

PN30
PN60 - PN70
PN81 - PN91 - PN92

Double-stage
Heavy oil Burners

MANUAL OF INSTALLATION - USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

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 electrics 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

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- UNI EN 676 Gas Burners
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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;
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- Directive 2004/108/EC on electromagnetic compatibility

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National standards :

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PART I: INSTALLATION

Burner model identification

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

| Type (1) | PN70 Model (2) | N-. (3) | AB. (4) | S. (5) | *. (6) | A. (6) |
|--------------------------------|-------------------|---|------------|-----------|-----------|-----------|
| (1) BURNER TYPE | | PN30-PN60-PN70-PN81-PN91-PN92 | | | | |
| (2) FUEL TYPE | | N - Heavy oil, viscosity $\leq 50\text{cSt}$ (7° E) @ 50° C E - Heavy oil, viscosity $\leq 110\text{cSt}$ (15° E) @ 50° C D - Heavy oil, viscosity $\leq 400\text{cSt}$ (50° E) @ 50° C P - Petroleum, viscosity 89cSt (12° E) @ 50° C | | | | |
| (3) OPERATION | | AB - Double stage | | | | |
| (4) BLAST TUBE | | S – Standard L – Extended | | | | |
| (5) DESTINATION COUNTRY | | * - see data plate | | | | |
| (6) SPECIAL VERSION | | A - Standard | | | | |

Specifications

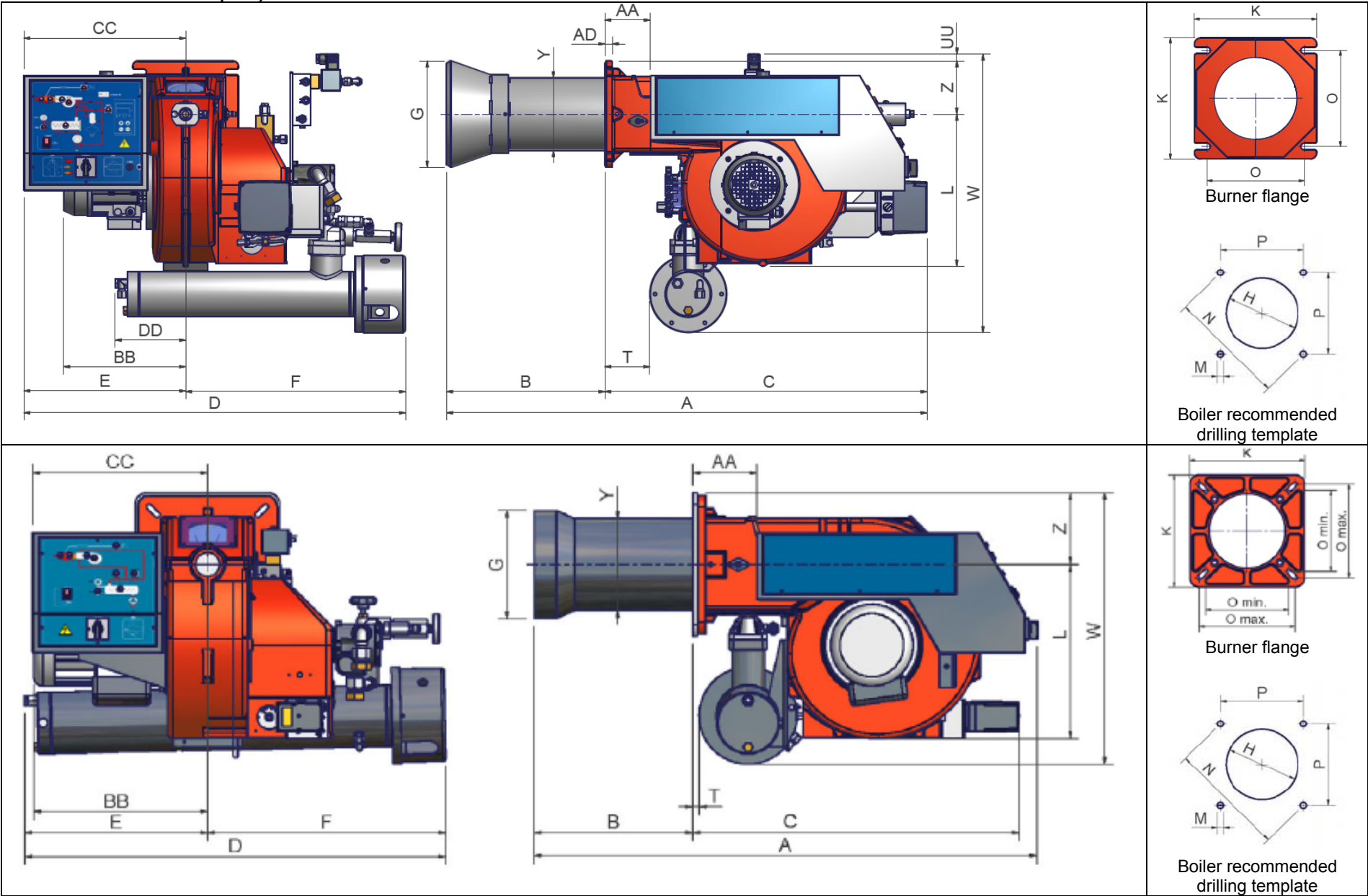
| BURNER TYPE | | PN30 | PN60 | PN70 | PN81 | PN91 | PN92 |
|--|--------------|---|---------|----------|----------|-----------|------------|
| Output | min-max kW | 105-383 | 145-698 | 291-1047 | 264-1900 | 1047-2093 | 849 - 2558 |
| Fuel | | Heavy oil | | | | | |
| Viscosity | | See "Burner model identification" table | | | | | |
| Heavy oil rate | min-max kg/h | 9-33 | 12.5-60 | 25-90 | 23.5-169 | 93-187 | 76- 228 |
| Oil train inlet pressure (viscosity $\leq 50\text{ cSt}$ (7 °E) @ 50 °C) | bar | 1.5max | | | | | |
| Oil train inlet pressure (viscosity $\leq 400\text{ cSt}$ (50 °E) @ 50 °C) | bar | 3.5max | | | | | |
| Power supply | | 230/400V 50Hz | | | | | |
| Electric motor | kW | 0.75 | 1.1 | 2.2 | 3 | 4 | 5.5 |
| Pre-heater resistors (heavy oil) | kW | 2.4 | 4.5 | 8 | 12 | 18 | 18 |
| Pre-heater resistors (petroleum) | kW | 2.4 | 1.5 | 2.7 | 4 | 6 | 6 |
| Total power consumption (Heavy oil) | kW | 3.65 | 6.1 | 10.7 | 15.5 | 22.5 | 24 |
| Total power consumption (petroleum) | kW | 3.65 | 3.1 | 5.4 | 7.5 | 10.5 | 12 |
| Approx. weight | kg | 60 | 90 | 110 | 130 | 190 | 230 |
| Operation | | Double-stage | | | | | |
| Operating temperature | °C | -10 ÷ +50 | | | | | |
| Storage temperature | °C | -20 ÷ +60 | | | | | |
| Working service * | | Intermittent | | | | | |

Heavy oil net calorific value (Hi): 40.4 kcal/kg (average value)

*. NOTE ON THE BURNER WORKING SERVICE:

- Burners provided with Siemens LOA24 control box: for safety reasons, one controlled shutdown must take place every 24 hours.
- Burners provided with Siemens LMO24-44 control box: the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.

Overall dimensions (mm)

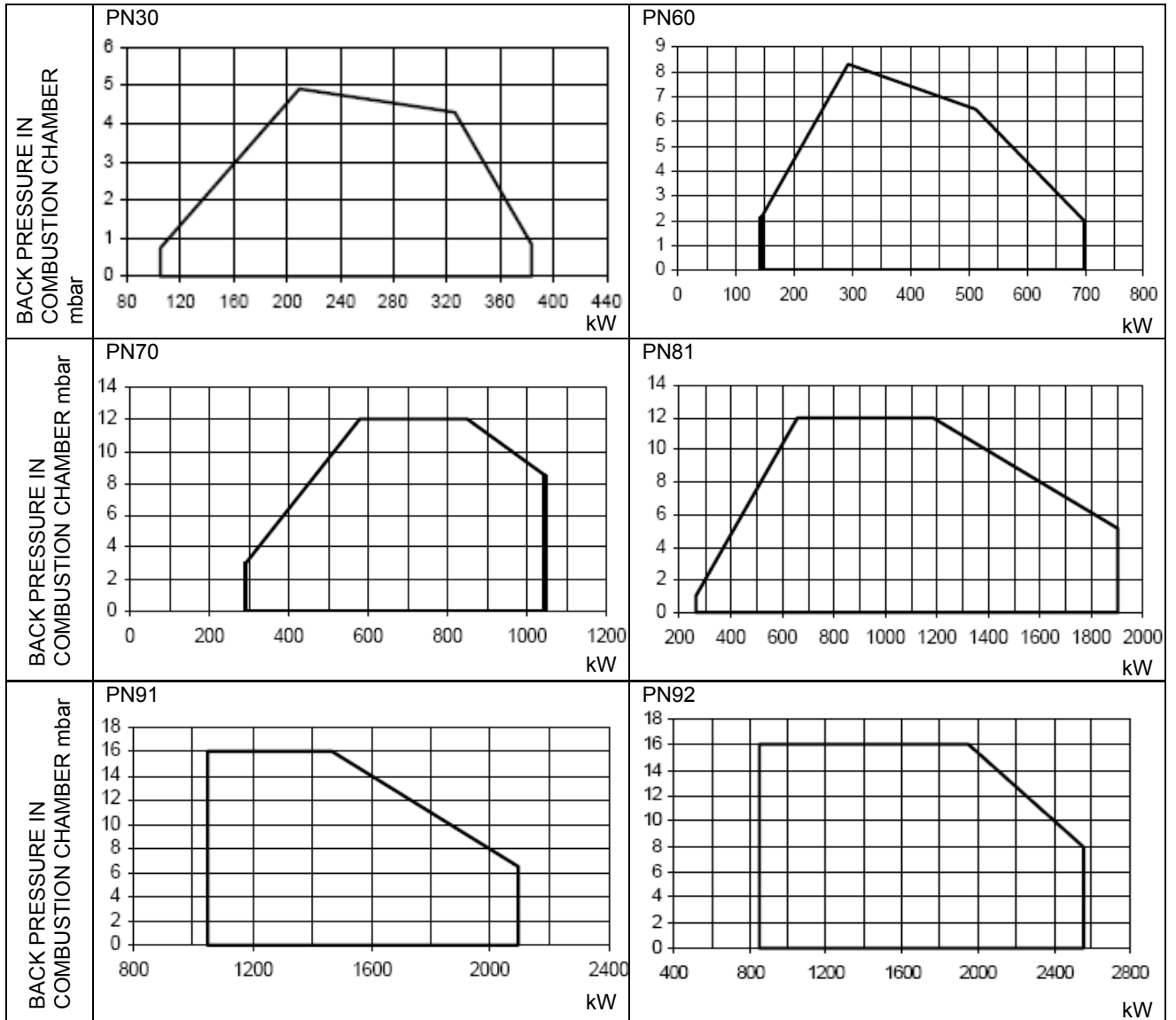


| | AS* | AL* | AA | BS* | BL* | BB | C | CC | D | DD | E | F | G | H | K | L | M | N | O - min | O - max | P | T | W | Y | Z |
|-------------|------|------|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------|------------|-----|----|-----|-----|-----|
| PN30 | 670 | 860 | x | 150 | 340 | x | 520 | x | 720 | | 270 | 450 | 121 | 151 | 190 | 400 | M10 | 219 | 155 | 155 | x | x | x | 131 | x |
| PN60 | 864 | 1062 | 102 | 244 | 442 | 274 | 620 | 365 | 660 | 159 | 330 | 330 | 153 | 182 | 240 | 400 | M10 | 269 | 190 | 190 | 190 | 92 | 520 | 162 | 120 |
| PN70 | 1106 | 1256 | 138 | 407 | 557 | 373 | 699 | 376 | 871 | x | 360 | 511 | 220 | 250 | 300 | 475 | M10 | 330 | 216 | 250 | 233 | 14 | 630 | 198 | 155 |
| PN81 | 1080 | 1230 | 138 | 340 | 490 | 373 | 699 | 376 | 903 | 392 | 392 | 511 | 234 | 264 | 300 | 376 | M10 | 330 | 216 | 250 | 233 | 14 | 587 | 198 | 155 |
| PN91 | 1315 | 1505 | 157 | 298 | 488 | 419 | 918 | 532 | 1052 | 356 | 532 | 520 | 262 | 292 | 360 | 464 | M12 | 417 | 280 | 310 | 295 | 45 | 722 | 228 | 185 |
| PN92 | 1318 | 1508 | 157 | 301 | 491 | 419 | 918 | 532 | 1052 | 356 | 532 | 520 | 292 | 322 | 360 | 464 | M12 | 417 | 280 | 310 | 295 | 45 | 722 | 228 | 185 |

*AS/BS = measure referred to burners provided with standard blast tube

*AL/BL = measure referred to burners provided with extended blast tube

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.

MOUNTING AND CONNECTIONS

Packages

Burners are despatched in wooden packages, whose dimensions are:

PN30: 1180 x 930 x 720 mm (L x P x H)

PN60: 1210 x 1020 x 790 mm (L x P x H)

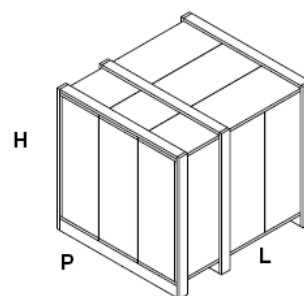
PN70/81: 1580 x 1010 x 860 mm (L x P x H)

PN91/92: 1730 x 1280 x 1020 mm (L x P x H)

Packing cases of this type are affected by humidity and are not suitable for stacking.

The following are placed in each packing case::

- burner;
- flexible hoses;
- filter;
- gasket to be inserted between the burner and the boiler;
- this manual.

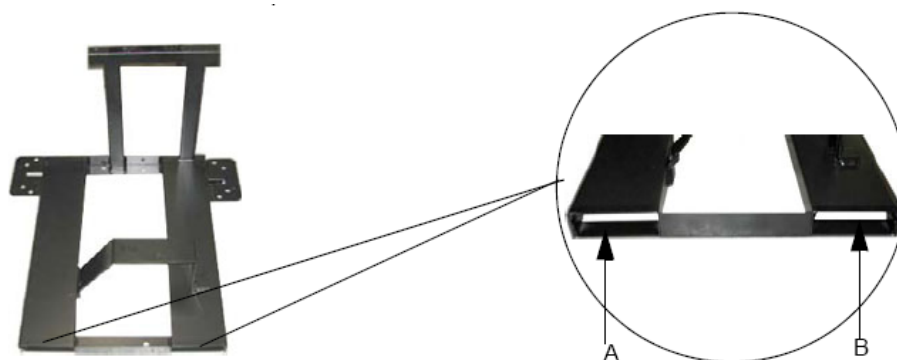


When disposing of the burner packing and if the packing is scrapped follow the procedures laid down in the current legislation regarding the disposal of materials.

