Honeywell | Industrial & Commercial Thermal

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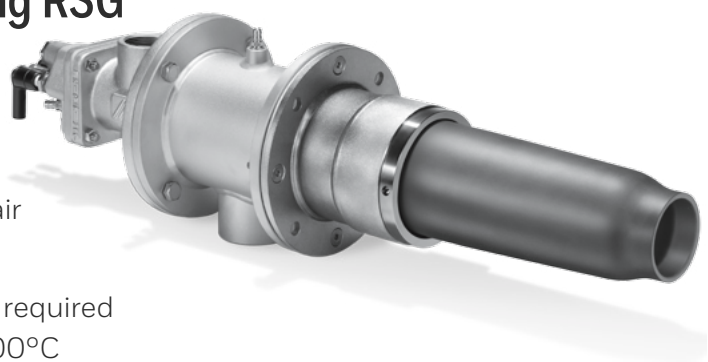
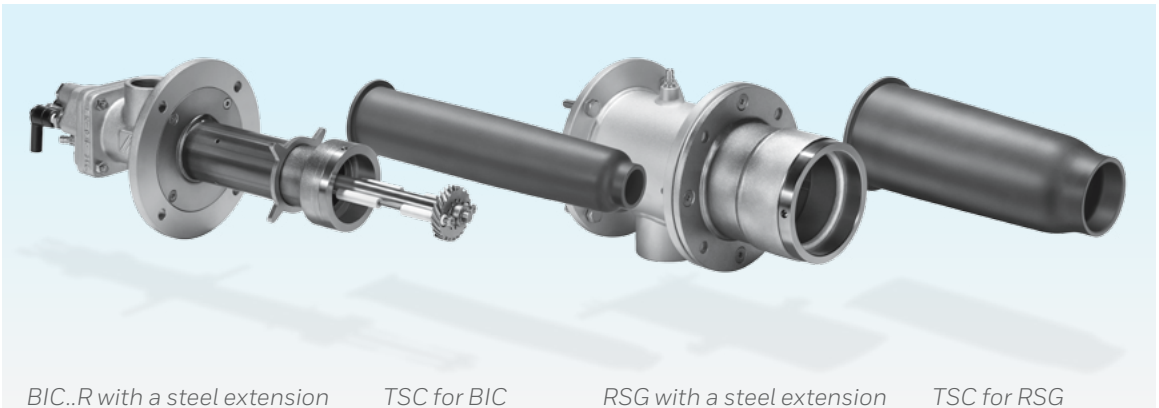
Annular excess air burner for gas BIC..R with annular excess air burner housing RSG

Technical Information · GB
7 Edition 08.16



- Separate connections for primary and secondary air
- Low pollutant emissions even with high excess air
- Adjustment of the flame outlet temperature to the required furnace temperature; flame temperature: 50 – 1500°C
- High outlet velocity possible even with low energy supply and furnace temperature

Contents



BIC..R with a steel extension TSC for BIC RSG with a steel extension TSC for RSG

Thanks to the annular excess air burner BIC..R's modular design, the components can be selected in accordance with the required gas type and burner output.

1 Application

The annular excess air burner is suitable for use in industrial kilns in the ceramics, pottery and enamel industries. Its mechanical construction means that it is particularly suitable for use on high-speed kilns.

Two air connections allow a very high lambda value of up to $\lambda = 50$ to be reached. The flame outlet temperature can be adjusted directly to the kiln temperature/time profile in intermittent systems with minimum energy supply while also supplying a high flame outlet velocity and therefore high convective heat transfer.

Separate secondary air ensures CO-optimised combustion with high excess air.

The large air cross-sections enable large volumes of air to be introduced during the system's cooling phase, which leads to a reduction in the cooling time and therefore to an increase in the system's availability.

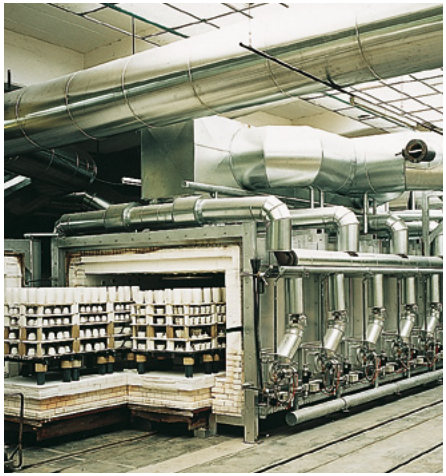
Reducing and oxidising combustion are possible.

Ceramics kiln with temperature control via impulse system

High-speed combustion in the fine ceramics industry

Chamber kiln for intermittent operation

Intermittent shuttle kiln in the fine ceramics industry



Intermittent shuttle kiln

Intermittent shuttle kiln

1.1 Examples of application

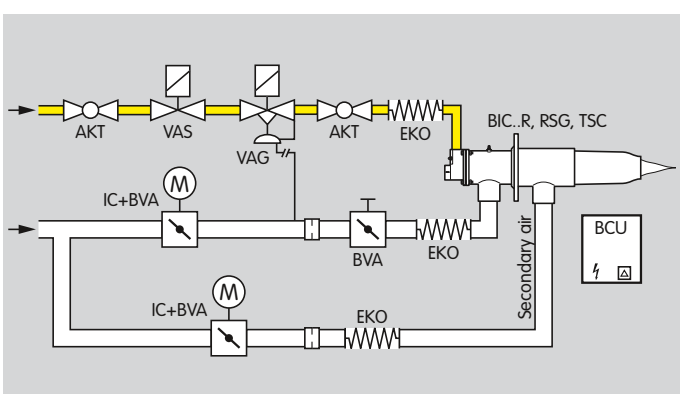
1.1.1 Modulating or stage-controlled burner system for high-speed kilns

The burner output is modulated or stage-controlled by adjusting the butterfly valve BVA. The air/gas ratio control VAG ensures a constant gas/air flow ratio via the impulse line.

