

PBY90 - PBY91 - PBY92
PBY510 - PBY515
PBY520 - PBY525

Progressive, Fully-modulating
Heavy oil Burners

MANUAL OF INSTALLATION - USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

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APPENDIX

WARNINGS

THIS MANUAL IS SUPPLIED AS AN INTEGRAL AND ESSENTIAL PART OF THE PRODUCT AND MUST BE DELIVERED TO THE USER.

INFORMATION INCLUDED IN THIS SECTION ARE DEDICATED BOTH TO THE USER AND TO PERSONNEL FOLLOWING PRODUCT INSTALLATION AND MAINTENANCE.

THE USER WILL FIND FURTHER INFORMATION ABOUT OPERATING AND USE RESTRICTIONS, IN THE SECOND SECTION OF THIS MANUAL. WE HIGHLY RECOMMEND TO READ IT.

CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.

1) GENERAL INTRODUCTION

- The equipment must be installed in compliance with the regulations in force, following the manufacturer's instructions, by qualified personnel.
- Qualified personnel means those having technical knowledge in the field of components for civil or industrial heating systems, sanitary hot water generation and particularly service centres authorised by the manufacturer.
- Improper installation may cause injury to people and animals, or damage to property, for which the manufacturer cannot be held liable.
- Remove all packaging material and inspect the equipment for integrity.

In case of any doubt, do not use the unit - contact the supplier.

The packaging materials (wooden crate, nails, fastening devices, plastic bags, foamed polystyrene, etc), should not be left within the reach of children, as they may prove harmful.

- Before any cleaning or servicing operation, disconnect the unit from the mains by turning the master switch OFF, and/or through the cut-out devices that are provided.
- Make sure that inlet or exhaust grilles are unobstructed.
- In case of breakdown and/or defective unit operation, disconnect the unit. Make no attempt to repair the unit or take any direct action.

Contact qualified personnel only.

Units shall be repaired exclusively by a servicing centre, duly authorised by the manufacturer, with original spare parts.

Failure to comply with the above instructions is likely to impair the unit's safety.

To ensure equipment efficiency and proper operation, it is essential that maintenance operations are performed by qualified personnel at regular intervals, following the manufacturer's instructions.

- When a decision is made to discontinue the use of the equipment, those parts likely to constitute sources of danger shall be made harmless.
- In case the equipment is to be sold or transferred to another user, or in case the original user should move and leave the unit behind, make sure that these instructions accompany the equipment at all times so that they can be consulted by the new owner and/or the installer.
- For all the units that have been modified or have options fitted then original accessory equipment only shall be used.
- This unit shall be employed exclusively for the use for which it is meant. Any other use shall be considered as improper and, therefore, dangerous.

The manufacturer shall not be held liable, by agreement or otherwise, for damages resulting from improper installation, use and failure to comply with the instructions supplied by the manufacturer.

2) SPECIAL INSTRUCTIONS FOR BURNERS

- The burner should be installed in a suitable room, with ventilation openings complying with the requirements of the regulations in force, and sufficient for good combustion.
- Only burners designed according to the regulations in force should be used.
- This burner should be employed exclusively for the use for which it was designed.
- Before connecting the burner, make sure that the unit rating is the same as delivery mains (electricity, gas oil, or other fuel).
- Observe caution with hot burner components. These are, usually, near to the flame and the fuel pre-heating system, they become hot during the unit operation and will remain hot for some time after the burner has stopped.

When the decision is made to discontinue the use of the burner, the user

shall have qualified personnel carry out the following operations:

- a Remove the power supply by disconnecting the power cord from the mains.
- b) Disconnect the fuel supply by means of the hand-operated shut-off valve and remove the control handwheels from their spindles.

Special warnings

- Make sure that the burner has, on installation, been firmly secured to the appliance, so that the flame is generated inside the appliance firebox.
- Before the burner is started and, thereafter, at least once a year, have qualified personnel perform the following operations:
 - a set the burner fuel flow rate depending on the heat input of the appliance;
 - b set the flow rate of the combustion-supporting air to obtain a combustion efficiency level at least equal to the lower level required by the regulations in force;
 - c check the unit operation for proper combustion, to avoid any harmful or polluting unburnt gases in excess of the limits permitted by the regulations in force;
 - d make sure that control and safety devices are operating properly;
 - e make sure that exhaust ducts intended to discharge the products of combustion are operating properly;
 - f on completion of setting and adjustment operations, make sure that all mechanical locking devices of controls have been duly tightened;
 - g make sure that a copy of the burner use and maintenance instructions is available in the boiler room.
- In case of a burner shut-down, reset the control box by means of the RESET pushbutton. If a second shut-down takes place, call the Technical Service, **without trying to RESET further**.
- The unit shall be operated and serviced by qualified personnel only, in compliance with the regulations in force.

3) GENERAL INSTRUCTIONS DEPENDING ON FUEL USED

3a) ELECTRICAL CONNECTION

- For safety reasons the unit must be efficiently earthed and installed as required by current safety regulations.
 - It is vital that all safety requirements are met. In case of any doubt, ask for an accurate inspection of electricians by qualified personnel, since the manufacturer cannot be held liable for damages that may be caused by failure to correctly earth the equipment.
 - Qualified personnel must inspect the system to make sure that it is adequate to take the maximum power used by the equipment shown on the equipment rating plate. In particular, make sure that the system cable cross section is adequate for the power absorbed by the unit.
 - No adaptors, multiple outlet sockets and/or extension cables are permitted to connect the unit to the electric mains.
 - An omnipolar switch shall be provided for connection to mains, as required by the current safety regulations.
 - The use of any power-operated component implies observance of a few basic rules, for example:
 - do not touch the unit with wet or damp parts of the body and/or with bare feet;
 - do not pull electric cables;
 - do not leave the equipment exposed to weather (rain, sun, etc.) unless expressly required to do so;
 - do not allow children or inexperienced persons to use equipment;
 - The unit input cable shall not be replaced by the user.
- In case of damage to the cable, switch off the unit and contact qualified personnel to replace.

When the unit is out of use for some time the electric switch supplying all the power-driven components in the system (i.e. pumps, burner, etc.) should be switched off.

3b) FIRING WITH GAS, LIGHT OIL OR OTHER FUELS

GENERAL

- The burner shall be installed by qualified personnel and in compliance with regulations and provisions in force; wrong installation can cause injuries to people and animals, or damage to property, for which the manufacturer cannot be held liable.
- Before installation, it is recommended that all the fuel supply system pipes be carefully cleaned inside, to remove foreign matter that might impair the burner operation.
- Before the burner is commissioned, qualified personnel should inspect the following:
 - a the fuel supply system, for proper sealing;
 - b the fuel flow rate, to make sure that it has been set based on the firing rate required of the burner;
 - c the burner firing system, to make sure that it is supplied for the designed fuel type;
 - d the fuel supply pressure, to make sure that it is included in the range shown on the rating plate;
 - e the fuel supply system, to make sure that the system dimensions are adequate to the burner firing rate, and that the system is equipped with all the safety and control devices required by the regulations in force.
- When the burner is to remain idle for some time, the fuel supply tap or taps should be closed.

SPECIAL INSTRUCTIONS FOR USING GAS

Have qualified personnel inspect the installation to ensure that:

- a the gas delivery line and train are in compliance with the regulations and provisions in force;
 - b all gas connections are tight;
 - c the boiler room ventilation openings are such that they ensure the air supply flow required by the current regulations, and in any case are sufficient for proper combustion.
- Do not use gas pipes to earth electrical equipment.
 - Never leave the burner connected when not in use. Always shut the gas valve off.
 - In case of prolonged absence of the user, the main gas delivery valve to the burner should be shut off.

Precautions if you can smell gas

- a do not operate electric switches, the telephone, or any other item likely to generate sparks;
 - b immediately open doors and windows to create an air flow to purge the room;
 - c close the gas valves;
 - d contact qualified personnel.
- Do not obstruct the ventilation openings of the room where gas appliances are installed, to avoid dangerous conditions such as the development of toxic or explosive mixtures.

DIRECTIVES AND STANDARDS

Gas burners

European directives:

- Directive 90/396/CEE - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

Harmonised standards :

- UNI EN 676 (Gas Burners);
- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

Light oil burners

European directives:

- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

Harmonised standards :

- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

- UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Heavy oil burners

European directives:

- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

Harmonised standards :

- CEI EN 60335-1 Household and similar electrical appliances - SafetyPart 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

- UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Gas - Light oil burners

European directives:

- Directive 90/396/CEE Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

Harmonised standards :

- UNI EN 676 Gas Burners
- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

- UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Gas - Heavy oil burners

European directives:

- Directive 90/396/CEE - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

Harmonised standards :

- UNI EN 676 (Gas Burners);
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- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

- UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

PART I: INSTALLATION

GENERAL FEATURES

This particular burner series has been studied to use compressed air or alternatively steam, to atomize heavy oil. In this way we have achieved higher efficiency compared to mechanical atomization. These burners are equipped with a low pressure nozzle which permits to save fuel and, above all, to preserve the whole system. All burners are progressive type, complete with electrical panel, with self cleaning nozzle system and oil pump motor to be separately installed by the final user. A supplying system of compressed air and steam at 8 bar must be provided on the site. All burners are ignited by means of a pilot flame burning LPG or Natural gas. The standard version of the burner uses compressed air to atomize oil fuel. If compressed air is not available on site, it is possible to use steam to atomize oil fuel by using a special kit. In any case compressed air is essential: to ignite the burner when steam is not available, to control valves and for self cleaning nozzle.

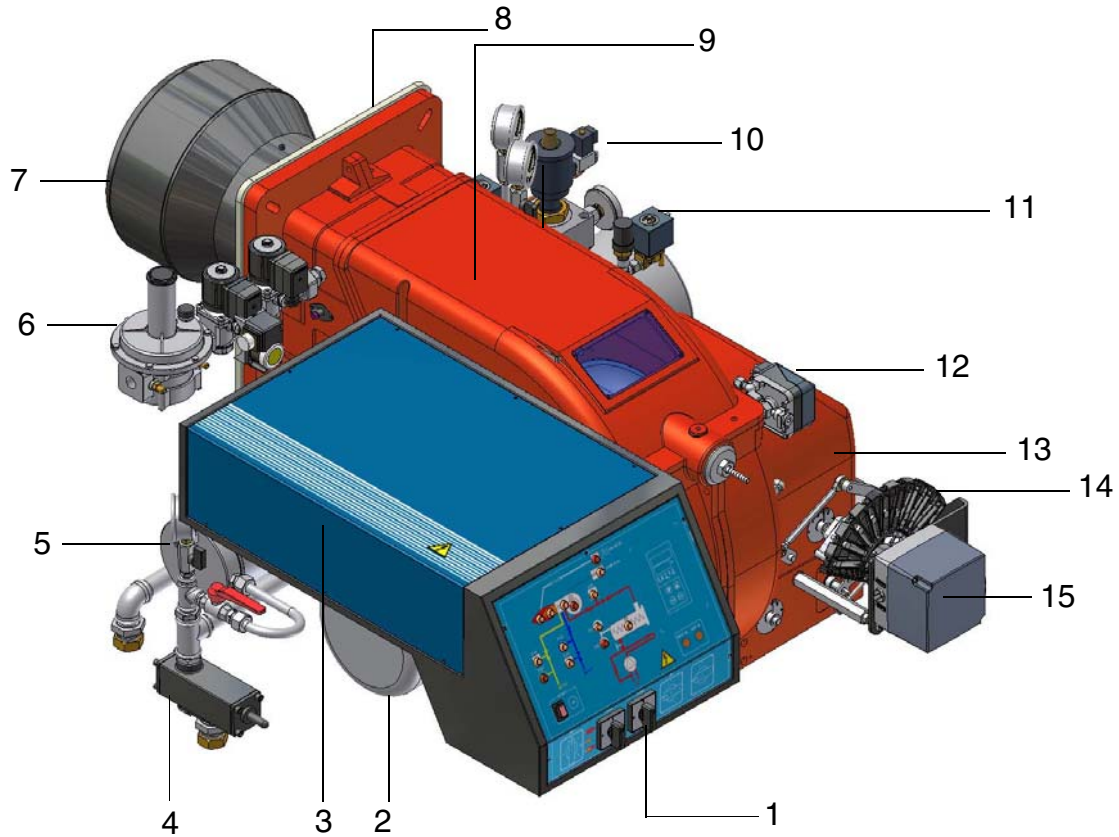


Fig. 1

- 1 Control panel
- 2 Fan motor
- 3 Electrical panel
- 4 Pressure governor
- 5 Oil pre-heater tank
- 6 Pilot gas train
- 7 Blast tube-combustion head
- 8 Burner flange
- 9 Burner cover
- 10 Oil train
- 11 Compressed air train
- 12 Air pressure switch
- 13 Air inlet
- 14 Adjusting cam
- 15 Actuator

Burner model identification

Burners are identified by burner type and model. Burner model identification is described as follows.

Type	Model	H-	PR.	S.	*	A.
(1)	(2)	(3)	(4)	(5)	(6)	(6)
(1) BURNER TYPE	PBY90 - PBY91 - PBY92 - PBY510 - PBY515 - PBY520 - PBY525					
(2) FUEL	H - heavy oil, max viscosity 4000cSt (530°E) @ 50°C					
(3) OPERATION (Available versions)	PR - Progressive			MD - Fully modulating		
(4) BLAST TUBE	S - Standard			L - Extended		
(5) DESTINATION COUNTRY	* - see data plate					
(6) BURNER VERSION	A - Standard					

Technical Specifications

BURNER		PBY90	PBY91	PBY92
Output	min ÷ max kW	670 - 2000	500 - 2500	700 - 3000
Fuel		Heavy oil		
Oil viscosity		See "Burner model identification" table		
Heavy oil rate	min. ÷ max. kg/h	60 - 178	45 - 223	62 - 267
Gas pressure	max. mbar	500		
Gas pressure after gas governor	mbar	100		
Compressed air pressure	min. ÷ max. bar	4 - 10		
Power supply		400V 3N a.c. 50Hz		
Total power consumption	kW	12.25	13.25	18.75
Fan motor	kW	3	4	5.5
Pump motor	kW	0.75	0.75	0.75
Pre-heater resistors	kW	8	8	12
Protection		IP40		
Approx. weight	kg	165	175	185
Operation		Progressive - Fully modulating		
Operating temperature	°C	-10 ÷ +50		
Storage Temperature	°C	-20 ÷ +60		
Working service*		Intermittent		

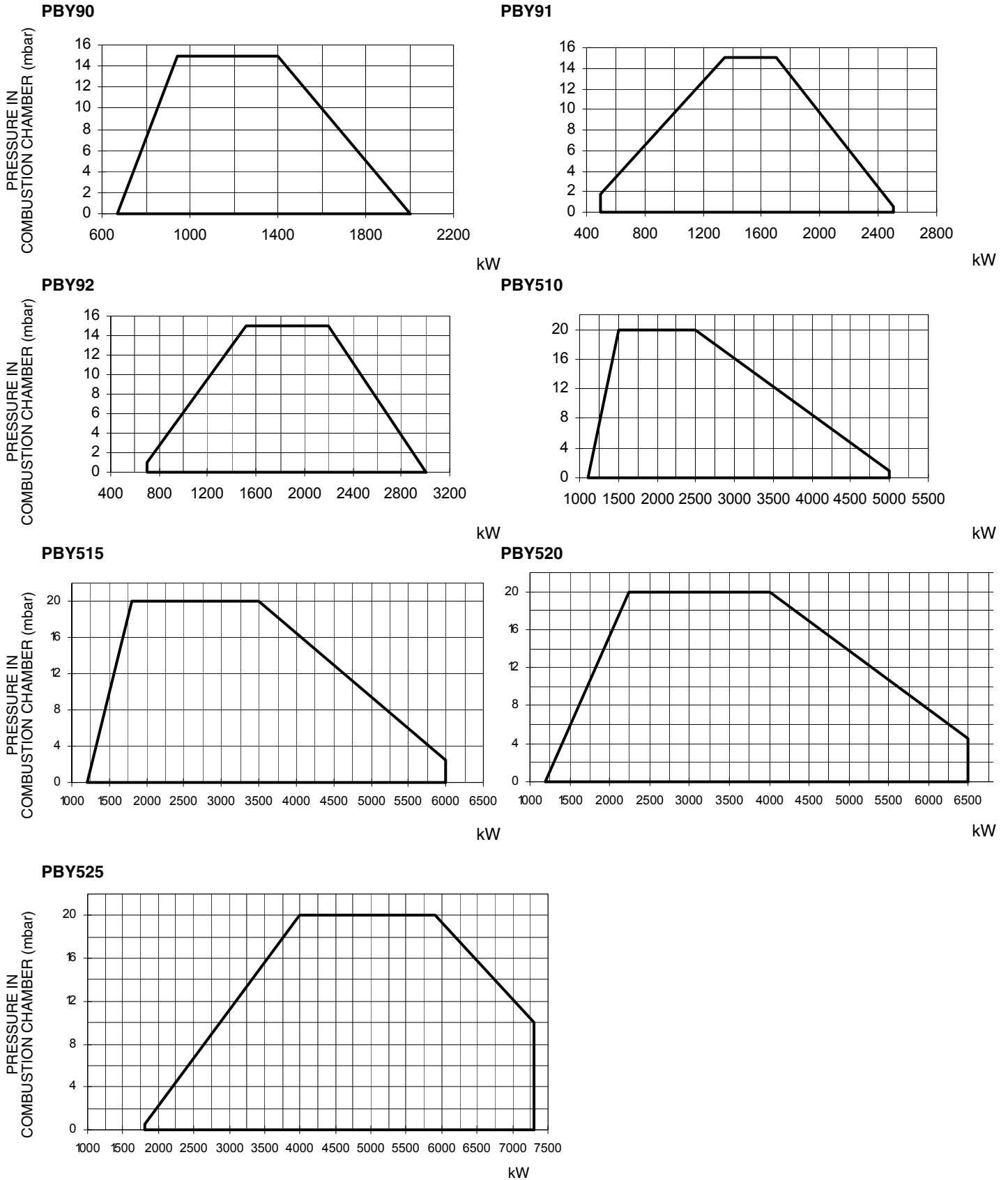
BURNER		PBY510	PBY515	PBY520	PBY525
Output	min ÷ max kW	1100 - 5000	1200 - 6000	1200 - 6500	1800 - 7300
Fuel		Heavy oil			
Oil viscosity		See "Burner model identification" table			
Heavy oil rate	min. ÷ max. kg/h	98 - 446	107 - 535	107 - 579	160 - 651
Gas pressure	max. mbar	500			
Gas pressure after gas governor	mbar	100			
Compressed air pressure	min. ÷ max. bar	4 - 10			
Power supply		400V 3N a.c. 50Hz			
Total power consumption	kW	26.75	30.25	40.25	43.75
Fan motor	kW	7.5	11	15	18.5
Pump motor	kW	0.75	0.75	0.75	0.75
Pre-heater resistors	kW	18	18	24	24
Protection		IP40			
Approx. weight	kg	230	240	250	260
Operation		Progressive - Fully modulating			
Operating temperature	°C	-10 ÷ +50			
Storage Temperature	°C	-20 ÷ +60			
Working service*		Intermittent			

Heavy oil net calorific value (Hi): 40.43 MJ/kg (average value).

