



LOW NO_x MODULATING GAS BURNERS

▶ **RS/P BLU SERIES**

▶ **RS 300/P BLU** 500/1350 ÷ 3800 kW

▶ **RS 400/P BLU** 800/1800 ÷ 4500 kW



RS/P series burners are characterised by a modular monoblock structure which means that all necessary components can be combined in a single unit thus making installation easier, faster and, above all, more flexible.

The series covers a firing range from 700 to 4500 kW, and they have been designed for use in hot water boilers or industrial steam generators.

Operation can be "two stage progressive" or alternative "modulating" with the installation of a PID logic regulator.

Using a particular proportioning valve the burner keeps desired air to gas ratio in every working condition.

The burner can, also, supply with precision the demanded power, guaranteeing an high efficiency system level and the stability setting, obtaining fuel consumption and operating costs reduction.

The innovative combustion head ensures reducing noise and pollutants.

TECHNICAL DATA



Model			▼ RS 300/P BLU	▼ RS 400/P BLU
Burner operation mode			Modulating	
Modulation ratio at max. output			4 ÷ 1	
Servomotor	type		LKS 310	
	run time	s	30	30
Heat output	kW		500/1350-3800	800/1800-4500
	Mcal/h		430/1161-3268	688/1548-3870
Working temperature		°C min./max.	0/60	
Net calorific value G20 gas		kWh/Nm ³	10	
G20 gas density		kg/Nm ³	0,71	
G20 gas delivery		Nm ³ /h	50/135-380	80/180-450
Net calorific value G25 gas		kWh/Nm ³	8,6	
G25 gas density		kg/Nm ³	0,78	
G25 gas delivery		Nm ³ /h	58/156-442	93/209-523
Net calorific value LPG gas		kWh/Nm ³	25,8	
LPG gas density		kg/Nm ³	2,02	
LPG gas delivery		Nm ³ /h	--	--
Fan		type	Reverse curve blades	
Air temperature		max °C	60	
Electrical supply		Ph/Hz/V	3N/50/230-400 (±10%)	3N/50/230 (±10%) - 3N/50/400 (±10%)
Auxiliary electrical supply		Ph/Hz/V	1/50/230 ~ (±10%)	
Control box		type	RMG/M	
Total electrical power		kW	5,5	9
Auxiliary electrical power		kW	--	--
Protection level		IP	54	
Motor electrical power		kW	4,5	7,5
Rated motor current		A	15,8 - 9,1	17,5 - 30
Motor start up current		A	--	113 - 195
Motor protection level		IP	55	
Ignition transformer		type	--	
		V1 - V2	230 V - 1x8 kV	
		I1 - I2	1 A - 20 mA	
Operation			Intermittent (at least one stop every 24 h) or Continuous as optional (at least one stop every 72 h)	
Sound pressure		dB (A)	82	85
Sound power		W	--	--
CO emission		mg/kWh	< 10	
NOx emission		mg/kWh	< 80	
Directive			90/396 - 89/336 - 73/23 EEC	
Conforming to			EN 676	
Certification			CE 0085 B0 341	

Reference conditions:

Temperature: 20°C

Pressure: 1000 mbar

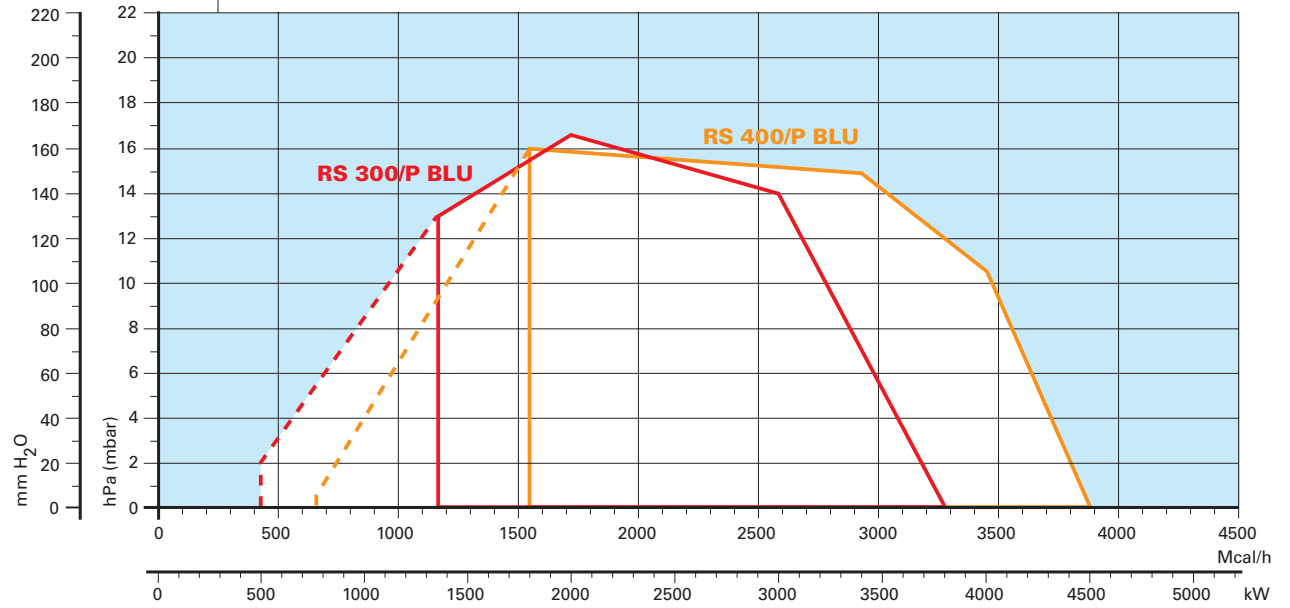
Altitude: 100 m a.s.l.

Noise measured at a distance of 1 meter.


Since the Company is constantly engaged in the production improvement, the aesthetic and dimensional features, the technical data, the equipment and the accessories can be changed.
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FIRING RATES



 Useful working field for choosing the burner

 Modulation range

Test conditions conforming to EN 676:

Temperature: 20°C
Pressure: 1000 mbar
Altitude: 100 m a.s.l.



FUEL SUPPLY

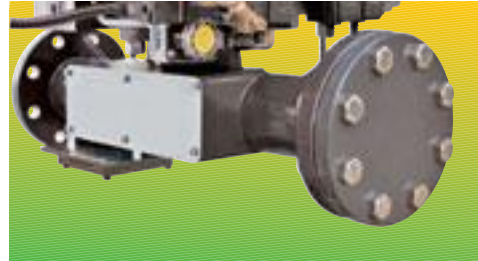
GAS TRAIN

The gas train can be selected to best fit system requirements depending on the fuel output and pressure in the supply line.

The proportioning valve installed on the gas train maintains constant desired air to gas ratio in every working condition regardless variation of external factors such as: changing in gas pressure, air delivery, chamber backpressure and voltage fluctuation.

