

BLU 3000.1 PRE  
BLU 4000.1 PRE



**Technical data**



**Operating instructions**



**Electric diagrams**



**Spare parts list**



**Gas train manual is separate**



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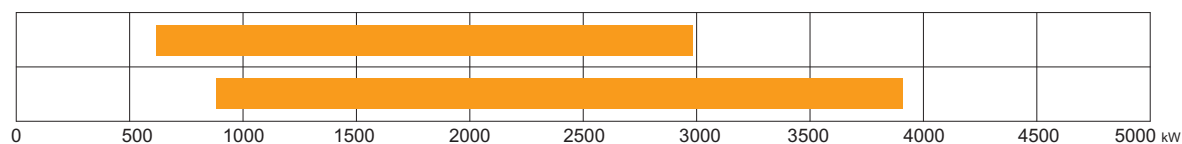
28-08-2017

BLU 3000.1 PRE TC	3145124
BLU 3000.1 PRE TL	3145125
BLU 4000.1 PRE TC	3145126
BLU 4000.1 PRE TL	3145127

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## GENERAL WARNINGS - CONFORMITY DECLARATION

BLU burners are designed for the combustion of natural gas or LPG with kit. The design and function of the burners meet the standard EN676. They are suitable for use with all heat generators complying with standard within their respective performance range. Any other type of application requires the approval of ECOFLAM.

Installation, start-up and maintenance must only be carried out by authorised specialists and all applicable guidelines and regulations must be complied with.

### BURNER DESCRIPTION

BLU PRE burners are progressive electronic fully automatic monoblock devices. Emissions values may differ, depending on combustion chamber dimensions, combustion chamber load and the firing system (three-pass boilers, boilers with reverse firing).

### PACKAGING

The burner, the gas train and all the additional components are supplied in a modular system of packages according to the configuration ordered that based on the country of installation shall follow the applicable standards and the local rules and code of practise.

The following standards should be observed in order to ensure safe, environmentally sound and energy-efficient operation:

### EN 676

Forced-draught gas burners

### EN 60335-1, -2-102

Specification for safety of household and similar electrical appliances, particular requirements for gas burning appliances

### GAS LINES

When installing the gas lines and gas train, the general EN676 directives and guidelines must be observed.

EN676 compulsory kit and accessories in order to comply to the safety regulations. Additional accessories and kits shall be installed by the installer in accordance to the local safety regulations and codes of practise.

### INSTALLATION LOCATION

The burner must not be operated in rooms containing aggressive vapours (e.g. spray, perchloroethylene, hydrocarbon tetrachloride, solvent, etc.) or tending to heavy dust formation or high air humidity. Adequate ventilation must be provided at the place of installation of the furnace system to ensure a reliable supply with combustion air.

### Declaration of conformity for gas burners

We,  
**Ecoflam Bruciatori S.p.A.**

declare under our sole responsibility that the gas burners named

### BLU

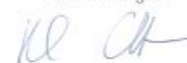
conform to the following standards:

<b>EN 676</b>	<b>EN 50156-1</b>
<b>EN 55014-1</b>	<b>EN 55014-2</b>
<b>EN 60335-1</b>	<b>EN 60335-2-102</b>
<b>EN 61000-6-2</b>	<b>EN 61000-6-3</b>

These products bear the CE mark in accordance with the stipulations of the following directives:

**2014/35/UE Low Voltage Directive**  
**2014/30/UE EMC Directive**  
**2006/42/EC Machine directive**  
**2011/65/EU RoHS2 directive**  
**2009/142/CEE Gas Appliance Directive**

*February, 2016 / Mr. Ruben Cattaneo  
R&D manager*




**BURNER SELECTION:** Type of operation and configuration must be done by professional personnel in order to grant correct working of the burner. Installation, start-up and maintenance must be carried out by authorised specialists and all applicable guidelines and regulations (including local safety regulations and codes of practise) must be observed.

### We accept no responsibility for damage arising from:

- inappropriate use;
- incorrect installation and/or repair on the part of the buyer or any third party, including the fitting of non-original parts;
- non authorised modifications made on the burner.

### Final delivery and instructions for use

The firing system installer must supply the operator of the system with operating and maintenance instructions on or before final delivery. These instructions should be displayed in a prominent location at the point of installation of the heat generator. They should include the address and telephone number of the nearest customer service centre.

### Notes for the operator

The system should be inspected by a specialist at least once a year. Depending on the type of installation, shorter maintenance intervals may be necessary. It is advisable to take out a maintenance contract to guarantee regular servicing.

Ecoflam burners have been designed and built in compliance with all current regulations and directives.

All burners comply to the safety and energy saving operation regulations within the standard of their respective performance range. The quality is guaranteed by a quality and management system certified in accordance with ISO 9001:2008.



## BURNER DESIGNATION

### BLU 3000.1 PRE TC

#### RANGE NAME BY FUEL TYPE

**BLU** Gas

#### MODEL SIZE

**BLU 3000.1** 3000 kW

#### EMISSIONS

**LN** Standard Class 2 - GAS EN676 (<120 mg/kWh)

Low NOx Class 3 - GAS EN676 (<80 mg/kWh)

#### OPERATION TYPE

**PAB** 2 stages soft start

**PR** 2 stages progressive mechanical

**PRE** 2 stages modulating electronic

#### HEAD TYPE

**TC** Short head

**TL** Long head

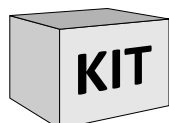
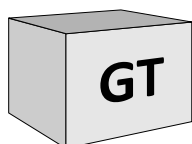
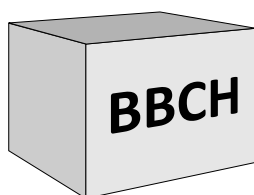
#### FUEL

**LPG** Natural gas

**BIOGAS** Liquid gas

Biogas

## MODULAR DELIVERY SYSTEM



### Gas burners

All gas burners are delivered in separate set/box, i.e. burner body including combustion head and separate gas train with separate additional kit and accessories that shall complete the gas train or the burner according to the applicable standard. Kit and accessories are delivered separately.

### Gas train - GTCP - KITS - Accessories

All gas and dual fuel burners gas trains are delivered separately in different models and configuration.

Export configuration gas train completion are available but it is mandatory for the local installer in this case to comply to the local safety regulations.

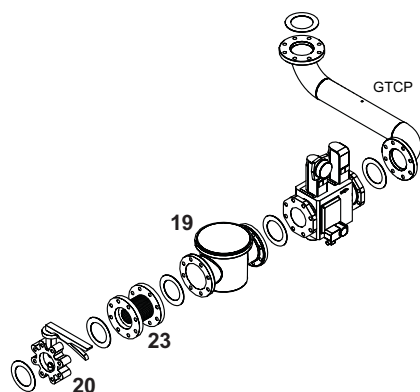
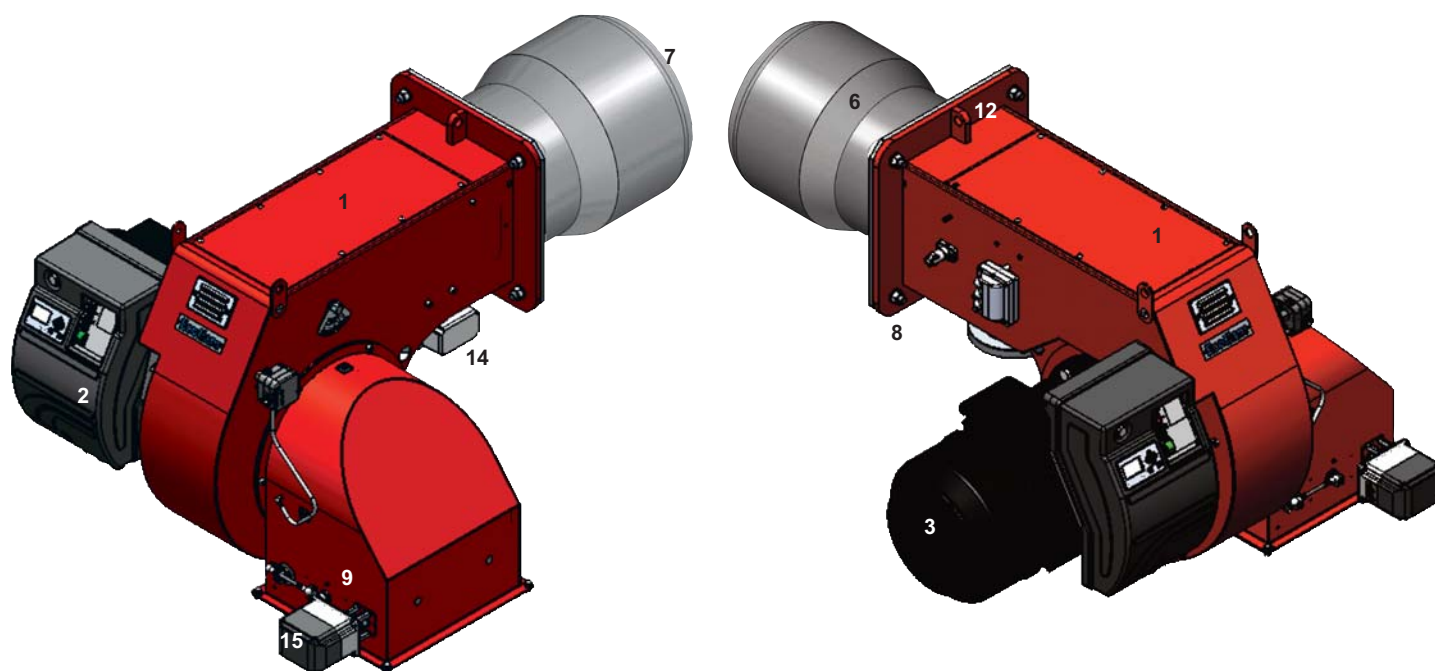
For burners over 1700 kW gas train connection pipe must be ordered.

Kits and accessories are managed and delivered separately.

### Component type

<b>BBCH</b>	Burner Body with Combustion Head (without gas train)
<b>GTCP</b>	Gas Train Connection pipe
<b>GT</b>	Gas Train (delivered separately)

## BURNER DESCRIPTION

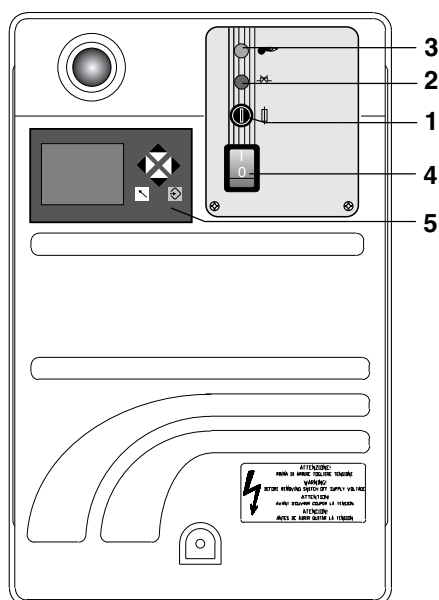


### LEGENDA

- 1. Housing
- 2. Electrical control panel
- 3. Blower motor
- 5. Hinge flange
- 6. Blast tube
- 7. Burner head
- 8. Burner fixing flange
- 9. Air flap regulation
- 12. Lifting eyebolts
- 14. Gas servomotor

- 15. Air servomotor
- 19. Gas filter
- 20. Ball valve
- 23. Antivibration coupling
- GTCP. Gas train connection pipe