The secondary air flow is varied by adjusting the second butterfly valve, independent of the burner output. This means that the flame temperature can be matched to the kiln temperature while maintaining a high flame outlet velocity.

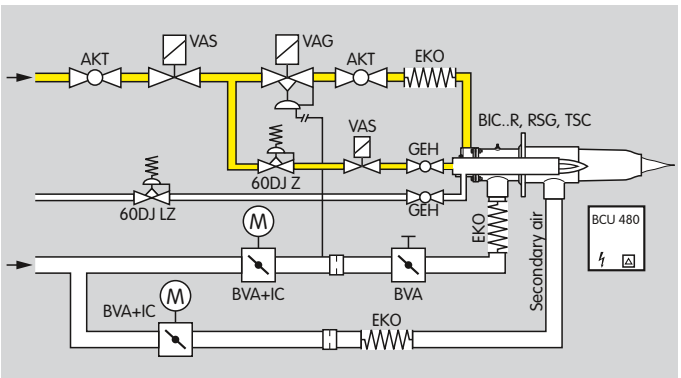
Short cooling times are achieved by feeding the maximum cooling air volume when the burner is switched off and the butterfly valves are fully open.

This example system can be used in the manufacture of heavy clay and fine ceramics, porcelain, technical ceramics and ceramic refractory products.



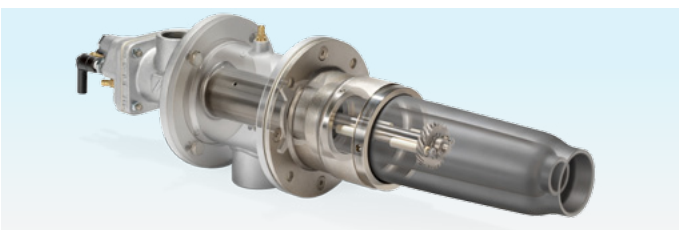
1.1.2 Burner system with lance

The burner may also optionally be ignited by an integrated ignition lance.



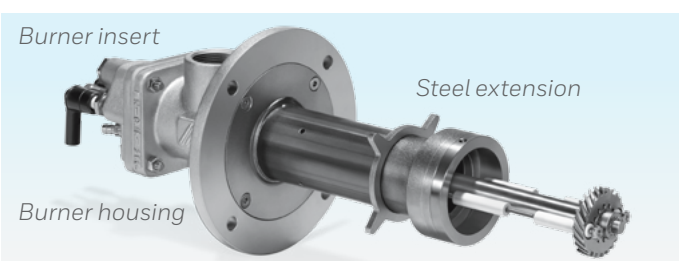
2 Mechanical construction

The annular excess air burner consists of the modules BIC..R with a steel extension, ceramic tube set TSC and the annular excess air burner housing RSG (also with a steel extension if applicable) with a further ceramic tube set TSC. The modular design allows the annular excess air burner to be easily adapted to the respective process or to be integrated into existing systems. Maintenance and repair times are reduced and existing kiln installations can easily be converted.

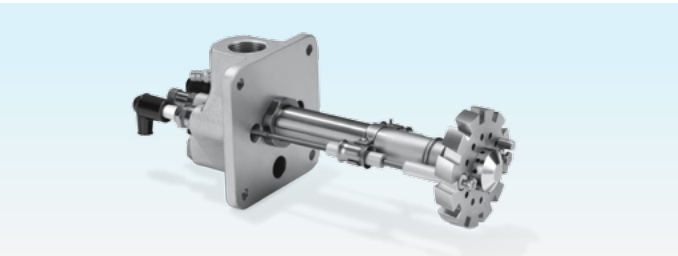


2.1 BIC..R with a steel extension

The burner unit BIC..R is composed of the following modules: burner housing, burner insert and steel extension.



2.1.1 Burner insert



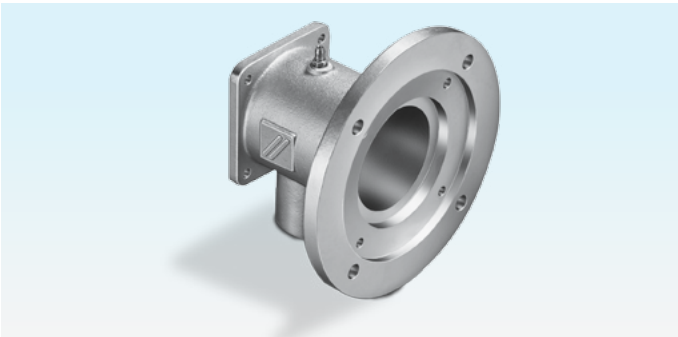
The combustion gas is supplied to the burner head via the gas connection and the gas nozzle. The gas connection flange comprises of the sight glass, ground screw and electrode plugs with plug caps.

