



VM1500 & VM5000 Series Electric Valve Actuators

VM1500 and VM5000 are strong electric valve actuators capable of closing large valves against high differential pressures. The integral linkage and manual override features make for easy installation on the valve. The override also permits positioning of the valve at start-up and on power failures.

Floating and modulating models are available.

In modulating models the signal range self adjusts to match the valve stroke. The control signals are 0 - 10 or 2 - 10 volts DC and 0 - 20 or 4 - 20 ma. The signal is selected by switches on the circuit board. Signal ranges can also be split so that one control signal can operate two actuators sequentially.

Another switch sets the actuator so that an increasing signal can either raise or lower the valve stem.

One switch, when it is on, alters the relationship of the input signal to the stroke so that an equal percentage valve will act as a linear valve.

"Fail-Safe" operation is provided when the actuators are used with the VMS-25 power pack.

These actuators fit all Paxton valve bodies and can be adapted to similar valves made by others.

Technical Data

Voltage	24 volts ac		
Input Signals			
VM1500 & VM5000	24 volts ac floating		
VM1500E & VM5000E	24 volts ac floating		
	2 - 10 & 0 - 10 volts dc		
	4 - 20 & 0 - 20 ma		
	split range volt & ma signals		
Feedback Signals			
VM1500E & VM5000E	0 - 10 or 2 - 10 vdc		
VM1500E & VM5000	Optional 10 K ohm potentiometer		
Materials			
Housing	Polycarbonate		
Linkage & Yoke	Steel		
Maximum Temperature			
At Valve Bonnet	250° F	120° C	
Ambient	122° F	40° C	



Ordering Data

Part Number	Signal		Force		Max Stroke		Speed	Power Draw
	Input	Feedback	lb	N	in	mm		
VM1500	Floating	Optional	330	1500	1 1/2	40	4 sec/mm	12 va
VM5000	Floating	Optional	1100	5000	2 1/8	55	8 sec/mm	25 va
VM1500E	All	Yes	330	1500	1 1/2	40	4 sec/mm	12 va
VM5000E	All	Yes	1100	5000	2 1/8	55	2 sec/mm	25 va

Two auxiliary switches and one potentiometer are available as options in the floating models VM1500 & VM5000. Specify when ordering. There are 2 spdt switches in the set. The potentiometer is a 3-wire, 10 K ohm unit.

Wiring Diagrams

Modulating Models VM1500E & VM5000E

Terminals

SP	System Power 24Vac
SN	System Neutral 24 vac
Y	Signal Input
X	Position Feedback Signal
1	Override Stem Up
3	Override Stem Down

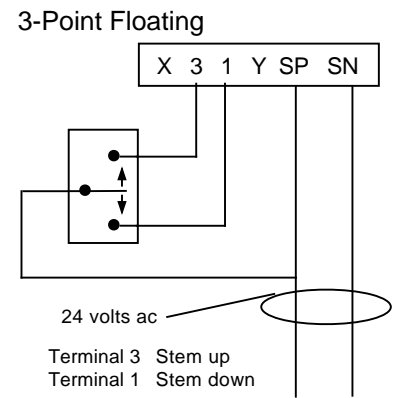
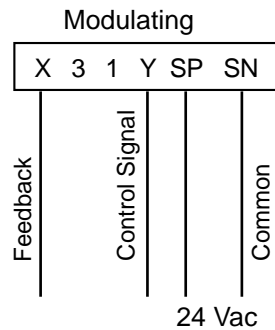
SN is neutral for both the 24 volt ac power and the dc control signal. If the system is grounded ground SN.

Control Signal Override

Jumper terminal 1 to SN to raise the stem.

