

Specifications of KINEMAX® burners

Series G KINEMAX® burners

Gas only

Typical burner data																	
Fuel : natural gas at 60° F with 1000 Btu/ft ³ (st) HHV - sg = 0.6 [1]																	
Combustion air : 60° F - 21 % O ₂ - 50 % Humidity - sg = 1.0 [1]																	
Stated pressures are indicative - actual pressures are function of air humidity, altitude, type of fuel, gas quality																	
Performance factors	Burner size		1.5 Series G			2 Series G			3 Series G			4 Series G			6 Series G		
	Combustion air diff. pressure [2]	"wc	12	19	26	12	19	26	12	19	26	12	19	26	26		
Combustion air volume for max. capacity (no excess air)		scfm	63	79	92	117	147	167	267	334	400	450	567	667	1470		
Capacities	Maximum		MBtu/h		0.375	0.47	0.55	0.7	0.88	1.0	1.6	2.0	2.4	2.7	3.4	4.0	8.0
	Maximum with 425°C preheated combustion air		MBtu/h		0.245	0.305	0.355	0.455	0.57	0.65	1.04	1.34	1.56	1.75	2.205	2.6	5.2
	On-ratio pilot / min.		1000's Btu/h		30			30			40			50			300
	Pilot/minimum with 75% excess air [3]		1000's Btu/h		20			20			25			30			200
	Turndown ratio with 75% excess air		27.5:1			50:1			96:1			133:1			40:1		
Performance limits with full excess air	Percent excess air		%		1800	2200	2600	2700	3400	3900	3100	3900	4700	2600	3300	3900	3900
	Turndown ratio with full excess air				11:1	13:1	16:1	20:1	25:1	29:1	32:1	40:1	48:1	27:1	34:1	40:1	16:1
	Minimum capacity to light burner		1000's Btu/h		35			35			50			100			500
Differential gas pressure required for max capacity [2]		"wc	2	3.1	4.2	2.1	3.2	4.2	1.8	2.8	3.8	1.5	2.3	3.2	6.2		
Flame Geometry	Length [4]		in.		4	6	8	8	10	14	12	18	24	24	30	40	48
	Diameter		in.		4	5	6	4	5	6	8	9	10	12	15	15	36

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

[2] Combustion air and gas differential pressure are measured between burner test connections and combustion chamber pressure.

[3] Pilot gas must be regulated separately to 3 "wc - 4 "wc at pilot inlet. For light off with full excess air, pilot must be increased to the indicated main burner minimum capacity, requiring considerably higher gas pressures.

[4] Flame lengths measured from the end of the burner block at maximum rated capacity. Overfiring or excess fuel operation requires higher natural gas supply pressures and gives longer flame lengths.

Series C KINEMAX® burners

Gas/oil

Typical burner data					
Fuel : natural gas at 60° F with 1000 Btu/ft ³ (st) HHV - sg = 0.6 [1]					
Fuel : light oil (#2): 142,000 Btu/gal - viscosity to be max. 50 SSU					
Combustion air : 60°F - 21 % O ₂ - 50 % Humidity - sg = 1.0 [1]					
Stated pressures are indicative - actual pressures are function of air humidity, altitude, type of fuel, gas quality					
Performance factors	Burner Size		2 Series C	6 Series C	
	Combustion air diff. Pressure [2]	"wc	26	26	
Capacities	Maximum	(MBtu/h)	1	8.4	
		GPh # 2 oil	7.15	60.0	
	On-ratio pilot/minimum with interrupted pilot	(MBtu/h)	0.062	0.775	
		GPh # 2 oil	0.45	5.5	
	Pilot/minimum with 75% excess air [5]	(MBtu/h)	40.0	525	
		GPh # 2 oil	.3	3.75	
Turndown ratio with 75% excess air			28.6:1	16:1	
Performance limits with full excess air [3]	Percent excess air		%	535	1100
	Turndown ratio with full excess air			5.3:1	10:1
	Minimum capacity to light burner	(MBtu/h)		210	840
		GPh # 2 oil		1.5	6
Air volume for maximum capacity (no excess air)	Combustion air @26 "wc		scfm	167	1470
	Atomizing air @ 26 "wc [4]		scfm	20	70
Differential gas pressure required for max capacity [2]		"wc	4.2	6.2	
Differential fuel supply pressure (N°2 oil) for max. capacity		psig	10	13	
Flame Geometry	Length [6]	in.	36	96	
	Diameter	in.	8	24	

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

[2] Combustion air and gas differential pressure are measured between burner test connections and combustion chamber pressure.

