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.

12" straight Style LBA-12 LINOFLAME® Burner section shown with optional direct spark ignition rail arrangement

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.

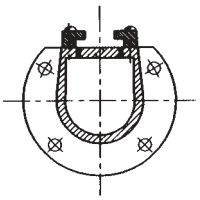
Over 200 modular sections are available in various shapes and configurations. These sections may be assembled into virtually any desired shape in order to match flame and heat distribution to your job requirements.

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.

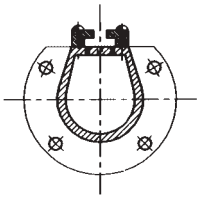
The short ribbon-type flame widely distributes the desired heat release for greater temperature uniformity. They provide stable operation in still, fresh air and/or in highly inert air stream atmospheres.

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.

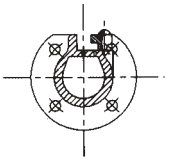
Three styles of LINOFLAME® Burner sections are offered. All styles (sizes) incorporate cast iron burner bodies and are available with cast iron or alloy ignition rails. The alloy ignition rails offer extended life in difficult service conditions and are recommended for propane-fired applications or those 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.

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

Number of holes/lineal foot
24
36
72
96

Drill size of main ports
none = no main ports

Drill size of ignitor ports*

*** The maximum drill size for ignitor ports is .188" diameter.**

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

Burner inlet flange	Maximum Btu/hr
1-1/2" end inlet (LFE- 1-1/2") [1]	350,000
1-1/2" back inlet (LFB- 1-1/2")	
2" end inlet (LFE- 2") [1]	600,000
2" back inlet (LFB- 2")	
2-1/2" back inlet (LFB- 2-1/2")	850,000
3" back inlet (LFB- 3")	1,250,000

[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:

Velocity of air flowing past a LINOFLAME®

Section Description	Displacement Area
3" straight sections (-3)	.064 ft^2
6" straight sections (-6)	.117 ft^2
8" straight sections (-8)	.152 ft^2
12" straight & back inlet sections (-12)	.223 ft^2
Tee section, bottom inlet (-TB)	.300 ft^2
Tee section, side inlet (-TS)	.359 ft^2
Tee section, cross ignition (-TX)	.270 ft^2
3" elbow section (E-3)	.176 ft^2
6" elbow section (E-6)	.175 ft^2

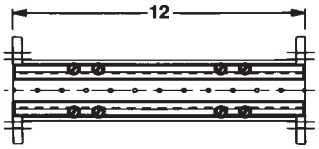
Burner assembly used for air heating is determined by dividing SCFM of air passing over the burner by the net area (in ft^2) of the cross-section of the duct surrounding the burner. This net area is determined by subtracting the space displaced by the LINOFLAME® Burner from the gross area of the duct itself.

Dimensions (in inches)

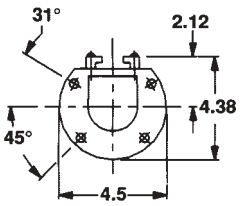
Style "A" LINOFLAME® Burner Sections

6" Straight LA-6, LAA-6

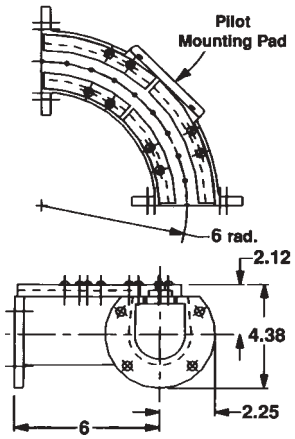
12" Straight LA-12, LAA-12



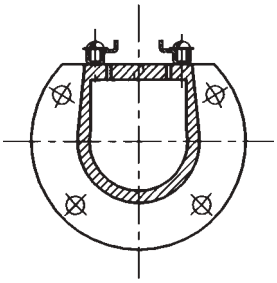
End View Typical of All Style A LINOFLAME® Burner Straight Sections



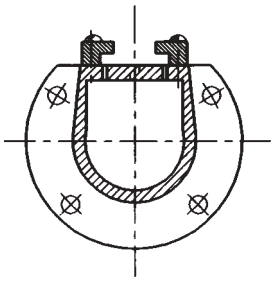
6" Elbow Section LAA-E6



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

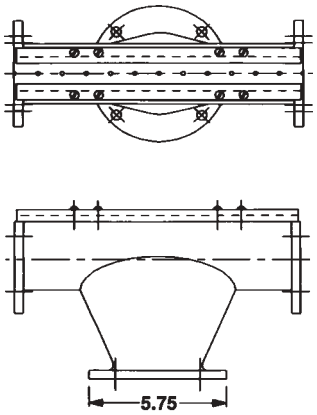


Typical Cross Sectional View of Style A LINOFLAME® Burner with cast iron ignition rails



Inlet Feed Section

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

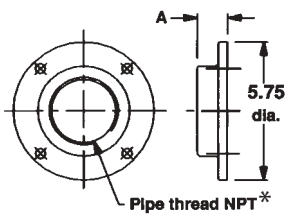


Back inlet tee section requires a back inlet flange set from below

Inlet flange set options
for back inlet tee section

ANSI Flange Identification	NPT Pipe Thread*	Dimension "A"
LFB- 1-1/2"	1-1/2"	0.88
LFB- 2	2"	
LFB- 2-1/2	2-1/2"	1.25
LFB- 3	3"	

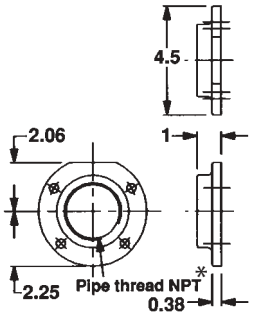
Back Inlet Flange Set



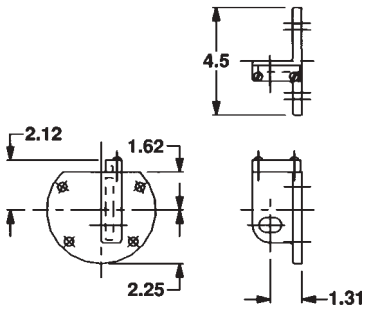
End inlet flange set

ANSI Flange Designation	NPT Pipe Thread*
1-1/2" LFE	1-1/2"
2" LFE	2"

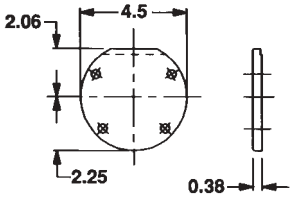
End Inlet Flange Set



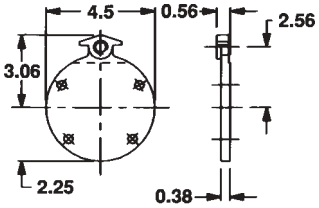
Cross Ignition End Plate Set LX-EP, LXA-EP (normally supplied in pairs)



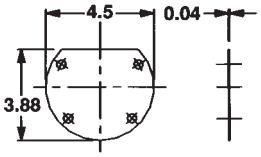
LEP Plain End Plate



EP-FR End Plate



LDP Division Plate



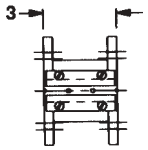
*** ISO threaded flanges available; contact Maxon.**

Dimensions (in inches)

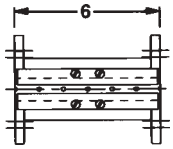
Style "B" LINOFLAME® Burner Sections

Burner Sections

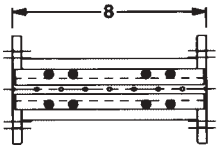
3" Straight
LB-3, LBA-3



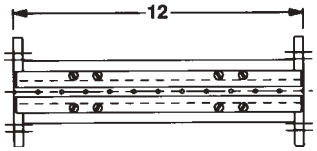
6" Straight
LB-6, LBA-6



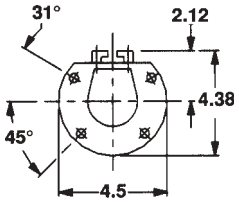
8" Straight
LB-8, LBA-8



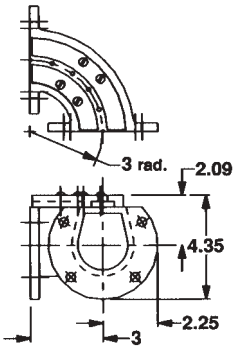
12" Straight
LB-12, LBA-12



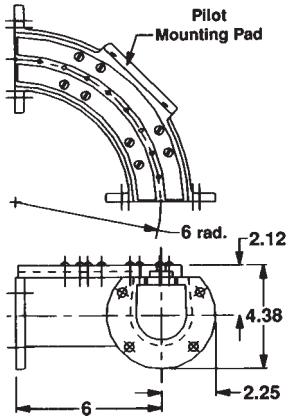
End view typical of all Style B LINOFLAME® Burner straight sections



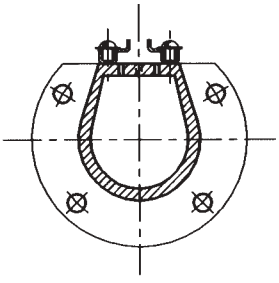
3" Elbow Section
LB-E3, LBA-E3



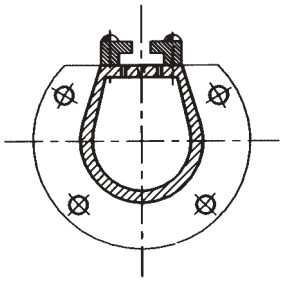
6" Elbow Section
LB-E6, LBA-E6



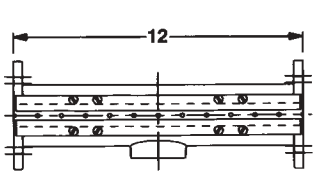
Typical Cross Section View of Style B LINOFLAME® Burner with alloy ignition rails

