

High capacity low NO_x gas burners KINEDIZER® Staged LE

TECHNICAL INFORMATION

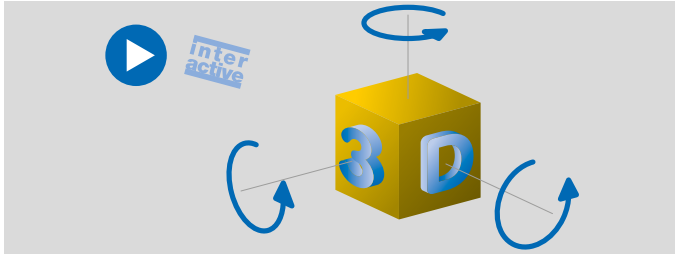
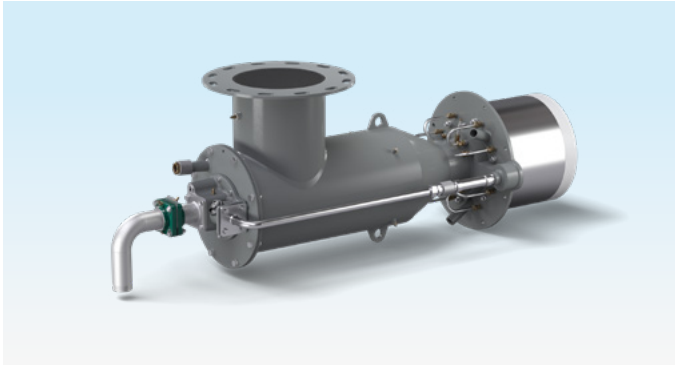
- Field proven low emissions. State-of-the-art low NO_x firing - adjustable for application flexibility
- Lower NO_x and less excess air than KINEDIZER® LE burners
- Rugged design for oxidizers, process heaters, kilns, furnaces, dryers, waste incineration and other high temperature applications
- Burns natural gas, propane or other fuel gases
- Provides excellent stirring and mixing with its medium velocity exhaust
- 70% hydrogen fuel mixture by volume possible



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1 Application



The KINEDIZER Staged LE burner is a nozzle-mix, medium-velocity design. Using advanced mixing technology, the burner produces low emissions with very little excess air. Ruggedly built with a reinforced refractory block and steel burner body and nozzle, it burns natural gas, propane or other gaseous fuels. Combustion air is supplied with an external blower. Accurate air and fuel modulation can be accomplished by fuel-air ratio control technology such as Smartlink or Slate.

KINEDIZER Staged LE burners can be used in all direct fired high temperature air heating applications. It combines flexibility and stability with high turndown and the lowest

available NO_x emissions. The use of KINEDIZER Staged LE burners in indirect applications above $7000 \text{ Btu/h/inch}^2$ (3155 kW/m^2) requires special consideration, and has separate cataloged values

The primary applications for this burner are thermal oxidizers, helical coil fluid heaters, and high temperature direct processes. Each of these applications will subject the burner to very different environments. For support in your application contact your local sales representative.

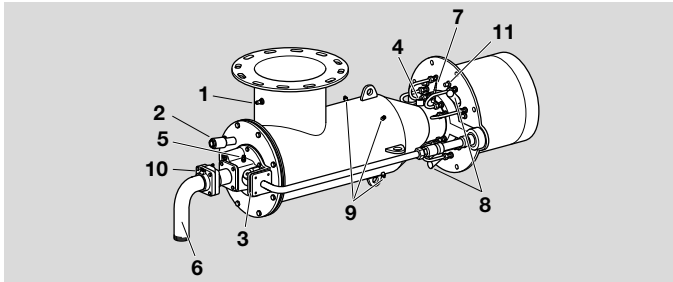
2 Function

2.1 Typical emissions

The KINEDIZER Staged LE burner is capable of low NO_x when given excess air, typically 20-30% at high fire.

The same burner, when adjusted for on-ratio operation, will give low CO and high thermal efficiency.

