Specifications of KINEDIZER® burners

Typical burner data Fuel : natural gas at 15 °C with 10.9 kWh/Nm³ (HHV) - sg = 0.6 [1] Combustion air : 15 °C - 21 % O_2 - 50 % Humidity - sg = 1.0 [1] Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality									
KINEDIZER® size			0.5M	2.5M	5M	9M	18M	27M	40M
Max. capacity @ n=1.3 (low NO_x)	[2]	kW HHV	145	730	1450	2650	5300	7900	11700
Max. capacity @ n=1.1		kW HHV	170	865	1730	3100	6300	9350	13850
Min. capacity		kW HHV	15	50	38	68	135	205	375
Turndown @ n=1.3	[2]		1:10	1:15	1:40	1:40	1:40	1:40	1:30
Turndown @ n=1.1			1:11	1:17	1:45	1:45	1:45	1:45	1:37
Air flow at max. capacity		$m^3_{(st)}/h$	182	918	1820	3330	6660	9930	14710
Air flow at min. capacity		$m^3_{(st)}/h$	30	97	112	204	283	421	1016
Air turndown			1:6	1:9	1:16	1:16	1:23	1:23	1:14
Advised pilot capacity	[3]	kW HHV	30	100	50	100	150	300	750
Absolute min. pilot capacity	[4]	kW HHV	23	73	29	51	73	146	440
Pilot gas pressure	[5]	mbar	<1	2.5	<1	1.5	2.5	10	20
Advised pilot gas piping diameter	[6]		1/2”	3/4”	3/4”	3/4”	1”	1-1/2”	2”
Combustion air pressure @ inlet	[7]	mbar	90	90	90	90	90	90	70
Combustion air pressure diff.	[8]	mbar	70	70	70	70	70	70	50
Natural gas inlet pressure diff.	[9]	mbar	120	155	220	210	280	280	170
Flame length @ n=1.3	[2]	m [10]	0.3	0.45	0.60	1.20	1.80	2.70	4.00
Flame diameter @ n=1.3	[2]	m [10]	0.15	0.20	0.25	0.45	0.90	1.20	1.50
Flame length @ n=1.1		m [10]	0.5	0.75	1.0	2.0	3.0	4.5	7.0
Flame diameter @ n=1.1		m[10]	0.15	0.20	0.25	0.45	0.90	1.20	1.50

[1] sg (specific gravity) = relative density to air (density air = 1.293 $kg/m^3_{(st)}$).
[2] n = 1.3 meaning 30 % excess air.
[3] Most installations will require a stronger pilot (advised pilot capacity will be required – see [3]).
[4] Absolute minimum pilot capacity is only valid for those supplies that can be started at min. stated combustion air flow, with "long block" and no flow around the flame.
[5] Natural gas pressure at pilot burner gas inlet (absolute minimum pilot capacity).
[6] For information only – strong pilots require adapted piping.
[7] Combustion air pressure required at full capacity at burner inlet, relative to process - add 5 % safety margin + piping & control valve pressure drops for blower sizing.
[8] Differential combustion air pressure at full capacity, between inlet test connection (downstream of the swirler) and process.
[9] Differential natural gas pressure required at burner gas inlet (gas inlet test connection) relative to process, for the “n=1.3” maximum capacities.
[10] All dimensions in m, for burner firing at max. listed capacity

Materials of construction

Burner parts (away from the furnace)	Carbon steel, painted	[1]
Burner parts (in contact with furnace)	AISI 304 (1.4301)	
Flame tip (in contact with the flame)	AISI 310 (1.4541)	
Burner block sleeve (optional)	AISI 304 (1.4301)	
Burner block	Castable refractory	[2]

[1] Optional available: 100 % stainless steel burner
[2] Typical composition of castable refractory : refractory with 50% SiO_2 45 % Al_2O_3 and smaller fractions of iron oxide, titanium, lime, ... reinforced with needles (AISI304-1.4301)

Selection criteria

KINEDIZER® burner versions

To suit the local demands of industry and specific regulations worldwide, the standard KINEDIZER® burner is available in 3 different versions.

All burners can be ordered with NPT gas connection and SCH 10/40 air pipe connection (ANSI version - see drawings on page 3-11.6-13 and page 3-11.6-14). An optional air inlet flange can be provided acc. to ANSI 150 lbs (ANSI version with air flange - see drawing on page 3-11.6-14).

KINEDIZER® 9M through 40M are also available with flanged gas connection (ISO 7005) and air flanges (ISO version - see drawing on page 3-11.6-15). Refer to the drawings or contact MAXON for more details.

On request, special versions, versions for hazardous locations or high back-pressure may be supplied.
Contact MAXON for more details.

