

# **QF DUPLEX FLOAT CONTROL PANEL SPECIFICATION**

## **STANDARD**

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## **1. General**

### **1.1 Scope Of Work**

The contractor shall furnish and install a pump control system designed to operate sewage pumps in a sewage lift station as described herein. The utility power supply at the pump station shall be \_\_\_ volts, \_\_\_ phase, \_\_\_ wire. The duplex pump motors shall be rated at \_\_\_ HP, \_\_\_ FLA.

The control system shall be designed to operate two pumps based on wet well level monitored by four float type level sensors. Four normally open float level sensors shall be required for automatic operation of the duplex pump station. The control panel shall be designed for the float level sensors to operate on 24 VAC to provide the following functions; stop pumps, start lead pump, start lag pump, and high-level alarm. The panel shall require electromechanical and solid state components for interface with wet well level sensor to meet control requirements.

This specification describes a QF Float pump control system as manufactured by EG Controls, Inc.

### **1.2 Codes and Standards**

Electrical equipment, materials and workmanship shall comply with all applicable codes, safety and fire law regulations at the location of the work and shall conform to applicable codes and standards of the organizations listed below.

1. Institute of Electrical and Electronic Engineers. (IEEE)
2. National Electric Code. (NEC)
3. National Electrical Manufacturers Association (NEMA)
4. American National Standards Institute. (ANSI)
5. Underwriters Laboratories. (UL-508)

All equipment and materials shall be new and shall bear the manufacturers name and trade name. In cases where the standard has been established for the particular material, the material shall be so labeled. The equipment to be furnished shall essentially be the standard product of a manufacturer regularly engaged in the production of the required type of equipment for this type of work and shall be the manufacturers latest approved design. Equipment and material shall be suitably delivered and stored and shall be readily accessible for inspection. All items subject to moisture damage shall be stored in dry spaces. All material and equipment shall be protected against dirt, dust, water and chemical or mechanical injury, vandalism and theft.

## 2. Products

### 2.1 Construction

#### 2.1.1 Enclosure

The described equipment shall be housed in a single NEMA 3R enclosure gasketed with a three-point pad-lockable latch and shall be fabricated from cold roll steel.

#### 2.1.2 Hinged Inner Door

The hinged inner door shall be provided fabricated from, 5052-H32.080 marine alloy aluminum. The hinged inner door shall contain cut outs for all circuit breaker toggles. Control switches and indicators shall be labeled and mounted to the hinged inner door to keep operators from entering the live electrical compartment. A warning sign stating “DANGER -- Disconnect all sources of power before opening door” shall be installed on the inner door. It shall be completely removable for ease of service and shall be held closed by at least (2) hand operated 1/4 turn fasteners.

The hinged inner door shall contain a Duplex Logic Plate and cutouts for all circuit breaker toggles. Control switches and indicators shall be labeled and mounted to the hinged inner door to keep operators from entering the live electrical compartment. A warning sign stating “**DANGER - disconnect all sources of power before opening door**” shall be installed on the inner door.

#### 2.1.3 Back-panel

The control system enclosure shall include a removable back-panel. The back-panel shall be white and fabricated from cold roll steel.

Components shall be fastened to the back-panel using stainless steel pan-head machine screws. All devices shall be clearly labeled in accordance with the schematic ladder diagram.

### 2.2 Control Circuit Wiring

Control circuit wiring inside the panel shall be (16) gauge minimum, type MTW or THW, rated for 300 volts. All power wiring shall be rated for 600 volts. Conductors shall be color coded in the same colors throughout the entire panel.

All conduit entries shall be sealed to prevent moisture and gas vapors from entering the control system enclosure.

### 2.3 Float Control Circuitry

#### 2.3.1 24VAC Float Control

The panel shall have 24 volt control circuitry for the float sensor in the wet well from the duplex logic control system. The duplex logic control system shall consist of a logic chassis mounted on the back panel and a logic panel mounted on the inner door connected by a multi-conductor cable. The duplex logic control

chassis shall be a pre-wired assembly constructed of corrosion resistant anodized aluminum, permanently marked with numbers, letters and graphic symbols to indicate the functions of each device or connection point. The duplex logic chassis shall contain; a 120 VAC control power off-on switch, circuit breakers for 120 and 24 VAC, 120/24 VAC class II control transformer, lead pump selector switch, simplex and duplex 120 VAC receptacles, five control relays with separate mounted LED indicators, duplex alternator, three terminal strips, two pump monitor and one power monitor LED indicators. The duplex logic panel shall consist of a pre-wired assembly constructed of corrosion resistant anodized aluminum permanently marked to indicate the function of each device. The standard logic panel shall contain; two H-O-A switches, two run LED indicators, one 24 VAC power on LED indicator, one start lag pump LED indicator, one level alarm LED indicator, and one silence push button.

