

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.

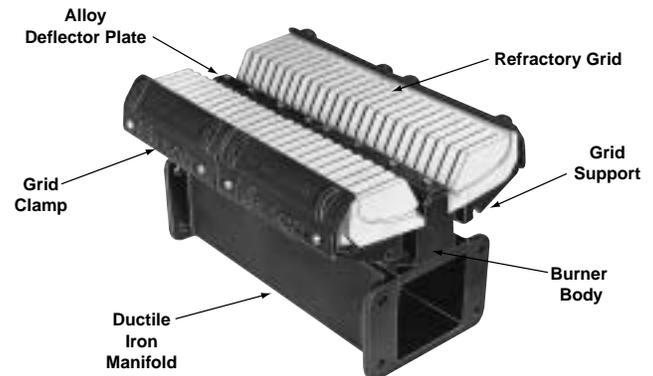
Total heat release and INFRAWAVE® Burner footages are normally selected from the tables given in the various premixing equipment sections of the Maxon catalog:

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

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

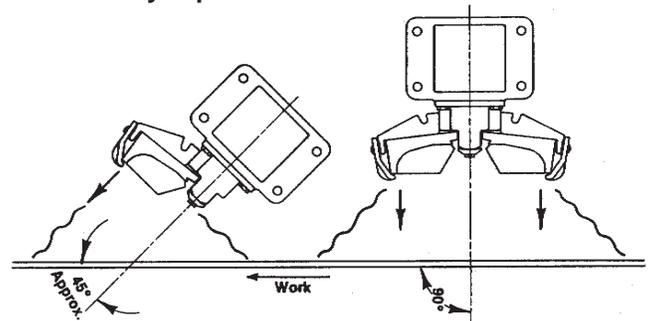
“DG” – high capacity double grid, or
 “SG” – lower capacity single grid.

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.)

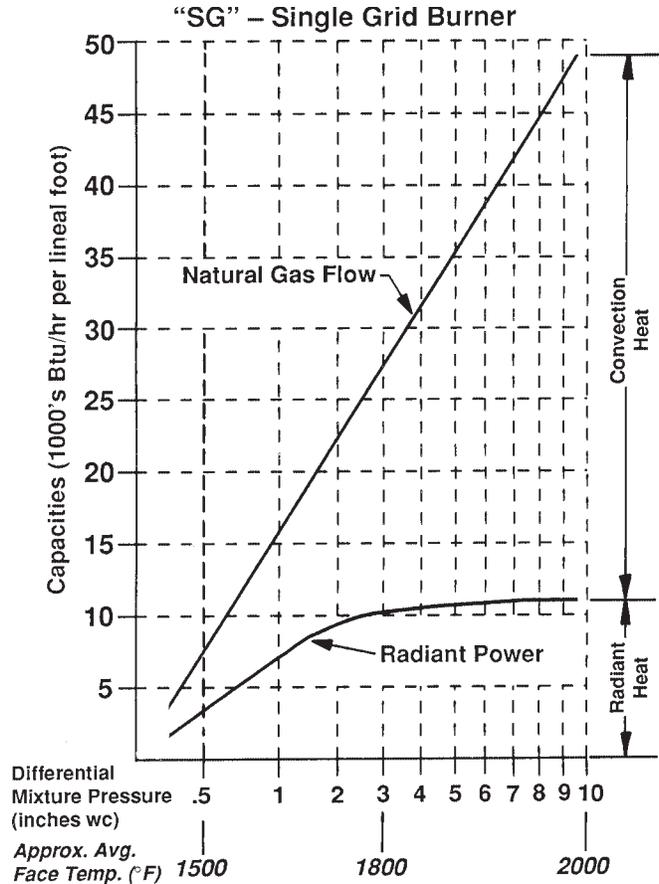
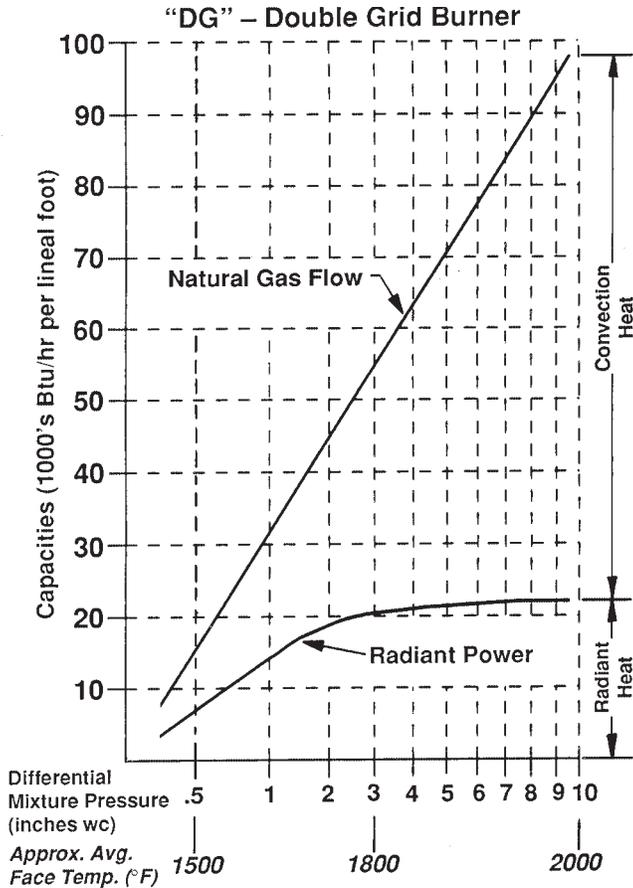
Burner face to product distance

