

CSI SPECIFICATION: *PLL (Pump Lead-Lag Control)*

SECTION: 230913 Instrumentation and Control devices for HVAC

PART 1 GENERAL

1.1 Summary

- A. Section Includes:
 - 1. Pump Lead-Lag control for multiple pump rotation and alarming.
- B. Related Sections:
 - 1. Conforms to applicable building code requirements of all authorities having jurisdiction.

1.2 References

- A. **International Organization for Standardization (ISO)**
 - 1. Manufacturer shall be ISO 9001:2008 Quality Management Systems Certified.
- B. **Underwriters Laboratories, Inc. (UL):**
 - 1. The control shall be tested and certified per standard 916 "Energy Management Equipment".

1.3 Quality Assurance

- A. **Manufacturer's Quality System:**
 - 1. Registered to ISO 9001:2008 Quality Standard, including in-house engineering for product design activities.
 - 2. The control must be UL tested and certified per standard 916, "Energy Management Equipment".

1.4 Control Operation

- A. **Description:** The control shall operate on 120VAC, with a maximum power of 12 watts. The control shall be pre-engineered and programmed exclusively for the rotation of system pumps. It shall incorporate the following integrated functions: lead pump rotation and alarm on pump failure to provide proof-of-flow.
- B. **Control Operating Concept:** The control is designed to rotate the lead system pump in Hydronic applications. It does that by connecting to the boiler control and the pump flow prove equipment. When the lead pump fails to provide proof-of-flow for over 30 seconds, the control shall turn off that pump in addition to turning on the pump alarm and the lag pump. The failed pump shall not be available for running until the alarm-reset button is pressed.
- C. **Sequence of Operation:** The control shall use different pump call inputs and pump outputs based on the mode selected. When the control receives a call for a pump, the control shall turn on the lead pump. The control shall follow that by checking the flow input. If a proof-of-flow existed, the pump shall run until the pump call ends or the lead pump rotation takes place. However, if a proof-of-flow did not exist within 30 seconds, the control shall turn the lead pump off and turn that pump alarm on. In this case, the control shall replace the failing lead pump with the lag pump.

D. Features:

1. **Multiple Operating Mode:** The control shall incorporate several operating modes that satisfy multiple pump applications. It shall include the following mode capabilities:
 - 2-System Pump Rotation with 1 call input signal and 1 flow input signal
 - 2-System Pump Rotation with 1 call input signal and 2 flow input signal
 - 3-System Pump Rotation with 1 call input signal and 1 flow input signal
 - Two boiler feed system with an auxiliary pump and solenoid valves outputs
 - 3-Boiler Pump each with its own flow input signal and optional run-on delay
2. **Power up to 3 Pumps:** The control shall be capable of operating up to 3 pumps. It shall provide 120 VAC to each of the pumps without the need for external power. Each pump output shall operate a pump not to exceed ¼ HP. If a pump requires more than that, the contractor must use an external relay or a starter.
3. **System Pump Rotation:** The control shall be capable of rotating the pumps based on a timed rotation of one-day or 7-days. It shall also offer a per-call rotation option. During timed rotation, the control shall run both pumps together for a few seconds before switching the lead pump. This shall prevent boiler short cycling due to intermittent flow reduction.
4. **Alarm on Flow Failure:** The control shall have a separate alarm output for each of the pump outputs. If a pump fails to provide proof-of-flow for within 30 seconds, the control shall turn on its alarm output.
5. **Alarm Reset:** The control shall have an alarm-reset button to deactivate current alarms and make failed pumps available.
6. **Re-direct System flow using Solenoid Valves on Boiler Feed Pump Application:** In a two boiler pump system, if a pump failed to provide proof-of-flow within 30 seconds, the control shall turn off the failing pump output and turn on the replacement/auxiliary pump output. In addition, the control shall turn on the normally closed solenoid valve output to direct the flow of the new lead pump.
7. **Pump Exercise:** The control shall have an option to intermittently run any pump that has not run for over 7 days. The use of this option shall help lubricate wet-seal pumps and reduce impeller seizer.

E. Inputs:

1. **3 Pump Call Inputs:** These inputs are dry-contacts. They initiate a pump call. The number of inputs used will depend on the operating mode selected.
2. **3 Flow Inputs:** These inputs are dry-contacts. They connect to flow checking devices. The number of inputs used will depend on the operating mode selected.

F. Outputs:

1. **3 Pump Output relays:** (power sourcing 120 VAC)
2. **2 Valve Output relays:** (power sourcing 120 VAC)
3. **3 Alarm output relays:** (No power sourcing)

1.5 Regulatory Approvals

A. Underwriters Laboratories, Inc. (UL):

1. The control shall be tested per standard 916 "Energy Management Equipment".

