

## Specifications of "HC" AIRFLO® burners

Typical burner data						
Fuel : natural gas with 10.9 kWh/Nm <sup>3</sup> HHV - sg = 0.6 [1]						
Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality						
Application		Boiler firing		Process firing		
		TEG-firing [2]	AUX-firing [3]	High temp. (T <sub>in</sub> > 100° C)	Low temp. (T <sub>in</sub> < 100° C)	
Nominal capacity per ft	[4][8]	kW HHV	1500	1500	1500	1500
Min. capacity per ft	[8]	kW HHV	200	200	200	150
Upstream temperature	Max.	°C	600	40	600	100
	Min.	°C	N/A	-30	-30	-30
Max. downstream temperature	[5]	°C	950	750 [5]	950	950
Process air local differential pressure		mbar	0.4 - 1.5	0.4 - 0.6	0.3 - 1.5	0.4 - 2
Air factor			N/A	3.5	3.5	3.5
Nat. gas pressure @ burner inlet	[6]					
Nat. gas pressure @ nominal capacity		bar(g)	1 - 1.3	1 - 1.3	1 - 1.3	1 - 1.3
Nat. gas pressure @ min. capacity		mbar(g)	16	16	16	9
Flame length at 50 % capacity or up	[7]	m	3.5 ... 5	2.5 ... 4.5	3.5 ... 5	2.5 ... 4.5
Flame width at 50 % capacity or up		m	0.5	0.5	0.5	0.5
Burner displacement		cm <sup>2</sup> /ft	1197			

[1] sg (specific gravity) = relative density to air (density air = 1,293 kg/Nm<sup>3</sup>).

[2] TEG = turbine exhaust Gas

[3] AUX = Auxiliary firing

[4] Maximum capacity will depend on application boundary conditions such as acceptable flame length, required emissions, available oxygen, up/downstream temperatures, duct lay-out, process air differential pressure, ...). Therefore, the actual maximum capacity might be lower than 1500 kW per foot or could be up to and even above 2500 kW per foot in specific applications.

[5] Limitation on downstream temperature from 950° C down to 750° C is due to possible risk of higher NO<sub>x</sub> emissions when this limit is crossed.

[6] The stated pressures are valid for burner sizes up to 4 ft. For larger burners, the gas inlet pressures will be higher. Refer to graph below for correct gas pressures. Stated pressures are measured at burner gas inlet tube.

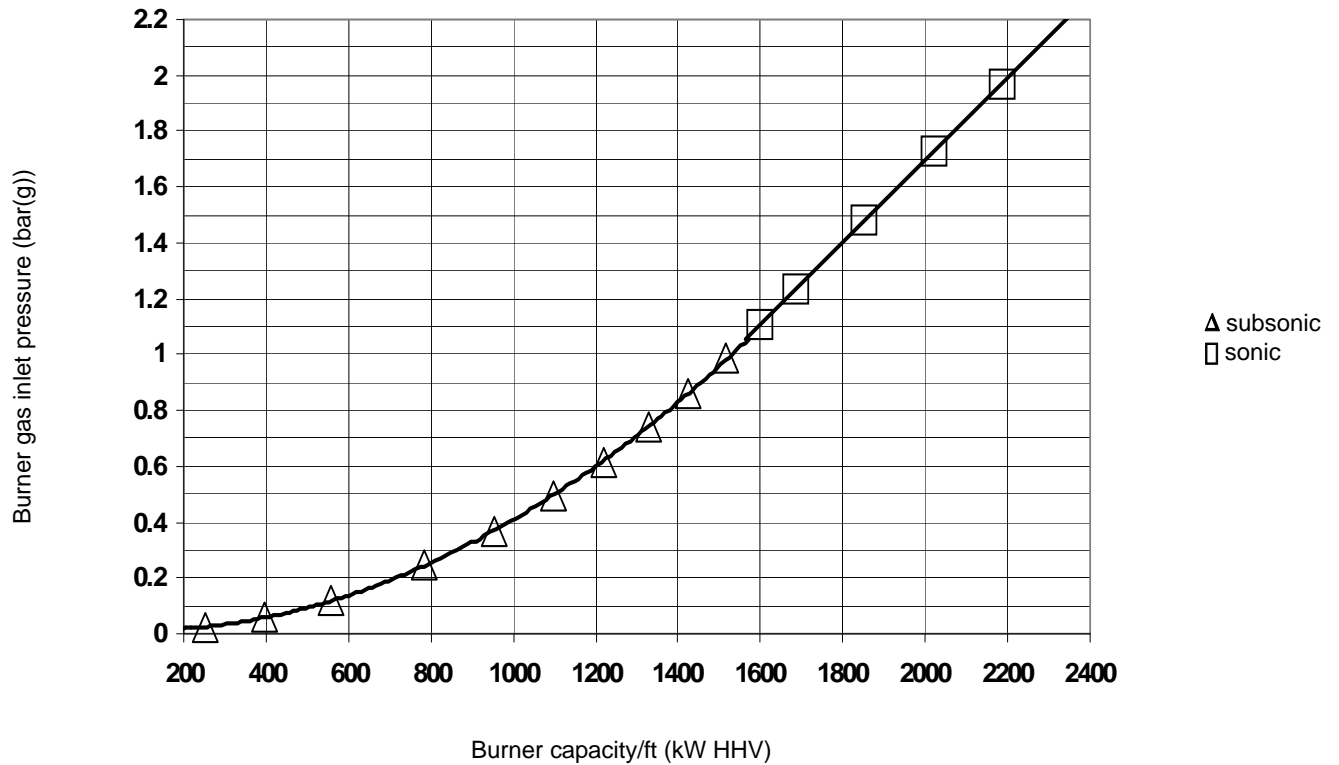
[7] Flame length is only given as a guideline. Actual flame length depends on a number of parameters such as process air oxygen level, process air pressure drop across burner (contact MAXON for specific information).

[8] 1 ft = 305 mm.

### Required gas fuel pressures at different burner capacities

Because of the high fuel outlet pressures, the fuel flow will be subsonic at the lower burner capacity range and sonic for higher capacities. The effect of this phenomenon can be seen on the graph below. At low capacities the differential pressure versus capacity relationship is quadratic. When burner capacities are increased and exceed 1500 kW per foot, this relationship is linear.

Fuel differential pressures in bar(g) (natural gas with 10.9 kWh/Nm<sup>3</sup> HHV - sg = 0.6) related to the required burner capacity (kW) per foot of burner.