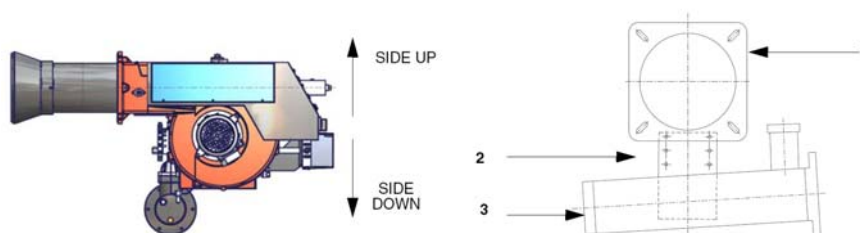
Handling the burner

| | |
|--|--|
| | <p>WARNING! 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.</p> |
| | <p>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.</p> |

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.



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.



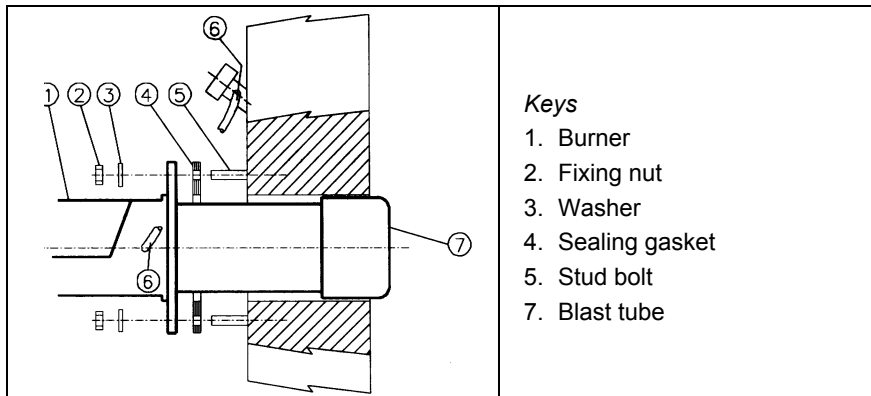
Key

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

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 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)..



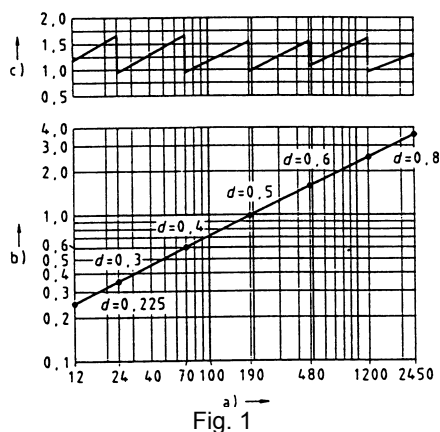
Once the burner is installed, execute the electrical and hydraulic connections, according to the schemes showed in the next paragraphs.

Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN267 regulation and whose dimensions are described in the diagram . In case the burner must be coupled with boilers with a combustion chamber smaller in diameter or shorter than those described in the diagram, please contact the supplier, to verify that a correct matching is possible, with respect of the application involved. To correctly match the burner to the boiler verify the necessary input and the pressure in combustion chamber are included in the burner performance curve; otherwise the choice of the burner must be revised consulting the burner manufacturer. To choose the blast tube lenght follow the instructions of the boiler manufacturer. In absence of these consider the following:

- Cast-iron boilers, three pass flue boilers (with the first pass in the rear part): the blast tube must protrude no more than 100 mm (values between 0 and 100mm) into the combustion chamber.
- Pressurised boilers with flame reversal: in this case the blast tube must penetrate at least 50 - 100 mm into combustion chamber in respect to the tube bundle plate.

The length of the blast tubes does not always allow this requirement to be met, and thus it may be necessary to use a suitably-sized spacer to move the burner backwards or to design a blast tube tha suites the utilisation (please, contact the manufacturer).



Keys

- a) Heat output in kW
- b) Length of the flame tube in meters
- c) Flame tube firing intensity in MW/m³
- d) Combustion chamber diameter (m)

Fig.1:Firing intensity, diameter and lenght of the test flame tube as a function of the heat input in kW.

HYDRAULIC DIAGRAMS

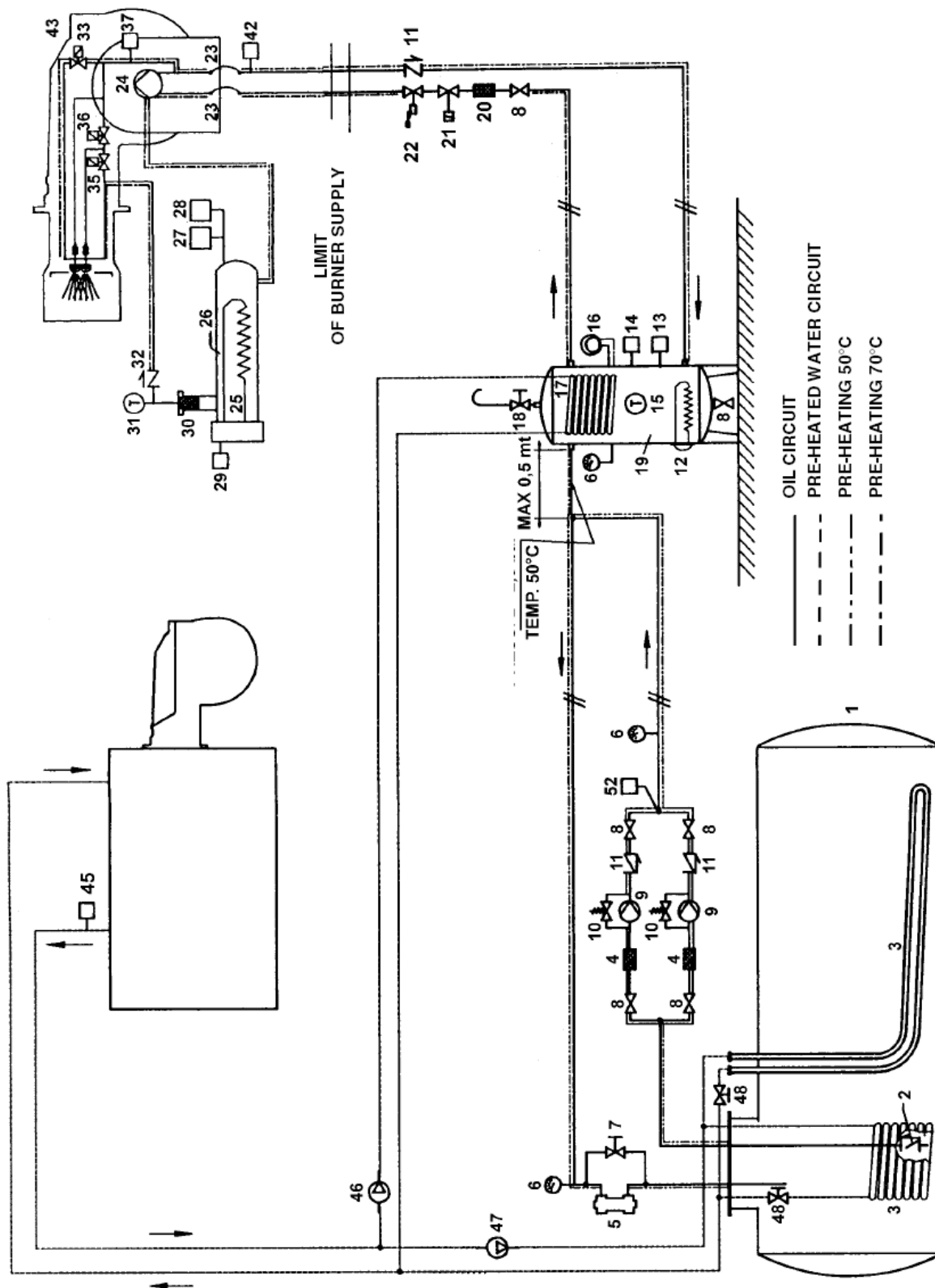


Fig. 2 - 31D0010 – Hydraulic diagram 31D0010 - Single burner configuration

* If the heavy oil used is up to 7° E a 50° C (model N-), the pressure must be 1.5mbar max.

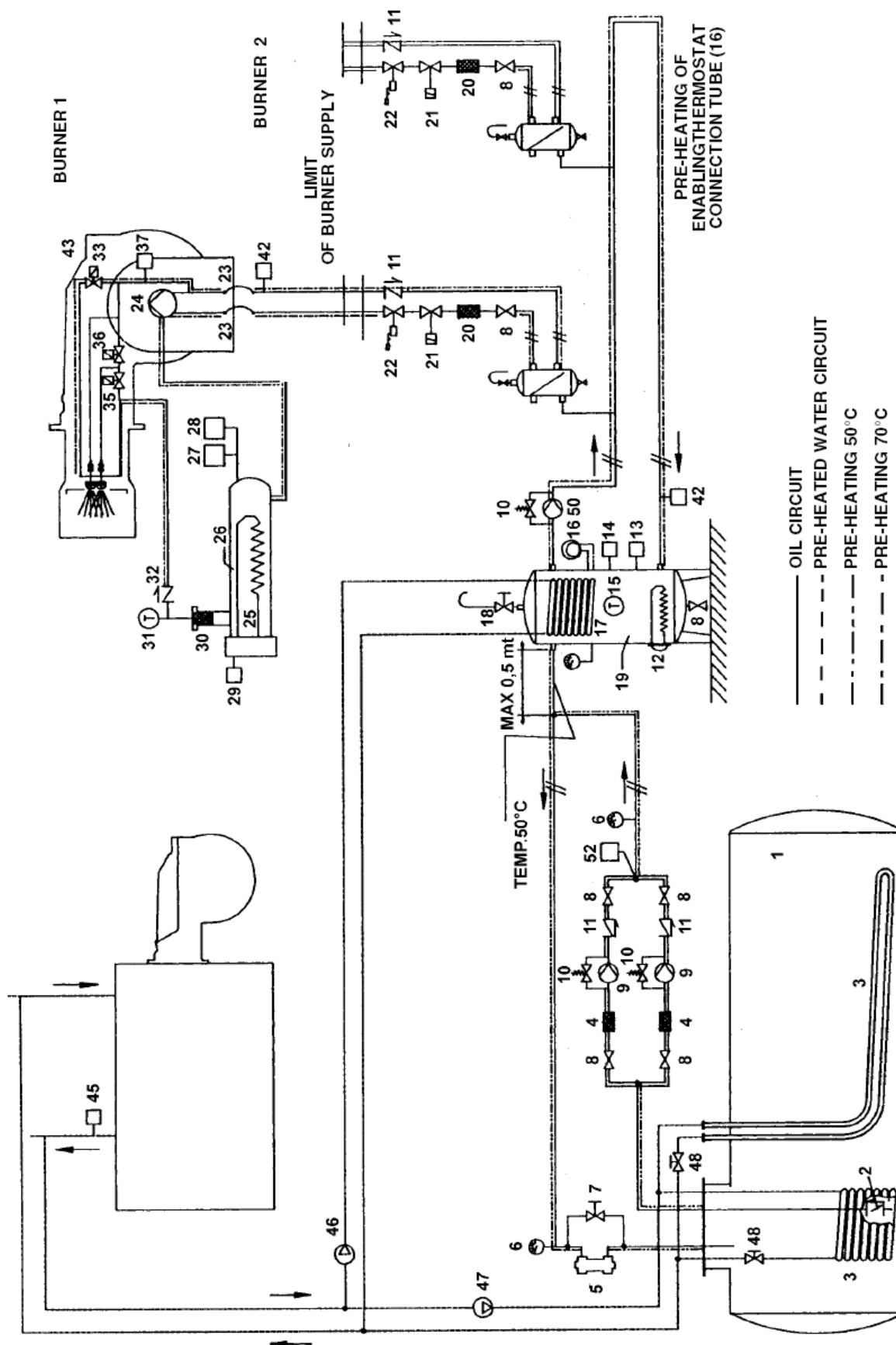
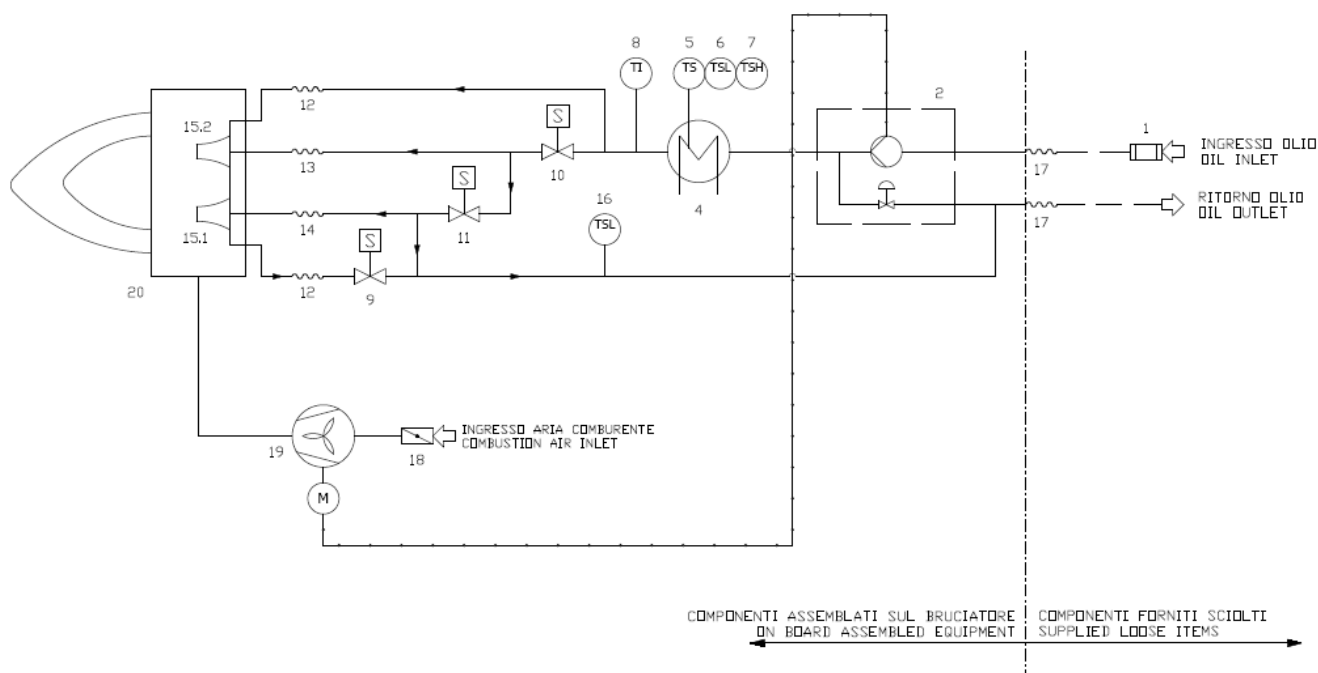


Fig. 3 - Hydraulic diagram 3ID0012 - Two or more burners configuration

* If the heavy oil used is up to 7° E at 50° C (model N-), the pressure must be 1.5mbar max.