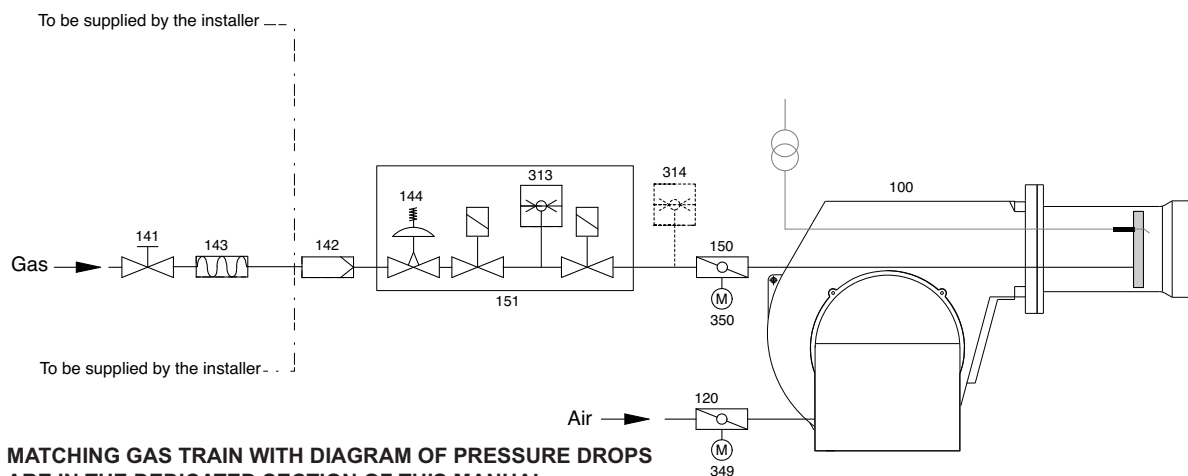
## Control panel



- 1 - Fuse
- 2 - Thermal lock-out lamp
- 3 - Working lamp
- 4 - Main switch I / O
- 5 - Display

## BURNER DESCRIPTION

### Gas train - Kit - Accessories: assembly to the burner



**MATCHING GAS TRAIN WITH DIAGRAM OF PRESSURE DROPS ARE IN THE DEDICATED SECTION OF THIS MANUAL**

Ecoflam gas trains are delivered separately for all gas and dual fuel burners and are available in different configurations:  
**Double gas valves with actuators and regulator VGD Siemens and min pressure switch + ACS gas filter**

VGD 20.503 Rp 2" / VGD 40.065 - 40.080 - 40.100 - 40.125				
	1. Main gas pipe	EXPORT	ACS	EN676
	2. Ball valve		ACS	
	3. Antivibration coupling		ACS	
	5. Min gas pressure switch	GAS TRAIN		
	6. Safety gas valve + 10. Actuator			
	7. Working gas valve + 11. Actuator	KITTC *		
	8. Gas leakage control			
	9. Gas filter	ACS		
	KIT - MAX Gas pressure switch	KITPRES		
	ACS - Gas train connection pipe	GTCP **		

**!** **GTCP-...\*** **WARNING:** in order to fit the gas train, the corresponding connection pipe must be ordered (GTCP size and fitting depend on the burner and the gas train selected).

**HOW TO INSTALL THE GAS TRAIN INTO THE BURNER AND CALCULATE THE OVERALL DIMENSIONS:**  
refer to the dimension page and the gas train manual for all detailed information

**!** **WARNING:** EN676 compulsory kit and accessories in order to comply to the safety regulations. Additional accessories and kits shall be installed by the installer in accordance to the local safety regulations and codes of practise.

Gas governor / Filter	Modulation Kit	Max Pressure switch	Other accessories
FGDR - FILTER	KITMD-RWF50	KITPRES50	
Compulsory EN676	Probe-...	KITPRES150	

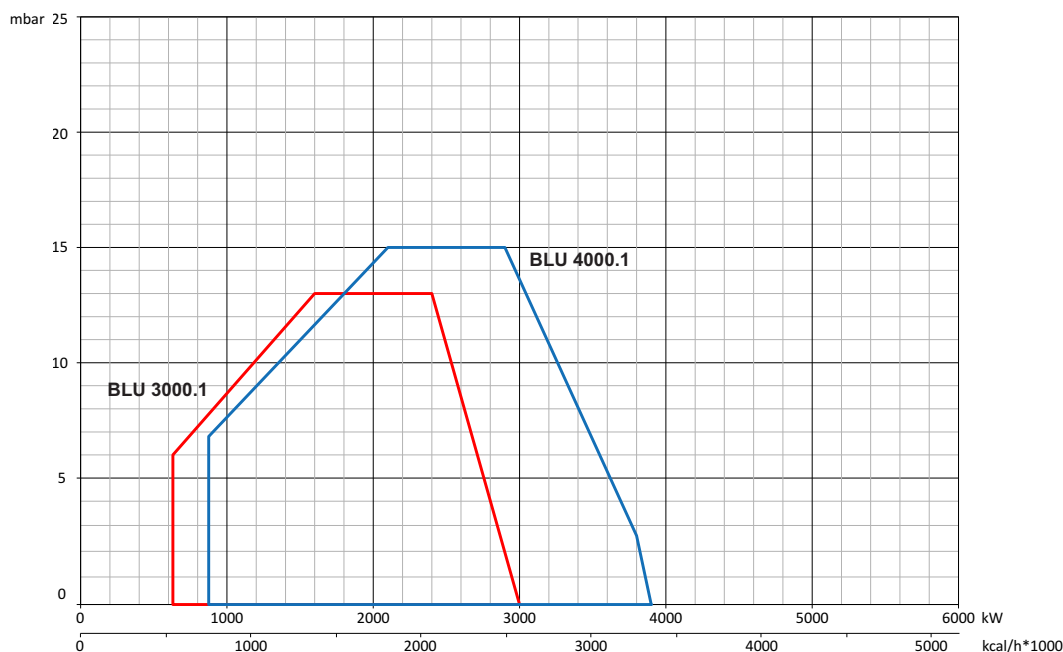
## TECHNICAL DATA

MODEL		BLU 3000.1 PRE	BLU 4000.1 PRE
Thermal power max.	kW	3.000	3.900
	kcal/h	2.580.000	3.354.000
Thermal power min.	kW	630	875
	kcal/h	541.800	752.500
Operation mode	Type	Modulating with PID	
Regulation ratio nominal	Type	1÷4 GAS	
Fuel	Type	G20 (L.C.V. 8.570 kcal/Nm <sup>3</sup> ), G25 (L.C.V. 7.370 kcal/Nm <sup>3</sup> )	
Emission class	std	Standard Class 2 - GAS EN676 (<120 mg/kWh)	
Control unit	Type	LAMTEC BT320	
Gas train	GT	VGD separate gas train + Filter + KIT Tightness control + Other KIT/ACS	
Gas connection	GTCP	Gas connection range RP50 to DN100 depending on the gas train selected	
NATURAL GAS pressure	mbar	22÷500	30÷500
Air regulation	Type	Air flap	Air flap
Air flap control with servomotor	Model	LAMTEC	
Air pressure switch	mbar	1...10 mbar	
Flame monitoring	Type	Ionization	
Ignitier	Model	COFI	
Motor	kW	5,5	7,5
Rpm	N°	2.800	2.800
Voltage	V/Hz	230/400 V - 50 Hz	
Total power consumption operation	W	7.000	9.000
Weight body BBCH	Kg	168,5 (174)	179,9 (182,2)
Electrical panel protection level	IP	IP40	IP40
Sound pressure level without silencer	dB(A) Lab tests	87,3	88,3
Sound pressure level with silencer		81,8	83
Ambient temperature storage	Min/Max	-20°...+70° C	
Ambient temperature use		-10°...+60° C	

## GAS CATEGORY BY COUNTRY

Gas category	Country																								
I <sub>2R</sub>	BE	CH	CZ	DE	DK	ES	FI	FR	GB	GR	HU	IE	IT	LU	NL	PT	SE	EE	LT	LV	NO	PL	SK	SI	-
I <sub>2H</sub>	AT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

## WORKING DIAGRAMS



Calculation of burner output  
 $Q_F$  = Burner output (kW)  
 $Q_N$  = Rated boiler output (kW)  
 $\eta$  = Boiler efficiency (%)

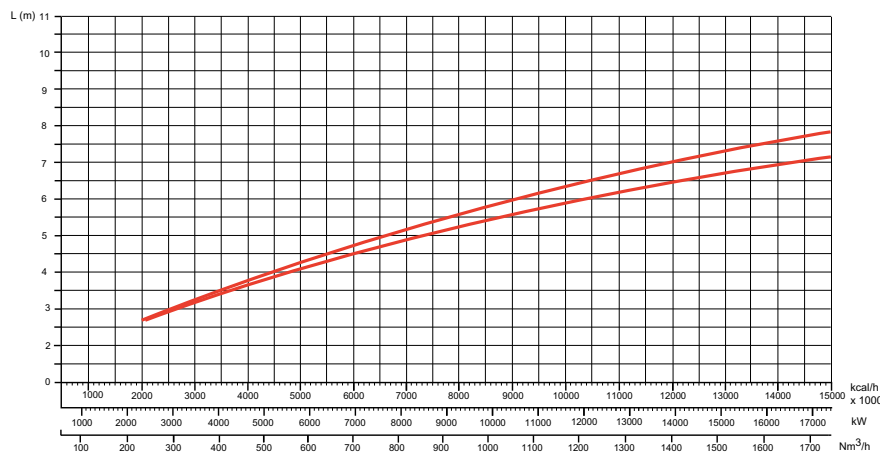
$$Q_F = \frac{Q_N}{\eta} \times 100$$

**Working diagrams**

The working diagram shows burner output as a function of combustion chamber pressure. It corresponds to the maximum values specified by EN 676 measured at the test fire tube. Boiler efficiency should be taken into consideration when selecting the burner.

## TEST BOILER - FLAME DIMENSIONS

FLAME LENGTH GAS BURNERS



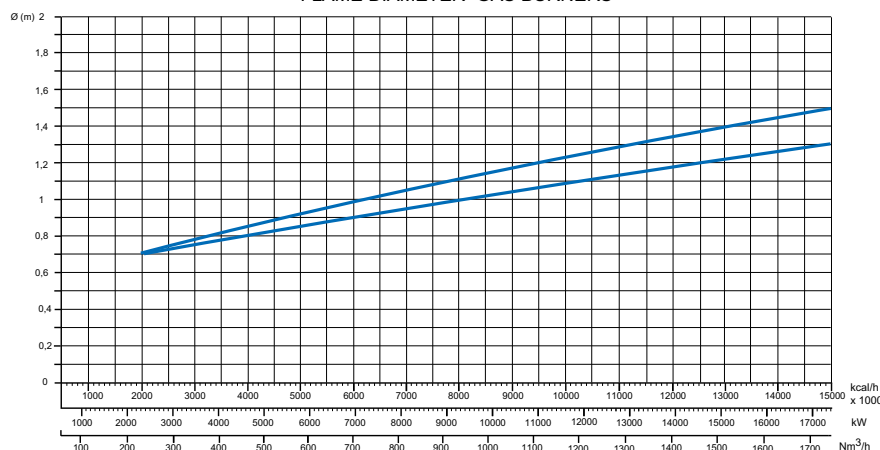
The burner/boiler matching does not pose any problems if the boiler is CE type-approved.

If the burner must be combined with a boiler that has not been CE type-approved and/or its combustion chamber dimensions are clearly smaller than those indicated in diagram, consult the manufacturer.

The firing rates were set in relation to special test boilers, according to EN676 - EN267 regulations.

The sizes are indicative and depend on the configuration, to the combustion chamber pressure and to the draught. The values have been taken out from tests executed with flame tubes.

FLAME DIAMETER GAS BURNERS



The dimensions of the flame are made in test boiler in laboratory without resistance therefore exists max and min length that take into account the difference in length that comes from the boiler backpressure.

