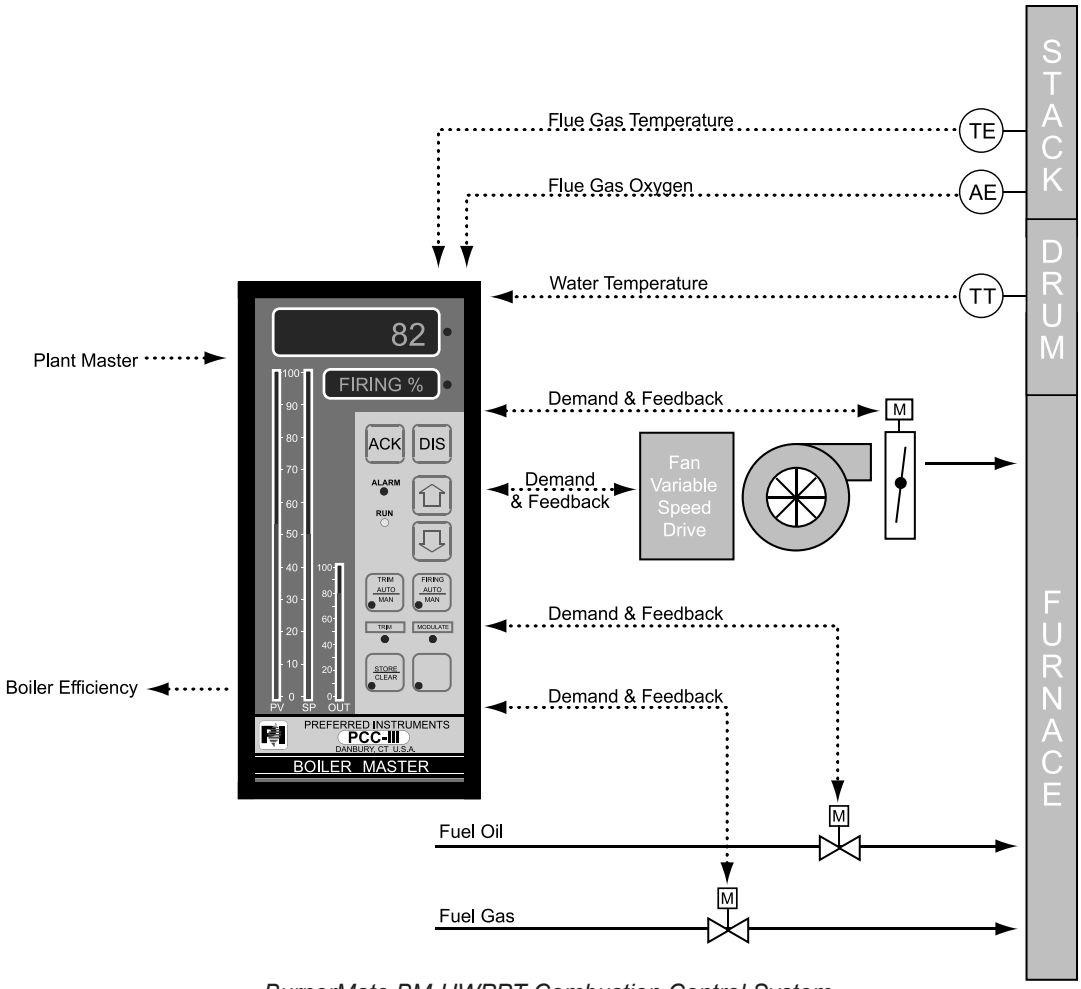
BURNERMATE MODEL BM-HWPPT

Hot Water Boiler Parallel Positioning Combustion Control



BurnerMate BM-HWPPT Combustion Control System

Application

The BurnerMate **Model BM-HWPPT** provides automatic firing rate control for new or existing steam or hot water boilers using parallel positioning combustion control with both Oxygen trim and variable speed fan combustion air flow control. Separate controller outputs are provided for each fuel flow control valve, air control damper and Variable Speed Drive (VSD). Fuel/air ratio is established and adjusted by use of a "soft" function curve of fuel valve position vs. air fan speed and damper position. Cross Limiting using VSD and actuator position feedbacks is employed for safety and to prevent combustibles or smoke during load changes.