[3] Excess air based on min. capacity required for ignition. Increased smoke numbers possible, depending on air temperature and fuel-oil quality

[4] When gas firing on series C burners, a ½" diameter by-pass line is necessary to keep atomizing air passage purged. When oil firing, the use of a flame rod for flame detection is not possible. Atomizing air should be fresh and not preheated, indicated air pressures and flows should always be available over the entire capacity range.

[5] Pilot gas must be regulated separately to 3"wc-4"wc at pilot inlet. For light off with full excess air however, pilot must be increased to the indicated main burner minimum capacity, requiring considerably higher gas pressures.

[6] Flame lengths measured from the end of the burner block at maximum rated capacity.

Overfiring or excess fuel operation requires higher natural gas supply pressures and gives longer flame lengths

materials of construction	
housing	gray iron
gas nozzle	carbon steel
air orifice plate	carbon steel
block sleeve	carbon steel
	AISI 304 (1.4301)
block	castable refractory
sleeve (without block)	AISI 310 (1.4541)



Selection criteria

KINEMAX® burner versions

The KINEMAX® burner is available in two basic versions. KINEMAX® type G burners are designed to operate on gas only. KINEMAX® type C burners are able to operate on both gas and light oil (not simultaneously). Each type has different sizes available to cover a broad range of capacities to suit all heating applications.

All burners are available in ANSI and ISO version. Connections larger than 2" are available as threaded or flanged. (see detailed drawings on page ...)

Burner discharge sleeves are available in different lengths and materials:

- **standard version** with refractory block for installation in refractory walls, available in different lengths
- **complete with block sleeve** to provide additional block support in chamber walls of softwall constructions. Block sleeves are available in stainless or carbon steel.
- **complete with stainless steel discharge sleeve** offering lightweight refractory-less burner for use in air heating applications. Maximum upstream temperature is 1000° F and maximum downstream temperature for this configuration is 1500° F
- **Optional mounting flange** enables easy mounting in cases where the standard or extended block lengths do not comply with installation insulation thickness.

KINEMAX® size		Standard version (block/ no sleeve)		Block with carbon steel sleeve		Block with stainless steel sleeve		Stainless steel sleeve (no block)
		standard	extended	standard	extended	standard	extended	
GAS ONLY	G-1.5	x	x	x o		x o	x o	x
	G-2	x	x	x o		x o	x o	x
	G-3	x	x	x o		x o	x o	x
	G-4	x	x	x o		x o	x o	x
	G-6	x				x		x
GAS / OIL	C-2	x	x	x o		x o	x o	x
	C6	x				x		x

x : discharge sleeve availability

o : optional mounting flange available

Application details

In high temperature furnaces KINEMAX® burners can be used wherever good temperature uniformity without flame impingement is required. Among the typical applications are oxidizers, forge furnaces, annealing furnaces, melting furnaces, lehrs, kilns, ceramic furnaces, etc. They can also be used in certain air heating applications.

Special considerations have to be taken to protect the flame from high cross velocities. Contact MAXON for more details.

Maximum capacities

All KINEMAX® burners can be fired on-ratio, excess gas (40%) or with excess air (depending on size, up to 4700 %). Performance data are given on page 3-11.4-10.

Maximum capacity is a function of differential air pressure supplied to the burner air inlet as read between air test connection and combustion chamber. Combustion air blower rating must be sized to allow for manifold pressure losses

Preheated air

Preheated combustion air up to 800° F can be accommodated by standard KINEMAX® burner, resulting in lower fuel consumptions.

The preheated combustion air can have reduced oxygen levels (as low as 17 % O₂ if combustion air is 425° C)

Mixing of some low O₂ flue gas allows to combine system thermal efficiency with best emissions.

Process temperature

Standard refractory block permits operation at combustion chamber temperatures of 2600° F. Special refractory block material allows operation up to 3000° F.

The optional stainless steel sleeve (without block) can only be used when secondary cooling air ($t^{\circ} < 575^{\circ} \text{F}$) is available and can be forced over the combustion sleeve.

Piloting and ignition

KINEMAX® burners are equipped with an integrated raw gas pilot, but can use direct ignition as well. Recommended 3/8" pilot gas fine adjustment needle valve is available as an option. Pilots shall be used only for ignition of the main flame (interrupted pilot). Permanent pilot operation is not advised (no permanent or intermittent pilot). Use the main burner at minimum capacity for continuous operation.

Use minimally 5000 V/200 VA ignition transformers for sparking of the spark igniter.

Locate pilot gas valves as close as possible to the pilot burner gas inlet, to have fast ignition of the pilot burner.

