

Selas PyroFlex Package Burner

SAFETY

These instructions pertain only to the PyroFlex Burner series and should only be used for its intended purpose. Only qualified personnel should work on the PyroFlex to ensure proper installation, especially when installing gas piping or electrical wiring. All regulations MUST follow/ meet region requirements; if unsure about this information, contact your local gas or electric company. This product can cause serious injury/harm if misused; any person working with the PyroFlex Burner should be equipped with proper protective equipment, such as safety glasses, ear protection, closed-toe shoes, and adequate clothing attire. Contact the factory if you have any questions or concerns regarding the PyroFlex Burner series.

Warning: This guide **does not** provide every eventuality; the information provided should be considered when working with the PyroFlex Burner Series.

Description: How It Works

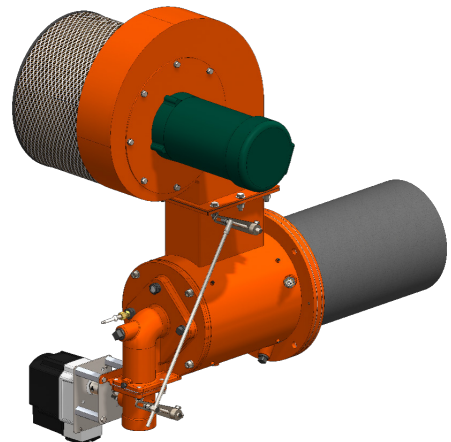
The PyroFlex series is a packaged, nozzle-mix burner producing a conical flame type designed for air heating and oven applications. Flexible air-gas controller options allow for fixed air or ratio air modulation, as well as high/low gas control, gas-only modulation, or precision gas modulation to automatically adjust air-gas ratio to maintain oven temperature. Air-gas ratios controlled with linkage system for easy adjustment in-house. 4-20 mA signal control motors are standard with all gas modulation options.

For burner applications that require 0.5 to 15 MM Btu/hr, PyroFlex Package Burners offer several flexible controller options and 40:1 turndown. Pyroflex burners accommodate a wide variety of fuels from low Btu gases to butane. Higher turndowns are available for specially designed systems. Gas trains are approvable for use in all countries and motors are available for 60Hz and 50Hz frequencies.

Applications

Ideal for applications such as:

- Ovens
- Air heaters
- Textile machines
- Food, paper & pulp, and plastic processing
- Paper drying
- Fume incineration
- Metal industry
- Low temperature metal finishing



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General Overview

The burner consists of a nozzle assembly with fuel and air jets designed to mix the fuel and combustion air effectively, providing good flame stability.

The nozzle assembly has ignition and flame sensor facilities.

Each PyroFlex unit has all valves and controls pre-wired and mounted on the burner, which is required for a complete package burner assembly.

All the electrical equipment on the unit is pre-wired to a terminal enclosure on the assembly with the expectation of 3-phase blower motors (optional).

The electrical operation of the burner is as follows:

- The burner light-up sequence is initiated when the electrical supply is switched on the burner and all the control circuits are closed.
- The burner flame safety sequence control unit receives the electrical start signal and begins to cycle through an air pre-purge and light-up sequence.
- The air pre-purge is for a specified, preset time and allows for dilution of any fuel leakage to safeguard against the possibility of explosive fuel/air mixture in the firing chamber when the ignition is energized.
- After pre-purge, the burner turns down to low fire. The ignition and flame-proving period begins.
- When flame signal is proven, the burner sequence control remains operating until the control circuits are switched off or a flame failure (lockout) condition occurs.

Installation

Before installation, carefully examine the burner for physical damage due to transporting, storage, or offloading. Damages found should be reported immediately to the factory.

- Under no circumstances should pipe work or gas valves be used for lifting; it can cause fittings to loosen or damage the valves contributing to leaks during operation.
- Use the structure of your application to mount the burner in the firing position. It should be sufficiently designed to minimize vibration and heat to the burner. A mounting gasket is supplied with the PyroFlex.
- Ensure adequate space around the burner for accessibility, adjustment, and maintenance, and that the combustion air inlet is not blocked.
- Electrical equipment can be prewired in an enclosed terminal on the assembly or attached to the control panel with flame and temperature control options.
- Establish a suitable supply of fresh air available for combustion and general ventilation.
 - This will help prevent gas leakage in valves and pipe work from forming combustible gas/air pockets.
 - A separately ducted combustion air supply or external blower should be considered for installation in buildings with high negative pressure.