- Hot Water Temperature Is Maintained using local PID setpoint control. PID control provides efficient, accurate control by eliminating drum pressure "offset" (error). Also responds to Plant Master demand
- Minimum Fuel Usage – Flue gas Oxygen is used to continuously adjust (trim) the fuel/air ratio. Oxygen trim saves fuel by fine tuning the burner to operate safely and reliably at reduced excess air levels throughout the burner firing range
- Minimum Fan Power Usage – Fan speed control minimizes damper pressure drop related to fan power usage
- Real Time Boiler Efficiency Display – Allows the boiler operator to instantly identify inefficiencies and potential operational problems
- Safety – Flue gas temperature and Oxygen are monitored. Warning alarms and burner safety shutdown interlocks are available. VSD speed and actuator position feedbacks are continuously monitored and the burner trips if any are out of position

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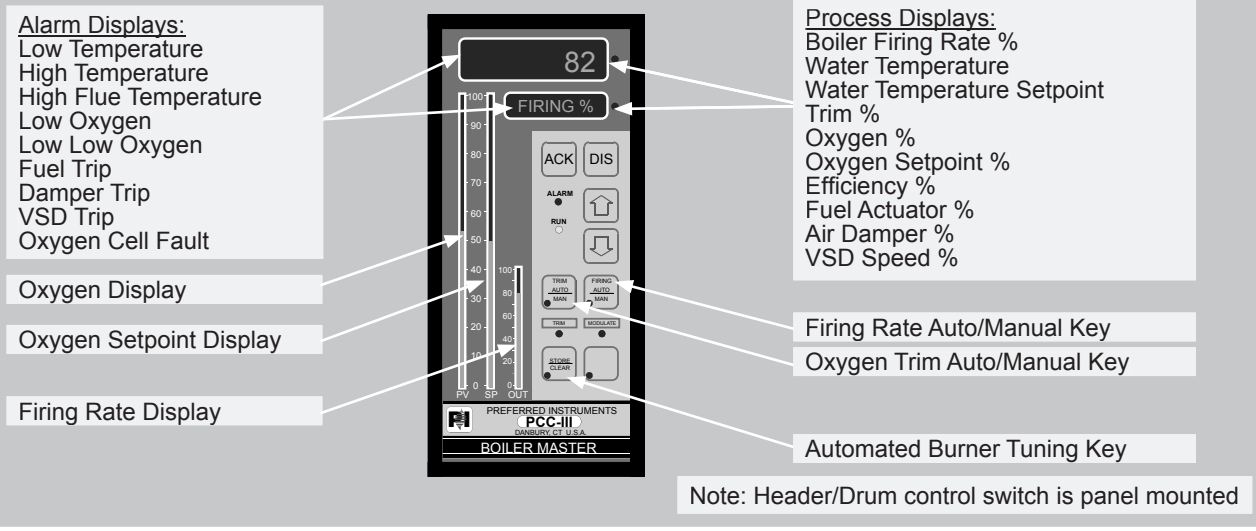

BurnerMate Model BM-HWPPT Front Panel

Specifications

BurnerMate Panel

Controller:	**PCC-III-GZS0** (*see page 190*)
Input Power:	120 Vac (+/- 15%)

Inputs

Water Temperature:	4-20 mAdc
Flue Gas Temperature:	T/C (Option "-ZP")
Flue Gas Oxygen:	**ZP** Probe (Option "-ZP")
Plant Master:	4-20 mAdc*
Fuel Gas Actuator Feedback:	Potentiometer*
Fuel Oil Actuator Feedback:	Potentiometer*
Air Actuator Feedback:	Potentiometer
VSD Speed Feedback:	4-20 mAdc (Option "-VSD")

Outputs

Boiler Efficiency:	4-20 mAdc
Fuel Gas Valve Actuator:	Triac*
Fuel Oil Valve Actuator:	Triac*
Air Damper Actuator:	Triac
VSD Speed Demand:	4-20 mAdc (Option "-VSD")

*These features are standard, but their use is selectable at time of start-up.

Ordering Information

Description	Catalog Number
Hot Water Boiler Control	**BM-HWPPT**

Additional Ordering Information and Suggested Specifications

1. See page 198 for **Model ZP** In-Situ Oxygen Sensor
2. See page 211 for Variable Speed Drive (VSD)
3. See page 205 for actuator
4. Consult factory for low fire change over and VSD bypass

Order Sensors Separately (Optional)	Catalog Number
Hot Water Temperature Transmitter, 4-20 mAdc, 0 to 500° F, NEMA 4, Smart with 4½" depth	**Consult Factory**
Thermowell, SS, 4½" x ½ NPT	**Consult Factory**

BURNERMATE MODEL BM-HWPPT
Suggested Specifications

1. Application
Supply a self contained Boiler Control System to provide both electricity and fuel savings within the limits of stable burner operation. The control system shall be microprocessor-based and suitable for wall or windbox mounting. Provide all the logic required to ensure automated pre-purge, post-purge, light-off, and burner modulate cycles.