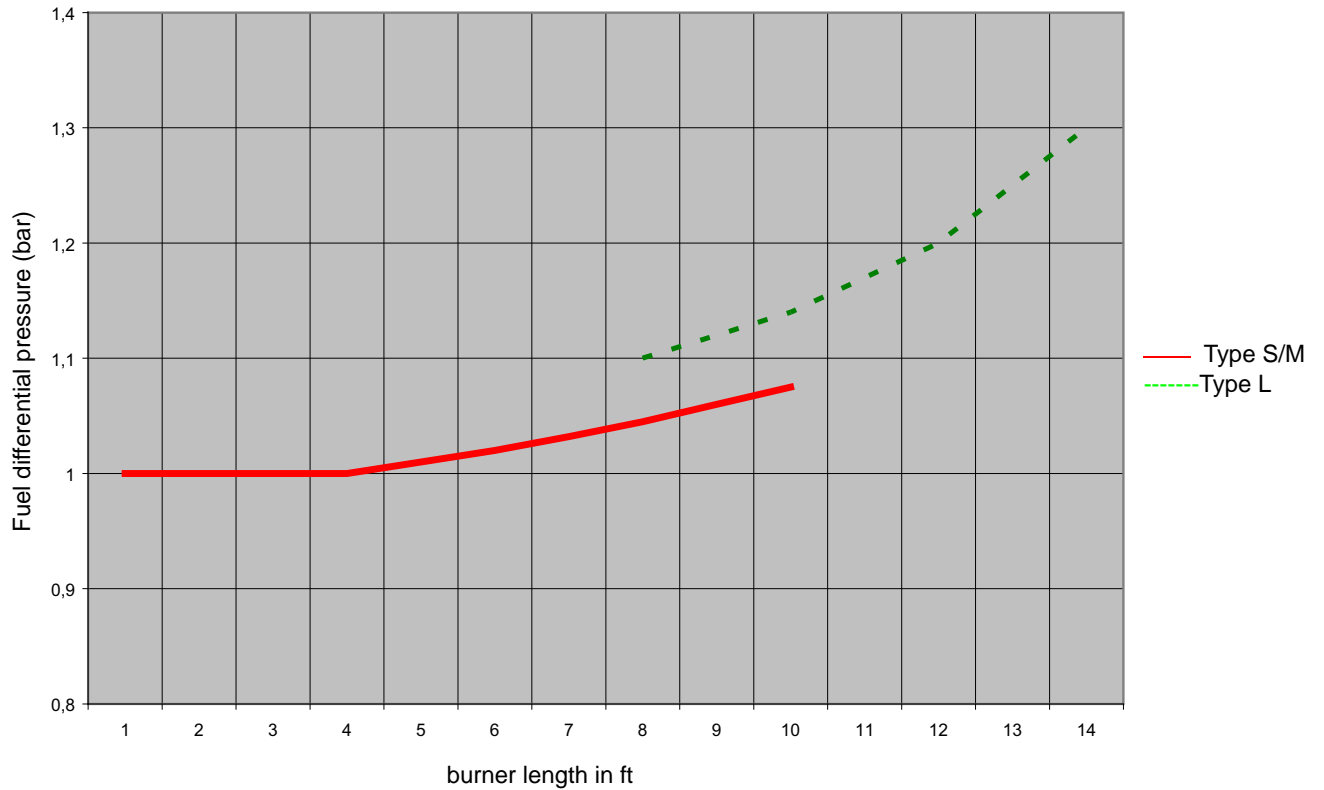


Above graph is only valid for burner sizes equal or smaller than 4 ft.  
Longer burners will need higher fuel pressures. See graph on the next page.

**Influence of burner size on required fuel inlet pressure**

Due to increasing pressure losses in burner manifold for longer burner, the required fuel inlet pressure will increase. Check below graph for correct fuel inlet pressure. For type L burners the required inlet pressures are higher because of additional pressure losses in gas flexibles.

Fuel differential pressures in bar(g) (natural gas with 10.9 kWh/Nm<sup>3</sup> HHV - sg = 0.6) required for nominal capacity of 1500 kW per foot (HHV) in relation with burner length in ft (1 ft = 305 mm).

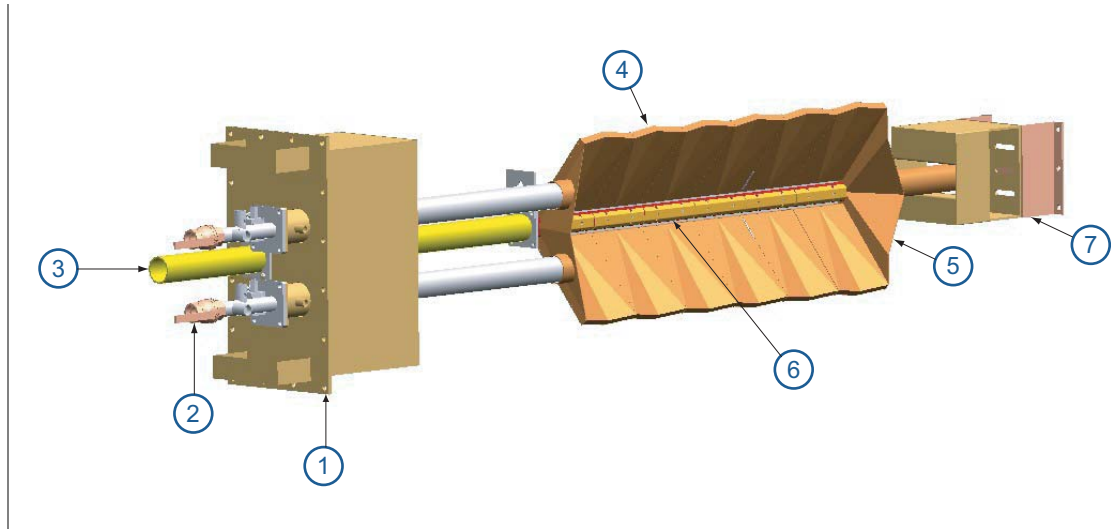


## Materials of construction

The complete "HC" AIRFLO® burner assembly, including the LVDT/HC pilots, consists of high grade stainless steel components exclusively.

The light weight flexible construction without the use of thick castings makes the burner very suitable to handle thermal stress due to fluctuating temperatures (for example change over from gas turbine to fresh air operation), while maintaining its mechanical durability.

- 1) Mounting plug
- 2) LVDT/HC pilot burner
- 3) Gas inlet
- 4) Mixing plates
- 5) End plates
- 6) Deflector plates
- 7) Mounting support



N°	DESCRIPTION	MATERIAL
1	Mounting plug	AISI304 (1.4301)
2	LVDT/HC pilot burner	AISI304 (1.4301)
3	Gas inlet	AISI304 (1.4301)
4	Mixing plates	Hastelloy X (2.4613)
5	End plates	Hastelloy X (2.4613)
6	Deflector plates	Hastelloy X (2.4613)
7	Mounting support	AISI304 (1.4301)

## Selection criteria

### Application details

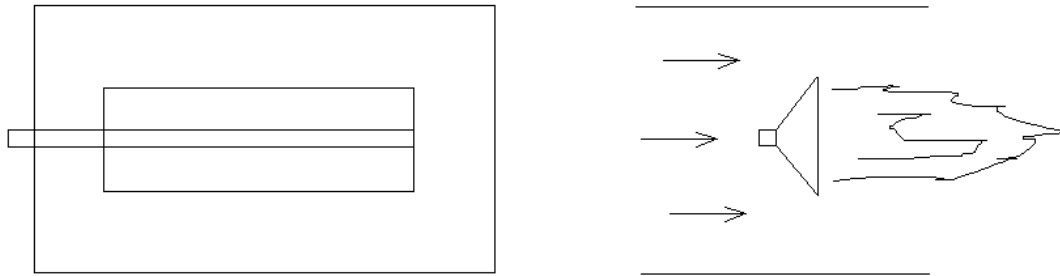
The "HC" AIRFLO® burner has been designed to provide high output capacities per foot of burner length. The recirculating flame pattern provides low emission combustion in fresh air and low oxygen process air firing. Typical applications are turbine exhaust gas reheating, start-up burners for fluidized bed combustion, large incinerators and processes with low oxygen recirculating air heating.

### Process air local differential pressure

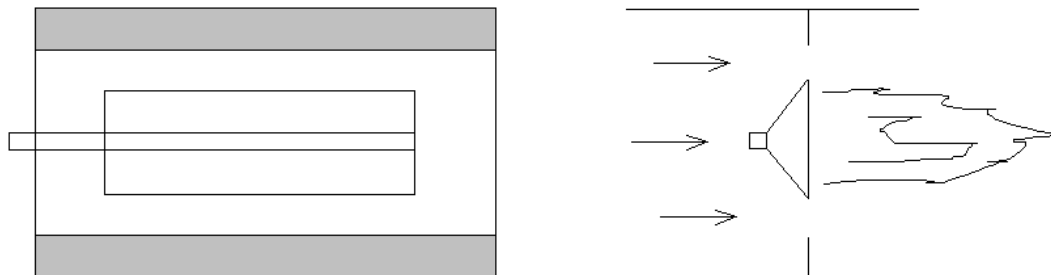
"HC" AIRFLO® burners are designed to operate at a low local process air differential pressure between 0.3 mbar and 2 mbar across the burner. (refer to table page 4-22.2-8. for optimal values depending on the application). The local process air differential pressure is the difference between the static pressures measured just upstream and downstream of the burner. The remaining process air pressure loss across the burner will always be much lower than this local differential pressure. A minimum local differential pressure across the burner is required for good burner performance.

To create this pressure drop at a given process air flow, it could be necessary depending on the installation, to install profile plates around the burners. In case these profile plates are required, MAXON can provide them to be installed in the process air duct.

