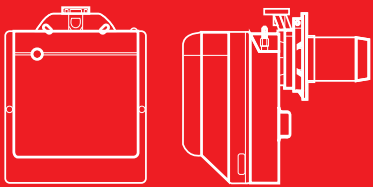




Gulliver BSD Series

Low NOx Two Stage Gas Burners

BS1D	16/19	÷	52	kW
BS2D	35/40	÷	91	kW
BS3D	65/80	÷	190	kW
BS4D	110/140	÷	250	kW



The Riello Gulliver BSD series of two stage gas burners, is a complete range of Low NOx emission products, developed to respond to any request for home heating, conforming to the most severe standards regarding the reduction of polluting emissions. This series of burners is available in four different models with an output ranging from 16 to 250 kW, divided in four different structures.

All the models use the same components designed by Riello for the Gulliver series. The high quality level guarantees safe working. The burners are fitted with a microprocessor-based burner safety control box which supplies indication of operation and diagnosis of fault cause.

In developing these burners, special attention was paid to reducing noise, the ease of installation and adjustment, to obtaining the smallest size possible to fit into any sort of boiler available on the market.

Two stage working guarantees high level performance from the thermal unit.

All the models are approved by the EN 676 European Standard and conform to European Directives, Gas Appliance, EMC, Low Voltage, Boiler Efficiency.

All the Gulliver BSD burners are tested before leaving the factory.

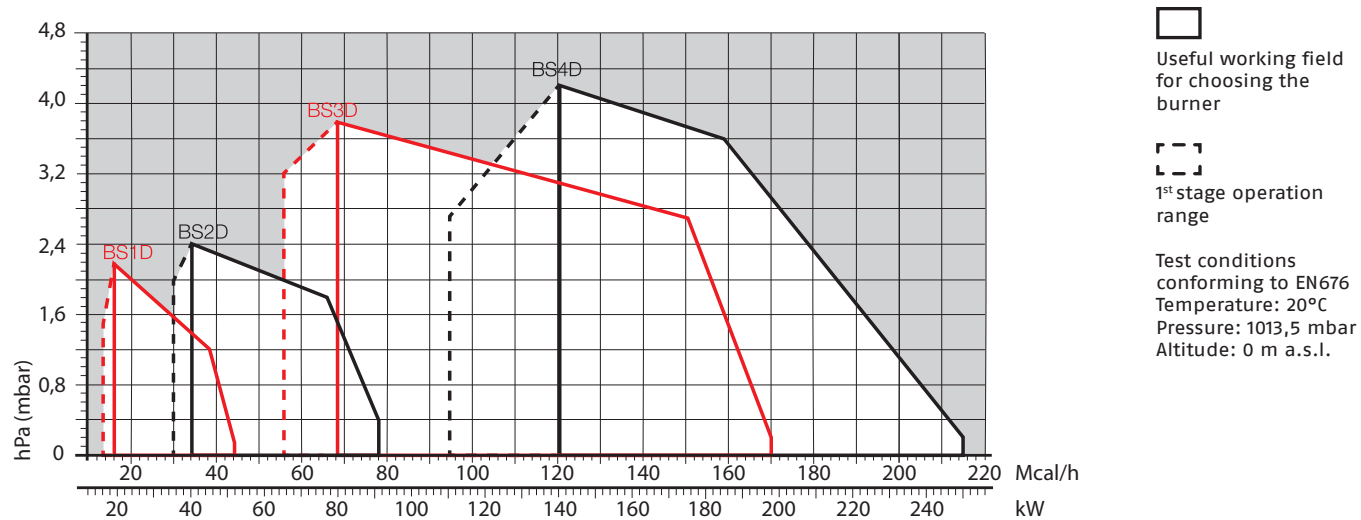
Technical Data

MODEL			BS1D	BS2D	BS3D	BS4D	
Burner operation mode			Two stage				
Modulation ratio at max. output			--				
Servomotor			type	--			
			run time s	--			
Heat output			kW	16/19 ÷ 52	35/40 ÷ 91	65/75 ÷ 190	110/140 ÷ 250
			Mcal/h	13.8/16.3 ÷ 44.7	30.1/34.4 ÷ 78.3	55.9/68.8 ÷ 172	94.6/120.4 ÷ 215
Working temperature			°C min./max.	0/40			
FUEL/AIR DATA							
G20 gas	net calorific value	kWh/Nm³	10				
	gas density	kg/Nm³	0.71				
	gas delivery	Nm³/h	1.6 ÷ 5.2	3.5 ÷ 9.1	6.5 ÷ 18.9	11 ÷ 24.6	
G25 gas	net calorific value	kWh/Nm³	8.6				
	gas density	kg/Nm³	0.78				
	gas delivery	Nm³/h	1.9 ÷ 6	4 ÷ 10.6	7.6 ÷ 22	12.8 ÷ 28.6	
LPG gas	net calorific value	kWh/Nm³	25.8				
	gas density	kg/Nm³	2.02				
	gas delivery	Nm³/h	0.6 ÷ 2	1.3 ÷ 3.5	2.5 ÷ 7.3	4.3 ÷ 9.5	
Fan			type	Centrifugal with forward curve blades			
Air temperature			max °C	40			
ELECTRICAL DATA							
Electrical supply			Ph/Hz/V	1/50/230 (±10%)			
Auxiliary electrical supply			Ph/Hz/V	--			
Control box			type	MG569			
Total electrical power			kW	0.15	0.18	0.35	0.53
Auxiliary electrical power			kW	--			
Protection level			IP	X0D			
Fan motor	electrical power	kW	0.09		0.15	0.25	
	rated current	A	0.6	0.7	1.6	1.9	
	start up current	A	2.4	2.8	6.4	7.6	
	protection level	IP	20				
Ignition transformer			type	Incorporated in the control box			
			V1 - V2	230V - 8 kV			
			I1 - I2	0.2 A - 12 mA			
Operation			Intermittent (at least one stop every 24 h)				
EMISSIONS							
Noise levels	sound pressure	dB (A)	61	62	66	71	
	sound power	W	72	73	77	82	
Gas G20	CO emission	mg/kWh	< 40				
	NOx emission	mg/kWh	< 80				
APPROVAL							
Directive			2006/42 EC - 2009/142 EC - 2014/30 UE - 2014/35 UE				
Conforming to			EN 676 - EN 12100				
Certification			CE-0085AQ0409				

Reference conditions:

Temperature: 20°C - Pressure: 1013.5 mbar - Altitude: 0 m a.s.l. - Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the "Free Field" method, as per EN 15036, and according to an "Accuracy: Category 3" measuring accuracy, as set out in EN ISO 3746.