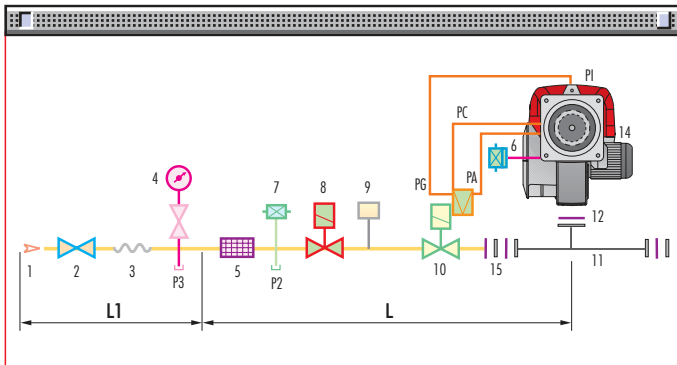
This result is obtained by measuring: air pressure after air damper, gas pressure entering the burner and chamber backpressure.

Fuel can be supplied either from the right or left side, on the basis of the application.

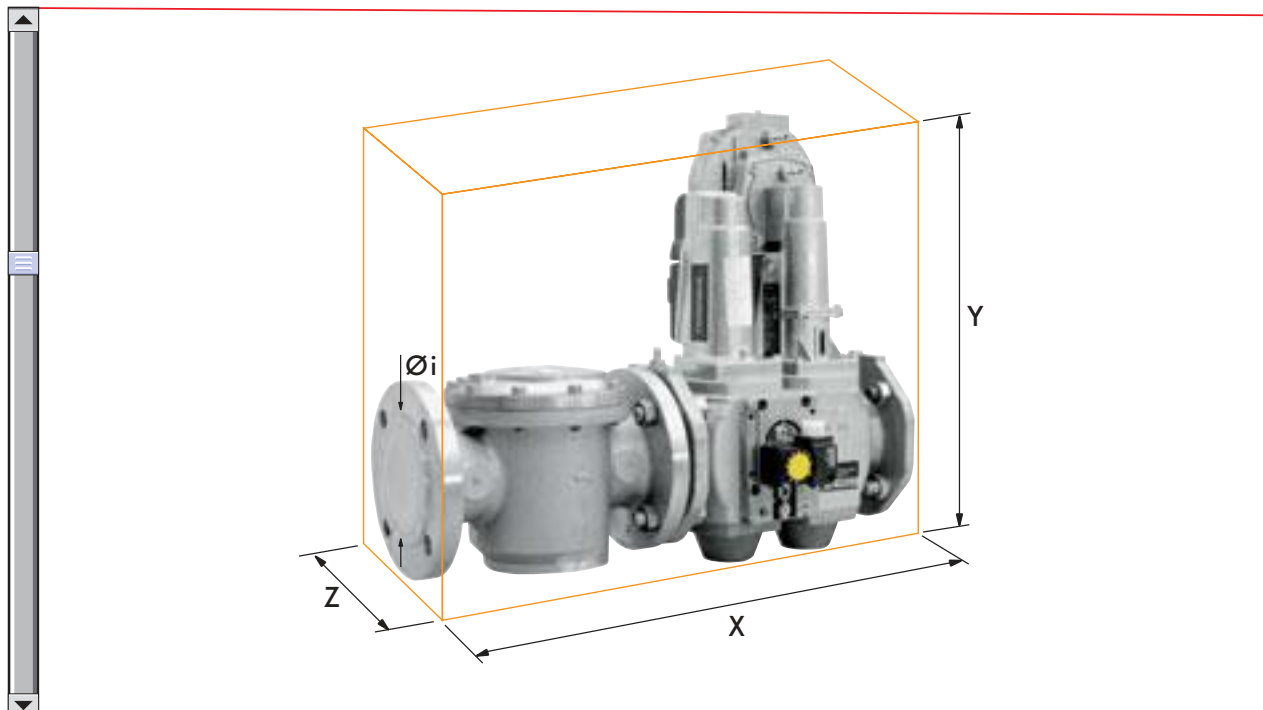


Example of the RS/P BLU gas inlet.

VGD gas train with seal control



1	Gas input pipework
2	Manual valve
3	Anti-vibration joint
4	Pressure gauge with pushbutton cock
5	Filter
6	Maximum gas pressure switch
7	Minimum gas pressure switch
8	Safety shut-off valve VS
9	Gas leak detection control device
10	Air/gas ratio control/shut-off valve VR
11	Gas train/burner adaptor
12	Standard issue burner gasket with flange
13	Flange gasket
14	Burner
15	Gas train burner adapter (not present on gas train DN80)
16	Blind flange
P1	Pressure at combustion head
P2	Pressure downstream the filter
P3	Pressure upstream the filter
PA	Air pressure test point
PC	Combustion chamber pressure test point
PG	Gas pressure test point
L	Gas train supplied separately, with code
L1	Installer's responsibility



Example of gas train VGDF type

Gas trains are approved by standard EN 676 together with the burner.

The overall dimensions of the gas train depends on how they are constructed. The following table shows the maximum dimensions of the gas trains that can be fitted to RS/P BLU burners, intake and outlet diameters. Please note that leakage control has to be installed as an accessory.

The maximum working gas pressure is 500 mbar.

	Name	Code	Ø i	X	Y	Z	Seal Control
GAS TRAINS	VGDF 50	3970215	2"	615	495	245	3010367
	VGDF 65	3970212	DN 65	600	520	245	3010367
	VGDF 80	3970213	DN 80	625	545	245	3010367
	VGDF 100	3970214	DN 100	755	575	245	3010367





► PRESSURE DROP DIAGRAM

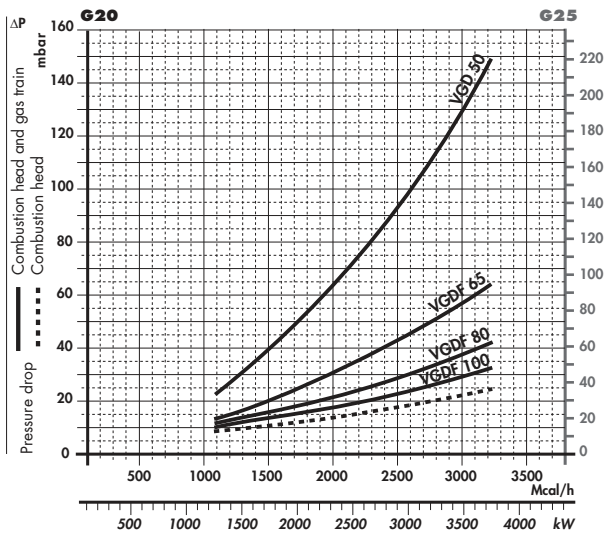
The diagrams indicate the minimum pressure drop of the burners with the various gas trains that can be matched with them; at the value of these pressure drop add the combustion chamber pressure.