Application details

KINEDIZER® burners can be used in all direct fired air heating applications, as well low as high temperature. It combines flexibility and stability with high turndown and the lowest available NO_x-emissions. It can be used in all air heating applications that require low NO_x firing and allow excess combustion air (typically 30 %) to the burner. The use of KINEDIZER® burners in indirect applications requires special consideration.
Contact MAXON for application details.

Maximum capacities

All KINEDIZER® burners can be fired at higher maximum capacities if sufficient combustion air and fuel gas is allowed to the burner – max. capacities of all sizes can be 20 % higher (40M can be fired up to 40 % higher capacity) if combustion air is available at 150 mbar .

Preheated air/reduced O_2 air

KINEDIZER® burners accept preheated combustion air up to 350 °C (425 °C on request). Maximum capacities shall be reduced. Preheated combustion air can have reduced O_2 (as low as 17 % if combustion air temperature is 425 °C). Mixing of some low O_2 flue gas allows to combine increased system thermal efficiency with best emissions.

Process back pressure

Standard KINEDIZER® burners can accept static back pressures between -100 mbar and +100 mbar . The burner shall be connected to a fuel gas and combustion air control system that is capable of controlling a correct fuel gas ratio against all possible installation back pressures. Special versions are available to accept up to 1 bar(g) back pressure (with PED-certification).

Process temperature

The construction of the burner allows operation in all applications with process temperatures from ambient up to 1100 °C. Protect burner from high furnace temperatures during burner stop (purge to avoid back flow of hot furnace/process air).

Piloting & ignition

Direct ignition of standard KINEDIZER® burners is not possible. All KINEDIZER® burners are equipped with a “raw gas” pilot to ignite the main flame (using main burner comb. air). Pilots shall be used only for ignition of the main flame (“interrupted”). Permanent pilot operation is not advised (no “permanent” or “intermittent” pilot) - use main burner at minimum capacity for continuous operation.
Use minimally 5000 V/200 VA ignition transformers for sparking of the spark igniter. Optional ignition equipment for hazardous locations is available as well as high energy ignitors for direct ignition.

Typical ignition sequence

- 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.
- Pre-ignition (typically 2 s sparking in air).
- Open pilot gas and continue to spark the ignitor (typically 5 s).
- Stop sparking, continue to power the pilot gas valves and start flame check. Trip burner if no flame from here on.
- Check pilot flame stability (typical 5 s to prove stable pilot)
- Open main gas valves and allow enough time to have main gas in the burner (typical 5 s + time required to have main gas in the burner).
- Close the pilot gas valves.
- Release to modulation (allow modulation of the burner).

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

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

Ratio control

KINEDIZER® burners can be fired stable with air factors ("n") : $1.05 < n < 1.60$ (5% to 60% excess air) from 20% to 100% of listed maximum air flows (lower capacities require somewhat higher excess air). Flame dimensions and burner emissions are heavily affected by the excess air amount.

Ratio control on reduced capacity

Most KINEDIZER® applications will require burner operation with 30% excess air to have low NO_x.
On reduced capacities, the excess air will slowly increase.
KINEDIZER® burners will operate with low NO_x between 20% & 100% of their listed maximum capacity (n = 1.3). Below 20% firing rate, the air factor will slightly increase to have the listed air flow at minimum capacity. Changes of combustion air temperature, system back pressure and other parameters could influence gas/air ratio if the control system is not designed to compensate for these.

Flame supervision

KINEDIZER® flames shall be supervised by UV-scanners. Two scanner positions are available. Both locations allow verification of both pilot flame and main flame (it is not possible to distinguish main and pilot flame).
Scanners are mounted on the burner flange and look through the block (30° relative to the burner center line).
Pay attention to possible pick-up of strange flames (if any in the furnace). Allow some purge or cooling air to the scanner connections (typically 2 $m^3_{(st)}/h$ of fresh clean air).

Flame development

KINEDIZER® 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 have diameters of 1.5 to 2 x burner flame diameter (see table on page 3-11.6-8).

Consult MAXON for proper combustion chamber lay-out.

