Honeywell

VRN2 Dynamic Pressure-Regulating Control Ball Valves

PRODUCT DATA

VRN2...A

VRN2...D

APPLICATION

The VRN2 two-way dynamic pressure-regulating control ball valves maintain constant flow of hot or chilled water in closed-loop heating, ventilating, and air conditioning (HVAC Division 23) systems regardless of head pressure fluctuations above the minimum specified pressure drop. These valve assemblies can be used with Honeywell non-spring return or spring return direct coupled actuators (DCA) with minimum torque of 35 lb-in (4 Nm) on valve sizes up to 3 inches (DN80).

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. VRN2 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. In new construction, VRN2 valves perform better than reverse return piping designs without the extra materials these systems need.

Systems that utilize the capabilities of properly installed and monitored pressure-independent control valves may qualify for LEED points. Pressure-independent control requires less flow, enabling use of smaller piping, pumps, and chillers.

FEATURES

- **Sizes from 1/2 to 3 in. with internal (female) NPT connections.**
- **Controls hot or chilled water with up to 50% glycol.**
- **Regulated flow rates available from 1 to 95 gpm.**
- **Differential pressure regulator for constant pressure drop across valve seat.**
- **Positive pressure, rolling diaphragm regulator design for flow control accuracy of ±5%.**
- **Equal percentage flow characteristic using patented flow control ball insert.**
- **Multiple maximum flow rates available per valve size.**
- **Patented ball seals for low operating torque.**
- **Nickel-chrome plated brass or stainless steel trim.**
- **Choice of factory-installed actuation using Honeywell N05/S05-series direct coupled actuators: Floating, Modulating (2-10 V), Spring Return Modulating/ Floating.**
- **Spring return actuators field-configurable for normally open or normally closed fail-safe position.**
- **Removable, manual operating handle to control valve during installation or in an event of power failure.**
- **Upstream Test Port for venting or pressure gauge attachment.**
- **Three actuator orientations on the valve for cramped spaces.**

Contents

62-3115-02

SPECIFICATIONS

Models: See Table 1.

Dimensions: See Fig. 1.

Body Style: Two-way ball valve, straight-through flow, full port with patented flow control insert.

Pipe Size: 1/2 to 3 inches with female NPT pipe fittings.

Flow Capacity: See Tables 1 and 4.

Body Pressure Rating (maximum): 360 psi (2500 kPa) at 250°F (121 C).

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

Medium Temperature Range: -22 to +250°F (-30 to +121 C).

Maximum Differential Pressure: See Table 1.

Close-off pressure: 100 psid

Flow Characteristics
Equal Percentage with flow control insert. See Fig. 12.

Materials
Body: Forged Brass (ASTM B283).

Flow Optimizer: laser-milled, glass-reinforced Noryl®

Trim (ball and stem): Nickel-chrome plated brass, or stainless steel.

Stem Seals: EPDM O-ring and Teflon™ bearings.

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

Regulator: Hydrogenated acrylonitrile-butadiene rubber rolling diaphragm in stainless steel housing.

Compatible Actuators
Minimum Torque Required: 35 lb-in. (4 Nm) up to 3 in. (≤DN80).
18 lb-in. (2 Nm) up to 3/4 in. (and 1 in. up to 9 gpm).

Non- spring return: ML6161, ML7161, MN6105*, MN7505*.

Spring return: MS6105, MS7505*, MS8105; MS6103, MS7503, MS8103 only at 1/2 in. or 3/4 in. (DN15 ~ DN 20).
* These actuators available factory-installed.
See Table 4.

Approvals Standards
Actuators: See literature for the given actuator.

Parts and Accessories
BN-series of venturi valves for measuring pressure drop across coil for system balancing report.
5112-11 replacement mounting kit for Honeywell direct coupled actuators. See Fig. 19.
5112-34/35/36 replacement brass stem assemblies
5112-37/38/39 replacement stainless steel stem assemblies
8615-100/101/102/031 replacement pressure regulator assemblies
SW2-US auxiliary switch kit for MN non-spring return actuators, MS7505A2130 spring return DCAs with built-in SPDT auxiliary switch sold separately.

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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 Automation and Control Products Sales Office (check white pages of your phone directory).
2. Honeywell Customer Care
   1885 Douglas Drive North
   Minneapolis, Minnesota 55422-4386

In Canada—Honeywell Limited/Honeywell Limitée, 35 Dynamic Drive, Toronto, Ontario M1V 4Z9.
International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

Table 1. Model Selection.

