HEAT-TIMER® CORPORATION 20 New Dutch Lane, Fairfield, NJ 07004 973-575-4004 • Fax 973-575-4052 http://www.heat-timer.com

CSI SPECIFICATION: *SRC PLATINUM*

SECTION: 230913 Instrumentation and Control devices for HVAC

PART 1 GENERAL

1.1 Summary

A. Section Includes:
   1. Steam Heating Control.

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 per standard 916 “Energy Management 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 9001:2008 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 sub-atmospheric steam heating systems. It shall incorporate the following integrated functions: Sub-atmospheric steam Outdoor Reset, Outdoor temperature cutoff(s); day/night heat level programming; Boost (optimum start/stop); and system cycling (steam reset).

B. **Cycle Operating Concept:** By monitoring the outside temperature, the control shall be able to anticipate the heating needs of the building. Each Cycle period (usually 60 minutes long but adjustable between 10 minutes and 240 minutes, depending on the building response) is divided into a Cycle-ON segment and a Cycle-OFF segment. In any of the cycle segments, the valve shall partially open to a percent that is related to the outdoor temperature as well as the heat adjustment curve selected. The length of the Cycle-ON segment will vary with the outdoor temperature and the Heat Adjustment selection. The colder it is outside, the longer the ON part of the cycle shall be and the greater the valve opening percentage. During the Cycle-OFF segment, the valve opening percentage shall be reduced. The Heat Adjustment selection provides multiple ratios of Cycle-ON to Cycle-OFF that varies based on the building heat dissipation rate.

C. **Sequence of Operation:** When the control is powered up, the control shall energize the Motorized Valve Close relay for a pre-vacuum period of 10 minutes. This shall be followed by the normal cycle operation. Upon termination of heat either due to the season change or warm outdoor temperatures, the control shall allow the vacuum pump to run for an additional full cycle while de-energizing the boiler.

D. **Space Average Feedback Operation:** Is used to prevent space over heating and minimizes fuel consumption. If the control is equipped with Internet communication, the control shall have the option of accepting values from up to 64 space sensors. The sensors shall be of the wired or wireless type. For each space sensor configured, the control shall provide the option of including it in or excluding it from the space average calculation. ***The control shall not start a heating cycle if the space average is at or greater than the space average target setting.*** The control shall have a day space average target setting and a night space average target setting. Each shall take effect during its scheduled time.

   a. **Smart Space Average:** The control shall incorporate a statistical logic to exclude sensors from the space average based on how far off their current values are from the total average based on an adjustable differential. The control shall average the temperature of all the space sensors that are selected to be part of the space average. Then it shall scan through them and exclude all the sensors that have a reading greater than the sum of space average and the differential. In addition, it shall exclude all the sensors that have a reading that is less than the space average minus the differential. Then, the control shall recalculate the space average using only the included sensors (all excluded sensors values shall be logged but not included in the space average). This new calculation shall be the smart space average that shall be used by the control logic to manage the space heat.

   b. **Day and Night Space Average Target:** The control shall have two independent space average target settings; a day setting and a night setting. The day space average setting shall take effect when the control is operating in the day schedule while the night space average setting shall take effect when the control is operating in the night schedule. Both settings are adjustable.

E. **Space Lockout:** Prior to the control starting the heat establish and cycle mode, the control shall check that the smart space average is less than the day space average target or night space average target depending on the time of day and the current schedule. ***If the space average calculation was at or greater than the space average target, the control shall start the space lockout feature where no heat output shall be active.*** This heat off period shall remain until the space average temperature drops below the space average target. In this case, the control shall evaluate its parameters for starting a new heating cycle (outdoor temperature, return line temperature, etc..).

F. Features:

1. **Automatic Valve Calibration:** The control shall have an option to automatically calibrate a motorized valve with feedback to its parameters.
2. **Vacuum Pump Pre-Vacuum Period:** The control shall be able to start the vacuum pump system 10 minutes prior to starting the heating system for a pre-vacuum period.
3. **Vacuum Pump Post-Vacuum Period:** The control shall energize the vacuum pump relay for an additional period of a full cycle after a shutdown signal, or when the outdoor temperature rises above the outdoor cutoff.
4. **Schedules:** A digital, 7 day electronic time clock shall be incorporated to switch between the Normal (Day) and Save (Night) modes of operation. The clock shall be capable of 4 separate Normal (Day) / Save (Night) schedules per day and each day can be programmed independently. The normal/save schedule shall be stored in E-Prom indefinitely. Copy and erase functions shall be provided to facilitate programming.
5. **Day Light Savings Automatic Adjustment:** The control shall be capable of adjusting its clock based on the Day-Light-Savings system. This shall be an option to activate and de-activate this feature when needed.
6. **Season:** A summer/winter menu selection shall be provided for summer shutdown. In the summer mode the control panel will not activate the steam source.
7. **Boost:** The control shall incorporate three separate field selectable “boost” functions. The digital display will indicate a boost is occurring and the type of boost. The Manual Boost, Vari-Boost or Vari-Boost & Early Shutdown setting shall be adjustable on the control panel. The choices are:
   - Manual boost shall provide for a fixed warm-up period of 0-120 minutes.

