

PBY70

Double-stage Heavy oil Burners

MANUAL OF INSTALLATION - USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

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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 2009/142/EC - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC 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/EC 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/EC 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 2009/142/EC - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC 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 2009/142/EC - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC 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

PART I: INSTALLATION

Burner model identification

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

Type (1)	Model (2)	H. (3)	AB. (4)	S. (5)	*. (6)	A. (6)
(1) BURNER TYPE	PBY70					
(2) FUEL	H - heavy oil , high viscosity $\leq 4000\text{cSt}$ (530°E) @ 50°C					
(3) OPERATION (Available versions)	AB - Double stage					
(4) BLAST TUBE	S - Standard			L - Extended		
(5) DESTINATION COUNTRY	* - see data plate					
(6) BURNER VERSION	A - Standard					

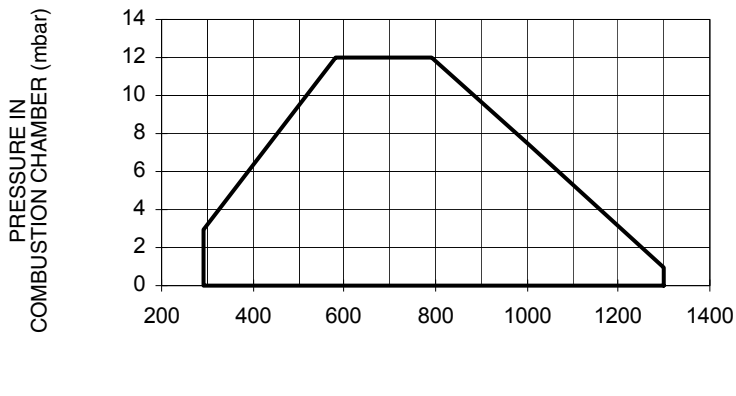
Technical Specifications

BURNER		PBY70
Output	min - max kW	290 - 1300
Fuel		Heavy oil
Oil viscosity		see "Burner model identification"
Heavy oil rate	min. - max. kg/h	26 - 116
Gas pressure	max. mbar	500
Gas pressure after gas governor	mbar	100
Compressed air pressure	bar	4 - 10
Oil train inlet pressure	bar	2 max
Power supply		400V 3N a.c. 50Hz
Total power consumption	kW	7.2
Pump-fan motor	kW	2.2
Pre-heater resistors	kW	4.5
Protection		IP40
Weight (approx)	kg	130
Operation		Double stage
Operating temperature	°C	(-10) / (+50)
Storage Temperature	°C	(-20) / (+60)
Working service*		Intermittent

Heavy oil net calorific value (Hi): 9650 kcal/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.

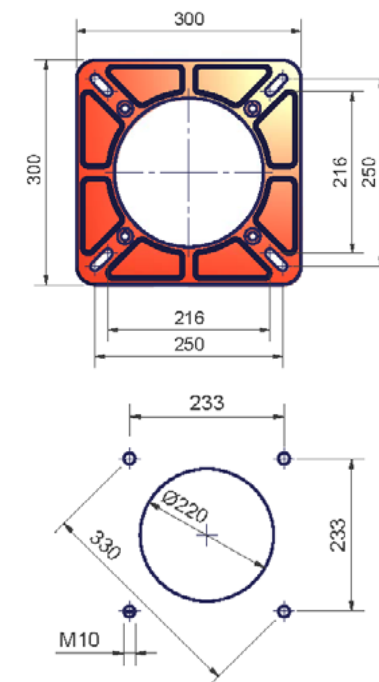
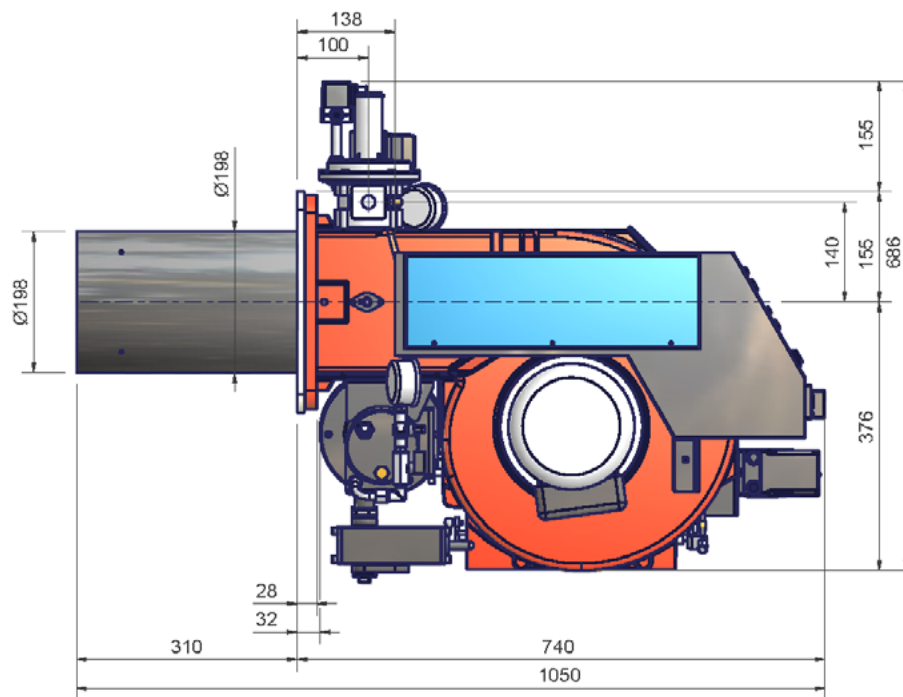
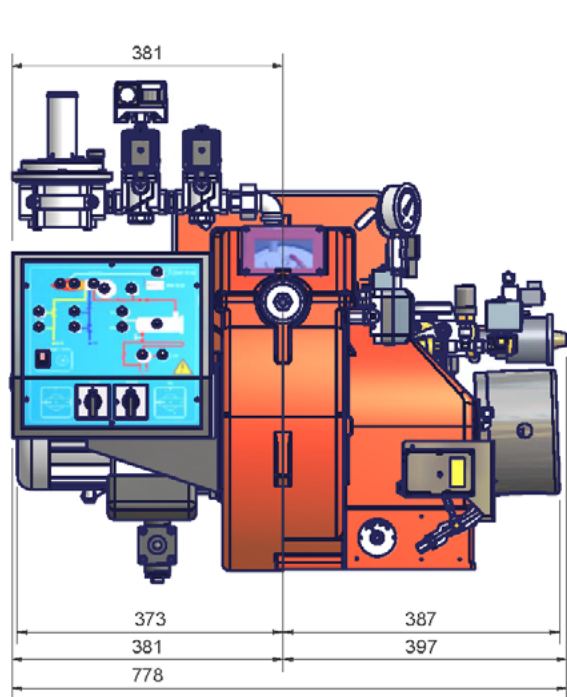
Performance Curves**PBY70**

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)



boiler recommended drilling template

INSTALLING THE BURNER

Packing

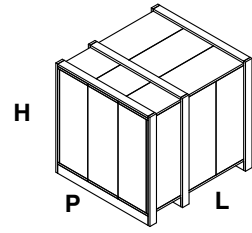
Burners are despatched in wooden crates whose dimensions are:

- 1520 mm x 1170 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 to be inserted between the burner and the boiler;
- oil flexible hoses;
- oil filter;
- envelope containing this manual.

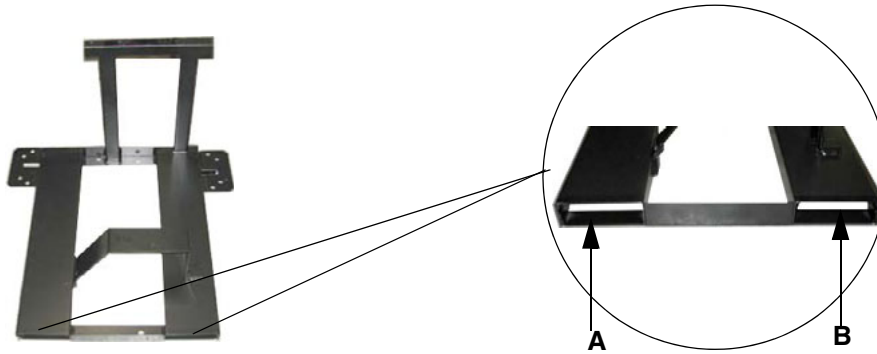


To get rid of the burner's packing, follow the procedures laid down by current laws on disposal of materials.

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.

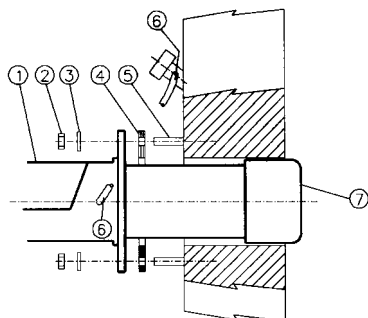
The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A and B ways. Remove the stirrup only once the burner is installed to the boiler.



