

# **KP60 KP72 - KP73**

***Progressive  
and fully-modulating  
gas - heavy oil burners***

**MANUAL OF INSTALLATION - USE - MAINTENANCE**

***CIB UNIGAS***

**BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ**

## DANGERS, WARNINGS AND NOTES OF CAUTION

**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 and accessories.

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.
- 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. The occurrence of any of the following circumstances may cause explosions, polluting unburnt gases (example: carbon monoxide CO), burns, serious harm to people, animals and things:

- Failure to comply with one of the WARNINGS in this chapter
- Incorrect handling, installation, adjustment or maintenance of the burner
- Incorrect use of the burner or incorrect use of its parts or optional supply

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

### 3) GENERAL INSTRUCTIONS DEPENDING ON FUEL USED

#### 3a) ELECTRICAL CONNECTION

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

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

#### GENERAL

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

#### SPECIAL INSTRUCTIONS FOR USING GAS

Have qualified personnel inspect the installation to ensure that:

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

#### Precautions if you can smell gas

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

### DIRECTIVES AND STANDARDS

#### *Gas burners*

##### European directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

##### Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

#### *Light oil burners*

##### European directives

- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

##### Harmonized standards

- UNI EN 267-2011 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

#### *Heavy oil burners*

##### European Directives

- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

##### Harmonized standards

- UNI EN 267 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

### Gas - Light oil burners

#### European Directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

#### Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- UNI EN 267 (Automatic forced draught burners for liquid fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

### Gas - Heavy oil burners

#### European directives:

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

#### Harmonized standards

- UNI EN 676 (Automatic forced draught burners for gaseous fuels)
- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- CEI EN 60335-1 (Specification for safety of household and similar electrical appliances);
- CEI EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections).
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

### Industrial burners

#### European directives

- Regulation 2016/426/UE (appliances burning gaseous fuels)
- 2014/35/UE (Low Tension Directive)
- 2014/30/UE (Electromagnetic compatibility Directive)
- 2006/42/EC (Machinery Directive)

#### Harmonized standards

- EN 55014-1 (Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus)
- EN 746-2 (Industrial thermoprocessing equipment - Part 2: Safety requirements for combustion and fuel handling systems)
- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);
- EN 60204-1:2006 (Safety of machinery – Electrical equipment of machines.)
- EN 60335-2 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements)

### Burner data plate

For the following information, please refer to the data plate:

- burner type and burner model: must be reported in any communication with the supplier
- burner ID (serial number): must be reported in any communication with the supplier
- date of production (year and month)
- information about fuel type and network pressure

|              |    |
|--------------|----|
| Type         | -- |
| Model        | -- |
| Year         | -- |
| S.Number     | -- |
| Output       | -- |
| Oil Flow     | -- |
| Fuel         | -- |
| Category     | -- |
| Gas Pressure | -- |
| Viscosity    | -- |
| El. Supply   | -- |
| El. Consump. | -- |
| Fan Motor    | -- |
| Protection   | -- |
| Drwaing n°   | -- |
| P.I.N.       | -- |

### SYMBOLS USED



#### WARNING!

Failure to observe the warning may result in irreparable damage to the unit or damage to the environment



#### DANGER!

Failure to observe the warning may result in serious injuries or death.



#### WARNING!

Failure to observe the warning may result in electric shock with lethal consequences

Figures, illustrations and images used in this manual may differ in appearance from the actual product.

### BURNER SAFETY

The burners - and the configurations described below - comply with the regulations in force regarding health, safety and the environment. For more in-depth information, refer to the declarations of conformity that are an integral part of this Manual.



**DANGER! Incorrect motor rotation can seriously damage property and injure people.**

### Residual risks deriving from misuse and prohibitions

The burner has been built in order to make its operation safe; there are, however, residual risks.



Do not touch any mechanical moving parts with your hands or any other part of your body. Injury hazard  
Do not touch any parts containing fuel (i.e. tank and pipes). Scalding hazard  
Do not use the burner in situations other than the ones provided for in the data plate.  
Do not use fuels other than the ones stated.  
Do not use the burner in potentially explosive environments.  
Do not remove or by-pass any machine safety devices.  
Do not remove any protection devices or open the burner or any other component while the burner is running.  
Do not disconnect any part of the burner or its components while the burner is running.  
Untrained staff must not modify any linkages.



After any maintenance, it is important to restore the protection devices before restarting the machine.  
All safety devices must be kept in perfect working order.  
Personnel authorized to maintain the machine must always be provided with suitable protections.



ATTENTION: while running, the parts of the burner near the generator (coupling flange) are subject to overheating. Where necessary, avoid any contact risks by wearing suitable PPE.

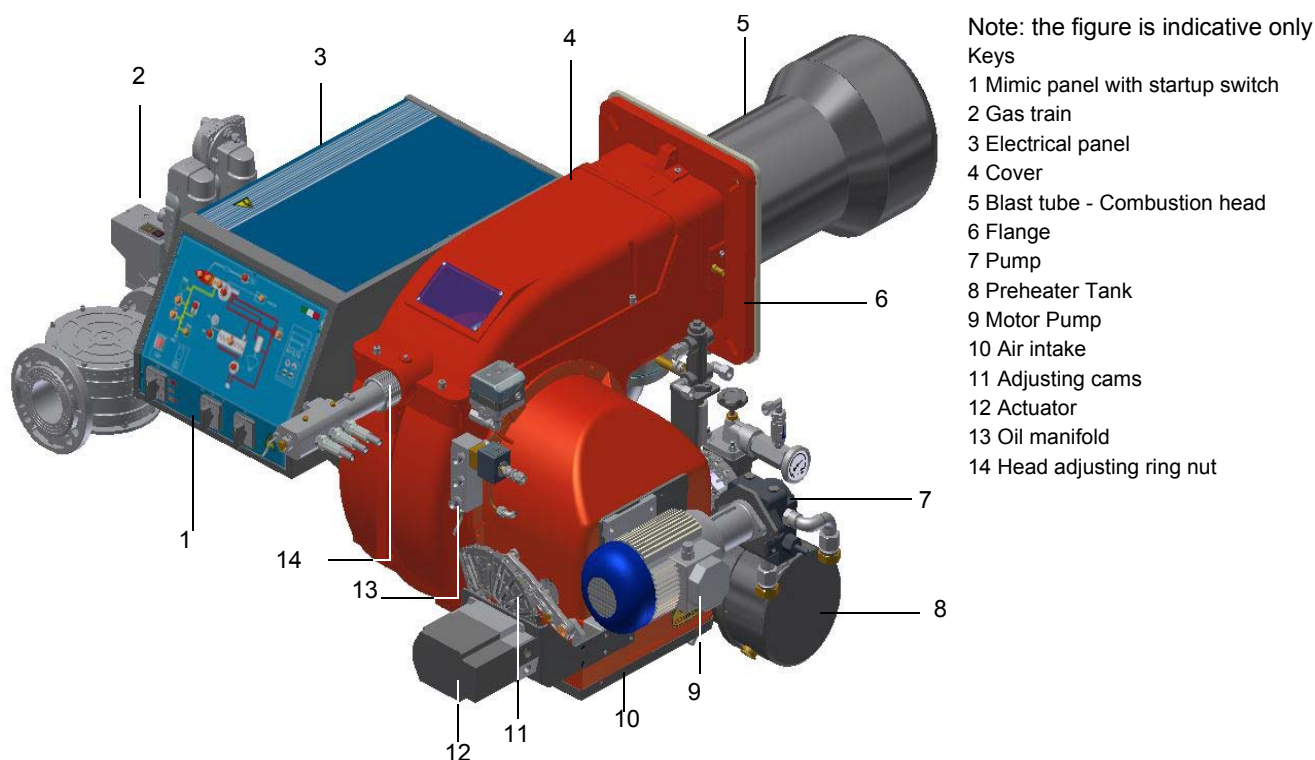
## PART I: INSTALLATION MANUAL

### Burner model identification

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

| Type | Model | MP. | MD. | S.  | .   | A.  | 1.  | 65 |
|------|-------|-----|-----|-----|-----|-----|-----|----|
| (1)  | (2)   | (3) | (4) | (5) | (6) | (7) | (8) |    |

|                         |                                                                                                                                                                             |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) BURNER TYPE         | KP60 - KP72 - KP73                                                                                                                                                          |
| (2) FUEL                | M - Natural gas<br>N - Heavy oil, viscosity <= 50cSt (7° E) @ 50° C<br>D - Heavy oil, viscosity <= 400cSt (50° E) @ 50° C<br>P - Petroleum, viscosity 89cSt (12° E) @ 50° C |
| (3) OPERATION           | PR - Progressive<br>MD - Fully modulating                                                                                                                                   |
| (4) BLAST TUBE          | S - Standard                                                                                                                                                                |
| (5) DESTINATION COUNTRY | * - see data plate                                                                                                                                                          |
| (6) BURNER VERSION      | A - Standard                                                                                                                                                                |
| (7) EQUIPMENT           | 0 = 2 Gas valves<br>1 = 2 Gas valves + gas proving system<br>7 = 2 Gas valves+high gas pressure switch<br>8 = 2 Gas valves + gas proving system+high gas pressure switch    |
| (8) GAS CONNECTION      | 32 = Rp1" <sup>1</sup> / <sub>4</sub> 40 = Rp1" <sup>1</sup> / <sub>2</sub> 50 = Rp2"    65 = DN65    80 = DN80                                                             |



## Specifications

| BURNERS                             |                                   | KP60                                    |
|-------------------------------------|-----------------------------------|-----------------------------------------|
| Output                              | min. kW - max. kW                 | 160 - 880                               |
| Fuel                                |                                   | Natural gas - Heavy oil                 |
| Gas category                        |                                   | (see next paragraph)                    |
| Heavy oil viscosity                 |                                   | See "Burner model identification" table |
| Oil train inlet pressure            | bar                               | 2 max                                   |
| Gas rate                            | min. - max. (Stm <sup>3</sup> /h) | 17 - 93                                 |
| Gas pressure                        | min. - max. mbar                  | (Note2)                                 |
| Heavy oil rate                      | min. - max. kg/h                  | 14 - 77                                 |
| Power supply                        |                                   | 400V 3N ~ 50Hz                          |
| Total power consumption (Heavy oil) | kW                                | 6.65                                    |
| Total power consumption (Petroleum) | kW                                | 3.65                                    |
| Fan motor                           | kW                                | 1.1                                     |
| Pump motor                          | kW                                | 0.55                                    |
| Pre-heater resistors (heavy oil)    | kW                                | 4.5                                     |
| Pre-heater resistors (Petroleum)    | kW                                | 1.5                                     |
| Protection                          |                                   | IP40                                    |
| Operation                           |                                   | Progressive - Fully modulating          |
| Gas Train 32                        | Valves size/Gas connection        | 32 / Rp1" <sub>1/4</sub>                |
| Gas Train 40                        | Valves size/Gas connection        | 40 / Rp1" <sub>1/2</sub>                |
| Gas Train 50                        | Valves size/Gas connection        | 50 / Rp 2"                              |
| Gas Train 65                        | Valves size/Gas connection        | 65 / DN65                               |
| Operating temperature               | °C                                | -10 ÷ +50                               |
| Storage temperature                 | °C                                | -20 ÷ +60                               |
| Working service *                   |                                   | Intermittent                            |

|               |                                                                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Note1:</b> | All gas flow rates are referred to Stm <sup>3</sup> /h (1013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value H <sub>i</sub> = 34.02 MJ/Stm <sup>3</sup> ). |
| <b>Note2:</b> | Maximum gas pressure = 360mbar (with Dungs MBDLE/MBC valves)<br>= 500mbar (with Dungs MBC or Siemens VGD gas valves).<br>Minimum gas pressure = see gas curves.                                      |

\* **NOTE ON THE WORKING SERVICE:** the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.



| BURNERS                             |                                   | KP72 ..0.xx                             | KP72 ..1.xx                           | KP73       |
|-------------------------------------|-----------------------------------|-----------------------------------------|---------------------------------------|------------|
| Output                              | min. kW - max. kW                 | 330 - 1200                              | 330 - 1550                            | 320 - 2050 |
| Fuel                                |                                   | Natural gas - Heavy oil                 |                                       |            |
| Gas category                        |                                   | (see next paragraph)                    |                                       |            |
| Heavy oil viscosity                 |                                   | See "Burner model identification" table |                                       |            |
| Oil train inlet pressure            | bar                               | 2 max                                   |                                       |            |
| Gas rate                            | min. - max. (Stm <sup>3</sup> /h) | 35 - 127                                | 35 - 164                              | 34 - 217   |
| Gas pressure                        | min. - max. mbar                  | (Note2)                                 |                                       |            |
| Heavy oil rate                      | min. - max. kg/h                  | 29 - 107                                | 29 - 138                              | 28 - 179   |
| Power supply                        |                                   | 400V 3N ~ 50Hz                          |                                       |            |
| Total power consumption (Heavy oil) | kW                                | 11.25                                   | 11.25                                 | 16.6       |
| Total power consumption (Petroleum) | kW                                | 5.91                                    | 5.91                                  | 8.6        |
| Fan motor                           | kW                                | 2.2                                     | 2.2                                   | 3          |
| Pump motor                          | kW                                | 0.55                                    | 0.55                                  | 1.1        |
| Pre-heater resistors (heavy oil)    | kW                                | 8                                       | 8                                     | 12         |
| Pre-heater resistors (Petroleum)    | kW                                | 2.66                                    | 2.66                                  | 4          |
| Protection                          |                                   | IP40                                    |                                       |            |
| Operation                           |                                   | Progressive - Fully modulating          |                                       |            |
| Gas Train 40                        | Valves size / Gas connection      | 40 / Rp1" <sup>1</sup> / <sub>2</sub>   | 40 / Rp1" <sup>1</sup> / <sub>2</sub> | -          |
| Gas Train 50                        | Valves size / Gas connection      | 50 / Rp 2                               |                                       |            |
| Gas Train 65                        | Valves size / Gas connection      | 65 / DN65                               |                                       |            |
| Gas Train 80                        | Valves size / Gas connection      | 80 / DN80                               |                                       |            |
| Operating temperature               | °C                                | -10 ÷ +50                               |                                       |            |
| Storage temperature                 | °C                                | -20 ÷ +60                               |                                       |            |
| Working service                     |                                   | Intermittent                            |                                       |            |

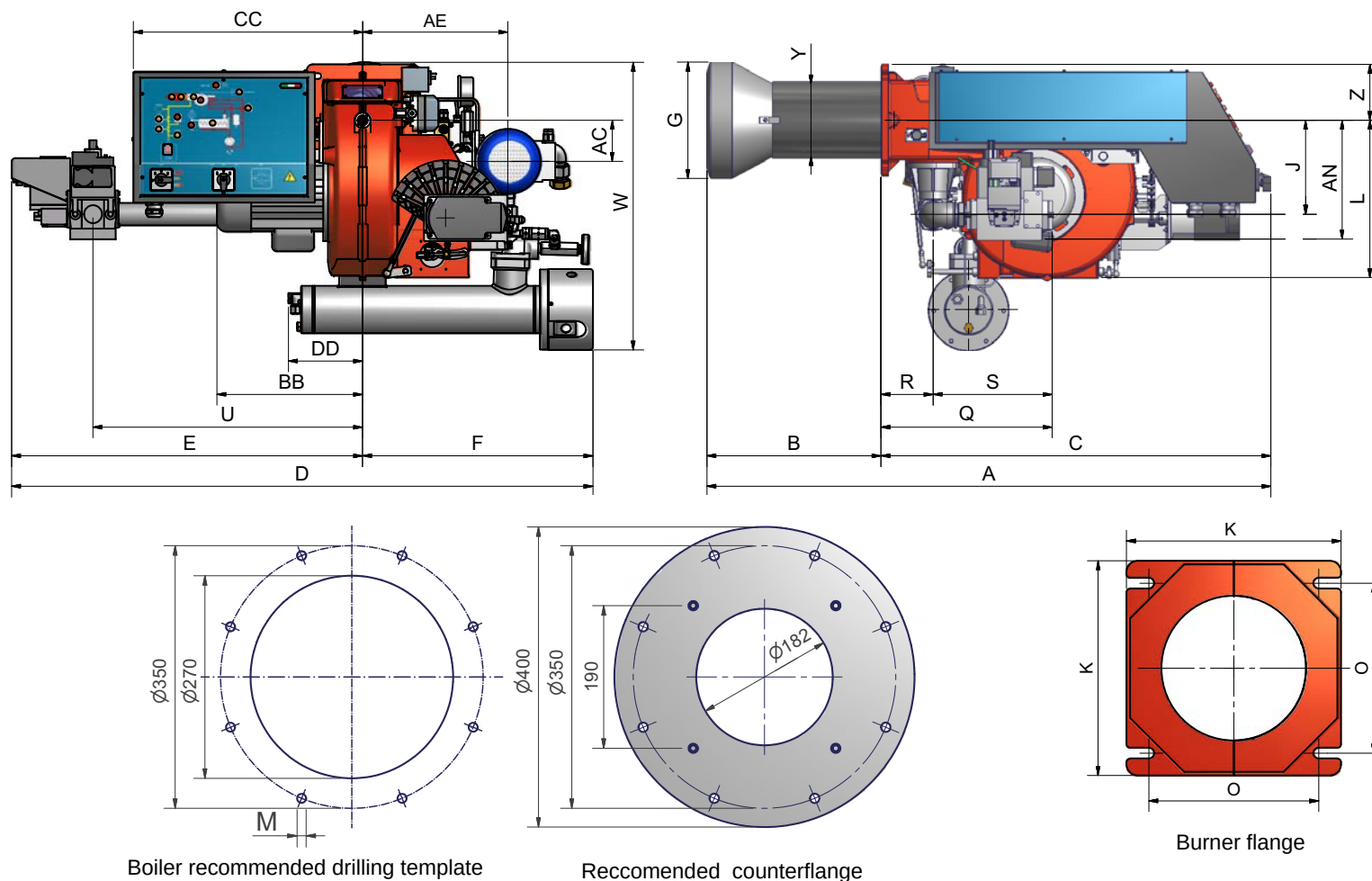
|               |                                                                                                                                                                                                      |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Note1:</b> | All gas flow rates are referred to Stm <sup>3</sup> /h (1013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value H <sub>i</sub> = 34.02 MJ/Stm <sup>3</sup> ). |
| <b>Note2:</b> | Maximum gas pressure = 360mbar (with Dungs MBDLE/MBC valves)<br>= 500mbar (with Dungs MBC or Siemens VGD gas valves).<br>Minimum gas pressure = see gas curves.                                      |

**\* NOTE ON THE WORKING SERVICE:** the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.

### Country and usefulness gas categories

| GAS<br>CATEGORY        | COUNTRY |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
|------------------------|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
|                        | AT      | ES | GR | SE | FI | IE | HU | IS | NO | CZ | DK | GB | IT | PT | CY | EE | LV | SI | MT | SK | BG | LT | RO | TR | CH |  |
| I <sub>2H</sub>        |         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| I <sub>2E</sub>        | LU      | PL | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |  |
| I <sub>2E( R ) B</sub> | BE      | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |  |
| I <sub>2L</sub>        | NL      | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |  |
| I <sub>2ELL</sub>      | DE      | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |  |
| I <sub>2Er</sub>       | FR      | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  | -  |  |

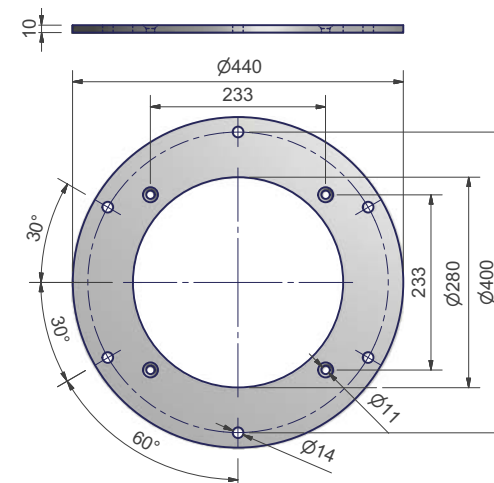
# Overall dimensions - (mm)



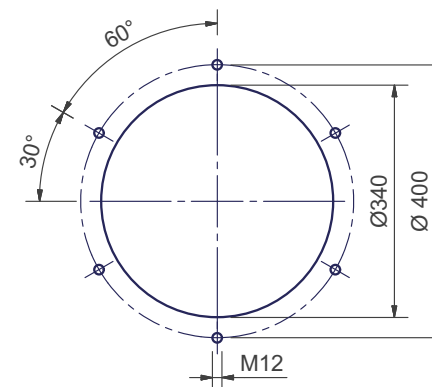
|      | *DN | A    | AC | AE  | AN  | B   | BB  | C   | CC  | D    | DD  | E   | F   | G   | J   | K   | L   | M   | O   | Q   | R   | S   | U   | W   | Y   | Z   |
|------|-----|------|----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| KP60 | 32  | 1213 | 89 | 313 | 256 | 374 | 314 | 839 | 493 | 1251 | 160 | 755 | 496 | 250 | 202 | 240 | 335 | M12 | 190 | 368 | 112 | 256 | 580 | 619 | 156 | 120 |
|      | 40  | 1213 | 89 | 313 | 256 | 374 | 314 | 839 | 493 | 1251 | 160 | 755 | 496 | 250 | 202 | 240 | 335 | M12 | 190 | 439 | 112 | 327 | 580 | 619 | 156 | 120 |
|      | 50  | 1213 | 89 | 313 | 256 | 374 | 314 | 839 | 493 | 1251 | 160 | 755 | 496 | 250 | 202 | 240 | 335 | M12 | 190 | 447 | 112 | 335 | 580 | 619 | 156 | 120 |
|      | 65  | 1213 | 89 | 313 | 256 | 374 | 314 | 839 | 493 | 1436 | 160 | 774 | 496 | 250 | 202 | 240 | 335 | M12 | 190 | 515 | 112 | 403 | 560 | 619 | 156 | 120 |

A COUNTERFLANGE IS MANDATORY:a gasket must be placed between the generator and the counterflange





Reccomended counterflange



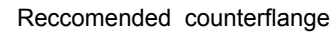
Burner flange

Boiler recommended drilling template

\*DN = gas valves size

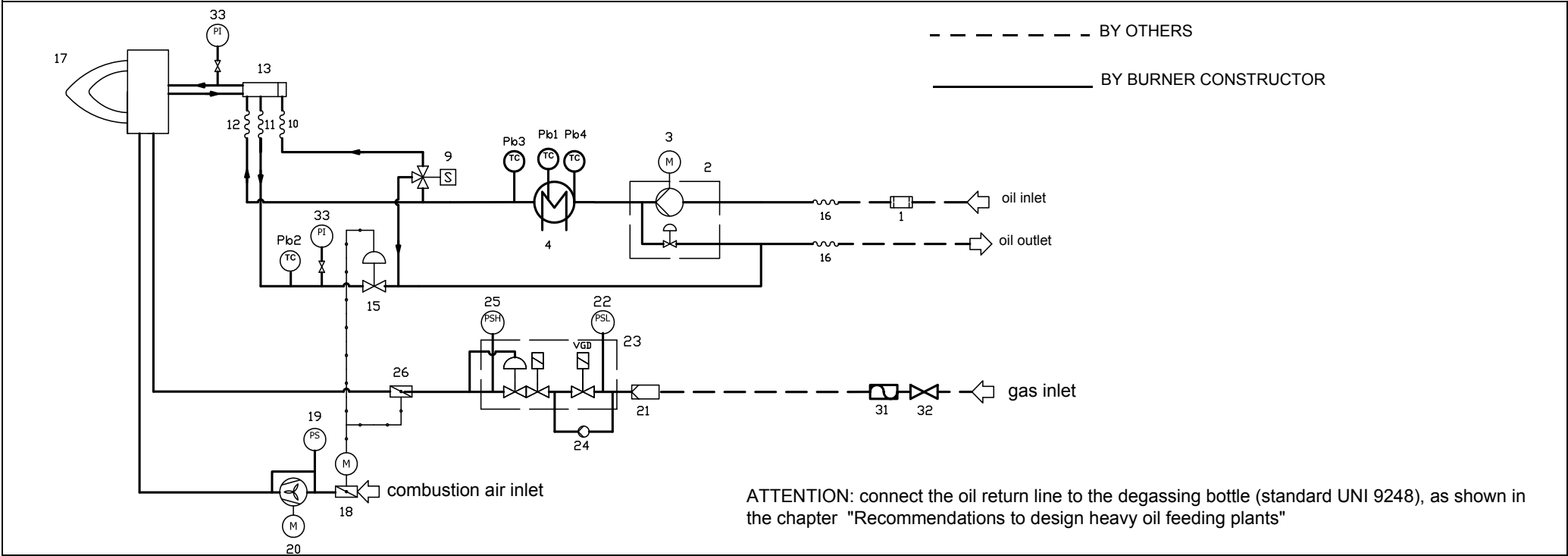
A COUNTERFLANGE IS MANDATORY:a gasket must be placed between the generator and the counterflange

NOTE: the overall dimensions are referred to burners provided with Siemens VGD valves.



ATTENTION: the counterflange is an optional supplied only on request. A gasket must be placed between the generator and the counterflange

Fig. 1 3I2MD11 v1 Hydraulic diagram

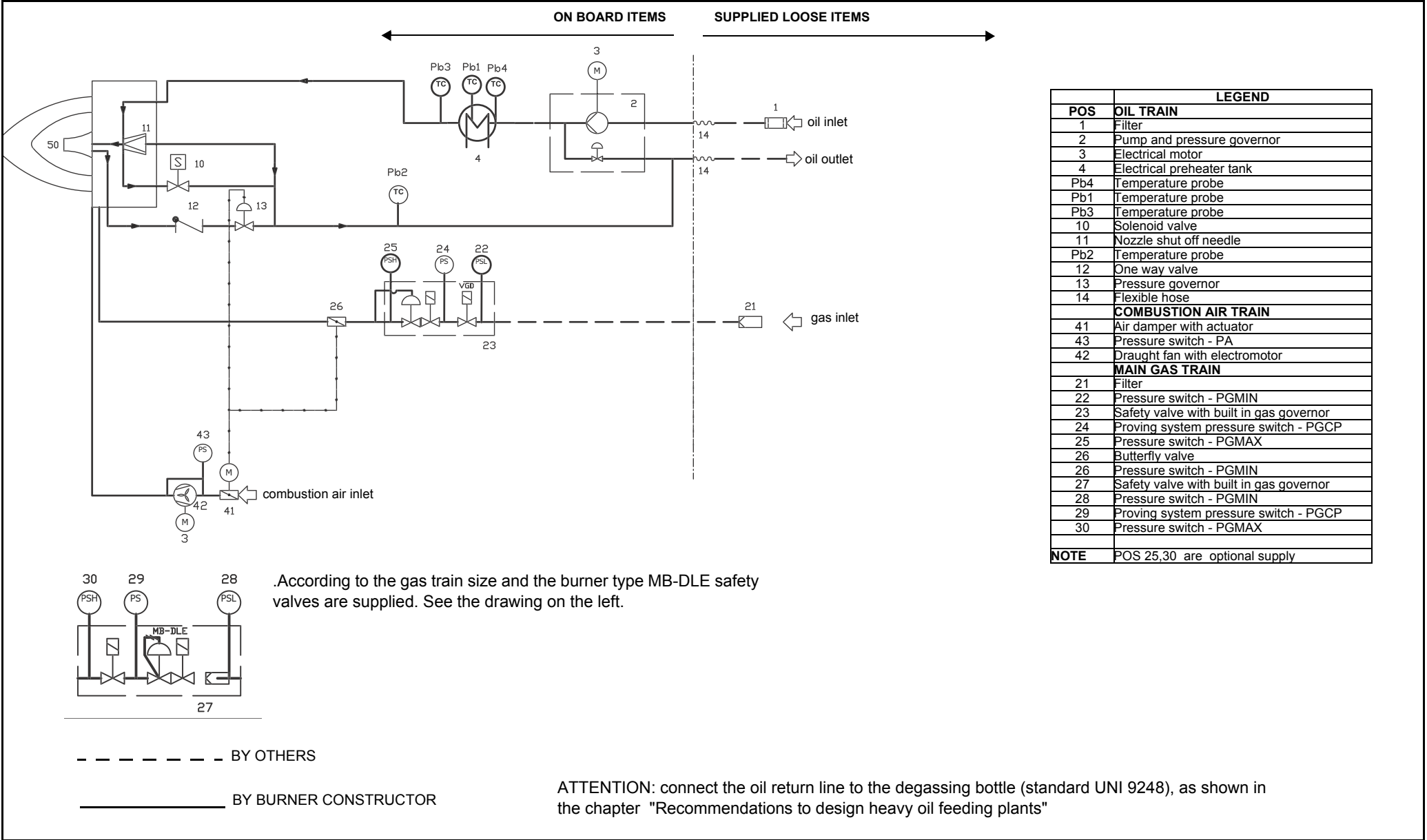


NOTE: POS 25, POS 31, POS 32, POS 33 are optional supply

| POS | OIL TRAIN                        |    | COMBUSTION AIR TRAIN                    |
|-----|----------------------------------|----|-----------------------------------------|
| 1   | Filter                           | 18 | Air damper with actuator                |
| 2   | Pump and pressure governor       | 19 | Pressure switch - PA                    |
| 3   | Electrical motor                 | 20 | Draught fan with electromotor           |
| 33  | Pressure gauge with manual valve |    | <b>MAIN GAS TRAIN</b>                   |
| 4   | Electrical preheater tank        | 21 | Filter                                  |
| Pb4 | Temperature probe                | 22 | Pressure switch - PGMIN                 |
| Pb1 | Temperature probe                | 23 | Safety valve with built in gas governor |
| Pb3 | Temperature probe                | 24 | Proving system                          |
| 9   | 3-way solenoid valve             | 25 | Pressure switch - PGMAX                 |
| 10  | Flexible hose                    | 26 | Butterfly valve                         |
| 11  | Flexible hose                    | 31 | Bellows unit                            |
| Pb2 | Temperature probe                | 32 | Manual valve                            |
| 13  | Oil distributor                  |    |                                         |
| 14  | Low thermostat - TCI             |    |                                         |
| 15  | Pressure governor                |    |                                         |
| 16  | Flexible hose                    |    |                                         |
| 17  | Burner                           |    |                                         |

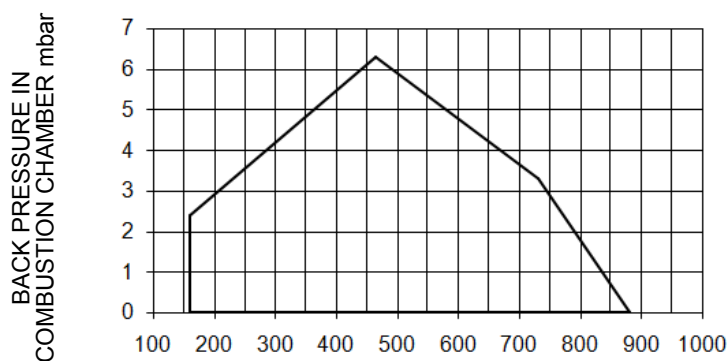
The following items are included only on certain types of burner: 10, 11, 12

Fig. 2 - 3I2MD21 v1 Hydraulic diagram

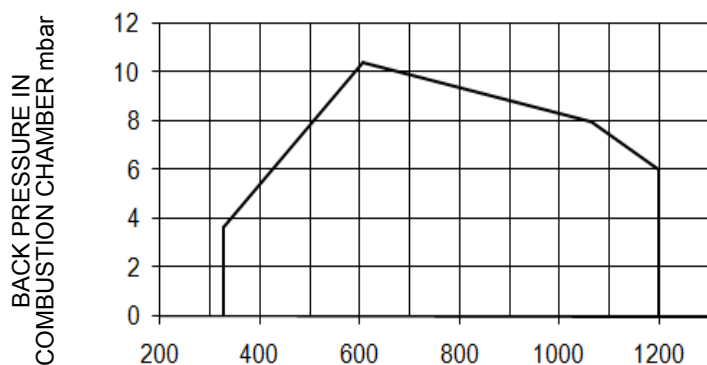


## Performance curves

**KP60**

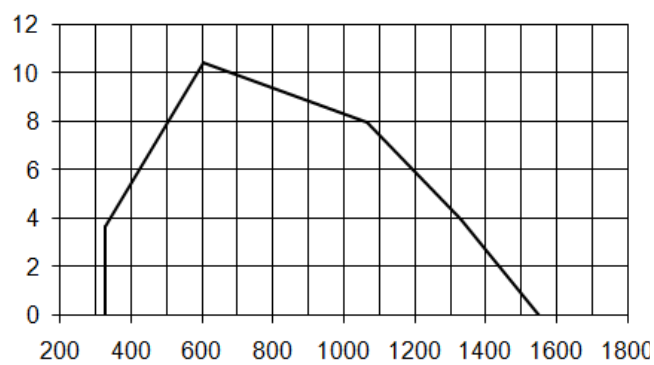


**KP72 ...0.xx**



kW

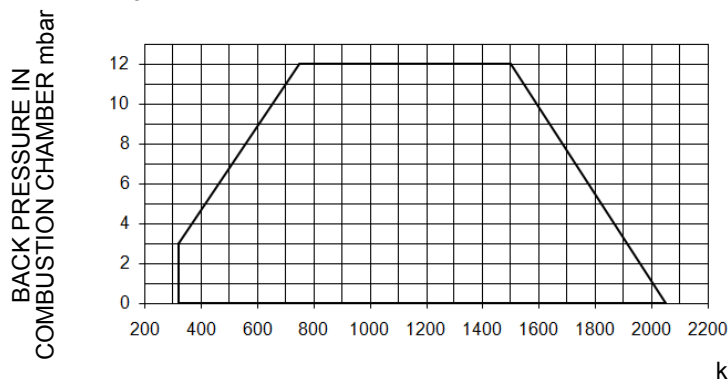
**KP72 ...1.xx**



kW

kW

**KP73**



kW

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

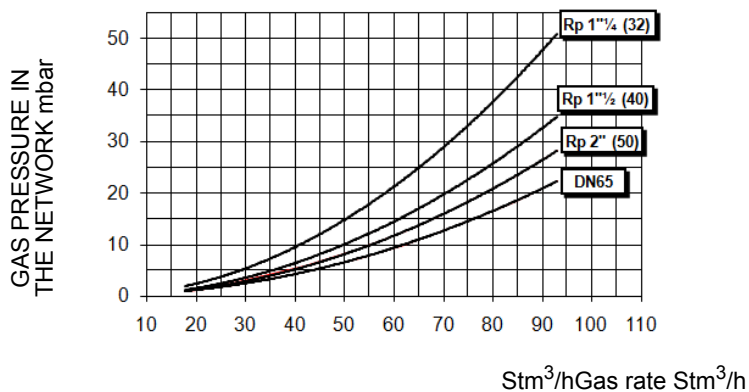
Data are referred to standard conditions: atmospheric pressure at 1013mbar, ambient temperature at 15°C.

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

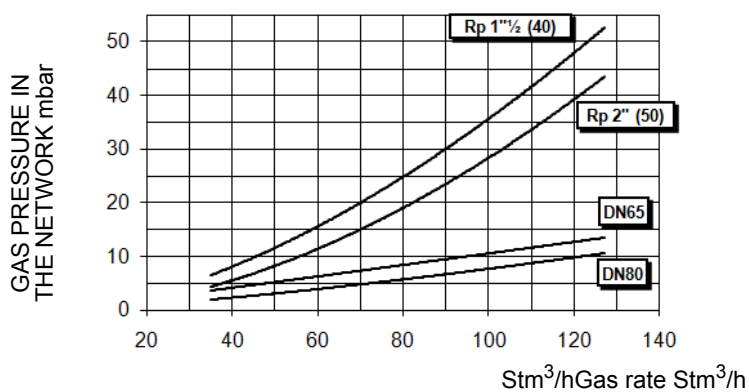
## Pressure in the Network / gas flow rate curves

### ● Gas burners

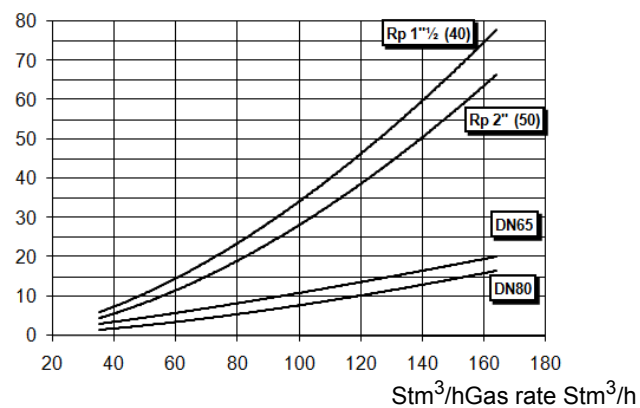
#### KP60



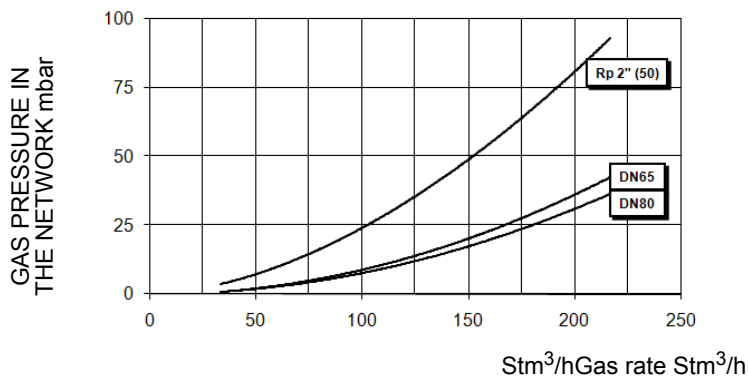
#### KP72 ...0.xx



#### KP72 ...1.xx



#### KP73



**Caution:** the gas rate value is quoted on the x-axis, the related network pressure is quoted on the y-axis (pressure value in the combustion chamber is not included). To know the minimum pressure at the gas train inlet, necessary to get the requested gas rate, add the pressure value in the combustion chamber to the value read on the y-axis.



