ELECTRONIC VALVE CONTROLLER

INTRODUCTION

This specification covers the design, manufacture, and testing of Electronic Valve Controllers

PART 1 - GENERAL

1. Standard products - use the same manufacturer for multiple units of same type.

2. "Tying" of equipment into packages for the purpose of thwarting competition shall be considered to be in non-compliance with these specifications.

3. Manufacturers shall price items under different subsections or sections separately.

PART 2 - PRODUCTS

2.01 ELECTRONIC VALVE CONTROLLER

A. GENERAL FUNCTION

The electronic valve controller shall provide the interface between a remote computer system and the hydraulic control valve with the ability to tie into SCADA Systems. Preinstalled with standard valve application templates allowing the Electronic Valve Controller to easily be configured to perform a wide range of control valve individual or multiple functions to match the single or multiple application(s) desired of the valve in the piping system. Designed to provide fully programmable monitoring and hydraulic valve control for rate of flow, pressure reducing, pressure sustaining, level control (altitude and modulating), valve position, blending, pressure management or select combinations of any of these applications. Custom valve applications can be programmed upon request.

B. ELECTRONIC TWO SOLENOID CONTROL

Solenoid pilot controls equipped onto the control valve are actuated by electrical signals received from the Electronic Valve Controller which enables remote computer control over the diaphragm valve operations. The solenoid pilots either add or relieve line pressure from the cover chamber of the valve, causing it to open or close as directed by the electronic valve controller. The electric solenoid pilot controls can also be combined with hydraulic or electronic motorized pilot controls to create dual function, or fail-safe capability. The electronic valve controller shall accept an analog 4-20mA feedback signal. Upon receiving the remote setpoint command from the computer system or local command from the operator, the electronic valve controller shall provide proper signals to modulate and maintain the valve at the desired setpoint value. When the feedback signal deviates from the setpoint, using a proprietary Cla-Val PID algorithm, the appropriate opening or closing solenoid on the valve will pulse. As the feedback signal approaches the setpoint, this on/off pulse time will gradually decrease to smoothly modulate the valve to setpoint. Each solenoid is controlled by a solid state relay with zero switching voltage. The total cycle time between each pulse shall be programmable. When the feedback signal is within a programmable dead band, the opening and closing solenoids will lock the cover and the valve will maintain position.

C. ELECTRONIC MOTORIZED PILOT CONTROL

Electronic valve control via direct / indirect positioning pilot control (CPC) or via electronic actuated hydraulic pilot control(s) (34 Series), the control valve is actuated using a DC powered 4-20 mA analog command signal received from the Electronic Valve Controller. The controller shall also accept an analog 4-20mA feedback signal. Upon receiving the remote setpoint command from SCADA or local command from the operator, the electronic valve controller shall provide a 4-20 mA analog or digital signal to the electronic motorized pilot(s) to maintain the desired setpoint. This enables simple remote setpoint control over the

electronic pilot actuator(s). Upon loss of power, the DC powered motor will become non-operational, leaving the hydraulic set point in its last position. The electronic motorized control scheme can also be combined with hydraulic solenoid pilot(s) and/or hydraulic controls to create dual function, or fail-safe capability.

D. CONTROLLER TECHNICAL INFORMATION

The electronic valve controller shall have remote communication capabilities. The controller shall include six (6) configurable 4-20mA analog inputs; six (6) dry contact digital inputs; four (4) 4-20mA analog outputs; two (2) solid-state relays and two (2) mechanical relays. All inputs and outputs shall have a configuration menu which programs signal name, scaling, engineering units, precision, & filtering. When a setpoint or feedback signal has been lost, the controller shall be configured to maintain some known value. When local mode is selected, the controller shall have the ability to output a signal & screen warning noting a local condition.

Controller shall include a maximum of four (4) PID loops for multi-function control, with local or remote set point inputs. Each loop shall have the ability to be broken into (4) different control zones with customizable PID parameters in each. The controller shall have a programmable set point ramping feature which linearly changes a set point over time until the desired value is achieved. The electronic valve controller shall have real time dynamic charting capability to compare set point vs feedback signals. Each PID loop shall have an independent output limiting feature which limits the duration a solenoid can remain energized, providing ultimate system protection. In the event of a signal loss, the PID shall have the ability to lock valve in last position, close valve, or open valve.

The electronic controller shall have relay outputs capable of Alarm indication to SCADA and shall be capable of generating and sending signal loss warnings and other configurable control actions. Actions (alarm) can include valve failures, other valves to open/close

The controller shall include a built in flow rate calculator. Using a valve position transmitter & DP transmitter (or inlet/outlet pressure transducers), the electronic controller shall calculate and display flow rate. A graphical menu allows the operator to easily select valve size and seat type. A built in totalizer keeps track of total volume as a function of time. Customizable units and reset functionality allow for simplified setup and configuration.

The electronic valve controller shall come equipped with Control Curves valuable in making relationships against other signals, internal variables, or time. Using a graphical function, coordinates can be added, removed or moved making relationship adjustments convenient.

The electronic valve controller shall have the ability to retransmit any input signal, variable, or calculation to a SCADA system.

The electronic valve controller shall have a high speed logging feature which captures all I/O at a maximum sample rate of 1Hz. Captured data shall be downloadable in .csv file format to a portable memory device such as a USB drive or FTP server.

The controller shall have a color TFT screen to graphically display the valve application with real-time system information. The controller display shall have the ability to show all I/O signal readings, PID settings, I/O configuration settings, along with customizable graphics for various warnings. . Each signal displayed on the “home” screen is color coded representing normal or lost signal. “Home” screen graphics shall have the ability to be customized.

An easy to use five press-button operator interface keypad provides simple navigation through software menus. Security key codes shall be provided to protect against unauthorized changes. An IP-68 rated enclosure shall be provided to house the controller for environmental protection.

