Valco Instruments Co. Inc.

Micro – Electric Multiposition Valve Actuator

Installation and Use

The microprocessor-based multiposition actuator consists of the control module, the stepper motor/ gearbox assembly, a manual controller (use is optional), a 110 or 220VAC to 24VDC power supply, and the interconnecting cables.

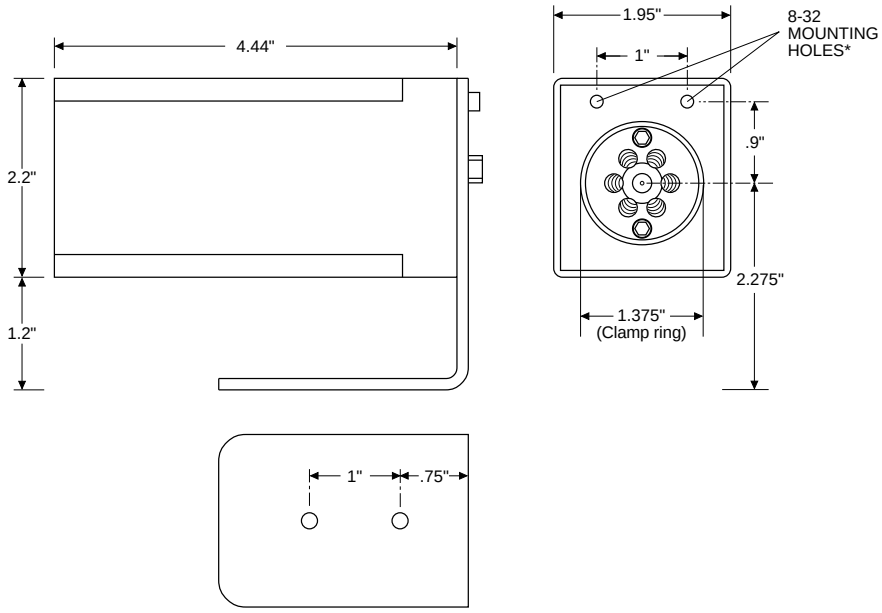

Figure 1: Mounting dimensions

Connections

Figure 2 shows the functions of the cables suppled with the actuator. There are four connectors on the control module, keyed and sized to prevent incorrect connection.

Input power (20 – 30 VDC, with 24 – 28 VDC preferred) is supplied through a four-pin connector: pins 1 and 2 are positive inputs; 3 and 4 are negative. The four wires of the power supply cable are functionally paired to provide the lowest possible impedance. We strongly recommend that all four wires be connected to the power supply source to prevent any loss of torque. Average DC current requirement is 2.5 amps, with transient peaks as high as 4 amps. Standby current draw is less than 100 milliamps.

NOTE: Noise-sensitive electronics may experience problems when sharing the 24V power supply with the actuator.