***NOTE ON THE BURNER WORKING SERVICE: for safety reasons, one controlled shutdown must be performed after 24 hours of intermittent operation.**

WARNING: the burners are supplied for 400V three phase supply; in case of three phase 230V supply, replace the thermal overload relays. Maximum output is referred to a null backpressure in the furnace.

Performance Curves

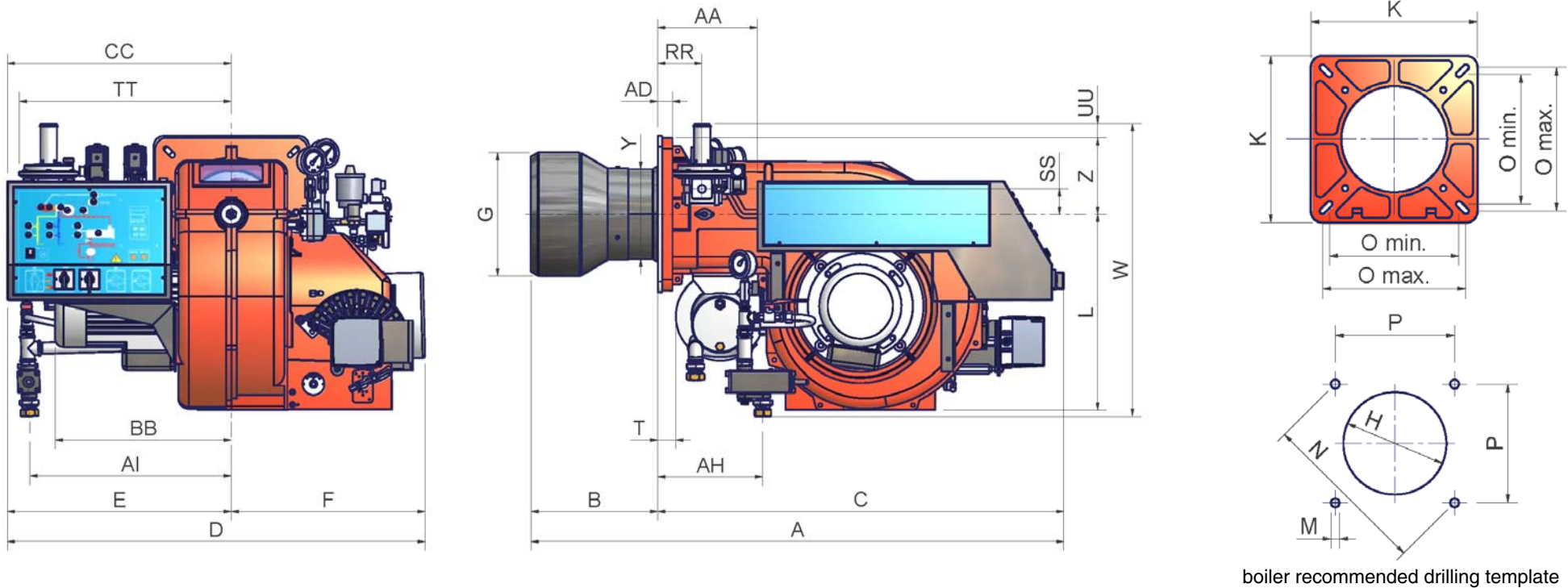


To get the input in kcal/h, multiply value in kW by 860.

Data are referred to standard conditions: atmospheric pressure at 1013mbar, ambient temperature at 15°C

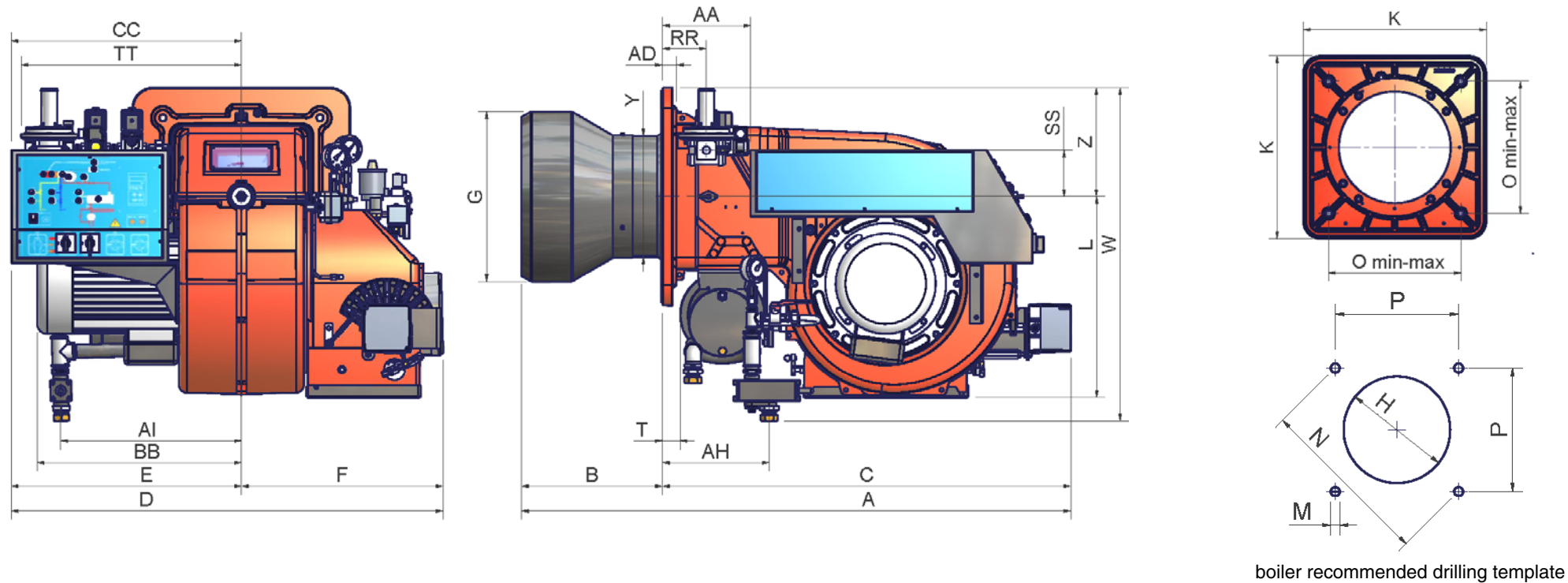
NOTE: The performance curve is a diagram that represents the burner performance in the type approval phase or in the laboratory tests, but does not represent the regulation range of the machine. On this diagram the maximum output point is usually reached by adjusting the combustion head to its "MAX" position (see paragraph "Adjusting the combustion head"); the minimum output point is reached setting the combustion head to its "MIN" position. During the first ignition, the combustion head is set in order to find a compromise between the burner output and the generator specifications, that is why the minimum output may be different from the Performance curve minimum.

Overall dimensions (mm)



8

	A	AA	AD	AH	AI	B	BB	C	CC	D	E	F	G	H	K	L	M	N	O min	O max	P	RR	SS	T	TT	UU	W	Y	Z
PBY90	1258	237	35	250	479	294	419	964	532	992	532	460	246	276	360	464	M12	417	280	310	295	105	60	43	504	34	693	228	180
PBY91	1262	237	35	250	479	298	419	964	532	992	532	460	262	292	360	464	M12	417	280	310	295	105	60	43	504	34	693	228	180
PBY92	1265	237	35	250	479	301	419	964	532	992	532	460	292	322	360	464	M12	417	280	310	295	105	60	43	504	34	693	228	180



boiler recommended drilling template

	A(*S)	A(*L)	AA	AD	AH	AI	B(*S)	B(*L)	BB	C	CC	D	E	F	G	H	K	L	M	N	O	P	RR	SS	T	TT	UU	W	Y	Z
PBY510	1364	1544	219	35	265	448	350	530	468	1014	571	1072	571	501	345	385	540	498	M14	552	390	390	109	115	44	547	30	827	245	270
PBY515	1364	1544	219	35	265	448	350	530	508	1014	571	1072	571	501	384	424	540	498	M14	552	390	390	109	115	44	547	30	827	276	270
PBY520	1364	1544	219	35	265	448	350	530	508	1014	571	1072	571	501	422	472	540	498	M14	552	390	390	109	115	44	547	x	827	300	270
PBY525	1408	-	219	35	265	448	350	-	642	1058	571	1142	642	501	422	472	540	498	M14	552	390	390	109	115	44	547	x	827	300	270

*S = measure referred to burner fitted with standard blast tube

*L = measure referred to burner fitted with extended blast tube

INSTALLING THE BURNER

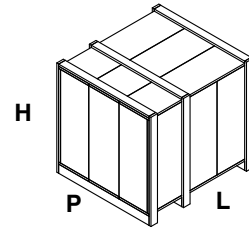
Packing

Burners are despatched in wooden crates whose dimensions are:

- PBY90-91-92: 1730 mm x 1280 mm x 1020 mm(L x P x H)
- PBY510-515-520-525: 1730 mm x 1430 mm x 1130 mm(L x P x H)

Packing cases of this kind are affected by humidity and are not suitable for stacking. The following are placed in each packing case:

- burner;
- gasket/ceramic fiber plait to be inserted between the burner and the boiler;
- oil flexible hoses;
- oil filter;
- envelope containing this manual.

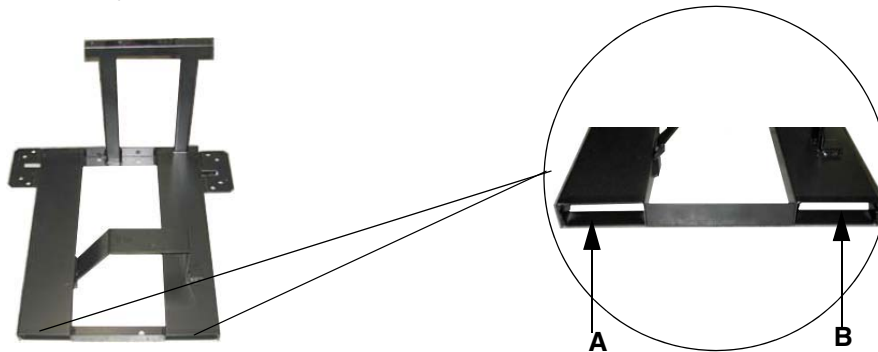


To get rid of the burner's packing, follow the procedures laid down by current laws on disposal of materials.

Handling the burner

	ATTENTION! The handling operations must be carried out by specialised and trained personnel. If these operations are not carried out correctly, the residual risk for the burner to overturn and fall down still persists.
	To move the burner, use means suitable to support its weight (see paragraph "Technical specifications").
	The unpacked burner must be lifted and moved only by means of a fork lift truck.

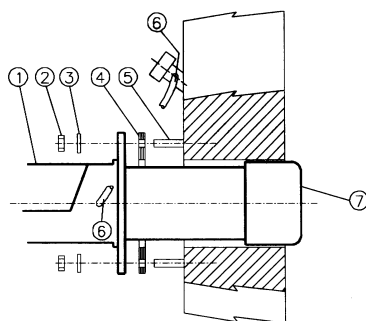
The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A and B ways. Remove the stirrup only once the burner is installed to the boiler.



Fitting the burner to the boiler

To install the burner into the boiler, proceed as follows:

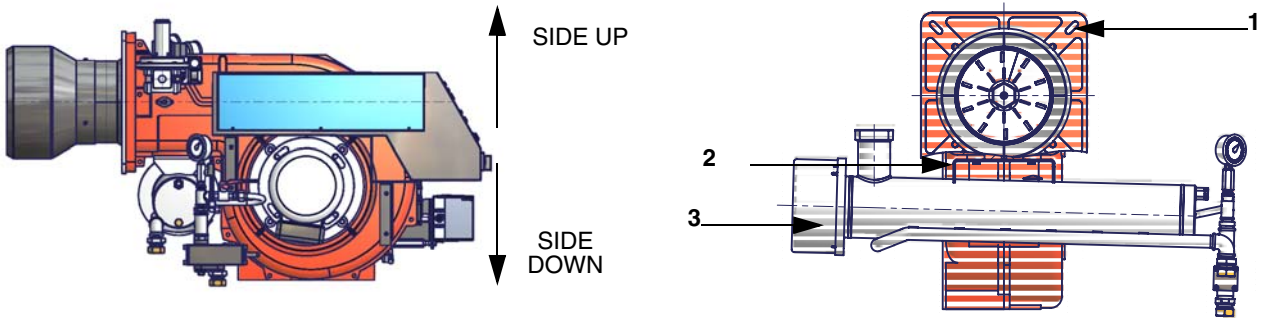
- 1 make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions"
- 2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
- 3 place the 4 stud bolts (5) on boiler's door, according to the burner's drilling template described on paragraph "Overall dimensions";
- 4 fasten the 4 stud bolts;
- 5 place the gasket on the burner flange;
- 6 install the burner into the boiler;
- 7 fix the burner to the stud bolts, by means of the fixing nuts, according to the next picture.
- 8 After fitting the burner to the boiler, ensure that the gap between the blast tube and the refractory lining is sealed with appropriate insulating material (ceramic fibre cord or refractory cement).



Keys

- 1 Burner
- 2 Fixing nut
- 3 Washer
- 4 Sealing gasket
- 5 Stud bolt
- 7 Blast tube



The burner is designed to work positioned according to the picture below. Set the upper side of the burner flange in a horizontal position, in order to find the correct inclination of the pre-heater tank. For different installations, please contact the Technical Department.



Key

- 1 Burner flange (upper side indicated)
- 2 Bracket
- 3 Pre-heating tank on the burner

Electrical connections

	Respect the basic safety rules. Make sure of the connection to the earthing system. Do not reverse the phase and neutral connections. Fit a differential thermal switch adequate for connection to the mains.
	ATTENTION: before executing the electrical connections, pay attention to turn the plant's switch to OFF and be sure that the burner's main switch is in 0 position (OFF) too. Read carefully the chapter "WARNINGS", and the "Electrical connections" section.
	WARNING: The burner is provided with an electrical bridge between terminals 6 and 7; when connecting the high/low flame thermostat, remove this bridge before connecting the thermostat.
	IMPORTANT: Connecting electrical supply wires to the burner terminal block MA, be sure that the ground wire is longer than phase and neutral ones.
	auxiliary contacts are provided (terminals no. 507 and no. 508 of the MA terminal block) to connect an intervention system (alarm/power supply cutoff) in case of fault of the oil resistor contactor (see Fig. 2-Fig. 3).

To execute the electrical connections, proceed as follows:

- 1 remove the cover from the electrical board, unscrewing the fixing screws;
- 2 execute the electrical connections to the supply terminal board as shown in the following diagrams;
- 3 check the direction of the fan-pump motor (see next paragraph);
- 4 refit the panel cover.

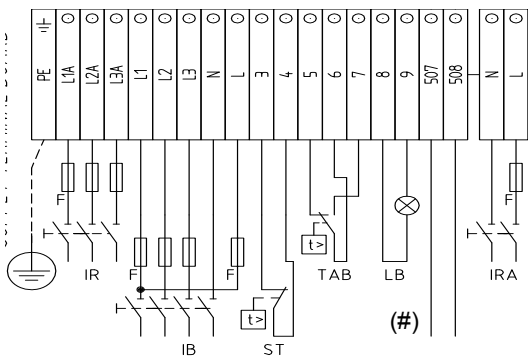


Fig. 2 - Progressive burners

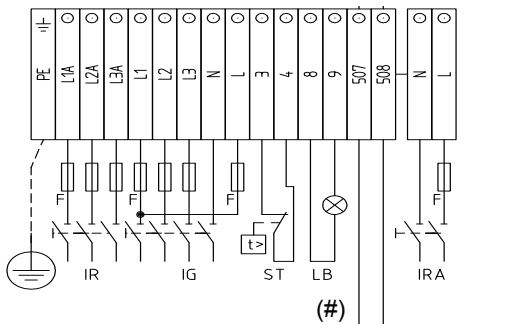


Fig. 3 - Fully modulating burners

(#) Free contact for "Faulty heater resistor contactor"

(**) Probes connection (see Fig. 4)

MA

MA

Probes connection

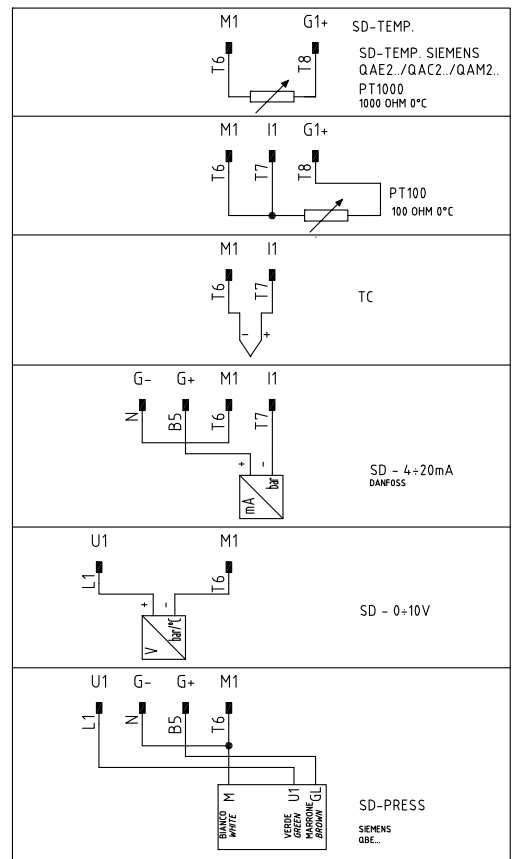


Fig. 4

Probes connection oby means of the 7-pins plug (Fig. 5) - see Fig. 4 for connections.

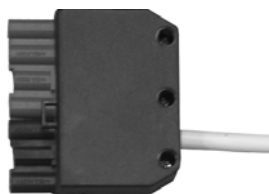


Fig. 5

Fan motor and pump motor direction

Once the electrical connection of the burner is performed, remember to check the rotation of the motor. The motor should rotate according to the arrow shown on the next picture. In the event of incorrect rotation reverse the three-phase supply and check again the rotation of the motor.

NOTE: burners are supplied for three-phase 400 V supply, and in the case of three-phase 230 V supply it is necessary to modify the electrical connections inside the terminal box of the electric motor and replace the thermal cutout relay.