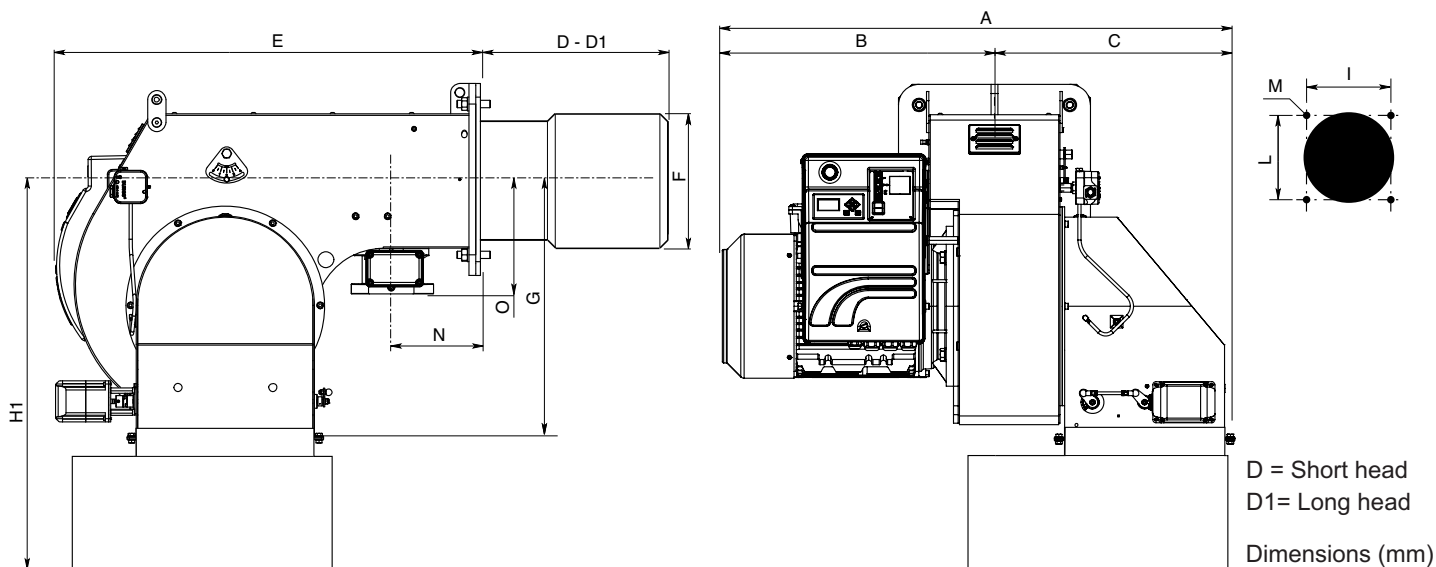
Example:

Burner thermal output = 8000 kW;  
 L flame (m) = 5 m (medium value)  
 D flame (m) = 1 m (medium value)

**WARNING:** Some flame modifications can be done in our FLEXSHOP in the factory in order to shape the flame and adapt it to some special boiler or application.



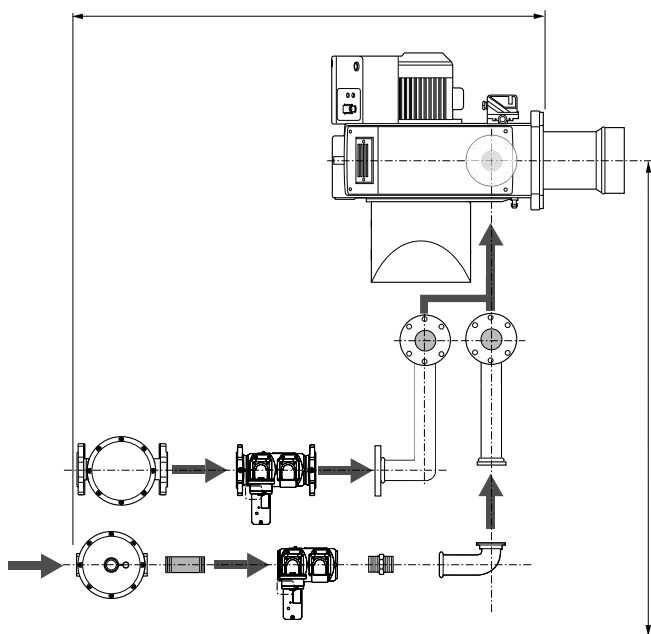
## OVERALL DIMENSIONS



Model	A	B	C	D	D1	E	F	G	H1	I	L	M	N	O
BLU 3000.1 PRE	941	448	493	330	530	780	290	471	746	315	315	M16	195	250
BLU 4000.1 PRE	941	448	493	365	565	780	320	471	746	315	315	M16	195	250

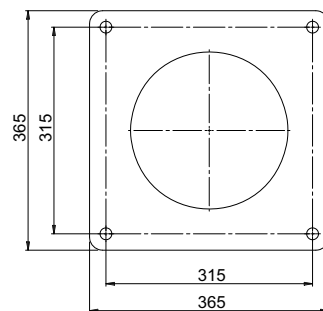
### HOW TO INSTALL THE GAS TRAIN INTO THE BURNER AND CALCULATE THE OVERALL DIMENSIONS:

refer to the dimension page and the gas train manual for all detailed information



### Burner-boiler mounting flange

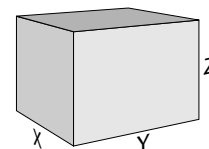
Fixing hole dimensions are "I" and "L" as per dimension table. Boiler hole shall be done according to the blast tube dimension "F" plus 15-25 mm in order to be able to extract it during maintenance.



**WARNING:** Please follow the suggested dimension for the hole on the boiler flange in order to fit the burner. Make sure that between the boiler and the blast tube proper insulation is fitted.

### Packaging (only burner)

Model	X	Y	Z	kg
BLU 3000.1	1580	1630	1090	230(241,2)
BLU 4000.1	1580	1630	1090	249,5



## GAS OPERATING MODE - GENERAL SAFETY FUNCTIONS

### START-UP MODE

As soon as the furnace system is required to supply heat, the burner control circuit will close and the program flow started. When the program has come to its end, the burner will be turned on.

An automatic test is made for the tightness of the gas valves prior to each burner start. The air damper is in its closed position when the burner is out of operation.

The electric actuator will open the closed air damper to its full-load position so that the burner will ventilate the furnace and the exhaust hoods with the specified air rate.

Shortly after the prevention process has been started the lack-of-air cut-out must change over to operating position within a certain time, i.e. the minimum air pressure setting must be reached and maintained until the burner is turned off. At the end of the specified pre-ventilation time the air damper will be moved into its partial-load position in a linked control concept with the gas damper.

The ignition transformer will be started.

At the end of the pre-ignition time the ignition gas solenoid valves will be opened to allow gas to flow into the burner.

The ignition electrodes incorporated in the burner will ignite the ignition gas.

The flame sensor gives flame signal to control box so that the safety shut-off valves will be opened.

The gas will be fed to the gas nozzles via the gas damper while combustion air is supplied by the fan.

Gas and air will be intensively mixed in the mixing unit and ignited by the pilot flame with a specified safety period (minimum furnace heat generating rate).

After the safety period has run down the ignition spark will be turned off.

#### Attention:

If there are shut-off dampers in the flue gas tract they must be completely open. Otherwise there will be a high danger of low-speed detonation or explosion!

### GAS OPERATING MODE

After the flame has developed the load regulator will be enabled which brings the burner into its operating position.

The load regulator will now control the burner automatically between its partial-load and full-load stages. Depending on the heat demand, the electric actuator of the compound control system will be fed with the OPEN or CLOSE command via the regulator and thus increase or decrease the gas and air flow rates.

This compound control system will vary the positions of the gas control valve and air damper and thus regulate the gas flow rate in a linked concept with the air flow rate. The burner can either be controlled by a 2-stage sliding or, if a respective controller is provided, a stepless control concept.

The stepless control will allow the burner to be operated at any desired stage between its partial-load and full-load positions.

The burner will always be turned off out of its partial-load position.

The air damper will be closed when the burner is out of operation and will thus prevent cold air flowing through the burner chamber, heat exchanger and chimney.

The interior cooling losses will thus be greatly minimized.

### GAS LEAKAGE CONTROL FOR BURNERS IN PRE VERSION

The relevant function is ACTIVE as a standard. Before commissioning the burner, please check if this feature is "ACTIVATED" (look inside menu on section 5 "Operating Control and Displays" page 64, fig.5-32").

If it is "NOT ACTIVATED" and it is not mandatory to fit the valve proving, a suitable gas train must be fit. Such a gas train must be equipped with a pressure switch upstream of the first gas valve (referring to the picture on page 12, the 313 min. gas pressure switch must be fit after the device 144).

It works as follows:

The valve leakage test checks whether the main gas valves are leak-tight. The supply gas pressure is used for this purpose.

Since the valve leakage test line (space between the two main valves) burns empty in the event of a shut-off, this part is normally without pressure when starting (gas pressure > min. = 0). The FA1 checks this. Main gas 1 is then opened shortly and gas flows into the test line (gas pressure > min. changes from 0 to 1). This pressure must then subsist for 30 seconds. The valve leakage test is then deemed to be completed. If the valve leakage test line is not empty at the start (e.g. as a result of a previous fault shut-down), main gas valve 2 opens first. The valve leakage test line is vented (into the combustion chamber or over the roof, depending on the system; for suggested circuit, see Appendix). It is checked, whether the line remains pressureless for 30 seconds. Otherwise the procedure is, as described previously.

### GENERAL SAFETY FUNCTIONS

In case a flame does not develop when starting the burner (fuel release) the burner will shut off at the end of the safety period (shut-off on trouble).

A shut-off on trouble will also occur in the case of flame failure during operation, air flow failure during the pre-ventilation phase and pressure failure during the whole period of burner operation.

Any failure of the flame signal at the end of the safety period and a flame signal during

the pre-ventilation phase (external light control) will result in a shut-off on trouble with the automatic furnace controller being locked.

The trouble is indicated by the trouble signal lamp lighting up.

The automatic furnace controller can be unlocked immediately after a shut-off on trouble by pressing the unlocking key. The program unit will return to its starting position and proceed with the restart of the burner.

A voltage failure will result in a regular shut-off of the burner. Upon voltage recovery there may be an automatic restart unless another interlock is provided, e.g. by the safety system. In any case of trouble the fuel oil supply will be shut off right away. The program unit will stop at the same time causing also the trouble location indicator to stop. The symbols will indicate the kind of trouble.

## INSTALLATION

### Fitting the burner to the boiler

**!** **WARNING:** handling and moving operations must be carried out by specialised personnel. Use the eyebolts to lift the burner in order that it will not overturn and fall down.

To perform the installation of the burner into the boiler drill the boiler plate according to the dimension given on this manual and place the burner towards it by lifting and moving the burner by means of eyebolts.

Place the gasket on the burner flange and install the burner into the boiler by fixing nuts into the bolts. The space between the blast tube and the boiler lining must be sealed with appropriate insulating material.

#### Burner blast tube insertion depth and brickwork

Unless otherwise specified by the boiler manufacturer, heat generators without a cooled front wall require brickwork or insulation 5 as shown in the illustration. The brickwork must not protrude beyond the leading edge of the blast tube, and should have a minimum conical angle of 60°. Gap 6 must be filled with an elastic, non-combustible insulation material. For boilers with reverse firing, the minimum burner tube insertion depth A as specified in the boiler manufacturer's instructions must be observed.

On boilers the blast tube insertion depth should be observed as per the boiler manufacturer's instructions.

Reverse flame boiler :

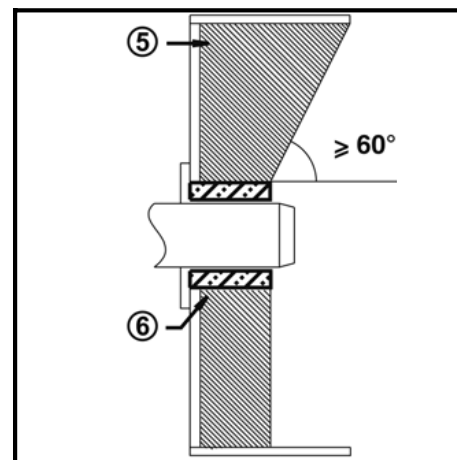
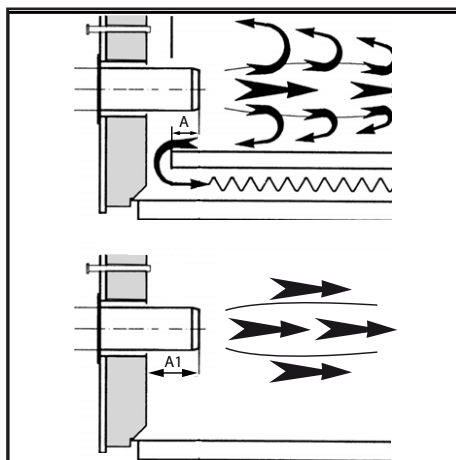
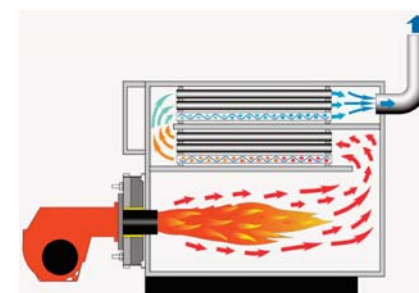
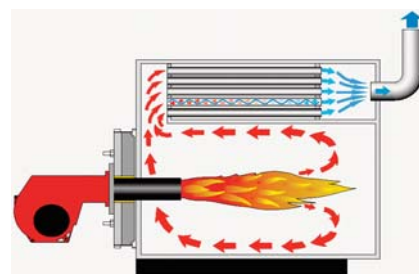
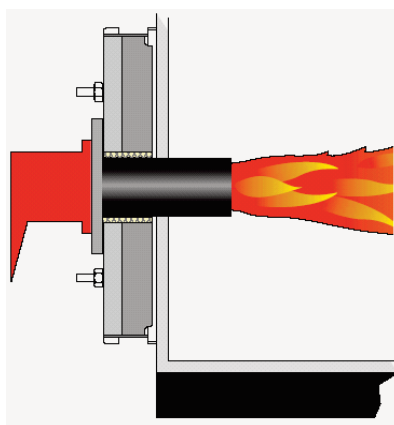
A = 50-100 mm.