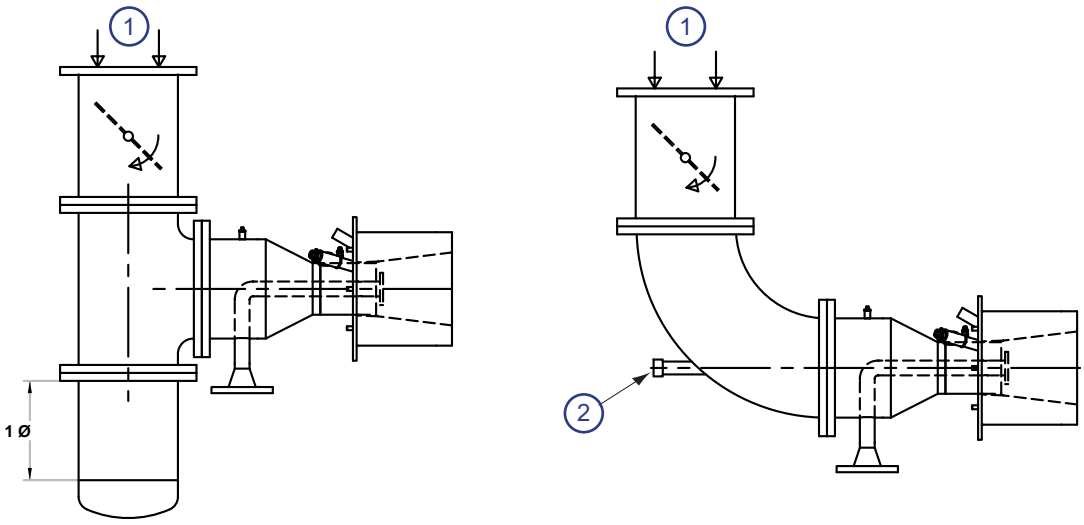
Cross velocities

Cross velocities up to 15 m/s can be allowed over the KINEDIZER® flame. Contact MAXON for proper lay-out and correct emission information in case of cross velocity over the flame.

Combustion air control & piping

KINEDIZER® burners require combustion air control valves with high turn-down (to guarantee correct air flow at minimum capacity). Air control valves shall be properly sized – typically, the air control valve diameter shall be smaller than the burner air inlet. Combustion air piping to the burner shall be done in such way that the air flow to the burner will not disturb the flame. Location of air control valves directly on the burner inlet is not possible.

1) Air flow
2) Sight glass



Typical lay-outs with correct piping between air control valve on the KINEDIZER® burner.

Fuels

Standard KINEDIZER® burners are designed for low NO_x firing of natural gas only. Special versions are available to fire propane/ LPG. Multifuel burners will have higher NO_x on the alternative fuel.

Expected emissions

Typical NOx for KINEDIZER® burners firing natural gas with 30% excess air:

- cold furnaces (< 750 °C): 30% of a conventional burner
- furnaces up to 950 °C: 40% of a conventional burner

CO highly depends on the installation's lay-out and can be reduced if sufficient dwell time after the flame is allowed. Consult MAXON for correct application information.

Low NOx furnace requirements

Low NOx operation requires properly designed combustion chamber or furnace.

KINEDIZER® flames have medium velocity and will be influenced by the atmosphere around the flame. Contact MAXON for proper design.

CO & low NOx Operation

Low NOx in combination with low CO is possible if sufficient dwell time is available after the flame. Too fast mixing with cold process air will increase CO.

Burner blocks

Standard KINEDIZER® burners will be shipped with "long block" as shown on page 3-11.6-13. Two long block options are available: standard (without supporting sleeve) and with supporting sleeve.

Standard blocks without supporting sleeves shall be used only if the blocks are supported by the furnace walls. Supporting sleeves shall be used in all installations where the blocks are not supported (soft walls or steel ducting). Protect the supporting sleeve with insulation if used on high temperature furnaces. Consult Installations instructions for detailed information. For specific applications, burners can be shipped with special block (short block, heat shield or wide block).

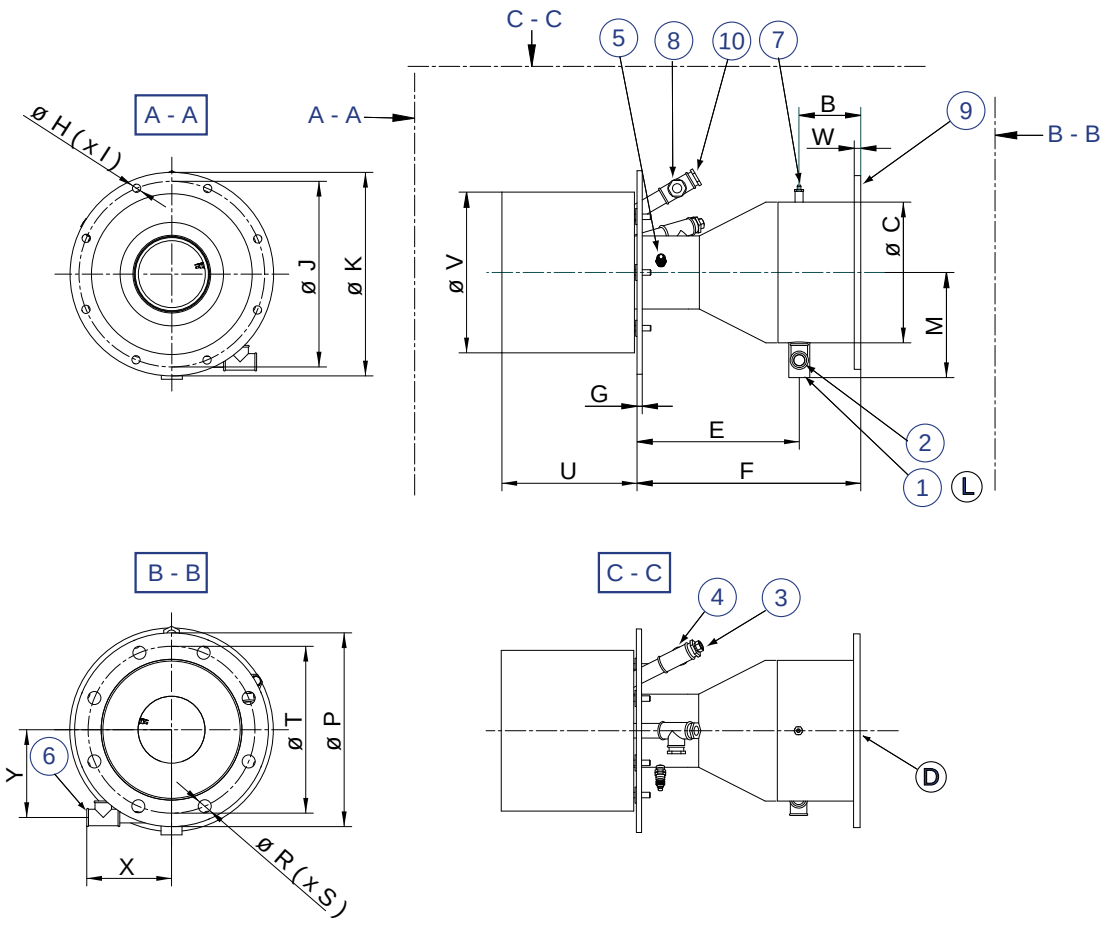
Consult MAXON for detailed information.

