Design and Application Details
Style A, B & C LINOFLAME® Burners

Principle of Operation
These LINOFLAME® Burners consist of a cast iron air-gas manifold, incorporating a drilled face and flame retention ignition rails. When supplied with a full air/gas premixture, they provide a “ribbon” flame pattern.

Capacities of LINOFLAME® Burner assemblies are established by the minimum and maximum differential mixture pressures developed by the air/gas premixing equipment. Refer to the appropriate catalog section of Maxon premixing devices for the capacity and turndown range of the complete system.

Three styles of LINOFLAME® Burner sections are offered. All styles (sizes) incorporate cast iron burner bodies and are available with cast iron or alloy ignition rails. The alloy ignition rails offer extended life in difficult service conditions and are recommended for propane-fired applications or those involving temperatures above 400°F (204°C). Ambient airstream temperatures passing over the burner should not exceed 600°F.

Style A LINOFLAME® Burners offer the highest heat release potential per lineal foot. They are available in 36 and 72 holes per foot drilling patterns. Normal maximum capacities are up to 525,000 Btu/hr per lineal foot at 7.5” wc differential mixture pressure.

Style B LINOFLAME® Burners provide medium heat release potential per lineal foot and are available in 24, 36, 72 and 96 holes per foot drilling patterns. Normal maximum capacities are up to 250,000 Btu/hr per lineal foot at 13” wc differential mixture pressure. (Main drillings for 24 hole pattern do not need to be specified.)

Style C LINOFLAME® Burners provide the lowest heat release per lineal foot. These burners are offered in 24 holes per foot drilling pattern only. Normal maximum capacities are up to 25,000 Btu/hr per lineal foot at 2.5” wc differential mixture pressure.

Direct spark ignition rails are available in most LINOFLAME® sections that provide a means of direct mounting an 18mm spark ignitor onto the face of the burner. This allows a constant source of spark to ignite the air/gas premixture coming out of the main and/or ignitor ports of the LINOFLAME® Burner section.

The replaceable ignition rail design forms a zipper channel on the face of the burner which provides positive flame retention and quick, reliable cross-ignition throughout the entire burner assembly.

Over 200 modular sections are available in various shapes and configurations. These sections may be assembled into virtually any desired shape in order to match flame and heat distribution to your job requirements.

Customized drilled sections are also available. The LINOFLAME® Burner’s discharge area must be matched to the air/gas premixing equipment being used. By specifically sizing each drill pattern to the job specification, a truly unique burner element can be created that is tailored to meet your exact heating requirements. They are cataloged for the matching premixing equipment with several of the most popular drilling options.

The short ribbon-type flame widely distributes the desired heat release for greater temperature uniformity. They provide stable operation in still, fresh air and/or in highly inert air stream atmospheres.

12” straight Style LBA-12 LINOFLAME® Burner section shown with optional direct spark ignition rail arrangement
Capacity/Selection Data
Style A, B & C LINOFLAME® Burners

LINOFLAME® Burner Designations
Each LINOFLAME® Burner section is identified with a designation code that identifies the specific type, shape, size, drilling pattern, and drill sizes of the main and ignitor ports.

For example: \[ L \ B \ A - 12 - 96 - 36 - 43 \]

- L = LINOFLAME® Burner
- Style of LINOFLAME® Burner:
  - A = Style A
  - B = Style B
  - C = Style C
- Type of ignition rail:
  - A = with alloy rails
  - (blank) = with cast iron rails
- Specific Section:
  - -3 = 3” straight
  - -6 = 6” straight
  - -8 = 8” straight
  - -12 = 12” straight
  - -12S = 12” straight with bossed side inlet
  - -12B = 12” straight with bossed back inlet
  - -3B = 3” straight with bossed back inlet
  - -TS = 12” tee section with side inlet
  - -TB = 12” tee section with bottom inlet
  - -TX = 12” cross ignition
  - -E3 = 3” elbow
  - -E6 = 6” elbow

- Drill size of ignitor ports:
  - *The maximum drill size for ignitor ports is .188” diameter.
- Drill size of main ports:
  - none = no main ports
- Number of holes/lineal foot:
  - 24
  - 36
  - 72
  - 96

In the example above, we have described a 12” straight section of Style B LINOFLAME® Burner with alloy ignition rails and a 96 hole drilling pattern. The main ports are drilled with #36 drill and the ignitor ports are #43 drilled.
Capacity/Selection Data

Total heat release and LINOFLAME® Burner footage are normally selected from the tables given in the various premixing equipment sections of the Maxon catalog:

- PREMIX® Blower Mixers ............... Bulletin 3100
- Series LG & HG Mixing Tubes,
- MULTI-RATIO™ Mixers .................. Bulletin 3200
- VENTITE™ Inspirator Mixers .......... Bulletin 3300

Based on capacity information given in these catalog sections, and within the constraints of duct size and air volume flows, a LINOFLAME® Burner assembly is designed utilizing the available sections shown on the following pages.

When ordering a burner assembly made up from these available module components, be sure to provide an assembly sketch of the complete burner (as viewed from the back, or upstream, side) including locations of all accessories and/or individual component sections.

Start-up and operating procedures will be greatly simplified if observation ports are provided and positioned to allow direct visual inspection of both pilot and main flame.

All “open” ends of burner assembly must be closed off with one of the end closures or pilot assemblies shown on the following pages. Any end plate ports not used must be plugged.

Burner inlet feed piping must be adequate to provide a well-distributed flow of air/gas throughout the burner assembly.

Inlet flanges bolt directly to burner body casting and accept threaded NPT piping.