The value thus calculated represents the minimum required input pressure to the gas train related to the needed capacity.

Gas inlet pressure should not exceed 20% of total pressure drop (head, chamber and gas train) in order to keep a wide and stable modulation range.

NATURAL GAS

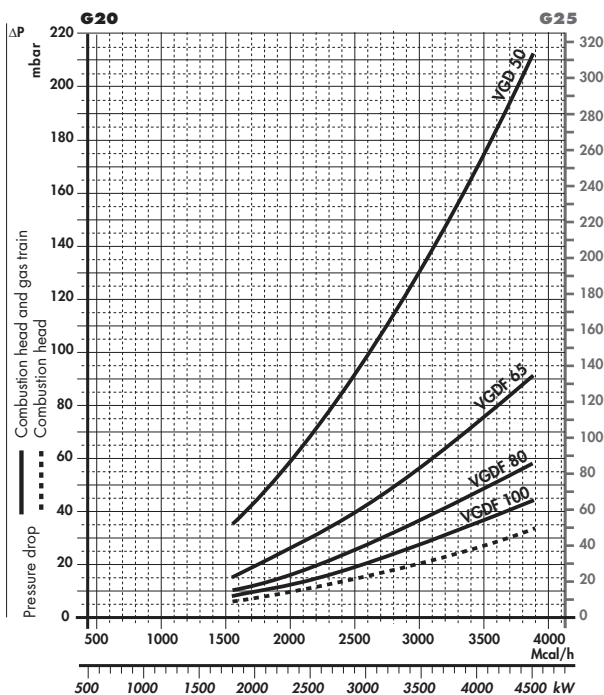
RS 300/P BLU



Gas train	Code	Adapter	Seal Control
VGD 50	3970215	(*) 3010222	3010367
VGDF 65	3970212	(*) 3010222	3010367
VGDF 80	3970213	(*) 3010222	3010367
VGDF 100	3970214	(*) 3010222	3010367

(*) compulsory for gas train installation leftside

RS 400/P BLU



Gas train	Code	Adapter	Seal Control
VGD 50	3970215	(*) 3010222	3010367
VGDF 65	3970212	(*) 3010222	3010367
VGDF 80	3970213	(*) 3010222	3010367
VGDF 100	3970214	(*) 3010222	3010367

(*) compulsory for gas train installation leftside

note Please contact the Riello Burner Technical Office for different pressure levels from those above indicated and refer to the technical manual for optimised selection.

SELECTING THE FUEL SUPPLY LINES

The following diagram enables pressure drop in a pre-existing gas line to be calculated and to select the correct gas train.

The diagram can also be used to select a new gas line when fuel output and pipe length are known. The pipe diameter is selected on the basis of the desired pressure drop. The diagram uses methane gas as reference; if another gas is used, conversion coefficient and a simple formula (on the diagram) transform the gas output to a methane equivalent (refer to figure A). Please note that the gas train dimensions must take into account the back pressure of the combustion chamber during operations.

Control of the pressure drop in an existing gas line or selecting a new gas supply line.

The methane output equivalent is determined by the formula fig. A on the diagram and the conversion coefficient.

Once the equivalent output has been determined on the delivery scale (\dot{V}), shown at the top of the diagram, move vertically downwards until you cross the line that represents the pipe diameter; at this point, move horizontally to the left until you meet the line that represents the pipe length.

Once this point is established you can verify, by moving vertically downwards, the pipe pressure drop on the bottom scale below (mbar).

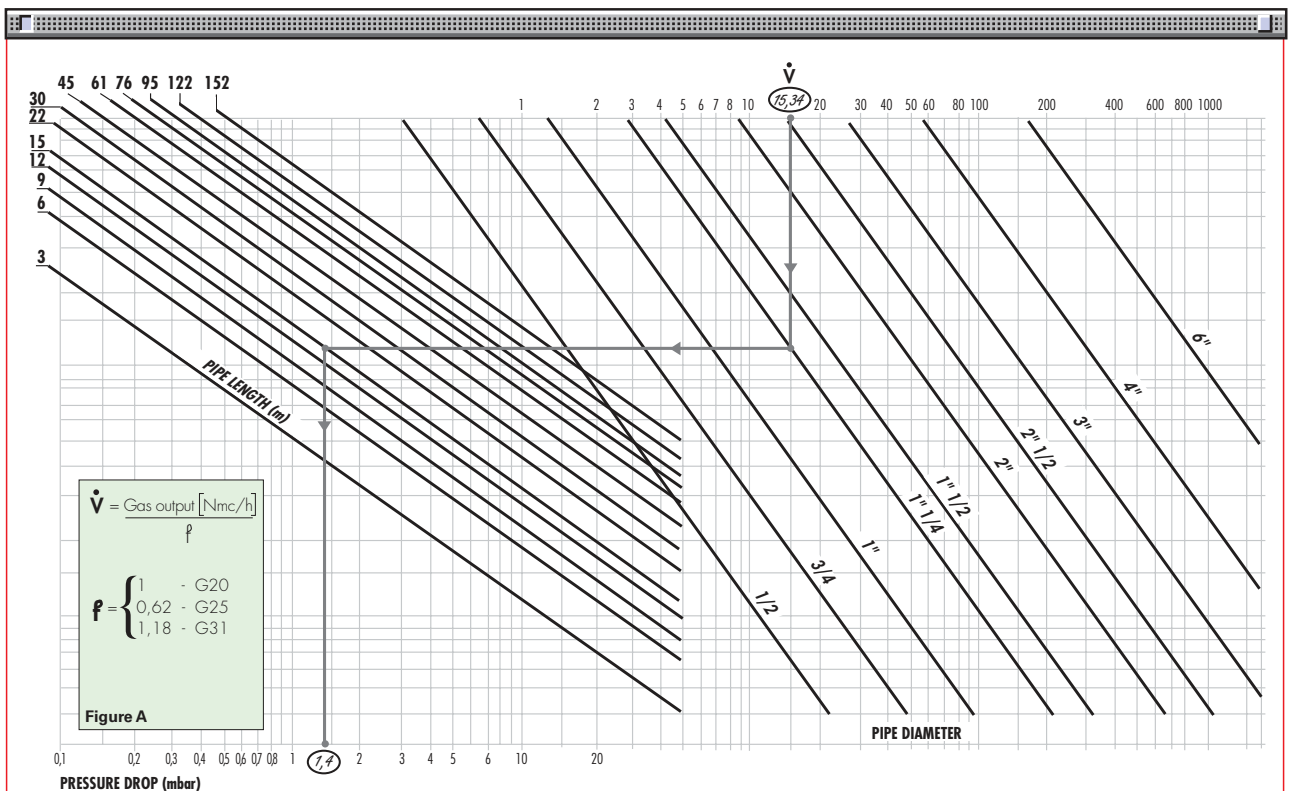
By subtracting this value from the pressure measured on the gas meter, the correct pressure value will be found for the choice of gas train.

