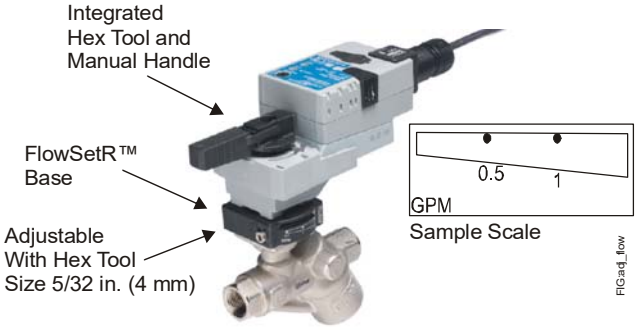


Figure 2: Adjustment of FlowSetR Base

Dimensions

Figure 3 and Figure 4 show the dimensions of the VA2104-AGA-2 and VA2104-HGA-2 Actuated P1000 Valves without pressure taps.

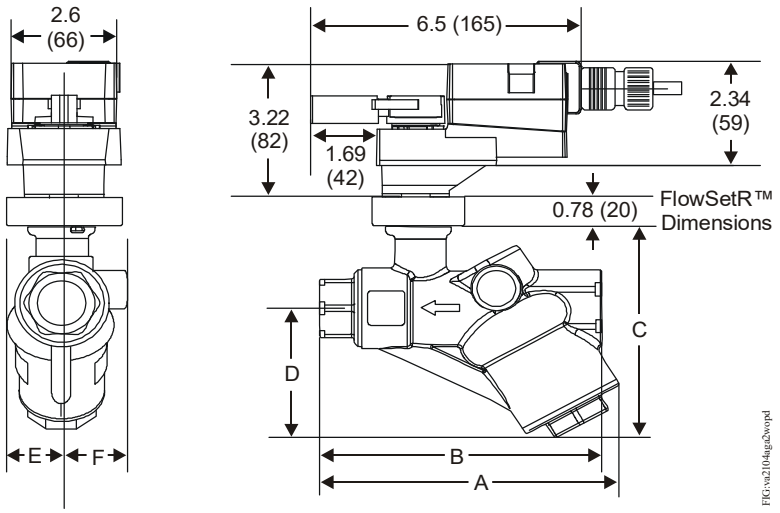


Figure 3: VA2104-AGA-2 Actuated P1000 Valve without Pressure Taps Dimensions, in. (mm)

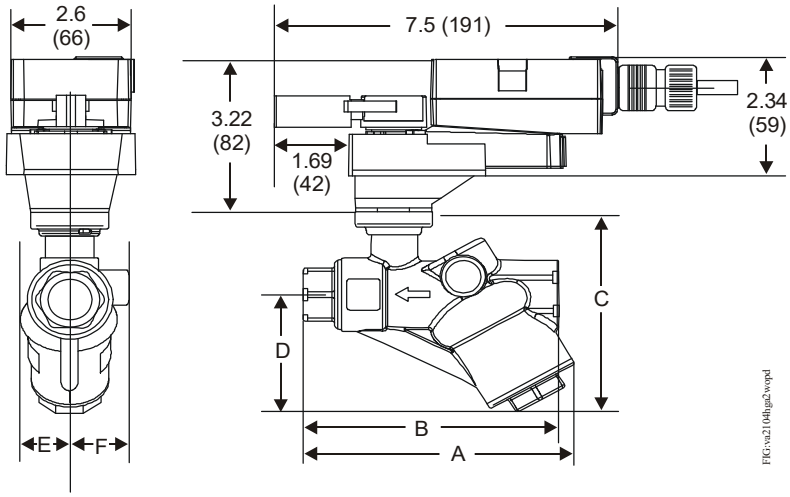


Figure 4: VA2104-HGA-2 Actuated P1000 Valve without Pressure Taps Dimensions, in. (mm)

Table 1: VA2104 Actuated P1000 Valve without Pressure Taps Dimensions, in. (mm)

Valve Size, in. (DN)	A	B	C	D	E	F
1/2 (DN15)	4.80 (122)	4.60 (117)	4.02 (102)	2.28 (58)	1.04 (26.4)	1.30 (33.0)
3/4 (DN20)	5.25 (133)	5.03 (128)	4.22 (107)	2.38 (61)	1.04 (26.4)	1.30 (33.0)
1 (DN25)	7.05 (179)	6.85 (174)	4.80 (122)	3.23 (82)	1.60 (40.6)	1.60 (40.6)

Figure 5 shows the dimensions of the M2204 Actuated P1000 Valve without pressure taps.

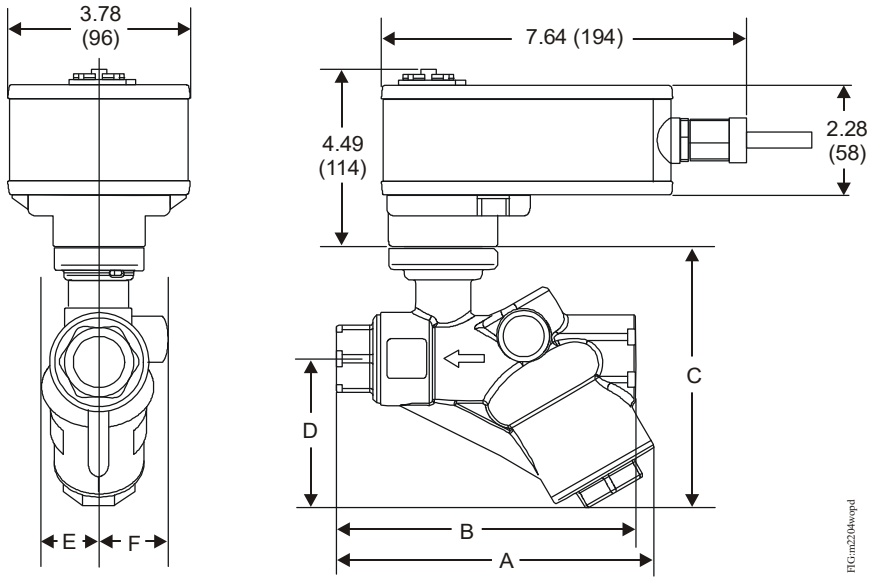


Figure 5: M2204 Actuated P1000 Valve without Pressure Taps Dimensions, in. (mm)

Table 2: M2204 Actuated P1000 Valve without Pressure Taps Dimensions, in. (mm)

Valve Size, in. (DN)	A	B	C	D	E	F
1/2 (DN15)	4.80 (122)	4.60 (117)	4.02 (102)	2.28 (58)	1.04 (26.4)	1.30 (33.0)
3/4 (DN20)	5.25 (133)	5.03 (128)	4.22 (107)	2.38 (61)	1.04 (26.4)	1.30 (33.0)
1 (DN25)	7.05 (179)	6.85 (174)	4.80 (122)	3.23 (82)	1.60 (40.6)	1.60 (40.6)

Figure 6 and Figure 7 show the dimensions of the VA2120 Actuated P1000 Valve without pressure taps.