### Combustion head gas pressure curves depending on the flow rate

**Curves are referred to pressure = 0mbar in the combustion head!**

The curves referred to the gas pressure in the combustion head, depending on the gas flow rate, are referred to the burner properly adjusted (percentage of residual  $O_2$  in the flues as shown in the "Recommended combustion values" table and CO in the standard limits). During this stage, the combustion head, the gas butterfly valve and the actuator are at the maximum opening. Refer to Fig. 3, showing the correct way to measure the gas pressure, considering the values of pressure in combustion chamber, surveyed by means of the pressure gauge or taken from the boiler's Technical specifications.

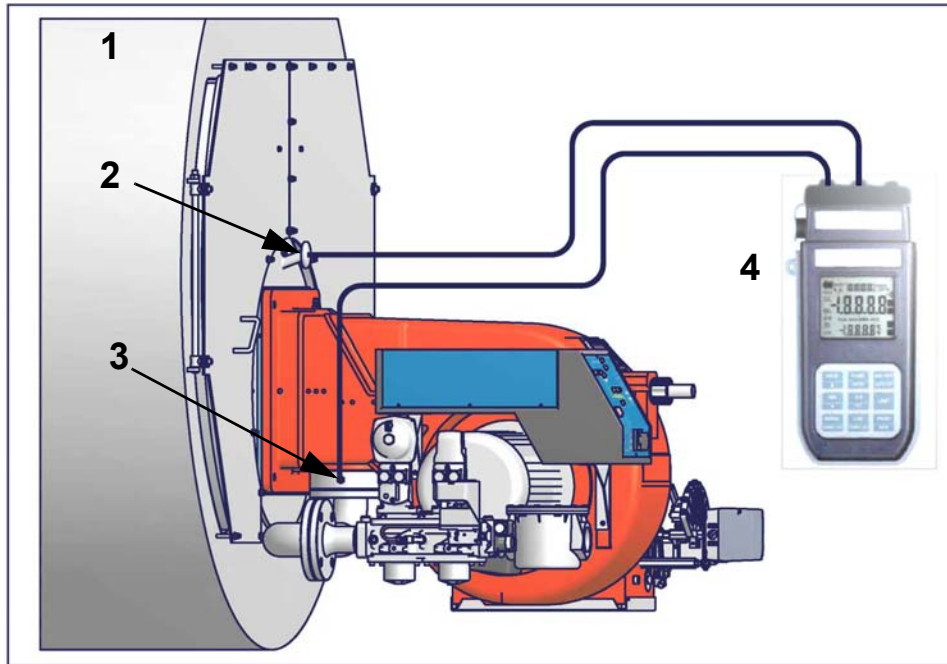


Fig. 3

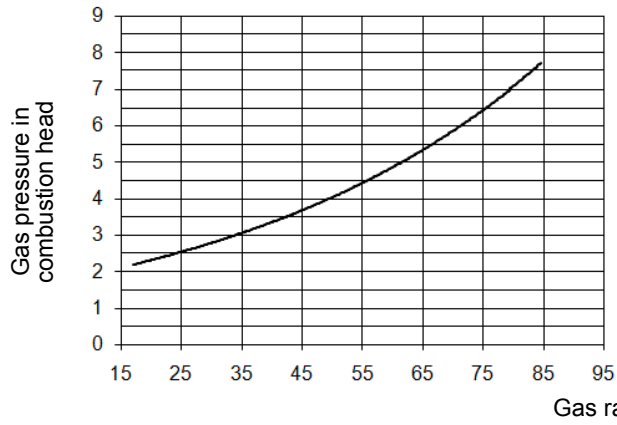
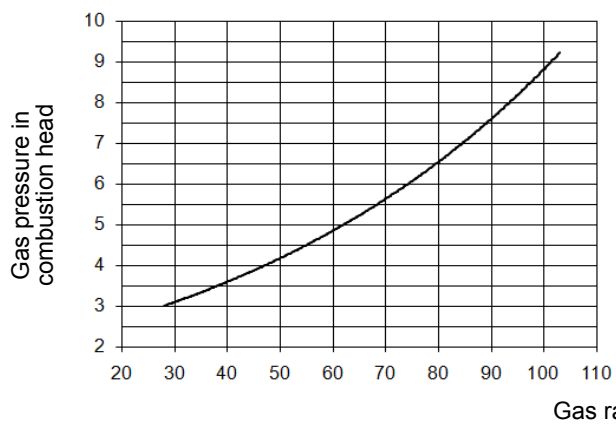
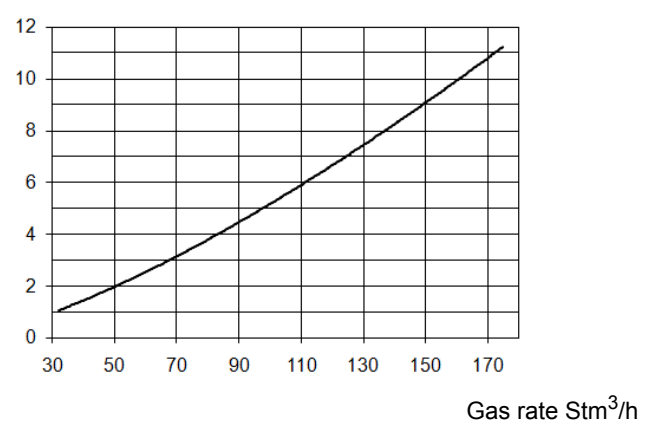
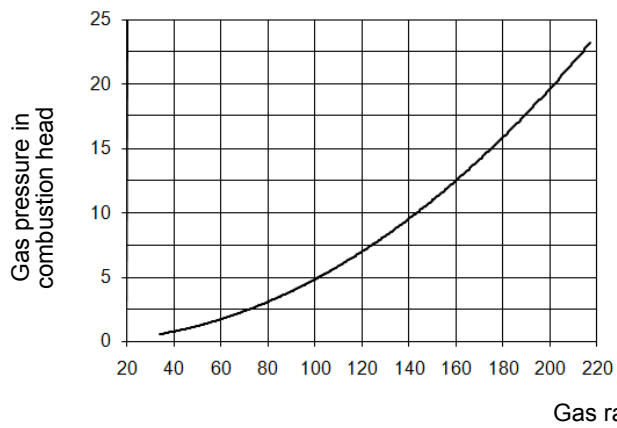
#### Key

- 1 Generator
- 2 Pressure outlet on the combustion chamber
- 3 Gas pressure outlet on the butterfly valve
- 4 Differential pressure gauge

### Measuring the gas pressure in the combustion head

In order to measure the pressure in the combustion head, insert the pressure gauge probes: one into the combustion chamber's pressure outlet to get the pressure in the combustion chamber and the other one into the butterfly valve's pressure outlet of the burner. On the basis of the measured differential pressure, it is possible to get the maximum flow rate: in the pressure - rate curves (showed on the next paragraph), it is easy to find out the burner's output in  $Stm^3/h$  (quoted on the x axis) from the pressure measured in the combustion head (quoted on the y axis). The data obtained must be considered when adjusting the gas flow rate.

**NOTE: THE PRESSURE-RATE CURVES ARE GIVEN AS INFORMATION ONLY; FOR A PROPER SETTING OF THE GAS RATE, PLEASE REFER TO THE GAS METER READING.**

**Pressure in combustion head - gas rate curves****KP60 ...****KP65****KP72****KP73**

## MOUNTINGS AND CONNECTIONS

### Packing

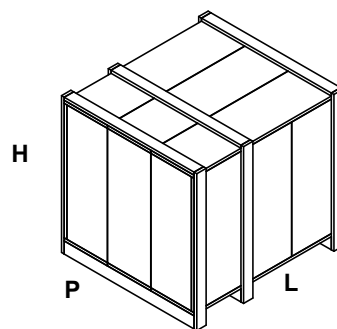
The burners are despatched in cardboard boxes or wooden cages whose dimensions are:

1730mmx 1280mm x 1020mm (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 with gas train detached;
- gasket to be inserted between the burner and the boiler;
- flexible oil pipes;
- oil filter;
- envelope containing this manual

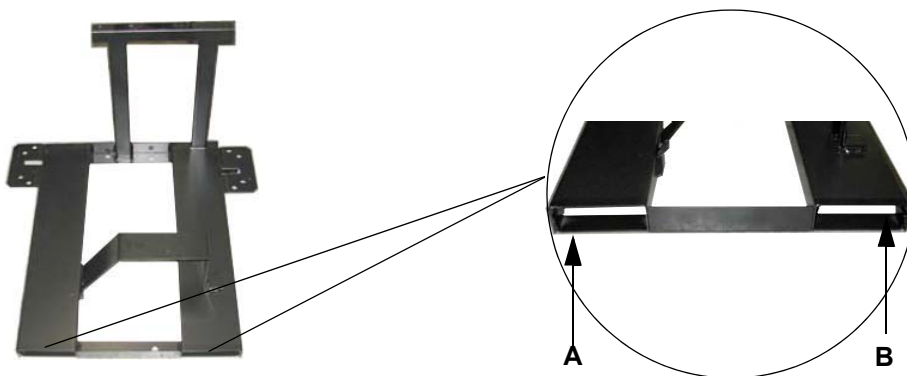
To get rid of the burner's packing, follow the procedures laid down by current laws on disposal of materials.



### Handling the burner

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

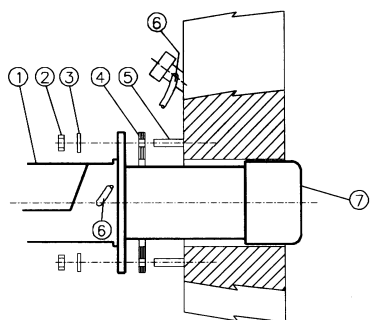
The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A and B ways. Remove the stirrup only once the burner is installed to the boiler.



### Fitting the burner to the boiler

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

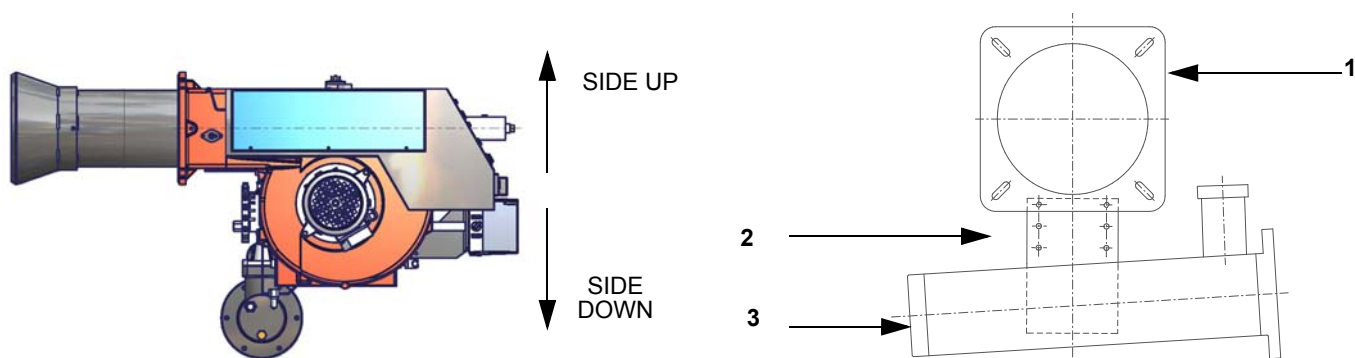
- 1 make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions")
- 2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
- 3 place the stud bolts (5) on boiler's door, according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



#### Keys

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

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

**Key**

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

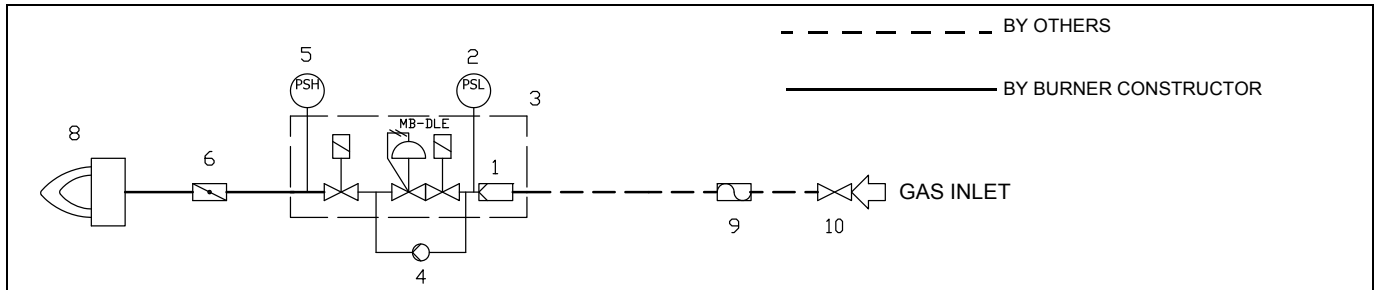
## GAS TRAIN CONNECTIONS

The diagrams show the components of the gas train included in the delivery and which must be fitted by the installer. The diagrams are in compliance with the current laws.

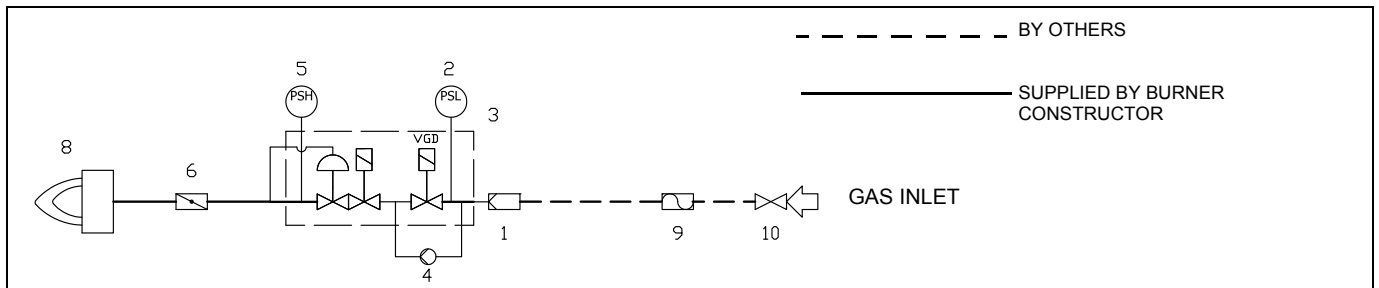


**WARNING: BEFORE EXECUTING THE CONNECTIONS TO THE GAS PIPE NETWORK, BE SURE THAT THE MANUAL CUTOFF VALVES ARE CLOSED.**

Gas train with valves group MB-DLE (2 valves + gas filter + pressure governor) + VPS504 gas proving system



Gas train with valves group VGD with built-in gas pressure governor + gas proving system VPS504



Key

|   |                                         |    |                         |
|---|-----------------------------------------|----|-------------------------|
| 1 | Filter (*optional)                      | 6  | Butterfly valve         |
| 2 | Pressure switch - PGMIN                 | 8  | Main burner             |
| 3 | Safety valve with built in gas governor | 9  | Manual valve(*optional) |
| 4 | Proving system (*if provided)           | 10 | Bellows unit(*optional) |
| 5 | Pressure switch - PGMAX (*optional)     |    |                         |

## Assembling the gas grain

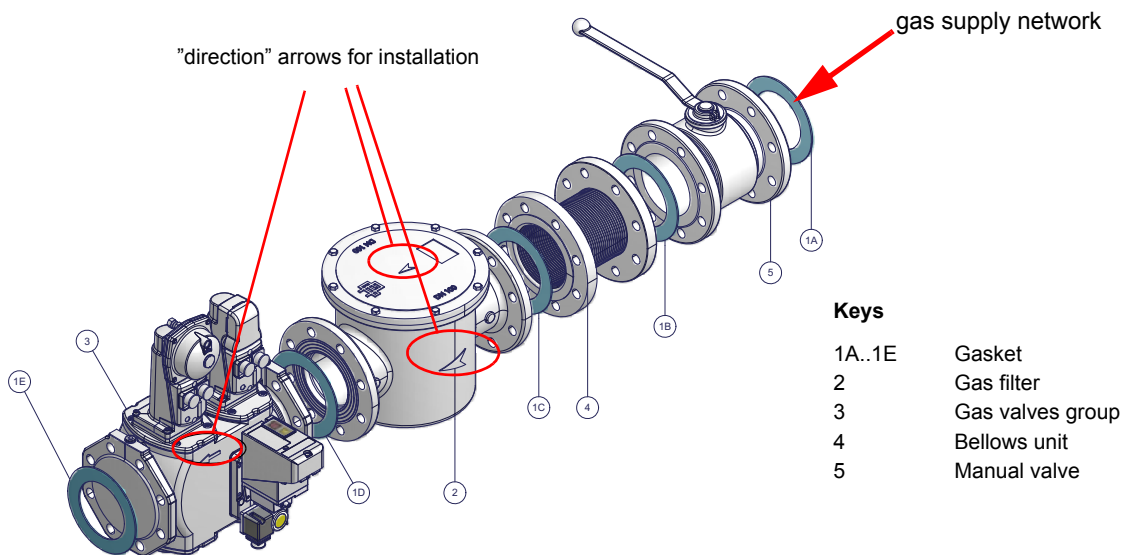


Fig. 4 - Example of gas train

To mount the gas train, proceed as follows:

1-a) in case of threaded joints: use proper seals according to the gas used;

1-b) in case of flanged joints: place a gasket (no. 1A..1E - Fig. 4) between the elements

**NOTE:** the bellows unit, the manual valve and the gaskets are not part of the standard supply.



**ATTENTION:** once the gas train is mounted according to the diagram on Fig. 4, the gas proving test must be performed, according to the procedure set by the laws in force.



**ATTENTION:** it is recommended to mount filter and gas valves to avoid that extraneous material drops inside the valves, during maintenance and cleaning operation of the filters (both the filters outside the valves group and the ones built-in the gas valves).

The procedures of installation for the gas valves are shown in the next paragraphs, according to the gas train used:

- threaded gas trains with Multibloc Dungs MB-DLE or Siemens VGD20..
- flanged gas trains with Multibloc Dungs MB-DLE or Siemens VGD40..

**MULTIBLOC DUNGS MB-DLE 415..420****Mounting**

1. Loosen screws A and B **do not** unscrew (Fig. 5 - Fig. 6).
2. unscrew screws C and D (Fig. 5 - Fig. 6).
3. Remove MultiBloc between the threaded flanges (Fig. 6).
4. After mounting, perform leakage and functional tests.

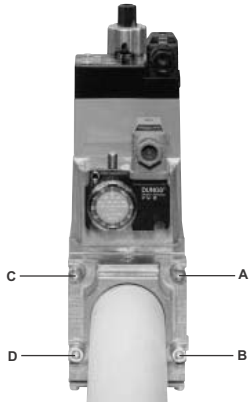


Fig. 5

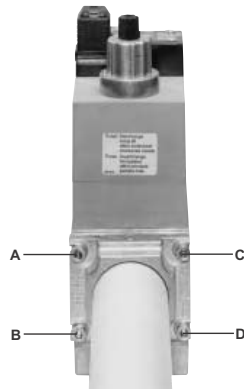


Fig. 6

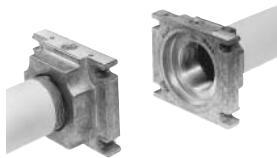


Fig. 7

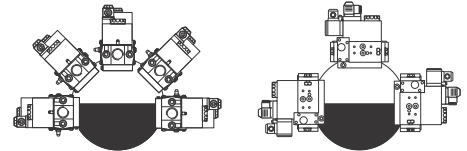
**MOUNTING POSITIONS**

Fig. 8

**Siemens VGD20.. and VGD40.. gas valves - with SKP2.. (pressure governor)****Mounting**

- When mounting the VGD.. double gas valve, two flanges are required (as for VGD20.. model, the flanges are threaded); to prevent cuttings from falling inside the valve, first fit the flanges to the piping and then clean the associated parts;
- install the valve;
- the direction of gas flow must be in accordance with the direction of the arrow on the valve body;
- ensure that the bolts on the flanges are properly tightened;
- ensure that the connections with all components are tight;
- make certain that the O-rings and gaskets between the flanges and the double gas valve are fitted.
- Connect the reference gas pipe (**TP** in figure; 8mm-external size pipe supplied loose), to the gas pressure nipples placed on the gas pipe, downstream the gas valves: gas pressure must be measured at a distance that must be at least 5 times the pipe size.

Leave the blowhole free (**SA** in figure). Should the spring fitted not permit satisfactory regulation, ask one of our service centres for a suitable replacement.



**Caution:** the SKP2 diaphragm D must be vertical (see Fig. 12).



**WARNING:** removing the four screws BS causes the device to be unserviceable!

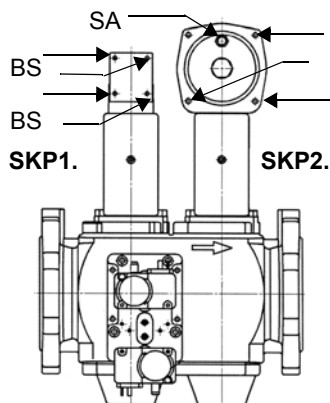


Fig. 9

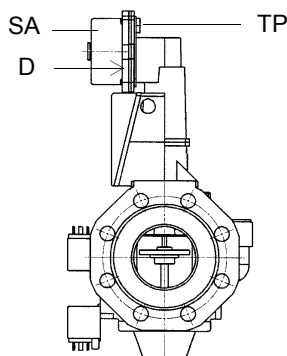
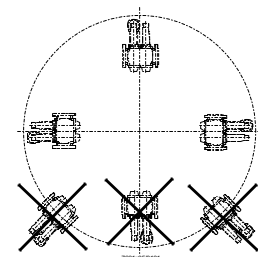


Fig. 10



SIEMENS VGD..MOUNTING POSITIONS

Fig. 11



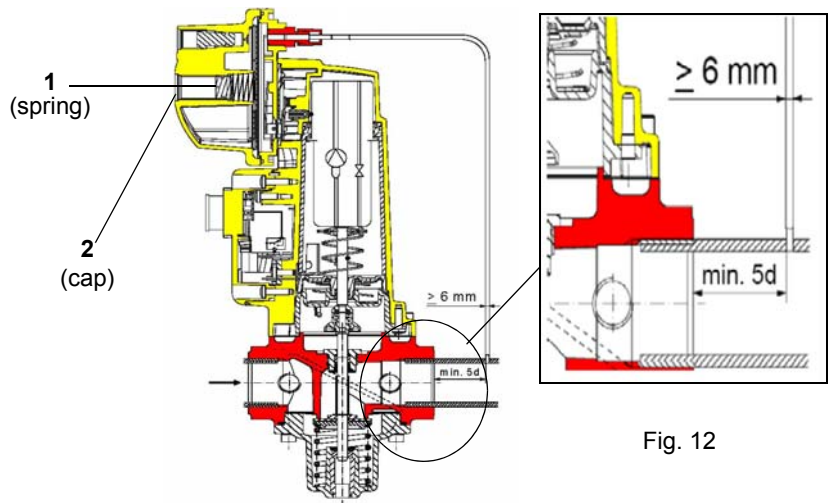


Fig. 12

**Siemens VGD valves with SKP actuator:**

The pressure adjusting range, upstream the gas valves group, changes according to the spring provided with the valve group.

|                                 |         |          |           |
|---------------------------------|---------|----------|-----------|
| <b>Performance range (mbar)</b> | 0 - 22  | 15 - 120 | 100 - 250 |
| <b>Spring colour</b>            | neutral | yellow   | red       |

Once the train is installed, connect electrically all its elements: gas valves group, pressure switches, gas proving system.



**ATTENTION:** once the gas train is mounted according to the diagram on Fig. 4, the gas proving test mus be performed, according to the procedure set by the laws in force.

## Double-pipe and single-pipe system

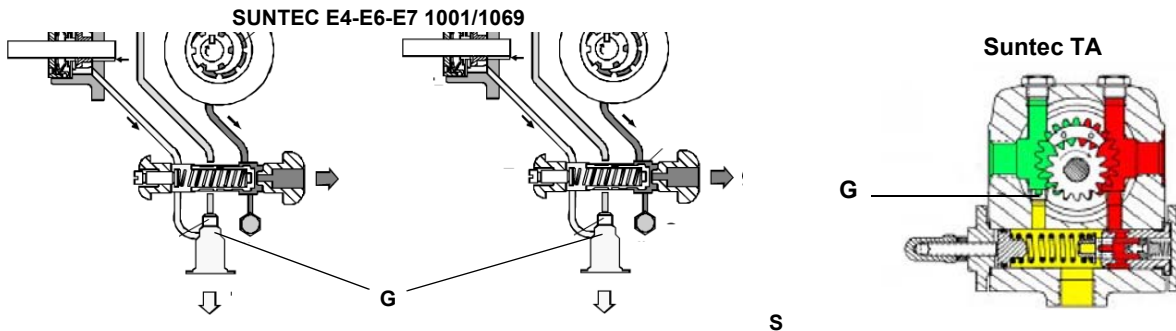
The pumps that are used can be installed both into single-pipe and double-pipe systems.

**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 other part goes back to the pump. In this system, the by-pass plug, 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 pump'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 described 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.



## Bleed

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

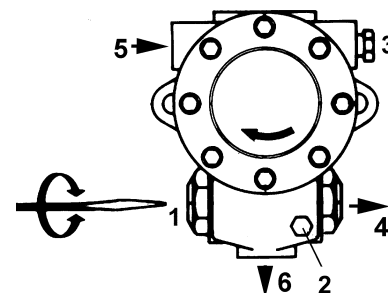
## About the use of fuel pumps

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

**Oil pumps****KP60 - KP65 - KP72:**

- Pumps for heavy-oil viscosity up to 7° E at 50° C (burner model MN.)

| <b>Suntec E4 - E6 - E7 1001</b> |                        |
|---------------------------------|------------------------|
| Oil viscosity                   | 2.8 ÷ 450 cSt          |
| Oil temperature                 | 0 ÷ 90°C               |
| Inlet maximum pressure          | 1,5 bar                |
| Maximum return pressure         | 1,5 bar                |
| Minimum inlet pressure          | - 0.45 to avoid gasing |
| Rotation speed max.             | 3600 rpm               |



Pump : Suntec E

- Pumps for heavy oil viscosity up to 50° E at 50° C (burner model MD.) or eco-heavy-oil viscosity 12 °E at 50°C (burner model ME.)

| <b>Suntec E4 - E6 -E7 1069</b> |                        |
|--------------------------------|------------------------|
| Oil viscosity                  | 3 ÷ 75 cSt             |
| Oil temperature                | 0 ÷ 130°C              |
| Minimum inlet pressure         | - 0.35 to avoid gasing |
| Inlet maximum pressure         | 3.5 bar                |
| Maximum return pressure        | 3.5 bar                |
| Rotation speed max.            | 3600 rpm/обор/мин      |

**SUNTEC**

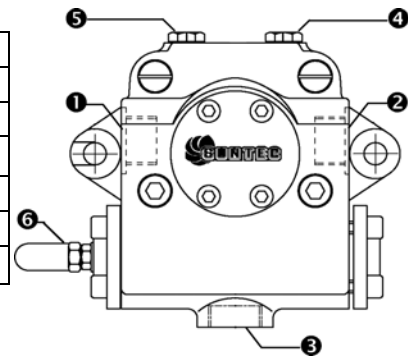
- 1 Pressure governor
- 2 Pump pressure gauge
- 3 Vacuum pressure gauge
- 4 To the nozzle
- 5 Inlet
- 6 Return

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

**KP73:**

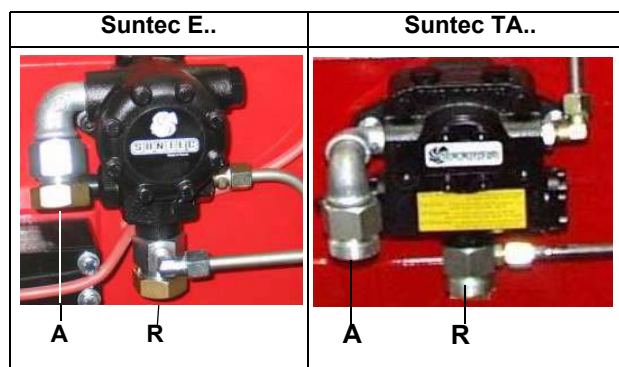
| <b>Suntec TA..</b>    |                            |
|-----------------------|----------------------------|
| Oil viscosity         | 3 ÷ 75 cSt                 |
| Oil temperature       | 0 ÷ 150°C                  |
| Min. suction pressure | - 0.45 bar to avoid gasing |
| Max. suction pressure | 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

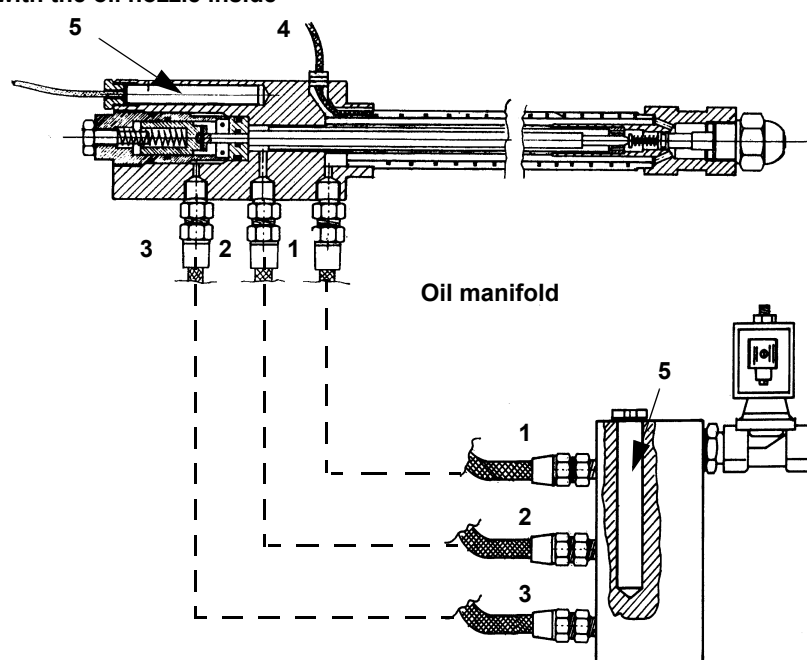
**Assembling the light oil flexible hoses**

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 previous paragraph).

**Connections to the oil gun (KP73)**

- 1 Inlet
- 2 Return
- 3 Gun opening
- 4 Heating wire (only for high density oil burners)
- 5 Cartridge-type heater (only for Ecoden or heavy oil burners)

**Gun with the oil nozzle inside**

## RECOMMENDATIONS TO DESIGN HEAVY OIL FEEDING PLANTS

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

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

The oil viscosity is referred in various unit measures; the most common are: °E, cSt, Saybolt and Redwood scales. Table 3 shows the various unit conversions (e.g.: 132 cSt viscosity corresponds to 17.5°E viscosity). The diagram in Fig. 13 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. 13 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. 14, it is possible to realise that to pump an oil with 50°E viscosity at 50°C, it must be heated at about 80°C.

### **Pipe heating system**

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

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

A very low pressure leads to cavitation (signalled by its peculiar noise): the pump manufacturer declares the minimum value. Therefore, check the pump technical sheets. By increasing the oil temperature, also the minimum inlet pressure at the pump must increase, to avoid the gassification of the oil low-boiling products and the cavitation. The cavitation compromises the burner operation, it causes the pump to break too. The diagram on Fig. 15 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. 18 and Fig. 17 are taken from UNI 9248 "liquid fuel feeding lines from tank to burner" standard and show how a feeding line should be designed. For other countries, see related laws in force. The pipe dimensioning, the execution and the winding dimensioning and other constructive details must be provided by the installer.