Model	Pipe Size		Differential Pressure, psid (kPa)			Maximum GPM[d]																										
NPT	in.	S.I.	Min.[b]	Max.[b]	Close-off	...B	...D	...E	...F	...G	...H	...J	...K	...L	...M	...N	...P	...Q	...R	...S	...T	...U	...1	...2	...3	...4	...5	...6	...7	...8	...9
VRN2A...	1/2	DN15	3.0 (21)	35 (240)	100 (690)	1.0	2.0	3.0	4.0	5.0	6.0	7.0																			
VRN2B...	3/4	DN20	6.0 (41)										8.0	9.0	10[a]																
VRN2C...	1	DN25	3.0 (21)			1.0	2.0	3.0	4.0	5.0	6.0	7.0																			
			6.0 (41)										8.0	9.0																	
			3.0 (21)	50 (345)											10[c]	15[c]															
			4.0 (28)														20[c]														
VRN2D...	1 1/4	DN32	3.0 (21)												10	15															
			4.0 (28)														20														
			5.0 (34)															25	30												
			6.5 (45)	58 (400)																35[a]											
VRN2E...	1 1/2	DN40	3.0 (21)	50 (345)											10	15															
			4.0 (28)														20														
			5.0 (34)															25	30												
			4.0 (28)	58 (400)																35[c]											
			6.0 (41)																		40[c]	45[c]	50[c]								
VRN2F... VRN2G... VRN2H...	2 2 1/2 3	DN50 DN65 DN80	4.0 (28)															25	30	35											
			6.0 (41)																		40	45	50								
			7.0 (48)																					55	60	65	70	75			
			10.0 (69)																										80	85	
			12.0 (83)																												95[a]

[a] Full port ball, no flow characterization insert. See Fig. 3.

[b] Pressure range for ±5% accuracy.

[c] Larger body size. See Fig. 1, Dimensions.

[d] Multiply GPM by 0.063 to convert to L/s, or by 0.227 to convert to m^3/h.

Table 2. Actuator Selections.

Model*	Pipe Size		Non-spring Return		Spring Return Fail-Safe		
NPT	in.	S.I.	Floating	Modulating	2-position	Floating	Modulating
VRN2A...	1/2	DN15	ML6161* MN6105†	ML7161* MN7505†	MS8103*	MS7503*	
VRN2B...	3/4	DN20					
VRN2C...	1	DN25			MS8105 MS4105	MS7505†	
VRN2D...	1 1/4	DN32					
VRN2E...	1 1/2	DN40					
VRN2F...	2	DN50					
VRN2G...	2 1/2	DN65					
VRN2H...	3	DN80					

* Minimum recommended torque; higher torque is acceptable.
† Available factory options. Auxiliary switches not included.

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
	N								Female NPT fitting
		2							2-way
			A						Valve size, 1/2 in. (DN15)
			B						Valve size, 3/4 in. (DN20)
			C						Valve size, 1 in. (DN25)
			D						Valve size, 1-1/4 in. (DN32)
			E						Valve size, 1-1/2 in. (DN40)
			F						Valve size, 2 in. (DN50)
			G						Valve size, 2-1/2 in. (DN65)
			H						Valve size, 3 in. (DN80)
				B	1.0 gpm				
				D	2.0 gpm				
				E	3.0 gpm				
				F	4.0 gpm				
				G	5.0 gpm				
				H	6.0 gpm				
				J	7.0 gpm				
				K	8.0 gpm				
				L	9.0 gpm				
				M	10 gpm				
				N	15 gpm				
				P	20 gpm				
				Q	25 gpm				
				R	30 gpm				
				S	35 gpm				
				T	40 gpm				
				U	45 gpm				
				1	50 gpm				
				2	55 gpm				
				3	60 gpm				
				4	65 gpm				
				5	70 gpm				
				6	75 gpm				
				7	80 gpm				
				8	85 gpm				
				9	95 gpm				
								3	360 psig body static pressure rating
							D		Brass trim, dual Test Ports
							S		Stainless steel trim, dual Test Ports
								2	NEMA-2 actuator housing
								F	Flanged valve bonnet (no actuator)
									A Floating actuator
									B Modulating actuator
									D Modulating spring return actuator
									X Valve body only

VR	**N**	**2**	**B**	**F**	**3**	**S**	**2**	**D**	**=** 2-way, 3/4-in. NPT dynamic pressure-regulated valve, SS trim, max. 4 gpm, modulating spring return.

	1/2 in.	3/4 in.	1 in.	1-1/4 in.	1-1/2 in.	2 in.	2-1/2 in.	3 in.
B–L		F.P.						
M–P								
Q–S				F.P.				
T–U								
1–6								
7–8								
9							F.P.	F.P.

NOTE: Table 4 is a guide to the meaning of the product nomenclature, and is not intended to indicate all legal combinations of bodies and actuators. For example, 1/2-in. valves use common bodies with 3/4-in. valves but have a maximum flow of 7 gpm, to avoid cavitation.

"F.P." indicates full port ball (no flow characterization insert).