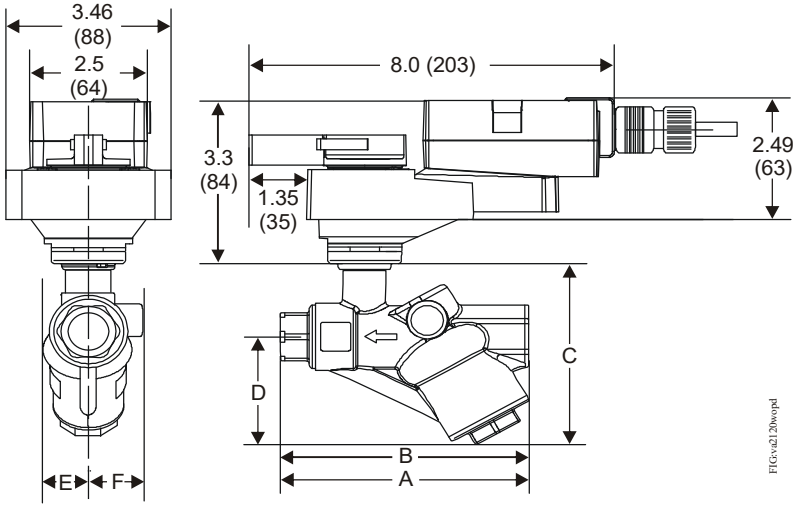


Figure 6: VA2120 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in.

Table 3: VA2120 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)[1]

Valve Size, in. (DN)	A	B	C	D	E	F
1-1/4 (DN32)	8.19 (208)	8.19 (208)	5.67 (144)	3.66 (93)	1.77 (45)	1.61 (41)
1-1/2 (DN40)	8.03 (204)	8.03 (204)	5.67 (144)	3.66 (93)	1.77 (45)	1.61 (41)
2 (DN50)	8.50 (216)	8.50 (216)	5.91 (150)	3.66 (93)	1.77 (45)	1.61 (41)

1. Dimensions shown are for 2 in. valves with flows up to 40 Gallons Per Minute (GPM).

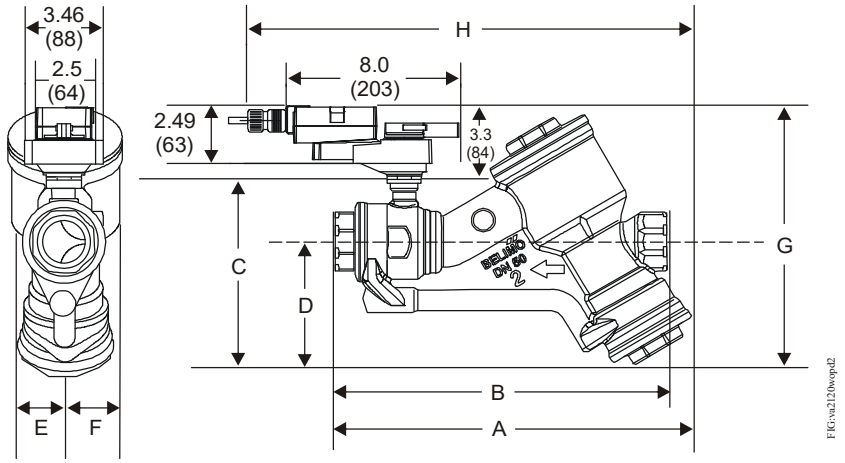


Figure 7: VA2120 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)

Table 4: VA2120 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)[1]

Valve Size, in. (DN)	A	B	C	D	E	F	G	H
2 (DN50)	16.39 (416)	15.60 (396)	8.94 (227)	5.87 (149)	2.64 (67)	2.64 (67)	12.83 (326)	21.90 (556)

1. Dimensions shown are for 2 in. valves with flows from 44 to 100 GPM.

Figure 8 and Figure 9 show the dimensions of the VA2220 Actuated P1000 Valves without pressure taps.

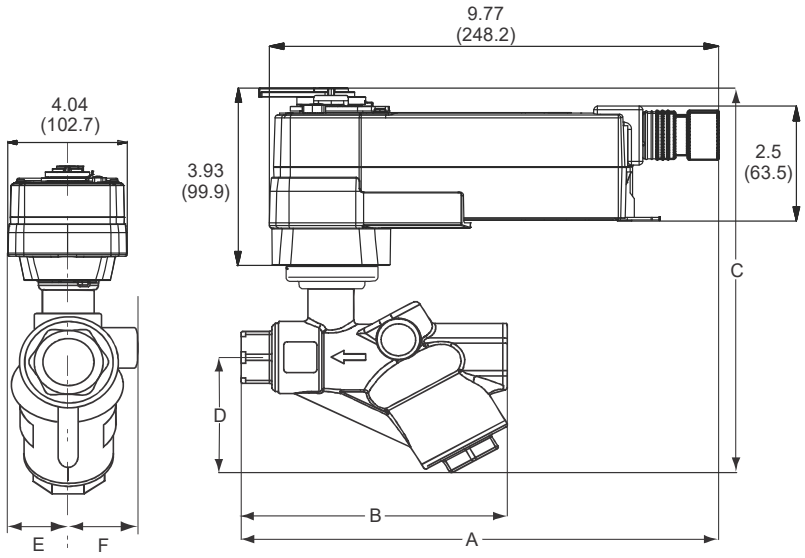


Figure 8: VA2220 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)

Table 5: VA2220 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)[1]

Valve Size, in. (DN)	A	B	C	D	E	F
1-1/4 (DN32)	10.92 (277)	8.19 (208)	9.6 (244)	3.66 (93)	2.02 (51)	2.02 (51)
1-1/2 (DN40)	11.24 (285)	8.03 (204)	9.6 (244)	3.66 (93)	2.02 (51)	2.02 (51)
2 (DN50)	11.2 (284)	8.5 (216)	9.84 (250)	3.66 (93)	2.02 (51)	2.02 (51)

1. Dimensions shown are for 2 in. valves with flows up to 40 GPM.

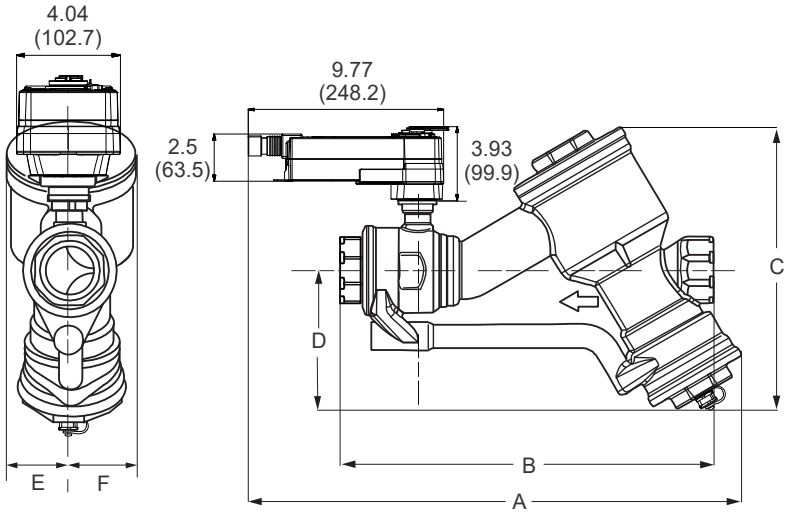


Figure 9: VA2220 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)

Table 6: VA2220 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)[1]

Valve Size, in. (DN)	A	B	C	D	E	F
2 (DN50)	22 (559)	15.6 (396)	12.87 (327)	5.87 (149)	2.64 (67)	2.64 (67)

1. Dimensions shown are for 2 in. valves with flows from 44 to 100 GPM.

Figure 10 shows the dimensions of the VA2204-HGA-2 Actuated P1000 Valves without pressure taps.

