

# Superflame™ Velocity Burner Installation

### SAFETY

These instructions pertain only to the Superflame Burner series and should only be used for its intended purpose. Only qualified personnel should work on the Superflame Burner 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 Superflame Burner should be equipped with proper protective equipment, such as safety glasses, close-toed shoes, and adequate clothing attire. Contact the factory if you have any questions or concerns regarding the Superflame Burner series.

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

### Description: How It Works

Superflame high velocity discharge circulates heat to furnace loads to create uniform temperatures. Featuring staged air combustion, the burner reduces production of NO<sub>x</sub> below conventional burners. Superflames are rated for ambient air or for preheated combustion air up to 700°F (371°C). SiC firing tubes are sustainable, lightweight, and self-supporting for easy mounting on brick or fiber wall furnaces. Alloy firing tubes are optional for lower temperature applications. These low NO<sub>x</sub> burners work with ultraviolet detectors and flame rods. Direct spark permits flexibility in control system design.

### Applications

The Superflame Burner is ideal for applications with firing temperatures up to 2500°F (1371°C) such as:

- Annealing Furnaces
- Nonferrous Melting Furnaces
- Sintering Furnaces
- Ceramic Kilns
- Rotary Forge Furnaces
- Incinerators
- Tundish Preheaters
- Glass Dry Tank



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### Installation

1. The Selas Superflame does not require refractories or mechanical support due to the self-supporting burner combustor.
  - Allow 1/4" gap around discharge sleeve when cutting opening into the furnace shell.
  - Under no circumstances should the firing tube be used to bear the refractory furnace walls.
  - Allow enough clearance (0.5" minimum) for wall expansion so there is no stress on the firing tube. Fill the open area with soft wall or blanket insulation appropriate for the application temperature.
  - Superflame can be mounted horizontally, vertically, up, or down.
2. It is essential the opening on the burner is at least one inch bigger than the outside diameter of the firing tube.
  - DO NOT let the metal shell of the furnace touch the firing tube. It causes mechanical damage.
3. Mount the burner to the furnace casing using four (4) proper-size studs or bolts and attach the body of the burner tightly to the furnace casing.
  - Burner body should NOT be used to support air/gas piping or furnace refractories.
  - Flexible nipples or expansion joints in the air and gas pipe are required.
4. Firing tubes extend 12" past the burner body mounting flange, and the cylindrical portion of the tube can be exposed to the furnace environment up to 2500°F (1371°C).
  - The conical end of tubes cannot be insulated; the tube needs to be able to radiate heat generated by the burner.
  - For operating temperatures above 2500°F (1371°C), consult the factory.
5. A standoff mounting flange should be installed if the furnace walls are thin, and the firing tube extends deep into the furnace.
  - A standoff mounting flange for the cylindrical will require minimal insulation since the firing tube does not get hot.
  - A ½" of ceramic fiber is sufficient to insulate the mounting flange cavity.
6. If the furnace wall is thicker than 12" and the firing tubes do not extend past the wall, it will still be a proper installation if the conical end of the tube is not covered with insulation and is allowed to radiate to the furnace cavity.

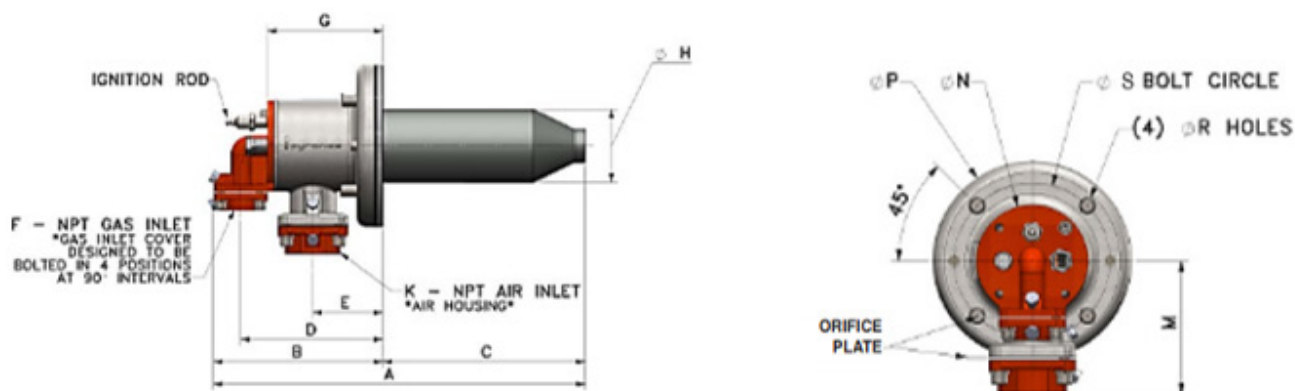
*For specific questions, consult the factory.*



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## Superflame™ Velocity Burner Installation

### Superflame Dimensions



### Measurement Dimensions (Inches)

| Superflame Models   |           |           |                |             |               |
|---------------------|-----------|-----------|----------------|-------------|---------------|
|                     | 150 & 250 | 500 & 750 | 1000-1500-2000 | 3000 & 5000 | 7500 & 10,000 |
| <b>A</b>            | 16        | 21-5/8    | 24             | 33          | 46            |
| <b>B</b>            | 7-11/32   | 9-3/4     | 12-1/16        | 16-27/32    | 26-1/2        |
| <b>C</b>            | 8-21/32   | 11-7/8    | 11-15/16       | 16-5/32     | 19-1/2        |
| <b>D</b>            | 6-3/32    | 8-21/32   | 10-17/32       | 15-1/16     | 22-3/8        |
| <b>E</b>            | 3         | 3-5/16    | 4-3/8          | 6-3/32      | 10-3/16       |
| <b>F</b>            | 1/2       | 3/4       | 1-1/2          | 2           | 3             |
| <b>G</b>            | 5-7/16    | 7-1/4     | 8-29/32        | 12-1/8      | 20-3/16       |
| <b>H</b>            | 3-1/8     | 4.47      | 6.41           | 9-9/16      | 11-5/8        |
| <b>K</b>            | 1-1/2     | 2         | Note 1         | Note 2      | Note 3        |
| <b>M</b>            | 4-5/8     | 5-3/16    | 6-3/16         | 11          | 12-1/2        |
| <b>N</b>            | 3-7/8     | 5         | 6-5/8          | 10          | 13            |
| <b>P</b>            | 6-7/8     | 8-1/2     | 9-3/4          | 13          | 15            |
| <b>R</b>            | 9/16      | 9/16      | 9/16           | 9/16        | 9/16          |
| <b>S</b>            | 5.4       | 7         | 8-1/4          | 11.80       | 13.80         |
| <b>Weight (lbs)</b> | 20        | 7         | 50             | 115         | 140           |

**Note 1:** Standard air connection for 1000 and 1500 is 2-1/2" NPT, and it is 3" NPT for the 2000.

**Note 2:** Standard air connection for 3000 is 4" pipe extension with butt weld (BW) end; 6" BW for 5000.

ANSI flange air connections are optional for both 3000 and 5000 sizes.