Typical ignition sequences

- Pre purge of burner and installation, according to the applicable codes and the installation's requirements.
- Combustion air control valve shall be in the minimum position to allow minimum combustion air flow to the burner.
- In case of oil firing: Atomizing air should be applied to the burner.
- Pre-ignition (typically 2s sparking in air).
- Open pilot gas and continue to spark the igniter (typically 5s).
- Stop sparking, continue to power the pilot gas valves and start flame check.
Trip burner if no flame can be detected from here on ?
- Check pilot flame stability (typical 5s to prove the stable pilot).
- Open main gas or oil valves and allow enough time to have main gas or oil in the burner. (typical 5s + time required to have main gas or oil in the burner).
- Close the pilot gas valves.
- Release to modulation (allow modulation of the burner).

Above sequences shall be completed to include all required safety checks during the start-up of the burner (process & burner safeties).

Ratio control

KINEMAX® burners can be fired on ratio throughout the firing range or set to give a choice between on ratio and excess air or excess fuel firing. As high as 4700% excess air is possible at minimum capacity.

Air / fuel ratio control can be accomplished with MAXON MICRO-RATIO® valves and SMARTLINK® technology.

Flame supervision

All KINEMAX® burner sizes and types can be supervised by means of a UV-scanner.

Burner design incorporates UV-scanner port suitable for supervision of both pilot and main flames.

Two scanner positions are available (see drawings on pages...)

Pay attention to possible pick-up of strange flames (if any in the furnace) when using UV-scanner for flame detection. Allow some purge or cooling air to the scanner connections (typically 2 m³(st)/h of fresh clean air)

Scanners should be installed as close to the burner as possible.

Sizes 1-1/2 up to 4 have a flame rod assembly optional available. Flame rod sensing should not be used on oil firing.

Flame development

KINEMAX® burners shall be installed in combustion chambers or furnaces that allow full development of the burner flame. Cylindrical combustion chambers or flame protection sleeves shall be sized correctly.

Consult MAXON for proper combustion chamber lay-out.



Combustion air and gas piping

Combustion air piping to the burner shall be done in such way that the air flow to the burner will not disturb the flame. For optimum performance, the first elbow in combustion air piping must be at least six pipe diameters from burner test connection. Location of air control valves directly on the burner inlet is not advised. When possible, locate the air/gas/oil control valves in a position that allows viewing of burner flame during adjustment. Protect control valve operator from excessive radiant and/or ambient heat.

When using one air/gas control valve for multiple KINEMAX® G burners, gas check valves should be installed as close as possible to each burner inlet for dependable light off. MAXON air and gas balancing valves may be used on multi-burner installations for improving heating uniformity.

Oxygen enriched combustion air

MAXON KINEMAX® burners can be used with oxygen enriched combustion air.

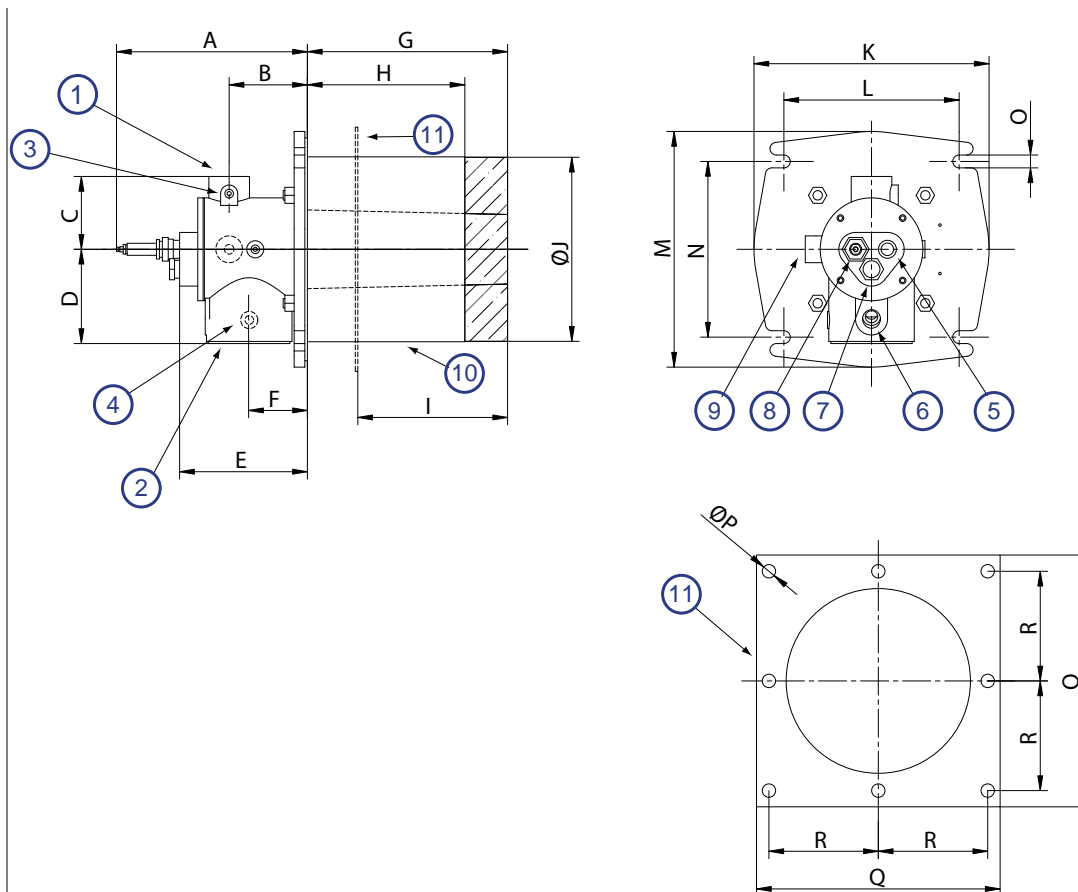
Consult MAXON for more information.