For specific questions, consult the factory.



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Installation Cont.

Gas Supply:

- Gas piping to the burner needs to be an adequate size to have the correct pressure at the burner valve assembly inlet.
 - If unsure about sizing or available pressure, contact local gas supplier with any questions.
- The following maximum pipeline velocities are recommended to avoid excessive noise and erosion:

Unfiltered Supply	Filtered Supply (250 microns)
65.6 ft.sec (20 m/s)	148 ft.sec (45 m/s)

- For low-pressure supplies up to 10" w.c (25mbar), the pressure drop between the meter and the burner inlet should typically not exceed 0.4" w.c (1mbar). This pressure drop should not exceed 10% of the available gas pressure for high-pressure supplies.
- A manual shut-off valve should be built into the gas supply pipe, followed by a union or flanged joint; the valve should be next to the burner.
 - This valve provides the supply and removal of the burner assembly for maintenance purposes.
 - The manual shut-off valve needs to be easy to access.
- Prior to connecting the gas supply, ensure the available gas is correct.
- Check the design and installation of the gas supply system to ensure the pressures over the maximum design rating of the equipment cannot be reached during fault conditions.
- Vent piping should be supplied for vented regulators if a burner is installed in a closed space.
 - There should not be multiple vents used for regulators and should be terminated in a safe space (preferably above roof level).
- The gas supply pipe will be full of air and will require purging.
- Qualified personnel should only conduct purging and leak testing that follow local safety requirements.
- Operators should be aware of maximum pressure ratings on all devices subject to testing that valves are not exceeding.
- The manual shut-off valves should be left in the closed position until the plant has been commissioned by qualified personnel.

Electrical Supply:

- Confirm that the electrical power supply fits the system voltage and frequencies (HZ) requirements.
 - Containing a three-phase power supply and single-phase control circuits.
- Burner wiring should fit the local electrical code requirements of practice.
- All conduits should be kept clear of heat zones.
- Local means of electrical isolation should be installed close to the burner.
- Ensure that the electrical voltage does not vary from the specified by more than 6%.



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Installation (Cont.)

Electrical Supply Cont.:

- High-temperature wire should be used for all electrical connections.
- Do not use gas pipe work as electrical earth.

Note: *These installation guidelines can ensure the safe and efficient operation of the Selas PyroFlex Package Burner. If you have any specific requirements or need further assistance, then please consult qualified electrical or mechanical personnel or contact Selas for support.*

Commissioning: Initial Light-Up

Please Note: *Without exception, burners should only be commissioned by suitably qualified personnel. The following notes are intended as guidance and in no way negate the need for the equipment to be commissioned by suitably qualified personnel.*

1. Examine the Burner: Inspect the burner for any physical damage.
2. Ensure all manual fuel valves are closed.
3. Verify that the electrical supply is de-energized.
4. Verify Electrical Connections: Ensure all electrical connections are correct, particularly that the combustion air pressure switch and the safety shut-off valves are wired to the correct burner safety control unit terminals.
5. Check Incoming Gas Pressure: Open main manual gas valve and verify and record the incoming gas pressure at the safety shut off valves. Pressure will generally be higher when the burner is not operating.
6. Ensure the burner on/off switch is in the 'off' position and that the manual valves at burner are closed.
7. Apply temporary electrical supply to main safety shut off valves and pilot shut off valve to pressurize fuel up to the burner and pilot local manual shut off valves.
8. Check for external leakage using a soap solution or gas detector on pipework and valve joints, rectifying any leaks before proceeding.

Note: *In cases where burners are fitted with central multi-block/combination safety valve units, the above procedure will vary; the valve should be energized to check for downstream pipe leakages and de-energized, followed by venting of downstream pipe space to check for valve seat leakages.*

9. Set the combustion air pressure switch 25% below the required air pressure.
10. Set the low and high gas pressure switches on the main supply to 50% below and 150% above, respectively, that of the expected burner operating pressure. See burner datasheet for operating fuel gas pressure.
11. Check Rotation of the Combustion Air Fan: Temporarily energize power to fan (bump-start) and confirm proper rotation.
12. Start the fan supplying the combustion air and check the motor's running current. Cross-check this with the data on the motor label. Ensure that the motor overload protection is correctly set.