Do not exceed the capacity feed limitations shown in the table below.

Inlet feed capacity limitations

<table>
<thead>
<tr>
<th>Burner inlet flange</th>
<th>Maximum Btu/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2” end inlet (LFE- 1-1/2”) [1]</td>
<td>350,000</td>
</tr>
<tr>
<td>1-1/2” back inlet (LFB- 1-1/2”)</td>
<td></td>
</tr>
<tr>
<td>2” end inlet (LFE- 2”) [1]</td>
<td>600,000</td>
</tr>
<tr>
<td>2” back inlet (LFB- 2”)</td>
<td></td>
</tr>
<tr>
<td>2-1/2” back inlet (LFB- 2-1/2”)</td>
<td>850,000</td>
</tr>
<tr>
<td>3” back inlet (LFB- 3”)</td>
<td>1,250,000</td>
</tr>
</tbody>
</table>

[1] Do not end-feed straight rows of LINOFLAME® Burner if capacity exceeds 600,000 Btu/hr (150,000 Btu/hr for Style C). The effect of velocity pressure in such instances will prevent uniform heat distribution.

Avoid continuous straight runs longer than 7 feet of LINOFLAME® Burner. Beyond that length, the burner should be broken into separately-fed, shorter lengths (connected by cross ignition end plate sets) to minimize burner distortion and stresses during alternate heating and cooling cycles.

Use alloy ignition rails whenever burner is to be fired on propane, or when application involves temperatures above 400°F (204°C).

Do not use side inlet tees if air velocities across the LINOFLAME® Burner assembly exceed 1000 SFPM because of the air stream turbulence created.

To center-feed Style C LINOFLAME® Burner assemblies, use a Style B bottom inlet section and two LBC-3 reducing sections.

Warning: Discharge areas of this or any premix-type burner are carefully matched to the equipment supplying air/gas premixture. Increasing the discharge area by adding to the burner or enlarging burner ports could result in ignition within the burner or backfire during operation.

Burner duct area displacement

For purposes of calculating operating air velocities and resulting static pressure drops across the burner assembly, use the following equivalent displacements:

<table>
<thead>
<tr>
<th>Section Description</th>
<th>Displacement Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>3” straight sections (-3)</td>
<td>.064 ft²</td>
</tr>
<tr>
<td>6” straight sections (-6)</td>
<td>.117 ft²</td>
</tr>
<tr>
<td>8” straight sections (-8)</td>
<td>.152 ft²</td>
</tr>
<tr>
<td>12” straight &amp; back inlet sections (-12)</td>
<td>.223 ft²</td>
</tr>
<tr>
<td>Tee section, bottom inlet (-TB)</td>
<td>.300 ft²</td>
</tr>
<tr>
<td>Tee section, side inlet (-TS)</td>
<td>.359 ft²</td>
</tr>
<tr>
<td>Tee section, cross ignition (-TX)</td>
<td>.270 ft²</td>
</tr>
<tr>
<td>3” elbow section (E-3)</td>
<td>.176 ft²</td>
</tr>
<tr>
<td>6” elbow section (E-6)</td>
<td>.175 ft²</td>
</tr>
</tbody>
</table>

Burner assembly used for air heating is determined by dividing SCFM of air passing over the burner by the net area (in ft²) of the cross-section of the duct surrounding the burner. This net area is determined by subtracting the space displaced by the LINOFLAME® Burner from the gross area of the duct itself.
Dimensions (in inches)

Style “A” LINOFLAME® Burner Sections

6" Straight LA-6, LAA-6

12" Straight LA-12, LAA-12

Inlet Feed Section

12" Back Inlet Tee LA-TB, LAA-TB

Inlet flange set options for back inlet tee section

| ANSI Flange Identification | NPT Pipe Thread* | Dimension "A"
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LFB- 1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>0.88</td>
</tr>
<tr>
<td>LFB- 2</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>LFB- 2-1/2&quot;</td>
<td>2-1/2&quot;</td>
<td>1.25</td>
</tr>
<tr>
<td>LFB- 3</td>
<td>3&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Typical Cross Sectional View of Style A LINOFLAME® Burner with alloy ignition rails

Typical Cross Sectional View of Style A LINOFLAME® Burner with cast iron ignition rails

Cross Ignition End Plate Set LX-EP, LXA-EP (normally supplied in pairs)

LEP Plain End Plate

EP-FR End Plate

LDP Division Plate

* ISO threaded flanges available; contact Maxon.
Dimensions (in inches)
Style “B” LINOFLAME® Burner Sections

**Burner Sections**

- **3” Straight**
  - LB-3, LBA-3

- **6” Straight**
  - LB-6, LBA-6

- **8” Straight**
  - LB-8, LBA-8

- **12” Straight**
  - LB-12, LBA-12

**Bossed Inlet Feed Sections**

- **12” Back Inlet Section**
  - LB-12B, LBA-12B

- **3” Elbow Section**
  - LB-E3, LBA-E3

- **6” Elbow Section**
  - LB-E6, LBA-E6

- **12” Side Inlet Section**
  - LB-12S, LBA-12S

- **3” Back Inlet Section**
  - LB-3B, LBA-3B

* ISO threaded manifolds available as loose parts; contact Maxon.
**Dimensions** (in inches)

**Style “B” LINOFLAME® Burner Sections**

### Inlet Tee Feed Sections

**12” Back Inlet Tee**  
LB-TB, LBA-TB  

![12" Back Inlet Tee Diagram](image)

Tee section with back inlet requires a back inlet flange set from below

**12" Side Inlet Tee**  
LB-TS, LBA-TS  

![12" Side Inlet Tee Diagram](image)

Tee section with side inlet requires a back inlet flange set from below

### 3” Midget Section

**LM-3-72**  

![3" Midget Section Diagram](image)

### End Inlet Flange Set

<table>
<thead>
<tr>
<th>ANSI Flange Designation</th>
<th>NPT Pipe Thread</th>
<th>Dimension &quot;A&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2&quot; LFE</td>
<td>1-1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>2&quot; LFE</td>
<td>2&quot;</td>
<td></td>
</tr>
</tbody>
</table>

### Universal Support Bracket

(normally ordered in pairs).  
Carbon steel and stainless steel versions available.