### **Adjusting the supplying oil ring**

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

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

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

Tab. 1

## Viscosity units conversion table

| Cinematics<br>viscosity<br>Centistokes (cSt) | Engler Degrees<br>(°E) | Saybolt<br>Seconds<br>Universal<br>(SSU) | Saybolt<br>Seconds<br>Furol (SSF) | Redwood<br>Seconds no.1<br>(Standard) | Redwood Seconds<br>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. 2

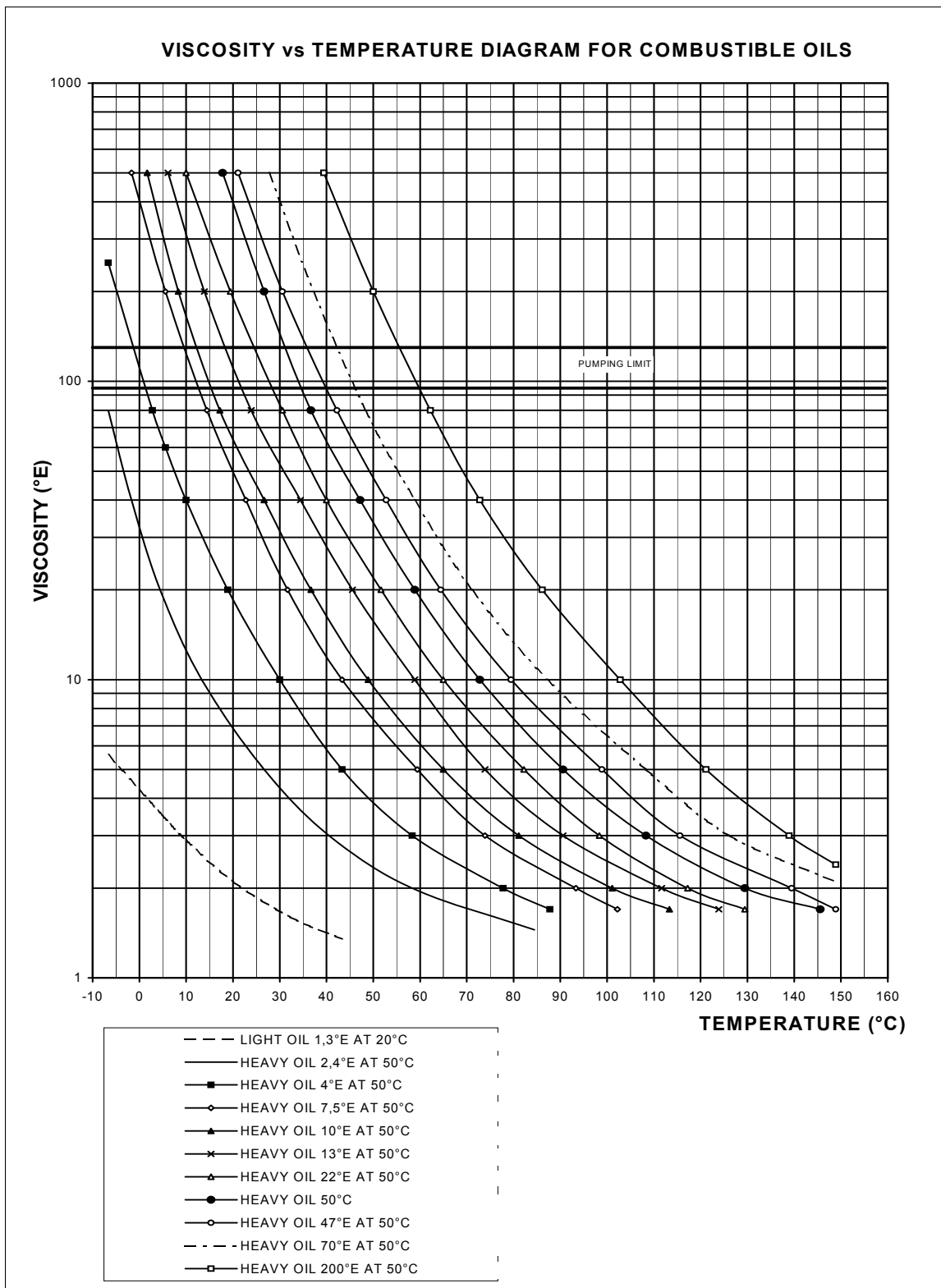


Fig. 13

**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).

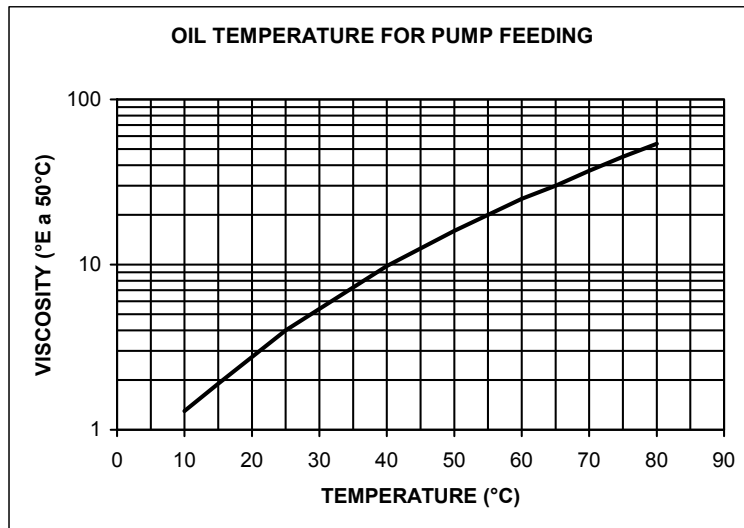


Fig. 14

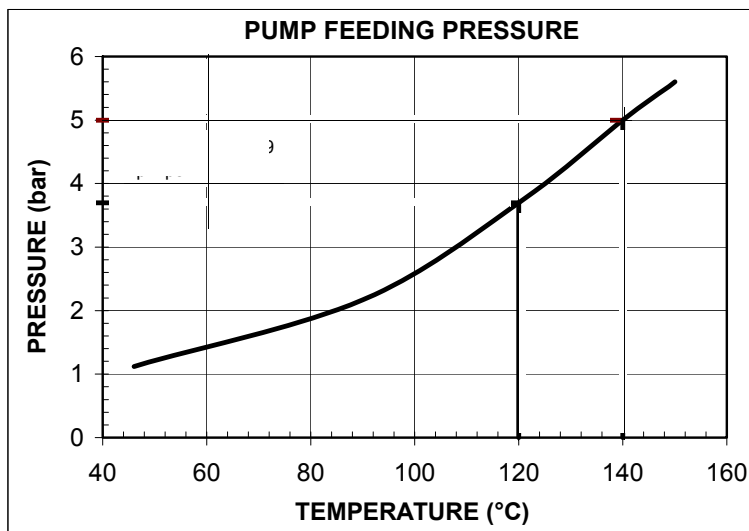
**Indicative diagram showing the oil pressure according to its temperature**

Fig. 15

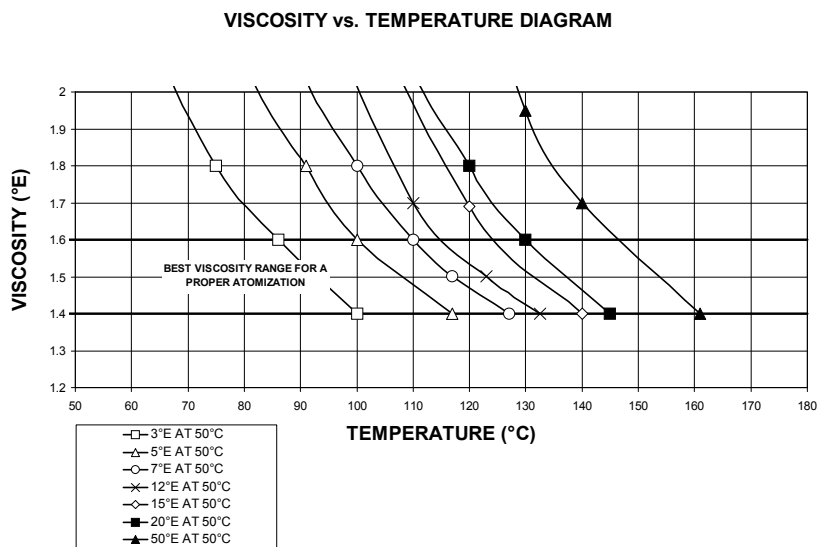
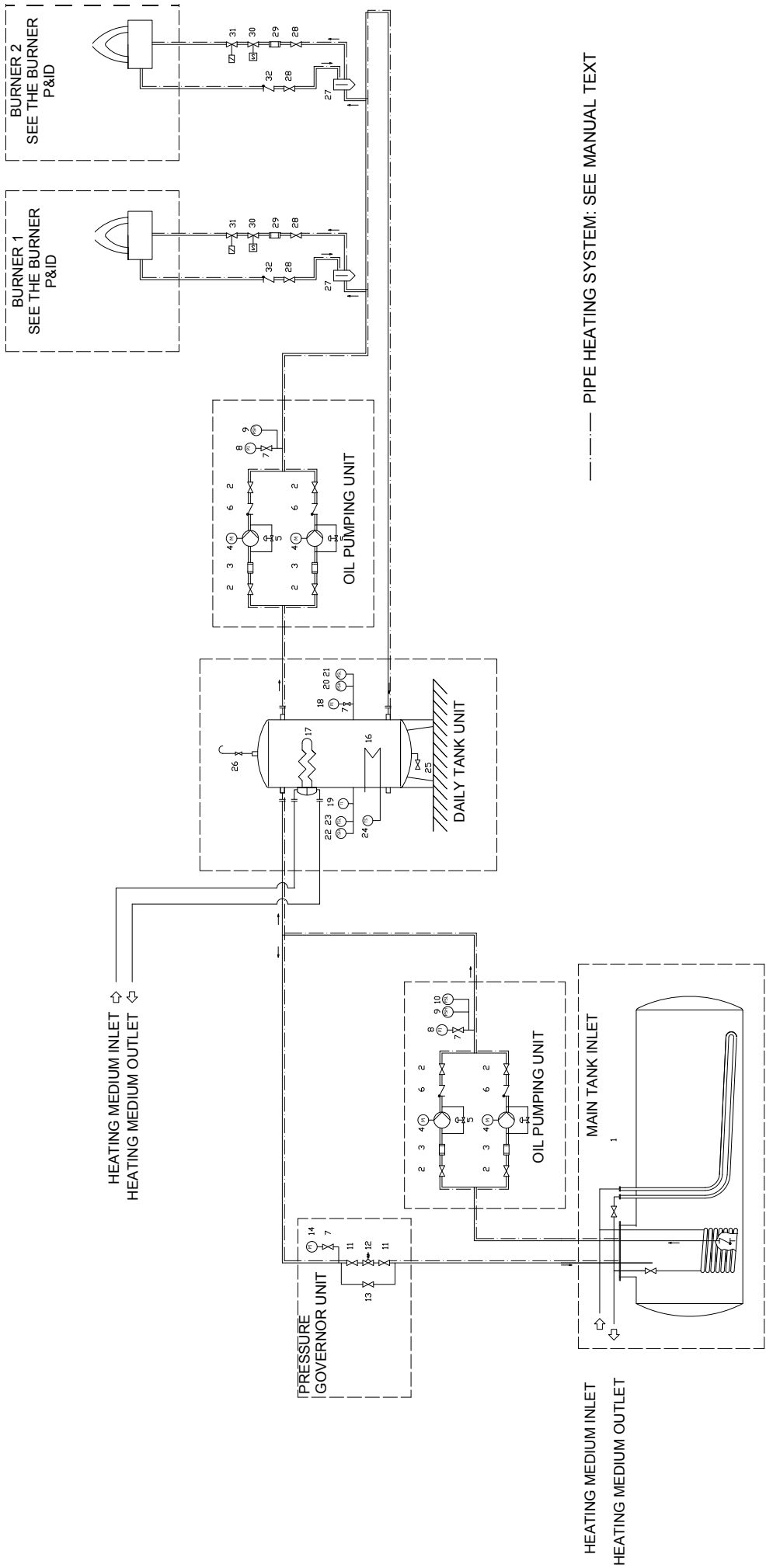
**Indicative diagram showing the oil atomising temperature according to its viscosity**

Fig. 16

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).

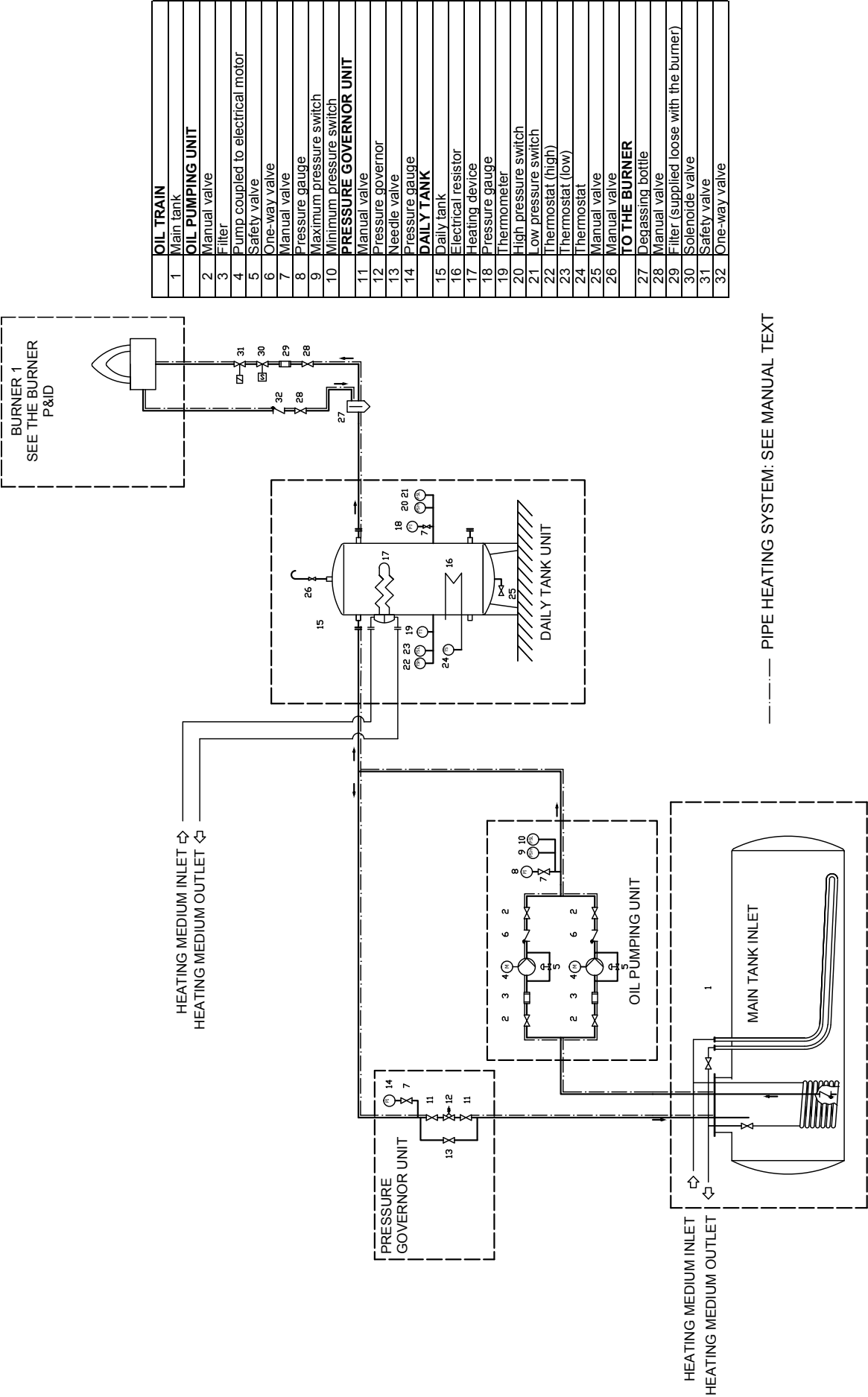


Fig. 17 3ID00014 v2 Hydraulic diagram - Two or more burners configuration



| OIL TRAIN        |                                  | PRESSURE GOVERNOR UNIT |                      | PRESSURE GOVERNOR UNIT |                                         | PRESSURE GOVERNOR UNIT |               |
|------------------|----------------------------------|------------------------|----------------------|------------------------|-----------------------------------------|------------------------|---------------|
| 1                | Main tank                        | 11                     | Manual valve         | 21                     | Low pressure switch                     | 31                     | Safety valve  |
| OIL PUMPING UNIT |                                  | 12                     | Pressure governor    | 22                     | Thermostat (high)                       | 32                     | One-way valve |
| 2                | Manual valve                     | 13                     | Needle valve         | 23                     | Thermostat (low)                        |                        |               |
| 3                | Filter                           | 14                     | Pressure gauge       | 24                     | Thermostat                              |                        |               |
| 4                | Pump coupled to electrical motor | DAILY TANK             |                      | 25                     | Manual valve                            |                        |               |
| 5                | Safety valve                     | 15                     | Daily tank           | 26                     | Manual valve                            |                        |               |
| 6                | One-way valve                    | 16                     | Electrical resistor  | TO THE BURNER          |                                         |                        |               |
| 7                | Manual valve                     | 17                     | Heating device       | 27                     | Degassing bottle                        |                        |               |
| 8                | Pressure gauge                   | 18                     | Pressure gauge       | 28                     | Manual valve                            |                        |               |
| 9                | Maximum pressure switch          | 19                     | Thermometer          | 29                     | Filter (supplied loose with the burner) |                        |               |
| 10               | Minimum pressure switch          | 20                     | High pressure switch | 30                     | Solenoid valve                          |                        |               |

Fig. 18 - 3ID0023 v2 - Hydraulic diagram - Single burner configuration



----- PIPE HEATING SYSTEM: SEE MANUAL TEXT

## Electrical connections

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>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.</b></p> <p><b>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.</b></p> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

To execute the electrical connections, proceed as follows:

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

|  |                                                                                                                                                                                                                                                                                                                                      |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>WARNING: It is recommended to install a shunt trip disconnect switch that acts on the preheater unit supply line and avoids the oil overheating / resistance damage in case of a malfunction of the resistance contactor. Inside the electric board a free contact is provided (terminals 507 - 508) for this purpose.</b></p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Note on electrical supply

If the power supply to the burner is 230V three-phase or 230V phase-phase (without a neutral), with the Siemens control box, between the terminal 2 (terminal X3-04-4 in case of LMV2x, LMV3x, LMV5x, LME7x) on the board and the earth terminal, an RC Siemens RC466890660 filter must be inserted.

### Key

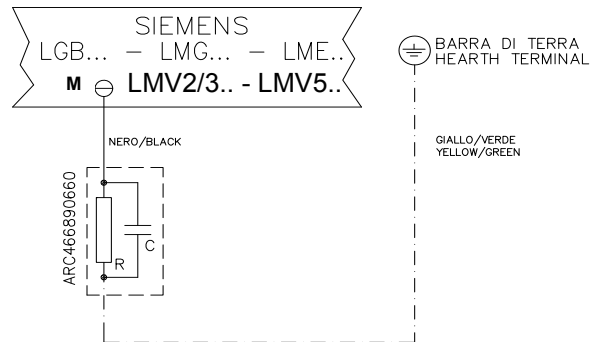
C - Capacitor (22nF/250V)

LME / LMV - Siemens control box

R - Resistor (1MΩ)

M - Terminal 2 (LGB,LMC,LME), terminal X3-04-4 ( LMV2x, LMV3x, LMV5, LME7x)

RC466890660 - RC Siemens filter



For LMV5 control box, please refer to the labeling recommendations available on the Siemens CD attached to the burner

### Rotation of electric motor

Once the electrical connection of the burner is executed, remember to check the rotation of the electric motor. The motor should rotate according to the "arrow" symbol on the body. In the event of wrong rotation, reverse the three-phase supply and check again the rotation of the motor.

|  |                                                                   |
|--|-------------------------------------------------------------------|
|  | <p><b>CAUTION: check the motor thermal cut-out adjustment</b></p> |
|--|-------------------------------------------------------------------|

**NOTE:** the burners are supplied for three-phase 380 V or 400 V supply, and in the case of three-phase 220 V or 230 V supply it is necessary to modify the electrical connections into the terminal box of the electric motor and replace the overload tripped relay.

## Connecting the oil heating resistors

2.4 - 4.5 kW

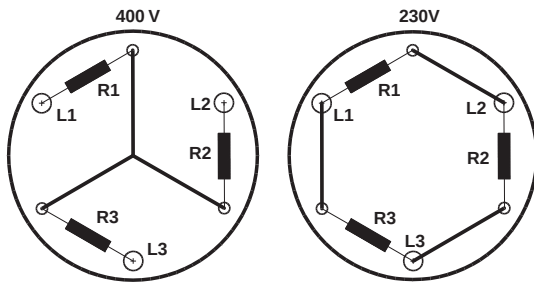


Fig. 19

8 - 12 kW

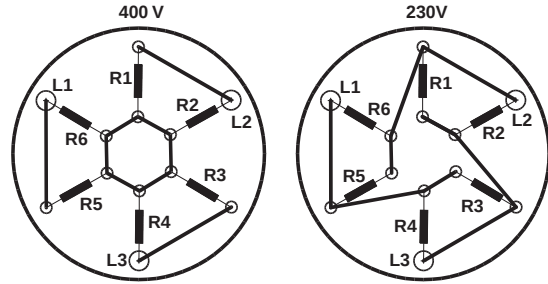


Fig. 20

18 - 24 kW

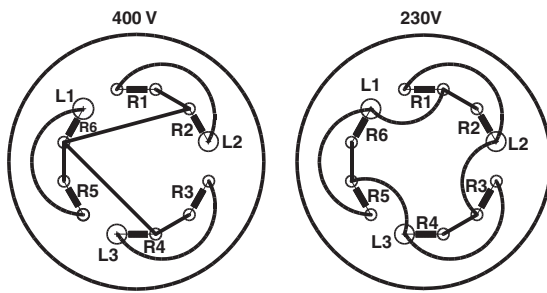


Fig. 21

### ELECTRIC MOTOR CONNECTION

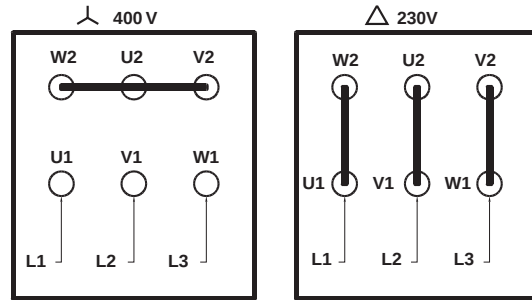


Fig. 22

## AIR FLOW AND FUEL ADJUSTMENT

### Adjustments - brief description

Adjust the air and gas 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.
- .Check the flow rate measuring it on the counter or, if it was not possible, verifying the combustion head pressure by means of a differential pressure gauge.
- 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/gas ratio in those points, regulating the opening-closing of the throttle gas valve.
- Set, now, 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 that the flues temperature gets too low to cause condensation in the chimney.

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



**WARNING! During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the fuel decrease slowly until the normal combustion values are achieved.**

**WARNING! the combustion air excess must be adjusted according to the values in the following chart.**

| Recommended combustion parameters |                                 |                                |
|-----------------------------------|---------------------------------|--------------------------------|
| Fuel                              | Recommended (%) CO <sub>2</sub> | Recommended (%) O <sub>2</sub> |
| Natural gas                       | 9 ÷ 10                          | 3 ÷ 4.8                        |
| Heavy oil                         | 11 ÷ 12.5                       | 4.7 ÷ 6.7                      |
| Heavy oil ≤7°E a 50 °C            | 11 ÷ 12                         | 4.2 ÷ 6.2                      |

## ADJUSTMENTS FOR GAS OPERATION

- 1 check the fan motor rotation.
- 2 Only for burners provided with **Multibloc MB-DLE gas valves**: before starting the burner up, set the slow opening. To set the slow opening, remove cover **T**, reverse it upside down and use it as a tool to rotate screw **VR**. Clockwise rotation reduces start flow rate, anticlockwise rotation increases it. Do not use a screwdriver on the screw **VR**!

**Note:** the screw **VSB** must be removed only in case of replacement of the coil.

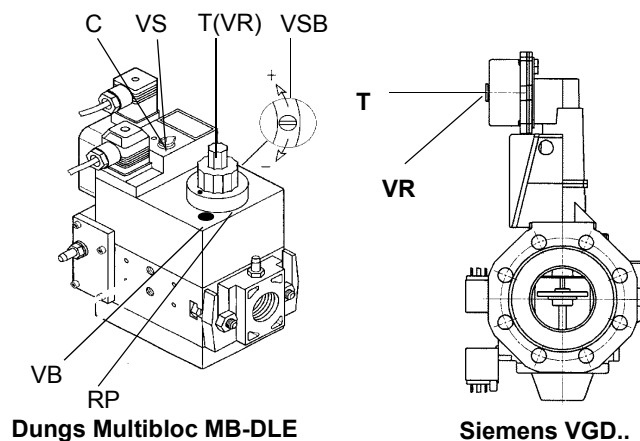
- 3 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.
- 4 Start the burner up by means of the thermostat series and wait until the pre-purge time comes to an end and that the burner starts up;
- 5 drive the burner to high flame stage, by means of the thermostat **TAB**.
- 6 Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values and eventually adjusting the gas by means of the valves group stabiliser.
- 7 go on adjusting air and gas flow rates: check, continuously, the flue gas analysis, as to avoid combustion with little air; dose the air according to the gas flow rate change following the steps quoted below;



- 8 acting on the pressure stabiliser of the valves group, adjust the **gas flow rate in the high flame stage** as to meet the values requested by the boiler/utilisation:

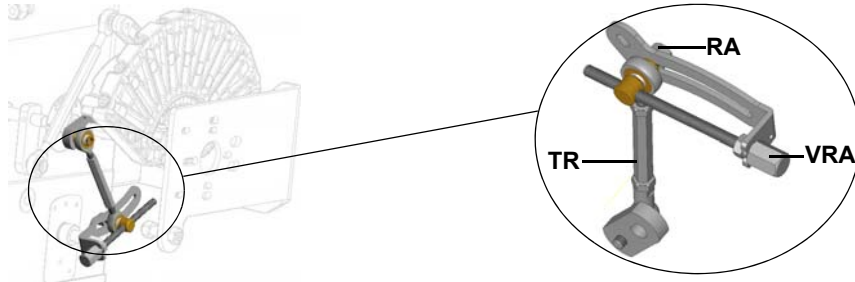
**-Multibloc MB-DLE:** The pressure governor is adjusted by operating the screw **VS** located under the cover **C**. By screwing down the pressure is increased and by unscrewing it is reduced. The valve is adjusted by means of the **RP** regulator after slackening the locking screw **VB** by a number of turns. By unscrewing the regulator **RP** the valve opens, screwing the valve closes.

**- Siemens VGD valves group:** remove cap **T** and act on the **VR** adjusting screw to increase or decrease the pressure and consequently the gas rate; screwing **VR** the rate increases, unscrewing it decreases (see next figure).



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

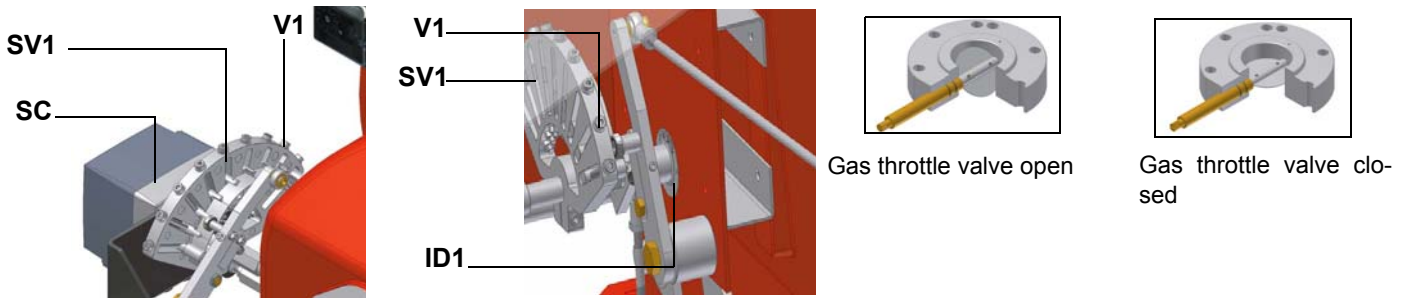


10 If necessary, adjust the combustion head position (see the dedicated paragraph)..



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

- 11 The air and gas rate are now adjusted at the maximum power stage, go on with the point to point adjustment on the **SV1** (gas side) adjusting cam as to reach the minimum output point.
- 12 as for the point-to-point regulation, move the gas low flame microswitch a little lower than the maximum position (90°);
- 13 set the **TAB** thermostat to the minimum in order that the actuator moves progressively towards the low flame position;
- 14 move the gas low flame microswitch to the minimum to move the actuator towards the low flame until the two bearings find the adjusting screw that refers to the lower position: screw **V1** to increase the rate, unscrew to decrease.



- 15 Move again the gas low flame microswitch 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.
- 16 Now adjust the pressure switches.
- 17

### Multibloc MB-DLE

The multibloc unit is a compact unit consisting of two valves, gas pressure switch, pressure stabilizer and gas filter.

The valve is adjusted by means of the **RP** regulator after slackening the locking screw **VB** by a number of turns. By unscrewing the regulator **RP** the valve opens, screwing the valve closes. To set the fast opening remove cover **T**, reverse it upside down and use it as a tool to rotate screw **VR**. Clockwise rotation reduces start flow rate, anticlockwise rotation increases it.

Do not use a screwdriver on the screw **VR**!

The pressure stabilizer is adjusted by operating the screw **VS** located under the cover **C**. By screwing down the pressure is increased and by unscrewing it is reduced.

Note: the screw **VSB** must be removed only in case of replacement of the coil.

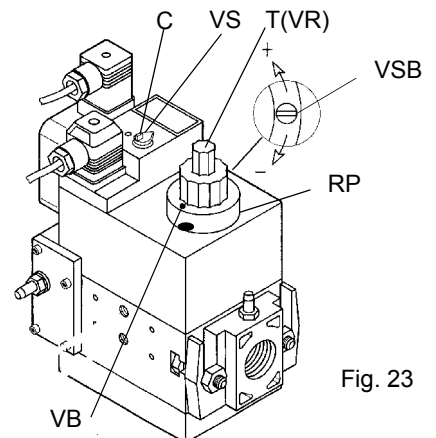


Fig. 23

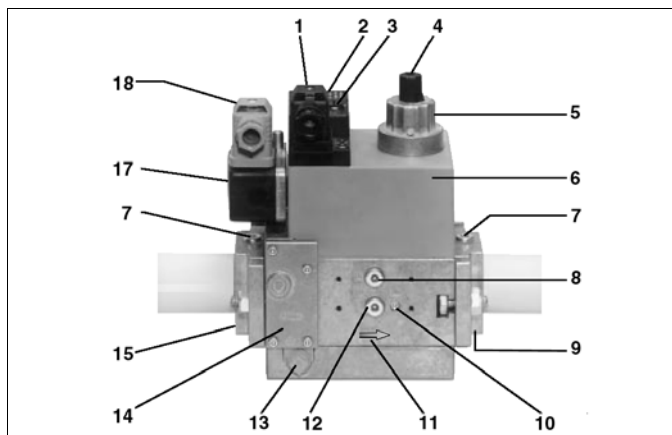


Fig. 24

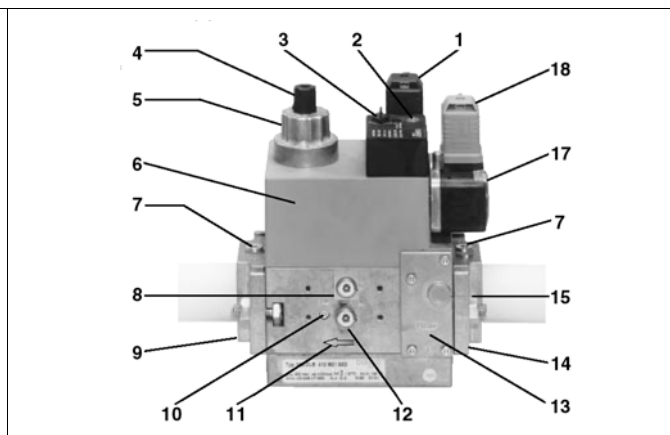


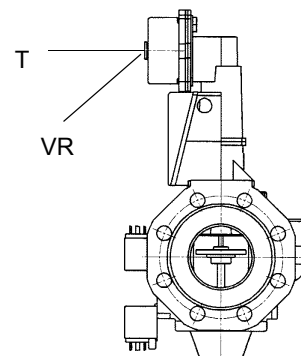
Fig. 25

**Key**

- |                                                                    |                                                               |
|--------------------------------------------------------------------|---------------------------------------------------------------|
| 1 Electrical connection for valves                                 | 9 Output flange                                               |
| 2 Operation display (optional)                                     | 10 Test point connection M4 downstream of valve 2             |
| 3 Pressure governor closing tap                                    | 11 Gas flow direction                                         |
| 4 Start setting cap                                                | 12 Test connection G 1/8 downstream of valve 1, on both sides |
| 5 Hydraulic brake and rate regulator                               | 13 Vent nozzle pressure regulator                             |
| 6 Coil                                                             | 14 Filter (below cover)                                       |
| 7 Test point connection G 1/8                                      | 15 Input flange                                               |
| 8 Test point connection G 1/8 downstream of valve 1, on both sides | 17 Pressure switch                                            |
|                                                                    | 18 Pressure switch electric connection                        |

**Gas valves Siemens VGD - Version with SKP2. (provided with pressure stabilizer).**

To increase or decrease gas pressure, and therefore gas flow rate, remove the cap **T** and use a screwdriver to adjust the regulating screw **VR**. Turn clockwise to increase the flow rate, counterclockwise to reduce it.

**Setting air and gas pressure switches**

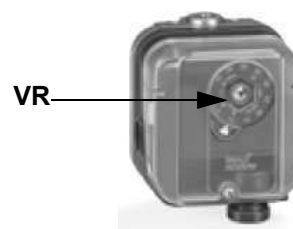
The **air pressure switch** locks the control box if the air pressure is not the one requested. If it happens, unlock the burner by means of the control box unlock pushbutton, placed on the burner control panel.

The **gas pressure switches** check the pressure to avoid the burner operate when the pressure value is not in the requested pressure range.

**Calibration of low gas pressure switch**

As for the gas pressure switch calibration, proceed as follows:

- Be sure that the filter is clean.
- Remove the transparent plastic cap.
- While the burner is operating at the maximum output, test the gas pressure on the pressure port of the minimum gas pressure switch.
- Slowly close the manual cutoff valve (placed upstream the pressure switch, see gas train installation diagram), until the detected pressure is reduced by 50%. Pay attention that the CO value in the flue gas does not increase: if the CO values are higher than the limits laid down by law, slowly open the cutoff valve as to get values lower than these limits.
- Check that the burner is operating correctly.
- Clockwise turn the pressure switch adjusting ring nut (as to increase the pressure value) until the burner stops.
- Slowly fully open the manual cutoff valve.
- Refit the transparent plastic cover on the pressure switch.

**Adjusting the maximum gas pressure switch (when provided)**



To calibrate the maximum pressure switch, proceed as follows according to its mounting position:

- 1 remove the pressure switch plastic cover;
- 2 if the maximum pressure switch is mounted upstream the gas valves: measure the gas pressure in the network, when flame is off; by means of the adjusting ring nut **VR**, set the value read, increased by the 30%.
- 3 if the maximum pressure switch is mounted downstream the "gas governor-gas valves" group and upstream the butterfly valve: light the burner, adjust it according to the procedure in the previous paragraph. Then, measure the gas pressure at the operating flow rate, downstream the "gas governor-gas valves" group and upstream the butterfly valve; by means of the adjusting ring nut **VR**, set the value read on step 2, increased by the 30%;
- 4 replace the plastic cover.

#### ***Calibration of air pressure switch***

To calibrate the air pressure switch, proceed as follows:

- Remove the transparent plastic cap.
- Once air and fuel setting have been accomplished, startup the burner.
- During the pre-purge phase of the operation, turn slowly the adjusting ring nut **VR** in the clockwise direction (to increase the adjusting pressure) 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.

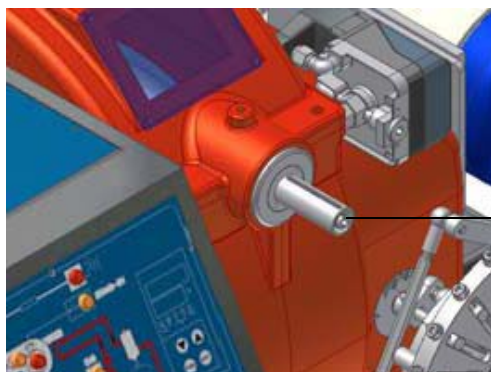
#### ***PGCP Gas leakage pressure switch (with Siemens LDU/LME7x burner control/Siemens LMV Burner Management System)***

- remove the pressure switch plastic cover;
- adjust the PGCP pressure switch to the same value set for the minimum gas pressure switch;
- replace the plastic cover.

## Adjusting the combustion head

### KP60 - KP72

Only if necessary, change the combustion head position. The burner is factory-set with the head in its MAX position (maximum output). To let the burner operate at a lower output, turn clockwise the **VRT** screw and move progressively the combustion head back towards the MIN position. **Attention!** if it is necessary to change the head position, repeat the air and gas adjustments described above.



VRT

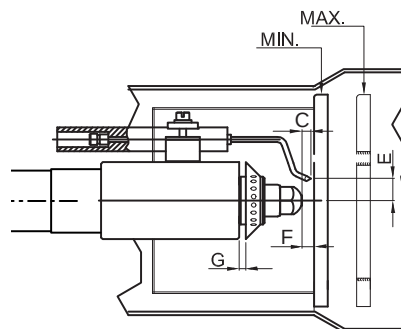
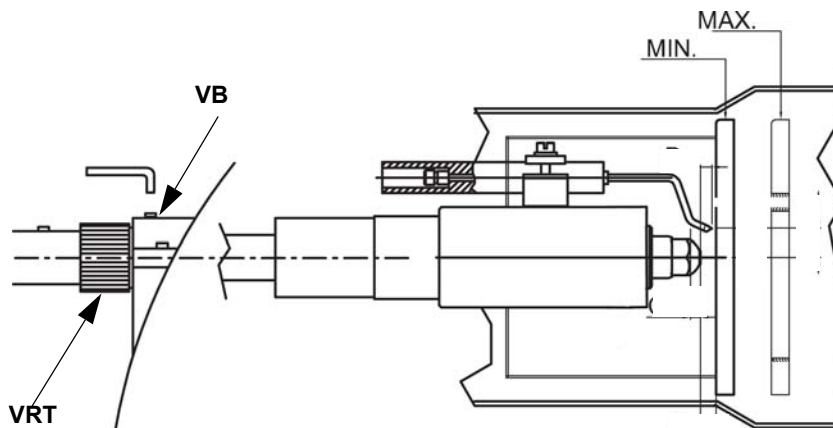


Fig. 26

### KP73

Only if necessary, change the combustion 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 fuel adjustments described above.

## ADJUSTMENTS FOR OIL OPERATION



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.



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

### Oil thermostat adjustment

Progressive and fully modulating oil burners are equipped with electronic multi-thermostat Danfoss MCX, whose operation is controlled by thyristor. (for details refer to the attached technical documentation)



Fig. 27 - Danfoss MCX

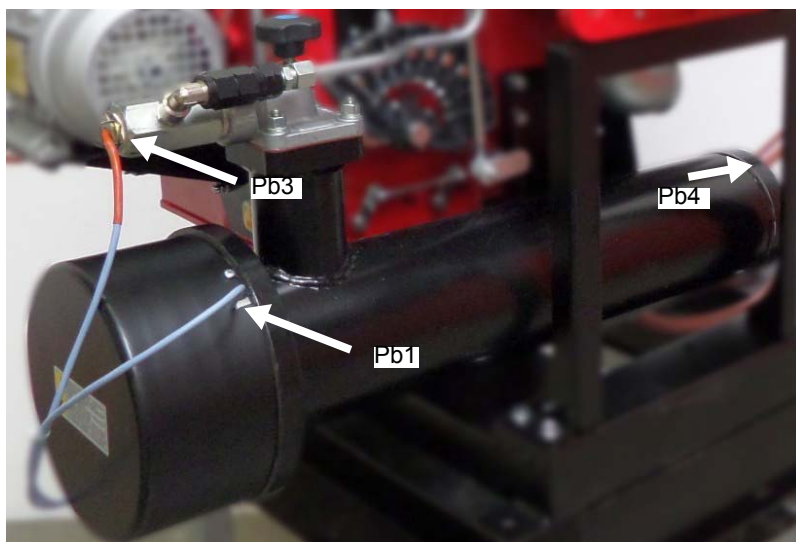


Fig. 28 - Probe connections (Danfoss MCX)

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

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

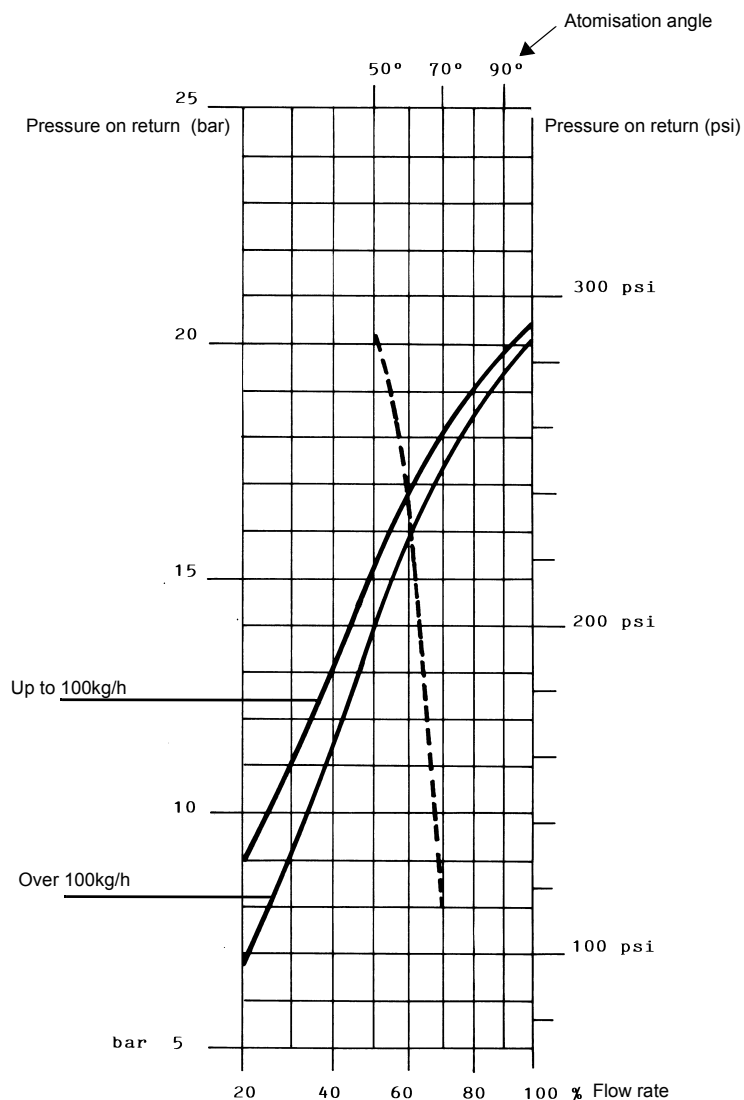
### Adjustment in the heavy oil operation

The heavy 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. 30-Fig. 31.