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.

Radiant Heat Input Calculations

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

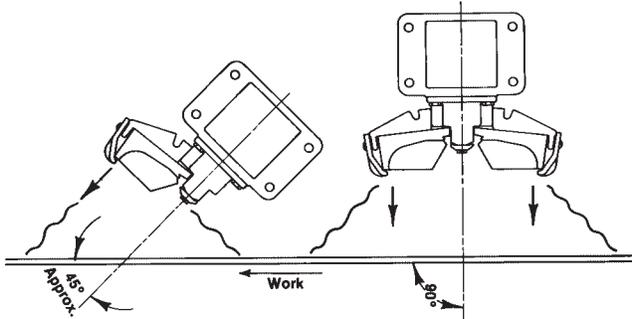
Check that adequate product area is exposed to radiant heating. A 12" length of "DG" INFRAWAVE® Burner has approximately 1.56 ft² of radiating surface area.

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		

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

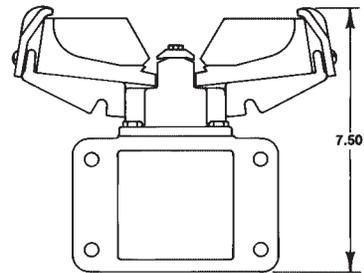
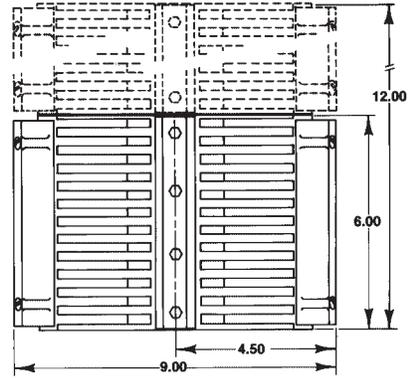
6" DG