**Note 3:** Standard air connection for 7500 and 10,000 is 8" pipe extension with butt weld (BW) end; 10" BW for 10,000. ANSI flange air connections are optional for both 7500 and 10,000 sizes.



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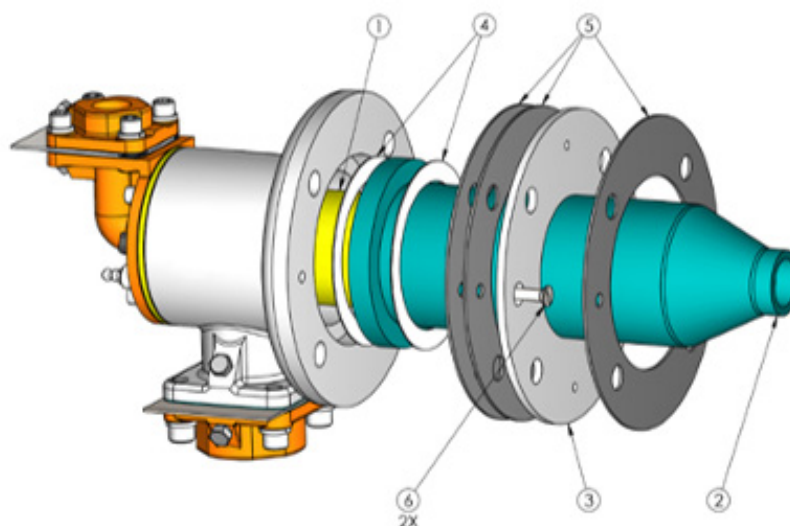
# Superflame™ Velocity Burner Installation

### Superflame Silicon Carbide Tube Replacement

1. In the mounting flange of the burner body, there is a machined counterbore that will fit the outer tube, item 2.
  - First, place one soft gasket, item 4, into the counterbore.
  - Next, carefully install the outer tube over the inner tube and into the counterbore.
  - Then, by eye, center the outer tube concerning the inner tube.
2. Place one soft gasket, item 4, over the outer tube and center them by eye on the flange of the outer tube.
3. Place two rigid gaskets, item 5, over the outer tube and onto the mounting flange of the burner body.
  - Align the four (4) mounting holes and two (2) smaller holes for the flange retention screws.
4. Slide the outer tube holding flange, item 3, over the outer tube, careful not to disturb the position of the soft gaskets or the outer tube.
  - Carefully align the mounting holes and retention screw holes.
  - Next, insert the retention screws, item 6, and tighten them in a crisscross pattern until the holding flange is tight against the hard gasket.

The burner assembly is ready for installation.

**Note:** Alloy tube variants do not require items 3 and 4.



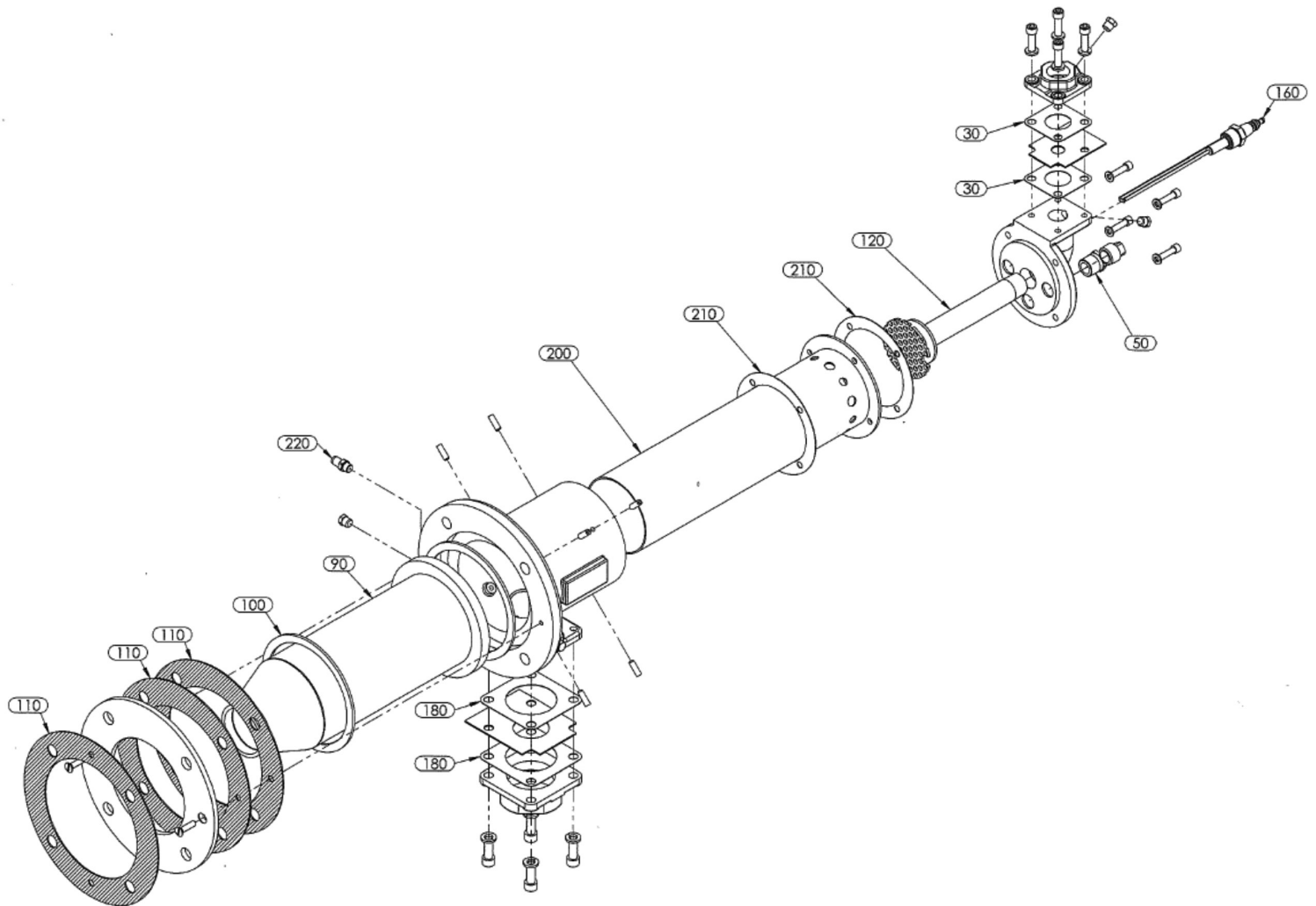
**CAUTION:** Operation of combustion equipment can be hazardous resulting in bodily injury or equipment damage. Each burner should be supervised by a combustion safeguard and only qualified personnel should install, make system adjustments and perform any required service.