Hydraulic diagrams 3id0010 / 3id0012 – complete key

- 1 Oil storage tank
- 2 Foot valve
- 3 Oil storage tank pre-heating coils (1)
- 4 Oil circuit filter (1 mm mesh)
- 5 Circuit pressure regulator
- 6 Pressure gauge scale 0 - 10 bars
- 7 Pressure regulator by-pass valve (5)
- 8 Gate valve
- 9 Oil circuit pressure regulator pump
- 10 Pump pressure regulator (9)
- 11 One-way valve
- 12 Oil buffer tank pre-heater (19)
- 13 Oil buffer tank thermostat
- 14 Burner enabling thermostat
- 15 Thermometer scale 0 - 90° C
- 16 Oil buffer tank heater enabling pressure switch
- 17 Oil buffer tank pre-heating coil (19)
- 18 Oil buffer tank air vent valve
- 19 Oil buffer tank, capacity 600 l approx.
- 20 Oil filter (0.3 mm mesh)
- 21 Fuel cutoff solenoid valve
- 22 Fuel gate valve
- 23 Burner pump hoses (24)
- 24 Burner oil pump
- 25 Pre-heating tank resistor
- 26 Pre-heating tank
- 27 Oil enabling thermostat TCN (26)
- 28 Pre-heating tank resistor safety thermostat TRS (26)
- 29 Oil temperature regulator thermostat TN (26)
- 30 Pre-heating tank (26) filter (0.1 mm mesh)
- 31 Thermometer 0 - 200° C
- 32 Check valve, opening 3.5 - 6 bars
- 33 N. O. burner 1st stage solenoid valve EVN1
- 35 N. O. burner 2nd stage solenoid valve EVN2
- 36 N. C. burner 2nd stage solenoid valve EVN3
- 37 Ignition enabling thermostat TCI
- 42 Burner enabling thermostat
- 43 Burner
- 45 Coils and tubes pre-heating pumps thermostat
- 46 Oil buffer tank pre-heating water pump (19)
- 47 Oil storage tank pre-heating water pump (1)
- 48 Pre-heating water balance calibration valves
- 50 Oil pump (diagram 3ID0012 only)
- 52 Maximum circuit pressure switch (if present)



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| 3I2D-05 | KEYS |
|---------|-------------------------------|
| 1 | Filter |
| 2 | Pump and pressure governor |
| 4 | Electrical preheater tank |
| 5 | Thermostat - TR |
| 6 | Low thermostat - TCN |
| 7 | High thermostat - TRS |
| 8 | Thermometer |
| 9 | Solenoid valve - EVN1-NO |
| 10 | Solenoid valve - EVN2-NO |
| 11 | Solenoid valve - EVN3-NC |
| 12 | Flexible hose |
| 13 | Flexible hose |
| 14 | Flexible hose |
| 15.1 | Nozzle - I° stage |
| 15.2 | Nozzle - II° stage |
| 16 | Thermostat - TCI |
| 17 | Flexible hose |
| 20 | Burner |
| 18 | Air damper with actuator |
| 19 | Draught fan with electromotor |

| Working phase | Valve status EVN1-NO | Valve status EVN2-NO | Valve status EVN3-NC |
|---------------|----------------------|----------------------|------------------------|
| Prepurge | Not energised (open) | Not energised (open) | Not energised (closed) |
| First stage | Energised (closed) | Not energised (open) | Not energised (closed) |
| Second stage | Energised (closed) | Energised (closed) | Energised (open) |

Pump operating principle

In the burners, the mixture between oil and air, to perform a clean and efficient combustion, is activated by atomization of oil into very small particles. This process is achieved making oil passing through the nozzle at a determined pressure. The pump's main function is to transfer oil from the tank to the nozzle in the desired quantity and pressure. To adjust this pressure, pumps are provided with a pressure regulator (except for some models for which a separate regulating valve is provided).

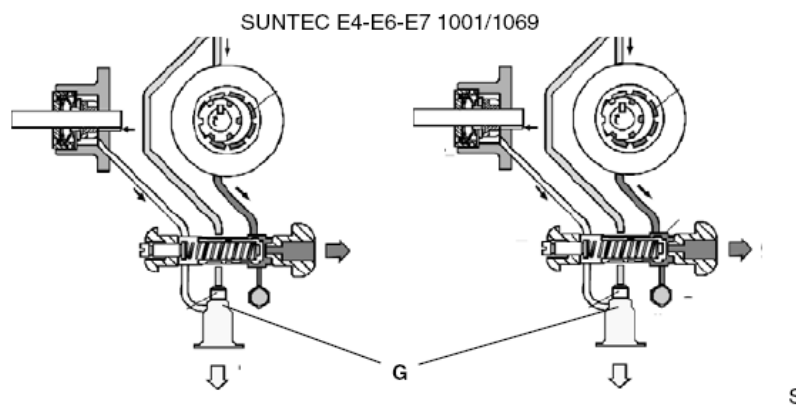
Other pumps are provided with two pressure regulators: one for the high and one for low pressure (in tow-stage systems with one nozzle).

These pumps can be installed both into single-pipe and double-pipe systems.

Single-pipe system: a single pipe drives the oil from the tank to the pump's inlet. Then, from the pump, the pressurised oil is driven to the nozzle: a part comes out from the nozzle while the othe part goes back to the pump. In this system, the by-pass pulg, if provided, must be removed and the optional return port, on the pump's body, must be sealed by steel plug and washer.

Double-pipe system: as for the single pipe system, a pipe that connects the tank to the pump's inlet is used besides another pipe that connects the pum's return port to the tank, as well. The excess of oil goes back to the tank: this installation can be considered self-bleeding. If provided, the inside by-pass plug must be installed to avoid air and fuel passing through the pump.

Burners come out from the factory provided for double-stage systems. They can be suited for single-pipe system (recommended in the case of gravity feed) as decribed before



Bleed

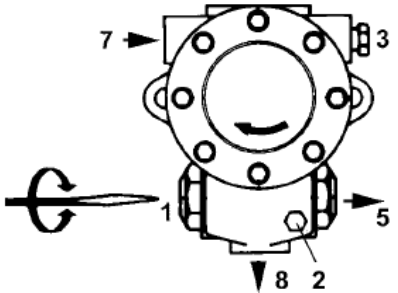
Bleeding in two-pipe operation is automatic: it is assured by a bleed flat on the piston. In one-pipe operation, the plug of a pressure gauge port must be loosened until the air is evacuated from the system.

About the use of fuel pumps

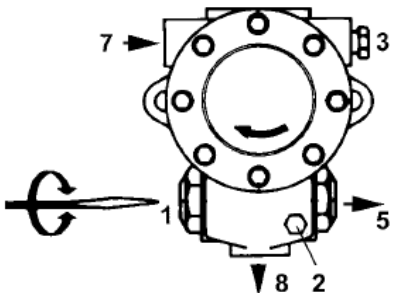
- Make sure that the by-pass plug is not used in a single pipe installation, because the fuel unit will not function properly and damage to the pump and burner motor could result.
- Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear 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 sg 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..

Oil pumps

Pumps for heavy oil - viscosity $\leq 50\text{cSt}$ (7° E) @ 50° C

| | | |
|---------------------------------|----------------------------|---|
| Suntec E4 - E6 - E7 1001 | |  |
| Oil viscosity | 2.8 - 450 cSt | |
| Oil temperature | 0 - 90 °C | |
| Minimum inlet pressure | - 0.45 bar to avoid gasing | |
| Maximum inlet pressure | 1.5 bar | |
| Maximum return pressure | 1.5 bar | |
| Rotation speed | 3600 rpm | |

Pumps for heavy oil - viscosity $\leq 400\text{ cSt}$ (50° E) @ 50° C

| | | |
|---------------------------------|----------------------------|---|
| Suntec E4 - E6 - E7 1069 | |  |
| Oil viscosity | 3 - 75 cSt | |
| Oil temperature | 0 - 120 °C | |
| Minimum inlet pressure | - 0.45 bar to avoid gasing | |
| Maximum inlet pressure | 3.5 bar | |
| Maximum return pressure | 3.5 bar | |
| Rotation speed | 3600 rpm | |

Keys

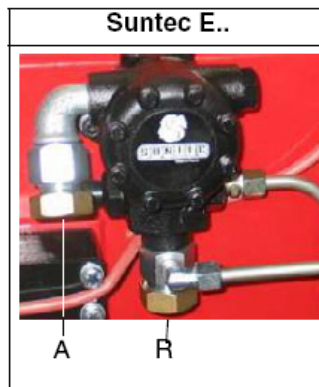
1. Pressure governor
2. Pump pressure gauge G1/8
3. Vacuum pressure gauge G1/2
4. To the nozzle G1/4
5. Inlet G1/2
6. Return G1/2

Note: the 1069 pumps are fitted with mechanical seal and electric pre-heater (80 W).

Mounting of flexible oil hoses

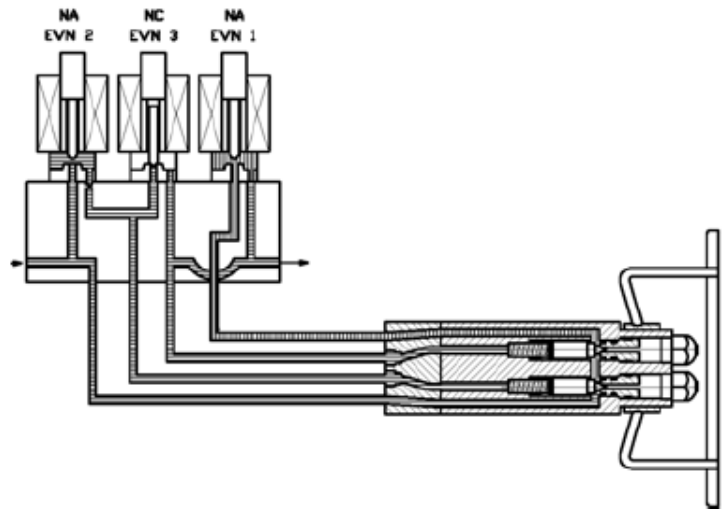
To connect the flexible light oil hoses to the pump, proceed as follows, according to the pump provided:

- remove the closing nuts on the inlet (A) and return (R) connections of the pump;
- screw the rotating nut of the two flexible hoses on the pump being careful to avoid exchanging the inlet and return lines: see the arrows marked on the pump that show the inlet and the return (see previous paragraph).

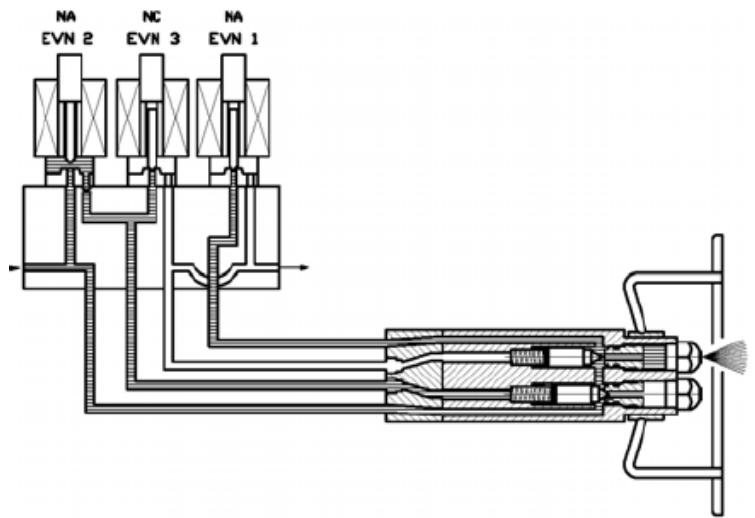


Heavy oil circuit - Operating principle

Pre-purge phase: pipes are at the same pressure




Low flame




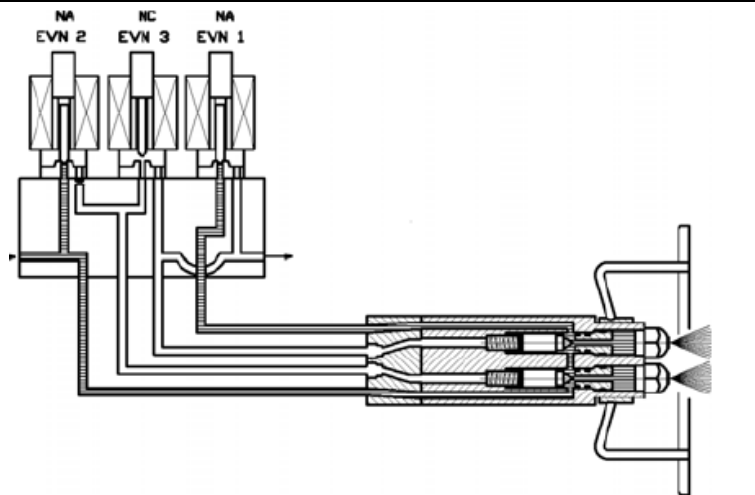
High flame

NOTE


The black pipes indicate the route of the pressurised oil.

 pipe with no pressure

 pressurised pipe




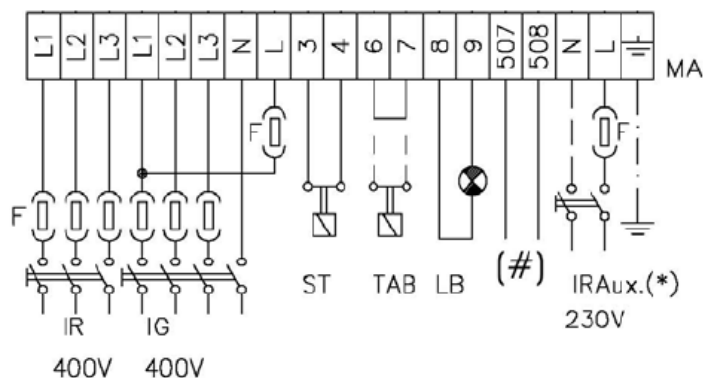
Electrical connections

| | |
|---|--|
|  | 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 magnet 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. |

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 and refer to the attached wiring diagrams,
- 3.check the direction of the fan-pump motor (see next paragraph)
- 4.refit the panel cover.