Three pass boilers :

A1 = 50-100 mm.

#### Exhaust system

To avoid unfavourable noise emissions, right-angled connectors should not be used on the flue gas side of the boiler.



### BURNER LINING

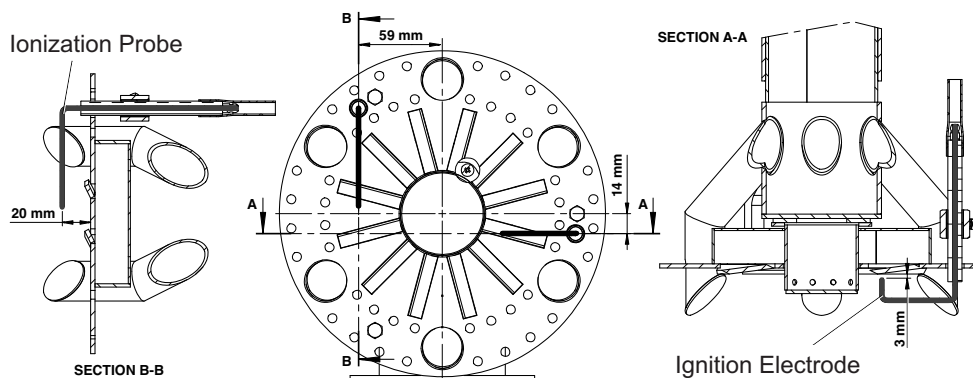
Check before burner installation:

1. Depending on the type of boiler (reverse flame or three pass) check the burner blast tube installation depth according to the data specified by the boiler manufacturer or consult the burner producer.

2. Check the ignition electrodes on the burner head as per factory setting (see figures). The setting of the mixing and ignition unit according to the boiler output will be performed during commissioning procedure.

3. Check that the head is preset at 50%.

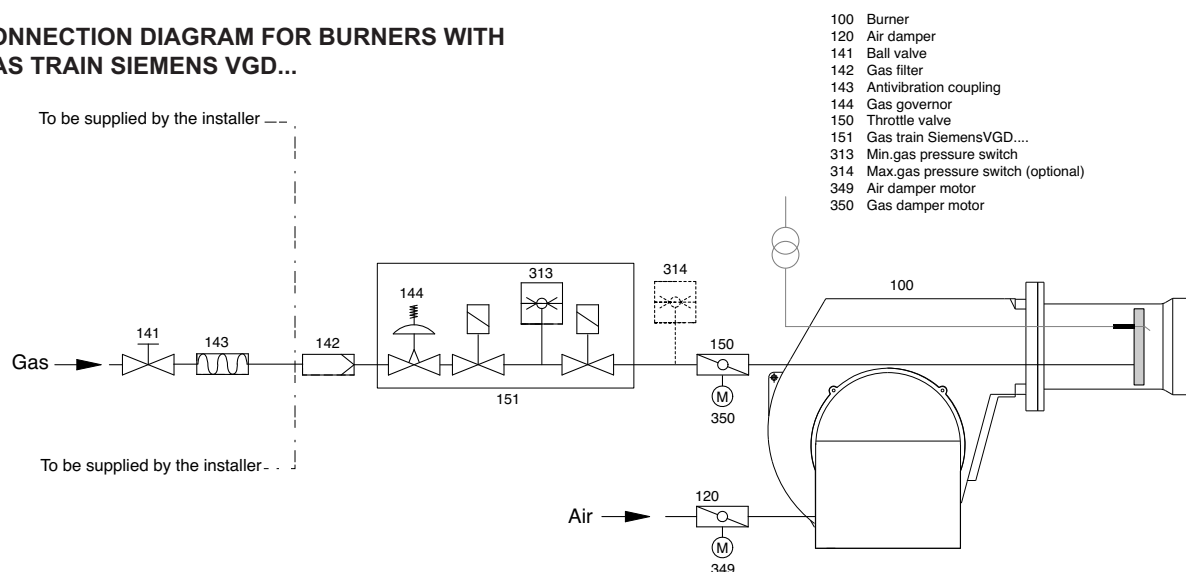
#### Position of the electrodes



## INSTALLATION

### Gas line

#### CONNECTION DIAGRAM FOR BURNERS WITH GAS TRAIN SIEMENS VGD...



#### GAS VALVES AND INSTRUMENTS GROUP

The gas valves and instruments group used with the furnace will be selected according to the specific requirements to be met by a burner system.

The following factors must be taken into account:

- burner output
- furnace back pressure
- gas pressure loss of the burner head
- gas pressure losses of the gas valves and instruments group

**NOTE:** Only gas trains assembled by the burner manufacturer and approved in accordance with the burner test specifications. EN676 compulsory kit and accessories in order to comply to the safety regulations. Additional accessories and kits shall be installed by the installer in accordance to the local safety regulations and codes of practise.

#### GAS CONNECTION PRESSURE

A minimum connection pressure must be available upstream of the burner gas valve to ensure the proper functioning of the burner.

**WARNING:** the total gas pressure loss must always be smaller than the available gas flow pressure.

For the installation of the valves and instruments group take care to observe the mounting instructions supplied by their manufacturers (these are packed with the equipment).

The gas line installed to the burner must be dimensioned in accordance with the throughput rate and the available pressure.

For selecting the nominal bore "DN" of the gas valves and instruments group care should be taken to observe the flue resistance of the boiler and the gas pressure loss of the burner and valves and instruments group.

#### GAS VALVES AND INSTRUMENTS GROUP

The gas valves and instruments group can be connected directly to the gas feed line.

Take care to observe the correct order of installation and direction of flow (arrow on housing).

Check the valves and instruments and connection pieces for absence of dirt particles and foreign matter before installation and initial operation. To provide effective conditions for start-up make sure the distance between the burner and the gas stop valve is as short as possible.

#### LEAK TEST

The gas line upstream of the burner gas valves and instruments group must be installed in accordance with the applicable regulations, checked for absence of leaks, vented and certified accordingly by the gas installation company. The screwed unions and flanged joints must be checked for proper tightness (by making a pressure test). The leak test must be made under pressure using approved foaming agents which do not cause corrosion. For steam boiler furnaces the result of the leak test must be duly certified.

#### VENTING

Prior to taking the burner into operation or after any repair work make sure to vent the complete gas feed line and the gas valves and instruments group into the open atmosphere (e.g. by means of a hose) taking care to avoid any hazards.

In no case should the gas line be vented into the heating or furnace chambers. Make use of a test burner to check the gas-carrying spaces are free from an inflammable gas mixture.

#### SUPPORT

The valves and instruments group must be supported with a telescopic jacking member or similar during and after installation (e.g. on filter and valve).

#### JOINT

It is recommended to provide an easy to disconnect joint (with planar sealing faces) to facilitate repair work on the boiler (furnace) and allow the boiler door to be swivelled out if required.

## INSTALLATION



### KITPRES... Maximum pressure switch assembly

Maximum pressure switch is provided as a kit and shall be assembled into the main gas train according to the instructions of the gas train separate manual.

### KITMD-RWF50 PID regulator

All progressive burner can be turned modulating with the installation of the PID that regulates the output combined with a probe.

Modulation Kit	Max Pressure switch
KITMD-RWF50	KITPRES50
Probe-...	KITPRES150

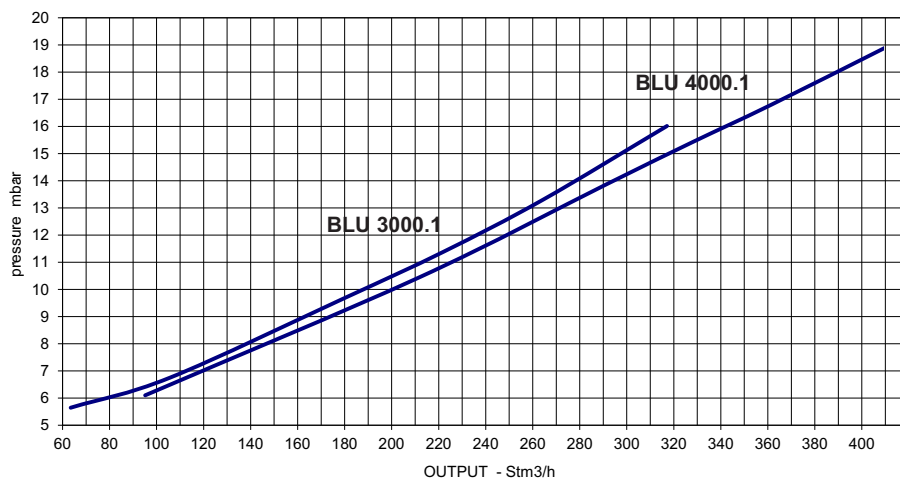



### GAS PRESSURE LOSS DIAGRAM: combustion head - platform 320

The diagram provides combustion head pressure loss. To have pressure loss combined with the different type of gas train you must refer to the pressure loss diagrams.

#### WARNING:

Note that the head loss diagram is only indicative and does vary depending on the setting of the head.



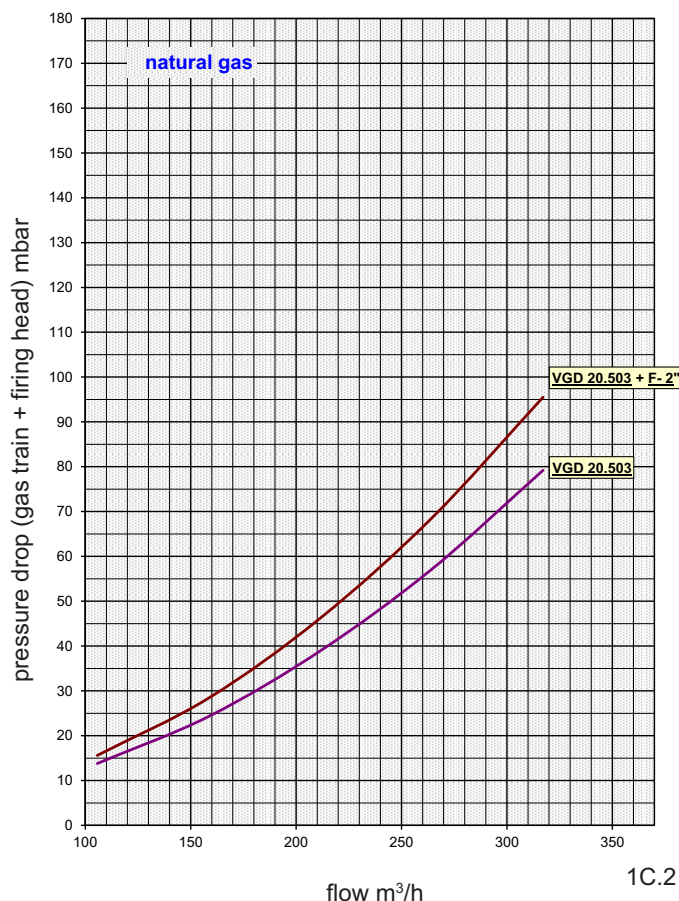
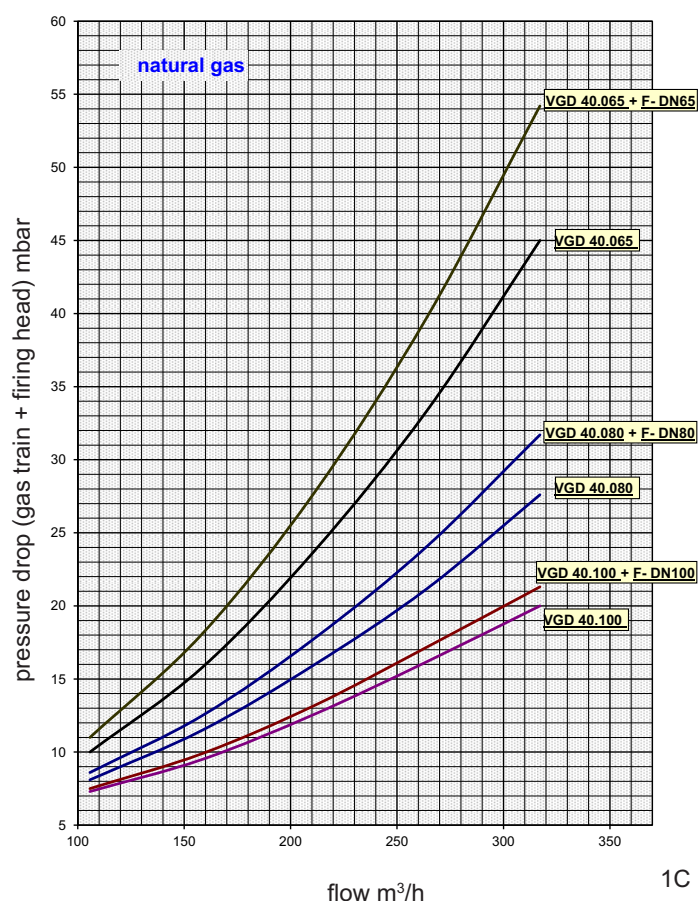
## INSTALLATION