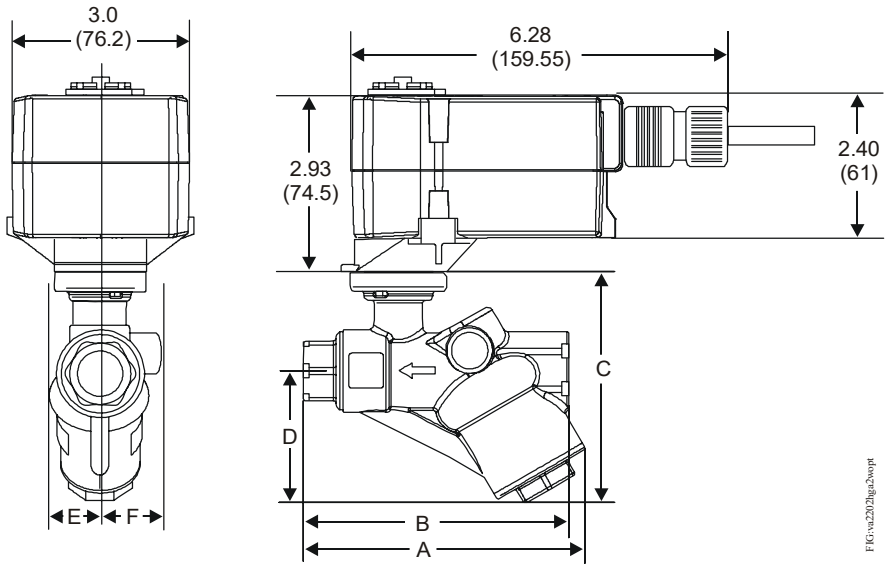


Figure 10: VA2204-HGA-2 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)

Table 7: VA2204-HGA-2 Actuated P1000 Pressure Independent Valve without Pressure Taps Dimensions, in. (mm)

Valve Size, in. (DN)	A	B	C	D	E	F
1/2 (DN15)	4.80 (122)	4.60 (117)	4.02 (102)	2.28 (58)	1.04 (26.4)	1.30 (33)

Piping

Figure 11 shows the typical piping for P1000 Series Valves.

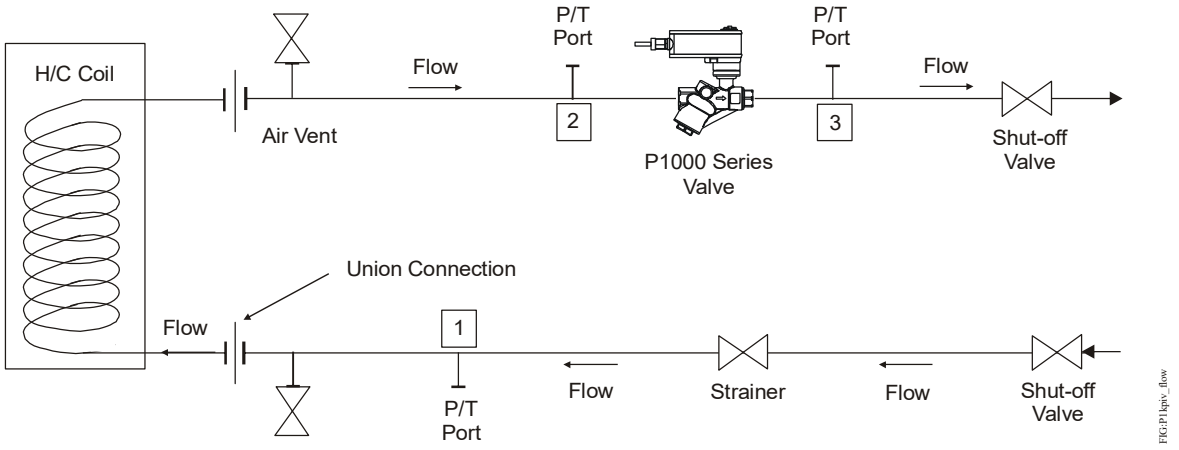


Figure 11: Typical P1000 Piping

Wiring

Note the following cautions and important statements for all actuators used with P1000 Series Valves.

⚠ CAUTION

Risk of Electric Shock.
Disconnect the power supply before making electrical connections to avoid electric shock.

⚠ ATTENTION

Risque de décharge électrique.
Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

NOTICE

Risk of Property Damage.
Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

NOTICE

Risque de dégâts matériels.
Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

IMPORTANT: Before specifying VA21xx Series Electric Non-Spring Return Valve Actuators or M22xx Series Spring Return Electric Actuators for plenum applications, verify acceptance of exposed plastic materials in plenum areas with the local building authority. Building codes for plenum requirements vary by location. Some local building authorities accept compliance to UL 1995, Heating and Cooling Equipment, whereas others use different acceptance equipment.

IMPORTANT: Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the electrical ratings of the VA21xx or M22xx Series Electric Valve Actuators.

IMPORTANT: Do not install or use VA21xx Series Electric Non-Spring Return Valve Actuators or M22xx Series Spring Return Electric Actuators in or near environments where corrosive substances or vapors could be present. Exposure of the electric actuator to corrosive environments may damage the internal components of the device and voids the warranty.

VA2104-AGA-2

The VA2104-AGA-2 Electric Non-Spring Return Valve Actuator requires an AC or DC 24 V input signal and is compatible with a variety of controllers.

