# PN91 - PN92 - PN93
# PN510 - PN515
# PN520 - PN525

## *Progressive, Fully-modulating*

## *Heavy oil Burners*

MANUAL OF INSTALLATION - USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

M039196CC Rel. 2.5 11/2023
M12923CA Rel. 0.7 03/2016

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**APPENDIX**

## WARNINGS

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

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

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

**CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.**

### 1) GENERAL INTRODUCTION

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

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

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

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

Contact qualified personnel only.

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

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

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

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

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

### 2) SPECIAL INSTRUCTIONS FOR BURNERS

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

When the decision is made to discontinue the use of the burner, the user shall have qualified personnel carry out the following operations:

a Remove the power supply by disconnecting the power cord from the mains.

b) Disconnect the fuel supply by means of the hand-operated shut-off valve and remove the control handwheels from their spindles.

**Special warnings**

- Make sure that the burner has, on installation, been firmly secured to the appliance, so that the flame is generated inside the appliance firebox.
- Before the burner is started and, thereafter, at least once a year, have qualified personnel perform the following operations:

a set the burner fuel flow rate depending on the heat input of the appliance;

b set the flow rate of the combustion-supporting air to obtain a combustion efficiency level at least equal to the lower level required by the regulations in force;

c check the unit operation for proper combustion, to avoid any harmful or polluting unburnt gases in excess of the limits permitted by the regulations in force;

d make sure that control and safety devices are operating properly;

e make sure that exhaust ducts intended to discharge the products of combustion are operating properly;

f on completion of setting and adjustment operations, make sure that all mechanical locking devices of controls have been duly tightened;

g make sure that a copy of the burner use and maintenance instructions is available in the boiler room.

- In case of a burner shut-down, reser 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 saftey 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

**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 **PN91** Model **N-. PR. S. *. A.**<br>(1) (2) (3) (4) (5) (6) | |
|---|---|
| (1) BURNER TYPE | **PN91 - PN92 - PN93 - PN510 - PN515 - PN520 - PN525** |
| (2) FUEL | N - Heavy oil, viscosity ≤ 50cSt (7° E) @ 50° C<br>E - Heavy oil, viscosity ≤ 110cSt (15°E) @ 50° C<br>D - Heavy oil, viscosity ≤ 400cSt (50° E) @ 50° C<br>P - Petroleum, viscosity 89cSt (12° E) @ 50° C |
| (3) OPERATION (Available versions) | PR - Progressive MD - Fully modulating |
| (4) BLAST TUBE | S - Standard L - Extended |
| (5) DESTINATION COUNTRY | * - see data plate |
| (6) BURNER VERSION | A - Standard |

## *Technical Specifications*

| **BURNER** | | **PN91** | **PN92** | **PN93** |
|---|---|---|---|---|
| Output | min - max kW | 698 - 2093 | 849 - 2558 | 550 - 4100 |
| Fuel | | Heavy oil | | |
| Oil viscosity | | See “Burner model identification” table | | |
| Heavy oil rate | min. - max. kg/h | 62 - 187 | 76- 228 | 49- 365 |
| Power supply | | 230/400V 3N a.c. 50Hz | | |
| Total power consumption (Heavy oil) | kW | 23 | 24 | 32 |
| Total power consumption (Petroleum) | kW | 10.5 | 12 | 16 |
| Fan motor | kW | 4 | 5.5 | 7.5 |
| Pre-heater resistors (heavy oil) | kW | 18 | 18 | 24 |
| Pre-heater resistors (Petroleum) | kW | 6 | 6 | 8 |
| Protection | | IP40 | | |
| Approx. weight | kg | 240 | 280 | 290 |
| Operation | | Progressive - Fully modulating | | |
| Operating temperature | °C | -10 ÷ +50 | | |
| Storage Temperature | °C | -20 ÷ +60 | | |
| Working service* | | Intermittent | | |

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

- Burners provided with Siemens LMO44 control box: the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.
- Burners provided with Siemens LAL25 control box: for safety reasons, one controlled shutdown must take place every 24 hours of continuous working.

| BURNER | | PN510 | PN515 | PN520 | PN525 |
|---|---|---|---|---|---|
| Output | min - max kW | 1314 - 3953 | 1628 - 4884 | 2326 - 6977 | 2000 - 8000 |
| Fuel | | Heavy oil | | | |
| Oil viscosity | | See “Burner model identification” table | | | |
| Heavy oil rate | min. - max. kg/h | 117 - 352 | 145 - 435 | 207 - 622 | 178 - 713 |
| Power supply | | 230/400V 3N a.c. 50Hz | | | 400V 3N a.c. 50Hz |
| Total power consumption (Heavy oil) | kW | 32 | 41.5 | 59.7 | 69.2 |
| Total power consumption (Petroleum) | kW | 16 | 20 | 28 | 32 |
| Fan-pump motor | kW | 7.5 | 11 | - | - |
| Fan motor | kW | - | - | 15 | 18.5 |
| Pump motor | kW | - | - | 2.2 | 2.2 |
| Pre-heater resistors (heavy oil) | kW | 24 | 30 | 42 | 48 |
| Pre-heater resistors (Petroleum) | kW | 8 | 10 | 14 | 16 |
| Protection | | IP40 | | | |
| Approx. weight | kg | 320 | 370 | 415 | 430 |
| Operation | | Progressive - Fully modulatingProgressive - Fully modulating | | | |
| Operating temperature | °C | -10 ÷ +50 | | | |
| Storage Temperature | °C | -20 ÷ +60 | | | |
| Working service* | | Intermittent | | | |

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

- Burners provided with Siemens LMO44 control box: the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.
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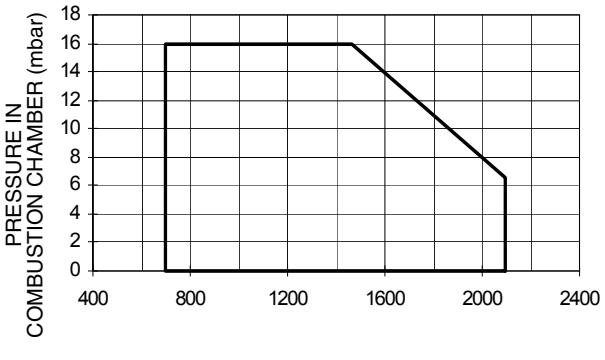
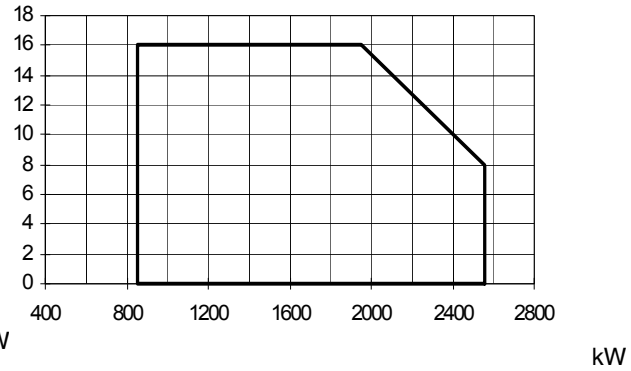
## *Performance Curves*

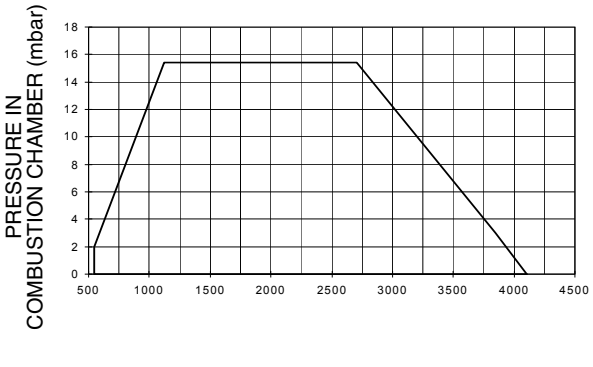
**PN91**



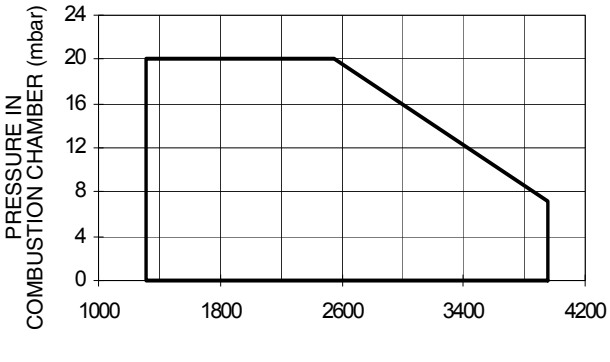

**PN92**



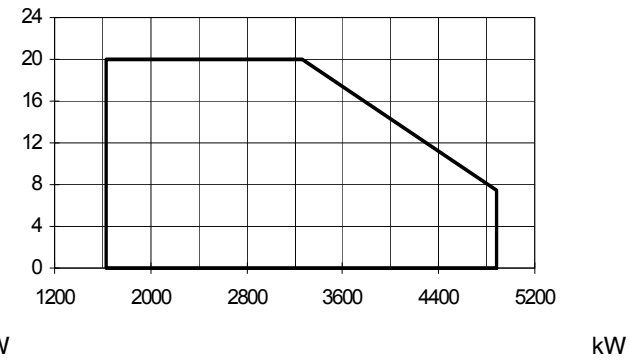

**PN93**



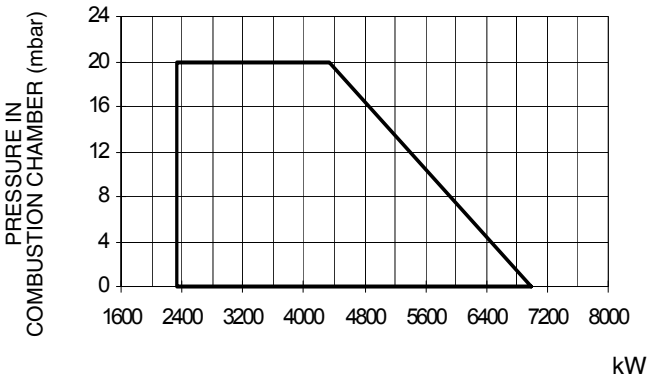

**PN510**



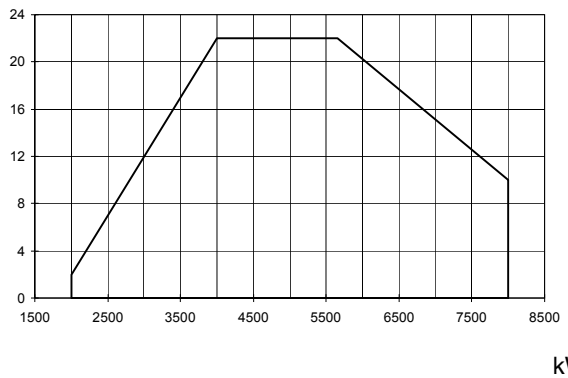

**PN515**




**PN520**




**PN525**

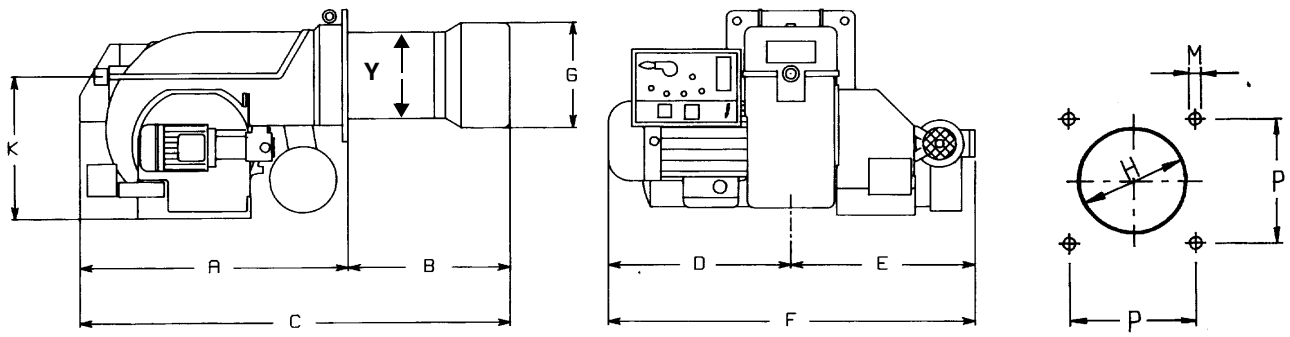



To get the input in kcal/h, multiply value in kW by 860.

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 adjsuting 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)*




| Type | A | B | BL | C | CL | D | E | F | G | K | H | M | P | Y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PN91 | 1017 | 298 | 488 | 1315 | 1505 | 532 | 520 | 1052 | 262 | 464 | 292 | M12 | 295 | 228 |
| PN92 | 1017 | 301 | 491 | 1318 | 1508 | 532 | 520 | 1052 | 292 | 464 | 322 | M12 | 295 | 228 |
| PN93 | 1017 | 301 | 491 | 1318 | 1508 | 532 | 520 | 1052 | 292 | 464 | 322 | M12 | 295 | 228 |
| PN510 | 1050 | 340 | 520 | 1390 | 1570 | 550 | 560 | 1110 | 345 | 650 | 385 | M14 | 390 | 328 |
| PN515 | 1050 | 340 | 520 | 1390 | 1570 | 550 | 560 | 1110 | 384 | 650 | 424 | M14 | 390 | 328 |
| PN520 | 1050 | 340 | 520 | 1390 | 1570 | 650 | 670 | 1320 | 422 | 650 | 472 | M14 | 390 | 328 |
| PN525 | 1050 | 340 | 520 | 1390 | 1600 | 650 | 670 | 1320 | 434 | 650 | 484 | M14 | 390 | 340 |

B = standard blast tube

BL = extended blast tube

## INSTALLING THE BURNER

### *Packing*

Burners are despatched in wooden crates whose dimensions are:

**PN91-92-93** 1730mm x 1280mm x 1020mm (L x P x H)

**PN510-515-520-525** 1730mm x 1430mm x 1130mm(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:

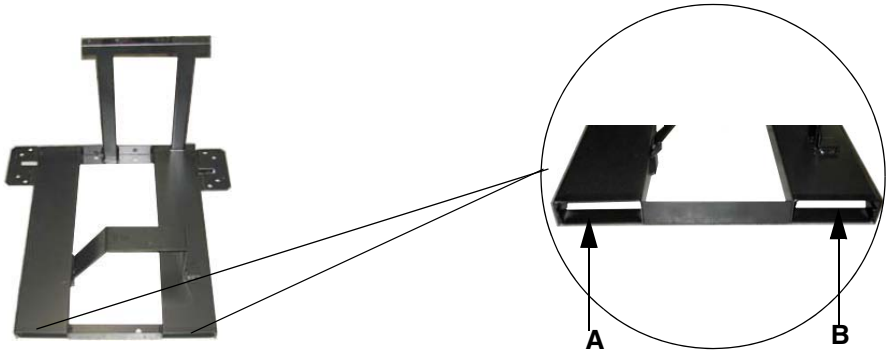
- burner;
- gasket to be inserted between the burner and the boiler;
- oil flexible hoses;
- oil filter;
- envelope containing this manual.

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 lhandling 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.** |

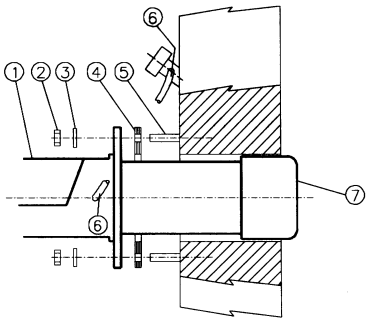
The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A anb B ways. Remove the stirrup only once the burner is installed to the boiler.



### *Fitting the burner to the boiler*

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

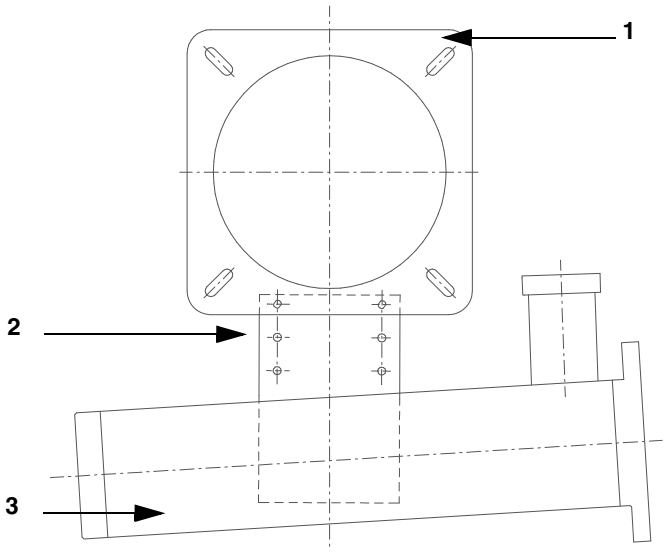
1 make a hole on the closing door of the combustion chamber as described on paragraph “Overall dimensions”)
2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph “Handling the burner”;
3 place the 4 stud bolts (5) on boiler’s door, according to the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

Set the upper side of the burner flange in a horizontal position, in order to obtain the correct inclination of the pre-heating tank

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



## *Electrical connections*

| | |
|---|---|
| | **Respect the basic safety rules. Make sure of the connection to the earthing system. do not reverse the phase and neutral connections. Fit a differential thermal 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.** |

| | |
|---|---|
| | **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.** |
| | **CAUTION: 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. 1-Fig. 2).** |

To execute the electrical connections, proceed as follows:

1 remove the cover from the electrical board, unscrewing the fixing screws;

2 execute the electrical connections to the supply terminal board as shown in the following diagrams,

3 check the direction of the fan-pump motor (see next pargraph)

4 refit the panel cover.

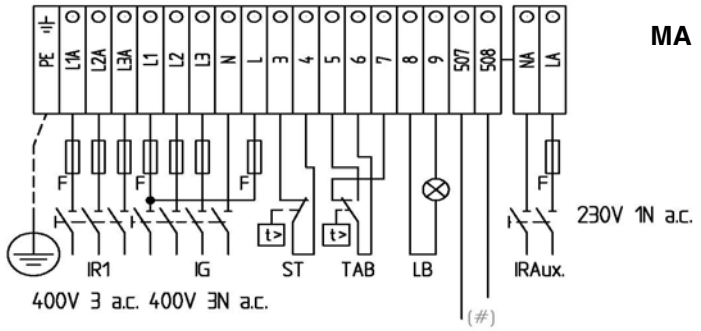



Fig. 1 - Progressive burners

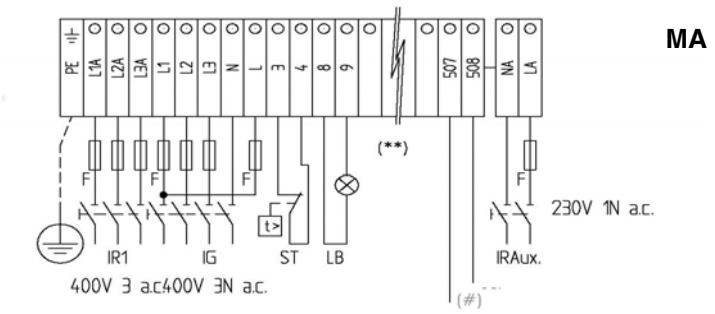



Fig. 2 - Fully modulating burners

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

(**) Probes connection (see Fig. 3)

**Probes connection**

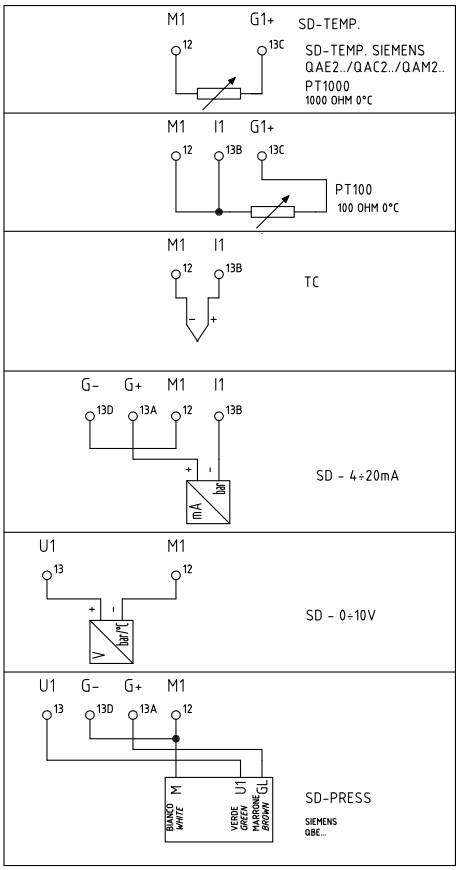



Fig. 3

Probes connection oby means of the 7-pins plug (Fig. 4) - see Fig. 3 for connections.

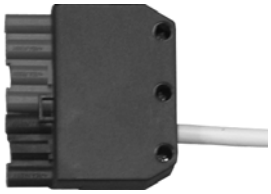


Fig. 4

### *Fan motor direction ( and pump motor direction only for PN520 - PN525)*

Once the electrical connection of the burner is performed, remember to check the rotation of the motor. The motor should rotate in an counterclockwise direction looking at cooling fan. In the event of incorrect rotation reverse the three-phase supply and check again the rotation of the motor.

### *Connecting the oil heating resistors*

**2.4 - 4.5 kW**

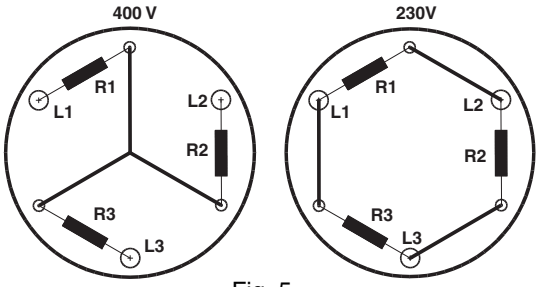



Fig. 5

**8 - 12 kW**

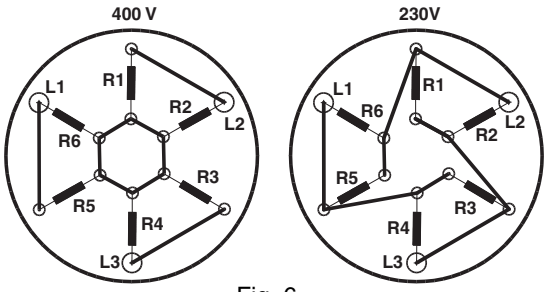



Fig. 6

**18 - 24 kW**

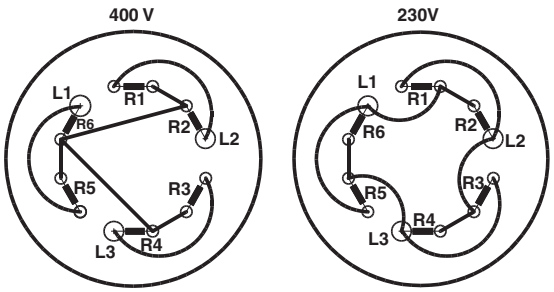



Fig. 7

**ELECTRIC MOTOR CONNECTION**

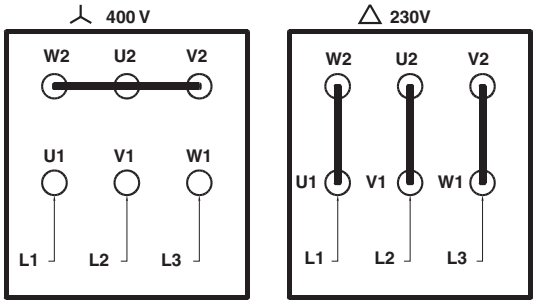



Fig. 8

### *Double-pipe and single-pipe system*

The pumps that are used 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.

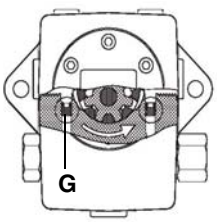
**Double-pipe system:** as for the single pipe system, a pipe that connects the tank to the pump's inlet is used besides another pipe that connects the pum's return port to the tank, as well. The excess of oil goes back to the tank: this installation can be considered self-bleeding. If provided, the 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.

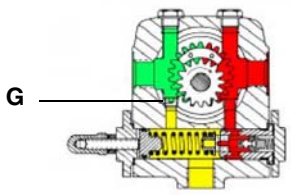
To change from a 1-pipe system to a 2-pipe-system, insert the by-pass plug **G** (as for ccw-rotation- referring to the pump shaft).

**Caution:** Changing the direction of rotation, all connections on top and side are reversed.

**Danfoss KSM..**




**Suntec TA**



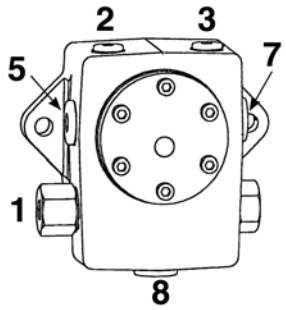

### *Bleed*

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.

## *Oil pumps*

PN91: SUNTEC TA2 / DANFOSS KSM50
PN92/93/510: SUNTEC TA3 / DANFOSS KSM70
PN515: SUNTEC TA4 / DANFOSS KSM100
PN520/525: SUNTEC TA5 / DANFOSS KSM140

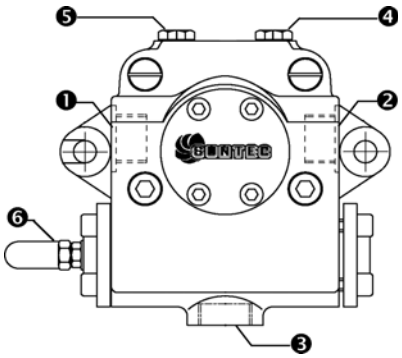
| **Danfoss KSM..** | |
|---|---|
| Oil viscosity | 2.5 ÷ 450 cSt |
| Oil temperature | -10 ÷ 160 °C |
| Max. suction pressure | 4 bar |
| Min. suction pressure | -0.45 bar to avoid gasing |
| Max. return pressure | 4 bar |
| Rotation speed | 3450 rpm max |




**Keys**

1 Pressure regulator
2 Pressure/Vacuum gauge port to measure inlet pressure/vacuum
3 Pressure gauge port
5 Suction
7 To the nozzle
8 Return

| **Suntec TA..** | |
|---|---|
| Oil viscosity | 3 ÷ 75 cSt |
| Oil temperature | 0 ÷ 150°C |
| Min. suction pressure | - 0.45 bar to avoid gasing |
| Max. suction pressure | 5 bar |
| Max. return pressure | 5 bar |
| Rotation speed | 3600 rpm max. |




1 Inlet G1/2
2 To the nozzle G1/2
3 Return G1/2
4 Pressure gauge port G1/4
5 Vacuum gauge port G1/4
6 Pressure governor

## *About the use of fuel pumps*

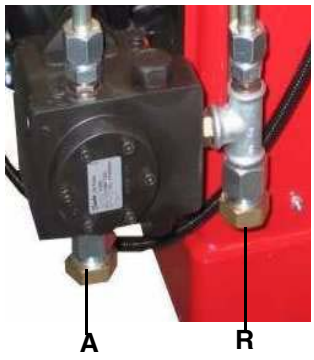
- Make sure that the by-pass plug is not used in a single pipe installation, because the fuel unit will not function properly and damage to the pump and burner motor could result.
- Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear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

### *Connecting the oil flexible hoses*

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

1 remove the closing nuts **A** and **R** on the inlet and return connections of the pump;

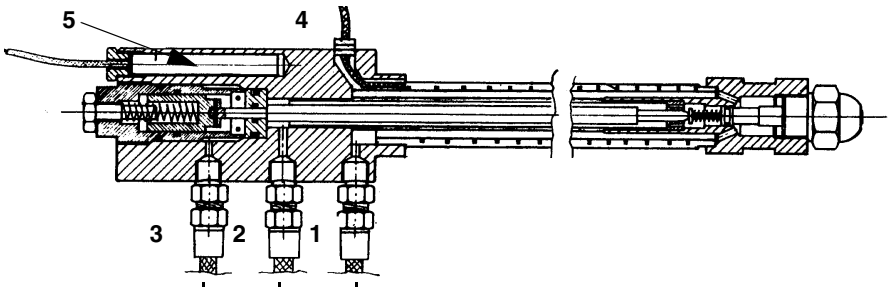
2 screw the rotating nut of the two flexible hoses on the pump **being careful to avoid exchanging the inlet and return lines**: see the arrows marked on the pump that show the inlet and the return (see prevoius paragraph).

| Suntec TA.. | Danfoss KSM.. |
|---|---|
| |   |

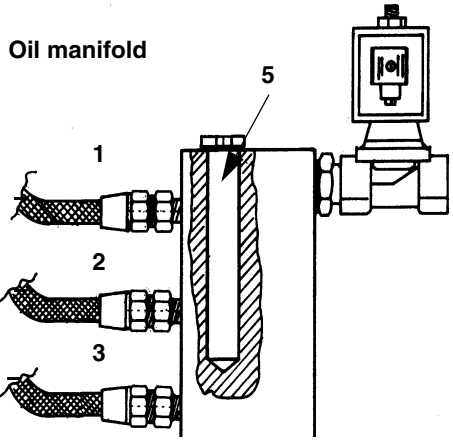
### *Connections to the oil gun*

1 Inlet
2 Return
3 Gun opening
4 Heating wire (only for oil viscosity > 50Cst @ 50°C)
5 Cartdrige-type heater (only for oil viscosity > 50Cst @ 50°C)

**Gun with the oil nozzle inside**




**Oil manifold**




### *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 convertions (e.g.: 132 cSt viscosity corresponds to 17.5°E viscosity).

The diagram in Fig. 9 shows how the heavy oil viscosity changes according to its temperature.

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

As far as the pumping capability, it depends on the type of the pump that pushes the oil even if on diagram in Fig. 9 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. 10, 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 mantain 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 manifacturer 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. 11 roughly shows the inlet pump pressure according to the oil temperature.