Firing Rates



Gas train

GAS TRAIN DESIGNATION

Series: MB							
Size: 405 407 410 412							
Operation: /2 stage mode opening							
Leak detection control: - 0							
Joint type: R threaded joint							
F1 square flange BS1							
F2 square flange BS2							
F3 square flange BS3 – BS4							
Electrical connection: SD Domestic plug							
Standard output pressure range: - without pressure governor							
0 with governor and air/gas proportional pressure							
2 with governor and output pressure up to 20 mbar							
3 with governor and output pressure up to 30 mbar							
4 with governor and output pressure up to 40 mbar							
5 with governor and output pressure up to 50 mbar							
Valve control: 0 shared							

MB	407	/2		F2	SD	2	0
BASIC DESIGNATION							
EXTENDED DESIGNATION							

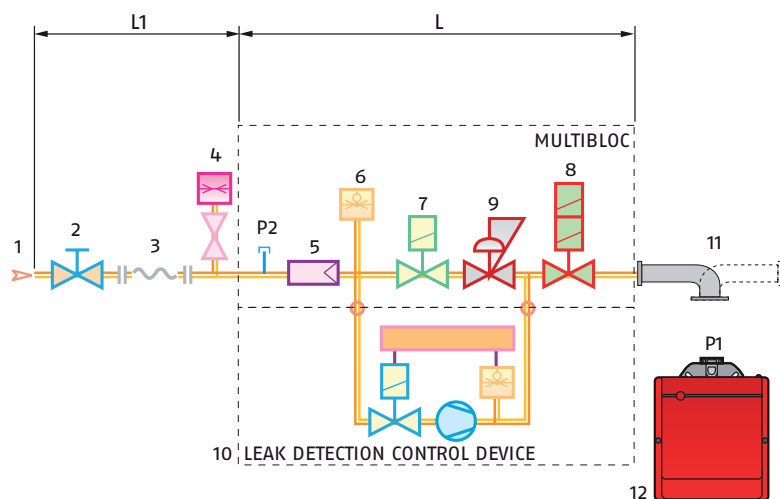
GAS TRAINS

The burners are set for fuel supply from either the right or left hand sides.

Depending on the fuel output and the available pressure in the supply line, you should check the correct gas train to be adapted to the system requirements.

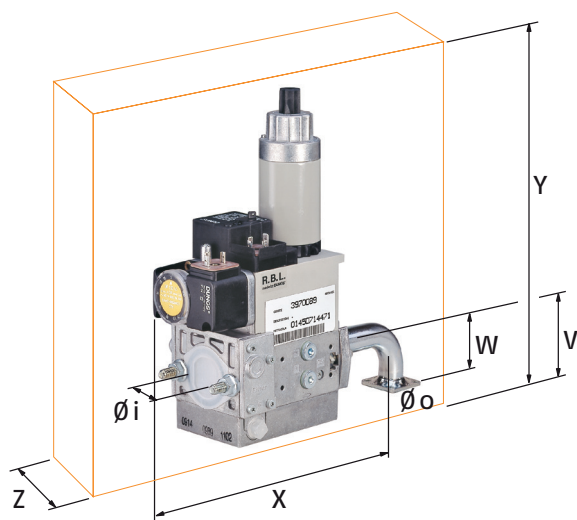
The gas train is Multibloc type, containing the main components in a single unit and it can be fitted with the valve seal control (as an accessory).

MB 405/2 - 407/2 - 410/2 - 412/2



Gas train installed on the burner

1	Gas input pipework
2	Manual valve
3	Anti-vibration joint
4	Gas pressure gauge
5	Filter
6	Gas pressure switch
7	Safety valve
8	Adjustment solenoid 1st and 2nd stage: firing delivery adjustment (rapid opening) maximum delivery adjustment (slow opening)
9	Pressure adjuster
10	Leak detection device for valves 7 and 8 (accessory)
11	Gas train-burner adapter
12	Burner
P1	Combustion head pressure
P2	Upstream pressure from the filter
L	Gas train supplied separately
L1	Installer's responsibility



The dimensions of the gas trains vary depending on their construction features.

The following table shows the dimensions of the gas trains that can be fitted to Gulliver BSD burners, intake diameter and the coupling flange to the burner.

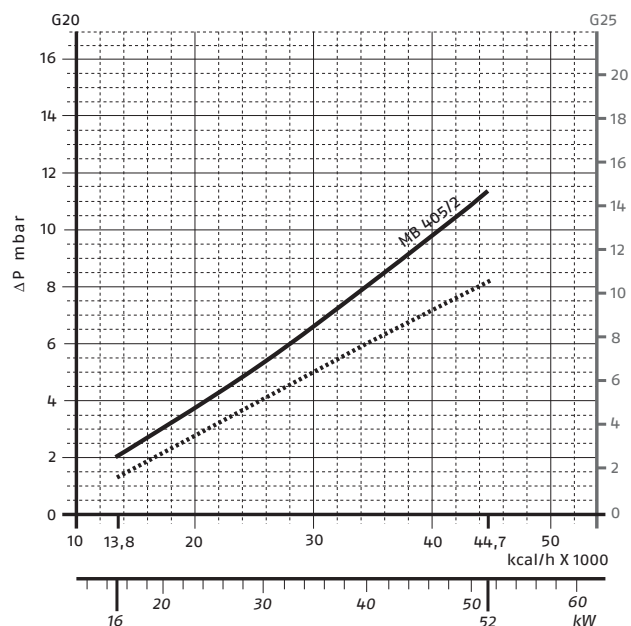
GAS TRAIN									
MODEL	CODE	Ø in	Ø out	X mm	Y mm	W mm	Z mm	V mm	mbar max*
MB 405/2	3970539	1/2"	FLANGE 1	246	257	45	120	46	300
MB 405/2	3970540	3/4"	FLANGE 2	236	257	47	120	46	300
MB 407/2	3970538	3/4"	FLANGE 2	236	257	47	120	46	300
MB 407/2	3970541	3/4"	FLANGE 3	236	257	47	120	46	300
MB 410/2	3970542	1" 1/4	FLANGE 3	259	315	47	145	55	300
MB 412/2	3970543	1" 1/4	FLANGE 3	259	315	47	145	55	300

* max inlet gas pressure (mbar)

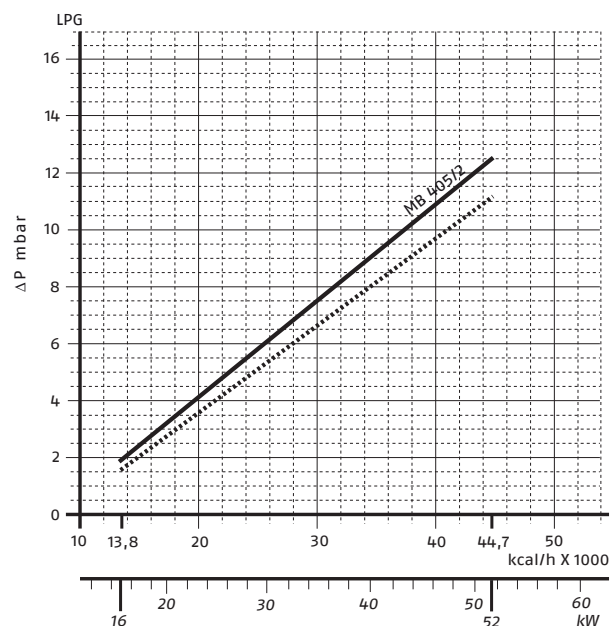
Pressure Drop Diagram

The diagrams indicate the minimum pressure drop of the burners with the various gas trains that can be matched with them; at the value of these pressure drop add the combustion chamber pressure. The value thus calculated represents the minimum required input pressure to the gas train.