| | |
|---|---|
|  | 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 teminal block MA, be sure that the ground wire is longer than phase and neutral ones. |
| | IMPORTANT: 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). |




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

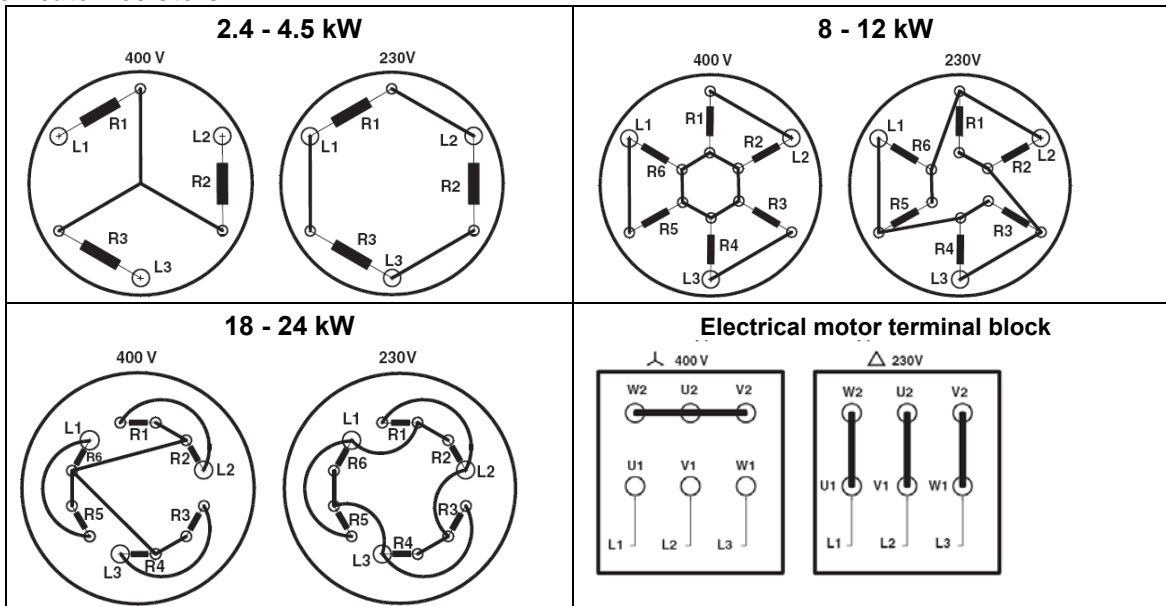
Rotation of fan-pump motor (excluded PN30)

Once the electrical connection is accomplished, remember to check the rotation of the fan-pump motor. It should rotate in an anticlockwise direction looking at cooling fan of the motor. If rotation is not correct, 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 overload thermal cutout.

| | |
|---|---|
|  | CAUTION: adjust the thermal cut-out according to the motor rated current value. |
|---|---|

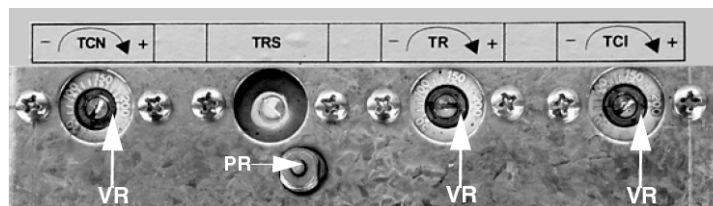
Pre-heater resistors



Oil thermostats adjustment

To access the thermostats, remove the cover of the burner switchboard. Calibrate using a screwdriver on the VR screw as shown in figure.

NOTE: thermostat TCI is fitted on burners fired with fuel oil with a viscosity of 400cSt (50 °E) at 50° C only.



TCN - Oil enabling thermostat: alibrate this thermostat to a value 10% lower than that indicated in the viscosity-temperature diagram).

TRS - Resistor safety thermostat: The thermostat is set during factory testing at a value of about 190°C.

This thermostat trips when the operating temperature exceeds the set limit. Ascertain the cause of the malfunction and reset the thermostat using the PR button.

TR - Resistor thermostat: Calibrate this thermostat to the correct value according to the viscosity-temperature diagram and check the temperature using a thermometer mounted on the pre-heating tank.

TCI - Installation enabling thermostat: This thermostat is fitted on burners fired with oil at a viscosity of 400cSt (50°E) at 50°C only. Set the thermostat to a temperature about 40°C lower than the TR.

Thermostat adjustment for petroleum burners

To find the thermostats, remove the burner switchboard cover. Adjust them using a screwdriver on the VR screw as shown in the next picture.

TCI - Installation enabling thermostat - Set this thermostat to about 40° C.

TCN - Oil enabling thermostat - Adjust this thermostat to a value between 45 and 50°C. Anyway, set TCN to a value possibly lower than the one set for TR (see below).


TR - Resistor thermostat - Adjust this thermostat to a value between 45 and 50°C. Check the temperature by using a thermometer mounted on the pre-heating tank.


TRS - Resistor safety thermostat - The thermostat is set during factory testing at about 190° C.

This thermostat trips when the operating temperature exceeds the set limit. Ascertain the cause of the malfunction and reset the thermostat by means of the PR button (see picture).

CAUTION: even if the adjusting ranges for the TR (Resistor thermostat) and TCN (Oil enabling thermostat) are the same, set TCN to a value lower than the one set for TR.


ADJUSTMENTS

| | |
|---|--|
|  | ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open and check that the pressure upstream the gas train complies the value quoted on paragraph "Technical specifications". 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. |
| | WARNING: NEVER LOOSE THE SEALED SCREWS! OTHERWISE, THE DEVICE WARRANTY WILL BE INVALIDATE! |
| | Prior to start 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 in the following chart: |
|---|---|

| Recommended combustion parameters | | |
|-----------------------------------|---------------------------------|--------------------------------|
| Fuel | Recommended (%) CO ₂ | Recommended (%) O ₂ |
| Heavy oil | 11 ÷ 12 | 4.2 ÷ 6.2 |

Priming the pump

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

Adjusting the heavy oil flow rate

Oil flow rate is regulated by choosing the correct size of nozzle for the 1st and 2nd stages and calibrating pump delivery pressure (see outline oil circuit diagrams). To select the nozzles, refer to Tab. 1. To adjust the pump pressure, see pag. 21. Further information on oil pump see the following paragraphs.

Choosing the oil nozzles

| NOZZLE G.P.H. | PUMP PRESSURE bar | | | NOZZLE G.P.H. | PUMP PRESSURE bar | | |
|------------------|-------------------|-------|-------|------------------|-------------------|-------|--------|
| | 24 | 25* | 26 | | 24 | 25* | 26 |
| 1.35 | 8.70 | 8.90 | 9.10 | 6.50 | 41.90 | 42.80 | 43.60 |
| 1.50 | 9.70 | 9.90 | 10.10 | 7.00 | 45.10 | 46.10 | 47.00 |
| 1.65 | 10.60 | 10.90 | 11.10 | 7.50 | 48.40 | 49.40 | 50.30 |
| 1.75 | 11.30 | 11.50 | 11.70 | 8.30 | 53.50 | 54.60 | 55.70 |
| 2.00 | 12.90 | 13.20 | 13.40 | 9.50 | 61.30 | 62.5 | 63.8 |
| 2.25 | 14.50 | 14.80 | 15.10 | 10.50 | 67.70 | 69.1 | 70.5 |
| 2.,50 | 16.10 | 16.50 | 16.80 | 12.00 | 77.4 | 79 | 80.5 |
| 3.00 | 19.30 | 19.70 | 20.10 | 13.80 | 89 | 90.8 | 92.6 |
| 3.50 | 22.50 | 23.00 | 23.50 | 15.30 | 98.7 | 100.7 | 102.7 |
| 4.00 | 25.80 | 26.30 | 26.80 | 17.50 | 112.8 | 115.2 | 117.5 |
| 4.50 | 29.00 | 29.60 | 30.20 | 19.50 | 125.7 | 128.3 | 130.9 |
| 5.00 | 32.20 | 32.90 | 33.60 | 21.50 | 138.6 | 141.5 | 144.3 |
| 5.50 | 35.50 | 36.20 | 36.90 | 24.00 | 154.8 | 158 | 161.10 |
| 6.00 | 38.70 | 39.50 | 40.30 | 28.00 | 180.6 | 184.3 | 187.90 |

* Factory-set pressure

Tab 1 - Nozzle flow rate (kg/h) according to oil pressure

Burner ignition procedure

Oil pump

- Check that mains voltage corresponds to the voltage indicated on the rating plate.
- Check oil pressure in the feeding hydraulic circuit (about 2 bar at 50°C).
- Check that the oil supply cocks are open.
- Check that the motor rotates anticlockwise looking at the motor from the cooling cover.
- Act on the motor contactor until the pre-heating tank and entire burner oil circuit is full.

Refer to the hydraulic diagrams on pages 14-15 and Fig. 6 - Fig. 7. Also see pictures below.

After filling the pre-heating tank, the burner is ready for operation.

Turn on the main switch on the burner switchboard. This starts pre-heating of the oil until the temperature set on thermostat TCN is reached. The resistors remain on until the temperature set on thermostat TR is reached.

When the contact of thermostat TCN closes, the fan motor starts up and the pre-washing phase begins. During this phase, the oil is sucked up by the pump (no.24 in Fig. 6 - Fig. 7), passes through the filter (no.20 in Fig. 6 - Fig. 7) and is introduced into the tank (26) where it is pre-heated.

On leaving the pre-heating tank, the oil crosses the check valve (no.32 in Fig. 6-Fig. 7) and reaches the nozzle U (normally closed by pin S). It crosses the normally open valve EN1 and returns to the oil buffer tank (no.19 in Fig. 6 - Fig. 7).

The pre-washing phase is necessary to remove possible fuel residues accumulated during the period of inactivity and completely free the piping and nozzle assembly of obstacles. During this phase, the flow of oil to the nozzles at the ideal temperature for combustion is guaranteed.

At the end of pre-washing, the temperature at the nozzles is the same as the temperature in the pre-heating tank. The servo control supplies the EVN1 valve and the pump pressure acts on the pin, causing it to move back and allowing the oil to flow freely to the nozzle.

About eight seconds after burner ignition, the TAB thermostat activates the air servo control. This brings the damper to the maximum open position and, via a limit microswitch, supplies the normally open valve EVN2 and the normally closed valve EVN3, enabling the oil to flow to the second nozzle U'.

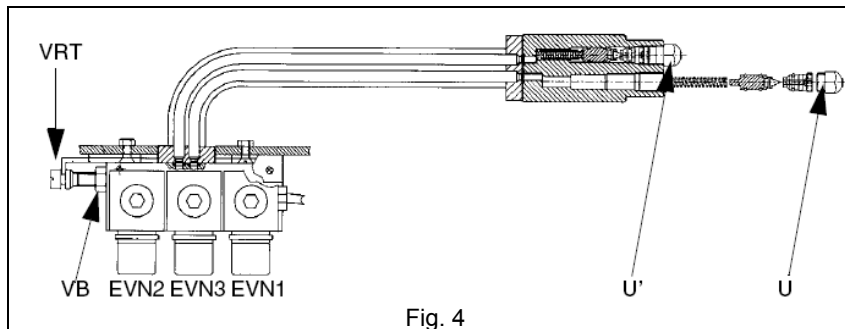


Fig. 4

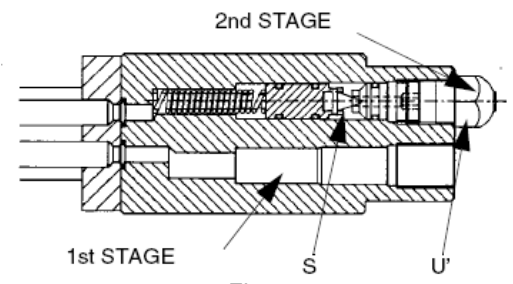
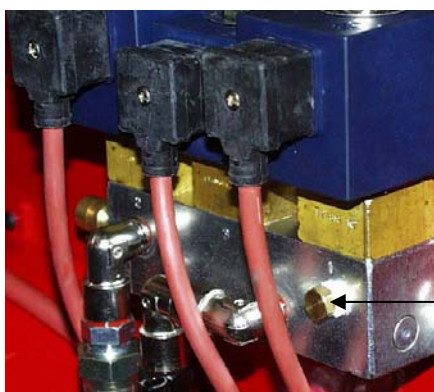


Fig. 5



Pressure gauge plug

Adjusting the combustion head

The burner is adjusted by the factory with the combustion head in the "MAX." position, corresponding to the maximum output. To operate at a reduced power, move back the combustion head progressively, towards the "MIN." position, by means of the screw VRT (see picture below).

NOTE: Unloose the screw VB before start the setting and tight it at the end of setting.

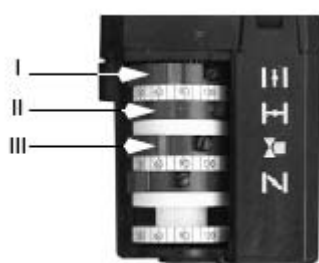
ATTENTION: adjust the combustion head only if necessary..



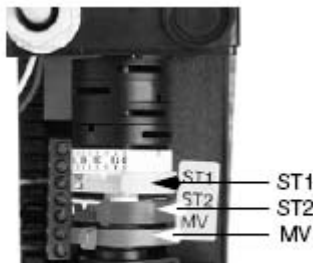
Air flow regulation

Air flow is adjusted by means of the cams on the air damper actuator.

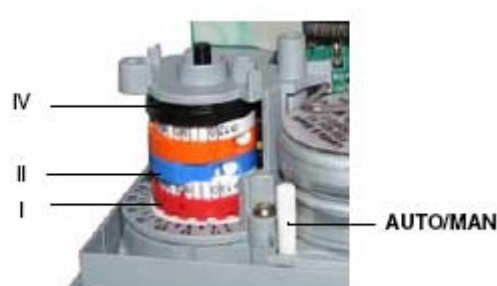
1. Remove the actuator cover.
2. Start the burner up and leave it in the low flame stage (remove the bridge between terminals 6 and 7).
3. Adjust the air flow rate at low flame by means of the related cam (see table below).
4. Drive the burner to the high flame stage (bridge terminals 6 and 7).
5. Adjust the air flow rate at high flame by means of the related cam (see table below).
6. The third cam enables 2nd stage fuel valve opening (valves EVN2 and EVN3). It must be set between the two other cams, about 5° more than cam ST1 or cam II.
7. Replace the actuator cover.