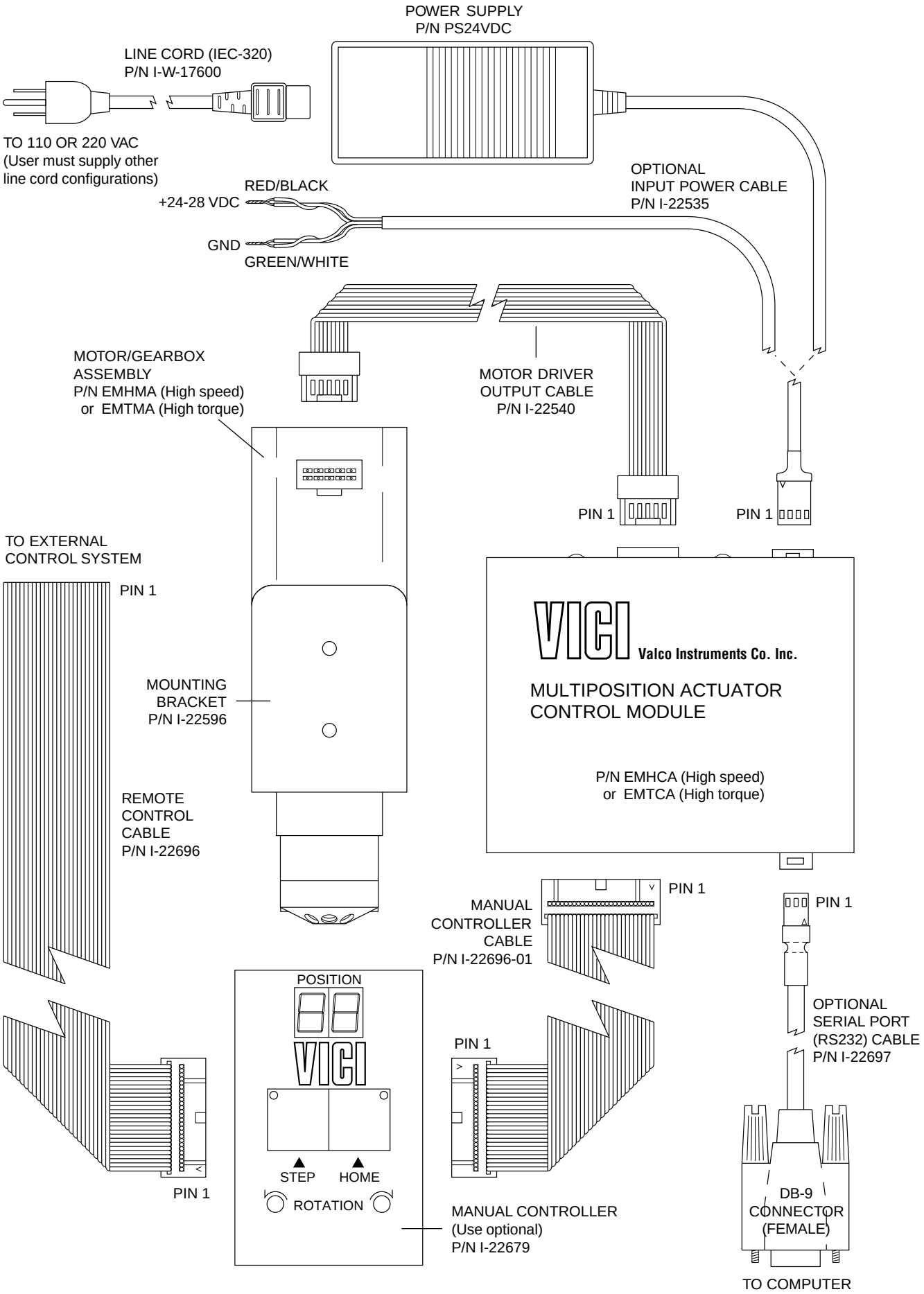

Figure 2: Actuator and controller connections

Motor driver output is through a 10 pin connector. The 26-pin connector is for the **manual controller** or **digital input/output signals**. (The actuator can be controlled by either or both. The manual controller has a through port, so an additional cable can provide simultaneous control by an external system.) The three-pin connector is for a serial **RS-232 interface**. The digital and serial functions are fully described on the insert page.

Manual Controller

The manual controller allows the user to select the rotation direction, set the total number of positions, and control the STEP and HOME functions. The controller is connected to the actuator control module with the 26 pin ribbon cable. The manual controller has two functional modes – the operating mode and the setup mode.
(**NOTE:** An LED display of "EP" indicates a positioning error due to valve binding.)

Operating Mode

This is the default mode; that is, the controller will be in this mode when it is initially powered. In this mode the STEP and HOME functions are clearly labelled as the primary functions of the left and right switches, respectively. To change the direction of rotation, momentarily depress the STEP and HOME switches at the same time. The DIRECTION LED's will change, indicating that the direction has reversed.

Setup Mode

To shift into the setup mode, depress the STEP and HOME switches for 8 seconds. The position display LED's will begin to flash, showing the current setting for the total number of positions in a full rotation. Use the STEP switch to increase or the HOME switch to decrease the setting to the desired value. To return to the operating mode, depress both switches until the LED's stop blinking.

Simultaneous Use of the Manual Controller and an External Control System

The manual controller has two identical connectors for input and/or output, permitting an external system to be used simultaneously with the manual STEP and HOME commands. However, *the following precaution should be observed*:

> If the STEP, HOME, and DIRECTION functions are to be used by *both* systems, the external system control output should be either contact closure or open collector outputs *rather than TTL signals*. While TTL signals will cause no damage to either system, they will effectively override the manual controller.

Connecting External Systems

An external control system can be connected to the actuator in several ways:

1. The Digital Input/Output connector is a 26 pin dual in-line connector which can mate to a mass terminatable flat cable connector availble from a number of manufacturers. The flat cable can then be integrated into the control system.
2. The manual controller can be connected to the actuator, and then a 26 pin dual in-line connector and flat cable assembly can be attached to the controller. This allows dual control as well as a visual indication of the actuator position.
3. A breakout board can be attached to the Digital Input/Output port, either alone or in conjunction with the manual controller. This provides screw terminal connections to the individual input/output signals of the actuator control unit.
4. A serial port can be connected from a host control system to the actuator, using the optional RS232 cable (Product No. I-22697).

Valve Mounting

Cheminert valves

With the valve and actuator in Position 1, engage the drive pin of the valve with the coupling of the actuator. Rotate the valve by hand until the pin on the actuator clamp ring lines up with the hole in the face of the valve. Push the valve on all the way and tighten the clamp ring screw.