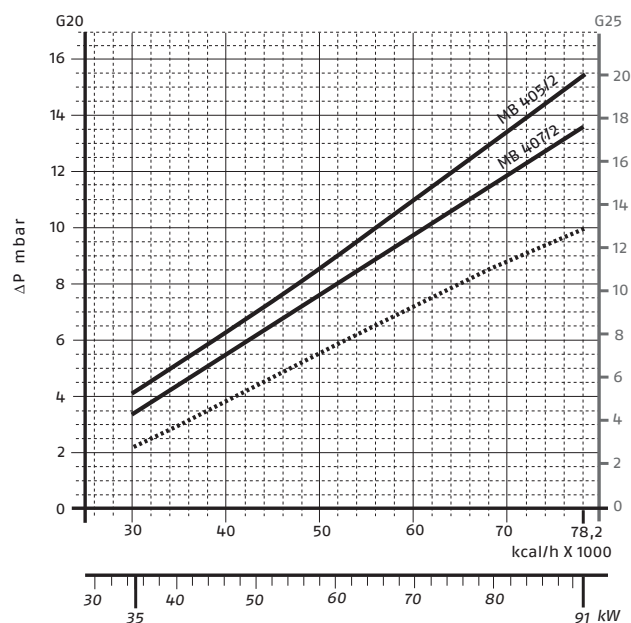
BS1D (NATURAL GAS)



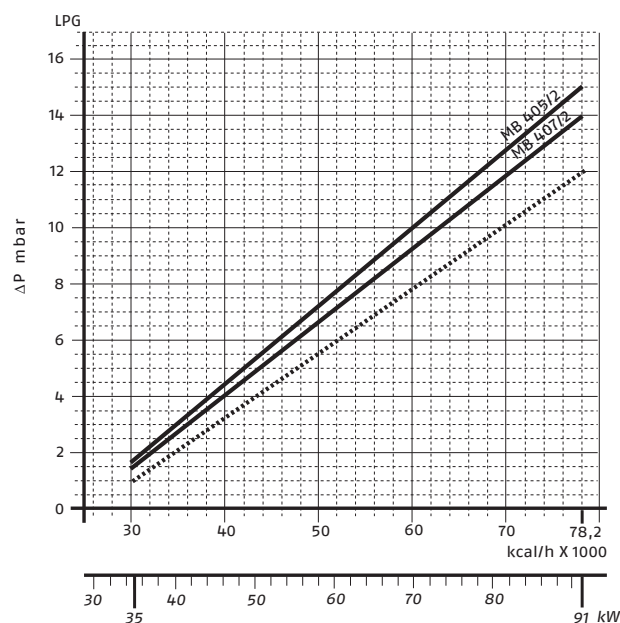
BS1D (LPG)



BS2D (NATURAL GAS)

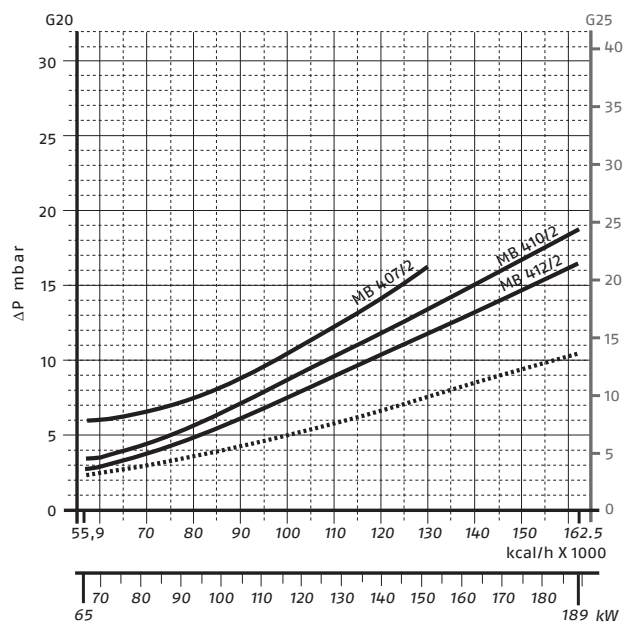


BS2D (LPG)

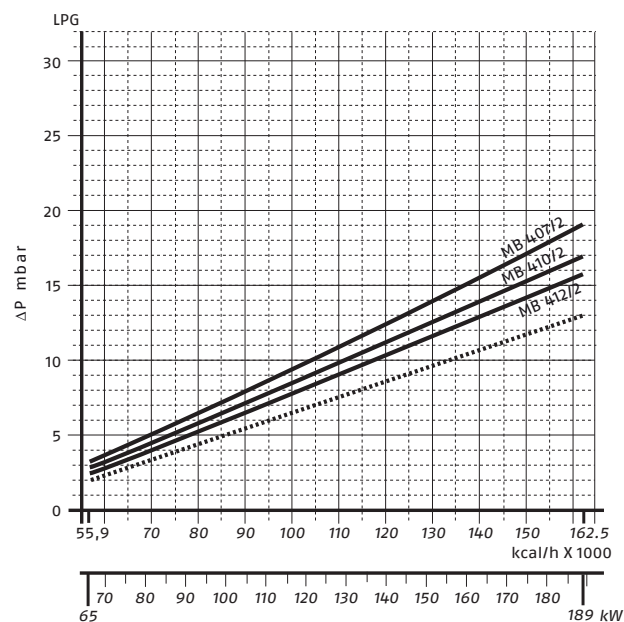


— Combustion head + gas train
 - - - Combustion head

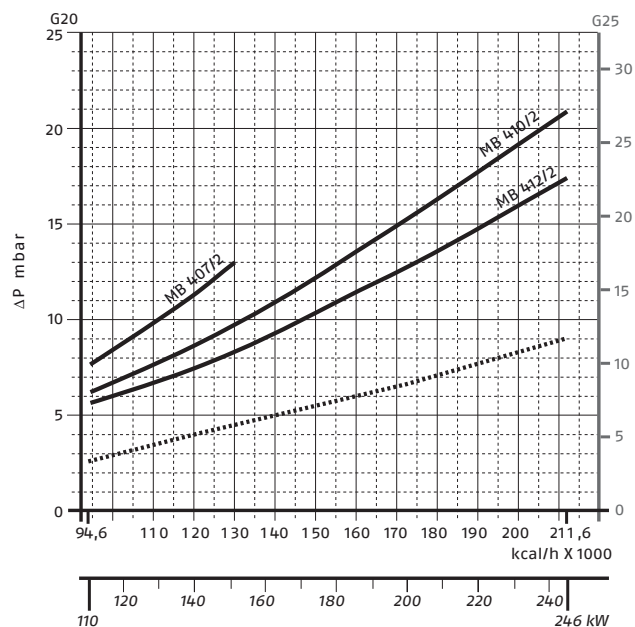
BS3D (NATURAL GAS)