Dimensions

0.5M and 2.5M KINEDIZER® burners - ANSI

1) Main gas inlet
2) Pilot gas inlet
3) 1/2" NPT scanner connection
4) 1/4" NPT purge air connection
5) Spark ignitor
6) 1/4" NPT gas test connection
7) 1/4" NPT air test connection
8) 1/4" NPT optional purge air connection
9) Optional air inlet flange
10) Observation port / alt. scanner position

Conforms to 150# ANSI Fig. Pattern. Bolt holes to straddle burner vertical & horizontal centerline.



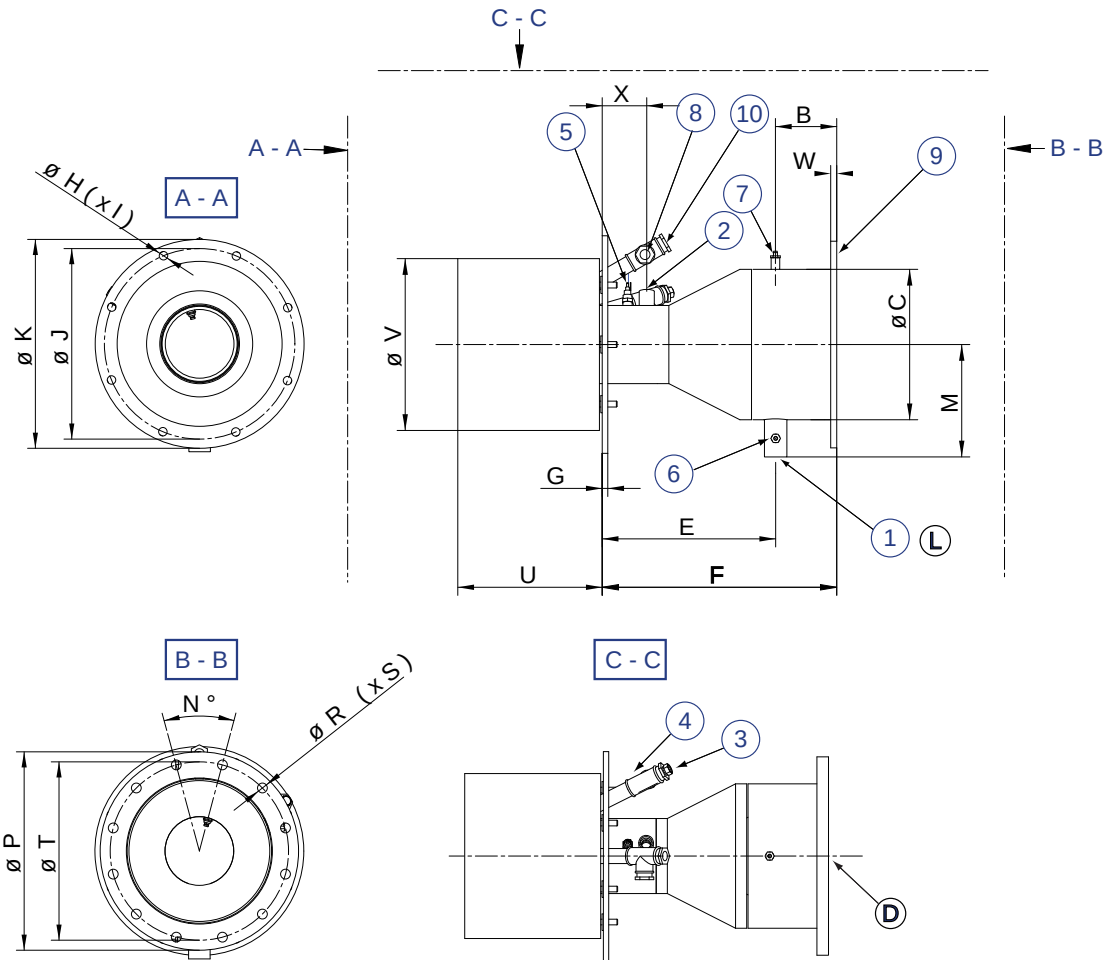
dimensions in mm unless stated otherwise												
Size	A NPT	B	C Ø	D pipe ANSI	E	F	G	H Ø	I # holes	J Ø	K Ø	L NPT [1]
0.5M	3/8”	50	89	3”	145	200	6	16	8	272	305	1/2”
2.5M	3/8”	79	168	6”	176	255.5	10	16	8	318	359.4	1-1/4”
Size	M	N	P Ø	R Ø	S # holes	T Ø	U	V Ø	W	X	Y	Weight kg
0.5M	120	45°	191	19	4	152	244	217	6	90.5	92	30
2.5M	159	22.5°	279	22	8	241	244	265	6	114	118	45

