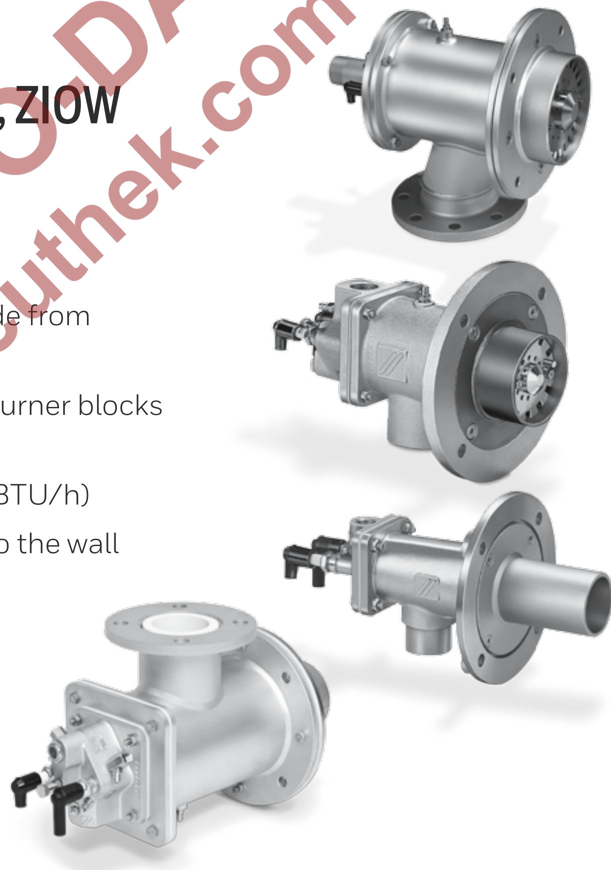
Honeywell | Industrial & Commercial Thermal

krom schroder

Burners for gas BIO, BIOA, BIOW, ZIO, ZIOW

Technical Information · GB
7 Edition 08.16

- To be used in combination with a burner block made from refractory concrete
- Different flame shapes can be achieved by using burner blocks with different geometries
- Large capacity range up to 1000 kW (3782 × 103 BTU/h)
- Length increments enable individual adjustment to the wall thickness of the system
- Air preheating to 600°C (1112°F)



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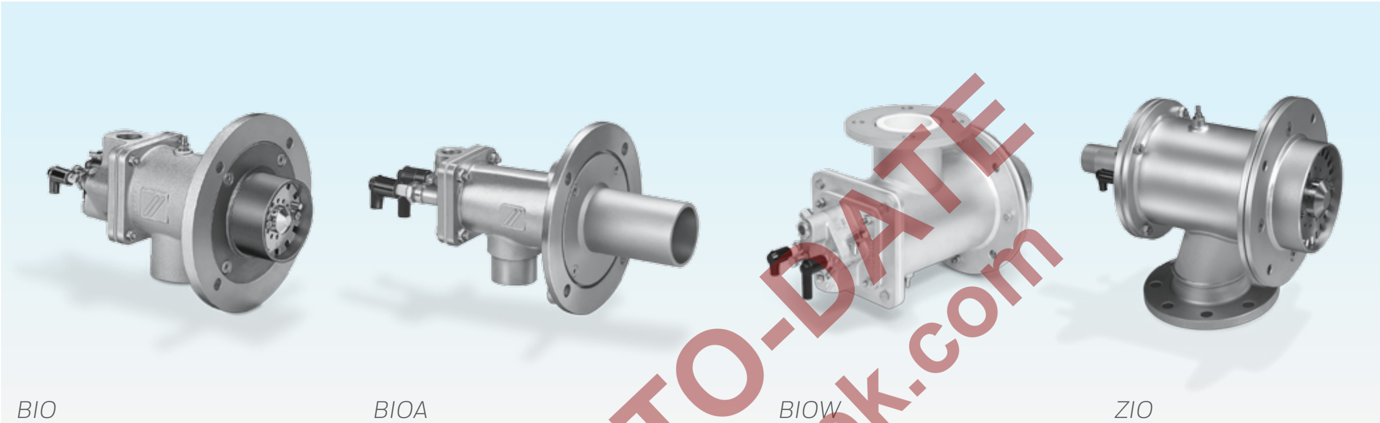


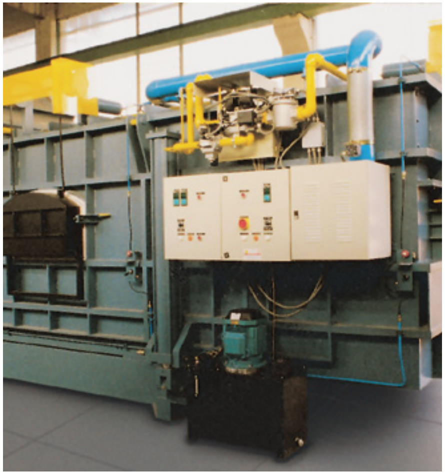
1 Application

For industrial furnaces and firing systems in the iron and steel industries in the precious, non-ferrous and light metal sector, as well as in the plastics, fibre and paper industries. Other fields of application are thermal incineration installations, as well as driers and hot air generators.

The burners are used in combination with a burner quarl made from refractory concrete. Different flame shapes can be achieved by using burner quarls with different geometries. The burner may be adapted to the system requirements using different burner lengths.

A high temperature version of the burner is available for high temperature applications (e.g. forging furnaces).

For low temperature applications (e.g. for radiant tube heating or hot air generation), the burners are equipped with a heat-resistant steel attachment tube.


Smelting and holding furnace

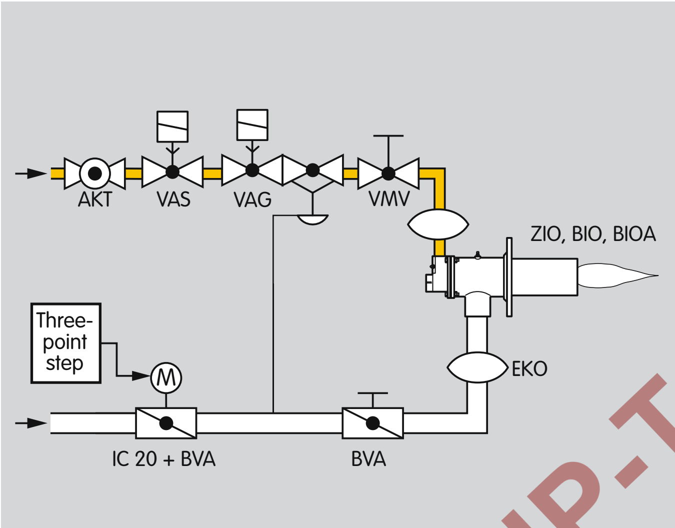

Bogie hearth forging furnace

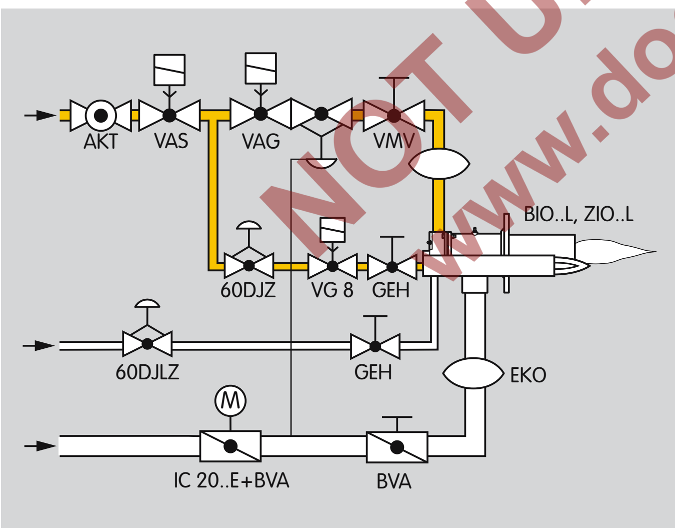
Incineration installation for thermal regenerative flue air purification


Strip galvanizing plant


Rotary table furnace


Aluminium tank furnace





1.1 Examples of application

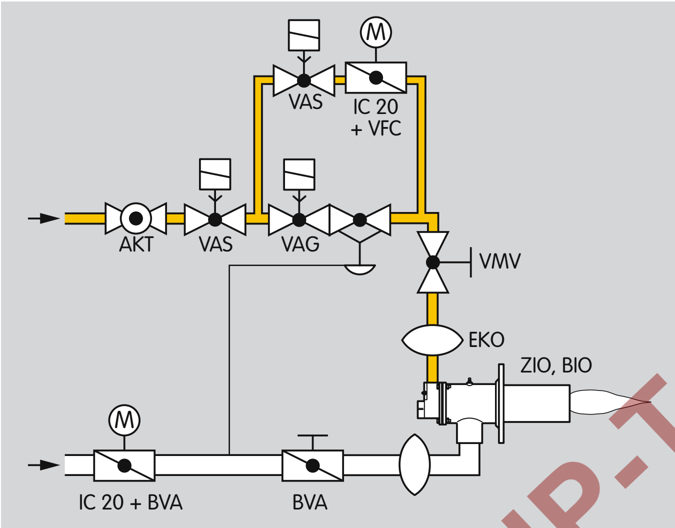
Explanation of symbols, see page 47 (Legend).

1.1.1 Modulating control with pneumatic ratio control system

The burner capacity is controlled in modulating mode by adjusting the butterfly valve BVA. The impulse line on the air/gas ratio control VAG ensures constant air and gas pressures. The ratio of the gas volume is kept constant. This type of control is used in melting furnaces in the aluminium industry or in regenerative incineration installations in the environment industry, for example.

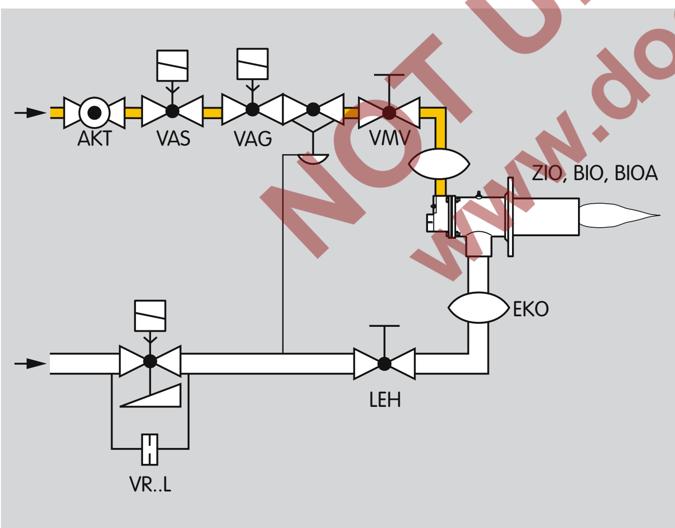
1.1.2 Modulating control with pneumatic ratio control system and lance

The burner's flexibility is increased thanks to an ignition lance. This type of control is used in heat treatment furnaces in the iron and non-ferrous metal industries and in heating furnaces in the steel industry, for example.



