Honeywell

VRW2 Dynamic Pressure-Regulating Flanged Control Valves

PRODUCT DATA

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 makes 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.

Systems that utilize the capabilities of properly installed and adjusted pressure-independent control valves may qualify for LEED points.

FEATURES

- **Multi-sized bodies from 2½ to 6 inch pipes with wafer-flanged connections.**
- **Combination ANSI/ASME Class 150/300 pressure rating.**
- **Controls hot or chilled water with up to 50% glycol.**
- **Regulated flow rates available from 39 to 469 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 ±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.**

Contents

62-3116-01

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).

Minimum Differential Pressure: See Table 1.

Maximum Differential Pressure: 58 psid (400 kPa).

Close-off Pressure: 101 psid (700 kPa), maximum 0.2% leakage.

Flow Characteristics: Equal Percentage.

Materials

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

Ball and Stem: Nickel-chrome plated brass, or stainless steel.

Stem Seals: EPDM and Nitrile O-rings.

Ball Seals: Reinforced Teflon™ seals, with EPDM O-rings.

Regulator: EPDM rolling diaphragm in 316 stainless steel housing.

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	Minimum gpm (L/s)	Maximum gpm (L/s)	Minimum psid (kPa)	Maximum psid (kPa)	Minimum gpm (L/s)	Maximum gpm (L/s)	Minimum psid (kPa)	Maximum psid (kPa)
2-1/2 & 3	DN65 DN80	J	39 (2.5)	112 (7.1)	5.1 (35)	58 (400)	56 (3.5)	155 (9.8)	11.6 (80)	58 (400)
3 & 4	DN80 DN100	K	55 (3.5)	147 (9.3)			73 (4.6)	222 (14.0)	8.6 (60)	
5 & 6	DN125 DN150	L	103 (6.5)	370 (23.3)			118 (7.4)	469 (29.6)		

[a] Wafer-style flanges for each model fit between 2 pipe flange sizes, of either ANSI/ASME Class 150 or Class 300.

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.

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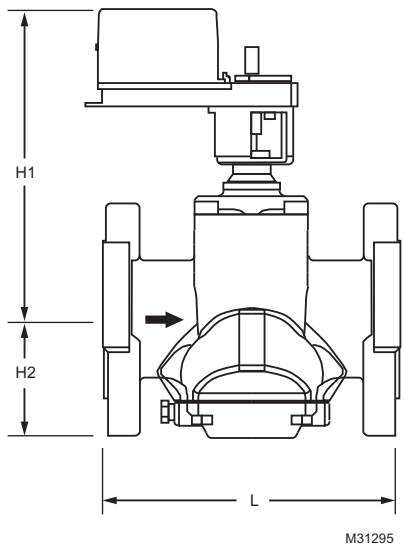

Fig. 1. Dimensions in in. (mm).

Table 2. Dimensions.

Model	Size[a]		L	H_1	H_2	Weight
	In.	S.I.	in. (mm)	in. (mm)	in. (mm)	lbs. (kg)
VRW2J…	2-1/2 & 3	DN65, DN80	8 3/4 (224)	9 3/4 (246)	3 3/4 (95)	27.8 (10.0)
VRW2K…	3 & 4	DN80, DN100	12 5/8 (320)	11 3/8 (290)	5 1/4 (135)	75.0 (30.0)
VRW2L…	5 & 6	DN125, DN150	16 5/8 (422)	13 1/4 (338)	7 1/8 (180)	148.0 (70.0)

[a]Wafer-style flanges for each model fit between 2 pipe flange sizes, of either ANSI/ASME Class 150 or Class 300. Valve is suspended from the rods joining the flanges attached to the pipes.

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 electronic fail safe.

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.

