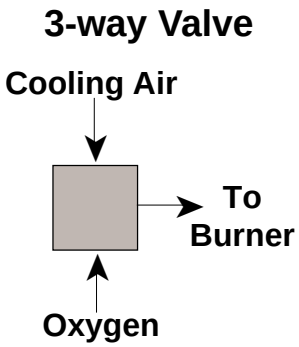
Design Guidelines

Applications using oxygen-fuel burner technology can vary greatly. Therefore, Maxon is providing general information which should guide users and designers of furnaces that use oxygen-fuel burners.

NOTE: Premium-quality materials have been used on the OXY-THERM® Burner, but metal components can be destroyed by high furnace temperatures if the burner is misused or left unprotected from cooling flows. Because most oxygen-fuel burner applications operate at very high temperatures, these guidelines focus on enhancing burner performance and longevity.

Design Guidelines

1. Whenever the gas or oil insert is installed in the burner housing, cooling flow should be established through the combustion oxygen connection (see item 4 for recommended piping). Cooling flow may be either air or oxygen, but not compressed air. An example of a cooling air source would be the block cooling air on a glass melter. **Minimum recommended cooling air/ oxygen flows are 15 scfm for Series 600 OXY-THERM® Burners and 30 scfm for Series 900 OXY-THERM® Burners.**
2. If the burner will not be fired for an extended period (over 24 hours), then the gas or oil insert should be withdrawn from the housing. The service nut should be installed in its place, and cooling air/oxygen flow established (see item 1 for recommended flow rates). This cooling flow will extend gasket life and retard the collection of particulate material inside the burner block opening. As an alternative to cooling flow, the burner housing may be removed, if desired, leaving the block/frame assembly mounted to the furnace wall.
3. On oil fired burners, reduced pressure atomizing air/oxygen should be maintained when the burner is not firing. Without atomizing flow, some residual oil can communicate through the atomizer holes and into oxygen clean components in the oil insert. The atomizing flow will also serve to cool the oil nozzle (10 psig atomizing pressure would be sufficient). Required safety practice is that any time atomizing flow is shut off, oil inserts are to be removed and re-cleaned to prevent any fuel oil residue and oxygen from coming into contact with each other.
4. To provide cooling flow to the burner housing, Maxon recommends installing a 3-way ball valve immediately upstream from the combustion oxygen connection on the burner (see diagram at right). Block cooling air/ oxygen (or other air source) connects to the valve, in addition to combustion oxygen. The cooling source should not be compressed air, since compressed air could contain oils which contaminate oxygen-clean components.



A 3-way valve is recommended. The valve should offer 180° operation, with shut-off at 90°. **Every component that comes in contact with oxygen must be cleaned for oxygen service.**
5. Quick-connect devices for the combustion oxygen, atomizing air/oxygen and fuel will facilitate hook-up and installation, especially when switching from fuel gas to fuel oil. Quick-connect devices also limit the amount of time that burner components are exposed to furnace temperatures without cooling flow. This is helpful during hot conversions or when replacing existing burners.
6. Burner and piping should be supported as shown in the installation instructions. Unsupported piping puts stress on the block/frame assembly. If enough stress is present, the burner block could crack, affecting performance and burner life.
7. The Zedmul 20-C block is recommended for fuel gas fired applications. It provides an economical, high-quality burner block material, and is familiar to users throughout industry. Zedmul 20-C burner blocks have been used on applications such as container glass, sodium silicate and fiberglass furnaces.
8. The Zirconia block is required for all fuel oil fired applications. Even if fuel oil is anticipated only as a back-up fuel, the Zirconia block must be used. The Zirconia block may also be used for gas firing if the user has concerns about the compatibility of the Zedmul 20-C block with his or her process.
9. All liquids and atomizing air/oxygen should be filtered. A 100-mesh duplex fuel oil filter is recommended for oil fired OXY-THERM® Burners. Filtering the atomizing air/oxygen will help prevent debris from plugging the atomizing holes.
10. OXY-THERM® fuel gas burners should be specified at or near expected design capacity. For

Design Guidelines (continued)

applications requiring maximum flame length, the burners should be sized or specified for the true expected maximum capacity. Maxon sizes and fabricates fuel gas burner nozzles according to customer specifications. The design of the OXY-THERM® allows quick changing of the threaded gas nozzle in those cases where burners may need more capacity than expected, or if future furnace loads are expected to increase.