#### "HC" AIRFLO® burner in duct WITHOUT profile plate



#### "HC" AIRFLO® burner in duct WITH profile plate

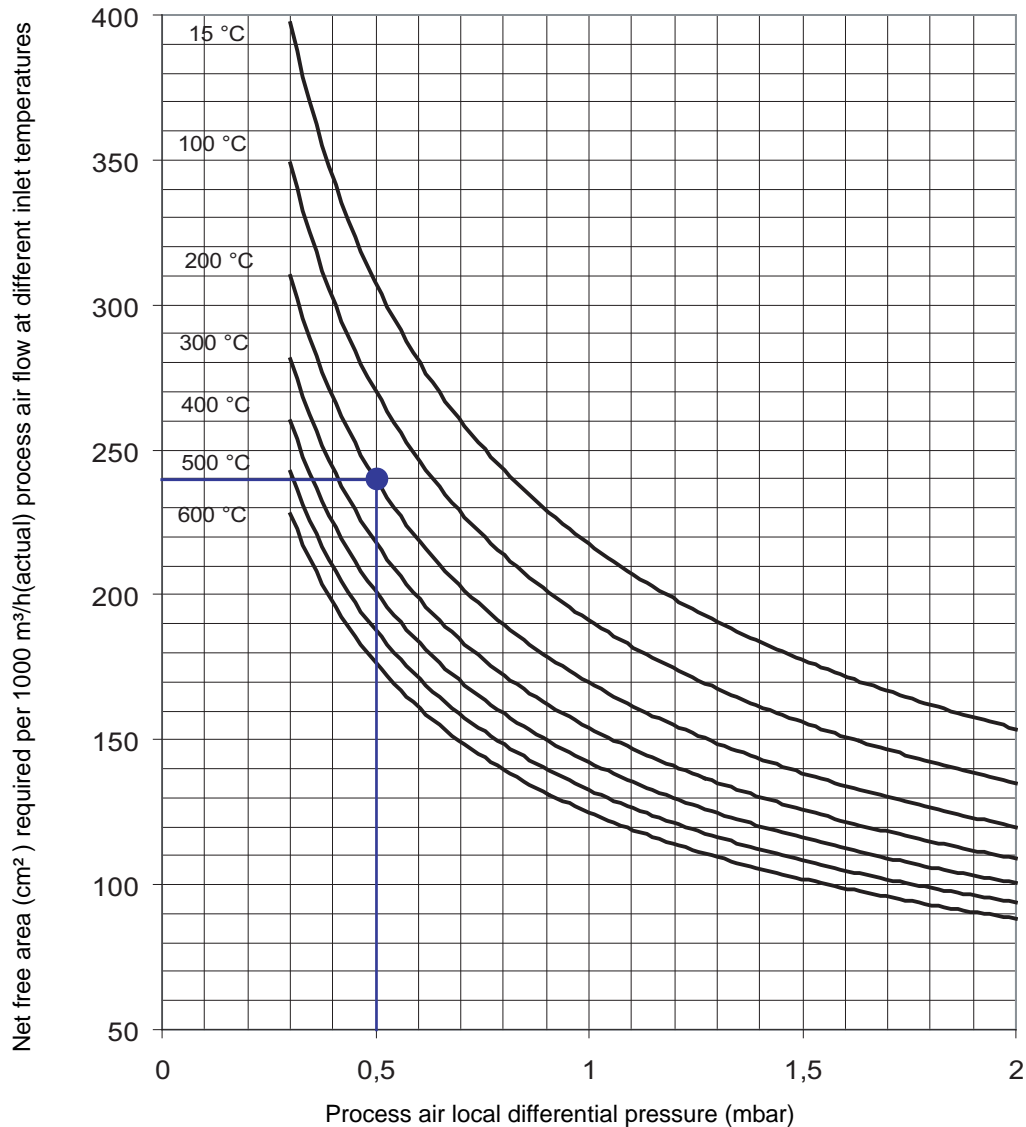


For process air differential pressure drop calculation, use the graphs on the next pages to define the net free area required around the burner. Note that the burner itself creates a displacement area of 1197 cm<sup>2</sup> per foot.

## Process air local differential pressure drop – ducts without profile plate

The differential pressure depends on air mass flow (actual air flow and air temperature) and the geometry of duct and profile.

Use graph on this page for duct sizing in case no profile plate around the burner is used to get an indication of local differential pressures. Contact MAXON for detailed information.



### Calculation example

Preheated air, 30.000 m<sup>3</sup>/h (actual) at 200° C inlet temperature to be heated with 2 ft "HC" AIRFLO® burner

Determine the process air local differential pressure drop across the burner in a duct section of 1200 mm x 800 mm

Duct section = 120 cm x 80 cm = 9.600 cm<sup>2</sup>

Burner displacement = 2 x 1197 cm<sup>2</sup> = 2.394 cm<sup>2</sup>

The net free area around the burner = 9.600 cm<sup>2</sup> – 2.394 cm<sup>2</sup> = 7.206 cm<sup>2</sup>

The net free area per 1000 m<sup>3</sup>/h process air = 7.206 cm<sup>2</sup>/30 = 240 cm<sup>2</sup>

From above graph it reads for 240 cm<sup>2</sup> and 200° C → 0.5 mbar

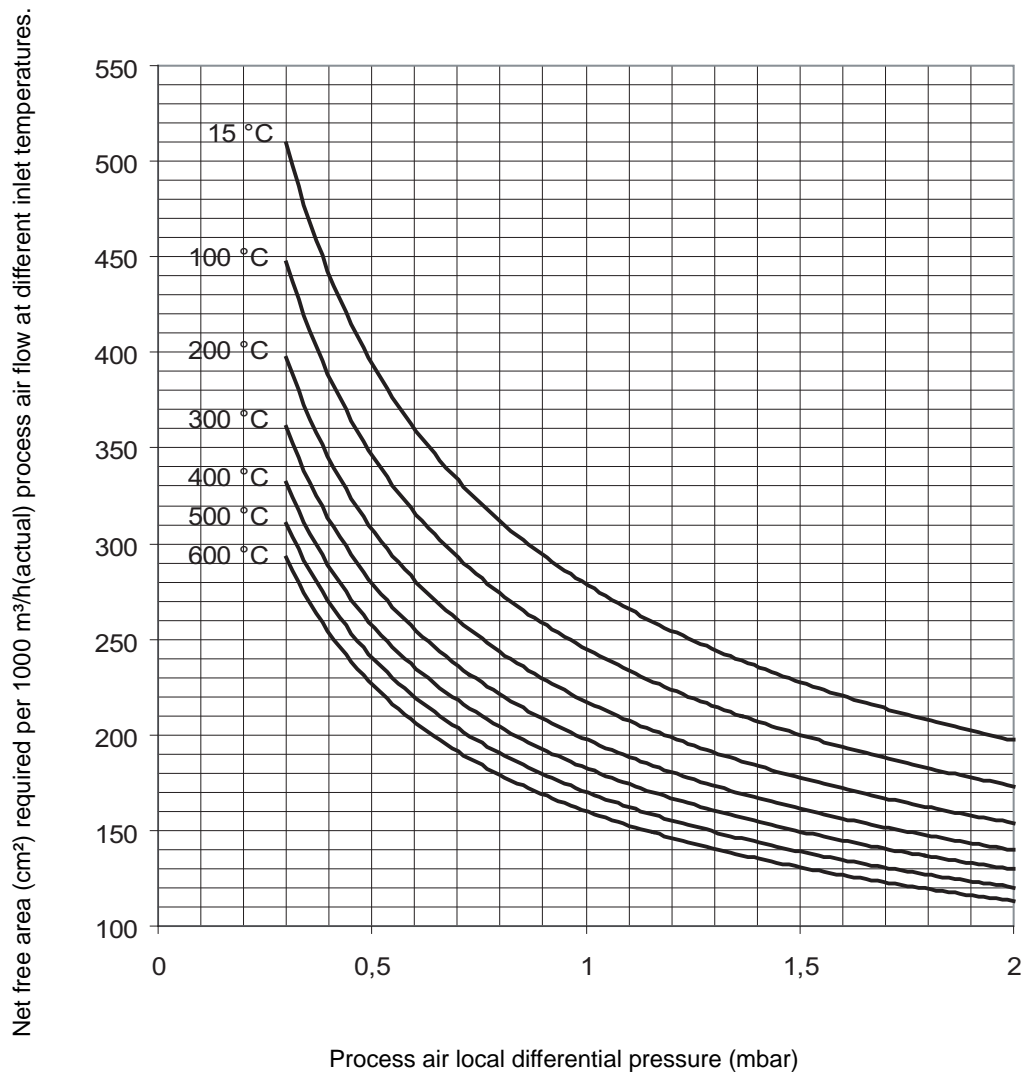
Referring to table page 4-22.2-8 it states that for high temperature process firing the process air differential pressure should be 0.3 mbar – 1.5 mbar. So the given conditions in the example are acceptable.

## Process air pressure drop – with profiling

Use graph on this page for duct sizing in case a profile around the burner is used.

The data is based on a duct/profile geometry with resulting contraction factor ( $K = 0.78$ ).

Contact MAXON for detailed information.



### Calculation example

Fresh air, 50.000 m<sup>3</sup>/h (actual) at 15° C inlet temperature to be heated with 3 ft "HC" AIRFLO® burner

Determine profile plate opening area to obtain a process air local pressure differential of 1.5 mbar

From graph above it reads for 1.5 mbar and 15° C : 230 cm<sup>2</sup> net free area per 1000 m<sup>3</sup> actual airflow

For 50.000 m<sup>3</sup>/h this gives :  $50 \times 230 = 11.500 \text{ cm}^2$  net free area around the burner

Burner displacement =  $3 \times 1197 \text{ cm}^2 = 3591 \text{ cm}^2$

Profile opening = net free area around the burner + burner displacement

$$11.500 + 3591 = 15.091 \text{ cm}^2$$

## Process air oxygen content

"HC" AIRFLO® burners are capable to fire in process air streams with far reduced oxygen levels, without the need to add additional combustion air. The required oxygen for combustion is simply extracted from the reduced oxygen process stream.