Connecting the oil heating resistors

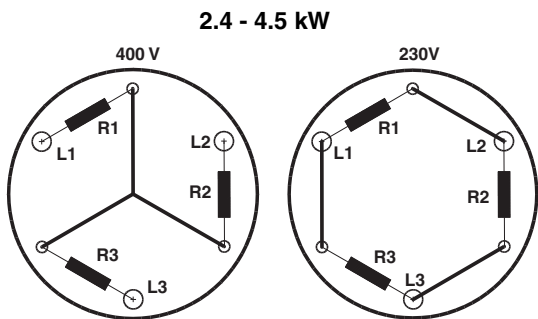


Fig. 6

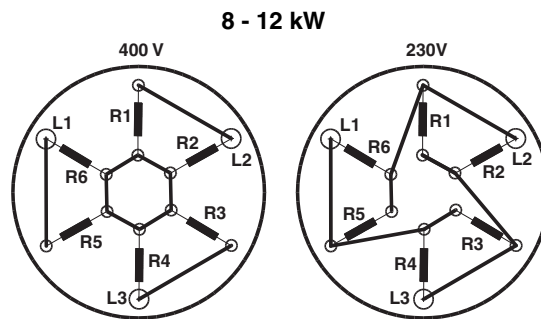


Fig. 7

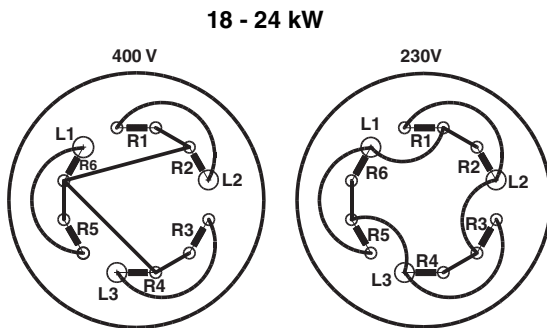


Fig. 8

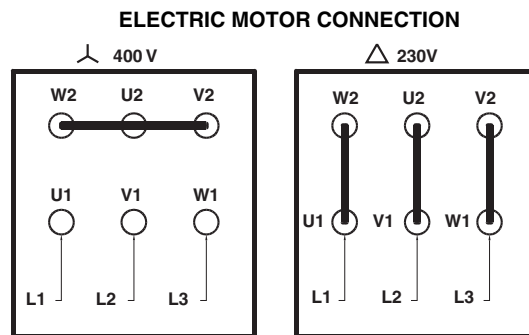


Fig. 9

Recommendations to design heavy oil feeding plants

This paragraph is intended to give some suggestions to make feeding plants for heavy oil burners. To get a regular burner operation, it is very important to design the supplying system properly. Here some suggestions will be mentioned to give a brief description.

The term "heavy oil" is generic and summarises several chemical-physical properties, above all viscosity. The excessive viscosity makes the oil impossible to be pumped, so it must be heated to let it flow in the pipeline; because of the low-boiling hydrocarbons and dissolved gases, the oil must be also pressurised. The pressurisation is also necessary to feed the burner pump avoiding its cavitation because of the high suction at the inlet. The supplying system scope is to pump and heat oil.

The oil viscosity is referred in various unit measures; the most common are: °E, cSt, Saybolt and Redwood scales. Table 3 shows the various unit conversions (e.g.: 132 cSt viscosity corresponds to 17.5°E viscosity).

The diagram in Fig. 10 shows how the heavy oil viscosity changes according to its temperature.

Example: an oil with 22°E viscosity at 50°C once heated to 100°C gets a 3 °E viscosity.

As far as the pumping capability, it depends on the type of the pump that pushes the oil even if on diagram in Fig. 10 a generic limit is quoted at about 100 °E, so it is recommended to refer to the specifications of the pump provided.

Usually the oil minimum temperature at the oil pump inlet increases as viscosity does, in order to make the oil easy to pump. Referring to the diagram on Fig. 11, it is possible to realise that to pump an oil with 50°E viscosity at 50°C, it must be heated at about 80°C.

Pipe heating system

Pipe heating system must be provided, that is a system to heat pipes and plant components to maintain the viscosity in the pumping limits. Higher the oil viscosity and lower the ambient temperature, more necessary the pipe heating system.

Inlet minimum pressure of the pump (both for supplying system and burner)

A very low pressure leads to cavitation (signalled by its peculiar noise): the pump manufacturer declares the minimum value. Therefore, check the pump technical sheets.

By increasing the oil temperature, also the minimum inlet pressure at the pump must increase, to avoid the gassification of the oil low-boiling products and the cavitation. The cavitation compromises the burner operation, it causes the pump to break too. The diagram on Fig. 12 roughly shows the inlet pump pressure according to the oil temperature.

Pump operating maximum pressure (both for the supplying system and burner)

Remember that pumps and all the system components through which the oil circulates, feature an upper limit. Always read the technical documentation for each component. Schemes on Fig. 13 and Fig. 14 are taken from UNI 9248 "liquid fuel feeding lines from tank to burner" standard and show how a feeding line should be designed. For other countries, see related laws in force. The pipe dimensioning, the execution and the winding dimensioning and other constructive details must be provided by the installer.

Adjusting the supplying oil ring

According to the heavy oil viscosity used, in the table below indicative temperature and pressure values to be set are shown.

Note: the temperature and pressure range allowed by the supplying ring components must be checked in the specifications table of the components themselves.

HEAVY OIL VISCOSITY AT 50 °C		PIPELINE PRESSURE	PIPELINE TEMPERATURE
cSt (°E)		bar	°C
	< 50 (7)	1- 2	20
> 50 (7)	< 110 (15)	1- 2	50
> 110 (15)	< 400 (50)	1- 2	65
> 400 (50)	< 4000 (530)	1- 2	100

Tab. 1 - Supply pipeline hydraulic scheme 3ID0024, pump n.4

Burner adjustments

The table below shows indicative values of temperature and pressure to be set on the burner devices, according to the viscosity of the heavy oil used. The oil temperature should be set on TR resistor thermostat in order to get about 10 - 40 cSt (2 - 5 °E) viscosity at the nozzle. The oil temperature must not exceed 160°C.

VISCOSITY AT 50 °C		OIL PRESSURE AFTER BURNER PUMP (N. 2 in 3I2D01)		OIL PRESSURE AFTER OIL METERING VALVE (N. 14 IN 3I2D01)		TEMPERATURE OF THE PRE-HEATING RESISTORS THERMOSTAT TR		TEMPERATURE OF THE RESISTORS SAFETY THERMOSTAT TRS	TEMPERATURE OF THE PLANT ENABLING THERMOSTAT TCI
		min	max	min	max	min	max		
°E		bar		bar		°C		°C	°C
	< 50 (7)	5	8	0.5	2	70	95	190	50
> 50 (7)	< 110 (15)	5	8	0.5	2	75	105	190	60
> 110 (15)	< 400 (50)	5	8	0.5	2	100	140	190	70
> 400 (50)	<4000 (530)	5	8	0.5	2	140	160	190	70

Tab. 2 - Burner - hydraulic scheme 3I2D01, pump n.2



ATTENTION: Atomizing air pressure is typically set at 0.1 ÷ 0.3 bar lower than oil pressure.

Viscosity units conversion table

Cinematics viscosity Centistokes (cSt)	Engler Degrees (°E)	Saybolt Seconds Universal (SSU)	Saybolt Seconds Furol (SSF)	Redwood Seconds no.1 (Standard)	Redwood Seconds no..2 (Admiralty)
1	1	31	--	29	--
2.56	1.16	35	--	32.1	--
4.3	1.31	40	--	36.2	5.1
7.4	1.58	50	--	44.3	5.83
10.3	1.88	60	--	52.3	6.77
13.1	2.17	70	12.95	60.9	7.6
15.7	2.45	80	13.7	69.2	8.44
18.2	2.73	90	14.44	77.6	9.3
20.6	3.02	100	15.24	85.6	10.12
32.1	4.48	150	19.3	128	14.48
43.2	5.92	200	23.5	170	18.9
54	7.35	250	28	212	23.45
65	8.79	300	32.5	254	28
87.6	11.7	400	41.9	338	37.1
110	14.6	500	51.6	423	46.2
132	17.5	600	61.4	508	55.4
154	20.45	700	71.1	592	64.6
176	23.35	800	81	677	73.8
198	26.3	900	91	762	83
220	29.2	1000	100.7	896	92.1
330	43.8	1500	150	1270	138.2
440	58.4	2000	200	1690	184.2
550	73	2500	250	2120	230
660	87.6	3000	300	2540	276
880	117	4000	400	3380	368
1100	146	5000	500	4230	461
1320	175	6000	600	5080	553
1540	204.5	7000	700	5920	645
1760	233.5	8000	800	6770	737
1980	263	9000	900	7620	829
2200	292	10000	1000	8460	921
3300	438	15000	1500	13700	--
4400	584	20000	2000	18400	--

Tab. 3

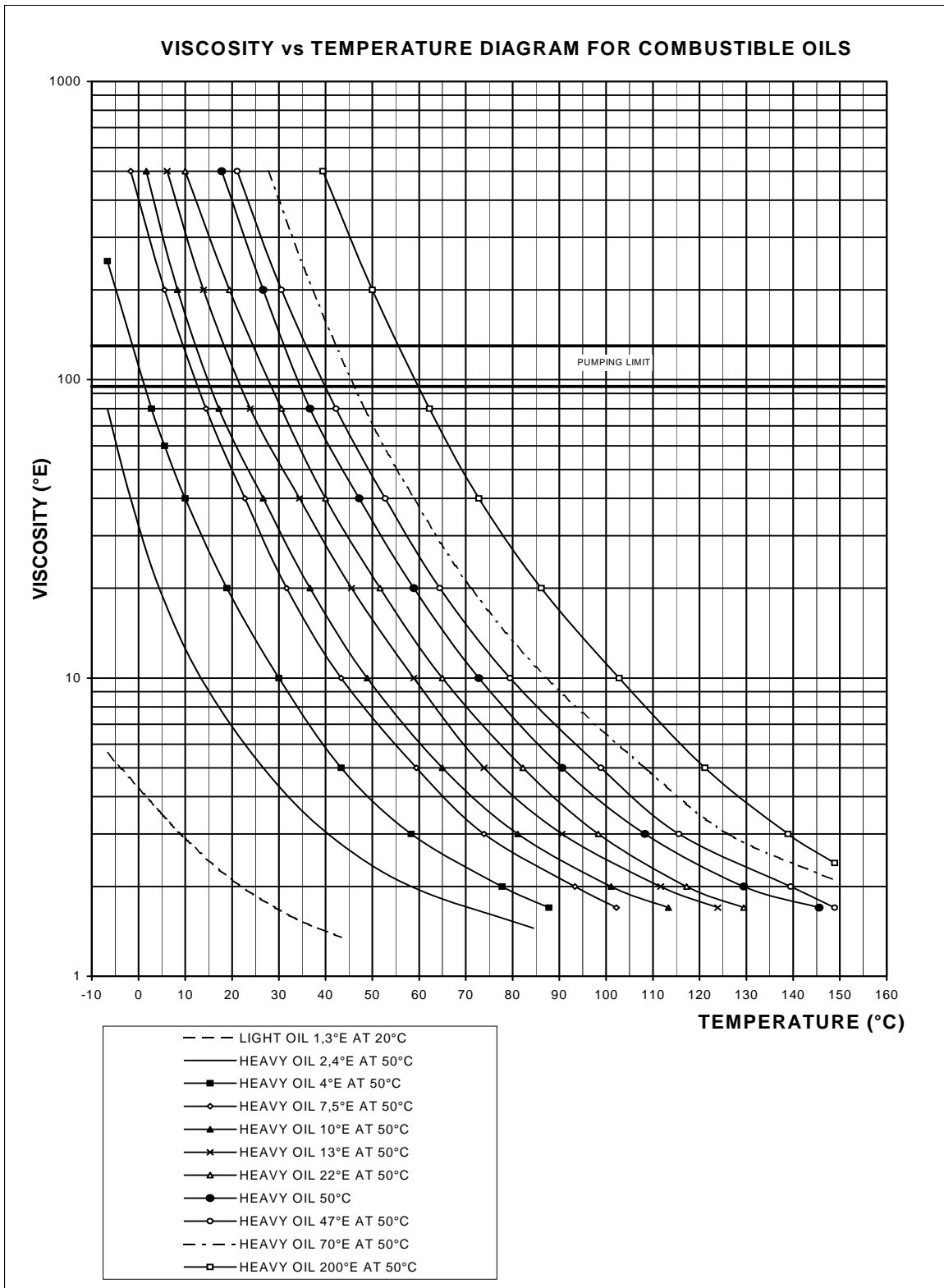


Fig. 10

Indicative diagram showing the oil temperature at burner pump inlet vs. oil viscosity

Example: if the oil has a 50°E @ 50°C viscosity, the oil temperature at the pump inlet should be 80°C (see diagram).

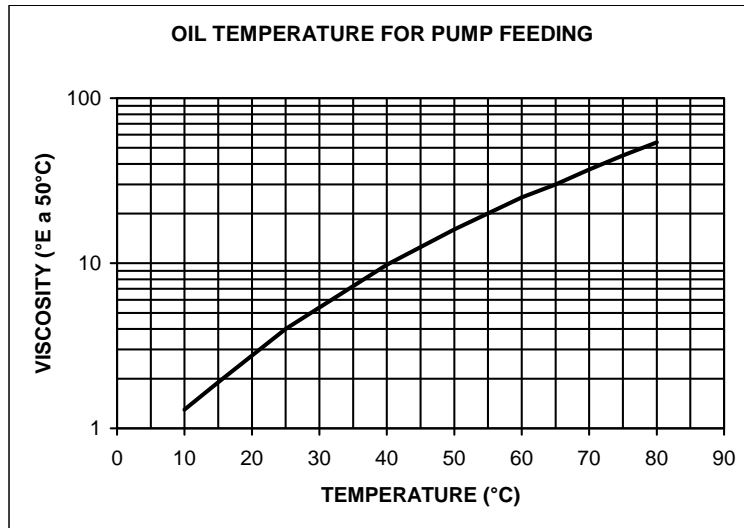


Fig. 11

Indicative diagram showing the oil pressure according to its temperature

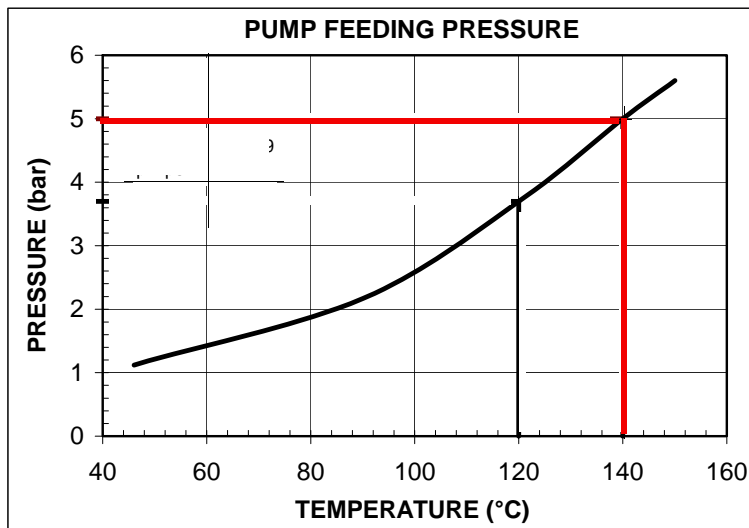
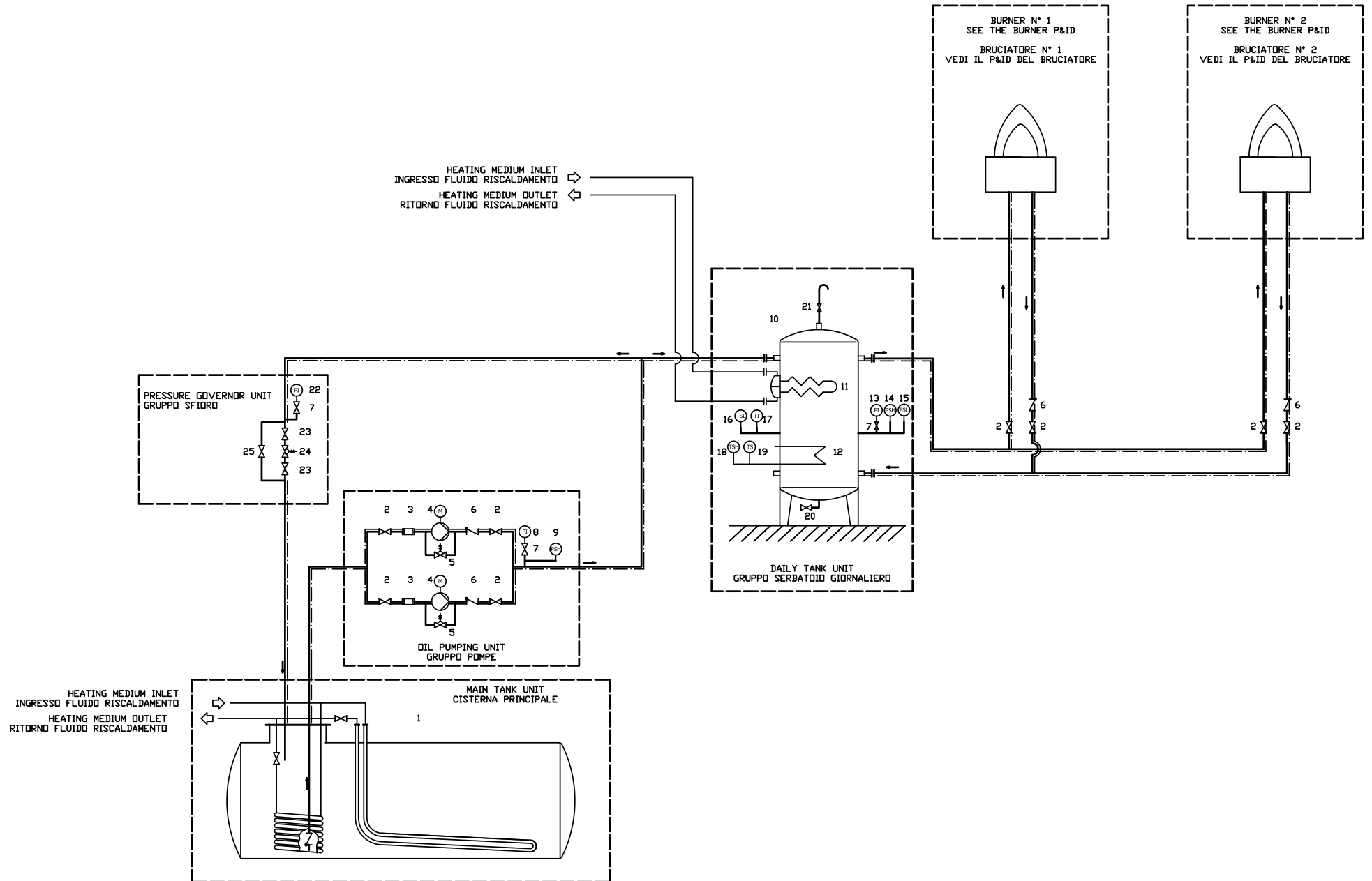