1.1.3 Cascade control for extended control range

The burner is adjusted near-stoichiometrically to a low-fire rate of 10% using a pneumatic ratio control system. Smaller capacities can be adjusted with the IC 20 at a constant low-fire air flow rate by restricting the gas flow. With cascade control, control ranges of 1:45 can be achieved with excess air.

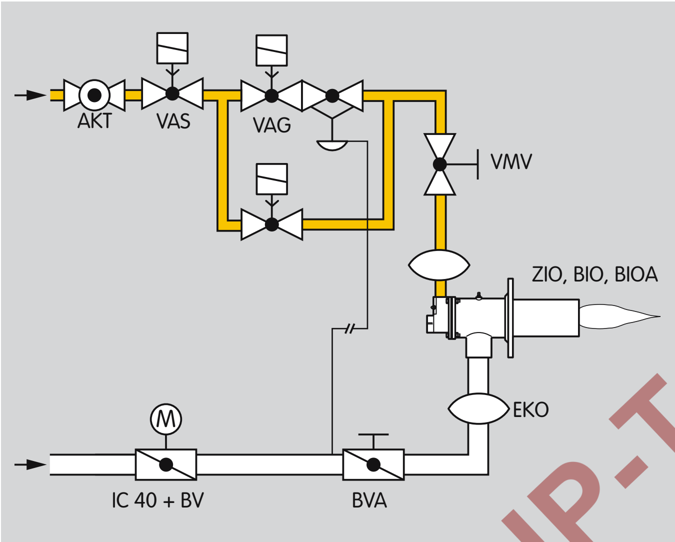


1.1.4 Staged control with pneumatic ratio control system and ON/OFF cyclical control

With ON/OFF cyclical control, the capacity supplied to the process is controlled by means of a variable ratio of the operating time to the pause time.

The burner is ignited while the air valve is opening slowly. The pneumatic ratio control system controls the gas volume and ensures a constant mixture of gas and air in the burner. In accordance with EN 746-2, this type of control can only be used for burner capacities of up to 360 kW (1229×10^3 BTU/h).

While the burner is switched off and depending on the furnace temperature, there must be a certain air flow, see page 28 (Purging air/cooling air).

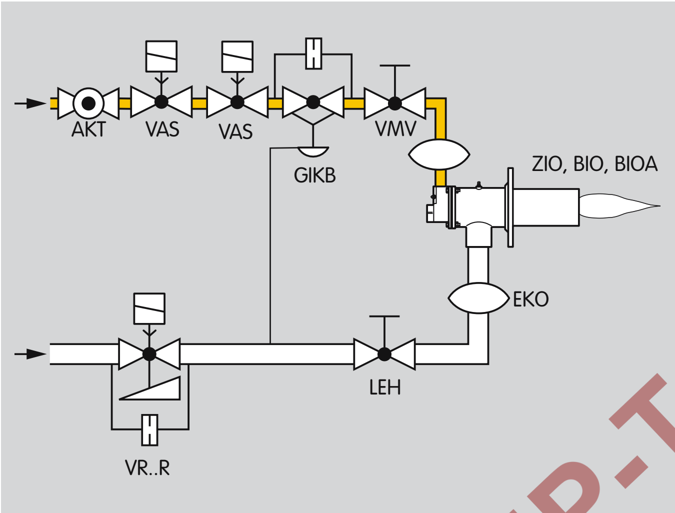


1.1.5 Staged control with pneumatic ratio control system and ON/OFF cyclical control with a defined pilot rate

With this kind of cyclical control, the capacity supplied to the process is controlled by means of a variable ratio of the operating time to the pause time (ON/OFF).

Here, the burner is ignited at a defined pilot rate via a bypass valve (PILOT RATE/HIGH/OFF burner control). This burner system can thus be used regardless of the burner capacity.

A 2-stage air control valve allows the volume of air infiltrating when the burners are switched off to be minimized. Alternatively, a single-stage air control valve with bypass for the pilot rate can be used if the volume of air infiltrating into the process is non-critical.



1.1.6 Staged control with pneumatic ratio control system and LOW/HIGH cyclical control

The burner is ignited at a defined pilot rate. In the gas circuit, the pilot rate is achieved via a bypass nozzle in the GIKB and in the air circuit, via a hole in the air valve, for example. This burner system can thus be used regardless of the burner capacity.

The burner capacity is switched cyclically between HIGH fire and LOW fire by opening and closing the air valve. The air control valve should open and close slowly.

For other burner systems – see www.system-technik.info

2 Certification

Approval for Russia

Certified by Gosstandart under Technical Regulations.

Approved by Rostekhnadzor (RTN).

Declaration of Incorporation pursuant to the Machinery Directive

Burners BIO, BIOA, ZIO, BIOW and ZIOW comply with the requirements of EN 746-2 and the Machinery Directive 2006/42/EC. This is confirmed by the manufacturer's Declaration of Incorporation.

3 Mechanical construction

The burners are composed of three modules: burner housing, burner insert and burner tube. This structure allows the burners to be easily adapted to the respective process or to be integrated into existing systems. Maintenance and repair times are reduced, and existing furnace installations can easily be converted.

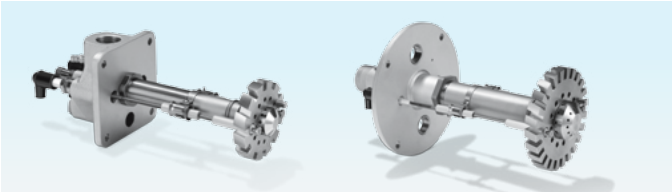
3.1 Burner housing (furnace flange)

The burner is secured to the furnace by the burner housing. The burner housing accommodates the burner insert and the burner tube, and routes the combustion air. The combustion air pressure can be measured using an air pressure test nipple.

3.1.1 With insulation

Burner housings with insulation can be used for higher hot air temperatures of up to 500°C (932°F). The insulation consists of vacuum-shaped ceramic fibres (RCF = refractory ceramic fibre) with a specially hardened surface. Its purpose is to reduce the surface temperature of the housing.

3.2 Burner insert



BIO, BIOA, BIOW   ZIO, ZIOW

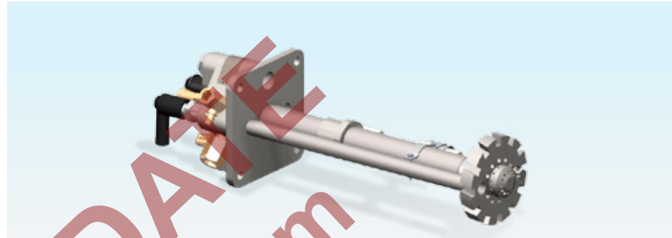
The combustion gas is supplied to the burner head via the gas connection and the gas pipe. The gas connection flange assembly includes the sight glass, ground screw and spark plugs with angle plugs.

As of construction stage E, a measuring orifice and flow adjustment are integrated in the connection flange to allow the gas flow rate to be easily measured and adjusted.

The ignition and ionization electrodes are screwed into the connection flange and can be replaced without removing the burner insert.

Burners BIO, BIOA, BIOW, ZIO and ZIOW are nozzle-mixing burners. Gas and air are mixed only once they are in the burner head. This prevents explosive gases from being generated in the pipeline. There are various burner head versions for different uses and gas types.

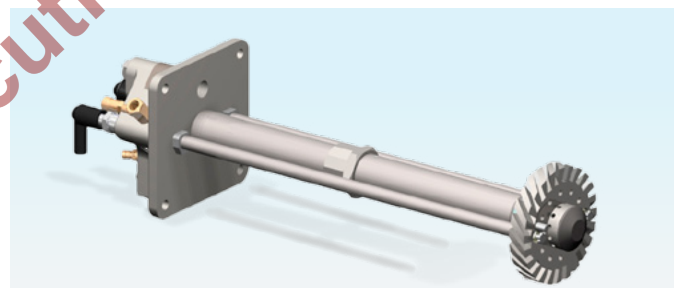
3.2.1 Ignition lance



Burner insert BIO with ignition lance

A complete pilot burner with separate gas and air connection is integrated on burners with integrated ignition lance instead of the ignition electrode.

3.2.2 High temperature version

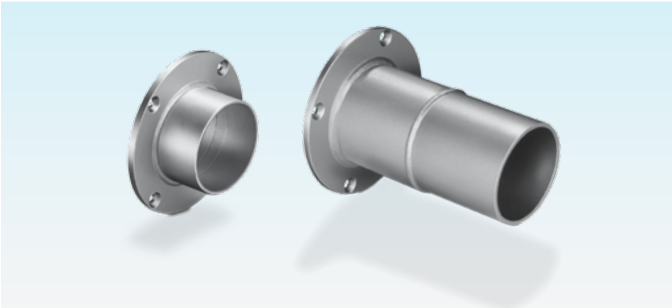


Burner insert BIO with ignition lance

A high temperature version is available for burners with preheated combustion air and minimum cooling air.

This version is characterized by a burner head made of heat-resistant steel and electrodes with an air connection. For use in forging furnaces, where flat flame burners are used predominantly, the heat-resistant burner head is also equipped with a partly ceramic gas nozzle.

3.3 Burner tube



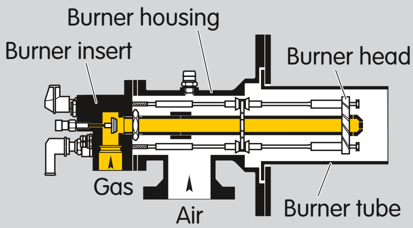
Different overall lengths enable adjustment to the furnace wall thickness of the system.

3.3.1 Burner tube in burner quarl

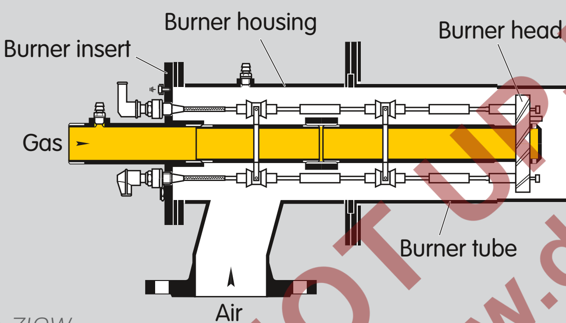
The burner head is positioned inside the burner tube. The burner quarl accommodates the burner tube and simultaneously acts as the combustion chamber for the complete combustion of the flame. The burner quarls are components of the refractory lining of the furnace and are usually supplied by the furnace manufacturer.