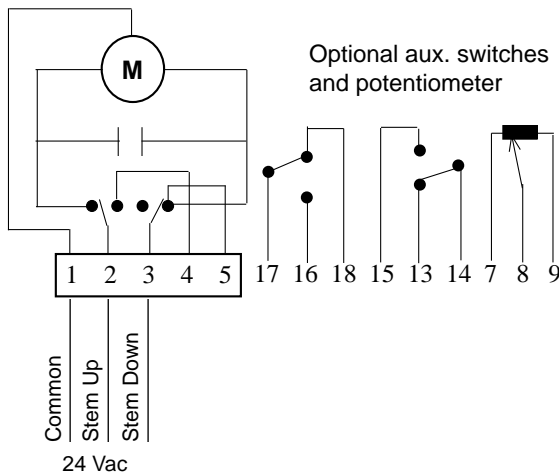
Jumper terminal 3 to SN to lower the stem.

The actuator moves to the end position and remains there until the jumper is disconnected.



For DIP switch settings, see page 4

Floating Models VM1500 & VM5000



Potentiometer

- 8 - 7 1 K ohms stem down
- 8 - 9 1 K ohms stem up

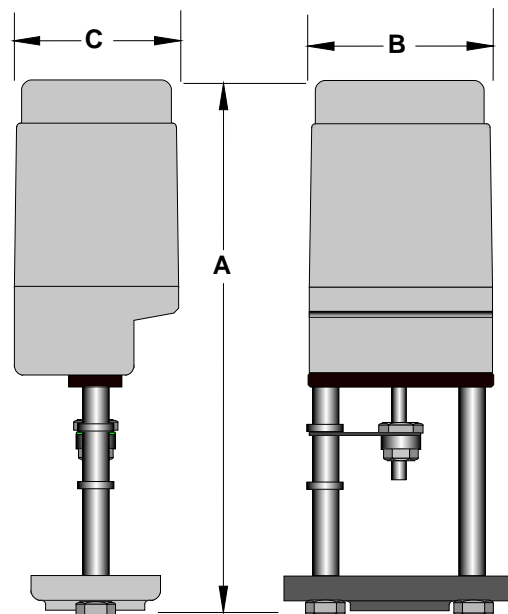
Switches

- 17 - 16 close stem down
- 17 - 18 close stem up
- 14 - 15 close stem down
- 14 - 13 close stem up