### FLUIDICS NOZZLE: REFERENCE DIAGRAM (INDICATIVE ONLY)

| DIMENSIONS | FLOW RATE kg/h |     | Indicative pressure 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. 3



**NOZZLE SUPPLY PRESSURE = 25 bar**

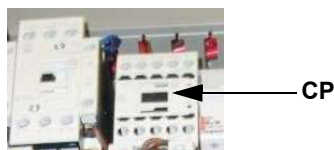
----- Atomisation angle according to the return pressure  
 ————— % Flow rate  
 viscosity at nozzle = 5 cSt



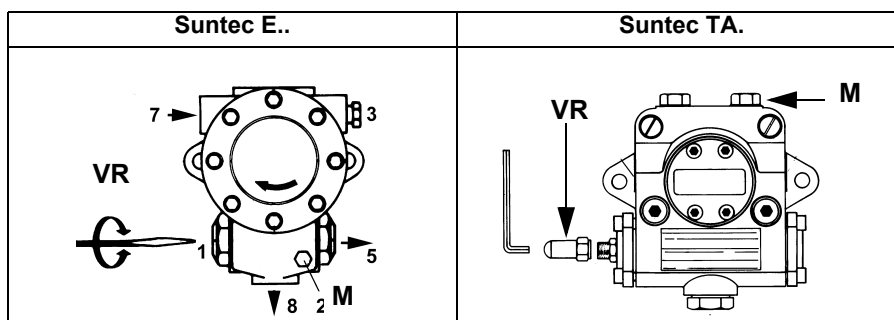
**ATTENTION! To achieve the maximum flow rate close completely the return line.**

## ADJUSTMENTS FOR OIL OPERATION

- 1 Once the air and gas flow rates are adjusted, turn the burner off, switch to the oil operation (OIL, on the burner control panel).
- 2 with the electrical panel open, prime the oil pump acting directly on the related **CP** contactor (see next picture): check the pump motor rotation and keep pressing for some seconds until the oil circuit is charged;

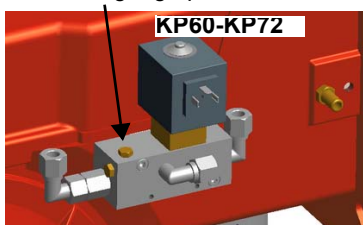


- 3 bleed the air from the **M** pressure gauge port by loosening the cap without removing it, then release the contactor.

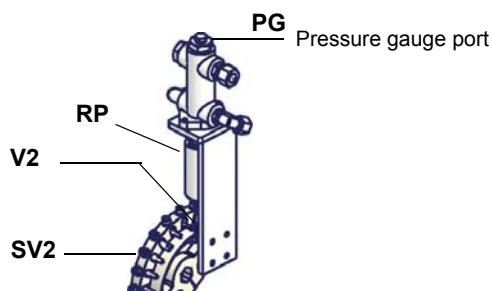
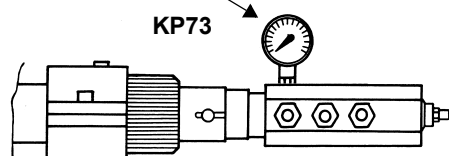


- 4 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage .
- 5 Start the burner up by means of the thermostat series and wait until the pre-purge time comes to an end and that the burner starts up;
- 6 drive the burner to high flame stage, by means of the thermostat **TAB** (as far as fully-modulating burners, see the related paragraph).
- 7 Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values and eventually adjusting the oil pressure (see next step).

Pressure gauge port



Pressure gauge port



- 8 Only if necessary, adjust the supply pressure as follows; insert a pressure gauge into the port shown on figure and act on the pump adjusting screw **VR**. Pressure values are indicated at the beginning of this paragraph.
- 9 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the **PG** pressure gauge) without changing the air flow rate set during the gas operation adjustments (see previous paragraph): checking always the combustion parameters, the adjustment is to be performed by means of the **SV2** adjusting cam screw (see picture) when the cam has reached the high flame position.
- 10 once the oil rate is adjusted at the maximum output (the air rate was adjusted in the gas regulation), go on with the point to point adjustment on the **SV2** (light oil side) adjusting cam as to reach the minimum output point, as described on the next steps.
- 11 as for the point-to-point regulation, move the gas low flame microswitch 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 (as far as fully-modulating burners, see the related paragraph);
- 13 move the low flame cam to the minimum to move the actuator towards the low flame until the two bearings find the adjusting screw that refers to the lower position: screw **V2** to increase the rate, unscrew to decrease.
- 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 the cam 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.

## PART II: OPERATION

### LIMITATIONS OF USE

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

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

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

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

NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

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

IN THE EVENT OF REPEATED LOCKOUTS, DO NOT PERSIST WITH THE RESET BUTTON AND CONTACT QUALIFIED PERSONNEL WHO WILL PROCEED TO ELIMINATE THE MALFUNCTION.

**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".

- Select the fuel by turning the switch CM on the burner control panel .

**N.B. if the heavy oil is used, be sure the cutoff valves on the delivery and return pipes are OPEN.**

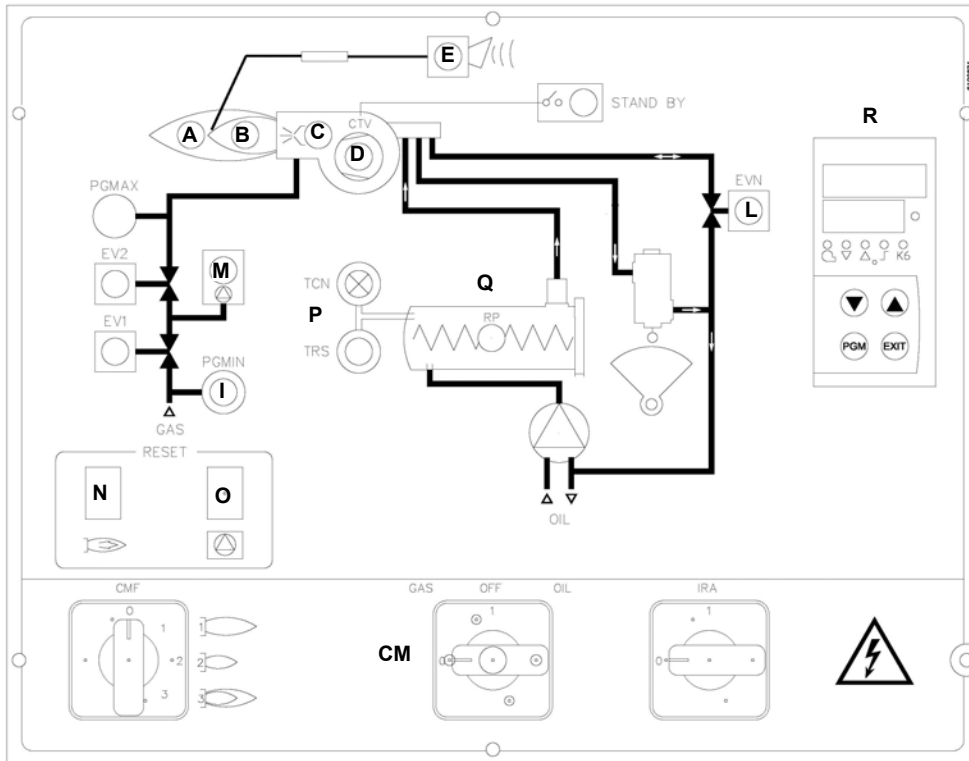
- Check that the burner is not locked (LED **E** lights up); if so, reset it by pressing the reset button **N**.
- Check that the series of thermostats (or pressure switches) enable the burner to start up.

#### Gas Operation

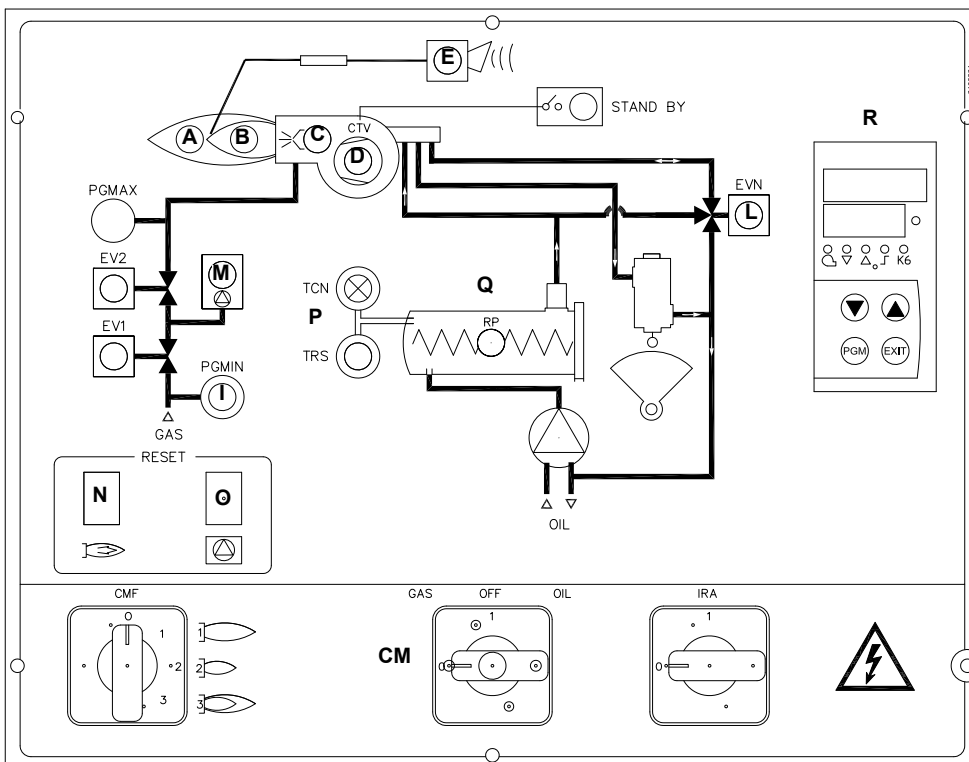
- Check that the gas pressure in the circuit is high enough (LED **I** on).
- The valve proving test begins.
- At the beginning of the start-up cycle the the air damper moves to the maximum opening, the fan motor starts and the pre-purge phase begins. During the pre-purge phase the complete opening of the air damper is signalled by the LED **F** on the front panel.
- At the end of the pre-purge stage, the air damper moves to the ignition position, the ignition transformer is energised (signalled by LED **C** on the panel) and, after few seconds the two gas valves EV1 and EV2 are energised (indicator lights **H** and **G** on). Few seconds after the opening of the gas valves, the ignition transformer is de-energised and LED **C** is off.
- To move from the low flame position, the actuator opening time (<10 s) is controlled by the control box. When this time elapses, the burner operates according to the plant needs.

#### Heavy oil Operation

- At the beginning of the start-up cycle the air damper moves 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 LED **F** on the front panel.
- At the end of the pre-purge the air damper is brought to the ignition position and the ignition transformer is energised (signalled by LED **C** on the panel). Few seconds later, the oil valve opens and the ignition transformer is de-energized (LED **C** off).
- The burner is now operating and after some seconds the burner is automatically driven into high flame (LED **A** on), or remains in low flame (LED **B** on) according to the plant needs.

**Burner front panel****KP60-72****Key**

- A High flame mode indicating light
- B Low flame mode indicating light
- C Ignition transformer operation
- CM Main switch/operation mode (Gas / Oil)
- D Fan motor overload tripped intervention
- E Burner lockout indicating light
- F Stand-by mode indicating light
- G Gas valve EV2 operation
- H Gas valve EV1 operation
- I Gas pressure switch consent
- IRA Pre-heater resistor switch
- L Oil solenoid valve operation
- M Gas proving system intervention
- N Flame monitor device reset pushbutton
- O Gas proving system device reset pushbutton
- P Pre-heating resistors safety thermostat
- Q Pre-heating oil tank
- R Modulator

**KP73**



## PART III: MAINTENANCE

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



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

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

### ROUTINE MAINTENANCE

- Clean and examine the gas filter cartridge and replace it if necessary (see next paragraph).
- Check and clean the oil filter cartridge; replace it if necessary (see next paragraphs).
- Examine the condition of the oil flexible hoses and check for possible leaks.
- Check and clean if necessary the oil heaters and the tank, according to the fuel type and its use; remove the heaters flange fixing nuts and remove the heaters from the tank: clean by using steam or solvents and not metallic things.
- 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 50).
- Examine and clean the ignition electrodes, adjust and replace if necessary (see page 50).
- Examine and clean the detection probe, adjust and replace if necessary (see page 50).
- Examine the detection current (see page 52).
- Remove and clean (page 47) the heavy oil nozzle (**Important: use solvents for cleaning, not metal utensils**) 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. On flanged heaters, replace the seal gasket before refitting it. Periodic inspections must be carried out to determine the frequency of cleaning.**

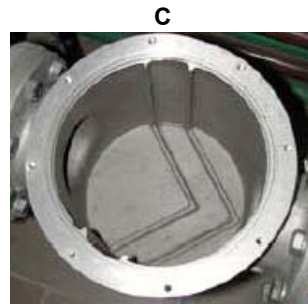
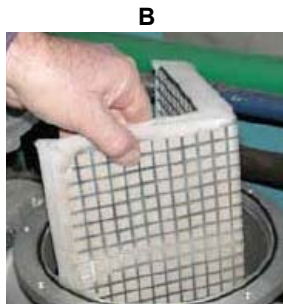
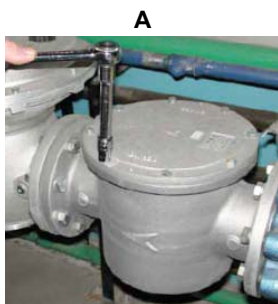
### Gas filter maintenance



**ATTENTION:** Before opening the filter, close the manual cutoff valve downstream the filter and bleed the gas; check that inside the filter there is no pressurised gas.

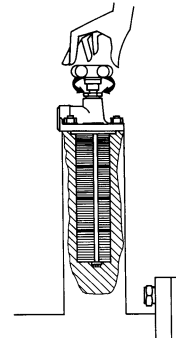
To clean or remove the filter, proceed as follows:

- 1 remove the cap unscrewing the fixing screws (A);
- 2 remove the filtering cartridge (B), clean it using water and soap, blow it with compressed air (or replace it, if necessary)
- 3 replace the cartridge in its proper position taking care to place it inbetween the guides as not to hamper the cap replacement;
- 4 be sure to replace the Or ring into its place (C) and replace the cover fastening by the proper screws (A).



### Self-cleaning filter

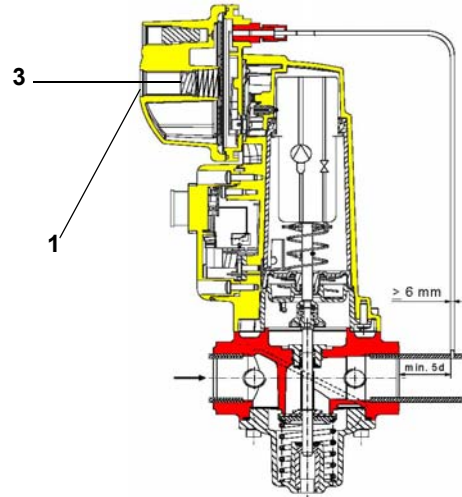
Fitted only on high viscosity oil burners. Periodically turn the knob to clean the filter.



### Replacing the spring in the gas valve group

To replace the spring in the gas valve group, proceed as follows:

- 1 Carefully twist the protection cap 1 and the O-ring 2.
- 2 remove the "set value" spring 3 from housing 4.
- 3 Replace spring 3.
- 4 Carefully insert the new "set value" spring. Pay attention to mount properly. First insert the spring part with smaller diameter in the housing.
- 5 Place O-ring 2 in protective cap 1. Screw in the protective cap with the O-ring in it.
- 6 Stick the adhesive label for spring identification on the type plate.



SKP Siemens actuator

### 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 remove the oil gun and the electrodes: check the oil gun, replace it if necessary;
- 3 after removing the oil gun, unscrew the nozzle and replace it if necessary;
- 4 in order to replace the electrodes, unscrew the fixing screws and remove them: place the new electrodes being careful to observe the measures shown on next paragraph; reassemble following the reversed procedure.

**Caution:** adjust the nozzle position according to the procedure on the next paragraph.

(KP60, KP72) Electrodes Adjustment

Important Note: Check the ignition and detection electrodes after removing/adjusting the combustion head.



**ATTENTION:** avoid the ignition and detection electrodes to contact metallic parts (blast tube, head, etc.), otherwise the boiler's operation would be compromised. Check the electrodes position after any intervention on the combustion head.

Adjust the electrodes position, according to the quotes shown othe next picture

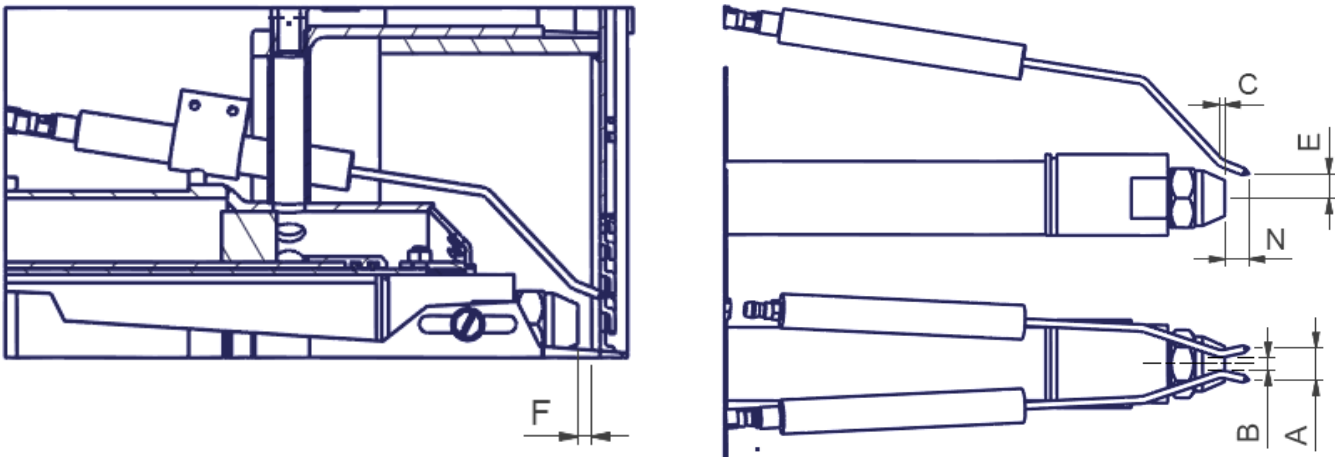
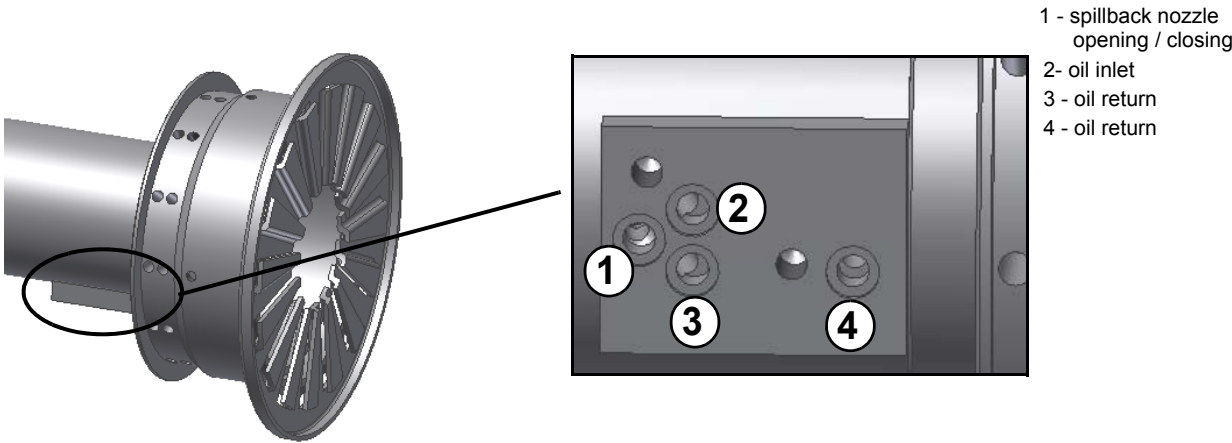


Fig. 29

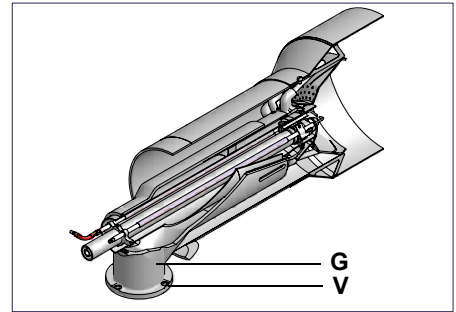
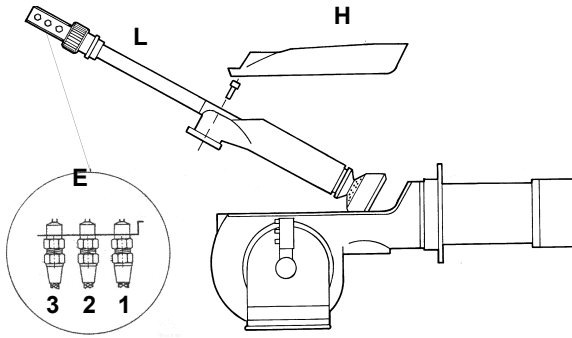
| A     | B   | C   | E     | F | N     |
|-------|-----|-----|-------|---|-------|
| 10÷15 | 3÷5 | 3÷4 | 10÷13 | 8 | 10÷13 |



### Removing the combustion head (KP73)

- 1 Remove the cover **H**.
- 2 Slide the photoresistance out of its housing.
- 3 Unscrew the **V** screws that block the gas collector **G**, loosen the three joints **E** and remove the ass.y as shown on the following picture.
- 4 Clean the combustion head by means fo a vacuum cleaner; scrape off the scale by means fo a metallic brush.

**Note:** to remount the burner, fllow the same procedure in the reversed order.



#### Key

- 1 Inlet
- 2 Return
- 3 Gun opening
- E Oil piping connections

- G Gas manifold
- H Cover
- L Oil gun
- V Screws

### Removing the oil gun, replacing the nozzle and the electrodes (KP73)



**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 prevoius paragraph;
- 2 loosen the **VL** screw and remove the oil gun and the electrodes: check the oil gun, replace it if necessary;
- 3 after removing the oil gun, unscrew the nozzle and replace it if necessary;
- 4 in order to replace the electrodes, unscrew the **VE** fixing screws and remove them: place the new electrodes being careful to observe the measures shown on : reassemblbe following the reversed procedure.

**Caution:** adjust the nozzle position according to the air pipe, by means of the **VU** screw, ance the **VL** screw is fastened.

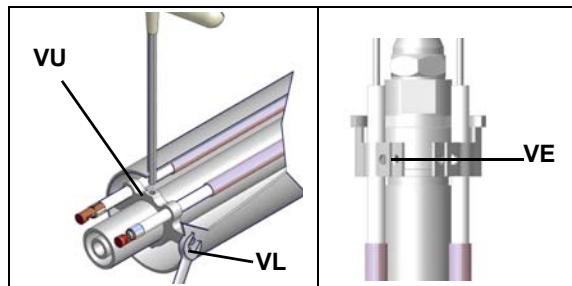


Fig. 30

### Adjusting the electrodes position (KP73)

Adjust the electrodes position, according to the quotes shown in the next picture.

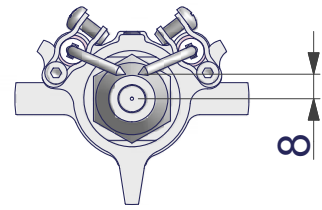
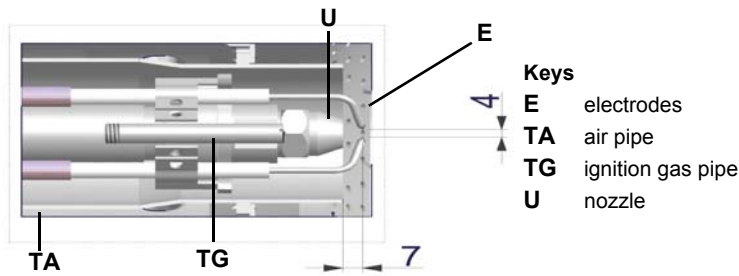


Fig. 31

### Checking the detection current

To check the detection signal follow the scheme in the picture below. If the signal is less than the value indicated, check the position of the detection electrode or detector, the electrical contacts and, if necessary, replace the electrode or the detector.

| Control box      | Minimum detection signal     |
|------------------|------------------------------|
| Siemens LFL1.3.. | 70 $\mu$ A with UV detector) |

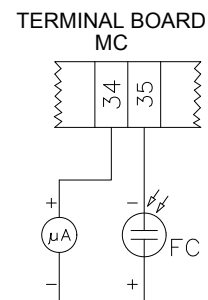


Fig. 32: Detection by photocell QRA..

### Cleaning and replacing the detection photocell

The photocell working life is about 10000 working hours (about 1 year), at max 50°C after which it must be replaced.

To clean/replace the detection photocell, proceed as follows:

- 1 Disconnect the system from the electrical power supply.
- 2 Shut off the fuel supply
- 3 remove the photocell from its slot (see next figure);
- 4 clean the bulbe if dirty, taking care not to touch it with bare hands;
- 5 if necessary, replace the bulb;
- 6 replace the photocell into its slot.



### 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****Heavy oil operation**

|                                                 | THE BURNER<br>DOESN'T START | THE BURNER<br>REPEATS PRE-<br>PURGE | NOISY FUEL PUMP | THE BURNER<br>DOESN'T START<br>AND STOPS | THE BURNER<br>STARTS AND<br>STOPS | THE BURNER<br>DOESN'T SWITCH<br>TO HIGH FLAME | THE BURNER<br>STOPS DURING<br>OPERATION | THE BURNER STOPS<br>AND REPEATS THE<br>CYCLE DURING OPE-<br>RATION |
|-------------------------------------------------|-----------------------------|-------------------------------------|-----------------|------------------------------------------|-----------------------------------|-----------------------------------------------|-----------------------------------------|--------------------------------------------------------------------|
| MAIN SWITCH OPEN                                | ●                           |                                     |                 |                                          |                                   |                                               |                                         |                                                                    |
| LINE FUSE INTERVENTION                          | ●                           |                                     |                 |                                          |                                   |                                               |                                         |                                                                    |
| MAX. PRESSURE SWITCH FAULT                      | ●                           |                                     |                 |                                          |                                   |                                               |                                         | ●                                                                  |
| FAN THERMAL CUTOUT INTERVENTION                 | ●                           |                                     |                 |                                          |                                   |                                               |                                         |                                                                    |
| AUXILIARY RELAIS FUSES INTERVENTION             | ●                           |                                     |                 |                                          |                                   |                                               |                                         |                                                                    |
| CONTROL BOX FAULT                               | ●                           | ●                                   |                 | ●                                        | ●                                 |                                               | ●                                       |                                                                    |
| SERVOCONTROL FAULT                              |                             |                                     |                 |                                          |                                   | ●                                             |                                         |                                                                    |
| SMOKEY FLAME                                    |                             |                                     |                 |                                          | ●                                 |                                               | ●                                       |                                                                    |
| IGNITION TRANSFORMER FAULT                      |                             |                                     |                 | ●                                        |                                   |                                               |                                         |                                                                    |
| IGNITION ELECTRODE DIRTY OR WRONG<br>POSITIONED |                             |                                     |                 | ●                                        |                                   |                                               |                                         |                                                                    |
| DIRTY NOZZLE                                    |                             |                                     |                 | ●                                        |                                   |                                               | ●                                       |                                                                    |
| FUEL SOLENOID VALVE DEFECTIVE                   |                             |                                     |                 | ●                                        |                                   |                                               | ●                                       |                                                                    |
| PHOTORESISTOR DIRTY OR DEFECTIVE                |                             |                                     |                 |                                          | ●                                 |                                               | ●                                       |                                                                    |
| HI-LO FLAME THERMOSTAT DEFECTIVE                |                             |                                     |                 |                                          |                                   | ●                                             |                                         |                                                                    |
| WRONG POSITION OF SERVOCONTROL<br>CAMS          |                             |                                     |                 |                                          |                                   | ●                                             |                                         |                                                                    |
| FUEL PRESSURE TOO LOW                           |                             |                                     |                 | ●                                        |                                   |                                               |                                         |                                                                    |
| DIRTY FUEL FILTERS                              |                             |                                     | ●               | ●                                        |                                   |                                               | ●                                       |                                                                    |

## Gas operation

## TROUBLESHOOTING

| CAUSE                                                                    | TROUBLE                  |                         |                            |                                     |                              |                     |                                                        |                              |                             |                           |                                              |
|--------------------------------------------------------------------------|--------------------------|-------------------------|----------------------------|-------------------------------------|------------------------------|---------------------|--------------------------------------------------------|------------------------------|-----------------------------|---------------------------|----------------------------------------------|
|                                                                          | THE BURNER DOESN'T START | CONTINUE WITH PRE-PURGE | DOESN'T START AND LOCK-OUT | DOESN'T START AND REPEATS THE CYCLE | STARTS AND REPEATS THE CYCLE | STARTS AND LOCK-OUT | THE FLAME MONITOR DEVICE DOESN'T GIVE CONSENT TO START | DOESN'T SWITCH TO HIGH FLAME | DOESN'T RETURN IN LOW FLAME | LOCK-OUT DURING OPERATION | TTURNS OF AND REPEATS CYCLE DURING OPERATION |
| MAIN SWITCH OPEN                                                         | ●                        |                         |                            |                                     |                              |                     |                                                        |                              |                             |                           |                                              |
| LACK OF GAS                                                              | ●                        |                         |                            | ●                                   |                              |                     |                                                        |                              |                             |                           |                                              |
| MAXIMUM GAS PRESSURE SWITCH DEFECTIVE                                    | ●                        |                         | ●                          |                                     |                              |                     |                                                        |                              |                             |                           | ●                                            |
| THERMOSTATS/PRESSURE SWITCHES DEFECTIVES                                 | ●                        |                         |                            | ●                                   |                              |                     |                                                        |                              |                             |                           |                                              |
| OVERLOAD TRIPPED INTERVENTION                                            | ●                        |                         |                            |                                     |                              |                     |                                                        |                              |                             |                           |                                              |
| AUXILIARIES FUSE INTERRUPTED                                             | ●                        |                         |                            |                                     |                              |                     |                                                        |                              |                             |                           |                                              |
| DEFECTIVE CONTROL BOX                                                    | ●                        | ●                       | ●                          |                                     |                              |                     |                                                        |                              |                             | ●                         |                                              |
| DEFECTIVE ACTUATOR                                                       | ●                        | ●                       | ●                          |                                     |                              |                     |                                                        |                              |                             |                           |                                              |
| AIR PRESSURE SWITCH FAULT OR BAD SETTING                                 | ●                        |                         |                            |                                     |                              |                     | ●                                                      |                              |                             | ●                         |                                              |
| MINIMUM GAS PRESSURE SWITCH DEFECTIVE OR GAS FILTER DIRTY                | ●                        |                         |                            | ●                                   |                              |                     | ●                                                      |                              |                             |                           | ●                                            |
| IGNITION TRANSFORMER FAULT                                               |                          |                         | ●                          |                                     |                              |                     |                                                        |                              |                             |                           |                                              |
| IGNITION ELECTRODES BAD POSITION                                         |                          |                         | ●                          |                                     |                              |                     |                                                        |                              |                             |                           |                                              |
| BUTTERFLY VALVE BAD SETTING                                              |                          |                         | ●                          |                                     |                              |                     | ●                                                      |                              |                             |                           |                                              |
| DEFECTIVE GAS GOVERNOR                                                   |                          |                         | ●                          |                                     |                              |                     |                                                        |                              |                             |                           | ●                                            |
| GAS VALVE DEFECTIVE                                                      |                          |                         | ●                          | ●                                   |                              |                     |                                                        |                              |                             |                           |                                              |
| BAD CONNECTION OR DEFECTIVE HIGH/LOW FLAME THERMOSTAT OR PRESSURE SWITCH |                          |                         |                            |                                     |                              |                     |                                                        | ●                            | ●                           |                           |                                              |
| ACTUATOR CAM WRONG SETTING                                               |                          |                         |                            |                                     |                              |                     | ●                                                      | ●                            | ●                           |                           |                                              |
| UV PROBE DIRTY OR DEFECTIVE                                              |                          |                         | ●                          |                                     |                              |                     |                                                        |                              |                             | ●                         |                                              |

## **WIRING DIAGRAMS**

Refer to the attached wiring diagrams.

### **WARNING**

- 1 - Electrical supply 230V / 400V 50Hz 3N a.c.
- 2 - Do not reverse phase with neutral
- 3 - Ensure burner is properly earthed



## APPENDIX

### SIEMENS LFL 1.3.. CONTROL BOX

Automatic programme in the event of interruption and indication of position when interrupted

By default, in the event of any kind of interruption, the flow of fuel is immediately interrupted. At the same time the programmer stops and this indicates the position at the time of the interruption.

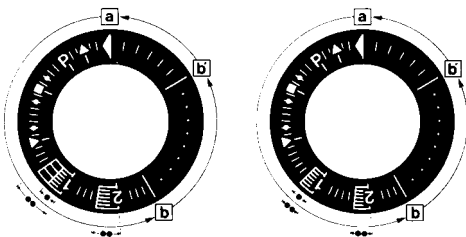
A symbol on the indicator disc shows each time the type of stoppage:

- ◀ No start-up (for example fault in the CLOSED signal for the limit contact "Z" at terminal 8 or some other contact between the terminals 12 and 4 or 4 and 5 is not closed).
- ◀ Start-up suspended because of a fault in the OPEN signal for the limit contact "A" at terminal 8.
- P Block due to absence of air pressure signal. From this moment onwards any absence of air pressure will cause a block.
- Block due to malfunction of the flame detector circuit.
- ▼ Start-up interrupted because there is a fault in the MINMUM signal for the auxiliary contact of the damper servo motor at terminal 8.
- 1 Block due to absence of flame signal at the end of the 1st safety period.

From this moment onwards any absence of a flame signal will cause a block.

- 2 Block due to absence of flame signal at the end of the 2nd safety period (flame signal of main burner).
- Block due to absence of flame signal or air pressure during operation.

Where a block stoppage occurs at any moment between switch on and pre-ignition without registering any symbol, the cause is normally an unscheduled flame signal.



a-b Start-up programme

b-b' For time variants: move the programmer on to the automatic stop after the burner starts up (b' = position of the programmer during normal burner operation).

b(b')-a Post-ventilation programme after a regulation stop. At the start-up position "a" the programmer stops automatically.

. Safety time duration for mono-tube burners

.. Safety time duration for twin-tube burners

The apparatus can be reset immediately after a block. After resetting (and after the elimination of any problem causing the stoppage or after a power failure) the programmer returns to its start-up position. In this event only the terminals 7, 9, 10 and 11 are live in accordance with the monitoring programme. Only after this the device programs a new startup.

#### Operation

The wiring system and also the control system of the programmer "P" have already been given in this manual. The response signals required for the active parts and the flame monitor circuit are shown by a hatching. In the absence of these response signals the mechanism interrupts the start-up programme; the exact time of the interruption can be identified from the visual indicator and will cause a block if the safety code requires it.