### Gas pressure loss diagrams



PRESSURE DROP includes: "COMBUSTION HEAD + GAS TRAIN + GAS GOVERNOR & FILTER" as per EN676 Standard.  
Back pressure of boiler (or other applications) must be added/included in order to have the total min pressure drop.

Burner	Gas train	Advisable gas governor & filter	Spring color	Inlet gas pressure MIN [mbar]	Inlet gas pressure MAX [mbar]	Diagram
BLU 3000.1 MULTICALOR 300.1 MULTIFLAM 300.1	VGD 40.100	no	neutral	20	500	1C
		FILTER DN 100		22	500	
	VGD 40.080	no	neutral	30	500	
		FILTER DN 80		35	500	
	VGD 40.065	no	neutral	45	500	
		FILTER DN 65		55	500	
VGD 20.503	no	neutral	80	500	1C.2	
	FILTER 2"		100	500		

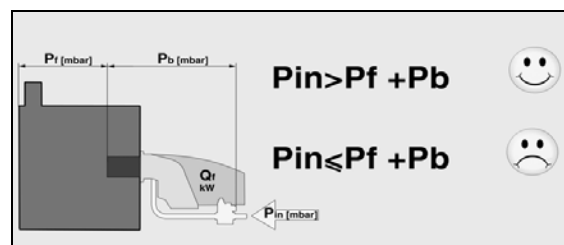


#### LEGENDA

Pf: Back pressure of furnace

Pb: Pressure of burner (combustion head + complete gas train)

Pin: Minimum inlet pressure

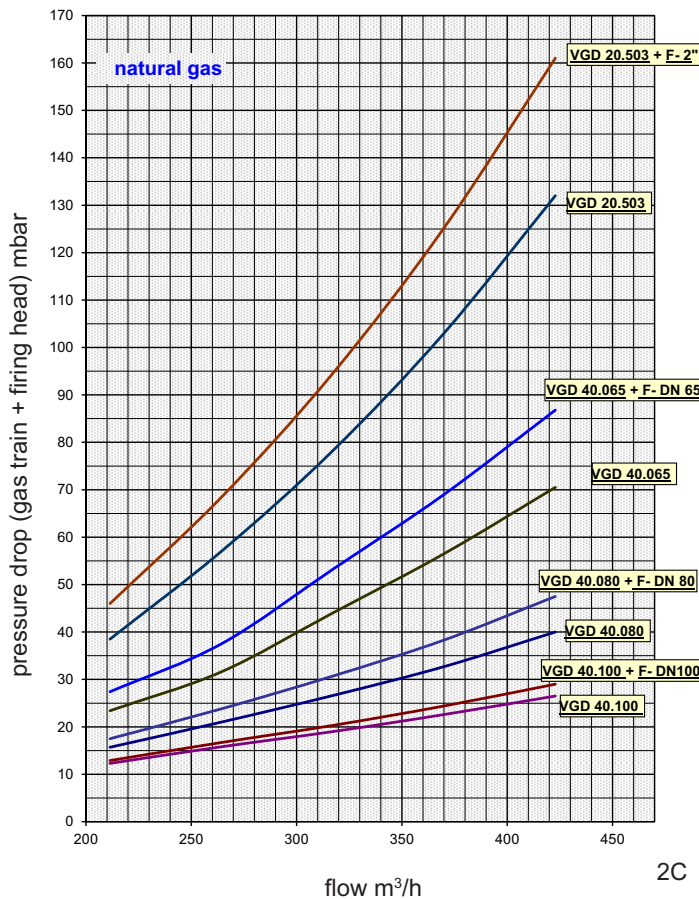


## INSTALLATION

### Gas pressure loss diagrams

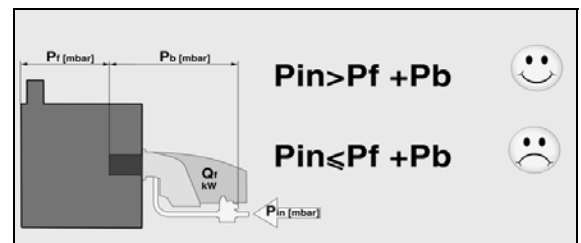
**!** PRESSURE DROP includes: "COMBUSTION HEAD + GAS TRAIN + GAS GOVERNOR & FILTER" as per EN676 Standard. Back pressure of boiler (or other applications) must be added/included in order to have the total min pressure drop.

Burner	Gas train	Advisable gas governor & filter	Spring color	Inlet gas pressure MIN [mbar]	Inlet gas pressure MAX [mbar]	Diagram
BLU 4000.1 PR MULTICALOR 400.1 MULTIFLAM 400.1	VGD 40.100	no	neutral	27	500	2C
		FILTER DN 100		30	500	
	VGD 40.080	no	neutral	40	500	
		FILTER DN 80		50	500	
	VGD 40.065	no	neutral	75	500	
		FILTER DN 65		90	500	
	VGD 20.503	no	neutral	135	500	
		FILTER 2"		170	500	



**LEGENDA**

Pf: Back pressure of furnace  
 Pb: Pressure of burner (combustion head + complete gas train)  
 Pin: Minimum inlet pressure



## INSTALLATION

### Electrical connections

**! WARNING:** Electrical wiring must be carried out with electrical supply disconnected and with burner switch in position OFF. Electrical supply must correspond to the one shown on the burner label.

#### APPLICABLE STANDARD

The electrical connection work comprising all the installation materials, terminals and earth connections must be carried out in accordance with the applicable regulations. For the electrical installation of the burner care must be taken to observe the circuit diagram made out for the furnace system.

The electrical connection of the burner and gas valves and instruments shall be entrusted to authorized specialists only.

**NOTE:** For the installation of the connection cables care must be taken to provide cable loops of sufficient length to allow for the swing-out of the boiler door and burner.

Make sure after the completion of the electrical connection work to check the wiring of the electrical system of the burner. This should include a check of the direction of rotation of the burner motor (fan).

#### GENERAL WARNINGS:

All applicable electrical safety regulations must be followed. Failure to correctly dimension the suitable input power and earth the equipment may cause damages to person and compromise the correct function of the burner therefore the electrical system shall be checked by qualified personnel.

The manufacturer declines all responsibility for modifications or connections different from those shown in the electrical scheme.

Adapters, multiple plugs and extension cables may not be used for the equipment's power supply.

An omnipolar switch in accordance with current safety regulations is required for the mains supply connection.

#### ELECTRICAL CONNECTION

##### 1) of the burner

- Built-in electrical cabinet

Use cable gland in order to secure the required level of protection. All the links, power and control, are connected to the terminal block of the cabinet. Provide cables in sufficient length to secure the rotation of the burner body according to the assembly.

Check and adjust the size of the contactors and thermal relays and the wires section according to the motor and supply voltage specs.

**ATTENTION:** Wiring is not supplied.

##### 2) of the gas train

- Connect the plugs pending to the valve: either on the cabinet, or on the coupling case on the body of the burner.

**The burners are produced with connections suitable for power supply 380-400 V three-phase.**

The burners with electric motors of an output lower or equal to 3 kW can be adapted to 220-230 V (please follow the instructions on the backside); motors with higher output can only work 380-400 V three-phase.

In case of request of burners different from the above mentioned standard, it is recommended to make specific mention in the order.

**Instructions: how to adapt electric motors of an output lower or equal to 3 kW to 220-230 V power supply**

It is possible to change the voltage of the burner by operating as follows:

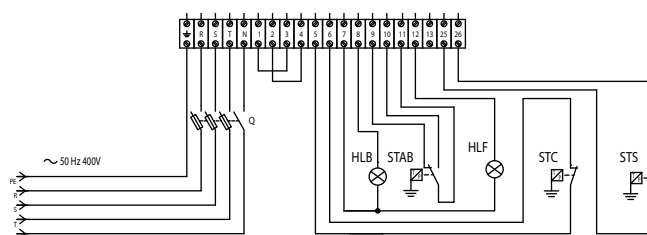
1. change the connection inside the electric box of the motor, from star to delta (see picture 1);
2. change the setting of the thermal relay, referring to the absorption values indicated in the motor nameplate. If necessary, replace the thermal relay with another one of suitable scale.

This operation is not possible on motors above 3 kW.

For more information, please contact the Ecoflam staff.

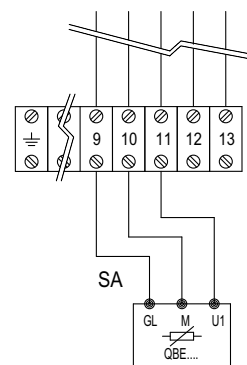
#### LEGENDA

HLB: lock-out lamp  
STAB: two stages thermostat  
HLF: burner on flame lamp  
STC: boiler thermostat  
STS: safety thermostat  
SA: active probe  
SP: passive probe



#### PROBES CONNECTION

##### ACTIVE PROBE CONNECTION (FOR MODULATING VERSION)



##### PASSIVE PROBE CONNECTION (FOR MODULATING VERSION)

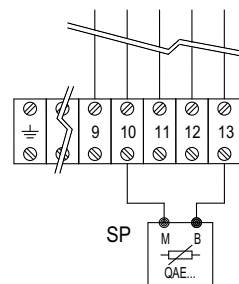
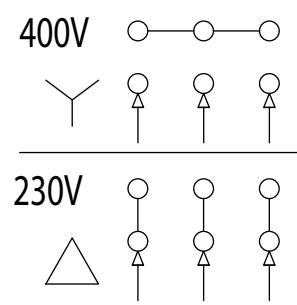


fig.1





## START-UP: CHECKING PROCEDURE

### CHECKS BEFORE COMMISSIONING:

- That the burner is assembled in accordance with the instructions given here.
- Setting the combustion components.
- All electrical connections must be correct.
- Check the burner motor for correct direction of rotation.
- The heat generator must be ready for operation, and the operating regulations for the heat generator must be observed.
- The heat generator and heating system must be filled with water and the circulating pumps must be in operation.
- The temperature regulator, pressure regulator, low water detectors and any other safety or limiting devices that might be fitted must be connected and operational.
- The exhaust gas duct must be unobstructed and the secondary air system, if available, must be operational.
- An adequate supply of fresh air must be guaranteed.
- Make a test of the all gas-carrying elements for absence of leaks.
- With burner in starting position check that air damper is in "CLOSED" position.
- Check that control box is unlocked and in its original position.
- A standard-compliant measuring point must be available, the exhaust gas duct up to the measuring point must be free of leaks to prevent anomalies in the measurement results.