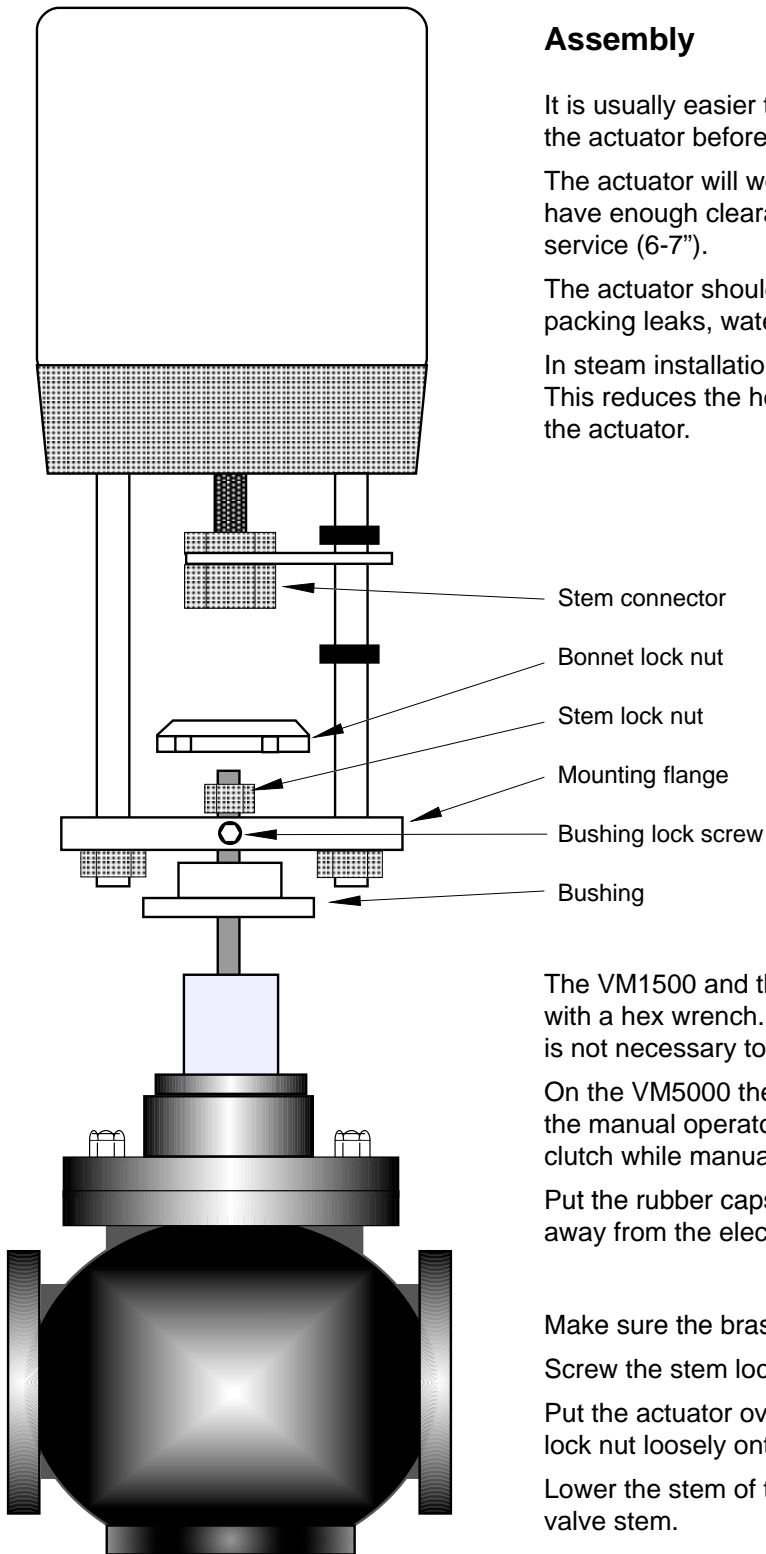
Dimensions

	VM1500		VM5000	
	in	mm	in	mm
A	15 3/4	401	15 3/4	401
B	4 3/4	120	6 5/8	167
C	4 1/4	106	7 1/4	183

Leave clearance above the actuator for removing the cover and for manual operation. (approx 6")



Installation on a valve



Assembly

It is usually easier to assemble the valve and actuator and adjust the actuator before the valve is installed.

The actuator will work in any position except up side down. It must have enough clearance to be able to remove the top for wiring and service (6-7").

The actuator should be higher than the valve so that if the stem packing leaks, water will not damage the actuator.

In steam installations, always tilt the actuator 45-90° from vertical. This reduces the heat transfer from the valve and extends the life of the actuator.

The VM1500 and the VM5000 actuators can be manually operated with a hex wrench. The operator is at the top of the actuator and it is not necessary to remove the cover for access.

On the VM5000 there are two rubber caps on the top: one covers the manual operator and the other covers the clutch. Depress the clutch while manually operating the actuator.

Put the rubber caps back on when finished to keep dirt and moisture away from the electronic circuit.

Make sure the brass bushing is inserted in the mounting flange.

Screw the stem lock nut onto the valve stem.

Put the actuator over the valve bonnet and then screw the bonnet lock nut loosely onto the bonnet.

Lower the stem of the actuator until it can engage the thread on the valve stem.

Screw the stem connector about 3/8" onto the valve stem.

Raise the stem far enough to make sure the actuator yoke bottoms on the bonnet and then tighten the bonnet lock nut.

