

VRW2 Dynamic Pressure-Regulating Flanged Control Valves



APPLICATION

The VRW2 two-way dynamic pressure-regulating control valves maintain constant flow of hot and chilled water in closed-loop heating, ventilating, and air conditioning (HVAC) systems regardless of head pressure fluctuations above minimum specified pressure drop. These valves come complete with proportional, stay-in-place or electronic fail-safe actuators.

The built-in differential pressure regulator maintains fluid flow through the valve independent of changes in supply pressure, eliminating “hunting” by the control system, even at low coil flow. The pressure regulator virtually eliminates cavitation in the valve, and decouples the control valve from the effects of piping components such as reducers and elbows.

Pressure independent control valves are sized to match design coil flow regardless of coil size. VRW2 valves eliminate the need to balance the system for proper flow, and allow chillers to be operated at design temperature differential for maximum efficiency at every load condition. When used in a system with variable speed pump drives, 3-way valves and coil bypass lines are not required.

FEATURES

- 2-1/2 to 6-inch pipes with wafer-flanged connections.
- Combination ANSI/ASME Class 150/300 flange connections.
- Controls hot or chilled water with up to 50% glycol.
- Regulated flow rates available from 40.7 to 468 gpm.
- Stainless steel pressure regulator maintains constant pressure drop across valve seat.
- Positive pressure, rolling diaphragm regulator design for long service life provides flow control accuracy of $\pm 5\%$.
- Equal percentage flow characteristic using multi-turn, non-rising, characterized plug.
- High close-off rating.
- 50 discrete, selectable flow rates available per valve size.
- Stainless steel trim.
- Six-turn actuator with floating or modulating inputs available with stay-in-place or electronic fail-safe action.
- Fail-safe actuators field-configurable for normally open or normally closed power failure return position.
- Two Test Ports for venting or pressure gauge attachment.

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SPECIFICATIONS

Models: See Table 3.

Dimensions: See Fig. 1.

Body Style: Two-way, multi-turn, non-rising stem valve, straight-through flow.

Pipe Size: 2-1/2 to 6 inches with multi-size, wafer flange pipe fittings.

Test Ports: 1/4 in. ISO

Flow Capacity: See Table 1.

Body Pressure Rating (maximum): 580 psig (40 bar) at 248°F (120 C).

Controlled Medium: Water or Glycol solutions up to 50%. Not suitable for combustible gases, oil or steam.

Fluid Temperature Range: -4 to +248°F (-20 to +120 C).

Differential Pressure Range: See Table 1.

Close-off Pressure: 100 psid (700 kPa), maximum 0.2% leakage.

Flow Characteristics: Equal Percentage.

Materials

Body: Ductile iron (ASTM A536-65T, Class 60-45-18).

Flow Regulation Unit: Stainless steel.

Stem Seals: EPDM and Nitrile O-rings.

Regulator: EPDM rolling diaphragm in 316 stainless steel housing.

Power Supply:
Voltage: 24 Vac/Vdc
Frequency: 50/60 Hz
Power: 12 VA

Approvals Standards

Actuators: Safety Extra-Low Voltage, Class II wiring only.

Table 1. VRW2 Flow Ratings.

VRW2...		...x...	...V...				...W...			
Size ^a			Flow		Differential Pressure		Flow		Differential Pressure	
In.	S.I.	Code	Lowest Max Setting gpm (L/s)	Maximum gpm (L/s)	Minimum psid (kPa)	Maximum psid (kPa)	Lowest Max Setting gpm (L/s)	Maximum gpm (L/s)	Minimum psid (kPa)	Maximum psid (kPa)
2-1/2 & 3	DN65 DN80	J	40.7 (2.6)	113 (7.1)	4.5 (31)	87 (600)	56.3 (3.5)	157 (9.9)	5.1 (35)	87 (600)
3 & 4	DN80 DN100	K	55.4 (3.5)	149 (9.4)			75 (4.7)	225 (14.2)		
5 & 6	DN125 DN150	L	103 (6.5)	369 (23.2)			113 (7.1)	468 (29.5)		

^a Wafer-style flanges for each model fit between 2 pipe flange sizes.

ORDERING INFORMATION

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the TRADELINE® Catalog or price sheets for complete ordering number. If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Environmental and Combustion Controls Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care
1985 Douglas Drive North
Golden Valley, Minnesota 55422-4386
3. <http://customer.honeywell.com> or <http://customer.honeywell.ca>

International Sales and Service Offices in all principal cities of the world. Manufacturing in Belgium, Canada, China, Czech Republic, Germany, Hungary, Italy, Mexico, Netherlands, United Kingdom, and United States.