Dimensions

KINEMAX® Size 1.5 and 2 – type G

Gas only

- 1) Gas inlet
- 2) Combustion air inlet
- 3) Gas pressure test connection
- 4) Combustion air pressure test connection
- 5) Flame supervision port
1/2" (NPT or ISO)
- 6) Alternate scanner connection
1/2" (NPT or ISO)
- 7) Sight glass
- 8) Spark ignitor
- 9) Pilot gas inlet
3/8" (NPT or ISO)
- 10) Optional block sleeve
(carbon steel or stainless steel)
- 11) Optional mounting flange (only in combination with block sleeve)



Dimensions in in. unless stated otherwise

Burner size	Gas inlet		Air inlet		A [1]	B	C	D	E	F	K	L	M	N	O	P Ø	Q	R
	ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)														
1.5"	3/4	3/4	1.1/2	1.1/2	11	3.69	3.38	4.31	6	2.75	11	8.19	11	8.19	0.6	2	11.75	5.12
2"	1	1	2	2	11	3.69	3.38	4.31	6	2.75	11	8.19	11	8.19	0.6	2	11.75	5.12

[1] includes clearance for removal.

Dimensions in in. unless stated otherwise

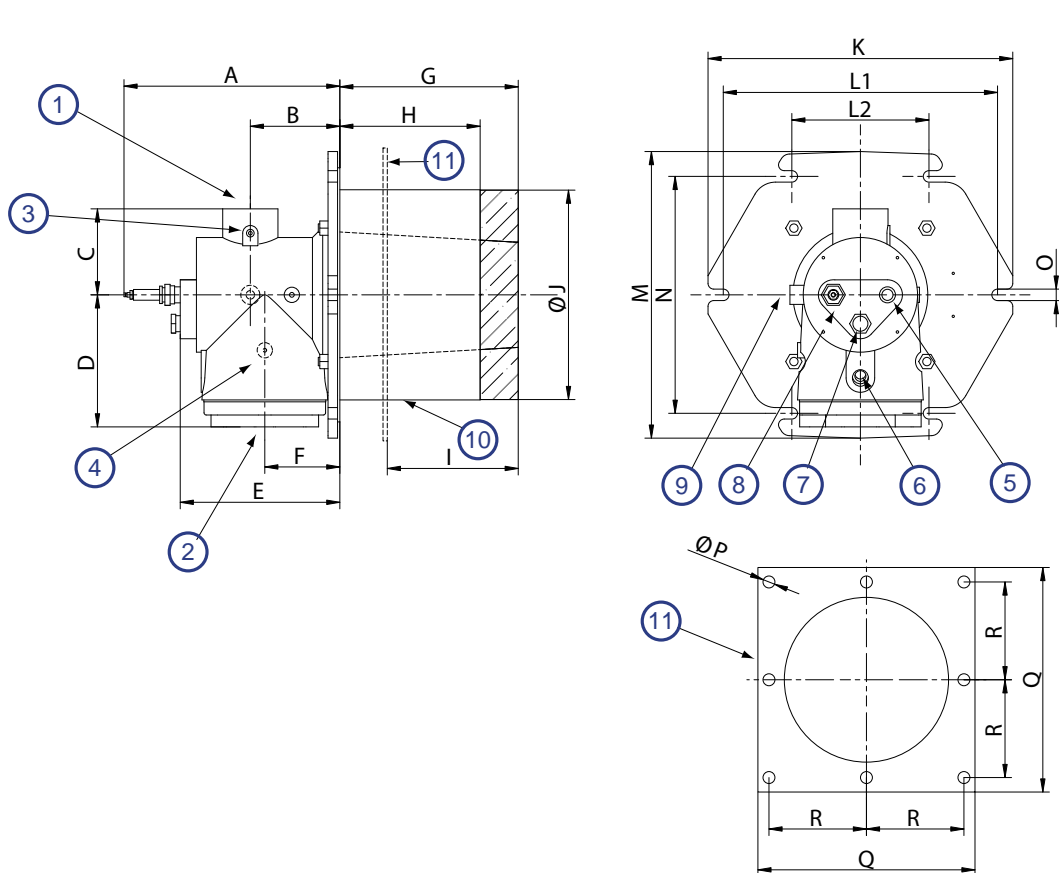
Burner size	Carbon steel block sleeve					Stainless steel block sleeve					Stainless steel long block sleeve					Stainless steel sleeve (no block)	
	Standard block					Standard block					Extended block					G	J Ø
	G	H	I min	I max	J Ø	G	H	I min	I max	J Ø	G	H	I min	I max	J		
1.5"	9.25	2.25	2	5	8.62	9.25	7.25	2	7.25	8.62	13.5	10	3.5	11.5	8.62	9.5	4.0
2"	9.25	2.25	2	5	8.62	9.25	7.25	2	7.25	8.62	13.5	10	3.5	11.5	8.62	9.5	4.25