- A consent to start-up by means of the thermostat or pressostat "R"
- A-B start-up program
- B-C normal burner operation
- C regulation stop caused by "R"
- C-D programmer returns to start-up position A.

During the regulation stop only terminals 11 and 12 are live and the damper, through the limit contact "Z" of its servo-motor is in the CLOSED position. The flame detector circuit F is activated (terminals 22 and 23 or 23/4) for the detector test and the paracitic light test.

Where the burners do not have dampers (or have an independent 00 damper control mechanism) there must be a bridge between terminals 6 and 8, otherwise the mechanism will not start up the burner.

For a burner to start up the following conditions must be met:

- Mechanism not blocked/reset.
- Damper closed. Limit contact switch Z must be in the CLOSED position and allow current to flow between terminals 11 and 8.
- Any contacts checking that the fuel valve (bv...) is closed, or other contacts with similar functions, must be closed between terminal 12 and the air pressostat LP.
- The contact for the air pressostat LP must be in the off position (LP test) so as to feed terminal 4.
- The gas pressostat contacts GP and the safety thermostat and pressostat contacts W must also be closed.

#### Start-up program

A Start-up

(R closes the start-up control ring between terminals 4 and 5)

The programmer starts up. At the same time the ventilator motor is fed through terminal 6 (only for pre-ventilation) and, after t7, the ventilator motor or the combustion gas exhaust fan is fed through terminal 7 (pre-ventilation and post-ventilation).

At the end of t16, the command opening the damper passes through terminal 9; during the damper opening time the programmer does not move since terminal 8, through which the programmer is fed, is dead.

Only once the damper is fully open and the limit contact switch A has switched on, feeding terminal 8, does the programme proceed.

t1 Pre-ventilation time with damper fully open (nominal air flow).

Shortly after the beginning of the pre-ventilation time, the air pressostat should switch off the current between terminals 4 and 13; otherwise the apparatus would block (air pressure monitor).

At the same time the terminal 14 should be live since current feeding the ignition transformer and the fuel valves passes through this circuit.

During pre-ventilation time the flame detector circuit is checked and in the event of an operational defect the monitor brings about a block.

At the end of the pre-ventilation time the monitor automatically moves the damper servo-motor, through terminal 10, to the flame ignition position which is governed by the auxiliary contact "M".

During this period the programmer stops until terminal 8, is again activated through contact "M".

After a few seconds the little programmer motor is directly fed by the active part of the apparatus.

After this point terminal 8 plays no further part in the burner ignition process.

#### Mono-tube burner

t3 Pre-ignition time waiting the response from the fuel valve at terminal 18.

t2 Safety time (start up flame strenght); at the end of the safety time a flame signal should appear at terminal 22 of the amplifier and it should stay on until a regulation stop; if this does not happen the mechanism will block.

t4 Interval; at the end of t4, terminal 19 is live.

t5 Interval At the end of t5 terminal 20 is live. At the same time the monitor outlets from 9 and 11 and terminal 8 into the active part of the apparatus are kept galvanically separated so as to protect the monitor itself from recovery voltage through the capacity regulator circuit.

## Twin-tube burners (\*\*)

t3 Preignition time until the all clear to the pilot burner valve at terminal 17.

t2 First safety time (pilot flame strenght); at the end of the safety time a flame signal should appear at terminal 22 of the amplifier and it should stay on, until a regulation stop; if it does not, the apparatus will block.

t4 Interval until the consent to the fuel valve at terminal 19, for the first flame of the main burner.

t9 2nd safety time; at the end of the second safety time the main burner should be lit by means of the pilot. At the end of this period, terminal 17 is dead and therefore the pilot burner will be out.

t5 Interval; at the end of t5 terminal 20 is live. At the same time the monitor outlets from 9 to 11 and the terminal 8 at the input of the active part of the apparatus are galvanically separated so as to protect the apparatus itself from recovery voltage through the strenght regulator circuit.

When the strenght regulator LR at terminal 20 gives the consent, the start-up programme for the apparatus comes to an end. Depending on time variants, the programmer stops either immediately or at the end of a set time, without effecting the position of the contacts.

B Operational position of the burner

B-C Burner operation (production of heat)

While the burner is working the strenght regulator controls the damper, according to the demand for heat, by means of the positioning at nominal load of the auxiliary contact "V" of the damper servocontrol.

C Regulation stop for operation of "R"

When there is a regulation stop the fuel valves immediately close. At the same time the programmer starts to programme:

t6 Post-ventilation time (post-ventilation with the ventilator "G" at terminal 7). Shortly after beginning of the post-ventilation time terminal 10 becomes live and moves the damper to the "MIN" position. The full closure of the damper only happens towards the end of the post-ventilation time and is prompted by an automatic signal from terminal 11

t13 Admissible post-ignition time

During this time the flame monitor circuit may still receive a flame signal without the apparatus blocking.

D-A End of automatic programme

At the end of t6, at the point where the programmer and the automatic contacts have reverted to the starter position, the detection probe test restarts.

During an operational stop even an unscheduled flame signal lasting a few seconds can cause a block because during this period an NTC in the circuit acts as retarder. This means that brief unscheduled influences cannot cause a block.

(\*\*) Times t3, t2 and t4 only apply only to safety devices in the series 01.

## Specifications

|                                     |                                              |
|-------------------------------------|----------------------------------------------|
| Mains voltage                       | 220V -15%...240V +10%                        |
| Frequency                           | 50Hz -6%...60Hz +6%                          |
| Absorbed capacity                   | 3.5 VA                                       |
| Built-in fuse                       | T6.3/250E slow action DIN41571 No. 451915070 |
| External fuse                       | max. 16A                                     |
| Interference                        | N-VDE0875                                    |
| Flow permitted at terminal 1        | 5A (DIN 0660 AC3)                            |
| Flow permitted at control terminals | 4A (DIN 0660 AC3)                            |

|                           |                                                            |
|---------------------------|------------------------------------------------------------|
| Flow at monitor contacts: |                                                            |
| input at terminals 4 & 5  | 1A, 250V                                                   |
| input at terminals 4 & 11 | 1A, 250V                                                   |
| input at terminals 4 & 14 | function of the load at terminals 16 and 19, min. 1A, 250V |

|                                  |              |
|----------------------------------|--------------|
| Emplacement                      | Any          |
| Protection                       | IP40         |
| Permitted ambient temp           | -20...+60° C |
| Min. temperature (trans/storage) | -50° C       |

|           |                 |
|-----------|-----------------|
| Weight:   |                 |
| apparatus | approx. 1,000g. |
| base      | approx. 165g.   |

## Ionisation monitor

|                                                           |             |
|-----------------------------------------------------------|-------------|
| voltage in detector electrode                             |             |
| normal working                                            | 330V ±10%   |
| test                                                      | 380V ±10%   |
| short circuit current                                     | max. 0,5 mA |
| Ionisation current, min. request                          | 6 µA        |
| max. permitted length for connecting cables               |             |
| normal cable (laid separately**) 80m                      |             |
| armoured cable (high frequency) protection at terminal 22 | 140m        |

|                                                          |           |
|----------------------------------------------------------|-----------|
| UV monitor                                               |           |
| Voltage in UV detector                                   |           |
| normal working                                           | 330V ±10% |
| test                                                     | 380V ±10% |
| Detector current, min. request*                          | 70µA      |
| Max. detector current                                    |           |
| normal working                                           | 630 µA    |
| test                                                     | 1300 µA   |
| Max. length of connecting cable                          |           |
| normal cable (laid separately**) 100m                    |           |
| armoured cable (high frequency) protected at terminal 22 | 200m      |

|        |        |
|--------|--------|
| Weight |        |
| QRA2   | 60 g   |
| QRA10  | 450 g. |

\*Connect up in parallel to the measuring device a condenser 100µF, 10...25V.

\*\* The wire connecting up the detector electrode should not be in the same sleeve as the other conductor wires.

Ignition spark monitor with QRE1 series 02 detector  
Minimum detector current 30µA

## Operating times

|                                                                                  |                |
|----------------------------------------------------------------------------------|----------------|
| t7 initial delay for ventilator G2                                               | 2              |
| t16 initial delay of air damper OPEN consent                                     | 4              |
| t11 opening time for damper                                                      | any            |
| t10 initial delay for air pressure monitor                                       | 8              |
| t1 pre-ventilation time with damper open                                         | 36             |
| t12 travel time for air damper to MIN position                                   | any            |
| t3 t3' pre-ignition time                                                         | t3 4<br>t3 '-  |
| t2 t2' safety time (1st safety time for burners with intermittent pilot lighter) | t2 2<br>t2 '-  |
| t4 t4' interval between start of t2 and response to valve at terminal 19         | t4 10<br>t4 '- |

|                                                                                               |    |
|-----------------------------------------------------------------------------------------------|----|
| t9 2nd safety time for burners with intermittent pilot lighter                                | 2  |
| t5 interval between end of t4 and response at terminal 20                                     | 10 |
| t20 interval before programmer cuts out after start-up-<br>duration of start-up               | 60 |
| t6 post-ventilation time (G2 only)                                                            | 12 |
| t13 permitted post-ignition time                                                              | 12 |
| t16 initial delay from opening consent of the air damper                                      |    |
| t20 interval until the automatic shut-off of the programming mechanism after the burner start |    |

---

**Key**

|     |                                                                                                     |
|-----|-----------------------------------------------------------------------------------------------------|
| A   | limit contact switch for damper OPEN position                                                       |
| AI  | block remote signal                                                                                 |
| AR  | main relay (working network) with contacts "ar"                                                     |
| AS  | Monitor fuse                                                                                        |
| BR  | block relay with "br" contacts                                                                      |
| BV  | fuel valve                                                                                          |
| EK  | reset button                                                                                        |
| FE  | detector electrode of ionisation circuit                                                            |
| FR  | flame relay with "fr" contacts                                                                      |
| G   | ventilator motor or burner motor                                                                    |
| GP  | gas pressure switch                                                                                 |
| H   | main interruptor switch                                                                             |
| L   | block stoppage LED                                                                                  |
| LK  | air damper                                                                                          |
| LP  | air pressostat                                                                                      |
| LR  | safety regulator                                                                                    |
| M   | auxiliary contact switch for damper "MIN" position                                                  |
| QRA | UV detector                                                                                         |
| QRE | ignition spark detector                                                                             |
| R   | thermostat or pressostat                                                                            |
| S   | fuse                                                                                                |
| SA  | damper servo-motor                                                                                  |
| SM  | synchronous programmer motor                                                                        |
| V   | flame signal amplifier                                                                              |
| V   | in case of servo-motor: auxiliary contact for response to fuel valve with regard of damper position |
| W   | safety pressostat or thermostat                                                                     |
| Z   | ignition transformer                                                                                |
| Z   | in case of servomotor: end of limit contact switch for damper CLOSED position                       |
| ZBV | pilot burner fuel valve                                                                             |
| °   | for mono-tube burners                                                                               |
| °°  | for twin-tube burners                                                                               |

- (1) input for raising QRA detector voltage to test level
- (2) input for excitation of flame relay during flame detector test circuit (contact XIV) and during safety time (contact IV)
- (3) Do not press EK for more than 10 seconds

**Programmer diagram**

|                                                                                                                           |                                                                    |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| t1                                                                                                                        | pre-ventilation time                                               |
| t2                                                                                                                        | safety time                                                        |
| *t2                                                                                                                       | '1st safety time                                                   |
| t3                                                                                                                        | pre-ignition time                                                  |
| *t3                                                                                                                       | 'pre-ignition time                                                 |
| t4                                                                                                                        | interval for creating current between terminals 18 and 19          |
| *t4                                                                                                                       | 'interval for creating current between terminals 17 and 19         |
| t5                                                                                                                        | interval for creating current between terminals 19 and 20          |
| t6                                                                                                                        | post-ventilation time                                              |
| t7                                                                                                                        | interval between startup consent and current created at terminal 7 |
| t8                                                                                                                        | duration of start-up                                               |
| *t9                                                                                                                       | 2nd safety time                                                    |
| t10                                                                                                                       | interval before air pressure monitoring begins                     |
| t11                                                                                                                       | damper opening travel time                                         |
| t12                                                                                                                       | damper closure travel time                                         |
| t13                                                                                                                       | permissible post-combustion time                                   |
| t16                                                                                                                       | initial delay of damper OPEN response                              |
| t20                                                                                                                       | interval before programmer automatically stops                     |
| * These times are valid with the use of a series 01 safety device for monitoring burners with intermittent pilot lighter. |                                                                    |

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



***CIB UNIGAS***

## ***WIRING DIAGRAMS***

***SE05-706: progressive burners***

***SE05-709: fully-modulating burners***



# ELECTRICAL WIRING DIAGRAMS

## WIRING DIAGRAM Cod. 05-706 - Progressive burners

## WIRING DIAGRAM Cod. 05-709 - Fully-modulating burners

### Keys

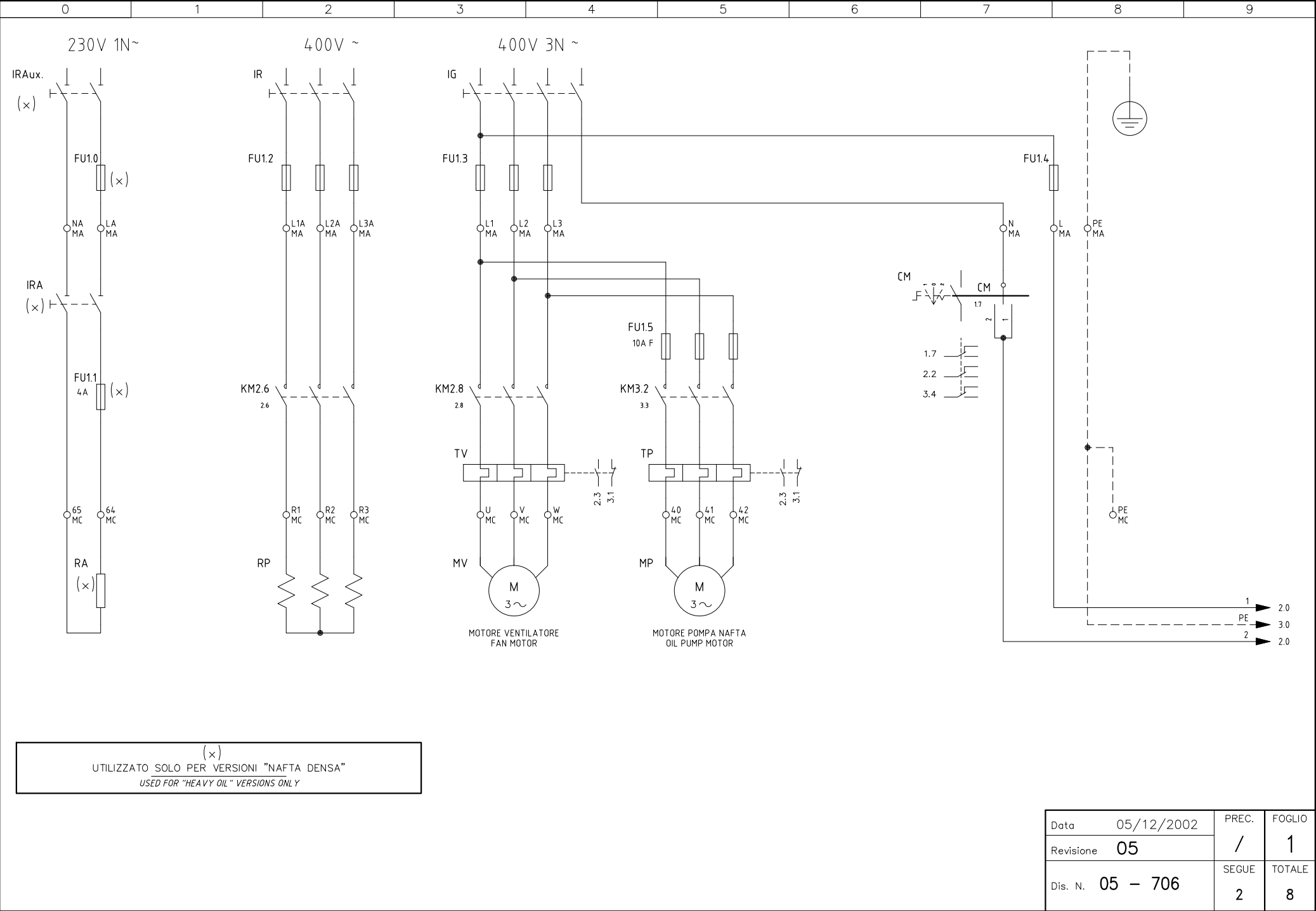
|               |                                                                                                                          |
|---------------|--------------------------------------------------------------------------------------------------------------------------|
| BP            | Oil pump contactor coil                                                                                                  |
| BR            | Contactor coil for oil pre-heater resistors                                                                              |
| BV            | Fan motor contactor coil                                                                                                 |
| CAP           | Auxiliary contacts on oil pump motor contactor                                                                           |
| CAR           | Auxiliary contacts on oil pre-heater resistor contactor                                                                  |
| CM            | Operation selector 0) Off - 1) Gas - 2) Oil                                                                              |
| CMF           | Manual operation selector 0) Stop - 1) High flame - 2) Low flame - 3) Automatic                                          |
| CP            | Contacts on oil pump motor contactor                                                                                     |
| CR            | Contacts on oil pre-heater resistor contactor                                                                            |
| CR1÷3         | Contacts on auxiliary relays                                                                                             |
| CTP           | Contacts on oil pump motor thermal cutout                                                                                |
| CTV           | Contacts on fan motor thermal cutout                                                                                     |
| CV            | Contacts on fan motor contactor                                                                                          |
| EV1           | Gas solenoid valve, network side (or valves group)                                                                       |
| EV2           | Gas solenoid valve, burner side (or valves group)                                                                        |
| EVN           | Oil solenoid valve                                                                                                       |
| F÷F4          | Fuses                                                                                                                    |
| FC            | UV probe                                                                                                                 |
| FU1.0         | Line fuse                                                                                                                |
| FU1.1         | Auxiliary line fuse                                                                                                      |
| FU1.2/3/4     | Line fuse                                                                                                                |
| FU1.5         | Pump line fuse                                                                                                           |
| IG            | Main switch                                                                                                              |
| IR            | Pre-heater resistor switch                                                                                               |
| IRA           | Pre-heater resistor switch                                                                                               |
| IRA aux.      | Auxiliary resistor line switch                                                                                           |
| KA2.1 - KA4.4 | Auxiliary relay                                                                                                          |
| KA2.5         | Pre-heater resistor contactor (RP)                                                                                       |
| KA2.8         | Fan motor contactor                                                                                                      |
| KA3.2         | Oil pump motor contactor                                                                                                 |
| L             | Phase                                                                                                                    |
| LAF           | High flame operation signalling lamp                                                                                     |
| LB            | Burner lockout signalling lamp                                                                                           |
| LBF           | Low flame operation signalling lamp                                                                                      |
| LEV1          | Opening of EV1 signalling lamp                                                                                           |
| LEV2          | Opening of EV2 signalling lamp                                                                                           |
| LEVN          | Opening of EVN signalling lamp                                                                                           |
| LFL1.3..      | SIEMENS control box                                                                                                      |
| LPGMIN        | Low gas pressure in the network signalling lamp                                                                          |
| LS            | Burner in stop position (STAND-BY) signalling lamp                                                                       |
| LSPG          | Gas valves leakage signalling lamp                                                                                       |
| LT            | Intervention of thermal cutout signalling lamp                                                                           |
| LTA           | Ignition transformer in operation signalling lamp                                                                        |
| LTRS          | Safety thermostat lockout signalling lamp                                                                                |
| MA            | Burner power supply terminal board                                                                                       |
| MC            | Burner components terminal board                                                                                         |
| MP            | Pump motor                                                                                                               |
| MV            | Fan motor                                                                                                                |
| N             | Neutral                                                                                                                  |
| PA            | Air pressure switch                                                                                                      |
| PGMAX         | Maximum gas pressure switch (optional, if fitted remove the connection between terminals 156 e 158 in terminal board MC) |
| PGMIN         | Minimum gas pressure switch                                                                                              |
| PS            | Reset pushbutton for LFL1.3xx                                                                                            |
| Pt100         | Connection for Pt100                                                                                                     |
| R1÷R3         | Auxiliary relays                                                                                                         |
| RA            | Auxiliary resistors                                                                                                      |
| RA1           | Auxiliary resistors                                                                                                      |
| RP            | Pre-heater oil tank resistors                                                                                            |
| RWF40.000     | SIEMENS modulator                                                                                                        |
| SD 0/4÷20mA   | Probe connection with signal 0÷20 mA / 4÷20 mA                                                                           |

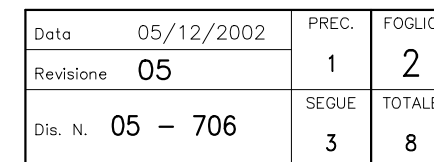
|             |                                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------|
| SD-0÷10V    | Probe connection with signal 0÷10V                                                                            |
| SD-PRESS    | Pressure probe connection (SIEMENS QBE620...)                                                                 |
| SD-TEMP     | Temperature probe connection (Pt1000 or SIEMENS QAE2...-QAC2..)                                               |
| SQL/SQM/STM | Actuator for air damper                                                                                       |
| ST          | Series of thermostats or pressure switches                                                                    |
| TA          | Ignition transformer                                                                                          |
| TAB         | Hi-Lo flame thermostat (if fitted remove the connection between terminals 6 and 7 on terminal board MA)       |
| TC          | Thermocoupling                                                                                                |
| TCI         | Plant enabling thermostat                                                                                     |
| TCN         | Oil enabling thermostat                                                                                       |
| TP          | Oil pump motor thermal cutout                                                                                 |
| TR          | Oil pre-heater resistor thermostat                                                                            |
| TRS         | Oil pre-heater resistor safety thermostat                                                                     |
| TV          | Fan motor thermal cutout                                                                                      |
| VPS504      | DUNGS gas proving system (optional, if fitted remove the connection between 177 and 178 on terminal board MC) |

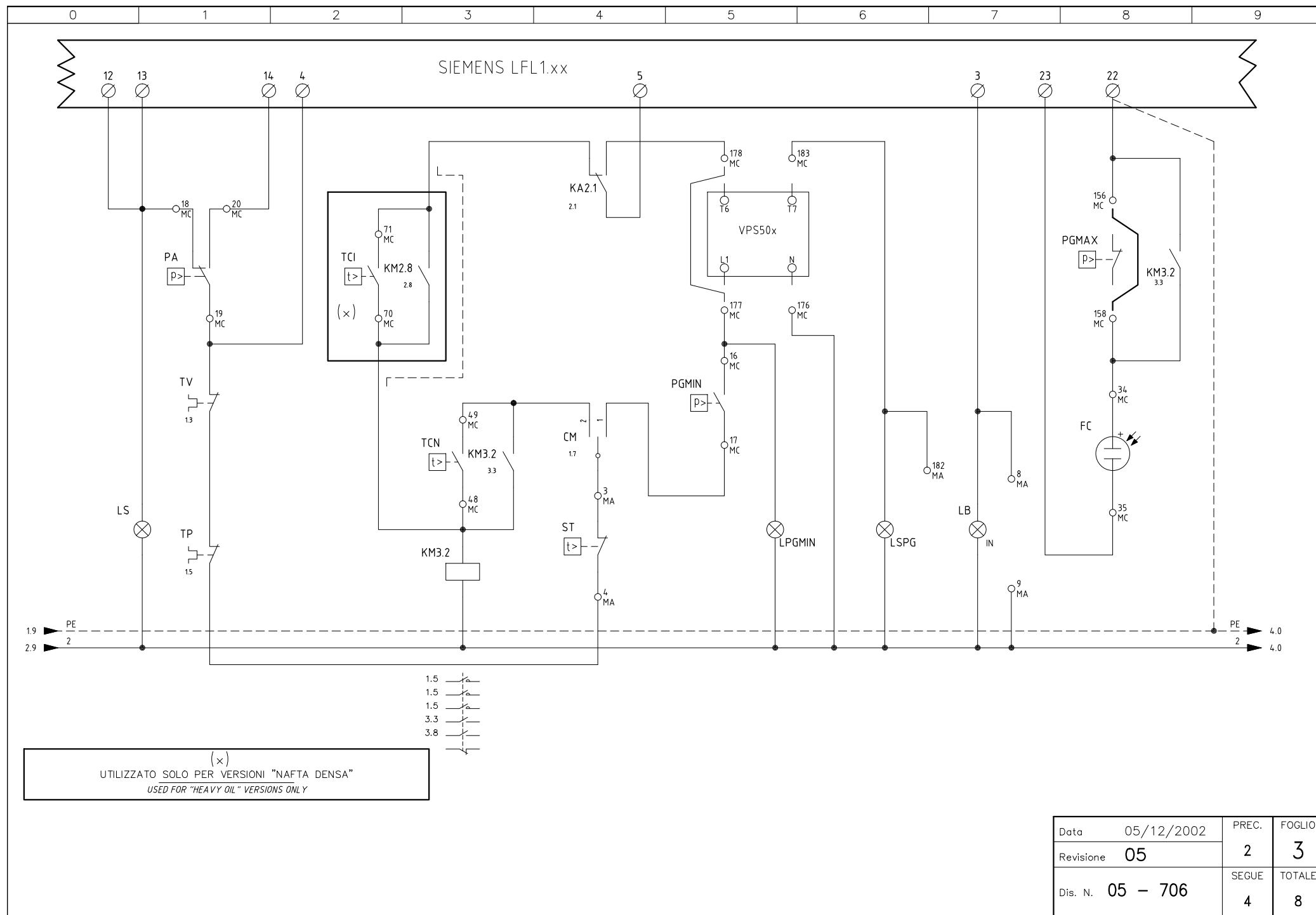
**Note:** It is recommended to execute the external mains connections in the way that any IR switch opening causes the burner lockout by cutting off the burner monophas power supply.  
Terminals Q13 and Q14 are contacts of a limit switch that stops the burner if the set parameters overcome the fixed differential.

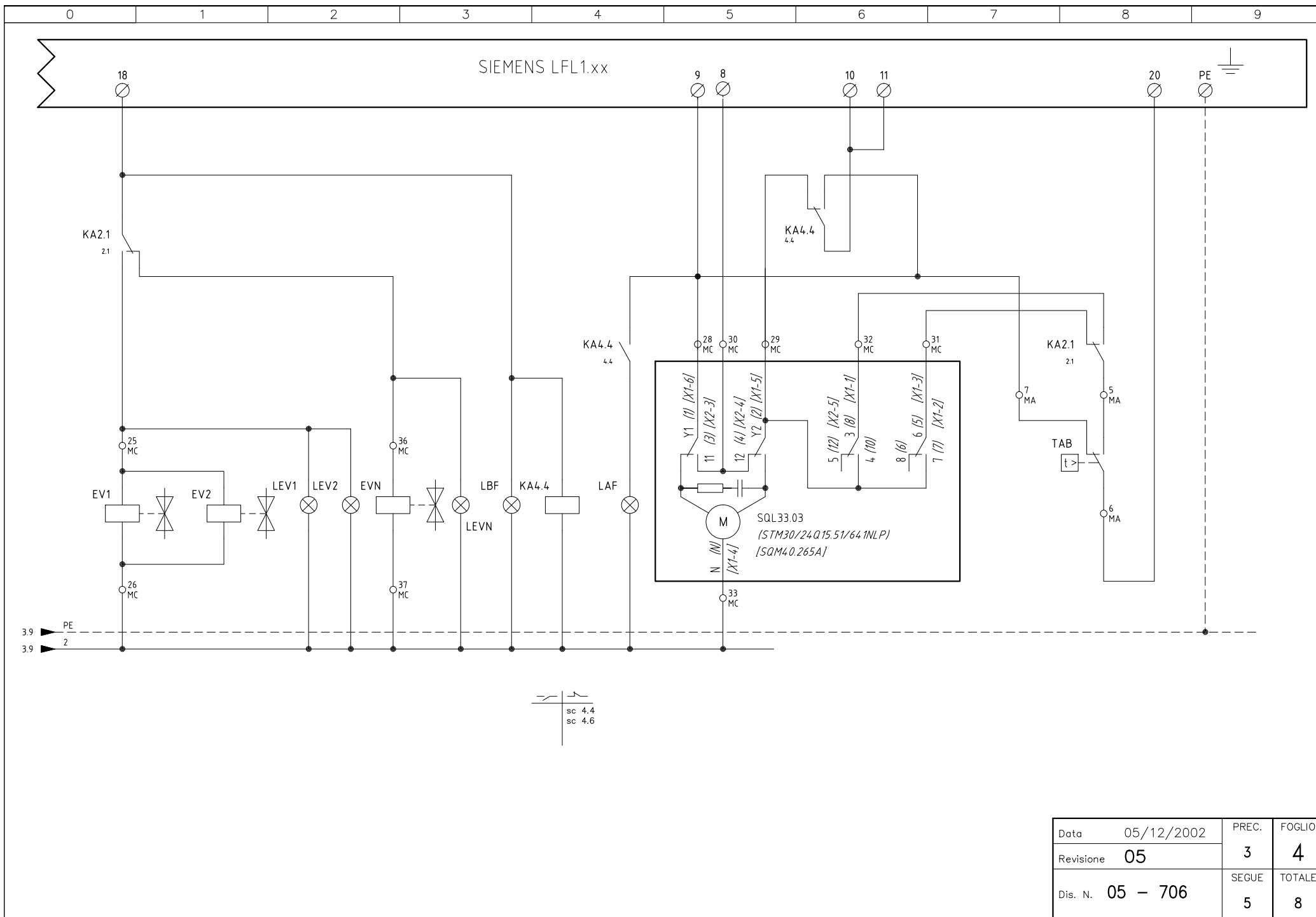
| SIEMENS SQL33 ACTUATOR CAMS | BERGER STM30 ACTUATOR CAMS | SIEMENS SQM40 ACTUATOR CAMS | DESCRIPTION           |
|-----------------------------|----------------------------|-----------------------------|-----------------------|
| Y1                          | I                          | I                           | High flame            |
| Y2                          | II                         | II                          | Stand-by and ignition |
| 3                           | III                        | III                         | Low flame GAS         |
| 6                           | V                          | IV                          | Low flame OIL         |

- ATTENTION:**
- 1 - Electrical supply 400V 50Hz 3N a.c.
  - 2 - Don't reverse phase with neutral
  - 3 - Ensure to the burner a proper hearthing

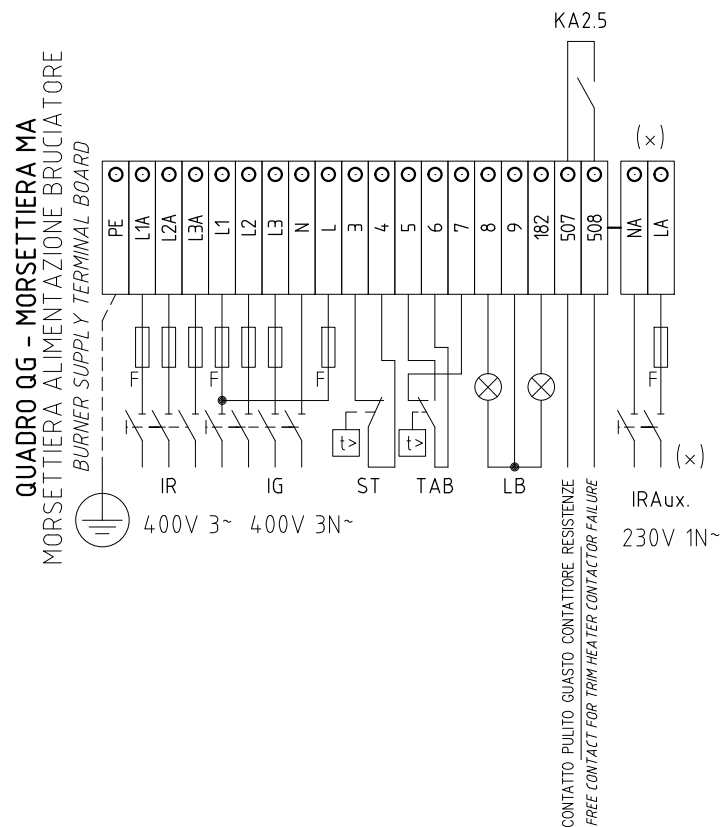




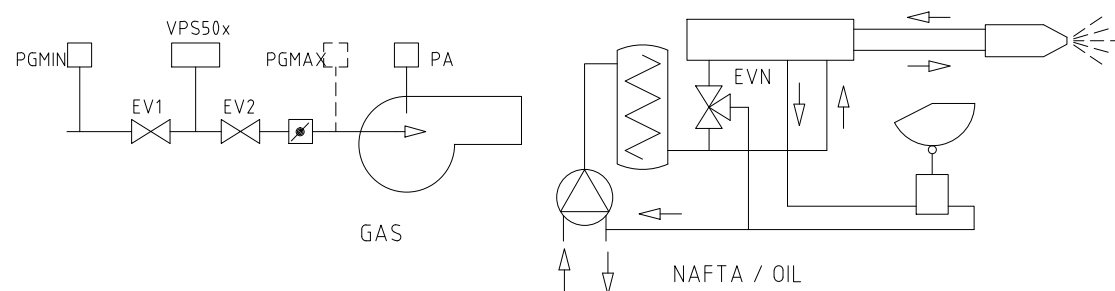




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|-----------|------------|-------|--------|
| Data      | 05/12/2002 | PREC. | FOGLIO |
| Revisione | 05         | 3     | 4      |
| Dis. N.   | 05 - 706   | SEGUE | TOTALE |
|           |            | 5     | 8      |



(x)  
UTILIZZATO SOLO PER VERSIONI "NAFTA DENSE"  
USED FOR "HEAVY OIL" VERSIONS ONLY



|           |            |       |        |
|-----------|------------|-------|--------|
| Data      | 05/12/2002 | PREC. | FOGLIO |
| Revisione | 05         | 4     | 5      |
| Dis. N.   | 05 - 706   | SEGUE | TOTALI |
|           |            | 6     | 8      |





|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|

$$\left( \times \right)$$

|           |            |       |       |
|-----------|------------|-------|-------|
| Data      | 05/12/2002 | PREC. | FOGLI |
| Revisione | 05         | 6     | 7     |
| Dis. N.   | 05 - 706   | SEGUE | TOTAL |
|           |            | 8     | 8     |