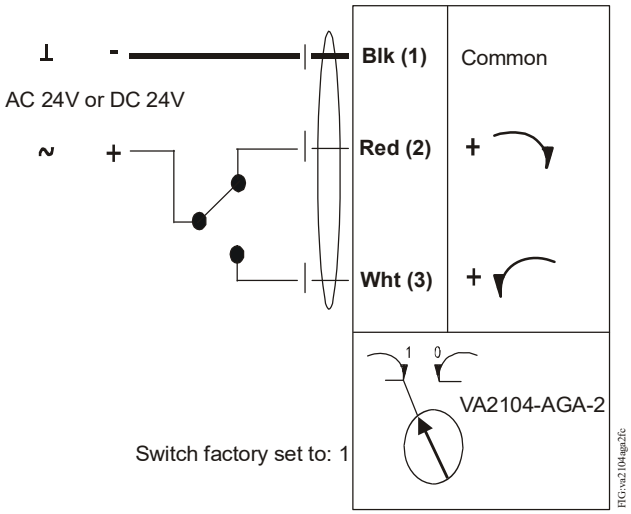


Figure 12: VA2104-AGA-2 Floating Control

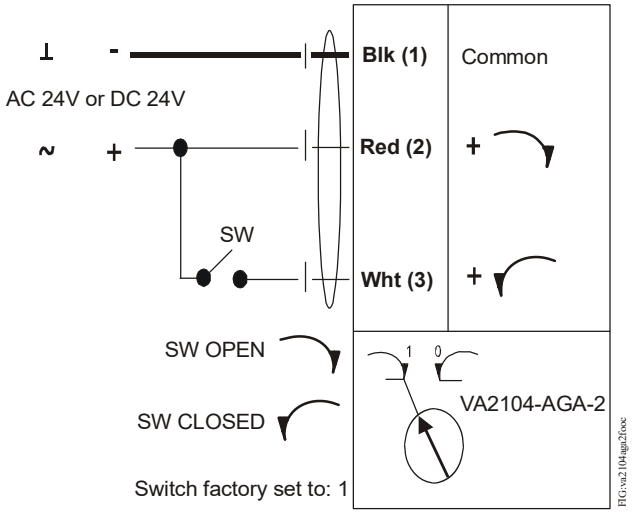
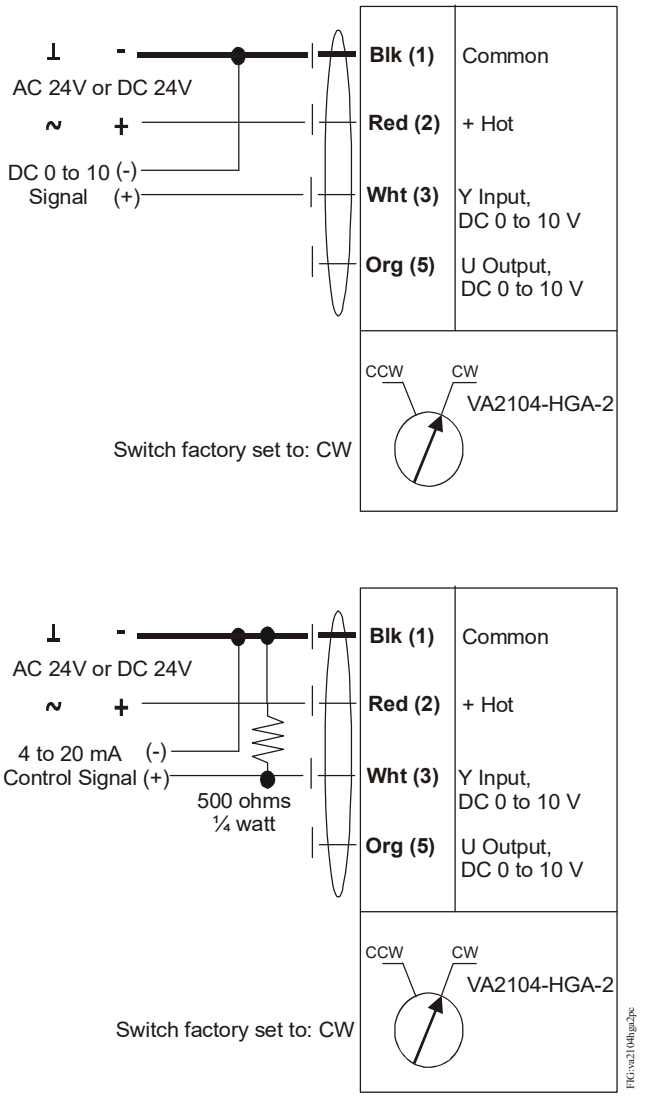


Figure 13: VA2104-AGA-2 On/Off Control

VA2104-HGA-2 and VA2120-HGA-2

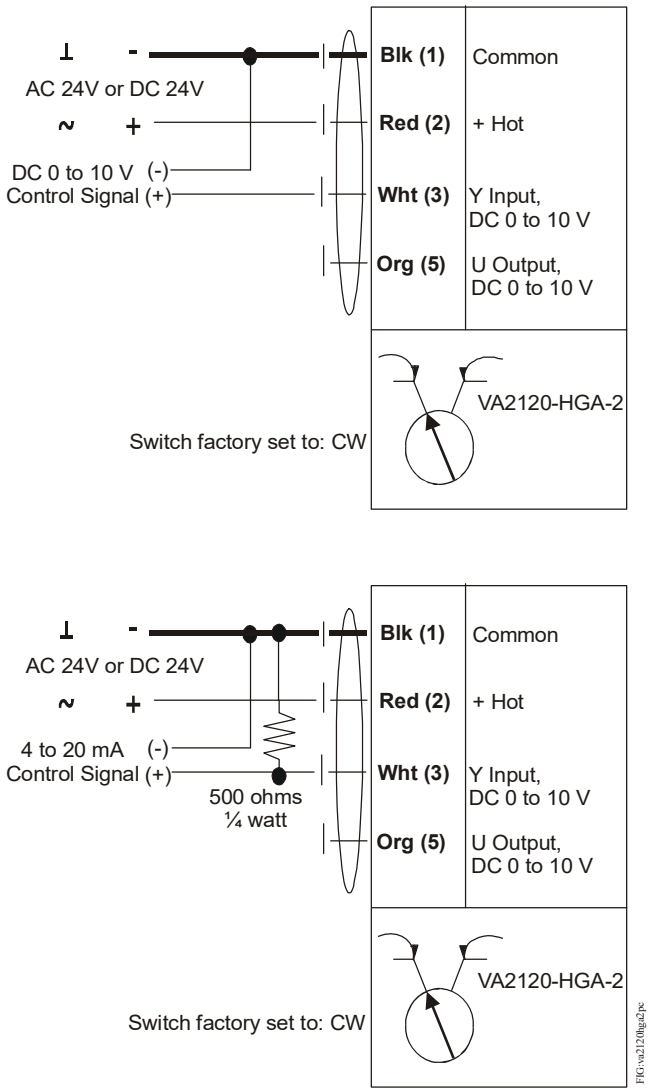
The VA2104-HGA-2 and VA2120-HGA-2 Electric Non-Spring Return Valve Actuators require AC or DC 24 V power supply, and a DC 0 to 10 V or 0(4) to 20 mA input signal from the controller. Factory settings are as follows:

- 0 V: Valve closed (Clockwise)
- 10 V: Valve open to rated flow setting (Counterclockwise)



Note: Resistor is for 4 to 20 mA applications only.

Figure 14: VA2104-HGA-2 Proportional Control



Note: Resistor is for 4 to 20 mA applications only.

Figure 15: VA2120-HGA-2 Proportional Control

VA2202-HGA-2P, M2204-HGA-2, and VA2220-HGA-2

The VA2202-HGA-2P, M2204-HGA-2, and VA2220-HGA-2 Electric Spring Return Valve Actuators require an AC or DC 24 V power supply and a DC 0 to 10 V or 0(4) to 20 mA input signal from the controller. The factory setting is fully closed, 0 V (Clockwise). If switches are moved to Counterclockwise ([CCW], or 0 for some models), the settings are as follows:

- 10 V: Valve closed (clockwise)
- 0 V: Valve open (counterclockwise)

IMPORTANT: P1000 valves must always be applied as an electric normally closed valve. Zero volt control signal must always indicate valve closed. The P1000 valve loses its ability to properly control the maximum flow if it is applied as an electrically normally open valve or zero volts indicates valve open.

