Honeywell

MAXON

Gas or oil burners OXY-THERM® LE

TECHNICAL INFORMATION

- Extremely low NOx levels with patented oxygen staging design.
- Burns any gaseous fuel, including fuels that may be unstable using air for combustion.
- Fuel oil capability ranges from light to heavy fuel oils.
- Quickly convert between gas and oil service by changing the burner nozzle.
- Patented design eliminates flame lofting providing cooler furnace crowns.
- Designed for easy installation and service. OXY-THERM® LE Burner nozzles can be removed during furnace operation, eliminating costly downtimes.
- Dramatically increase available heat by producing higher flame temperatures from burning fuels with oxygen.

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Contents

1 Application

OXY-THERM® LE burners produce dramatic savings in high temperature applications by reducing the total flue gas volume in a furnace. In addition, the higher flame temperature of oxy-fuel firing increases the radiant heat transfer to most applications.

OXY-THERM® LE burners have been successfully applied to glass furnaces, day tanks, incinerators, metal melting furnaces, reheat furnaces, kilns, and many other types of higher temperature applications.

Typical applications in industry include converted regenerative-type furnaces and melters, unit melters, non-ferrous melting, waste incinerators, smelters, and special applications requiring high temperatures.

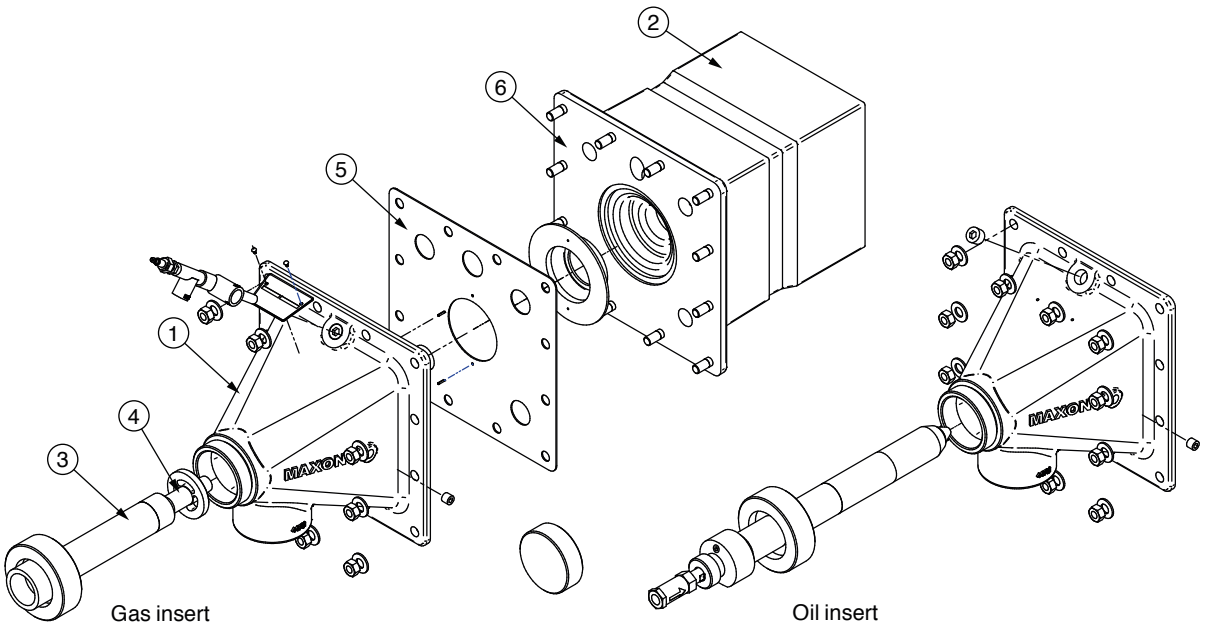
Flow control and shut-off valves (available from MAXON) need to conform with the appropriate standards for oxygen service.

Two refractory block materials are available for OXY-THERM® LE Burners. Alumina/zirconia/silica (AZS) burner blocks and zirconia burner blocks may be used with gas firing and oil firing. Extended block versions are only available in AZS material.

OXY-THERM® LE mounted on a glass furnace

OXY-THERM® LE staged flame pattern

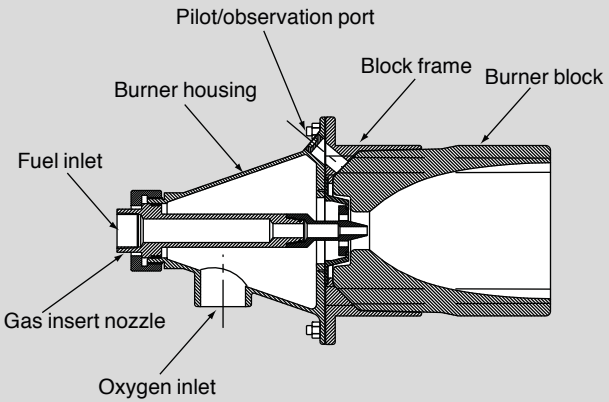
2 Mechanical construction



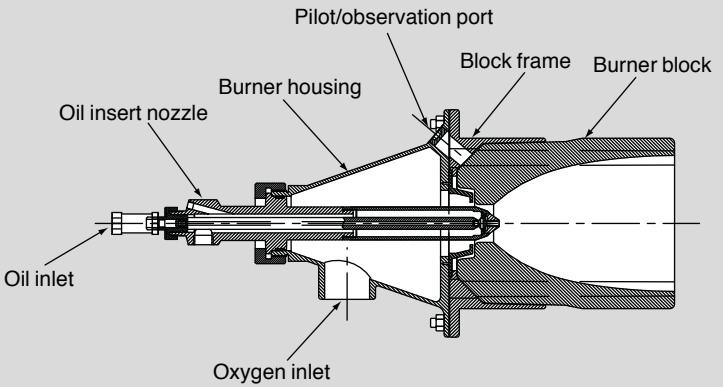
Item number	Burner part	Material
1	Burner housing	Bronze casting SAE 622 UNS C92200
2	Block*	Castable refractory alumina-zirconia-silica or castable refractory calcia stabilized zirconia
3	Gas body	Brass UNS C48500
4	Gas nozzle	440F Stainless steel ASTM A276-79
5	Mounting gasket	COGEMICANITE 132-1P
6	Block frame	Gray iron ASTM A159-77

**Extended block version only available in AZS block material*

3 Function



OXY-THERM® LE gas burners



OXY-THERM® LE oil burners

With OXY-THERM® LE Burners firing gas, oxygen for combustion enters the burner housing and exits the burner block where it mixes with the fuel.