### GAS START-UP

- Connect the measuring instruments for the gas head pressure on the test connection downstream of the gas damper and the air pressure on the burner test connection.
- Open the gas shut-off valve before the gas-armatures and test the gas pressure on the pressure gauge
- Set the "Manual-Automatic" selector switch to "Manual".

If the gas valves are tested for absence of leaks, this should be continued until a positive result is obtained. If a valve is found to leak, the program will not step forward to the control box.

The burner will start according to the program flow of the control box.

**Prior to the initial fuel feed start make a functional test of the burner program flow:**

#### Gas system:

- Shortly open the gas shut-off valve before the gas train until pressure is available and close again.
- Start burner and check program flow for correct start-up sequence:
  1. Fan.
  2. Pre-ventilation damper.
  3. Check air pressure.
  4. Partial-load damper.
  5. Ignition.
  6. Valves open.
  7. The burner will either stop as the gas valves open (due to gas pressure decrease) or lock out at the end of the safety time.
- Unlock the control box.

## EXHAUST GAS TEST

To ensure an economically efficient and trouble-free operation of the system it will be necessary to adjust the burner specifically in accordance with the furnace system. This is achieved by means of a fuel-combustion air compound control unit which adjusts the burner to ensure a proper combustion. Exhaust gas tests are required for this purpose.

The percentage CO<sub>2</sub> and O<sub>2</sub> and the exhaust gas temperature will have to be measured to determine the efficiency and combustion quality.

Prior to any measurement make sure to check the boiler and exhaust gas system for absence of leaks.

### Secondary air will falsify the measured results

Check that the exhaust gases have a residual oxygen (O<sub>2</sub>) content as low as possible and a carbon dioxide (CO<sub>2</sub>) content as high as possible.

The carbon monoxide content of the exhaust gases must be below the currently applicable specifications in all load stages. In the fuel oil combustion mode the permissible soot number in the exhaust gas is not allowed to be exceeded

### DETERMINING THE VOLUMETRIC GAS FLOW RATE

The thermal furnace output of a boiler (Q<sub>F</sub>) is the amount of heat supplied with the gas in a unit of time.

When taking the burner into operation the volumetric fuel flow rate should be selected according to the nominal thermal capacity of the boiler.

#### Example:

Nom. thermal output	Q <sub>N</sub>	1000 kW
Boiler efficiency	η <sub>K</sub>	0,88
Calorific value of gas	H <sub>U</sub>	9,1 kWh/m <sup>3</sup>
Gas pressure	p <sub>U</sub>	100 mbar
Barometer reading	p <sub>amb</sub>	980 mbar
Gas temperature relative	t <sub>gas</sub>	15°C
Gas temperature absolute	T	(t <sub>gas</sub> +273)
Standard atmospheric pressure	p <sub>n</sub>	1013 mbar

$$Q_F = \frac{Q_N}{\eta_K} = \frac{1000}{0,88} = 1136 \text{ kW}$$

Volumetric gas flow rate at STP:

$$v_{Bn} = \frac{Q_N}{H_U \cdot \eta_K} = \frac{1000}{9,1 \cdot 0,88} = 125 \text{ m}^3/\text{h}$$

Volumetric gas flow rate in operating condition:

$$v_{BB} = v_{Bn} \frac{T}{273} = \frac{p_n}{p_{amb} + p_U} =$$

$$= 125 \frac{273+15}{273} \frac{1013,25}{980+100} = 123,9 \text{ m}^3/\text{h}$$

### Recommended combustion parameters

Fuel	Recommended (%) CO <sub>2</sub>	Recommended (%) O <sub>2</sub>
Natural gas	10 ÷ 9	3,1 ÷ 4,8
Light oil	13 ÷ 11,5	3,3 ÷ 5,3
Heavy oil	12,5 ÷ 11	4,2 ÷ 6,2

**WARNING:** if the installation is above sea level the output of the burner vary base on the diagram.

The regulation of the burner in this case shall take into account the reduced power of the burner due to the missing air.

Ratio between O<sub>2</sub>- and CO<sub>2</sub>- for natural gas H (CO<sub>2</sub>max = 11,7%)

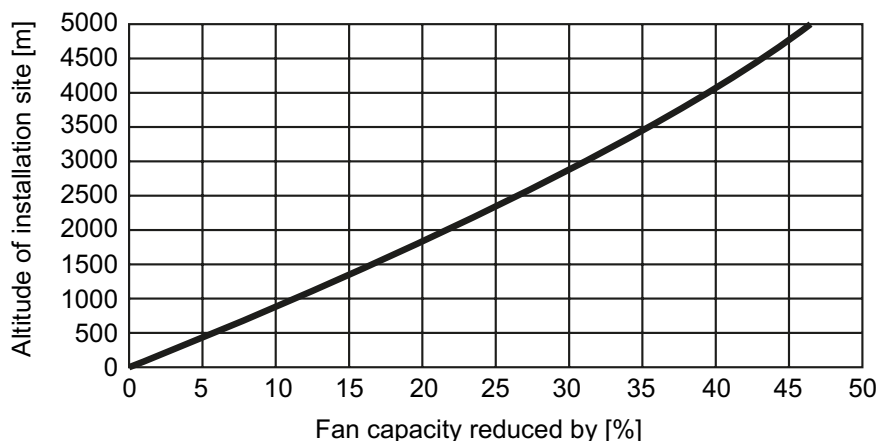
Ratio between O<sub>2</sub>- and CO<sub>2</sub>- for light oil EL (CO<sub>2</sub>max = 15,40%)

Ratio between O<sub>2</sub>- and CO<sub>2</sub>- for heavy oil S (CO<sub>2</sub>max = 15,60%)

$$O_2 = 21 \frac{CO_2\text{max} - CO_2\text{gem}}{CO_2\text{max}} = \%$$

CO<sub>2</sub> gem = % CO<sub>2</sub> measured on dry flue gases

Mean air pressure vs. altitude above sea-level



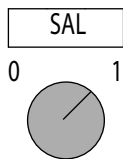
## START-UP

Select the gas operation in order to proceed with start up on the gas side. On the selector put the operation on minimum capacity.

### MAIN SWITCH

0 - OFF

1 - ON



**KMV contactor:** check the air fan motor rotation. If not correct invert the two phases on the power supply.



KMV

### START UP THE BURNER

The control box starts the pre-purge cycle, the fan motor and opens the air flaps in full open position.

At the end of pre-purging, the control box drives the servomotor into the ignition position and starts the ignition transformer.

After a few seconds the control box opens the main valves and the burner goes in the low flame.

In case of faulty ignition, the control box switches the burner into safety condition, in such a case you must rearm the burner.

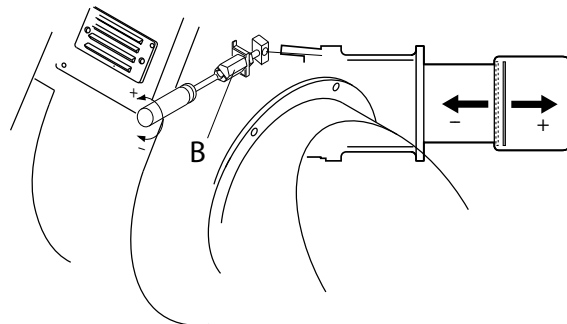
Gradually increase burner output from the low flame to the high flame and set gas servomotor curve in order to have a stable flame. Refer to LAMTEC manual attached.

### Adjusting the maximum air flow rate

Air and Gas adjustment are accomplished through LAMTEC parameters setting. Refer to LAMTEC manual attached.

### Firing head setting

The firing head is pre-adjusted at the 50% from the factory. The setting fully open enables to reach the full power of the burner and full close to reach the minimum power of the burner. The optimal position depends on the output that we need to reach but the default setting shall be modified only when you are not able to reach the suggested combustion value by adjusting the air flow in the maximum flame.



### Servomotor STE... - Air damper motor pre-setting

Air adjustment is accomplished through LAMTEC parameters setting. Refer to LAMTEC manual attached.



## START-UP

### Adjusting the intermediate burner capacity

Gas adjustment is accomplished through LAMTEC parameters setting. Refer to LAMTEC manual attached.

**WARNING:** the variable profile of the cam shall have a normal proportional curvature in order to have good combustion values and reduce its mechanical stress breakdown.

### Pressure switch adjustment

#### AIR PRESSURE SWITCH CALIBRATION

The air pressure switch is provided for monitoring the pressure of the combustion air fan. Unscrew screws A and B and remove cover C.

After the air and gas setting you have to calibrate the air switch with the burner working on the low flame by slowly turning the relative knob clockwise until the burner locks out. Read the value and then decrease it by 15%.

Set the pressure switch to the minimum by turning knob D to position 1.

Start the burner and keep in low flame running, while checking that combustion is correct. Through a small cardboard, progressively obstruct the air intake until to obtain a CO<sub>2</sub> increase of 0,5±0,8% or else, if a pressure gauge is available, connected to pressure port E, until reaching a pressure drop of 1 mbar (10 mm of W.G.).

Slowly increase the adjustment value of the air pressure switch until to have the burner lockout. Remove the obstruction from the air intake, screw on the cover C and start the burner by pressing the control box rear button.

**WARNING:** the air pressure switch shall prevent the air pressure to go below 80% from the adjustment value in order to prevent the CO in the fumes to exceed 1% (10000 ppm). Using the analyser try to close the air inlet and check that the burner locks out before exceeding CO value of 1% in the fumes.

#### MIN GAS PRESSURE SWITCH

The gas pressure switch has the function to check that the gas pressure before the gas valve does have the minimum pressure to make the burner running correctly.

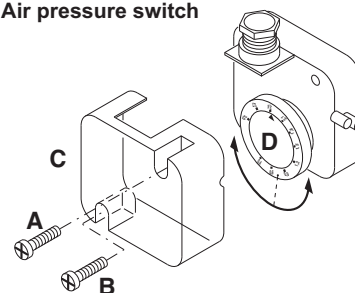
Unscrew off and remove cover M. - Set knob N to a value equal to 60% of gas nominal feed pressure (i.e. for natural gas nom. pressure = 20 mbar, set knob to a value of 12 mbar; for LPG nom. pressure of G30/G31- 30/37 mbar, set knob to a value of 18 mbar).

#### MAX GAS PRESSURE SWITCH (KIT)

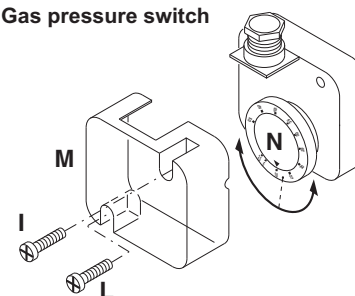
The maximum gas pressure switch has the function to check that the gas pressure after the gas train and before the head does not exceed the pre-set limits.

Max gas pressure switch: it is available as a kit for different pressure.

Air pressure switch



Gas pressure switch



## MAINTENANCE PROGRAM

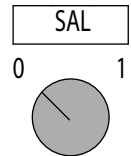
**!** Burner and boiler servicing must only be carried out by authorised and qualified personnel at least once a year. Depending on the type of installation, shorter maintenance intervals may be necessary. The system operator is advised to take out a maintenance contract to guarantee regular servicing.  
**WARNING:** Use original spare parts.

### SAFETY WARNINGS:

1. Turn off the power supply and protect the system from accidental start-up
2. Cut gas supply
3. Make sure there is no residual power in the system and that the actions in points 1 and 2 have been completed.
4. Before opening the burner casing, ensure that the fan motor has stopped completely

### MAIN SWITCH

- 0 - OFF
- 1 - ON



Failure to observe any of these instructions will result in the risk of death or injury!

### WORKS RECOMMENDED AS PART OF ANNUAL BURNER MAINTENANCE:

- Emergency stop button function check
- Check burner start characteristics
- Run burner test and input measurement in the boiler room
- Clean the combustion components and replace defective parts if necessary
- Check the combustion head components and make sure that all components are in good condition otherwise replace them
- Replace ignition electrodes if necessary and check their correct position after any intervention
- Flame monitor and automatic combustion control unit function check
- Clean the fan wheel and the housing and grease rotating parts if necessary
- Perform visual inspection of gas lines in the boiler room and check the gas flow
- Clean the gas filter cartridge with air periodically, replace it if necessary
- After the cleaning of the components of the gas train perform the leakage test
- Make visual inspection of the burner's electrical components and eliminate malfunctions if necessary
- Burner safety devices function check (air pressure/gas pressure switches)
- Commissioning the burner and correct the adjustment values if necessary

**NOTES ON REASSEMBLING:** Perform the described step in reverse order and make sure to refit components as they were originally assembled and the system is free from leaks. Use only original spare parts.

