Maxon Model “400” OVENPAK® Gas Burners

Model 415 OVENPAK® Burner with connecting base and linkage assembly to adapt customer's automatic electric control motor

- **Burns any clean fuel gas**
- **Fires into passing air streams**
- **Requires only low pressure gas**
- **Provides clean combustion with low NOx levels**
- **Compact burner design provides quick and easy installation**
- **Simple field adjustment and maintenance**

Model “400” OVENPAK® Burner applications have included:

Air heating in ovens and dryers, paint finishing lines, paper and textile machines, food baking ovens, coffee roasters, grain dryers, and fume incinerators. Manufactured under U.S. patent #3,574,508; Canadian and European patents granted and pending.

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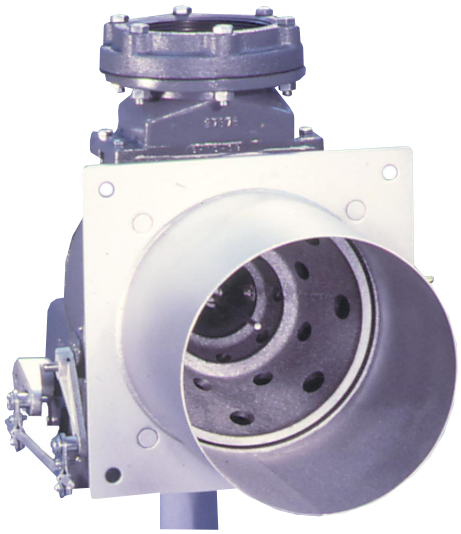
Maxon Model “400” OVENPAK® Gas Burners

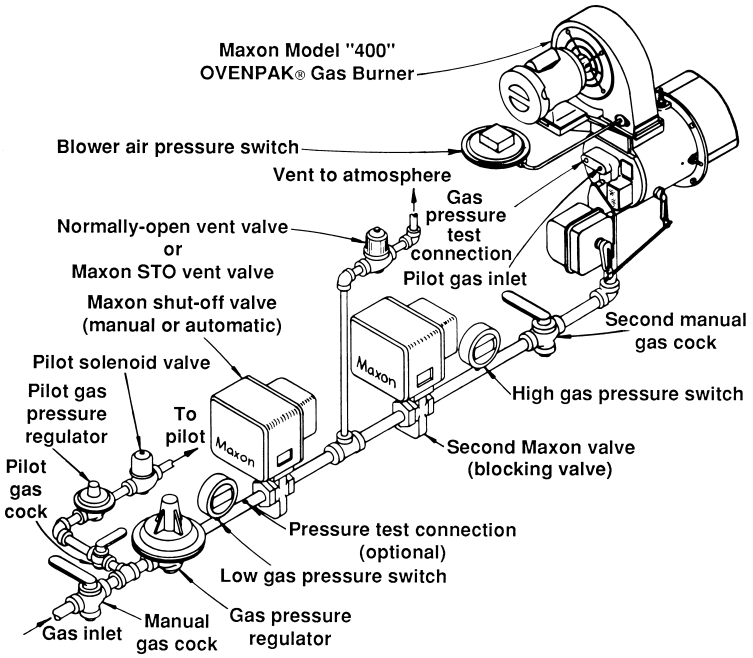


Model EB-3 OVENPAK® Burner with connecting base and linkage assembly

Provide application flexibility with:

- **40:1 turndown or more**
- **Over 90 different styles and sizes**
- **Heat releases to 16,500,000 Btu/hr**
- **Cost-effective external blower (EB) version**

Typical piping layout with “Block and Bleed” gas train arrangement



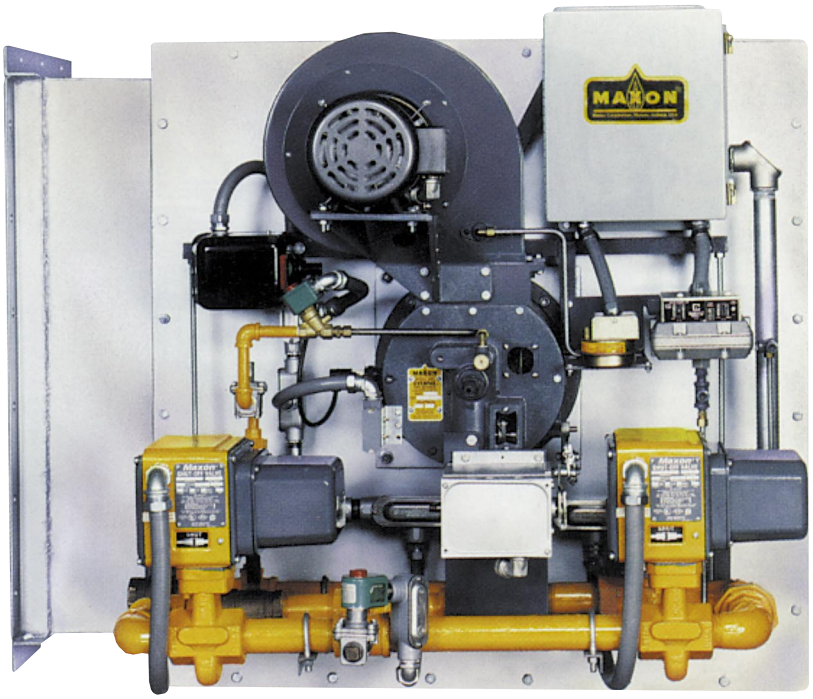
Maxon Pre-Assembled Package Model “400” OVENPAK® Gas Burner System

Model 435 OVENPAK® Burner with pre-assembled “Block & Bleed” pipe train and pre-wired into package system

- **A complete “packaged burner” system for maximum efficiency**
- **Pre-assembled system includes:**
  - **– High turndown Model “400” OVENPAK® Burner**
  - **– Completely assembled and pre-wired pipe train package**
- **Fast and easy installation with your choice of mounting options:**
  - **– Arranged for mounting onto your existing duct;**
  - **– Or mounted by Maxon in a pre-fabricated combustion heater/duct**

Maxon Packaged Heater/Duct Sections

for Pre-Assembled OVENPAK® Gas Burner Systems



Model 425 OVENPAK® Burner pre-assembled package system, installed and mounted onto a Maxon pre-fabricated heater/duct section

- **Reduce your fabrication time and costly design details**
- **Easy mounting provided by flanged duct connection joints**
- **Application flexibility offered by:**
  - **– Three duct sizes**
  - **– Five capacity options**
  - **– Optional return/inlet duct opening positions**
- **Discharge air volumes up to 12,000 SCFM**
- **Handles discharge air temperatures up to 600°F (316°C)**

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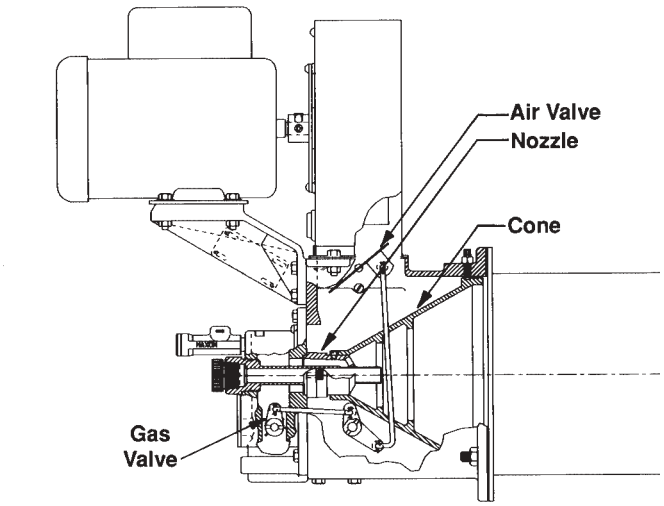
Design and Application Details

OVENPAK® Burners are nozzle-mixing gas burners for many industrial direct-fired applications where clean combustion and high turndown are required. They are simple and versatile for use on a variety of heating applications.

The Model “400” OVENPAK® Burner (shown at right) includes a combustion air blower with non-sparking paddle wheel-type impeller, pilot, spark ignitor, stainless steel discharge sleeve, mixing cone, self-contained internal air and gas proportioning valves, and provision for your flame safeguard sensor.

Right: Model 415 OVENPAK® Gas Burner with optional:
- combustion air filter
- connecting base and linkage assembly
- electrical control motor (by others)



Cross sectional view of a Model “400” OVENPAK® Gas Burner

Principle of operation (illustrated at left)

The OVENPAK® Burner is designed for industrial air heating applications. It is available in two basic versions: 1) packaged with integral combustion air blower, or 2) for use with an external blower. Both versions include a gas and air valve, internally linked together to control the gas-air ratio over the full operating range. The gas flows through the nozzle, then along the inside of the burner cone where combustion air is progressively and tangentially mixed with the gas. This produces a very wide turndown range and a highly stable flame under a variety of operating conditions.

Design and Application Details

Model “EB” (external blower) OVENPAK® Burners (shown at right), like all OVENPAK® Burner assemblies, are designed to deliver heat through a patented mixing cone and stainless steel sleeve.

Flanged burner body design on all OVENPAK® Burner assemblies simplifies mounting and installation on your application. Burner can be installed in any position that does not conflict with your control motor or flame detector requirements.

Minimal torque requirements permit use of most electric or air operators in conjunction with the optional (Maxon supplied) connecting base and linkage assemblies.

Model “EB-MA” OVENPAK® Burner with discharge sleeve and optional manual gas control

“EB-MRV” versions (photo at right)

“EB-MRV” versions of OVENPAK® Burners permit air/fuel ratio control via a Maxon MICRO-RATIO® control valve throughout the firing range. They differ from standard “EB” burners in that internal gas and air butterflies and the related shafts and linkages are omitted.

In normal operation, air and fuel will be proportioned by an external Maxon MICRO-RATIO® Control valve.

Maximum capacities match those cataloged for “EB” burners of equivalent size and differential air pressure. **Minimum capacity** and air differential pressure will vary with your application.

view into cone of EB version

Model EB-3 OVENPAK® Burner arranged for external blower source with connecting base and linkage assembly to adapt customer's automatic control motor

“400-MA” and “EB-MA” versions

Model “400-MA” versions include a combustion air blower in your choice of the voltages shown on page 2107, but provide constant combustion air volumes. They differ from “standard” versions by use of a slotted adjustable air butterfly locking device as shown in photo at left. Internally, the linkage normally cross-connecting air and gas butterflies is omitted.

In normal operation, the air butterfly is set to the desired air differential pressure, and the fuel only is throttled by a separate control valve. **Maximum capacities** match those cataloged for “standard” burners of equivalent size. **Minimum capacities** with full air flow will be higher than those of “standard” burner.

Model “EB-MRV” OVENPAK® Burner with optional 12" discharge sleeve

Capacities and Specifications – 60 Hertz

Standard Model "400" OVENPAK® Burner includes a combustion air blower with motor.

Maximum capacity of Model "400" OVENPAK® Burner is affected by the static pressure within the combustion chamber. Data shown assumes firing in the open, or into an airstream with enough oxygen to complete the combustion process. If burner is fired into an oxygen-starved chamber or airstream, capacities may be reduced as much as 25-30%. Do not attempt to operate beyond the duct static pressure range shown. For higher back pressure applications, select from Model "EB" or "EB-MRV" OVENPAK® Burner options.

All gas pressures are differential pressures and are measured at the gas pressure test connection on the backplate of each OVENPAK® Burner. Differential pressures shown are approximate.