For oil firing, the oil enters through the nozzle and is atomized with either oxygen, air, steam, or fuel gas and combines with the combustion oxygen as it exits the burner block.

The oxygen-fuel flame discharges through the refractory block tunnel and develops a luminous, non-lofting, tightly-wrapped flame pattern.

3.1 Typical emissions

OXY-THERM® LE burners utilize a patented oxygen staging technology to reduce the formation of NOx in high temperature furnaces. Through deep staging of the oxidant flow, NOx is controlled to levels typically lower than conventional oxy-fuel burners. By reduction in total flue gas volume, the total mass of NOx created is often lower than air-fuel firing.

Exact emissions performance may vary in your application. Contact MAXON for information on installation specific estimates or guarantees. No guarantee of emissions is intended or implied without specific written guarantee from MAXON.

4 Selection

4.1 Selection criteria

OXY-THERM® LE burners are able to operate on gas, light oils or heavy oils. Each fuel requires the use of separate nozzle inserts. In some cases, fuel oils may be atomized by fuel gases allowing simultaneous firing of two fuels.

OXY-THERM® LE fuel inserts may be standard sizes or custom drilled for specific flame sizes and capacities. For custom drilled inserts, contact MAXON with information on your furnace dimensions, process, and capacity requirements.

Burner blocks are available in a variety of different materials and geometries to suit your application. Read “4.2 Burner blocks“ on page 6 for more information on block selection.

4.2 Burner blocks

Two refractory block materials are available for OXY-THERM® LE Burners. Alumina/zirconia/silica (AZS) burner blocks and zirconia burner blocks may be used with gas firing and oil firing.

Series 600 and Series 900 burner blocks are available in a standard length and an extended length version. Extended length blocks are only available in AZS material. See “7.1.2 OXY-THERM® LE EX (extended block) gas or oil burners“ on page 23.

Block material		
Type	Alumina/zirconia/ silica (AZS)	Zirconia
Maximum temperature	3002°F (1650 °C)	3200°F (1760 °C)

In addition to maximum furnace temperatures, temperature variations and furnace atmosphere (chemical composition) can also be factors used to determine the appropriate block material.

4.3 OXY-THERM® LE gas burners

4.3.1 Imperial

Typical burner data Fuel: natural gas at 60°F with 1000 Btu/ft3 (st) HHV - sg = 0.6[1] propane at 60°F with 2500 Btu/ft3 HHV - sg = 1.57 [1] Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.					
Gas OXY-THERM® LE Burners			OXY-THERM® LE Burners		
			Series 600	Series 900	Series 1200[2]
Maximum capacity range		MBtu/h	0.2 to 2.7	1.5 to 11	5 to 15[3]
Turndown			5:1		
Pressures required to burner inlet for maximum capacities	Oxygen		Refer to pressure curves “5.2 Combustion oxygen pressure - gas burner“ on page 13		
	Natural gas	psig	0.5-8[4]		
	Propane	psig	1-20[4]		
Typical oxygen to fuel volumetric ratios	To natural gas		2.05 to 1[5]		
	To propane		5 to 1[5]		
Approximate flame size	Diameter	inches	18	30	36
	Length	ft	2.2 - 2.0 per MBtu/h	2.0 - 1.6 per MBtu/h	2.0 - 1.3 per MBtu/h

1 sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft3 (st))

2 Series 1200 not available in LE EX (extended block) version.

3 Capacities greater than 15 MBtu are possible. Contact MAXON for specific details.

4 Gas OXY-THERM® Burners are custom sized to meet your application and utility requirements. Please contact MAXON for specific details.

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

4.3.2 Metric

Typical burner data Fuel: natural gas at 15°C with 10.9 kWh/Nm³ HHV - sg = 0.6[1] propane at 15°C with 26.8 kWh/Nm³ HHV - sg = 1.57[1] Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.					
Gas OXY-THERM® LE Burners			OXY-THERM® LE Burners		
			Series 600	Series 900	Series 1200[2]
Maximum capacity range		kW	59 to 790	440 to 3225	1465 to 4400[3]
Turndown			5:1		
Pressures required to burner inlet for maximum capacities	Oxygen		Refer to pressure curves “5.2 Combustion oxygen pressure - gas burner“ on page 13		
	Natural gas	mbar	34-552[4]		
	Propane	mbar	69-1379[4]		
Typical oxygen to fuel volumetric ratios	To natural gas		2.05 to 1[5]		
	To propane		5 to 1[5]		
Approximate flame size	Diameter	mm	460	760	920
	Length	mm	2.35 - 2.1 per kW	2.12 - 1.6 per kW	2.12 - 1.36 per kW

1 sg (specific gravity) = relative density to air (density air = 1.293 kg/Nm³ (st))

2 Series 1200 not available in LE EX (extended block) version.

3 Capacities greater than 4400 kW are possible. Contact MAXON for specific details.

4 Gas OXY-THERM® Burners are custom sized to meet your application and utility requirements. Please contact MAXON for specific details.