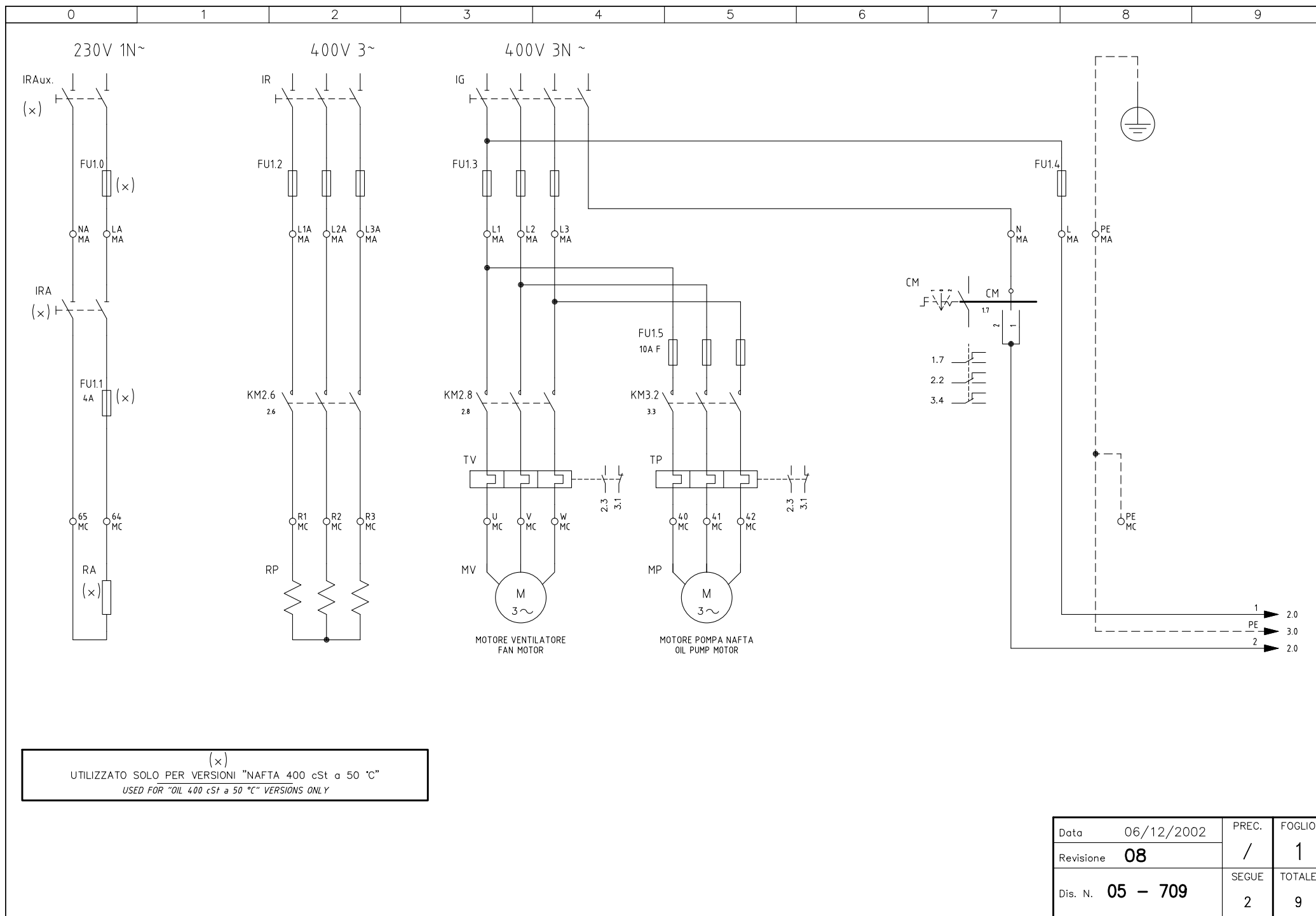
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|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|

| SIGLA/ITEM       | FOGLIO/SHEET | FUNZIONE                                                  | FUNCTION                                             |
|------------------|--------------|-----------------------------------------------------------|------------------------------------------------------|
| LSPG             | 3            | LAMPADA SEGNALAZIONE BLOCCO CONTROLLO TENUTA VALVOLE      | INDICATOR LIGHT FOR LEAKAGE OF VALVES                |
| LT               | 2            | LAMPADA SEGNALAZIONE BLOCCO TERMICO MOTORE VENTILATORE    | INDICATOR LIGHT FOR FAN OVERLOAD TRIPPED             |
| LTA              | 2            | LAMPADA SEGNALAZIONE TRASFORMATORE DI ACCENSIONE          | IGNITION TRANSFORMER INDICATOR LIGHT                 |
| LTP              | 2            | LAMPADA SEGNALAZIONE BLOCCO TERMICO POMPA                 | INDICATOR LIGHT FOR PUMP OVERLOAD TRIPPED            |
| LTRS             | 2            | LAMPADA SEGNALAZIONE BLOCCO TERMOSTATO DI SICUREZZA [TRS] | INDICATOR LIGHT FOR [TRS] SAFETY THERMOSTAT          |
| MP               | 1            | MOTORE POMPA NAFTA                                        | OIL PUMP MOTOR                                       |
| MV               | 1            | MOTORE VENTILATORE                                        | FAN MOTOR                                            |
| PA               | 3            | PRESSOSTATO ARIA                                          | AIR PRESSURE SWITCH                                  |
| PGMAX            | 4            | PRESSOSTATO GAS DI MASSIMA PRESSIONE (OPTIONAL)           | MAXIMUM PRESSURE GAS SWITCH (OPTIONAL)               |
| PGMIN            | 3            | PRESSOSTATO GAS DI MINIMA PRESSIONE                       | MINIMUM GAS PRESSURE SWITCH                          |
| 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 LFL 1.xx | 2            | APPARECCHIATURA CONTROLLO FIAMMA                          | CONTROL BOX                                          |
| SQL33.03         | 4            | SERVOCOMANDO SERRANDA ARIA                                | AIR DAMPER ACTUATOR                                  |
| ST               | 3            | SERIE TERMOSTATI/PRESSOSTATI                              | SERIES OF THERMOSTATS OR PRESSURE SWITCHES           |
| TA               | 2            | TRASFORMATORE DI ACCENSIONE                               | IGNITION TRANSFORMER                                 |
| TAB              | 4            | TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA                  | HIGH-LOW THERMOSTAT/PRESSURE SWITCHES                |
| TCI              | 3            | TERMOSTATO CONSENSO IMPIANTO                              | PLANT CONSENT THERMOSTAT                             |
| TCN              | 3            | TERMOSTATO CONSENSO NAFTA                                 | OIL CONSENT THERMOSTAT                               |
| TP               | 1            | TERMICO MOTORE POMPA                                      | PUMP MOTOR THERMAL                                   |
| TR               | 2            | TERMOSTATO DI REGOLAZIONE PRERISCALDATORE [RP]            | REGULATION THERMOSTAT FOR PRE-HEATING [RP] RESISTORS |
| TRS              | 2            | TERMOSTATO DI SICUREZZA PRERISCALDATORE [RP]              | PRE-HEATING [RP] A SAFETY THERMOSTAT                 |
| TV               | 1            | TERMICO MOTORE VENTILATORE                                | FAN MOTOR THERMAL                                    |
| VPS50x           | 3            | CONTROLLO TENUTA VALVOLE (OTIONAL)                        | GAS PROVING SYSTEM (OPTIONAL)                        |

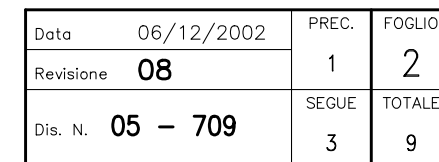
$$\left( \times \right)$$

UTILIZZATO SOLO PER VERSIONI "NAFTA Densa"  
USED FOR "HEAVY OIL" VERSIONS ONLY

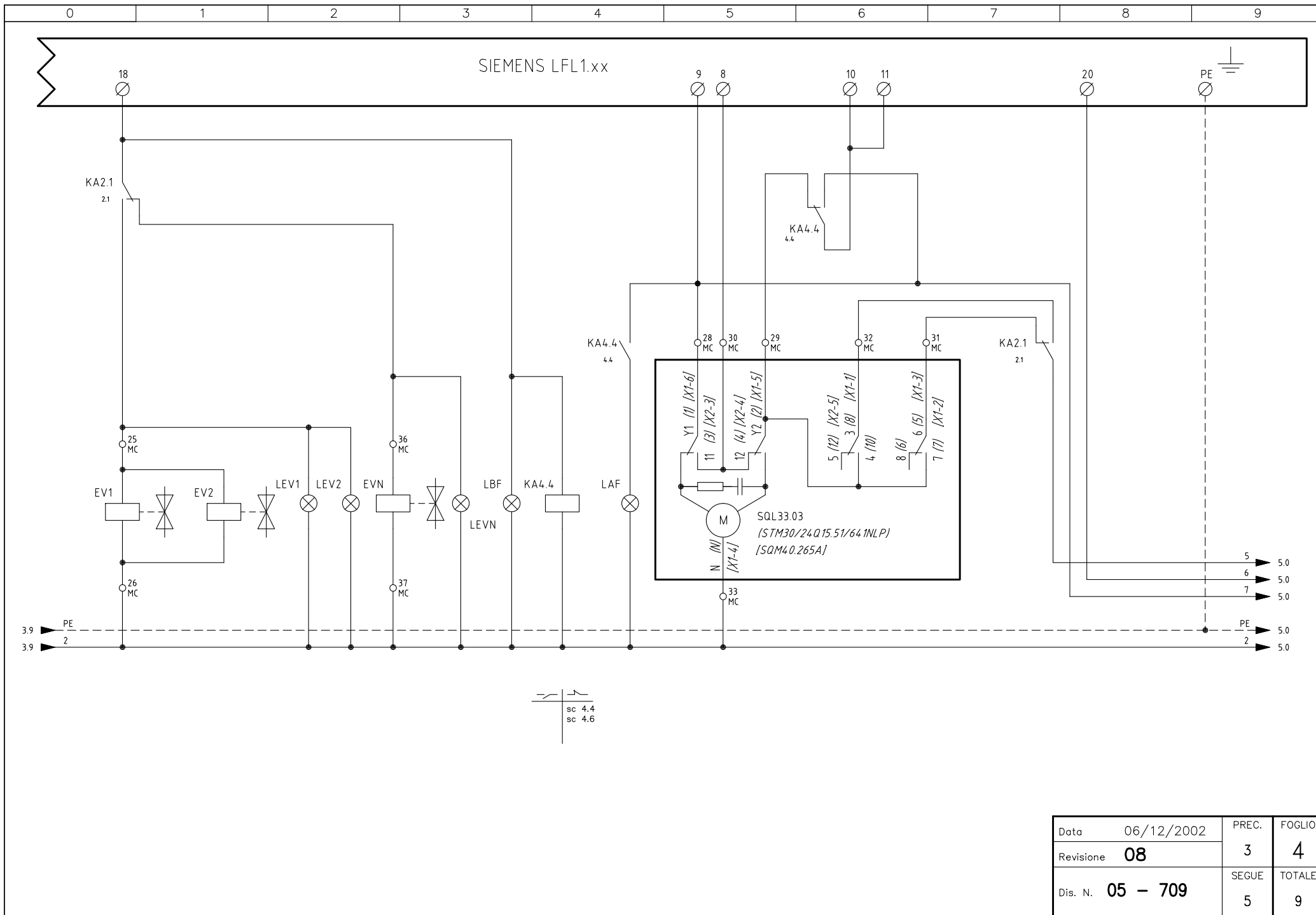
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|-----------|------------|-------|--------|
| Data      | 05/12/2002 | PREC. | FOGLIO |
| Revisione | 05         | 7     | 8      |
| Dis. N.   | 05 - 706   | SEGUE | TOTALI |
|           |            | /     | 8      |



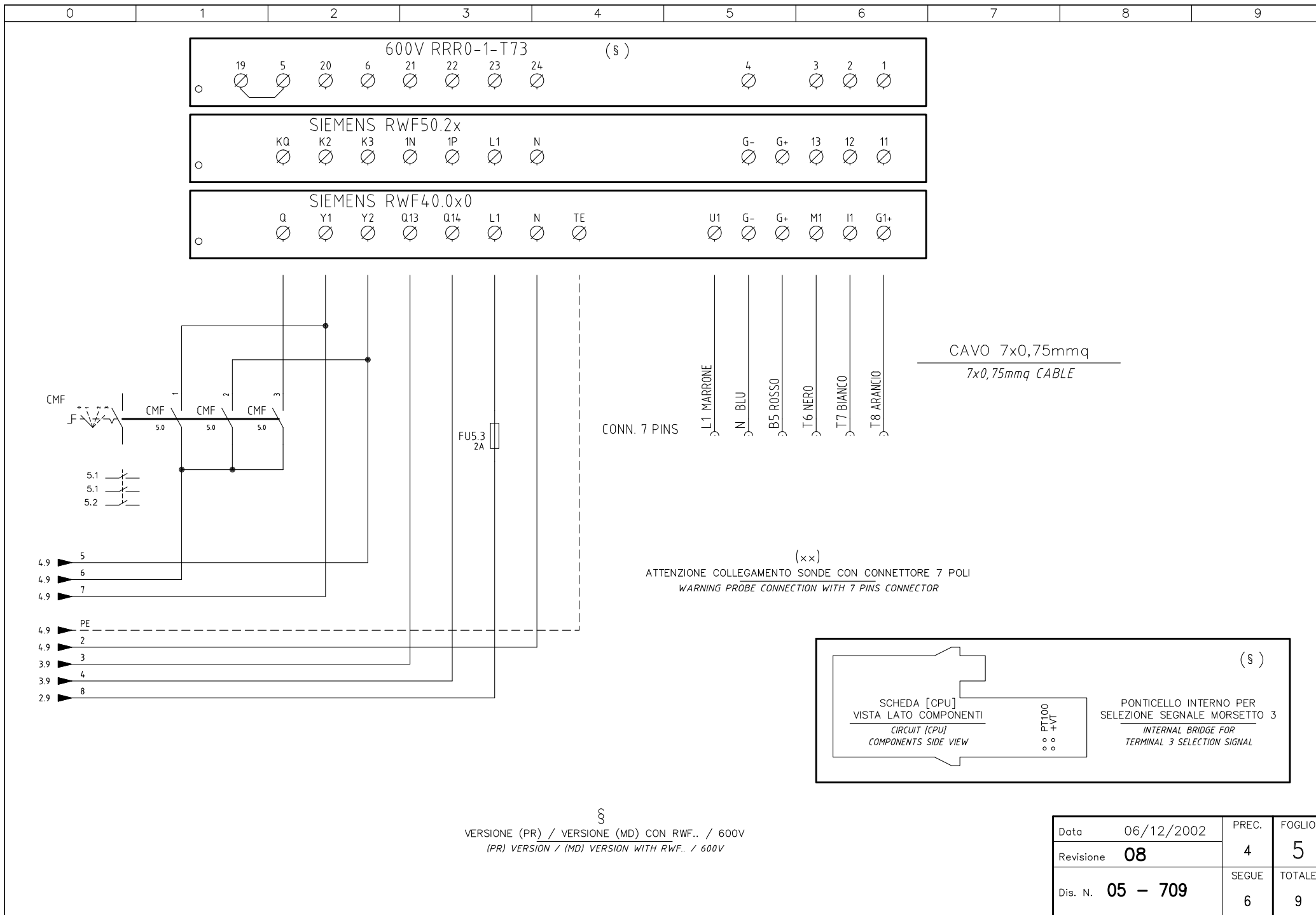
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|-----------|------------|-------|--------|
| Data      | 06/12/2002 | PREC. | FOGLIO |
| Revisione | 08         | /     | 1      |
| Dis. N.   | 05 - 709   | SEGUE | TOTALE |
|           |            | 2     | 9      |







|           |            |       |        |
|-----------|------------|-------|--------|
| Data      | 06/12/2002 | PREC. | FOGLIO |
| Revisione | 08         | 3     | 4      |
| Dis. N.   | 05 - 709   | SEGUE | TOTALE |
|           |            | 5     | 9      |



(xx)

ATTENZIONE COLLEGAMENTO SONDE CON CONNETTORE 7 POLI

WARNING PROBE CONNECTION WITH 7 PINS CONNECTOR

600V RRR0-1-T73

PT100

oo

+VT

(§)

3 = PT100

PONTICELLO INTERNO PER SELEZIONE SEGNALE MORSETTO 3

INTERNAL BRIDGE FOR TERMINAL 3 SELECTION SIGNAL

oo

oo

3 = +VT

3 (PT100) 2 1

T6

T7

T8

PT100

100 OHM 0°C

2 1

T7

T8

TC

4 3 (+VT) 2 1

N

T6

T7

T8

mA

bar/°C

SD - 4÷20mA

(#)

2 1

T7

T8

V

bar/°C

SD - 0÷10V

3 (+VT) 2 1

T6

T7

T8

BIANCO WHITE

VERDE GREEN

MARRONE BROWN

GL

M

U1

GL

SD-PRESS

SIEMENS QBE...

(#)

RWF40.0x0

M1

G1+

SD-TEMP.

SD-TEMP. SIEMENS QAE2../QAC2../QAM2..

PT1000

1000 OHM 0°C

M1 I1 G1+

T6

T7

T8

PT100

100 OHM 0°C

M1 I1

T6

T7

TC

G- G+ M1 I1

N

B5

T6

T7

mA

bar/°C

SD - 4÷20mA

(#)

U1 M1

L1

T6

V

bar/°C

SD - 0÷10V

U1 G- G+ M1

L1

N

B5

T6

BIANCO WHITE

VERDE GREEN

MARRONE BROWN

GL

M

U1

GL

SD-PRESS

SIEMENS QBE...

(#)

RWF50.2x

13 11

SD-TEMP.

SD-TEMP. SIEMENS

PT1000

1000 OHM 0°C

13 12 11

T6

T7

T8

PT100

100 OHM 0°C

G- G+ 13 12

N

B5

T6

T7

mA

bar/°C

SD - 4÷20mA

(#)

13 11

T6

T8

V

bar/°C

SD - 0÷10V

G- G+ 13 11

N

B5

T6

T8

BIANCO WHITE

VERDE GREEN

MARRONE BROWN

GL

M

U1

GL

SD-PRESS

SIEMENS QBE... 0÷10V

(#)

(#)

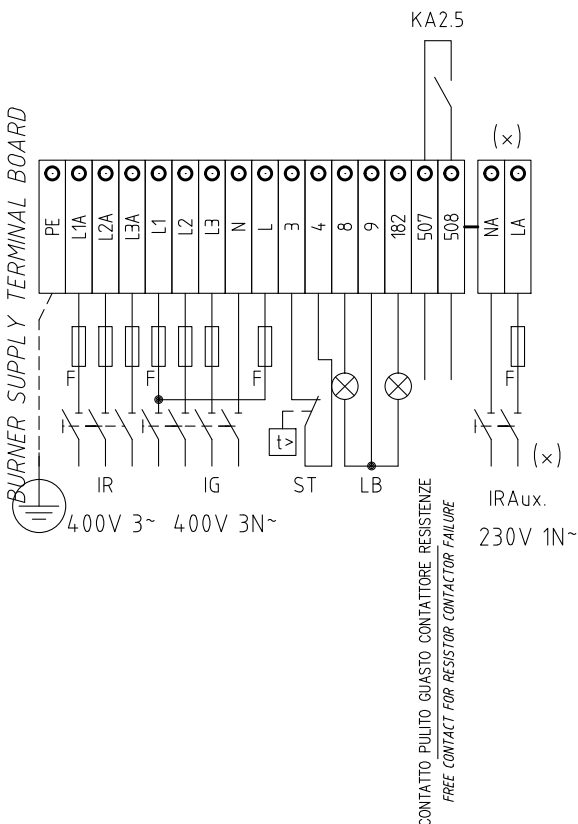
COLLEGAMENTO SOLO PER TRASDUTTORI PASSIVI

TRASDUCER PASSIVE CONNECTION ONLY

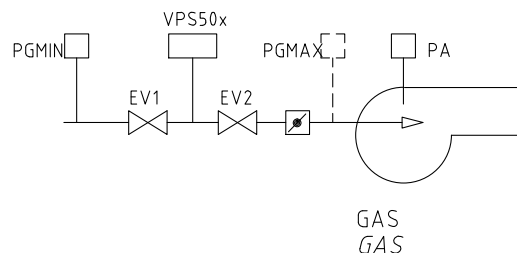
|           |            |       |        |
|-----------|------------|-------|--------|
| Data      | 06/12/2002 | PREC. | FOGLIO |
| Revisione | 08         | 5     | 6      |
| Dis. N.   | 05 - 709   | SEGUE | TOTALE |
|           |            | 7     | 9      |



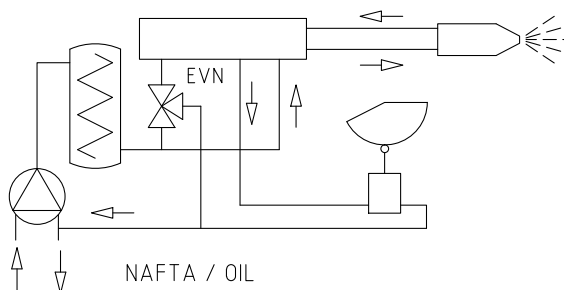
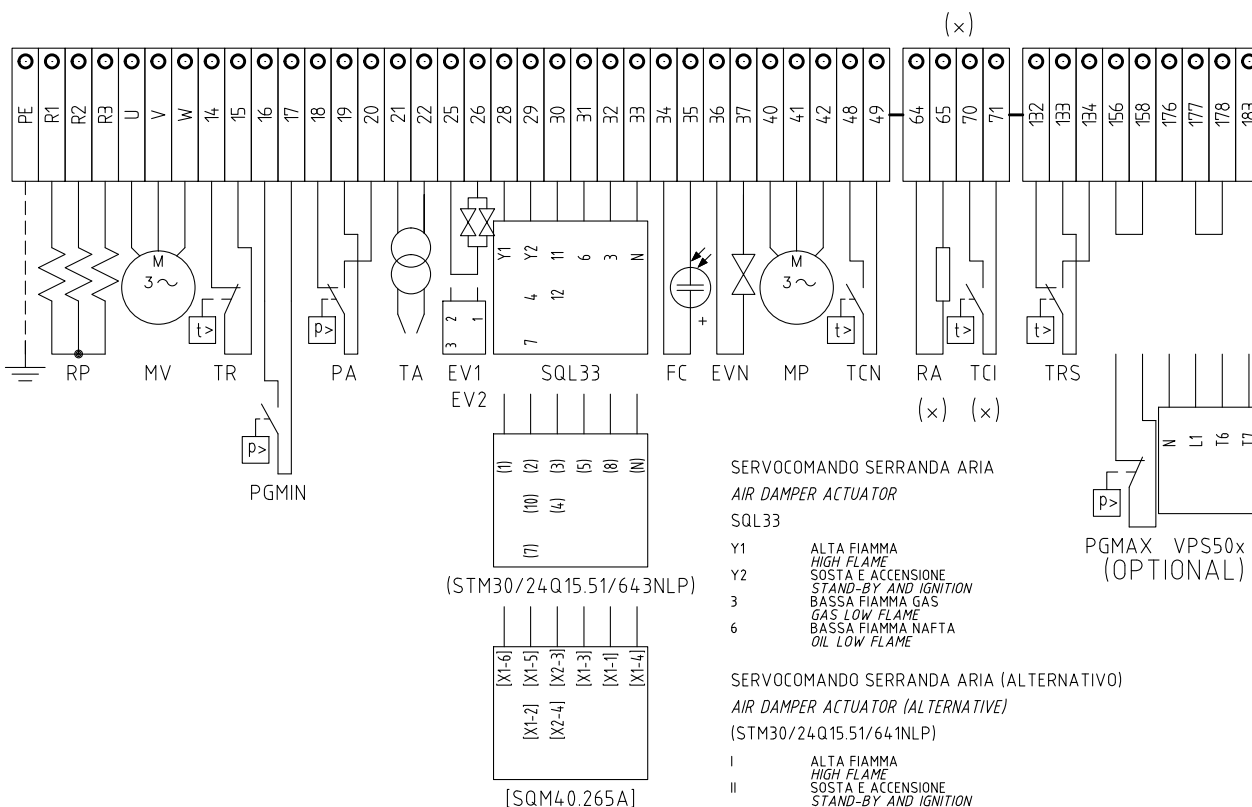
**QUADRO QG - MORSETTIERA MA**  
MORSETTIERA ALIMENTAZIONE BRUCIATORE  
BURNER SUPPLY TERMINAL BOARD



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



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



SERVOCOMANDO SERRANDA ARIA  
AIR DAMPER ACTUATOR  
SQL33

|    |                                             |
|----|---------------------------------------------|
| Y1 | ALTA FIAMMA<br>HIGH FLAME                   |
| Y2 | SOFFA E ACCENSIONE<br>STAND-BY AND IGNITION |
| 3  | BASSA FIAMMA GAS<br>GAS LOW FLAME           |
| 6  | BASSA FIAMMA NAFTA<br>OIL LOW FLAME         |

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
(STM30/24.Q15.51/64.1NLP)

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

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

I ALTA FIAMMA  
HIGH FLAME  
II SOSTA E ACCENSIONE  
STAND-BY AND IGNITION  
III BASSA FIAMMA GAS  
GAS LOW FLAME  
IV BASSA FIAMMA NAFTA  
OIL LOW FLAME

|           |            |       |        |
|-----------|------------|-------|--------|
| Data      | 06/12/2002 | PREC. | FOGLIO |
| Revisione | 08         | 6     | 7      |
| Dis. N.   | 05 - 709   | SEGUE | TOTAL  |
|           |            | 8     | 9      |

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|

$$\left( \times \right)$$

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|

$$\left( \times \right)$$

|           |            |       |        |
|-----------|------------|-------|--------|
| Data      | 06/12/2002 | PREC. | FOGLIO |
| Revisione | 08         | 8     | 9      |
| Dis. N.   | 05 - 709   | SEGUE | TOTALI |
|           |            | /     | 9      |









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web site: [www.cibunigas.it](http://www.cibunigas.it) - e-mail: [cibunigas@cibunigas.it](mailto:cibunigas@cibunigas.it)

# RWF55.5X & RWF55.6X

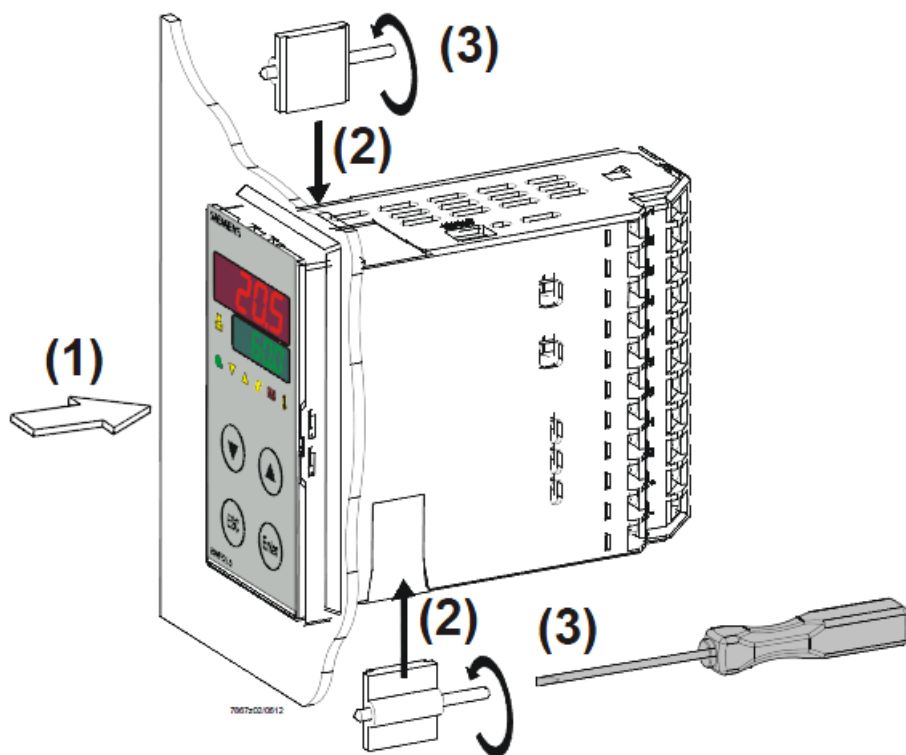


*User manual*

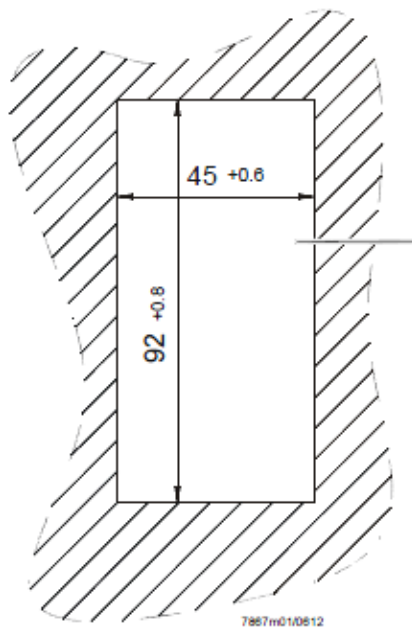


## DEVICE INSTALLATION

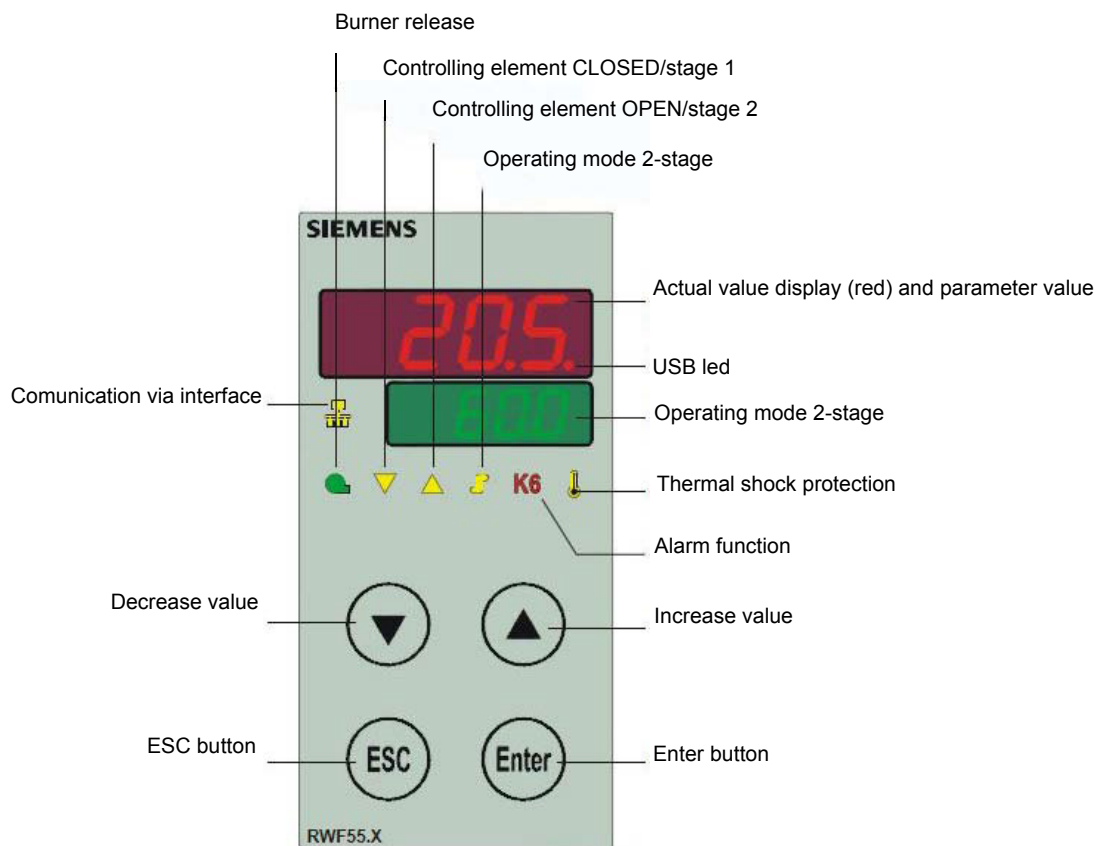
### Fixing system

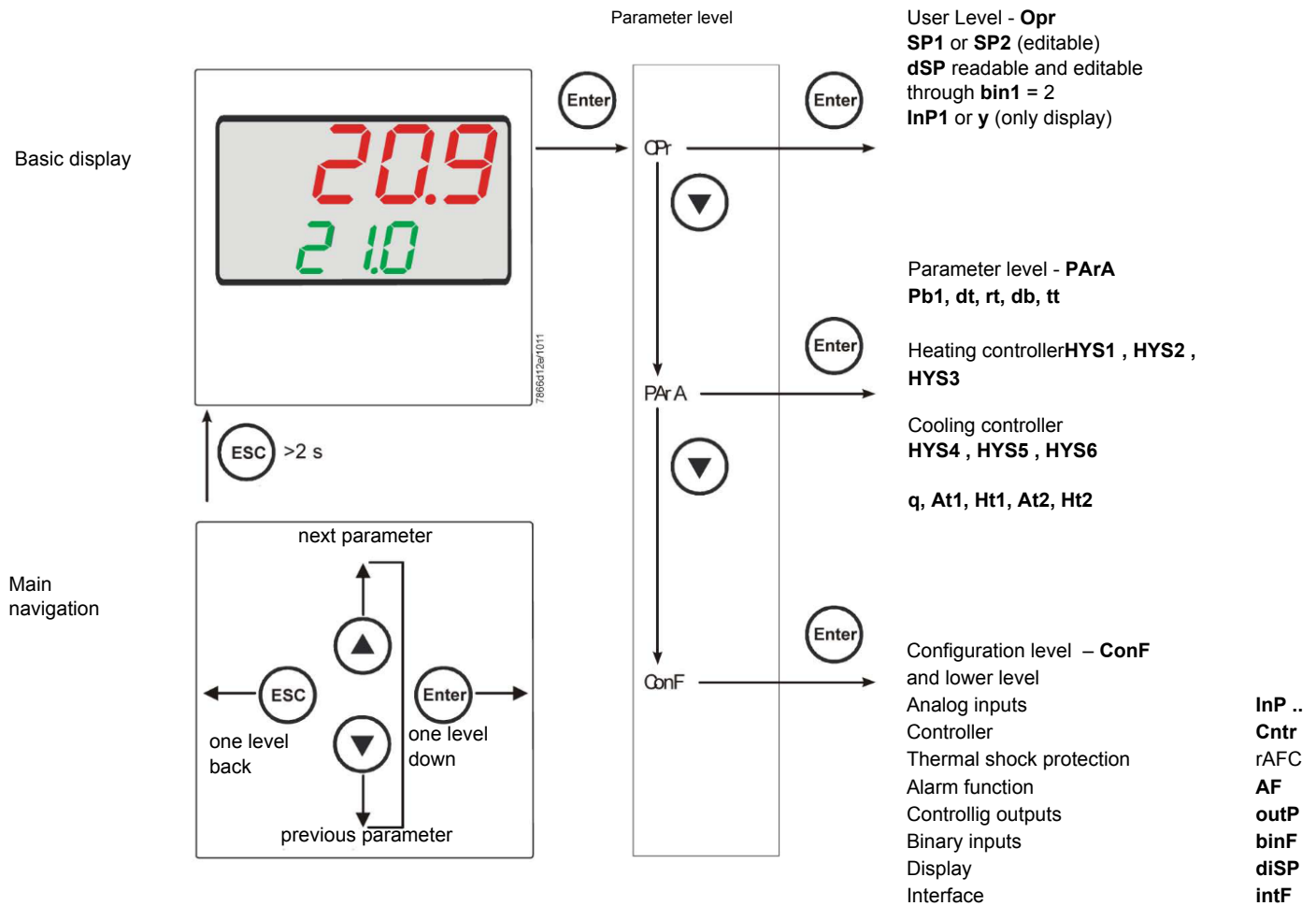


### Drilling dimensions:



## FRONT PANEL





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 **Op** 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                                                            |
| Derivative action                                          | dt      | 0... 9999 sec.     | 80              | Typical value for temperature                                                            |
| Integral action                                            | rt      | 0... 9999 sec.     | 350             | Typical value for temperature                                                            |
| 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<br>(enable only with parameter <b>CACT</b> = 0)                              |
| Switch-off differential 2° stage on cooling controller (*) | HYS5    | HYS6...0,0 digit   | 5               | Do not used<br>(enable only with parameter <b>CACT</b> = 0 and parameter <b>bin1</b> =0) |
| Upper switch-off differential on cooling controller (*)    | HYS6    | 0,0... -1999 digit | 5               | Do not used<br>(enable only with parameter <b>CACT</b> = 0)                              |
| Delay modulation                                           | q       | 0,0... 999,9 digit | 0               | Do not alter                                                                             |
| 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<br>1                                  |
| 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<br>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 displayed. 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<br>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                  | 1 = <b>degrees</b> Celsius                                                        |
|                                              | 2                  | 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                           | 0= <b>no function</b>                                                             |
|                             | 1                           | 1= external setpoint (display <b>SPE</b> )                                        |
|                             | 2                           | 2 =setpoint shifting (display <b>dSP</b> )                                        |
|                             | 3                           | 3 = angular positioning feedback                                                  |
| SEn2<br>sensor 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.. <b>0</b> .. +9999   | Correction value measured by the sensor                                           |
| SCL2<br>scale low level     | -1999.. <b>0</b> .. +9999   | minimum scale value(for input ohm, mA, V)                                         |
| SCH2<br>scale high level    | -1999.. <b>100</b> .. +9999 | maximum scale value(for input ohm, mA, V)                                         |
| dF2<br>digital filter       | 0... <b>2</b> ...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 3<br>sensor type input 2 | 0                         | 0 =                                                                               |
|                                                    | 1                         | 1 = wire                                                                          |
|                                                    | 2                         | 2 = wire                                                                          |
| OFF3<br>Sensor offset                              | -1999.. <b>0</b> .. +9999 | Correction value measured by the sensor                                           |
| dF3<br>digital filter                              | 0... <b>1278</b> ...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 presets for self-optimization are selected

| Parameter                                               | Value                     | Description                                                                                                                                                                               |
|---------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CtYP<br>controller type                                 | 1<br>2                    | <b>1 = 3-position controller (open-stop-close)</b><br>2 = continuative action controller (0 ÷ 10V or 4 ÷ 20mA)                                                                            |
| CACT<br>control action                                  | 1<br>0                    | <b>1 = heating controller</b><br>0 = cooling controller                                                                                                                                   |
| SPL<br>least value of the set-point range               | -1999.. <b>0</b> ..+9999  | minimum set-point scale                                                                                                                                                                   |
| SPH<br>maximum value of the set-point range             | -1999.. <b>100</b> ..+999 | maximum set-point scale                                                                                                                                                                   |
| Self-optimization                                       | 0<br>1                    | <b>0 = Free</b><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 |
| pLLo<br>set-point limitation start, operation limit low | -1999.... +9999           | lower working range limit                                                                                                                                                                 |
| pLHi<br>set-point limitation end, operation limit high  | -1999.... <b>+9999</b>    | upper working range limit                                                                                                                                                                 |

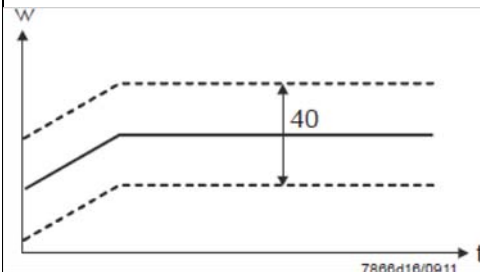
(**bold** = factory settings)