As from construction stage E, a measuring orifice and flow adjustment are integrated in the connection flange to easily measure and adjust the gas flow rate.

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

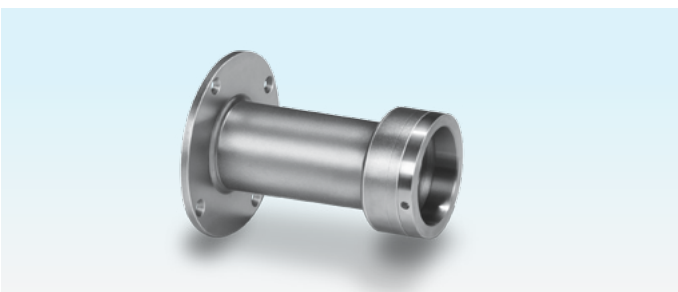
Burners BIC and BICA are nozzle-mixing burners. Gas and air are mixed only once they are in the burner head. This prevents explosive gases from being generated in the pipeline. There are various burner head versions for different flame shapes and gas types.

2.1.2 Burner housing (kiln flange)



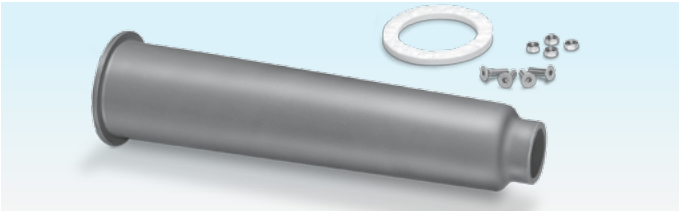
The burner BIC is secured to the annular excess air burner housing RSG by the burner housing. The burner housing accommodates the burner insert and the ceramic tube TSC, and routes the combustion air. The combustion air pressure can be measured using an air pressure test nipple.

2.1.3 Steel extension for BIC..R



The burner is adapted to the length of the annular excess air burner housing RSG via the steel extension for BIC..R.

2.2 Ceramic tube set TSC for BIC and RSG



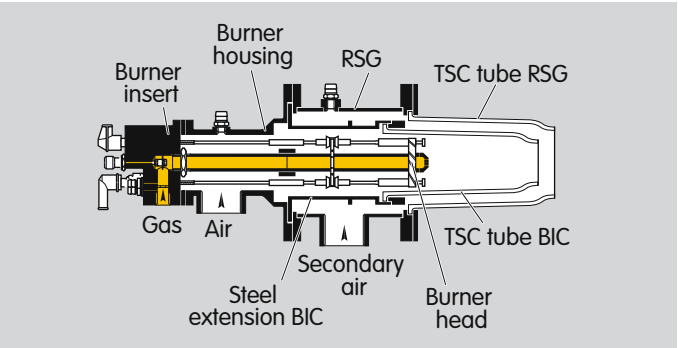
A SiC ceramic tube TSC in lightweight design serves as combustion chamber. The SiC tube ensures complete combustion so that no burner quarl is required.

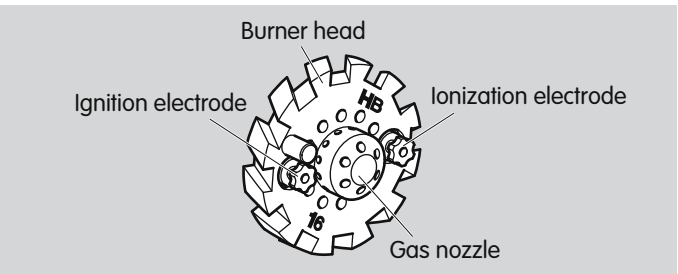
2.3 Annular excess air burner housing RSG with a steel extension

The burner BIC..R and the annular excess air burner housing RSG are fitted as a unit to the kiln wall. Secondary air is supplied to the burner via the RSG independently of the primary burner operation. The annular excess air burner housing RSG accommodates the second ceramic tube set TSC.

The burner may be adapted to different kiln wall thicknesses via the steel extension for RSG.

3 Function





Gas flows through the gas connection in the burner housing and air flows through the burner insert 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 degree and manner of twisting of the combustion air and determine the flame shape. 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 ionisation electrode or optionally using a UV sensor.

Secondary air is additionally supplied to the process via the annular excess air burner housing RSG. The flame is not “influenced” in this process. The flame temperature decreases with increasing secondary air flow. Higher lambda values can be achieved than with only primary burner operation. High outlet velocities are possible with minimum energy supply.

The required flame velocity and burner output are achieved from the burner being combined with an appropriately shaped ceramic tube. The suitable shaping of the second ceramic tube TSC for RSG ensures a high outlet velocity of the secondary air.

4 Selection

4.1 Burner type

Type	Housing	Air temperature [°C]	Kiln temperature [°C]
BIC	GG 25	20 – 450	50 – 1450
BICA	AlSi	20 – 200	50 – 1450

4.2 Burner size

Burner size	Output [kW]
BIC 65, BICA 65	15, 50, 60
BIC 100	130, 200, 230
BIC 140	320, 360

4.3 Burner head

The choice of burner head depends on the flame shape, gas type and variant.