[1] 1/2” NPT is female 1-1/4” NPT is male.

5M through 40M KINEDIZER® burners - ANSI

1) Main gas inlet
2) Pilot gas inlet
3) 1" NPT scanner connection
4) 1/4" NPT purge air connection
5) Spark ignitor
6) 1/4" NPT gas test connection
7) 1/4" NPT air test connection
8) 1/4" NPT chamber test connection
9) Optional air inlet flange
10) Observation port / alt. scanner position

Conforms to 150# ANSI Fig. Pattern*. Bolt holes to straddle burner vertical & horizontal centerline.
material: 6 mm thK. carbon steel
*Note: 40M air inlet flange does not follow ANSI bolt patterns. 9M through 40M air inlet flanges have elongated holes

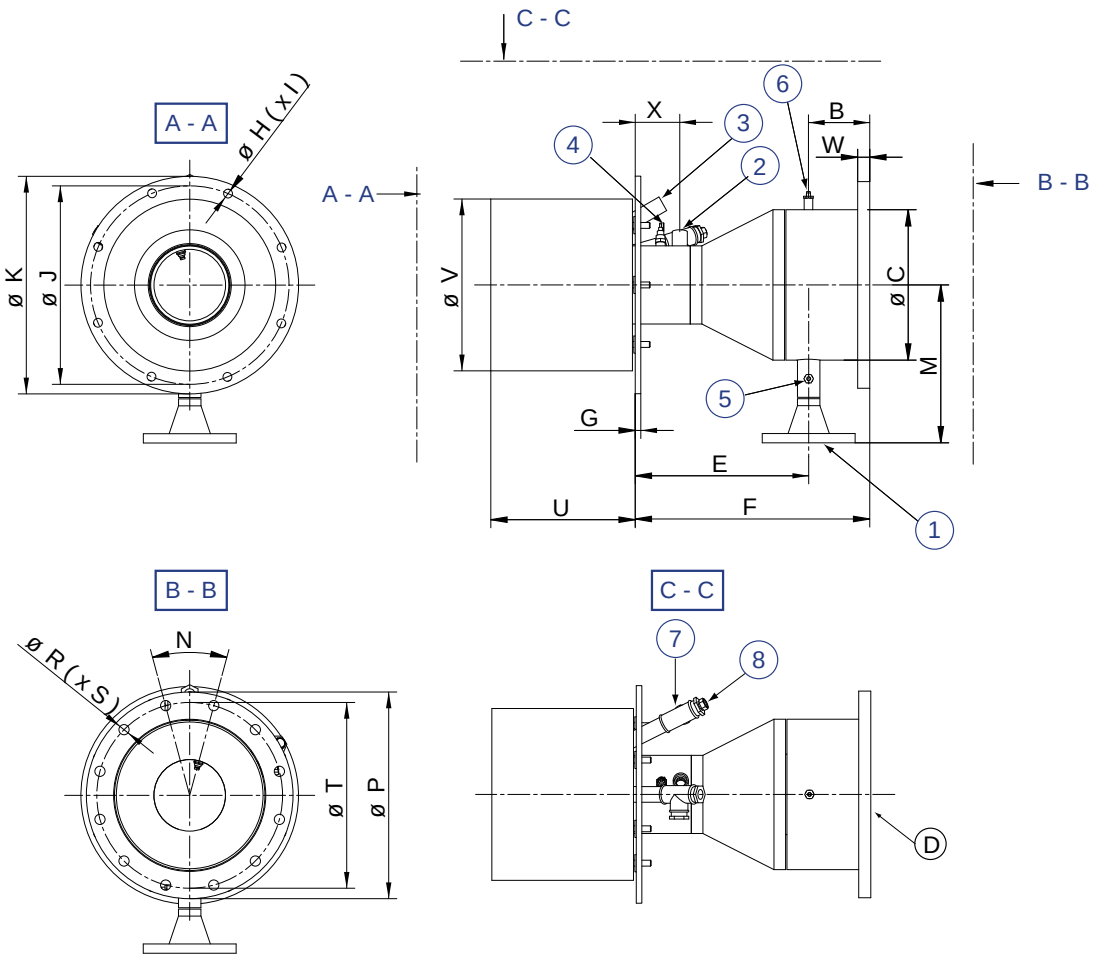


dimensions in mm unless stated otherwise												
Size	A NPT	B	C Ø	D pipe ANSI	E	F	G	H Ø	I # holes	J Ø	K Ø	L NPT [1]
5M	3/8"	98	219	8"	285	383	10	5/8"	8	384	425.4	1-1/2"
9M	1/2"	127	324	12"	374	502	13	5/8"	8	428	469	3"
18M	3/4"	183	324	12"	466	628	13	5/8"	8	478	519	3"
27M	3/4"	183	457	18"	606	755	13	5/8"	8	523	573	4"
40M	3/4"	283	559	22"	942	1225	13	5/8"	8	672	711	6"
Size	M	N	P Ø	R Ø	S # holes	T Ø	U	V	W	X	Weight kg	
5M	190	22.5°	343	22	8	298	244	329	6	68	75	
9M	318	22.5°	482	25	12	432	311	370	6	94	120	
18M	297	15°	482	25	12	432	311	421	6	110	150	
27M	363	15°	635	32	16	578	311	474	6	110	300	
40M	413	9°	654	14	20	613	308	607	6	110	450	

[1] 1-1/2" NPT is male, 4" (27M) and 6" (40M) gas inlets are 150# raised face flanges, not NPT

9M through 40M KINEDIZER® burners - ISO

1) Main gas inlet
2) Pilot gas inlet
3) 1" scanner connection
4) Spark ignitor
5) Gas test connection
6) Air test connection
7) Chamber test connection
8) Observation port / alt. scanner position



Dimensions in mm unless stated otherwise											