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

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

### *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 1.5°E viscosity at the nozzle.

| VISCOSITY AT 50 °C | | NOZZLE PRESSURE MEASURED IN THE GUN | RETURN NOZZLE PRESSURE | | TEMPERATURE ON THE PRE-HEATING RESISTORS | | TEMPERATURE OF THE RESISTORS SAFETY THERMOSTAT TRS | TEMPERATURE ON THE OIL ENABLING THERMOSTAT TCN | TEMPERATURE ON THE PLANT ENABLING THERMOSTAT TCI |
|---|---|---|---|---|---|---|---|---|---|
| | | | min. | max. | min. | max. | | | |
| cSt (°E) | | bar | bar | | °C | | °C | °C | °C |
| | < 50 (7) | 25 | 7-9 | 19-20 | 100 | 115 | 170 | 80 | 50 - 60 |
| > 50 (7) | < 110 (15) | 25 | 7-9 | 19-20 | 125 | 140 | 190 | 100 | 60 - 80 |
| > 110 (15) | 400 (50) | 25 | 7-9 | 19-20 | 145 | 160 | 190 | 110 | 70 - 90 |

Tab. 1 - Fluidics WR2 nozzle

| VISCOSITY AT 50 °C | | NOZZLE PRESSURE MEASURED IN THE GUN | RETURN NOZZLE PRESSURE | | TEMPERATURE ON THE PRE-HEATING RESISTORS | | TEMPERATURE OF THE RESISTORS SAFETY THERMOSTAT TRS | TEMPERATURE ON THE OIL ENABLING THERMOSTAT TCN | TEMPERATURE ON THE PLANT ENABLING THERMOSTAT TCI |
|---|---|---|---|---|---|---|---|---|---|
| | | | min. | max. | min. | max. | | | |
| cSt (°E) | | bar | bar | | °C | | °C | °C | °C |
| | < 50 (7) | 20 | 5-7 | 11-13 | 100 | 115 | 170 | 80 | 50 - 60 |
| > 50 (7) | < 110 (15) | 20 | 5-7 | 11-13 | 125 | 140 | 190 | 100 | 60 - 80 |
| > 110 (15) | 400 (50) | 20 | 5-7 | 11-13 | 145 | 160 | 190 | 110 | 70 - 90 |

Tab. 2 - Bergonzo A3 nozzle

*

**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

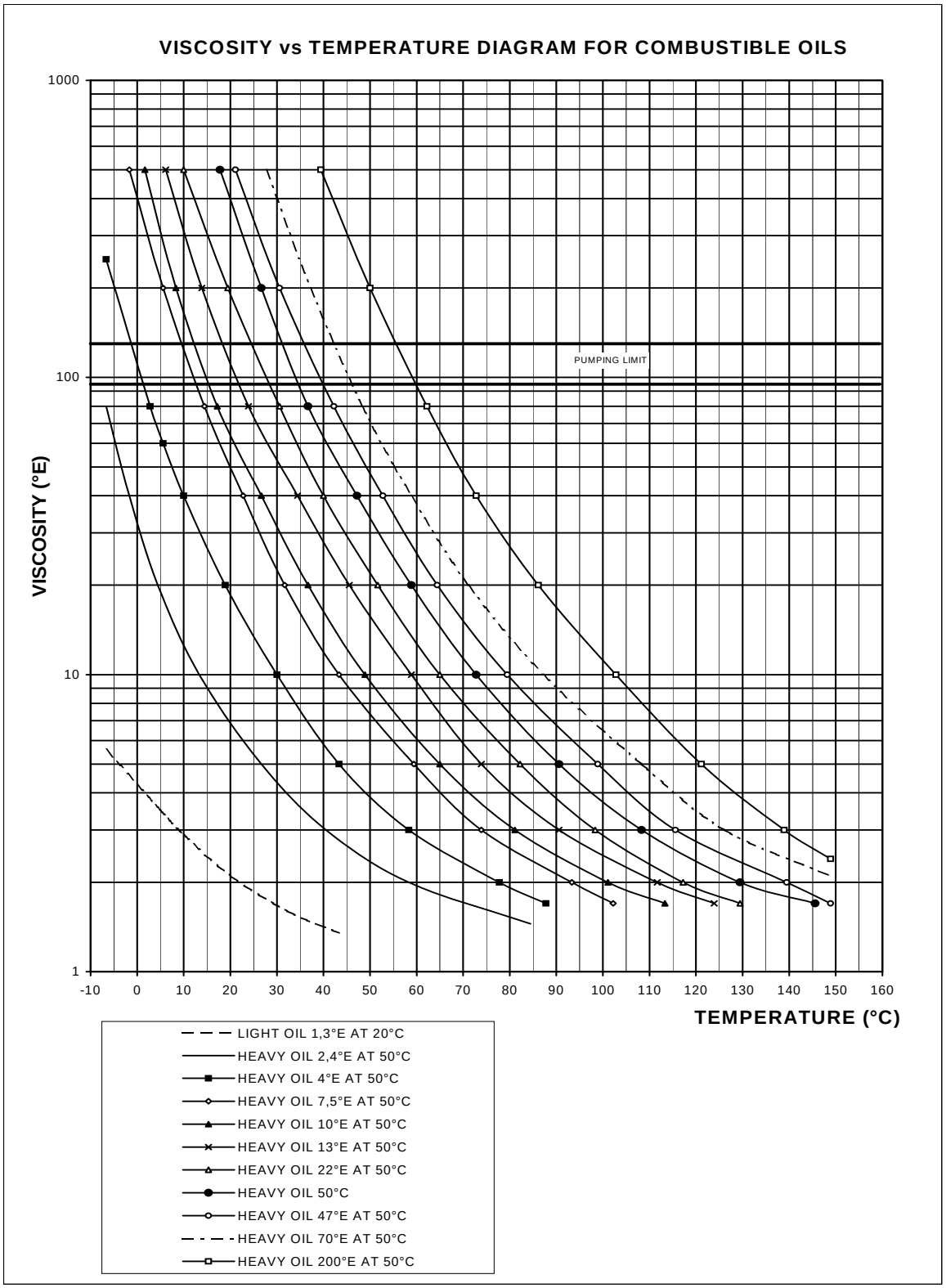

VISCOSITY vs TEMPERATURE DIAGRAM FOR COMBUSTIBLE OILS
1000
100
10
1
VISCOSITY (°E)
PUMPING LIMIT
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
TEMPERATURE (°C)
LIGHT OIL 1,3°E AT 20°C
HEAVY OIL 2,4°E AT 50°C
HEAVY OIL 4°E AT 50°C
HEAVY OIL 7,5°E AT 50°C
HEAVY OIL 10°E AT 50°C
HEAVY OIL 13°E AT 50°C
HEAVY OIL 22°E AT 50°C
HEAVY OIL 50°C
HEAVY OIL 47°E AT 50°C
HEAVY OIL 70°E AT 50°C
HEAVY OIL 200°E AT 50°C

Fig. 9

**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).

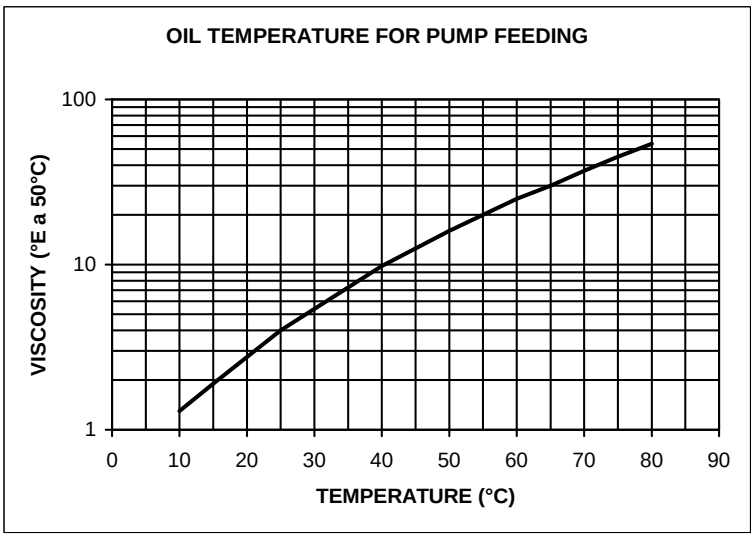



Fig. 10

**Indicative diagram showing the oil pressure according to its temperature**

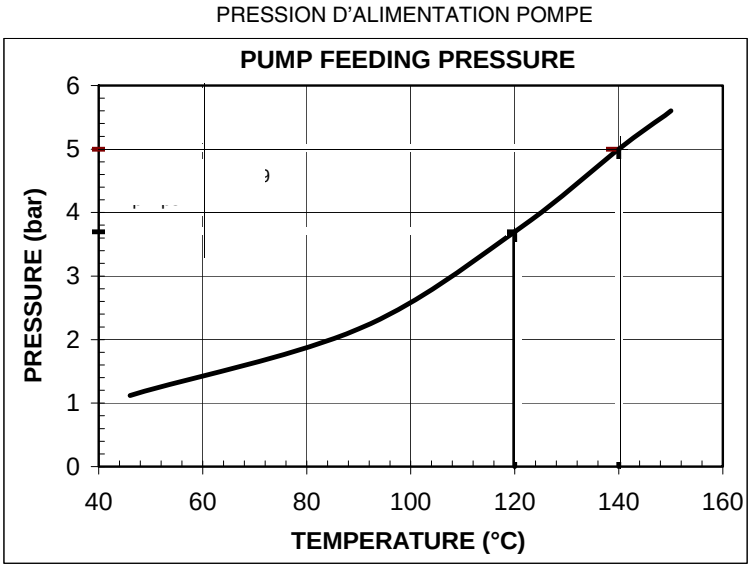



Fig. 11

**Indicative diagram showing the oil atomising temperature according to its viscosity**

Example: if the oil has a 50°E @ 50°C viscosity, the oil atomising temperature should be between 145°C and 160°C (see diagram).

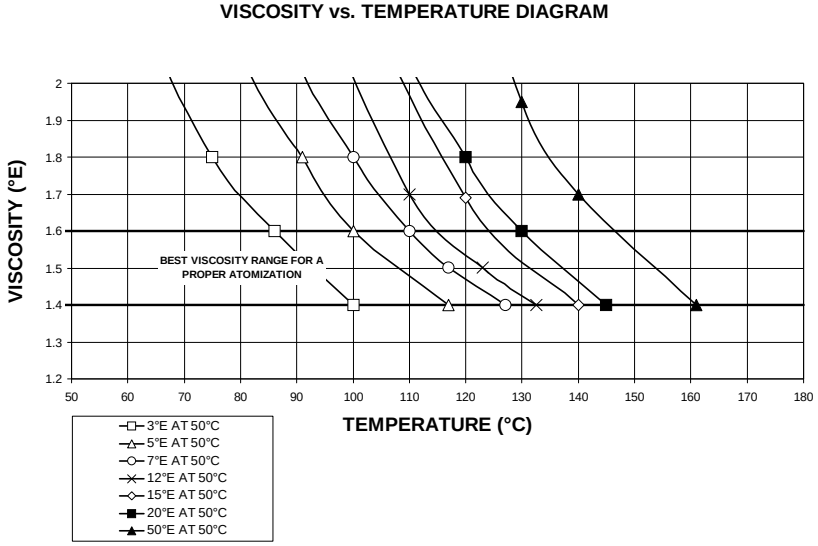



Fig. 12

## HYDRAULIC DIAGRAMS

Fig. 13 - **Hydraulic diagram 3ID0023 - Single burner configuration**

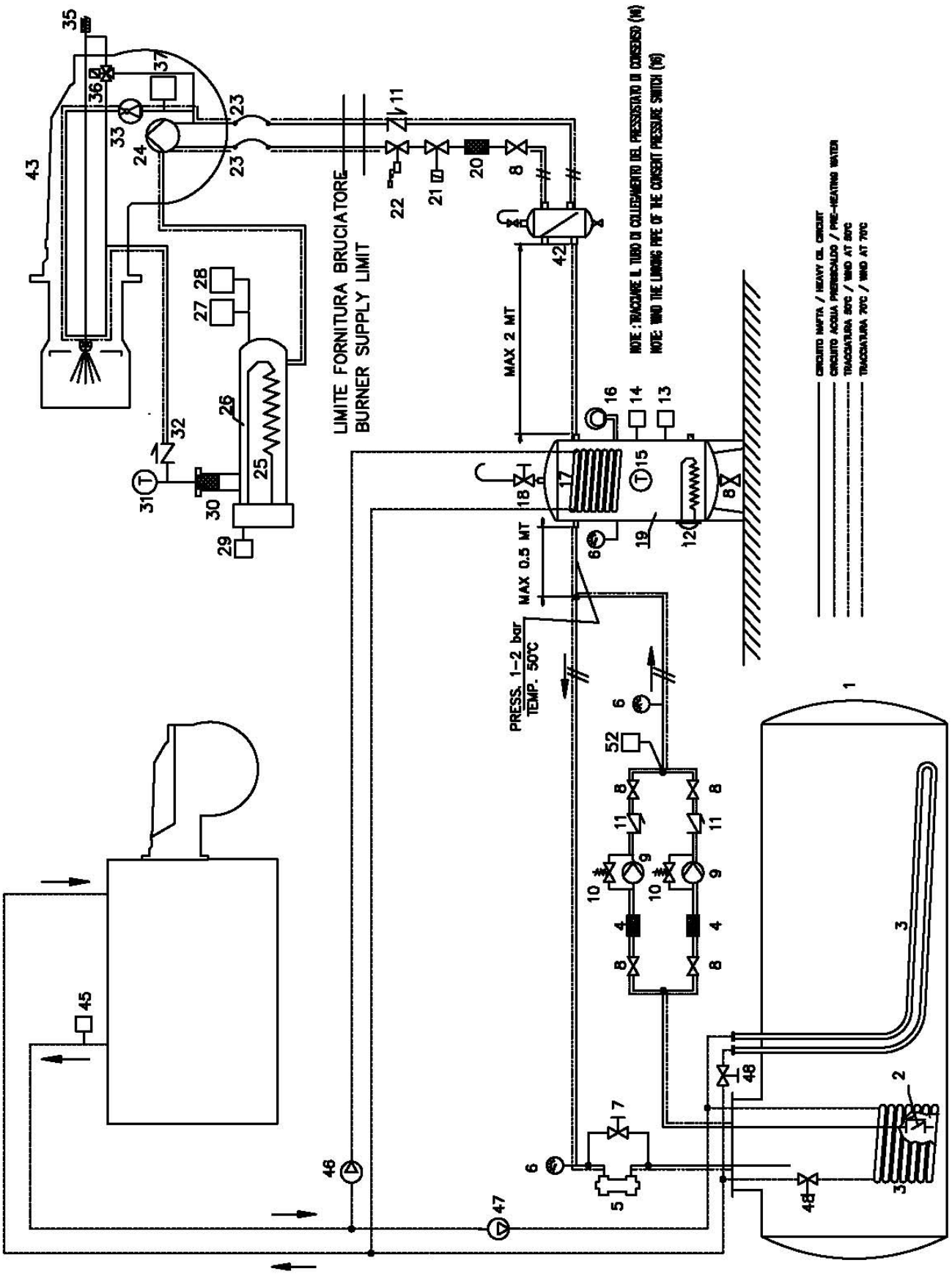
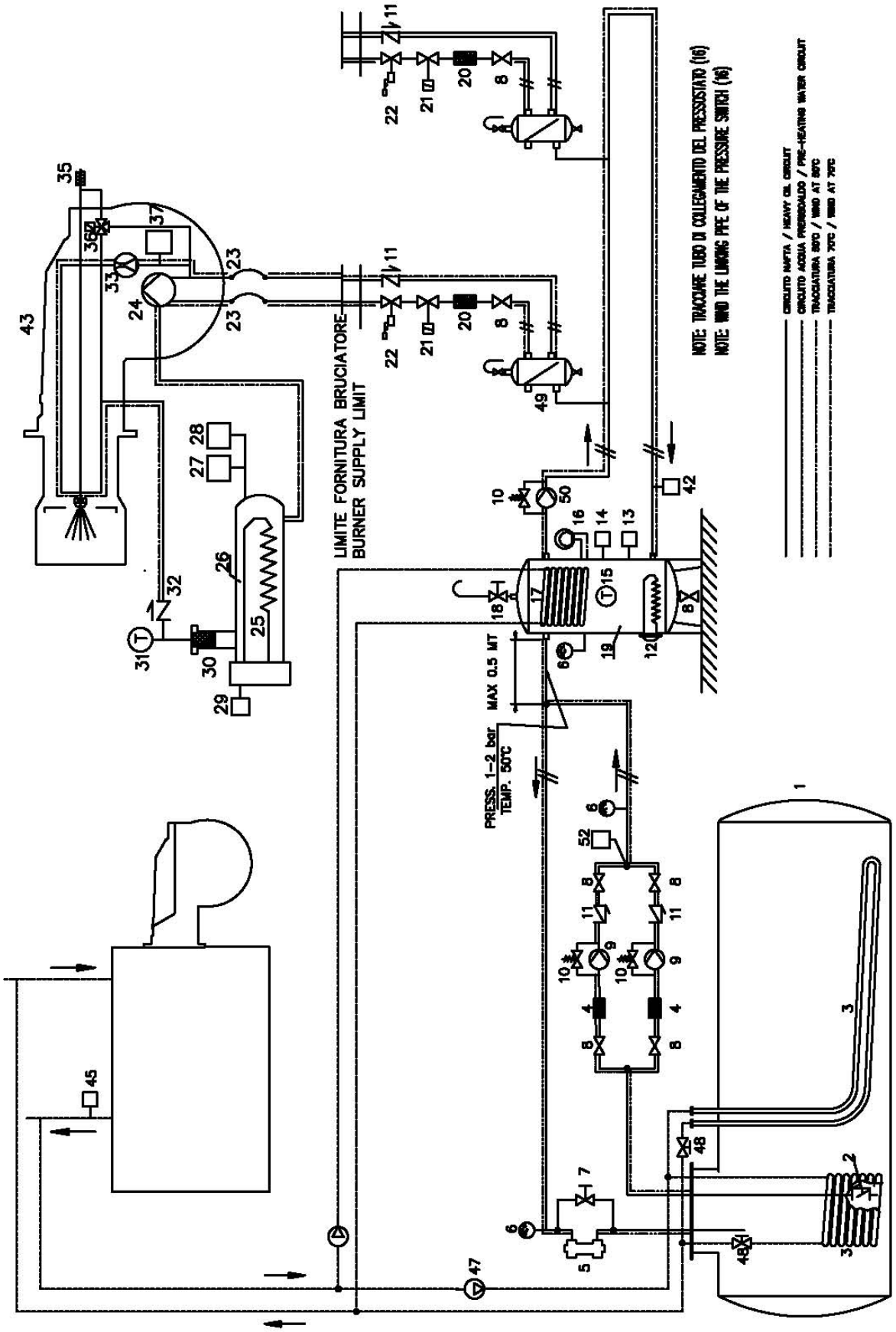


Fig. 14 - **Hydraulic diagram 3ID0014 - Two or more burners configuration**



**Hydraulic Diagram 3ID0014**

1 Main tank
2 Bottom valve
3 Main tank pre-heating pipe
4 Oil filter (filtration, 1mm)
5 Circuit pressure regulator
6 Manometer
7 Pressure regulation by-pass valve
8 Manual valve
9 Oil pump
10 Pump pressure regulator
11 Unidirectional valve
12 Service tank pre-heating resistor
13 Service tank pre-heating thermostat
14 Burner consent thermostat
15 Thermometer
16 Consent pressure switch for service tank resistor
17 Service tank heating pipe
18 Service tank air drain valve
19 Service tank
20 Oil filter
21 Fuel solenoid valve
22 Fuel valve
23 Burner pump flexible hoses
24 Burner oil pump
25 Pre-heating tank resistor
26 Pre heating tank
27 Oil consent thermostat
28 Heather safety thermostat
29 Thermostat for oil temperature setting
30 Tank filter
31 Thermometer
32 Check valve
33 Return pressure governor
35 Oil needle drive piston
36 Oil rate regulator
37 Burner consent thermostat
42 Burner start consent thermostat
43 Burner
45 Thermostat for pipes pre-heating pumps
46 Water pump for service tank pre-heating (1)
47 Water pump for main tank pre-heating (19)
48 Water pre-heating balance setting valve
50 Oil circulation pump
52 Oil ring max. pressure switch

**Hydraulic Diagram 3ID0023**

1 Main tank
2 Bottom valve
3 Main tank pre-heating pipe
4 Oil filter
5 Circuit pressure regulator
6 Manometer
7 Pressure regulation by-pass valve
8 Manual valve
9 Oil pump
10 Pump pressure regulator
11 Unidirectional valve
12 Service tank pre-heating resistor
13 Service tank pre-heating thermostat
14 Burner consent thermostat
15 Thermometer
16 Consent pressure switch for service tank resistor
17 Service tank heating pipe
18 Service tank air drain valve
19 Service tank
20 Oil filter
21 Fuel solenoid valve
22 Fuel valve
23 Burner pump flexible hoses
24 Burner oil pump
25 Pre-heating tank resistor
26 Pre heating tank
27 Oil consent thermostat
28 Pre-heating tank resistors safety thermostat
29 Thermostat for oil temperature setting
30 Pre-heating tank filter
31 Thermometer
32 Check valve
33 Return pressure governor
35 Oil needle drive piston
36 Three way valve for piston drive
37 Burner consent thermostat
42 Air separation bottle
43 Burner
45 Thermostat for pipes pre-heating pumps
46 Water pump for service tank pre-heating (1)
47 Water pump for main tank pre-heating (19)
48 Valves for setting of pre-heating water balance
52 Oil ring max. pressure switch

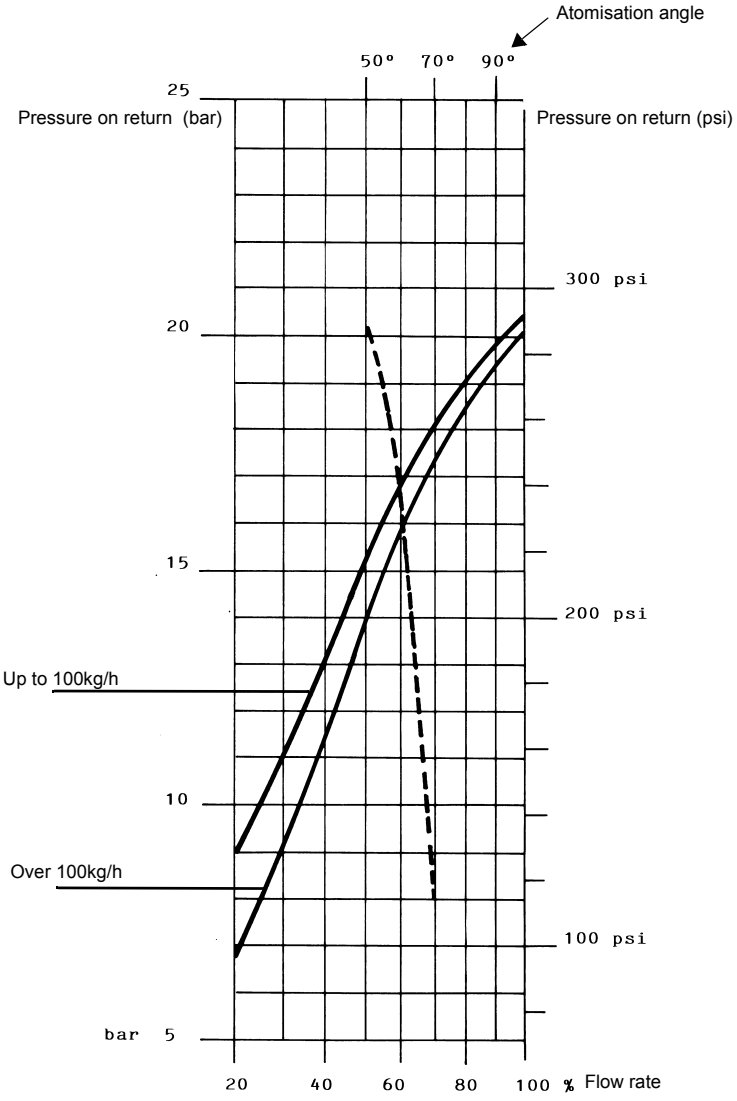
### *Adjusting light oil flow rate*

The light oil flow rate can be adjusted choosing a by-pass nozzle that suits the boiler/utilisation output and setting the delivery and return pressure values according to the ones quoted on the chart below and the diagram on Fig. 16 (as far as reading the pressure values, see next paragraphs).

## FLUIDICS NOZZLE: REFERENCE DIAGRAM (INDICATIVE ONLY)

| DIMENSIONS | FLOW RATE kg/h | | Indicative pessure on return (bar) |
|---|---|---|---|
| | Min | Max | |
| 40 | 13 | 40 | 19 |
| 50 | 16 | 50 | 22 |
| 60 | 20 | 60 | 20 |
| 70 | 23 | 70 | 23 |
| 80 | 26 | 80 | 23 |
| 90 | 30 | 90 | 22 |
| 100 | 33 | 100 | 22 |
| 115 | 38 | 115 | 21 |
| 130 | 43 | 130 | 22 |
| 145 | 48 | 145 | 21 |
| 160 | 53 | 160 | 21 |
| 180 | 59 | 180 | 22 |
| 200 | 66 | 200 | 21 |
| 225 | 74 | 225 | 22 |
| 250 | 82 | 250 | 22 |
| 275 | 91 | 275 | 22 |
| 300 | 99 | 300 | 23 |
| 330 | 109 | 330 | 23 |
| 360 | 119 | 360 | 22 |
| 400 | 132 | 400 | 22 |
| 450 | 148 | 450 | 22 |
| 500 | 165 | 500 | 22 |
| 550 | 181 | 550 | 22 |
| 600 | 198 | 600 | 23 |
| 650 | 214 | 650 | 23 |
| 700 | 231 | 700 | 23 |
| 750 | 250 | 750 | 23 |
| 800 | 267 | 800 | 22 |

Tab. 5




**NOZZLE SUPPLY PRESSURE = 25 bar**

- - - - - Atomisation angle according to the return pressure

——— % Flow rate

viscosity at nozzle = 5 cSt

***ATTENTION! To achieve the maximum flow rate close completely the return line.***

### *Oil thermostat adjustment*

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

**NOTE:** thermostat **TCI** is provided on burners fired with fuel oil having a 50° E at 50° C viscosity only.

**TCN - Oil enabling thermostat (Fig. 16)**

Adjust this thermostat to a value 10% lower than that showed in the viscosity-temperature diagram ().

**TRS - Resistor safety thermostat (Fig. 16)**

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.

**TR - Resistor thermostat (Fig. 16)**

Adjust this thermostat to the correct value according to the viscosity-temperature diagram (page 13) and check the temperature by using a thermometer mounted on the pre-heating tank.

**TCI - Installation enabling thermostat (Fig. 16)**

This thermostat is fitted on burners fired with oil at a viscosity of 400cSt at 50° C only. Set the thermostat according to data on page 13.

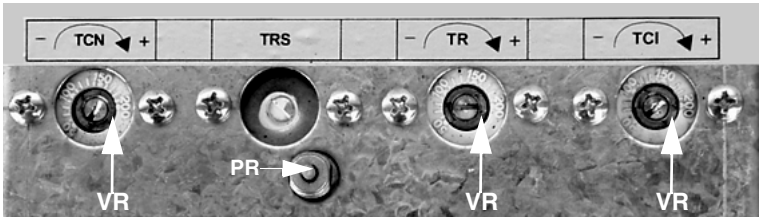



Fig. 16

### *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.

## 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 |

### *Adjustments - brief description*

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

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

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

1 with the electrical panel open, prime the oil pump acting on the related contactor (see next picture): check the pump motor rotation (page 11) and keep pressing for some seconds until the oil circuit is charged;

2 bleed the air from the **M** pressure gauge port (Fig. 17) by loosing the cap without removing it, then release the solenoid starter.

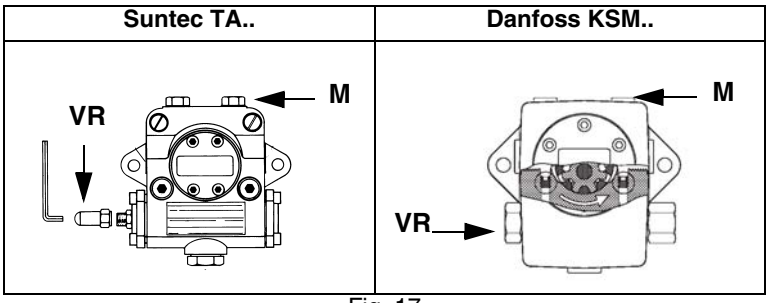
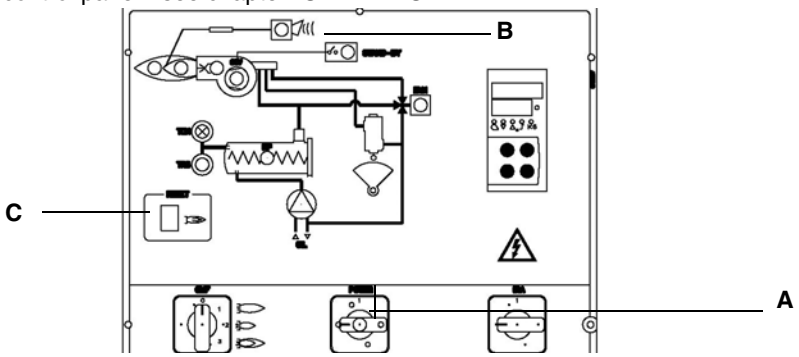



Fig. 17

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.

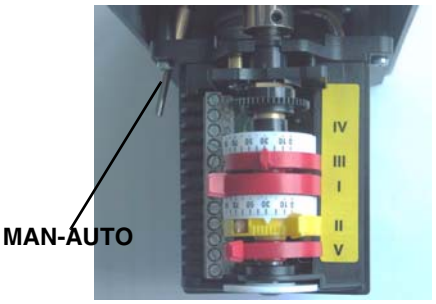
4 Turn the burner on by means of its main switch **A** (see next picture): if the burner locks (LED **B** on in the control panel) press the RESET button (**C**) on the control panel - see chapter “OPERATION”.




5 Start the burner up by means of the thermostat series and wait unitl the pre-purge phase comes to end and that burner starts up;

6 drive the burner to high flame stage, by means fo the thermostat **TAB**.

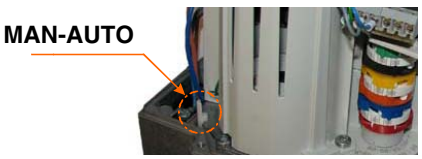
Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values (see next steps).




Berger STM30

**Actuator cams**

| | |
|---|---|
| I | High flame |
| II | Stand-by and Ignition |
| III | Low flame |




Siemens SQM40

7 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);insert a pressure gauge into the port shown on Fig. 18 and act on on the pump adjusting screw **VR** (see Fig. 17) as to get the nozzle pressure at 25bar (Fluidics nozzles - see diagram on page 21).

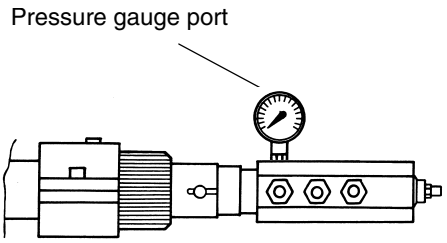



Fig. 18

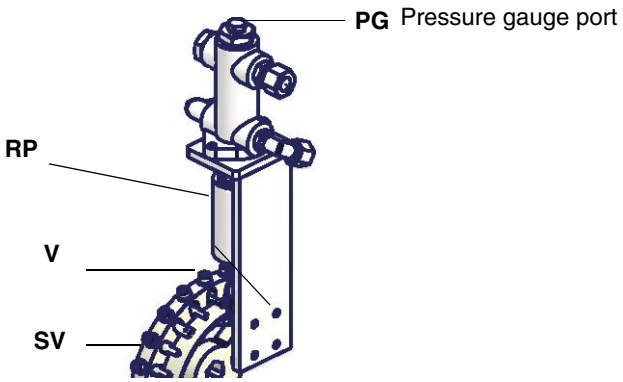
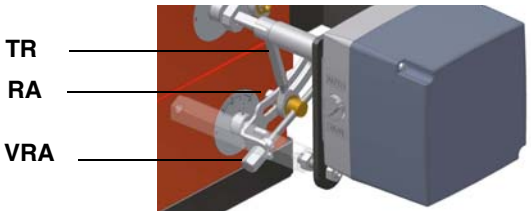



Fig. 20

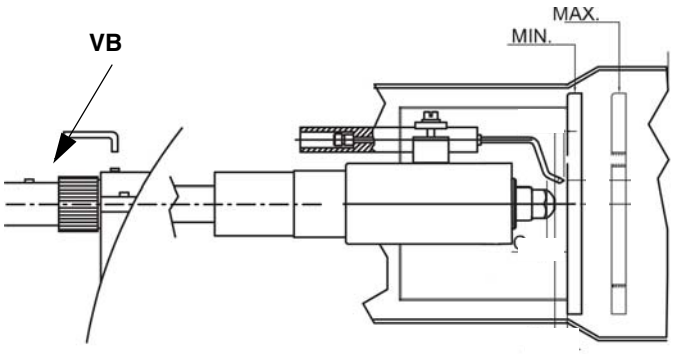
8 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the **PG** pressure gauge): checking always the combustion parameters, the adjustment is to be performed by means of the **SV** adjusting cam screw **V** (see picture) when the cam has reached the high flame position.

9 To adjust the **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 perfomed, be sure that the blocking nut **RA** is fasten. Do not change the position of the air damper rods.




10 If necessary, change the combusiton head position: to let the burner operate at a lower output, loose the **VB** screw and move progressively back the combustion head towards the MIN position, by turning clockwise the **VRT** ring nut. Fasten **VB** screw when the adjustment is accomplished.




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

11 as for the point-to-point regulation in order to set the cam foil shape, move the low flame microswitch (cam III) a little lower than the maximum position (90°);

12 set the **TAB** thermostat to the minimum in order that the actuator moves progressively towards the low flame position;

13 move cam III towards the minimum to make the actuator move towards the low flame until the two bearings find the adjusting screw that refers to a lower position: screw **V** to increase the rate, unscrew to decrease, in order to get the pressure as showed on diagram on Fig. 15, according to the requested rate.

14 Move again cam III towards the minimum to meet the next screw on the adjusting cam and repeat the previous step; go on this way as to reach the desired low flame point.

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

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

### *Adjustment by the Siemens SQL33.. actuator*

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

2 bleed the air from the **M** pressure gauge port (Fig. 21) by loosing the cap without removing it, then release the contactor.

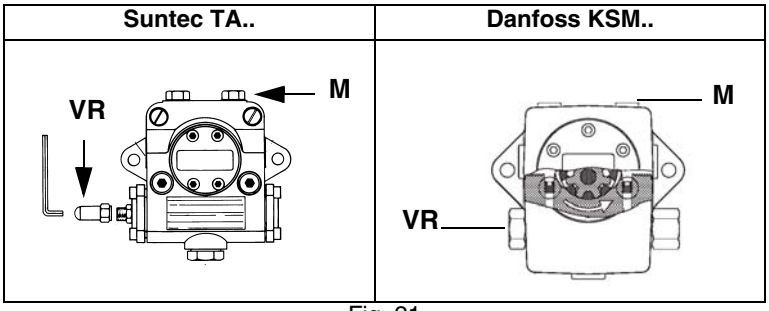
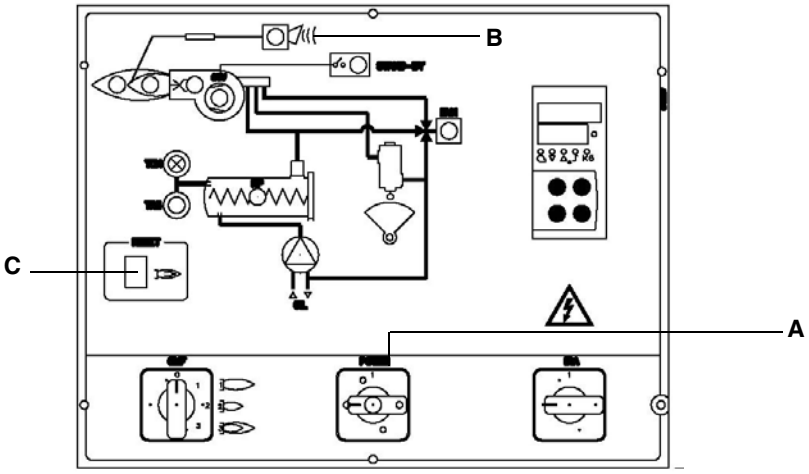



Fig. 21

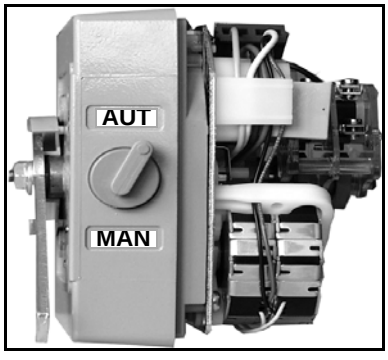
3 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.