### Cross Ignition Section

**LB-TX, LBA-TX**

![Cross Ignition Section Diagram](image)

### LDP Division Plate

![LDP Division Plate Diagram](image)

### LEP Plain End Plate

![LEP Plain End Plate Diagram](image)

### EP-FR End Plate

![EP-FR End Plate Diagram](image)

* ISO threaded flanges available; contact Maxon.
Premix-type Line Burners

Dimensions (in inches)

Style “C” LINOFLAME® Burner Sections

12” Straight
LC-12, LCA-12

9” Straight
LC-9, LCA-9

Typical Cross Section view of
Style C LINOFLAME® Burner with
alloy ignition rails

Cross Ignition End
Plate Set
LX-EP, LXA-EP
(normally supplied in pairs)

B to C Reducing Section
LBC-3-24

Typical Cross Section view of
Style C LINOFLAME® Burner with
cast iron ignition rails

Flame Rod Holder

Typical mounting
of flame rod
holder and/or
pilot mounting
bracket

Pilot Mounting Bracket

LEP Plain End Plate

1-1/4” LFC End Inlet Flange*

LDP Division Plate

* ISO threaded flanges available;
contact Maxon.
### End-mounted LINOPAK Pilots for Style A, B, & C LINOFLAME® Burners

<table>
<thead>
<tr>
<th>Sketch Number (below)</th>
<th>Pilot Description</th>
<th>Pressures required to pilot mixer</th>
<th>Nominal Capacity 1000's Btu/hr</th>
<th>Pilot Assembly Includes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Natural Gas</td>
<td>Combustion Air</td>
<td>Pilot Mixer</td>
</tr>
<tr>
<td>3</td>
<td>Inert air LINOPAK pilot</td>
<td>8-27&quot; wc</td>
<td>---</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>Fresh air LINOPAK pilot</td>
<td>8-27&quot; wc</td>
<td>---</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Fresh air LINOPAK pilot (w/vane)</td>
<td>8-27&quot; wc</td>
<td>---</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Inert air LINOPAK pilot (w/vane)</td>
<td>8-16 osi</td>
<td>---</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Pressure type LINOPAK pilot</td>
<td>4-7&quot; wc</td>
<td>---</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Pressure type LINOPAK pilot (w/vane)</td>
<td>4-7&quot; wc</td>
<td>---</td>
<td>15</td>
</tr>
</tbody>
</table>

### Optional/Replacement Parts

- **Optional Flame Rod**

- **18mm Spark Ignitor**

- **Optional electrode cover** protects porcelain insulator and electrical connection from dirt and moisture. May be used for ambient temperatures up to 450°F (232°C).
Pilot Capacities/Specifications/Dimensions (in inches) for Style A, B & C LINOFLAME® Burners

Side-mounted pilots for Style A, B, & C LINOFLAME® Burners

<table>
<thead>
<tr>
<th>Sketch Number (below)</th>
<th>Pilot Description</th>
<th>Pressures required to pilot mixer</th>
<th>Nominal Capacity 1000’s Btu/hr</th>
<th>Pilot Assembly Includes:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Natural Gas</td>
<td>Combustion Air</td>
<td>Pilot Mixer</td>
</tr>
<tr>
<td>1</td>
<td>Fresh air type LINOPAK pilot</td>
<td>8-27” wc</td>
<td>---</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Recirculating type (with vane)</td>
<td>4-7” wc</td>
<td>8-16 oz.</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Pressure type pilot (with vane)</td>
<td>4-7” wc</td>
<td>---</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Open port venturi pilot</td>
<td>2-15 PSIG</td>
<td>---</td>
<td>30</td>
</tr>
</tbody>
</table>

**Fresh Air Type**

[Diagram of Fresh Air Type]

**Pressure Type**

[Diagram of Pressure Type]

**Inert Air Type**

[Diagram of Inert Air Type]

Optional/Replacement Parts

18mm Spark Ignitor

10mm Spark Ignitor

**NOTE:** Sketch 2 shows pilot mounting bracket mounted to side of a LINOFLAME® Burner section. Pilot assembly and mounting bracket must be ordered separately.
Design and Application Details
Type “VF” LINOFLAME® Burners

Principle of Operation
Type “VF” LINOFLAME® Burners consist of a cast iron air/gas manifold incorporating a V-shaped drilled burner face. When supplied with a full air/gas premixture, they provide a wide ribbon flame pattern. The “VF” V-faced burner design provides excellent flame retention and constant cross ignition with differential mixture pressures up to 10 inches w.c. without separate flame ignition rails.

Maintenance and cleaning are easier, due to the larger drilled ports on the face and the absence of flame ignition rails on the “VF” LINOFLAME® Burner.

As with other premix-type line burners, the “VF” LINOFLAME® Burner is assembled using modular component sections. Over 23 modular shapes may be assembled to most any desired shape, matching flame and heat distribution to your heating requirements.

