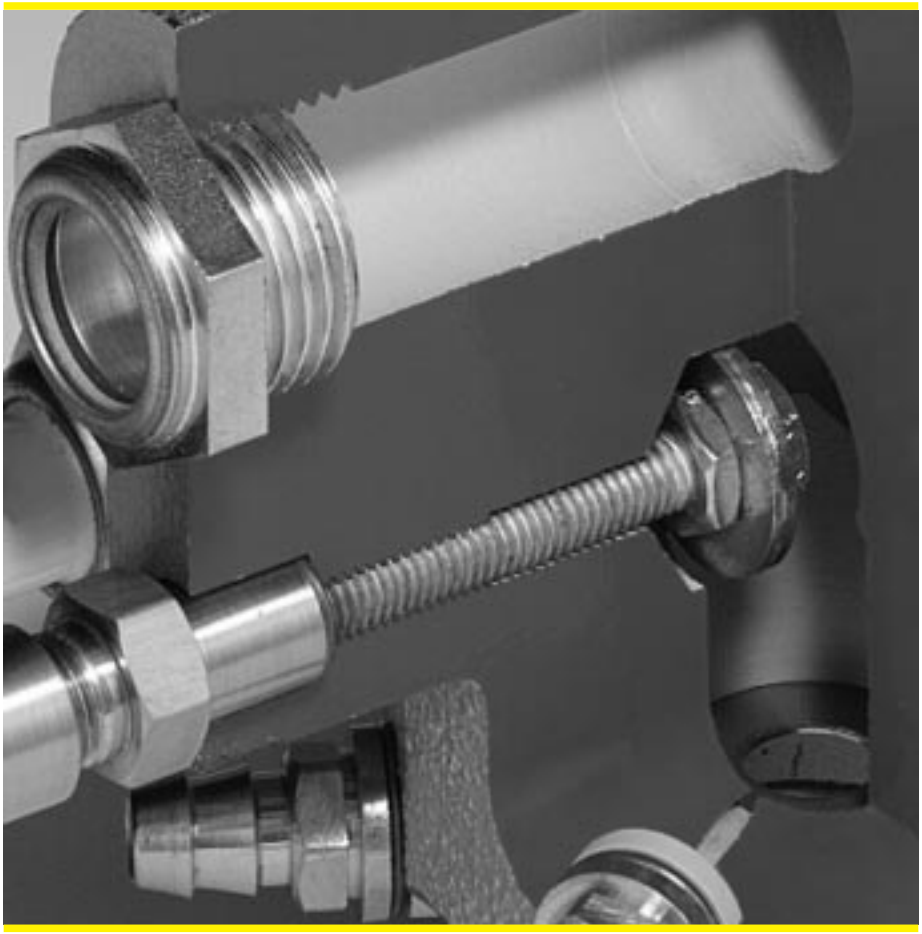
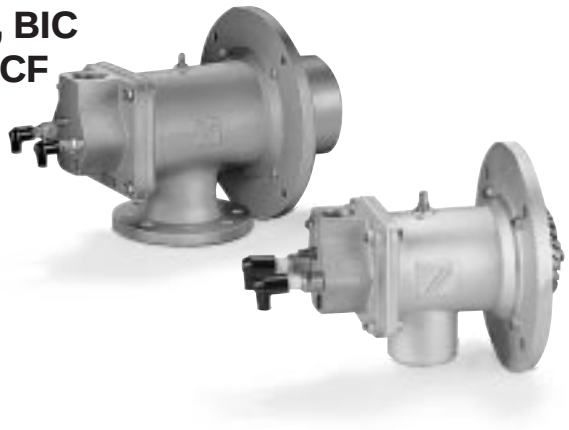
krom//schroder



Burners for gas

BIO, BIOA, ZIO, BIC
BICA, BICF, BOCF



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BIO


BOA


BIC


BICA


ZIO


BIO + UVS 8

Burners for gas BIO, BIOA, ZIO, BIC, BICA, BICF, BOCF

- Capacity range 5,000 to 3,400,000 BTU/h (1.5 to 1000 kW)
- Modular design
- High outlet velocity and high impulse
- Directly ignited and controlled
- Low pollutant emission thanks to optimised combustion
- Extremely low NO_x emissions with BICF, BOCF thanks to flameless oxidation (FLOX®)
- Customised versions for various applications and types of gas; also for indirect heating systems and installations with recuperative heat recovery
- Suitable for use as roof or side burners
- Kromschröder is a company certified to ISO 9001

Application

On industrial furnaces and kilns and gas-fired installations
– in the iron and steel industry,
– in the precious-metals, nonferrous-metals and light-alloys sector,
– in the glass, heavy-clay and fine-ceramics, pottery or enamel industry,
– in the ore, rock and soil sector or
– for the plastics, fabric-material or paper industry,
– on thermal afterburning plants
– and on dryers and hot air generators.

Features

BIO(A), ZIO with steel tube for burner tile or with additional tube.
BIC(A), BICF, BOCF in conjunction with a ceramic tube set TSC made of SiC, no burner tile is required.
Outlet velocities: Low, medium and high-velocity burners up to 492 ft/s (150 m/s).
Heating modes: direct and indirect.
Control modes: Step-by-step: On/Off, High/Low/Off
Continuous: Constant l or constant air flow rate.
Hot air up to 842°F (450°C).
Flame shapes: Flat, normal, long or flameless.
With separate low-fire rate supply
– for gas as ..G version,
– for gas and air as ..L version for external regulating ranges up to 1:650.
Types of gas: Natural gas L and H, propane, propane/butane, butane, town gas, coke oven gas, CO gas and BOF gas; other gases on request.
Overall lengths: 2 to 315 inch (50 to 8000 mm).
Control: Direct ionisation, optionally with UV detector.
Ignition: direct electrical.

FLOX® is a registered trademark of WS-Wärmeprozeß-technik GmbH.

Mechanical construction of the burners

The burners have a modular design. This allows them to be adapted easily to the relevant process or integrated easily into an existing system. Maintenance and repair times are shorter and conversion work on existing furnace and kiln systems is simplified. The burners consist of 3 modules:

1. Burner housing and burner mounting flange (Fig. 1)

For mounting the burner on the furnace or kiln, for accommodating burner insert and burner tube and for ducting the combustion air. With air pressure measuring test point for determining the combustion air pressure.

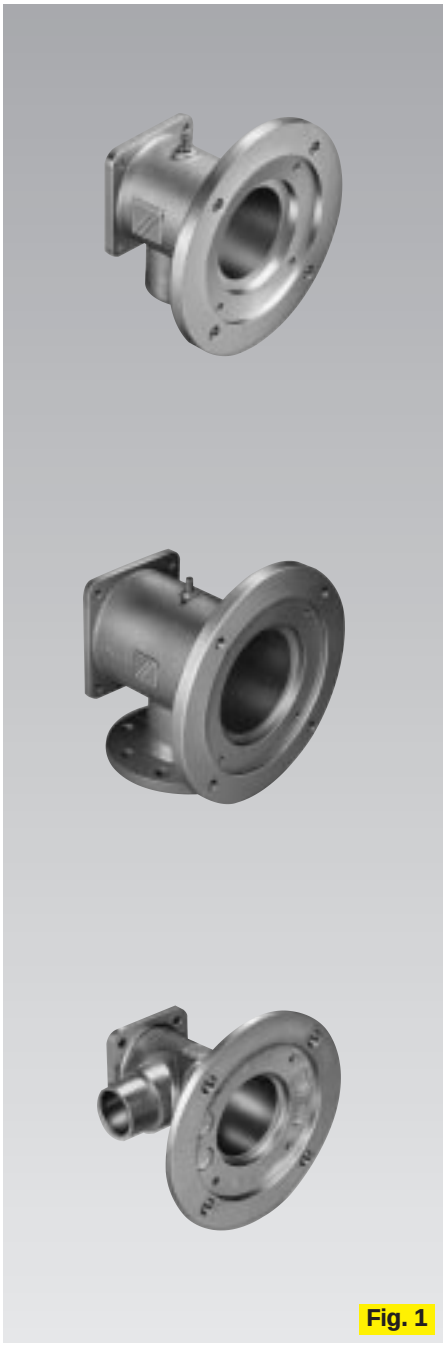


Fig. 1

2. Burner insert (Fig. 2)

For piping the combustion gas, consisting of:

Gas connection flange
As of constructional stage E with integrated measuring orifice and flow adjustment for simple and precise adjustment.