Flame shape	Code letter	Control range[2]		Low fire λ	λ[3]	Kiln temperature [°C]	Air temperature[4] [°C]
		Continuous	Staged				
Short	R	1:10	› 1:10	› 1.05	0.8 – 1.3	50 – 1350	20 – 150 [5]
Long	H [1]	1:10	1:10	› 1.3	0.8 – 1.5	500 – 1600	20 – 450

1) *Only for BIC 65, BICA 65*
2) *A wider control range can be achieved by choosing a variant.*
3) *For exact values for the respective burner version, see burner diagram at www.docuthek.com.*
4) *The gas flow rate should be reduced in accordance with the enthalpy gain of the preheated combustion air.*
5) *Higher temperatures available on request.*

Gas type	Code letter	Calorific value range [kWh/m³(n)]	Density [kg/m³]
Natural gas L and H quality	B	8 – 12	0.7 – 0.9
Propane and propane/butane	G[1]	25 – 35	2 – 2.7
Propane, propane/butane, butane	M	25 – 35	2 – 2.7

1) *Only for BIC 100*

Variant	Code letter	Output [kW]	λ
Ignition lance	L	approx. 1.5	› 1.05
Reduced max. connection rating	R	–	› 1.05

4.4 Combination TSC for BIC and second TSC for RSG

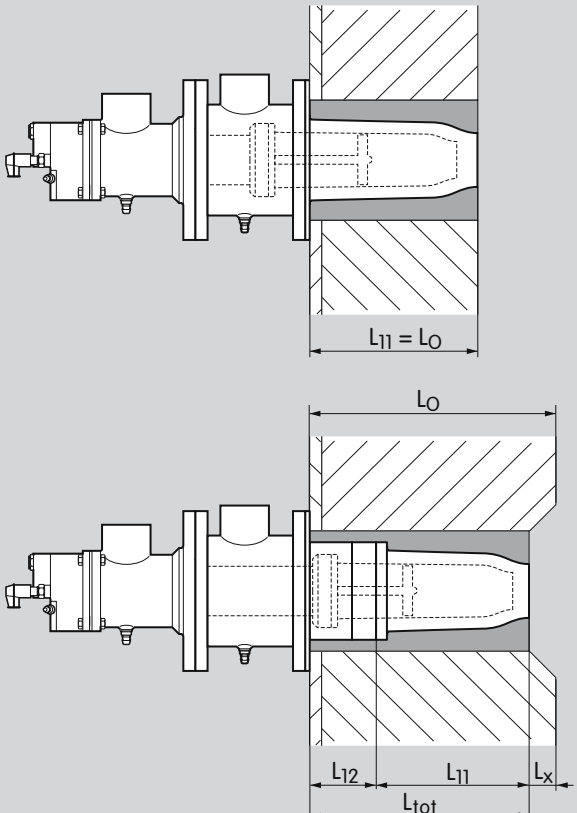
Output [kW]	BIC	Outlet dia.TSC for BIC..R	RSG	Outlet dia. TSC for RSG	Secondary air flow [m³/h]	psecondary air [mbar]
15	BIC(A) 65	TSC 50B020-300/135	RSG 100/65	TSC 100B050-250/35	250	25
50	BIC(A) 65	TSC 65B033-300/135	RSG 100/65	TSC 100B050-250/35	380	70
50	BIC(A) 65	TSC 65B033-300/135	RSG 100/65	TSC 100B065-250/35	600	60
60	BIC(A) 65	TSC 65B040-300/135	RSG 100/65	TSC 100B065-250/35	400	40
130	BIC 100	TSC 100B050-300/35	RSG 140/100	TSC 140B070-300/35	500	50
200	BIC 100	TSC 100B065-300/35	RSG 140/100	TSC 140B085-300/35	500	45
230	BIC 100	TSC 100B082-300/35	RSG 140/100	TSC 140A120-300/35	500	25
320	BIC 140	TSC 140B085-300/35	RSG 200/140	TSC 200B107-300/35	650	25
360	BIC 140	TSC 140A120-300/35	RSG 200/140	TSC 200A180-300/35	750	30

4.5 SiC material for TSC

Material	Air temperature [°C]	Burner head code letter	Optional lance (L)	Kiln temperature [°C]	Max. application temperature [°C]
Si-1500	< 450	H, R	L	< 1450[1)]	1500[2)]

[1)] Higher kiln temperatures up to 1600°C available on request.

[2)] Melting point of silicon 1380°C.



Legend

L_{11} = Length of TSC tube for RSG
L_{12} = Length of steel extension for RSG
L_O = Kiln wall thickness
L_X ≤ 50 mm
L_{tot} = Total length ($L_K - L_X$)

4.6 Calculating the length of BIC..R

We recommend adapting the steel extension length (L_{12}) for RSG and the TSC tube length (L_{11}) so that the opening of the TSC tube is flush with the interior kiln wall ($L_X = 0$). The opening may not retreat more than 50 mm (L_X) from the surface of the interior kiln wall.

Calculating the steel extension for RSG

Length of TSC tube for RSG:

L_{11} = 250 or 300 mm

Length of steel extension for RSG:

$L_{12} = LK - (L_{11} + L_X)$

Selecting the related burner length

There is a suitable burner length for every RSG length, depending on the burner size.