The "flammability" of "HC" AIRFLO® burners in a given process stream depends on several variables, such as:

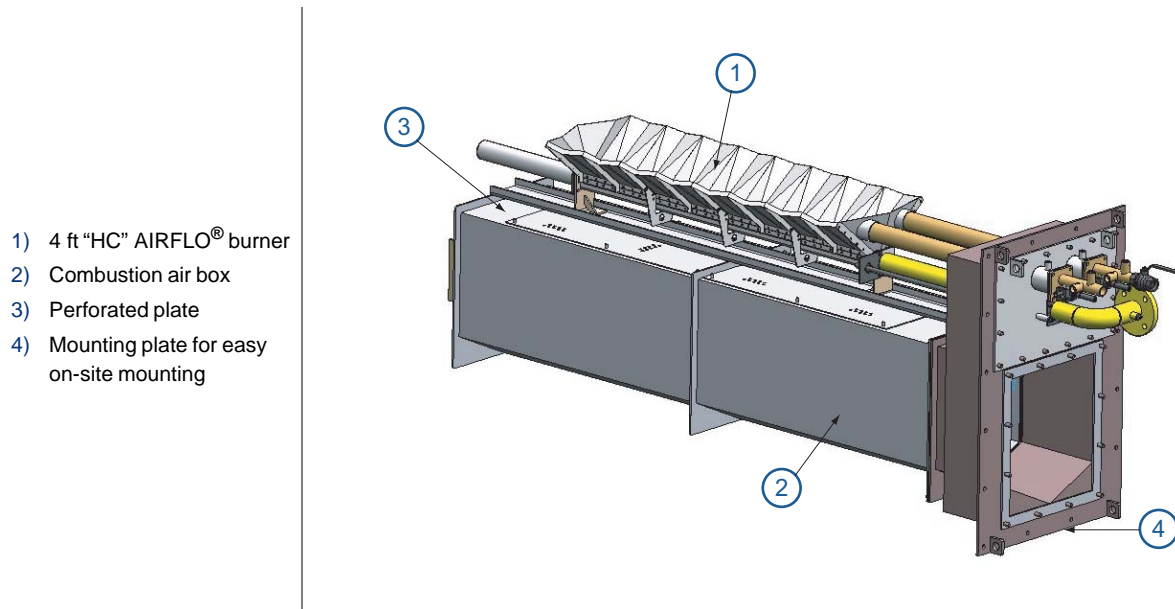
- upstream process temperature and oxygen level
- amount of water in the process stream (cfr water injection on gasturbine)
- local process differential pressure across the burner
- burner size

Contact MAXON for detailed information on flammability of "HC" AIRFLO® burners.

Outside the flammability limits, MAXON offers an elegant and simple solution to introduce extra combustion air by means of an air box located immediately upstream of the "HC" AIRFLO® burner.

Contact MAXON for more information.

**Example of a "HC" AIRFLO® burner unit, complete with combustion air box for process air streams having extremely low oxygen content.**



- 1) 4 ft "HC" AIRFLO® burner
- 2) Combustion air box
- 3) Perforated plate
- 4) Mounting plate for easy on-site mounting

## Process back pressure

The "HC" AIRFLO® is designed to be used for maximum back pressures of 100 mbar (over- and under pressure). For applications where this range is not sufficient, please contact MAXON for reinforced burner design availability.

## Burner capacity control

The "HC" AIRFLO® is only controlled by altering the gas flow by means of a gas control valve. Since the gas control valve outlet pressures are high (typically around 1.5 – 2.5 bar at maximum capacity), MAXON advises the use of precise and heavy duty control valves such as the MAXON SMARTLINK CV control valve.

Apart from their excellent control capabilities, these control valves have the ability of reducing high fuel pressures (typically 4 bar) directly to the desired burner inlet pressure, thus eliminating the necessity of a pressure regulator.



The "HC" AIRFLO® is designed to operate on a process air stream which is independent of the burner capacity. Process air flow should not be controlled as a function of burner capacity but kept at a constant rate.



## Piloting and ignition

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Direct ignition of "HC" AIRFLO® burners is not possible.

All "HC" AIRFLO® burners will be standard equipped with two LVDT-HC PILOT BURNERS. (refer to catalog section 4-22.4 for details on this pilot burner). Note that one LVDT-HC PILOT BURNER can only carry one UV-scanner. Therefore, the standard "HC" AIRFLO® with double pilot allows for easy mounting of two UV-scanners on one burner when redundant or 1-out-of-2 detection is requested. If only one pilot is needed, the second one will have its connections plugged. Its UV-scanner port will be used as a view port and the spark ignitor will be left in the pilot burner and shall be used as a spare.

## Typical ignition sequence

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1. Pre-purge of combustion chamber, according to the applicable codes and the installation's requirements.
2. Pre-ignition (typically 2 s sparking in air).
3. Open pilot gas and continue to spark the igniter (typically 5 to 10s depending on local code requirement).
4. Stop sparking, continue to power the pilot gas valves and start flame check. Trip burner if no flame from here on.
5. Check pilot flame stability (typically 5 to 10 s to prove stable pilot).
6. Open main gas valves and allow enough time to have main gas in the burner (typically 5 s + time required to have main gas in the burner).
7. Close the pilot valves.
8. 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).

One pilot gas valve should be positioned as close as possible to the pilot burner gas inlet for fast ignition of the pilot burner.

## Flame supervision

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The flame of a "HC" AIRFLO® burner shall be supervised by a flame scanner. Scanners will be mounted on the 1" ball valve scanner connection of the included LVDT/HC pilot burner, which is the only correct position for safe supervision of both the pilot flame and main flame.

It is not possible to distinguish pilot and main flame. The "HC" AIRFLO® is designed to operate with interrupted pilot. If continuous pilot is preferred, a special continuous LVDT-HC pilot version can be used as well.



All "HC" AIRFLO® burners have standard two pilot burners installed. In most applications only one pilot burner will be connected. The second pilot burner will be used as extra view port and spare spark igniter holder. In some applications both pilot burners can be connected and can function parallel. See catalog section 4-22.4 for full details on LVDT/HC pilot burners.

## Flame development and duct lay-out

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The flame of "HC" AIRFLO® burners is influenced by process air differential pressure across the burner, the oxygen level and temperature of the upstream process air, burner capacity, fuel gas, duct geometry. An approximate flame length can be found in table page 4-22.2-8. Because of the high radiant flames, special care should be taken when designing burner ducts. The distance between flame and steel sheeting on internal duct wall should be at least 500 mm. When burner is mounted in an internally insulated duct without cladding, minimum 200 mm between flame and duct wall should be respected. Contact MAXON for detailed information on your particular installation.



When multiple burner rows are mounted in duct, the distance between two burner rows should be at least 1000 mm. This is to avoid the effect of flame interaction.

## Fuels

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Standard "HC" AIRFLO® burners can fire on natural gas, hydrogen and any mixture of both. Special adapted "HC" AIRFLO® burners are available for firing on low calorific gas, LPG, propane, butane and refinery gases. These special adapted burners have different specifications than the standard burners. Contact MAXON for available burner lengths, flammability and fuel pressures whenever one of these fuels is selected.

## Expected Emissions

The production of pollutants can be highly dependant upon burner application and installation. Differing temperatures, process velocities, oxygen levels, fuels and other process related factors such as unequal process air distribution can all influence the actual level of emissions produced.

Contact MAXON for evaluation of expected emissions on your typical application.

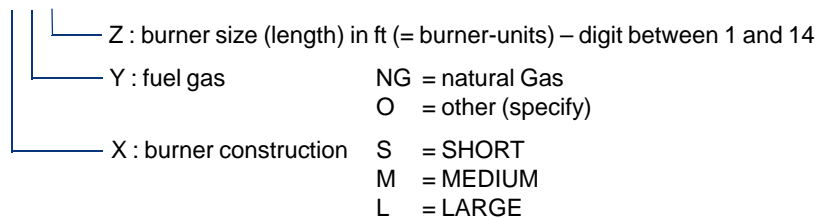
## Available burner types

For selecting the correct burner for the required capacity, different burners are available between 1 ft and 14 ft in steps of 0.5 ft.