KINEMAX® Size 3 and 4 – type G

Gas only

- 1) Gas inlet
- 2) Combustion air inlet
- 3) Gas pressure test connection
- 4) Combustion air pressure test connection
- 5) Flame supervision port 1/2" (NPT or ISO)
- 6) Alternate scanner connection 1/2" (NPT or ISO)
- 7) Sight glass
- 8) Spark ignitor
- 9) Pilot gas inlet 3/8" (NPT or ISO)
- 10) Optional block sleeve (carbon steel or stainless steel)
- 11) Optional mounting flange (only in combination with block sleeve)



Dimensions in in. unless stated otherwise																			
Burner size	gas inlet		air inlet [2]		A [1]	B	C	D	E	F	K	L1	L2	M	N	O	P Ø	Q	R
	ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)															
3"	1.1/2	1.1/2	3	3	14.3	4.44	4.19	6.38	7.38	3.31	5	13	6.62	14	11.62	0.6	0.625	13.25	5.88
4"	2	2	4	4	16	4.81	4.5	7	8.56	4.06	16	14.3	7.19	15	12.38	0.6	0.625	14.12	6.31

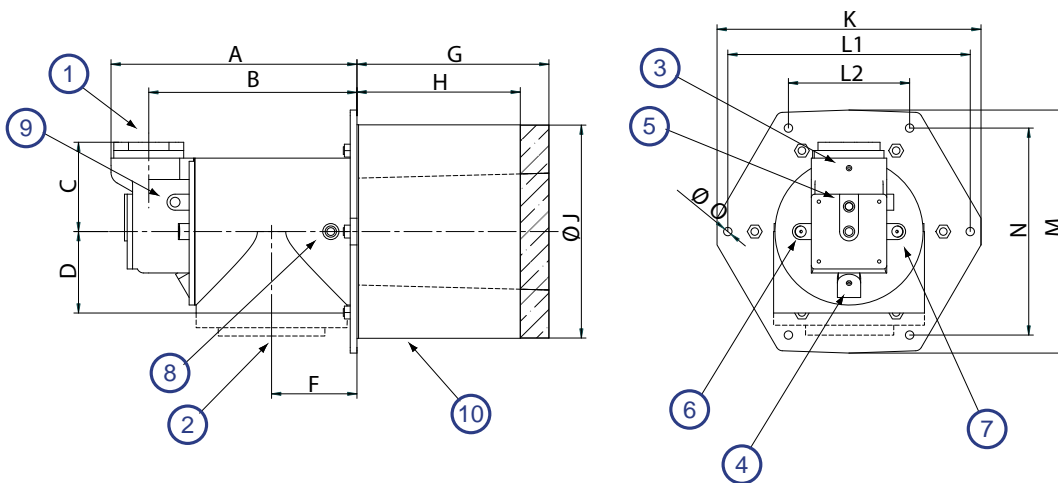
[1] includes clearance for removal.
[2] optional welding flanges are available.