3.3.2 Burner tube with attachment tube

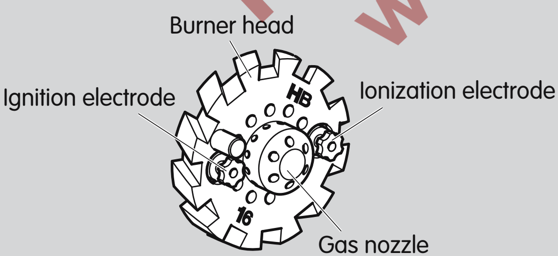
The burner head is positioned inside the burner tube. An attachment tube made of heat-resistant steel acts as the combustion chamber for the complete combustion of the flame for low- and medium-temperature applications.



BIO, BIOA, BIOW



ZIO, ZIOW



4 Function

The burner control unit opens the gas and air control valves. Gas flows through the gas connection flange and air flows through the burner housing as far as the nozzle-mixing burner head.

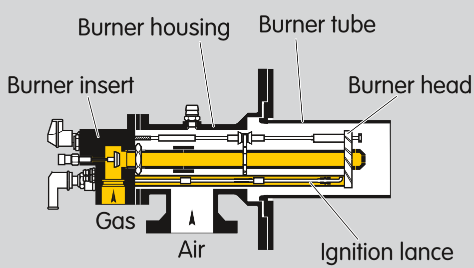
The combustible gas/air mixture is produced downstream of the burner head. Slots and holes in the air disc vary the angle of twist of the combustion air and determine the flame geometry. Depending on the gas type, the geometry of the gas nozzle varies.

The gas/air mixture is electrically ignited directly by an ignition electrode or an ignition lance. A flame forms which is monitored using an ionization electrode or optionally using the UV sensor.

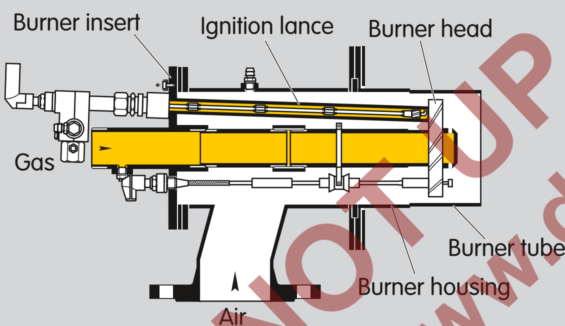
The choice of the respective combustion chamber material and geometry is primarily determined by the process.

Using burner quarls, almost any flame shape and outlet velocity can be achieved.

For low temperature applications, a combustion chamber made of heat-resistant steel can be used. The flame burns inside the metal burner attachment tube.



BIO, BIOW



ZIO, ZIOW

4.1 Burners with ignition lance

In the case of ignition with an ignition lance, the pilot burner is supplied with gas and air before the main burner starts. The gas/air mixture is electrically ignited directly by the ignition lance electrode and is then monitored by this electrode using ionization control.

Once the ignition lance has been successfully ignited, the main burner is ignited via the ignition lance.

5 Selection

5.1 Burner type

Type	Housing	Air temperature		Furnace temperature	
		°C	°F	°C	°F
BIO	Cast steel	up to 450	up to 842	up to 1600	up to 2912
BIOA	AlSi	up to 200	up to 392	up to 1400	up to 2552
ZIO	St	up to 450	up to 842	up to 1600	up to 2912
BIOW	St with internal insulation	up to 500	up to 932	up to 1600	up to 2912
ZIOW	St with internal insulation	up to 500	up to 932	up to 1600	up to 2912

5.2 Burner size

Burner size	Burner capacity	
	kW[1)]	10^3 BTU/h[2)]
BIO 50	40	151
BIO, BIOA, BIOW 65	90	340
BIO, BIOW 80	150	567
BIO, BIOW 100	230	870
BIO, BIOW 125	320	1210
BIO, BIOW 140	450	1702
ZIO, ZIOW 165	630	2382
ZIO, ZIOW 200	1000	3782

1) *Capacities in kW refer to the lower calorific value H_u.*
2) *Capacities in BTU/h refer to the upper calorific value H_o.*

5.3 Burner head

The choice of burner head depends on the use, **gas type** and **variant**.

5.3.1 Use

Use	Burner head code letter	Air temperature		Furnace temperature		Control range	
		°C	°F	°C	°F	continuous	staged
Cold air	R	up to 150	up to 302	up to 1100	up to 2012	1:10	1:10
Hot air	H	up to 500	up to 932	up to 1400	up to 2552	1:10	1:10
Hot air/high temperature operation	H(..E)	up to 500	up to 932	up to 1600*	up to 2912*	1:10	1:10
Flat flame	K	up to 150	up to 302	up to 1100	up to 2012	1:2.5	1:10
Flat flame/high temperature operation	K(..E)	up to 450	up to 842	up to 1350	up to 2462	-	ON/OFF

** T furnace > 1400°C (2552°F): limited control range*

5.3.2 Gas type

Gas type	Code letter	Calorific value range		Density ρ	
		kWh/m^3(n)[4)]	BTU/scf[5)]	kg/m3	lb/scf
Natural gas L and H quality	B	8 – 12	810 – 1215	0.7 – 0.9	0.041 – 0.053
Propane, propane/butane, butane	M	25 – 35	2560 – 3474	2.0 – 2.7	0.118 – 0.159
Propane, propane/butane, butane	G1)	25 – 35	2560 – 3474	2.0 – 2.7	0.118 – 0.159
Coke oven gas, town gas	D	4 – 5	421 – 503	0.4 – 0.6	0.024 – 0.035
Low calorific value gas	L	1.72) – 3	161 – 290	0.9 – 1.15	0.053 – 0.068
Biologically produced methane	F3)	4.5 – 6.5	457 – 658	1.4 – 1.16	0.083 – 0.069

1) *For λ < 0.9 or when using the BIO 50.*
2) *Calorific value range < 1.7 on request.*
3) *Only with reduced capacity and with R burner head for composition of the fuel gas CH_4 = 45% – 65%, remaining components CO_2 or N_2. Suitable burner sizes on request.*
4) *Calorific value ranges in kWh/m^3 refer to the lower calorific value H_u.*
5) *Calorific value ranges in BTU/scf refer to the upper calorific value H_o.*

Low calorific value gas

In the case of low calorific value gas, the composition of the fuel gas is required to select the burner.

Recommended with burner quarl type (**C**) for an outlet velocity of approximately 80 m/s.

Burner	Rated capacity		Burner quarl outlet diameter	
	kW[1)]	10^3 BTU/h[2)]	mm	inch
BIO 65HLR	45	163	33	1.3
BIO 80HLR	75	271	40	1.57
BIO 100HLR	115	415	50	1.97
BIO 125HLR	160	578	66	2.6
BIO 140HLR	225	813	70	2.76

1) *Capacities in kW refer to the lower calorific value H_u.*
2) *Capacities in BTU/h refer to the upper calorific value H_o.*

5.3.3 Variant

		Capacity	
Variant	Code letter	kW[1)]	BTU/h[2)]
Ignition lance	L	approx. 1.5	approx. 5119
Reduced max. connection rating	R	–	–

1) *Capacities in kW refer to the lower calorific value H_u.*

2) *Capacities in BTU/h refer to the upper calorific value H_o.*

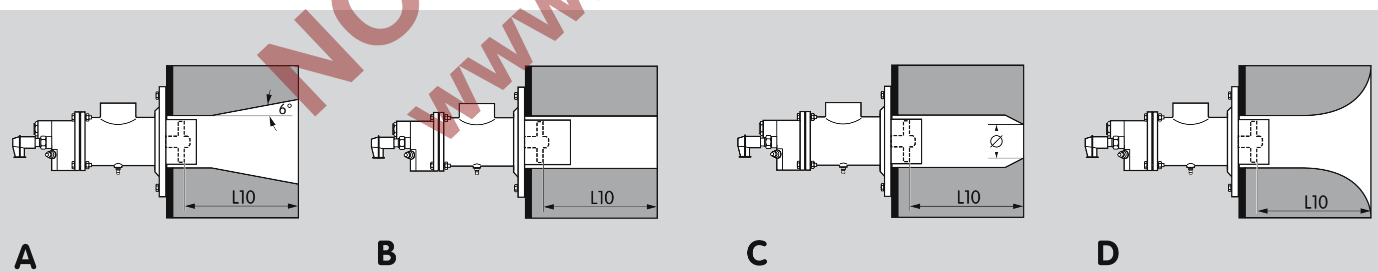
5.4 Field of application

For optimal operation, the combustion chamber and burner head are combined according to the field of application.

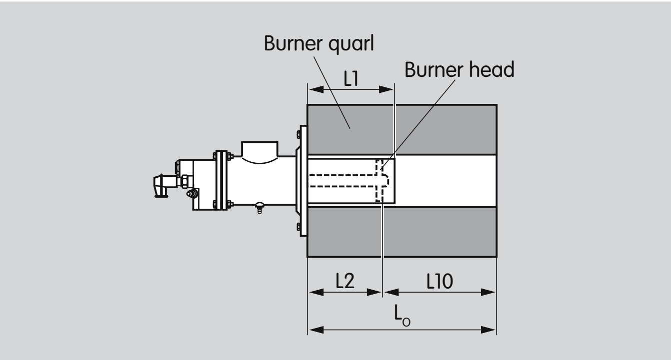
5.4.1 Burners with burner quarl

Field of application	Illustration	Combustion chamber	Control	Burner head	Max. capacity	Remarks
Industrial furnaces, open combustion chambers	**A**	Open cone	LOW/HIGH Modulating	R	100%	Recommended for cold-air operating mode only, otherwise the nitric oxide values are too high
Industrial furnaces, open combustion chambers	**B**	Cylindrical	LOW/HIGH Modulating ON/OFF	R, H	100%	Normal to medium flow velocity
Industrial furnaces, open combustion chambers	**C**	Tapered	LOW/HIGH Modulating ON/OFF	R, H	approx. 80%	Medium to high velocity, rated capacity depending on the diameter
Industrial furnaces, open combustion chambers	**C**	Tapered	LOW/HIGH Modulating	H(..E)	approx. 80%	Min. capacity = 35% of the rated capacity, depending on the diameter
Industrial furnaces, open combustion chambers	**D**	Flat flame quarl	LOW/HIGH (modulating) ON/OFF	K	100%	With modulating control, limited control range (≥ 40%)
Forging furnaces, open combustion chambers	**D**	Flat flame quarl	ON/OFF	K(...E)	100%	Hot air, only staged control possible (min. capacity = 50% of the rated capacity)

Burner quarl type



For further information on burner quarl dimensions see the burner quarl tables at www.docuthek.com.