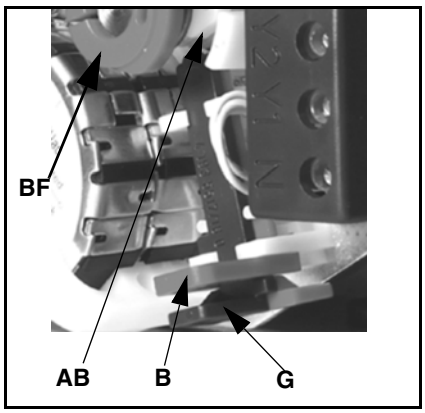
4 Turn the burner on by means of its main switch **A** (see next picture): if the burner locks (LED **B** on in the control panel) press the RESET button (**C**) - see chapter “OPERATION”.




5 Start the burner up by means of the thermostat series and wait until the pre-purge phase comes to end and that burner starts up;

6 the burner starts up with the actuator on the ignition position, set it to the **MAN** (manual mode), by the **MAN/AUTO** selector (ignition position= read on the air damper index **ID**);




**SQL33.. actuator cams**

AB = High flame

BF = Low flame

B = plastic cam

G = cam locking lever

7 disconnect the **TAB** thermostat removing the wire from the terminal no. 6 or by setting MAN on the RWF40 modulator or by setting 0 by means of the **CMF** switch (only for fully-modulating burners);

8 set the actuator to the manual mode (MAN) by means of the MAN/AUTO switch (see next pictures).

9 manually drive the adjusting cam **SV** to the high flame position and set the actuator to the AUTO mode (by means of the related switch - see picture) to lock the adjusting cam.

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);insert a pressure gauge into the port showed on Fig. 22 and act on on the pump adjusting screw **VR** (see Fig. 21) as to get the nozzle pressure at 25bar (Fluidics nozzles - see diagramd on pag. 21).

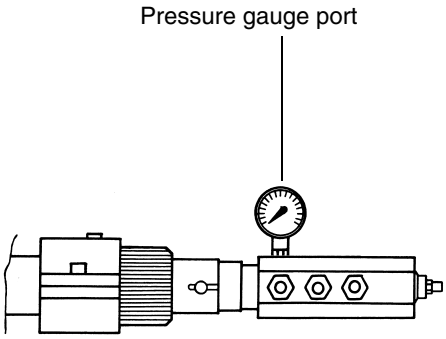



Fig. 22

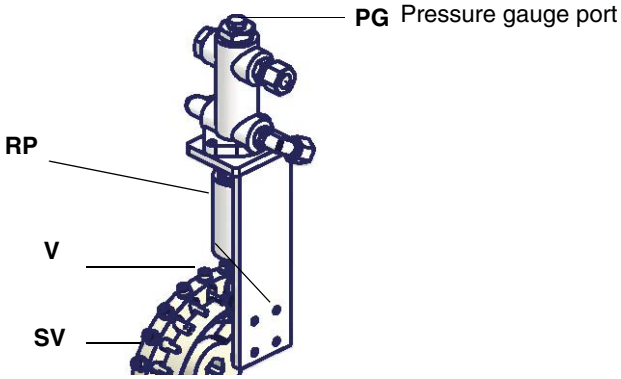
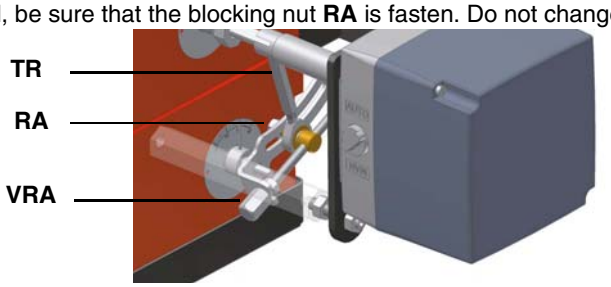



Fig. 23

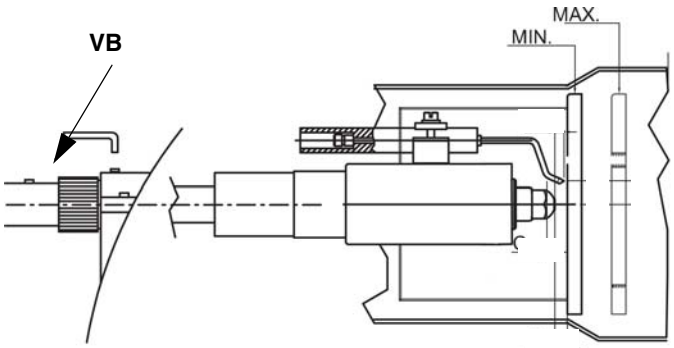
10 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the **PG** pressure gauge): always checking the combustion parameters, the adjustment is to be performed by means of the **SV** adjusting cam screw **V** (see picture) when the cam has reached the high flame position.

11 To adjust the **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 perfomed, be sure that the blocking nut **RA** is fasten. Do not change the position of the air damper rods.




12 If necessary, change the combusiton head position: to let the burner operate at a lower output, loose the **VB** screw and move progressively back the combustion head towards the MIN position, by turning clockwise the **VRT** ring nut. Fasten **VB** screw when the adjustment is accomplished.




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

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

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

15 act on the **V** screw that mathces the bearings referring to the adjusting cam position;

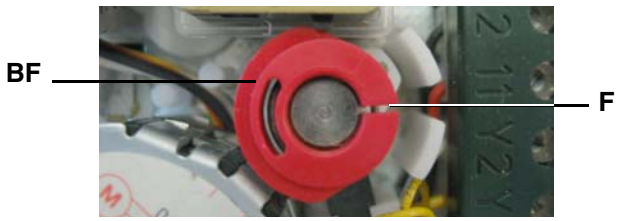
16 to adjust the next screw, set again the actuator mode to MAN, turn the adjusting cam and set the actuator to AUTO mode to lock the adjusting cam on the next screw; adjust it and go on this way to adjust all the screws in order to set the cam foil shape, according to the combustion values read.

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

18 Turn the burner off then start it up again.

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

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




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

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

### *Calibration of air pressure switch* (only for PN520 - PN525)

To calibrate the air pressure switch, proceed as follows:

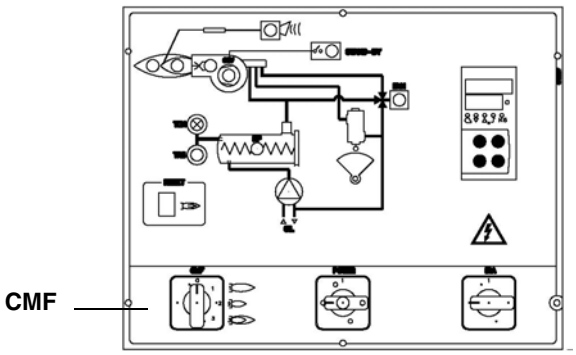
- Remove the transparent plastic cap.
- Once air and heavy oil setting have been accomplished, startup the burner.
- During the pre-purge phase o the operation, turn slowly the adjusting ring nut **VR** in the clockwise direction until the burner lockout, then read the value on the pressure switch scale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

### *Fully-modulating burners*

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

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

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




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

### *Oil circuit*

The fuel is pushed into the pump 1 to the nozzle 3 at the delivery pressure set by the pressure governor. The solenoid valve 2 stops the fuel immission into the combustion chamber. The fuel flow rate that is not burnt goes back to the tank through the return circuit. The spill-back nozzle is feeded at constant pressure, while the return line pressure is adjusted by means of the pressure governor controlled by an actuator coupled to an adjusting cam. The fuel amount to be burnt is adjusted by means of the burner actuator according to the adjustments set (see prevoius paragraph).

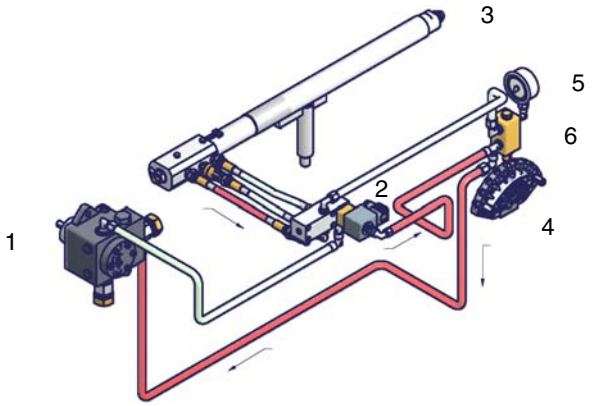



Fig. 24 - Stand-by

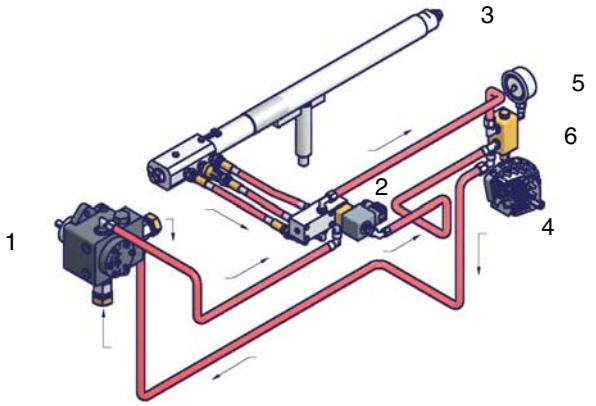



Fig. 25 - Prepurge

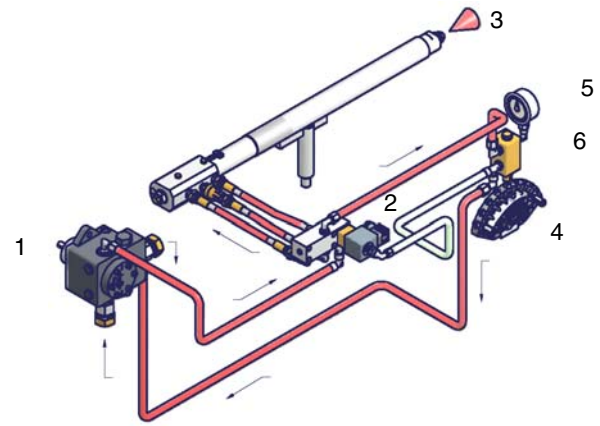



Fig. 26 - Low flame

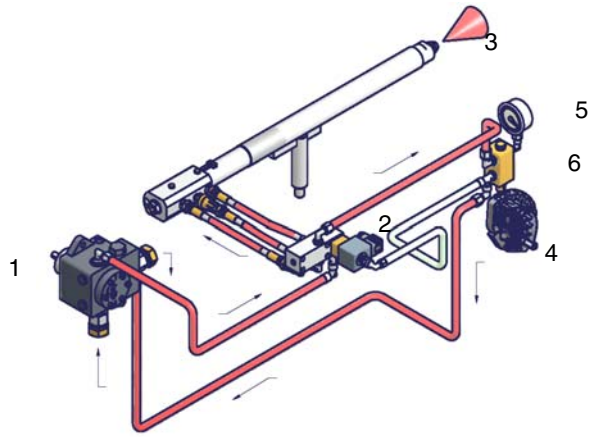



Fig. 27 - High flame

**Key**

1 Oil pump
2 Oil solenoid valve
3 Nozzle
4 Adjusting cam
5 Pressure gauge
6 Pressure governor

# 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 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 BURNT.**

## OPERATION

| | |
|---|---|
| | *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". |

**N.B. be sure the cutoff valves on the delivery and return pipes are OPEN.**

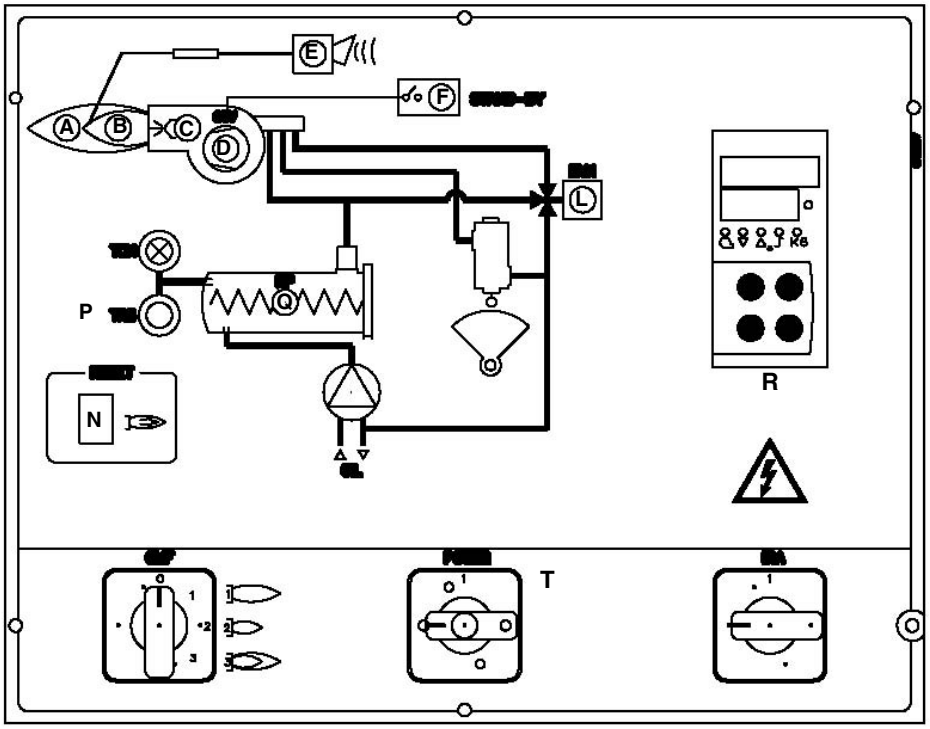
- Turn the burner on by means of its main switch **A** (see next pictures).
- Check that the burner is not locked (LED **E** lights up); if so, reset it by pressing the reset button **N**.
- Check that the series of thermostats (or pressure switches) enable the burner to start up.
- At the beginning of the start-up cycle the servo control drives the air damper to the maximum opening, the fan motor starts and the pre-purge phase begins. During the pre-purge phase the complete opening of the air damper is signalled by the indicator light F on the front panel.
- At the end of the pre-purge the ignition transformer is energised (signalled by the indicator light C on the panel). Two seconds later, the oil valve opens and the ignition transformer is de-energized (light C off).

The burner is now into operation, the servocontrol begins the opening, after few seconds the burner goes to two stages operation and eventually switches to the high flame operation, depending on the needs of the plant (light A, on) or continues with low flame operation (light B, on).

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

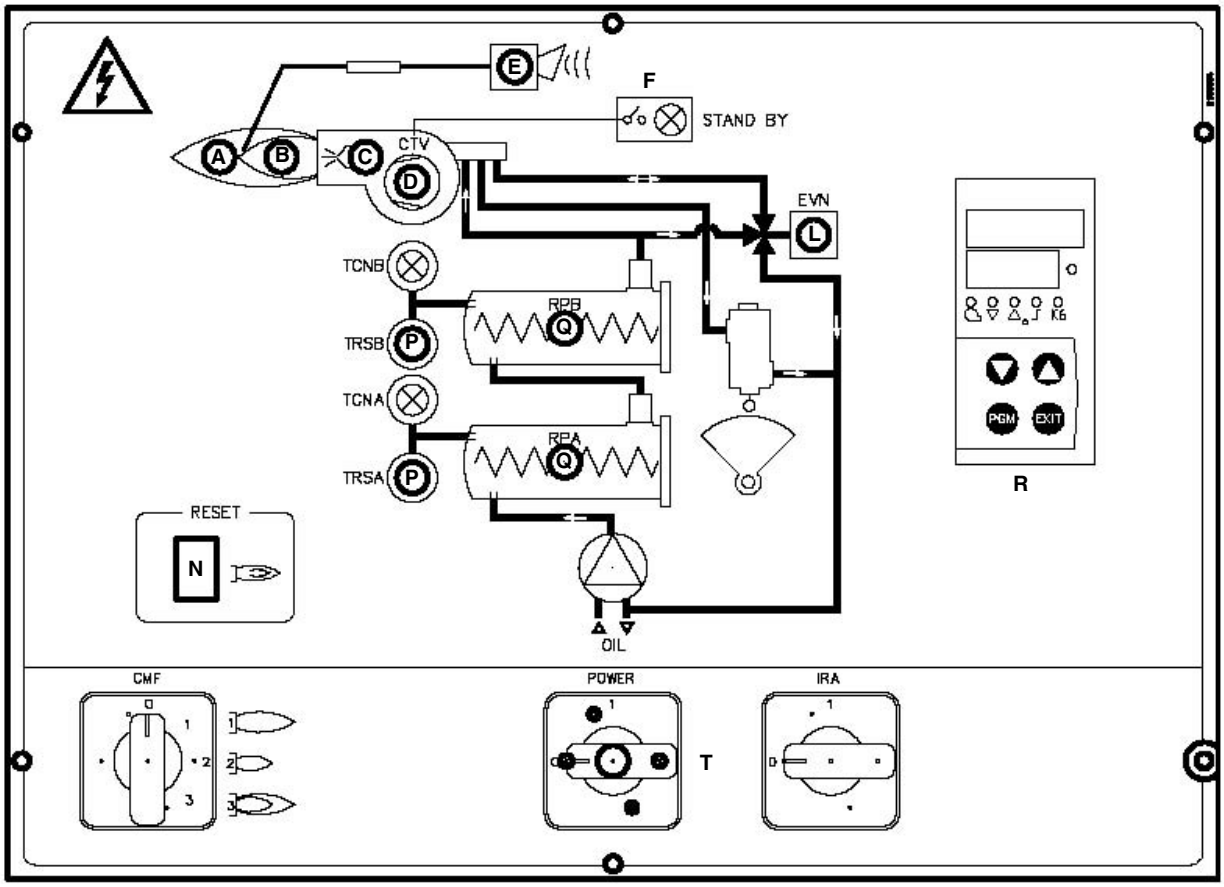
## *Control panel*

**PN91 - PN92 - PN93 - PN510**




A High flame lamp
B Low flame lamp
C Ignition transformer operation
CMF Manual operation switch
0= Off 1= High flame
2= Low flame 3= Automatic
D Fan motor thermal cutout intervention
E Burner lockout
F Burner in stand-by
IRA Auxiliary resistors wsitch
L Heavy oil solenoid lamp operation
N Contrlol box reset pushbutton
P Heating resistors safety thermostat
Q Pre-heating tank
R Modulator
T Main switch

**PN515 - PN520 - PN525**



## 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 MANAUL CUTOFF VALVES CLOSED!** |
| | **ATTENTION: READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNIG OF THIS MANUAL..** |

### ROUTINE MAINTENANCE

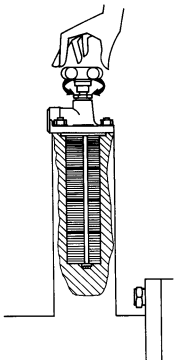
- Clean and examine the oil filter cartridge and replace it if necessary.
- Examine the condition of the oil flexible tubing and check for possible leaks.
- Check and clean if necessary the oil heaters and the tank, according to the fuel type and its use; remove the heaters flange fixing nuts and remove the heaters from the tank: clean by using steam or solvents and not metallic things.
- 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.
- Remove and clean the combustion head (page 32).
- Examine and clean the ignition electrodes, adjust and replace if necessary (see page 33).
- Examine and clean the detection probe, adjust and replace if necessary (see page 34).
- Examine the detection current (see page 34).
- 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 electrodes.***

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

### *Self-cleaning filter*

Fitted only for oil viscosity >110 cSt @ 50 °C. Periodically turn the knob to clean the filter.



### *Removing the combustion head*

- Remove the cover H.
- Slide the UV photoelectric cell out of its housing.
- Unscrew the oil connections E (Fig. 28) connecting the flexible pipes to the lance L and remove the whole assembly as shown in Fig. 28-Fig. 29.
- clean the combustion head by means of a vacuum cleaner; to scrape off the scale use a metallic brush.

Note: to replace the combustion head reverse the procedure described above.

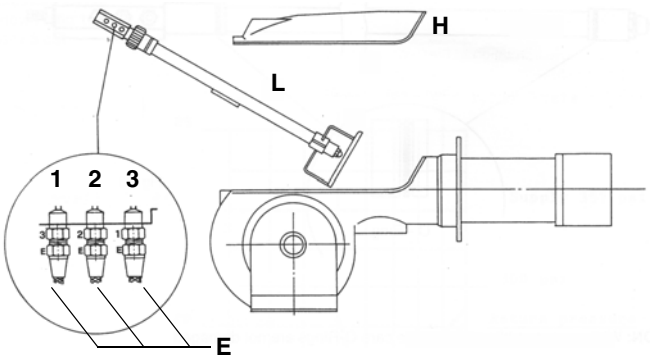



Fig. 25

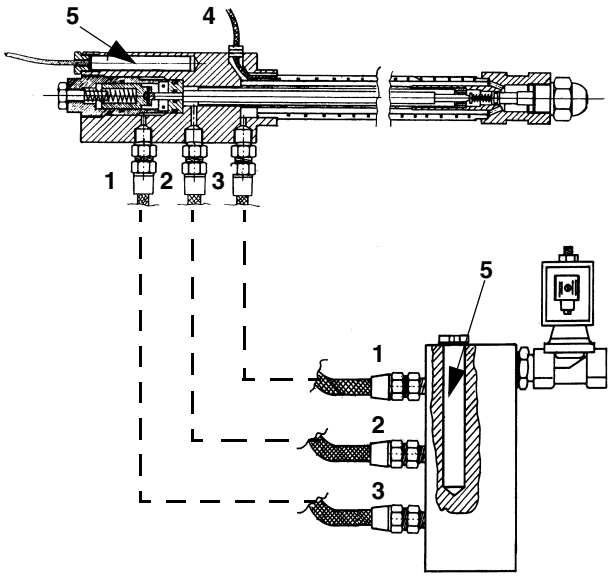



Fig. 26

**Key**

1 Inlet
2 Return
3 Lance opening
4 Heating wire (only for oil viscosity > 110 cSt @ 50 °C)
5 Cartdrige-type heater
H Cover
L Oil lance
E Oil piping connections

### *Removing the oil gun, replacing the nozzle and the electrodes*

| | |
|---|---|
| ⚠ | **ATTENTION:** avoid the electrodes to get in touch with metallic parts (blast tube, head, etc.), otherwise the boiler operation would be compromised. Check the electrodes 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 loosen the **VU** screw and remove the oil gun: check the oil gun, replace it fi necessary;
3 after removing the oil gun, unscrew the nozzle and replace it if necessary;
4 in order to replace the electrodes, unscrew the **VB** fixing screws and remove them: place the new electrodes being careful to observe the measures shown on next paragraph: reassemlbe following the reversed procedure.

**Caution**: adjust the nozzle position, by means of the **VU** screw.

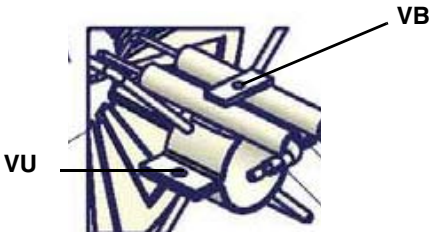



Fig. 27

### *Nozzle and electrodes correct position*

Place the nozzle according to the combustion head; unscrew **VB** and move the combustion head. Check the ignition electrodes at the end of the procedure. Quotes are referred in mm.

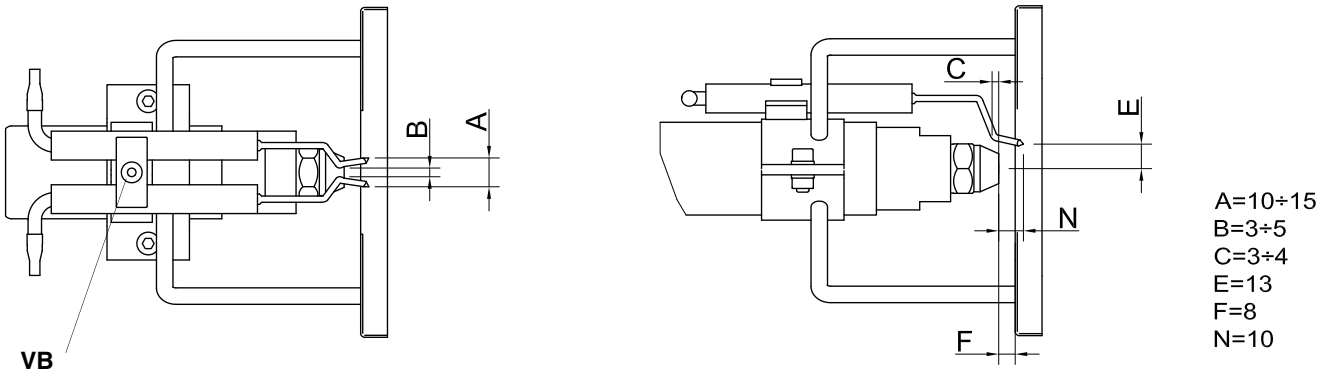



Fig. 28

### *Checking the detection current*

To check the flame itensity signal, follow the diagram shown on the next picture. If the measured value is lower than the suggested one, check the photoresistor position, the electrical contacts. Replace the photoresistor if necessary.

PN91-PN92 - PN93: LMO44
PN510-PN515-PN520-PN525: LAL2.

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

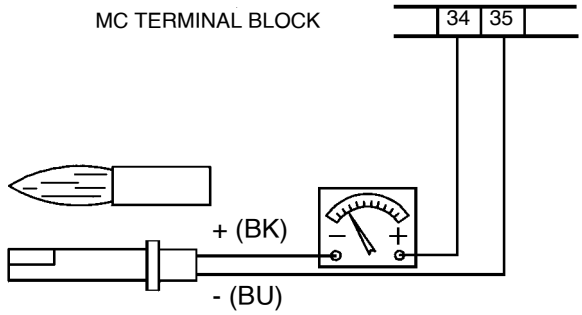



Fig. 29

### *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

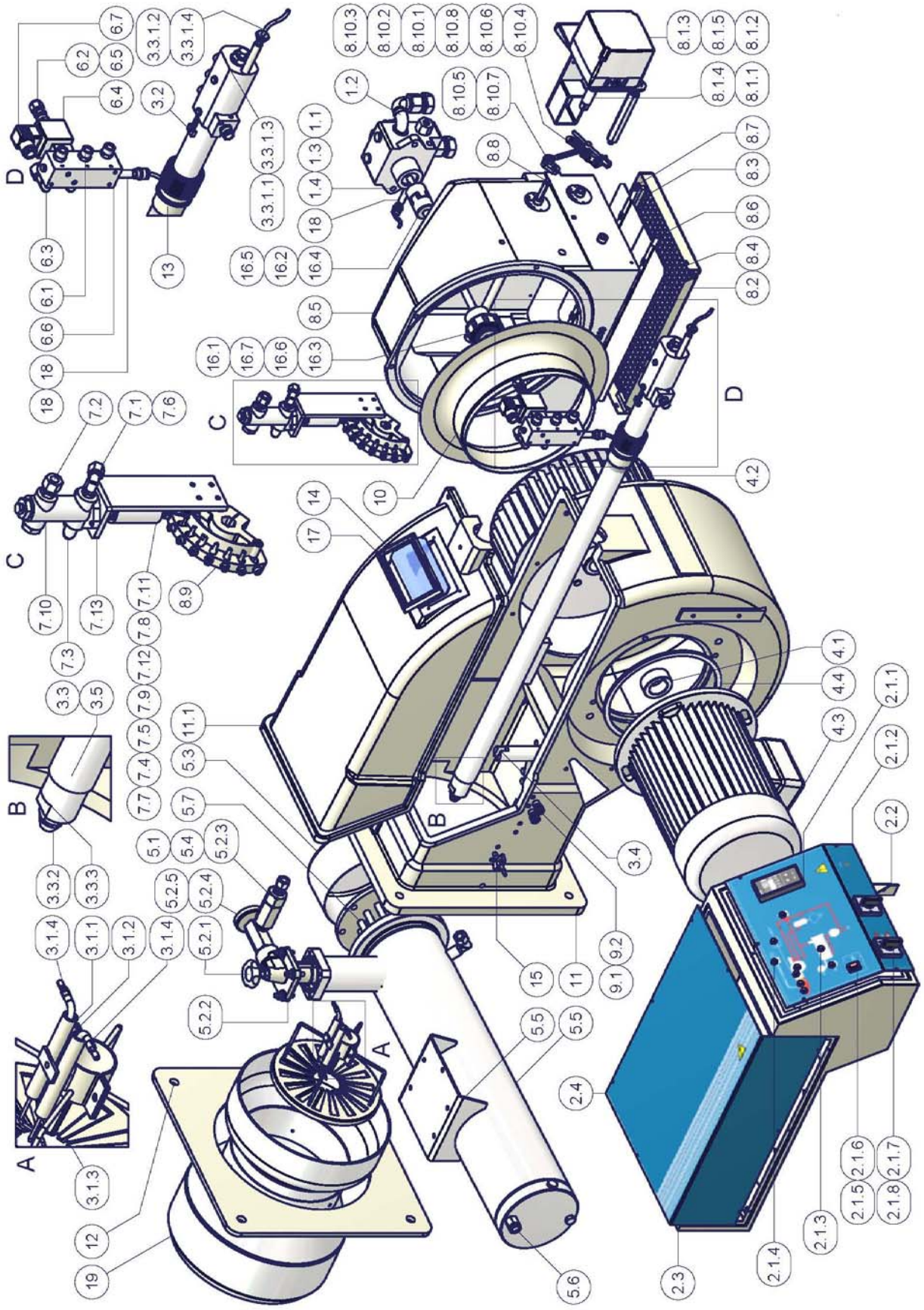
| CAUSES/TROUBLES | DOES NOT START UP | CONTINUES PRE-PURGUE | BURNER STARTS UP WITH COLD OIL | DOES NOT IGNITE AND GOES TO SHUT DOWN | DOES NOT PASS TO HIGH FLAME | GOES TO SHUT DOWN DURING OPERATION | GOES OFF AND REPEATS THE CYCLE DURING OPERATION |
|---|---|---|---|---|---|---|---|
| MAIN SWITCH 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 FAULTY | | | | ● | | | |
| IGNITION ELECTRODES 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 | | | | ● | | ● | ● |

## BURNER EXPLODED VIEW

| ITEM | DESCRIPTION |
|---|---|
| 1.1 | NIPPLE |
| 1.2 | ELBOW |
| 1.3 | NIPPLE |
| 1.4 | PUMP |
| 2.1.1 | POWER CONTROLLER |
| 2.1.2 | FRONT CONTROL PANEL |
| 2.1.3 | LIGHT |
| 2.1.4 | LIGHT |
| 2.1.5 | LOCK-OUT RESET BUTTON |
| 2.1.6 | PROTECTION |
| 2.1.7 | SWITCH |
| 2.1.8 | SWITCH |
| 2.2 | BRACKET |
| 2.3 | BOARD |
| 2.4 | COVER |
| 3.1.1 | LONG IGNITION ELECTRODE |
| 3.1.2 | LONG IGNITION ELECTRODE |
| 3.1.3 | COMBUSTION HEAD |
| 3.1.4 | IGNITION CABLE |
| 3.2 | GUN TERMINAL |
| 3.3 | STANDARD COMPLETE OIL GUN |
| 3.3.1.1 | NIPPLE |
| 3.3.1.2 | RESISTOR FIXING SCREW |
| 3.3.1.3 | OIL MANIFOLD |
| 3.3.1.4 | RESISTOR |
| 3.3.2 | NOZZLE |
| 3.3.3 | NOZZLE HOLDER |
| 3.4 | OIL GUN HOLDER |
| 3.5 | COMBUSTION HEAD ADJUSTING PIPE |
| 4.1 | SPACER |
| 4.2 | FAN WHEEL |
| 4.3 | MOTOR |
| 4.4 | GAUGE RING |
| 5.1 | STRAIGHT UNION |
| 5.2.1 | OIL FILTER |

| ITEM | DESCRIPTION |
|---|---|
| 5.2.2 | GASKET |
| 5.2.3 | GAS BLEEDING VALVE |
| 5.2.4 | THERMOMETER |
| 5.2.5 | MUFF |
| 5.3 | COVER |
| 5.4 | REDUCTION |
| 5.5 | OIL PRE-HEATER |
| 5.6 | SHEATH |
| 5.7 | RESISTOR |
| 6.1 | NIPPLE |
| 6.2 | STRAIGHT JOINT |
| 6.3 | UNION ELBOW |
| 6.4 | OIL SOLENOID VALVE |
| 6.5 | REDUCTION |
| 6.6 | OIL MANIFOLD |
| 6.7 | CONNECTOR |
| 7.1 | UNION ELBOW |
| 7.2 | STRAIGHT UNION |
| 7.3 | UNION ELBOW |
| 7.4 | SCREW |
| 7.5 | ADJUSTING ROD |
| 7.6 | REDUCTION |
| 7.7 | WASHER |
| 7.8 | BUSH |
| 7.9 | BEARING |
| 7.10 | PRESSURE GOVERNOR |
| 7.11 | |
| 7.12 | BRACKET |
| 7.13 | BRACKET |
| 8.1.1 | SPACER |
| 8.1.2 | BUSH |
| 8.1.3 | ACTUATOR |
| 8.1.4 | ACTUATOR SHAFT |
| 8.1.5 | BRACKET |
| 8.2 | NET |

| ITEM | DESCRIPTION |
|---|---|
| 8.3 | AIR INTAKE DAMPER |
| 8.4 | AIR INTAKE DAMPER |
| 8.5 | AIR INTAKE |
| 8.6 | LOUVER SHAFT |
| 8.7 | LOUVER SHAFT |
| 8.8 | ADJUSTING CAM SHAFT |
| 8.9 | ADJUSTING CAM |
| 8.10.1 | SCREW |
| 8.10.2 | SCREW |
| 8.10.3 | SPACER |
| 8.10.4 | CAM |
| 8.10.5 | LEVERAGE |
| 8.10.6 | ROD |
| 8.10.7 | JOINT |
| 8.10.8 | JOINT |
| 9.1 | FAIRLEAD |
| 9.2 | FAIRLEAD |
| 10 | AIR INLET CONE |
| 11 | BURNER HOUSING |
| 11.1 | COVER |
| 12 | GENERATOR GASKET |
| 13 | RING NUT |
| 14 | INSPECTION GLASS |
| 15 | PHOTORESISTOR |
| 16.1 | PIN |
| 16.2 | ELASTIC RING |
| 16.3 | ELASTIC RING |
| 16.4 | HALF-COUPLING |
| 16.5 | HALF-COUPLING |
| 16.6 | HALF-COUPLING |
| 16.7 | HALF-COUPLING |
| 17 | BRACKET |
| 18 | RESISTOR |
| 19 | STANDARD BLAST TUBE |
| | |