Fitting the burner to the boiler

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

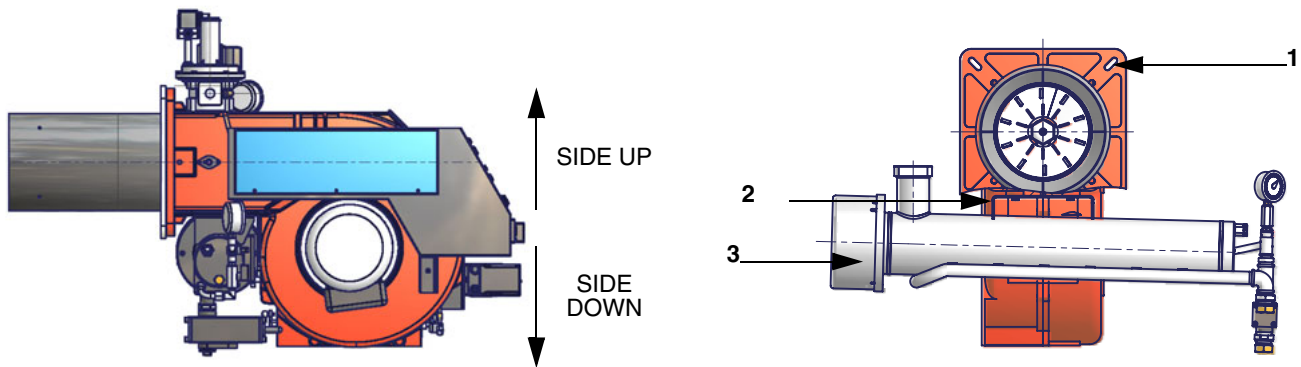
- 1 make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions"
- 2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
- 3 place the 4 stud bolts (5) on boiler's door, according 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-heating 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

	<p>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 magnet switch adequate for connection to the mains.</p>
	<p>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.</p>
	<p>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.</p>
	<p>IMPORTANT: Connecting electrical supply wires to the burner terminal block MA, be sure that the ground wire is longer than phase and neutral ones.</p>
	<p>Auxiliary contacts are provided (terminals no. 507 and no. 508 of the MA terminal block - see wiring diagrams) to connect an intervention system (alarm/power supply cutoff) in case of fault of the oil resistor contactor (see wiring diagram).</p>

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 wiring diagrams (see related chapter),
- 3 check the direction of the fan and pump motors (see next paragraph)
- 4 refit the panel cover

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

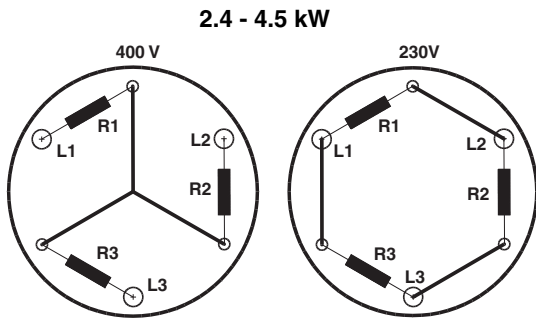


Fig. 1

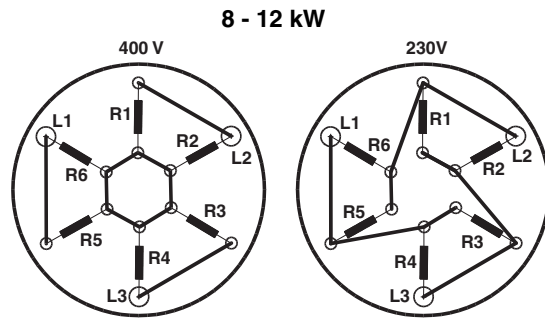


Fig. 2

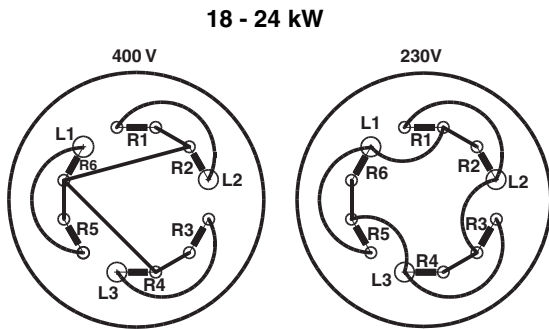


Fig. 3

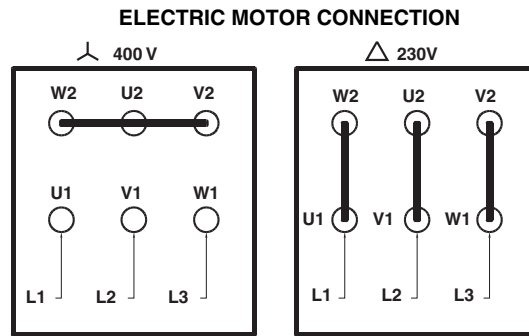


Fig. 4

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 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 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. 2, 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. 3 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 and 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 3I2D-01)		OIL PRESSURE AFTER OIL METERING VALVE (N. 14 IN 3I2D-01)		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 32ID-01, pump n.2



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



ATTENTION: on High flame, set atomising air pressure at 1.8 ÷ 2 bar.

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

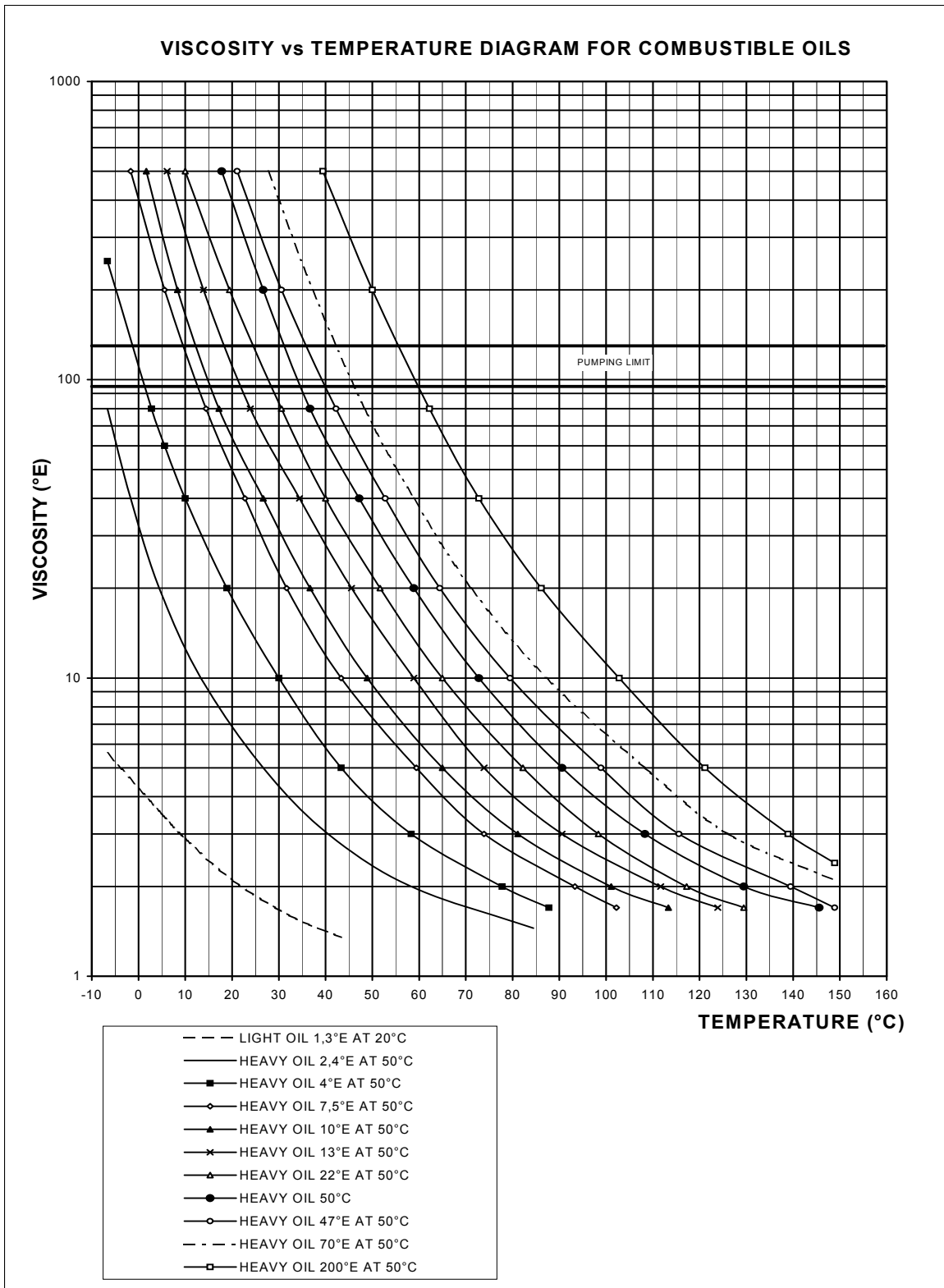


Fig. 5

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).