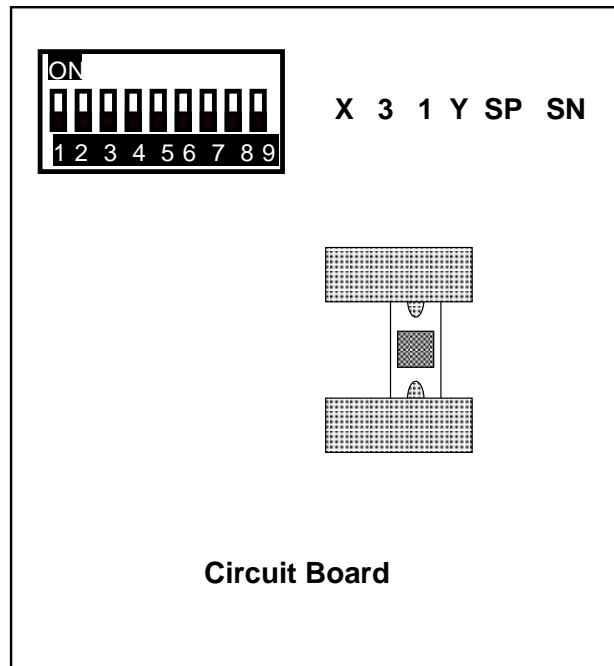
Tighten the stem lock nut.

Wiring Terminals

SP & SN	24 volts AC power in
Y	Control signal in
X	Feedback signal out
1	Override
3	Override

SN is common to the 24 volts AC power and the control signal negative.
If the actuator is grounded it should be at SN.

DIP Switches & Terminals



Switch Functions

Switch	OFF	ON
1	Voltage Control Signal	Milliamp Control Signal
2	2 - 10 Volts or 4 - 20 ma	0 - 10 volts or 0 - 20 ma
3	Direct Acting	Reverse Acting
4	Full Range	Split Range
5	Low Range Signal	High Range Signal
6	Proportional	3 Point Floating
7	Equal Percentage Valve	Linear Valve
8	100% Cv	Reduced Cv
9	Stroke adjustment	Stroke adjustment

At first power up, the actuator self-adjusts to the stroke of the valve.
To redo the adjustment later, flip switch 9 ON momentarily, then back to OFF.

When the actuator settings are known, it is easier to make them before the valve and actuator are installed in the system. When power is first applied to the actuator, check to see that it moves through its full range. If it does not, reset the stroke by turning switch #9 on & off momentarily.

Manual operation and override

The actuator can be manually operated with a metric hex wrench. The key is on top of the actuator projecting through the cover. VM5000 actuators have a clutch button that should be depressed while manually operating the actuator.

Override: Switching the neutral from terminal SN to terminal 1 raises the stem and SN to terminal 3 lowers the stem. This can be done from an external switch or controller.

Automatic stroke adjustment

The stroke adjusts itself automatically. This happens the first time power is applied or whenever switch #9 is flipped on & off momentarily. Adjustment takes several minutes during which the actuator moves through its full stroke once, in both directions. The actuator remembers the settings in case of a power failure. The automatic stroke adjustment does not work if the valve stroke is greater than the limits of the actuator.

The maximum strokes are:

VM1500E	1 1/2"	40 mm
VM5000E	2 1/8"	55 mm

The auto-adjustment assures that the control signal covers the actual stroke of the valve.

Reset

Turning Switch #9 on & off momentarily causes the actuator to recalculate the stroke. Do this if the actuator has been tested without a valve or, has been taken off the valve and reinstalled.

Control signals

The actuator must be set for the control signal being used and whether the signal is direct acting or reverse acting. The acceptable signals are:

24 volts ac 3 point floating or any of these proportional signals

Full Range	Split Range	
0 - 10 vdc	0 - 5 vdc	5 - 10 vdc
2 - 10 vdc	2 - 6 vdc	6 - 10 vdc
0 - 20 ma	0 - 10 ma	10 - 20 ma
4 - 20 ma	4 - 12 ma	12 - 20 ma

Split ranges allow two actuators to be operated in sequence from one full range signal.

Proportional signals are programmed with switches 1 - 5.

The actuators are set for floating control by turning on switch #6. Turning switch #6 on deactivates switches 1 - 5. Please note the wiring for floating control differs from the wiring for proportional control.

Selecting the Signal

Floating Switch #6 **ON** When switch #6 is on switches 1 - 5 are inactive.

