CEMLINE® STEAM-TROL® OPERATIONS AND FUNCTIONS

OVERVIEW

The STEAM-TROL controller is used on the CEMLINE Unfired Steam Generator (USG). The STEAM-TROL is used to maintain the proper water level within the vessel of the USG, monitor the steam pressure for high and low limit alarms and modulate the control valve to maintain the desired pressure setpoint. The STEAM-TROL may also be used for a timed blowdown when equipped with an optional 24Vac blowdown solenoid valve. The STEAM-TROL has a touch screen interface which implements user friendly access to the settings menus. The STEAM-TROL 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

Level Control

The STEAM-TROL controller, when first powered on, allows the USG to fill with water to the proper level. This is accomplished by the use of one of three different level control types available in the level control menu. The level controls available are the ALS-700 (Four Ball Float Level Control), the McDonnell Miller 157 (Two Float Level Control), or the TR-420 Modulating Level Control (Analog). These level controls are used by the STEAM-TROL controller to maintain the proper water level within the vessel as well as to monitor water level for conditions such as *high water*, *water feed*, and *low water*. To change the Level control type, a password will need to be entered, otherwise the changes will not be saved. This is to prevent the Level control type from being changed by accident. The ALS-700 (Four Ball Float Level Control) and the McDonnell Miller 157 (Two Float Level Control) typically are used with an open/closed solenoid valve as the feedwater valve. The TR-420 (Analog Level Control) uses a feedwater valve that modulates position based on a 4-20ma output from the STEAM-TROL controller.

Pressure Sensors

The STEAM-TROL controller uses two pressure sensors with a 4-20 mA output. There are a variety of pressure sensor values available to use within the "Pressure Sensor" menu in the STEAM-TROL. To change the pressure sensors value, a password is required or the changes will not be saved. This is to ensure that the value is not accidentally changed.

If any type of sensor error is present the STEAM-TROL controller will not allow the steam/boiler water control valve to operate. Two sensors are used for redundancy and safety. If one of the sensors starts giving inaccurate pressure readings a differential between the two pressure sensors will cause a pressure differential error. If a pressure transducer shows a pressure reading of -1.0, that indicates that either there is no pressure sensor connected or the pressure sensor is not functioning. If both pressure sensors are showing a pressure of -1.0 it could indicate a vacuum situation within the vessel. This can happen when the USG is shut down and the clean steam within the USG vessel and steam header condenses. To alleviate this condition, open a valve or port to allow air to enter the vessel to break the vacuum.

Set Point

After the proper water level has been achieved the STEAM-TROL controller will allow the control valve to modulate and allow the heating medium (steam or boiler water) to enter the coil for the production of clean steam. The STEAM-TROL controller uses two pressure transducers to monitor the clean steam pressure within the vessel. When the pressure falls below Set Point the control signal to the steam/boiler water control valve increases causing the valve to open and allow the heating medium to enter the coil as needed to meet Set Point. As the pressure within the vessel approaches Set Point the control voltage being sent to the steam/boiler water control valve decreases, allowing the steam/boiler water control valve to modulate closed and restrict the flow of the heating medium into the coil.

Timed Blowdown

Within the STEAM-TROL settings menus the option for a Timed Blowdown is available. When equipped with a Timed Blowdown a normally closed 24 VAC solenoid valve is utilized. Meaning the output to the 24 VAC Blowdown valve is de-energized while the blowdown is not active. When activated the STEAM-TROL sends 24 VAC to the coil on the solenoid valve causing the solenoid valve to open for a pre-determined duration. The *Duration* is the length of time the blow down occurs (set in seconds) and the *Interval* is the number of hours between blowdown (set in hours). Both setting may be found on the first screen of the STEAM-TROL's Menu.