11. OXY-THERM® fuel oil burners should also be specified at or near expected design capacity. If, for example, a 300-liter-per-hour burner was specified, but operated at 200 liters per hour, the flame length would be significantly shorter than if the 200-liter-per-hour burner was specified and used. See below for nominal and maximum capacities for fuel oil inserts.
12. For proper atomization, fuel oils should be supplied to the burner inlet at a viscosity of 100 SSU (20 centistokes) or less. A typical #6 fuel oil would need to be heated to approximately 220°F to obtain the proper viscosity.

Capacity / Selection Data

All Maxon gas OXY-THERM® Burners are custom drilled to meet your specific application requirements. This helps assure that you get the best possible burner – selected, sized and drilled – to meet your specific job's requirements.

NOTE: A calibrated flow meter in the gas and the oxygen line is recommended for establishing accurate volumetric flow rates.

Maxon oil OXY-THERM® Burners are available in two block sizes and six oil insert sizes – 70, 100, 150, 200, 300 and 400 liters per hour (maximum capacities 2.7 MMBtu/hr through 17.6 MMBtu/hr).

The maximum capacities shown in the accompanying charts are a range of heat releases. **The minimum capacity** will be 1/5 of the specific maximum capacity selected. Your specified maximum capacity dictates the individualized fuel drilling used in the manufacture of the burner's gas insert.

The Zedmul 20-C block is recommended for fuel gas fired applications. It provides an economical, high-quality burner block material and is familiar to users throughout industry. **The Zirconia block** is required for all fuel oil fired applications. Even if fuel oil is anticipated only as a back-up fuel, the Zirconia block must be used. The Zirconia block may also be used for gas firing if the user has concerns about the compatibility of the Zedmul 20-C block with his or her process. Both materials have shown excellent results in operations with no reports of failures after five years of operation and several campaigns.

Gas OXY-THERM® Burner		Series 600	Series 900
Maximum capacity range in 1000's Btu/hr		200 to 2,000	1250 to 7,500
Minimum capacity		1/5 of maximum capacity	
Required pressures to burner inlet for maximum capacities	Oxygen	see curves on page 4605	
	Natural gas	8 psig	
	Propane	20 psig	
Typical oxygen to fuel volumetric ratios*	To natural gas	2.1 to 1	
	To propane	5.2 to 1	
Approximate flame geometry	Diameter	18" maximum	30" maximum
	Length	1.5 ft per MMBtu/hr	

*Exact calorific values should be checked and oxygen/fuel ratio adjusted accordingly.

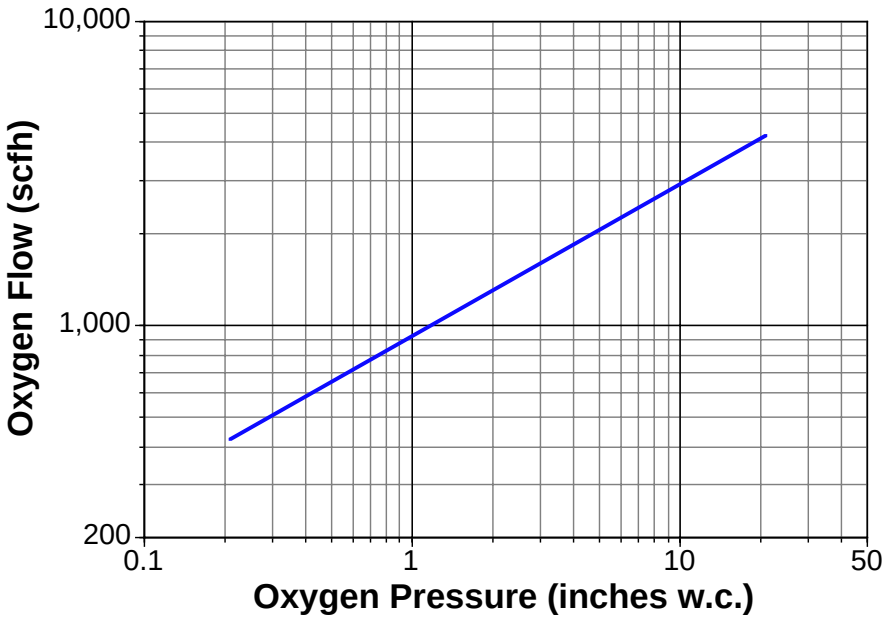
Oil OXY-THERM® Burners	Series	Series 600 or 900	Series 900				
	Size	70	100	150	200	300	400
Maximum fuel flow (liters/hr)		80	115	173	230	345	460
Maximum output (MMBtu/hr)		3.06	4.40	6.61	8.81	13.21	17.62
Nominal fuel flow (liters/hr)		70	100	150	200	300	400
Minimum with 5:1 turndown (MMBtu/hr)		0.61	0.88	1.32	1.76	2.64	3.52
Atomizing oxygen/air flow (scfh) at 50 psig		434	519	646	784	1205	1591
Oxygen pressure to burner inlet ("wc)		See curves on page 4606					
Fuel pressure to burner inlet (psig) at nominal		18.1	25.7	38.6	51.5	77.1	102.7
Approximate flame diameter (inches)		18	18	24	24	30	36
Approximate flame length (feet)		3.0	4.0	6.0	7.5	11.5	15.5