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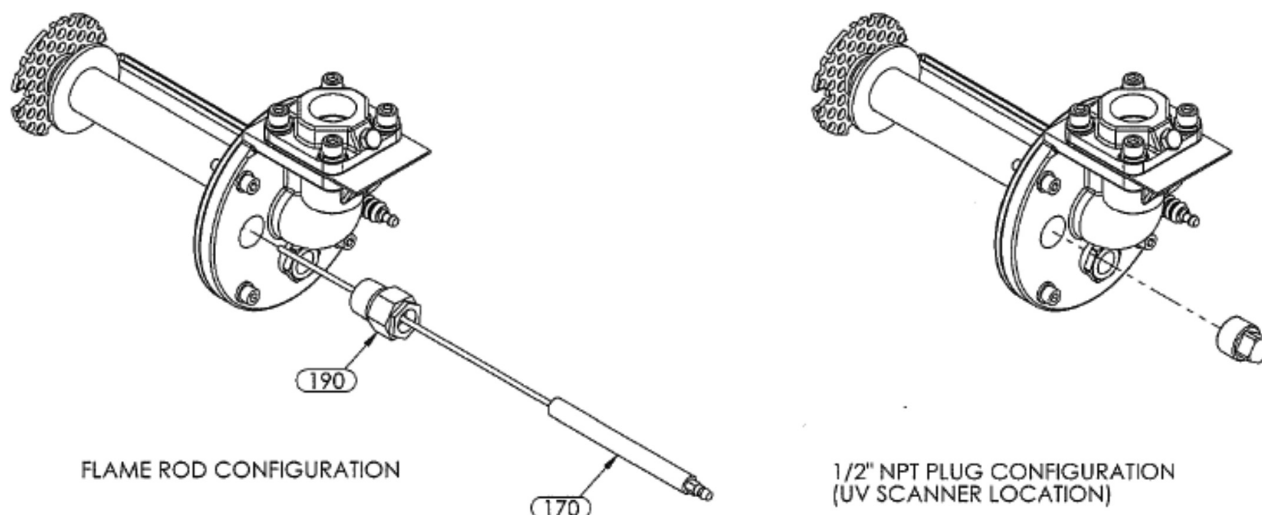
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Superflame Drawing Sizes 500 & 750



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Sizes 500 & 750 (consult factory other size burner part numbers)

| MAINTENANCE KIT  |              |                                             |     |
|------------------|--------------|---------------------------------------------|-----|
| ITEM NO.         | PART NUMBER  | DESCRIPTION                                 | QTY |
| 30               | 01130D1      | 1/2", 3/4", 1" FLANGE GASKET                | 2   |
| 210              | 95805590     | 500-750 BACKPLATE MTG GASKET                | 2   |
| 220              | 95807270     | 1/8" TEST NIPPLE                            | 4   |
| TILE KIT         |              |                                             |     |
| ITEM NO.         | PART NUMBER  | DESCRIPTION                                 | QTY |
| 30               | 01130D1      | 1/2", 3/4", 1" FLANGE GASKET                | 2   |
| 180              | 18997D4      | 2" FLANGE GASKET, GARLOCK                   | 2   |
| 90               | 06233D       | 500MV/750HV OUTER TUBE                      | 1   |
| 100              | 06259D       | 650HMB 500/750 SUPERFLAME OUTER TUBE GASKET | 2   |
| 110              | 06265D       | 650HMB 500/750 SUPERFLAME MTG GASKET        | 3   |
| NOZZLE KIT       |              |                                             |     |
| ITEM NO.         | PART NUMBER  | DESCRIPTION                                 | QTY |
| 30               | 01130D1      | 1/2", 3/4", 1" FLANGE GASKET                | 2   |
| 120              | 06292C2      | 500-750 BURNER NOZZLE                       | 1   |
| 210              | 95805590     | 500-750 BACKPLATE MTG GASKET                | 2   |
| AIR TUBE KIT     |              |                                             |     |
| ITEM NO.         | PART NUMBER  | DESCRIPTION                                 | QTY |
| 30               | 01130D1      | 1/2", 3/4", 1" FLANGE GASKET                | 2   |
| 200              | 95805519-304 | 500/750 SUPERFLAME INNER TUBE               | 1   |
| 210              | 95805590     | 500-750 BACKPLATE MTG GASKET                | 2   |
| INDIVIDUAL PARTS |              |                                             |     |
| ITEM NO.         | PART NUMBER  | DESCRIPTION                                 | QTY |
| 30               | 01130D1      | 1/2", 3/4", 1" FLANGE GASKET                | 2   |
| 50               | 01888D2      | 1/2" PEEPSIGHT                              | 1   |
| 160              | 06447C1      | 500/750 SUPERFLAME IGN ELECTRODE            | 1   |
| 170              | 06512C2      | 500/750 SUPERFLAME ROD                      | 1   |
| 180              | 18997D4      | 2" FLANGE GASKET, GARLOCK                   | 2   |
| 190              | 45202        | CROWN ENG 7/16 COMPRESSION FITTING          | 1   |
| 220              | 95807270     | 1/8" TEST NIPPLE                            | 4   |



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### Handling

- Work area must be clean.
- Protect Superflame components from weather, damage, dirt, moisture, excessive temperatures, and humidity.
- Do not drop or damage Superflame components.