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

4.4 OXY-THERM® LE oil burners

4.4.1 Imperial

Typical burner data Fuel: light oil (#2): 19.4 Btu/lb Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.								
Oil OXY-THERM® LE Burners	Series	Series 600 or 900	Series 900				Series 1200	
	Size	70	100	150	200	300	300	400
Maximum capacity range	MBtu/h	3.1	4.4	7.5	10	14.9	14.9	19.9
Maximum fuel flow	gallons/h	21	30	52	69	103	103	137
Minimum fuel flow	gallons/h	4.2	6	10	15	26	26	34
Turndown		5:1	5:1	5:1	4.6:1	4:1	4:1	4:1
Atomizing oxygen/air/gas flow		Refer to pressure curves “5.4 Atomizing oxygen/air flow vs. pressure“ on page 15						
Oxygen pressure to burner inlet		Refer to pressure curves “5.3 Combustion oxygen pressure - oil burner“ on page 14						
Fuel pressure to burner at maximum		Refer to pressure curves “5.5 Fuel oil flow vs. pressure“ on page 16						
Approximate flame diameter at maximum output	in	18	18	24	30	30	30	36
Approximate flame length at maximum output	ft	6	8	11.55	14	18	18	20

4.4.2 Metric

Typical burner data Fuel: light oil (#2): 12.5 kWh/kg Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.								
Oil OXY-THERM® LE Burners	Series	Series 600 or 900	Series 900				Series 1200	
	Size	70	100	150	200	300	300	400
Maximum capacity range	kW	910	1290	2200	2930	4370	4370	5830
Maximum fuel flow	l/h	80	115	195	260	390	390	520
Minimum fuel flow	l/h	16	23	39	57	98	98	130
Turndown		5:1	5:1	5:1	4.6:1	4:1	4:1	4:1
Atomizing oxygen/air/gas flow		Refer to pressure curves “5.4 Atomizing oxygen/air flow vs. pressure“ on page 15						
Oxygen pressure to burner inlet		Refer to pressure curves “5.3 Combustion oxygen pressure - oil burner“ on page 14						
Fuel pressure to burner at maximum		Refer to pressure curves “5.5 Fuel oil flow vs. pressure“ on page 16						
Approximate flame diameter at maximum output	mm	460	460	610	760	760	760	920
Approximate flame length at maximum output	m	1.8	2.5	3.5	4.5	5.5	5.5	6.0

4.5 Burner designation

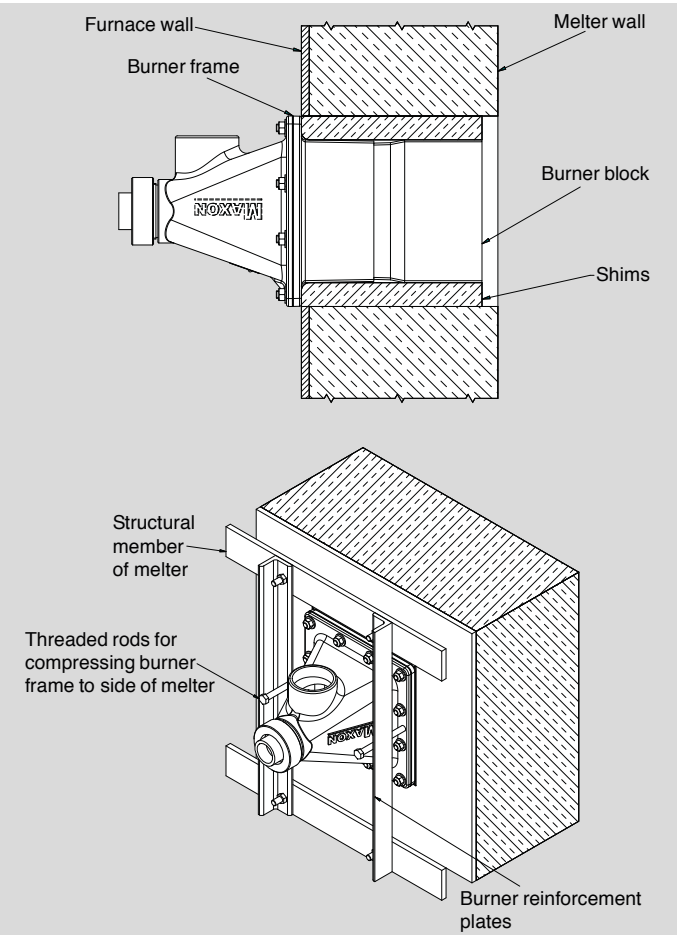
The example below shows a typical OXY-THERM® LE burner designation along with the available choices for options and versions.

Burner	Series	Size		Fuel	Block material	Pilot
OT LE	9	15	–	2	A	O

Code	Description
OT LE	OXY-THERM® LE BURNER
SERIES	
6	Series 600
9	Series 900
12	Series 1200
SIZE	Gas burner (one size only)
00	Oil burner size 70 (for Series 600 and 900)
07	
10	Oil burner size 100 (for Series 900)
15	Oil burner size 150 (for Series 900)
20	Oil burner size 200 (for Series 900)
30	Oil burner size 300 (for Series 900 and 1200)
40	Oil burner size 400 (for Series 1200)
FUEL	
N	Natural gas
O	Other gas (see Engineering)
P	Propane gas
2	#2 fuel oil
6	Preheated #6 fuel oil
BLOCK MATERIAL	
A	Alumina/zirconia/silica
Z	Zirconia
PILOT	
N	No pilot chosen
O	Oxy pilot without UV location
U	Oxy pilot with UV location

5 Project planning information

5.1 Installation



Burners should not be installed in a down-fired position. If this mounting arrangement is required, please contact MAXON for additional assistance.

The primary objective is to compress the frame against the wall of the melter and to support the weight of any system piping.