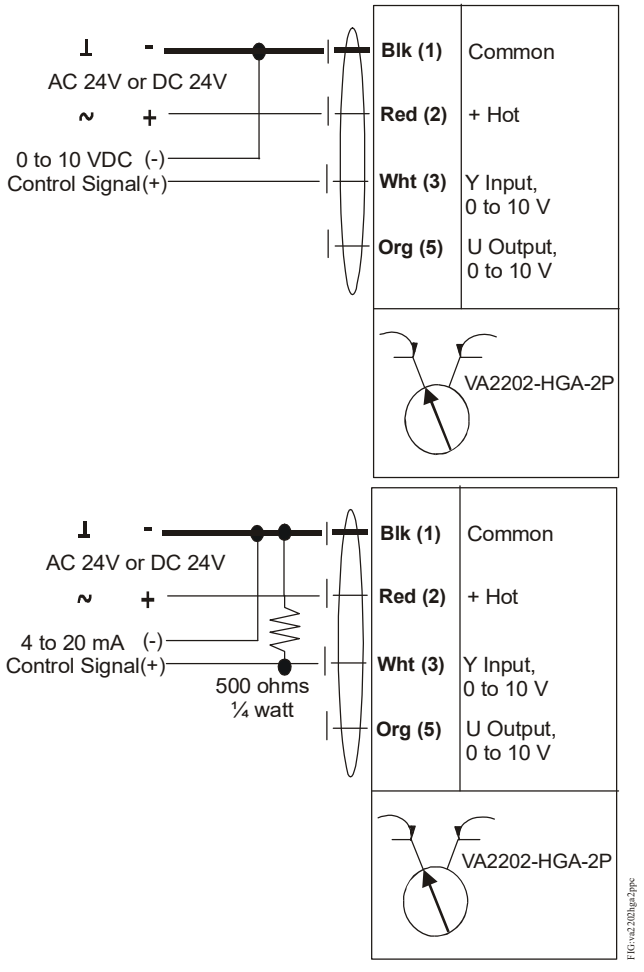


Figure 16: VA2202-HGA-2P Proportional Control

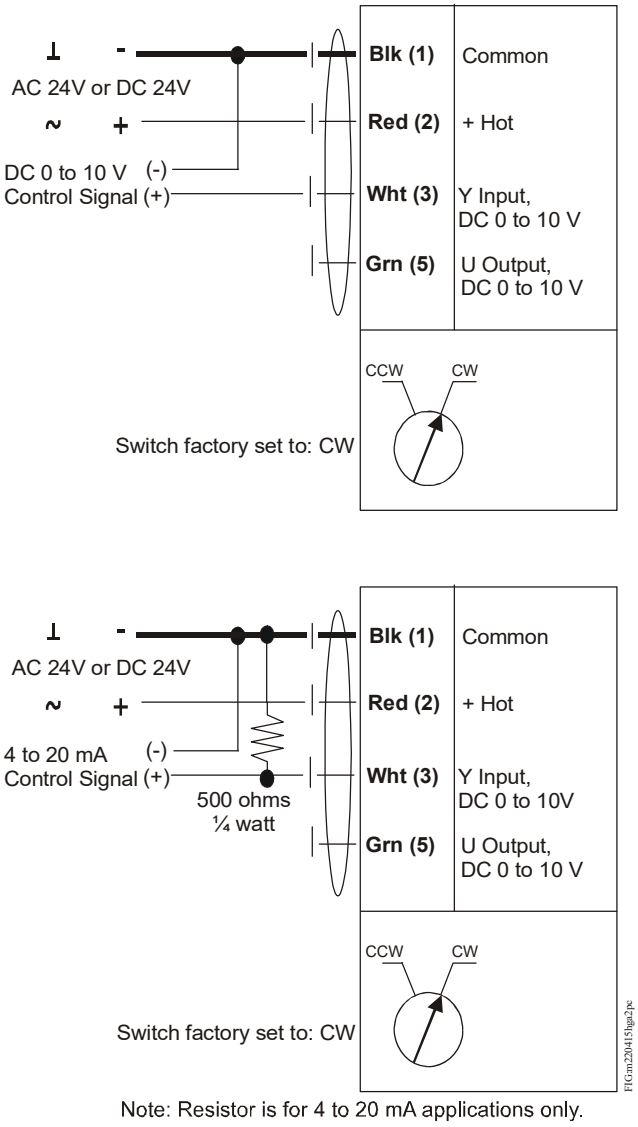


Figure 17: M2204-HGA-2 or VA2220-HGA-2 Proportional Control

Table 8 outlines the field adjustable flow ranges, pressure tap flow data, and runtime data for each valve.

Table 8: Field Adjustable Flow Ranges, Pressure Tap Flow Data, and Runtime Data (Part 1 of 2)

Size (in.)	Valve Code Number	Factory Flow Rate (GPM)	Field Adjustable Flow Range Using FlowSetR Base (GPM)	Running Time (Seconds)		
	Without Pressure Taps			VA2104-AGA-2	VA2104-HGA-2 VA2120-HGA-2 VA2202-HGA-2P M2104-HGA-2	VA2220-HGA-2
1/2	P1241A00	0.5	0.5 to 1.0	36	100	95
	P1241A01	1	0.5 to 1.0	60		
	P1241A015	1.5	0.5 to 5.5	47		
	P1241A02	2	0.5 to 5.5	51		
	P1241A025	2.5	0.5 to 5.5	53		
	P1241A03	3	0.5 to 5.5	56		
	P1241A035	3.5	0.5 to 5.5	58		
	P1241A04	4	0.5 to 5.5	63		
	P1241A045	4.5	0.5 to 5.5	66		
	P1241A05	5	0.5 to 5.5	68		
	P1241A055	5.5	0.5 to 5.5	73		
3/4	P1241B06	6	2 to 10	61	100	95
	P1241B065	6.5	2 to 10	62		
	P1241B07	7	2 to 10	64		
	P1241B075	7.5	2 to 10	66		
	P1241B08	8	2 to 10	67		
	P1241B085	8.5	2 to 10	68		
	P1241B09	9	2 to 10	69		
	P1241B095	9.5	2 to 10	71		
	P1241B10	10	2 to 10	76		
1	P1241C11	11	2 to 16	60	100	95
	P1241C12	12	2 to 16	62		
	P1241C13	13	2 to 16	64		
	P1241C14	14	2 to 16	67		
	P1241C15	15	2 to 16	69		
	P1241C16	16	2 to 16	86		
	P1241C17	17	6 to 19	65		
	P1241C18	18	6 to 19	67		
	P1241C19	19	6 to 19	78		

Table 8: Field Adjustable Flow Ranges, Pressure Tap Flow Data, and Runtime Data (Part 2 of 2)