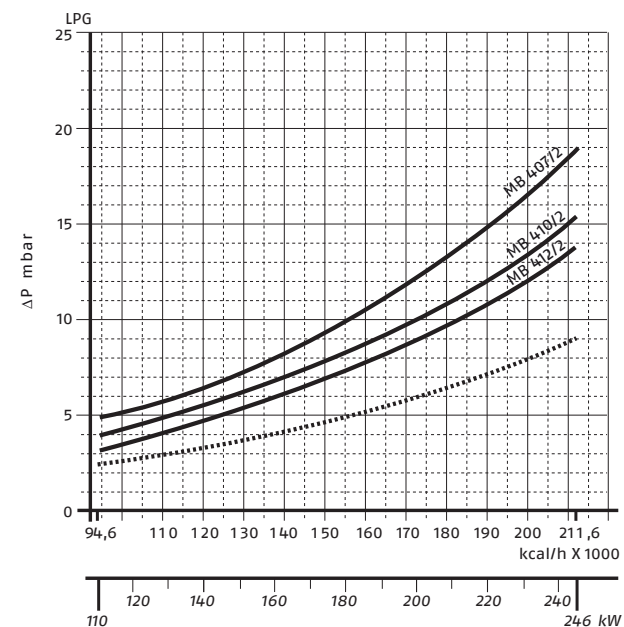
BS3D (LPG)



BS4D (NATURAL GAS)



BS4D (LPG)



For pressure levels different from those indicated above, please contact Riello Burners Technical Office.

In LPG plants, Multibloc gas trains do not operate below 0°C.

They are only suitable for gaseous LPG (liquid hydrocarbons destroy the seal materials).

— Combustion head + gas train
 - - - Combustion head

GAS TRAIN				
CODE	MODEL	BURNER MODEL	OUTPUT	PLUG AND SOCKET
3970539	MB 405/2 - F1SD 20	BS1D	≤ 45 kW *	●
3970540	MB 405/2 - F2SD 20	BS2D	-	●
3970538	MB 407/2 - F2SD 20	BS2D	-	●
3970541	MB 407/2 - F3SD 20	BS3D - BS4D	≤ 150 kW *	●
3970542	MB 410/2 - F3SD 20	BS3D - BS4D	-	●
3970543	MB 412/2 - F3SD 20	BS3D - BS4D	-	●

Key to layout

* with natural gas

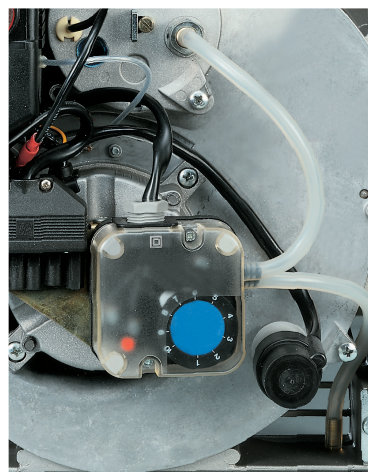
Ventilation

The different ventilation circuits always ensure low noise levels with high performance of pressure and air delivery, inspite of their compact size.

The burners are fitted with an adjustable air pressure switch, conforming to EN 676 standards.



Air suction



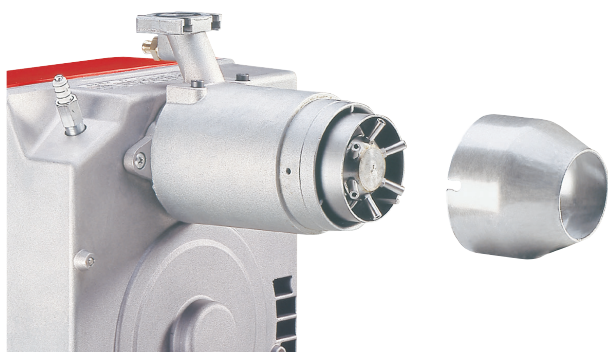
Air pressure switch

Combustion Head

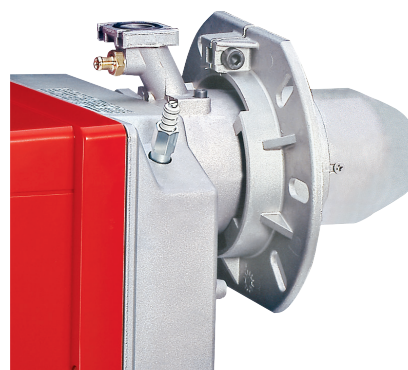
The combustion head in Gulliver BSD burners is the result of an innovative design, which allows combustion with low polluting emissions, while being easy to adapt to all the various types of boilers and combustion chambers.

Thanks to the use of a mobile coupling flange, the penetration of the head into the combustion chamber can be adjusted.

Simple adjustment allows the internal geometry of the combustion head to be adapted to the burner output.

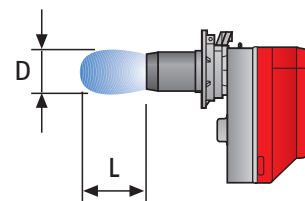
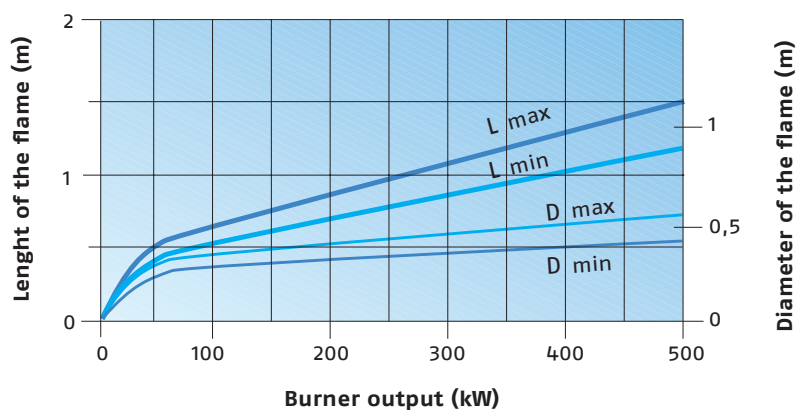


Combustion head



Mobile flange

DIMENSIONS OF THE FLAME

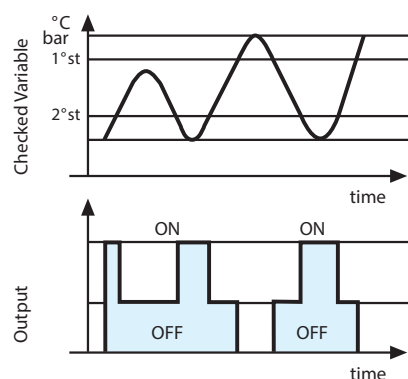


Example:
Burner thermal output = 350 kW;
L flame (m) = 1.2 m (medium value);
D flame (m) = 0.6 m (medium value)

Operation

BURNER OPERATION MODE

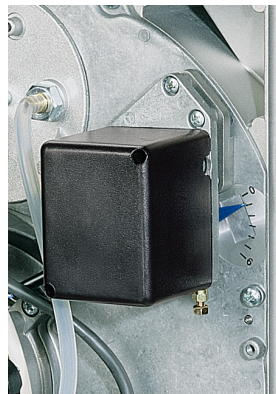
All these models are two stage operation. The Gulliver BSD series of two stage burners allows operating at both full and reduced output, with consequent reduction in turning the burner on and off, their giving better performance to the boiler. During stand-by, the air damper is completely closed (controlled by an electric servomotor) and prevents heat loss due to the flue draught.



