PRODUCT GUIDE SPECIFICATION

FIREYE PPC4000 PARALLEL POSITIONING SYSTEM WITH BURNERLOGIX FLAME SAFEGUARD BURNER MANAGEMENT

GENERAL OVERVIEW

1.1.1. Each burner shall be equipped with a Micro-processor Based Burner Management Flame Safeguard Control System. The control shall provide: (1) automatic sequencing of the boiler system through pre purge, pilot trial for ignition (PTFI), main trial for ignition (MTFI), run (AUTO), and post purge. (2) flame proving and lockout on flame failure during PTFI, MTFI, and AUTO.

1.1.2. The control system shall be provided by Fireye or written approved equal.

1.1.3 The control system shall be made in the U.S.A.

2. PARALLEL POSITIONING CONTROL

2.1.1. Each burner shall be equipped with a state of the art microprocessor based stand alone parallel positioning control. The control shall be constructed utilizing surface mount technology thus reducing panel space requirements

2.1.2. The control system shall be provided by Fireye or written approved equal.

3. CODES AND STANDARDS

3.1.1. The control shall be listed by Underwriters Laboratories in accordance with US and Canadian standards and Factory Mutual for its intended purposes.

Underwriter's Laboratories Inc.:

File MJAT.MH10808, UL353
• LISTED SECTION OF A FUEL AIR RATIO SYSTEM

File MJAT2.MH10808, UL353 - COMPONENT
File MJAT7.MH10808, CSA-C22.2 No 24
• LISTED SECTION OF A FUEL AIR RATIO SYSTEM

File MJAT8.MH10808, CSA-C22.2 No 24

Factory Mutual:

FM Class 7610

3.1.2. The control shall be in compliance with ASME/CSD-1.

3.1.3. The control shall be in compliance with NFPA 85, Boiler and Combustion Systems Hazards code.

PARALLEL POSITIONING SYSTEM

4. SYSTEM HARDWARE

4.1.1. Each burner shall be equipped with a microprocessor based fully functional stand alone parallel positioning system of surface mount design to reduce cabinet space.

4.1.2. The parallel positioning control system shall be interlocked with the flame safeguard system via hard wired dry (volt free) contact. The contact shall be wired in such a manner as to assure a safety shut down and lock out in the event of a safety related fault.

4.1.3. The parallel positioning controller shall be capable of powering up to four servomotors directly from the main controller, six additionally using a low voltage external power supply. Servomotors will be of the low voltage type and controlled by secure ModBus communications via two wire cable.

4.1.4. Servomotors in the following torque ranges shall be available; 3 ft/lb, 15 ft/lb, 37 ft/lb. Servomotors will be of NEMA4 design and will be available with or without quick disconnects for ease of installation.

4.1.5 The basic system shall include sequencing for up to four boilers without need for an external "plant master" controller. The sequence of boilers shall be adjustable and allow for different sequences depending on which boiler is designated as lead. Adjustable on and off delays shall be included to prevent short cycling. The sequencing system will include fully adjustable lag start and stop points based upon lead firing rate. Adjustable internal timers shall be available so as to reduce lag boiler short cycling.

4.1.6. The parallel positioning controller shall include Cold Start Thermal Shock Protection for the boiler that includes low fire and segmented firing methods. Cold start thermal shock protection shall provide this adjustable control of the burner, firing rate on a cold start, thereby limiting mechanical stress due to thermal differences.

4.1.7. The parallel positioning controller shall contain a Real Time Clock that enables time stamping for fault events and history. This shall enable time switching functions, like night setback to be initiated via the internal time clock.

4.1.8. Each parallel positioning control will have up to four independent fuel profiles. Profiles will not be limited to specific fuels. That is, all four could utilize the same servomotors for various operating conditions or fuel availability. Each profile shall have up to a maximum twenty four (24) points.

4.1.9. Two independent PID control loops shall be available to optimize the response of the combustion control to various load conditions.

4.1.10. All connections to the main controller will be via un-pluggable connectors eliminating the need for a separate wiring base.

4.1.11. The main controller shall be capable of mounting in any orientation without compromising system temperature ratings. The control system shall operate within the following limits:

Voltage 120 VAC (+10%, -15%) 50/60 Hz
Power Consumption: 25 VA
Temperature Rating: 32°F to 140°F (0°C to +60°C)

4.1.12. Ten safety rated digital/analog inputs shall be provided on the main controller. These inputs shall be configurable for, but not limited to, the following; Burner On/Off, Low Fire Hold, Manual Modulation, Setpoint 2 Select, Remote Reset, Forced Setback, Setback Override

4.1.13 A sensor input can be configured to allow for remote modulation from Building Automation Systems or other systems.