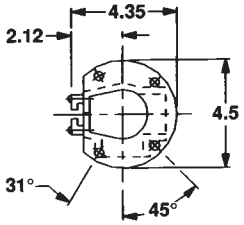


Typical Cross Section View of Style B LINOFLAME® Burner with cast iron ignition rails

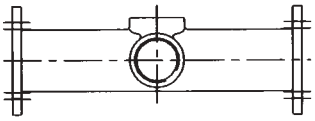


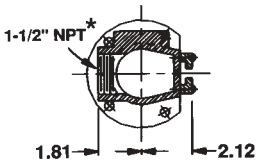
Bossed Inlet Feed Sections



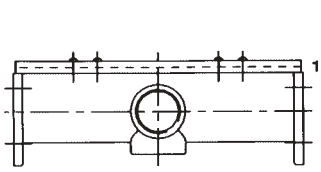


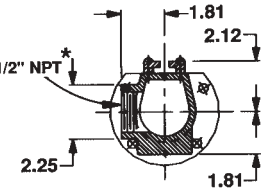
Bossed 12" Back Inlet Section
LB-12B, LBA-12B



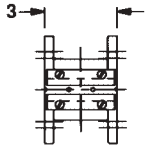


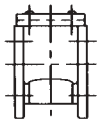
Bossed 12" Side Inlet Section
LB-12S, LBA-12S

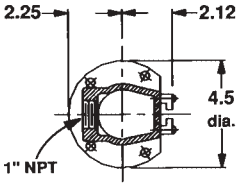


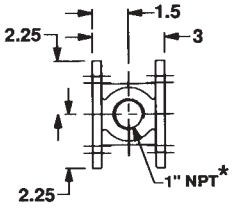


Bossed 3" Back Inlet Section
LB-3B, LBA-3B









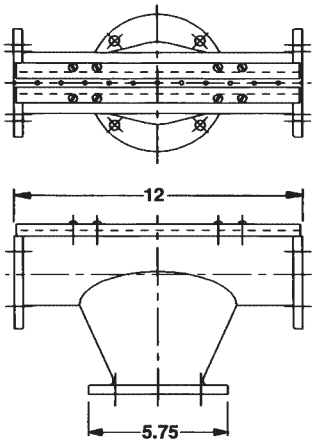
*** ISO threaded manifolds available as loose parts; contact Maxon.**

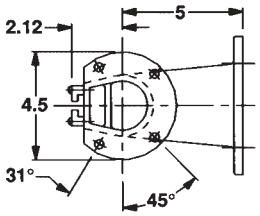
Dimensions (in inches)

Style "B" LINOFLAME® Burner Sections

Inlet Tee Feed Sections

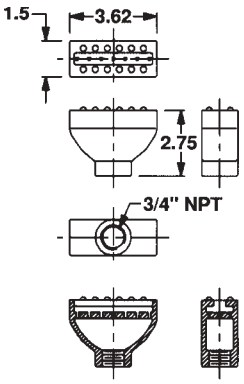
12" Back Inlet Tee LB-TB, LBA-TB





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

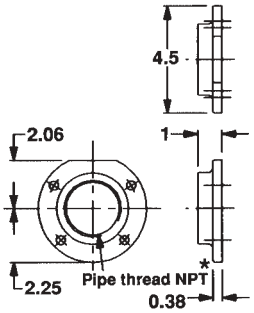
3" Midget Section LM-3-72



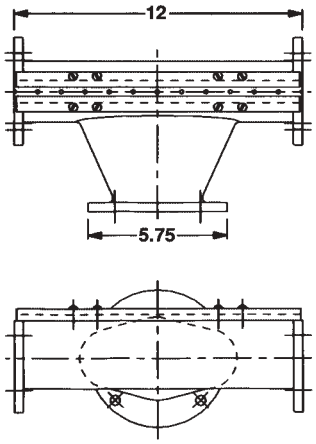
End inlet flange set

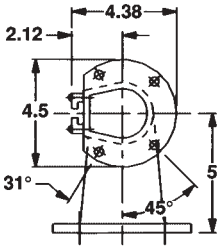
ANSI Flange Designation	NPT Pipe Thread*
1-1/2" LFE	1-1/2"
2" LFE	2"

End Inlet Flange Set

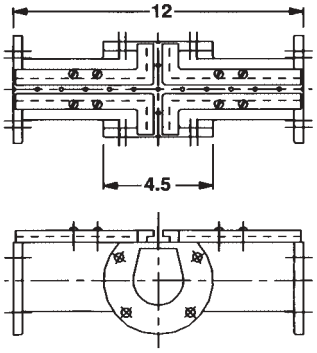


12" Side Inlet Tee LB-TS, LBA-TS

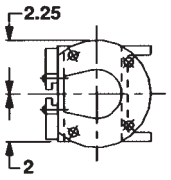




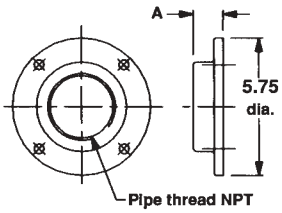
Tee section with side inlet requires a back inlet flange set from below



Cross Ignition Section LB-TX, LBA-TX



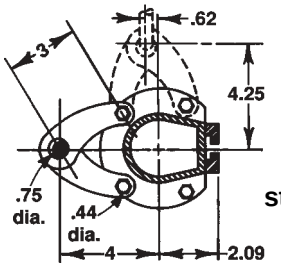
Back Inlet Flange Set



Inlet flange set options

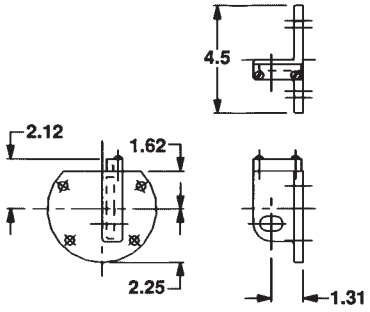
for inlet tee sections above

ANSI Flange Identification	NPT Pipe Thread	Dimension "A"
LFB- 1-1/2"	1-1/2"	0.88
LFB- 2	2"	
LFB- 2-1/2"	2-1/2"	1.25
LFB- 3	3"	

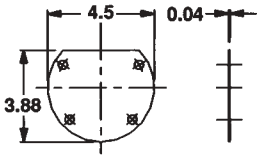


Universal Support Bracket (normally ordered in pairs). Carbon steel and stainless steel versions available.

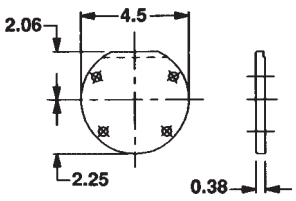
Cross Ignition End Plate Set LX-EP, LXA-EP (normally supplied in pairs)



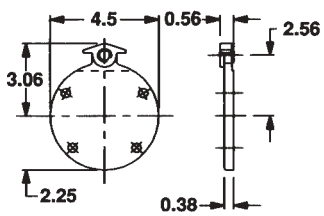
LDP Division Plate



LEP Plain End Plate



EP-FR End Plate

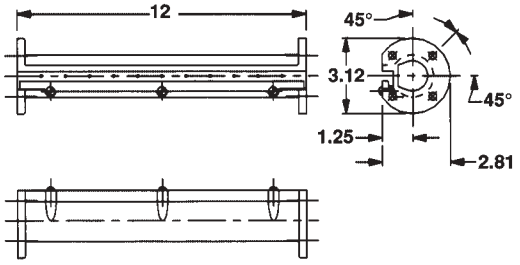


* ISO threaded flanges available; contact Maxon.

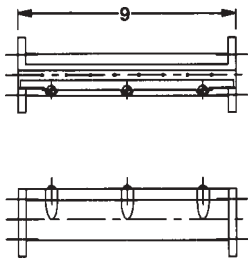
Dimensions (in inches)

Style "C" LINOFLAME® Burner Sections

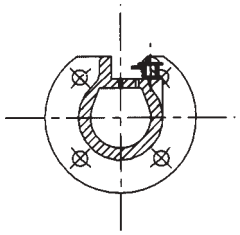
12" Straight
LC-12, LCA-12



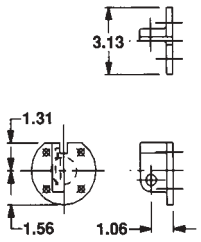
9" Straight
LC-9, LCA-9



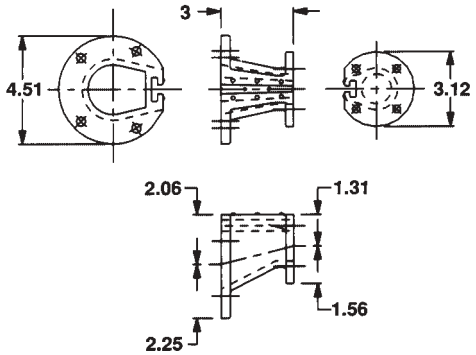
Typical Cross Section view of Style C LINOFLAME® Burner with alloy ignition rails



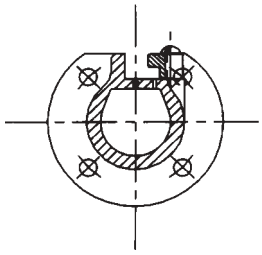
Cross Ignition End Plate Set
LX-EP, LXA-EP
(normally supplied in pairs)



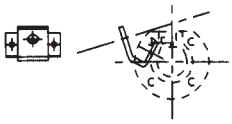
B to C Reducing Section
LBC-3-24



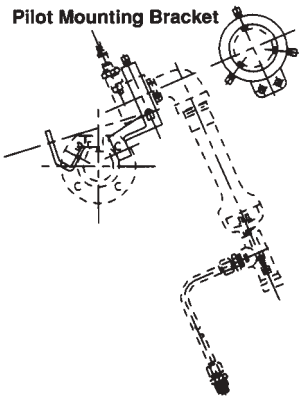
Typical Cross Section view of Style C LINOFLAME® Burner with cast iron ignition rails