The "HC" AIRFLO® burners are available in 3 basic versions depending on burner length :

- "HC" AIRFLO® type S burners : short sizes – 1 ft to 7.5 ft
- "HC" AIRFLO® type M burners : medium sizes – 4 ft to 10 ft
- "HC" AIRFLO® type L burners : large sizes – 8 ft to 14 ft

Type description : HC-X-Y-Z

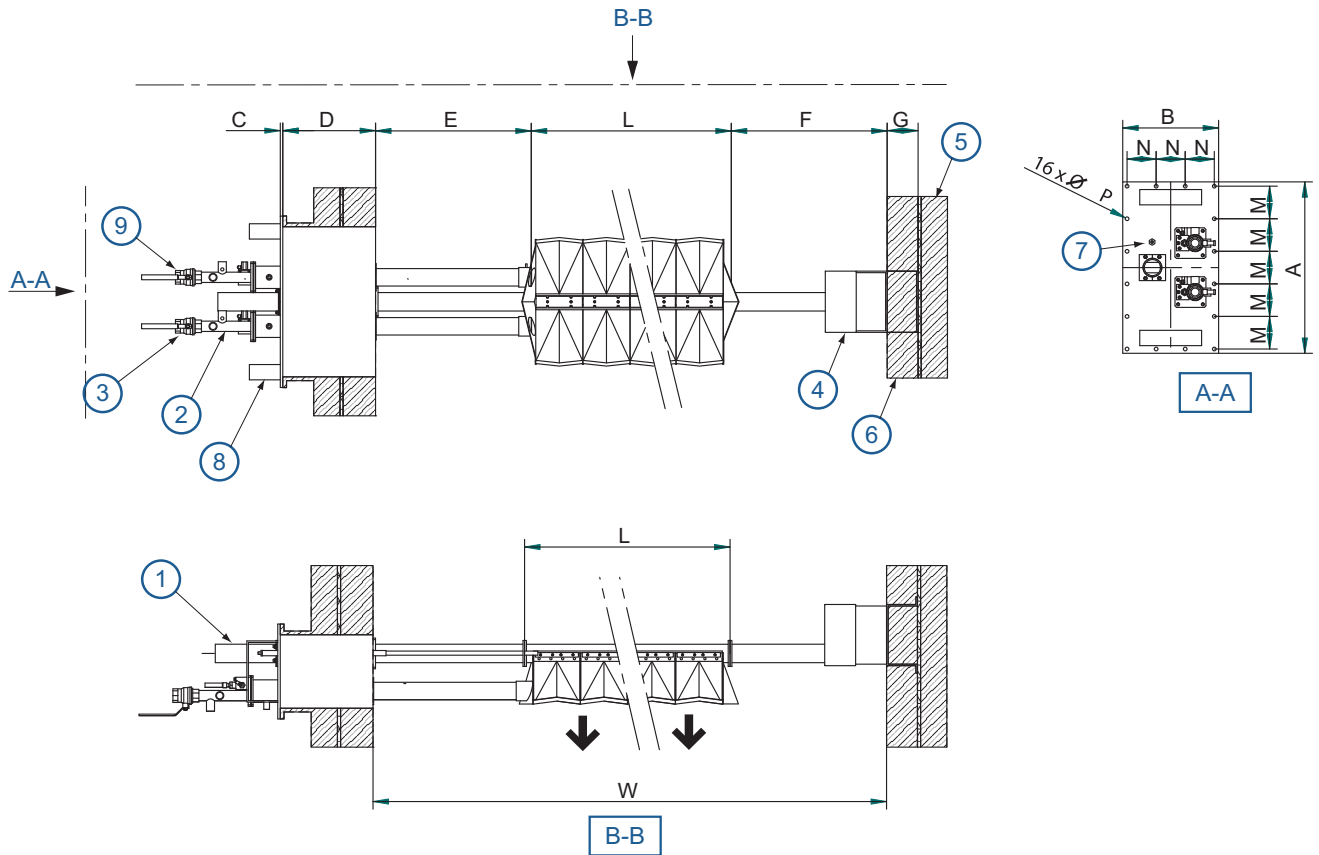


Difference between S, M & L types is because of larger thermal expansion effects on larger burners, requiring special mounting constructions. Since the total duct width is an important factor in selecting the correct burner type, there is some overlapping in the different sizes for some of the burner lengths (see table below).

Type	Maximum duct width (mm)		
	Standard material inlet t° < 550° C	Standard material inlet t° < 600° C	High grade material inlet t° < 650° C
HC-S 1 ... 7.5	4000	4000	N/A
HC-M 4 ... 9.5	8000	6000	8000
HC-L 8 ... 14	8000	6000	8000

## Dimensions and weights

Drawing of "HC" AIRFLO® type S (size 1 ft – 7.5 ft)



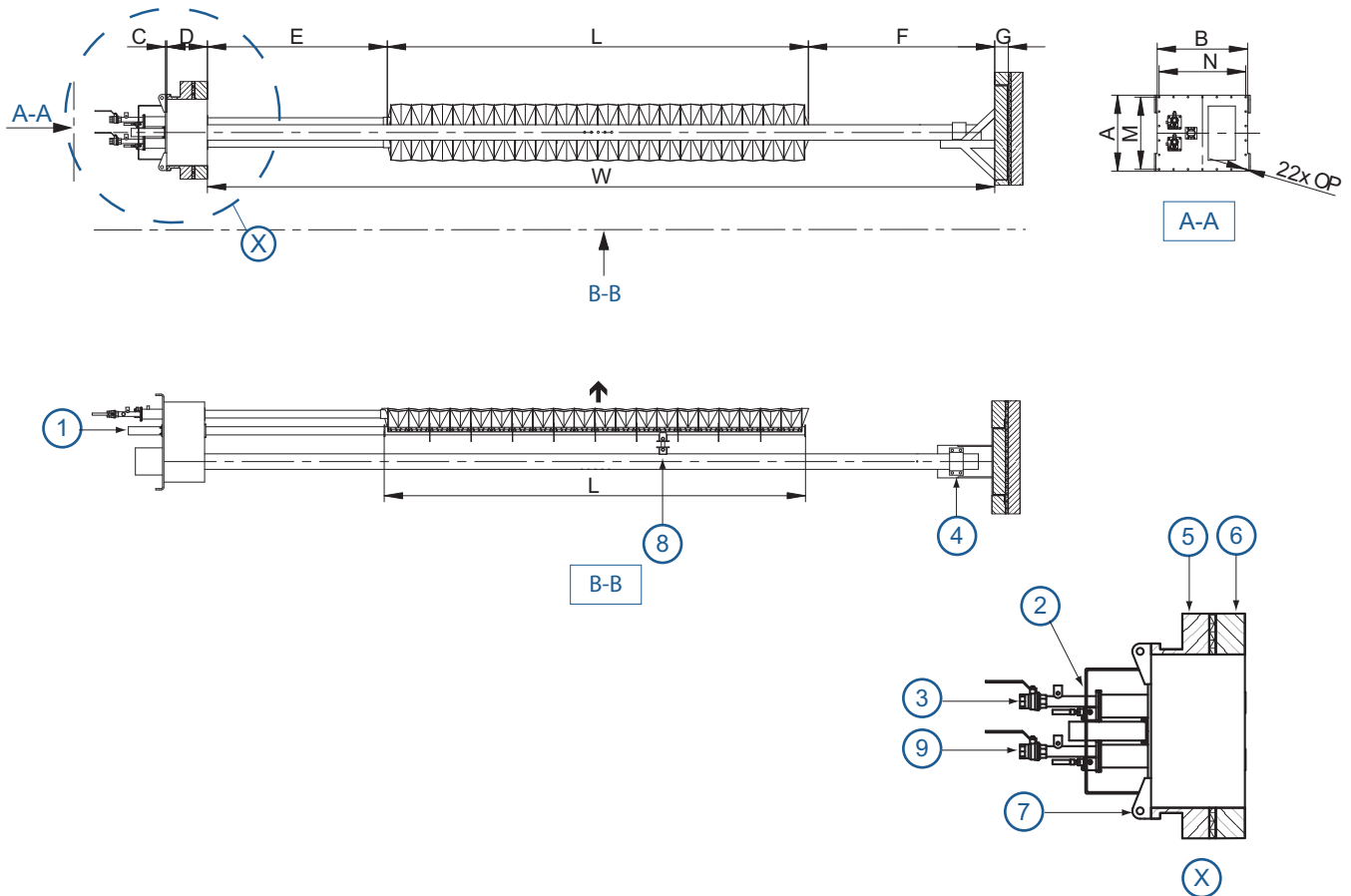
- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1) Gas connection 2"</li> <li>2) Pilot burner</li> <li>3) UV-scanner connection 1"</li> <li>4) Internal mounting support</li> <li>5) External duct insulation</li> </ul> | <ul style="list-style-type: none"> <li>6) Internal duct insulation</li> <li>7) Upstream process air test connection</li> <li>8) Mounting plug</li> <li>9) Alternative UV-scanner</li> <li>10) Connection or view port</li> </ul> |
|---|--|