Ignition and ionisation electrodes
Can be exchanged with the burner fitted, upwards of burner size 65 and constructional stage B.

Burner head
This mixes the air and gas on the basis of the nozzle-mixing principle, thus preventing explosive gases in pipework. The mixing mode defines the flame shape.
There are versions for flameless oxidation and burner heads with separate low-fire rate supply for gas and air (see Selection – Variant).

3. Burner tile or burner tube made of steel or ceramic material (Fig. 3)

The various overall lengths allow precise adaptation to the requirements of the installation.
BIO(A), ZIO with burner tile:
The standard burner tube ensures the correct position of the burner head and a burner tile completes combustion.
BIO(A), ZIO with burner additional tube:
A heat-resistant additional tube made of steel can be used for combustion instead of a burner tile.
BIC(A), BICF, BOCF:
A ceramic tube made of SiC of lightweight design forms a combustion chamber. Combustion occurs in the SiC tube and no burner tile is required.
Additional versions and special versions, see section Modifications.

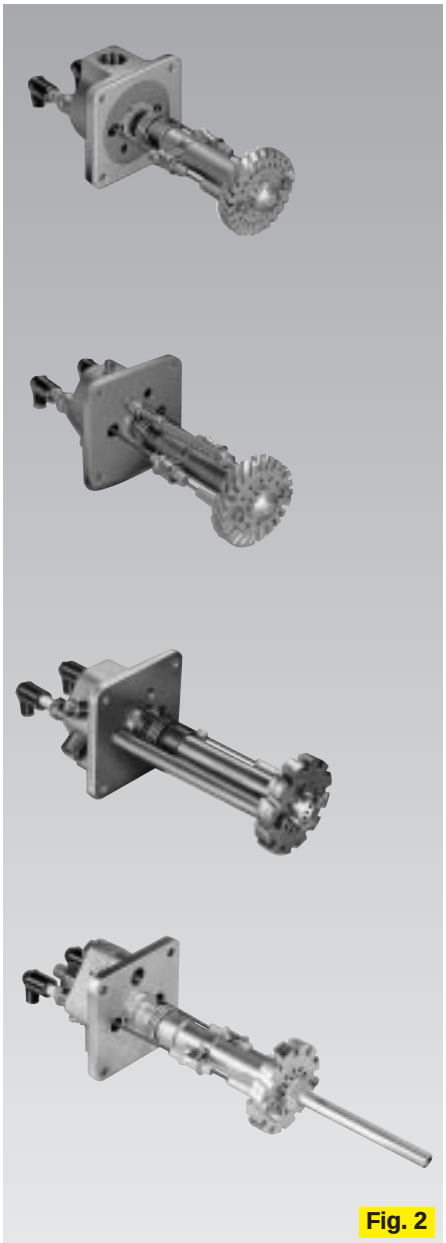


Fig. 2

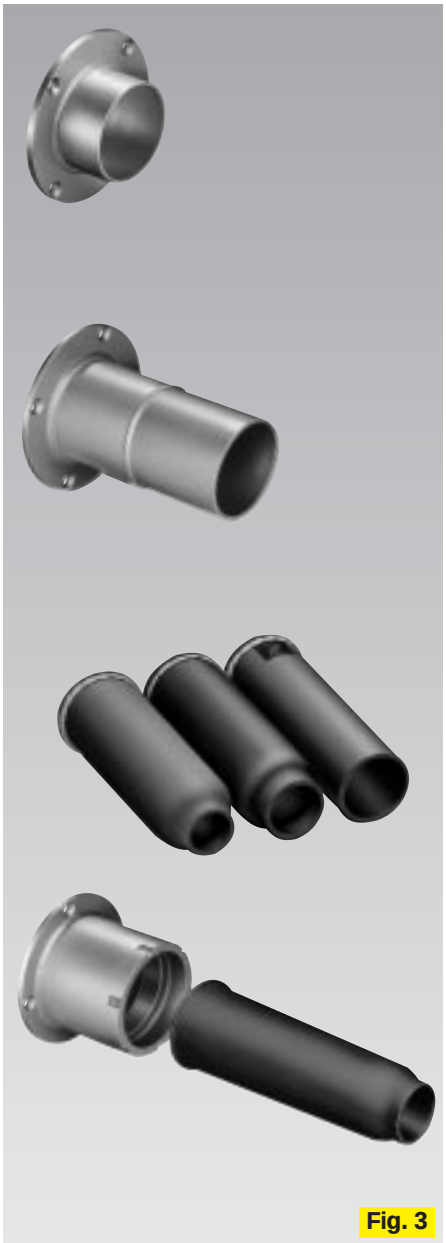
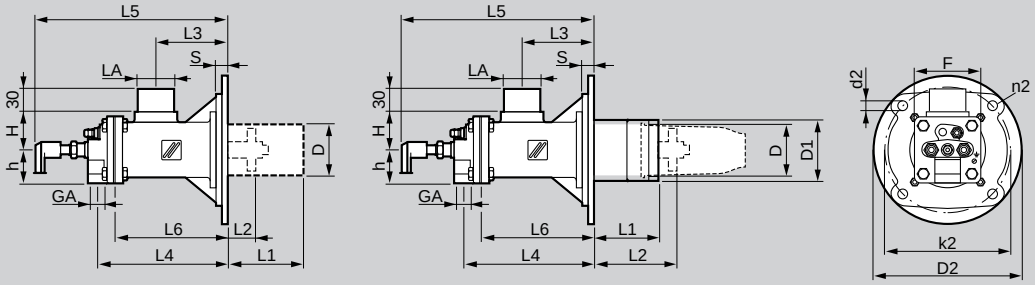
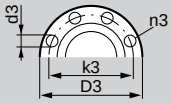


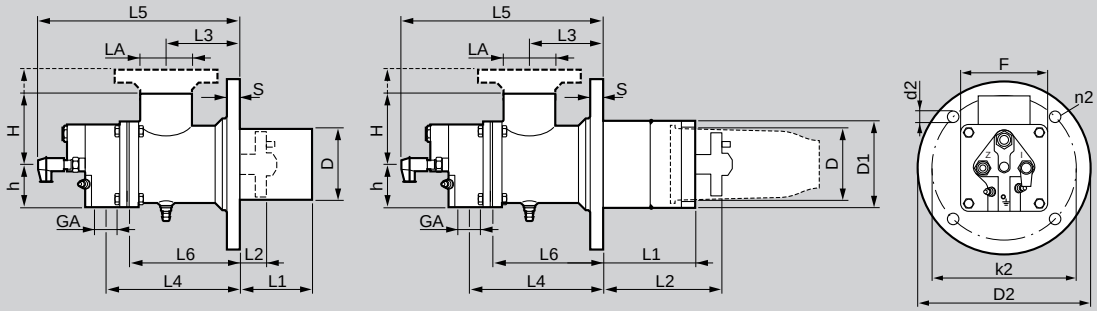
Fig. 3

BIOA, BICA

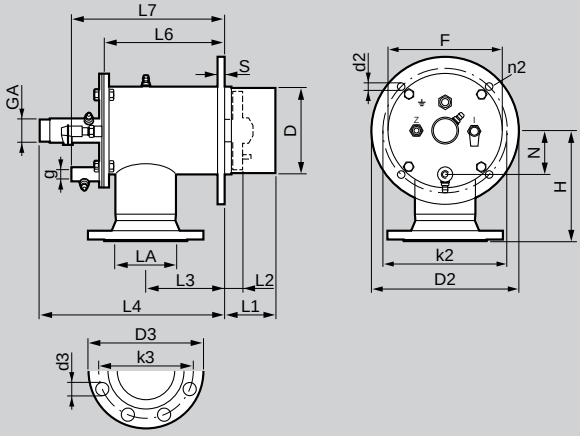




BIO, ZIO 40, BIC



ZIO, ZIO..G



L1 and L2 are variable in steps of 3.94 inch (100 mm).