4.1.14 The main control will contain the means to accept an SD (secure digital) card. The SD card will provide to the user a method to backup and restore all configuration data and profiles, all profiles, and configuration data.

5. USER INTERFACE

5.1.1 Each combustion control system shall be equipped with a NEMA4 four-line backlit liquid Crystal (LCD) keypad display. The keypad display will provide all relevant information during commissioning and operation. The keypad display shall indicate Steam pressure, Boiler firing rate, Boiler status, Boiler set point, Fuel valve position, Air damper(s) position, Modulation status (auto/man) and any Faults present or clearable. All programming of the combustion control shall be done via the keypad display.

5.1.2 The keypad display will incorporate three levels of

passwords for protection against unauthorized changes. One level shall be for operators and prohibit the access to any safety critical settings.

5.1.3 The keypad display will include an INFO key for access to internal variables for system diagnostics, a burner on/ off key and a low fire key to allow operator control of the burner directly from the keypad.

6. VARIABLE SPEED DRIVE

6.1.1. The combustion control system shall have provisions for utilizing a Variable Speed Drive to control combustion air, fuel, and/or flue gas recirculation..

6.1.2. The associated VFD controller card shall fit within the combustion control so as not to require additional panel space.

6.1.3. The VSD card shall include two (2) independent channels with each channel providing one (1) 4-20mA analog output, one (1) 4-20mA analog input and one (1) encoder input.

6.1.4. Any channel of the VSD card can be alternately used to provide 4-20mA outputs and mapped to chart firing range, sensor value or servo positions.

7. OXYGEN TRIM

7.1.1. The combustion control system shall incorporate an in situ Zirconia Oxide heated exhaust gas probe. The probe design shall be such that particulate in the flue gas stream does not impact directly on the probe filter thus increasing uptime.

7.1.2. The Zirconia Oxide probe shall not employ any pumps or gas preparation equipment such as solid state coolers. No probe condensate pumps will be permitted.

7.1.3. The keypad display will indicate; Oxygen level, Gross stack temperature, Combustion efficiency, Ambient air temperature, Calculated CO2 levels and Oxygen target level.

7.1.4. The oxygen probe shall be directly connected to the combustion control via secure communications.

8. FLAME SAFEGUARD SYSTEM

The boiler management system shall provide the following capabilities:

8.1.1. User selectable burner operating parameters such as purge time, PTFI & MTFI time, post purge time and specific operation of the various interlocks.

8.1.2. All burner operating parameters become permanent after 8 hours of main burner on time.

8.1.3. An adaptive Infrared flame scanning detection system where the characteristics of the pilot and main flames are separately learned in order to set the on/off thresholds and optimizing safety.

8.1.4. Flame proving and lockout on flame failure during PTFI, MTFI and AUTO.

8.1.5. The control shall have a non-volatile memory which allows it to remember burner history and present position, even after a power interruption.

8.1.6. The control shall provide a check-run switch to allow a qualified service technician to halt the burner sequence in any of five different positions:

High fire purge
Low fire purge
Pilot trial for ignition
Main trial for ignition
Low fire (burner on)

8.1.7. Alpha-numeric multi-line LCD or VFD display to continually indicate operating parameters as well as first out annunciation.

8.1.8. SMART light emitting diodes (LED's) to provide operating status as well as lockout code identification.

8.1.9. Damper motor high and low fire damper motor position proving.

8.1.10. Non-volatile lockout and history files with the last 10 lockouts readable through the optional display.

8.1.11. Field replaceable 10 amp fuse in the fuel valve and ignition circuit for short circuit protection.

8.1.12. The control system shall operate within the following limits:

Temperature: -40°F to 140°F (-40°C to 60°C)
- Humidity: 0% to 85% Non-condensing
- Voltage: 120 VAC (+10%, -15%) 50/60 Hz
- Power Consumption: 20 VA maximum

-2000 VA maximum connected load
-0.5G continuous vibration

9. DISPLAY MODULE

9.1.1. The Display Module shall consist of a two (2) line with sixteen (16) characters per line liquid crystal (LCD) or vacuum fluorescent (VFD) display and multi-functional 4-key, positive action keypad.

9.1.2. The display module will provide the user the option of displaying messages in one (1) of six (6) languages.

9.1.3. The messages shall be clear, concise information concerning system timing, present burner sequence position, lockout causes (including wiring base terminal designations) and historical data.