2. Combustion Control
A PID based, parallel positioning control strategy shall position the fuel valve(s), combustion air damper, and forced draft fan speed for minimum fan kWh usage, and shall continuously trim the fuel/air ratio based on measured flue gas Oxygen levels to minimize fuel consumption. Systems that control forced draft fan speed based simply on burner windbox pressure are not acceptable. The system shall position the fuel and combustion air final control elements' movement and VSD speed with "Position Cross-Limiting" to insure that a safe fuel/air ratio is maintained under all load change conditions. Fuel/air ratio shall be established and adjusted by the use of a "soft" function curve relating fuel valve position to air damper position. Provide a PID based Oxygen trim control strategy with automatic adaptive gain for stable operation. Flue gas Oxygen setpoint shall vary automatically based on firing rate. Fuel valve and air damper shall modulate in response to an external Plant Master demand signal or measured hot water temperature compared to setpoint. At a minimum, the control system shall display the following: Boiler Firing Rate, Hot Water Temperature, Hot Water Temperature Setpoint, Boiler Efficiency, Trim %, Flue Gas Oxygen Setpoint, Flue Gas Oxygen, Flue Gas Temperature, Fuel Valve Position, Air Damper Position, and VSD Speed and alarm messages for Low Temperature, High Temperature, High Flue Gas Temperature, Low Oxygen, Low Oxygen Trip, Fuel Trip, Damper Trip, VSD Trip, and Oxygen Cell Fault. The control system shall include a dedicated, normally energized, fail safe relay output contact in the "running" interlock circuit of the flame safeguard that will cause a fired equipment shutdown in the event of: Low Oxygen, Air Damper Actuator Fault, Fuel Valve Actuator Fault, VSD Fault, or Controller Fault.

3. Hot Water Temperature Setpoint
When the controller setpoint is in automatic mode the control system shall establish the setpoint based on outside air temperature. When in manual mode, the operator may adjust the setpoint via the front panel display.

4. Boiler Efficiency Display
Real time boiler efficiency shall be calculated and displayed, thereby allowing the boiler operator to instantly identify inefficiencies and potential operational problems. The calculation shall be based on the ASME "by losses" method and must utilize real time inputs of boiler firing rate, flue gas Oxygen, flue gas temperature and fuel selected. Two sets of adjustable fuel chemistry data parameters shall be included, and firing rate scaled radiation losses shall be used for maximum accuracy. Calculations that rely on fixed constants, or manually inputted values for these conditions, are not acceptable. NOTE: Flue gas temperature transmitters must be provided and installed at each boiler outlet.

5. Boiler Controllers
To assure system integrity, a pre-wired and factory-tested, microprocessor-based, multiple loop controller system shall be provided. The controller shall include process variable and "first - out" annunciator displays with 16 character English language descriptions, two 50 segment bargraphs to display the controlled variable and setpoint, one 20 segment bargraph to display the loop output, 120 Vac discrete inputs and outputs, and 4-20 mAdc analog inputs and outputs. Configuration and calibration data shall be stored on redundant non-volatile EEPROM memory modules. The backup memory module shall automatically download into the primary memory in the event of primary memory data corruption. All control logic, tuning, and fuel/air ratio curves shall be field configurable. If required to allow field modifications to the controller logic, provide one configuration tool or laptop computer per facility.

6. Flue Gas Oxygen Analyzer
Provide a boiler breeching mounted in-situ, zirconium oxide Oxygen analyzer for each boiler. Extractive or "Wet Cell" type Oxygen analyzers are not acceptable. The probe shall be of a suitable length for sensing the Oxygen level in the middle ⅓ of the breeching. All wetted parts shall be stainless steel. The Oxygen analyzer shall include a digital controller that performs continuous self-diagnostics with diagnostic codes for at least 10 common faults. The system shall automatically send the trim actuator to the 'null' position and trigger the alarm dry contacts in the event of an Oxygen analyzer fault. The detector shall be field replaceable without removing the probe from the stack and shall not require special tools. The analyzer shall automatically perform periodic detector cell impedance tests to be used by the operator as an indication of calibration shift. Analyzer calibration shall be pushbutton semi-automatic (no trim pots), with English language prompts and diagnostic messages. Analyzer output shall be field selectable as 0-10% or 0-21% without field recalibration.

7. Communication
Each controller shall be equipped with an optically isolated RS485 communications data highway and shall allow: Auto/Manual mode change, setpoint change, variation of the manual output, sensing and silencing of alarms, change of any configuration parameter (including PID tuning constants), change of timers, etc. Provide all equipment capabilities specified in this paragraph, even if a connecting SCADA system is not included in this project.

8. Quality Assurance
The system shall be factory manufactured and tested according to UL508A requirements (CSA C22.2 #14 for use in Canada). The control system shall be a Preferred Instruments, Danbury, CT, **BurnerMate Model BM-HWPPT-ZP-VSD**.