A
B
C
D
1.1
1.2
1.3
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2.1.1
2.1.2
2.1.3
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2.1.5
2.1.6
2.1.7
2.1.8
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8.10.4
8.10.5
8.10.6
8.10.7
8.10.8
9.1
9.2
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11.1
12
13
14
15
16.1
16.2
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16.4
16.5
16.6
16.7
17
18
19

## SPARE PARTS

| DESCRIPTION | PN91 | PN92 | PN93 |
|---|---|---|---|
| CONTROL BOX SIEMENS LMO | 2020455 | 2020455 | 2020420 |
| RIGHT ELECTRODE | 2080250 | 2080250 | 2080250 |
| LEFT ELECTRODE | 2080251 | 2080251 | 2080251 |
| FILTER FOR OIL VISCOSITY > 50 cSt @ 50°C | 2090207 | 2090207 | 2090207 |
| SELF-CLEANING PRE-HEATER FILTER | 2090212 | 2090212 | 2090212 |
| GASKET | 2110048 | 2110048 | 2110047 |
| FAN WHEEL | 2150031 | 2150033 | 2150032 |
| IGNITION TRANSFORMER | 2170005 | 2170005 | 2170005 |
| ELECTRIC MOTOR | 2180276 | 2180277 | 2180206 |
| SOLENOID VALVE | 2190437 | 2190437 | 2190437 |
| OIL HOSES | 2340004 | 2340004 | 2340004 |
| OIL GUN HOSES | 2340087 | 2340087 | 2340087 |
| OIL GUN HOSES | 2340088 | 2340088 | 2340088 |
| OIL GUN HOSES | 2340091 | 2340091 | 2340091 |
| ADJUSTING CAM FOIL | 2440013 | 2440013 | 2440013 |
| ACTUATOR mod. SIEMENS SQL.. | 2480007 | 2480007 | 2480007 |
| ACTUATOR mod. BERGER STM30 | 2480090 | 2480090 | 2480090 |
| ACTUATOR mod. SIEMENS SQM40 | 24800A5 | 24800A5 | 24800A5 |
| PHOTORESISTOR SIEMENS | 2510003 | 2510003 | 2510003 |
| COUPLING | 2540121 | 2540121 | 2540134 |
| RESISTOR THERMOSTATTR-TCN-TCI | 2560026 | 2560026 | 2560026 |
| THERMOSTAT TRS | 2560028 | 2560028 | 2560028 |
| PRESSURE GOVERNOR FOR OIL VISCOSITY < 110 cSt @ 50 °C | 2570054 | 2570054 | 2570077 |
| PRESSURE GOVERNOR OIL VISCOSITY > 110 cSt @ 50 °C | 25700A6 | 25700A6 | 25700A6 |
| BURNER MODULATOR (only for fully-modulating burners) | 2570112 | 2570112 | 2570112 |
| PUMP mod. DANFOSS | 2590310 | 2590310 | 2590311 |
| PUMP mod. SUNTEC | 2590118 | 2590118 | 2590119 |
| NOZZLE mod. FLUIDICS WR2 50° | 2610203 | 2610203 | 2610203 |
| STANDARD OIL GUN FOR OIL VISCOSITY < 110 cSt @ 50 °C | 2700331 | 2700331 | 2700331 |
| EXTENDED OIL GUN FOR OIL VISCOSITY < 110 cSt @ 50 °C | 2700332 | 2700332 | 2700332 |
| STANDARD OIL GUN FOR OIL VISCOSITY > 110 cSt @ 50 °C | 2700339 | 2700339 | 2700339 |
| EXTENDED OIL GUN FOR OIL VISCOSITY > 110 cSt @ 50 °C | 2700333 | 2700333 | 2700333 |
| COMBUSTION HEAD | 3060160 | 3060161 | 3060161 |
| STANDARD BLAST TUBE | 30910E2 | 30910E3 | 30910E3 |
| EXTENDED BLAST TUBE | 3091091 | 30910A2 | 30910A2 |
| IGNITION CABLES | 6050144 | 6050144 | 6050144 |

| DESCRIPTION | PN510 | PN515 | PN520 | PN525 |
|---|---|---|---|---|
| CONTROL BOX SIEMENS LAL | 2020420 | 2020420 | 2020420 | 2020420 |
| RIGHT ELECTRODE | 2080250 | 2080250 | 2080250 | 2080250 |
| LEFT ELECTRODE | 2080251 | 2080251 | 2080251 | 2080251 |
| FILTER FOR OIL VISCOSITY > 50 cSt @ 50°C | 2090207 | 2090207 | 2090207 | 2090207 |
| SELF-CLEANING PRE-HEATER FILTER | 2090212 | 2090212 | 2090212 | 2090212 |
| GASKET | 2110047 | 2110047 | 2110047 | 2110047 |
| FAN WHEEL | 2150032 | 2150035 | 2150029 | 2150029 |
| IGNITION TRANSFORMER | 2170005 | 2170005 | 2170005 | 2170005 |
| ELECTRIC MOTOR | 2180206 | 2180209 | 2180278 | 2180289 |
| ELECTRIC MOTOR | - | - | 2180210 | 2180210 |
| SOLENOID VALVE | 2190437 | 2190437 | 2190437 | 2190437 |
| OIL HOSES | 2340004 | 2340004 | 2340004 | 2340004 |
| OIL GUN HOSES | 2340087 | 2340087 | 2340087 | 2340087 |
| OIL GUN HOSES | 2340088 | 2340088 | 2340088 | 2340088 |
| OIL GUN HOSES | 2340089 | 2340089 | 2340089 | 2340089 |
| ADJUSTING CAM FOIL | 2440013 | 2440013 | 2440013 | 2440013 |
| ACTUATOR mod. SIEMENS SQL.. | 2480007 | 2480007 | 2480007 | 2480007 |
| ACTUATOR mod. BERGER STM30 | 2480090 | 2480090 | 2480090 | 2480090 |
| ACTUATOR mod. SIEMENS SQM40 | 24800A5 | 24800A5 | 24800A5 | 24800A5 |
| PHOTORESISTOR SIEMENS | 2510003 | 2510003 | 2510003 | 2510003 |
| COUPLING | 2540122 | 2540122 | 2540126 | 2540126 |
| RESISTOR THERMOSTATTR-TCN-TCI | 2560026 | 2560026 | 2560026 | 2560026 |
| THERMOSTAT TRS | 2560028 | 2560028 | 2560028 | 2560028 |
| PRESSURE GOVERNOR FOR OIL VISCOSITY < 110 cSt @ 50 °C | 2570077 | 25700B2 | 25700B2 | 25700A7 |
| PRESSURE GOVERNOR OIL VISCOSITY > 110 cSt @ 50 °C | 25700A6 | 25700A7 | 25700A7 | 25700A7 |
| BURNER MODULATOR (only for fully-modulating burners) | 2570112 | 2570112 | 2570112 | 2570112 |
| PUMP mod. DANFOSS | 2590311 | 2590312 | 2590313 | 2590313 |
| PUMP mod. SUNTEC | 2590119 | 2590120 | 2590121 | 2590121 |
| NOZZLE mod. FLUIDICS WR2 50° | 2610203 | 2610203 | 2610203 | 2610203 |
| STANDARD OIL GUN FOR OIL VISCOSITY < 110 cSt @ 50 °C | 2700347 | 2700347 | 2700347 | 2700244 |
| EXTENDED OIL GUN FOR OIL VISCOSITY < 110 cSt @ 50 °C | 2700337 | 2700337 | 2700337 | - |
| STANDARD OIL GUN FOR OIL VISCOSITY > 110 cSt @ 50 °C | 2700348 | 2700348 | 2700348 | 2700245 |
| EXTENDED OIL GUN FOR OIL VISCOSITY > 110 cSt @ 50 °C | 2700338 | 2700338 | 2700338 | - |
| COMBUSTION HEAD | 3060167 | 3060164 | 3060165 | 30601C9 |
| STANDARD BLAST TUBE | 30910E4 | 30910E5 | 30910E6 | 30910L9 |
| EXTENDED BLAST TUBE | 30910A3 | 30910A4 | 30910A5 | - |
| IGNITION CABLES | 6050144 | 6050144 | 6050144 | 6050144 |

## ELECTRICAL WIRING DIAGRAMS

**Electrical diagram 07-345 - Burners type PN 91 - 92 -93 x-.PR...**
**Electrical diagram 07-403 - Burners type PN91 - 92 - 93 x-.MD..**
**Electrical diagram 11-275 - Burners type PN510 x-.PR...**
**Electrical diagram 11-294 - Burners type PN510 x-.MD...**
**Electrical wiring diagram 11-276 - Burners type PN515 D-.PR..**
**Electrical wiring diagram 11-277 - Burners type PN520 D-.PR...**
**Electrical wiring diagram 11-295 -Burners type PN515 D-.MD...**
**Electrical wiring diagram 11-296 - Burners type PN520 D-.MD...**

# 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**

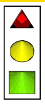
If the flame is lost during «TSA», the burner will be reignited, but not later than at the end of «TSAmax.». This means that several ignition attempts can be made during TSA (refer to «Program sequence»).

**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» | lllllllllll | Yellow |
| Ignition phase, ignition controlled | lmlmlmlmlml | Yellow-off |
| Operation, flame o.k. | ooooooooooo | Green |
| Operation, flame not o.k. | omomomomomo | Green-off |
| Undervoltage | lslslslslsl | Yellow-red |
| Fault, alarm | sssssssssss | 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 | sssssssssssss | 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<br>● Faulty or soiled fuel valves<br>● Faulty or soiled flame detector<br>● Poor adjustment of burner, no fuel<br>● Faulty ignition |
| 3 blinks *** | Free |
| 4 blinks **** | Extraneous light on burner startup |
| 5 blinks ***** | Free |
| 6 blinks ****** | Free |
| 7 blinks ******* | Too manny losses of fleme during operation (limitattion og the number of repetitions)<br>● Faulty or soiled fuel valves<br>● Faulty or soiled flame detector<br>● 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.

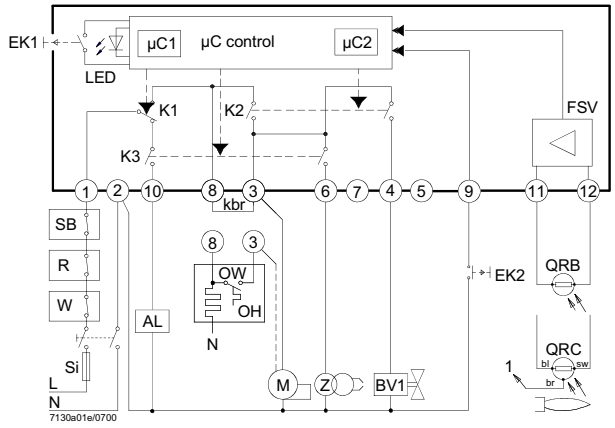
- Burner remains shut down
- Fault status signal «AL» at terminal 10 is activated

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

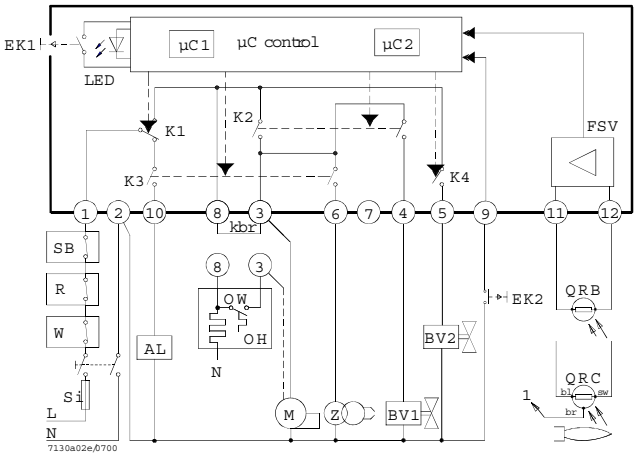
Press lock-out reset button for about 1 second (< 3 seconds).

## Connection diagram and internal diagram

### LMO14

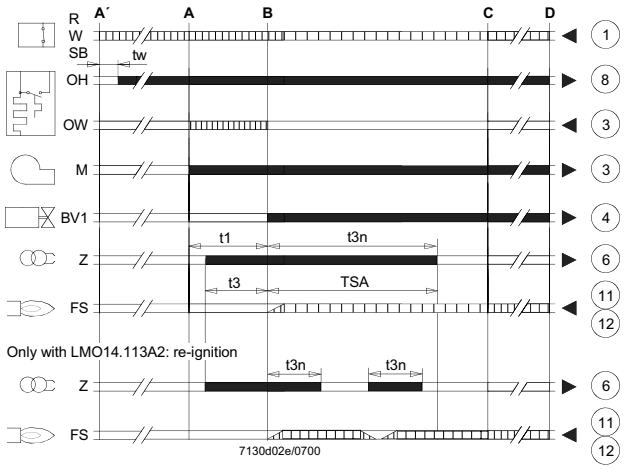



### LMO24 - LMO44

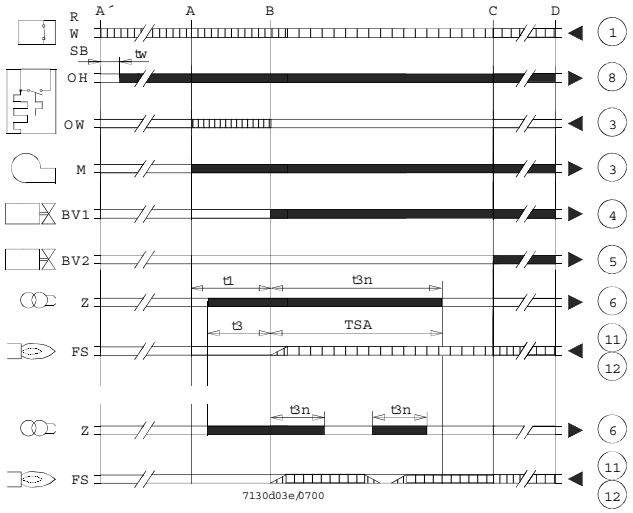



## Control sequence

### 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 |
| | Required input signals |
| 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 %<br>AC 110 V +10 % / -15 % |
| Mains frequency | 50...60 Hz ±6 % |
| External primary fuse | (Si) 5 A (slow) |
| Power consumption | 12 VA |
| Mounting orientation | optional |
| Weight | approx. 200 g |
| Degree of protection | IP 40 |
| Perm. cable lengths | max. 3 m at a line capacitance of 100 pF/m |
| Detector cable laid separately | 20 m |
| Remote reset | 20m |

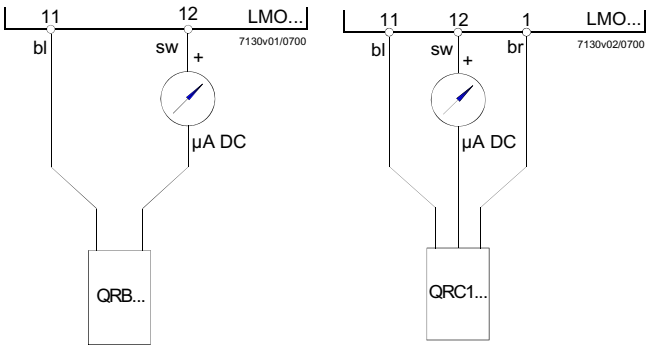
Max perm. amperage at cosφ≥ 0.6

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

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 (tipically) | 100 µA | 100 µA |

**Measurement circuit for detector current**




**Key**

| | |
|---|---|
| µA DC | DC microamperometer with an internal resistance of 5 kΩ max. |
| bl | Blue |
| sw | Black |
| br | Brown |

**SIEMENS LAL.. CONTROL BOX**

**Use**

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

**Housing and plug-in base**

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

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

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

**Operation**

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

**Pre-conditions for burner startup**

- Burner control is not in the lockout position
- Sequence switch is in its start position (with LAL2 voltage is present at terminals 11 and 12.
- Air damper is closed; end switch «z» for the CLOSED position must feed power from terminal 11 to terminal8.
- Contact of the limit thermostat or pressure switch «W» and the contacts of any other switching devices in the control loop between terminals 4 and 5 must be closed e.g. a control contact for the oil preheater's temperature
- Normally closed contact of the air pressure switch must be closed.

**Startup sequence**

Start command by «R»:

«R» closes the start control loop between terminals 4 and 5

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

t1 Prepurge time with air damper fully open:

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

With LAL2:

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

t3 Short preignition time:

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

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

t3n Postignition time:

- «Z» must be connected to terminal 15

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

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

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

LAL... is now protected against reverse voltages from the load control

circuit. With the release of «LR» at terminal 20, the startup sequence of the LAL... ends. After a few idle steps (steps with no contact position changes), the sequence switch switches itself off.

B Operating position of the burner

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

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

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

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

following burner off time, terminal 11 is live.

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

D-A End of control program: start position

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

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

**Lockout and indication of the stop position**

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

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

Extraneous light:

Lockout during or after completion of the control program

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

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

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

■ Defect in the flame supervision circuit.

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

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

I Flame signa has been lost during operation.

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

B Operating position of the burner

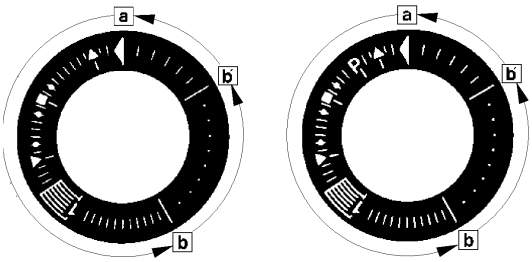
B-C Burner operation: during burner operation, «LR» drives the air damper to the nominal load or low-fire position, depending on heat demand; the release of the nominal load takes place via auxiliary switch «v» in the actuator and in the event of loss of flame during operation, the LAL... will initiate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

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

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

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

**Lockout indication**




a-b Startup sequence

b-b' Idle step (with no contact confirmation)

b(b')-a Postpurge program

Burner control can immediately be reset after lockout:

Do not press the lockout reset button for more than 10 seconds

The sequence switch always travels to the start position first

After resetting

After rectification of a fault that led to shutdown

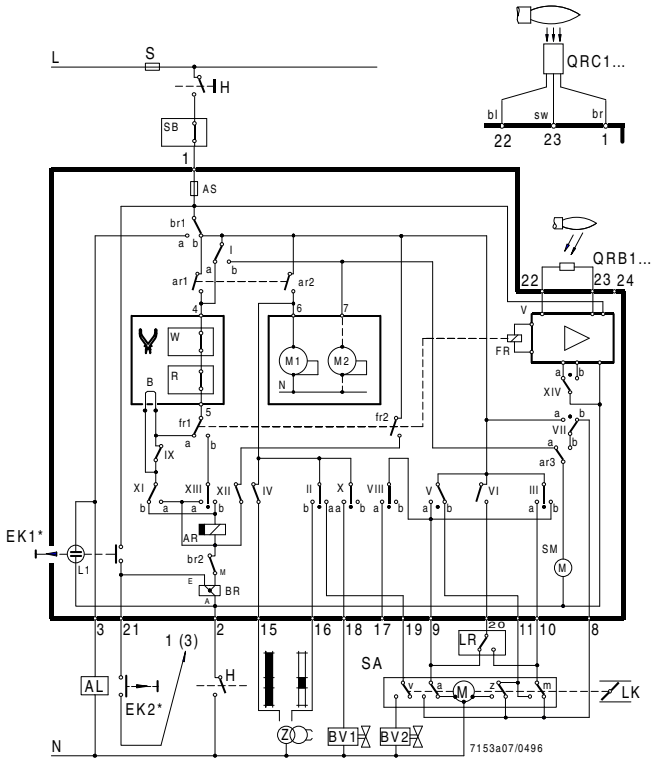
After each power failure

During this period of time, power is only fed to terminals 7 and 9...11.

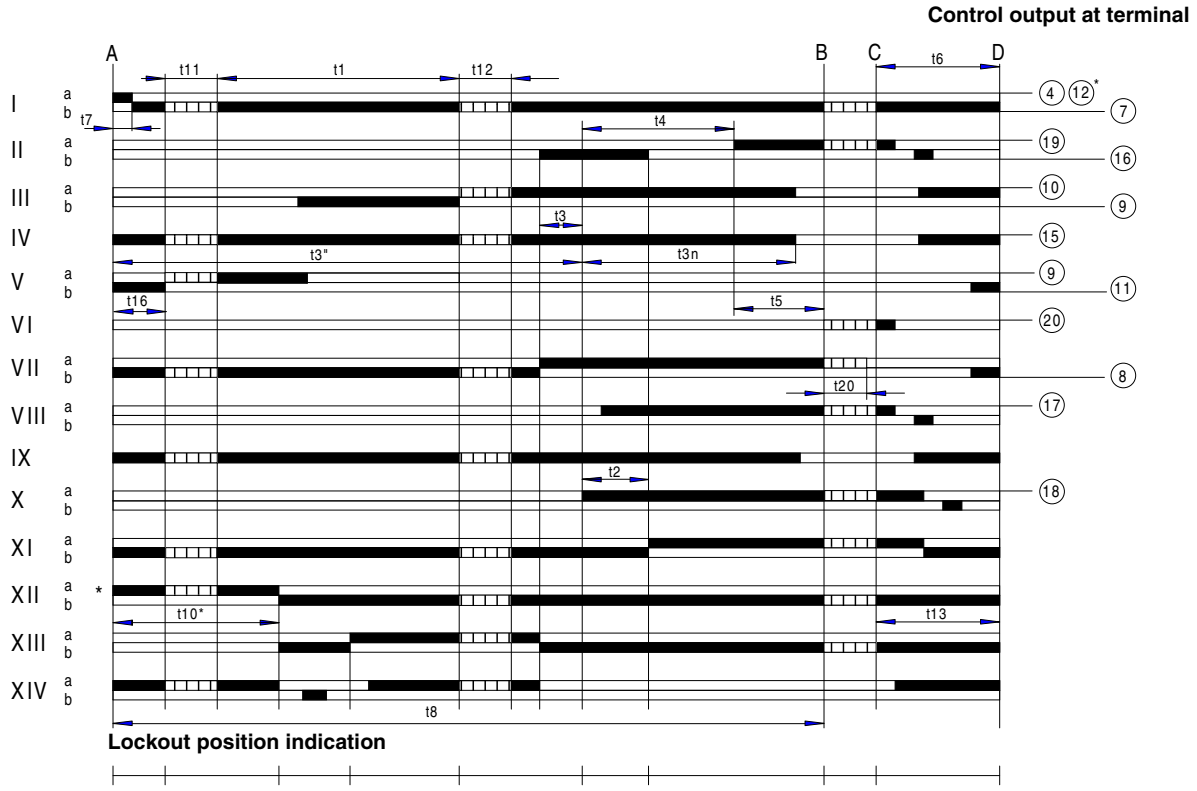
Then, the LAL.... will program a new burner startup sequence

**Specifications**

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



**Sequence diagram**




**Key**

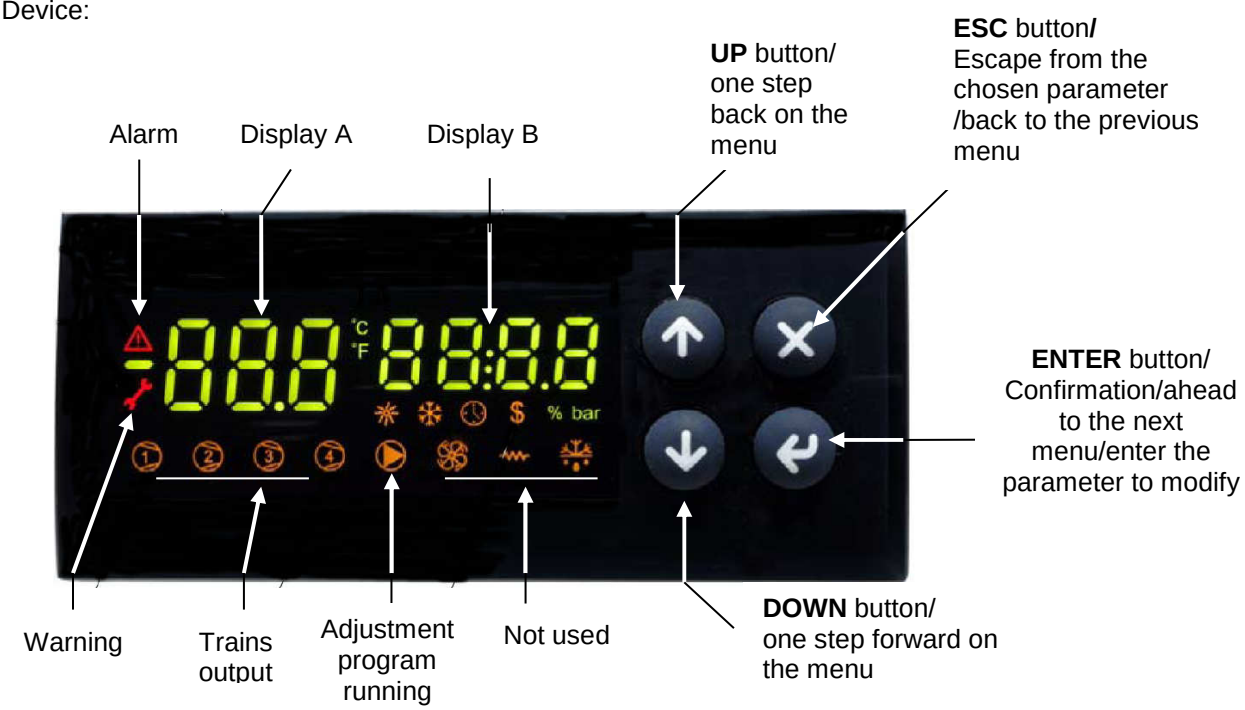
| | |
|---|---|
| t1 | Prepurge time with air damper fully open |
| t2 | Safety time |
| t3 | Preignition time, short («Z» connected to terminal 16) |
| T3’ | Preignition time, long («Z» connected to terminal 15) |
| t3n | Postignition time («Z» connected to terminal 15) |
| t4 | Interval between voltage at terminals 18 and 19 («BV1-BV2») |
| t5 | Interval between voltage at terminals 19 and 20 («BV2» load controller) |
| t6 | Postpurge time (with «M2») |
| t7 | Interval between start command and voltage at terminal 7 (start delay time for «M2») |
| t8 | Duration of startup sequence (excluding «t11» and «t12») |
| t10 | Interval from startup to the beginning of the air pressure check |
| t11 | Air damper running time to the OPEN position |
| t12 | Air damper running time to the low-fire position (MIN) |
| t13 | Permissible afterburn time |
| t16 | Interval to the OPEN command for the air damper |
| t20 | For self-shutdown of the sequence switch |

USER MANUAL OF MULTI-THERMOSTAT

# MCX06C

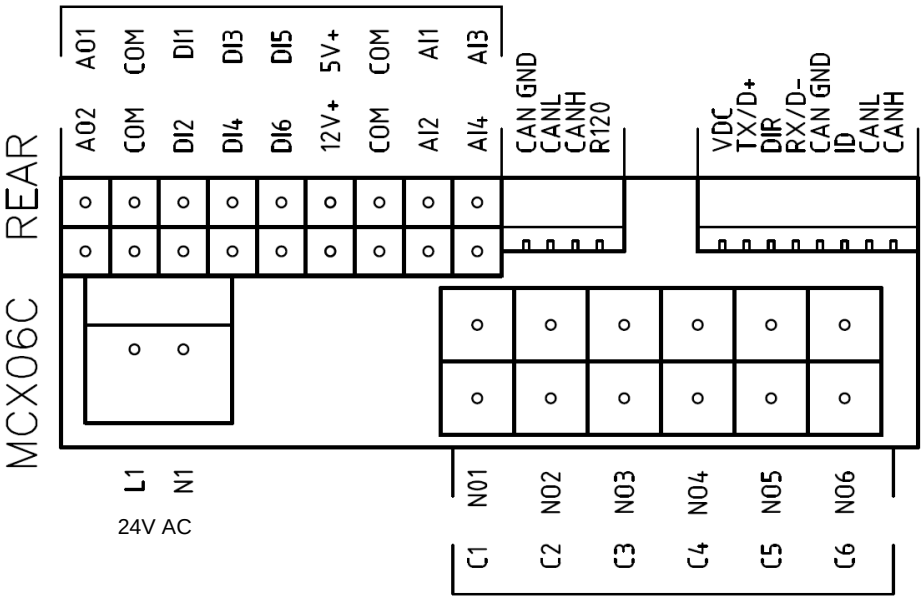
MCX06C is a multi-thermostat with four 100k NTC inputs. It can control up to 4 temperatures showing them (not more than 2 at the same time) on a couple of displays.
It is used to check and adjust oil heater temperatures.

**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 "**tCI**" = 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<br>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 show n in the burner model | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | **P** | **N** | **E** | **D** | **H** |
| | | | | 89 cSt | < 50 cSt | > 50 cSt<br>< 110 cSt | > 110 cSt<br>< 400 cSt | > 400 cSt<br>< 4000 cSt |
| | | | | 12 °E | < 7°E | > 7 °E<br>< 15 °E | > 15 °E<br>< 50 °E | > 50 °E<br>< 530 °E |
| Par | | | | | | | | |
| rEG | Pb1 | tr | Oil heater temperature probe | parameter not visible | | | | |
| | Pb2 | tCI | 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.

C.I.B. UNIGAS S.p.A.
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Note: specifications and data subject to change without notice. Errors and omissions excepted.