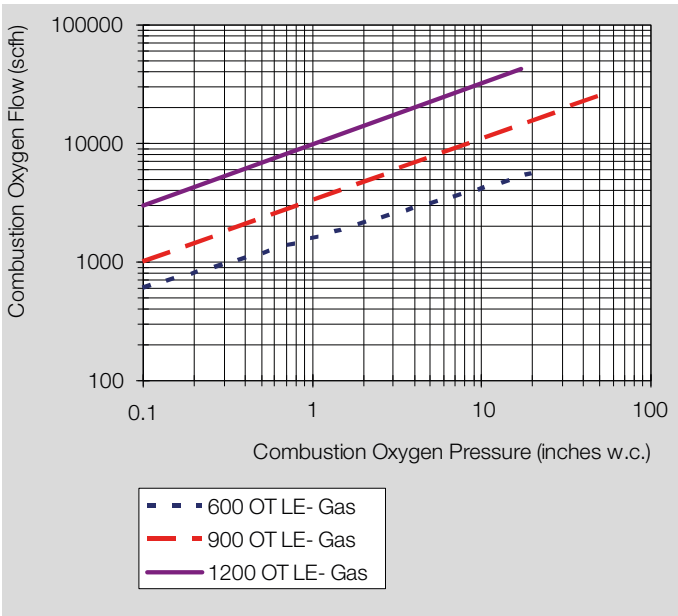
The burner block sits on the sill or wall. The block must rest flat on the sill or wall without rocking to allow weight to be equally distributed. Failure to do so could result in cracking and block failure. If burner port holes are too large, shims may be used to align the burner.

Burner block failure could result from external forces and stresses transmitted to the burner through the piping. Under no circumstances should the burner be the only support for the piping. Flexible connections are recommended in all piping to reduce piping stresses and alignment/shifting problems. Installation of such connectors at certain key spots in the oxygen or gas manifolding can prevent damage to the burners from uneven thermal expansion.

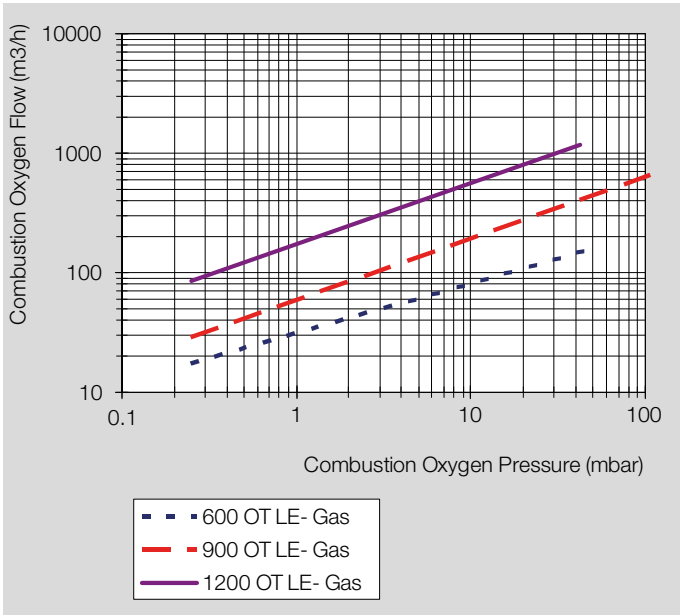
The opening of the furnace wall should provide 1/16” clearance on all sides. High temperature furnace sealant or gasketing should be used between burner mounting flange and furnace wall.