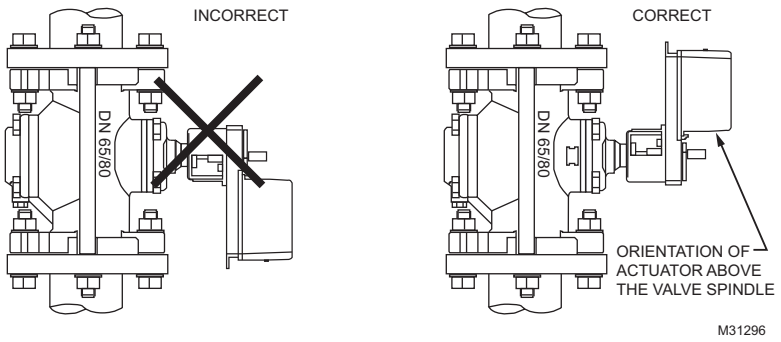

Fig. 2. Vertical pipe installation.

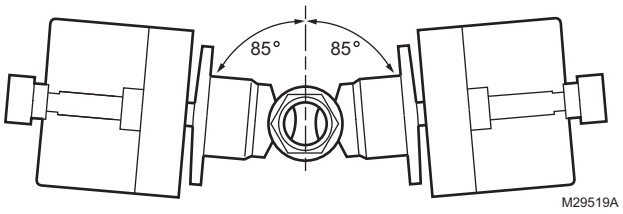

Fig. 3. Acceptable valve angle from vertical.

ACTUATOR WIRING AND PROGRAMMING

Shielded cable is recommended when using 0-10 Vdc modulating control signals for signal protection from RFI/EMI. *Ground shield at one point only*, preferably where signal is weakest. Do not ground transformer secondary, and isolate burner ignition systems, which are grounded.

1. Remove the Actuator Cover from the motor by loosening screw. Safeguard the screw. See Fig. 4.

ACTUATOR CIRCUIT BOARD LAYOUT

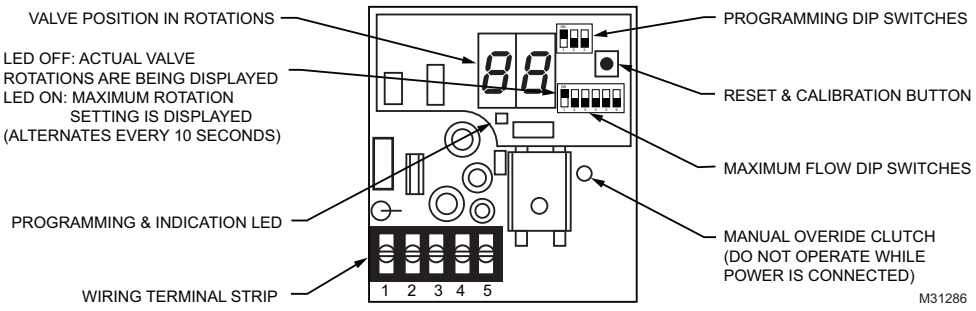

Fig. 4. Actuator circuit board layout.

2. Set the Maximum Flow Dip Switches so that the actuator limits the valve position to the maximum flow rate required. (Select the actuator dipswitch setting from Table 4.) If adjusting the Dip Switch settings after power has been connected, press the Reset Button to input the new setting.

Table 4. Maximum Flow Rate Settings.