Size	B	C ø	D air conn.	E	F	G	H ø	I # holes	J ø	K ø	L gas conn.
9M	132	324	DN300	374	505	12	19	8	427	469	DN80
18M	188	324	DN300	417	582	12	19	8	478	519	DN80
27M	188	457	18"ANSI	603	759	12	19	8	532	573	DN100
40M	290	559	22"	941	1228	12	19	8	670	711	DN150
Size	M	CC	EE	N	P ø	R ø	S # holes	T ø	U	V ø	Weight kg
9M	340	96	26	45°	445	22	12	400	311	370	120
18M	305	109	26	45°	445	22	12	400	311	421	150
27M	415	111	12	22.5°	635	24	16	578	311	474	300
40M	419	109	12	18°	750	24	20	690	308	608	450

KINEDIZER® burners can be used in all orientations (if accessories allow it) - alternative positions for fuel gas inlet, pilot gas inlet or UV-scanner connection are not available. 40M burners are shipped with lifting lugs welded on the burner (not shown).

Installation instructions for KINEDIZER® burners

Application requirements

View port

A view port to observe burner flame is essential to inspect flame aspect. Locate the view port downstream of the flame, looking back to the burner block. Make sure the complete flame can be evaluated.

Support burner air and gas piping

The KINEDIZER® burner shall not be used as support for the piping to the burner. Gas and air piping shall be supported in such way that no additional loads will be created on the burner.

Burner mounting flange loads

Check burner weight and reinforce burner mounting flange or combustion chamber/furnace back wall if necessary to take complete burner weight.

Installation instructions

Storage of KINEDIZER® burners

KINEDIZER® burners shall be stored dry (inside). Burners blocks have been cured carefully before shipment and shall be kept dry. Wetting of the blocks could result in premature failures.