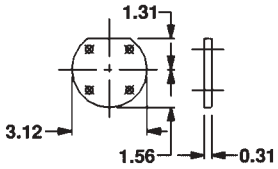
Flame Rod Holder



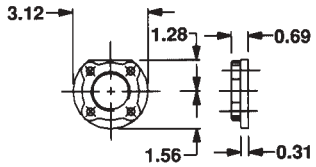
Typical mounting of flame rod holder and/or pilot mounting bracket



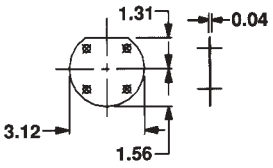
LEP Plain End Plate



1-1/4" LFC End Inlet Flange*



LDP Division Plate



*** ISO threaded flanges available; contact Maxon.**

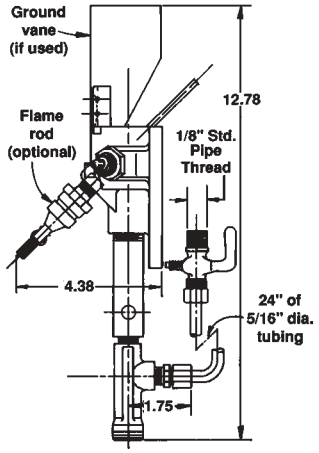
Pilot Capacities/Specifications/Dimensions (in inches)
for Style A, B & C LINOFLAME® Burners

End-mounted LINOPAK Pilots for Style A, B, & C LINOFLAME® Burners

Sketch Number (below)	Pilot Description	Pressures required to pilot mixer		Nominal Capacity 1000's Btu/hr	Pilot Assembly Includes:			
		Natural Gas	Combustion Air		Pilot Mixer	Gas Adjustable Orifice	Gas Adjustable Cock	Spark Ignitor
3	Inert air LINOPAK pilot	8-27" wc	---	30	Yes	No	Yes	18 mm
1	Fresh air LINOPAK pilot					Yes	No	
	Fresh air LINOPAK pilot (w/vane)							
3	Inert air LINOPAK pilot (w/vane)					No	Yes	
2	Pressure type LINOPAK pilot	4-7" wc	8-16 osi	15		Yes	No	
	Pressure type LINOPAK pilot (w/vane)							

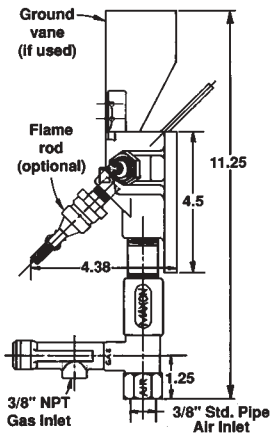
Fresh Air Type

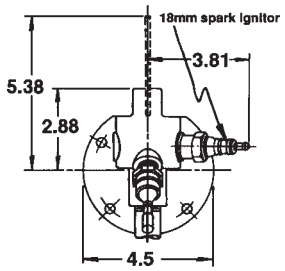
1



Pressure Type

2

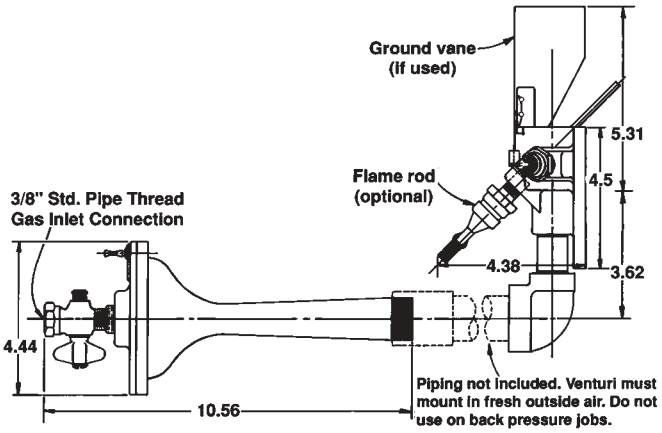




Typical End View

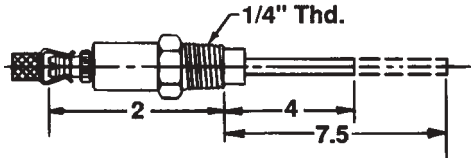
Inert Air Type

3

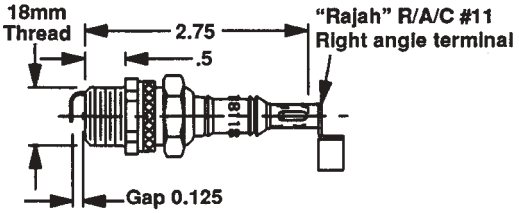


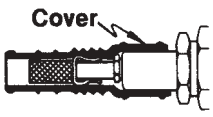
Optional/Replacement Parts

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).

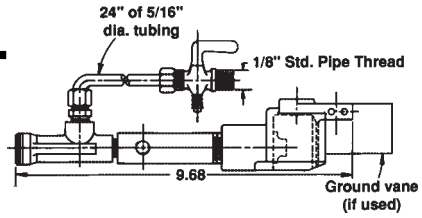
Pilot Capacities/Specifications/Dimensions (in inches)
for Style A, B & C LINOFLAME® Burners

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

Sketch Number (below)	Pilot Description	Pressures required to pilot mixer		Nominal Capacity 1000's Btu/hr	Pilot Assembly Includes:			
		Natural Gas	Combustion Air		Pilot Mixer	Gas Adjustable Orifice	Gas Adjustable Cock	Spark Ignitor
1	Fresh air type LINOPAK pilot	8-27" wc	---	30	Yes	Yes	No	18 mm
	Fresh air type (with vane)							
4	Recirculating type (with vane)					No	Yes	
3	Pressure type pilot (with vane)	4-7" wc	8-16 oz.	15				
2	Open port venturi pilot	4-7" wc	---	15		Yes	No	No
								10 mm
		2-15 PSIG		30				No
								10mm

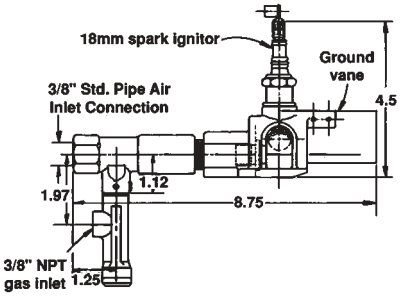
Fresh Air Type

1



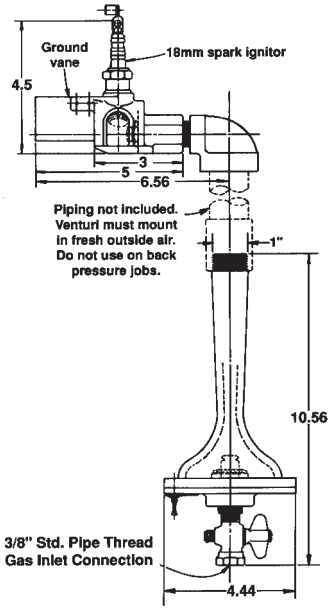
Pressure Type

3



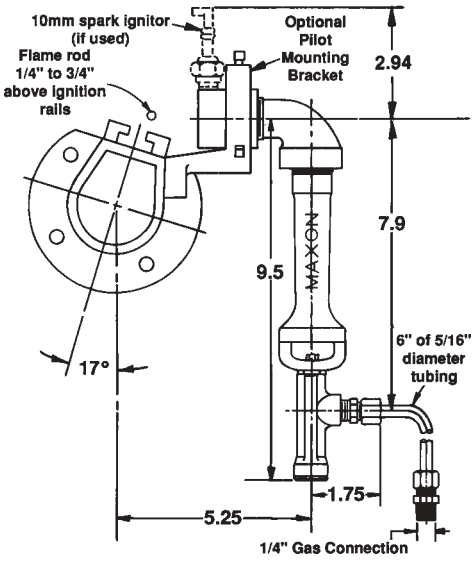
Inert Air Type

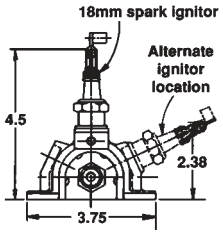
4



Open Port Type

2



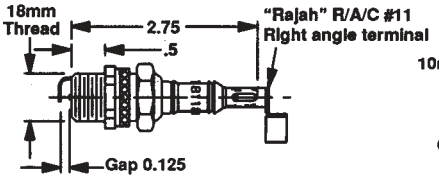


Typical Top View

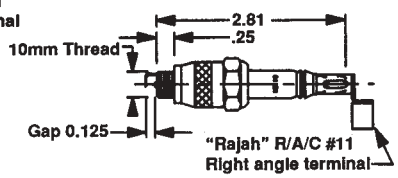
NOTE: Sketch 2 shows pilot mounting bracket mounted to side of a LINOFLAME® Burner section. Pilot assembly and mounting bracket must be ordered separately.

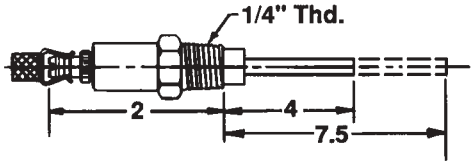
Optional/Replacement Parts

18mm Spark Ignitor



10mm Spark Ignitor





Optional Flame Rod

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.

VFH-12" section

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:

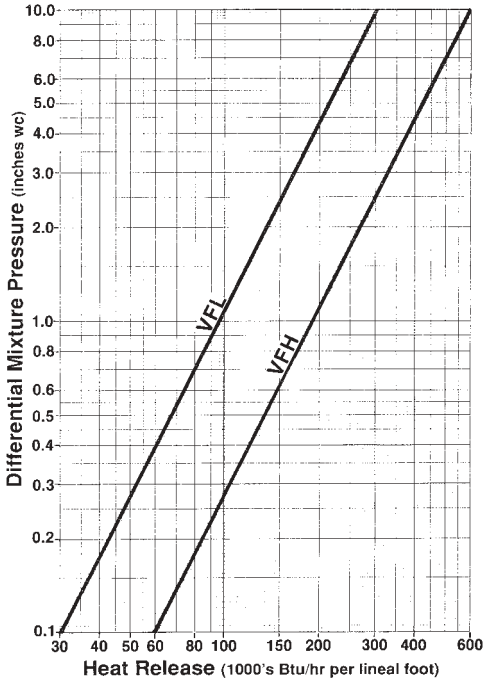
"VFH" (V-faced, high capacity) is normally rated up to 600,000 Btu/hr per lineal foot of burner with 10" wc mixture pressure.