Fig. 12

Fig. 13 - Hydraulic diagram 3ID0024



3ID0024	KEYS
----------------	-------------

POS	OIL TRAIN
------------	------------------

1	Main tank
---	-----------

OIL PUMPING UNIT

2	Manual valve
---	--------------

3	Filter
---	--------

4	Pump coupled to electrical motor
---	----------------------------------

5	Safety valve
---	--------------

6	One-way valve
---	---------------

7	Manual valve
---	--------------

8	Pressure gauge
---	----------------

9	High pressure switch - PO MAX
---	-------------------------------

DAILY TANK

10	Daily tank
----	------------

11	Heating device
----	----------------

12	Electrical resistor
----	---------------------

13	Pressure gauge
----	----------------

14	High pressure switch - PO MAX
----	-------------------------------

15	Low pressure switch - PO MIN
----	------------------------------

16	Low thermostat - TCN
----	----------------------

17	Thermometer
----	-------------

18	High thermostat - TRS
----	-----------------------

19	Thermostat - TR
----	-----------------

20	Manual valve
----	--------------

21	Manual valve
----	--------------

PRESSURE GOVERNOR UNIT

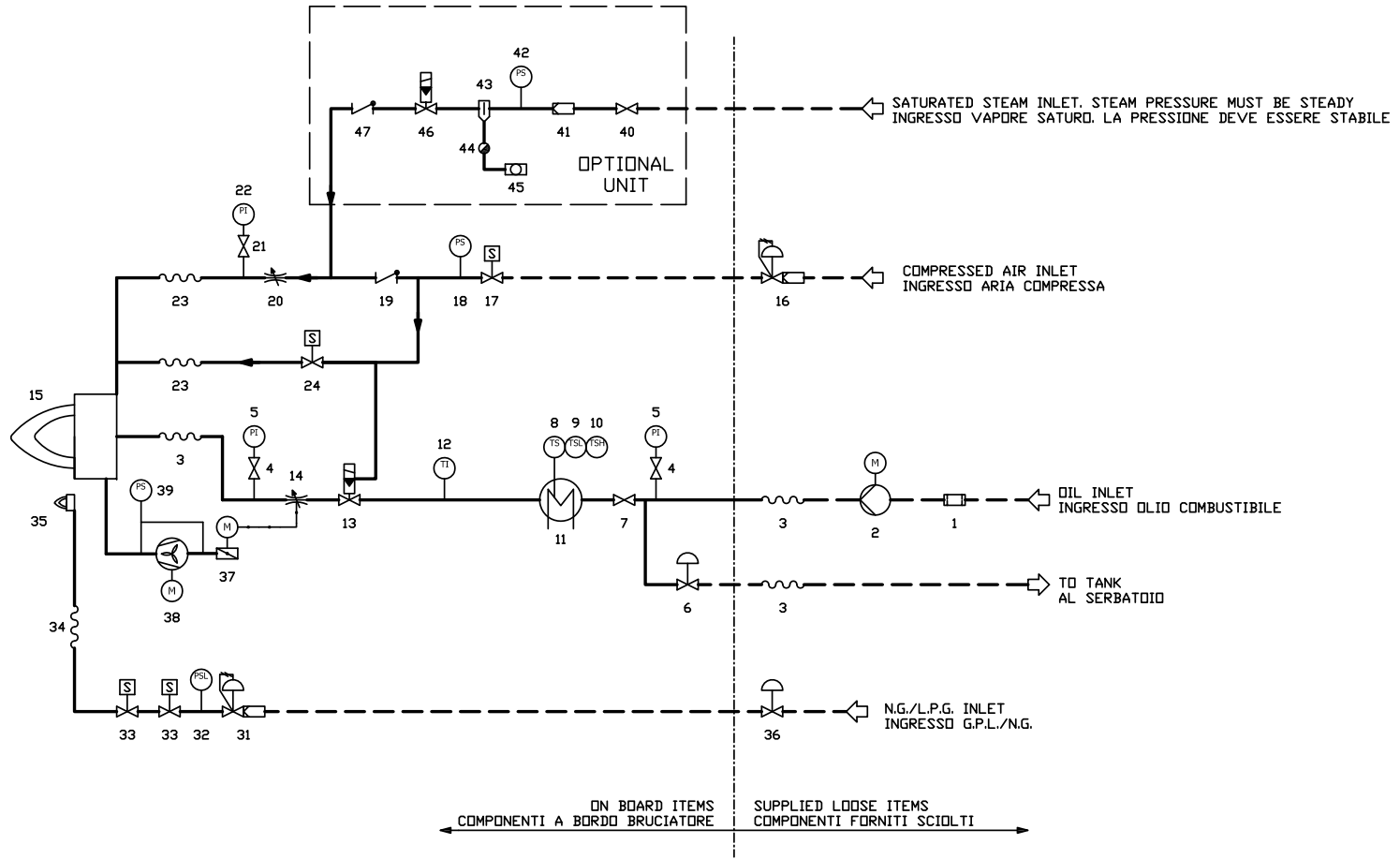
22	Pressure gauge
----	----------------

23	Manual valve
----	--------------

24	Pressure governor
----	-------------------

25	Needle valve
----	--------------

Fig. 14 - Hydraulic diagram 3I2D01



——— BY CIB UNIGAS
 ——— FORNITURA CIB UNIGAS
 - - - BY OTHERS
 - - - NON DI FORNITURA CIB UNIGAS

3I2D-01	KEYS		3I2D-01	KEYS
POS	OIL TRAIN			PILOT GAS TRAIN
1	Filter		31	Pressure governor with filter
2	Pump coupled to an electrical motor		32	Pressure switch - PGP
3	Flexible hose		33	Solenoid valve
4	Manual valve		34	Flexible hose
5	Pressure gauge		35	Pilot burner
6	Pressure governor		36	Pressure governor for L.P.G. tank
7	Manual valve			COMBUSTION AIR TRAIN
8	Thermostat - TR		37	Air damper with actuator
9	Low thermostat - TCI		38	Draught fan with electromotor
10	High thermostat - TRS		39	Pressure switch - PA
11	Electrical preheater tank			STEAM TRAIN (OPTIONAL)
12	Thermometer		40	Manual valve
13	Pneumatic valve		41	Filter
14	Metering valve		42	Pressure switch
15	Main burner		43	Water separator
	COMPRESSED AIR TRAIN		44	Water discharger
16	Pressure governor with filter		45	Flow indicator
17	Solenoid valve		46	Pneumatic valve
18	Pressure switch - PAC		47	One-way valve
19	One-way valve			
20	Metering valve			
21	Manual valve			
22	Pressure gauge			
23	Flexible hose			
24	Solenoid valve			

NOTE POS 36 is optional
Steam train is optional

Pilot gas train

The connection to the pilot gas train must be done according to the following scheme.

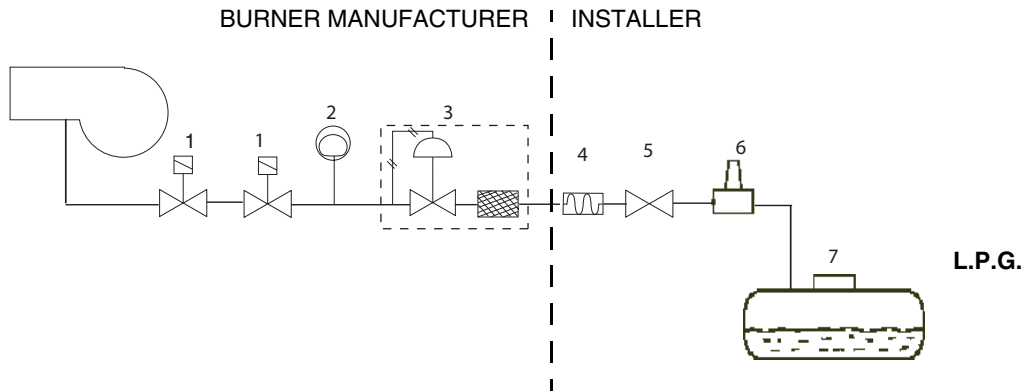


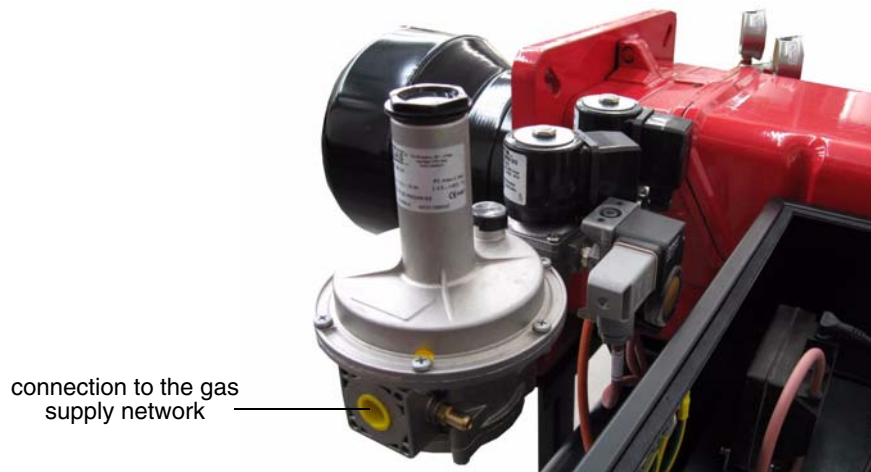
Fig. 15

Key

- 1 Gas solenoid valve
- 2 Gas pressure switch
- 3 Pressure governor with filter
- 4 Bellows unit
- 5 Manual cutoff valve
- 6 Pressure governor
- 7 Tank

Gas supply: LPG

The pilot gas train is already installed into the burner, the connection from the pressure governor with filter to the gas supply network must be carried out.



Once the gas train is installed, execute the electrical connections for all its items (gas valves group, pressure switch).



ATTENTION: once the gas train is mounted according to the diagram on Fig. 15, the gas proving test must be performed, according to the procedure set by the laws in force.

Heavy oil pumps

The pump provided with the burner must be installed according to the hydraulic diagram.

Cucchi FMG25 pumps

Capacity 1500l/h

Power consumption: 0.75kW

Speed: 1400 rpm

Max outlet pressure: 10bar

Max inlet pressure: 2bar

Min inlet pressure: -0.4bar

For further details see the manufacturer documentation.

Suntec TV Pressure governor

Pressure adjustment

Remove cap-nut 1 and the gasket 2, unscrew the lock nut 4. To increase pressure, twist adjusting screw 3 clockwise.

To decrease the pressure, twist screw counterclockwise. Tight the lock nut 4, refit the gasket 2 and the cap nut 1.

Key

- | | |
|---|-----------------|
| 1 | Cap nut |
| 2 | Gasket |
| 3 | Adjusting screw |
| 4 | Lock nut |
| 5 | Gasket |

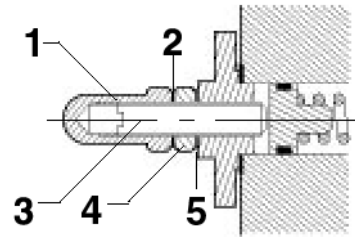


Fig. 16

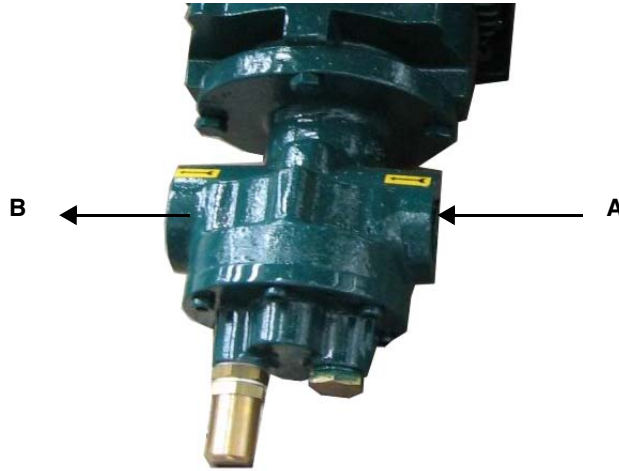
About the use of fuel pumps

- Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear teeth, thus obstructing them.
- After filling the tank, wait before starting the burner. This will give any suspended impurities time to deposit on the bottom of the tank, thus avoiding the possibility that they might be sucked into the pump.
- On initial commissioning a "dry" operation is foreseen for a considerable length of time (for example, when there is a long suction line to bleed). To avoid damages inject some lubrication oil into the vacuum inlet.
- Care must be taken when installing the pump not to force the pump shaft along its axis or laterally to avoid excessive wear on the joint, noise and overloading the gears.
- Pipes should not contain air pockets. Rapid attachment joint should therefore be avoided and threaded or mechanical seal junctions preferred. Junction threads, elbow joints and couplings should be sealed with removable seal component. The number of junctions should be kept to a minimum as they are a possible source of leakage.
- Do not use PTFE tape on the suction and return line pipes to avoid the possibility that particles enter circulation. These could deposit on the pump filter or the nozzle, reducing efficiency. Always use O-Rings or mechanical seal (copper or aluminium gaskets) junctions if possible.
- An external filter should always be installed in the suction line upstream of the fuel unit.

Connecting the oil flexible hoses to the pump

To connect the flexible oil hoses to the pump, proceed as follows, according to the pump provided:

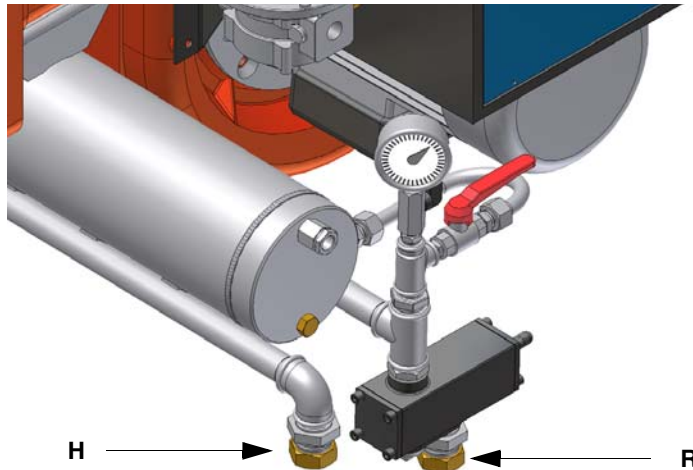
- 1 remove the closing nuts **A** (on the pump inlet) and **B** (from pump to the burner);
- 2 screw the rotating nut of the two flexible hoses on the pump **being careful to avoid exchanging the lines**: see the arrows marked on the pump.



Connecting the oil flexible hoses to the burner

To connect the flexible oil hoses to the pump, proceed as follows, according to the pump provided:

- 1 remove the closing nuts **H** (on the heater) and **R** (on the oil pressure governor) of the inlet and return connections;
- 2 screw the rotating nut of the two flexible hoses on the burner **being careful to avoid exchanging the inlet and return lines**: see the arrows marked that show the inlet and the return.

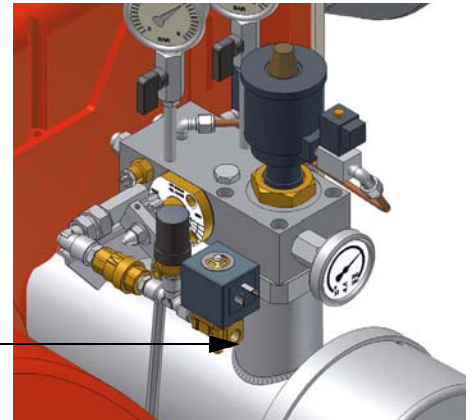


Connecting the compressed air hoses

To connect the compressed air supply, refer to the following pictures



Pressure governor with filter



Hydraulic connections

Key

- G Gas
- A Air
- O Oil
- CA Cleaning air

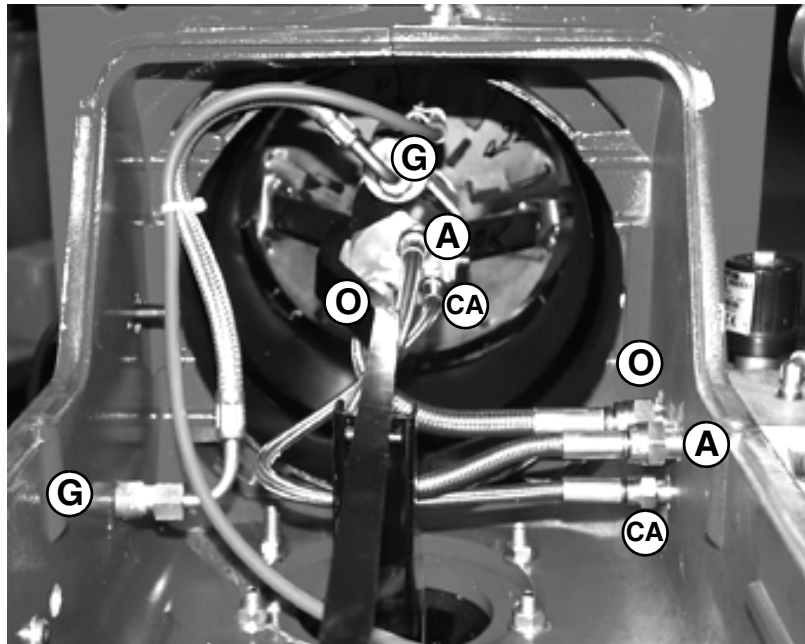


Fig. 17

ADJUSTING AIR AND FUEL RATE

	ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open. Be sure that the mains switch is closed.
	ATTENTION: During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the fuel decrease slowly until the normal combustion values are achieved.

	Before starting up the burner, make sure that the return pipe to the tank is not obstructed. Any obstruction would cause the pump seal to break.
--	--

	IMPORTANT! the combustion air excess must be adjusted according to the values in the following chart.
--	--

Recommended combustion parameters		
Fuel	Recommended (%) CO ₂	Recommended (%) O ₂
Heavy oil	11 ÷ 12.5	4.7 ÷ 6.7

The heavy oil flow rate can be adjusted choosing a nozzle that suits the boiler/utilisation output and setting properly the delivery pressure values.

Nozzles selection table

Nozzle	Maximum oil rate	Item code
	kg/h	
AA.120.1	120 kg/h	2610341
AA.150.2	150 kg/h	2610342
AA.190.3	190 kg/h	2610343
AA.220.4	220 kg/h	2610344
AA.300.5	300 kg/h	2610345
AA.350.6	350 kg/h	2610346
AA.470.7	470 kg/h	2610347
AA.570.8	570 kg/h	2610348
AA.750.9	750 kg/h	2610349
AA.950.0	950 kg/h	2610350

Oil thermostat adjustment

All thermostats are located inside the control panel. To set the temperature use a small screwdriver. Such temperature must be set during burner operation, checking temperature in the thermometer mounted on the pre-heating tank. We suggest a thermometer with scale up to 200° C.

Safety resistors thermostat TRS: it is factory preset and sealed. Do not change it!

When the set temperature is exceeded, check the reason why and reset it by means of the push button PR.

Resistor thermostat TR: check the best atomising oil temperature on paragraph on page 13 and set it on TR.

Thermostat TCI (it gives the enabling signal to the oil N.C. valve): set TCI at about 20° less than TR.

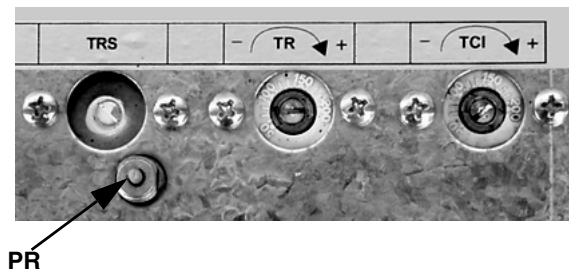


Fig. 18

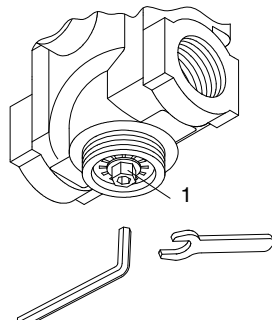
Adjusting the pilot gas flow rate: gas valve Brahma EG12xR and pressure governor

To change the pilot gas valve flow rate, proceed as follows:

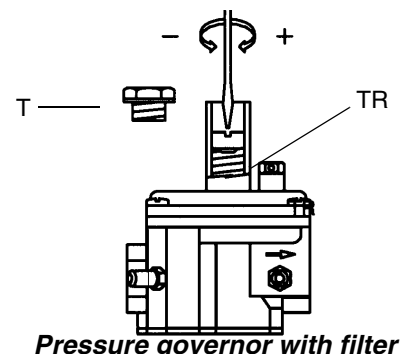
- 1 remove the protection on the bottom of the valve, moving it counterclockwise (see next picture);
- 2 rotate clockwise the nut 1 as shown in to close the valve or counterclockwise to open.