Dimensions [inch]

Table 4

Type	Size	Max. capacity*	Dimensions [inch]																					Weight
																				****				***
		1000 BTU/h	D**	D1**	GA	LA	H	h	S	L3	L4	L5	L6	D2	k2	d2	n2	F	D3	k3	d3	n3	LBS
ZIO	40	68	1.57	–	NPT 3/8	NPT 3/4	1.81	1.50	0.24	1.73	3.90	7.52	3.03	3.94	3.15	0.35	0.16	2.95	–	–	–	–	6.61
BIO	50	137	1.97	–	NPT 1/2	NPT 1 1/2	1.97	1.50	0.47	3.03	5.87	9.25	5.00	7.13	5.94	0.47	0.16	2.95	–	–	–	–	8.16
BIOA	65	307	2.56	–	NPT 1/2	ø 1.89	1.97	1.73	0.63	3.74	6.69	9.96	5.87	7.68	6.50	0.51	0.16	3.46	–	–	–	–	11.02
BIO	65	307	2.56	–	NPT 3/4	NPT 1 1/2	2.44	1.89	0.47	2.87	6.14	9.65	5.00	7.68	6.50	0.47	0.16	3.74	–	–	–	–	14.33
BIO	80	512	3.23	–	NPT 3/4	NPT 2	4.41	2.17	0.55	3.54	6.77	10.63	5.51	9.45	8.27	0.55	0.16	4.33	–	–	–	–	22.05
BIO	100	785	4.02	–	NPT 1	NPT 2	3.94	2.36	0.63	4.06	7.28	11.22	6.02	9.45	7.84	0.55	0.16	4.72	–	–	–	–	24.25
BIO	125	1092	5.00	–	NPT 1 1/2	ANSI 2 1/2	5.31	2.87	0.71	4.72	10.08	13.98	4.41	10.63	9.45	0.55	0.16	5.71	7.23	5.71	0.71	0.16	55.12
BIO	140	1536	5.51	–	NPT 1 1/2	ANSI 3	5.91	3.15	0.71	5.11	11.02	14.96	9.17	11.81	10.43	0.55	0.16	6.30	7.84	6.23	0.71	0.31	61.73
ZIO	165	2150	6.65	–	NPT 1 1/2	ANSI 4	8.27	–	0.39	5.91	14.17	–	9.06	11.22	9.45	0.55	0.16	ø 8.66	8.66	7.09	0.71	0.31	52.91
ZIO	200	3413	7.64	–	NPT 2	ANSI 6	8.66	–	0.39	8.66	18.46	–	13.39	13.00	11.61	0.87	0.31	ø 10.04	11.22	9.45	0.87	0.31	81.57
BIC	50	51, 102, 119	2.17	2.99	NPT 1/2	NPT 1 1/2	1.97	1.50	0.47	2.87	5.87	9.25	5.00	7.23	5.94	0.47	0.16	2.95	–	–	–	–	8.16
BICA	65	34, 85,171, 205, 239	2.72	3.54	NPT 1/2	ø 1.89	1.97	1.73	0.63	3.74	6.69	9.96	5.87	7.68	6.50	0.51	0.16	3.46	–	–	–	–	11.02
BIC	65	34, 85,171, 205, 239	2.72	3.54	NPT 3/4	NPT 1 1/2	2.44	1.89	0.47	2.87	6.14	9.65	5.00	7.68	6.50	0.47	0.16	3.74	–	–	–	–	14.33
BICF, BOCF 65 in preparation																								
BIC	80	358	3.39	4.53	NPT 3/4	NPT 2	4.41	2.17	0.55	3.54	6.77	10.63	5.51	9.45	8.27	0.55	0.16	4.33	–	–	–	–	20.94
BICF, BOCF 80 in preparation																								
BIC	100	307, 546, 614, 682	4.09	5.00	NPT 1	NPT 2	3.94	2.36	0.63	4.06	7.28	11.22	6.02	9.45	7.84	0.55	0.16	4.72	–	–	–	–	24.25
BICF, BOCF 100 in preparation																								
BIC	140	921, 1092, 1228	5.59	6.61	NPT 1 1/2	ANSI 3	5.91	3.15	0.71	5.12	11.02	14.96	9.17	11.81	10.43	0.55	0.16	6.30	7.87	6.23	0.71	0.31	61.73
BICF, BOCF 140 in preparation																								

*Cold air connection, open flame, $\lambda = 1{,}1$ / **In the case of deviations from standard length: D (BIO, ZIO) or D1 (BIC) approx. 0.39 in (10 mm) larger due to weld seam.

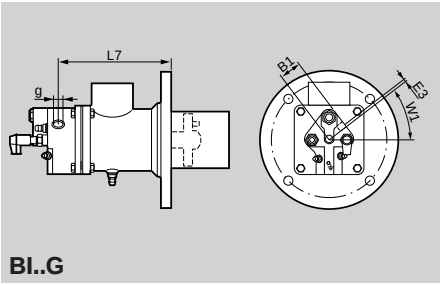
***Standard overall length / ****Air connection to DIN 2501 PN 16

Dimensions [mm]

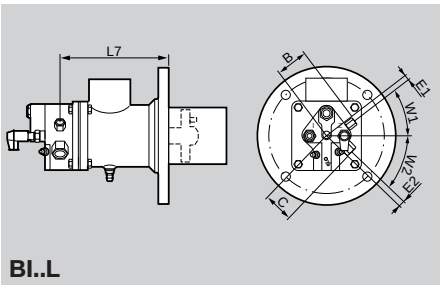
Table 4

Type	Size	Max. capacity*	Dimensions [mm]																****				Weight ***
		kW	D**	D1**	GA	LA	H	h	S	L3	L4	L5	L6	D2	k2	d2	n2	F	D3	k3	d3	n3	kg
ZIO	40	20	40	–	NPT 3/8	NPT 3/4	46	38	6	44	99	191	77	100	80	9	4	75	–	–	–	–	3
BIO	50	40	50	–	NPT 1/2	NPT 1 1/2	50	38	12	73	149	235	127	181	151	12	4	75	–	–	–	–	3,7
BIOA	65	90	65	–	NPT 1/2	ø 48	50	44	16	95	170	253	149	195	165	13	4	88	–	–	–	–	5
BIO	65	90	65	–	NPT 3/4	NPT 1 1/2	62	48	12	73	156	245	127	195	165	12	4	95	–	–	–	–	6,5
BIO	80	150	82	–	NPT 3/4	NPT 2	112	55	14	90	172	270	140	240	210	14	4	110	–	–	–	–	10
BIO	100	230	102	–	NPT 1	NPT 2	100	60	16	103	185	285	153	240	200	14	4	120	–	–	–	–	11
BIO	125	320	127	–	NPT 1 1/2	ANSI 2 1/2	135	73	18	120	256	355	212	270	240	14	4	145	185	145	18	4	25
BIO	140	450	140	–	NPT 1 1/2	ANSI 3	150	80	18	130	280	380	233	300	265	14	4	160	200	160	18	8	28
ZIO	165	630	169	–	NPT 1 1/2	ANSI 4	210	–	10	150	360	–	230	285	240	14	4	ø 220	220	180	18	8	24
ZIO	200	1000	194	–	NPT 2	ANSI 6	220	–	10	220	469	–	340	330	295	22	8	ø 255	285	240	22	8	37
BIC	50	15, 30, 35	55	76	NPT 1/2	NPT 1 1/2	50	38	12	73	149	235	127	181	151	12	4	75	–	–	–	–	3,7
BICA	65	10, 25, 50, 60, 70	69	90	NPT 1/2	ø 48	50	44	16	95	170	253	149	195	165	13	4	88	–	–	–	–	5
BIC	65	10, 25, 50, 60, 70	69	90	NPT 3/4	NPT 1 1/2	62	48	12	73	156	245	127	195	165	12	4	95	–	–	–	–	6,5
BICF, BOCF 65 in preparation																							
BIC	80	105	86	115	NPT 3/4	NPT 2	112	55	14	90	172	270	140	240	210	14	4	110	–	–	–	–	9,5
BICF, BOCF 80 in preparation																							
BIC	100	90, 160, 180, 200	104	127	NPT 1	NPT 2	100	60	16	103	185	285	153	240	200	14	4	120	–	–	–	–	11
BICF, BOCF 100 in preparation																							
BIC	140	270, 320, 360	142	168	NPT 1 1/2	ANSI 3	150	80	18	130	280	380	233	300	265	14	4	160	200	160	18	8	28
BICF, BOCF 140 in preparation																							