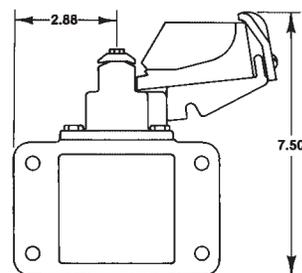
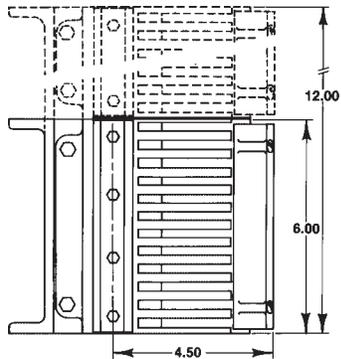
12" DG



Typical end & top views,
double grid (DG)



Typical end & top views,
single grid (SG)

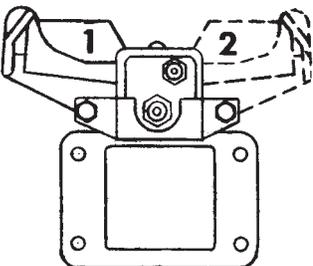


NOTE: All INFRAWAVE® Burner sections use ISO standard (metric) fasteners

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.)

Dimensions (in inches) INFRAWAVE® Burners

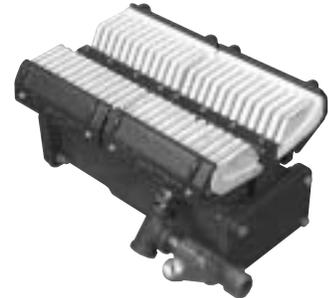
Standard 6" and 12" Straight Sections with Side-mounted Accessories

With spark ignitor and provision for FR/UV



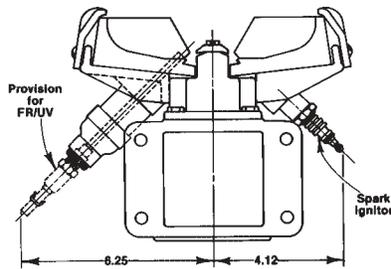
Right: Plain SG-12" straight with optional flame rod

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

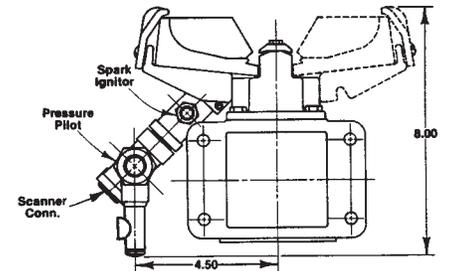
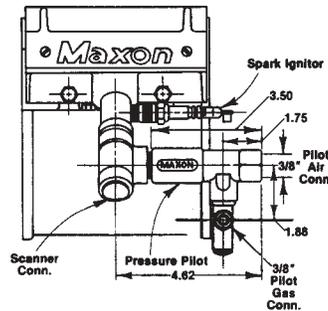


Right: DG-12" straight section shown with end closure set

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

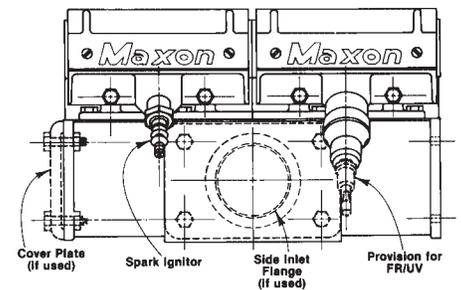
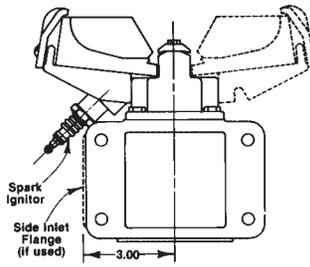
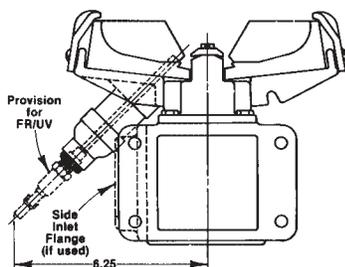