Dimensions in mm unless stated otherwise											
A	B	C	D	E (min.) [1]	F (min.) [1]	G (min.)	L	M	N	ØP	W (max.)
560	310	8	200 (min) to 600 (max)	200	300	100	see table below	106.4	94	12	4000
			default = 300			default = 100					

[1] Valid when duct has internal insulation (without cladding). In case of sheet metal wall, E and F should be at least 500 mm

L (burner length) in mm & weight in kg														
Burner size	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5
L	358	510	622	815	967	1120	1272	1425	1577	1729	1882	2034	2186	2338
weight	71	73	75	78	81	83	85	88	91	93	95	98	101	103

Drawing of "HC" AIRFLO® type M (size 4 ft – 10 ft)



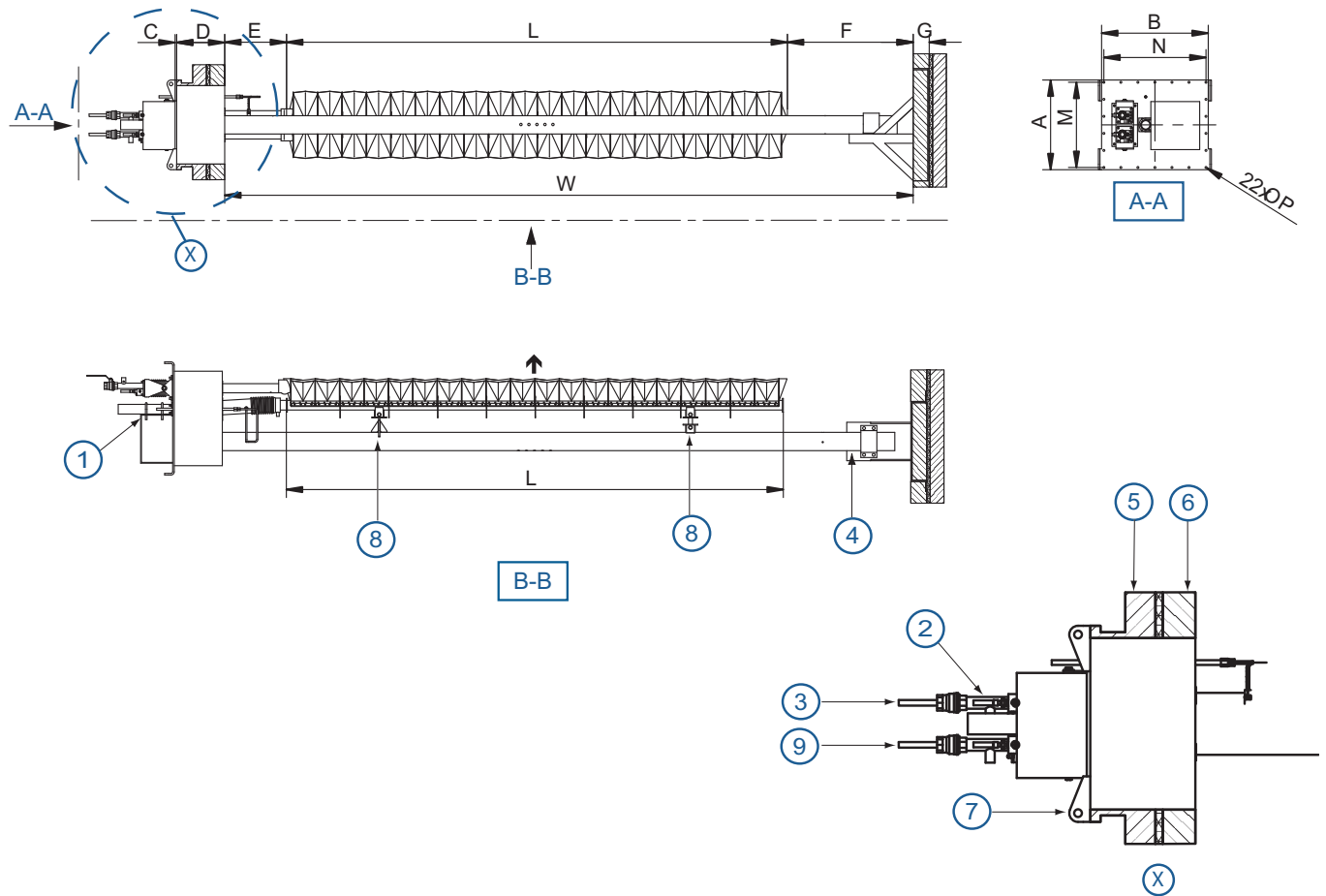
- |                              |  |
|------------------------------|--|
| 1) Gas connection 2"         | 6) Internal duct insulation                        |
| 2) Pilot burner              | 7) Mounting plug                                   |
| 3) UV-scanner connection 1"  | 8) Burner support hinge to allow thermal expansion |
| 4) Internal mounting support | 9) Alternative UV-scanner connection or view port  |
| 5) External duct insulation  |  |

Dimensions in mm unless stated otherwise											
A	B	C	D	E (min.) [1]	F (min.) [1]	G (min.)	L	M	N	ØP	W (max.)
560	666	10	200 (min) to 600 (max) default = 300	200	400	100 default = 100	see table below	532 (5x106.4)	638 (6x106.3)	12	8000

[1] valid when duct has internal insulation. In case of sheet metal wall, E and F should be at least 500 mm

L (burner length) in mm & weight in kg													
Burner size	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
L	1272	1425	1577	1729	1882	2034	2186	2339	2492	2644	2797	2949	3102
weight	204	208	211	215	218	222	225	229	232	236	239	243	246

Drawing of "HC" AIRFLO® type L (size 8 ft – 14 ft)



- 1) Gas connection 2"
- 2) Pilot burner
- 3) UV-scanner connection 1"
- 4) Internal mounting support
- 5) External duct insulation
- 6) Internal duct insulation
- 7) Mounting plug
- 8) Burner support hinge to allow thermal expansion
- 9) Alternative UV-scanner connection or view port

Dimensions in mm unless stated otherwise											
A	B	C	D	E (min.) [1]	F (min.) [1]	G (min.)	L	M	N	ØP	W (max.)
560	666	10	200 (min) to 600(max) default = 300	700 - D	400	100 default = 100	see table below	532 (5x106.4)	638 (6x106.3)	12	8000

[1] Valid when duct has internal insulation. In case of sheet metal wall, E and F should be at least 500 mm

L (burner length) in mm & weight in kg													
Burner size	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14
L	2492	2644	2797	2492	3102	3255	3408	3561	3714	3867	4020	4173	4326
weight	263	265	268	271	274	277	281	284	288	292	296	301	306

## Installation and operating instructions

### Application requirements

#### View port

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A view port to inspect burner flame is essential to inspect flame aspect. It is recommended to install the view port downstream of the flame, such that the entire burner front can be observed, as well as the pilot flame.



The burner's incorporated view port on the alternative UV-scanner connection only allows observation of flame presence but is not suitable to evaluate burner flame aspect. One or more separate view ports on the duct are always necessary.

#### Required ancillary equipment

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Ensure that all required ancillary equipment for safe operation and correct performance of the "HC" AIRFLO® burner is installed, as described in the applicable local codes and/or process-related instructions.

#### Position of the burner in the process flow

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MAXON "HC" AIRFLO® burners are designed for heating of process air in motion. They should be mounted so that they fire in the same direction as the flow of air. Refer to page 4-22.2-13 & page 4-22.2-14 to determine the correct process flow differential pressures across the burners. This is essential for good burner performance.

Do not mount the burner so that the movement of the process flow is across the face of the burner, nor should it be mounted too near to a duct which causes the process flow to be directed at an angle over the burner.

Ensure that the process flow in the duct immediately upstream the burner is as uniform as possible. (max. deviation of process air velocity of approximately 5 % over 90 % of the area of a plane immediately in front of the burner.)

Swirling, recirculating or reverse process air flowing at the burner front plane will dramatically reduce lifetime of the burner due to the risk of backfiring of the burner and overheating.

#### Duct

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"HC" AIRFLO® burners have quite luminous and radiant flames which require special attention when designing duct parts covering the flame (combustion chamber). Especially in narrow ducts with flames close to the wall, it is essential to use correct materials and proper construction design. Refer to "Flame development and duct layout" section for more details.