2.2 Part designations



- 1 1/4" NPT air test connection
- 2 Observation port
- 3 Adjustable staging orifice
- 4 Pilot gas inlet
- 5 1/4" NPT burner gas test connection
- 6 Main gas inlet
- 7 Spark ignitor
- 8 UV scanner ports
- 9 Nozzle assembly centering screws
- 10 Gas orifice meter
- 11 1/4" NPT staged fuel pressure test connection

3 Selection

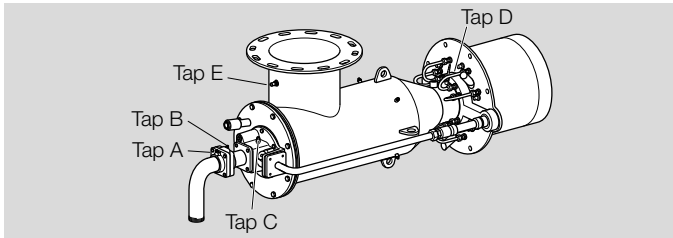
3.1 Selection table

Description	Code	Availability	
		030	060
High capacity low NO _x gas burner	KDZERLES	•	•
Rated capacity			
2.5 MBtu/h (660 kW)		•	
10 MBtu/h (2667 kW)			•
Gas type			
Natural gas	N	•	•
Flame sensor quantity			
One	1	•	•
Two	2	•	•
Three	3	•	•
Fuel inlet orientation			
Fuel inlet 0°, air inlet 0°	1	•	•
Fuel inlet 90°, air inlet 0°	2	•	•
Fuel inlet 180°, air inlet 0°	3	•	•
Fuel inlet 270°, air inlet 0°	4	•	•
Block			
Standard block	B	•	•
Block with sleeve	S	•	•

Example

060KDZERLESN23B

3.2 Typical burner data



Imperial

Natural gas at 60°F with 1000 Btu/ft³ (st) HHV, sg = 0.6¹⁾

Combustion air: 60°F, 21% O₂, 50% humidity, sg = 1.0¹⁾

Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.

Installations without fuel air ratio control custom light-off position capability will require increased pilot capacities and pressures.

All pressures are differential to the chamber unless indicated otherwise.

All imperial inputs based upon gross calorific values (HHV).

3 Selection

Size	Max. capacity	Min. capacity	Turn-down	Air flow			Light off				Flame characteristics	
	$\lambda=1.2$		$\lambda=1.2$	max. capacity	min. capacity	pilot lightoff	Advised pilot capacity	Pilot gas pressure	Advised direct spark capacity	Direct spark gas pressure	Length	Diameter
	(HHV)	(HHV)					(HHV)		(HHV)	Tap A-B		
	MBtu/h	kBtu/h		SCFM	SCFM	SCFM	MBtu/h	"WC	MBtu/h	"WC	ft	ft
Heat density below 6500 Btu/h/inch²												
3"	2.5	125	20:1	485	32	75	0.3	0.2	0.35	0.4	2.3	0.8
6"	10	520	20:1	1950	120	300	0.8	0.7	1.2	0.3	5.5	2
Heat density above 6500 Btu/h/inch²												
3"	2.5	250	10:1	485	55	75	0.3	0.2	0.35	0.4	2.3	0.8
6"	10	909	10:1	1950	253	300	0.8	0.7	1.2	0.4	5.5	2

Size	Combustion air pressure			Main gas pressure				Minimum chamber pressure	
	inlet @ max capacity	max capacity	light off	Fuel inlet pressure	Fuel inlet orifice	Fuel pressure at burner	Staged fuel @ max capacity	high fire	low fire
	Tap E		Tap A	Tap A-B	Tap C	Tap D			
	"WC	"WC	"WC	"WC	"WC	"WC	"WC	"WC	"WC
Heat density below 6500 Btu/h/inch²									
3"	30	28	0.5	70	12.5	58	12.3	N/A	N/A
6"	32.5	31	0.4	75	17.25	60	20	N/A	N/A
Heat density above 6500 Btu/h/inch²									
3"	30	28	0.5	70	12.5	58	12.3	2.0	0.15
6"	32.5	31	0.45	75	17.25	60	12	2.8	0.3

3 Selection

Metric

Natural gas at 15°C with 9.3 kWh/m³ (st) LHV, sg = 0.6¹⁾
 Combustion air: 15°C - 21% O₂, 50% humidity, sg = 1.0¹⁾
 Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.

Installations without fuel air ratio control custom light-off position capability will require increased pilot capacities and pressures.

All pressures are differential to the chamber unless indicated otherwise.

All metric inputs based upon net calorific values (LHV).