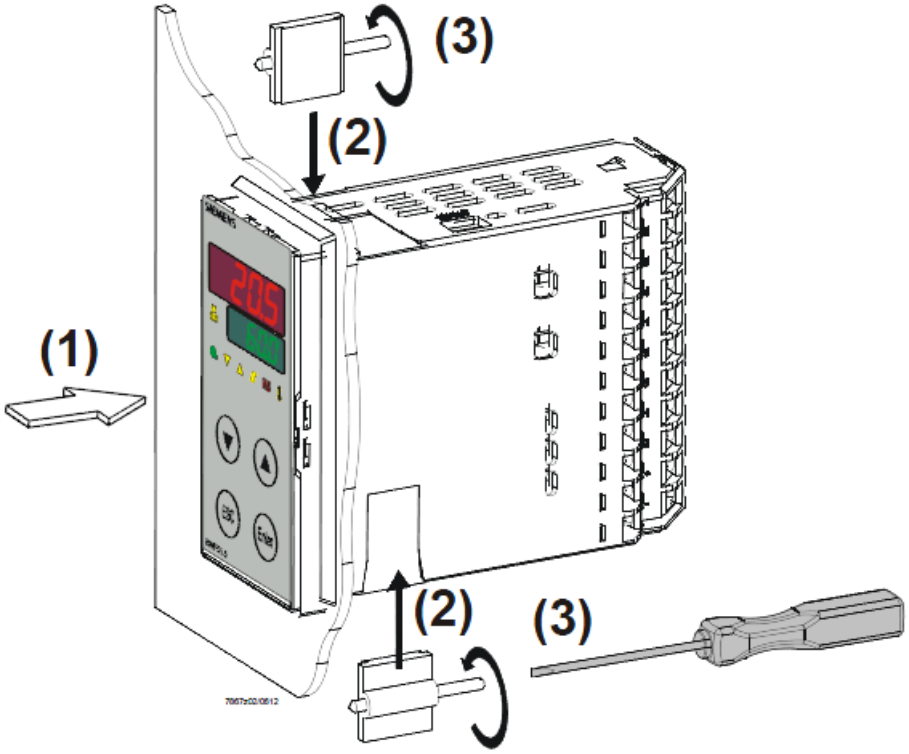
# RWF55.5X & RWF55.6X

***User manual***

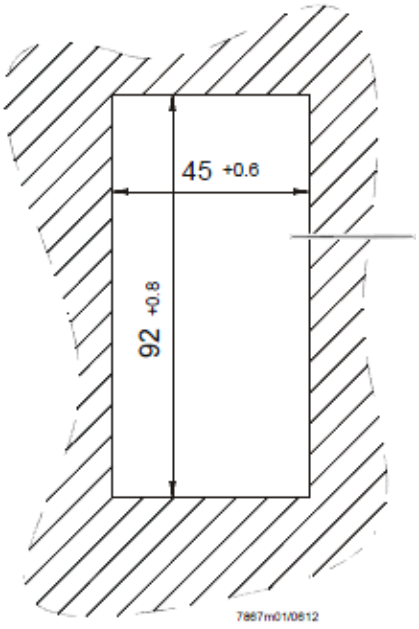
M12926CA Rel.0.2 11/2023

## DEVICE INSTALLATION

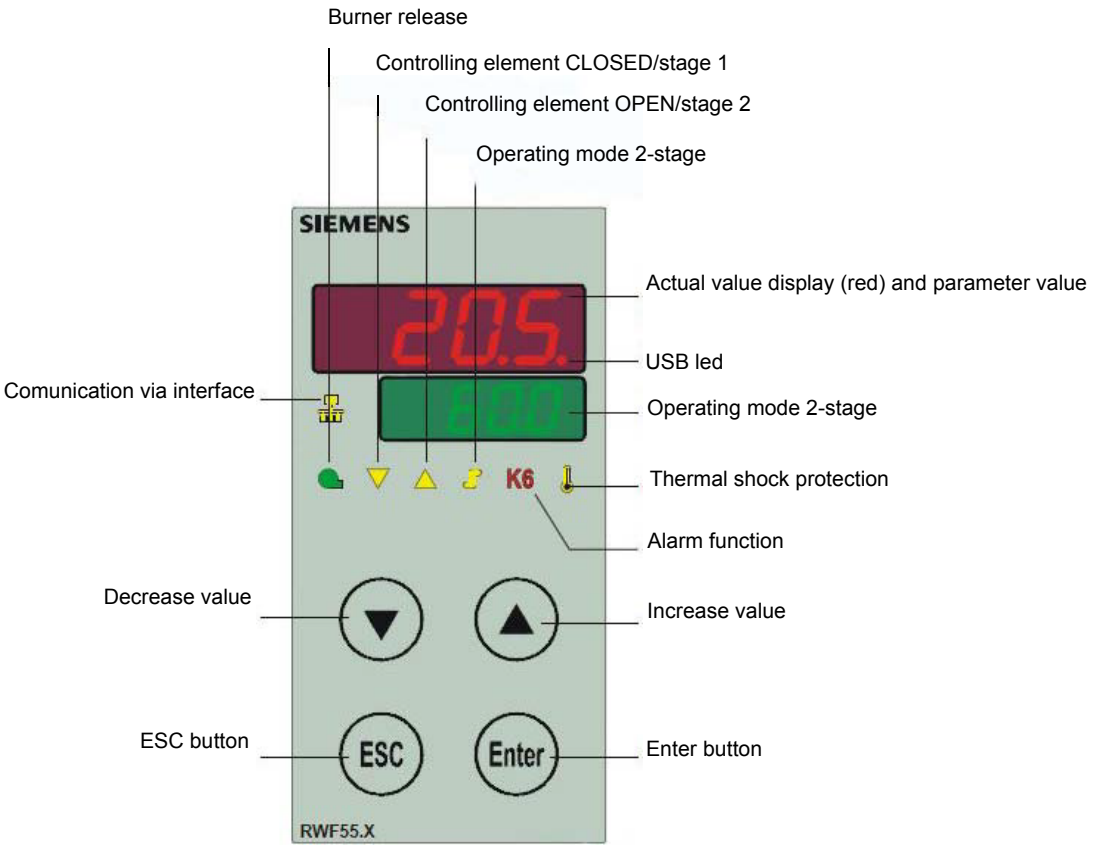
***Fixing system***



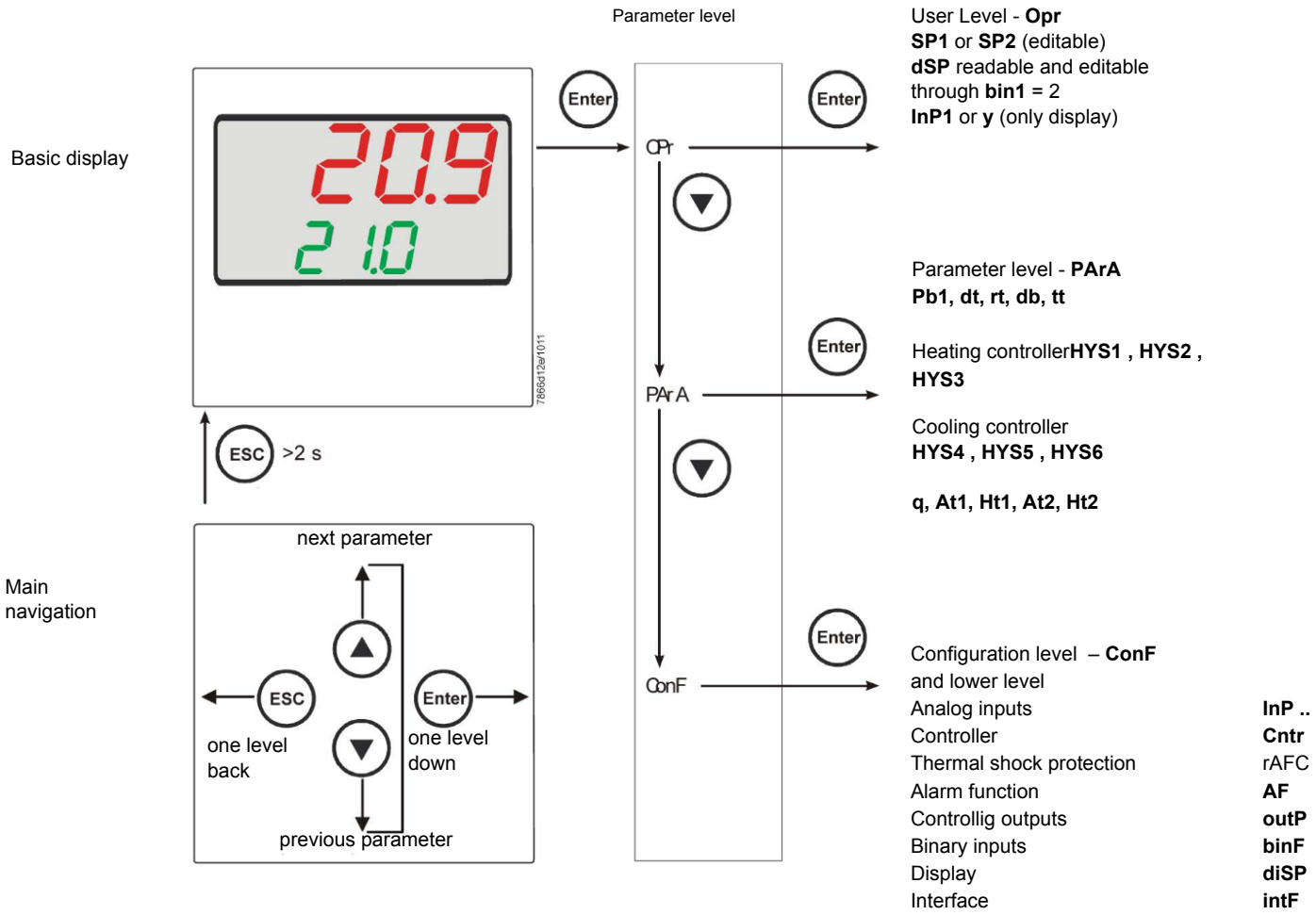

***Drilling dimensions:***



## FRONT PANEL


Burner release
Controlling element CLOSED/stage 1
Controlling element OPEN/stage 2
Operating mode 2-stage
SIEMENS
Actual value display (red) and parameter value
USB led
Comunication via interface
Operating mode 2-stage
K6
Thermal shock protection
Alarm function
Decrease value
Increase value
ESC button
ESC
Enter
Enter button
RWF55.X

## NAVIGATION MENU




RWF55 is preset good for 90% of applications. However, you can set or edit parameters as follow:

### *Set-point: set or modification:*

When the burner is in stand-by, (safety loop open, that is terminals 3-4/T1-T2 on the 7 pole plug open) push the Enter button: on the lower display (green) Opr appears; push Enter again and in the same display SP1 appears. Push Enter again and the lower display (green SP1) flashes. Using the up and down arrows change the set-point on the upper display (red).Push Enter to confirm and push ESC more times to get the home position.

### *PID parameters set and modifications (PArA):*

Push **Enter** button, on the green display **Opr** appears; using the **down arrow,** scroll until group **PArA** is reached and push **Enter**.
On the green display **Pb1** e appears and on the red one the set parameter. Push is sequence the **down or up** arrow the menu is scrolled.
Push **Enter** to select and the **arrows** to choose the desired value. **Enter** to confirm

| Parameter | Display | Range | Factory setting | Remarks |
|---|---|---|---|---|
| Proportional band | Pb1 | 1… 9999 digit | 10 | Typical value for temperature |
| erivative action | dt | 0… 9999 sec. | 80 | Typical value for temperature |
| Integral action | rt | 0… 9999 sec. | 350 | Typical value for temperatureT |
| Dead band (*) | db | 0… 999,9 digit | 1 | Typical value |
| Servocontrol running time | tt | 10… 3000 sec. | 15 | Set servocontrol running time |
| Switch-on differential (*) | HYS1 | 0,0… -1999 digit | -5 | Value under setpoint below which the burner switches back on (1N-1P closes) |
| Switch-off differential 2° stage (*) | HYS2 | 0,0 … HYS3 | 3 | (enable only with parameter bin1 = 4) |
| Upper switch-off differential (*) | HYS3 | 0,0… 9999 digit | 5 | Value over setpoint above which the burner switches off (1N-1P opens) |
| Switch-on differential on cooling controller (*) | HYS4 | 0,0… 9999 digit | 5 | Do not used (enable only with parameter **CACt** = 0) |
| Switch-off differential 2° stage on cooling controller (*) | HYS5 | HYS6…0,0 digit | 5 | Do not used (enable only with parameter **CACt** = 0 and parameter **bin1**=0) |
| Upper switch-off differential on cooling controller (*) | HYS6 | 0,0… -1999 digit | 5 | Do not used (enable only with parameter CACt = 0) |
| Delay modulation | q | 0,0… 999,9 digit | 0 | Do not alter |
| T Outside temperature Curve point 1 (*) | At1 | -40 ...120 digit | -10 | First point of external temperature for climatic curve |
| Boiler temperature Curve point 1 (*) | Ht1 | SPL...SPH | 60 | Set-point temperature for the external temperature 1 |
| TT Outside temperature Curve point 2 (*) | At2 | -40 ...120 digit | 20 | Second point of external temperature for climatic curve |
| Boiler temperature Curve point 2 (*) | Ht2 | SPL...SPH | 50 | Set-point temperature for the external temperature 2 |

(*) Parameters affected by setting of decimal place (**ConF > dISP** parameter **dECP**)

### *Setting the kind of sensor to be connected to the device:*

Push the **Enter** button: on the lower display (green) **Opr** appears. Using the **up and down arrows** find **ConF.** Push **Enter** to confirm. Now on the green display the group **InP** appears. Push **Enter** and **InP1** is displaied. Enter to confirm.You are inside **InP1**; the green display shows **Sen1 (sensor type)**, while the red display shows the chosen sensor code Push **Enter** to enter the **Sen1** parameter, then choose the desired sensor using the **arrows.** Push **Enter** to confirm and **ESC** to escape.

Once selected the sensor, you can modify all the other parameters using **up and down arrows** according to the tables here below :

### *ConF > InP >InP1*

| Parameter | Value | Description |
|---|---|---|
| SEn1<br>type of sensor for analog input 1 | 1 | Pt100 3 wire |
| | 2 | Pt100 2 wire |
| | 3 | Pt1000 3 wire |
| | 4 | Pt1000 2 wire |
| | 5 | Ni1000 3 wire |
| | 6 | Ni1000 2 wire |
| | 7 | 0 ÷ 135 ohm |
| | 8 | Cu-CuNi T |
| | 9 | Fe-CuNi J |
| | 10 | NiCr-Ni K |
| | 11 | NiCrSi-NiSi N |
| | 12 | Pt10Rh-Pt S |
| | 13 | Pt13Rh-Pt R |
| | 14 | Pt30Rh-Pt6Rh B |
| | 15 | 0 ÷ 20mA |
| | 16 | 4 ÷ 20mA |
| | 17 | 0 ÷ 10V |
| | 18 | 0 ÷ 5V |
| | 19 | 1 ÷ 5V |
| OFF1<br>Sensor offset | -1999..**0**.. +9999 | Correction value measured by the sensor |
| SCL1<br>scale low level | -1999..**0**.. +9999 | minimum scale value(for input ohm, mA, V) |
| SCH1<br>scale high level | -1999..**100**.. +9999 | maximum scale value(for input ohm, mA, V) |
| dF1<br>digital filter | 0…**0,6**…100 | Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off) |
| Unit<br>temperature unit | **1**<br>2 | 1 = **degrees** Celsius<br>2 = degrees Fahrenheit |

(**bold** = factory settings)

### *ConF > InP >InP2*

Input 2 : this input can be used to specify an external setpoint or carry out setpoint shifting

| Parameter | Value | Description |
|---|---|---|
| FnC2 | 0<br>1<br>2<br>3 | 0= **no function**<br>1= external setpoint (display **SPE**)<br>2 =setpoint shifting (display **dSP**)<br>3 = angular positioning feedback |
| SEn2<br>tisensor type input 2 | 1 | 0 ÷ 20mA |
| | 2 | 4 ÷ 20mA |
| | 3 | 0 ÷ 10V |
| | 4 | 0 ÷ 5V |
| | 5 | 1 ÷ 5V |
| | 1 | 0 ÷ 20mA |
| OFF2<br>Sensor offset | -1999..**0**.. +9999 | Correction value measured by the sensor |
| SCL2<br>scale low level | -1999..**0**.. +9999 | minimum scale value(for input ohm, mA, V) |
| SCH2<br>scale high level | -1999..**100**.. +9999 | maximum scale value(for input ohm, mA, V) |
| dF2<br>digital filter | 0…**2**…100 | Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off) |

(**bold** = factory settings)

### *ConF > InP >InP3*

Input 3: this input is used to acquire the outside temperature

| Parameter | Value | Description |
|---|---|---|
| SEn3<br>sensor type input 3sensor type input 2 | 0 | 0 = |
| | 1 | 1 = wire |
| | 2 | 2 = wire |
| OFF3<br>Sensor offset | -1999..**0**.. +9999 | Correction value measured by the sensor |
| dF3<br>digital filter | 0…**1278**…1500 | Is used to adapt the digital 2nd order input filter (time in s; 0 s = filter off) |

(**bold** = factory settings)

### *ConF > Cntr*

Here, the type of controller, operating action, setpoint limits and presettings for self-optimization are selected

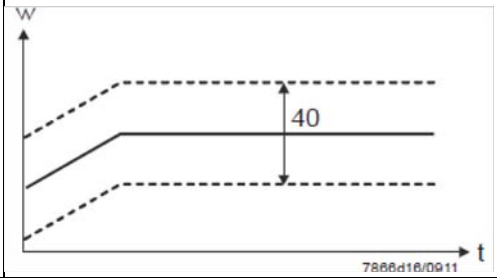
| Parameter | Value | Description |
|---|---|---|
| CtYP<br>controller type | 1<br>2 | **1 = 3-position controller (open-stop-close)**<br>2 = continuative action controller (0 ÷10V or 4 ÷ 20mA) |
| CACt<br>control action | **1**<br>0 | 1 = **heating controller**<br>0 = cooling controller |
| SPL<br>least value of the set-point range | -1999..**0**..+9999 | minimum set-point scale |
| SPH<br>maximum value of the set-point range | -1999..**100**..+999 | maximum set-point scale |
| Self-optimization | 0<br>1 | 0 = **Free**<br>1 = Locked<br>Self-optimization can only be disabled or enabled via the ACS411 setup program.<br>Self-optimization is also disabled when the parameter level is locked |
| oLLo<br>set-point limitation start, operation limit low | **-1999**.... +9999 | lower working range limit |
| oLHi<br>set-point limitation end, operation limit high | -1999.... **+9999** | upper working range limit |

(**bold** = factory settings)

### *ConF > rAFC*

Activation boiler shock termic protetion:

RWF55.. can activate the thermal shock protection only on sites where the set-point is lower than 250°C and according to **rAL** parameter

| Parameter | Value | Description |
|---|---|---|
| FnCT<br>type of contol | <br>**0**<br>1<br>2 | tchoose type of range degrees/time<br>**0 = deactived**<br>1 = Kelvin degrees/minute<br>2 = Kelvin degrees/hour |
| rASL<br>ramp rate | **0,0 …** 999,9 | Slope of thermal shock protection (only with functions 1 and 2)<br>. |
| toLP<br>tolerance band ramp | **2 x (HYS1) = 10**…9999 | width of tolerance band (in K) about the set-point<br>**0 = tolerance band inactive**<br>  |
| rAL<br>ramp limit | **0**…250 | Ramp limit. When this value is lower than the temperature set-point, the RWF controls the output increasing the temp set point step by step according to **rASL**. If this is over the temp set point, the control is performed in cooling |

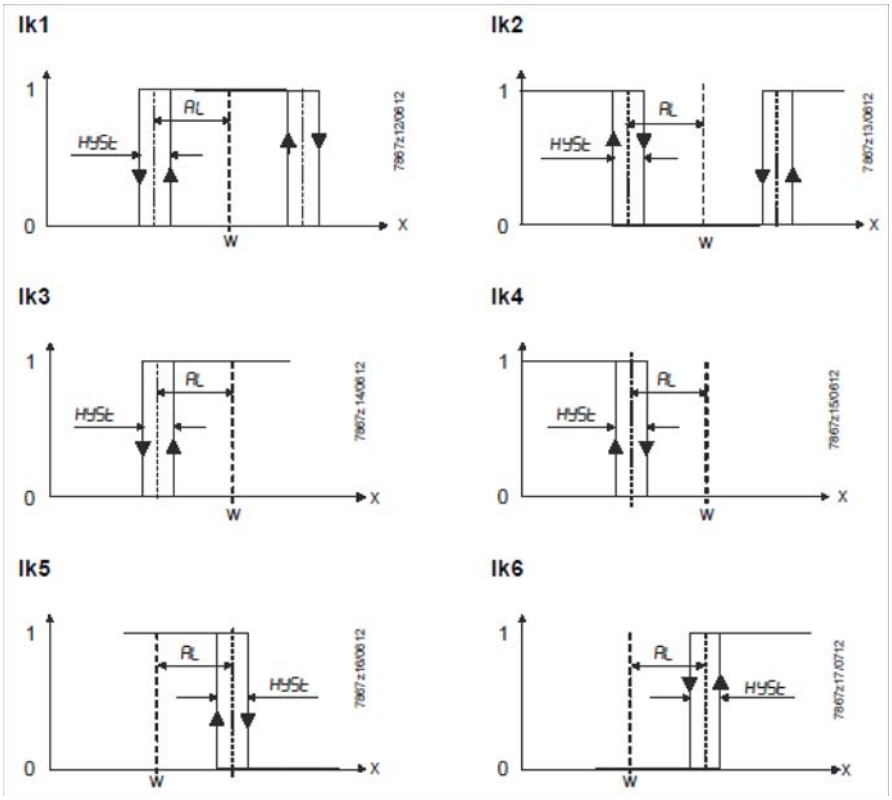
(**bold** = factory settings)

### *Alarm functionAF*

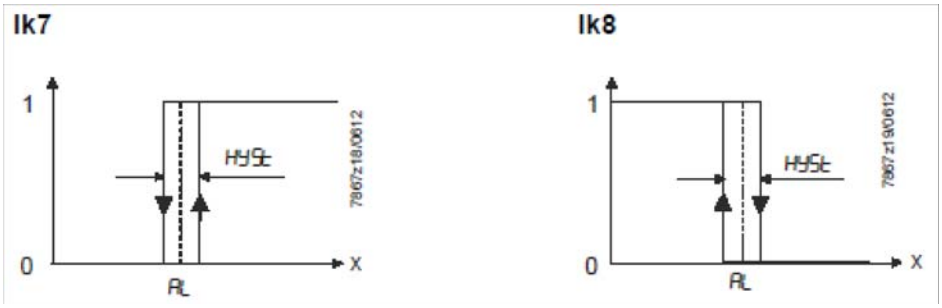
The alarm function can be used to monitor the analog inputs. If the limit value is exceeded, multifunctional relay K6 (terminals **6N** and **6P**) is activated (depending on the switching characteristic)

The alarm function can have different switching functions (lk1 to lk8) and can be set to a deviation from the active setpoint or to a fixed limit value

Limit value **AL** relative to setpoint (x)




Fixed limit value **AL**



### *ConF > AF*

| Parameter | Value | Description |
|---|---|---|
| FnCt<br>type of control | 0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12 | 0 = **Without function**<br>Ik1 = monitored input **InP1**<br>Ik2 = monitored input **InP1**<br>Ik3 = monitored input **InP1**<br>Ik4 = monitored input **InP1**<br>Ik5 = monitored input **InP1**<br>Ik6 = monitored input **InP1**<br>Ik7 = monitored input **InP1**<br>Ik8 = monitored input **InP1**<br>Ik7 = monitored input **InP2**<br>Ik8 = monitored input **InP2**<br>Ik7 = monitored input **InP3**<br>Ik8 = monitored input **InP3** |
| Alarm value<br>AL | -1999 ...<br>**0**<br>1999 | Limit value or deviation from setpoint to be monitored (see alarm functions **Ik1** to **Ik8**: limit value **AL**)<br>Limit value range for **Ik1** and **Ik2**0 ...9999 |
| HySt<br>switching differential | 0…<br>**1**...<br>9999 | Switching differential for limit value **AL** |
| ACrA<br>response by out of range | **0**<br>1 | **Switched-off**<br>ON<br>Switching state in the case of measuring range overshoot or undershoot (Out of Range) |

(**bold** = factory settings)

### *ConF > OutP*

For fuel-air ratio control purposes, the RWF55 has the binary outputs K2, K3 (terminals KQ,K2, K3) and the analog output (terminals A+, A-). The burner is released via relay K1 (terminals 1N, 1P) .

The binary outputs of the RWF55 offer no setting choices

The RWF55 has an analog output.

The analog output offers the following setting choices:

| Parameter | Value | Description |
|---|---|---|
| FnCt<br>type of control | 1<br>2<br>3<br>**4** | 1 = analog input 1 doubling with possibility to convert<br>2 = analog input 2 doubling with possibility to convert<br>3 = analog input 3 doubling with possibility to convert<br>**4 = Controller's angular positioning is delivered (modulating controller)** |
| SiGn<br>type of output signal | <br>**0**<br>1<br>2 | physical output signal (terminals A+, A-)<br>**0 = 0÷20mA**<br>1 = 4÷20mA<br>2 = 0÷10V DC |
| rOut<br>value when out of input range | **0**…101 | signal (in percent) when measurement range is crossed |
| oPnt<br>zero point | -1999…**0**..+9999 | A value range of the output variable is assigned to a physical output signal (for **FnCt** = 1, 2, 3) |
| End<br>end point | -1999…**100**..+9999 | A value range of the output variable is assigned to a physical output signal (for **FnCt** = 1, 2, 3) |

(**bold** = factory settings)

### *ConF > binF*

This setting decides on the use of the binary inputs**D1**, **D2**, **DG**

b

| Parameter | Value | Description |
|---|---|---|
| bin1<br>binary imput 1 (terminals **DG – D1**) | **0**<br>1<br>2<br>3 | **0 = without function**<br>1 = set-point changeover (SP1 / SP2)<br>2 = Iset-point shift (Opr > dSP parameter = value of set-point modify)<br>3 = input alarm |
| bin2<br>binary imput 2 (terminalsк **DG – D2**) | **4** | **changeover of operating mode**<br>DG-D2 open = modulating operation<br>DG-D2 close = 2 stage operation |

(**bold** = factory settings)

### *ConF > dISP*

.Both displays can be customized to suit your needs by configuring the displayed value, decimal, time out and blocking

| Parameter | Value | Description |
|---|---|---|
| diSU<br>pper display (red) | 0<br>**1**<br>2<br>3<br>4<br>6<br>7 | Display value for upper display:<br>0 = display power-off<br>**1 = analog input 1 (InP1) value**<br>2 = analog input 2 (InP2) value<br>3 = analog input 3 (InP3) value<br>4 = controller's angular positioning<br>6 = set-point valueв<br>7 = end value with thermal shock protection |
| diSL<br>lower display (green) | 0<br>1<br>2<br>3<br>4<br>**6**<br>7 | Display value for lower display3:<br>0 = display power-off<br>1 = analog input 2 (InP2) value<br>2 = analog input 2 (InP2) value<br>3 = analog input 2 (InP2) value<br>4 = controller's angular positioning<br>**6 =** set-point value**в**<br>7 = end value with thermal shock protection |
| tout<br>timeout | 0..**180**..250 | time (s) on completion of which the controller returns automatically to the basic display, if no button is pressed |
| dECP<br>decimal point | **0**<br>1<br>2 | **0 = no decimal place**<br>1 = one decimal place<br>2 = two decimal place |
| CodE<br>level lockout | **0**<br>1<br>2<br>3 | **0 = no lockout**<br>1 = configuration level lockout (**ConF**)<br>2 = parameter and configuration level lockout (**PArA** & **ConF**)<br>3 = keyboard lockout |

(**bold** = factory settings)

### *ConF > IntF*

The controller can be integrated into a data network using an optional RS-485 (terminals R+ and R-) interface or an optional Profibus DP interface(only model**RWF55.6x** terminalsC1-C2-C3-C4)

| Parameter | Value | Description |
|---|---|---|
| bdrt<br>baudrate | **0**<br>1<br>2<br>3 | **0 = 4800 baud**<br>1 = 9600 baud<br>2 = 19200 baud<br>3 = 38400 baud |
| Adr<br>Device address Modbus | 0..<br>**1**..<br>254 | Address in the data network |
| dP<br>Device address Profibus | 0..**125** | only withRWF55.6x |
| dtt<br>Remote detection time | 0..<br>**30**..<br>7200s | 0 = swiched-off |

(**bold** = factory settings)

### *Manual control :*

In order to manual change the burner load, while firing keep pushing the **ESC** button for more than 5 s; on the lower green display **Hand** appears.

using the **UP** and **DOWN** arrows, the load varies.

Keep pushing the **ESC** button for getting the normal operation again.

NB: every time the device shuts the burner down (start led switched off - contact 1N-1P open), the manual control is not active.

### *Device self-setting (auto-tuning):*

If the burner in the steady state does not respond properly to heat generator requests, you can activate the Device's self-setting function, which recalculates PID values for its operation, deciding which are most suitable for the specific kind of request

Follow the below instructions:

push the **UP** and **DOWN** arrows for more than 5 s; on the green lower display **tUnE** appears. Now the device pushes the burner to increase and decrease its output. During this time, the device calculates **PID** parameters (**Pb1**, **dt** and **rt**). After the calculations, the **tUnE** is automatically deactivated and the device has already stored them.

In order to stop the Auto-tuning function while it works, push again the **UP** and **DOWN** arrows for more than 5 s. The calculated **PID** parameters can be manually modified following the previously described instructions.

### *Display of software version :*

The software version is shown by pushing Enter + UP arrow on the upper display.

### *Weather-compensated setpoint shifting(climatic regulation):*

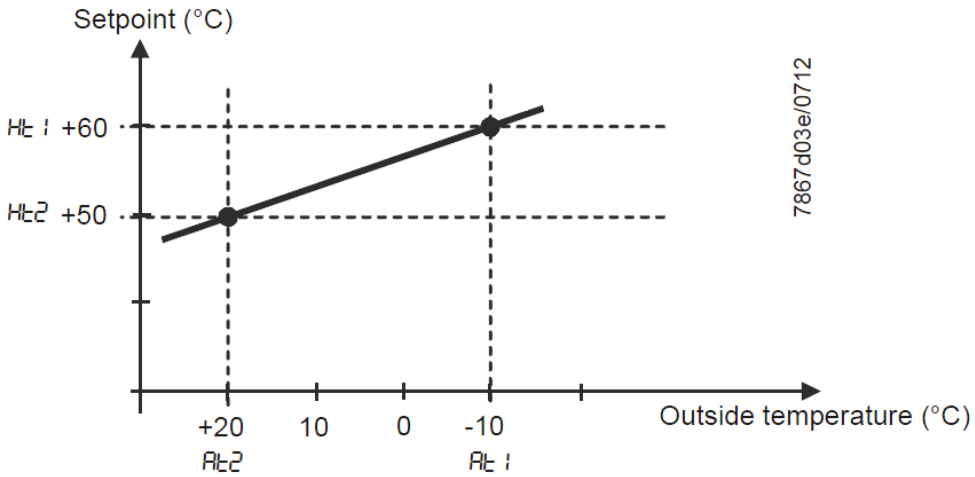
The RWF55 can be configured so that weather-compensated setpoint shifting is activated when an LG-Ni1000 outside sensor or a Pt1000 is connected (see parameter **InP3**).

To take into account the time response of a building, weather-compensated setpoint shifting uses the attenuated outside temperature rather than the current outside temperature

The minimum and maximum setpoints can be set using the lower setpoint limit **SPL** and the upper setpoint limit **SPH** of the menù **Crtr**.

The system also prevents the lower working range limit **oLLo** and upper working range limit **oLHi** from exceeding/dropping below the system temperature limits.

The heating curve describes the relationship between the boiler temperature setpoint and the outside temperature. It is defined by 2 curve points. For 2 outside temperatures, the user defines the boiler temperature setpoint that is required in each case. The heating curve for the weather-compensated setpoint is calculated on this basis. The effective boiler temperature setpoint is limited by the upper setpoint limit **SPH** and the lower setpoint limit **SPL**.




For setting climatic regulation function set:

**PArA >** parameters**At1, Ht1, At2, Ht2**

**ConF > InP > InP3** parameters**SEn3, FnC3 = 1** (Weather-compensated setpoint).

### *Modbus interface*

The tables that follow in this chapter specify the addresses of the readable and writable words that the customer is able to access. The customer may read and/or write the values using SCADA programs, PLCs, or similar.

The entries under Access have the following meanings:

**R/O** Read Only, value can only be read

**R/W** Read/Write, value can be read and written

The number of characters specified under Data type in the case of character strings includes the final \0.