Annular excess air burner housing RSG	Steel extension required for RSG L_{12} [mm]	Length TSC for RSG L_{11} [mm]	Total length L_{tot} [mm]	Corresponding burner	Length of burner extension/position of burner head [mm]	Length TSC for BIC [mm]
100/65	0	250	250	BIC(A) 65	100/235	300/135
100/65	50	250	300	BIC(A) 65	150/285	300/135
100/65	100	250	350	BIC(A) 65	200/335	300/135
100/65	150	250	400	BIC(A) 65	250/385	300/135
140/100	0	300	300	BIC 100	150/185	300/35
140/100	50	300	350	BIC 100	200/235	300/35
140/100	100	300	400	BIC 100	250/285	300/35
200/140	0	300	300	BIC 140	250/285	300/35

Example for RSG 140/100 and BIC 100

L_K = 400 mm, L_{11} = 300 mm, L_X = 0 mm.

Required steel extension (L_{12}) for RSG:

$L_{12} = L_K - L_{11} \Rightarrow 400 - 300 = 100$ mm

select: RSG 140/100-100 and BIC 100 – 250/285.

4.7 Type code

4.7.1 Annular excess air burner BIC..R

Code	Description
BIC BICA	Burner for gas Burner for gas with aluminium housing
65 – 140	Burner size
R H	Flame shape: short long
B G M	Gas type: natural gas propane, propane/butane, butane butane, propane, propane/butane
L R	Versions: separate low-fire gas and air rate supply reduced max. connection rating
-100 -150 -200 -250 ...	Length of burner extension
/185- /235- /285- /335- ...	Position of burner head
(1 – 99)	Burner head identifier
A–Z	Construction stage
R	Annular excess air burner

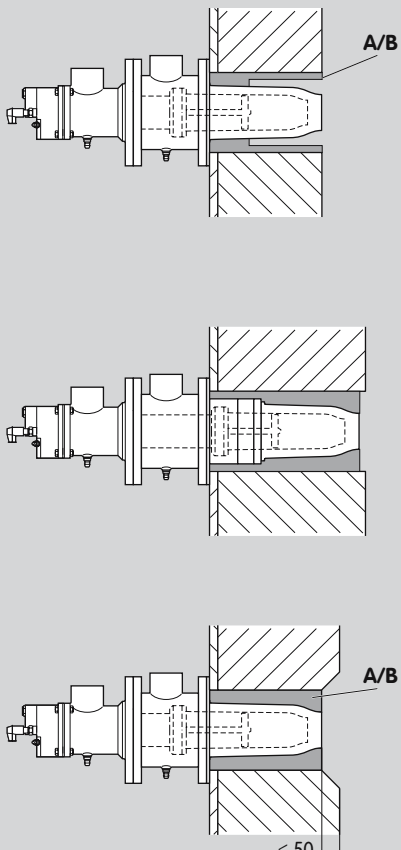
4.7.2 Ceramic tube set TSC

Code	Description
TSC	Ceramic tube set
50 – 200	Designed for burner size
A B	Shape: cylindrical tapered
020, 033, 040, 050, 065, 070, 082, 085, 107, 120	Outlet dia. [mm]
–250, –300	Tube length [mm]
/35– /135–*	Position of burner head
Si-1500	Ceramic tube material

** Only for BIC 65, BICA 65*

4.7.3 Annular excess air burner housing RSG

Code	Description
RSG 100 RSG 140 RSG 200	Annular excess air burner housing size
/65 /100 /140	Designed for burner size: BIC 65, BICA 65 BIC 100 BIC 140
-0 -50 -100 -150	Annular excess air burner housing extension



5 Project planning information

5.1 Installation

Installation position: any.

Gas and air connection in the burner housing BIC:
can be rotated in 90° steps.

Air connection in the annular excess air burner housing RSG:
can be rotated in 90° steps.

Install flexible tubes or bellows units to prevent mechanical stress or vibrations.

Insulate the TSC tube and the steel extension for RSG. Use solid shaped parts **A** or high temperature resistant ceramic fibrous material **B** for insulation.

The insulating material may come into contact with the RSG TSC tube in the flame formation area.

5.2 Recommended ignition transformer

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

5.3 Nozzle-mixing burners

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

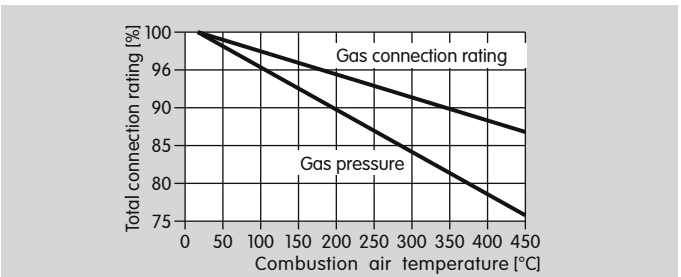
5.4 Flame control

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

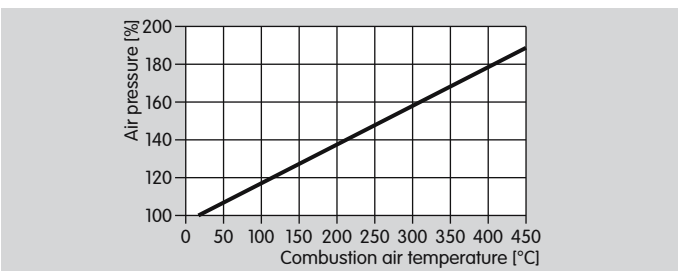
5.5 Hot air compensation

In order to maintain the total connection rating constant in hot-air operating mode:

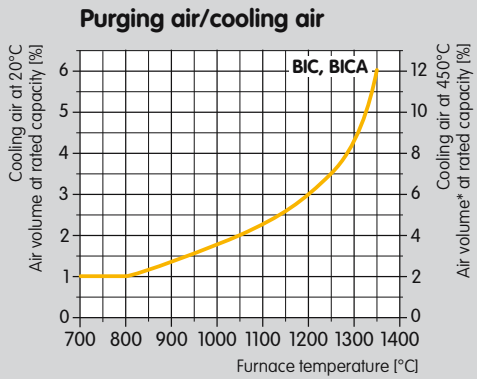
1. Gas connection rating and gas pressure are reduced



2. Air pressure is increased



5.6 Purging air/cooling air



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

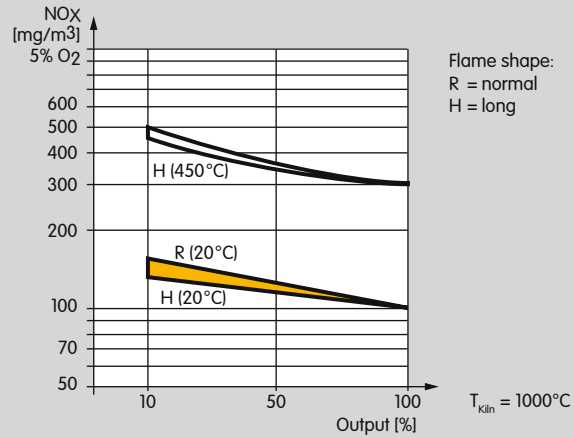
Purging air

While the burner is switched off and depending on the kiln temperature, the burner must be cooled with a low air volume in order to avoid condensation due to the kiln atmosphere entering the burner housing. The air fan should not be switched off until the kiln has cooled down completely.

Cooling air

Thermal overload of the burner components must be avoided while the burner is switched off. The cooling air volume depends on the kiln and cooling air temperatures.

5.7 Emissions



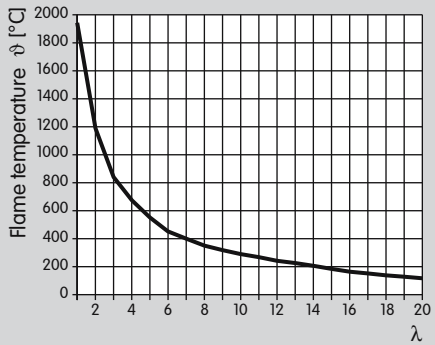
Emissions for cold-air operating mode do not exceed the limits stipulated by the German Clean Air Directive.

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

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

5.8 Flame temperature

Theoretical interrelationship of flame temperature and lambda λ.



5.9 Gas line connection

To ensure accurate measurements of the pressure differential on the integrated gas measuring orifice for burners BIC as from construction stage E, the following applies for the design of the gas connection:

– Ensure undisturbed flow to the gas connection on the burner inlet 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 bend 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, to avoid incorrect measurements and to enable burner operation with excess gas, we recommend the following:

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

5.10 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.

5 Technical data

Output [kW]	Burner	Outlet dia. TSC for BIC..R	Flame shape/ code letter	Construction stage	Visible flame length[1)]	Flame outlet velocity [m/s][2)]
15	BIC(A) 65	20	H...R	E (D)	15	100
50	BIC(A) 65	33	H	E (D)	27	120
60	BIC(A) 65	40	H	E (D)	33	100
130	BIC 100	50	R	F	40	145
200	BIC 100	65	R	F	45	130
230	BIC 100	82	R	F	50	100
320	BIC 140	85	R	E	60	125
360	BIC 140	120	R	E	80	70

1) *Measured from ceramic tube opening at rated capacity in the open air, λ = 1.05.*
2) *Referred to rated capacity, calculated using the flame temperature: 1600°C = type "R" flame shape, 1500°C = type "H" flame shape, λ = 1.05.*

Gas supply pressure: approx. 10 to 40 mbar, air supply pressure: approx. 10 to 30 mbar, secondary air pressure: 25 to 70 mbar, each depending on flame shape and gas type (gas and air pressures and secondary air – see Operating characteristic diagram (D, GB) and Flow rate curve (D, GB) – www.docuthek.com ➔ Elster Kromschröder ➔ Products ➔ 07 Burners and pilot burners ➔ Annular excess air burners ➔ Kind of document: Operating characteristic diagram/Flow rate curve.

Annular excess air burner housing RSG length: 0 to 150 mm (other lengths available on request).

Types of gas: natural gas, LPG (gaseous).

Control ranges:
approx. 1:10 for modulating or stage control.

Excess air up to $\lambda = 50$ is possible, depending on the burner size and ceramic tube combination.

Flame control:
direct ionisation control (UV control as an option).

Ignition: direct, electrical, lance as an option.

Ignition capacity ≤ 40% of max. burner capacity.
For higher ignition capacity – see Operating characteristic diagram (D, GB) – www.docuthek.com ➔ Elster Kromschröder ➔ Products ➔
07 Burners and pilot burners ➔
Annular excess air burners ➔ Kind of document: Operating characteristic diagram.