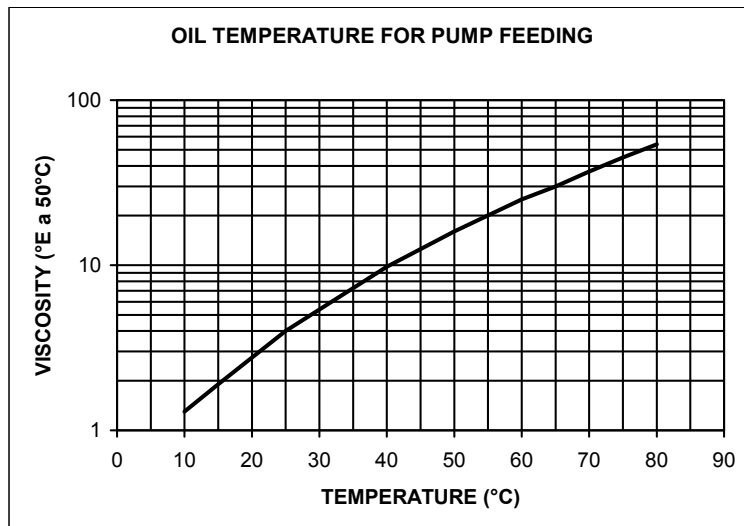


Fig. 6

Indicative diagram showing the oil pressure according to its temperature

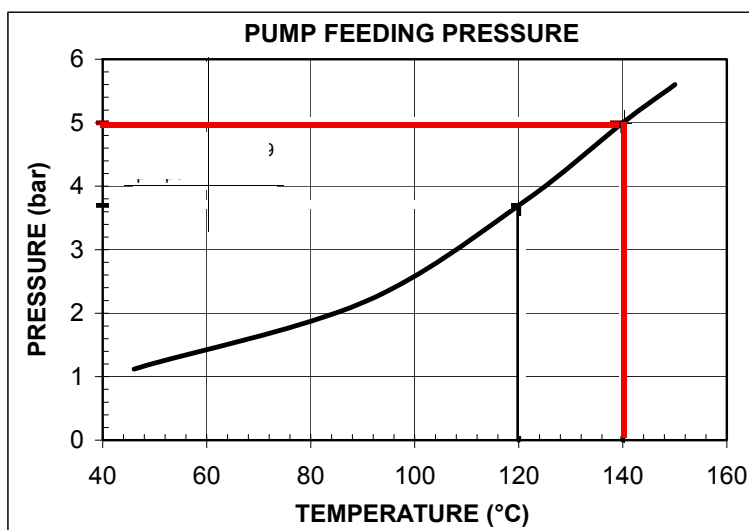
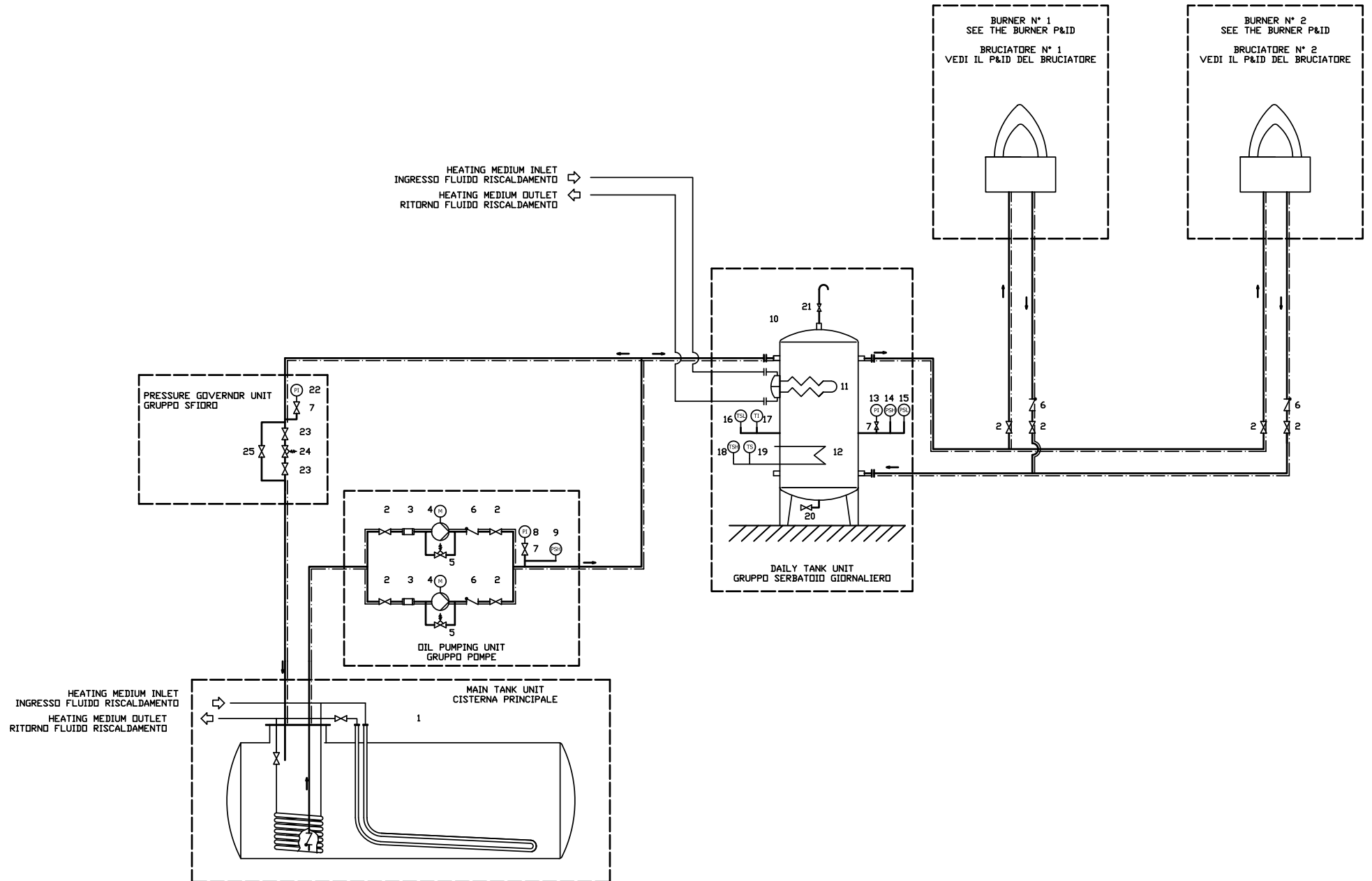


Fig. 7

Fig. 8 - 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

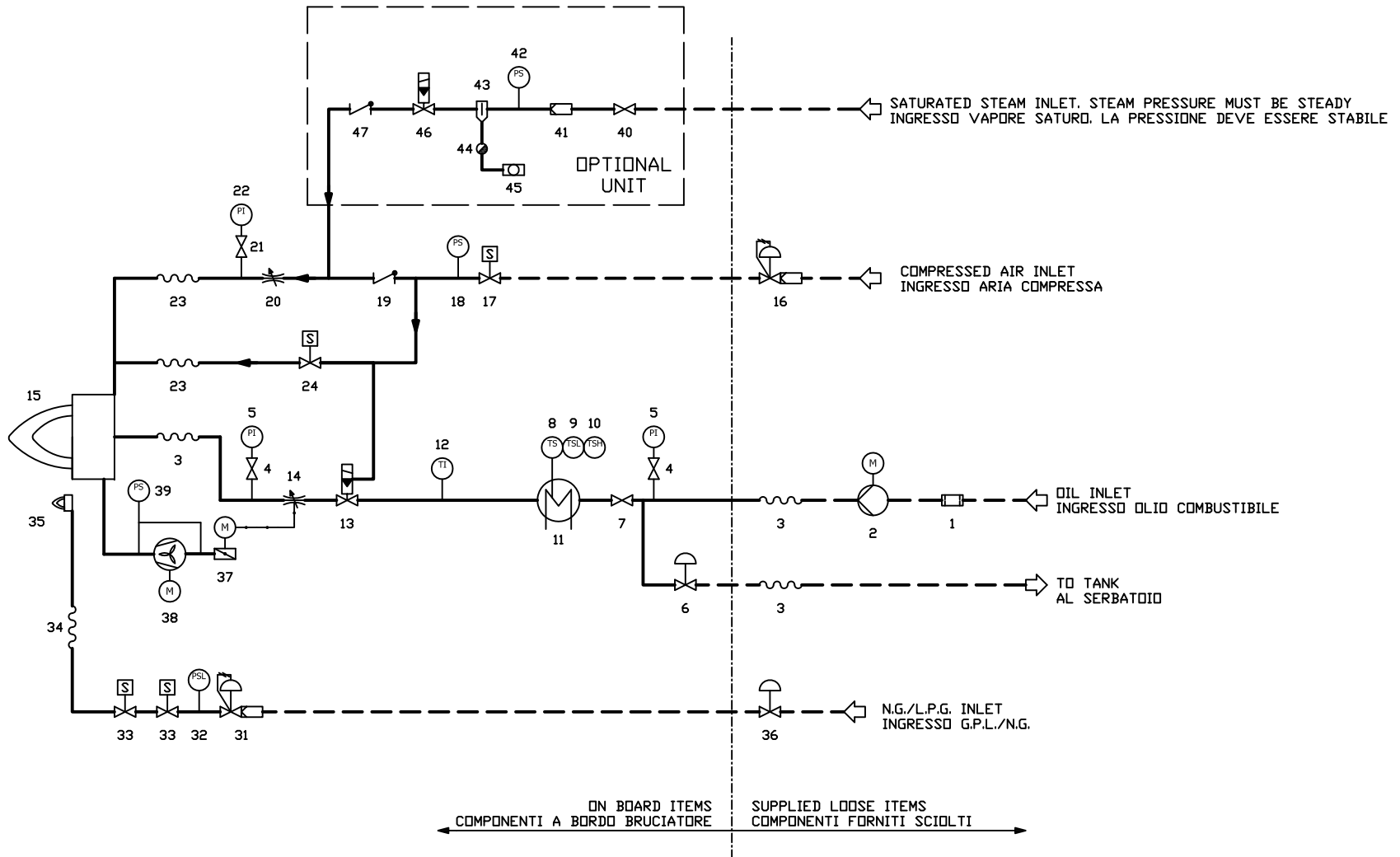
DAILY TANK

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. 9 - Hydraulic diagram 312D-01



3LMD-01		KEYS				
POS	OIL TRAIN			POS	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				NOTE: POS 36 is optional	
21	Manual valve				Steam train is optional	
22	Pressure gauge					
23	Flexible hose					
24	Solenoid valve					

Pilot burner assembly

The connection to the pilot must be done according to the following scheme

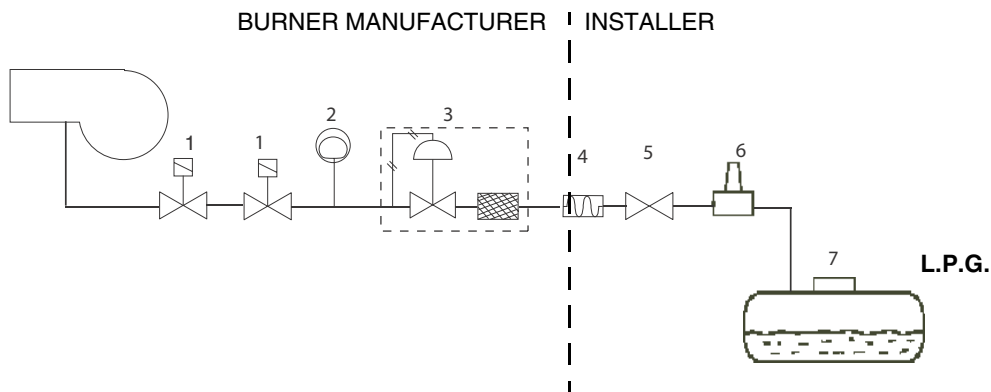


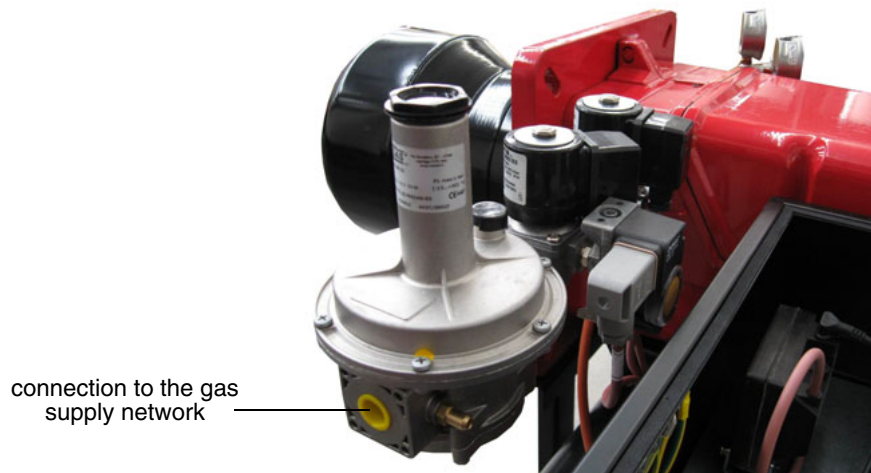
Fig. 10

Key

- 1 Gas valves
- 2 Gas pressure switch
- 3 Gas 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 gas 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. 10, 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