Dip Switch Settings						Stem Rotations From Closed	VRW2JV... 2-1/2 & 3" (DN65/80) 5.1~58 psid (35~400 kPa)	VRW2JW... 2-1/2 & 3" (DN65/80) 11.6~58 psid (80~400 kPa)	VRW2KV... 3 & 4" (DN80/100) 5.1~58 psid (35~400 kPa)	VRW2KW... 3 & 4" (DN80/100) 8.6~58 psid (59~400 kPa)	VRW2LV... 5 & 6" (DN125/150) 5.1~58 psid (35~400 kPa)	VRW2LW... 5 & 6" (DN125/150) 8.6~58 psid (59~400 kPa)
#1	#2	#3	#4	#5	#6		gpm (L/s)	gpm (L/s)	gpm (L/s)	gpm (L/s)	gpm (L/s)	gpm (L/s)
ON	ON	ON	ON	ON	ON	1.0	39.0 (2.5)	55.5 (3.5)	54.7 (3.5)	73.4 (4.6)	103 (6.50)	118 (7.4)
OFF	ON	ON	ON	ON	ON	1.1	43.2 (2.7)	60.1 (3.8)	60.5 (3.8)	82.0 (5.2)	115 (7.26)	131 (8.3)
ON	OFF	ON	ON	ON	ON	1.2	47.4 (3.0)	64.7 (4.1)	66.3 (4.2)	90.6 (5.7)	126 (7.95)	143 (9.0)
OFF	OFF	ON	ON	ON	ON	1.3	51.6 (3.3)	69.4 (4.4)	72.1 (4.5)	99.1 (6.3)	137 (8.64)	156 (9.8)
ON	ON	OFF	ON	ON	ON	1.4	55.9 (3.5)	74.0 (4.7)	77.9 (4.9)	108 (6.8)	148 (9.34)	168 (10.6)
OFF	ON	OFF	ON	ON	ON	1.5	60.1 (3.8)	78.6 (5.0)	83.7 (5.3)	116 (7.3)	160 (10.09)	181 (11.4)
ON	OFF	OFF	ON	ON	ON	1.6	62.7 (4.0)	82.3 (5.2)	88.4 (5.6)	123 (7.8)	170 (10.73)	193 (12.2)
OFF	OFF	OFF	ON	ON	ON	1.7	65.3 (4.1)	86.0 (5.4)	93.1 (5.9)	130 (8.2)	180 (11.36)	205 (12.9)
ON	ON	ON	OFF	ON	ON	1.8	67.9 (4.3)	89.6 (5.7)	97.7 (6.2)	137 (8.6)	190 (11.99)	218 (13.8)
OFF	ON	ON	OFF	ON	ON	1.9	70.5 (4.4)	93.3 (5.9)	102.0 (6.4)	143 (9.0)	200 (12.62)	230 (14.5)
ON	OFF	ON	OFF	ON	ON	2.0	73.1 (4.6)	97.0 (6.1)	107.0 (6.8)	150 (9.5)	210 (13.25)	242 (15.3)
OFF	OFF	ON	OFF	ON	ON	2.1	74.8 (4.7)	99.3 (6.3)	110.0 (6.9)	155 (9.8)	218 (13.75)	252 (15.9)
ON	ON	OFF	OFF	ON	ON	2.2	76.6 (4.8)	102 (6.4)	113 (7.1)	159 (10.0)	227 (14.32)	262 (16.5)
OFF	ON	OFF	OFF	ON	ON	2.3	78.4 (4.9)	104 (6.6)	115 (7.3)	164 (10.3)	235 (14.83)	271 (17.1)
ON	OFF	OFF	OFF	ON	ON	2.4	80.2 (5.1)	106 (6.7)	118 (7.4)	168 (10.6)	243 (15.33)	281 (17.7)
OFF	OFF	OFF	OFF	ON	ON	2.5	81.9 (5.2)	108 (6.8)	121 (7.6)	173 (10.9)	251 (15.84)	291 (18.4)
ON	ON	ON	ON	OFF	ON	2.6	83.4 (5.3)	111 (7.0)	123 (7.8)	176 (11.1)	257 (16.21)	301 (19.0)
OFF	ON	ON	ON	OFF	ON	2.7	84.8 (5.4)	113 (7.1)	125 (7.9)	179 (11.3)	263 (16.59)	310 (19.6)