NOTE: See photo above of DG-12" straight section showing end closure set mounted to close off the burner body/manifold cavity

12" DG
Side Inlet



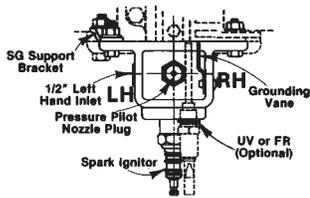
Typical end view of side inlet section (with optional accessories)



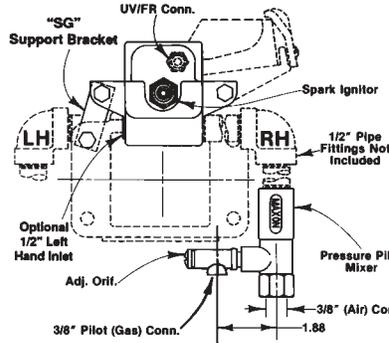
Dimensions (in inches) INFRAWAVE® Burners

End-mounting Accessories for ALL Sections

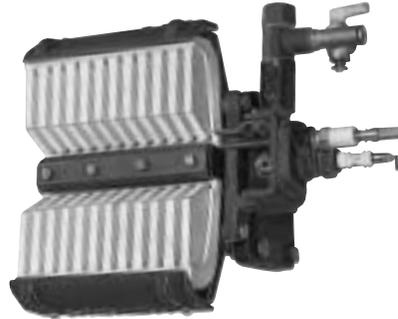
End-mounted pilot and bracket for "SG" burner



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.

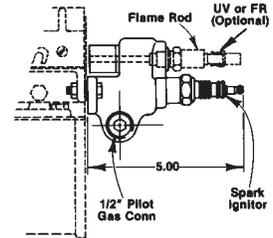
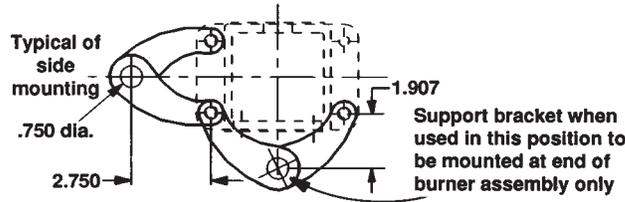


End-mounted pilot and bracket for "DG" burner



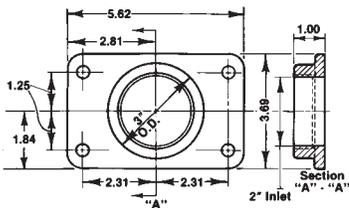
6" DG straight shown with end mounted pilot, bracket, flame rod (optional) and end closure kit (optional) on body manifold

Universal Support Bracket (normally supplied in pairs)

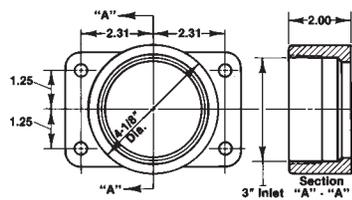


Flange and End Closure Plate Sets

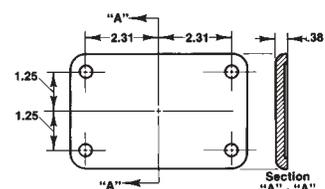
2" ANS Inlet Flange ①



3" ANS Inlet Flange ①



End Closure Plate



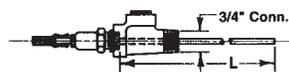
① DIN threaded flange sets are also available upon request

Optional Flame Rods

Plain

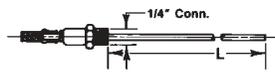


With Cooling Tee

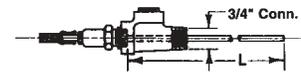


Replacement Spark Ignitors

10mm Spark Ignitor



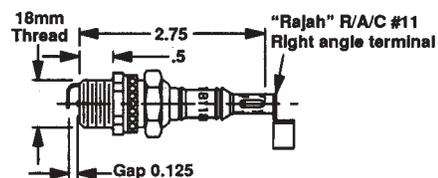
14mm Spark Ignitor



Flame rod length "L" (in inches)