*Cold air connection, open flame, $\lambda = 1{,}1$ / **In the case of deviations from standard length: D (BIO, ZIO) or D1 (BIC) approx. 0.39 in (10 mm) larger due to weld seam.
***Standard overall length / ****Air connection to DIN 2501 PN 16



BI..G



BI..L

Dimensions for burners with separate low-fire rate supply for gas

Table 5

Type	Size	Dimensions										
		N		B1		E3		W1	L7		g*	
		in	mm	in	mm	in	mm	°	in	mm		
BIO/C	100	–	–	1.54	39	0.12	3	36	7.68	195	NPT 1/4	
BIO/C	140	–	–	1.77	45	0.12	3	42	10.87	276	NPT 3/8	
ZIO	165	2.17	55	–	–	–	–	–	11.42	290	NPT 3/8	
ZIO	200	2.36	60	–	–	–	–	–	15.75	400	NPT 3/8	

*Gas pressure: 12 – 16 "WC (30 – 40 mbar)

Dimensions for burners with separate low-fire rate supply for gas and air

Table 6

Type	Size	Dimensions											
		B		C		E1		E2		L7		W1	W2
		in	mm	in	mm	in	mm	in	mm	in	mm	°	°
BIO/C	80	2.24	57	2.13	54	0.28	7	0.39	10	6.97	177	36	45
BIO/C	100	2.24	57	2.13	54	0.28	7	0.39	10	7.48	190	36	45
BIO/C	125	2.13	54	2.56	65	0.35	9	0.31	8	10.28	261	30	30
BIO/C	140	2.48	63	2.44	62	0.63	16	0.71	18	10.87	276	42	45
ZIO	165	ZIO 165 and 200 with ZMI 16 pilot burner											
ZIO	200	Dimensions on request											

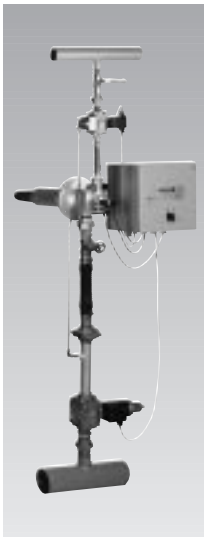
Gas connection: NPT 1/4 / Gas pressure: 12 – 16 "WC (30 – 40 mbar) / Air connection: NPT 3/8
if used with separate ZMI 16 pilot burner: NPT 1/2 / Air pressure: 12 – 16 "WC (30 – 40 mbar)

BIC..L

Technical data (Table 4+5+6)

Ignition and ionisation electrode made of Kanthal A1, max. temperature 2507°F (1375°C).
Burner additional tubes for BIO(A) and ZIO: 25Cr20Ni, max. temperature 2102°F (1150°C).

Burner tubes and tube extensions:
Length graded in steps of 3.94 inch (100 mm), max. length 26.24 ft (8000 mm), components made of normal steel; also available made of high-temperature or corrosion-resistant steel on request.



Selection

Type (Table 7)

BIO(A), ZIO
Burner with steel tube
Optimum combustion is ensured either by a burner tile integrated within the refractory brickwork or by a high-temperature-resistant burner additional tube or steel tubes if used in combustion chambers in the low and moderate temperature range.

BIC(A), BICF, BOCF
Burner with ceramic tube
Particularly suitable for furnaces and kilns with fibre mat lining in conjunction with a ceramic tube set TSC of lightweight design; no burner tile is required.

BIC(A)
Used preferably as impulse burner with moderate to high outlet velocity 262 to 492 ft/s (80 to 150 m/s) on industrial furnaces and kilns on which temperature regulation is performed by an impulse system.

BICF
The burner operates in flame mode up to a furnace or kiln temperature of 1562°F (850°C). Thereafter, it switches over to flameless oxidation on the basis of the FLOX® principle. This minimises the nitrous oxide values.

BOCF
Can be used in FLOX® mode for furnace and kiln temperatures above 1562°F (850°C).
BICF and BOCF are particularly well-suited to installations with pre-heated combustion air.

Selection

Table 7

Type	Housing	Operation	Air temp.		Furnace temp.	
			°F	°C	°F	°C
BIO	GG 25	Flame	68 – 842	20 – 450	122 – 2912	50 – 1600
BIOA	AlSi	Flame	68 – 392	20 – 200	122 – 2912	50 – 1600
BIC	GG 25	Flame	68 – 842	20 – 450	122 – 2642	50 – 1450
BICA	AlSi	Flame	68 – 392	20 – 200	122 – 2642	50 – 1450
BICF	GG 25	Flame/FLOX	68 – 842	20 – 450	122 – 2642	50 – 1450
BOCF	GG 25	FLOX	68 – 842	20 – 450	1562 – 2642	850 – 1450
ZIO	ST	Flame	68 – 842	20 – 450	122 – 2912	50 – 1600

Burner size

Selection on the basis of Table 10.
In order to maintain the total connected load constant in hot-air operation, it is necessary to reduce the connected gas load and gas pressure and increase the air pressure (Figures 8 + 9).

Burner head

The burner head is selected on the basis of the following criteria.
1. Flame shape (Table 11)
2. Type of gas (Table 12)
3. Variant (Table 13)

Reduction in connected gas load and gas pressure in the case of air pre-heating and constant total connected load

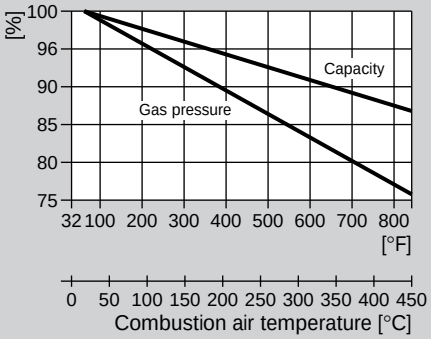


Fig. 8

Increase in air pressure in the case of air pre-heating and constant total connected load