NOTE: In the Imperial System, "MM" refers to 10^6.

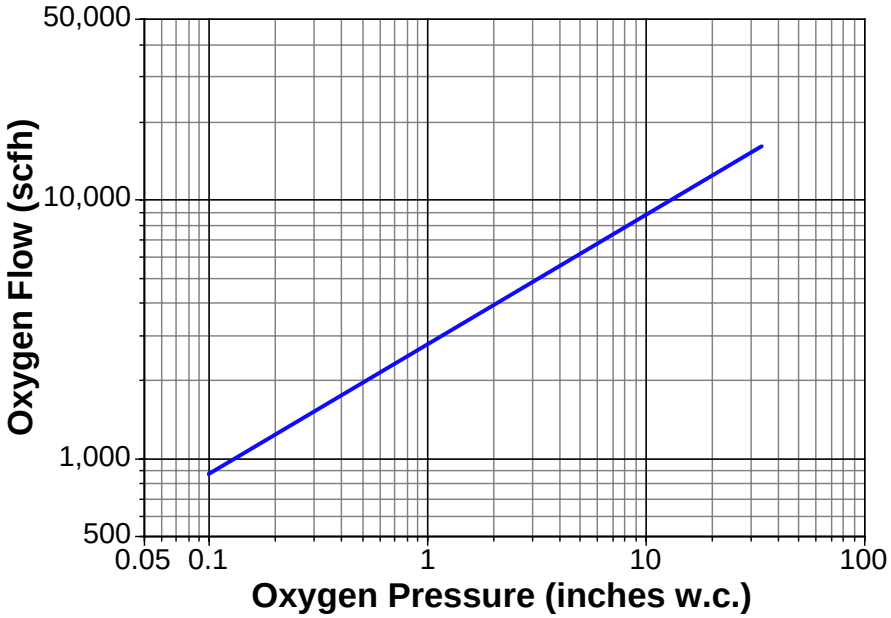
Capacity / Selection Data

Gas OXY-THERM® Burners
Combustion Oxygen Pressure Curves

Series 600



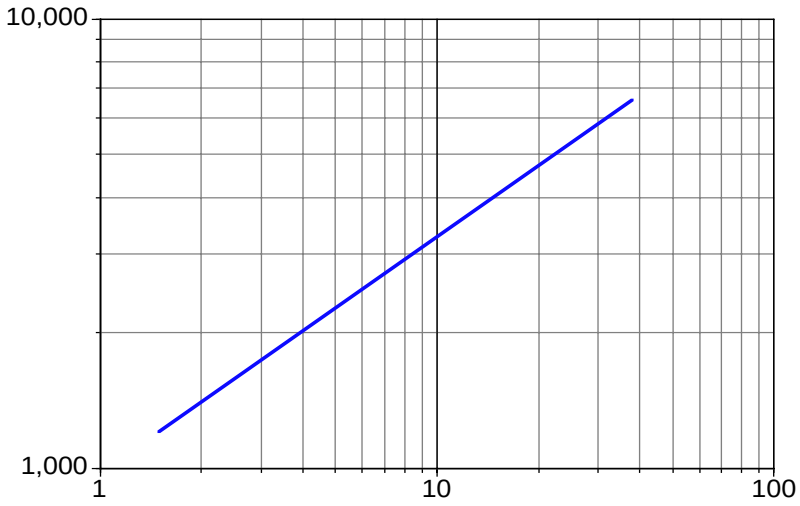
