

V50 Series Self-Operated Modulating Valves For Outdoor Crop Dryer Service

Application

These valves control the flow of gas on natural or LP gas fired outdoor crop dryers and are used to maintain a desired air drying temperature. Changes in air temperature at the sensing bulb cause the valve to modulate the gas supply to the main burner. CAUTION: Valves are for outdoor crop dryer service only. Not for use on applications of any other kind.

All Series V50 valves are designed for use *only* as operating devices. Where system closure, improper flow or loss of pressure due to valve failure can result in personal injury and/or loss of property, a separate pressure relief or safety shutoff valve, as applicable, must be added by the user.



Fig. 1 -- V50A Modulating Valve.

Specifications

peomoa					
			V50AB	1/2" Female NPT	
	Less Gage	- -	V50AC	³ /4" Female NPT	
		añe 1	V50AD	1" Female NPT	
vpe		-	V50AE	1 1/4" Female NPT	
lumber	With G	iage	V50BB	1/2" Female NPT	
				55 to 155°F (13 to 68°C)	
				60 to 170°F (16 to 77°C)	
Range of	Closing	Points		90 to 210°F (32 to 99°C)	
-	-			140 to 250°F (60 to 121°C)	
				225 to 345°F (107 to 173°C)	
				A 2 ¹¹ /16" Diameter Gage Available for 55 to	
				155°F, 90 to 210°F and 140 to 250°F Ranges.	
Temperature Gage				Normally Supplied on Front (Gas Flow Left to	
				Right). Can be Mounted on Valve (Gas Flow	
				Right to Left) at Additional Cost	
Maximum at Sensin	Allowal g Bulb	ble Tem	perature	20F° (10°C) Above Maximum Valve Bange	
Maximum of Gas Pa	Allowa	ble Tem hrough \	perature /alve	250°F (121°C)	
Maximum Around V	Allowa alve Boo	ble Tem dy	perature	175°F (79°C)	
Maximum	Line W	orking P	ressure	30 PSIG (207 kPa)	
		V50AB	V50BB	¹ /2" Valve 3.4 C _v (2.9 kv)	
	fficient	V50AC		³ /4" Valve 5.5 C _v (4.7 kv)	
FIOW COE	Hicient	V50AD		1" Valve 8.5 C _v (7.3 kv)	
		V50AE		1 1/4" Valve 11.0 Cv (9.4 kv)	
Pumper O	Pursea Osliliana			Five Different Sizes Included with Each Valve.	
Dypass Urinces			See Selection Table for Sizes		
Adjustme	nt			"T" Handle on Top of Spring Housing	
Diaphrag	m Mater	ial	2 ·	Viton on Dacron (High Temperature)	
				1/2" and 3/4" Sizes — Cast Brass Bodies	
Valve Body Material				1" and 1 1/4" Sizes — Cast Iron Bodies with	
	•			Rust Resisting Finish	



Fig. 2 -- V50B Modulating Valve.

Features

- Free movement of parts provides fast, uniform response.
- Easy to adjust by turning "T" handle range screw.
- High temperature diaphragms as required for most LP gas units.

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- Variety of temperature ranges for various drying conditions.
- Built-in temperature gage available to indicate sensed air temperature.

General Description

A vapor pressure sensing element opposes the range spring to increase gas flow on temperature drop and decrease gas flow on temperature rise. Amount of movement toward open or closed gas flow depends on amount of temperature change at the sensing bulb.

The operator can set the valve to be fully closed at any temperature within its range.

A temperature indicating gage is available at additional cost on quantity orders. The gage is an integral part of the temperature element and helps the operator make accurate settings.

Optional Constructions

Bulb Styles

Style 1 -- Bulb is 11/16 in. (17 mm) diameter. The length will vary with capillary length, valve size and whether gage is supplied.

Style 4 -- Same as Style 1 except 1/2 in. NPT male connector for insertion into female pipe flange.

Style 18 -- Same as Style 1 except with spiral fins to increase transfer rate between air and bulb. Bulb is 1-1/4 in. (32 mm) diameter.

Bypass Orifice

These valves have a threaded hole in the internal web of the valve for an internal bypass. (See Fig. 3.) They are normally supplied with a solid plug installed in this hole for complete shutoff. Five drilled orifice fittings are supplied with each



Fig. 3 — Cutaway view showing location of orifice plug.

valve for field selection and installation, if bypass is needed to maintain a minimum flame even when the close off point has been reached. See selection table for sizes.

Factory installed orifice is available at additional cost.

Selection Table below is for orifices supplied with valves (solid plug is normally factory installed).

