ELECTRONIC SURGE CONTROL PANEL

INTRODUCTION

This specification covers the design, manufacture, and testing of Electronic Surge Control Panels

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 SURGE CONTROL PANEL

A. GENERAL FUNCTION

The Electronic Surge Control Panel shall provides electronic control to a surge anticipator valve to open in response to events which create pressure surges, such as a pump power failure or pump failure which is not related to a power loss. The electronically controlled surge valve will then be fully open before the returning surge arrives at the valve. The surge valve will, after a pre-set time delay, close slowly. The surge valve shall respond at any time to over pressure surges independently of the electronic controls of the panel. The control panel shall be capable of operating in either one of two different modes, depending on the system requirements. The two modes "A" and "B" shall be selected by the operator within the enclosure.

Panel shall include appropriate visual indication of system status throughout all modes of operation. Colored lights shall be provided to indicte normal operation and alarm conditions of the pmp and control valve. System indicators provide local visual indication of the system and valve status, in addition to mode selection and time configuration. The electronic surge control panel shall be supplied with contacts for mode selection, test the system, limit switch, pressure switch (optional), pump start command (optional) and alarm conditions.

The integral programmable valve controller shall be housed in a NEMA 4X fiberglass enclosure with polycarbonate window, gasketed door, continuous stainless steel hinge, stainless steel twist/latch door fasteners, and padlockable door hasp.

The electronic surge control panel shall be manufactured by the control valve manufacture. Control panel shall have a minimum amount of field wiring. Control panel shall be pre-programmed for the most common surge control applications. Control panel manufacturer shall have custom application programming available.

B. PANEL TECHNICAL INFORMATION AND OPERATION

"Arming" the control panel to protect against surges requires the following conditions to be met:

1. Must have 120 volt AC power to the control box. All electrical connections to the control box must originate form the same power source as pump power. A power failure to the pumps must also result in a power failure to the elctornic control panel.

2. The "pump on" contact must be closed indicating a pump is running. If a pump status signal is not connected to the control panel a jumper across the contacts can be put in place.

3. The minimum system pressure must be met. A pressure switch is connected with its normally open contacts. The pressure switch contacts open when system pressure falls under minimum pressure.

The control panel shall be capable of operating in either one of two different modes depending on the system requirements. The two modes termed "A" and "B" shall be selected by a digital contact within the box. In either mode, the integral valve controller shall provide an adjustable time delay feature which can preclude any surge valve action for a pre-set time period on initial pump start-up. The control box will then not respond to minor or insignificant surges normally associated with the start-up of pumps which employ conventional check valves. The adjustment period shall be zero to 300 seconds. During this time period, a red flashing light shall give indication on the integral controller screen. In the "A" mode, the following sequences shall be provided:

1. The control box when "armed", shall cause the surge valve to open when a power failure occurs, accompanied by a downsurge (pressure switch actuation). This feature precludes the opening of the surge vlave upon a power failure where no significant surge would have resulted. For example, a power failure to a small pump in a large pumping station may not result in any significant surging. When an event occurs, both system power and system pressure indicators shall turn red. The surge control valve solenoid shall energize and the valve shall begin to open.

2. The control box shall be provided with an adjustable surge wave timer on which the duration of time the surge valve is to be fully open can be adjusted. Anytime the control box commands the surge valve to open, a steady red light indication shall be given on the control box door. After the time period on the adjustable zero to 30 seconds surge wave timer transpires, the red light shall go out and the surge valve will begin to close. The control box at this time shall be completely "de-armed". When normal system pressure and A.C. power is once again restored, the control box shall prepare to arm itself.

In the "B" mode and when the control box is "armed", the surge valve operation shall be similar to the "A" mode with the exception, the control box shall command the surge valve to open anytime a power failure occurs or anytime there is a downsurge (pressure switch actuation).

The electronic surge control panel shall be provided with a manual test button. This button, when pressed will simulate a power failure and downsurge causing the surge control valve to open as described in the above paragraph. It is recommended that the valve be tested periodically to assure proper operation when necessary.

TIMERS AND SETTINGS:
The pump control panel shall include the following timers and settings, programmable from a set-up screen on the integral controller:

1. Surge Wave Timer – Allowable time for the surge control valve to remain open. After the timer expires the surge control valve will close.

2. Pump Start Delay Timer – Allowable time for the pump to run before the control box is "armed". The control box will not respoind to minor or insignificant surges normally associated with the start-up of pumps which employ conventional check valves.