Size	Max. capacity	Min. capacity	Turn-down	Air flow			Light off				Flame characteristics	
	$\lambda=1.2$		$\lambda=1.2$	max. capacity	min. capacity	pilot lightoff	Advised pilot capacity	Pilot gas pressure	Advised direct spark capacity	Direct spark gas pressure	Length	Diameter
	(LHV)	(LHV)					(LHV)		(LHV)	Tap A-B		
	kW	kW		m ³ /h (st)	m ³ /h (st)	m ³ /h (st)	kW	mbar	kW	mbar	m	m

Heat density below 2930 kW/m²

3"	661	33.1	20:1	824	54	127	79	0.5	93	1	0.7	0.24
6"	2667	139	20:1	3314	204	510	213	1.7	317	0.75	1.7	0.6

Heat density above 2930 kW/m²

3"	661	66.1	10:1	824	94	127	79	0.5	93	1	0.7	0.24
6"	2667	240	10:1	3314	430	510	213	1.7	317	1	1.7	0.6

Size	Combustion air pressure			Main gas pressure				Minimum chamber pressure	
	inlet @ max capacity	max capacity	light off	Fuel inlet pressure	Fuel inlet orifice	Fuel pressure at burner	Staged fuel @ max capacity	high fire	low fire
	Tap E			Tap A	Tap A-B	Tap C	Tap D		
	mbar	mbar	mbar	mbar	mbar	mbar	mbar	mbar	mbar

Heat density below 2930 kW/m²

3"	75	70	1.2	174	31	144	31	N/A	N/A
6"	81	77	1	187	43	149	50	N/A	N/A

Heat density above 2930 kW/m²

3"	75	70	1.2	174	31	144	31	5	0.37
6"	81	77	1.4	187	43	149	30	7	0.75

¹⁾ sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft³ (st) (1.293 kg/Nm³))

²⁾ Installations without fuel air ratio control custom light-off position capability will require increased pilot capacities and pressures.

³⁾ Natural gas differential pressure at pilot burner gas inlet.

3 Selection

- 4) *Differential air pressure needed to the burner's combustion air inlet.*
- 5) *Minimum capacity requires not less than 0.25"WC (0.62 mbar) STP differential air pressure.*
- 6) *Above differential pressures are relative to combustion chamber static pressures. Chamber pressure must be measured from a chamber tap in the furnace (do not use taps on burner assembly).*

4 Project planning information

4.1 Maximum capacities

All KINEDIZER Staged LE burners can be fired at higher than maximum capacities if sufficient combustion air and fuel gas is provided to the burner. Maximum capacities of all sizes can be 20% higher.

4.2 Process back pressure

Standard KINEDIZER Staged LE burners can accept static back pressures between -40 and 40 "WC (-100 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.

4.3 Process temperature

The construction of the burner allows operation in all applications with process temperatures from ambient up to 2000°F (1100°C). Protect burner from high furnace temperatures during burner stop (purge to avoid back flow of hot furnace/process air). In low temperature air heating applications (less than 1400°F (760°C)), a user-supplied discharge sleeve is needed. Contact Honeywell Maxon for recommended discharge sleeve size and installation instructions.

4.4 Piloting and ignition

Direct ignition of KINEDIZER Staged LE burners is possible. In case the use of a pilot is preferred, the burner will be equipped with a raw gas pilot to ignite the main flame (using main burner combustion air). Pilots shall be used only for ig-

nition 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 ignitor. Optional ignition equipment for hazardous locations is available as well as high energy ignitors for direct ignition.

For both pilot and direct spark ignition a custom light-off position is required. The light-off position should be below the fuel and air curve so that after light-off the burner is modulated to a higher capacity than the light-off position.

4.5 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 seconds sparking in air).
- Open pilot gas and continue to spark the ignitor (typically 5 seconds).
- 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 seconds to prove stable pilot).
- Open main gas valves and allow enough time to have main gas in the burner (typical 5 seconds + time required to have main gas in the burner).
- Close the pilot gas valves.
- Release to modulation (allow modulation of the burner).

4 Project planning information

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

4.6 Ratio control

In order to achieve the best ratio control and emissions, Honeywell Smartlink, Slate, or similar Fuel Air Ratio Control systems should be utilized.

4.7 Flame supervision

KINEDIZER Staged LE flames shall be supervised by UV scanners. Three scanner positions are available. All 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 1.5 SCFM (2.5 m³/h) of fresh clean air).