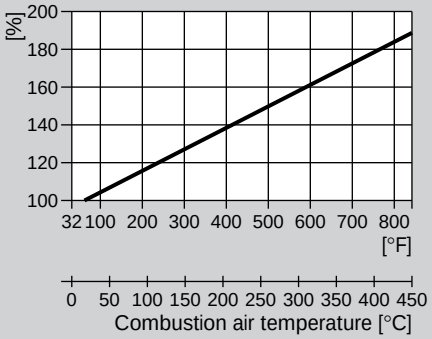


Fig. 9

Capacity/performance data
BIO(A), BIC(A), BICF, BOCF, ZIO for natural gas

Table 10

Type	Ceramic tube	max. Capacity 1000 BTU/h [1), 5)]	max. Capacity kW [1), 5)]	Burner head	Constr. stage	Flame length inch [4), 8)]	Flame length cm [4), 8)]	Orifice plate Δp "WC	Orifice plate Δp mbar	Gas supply pressure max. [1)] "WC	Gas supply pressure max. [1)] mbar	Air supply pressure max. [1)] "WC	Air supply pressure max. [1)] mbar	Velocity [3), 6)] ft/s	Velocity [3), 6)] m/s
ZIO 40 [2)]	–	68	20	H	A	5.91 – 7.84	15 – 20	–	–	10	25	12	30	–	–
BIO 50	–	136	40	R	A	7.84 – 8.66	20 – 22	–	–	10.8	27	10	25	164	50
BIO 50	–	136	40	H	C	7.09 – 13.8	18 – 35	–	–	14	35	16	40	49	15
BIO(A) 65	–	307	90	R	E (A)	7.84 – 9.06	20 – 23	3 (-)	7,5 (-)	16 (10.8)	40 (27)	16.8 (15)	42 (38)	213	65
BIO(A) 65	–	307	90	H	E (A)	11.81 – 21.65	30 – 55	3 (-)	7,5 (-)	10.8 (7.2)	27 (18)	13.6 (12)	34 (30)	66	20
BIO 65	–	307	90	K	E	–	–	3	7,5	21.2	53	12.4	31	–	–
BIO 80	–	512	150	R	E	7.84 – 5.75	20 – 40	3.8	9,5	9.6	24	11.2	28	230	70
BIO 80	–	512	150	H	E	23.62 – 35.43	60 – 90	3.8	9,5	8.8	22	10	25	66	20
BIO 80	–	512	150	K	E	–	–	3.8	9,5	17.2	43	14	35	–	–
BIO 100	–	785	230	R	E	7.84 – 21.65	20 – 55	3.6	9	12	30	13.2	33	66	20
BIO 100	–	785	230	H	E	5.75 – 39.37	40 – 100	3.6	9	9.2	23	12	30	230	70
BIO 100	–	785	230	K	E	–	–	3.6	9	16	40	16	40	–	–
BIO 125 [7)]	–	1092	320	R	D	5.75 – 35.43	40 – 90	–	–	12	30	12	30	66	20
BIO 125 [7)]	–	1092	320	H	D	27.56 – 53.15	70 – 135	–	–	12.8	32	13.6	34	82	25
BIO 140	–	1535	450	R	E	13.78 – 5.75	35 – 40	3.2	8	13.2	33	7.2	18	197	60
BIO 140	–	1535	450	H	E	23.62 – 47.24	60 – 120	3.2	8	16	40	11.2	28	230	70
BIO 140	–	1535	450	K	E			3.2	8	23.2	58	14.4	36	–	–
ZIO 165	–	2150	630	R	D	3.94 – 19.69	10 – 50	–	–	13.2	33	16	40	230	70
ZIO 165	–	2150	630	H	D	27.56 – 47.24	70 – 120	–	–	16	40	9.2	23	66	20
ZIO 165	–	2150	630	K	D	–	–	–	–	12.4	31	14.4	36	–	–
ZIO 200	–	3412	1000	R	A	3.94 – 23.62	10 – 60	–	–	10.4	26	16	40	262	80
ZIO 200	–	3412	1000	H	A	43.31 – 94.49	110 – 240	–	–	8	20	16.8	42	82	25
BIC 50	B020	51	15	H..R	A	3.94 – 5.91	10 – 15	–	–	11.2	28	12	30	328	100
BIC 50	B028	102	30	R	C	3.94 – 6.30	10 – 16	–	–	13.2	33	12	30	361	110
BIC 50	B028	102	30	H	C	4.72 – 7.84	12 – 20	–	–	5.2	13	7.2	18	328	100
BIC 50	A035	119	35	R	C	5.91 – 7.84	15 – 20	–	–	10.4	26	10	25	262	80
BIC 50	A035	119	35	H	C	6.30 – 8.66	16 – 22	–	–	4.8	12	7.2	18	246	75
BIC(A) 65	B020S	34	10	H..R	- (A)	4.33 – 8.66	11 – 22	- (-)	- (-)	- (2.8)	- (7)	- (2.8)	- (7)	213	65
BIC(A) 65	B025S	85	25	H..R	- (A)	4.33 – 8.66	11 – 22	- (-)	- (-)	- (5.6)	- (14)	- (5.6)	- (14)	312	95
BIC(A) 65	B033	171	50	R	E (A)	7.09 – 10.63	18 – 27	2 (-)	5 (-)	13 (13)	32 (32)	13 (10)	32 (25)	426	130
BIC(A) 65	B033	171	50	H	E (A)	4.33 – 8.66	11 – 22	2 (-)	5 (-)	7.2 (7.2)	18 (18)	7.2 (8)	18 (20)	394	120
BIC(A) 65	B040	205	60	R	E (A)	6.69 – 9.84	17 – 25	3.2 (-)	8 (-)	12.8 (14)	32 (35)	11.2 (8)	28 (20)	344	105
BIC(A) 65	B040	205	60	H	E (A)	7.84 – 12.99	20 – 33	3.2 (-)	8 (-)	8.8 (6)	22 (15)	8 (8)	20 (20)	328	100
BIC(A) 65	A048	239	70	R	E (A)	6.69 – 9.84	17 – 25	4.4 (-)	11 (-)	16.4 (16)	41 (40)	11.2 (12)	28 (30)	279	85
BIC(A) 65	A048	239	70	H	E (A)	9.06 – 5.75	23 – 40	4.4 (-)	11 (-)	10 (7.2)	25 (18)	7.6 (7.2)	19 (18)	262	80
BICF, BOCF 65	in preparation														
BIC 80	B040	358	105	R	E	11.81 – 5.75	30 – 40	3	7,5	16	40	14	35	590	180
BICF, BOCF 80	in preparation														
BIC 100	B050	307	90	R	E	5.91 – 13.78	15 – 35	1	2,5	6	15	5.6	14	328	100
BIC 100	B050	307	90	H	E	13.78 – 19.69	35 – 50	1	2,5	4.8	12	0.4	10	312	95
BIC 100	B065	546	160	R	E	9.84 – 17.72	25 – 45	2.8	7	12	30	12	30	344	105
BIC 100	B065	546	160	H	E	17.72 – 25.59	45 – 65	2.8	7	11.2	28	7.2	18	328	100
BIC 100	A082	614	180	R	E	11.81 – 19.69	30 – 50	3.4	8,5	12	30	10	25	246	75
BIC 100	A082	614	180	H	E	17.72 – 23.62	45 – 60	3.4	8,5	9.6	24	7.2	18	230	70
BICF, BOCF 100	in preparation														
BIC 140	B070	921	270	R	E	7.84 – 5.75	20 – 40	1.8	4,5	12	30	8.8	22	508	155
BIC 140 [7)]	–	921	270	H	E	19.69 – 23.62	50 – 60	1.8	4,5	11.6	29	8	20	476	145
BIC 140	B085	1091	320	R	E	5.75 – 23.62	40 – 60	2.6	6,5	12.8	32	9.2	23	410	125
BIC 140 [7)]	–	1091	320	H	E	5.75 – 31.50	40 – 80	2.6	6,5	12	30	8	20	394	120
BIC 140	A120	1228	360	R	E	11.81 – 31.50	30 – 80	3.2	8	12	30	5.6	14	230	70
BIC 140 [7)]	–	1228	360	H	E	5.75 – 35.43	40 – 90	3.2	8	12	30	8	20	213	65
BICF, BOCF 140	in preparation														

Ionisation current: 5 – 35 µA, depending on set burner capacity and flame amplifier used.
Values in parenthesis for BIOA, BICA. In addition, the burner heads feature code numbers which allow a direct assignment to the pressure loss diagrams.

1) Natural gas L, cold-air operation, open flame, $\lambda = 1.1$, Hu = 8.9 kWh/m³, $L_o = 8.4$ m³/m³, $\delta = 0.8$ kg/m³.
In the case of operation with natural gas H, convert as a function of the kW burner capacity in order to determine the gas flow rate.

2) ZIO 40 is an unregulated pilot burner.

3) Calculated on the basis of flame temperature 1600°C R and K head, 1500°C H head, referred to max. burner capacity.

4) BIO measured with burner tile, as of burner tile front edge, opening 6° with R head, cylindrical with H head, length 3 x D in each case.

5) Connection ratings are guideline values. Higher capacities are possible in the case of various burners (on request).

6) BIO calculated for burner tiles as specified in 4). It is possible to increase the flow velocity to the values of the BIC burners by reducing the outlet diameter of the burner tile.

7) Suitable only for cold air.