### Storage

- Keep Superflame components are clean and not damaged.
- Components should be stored in a cool, clean, and dry area.
- Leave components in original packaging for as long as possible.

### Maintenance

The information provided in the Maintenance/Troubleshooting sections pertains to the Superflame Burner only; proper maintenance checks are required for safe and dependable operations. Qualified personnel should perform maintenance procedures within the industry guideline (e.g., NFPA, UL, FM, CSA) and the company's quality and safety programs. The frequency of the maintenance checks depends on the equipment use and specific heating needs; the higher amount of use/heat equals an increase in maintenance checks. Consult the factory with questions or concerns regarding the information below.

**Warning:** Only qualified personnel should perform maintenance checks on combustion equipment due to difficulty level and to prevent equipment damage. Protective gear is required during maintenance checks as equipment can be hazardous, resulting in severe injury.

#### Regular Shift (Daily) Inspections

- **Fuel Gas Leak:** Report any fuel gas odor immediately to your supervisor or safety personnel.
- **Accessibility:** Superflame must be easily accessible with adequate lighting for visual inspection of the chamber walls/roof, burner, blower, safety fuel train, and control panel.
- **Excessive Temperature:** Paint peeling, glowing metal, or distortion indicate excessive temperature. The burner mounting, flue stack, door seal, and around various ports are areas to look for if the excessive temperature becomes an issue. Record and report all extreme cases to a supervisor.
- **Burner Flame:** Check that the burner sight port and chamber viewports are clear of debris or obstructions. Record and report any unusual flame color or distortion.
- **Flue Stack:** Stingers are an indicator of an upset in air-fuel (fuel-rich condition), report stingers to the supervisor.
- **Combustion Air Blower:** Record and report any unusual sound or vibration.
- **Igniter and Detector:** Check that I-D devices, connectors, and wiring are correctly installed and in working condition.
- **Manual Valves and Dampers:** Record/note any changes to handle positions.
- **Process Control Temperature:** Record/note any unusual changes.
- **Pressure Gauges:** Record/note devices that appear inoperative.
- **Test Ports:** Record/note any open test ports and be sure to close them.



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### Periodic Inspection

- **Fuel Supply Piping:** To check for leaks within the fuel pipe joints, regulator vents, test ports, and SSOV (Safety shut-off valve) by directly spraying soap bubbles onto the joints or using a combustible gas detector.
- **Plant:** Check all CO detectors, fire extinguishers, sprinklers, and alarms are up-to-date and functional.
- **Fuel Regulators:** Check the stem cap is installed correctly and secured.
- **Manual Air Dampers and Fuel Valves:** The handle or adjuster operation must be smooth and unrestricted; the customer can find more information on lubrication recommendations in the manufacturer's instructions.
- **Motorized Control Valves:** Check the drive shaft, coupling, and linkage joints for tightness, then compare the operating positions with the commissioning reports.
- **Pressure Switches:** Record fuel (high and low) and air (combustion air and purge) switch settings, then compare them to the commissioning report.
- **Combustion Blower:** Check for unusual vibration, bearing noise, or excessive temperature. Clean and/or replace the intake filter. For V-belt equipment, check the drive belt tension.
- **Impulse Tubing (if applicable):** Check the tube for the following: crimping or damage, tightness of joints, and leakage. Also, check associated bleeders and components for leakage or damage.
- **Flame Controller:** Record flame signal strength and compare it with the commissioning report.
- **Process Controls:** Check the control panel for loose wires or charred components. Use the commissioning report to compare the process settings (e.g., temperature, pressure)
- **Burner Air and Fuel Pressures:** Using the commissioning report, compare recorded static and differential pressures at the burner. Check the test ports are closed/sealed and then test for leaks.
- **Air and Fuel Meters (if applicable):** Record pressures, indications, or levels, depending on devices. Then compare it with the commissioning report. Check test ports (if applicable) are closed/sealed, and then test for leaks.



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### Annual Inspections

- **Burner General:** In most cases, the burner will not need to be removed unless there is apparent damage to the tile or main body. The factory recommends inspecting the internal components; this inspection will involve disconnecting the fuel supply and removing the gas inlet subassembly.
- **Burner Tile:** Start by inspecting the burner tile/interior walls and replace tiles if damaged. Use a high-temperature fiber blanket to wrap the entire tile when reinstalling. At the burner mounting, check the chamber for damage and the shell condition; shell distortion indicates leakage between the chamber and burner—repair the chamber and seals.
- **Gas Nozzle and Inner Air Tube:** Remove the gas inlet subassembly and inspect the components. Some components will become discolored due to high temperatures, which is normal. However, components can be exposed to extreme conditions causing permanent damage such as warping, cracking, or metal erosion. Use a wire brush or abrasive cloth to clean debris and carbon build-up. Replace damaged parts (including gaskets) as needed.
- **Ignition Components:**
  - > **Ignitor:**

First, check the spark gap measurements and the ceramic insulator for cracks. Next, use a brass wire brush or WD-40 to remove carbon from the spark tip. Anti-seize can be applied to threads when replacing an igniter; check the tip aligns with the gas nozzle ports. Check the connector and wiring for tightness and damage.
  - > **Pilot (option available only on 3000, 5000, 7500 and 10,000 sizes):**

Remove the pilot and clear debris from ports to inspect the retention tip. Use a brass wire brush or WD-40 to clean the spark plug after removal; the gap for the spark plug is 0.06 inches. If components are damaged, replace them as necessary. Anti-seize can be applied to the thread components, then reinstall the spark plug on the pilot body and the pilot assembly onto the burner. Check the connector and wiring for tightness and damage.
- **Detection Components:**
  - > **UV Scanner (if applicable):**

Remove the UV scanner from the burner and check the conditions of the seal gasket. To clean the sensor glass, use a soft cloth. Follow manufacturer's instructions for self-checking type scanner, adapters, and air purging-type accessories when regarding maintenance. The operator must replace the scanner per the manufacturer's stated life expectancy. When reinstalling the scanner, use a good seal at the gasket and check the wiring for tightness and damage. When necessary, replace the damaged components.
  - > **Flame Rod (if applicable):** The flame rod must be straight and checked for cracks in the ceramic insulator. Use a soft abrasive cloth to remove accumulated carbon from the flame rod. The rod must NOT touch metal; check the connector and wiring for tightness and damage. Replace components.



