

CSI SPECIFICATION: *MULTI-MOD PLATINUM*

SECTION: 230913 Instrumentation and Control devices for HVAC

PART 1 GENERAL

1.1 Summary

- A. Section Includes:
 - 1. Multiple modulating boiler Heating Control.
- B. Related Sections:
 - 2. 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 9001:2000 Quality Management Systems Certified.
- B. Underwriters Laboratories, Inc. (UL):
 - 1. Tested per standard 916, Temperature Indicating and Regulating Equipment.
- C. The City of New York, Department of Environmental Protection (DEP).
 - 1. The control shall be approved for installation in New York City by DEP.

1.3 Quality Assurance

- A. Manufacturer's Quality System:
 - 1. Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.
 - 2. The control must be UL tested and certified per standard 916, Temperature Indicating and regulating Equipment.

1.4 Control Operation

- A. **Description:** The control shall operate on 120VAC, with a maximum power of 30 watts. The control shall be pre-engineered and programmed exclusively for the operation of multiple modulating steam/hydronic heating systems based on a PID logic. It shall be capable of controlling four modulating boilers without any additional extra modules. However, it shall be modular and capable of controlling a total of 20 modulating boilers using a maximum of two external modulating extension controls.
- B. **Modulating Outputs:** The control shall have four normally open relay contacts that can be used to start/stop each burner. These relays shall be field replaceable. The control shall have four modulating outputs. Every two modulating outputs shall have the same modulating signal and be controlled by the same modulating output card. The control shall have the capability to operate modules having 0 – 5 volts, 1 - 5volts, 0 – 10 volts, 2 - 10 volts, 4 – 20 ma, and 135-ohm outputs. The control shall be capable of identifying the output module types and adjusting control output accordingly. Where practical, the output modules shall be protected from accidental incorrect connection. Should damage occur, where practical, damage shall be confined to the output module.

C. **Sequence of Operation:** When heat is required, the control PID shall activate the lead boiler and start its pre-purge cycle followed by the initiation of modulation at the Fire Start Percent. When additional heat is needed, the control shall start to increase modulation until the Modulation Start percent has been reached. That shall be followed by the lag boiler pre-purge cycle. Then, the lag boiler shall remain at the Fire Start percent and the lead boiler shall resume its modulation until it reaches full fire (100% modulation). Any additional requirements for heat shall trigger the control to increase the lag boiler. When the control PID requires reduced output, the control shall reduce the modulation of the lag boiler until it reaches its Fire Start percent. That shall be followed by the reduction of modulation of the lead boiler until it reaches 40% percent of its Modulation Start percent. This shall trigger the control to turn off the lag boiler.

D. **Features:**

1. **Outdoor Reset or Set Point:** The control shall provide an integral sensor set point adjustment. The set point shall be adjustable either through the control menu or remotely using a 4-20mA input signal. In addition, when in temperature mode and equipped with an outdoor sensor, the control shall be capable of varying the set point based on an outdoor reset curve. The outdoor reset curve parameters shall be field adjustable.
2. **Fire Start Percent:** Adjustable from 1 to 100%. This setting shall set the firing percent at which the burner shall start at when energized or de-energized. There shall be an independent adjustment of this setting for each burner.
3. **Modulation Start Percent:** Adjustable from 0 to 100%. This setting shall set the percent of modulation the lead boiler must achieve before the lag boiler is activated. There shall be an independent adjustment of this setting for each burner.
4. **Gain:** Adjustable from -10 to +10. This setting shall increase or decrease the amount of modulation based on the rate of change in system sensor reading and the set point.
5. **Purge Time:** Adjustable from 0- 10.0 minutes. This setting shall set the delay time between a boiler being energized and the beginning of modulation.
6. **Last Stage Hold:** Adjustable from 0 to 30 minutes. The last stage hold shall keep the last boiler at low fire for an additional degrees/lbs of pressure to reduce short cycling of the lead boiler.
7. **Lag delay:** Adjustable from 0 to 60 minutes. The lag boiler in the rotation shall not be fired until the lead boiler has remained in high fire for the period of time set by the Lag Stage delay.
8. **Rotation:** The control shall be capable of rotating the boilers either based on an adjustable time period, Last-On/last-Off, or manually.
9. **Parallel Modulation:** The control shall have an option for parallel modulation where multiple boilers can modulate upward or downward together with increase or decrease modulation.
10. **Memory:** The control shall store all configuration and settings on EE-Prom. In case of power failure the control should be able to retrieve all of its latest settings.
11. **Display:** The control shall have a four line by eighty-character alphanumeric display capable of displaying both numbers and characters. The display shall be visible with no ambient light. All control operation information shall be available for display. During times of inactivity, or 10 minutes after last user entry, the display shall enter a lower power mode. In this mode the control should display date and time of day, cycle status, outdoor temperature, system temperature, and valve opening percentage. In this mode, the display shall reduce visible light output. The control shall exit this mode whenever button or digital encoder activity is sensed.
12. **Boiler Lockout Input:** The control shall have a dry contact input for boiler failure. The control shall not include failed boilers in its modulation sequence.