5.2 Combustion oxygen pressure - gas burner

5.2.1 Imperial

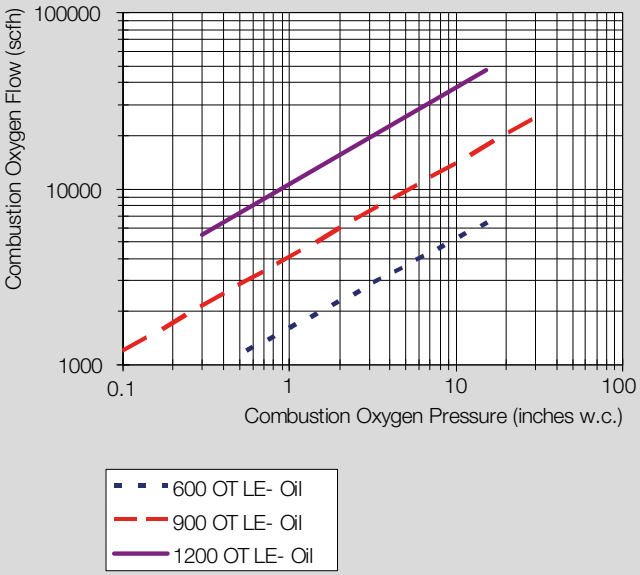


5.2.2 Metric

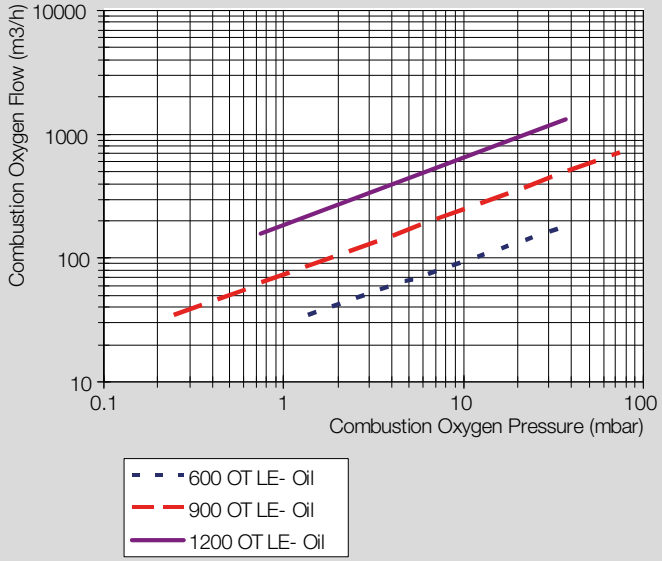


5.3 Combustion oxygen pressure - oil burner

5.3.1 Imperial

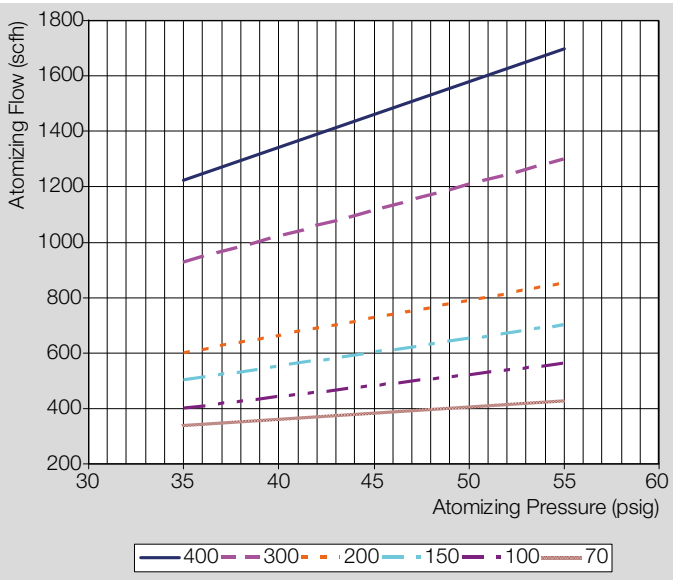


5.3.2 Metric

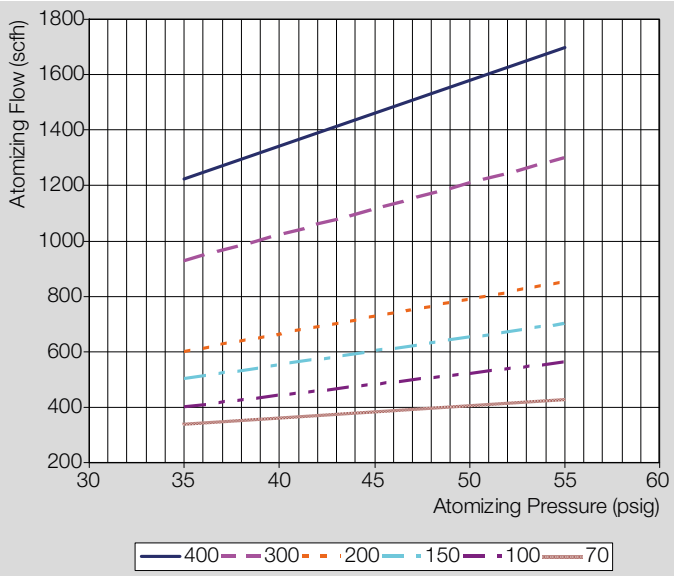


5.4 Atomizing oxygen/air flow vs. pressure

5.4.1 Imperial

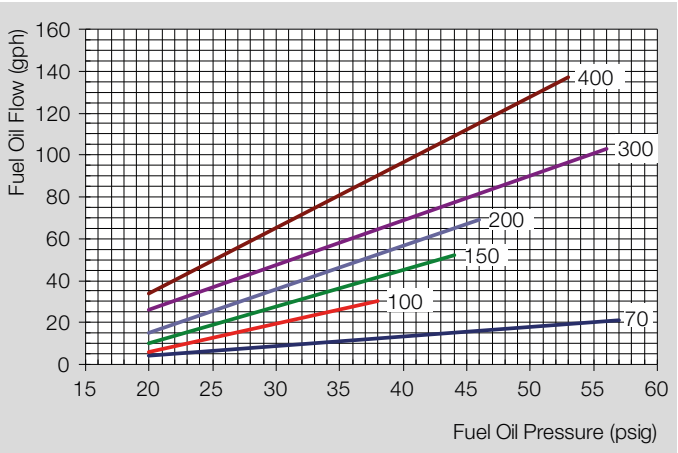


5.4.2 Metric

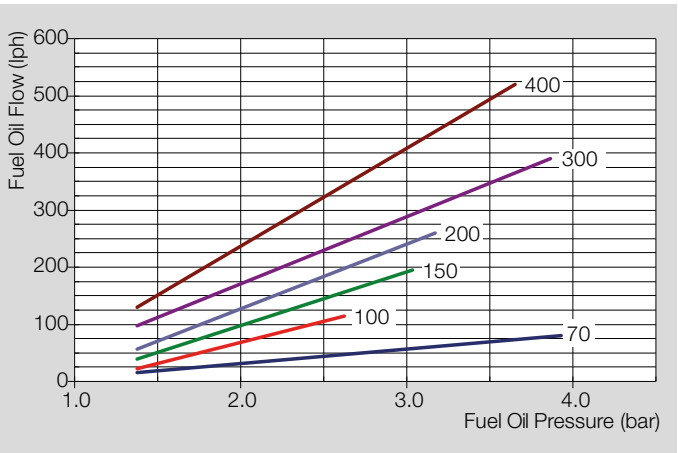


5.5 Fuel oil flow vs. pressure

5.5.1 Imperial



5.5.2 Metric



5.6 Process temperatures

OXY-THERM® LE burners may be applied to furnace temperatures up to 3200 °F (1760 °C) with standard block materials. For higher temperatures, special block materials are available. Refer to “Burner blocks” for more details.

Cooling flow, either clean, dry air or oxygen, must be used whenever the burner assembly is in a high temperature atmosphere and is not firing. See installation and operating instructions for more details.

5.7 Process flows and oxygen content

The OXY-THERM® LE burner requires no additional oxygen for complete, clean combustion beyond the oxygen fed through the burner.

In applications with heavy drafts or process flows, the burner flame will be moved by the atmosphere motion. Do not allow oxy-fuel flames to contact furnace walls or product as this may damage refractories and other materials.

