Cemline® Cem-trol® II Controller

OVERVIEW

The CEM-TROL® II controller is used on CEMLINE water heaters to operate a control valve to maintain a temperature set point. The CEM-TROL II controller also monitors the temperature of the water within the heater for primary and secondary high limit alarms. This water heater controller has a touch screen interface used to access and change settings. The settings include menu options that allow for better temperature control such as "Output Curve" and "Ramp Delay". The CEM-TROL II controller has built in MODBUS communication, remote set point and remote readout via 4-20 mA signals, remote on-off, and several dry contacts to allow for integration into a Building Automation System (BAS).

OPERATION

The CEM-TROL II water heater controller operates using two temperature sensors, Temperature Sensor 1 and Temperature Sensor 2. These two sensors are 1000 ohm Platinum PT sensors. The resistance value of these two sensors change depending on the temperature which the sensor is being exposed. These sensors can be tested with an ohmmeter, a chart showing temperature versus resistance can be found in the CEM-TROL Installation, Operation, and Maintenance Manual.

Temperature Sensor 1 is used by the CEM-TROL II to monitor the temperature of the water within the vessel in order to modulate the steam/boiler water control valve to maintain the temperature setpoint. The CEM-TROL II uses Temperature Sensor 2 to monitor the water temperature within the vessel for Primary and Secondary High Limits. The Temperature Sensor 2 reading is also used as the display temperature found at the top left of the CEM-TROL II home screen display.

TEMPERATURE SENSOR 1

When the temperature read by the Temperature Sensor 1 falls below the temperature setpoint the control voltage being sent to the control valve will increase, opening the valve to allow the heating medium to enter the heat exchanger. As the temperature read by the Temperature Sensor 1 rises and approaches the temperature setpoint the control voltage will decrease, allowing the control valve to close and restrict the heating medium from entering the heat exchanger.

TEMPERATURE SENSOR 2

Temperature Sensor 2 is used by the CEM-TROL II water heater controller for the temperature shown on the touchscreen display and the temperature high limits.

Primary High Limit (High Limit 1)

The *Primary High Limit* is a temperature alarm limit usually set 10 degrees above the temperature set point. Upon reaching the Primary High Limit the CEM-TROL II controller illuminates the Primary High

 Limit LED on the display, an alarm horn is sounded, and the 24Vac is removed from terminal P5 causing the control valve to fail closed. This condition remains until the temperature falls below the HIGH LIMIT 1 value minus the value of DIFFERENTIAL 1.

Secondary High Limit (High Limit 2)

The *Secondary High Limit* is a temperature high limit usually set 20 degrees above the temperature set point. Upon reaching the Secondary High Limit all Primary High Limit conditions will remain. Additionally, the CEM-TROL II controller will illuminate the Secondary High Limit LED, an alarm horn is sounded, and 24Vac is applied to terminal P4 to actuate the high limit dump solenoid valve. This allows the over temperature water to be drained from the vessel in order to allow cold water to enter the vessel and lower the temperature of the water. This condition will remain until the temperature falls below the HIGH LIMIT 2 value minus the value of DIFFEFRENTIAL 2.

DRY CONTACTS

The CEM-TROL II water heater controller has four dry contacts that can be used for building automation or other desired functions. These are normally open contacts (NO) with a 1 Amp maximum contact rating. The Dry contacts are: *POWER ON*, *ANY ALARM*, *HIGH LIMIT 1*, and *HIGH LIMIT 2.*

POWER ON is an open ($\infty\Omega$) when there is no power applied to the water heater and becomes a short(0Ω) when the water heater has been powered on.

ANY ALARM is an open ($\infty\Omega$) during normal operation when there is no alarm condition and becomes a short(0Ω) when there is an alarm condition.

PRIMARY HIGH LIMIT is an open($\infty\Omega$) when the temperature read by the secondary temperature sensor is below the primary high limit value, then becomes a short(0Ω) when a PRIMARY high limit condition is met.

SECONDARY HIGH LIMIT is an open($\infty\Omega$) when the temperature read by the secondary temperature sensor is below the secondary high limit value, then becomes a short(0Ω) when a SECONDARY high limit condition is met.

MODBUS/BAS

The CEM-TROL II controller has built in MODBUS communication that can be used to monitor and report on the following conditions, "Any Alarm", "Alarm", "High limit 1", "High limit 2", "Boiler water pump status", "Sensor Loss 1", "Sensor Loss 2", "Power status/disabled remotely", "Setpoint Value", and registers to report the temperatures being reported by all available temperature sensors. The CEMTYROL II controller is capable of having the temperature read and set remotely by using a 4-20 mA

signal. The MODBUS settings also allow the user to select from a variety of BAUD RATES and the ability to set a specific DEVICE ID so that the CEM-TROL II controller can be easily integrated into the customers BAS (Building Automation System). If MODBUS is not the desired communication method BACNET IP and BACNET MSTP are also available with the addition of the proper communications gateway.

REMOTE SET POINT/READ OUT

The CEM-TROL controller has built in *Remote Temperature Read Out and Set Point* using 4-20 mA signals. The BAS system can read the temperature of the water heater remotely using a 4 -20 mA signal from terminal block P-10 (terminals 1 -2). The BAS system can remotely set the temperature via a 4-20 mA signal at terminal block P-8 (terminals 1-2). In order to use the *Remote Temperature Set Point* the Remote Control must be enabled on the controller. Please reference the CEM-TROL II Installation, Operation, and Maintenance Manual for these specific instructions along with instructions for using the *Remote Temperature Read Out.*

REMOTE ON-OFF

The CEM-TROL II controller has built in *Remote Temperature Remote On-Off* contact. Terminal block P-7 is a four pole block. To wire for remote on-off install a switch or relay contacts connecting terminals 3 and 4.

For more information about the CEM-TROL II Water Heater Controller please refer to the CEM-TROL II Installation, Operation, and Maintenance Manual.