Standard drilled sections permit matching the discharge area to the specific premixing equipment used by simply controlling the total burner assembly footage.

Two varieties of “VF” LINOFLAME® Burners are available:

“VFH” (V-faced, high capacity) is normally rated up to 600,000 Btu/hr per lineal foot of burner with 10” wc mixture pressure.

“VFL” (V-faced, low capacity) is rated up to 300,000 Btu/hr per lineal foot of burner with 10” wc mixture pressure.

Turndown ratios of 10:1 are common with both “VFL” and “VFH” LINOFLAME® Burner assembly applications.

Capacities of Type “VF” LINOFLAME® Burners depend on both mixture pressure and air velocity over the burner.

Nominal ratings are shown in the graph below which plots mixture pressure (in inches wc) against heat release per lineal foot of burner. Graph is based on firing in still air or in air streams with velocities with less than 1500 fpm for VFL, 2000 fpm for VFH Burner.

Minimum capacities must be increased to those figures shown in Table 1 below if velocity exceeds those outlined above. Do not exceed 3000 SFPM velocity with VFL (4000 SFPM velocity for VFH).

Maximum ratings require 10” wc mixture pressure, but must be reduced by 5% if firing into a highly inert atmosphere.

<table>
<thead>
<tr>
<th>Burner Type</th>
<th>Still Air</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
<th>4000</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFL</td>
<td>30</td>
<td>30</td>
<td>34</td>
<td>37</td>
<td>40</td>
<td>---</td>
</tr>
<tr>
<td>VFH</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>65</td>
<td>70</td>
<td>80</td>
</tr>
</tbody>
</table>

VFH-12” section
Capacity/Selection Data
Type “VF” LINOFLAME® Burners

Temperature limitations
Ambient and/or return air stream temperatures passing over the burner should not exceed 800°F (427°C). Downstream temperature should not exceed 1000°F (538°C) for recirculated air streams, 1200°F (649°C) for all fresh air.

Burner inlet feed piping must be adequate to provide a well-distributed flow of air/gas throughout the burner assembly. In regards to capacity, there is no penalty for either an oversized header or too many inlet feeds on the burner assembly.

Inlet flanges bolt directly to burner body casting and accept threaded NPT piping.

Do not exceed the capacity feed limitations shown in the table below.

Burner duct area displacement
For purposes of calculating operating air velocities and resulting static pressure drops across the burner assembly, use the equivalent displacements given in the table below.

Velocity of air flowing past a LINOFLAME® Burner assembly used for air heating is determined by dividing SCFM of air passing over the burner by the net area (in ft²) of the cross section of the duct surrounding the burner. This net area is determined by subtracting the space displaced by the LINOFLAME® Burner from the gross area of the duct itself.

Total heat release and “VF” LINOFLAME® Burner footage are normally selected from the tables given in the various premixing equipment sections of the Maxon catalog.

Series LG & HG Mixing Tubes,
MULTI-RATIO™ Mixers .......... Bulletin 3200
VENTITE™ Inspirators .......... Bulletin 3300

Based on capacity information given in these catalog sections, and within the constraints of duct size and air volume flows, a “VF” LINOFLAME® Burner assembly is designed utilizing the available sections shown on the following pages.

Warning: Discharge areas of this or any premix-type burner are carefully matched to the equipment supplying air/gas premixture. Increasing the discharge area by adding to the burner length could result in ignition within the burner or backfire during operation.

Inlet Feed Capacity Limitations

<table>
<thead>
<tr>
<th>Feed Location</th>
<th>Type “VF” LINOFLAME® Burner Flange Designation Used</th>
<th>Maximum Feet per Leg</th>
<th>Maximum Feet per Feed</th>
<th>Type “VFL” LINOFLAME® Burner Flange Designation Used</th>
<th>Maximum Feet per Leg</th>
<th>Maximum Feet per Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>End of straight</td>
<td>VFH-2 EF</td>
<td>2</td>
<td></td>
<td>VFL-1-1/2 EF</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12” back inlet</td>
<td>VFH-3 BF</td>
<td>5</td>
<td></td>
<td>VFL-2 BF</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>12” x 12” back inlet cross</td>
<td>VFH-3 XF</td>
<td>6</td>
<td></td>
<td>VFL-3 XF</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>VFH-4 XF</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[1] A “leg” is defined as the additional burner sections attached to any one end of the section containing the inlet.

Burner Duct Area Displacement

<table>
<thead>
<tr>
<th>Section Description</th>
<th>Type “VF” LINOFLAME® Burner Designation</th>
<th>Displacement Area (ft²)</th>
<th>Type “VFL” LINOFLAME® Burner Designation</th>
<th>Displacement Area (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3” straight</td>
<td>VFH-3</td>
<td>0.1</td>
<td>VFL-3</td>
<td>0.05</td>
</tr>
<tr>
<td>6” straight</td>
<td>VFH-6</td>
<td>0.1</td>
<td>VFL-6</td>
<td>0.1</td>
</tr>
<tr>
<td>12” straight</td>
<td>VFH-12</td>
<td>0.4</td>
<td>VFL-12</td>
<td>0.2</td>
</tr>
<tr>
<td>12” back inlet straight</td>
<td>VFH-12B</td>
<td>0.4</td>
<td>VFL-12B</td>
<td>0.2</td>
</tr>
<tr>
<td>6” elbow</td>
<td>----</td>
<td>---</td>
<td>VFL-L</td>
<td>---</td>
</tr>
<tr>
<td>12” x 6” tee</td>
<td>VFH-T</td>
<td>0.5</td>
<td>VFL-T</td>
<td>0.28</td>
</tr>
<tr>
<td>12” x 12” cross</td>
<td>VFH-X</td>
<td>0.6</td>
<td>VFL-X</td>
<td>0.36</td>
</tr>
<tr>
<td>12” x 12” back inlet cross</td>
<td>VFH-XB</td>
<td>0.6</td>
<td>VFL-X</td>
<td>0.36</td>
</tr>
</tbody>
</table>
When making premix-type line burner comparisons, the discharge areas and capacity equivalents may be shown as follows:

1’ of VFL = 1/2’ of VFH = 1’ of Style B-96-36-43

When ordering a burner assembly made up from the available module components, be sure to provide an assembly sketch of the complete burner (as viewed from the back, or upstream, side) including locations of all accessories and/or individual component sections.