5.8 Piloting & ignition

Use the optional oxy-fuel pilot only. (Refer to “6 Accessories“ on page 19).

Oxy-fuel pilot specifications			
Fuel	Flow cfh (m^3/h)	Pressure "wc (mbar)	Capacity Btu/h (kW)
Natural gas	25 (0.71)	2.25 (5.7)	25,000 (7.3)
Propane	10 (0.28)	0.83 (2.1)	
Oxygen	53 (1.5)	0.5 (1.3)	

5.9 Ratio control

Correct fuel/oxygen ratio control valves should be selected. Trims should be selected to enable the use with oxygen. MAXON’s MICRO-RATIO® valves are available with oxygen trim. For more accurate ratio control, use MAXON SMART-LINK® MRV valves, or for best performance, use SMART-FIRE® Intelligent Combustion Control System. Calibrated flowmeters in the fuel and the oxygen lines are recommended for establishing accurate volumetric flow rates.

5.10 Combustion oxygen pressure vs. flow

OXY-THERM® LE burners may be adjusted to operate on ratio, with excess oxygen (oxidizing environment) or with excess fuel (reducing environment). Typical applications will operate with 1-2% excess oxygen.

If burners are shut down while the furnace remains hot, it is recommended to continue a small flow of oxygen for cooling of the burner. Alternatively, air or nitrogen can be used for burner cooling during burner shut down. Total elimination of oxygen flow in hot furnaces can thermally damage burner fuel inserts and other parts. For extended shutdowns in hot furnaces, it is recommended that the fuel insert be removed and the burner fuel pathway be sealed with the service nut shipped with each burner.

5.11 Flame supervision

Flame scanning is possible down the gas nozzle. The flame scanner cannot be used through the pilot location to see the main flame. The use of a flame rod for flame detection is not possible. If required, flame sensing may be accomplished by UV scanner. Burner design can incorporate a UV scanner port suitable for supervision of both pilot and main flames. UV scanner, if used, should be kept as close to burner as feasible. Heat block, if used, may affect signal strength with some brands of UV scanners.

In case of oil firing where flame supervision is required, contact MAXON for alternative options.

5.12 Piping

Burner and piping should be supported as shown in the installation instructions. Unsupported piping puts stresses on the block/ frame assembly resulting in block failure.

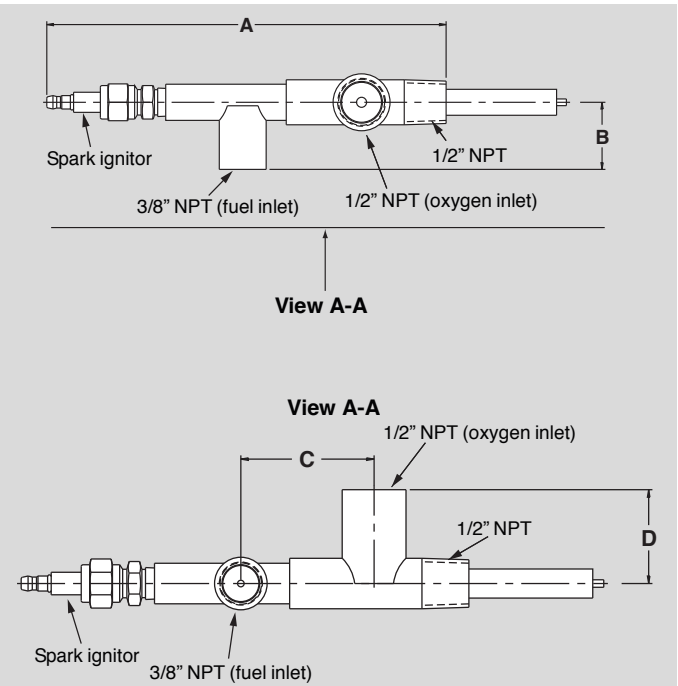
5.13 Fuels

OXY-THERM® LE burners are designed for firing on any clean fuel gas or light and heavy oils.

6 Accessories

A list of spare parts can be found at PartDetective.

6.1 Oxy-pilot



Dimensions in inches unless stated otherwise			
A	B	C	D
7.5	1.3	2.2	1.6

Dimensions in inches mm stated otherwise			
A	B	C	D
191	33	56	41

7 Technical data

Gas types: Natural gas,Propane gas, #2 fuel oil, Preheated #6 fuel oil; other types of gas on request.

Process temperatures: furnace temperatures up to 3200 °F (1760 °C) with standard block materials.

OXY-THERM® LE gas burners

Maximum capacity range: 0.2 to 15 MBtu/h (59 to 4400 kW);
Capacities greater than 15 MBtu/h (4400 kW) are possible. Contact MAXON for specific details.

Turndown: 5:1

OXY-THERM® LE oil burners

Maximum capacity range: 3.1 to 19.9 MBtu/h (910 to 5830 kW)

Turndown: 5:1, 4.6:1, 4:1

7.1 Dimensions and weights

7.1.1 OXY-THERM® LE gas or oil burners

Imperial

1) Gas inlet
2) Oxygen inlet
3) 1/4" NPT oxygen test connection
4) 3/8" NPT oil inlet
5) 3/4" NPT atomizing oxygen inlet
6) 1/2" NPT pilot and/or flame detection
7) Furnace wall exterior