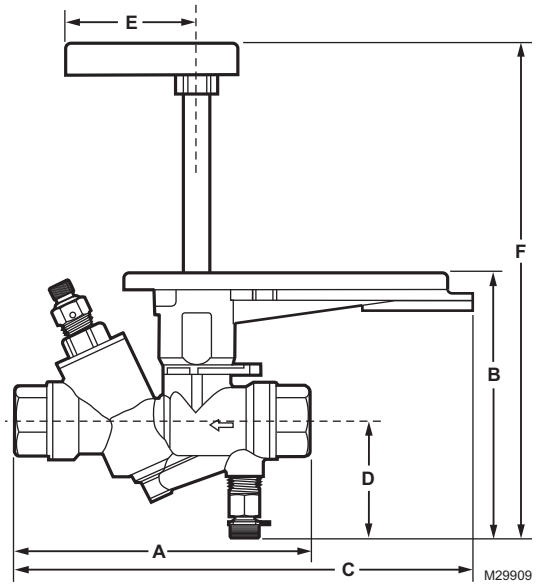

Fig. 1. Dimensions; see Table 4.

Table 4. Valve Dimensions.

Model	Pipe Size		Flow, gpm (m^3/h)			Dimensions[c] in in. (mm)							Weight	Service Replacement Parts
NPT	in.	S.I. metric	Min. Rating	Max. Rating	Full Port	A	B	C	D	E	F_z[a]	F_s[a]	lb. (kg)	
VRN2A	1/2	DN15	1.0 (0.23)	7.0 (1.6)		5.7 (145)	4.3 (109)	8.6 (218)	1.0 (26)	2.5 (64)	8.4 (213)	7.2 (182)	0.9 (0.4)	Stem: 5112-34 5112-37 (SS[b]); Regulator: 8615-100 for 1 to 3 gpm; 8615-101 for 4 to 10 gpm
VRN2B	3/4	DN20		9.0 (2.0)	10 (2.3)									
VRN2C	1	DN25				5.9 (150)		8.7 (221)						
			10 (2.3)	20 (4.5)		9.0 (229)	4.6 (117)	10.9 (277)	1.6 (41)		9.4 (239)	8.2 (207)	1.5 (0.7)	Stem: 5112-35 5112-38 (SS[b]); Regulator: 8615-102
VRN2D	1 1/4	DN32		30 (6.8)	35 (7.9)	8.4 (213)		10.6 (269)						
VRN2E	1 1/2	DN40				8.2 (208)		10.5 (267)						
			35 (7.9)	50 (11.4)		10.0 (254)	5.2 (132)	12.1 (307)	2.1 (53)		10.4 (264)	9.2 (232)	3.6 (1.6)	Stem: 5112-36 5112-39 (SS[b]); Regulator: 8615-031
VRN2F	2	DN50	25 (5.7)	75 (17.0)		9.9 (251)		12.0 (305)						
VRN2G	2 1/2	DN65		85 (19.3)	95 (21.6)	10.3 (263)		12.2 (310)						
VRN2H	3	DN80				10.8 (274)		12.4 (314)						

[a] Long shaft supplied with “Zelix” direct coupled spring return actuators; short shaft supplied with MN series stay-in-place DCAs.

[b] Do not use stainless steel replacement stem assemblies in valves with plated brass trim; galvanic reactions may occur.

[c] Actuator dimensions fall within the envelope of the handle and mounting bracket. See actuator literature for detailed dimensions.

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.

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 fluid temperature range of from -22 to +250°F (-30 to +121°C), at a maximum pressure of 360 psig (24.8 bar). VRN2 valves are to be operated with Honeywell direct coupled actuators only.

NOTE: **Manual balancing valves are not required** when dynamic pressure-regulating control valves are installed.

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 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 the ball seals and pressure regulator.
- 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 or Separators are suggested. Remove all filters and screens before flushing the system to avoid trapping dirt in the system.
- 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 an addition to, or 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. The test port on the valve regulator may be used for installation of an automatic air vent in a horizontal pipe run at a high point in the building.
4. When installing threaded fittings and pipes, if Teflon™ tape is unavailable, use minimum possible amount of pipe dope. Excessive dope may be forced into ball seals or pressure sensing channel and interfere with valve operation when pipe is assembled to body. Installation torque should not exceed 75 lb-ft (100 Nm).

IMPORTANT

- *Hold valve with pipe wrench by NPT fittings adjacent to pipe ONLY. Do NOT hold valve by far pipe or pipe fittings.*
- *Do NOT hold the valve body with a pipe wrench: product damage may result.*
- *Take care not to apply counter-clockwise torque to valve's pipe fittings: this may break water-tight seal between valve body and pipe fittings.*
- *Flow arrows must point in the direction of the flow for proper operation. Pressure regulator is downstream of valve stem.*

5. Stem rotation as viewed from above:
   a. Clockwise to close.
   b. Counterclockwise to open
6. 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 Fig. 3.)