All “open” ends of burner assembly must be closed off with one of the end closures or pilot assemblies shown on the following pages. Any end plate ports not used must be plugged.

Ignition may be either direct spark (utilizing special flame rod and spark ignitor end closures offered) or more typically, by incorporating one of the available LINOPAK® pilots (offered for both low- and high-pressure gas supplies and in your choice of atmospheric and pressure types).

Burner expansion and bowing
Due to the increased mass of “VF” LINOFLAME® Burner casting, special consideration must be made to allow for the additional linear expansion.

“VF” Burner face temperatures are essentially constant (850°F) at their maximum firing rates. At this temperature, the theoretical linear expansion is 0.06 inches/lineal foot. (Example: A 5’ center-fed bar of “VF” LINOFLAME® Burner will deflect approximately 0.75” at 850°F and the deflection commences at the ends of its feed section.)

With or without inlet feed flexible connectors in the air/gas premixture line(s), the maximum linear distance recommended between cross-ignition end plates or between an end plate and a cross-ignition end plate is 10 ft.

Avoid continuous straight runs longer than 7 feet of LINOFLAME® Burner. Beyond that length, the burner should be broken into separately-fed, shorter lengths (connected by cross ignition end plate sets) to minimize burner distortion and stresses during alternate heating and cooling cycles.

Burner support methods provide support to your inlet feed manifolds and bolt the “VF” burner assembly to the inlet flanges. If Universal Support Brackets (USB) are used, locate them nearer to the inlet feed sections, and not at the extreme ends of the burner.

Start-up and operating procedures will be greatly simplified if observation ports are provided and positioned to allow direct visual inspection of both pilot and main flame.

### End-mounted LINOPAK Pilots for VF LINOFLAME® Burners

<table>
<thead>
<tr>
<th>Available Natural Gas Pressures</th>
<th>Pilot Mixer</th>
<th>Type of Flame Safeguard</th>
<th>VFH LINOFLAME® Burner LINOPAK Pilot</th>
<th>VFL LINOFLAME® Burner LINOPAK Pilot</th>
<th>Normal Capacity (1000’s Btu/hr)</th>
<th>Pilot Mixer</th>
<th>Adjustable Gas Orifice</th>
<th>Spark Ignitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Gas Pressures (4.7&quot; wc)</td>
<td>Venturi-type</td>
<td>UV scanner</td>
<td>VFH-LO-V-UV</td>
<td>VFL-LO-V-UV</td>
<td>20</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flame rod</td>
<td>VFH-LO-V-FR</td>
<td>VFL-LO-V-FR</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Pressure-type (requires 4-16 psi combustion air)</td>
<td>UV scanner</td>
<td>VFH-LO-P-UV</td>
<td>VFL-LO-P-UV</td>
<td>25</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flame rod</td>
<td>VFH-LO-P-FR</td>
<td>VFL-LO-P-FR</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Higher Gas Pressures (1-2 PSIG)</td>
<td>Venturi-type</td>
<td>UV scanner</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flame rod</td>
<td>VFH-HI-V-FR</td>
<td>VFL-HI-V-FR</td>
<td>75</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Pressure-type (requires 4-16 psi combustion air)</td>
<td>UV scanner</td>
<td>VFH-HI-P-UV</td>
<td>VFL-HI-P-UV</td>
<td>75</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flame rod</td>
<td>VFH-HI-P-FR</td>
<td>VFL-HI-P-FR</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
Dimensions (in inches)

“VFH” LINOFLAME® Burner Sections

<table>
<thead>
<tr>
<th>Straight Section</th>
<th>Dimension “L”</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFH-12</td>
<td>12”</td>
</tr>
<tr>
<td>VFH-6</td>
<td>6”</td>
</tr>
<tr>
<td>VFH-3</td>
<td>3”</td>
</tr>
</tbody>
</table>

**VFH straight sections**

**VFH-X 12” x 12” cross**

**VFH-T 12” x 6” tee**

**Inlet Feed Sections**

VFH-12B 12” back inlet

VFH-XB 12” x 12” back inlet cross

Typical cross sectional view of VFH LINOFLAME® section

VFH-12B requires inlet flange set below (order separately)

VFH-3BF back inlet flange set for 12B inlet section

VFH-XB requires one of the inlet flange sets shown below (order separately)

* ISO threaded flanges available; contact Maxon.