Proportional Switch #6 **OFF**

Signal Vdc	Switch Number				Signal mA	Switch Number			
	1	2	4	5		1	2	4	5
2 - 10	OFF	OFF	OFF	OFF	4 - 20	ON	OFF	OFF	OFF
0 - 10	OFF	ON	OFF	OFF	0 - 20	ON	ON	OFF	OFF
2 - 6	OFF	OFF	ON	OFF	4 - 12	ON	OFF	ON	OFF
6 - 10	OFF	OFF	ON	ON	12 - 20	ON	OFF	ON	ON
0 - 5	OFF	ON	ON	OFF	0 - 10	ON	ON	ON	OFF
5 - 10	OFF	ON	ON	ON	10 - 20	ON	ON	ON	ON

Direct or Reverse Acting

An increasing signal can either drive the valve stem down (direct acting) or up (reverse acting).

Direct Acting	Switch #3	OFF
Reverse Acting	Switch #3	ON

Flow Characteristic:

Change Flow Characteristic: Switch #7

In the OFF position the stem travel is proportional to the control signal and does not alter the flow characteristic of the valve. This is the position this switch should be in normally.

In the ON position the stroke is electronically adjusted so that an equal percentage valve performs as a linear valve and a linear valve performs as a quick opening valve.

Most 2-way control valves have an equal percentage flow characteristic because this works best for heat transfer with water or water & glycol mixtures. Usually the stem travel of an actuator and valve is proportional to the control signal and the valve plug is shaped to adjust the flow. An equal percentage valve opens slowly at the start so that 25% stem travel results in less than 25% flow.

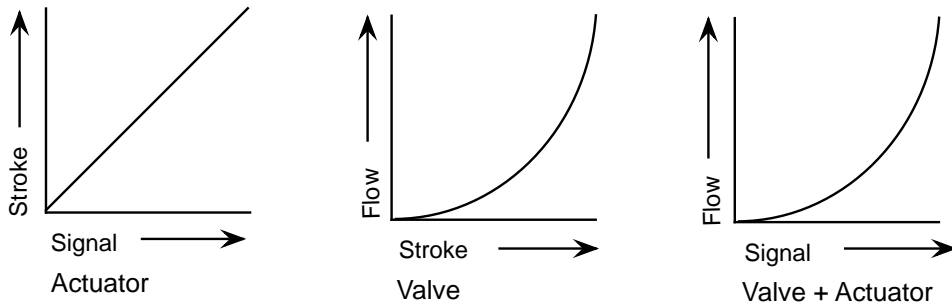
Mixing valves usually have linear flow through both ports so that the total flow through the valve doesn't change with the stem position. Switch #7 should be OFF when you use mixing valves.

If you have an equal percentage valve and want to control the volume of liquid such as the level of water in a tank, changing to a linear valve characteristic may work better.

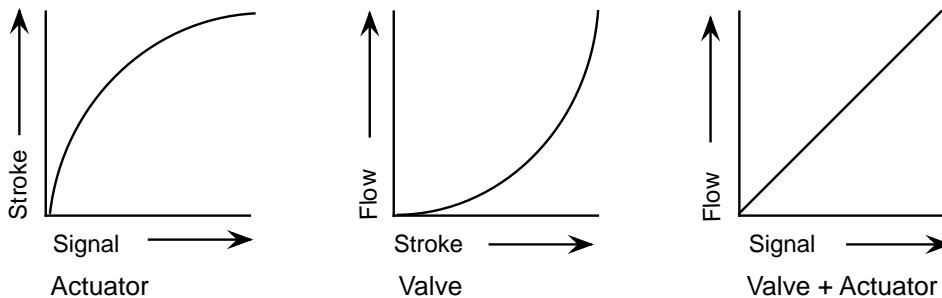
Steam heat depends on the quantity of steam per hour condensed. A linear characteristic may work better for steam. In these cases, turn Switch #7 ON.

If the valve itself has linear trim, leave switch #7 OFF.

Equal Percentage Valve & Switch #7 Off



Equal percentage Valve & Switch #7 On



Flow Coefficient

Full Flow	Switch #8	OFF
Reduced Flow	Switch #8	ON

This function only works when switch #7 is off.