"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 1: Minimum firing rate (1000's Btu/hr per lineal foot) for various velocities (SFPM)

Burner Type	Still Air	1500	2000	2500	3000	4000
VFL	30	30	34	37	40	---
VFH	60	60	60	65	70	80

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 ft^2) 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

Feed Location	Type "VFH" LINOFLAME® Burner			Type "VFL" LINOFLAME® Burner		
	Flange Designation Used	Maximum Feet per Leg [1]	Maximum Feet per Feed	Flange Designation Used	Maximum Feet per Leg [1]	Maximum Feet per Feed
End of straight	VFH- 2 EF	2	2	VFL- 1-1/2 EF	2	2
12" back inlet	VFH- 3 BF		5	VFL- 2 BF	1.5	4
12" x 12" back inlet cross	VFH- 3 XF		6	VFL- 3 XF		8
	VFH- 4 XF		10	---	---	---

[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

Section Description	Type "VFH" LINOFLAME® Burner		Type "VFL" LINOFLAME® Burner	
	Designation	Displacement Area (ft^2)	Designation	Displacement Area (ft^2)
3" straight	VFH-3	0.1	VFL-3	0.05
6" straight	VFH-6	0.1	VFL-6	0.1
12" straight	VFH-12	0.4	VFL-12	0.2
12" back inlet straight	VFH-12B		VFL-12B	
6" elbow	----	---	VFL-L	
12" x 6" tee	VFH-T	0.5	VFL-T	0.28
12" x 12" cross	VFH-X	0.6	VFL-X	0.36
12" x 12" back inlet cross	VFH-XB		VFL-XB	

Capacity/Selection Data
Type "VF" LINOFLAME® Burners

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.

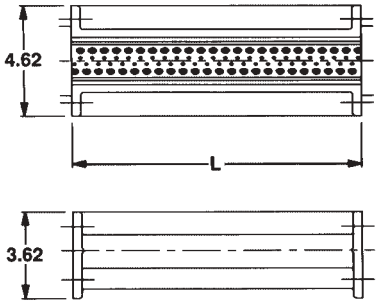
End-mounted LINOPAK Pilots for VF LINOFLAME® Burners

Selection Paramenters			VFH LINOFLAME® Burner LINOPAK Pilot	VFL LINOFLAME® Burner LINOPAK Pilot	Normal Capacity (1000's Btu/hr)	Pilot Assembly Includes:		
Available Natural Gas Pressures	Pilot Mixer	Type of Flame Safeguard				Pilot Mixer	Adjustable Gas Orifice	18mm Spark Ignitor
Low Gas Pressures (4-7" wc)	Venturi-type	UV scanner	**VFH-LO-V-UV**	**VFL-LO-V-UV**	20	Yes	No	Yes
		Flame rod	**VFH-LO-V-FR**	**VFL-LO-V-FR**	20			
	Pressure-type (requires 4-16 osi combustion air)	UV scanner	**VFH-LO-P-UV**	**VFL-LO-P-UV**	25		Yes	
		Flame rod	**VFH-LO-P-FR**	**VFL-LO-P-FR**	25			
Medium Gas Pressures (8-27" wc)	Atmospheric-type	UV scanner	**VFH-M-A-UV**	**VFL-M-A-UV**	25		No	
		Flame rod	**VFH-M-A-FR**	**VFL-M-A-FR**	25			
Higher Gas Pressures (1-2 PSIG)	Venturi-type	UV scanner	**---**	**---**	---	---	---	---
		Flame rod	**VFH-HI-V-FR**	**VFL-HI-V-FR**	75	Yes	No	Yes
	Pressure-type (requires 4-16 osi combustion air)	UV scanner	**VFH-HI-P-UV**	**VFL-HI-P-UV**	75		Yes	
		Flame rod	**VFH-HI-P-FR**	**VFL-HI-P-FR**	75			

Dimensions (in inches)

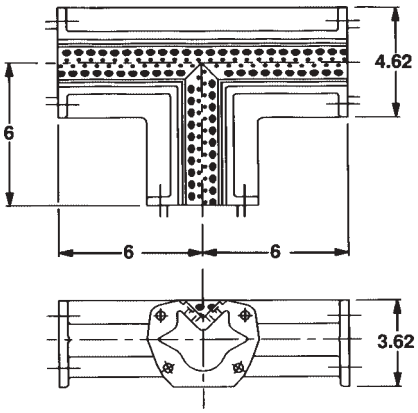
"VFH" LINOFLAME® Burner Sections

VFH straight sections

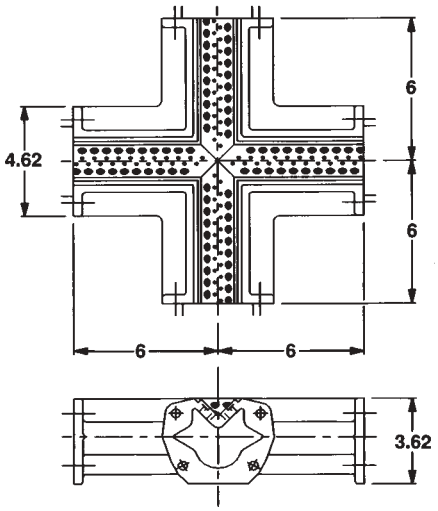


Straight Section	Dimension "L"
VFH-12	12"
VFH-6	6"
VFH-3	3"

VFH-T 12" x 6" tee

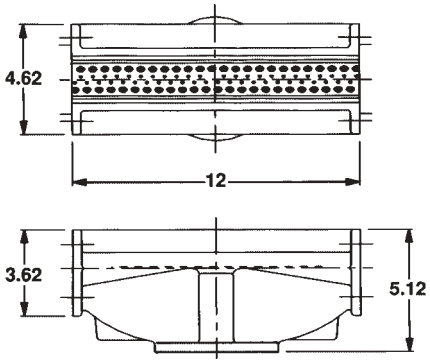


VFH-X 12" x 12" cross



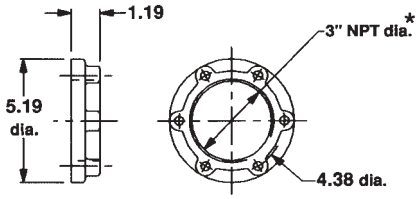
Inlet Feed Sections

VFH-12B 12" back inlet



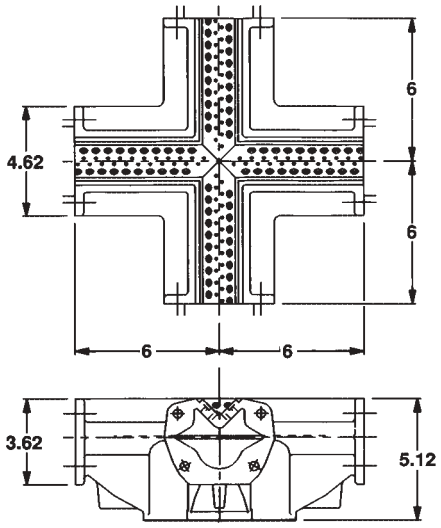
VFH-12B requires inlet flange set below (order separately)

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

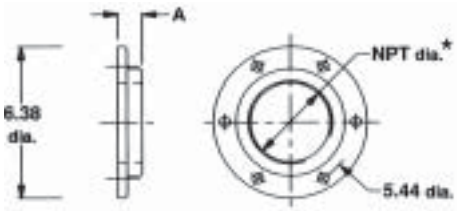


*** ISO threaded flanges available; contact Maxon.**

VFH-XB 12" x 12" back inlet cross

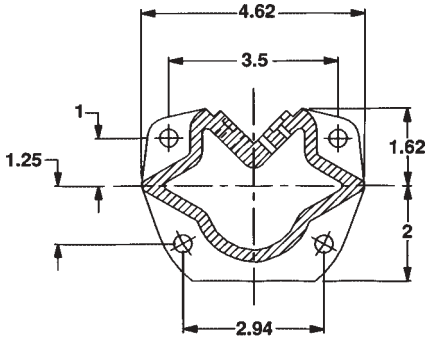


VFH-XB requires one of the inlet flange sets shown below (order separately)



(XB) back inlet cross inlet flange sets	NPT Pipe Size	Dimension "A"
VFH-3XF	3"	1
VFH-4XF	4"	1.31

Typical cross sectional view of VFH LINOFLAME® section

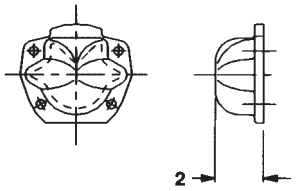


Dimensions (in inches)

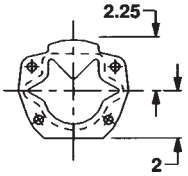
"VFH" LINOFLAME® Burner Sections

End Closures

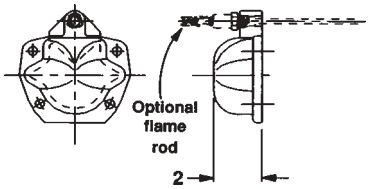
VFH-EC



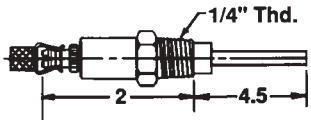
Typical for all VFH end closures



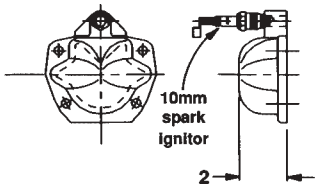
VFH-EC-FR



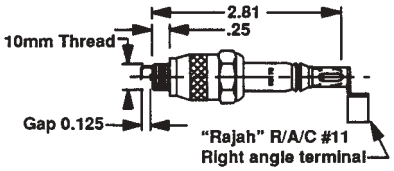
Optional flame rod (order separately)