<table>
<thead>
<tr>
<th>(XB) back inlet cross inlet flange sets</th>
<th>NPT Pipe Size</th>
<th>Dimension “A”</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFH-3XF</td>
<td>3”</td>
<td>1</td>
</tr>
<tr>
<td>VFH-4XF</td>
<td>4”</td>
<td>1.31</td>
</tr>
</tbody>
</table>
Dimensions (in inches)
“VFH” LINOFLAME® Burner Sections

**End Closures**

<table>
<thead>
<tr>
<th>VFH-EC</th>
<th>Typical for all VFH end closures</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFH-EC-FR</td>
<td>Optional flame rod (order separately)</td>
</tr>
<tr>
<td>VFH-EC-SI</td>
<td>10 mm spark ignitor (included)</td>
</tr>
<tr>
<td>VFH-XEP Expansion end plate set</td>
<td></td>
</tr>
</tbody>
</table>

**End Inlet Sets**

| VFH-2EF | |
| VFH-2EF-FR | |
| VFH-2EF-SI | 14mm spark ignitor (included) |

**VFH-HREP**

Hi-recirc end plate
Dimensions (in inches)
VFL LINOFLAME® Burner Sections

VFL straight sections

<table>
<thead>
<tr>
<th>Straight Section</th>
<th>Dimension &quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>VFL-12</td>
<td>12&quot;</td>
</tr>
<tr>
<td>VFL-6</td>
<td>6&quot;</td>
</tr>
<tr>
<td>VFL-3</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

VFL-X 12" x 12" cross

VFL-12B 12" back inlet

VFL-12B requires inlet flange set below (order separately)

VFL-2BF back inlet flange set for 12B inlet section

Inlet Feed Sections

VFL-XB 12" x 12" back inlet cross

VFL-XB requires one of the inlet flange sets shown below (order separately)

VFL-3XF inlet flange set for XB section

* ISO threaded flanges available; contact Maxon.

Typical cross sectional view of VFL LINOFLAME® section

* ISO threaded flanges available; contact Maxon.
Dimensions (in inches)
VFL LINOFLAME® Burner Sections

End Closures

VFL-EC

VFL-EC-FR

Optional flame rod
(order flame rod separately)

1/4" Thd.

2

4.5

3.75

1.75

0.44

1.56

VFL-EC-SI

10mm spark ignitor
(included)

10mm Thread

Gap 0.125

“Rajah” R/A/C #11
Right angle terminal

1.75

3.75

2

2.61

2.81

0.25

End Inlet Sets

VFL- 1-1/2" -EF

VFL-XEP expansion end plate set

VFL-HREP
hi-recirc end plate
Dimensions (in inches)
LINOPAK Pilots with VF LINOFLAME® Burners

LINOPAK Pilots (using UV scanner) with VF LINOFLAME® Burners

LINOPAK Pilots (using flame rods) with VF LINOFLAME® Burners

Pipe threads on this page conform to NPT (ANSI Standard B2.1)
**Premix-type Line Burners**

**Dimensions** (in inches)

**18mm spark ignitor** included with all LINOPAK pilots

- **Thread** 18mm
- **Gap** 0.125
- **“Rajah” R/A/C #11 Right angle terminal**

**Universal Support Brackets (USB)**

- (12 gauge mild steel) for VF LINOFLAME® Burners
- Stainless steel versions available.

**Optional flame rod** for LINOPAK pilots

- **1/4” Thd.**
- **2**
- **4.5**

**Air-Gas Pilot Mixers for all LINOPAK Pilots**

**Atmospheric type**

- Low pressures venturi type
- 1/2" NPT pipe thread
- Spud orifice 3/8" NPT gas connection
- 4.5

**Medium pressures**

- 7/64" dia. orifice 3/8" NPT pipe thread
- 6.56

**Pressure type**

**Low pressures**

- Adjustable orifice 1/2" NPT pipe thread
- 6" of 5/16" dia. tubing
- Gas mixture outlet
- 1/4" gas connection
- 3/8" NPT pipe thread
- Air inlet
- 3.5

**High pressures**

- Adjustable orifice 1/2" NPT pipe thread
- Gas mixture outlet
- 1/4" gas connection
- 3/8" NPT pipe thread
- Gas inlet
- 3.5

**External Mounting Assemblies for all LINOPAK Pilots**

**Description**

- Includes Mounting Plate with two (2) feed-through insulators for internal mounting of spark ignitor and flame rod

- Includes Mounting Plate with feed-through insulator for internal spark ignitor and provision for external UV scanner

Pipe threads on this page conform to NPT (ANSI Standard B2.1)
**Design and Application Details**

**INFRAWAVE® Burners**

**Principle of Operation**

INFRAWAVE® Burners utilize air-gas premixtures supplied to a ductile iron burner body/manifold. Drilled burner body ports and alloy deflector rails provide flame retention, direction, and reliable cross-ignition throughout the entire length of the modular designed burner assembly. Because the air-gas premixture passes through drilled ports in the burner body and not through a porous refractory, the problems of plugging caused by dirty/contaminated combustion air are virtually eliminated.

Small fingers of flame are deflected down between the ribs of the high-temperature refractory grids where the grids are rapidly heated to radiant temperatures. The average refractory face temperature (with 10" wc mixture pressure) is up to 2000°F (1093°C) and even at minimum capacities, this face temperature typically remains at 900°F (482°C).

The INFRAWAVE® Burner’s higher face temperatures provide a very high intensity infrared radiation source. The radiant power from a 2000°F face temperature is approximately 2.4 times the radiant power potential of the burner face temperature at only 1500°F.

Face temperatures, and thus the radiant power (capacity) effect of INFRAWAVE® Burners, increase from minimum capacities up to approximately 10" wc mixture pressures. Above that pressure, fingers of flame extend forward from the outer edge of the slots in the refractory grids. These hot products of combustion exit with a very low forward velocity after traveling along and between the refractory grid ribs. They can provide additional convection heating for overall increased system efficiencies.