PN30-PN60: Berger STA4.5



PN70 - PN81: Berger STA6



PN60 - PN70 - PN81 - PN91: Siemens SQN72

| | Berger STA4.5 | Berger STA6 | Siemens SQN72 |
|--|---------------|-------------|---------------|
| "Air adjustment in high flame" cam | I | ST2 | I (red) |
| Air adjustment in low flame - Stand-by - Ignition cam | II | ST1 | II (blue) |
| Auxiliary cam for the opening consent to the second fuel valve | III | MV | IV (black) |

Note: to move the actuator cams, use the followings:

Berger STA4: this actuator is not provided with the manual control of the air damper. The adjustment of the cams is carried out by means of a screwdriver, by twisting the VS screw located inside the cam.

Berger STA6: this actuator is not provided with the manual control of the air damper. The adjustment of the cams is carried out by means of the cam lever.

Siemens SQN72: a key is provided to move cams I and IV, the other cams can be moved by means of screws. On the Siemens actuator the AUTO/MAN mode is provided (see picture).

PART II – OPERATION

LIMITATION 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 AUTHORISED 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 BURNED.

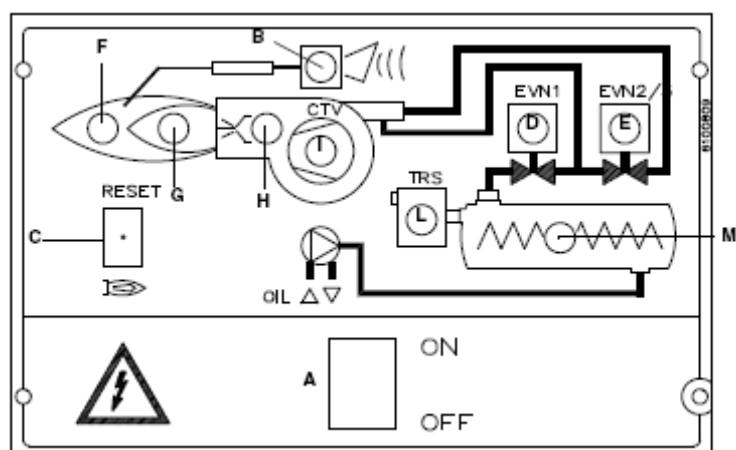
OPERATION



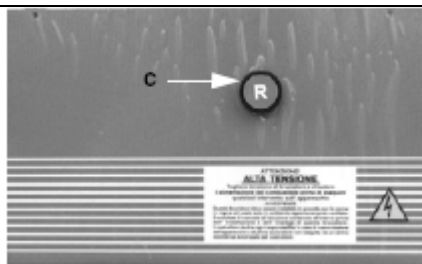
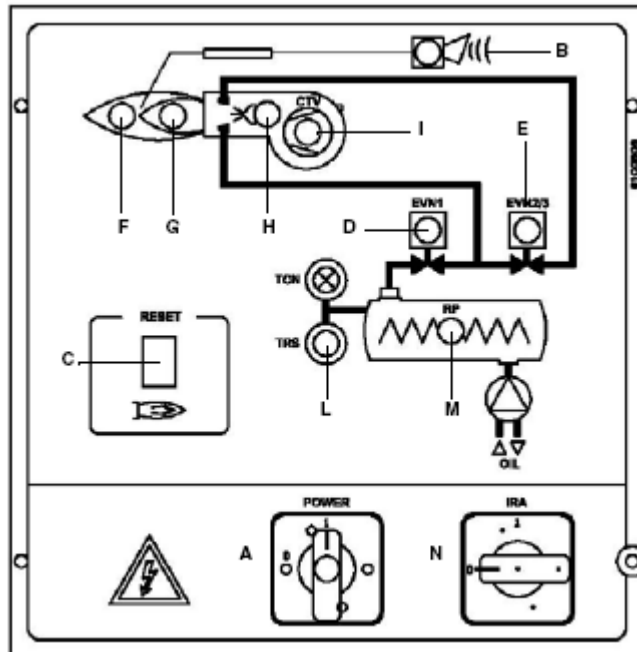
ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open. Be sure that the mains switch is closed.

- Turn to position 1 the switch A, placed on the burner control panel.
- Make sure the burner is not locked (LED B on). If necessary, reset by pressing button C.
- Make sure the series of thermostats (or pressure switches) enables burner operation.
- Start the burner ignition cycle. The control unit starts up the burner fan and at the same time turns the ignition transformer on (LED H on). Pre-purge lasts some seconds depending on the control unit fitted on the burner.
- At the end of pre-purge time, the oil solenoid valve is powered up (1st stage, EVN1), indicated by the LED D on the graphic panel. The burner is ignited.
- The ignition transformer remains on for a few seconds after flame ignition (post-ignition time). At the end of this period, it is cut out of the circuit and LED H turns off.
- The burner is operating in the low flame stage (LED G on). After few seconds (depending on the control box provided) the two-stage operation starts and the burner operates automatically on high flame or low flame according to the demand from the installation. High or low flame operation is indicated by turning on and off of LED F on the graphic panel. LED E shows the opening of solenoid valves EVN2 and EVN3 supplying the 2nd stage nozzle (high flame).

PN30-PN60



PN70-PN8 1-PN91-PN92




Control box reset button on PN30 and PN60

Keys

- A Main on/off switch
- B Shut down indicator light
- C Burner control box reset button (except PN30, PN60 e PN70, see picture)
- D 1st stage solenoid valve opening indicator light
- E 2nd stage solenoid valve opening indicator light
- F High flame operation indicator light
- G Low flame operation indicator light
- H Ignition transformer operation indicator light
- I Thermal cutout tripped indicator light
- L Resistors safety thermostat tripped indicator light
- M Pre-heat resistor light
- N Auxiliary resistors switch

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. |

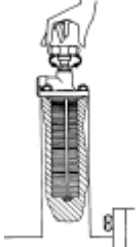
ROUTINE MAINTENANCE

1. Clean and examine the oil filter cartridge and replace it if necessary.
2. Examine the condition of the oil flexible tubing and check for possible leaks.
3. 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.
4. Clean and examine the filter inside the oil pump. Filter must be thoroughly cleaned at least once in a season to ensure correct working of the fuel unit. To remove the filter, unscrew the four screws on the cover. When reassemble, make sure that the filter is mounted with the feet toward the pump body. If the gasket between cover and pump housing should be damaged, it must be replaced. An external filter should always be installed in the suction line upstream of the fuel unit.
5. Remove and clean the combustion head (see following paragraphs).
6. Examine and clean the ignition electrodes, adjust and replace if necessary (see pag. 24).
7. Examine and clean the detection probe, adjust and replace if necessary (see pag. 24).
8. Examine the detection current (see pag. 26).
9. Remove and clean (pag. 26) 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.
10. Clean and grease joints and rotating parts.

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

| | |
|---|--|
|  | 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. |

Self-cleaning filter

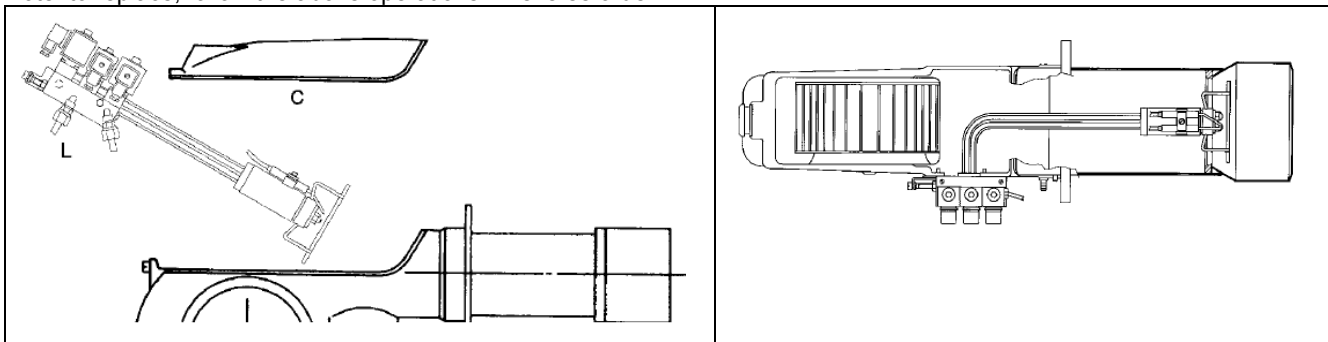
| | |
|--|---|
| Fitted only on high viscosity oil burners. Periodically turn the knob to clean the filter. |  |
|--|---|

Removing the combustion head

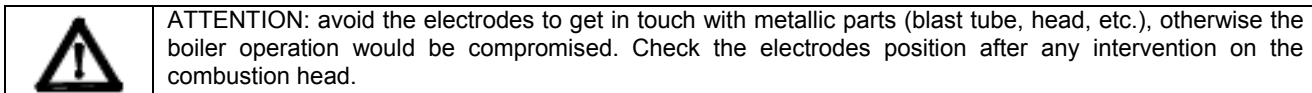
Remove cover C;

- remove the photoresistor from its housing;
- unscrew the rotating couplings on the two oil hoses (use two spanners to avoid loosening the couplings fixed to the distributor block);
- remove the complete assembly L as shown in the figure.

Note: to replace, follow the above operations in reverse order.



Correct position of electrodes and combustion head



To guarantee efficient ignition, observe the measures shown on the pictures below. Make sure the electrode locking screw is tight before replacing the combustion head.

PN30

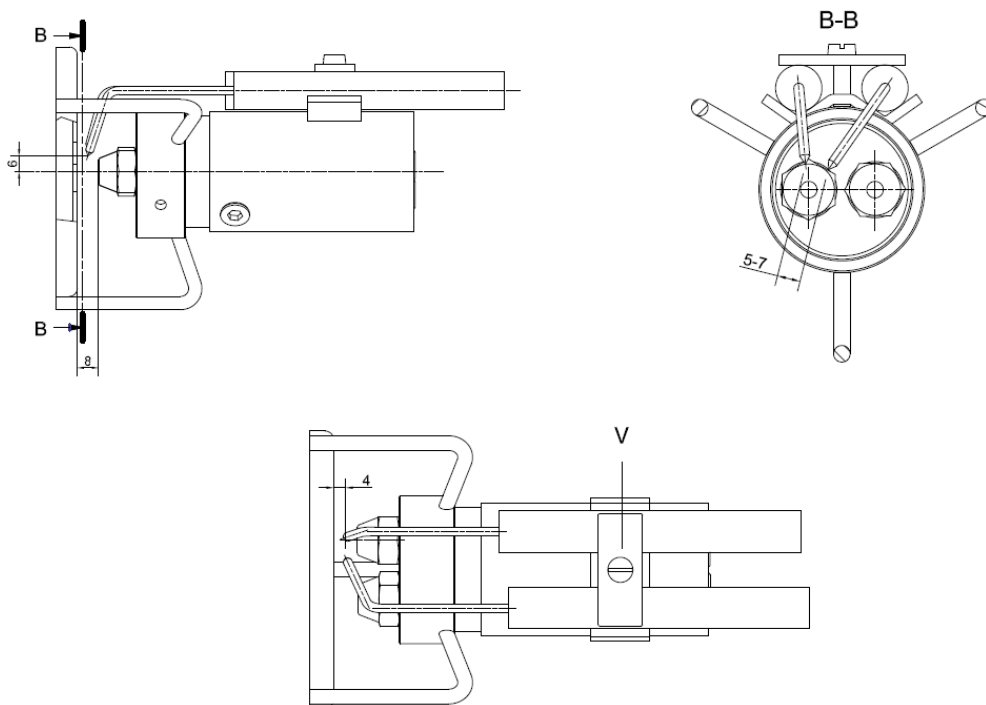
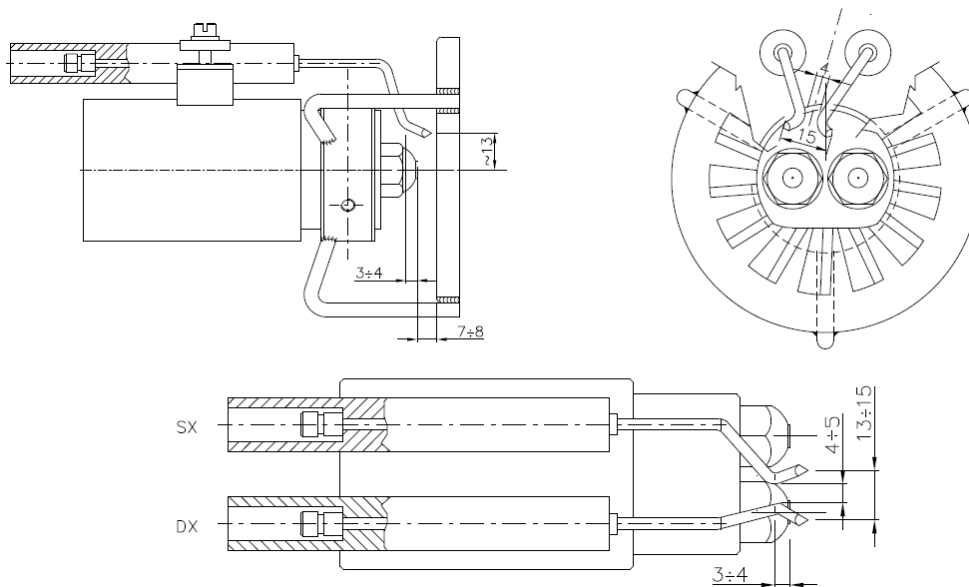


Рис. 6

PN60/70/81/91/92



Cleaning and replacing the detection photoresistor

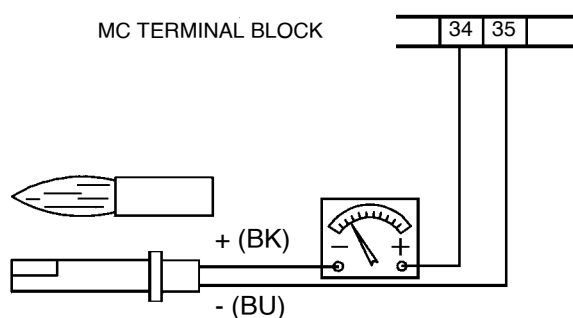
To clean/replace the photoresistive detector, remove it from its slot. To clean the photoresistor, use a clean cloth, not cleaning sprays.

Checking the detection current

To measure the detection signal, follow the scheme in Fig.).

If the signal does not correspond to the quoted values, check the electrical contacts, if the combustion head is clean and the photoresistor probe position (replace it if necessary).

| Control box | Flame sensor | Minimum detection signal |
|-------------|--------------|--------------------------|
| LMO44 | QRB4 | 45 μ A |
| LAL2.. | QRB1 | 95 μ A |



Seasonal stop

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

- turn the burner main switch to 0 (Off position)
- disconnect the power mains
- 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".

