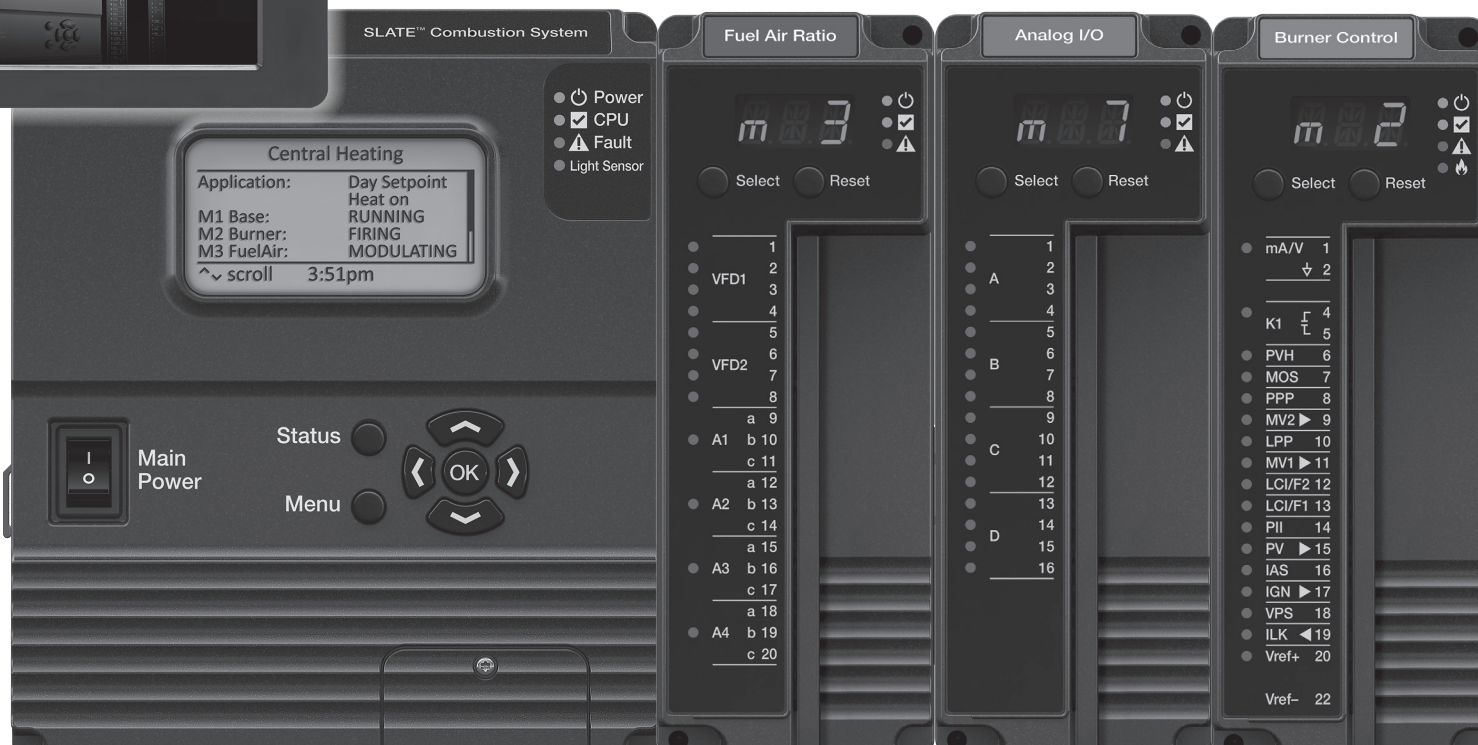


SLATE™

Integrated Combustion Management System

SUBMITTAL SPECIFICATION



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CONSTRUCTION

A. Description: The integrated combustion management system shall combine configurable safety and programmable logic ancillary control into a singular control platform in a modular format. Each boiler/burner control system shall be factory equipped with a pre-configured combustion management system and Human Machine Interface (HMI).

BOILER/BURNER CONTROLS

A. Description: The boiler/burner integrated combustion management system shall provide automatic burner sequencing, fan control, electronic ignition, flame supervision, critical safety load control (pilot valve(s), main fuel valve(s)), system status indication, firing rate control, limit control, load control, multiple control loops (e.g., central heating low temp water, central heating high temp water, central heating steam, domestic hot water control, etc), circulation pump control, system or self-diagnostics, and communications for a display, other devices, Building Automation System, or industrial control system.

Burner management operation including; automatic sequencing of the burner through standby, safe start check, pre-purge, flame ignition trials (pilot flame establishing period, main flame establishing period), run and post purge. Flame proving and lockout on flame failure during pilot flame proving, main failure proving, or run. Purge damper/valve position for pre-purge, Light-off damper/valve position for flame ignition trials. Full modulating control of fuel and combustion air.

The combustion management system shall meet the requirements and be certified to; cULus, CE, FM, ISO 23552-1, and SIL 3 capable.