**Total heat release and INFRAWAVE® Burner footages** are normally selected from the tables given in the various premixing equipment sections of the Maxon catalog:

- PREMIX® Blower Mixers .......... Bulletin 3100
- Series LG/HG Mixing Tubes and MULTI-RATIO™ Mixers ....... Bulletin 3200

INFRAWAVE® Burners are offered in two (2) versions:

- “DG” – high capacity double grid, or
- “SG” – lower capacity single grid.

**Modular design** permits tailoring total heat release and radiant pattern to your particular application.

**Heating intensity** can be further varied by adjusting burner-to-product distances, since radiant heating intensity and effectiveness depend on the total radiating surface area. Misalignment or geometrical positioning of the workpiece with respect to an INFRAWAVE® Burner can reduce its ability to absorb radiant energy.

**Typical INFRAWAVE® Burner mounting on a web/conveyor process**

DG Burners should normally be installed to fire directly at the work. Efficiency of SG burners is improved by angling at approximately 45°. (See sketch above.)

**Burner face to product distance**

INFRAWAVE® Burners discharge products of combustion with a low forward velocity. This minimizes the disturbance of granules and powders, but does not permit convection heating effect to cross large gaps. **Side-fired and down-fired burners should generally be spaced 2-6” from product.** Larger spacings are possible with upward firing.

The gap will normally be kept uniform along the entire burner length, with the distance field-adjustable to optimize performance.
INFRAWAVE® Burner capacities as a function of differential mixture pressures

Select all premixing equipment and control valves based on the “gross” fuel flow capacity curves shown on chart above.

Radiant power flow curves reflect the infrared heat output in radiant energy and do not take into consideration any convected heat available from the hot combustion products.

CAUTION: Emissivity of the product and/or geometric positioning of the workpiece will affect the infrared energy absorption rates.

Typical product emissivity factors (@ 100°F)

<table>
<thead>
<tr>
<th>Material</th>
<th>Emissivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick, red</td>
<td>0.93</td>
</tr>
<tr>
<td>Cloth</td>
<td>0.75 - 0.9</td>
</tr>
<tr>
<td>Concrete</td>
<td>0.94</td>
</tr>
<tr>
<td>Glass, window</td>
<td>0.93</td>
</tr>
<tr>
<td>Gypsum</td>
<td>0.91</td>
</tr>
<tr>
<td>Paint, black</td>
<td>0.98</td>
</tr>
<tr>
<td>Paint, white</td>
<td>0.91</td>
</tr>
<tr>
<td>Paper</td>
<td>0.95</td>
</tr>
<tr>
<td>Plaster</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Radiant Heat Input Calculations

Consider mass and specific heat of system through-put, latent heat of vaporization and/or fusion, radiation and exhaust losses.

Check that adequate product area is exposed to radiant heating. A 12" length of “DG” INFRAWAVE® Burner has approximately 1.56 ft² of radiating surface area.
INFRAWAVE® Burner Application Considerations

DG Burners should normally be installed to fire directly at the work. Transfer efficiency of SG burners is improved by angling at approximately 45°. (See sketch below.)

Web stoppage may cause problems from residual heat, even with automatic burner shut-off. It may be necessary to use pillow blocks, air cylinder and lever arm to rotate the burner automatically out of the way upon deliberate or accidental web stoppage.

Spacing between rows. Because of burner face contours, the effective area of coverage is about double that of the actual physical size.

Adjacent rows of burner should be spaced far enough apart to allow dispersion of hot gases into the diluting ambient. As a rule-of-thumb: side- or up-firing burners should not be closer than 15” on center. Down-firing burners should not be closer than 18” on center.

If firing from both sides of a product, stagger burner rows to minimize heat concentration.

Hot combustion product/convection gases are always hotter than the lowest grid temperature. They may reach 2000°F (1093°C). If not collected, these gases disperse into the diluting ambient air and can have harmful effects on exposed equipment and components. The situation is particularly noticeable with down-fired burners where spark electrode and flame rod leads may require special insulation material.

Main flame characteristics. At minimum fire (0.2” wc mixture pressure) approximately a 1/8” long blue knife-edge flame should be visible beneath the deflector rails. There should be virtually no sound, and only very slight radiance visible on the refractory grids near burner ports.

At high fire (8” wc mixture pressure) small points of amber-tipped flame should be visible protruding from the ends of grid slots. Complete grid area should be radiant.

Mixture pressures above 8” wc will provide no further radiant increase, but will give flame extension from grid slot ends and an increased volume of hot convection gases.

Maximum infrared radiation, at any firing rate, is produced by the air-fuel ratio giving brightest refractory glow.

Physical damage to burner. Avoid mounting burner where work or other foreign material will fall or bump against it. Take care during storage and handling not to damage the refractory grid sections.

Required burner type, footage and configuration. In general, plastics and dry flammables cannot withstand the intense radiation of double-grid (DG) burner at high mixture pressures. Even single grid (SG) at full fire may be too much for solvent evaporation. Mixing equipment and combustion air pressure should be selected to achieve only the required mixture pressure.

The width of web, conveyor or product will generally determine maximum heat input from a single row of SG or DG burner. From this, total heat input will give you the required number of rows of burner and minimize the risk of longitudinal hot streaks.

Flame supervision. INFRAWAVE® Burners include provision for flame rod or UV scanner detection. Main flame pick-up is difficult below about 0.5” wc mixture pressure, so for lowest possible minimum capacity (and maximum turndown), interrupted pilots or direct spark ignition should be avoided. Flame rods sensing a pressure pilot may require cooling tees if porcelain is subject to temperatures exceeding 400°F (204°C) (as with down-fired burners).