Size (in.)	Valve Code Number	Factory Flow Rate (GPM)	Field Adjustable Flow Range Using FlowSetR Base (GPM)	Running Time (Seconds)		
	Without Pressure Taps			VA2104-AGA-2	VA2104-HGA-2 VA2120-HGA-2 VA2202-HGA-2P M2104-HGA-2	VA2220-HGA-2
1-1/4	P1241D18	18			100	95
	P1241D19	19				
	P1241D20	20				
	P1241D21	21				
	P1241D22	22				
	P1241D23	23				
	P1241D24	24				
	P1241D25	25				
	P1241D26	26				
1-1/2	P1241E26	26			100	95
	P1241E27	27				
	P1241E28	28				
	P1241E29	29				
	P1241E30	30				
	P1241E31	31				
	P1241E32	32				
	P1241E33	33				
2	P1241F33	33			100	95
	P1241F34	34				
	P1241F35	35				
	P1241F36	36				
	P1241F37	37				
	P1241F38	38				
	P1241F39	39				
	P1241F40	40				
	P1241F44	44				
	P1241F48	48				
	P1241F52	52				
	P1241F56	56				
	P1241F60	60				
	P1241F65	65				
	P1241F70	70				
	P1241F75	75				
	P1241F80	80				
	P1241F90	90				
	P1241F100	100				

Test and Balance Procedure

The following flow verification techniques are optional and not mandatory to ensure proper operation of P1000 Series Pressure Independent Valves. Pressure independent control valves are different than pressure dependent control valves. System pressure variations do not affect valve flow. The ability to adjust and/or control the flow rate which passes through the pressure independent valve is not possible via another mechanical device, and additional mechanical devices should not be used. This makes the test and balance and commissioning process much different than with standard control valves.

Pressure independent valves offer numerous maximum design flow values in each valve body size. Most pressure independent valves do not rotate a full 90° when commanded to full design flow position. Design flow in a P1000 Series Valve is adjusted through the maximum angle of ball travel. Therefore, if the valve's maximum flow setting is not located at the end of the range, the valve travels to a point less than 90°. This is normal operation for a pressure independent control valve.

Note: You must install three independent Pressure/Temperature (P/T) ports if the P1000 Series Valve is not supplied with integrated ports. See Figure 18 for P/T port locations.

External P/T ports allow for true independent verification of proper P1000 Series Pressure Independent Valve operation. Once the system has been operating for an extended time period, external P/T ports also allow for comprehensive troubleshooting and diagnosis. In Figure 18:

- P/T port #1 and P/T port #2 are used for measuring pressure differential across the coil (used to measure water pressure drop to equate to flow or to measure water temperature delta T through the coil).
- P/T port #2 and P/T port #3 are used to measure pressure drop across the P1000 Series Valves (must be between 5–50 psi pressure across valve body). The valve body must have required differential pressure within this range with valve assembly commanded to design flow. The valve must be commanded to the design flow position via an Energy Management System (EMS) signal. Do not manually open the valve with the override handle. This pressure difference across the valve is necessary to ensure the valve is functioning pressure independently.

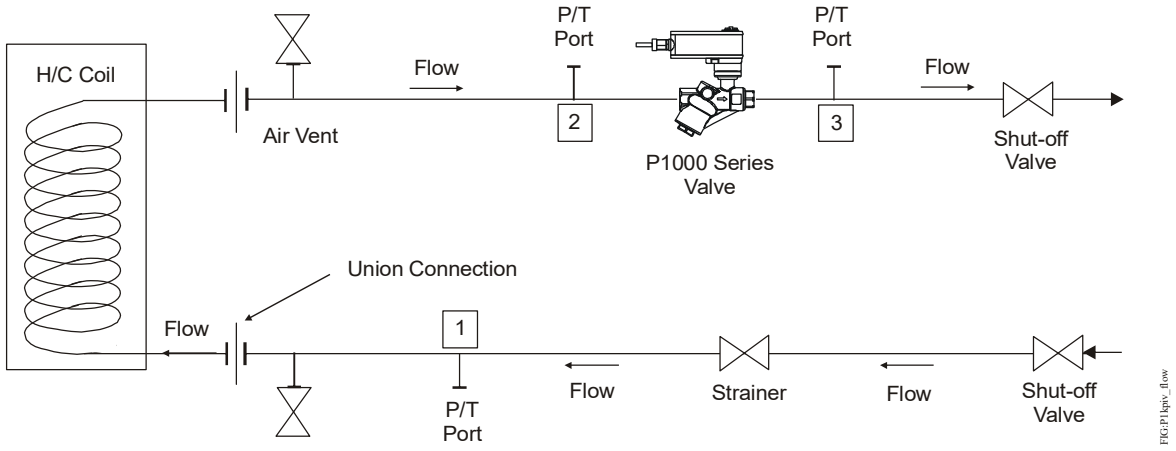


Figure 18: Typical P1000 Series Pressure Independent Valve Installation

Pre-flow Verification System Checklist

To ensure a properly functioning hydronic system P1000 Series Valves, verify that the following items have been confirmed before beginning flow verification:

- The system is purged of air and filled to proper pressure.
- Each P1000 Series Valve has at least 5 psi but less than 50 psi dP across the valve (Figure 18) by taking a reading taken across P/T ports 2 and 3.
- Pump is operating per manufacturer's specifications.
- Proper supply water temperature is available and is at design temperature.
- Proper air filter maintenance has been completed.
- Fan belts are in proper working order.
- Heat transfer devices (coils) are clean.
- Strainers are clean.
- All manual shutoff valves are open.
- All bypass valves are closed.
- No automatic or manual balancing valves exist (or if they do, they must be set fully open and locked so as not to interfere with the pressure independency of the P1000 Series Valve).

The following are accepted procedures for verifying/ commissioning pressure independent control valves.

Procedure #1 (System Verification): Total System Flow Method

1. Verify that System is in proper working order. See *Pre-flow Verification System Checklist*.
2. Command open all P1000 Series Valves in a given system via the building automation system if the total connected load matches the pump capacity and system diversity = 100%. Systems with less than 100% diversity need to have a % of valves closed to match pump capacity.
3. Ensure that pumps are commanded to 100% speed (or VFD control loop has high enough dP setpoint to satisfy connected load).
4. Verify total system flow rate using an accurate method. Accurate methods include calibrated circuit setters on main lines, orifices, venturi, or an ultrasonic flowmeter.
5. Decrease the pump speed (or decrease dP setpoint if under control) until a measurable flow decrease occurs.
6. Increase pump speed (or increase dP setpoint if under control) slowly until design flow is reestablished. Make note of this final measured dP. This is the correct system dP operating setpoint.

Note: If total flow does not match design flow then troubleshooting must be done to determine cause. This may involve verifying flows at the terminal level.

Procedure #2 (Terminal Level Verification): Air DeltaT Method

1. Verify that System is in proper working order. See *Pre-flow Verification System Checklist*.
2. Ensure that water is at design temperature.
3. Ensure that terminal airflow is at design airflow rate in cubic feet per minute (cfm).
4. Command open pressure independent characterized control valve to maximum design flow position.
5. Reference approved engineering document containing design air delta T for heating/cooling coil associated with corresponding pressure independent characterized control valve.
6. Measure coil inlet air temperature and coil discharge air temperature.
7. Difference between coil inlet air reading and coil discharge air reading should equal or exceed design air delta T.