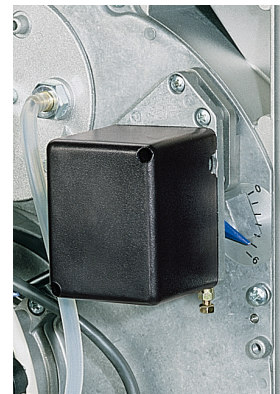
Two stage operation



Air damper adjustment



Air damper opening mechanism



All Gulliver BSD series burners are fitted with a new microprocessor control panel for the supervision during intermittent operation. For helping the commissioning and maintenance work, there are two main elements:



The lock-out reset button is the central operating element for resetting the burner control and for activating / deactivating the diagnostic functions.

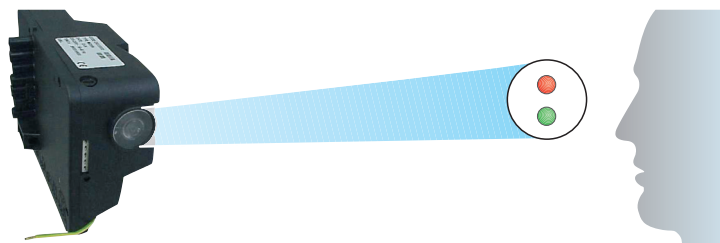


The multi-color LED is the central indication element for visual diagnosis and interface diagnosis.

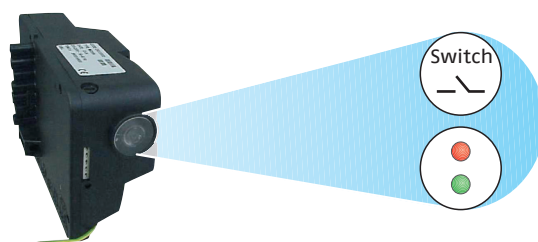
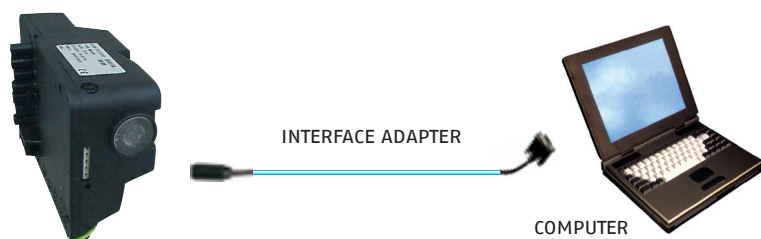
Both elements are located under the transparent cover of lock-out reset button, as showed.

There are two diagnostic choices, for indication of operation and diagnosis of fault cause:

- visual diagnosis:



- interface diagnosis:



By the interface adapter and a PC with dedicated software.

Indication of operation

In normal operation, the various statuses are indicated in the form of colour codes according to the table below.

Diagnosis of fault causes

After lock-out has occurred, the red signal lamp is steady on.

In this status, the visual fault diagnosis according to the error code table can be activated by pressing the lock-out reset button for over 3 seconds.

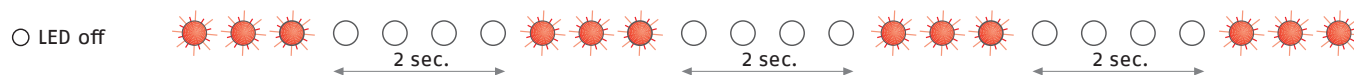
The control box sends a sequence of pulses that are repeated at 2 second intervals.

The interface diagnosis (with adapter) can be activated by pressing again the lock-out button for over 3 seconds.

Color code table

Operation statuses	Color code
Stand-by	○ Led off
Pre-purging	● Green
Ignition phase	● Green
Flame OK	● Green
Post purge	● Green
Undervoltage, built-in fuse	○ Led off
Fault, alarm	● Red

Example of blinks sequence:

**Error code table**

Blink code	Possible cause of fault
2 blinks 	No flame at the end of safety time: - faulty or soiled gas valves - faulty ionisation probe - poor adjustment of burner, no gas - faulty ignition - neutral / phase exchange
3 blinks 	Air pressure switch does not close or is already closed before heat demand: - faulty air pressure switch - air pressure switch incorrectly regulated
4 blinks 	Presence of flame: - in stand-by position - with thermostat of heat demand in idle or working position - during pre-purge - during post-purge
6 blinks 	Loss of air pressure: - during pre-purge - during or after safety time
7 blinks 	Loss of flame during operations after n°3 attempts of re-cycle: - faulty or soiled gas valves - faulty ionisation probe - short circuit between ionisation probe and earth of the burner - poor adjustment of burner, no fuel

The MG569 digital control box gives some other advantages:

Post ignition (during safety time)

The spark ignition is present during all safety time.

Adjustable post purge

The Post-purge is a function that maintains air ventilation even after the burner is switched off.

Post-purge time can be set to a maximum of 6 minutes.

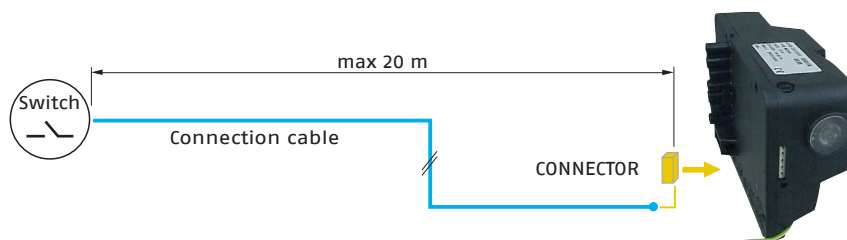
This function can be activated and set in a very easy way by pressing repeatedly the reset button; after 5 seconds the control box automatically shows the minutes set by the red LED flashing (1 pulse = post-ventilation for 1 minute). If during post-purge there is a new request for heat, it is halted and a new operating cycle starts.

The control box leaves the factory with the setting 0 minutes (no post-ventilation).

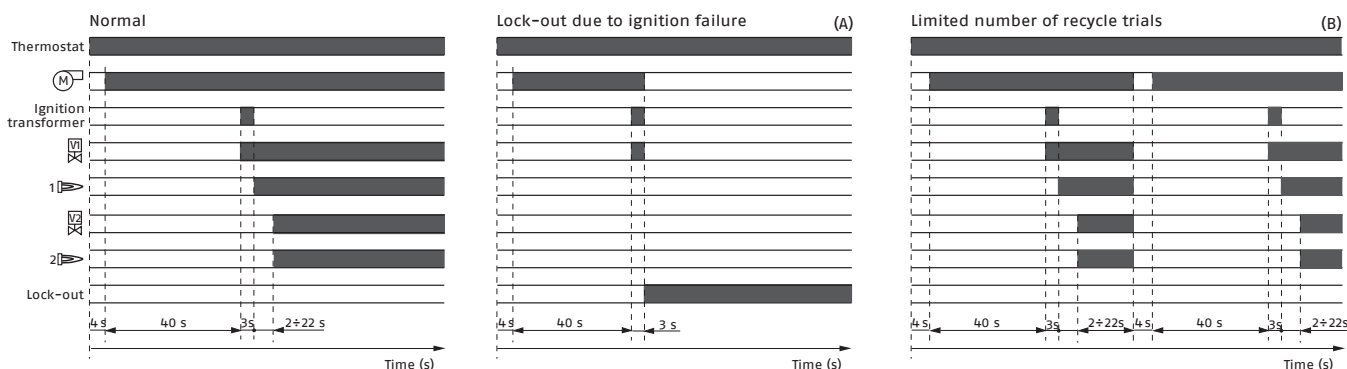
Remote lock-out reset

The "Remote lock-out reset" is a function that allows to reset the control-box operation from a remote position. In the burner packages will be included a particular connector to remote the reset signal.