Legend

L1 = burner tube length

L2 = position of burner head

L_O = furnace wall thickness

L10 = length of combustion chamber

Calculation example

L2 should be appropriately selected, so that the burner head extends into the burner quarl.

The following lengths are available for L2: 35, 135, 235, 335 mm, etc.

The burner chamber length L10 for ensuring optimum flame formation and stable burner operation must be observed – see burner quarl (Kind of document: General info) at www.docuthek.com.

To determine L2: L2 = L_O - L10

The burner tube length (L1) is predefined, depending on the burner head R, K or H:

R, K burner head:

L1 = L2 + 15 mm (L1 = L2 + 0.591 inches)

H burner head:

L1 = L2 + 65 mm (L1 = L2 + 2.56 inches)

Example

Desired burner quarl type = B, desired burner head = R (cold air).

Selected burner with 90 kW capacity = BIO 65, suitable for a burner chamber length (L10) = 115 to 265 mm.

Furnace wall thickness L_O = 340 mm.

Calculate shortest length for L2:
Select maximum burner chamber length:
L10 = 265 mm.
L2 = L_O - L10 = 340 mm - 265 mm = 75 mm.

Compare L2 (here 75 mm) with standard lengths (35, 135, 235, 335 mm, etc.).

Select next longest standard length L2: L2 = 135 mm.

Test whether the burner chamber length L10 fits:
L_O - L2 = L10 ➔ 340 mm - 135 mm = 205 mm.
205 mm falls into the burner chamber length range for burners BIO 65: 115 to 265 mm – see burner quarl (Kind of document: General info) at www.docuthek.com.

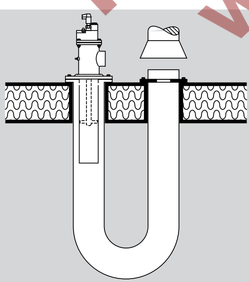
Burners with burner attachment tube

Field of application	Illustration	Combustion chamber	Control	Burner head	Max. capacity	Remarks
Radiant tube heating	**E**	Burner with attachment tube and purging air bore holes	ON/OFF	H	100%	Note the capacity of the radiant tube in accordance with the manufacturer's specifications. A draught blocker must be fitted on the flue gas side. Only with cold air and where the furnace temperature is < 850°C.
Hot-air generation	**F**	Burner with attachment tube and purging air bore holes, protective flame tube FPT	LOW/HIGH Modulating ON/OFF	R	100%	Protection of the flame from cooling is ensured by using a protective flame tube FPT at flow velocities of > 15 m/s). Only with cold air and where the furnace temperature is < 600°C.

Radiant tube heating

When using the burner in radiant tubes or protective flame tubes, the extended burner tube (attachment tube) acts as the combustion chamber. Burners for this field of application are supplied with purging air bore holes for optimal flame stability. The burner with attachment tube is only suitable for cold air applications. Maximum furnace temperature approx. 850°C (1562°F).

The outlet diameter of the radiant tube must be reduced to the point where a pressure loss of approx. 10 mbar (3.94 "WC) occurs at the burner's rated capacity.



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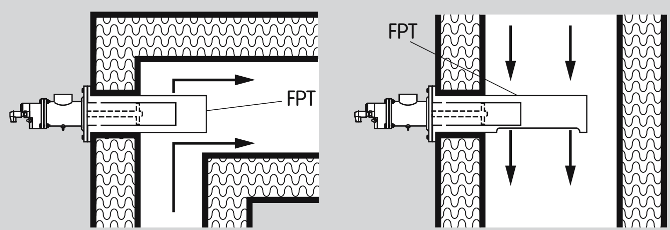
Hot air generation

To generate hot air at a furnace temperature of < 600°C (< 1112°F), burners with an attachment tube and purging air bore holes are used. The burner with attachment tube is only suitable for cold air applications.

At flow velocities of > 15 m/s, the protective flame tube FPT is used to protect the flame from being cooled. At flow velocities of < 15 m/s, the protective flame tube FPT is not needed.



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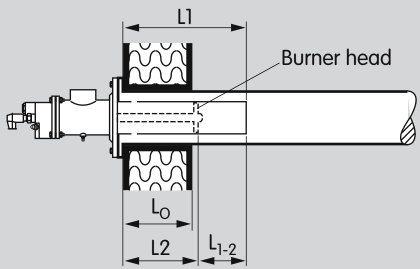


Legend

L1 = burner tube length

L2 = position of burner head

L_O = furnace wall thickness

L1-2 = attachment tube length
(distance of burner head to burner tube end)

Calculation example

Attachment tube lengths (L_{1-2}):

BIO, BIOA, ZIO	H burner head		R burner head	
	mm	inch	mm	inch
50	115	4.53	115	4.53
65	115	4.53	115	4.53
80	165	6.5	165	6.5
100	165	6.5	165	6.5
125	215	8.46	215	8.46
140	265	10.4	265	10.4
165	265	10.4	165	6.5
200	315	12.4	215	8.46

L2 should be appropriately selected, so that the burner head is positioned near the interior furnace wall:
$L2 = L_O \pm 50$ mm ($L2 = L_O \pm 1.97$ inches)

The burner tube length (L1) is calculated by adding L2 to the attachment tube length (L_{1-2}):
$L1 = L2 + L_{1-2}$

Example

Burner head = H – see page 20 (Field of application).

Selected burner with 90 kW capacity = BIO 65, attachment tube length (L_{1-2}) = 115 mm.

Furnace wall thickness L_O = 300 mm.

Calculate the shortest distance for L2:
$L2 = L_O$ - 50 mm = 300 - 50 mm = 250 mm.

Compare L2 (here 75 mm) with standard lengths (35, 135, 235, 335 mm, etc.).

Select next longest standard length L2: L2 = 335 mm.

Calculate the related burner tube length (L1):
$L1 = L2 + L_{1-2}$ = 335 mm + 115 mm = 450 mm.

5.5 Selection table

	W	50	65	80	100	125	140	165	200	H	R	K	B	F	G	M	L	D	L	R	- 50 bis ...	/35 bis ...	-(1) bis -(199)	-(1E) bis -(199E)	A - Z	B
BIO	○	●	●	●	●	●	●			●	●	●	●	○	○	●	○	●	○	○	●	●	●	○	●	○
BIOA			●							●	●	●	●		○	●	○	●		○	●	●	●		●	○
ZIO	○							●	●	●	●	●	●		○	●	○	●	○	○	●	●	●	○	●	○

● = *standard*, ○ = *available*

Order example

ZIO 165RB-50/35-(17)D

5.5.1 Type code

Code	Description
BIO BIOA BIOW ZIO ZIOW	Burner for gas Burner for gas with aluminium housing Burner for gas with internal insulation Burner for gas Burner for gas with internal insulation
50 to 200	Burner size
 R H K	Use: cold air hot air flat flame
 B G[1], M L D F	Gas type: natural gas propane, propane/butane, butane low calorific value gas coke oven gas, town gas biologically produced methane
 L R	Variants: with ignition lance with reduced max. connection rating
-50[2] -100[3] -150[2] -200[3] -250[2] -300[3] ...	Burner tube length (L1) [mm]
/35- /135- /235- /335- ...	Position of burner head (L2) [mm]
-(1) to -(199) -(1E) to -(199E)	Burner head identifier High temperature version
A to Z	Construction stage
B	With purging air bore holes

1) *For λ < 0.9 or when using the BIO 50.*

2) *R, K burner head*

3) *H burner head*

6 Project planning information

6.1 Installation

Installation position: any.

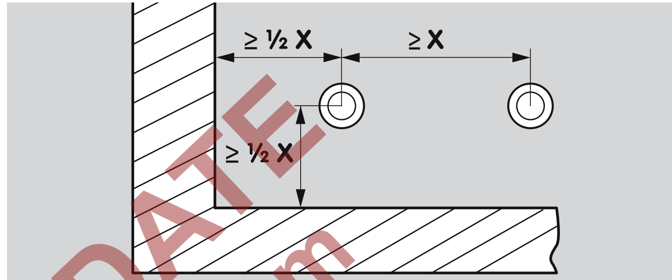
Gas and air connection: can be rotated in 90° steps.

Install and insulate the burner in order to avoid any overheating of the components during operation. Where applicable, purging air must be used to prevent ingress of aggressive gases and thermal overload of components.

6.2 Flat flame burner spacing

In the case of flat flame burners, the spacing between burners and the distance from the furnace wall must be observed.

Burner	Flat flame diameter		Minimum distance X	
	mm	inch	mm	inch
BIO 50	300	11.8	330	13
BIO 65	400	15.7	450	17.7
BIO 80	550	21.7	600	23.6
BIO 100	700	27.6	800	31.5
BIO 125	830	32.7	900	35.4
BIO 140	1000	39.4	1100	43.3
BIO 165	1200	47.2	1300	51.2
BIO 200	1500	59.1	1600	43



6.3 Recommended ignition transformer

≥ 7.5 kV, ≥ 12 mA, e.g. TZI 7,5-12/100 or TGI 7,5-12/100.

6.4 Non-return gas valve

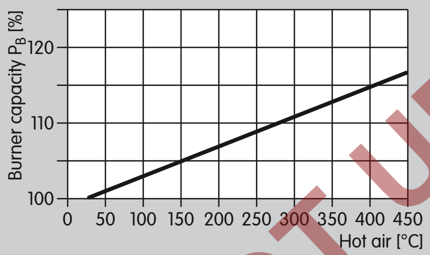
Non-return gas valves are not required, since the burners are of the nozzle-mixing type.

6.5 Flame control

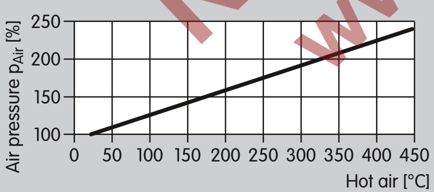
Flame control is performed using an ionization electrode or optionally using a UV sensor.