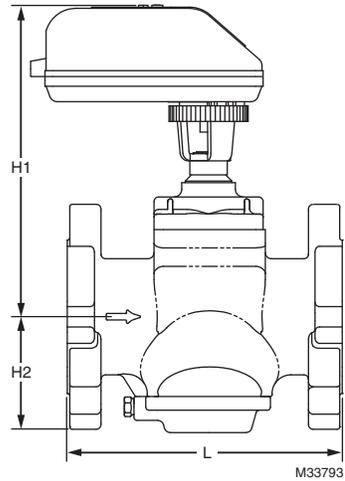


Fig. 1. Dimensions in in. (mm).

Table 2. Dimensions and Flange Type Compatibility.

Model	Size		L in. (mm)	H ₁ in. (mm)	H ₂ in. (mm)	ASME B16.5 Weld Neck		ASME B16.5 Slip On		Weight lbs. (kg)
	In.	S.I.				Class 150	Class 300	Class 150	Class 300	
VRW2J...	2-1/2	65	8 3/4 (224)	9 3/4 (246)	3 3/4 (95)	•	•	•	•	27.8 (10.0)
	3	80				•	•			
VRW2K...	3	80	12 5/8 (320)	11 3/8 (290)	5 1/4 (135)	•	•	•	•	75.0 (30.0)
	4	100				•	•			
VRW2L...	5	125	16 5/8 (422)	13 1/4 (338)	7 1/8 (180)	•	•	•	•	148.0 (70.0)
	6	150				•				

Table 3. Model Selection.

Valve, Regulated	Pipe fitting	Body Pattern	Valve Size	Flow Rating	Pressure Rating	Valve Trim	Actuator Secondary Spec	Actuator Control Form	Description
VR	Dynamic pressure regulated control valve								
	W	Combination-size wafer flange							
		2	2-way						
			J	Valve size, 2-1/2 and 3 in. (DN65 and DN80)					
			K	Valve size, 3 and 4 in. (DN80 and DN100)					
			L	Valve size, 5 and 6 in. (DN125 and DN150)					
			V	Adjustable, low minimum differential pressure					
			W	Adjustable, high minimum differential pressure					
				4	ANSI/ASME 150/300				
					S	Stainless steel trim, dual Test Ports			
						M	Multi-turn valve		
							B	Modulating actuator	
							D	Modulating fail-safe actuator	
VR	W	2	K	V	4	S	M	B	= 2-way, 3 & 4" wafer flanged dynamic pressure-regulated valve, SS trim, 55~147 gpm, modulating actuator.

NOTE: This is a guide to the meaning of the product nomenclature, and is not intended to indicate all legal combinations of bodies and actuators.

Application Notes

Accurate valve sizing and adjustment is crucial for efficient system operation. Pressure regulated control valves optimize hydronic HVAC systems at all load conditions as well as balancing the system at design conditions.

Low flow rates maximize coil efficiency, but require pressure regulated valves for stable operation.

High temperature change (ΔT) is needed to maintain thermal transfer at low flow rates, and maximizes efficiencies in chillers and condensing boilers.

In new construction, low flow rates at high ΔT reduce the size requirements for pumps, chillers, boilers, and piping components. In retrofit applications, lower flow rates reduce pump energy consumption and peak power requirements.

Pressure regulated control valves work as effectively as reverse return piping designs, but use less material.

If a system balancing report is required, coil flow must be verified by measuring pressure drop across the coil, not the control valve, using the coil manufacturer's specifications. Bubble-tight close-off will require use of a resilient-seat butterfly valve in series with the load.

Proper Use

These valves are only for use in cold, warm, and hot water systems applications with ethylene glycol or propylene glycol up to 50% concentration. They are designed for a medium temperature range of from -4°F (-20°C) to 228°F (120°C) at a maximum pressure of 580 psig (40 bar). VRW2 valves are to be operated with supplied multi-turn actuators only.

IMPORTANT

Water should be properly filtered, treated and conditioned according to local conditions and the recommendations of the boiler or chiller manufacturers. The installation of strainers and side-stream filters is strongly recommended to protect the pressure regulator cartridge

The presence of excessive iron oxide (red rust) in the system voids the valve warranty. Rust is highly abrasive.

EPDM rubber used in this valve absorbs oil. Do not use petroleum-based additives and thoroughly flush system to remove petroleum-based cutting oil, solder flux, etc. Do not use solvents that will dissolve silicon grease

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check ratings given in instructions and on the product to ensure the product is suitable for your application.
3. Installer must be a trained, experienced, licensed service technician.
4. After installation is complete, check out product operation as provided in these instructions

Preparation



CAUTION

Equipment Damage Hazard

- Foreign particles like sand and metal chips can damage valve seals and regulator diaphragm.
 - For trouble-free operation of the product, good installation practice must include initial system flushing, and chemical water treatment.
 - Use of a 50 micron (or finer) system side stream filter is recommended and in-line Y-strainers are suggested. Remove all sieves before flushing the system to avoid trapping dirt in the filters.
 - Acceptable antifreeze solutions, with minimum 50% water dilution, are diethylene glycol, ethylene glycol, and propylene glycol.
 - Do not use boiler additives, solder flux and wetted materials which are petroleum based or contain mineral oil, hydrocarbons, or ethylene glycol acetate. If in doubt, consult an HVAC water treatment specialist.
 - If installing these valves in a new addition, or if retrofitting an existing building, do not assume that the fluid in the existing piping meets these criteria.
1. Clean the lines upstream of particles larger than 1/16 in. diameter (welding slag, pipe scale and other contaminants).
 2. Proceed with installation once the system specifics (expansion/contraction of the system and its medium as well as operating pressures) are within tolerances.