Example:

- gas used G25
- gas output 9.51 mc/h
- pressure at the gas meter 20 mbar
- gas line length 15 m
- conversion coefficient 0.62 (see figure A)

$$\text{- equivalent methane output } \dot{V} = \left[\frac{9.51}{0.62} \right] = 15.34 \text{ mc/h}$$

- once the value of 15.34 has been identified on the output scale (\dot{V}), moving vertically downwards you cross the line that represents 1" 1/4 (the chosen diameter for the piping);
- from this point, move horizontally to the left until you meet the line that represents the length of 15 m of the piping;
- move vertically downwards to determine a value of 1.4 mbar in the pressure drop bottom scale;
- subtract the determined pressure drop from the meter pressure, the correct pressure level will be found for the choice of gas train;
- correct pressure = (20-1.4) = 18.6 mbar





VENTILATION

The ventilation unit comes with a sound proofing radial regulating system.

All the burners in the RS/P series are fitted with fans with reverse curve blades, which give excellent performance and are fitted in line with the combustion head. The air flow and sound-deadening materials used in the construction are designed to reduce sound emissions to the minimum and guarantee high levels of performance in terms of output and air pressure.

A high precision servomotor through the main management module installed on each burner of RS/P series, controls the air dampers position constantly.



Example of a sound proofing radial regulating system

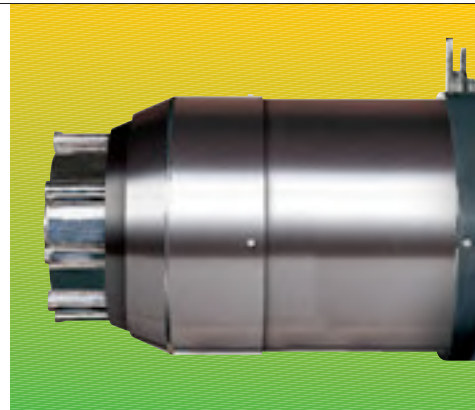


COMBUSTION HEAD

Different lengths of the combustion head can be chosen for the RS/P series of burner. The choice depends on the thickness of the front panel

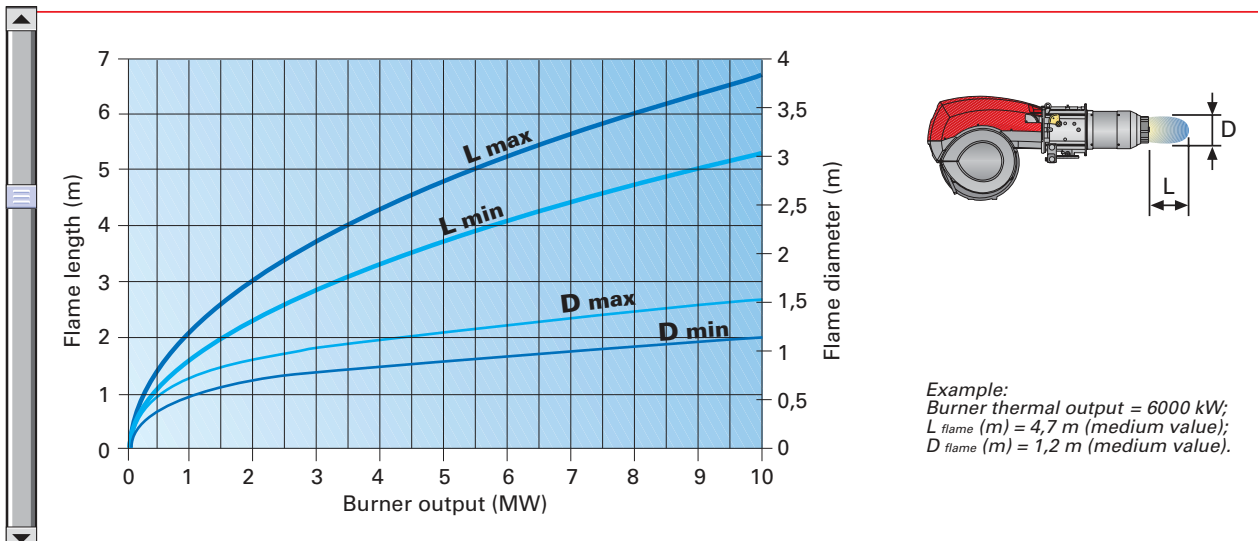
and the type of boiler. Depending on the type of generator, check that the penetration of the head into the combustion chamber is correct.

The head is designed to allow Low NOx emissions.



Example of a RS/P BLU burner combustion head

Flame dimensions



ADJUSTMENT



BURNER OPERATION MODE

The RS/P BLU series of burners can have “two-stage progressive” or “modulating” operation.

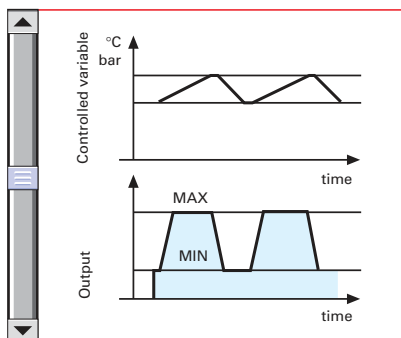


Output regulator



Analog control signal converter

“Two-stage progressive” operation

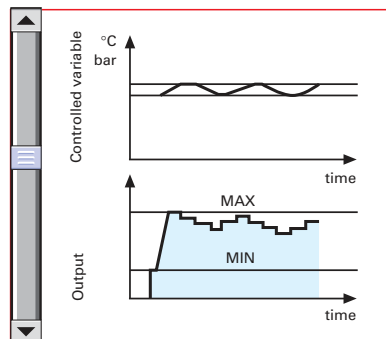


Picture A

On “two-stage progressive” operation, the burner gradually adapts the output to the requested level, by varying between two pre-set levels (see picture A).

On “modulating” operation, normally required in steam generators, in superheater boilers or diathermic oil burners, a specific regulator and probes are required. These are supplied as accessories that must be ordered separately. The burner can work for long periods at intermediate output levels (see picture B).

“Modulating” operation



Picture B



All RS/P 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:

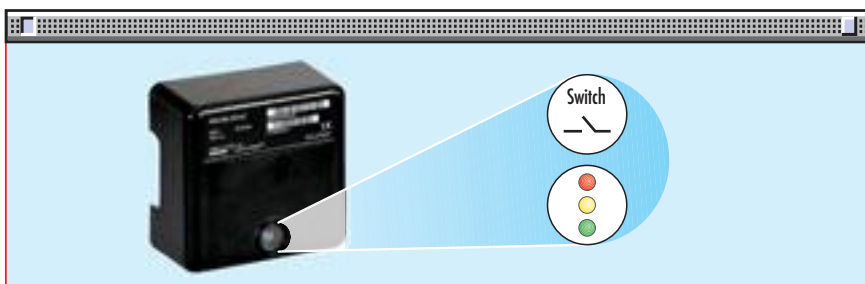


The lock-out reset button is the central **operating element** for resetting the burner control and for activating / deactivating the diagnostic functions.