- Vari-Boost shall provide for an automatically variable warm-up period based on outside temp.
- Vari-Boost with Early Shutdown shall provide an automatically variable warm-up with an automatically variable early switch to the Setback Save mode based on outside temp. Manual Valve Control.

8. **Auto/Bypass Manual Switch:** An Auto/Bypass switch shall be integrated into the control to select the required operating mode. In Bypass the heating system shall operate independently of the control. The Auto mode shall allow the control to regulate the heating system. A counter shall record the cumulative days, hours and minutes in Bypass. The accumulated time in bypass shall be stored indefinitely in EE Prom.
9. **Manual Shift to Day:** A menu selection option shall be provided to immediately switch from the Save (Night) to the Normal (Day), Save to Normal mode, or extended day schedule with an adjustable delay. If a shift to Save (Night) or to Normal (Day) is selected the control shall remain as such until the next setting on the schedule. In Extended Day Schedule mode, a shift to Normal (Day) the control shall automatically revert back to the Save (Night) mode after an adjustable time delay that ranges from 60 to 240 minutes.
10. **Cycle Length:** The total cycle time shall be field adjustable to between 10 to 240 minutes.
11. **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.
12. **Display:** The control shall have a four line by eighty-character alphanumeric display. 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 return line 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.

G. Input Points:

1. **Outdoor Temperature:** This shall be the value read from the Outdoor Thermistor placed on the north side of the building at least 10 Ft. above the ground.
2. **System Temperature:** This shall be the value read from the system sensor placed on the return pipe to measure steam circulation.
3. **Valve Position Feedback:** The control shall operate either a floating valve motor with a feedback 0-1K Ohm signal or floating valve motor based on a specified motor time that ranges from 2 to 10 minutes.
4. **Prove Input:** The control shall provide a dry-contact prove check input on system components. This input shall be checked before the system energize any boiler or activate the heating output.
5. **Shutdown:** The control shall provide a dry-contact shutdown input to turn the operation of the control off during maintenance period.
6. **Optional Sensor Inputs:** The control circuitry shall be capable of accepting two standard and up to three optional (sensor) inputs. Standard sensor inputs shall be of the thermistor type. Operating temperature range shall be -30°F to 250°F. Optional (sensor) inputs shall include multiple thermistor type sensors or dry-contacts.
7. **Optional Wireless Sensor Input:** The control shall be capable of accepting wireless sensor and transceiver devices through a RS485 connection. Wireless sensors shall be of the space temperature sensor, outdoor temperature sensor, water temperature sensor, and switch sensor types.
8. **Optional Network Sensor Inputs:** The control shall be capable of communicating to up to 64 additional sensors through these inputs.

H. Output Points/Relays:

1. Vacuum Pump Output

2. Floating Motorized Valve Outputs
3. Burner Output

I. Data Points:

1. **Operating Mode:** The control shall be capable of operating in burner/valve mode or a district steam mode.
2. **Day-Heat Adjustment/Night-Heat Adjustment:** The control shall have two individually changeable heat-adjustments, one for the day and the second for the night. The heat-adjustment setting shall change the ratio of the Cycle-ON to Cycle-OFF at any given outdoor temperature.
3. **Day Outdoor Cutoff/Night Outdoor Cutoff:** The control shall provide two (2) integral outdoor sensor set points, one for Normal (Day) operation and one for Save (Night) operation. They shall be independently adjustable, in 1° increments. Their settings shall be digitally displayed. The range of settings is 20° to 100°. The settings shall be stored in E-Prom for an indefinite time period.
4. **Heating Cycle Length:** The cycle length shall be adjustable between 10 to 240 minutes. The control shall digitally display the elapsed time of the cycle as well as the current segment of the current cycle.
5. **Valve Opening Percent:** The control shall digitally display the current valve opening percent at all times.

J. Optional Add-Ons: Internet capable controls shall be capable of connecting to and alarming on different adjustable settings and delays for the following sensors.

a. Wireless Temperature and Switch Sensors: The control shall be capable of communicating to wireless space temperature, wireless outdoor temperature, and wireless temperature/ switch sensors.

b. Stack Network Temperature Sensor

c. Oil Tank Level

d. Domestic Hot Water and other Temperature Sensors

e. Flame Failure and other Switch Sensor

f. Pressure Network Sensor

g. Water Counter/Pulse Network Sensor

h. Smoke Alarm Sensor

i. **Sump Pump Float Sensor**

1.5 Regulatory Approvals

A. Underwriters Laboratories, Inc. (UL):
   1. The control shall be tested per standard 916 “Energy Management 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 under “Engineering Criteria for Fuel Oil Burning Equipment”.

1.6 Included 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 return line temperature Sensor shall be of the Thermistor type capable of measuring from –30°F to 250°F. It shall be of the strap-on type.

C. Five 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.

1.7 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 vacuum pump, valve, and/or boiler 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 the vacuum pump, valve, and/or boiler 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 manage the vacuum pump, valve, and/or boiler through direct wiring to the equipment and not through the MODBUS network.

E. **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 vacuum pump, valve, and/or boiler through direct wiring to the equipment and not through the EMS/ BMS network.

1.8 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 Security:

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