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Commissioning: Initial Light-Up (Cont.)

13. Check that all pressure switches associated with the burner are in the correct position. Note that the burner combustion air pressure switch should switch over after the combustion air fan has started.
14. Switch Burner On: Open the main manual valve upstream of fuel train (maintaining pilot manual valve in the closed position) and check that all pressure switches associated with the burner are in the 'on' position, calling for heat and switching the burner on. It may be necessary to reset the burner lockout fault button.
15. Cycle Flame Safety Control Unit: Allow the flame safety control unit to cycle through the start-up sequence. Check that the ignition and pilot solenoid valves are electrically energized at the correct time and sequence. The burner flame safety control unit should then lock out.
16. Open the manual pilot valve at burner.
17. Fit a micro-ammeter into the circuit with the flame sensor.
18. Reset the burner lockout button; the burner will cycle, and the pilot flame should light. It may be necessary to start the light-up sequence (reset) several times.

Note: *Purge the firing chamber and flue between lighting trials. Purge represents allotting appropriate time for fresh air to evacuate combustion chamber and stack and is equivalent to four times their combined volume. Use burner fan and exhaust fan data to estimate volume flow rate.*

19. Pilot Flow Setting: Once pilot is lit, use adjuster or pilot gas regulator to establish correct size and flame strength. Record flame signal using the micro-ammeter.
 - a. The burner's low fire setting should be by the process requirements while still maintaining a steady flame signal.
20. If satisfactory at low fire, then switch burner to off position.
21. Half open the manual main valve at burner. Reset the burner lockout button. The burner should cycle through pilot sequence and ignite main flame.
22. Main Gas Flow Setting: Slowly open the manual main valve at burner to the full position and use adjuster or main gas regulator to produce the required flame size, pressure and strength. With the burner on full fire (temperature control calling heat), check and record the gas pressure at the nozzle and compare with required thermal/fuel rating. This information will be indicated on the burner datasheet.
23. Check and record the main flame signal on the micro-ammeter.
24. Check Combustion Air Pressure Switch: Reduce combustion air pressure switch setting to confirm shut down. Final switch setting should be 25% below operational conditions.
 - a. Block the combustion air supply at the fan inlet to confirm that the burner properly shuts down.
25. Check Flame Safety Control: Remove the electrical connector from the flame sensor while the burner is operating. Check that the burner's flame safety control locks out immediately and that the gas supply is automatically shut off.
26. Check Low and High Gas Pressure Switches: Increase the low gas pressure switch setting to confirm shut down. Similarly, reduce the high gas pressure switch setting to do the same. Final settings should be 50% below and 150% above rated pressure per burner datasheet.
 - a. With main flame firing, slowly close the main manual gas valve (upstream of the safety shut off) to confirm lock out occurs due to a low gas pressure switch failure.



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Commissioning: Initial Light-Up (Cont.)

27. Check the operation of all other control and safety devices in the burner control circuits, such as overtemperature limit, purge switch, low-fire actuator position switch, etc. Usage and number of these may vary depending on the application and user requirements. Ensure that the burner operates correctly and note all control settings.
28. Depending on the application and accessibility, it may be appropriate to check stack O₂ and CO emissions. At full firing capacity, CO emissions should not exceed 400 ppm (volumetric basis, corrected to 3% O₂ in dry flue products).

Note: Once correctly commissioned, the burner settings should only be altered by suitably qualified personnel and only when changes to the process requirements deem it necessary. At no point should the settings of any safety device be modified to overcome changes in process conditions without the burner again being fully commissioned in line with those process conditions.