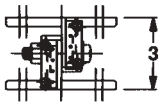
VFH-EC-SI

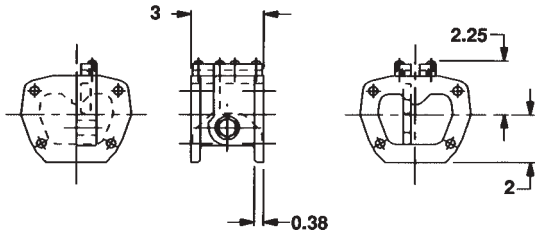


10 mm spark ignitor (included)



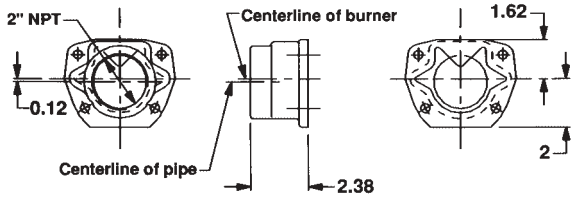
VFH-XEP Expansion end plate set



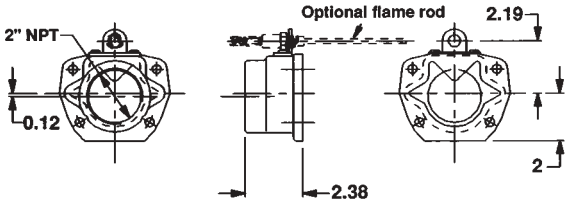


End Inlet Sets

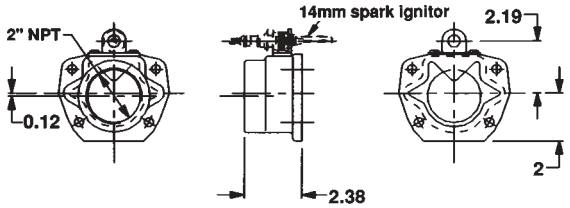
VFH-2EF



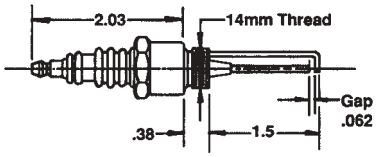
VFH-2EF-FR



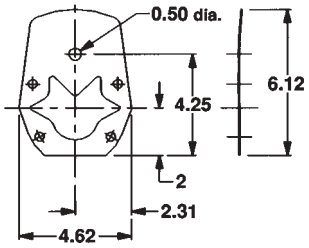
VFH-2EF-SI



14mm spark ignitor (included)



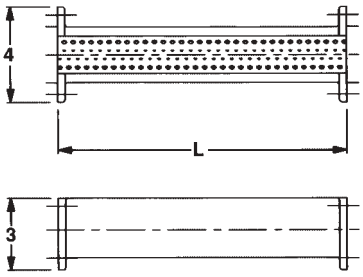
VFH-HREP Hi-recirc end plate



Dimensions (in inches)

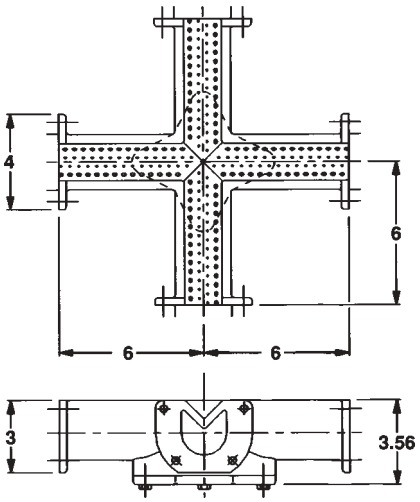
VFL LINOFLAME® Burner Sections

VFL straight sections

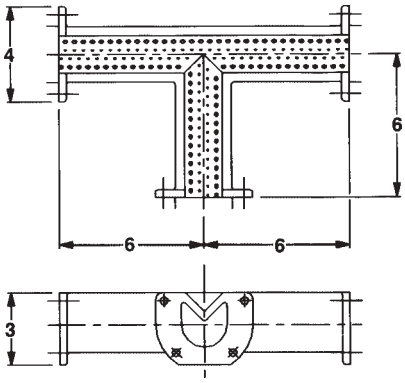


Straight Section	Dimension "L"
VFL-12	12"
VFL-6	6"
VFL-3	3"

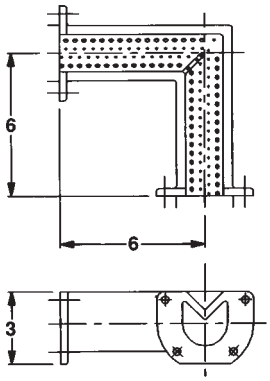
VFL-X 12" x 12" cross



VFL-T 12" x 6" tee

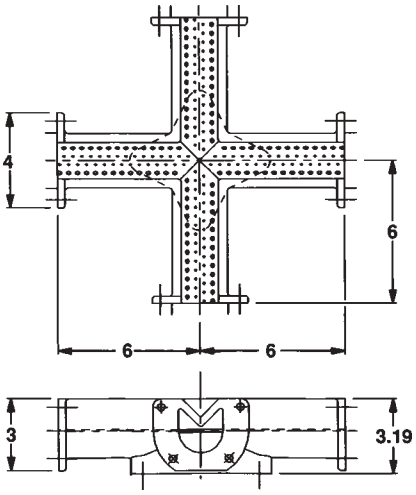


VFL-L 6" elbow section



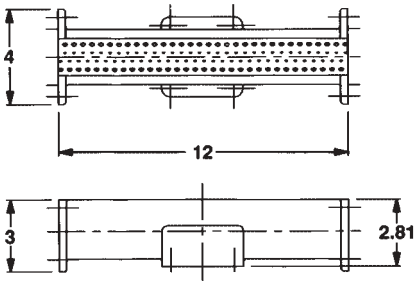
Inlet Feed Sections

VFL-XB
12" x 12" back inlet cross



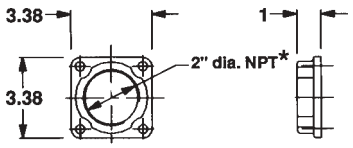
VFL-XB requires one of the inlet flange sets shown below (order separately)

VFL-12B 12" back inlet

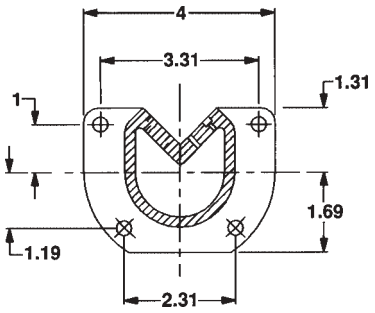


VFL-12B requires inlet flange set below (order separately)

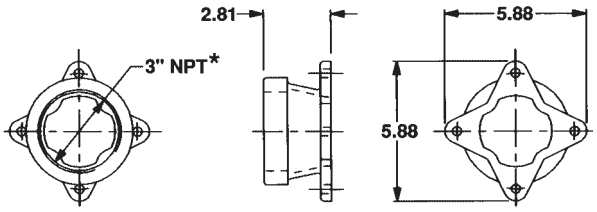
VFL-2BF back inlet flange set for 12B inlet section



Typical cross sectional view of VFL LINOFLAME® section



VFL-3XF inlet flange set for XB section



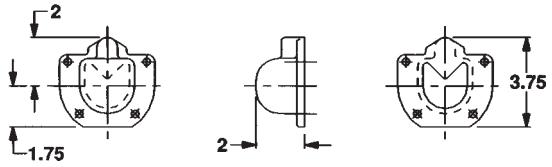
*** ISO threaded flanges available; contact Maxon.**

Dimensions (in inches)

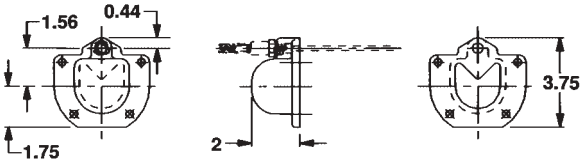
VFL LINOFLAME® Burner Sections

End Closures

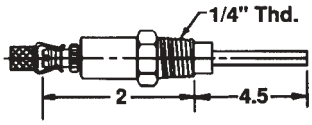
VFL-EC



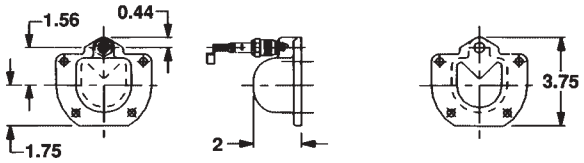
VFL-EC-FR



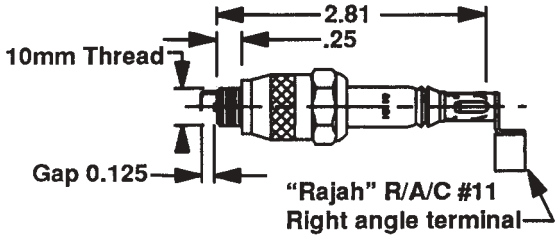
Optional flame rod
(order flame rod separately)



VFL-EC-SI

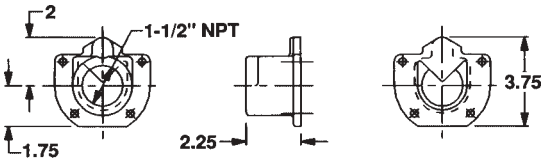


10mm spark ignitor
(included)