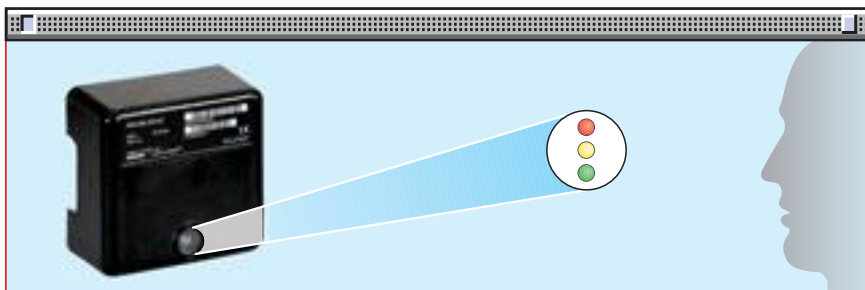
The multi-color LED is the central **indication element** for visual diagnosis and interface diagnosis.

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



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 or by a predisposed flue gas analyzer (see paragraph accessories).



Indication of operation:

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

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

Color code table	
Operation status	Color code table
Stand-by	○ ○ ○ ○ ○ ○ ○ ○
Pre-purging	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀
Ignition phase	☀ ○ ☀ ○ ☀ ○ ☀ ○
Flame OK	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀
Poor flame	☀ ○ ☀ ○ ☀ ○ ☀ ○
Undervoltage, built-in fuse	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀
Fault, alarm	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀
Flame simulation	☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀

○ LED off

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

The flashes of red LED are a signal with this sequence:

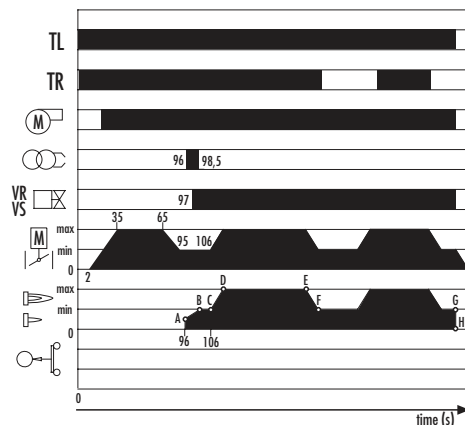
(e.g. signal with n° 3 flashes – faulty air pressure monitor)



Error code table	
Possible cause of fault	Flash code
No establishment of flame at the end of safety time : - faulty or soiled fuel valves - faulty or soiled flame detector - poor adjustment of burner, no fuel - faulty ignition equipment	2 flashes ☀ ☀
Faulty air pressure monitor	3 flashes ☀ ☀ ☀
Extraneous light or simulation of flame on burner start up	4 flashes ☀ ☀ ☀ ☀
Loss of flame during operation : - faulty or soiled fuel valves - faulty or soiled flame detector - poor adjustment of burner	7 flashes ☀ ☀ ☀ ☀ ☀ ☀ ☀
Wiring error or internal fault	10 flashes ☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀ ☀

START UP CYCLE

RS 300-400/P BLU



- 0 s Load control TL closes.
- 2 s Servomotors starts running.
- 35 s Motor starts: pre-purge phase.
- 65 s Servomotor (min output).
- 95 s Air gate / gas butterfly to min output.
- 96 s Ignition electrode sparks.
- 97 s Safety valve VS and adjustment valve VR open.
- 98,5 s Spark goes out.
- 106 s End.





WIRING DIAGRAMS

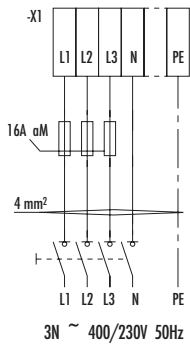
Electrical connections must be made by qualified and skilled personnel, according to the local norms.



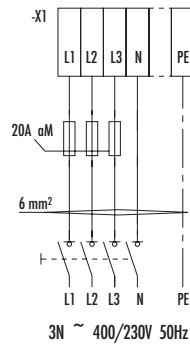
Example of the terminal board for electrical connections

THREE PHASE SUPPLY TO THE POWER CIRCUIT AND CONNECTING THE AUXILIARY CONTROLS

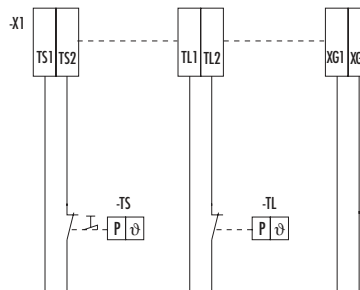
RS 300/P BLU



RS 400/P BLU



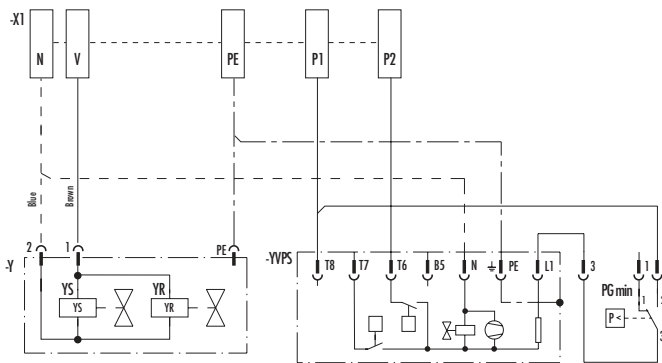
Triggering / Safety devices



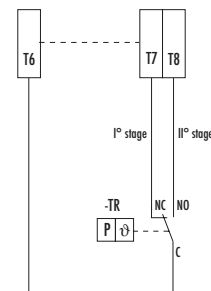
X1 - General supply terminal board
TS - Safety thermostat
TL - Threshold thermostat

CONNECTION OF THE PROBES FOR THE CONTROLLED PARAMETER AND DATA CONNECTION FOR THE VARIOUS MODULES (Accessories)