Turning switch #8 on reduces the valve stroke and then sets the control signal over the range of the reduced stroke. The result is that the valve never fully opens and it performs like a smaller valve.

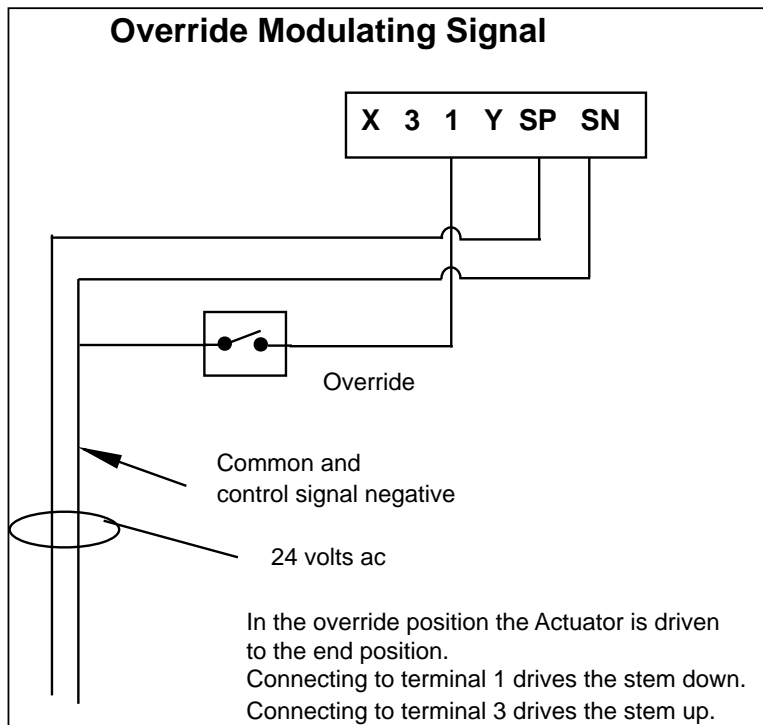
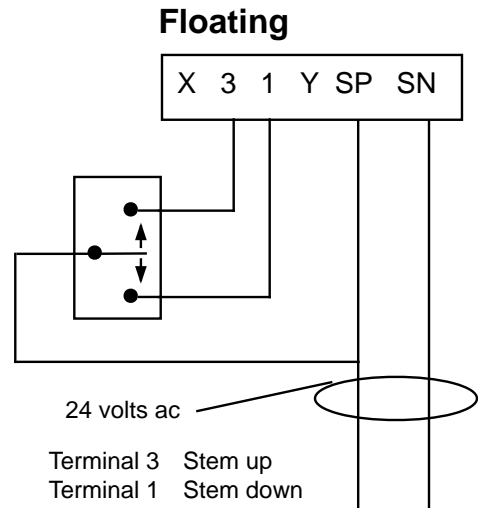
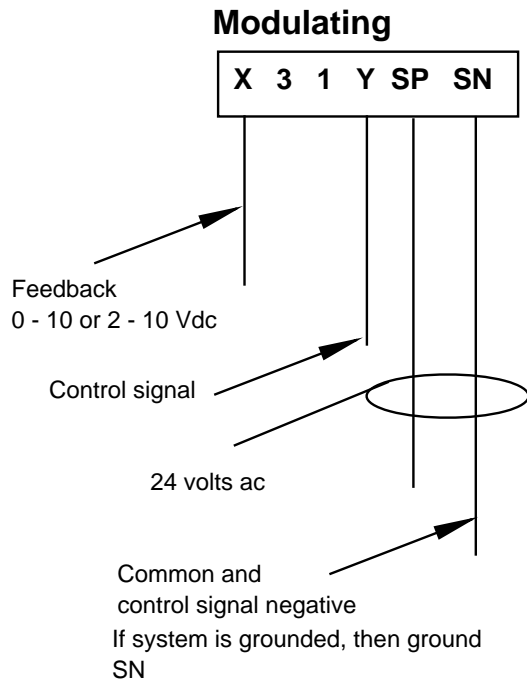
Wiring