Series 900



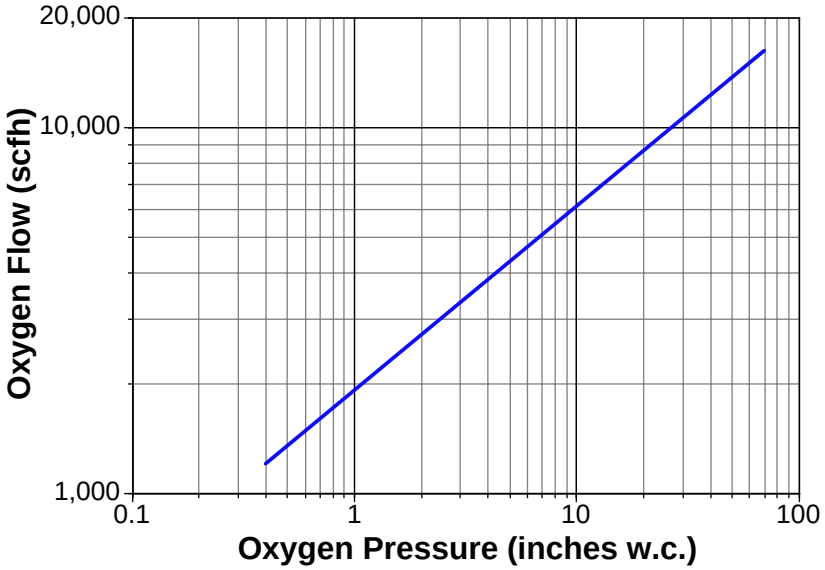
Capacity / Selection Data

Oil OXY-THERM® Burners
Combustion Oxygen Pressure Curves

Series 600 (70 lph)



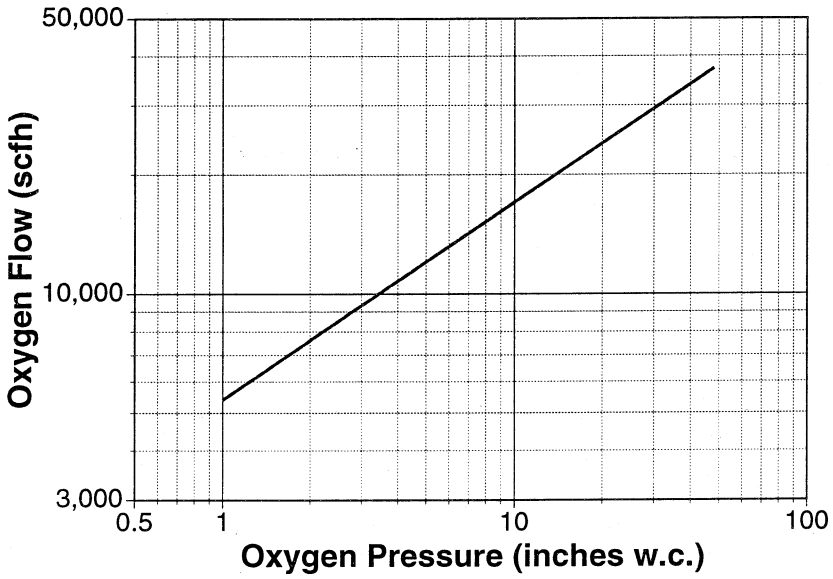
Series 900 (70, 100, 150, 200 lph)