## 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 control     | <b>0</b><br>1<br>2             | choose type of range degrees/time<br><b>0 = deactivated</b><br>1 = Kelvin degrees/minute<br>2 = Kelvin degrees/hour                                                                                                                            |
| rASL<br>ramp rate           | <b>0,0</b> ... 999,9           | Slope of thermal shock protection (only with functions 1 and 2)                                                                                                                                                                                |
| tolP<br>tolerance band ramp | <b>2 x (HYS1) = 10</b> ...9999 | width of tolerance band (in K) about the set-point<br><b>0 = tolerance band inactive</b>                                                                                                                                                       |
| rAL<br>ramp limit           | <b>0</b> ...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 <b>rASL</b> . If this is over the temp set point, the control is performed in cooling |



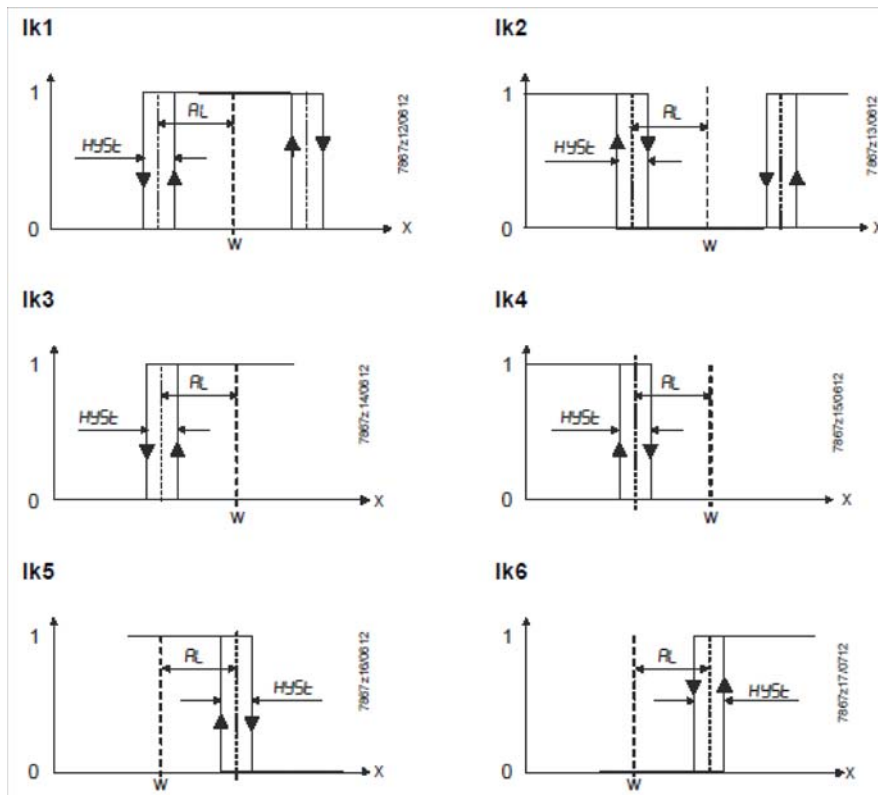
(**bold** = factory settings)

## Alarm functionAF

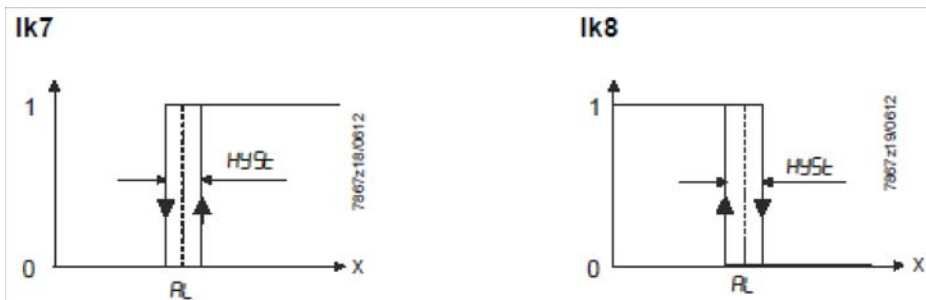
The alarm function can be used to monitor the analog inputs. If the limit value is exceeded, multifunctional relay K6 (terminals **6N** and **6P**) is activated (depending on the switching characteristic)

The alarm function can have different switching functions (Ik1 to Ik8) 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 = <b>Without function</b><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><b>0</b><br>1999                                    | Limit value or deviation from setpoint to be monitored (see alarm functions<br><b>Ik1 to Ik8</b> : limit value <b>AL</b> )<br>Limit value range for <b>Ik1</b> and <b>Ik20</b> ...9999                                                                                                                                                                                                              |
| HySt<br>switching differential   | 0...<br>1...<br>9999                                             | Switching differential for limit value <b>AL</b>                                                                                                                                                                                                                                                                                                                                                    |
| ACrA<br>response by out of range | <b>0</b><br>1                                                    | <b>Switched-off</b><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><b>4</b>      | 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><b>4 = Controller's angular positioning is delivered (modulating controller)</b> |
| SiGn<br>type of output signal         | <b>0</b><br>1<br>2           | physical output signal (terminals A+, A-)<br><b>0 = 0÷20mA</b><br>1 = 4÷20mA<br>2 = 0÷10V DC                                                                                                                                                                      |
| rOut<br>value when out of input range | <b>0</b> ...101              | signal (in percent) when measurement range is crossed                                                                                                                                                                                                             |
| oPnt<br>zero point                    | -1999... <b>0</b> ...+9999   | A value range of the output variable is assigned to a physical output signal (for <b>FnCt</b> = 1, 2, 3)                                                                                                                                                          |
| End<br>end point                      | -1999... <b>100</b> ...+9999 | A value range of the output variable is assigned to a physical output signal (for <b>FnCt</b> = 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 input 1 (terminals <b>DG</b> – <b>D1</b> ) | <b>0</b><br>1<br>2<br>3 | <b>0 = without function</b><br>1 = set-point changeover (SP1 / SP2)<br>2 = lset-point shift (Opr > dSP parameter = value of set-point modify)<br>3 = input alarm |
| bin2<br>binary input 2 (terminals <b>DG</b> – <b>D2</b> ) | <b>4</b>                | <b>changeover of operating mode</b><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>upper display (red)   | <b>0</b><br>1<br>2<br>3<br>4<br>6<br>7 | Display value for upper display:<br>0 = display power-off<br><b>1 = analog input 1 (InP1) value</b><br>2 = analog input 2 (InP2) value<br>3 = analog input 3 (InP3) value<br>4 = controller's angular positioning<br>6 = set-point values<br>7 = end value with thermal shock protection |
| diSL<br>lower display (green) | <b>0</b><br>1<br>2<br>3<br>4<br>6<br>7 | Display value for lower display:<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><b>6 = set-point values</b><br>7 = end value with thermal shock protection |
| tout<br>timeout               | 0.. <b>180</b> ..250                   | time (s) on completion of which the controller returns automatically to the basic display, if no button is pressed                                                                                                                                                                       |
| dECP<br>decimal point         | <b>0</b><br>1<br>2                     | <b>0 = no decimal place</b><br>1 = one decimal place<br>2 = two decimal place                                                                                                                                                                                                            |
| CodE<br>level lockout         | <b>0</b><br>1<br>2<br>3                | <b>0 = no lockout</b><br>1 = configuration level lockout ( <b>ConF</b> )<br>2 = parameter and configuration level lockout ( <b>PARa</b> & <b>ConF</b> )<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** terminals C1-C2-C3-C4)

| Parameter                     | Value                        | Description                                                               |
|-------------------------------|------------------------------|---------------------------------------------------------------------------|
| bdr<br>baudrate               | <b>0</b><br>1<br>2<br>3      | <b>0 = 4800 baud</b><br>1 = 9600 baud<br>2 = 19200 baud<br>3 = 38400 baud |
| Adr<br>Device address Modbus  | 0..<br><b>1</b> ..<br>254    | Address in the data network                                               |
| dP<br>Device address Profibus | 0.. <b>125</b>               | only with RWF55.6x                                                        |
| dt<br>Remote detection time   | 0..<br><b>30</b> ..<br>7200s | 0 = switched-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):

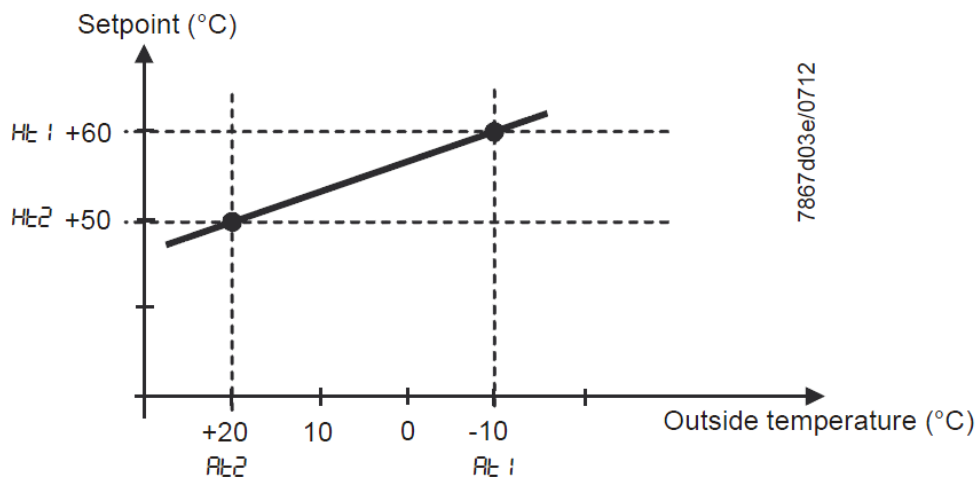
The RWF55 can be configured so that weather-compensated setpoint shifting is activated when an LG-Ni1000 outside sensor or a Pt1000 is connected (see parameter **InP3**).

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 menu **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

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**Dati dell'apparecchio**

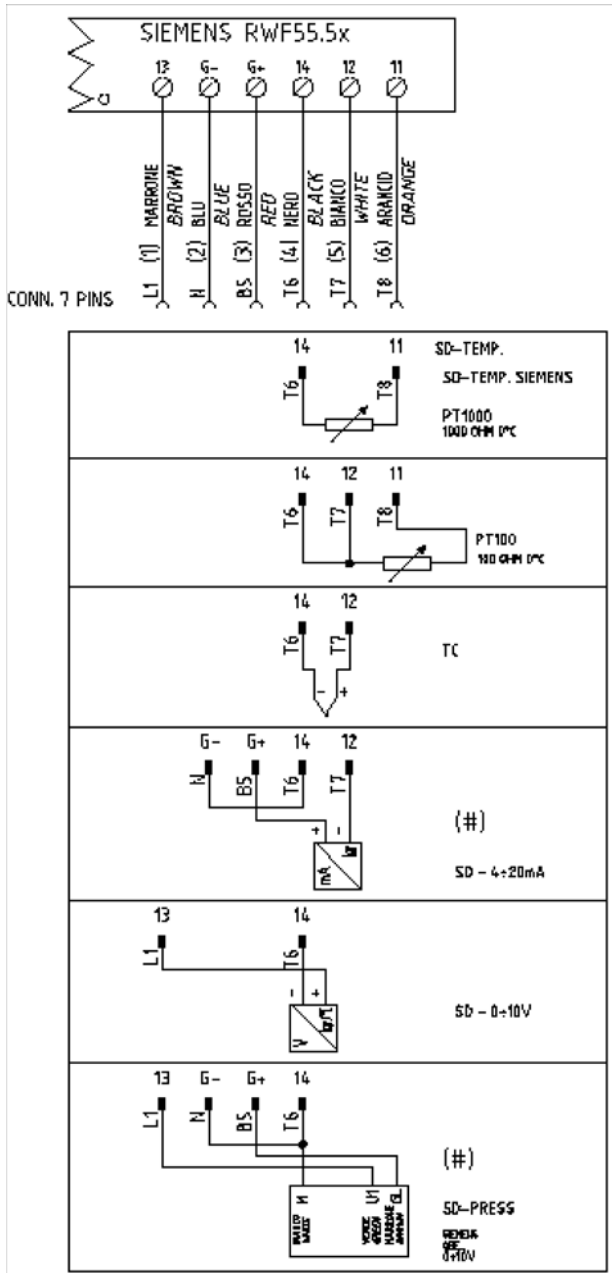
| Address | Access | Data type | Signal reference | Parameter        |
|---------|--------|-----------|------------------|------------------|
| 0x8000  | R/O    | Char12    | ---              | Software version |
| 0x8006  | R/O    | Char14    | ---              | VdN number       |

**Stato dell'apparecchio**

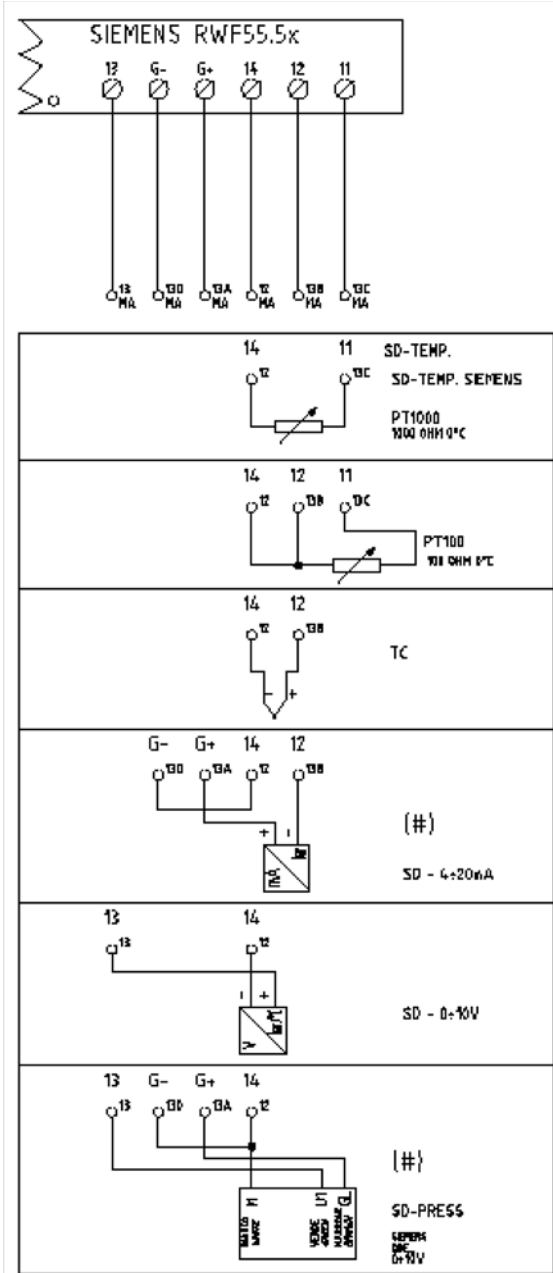
| Address | Access | Data type | Signal reference | Parameter                             |
|---------|--------|-----------|------------------|---------------------------------------|
| 0x0200  | R/O    | Word      | ---              | Outputs and states                    |
|         |        |           | 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 :

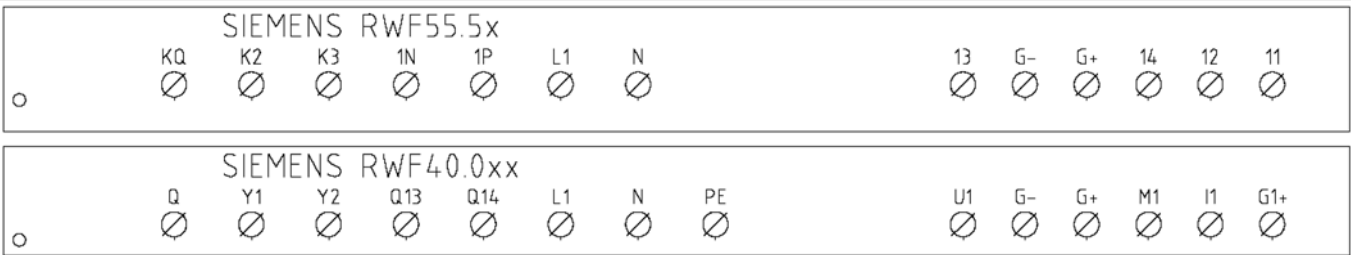
With 7 pins connector version



With terminals version



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





## Parameters summarising for RWF55.xx :

| Navigation menù        | ConF           |      |          |          |          | ConF     |          |          |      |       |      |     |      |          | Opr         |
|------------------------|----------------|------|----------|----------|----------|----------|----------|----------|------|-------|------|-----|------|----------|-------------|
|                        | Inp            |      |          |          |          |          |          | diSP     |      |       |      |     |      |          |             |
|                        | Inp1           |      |          |          |          |          |          |          | Cntr |       | PArA |     |      |          |             |
|                        | Types of probe | SEn1 | OFF1     | SCL      | SCH      | Unit     | SPL      | SPH      | dECP | Pb. 1 | dt   | rt  | tt   | HYS1 (*) |             |
| 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

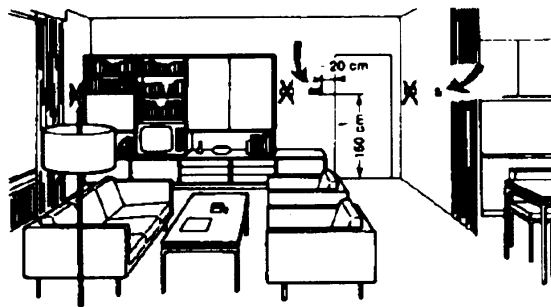
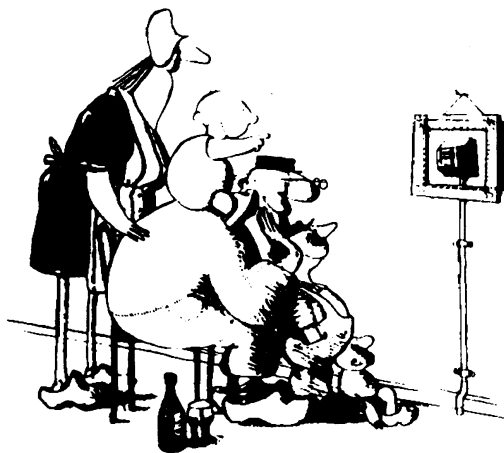
To assure the utmost comfort, the control system needs reliable information, which can be obtained provided the sensors have been installed correctly. Sensors measure and transmit all variations encountered at their location.

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 measurements without being affected by foreign factors.

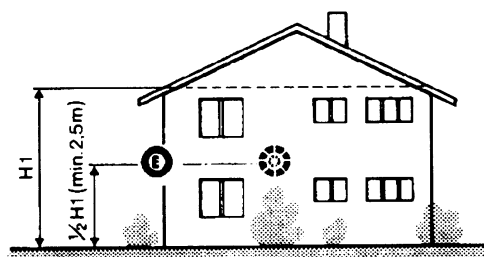
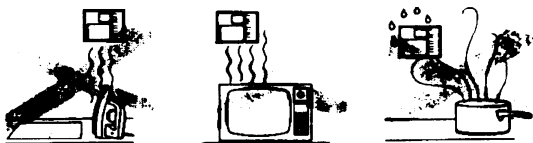


#### Outside probes (weather) Installation

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

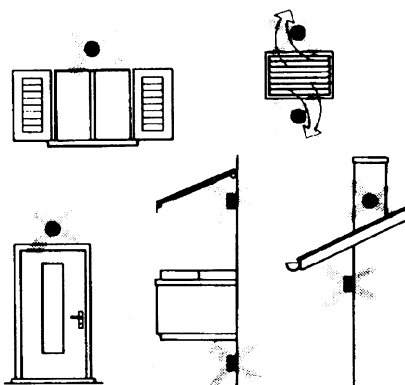
#### It's good to be admired ...even better to be effective

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.



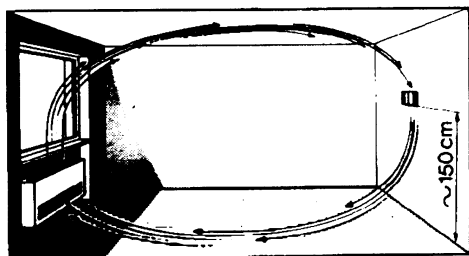
**General rule:** en on the outer wall of the building where the living rooms are, never on the south-facing wall or in a position where they will be affected by morning sun. If in any doubt, place them on the north or north-east façade.

#### Positions to be avoided



#### Location

On an inner wall on the other side of the room to heating units height 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 windows, 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.

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:

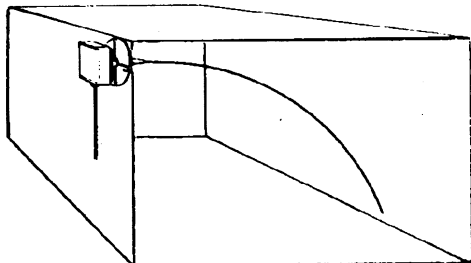
"after delivery fan or

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

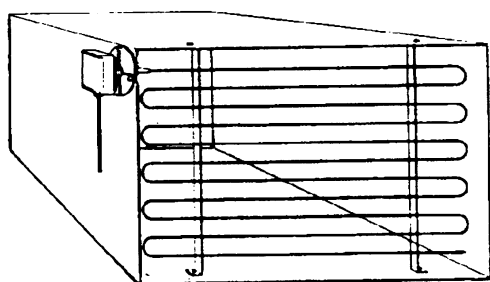
For measuring room temperature:

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

For measuring saturation temperature: after mist eliminator.



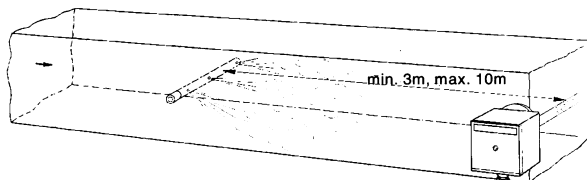
Bend 0.4m sensor by hand (never use tools) as illustrated .



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

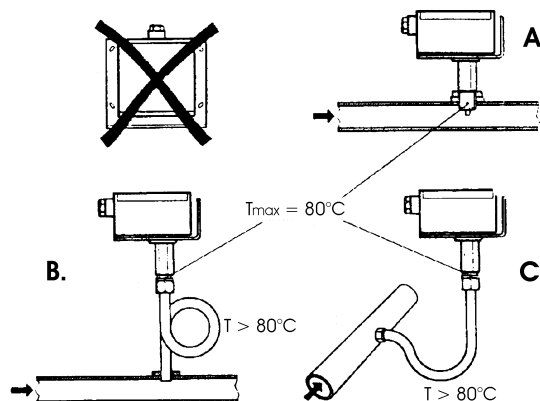
A - installation on ducts carrying fluids at max. temperature 80°C

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

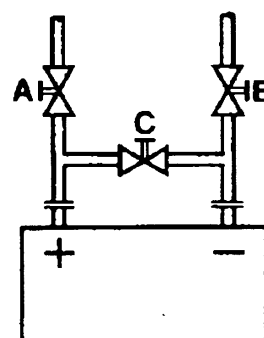
Start disable

1=open C1=open C

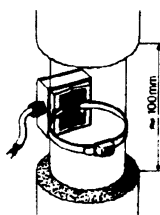
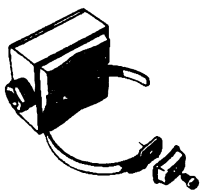
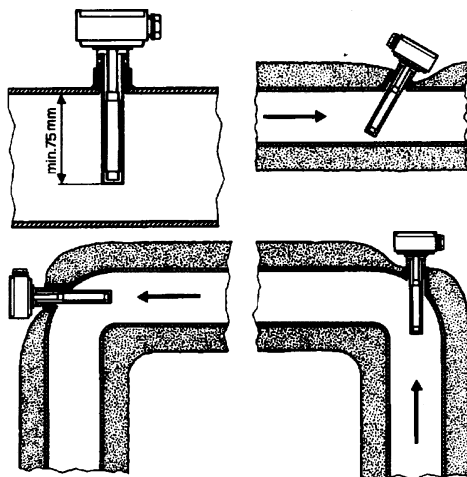
2=open A2=close B

3=open B3=close A

4= close C



## Immersion or strap-on sensors



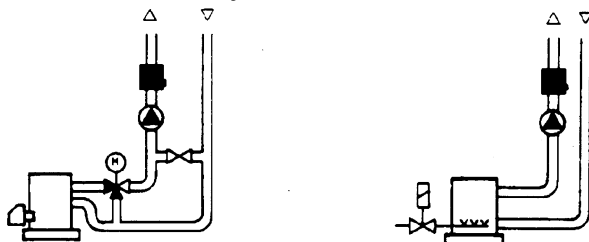
### Placing the probes (QAD22.../QAE21.../QAP21.../RCA...)

#### 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



### 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 .

### 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

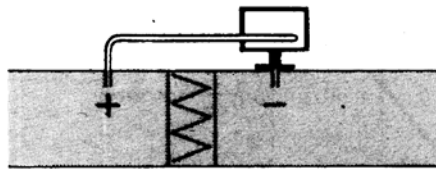
Advantages:

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

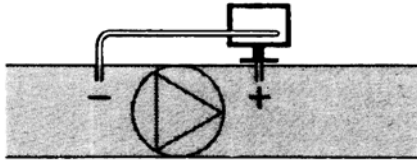
Limits:

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

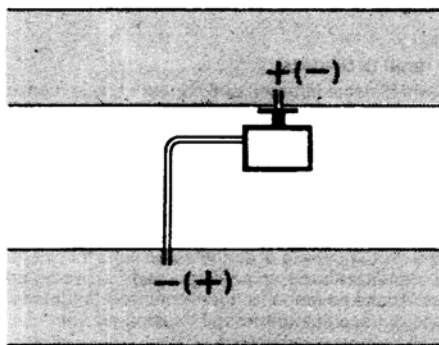
Installing differential pressure probes for air



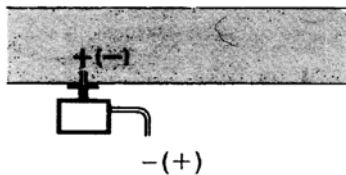
A - Control a filter (clogging)



B - Control a fan (upstream/downstream)



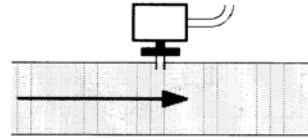
C - Measurement of difference in pressure between two ducts



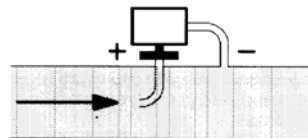
D - Measurement of difference in pressure between two rooms or of inside of duct and outside

Basic principles

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



Measuring dynamic pressure

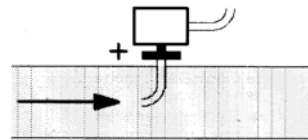


$$P_d = \frac{\gamma q^2}{2g}$$

Legend

- $\gamma$  Kg/m<sup>3</sup>, specific weight of air
- $q$  m/s, air speed
- $g$  9.81 m/s<sup>2</sup> gravity acceleration
- $P_d$  mm C.A., dynamic pressure

Measuring total pressure





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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.

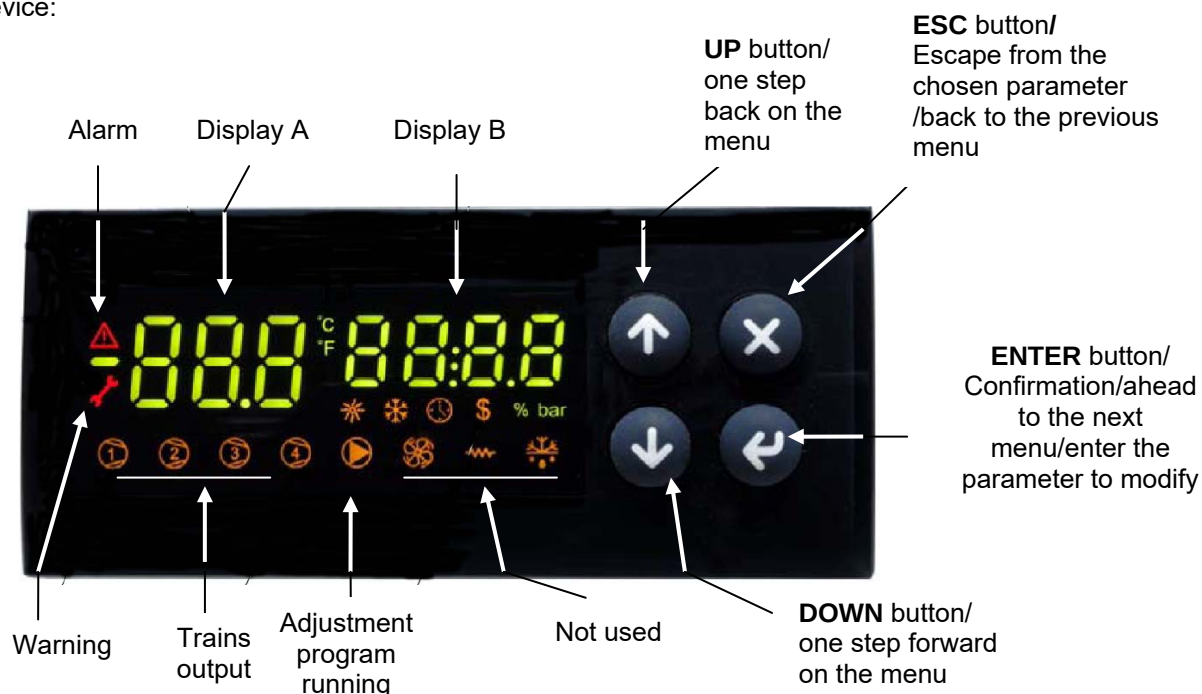
When set-point **trS** is got to, output number 5 is ON (terminals C5-NO5) linked to the relais KTRS. It switches the resistors off and activates an alarm on the device.

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:



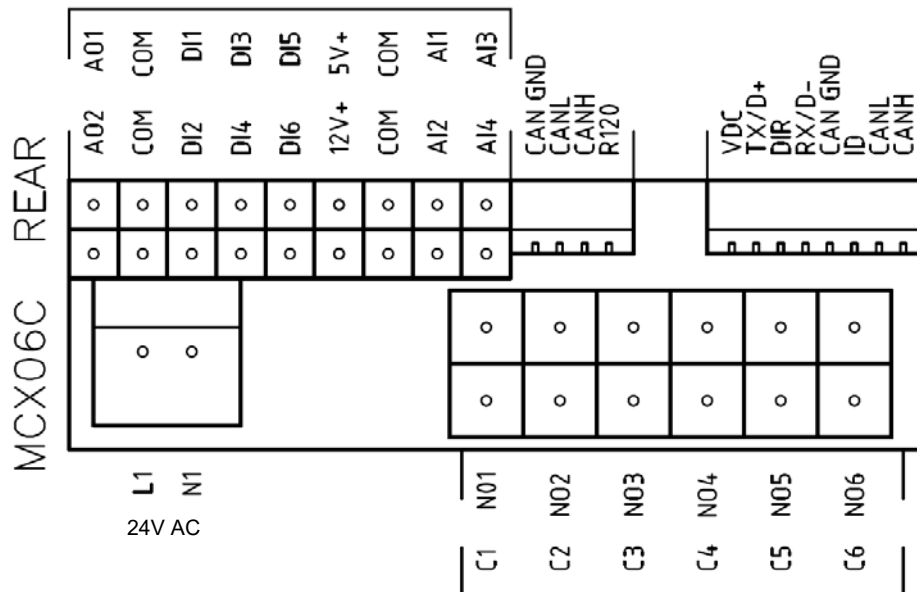
#### Note :

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).

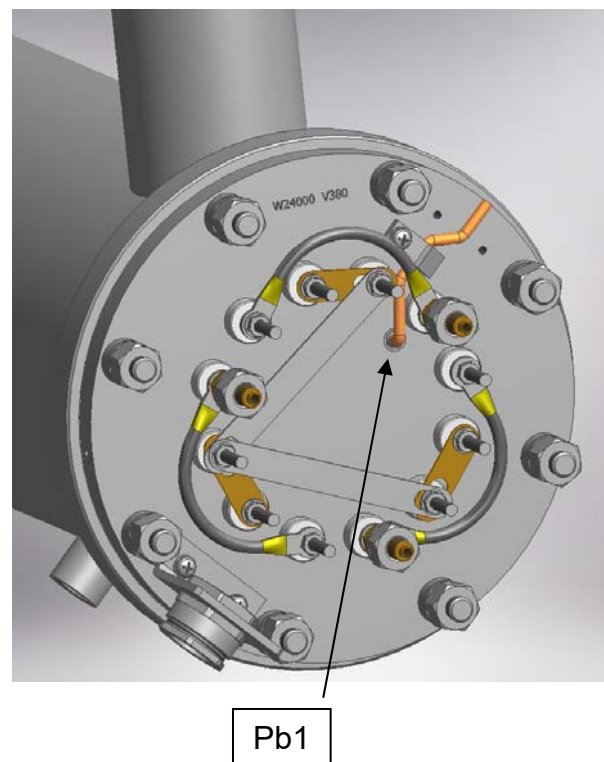
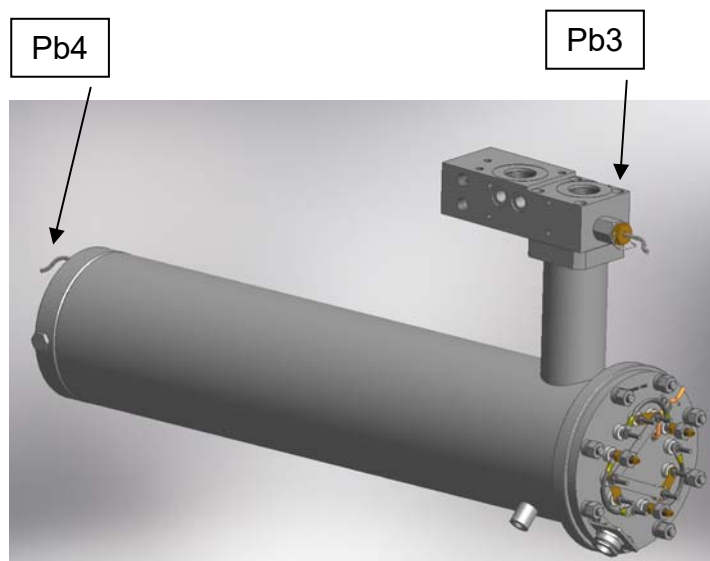


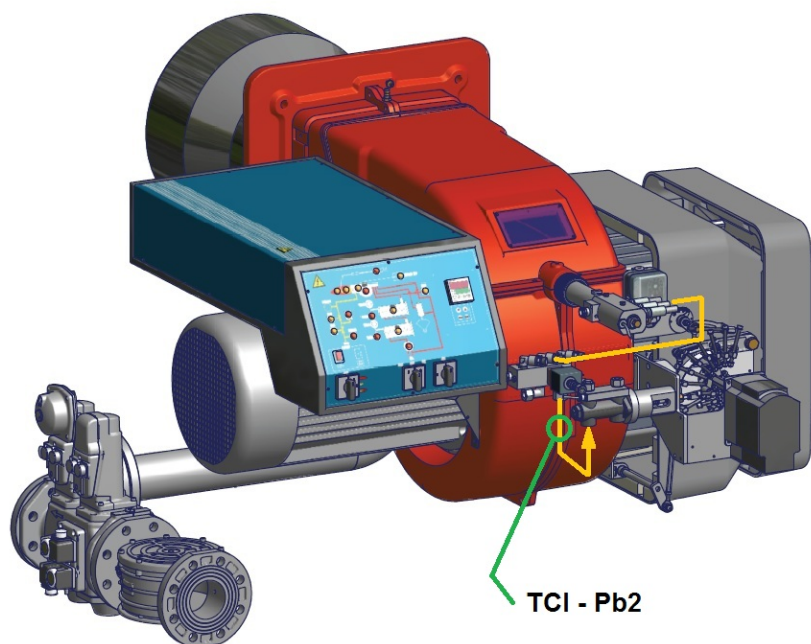
## Connections from terminal side :



## Probe connection:

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





(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 |
|------------|-----------|-------------------------------------|------------------------------------------------------------------------|--------|-------|---------|------|----------------------|----------------|--------------|
| <b>CnF</b> |           | <b>CONFIGURATION</b>                |                                                                        |        |       |         |      |                      | 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           |
| dl         |           | Digital input                       |                                                                        |        |       |         |      |                      | 1              |              |
|            | dl1       | Input 1 polarity (Pump)             | Change type of digital input ( NC o NO)                                | 0      | 1     | 1       |      |                      | 3              | 13           |
|            | dl2       | Alarm polarity from input 2         | Change type of digital input ( NC o NO)                                | 0      | 2     | 2       |      |                      | 2              | 14           |
|            | dl3       | Alarm polarity from input 3         | Change type of digital input ( NC o NO)                                | 0      | 2     | 2       |      |                      | 2              | 15           |
|            | dl4       | Alarm polarity from input 4         | Change type of digital input ( NC o NO)                                | 0      | 2     | 2       |      |                      | 2              | 16           |
|            | dl5       | Alarm polarity from input 5         | Change type of digital input ( NC o NO)                                | 0      | 2     | 2       |      |                      | 2              | 17           |
|            | dl6       | Alarm polarity from input 6         | Change type of digital input ( NC o NO)                                | 0      | 2     | 2       |      |                      | 2              | 18           |
| dl         |           | Digital output<br>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              |              |
|            | Slp       | Selection of safety probe           | Probe which also activates the relay<br>Warning (ns. KTRS)             | 0      | 4     | 4       |      |                      | 3              | 21           |
| SyS        |           | System                              |                                                                        |        |       |         |      |                      | 0              |              |
|            | dSA       | display A output                    | Probe temperature or set-point to be<br>displayed in the left display  | 0      | 8     | 1       |      |                      | 3              | 22           |
|            | dSb       | display B output                    | Probe temperature or set-point to be<br>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 |
|------------|-----------|------------------------------------------------------------|-----------------------------------------------------------------------------|-------|--------|---------|------|----------------------|-------|--------------|
| <b>REG</b> |           | <b>REGULATION</b>                                          |                                                                             |       |        |         |      |                      | 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 <b>"Set point adjustment"</b>              | -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<br>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 <b>"Set point adjustment"</b> | -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 value tank 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                      | Source                | 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 | tCl | Plant consent temperature probe (when installed)      | 20 °C                                                                    | 70 °C      | 70 °C                 | 70 °C                  | ---                     |
|           | Pb3 | Oil | oil heater output temperature probe (PID regulation); | 60-70 °C                                                                 | 110-120 °C | 120-130 °C            | 130-140 °C             | 140-150 °C              |
|           |     | SP0 | Set-point oil heater with oil pump stopped (stand-by) | 45 °C                                                                    | 120 °C     | 130 °C                | 140 °C                 | 150 °C                  |
|           | Pb4 | tcn | Oil heater consent temperature probe                  | 40 °C                                                                    | 100 °C     | 100 °C                | 110 °C                 | 120 °C                  |
|           |     | trS | Safety temperature tank resistors (manual reset)      | 120 °C                                                                   | 190-200 °C | 190-200 °C            | 190-200 °C             | 190-200 °C              |

The above temperature values are suggested and refer to a plant designed according to the prescriptions in the burner user manual.