ON	OFF	ON	ON	OFF	ON	2.8	86.2 (5.4)	115 (7.3)	126 (8.0)	181 (11.4)	269 (16.97)	320 (20.2)
OFF	OFF	ON	ON	OFF	ON	2.9	87.7 (5.5)	117 (7.4)	128 (8.1)	184 (11.6)	276 (17.41)	329 (20.8)
ON	ON	OFF	ON	OFF	ON	3.0	89.1 (5.6)	119 (7.5)	130 (8.2)	187 (11.8)	282 (17.79)	339 (21.4)
OFF	ON	OFF	ON	OFF	ON	3.1	90.0 (5.7)	121 (7.6)	131 (8.3)	189 (11.9)	287 (18.11)	344 (21.7)
ON	OFF	OFF	ON	OFF	ON	3.2	90.9 (5.7)	122 (7.7)	132 (8.3)	191 (12.1)	293 (18.49)	350 (22.1)
OFF	OFF	OFF	ON	OFF	ON	3.3	91.7 (5.8)	124 (7.8)	134 (8.5)	193 (12.2)	298 (18.80)	355 (22.4)
ON	ON	ON	OFF	OFF	ON	3.4	92.6 (5.8)	125 (7.9)	135 (8.5)	195 (12.3)	304 (19.18)	360 (22.7)
OFF	ON	ON	OFF	OFF	ON	3.5	93.5 (5.9)	127 (8.0)	136 (8.6)	198 (12.5)	309 (19.49)	366 (23.1)
ON	OFF	ON	OFF	OFF	ON	3.6	94.4 (6.0)	128 (8.1)	137 (8.6)	200 (12.6)	315 (19.87)	371 (23.4)
OFF	OFF	ON	OFF	OFF	ON	3.7	95.3 (6.0)	129 (8.1)	138 (8.7)	202 (12.7)	320 (20.19)	376 (23.7)
ON	ON	OFF	OFF	OFF	ON	3.8	96.2 (6.1)	131 (8.3)	140 (8.8)	204 (12.9)	326 (20.57)	381 (24.0)
OFF	ON	OFF	OFF	OFF	ON	3.9	97.1 (6.1)	132 (8.3)	141 (8.9)	206 (13.0)	331 (20.88)	387 (24.4)
ON	OFF	OFF	OFF	OFF	ON	4.0	98.0 (6.2)	134 (8.5)	142 (9.0)	208 (13.1)	337 (21.26)	392 (24.7)
OFF	OFF	OFF	OFF	OFF	ON	4.1	98.7 (6.2)	135 (8.5)	142 (9.0)	209 (13.2)	339 (21.39)	396 (25.0)
ON	ON	ON	ON	ON	OFF	4.2	99.3 (6.3)	136 (8.6)	143 (9.0)	210 (13.2)	342 (21.58)	401 (25.3)
OFF	ON	ON	ON	ON	OFF	4.3	100 (6.3)	137 (8.6)	143 (9.0)	212 (13.4)	344 (21.70)	405 (25.6)
ON	OFF	ON	ON	ON	OFF	4.4	101 (6.4)	138 (8.7)	144 (9.1)	213 (13.4)	346 (21.83)	409 (25.8)
OFF	OFF	ON	ON	ON	OFF	4.5	101 (6.4)	139 (8.8)	144 (9.1)	214 (13.5)	349 (22.02)	414 (26.1)
ON	ON	OFF	ON	ON	OFF	4.6	102 (6.4)	141 (8.9)	144 (9.1)	215 (13.6)	351 (22.14)	418 (26.4)
OFF	ON	OFF	ON	ON	OFF	4.7	103 (6.5)	142 (9.0)	145 (9.1)	216 (13.6)	353 (22.27)	422 (26.6)
ON	OFF	OFF	ON	ON	OFF	4.8	104 (6.6)	143 (9.0)	145 (9.1)	218 (13.8)	355 (22.40)	426 (26.9)
OFF	OFF	OFF	ON	ON	OFF	4.9	104 (6.6)	144 (9.1)	146 (9.2)	219 (13.8)	358 (22.59)	431 (27.2)
ON	ON	ON	OFF	ON	OFF	5.0	105 (6.6)	145 (9.1)	146 (9.2)	220 (13.9)	360 (22.71)	435 (27.4)
OFF	ON	ON	OFF	ON	OFF	5.1	106 (6.7)	146 (9.2)	146 (9.2)	220 (13.9)	361 (22.78)	438 (27.6)