B. The integrated combustion management system and the associated control panel shall be factory pre-wired supplied with

each boiler/burner unit. The system shall consist of an array of modules implementing a singular controller; Honeywell SLATE™ Integrated Combustion Management System, programmed at the OEM production facility. The control panel shall be mounted on the boiler/burner, Base Module with light sensor backlit LCD screen local Operator Interface for monitoring the individual boiler.

C. The integrated combustion management system shall provide advanced system functions, configurable safety and programmable logic using Niagara AX wire sheet editor, that allow standard and customizable control solutions including tamper resistant control logic and password protection. The wire sheet editor shall be common for HMI and control logic development and shall provide a means for backwards compatibility enabling future system changes, module expansion, and external system integration.

The integrated combustion management system shall provide a flexible DIN rail mounting configuration for optimizing control panel space. The DIN rail mounting system must be capable of contiguous module connections or detached module connections with pre-assembled wiring harnesses. The system architecture must be capable of sharing system power and module inter-communication without requiring external wiring. (SLATE™ accomplishes this with the use of a common subbase).

Each module in the system must employ mis-wiring protections and allow for replacement without requiring reprogramming or rewiring. (SLATE™ accomplishes this with backup/restore functions, USB memory sticks, and SD cards).

The integrated combustion management system shall provide universal voltage operation of 24Vdc or 24Vac to 240Vac powered systems with only wiring changes. System programming or external voltage level shifting is required to change between different voltage levels. Different voltage levels may also be employed on each of the modules.

D. Integrated Combustion Management System modules:

1. Base module shall provide:

- a.** Storage of data for device configuration and control program initialization.
- b.** Backlit LCD screen with light sensor, local Operator Interface for monitoring the individual boiler through menu driven messaging
- c.** Power supply for all modules with multiple voltage options.
- d.** Real time clock.
- e.** Event log storage for lock-outs, fault history, and OEM requested events.
- f.** Trend logging for OEM specified data.
- g.** Network identification of the system as singular device.
- h.** External communication 10BASE-T for Ethernet and /or RS485.
- i.** Web services for direct browser access to the system, both Honeywell provided and designer customized pages, based on JavaScript, such as implemented and supports HTML5.
- j.** Password protection of configurable programmable logic and fuel air ratio control.
- k.** Alarm annunciation.
- l.** Historical fault and alarm indication via HMI.
- m.** Text readable system fault and troubleshooting.
- n.** Module auto addressing via platform communication bus.
- o.** Safety and programmable logic integration system.
- p.** 24 VDC or 24 VAC to 240 VAC power.

2. Burner Control module shall provide:

- a.** Configurable safety.
- b.** Flame safeguard control, 24 VDC or 24 to 240 VAC, primary or programmer, semi-automatic or fully automatic.
- c.** Valve proving.
- d.** Dual fuels capability.
- e.** Examine all load terminals to assure it is capable of

recognizing the true status of the external controls, limits, and interlocks. If any input fails this test, the burner control module and combustion management system shall lockout on safety shutdown.

- f.** Closed loop logic test verifies integrity of safety critical loads and must be able to lockout on safety shutdown.
- g.** Preignition interlocks (fuel valve proof of closure, etc) and flame signal checked during standby, purge, and off cycles.
- h.** Light-off and Purge position proving.
- i.** Tamper proof timing and safety logic.

3. Flame Amplifier module shall provide:

- a.** Signal from flame detector to indicate presence of flame, operated by Burner Control "parent" safety module.
- b.** Display for flame signal strength.
- c.** DIN rail or remote mounting.
- d.** Dynamic checking of the flame amplifier module. The integrated combustion management system flame amplifier module must be able to recognize a no flame signal during this dynamic amplifier check.
- e.** UV with dynamic ampli-check and dynamic self-check.
- f.** Low voltage IR with dynamic ampli-check.
- g.** Low voltage UV/visible with dynamic ampli-check.
- h.** Rectification with dynamic ampli-check and dynamic self-check.
- i.** Daisy chain option to interface with multiple detectors.

4. Fuel Air Ratio Control module shall provide:

- a.** Relational control between fuel, airflow, and flue gas recirculation for the power burner.
- b.** Parallel-positioning control of up to four SLATE™ actuators and /or two variable frequency drives, up to (24) point curve with no slope constraints that would limit the steepness of the curve.
- c.** Control of the SLATE™ actuators and receive feedback with component anti-swap protection.
- d.** Curve verification and off curve checking algorithms.
- e.** Dual fuels capability.