6.6 Hot air compensation

In order to maintain the λ constant in hot air operating mode, the combustion air pressure is increased. The gas pressure increases in hot air operating mode (450°C (842°F)) by approx. 5 mbar (1.97 "WC) for BIO..K and by approx. 10 mbar (3.94 "WC) for BIO..H. The total capacity (gas capacity + hot air capacity) must not exceed the maximum possible burner capacity (see also burner operating characteristic diagrams at www.docuthek.com):



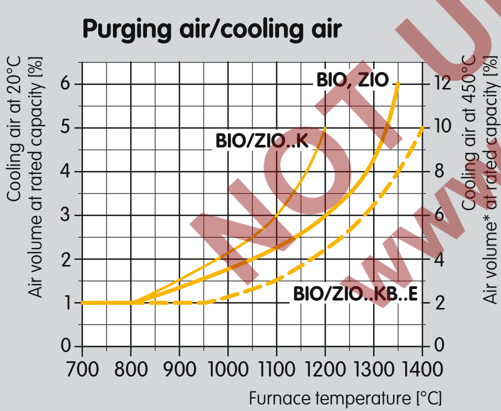
The air pressure is increased for a constant λ.



6.7 Purging air/cooling air

While the burner is switched off and depending on the furnace temperature, there must be a certain air flow in order to ensure safe ignition and monitoring of the burners, and for cooling the burner components. For this, leave the air fan switched on until the furnace has cooled down completely.

The relative air volume in percentage values, based on the air volume for the rated capacity of the relevant size, is given in the "Purging/cooling air volume for burners" diagram. For hot air, the values on the right-hand axis are based on the standard air volume for the relevant rated capacity.

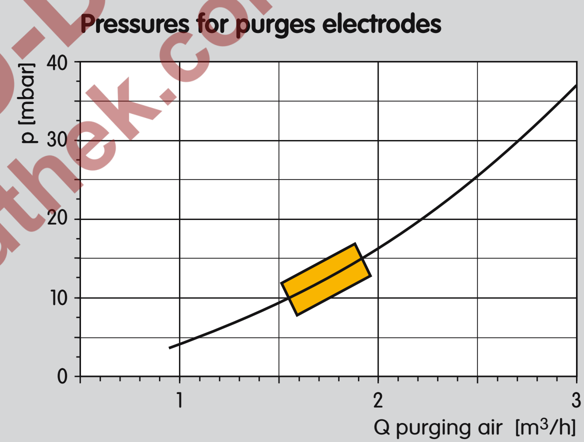


* The cooling air volumes measured in standard cubic metres are converted into percentage values.

6.7.1 Electrodes with air connection

In order to reduce the cooling air volume via the burner air connection, electrodes with an air connection can be installed.

A purging air volume of approx. 1.5 to 2 m^3/h per electrode is recommended. This corresponds to a pressure of 10 to 15 mbar (3.94 to 5.91 "WC).

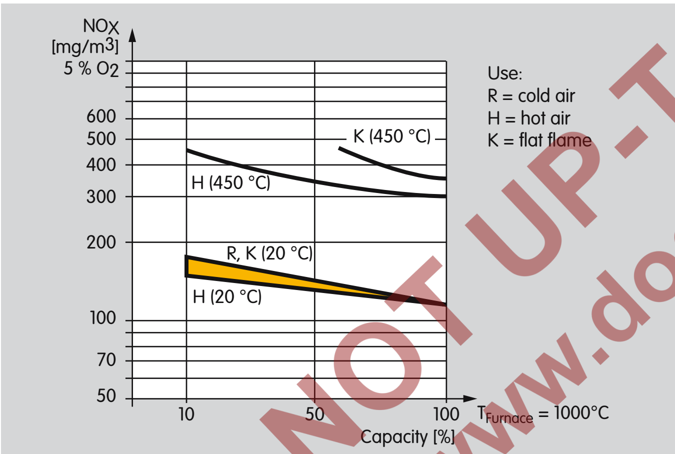


6.8 Emissions

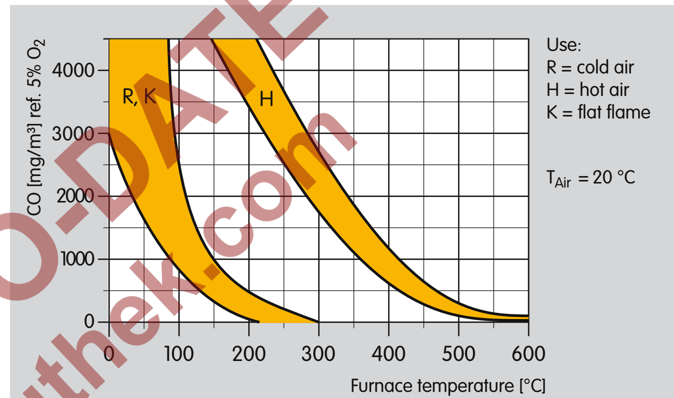
Emissions for cold air operating mode do not exceed the limits stipulated by the German Clean Air Directive.

NO_X values depend on the temperature, burner head, combustion chamber, furnace chamber, λ value and capacity (NO_X values on request).

If operated with LPG, NO_X values are approx. 25% higher.



CO values depend on the temperature, burner head, combustion chamber, furnace chamber, λ value and capacity (CO values on request).



6.9 Gas line connection

To ensure accurate measurements of the pressure differential on the integrated gas measuring orifice, the following applies for the design of the gas connection:

– Ensure undisturbed flow to the gas connection on the burner for a distance of ≥ 5 × DN.
– Use a bellows unit with the same nominal dimensions as the gas connection on the burner.
– Use a pipe elbow up to an angle of 90° with the same nominal dimensions as the gas connection on the burner.
– Only use reducing nipples with an external thread at both ends in order to reduce the nominal diameter on the burner (e.g. from 1" to ¾").

To ensure optimum flow and to avoid incorrect measurements and burner operation with excess gas, we recommend the following:

– Do not screw the manual valve directly into the burner.

6.10 Air line connection

Ensure there is a bellows unit and an air adjusting cock upstream of the burner. It is recommended to install a measuring orifice FLS to determine the air flow rate.

6.11 Condition on delivery

Gas and air connections are fitted opposite one another at the factory.

6.12 Special applications

If you have an application which is not specified here, please contact your sales partner.

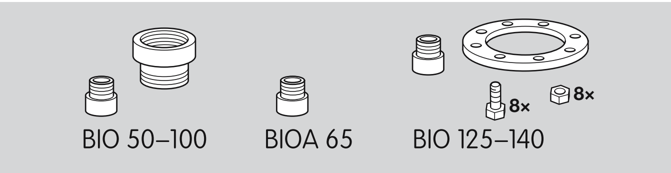
6.13 Build up of noise

Depending on the burner quarl geometry, the noise volume of a burner in the open air is up to 95 dBA at a distance of 1 m (39.4") from the burner quarl (measured at an angle of < 45° to the flame).

If the burner is installed in a furnace, the noise volume is greatly reduced by the furnace insulation (in the case of a 300 mm (11.8") fibre lining, the noise volume is approx. 75 dBA).

7 Accessories

7.1 Adapter set



For connecting BIO and BIOA burners to NPT/ANSI connections.

Burner	Adapter set	Gas connection	Air connection	Order No.
BIO 50	BR 50 NPT	NPT ½	NPT 1½	74922630
BIO 65	BR 65 NPT	NPT ¾	NPT 1½	74922631
BIOA 65*	–	NPT ½	⌀ 1.89"	75456281
BIO 80	BR 80 NPT	NPT ¾	NPT 2	74922632
BIO 100	BR 100 NPT	NPT 1	NPT 2	74922633
BIO 125	BR 125 NPT	NPT 1½	⌀ 2.94"	74922634
BIO 140	BR 140 NPT	NPT 1½	⌀ 3.57"	74922635

* *An NPT thread adapter is required for connection to the gas circuit only.*

Adapter set for BIOW and ZIOW on request.

7.1.1 Nozzle set 80-140

The nozzle set with NPT thread is required for integrated ignition lances.

Gas type	Order No.
Natural gas	74922638
LPG	74922639

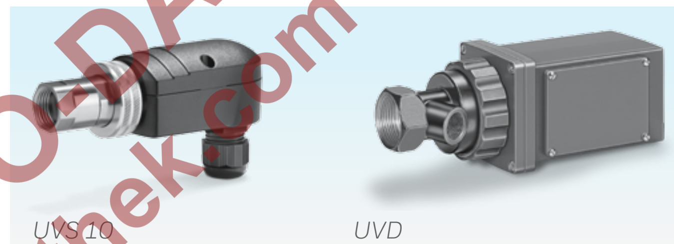
Nozzle set for ZIO 165 and ZIO 200 on request.

7.2 Ceramic paste

For avoiding cold-setting on screw connections after replacing burner components.

Order No.: 05012009.

7.3 UV sensor



For monitoring gas burners in conjunction with flame detectors or automatic burner control units.

An installation set is required for installation on a burner BIO, BIOA or ZIO.

For burner BIO 50, UV control using UVS 10 plus a lens is only possible using the sight glass thread.

UVS 10: with quartz glass heat guard,
UVD: for continuous operation, in aluminium housing with socket, 24 V supply voltage.

UV sensor and installation set supplied on request.

8 Technical data

Gas supply pressure and air supply pressure each depend on the use and gas type (gas and air pressures: see burner diagrams at www.docuthek.com).

Burner length increments: 100 mm (3.94").

Gas types: natural gas, LPG (gaseous), coke oven gas and biologically produced methane; other types of gas on request.

Control type:
staged: ON/OFF, LOW/HIGH,
modulating: constant λ value.

Most of the burner components are made of corrosion-resistant stainless steel.

Housing:
BIO: cast steel,
BIOA: AlSi,
ZIO: St,
BIOW: St + internal insulation,
ZIOW: St + internal insulation.

Flame control: with ionization electrode (UV sensor as an option).

Ignition: direct spark ignition; lance as an option.

Maximum furnace temperature:
BIO/ZIO in burner quarl: up to 1600°C (up to 2912°F),
BIO/ZIO with burner attachment tube: up to 600°C (up to 1112°F).

Maximum air temperature:
BIO, ZIO: up to 450°C (842°F),
BIOA: up to 200°C (392°F),
BIOW, ZIOW: up to 500°C (932°F).

REACH Regulation

applies to BIOW and ZIOW only.

Information pursuant to REACH Regulation No. 1907/2006, Article 33.

Insulation contains refractory ceramic fibres (RCF)/aluminium silicate wool (ASW).

RCF/ASW are listed in the Candidate List of the European REACH Regulation No. 1907/2006.