The maximum length of connection must be 20 m.



START UP CYCLE



(A) Lock-out is shown by a led on the appliance.

(B) Total number of recycle trials is 3.

Correct operation

0s	Start of heat demand the burner begins the ignition cycle
0s-4s	The burner is in stand-by
4s-44s	Pre-purge with opened air damper
44s	Ignition 1st stage
49s-69s	Ignition 2nd stage

Lock-out due to ignition failure

If the flame does not light within the safety limit (~ 3s) the burner locks-out.

Re-cycle

The burner permits maximum three repetitions of complete ignition cycle if there is flame failure during operation.

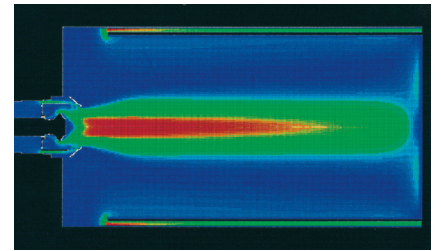
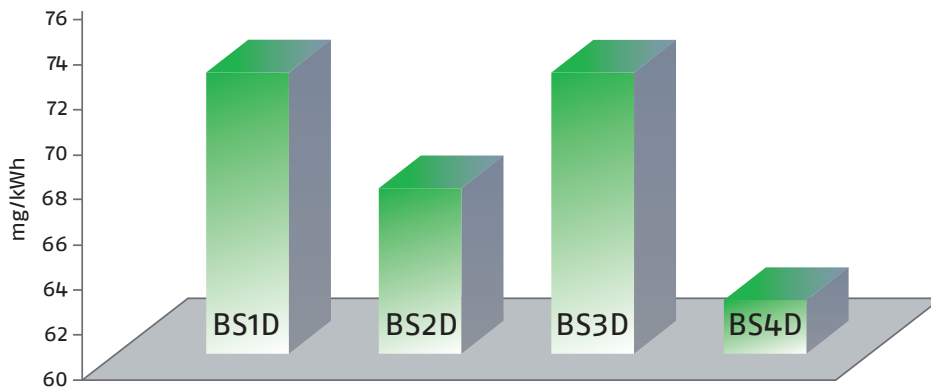
The burner goes in safety shut-down within one second.

The final action at the last trial following at last flame failure is a lock-out.

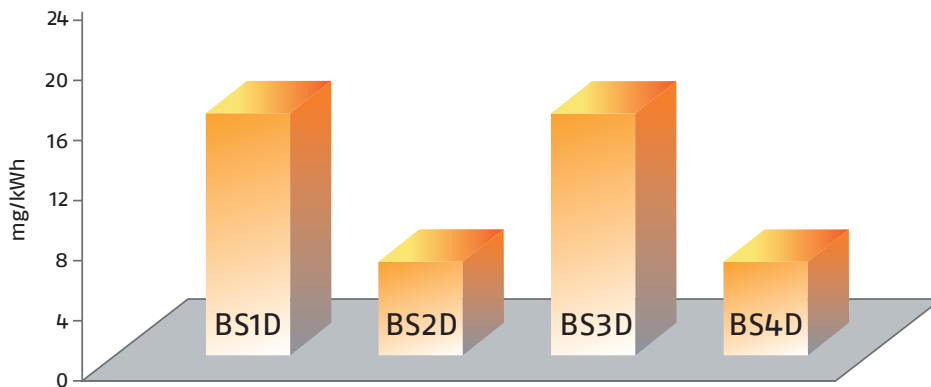
Emissions

The burners in the Gulliver BSD series guarantee controlled combustion, reducing emissions of both CO and NOx, this combustion control is due to the recirculation of the combustion products in the chamber (thanks to different combustible air flow speeds) and to the fuel staging technique (thanks to the special geometry of the gas nozzles).

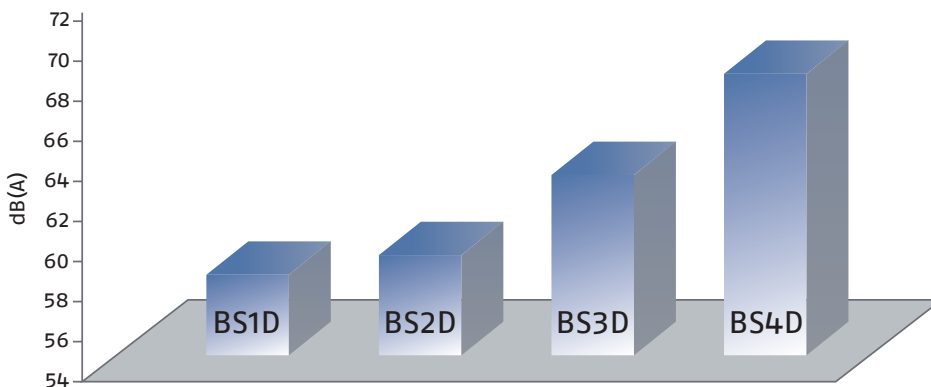
NO2 EMISSIONS



CO EMISSIONS (gas G20)



NOISE EMISSIONS

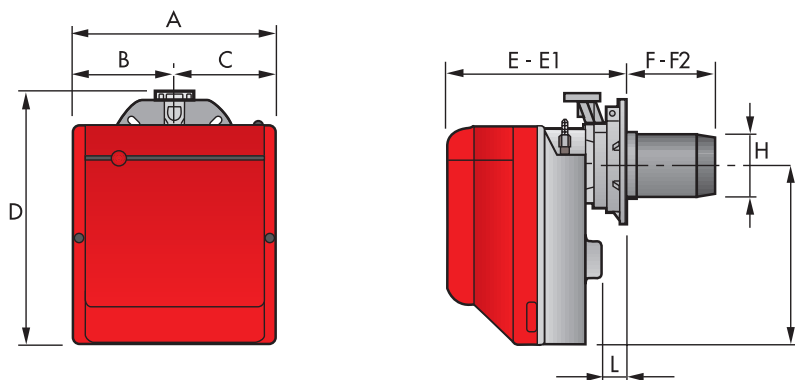


The emission data have been measured in the various models at maximum output, in conformity with EN 676 standard.

Special attention has been paid to noise reduction. All models are fitted with sound-proofing material inside the cover.