kW 0.75

Speed 1400

Max Outlet Pressure 10bar

Max Inlet Pressure 5bar

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

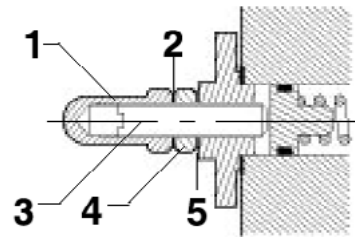
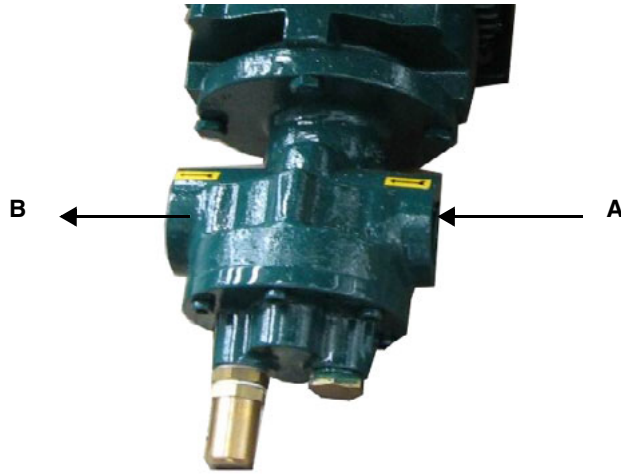


Fig. 11

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 **A** (on the heater) and **R** (on the oil pressure governor);
- 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



Hydraulic connections

Key

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

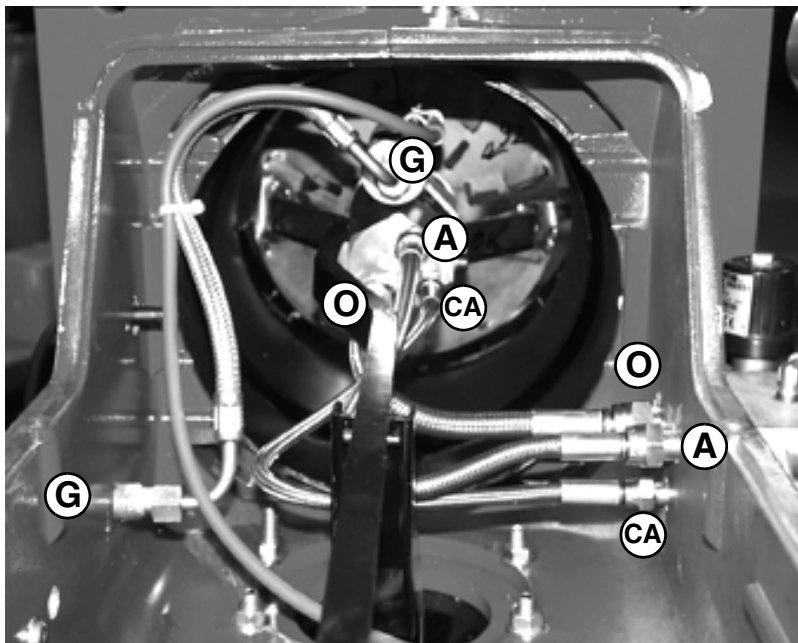


Fig. 12

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

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.

Safety resistors thermostat TRS: it is factory preset and sealed. Don not modify it!

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

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

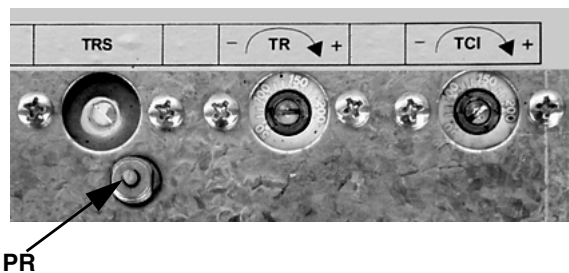


Fig. 13

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

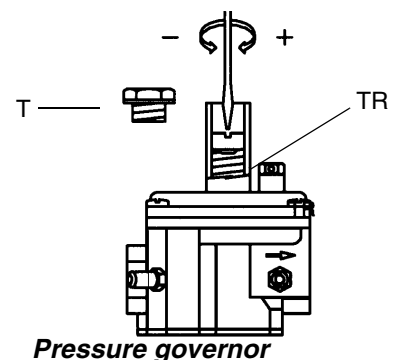
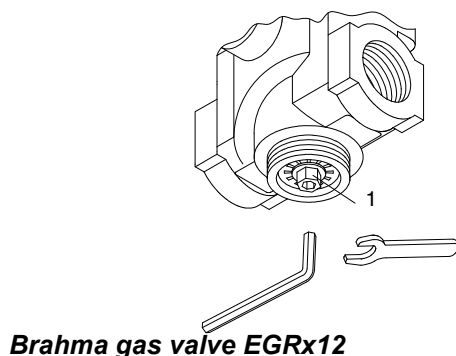
Adjusting the pilot gas flow rate: gas valve Brahma EG12*R and pressure governor

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.



Set pilot gas pressure switch at 50 mbar.

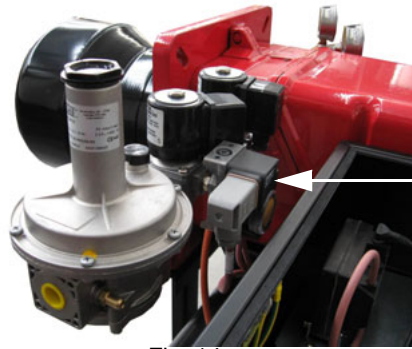


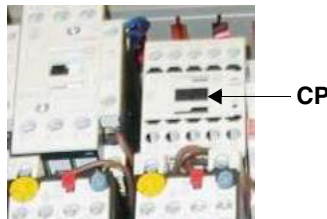
Fig. 14

Adjustments - brief description

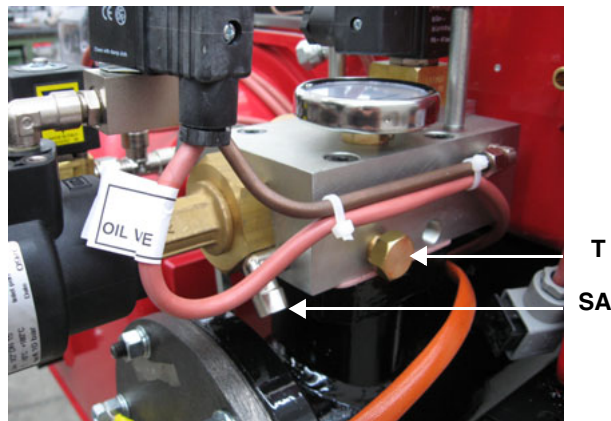
- Adjust the air and oil flow rates at the maximum output (“high flame”) first, by means of the air damper and the adjusting cam respectively.
- Check that the combustion parameters are in the suggested limits.
- Now set the low flame output, acting on the low flame microswitch of the actuator in order to avoid the low flame output increasing too much or the flues temperature getting too low to cause condensation in the chimney.

Oil Flow Rate Settings

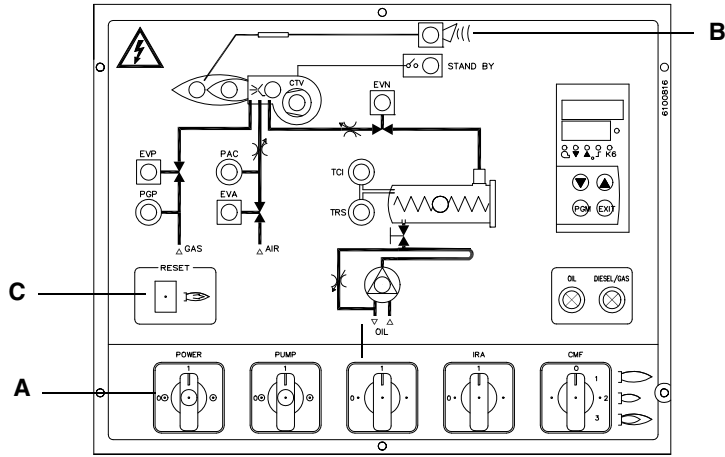
- 1 With the electrical panel open, prime the oil pump acting on the related contactor **CP** (see next picture): check the pump motor rotation (see “Fan motor and pump motor direction” on page 10) and keep pressing for some seconds until the oil circuit is charged;



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



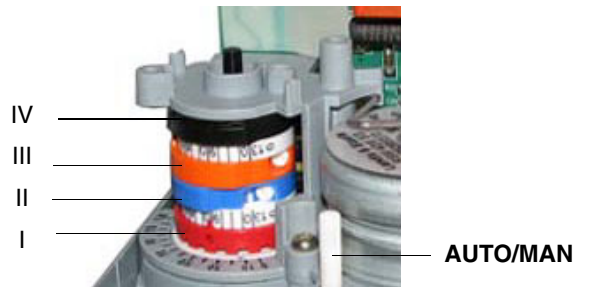
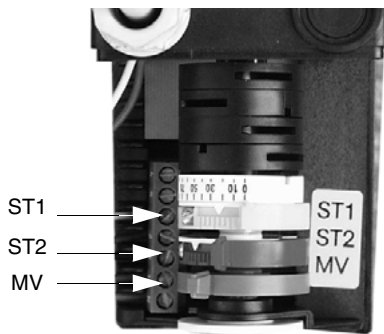
- 3 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.
- 4 Turn the burner on by means of its main switch **A** (see next picture): if the burner locks (LED **B** on in the control panel) press the RESET button (**C**) on the control panel - see chapter “OPERATION”.