### DRAW UP A MEASUREMENT REPORT ACCORDING TO THE LOCAL REGULATION AND CODES OF PRACTISE OF THE COUNTRY

### EXHAUST GAS LOSS

Exhaust gas loss by way of free heat will occur as a result of the temperature difference between the fuel-air mixture entering the furnace chamber and the gases discharged. Any increase in the excess of air and the resultant higher exhaust gas volume will cause the exhaust gas loss to rise. The exhaust gas loss can be calculated as follows:

$$q_A = (t_A - t_L) \frac{A_1}{CO_2} + B$$

- $q_A$  = exhaust gas loss [%]
- $t_A$  = exhaust gas temperature [°C]
- $t_L$  = combustion air temperature [°C]
- $CO_2$  = volumetric content of carbon dioxide [%]

	Light oil EL	Heavy oil S	Natural gas	Town gas	LPG
A1	0,50	0,490	0,370	0,350	0,420
B	0,007	0,007	0,009	0,011	0,008

### Example

Data measured in natural gas mode:  
 CO<sub>2</sub> content of exhaust gases: 10,8%  
 Exhaust gas temperature: 195°C  
 Air intake temperature: 22°C

The exhaust gas loss can be calculated as follows:

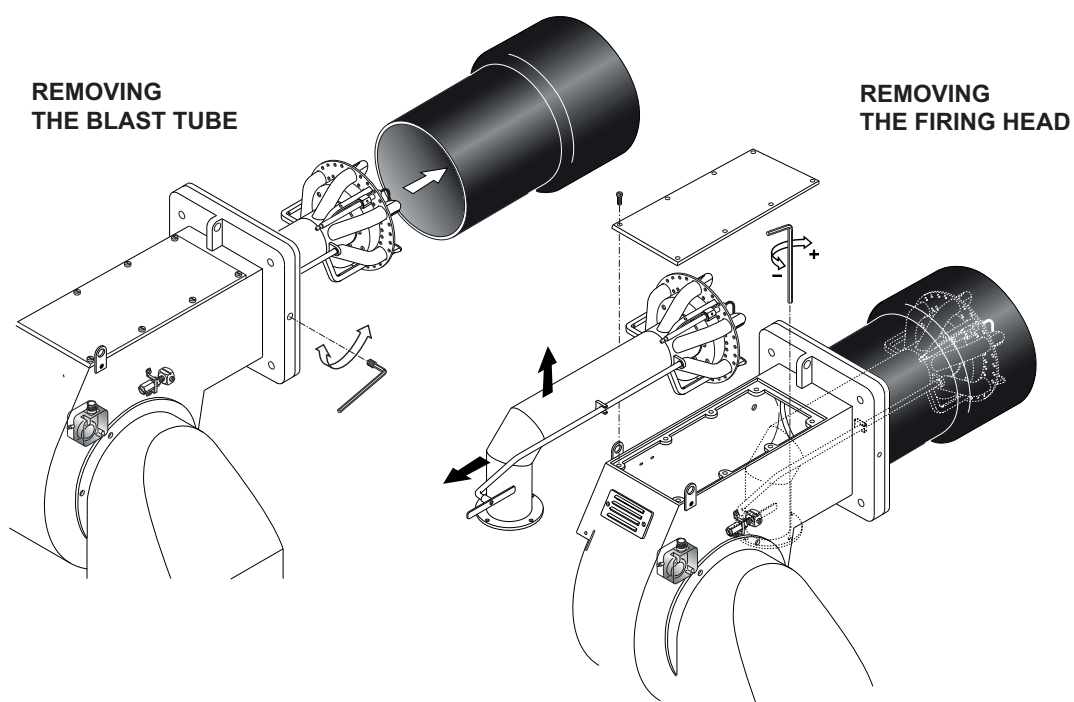
$$q_{Af} = (195-22) \left( \frac{0,37}{10,8} + 0,009 \right) = 7,48\%$$

Data measured in fuel oil mode:  
 CO<sub>2</sub> content of exhaust gases: 12,8%  
 Exhaust gas temperature: 195°C  
 Air intake temperature: 22°C

The exhaust gas loss can be calculated as follows:

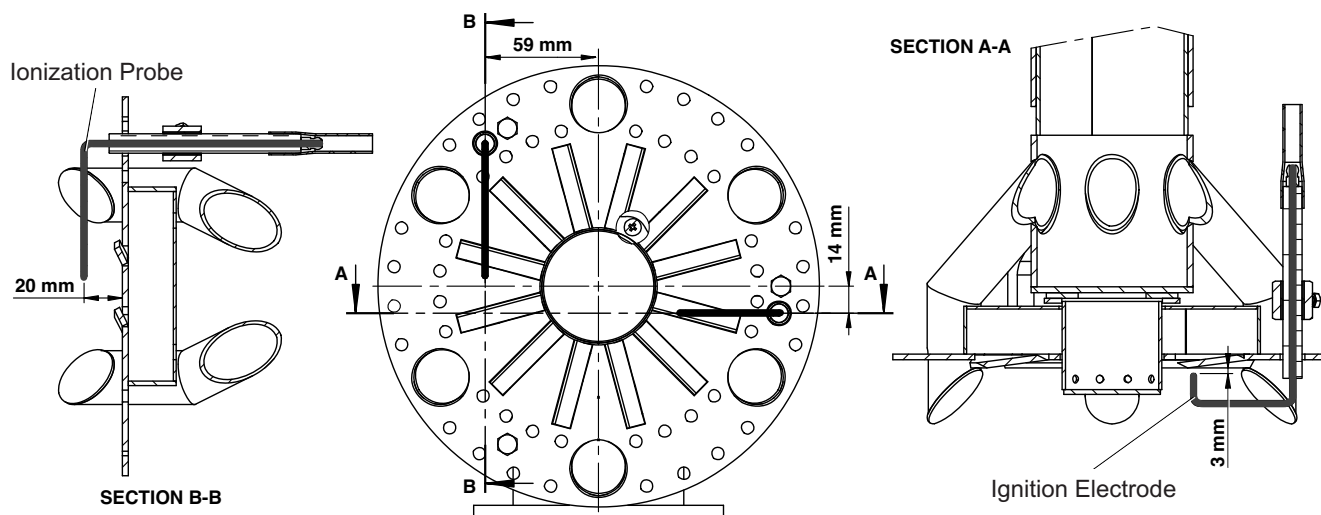
$$q_{Af} = (195-22) \left( \frac{0,49}{12,8} + 0,007 \right) = 7,83\%$$

## MAINTENANCE PROGRAM



### ATTENTION:

Check the position of the electrodes after any intervention as wrong position could cause ignition troubles.



### GAS FILTER CLEANING



## TROUBLESHOOTING INSTRUCTIONS

For Setting and Error Lists refer to LAMTEC manual attached.

### OPERATING TROUBLE

In case of operating trouble it should be checked whether the system is in proper working order.

Make a check for the following:

1. Availability of fuel.  
Availability of gas in the line at sufficiently high pressure.  
Availability of fuel oil in the tank (for dual fuel burner).  
Correct position of fuel selector switch.
2. Availability of electric power in the burner system.

3. Proper functional order and setting of all control and safety instruments such as temperature controller, safety limiter, water failure cut-out, electrical limit switches, etc. If the trouble is not found to be due to any of the above-mentioned points it will be necessary to test the burner functions very carefully.

Prevailing conditions:  
The burner will be found to be out of operation and in faulty and interlocked position.

Proceed with searching for the cause of the trouble and eliminate it. Unlock the control box by pressing the fault eliminate key and start the burner.

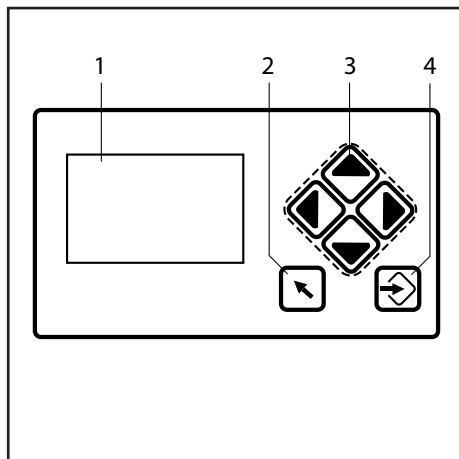
Do not press the fault eliminate key longer than 10 seconds.

The start-up program will be initiated and should be carefully monitored.

The possible cause of the fault may be quickly found by reference to the fault indicator of the control box and watching the start-up and operating program.

## APPENDIX

### Display - Control box - Damper actuators



- 1 Display
- 2 Back key
- 3 Cursor keys
- 4 Enter key

Display  
The display shows in pictogram:

- the menu structure
- operating status
- parameters
- error messages



Jump to previous window.



You navigate in the menu using cursor keys. You use 'left' and 'right' keys to move step by step in a selected row. At the end of the selected row the cursor jumps down to the next row, if possible. In a multiline menu use 'up' and 'down' keys to switch to other rows. To display parameters, switch between various fields.



Press ENTER to call up a menu on the start screen. Select a sub-menu in the menu window. Transfer setting values by pressing ENTER key in a parameter window. Use a flushing, red ENTER key to release a fault interlocker. If the ENTER key is permanently lit red, a fault with an automatic restart is displayed.

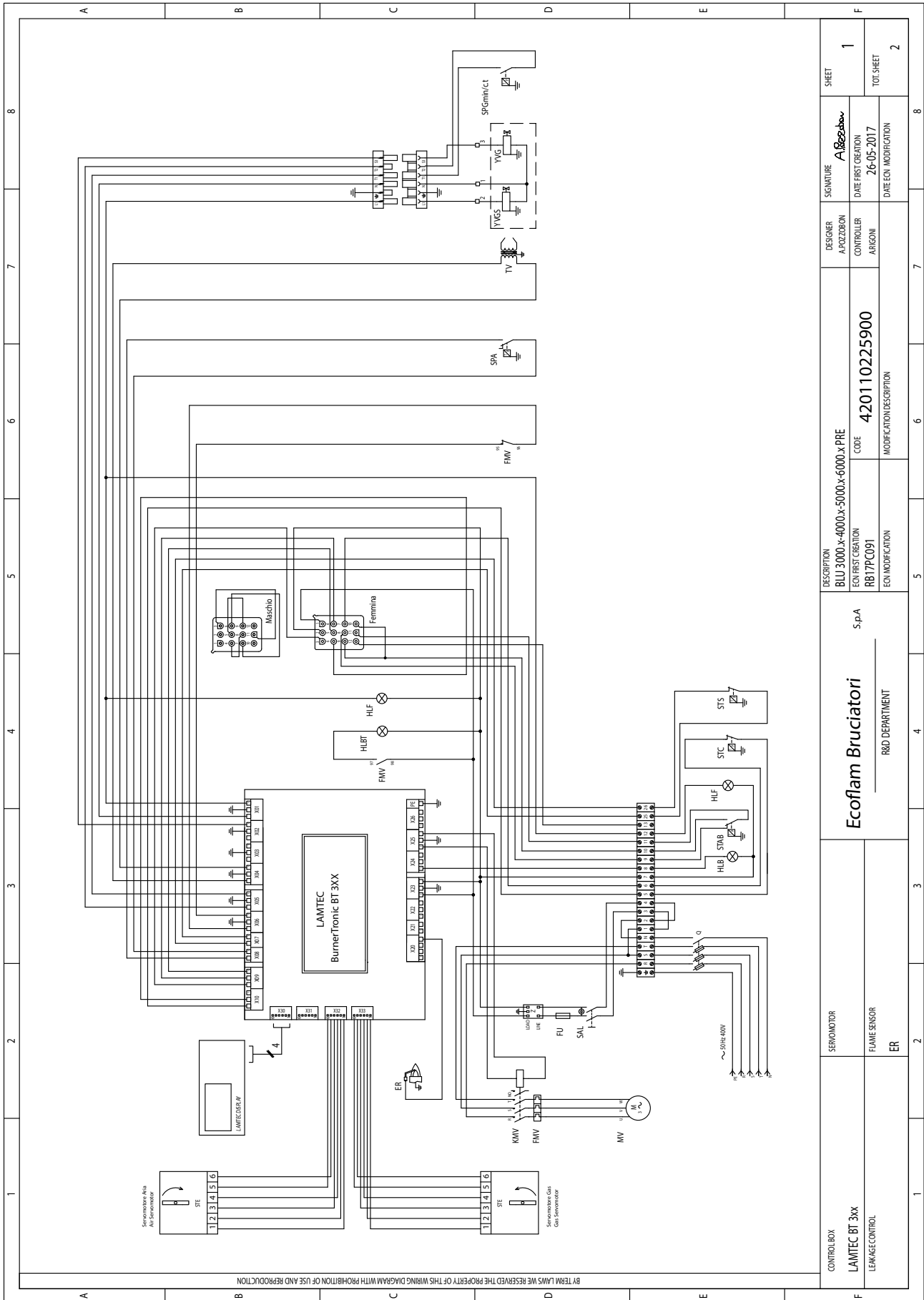


Always switch off the power supply before installing or removing the control unit. Do not attempt to open or carry out repairs on the control unit.