Table 4. Maximum Flow Rate Settings. (Continued)

Dip Switch Settings						Stem Rotations From Closed	VRW2JV... 2-1/2 & 3" (DN65/80) 5.1~58 psid (35~400 kPa)	VRW2JW... 2-1/2 & 3" (DN65/80) 11.6~58 psid (80~400 kPa)	VRW2KV... 3 & 4" (DN80/100) 5.1~58 psid (35~400 kPa)	VRW2KW... 3 & 4" (DN80/100) 8.6~58 psid (59~400 kPa)	VRW2LV... 5 & 6" (DN125/150) 5.1~58 psid (35~400 kPa)	VRW2LW... 5 & 6" (DN125/150) 8.6~58 psid (59~400 kPa)
#1	#2	#3	#4	#5	#6		gpm (L/s)	gpm (L/s)	gpm (L/s)	gpm (L/s)	gpm (L/s)	gpm (L/s)
ON	OFF	ON	OFF	ON	OFF	5.2	106 (6.7)	147 (9.3)	146 (9.2)	220 (13.9)	362 (22.84)	442 (27.9)
OFF	OFF	ON	OFF	ON	OFF	5.3	107 (6.8)	148 (9.3)	146 (9.2)	221 (13.9)	363 (22.90)	445 (28.1)
ON	ON	OFF	OFF	ON	OFF	5.4	108 (6.8)	149 (9.4)	146 (9.2)	221 (13.9)	364 (22.96)	448 (28.3)
OFF	ON	OFF	OFF	ON	OFF	5.5	108 (6.8)	150 (9.5)	147 (9.3)	221 (13.9)	365 (23.03)	452 (28.5)
ON	OFF	OFF	OFF	ON	OFF	5.6	109 (6.9)	151 (9.5)	147 (9.3)	221 (13.9)	366 (23.09)	455 (28.7)
OFF	OFF	OFF	OFF	ON	OFF	5.7	110 (6.9)	153 (9.7)	147 (9.3)	221 (13.9)	367 (23.15)	458 (28.9)
ON	ON	ON	ON	OFF	OFF	5.8	111 (7.0)	154 (9.7)	147 (9.3)	222 (14.0)	368 (23.22)	461 (29.1)
OFF	ON	ON	ON	OFF	OFF	5.9	111 (7.0)	155 (9.8)	147 (9.3)	222 (14.0)	369 (23.28)	465 (29.3)
ON	OFF	ON	ON	OFF	OFF	6.0	112 (7.1)	156 (9.8)	147 (9.3)	222 (14.0)	370 (23.34)	468 (29.5)

3. Wire the Terminal Strip according to the appropriate diagram for your actuator. See Fig. 5.

4. 500 ohm resistors are supplied for 4-20mA to 2-10 Vdc conversions. Two 2.2Kohm resistors are supplied for digital/3-Point Floating control. In this mode the actuator is sensitive to induced electrical voltages from other sources. To prevent such interference, wire the 2.2Kohm, 0.5W resistor between pins 4 and 1 and a second 2.2Kohm, 0.5W resistor between pins 3 and 1.

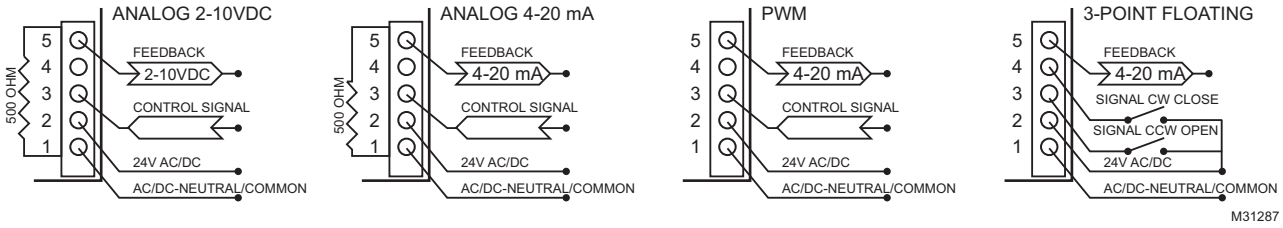

Fig. 5. Wiring connections.