60 Hz Motor Voltages Available

Horsepower	Type	115/208-230/1/60	208-230/460/3/60	575/3/60
1/3 & 1/2	Totally Enclosed	X	X	X
3/4 & 1	Totally Enclosed	X	X	X
1-1/2, 2 & 3	Totally Enclosed	Not Available	X	X

Capacities and Operating Data – Model 405 through 422M

Burner Model			405	407M	408	408M	412M	413M	415	422M
Motor Specification	Horsepower:		1/3	1/2	1/3	3/4	1/2	3/4	1/3	3/4
	Frame Number:		48	48	48	56	48	56	48	56
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	**DUCT STATICS**	**-5.0 to -0.5" wc**	550 *2.8"*	---	880 *3.4"*	--	---	---	1650 *1.7"*	---
		±0" wc	500 *2.3"*	750 *2.5"*	800 *2.8"*	790 *2.7"*	1200 *2.8"*	1300 *3.3"*	1500 *1.4"*	2150 *2.9"*
		+1.0" wc	475 *2.1"*	700 *2.2"*	760 *2.6"*	750 *2.5"*	1100 *2.4"*	1190 *2.8"*	1425 *1.3"*	2000 *2.5"*
		+2.0" wc	450 *1.9"*	600 *1.6"*	720 *2.3"*	640 *1.8"*	925 *1.7"*	1100 *2.4"*	1350 *1.1"*	1725 *1.9"*
		+3.0" wc	---	510 *1.1"*	---	550 *1.3"*	800 *1.3"*	1000 *2.0"*	---	1610 *1.6"*
		+4.0" wc	---	450 *0.9"*	---	495 *1.1"*	750 *1.1"*	900 *1.6"*	---	1500 *1.4"*
		+5.0" wc	---	---	---	475 *1.0"*	---	800 *1.3"*	---	1420 *1.3"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		15			20			37	
	Pilot only		10			15			20	
Required natural gas differential pressure to burner inlet ("wc)			3.0		3.5	4.1	4.5	5.2	4.2	7.2
Approximate flame length in still air			1/2 to 1 ft.		1 to 1-1/2 ft.	1/2 to 1 ft.	1 to 2-1/2 ft.		2-1/2 to 3-1/2 ft.	1-1/2 to 2 ft.

Capacities and Specifications – 60 Hertz

Capacities and Operating Data – Model 425 through 487M

Burner Model			425	432M	435	442M	445	456M	470M	487M
Motor Specification	Horsepower:		3/4	3/4	3/4	1	1	1-1/2	2	3
	Frame Number:		56	56	56	56	56	143T	145T	182T
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	**DUCT STATICS**	**-5.0 to -0.5" wc**	2750 *2.7"*	---	3850 *2.2"*	---	5175 *3.4"*	6400 *3.6"*	8050 *3.7"*	10060 *4.6"*
		±0" wc	2500 *2.2"*	3200 *3.6"*	3500 *1.8"*	4150 *2.5"*	4500 *2.6"*	5600 *2.8"*	7000 *2.8"*	8700 *3.4"*
		+1.0" wc	2375 *2.0"*	3000 *3.2"*	3325 *1.6"*	4000 *2.4"*	4280 *2.3"*	5340 *2.5"*	6570 *2.5"*	8400 *3.2"*
		+2.0" wc	2250 *1.8"*	2800 *2.8"*	3150 *1.4"*	3800 *2.1"*	4125 *2.2"*	5200 *2.4"*	6300 *2.3"*	8200 *3.0"*
		+3.0" wc	---	2650 *2.5"*	---	3650 *1.9"*	---	5000 *2.2"*	5500 *1.7"*	7500 *2.5"*
		+4.0" wc	---	2500 *2.2"*	---	3500 *1.8"*	---	4600 *1.9"*	5000 *1.4"*	6200 *1.7"*
		+5.0" wc	---	2250 *1.8"*	---	3300 *1.6"*	---	4100 *1.5"*	4500 *1.2"*	5500 *1.4"*
		+6.0" wc	---	---	---	---	---	---	3500 *0.7"*	5000 *1.1"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		60		87		110	125	150	175
	Pilot only		35		45		90	105	115	117
Required natural gas differential pressure to burner inlet ("wc)			3.6	4.9	3.8	4.9	4.5	5.1	5.2	7.6
Approximate flame length in still air			2-1/2 to 3-1/2 ft.		3-1/2 to 5 ft.	4 to 5 ft.	4 to 6 ft.	5 to 7 ft.	6 to 8 ft.	8 to 10 ft.

Capacities and Specifications – 50 Hertz

Standard Model "400" OVENPAK® Burner includes a combustion air blower with motor.

Maximum capacity of Model "400" OVENPAK® Burner is affected by the static pressure within the combustion chamber. Data shown assumes firing in the open, or into an airstream with enough oxygen to complete the combustion process. If burner is fired into an oxygen-starved chamber or airstream, capacities may be reduced as much as 25-30%. Do not attempt to operate beyond the duct static pressure range shown. For higher back pressure applications, select from Model "EB" or "EB-MRV" OVENPAK® Burner options.

All gas pressures are differential pressures and are measured at the gas pressure test connection on the backplate of each OVENPAK® Burner. Differential pressures shown are approximate.

50 Hz Motor Voltages Available (possible net extra cost)

Horsepower	Type	190-200/1/50	380-415/3/50	500/3/50
1/3 & 1/2	Totally Enclosed	X	X	X
3/4 & 1	Totally Enclosed	X	X	X
1-1/2, 2 & 3	Totally Enclosed	X	X	X

Capacities and Operating Data - Model 405 through 422M

Burner Model			405	407M	408	408M	412M	413M	415	422M
Motor Specification	Horsepower:		1/3	1/2	1/3	3/4	1/2	3/4	1/3	3/4
	Frame Number:		48	48	48	56	48	56	48	56
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	DUCT STATICS	**-5.0" wc**	460 *2.0"*	---	735 *2.4"*	---	---	---	1375 *1.2"*	---
		-3.0" wc	460 *2.0"*	---	735 *2.4"*	---	---	---	1375 *1.2"*	---
		±0" wc	415 *1.6"*	625 *1.7"*	670 *2.0"*	660 *1.9"*	1000 *2.0"*	1080 *2.5"*	1250 *1.0"*	1800 *2.0"*
		+1.0" wc	390 *1.4"*	585 *1.5"*	630 *1.7"*	625 *1.7"*	920 *1.7"*	990 *2.4"*	1190 *0.9"*	1670 *1.8"*
		+2.0" wc	---	---	---	---	---	920 *1.7"*	---	1440 *1.3"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		15		20	15	20		37	
	Pilot only		10				15		20	
Required natural gas differential pressure to burner inlet ("wc)			2.2	2.3	3.0	2.6	3.5	4.1	2.9	5.6
Approximate flame length in still air			1/2 to 1 ft.		1 to 1-1/2 ft.	1/2 to 1 ft.	1 to 2 ft.		1-1/2 to 2 ft.	2 to 2-1/2 ft.

Capacities and Specifications – 50 Hertz

Capacities and Operating Data - Model 425 through 487M

Burner Model			425	432M	435	442M	445	456M	470M	487M
Motor Specification	Horsepower:		3/4	3/4	3/4	1	1	1-1/2	2	3
	Frame Number:		56	56	56	56	56	143T	145T	182T
Maximum Capacities (1000's Btu/hr) *with Natural Gas Pressures ("wc)*	DUCT STATICS	**-5.0" wc**	2300 *1.9"*	---	2920 *1.3"*	---	4325 *2.4"*	5350 *2.5"*	6700 *2.6"*	8400 *3.2"*
		-3.0" wc	2300 *1.9"*	---	2920 *1.3"*	---	4325 *2.4"*	5350 *2.5"*	6700 *2.6"*	8400 *3.2"*
		±0" wc	2090 *1.6"*	2670 *2.5"*	2780 *1.1"*	3460 *1.8"*	3760 *1.8"*	4670 *1.9"*	5850 *2.0"*	7250 *2.3"*
		+1.0" wc	1970 *1.4"*	2340 *2.0"*	---	3340 *1.6"*	---	4450 *1.8"*	5500 *1.7"*	7050 *2.1"*
		+2.0" wc	---	---	---	3220 *1.5"*	---	4340 *1.7"*	5250 *1.6"*	6850 *2.1"*
		+3.0" wc	---	---	---	---	---	---	---	6250 *1.7"*
Minimum Capacities (1000's Btu/hr)	Main plus pilot		60		87		110	125	150	175
	Pilot only		35		45		90	105	115	117
Required natural gas differential pressure to burner inlet ("wc)			2.5	3.8	2.2	3.8	3.1	3.6	5.0	5.0
Approximate flame length in still air			2 to 3 ft.		3 to 4-1/2 ft.	3-1/2 to 4 ft.	4 to 5 ft.	5 to 6 ft.		7 to 8 ft.

Capacities and Specifications
External Blower (EB) versions

EB-1 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	150	170	190	210	240	255	270	280
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**460**	**580**	**715**	**780**	**870**	**910**	**960**	**1000**
		Minimum & pilot	60	60	60	60	60	60	60	60
		Pilot only	45	45	45	45	45	45	45	45
	Natural Gas differential pressures ("wc)	At burner inlet	2.1	3.4	5.1	6.1	7.6	8.3	9.2	10.0
		At burner gas test connection	2.0	3.1	4.7	5.6	7.0	7.6	8.5	9.2
	Flame Lengths	In still air	4" to 15" beyond end of discharge sleeve							

EB-2 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	220	250	280	310	355	375	395	415
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**750**	**980**	**1200**	**1330**	**1450**	**1500**	**1550**	**1600**
		Minimum & pilot	60	60	60	60	70	70	75	80
		Pilot only	25	25	25	25	30	30	35	35
	Natural Gas differential pressures ("wc)	At burner inlet	3	5.2	7.8	9.5	11.3	12.1	12.9	13.8
		At burner gas test connection	2.5	4.2	6.3	7.7	9.2	9.8	10.5	11.2
	Flame Lengths	In still air	12" to 30" beyond end of discharge sleeve							

EB-3 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	350	405	455	495	575	615	650	675
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**1620**	**1900**	**2120**	**2320**	**2670**	**2840**	**3000**	**3150**
		Minimum & pilot	90	95	105	115	130	140	150	155
		Pilot only	45	45	50	55	65	70	75	75
	Natural Gas differential pressures ("wc)	At burner inlet	4.1	5.6	7.0	8.3	11.0	12.5	13.9	15.4
		At burner gas test connection	1.6	2.2	2.8	3.3	4.4	5.0	5.6	6.2
	Flame Lengths	In still air	2 to 3 feet beyond end of discharge sleeve							

EB-4 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	550	635	710	775	895	950	1000	1050
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**2320**	**2800**	**3230**	**3500**	**3950**	**4150**	**4330**	**4600**
		Minimum & pilot	100	115	130	140	160	170	180	190
		Pilot only	40	40	40	45	50	55	55	60
	Natural Gas differential pressures ("wc)	At burner inlet	2.5	3.7	4.9	5.8	7.4	8.1	8.8	10.0
		At burner gas test connection	1.9	2.8	3.7	4.3	5.5	6.1	6.6	7.5
	Flame Lengths	In still air	2-1/2 to 3-1/2 feet beyond end of discharge sleeve							

Capacities and Specifications
External Blower (EB) versions

EB-5 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**
		Volume (SCFM)	665	770	860	940	1080	1150	1210	1270
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**2940**	**3500**	**3980**	**4420**	**5130**	**5450**	**5740**	**6000**
		Minimum & pilot	155	180	200	220	255	270	285	300
		Pilot only	25	30	35	35	40	45	50	50
	Natural Gas differential pressures ("wc)	At burner inlet	2.2	3.1	4.0	4.9	6.6	7.5	8.3	9.1
		At burner gas test connection	1.3	1.8	2.3	2.9	3.9	4.4	4.8	5.3
	Flame Lengths	In still air	3 to 5 feet beyond end of discharge sleeve							