Max. kiln temperature: 1450°C with TSC tube SI-1500.

Burner housing:
BIC: GG25,
BICA: AlSi.
Hot air:
BIC up to 450°C,
BICA up to 250°C.

Flame outlet velocity: medium to high.

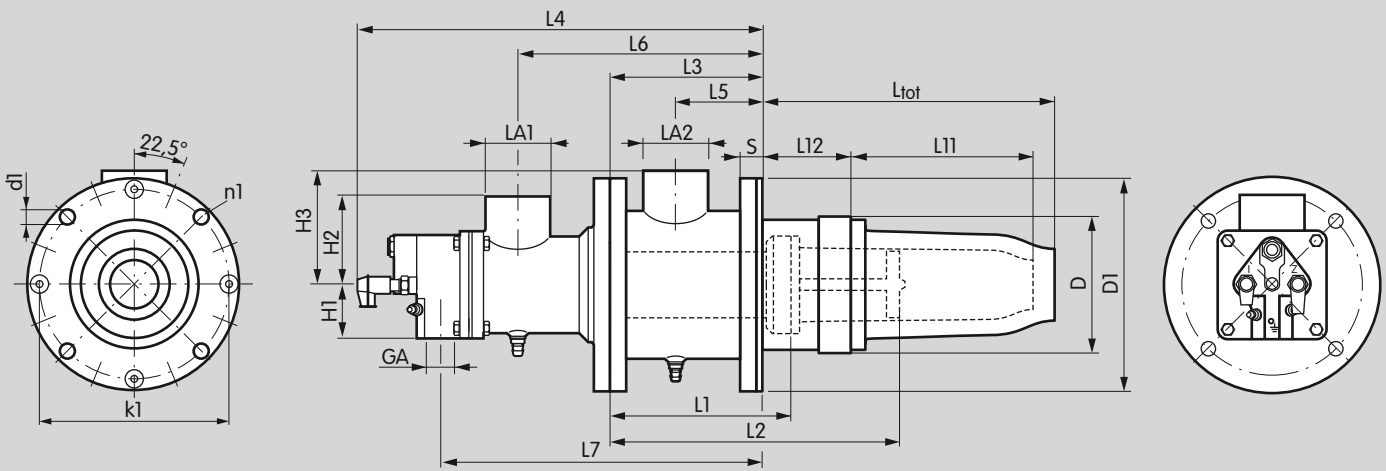
Flame shape: normal, long.

The flame diameter is one to two times that of the burner tube outlet.

Integrated measuring orifice and adjuster for the gas flow rate in the gas connection flange (only BIC).

5.1 Dimensions

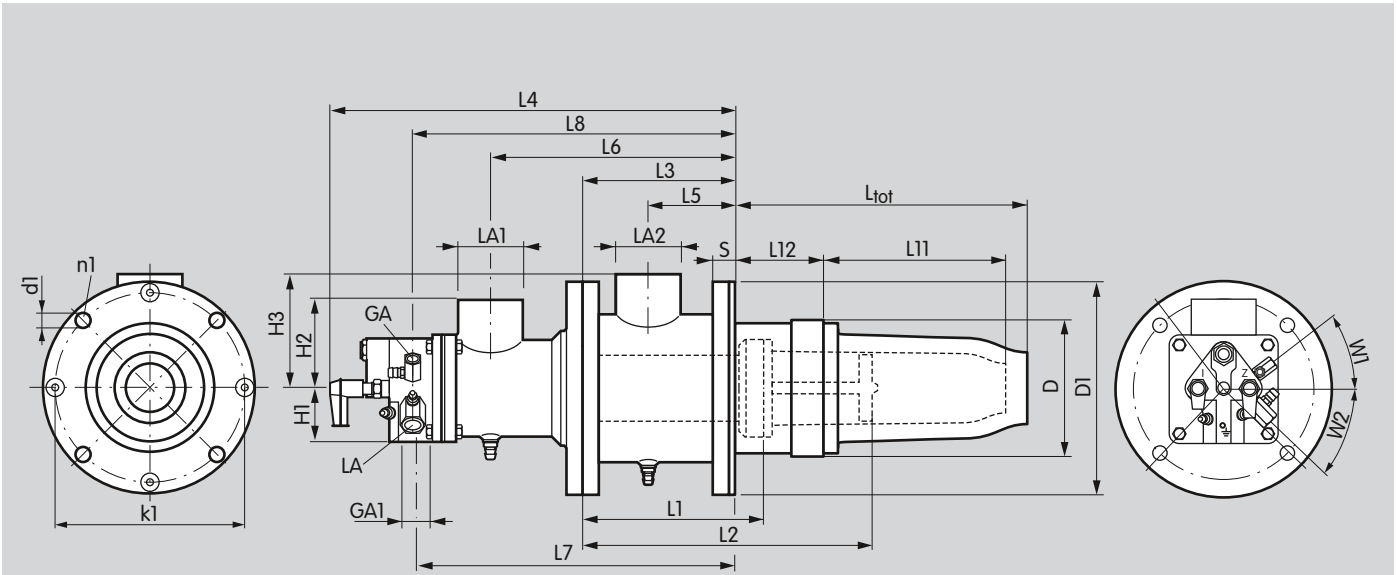
5.1.1 BIC..R with annular excess air burner housing RSG



