
Innovators in Control Valve Technology

GENERAL DESCRIPTION FOR ME-4840, ME-4740 & ME-4640 SPRING RETURN PROPORTIONAL MICROPROCESSOR BASED CONTROL VALVE ACTUATORS

A 24Vac hysteresis brushless motor is used to position a valve in response to an input set point signal either at 2-10Vdc or 10-2Vdc in proportional mode, 0.2 to 5 seconds or 5 to 0.2 seconds in time proportional mode, and a triac or relay 24Vac output for floating mode. A quadrature optical system using two LED's, two phototransistors and a rotating flag on the rear of the motor measure the displacement of the valve. A microprocessor is used to access the input signal, monitor and store the position count, determine the count difference and appropriately control the drive to the motor.

At power-up the valve performs a re-span operation, the valve is driven fully closed and then fully open. The microprocessor stores the end position and the span values. The pulse-counting algorithm is conceived to avoid any uncertainties associated with fringe condition if one or the other phototransistors is partially obscured.

Four transistors in a bridge configuration drive the motor and the applied voltage, determined by a torque limiting circuit, determines the motor stall-start current. The perceived position count is continuously converted to a PWM signal. This exits the microprocessor and outputs as a 1-5V signal to use by others, for monitoring or positioning other devices. Upon power failure, the motor will be returned to its' starting open position by the valve spring.

PROPORTIONAL MODE - ME-4840

The unit receives a 2-10V or 10-2Vdc input signal that is converted into 1-5 at microprocessor A/D input. The microprocessor converts this to a pulse count. This count is compared, on an ongoing basis, with the actual position measured by pulsed received from the optical quadrature encoder. The pulse-count difference causes the microprocessor to drive the motor in an appropriate direction. The pulse count is correlated with position by using Span and Zero counts acquired during the ReSpan. When the valve is driven all the way to the end and a stall is detected, on-going pulse count ERROR detection system will update automatically if there is a discrepancy.

TIME PROPORTIONAL MODE – ME-4740

In time proportional versions, the input is pulse, either by the external relay contact or a solid-state device (triac). A resistor Zenner network is connected across the input to assure adequate holding current for the triac (>10Ma). The duration of the signal is timed and converted into a position command on the basis that 0.2 seconds requires fully open and 5 seconds requires fully closed (in normal mode), with 48 intermediate steps. When the input signal changes by more than 0.1 seconds, this time is converted into a target position time count, which is compared to an actual position count. If the difference exceeds 0.1 seconds the valve is driven into the appropriate position. The circuit will accept a new position command while the actuator is in transition, which will override the first.

THREE POINT FLOATING – ME-4640

Two inputs are used, one for open commands, one for close. The input de-bouncing requires a signal duration of not less than 0.1 second to register as valid.

The total range of the valve opening or closing signal is 60 seconds, divided into 30 X 2 second pulses. Input activation is recorded cumulatively and algebraically, until the signal time exceeds 2 seconds (i.e. open pulses accumulate and close pulses subtract until a > 2 second time is registered). The motor then steps 1/30th of the span (as determined during latest ReSpan)

SPECIFICATIONS ME-4840, ME-4740 & ME-4640 – SPRING RETURN VALVE ACTUATORS

GENERAL

Supply: 24Vac +/- 10%, 60Hz/50Hz

Motor Type: AC hysteresis

Nominal Consumption: 8VA

Ambient operating temperature: 0-50°C (120°F)

Typical opening (closing) time: 25 seconds

Signal output: 1-5Vdc +/- .1V

Signal output impedance: 100 K Ω

Motor jam recovery: if an unexpected stall occurs – i.e. in midrange – the system reverses the motor, backs up, and then again attempts to move to the calculated position

Position feedback (internal): Quadrature optical encoder

Drift: no detectable drift after 100,000 cycles

Re-span (standard): after power up as follows: drive to full closed. Reset count to zero. Allow (controlled) spring return to full open, store span count, and then assume set point

Operating modes: proportional, time proportional, floating

Input Protection: inputs will accept 30Vac continuously without damage. Misconnection (mixing) of the connections to unit will not cause damage

Wiring Connection: Plenum Cable 32"

Uses PIC 16F676-04/P microprocessor (flash memory)

CE- Approved to EN55022, 55011

Low voltage class 2, 24Vac device

Do not power more than 5 actuators with one transformer

PROPORTIONAL (ME-4840)

Signal input (normal mode): 2-10Vdc (10V to close) by removing Jumper J3

Signal input (reverse mode): 10-2Vdc (10V to open) by installing Jumper J3

(These values are normalized to 1-5V at the microprocessor input)

Input Impedance: 200 K Ω

Dead Band: 0.1V

Delay: two seconds before implementing motor direction change

End Update: When the input signal is within ~.2V of an end value(i.e. 2.2V or 9.8V), the valve is driven until stall is detected.

TIME PROPORTIONAL (ME-4740)

Signal input (normal mode): 0.2 seconds to 5 seconds – 5 seconds to close

Signal input (reverse mode): 0.2 seconds to 5 seconds – 5 seconds to open

Inputs shorter than .1 second are ignored, inputs longer than 5 seconds (e.g. continuous contact closure) initiate fully closed action after 5 seconds. Other time ranges are available.

Number of steps: end-to-end 40

Input polarity: Input to common or input to 24Vac (+/-10%)

Input Impedance/current: 2K Ω or 12mA RMS

Switching: low energy (gold) dry contacts of solid state (triac)

Dead Band: 0.12 seconds

Re-span (standard): after power up

FLOATING (ME-4640)

Signal input: .1 to 60 seconds in either direction, inputs shorter than .1 second are ignored

Number of steps: end-to-end 30

Input polarity: Input to common

Input Impedance/current: 2K Ω or 12mA RMS

Switching: low energy (gold) dry contacts of solid state (triac)

Dead Band: 0.12 seconds

Re-span (standard): after power up

Interlock: if both inputs are energized simultaneously, no movement results

FEATURES

The hardware accommodates proportional, time proportional or floating protocols. An appropriately programmed microprocessor must be installed. Normal or reverse acting selected by jumper J3.

4-20mA input: proportional units can be used with such signals if converted to 2-10V by a suitable shunt, 500ohms 1%, 1/2W resistor.

DEFINITIONS

Dead band: if the perceived position difference (+ or -) is less than .1V (-1 second) referred to the signal input, no motor activity is initiated.

Stall: assumed if motor is fully energized or de-energized, but pulses not detected for 2 seconds