Replacing an Existing Actuator

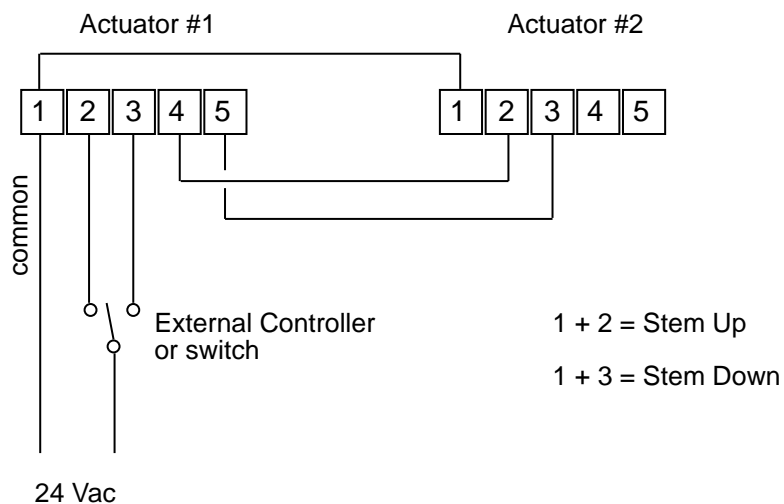
If the actuator is a replacement for an older model (actuators programmed with jumpers), notice that terminal 2 has been relabeled as terminal 1 in the new models, but has the same function. The other terminals are marked the same as before, but are not in the same order on the terminal strip.

If the actuator is being used in the floating mode, please notice that the wiring is different from the older models.

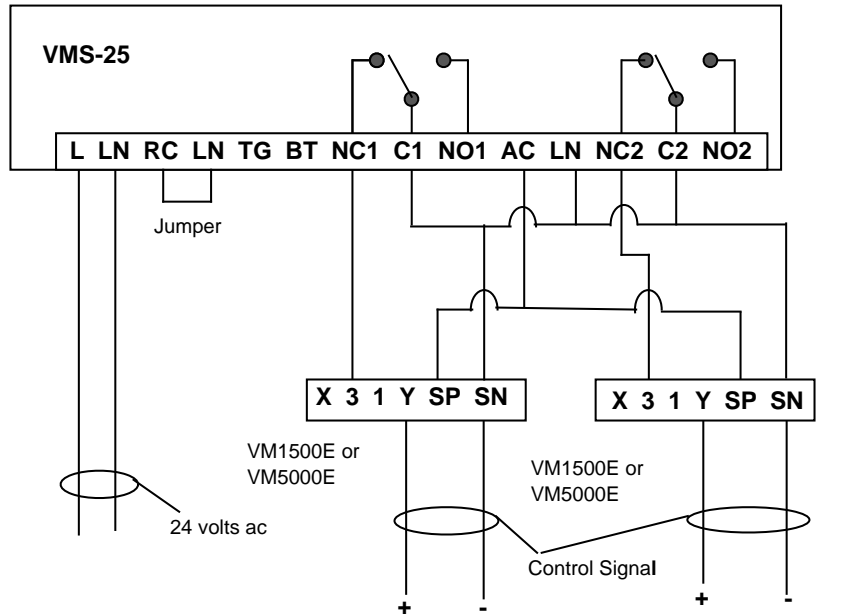
Models VM1500E & VM5000E



VM1500 & VM5000 3-point floating
One actuator or 2 in sequence



VMS-25 Electronic “Spring return” Unit
(Optional accessory)



NC1 or NC2 to 3 on actuator = stem up
NC1 or NC2 to 1 on actuator = stem down
on power failure

The VMS-25 is an optional accessory for all VM1500 & VM5000 series actuators.

VMS-25 is a standby power supply that functions as an “electronic spring return” to automatically power the actuator to the fully open or fully closed position in the event of a power failure.

The VMS-25 can drive two VM1500 actuators or one VM5000.