Capacity / Selection Data

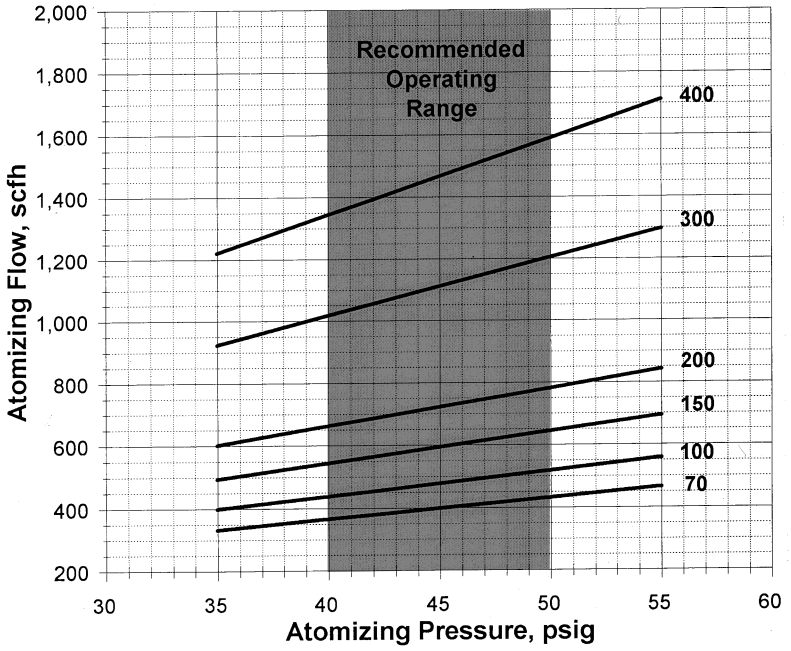
Oil OXY-THERM® Burners
Combustion Oxygen Pressure Curves

Series 900 (300, 400 lph)



Capacity / Selection Data

Oil OXY-THERM® Burners
Atomizing Oxygen/Air Flow vs. Pressure

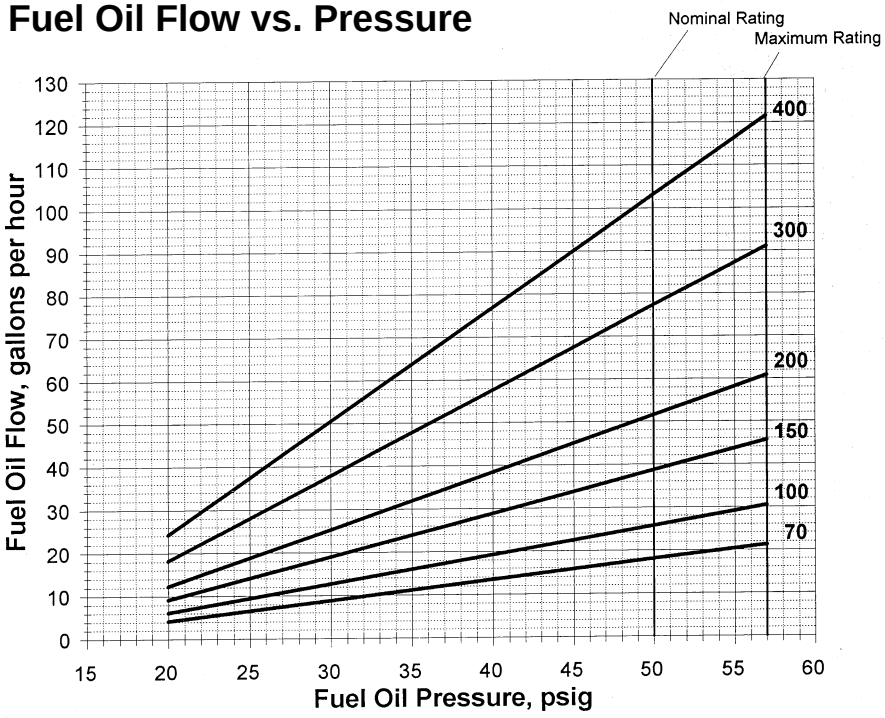


Each line represents a particular oil nozzle nominal rating, e.g., "400" represents the 400 liter per hour oil nozzle.