## Installation

### Storage

"HC" AIRFLO® burners should be stored dry (inside). Prevent that water and/or dust can penetrate into the burner manifold during storing.

### Handling

"HC" AIRFLO® burners are shipped as complete units. Handle burner with care, using proper equipment during unpacking, transport, lifting and installation. Any impact on the burner could result in damage. Make use of the available lifting lugs on M and L type burners' mounting plugs and the pipe-support at the opposite end of the burner for handling.

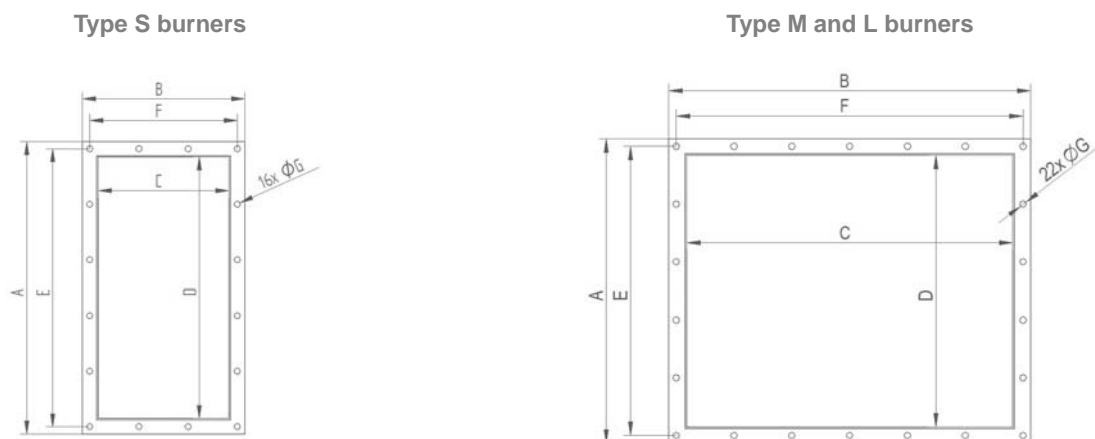
When the burner elements are installed at an early stage and remain un-commissioned for a considerable long period, we advise to make additional precautions to protect the spark igniter and UV-scanner from damage. This can be done by temporarily removing these items and storing them in a dry place until date of commissioning.

### Flange the burner to the installation

Each burner is equipped with a mounting plug. Bolt this mounting plug onto the combustion chamber's burner mounting flange. Use proper gasket between burner mounting plug and combustion chamber's flange. MAXON advises to use glass-fibre cord diam. 8 mm, available as an option. Tighten the flange bolts with correct torque. Retighten all bolts after first firing and regularly after commissioning.

### Burner mounting flange dimension for type S burners

The combustion chamber burner mounting flange is not included with the burner and should have the appropriate dimensions (refer to dimensional sketches below). Make sure that you have a standard MAXON "HC" AIRFLO® burner with standard mounting plug prior to combustion chamber mounting flange manufacturing. For special designed burners, refer to project specific construction drawings when applicable.



Dimensions in mm unless stated otherwise							
Burner type	A	B	C	D	E	F	ØG
Type S	560	310	250	500	5 x 106.4 = 560	3 x 94 = 282	12
Type M and L	560	666	600	500	5 x 106.4 = 560	6 x 106.3 = 638	12

## Mounting support

Only use the "HC" AIRFLO® mounting support supplied by MAXON for supporting the burner at the opposite side of the mounting plug.

The "HC" AIRFLO® mounting support is especially designed to give the burner sufficient flexibility during firing. Use of different kind of supports may damage or destroy the burner.

Type M and type L burners have a support which is to be mounted in such a way that the weight of the burner is supported. This is only possible in one way, regardless the orientation of the burner.

Type S burners have a different support. This support has to be mounted so that the burner weight is supported and burner is allowed to move backwards with thermal expansion.

The position of the support bracket must be determined after installation of the burner element and must be positioned strictly in accordance with the typical installation sketches [1] and/or with the project drawings. Note that the bracket must always support the burner weight. The supporting arrangement must allow the burner element to move back freely. Due to thermal expansion the burner element will have the tendency to curve towards the upstream process air flow direction.

All bolts and nuts on the supporting connection shall be checked and fastened after installation has been complete and must be tack welded to prevent them from spinning.

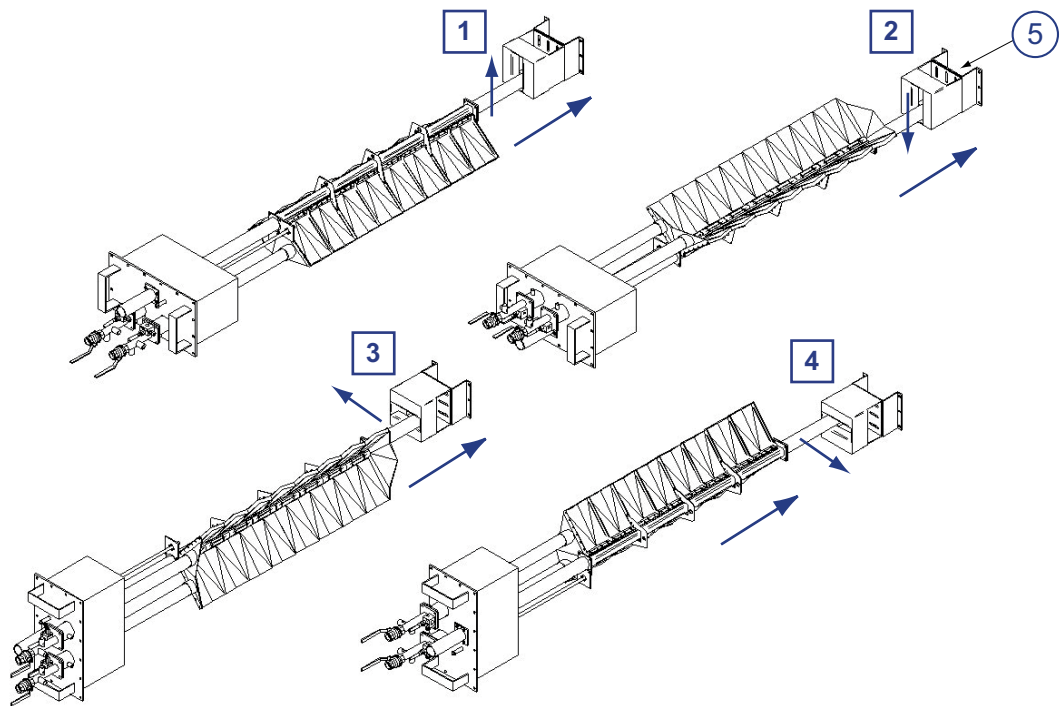
[1] See sketches in section 'burner orientation' below for correct burner support mounting.

## Burner orientation

MAXON advises to mount the "HC" AIRFLO® burner horizontally, with burner gas manifold in an horizontal plane. The burner can fire left, right, upwards or downwards or in any desired angle. Since all burners are symmetrical, it is not necessary to specify burner orientation when ordering.

When burners are mounted vertically with mounting plug on top of the process air duct, special care should be taken to avoid excessive heating of accessories mounted on the mounting plate. Vertical mounting with mounting plug at the bottom of the process air duct is not advised because of dirt and/or moist build up in the UV-scanner tube.

## Burner type S



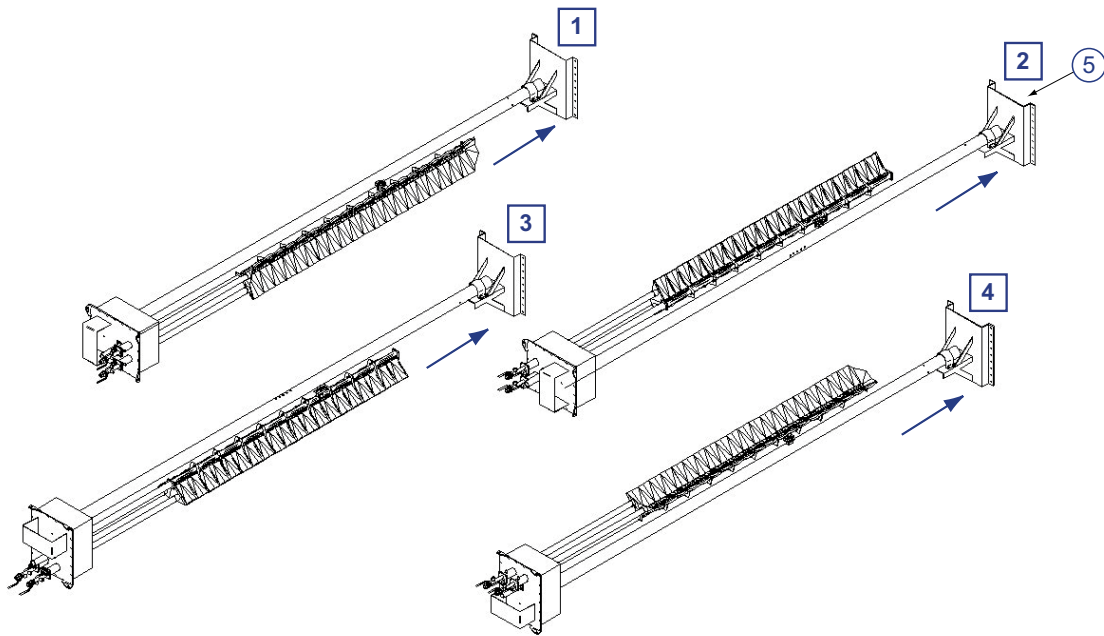
- 1) Firing down
- 2) Firing up
- 3) Firing right