4.8 Flame development

KINEDIZER Staged LE burners shall be installed in combustion chambers or furnaces that allow full development of the burner flame. Cylindrical combustion chambers shall have diameters of 1.5 to 2 times burner flame diameter (see page 6 (3.2 Typical burner data)). Consult Honeywell Maxon for proper combustion chamber layout.

4.9 Cross velocities

Cross velocities up to 3000 ft/min (15 m/s) can be allowed over the KINEDIZER Staged LE flame. Contact Honeywell Maxon for proper lay-out and correct emission information in case of cross velocity over the flame.

4.10 Combustion air control and piping

KINEDIZER Staged LE burners require combustion air control valves with high turndown (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 a way that the air flow to the burner will not disturb the flame.

4.11 Fuels

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

4.12 Expected emissions

Typical NO_x for KINEDIZER Staged LE burners firing natural gas with 20% excess air:

- cold furnaces (< 1382°F (750°C)): 55% of a conventional burner
- furnaces up to 1742°F (950 °C) : 45% 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 Honeywell Maxon for correct application information.

4.13 Low NO_x furnace requirements

Low NO_x operation requires properly designed combustion chamber or furnace. KINEDIZER Staged LE flames have a medium velocity and will be influenced by the atmosphere around the flame. Contact Honeywell Maxon for proper design.

4.14 Nozzle Removal

The nozzle assembly should be removed from the burner in the following sequence (only by a qualified technician):

- Disconnect burner fuel inlet connections.
- Remove spark ignitor.
- Back out x4 centering screws on the air housing by turning the nut with a wrench (note: do not back out centering screw with allen. This will change the location of the nut and nozzle will need recentered)
- Remove x4 bolts from staging line flange (Note: O-ring at the staging line flange interface with backplate)

- Remove x8 bolts from adapter plate.
- The nozzle assembly is now free and can be slide out of air housing.
- To return nozzle assembly, slide nozzle into air housing. (Note: if changing nozzle assemblies, or installing a new nozzle assembly, nozzle must be recentered by adjusting centering screws. Best practice is to remove burner from chamber to center nozzle in air housing. Contact Honeywell for details)
- Snug bolts on adapter plate.
- Run x4 centering screws down until the nut contacts air housing.
- Ensure staging line O-ring is installed and reconnect staging line with x4 staging line bolts.
- Tighten adapter plate bolts.
- Reconnect spark ignitor.
- Reconnect burner fuel inlet connections.
- Leak test fuel joints to ensure tightness.

4.15 CO and low NO_x operation

Low NO_x in combination with low CO is possible if sufficient dwell time is available after the flame. Mixing that occurs too fast with cold process air will increase CO.

4.16 Burner blocks

Standard KINEDIZER Staged LE burners will be shipped with block as shown on page page 17 (5.3 Dimensions). 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 installation instructions for detailed information.

4.17 Burner Staging

The Kinedizer Staged LE is equipped with a staging line and 8 staging risers. Burner staging pressures are differential and should be set using the adjustable orifice. The orifice should be set at start-up and locked after adjustment is made.