5. The actuator is preset for an analog input signal, normally closed operation. If this is suitable for the application simply connect the wiring per diagram. Once the power has been connected the actuator will run a calibration program and then begin normal operation. If the signal requirement must be changed, proceed to instruction 6.

6. Remove power and set all Programming Dip Switches to OFF by sliding DIP switch toggles away from edge of circuit board (in direction of arrows in Fig. 6–9).

7. Apply power and within 10 seconds, press and release the Reset Button. The programming and indication LED should start blinking.

8. Turn Programming Dip Switch #1, #2, or #3 ON then OFF to select signal requirement.

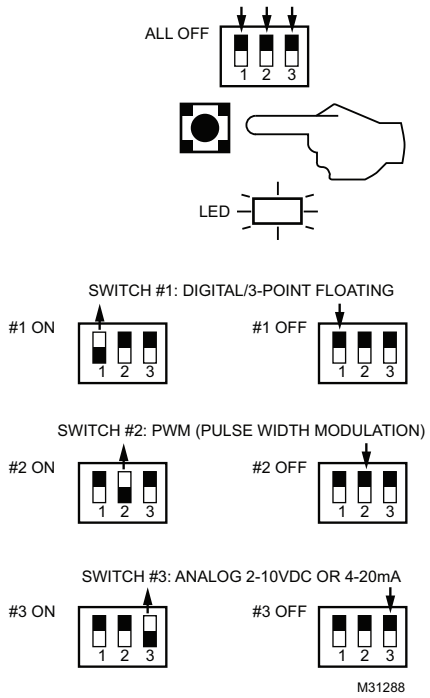

Fig. 6. Set control input type.

Programming Normally Open or Normally Closed Setting

The Actuator is delivered from the factory set to the “normally closed” function for an analog control signal so that a minimum signal of 2V or 4mA will close the valve and a maximum signal of 10V or 20mA will open the valve to maximum flow.

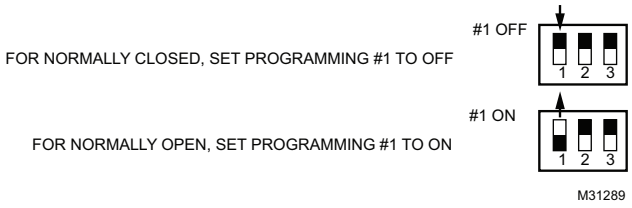

Fig. 7. Actuator programming.

Programming Failsafe Open or Failsafe Closed Setting

This function applies to battery backup, failsafe models only that provide power storage to drive the actuator either open to the Maximum Flow Setting or fully closed in the event of a power supply failure.

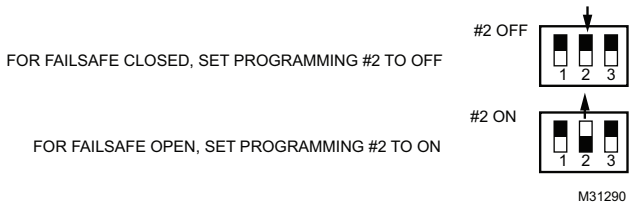

Fig. 8. Failsafe programming.

Programming PWM Time Base Resolution Setting

This function applies only if the Actuator has been programmed to accept Pulse Width Modulation (PWM) signal.

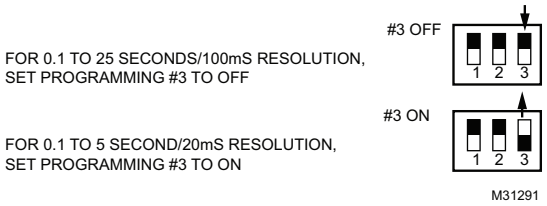

Fig. 9. PWM time base programming.