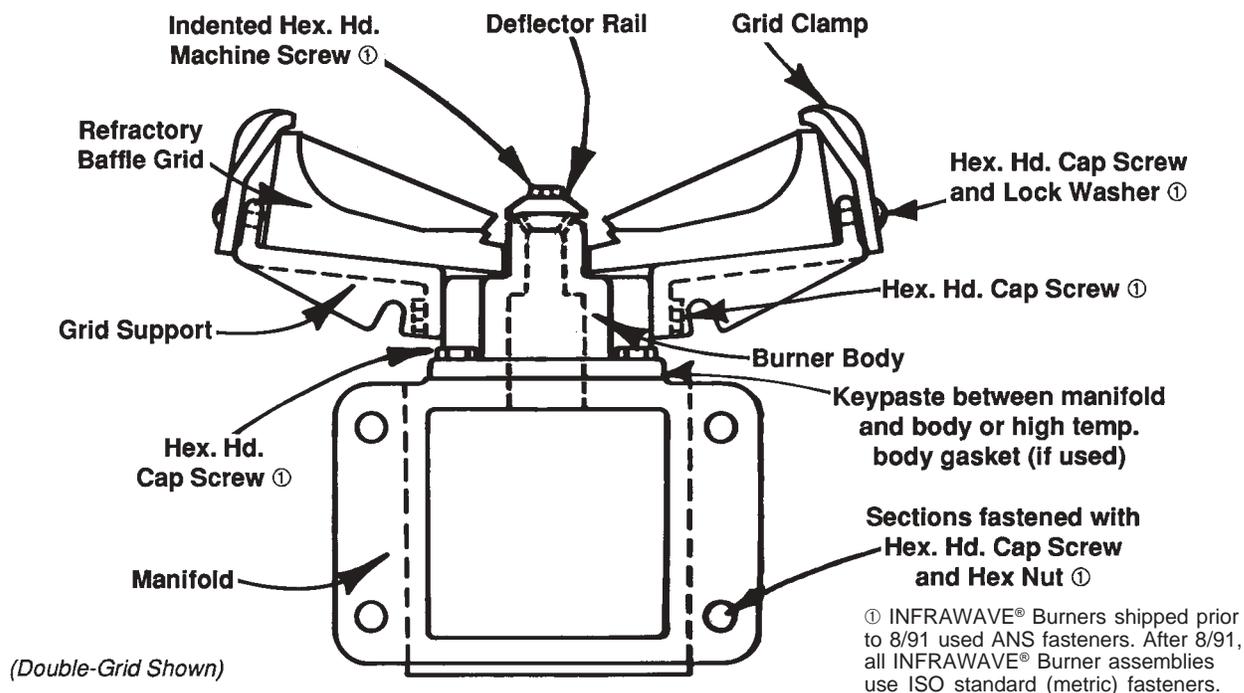
INFRAWAVE® Section	With cooling tee	Without tee
For all 6" & 12" SG or DG burner sections	6-13/16	4-1/2
For end mounted pilot assemblies	4-13/16	2-1/2

18mm Spark Ignitor



Component Identification

INFRAWAVE® Burners



Suggested spare parts

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

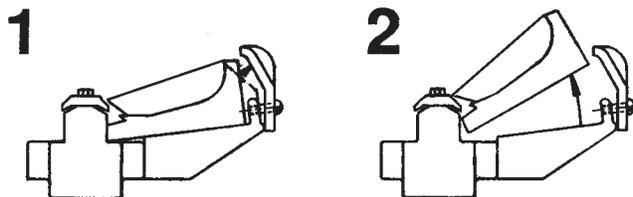
Gaskets

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