Procedure #3 (Terminal Level Verification): Water DeltaT Method

1. Verify that System is in proper working order. See *Pre-flow Verification System Checklist*.
2. Ensure that water is at design temperature.
3. Ensure that terminal airflow is at design flow rate (cfm).
4. Command open pressure independent characterized control valve to maximum design flow position.
5. Reference approved engineering document containing design water deltaT for heating/cooling coil associated with corresponding pressure independent characterized control valve.
6. Measure water temperature differential of coil by using P/T ports #1 and #2 as referenced in Figure 18.
7. Measured temperature differential should be equal to designed water temperature differential.

Procedure #4 (Terminal Level Verification): Coil dP (DeltaP) Method

1. Verify that System is in proper working order. See *Pre-flow Verification System Checklist*.
2. Command open pressure independent characterized control valve to maximum design flow position.
3. Reference approved engineering document containing design coil water pressure drop (usually expressed in ft. of H_2O) for design flow. This value is for the heating/cooling coil associated with corresponding pressure independent characterized control valve.
4. Measure coil dP by using P/T ports #1 & #2 as referenced in Figure 18.
5. Formula to calculate flow is:

$$\text{ActualGPM} = \sqrt{(\text{MeasuredCoildP})/(\text{DesignCoildP})} \times \text{DesignGPM}$$

Note: Coil dP and Design dP expressed in feet of H_2O.

P1000 Valve Troubleshooting

1. Is the pump on and rotating properly?
2. Is the pressure differential adequate to produce the design GPM?
3. Is the water temperature at the required level?
4. Is the P1000 Valve installed in the correct direction?
5. Is there too much diversity in the system?
6. Does the valve tag GPM match the listed design GPM?
7. Does the controller signal rotate the valve in the correct direction (counterclockwise open, clockwise closed)?
8. Are strainers plugged?
9. Is the coil installed counterflow?
10. If the discharge temperature is not to the required rating:
    - Is the reset temperature high enough?
    - Is air bypassing the coil?
    - Are all coil areas heating/cooling uniformly?
11. If there are room cold complaints:
    - Is the air velocity sufficient for the air to be propelled to the occupancy level?
    - Test discharge air temperature and stratification.
    - Is the building under a negative pressure?
    - Is the hot water temperature at the design value? Resets may not be effective for reheat coils.

Design Tips

To facilitate system checkout and troubleshooting, it is recommended you install pressure taps on at least one valve with the largest differential pressure requirement, and near the end of the piping run and the differential pressure transmitter.

Remember that the pump may be sized for normal operating conditions and may be insufficient to supply all valves during initial startup conditions. It may be necessary to reduce the number of valves open during system checkout.

Repair Information

If the P1000 pressure independent valve or assembly parts fail to operate within their specifications, see Table 9 and Table 10 for a list of replacement valves and parts.

Table 9: Replacement Valves (Part 1 of 2)

Valve Size, in.	GPM	Valve Assembly	Replacement Valve
Valves without Pressure Taps			
1/2 (DN15)	0.5	P1241A00+2xxxxx	P1241A01
	1	P1241A01+2xxxxx	
	1.5	P1241A0152xxxxx	P1241A05
	2	P1241A02+2xxxxx	
	2.5	P1241A0252xxxxx	
	3	P1241A03+2xxxxx	
	3.5	P1241A0352xxxxx	
	4	P1241A04+2xxxxx	
	4.5	P1241A0452xxxxx	
	5	P1241A05+2xxxxx	
	5.5	P1241A0552xxxxx	
3/4 (DN20)	6	P1241B06+2xxxxx	P1241B10
	6.5	P1241B0652xxxxx	
	7	P1241B07+2xxxxx	
	7.5	P1241B0752xxxxx	
	8	P1241B08+2xxxxx	
	8.5	P1241B0852xxxxx	
	9	P1241B09+2xxxxx	
	9.5	P1241B0952xxxxx	
	10	P1241B10+2xxxxx	
1 (DN25)	11	P1241C11+2xxxxx	P1241C16
	12	P1241C12+2xxxxx	
	13	P1241C13+2xxxxx	
	14	P1241C14+2xxxxx	
	15	P1241C15+2xxxxx	
	16	P1241C16+2xxxxx	
	17	P1241C17+2xxxxx	P1241C18
	18	P1241C18+2xxxxx	
	19	P1241C19+2xxxxx	

Table 9: Replacement Valves (Part 2 of 2)

Valve Size, in.	GPM	Valve Assembly	Replacement Valve
1-1/4 (DN32)	18	P1241D18+2xxxxx	P1241D26
	19	P1241D19+2xxxxx	
	20	P1241D20+2xxxxx	
	21	P1241D21+2xxxxx	
	22	P1241D22+2xxxxx	
	23	P1241D23+2xxxxx	
	24	P1241D24+2xxxxx	
	25	P1241D25+2xxxxx	
	26	P1241D26+2xxxxx	
1-1/2 (DN40)	26	P1241E26+2xxxxx	P1241E33
	27	P1241E27+2xxxxx	
	28	P1241E28+2xxxxx	
	29	P1241E29+2xxxxx	
	30	P1241E30+2xxxxx	
	31	P1241E31+2xxxxx	
	32	P1241E32+2xxxxx	
	33	P1241E33+2xxxxx	
2 (DN50)	33	P1241F33+2xxxxx	P1241F40
	36	P1241F36+2xxxxx	
	40	P1241F40+2xxxxx	
	44	P1241F44+2xxxxx	P1241F80
	48	P1241F48+2xxxxx	
	52	P1241F52+2xxxxx	
	56	P1241F56+2xxxxx	
	60	P1241F60+2xxxxx	
	65	P1241F65+2xxxxx	
	70	P1241F70+2xxxxx	
	75	P1241F75+2xxxxx	
	80	P1241F80+2xxxxx	
	90	P1241F90+2xxxxx	P1241F100
	100	P1241F1002xxxxx	

Table 10: Actuator, Linkage, and FlowSetR Base Replacement Parts

Actuator	Actuator Description	Linkage	FlowSetR Base
VA2104-AGA-2	35 lb·in (4 N·m) Non-Spring Return Electric Actuator, 24 VAC/VDC On/Off (Floating) Control for use with 1/2, 3/4, and 1 in. P1000 Series Pressure Independent Valves	None Needed	M2104-50x Refer to *P1000 Series Pressure Independent Valves Product Bulletin (LIT-12011272)* for details.
VA2104-HGA-2	35 lb·in (4 N·m) Non-Spring Return Electric Actuator, DC 0 to 10 V Proportional Control for use with 1/2, 3/4, and 1 in. P1000 Series Pressure Independent Valves		None
VA2120-HGA-2	177 lb·in (20 N·m) Non-Spring Return Electric Actuator, DC 0 to 10 V Proportional Control for use with 1 through 2 in. P1000 Series Pressure Independent Valves		
VA2202-HGA-2P	18 lb·in (2 N·m) Spring Return Electric Actuator, DC 0 to 10 V Proportional Control for use with 1/2 in. P1000 Series Pressure Independent Valves	VA2202-500P	
M2204-HGA-2	35 lb·in (4 N·m) Spring Return Electric Actuator, DC 0 to 10 V Proportional Control for use with 1/2, 3/4, and 1 in. P1000 Series Pressure Independent Valves	M2204-500	
VA2220-HGA-2	180 lb·in (20 N·m) Spring Return Electric Actuator, DC 0 to 10 V Proportional Control for use with 1 through 2 in. P1000 Series Pressure Independent Valves	None Needed	

