

Lift Station Control Specification

General

1. General Description and Qualifications

- 1.1. Provide a complete lift station control panel with solid state programmable controller, motor starters, operator interface devices, and appurtenances installed in a single NEMA 4 enclosure, Automated Flow Systems™ SL series or approved equal.
- 1.2. The pump control panel shall be manufactured at a facility meeting U.L. Standard 508a for industrial controls. Manufacturer shall have at least five years experience manufacturing similar products. All components shall be products of reputable manufacturers.

2. Construction And Functionality

2.1. Operator Interface Devices

- 2.1.1 All operator interface devices shall be located on the panel dead front unless otherwise indicated. Each device shall be labeled according to its function and the designation of any associated equipment.
- 2.1.2. The Hand-Off-Auto (HOA) switch shall be NEMA 4X, watertight type with detachable contact blocks, Idec HW series or approved equal. One H-O-A switch shall be supplied for each pump. Each H-O-A switch shall be labeled according to function and designation of the associated pump.
- 2.1.3. Pilot lights shall be NEMA 4X, watertight type with 120VAC LED lamp and colored lens, Idec HW series or approved equal. Push button switches shall be used where required. Each pilot light shall be labeled according to function, as listed below.

<u>Name</u>	<u>Color</u>	<u>Features</u>
Liquid Level Alarm	Red	High or low level Solid high level Flashing low level Auto-reset Audio Push-to-silence
Pump 1 Run	Green	
Pump 2 Run	Green	
Pump 1 Seal Failure	Amber	Push-to-reset
Pump 2 Seal Failure	Amber	Push-to-reset
Main Power	Blue	

- 2.1.4. The liquid level pilot light and audio alarm shall activate upon determination of a high or low water alarm condition and remain activated until such time as the high or low water alarm condition has cleared. The liquid level audio alarm shall be of molded case waterproof design with epoxy encapsulated solid state electronics, mounted through the bottom of the enclosure, Floyd Bell MW series or approved equal. The audio alarm and pushbutton pilot light shall be wired to an alarm silence relay. Pressing the pushbutton pilot light during an alarm condition shall silence the audio alarm while keeping the pilot light illuminated.



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- 2.1.5. The pump running pilot light shall be illuminated when the associate pump starter is engaged.
- 2.1.5. The pump seal failure fault pilot light shall be illuminated when the associated pump seal failure sensor relay is energized. The pump seal failure fault pilot light shall remain illuminated until the fault has been acknowledged. Operating the pushbutton shall acknowledge and reset the pump seal failure fault.

2.2 Programmable Logic Module

2.2.1 The programmable logic module shall have, as a minimum, the following features:

- liquid crystal display for viewing of input/output status, elapsed run times, cycle counters, and alarm counters
- Programming keys to allow adjustment of user set points without use of a portable computer
- non-volatile storage of control program and parameters on internal EEPROM

• EEPROM card port to facilitate easy changes of panel functions

The programmable logic module shall be programmed to provide the following functions as a minimum:

- determination of liquid level based on digital inputs from float switches
- determination of pump start failure fault based on digital input from the current monitor relay
- delay timers to prevent pumps from starting or stopping simultaneously
- digital outputs for pump on/off to control pumps in lead/lag alternating fashion
- digital output for liquid level audio alarm and pilot light for high or low level condition
- user selection for pump alternation, Pump 1 lead or Pump 2 lead

2.3. Float Switches

2.3.1 Liquid level will be determined based on digital inputs from external float switches. Provide one set of terminals for connection to each float switch. Float switch terminals shall be wired to the programmable controller to provide digital inputs for low water alarm / redundant off, pump(s) off, lead pump on, lag pump on / high water alarm (optional – lag pump on, high water alarm).

2.4. Relays

- 2.4.1. General-purpose relays shall have 10A contacts and standard bases with DIN rail mounted sockets, Idec RH series or approved equal.
- 2.4.2. The seal failure sensor relay shall be a DIN rail mounted SPDT conductivity based liquid level control with adjustable sensitivity and LED indicator,