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- **Air and Gas Inlet Orifices:** Use a soft abrasive cloth or solvent to clean the burner after removal. To remove the plate and separate the flanges, start by removing only two (2) of the four (4) retaining bolts at each flange. The other two (2) bolts only require to be loosened. Then, to separate the plate from the gasket, use a pen knife or thin scraper; replace the gasket if damaged.
- **Fuel Strainers:** Clean or replace them per the manufacturer's recommendations.
- **Fuel Safety Shut-Off Valves:** Check for leaks per the manufacturer's recommendations.
- **Fuel Venting:** Vents must be clear of debris, dirt, or obstructions and directed to a safe location. Check the relief and vent valves are operating correctly.
- **Blower Motor:** Record measurements of amperage and then compare results with commissioning data.
- **Blower Impeller:** Remove blower inlet components (e.g., silencer, filter, guard) when an electric power lockout occurs. Inspect the impeller for excessive dirt and clean it per the manufacturer's recommendations. Replace the impeller if damaged.
- **Combustion air supply system:** Check air piping for damage or leakage and manual dampers for smooth operation. Repair or replace as needed.
- **Motorized Control Valve(s):** Operate the valve through the entire stroke to confirm the smoothness of action and position of endpoints. Confirm end switches are functioning and replace or troubleshoot if not functional.
- **Pressure Switches:** Compare the recording of fuel (high and low) and air (combustion air and purge) device settings with the commissioning report. Check the interlock system (common limits) by temporarily adjusting the switch set to confirm the fail-safe condition. If the switch is not functioning, try to replace it or troubleshoot it. Check switches for loose connections or damaged wiring, then return switches to the original setting after completing the test.
- **Pressure Gauges and Test Ports:** Inspect and/or operate all devices; replace if damaged.
- **Lubrication:** Manufacturers will state whether lubrication is required for blower motor(s), control motor(s), and linkages.
- **Flame Controller:** Simulate the following conditions below to check fail-safe interlocks (if possible).
  - > Disconnect the flame sensor during operation to confirm fuel SSOV de-energizes (i.e., closes).
  - > To confirm the SSOV is de-energized, manually close the fuel supply near the burner during operations.
  - > Before reattempting to start the burner, remove the detector or disconnect the wire. Record the detection trial time and compare it to the manufacturer's literature.
  - > Disconnect the igniter wire, safely isolate from contact with ground or personnel, and attempt to start the burner. Record the ignition trial time and compare it with the manufacturer's literature.
  - > Check the audible and visual alarms are operating.
- **Process Controls:**
  - > Using the manufacturer's information, evaluate the thermocouple's life expectancy and replace it if needed.
  - > Check the conditions of the thermocouple connectors and wiring; if damaged, replace components.
  - > Confirm operation of low and high-temperature limit devices.
  - > Check the audible and visual alarms are operating.
- **Air and Fuel Meters (if applicable):** For calibration methods and frequency, consult with the manufacturer's recommendations.



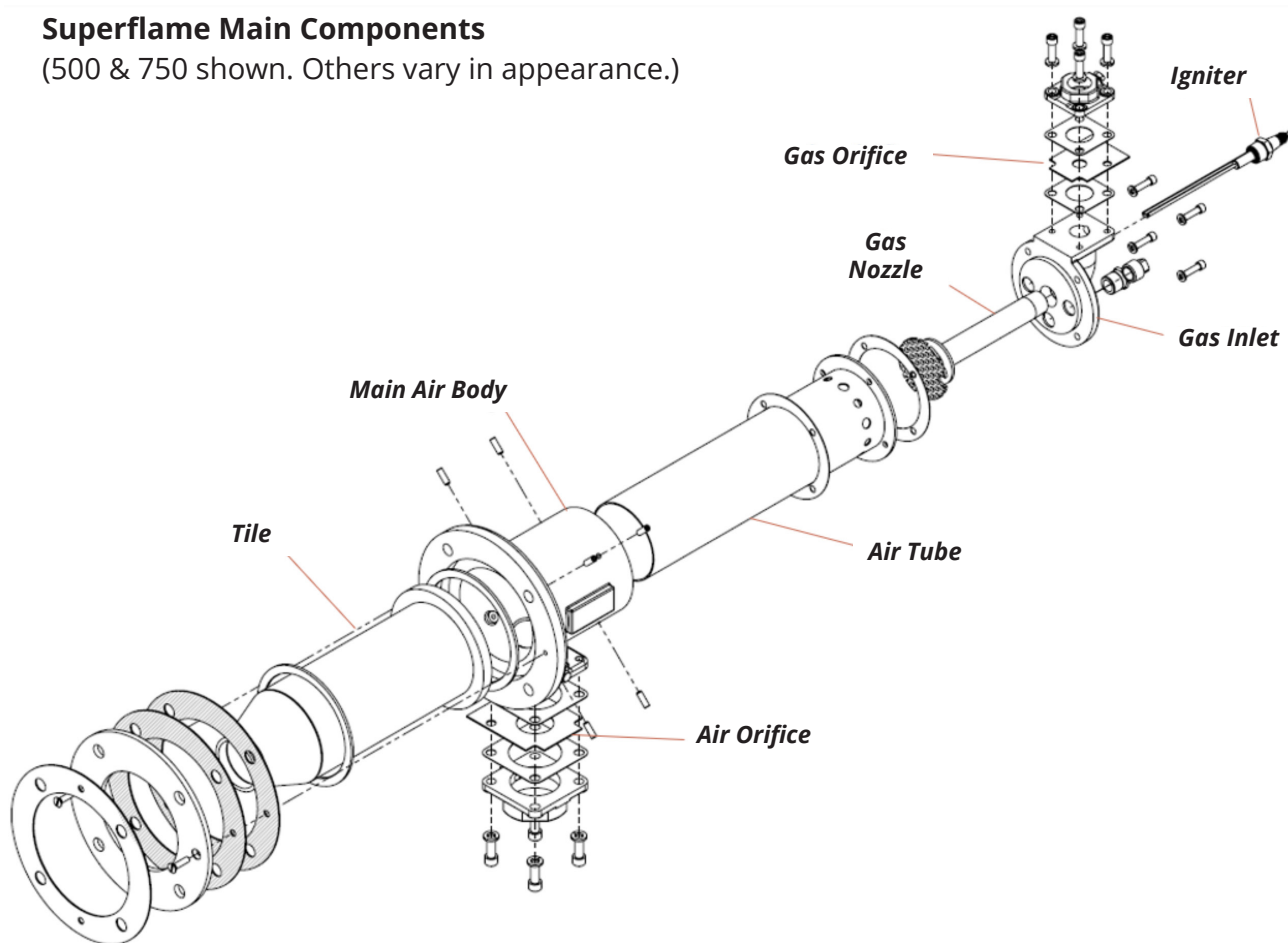
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- **Chamber Conditions:** Measure/record the temperature and pressure, then compare them with commissioning data.
- **Chamber Stack Emissions:** Measure/record O<sub>2</sub>, CO, and NO<sub>x</sub>; then compare to commissioning data.
- **Firing Chamber:** Achieve appropriate lock-out-tag-out and confined space permissions.
  - > **Interior:** Check insulation, report conditions, and replace/repair when needed.
  - > **Thermocouples:** Record locations and insertion depth. Compare records with commissioning reports and check and replace thermocouples as needed.
  - > **Flue:** If applicable, check the damper and its operation. The flue must be unobstructed and in good condition; repair/replace damaged components.
  - > **Exterior:** Notes areas of excessive temperature and possible leakage at seals.