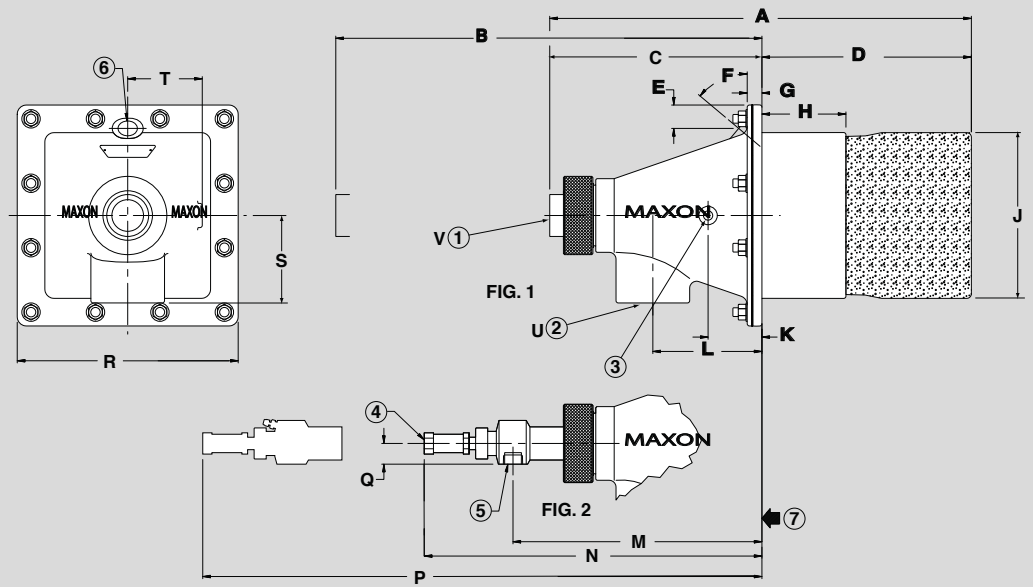


FIG. 1 = OXY-THERM® LE gas burner
FIG. 2 = OXY-THERM® LE oil burner

Dimensions in inches unless stated otherwise																			U NPT	V NPT	Weight lbs	
Burner series	A	B [1]	C	D	E	F	G	H	J sq.	K	L	M	N	P[1]	Q	R sq.	S	T			AZS	Zirc
600	16.4	16.5	7.78	8.63	1.23	58°	0.9	3.25	6.06	1.93	3.18	8.91	15.15	24.5	---	9.0	---	---	1-1/4"	1"	65	95
900	22.9	24.0	11.52	11.38	1.28	50°	0.9	4.56	9.0	2.92	5.92	13.52	18.34	31.0	1.13	12.06	4.75	4.13	3"	1-1/2"	160	225
1200	22.9	24.0	11.52	11.38	1.28	50°	0.9	4.56	12.0	2.92	5.92	13.52	18.34	31.0	1.13	12.06	4.75	4.13	3"	1-1/2"	225	340

[1] Removal clearance

Metric

1) Gas inlet
2) Oxygen inlet
3) 1/4" NPT oxygen test connection
4) 3/8" NPT oil inlet
5) 3/4" NPT atomizing oxygen inlet
6) 1/2" NPT pilot and/or flame detection
7) Furnace wall exterior

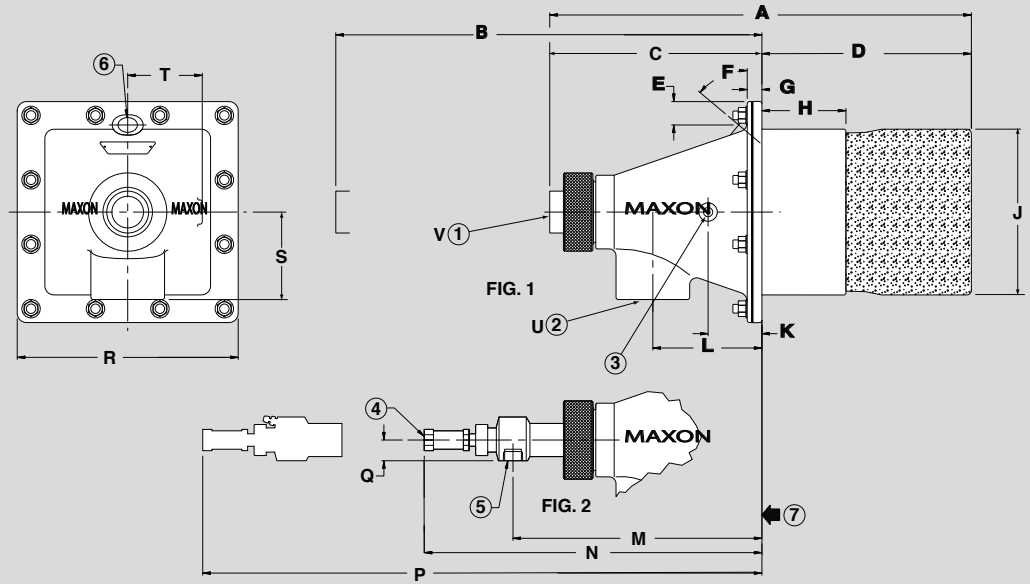


FIG. 1 = OXY-THERM® LE gas burner
FIG. 2 = OXY-THERM® LE oil burner

Dimensions in inches mm stated otherwise																			U NPT	V NPT	Weight kg	
Burner series	A	B [1]	C	D	E	F	G	H	J sq.	K	L	M	N	P[1]	Q	R sq.	S	T			AZS	Zirc
600	417	419	198	219	31	58°	23	83	154	49	81	226	385	622	-	229	-	-	1-1/4"	1"	29.5	43
900	582	610	293	289	33	50°	23	116	229	74	150	343	466	787	29	306	121	105	3"	1-1/2"	72.5	102
1200	582	610	293	289	33	50°	23	116	305	74	150	343	466	787	29	306	121	105	3"	1-1/2"	102	154

[1] Removal clearance

7.1.2 OXY-THERM® LE EX (extended block) gas or oil burners

Imperial

1) Gas inlet
2) Oxygen inlet
3) 1/4” NPT oxygen test connection
4) 3/8” NPT oil inlet
5) 3/4” NPT atomizing oxygen inlet
6) Furnace wall exterior