- 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.

Berger STA6 B2.41/6

Siemens SQN72.2A4Ax



	Actuator cams Berger STA	Siemens SQN72
High flame position (set to 90°)	ST1	I (red)
Low flame and ignition position	ST2	III (orange)
Not used	MV	II (blue) - IV (black)

Berger STA6: to move the cams, act on the related screw.

Siemens SQN72: a key is provided to move cams I and IV, the other cams can be moved by means of screws.

On the BERGER STA actuator, the manual air damper control is not provided. On the Siemens actuator the AUTO/MAN mode is provided (see picture).

- 7 During high fire operation, oil pressure is about 4-4.5 bar (read on oil pressure gauge).

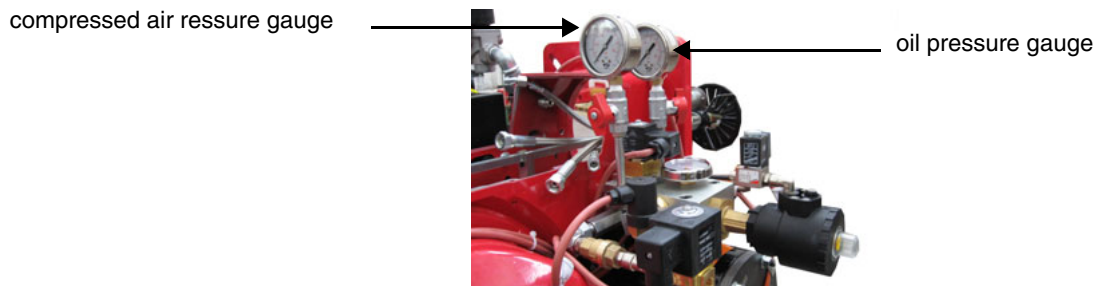


Fig. 15

- 8 Set the atomising air pressure switch **PA** (Fig. 16) at 0.5 bar

9 Set the ignitor gas pressure switch **PG** (Fig. 17) at 50 mbar.

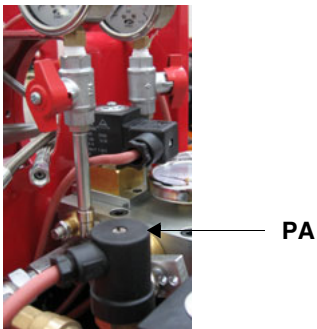


Fig. 16 - Atomising air pressure switch



Fig. 17 - Gas pressure switch

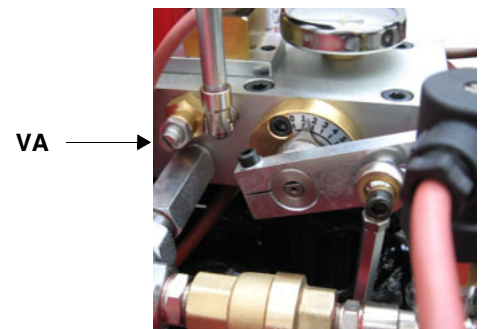


Fig. 18 - Atomising air flow rate adjustment

10 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. 15 and act on on the pump governor adjusting screw **VR** (see Fig. 19 and description on page 21) as to get the nozzle pressure at 4-4.5bar (see step 7). If the required flow rate is not reached, increase the feeding pressure by means of the Suntec TV governor (see Fig. 19)

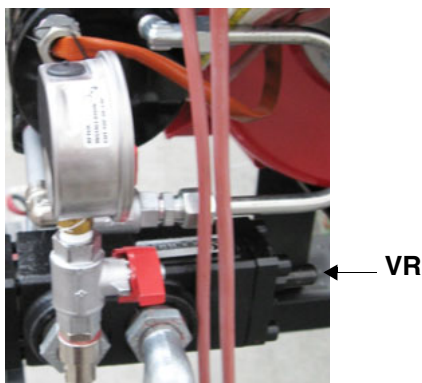
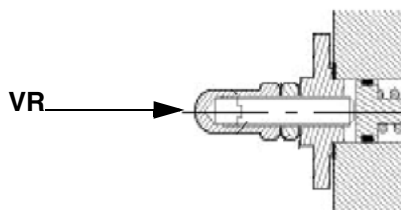


Fig. 19 - Suntec TV

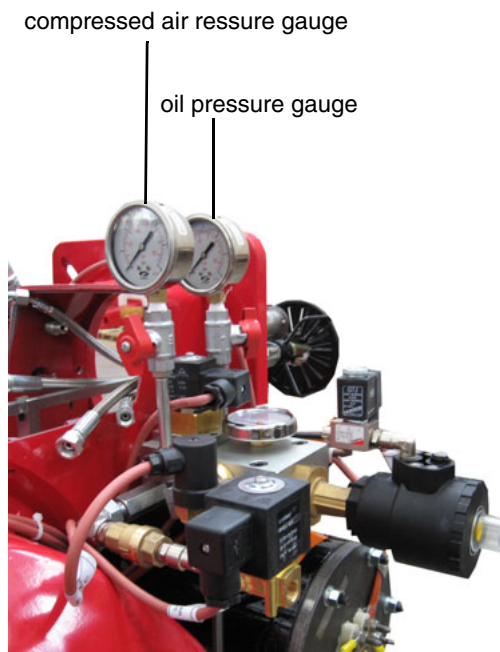
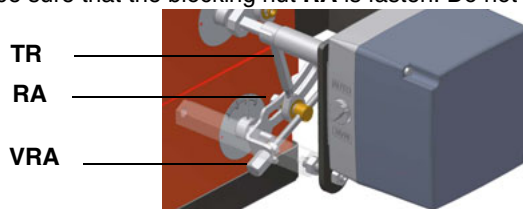


Fig. 21 - Oil metering valve

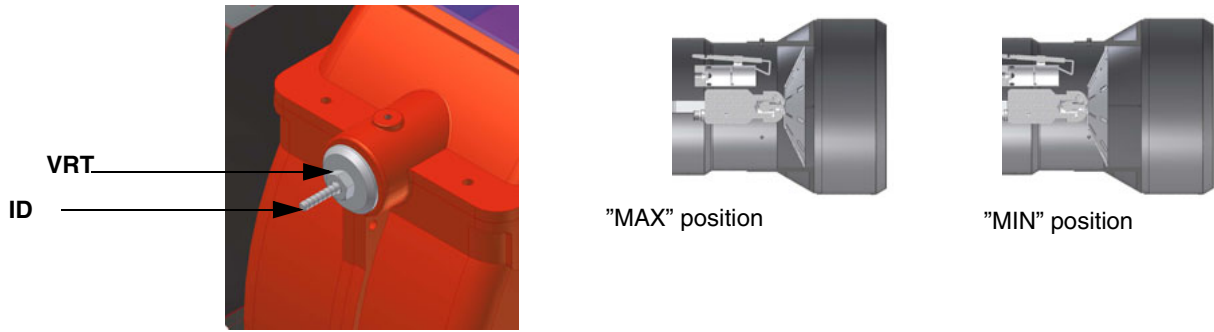
11 The atomising air flow rate and pressure (see paragraph) can be adjusted with the **VA** screw (Fig. 18). Too low a pressure produces poor atomising with smoke in the flue. Too high a pressure produces instability and the flame can blow off.

12 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.



13 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.

- 14 set the **TAB** thermostat to the low flame position;
- 15 During low fire operation, oil pressure is about 1 bar (read on oil pressure gauge).

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.



EVL air valve for gun cleaning

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

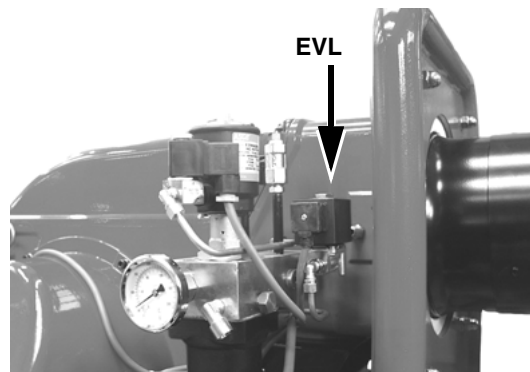


Fig. 23

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.