To perform a finest adjustment, act directly on the pressure governor as follows (see next picture):

- 3 remove the cap T: to increase the gas pressure at the outlet use a screwdriver on the screw TR as shown in the next picture. Screw to increase the pressure, unscrew to decrease; once the regulation is performed, replace cap T.



Brahma gas valve EGRx12



Pressure governor with filter

Set pilot gas pressure switch at 50 mbar.



Fig. 19

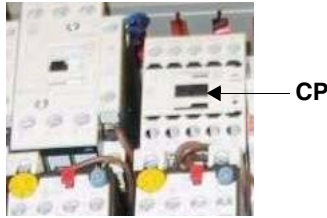
Adjustments - brief description

- Adjust the air and oil flow rates at the maximum output ("high flame") first, by means of the air damper and the adjusting cam respectively.
- Check that the combustion parameters are in the suggested limits.
- Then, adjust the combustion values corresponding to the points between maximum and minimum: set the shape of the adjusting cam foil. The adjusting cam sets the air/fuel ratio in those points, regulating the opening-closing of the fuel governor.
- Now set the low flame output, acting on the low flame microswitch of the actuator in order to avoid the low flame output increasing too much or the flues temperature getting too low to cause condensation in the chimney.

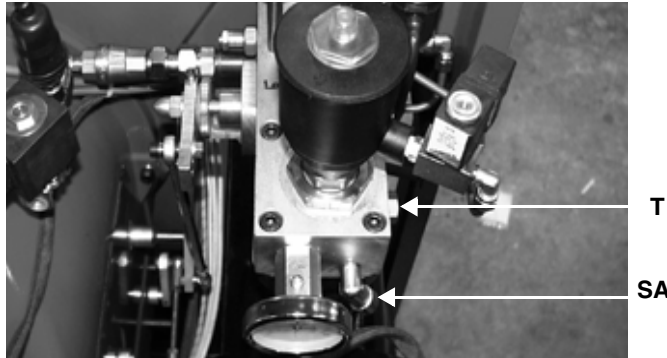
Now, adjust the burner according to the actuator model provided.

Oil Flow Rate Settings by means of Berger STM30./Siemens SQM40.. actuator

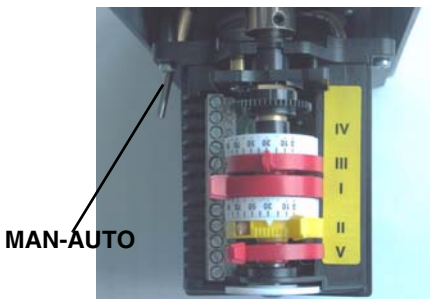
- 1 with the electrical panel open, prime the oil pump acting directly on the related contactor **CP** (see next picture): check the pump motor rotation (see “Fan motor and pump motor direction” on page 13) and keep pressing for some seconds until the oil circuit is charged;



- 2 bleed the air from the **SA** port by loosening the cap **T** without removing it, then release the contactor and fasten cap **T**.



- 3 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.
- 4 Turn the burner on by means of its main switch **A** (see next picture): if the burner locks (LED **B** on in the control panel) press the RESET button (**C**) on the control panel - “See “OPERATION” on page 34.”
- 5 Start the burner up by means of the thermostat series (terminals 3 and 4 - see wiring diagrams) and wait until the pre-purge phase comes to end and that burner starts up;
- 6 drive the burner to high flame stage, by means of the thermostat **TAB** (high/low flame thermostat - see Wiring diagrams), as far as fully-modulating burners, see related paragraph.
- 7 Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values (see next steps).



Berger STM30



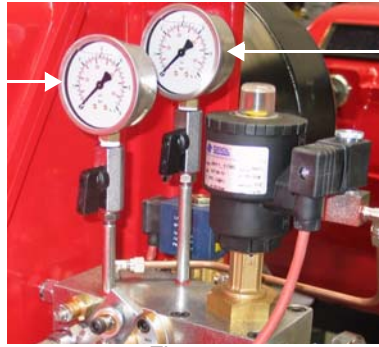
- Actuator cams**
- I High flame
 - II Stand-by and Ignition
 - III Low flame



Siemens SQM40

- 8 During high fire operation, oil pressure is about 2 bar (read on oil pressure gauge - see picture below).

compressed air pressure gauge



oil pressure gauge

Fig. 20

- 9 Set the atomising air pressure switch **PA** (Fig. 21) at 0.5 bar
- 10 Set the pilot gas pressure switch **PG** (Fig. 22) at 50 mbar.

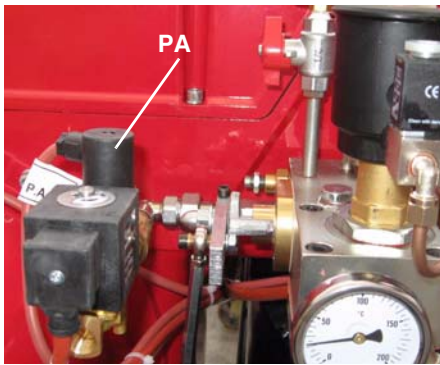


Fig. 21 - Atomising air pressure switch



Fig. 22 - Gas pressure switch

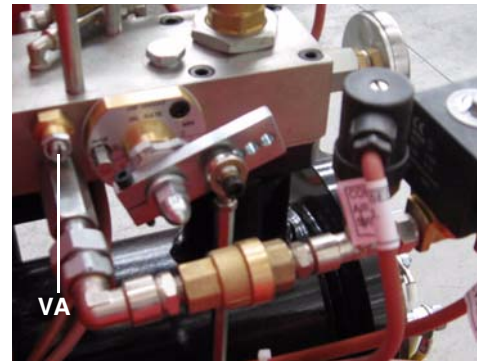


Fig. 23 - Atomising air flow rate adjustment

- 11 The nozzle supply pressure is already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); read the pressure on the oil pressure gauge on Fig. 25 and act on on the Suntec TV governor adjusting screw **VR** (see Fig. 24 and description on page 23) as to get the nozzle pressure at 2bar (see step 8). If the required flow rate is not reached, increase the feeding pressure by means of the Suntec TV governor (see picture below)

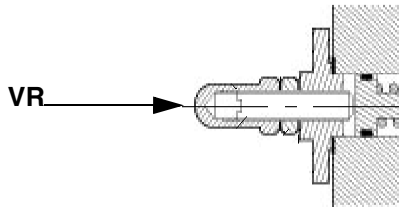


Fig. 24 - Suntec TV governor

compressed air pressure gauge
oil pressure gauge



Fig. 25 - Oil pressure governor



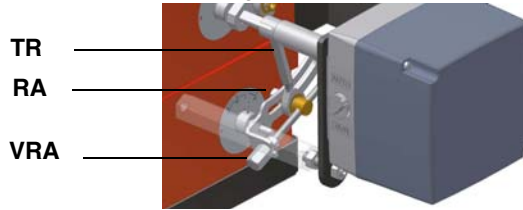
SV

Fig. 26

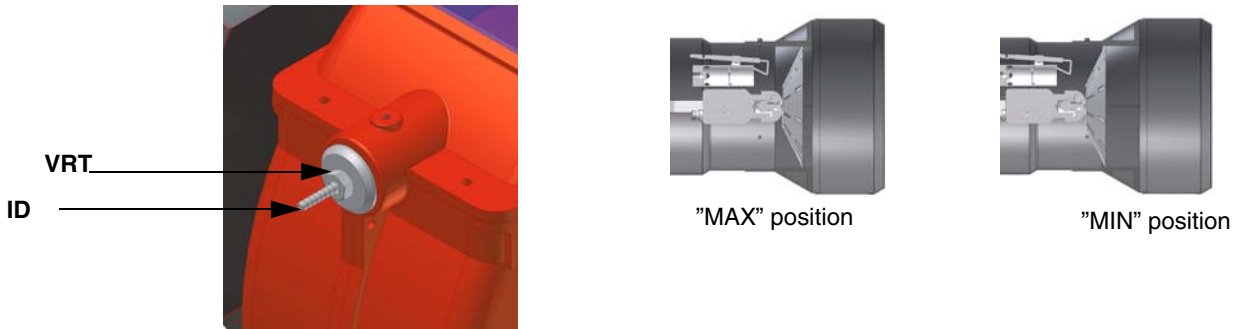
- 12 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the oil pressure gauge (Fig. 25): checking always the combustion parameters, the adjustment is to be performed by means of the **SV** adjusting cam screw **V** (Fig. 26) when the cam has reached the high flame position.

- 13 The atomising air flow rate and pressure can be adjusted with the **VA** screw (Fig. 23). Too low a pressure produces poor atomising with smoke in the flue. Too high a pressure produces instability and the flame can be cut off.
- 14 To adjust the **comburent air flow rate in the high flame stage**, loose the **RA** nut and screw **VRA** as to get the desired air flow rate: moving the rod **TR** towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it far from the shaft the air damper closes and the air flow rate decreases.

Note: once the procedure is performed, be sure that the blocking nut **RA** is fasten. Do not change the position of the air damper rods.



- 15 If necessary, change the combustion head position: to let the burner operate at a lower output, move progressively back the combustion head towards the MIN position, by turning clockwise the **VRT** ring nut. The graduated index **ID** shows the combustion head shifting (each mark refers to 5mm).



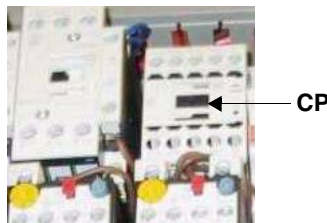
Attention! if it is necessary to change the head position, repeat the air and gas adjustments described above.

- 16 as for the point-to-point regulation in order to set the cam foil shape, move the low flame microswitch (cam III) a little lower than the maximum position (90°);
- 17 set the **TAB** thermostat to the minimum in order that the actuator moves progressively towards the low flame position;
- 18 move cam III towards the minimum to make the actuator move towards the low flame until the two bearings find the adjusting screw that refers to a lower position: screw **V** to increase the rate, unscrew to decrease, in order to get the pressure as showed on diagram on , according to the requested rate.
- 19 Move again cam III towards the minimum to meet the next screw on the adjusting cam and repeat the previous step; go on this way as to reach the desired low flame point.
- 20 The low flame position must never match the ignition position that is why cam III must be set 20°- 30° more than the ignition position.

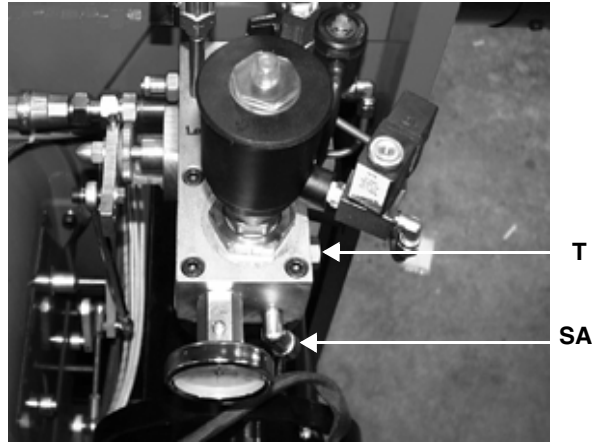
Turn the burner off; then start it up again. If the adjustment is not correct, repeat the previous steps.

Adjustment by the Siemens SQL33.. actuator

- 1 with the electrical panel open, prime the oil pump acting directly on the related contactor **CP** (see next picture): check the pump motor rotation (see “Fan motor and pump motor direction” on page 13) and keep pressing for some seconds until the oil circuit is charged;

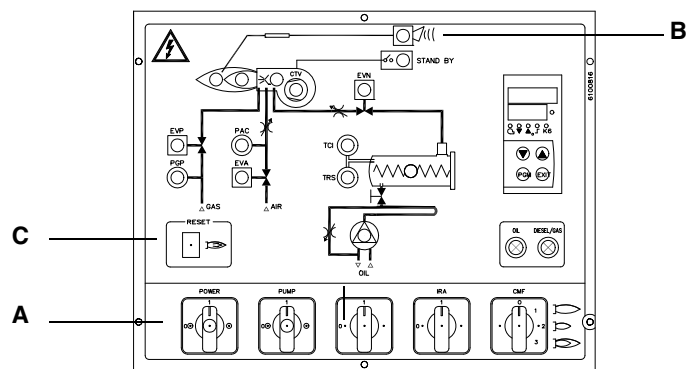


- 2 bleed the air from the **SA** port (see picture below) by loosening the cap **T** without removing it, then release the contactor and fasten cap **T**.

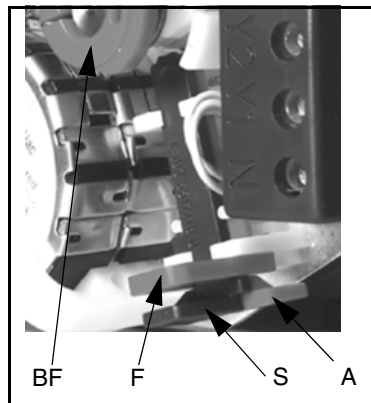
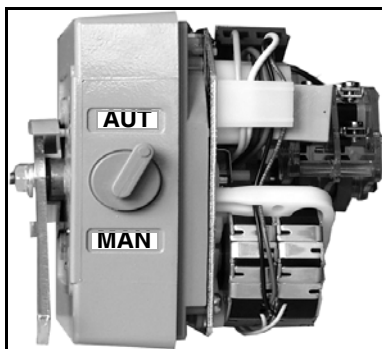


3 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.

Turn the burner on by means of its main switch **A** (see next picture): if the burner locks (LED **B** on in the control panel) press the RESET button (**C**) - See "OPERATION" on page 34.



- 4 Start the burner up by means of the thermostat series (terminals 3 and 4 - see wiring diagrams) and wait until the pre-purge phase comes to end and that burner starts up;
- 5 the burner starts up with the actuator on the ignition position, set it to the **MAN** (manual mode), by the **MAN/AUTO** selector (read the ignition position on the air damper index);

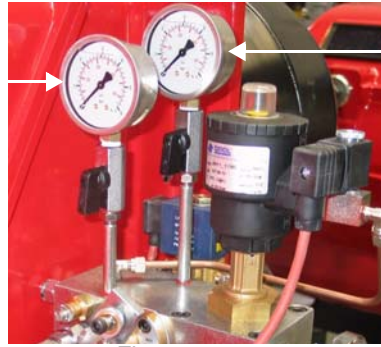


SQL330.. actuator cams

- A = (red) cam locking lever for "high flame"
- S = (green) cam locking lever for "stand-by and ignition"
- BF = Low flame
- F = plastic cam

- 6 disconnect the **TAB** thermostat removing the wire from the terminal no. 6 or by setting MAN on the RWF40 output controller or by setting 0 by means of the **CMF** switch (only for fully-modulating burners);
- 7 set the actuator to the manual mode (MAN) by means of the MAN/AUTO switch (see next pictures).
- 8 manually drive the adjusting cam **SV** to the high flame position and set the actuator to the AUTO mode (by means of the related switch - see picture) to lock the adjusting cam.
- 9 During high fire operation, oil pressure is about 2 bar (read on oil pressure gauge).

compressed air pressure gauge



oil pressure gauge

Fig. 27

- 10 Set the atomising air pressure switch **PA** (Fig. 28) at 0.5 bar
- 11 Set the pilot gas pressure switch **PG** (Fig. 29) at 50 mbar.

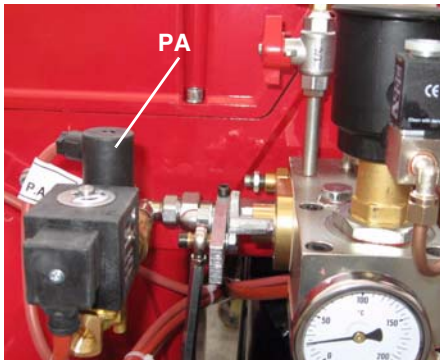


Fig. 28 - Atomising air pressure switch



Fig. 29 - Gas pressure switch

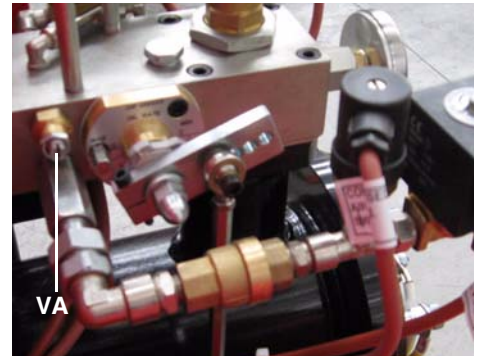
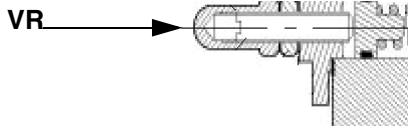


Fig. 30 - Atomising air flow rate adjustment

- 12 The nozzle supply pressure is already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); read the pressure on the oil pressure gauge on Fig. 32 and act on the Suntec TV governor adjusting screw **VR** (see Fig. 31 and description on page 23) as to get the nozzle pressure at 2bar (see step 9). If the required flow rate is not reached, increase the feeding pressure by means of the Suntec TV governor (see picture below).



compressed air pressure gauge

oil pressure gauge



VR

Fig. 31 - Suntec TV governor



Fig. 32 - Oil pressure governor



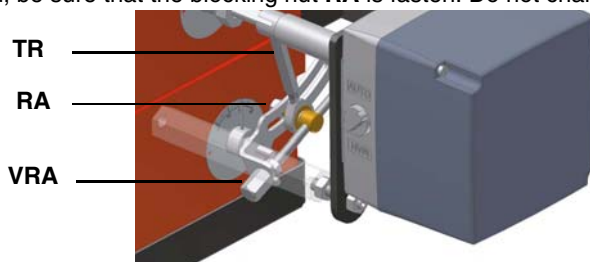
SV

Fig. 33

- 13 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the oil pressure gauge (Fig. 32): checking always the combustion parameters, the adjustment is to be performed by means of the **SV** adjusting cam screw (Fig. 33) when the cam has reached the high flame position.
- 14 The atomising air flow rate and pressure can be adjusted with the **VA** screw (Fig. 30). Too low a pressure produces poor atomising with smoke in the flue. A too high a pressure produces instability and the flame can be cut off. A too low pressure produces poor atomising with smoke in the flue.
- 15 To adjust the **comburent air flow rate in the high flame stage**, loose the **RA** nut and screw **VRA** as to get the desired air flow rate: moving the rod **TR** towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it

far from the shaft the air damper closes and the air flow rate decreases.

Note: once the procedure is performed, be sure that the blocking nut **RA** is fasten. Do not change the position of the air damper rods.



16 If necessary, change the combustion head position (see page 29).

Attention! if it is necessary to change the head position, repeat the air and gas adjustments described above.

17 once the air and oil flow rate have been adjusted at the maximum output, go on with the point to point adjustment on the **SV** adjusting cam as to reach the minimum output point: gradually move the adjusting cam in order to adjust each of the **V** screws as to describe the cam foil shape.