Troubleshooting Chart

Symptom	Cause	Remedy
Burner light up sequence does not start	No electrical supply	- Check electrical supply at local isolator - Check the control fuse
	Burner electrical control circuits are not in 'start up' condition	- Check controls and switches in control circuit - Check all pressures switches and micro-switches
	Airflow pressure switch not made	Check setting on switch; if this is correct, check airflow
	Low gas pressure switch not made	Check setting on switch; if this is correct, check the gas pressure
Start cycle begins but the burner locks out of shuts down before initiating the ignition sequence	Low combustion air pressure differential	- Reset burner pressure switch - If pressure switch is set correctly, open the air damper on the combustion air fan - Check that the combustion air fan motor is rotating in the correct direction - Check that the combustion air fan is running; if not, check the overload or circuit breakers



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Troubleshooting Chart (Cont.)

Symptom	Cause	Remedy
Pilot does not light	No spark	• Check electrical supply to ignition transformer • Check electrical connection to spark plug • Check operation of ignition transformer • Check condition of spark plug and clean, reset, or replace
	No pilot gas	• Check manual valve open • Check that pilot solenoid valve opens • Ensure gas is available at burner
	Not enough pilot gas	• Check pilot gas flow adjuster and pilot gas regulator
	Pilot blown out	• Reduce process air flow if possible • Increase pilot gas rate
Pilot lights but locks out when ignition de-energized	Pilot gas rate too low	• Adjust pilot gas rate
Pilot lights but the burner locks out before the main valves are energized	Flame sensor not detecting the flame or faulty sensor	• Check sensor for damage or moisture • Clean flame sensor • Check flame sensor installation and position • Replace sensor



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Troubleshooting Chart (Cont.)

Symptom	Cause	Remedy
Main flame does not light, and burner locks out the end of the pilot phase	Faulty main shut off valve	- Check electrical supply to valve - Check the condition of the valve; if faulty, replace it
	No main gas	- Check manual valve open - Check the adjustment of the gas control valve - Ensure gas is available at burner
	Not enough main gas	Check main gas flow adjuster and main gas regulator
Main flame lights but shuts down after a short period of time	Pilot gas rate too high	Adjust pilot gas rate
	Control circuit operating	Checks control circuit, over temperature limits, etc.
	Burner gas or air ports blocked	- Check and clean - Identify source of blockage and rectify
	Flame sensor not detecting the flame	- Over firing and flame is 'lifting off'; reset main flame firing rate - Check flame sensor installation and position - Check the main gas pressure governor



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Troubleshooting Chart (Cont.)

Symptom	Cause	Remedy
Flame failure (lockout) during normal main flame operation	Faulty main shut off valve	• Check electrical supply to valve • Check condition of the valve; if faulty, replace it
	No main gas	• Check manual valve open • Check the adjustment of the gas control valve • Ensure gas is available at burner
	Not enough main gas	• Check main gas flow adjuster and main gas regulator
	Low fire set too low	• Check and adjust
	Control circuit operating	• Check control circuit, over temperature limits, etc.
	Burner gas or air ports blocked	• Check and clean • Identify source of blockage and rectify
	Flame sensor not detecting the flame	• Over firing and flame is 'lifting off'; reset main flame firing rate • Check flame sensor installation and position
	Combustion air failure	• Inspect combustion air fan for damage • Check fan overloads • Check air filter (if fitted) and clean if necessary



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Troubleshooting Chart (Cont.)

Symptom	Cause	Remedy
Flame Failure (lockout) at low fire	Faulty low fire bypass valve (high low burners only)	• Low fire flame set too low • Check electrical supply to valve • Check condition of the valve; if faulty, replace
	Low fire flame set too low	• Check the adjustment of the gas control valve • Ensure gas is available at burner
	Too much air	• Check and reset air at high and low fire
	Low fire air set too low (modulating gas and air burners only)	• Check and adjust
	Control circuit operating due to temperature 'creep'	• Check control circuit, over temperature limits, and low fire settings
	Flame sensor not detecting the flame	• Check flame sensor installation and position
Main Flame too long	Too much gas	• Check main gas pressure and reset • Check gas control valve and reset • Check fuel type
	Combustion air set too low	• Check air dampers, linkages, and air filter (where fitted)



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Troubleshooting Chart (Cont.)