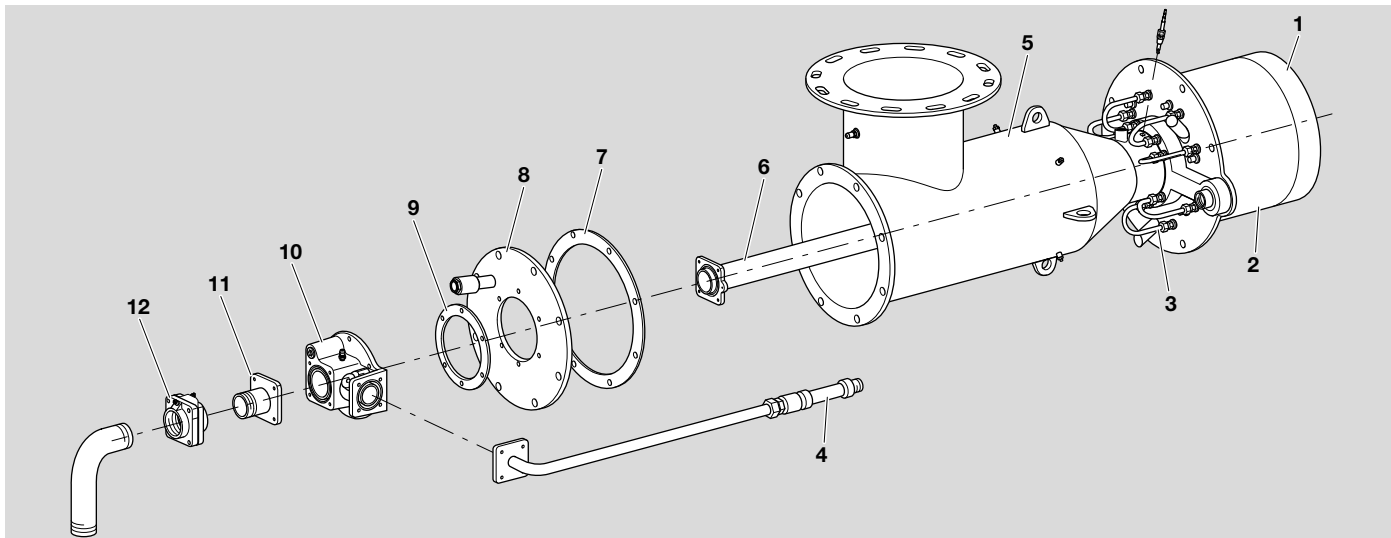
Staging risers should be inspected and leak tested annually.

4.18 Leak test

Leak test required on burner fuel inlet connection after installation.

5 Technical data

5.1 Materials of construction



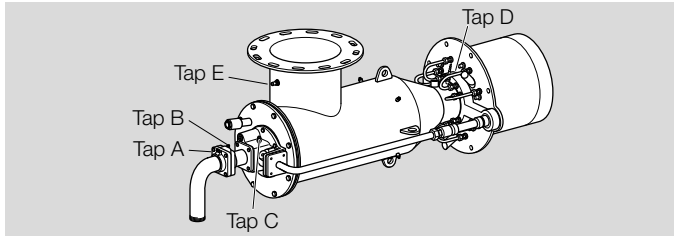
Item number	Burner part	Material
1	Refractory block	Refractory
2	Burner block sleeve (optional)	Refractory with 304SS
3	Staging risers	304SS
4	Staging line	304SS
5	Body assembly	Carbon Steel
6	Nozzle assembly	Carbon Steel/304SS/310SS
7	Body gasket	Rubber
8	Body mounting plate	Carbon Steel
9	Backplate gasket	Rubber
10	Backplate assembly	Carbon Steel

Item number	Burner part	Material
11	Backplate rotational inlet	Carbon Steel
12	OMG gas orifice	Carbon Steel/Fiber/Brass

5.2 Performance graphs

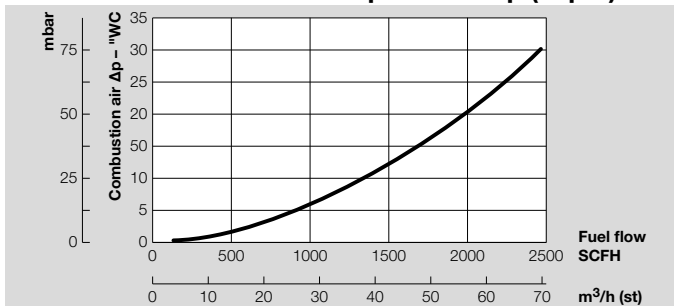
Emissions from the burner are influenced by:

- Fuel type
- Combustion air temperature
- Firing rate
- Chamber conditions
- Percent of excess air