EB-6 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**5**	**8**	**11**	**16**	**18**	**22**	**24**
		Volume (SCFM)	975	1260	1590	1870	2250	2390	2640	2760
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**4710**	**6700**	**9500**	**11200**	**13500**	**14300**	**15800**	**16500**
		Minimum & pilot	335	390	490	575	695	735	815	850
		Pilot only	100	100	100	115	140	145	165	170
	Natural Gas differential pressures ("wc)	At burner inlet	2.8	5.6	11.3	15.7	22.8	25.6	31.3	34.1
		At burner gas test connection	2.0	4.0	8.1	11.2	16.3	18.3	22.3	24.3
	Flame Lengths	In still air	3 to 8 feet beyond end of discharge sleeve				8 to 12 feet beyond end of discharge sleeve			

EB-7 OVENPAK® Burner	**Combustion and Cooling Air required**	Differential Air Pressure ("wc)	**3**	**5**	**8**	**11**	**16**	**18**	**22**	**24**
		Volume (SCFM)	975	1260	1590	1870	2250	2390	2640	2760
	Heat Releases (1000's Btu/hr)	**Maximum Capacity**	**4710**	**6700**	**9500**	**11200**	**13500**	**14300**	**15800**	**16500**
		Minimum & pilot	335	390	490	575	695	735	815	850
		Pilot only	100	100	100	115	140	145	165	170
	Natural Gas differential pressures ("wc)	At burner inlet	1.8	3.6	7.3	10.1	14.8	16.6	20.2	22.1
		At burner gas test connection	1.0	2.0	4.1	5.6	8.2	9.2	11.2	12.2
	Flame Lengths	In still air	3 to 8 feet beyond end of discharge sleeve				8 to 12 feet beyond end of discharge sleeve			

Accessory Options

Air filter assemblies and silencers

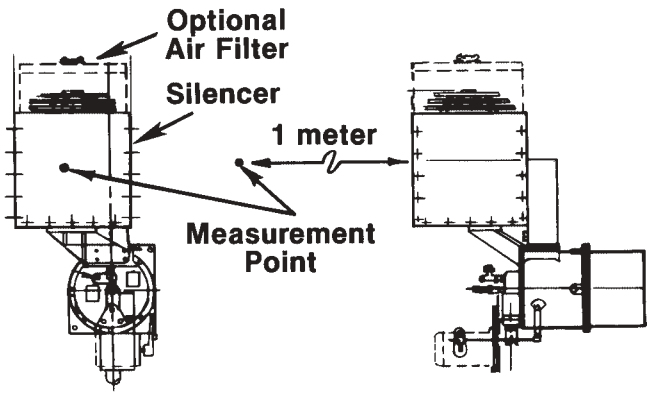
Air filter assemblies help to trap airborne particulate matter. They are offered with washable replaceable filter elements or with permanent metallic elements (as shown in photograph above). Filters mount onto OVENPAK® Burner's blower housing (or silencer housing of burners so equipped) and surround the blower motor and combustion air inlet.

Filter silencers help reduce noise levels. They mount onto OVENPAK® Burner's blower housing and enclose the blower motor and combustion air inlet (as shown in above photograph). They can be furnished in conjunction with a permanent or replaceable filter element assembly described above.

dB(A) sound levels from actual tests conducted at full-rated 60 Hz capacity are shown in table at right. Measurement point is shown in sketch below. (Meter was set to A-scale, slow response.)

Operation on 50 Hz power results in lower rotational speed of blower, and so reduces air output, capacity, and resulting noise levels. 50 Hz noise levels should not exceed the above data measured on 60 Hz operation.

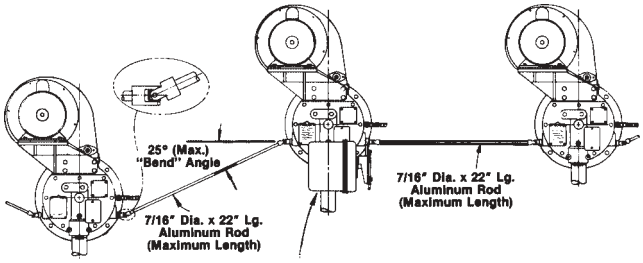
Burner Model	Sound Level dB(A)	
	Standard Burner	with Silencer
405	84	75
407M	83	77
408M	84	75
408	87	78
412M	81	73
413M	82	72
415	89	77
422M	88	79
425	89	78
432M	88	80
435	87	78
442M	89	80
445	89	81
456M	90	83
470M	92	83
487M	94	85



Accessory Options

Universal Joint Arrangements (for all versions except EB-MRV) allow control of as many as 5 burners by a single control motor. Torque requirement is 10 in-lbs for EACH burner driven. Primary burner should drive no more than 2 Secondary burners to either side of itself.

Miniature universal joints simplify burner alignment. Aluminum connecting rod can be cut to fit actual burner spacing. (Allowable distance between adjacent burner centerlines is 21" – 33" for 422M and smaller, 23.5" – 36" for larger burners.)



Model "400" OVENPAK® Burner with Control Motor

To order, specify:

1. **Primary and secondary burners**
2. **Any other accessories desired**
3. **Required quantity of Universal Joint Assemblies**

Manual Handle Kit permits setting and locking air and fuel valves at a constant firing rate. See photo below.

Auxiliary Switches

Maxon offers 4 types, all cam-actuated by the burner main operating shaft. (If Universal Joint Arrangements are used, switch must mount on furthest left burner.) Field installation MAY require burner modification per instructions provided in Product Information Sheet 2000-7/8.

Low Fire Start Switch Assembly (SPDT) opens the circuit when burner leaves minimum position. Also available in Weatherproof and Hazardous Location/ Weatherproof versions.

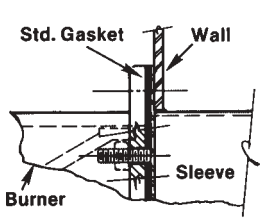
High and Low Fire Position Switch Assembly includes 2 SPDT switches. One switch may be field-set to activate at high fire position, while other is set to activate at low fire position. Switch assemblies are also available in a weatherproof version.

Low Fire Start Switch shown

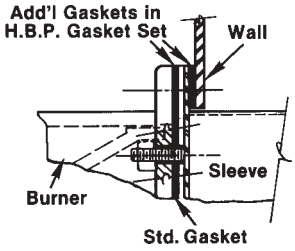
Discharge Sleeve Mounting Gaskets

Standard discharge sleeve gasket provides adequate sealing in most applications.

High Back Pressure Gasket Kit includes 2 additional gaskets to provide sealing against back pressures as shown in sketch below.



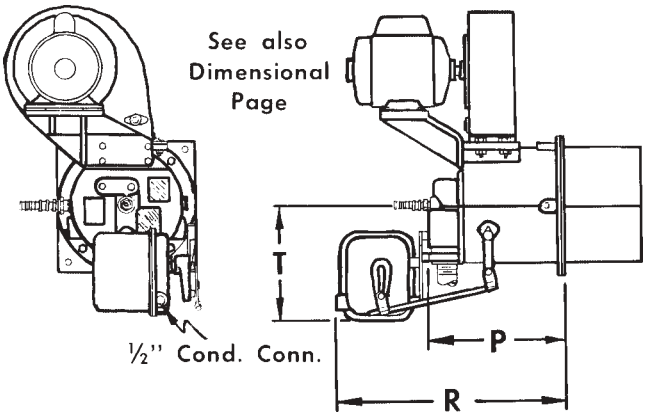
Standard Arrangement



With High Back Pressure Kit

Accessory Options

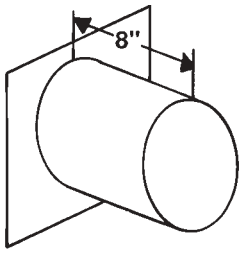
Hi/Lo Control Motor Sets for high or low firing. Optional set includes 2-position unidirectional 11-second 120v 50/60 Hz motor and connecting base with mounting linkage. See table below for dimensions which differ from standard burner.



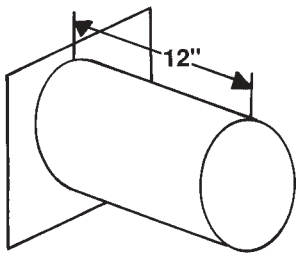
Burner Model		Dimensions in Inches		
		P	R	T
EB-1, 2	405 - 413M	10.25	17.63	7.75
EB-3	415 - 422M	10.19	17.56	7.75
EB-4, 5	425 to 442M	11.69	19.06	8.75
EB-6, 7	445 - 487M	16.69	24.06	8.75

Discharge Sleeves are available in 3 versions:

- **Standard sleeve** is 8" long, made of #310 SS, and is suitable for downstream temperatures up to 1000°F (538°C).
- **For higher velocities**, specify 12" long sleeve made of #310 SS for downstream temperatures up to 1000°F (538°C).
- **For higher downstream temperatures** between 1000°F (538°C) and 1500°F (816°C), specify 8" long, #RA 330 SS sleeve.



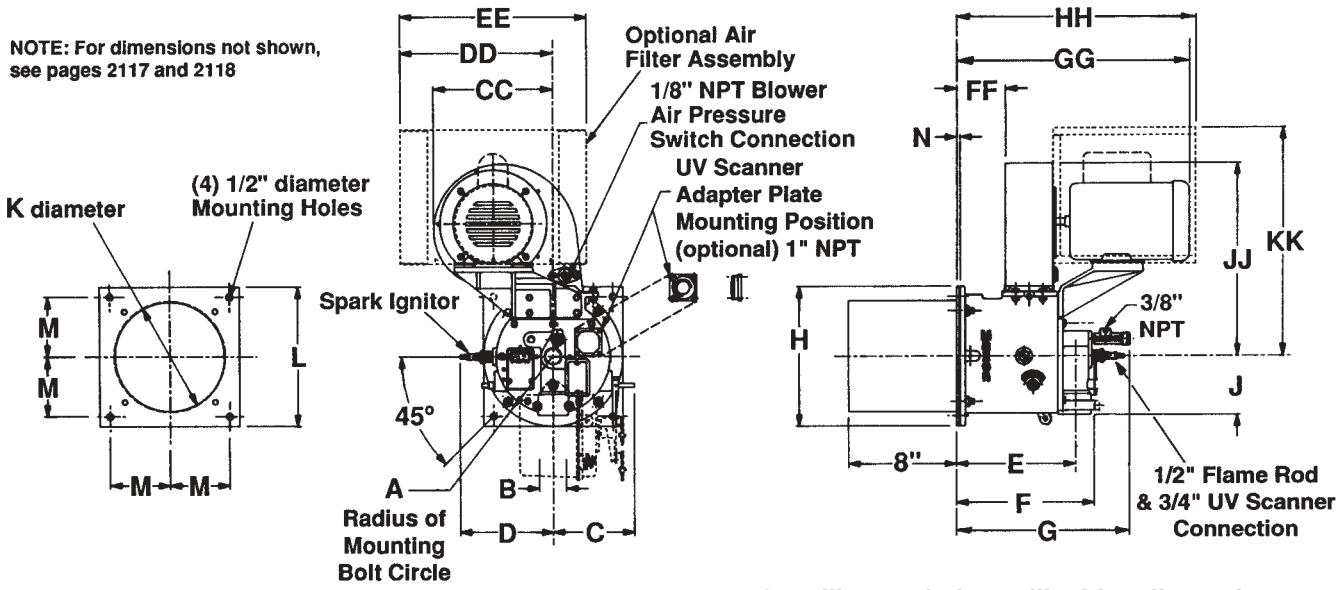
310 SS (std.) or RA 330 (Hi Temp.)



310 SS

Dimensions (in Inches)

Model "400" and "400-MA" OVENPAK® Burners



NOTE: Use of auxiliary switches will add to dimension D.