Symptom	Cause	Remedy
Combustion chamber glows red	Low combustion airflow	Reset air
	Main flame too long	Check the adjustment of the gas control valve
	Combustion air set too low	Check air dampers, linkages, and air filter (where fitted)
Unit will not achieve temperature	Too much process air	Check and reset air
	Burner input setting too low	Check and reset burner
	Leakage of cold air into system	Source and rectify
Burner shuts down	Control circuit operating	Check control circuit, process airflow switch, over temperature limits, and low fire setting
	Flame sensor not detecting the flame	Check flame sensor installation and position
	Too much pressure in chamber	Check flue



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Maintenance

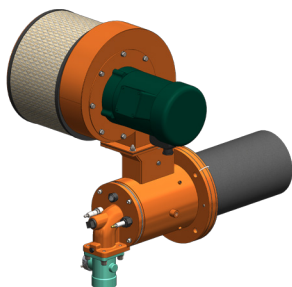
The factory suggests qualified or experienced personnel should do maintenance for the PyroFlex burners at a minimum of every six (6) months. Other variables might occur for the burner to need maintenance earlier than the suggested time; for specific questions, consult the factory.

1. First, de-energize and lock out all electrical and fuel sources.
2. Next, remove air filter (if used) and clean with compressed air. Reassemble when complete or replace with new if necessary.
3. Remove motor-impeller subassembly and clean impeller blades. Inspect and clean dirt accumulated within fan housing. Clear any build-up of dirt at the combustion air switch connection. Reassemble when complete and check that impeller is free to rotate.
4. Remove rear cover subassembly from burner air housing to access internal components.
 - a. Remove four bolts from gas flange to disconnect from fuel supply piping.
 - b. Disconnect four screws from burner rear cover to remove it from air housing.
5. Inspect gas nozzle and igniter and replace if necessary. Note that nozzle discoloration and minor distortion are normal due to extended use and should not affect performance.
6. Next, inspect the flame-sensing device (flame rod or UV scanner).
 - a. Flame rod - Inspect ceramic for any cracks or damage and replace if necessary. Clean metal detector rod using emery paper.
 - b. UV scanner - Clean the UV scanner bulb with a soft cloth. Make sure not to touch the glass bulb itself with bare hands.
7. Remove accumulated dirt or debris from within burner air housing.
8. Inspect the condition of burner inner air tube and discharge sleeve.
 - a. Inner tube and sleeve discoloration are normal and acceptable.
 - b. If inner tube or discharge sleeve are substantially distorted or broken, then the burner needs further disassembly to remove and fit replacement components.
9. Remove and check impulse lines, if applicable, for any holes, pinched tube sections, or blockage.
10. Reassemble igniter and detector. Note that spark tip should extend to gas nozzle fuel ports, and that the flame rod wire (if applicable) should not touch ground. Reattach electrical connectors onto igniter and detector.
11. Install new gasket at gas flange. Replace rear access cover and re-energize electric and fuel sources.
12. While the burner is shut down, check the integrity and correct operation of safety pressure switches and solenoids.
13. It is essential to check for gas leaks in the burner valve assembly.
14. Lastly, compare all burner gas and air settings with initial and prior service records.



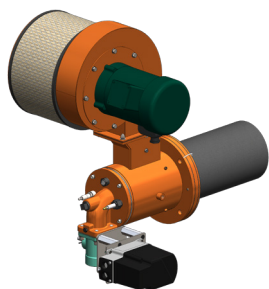
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Options and Control Configurations



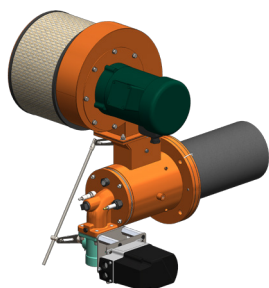
On-Off Control

- Manual Adjust Fuel Balancing Valve
- Manual Adjust Air Damper
- Low or High Pressure Blower with TEFC Motor and Pressure Switch
- Blower Filter (recommended)
- 310 Alloy or SiC Discharge Sleeve
- Flame Rod (supplied with burner) or UV (sold separate)