18 to change the **SV** position set the actuator on the manual mode (MAN), turn the adjusting cam **SV** and set again the actuator to the AUTO mode to lock the adjusting cam;

19 act on the **V** screw that matches the bearings referring to the adjusting cam position;

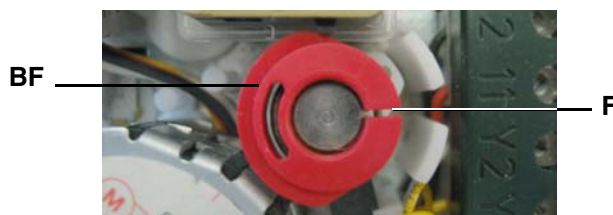
20 to adjust the next screw, set again the actuator mode to MAN, turn the adjusting cam and set the actuator to AUTO mode to lock the adjusting cam on the next screw; adjust it and go on this way to adjust all the screws in order to set the cam foil shape, according to the combustion values read.

21 Once the cam foil shape is defined, reconnect the **TAB** thermostat by reconnecting the wire to the terminal no.6 or setting the RWF40 burner modulator to AUTO or the CMF switch to 3 (only for fully-modulating burner).

22 Turn the burner off then start it up again.

23 Once the pre-purge time comes to end and the burner is on, drive the burner to the high flame stage by the **TAB** thermostat: check the combustion values;

24 drive the burner to low flame, if necessary adjust the low flame size (output) by inserting a screwdriver on the slot **F** to move the **BF** cam.



25 The low flame position must never match the ignition position that is why cam **BF** must be set 20°- 30° more than the ignition position.

26 Turn the burner off; then start it up again. If the adjustment is not correct, repeat the previous steps.

Calibration of air pressure switch

To calibrate the air pressure switch, proceed as follows:

- Remove the transparent plastic cap.
- Once air and heavy oil setting have been accomplished, startup the burner.
- During the pre-purge phase of the operation, turn slowly the adjusting ring nut **VR** in the clockwise direction until the burner lockout, then read the value on the pressure switch scale and set it to a value reduced by 15%.
- Repeat the ignition cycle of the burner and check it runs properly.
- Refit the transparent plastic cover on the pressure switch.

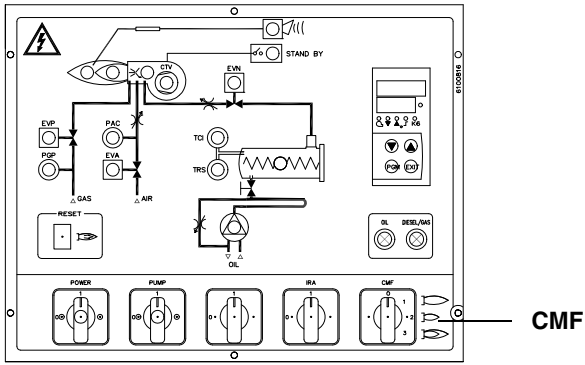


Fully-modulating burners

To adjust the fully-modulating burners, use the **CMF** switch on the burner control panel (see next picture), instead of the **TAB** thermostat as described on the previous paragraphs about the progressive burners. Go on adjusting the burner as described before, paying attention to use the CMF switch instead of **TAB**.

The **CMF** position sets the operating stages: to drive the burner to the high-flame stage, set CMF=1; to drive it to the low-flame stage, set CMF=2.

To move the adjusting cam set CMF=1 or 2 and then CMF=0.



- CMF = 0 stop at the current position
- CMF = 1 high flame operation
- CMF = 2 low flame operation
- CMF = 3 automatic operation

EVL air valve for gun cleaning

After the flame is off, an automatic system provides the compressed air to clean the gun.

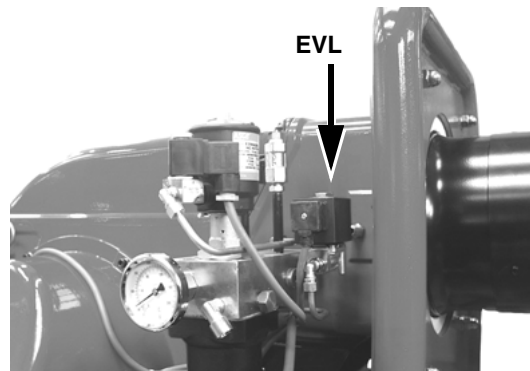


Fig. 34

PART II: OPERATION

LIMITATIONS OF USE

THE BURNER IS AN APPLIANCE DESIGNED AND CONSTRUCTED TO OPERATE ONLY AFTER BEING CORRECTLY CONNECTED TO A HEAT GENERATOR (E.G. BOILER, HOT AIR GENERATOR, FURNACE, ETC.), ANY OTHER USE IS TO BE CONSIDERED IMPROPER AND THEREFORE DANGEROUS.

THE USER MUST GUARANTEE THE CORRECT FITTING OF THE APPLIANCE, ENTRUSTING THE INSTALLATION OF IT TO QUALIFIED PERSONNEL AND HAVING THE FIRST COMMISSIONING OF IT CARRIED OUT BY A SERVICE CENTRE AUTHORIZED BY THE COMPANY MANUFACTURING THE BURNER.

A FUNDAMENTAL FACTOR IN THIS RESPECT IS THE ELECTRICAL CONNECTION TO THE GENERATOR'S CONTROL AND SAFETY UNITS (CONTROL THERMOSTAT, SAFETY, ETC.) WHICH GUARANTEES CORRECT AND SAFE FUNCTIONING OF THE BURNER.

THEREFORE, ANY OPERATION OF THE APPLIANCE MUST BE PREVENTED WHICH DEPARTS FROM THE INSTALLATION OPERATIONS OR WHICH HAPPENS AFTER TOTAL OR PARTIAL TAMPERING WITH THESE (E.G. DISCONNECTION, EVEN PARTIAL, OF THE ELECTRICAL LEADS, OPENING THE GENERATOR DOOR, DISMANTLING OF PART OF THE BURNER).

NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

OPERATE ONLY THE MAIN SWITCH, WHICH THROUGH ITS EASY ACCESSIBILITY AND RAPIDITY OF OPERATION ALSO FUNCTIONS AS AN EMERGENCY SWITCH, AND ON THE RESET BUTTON.

IN CASE OF A BURNER SHUT-DOWN, RESET THE CONTROL BOX BY MEANS OF THE RESET PUSHBUTTON. IF A SECOND SHUT-DOWN TAKES PLACE, CALL THE TECHNICAL SERVICE, WITHOUT TRYING TO RESET FURTHER.

WARNING: DURING NORMAL OPERATION THE PARTS OF THE BURNER NEAREST TO THE GENERATOR (COUPLING FLANGE) CAN BECOME VERY HOT, AVOID TOUCHING THEM SO AS NOT TO GET BURNT.

OPERATION

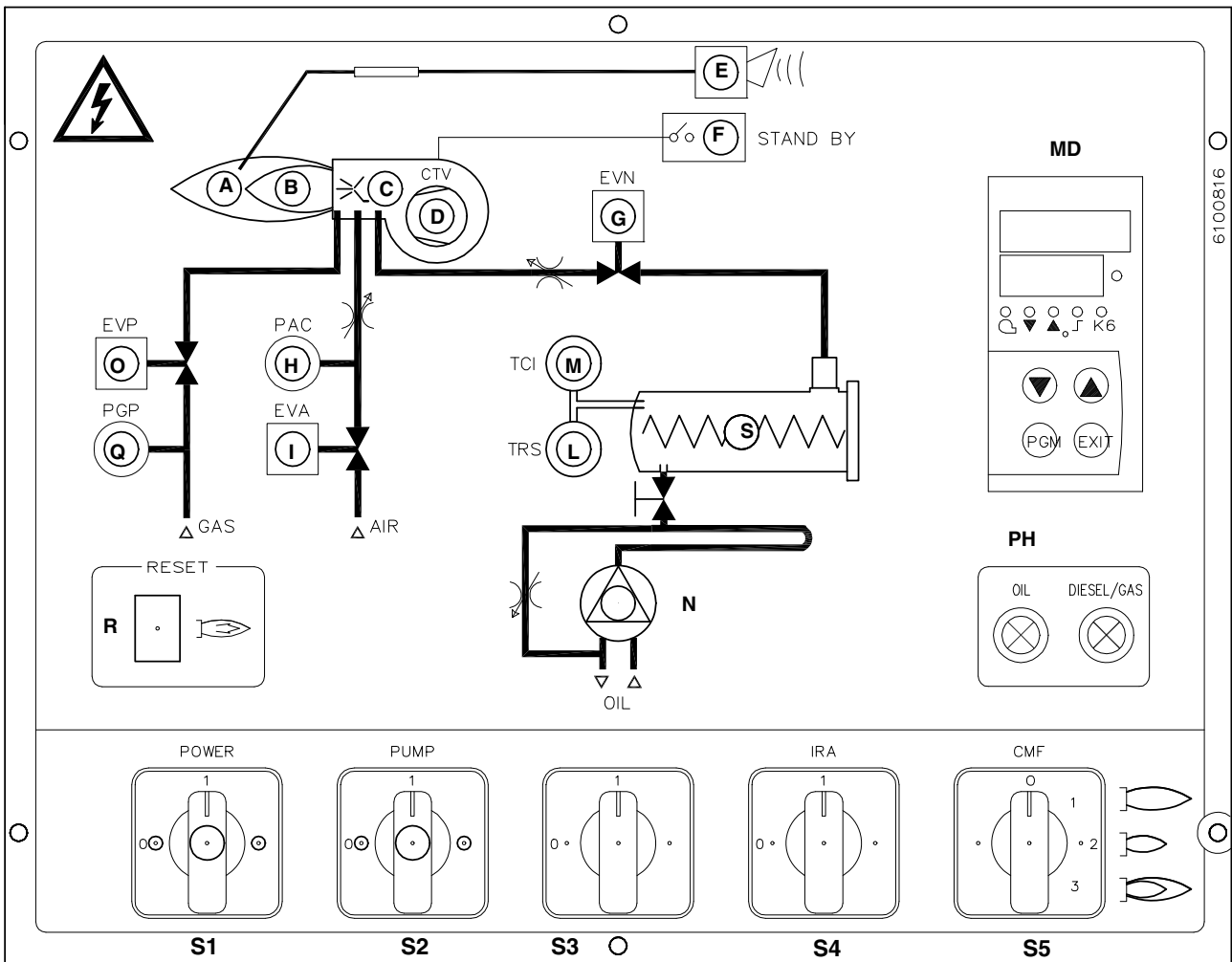


ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open. Be sure that the mains switch is closed.

- Turn the burner on by means of its main switch **S1** (see next pictures).
- Check that the burner is not locked (LED **E** lights up); if so, reset it by pressing the reset button **R**.
- Check that the series of thermostats/pressure switches (terminals 3 and 4 - see Wiring diagrams), the TCI thermostat and the pilot gas pressure switch enable the burner to start up.
- At the beginning of the start-up cycle, the fan motor starts up and the compressed air valve (EVA) opens. (If the oil atomising pressure is not enough, the PAC pressure switch closes the oil valve causing the burner to lock out). The pre-purge phase begins (the air damper is closed).
- After the post-ignition time, the transformer is de-energised and the pilot turns off some seconds later.
- When the oil valve opens, the burner is working: the actuator starts opening. The burner drives to high flame (A signalling lamp on) or to low flame (B signalling lamp on) according to the plant requirements.
- When the burner turns off, even in case of lock out, the EVL valve performs the oil gun cleaning (page 33).

As far as fully-modulating burners, see the Siemens RWF40 burner modulator manual.

Control panel



- A High flame lamp
- B Low flame lamp
- C Ignition transformer lamp
- D Fan motor thermal cutout lamp
- E Burner lockout lamp
- F Burner stand-by lamp
- G Solenoid valve lamp
- H Compressed air pressure switch lamp
- I Compressed air solenoid valve lamp
- L Heating resistors safety thermostat lamp
- M Plant enabling thermostat lamp
- MD Siemens output controller (on fully modulating versions only)
- N Oil pump in operation
- O Pilot solenoid valve lamp
- PH Heavy oil operation lamp
- Q Pilot gas pressure switch
- R Reset pushbutton for control box
- S Pre-heater in operation lamp
- S1 Main switch
- S2 Pump operation selector "MAN-AUTO"
- S3 Fuel operation selector
- S4 Auxiliary resistors switch
- S5 Operation mode manual selector

PART III: MAINTENANCE

At least once a year carry out the maintenance operations listed below. In the case of seasonal servicing, it is recommended to carry out the maintenance at the end of each heating season; in the case of continuous operation the maintenance is carried out every 6 months.



WARNING: ALL OPERATIONS ON THE BURNER MUST BE CARRIED OUT WITH THE MAINS DISCONNECTED AND THE FUEL MANUAL CUTOFF VALVES CLOSED!

ATTENTION: READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNING OF THIS MANUAL..

ROUTINE MAINTENANCE

- Clean and examine the gas filter and replace it if necessary (page 36).
- Clean and examine the oil filter cartridge and replace it if necessary.
- Examine the flexible hoses and check for possible leaks.
- Check and clean if necessary the oil heaters and the tank, according to the fuel type and its use; remove the heaters flange fixing nuts and remove the heaters from the tank: clean by using steam or solvents and not metallic things.
- Remove and clean the combustion head (page 37).
- Examine and clean the ignition electrode, adjust and replace if necessary (see page 38).
- Examine and clean the detection probe, adjust and replace if necessary (see page 39).
- Examine the detection current (see page 39).
- Remove and clean (page 39) the heavy oil nozzle (**Important: use solvents for cleaning, not metallic tools**) and at the end of the maintenance procedures, after replacing the burner, turn it on and check the shape of the flame; if in doubt replace the nozzle. Where the burner is used intensively it is recommended to replace the nozzle as a preventive measure, at the begin of the operating season.
- Clean and grease joints and rotating parts.

IMPORTANT: Remove the combustion head before checking the ignition electrode.

- Remove and clean the compressed air regulator **A** in Fig. 35.
- Remove and clean the oil regulator **B** in Fig. 35.



CAUTION: avoid the contact of steam, solvent and other liquids with the electric terminals of the resistor. On flanged heaters, replace the seal gasket before refitting it. Periodic inspections must be carried out to determine the frequency of cleaning.

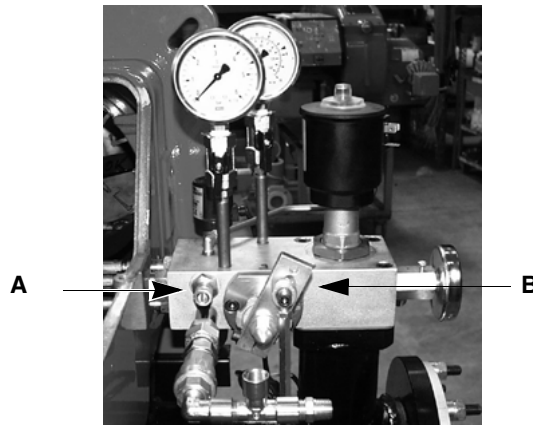


Fig. 35

Maintenance of the gas governor with filter

Before disassembling the device, be sure that there is no pressurised gas inside it.

To check the filtering part (1) on threaded bodies (see Fig. 36):

- remove the bottom cover, unscrewing the fixing screws;
- remove the filtering part (1), clean it with water and soap, blow it with compressed air or replace it if necessary;
- reassemble the filtering part in its initial position checking that it is placed in its own slots (see Fig. 37);
- reassemble the bottom cover (3), being sure that the main bolt is centered in the bottom cover slot.

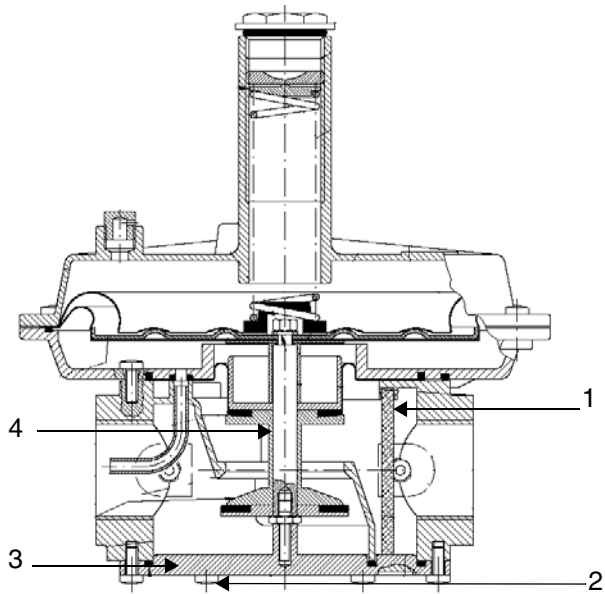


Fig. 36 - threaded body

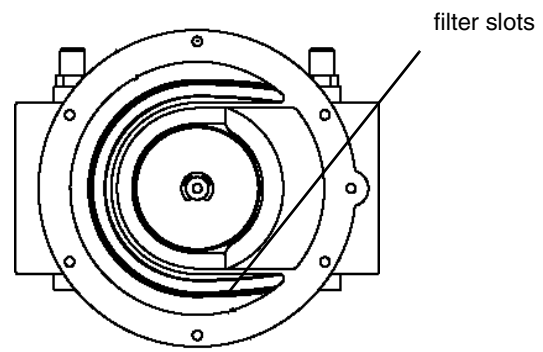


Fig. 37

Removing the combustion head

- Remove the cover H.
- Slide the photoresistor out of its housing.
- Unscrew the flexible hoses from the gun (burner side) and remove the whole assembly as shown on Fig. 38.

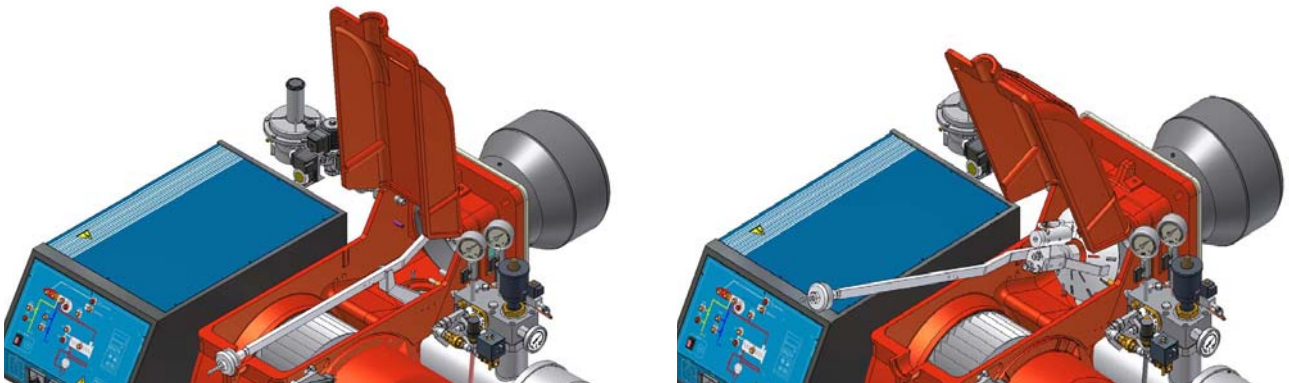


Fig. 38

Removing the oil gun, replacing/adjusting the nozzle and the ignition electrode



ATTENTION: avoid the electrode to get in touch with metallic parts (blast tube, head, etc.), otherwise the boiler operation would be compromised. Check the electrode position after any intervention on the combustion head.