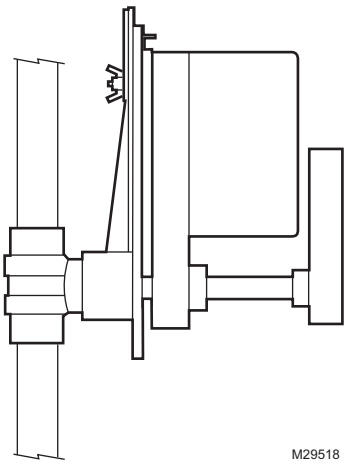

Fig. 2. Vertical valve installation.

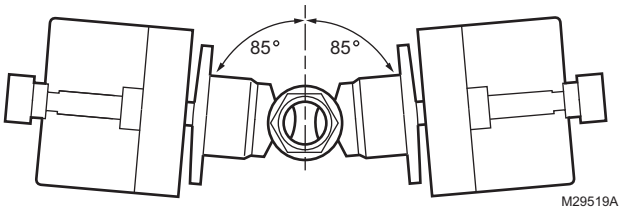

Fig. 3. Acceptable valve angle from vertical.

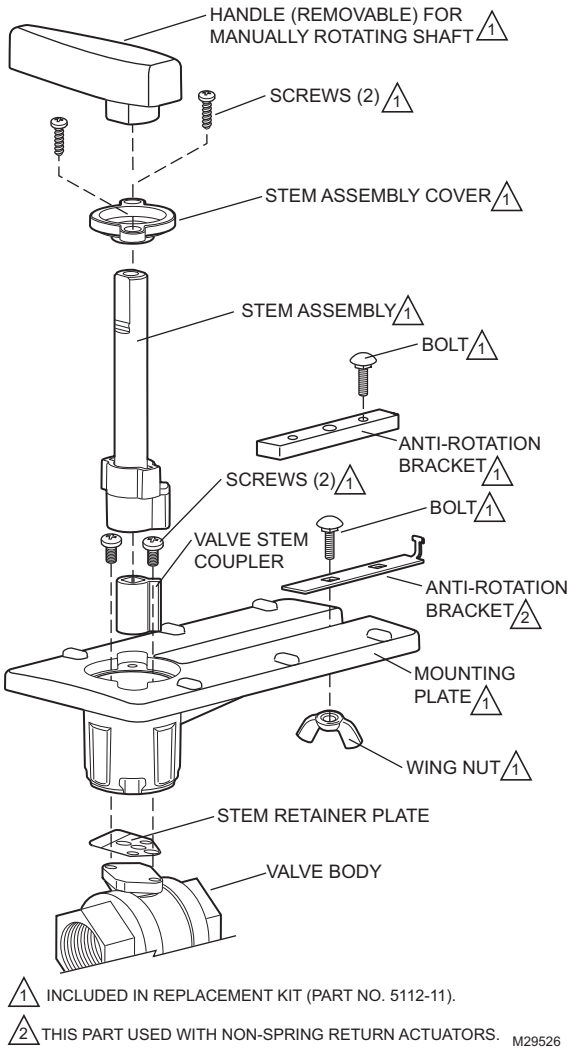

Fig. 4. Actuator mounting plate adjustment.

Actuator Mounting Plate Re-Positioning (optional, see Fig. 4)

⚠ WARNING

System may be under pressure.
Isolate VRN2 control valve using shut-off valves, or service and maintenance tools designed for this use before proceeding, or personal injury and property damage may result.

The Actuator Mounting Plate can be rotated to a different position for installation in confined spaces. This is accomplished as follows:

1. **CLOSE VALVE**. This will seal ball to system pressure.
2. If actuator is mounted to valve, remove the handle from the shaft and set it aside. Disconnect actuator from valve stem and remove from bracket. See Fig. 4.
3. Remove the two screws that hold the stem assembly cover to the mounting plate and set them aside.
4. Remove and set aside the stem assembly cover, stem assembly, thermal isolator, and valve stem coupler.
5. Remove and set aside the two screws that attach the mounting bracket to the valve body.
6. **ENSURE VALVE IS ISOLATED AND DEPRESSURIZED BEFORE PROCEEDING.**
7. Remove yellow pressure plate marked "**HIGH PRESSURE**" from valve bonnet,
8. Rotate pressure plate 90° and re-install, using the other pair of tapped holes in the valve bonnet. Take care not to over-tighten screws: pressure plate damage, *not covered by warranty*, may result.
9. Re-install actuator mounting bracket onto valve in reverse order of disassembly.
10. Re-install actuator and handle.
11. Re-pressurize valve.