NOTES:

- If oxygen is used for atomizing, its volume should be factored in when establishing the excess oxygen requirements for each application. If air is used for atomizing, the volume of oxygen contained in the air is so small that it represents an insignificant amount of the oxygen required for combustion. Therefore, it should not be factored into the operating fuel/oxygen ratios.
- The volume of atomizing flow for cooling as described on page 4603, item 3, would equal approximately 20 percent of the atomizing volume at 50 psig shown on the chart.

Oil OXY-THERM® Burners
Fuel Oil Flow vs. Pressure

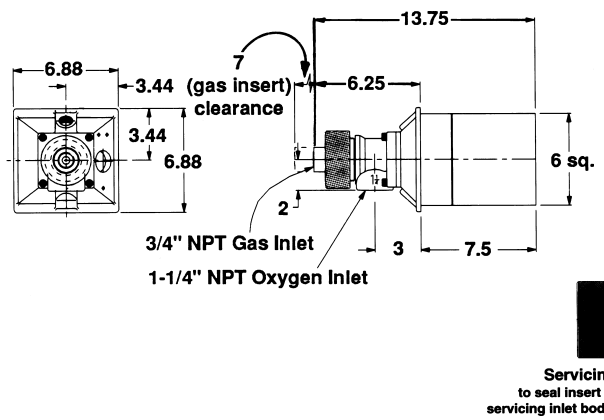


Each line represents a particular oil nozzle nominal rating, e.g., "400" represents the 400 liter per hour oil nozzle