Burner	Rated capacity1)		Burner quarl type	Burner head code letter	Flame length2)		Flame outlet velocity3)	
	kW	10^3 BTU/h			cm	inch	m/s	ft/s
BIO 50	40	151	A	R	25	9.84	15	49.2
BIO 50	40	151	B	R	30	11.8	55	180
BIO 50	40	151	B	H	50	19.7	50	164
BIO 50	40	151	D	K	–	–	–	–
BIO(A) 65	90	340	A	R	40	15.7	20	65.6
BIO(A) 65	90	340	B	R	50	19.7	70	230
BIO(A) 65	90	340	B	H	60	23.6	65	213
BIO(A) 65	90	340	D	K	–	–	–	–
BIO 80	150	567	A	R	45	17.7	20	65.6
BIO 80	150	567	B	R	60	23.6	75	246
BIO 80	150	567	B	H	70	27.6	70	230
BIO 80	150	567	D	K	–	–	–	–
BIO 100	230	870	A	R	55	21.7	20	65.6
BIO 100	230	870	B	R	70	27.6	75	246
BIO 100	230	870	B	H	80	31.5	70	230
BIO 100	230	870	D	K	–	–	–	–
BIO 125	320	1210	A	R	60	23.6	20	65.6
BIO 125	320	1210	B	R	100	39.4	65	213
BIO 125	320	1210	B	H	115	45.3	60	197
BIO 125	320	1210	D	K	–	–	–	–
BIO 140	450	1702	A	R	80	31.5	20	65.5

1) Rated capacity for cold air. Higher capacities are are possible – either on request or see burner diagrams at www.docuthek.com. Capacities in kW refer to the lower calorific value H_u and capacities in BTU/h refer to the upper calorific value H_o.

2) Measured in the burner quarl from the front edge of the burner quarl. The flame diameter is approx. one to two times that of the burner tube or burner quarl outlet.

3) Based on the rated capacity for cold air, with a flame temperature of 1600°C for R burner head and 1500°C for H burner head. The flow velocity is increased when the outlet diameter of the burner quarl is reduced. The rated capacity must then be adjusted to the outlet diameter.

Burner	Rated capacity1)		Burner quarl type	Burner head code letter	Flame length2)		Flame outlet velocity3)	
	kW	10^3 BTU/h			cm	inch	m/s	ft/s
BIO 140	450	1702	B	R	120	47.2	75	246
BIO 140	450	1702	B	H	140	55.1	70	230
BIO 140	450	1702	D	K	–	–	–	–
ZIO 165	630	2382	A	R	90	35.4	20	65.6
ZIO 165	630	2382	B	R	110	43.3	75	246
ZIO 165	630	2382	B	H	160	63	70	230
ZIO 165	630	2382	D	K	–	–	–	–
ZIO 200	1000	3782	A	R	100	39.4	25	82
ZIO 200	1000	3782	B	R	130	51.2	85	279
ZIO 200	1000	3782	B	H	200	78.7	80	262
ZIO 200	1000	3782	D	K	–	–	–	–

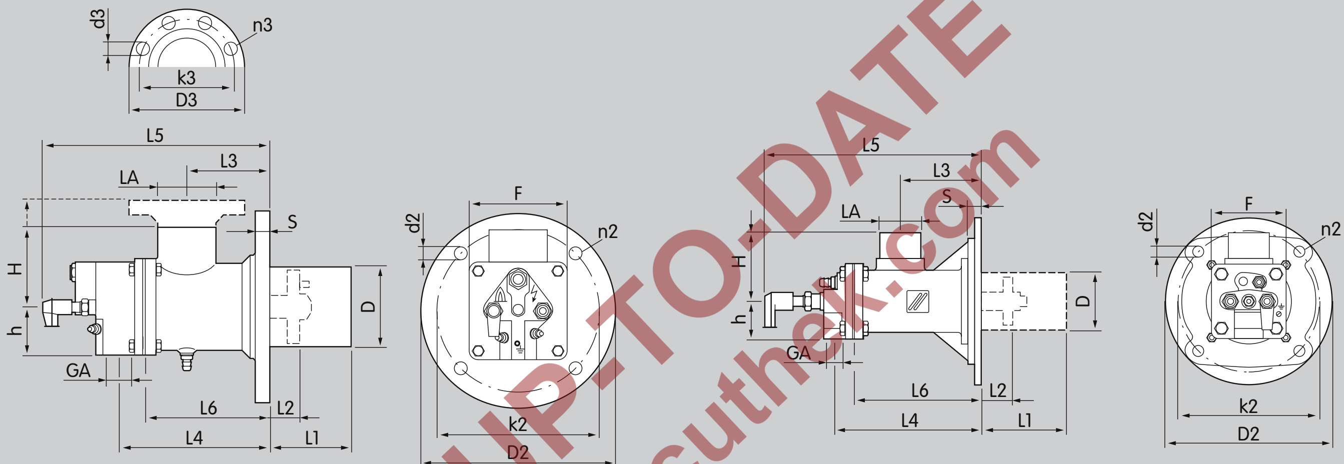
1) *Rated capacity for cold air. Higher capacities are are possible – either on request or see burner diagrams at www.docuthek.com. Capacities in kW refer to the lower calorific value H_u and capacities in BTU/h refer to the upper calorific value H_o.*

2) *Measured in the burner quarl from the front edge of the burner quarl. The flame diameter is approx. one to two times that of the burner tube or burner quarl outlet.*

3) *Based on the rated capacity for cold air, with a flame temperature of 1600°C for R burner head and 1500°C for H burner head. The flow velocity is increased when the outlet diameter of the burner quarl is reduced. The rated capacity must then be adjusted to the outlet diameter.*

8.1 Dimensions

8.1.1 BIO, BIOA [mm]



L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

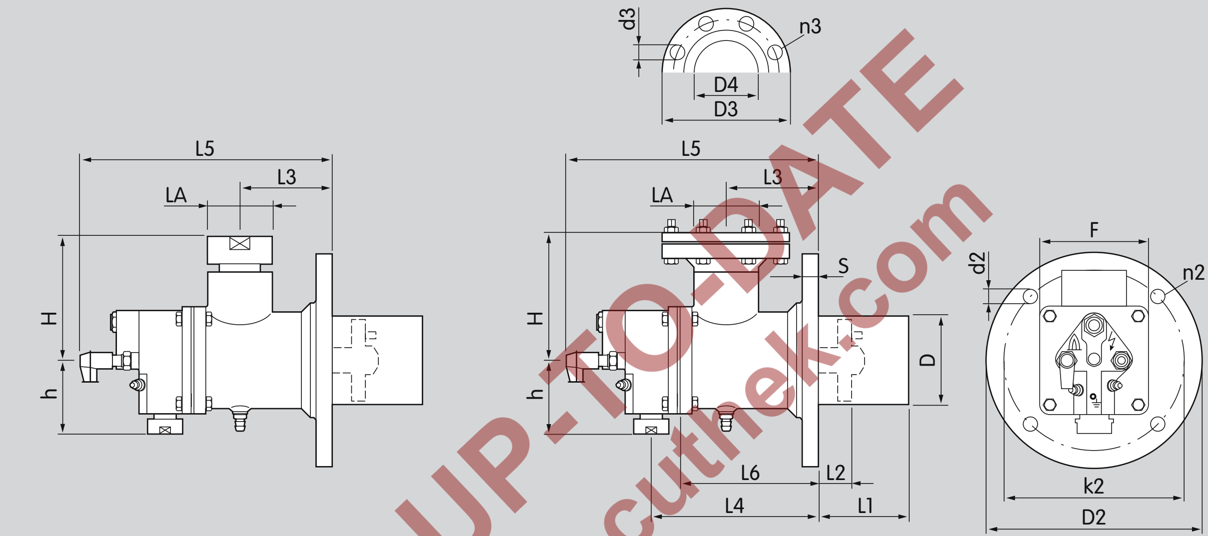
BIO *BIOA*

Burner	Rated capacity*	Connections		Gas connection												Air connection			No. of drillings		Weight
	[kW]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	k3	d3	n2	n3	[kg]
BIO 50	40	Rp 1/2	Rp 11/2	50	50	38	12	73	149	240	127	151	151	12	75	-	-	-	4	-	5.4
BIO 65	90	Rp 3/4	Rp 11/2	65	62	48	12	73	156	246	127	165	165	12	95	-	-	-	4	-	7.2
BIOA 65	90	Rp 1/2	Ø 48	65	110	44	16	95	170	261	149	165	165	13	88	-	-	-	4	-	3.6
BIO 80	150	Rp 3/4	Rp 2	82	112	55	14	90	172	272	140	210	210	14	110	-	-	-	4	-	11.2
BIO 100	230	Rp 1	Rp 2	100	100	60	16	103	185	285	153	200	200	14	120	-	-	-	4	-	12.6
BIO 125	320	Rp 11/2	DN 65	127	135	73	16	120	254	350	212	240	240	14	145	185	145	18	4	4	21.7
BIO 140	450	Rp 11/2	DN 80	140	150	80	18	130	271	381	232	265	265	14	160	200	160	18	4	8	29

* *Cold air connection, open flame, λ = 1.1.*
Capacities in kW refer to the lower calorific value H_u.

** *Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.*

8.1.2 BIO [inch]



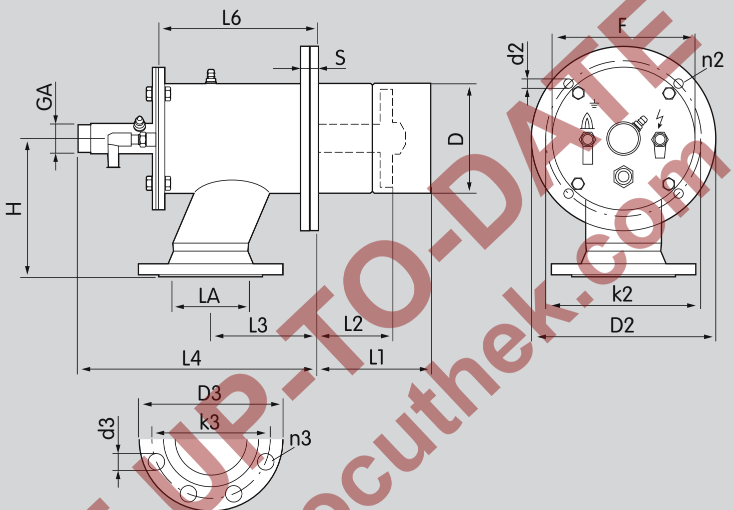
L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

Burner	Rated capacity*	Connections		Gas connection												Air connection			No. of drillings		Weight
	[10^3 BTU/h]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	D4	d3	n2	n3	[lbs]
BIO 50	151	1/2 NPT	11/2 NPT	1.97	1.97	1.5	0.472	2.87	5.87	9.45	5	7.13	5.94	0.47	2.95	-	-	-	4	-	11.9
BIO 65	340	3/4 NPT	11/2 NPT	2.56	2.44	1.89	0.472	2.87	6.14	9.69	5	7.68	6.5	0.47	3.74	-	-	-	4	-	15.8
BIO 80	567	3/4 NPT	2 NPT	3.23	4.41	2.17	0.551	3.54	6.77	10.7	5.51	9.45	8.27	0.55	4.33	-	-	-	4	-	24.6
BIO 100	870	1 NPT	2 NPT	3.94	3.94	2.36	0.63	4.06	7.28	11.2	6.02	9.45	7.87	0.55	4.72	-	-	-	4	-	27.7
BIO 125	1210	11/2 NPT	DN 65	5	5.31	2.87	0.63	4.72	10	13.8	8.35	10.6	9.45	0.55	5.71	7.28	2.94	0.709	4	4	47.7
BIO 140	1702	11/2 NPT	DN 80	5.51	5.91	3.15	0.709	5.12	10.7	15	9.13	11.8	10.4	0.55	6.3	7.87	3.57	0.709	4	8	63.8

* *Cold air connection, open flame, λ = 1.1.*
Capacities in BTU/h refer to the upper calorific value H_o.