Each controller enclosure and supporting AC/DC power supply conversion box enclosure (where required), shall be provided standard with an anodized aluminum universal mounting bracket(s), allowing for versatile

installation to system piping (horizontally or vertically), wall mounting, panel / cabinet enclosures, unistrut, valves, & other configurations. Sufficient clearance around controller enclosure should be made for adequate access/wiring. Considerations should be made to comply with all the various local codes, standards and best practices.

E. MULTI FUNCTION CONTROL

The electronic valve controller shall have the ability to perform multiple functions (PID loops) at once. Ultimately there is only one PID loop in control at a given time, with the remaining loops computing in the background. Advanced Cla-Val algorithms provide seamless crossover between loops, simulating multiple hydrauilic pilots. Additionally, using digital inputs or internal variables, PID loops can manually be selected to shift between various types of control.

F. COMMUNICATIONS

The electronic valve controller shall come standard with Modbus protocol. This protocol defines a message structure that PLC's will recognize and use, regardless of the type of networks over which they communicate. The valve controller can be configured to communicate on standard Modbus networks using either of two transmission modes: TCP/IP or RTU. Users shall have the ability to select the desired mode, along with communication parameters (IP address, subnet mask, baud rate, etc.). The electronic valve controller shall have a built in VNC server. A viewer/client uses TCP port 5900 to connect to a server (or 5800 for browser access), but can also be set to use any other port.

G. MATERIALS

1. Material Specification for the Electronic Valve Controllers as follows:

Component	Material
Enclosure	
Enclosure Material	Flame retardant UL rated PC/ABS plastic UV Resistant
Enclosure Connections	(2) ½" Cable Gland Knockouts, (10) 3/8" Cable Gland Knockouts, IP-68 USB Type A & Type B Connection, IP-68 Ethernet Port
Environmental	IP-68, 2 meter for 48 hours IP-65 NEMA Type 4 IP-20 Panel Mount
Enclosure Dimensions	8.75" (223 mm) H x 6" (153 mm) W x 3.5" (89 mm) D
Enclosure Weight	3 lbs. (1.37 kg)
Mounting Bracket	Anodized Aluminum
Display	
Display Type	4.3" Color TFT-LCD, 480 x 272 pixels with Polycarbonate screen, scratch resistant
Display Update Rate	500ms
Programming Method	Mechanical Push Button VNC
Password	5 digit
Mass Data Storage	
Type	4GB SD Card
Language	English
Temperature	14°F to 158°F (-10°C to 70° C)
Humidity	90% RH, non-condensing
Memory Protection	10 year life lithium battery

Power Requirement	
Power	300 mA @ 24VDC (Steady State)
Voltage Input	12-24 VDC – Full Function (standard) 90-264VAC 47-440Hz (optional power supply) Cla-Val X143 Series Power Generators (optional)
Power Protection	Max. 32 VDC over voltage Reverse polarity & short circuit
Fuse Type	3A Fuse recommended
Inputs	
Analog	(6) Inputs (4-20mA / 0-5 V / 0-10 V)
Resolution	10 bit
Digital	(6) digital inputs (Dry contact)
Units	Configurable
Decimal Point	0 / 0.0 / 0.00
Signal Filter	Configurable 0 to 99 %
Totalizer	Configurable Input and Units
Totalizer Reset	Yes
I/O Connection	Screw Terminals
Outputs	
Analog	(4) Outputs (4-20mA)
Resolution	10 bit
Solenoid	(2) Solid State Relay, Zero Switching Voltage
Relay	(2) Mechanical Relay, Rated Voltage 250VAC, Rated Current 6A
Logging	
Configurable	Yes
Logging Speed	1 Second or Greater
Event Memory	128 Mbytes rolling memory up to 80,000,000 values capacity (extended to 4GB by SD card)
Output	CSV format suitable for exporting to MS Excel
Control Parameters	
Control Input	4-20mA full scale / digital (dry contact)
Proportional Band	0-100% (50% default) adjustable in 1% increments Independently for opening and closing
Dead band	Adjustable 0 to full scale of setpoint signal
Cycle Time	0 to 60 seconds in 1 sec. increments
Integral Band	Adjustable 0 to 60 seconds
Derivative Band	Adjustable 0 to 60 seconds
Loop Zoning	Adjustable up to (4) zones
PID Loops	4 Configurable
Control Curves	4
Retransmission	4 Analog (4-20mA signal)
Actions (Alarms)	4 (1 or 2 triggering conditions)
Communication	
Local	Mechanical Push Button

Remote	VNC Server
Interfaces	GPRS Modem Quad Band / Ethernet / RJ-45 / RS-232 / RS-485
Protocols	ModbusTCP / ModbusRTU / VNC

Approvals

Conformity Marking	**CE marking**

Optional Features / Accessories

Optional Power Supply's	EPC AC-DC Power Converter IP68/65 EPC AC-DC Power Converter Panel Mount Cla-Val X143 Series Power Generator

H. MANUFACTURE

1. Each Electronic Valve Controller shall be factory assembled by the control valve manufacturer.
2. Each Electronic Valve Controls shall be provided with an identifying nameplate
3. Each Electronic Valve Controller shall undergo full factory functional and operational testing.

I. PRODUCT DATA

1. Electronic Valve Controller manufacturer's technical product data shall be provided.

The Electronic Valve Controller manufacturer shall warrant the controller to be free of defects in material and workmanship for a period of one year from date of shipment provided the controller is installed and used in accordance with all applicable instructions.

The Electronic Valve Controller shall be the **CLA-VAL Company Model No. VC-22D**, as manufactured by Cla-Val Co., Costa Mesa, CA 92627-4416.

END OF SECTION