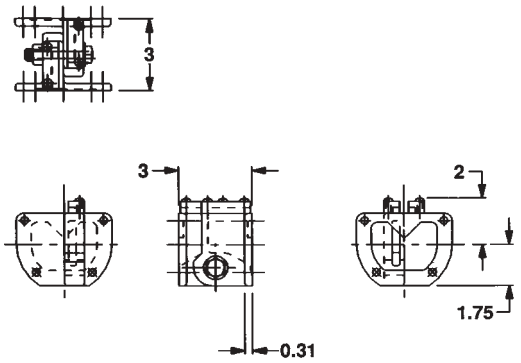


End Inlet Sets

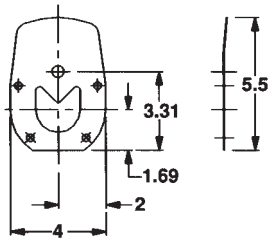
VFL- 1-1/2" -EF



VFL-XEP expansion end plate set



VFL-HREP
hi-recirc end plate

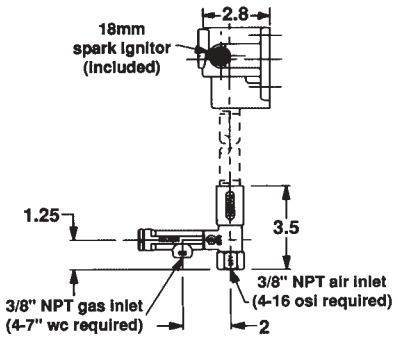


Dimensions (in inches)

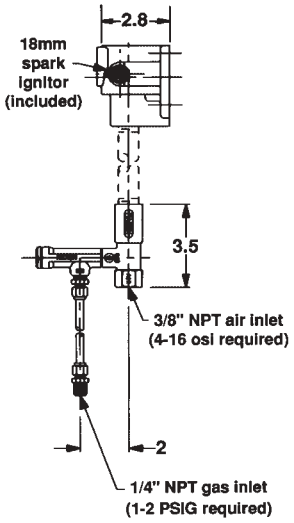
LINOPAK Pilots with VF LINOFLAME® Burners

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

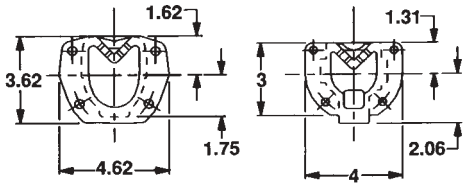
VFH-LO-P-UV
VFL-LO-P-UV
low pressures



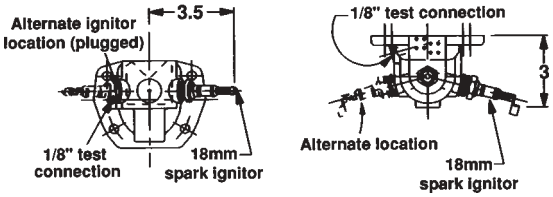
VFH-HI-P-UV
VFL-HI-P-UV
higher pressures



VFH **VFL**

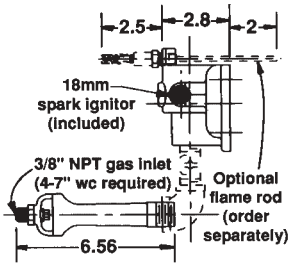


Typical for the LINOPAK pilots at left

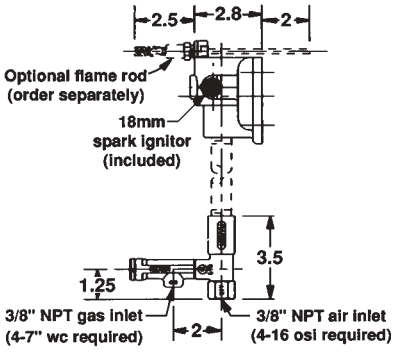


LINOPAK Pilots (using flame rods) with VF LINOFLAME® Burners

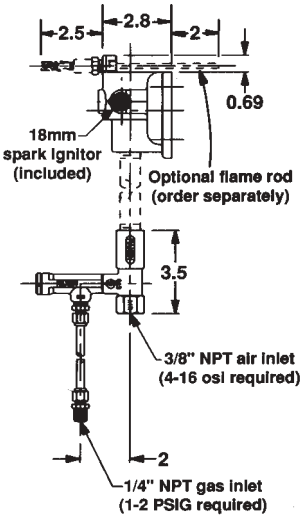
VFH-LO-V-FR
VFL-LO-V-FR
low pressures
venturi type



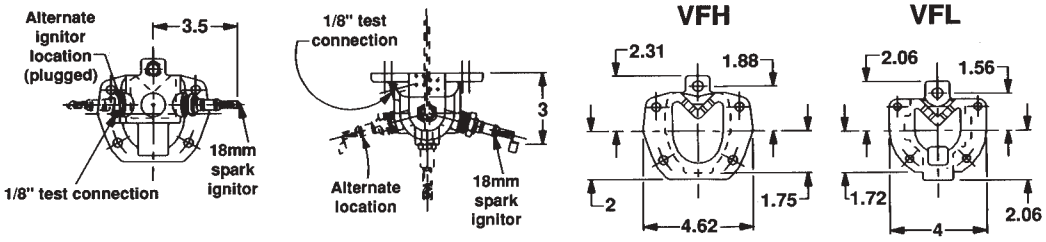
VFH-LO-P-FR
VFL-LO-P-FR
low pressures



VFH-HI-P-FR
VFL-HI-P-FR
higher pressures



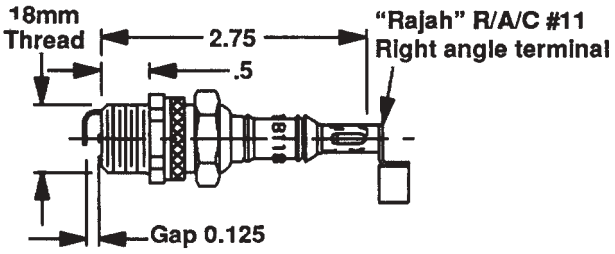
Typical for all of the above LINOPAK pilots



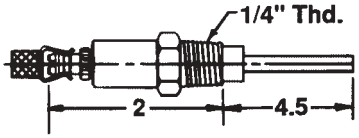
Pipe threads on this page conform to NPT (ANSI Standard B2.1)

Dimensions (in inches)

18mm spark ignitor included with all LINOPAK pilots



Optional flame rod for LINOPAK pilots

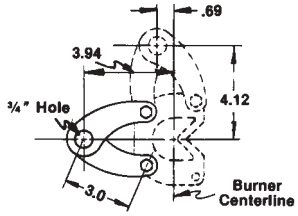


Universal Support Brackets (USB)

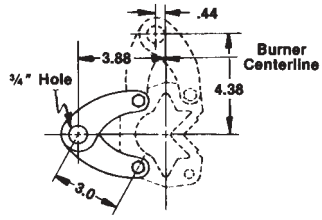
(normally ordered in pairs)

(12 gauge mild steel) for VF LINOFLAME® Burners

Stainless steel versions available.



Used with VFL LINOFLAME® Burners

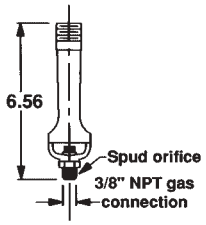


Used with VFH LINOFLAME® Burners

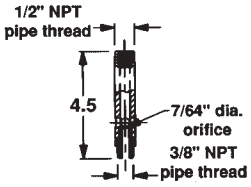
Air-Gas Pilot Mixers for all LINOPAK Pilots

Atmospheric type

Low pressures venturi type

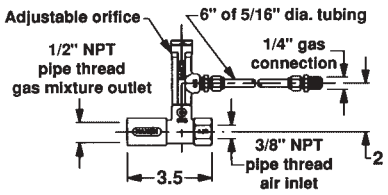


Medium pressures

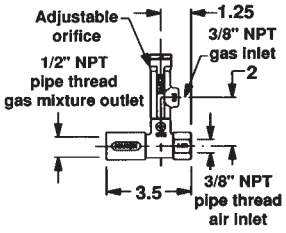


Pressure type

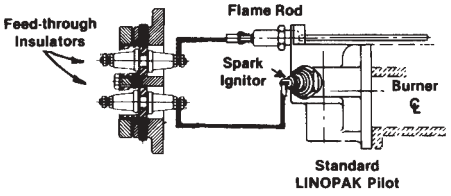
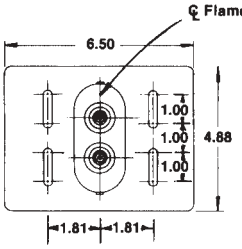
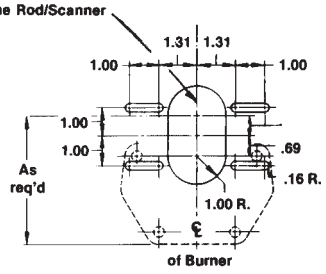
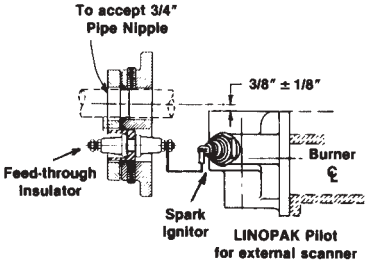
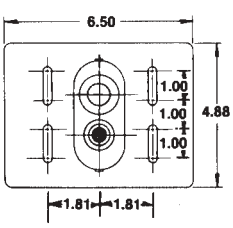
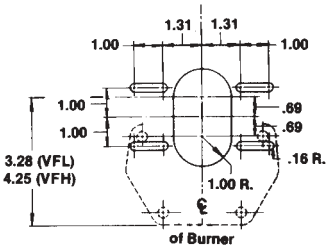
High pressures



Low pressures



External Mounting Assemblies for all LINOPAK Pilots

Description	Side View	Mtg. Plate Dim.	Opening Dimension
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.