3. Eliminate air from system. Free oxygen will corrode iron parts.

IMPORTANT

- Ensure that the valve is not in the fully closed position when filling the system with water. **TURN OFF POWER** and open manually if necessary.
 - Do not exceed maximum pressure differential control range for valve.
 - Install valve indoors. If valve is installed outdoors, water tight protection is required for the actuator.
 - If the valve is to be installed in vertical pipe on a chilled water system, ensure that the covered electronics are upwards above the valve spindle, to prevent condensation from entering the electronics. If necessary use a socket and ratchet to remove the brass nut attaching the mounting bracket to the valve body, re-position the Actuator and replace the brass nut.
 - Even torque on all flange bolts and connecting rods is critical to pipe seals.
 - Flow arrows must point in the direction of the flow for proper operation.
4. Stem rotation as viewed from above:
 - a. Clockwise to close.
 - b. Counterclockwise to open
 5. Valve must be mounted with the actuator/bracket above pipe center line. Do not install the valve with the stem below horizontal or upside down without NEMA 3, 4, or 4X actuator enclosure to prevent actuator damage due to condensation or leaks. See Fig. 2 and 3.

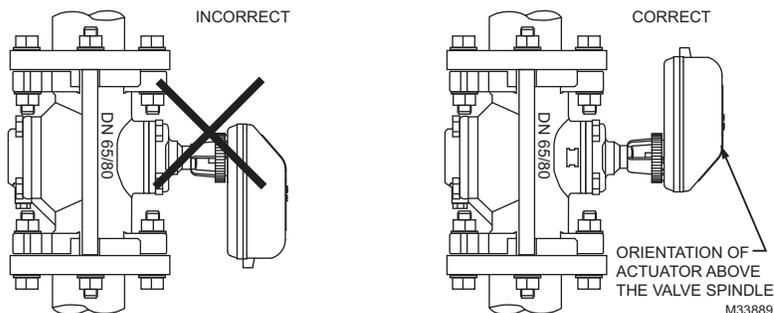


Fig. 2. Vertical pipe installation.

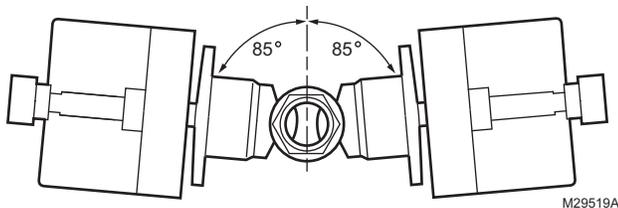


Fig. 3. Acceptable valve angle from vertical.

General Information

1. Clean the lines upstream of valve particles larger than 1/16 in. diameter (welding slag, pipe scale and other contaminants). Honeywell recommends the use of a strainer upstream to prevent damage or blockage.
2. Air should be eliminated from the system so valves remain full of fluid during operation. All PI valves trap air in the regulator section of the valve. If the air is not removed, one of the effects is a valve that may pulsate with a mild or violent shaking force. The normal process of bleeding air from a system will not remove this air because the air is trapped within a chamber. A convenient way to bleed the air is to cycle the valve closed, wait 10-15 seconds, then open it. This exhausts air out of the diaphragm chamber and into the pipe where it can later rise to a high point for extraction. In a building with several valves, it is most convenient to perform this from a central building automation control. Honeywell recommends sequentially closing one valve at a time to minimize the disruption to occupants. If the building is not occupied it is acceptable to cycle all the valves at once as long as there is a method in place to keep the system pressure differential to within the valve differential pressure range. In the event that vibration persists, the VRW products have a pressure response valve (PRV) for additional control over the regulator response time. It's a small needle valve located on the bottom of the valve at the center of a hex nut designed to control the response time of the valve as it corrects for pressure fluctuations. Screw the small needle valve clockwise to close. DO NOT over tighten as it is a small brass screw and can easily be damaged. Then open it about 1/4 turn. This will slow down the response and should further suppress vibration.
3. All styles of Honeywell 2-way flow control valves are marked to show the direction of flow. THE FLOW ARROW MUST POINT IN THE DIRECTION OF FLOW FOR PROPER OPERATION.
4. Do not use boiler additives, chemicals which are petroleum based or contain mineral oil, hydrocarbons, azole compounds or ethylene glycol acetate. Compounds which can be used, with minimum 50% water dilution, are diethylene glycol, ethylene glycol, and propylene glycol. If installing these valves in an addition or retrofitting an existing building, do not assume that the fluid in the existing piping meets these criteria.
5. Do not install valves at pump discharge. Minimum of 8 pipe diameters (or 8 feet) is required before the valve.