Gas valve + PVP leak detection

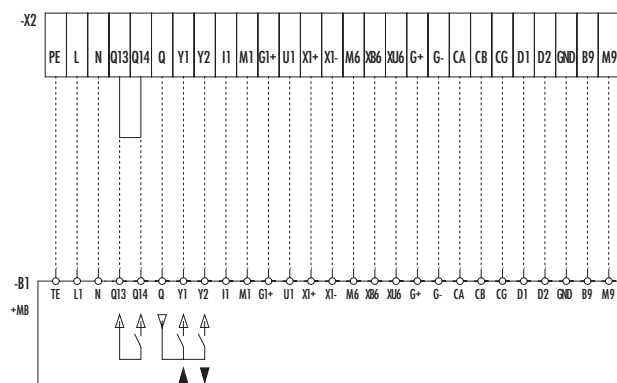


Power regulation with 3-position contact

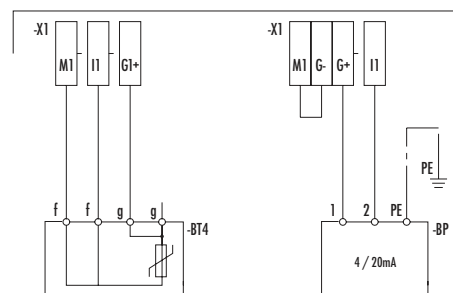


TR - High/Low flame setting thermostat
YVPS - Seal control
YS - Safety valve
YR - Adjustment valve
BT4 - Temperature probe
BP - Pressure probe

RWF40



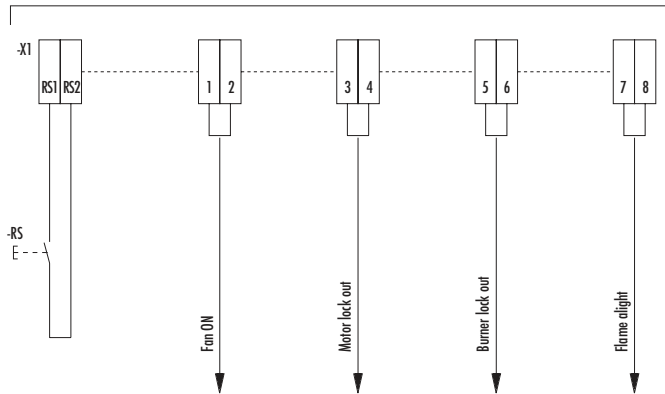
Possibility of modulation input with Riello probe



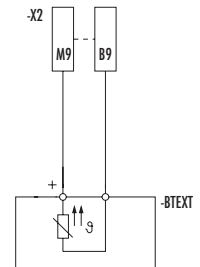


OPTIONAL CONNECTION

Indicators / Ancillaries



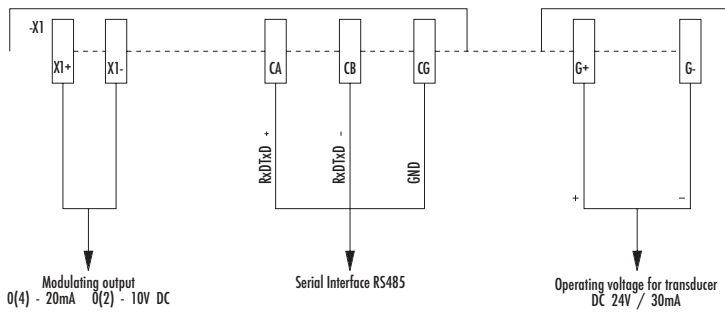
Outside temperature



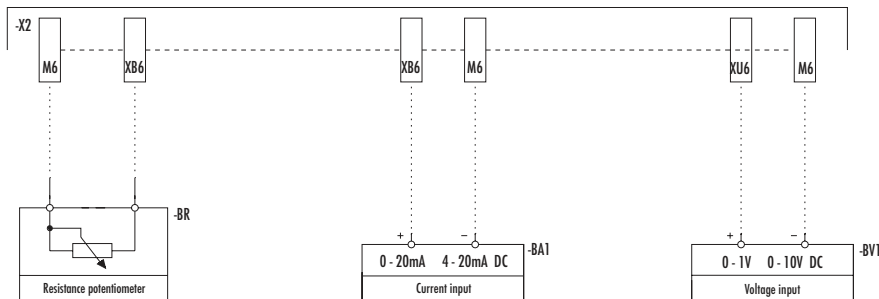
- BTEXT** - Outside temperature
- BV1** - Voltage input
- BA1** - Current input
- BR** - Resistance potentiometer

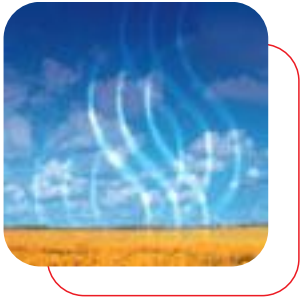
Optional

Service



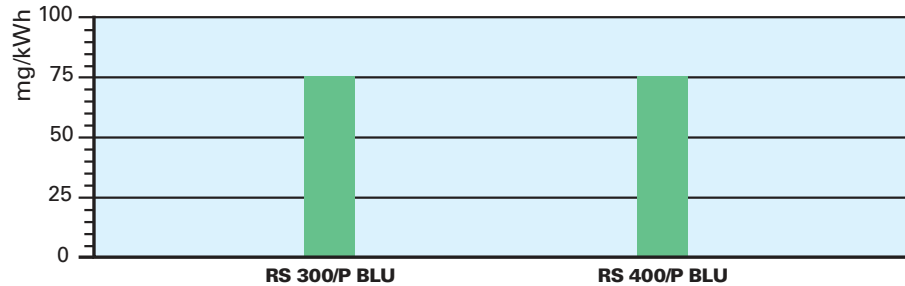
Possibility of setpoint input and setpoint shift



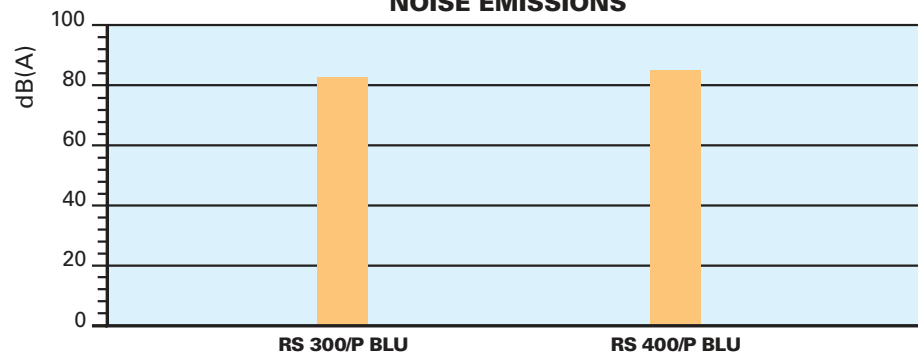


EMISSIONS

NO₂ EMISSIONS



NOISE EMISSIONS

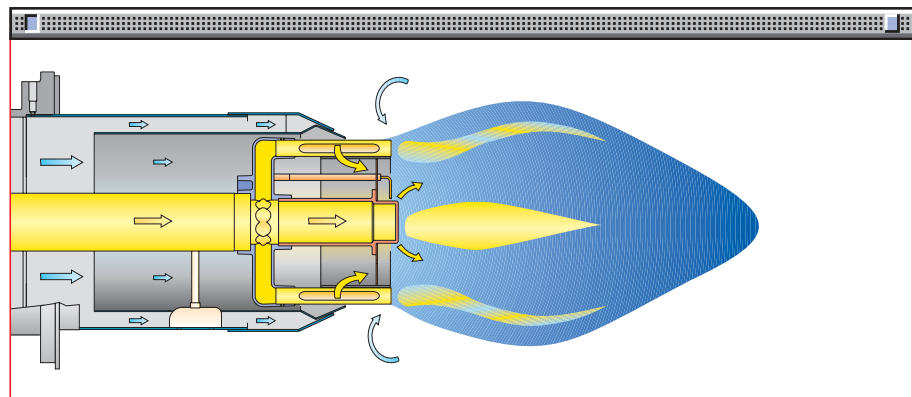


The noise emissions have been measured at the maximum output.