Char10 means that the text is up to 9 characters long. The final \0 character is then added to this

**User level**

| **Address** | **Access** | **Data type** | Signal reference | Parameter |
|---|---|---|---|---|
| 0x0000 | R/O | Float | X1 | Analog input InP1 |
| 0x0002 | R/O | Float | X2 | Analog input InP2 |
| 0x0004 | R/O | Float | X3 | Analog input InP2 |
| 0x0006 | R/O | Float | WR | Actual setpoint |
| 0x0008 | R/W | Float | SP1 | Setpoint 1 |
| 0x000A | R/W | Float | SP2 (= dSP) | Setpoint 2 |
| 0x1035 | R/O | Float | --- | Analog input InP3 (unfiltered) |
| 0x1043 | R/O | Float | --- | Actual angular positioning |
| 0x1058 | R/O | Word | B1 | Burner alarm |

**Parameter level**

| **Address** | **Access** | **Data type** | Signal reference | Parameter |
|---|---|---|---|---|
| 0x3000 | R/W | Float | Pb1 | Proportional range 1 |
| 0x3004 | R/W | Float | dt | Derivative action time |
| 0x3006 | R/W | Float | rt | Integral action time |
| 0x300C | R/W | Float | db | Dead band |
| 0x3012 | R/W | Word | tt | Controlling element running time |
| | | | | |
| 0x3016 | R/W | Float | HYS1 | Switch-on threshold |
| 0x3018 | R/W | Float | HYS2 | Switch-off threshold down |
| 0x301A | R/W | Float | HYS3 | Switch-off threshold up |
| 0x301C | R/W | Float | HYS4 | Switch-on threshold (cooling) |
| 0x301E | R/W | Float | HYS5 | Switch-off threshold down (cooling) |
| 0x3020 | R/W | Float | HYS6 | Switch-off threshold up (cooling) |
| 0x3022 | R/W | Float | **q** | Reaction threshold |
| | | | | |
| 0x3080 | R/W | Float | At1 | Outside temperature 1 |
| 0x3082 | R/W | Float | Ht2 | Boiler temperature 1 |
| 0x3084 | R/W | Float | At2 | Outside temperature 2 |
| 0x3086 | R/W | Float | Ht2 | Boiler temperature 2 |

**Configuration level**

| Address | Access | Data type | Signal reference | Parameter |
|---|---|---|---|---|
| 0x3426 | R/W | Float | SCL1 | Start of display input 1 |
| 0x3428 | R/W | Float | SCH1 | End of display input 1 |
| 0x3432 | R/W | Float | SCL2 | Start value input 2 |
| 0x3434 | R/W | Float | SCH2 | End value input 2 |
| 0x3486 | R/W | Float | SPL | Start of setpoint limitation |
| 0x3488 | R/W | Float | SPH | End of setpoint limitation |
| 0x342A | R/W | Float | OFFS1 | Offset input E1 |
| 0x3436 | R/W | Float | OFFS2 | Offset input E2 |
| 0x343A | R/W | Float | OFFS3 | Offset input E3 |
| | | | | |
| 0x1063 | R/W | Word | FnCt | Ramp function |
| 0x1065 | R/W | Float | rASL | Ramp slope |
| 0x1067 | R/W | Float | toLP | Tolerance band ramp |
| 0x1069 | R/W | Float | rAL | Limit value |
| 0x1075 | R/W | Float | dtt | Remote Detection Timer |
| | | | | |
| 0x1077 | R/W | Float | dF1 | Filter constant input 1 |
| 0x1079 | R/W | Float | dF2 | Filter constant input 2 |
| 0x107B | R/W | Float | dF3 | Filter constant input 3 |
| 0x107D | R/O | Float | oLLo | Lower working range limit |
| 0x107F | R/O | Float | oLHi | Upper working range limit |
| | | | | |
| 0x106D | R/W | Word | FnCt | Alarm relay function |
| 0x106F | R/W | Float | AL | Alarm relay limit value (limit value alarm) |
| 0x1071 | R/W | Float | HYSt | Alarm relay hysteresis |

**Remote operation**

| Address | Access | Data type | Signal reference | Parameter |
|---|---|---|---|---|
| 0x0500 | R/W | Word | REM | Activation remote operation * |
| 0x0501 | R/W | Word | rOFF | Controller OFF in remote setpoint ** |
| 0x0502 | R/W | Float | rHYS1 | Switch-on threshold remote |
| 0x0504 | R/W | Float | rHYS2 | Switch-off threshold down remote |
| 0x0506 | R/W | Float | rHYS3 | Switch-off threshold up remote |
| 0x0508 | R/W | Float | SPr | Setpoint remote |
| | | | | |
| 0x050A | R/W | Word | RK1 | Burner release remote operation |
| 0x050B | R/W | Word | RK2 | Relay K2 remote operation |
| 0x050C | R/W | Word | RK3 | Relay K3 remote operation |
| 0x050D | R/W | Word | RK6 | Relay K6 remote operation |
| 0x050E | R/W | Word | rStEP | Step-by-step control remote operation |
| 0x050F | R/W | Float | rY | Angular positioning output remote operation |
| 0x0511 | R/W | Float | rHYS4 | Switch-on threshold remote (cooling) |
| 0x0513 | R/W | Float | rHYS5 | Switch-off threshold down remote (cooling) |
| 0x0515 | R/W | Float | rHYS6 | Switch-off threshold up remote (cooling) |

Legend

* = Local

** = Controller OFF

**Dati dell’apparecchio**

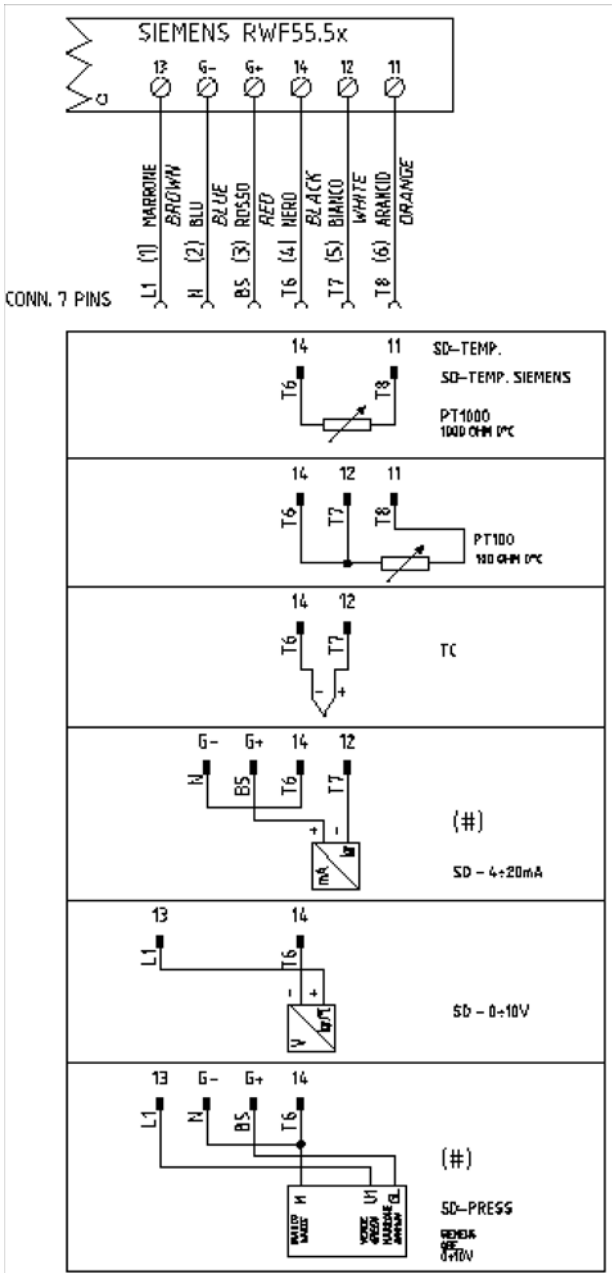
| Address | Access | Data type | Signal reference | Parameter |
|---|---|---|---|---|
| 0x8000 | R/O | Char12 | --- | Software version |
| 0x8006 | R/O | Char14 | --- | VdN number |

**Stato dell’apparecchio**

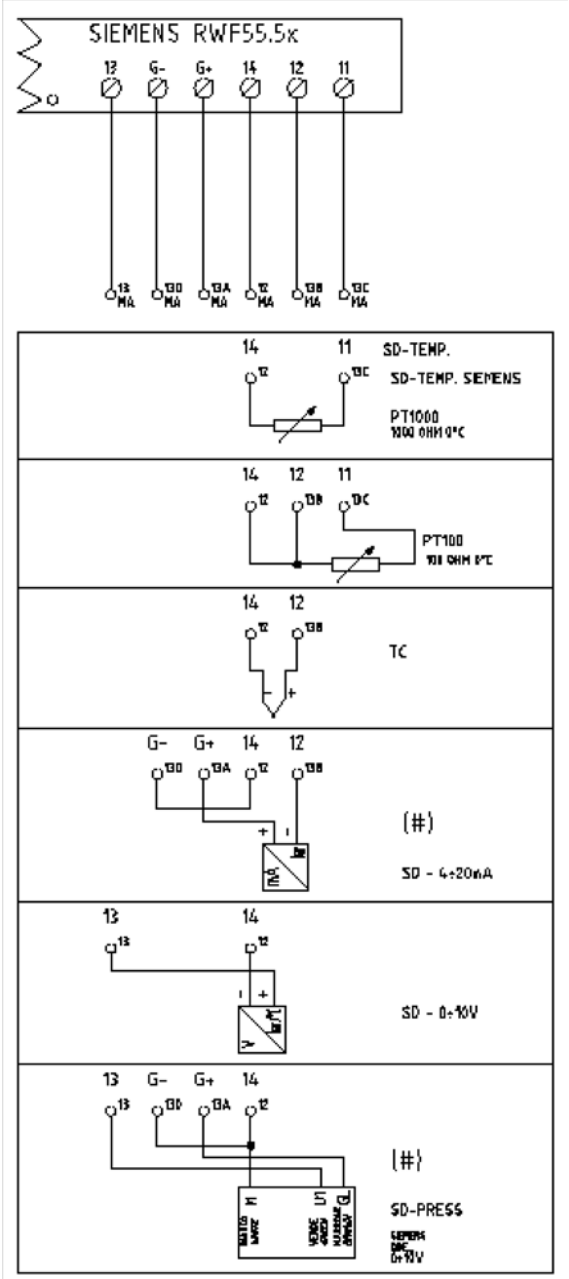
| Address | Access | Data type | Signal reference | Parameter |
|---|---|---|---|---|
| 0x0200 | R/O | Word | --- | Outputs and states |
| | | | Bit 0 | Output 1 |
| | | | Bit 1 | Output 3 |
| | | | Bit 2 | Output 2 |
| | | | Bit 3 | Output 4 |
| | | | Bit 8 | Hysteresis limitation |
| | | | Bit 9 | Control system |
| | | | Bit 10 | Self-optimization |
| | | | Bit 11 | Second setpoint |
| | | | Bit 12 | Measuring range overshoot InP1 |
| | | | Bit 13 | Measuring range overshoot InP2 |
| | | | Bit 14 | Measuring range overshoot InP3 |
| | | | Bit 15 | Calibration mode |
| | | | | |
| 0x0201 | R/O | Word | --- | Binary signals and hardware detection |
| | | | Bit 0 | Operation mode 2-stage |
| | | | Bit 1 | Manual mode |
| | | | Bit 2 | Binary input D1 |
| | | | Bit 3 | Binary input D2 |
| | | | Bit 4 | Thermostat function |
| | | | Bit 5 | First controller output |
| | | | Bit 6 | Second controller output |
| | | | Bit 7 | Alarm relay |
| | | | Bit 13 | Analog output available |
| | | | Bit 14 | Interface available |

**Electric connections :**

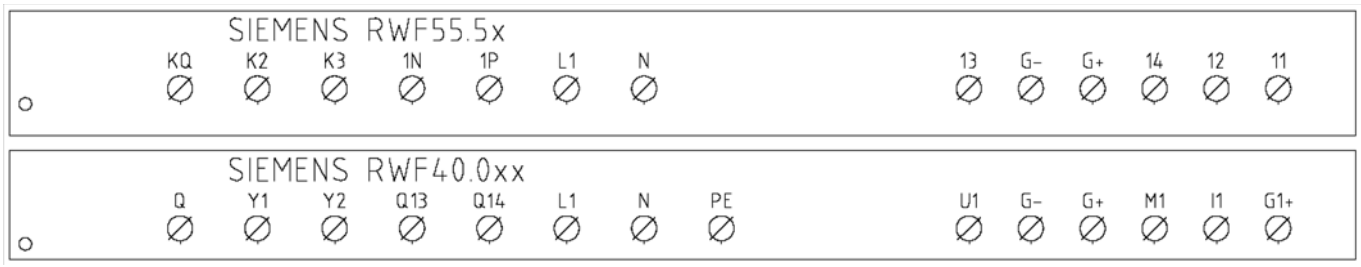
With 7 pins connector version




With terminals version




Corrispondences bornes entre RWF55.5x y RWF40.0x0Matches terminals betweenRWF55.5x and RWF40.0x0



## Parameters summarising for RWF55.xx :

| Navigation menù | ConF | | | | | ConF | | | PArA | | | | | | Opr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inp | | | | | Cntr | | diSP | | | | | | | |
| | Inp1 | | | | | | | | | | | | | | |
| Types of probe | SEn1 | OFF1 | SCL | SCH | Unit | SPL | SPH | dECP | Pb. 1 | dt | rt | tt | HYS1 (*) | HYS3 (*) | SP1 (*) |
| Siemens QAE2120… | 6 | 0 | needless | needless | 1 | 30 | 95 | 1 | 10 | 80 | 350 | (#) | -5 | 5 | 80 °C |
| Siemens QAM2120.. | 6 | 0 | needless | needless | 1 | 0 | 80 | 1 | 10 | 80 | 350 | (#) | -2,5 | 2,5 | 40°C |
| Pt1000 (130°C max.) | 4 | 0 | needless | needless | 1 | 30 | 95 | 1 | 10 | 80 | 350 | (#) | -5 | 5 | 80°C |
| Pt1000 (350°C max.) | 4 | 0 | needless | needless | 1 | 0 | 350 | 1 | 10 | 80 | 350 | (#) | -5 | 10 | 80°C |
| Pt100 (130°C max.) | 1 | 0 | needless | needless | 1 | 0 | 95 | 1 | 10 | 80 | 350 | (#) | -5 | 5 | 80°C |
| Pt100 (350°C max) | 1 | 0 | needless | needless | 1 | 0 | 350 | 1 | 10 | 80 | 350 | (#) | -5 | 10 | 80°C |
| Probe4÷20mA / 0÷1,6bar | 16 | 0 | 0 | 160 | needless | 0 | 160 | 0 | 5 | 20 | 80 | (#) | 0 | 20 | 100 kPa |
| Probe4÷20mA / 0÷3bar | 16 | 0 | 0 | 300 | needless | 0 | 300 | 0 | 5 | 20 | 80 | (#) | 0 | 20 | 200 kPa |
| Probe 4÷20mA / 0÷10bar | 16 | 0 | 0 | 1000 | needless | 0 | 1000 | 0 | 5 | 20 | 80 | (#) | 0 | 50 | 600 kPa |
| Probe 4÷20mA / 0÷16bar | 16 | 0 | 0 | 1600 | needless | 0 | 1600 | 0 | 5 | 20 | 80 | (#) | 0 | 80 | 600 kPa |
| Probe 4÷20mA / 0÷25bar | 16 | 0 | 0 | 2500 | needless | 0 | 2500 | 0 | 5 | 20 | 80 | (#) | 0 | 125 | 600 kPa |
| Probe 4÷20mA / 0÷40bar | 16 | 0 | 0 | 4000 | needless | 0 | 4000 | 0 | 5 | 20 | 80 | (#) | 0 | 200 | 600 kPa |
| Probe 4÷20mA / 0÷60PSI | 16 | 0 | 0 | 600 | needless | 0 | 600 | 0 | 5 | 20 | 80 | (#) | 0 | 30 | 300 (30PSI) |
| Probe4÷20mA / 0÷200PSI | 16 | 0 | 0 | 2000 | needless | 0 | 2000 | 0 | 5 | 20 | 80 | (#) | 0 | 75 | 600 (60PSI) |
| Probe4÷20mA / 0÷300PSI | 16 | 0 | 0 | 3000 | needless | 0 | 3000 | 0 | 5 | 20 | 80 | (#) | 0 | 120 | 600 (60PSI) |
| Siemens QBE2002 P4 | 17 | 0 | 0 | 400 | needless | 0 | 400 | 0 | 5 | 20 | 80 | (#) | 0 | 20 | 200 kPa |
| Siemens QBE2002 P10 | 17 | 0 | 0 | 1000 | needless | 0 | 1000 | 0 | 5 | 20 | 80 | (#) | 0 | 50 | 600 kPa |
| Siemens QBE2002 P16 | 17 | 0 | 0 | 1600 | needless | 0 | 1600 | 0 | 5 | 20 | 80 | (#) | 0 | 80 | 600 kPa |
| Siemens QBE2002 P25 | 17 | 0 | 0 | 2500 | needless | 0 | 2500 | 0 | 5 | 20 | 80 | (#) | 0 | 125 | 600 kPa |
| Siemens QBE2002 P40 | 17 | 0 | 0 | 4000 | needless | 0 | 4000 | 0 | 5 | 20 | 80 | (#) | 0 | 200 | 600 kPa |
| Signal 0÷10V | 17 | 0 | needless | needless | needless | needless | needless | needless | 5 | 20 | 80 | (#) | | | |
| Signal 4÷20mA | 16 | 0 | needless | needless | needless | needless | needless | needless | 5 | 20 | 80 | (#) | | | |

**NOTE:**

(#) tt – servo control run time

SQL33 ; STM30; SQM10; SQM40; SQM50; SQM54 = 30 (secondi) - STA12B3.41; SQN30.251; SQN72.4A4A20 = 12 (secondi)

(*)These values are factory set - values must be set during operation at the plant based on the real working temperature/pressure value.

**WARNING** :

With pressure probes in bar the parameters SP1, SCH, SCL, HYS1, HYS3 must be set and displayed in kPa (kilo Pascal); 1bar = 100,000Pa = 100kPa.

With pressure probes in PSI the parameters SP1, SCH, SCL, HYS1, HYS3 must be set and displayed in PSI x10 (example: 150PSI > I display 1500).

## APPENDIX: PROBES CONNECTION

To assure the utmost comfort, the control system needs reliable information, which can be obtained provided the sensors have been installed correctly. Sensors measure and transmit all variations encountered at their location.

Measurement is taken based on design features (time constant) and according to specific operating conditions.With wiring run in raceways, the sheath (or pipe) containing the wires must be plugged at the sensor's terminal board so that currents of air cannot affect the sensor's measurements.

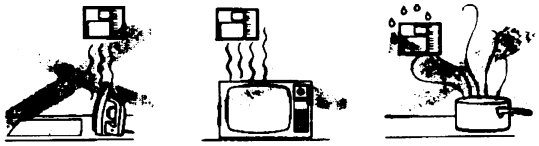
**Ambient probes (or ambient thermostats)**

**Installation**

The sensors (or room thermostats) must be located in reference rooms in a position where they can take real temperature measure-ments without being affected by foreign factors.

**It's good to be admired …even better to be effective**

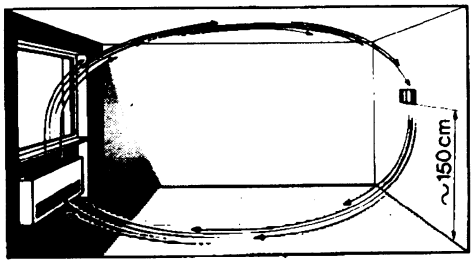
Heating systems: the room sensor must not be installed in rooms with heating units complete with thermostatic valves. Avoid all sources of heat foreign to the system.



**Location**

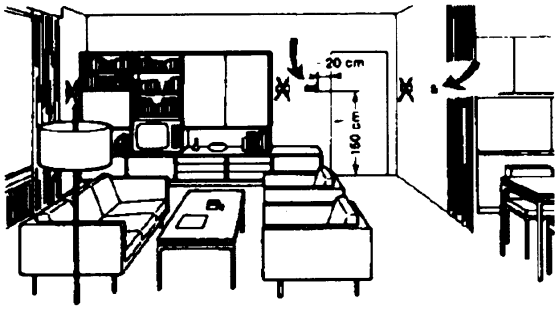
On an inner wall on the other side of the room to heating unitsheight above floor 1.5 m, at least 1.5 m away from external sources of heat (or cold).

.



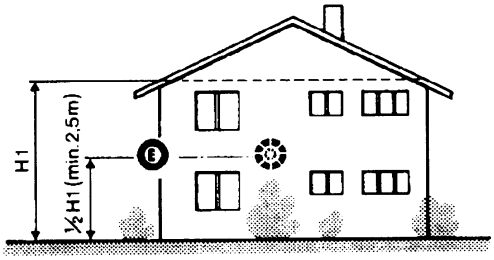

**Installation position to be avoided**

near shelving or alcoves and recesses, near doors or win-dows, inside outer walls exposed to solar radiation or currents of cold air, on inner walls with heating system pipes, domestic hot water pipes, or cooling system pipes running through them.



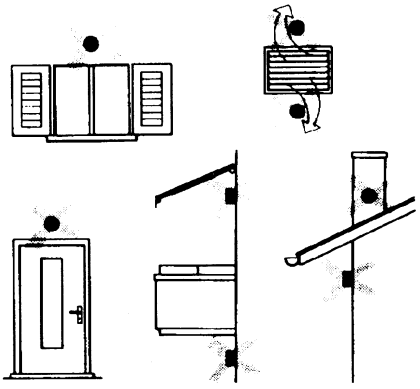

**Outside probes (weather)Installation**

In heating or air-conditioning systems featuring adjustment in response to outside temperature, the sensor's positioning is of paramount importance.




**General rule:** en on the outer wall of the building where the living rooms are, never on the south-facing wall or in a position where they will be affected by morning sun. If in any doubt, place them on the north or north-east façade.

**Positions to be avoidedH**



Avoid installing near windows, vents, outside the boiler room, on chimney breasts or where they are protected by balconies, cantilever roofs .

**The sensor must not be painted (measurement error) .**

**Duct or pipe sensors**

**Installing temperature sensors**

For measuring outlet air:

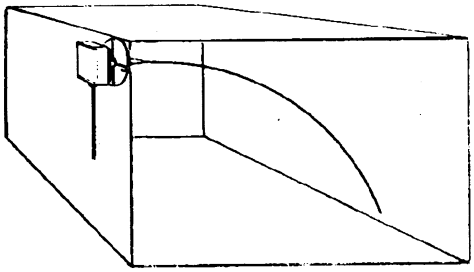
"after delivery fan or

"after coil to be controlled, at a distance of at least 0,5 m

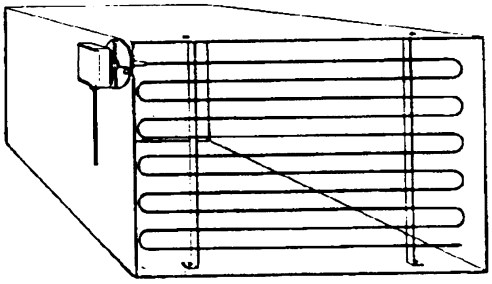
For measuring room temperature:

"before return air intake fan and near room's return airintake.

For measuring saturation temperature: after mist eliminator.



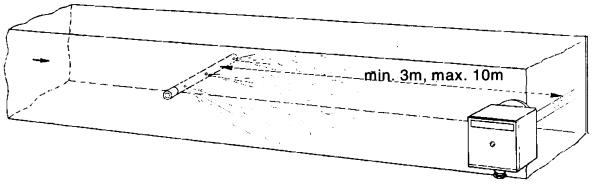
Bend 0.4m sensor by hand (never use tools) as illustrated .



Use whole cross-section of duct, min. distance from walls 50 mm, radius of curvature 10 mm for 2m or 6m sensors

**Installing combined humidity sensors**

As max. humidity limit sensor on outlet (steam humidifiers) .




**Installing pressure sensors**

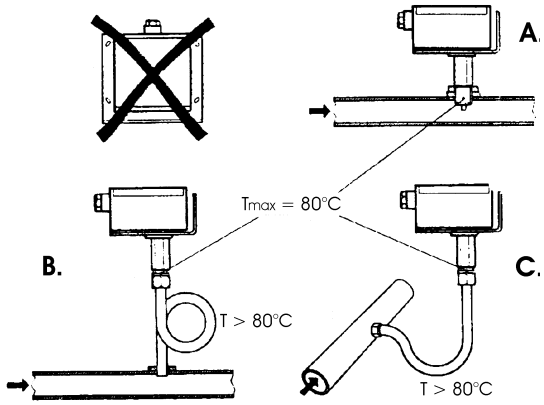
A - installation on ducts carrying fluids at max. temperature 80°C

B - installation on ducts at temperature over 80°C and for refrigerants

C - installation on ducts at high temperatures :

·"increase length of siphon

"place sensor at side to prevent it being hit by hot air coming from the pipe.




**Installing differential pressure sensors for water**

Installation with casing facing down not allowed.

With temperature over 80°C, siphons are needed.

To avoid damaging the sensor, you must comply with the following instructions :

when installing: make sure pressure difference is not greater than the value permitted by the sensor

when there are high static pressures, make sure you insert shutoff valves A-B-C.

**Putting into operation**

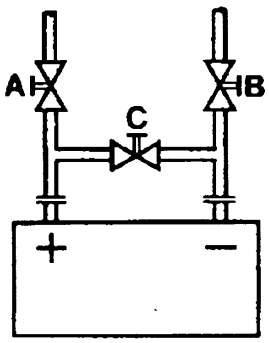
Start disable

1=open C1=open C

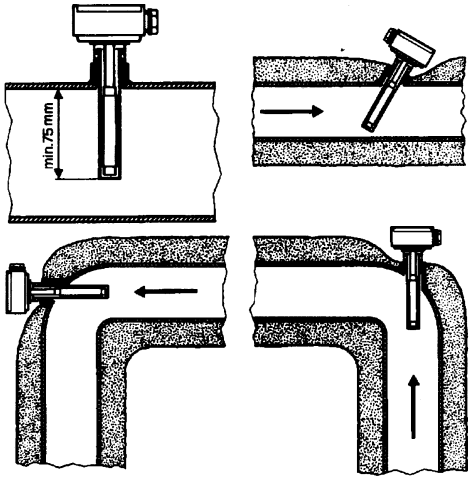
2=open A2=close B

3=open B3=close A

4= close C



## Immersion or strap-on sensors



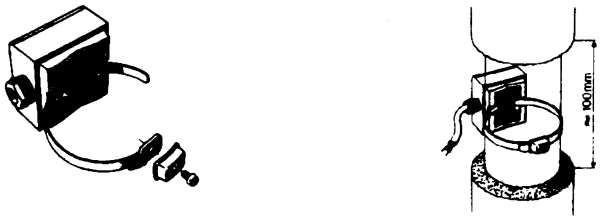

**Immersion probes installation**

Sensors must be installed on the stretch of pipe in which fluid circulates all the time.

The rigid stem (sensing element doing the measuring) must be inserted by at least 75mm and must face the direction of flow.

Recommended locations: on a bend or on a straight stretch of pipe but tilted by 45° and against the flow of fluid.

Protect them to prevent water from infiltrating (dripping gates, condensation from pipes etc.) .




**Installing QAD2.. strap-on sensors**

Make sure fluid is circulating in the chosen location.

Eliminate insulation and paintwork (including rust inhibitor) on a min. 100mm length of pipe.

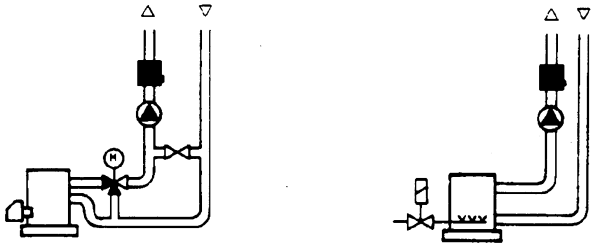
Sensors come with straps for pipes up to 100 mm in diameter .

**Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)**

**With pumps on outlet**

**with 3 ways valves / with 4 ways valves**

**Panel system / burner control**



**With pumps on return**

**with 3 ways valves / with 4 ways valves**

**Strap-on or immersion sensors?**

**QAD2.. strap-on sensors**

Advantages :

- 10 sec. time constant
- Installed with system running (no plumbing work)
- Installation can be changed easily if it proves incorrect

ΠLimits:

- Suitable for pipe diameters max. 100 mm
- Can be affected by currents of air etc.

**QAE2... immersion sensors**

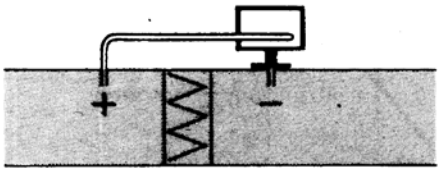
Advantages:

- Measure "mean" fluid temperature
- No external influence on measurement such as: currents of air, nearby pipes etc.

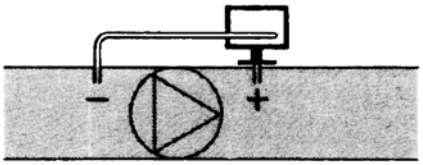
Limits:

- Time constant with sheath: 20 sec.
- Hard to change installation position if it proves incorrect

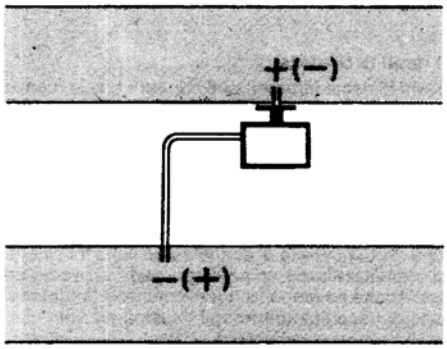
## Installing differential pressure probes for air



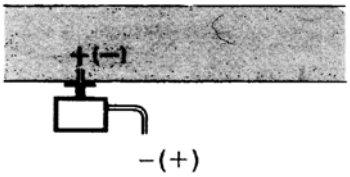

A - Control a filter (clogging)




B - Control a fan (upstream/downstream)



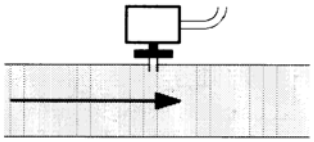

C - Measurement of difference in pressure between two ducts



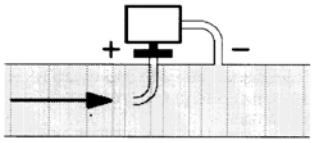

D - Measurement of difference in pressure between two rooms or of inside of duct and outside

## Basic principles

### Measuring static pressure(i.e. pressure exerted by air on pipe walls)



### Measuring dinamic pressure

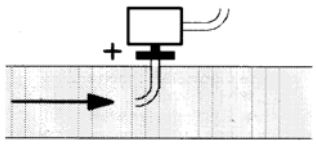



$$Pd = \frac{y\,\vartheta^2}{2g}$$

**Legend**

| | |
|---|---|
| y | Kg/m3, specific weight of air |
| q | m/s, air speed |
| g | 9.81 m/s2 gravity acceleration |
| Pd | mm C.A., dynamic pressure |

### Measuring total pressure



Note: Specifications and data subject to change. Errors and omissions excepted.

# MANUALE USER SUPPORT

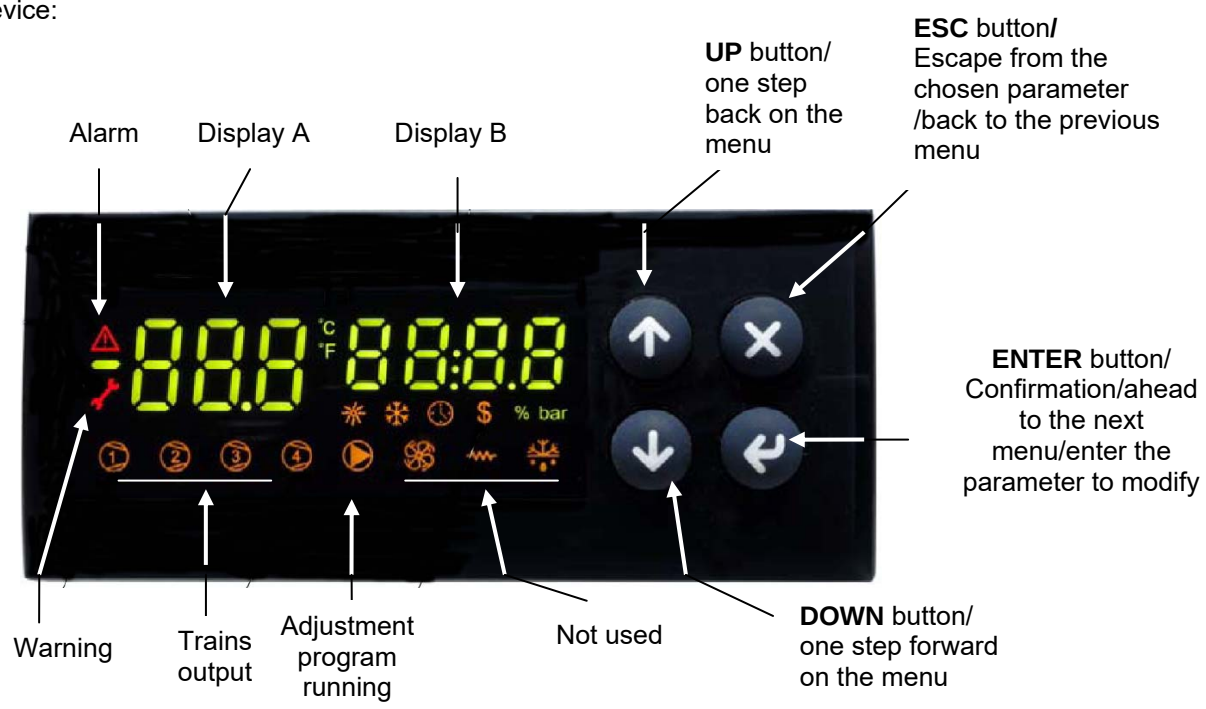
# MULTI-THERMOSTAT

# 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. it works as follows:
as soon as the burner control gives the GO to the digital 1 input (terminals DI1-COM), the adjustment program runs (the relevant LED is ON). Reading the outlet temperature through the probe **Pb3** (terminals AI3-COM), a PID signal is produced. This signal becomes the set-point for the electric resistors. The electric resistors temperature is read through the probe **Pb1** (terminals AI1-COM) so that a second PID signal is produced. This second PID drives a couple of SCR by means of 0-10 V impulses in order to control the electric resistors temperature.
When the burner is in stand-by, resistor set-point is kept at the temperature set in parameter "**p30**" (see parameter group **REG**).
Probe **Pb4** (terminals AI4-COM) controls the inner heater temperature. As soon the relevant set-point is got, it drives the output number 4 (terminals C4-NO4) linked to the relais KTCN. This allows the oil pump to start and also the burner control proceeds with its cycle.
When set-point **trS** is got to, output number 5 is ON (terminals C5-NO5) linked to the relais KTRS. It switches the resistors off and activates an alarm on the device.
Probe **Pb2** (terminals AI2-COM), when fitted, drives output number 2 (terminals C2-NO2) linked to the relais KTCI. This allows the burner control to proceed with ignition.
See below the set-point recommended figures.