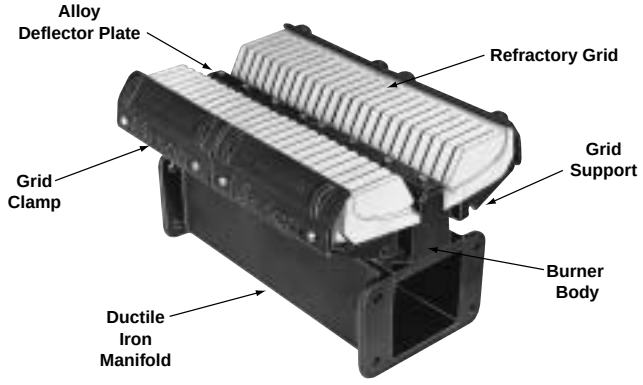
Face temperatures, and thus the radiant power (capacity) effect of INFRAWAVE® Burners, increase from minimum capacities up to approximately 10" wc mixture pressures. Above that pressure, fingers of flame extend forward from the outer edge of the slots in the refractory grids. These hot products of combustion 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

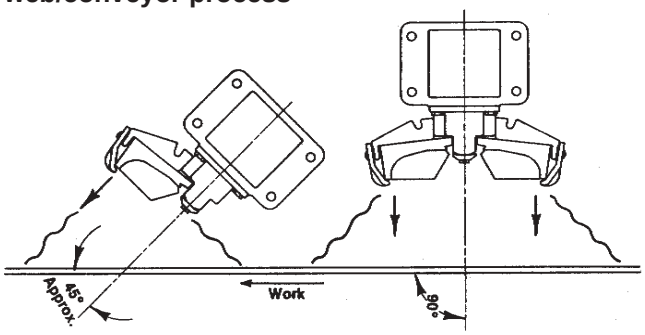
INFRAWAVE® Burners are offered in two (2) versions:
"DG" – high capacity double grid, or
"SG" – lower capacity single grid.

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

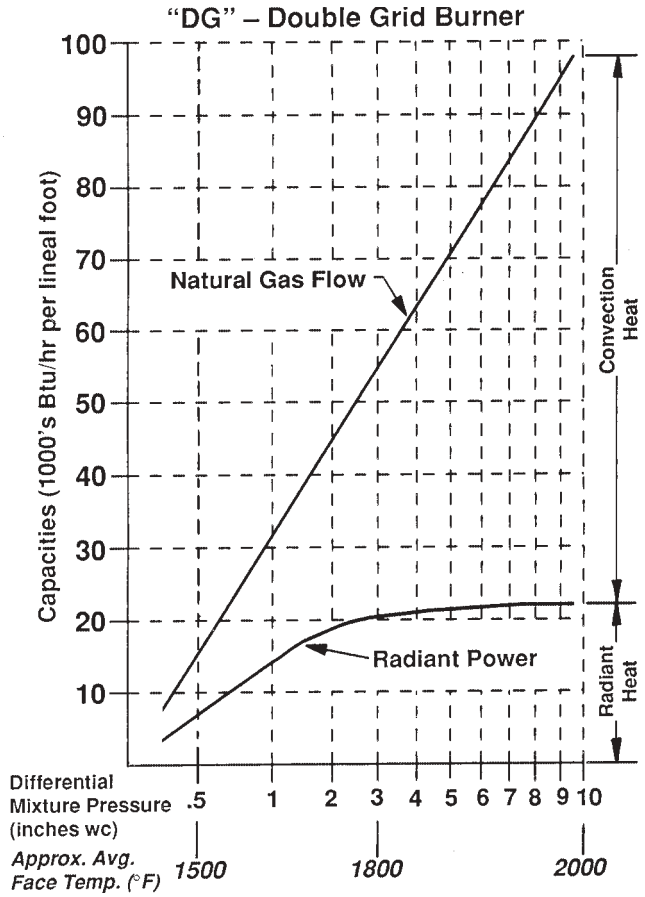
INFRAWAVE® Burners discharge products of combustion with a low forward velocity. This minimizes the disturbance of granules and powders, but does not permit convection heating effect to cross large gaps. **Side-fired and down-fired burners should generally be spaced 2-6" from product.** Larger spacings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

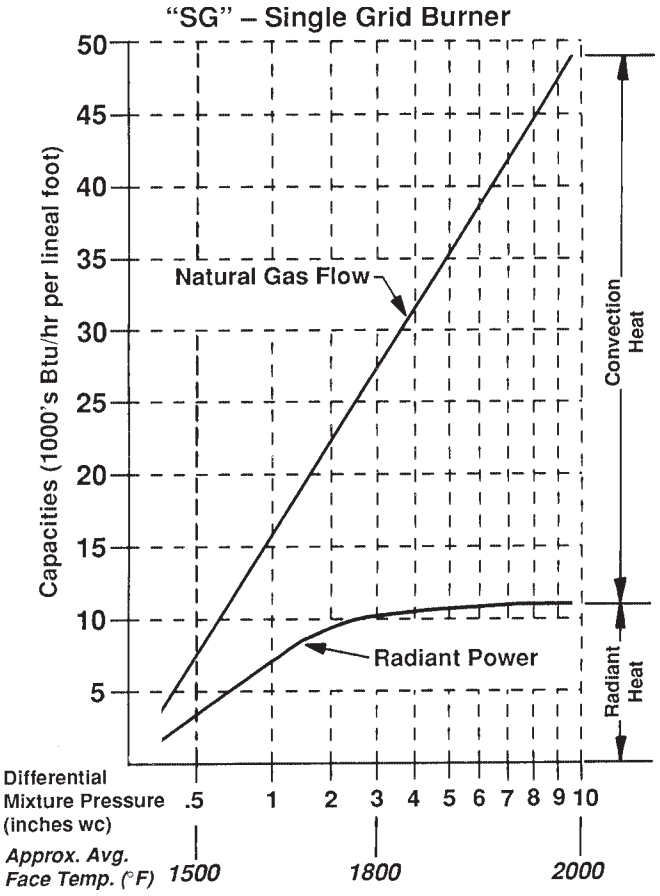
The gap will normally be kept uniform along the entire burner length, with the distance field-adjustable to optimize performance.

Capacity/ Specification Data

INFRAWAVE® Burners

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)			
Brick, red	0.93	Paint, black	0.98
Cloth	0.75 - 0.9	Paint, white	0.91
Concrete	0.94	Paper	0.95
Glass, window	0.93	Plaster	0.91
Gypsum	0.91		

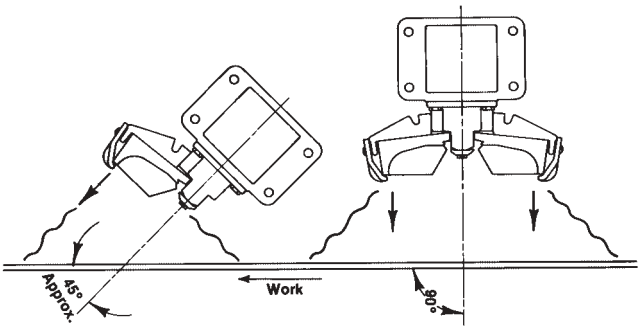
Radiant Heat Input Calculations

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 ft^2 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.

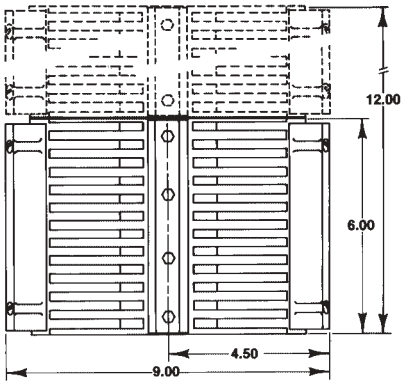
Dimensions (in inches)
INFRAWAVE® Burners

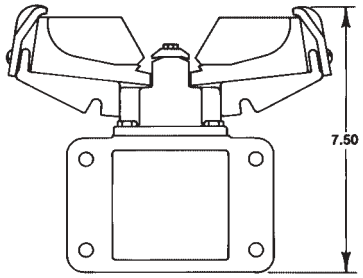
Standard 6" and 12" straight sections

6" DG

12" DG

Typical end & top views, double grid (DG)



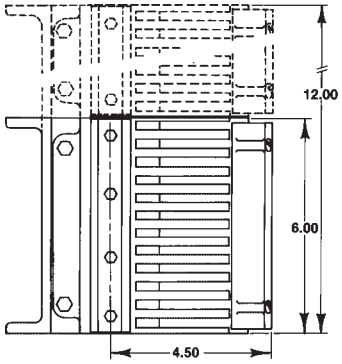


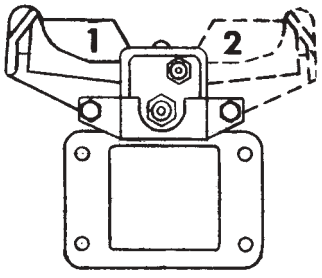
NOTE: All INFRAWAVE® Burner sections use ISO standard (metric) fasteners

6" SG

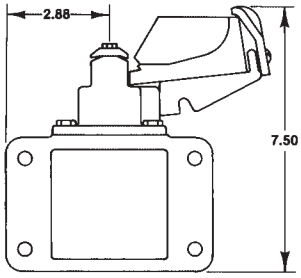
12" SG

Typical end & top views, single grid (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.)