9.1.4. During the firing cycle, a constant read-out of the flame signal will be displayed.

9.1.5. The Display Module shall incorporate a four (4) key keypad to allow the user direct local access to the following information:

Number of burner operating cycles.
Number of burner lockouts.
Number of system hours.
Reason for the last ten lockout along with the Burner cycle and burner hour when the lockout occurred.
Average pilot and main flame signal strength.
Status of high fire and low fire end switches.

9.1.6. The LCD keypad/display module shall operate within the following temperature limits: -4°F to 140°F (-20°C to 60°C).

9.1.7. The VFD keypad/display module shall operate within the following temperature limits: -40°F to 140°F (-40°C to 60°C).

9.1.8. The keypad/display module shall have the capability to be remotely mounted to a distance of 8 feet (2.43 meters).

9.1.9. When remotely mounted, both the LCD and VFD display modules shall provide NEMA4 protection.

10. WIRING BASE

10.1.1. A pre-wired or terminal block wiring base shall be provided which will allow for all system terminations to be completely wired prior to the installation of the control. The control shall be removable or replaceable without removing any wiring terminations.

10.1.2. The wiring base shall provide line voltage terminal inputs from direct connection of limit and operating controls, fuel valve interlock, damper position interlocks, running interlocks (such as air flow, gas pressure, oil pressure, oil temperature), burner motor, ignition, pilot valves, main fuel valves, firing rate motor, and alarm.

10.1.3. The pre-wired wiring base shall be provided with 4 foot leads sufficiently sized to carry the load currents and each wire is labeled in accordance with its function.

10.1.4. The terminal block wiring base shall allow the user to measure the voltages and signals on any of the terminals without having to remove the control from the wiring base.

11. SYSTEM SOFTWARE

11.1.2. The control shall provide to the user a range of keypad selectable operational parameters that will allow the control to be properly suited to meet the application requirement. These parameters shall include purge time, PTFI/MTFI timings, post purge time, terminal 6 operation, M-8 prove open, M-D prove open, 3-P prove open, prove M-D during TFI, baud rate and unit address.

11.1.3. User programmable safety parameters become permanent after 8 hours of main burner operation.

12. SEQUENCE OF OPERATION

12.1.1. The control shall accomplish a safe start component check during each start. This shall prevent the burner from firing under any condition which causes the flame relay to assume and hold its energized position due to the presence of an actual flame, a flame simulating component failure or mechanical failure.

12.1.2. A purge period of not less than 30 seconds with a damper driven to the open position and an interlock circuit provided to prove air flow rate during the purge period. A starting interlock circuit is required to prove that the burner equipment is in the low fire position at

12.1.3. The time of ignition, plus an interlock to prove air flow during the purge and firing cycle.

12.1.4. Limited trial-for-ignition of pilot flame restricted

to 10 seconds, trial-for-main flame restricted to 10 or 15 seconds (selectable) for oil or gas.

12.1.5. Safety shutdown following flame failure, with fuel and ignition circuits de-energized in not more than 4 seconds.

12.1.6. A post purge of not less than 15 seconds following a shutdown.

12.1.7. The system shall recycle automatically under control of the operating control and when power is restored following a power failure. Manual reset shall be required following any safety lockout, even after a power failure. When in a lockout condition, power interruptions will not recycle the control.

12.1.8. The control shall provide a check-run switch which shall allow a qualified service technician to halt the burner sequence in any of four different positions.

13. SAFETY PROVISIONS

13.1.1. A self diagnostic circuit within the control will identify module failures and an appropriate message will be displayed for servicing. This circuit will cause a safety shutdown should any component in the control fail. For example, if the chassis section is malfunctioning, the display module will display the message

"LOCKOUT CHECK CHASSIS"

13.1.2. The control will continually test the status of all safety critical loads (ignition transformer, pilot fuel valve, main fuel valve) to insure they are operating properly.

14. ANNUNCIATION AND DIAGNOSTICS

14.1.1. First out annunciation with burner sequence position indication.

14.1.2. Indication of failures at start up or during normal sequence operation.

14.1.3. Test itself for failure, detect and isolate an alarm, and report internal circuit faults.

14.1.4. Multiple language text description of system fault.

14.1.5. Maintain the last 10 faults with burner hour and burner cycle stamp in historical memory, accessible through the display or remote communications.

15. REMOTE COMMUNICATIONS

15.1.1. The burner management system shall operate either as an independent stand alone control, or as part of a distributed system network. In a distributed system network, multiple controllers are connected via a data link (a single twisted shielded pair wire) to a Supervisory Master Controller (eg: personal computer, PLC, building management system).

15.1.2. Up to 31 burner management controls can be connected together in a multi-drop configuration on a single data link.