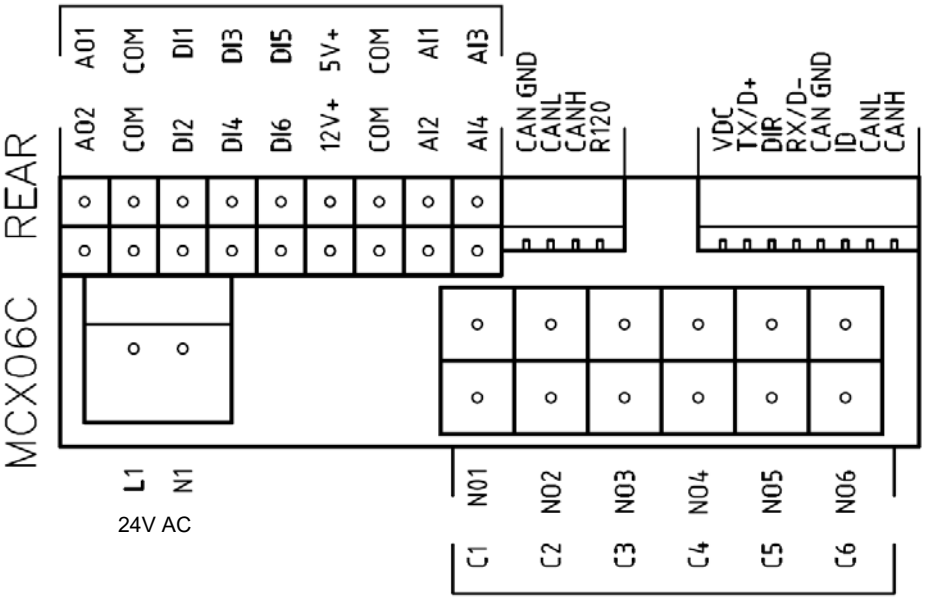
**User interface:**

Device:



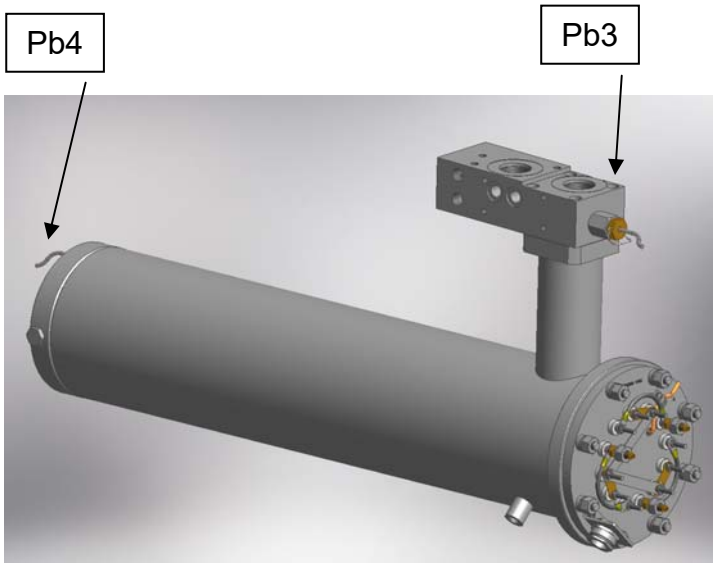

Note :
In normal operation, the display A shows the oil tank resistor temperature (probe Pb1).
In normal operation, the display B shows the oil output temperature (probe Pb3).

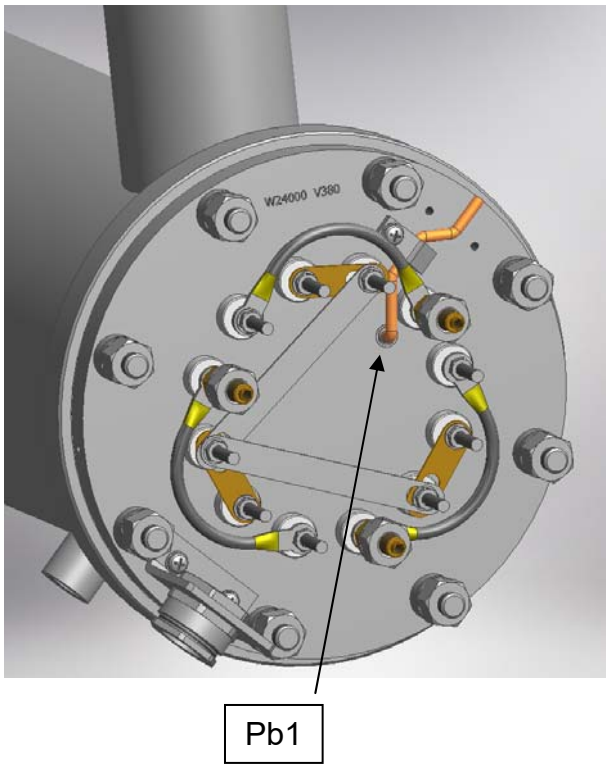
**Connections from terminal side :**

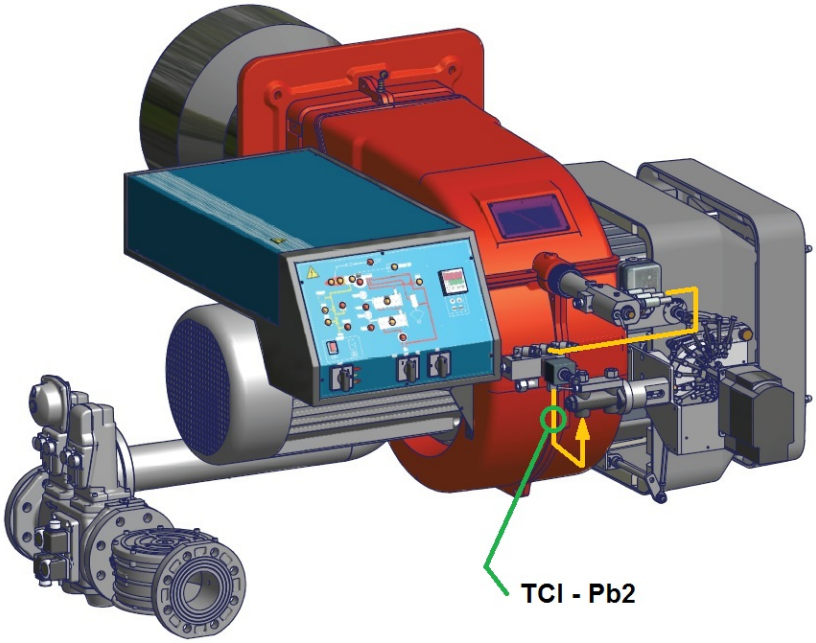



**Probe connection:**

input **AI1** = probe **Pb1** = set-point "**tr**" = oil heater temperature probe;
input **AI2** = probe **Pb2** = set-point "**tCI**" = 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.






(**tCI - Pb2** probe only for mechanical atomizing burners)

**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 | Reset of the manual reset alarms |
| Loc | | Lock/Unlock functions | Not used |
| InF | rEL | Software version | Installed software version |
| tUN | | Autotuning | Activation On, deactivation ESC<br>PID parameter autotuning |

**Login:**
All the parameters inside the **Par** menu are locked by a password.
Without password, only set-points can be modified.
To login, on the log menu, press **ENTER** for more than 3 s. Input your password (level 2 or 3) inside **PAS**
With password for level 3 all the data can be set.

submenu **CnF - configuration parameters group :**

| Menu | Parameter | Description | Additional description | Min | Max | Default | U.M. | Visibility condition | Password level | Modbus index |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| **CnF** | | **CONFIGURATION** | | | | | | | 0 | |
| AI1 | | Analog Input 1 | | | | | | | 1 | |
| | A1P | Probe 1 Presence | This parameter enables or disables the probe | 0 | 1 | 1 | | | 2 | 1 |
| | A1C | Calibration Probe 1 | Don't modify it | -20,0 | 20,0 | 0,0 | °C | A1P >0 | 3 | 2 |
| AI2 | | Analog Input 2 | | | | | | | 1 | |
| | A2P | Probe 2 Presence | This parameter enables or disables the probe | 0 | 1 | 1 | | | 2 | 3 |
| | A2C | Calibration Probe 2 | Don't modify it | -20,0 | 20,0 | 0,0 | °C | A2P >0 | 3 | 4 |
| AI3 | | Analog Input 3 | | | | | | | 1 | |
| | A3P | Probe 3 Presence | This parameter enables or disables the probe | 0 | 4 | 1 | | | 2 | 5 |
| | A3L | Min. Value conversion AI3 | Don't modify it | -999,9 | 999,9 | 0,0 | | A3P >2 | 3 | 6 |
| | A3H | Max. Value conversion AI3 | Don't modify it | -999,9 | 999,9 | 30,0 | | A3P >2 | 3 | 7 |
| | A3C | Calibration Probe 3 | Don't modify it | -20,0 | 20,0 | 0,0 | °C | A3P >0 | 3 | 8 |
| AI4 | | Analog Input 4 | | | | | | | 1 | |
| | A4P | Probe 4 Presence | This parameter enables or disables the probe | 0 | 4 | 1 | | | 2 | 9 |
| | A4L | Min. Value conversion AI4 | Don't modify it | -999,9 | 999,9 | 0,0 | | A4P >2 | 3 | 10 |
| | A4H | Max. Value conversion AI4 | Don't modify it | -999,9 | 999,9 | 30,0 | | A4P >2 | 3 | 11 |
| | A4C | Calibration Probe 4 | Don't modify it | -20,0 | 20,0 | 0,0 | °C | A4P >0 | 3 | 12 |
| dI | | Digital input | | | | | | | 1 | |
| | dI1 | Input 1 polarity (Pump) | Change type of digital input ( NC o NO) | 0 | 1 | 1 | | | 3 | 13 |
| | dI2 | Alarm polarity from input 2 | Change type of digital input ( NC o NO) | 0 | 2 | 2 | | | 2 | 14 |
| | dI3 | Alarm polarity from input 3 | Change type of digital input ( NC o NO) | 0 | 2 | 2 | | | 2 | 15 |
| | dI4 | Alarm polarity from input 4 | Change type of digital input ( NC o NO) | 0 | 2 | 2 | | | 2 | 16 |
| | dI5 | Alarm polarity from input 5 | Change type of digital input ( NC o NO) | 0 | 2 | 2 | | | 2 | 17 |
| | dI6 | Alarm polarity from input 6 | Change type of digital input ( NC o NO) | 0 | 2 | 2 | | | 2 | 18 |
| dI | | Digital output Alarm and Warning | | | | | | | 1 | |
| | dO5 | Polarity output Warning | Change type of digital input ( NC o NO) | 0 | 1 | 0 | | | 3 | 19 |
| | dO6 | Polarity output Alarm | Change type of digital input ( NC o NO) | 0 | 1 | 0 | | | 3 | 20 |
| SIC | | Safety probe | | | | | | | 1 | |
| | SIp | Selection of safety probe | Probe which also activates the relay Warning (ns. KTRS) | 0 | 4 | 4 | | | 3 | 21 |
| SyS | | Syistem | | | | | | | 0 | |
| | dSA | display A output | Probe temperature or set-point to be displayed in the left display | 0 | 8 | 1 | | | 3 | 22 |
| | dSb | display B output | Probe temperature or set-point to be displayed in the right display | 0 | 8 | 3 | | | 3 | 23 |
| PAS | | Password | | | | | | | 1 | |
| | PL1 | Password level 1 | | 0 | 9999 | 0 | | | 1 | 32 |
| | PL2 | Password level 2 | | 0 | 9999 | | | | 2 | 33 |
| | PL3 | Password level 3 | | 0 | 9999 | | | | 3 | 34 |

| Menu | Parameter | Description | Additional description | Min | Max | Default | U.M. | Visibility condition | Level | Modbus index |
|---|---|---|---|---|---|---|---|---|---|---|
| tUN | | Autotuning | | | | | | | 3 | |
| | tU1 | Output temperature hysteresis | Don't modify it | 0 | 50,0 | 0,5 | °C | | 3 | 35 |
| | tU2 | Startup number | Don't modify it | 0 | 5 | 2 | | | 3 | 36 |
| | tU3 | Measurement cycles number | Don't modify it | 1 | 4 | 2 | | | 3 | 37 |
| | tU4 | Max. differential command exit | Don't modify it | 0,01 | 10,00 | 10,00 | V | | 3 | 38 |
| | tU5 | Differential reduction exit command (%) | Don't modify it | 0 | 100 | 15 | | | 3 | 39 |
| | tU6 | Calculating mode:<br>0= Symmetrical;<br>1=Asymmetrical;<br>2=Simple | Don't modify it | 0 | 2 | 2 | | | 3 | 40 |
| | tU7 | Enabling | Don't modify it | 0 | 1 | 1 | | | 3 | 41 |

Submenu **REG – regulation parameters group :**

| Menu | Parameter | Description | Additional description | Min | Max | Default | U.M. | Visibility condition | Level | Modbus index |
|---|---|---|---|---|---|---|---|---|---|---|
| **REG** | | **REGULATION** | | | | | | | 0 | |
| Pb1 | | Probe 1 | | | | | | | 0 | |
| | rES | Set-point Probe 1 (Tank resistor) | Don't modify it | -50,0 | 200,0 | 0,0 | °C | | 3 | 42 |
| | AL1 | Probe 1 - Low Temperature Alarm Threshold | Don't modify it | -50,0 | 200,0 | -50,0 | °C | | 3 | 43 |
| | AH1 | Probe 1 - High Temperature Alarm Threshold | Don't modify it | -50,0 | 200,0 | 200,0 | °C | | 3 | 44 |
| | d01 | Probe 1 differential | | 0,0 | 20,0 | 3,0 | °C | | 3 | 45 |
| Pb2 | | Probe 2 | | | | | | | 0 | |
| | tCI | Set-point Probe 2 (Plant Consent) | Plant consent according to table "**Set point adjustment**" | -50,0 | 200,0 | 120,0 | °C | | 0 | 46 |
| | AL2 | Probe 2 - Low Temperature Alarm Threshold | Don't modify it | -50,0 | 200,0 | -50,0 | °C | | 2 | 47 |
| | AH2 | Probe 2 - High Temperature Alarm Threshold | Don't modify it | -50,0 | 200,0 | 200,0 | °C | | 2 | 48 |
| | d02 | Probe 2 differential | | 0,0 | 20,0 | 3,0 | °C | | 2 | 49 |
| Pb3 | | Probe 3 | | | | | | | 0 | |
| | rE3 | Type of regulation of probe 3 (Oil tank exit) | Type of regulation 0= thermostat; 1= PID (don't modify) | 0 | 1 | 1 | | | 3 | 50 |
| | OIL | Set-point Probe 3 (Oil tank exit) | Nozzle oil temperature according to the table "**Set point adjustment**" | -50,0 | 200,0 | 130,0 | °C | | 0 | 51 |
| | AL3 | Probe 3 - Low Temperature Alarm Threshold (Oil tank exit) | Don't modify it | -50,0 | 200,0 | -50,0 | °C | | 2 | 52 |
| | AH3 | Probe 3 - High Temperature Alarm Threshold (Oil tank exit) | Don't modify it | -50,0 | 200,0 | 200,0 | °C | | 2 | 53 |
| | Pb3 | Proportional band for PID Probe 3 (Oil tank exit) | Proportional band for first PID regulation | 0,0 | 200,0 | 60,0 | | | 3 | 54 |
| | db3 | Dead Zone for PID Probe 3 (Oil tank exit) | Dead zone for first PID regulation | 0,0 | 20,0 | 0,0 | °C | rE3 =1 | 3 | 55 |
| | rt3 | Integral Time (Ti) for PID Probe 3 (Oil tank exit) | Integral time for first PID regulation | 0,0 | 1000,0 | 120,0 | s | rE3 =1 | 3 | 56 |
| | dt3 | DerivativeTime (Td) for PID Probe 3 (Oil tank exit) | Derivative time for first PID regulation (~ ¼ di rt3) | 0,0 | 300,0 | 30,0 | s | rE3 =1 | 3 | 57 |
| | db3 | Dead Zone for PID Probe 3 (Oil tank exit) | Dead zone for first PID regulation | 0,0 | 20,0 | 0,0 | °C | rE3 =1 | 3 | 55 |

| Menu | Parameter | Description | Additional description | Min | Max | Default | U.M. | Visibility condition | Level | Modbus index |
|---|---|---|---|---|---|---|---|---|---|---|
| | pi1 | Overshooting for Integral action (Oil tank exit) | Don't modify it | 100 | 1000 | 200 | | rE3 =1 | 3 | 58 |
| | pi2 | Derivative action enabling (Oil tank exit) | Don't modify it | 0 | 1 | 1 | | rE3 =1 | 3 | 59 |
| | pi3 | Filtering factor for derivative action (Oil tank exit) | Don't modify it | 1 | 100 | 20 | | rE3 =1 | 3 | 60 |
| | pi4 | Duty cicle PWM for output DO3 and/or AO1 (0-10V) | Don't modify it | 1 | 300 | 5 | s | rE3 =1 | 3 | 61 |
| | SL3 | Output selection DO3 and/or AO1 (0-10V) | Digital selection output for control thyristors; Don't modify it | 0 | 2 | AO1 | | | 3 | 62 |
| | p21 | Proportional band for PID Probe 1 (Tank resistor) | Proportional band for second PID regulation | 0,0 | 200,0 | 50,0 | | rE3 =1 | 3 | 63 |
| | p22 | Dead Zone for PID Probe 1 (Tank resistor) | Dead zone for second PID regulation | 0,0 | 20,0 | 0,0 | °C | rE3 =1 | 3 | 64 |
| | p23 | Integral Time (Ti) for PID Probe 1 (Tank resistor) | Integral time for second PID regulation | 0,0 | 1000,0 | 110,0 | s | rE3 =1 | 3 | 65 |
| | p24 | DerivativeTime (Td) for PID Probe 1 (Tank resistor) | Derivative time for second PID regulation | 0,0 | 300,0 | 23,0 | s | rE3 =1 | 3 | 66 |
| | p25 | Overshooting for Integral action (Tank resistor) | Don't modify it | 100 | 1000 | 200 | | rE3 =1 | 3 | 67 |
| | p26 | Derivative action enabling (Tank resistor) | Don't modify it | 0 | 1 | 1 | | rE3 =1 | 3 | 68 |
| | p27 | Filtering factor for derivative action (Tank resistor) | Don't modify it | 1 | 100 | 20 | | rE3 =1 | 3 | 69 |
| | p28 | Min Output PID Probe 3 (Oil tank exit) | Minimum value tank resistor set-point (delta of 100°C above p29) | 0,0 | 1000,0 | 80,0 | °C | rE3 =1 | 3 | 70 |
| | p29 | Max Output PID Probe 3 (Oil tank exit) | Maximum valuetank resistor set-point | 0,0 | 1000,0 | 180,0 | °C | rE3 =1 | 3 | 71 |
| | SP0 | Set-point Tank Resistor with oil pump stops (stand by) | Set-point of maintaining resistance during stand by "**Set point adjustment**" | -50,0 | 200,0 | 140,0 | °C | rE3 =1 | 0 | 72 |
| Pb4 | | Probe 4 | | | | | | | 0 | |
| | tcn | Setpoint Probe 4 (Oil consent) | Oil consent according table "**Set point adjustment**" | -50,0 | 200,0 | 110,0 | °C | | 0 | 73 |
| | AL4 | Low Threshold Probe 4 | | -50,0 | 200,0 | -50,0 | °C | | 2 | 74 |
| | trS | Probe 4 - High Temperature Alarm Threshold (Safety Thermostat) | Tank resistor safety temperature according table "**Set point adjustment**" | -50,0 | 200,0 | 190,0 | °C | | 0 | 75 |
| | d04 | Probe 4 differential | | 0,0 | 20,0 | 3,0 | °C | | 2 | 76 |

**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, 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" on 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<br>< 110 cSt | > 110 cSt<br>< 400 cSt | > 400 cSt<br>< 4000 cSt |
| | | | | 12 °E | < 7°E | > 7 °E<br>< 15 °E | > 15 °E<br>< 50 °E | > 50 °E<br>< 530 °E |
| Par | | | | | | | | |
| rEG | Pb1 | tr | Oil heater temperature probe | parameter not visible | | | | |
| | Pb2 | tCI | 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 |

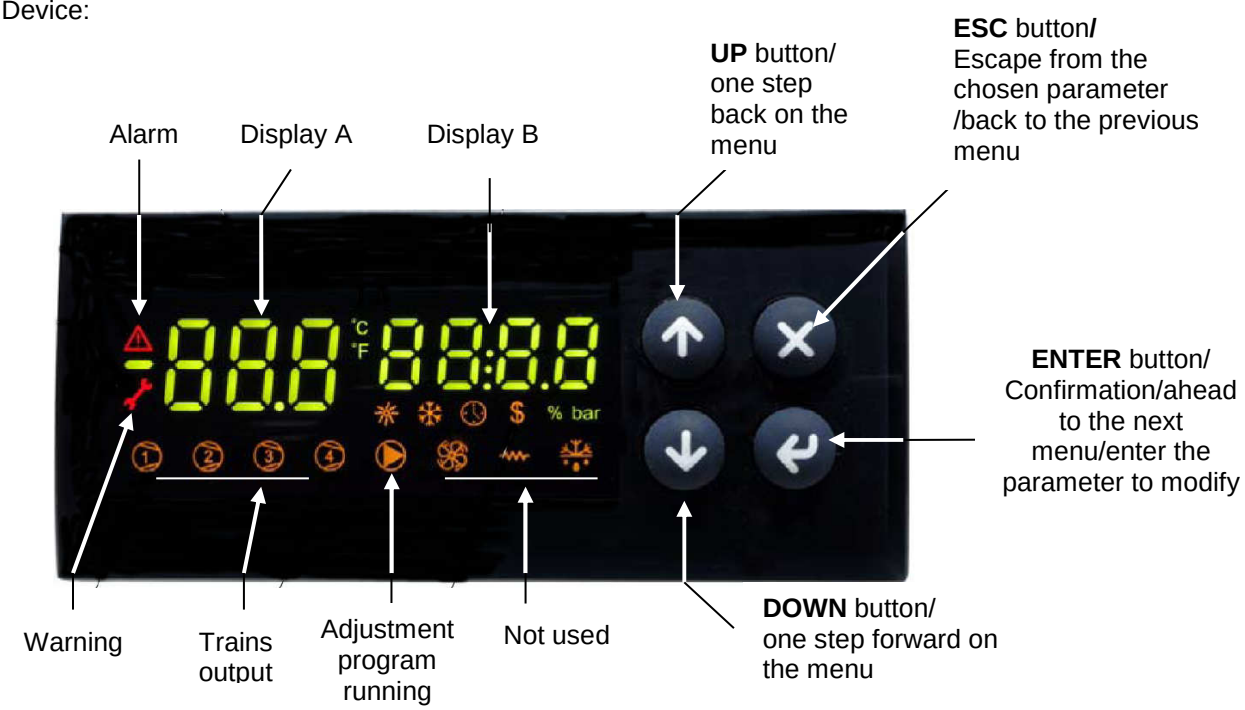
The above temperature values are suggested and refer to a plant designed according to the prescriptions in the burner user manual.
The suggested values can change in reference to the fuel oil specifications.

USER MANUAL OF MULTI-THERMOSTAT

# MCX06C

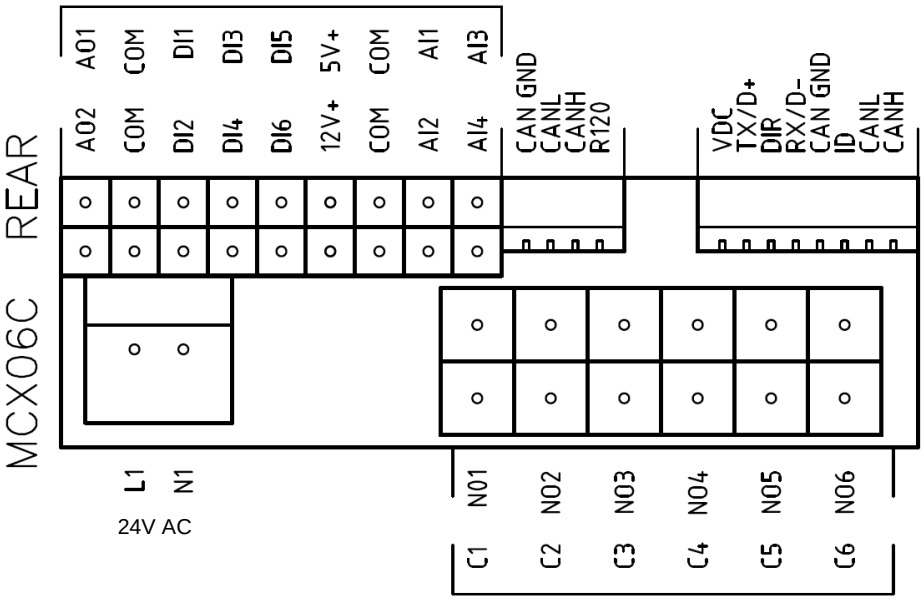
MCX06C is a multi-thermostat with four 100k NTC inputs. It can control up to 4 temperatures showing them (not more than 2 at the same time) on a couple of displays.
It is used to check and adjust oil heater temperatures.

**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 "**tCI**" = 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<br>PID parameter autotuning |

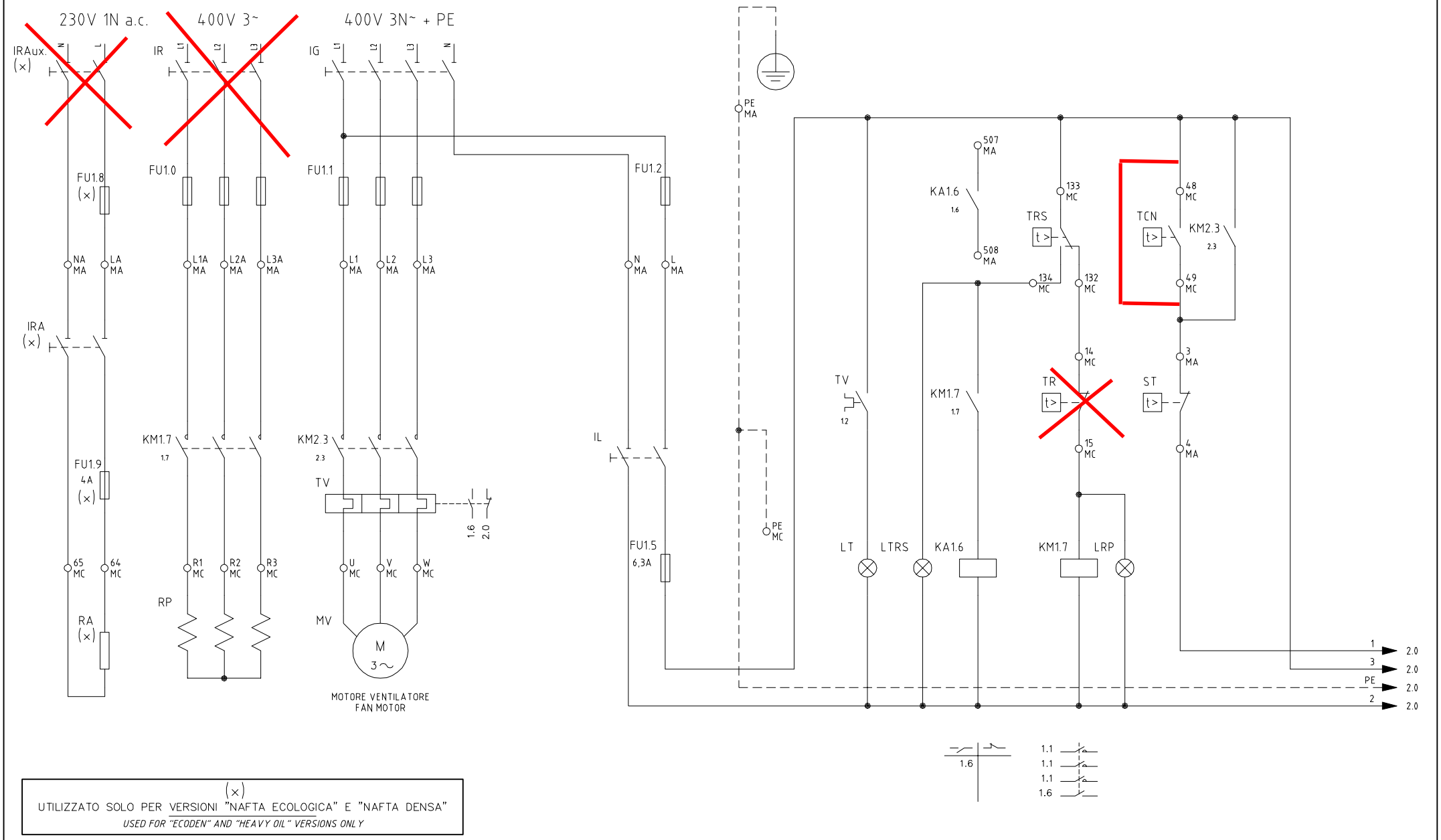
**Alarms & Warning:**
When the red triangle on the top left lights, one or more alarms are activated.
When the red key on the left lights, the output N05-C5 is active and the relay **KTRS** switches the resistors OFF.
Check the reason, correct the failure and, as soon as the temperature is lower than **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 show n in the burner model | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | **P** | **N** | **E** | **D** | **H** |
| | | | | 89 cSt | < 50 cSt | > 50 cSt<br>< 110 cSt | > 110 cSt<br>< 400 cSt | > 400 cSt<br>< 4000 cSt |
| | | | | 12 °E | < 7°E | > 7 °E<br>< 15 °E | > 15 °E<br>< 50 °E | > 50 °E<br>< 530 °E |
| Par | | | | | | | | |
| rEG | Pb1 | tr | Oil heater temperature probe | parameter not visible | | | | |
| | Pb2 | tCI | 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.