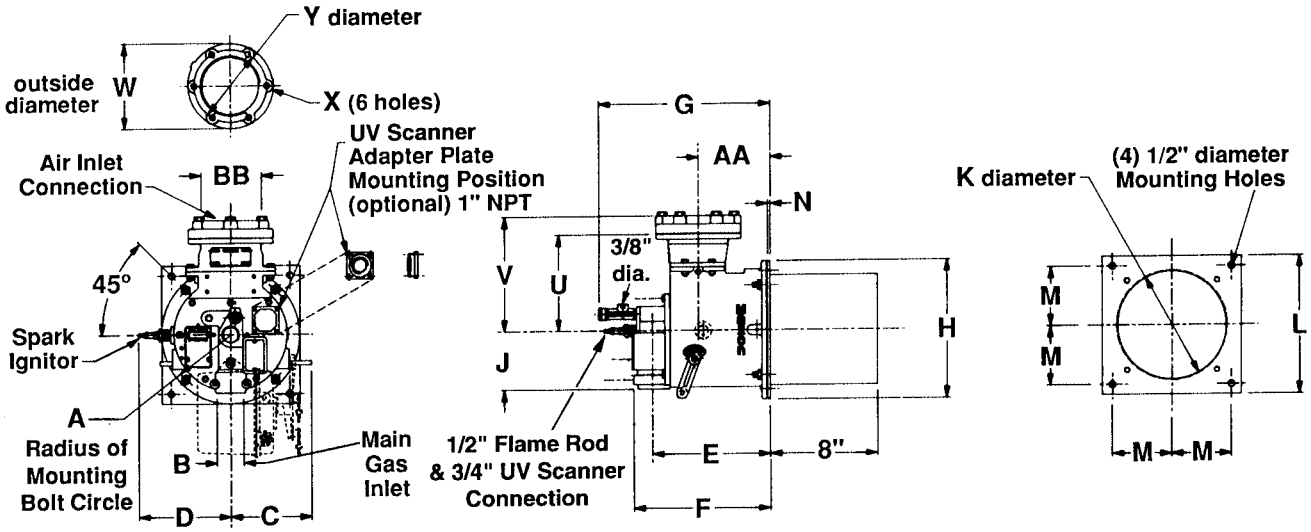
Model	A	B*	C	D	E	F	G	H	J	K	L	M	N	CC	DD	EE	FF	GG	HH	JJ	KK
405	3.75	1	5.44	6.62	8.87	10.30	13.19	8.44	4.37	6.31	8.44	3.62	0.25	8.81	11.37	14	3.66	17.31	17.81	14.37	17.06
407M														15.25	15.87	18	4.69		19.69	21.69	18.62
408														8.81	11.37	14	3.66	19.12	17.81	14.37	17.06
408M														15.25	15.87	18	4.69	17.31	19.69	21.69	18.62
412M																					
413M																		19.12			
415	4.75	1-1/4		7.69	8.81	10.25		10.37		8.25	10.37	4.44		8.81	11.37	14	3.59	17.31	17.75	14.37	17.06
422M														15.25	15.87				19.56	21.69	18.62
425	5.75	1-1/2	6.06	8.62	10.06	11.88	14.69	12.50	5.44	10.25	12.5	5.62	0.37	12.12	14.44	18	3.94	18.25	20.5	20.25	19.75
432M		2												15.25	15.87		2.81		21.25	23.56	29.62
435														12.12	14.44		3.94		20.5	20.25	19.75
442M														15.25	15.87		2.81		21.25	23.56	29.62
445	6.81				14.38	16.88	19.31	14.62	6.5	12.25	14.75	6.69					5.37	22.5	25	23.5	
456M																		24			
470M		3												17.75	17.79	19			26.81	25.94	
487M																					

*Main fuel gas inlet NPT

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

Dimensions (in Inches)

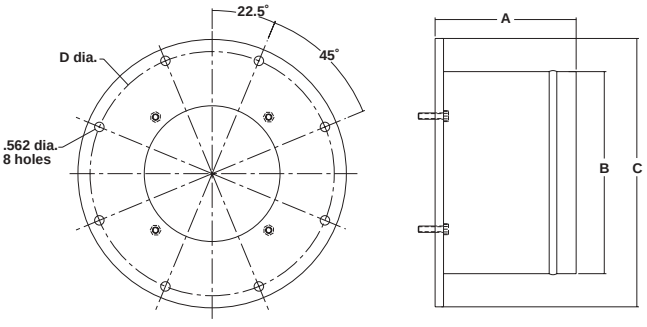
Model EB, EB-MA, and EB-MRV OVENPAK® Burners



NOTE: Use of auxiliary switches will add to dimension D.

Model	A	B	C	D	E	F	G	H	J	K	L	M	N	U	V	W	X	Y	AA	BB
EB-1	3.75	1-1/4	5.44	6.62	8.87	10.31	13.19	8.44	4.37	6.31	8.44	3.62	0.25	7.25	8.62	6.37	0.44	5.44	5.44	4
EB-2																				
EB-3	4.75			7.69				10.37		8.25	10.37	4.44							5.38	
EB-4	5.75	2	6.06	8.62	10.06	11.88	14.69	12.5	5.44	10.25	12.5	5.62	0.37	9.25	10.62	8.87	0.56	7.75	6	6
EB-5																				
EB-6	6.81	3			14.38	16.88	19.31	14.62	6.5	12.25	14.75	6.69		9.62	11.12	11.7-5		10.25	8.5	8
EB-7																				

Refractory Lined Discharge Sleeve

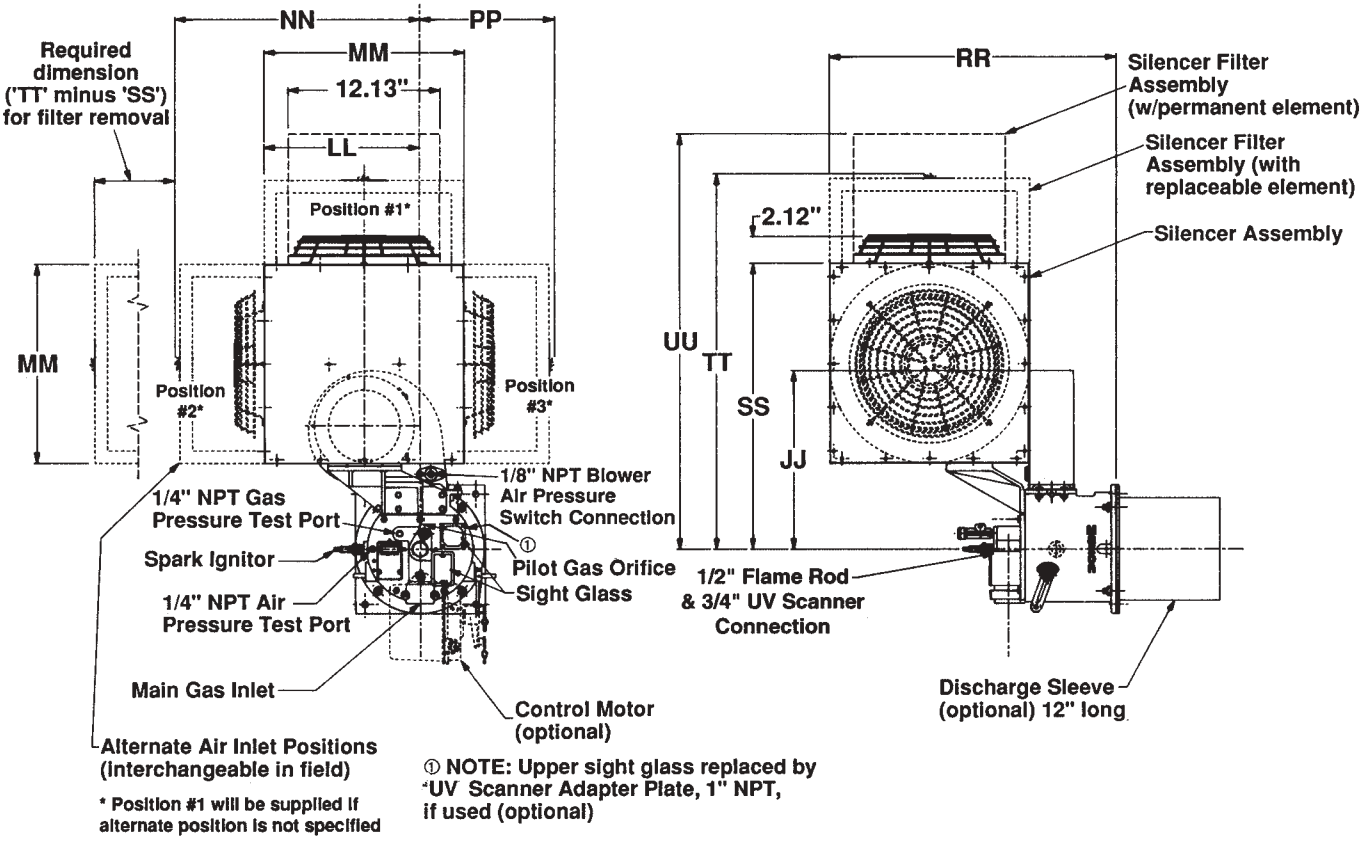


Burner Size	A	B	C	D dia.
405 - 413M EB1, EB2	8.38	10.13	14.06	12.63
415, 422M EB3	8.38	12.0	15.94	14.5
425-442M EB4, EB5	8.38	14.06	18.0	16.53
445-487M EB6, EB7	8.38	16.06	20.0	18.53

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

Accessory Dimensions (in Inches)

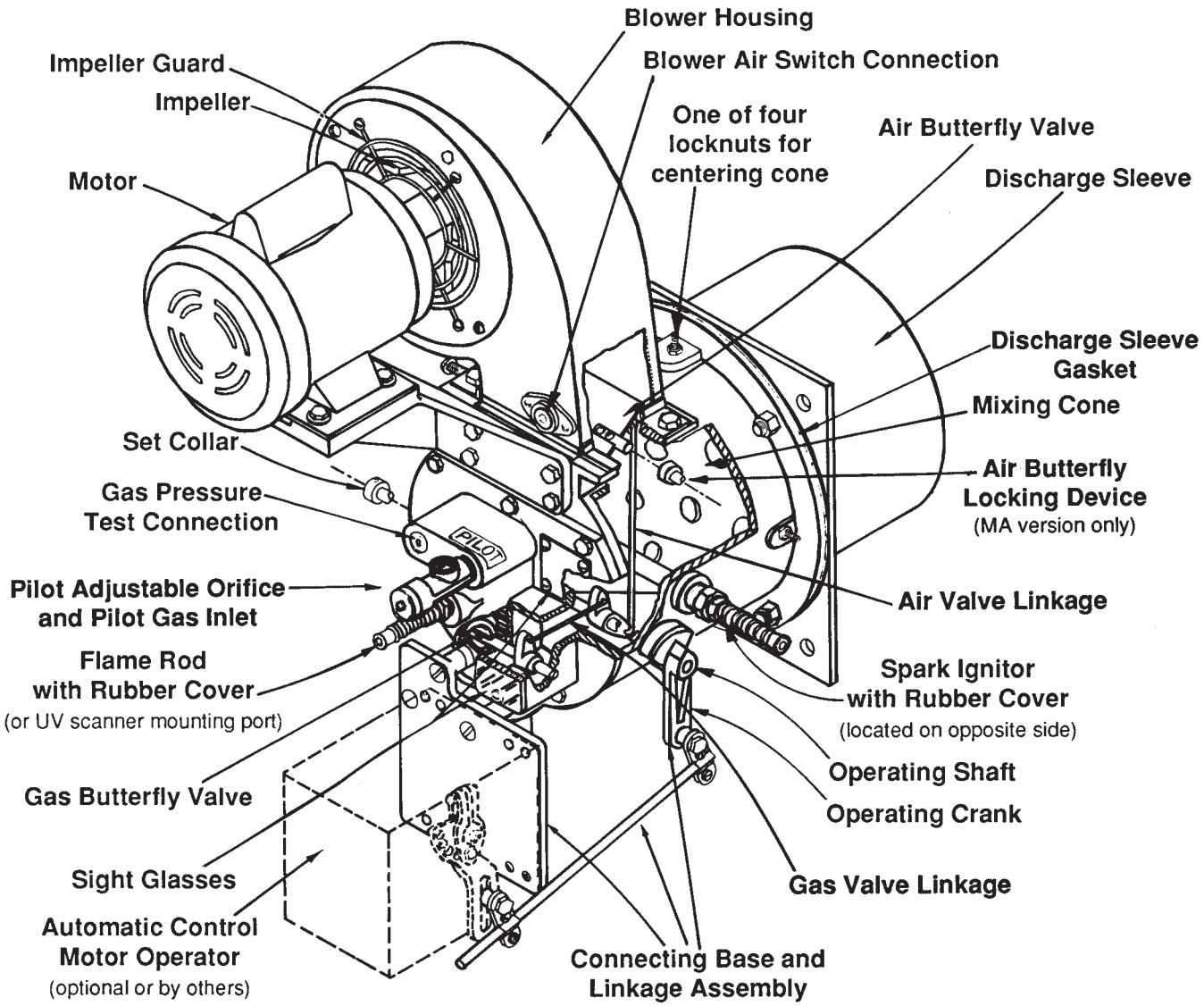
Filter with silencer for Model “400” OVENPAK® Burner