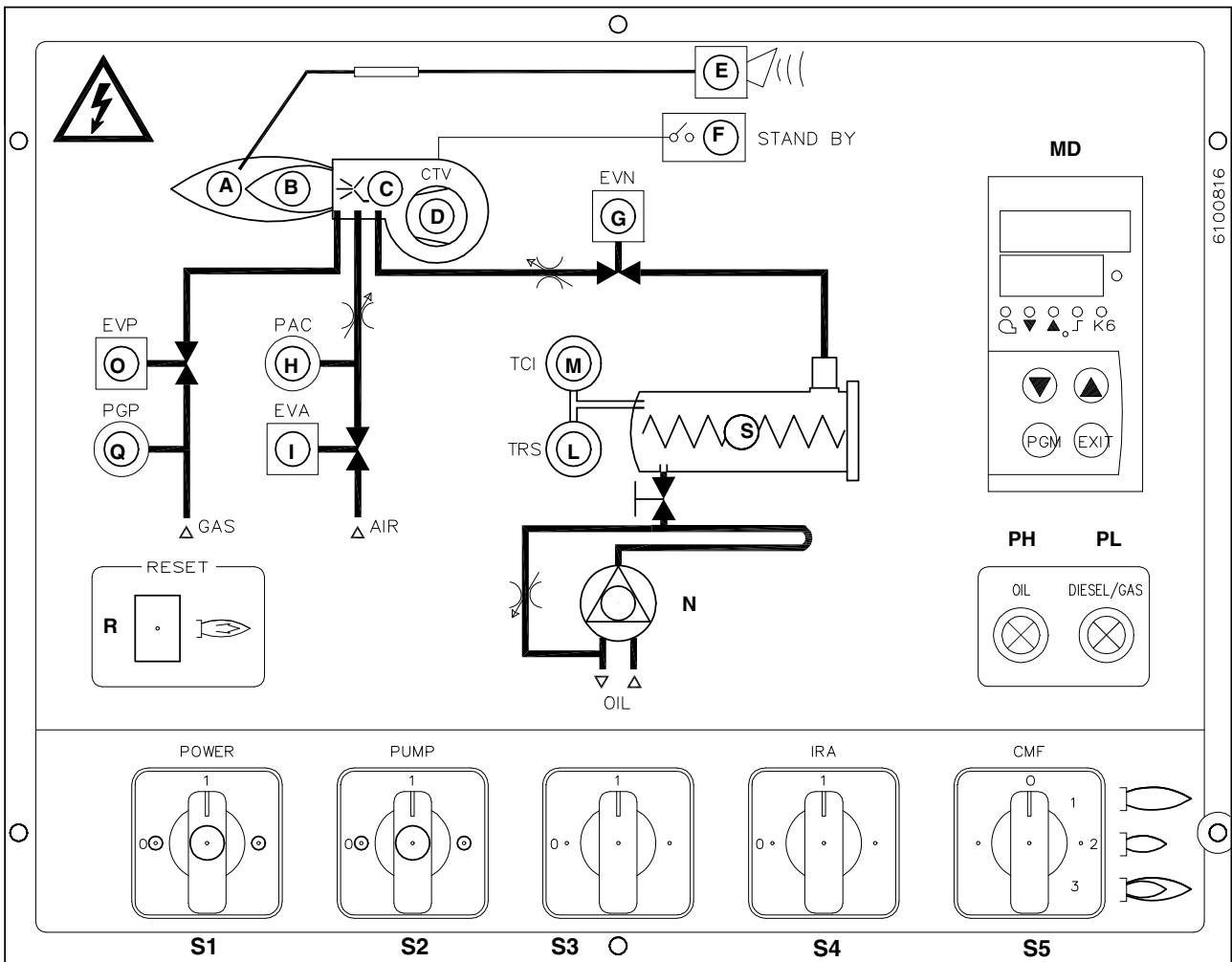
OPERATION



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 28).

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 Atomisation air pressure switch lamp
- I Compressed air solenoid valve lamp
- L Heating resistors safety thermostat lamp
- M Plant enabling thermostat lamp
- N Oil pump in operation
- O Ignitor solenoid valve lamp
- PL Light oil operation lamp
- PH Heavy oil operation lamp
- Q Ignitor gas pressure switch
- R Reset pushbutton for control box
- S Pre-heating in operation lamp
- S1 Burner main switch
- S2 Pump operation selector MAN-AUTO
- S3 Heavy oil/light oil 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 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 32).
- Examine and clean the ignition electrode, adjust and replace if necessary (see page 32).
- Examine and clean the detection probe, adjust and replace if necessary (see page 33).
- Examine the detection current (see page 33).
- Remove and clean (page 34) 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. 24
- Remove and clean the oil regulator B in Fig. 24



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.

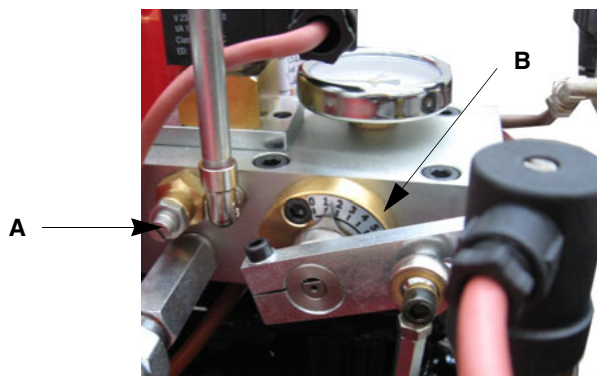


Fig. 24

Maintenance of the gas governor with filter (ignitor gas train)

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. 25):

- 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. 26);
- reassemble the bottom cover (3), being sure that the main bolt is centered in the bottom cover slot.

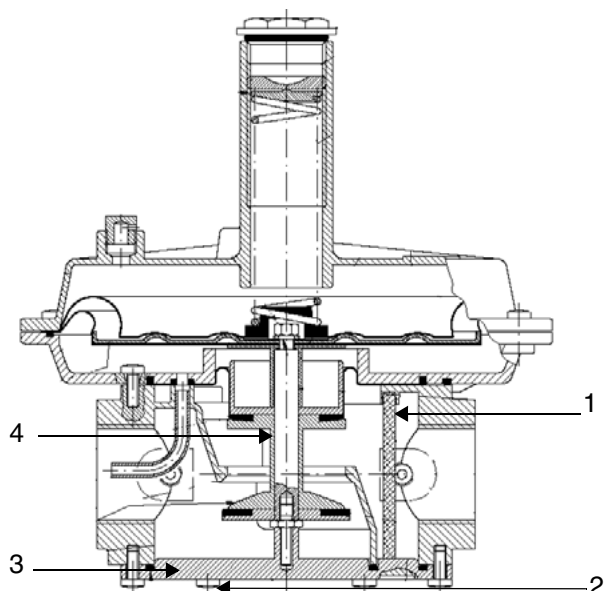


Fig. 25 - threaded body

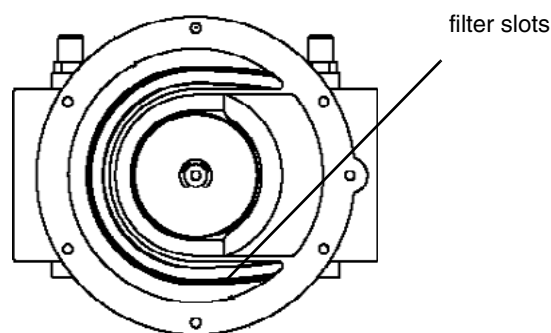


Fig. 26 - threaded body without bottom cover

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. 27.

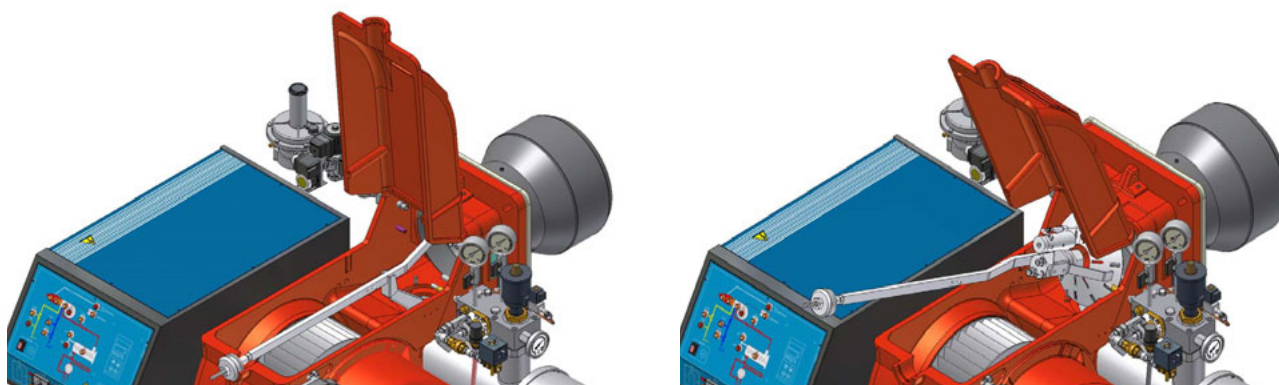


Fig. 27

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, unscrew the nozzle and replace it if necessary;
- 3 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.

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.

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

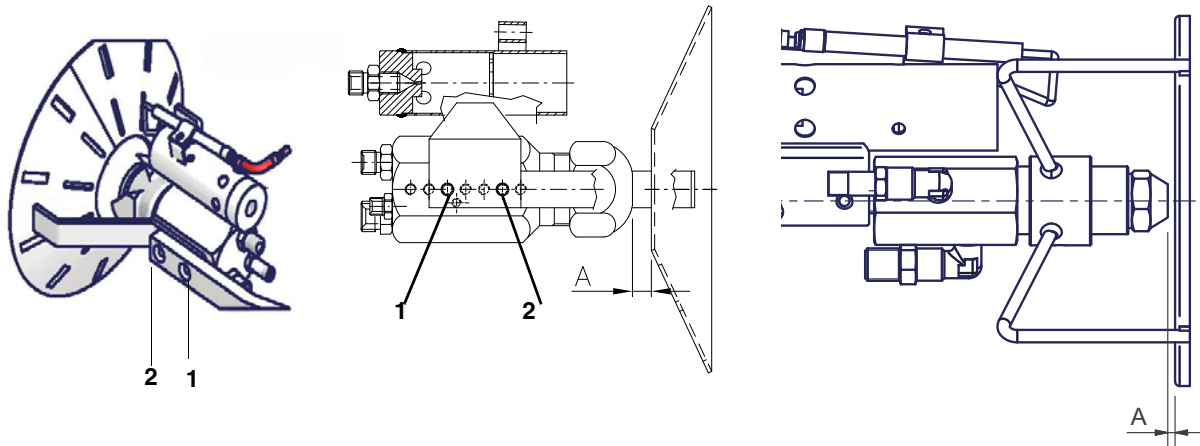


Fig. 28

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, unscrew the nozzle and replace it if necessary;
- 3 in order to replace the electrode, unscrew the fixing screw and remove it: place the new electrode being careful to observe the measures shown on next paragraph and reassemble following the reversed procedure.

Checking the detection current

To measure the detection signal follow the diagram in Fig. 29.

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.

Minimum current intensity with flame: 45 μ A

Max.perm.current intensity without flame: 5.5 μ A

Maximum possible current intensity with flame: 100 μ A

μ A DC: DC microammeter with $R_i = \text{max. } 5\text{kohm}$

bl: Blue

sw: Black

br: Brown

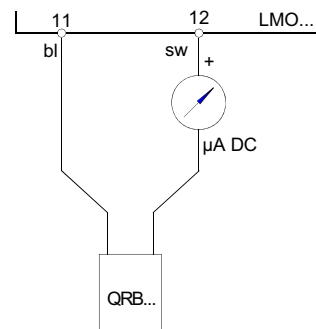


Fig. 29

Cleaning and replacing the detection photoresistor

When cleaning the photoresistive detector, always use a clean cloth. If necessary, remove it from its slot to replace it.