** *Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.*

8.1.3 ZIO [mm]



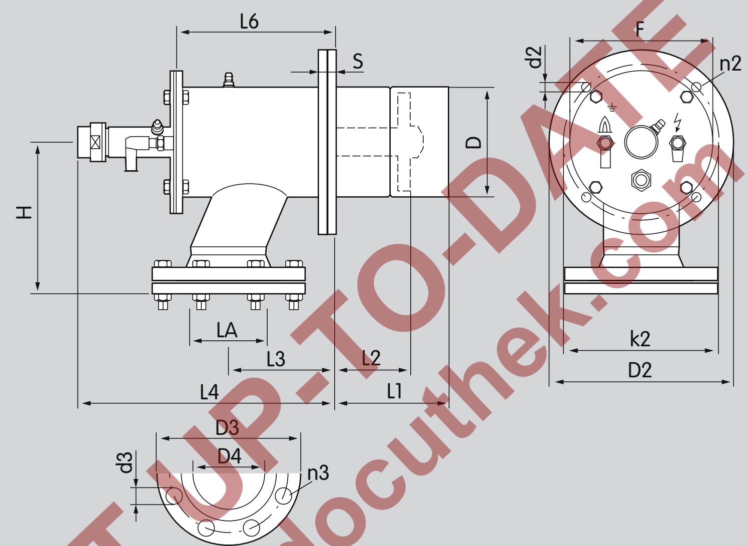
L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

Burner	Rated capacity*	Connections		Gas connection												Air connection			No. of drillings		Weight
	[kW]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	k3	d3	n2	n3	[kg]
ZIO 165	630	R 1 1/2	DN 100	165	213	–	20	150	359	–	230	285	240	14	∅ 220	220	180	18	4	8	26
ZIO 200	1000	R 2	DN 150	194	220	–	20	220	469	–	340	330	295	22	∅ 255	285	240	22	8	8	37

* *Cold air connection, open flame, λ = 1.1.*
Capacities in kW refer to the lower calorific value H_u.

** *Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.*

8.1.4 ZIO [inch]



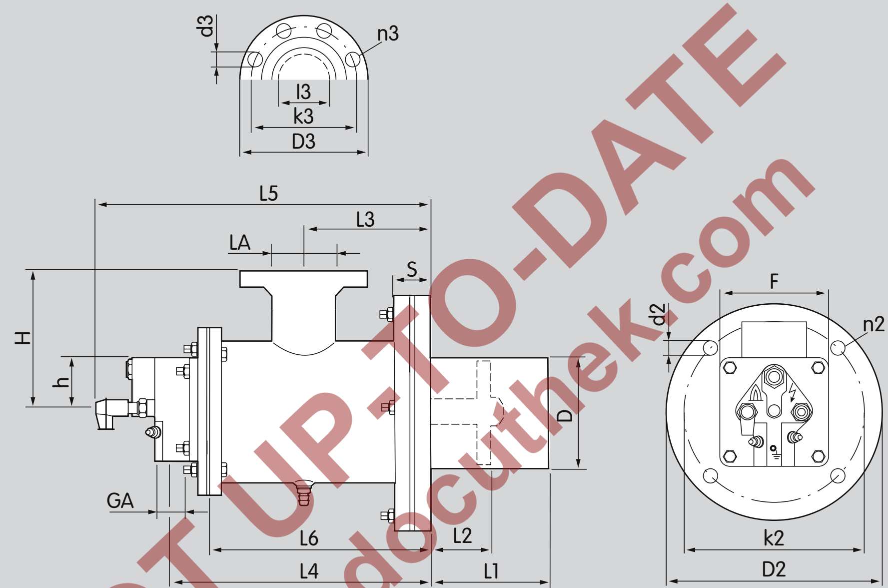
L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

Burner	Rated capacity*	Connections		Gas connection												Air connection			No. of drillings		Weight
	[10^3 BTU/h]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	D4	d3	n2	n3	[lbs]
ZIO 165	2382	11/2 NPT	DN 100	6.5	8.39	–	0.787	5.91	14.1	–	9.06	11.2	9.45	0.55	∅ 8.66	8.66	4.57	0.709	4	8	57.2
ZIO 200	3782	2 NPT	DN 150	7.64	8.66	–	0.787	8.66	18.5	–	13.4	13	11.6	0.87	∅ 10	11.2	6.72	0.866	8	8	81.4

* Cold air connection, open flame, λ = 1.1.
Capacities in BTU/h refer to the upper calorific value H_o.

** Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.

8.1.5 BIOW [mm]



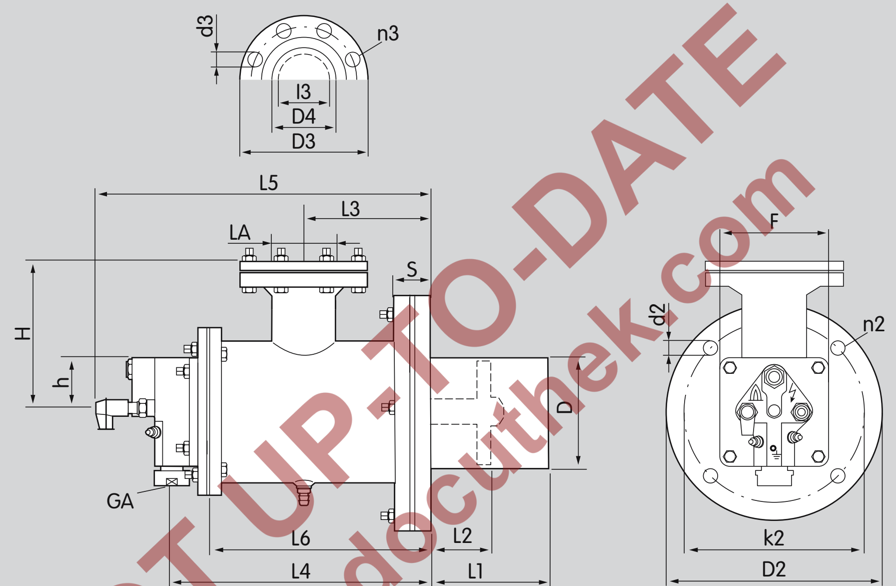
L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

Burner	Rated capacity*	Connections		Gas connection												Air connection				No. of drillings		Weight
	[kW]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	k3	d3	l3	n2	n3	[kg]
BIOW 65	90	Rp 3/4	DN 65	65	142	47	22	121.5	256	344	216	195	165	12	138	185	145	18	58	4	8	11.2
BIOW 80	150	Rp 3/4	DN 80	82	152	54	22	139	272	368	229	240	210	14	156	200	160	18	70	4	8	15.2
BIOW 100	230	Rp 1	DN 80	100	152	59	22	139	285	381	242	240	200	14	172	200	160	18	70	4	8	17.1
BIOW 125	320	Rp 11/2	DN 100	127	182	72	22	170	351	450	299	270	240	14	200	220	180	18	83	4	8	26.2
BIOW 140	450	Rp 11/2	DN 125	140	195	79	22	180	371	480	319	300	265	14	215	250	210	18	106	4	8	24

* *Cold air connection, open flame, λ = 1.1.*
Capacities in kW refer to the lower calorific value H_u.

** *Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.*

8.1.6 BIOW [inch]



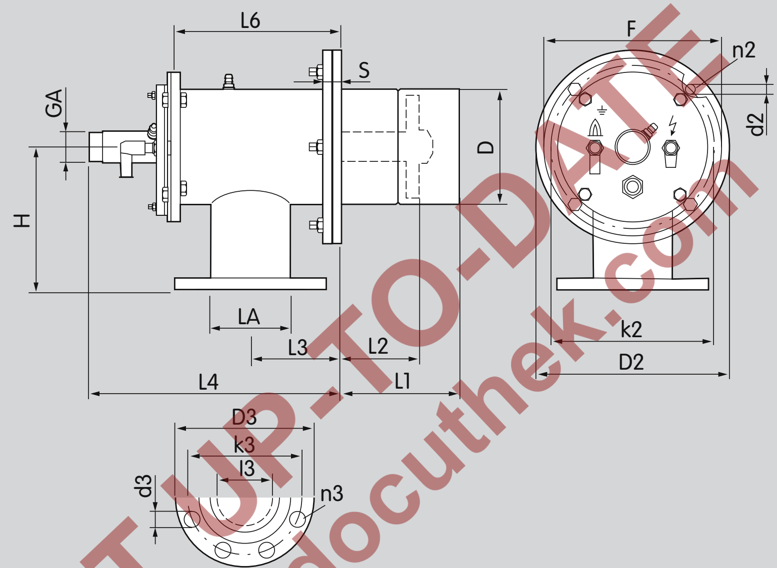
L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

Burner	Rated capacity*	Connections		Gas connection												Air connection				No. of drillings		Weight
	$[10^3$ BTU/h]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	D4	d3	l3	n2	n3	[lbs]
BIOW 65	340	3/4 NPT	DN 65	2.56	5.59	1.85	0.866	4.78	10.1	13.5	8.5	7.68	6.5	0.47	5.43	7.28	2.94	0.709	58	4	8	24.6
BIOW 80	567	3/4 NPT	DN 80	3.23	5.98	2.13	0.866	5.47	10.7	14.5	9.02	9.45	8.27	0.55	6.14	7.87	3.57	0.709	70	4	8	33.7
BIOW 100	870	1 NPT	DN 80	3.94	5.98	2.32	0.866	5.47	11.2	15	9.53	9.45	7.87	0.55	6.77	7.87	3.57	0.709	70	4	8	37.6
BIOW 125	1210	11/2 NPT	DN 100	5	7.17	2.83	0.866	6.69	13.8	17.7	11.8	10.6	9.45	0.55	7.87	8.66	4.57	0.709	83	4	8	57.6
BIOW 140	1702	11/2 NPT	DN 125	5.51	7.68	3.11	0.866	7.09	14.6	18.9	12.6	11.8	10.4	0.55	8.46	9.84	5.65	0.709	106	4	8	52.8

* *Cold air connection, open flame, $\lambda = 1.1$.*
Capacities in BTU/h refer to the upper calorific value H_o.