Model	JJ	LL	MM	NN	PP	RR	SS	TT	UU
405	14.4	12.4	16	19.3	10.4	23.2	23.2	29.9	33.6
407M	21.7	15.1		21.9	7.8		24.7	31.4	35.1
408	14.4	12.4		19.3	10.4		23.2	29.9	33.6
408M	21.7	15.1		21.9	7.8		24.7	31.4	35.1
412M									
413M									
415	14.4	12.4		19.3	10.4	23.1	23.2	29.9	33.6
422M	21.7	15.1		21.9	7.8		24.7	31.4	35.1
425	20.2	14.5			8.3	24	25.9	32.6	36.3
432M	23.6	18.1	22	24.9	10.8	24.9	31.9	38.5	42.3
435	20.25	14.5	16	21.4	8.3	24	25.9	32.6	36.3
442M	23.6	18.1	22	24.9	10.8	24.9	31.9	38.5	42.3
445	23.5					28.6			
456M									
470M	25.9	20.2	24	29.2	12.8	29.6	33.9	42.7	44.3
487M									

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

Component Identification



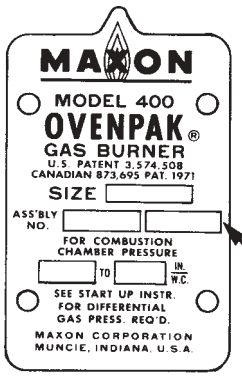
Suggested spare parts

- Spark Ignitor
- Flame Rod, if used
- Filter Elements, if used
- Mixing Cone
- Discharge Sleeve and Gasket
- Motor
- Impeller
- Gas/Air Valve Linkage Kit

To order parts for an existing OVENPAK® Burner assembly, list:

1. Name(s) of part(s) from above illustration
2. Quantity of each required
3. OVENPAK® Burner nameplate information:
   - size and model number of burner
   - assembly number
   - date of manufacture
   - if available, serial number of Maxon fuel shut-off valve in-line to OVENPAK® Burner (This serial number is on Maxon valve's nameplate.)

Nameplate



Suggested Maintenance/Inspection Procedures

Discharge sleeve and cone alignment

Centering of the mixing cone provides a small annular opening for the flow of some cooling combustion air along the discharge sleeve wall. We SUGGEST periodic inspection from the discharge side of the burner to assure that this alignment is maintained.

Caution: Tightening can lead to cone distortion and greatly reduce cone and discharge sleeve life. Cone should be free to move and allow for thermal expansion.

If re-adjustment is necessary, back out the four lock nuts and re-center mixing cone with adjusting screws handtight. Back each screw out one-half turn before re-locking. This allows for thermal expansion as cone gets hot.

Filters should be inspected regularly and cleaned, using a vacuum to remove loose/dry accumulations, then washing and/or degreasing as appropriate for the filter type used.

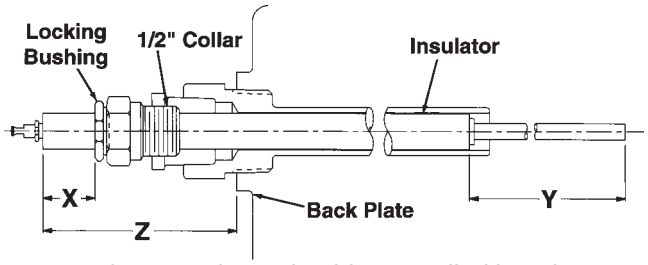
To replace flame rod or spark ignitor:

1. Check Table 1 at right for dimension “Y” and cut tip to length shown.
2. Insert 1/2" NPT collar into burner and snug into position.
3. Insert insulator through collar into burner.
4. Check table for dimension “X”, position accordingly, and tighten locking bushing until insulator is held firmly.

WARNING: Over-tightening locking bushing may damage insulator.

NOTE: A full-wave 6000 volt spark ignition transformer is suggested for use with Maxon burner equipment.

Flame Rod



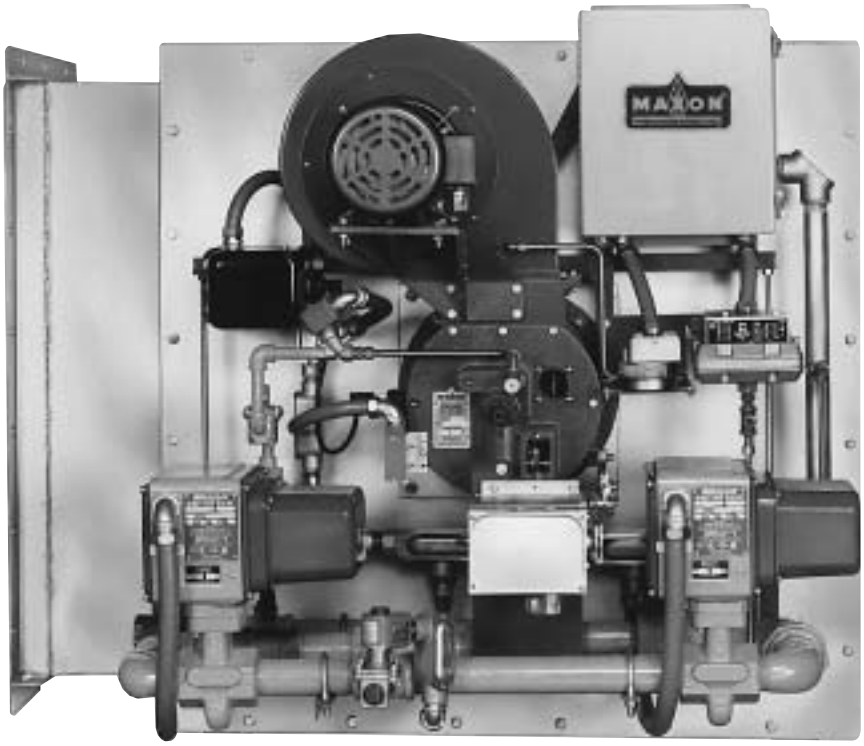
NOTE: 1/2" x 1" adapter bushing supplied by others

Table 1: Flame rod and spark ignitor dimensions for all Model “400” OVENPAK® Burners manufactured after 1/1/91 ①

Burner Model		Spark Ignitor Dimensions		Flame Rod Dimensions		
		X	Y	X	Y	Z
EB-1 EB-2	405	1.3	.4	.4	6	2.9
	407M					
	408M					
	408					
	412M					
	413M					
EB-3	415	1.5	.4			
	422M					
EB-4 EB-5	425	1.2	.4	.8	10.8	3.5
	432M					
	435					
	442M					
EB-6 EB-7	445	1.3	.4	.4	12.8	2.9
	456M					
	470M					
	487M					

① Manufactured date is stamped on metal nameplate of Model “400” OVENPAK® Burner. For specifics relative to units manufactured prior to 1/1/91, see Product Information Sheet 2100-3.

Maxon Pre-Assembled Package
Model "400" OVENPAK® Gas Burner System



425 OVENPAK® package system installed and mounted onto a Maxon pre-fabricated heater/duct section

Save time and reduce your installation costs with a completely assembled and pre-wired burner and pipe train "package".

All system components have been carefully selected to match the high performance characteristics of the Model "400" OVENPAK® Gas Burner.

The compact design of this "packaged system" makes mounting to your duct fast and easy. Connect to the gas line and bring in electricity. It's wired and piped, ready to go.

All pre-assembled package systems include a Model "400" OVENPAK® Burner and pipe train. The pipe trains are available with "Block and Bleed" arrangement options only.

Additional application flexibility is provided with five different sized systems, all with 40:1 turndown capacity ranges.

Packaged OVENPAK® Burner systems may also be mounted in a pre-fabricated combustion heater/duct section by Maxon. This option is value-engineered to give you the most for your dollar spent.

Design / Application Summary

Five Model "400" OVENPAK® pre-assembled package options:

OVENPAK® Burner Model >		405	408	415	425	435
Totally Enclosed Blower Motor	**Horsepower**	1/3			3/4	
	Frame Number	48			56	
Maximum Capacity (Btu/hr)		500,000	800,000	1,500,000	2,500,000	3,500,000
Minimum Capacity (Btu/hr) main plus pilot		15,000	20,000	37,000	60,000	87,000
Minimum natural gas pressure required at pipe train inlet		6" wc		10" wc	9" wc	14" wc
Inlet pipe train size NPT		1.25"			1.5"	
Approximate overall envelope dimensions		42" long x 40" high x 24" wide				

Pre-assembled pipe train “package” includes the following components:

– Burner gas shut-off cock
– Main inlet gas shut-off cock
– Pilot gas train consisting of:
  • Pilot gas shut-off cock
  • Pilot gas pressure regulator (maximum 1 PSIG natural gas inlet pressure)
  • Pilot gas solenoid valve, 115/60VAC
– Main gas pressure regulator (maximum 1 PSIG natural gas inlet pressure)
– Combustion air pressure switch, automatic reset, NEMA 1, 115/60VAC
– Combination high and low gas pressure switch, manual reset, NEMA 1, 115/60VAC
– Spark ignition transformer, 6000 volts, NEMA 1, 115/60VAC
– NEMA type 12 and 13 junction box with terminal wiring strip
– Normally open vent solenoid valve, 115/60VAC

A complete packaged system also includes:

• Maxon Model “400” OVENPAK® Burner assembly
  – Connecting base and linkage assembly to adapt customer-supplied automatic control motor (optional)
  – Low fire start switch (mounted to OVENPAK® Burner)
  – Air filter assembly
• Maxon main gas shut-off valve, position “L”, 115/60VAC
• Maxon main gas “blocking” shut-off valve, position “L”, 115/60VAC00000000

Factory pre-wiring includes the following components for 115 volts 60 hertz AC:

– Low fire start switch
– Combustion air pressure switch
– Combination high and low gas pressure switch
– Pilot gas solenoid valve
– Normally-open vent solenoid valve (when used)
– Spark ignition transformer
– Maxon “main” and/or “blocking” gas shut-off valve(s)
– NEMA type 12 and 13 junction box with terminal wiring strip

Field wiring is required:

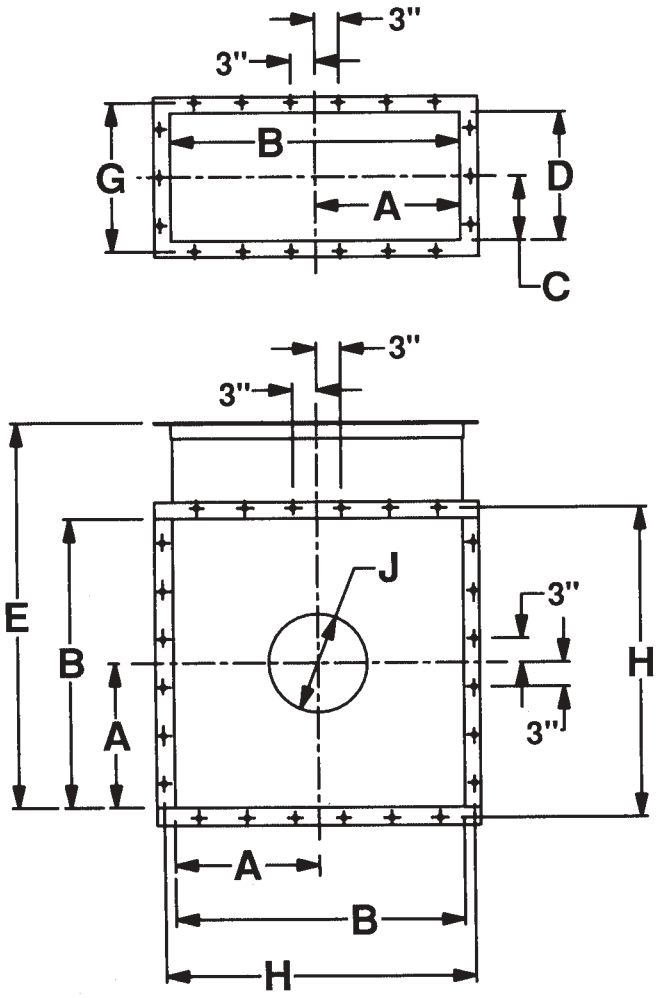
– To the packaged system's junction box wiring strip
– To the Model “400” OVENPAK® Burner's combustion air blower motor
– Between your flame safeguard relay and the OVENPAK® Burner's flame sensor
  NOTE: A flame rod may be furnished by Maxon; UV detector is a part of the control package when supplied by Maxon or may be supplied by others.
– Other field wiring connections may be required if your control circuit includes high/low temperature limits, automatic temperature controller, and/or other miscellaneous safety limit switches.