UV scanners generally will require remote mounting and air cooling to survive the ambient temperatures encountered at the burner.

Warning: Test every UV flame sensing installation for dangerous spark excitation from ignitors, other burners and other possible sources of direct or reflected UV radiation.
Dimensions (in inches)

INFRAWAVE® Burners

Standard 6" and 12" straight sections

6" DG          12" DG

NOTE: All INFRAWAVE® Burner sections use ISO standard (metric) fasteners

6" SG          12" SG

Single-grid (SG) burners may be specified with grid position #1 or #2 as viewed from the pilot end of an assembly and shown at left. (If side-mounted accessories are used, grids will always be assembled on the same side as accessories.)
INFRAWAVE® Burners

Standard 6" and 12" Straight Sections with Side-mounted Accessories

With spark ignitor and provision for FR/UV

Right: Plain SG-12" straight with optional flame rod

With pressure pilot, spark ignitor, adjustable orifice with provision for mounting a UV scanner

Right: DG-12" straight section shown with end closure set

With spark ignitor only (for direct ignition) or with provision for FR/UV

Inlet Feed Sections for INFRAWAVE® Burner assemblies

NOTE: Do not use 2" inlet flanges to feed more than 16' of SG burner (8' of DG). 3" inlet flanges may be used to feed a maximum of 32' of SG burner (16' of DG).

12" DG
Bottom Inlet

NOTE: See photo above of DG-12" straight section showing end closure set mounted to close off the burner body/manifold cavity

12" DG
Side Inlet

Typical end view of side inlet section (with optional accessories)
**Dimensions** (in inches)  
**INFRAWAVE® Burners**

### End-mounting Accessories for ALL Sections

**End-mounted pilot and bracket for “SG” burner**

![Image of SG Burner Setup](image1)

**End-mounted pilot and bracket for “DG” burner**

![Image of DG Burner Setup](image2)

*Caution: Be sure to specify refractory grid position on SG INFRAWAVE® Burner. UV scanner/flame rod must be located on refractory grid side of burner element.*

### Universal Support Bracket (normally supplied in pairs)

![Image of Support Bracket](image3)

**Flange and End Closure Plate Sets**

<table>
<thead>
<tr>
<th>Flange Type</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2” ANS Inlet Flange</td>
<td><img src="image4" alt="Flange Image" /></td>
<td>DIN threaded flange sets are also available upon request.</td>
</tr>
<tr>
<td>3” ANS Inlet Flange</td>
<td><img src="image5" alt="Flange Image" /></td>
<td></td>
</tr>
<tr>
<td>End Closure Plate</td>
<td><img src="image6" alt="Flange Image" /></td>
<td></td>
</tr>
</tbody>
</table>

### Optional Flame Rods

<table>
<thead>
<tr>
<th>Flame Rod Type</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain</td>
<td><img src="image7" alt="Flame Rod Image" /></td>
<td></td>
</tr>
<tr>
<td>With Cooling Tee</td>
<td><img src="image8" alt="Flame Rod Image" /></td>
<td></td>
</tr>
</tbody>
</table>

### Replacement Spark Ignitors

<table>
<thead>
<tr>
<th>Ignitor Type</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>10mm Spark Ignitor</td>
<td><img src="image9" alt="Ignitor Image" /></td>
<td></td>
</tr>
<tr>
<td>14mm Spark Ignitor</td>
<td><img src="image10" alt="Ignitor Image" /></td>
<td></td>
</tr>
<tr>
<td>18mm Spark Ignitor</td>
<td><img src="image11" alt="Ignitor Image" /></td>
<td></td>
</tr>
</tbody>
</table>

### Flame Rod Length "L" (in inches)

<table>
<thead>
<tr>
<th>INFRAWAVE® Section</th>
<th>With cooling tee</th>
<th>Without tee</th>
</tr>
</thead>
<tbody>
<tr>
<td>For all 6” &amp; 12” SG or DG burner sections</td>
<td>6-13/16</td>
<td>4-1/2</td>
</tr>
<tr>
<td>For end mounted pilot assemblies</td>
<td>4-13/16</td>
<td>2-1/2</td>
</tr>
</tbody>
</table>
Component Identification
INFRAWAVE® Burners

Suggested spare parts
- Deflector rail(s)
- Grid clamp(s)
- Grid support(s)
- Refractory baffle grid(s)
- Manifold gaskets

Gaskets
Unless specified otherwise, burners are shipped from the factory with manifold and body/manifold joints sealed with Keypaste.

For field replacements or sections shipped loose, high temperature gaskets should be ordered and installed between manifolds and between body and manifold.

To replace refractory baffle grids:
1. Apply penetrating oil to grid clamp screws and let stand for a few minutes. If still tight, tap with a hammer to loosen.
2. Unscrew grid clamp screws sufficiently so that grid clamp may be tilted back to clear refractory grids as shown in Sketch 1.
3. Remove broken grid section and any remaining fragments as shown in Sketch 2.
4. Insert replacement grid and return grid clamp to original position holding grid firmly against grid support.
5. Center grids on each grid clamp section so they do not overlap, then retighten grid clamp screws firmly.

NOTICE: INFRAWAVE® Burner grids must be cured before being taken to high fire.

This curing process must take place on initial firing and is to include at least a 15 minute slow bring-up time where the grid is fired low and brought up through the firing rate at even increments over the 15 minute period.

After this process has taken place, the refractory grids may be fired in the normal manner without negative side effects.

Failure to cure the refractory grids in this manner may result in cracking and quick erosion of the grids, which results in shortened burner life.