Dimensions in inches unless stated otherwise																		
Burner size	Carbon steel block sleeve					Stainless steel block sleeve					Stainless steel long block sleeve					Stainless steel sleeve (no block)		
	Standard block					Standard block					Extended block					G	J Ø	
	G	H	I min	I max	J Ø	G	H	I min	I max	J Ø	G	H	I min	I max	J Ø			
3"	9.25	2.25	7	7.2	10.12	9.25	7.25	2	7.25	10.12	13.5	10	3.5	11.5	10.12	9.5	5.38	
4"	9.25	2.25	7	7.2	11	9.25	7.25	2	7.25	11	13.5	10	3.5	11.5	11	9.5	6.85	

KINEMAX® Size 6 – type G

Gas only

- 1) Gas inlet
- 2) Combustion air inlet with optional flange (threaded or welding flange)
- 3) Gas pressure test connection
- 4) Combustion air pressure test connection
- 5) Flame supervision port 1/2" (NPT or ISO)
- 6) Alternate scanner connection 1/2" (NPT or ISO)
- 7) Sight glass
- 8) Spark ignitor
- 9) Pilot gas inlet 3/8" (NPT or ISO)
- 10) Optional block sleeve (stainless steel)



Dimensions in in. unless stated otherwise

gas inlet		air inlet [1]		A	B	C	D	F	G		H	J Ø		K	L1	L2	M	N	O
ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)						std. block	sleeve		block	sleeve						
3	3	6	6	18.25	4.4	6.55	7.75	6.31	14.25	15.5	12	16	8.38	19.62	18	9	18.19	15.5	0.625

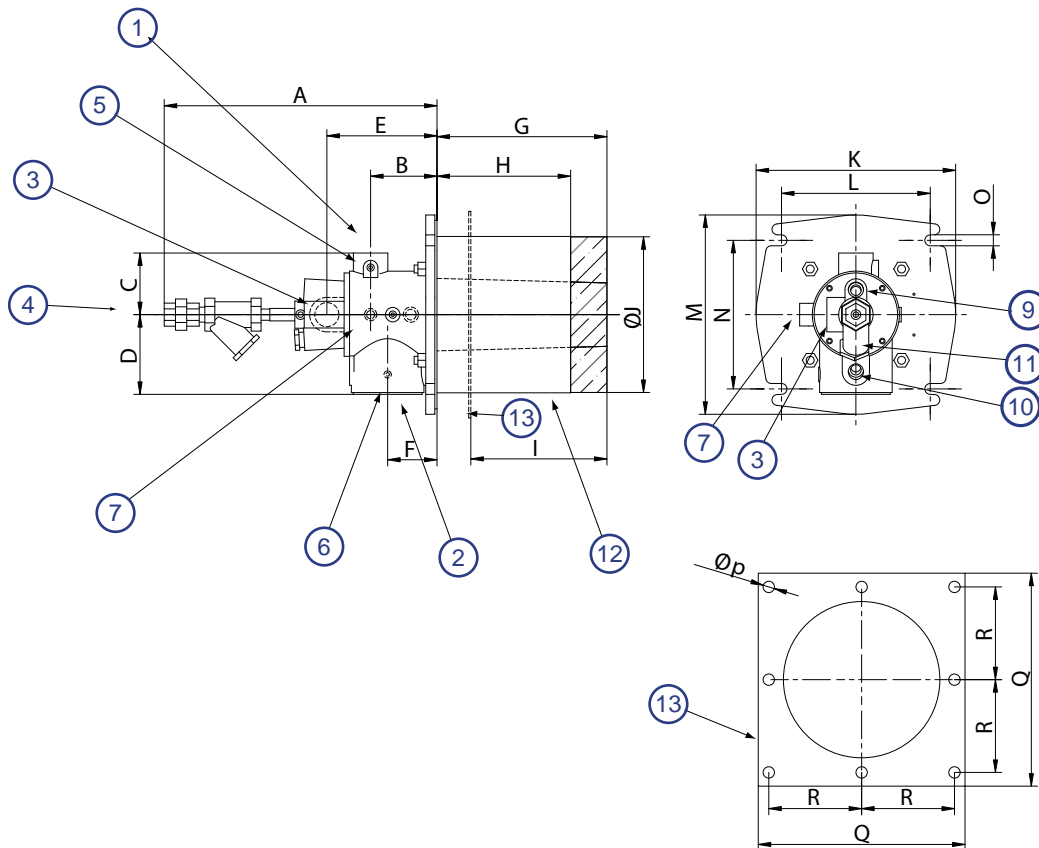
[1] 6" combustion air inlet flange available in either threaded or welding flange version.