- 4) Firing left
- 5) Mounting support

→ = movement of burner element when heated



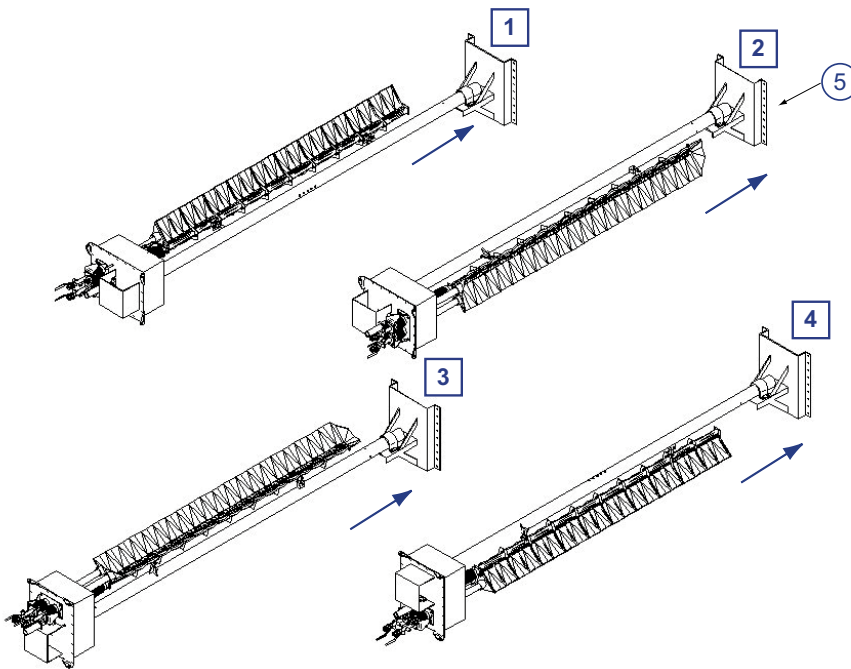
### Burner type M



- 1) Firing right
- 2) Firing left
- 3) Firing down

- 4) Firing up
- 5) Burner support
- ➔ = movement of burner element when heated

### Burner type L



- 1) Firing left
- 2) Firing right
- 3) Firing up

- 4) Firing down
- 5) Mounting support
- ➔ = movement of burner element when heated

## Start-up instructions



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 and authorized commissioning engineer.

### Safety interlocks

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Guarantee that all the required safety locks as described in the applicable local codes or regulations, or supplementary requested for safe operation of the overall installation, are working properly and resulting in a safety-lock of the burner. Do not bypass any of these safety interlocks, this will result in unsafe operation.

### Checks during and after start-up

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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.

### Purge

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For safety-reasons, it is required to purge the installation sufficiently long to ensure that all possible combustibles are evacuated before ignition. Refer to the applicable local codes and your specific application requirements to determine the purge time.

### Pilot ignition

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Adjust pilot gas regulator to correct set point before pilot ignition attempt. Refine during lighting of the pilot to a yellow/blue flame and/or strongest stable flame signal

### Main burner ignition

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Ensure that the maximum allowed starting capacity is not exceeded when lighting the the main burner. High starting capacities can cause sudden increase of pressure in the duct system.

### Maximum capacity adjustment

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Once the main flame is ignited, adjust gas flow of the burner to obtain the required combustion quality. Slowly increase capacity while observing the flame. Especially observe that the flame is well divided over the entire burner length, and going straight forward in the direction of the process air flow. Check that no damage is caused to duct walls or other equipment. Adjust the max. capacity while observing the flame. Ensure that the burner is protected from over-firing in a safe way (for instance using mechanical stops in the gas control valve).

### Minimum capacity adjustment

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The burner should be protected from firing at too low capacity rates. Refer to page 4-22.2-8 for the minimum allowed capacities. Firing at low capacities will overheat the mixing plates and manifold. Therefore, minimum gas flow should always be guaranteed (for instance using a mechanical stop on minimum position on the gas control valve).

## Maintenance and inspection

### Safety requirements

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

Perform the following activities at least annually as part of a recommended preventative maintenance routine :

- Inspect burner internal parts for wear and oxidation.
- Inspect associated control instruments and devices for function with particular attention to all safety interlocks.
- Inspect tightness of mounting plug, screws and nuts.

### Visual inspections

Regular visual inspection of all connections (air and gas piping to the burner, bolting of the burner mounting flange, mounting support in the duct) and burner flame shape and aspect are essential for safe operation.

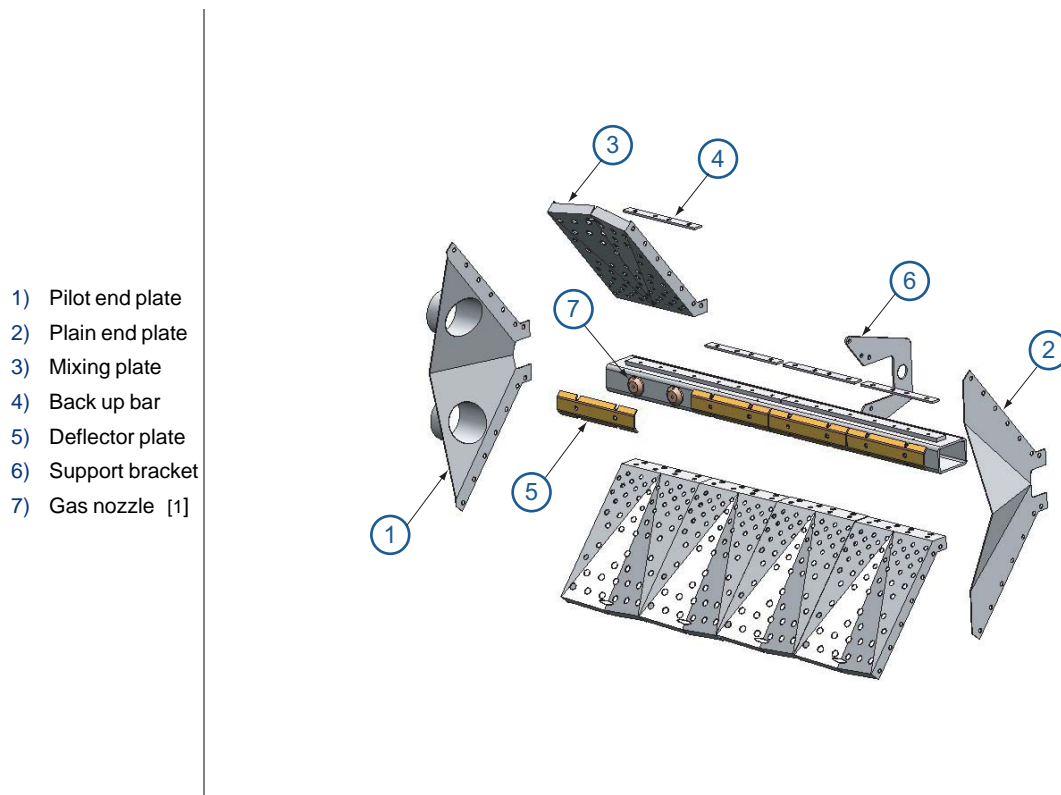
### Recommended spare parts

Keep local stock of spark igniter. It is not recommended to keep local stock of other burner parts. Consult user manual for burner spare parts and system accessories.

### Repair kits

Standard repair kits are available to upgrade your burner when traces of wear start showing after several years of intensive use.

These repair kits include all required bolts and nuts. Use this drawing for burner parts designation.



[1] gas nozzles are welded onto the burner manifold and are not available as separate spare parts.