C. **CONSTRUCTION**

The Electronic Surge Control Panel 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.

The electronic surge control panel shall have a maximum of four (4) PID loops for use with the 131 series pump control valve. Each loop shall have the ability to be broken into (4) different control zones with customizable PID parameters in each. Each PID loop shall have an independent output limiting feature which limits the duration a solenoid can remain energized, providing ultimate valve protection.

The control panel manufacture shall offer an optional a 120 watt heater with integral thermostat.

Labeled, screw-type terminal blocks shall be provided for all input and output connections and supply voltage connection. A minimum of (8) spare terminal blocks shall be provided.

The electronic surge control panel 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 (alarms) can include system failures.

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 integral controller in the surge control panel 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 pump status, pressure switch status, valve status, solenoid status, emergency stop status, system failures, & timer settings.

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.

Sufficient clearance around electronic pump control panel shall be made for adequate access/wiring. Considerations should be made to comply with all the various local codes, standards and best practices.

INPUTS:
The Surge Control Panel shall be capable of monitoring the following inputs:

- Mode
- System Power
- System Pressure Switch
- Pump Status
- Surge Control Valve Limit Switch
- Test Button

Local inputs shall be entered by means of the integral controller and shall include set-up screen for setting of timers and user-selectable options. If a pressure switch or pump status signals are not used, a jumper can be inserted across its contacts.

OUTPUTS:
The Surge Control Panel shall provide the following powered outputs:

- (1) Surge Control Valve Solenoid
- Up to (3) Alarms

The valve solenoid output is powered by the integral 24VDC battery and fuse protected. The alarm outputs are non-powered dry contact with a maximum amperage of 1 amp across the relay contact.

D.   MODBUS COMMUNICATIONS

The electronic surge control panel 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.

E.   MATERIALS

1. Material Specification for the Electronic Pump Control Panel as follows:

Panel Enclosure

Material	Flame retardant UL rated PC/ABS plastic
Enclosure Panel Dimensions	20.0" (508 mm) H x 18.0" (457 mm) W x 9.0" (228 mm) D
	The enclosure panel shall be provided with all necessary mounting brackets.

Panel Integral Controller

Display Type	4.3" Color TFT-LCD, 480 x 272 pixels
Display Update Rate	100ms
Programming Method	Mechanical Push Button VNC
Password	5 digit

Enclosure Environmental   NEMA 4X

Controller Mass Data Storage

Type	4GB SD Card
Language	English
Temperature Range	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	120VAC @ 60Hz protected with 5 Amp Fuse & Circuit Breaker
Motor Starter Contacts:	10 amp maximum
Valve Solenoid Contacts:	10 amp maximum
Remote Alarm:	1 amp maximum

Controller Inputs

Analog	4-20mA; (6) Inputs Available (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 1 to 60 seconds
Totalizer	Configurable Input and Units
Totalizer Reset	Yes
I/O Connection	Screw Terminals

Controller Outputs

Pump Relay	10 Amp Max
Control Valve Relays	120VAC @ 60Hz Output (single solenoid pump control valves)
	24VDC Solid State Relay Output (dual solenoid style valves)
Alarm Relay	(2) Available and Configurable
Analog	4-20mA; (4) Outputs available
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 minute

Event Memory	128 Mbytes rolling memory up to 80,000,000 values capacity
Output	CSV format suitable for exporting to MS Excel

Controller 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
Loop Zoning	Adjustable up to (4) zones
PID Loops	4 Configurable
Control Curves	Allowing two independent non linear opening and closing
Retransmission	4 Analog (4-20mA signal)
Actions (Alarms)	4 (1 or 2 triggering conditions)

Controller Communication

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

Conntroller Approvals

Conformity Marking	**CE marking**

Controller Optional

Features /Accessories	Fan / Heater with integral thermostat

F.   MANUFACTURE

1.   Each Electronic Surge Control Panel shall be factory assembled by the control valve manufacture.

2.   Each Electronic Surge Control Panel shall be provided with an identifying nameplate

3.   Each Electronic Surge Control Panel shall undergo full factory functional and operational testing.

G.   PRODUCT DATA

1.   Electronic Surge Control Panel manufacturer's technical product data shall be provided.

The Electronic Surge Control Panel 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 control panel is installed and used in accordance with all applicable instructions.

The Electronic Surge Control Panel shall be the **CLA-VAL Company Model No. SC-22D**, as manufactured by Cla-Val Co., Costa Mesa, CA 92627-4416.

END OF SECTION