Standard element has 6 ft (1.8 m) of 1/8 in. O.D. copper capillary. Optional lengths are

Orifice	Orifice Size		
in.	mm	Code	
.040	1.02	Red	
.062	1.57	Yellow	
.078	1.98	Green	
.093	2.36	Blue	
.125	3.18	Aluminum	
Solid	Plug	Brass	

Capillary

Valve Size	Capillary Length	Bulb Length	
10" 2/4"	6', 8', 10'	10"	
1/2 , 0/4	15', 20'	12 1/4"	
1" 1 1/A"	6', 8', 10'	16 1/4"	
1,11/4	15', 20'	17 7/8"	

available on quantity orders,

lengths of 8 ft (2.4 m), 10 ft (3.0 m) and longer in increments of 5 ft (1.5 m) at additional cost. Armored capillary tubing is available at additional cost.

Ordering Information

- To order, specify:
- 1. Type Number.
- 2. Range.
- 3. Temperature gage, if required, and location (quantity orders).
- 4. Bulb Style.
- 5. Length of capillary.
- 6. Armored capillary, if required.
- 7. Factory installed orifice, if required.
 - a. Size of bypass orifice.

Selection of Valve Size

For best operation use the following method of selecting the correct size valve.

- 1. Determine gas flow required (cubic feet per hour).
- Determine pressure (P₂) required at burner orifice (PSIG).
- Determine pressure (P₁) available to valve inlet (PSIG). This is usually the pressure regulator setting.
- From the foregoing information, calculate the required valve flow coefficient (Cv) by the following formula:

$$C_{v} = \frac{Q \sqrt{G(T_{f} + 460)}}{1360 \sqrt{(P_{1} - P_{2}) P_{2}}}$$

Shipping Weight (Approx.)

Valve	Individu	al Pack	Overpack of 10 Units		
Size	lb	kg	lb	kg	
1/2"	4.5	2.0	47	21	
3/4"	5.5	2.5	57	26	
1"	8.5	3.9	87	39	
1 1/4"	10.0	4.5	102	46	

- Q = Maximum flow in cubic feet per hour (cfh) at a gas temperature of 60°F (16°C).
- G = Specific gravity of gas being used.
- T_f = Gas temperature in °F.
- P₁ = Inlet (upstream) pressure in PSIA.
- P_2 = Outlet pressure in PSIA.

C_V = Valve flow coefficient.

Common Specific Gravities:

Air = 1.00; Propane = 1.56; Butane = 2.07; Natural Gas = 0.64.

Example:

Natural gas burner 5,000,000 Btu/hr. (5000 cfh).

Burner orifice pressure required (P_2) 5 PSIG = 19.7 PSIA.

Assume inlet pressure (P₁) 9 PSIG = 23.7 PSIA.

Gas temperature 70°F (21°C).



Performance specifications appearing herein are nominal and are subject to accepted manufacturing tolerances and application variables.



CAUTION: DO NOT INSTALL ANY VALVE OR SHUTOFF MEANS BETWEEN THE V50 AND BURNER ORIFICE

Fig. 4 — Typical piping for V50 Valve.

Specific gravity of gas: 0.6

See Specification chart to select proper valve.

 $C_{v} = \frac{5000\sqrt{0.6(70+460)}}{1360\sqrt{(23.7-19.7)19.7}}$

 $= \frac{5000 \times 17.83}{1360 \times 8.87} = 7.3903$ (required Cv)

Use 1 in. V50AD which has $C_{\rm V}$ of 8.5.

Operation

LP Gas Application

These valves are normally located on the crop dryer gas manifold between the pressure regulating valve and the burner orifice. They are used on vapor withdrawal systems or on liquid withdrawal systems using a direct or indirect vaporizer. They should not be used as expansion valves (handling liquid LP) on straight liquid withdrawal systems.

When using a fuel tank, a pressure regulating valve is required to maintain uniform inlet pressure to the V50 modulating valve because the tank pressure varies considerably due to changes in tank ambient temperature.

The recommended setting for the pressure regulating valve is no higher than 30 PSIG (207 kPa) as in many instances the outside temperature will not be high enough to provide the regulating valve with pressure above this value. The maximum working pressure for V50 selfoperating modulating valves is 30 PSIG.

▲ CAUTION: The valve should not be installed on lines where line pressure exceeds 30 PSIG (207 kPa). When there is a possibility of pressures over 30 PSIG, provide an overpressure or alarm control. The temperature at the sensing bulb must not exceed maximum valve range shown on the nameplate by more than 20F° (10C°).

As the modulating valve provides only a portion of the pressure drop, the maximum firing rate (valve wide open) is determined by the setting of the pressure regulator and the size of the burner orifice.

Repairs and Replacement

Field repairs must not be made except for replacement of the internal parts, orifice plug, diaphragm and sensing element. For a replacement valve or parts, contact the nearest Johnson Controls wholesaler.

Dimensions						
	B		С		D	
A	in.	mm	in.	mm	in.	mm
1/2" NPT	3.13	80	2.50	64	5.78	147
3/4" NPT	3.38	86	2.63	67	6.31	160
1" NPT	4.84	123	3.75	95	7.75	197
1 1/4" NPT	4.88	124	3.91	99	8.00	203

Notes



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