Programming Actuator Zero and Span Adjustment

1. Remove power.
2. Re-apply power to terminal 2 and within 10 seconds, press and hold the Reset Button until the indication LED blinks once.
3. Release the Reset Button. The indication LED should remain illuminated.
4. Apply the new zero voltage to terminal 3. (Any value between 0-7 Vdc)
5. Press and release the Reset Button to memorize this value. The LED should blink once as confirmation.
6. Apply the new maximum voltage to terminal 3. (Any voltage between 3-10 Vdc and at least 3 Vdc greater than the zero value.)
7. Press and release the Reset Button to memorize this value. The indication LED should blink once as confirmation and then cease to be illuminated. The Actuator will now operate with the new zero and span.
8. If the LED provides 3 sequences of 4 blinks the zero and span program was unsuccessful. This may occur if the difference between zero and maximum voltage were not equal or greater than 3 Vdc.

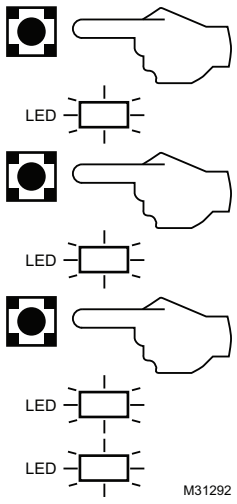

Fig. 10. Actuator programming and LED blink pattern.

OPERATION AND CHECKOUT

Once both the mechanical and electrical installations are complete:

1. Cycle the actuator to verify that the direction of rotation suits the control sequence.
2. If the rotation direction is incorrect:
   a. For floating control actuators: Reverse two control signal wires (CW/CCW), or change position of selector switches.
   b. For analog control actuators, change position of selector switches.
3. If the control scheme requires fail-safe operation, ensure that, upon removal of power, the fail position coincides with the control sequence.

Manual Override

1. Remove Actuator cover and DISCONNECT POWER before operating actuator manually.

   NOTE: Failure to disconnect power may cause damage to the actuator gears.

2. Press the clutch.
3. Rotate valve stem to manually operate valve. Clockwise to close, Counter-Clockwise to open. See Fig. 11.

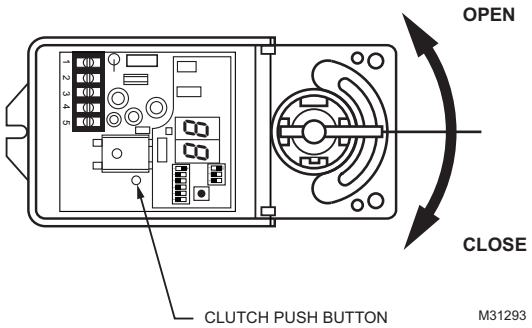

Fig. 11. Manual Operation.

MAINTENANCE

1. Continual blinking indicates that the Actuator torque output limit has been exceeded. This may have been caused by debris in the valve internals. Disconnect power and manually operate the valve to clear the debris. Reconnect power. The Actuator will automatically recalibrate and reset. If the problem reoccurs, inspect the valve body internally for debris.
2. 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.
3. If a separator is not used for system cleaning and filtration, the valves should be checked annually.

Operation

The differential pressure regulator maintains constant pressure drop (P_{IN} - P_{OUT}) across the valve seat through a wide range of head pressures. At a given shaft position, flow through the valve will constant as defined by the formula:

$$Q_{GPM} = C_V \times \frac{\sqrt{P_{IN} - P_{OUT}}}{\sqrt{\rho}}$$

where ρ is the density of the glycol mix.

P_{IN} 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

At the full open position, VRW valves will maintain flow at the gallons per minute rate determined by the DIP Switch settings shown in Table 4. 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.

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