8) The flame diameter is approx. 1-2 x burner tube diameter or burner tile outlet diameter.

Flame shape

Table 11

Code letter	Flame shape	Regulating range* continuous	Regulating range* constant air flow rate	Regulating range* high/low	Low-fire rate λ	λ**	Furnace temp. °F	Furnace temp. °C	Air temp.*** °F	Air temp.*** °C
R	normal	1:10	1:3	>1:10	>1.05	0.8 – 1.3	122 – 2462	50 – 1350	68 – 482	20 – 250
H	long	1:10	1:4	1:10	>1.3	0.6 – 1.5	932 – 2913	500 – 1600	68 – 842	20 – 450
K****	flat	–	–	>1:10	>1.05	0.9 – 1.2	122 – 2462	50 – 1350	68 – 752	20 – 400

* Standard version; see Variant for broader regulating ranges.

** Indicates the approximate range at max. connected load.
See burner diagrams for precise values for the individual versions. The ranges are determined for an ionisation current ≥ 5 µA.

*** The gas flow rate should be reduced in line with the increase in enthalpy of the pre-heated combustion air.

**** As radiant burner in conjunction with burner tile.

Type of gas

Table 12

Code letter	Type of gas	Calorific value range BTU/ft³	Calorific value range kWh/m³(n)
B	Natural gas L and H quality	773 – 1160	8 – 12
G	Propane and propane/butane 70/30	2416 – 2802	25 – 29
M	Propane, propane/butane, butane	2416 – 3382	25 – 35
D	Town gas, coke oven gas	290 – 483	3 – 5

Variant

Table 13

Code letter	Version	Regulating range continuous	Regulating range high/low	Low-fire rate Capacity 1000 BTU/h	Low-fire rate Capacity kW	Low-fire rate λ	Furnace temp. °F	Furnace temp. °C	Air temp. °F	Air temp. °C
G*	Separate low-fire rate supply for gas	–	up to 1:100	34 – 51	10 – 15	> 1.05	122 – 2462	50 – 1350	68 – 482	20 – 250
L	Separate low-fire rate supply for gas and air	1:10	up to 1:650	~ 5	~ 1,5	> 1.05	122 – 2912	50 – 1600	68 – 842	20 – 450
R	Reduced max. connected load	1:10	1:10	–	–	> 1.05	122 – 2462	50 – 1350	68 – 482	20 – 25

* Burners may not be operated at low-fire rate for longer than 6 hours since this would otherwise involve the risk of overheating and failure.

Burner length

BIO(A), ZIO in the burner tile (Table 18)
The total burner length measured from the burner mounting flange is equal to the length of the burner tube (L1). The position of the burner head must be selected such that the burner head projects into the burner tile: L2 = W - L10 (Fig. 14).
Depending on the burner head, the burner tube length can be calculated as follows:
R, K head: L1 = L2 + 0.59 inch (15 mm),
H head: L1 = L2 + 2.56 inch (65 mm).

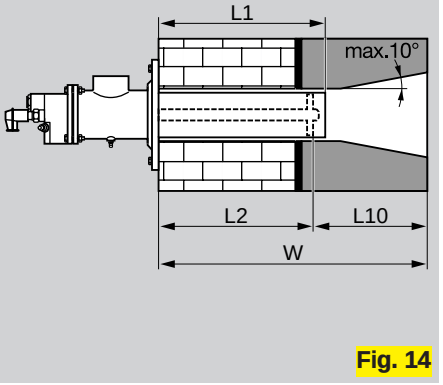


Fig. 14

BIO(A), ZIO with burner additional tube
The total burner length as of the furnace or kiln flange is the total of the length of the burner tube and the burner additional tube (L1).

Additional tubes for BIO(A) / ZIO burners

Table 15

Burner size	Recommended clearance L_{1-2} in	Recommended clearance L_{1-2} mm	Additional tube length H head in	Additional tube length H head mm	Additional tube length R head in	Additional tube length R head mm
50	4.53	115	1.97	50	3.94	100
65	4.53	115	1.97	50	3.94	100
80	6.50	165	3.94	100	5.90	150
100	6.50	165	3.94	100	5.90	150
125	8.46	215	5.90	150	7.84	200
140	10.43	265	7.84	200	9.84	250
165	10.43	265	7.84	200	9.84	250
200	12.40	315	9.84	250	11.81	300

Other lengths on request.

The position of the burner head is specified as follows (Fig. 16):
L2 = Wall thickness ±1.97 inch (50 mm).
L1 can be determined with the aid of Table 15.
L1 = L2 + L_{1-2}

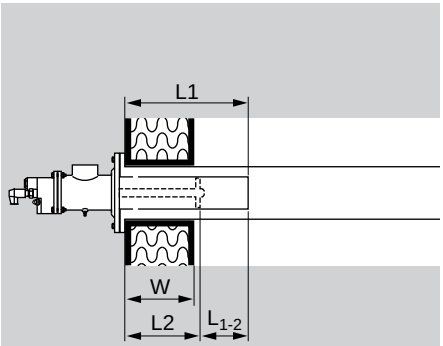


Fig. 16

BIC(A), BICF, BOCF (Fig. 17)
The total burner insertion depth into the furnace or kiln is dependant on the length of the burner extension made of steel and the ceramic tube length (Table 29). These lengths should be selected so that the burner nozzle ends within the area of the inside of the furnace or kiln wall or is max. 2 inch (50 mm) behind it.