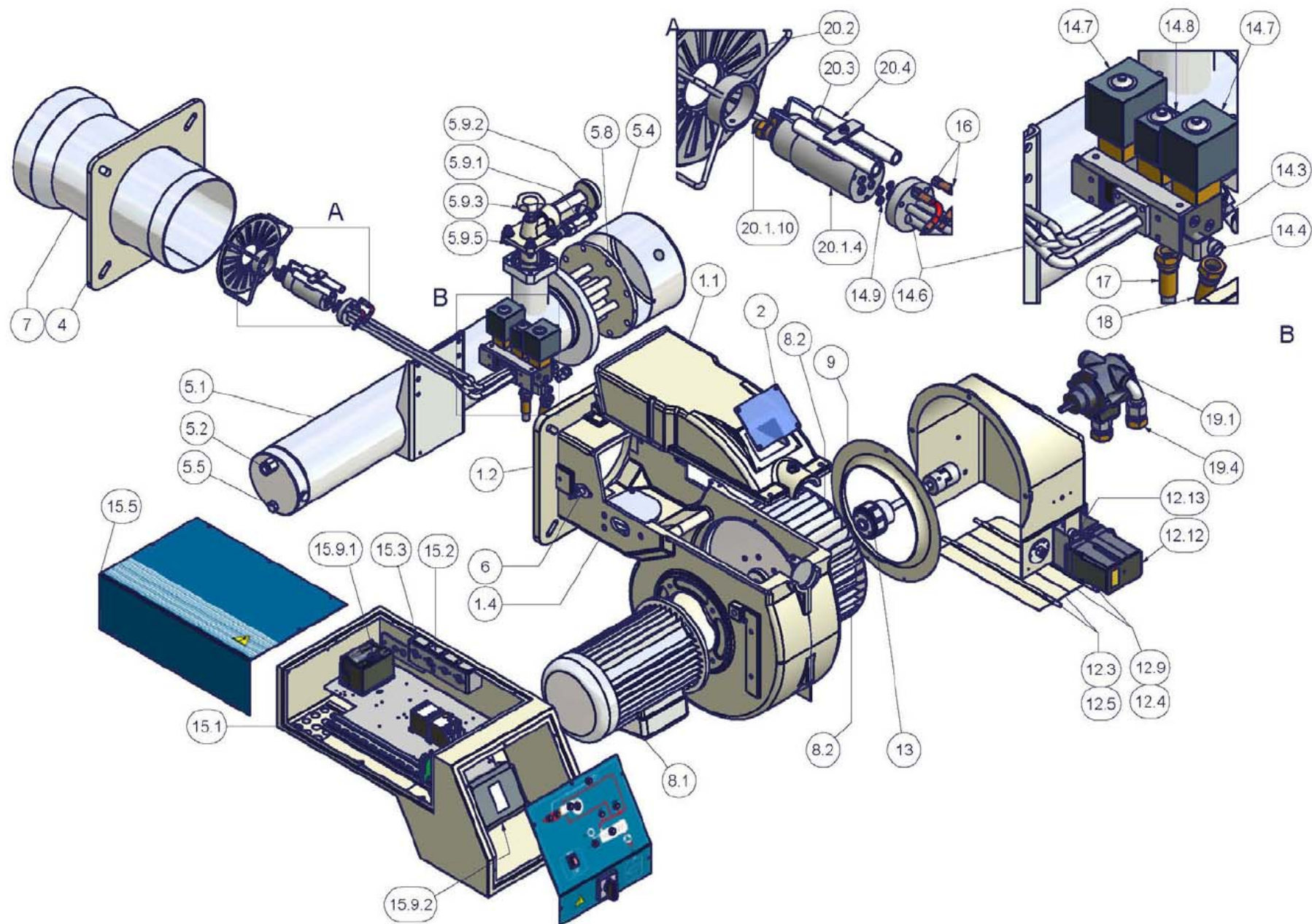
TROUBLESHOOTING

| CAUSES/TROUBLES | DOES NOT START UP | CONTINUES PRE- PURGUE | BURNER STARTS UP WITH COLD OIL | DOES NOT IGNITE AND GOES TO SHUT DOWN | DOES NOT PASS 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 | ● | | ● | | | | |
| CONTROL UNIT MALFUNCTION | ● | ● | | ● | ● | ● | ● |
| AIR SERVOCONTROL MALFUNCTION | | | | | ● | | |
| CIRCUIT ENABLING THERMOSTAT | | ● | | | ● | | |
| SMOKY FLAME | | | | | | ● | ● |
| IGNITION TRANSFORMER MALFUNCTION | | | | ● | | | |
| IGNITION ELECTRODES WRONGLY POSITIONED | | | | ● | | | |
| DIRTY NOZZLE | | | | ● | | ● | |
| FAULTY OIL VALVE | | | | ● | | | ● |
| FAULTY OR DIRTY PHOTORESISTOR | | | | | | | ● |
| FAULTY RESISTOR THERMOSTAT | ● | | | | | | |
| FAULTY HIGH-LOW FLAME THERMOSTAT | | | | | ● | | |
| SERVOCONTROL CAM NOT CALIBRATED | | | | | ● | | |
| LOW OIL PRESSURE | | | | ● | | ● | ● |
| DIRTY OIL FILTER | | | | ● | | ● | ● |
| DIRTY IGNITION ELECTRODES | | | | ● | | | |

BURNER EXPLODED VIEW

| ITEM | DESCRIPTION |
|-------|---------------------|
| 1.1 | COVER |
| 1.2 | FLANGE |
| 1.4 | BURNER HOUSING |
| 2 | INSPECTION GLASS |
| 4 | GENERATOR GASKET |
| 5.1 | OIL PRE-HEATER |
| 5.2 | SHEATH |
| 5.3 | O RING |
| 5.4 | COVER |
| 5.5 | PLUG |
| 5.8 | RESISTOR |
| 5.9.1 | GAS BLEEDING VALVE |
| 5.9.2 | THERMOMETER |
| 5.9.3 | OIL FILTER |
| 5.9.5 | GASKET |
| 6 | PHOTORESISTOR |
| 7 | STANDARD BLAST TUBE |
| 8.1 | MOTOR |
| 8.2 | FAN WHEEL |
| 9 | AIR INLET CONE |
| 12.1 | AIR INTAKE |
| 12.3 | LOUVER SHAFT |
| 12.4 | AIR INTAKE DAMPER |
| 12.5 | AIR INTAKE DAMPER |
| 12.9 | LOUVER SHAFT |

| ITEM | DESCRIPTION |
|---------|--------------------------|
| 12.11 | BRACKET |
| 12.12 | ACTUATOR |
| 13 | COUPLING |
| 14.3 | OIL MANIFOLD |
| 14.6 | OIL MANIFOLD |
| 14.7 | OIL SOLENOID VALVE |
| 14.8 | OIL SOLENOID VALVE |
| 14.9 | O RING |
| 15.1 | BOARD |
| 15.2 | THERMOSTAT |
| 15.3 | THERMOSTAT |
| 15.5 | COVER |
| 15.9.1 | CONTROL BOX |
| 15.9.2 | IGNITION TRANSFORMER |
| 15.10 | BRACKET |
| 16 | IGNITION CABLE |
| 17 | FLEXIBLE HOSE |
| 18 | FLEXIBLE HOSE |
| 19.1 | PUMP |
| 20.1.4 | NOZZLE HOLDER |
| 20.1.10 | NOZZLE |
| 20.2 | COMBUSTION HEAD |
| 20.3 | LONG IGNITION ELECTRODE |
| 20.4 | SHORT IGNITION ELECTRODE |
| | |



SPARE PARTS

| DESCRIPTION | PN30 | PN60 | PN70 | PN81 | PN91 | PN92 |
|---|---------|---------|-----------|---------|---------|---------|
| CONTROL BOX | 2020445 | 2020445 | 2020455 | 2020455 | 2020455 | 2020455 |
| SHORT ELECTRODE | 2080205 | 2080249 | 2080249 | 2080249 | 2080249 | 2080249 |
| LONG ELECTRODE | 2080206 | 2080251 | 2080251 | 2080251 | 2080251 | 2080251 |
| FILTER - oil viscosity ≤ 50 cSt (7 °E) @ 50 °C | 2090202 | 2090202 | 2090207 | 2090207 | 2090207 | 2090207 |
| FILTER - oil viscosity ≤ 400 cSt (50 °E) @ 50 °C | 2090207 | 2090207 | 2090207 | 2090207 | 2090207 | 2090207 |
| GASKET | 2110004 | 2110013 | 2110033 | 2110033 | 2110048 | 2110047 |
| FAN WHEEL | 2150006 | 2150043 | 2150018 | 2150069 | 2150031 | 2150032 |
| IGNITION TRANSFORMER | 2170305 | 2170305 | 2170005 | 2170005 | 2170005 | 2170005 |
| MOTOR | 2180008 | 2180020 | 218021101 | 2180256 | 2180276 | 2180277 |
| SOLENOID VALVE N.C. | 2190420 | 2190420 | 2190420 | 2190420 | 2190420 | 2190420 |
| SOLENOID VALVE EVN1-EVN2 N.O. | 2190421 | 2190421 | 2190421 | 2190421 | 2190421 | 2190421 |
| FLEXIBLE HOSES - oil viscosity ≤ 50 cSt (7 °E) @ 50 °C | 2340003 | 2340003 | 2340003 | 2340003 | 2340003 | 2340003 |
| FLEXIBLE HOSES - oil viscosity ≤ 400 cSt (50°E) @ 50°C | 2340004 | 2340004 | 2340004 | 2340004 | 2340004 | 2340004 |
| ACTUATOR (BERGER) | 2480057 | 2480057 | 2480041 | 2480041 | 2480041 | 2480041 |
| ACTUATOR (SIEMENS) | 24800A3 | 24800A3 | 24800A3 | 24800A3 | 24800A3 | 24800A3 |
| PHOTORESISTOR | 2510003 | 2510003 | 2510003 | 2510003 | 2510003 | 2510003 |
| INSTALLATION ENABLING THERMOSTAT TCI | 2560026 | 2560026 | 2560026 | 2560026 | 2560026 | 2560026 |
| RESISTOR THERMOSTAT TR/TCN | 2560026 | 2560026 | 2560026 | 2560026 | 2560026 | 2560026 |
| THERMOSTAT (TRS) | 2560028 | 2560028 | 2560028 | 2560028 | 2560028 | 2560028 |
| PUMP - oil viscosity ≤ 50 cSt (7 °E) @ 50 °C | 2590104 | 2590104 | 2590105 | 2590105 | 2590106 | 2590106 |
| PUMP - oil viscosity ≤ 400 cSt (50 °E) @ 50 °C | 25901A2 | 25901A2 | 2590116 | 2590116 | 2590117 | 2590117 |
| NOZZLE | 2610004 | 2610004 | 2610004 | 2610016 | 2610016 | 2610016 |
| NOZZLE | 2610004 | 2610004 | 2610017 | 2610017 | 2610017 | 2610017 |
| NOZZLE HOLDER WITH PISTONS | 3020084 | 3020084 | 3020084 | 3020084 | 3020084 | 3020084 |
| COMBUSTION HEAD | 3060173 | 3060174 | 30601A7 | 3060142 | 3060157 | 3060181 |
| STANDARD BLAST TUBE | 3090033 | 3090034 | 30900A7 | 30900G8 | 30910E2 | 30910E3 |
| EXTENDED BLAST TUBE | 3090035 | 3090038 | 30900B3 | 30900G9 | 3091091 | 30910A2 |
| IGNITION CABLE | 6050129 | 6050129 | 6050144 | 6050144 | 6050144 | 6050144 |

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

ELECTRICAL WIRING DIAGRAMS

WARNING:

- 1 - Electrical supply 400V 50Hz 3N a.c.
- 2 - Do not reverse phase with neutral
- 3 - Ensure burner is properly earthed

See the attached wiring diagram.

Wiring diagram: SE04-648

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).

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» | | Yellow |
| Ignition phase, ignition controlled | lmlmlmlml | Yellow-off |
| Operation, flame o.k. | oooooooooooo | Green |
| Operation, flame not o.k. | omomomomo | Green-off |
| Undervoltage | lslslsls | Yellow-red |
| Fault, alarm | ssssssssss | Red |
| Output of fault code (refer to Fault code table) | smsmsmsm | Red-off |
| Extraneous light prior to burner start-up | ososososo | 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 l Faulty or soiled fuel valves l Faulty or soiled flame detector l Poor adjustment of burner, no fuel l Faulty ignition |
| 3 blinks *** | Free |
| 4 blinks **** | Extraneous light on burner startup |
| 5 blinks ***** | Free |
| 6 blinks ***** | Free |
| 7 blinks ***** | Too many losses of flame during operation (limitation of the number of repetitions) l Faulty or soiled fuel valves l Faulty or soiled flame detector l 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

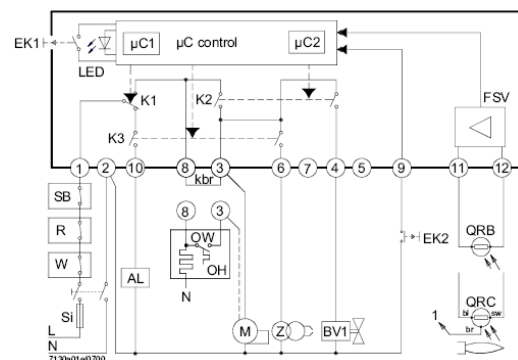
Fault status signal «AL» at terminal 10 is activated

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

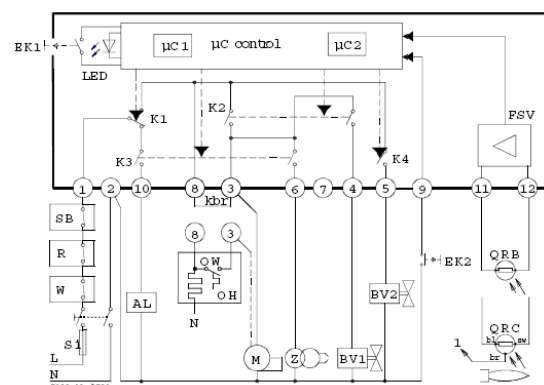
Press lock-out reset button for about 1 second (< 3 seconds).