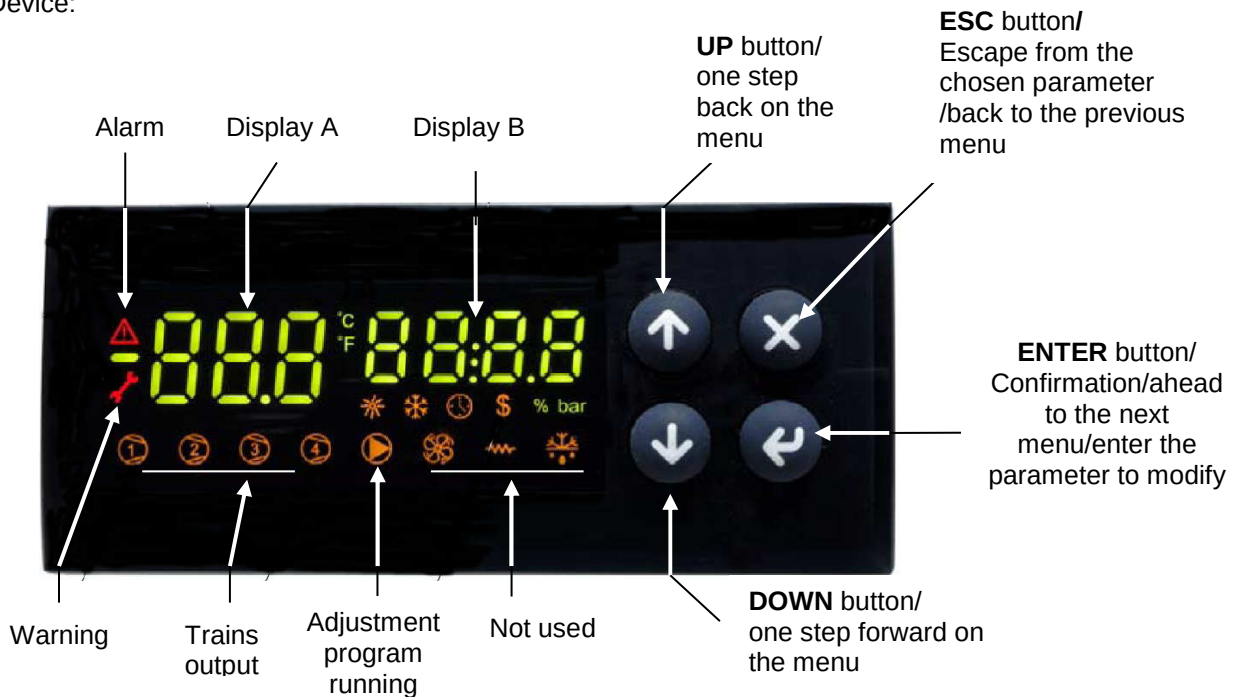
The suggested values can change in reference to the fuel oil specifications.

# USER MANUAL OF MULTI-THERMOSTAT MCX06C

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

## User interface:

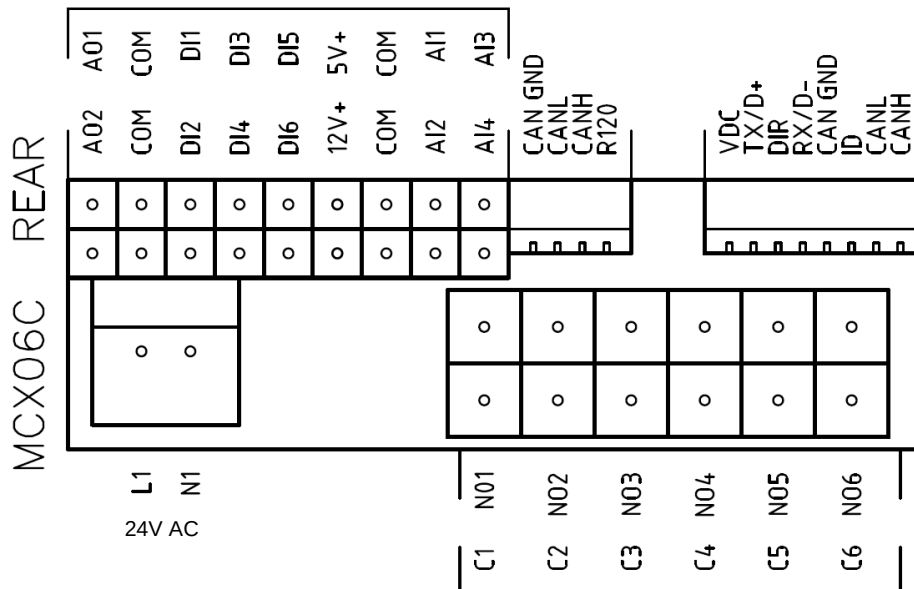
Device:



Note :

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

## Connections from terminal side:



## Probe connection:

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



**Menu:**

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

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

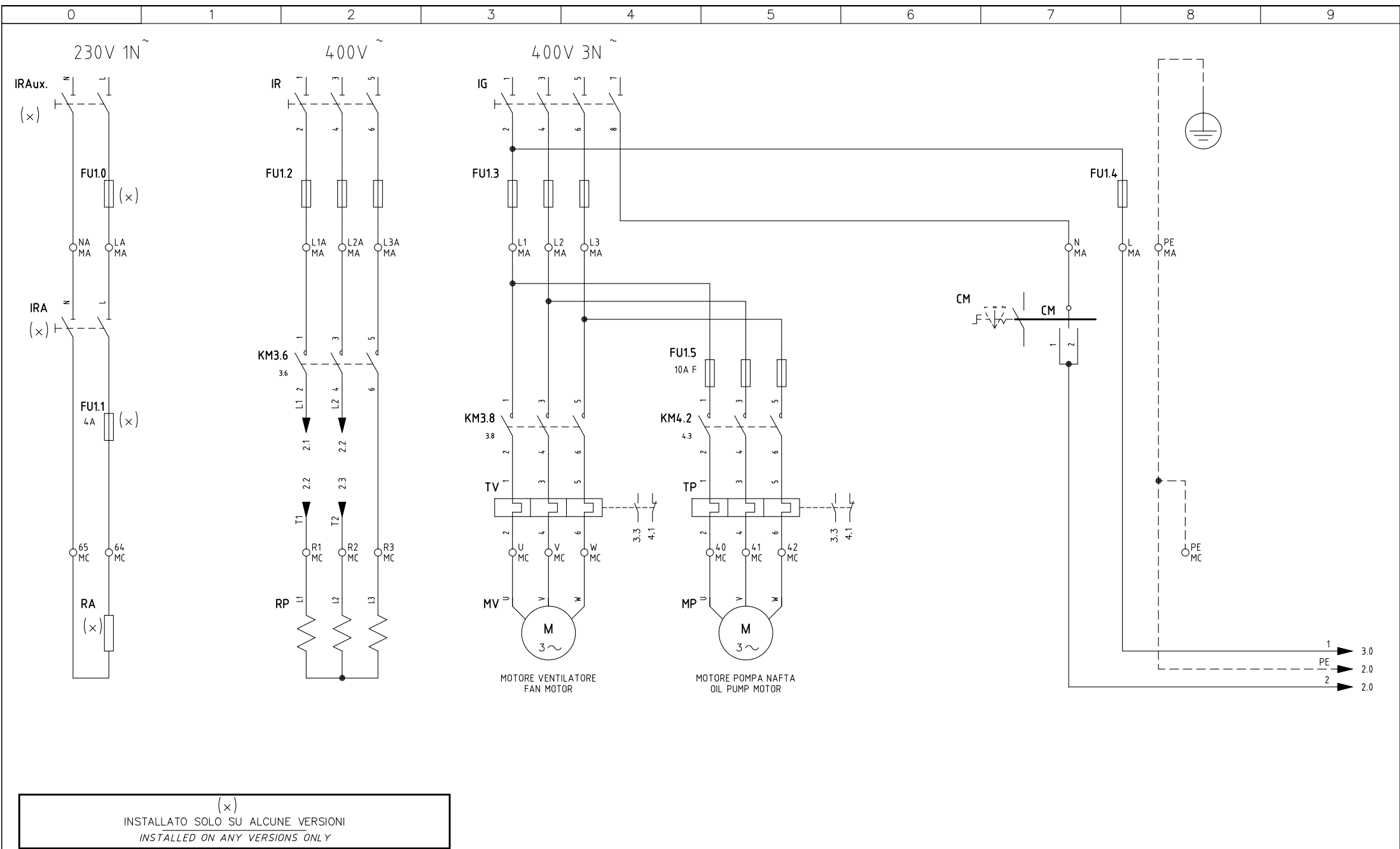
The oil viscosity at the nozzle, should be about 1,5<sup>°E</sup>, which guarantees correct and safe functioning of the burner.

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

Here below recommended set points:

| Menu path |     |     |                                                       | Oil viscosity at 50 °C according to the letter shown in the burner model |            |                       |                        |                         |
|-----------|-----|-----|-------------------------------------------------------|--------------------------------------------------------------------------|------------|-----------------------|------------------------|-------------------------|
|           |     |     |                                                       | <b>P</b>                                                                 | <b>N</b>   | <b>E</b>              | <b>D</b>               | <b>H</b>                |
|           |     |     |                                                       | 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 | tCl | Plant consent temperature probe (when installed)      | 20 °C                                                                    | 70 °C      | 70 °C                 | 70 °C                  | ---                     |
|           | Pb3 | Oil | oil heater output temperature probe (PID regulation); | 60-70 °C                                                                 | 110-120 °C | 120-130 °C            | 130-140 °C             | 140-150 °C              |
|           |     | SP0 | Set-point oil heater with oil pump stopped (stand-by) | 45 °C                                                                    | 120 °C     | 130 °C                | 140 °C                 | 150 °C                  |
|           | Pb4 | tcn | Oil heater consent temperature probe                  | 40 °C                                                                    | 100 °C     | 100 °C                | 110 °C                 | 120 °C                  |
|           |     | trS | Safety temperature tank resistors (manual reset)      | 120 °C                                                                   | 190-200 °C | 190-200 °C            | 190-200 °C             | 190-200 °C              |

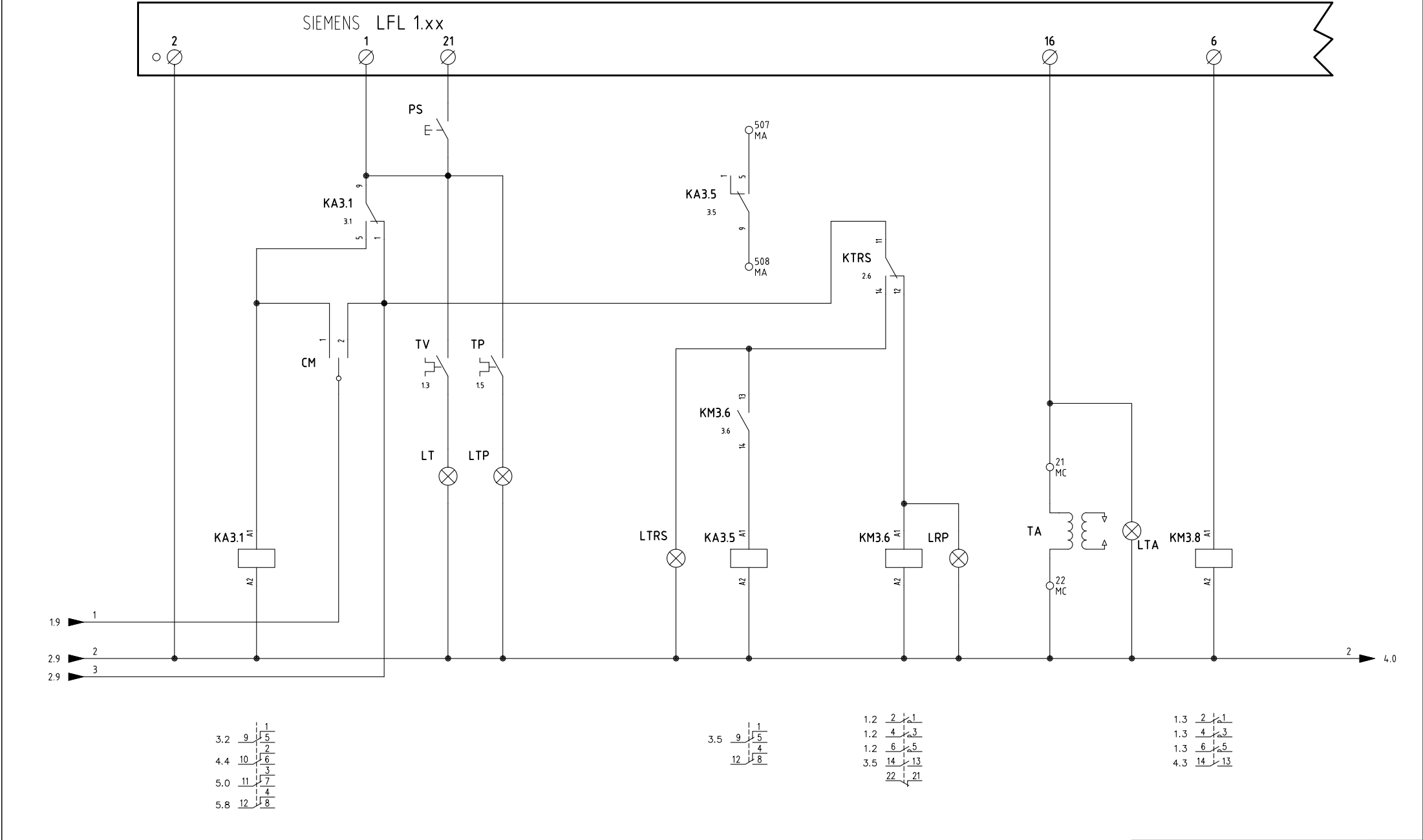
The above temperature values are suggested and refer to a plant designed according to the prescriptions in the burner user manual. The suggested values can change in reference to the fuel oil specifications.



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|      |                             |          |           |  |                                                                                                                                                                                      |                        |                                |           |            |       |        |
|------|-----------------------------|----------|-----------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------|-----------|------------|-------|--------|
|      |                             |          |           |  | Impianto<br><b>TIPO/TYPE KP60/.../KP93A – KR512A</b><br><b>MODELLO Mx.PR.x.xx.A.x.xx</b><br>Descrizione<br><b>CON MULTI-TERMOSTATO MCX06C</b><br><b>WITH MCX06C MULTI-THERMOSTAT</b> | Ordine                 |                                | Data      | 19/11/2012 | PREC. | FOGLIO |
|      |                             |          |           |  |                                                                                                                                                                                      | Commessa               | Data Controllato<br>04/02/2012 | Revisione | 01         | /     | 1      |
| 01   | MODIFIED MCX06C CONNECTIONS | 04/02/13 | U. PINTON |  |                                                                                                                                                                                      | Esecutore<br>U. PINTON | Controllato<br>S. MARCHETTI    | Dis. N.   | 05 – 972   | SEGUE | TOTALE |
| REV. | MODIFICA                    | DATA     | FIRME     |  |                                                                                                                                                                                      |                        |                                |           |            | 2     | 9      |





3.2

9

1

5

4.4

10

2

6

5.0

11

3

7

5.8

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4

8

3.5

9

1

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12

4

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2

1

1.2

4

3

1.2

6

5

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14

13

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21

1.3

2

1

1.3

4

3

1.3

6

5

4.3

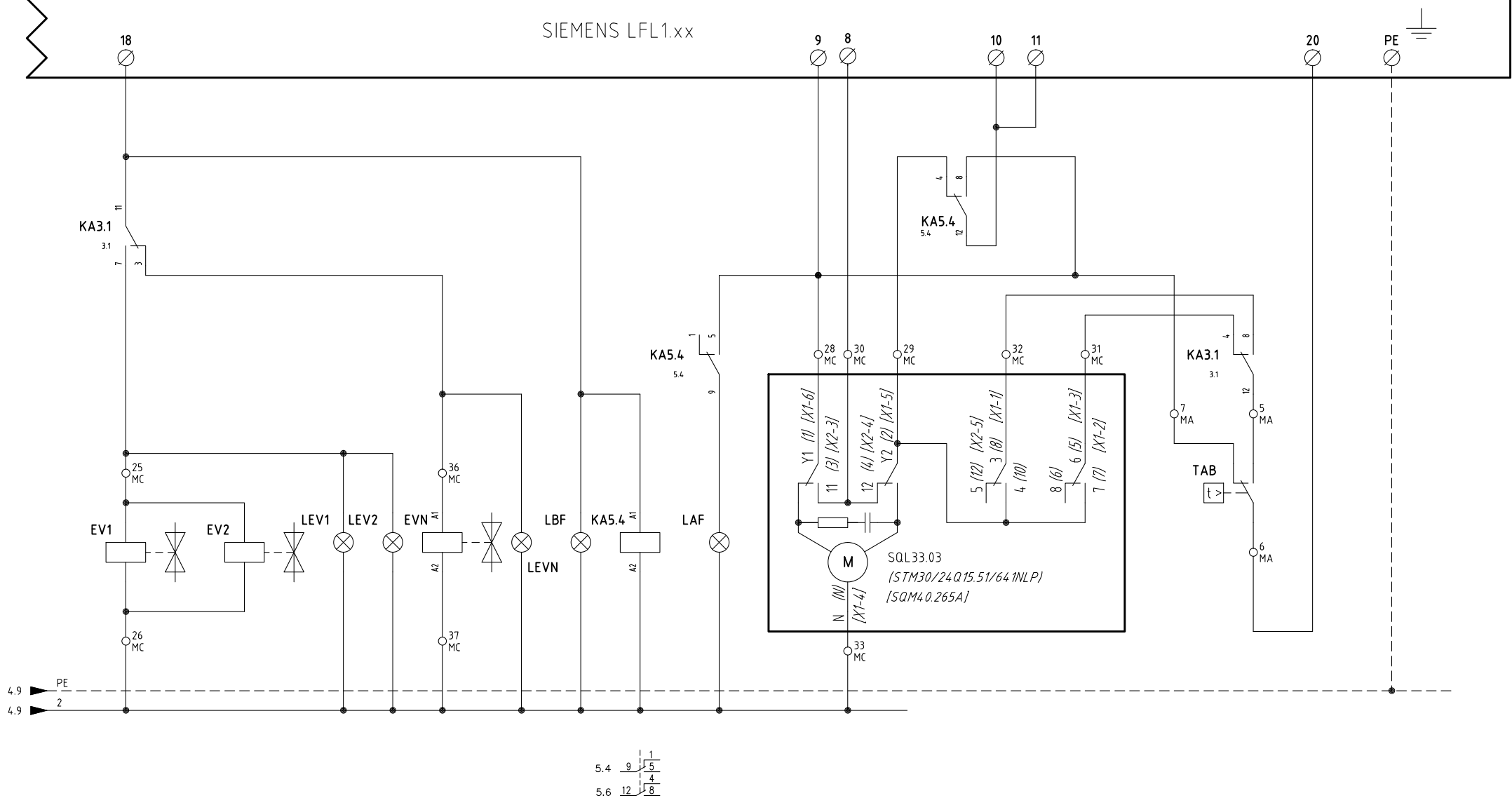
14

13

|           |            |       |        |
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| Data      | 19/11/2012 | PREC. | FOGLIO |
| Revisione | 01         | 2     | 3      |
| Dis. N.   | 05 - 972   | SEGUE | TOTALE |
|           |            | 4     | 9      |



SIEMENS LFL1.xx

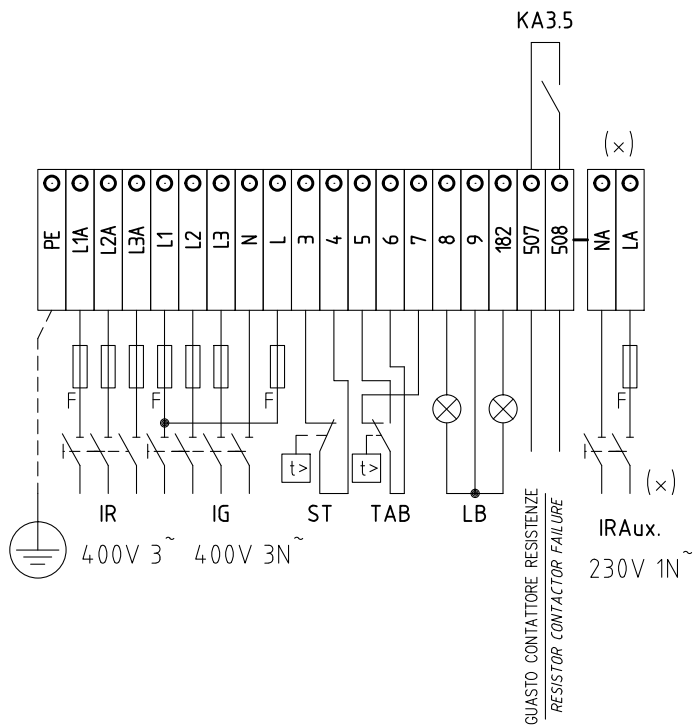


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| Data      | 19/11/2012 | PREC. | FOGLIO |
| Revisione | 01         | 4     | 5      |
| Dis. N.   | 05 - 972   | SEGUE | TOTALE |
|           |            | 6     | 9      |

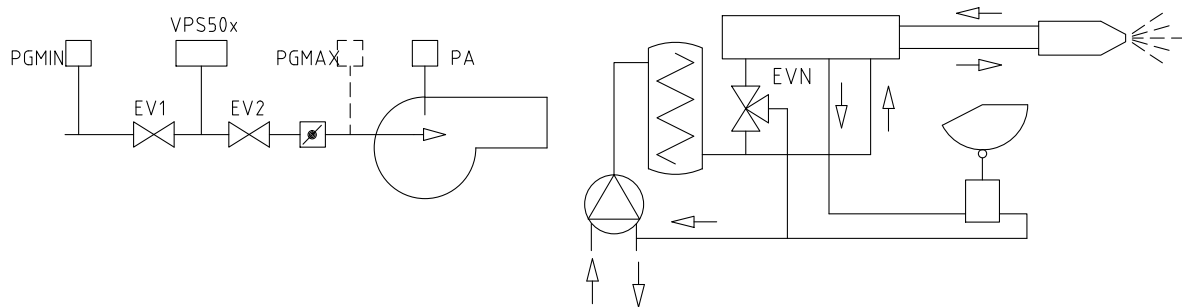
QUADRO QG - MORSETTIERA MA

MORSETTIERA ALIMENTAZIONE BRUCIATORE

BURNER SUPPLY TERMINAL BOARD



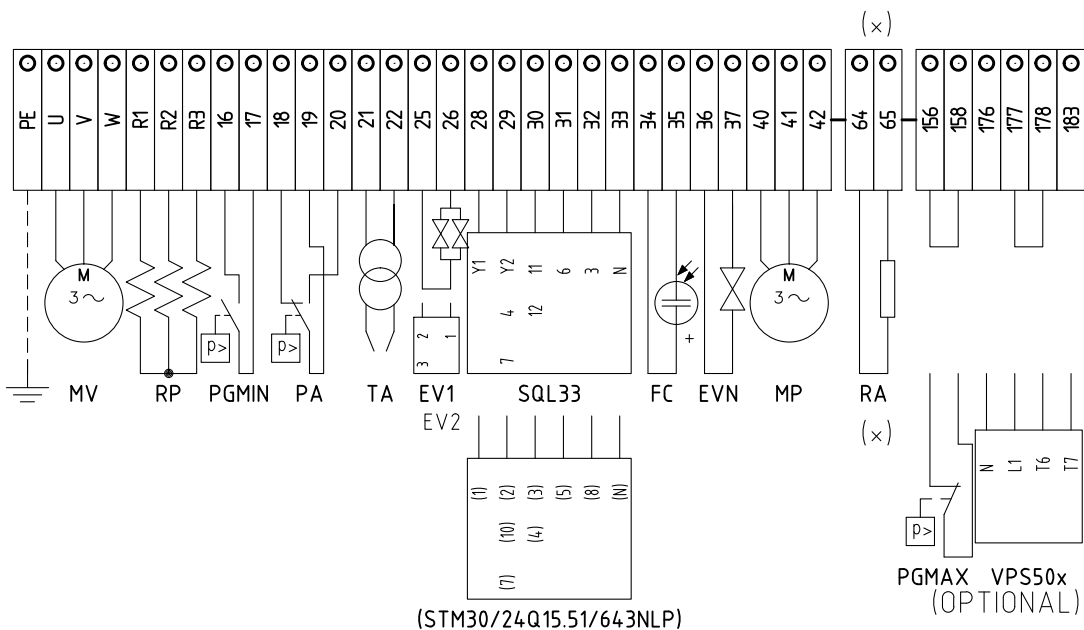
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|-----------|------------|-------|--------|
| Data      | 19/11/2012 | PREC. | FOGLIO |
| Revisione | 01         | 5     | 6      |
| Dis. N.   | 05 - 972   | SEGUE | TOTALE |
|           |            | 7     | 9      |



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



(STM30/24Q15.51/643NLP)

PGMAX VPS50x  
(OPTIONAL)

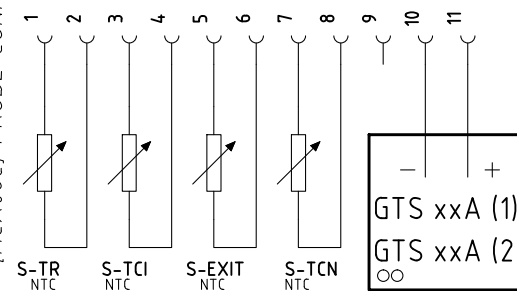
SERVOCOMANDO SERRANDA ARIA  
AIR DAMPER ACTUATOR  
SQL33

|    |                                             |
|----|---------------------------------------------|
| Y1 | ALTA FIAMMA<br>HIGH FLAME                   |
| Y2 | SOSTA E ACCENSIONE<br>STAND-BY AND IGNITION |
| 3  | BASSA FIAMMA GAS<br>GAS LOW FLAME           |
| 6  | BASSA FIAMMA NAFTA<br>OIL 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 GAS<br>GAS LOW FLAME           |
| V   | BASSA FIAMMA NAFTA<br>OIL LOW FLAME         |

**QC – PROBE\_F**  
CONNETTORE SONDE [MCX06C]  
[MCX06C] PROBE CONNECTOR



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 GAS<br>GAS LOW FLAME           |
| IV  | BASSA FIAMMA NAFTA<br>OIL LOW FLAME         |

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|           |            |       |        |
|-----------|------------|-------|--------|
| Data      | 19/11/2012 | PREC. | FOGLIO |
| Revisione | 01         | 6     | 7      |
| Dis. N.   | 05 - 972   | SEGUE | TOTALE |
|           |            | 8     | 9      |

| SIGLA/ITEM              | FOGLIO/SHEET | DESCRIZIONE                                                | DESCRIPTION                                          |
|-------------------------|--------------|------------------------------------------------------------|------------------------------------------------------|
| (STM30/24Q15.51/641NLP) | 5            | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)                   | AIR DAMPER ACTUATOR (ALTERNATIVE)                    |
| CM                      | 1            | COMMUTATORE FUNZIONAMENTO 1)METANO 0)SPENTO 2)BIOGAS       | MANUAL OPERATION SWITCH 1)NATURAL GAS 0)OFF 2)BIOGAS |
| EV1                     | 5            | ELETTROVALVOLA GAS LATO RETE (0 GRUPPO VALVOLE)            | UPSTREAM GAS SOLENOID VALVE (OR VALVES GROUP)        |
| EV2                     | 5            | ELETTROVALVOLA GAS LATO BRUCIATORE (0 GRUPPO VALVOLE)      | DOWNSTREAM GAS SOLENOID VALVE (OR VALVES GROUP)      |
| EVN                     | 5            | ELETTROVALVOLA NAFTA                                       | OIL SOLENOID VALVE                                   |
| FC                      | 4            | SONDA UV RILEVAZIONE FIAMMA                                | UV FLAME DETECTOR                                    |
| (x) FU1.0               | 1            | FUSIBILE LINEA RESISTENZE AUSILIARIE                       | LINE AUXILIARY HEATERS FUSE                          |
| (x) FU1.1               | 1            | FUSIBILE RESISTENZE AUSILIARIE                             | AUXILIARY HEATERS FUSE                               |
| FU1.2                   | 1            | FUSIBILI DI LINEA                                          | LINE FUSES                                           |
| FU1.3                   | 1            | FUSIBILI DI LINEA                                          | LINE FUSES                                           |
| FU1.4                   | 1            | FUSIBILE DI LINEA                                          | LINE FUSE                                            |
| FU1.5                   | 1            | FUSIBILI LINEA POMPA                                       | PUMP LINE FUSES                                      |
| 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                                         |
| IR                      | 1            | INTERRUTTORE LINEA RESISTENZE PRERISCALDATORE              | PRE-HEATING RESISTOR LINE SWITCH                     |
| (x) IRA                 | 1            | INTERRUTTORE RESISTENZE AUSILIARIE                         | AUXILIARY HEATERS SWITCH                             |
| (x) IRAux.              | 1            | INTERRUTTORE RESISTENZE AUSILIARIE                         | AUXILIARY HEATERS SWITCH                             |
| KA3.1                   | 3            | RELE' AUSILIARIO                                           | AUXILIARY RELAY                                      |
| KA3.5                   | 3            | RELE' AUSILIARIO SEGNALAZIONE GUASTO CONTATTORE RESISTENZE | AUXILIARY RELAY FOR RESISTOR CONTACTOR FAILURE       |
| KA5.4                   | 5            | RELE' AUSILIARIO                                           | AUXILIARY RELAY                                      |
| KM3.6                   | 3            | CONTATTORE RESISTENZE PRERISCALDATORE [RP]                 | PRE-HEATING RESISTOR [RP] CONTACTOR                  |
| KM3.8                   | 3            | CONTATTORE MOTORE VENTILATORE                              | FAN MOTOR CONTACTOR                                  |
| KM4.2                   | 4            | CONTATTORE MOTORE POMPA NAFTA                              | OIL PUMP MOTOR CONTACTOR                             |
| KTCI                    | 2            | RELE' AUSILIARIO                                           | AUXILIARY RELAY                                      |
| KTCN                    | 2            | RELE' AUSILIARIO                                           | AUXILIARY RELAY                                      |
| KTRS                    | 2            | RELE' AUSILIARIO                                           | AUXILIARY RELAY                                      |
| LAF                     | 5            | LAMPADA SEGNALAZIONE ALTA FIAMMA BRUCIATORE                | BURNER IN HIGH FLAME INDICATOR LIGHT                 |
| LB                      | 4            | LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE                     | INDICATOR LIGHT FOR BURNER LOCK-OUT                  |
| LBF                     | 5            | LAMPADA SEGNALAZIONE BASSA FIAMMA BRUCIATORE               | BURNER IN LOW FLAME INDICATOR LIGHT                  |
| LEV1                    | 5            | LAMPADA SEGNALAZIONE APERTURA [EV1]                        | INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV1]   |

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|           |            |            |             |
|-----------|------------|------------|-------------|
| Data      | 19/11/2012 | PREC.      | FOGLIO      |
| Revisione | 01         | 7          | 8           |
| Dis. N.   | 05 - 972   | SEGUE<br>9 | TOTALE<br>9 |

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| SIGLA/ITEM   | FOGLIO/SHEET | DESCRIZIONE                                                | DESCRIPTION                                             |
|--------------|--------------|------------------------------------------------------------|---------------------------------------------------------|
| LEV2         | 5            | LAMPADA SEGNA LAZIONE APERTURA [EV2]                       | INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV2]      |
| LEVN         | 5            | LAMPADA SEGNA LAZIONE APERTURA [EVN]                       | INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVN]      |
| LFL 1.xx     | 3            | APPARECCHIATURA CONTROLLO FIAMMA                           | CONTROL BOX                                             |
| LPGMIN       | 4            | LAMPADA SEGNA LAZIONE PRESENZA GAS IN RETE                 | INDICATOR LIGHT FOR PRESENCE OF GAS IN THE NETWORK      |
| LRP          | 3            | LAMPADA SEGNA LAZIONE FUNZIONAMENTO PRERISCALDATORE [RP]   | INDICATOR LIGHT FOR PRE-HEATING RESISTOR [RP] OPERATION |
| LS           | 4            | LAMPADA SEGNA LAZIONE SOSTA BRUCIATORE                     | INDICATOR LIGHT FOR BURNER STAND-BY                     |
| LSPG         | 4            | LAMPADA SEGNA LAZIONE BLOCCO CONTROLLO TENUTA VALVOLE      | INDICATOR LIGHT FOR LEAKAGE OF VALVES                   |
| LT           | 3            | LAMPADA SEGNA LAZIONE BLOCCO TERMICO MOTORE VENTILATORE    | INDICATOR LIGHT FOR FAN MOTOR OVERLOAD THERMAL CUTOUT   |
| LTA          | 3            | LAMPADA SEGNA LAZIONE TRASFORMATORE DI ACCENSIONE          | IGNITION TRANSFORMER INDICATOR LIGHT                    |
| LTP          | 3            | LAMPADA SEGNA LAZIONE BLOCCO TERMICO MOTORE POMPA          | INDICATOR LIGHT FOR PUMP MOTOR OVERLOAD THERMAL CUTOUT  |
| LTRS         | 3            | LAMPADA SEGNA LAZIONE BLOCCO TERMOSTATO DI SICUREZZA [TRS] | INDICATOR LIGHT FOR [TRS] SAFETY THERMOSTAT             |
| MCX06C       | 2            | REGOLATORE TEMPERATURE NAFTA                               | OIL TEMPERATURE REGULATOR                               |
| MP           | 1            | MOTORE POMPA NAFTA                                         | OIL PUMP MOTOR                                          |
| MV           | 1            | MOTORE VENTILATORE                                         | FAN MOTOR                                               |
| PA           | 4            | PRESSOSTATO ARIA                                           | AIR PRESSURE SWITCH                                     |
| PGMAX        | 4            | PRESSOSTATO GAS DI MASSIMA PRESSIONE (OPTIONAL)            | MAXIMUM PRESSURE GAS SWITCH (OPTIONAL)                  |
| PGMIN        | 4            | PRESSOSTATO GAS DI MINIMA PRESSIONE                        | MINIMUM GAS PRESSURE SWITCH                             |
| 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     | 5            | SERVOCOMANDO SERRANDA ARIA                                 | AIR DAMPER ACTUATOR                                     |
| ST           | 4            | SERIE TERMOSTATI/PRESSOSTATI                               | SERIES OF THERMOSTATS OR PRESSURE SWITCHES              |
| TA           | 3            | TRASFORMATORE DI ACCENSIONE                                | IGNITION TRANSFORMER                                    |
| TAB          | 5            | TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA                   | HIGH-LOW THERMOSTAT/PRESSURE SWITCHES                   |
| TP           | 1            | TERMICO MOTORE POMPA                                       | PUMP MOTOR THERMAL                                      |
| TRAFO        | 2            | TRASFORMATORE AUSILIARIO                                   | AUXILIARY TRANSFORMER                                   |
| TV           | 1            | TERMICO MOTORE VENTILATORE                                 | FAN MOTOR THERMAL                                       |
| VPS50x       | 4            | CONTROLLO DI TENUTA VALVOLE GAS (OPTIONAL)                 | GAS PROVING SYSTEM (OPTIONAL)                           |
| [SQM40.265A] | 5            | SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)                   | AIR DAMPER ACTUATOR (ALTERNATIVE)                       |

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INSTALLATO SOLO SU ALCUNE VERSIONI  
INSTALLED ON ANY VERSIONS ONLY

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