Actuator Mounting

1. MN and MS series actuators are wired inside their removable conduit cover. Wires may be connected before or after DCA body is mounted to valve. Wire according to actuator installation instructions.
2. Loosen wing nut under mounting bracket and slide anti-rotation bar as far out as possible. See Fig. 4
3. Remove the handle from the shaft and set it aside.
4. Open Self-Centering Shaft Adaptor of spring return DCA, or loosen U-bolt or set screws of non-fail safe DCA. Slide actuator down over valve shaft until seated evenly on mounting bracket.
   Fail safe action of spring return actuators is determined by actuator orientation - turning DCA over reverses direction of spring return on power loss.
5. Slide anti-rotation bar into slot in DCA base.
   Install bolt through rivet hole in Zelix spring return actuator, if used.
6. Tighten wing nut so that anti-rotation bar does not slide.
7. Ensure ball is at desired starting position. Stops for quarter turn ball travel are inside base of actuator mounting plate. Additional travel limit stops are provided on hubs of MN and MS series DCAs, which may be used for mechanically setting VRN2 flow rate in conjunction with flow characteristics seen in Fig. 12.
8. Firmly tighten SCSA bolt, U-bolt nuts, or set screws on DCA to valve shaft.
9. Snap handle onto top of shaft.
10. Set DCA operation switch, as needed.

For detailed actuator information, see Honeywell literature:
- 62-0274—MS7505/MS8105 Spring Return Actuator Installation Instructions
- 63-2632—MN6105 Floating Actuator Product Data
- 63-2633—MN7505 Modulating Actuator Product Data

Wiring

Typical connections shown for reference. Please refer to individual actuator data sheets for complete installation instructions.

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

Any 4-20 mA proportional control signal can be converted to 2-10 Vdc by connecting a 490 to 510 ohm, 1/2 W or larger, resistor across MN/MS7505 actuator terminals 2 and 3.

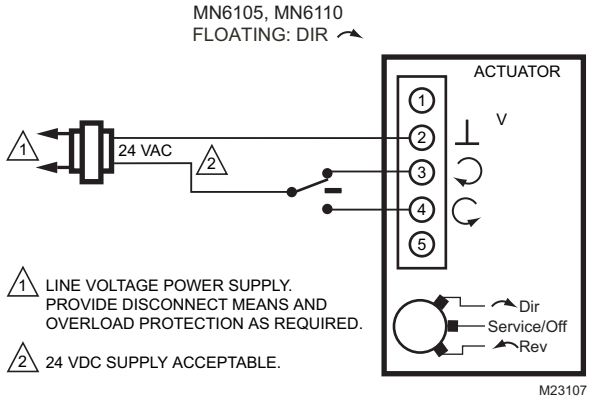

Fig. 5. Wiring MN6105 for Floating Control.

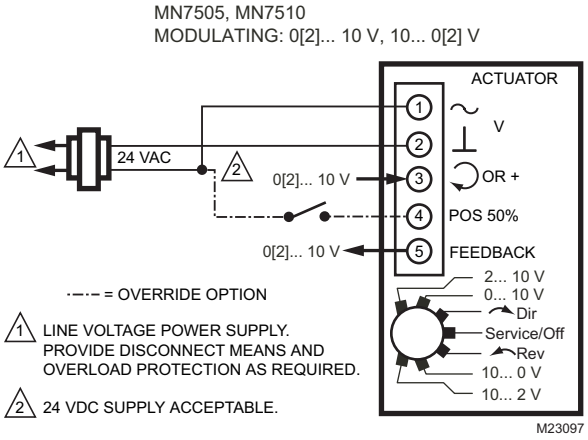

Fig. 6. Wiring MN7505 for Modulating Control.

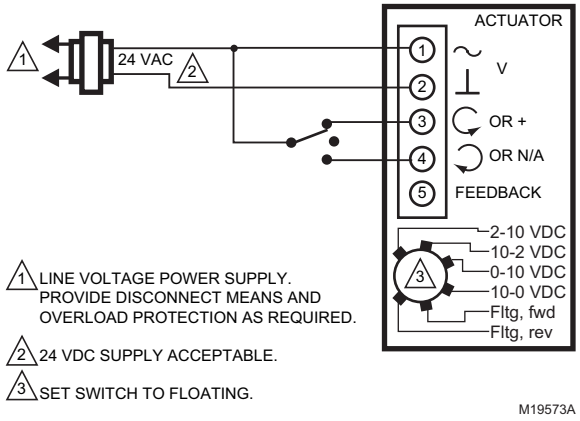

Fig. 7. Wiring MS7505 for Floating Control (Floating mode setting).