BIC..R

Type	Connections			Dimensions [mm]														Weight [kg]
	Gas GA	Air LA1	Air LA2	H1	H2	H3	L3	L4	L5	L6	L7	S	D	D1	k1	d1	n1	
BIC 65	Rp ¾	Rp 1½	Rp 2	47.5	62	105	169	414	101	244	327	22	125	195	165	13	4	13.4
BIC 100	Rp 1	Rp 2	Rp 2½	60	100	128	188	473	111	293	375	25	168.3	240	200	14	4	21.4
BIC 140	Rp 1½	DN 80 DIN 2501 PN 16	DN 100 DIN 2501 PN 16	80	150	210	280	661	150	412	553	22	252	330	295	22	8	50.6

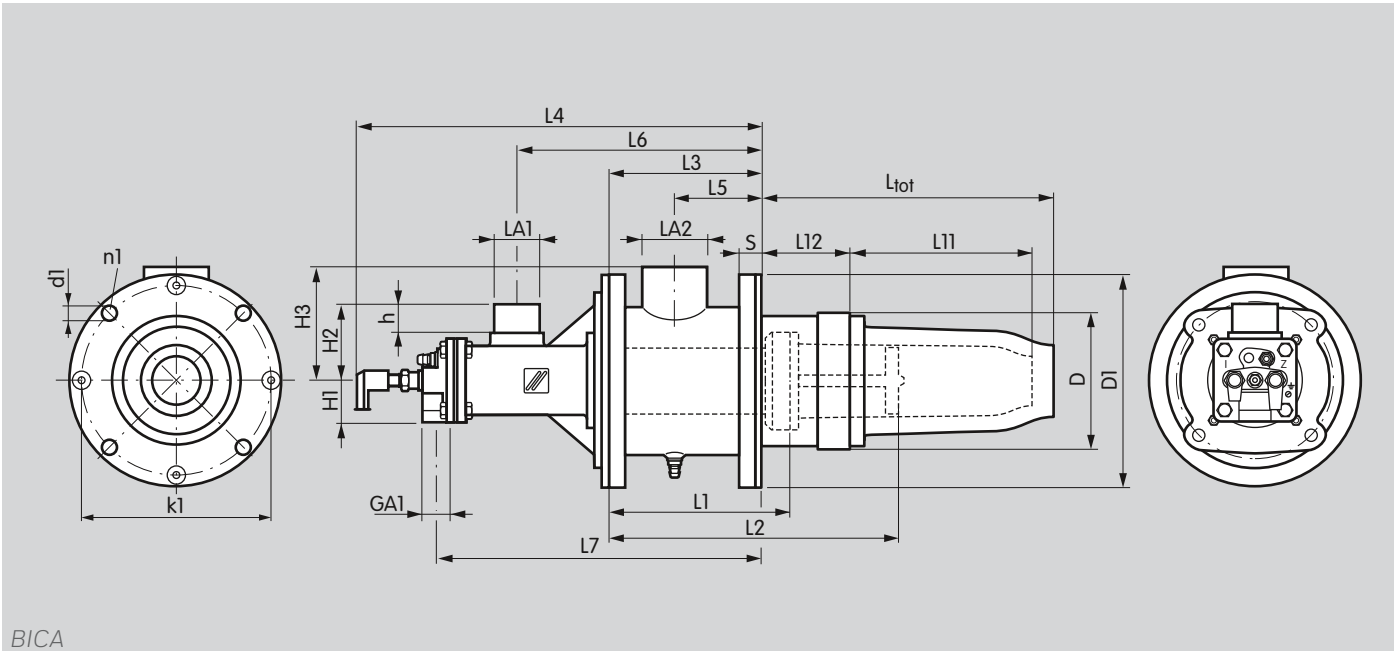
5.1.2 BIC..L..R with annular excess air burner housing RSG and steel extension for RSG



BIC..L..R

Type	Connections					Dimensions [mm]																Weight [kg]
	Gas GA	Air LA	Gas GA1	Air LA1	Air LA2	H1	H2	H3	L3	L4	L5	L6	L7	L8	S	D	D1	k1	d1	n1	W1	W2	
BIC 100...L	Rp 3/8	Rp ¼	Rp 1	Rp 2	Rp 2½	60	100	128	188	475	111	293	375	380	25	168.3	240	200	14	4 x	36°	45°	22.3
BIC 140...L	Rp 3/8	Rp ¼	Rp 1½	DN 80 DIN 2501 PN 16	DN 100 DIN 2501 PN 16	80	150	210	280	661	150	412	553	558	22	252	330	295	22	8	42°	45°	51.5

4.1.3 BICA with annular excess air burner housing RSG and steel extension for RSG



BICA

Type	Connections			Dimensions [mm]														Weight [kg]
	Gas GA	Air LA1	Air LA2	H1	H2	H3	L3	L4	L5	L6	L7	S	D	D1	k1	d1	n1	
BICA 65	Rp ½	ø 48	Rp 2	44	80	105	169	424	101	266	341	25	125	195	165	13	4 x	10.2

5 Maintenance cycles

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

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?
- ○ No answer

Comprehension

- ○ Coherent
- ○ Too complicated
- ○ No answer

Scope

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

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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www.kromschroeder.de/Weltweit.20.0.html?&L=1

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

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