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UTILIZZATO SOLO PER VERSIONI "NAFTA ECOLOGICA" E "NAFTA DENSA"
*USED FOR "ECODEN" AND "HEAVY OIL" VERSIONS ONLY*

| REV. | MODIFICA | DATA | FIRME |
|---|---|---|---|
| 05 | AGGIUNTO/ADDED PN93 | 26/05/08 | U. PINTON |
| 04 | AGGIUNTO/ADDED KA16 | 11/01/07 | U. PINTON |
| 03 | AGGIUNTO/ADDED STM30.. | 23/11/06 | U. PINTON |
| 02 | AGGIUNTO/ADDED IRA + FU1.9 | 27/01/04 | U. PINTON |
| 06 | AGGIUNTO/ADDED SQM40.265A | 15/12/09 | U. PINTON |

UNIGAS

Impianto
*TIPI/TYPES PN70 ÷ PN93*
*MODELLO/MODEL x–.PR.x.xx.A*

Descrizione

Ordine

Commessa

Esecutore U. PINTON

Data Controllato 15/12/2009

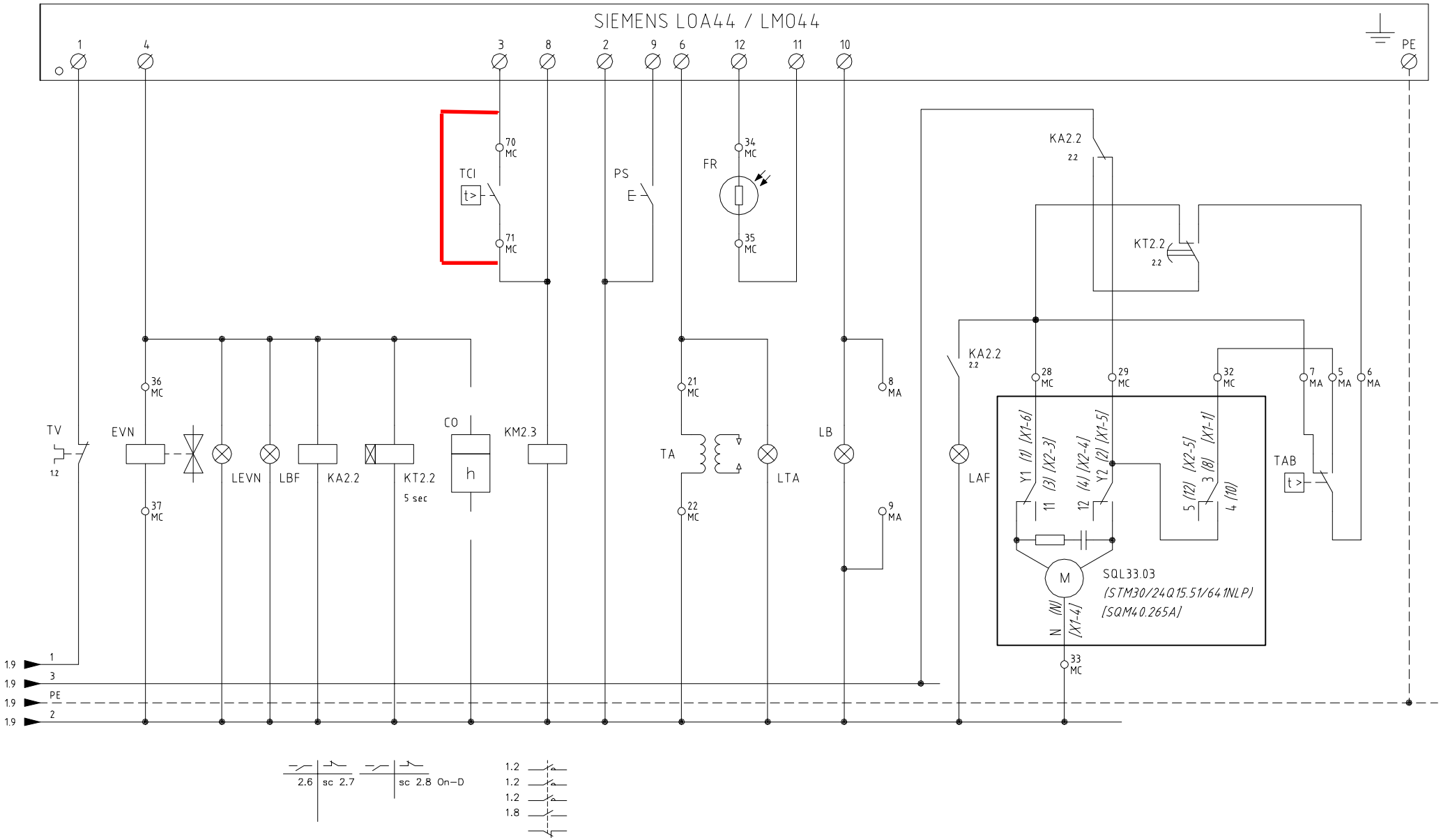
Controllato S. MARCHETTI

Data 22/10/1996

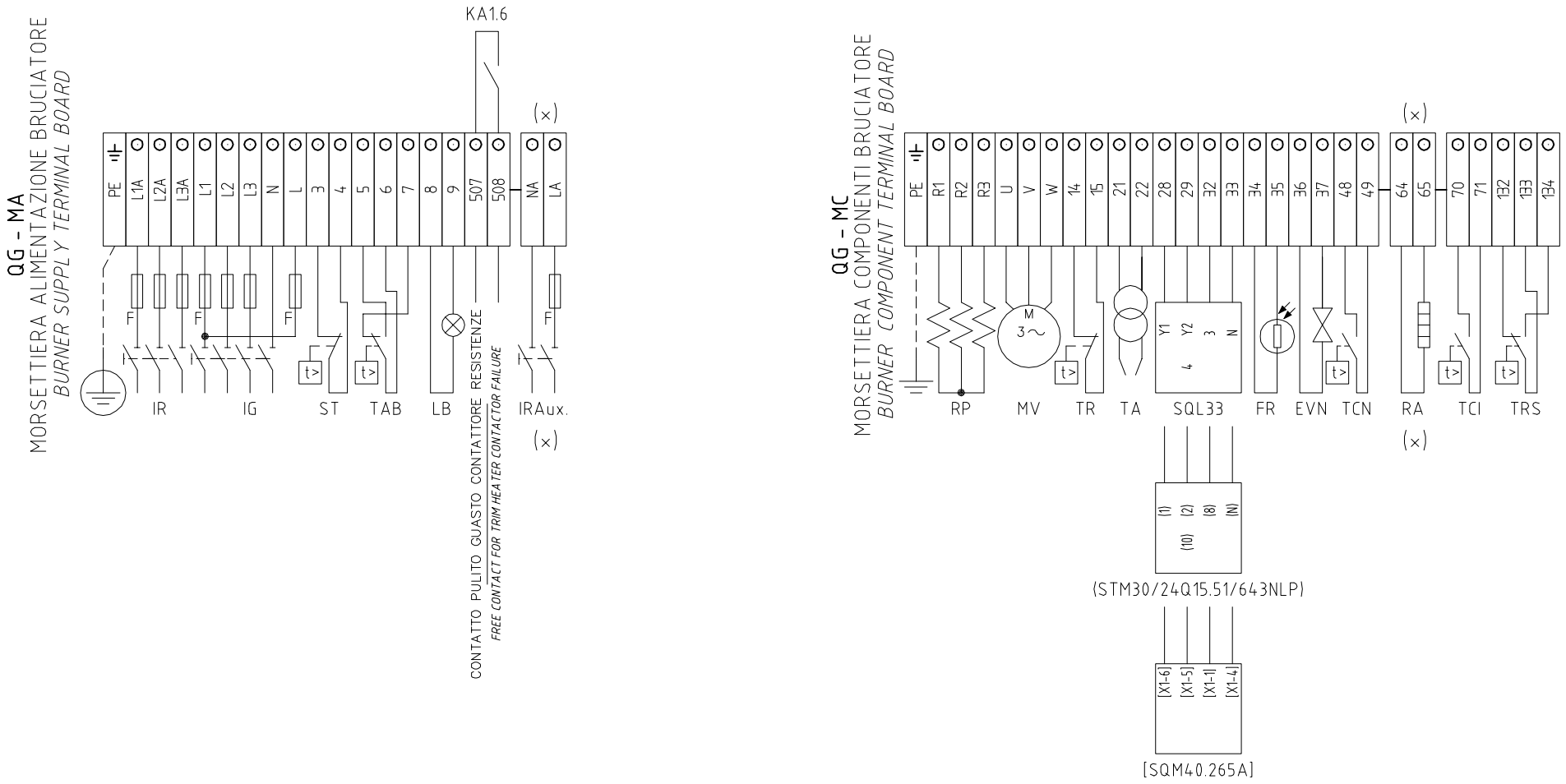
Revisione 06

Dis. N. 07 – 345

| PREC. | FOGLIO |
|---|---|
| 5 | 1 |
| SEGUE | TOTALE |
| 2 | 4 |




| | | | |
|---|---|---|---|
| Data 22/10/1996 | | PREC. | FOGLIO |
| Revisione 06 | | 1 | 2 |
| Dis. N. 07 – 345 | | SEGUE | TOTALE |
| | | 3 | 4 |




SERVOCOMANDO SERRANDA ARIA
*AIR DAMPER ACTUATOR*
SQL33

| | |
|---|---|
| Y1 | ALTA FIAMMA<br>*HIGH FLAME* |
| Y2 | SOSTA E ACCENSIONE<br>*STAND-BY AND IGNITION* |
| 3 | BASSA FIAMMA<br>*LOW FLAME* |

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)
*AIR DAMPER ACTUATOR (ALTERNATIVE)*
(STM30/24Q15.51/641NLP)

| | |
|---|---|
| I | ALTA FIAMMA<br>*HIGH FLAME* |
| II | SOSTA E ACCENSIONE<br>*STAND-BY AND IGNITION* |
| III | BASSA FIAMMA<br>*LOW FLAME* |

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)
*AIR DAMPER ACTUATOR (ALTERNATIVE)*
[SQM40.265A]

| | |
|---|---|
| I | ALTA FIAMMA<br>*HIGH FLAME* |
| II | SOSTA E ACCENSIONE<br>*STAND-BY AND IGNITION* |
| III | BASSA FIAMMA<br>*LOW FLAME* |

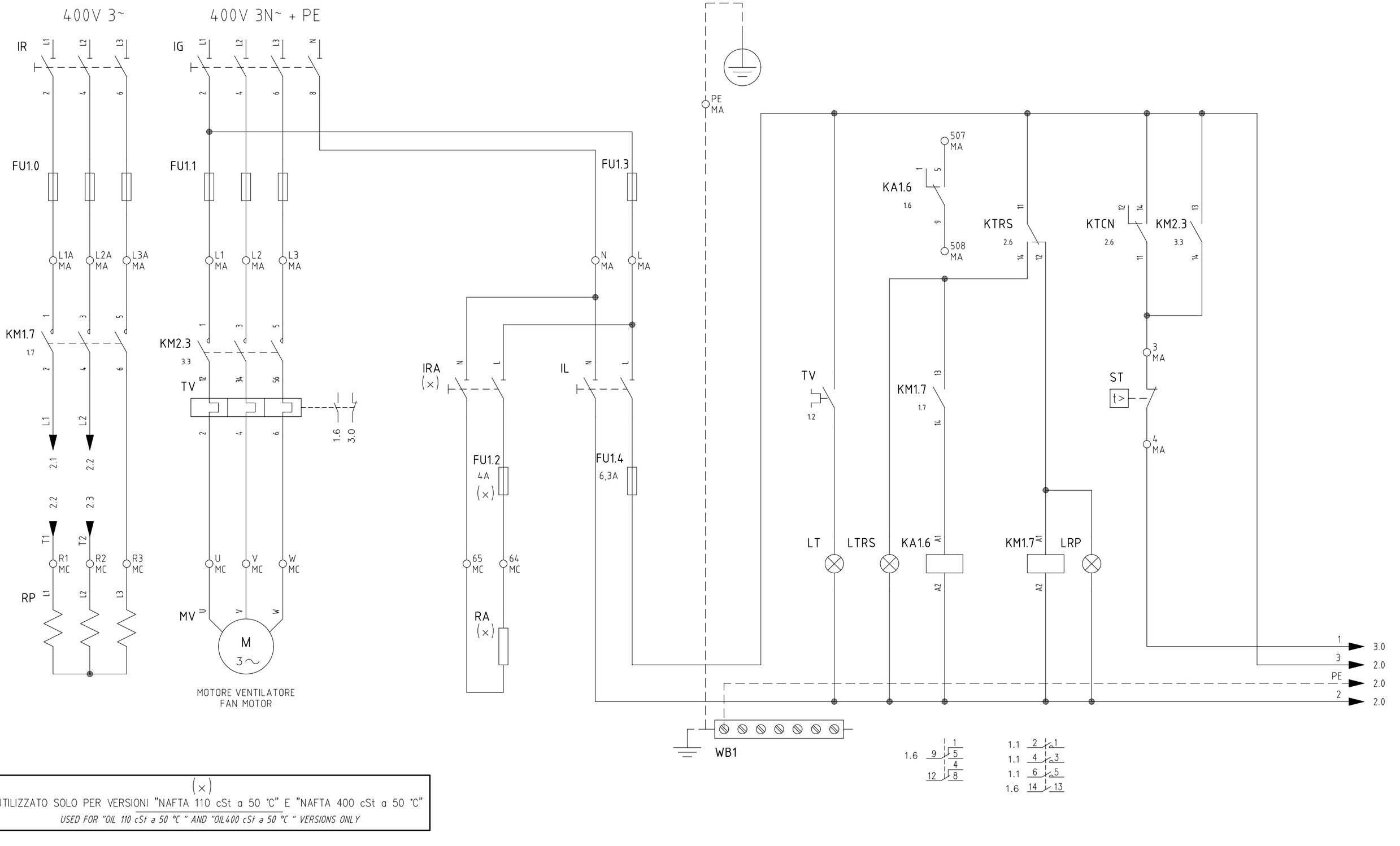
(x)
UTILIZZATO SOLO PER VERSIONI "NAFTA ECOLOGICA" E "NAFTA DENSA"
*USED FOR "ECODEN" AND "HEAVY OIL" VERSIONS ONLY*

| | | | |
|---|---|---|---|
| Data 22/10/1996 | | PREC. | FOGLIO |
| Revisione 06 | | 2 | 3 |
| Dis. N. 07 – 345 | | SEGUE | TOTALE |
| | | 4 | 4 |

| | SIGLA/ITEM | FOGLIO/SHEET | FUNZIONE | FUNCTION |
|---|---|---|---|---|
| | (STM30/24Q15.51/641NLP) | 2 | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO) | AIR DAMPER ACTUATOR (ALTERNATIVE) |
| | [SQM40.265A] | 2 | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO) | AIR DAMPER ACTUATOR (ALTERNATIVE) |
| | CO | 2 | CONTAORE (OPTIONAL) | TIME COUNTER (OPTIONAL) |
| | EVN | 2 | ELETTROVALVOLA NAFTA | OIL SOLENOID VALVE |
| | 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 |
| (×) | IRAux. | 1 | INTERRUTTORE RESISTENZE AUSILIARIE | AUXILIARY RESISTORS SWITCH |
| | KA1.6 | 1 | RELE' AUSILIARIO SEGNALAZIONE GUASTO CONTATTORE RESISTENZE | AUXILIARY RELAY FOR TRIM HEATER CONTACTOR FAILURE |
| | KA2.2 | 2 | RELE' AUSILIARIO | AUXILIARY RELAY |
| | KM1.7 | 1 | CONTATTORE RESISTENZE PRERISCALDATORE [RP] | PRE-HEATING RESISTORS [RP] CONTACTOR |
| | KM2.3 | 2 | CONTATTORE MOTORE VENTILATORE | FAN MOTOR CONTACTOR |
| | KT2.2 | 2 | RELE' TEMPORIZZATORE | DELAYED RELAY |
| | 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 |
| | LEVN | 2 | LAMPADA SEGNALAZIONE APERTURA [EVN] | INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVN] |
| | 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 | LOCK-OUT RESET BUTTON |
| (×) | RA | 1 | RESISTENZE AUSILIARIE | AUXILIARY RESISTORS |
| | RP | 1 | RESISTENZE PRERISCALDATORE NAFTA | PRE-HEATING TANK RESISTORS |
| | SIEMENS LOA44 / LMO44 | 2 | APPARECCHIATURA CONTROLLO FIAMMA | CONTROL BOX |
| | SQL33.03 | 2 | SERVOCOMANDO SERRANDA ARIA | AIR DAMPER ACTUATOR |
| | ST | 1 | 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 | 1 | 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 |

(×)
UTILIZZATO SOLO PER VERSIONI "NAFTA ECOLOGICA" E "NAFTA DENSA"
*USED FOR "ECODEN" AND "HEAVY OIL" VERSIONS ONLY*

| | | | |
|---|---|---|---|
| Data 22/10/1996 | | PREC. | FOGLIO |
| Revisione 06 | | 3 | 4 |
| Dis. N. 07 – 345 | | SEGUE | TOTALE |
| | | / | 4 |




(×)
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 "OIL400 cSt a 50 °C " VERSIONS ONLY*

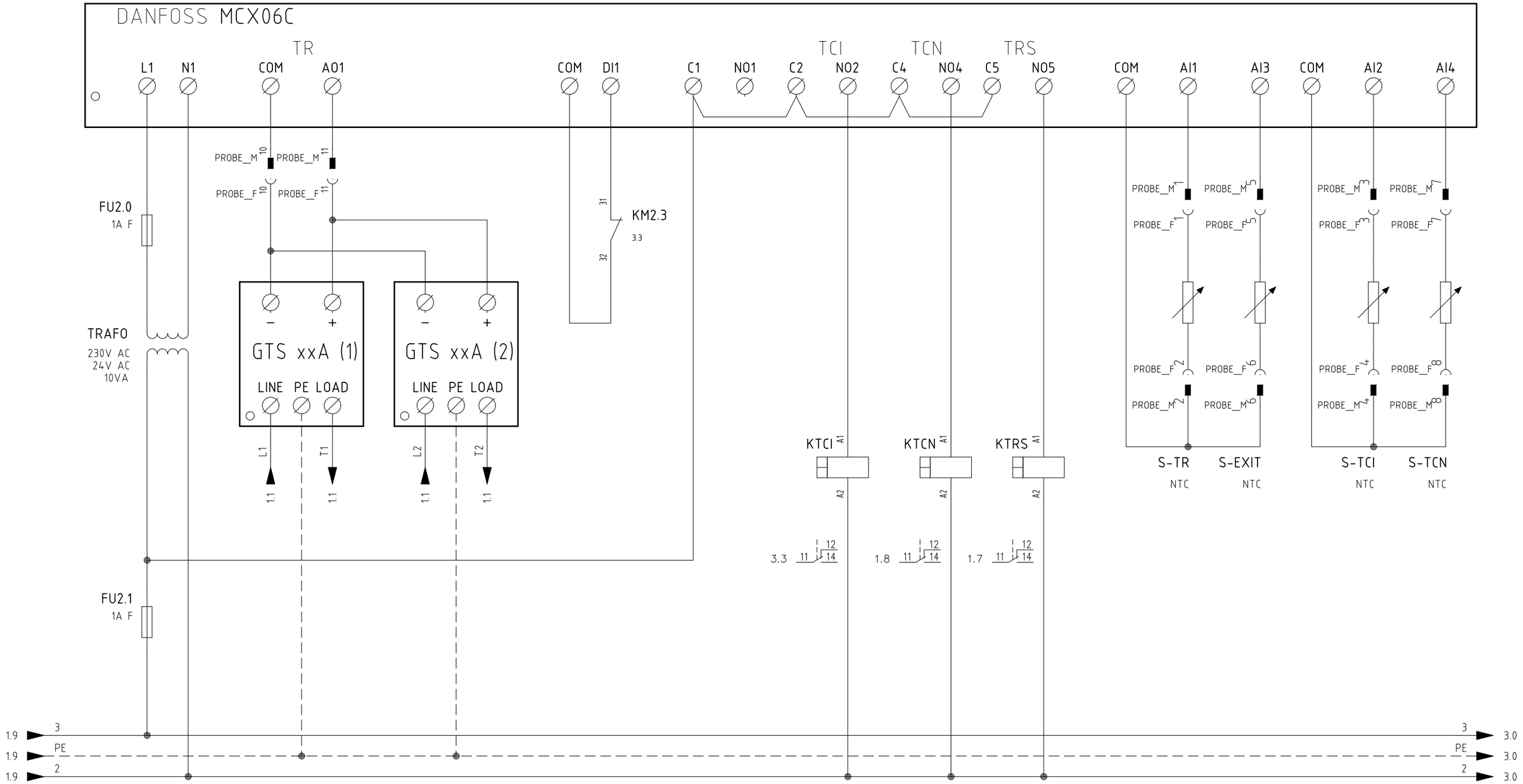
| REV. | MODIFICA | DATA | FIRME |
|---|---|---|---|
| 02 | MODIFIED MCX06C CONNECTIONS | 04/02/13 | U. PINTON |
| 01 | AGGIUNTO/ADDED LMO24.255 | 07/01/13 | U. PINTON |

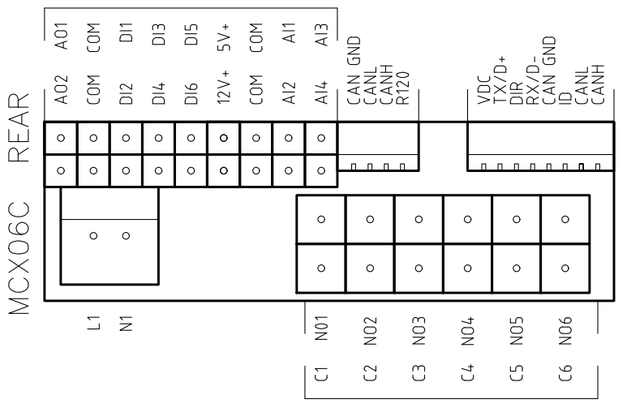
UNIGAS

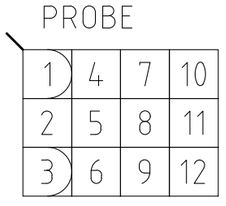
Impianto
*TIPI/TYPES PN70 ÷ PN93*
*MODELLO/MODEL x−.PR.x.xx.A*

Descrizione
*CON TIRISTORE E MULTI−TERMOSTATO*
*WITH THYRISTOR AND MULTI−THERMOSTAT DEVICE*

| Ordine | | Data 31/05/2012 | PREC. | FOGLIO |
|---|---|---|---|---|
| Commessa | Data Controllato 04/02/2013 | Revisione 02 | / | 1 |
| Esecutore U. PINTON | Controllato S. MARCHETTI | Dis. N. 07 − 0516 | SEGUE 2 | TOTALE 6 |




VISTA LATO COMPONENTI (SONDE)
*COMPONENTS SIDE VIEW (PROBE)*

| | | | |
|---|---|---|---|
| Data 31/05/2012 | | PREC. 1 | FOGLIO 2 |
| Revisione 02 | | | |
| Dis. N. 07 – 0516 | | SEGUE 3 | TOTALE 6 |

# SIEMENS LMO24.255 / LMO44.255

1 4 3 8 2 9 6 12 11 10 PE

KTCI 2.5 (12, 14, 11)

PS

FR 34 MC / 35 MC

TV 1.2

EVN A1 A2 — 36 MC / 37 MC

LEVN

LBF A1 A2

KA2.2 A1 A2

KT2.2 A1 A2 — 5 sec

CO

KM2.3 A1 A2

TA — 21 MC / 22 MC

LTA

LB — 8 MA / 9 MA

KA2.2 3.2 (12, 4, 8)

KT2.2 3.2 (16, 18, 15)

KA2.2 3.2 (1, 5, 9)

LAF

28 MC 29 MC 32 MC 7 MA 5 MA 6 MA

TAB t >

SQL33.03
*(STM30/24Q15.51/641NLP)*
*[SQM40.265A]*

Y1 (1) [X1-6] — 11 (3) [X2-3]
Y2 (2) [X1-5] — 12 (4) [X2-4]
3 (8) [X1-1] — 5 (12) [X2-5]
4 (10)

N (N) [X1-4] — 33 MC

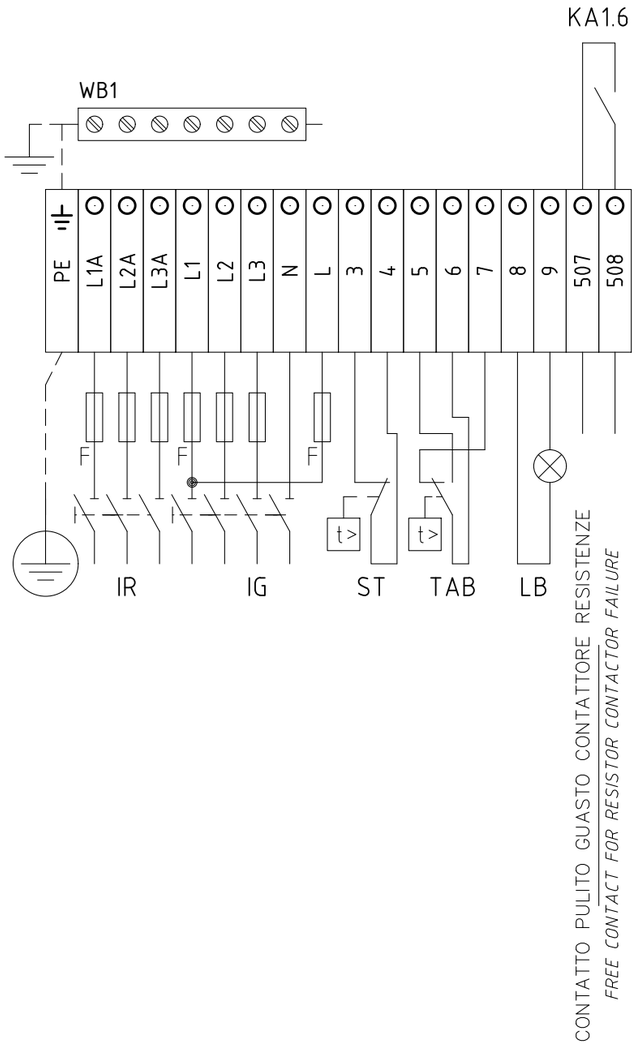
1.9 1
2.9 3
2.9 PE
2.9 2

3.6 9 1 5
3.7 12 4 8
3.8 15 16 18

1.2 2 1
1.2 4 3
1.2 6 5
1.8 14 13
2.3 32 31

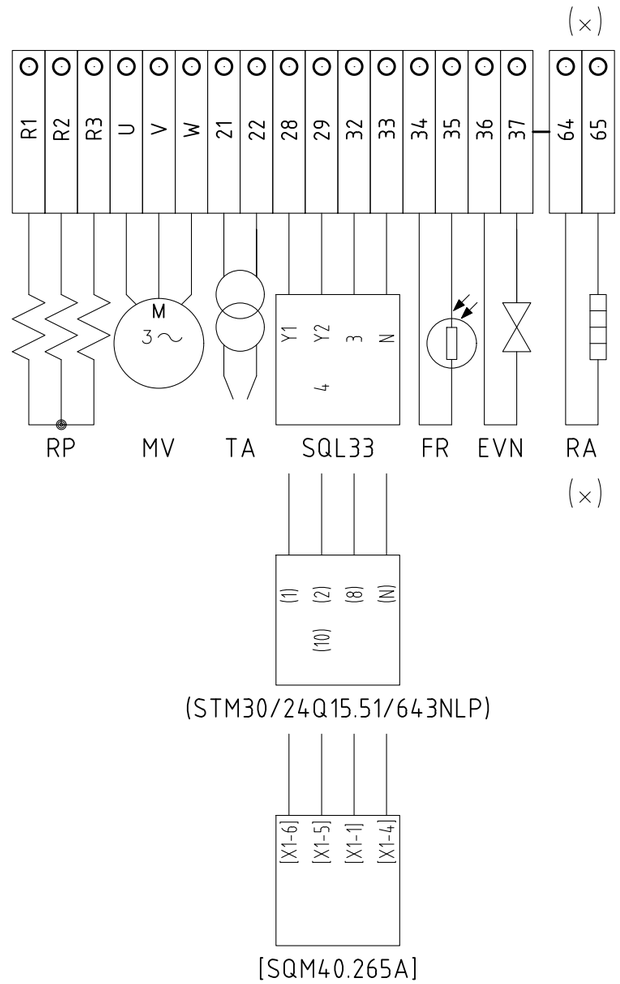
| | | | |
|---|---|---|---|
| Data 31/05/2012 | | PREC. | FOGLIO |
| Revisione 02 | | 2 | 3 |
| Dis. N. 07 – 0516 | | SEGUE 4 | TOTALE 6 |

## QG - MA
MORSETTIERA ALIMENTAZIONE BRUCIATORE
*BURNER SUPPLY TERMINAL BOARD*

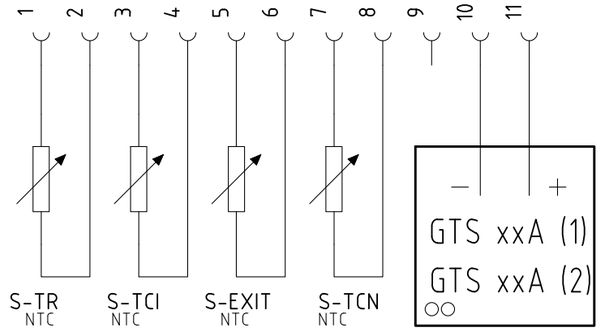



CONTATTO PULITO GUASTO CONTATTORE RESISTENZE
*FREE CONTACT FOR RESISTOR CONTACTOR FAILURE*

## QG - MC
MORSETTIERA COMPONENTI BRUCIATORE
*BURNER COMPONENT TERMINAL BOARD*




## QG – PROBE_F
CONNETTORE SONDE [MCX06C]
*[MCX06C] PROBE CONNECTOR*




SERVOCOMANDO SERRANDA ARIA
*AIR DAMPER ACTUATOR*
SQL33

| | |
|---|---|
| Y1 | ALTA FIAMMA<br>*HIGH FLAME* |
| Y2 | SOSTA E ACCENSIONE<br>*STAND-BY AND IGNITION* |
| 3 | BASSA FIAMMA<br>*LOW FLAME* |

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)
*AIR DAMPER ACTUATOR (ALTERNATIVE)*
(STM30/24Q15.51/641NLP)

| | |
|---|---|
| I | ALTA FIAMMA<br>*HIGH FLAME* |
| II | SOSTA E ACCENSIONE<br>*STAND-BY AND IGNITION* |
| III | BASSA FIAMMA<br>*LOW FLAME* |

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)
*AIR DAMPER ACTUATOR (ALTERNATIVE)*
[SQM40.265A]

| | |
|---|---|
| I | ALTA FIAMMA<br>*HIGH FLAME* |
| II | SOSTA E ACCENSIONE<br>*STAND-BY AND IGNITION* |
| III | BASSA FIAMMA<br>*LOW FLAME* |

(×)
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 "OIL400 cSt a 50 °C " VERSIONS ONLY*

| | | | |
|---|---|---|---|
| Data 31/05/2012 | | PREC. 3 | FOGLIO 4 |
| Revisione 02 | | | |
| Dis. N. 07 – 0516 | | SEGUE 5 | TOTALE 6 |

| | Sigla/Item | Foglio/Sheet | Funzione | Function |
|---|---|---|---|---|
| | (STM30/24Q15.51/641NLP) | 3 | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO) | AIR DAMPER ACTUATOR (ALTERNATIVE) |
| | CO | 3 | CONTAORE (OPTIONAL) | TIME COUNTER (OPTIONAL) |
| | EVN | 3 | ELETTROVALVOLA NAFTA | OIL SOLENOID VALVE |
| | FR | 3 | 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 RESISTENZE AUSILIARIE | AUXILIARY HEATERS FUSE |
| | FU1.3 | 1 | FUSIBILE LINEA AUSILIARI | AUXILIARY LINE FUSE |
| | FU1.4 | 1 | FUSIBILE AUSILIARIO | AUXILIARY FUSE |
| | FU2.0 | 2 | FUSIBILE AUSILIARIO | AUXILIARY FUSE |
| | FU2.1 | 2 | FUSIBILE AUSILIARIO | AUXILIARY FUSE |
| | GTS xxA (1) | 2 | TIRISTORE | THYRISTOR |
| | GTS xxA (2) | 2 | TIRISTORE | THYRISTOR |
| | IG | 1 | INTERRUTTORE GENERALE | MAINS SWITCH |
| | IL | 1 | INTERRUTTORE LINEA AUSILIARI | AUXILIARY LINE SWITCH |
| | IR | 1 | INTERRUTTORE LINEA RESISTENZE PRERISCALDATORE | PRE-HEATING RESISTOR LINE SWITCH |
| (×) | IRA | 1 | INTERRUTTORE RESISTENZE AUSILIARIE | AUXILIARY HEATERS SWITCH |
| | KA1.6 | 1 | RELE'' AUSILIARIO SEGNALAZIONE GUASTO CONTATTORE RESISTENZE | AUXILIARY RELAY FOR RESISTOR CONTACTOR FAILURE |
| | KA2.2 | 3 | RELE'' AUSILIARIO | AUXILIARY RELAY |
| | KM1.7 | 1 | CONTATTORE RESISTENZE PRERISCALDATORE [RP] | PRE-HEATING RESISTOR [RP] CONTACTOR |
| | KM2.3 | 3 | CONTATTORE MOTORE VENTILATORE | FAN MOTOR CONTACTOR |
| | KT2.2 | 3 | RELE'' TEMPORIZZATORE | DELAYED RELAY |
| | KTCI | 2 | RELE'' AUSILIARIO | AUXILIARY RELAY |
| | KTCN | 2 | RELE'' AUSILIARIO | AUXILIARY RELAY |
| | KTRS | 2 | RELE'' AUSILIARIO | AUXILIARY RELAY |
| | LAF | 3 | LAMPADA SEGNALAZIONE ALTA FIAMMA BRUCIATORE | BURNER IN HIGH FLAME INDICATOR LIGHT |
| | LB | 3 | LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE | INDICATOR LIGHT FOR BURNER LOCK-OUT |
| | LBF | 3 | LAMPADA SEGNALAZIONE BASSA FIAMMA BRUCIATORE | BURNER IN LOW FLAME INDICATOR LIGHT |
| | LEVN | 3 | LAMPADA SEGNALAZIONE APERTURA [EVN] | INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVN] |
| | LMO24.255 / LMO44.255 | 3 | 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 MOTOR OVERLOAD THERMAL CUTOUT |

(×)
UTILIZZATO SOLO PER VERSIONI "NAFTA 110 cSt a 50 °C" E "NAFTA 400 cSt a 50 °C"
*ИСПОЛЬЗУЕТСЯ ТОЛЬКО ДЛЯ «МАЗУТ 110 cSt a 50 °C» И «МАЗУТ 400 cSt a 50 °C»*

| | | | |
|---|---|---|---|
| Data 31/05/2012 | | PREC. | FOGLIO |
| Revisione 02 | | 4 | 5 |
| Dis. N. 07 – 0516 | | SEGUE | TOTALE |
| | | 6 | 6 |

| Sigla/Item | Foglio/Sheet | Funzione | Function |
|---|---|---|---|
| LTA | 3 | 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 |
| MCX06C | 2 | REGOLATORE TEMPERATURE NAFTA | OIL TEMPERATURE REGULATOR |
| MV | 1 | MOTORE VENTILATORE | FAN MOTOR |
| PS | 3 | PULSANTE SBLOCCO FIAMMA | FLAME UNLOCK BUTTON |
| (×) RA | 1 | RESISTENZE AUSILIARIE | AUXILIARY HEATERS |
| RP | 1 | RESISTENZE PRERISCALDATORE NAFTA | PRE-HEATING TANK RESISTORS |
| S-EXIT | 2 | SONDA TEMPERATURA USCITA BARILOTTO | TANK OUTLET OIL TEMPERATURE PROBE |
| S-TCI | 2 | SONDA TEMPERATURA CONSENSO IMPIANTO | PLANT CONSENT TEMPERATURE PROBE |
| S-TCN | 2 | SONDA TEMPERATURA CONSENSO NAFTA | OIL CONSENT TEMPERATURE PROBE |
| S-TR | 2 | SONDA TEMPERATURA RESISTENZE | RESISTOR TEMPERATURE PROBE |
| SQL33.03 | 3 | SERVOCOMANDO SERRANDA ARIA | AIR DAMPER ACTUATOR |
| ST | 1 | SERIE TERMOSTATI/PRESSOSTATI | SERIES OF THERMOSTATS OR PRESSURE SWITCHES |
| TA | 3 | TRASFORMATORE DI ACCENSIONE | IGNITION TRANSFORMER |
| TAB | 3 | TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA | HIGH-LOW THERMOSTAT/PRESSURE SWITCHES |
| TRAFO | 2 | TRASFORMATORE AUSILIARIO | AUXILIARY TRANSFORMER |
| TV | 1 | TERMICO MOTORE VENTILATORE | FAN MOTOR THERMAL |
| WB1 | 1 | BARRA DI TERRA | EARTH TERMINAL |
| [SQM40.265A] | 3 | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO) | AIR DAMPER ACTUATOR (ALTERNATIVE) |

(×)
UTILIZZATO SOLO PER VERSIONI "NAFTA 110 cSt a 50 °C" E "NAFTA 400 cSt a 50 °C"
*ИСПОЛЬЗУЕТСЯ ТОЛЬКО ДЛЯ «МАЗУТ 110 cSt a 50 °C» И «МАЗУТ 400 cSt a 50 °C»*

| | | | |
|---|---|---|---|
| Data 31/05/2012 | | PREC. 5 | FOGLIO 6 |
| Revisione 02 | | | |
| Dis. N. 07 – 0516 | | SEGUE / | TOTALE 6 |