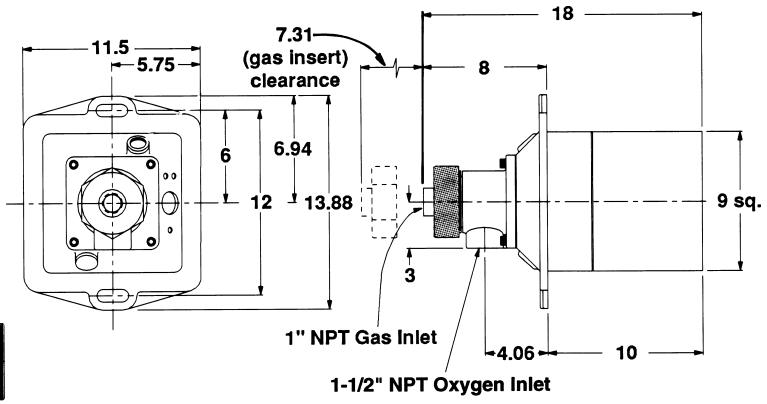
Dimensions

Gas OXY-THERM® Burners

Series 600

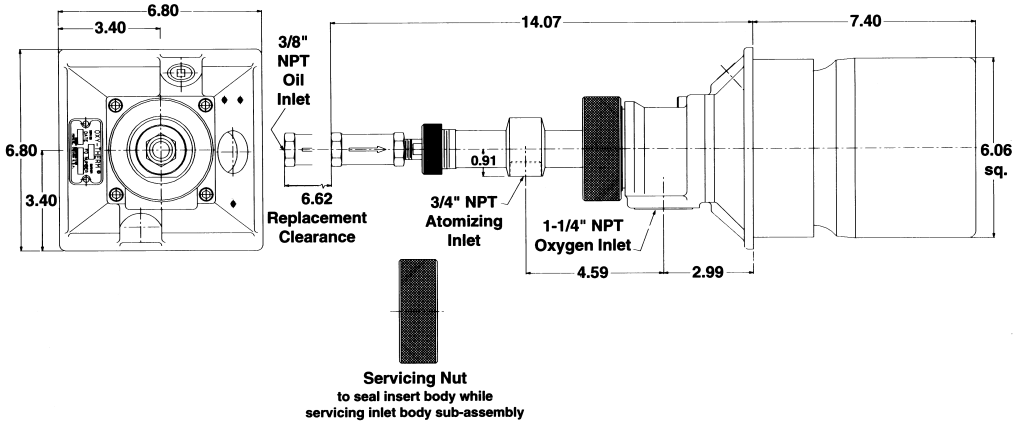


Series 900

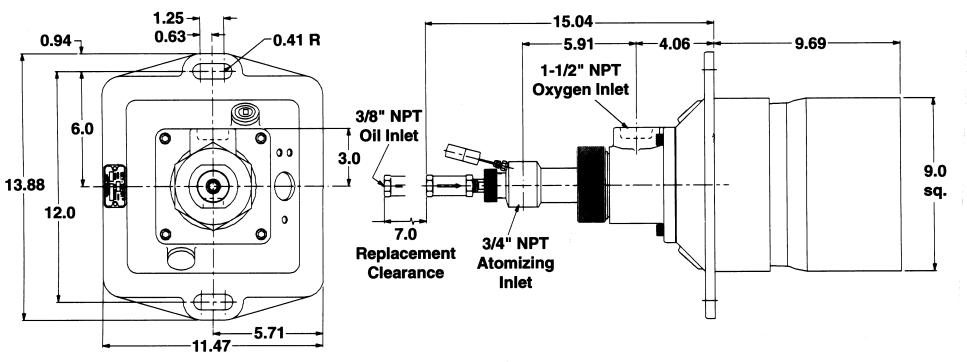


Oil OXY-THERM® Burners

Series 600



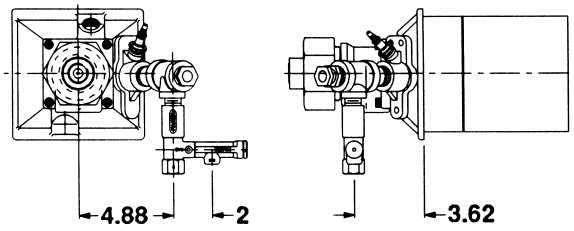
Series 900



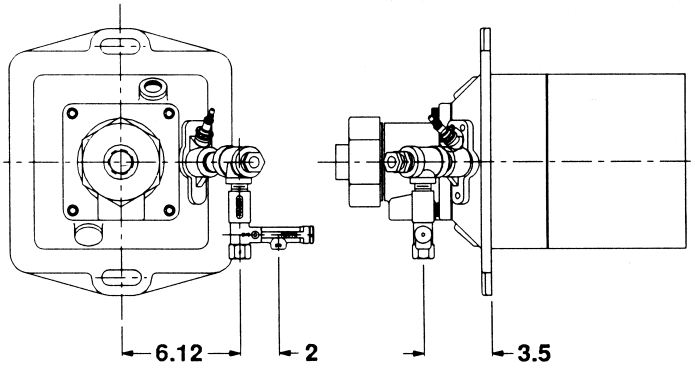
Dimensions

Optional Pilot Arrangements

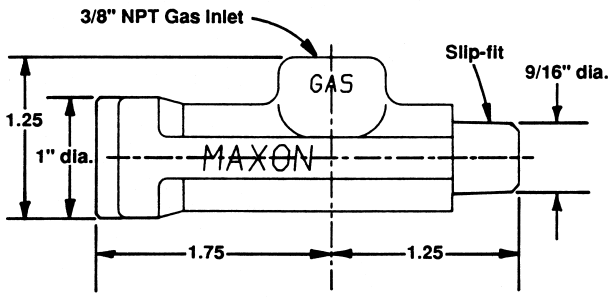
Series 600



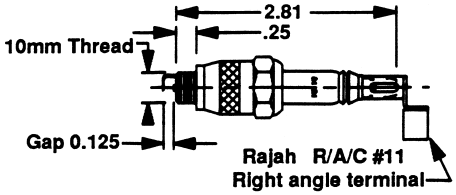
Series 900



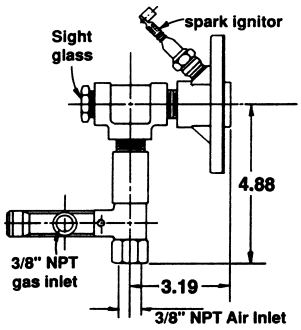
Adjustable Pilot Gas Orifice
(included in pilot)



Spark Ignitor
(included in pilot)