MODBUS/BAS

The STEAM-TROL controller has built in MODBUS communication that can be used to monitor and report on the following conditions, *"Any Alarm", "Low Water", "High Water", "High Pressure", "Low Pressure", "Pressure Sensor 1 Loss", "Pressure Sensor 2 Loss", "Pressure Differential Error", "Power On", "Blow Down Occurring", "Water Feed Occurring", "Optional Input", "Disabled Remotely", "Pressure Sensor 1 Value", "Pressure Sensor 2 Value", "Level Control", "Voltage Out to Control Valve 1", "Voltage Out to Control Valve 2", and "Set Point Value"*.

The STEAM-TROL controller can have the vessel pressure 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 STEAM-TROL controller can be easily integrated into the customers Building Automation System (BAS). If MODBUS is not the desired communication protocol BACNET IP and BACNET MSTP are also available with the addition of the proper communications gateway.

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DRY CONTACTS

The STEAM-TROL Controller has nine dry contacts. The nine dry contacts are *Power On, Blowdown, Low Water, Water Feed, High Water, High Pressure, Low Pressure, Any Alarm,* and *Optional Input/Output*. These dry contacts are all normally open (NO) and have a 1-amp maximum contact rating. The Dry contacts perform as follows:

1. The *Power On* contact will show an open (∞ Ω) when tested with an ohmmeter and no power is applied. When power is applied the POWER ON dry contact will show a short (0Ω) when tested with an ohmmeter.

2. The *Blowdown* dry contact will show an open (∞ Ω) when tested with an ohmmeter while the timed *Blowdown* is not occurring. The contact will show a short (0Ω) while the timed *Blowdown* is occurring.

3. The *Low-Water* dry contact will show an open (∞ Ω) when tested with an ohmmeter when there is no *Low-Water* condition occurring. The contact will show a short (0 Ω) when a *Low-Water* condition is occurring.

4. The *Water Feed* dry contact will show an open (∞ Ω) when tested with an ohmmeter while no *Water Feed* is occurring. The contact will show a short (0 Ω) when tested with an ohmmeter while the *Water Feed* condition is occurring.

5. The *High-Water* dry contact will show an open (∞ Ω) when tested with an ohmmeter while no *High-Water* condition is occurring. The contact will show a short (0Ω) when tested with an ohmmeter while a *High-Water* condition is occurring.

6. The *High-Pressure* dry contact will show an open (∞ Ω) when tested with an ohmmeter when no *High-Pressure* condition is occurring. The contact will show a short (0Ω) when tested with an ohmmeter while a *High-Pressure* condition is occurring.

7. The *Low-Pressure* dry contact will show an open (∞ Ω) when tested with an ohmmeter while no *High-Pressure* condition is occurring. The contact will show a short (0 Ω) when tested with an ohmmeter while a *High-Pressure* condition is occurring.

8. The *Any Alarm* dry contact will show an open (∞ Ω) when tested with an ohmmeter while no *Alarm* condition is occurring. The contact will show a short (0Ω) when tested with an ohmmeter while *Any Alarm* condition is occurring.

9. The STEAM-TROL is supplied with a normally open (N.O.) contact located on the board at terminal block P7 (terminals 1 - 2) that when this contact is closed the STEAM-TROL will provide a 24 VAC output from terminal block P11 (terminals 1 -2). This is called the *Optional Input/Output.* The *Optional Input/Output* dry contact is located at terminal block P15 (terminals 1 - 2) will show an open (∞ Ω) when tested with an ohmmeter while the *Optional Input/Output (terminal block P7 {terminals 1-2})* contact is open. The *Optional Input/Output* contact (terminal block P15 {terminals 1 -2}) will show a short (0 Ω) when the while the *Optional Input/Output (terminal block P7{terminals 1 – 2})* contact is closed.

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-14 (terminals 3 -4). 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 STEAM-TROL Installation, Operation, and Maintenance Manual for these specific instructions along with instructions for using the *Remote Temperature Read Out.*

REMOTE ON-OFF

The STEAM-TROL 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 STEAM-TROL Controller please refer to the CEM-TROL II Installation, Operation, and Maintenance Manual.