E. **Input Points:**

1. **Outdoor Temperature:** This shall be the value read from the outdoor sensor placed on the north side of the building at least 10 Ft. above the ground.
2. **System Temperature (Hydronic Systems):** This shall be the value read from the system sensor placed on the hot water system pipe to measure hot water circulating temperature.
3. **System Pressure (Steam Systems):** This shall be the value read from the system pressure sensor placed on the main header.
4. **External Shutdown:** The control shall be capable of accepting a dry closure type shutdown input. This shall prevent any boilers or pumps from activating when the contact is closed.
5. **Prove Input:** The control shall be capable of accepting a dry contact closure type for system prove input. This shall prevent any boilers from activating until the contact is closed.
6. **Lockout Input:** The control shall be capable of accepting dry contact closure for boiler failure.

7. **System Set Point (4-20mA Signal):** The control shall be capable of accepting a 4-20mA remote signal as a set point.

F. Output Points/Relays:

1. Burner relay output
2. Burner modulation output: 135 Ohm, 4-20mA, 0-5V, 1-5V, 0-1V, 2-10V
3. System relay output

G. Data Points:

1. **Burner Modulation Percent:** This shall indicate the percent of modulation status each boiler has.
2. **Fire Start Percent:** This shall be the percent at which a boiler will start its modulation. Each boiler shall have a separate configurable value.
3. **Last Stage Hold:** Adjustable from 0 to 30 minutes. The last stage hold shall keep the last boiler at low fire for an additional degrees/lbs of pressure to reduce short cycling of the lead boiler.
4. **Lag Delay:** Adjustable from 0 to 60 minutes. The lag boiler in the rotation shall not be fired until the lead boiler has remained in high fire for the period of time set by the Lag Stage delay.
5. **Modulation Speed** (for process applications only) This shall be adjusted the burner modulation motor speed for the control logic to match.
6. **Modulation Start Percent:** Adjustable from 0 to 100%. This setting shall set the percent of modulation the lead boiler must achieve before the lag boiler is activated. There shall be an independent adjustment of this setting for each burner.
7. **Rotation Mode:** Auto, Manual, Last-On/Last-Off
8. **Setback:** The control shall have a dry contact input to initiate a setback.
9. **Standby Delay:** This shall be the set to the amount of time for all automatically controlled boilers to be at high fire before starting boilers set to standby.
10. **System Run-On:** This shall be the value at which the system relay shall remain energized for after all boilers have turned off.
11. **System Set Point/Target.** This shall be either set to the desired system design temperature / pressure. If the control is set to outdoor temperature reset, this value should change dynamically based on the outdoor temperature and other reset ratio parameters.

1.5 Regulatory Approvals

A. Underwriters Laboratories, Inc. (UL):

1. The control shall be tested per standard 916, Temperature Indicating and Regulating Equipment.

B. The City of New York, Department of Environmental Protection (DEP).

1. The control shall be approved for installation in New York City by DEP.

1.6 Included Items

- A. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application. Only one relay is included for the system output. Additional relays are required for each boiler and must be ordered separately.

1.7 Optional Items

- A. Outdoor Temperature Sensor shall be of the Thermistor type capable of measuring between -30°F to 250°F. It shall have a weather shield to protect it from moisture and direct sun.
- B. System Temperature Sensor shall be of the Thermistor type capable of measuring between -30°F to 250°F
- C. System Pressure Sensor shall be of the Transducer type capable of measuring between 0-30PSI, 0-100PSI, 0-200PSI, 300PSI.

1.8 Communication (Select one of these Options)

- A. **Internet Communication:** The control shall be capable of communicating to the Internet using a high-speed Internet connection to communicate to the manufacturer or manufacturer representative web servers to send or receive its information. Remote users of the control shall have the capability of the control remotely using an Internet Browser with built-in Java when provided with security logging

information. The user shall be capable of viewing and changing control settings remotely. In addition, the web server shall offer customizable history reporting and graphing of all control and sensor data. The control and web system shall be capable of sending alarms to web viewers, several E-mails, and several cellular phones as text messages.

- B. **BACnet IP Communication:** The control shall be BACnet IP capable. It shall provide the user with BACnet IP communication Interface to an Energy Management System (EMS) or Building Management System (BMS) on the same BACnet network. The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the BACnet network.
- C. **BACnet MSTP Communication:** The control shall be BACnet IP capable. It shall provide the user with BACnet MSTP communication Interface to an Energy Management System (EMS) or Building Management System (BMS) on the same BACnet network. The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the BACnet network.
- D. **MODBUS (RTU):** The control shall be MODBUS RTU capable. It shall provide the user with RS485 communication Interface to an Energy Management System (EMS) or Building Management System (BMS) on the same BACnet network. The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the MODBUS network.
- B. **Johnson Metasys, Johnson N2, LonWorks, Honeywell, Tridium, and other protocol communications:** The control shall be BACnet IP capable. However, will communicate to the other proprietary protocol through a BACnet IP or BACnet MSTP to the specified proprietary protocol through a gateway that is supplied by the control manufacturer at additional cost. It shall provide the user with proprietary protocol communication Interface to an Energy Management System (EMS) or Building Management System (BMS). The control shall be designed to be BACnet Application Specific Controller (B-ASC). The control shall manage the boilers and their modulation and the system pump through direct wiring to the equipment and not through the BACnet network.

1.9 Security

A. Control Local Security:

1. The control shall have a secure password to deter unauthorized users. The password shall be optionally activated.
2. The control shall have a key-locked enclosure.

B. Control Remote Internet Security

1. To access an Internet communication control remotely, the control, web server, or proprietary software shall deter unauthorized users by requiring a secure password for logging to the control interface.