Mechanical Installation

Union Connections

1. When soldering union sweat-end ball valves, remove the union nut and slide over the pipe. Then sweat the tailpiece to the pipe. If there are sweat ends on both sides, repeat the same steps for each end. Next,

install the valve body assembly between the tailpieces and tighten the union nuts. This will prevent damage to the O-rings.

O-Ring Replacement

1. Assembly must be made with care to protect the O-ring from damage during installation. Some of the most important features to ensure this are:
 - Cleanliness is important for proper seal action and long O-ring life. Foreign particles like dirt, metal chips, etc. in the O-ring groove may cause O-ring leakage and can damage the O-ring thus reducing its life.
 - Using silicon oil or grease lubricant at assembly helps protect the O-ring from damage by abrasion, pinching or cutting. Do not use aerosol products or petroleum-based lubricants. The lubricant should not excessively soften or harden.
 - The O-ring should be placed in the groove.

Flange Connections

1. O-rings are supplied with the valve and are used to seal the connections. Place the O-ring in the grooves in the inlet and outlet of the valve body.
2. Using silicon oil or grease lubricant at assembly helps protect the O-ring.
3. 4 hole flanges require (4) bolts and (2) studs, 8 hole flanges require (8) bolts and (4) studs. Bolt length is 2-3/4" for all valve models. Required stud lengths are 12-1/2" for VRW2J, 14-1/2" for VRW2K and 19-1/2" for VRW2L. All models support 5/8" diameter bolts and studs, VRW2K and VRW2L also support 3/4" diameter bolts and studs. Additional length may be required if washers are used. See Table 2 for flange compatibility.

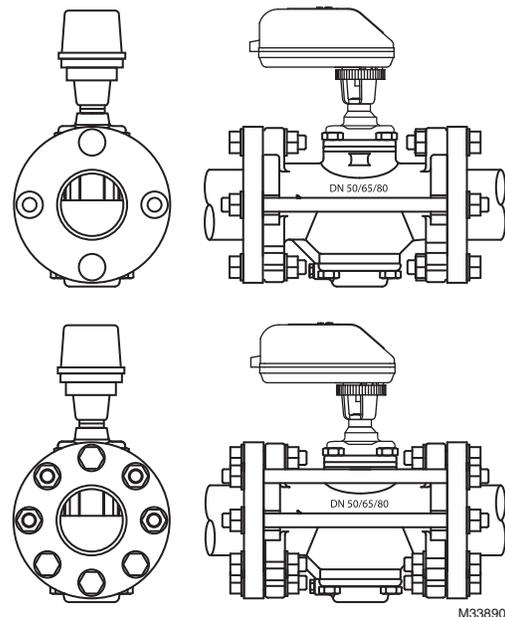


Fig. 4. 4-hole and 8-hole flanges.

Electrical Installation

Fitting and Orientation of the Actuator

1. To fit the actuator on the valve body, grease the o-ring on the spindle adaptor and place the spindle adaptor on the valve spindle.
2. Place the actuator on the spindle adaptor and place the three actuator “legs” into the three holes in the mounting bracket. Make sure that the snap ring is clicked onto the mounting bracket, so that the snap ring is locked at the top of the mounting bracket, but is able to rotate.
3. Turn the snap ring counter clockwise (upside view) approximately 1/6 of a turn until its stop points touch the actuator “legs” and the mounting is locked with a (small) click.
4. See Fig. 5 for wiring. If feedback signal is not required, leave green wire detached.

To remove the actuator, please reverse the procedure, i.e. turn the snap ring clockwise until the actuator is loosened and lift the actuator up. To ease removal of actuator, make sure that the valve is not fully closed.

Symbols on the bottom side of the actuator also indicate how to lock and unlock the actuator with the snap ring.

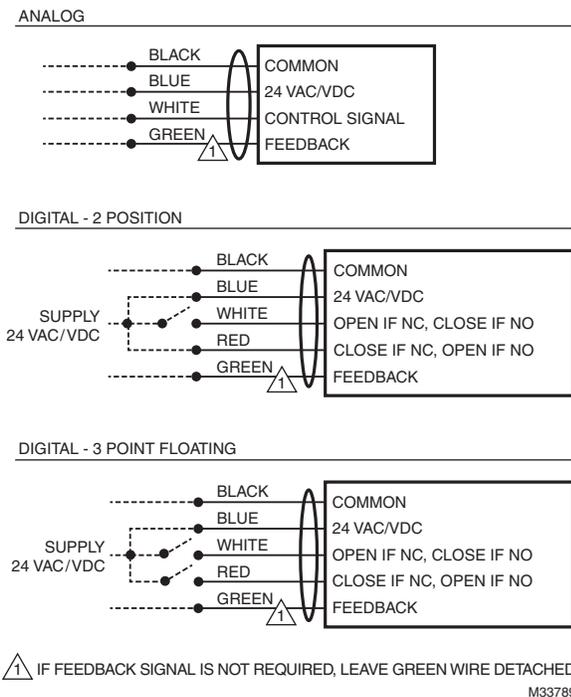


Fig. 5. Wiring Diagram

Fitting and Orientation of the Actuator

When power to the actuator is turned on, the actuator will automatically calibrate:

- Valve is calibrating to determine closing point. This calibration can take up to 10 minutes depending on the valve’s position at start-up. During calibration lower part of display will show “CAL”.
- If no control signal is detected, flush is started if enabled in programming menu (enabled by default), opening valve to 5/6 of fully open. Lower part of display will show “FLUSH” until control signal is detected.
- When control signal is present, actuator will adjust to current control signal and proceed with normal operation.

At first start-up please enter programming menu to adjust actuator settings.

Actuator Wiring and Programming



Fig. 6. Actuator Display

The programming menu is always accessible. To enter the programming menu, please simultaneously press the two arrow buttons (→ and ←) for 6 seconds, until bottom line blinks.

Generally, press → button to accept value and go to next step and press ← button to go to previous step. To change the value, press ▼ or ▲ keys, for quick scroll through values hold down the button.

Press → and ← simultaneously for 6 sec. to exit programming menu. Actuator will automatically return to operation mode if no action is detected on arrow keys for 1 minute.

All values selected in the programming menu are stored in non-volatile memory.

Table 4. Actuator Steps.

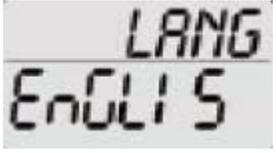
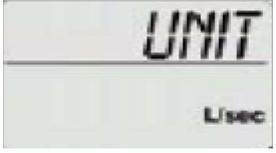
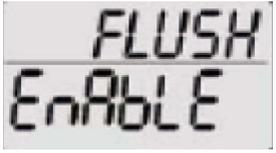
Step	Display	Description	Values
0		Password. *scrolling top: ENTER PASS WORD	Disabled by default Password: 3569266. Only if Enabled (in step 11). Change one digit at a time, press → and ← to move between digits. At last digit, press → to go to next step.
1		Select Language. *scrolling top: SELECT LANGUAG	Default: English. Possibility to choose other languages later on (not currently an option).
2		Select valve model onto which the actuator is installed. *scrolling top: SELECT VALVE MODEL	Default: SM.0.0 Select from the available valve models using this cross reference. VRW2JV=SM.3.1; VRW2JW=SM.3.2; VRW2KV=SM.4.1; VRW2KW=SM.4.2; VRW2LV=SM.5.1; VRW2LW=SM.5.2
3		Choose unit scale for flow rate. *scrolling top: SELECT UNIT SCALE	Default: l/sec. Options: l/sec or l/hr or GPM.
4		Activate Flush mode at startup. *scrolling top: SELECT FLUSH MODE	Default: Enable. Options: Enable or Disable. When no control signal (analog) is detected at start up, flush mode is started (5/6 of fully opened). It will be dismissed when control signal is detected.
5		Select type of control signal. *scrolling top: SELECT CONTROL SIGNAL	Default: 2-10VDC. Options: 2-10VDC or 4-20mA or digital. Choose: • 2-10VDC for VDC • 4-20mA for mA • Digital for 2 position or 3 point floating.
6		Select minimum control signal value. *scrolling top: SET MINIMUM LIMIT	<u>Volt default: 2.</u> Options: from 0-7. Increment: 0.1. <u>mA default: 4.</u> Options: from 0-14. Increment: 0.2. NA if Digital (in step 5).
7		Select maximum control signal value. *scrolling top: SET MAXIMUM LIMIT	<u>Volt default: 10.</u> Options: from 3-10 and at least 3 VDC greater than the selected minimum limit. Increment: 0.1. <u>mA default: 20.</u> Options: from 6-20 and at least 6 mA greater than the selected minimum limit. Increment: 0.2. NA if Digital (in step 5).
8		Select feedback signal. *scrolling top: SELECT FEEDBAC SIGNAL	Default: AU; Automatic match of control signal if analog. Options: 0-10 VDC, 2-10 VDC or 4-20 mA or AU. If Digital (in step 5) AU is not an option.