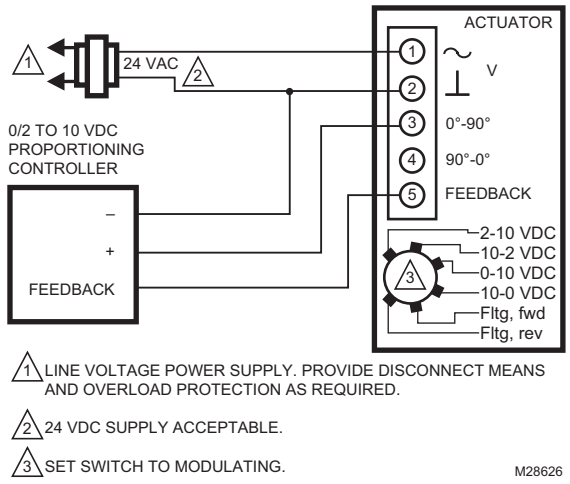

Fig. 8. Wiring MS7505 for modulating control (modulating mode setting).

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 2-position spring return actuators: Remove, flip over, and replace actuator on the bracket.
   b. For floating control actuators: Reverse two control signal wires (CW/CCW), or change position of selector switch.
   c. For analog control actuators either:
      (1) Change setting of reverse/direct-acting switch, or
      (2) Remount actuator on the bracket.
3. If the control scheme requires fail-safe operation, ensure that, upon removal of power, the fail position coincides with the control sequence.
4. Spring return actuators are factory-configured for normally-closed, fail-safe operation on power loss. To change this action to normally-open, remove and reinstall the actuator in the opposite orientation as follows:
   a. Loosen the shaft coupling bolt using a 10 mm wrench.
   b. Loosen all other mounting bolts connecting the actuator to the mounting bracket, and set aside.
   c. Remove the actuator from the valve shaft.
   d. Move the Self-Centering Shaft Adaptor to the opposite side of the actuator, as displayed in Fig. 9.

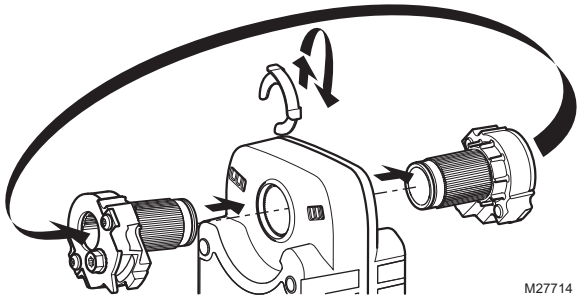

Fig. 9. Change actuator to normally open.

   (1) Remove the retainer clip from the Self-Centering Shaft Adapter and set it aside for later use.
   (2) Remove SCSA from actuator.
   (3) Reinstall SCSA on the opposite side of the actuator, aligning it based on the stroke labeling.
   (4) Replace the retainer clip on the shaft coupling using the groove of the coupling.
   e. Reconnect the actuator to the valve mounting bracket by replacing the screws previously removed (step b).
   f. Tighten the shaft coupling bolt using a 10 mm wrench or socket.

Operation

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

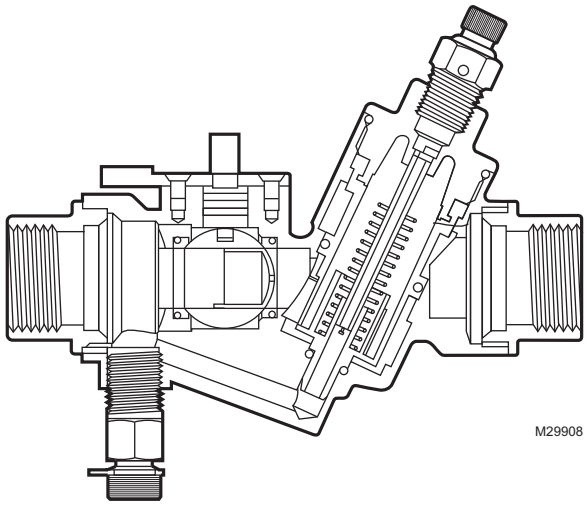

Fig. 10. VRN2 cross section showing fitting, control ball, and pressure regulator.

At full flow in a 2-position control application, a VRN2 behaves as a flow limiter.

The pressure regulator takes a minimum pressure to operate, and has a maximum differential regulation capability. See Table 1 and Fig. 11. The high pressure drop across a VRN2 Valve is comparable to the pressure drop across a control valve and balancing valve in a conventional system design.