### **3. Components and Features**

#### **3.1 Main Line Lugs**

Mainline lugs of the appropriate sizes shall be furnished for connecting the incoming supply power. The lugs shall be suitable for use with aluminum or copper conductors.

#### **3.2 Control Circuit Transformer**

Nominal control voltage shall not exceed 120V.

Control power transformers (CPT) shall be mounted inside the enclosure.

Over current protection shall be supplied on both the line and load sides. Line protection for all step-down transformers shall be provided.

Under full load conditions the transformers shall be sized for a minimum of 25% extra capacity (1 KVA Min).

One secondary line shall be grounded for operator safety.

Transformers shall be as manufactured by Eaton Corp.

#### **3.3 Relays**

Relays shall be of the square base plug in type with integral LED indicator lights. All relays shall have a transparent polycarbonate dust cover to protect the contact surfaces from airborne dust and other contaminants. All relays shall have DPDT or 4PDT contacts, as required. Relays shall be rated for continuous duty operation.

Relay contacts shall be rated for 10 amps at 300VAC. Relay sockets shall have screw terminals with self-lifting clamps and terminal identification numbers located at each connection on the relay socket.

#### **3.4 Lighting Arrester**

Provide a solid-state lightning arrester connected to the incoming supply power at the main line lugs or power distribution block. The lightning arrester shall be designed to protect control equipment from damage due to lightning strikes on the incoming power supply line. The lightning arrester shall be as manufactured by Square "D" Model Number SDSA 3650.

#### **3.5 Surge Arrester**

Provide a solid-state surge suppresser connected to the incoming supply power at the main line lugs or power distribution block. The surge suppresser shall be designed to protect control equipment from damage due to transient surges on the incoming power supply line. The surge suppresser shall be as manufactured by Square "D" Model Number SDSA 3650.

### **3.6 Phase Monitor Relay**

A phase monitor relay shall be installed to monitor the incoming three phase, power supply. The voltage level shall be adjustable and a LED indicator shall glow to indicate that the incoming power supply conditions are normal. The phase monitor relay shall be used to disconnect all motor starter coil power when the following conditions exist; under voltage, Phase loss, and Phase reversal. The phase monitor relay shall automatically reset when the fault condition has been corrected. The phase monitor relay shall be protected with an input fuse on each incoming power supply phase. The phase monitor relay shall be as manufactured by Diversified Electronics.

### **3.7 Motor Circuit Protector**

Molded case circuit interrupters (motor circuit protectors) shall be of the instantaneous magnetic type and shall provide instantaneous short circuit protection by means of a front adjustable trip unit. Units shall be supplied with a padlock attachment.

### **3.8 Motor Starters**

Each pump motor shall be provided with a horsepower rated full voltage non-reversing across-the-line magnetic motor starter. Starters shall provide single-phase protection and be equipped with Class 10 bimetallic ambient compensated overload heaters. The adjustable overload heaters shall be sized according to the motor nameplate data. The motor starter coil shall be rated 120 volts. The motor starter shall be inoperable whenever the overload heaters are removed or have tripped. The motor starters shall be as manufactured by Square "D" or Cutler Hammer Inc.

### **3.9 Convenience Receptacle**

A GFI receptacle shall be provided to protect against ground fault leakage and shock. The unit shall have a retractable ground pin and polarized blades for two (2) or three (3) wire receptacles. The unit shall require a reset after any ground fault interruption. The GFCI, convince receptacle shall be mounted on the inner door

### **3.10 Anti-condensation Heater**

An Anti-condensation heater shall be provided to maintain the internal temperature 2 - 3 degrees F above ambient temperature to prevent condensation inside the duplex control panel. A thermostat shall be provided with the heater.

### **3.11 Lead Pump Selector Switch**

The panel shall have a lead pump selector switch mounted on the Duplex Logic Chassis to manually select or automatically alternate the lead pump.

### **3.12 Operating Mode Switch**

The panel shall have a Hand-Off-Automatic rocker/toggle switch mounted on the inner door logic plate to select the operating mode for each pump.

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### **3.13 Elapse Time Meters**

A non-re-settable elapse time meter shall be mounted on the inner door logic plate to record the accumulated running time in hours for each pump. The elapse time meter shall be rated 120 VAC.

### **3.14 Alarm Beacon**

The panel shall have a red/amber alarm beacon mounted on top of the panel. The alarm beacon shall be rated 120 VAC, 25 W, and shall flash for the following condition high-level alarm. A rotating beacon shall not be acceptable

### **3.15 Terminal Strip**

The terminal strip shall be mounted on a 45° angle using rail offset brackets to angle up bottom side of terminals from back panel to ease field wiring connections. Rail offset brackets shall be zinc bichromate plated steel. All wiring within the control system enclosure should be installed in wiring duct and terminated at the terminal blocks.