To remove the oil gun, proceed as follows:

- 1 remove the combustion head as described on the previous paragraph;
- 2 after removing the oil gun, to clean the nozzle remove it from its place after unscrewing **V**;
- 3 unscrew cap **C** and clean the nozzle body **CU**; replace the nozzle if necessary;
- 4 in order to replace the electrode, unscrew the fixing screw and remove it: place the new electrode being careful to observe the measures (in mm) shown on next pictures and reassemble following the reversed procedure.
- 5 To adjust the nozzle position, unscrew the fixing screw, move the nozzle backwards or forwards, then fix the screw on the new position. In the example from "1" to "2" - see picture below.

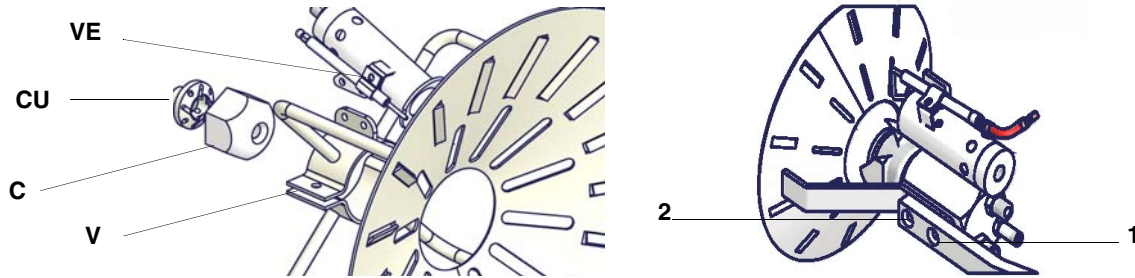


Fig. 37

C = 0 mm (factory set) to change the nozzle position, please contact the Technical Dpt.

PBY90, B=0.8mm

PBY91-92, B = 1 mm

PBY510-515-520-525, B = 1.6 mm

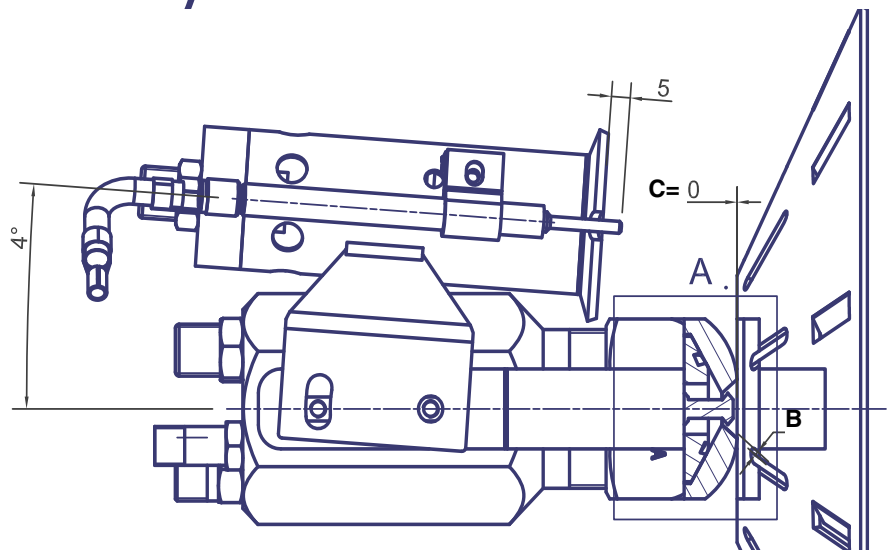
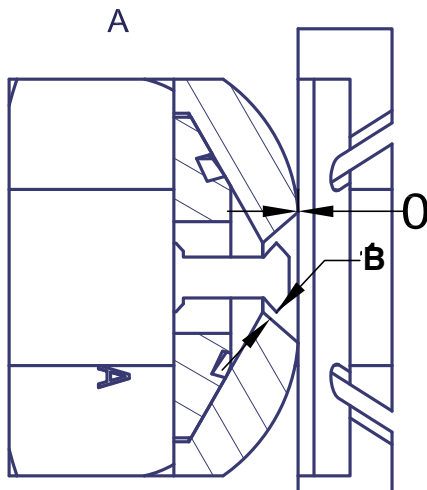
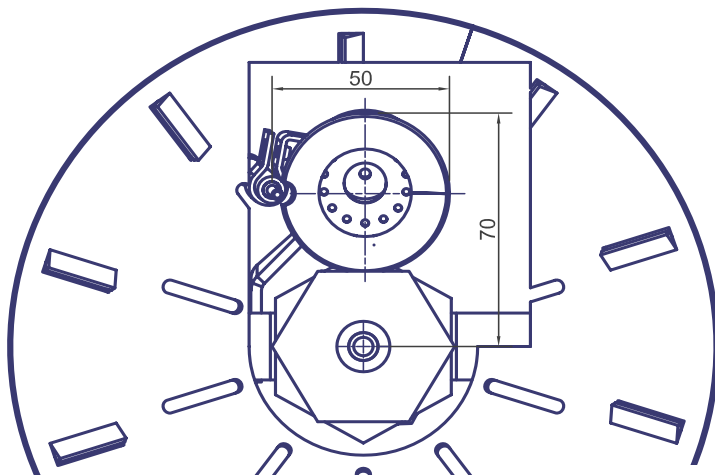


Fig. 38

Checking the detection current

To measure the detection signal follow the diagram in Fig. 39. If the signal is not in the advised range, check the electrical contacts, the cleaning of the combustion head, the position of the photoresistor and if necessary replace it.

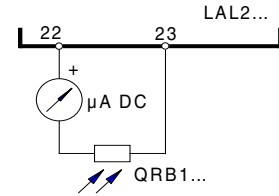


Fig. 39

Minimum current intensity with flame: 8μA

Maximum possible current intensity with flame: 35μA

Cleaning and replacing the detection photoresistor

To clean/replace the photoresistive detector, remove it from its slot. To clean the photoresistor, use a clean cloth, not cleaning sprays.

Seasonal stop

To stop the burner in the seasonal stop, proceed as follows:

- 1 turn the burner main switch to 0 (Off position)
- 2 disconnect the power mains
- 3 close the fuel valve of the supply line

Burner disposal

In case of disposal, follow the instructions according to the laws in force in your country about the “Disposal of materials”.

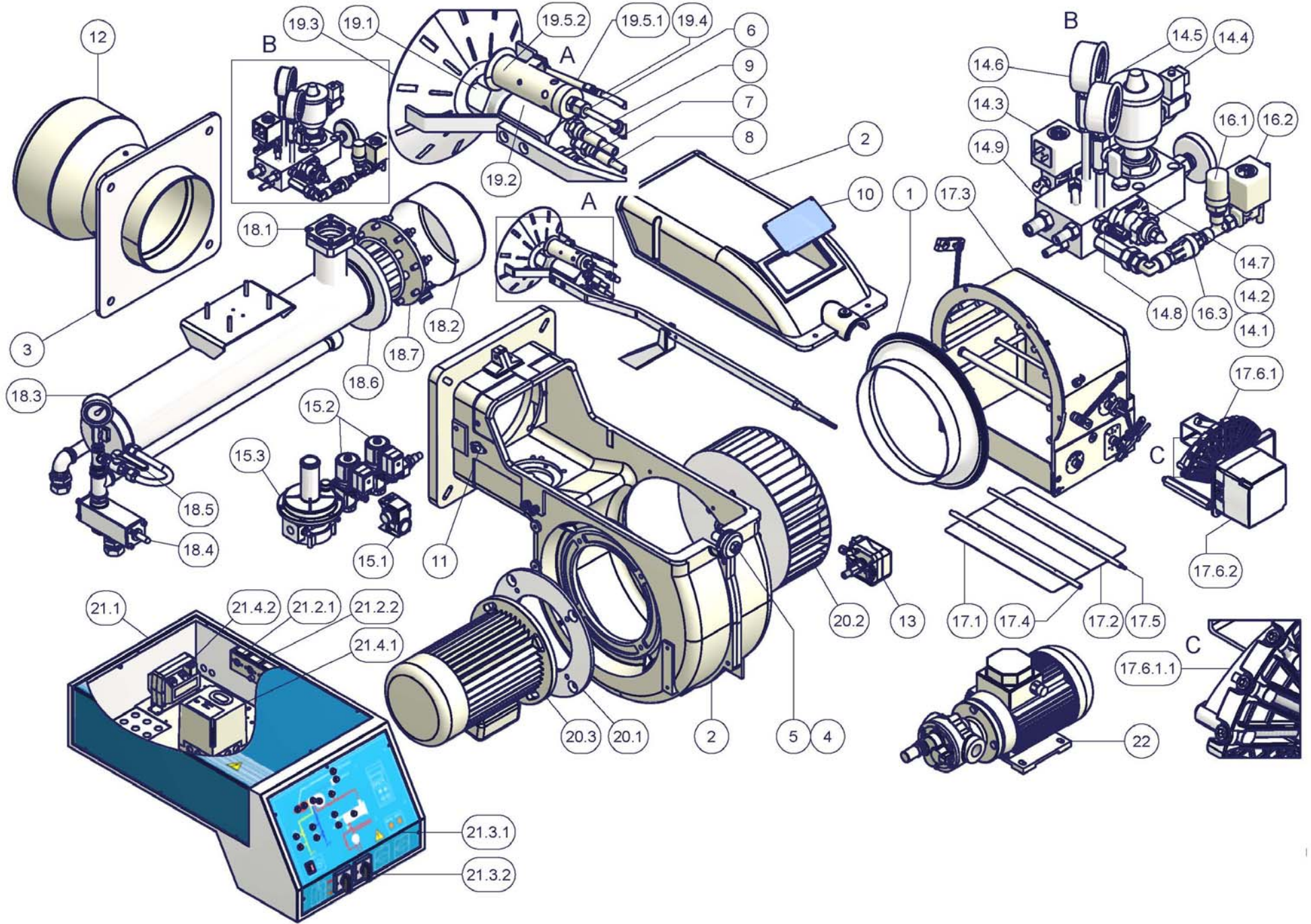
TROUBLESHOOTING

CAUSES/TROUBLES	DOES NOT START UP	CONTINUES PRE-PURGUE	IBURNER STARTS UP WITH COLD OIL	DOES NOT IGNITE AND GOES TO SHUT DOWN	DOES NOT DRIVE TO HIGH FLAME	GOES TO SHUT DOWN DURING OPERATION	GOES OFF AND REPEATS THE CYCLE DURING OPERATION
MAIN SWITCH OFF	●						
LINE FUSES BLOWN	●						
MAXIMUM THERMOSTAT MALFUNCTION	●						
FAN THERMAL CUTOFF TRIPPED	●						
AUXILIARY FUSE BLOWN	●						
OIL RESISTOR FAULTY	●		●				
OIL ENABLING THERMOSTAT TRIPPED	●		●				
FAULTY CONTROL BOX	●	●		●	●	●	●
AIR ACTUATOR MALFUNCTION					●		
CIRCUIT ENABLING THERMOSTAT		●			●		
SMOKY FLAME						●	●
FAULTY IGNITION TRANSFORMER				●			
IGNITION ELECTRODE WRONGLY POSITIONED				●			
DIRTY NOZZLE				●		●	
FAULTY OIL VALVE				●			●
FAULTY OR DIRTY PHOTORESISTOR							●
FAULTY RESISTOR THERMOSTAT	●						
FAULTY HIGH-LOW FLAME THERMOSTAT					●		
ACTUATOR CAM NOT CALIBRATED					●		
LOW OIL PRESSURE				●		●	●
DIRTY OIL FILTER				●		●	●
DIRTY IGNITION ELECTRODE				●			

BURNER EXPLODED VIEW**PBY90-PBY91-PBY92**

ITEM	DESCRIPTION
1	AIR INLET CONE
2	BURNER HOUSING
3	GENERATOR GASKET
4	PLUG
5	SCREW
6	GAS FLEXIBLE HOSE
7	FLEXIBLE HOSE
8	FLEXIBLE HOSE
9	FLEXIBLE HOSE
10	INSPECTION GLASS
11	PHOTORESISTOR
12	STANDARD BLAST TUBE
13	AIR PRESSURE SWITCH
14.1	GASKET
14.2	GASKET
14.3	OIL SOLENOID VALVE
14.4	COMPRESSED AIR SOLENOID VALVE
14.5	PNEUMATIC OIL VALVE
14.6	PRESSURE GAUGE
14.7	OIL PRESSURE GOVERNOR
14.8	COMPRESSED AIR PRESSURE GOVERNOR
14.9	OIL MANIFOLD
15.1	GAS PRESSURE
15.2	GAS SOLENOID VALVE
15.3	GAS GOVERNOR WITH FILTER
16.1	AIR PRESSURE SWITCH
16.2	OIL SOLENOID VALVE
16.3	ONE-WAY VALVE
17.1	AIR INTAKE DAMPER
17.2	AIR INTAKE DAMPER

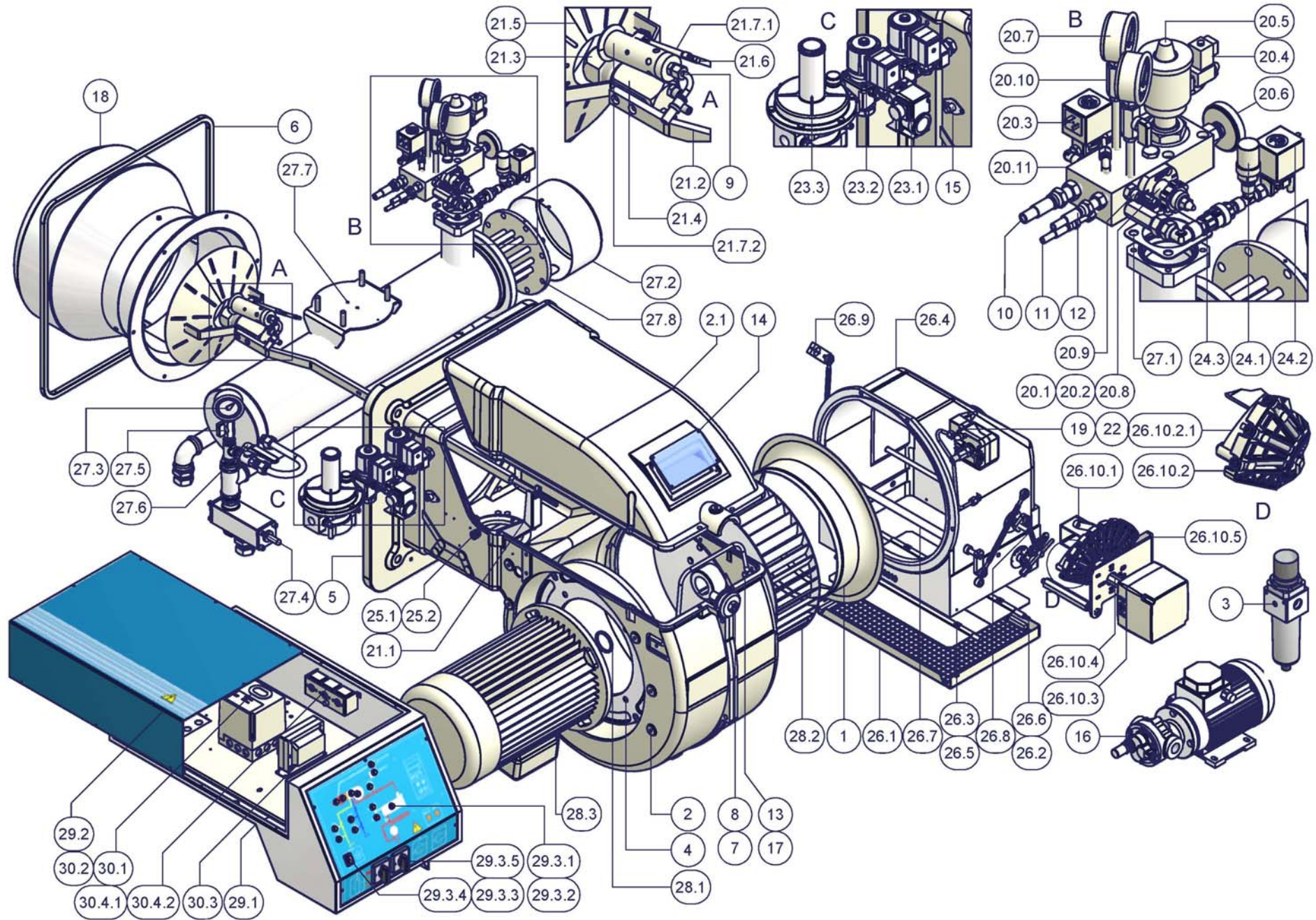
ITEM	DESCRIPTION
17.3	AIR INTAKE
17.4	LOUVER SHAFT
17.5	LOUVER SHAFT
17.6.1	ADJUSTING CAM
17.6.1.1	ADJUSTING CAM FOIL
17.6.2	ACTUATOR
18.1	GASKET
18.2	COVER
18.3	PRESSURE GAUGE
18.4	PRESSURE GOVERNOR
18.5	CUTOFF MANUAL VALVE
18.6	OIL PRE-HEATER
18.7	RESISTOR
19.1	NOZZLE
19.2	NOZZLE HOLDER
19.3	COMBUSTION HEAD
19.4	IGNITION CABLE
19.5.1	pilot ELECTRODE
19.5.2	PILOT
20.1	MOTOR MOUNTING FLANGE
20.2	FAN WHEEL
20.3	MOTOR
21.1	BOARD
21.2.1	THERMOSTAT
21.2.2	THERMOSTAT
21.3.1	FRONT CONTROL PANEL
21.3.2	SWITCH
21.4.1	CONTROL BOX
21.4.2	IGNITION TRANSFORMER
22	PUMP



ITEM	DESCRIPTION
1	AIR INLET CONE
2	BURNER HOUSING
2.1	COVER
3	PRESSURE GOVERNOR WITH FILTER
4	FLANGE
5	FLANGE
6	CERAMIC FIBRE PLAIT
7	PLUG
8	SCREW
9	GAS FLEXIBLE HOSE
10	FLEXIBLE HOSE
11	FLEXIBLE HOSE
12	FLEXIBLE HOSE
13	SCREW
14	INSPECTION GLASS
15	PHOTORESISTOR
16	PUMP
17	AIR PRESSURE SWITCH PIPE
18	STANDARD BLAST TUBE
19	AIR PRESSURE SWITCH
20.1	GASKET
20.2	GASKET
20.3	OIL SOLENOID VALVE
20.4	COMPRESSED AIR SOLENOID VALVE
20.5	PNEUMATIC OIL VALVE
20.6	THERMOMETER
20.7	PRESSURE GAUGE
20.8	OIL PRESSURE GOVERNOR
20.9	COMPRESSED AIR PRESSURE GOVERNOR
20.10	MANUAL VALVE