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- Crouzet NR series or approved equal. One seal failure sensor relay shall be provided for each pump. The seal failure sensor relay shall be wired to terminals facilitating field connection to the seal failure sensor probes. In the event of water in the seal cavity the seal failure sensor relay shall change states, energizing the pump seal failure fault pilot light.
- 2.4.3. Current sensor relay shall be a solid state self-powered go-no go monitor. The relay shall detect the presence of AC current to the motor. The relay shall be a Diversified Electronics model CMG, or approved equal.
- 2.4.4. The intrinsically safe relay(s) shall utilize a current and voltage limited circuit to determine float switch status and relay that status to the programmable logic module via an electromechanical output. Provide Pepperl+Fuchs transformer isolated barriers or approved equal.
- 2.5. Automatic Alarm Dialer/Data Logger (optional) shall be equipped with 8 inputs capable of either digital or analog operation. The unit shall be capable of reporting to up to 32 destinations in any combination of voice, fax, paging, or e-mail. Built in data logging capabilities shall have the ability to store up to 32,000 time stamped records for activity reports and trending. All data shall be stored in non-volatile memory. Software for real-time monitoring, analyzing stored data, generating reports, and processing alarms shall be included. Provide Phonetics Sensaphone 2000 or approved equal.
- 2.6. Automatic Alarm Dialer (optional) shall be equipped with 8 inputs capable of either digital or analog operation. The unit shall be capable of reporting to up to eight 32-digit phone numbers and play a message up to 1 minute in length specific to that input. Messages can be recorded locally or remotely with a total message time for all 8 inputs of eight minutes. Provide a Viking K-2000-DVA or approved equal.
- 2.7. Motor Starters
- 2.7.1. Contactor for motor starting shall be IEC rated with 120-volt coil. Select contactor appropriate for the hp, volt, phase motor being started. Provide Sprecher-Schuh or approved equal. Provide one contactor for each pump. Overload relay shall be solid state type with adjustable trip setting, selector for automatic or manual reset, visible trip indication, trip test, and manual reset button, Sprecher-Schuh or approved equal. Provide one overload relay for each pump. A normally closed contact shall be wired in series with the contactor coil.
- 2.7.2. Over load relay (optional) shall be Motor Saver model 777 (or 77C for single phase). Provide one overload relay for each pump. A normally closed contact shall be wired in series with the contactor coil.
- 2.8. Power Distribution
- 2.8.1. Provide non-fusible main disconnect switch with internal operator sized to match the current requirements of the pump control panel loads. The disconnect shall be a rotary cam style, ABB OT series, or approved equal.
- 2.8.2. Provide non-fusible combination disconnect / generator transfer switch



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- (optional) with internal operator sized to match the current requirements of the pump control panel loads. The disconnect shall be a rotary cam style, ABB OT series, or approved equal.
- 2.8.3. Molded case thermal magnetic circuit breakers shall be DIN rail mounted, cable in / cable out type. Breakers shall be provided with arc chutes on each pole. Breakers shall be provided with thermal and magnetic trip mechanisms on each pole. Two and three pole breakers shall be common trip. Provide one breaker for each pump power circuit, one breaker for control power and one breaker for enclosure lighting, heating, cooling and convenience receptacle (as required). The circuit breakers shall be Cutler Hammer, ABB, or approved equal.
 - 2.8.4. Fuses shall be of the type and amperage required for adequate protection of panel components. Fuses shall be provided to protect panel components as recommended by the component manufacturer. All fuses shall be installed in compatible fuse blocks. Fuses shall be Bussman or approved equal.
 - 2.8.5. Control power transformer (optional) shall be panel mount, epoxy encapsulated core and coil type, Acme AE series or approved equal. Size control power transformer as required to provide 120- volt power for internal control circuits, as well as any lighting, heating, ventilation or convenience receptacle that may be required by this specification. In no case shall the control power transformer be rated less than 100VA.
 - 2.8.6. Provide a high capacity varistor style surge arrester (optional). The surge arrester shall be a one-position, rail mountable surge voltage arrestor. The surge arrestor shall be an Intermatic AG series, or approved equal.
 - 2.8.7. Provide terminals for all control circuit wire terminations for both field wiring and internal wiring. Terminals shall be capable of terminating two #14 AWG stranded wires. Terminals shall be equipped with labeling devices designed specifically for use with provided terminal blocks. Terminals shall be Pheonix UK6N terminal blocks or approved equal.
 - 2.8.8. Provide terminal blocks for all power circuit wire terminations for both field wiring and internal wiring. Provide adequate terminals for all internal secondary circuits as well as tap off points for external circuits being fed from the panel power circuit. Terminals shall accommodate one conductor per opening and be touch safe. Power distribution blocks shall be Farraz FSPDB series or approved equal.
 - 2.8.9. Provide molded plastic wireways for all wiring in the panel. Wireways shall be complete with covers. Wireways shall be manufactured by Panduit or approved equal.

2.9. Equipment Enclosure and Accessories

- 2.9.1. The pump control panel enclosure shall be rated NEMA 4 and formed of 14 or 16 gauge steel with continuously welded seams (ground smooth). Enclosures shall be of dead front design and have a stud mounted back plane for mounting of control components.
- 2.9.2. Provide enclosure heater (optional) for protection against condensation and low temperatures. Heater shall have resistive heating element with



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adjustable thermostat, continuously running ball bearing fan and anodized aluminum housing. Provide wattage and voltage appropriate for enclosure size and installation environment. Enclosure heater shall be Hoffman D-AH series or approved equal.

2.10. All internal connection wires shall be numbered at each end using pre-printed heat shrink sleeve markers.

2.11. External or flush mounted devices shall be labeled with engraved laminated phenolic name plates secured with permanent pressure sensitive adhesive. Internal labels shall be white polyester permanent pressure sensitive tape printed with black thermal transfer lettering. Where operator interface devices are grouped according to associated equipment it shall be permissible to provide one label for each group of devices, i.e. an H-O-A switch, pump running pilot light, and elapsed time meter for pump #1 could be grouped together and identified with one label reading "PUMP 1".



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