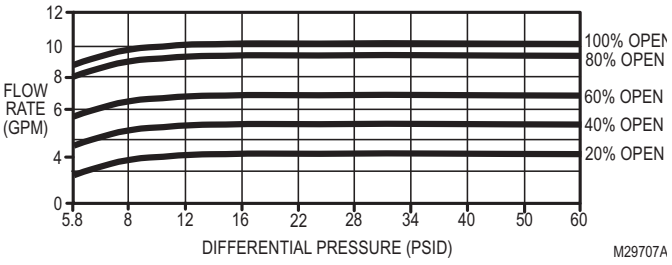

Fig. 11. Pressure regulation, large body models.

SETTINGS AND ADJUSTMENTS

At the full open position, VRN2 valves will maintain flow in the loop at the gallons per minute rate shown in Table 1. 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%. For optimum performance, choose only the next larger valve size needed to satisfy design load. Do not oversize valves—reduced rangeability and may result in less accurate temperature control.

Ball valves close between 10 and 15% of stroke, to ensure full seal engagement. If desired, modulating actuators can be set to 0-10 V response so that 2 V of a 2-10 V control signal more closely corresponds to minimum flow. The valve will still close with signal loss.

If desired, maximum flow may be trimmed to a lesser value in one of two ways:

1. With modulating actuator, limit span of control voltage issued by the building automation controller. Valves with flow control inserts have an equal percentage flow characteristic (See Fig. 12). Each 10% reduction in maximum control voltage will result in a 10% reduction in flow.

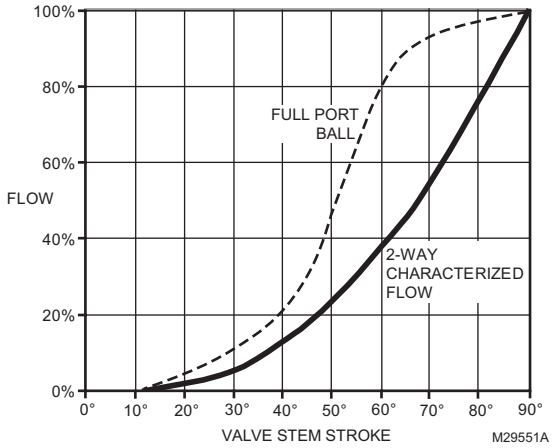

Fig. 12. Typical flow characteristics.

2. To mechanically limit stroke, set DCA to full open position. Loosen shaft coupling and rotate valve shaft to desired maximum flow position, as confirmed by pressure measurement across coil, using coil manufacturer's data. Retighten shaft coupling. Use Fig. 12 as a guide to setting actuator stroke.

   If using mechanical adjustment technique with MN/MS7505 modulating actuators, the stroke auto-adaption feature will automatically scale the 2–10 Vdc signal to the mechanical rotation of the ball. See actuator literature for details.

Coil flow can be confirmed by reading pressures at the coil inlet and coil outlet (not across control valve as with conventional balancing—this pressure drop will be constant), and using the manufacturer's data to calculate flow.

Note that the pressure regulator in this valve guarantees that the flow through the coil will not be affected by upstream changes in pressure. Unlike conventional balancing valves, it is not necessary to reconfirm coil 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.

Service and Repair

The valve stem can be replaced in-line, if necessary. See Fig. 13.

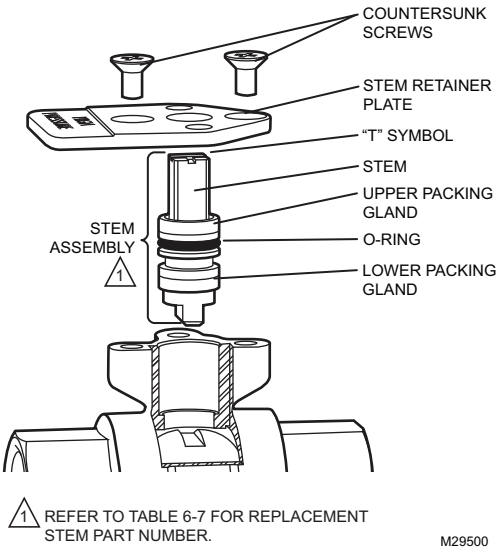

Fig. 13. Replacing the valve stem in-line.

Follow steps 1 to 6 of "Actuator Mounting Plate Re-Positioning" on page 7, then:

1. If the lower packing gland is stuck, remove it with gland removal tool or rubber-tipped dental tool.

⚠ CAUTION

Avoid scratching the inside of the valve neck.
This may cause a leak when re-assembled.

2. Carefully remove any fouling or corrosion from inside of valve.
3. Align arrow with short leg of "T" symbol on new stem assembly.

   NOTE: "T" symbol will vary.