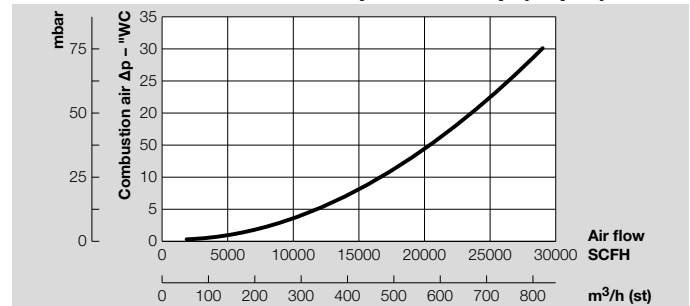


5.2.1 030 KDZERLES

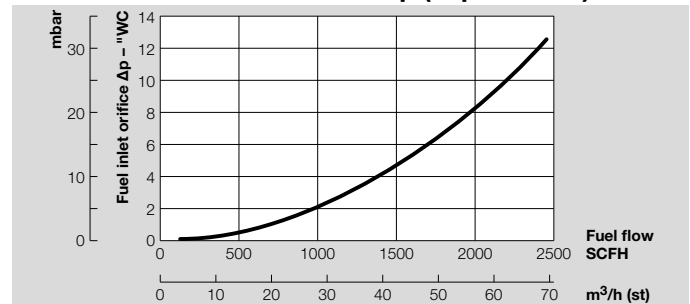
Fuel flow vs. combustion air pressure Δp (Tap E)



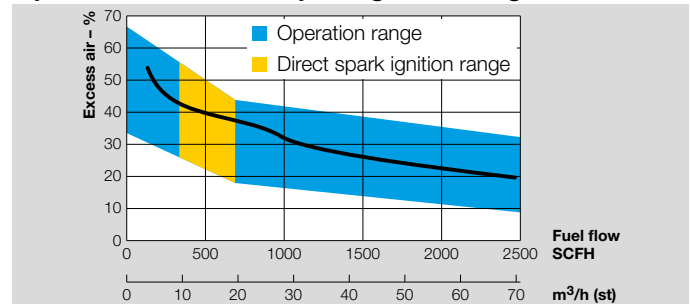
Combustion air flow vs. air pressure Δp (Tap E)



Fuel flow vs. fuel inlet orifice Δp (Tap A and B)

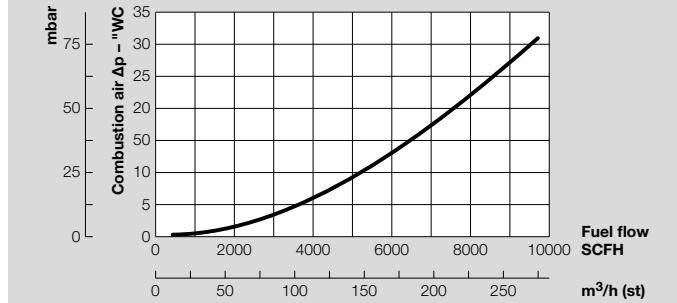


Operation and direct spark ignition range

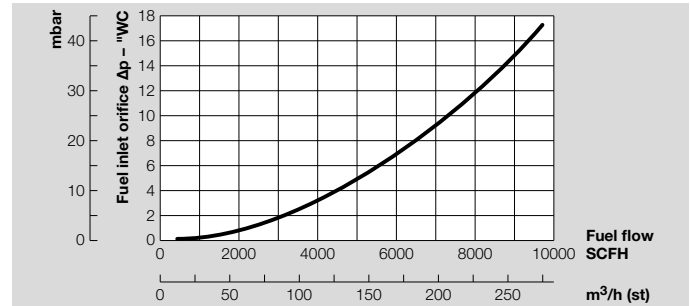


5.2.2 060 KDZERLES

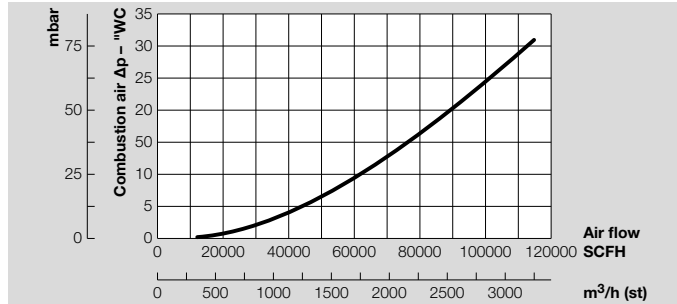
Fuel flow vs. combustion air pressure Δp (Tap E)



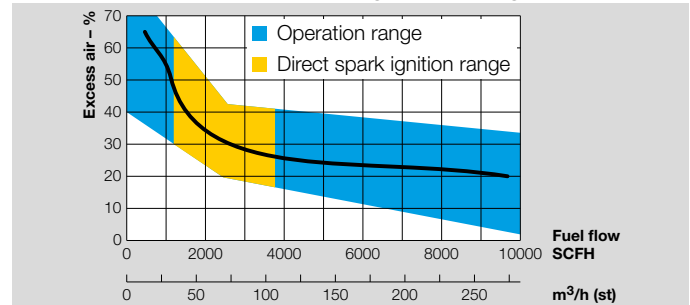
Fuel flow vs. fuel inlet orifice Δp (Tap A and B)