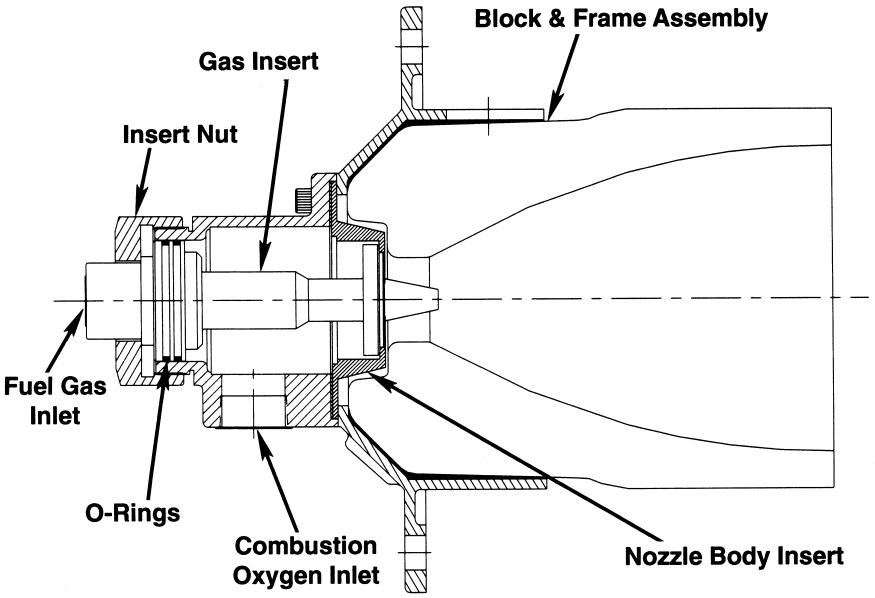


Pressure-type sealed port pilot
(optional)

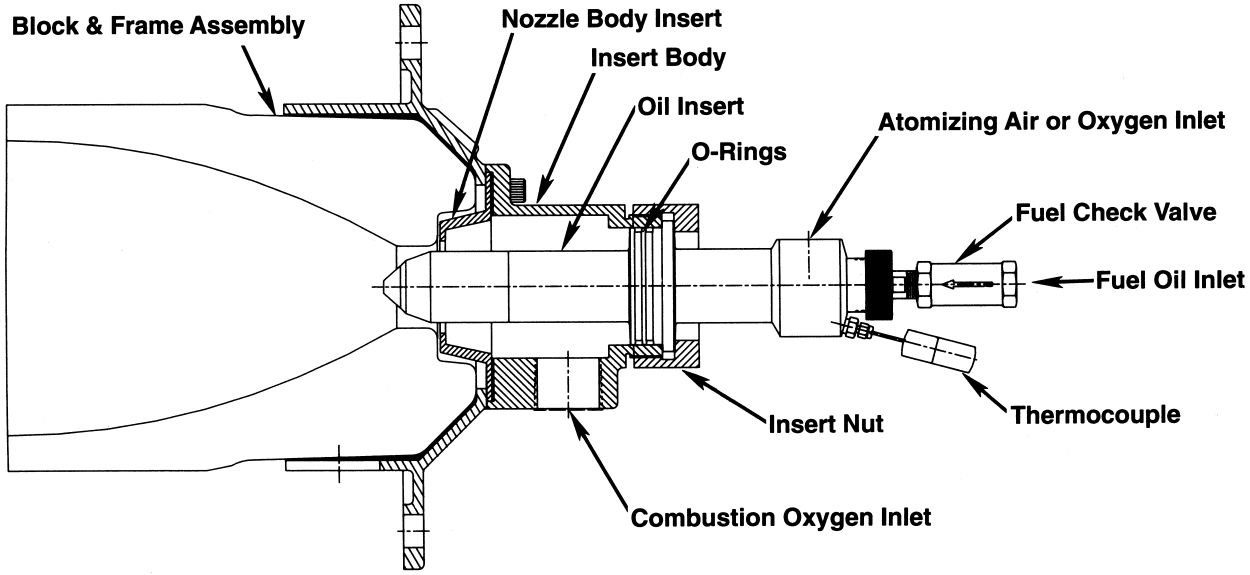


Component Identification

Gas OXY-THERM® Burners



Oil OXY-THERM® Burners



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