Maxon Packaged Heater/Duct Sections

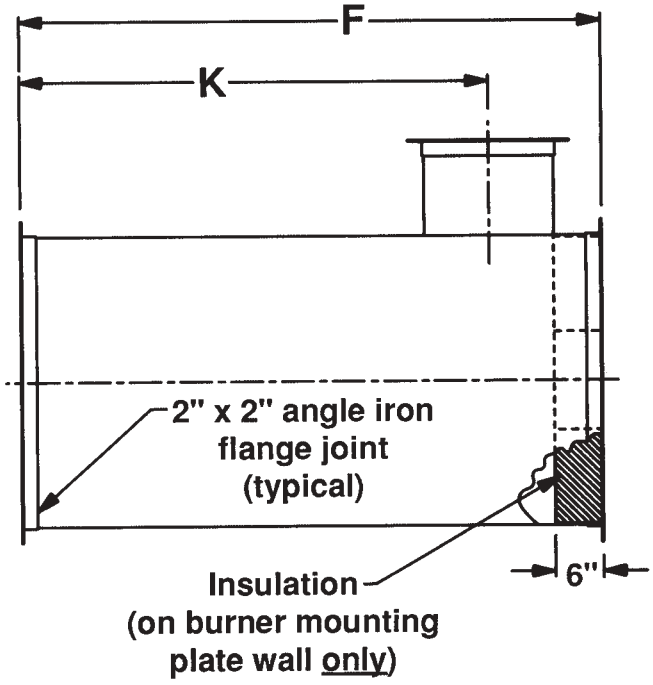
Reduce your fabrication time with a complete combustion heater/duct including the prewired and prepiped Model "400" OVENPAK® Burner system package.

Easy installation is provided by flanged duct connection joints. Burner is mounted to a .312" mild steel wall, lined with 6" thick fiber insulation. The other 16 gauge aluminized steel heater/duct walls are ready for your insulation.

Application flexibility is offered by three sizes of ducts. All sizes can be fabricated to have return/inlet opening at any 90° increment position (viewing from the back of the OVENPAK® Burner). Continuous welds on all joint seals permit duct section installation on pressure-side or suction-side applications.



NOTE:
9/16" holes located on 6" centerlines for all mounting flange joints



Approximate duct section dimensions (in inches)

Model	A	B (inside)	C	D (inside)	E	F	G	H	J (inside)	K
405 - 408	12	24	5	10	36	48	12.62	26.62	7.5	37
415	15	30	6	12	42	60	14.62	32.62	9.5	48
425 - 435	18	36	8	16	48	72	18.62	38.62	11.5	58

Maxon Packaged Heater/Duct Sections Design and Application Details

Maximum discharge temperature 600°F (316°C)
Duct static pressures may range between +2" wc and -5" wc
Optimum design parameters permit up to 3000 feet per minute air velocity through return/inlet duct.

Recommended maximum discharge air volumes

Model "400" OVENPAK® Burner	405	408	415	425	435
Maximum discharge air volume in SCFM	5000		7500	12,000	

To select your packaged system, specify:

1. **Quantity**_____

2. **Model "400" OVENPAK® Gas Burner Assembly** _____, for natural gas
   - Arranged ☐ for UV detector, or ☐ with flame rod
   - Furnished with blower motor for _____ AC
   - ☐ With **low fire start switch** _____, General Purpose, 115/60 AC
   - ☐ With **combustion air filter assembly** _____ (optional)
   - ☐ With **connecting base and linkage assembly** _____ to adapt customer's automatic electric control motor. Specify/select which one of these electric operators will be used:
     - ☐ Barber-Colman #EA51–58, also with prefix MC, MP or MF
     - ☐ Honeywell #M644, #M744, #M941, or #M944
     - ☐ Penn/Johnson #M-80 or #M81

3. Arranged into **pre-assembled and wired pipe train package,** 115/60VAC,
   - ☐ With **Block and Bleed** arrangement assembly _____.

4. With _____ ☐ 1-1/4" or ☐ 1-1/2" Maxon Series _____ ☐ Automatic Reset, ☐ Manual Reset **Shut-Off Valve**(s), for natural gas, in top assembly position "L" for 115/60VAC
   - ☐ With electrical terminal block (option)
   - ☐ With ☐ 6 second, or ☐ 2.5 second opening time (automatic reset valve(s) only)
   - ☐ With _____ auxiliary signal switch(es) (optional)
     NOTE: Specify which switch(es) go in main valve and which switch(es) in blocking valve, if different.

5. ☐ With **heater/duct section assembly** _____ (optional)
   with return/inlet duct positioned on ☐ top, ☐ right, bottom, or ☐ left

Model "200" OVENPAK® Burners

Model "200" OVENPAK® Burner arranged with air inlet guard and optional UV scanner

Model "200" OVENPAK® Gas Burners provide a broad range of heat without a combustion blower by firing through-the-wall into your combustion chamber on the suction side of the circulating fan. An internal mixing cone blends air drawn through the burner (by chamber suction) with fuel gas delivered through its central gas nozzle. The Model "200" OVENPAK® Burner is designed for applications involving suction-side firing from -0.2" to -1.6" wc static chamber conditions. They provide:

– low initial and operating cost
– easy installation
– simple adjustment
– heavy duty cast iron construction in a compact burner configuration

Performance data

NOTE: Maximum capacity varies with the range of suction provided at operating temperature

Performance data	**Maximum capacities** (1000's Btu/hr) with corresponding fuel gas differential pressures at specific combustion chamber static pressure conditions									
Combustion chamber suction ("wc)	**-0.2**	**-0.3**	**-0.4**	**-0.5**	**-0.6**	**-0.7**	**-0.8**	**-0.9**	**-1.0**	**-1.6**
Maximum capacity (1000's Btu/hr)	100	190	275	360	450	540	625	700	800	1000
Minimum capacity (1000's Btu/hr)	10	12	13	14	15	17	18	19	20	25
Combustion air volume required (SCFM)	65	80	90	95	110	120	130	135	145	184
Natural gas differential pressure required ("wc)	0.1	0.4	0.7	1.2	1.9	2.7	3.7	4.6	6.0	9.4
Propane gas differential pressure required ("wc)	---	---	0.3	0.5	0.8	1.1	1.5	1.8	2.4	3.8
Approximate flame lengths beyond end of discharge sleeve (inches)	0 - 3	6 - 9	12 - 18	15 - 21	18 - 24	21 - 27	24 - 30			24 - 26

Air volumes shown are for burners without damper, or with damper in full-open position. If damper is used to restrict air flow, maximum capacity will be similarly reduced.

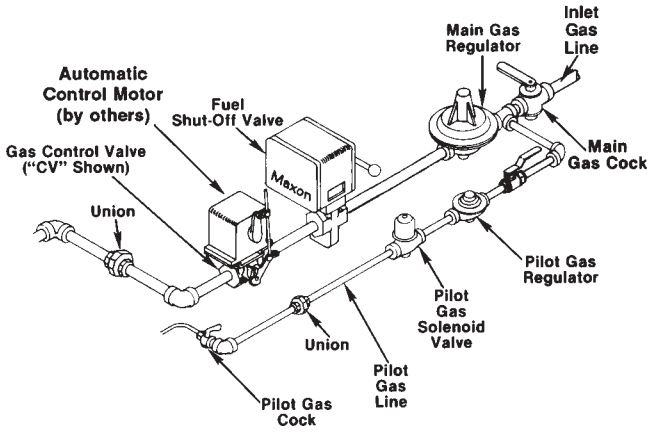
Pilot flame issues from the same gas ports as main flame, so proof of pilot gas ignition assures ignition of main gas supply.

Flame sensing can be either by flame rod or UV scanner when natural gas is the fuel, but only with UV scanner if propane is the fuel.

Installation is simple, utilizing the built-in, direct-mounting flange provided.

A complete combustion system utilizing Model "200" OVENPAK® Burners also includes gas train, fuel-throttling valve and control system. Your Maxon representative can help you choose from the broad range of options available.

Typical pipe train

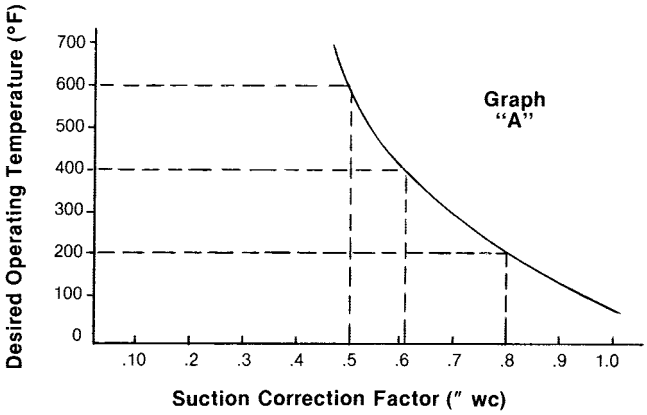


Design and Application Details

Differential gas pressures in inches water column (" wc) for both natural gas and propane are those that should be measured by connecting a manometer between test points shown in the photo below.

Model "208" OVENPAK® Burner shown with air damper and flame rod

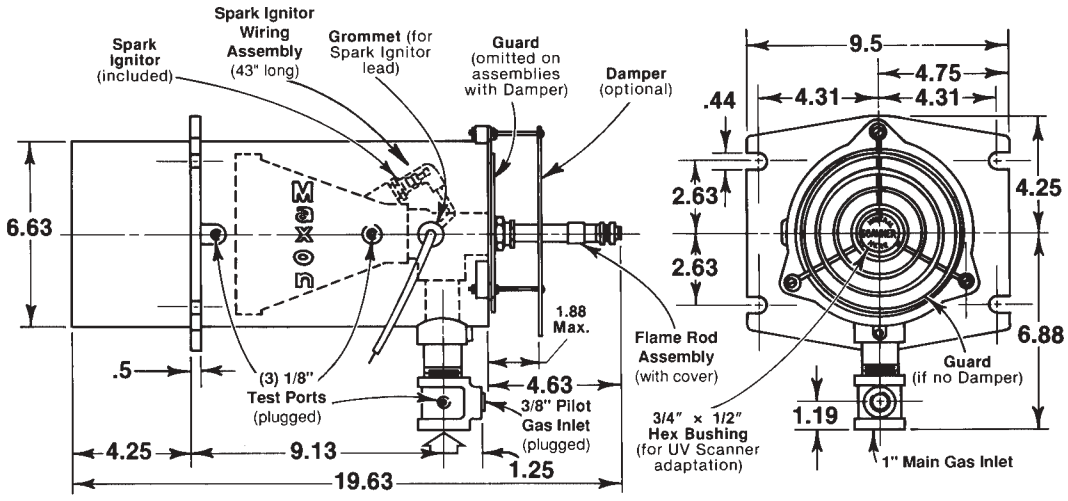
Suction (shown in inches wc) should be that available at operating temperature. It can be determined by a two-step procedure: First, measure cold suction (chamber to atmosphere). Second, multiply that reading by the correction factor shown in Graph "A" for your desired operating temperature.