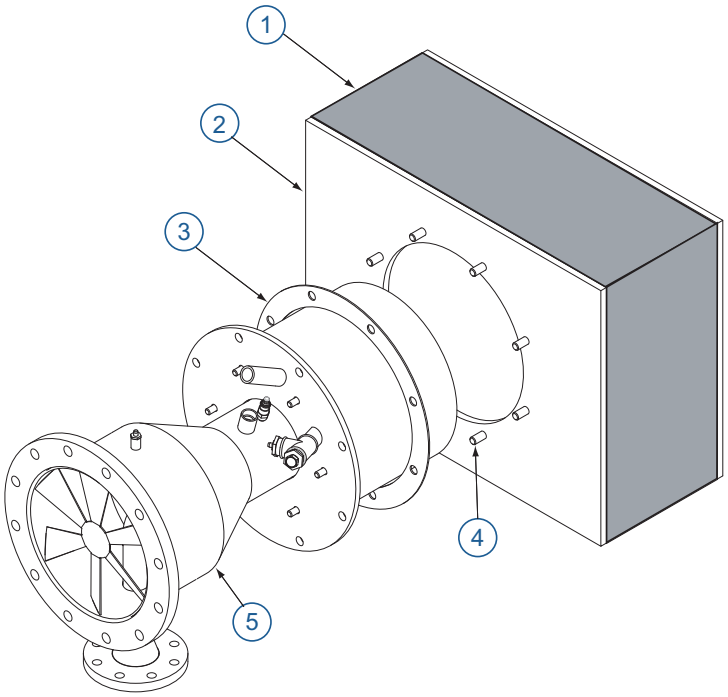
Handling of KINEDIZER® burners

KINEDIZER® burners are shipped as complete units. Handle burners with care during unpacking, transport, lifting and installation. Use proper equipment. Any impact on the burner could result in damage.

Flange the burner to the installation

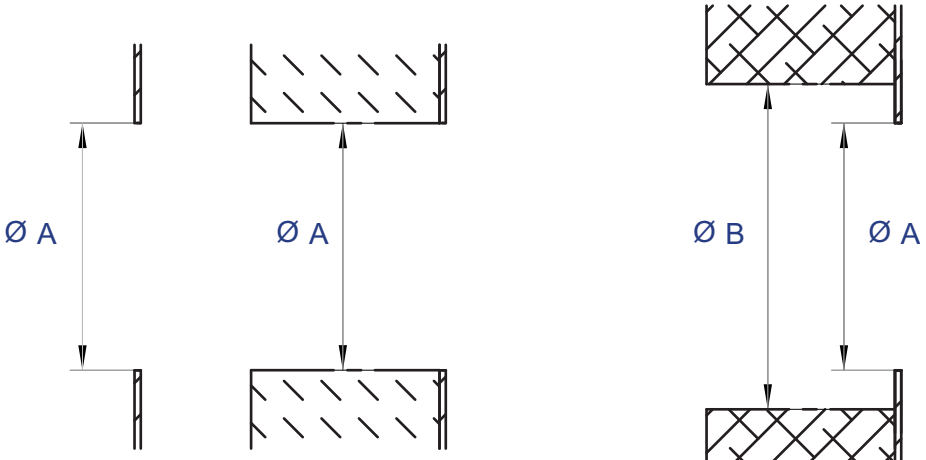
Bolt the burner to the installation's burner mounting flange. Use proper gasketing. Tighten the flange bolting with correct torque. Retighten all bolts after first firing and regularly after commissioning.

1) Insulation
2) Housing
3) Gasket (by others)
4) Mountings studs
5) Burner



Burner mounting

Furnace/combustion chamber requirements



Sketch 1 Sketch 2

Dimensions in mm unless stated otherwise							
Burner size	0.5M	2.5M	5M	9M	18M	27M	40M
ØA [1]	242	290	354	395	446	499	633
ØB [2]	367	415	479	520	571	624	758

[1] ØA = block diameter + 25 mm
[2] ØB = block diameter + 150 mm

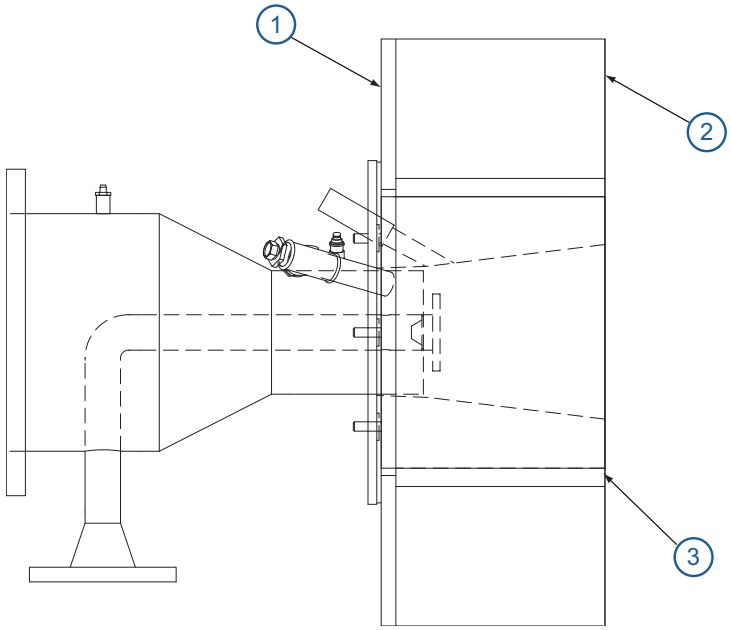
Sketch 1 : sheet metal combustion chambers, furnaces without internal insulation or with soft wall internal insulation : flange/ opening internal diameter shall be = ØA.