### Superflame Main Components

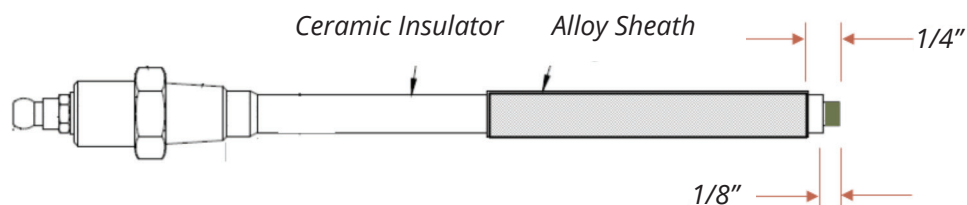
(500 & 750 shown. Others vary in appearance.)



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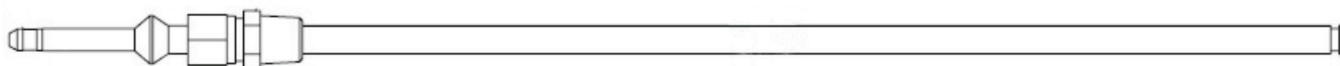
## Superflame Main Components, Continued



***Ignitor for sizes 150 & 250***



***Ignitor for sizes 500, 750, 1000, 1500 & 2000***



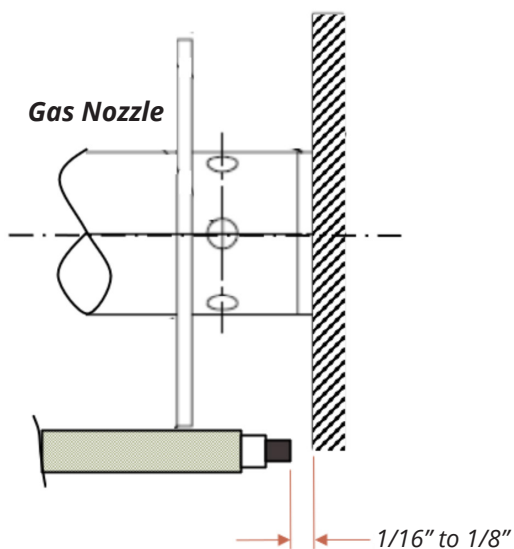
***Ignitor for sizes 3000, 5000, 7500 & 10,000***



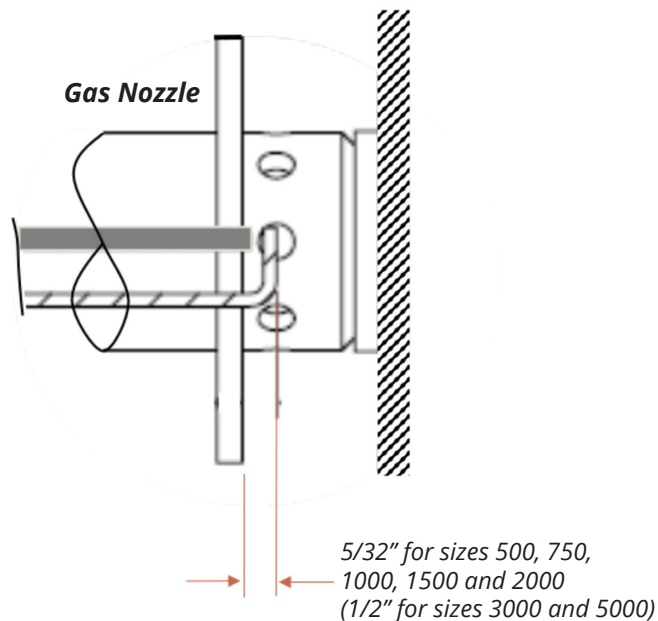
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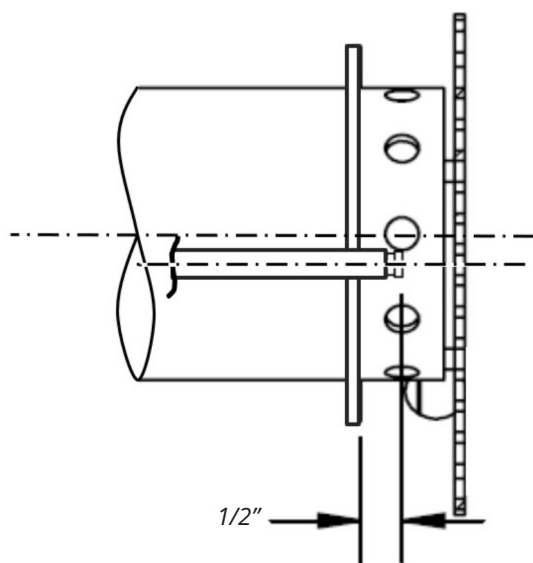
**Ignitor Install for Sizes 150 & 250**