** *Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.*

8.1.7 ZIOW [mm]



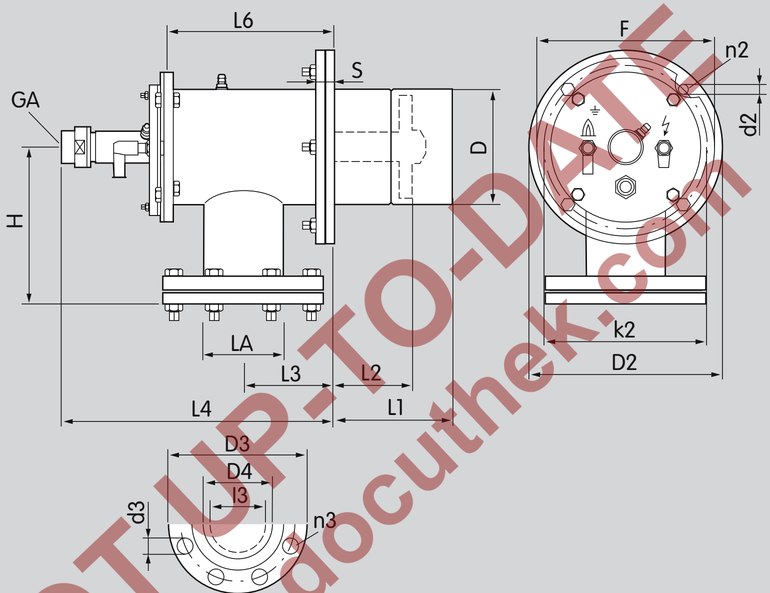
L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

Burner	Rated capacity*	Connections		Gas connection												Air connection				No. of drillings		Weight
	[kW]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	k3	d3	l3	n2	n3	[kg]
ZIOW 165	630	R 11/2	DN 150	165	213	–	20	187	460	–	320	285	240	14	264	285	240	22	130	4	8	32

* *Cold air connection, open flame, λ = 1.1.*
Capacities in kW refer to the lower calorific value H_u.

** *Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.*

8.1.8 ZIOW [inch]



L1 (burner tube length) and L2 (position of burner head) are variable (see page 21 (Calculation example))

Burner	Rated capacity*	Connections		Gas connection												Air connection				No. of drillings		Weight
	[10³ BTU/h]	GA	LA	D**	H	h	S	L3	L4	L5	L6	D2	k2	d2	F	D3	D4	d3	l3	n2	n3	[lbs]
ZIOW 165	2382	$1^1/_2$ NPT	DN 150	6.89	8.39	–	0.787	7.36	18.1	–	12.6	11.2	9.45	0.55	10.4	11.2	6.72	0.866	5.12	4	8	70.4

* *Cold air connection, open flame, λ = 1.1.*
Capacities in BTU/h refer to the upper calorific value H_o.

** *Approx. 10 cm larger in the case of a deviation from the standard length, as a weld seam is applied.*

8.2 Ignition lance

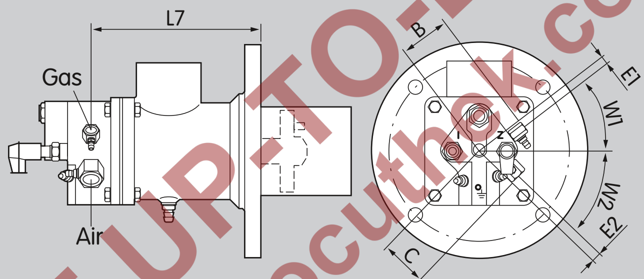
8.2.1 BIO

Gas connection: Rp ¼ (NPT ¼ – see page 31 (Nozzle set 80-140)).

Air connection: Rp 3/8 (NPT 3/8 – see page 31 (Nozzle set 80-140)).

Gas pressure: 30 – 50 mbar (11.8 – 19.7 "WC).

Air pressure: 30 – 50 mbar (11.8 – 19.7 "WC).



Burner	Gas connection		Air connection		Dimensions							
	B		C		E1		E2		L7		W1	W2
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	∠ °	∠ °
BIO 80..L	57	2.24	54	2.13	7	0.276	10	0.394	177	6.97	36	45
BIO 100..L	57	2.24	54	2.13	7	0.276	10	0.394	190	7.48	36	45
BIO 125..L	69	2.72	65	2.56	8	0.315	8	0.315	261	10.3	30	30
BIO 140..L	63	2.72	62	2.44	16	0.669	18	0.709	276	10.9	42	45

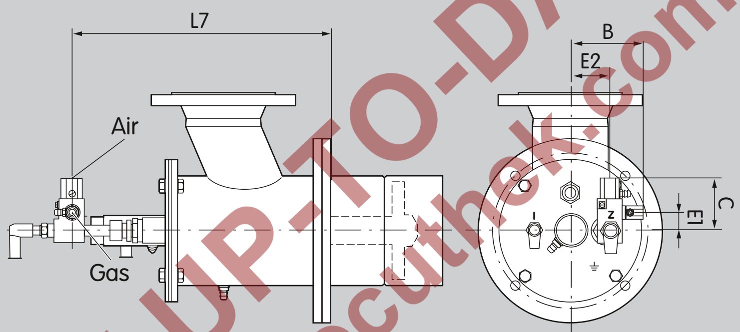
8.2.2 ZIO

Gas connection: Rp ¼ (NPT ¼ – see page 31 (Nozzle set 80-140)).

Air connection: Rp ½ (NPT ½ – see page 31 (Nozzle set 80-140)).

Gas pressure: 30 – 50 mbar (11.8 – 19.7"WC).

Air pressure: 30 – 50 mbar (11.8 – 19.7 "WC).

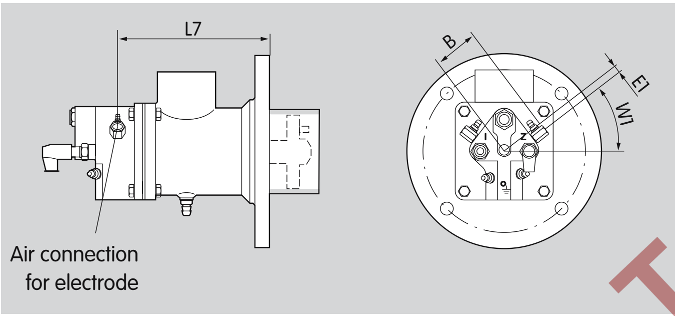


Burner	Gas connection		Air connection		Dimensions					
	B		C		E1		E2		L7	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
ZIO 165..L	118	4.65	77	3.03	27	1.06	71	2.8	382	15
ZIO 200..L	137	5.39	77	3.03	27	1.06	89	3.5	482	19

8.3 Electrodes with air connection

BIO/BIOW

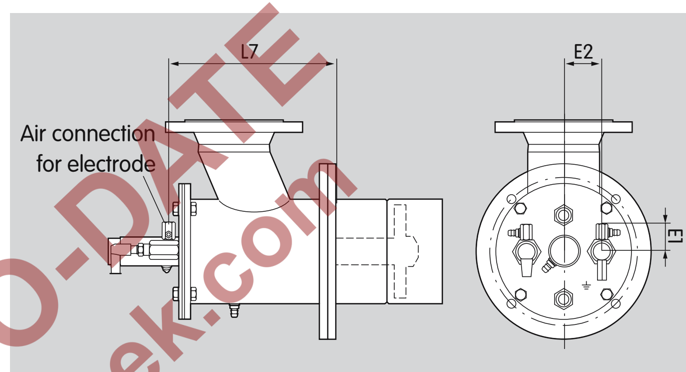
Air connection: Rp ¼ (NPT ¼)



Burner	Dimensions						
	B		E1		L7		W1
	mm	inch	mm	inch	mm	inch	∠ °
BIO 80	57	2.24	7	0.276	177	6.97	36
BIO 100	57	2.24	7	0.276	190	7.48	36
BIO 125	69	2.72	8	0.315	261	10.3	30
BIO 140	63	2.48	16	0.63	276	10.9	42
BIOW 80	57	2.24	7	0.276	277	10.9	36
BIOW 100	57	2.24	7	0.276	290	11.4	36
BIOW 125	69	2.72	8	0.315	361	14.2	30
BIOW 140	63	2.48	16	0.63	376	14.8	42

ZIO/ZIOW

Air connection: Rp ¼ (NPT ¼)

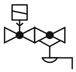
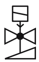
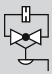


Burner	Dimensions					
	L7		E1		E2	
	mm	inch	mm	inch	mm	inch
ZIO 165	259	10.2	45.5	1.79	49	1.93
ZIO 200	369	14.5	45.5	1.79	55	2.17
ZIOW 165	359	14.1	45.5	1.79	49	1.93

9 Maintenance cycles

Twice per year, but if the media are highly contaminated, this interval should be reduced.

10 Legend

	Manual valve
	Gas solenoid valve
	Air/gas ratio control with solenoid valve
	Flow adjusting cock
	Butterfly valve with actuator
	Butterfly valve with manual adjustment
	Solenoid valve for gas, slow opening
	Air/gas ratio control with bypass nozzle

Feedback

Finally, we are offering you the opportunity to assess this “Technical Information (TI)” and to give us your opinion, so that we can improve our documents further and suit them to your needs.

Clarity

- ○ Found information quickly
- ○ Searched for a long time
- ◉ Didn’t find information

  What is missing? asc
- ○ No answer

Comprehension

- ○ Coherent
- ○ Too complicated
- ○ No answer

Scope

- ○ Too little
- ○ Sufficient
- ○ Too wide
- ○ No answer

interactive

Use

- ☐ To get to know the product
- ☐ To choose a product
- ☐ Planning
- ☐ To look for information

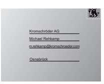
Navigation

- ○ I can find my way around
- ○ I got “lost”
- ○ No answer

My scope of functions

- ○ Technical department
- ○ Sales
- ○ No answer

Remarks



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We reserve the right to make technical modifications in the interests of progress.

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