ITEM	DESCRIPTION
20.11	OIL MANIFOLD
21.1	BRACKET
21.2	NOZZLE HOLDER ROD
21.3	NOZZLE
21.4	NOZZLE HOLDER
21.5	COMBUSTION HEAD
21.6	IGNITION CABLE
21.7.1	IGNITION ELECTRODE
21.7.2	PILOT
22	CONNECTOR
23.1	GAS PRESSURE
23.2	GAS SOLENOID VALVE
23.3	GAS GOVERNOR WITH FILTER
24.1	AIR PRESSURE SWITCH
24.2	OIL SOLENOID VALVE
24.3	ONE-WAY VALVE
25.1	FAIRLEAD
25.2	FAIRLEAD
26.1	NET
26.2	AIR INTAKE DAMPER
26.3	AIR INTAKE DAMPER
26.4	AIR INTAKE
26.5	LOUVER SHAFT
26.6	LOUVER SHAFT
26.7	BUTTERFLY VALVE PIN
26.8	ADJUSTING CAM SHAFT
26.9	LEVERAGE
26.10.1	LEVERAGE
26.10.2	ADJUSTING CAM
26.10.2.1	ADJUSTING CAM FOIL

ITEM	DESCRIPTION
26.10.3	ACTUATOR
26.10.4	ACTUATOR SHAFT
26.10.5	BRACKET
27.1	GASKET
27.2	COVER
27.3	PRESSURE GAUGE
27.4	PRESSURE GOVERNOR
27.5	MANUAL VALVE
27.6	CUTOFF MANUAL VALVE
27.7	OIL PRE-HEATER
27.8	RESISTOR
28.1	SPACER
28.2	FAN WHEEL
28.3	MOTOR
29.1	BOARD
29.2	COVER
29.3.1	LIGHT
29.3.2	LIGHT
29.3.3	LOCK-OUT RESET BUTTON
29.3.4	PROTECTION
29.3.5	SWITCHPILOT
30.1	CONTROL BOX
30.2	CONTROL BOX SOCKET
30.3	IGNITION TRANSFORMER
30.4.1	THERMOSTAT
30.4.2	THERMOSTAT



SPARE PARTS

DESCRIPTION	PBY90	PBY91	PBY92	PBY510	PBY515	PBY520	PBY525
CONTROL BOX	2020420	2020420	2020420	2020420	2020420	2020420	2020420
PILOT ELECTRODE	20802A7	20802A7	20802A7	20802A7	20802A7	20802A7	20802A7
OIL FILTER	2090236	2090236	2090236	2090236	2090236	2090236	2090236
GENERATOR GASKET	2110048	2110048	2110048	-	-	-	-
FAN WHEEL	2150009	2150009	2150028	2150010	2150030	2150029	2150029
AIR PRESSURE SWITCH	2160065	2160065	2160065	2160065	2160065	2160065	2160065
COMPRESSED AIR PRESSURE SWITCH - PMM10A 2-10 bar	2160083	2160083	2160083	2160083	2160083	2160083	2160083
GAS PRESSURE SWITCH - DUNGS GW150 A6	2160086	2160086	2160086	2160086	2160086	2160086	2160086
IGNITION TRANSFORMER	2170301	2170301	2170301	2170301	2170301	2170301	2170301
ELECTRIC MOTOR	2180204	218027601	218027701	218020601	2180209	2180278	2180289
SOLENOID VALVE	2190451	2190451	2190451	2190451	2190451	2190451	2190451
GAS SOLENOID VALVE	2190502	2190502	2190502	2190502	2190502	2190502	2190502
FLEXIBLE HOSE	2340004	2340004	2340004	2340004	2340004	2340004	2340004
FLEXIBLE HOSE L=300	2340040	2340040	2340040	2340040	2340040	2340040	2340040
FLEXIBLE HOSE L=235	2340090	2340090	2340090	2340086	2340086	2340086	2340086
FLEXIBLE HOSE L=365	234FX13	234FX13	234FX13	234FX13	234FX13	234FX13	234FX13
FLEXIBLE HOSE L=315	234FX14	234FX14	234FX14	234FX14	234FX14	234FX14	234FX14
ADJUSTING CAM FOIL	2440014	2440014	2440014	2440014	2440014	2440014	2440014
ACTUATOR mod. SIEMENS SQL..	2480007	2480007	2480007	2480007	2480007	2480007	2480007
ACTUATOR mod. BERGER STM30	2480090	2480090	2480090	2480090	2480090	2480090	2480090
ACTUATOR mod. SIEMENS SQM40	24800A5	24800A5	24800A5	24800A5	24800A5	24800A5	24800A5
PHOTORESISTOR SIEMENS QRB	2510008	2510008	2510008	2510008	2510008	2510008	2510008
RESISTOR THERMOSTATTR-TCN-TCI	2560026	2560026	2560026	2560026	2560026	2560026	2560026
THERMOSTAT TRS	2560028	2560028	2560028	2560028	2560028	2560028	2560028
PRESSURE GOVERNOR - SUNTEC TV	2570068	2570068	2570068	2570068	2570068	2570068	2570068
OIL PRESSURE GOVERNOR	2570088	2570088	2570088	2570089	2570089	2570089	2570089
BURNER MODULATOR (only for fully-modulating burners)	2570112	2570112	2570112	2570112	2570112	2570112	2570112
PUMP - CUCCHI	2590218	2590218	2590218	2590218	2590218	2590218	2590218
NOZZLE	2610342	2610344	2610345	2610347	2610347	2610349	2610349
L.P.G. PILOT	2640052	2640052	2640052	2640052	2640052	2640052	2640052
GAS PRESSURE GOVERNOR WITH FILTER	2800085	2800085	2800085	2800085	2800085	2800085	2800085
AIR PRESSURE GOVERNOR WITH FILTER	2800116	2800116	2800116	2800116	2800116	2800116	2800116
L.P.G. REDUCING UNIT	2800125	2800125	2800125	2800125	2800125	2800125	2800125
COMBUSTION HEAD	3060190	3060191	3060192	3060193	3060194	3060195	3060195
STANDARD BLAST TUBE	30910E1	30910E2	30910E3	30910S4	30910S5	30910S6	30910U2
EXTENDED BLAST TUBE	-	-	-	30910S7	30910S8	30910S9	-
AIR PRESSURE SWITCH ASS.Y	3500104	3500104	3500104	3500104	3500104	3500104	3500104
IGNITION CABLE	6050142	6050142	6050142	6050142	6050142	6050142	6050142
ELECTRIC BOARD PANEL	6100816	6100816	6100816	6100816	6100816	6100816	6100816

NOTE: it is recommended to mention the burner ID number on the spare parts request form.

SIEMENS LAL.. CONTROL BOX

Use

- Control and supervision of oil atomization burners
- For burners of medium to high capacity
- For intermittent operation (at least one controlled shutdown every 24 hours)
- Universally applicable for multistage or modulating burners

Housing and plug-in base

- Made of impact-proof and heat-resistance black plastic
- Lockout reset button with viewing window; located behind it:
- Lockout warning lamp
- Lockout indicator coupled to the spindle of the sequence switch and visible in the transparent lockout reset button
- uses easy-to-remember symbols to indicate the type of fault and the point in time lockout occurred

Base and plug-in section of the LAL... are designed such that only burner controls of the LAL... family can be plugged in.

- 24 connection terminals
- Auxiliary terminals «31» and «32»
- 3 earth terminals terminating in a lug for earthing the burner
- 3 neutral conductor terminals prewired to terminal 2
- 14 knockout holes for cable entry by means of cable glands
- 8 at the side
- 6 in the bottom of the base
- 6 lateral threaded knockout holes for cable entry glands Pg11 or M20

Operation

Flame detector and flame simulation test are made automatically during burner off times and the prepurge time «t1». If loss of flame occurs during operation, the burner control will initiate lockout. If automatic repetition of the startup sequence is required, the clearly marked wire link on the plug-in section of the LAL... must be cut away.

Pre-conditions for burner startup

- Burner control is not in the lockout position
- Sequence switch is in its start position (with LAL2 voltage is present at terminals 11 and 12.
- Air damper is closed; end switch «z» for the CLOSED position must feed power from terminal 11 to terminal 8.
- Contact of the limit thermostat or pressure switch «W» and the contacts of any other switching devices in the control loop between terminals 4 and 5 must be closed e.g. a control contact for the oil preheater's temperature
- Normally closed contact of the air pressure switch must be closed.

Startup sequence

Start command by «R»:

- «R» closes the start control loop between terminals 4 and 5
- The sequence switch starts to run
- Only prepurging, fan motor at terminal 6 receives power
- Pre- and postpurging, fan motor or flue gas fan at terminal 7 receives power on completion of «t7»
- On completion of «t16», the control command for opening the air damper is delivered via terminal 9
- Terminal 8 receives no power during the positioning time
- The sequence switch continues to run only after the air damper has fully closed.

t1 Prepurge time with air damper fully open:

- The correct functioning of the flame supervision circuit is checked during «t1»
- The burner control will initiate lockout if correct functioning is not ensured.

With LAL2:

Shortly after the beginning of «t1», the air pressure switch must change over from terminal 13 to terminal 14 otherwise, the burner control will initiate lockout start of the air pressure check.

t3 Short preignition time:

«Z» must be connected to terminal 16, release of fuel via terminal 18.

t3' Long preignition time: «Z» connected to terminal 15.

t3n Postignition time:

- «Z» must be connected to terminal 15

- With short preignition, «Z» remains on until «TSA» has elapsed connection to terminal 16.

t4 Interval «BV1 – BV2» or «BV1 - LR»: On completion of «t4», voltage is present at terminal 19. The voltage is required to power «BV2» connected to auxiliary switch «v» in the actuator.

t5 Interval: On completion of «t5», terminal 20 receives power. At the same time, control outputs 9 to 11 and input 8 are galvanically separated from the LAL...’s control section.

LAL... is now protected against reverse voltages from the load control circuit. With the release of «LR» at terminal 20, the startup sequence of the LAL... ends. After a few idle steps (steps with no contact position changes), the sequence switch switches itself off.

B Operating position of the burner

B-C Burner operation: during burner operation, «LR» drives the air damper to the nominal load or low-fire position, depending on heat demand; the release of the nominal load takes place via auxiliary switch «v» in the actuator and in the event of loss of flame during operation, the LAL... will initiate lockout. For automatic start repetition, the clearly marked wire link «B» on the plugin section of the LAL... must be cut away.

C Controlled shutdown: in the case of controlled shutdown, «BV...» will immediately be closed. At the same time, the sequence switch is started to program «t6»

C-D Sequence switch travels to start position «A»

t6 Postpurge time: fan «M2» connected to terminal 7. Shortly after the start of «t6», terminal 10 receives power and the air damper is driven to the MIN position. Full closing of the air damper starts only shortly before «t6» has elapsed initiated by the control signal at terminal 11. During the following burner off time, terminal 11 is live.

t13 Permissible afterburn time: during «t13», the flame signal input may still receive a flame signal.

D-A End of control program: start position

As soon as the sequence switch has reached the start position – having thereby switched itself off – the flame detector and flame simulation test will start again.

During burner off times, the flame supervision circuit is live.

Lockout and indication of the stop position

Whenever a fault occurs, the sequence switch stops and with it the lockout indicator. The symbol appearing above the reading mark indicates the type of fault:

◀ No start. One of the contacts is not closed (also refer to «Preconditions for burner startup»):

Extraneous light:

Lockout during or after completion of the control program

Examples: nonextinguished flame, leaking fuel valves faulty flame supervision circuit.

▲ Interruption of startup. No OPEN signal at terminal 8 from the changeover end switch «a». Terminals 6, 7 and 15 are live until fault has been corrected

P Lockout. No air pressure indication at the beginning of the air pressure check. Air pressure failure after the air pressure check.

■ Defect in the flame supervision circuit.

▼ Interruption of the startup sequence. No positioning signal at terminal 8 from the auxiliary switch «m» for the low-fire position. Terminals 6, 7 and 15 are live until fault has been corrected.

1 Lockout. No flame signal at the end of the safety time.

l Flame signal has been lost during operation.

A Consenso all'avviamento (ad esempio tramite il termostato o il pressostato R dell'impianto)

B Operating position of the burner

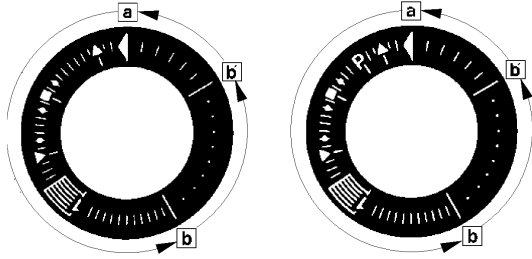
B-C Burner operation: during burner operation, «LR» drives the air damper to the nominal load or low-fire position, depending on heat demand; the release of the nominal load takes place via auxiliary switch «v» in the actuator and in the event of loss of flame during operation, the LAL... will initiate lockout. For automatic start repetition, the clearly marked wire link «B» on the plugin section of the LAL... must be cut away.

C Controlled shutdown: in the case of controlled shutdown, «BV...» will immediately be closed. At the same time, the sequence switch is started to program «t6»

C-D Sequence switch travels to start position «A».

During burner off times, the flame supervision circuit is live.

Lockout indication

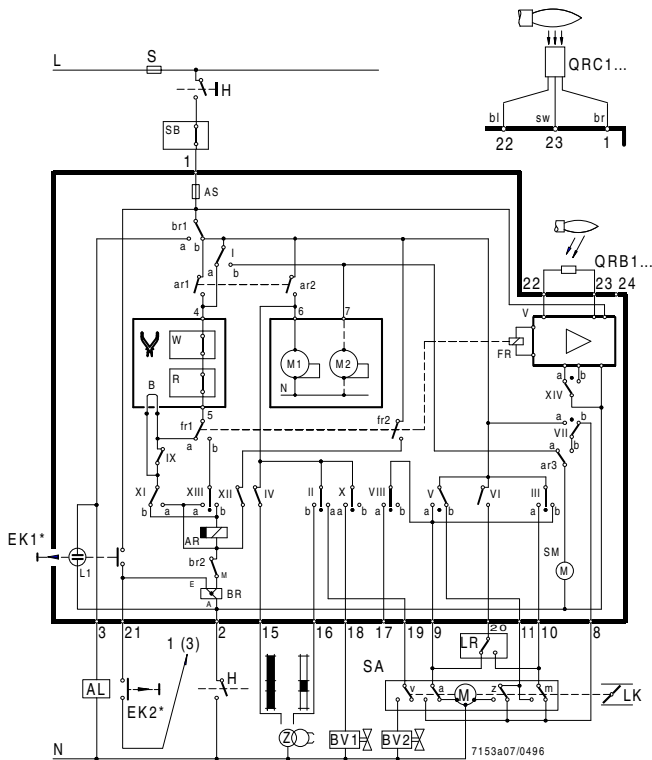


- a-b Startup sequence
- b-b' Idle step (with no contact confirmation)
- b(b')-a Postpurge program

Burner control can immediately be reset after lockout:
 Do not press the lockout reset button for more than 10 seconds
 The sequence switch always travels to the start position first
 After resetting
 After rectification of a fault that led to shutdown
 After each power failure
 During this period of time, power is only fed to terminals 7 and 9...11.
 Then, the LAL... will program a new burner startup sequence

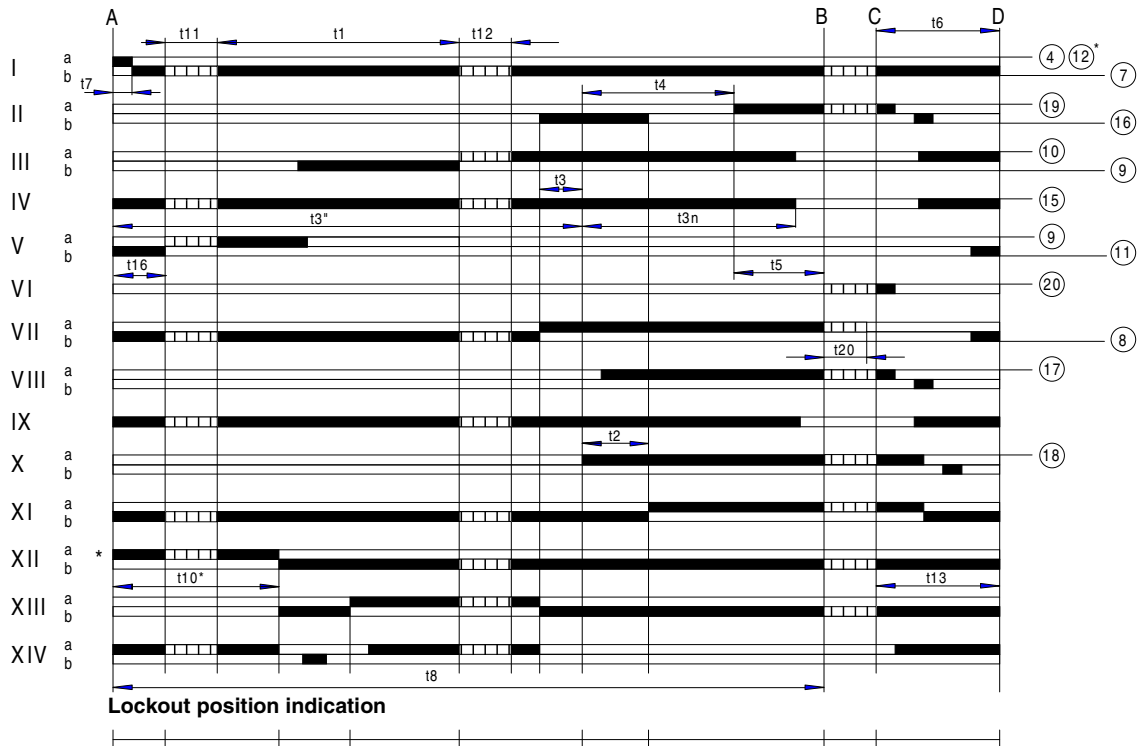
Specifications

Power supply	AC 230 V -15 / +10 %
for LAL2... on request	AC 100 V -15 %...AC 110 V +10 %
Frequency	50 Hz -6 %...60 Hz +6 %
Absorption	AC 3.5 VA
Mounting position	optional
Protection	IP 40
Perm. input current at terminal 1	AC 5 A max., 20 A peak
Perm. current rating of control terminals 3, 6, 7, 9...11, 15...20	4 A max., 20 A peak
Internal fuse	T6,3H250V according to IEC 127
External fuse	max. 10 A
Weight	Device 1000 g Plug-in base 165 g



Sequence diagram

Control output at terminal



Key

- t1 Prepurge time with air damper fully open
- t2 Safety time
- t3 Preignition time, short («Z» connected to terminal 16)
- t3' Preignition time, long («Z» connected to terminal 15)
- t3n Postignition time («Z» connected to terminal 15)
- t4 Interval between voltage at terminals 18 and 19 («BV1-BV2»)
- t5 Interval between voltage at terminals 19 and 20 («BV2» load controller)
- t6 Postpurge time (with «M2»)
- t7 Interval between start command and voltage at terminal 7 (start delay time for «M2»)
- t8 Duration of startup sequence (excluding «t11» and «t12»)
- t10 Interval from startup to the beginning of the air pressure check
- t11 Air damper running time to the OPEN position
- t12 Air damper running time to the low-fire position (MIN)
- t13 Permissible afterburn time
- t16 Interval to the OPEN command for the air damper
- t20 For self-shutdown of the sequence switch



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Note: specifications and data subject to change without notice. Errors and omissions excepted.