Dimensions (in inches)
INFRAWAVE® Burners

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

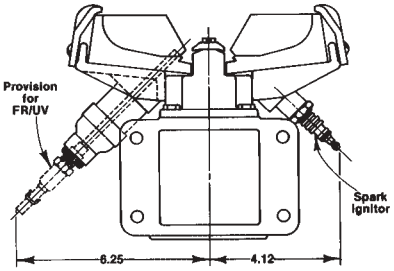
With spark ignitor and provision for FR/UV

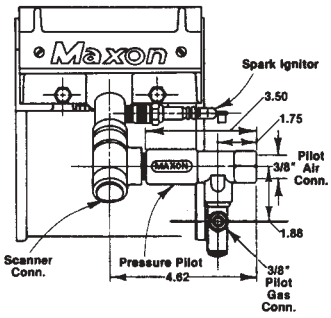
Right: Plain SG-12" straight with optional flame rod

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

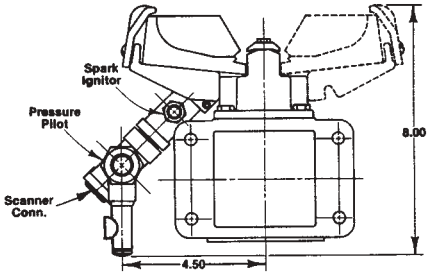
Right: DG-12" straight section shown with end closure set

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





With pressure pilot



Inlet Feed Sections for INFRAWAVE® Burner assemblies

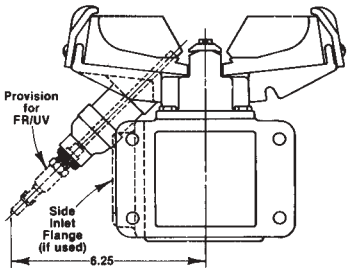
NOTE: Do not use 2" inlet flanges to feed more than 16' of SG burner (8' of DG). 3" inlet flanges may be used to feed a maximum of 32' of SG burner (16' of DG).

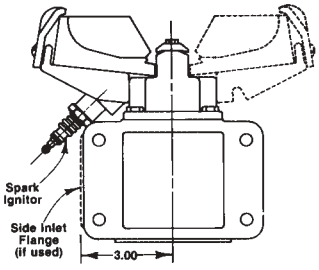
12" DG Bottom Inlet

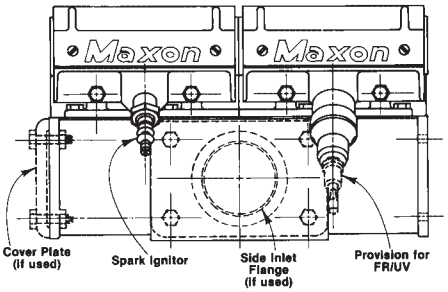
NOTE: See photo above of DG-12" straight section showing end closure set mounted to close off the burner body/ manifold cavity

12" DG Side Inlet

Typical end view of side inlet section (with optional accessories)



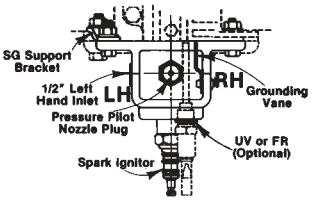


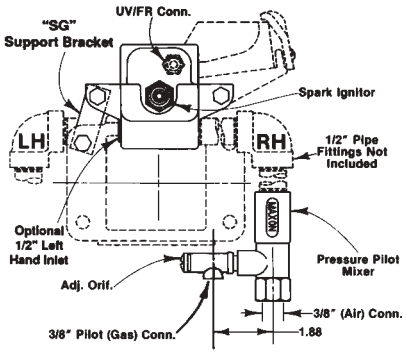


Dimensions (in inches)
INFRAWAVE® Burners

End-mounting Accessories for ALL Sections

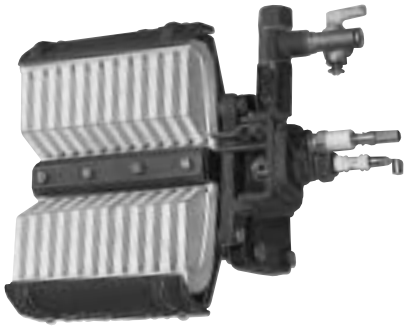
End-mounted pilot and bracket for "SG" burner





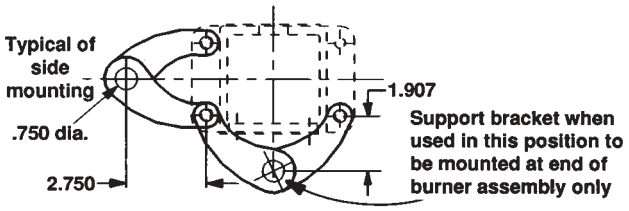
Caution: Be sure to specify refractory grid position on SG INFRAWAVE® Burner. UV scanner/flame rod must be located on refractory grid side of burner element.

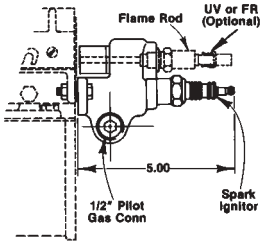
End-mounted pilot and bracket for "DG" burner



6" DG straight shown with end mounted pilot, bracket, flame rod (optional) and end closure kit (optional) on body manifold

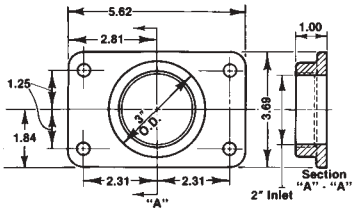
Universal Support Bracket (normally supplied in pairs)



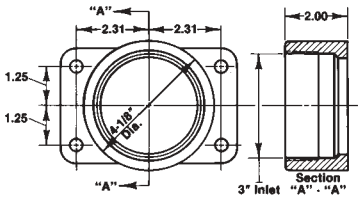


Flange and End Closure Plate Sets

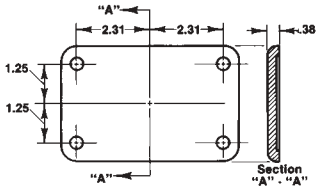
2" ANS Inlet Flange ①



3" ANS Inlet Flange ①



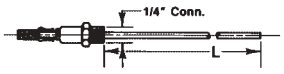
End Closure Plate



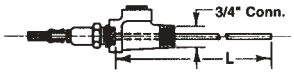
① DIN threaded flange sets are also available upon request

Optional Flame Rods

Plain



With Cooling Tee

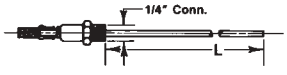


Flame rod length "L" (in inches)

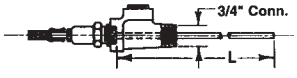
INFRAWAVE® Section	With cooling tee	Without tee
For all 6" & 12" SG or DG burner sections	6-13/16	4-1/2
For end mounted pilot assemblies	4-13/16	2-1/2

Replacement Spark Ignitors

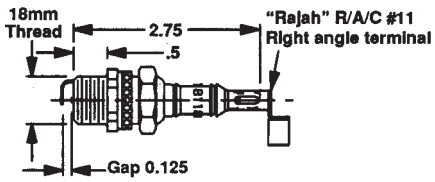
10mm Spark Ignitor



14mm Spark Ignitor

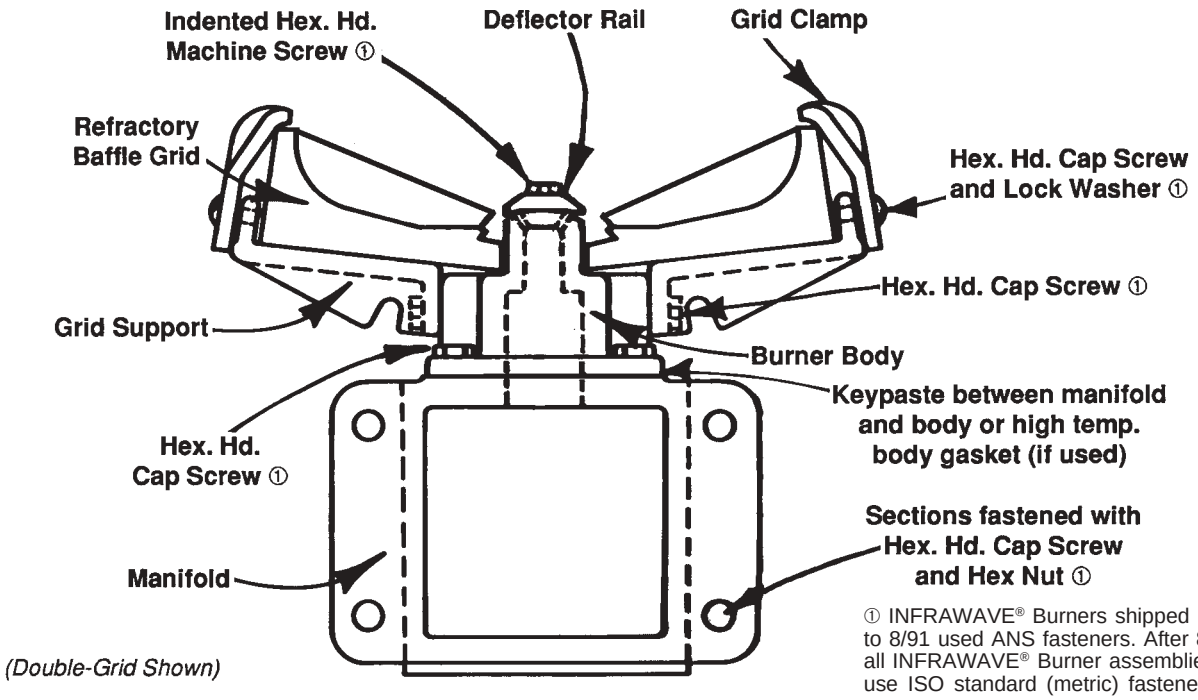


18mm Spark Ignitor



Component Identification

INFRAWAVE® Burners



(Double-Grid Shown)

① INFRAWAVE® Burners shipped prior to 8/91 used ANS fasteners. After 8/91, all INFRAWAVE® Burner assemblies use ISO standard (metric) fasteners.

Suggested spare parts

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

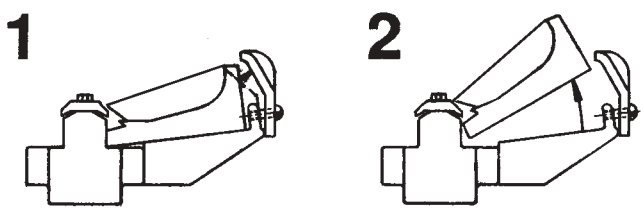
Gaskets

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.

Notes