- f.** O₂ Trim control, or other flue gas constituents or temperatures.
 - g.** Combustion control with programmable display.
 - h.** Control of the SLATE™ actuators; 50, 150, 300, or 900 inch pound torque
 - i.** NEMA 1 or NEMA 4 actuators.
 - j.** Internal actuator tests including temperature and health diagnostics.
 - k.** Control of 3rd party actuators using appropriate shaft location feedback.
- 5.** Limit module shall provide:
- a.** The capability to directly receive analog signal to create limits on either pressure or temperature or other.
 - b.** Four analog sensor cell inputs or two sets of redundant inputs.
 - c.** Twelve limit blocks, with each block monitoring any sensor or pair of sensors.
 - d.** Redundant relay output.
 - e.** Stack temperature sensor indication, alarm, and shutdown.
 - f.** UL353 limit operation rating.
- 6.** Analog I/O module shall provide:
- a.** Analog input and output capability for all combustion and ancillary control applications.
 - b.** Multiple combination of analog functionality for each cell.
 - c.** Four analog cells, with up to (12) signal inputs and outputs.
 - d.** The capability to support voltage, resistance, current, PWM, Tachometer, Thermocouples, RTD, Bridge and NTC sensors.
 - e.** The capability to configure inputs and outputs as voltage, current, or PWM signals.
 - f.** Universal analog cell logic.
 - g.** Utilize solid state controls and sensors to provide control functions such as:
 - i.** Modulating control algorithm by Proportional Integral Derivative (PID) logic.
- ii.** Temperature; water, air, and stack
 - iii.** Hydronic boiler system outdoor compensation and reset
 - iv.** Remote set point control
 - v.** Assured low fire cut off logic
 - vi.** Operating and modulating control
 - vii.** Steam pressure transmitter interface for steam pressure indication and on/off and modulating control
 - viii.** Water temperature transmitter for boiler water temperature indication, thermal shock protection, on/off and modulating control
 - ix.** Calculation of boiler efficiency
 - x.** Economizer operation
 - xi.** Analog monitoring including; steam flow, fuel flow, water flow, flue gas inlet and outlet temperature, feed water temperature, oil temperature, and gas and oil pressure
- 7.** Digital I/O module shall provide:
- a.** Digital input and output capability for all combustion and ancillary control applications.
 - b.** Universal I/O configurable in multiple combination up to (14) optical inputs or (6) relay outputs.
 - c.** Automatic adaptation to 24VDC or 24VAC to 240VAC.
 - d.** Provides discrete power and or isolated relay signals.
- 8.** Annunciator module shall provide:
- a.** Status monitoring of a series string of limit, control, and / or interlock contacts for diagnostic of a commercial or industrial burner.
 - b.** One relay output.
 - c.** Automatic adaptation to 24VDC or 24VAC to 240VAC.
 - d.** 14 opto – inputs
 - e.** Programmable tagging and interlock/limit string configuration

E. The platform shall be identified as a single network device, supporting communications protocols:

1. BACnet /IP -via 802.3i 10BASE-T.
2. BACnet /MSTP -via RS-485.
3. Modbus RTU /TCP -via 802.3i 10BASE-T.
4. Modbus RTU /485 -via RS-485.
5. Ethernet and Web Browser access (httpd) -via 802.3i 10BASE-T

F. The platform shall provide a web-based user interface for viewing system status, and viewing, creating, or modifying configurations. (Where Shown on Drawings). The touch screen graphical operator interface provides overview interface with combustion system parameters and configuration, burner management system, alarms, diagnostics, troubleshooting, alarm history, system firing rate, limit operation, analog – digital – first out annunciation, flame signal, fuel air ratio, and monitoring:

1. Manual control of burner firing rate increment and decrement the firing rate.
2. Indication of combustion management system status and diagnostics
3. Display of operating parameters
4. Troubleshooting information and diagnostics

The color touch screen display shall be:

- Honeywell R8001K5001 (7")
- Honeywell R8001K1010 (10")
- Third-party panel PC
- Tablet or SmartPhone

G. Multiple Boiler Management: The OEM shall factory configure the Honeywell SLATE™ Integrated Combustion Management System for Lead /Lag Master Operation of a multiple boiler heating plant. The system shall be configured with all components of the system listed as products of a single manufacturer under the appropriate category by the Underwriter’s Laboratories, Inc. and in accordance with the appropriate CSD-1/NFPA 85 sections. System shall be commissioned by a factory authorized representative or supplier/installer with factory trained personnel.

H. Operational Sequence:

1. Shall comply with requirements specified in MasterSpec Section 23 09 93 Sequence of Operations for HVAC Controls.
2. Shall comply with requirements specified in MasterSpec Section 25 95 00 Integrated Automation Control Sequences for HVAC.

I. SLATE™ System Integration: Each system shall function as a single network device responding to a single address, multiple SLATE™ systems may communicate “peer to peer” via BACnet/MSTP and/or BACnet/IP communication protocols.

J. Building Automation System Interface: The system shall function as a single network device responding to a single address or be comprised of multiple SLATE™ controllers, communicating via Modbus/RS485 or BACnet/MSTP and/or Modbus/TCP, BACnet/IP and/or HTTP communication protocols:

1. Shall comply with requirements specified in MasterSpec Section 23 09 23 Direct-Digital Control System for HVAC.
2. Shall comply with requirements specified in MasterSpec Section 25 55 00 Integrated Automation Control of HVAC.



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For More Information

For more information on the SLATE system please refer to the SLATE User Guide document located on our website at <http://combustion.honeywell.com/SLATE>

The Honeywell Thermal Solutions family of products includes Honeywell Combustion Safety, Honeywell Combustion Service, Eclipse, Exothermics, Hauck, Kromschroder and Maxon.

To learn more about our products, visit ThermalSolutions.honeywell.com or contact your Honeywell Sales Engineer.

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