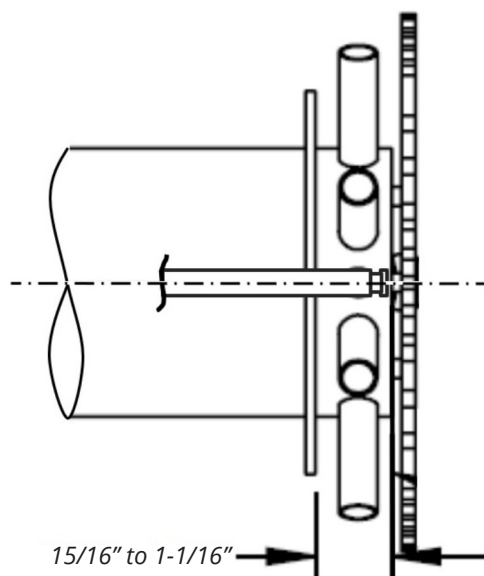
**Ignitor Install for Sizes 500, 750, 1000,  
1500 & 2000**



**Ignitor Install for Sizes 3000 & 5000**



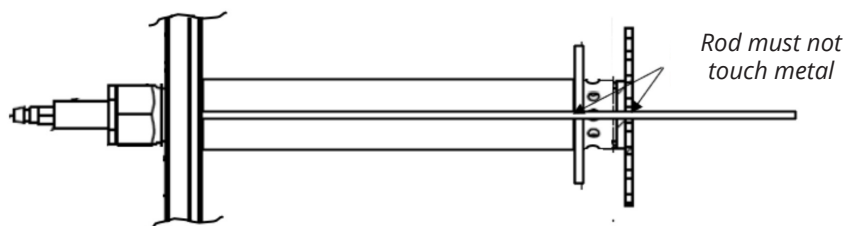
**Ignitor Install for Sizes 7500 & 10,000**



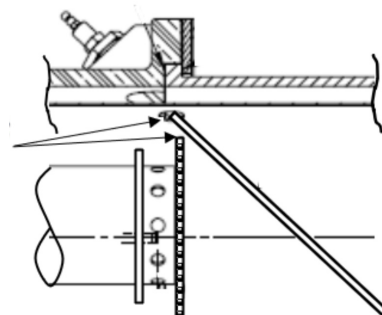
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## Superflame™ Velocity Burner Installation

Flame Rod Install for Sizes 150, 250,  
500,750, 1000,1500 & 2000



Flame Rod Install for  
Sizes 3000 & 5000



### Troubleshooting Chart

| Problem                                                 | Probable Cause                           | Corrective Action                                                                                                                                                                                                               |
|---------------------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Combustion system does not initiate trial for ignition. | Low fuel gas pressure switch (NO) fault. | <ul style="list-style-type: none"> <li>• Check that the switch is powered and there are no loose wires.</li> <li>• Check fuel gas pressure and switch setting; adjust fuel gas pressure or switch setting as needed.</li> </ul> |
|                                                         | Combustion air switch (NO) fault.        | <ul style="list-style-type: none"> <li>• Check that the switch is powered and there are no loose wires.</li> <li>• Check air pressure and switch setting; adjust air pressure and switch setting as needed.</li> </ul>          |



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### Troubleshooting Chart (continued)

| Problem                                                             | Probable Cause                                          | Corrective Action                                                                                                                                                                         |
|---------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Combustion system does not initiate trail for ignition (continued). | Safety shut off valve proof of closure switch fault.    | Check that SSOV (Safety Shut-off valve) is powered, and valve is visibly closed.                                                                                                          |
|                                                                     | Flame controllers lock out fault.                       | Check that the flame rod (if applicable) is not touching metal.<br>Reset controller.<br>Contact a qualified service technician to investigate.                                            |
|                                                                     | No power to panel or controller.                        | Make certain E-Stop is deactivated.<br>Call qualified service technician to investigate.                                                                                                  |
| System will not complete purge.                                     | Purge switch (NO) fault.                                | Check that the switch is powered and with no loose wires.<br>Compare measured air differential pressure and switch setting; adjust air pressure differential or switch setting as needed. |
|                                                                     | Purge timer fault.                                      | Check timer for loose wires and time setting.<br>Note that purge time is based on air flow rate into chamber and is equivalent to four (4) system volumes.                                |
|                                                                     | Combustion air is not reaching a high flow enough rate. | Check that the air damper actuator is powered and with no loose wires.<br>Confirm damper is operable.<br>Check that VFD (if applicable) is reaching desired frequency.                    |



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### Troubleshooting Chart (continued)

| Problem                                        | Probable Cause                                     | Corrective Action                                                                                                                                                                                                               |
|------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Purging completes but burner does not light.   | Low fire switch on fuel and/or air valve not made. | Check power to control motor/ actuator, and that position of valve is at low flow.                                                                                                                                              |
|                                                | No visible spark.                                  | Make certain that the spark cable is in good shape and connected firmly to igniter.<br>Ensure the spark tip is clean, appropriately gapped, and not touching medal.<br>Check for wire breaks between igniter and transformer.   |
| Sparkling initiates but burner does not light. | Combustion air flow.                               | Set air between 0.2 and 2 inches wc static pressure (measured at burner inlet).                                                                                                                                                 |
|                                                | Fuel gas flow.                                     | Make sure that fuel valves are opening.<br>Set low fire fuel flow between 0.1 and 1.5 inches w.c. static pressure (measured at burner inlet).<br>Note: New systems may take several attempts to evacuate air within gas piping. |
| Burner lights but does not stay lit.           | No flame signal.                                   | Check the flame sensor is connected and wiring is secure.<br>Check UV scanner (if applicable) lens is clean and has a clear view of flame.<br>Check the flame rod (if applicable) is not touching metal.                        |