The RS/P BLU series reduces polluting emissions with its exclusive design which optimises air/fuel mixture.

The gas in the combustion head is distributed through openings which are perpendicular to the air flow; part of the fuel is injected directly into the centre of the flame.

This results in low flame temperature combustion to prevent the formation of NO. Gradual and progressive combustion throughout the flame prevents areas of high oxidation inside the flame. Emissions are further reduced by the re-circulation of combustion gases due to the high velocity of air leaving the combustion head. Pollution levels are below even the most severe standards requirement.

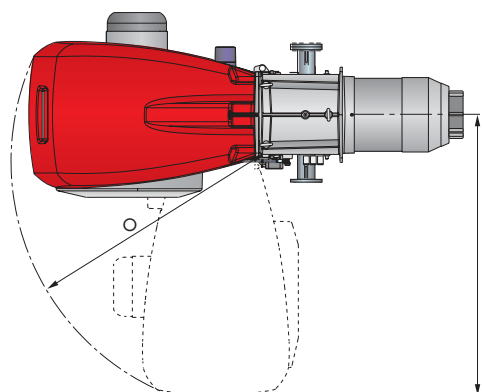
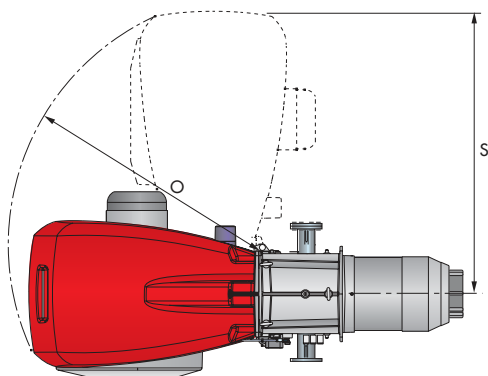
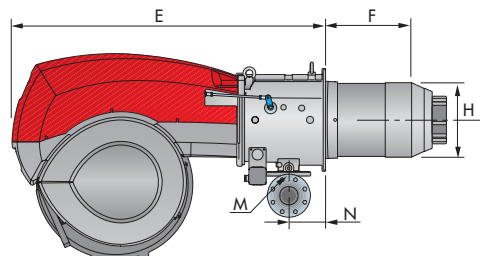
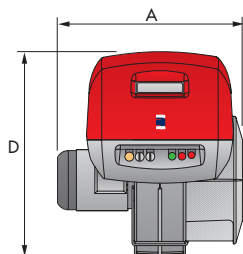


OVERALL DIMENSIONS (mm)



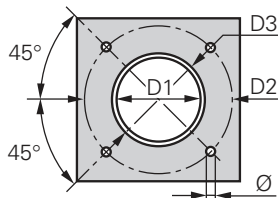
BURNER

RS 300-400/P BLU



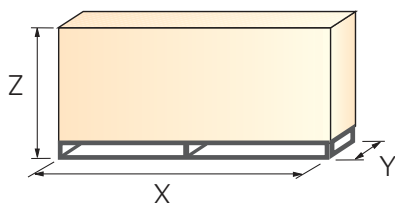
Model	A	D	E	F	H	I	M	N	O	S
▶ RS 300/P BLU	720	867	1325	521	313	588	DN80	164	1055	1175
▶ RS 400/P BLU	775	867	1325	521	313	588	DN80	164	1055	1175

BURNER - BOILER MOUNTING FLANGE



Model	D1	D2	D3	Ø
▶ RS 300/P BLU	350	452	354	M18
▶ RS 400/P BLU	350	452	354	M18

PACKAGING



Model	X	Y	Z	kg
▶ RS 300/P BLU	2100	1200	1000	225
▶ RS 400/P BLU	2100	1200	1000	236



BURNER ACCESSORIES

Accessories for modulating operation

To obtain modulating operation, the RS/P BLU series of burners requires a regulator with three point outlet controls. The following table lists the accessories for modulating operation with their application range.



Burner	Regulator type	Regulator code
RS 300-400/P BLU	RWF 40 Basic version with 3 position output	3010356
RS 300-400/P BLU	RWF 40 High version with additional modulating output and RS 485 Interface	3010357

The relative temperature or pressure probes fitted to the regulator must be chosen on the basis of the application.



Burner	Probe type	Range (°C) (bar)	Probe code
RS 300-400/P BLU	Temperature PT 100	-100 ÷ 500°C	3010110
RS 300-400/P BLU	Pressure 4 ÷ 20 mA	0 ÷ 2,5 bar	3010213
RS 300-400/P BLU	Pressure 4 ÷ 20 mA	0 ÷ 16 bar	3010214



Analog control signal converter		
Burner	Type (input signal)	Code
RS 300-400/P BLU	0/2 - 10 V (impedance 200 KΩ)	3010390
	0/4 - 20 mA (impedance 250 Ω)	



Potentiometer	
Burner	Code
RS 300-400/P BLU	3010393

It is necessary for analogic control signal converter operation.

Continuous ventilation kit

If the burner requires continuous ventilation in the stages without flame, a special kit is available as given in the following table:



Continuous ventilation kit	
Burner	Kit code
RS 300-400/P BLU	3010094



LPG kit

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



LPG kit	
Burner	Code
RS 300-400/P BLU	in progress

UV cell kit

A UV cell is available for the supervision of the flame alternatively to ionization probe for special applications.