KINEMAX® Size 2 – type C

Gas/oil

- 1) Gas inlet
- 2) Combustion air inlet
- 3) Atomizing air connection
- 4) Oil inlet
- 5) Gas pressure test connection
- 6) Combustion air pressure test connection
- 7) Pilot gas inlet 3/8" (NPT or ISO) - other side
- 8) Spark ignitor - other side
- 9) Flame supervision port 1/2" (NPT or ISO)
- 10) Alternate scanner connection 1/2" (NPT or ISO)
- 11) Sight glass
- 12) Optional block sleeve (stainless steel)
- 13) Optional mounting plate (only in combination with optional block sleeve)



Dimensions in in. unless stated otherwise																					
gas inlet [2]		combustion air inlet [2]		atomizing air inlet		oil inlet		A [1]	B	C	D	E	F	K	L	M	N	O	P Ø	Q	R
ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)														
1	1	2	2	1	1	1/4	1/4	15	3.69	3.38	4.38	6	2.75	11	8.19	11	8.2	0.6	0.62	11.75	5.12

[1] add 20 in. for retraction.

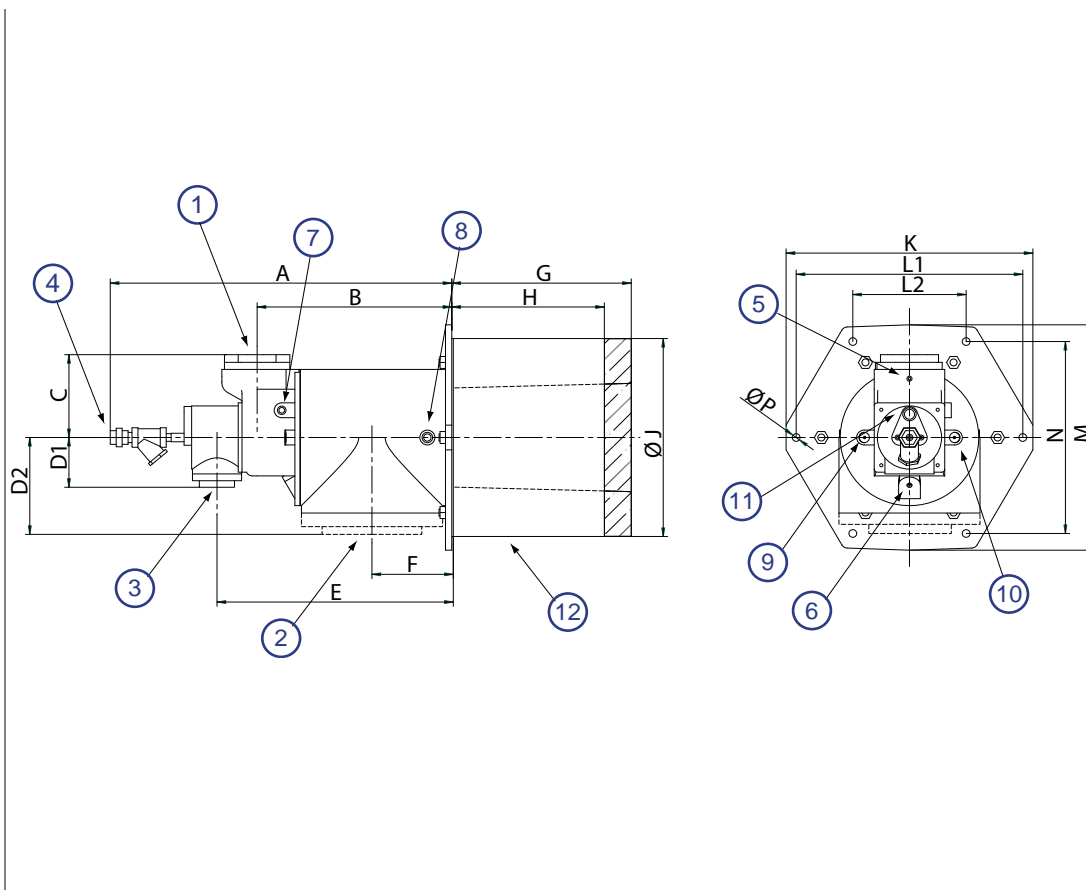
[2] gas and air inlet flanges are available with ISO or NPT thread or as welding flange.