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## Superflame™ Velocity Burner Installation

### Troubleshooting Chart (continued)

| Problem                                          | Probable Cause                                                           | Corrective Action                                                                                                                                                                                                                                                                               |
|--------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Burner lights but does not stay lit (continued). | No flame signal (continued).                                             | Diagnose flame controller using manufacturer's literature.<br>Contact a qualified service technician to diagnose.                                                                                                                                                                               |
|                                                  | High and low gas pressure switches.                                      | Record high and low gas pressures during ignition and note any unusual variation.<br>Adjust as fuel flow or switch setting as needed.                                                                                                                                                           |
| Very weak low fire flame signal.                 | Fuel gas flow is below 2% of rated burner capacity.                      | Increase low fire gas flow.                                                                                                                                                                                                                                                                     |
|                                                  | Combustion air flow is above 100% or below 10% of rated burner capacity. | Set burner air static pressure between 0.2 inches w.c and capacity as stated in literature for specific size and title.                                                                                                                                                                         |
|                                                  | UV scanner or flame rod.                                                 | Check device and wiring for damage, and installation.<br>UV scanner (if applicable) should have unobstructed view of flame.<br>Flame rods (if applicable) should not touch metal and have a good ground source.<br>Move detector to another location on burner (e.g., above burner centerline). |
|                                                  | Detector connecting wires.                                               | Detector wires should not share the same conduit as ignition cable.<br>Maximum detector wire length should be within the manufacturer's recommendation.                                                                                                                                         |



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### Troubleshooting Chart (continued)

| Problem                                                                              | Probable Cause                                                                                                  | Corrective Action                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Very weak low fire flame signal (continued).                                         | Excessive moisture near detector or wiring.                                                                     | For UV scanners, use a purge air adapter.<br>Note: Both CO <sub>2</sub> and H <sub>2</sub> O vapor (in flue products) can obstruct UV<br>Locate wires in a dry work area.                                             |
| Very weak flame signal at high fire or when transitioning between low and high fire. | Air-fuel ration upset fuel rich (too much fuel flow) or excessive air lean (too much combustion air) condition. | Utilize burner data sheets for reference.<br>Install separate air and fuel meters for increased flow accuracy.<br>Burner is capable of 10:1 turn-down(on-ratio), and 40:1 turndown (fixed air).                       |
|                                                                                      | UV scanner or flame rod.                                                                                        | Check for damage.<br>UV scanner must have an unobstructed view of flame.<br>A flame rod must not touch metal and have a good path to the ground.<br>Consider moving detector (e.g., located above burner centerline). |
|                                                                                      | Detector connecting wires.                                                                                      | Detector wires should not share the same conduit as ignition cable.<br>Detector wire length should be within manufacturer's recommendation.                                                                           |
|                                                                                      | Excessive heat or moisture near detector or wiring.                                                             | Follow recommendations states in manufacturer's literature.<br>For UV scanners, consider a purge air adapter.                                                                                                         |



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### Troubleshooting Chart (continued)

| Problem                                                                                          | Probable Cause                                                                                             | Corrective Action                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Very weak flame signal at high fire or when transitioning between low and high fire (continued). | Excessive heat or moisture near detector or wiring (continued).                                            | Note: Both CO <sub>2</sub> and H <sub>2</sub> O vapor (in flue products) can reduce UV signal.<br>Locate wires away from excessive heat in a dry work area.                                                               |
| Flame detaches during transition between low and high fire.                                      | Air-Fuel ratio upset: fuel rich (too much fuel) or excessive air lean (too much combustion air condition). | Utilize burner data sheets for reference.<br>Install separate air and fuel meters for increased flow accuracy.<br>Burner is capable of 10:1 turndown (on-ratio), and 40:1 turndown (fixed air).                           |
| Limited air capacity.                                                                            | Undersized blower or too much resistance in combustion air supply piping and components.                   | Utilize good practice regarding maximum pipe velocity, system piping losses and blower overage.                                                                                                                           |
|                                                                                                  | Blower impeller.                                                                                           | Lock-out-tag-out motor prior to accessing impeller.<br>Check impeller clearance at inlet and remove accumulated dirt.<br>When returning to service, bump the motor to make certain impeller rotates in proper direction.  |
|                                                                                                  | Blower inlet filter plugged.                                                                               | Clean or replace inlet filter.                                                                                                                                                                                            |
|                                                                                                  | Partially closed air valves, insufficient speed, duct leakage.                                             | Ensure manual air damper is open and/or automatic air valve is full flow position.<br>If using VFD, ensure frequency is at its maximum control setting.<br>Inspect air piping and joints for leaks and seal as necessary. |



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### Troubleshooting Chart (continued)

| Symptom                | Cause                                              | Remedy                                                                                                                                                                                                                      |
|------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Limited fuel capacity. | Undersized fuel supply piping and components.      | Utilize good practice regarding maximum pipe velocity, system piping losses and component size selection.                                                                                                                   |
|                        | Insufficient fuel supply pressure at burner inlet. | Increase fuel regulator pressure.                                                                                                                                                                                           |
|                        | Limiting orifice valve.                            | Manually open fuel gas valve.                                                                                                                                                                                               |
|                        | Fuel control valve                                 | Ensure that the actuator is functional and valve stroke opens to its full extent.                                                                                                                                           |
|                        | Impulse line                                       | Check impulse tubing and fittings for damage, leakage, or loose connections.<br>Repair and seal leaks.                                                                                                                      |
|                        | Ratio-regulator                                    | Measure and compare the fuel gas pressure downstream of the ratio-regulator with air impulse pressure.<br>Impulse air pressure should be greater than the fuel gas pressure.<br>Correct air and fuel pressure as necessary. |



SCAN FOR MORE INFORMATION

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