UV cell kit	
Burner	Code
RS 300-400/P BLU	3010359

PC interface kit

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



PC interface kit	
Burner	Kit code
RS 300-400/P BLU	3002719

Sound proofing box

If noise emission needs reducing even further, sound-proofing boxes are available, as given in the following table:



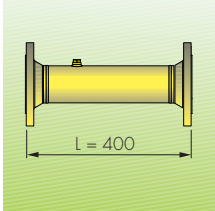
Sound proofing box			
Burner	Box type	Average noise reduction [dB(A)] (*)	Box code
RS 300-400/P BLU	C7	10	3010376

(*) according to EN 15036-1 standard

GAS TRAIN ACCESSORIES

Adapters

Below are given the adapters than can be fitted on the various burners:



Adapters			
Burner	Gas train	Dimensions	Adapter code
RS 300-400/P BLU	VGDF 65 - VGDF 80 VGDF 100- VGD 50	80x80x400	3010222

Seal control kit

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



Seal control		
Burner	Gas train	Code
RS 300-400/P BLU	All models	3010367

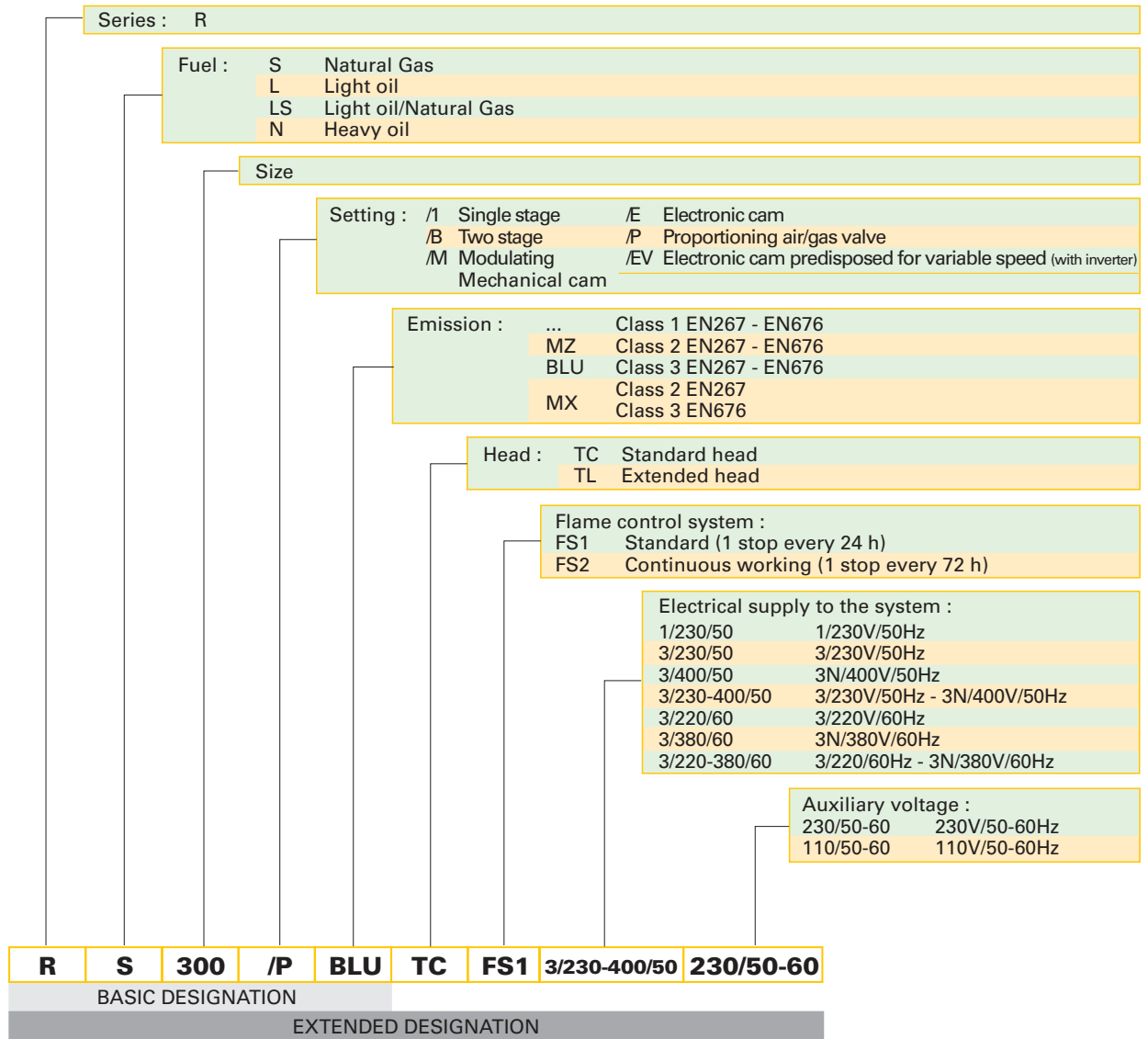
SPECIFICATION



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



DESIGNATION OF SERIES



AVAILABLE BURNER MODELS

RS 300/P BLU	TC	FS1 230-400/50	230/50-60
RS 400/P BLU	TC	FS1 400/50	230/50-60

Other versions are available on request.





▶ **PRODUCT SPECIFICATION**

Burner

Monoblock forced draught gas burner with “two stage progressive” or “modulating” operation, fully automatic, made up of:

- Fan with reverse curve blades high performance with low sound emissions
- Air suction circuit lined with sound-proofing material
- Air damper for air setting controlled by a high precision servomotor
- Air pressure switch
- Fan starting motor at 2900 rpm, three-phase 230/400 - 400/690 V with neutral, 50Hz
- Low emission combustion head, that can be set on the basis of required output, fitted with:
 - stainless steel end cone, resistant to corrosion and high temperatures
 - ignition electrodes
 - flame stability disk
- Maximum gas pressure switch, with pressure test point, for halting the burner in the case of over pressure on the fuel supply line
- Module for air/fuel setting and output modulation with separated PID control of temperature or pressure, available as accessory for RS/P BLU model
- Flame control panel for controlling the system safety
- Ionization probe for flame detector
- Star/triangle starter for the fan motor (version with motor electrical power 7,5 kW)
- Main electrical supply terminal board
- Burner on/off switch
- Auxiliary voltage led signal
- Burner working led signal
- Contacts motor and thermal relay with release button
- Motor internal thermal protection
- Motor failure led signal
- Burner failure led signal and lighted release button
- Emergency button
- Coded connection plugs-sockets
- Burner opening hinge
- Lifting rings
- IP 54 electric protection level.

Conforming to:

- 89/336/EEC directive (electromagnetic compatibility)
- 73/23/EEC directive (low voltage)
- 90/396/EEC directive (gas)
- EN 676 (gas burners).

Standard equipment:

- 1 flange gasket
- 4 screws for fixing the flange
- 1 thermal screen
- 4 screws for fixing the burner flange to the boiler
- Instruction handbook for installation, use and maintenance
- Spare parts catalogue.

Available accessories to be ordered separately:

- RWF 40 PID regulator for RS/P BLU
- Temperature probe -100 ÷ 500°C
- Pressure probe 0 ÷ 2.5 bar
- Pressure probe 0 ÷ 16 bar
- Analog control signal converter
- Potentiometer
- Analogic control signal converter
- Continuous ventilation kit
- Kit for LPG operation
- UV cell kit
- PC interface kit
- Sound proofing box
- Adapters
- Seal control kit.









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