Sketch 2 : furnaces or ovens with brick walls : opening in brick wall shall be = ØB (to be rammed with castable refractory).

Standard Blocks

Burners with standard blocks require supporting of the burner block by the furnace wall. Ram the gap between block and furnace wall with castable refractory.

1) Furnace shell
2) Furnace wall
3) Castable refractory material



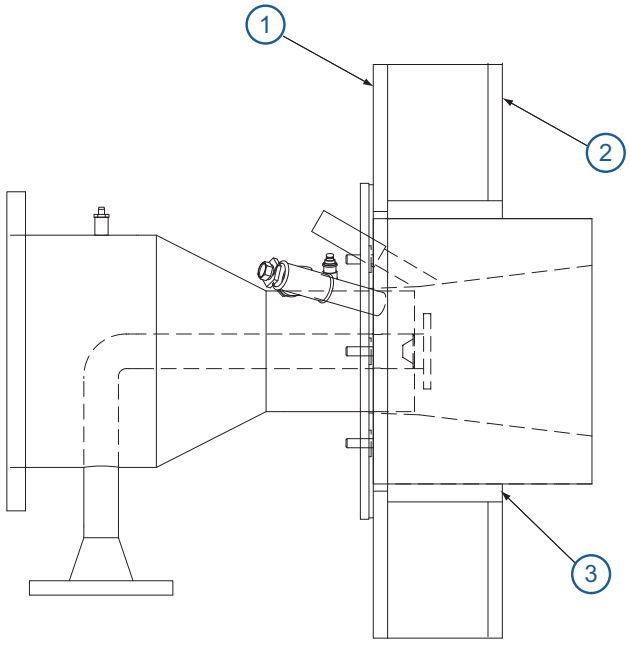
Blocks with supporting sleeve

Burners with blocks that have supporting sleeves can be used in all applications if the supporting sleeve is protected from too high a temperature.

Sheet metal combustion chambers without internal insulation do not require any provision for supporting or protecting the burner blocks.

Furnaces with internal insulation or refractory walls will require protection of the block supporting sleeve from the high temperature. Close the gap between block and furnace wall with soft insulation fibre, to have thermal protection of the block sleeve.

1) Furnace shell
2) Panel wall
3) Soft insulating material



Start-up instructions for KINEDIZER® burners

Instructions provided by the company or individual responsible for the manufacture and/or overall installation of a complete system incorporating MAXON burners take precedence over the installation and operating instructions provided by MAXON. If any of the instructions provided by MAXON are in conflict with local codes or regulations, please contact MAXON before initial start-up of equipment.

Read the combustion system manual carefully before initiating the start-up and adjustment procedure. Verify that all of the equipment associated with and necessary to the safe operation of the burner system has been installed correctly, that all pre-commissioning checks have been carried out successfully and that all safety related aspects of the installation are properly addressed.

Initial adjustment and light-off should be undertaken only by a trained commissioning engineer.

First firing or Restart after shut-down

During first start-up of the burner, and after every longer installation shut-down, the temperature rise shall be limited – allow the burner to fire on low fire for some time to allow the parts to heat-up slowly.

Checks during and after start-up

During and after start-up, check the integrity of the system. Check all bolted connections after first firing (first time on temperature) and retighten if necessary.

Pilot ignition

Before ignition of the pilot, adjust the combustion air to the minimum burner air flow. Pilot will not ignite if too high an air flow. Set pilot gas flow to the correct value before pilot ignition attempt.

Main burner ignition

Set correct gas flow for burner minimum capacity before attempt of main burner ignition.

After ignition of main burner, allow some time on minimum capacity to allow the burner parts to heat up slowly.

Adjust air-gas ratio, set maximum capacity

Once the main flame is ignited, adjust air/gas ratio of the burner to have the required combustion quality and slowly increase capacity (do not increase capacity too fast to avoid damage to burner parts or furnace due to excessive temperature gradient) .

Maintenance & inspection instructions

Safety requirements

Regular inspection, testing and recalibration of combustion equipment according to the installation's manual is an integral part of its safety. Inspection activities and frequencies shall be carried out as specified in the installation's manual.

Visual inspections

Regular visual inspection of all connections (air and gas piping to the burner, bolting of the burner to the furnace) and burner flame size and aspect are essential.

Spare parts

Keep local stock of spark ignitor. It is not recommended to keep local stock of other burner parts.

Consult installation manual for burner spare parts and system accessories.