Refer to LAMTEC manual attached.

APPENDIX

Electrical diagrams





## APPENDIX

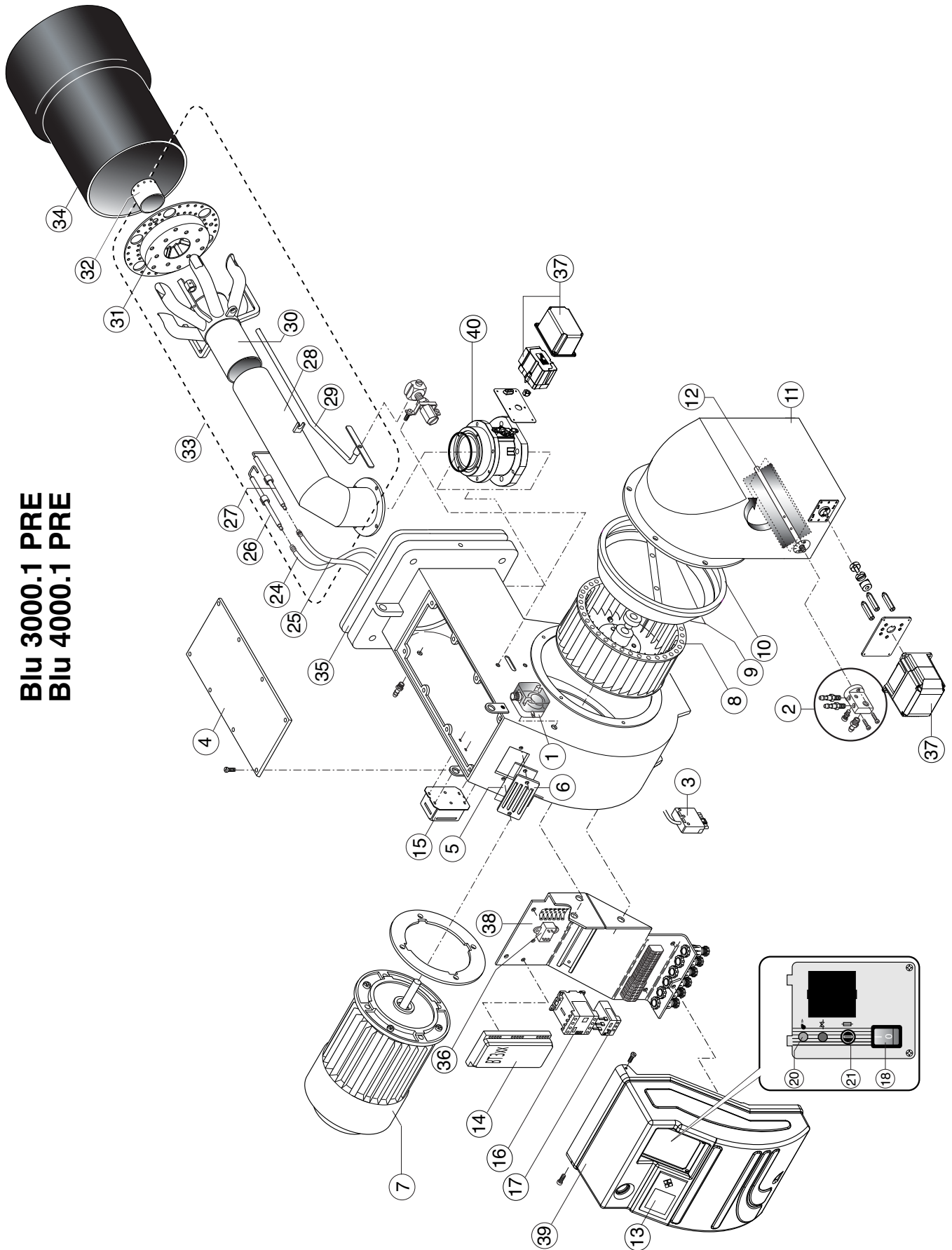
### Electrical diagrams

		1	2	3	4	5	6	7	8
A	Q	INTERRUTTORE GENERALE CON FUSIBILE MAIN SWITCH WITH FUSE INTERRUPTEUR GENERAL AVEC FUSIBLE INTERRUPTOR GENERAL CON FUSIBLE	YWG5	ELETTROVALVOLA GAS DI SICUREZZA EXTRA SAFETY GAS SOLENOID VALVE ELECTROVANNE GAZ DE SECURITE ELECTROVALVULA GAS DE SEGURIDAD					
	Z	FILTRO ANTIDISTURBO ANTI-JAMMING FILTER FILTRE ANTIPARASITES FILTRO DE PROTECCION ANTIDISTURBO	SPHM161	PRESOSTATO GAS DI MINIMA CONTROLO DI TENUTA GAS PRESSURE SWITCH MIN / LEAKAGE CHECK PRESOSTAT GAZ PRESSION MIN/TEST DE FUITE PRESOSTATO GAS DE MINIMA POT./PRUEBA DE FUGAS					
	FU	FUSIBILE FUSE FUSIBLE FUSIBLE	HIF	LAMPADA DI FUNZIONAMENTO WORKING LAMP LAMPE DE FONCTIONNEMENT ESPA DE FUNCIONAMIENTO					
	MV	MOTORE VENTILATORE MOTOR FAN MOTEUR VENTILATEUR MOTOR VENTILADOR							
	TV	TRASFORMATORE IGNITION TRANSFORMER TRANSFORMATEUR D'ALLUMAGE TRANSFORMADOR							
	ER	ELETTRODO DI RIVELAZIONE ELECTRODE PROBES ELECTRODE D'IONISATION ELECTRODO DE IONIZACION							
	FMV	RELE TERMICO MOTORE VENTILATORE MOTOR THERMAL RELAY (FAN MOTOR) RELAIS THERMIQUE MOTEUR VENTILATEUR RELE TERMICO MOTOR VENTILADOR							
	HUB	LAMPADA DI BLOCCO LOCK-OUT LAMP LAMPE DE SECURITE ESPA DE BLOQUEO							
	KWV	CONTATTORE MOTORE VENTILATORE REMOTE CONTROL SWITCH (FAN MOTOR) CONTACTEUR MOTEUR VENTILATEUR TELEINTERRUPTOR MOTOR VENTILADOR							
	SAL	INTERRUTTORE DI LINEA WORKING SWITCH INTERRUPTEUR DE LIGNE INTERRUPTOR DE LINEA							
	SPA	PRESOSTATO ARIA AIR PRESSURE SWITCH PRESOSTAT AIR PRESOSTATO AIRE							
	STC	TERMOSTATO CALDAIA BOILER THERMOSTAT THERMOSTAT CHAUDIERE TERMOSTATO CALDERA							
	STS	TERMOSTATO DI SICUREZZA SAFETY THERMOSTAT THERMOSTAT DE SECURITE THERMOSTATO DE SEGURIDAD							
HUBT	LAMPADA DI BLOCCO TERMICO THERMAL LOCK-OUT LAMP LAMPE DE THERMAL DE SECURITE ESPA DE BLOQUEO RELE TERMICO								
STAB	TERMOSTATO DI ALTA-BASSA FIAMMA HIGH-LOW FLAME THERMOSTAT THERMOSTAT GRANDE PETITE ALLURE TERMOSTATO DE ALTA-BAJA LLAMA								
YVG	ELETTROVALVOLA GAS DI PRIMA FIAMMA FIRST STAGE GAS SOLENOID VALVE ELECTROVANNE GAZ PETITE ALLURE ELECTROVALVULA GAS DE 1ª LLAMA								
BY TERM LAMPS WE RESERVE THE PROPERTY OF THIS WIRING DIAGRAM WITH PROHIBITION OF USE AND REPRODUCTION									
B									
C									
D									
E									
F	CONTROL BOX LAMITEC BT 3xx LEAKAGE CONTROL	SERVO MOTOR FLAME SENSOR ER	Ecoflam Bruciatori S.p.A. R&D DEPARTMENT		DESCRIPTION BLU 3000x-4000x-5000x-6000x- PRE ECON FIRST CREATION RB17PC091		DESIGNER A. POZZORON CONTROLLER ARIGONI	SIGNATURE A. Pozzoron DATE FIRST CREATION 26-05-2017 DATE ECON MODIFICATION	SHEET 2 TOT. SHEET 2

APPENDIX

Spare parts list

**Blu 3000.1 PRE**  
**Blu 4000.1 PRE**



## APPENDIX

### Spare parts list

N°	DESCRIPTION		BLU 3000.1 PRE	BLU 4000.1 PRE
			code	code
1	AIR PRESSURE SWITCH	DUNGS LGW10 A2P	65323047	65323047
2	AIR INTAKE SET		65322346	65322346
3	PLUG WIELAND	6 PIN	65322072	65322072
4	COVER		65320678	65320678
5	GLASS		65320487	65320487
6	PEED WINDOM FRAME		65320488	65320488
7	MOTOR	5500 W	65325357	-
		7500 W	-	65326331
8	FAN	320 X 150	65321800	65321800
9	FAN SCOOP		-	65320627
10	AIR CONVEYOR		65320645	65320645
11	AIR INTAKE		65324357	65324357
12	AIR INTAKE PIPE		65321230	65321230
13	DISPLAY	LAMTEC UI300	65326932	65326932
14	CONTROL BOX	BT 320 667R1320-1	65326933	65326933
15	IGNITION TRANSFORMER	TRS820 1X8 230V L1140	0T106-41	0T106-41
16	REMOTE CONTROL SWITCH	BF3800A230	65075273	65075273
17	MOTOR THERMAL RELAY	LOVATO RF381400	65323105	-
		RF38 1800 13-18 A	-	65326890
18	MAIN SWITCH	cod.40100I1509	65323064	65323064
19	RESET BUTTON		-	-
20	LAMP	EL/N-SC4 Elettrospring	65322053	65322053
21	FUSE SUPPORT	FUSIT FH-B528	65322181	65322181
22	RELAY BASE		-	-
23	RELAY		-	-
24	IGNITION CABLE	TC	65320944	65320944
		TL	65320946	65320946
25	IONIZATION CABLE	TC	65322003	65322003
		TL	65322004	65322004
26	IGNITION ELECTRODE		65320891	65320891
27	IONIZATION PROBE		65320892	65320892
28	PIPE	TC	65321664	65321664
		TL	65321665	65321665
29	ROD	TC	65320242	65320242
		TL	65320243	65320243
30	FIRING HEAD		65321666	65321666
31	FRONT DISC		65320742	65320742
32	FRONT PIPE	NATURAL GAS	65321607	65321608
33	INNER ASSEMBLY	TC	65322552	65325360
		TL	65322553	65324305
34	BLAST TUBE	TC	65320434	65320440
		TL	65320435	65320441
35	GASKET		65321125	65321125
36	ANTI JAMMING FILTER		65323170	65323170
37	AIR DAMPER MOTOR	STE 4,5 Q3.51/6 3NM R	65301001	65301001
		STE 4,5 B0.37/6-R 0.8NM	65300527	65300527
38	SUPPORT		65320476	65320476
39	COVER		65326894	65326894
40	THROTTLE GROUP	3" STE 4,5 0.8N	65326913	65326913

TC = SHORT HEAD TL = LONG HEAD

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