Connection diagram and internal diagram

LMO14

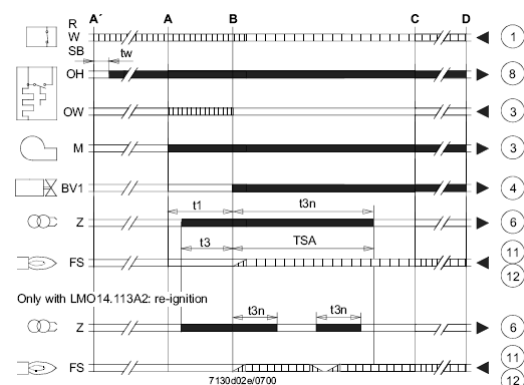


LMO24-LMO44

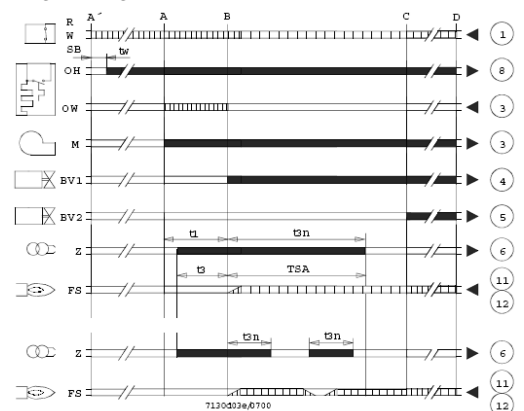


Control sequence

LMO14



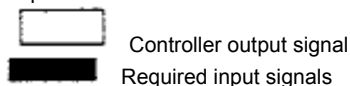
LMO24-LMO44



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 |



| | |
|------------|---|
| 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

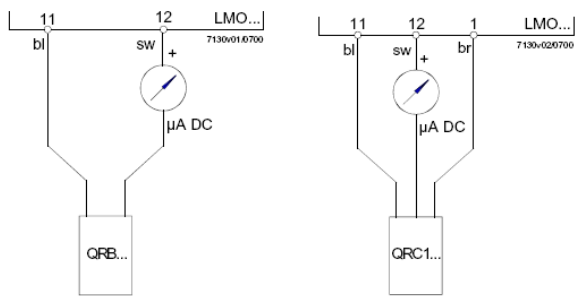
| | |
|--------------------------------|---|
| Mains voltage | AC 230 V +10 % / -15 % |
| | AC 120 V +10 % / -15 % |
| Mains frequency | 50...60 Hz ±6 % |
| External primary fuse (Si) | 6.3A (slow) |
| Power consumption | 12 VA |
| Mounting orientation | optional |
| Weight | approx. 200 g |
| Degree 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 µA | 70 µA |
| Min detector current permitted (without flame) | 5.5 µA | 5.5 µA |
| Max. possible with flame (typically) | 100 µA | 100 µA |

Measurement circuit for detector current



Key

μA DC DC microamperometer with an internal resistance of 5
kW max.

bl Blue
sw Black
br Brown



Via L.Galvani, 9 - 35011 Campodarsego (PD) - ITALY
Tel. +39 049 9200944 - Fax +39 049 9200945/9201269
web site: www.cibunigas.it - e-mail: cibunigas@cibunigas.it

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

USER MANUAL OF MULTI-THERMOSTAT MCX06C

MCX06C is a multi-thermostat with four 100k NTC inputs. It can control up to 4 temperatures showing them (not more than 2 at the same time) on a couple of displays.
It is used to check and adjust oil heater temperatures.

User interface:

Device:



Note :

In normal operation, the display A shows the oil tank resistor temperature (probe Pb1).
In normal operation, the display B shows the oil output temperature (probe Pb3).

Connections from terminal side:



Probe connection:

input **AI1** = probe **Pb1** = set-point "tr" = oil heater temperature probe;
input **AI2** = probe **Pb2** = set-point "tCl" = plant consent temperature probe (when installed);
input **AI3** = probe **Pb3** = set-point "OIL" = oil heater output temperature probe (PID regulation);
input **AI4** = probe **Pb4** = set-point "tcn" = oil heater consent temperature probe.

Menu:

To enter the menu below, keep pushing **ENTER** for more than 3 s.

| Menu code | Sub-menu code | Function | Notes |
|-----------|---------------|------------------------|--|
| Prb | | Probes values | You can see in sequence the 4 probe values (UP and DOWN keys): the probe code is on display A (Pb1,..., Pb4) and the probe value is on display B (not fitted or out of work probes show "----"). |
| Log | | Login | It defines the access level to menu and parameters (password) |
| | PAS | Password | Password input |
| Par | | Parameters menu | Access to parameters (you have to login first) |
| | CnF | Configuration menu | Parameter configuration |
| | rEG | Regulation menu | Set to set-point, probe, thresholds etc. |
| ALA | | Alarm menu | Access to alarm management |
| | Act | Active alarms | Show the active alarms |
| | rES | Reset alarms & Warning | Reset of the manual reset alarms and warning |
| Loc | | Lock/Unlock functions | Not used |
| InF | rEL | Software version | Installed software version |
| tUN | | Autotuning | Activation On, deactivation ESC PID parameter autotuning |

Alarms & Warning:

When the red triangle on the top left lights, one or more alarms are activated.

When the red key on the left lights, the output N05-C5 is active and the relay **KTRS** switches the resistors OFF.

Check the reason, correct the failure and, as soon as the temperature is lower than **trS**, reset it through **ALA/rES**.

In order to show active alarms and warnings, select the relevant menu through **ALA/Act**.and, using the **UP** and **DOWN** buttons, scroll the lines.

In order to perform the manual reset, select **ALA/rES**.

| Code | Description | Sourse | Active simbol | Reset type |
|------|----------------------------------|-----------------------|---------------|------------|
| trS | High temperature resistors alarm | probe Pb4 > value trS | red key | Manual |
| EP1 | Probe Pb1 fault | Probe Pb1 fault | red triangle | Automatic |
| EP2 | Probe Pb2 fault | Probe Pb2 fault | red triangle | Automatic |
| EP3 | Probe Pb3 fault | Probe Pb3 fault | red triangle | Automatic |
| EP4 | Probe Pb4 fault | Probe Pb4 fault | red triangle | Automatic |

Set point adjustment:

All the parameters inside the **Par** menu are locked by a password.

The user can modify only set points (menu **rEG**), without using any passwords.

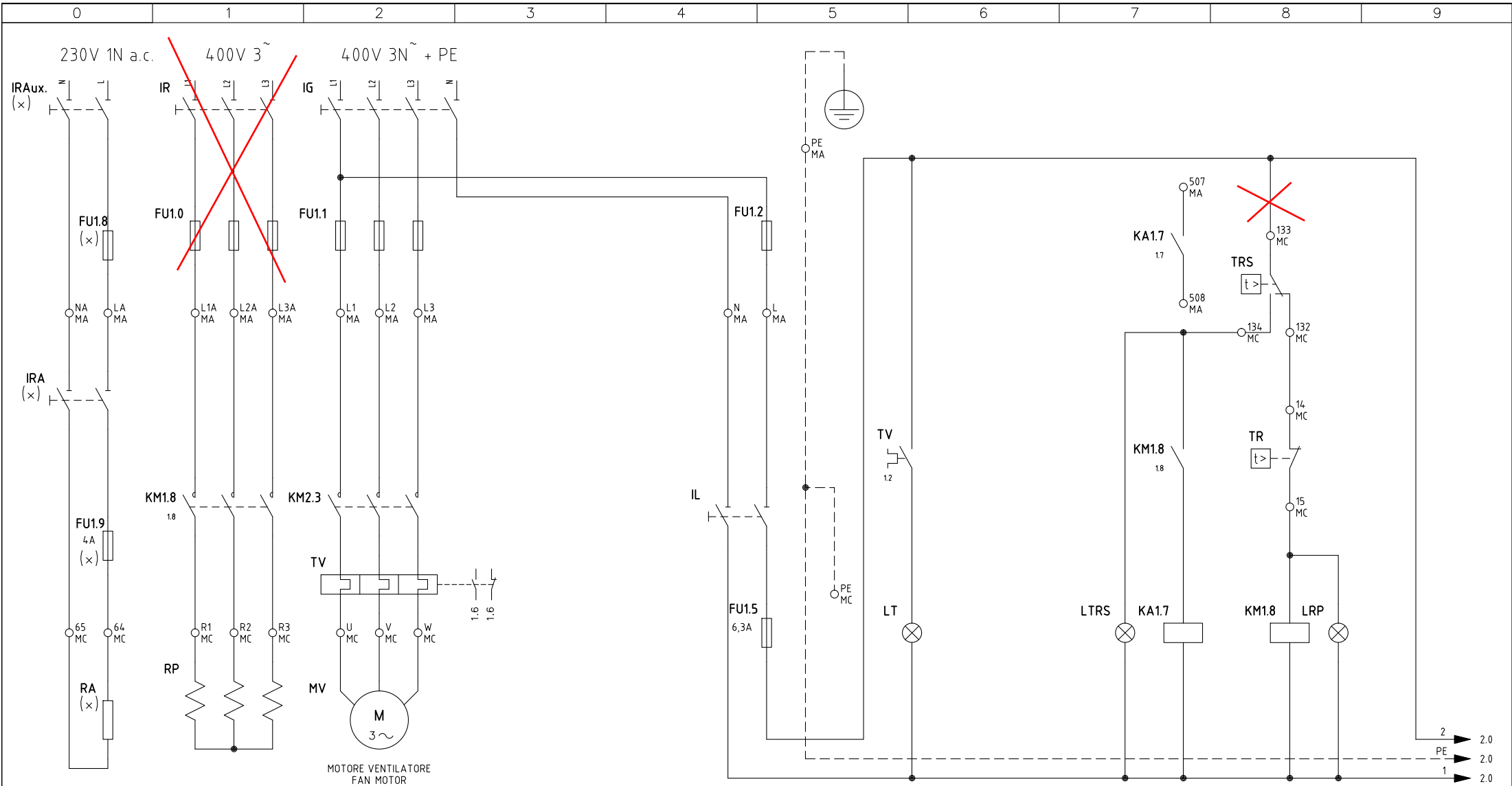
The oil viscosity at the nozzle, should be about 1,5^{°E}, which guarantees correct and safe functioning of the burner.

The temperature values in the table, guarantee the respect of that parameter and are valid when the pre heating tank is installed on the burner. For different configurations, please refer to the chapter "Recommendations to design heavy oil feeding plants" in the burner manual.

Here below recommended set points:

| Menu path | | | | Oil viscosity at 50 °C according to the letter shown in the burner model | | | | |
|-----------|-----|-----|---|--|------------|-----------------------|------------------------|-------------------------|
| | | | | P | N | E | D | H |
| | | | | 89 cSt | < 50 cSt | > 50 cSt < 110 cSt | > 110 cSt < 400 cSt | > 400 cSt < 4000 cSt |
| | | | | 12 °E | < 7°E | > 7 °E < 15 °E | > 15 °E < 50 °E | > 50 °E < 530 °E |
| Par | | | | | | | | |
| rEG | Pb1 | tr | Oil heater temperature probe | parameter not visible | | | | |
| | Pb2 | tCl | Plant consent temperature probe (when installed) | 20 °C | 70 °C | 70 °C | 70 °C | --- |
| | Pb3 | Oil | oil heater output temperature probe (PID regulation); | 60-70 °C | 110-120 °C | 120-130 °C | 130-140 °C | 140-150 ° C |
| | | SP0 | Set-point oil heater with oil pump stopped (stand-by) | 45 °C | 120 °C | 130 °C | 140 °C | 150 °C |
| | Pb4 | tcn | Oil heater consent temperature probe | 40 °C | 100 °C | 100 °C | 110 °C | 120 °C |
| | | trS | Safety temperature tank resistors (manual reset) | 120 °C | 190-200 °C | 190-200 °C | 190-200 °C | 190-200 °C |

The above temperature values are suggested and refer to a plant designed according to the prescriptions in the burner user manual. The suggested values can change in reference to the fuel oil specifications.



(x)
UTILIZZATO SOLO PER VERSIONI "NAFTA 110 cSt a 50 °C" E "NAFTA 400 cSt a 50 °C"
USED FOR "OIL 110 cSt a 50 °C " AND "OIL 400 cSt a 50 °C " VERSIONS ONLY

Con indicazioni per escludere le
resistenze e by-passare i
termostati per il funzionamento a
gasolio

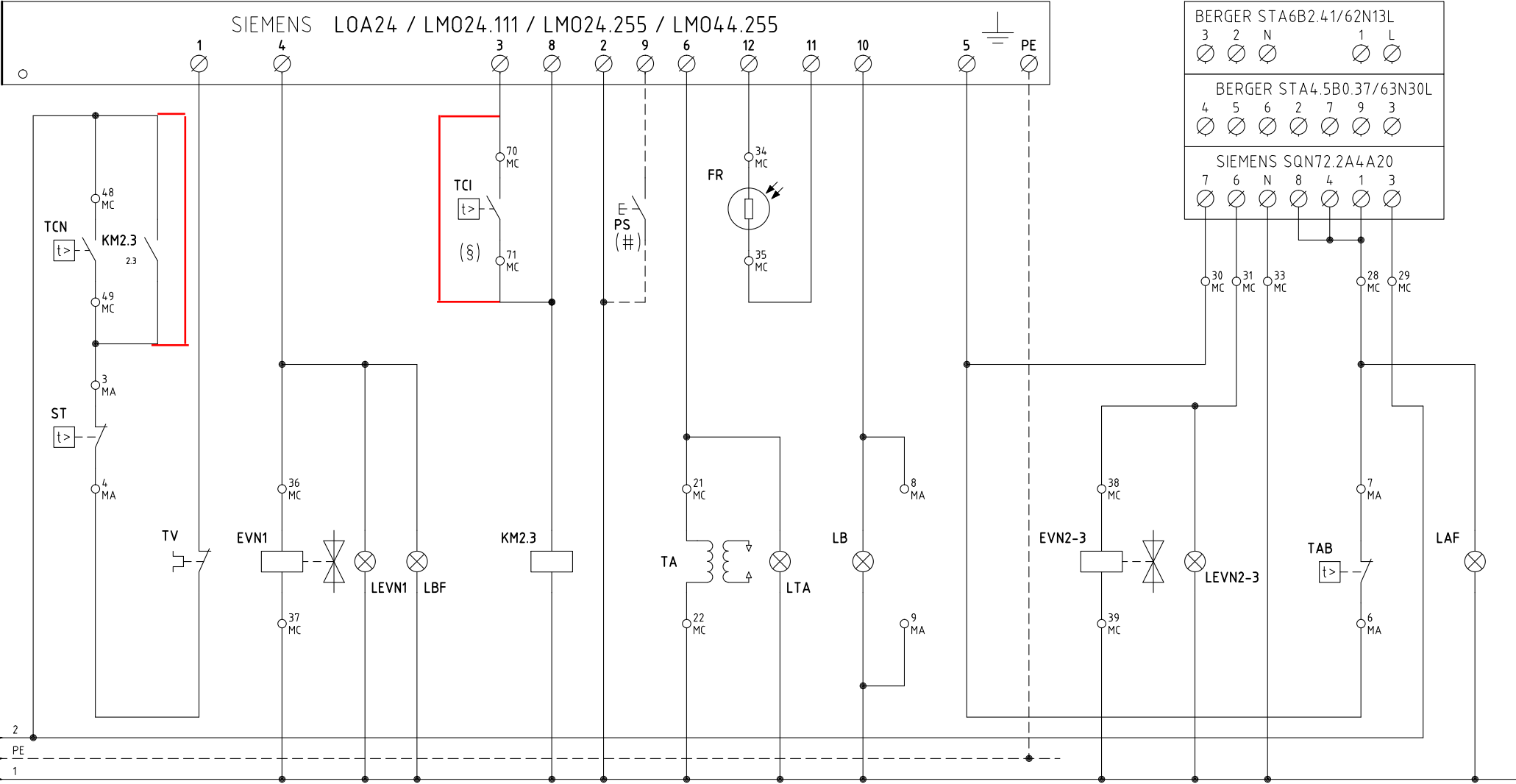
| | | | |
|------|--------------------------|----------|-----------|
| 04 | AGGIUNTO/ADDED LMQ24.255 | 07/01/13 | U. PINTON |
| 03 | SGN72.2A4A20 ADDED | 09/03/10 | U. PINTON |
| 02 | FREE CONTACT ADDED | 11/01/07 | U. PINTON |
| 01 | IRA AND FU19 ADDED | 27/01/04 | U. PINTON |
| REV. | MODIFICA | DATA | FIRME |



| | |
|-------------|--|
| Impianto | TIPI/TYPES PN30 /÷/ PN92 MODELLO/MODEL x-.AB.x.xx.A |
| Descrizione | |

| | |
|------------------------|--------------------------------|
| Ordine | |
| Commessa | Data Controllato 07/01/2013 |
| Esecutore U. PINTON | Controllato S. MARCHETTI |

| | | | |
|-----------|------------|-------|--------|
| Data | 08/03/2001 | PREC. | FOGLIO |
| Revisione | 04 | / | 1 |
| Dis. N. | 04 - 648 | SEGUE | TOTALE |
| | | 2 | 5 |