Technical Specifications

P1000 Series Pressure Independent Valves (Part 1 of 3)

Service[1]	Hot Water, Chilled Water, and 60% Glycol Solutions for HVAC Systems
Valve Fluid Temperature Limits	0 to 212°F (-18 to 100°C)
Valve Body Pressure/Temperature Rating	600 psig (4,134 kPa) - Sizes 1/2, 3/4, and 1 in. 400 psig (2,756 kPa) - Sizes 1-1/4, 1-1/2, and 2 in.
Maximum Closeoff Pressure	200 psi (1,378 kPa)
Recommended Minimum Differential Operating Pressure	5 psi (34 kPa)
Maximum Recommended Operating Pressure Drop	50 psi Maximum Differential Pressure
Flow Characteristics	Equal Percentage
Flow Accuracy	±10% Combination of manufacturing tolerances and pressure variations
Valve Body Size/Flow Rate	See Table 8.
Leakage	0.01% of Maximum Flow per ANSI/FCI 70-2, Class 4
End Connections	National Pipe Thread (NPT)

WARNING: BRASS AND BRONZE MAY CONTAIN LEAD

To fulfill our obligations towards Article 33, in accordance to the European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list:

- Lead

⚠ WARNING This product can expose you to chemicals including lead, which is known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

⚠ WARNING This product is made of copper alloy, which contains lead. The product is therefore not to be used on drinking water.

P1000 Series Pressure Independent Valves (Part 2 of 3)

Material	**Body**	Forged Brass, Nickel Plated
	Ball	Chrome Plated Brass
	Stem	Chrome Plated Brass
	Seats	Fiberglass Reinforced Teflon® Polytetrafluoroethylene (PTFE)
	Characterizing Disk	Tefzel®
	Packing	Two Ethylene Propylene Diene Monomer (EPDM) O-rings
	Diaphragm	Polyester Reinforced Silicone
	Regulator	Stainless Steel/Brass/Delrin
	Spring	Stainless Steel
Power Requirements	**VA2104-AGA-2**	AC 24 V ±20%, 50/60 Hz, DC 24 V ±10%, 3 VA Supply Class 2
	VA2104-HGA-2	AC 24 V ±20%, 50/60 Hz, DC 24 V ±10%, 4 VA Supply Class 2
	VA2120-HGA-2	AC 24 V ±20%, 50/60 Hz, DC 24 V ±10%, 5 VA Supply Class 2
	VA2202-HGA-2P	AC 24 V ±20%, 50/60 Hz, DC 24 V ±10%, 4 VA Supply Class 2
	M2204-HGA-2	AC 24 V ±20%, 50/60 Hz, DC 24 V ±10%, 5 VA Supply Class 2
	VA2220-HGA-2	AC 24 V ±20%, 50/60 Hz, DC 24 V ±10%, 10 VA Supply Class 2
Input Signal	**Floating**	AC 24 V ±20%, 50/60 Hz, DC 24 V ±10%
	Proportional	DC 0 to 10 V, 4 to 20 mA with Field Furnished 500 ohm Resistor
Input Impedance	**Floating**	600 ohm
	Proportional	100,000 ohm for DC 0 to 10 V
Feedback	**Proportional Only**	DC 0 to 10 V, 0.5 mA Maximum
Electric Connection	**VA2104 VA2120**	36 in. (.91 m) 18 AWG Plenum-Rated Cable, 1/2 in. Conduit
	VA2202 M2204	36 in. (.91 m) 18 AWG Plenum-Rated Cable, 1/2 in. Conduit
	VA2220	36 in. (.91 m) 18 AWG Appliance Cable, 1/2 in. Conduit
Runtime		See Table 8.
Audible Noise Rating	**VA2104**	<35 dB (A)
	M2204	<30 dB (A) Operating, <62 dB (A) Spring Return
	VA2202	<35 dB (A) Operating, <65 dB (A) Spring Return
	VA2120	<45 dB (A)
	VA2220	<40 dB (A) Operating, <62 dB (A) Spring Return
Manual Override	**VA2104**	External Push Button and Handle
	VA2120	
	VA2202	None
	M2204	
	VA2220	Hex Crank
Actuator Ambient Conditions	**Operating**	-22 to 122°F (-30 to 50°C), 5 to 95% RH Noncondensing (EN 60730-1)
	Storage	-40 to 176°F (-40 to 80°C), 5 to 95% RH Noncondensing (EN 60730-1)
Housing	**VA2104 VA2120 M2204 VA2220**	NEMA 2 (IP54)
	VA2202	NEMA 2 (IP42)

P1000 Series Pressure Independent Valves (Part 3 of 3)

Housing Material	**VA2104** **VA2120** **VA2202**	Thermoplastic Material, UL 94-5V
	M2204	Zinc-Coated Metal
	VA2220	Zinc-Coated Metal and Plastic Casing
Compliance (North America)	**VA2104** **VA2120** **M2204** **VA2220**	UL Listed, File E22734, CCN XAPX (United States) and XAPX7 (Canada)
	VA2202	UL Listed According to UL 60730-1, UL 60730-2-14 (XAPX) cUL Listed According to CAN/CSA C22.2 No. 24 (XAPX7)

1. Proper water treatment is recommended; refer to VDI 2035 Standard.

European Single Point of Contact:

JOHNSON CONTROLS
WESTENDHOF 3
45143 ESSEN
GERMANY

NA/SA Single Point of Contact:

JOHNSON CONTROLS
507 E MICHIGAN ST
MILWAUKEE WI 53202
USA

APAC Single Point of Contact:

JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT
NO. 22 BLOCK D NEW DISTRICT
WUXI JIANGSU PROVINCE 214142
CHINA

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Part Name 零件名	Hazardous substance 有害物质					
	Pb 铅	Hg 汞	Cd 镉	Cr 六价铬	PBB 多溴联苯	PBDE 多溴二苯醚
Body parts 阀体	X	O	O	O	O	O
Trim parts 阀芯/阀杆	O	O	O	O	O	O
Plastic parts 塑料件	O	O	O	O	O	O

O: Identify that this hazardous substance is below specified limits as described in SJ/T 11363-2006.
O：确定该有害物质低于SJ/T 11363-2006中规定的限值。
X: Identify that this hazardous substance is above specified limits as described in SJ/T 11363-2006.
X：确认该有害物质高于SJ/T 11363-2006中规定的限值。

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