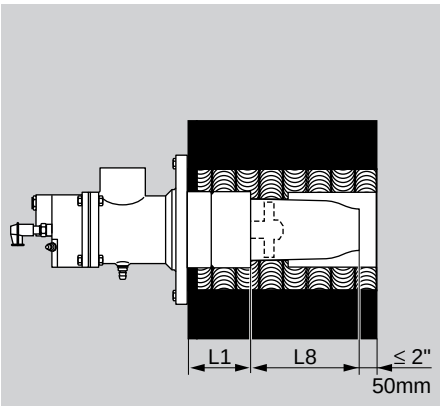


Fig. 17

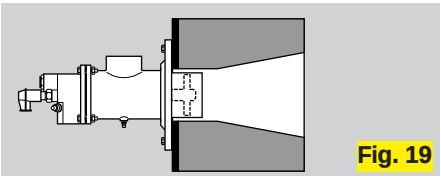


Fig. 19

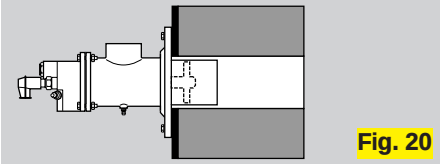


Fig. 20

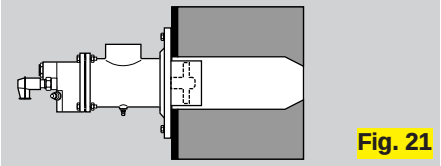


Fig. 21

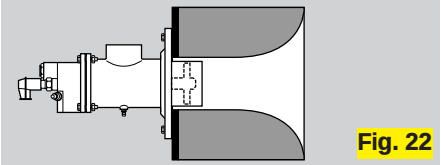


Fig. 22

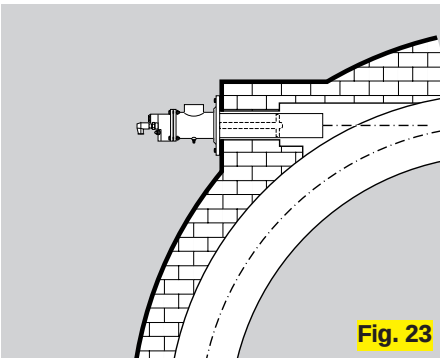


Fig. 23

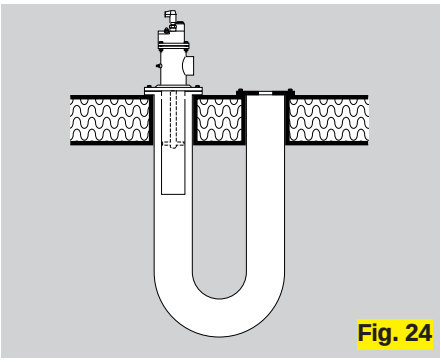


Fig. 24

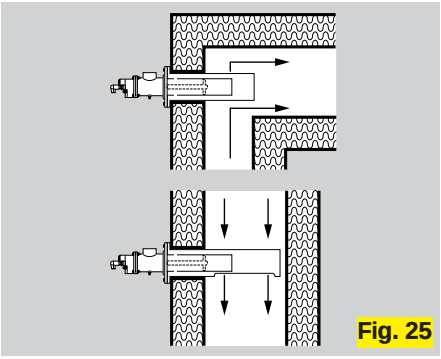


Fig. 25

BIO(A), ZIO in the burner tile

Table 18

Burner size	Type of tile Fig.	Type of gas	Flame shape	L10 (Fig. 14) in	 mm
50	19, 20, 21	B, M, G, D	R	4.53 – 10.43	115 – 265
65	19, 20, 21	B, M, G, D	R, H	6.50 – 10.43	165 – 265
65	22	B, M, G, D	K	6.50	165
80	19, 20, 21	B, M, G	R, H	8.46 – 10.43	215 – 265
80	22	B, M, G	K	8.46	215
100	19, 20, 21	B, M, G, D	R, H	10.43 – 12.40	265 – 315
100	22	D	K	7.09	180
100	22	B, M, G	K	9.45	240
125	19, 20, 21	B, M, G	R, H	12.40 – 14.37	315 – 365
140	19, 20, 21	B, M, G, D	R, H	14.37 – 16.34	365 – 415
140	22	B, M, G, D	K	8.86	225
165	19, 20, 21	B, M, G, D	R, H	16.34 – 20.28	415 – 515
165	22	B, M, G, D	K	9.84	250
200	19, 20, 21	B, M, G, D	R, H	18.31 – 22.24	465 – 565

Application of BIO(A) / ZIO burners

Burner tile shape and flame shape are combined, depending on type of application, in order to achieve optimum function.

Type of application	Fig.	Combustion chamber	Regulation	Head type	Max. capacity	Remarks
Industrial furnaces and kilns, open firing installations	19	Conically opening	High/Low Continuous	R	100%	Only cold-air operation recommended, otherwise the nitrous oxide values may become excessive
Industrial furnaces and kilns, open firing installations	20	Cylindrical	High/Low High/Low/Off Continuous	R, H	100%	Normal to moderate flow velocity
Industrial furnaces and kilns, open firing installations	21	Diameter-restricted	High/Low High/Low/Off	R, H	80%	Moderate to high velocity
Industrial furnaces and kilns, open firing installations	22	Flat flame quarl	High/Low High/Low/Off Continuous	K	100%	With continuous control restricted in the lower capacity range (≥ 40 %) depending on burner
Tangentially fired crucibles	23	Cylindrical	High/Low High/Low/Off Continuous	H	100%	Connected load of the burners essentially depends on the loading capacity of the burner chamber
Radiant tube heating*	24	Burner additional tube with secondary air holes	High/Low High/Low/Off Continuous	H	100%	Connected load of the burners essentially depends on the loading capacity of the radiant tube; < 0.015 BTU/s·in² (2,5 W/cm²) is conventional.
Air heating	25	Burner additional tube with secondary air holes, combustion chamber	High/Low High/Low/Off Continuous	R	100%	Protection of the flame against cooling by additional combustion chamber (recommended for flow velocities > 50 ft/s [15 m/s])

* If the burners are used in radiant tubes or small combustion chambers, it is advisable to conduct a test under operating conditions. The burnersmust be sealed via the furnace or kiln flange on the installation or at the burner tile so as to prevent hot exhaust gases flowing back.

Ceramic tube set TSC (Table 28 + 29)

Furnace/kiln and air temperature, burner head and the regulation mode of the burner determine the selection of the SiC material. The outlet diameter D4 determines the burner capacity and the flame velocity (Fig. 26).

Various tube lengths allow adaptation to the thickness of the furnace or kiln wall.
On the BIC(A), BICF and BOCF, there must be a **gap of at least 0.2 inch (5 mm)** in front of the burner head between ceramic tube and insulation (Fig. 27). An additional insulating tube made of lightweight refractory or vacuum formed fiber simplifies installation.

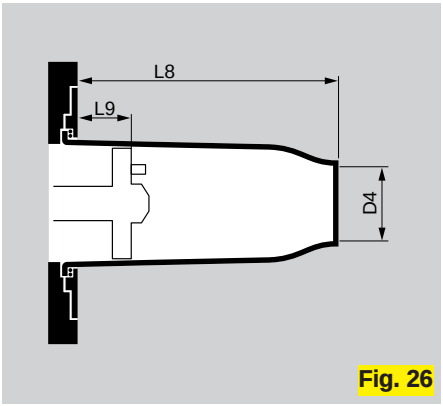


Fig. 26

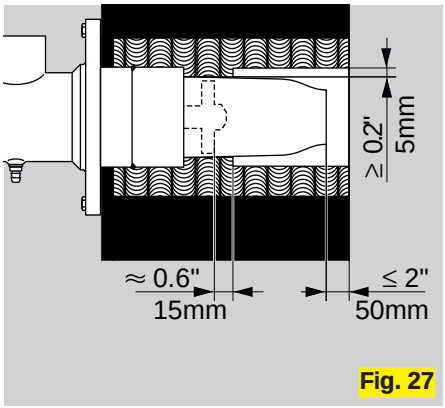


Fig. 27

Selection of the SiC material if using BIC, BICF, BOCF burners

Table 28

Material	Furnace/kiln temp.		Air temp.		Max. application temperature		Burner head	Type of control
	°F	°C **	°F	°C	°F	°C		
CRYSTAR-D	2282	1250	68 – 302	20 –150	2462	1350	R	1), 3)
CRYSTAR-D	2462	1350	68 – 482	20 –250	2462	1350	H	1), 2), 3)
CarSIK-GG	2462	1350	68 – 482	20 –250	2732	1500*	R	1), 3)
CarSIK-GG	2642	1450	68 – 842	20 –450	2732	1500*	H	1), 2), 3)

* Melting point of silicon 2516°F (1380°C)
** Higher furnace and kiln temperatures on request
1) = step-by-step control,
2) = continuous control,
3)= modulating control at constant air flow rate

Available ceramic tube sets TSC made of SiC

Table 29

Burner size	Burner capacity		Shape	Outlet diameter D4		Length (Fig. 26) L8 (in [mm])			Position of the burner head L9 (in [mm])		Material	
	1000 BTU/h	KW		in	mm	7.9 [200]	9.84 [250]	11.81 [300]	1.38 [35]	5.31 [135]	CRYSTAR-D	CarSIK-GG
50	51	15	B	0.79	20	–	–	●	–	●	●	–
50	102	30	B	1.10	28	–	–	●	●	–	●	–
50	119	35	A	1.38	35	–	–	●	●		●	–
65	34	10	B, S*	0.79	20	●	–	–	●	–	●	–
65	85	25	B, S*	0.98	25	●	–	–	●	–	–	●
65	170	50	B	1.30	33	●	–	–	●	–	●	●
65	170	50	B	1.30	33	–	–	●	●	●	●	●
65	204	60	B	1.57	40	●	–	–	●	–	●	●
65	204	60	B	1.57	40	–	–	●	●	●	●	●
65	238	70	A	1.89	48	●	–	●	●	–	●	●**
80	358	105	B	1.57	40	–	●	–	●	–	●	–
100	307	90	B	1.97	50	–	●	–	●	–	●	–
100	307	90	B	1.97	50	–	–	●	●	–	●	●
100	546	160	B	2.56	65	–	●	–	●	–	●	–
100	546	160	B	2.56	65	–	–	●	●	–	●	●
100	614	180	A	3.23	82	–	–	●	●	–	●	●
140	921	270	B	2.76	70	–	–	●	●	–	●	●
140	1092	320	B	3.35	85	–	–	●	●	–	●	●
140	1228	360	A	4.72	120	–	–	●	●	–	●	●

* Only in conjunction with burner head H..R
** Not for L8 = 7.84 in [200 mm]

Modifications

The following modifications are possible: **Secondary air connections** for preventing condensation in the burner.