Dimensions in in. unless stated otherwise														
Carbon steel block sleeve					Stainless steel block sleeve					Stainless steel long block sleeve				
Standard block					Standard block					Extended block				
G	H	I min	I max	Ø J	G	H	I min	I max	Ø J	G	H	I min	I max	Ø J
9.2	2.2	7	7.2	8.6	9.2	7.2	2	7.2	8.6	13.5	9.9	3.5	11.4	8.6

KINEMAX® Size 6 – type C

Gas/oil

- 1) Gas inlet
- 2) Combustion air inlet
- 3) Atomizing air connection
- 4) Oil inlet
- 5) Gas pressure test connection
- 6) Combustion air pressure test connection
- 7) Pilot gas inlet 3/8" (NPT or ISO)
- 8) Spark ignitor
- 9) Flame supervision port 1/2" (NPT or ISO)
- 10) Alternate scanner connection 1/2" (NPT or ISO)
- 11) Sight glass
- 12) Optional block sleeve (stainless steel)



Dimensions in in. unless stated otherwise

gas inlet [2]		combustion air inlet [2]		atomizing air inlet		oil inlet		A [1]	B	C	D1	D2	E	F	K	L1	L2	M	N	P Ø
ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)	ANSI (NPT)	ISO (Rp)													
3	3	6	6	2	2	3/8	3/8	27.24	15.5	6.56	4	7.75	18.81	6.31	19.62	18	9	18.2	15.5	0.625

[1] add 20 in. for retraction.

[2] gas and air inlet flanges are available with ISO or NPT thread or as welding flange.

Dimensions in in. unless stated otherwise

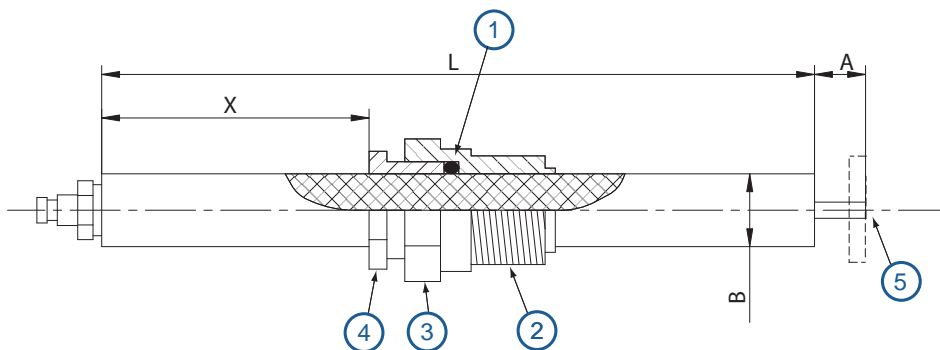
Stainless steel block sleeve			Stainless steel long block sleeve	
Standard block			Extended block	
G	H	J Ø	G	J Ø
14.25	12	16	12.5	8.38



Spark ignitor and flame rod

Spark ignitor

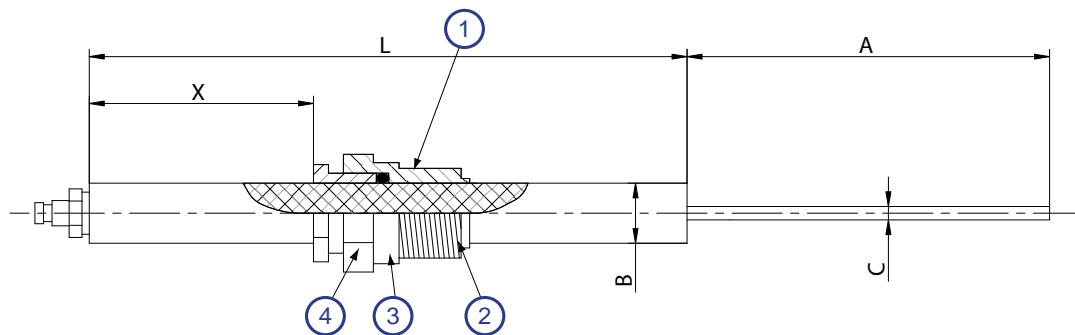
- 1) O-ring
- 2) Rc 1/2" NPT
- 3) wrench size 1"
- 4) wrench size 0.8"
- 5) Spark disk, only on 3-G and 4-G sizes.



Dimensions in in. unless stated otherwise				
Burner size	X	L	A	B
1.5-G	1.2	6.5	0.4	0.56
2-G	1.2	6.5		
2-C	1.2	3.5		
3-G	2.06	8.25	0.5	
4-G	1.44	8.25	0.5	
6-G	fit to burner	3.5	0.4	
G-C	fit to burner	3.5		

Flame rod

- 1) O-ring
- 2) Rc 1/2" NPT
- 3) wrench size 1"
- 4) wrench size 0.8"



Dimensions in in. unless stated otherwise					
Burner size	X	L	A	B	C
1.5	2.31	6.5	4.5	0.55	0.2
2	2.31	6.5	4.5	0.55	0.2
3	3.25	6.5	4.5	0.55	0.28
4	2.81	8.25	8	0.55	0.28