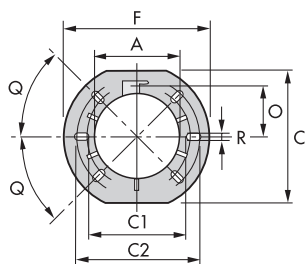
Overall Dimensions (mm)

These models are distinguished by their reduced size, in relation to the outputs achieved, which means they can be fitted to any boiler on the market.



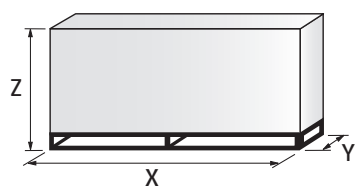
MODEL	A	B	C	D	E	E1	F	F2	H	I	L
BS1D	234	122	122	295	230	276	116	70	89	210	41
BS2D	255	125.5	125.5	325	238	252	114	100	106	230	45
BS3D	300	150	150	391	262	280	128	110	129	285	45
BS4D	300	150	150	392	271	301	168	145	137	286	45

BURNER - BOILER MOUNTING FLANGE



MODEL	A	C	C1	C2	F	O	Q	R
BS1D	89	167	140	170	192	66	45°	11
BS2D	106	167	140	170	192	66	45°	11
BS3D	129	201	160	190	216	76.5	45°	11
BS4D	137	203	170	200	218	80.5	45°	11

PACKAGING



MODEL	X	Y	Z	kg
BS1D	395	278	350	11
BS2D	405 - 593	298 - 300	375 - 380	12 - 14
BS3D	450 - 713	345	440 - 445	16 - 18
BS4D	510 - 713	345	440 - 445	18 - 20

Installation Description

Installation, start up and maintenance must be carried out by qualified and skilled personnel.

The burner is set in the factory on standard calibration (minimum output).

If necessary adjustments can be made on the basis of the maximum output of the boiler. All operations must be performed as described in the technical handbook supplied with the burner.

The mobile flange allows adapting the length of the combustion head to the combustion chamber (flame inversion or 3 smoke cycles) and to the thickness of the boiler panel.

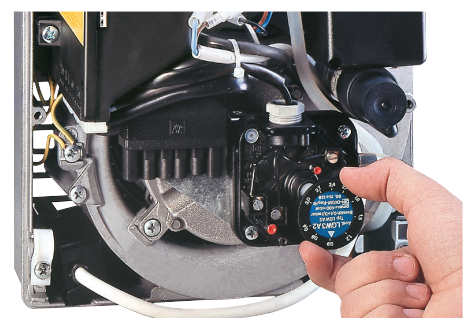
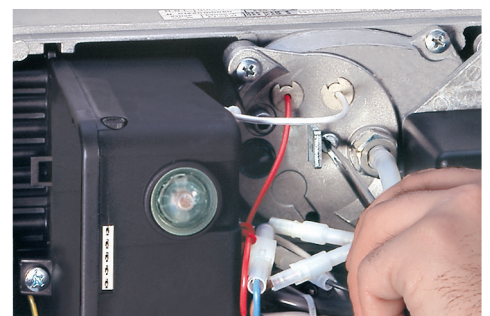
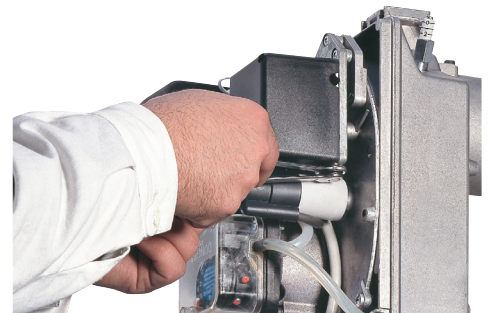
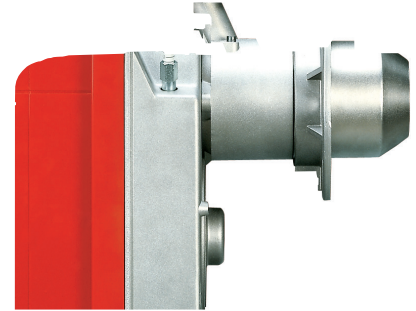
BURNER SETTING

The adjustment of the first stage air damper position can be easily carried out by setting the air damper motor and following the manual instruction.

The second stage position of the air damper can be adjusted without removing the burner cover.

Head setting is easy and aided by a graduated scale; a test point allows reading the air pressure in the combustion head.

Gulliver BSD burners are fitted with an air pressure switch which, in accordance with EN 676 standards, can be adjusted by the installer using a graduated selector, on the basis of the effective working conditions.

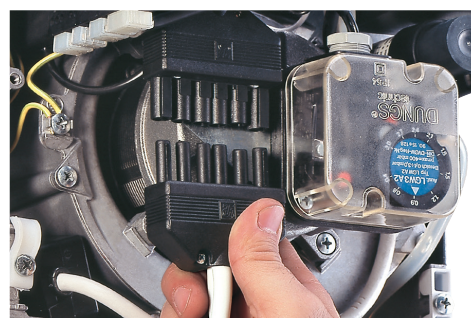
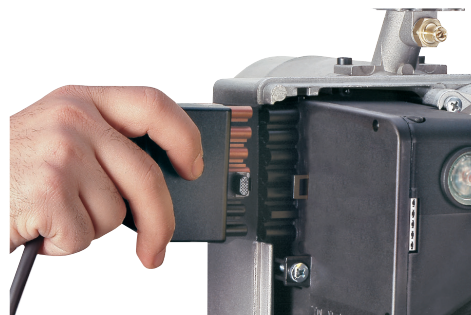


MAINTENANCE AND ELECTRICAL CONNECTIONS

Maintenance is easily solved because the combustion head can be disassembled without having to remove the burner and gas train from the boiler.

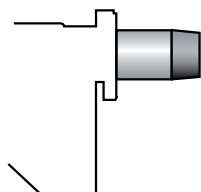
The 7-pole socket is incorporated in the control box, the 4-pole socket (for connecting the 2nd stage thermostat to the hour meter) and the 6-pole socket (for connection to the gas train) are already connected to the equipment and fixed into the burner.

The 7 and 4-pin plugs are also supplied for connection to the boiler.



Burner accessories

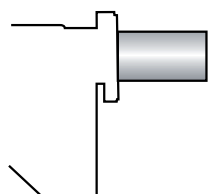
EXTENDED HEAD KIT



Burners standard head can be transformed into "extended head" versions by using the special kit. Here the KITS available for the various burners are listed, showing the original and the extended lengths.

BURNER	STANDARD HEAD LENGTH (mm)	EXTENDED HEAD LENGTH (mm)	CODE
BS1D	70 ÷ 116	70 ÷ 116	20031875
BS2D (long)	100 ÷ 114	170 ÷ 180	3001007
BS2D (extra long)	100 ÷ 114	270 ÷ 280	3001008
BS3D	110 ÷ 128	267 ÷ 282	3001009
BS4D	145 ÷ 168	302 ÷ 317	3001016

ALTERNATIVE COMBUSTION HEAD KIT



This kit can be used to prevent combustion instability which could arise with particular heat generators.