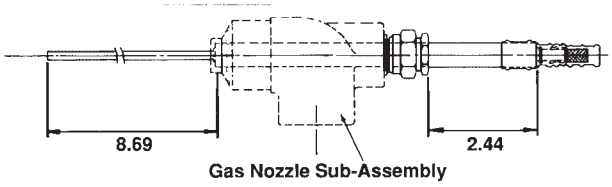
For example, if you anticipate running the system at 600°F, follow that dotted line to the right until it intersects curve, then read downward to a correction factor of 0.5. Therefore, if you read a cold suction of 1" wc, your expected suction "at temperature" would be 1" x 0.5 = 0.5" wc.

Dimensions (in inches)

Burner Assembly



Flame Rod Assembly



Installation Instructions

General Instructions

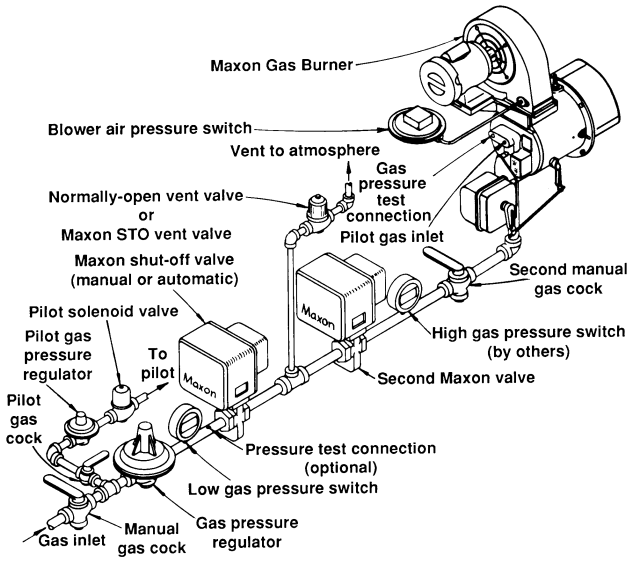
Important: Do not discard packing material until all loose items are accounted for.

To prevent damage in transit, the spark ignitor, discharge sleeve, mounting gaskets, flame rod and connecting linkage components may be packed separately and shipped loose with your new Maxon OVENPAK® Burner.

The burner itself is normally only a part of your complete combustion system. Additional pipe train accessories and control components will be required for a complete system installation. The sketch below shows a typical gas train as might be used with OVENPAK® gas fired burners.

Piping Layout as sometimes required by insurance and standards groups

Block and Bleed gas train arrangement illustrated with Model "400" OVENPAK® Burner



Model "400" OVENPAK® Burners provide the air supply (except for EB versions, which require a separate combustion air blower). They also serve as a fuel flow control and fuel/air mixing device. Model "200" OVENPAK® Burners serve as a mixing device and usually have an externally-mounted gas control valve.

Burner should not be exposed to direct radiant heat or positioned where it might draw in inert gases. If such conditions exist, consider filters, relocation and/or use of the EB version and external air supply.

Electrical service must match the voltage, phase and cycle of all electrical system components and be compatible with burner nameplate ratings. Insure that all normal control safeguards are satisfied. Combustion air blower should continue to run after shutdown to allow burner to cool.

Gas supply piping must be large enough to maintain the required fuel pressures cataloged for the particular burner size used with burner operating at full rated capacity.

Anything more than minimal distance or piping turns may necessitate oversizing piping runs to keep pressure drops within acceptable ranges.

Inlet pipe leading to any burner should be at least four pipe diameters in length. If multiple burners are fed from a single gas train, care should be taken to minimize pressure drop and give maximum uniformity.

Clean fuel lines are essential to prevent blockage of pipe train components or burner gas ports.

Main Shut-Off Cock should be upstream of both the main gas regulator and pilot line take-off. Use it to shut off fuel to both pilot and main burner during shut-down periods of more than a few hours.

The fuel throttling valve contained within a Maxon burner is not intended for tight shut-off.

Main gas regulator is essential to maintain a uniform system supply pressure. If one pipe train supplies multiple burners, provide a separate regulator in the branch leading to each burner system.

Size the regulator for full system capacity at the required pressure, carefully considering pipe train losses. Follow the instructions attached to the regulator during installation and be sure to remove any shipping pin or block.

Pilot take-off should be upstream of the main gas regulator, but downstream of the main gas cock. It should normally include its own pilot gas regulator, a solenoid valve and shut-off cock. A pilot adjustable orifice at the pilot inlet simplifies adjustment.

Pilot piping must be large enough to provide for the full flow and pressures shown in the catalog for your particular burner size.

Fuel Shut-Off Valves (when properly connected to a control system) shut the fuel supply off when a hazardous operating condition is sensed. Manual reset valves require operator attendance each time the system is started up (or restarted after a trip-out). Motorized shut-off valves permit automatic start-restart when used with an appropriate control system.

Test connections are essential for burner adjustment. They should be provided immediately downstream of the regulator and are included in the burner itself. **Test connections must be plugged except when readings are being taken.**

Installation Instructions

Horizontal mounting is preferred, but burner may be mounted in any position suitable for automatic control motor and UV scanner (if used).

OVENPAK® Burners will typically be installed through an oven wall or insulated air duct. Cut opening approximately 1" larger in diameter than discharge sleeve to allow for thermal expansion of sleeve.

Burner mounting requires four studs and a flat mounting surface perfectly centered on the discharge sleeve.

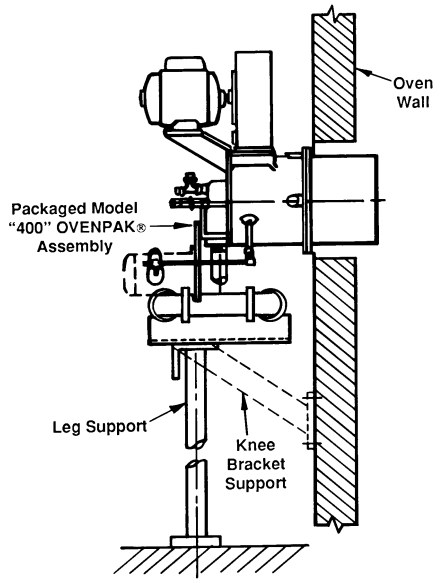
After placing burner in position over studs, add lock washers and nuts, then draw up hand-tight only. Check that burner is seated evenly all around the flange, filling any gaps to prevent air leakage, then tighten all nuts firmly.

For proper performance of any burner, air inlet and motor should be surrounded by clean, fresh, cool air.

Burner and pipe manifold support will be required to support weight of the burner and connected pipe train components. Air control motors, in particular, require additional support. Maxon connecting base and linkage assemblies are designed to position the control motors to work with the burner, **not** to support their weight.

The Packaged Model “400” OVENPAK® Burner requires external auxiliary support provided by the user. The support configuration may be similar to the leg support or knee bracket support illustrated below.

Suggested supporting arrangements for Packaged Model “400” OVENPAK® Burners:

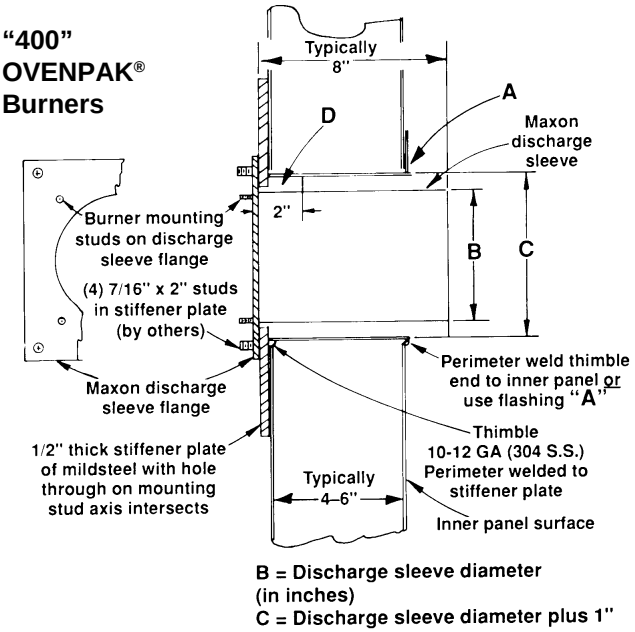


Additional burner support may be required in conjunction with a stiffener plate when mounting OVENPAK® Burner (weighing 100-350 pounds) through typical thin wall of heater/oven panels.

For push-through systems, use Maxon special back pressure gasket between stiffener plate and discharge sleeve flange and use (2) ring gaskets between discharge sleeve flange and burner casting to prevent back flow of high temperature air. Fill area **D** (see sketch below) with **no more than 2"** of high temperature packing (too little will overheat mounting; too much will overheat sleeve).

Typical discharge sleeve mounting recommendations

“400” OVENPAK® Burners



B = Discharge sleeve diameter (in inches)
C = Discharge sleeve diameter plus 1"

For pull-through systems, spacers may be installed on stud bolts and area **D** left empty to admit cooling air past the sleeve.

WARNING: Welding of burner flange to stiffener plate may cause warpage of burner flange and require additional seal material to prevent leakage.

Four lock screws permit centering of mixing cone within burner body and sleeve.

Installation Instructions

For "400" OVENPAK® Burners: Lock screws should be drawn up hand-tight, then backed out one-half turn to allow for cone expansion. **They must be re-checked after start-up,** and loosened if necessary to prevent deformation of cone. See start-up instructions for details. **Over-tightening lock screws can lead to cone distortion and greatly reduce cone and discharge sleeve life.**

Discharge sleeve must be flush with, or extend beyond, interior wall. Maxon can supply a special 12" long discharge sleeve, but higher noise levels may result, particularly when firing on propane.

An external viewing port should be provided for flame observation, preferably in such a position that burner pilot and main flame can both be seen.

Flame sensing can be accomplished by either flame rod or UV scanner. When UV scanner is used, it should be kept as close to burner as feasible. Heat block, if used, may affect signal strength with some brands of scanners.

For "400" OVENPAK® Burners, field conversion from a flame rod version to a UV scanner version and vice versa may require additional parts in the burner. Contact Maxon for requirements.

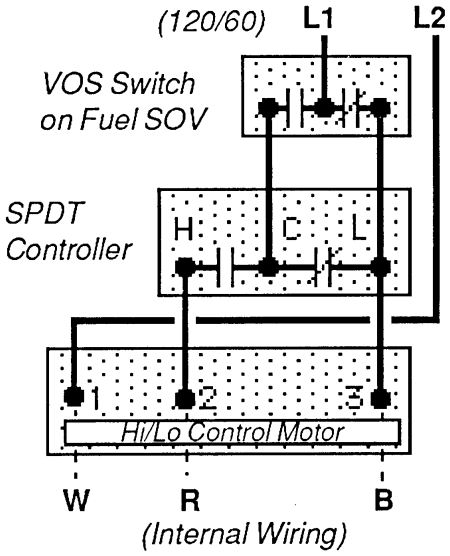
Alternate fuels may require correction of supply pressures.

If OVENPAK® Burner is equipped with Maxon Hi/Lo Control Motor, low-fire start wiring can be accomplished as shown in the sketch below.