Table 4. Actuator Steps. (Continued)

Step	Display	Description	Values
9		Set the designed maximum flow. Accuracy: Greatest of either $\pm 5\%$ of designed max. flow or $\pm 2\%$ of max. valve flow. *scrolling top: SELECT MAXIMUM FLOW	Default: Maximum setting. Values depend on valve model and unit scale chosen in step 2 and 3.
10		Select direction of rotation. *scrolling top: SELECT ROTAT DIRECT	Default: Normally Closed (NC). Options: Normally Open (NO) or Normally Closed (NC).
11		Activation of password. *scrolling top: ACTIVAT PASS WORD	Default: Disable. Options: Enable or Disable. If Enabled password is required to access alarm and programming menu.
12		Select direction of rotation when Failsafe. *scrolling top: SELECT FAIL SAFE DIRECT	Default: Closed. Options: Open or Closed. <i>Only valid for failsafe model. Failsafe direction open means opening to max. flow chosen in step 9.</i>

Notes about Failsafe mode

If power supply is out of range or lost, failsafe mode will be activated:

1. Approximately 80 second delay.
2. Actuator opens/closes valve (according to failsafe direction chosen in programming menu).
3. Actuator shuts off.

If power supply is restored during action 1 or 2, failsafe mode is deactivated.

In Operation

Table 5. In Operation.

Display	Description	Values
	Indicates unit scale system.	L/sec or L/min or GPM. mA or VDC.
	Alarm indicator.	Blinking if actuator is still functional (warning). Fully on if actuator is not working (critical).
	Current Flowrate ^a	Indicates current flow rate in L/sec, L/hr or GPM.

^a Note that the flow rate displayed on the actuator is a calculated value based upon differential pressure being within control range. If display shows “NA” instead of current flow rate, it indicates that the flow rate is below minimum defined flow rate according to tech note, or that valve model has not been chosen in programming menu step 2.

Alarm Menu

To enter the alarm menu, simultaneously press ▼ or ▲ for 6 seconds. You can access the alarm menu only if an alarm is present. Press → to go to the next alarm display, press ←

to return to previous step. Press ▼ or ▲ simultaneously for 6 seconds to exit alarm menu. Actuator will automatically return to operation mode if no action is detected on arrow keys during 1 minute.

Table 6. Alarm Menu.

Display	Description	Values
	Alarm	
	Enter password	If enabled in programming menu step 11 Disabled by default. Password: 3569266.

Table 7. Alarm Codes.

Code	Icon	Description	Details
01	 FULL ON	Valve/actuator is over torqued.	Operation is stopped. Actuator will retry operation every 4 minutes. If over torque condition disappears, error will convert to error code 02.
02	 BLINKING	Actuator has reached its torque limit in the past.	Actuator is functioning. To reset the alarm simultaneously press ▲ and ← for 6 seconds.
03	 FULL ON	Critical - over temperature.	Critical: Temperature in actuator is at least 70°C, motor operation is stopped. If temperature is decreasing, operation will resume.
04	 BLINKING	High temperature.	Actuator is still functioning. Temperature in actuator is at least 50°C/122 °F. If temperature is decreasing, operation will resume.
05	 FULL ON	No Failsafe: Power supply not in range.	Operation is stopped. Alarm will automatically reset when voltage is back in range.
	 BLINKING	With Failsafe: Power supply not detected / not in range.	Failsafe is activated. Alarm will automatically reset when voltage is back in range.
06	 FULL ON	Control signal not detected.	Operation is stopped. Alarm will automatically reset when control signal is back in range.
07	 BLINKING	Battery error.	Battery is not properly connected. Alarm will reset when battery is properly connected. <i>Only valid for failsafe model</i>

In Case of ERRORS or ALARM

If actuator is still functioning (error 02, 04, 05 with failsafe and 07 with failsafe) the ALARM icon will flash. Error codes can be found in the alarm menu.

If actuator is not functioning (error 01, 03, 05 without failsafe and 06) the ALARM icon is turned on. The error code will be available in the information in the upper part of the display and the alarm menu.

Auto Stroke Recalibration

In case the valve does not operate as expected, start the auto-stroke sequence to re-calibrate the closing point of the valve and to make sure that the actuator is able to open the valve fully. Press buttons → and ▲ simultaneously for 6 seconds to start the autostroke.

Auto-stroke sequence. (display shows: "AUTO STROKE CYCLES"):

1. Valve is closed to determine closing point.
2. Valve is opened fully (independent of max. flow chosen).
3. System returns to normal operation.

If actuator is not able to open valve fully, an error will be displayed. An auto-stroke cannot be cancelled.

Manual Override

Manual override is used to temporarily set the position of the valve regardless of the settings and control signal for the actuator.

1. Turn off power to the actuator.
2. Remove actuator from valve as described.
3. Turn spindle to the relevant position (Clockwise to close valve, counter clockwise to open valve). Be sure not to use more than 10 Nm torque. Please protect actuator from water while not on valve.
4. Re-mount actuator on valve as described.
5. Turn on power to the actuator when normal operation is needed.

Flowrate Versus Valve Position

Table 8. Flowrate in GPM Versus Valve Position.