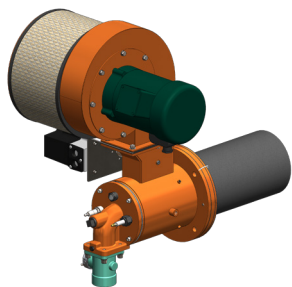
Fixed Air - Fuel Only Control

- Fuel Valve with Actuator
- Manual Adjust Air Damper
- Low or High Pressure Blower with TEFC Motor and Pressure Switch
- Blower Filter (recommended)
- 310 Alloy or SiC Discharge Sleeve
- Flame Rod (supplied with burner) or UV (sold separate)



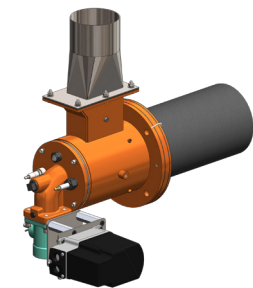
Linked Valve Control

- Fuel Valve with Actuator Linked to Air Damper
- Low or High Pressure Blower with TEFC Motor and Pressure Switch
- Blower Filter (recommended)
- 310 Alloy or SiC Discharge Sleeve
- Flame Rod (supplied with burner) or UV (sold separate)



Impulse Ratio-Regulator Control

- Air Damper with Actuator
- Impulse Connection to Ratio Regulator
- Manual Adjust Fuel Balancing Valve
- Low or High Pressure Blower with TEFC Motor and Pressure Switch
- Blower Filter (recommended)
- 310 Alloy or SiC Discharge Sleeve
- Flame Rod (supplied with burner) or UV (sold separate)



External Blower

- Fuel Valve with Actuator
- Manual Adjust Air Damper
- Blower and Air Supply Piping by Customer
- 310 Alloy or SiC Discharge Sleeve
- Flame Rod (supplied with burner) or UV (sold separate)



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Additional Options

Consult Selas for Custom Packaging

- External blower (EB)
- Ultraviolet scanner
- Ignition Transformer
- Temperature control
- Main gas regulator/packaged SSOV fuel train
- Remote terminal control panel

PyroFlex Specifications

Burner Size	500		750		1000		1500		2000		3000	
Capacity Btu/h	500,000		750,000		1,000,000		1,500,000		2,000,000		3,000,000	
Fuel Gas	NG	LP	NG	LP	NG	LP	NG	LP	NG	LP	NG	LP
Fuel Flow CFH	500	200	750	300	1000	400	1500	600	2000	800	3000	1200
Fuel Press. Inches w.c.	5	2	4	1.6	2	0.8	4.5	1.8	1.5	0.6	3.5	1.4
Fuel Conn. NPT	3/4"		3/4"		1-1/2"		1-1/2"		2"		2"	
Ignition	Direct Spark (included with burner)											
Detection	Flame Rod or UV Scanner ¹											
Blower	Integral Low (L) or High (H) Pressure or External ²											
Air Press. Inches w.c.	2 (L) and 6 (H)											
Blower Motor	1/3 HP (L) 1/2 HP (H) TEFC 56C 3600 rpm		1/3 HP (L) 3/4 HP (H) TEFC 56C 3600 rpm		1/2 HP (L) 1 HP (H) TEFC 56C 3600 rpm		1/2 HP (L) 1-1/2 HP (H) TEFC 56C 3600 rpm		3/4 HP (L) 2 HP (H) TEFC 56C 3600 rpm		1 HP (L) 3 HP (H) TEFC 56C 3600 rpm	
Blower Motor Source	230/460/3/60 (STD) or 115/230/1/60 (Special, only 1/3 & 1/2 HP)											
Air and Fuel Modulation	Two Stage, Fuel Only, Linked Fuel and Air, Ratio Regulator											
Control Actuator ³	Siemens SQM41 (STD) or Other Options (Special)											
Ratio Regulator ³	Dungs FRG (STD) or Other Options (Special)											
Combustion Air Switch	Included as Standard With Integral Blower 115/1/60											
Ignition Transformer	Optional 115/1/60											

Notes

1. Flame rod is optional and supplied with burner (UV flame scanner sold separately).
2. External blower (EB) allows up to 90% additional capacity. Consult factory for proper equipment selection and configuration.
3. Air and fuel modulation will determine options for actuators or ratio-regulators. Ratio-regulators require high pressure (H) type blowers.

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