Maxon assumes no responsibility for the use or misuse of the layouts shown. Specific piping and wiring diagrams should always be submitted to the appropriate agencies for approval on each application.

Multi-burner installations require special considerations if supplied by a common pipe train and/or air supply. **Air and Gas Balancing Valves** should be used for improved heating uniformity; **Gas Swing-Check Valves** should be installed as close as possible to each burner inlet for dependable lightoff (gas manifold may otherwise act as a reservoir, preventing lightoff during trial-for-ignition period).

Control system's circuitry must not allow main Fuel Shut-Off Valve to be opened unless combustion air is on, and must de-energize valve upon loss of combustion air pressure, along with the other usual system interlocks. Motor starter is to be interlocked with valve, whether or not a combustion air pressure switch is used.



Start-Up Instructions

Read complete instructions before proceeding, and familiarize yourself with all the system's equipment components. Verify that your equipment has been installed in accordance with the original manufacturer's current instructions.

CAUTION: Initial adjustment and light-off should be undertaken only by trained and experienced personnel familiar with combustion systems, with control/safety circuitry, and with knowledge of the overall installation. Instructions provided by the company and/or individuals responsible for the manufacture and/or overall installation of complete system incorporating Maxon burners take precedence over these provided by Maxon. If Maxon instructions conflict with any codes or regulations, contact Maxon Corporation before attempting start-up.

For initial OVENPAK® Burner start-up:

1. **Close all burner fuel valves and cocks.** Make preliminary adjustments to fuel gas regulators. Remove pilot and main gas regulator's adjusting screw covers. Turn adjusting screw down (clockwise) to approximately mid-position. Close pilot gas adjustable orifice screw by turning in clockwise until it stops. (Do not over-tighten.) Then back out the adjustable orifice (counter-clockwise) approximately 2-3 turns.
2. **Check all electric circuitry.** Verify that **all** control devices and interlocks are operable and functioning within their respective settings/ranges. Be sure all air and gas manifolds are tight and that test ports are plugged if not being used.
3. **Check that all duct and chamber dampers are properly positioned** and locked into operating positions.
4. **Disconnect the automatic control motor's linkage** from the "400" OVENPAK® Burner's operating crank arm by loosening the control motor's connecting rod from the burner's toggle linkage.

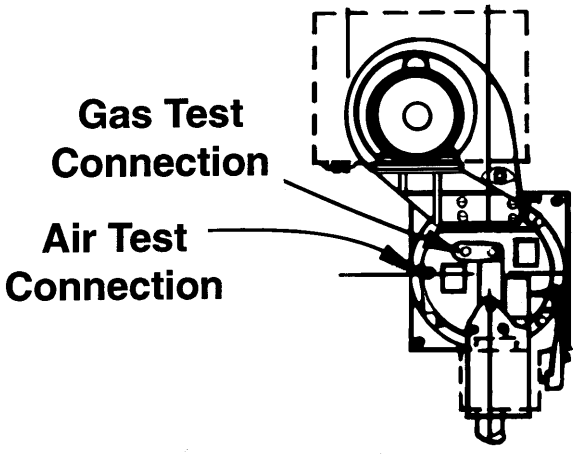
   For Model EB-MRV and Model "200" OVENPAK® Burners, the connecting linkage on the separate control valve must be similarly loosened and disconnected. Refer to specific adjusting procedures relating to control valve adjustment in Maxon catalog.

   Initial start-up adjustment should only be accomplished during a manual burner control mode.
5. **Start all system-related fans and blowers.** Check for proper motor rotation and impeller direction. Verify that all control interlocks are working. Allow air handling equipment to run for adequate purge of your manifolds and combustion chamber plenums. With main gas shut off, manually advance burner to high fire position so that air only flows through burner and combustion chamber.

CAUTION: Do not by-pass control panel timers typically controlling sequential operations.

For EB OVENPAK® Burners only (step 6)

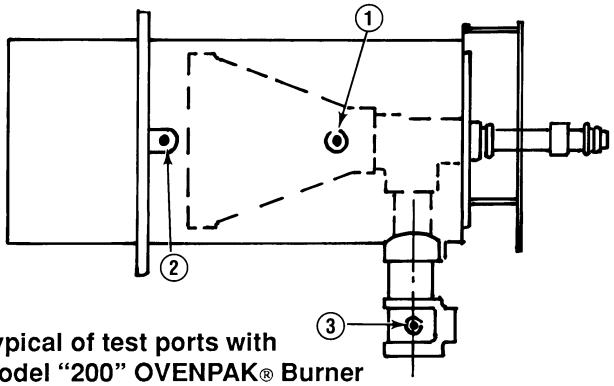
6. **Verify differential air pressure.** With combustion air blower on, **all** volume air fans operating, and burner at high fire position, connect a manometer between the air test connection on backplate of OVENPAK® Burner and your combustion chamber static pressure test connection. This will give a **direct** differential air pressure reading.



Start-Up Instructions

Determine your differential air pressure reading by taking an additional reading with manometer connected between the burner's **air** pressure test port and atmosphere with the burner at high fire position, fuel valves closed, and all air handling systems running. Subtract the combustion chamber static pressure obtained above from this air pressure reading to give you **differential air pressure reading.**

For Model "200" OVENPAK® Burner only (steps 6A-6C)



Typical of test ports with Model "200" OVENPAK® Burner

6A. Cross-connect manometer to upstream ① and downstream ② air pressure test connections on Model "200" OVENPAK® Burner's main housing.

6B. Start air handling system and adjust louvers, dampers, etc. to desired setting to establish cold suction design conditions.

6C. Transfer manometer connection from upstream air pressure test ① to gas pressure test connection ③. This is the differential air pressure reading for a Model "200" OVENPAK® Burner.

For "400" OVENPAK® Burners: The differential air pressure setting determines the burner's capacity and performance capabilities. Model EB and MA manual air OVENPAK® Burners, with their external air control valve(s), provide for the manual setting of this differential air pressure to the burner. Refer to specific adjusting procedures relating to MICRO-RATIO® and control valve adjustment in Maxon product line catalog. MA OVENPAK® Burners have an external locknut adjustment on the end of the air butterfly control valve. This lets you limit and set the differential pressure to the OVENPAK® Burner. Refer to Maxon specification tables in the catalog for the differential air settings required for your specific OVENPAK® Burner capacity.

7. **Determine the required differential gas pressure** using this differential air pressure reading obtained from step 6. If your combustion chamber does not have a static pressure test connection, then you must measure combustion chamber static pressure by connecting a manometer between the **gas** pressure test port on the burner's backplate and to atmosphere with the burner at low fire position, fuel valves closed, and all air handling systems running. High fire pressures are provided in Maxon product line catalog literature and/or read data stamped into burner nameplate.
8. **Verify that spark ignitor is properly positioned** and lines up with the appropriate dimensions required for your specific burner. (Refer to appropriate Maxon catalog specification table.) Check that spark ignitor arcs at the end of your properly positioned ignitor.
9. **Return burner control valve (or crank) to low fire position** when purge of system is complete.
10. **Open main and pilot gas cocks,** then attempt spark ignition to light pilot while slowly turning pilot gas regulator spring clockwise and/or adjustable orifice screw counter-clockwise to increase fuel flow. Repeat procedure as necessary until pilot ignites as air might have to be bled out of fuel supply lines before reliable pilot flame is established. Pilot gas regulator should normally be set for as low a pressure as possible, using fuller opening of pilot gas adjustable orifice (if used).
11. **After ignition, adjust pilot flame** for good stable flame shape. A rule of thumb is that any pilot over a tennis ball size is probably too large. This assumes you have visual access to the pilot flame. If this is not possible, then adjust pilot to give the strongest and most stable flame signal through your flame safety circuit. This signal strength can be read with a micro-amp meter. The signal strength (or range) will be determined by the specific type of flame safeguard instrument you have with your burner system.

Start-Up Instructions

12. **Re-check pilot ignition** by closing pilot gas cock or otherwise causing pilot outage. Re-light and refine pilot gas adjustment as necessary to get ignition within a second or two. The flame safeguard relays should now power your main fuel Shut-Off Valve(s).

CAUTION: After completing steps above, re-check all interlocking safety components and circuitry to prove that they are properly installed, correctly set, and fully operational. If in doubt, shut the system down, close pilot cock and contact responsible individual before proceeding further.

13. **Establish main flame.** With burner at low fire position, back out main gas pressure regulator adjusting screw (counter-clockwise) to get lowest outlet pressure possible. Open all manual fuel shut-off valves (automatic fuel shut-off valve should already be open) so gas flows to burner inlet. There should be little, if any, change in flame appearance. **Turn main regulator adjusting screw** in (clockwise) to obtain outlet pressure of about 4"-6" wc higher than combustion chamber pressure (2"-4" wc for propane, considerably higher for some EB versions). Main flame should now appear larger than pilot-only flame.
14. **Establish high fire setting** by slowly moving burner toward high fire position while observing gas pressure at burner gas test connection. Refine main gas regulator adjustment as necessary to provide correct differential pressure (gauge to combustion chamber, see step 7) at high fire. If pressure cannot be adjusted low enough, a different regulator or regulator spring may be necessary, or a limiting orifice valve (such as Maxon's Series “BV”) should be added. Do not, however, exceed 4" wc pressure drop between regulator outlet and burner inlet.

CAUTION: If burner(s) go out, close shut-off valve or shut main gas cock at once. Return to minimum setting, re-light pilots if necessary, then turn main gas on again. Check carefully that every burner is lit before proceeding.

Cycle burner from minimum to maximum and refine adjustment, if necessary.

For operation with interrupted pilot (as recommended), shut off pilots and cycle burner from minimum to maximum and back several times to verify the flame is maintained.

15. **When burner performance is satisfactory** and stable throughout the firing range, reconnect control motor.

For “400” OVENPAK® Burners: Reconnect linkage to control motor. Control linkage travel must be such that burner crank is moved throughout its complete travel, or cataloged capacities and turndowns will not be achieved. If less than full-rated burner capacity is required, linkage can be adjusted to limit maximum output.

With interrupted pilot, it may be necessary to set control for somewhat higher than minimum burner setting to permit hold-in of flame detection system without pilot.

CAUTION: Internal drive mechanism within the control motor may be damaged if linkage is adjusted so as to cause binding with burner in high or low fire position.

16. **Re-check differential gas pressure** with unit at operating temperature. Refine high fire setting if necessary, considering differential pressure, flame length, and appearance. Natural gas flame should normally be predominantly clear blue but possibly with semi-luminous tips. Dust or contaminants in the air stream may affect flame appearance.
17. **For “400” OVENPAK® Burners: Check for contact between mixing cone and top-most centering screw** after system has reached maximum operating temperature. If set screw touches cone, back off an additional 1/8 turn on top and both side set screws.
18. **Plug all test connections not in use to avoid dangerous fuel leakage.** Replace equipment cover caps and tighten linkage screws.

Start-Up Instructions

19. **Check out overall system operation** by cycling through light-off at minimum, interrupting pilot, and allowing temperature control system to cycle burner from minimum to maximum and return. **Recheck all safety system interlocks** for proper setting and operation.

NOTE: Typical gas firing control sequence for Maxon burner is provided only as a guide. Instructions provided by complete system manufacturer incorporating Maxon burners take precedence.

For gas firing Model "400" OVENPAK® Burner

Light-off:

1. Close cocks, shut-off valve(s)
2. Verify burner at low fire
3. Start recirculating/exhaust fans
4. Start burner blower
5. Purge at least 4 air changes
6. Open pilot & main gas cocks

Shut-down:

1. Close main & pilot gas cocks
2. Keep combustion air blower running after shut-down long enough to allow burner to cool

WARNING: Test every UV installation for dangerous spark excitation from ignitors and other possible sources of direct or reflected UV radiation. Use only gas-tight scanner connections.

20. **Before system is placed into full service, instruct operator personnel** on proper start-up operation with shut-down of system, establishing written instructions for their future reference.

Notes