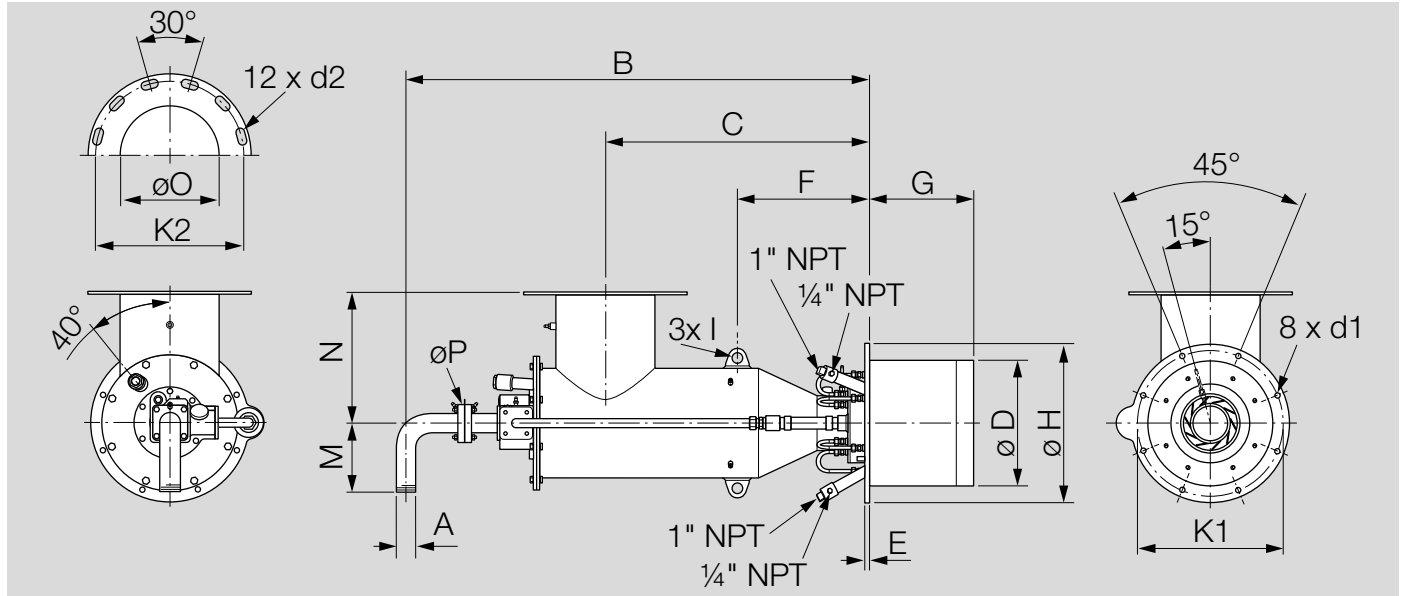
Combustion air flow vs. air pressure Δp (Tap E)



Operation and direct spark ignition range



5.3 Dimensions



Imperial

Size	A	B	C	Ø D	E	F	Size G	Ø H	I	K1	Ø d1	K2	Ø d2	M	N	Ø O	Ø P	Weight	
"NPT"	inch																		lbs
3"	1 1/4	33.20	15.25	10.42	0.5	8.79	9.47	14.15	0.75	12.52	0.625	9.5	0.875	6.88	7.25	5.26	0.735	125	
6"	2	53.71	30.59	15.56	0.5	15.34	12.11	18.45	1.25	16.82	0.625	17	1	8	15.25	11	1.375	431	

Metric

Size	A	B	C	Ø D	E	F	Size G	Ø H	I	K1	Ø d1	K2	Ø d2	M	N	Ø O	Ø P	Weight	
"NPT"	mm																		kg
3"	1 1/4	843	387	265	13	223	241	359	19	318	16	241	22	175	184	134	19	57	
6"	2	1364	777	396	13	390	308	469	32	427	16	432	25	203	387	279	35	195	

6 Converting units

See www.adlatus.org

For more information

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

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