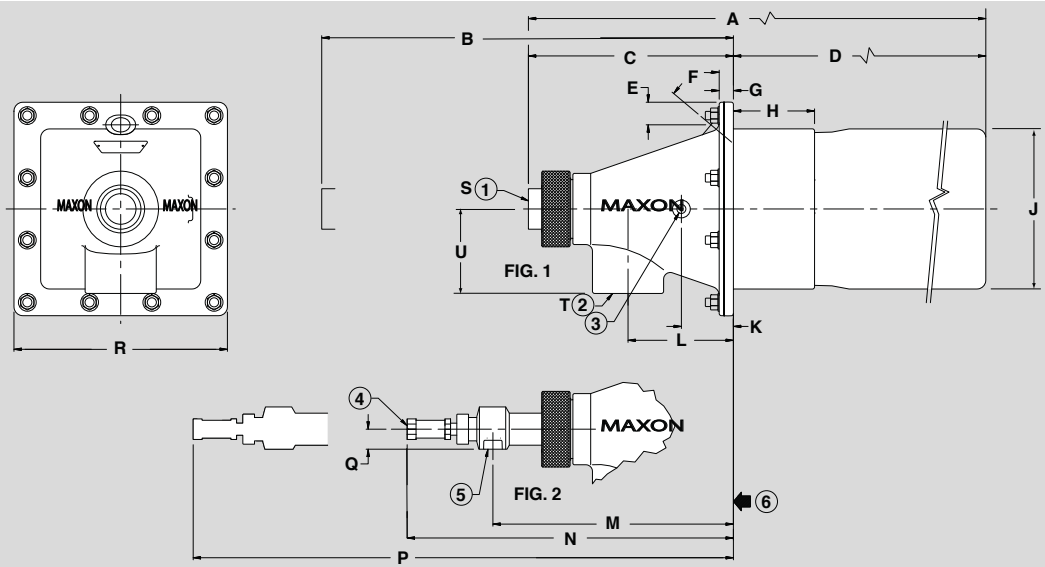


FIG. 1 = OXY-THERM® LE EX gas burner
FIG. 2 = OXY-THERM® LE EX oil burner

Dimensions in inches unless stated otherwise																			Weight lbs
Burner series	A	B [1]	C	D	E	F	G	H	J sq.	K	L	M	N	P [1]	Q	R sq.	S NPT	T NPT	U	AZS
600	25.67	25.73	7.67	18.0	1.23	58°	0.9	3.25	6.0	1.93	3.18	9.0	15.6	33.87	---	9.0	1”	1-1/4”	3.0	98
900	29.52	29.88	11.52	18.0	1.28	50°	0.9	4.56	9.0	2.92	5.92	13.68	18.74	37.34	1.13	12.0	1-1/2”	3”	4.75	200

[1] Removal clearance

Metric

1) Gas inlet
2) Oxygen inlet
3) 1/4” NPT oxygen test connection
4) 3/8” NPT oil inlet
5) 3/4” NPT atomizing oxygen inlet
6) Furnace wall exterior

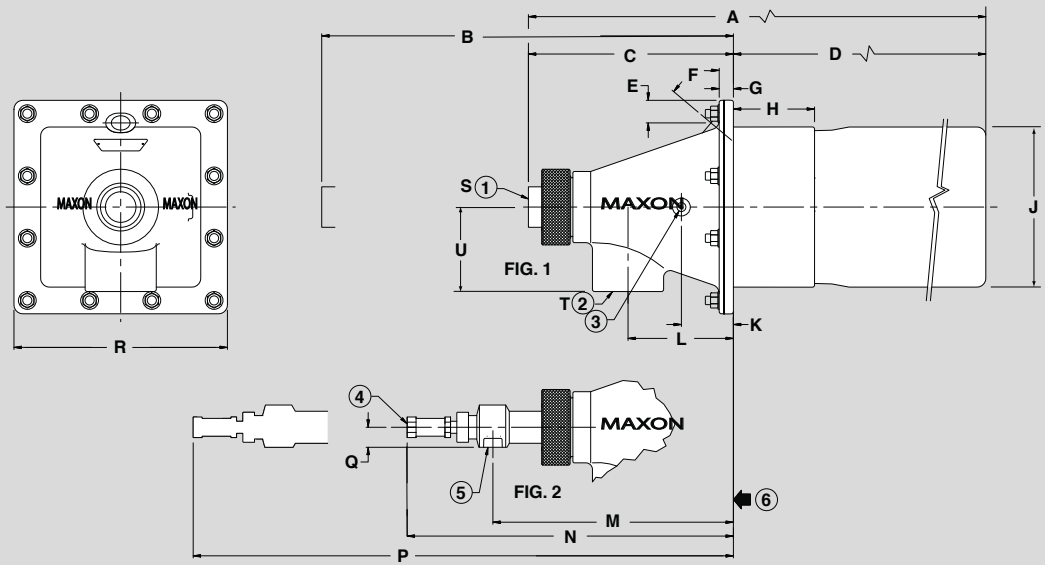


FIG. 1 = OXY-THERM® LE EX gas burner
FIG. 2 = OXY-THERM® LE EX oil burner

Dimensions in mm unless stated otherwise																			Weight kg
Burner series	A	B [1]	C	D	E	F	G	H	J sq.	K	L	M	N	P [1]	Q	R sq.	S NPT	T NPT	U	AZS
600	652	654	195	457	31	58°	23	83	152	49	81	229	396	860	-	229	1"	1-1/4"	76	44.5
900	750	759	293	457	33	50°	23	116	229	74	150	347	476	948	29	305	1-1/2"	3"	121	90.7

[1] Removal clearance

For More Information

The Honeywell Thermal Solutions family of products includes Honeywell Combustion Safety, Eclipse, Exothermics, Hauck, Kromschröder and Maxon. To learn more about our products, visit ThermalSolutions.honeywell.com or contact your Honeywell Sales Engineer.

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