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-PURGE	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 CUTOUT 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				●			

SPARE PARTS

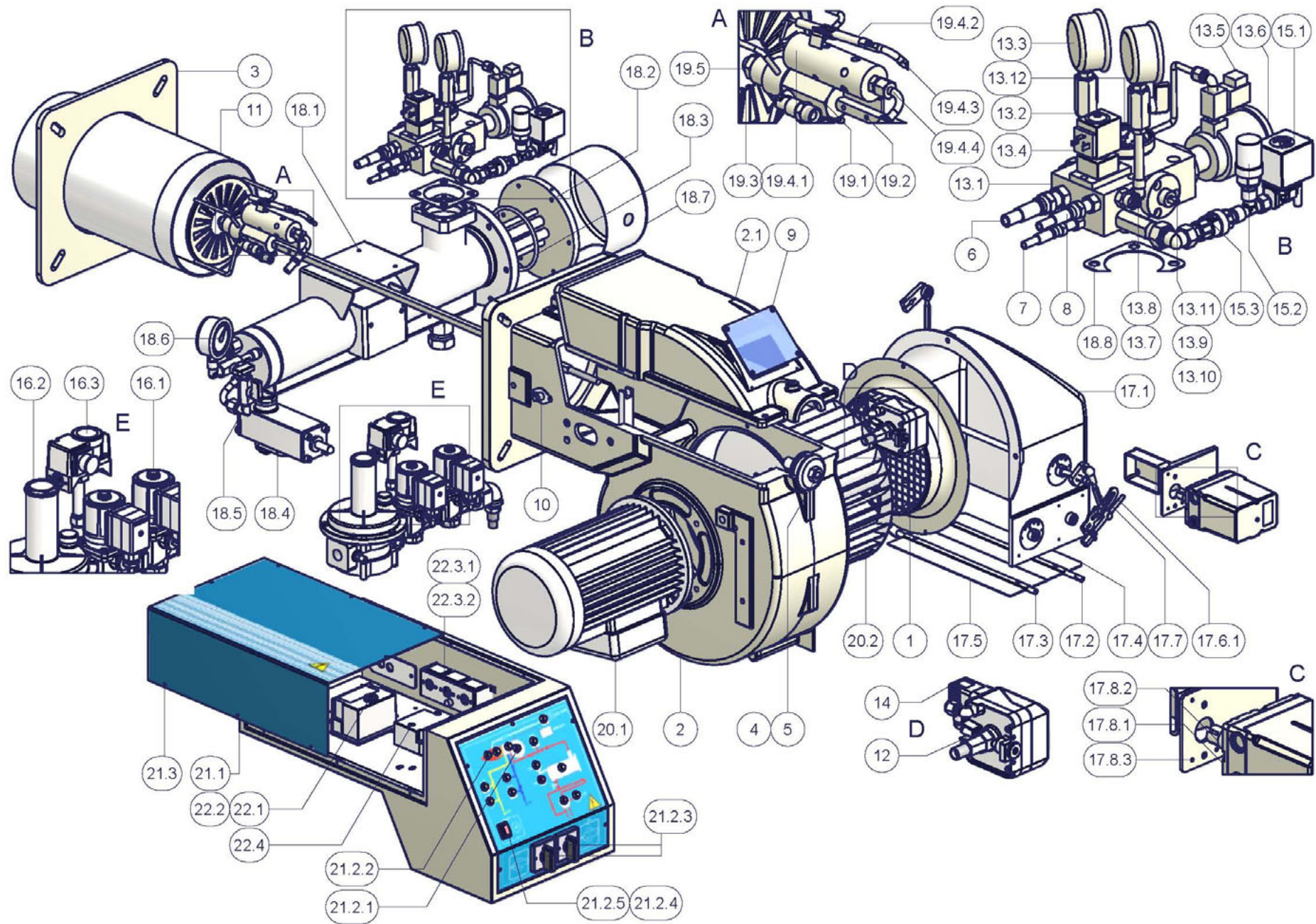
DESCRIPTION	PBY70
CONTROL BOX	2020455
IGNITOR ELECTRODE	2080254
OIL FILTER	2090236
GASKET	2110033
FAN WHEEL	2150038
AIR PRESSURE SWITCH	2160065
COMPRESSED AIR PRESSURE SWITCH - PMM10A 2-10 bar	2160083
GAS PRESSURE SWITCH - DUNGS GW150 A6	2160086
IGNITION TRANSFORMER	2170301
ELECTRIC MOTOR	218021101
SOLENOID VALVE L122	2190420
SOLENOID VALVE L139	2190451
GAS SOLENOID VALVE	2190502
FLEXIBLE HOSES	2340004
FLEXIBLE HOSES L=300	2340040
FLEXIBLE HOSES L=385 3/8"	2340088
FLEXIBLE HOSES L=365	234FX13
FLEXIBLE HOSES L=385 1/4"	234FX35
ADJUSTING CAM FOIL	2440014
ACTUATOR mod. BERGER STA6	2480041
ACTUATOR mod. SIEMENS SQN72	24800A3
PHOTORESISTOR SIEMENS QRB1B	2510008
RESISTOR THERMOSTATTR-TCN-TCI	2560026
THERMOSTAT TRS	2560028
PRESSURE GOVERNORSUNTEC TV	2570068
OIL METERING VALVE HAUCK	25700xx
PUMP - CUCCHI FMG25	2590218
NOZZLE	2610502
L.P.G.PILOT	2640051
GAS GOVERNOR WITH FILTER	2800085
AIR GOVERNOR WITH FILTER	2800116
L.P.G. REDUCER	2800125
COMBUSTION HEAD	30601D0
STANDARD BLAST TUBE	30900A9
AIR PRESSURE SWITCH ASS.Y	3500104
IGNITION CABLE	6050142
MIMIC PANEL	6100816

BURNER EXPLODED VIEW

ITEM	DESCRIPTION
1	AIR INLET CONE
2	BURNER HOUSING
2.1	COVER
3	GENERATOR GASKET
4	PLUG
5	NIPPLE
6	FLEXIBLE HOSE
7	FLEXIBLE HOSE
8	FLEXIBLE HOSE
9	INSPECTION GLASS
10	PHOTORESISTOR
11	STANDARD BLAST TUBE
12	AIR PRESSURE SWITCH
13.1	OIL MANIFOLD
13.2	MANUAL VALVE
13.3	PRESSURE GAUGE
13.4	OIL SOLENOID VALVE
13.5	COMPRESSED AIR SOLENOID VALVE
13.6	PNEUMATIC OIL VALVE
13.7	PRESSURE GOVERNOR
13.8	AIR ADJUSTING ROD
13.9	PRESSURE GOVERNOR
13.10	PRESSURE GOVERNOR
13.11	PRESSURE GOVERNOR

ITEM	DESCRIPTION
13.12	THERMOMETER
14	CONNECTOR
15.1	OIL SOLENOID VALVE
15.2	AIR PRESSURE SWITCH
15.3	ONE-WAY VALVE
16.1	GAS SOLENOID VALVE
16.2	GAS GOVERNOR WITH FILTER
16.3	GAS PRESSURE
17.1	AIR INTAKE
17.2	LOUVER SHAFT
17.3	LOUVER SHAFT
17.4	AIR INTAKE DAMPER
17.5	AIR INTAKE DAMPER
17.6.1	CAM
17.7	ACTUATOR SHAFT
17.8.1	ACTUATOR
17.8.2	ACTUATOR SHAFT
17.8.3	ACTUATOR BRACKET
18.1	OIL PRE-HEATER
18.2	RESISTOR
18.3	O RING
18.4	PRESSURE GOVERNOR
18.5	MANUAL VALVE
18.6	PRESSURE GAUGE

ITEM	DESCRIPTION
18.7	COVER
18.8	GASKET
19.1	NOZZLE HOLDER
19.2	NOZZLE HOLDER ROD
19.3	COMBUSTION HEAD
19.4.1	IGNITOR
19.4.2	IGNITION ELECTRODE
19.4.3	IGNITION CABLE
19.4.4	GAS FLEXIBLE HOSE
19.5	NOZZLE
20.1	MOTOR
20.2	FAN WHEEL
21.1	CONTROL PANEL
21.2.1	LIGHT
21.2.2	LIGHT
21.2.3	SWITCH
21.2.4	LOCK-OUT RESET BUTTON
21.2.5	PROTECTION
21.3	COVER
22.1	CONTROL BOX
22.2	CONTROL BOX SOCKET
22.3.1	THERMOSTAT
22.3.2	THERMOSTAT
22.4	IGNITION TRANSFORMER



ELECTRICAL WIRING DIAGRAMS

Electric supply connections must be arranged in order to ensure the burner stops if IRxx switches are open. When the three phase power supply is interrupted, the auxiliary (single phase) power supply must be interrupted as well.

WARNING:

- 1 - Power supply 400V 50Hz 3N AC with neutral
- 2 - Don't reverse phase with neutral
- 3 - Ensure the burner is properly earthed

APPENDIX

SIEMENS OIL BURNERS AUTOMATIC CONTROLLER SIEMENS LMO14 - LMO24 - LMO44

The LMO... burner controls are designed for the start-up and supervision of single- or 2-stage forced draught oil burners in intermittent operation. Yellow-burning flames are supervised with photoresistive detectors QRB..., blue-burning flames with blue-flame detectors QRC...

In terms of housing dimensions, electrical connections and flame detectors, the LMO... are identical to the LOA... oil burner controls.

Preconditions for startup

- Burner control is reset
- All contacts in the line are closed
- No undervoltage
- Flame detector is darkened, no extraneous light

Undervoltage

- Safety shut-down in the operating position takes place should the mains voltage drop below about AC 165 V
- Restart is initiated when the mains voltage exceeds about AC 175 V

Time supervision oil pre-heater

If the oil pre-heater's release contact does not close within 10 minutes, the burner control will initiate lock-out.

Controlled intermittent operation

After no more than 24 hours of continuous operation, the burner control will initiate an automatic safety shut-down followed by a restart.

Control sequence in the event of fault

If lock-out occurs, the outputs for the fuel valves and the ignition will immediately be deactivated (< 1 second).

Cause	Response
After a mains failure	Restart
After voltage has fallen below the undervoltage threshold	Restart
In the event of a premature, faulty flame signal during «t1»	Lock-out at the end of «t1»
In the event of a premature, faulty flame signal during «tw»	Prevention of start-up, lock-out after no more than 40 seconds
If the burner does not ignite during «TSA»	Lock-out at the end of TSA
In the event the flame is lost during operation	Max. 3 repetitions, followed by lock-out
Oil pre-heater's release contact does not close within 10 min.	Lock-out

Lock-out

In the event of lock-out, the LMO... remains locked (lock-out cannot be changed), and the red signal lamp will light up. This status is also maintained in the case of a mains failure.