2-1/2" - 3" VRW2JV	2-1/2" - 3" VRW2JW	3" - 4" VRW2KV	3" - 4" VRW2KW	5" - 6" VRW2LV	5" - 6" VRW2LW	Position From Closed (In Stem Rotations)
39.0	55.5	54.7	73.4	103	118	1.0
43.2	60.1	60.5	82.0	115	131	1.1
47.4	64.7	66.3	90.6	126	143	1.2
51.6	69.4	72.1	99.1	137	156	1.3
55.9	74.0	77.9	108	148	168	1.4
60.1	78.6	83.7	116	160	181	1.5
62.7	82.3	88.4	123	170	193	1.6
65.3	86.0	93.1	130	180	205	1.7
67.9	89.6	97.7	137	190	218	1.8
70.5	93.3	102	143	200	230	1.9
73.1	97.0	107	150	210	242	2.0
74.8	99.3	110	155	218	252	2.1
76.6	102	113	159	227	262	2.2
78.4	104	115	164	235	271	2.3
80.2	106	118	168	243	281	2.4
81.9	108	121	173	251	291	2.5
83.4	111	123	176	257	301	2.6
84.8	113	125	179	263	310	2.7
86.2	115	126	181	269	320	2.8
87.7	117	128	184	276	329	2.9
89.1	119	130	187	282	339	3.0
90.0	121	131	189	287	344	3.1
90.9	122	132	191	293	350	3.2
91.7	124	134	193	298	355	3.3
92.6	125	135	195	304	360	3.4
93.5	127	136	198	309	366	3.5
94.4	128	137	200	315	371	3.6

Table 8. Flowrate in GPM Versus Valve Position. (Continued)

2-1/2" - 3" VRW2JV	2-1/2" - 3" VRW2JW	3" - 4" VRW2KV	3" - 4" VRW2KW	5" - 6" VRW2LV	5" - 6" VRW2LW	Position From Closed (In Stem Rotations)
95.3	129	138	202	320	376	3.7
96.2	131	140	204	326	381	3.8
97.1	132	141	206	331	387	3.9
98.0	134	142	208	337	392	4.0
98.7	135	142	209	339	396	4.1
99.3	136	143	210	342	401	4.2
100	137	143	212	344	405	4.3
101	138	144	213	346	409	4.4
101	139	144	214	349	414	4.5
102	141	144	215	351	418	4.6
103	142	145	216	353	422	4.7
104	143	145	218	355	426	4.8
104	144	146	219	358	431	4.9
105	145	146	220	360	435	5.0
106	146	146	220	361	438	5.1
106	147	146	220	362	442	5.2
107	148	146	221	363	445	5.3
108	149	146	221	364	448	5.4
108	150	147	221	365	452	5.5
109	151	147	221	366	455	5.6
110	153	147	221	367	458	5.7
111	154	147	222	368	461	5.8
111	155	147	222	369	465	5.9
112	156	147	222	370	468	6.0

OPERATION

1. Ensure that the valve is not in the fully closed position when filling the system with water.
2. Do not exceed maximum pressure differential control range for valve.
3. Install valve indoors. If valve is installed outdoors, water tight protection is required for the actuator.
4. If the valve is to be installed in vertical pipe on a chilled water system, ensure that the covered electronics are upwards above the valve spindle, to prevent condensation from entering the electronics. If necessary use a socket and ratchet to remove the brass nut attaching the mounting bracket to the valve body, re-position the Actuator and replace the brass nut.

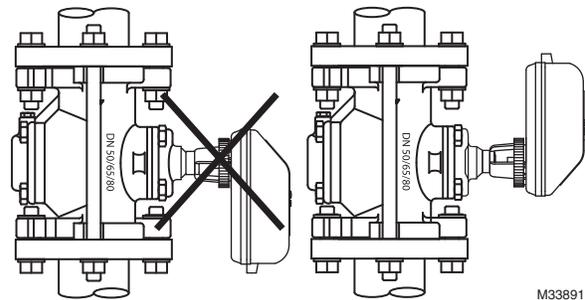


Fig. 7. Operation Diagram

The differential pressure regulator maintains constant pressure drop across the valve seat through a wide range of head pressures. At a given shaft position, flow through the valve will be constant.

Inlet pressure changes constantly in a multi-zone system as other valves open and close, changing system flow and head pressure according to the characteristics of the supply pump curve. Reaction of the mechanical pressure regulator is instantaneous, eliminating changes in room temperature due to changes in fluid flow, and reducing the need for the control system to constantly operate the

control portion of the valve to correct for the non-load related temperature changes that occur in a system with standard control valves.

At full flow in a 2-position control application, a VRW2 behaves as a flow limiter.

The pressure regulator takes a minimum pressure to operate, and has a maximum differential regulation capability. The pressure drop across a VRW Valve is comparable to the pressure drop across a control valve plus a balancing valve in a conventional system design.