To extend the adaptability of Gulliver BSD burners to any sort of application, alternative combustion heads have been developed.

These heads cause a very limited increase in NOx emissions, due to the slower air flow.

BURNER	CODE
BS1D	3001059
BS2D	3001064
BS3D	3001060
BS4D	3001070

PC INTERFACE KIT



To connect the control box to a personal computer for the transmission of operation, fault signals and detailed service information, an interface adapter with PC software are available.

BURNER	CODE
BS1D- BS2D - BS3D - BS4D	3002731

7-PIN PLUG KIT

If necessary a 7-pin plug kit is available (in packaging of n. 5 pieces).

BURNER	CODE
BS1D- BS2D - BS3D - BS4D	3000945

LPG KIT



For burning LPG gas, a special kit is available to be fitted to the combustion head on the burner, as shown in the following table.

BURNER	STANDARD HEAD CODE	EXTENDED HEAD CODE	CODE (*)
BS1D	3001003	3001003	3002734
BS2D	3001004	3001004	3002735
BS3D	3001005	3001005	3002736
BS4D	3001011	3001011	3002737

(*) CE certification in progress

TOWN GAS KIT



For burning Town Gas, a special kit is available to be fitted to the combustion head on the burner, as shown in the following table.

BURNER	STANDARD HEAD CODE (*)	EXTENDED HEAD CODE (*)
BS1D	3002727	-
BS2D	3002728	3002728
BS3D	3002729	3002729

(*) Without CE certification

GROUND FAULT INTERRUPTER KIT

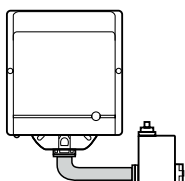


A "Ground fault interrupter kit" is available as a safety device in case of electrical system fault. It is supplied with burners with pin plug.

BURNER	CODE
BS1D - BS2D - BS3D - BS4D	3001180

(*) Without CE certification

MULTIBLOC ROTATION KIT



There is a special kit available that can be used to install the burner turned 180°. This kit is designed to ensure the gas train valve properly.

BURNER	CODE
BS1D	3001179
BS2D	3001177
BS3D - BS4D	3001178

Gas train accessories

SEAL CONTROL KIT



To test the valve seals on the gas train a special “seal control kit” is available.

GAS TRAIN	CODE	CODE
	for 50Hz operation	for 60Hz operation
MB/2 type	3010123	20050030

Specification

DESIGNATION OF SERIES

A specific index guides your choice of burner from the various models available in the BS series. Below is a clear and detailed specification description of the product.

Series:	B	Low NOx burners
	R	Standard emission burner
Fuel:	S	Natural Gas
	SP	LPG
	G	Light oil
Size:		
Optional variations:	R	Light oil pre-heater
	K	Cone shaped head
	S	Reduced output ignition
	D	Two stage output operation
Head length:	...	standard head
	TL	extended head
Electrical supply to the system:	1/230/50	1/230V/50Hz

B	S	3	D		1/230/50
BASIC DESIGNATION					
EXTENDED DESIGNATION					

AVAILABLE BURNER MODELS

BURNER MODELS	ELECTRICAL SUPPLY	HEAT OUTPUT		TOTAL ELECTRICAL POWER (kW)	CERTIFICATION	NOTE
		(kW)	NATURAL GAS (Nm ³ /h)			
BS1D	1/230/50	16/19 – 52	1.6/1.9 – 5.2	0.15	CE-0085AQ0409	(1)
BS2D	1/230/50	35/40 – 91	3.5/4 – 9.1	0.18	CE-0085AQ0409	(1)
BS2D TL	1/230/50	35/40 – 91	3.5/4 – 9.1	0.18	CE-0085AQ0409	(1)
BS3D	1/230/50	65/80 – 190	6.5/8 – 20	0.35	CE-0085AQ0409	(1)
BS3D TL	1/230/50	65/80 – 190	6.5/8 – 20	0.35	CE-0085AQ0409	(1)
BS4D	1/230/50	110/140 – 250	11/14 – 25	0.53	CE-0085AQ0409	(1)
BS4D TL	1/230/50	110/140 – 250	11/14 – 25	0.53	CE-0085AQ0409	(1)

Net calorific value G20: 10 kWh/Nm³ – Density: 0,71 kg/Nm³.

The burners of BS series are in according to EN 676.

(1) With plug and socket.

SPECIFICATION

STATE OF SUPPLY

Burner

Monoblock, gas burners, completely automatic, two stage operation, made up of:

- fan with forward curve blades
- cover lined with sound-proofing material
- air damper, completely closed in stand by, driven by an electric servomotor
- air damper with 1st and 2nd stage adjustment (2nd stage external adjustment, with no need to remove the cover)
- single phase electric motor 230V, 50Hz
- combustion head fitted with:
 - stainless steel head cone, resistant to high temperatures
 - ignition electrodes
 - ionisation probe
 - gas distributor
 - flame stability disk
- flame inspection window
- adjustable air pressure switch, with graduated selector, to guarantee burner lock out in the case of insufficient combustible air
- microprocessor-based burner safety control box, with diagnostic and remote reset functions
- protection filter against radio interference (included into burner safety control box)
- IP X0D (IP 40) electric protection level

Standard equipment:

- sliding flange
- flange insulation screen
- screws and nuts for fixing the flange to the boiler
- 7-pin plug
- 4-pin plug
- remote control release kit
- instruction handbook for installation, use and maintenance
- spare parts catalogue

Conforming to:

- 2014/30 UE Directive (electromagnetic compatibility)
- 2014/35 UE Directive (low voltage)
- 2009/142 EC Directive (gas)
- 2006/42 EC Directive (machine)
- EN 676 (gas burners)

Available accessories to be ordered separately:

- extended head kit
- alternative extended head kit
- LPG kit
- town gas kit
- ground fault interrupter kit
- Multibloc rotation kit
- 7-pin plug kit
- PC interface kit
- seal control kit

Riello Burners a world of experience in every burner we sell.

05/2016

TS00007UK04



[1]



[2]

[1] BURNERS PRODUCTION PLANT
S. PIETRO, LEGNAGO (VERONA) - ITALIA

[2] HEADQUARTER BURNERS DIVISION
S. PIETRO, LEGNAGO (VERONA) - ITALIA

Across the world, Riello sets the standard in reliable and high efficiency burner technology.

With burner capacity from 5 kW to 48 MW, Riello gas, oil, dual fuel and Low Nox burners deliver unbeatable performance across the full range of residential and commercial heating applications, as well as in industrial processes.

With headquarter in Legnago, Italy, Riello has been manufacturing premium quality burners for over 90 year. The manufacturing plant is equipped with the most innovative systems of assembling lines and modern manufacturing cells for a quick and flexible response to the market.

Besides, the Riello Combustion Research Centre, located in Angiari, Italy, represents one of the most modern facility in Europe and one of the most advanced in the world for the development of the combustion technology.

Today, the company's presence on worldwide markets is distinguished by a well-constructed and efficient sales network, alongside many important Training Centres located in various countries to meet its customers' needs. Riello has 13 operational branches abroad (in Europe, America and Asia), with customers in over 60 countries.

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