Serial Communication Protocol

Serial communication with the multiposition actuator is based on an ASCII string protocol. Carriage return (OD hex) characters parse the communications by defining the end of each command. Line feed characters (OA hex) are ignored.

The hardware interface utilizes only ground, transmit, and receive signals, on connector J3 pins 1, 2, and 3, respectively. Software flow control (Xon/Xoff) is not supported. The baud rate is set at 9600 baud, no parity, 8 data bits, 1 stop bit. The serial port output (transmit line) of the actuator is disabled (high impedance) when not in use. With the software-settable device "ID" feature, up to 10 actuators can be controlled from a single serial port by a host processor such as a personal computer.

Command set options include the ability to request position and direction in a single command, or to allow the actuator to choose the shortest route to the selected position. Other options include requesting the current position or firmware identification, changing the number of positions if a different valve is installed, and setting or clearing the command preface "ID".

The following is a description and explanation of each command:

Serial Commands	
NP<enter>	Displays the number of positions the actuator is currently set to index
NP=*nn*<enter>	Sets the number of positions (*nn*) for the current valve
CW*nn*<enter>	Sends the actuator to position *nn* (from 1 to NP) in a clockwise direction
CC*nn*<enter>	Sends the actuator to position *nn* (from 1 to NP) in a counterclockwise direction
GO*nn*<enter>	Sends the actuator to position *nn* (from 1 to NP) via the shortest route
CP<enter>	Displays the current position
SD<enter>	Displays the digital input status where 0 = enabled and 1 = disabled
SD=*n*<enter>	Sets the digital input status to [0] enabled or [1] disabled **NOTE:** At power up, digital input status is set to [0] enabled. Setting the status to [1] locks out communication through the manual controller and remote control cables.
ID<enter>	Displays the current device ID setting
ID=*n*<enter>	Sets the device ID to value *n*, from 0 to 9 **NOTE:** when the ID feature is enabled, all commands to the device must be prefaced by the ID. (Assigning an ID of *** disables this feature)
VR<enter>	Displays the part number and date of the firmware

Digital Input / Output Protocol

Digital input/output control of the multiposition actuator is designed for simplicity and flexibility of function. The simplest control of the actuator can be accomplished with two output control lines – STEP and HOME. On the other hand, the actuator can accept a latched BCD input with manual and automatic direction signals.

The **inputs** are held to a logical high (+5 volts) by pull-up resistors, and are designed to be driven low either by contact closure, 5 volt digital logic, or open collector transistor outputs. The signal polarity is defined as "negative true" – asserting the signal involves shorting the signal (in the case of contact closure) or driving it (in the case of logic or transistor signals) to within 0.8 volts of ground potential. These input signals must be at least 30 milliseconds in duration. The **outputs** are also "negative true" signals driven by standard high speed CMOS gates, capable of driving standard logic input gates. They include the BCD position, motor run, rotational direction, and error signals. If the actuator stops out of position due to a stuck valve, the BCD output is set to "0" (all lines high for a negative true output).

The digital interface is made through a 26 pin connector which also provides power (+5 volts/100 ma maximum) and ground outputs. The ground should be connected to the control system to maintain commonality between the actuator and the controlling device. If you intend to provide your own power supply, make sure that it has an isolated output or that it shares a common ground with the controlling system.

Pin signal definitions for the Digital Input/Output cable

Pin	Color	Signal	Direction	Pin	Color	Signal	Direction
1	brown	Home	Input	**14**	yellow	1.4 BCD	Output
2	red	Motor run	Output	**15**	green	10.2 BCD	Output
3	orange	Step	Input	**16**	blue	1.2 BCD	Output
4	yellow	Error	Output	**17**	violet	10.1 BCD	Output
5	green	Manual Dir.	Input	**18**	gray	1.1 BCD	Output
6	blue	Direction	Output	**19**	white	10.8 BCD	Input
7	violet	Auto Dir.	Input	**20**	black	1.8 BCD	Input
8	gray	Data latch	Input	**21**	brown	10.4 BCD	Input
9	white	+5 VDC 100 ma	Output	**22**	red	1.4 BCD	Input
10	black	Ground	Output	**23**	orange	10.2 BCD	Input
11	brown	10.8 BCD	Output	**24**	yellow	1.2 BCD	Input
12	red	1.8 BCD	Output	**25**	green	10.1 BCD	Input
13	orange	10.4 BCD	Output	**26**	blue	1.1 BCD	Input

VICI **Valco Instruments Co. Inc.**
P. O. Box 55603
Houston, TX 77255
Sales toll-free (800) FOR VICI
Technical help (713) 688-9345
Fax (713) 688-8106

VICI AG **Valco Europe**
Untertannberg 7
CH-6214 Schenkon
Switzerland
Telephone (041) 925-6200
Fax (041) 925-6201