SETTINGS AND ADJUSTMENTS

Under steady state operation, the control system will only require the valve to open enough to satisfy load conditions. During morning recovery from night setback, the controller will usually command the valve to 100%.

Coil flow can be confirmed by reading pressures at the supply inlet and return outlet, and using the system design data to calculate flow.

Note that the pressure regulator in this valve guarantees that the flow through the valve will not be affected by upstream changes in pressure. Unlike conventional balancing valves, it is not necessary to reconfirm flow after adjusting other valves. Any overflow during morning recovery due to oversized pressure regulated valves will not affect other valves in the system, provided pumps are capable of required flow.

TYPICAL SPECIFICATIONS

23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 09 00 Instrumentation and Control for HVAC

23 09 13 Instrumentation and Control Devices for HVAC

23 09 13.33 Control Valves

Multi-Turn, Dynamic Pressure-Regulating Wafer-Flanged Control Valve

Mounting and Wiring

1. Valves shall be available with wafer-flanges for use with either ANSI/ASME 125/150 or ANSI/ASME 250/300 pipe flanges in sizes from 2-1/2 up to 6 inches (DN65 to DN150). Each wafer flange shall be usable with either of two successive pipe sizes.
2. The valve shall have an integral differential pressure regulator to maintain constant pressure drop across valve seat to decouple valve flow from system pressure changes. Regulator will be constructed from 316 stainless steel with a rolling diaphragm and operate under positive pressure. Regulator shall be located above axis of pipe with 1/4-in. ISO test port fittings to allow pressure measurement and venting. Control accuracy shall be +/-5% or better.
3. Valves shall use a non-rising stem, characterized plug with equal percentage flow control characteristic. Valve trim shall be stainless steel.

4. Valve bodies shall have static pressure rating of 580 psig (4000 kPa) at 248°F (120 C).
5. Maximum operating differential pressure rating shall be no less than 58 psid. Close-off pressure shall be 100 psid minimum, at no more than 0.2% leakage.
6. Valve stem seals shall be a combination of EPDM and Nitrile O-rings.
7. Actuators shall be six turn rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket.
8. Actuators shall provide screw terminal wiring connections with adapters for flexible conduit where mechanical protection is required by local codes.
9. Valve actuator shall be capable of operating on 24 Vac Class II power, in both electronic fail-safe and stay-in-place configurations. Actuator fail-safe action in the event of power failure shall be field-selectable normally open or normally closed.

Control

1. The actuator shall provide two-position, floating, analog or digital proportional control. Analog proportional control refers to direct acceptance of 2-10 Vdc or a 4-20 mA input signal. Digital proportional control refers to direct acceptance of 24 Vac pulse-width-modulated input signal. Floating control refers to direct acceptance of 24 Vac pulsed open and close commands from a tri-state (SP3T) controller. Two-position control of non-fail safe actuators shall be in the form of 24 Vac power controlled by SPDT switch. Two-position control of fail safe actuators shall be in the form of 24 Vac power controlled by SPST switch.
2. Flow valve shall have minimum 50:1 rangeability with an equal percentage flow characteristic. Actuator shall have field-adjustable signal zero and span adjustments.
3. Flow settings shall be field-selectable from 50 unique settings.
4. Proportional and floating control actuators shall provide a 2-10 Vdc/4-20 mA feedback signal.
5. Actuators shall provide analog proportional, PWM, floating, or two-position control through wiring options.
6. Actuation will be available with electronic fail-safe operation.

Other

1. Valves may not be installed with stems below the horizontal plane to prevent actuator damage due to stem seal leakage, or accumulation of particulate in the stem packing.
2. A water filtration and treatment system shall be installed and operated according to the requirements of Division 23 25 13, Water Treatment for Closed-Loop Hydronic Systems. These requirements shall meet or exceed European Norm VDI 2035. The presence of excess rust in the system will void the manufacturer's warranty.
3. Run time shall be constant and independent of: load, temperature, and supply voltage (within specifications).
4. All valves and actuators shall be manufactured under ISO 9001 International Quality Control Standards.
5. Actuators shall have a one year warranty from date of installation.

6. Accessories Identification tags shall be available for all valves; tags shall be indelibly marked with gpm, model number, and tag location.
7. Valves and actuators shall be as supplied by Honeywell.

Balancing Valves (Mechanical section)

Balancing valve installation and commissioning shall not be required when dynamic pressure-regulating control valves are used throughout a building. The balancing

report, as required, shall confirm design coil flow by direct measurement across (a representative sample of/all) coils in the building.

MAINTENANCE

1. If the system experiences large amounts of pipe scale due to poor water conditions, as sometimes found in older or retrofit pipe systems, provisions should be made to keep the system clean. Proper water treatment is also recommended by the use of a separator.
2. IF A SEPARATOR IS NOT USED FOR SYSTEM CLEANING, THE VALVES SHOULD BE CHECKED ANNUALLY.

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