### **3.16 Panel Light**

A fluorescent panel light shall be provided and shall be located inside the enclosure. An on/off switch for the panel light shall be provided as well, and shall be located at a convenient and accessible location on the inner door.

### **3.17 Float Test Switches**

Test switches for each float shall be supplied to enable the operator to simulate float action. The simulation shall cause the pumps to start and stop and shall activate the high level alarm.

### **3.18 Seal Fail/Over Temperature Circuit**

A Seal failure and over temperature circuit shall be supplied whenever submersible pumps are being utilized. A seal failure and over temperature circuit shall not be utilized when dry pit pumps are being utilized.

## **4. Quality Assurance**

### **4.1 Manufacturer Experience**

#### **4.1.1. UL Certification**

The control system manufacture shall be certified by Underwriters Laboratories (UL) as being a UL 508 listed manufacturing facility and certified to install a serialized label for quality control and insurance liability considerations.

#### **4.1.2 Liability Insurance**

The manufacturer of the control system must carry blanket liability insurance of at least two (2) million dollars.

#### **4.1.3 Experience**

The manufacturer of the control system must be able to document ten years of experience in successfully designing and manufacturing similar control systems for wastewater pumping applications.

#### **4.2 Manufacturer Quality Control**

The complete control system shall be functionally tested at the manufacturing facility and certified as a complete system to assure proper operation per specification. All components must be mounted with stainless steel hardware.

#### **4.3 Manufacturer Approval**

Manufacturers listed in this specification do not constitute approval. All controls must have the capabilities and functions as outlined in the specifications.

### **5. Submittal Requirements**

#### **5.1 Base Bid**

The base bid control system shall be the QF float control system as manufactured by EG Controls Inc. of Jacksonville Florida. All bidding contractors shall base their bid on the float control system. Contract shall be awarded on the base bid control system. Alternative deductive systems will be considered only after contract award and must be specified with any applicable deducts at bid time in order to receive consideration. Bidders submitting alternate quotations shall submit appropriate cut sheets, circuit drawings and a detailed bill of materials with their alternate bid packages. Approval of an alternative system shall be at the sole discretion of the engineer.

#### **5.2 Substitutions**

The Engineer will consider proposals for substitution of materials, equipment, methods and services only when proposals are accompanied by complete technical data and all other information required by the Engineer for the proposed substitution. Substitution of materials, equipment, methods and/or services is not allowed unless; such substitution has been, approved by the Engineer.

#### **5.3 Shop Drawing Submittals**

##### **5.3.1 Drawing Requirements**

All drawings are to be computer generated.

##### **5.3.2 Engineering Approval**

The Engineer reserves the right to approve or disapprove any and all equipment based upon his evaluation. Approval for fabrication and installation will be made only after submittal and review of all submittal documents. The information required for approval shall include the following items and be provided in (8) sets as a minimum:

- (1) Appropriate cut sheets
- (2) Complete electrical schematics
- (3) A complete bill of material
- (4) Detailed drawings of the enclosure (including the inner door)
- (5) layout detail of every control switch, pilot light and elapsed time meter mounted on the exterior of the enclosure.

## **5.4 Record Documents And Testing**

### **5.4.1 Record Documents**

- (1) Eight (8) sets of as built drawings as per Section 5.3.2, items 1 through 5 of this specification are to be supplied depicting “as built” conditions. This as built is to include any field modifications made by the authorized start-up personnel during installation, start-up or testing.
- (2) Original copy of the factory Quality Control report.

### **5.4.2 Testing**

The control panel shall be thoroughly tested at the factory prior to shipment.

## **6. Warranties**

All guarantees implied or stated by the control system manufacturer shall be passed in full force to the owner.

All components in the specified control system are warranted for defects in material and workmanship for a minimum of twelve (12) months from the dates the control panel is shipped from the manufacturer.

The manufacturer of the control system shall warrant all components in the system for unit responsibility purposes.

## **7. Equipment Identification**

All electrical equipment shall be identified in accordance with these specifications. All identification labels, both within the enclosure and external, shall be engraved nameplates attached with stainless steel machine screws, photo etched, silk screened, or laser-screened laminated mylar. All control wiring shall be numbered on each termination.

Engraved nameplates attached with stainless steel machine screws, photo etching, silk screened, or laser-screened laminated mylar shall be provided to identify all individually mounted push-buttons, rocker switches, lights, meters, circuit breakers, motor starters, transformers, relays, fuses, phase monitors, surge arrester and any other equipment for which identification is required for eventual service or replacement. This includes the appropriate equipment within the cabinet. Embossed tape is not acceptable.



## **8. Execution**

### **8.1 Field Wiring**

Field installed interior wiring shall be neatly grouped by circuit and bound by plastic tie wraps. Circuit groups shall be supported such that circuit termination points are not stressed.

### **8.2 Panel Protection**

The pump control panel shall be protected at all times.