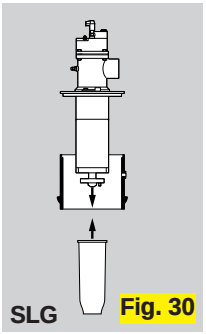
Burner tubes on BIO(A) with **secondary air holes** and/or of stainless steel design in conjunction with burner additional tubes for use in radiant tubes and combustion chambers (Fig. 24 + 25).

Spacers on burner tubes and burner extensions for centring in furnace and kiln openings or as stop for insulating packs.

Electrode rods with separately supplied air for cooling and for protection against contamination at high furnace/kiln and air pre-heating temperatures.

Flame control with **UV detector** instead of ionisation electrode, adapter available.

Pot burner



SLG Fig. 30

Valves for gas and air mounted on the burner and ignition transformer and automatic burner control as **complete unit**.

Modified BIC burners in sizes 50-100 in conjunction with a **pot housing SLG** as pot burner for roof firing of tunnel kilns in the ceramics industry (Fig. 30). The performance data corresponds to that for the BIC(A) burners.

BIC burners in conjunction with an **annular excess air burner housing RSG** (Fig. 32) as annular excess air burners, with the application focusing on intermittent-operation installations in the ceramics industry (Fig. 33).

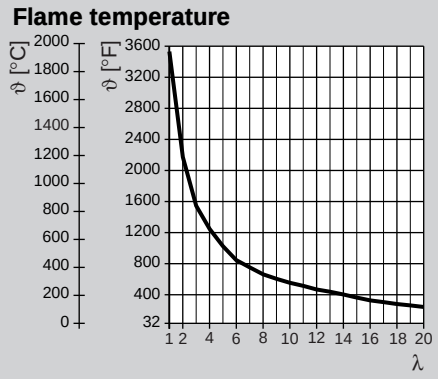
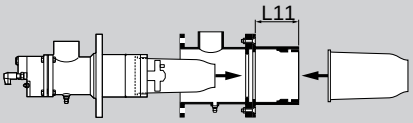


Fig. 31

A high λ value of 40 can be achieved via two air connections. This allows the flame temperature to be adjusted precisely (Fig. 31). The two-step combustion guarantees optimum combustion even with high excess air. Exact time and temperature profiles can be implemented. The system's cooling time can be minimised owing to the high air flow rates, thus enhancing system availability.



RSG Fig. 32

Exess air burner

Type code

	RSG	140	/100	-50
Type				
Secondary air tube ø [mm] = 100, 140				
Burner size = 65, 100				
Length of the secondary air housing L11 [mm] = 0, 50, 100, 150				

Capacity/performance data BIC(A) burners with annular excess air burner housing RSG

Table 33

Type	Housing	max. Capacity 1000 BTU/h	kW	max. Secondary air ft³/h	m³/h	Air pressure "WC	mbar	Possible λ range	Required ceramic tube sets		Total length* in	mm
BIC(A) 65	RSG 100/65-0	170	50	7768	220	16	40	0,7–40	TSC 65B033-300/135	TSC 100B050-250/35	9.84–15.75	250–400
BIC(A) 65	RSG 100/65-0	204	60	14124	400	16	40	0,7–65	TSC 65B040-300/135	TSC 100B065-250/35	9.84–15.75	250–400
BIC 100	RSG 140/100-0	682	200	14124	400	28	70	0,7–40	TSC 100B065-300/35	TSC 140B085-300/35	11.81–15.75	300–400

* in steps of 1.97 in [50 mm]

Project planning information

Fitting position: Any.

On the BIC(A), BICF and BOCF, there must be a **gap of at least 0.2 inch (5 mm)** in front of the burner head between ceramic tube and insulation (Fig. 27). An additional insulating tube made of lightweight refractory or vacuum formed fiber simplifies installation.

Gas and air connection: 90°-rotatable.

The burners ignite in the low-fire range (5-40% of nominal capacity).

Recommended ignition transformers:
≥ 5 kV, ≥ 15 mA,
on BIO, BIC and ZIO with step-by-step control: ≥ 7.5 kV, ≥ 12 mA.

There must be a **low air flow rate** (approx. 2-5% of high-fire rate) with the burner switched off in order to prevent condensation as the result of the furnace or kiln atmosphere penetrating the burner housing.

In order to avoid condenset formation in housings and pipework, the **combustion air** should not be switched off until the furnace or kiln has cooled down.

Install, insulate and operate al burners so that the components are **not overheated**.

Secondary air holes in the area of the burner mounting ensure cooling and stability when firing small combustion chambers, such as radiant tubes for instance (Fig. 24).

TGI, TZI

Non-return gas valves are not required since the burners are **nozzle-mixing burners**.

We certify that the burner meets the requirements of the applicable Directives and Standards with a "**Manufacturer's Declaration**" as defined by the Machinery Directive (89/392/EEC), Annex II B.

The **emission values** are below the limits stipulated in the German Air Pollution Control Directive (TA-Luft).
The NO_x values depend on temperature, combustion chamber, furnace or kiln chamber, λ and capacity value.
Fig. 34 provides a guideline for NO_x emission values.

NO_x emission values

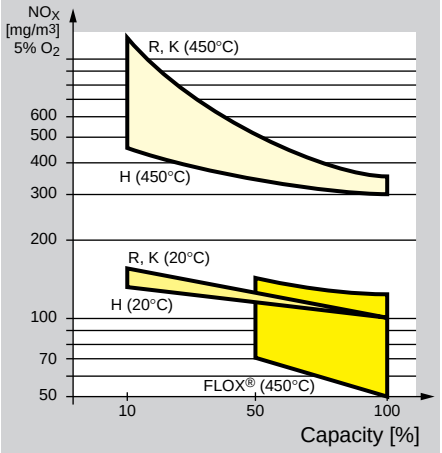


Fig. 34

ZIO 40

Type code

	BIC	65	R	B	G*	-50	/35/	200-*	N	(70)	E	Z*
Type BIO, BIOA, ZIO, BIC, BICA, BICF, BOCF												
Burner size 40, 50, 65, 80, 100, 125, 140, 165, 200												
Flame shape Normal flame = R Long flame = H Short flame = K												
Type of gas Natural gas = B Propane, propane/butane = G Butane, butane/propane, propane = M Town gas = D												
Variant Low fire* = G* Lance* = L* Reduced capacity* = R*												
Length of the burner tube/extension L1 [mm] = 0, 50, 100, 150...												
Position of the burner head L2 [mm] = 35, 85, 135, 185...												
Length of the FLOX lance [mm]* = 200, 300...*												
NPT-thread/ANSI-flange = N												
Code number of burner head = 1, 2, 3, 4, 5, 6...												
Constructional stage = A, B, C, D, E...												
Special version which is not described adequately by the type code.* = Z*												

* When "without", this letter is dropped, i.e. the next one moves up.

TSC

Type code

Type	TSC	100	B	065	-300	/35	CRYSTAR-D
Burner size = 50, 65, 80, 100, 140							
Shape Conical = A Diameter-restricted = B							
Outlet diameter D4 [mm] = 020–120							
Tube length L8 [mm] = 200–300							
Position of the burner head L9 [mm] = 35, 135							
Ceramic tube material = CRYSTAR-D, CarSIK-GG							

Kromschröder uses environment-friendly production methods.

We reserve the right to make technical changes designed to improve our products without prior notice.

Kromschroder Inc.
1691-H Georgetown Rd.
Hudson, OH 44236
Phone 3 30-3 42-05 95
Fax 3 30-3 42-05 96
www.kromschroder.com
KSINCUSA@ad.com

G. Kromschröder AG
Postfach 2809
D-49018 Osnabrück
Phone 05 41/12 14-0
Fax 05 41/12 14-3 70
www.kromschroeder.com
kromschroeder@t-online.de

03250098 8.99 ep/F:T 1.000