Resetting the burner

Whenever lock-out occurs, the burner control can immediately be reset. To do this, keep control the lock-out reset button depressed for about 1 second (< 3 seconds).

Ignition program with LMO24.113A2

If the flame is lost during «TSA», the burner will be reignited, but not later than at the end of «TSAmax.». This means that several ignition attempts can be made during TSA (refer to «Program sequence»).

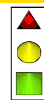
Limitation of repetitions

If the flame is lost during operation, a maximum of 3 repetitions can be made. If the flame is lost for the 4th time during operation, the burner will initiate lock-out. The repetition count is restarted each time controlled switching on by «R-W-SB» takes place.

Operation



Lock-out reset button «EK...» is the key operating element for resetting the burner control and for activating / deactivating the diagnostic functions.



The multicolour «LED» is the key indicating element for both visual diagnosis and interface diagnosis.

- s Red
- l Yellow
- o Green

Colour code table		
Status	Colour code	Colour
Oil pre-heater heats, waiting time «tw»	llllllllll	Yellow
Ignition phase, ignition controlled	lmlmlmlml	Yellow-off
Operation, flame o.k.	oooooooo	Green
Operation, flame not o.k.	omomomomo	Green-off
Undervoltage	lslslslsl	Yellow-red
Fault, alarm	ssssssssss	Red
Output of fault code (refer to Fault code table)	smsmsmsmsm	Red-off
Extraneous light prior to burner start-up	osososososo	Green-red
Interface diagnosis	ssssssssssss	Red flicker light

Key

- m Off
- l Yellow
- o Green
- s Red

Diagnosis of cause of fault

After lock-out, the red fault signal lamp remains steady on.

In that condition, the visual diagnosis of the cause of fault according to the error code table can be activated by pressing the lock-out reset button for more than 3 seconds.

Error code table	
Blink code	Possible cause
2 blinks **	No establishment of flame at the end of TSA <ul style="list-style-type: none"> ● Faulty or soiled fuel valves ● Faulty or soiled flame detector ● Poor adjustment of burner, no fuel ● Faulty ignition
3 blinks ***	Free
4 blinks ****	Extraneous light on burner startup
5 blinks *****	Free
6 blinks *****	Free
7 blinks *****	Too many losses of flme during operation (limitation og the number of repetitions) <ul style="list-style-type: none"> ● Faulty or soiled fuel valves ● Faulty or soiled flame detector ● Poor adjustment of burner
8 blinks *****	Time supervision oil pre-heater
9 blinks *****	Free
10 blinks *****	Wiring error or internal error, output contacts

During the time the cause of fault is diagnosed, the control outputs are deactivated.

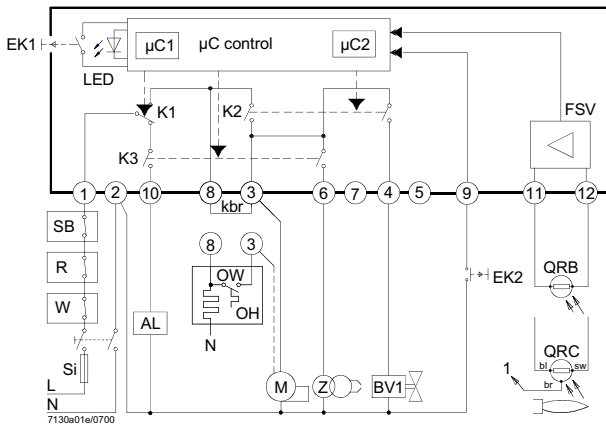
- Burner remains shut down
- Fault status signal «AL» at terminal 10 is activated

The diagnosis of the cause of fault is quit and the burner switched on again by resetting the burner control.

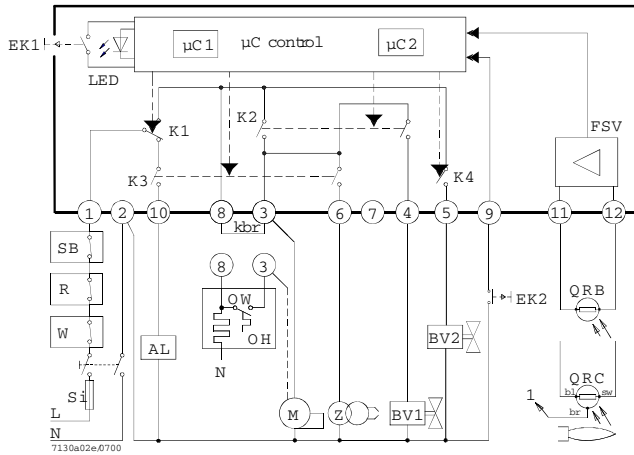
Press lock-out reset button for about 1 second (< 3 seconds).

Connection diagram and internal diagram

LMO14

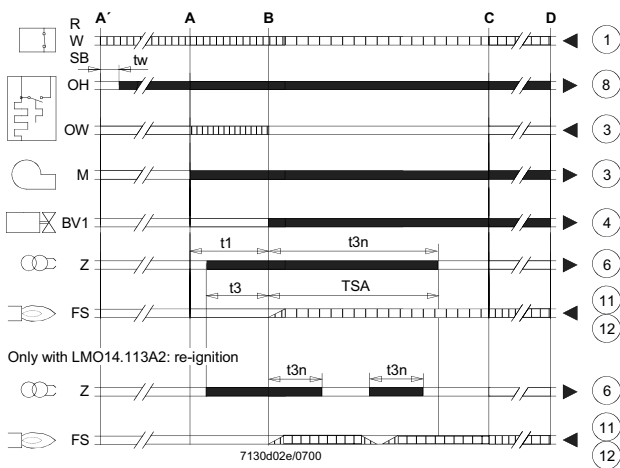


LMO24 - LMO44

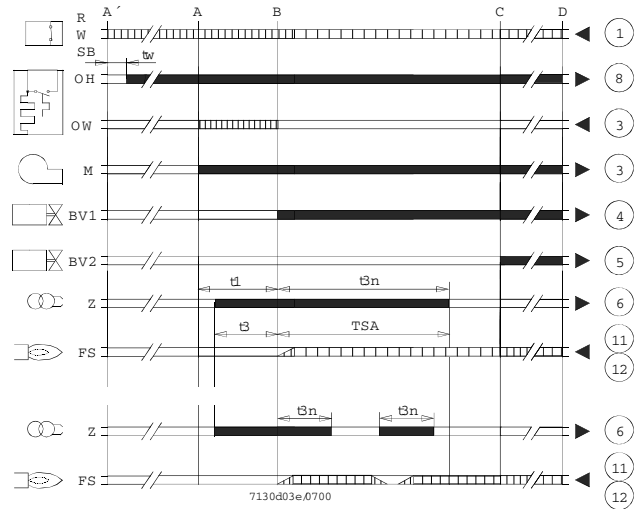


Control sequence

LMO14



LMO24 - LMO44



Key

- AL Alarm device
- kbr... Cable link (required only when no oil pre-heater is used)
- BV... Fuel valve
- EK1 Lock-out reset button
- EK2 Remote lock-out reset button
- FS Flame signal
- FSV Flame signal amplifier
- K... Contacts of control relay
- LED 3-colour signal lamps
- M Burner motor
- OW Release contact of oil pre-heater
- t1 Pre-purge time
- t3 Pre-ignition time
- t3n Post-ignition time
- A' Beginning of start-up sequence with burners using an oil pre-heater
- A Beginning of start-up sequence with burners using no oil pre-heater
- Controller output signals (represented by a white box)
- Required input signals (represented by a black box)
- OH Oil pre-heater
- QRB Photoresistive detector
- QRC Blue-flame detector
- bl = blue
- br = brown
- sw = black
- R Control thermostat or pressurestat
- SB Safety limit thermostat
- Si External primary fuse
- W Limit thermostat or pressure switch
- Z Ignition transformer
- t4 Interval from flame signal to release «BV2»
- TSA Ignition safety time
- tw Waiting time for oil pre-heating
- B Time of flame establishment
- C Operating position
- D Controlled shut-down by «R»
- μC1 Microcontroller 1
- μC2 Microcontroller 2

General unit data

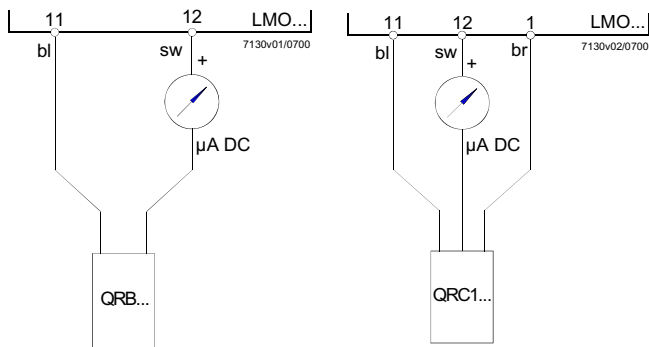
Mains voltage	AC 230 V +10 % / -15 %
	AC 120 V +10 % / -15 %
Mains frequency	50...60 Hz \pm 6 %
External primary fuse (Si)	6.3A (slow)
Power consumption	12 VA
Mounting orientation	optional
Weight	approx. 200 g
Degree of protection	IP40 (to be ensured through mounting)
Perm. cable lengths	max. 3m at line capacitance of 100 pF/m
Detector cable laid separately	10 m
Remote reset laid separately	20m

	LMO14	LMO24	LMO44
Terminal 1	5 A	5 A	5 A
Terminals 3 and 8	3 A	5 A	5 A
Terminals 4, 5 and 10	1 A	1 A	1A
Terminals 6	1 A	1 A	2A

Flame supervision with QRB and QRC

	QRB	QRC
Min. detector current required (with flame)	45 μ A	70 μ A
Min detector current permitted (without flame)	5.5 μ A	5.5 μ A
Max. possible with flame (typically)	100 μ A	100 μ A

Measurement circuit for detector current



Key

μ A DC	DC microamperometer with an internal resistance of 5 k Ω max.
bl	Blue
sw	Black
br	Brown





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