4. Insert the new stem assembly. Be sure to line up the stem key with the ball slot.

5. Fasten stem retainer high pressure plate to the valve using the new countersunk screws. Then fasten the mounting plate to the valve.
6. Repressurize valve and confirm stem does not leak before proceeding.
7. Slide the sub shaft over the stem with the tab oriented as shown in Fig. 13.
8. Replace the thermal break, shaft, and shaft cover. If shaft has come loose from thermal break, push firmly on end of shaft until blade in shaft snaps into thermal break.
9. Replace actuator and secure it to shaft and mounting plate.
10. Snap handle onto top of shaft.

Any other service to valve such as seat seal replacement requires removal of valve from piping.

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

Quarter-Turn, Dynamic Pressure-Regulating Threaded Control Valve

Mounting and Wiring

1. Valves shall be available with female national pipe thread pipe fittings in sizes from 1/2 up to 3 inches (DN15 to DN80).
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 stainless steel with a rolling diaphragm and operate under positive pressure. Regulator shall be located above axis of pipe and be available with optional 1/4-in. NPT test port fittings to allow pressure measurement and venting. Control accuracy shall be ±5% or better.
3. Flow control ball shall have an equal percentage flow characteristic provided by a laser-milled, glass-filled polymer ball insert. Valve seat seals shall make contact with the ball only, and not the flow control element.
4. Valve ball and stem construction shall be nickel-plated brass or stainless steel.
5. Maximum operating differential pressure shall be no less than 35 psid. Close-off pressure shall be 100 psid.
6. Valve stem assembly shall be of a packless design and be field-replaceable without removing the valve body from the piping. Teflon™ seals shall hold the stem in alignment, and protect the O-ring from system temperature fluctuations. Stem O-ring shall be made of peroxide-cured EPDM and be isolated from system treatment chemicals by a reservoir of silicon grease. Valve shall have a blow-out proof stem with minimum 600 psi rating.
7. Threaded valves bodies shall have static pressure rating of 360 psig (2500 kPa) at 250°F (121 C).
8. Actuators shall be direct coupled rotary type requiring neither crank-arm nor linkage and direct mount to the valve actuator bracket. The bracket shall provide for up to 2 in. (50 mm) of pipe insulation.
9. Actuators shall provide screw terminal wiring connections with adapters for flexible conduit where mechanical protection is required by local codes.
10. Valve actuator shall be capable of operating on 24 Vac Class II power, or be UL Listed or CSA Certified to U.S. and Canadian Standards where used with line voltage.

Control

1. The actuator shall provide two-position, floating, or proportional control. Proportional control refers to direct acceptance of 2-10 Vdc or, with addition of a 500 ohm resistor, a 4-20 mA input signal. Floating control refers to direct acceptance of 24 Vac pulse-width modulated 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. Multiple gpm flow ratings will be available in each valve size, with 26 discrete values available in 1 gpm increments up to 1 in. and 5 gpm increments from 1 to 3 in. Intermediate flow settings will be set using mechanical stop in the actuator, or by characterized modulating control signal from the controller.
3. Proportional and floating control actuators shall provide a 2-10 Vdc feedback signal.
4. Proportional actuators shall have a rotation direction control switch accessible on the cover to change between proportional or floating control.
5. Control actuators shall be available with integral or field-addable SPDT switch for position verification feedback as an available option.
6. Actuation will be available with fail-safe operation capable of returning the valve to a normally open or normally closed position following loss of power.

Other

1. Valve stems and differential pressure regulator must be field serviceable without removing valve from piping.
2. 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.
3. 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.
4. Actuated valves shall be capable of closing off against their maximum operating differential pressure.
5. All spring return actuators must be designed for either normally open or normally closed fail-safe operation with a continuously engaged mechanical return spring. This spring must return the actuator to a fail-safe position within 20-25 seconds of power loss.
6. All 44 lb-in (5 Nm) torque, spring return actuators must be able to spring return from -40°F to 150°F (-40 to 60 C).
7. All actuators shall be designed for a minimum of 60,000 full-stroke cycles, and 1,500,000 repositions at rated torque, fluid and ambient temperatures.

8. Two-position actuators shall be designed for a minimum of 100,000 full-stroke cycles at rated torque, fluid and ambient temperature.
9. Run time shall be constant and independent of load, temperature, and supply voltage (within specifications).
10. All valves and actuators shall be manufactured under ISO 9001 Registered quality control system.
11. Actuators shall have a five year warranty.
12. Accessories Identification tags shall be available for all valves; tags shall be indelibly marked with gpm, model number, and tag location
13. Valves and actuators shall be as supplied by Honeywell.

Accessories

1. Identification tags shall be available for all valves; tags shall be indelibly marked with flow rate, model number, and tag location.

Balancing Valves (Mechanical section)

1. Balancing valve installation and commissioning shall not be required when dynamic pressure-regulating control valves are used throughout a building.
2. The balancing report, as required, shall confirm design coil flow by direct measurement across (a representative sample of/all) coils in the building using coil manufacturer's data.

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