(§)

INSTALLATO SOLO SU ALCUNE VERSIONI
INSTALLED ON ANY VERSIONS ONLY

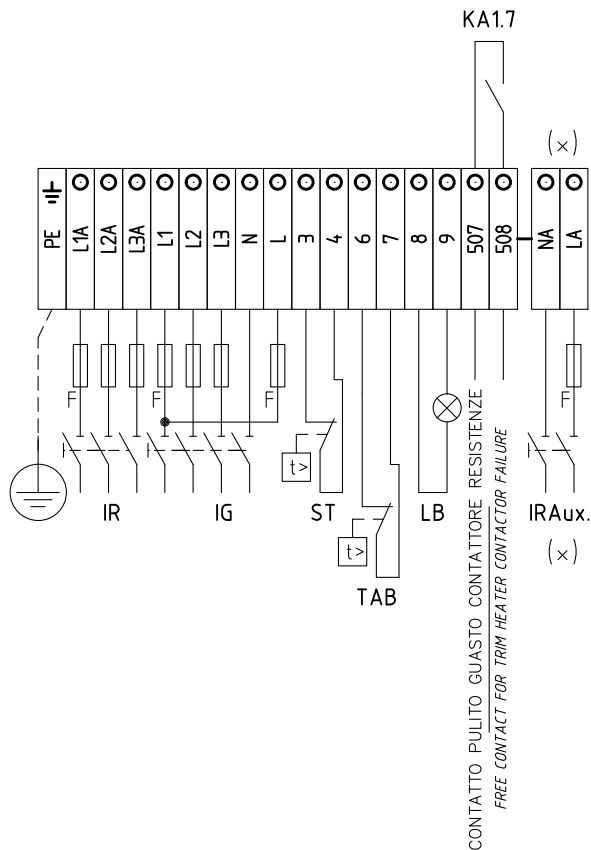
(#)

PULSANTE SBLOCCO FIAMMA (SOLO CON LM024/LOA44/LM044)
LOCK-OUT RESET BUTTON (LM024/LOA44/LM044 ONLY)

| | | | |
|-----------|------------|-------|--------|
| Data | 08/03/2001 | PREC. | FOGLIO |
| Revisione | 04 | 1 | 2 |
| Dis. N. | 04 - 648 | SEGUE | TOTALE |
| | | 3 | 5 |

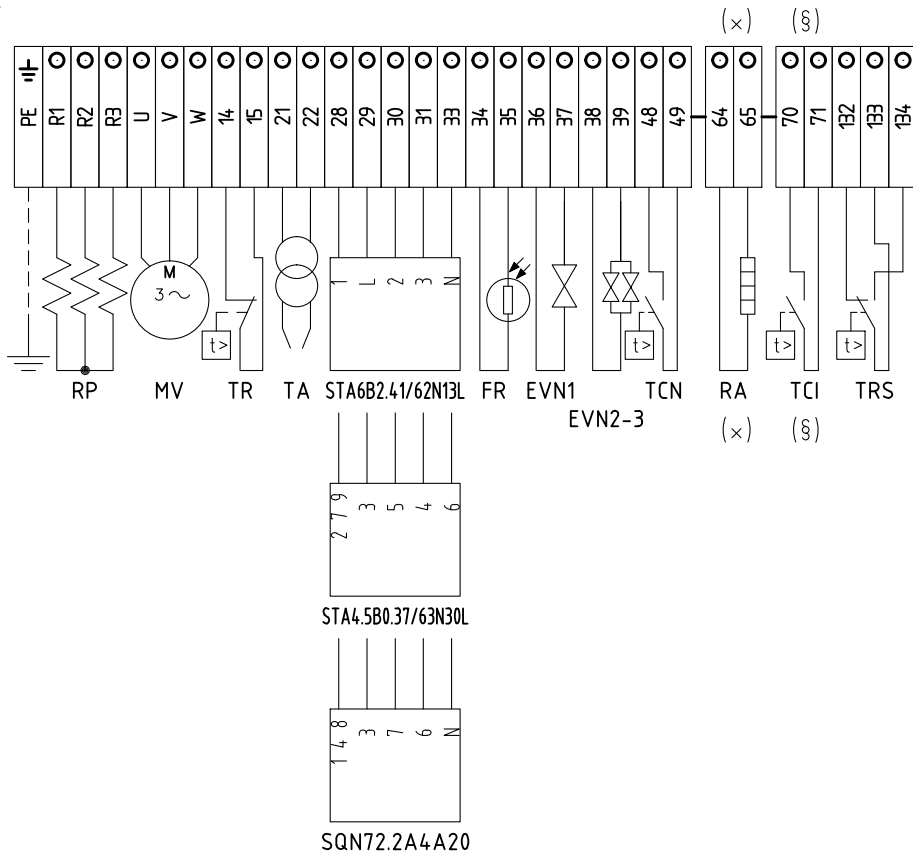
QG - MA

MORSETTIERA ALIMENTAZIONE BRUCIATORE
BURNER SUPPLY TERMINAL BOARD



QG - MC

MORSETTIERA COMPONENTI BRUCIATORE
BURNER COMPONENT TERMINAL BOARD



SERVOCOMANDO SERRANDA ARIA
AIR DAMPER ACTUATOR
STA4.5B0.37/63N30L

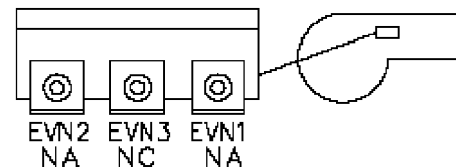
I ALTA FIAMMA
HIGH FLAME
II SOSTA E ACCENSIONE
STAND-BY AND IGNITION
III BASSA FIAMMA
LOW FLAME
IV APERTURA [EVN2-3]
OPENED [EVN2-3]

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)
AIR DAMPER ACTUATOR (ALTERNATIVE)
STA6B2.41/62N13L

ST2 ALTA FIAMMA
HIGH FLAME
ST1 SOSTA, ACCENSIONE E BASSA FIAMMA
STAND-BY, IGNITION AND LOW FLAME
MV APERTURA [EVN2-3]
OPENED [EVN2-3]

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)
AIR DAMPER ACTUATOR (ALTERNATIVE)
SQN72.2A4A20

I (ROSSO) ALTA FIAMMA
I (RED) HIGH FLAME
II (BLU) SOSTA, ACCENSIONE E BASSA FIAMMA
II (BLUE) STAND-BY, IGNITION AND LOW FLAME
IV (NERO) APERTURA [EVN2-3]
IV (BLACK) OPENED [EVN2-3]



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(§)
INSTALLATO SOLO SU ALCUNE VERSIONI
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| Data | 08/03/2001 | PREC. | FOGLIO |
| Revisione | 04 | 2 | 3 |
| Dis. N. | 04 - 648 | SEQUE | TOTALE |
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| SIGLA/ITEM | FOGLIO/SHEET | Funzione | FUNCTION |
|---------------------------------------|--------------|--|--|
| BERGER STA4.5B0.37/63N30L | 2 | SERVOCOMANDO SERRANDA ARIA | AIR DAMPER ACTUATOR |
| BERGER STA6B2.41/62N13L | 2 | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO) | AIR DAMPER ACTUATOR (ALTERNATIVE) |
| EVN1 | 2 | ELETTROVALVOLA NAFTA I° STADIO | OIL SOLENOID VALVE 1st STAGE |
| EVN2-3 | 2 | ELETTROVALVOLE NAFTA II° STADIO | OIL ELECTRO-VALVES II° STAGE |
| FR | 2 | FOTORESISTENZA RILEVAZIONE FIAMMA | PHOTORESISTOR FLAME DETECTOR |
| FU1.0 | 1 | FUSIBILI LINEA PRERISCALDATORE RP | LINE PRE-HEATING RP FUSES |
| FU1.1 | 1 | FUSIBILI LINEA BRUCIATORE | BURNER LINE FUSES |
| FU1.2 | 1 | FUSIBILE LINEA AUSILIARI | AUXILIARY LINE FUSE |
| FU1.5 | 1 | FUSIBILE AUSILIARIO | AUXILIARY FUSE |
| FU1.8 | 1 | FUSIBILE LINEA RESISTENZE AUSILIARIE | LINE AUXILIARY RESISTORS FUSE |
| FU1.9 | 1 | FUSIBILE RESISTENZE AUSILIARIE | AUXILIARY RESISTORS FUSE |
| IG | 1 | INTERRUTTORE GENERALE | MAINS SWITCH |
| IL | 1 | INTERRUTTORE LINEA AUSILIARI | AUXILIARY LINE SWITCH |
| IR | 1 | INTERRUTTORE LINEA RESISTENZE PRERISCALDATORE | PRE-HEATING RESISTORS LINE SWITCH |
| IRA | 1 | INTERRUTTORE RESISTENZE AUSILIARIE | AUXILIARY RESISTORS SWITCH |
| IRA _{ux.} | 1 | INTERRUTTORE RESISTENZE AUSILIARIE | AUXILIARY RESISTORS SWITCH |
| KA1.7 | 1 | RELE' AUSILIARIO SEGNALAZIONE GUASTO CONTATTORE RESISTENZE | AUXILIARY RELAY FOR TRIM HEATER CONTACTOR FAILURE |
| KM1.8 | 1 | CONTATTORE RESISTENZE PRERISCALDATORE [RP] | PRE-HEATING RESISTORS [RP] CONTACTOR |
| KM2.3 | 2 | CONTATTORE MOTORE VENTILATORE | FAN MOTOR CONTACTOR |
| LAF | 2 | LAMPADA SEGNALAZIONE ALTA FIAMMA BRUCIATORE | BURNER IN HIGH FLAME INDICATOR LIGHT |
| LB | 2 | LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE | INDICATOR LIGHT FOR BURNER LOCK-OUT |
| LBF | 2 | LAMPADA SEGNALAZIONE BASSA FIAMMA BRUCIATORE | BURNER IN LOW FLAME INDICATOR LIGHT |
| LEVN1 | 2 | LAMPADA SEGNALAZIONE APERTURA [EVN1] | INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVN1] |
| LEVN2-3 | 2 | LAMPADA SEGNALAZIONE APERTURA [EVN2-3] | INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVN2-3] |
| L0A24 / LM024.111 / LM024.255 / LM044 | 2 | APPARECCHIATURA CONTROLLO FIAMMA | CONTROL BOX |
| LRP | 1 | LAMPADA SEGNALAZIONE FUNZIONAMENTO PRERISCALDATORE RP | INDICATOR LIGHT FOR PRE-HEATING RESISTOR RP OPERATION |
| LT | 1 | LAMPADA SEGNALAZIONE BLOCCO TERMICO MOTORE VENTILATORE | INDICATOR LIGHT FOR FAN OVERLOAD TRIPPED |
| LTA | 2 | LAMPADA SEGNALAZIONE TRASFORMATORE DI ACCENSIONE | IGNITION TRANSFORMER INDICATOR LIGHT |
| LTRS | 1 | LAMPADA SEGNALAZIONE BLOCCO TERMOSTATO DI SICUREZZA PRERISCALDATORE [RP] | INDICATOR LIGHT FOR SAFETY THERMOSTAT [RP] PRE-HEATING |
| MV | 1 | MOTORE VENTILATORE | FAN MOTOR |
| PS | 2 | PULSANTE SBLOCCO FIAMMA (SOLO CON LM024) | LOCK-OUT RESET BUTTON (LM024 ONLY) |
| RA | 1 | RESISTENZE AUSILIARIE | AUXILIARY RESISTORS |

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| SIGLA/ITEM | FOGLIO/SHEET | Funzione | FUNCTION |
|----------------------|--------------|--|--|
| RP | 1 | RESISTENZE PRERISCALDATORE NAFTA | PRE-HEATING TANK RESISTORS |
| SIEMENS SQN72.2A4A20 | 2 | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO) | AIR DAMPER ACTUATOR (ALTERNATIVE) |
| ST | 2 | SERIE TERMOSTATI/PRESSOSTATI | SERIES OF THERMOSTATS OR PRESSURE SWITCHES |
| TA | 2 | TRASFORMATORE DI ACCENSIONE | IGNITION TRANSFORMER |
| TAB | 2 | TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA | HIGH-LOW THERMOSTAT/PRESSURE SWITCHES |
| TCI | 2 | TERMOSTATO CONSENSO IMPIANTO | PLANT CONSENT THERMOSTAT |
| TCN | 2 | TERMOSTATO CONSENSO NAFTA | OIL ENABLING THERMOSTAT |
| TR | 1 | TERMOSTATO DI REGOLAZIONE PRERISCALDATORE [RP] | REGULATION THERMOSTAT FOR PRE-HEATING [RP] RESISTORS |
| TRS | 1 | TERMOSTATO DI SICUREZZA PRERISCALDATORE [RP] | PRE-HEATING [RP] A SAFETY THERMOSTAT |
| TV | 1 | TERMICO MOTORE VENTILATORE | FAN MOTOR THERMAL |

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PULSANTE SBLOCCO FIAMMA (SOLO CON LM024)

LOCK-OUT RESET BUTTON (LM024 ONLY)

(§)

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