15.1.3. The communication protocol for the distributed system network shall be MODBUS-RTU.

15.1.4. The distributed network shall offer selectable baud rates, 4800, 9600, 19200 or 38400 bits per second.

16. WIRING

16.1.1. All wiring shall be in accordance with National Electrical Code and local electrical codes.

16.1.2. The installing contractor shall be responsible for insuring that the conduit size and wire size, type and quantities are applicable for the installation and equipment supplied.

17. PRODUCT INFORMATION

Parallel Positioning System	
PPC4000	Parallel positioning system, 120 VAC input. Used with flame safeguard control.
NXD410	User interface with keypad, 24 VDC operation, 4 line back lit LCD display, panel mount only, includes mounting brackets.
59-562-2	Cable assembly, 10 feet length, for interfacing NXD410 to PPC4000
FX04	Servo motor, 24 VDC operation, 4Nm, 3 lb.-ft torque, **without** connectors, accepts ½ inch NPT fitting, minimum travel time of 30 seconds for 90°
FX04-1	Servo motor, 24 VDC operation, 4Nm, 3 lb.-ft torque **with** connectors, minimum travel time of 30 seconds for 90°
FX20	Servo motor, 24 VDC operation, 20Nm, 15 lb.-ft torque, **without** connectors, accepts ½ inch NPT fitting, minimum travel time of 30 for 90°
FX20-1	Servo motor, 24 VDC operation, 20Nm, 15 lb.-ft, **with** connectors, minimum travel time of 30 seconds for 90°
FX50	Servo motor, 24 VDC operation, 50Nm, 15 lb.-ft. torque, **without** connectors, accepts 1/2 inch NPT fitting, minimum travel time of 30 seconds for 90°
FX50-1	Servo motor, 24 VDC operation, 50Nm, 15 lb.-ft. torque, **with** connectors, minimum travel time of 30 seconds for 90°
59-565-6, -40	Cord set, 6 feet, ½" NPT connectors on both ends, 40 feet, ½" NPT connectors on both ends, PVC jacket, temperature rating -40°C to 105°C, meets NEMA 1, 3, 4, 6P and IEC67
129-192	Connector, field wired. Used for FX04-1, FX20-1, FX50-1 servos with connectors. Use cable 59-561
129-194	Servo (male) connector kit for FX04, FX20, FX50
59-561	Cable, 2 twisted pair, 2 power wires, suitable for servo hookup
BLPS-15, -25, -30	Pressure transducer, 0-15 psi (0-1030 mb), -14.7 to 25 psi (-1013 to 1720 mb), 0-30 psi (0-2070 mb), 4-20 mA output linear with pressure. ¼" NPTF mounting. Screw terminal connection and conduit adapter cover.
BLPS-200, -300	Pressure transducer, 0-200 psi (0-13.8 Bar), 0-300 psi (0-20.7 Bar), 4-20 mA output linear with pressure. ¼" NPTF mounting. Screw terminal connection and conduit adapter cover.

17. PRODUCT INFORMATION CONT'D.

TS350-2, -4, -8	Temperature sensor, Range 32°F to 350°F (0°C to 176°C), 4-20 mA output, linear with temperature. Insertion length is 2, 4, 8 inches. Stainless steel thermowell included.
TS-752-2, -4, -8	Temperature sensor, Range 32°F to 752°F (0°C to 400°C), 4-20 mA output, linear with temperature. Insertion length is 2, 4, 8 inches. Stainless steel thermowell included.
NXCESO2-8, -16, -30	O2 probe assembly, 8", 16", 30" insertion
NXCESO2P42	Cartridge, probe replacement
35-381-2	Flange, O2 probe mounting
129-189	Cover, mounting flange
NXCESVFD	VFD Expansion card for PPC4000
Burner Management	
YB110**	Flame Safeguard Chassis and Amplifier type. (Specify IR for AutoCheck Infrared, UV for non self-check UV, UVSC for self-check UV).
YP1**	Programmer Module for Flame Safeguard Control. (Specify YP100, YP102, YP138 or YP1 13 to meet application requirements).
60-2810-1	Pre-wired wiring base for Flame Safeguard Control (surface mounted - UL listed).
60-2812-1	Closed Terminal block wiring base for Flame Safeguard Control (cabinet mounted - UL recognized).
60-2814-1	Open Terminal block wiring base for Flame Safeguard Control (cabinet mounted - UL recognized).
BLL510	LCD Keypad/Display Module.
BLV512	VFD Keypad/Display Module.
48PT2	Infrared scanner
UV1A	Ultra-violet (UV) scanner, non-self-check
45UV5-1009	Ultra-violet (UV) scanner, self-check
55UV5-1009	Ultra-violet (UV) scanner, self-check for hazardous locations

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