

# **TG90-TG91-TG92**

# **TG510-TG515**

# **TG520-TG525**

**Light 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);

##### National Standard

- UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods)

#### *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);

##### Norme nazionali / National Standard

- UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods).

### 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);
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- UNI EN ISO 12100:2010 (Safety of machinery - General principles for design - Risk assessment and risk reduction);

#### Norme nazionali / National Standard

- UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods.

### 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)
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- 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);

#### National Standard

- UNI 7824 (Atomizing burners of the monobloc type. Characteristics and test methods.

### 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.

## GENERAL FEATURES

This series of industrial burners is designed for all those applications that require big-sized air fans or air-flue heat exchangers to be installed in sound-proof areas to reduce noise. They can be provided with built-in or separately-mounted control panel (console or wall-mounted).

Note: the figure is indicative only

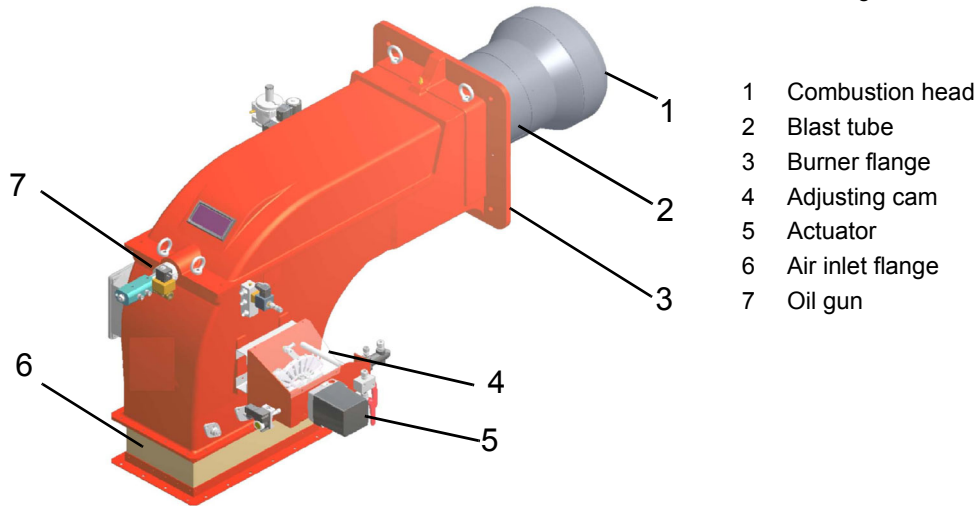


Fig. 1

**Light oil operation:**the fuel coming from the supply line, is pushed by the pump to the nozzle and then into the combustion chamber, where the mixture between fuel and air takes place and consequently the flame.

In the burners, the mixture between fuel and air, to perform clean and efficient combustion, is activated by atomisation of oil into very small particles. This process is achieved making pressurised oil passing through the nozzle.

The pump main function is to transfer oil from the tank to the nozzle in the desired quantity and pressure. To adjust this pressure, pumps are provided with a pressure regulator (except for some models for which a separate regulating valve is provided). Other pumps are provided with two pressure regulators: one for the high and one for low pressure (in double-stage systems with one nozzle).

The adjustable combustion head can improve the burner performance. The combustion head determines the energetic quality and the geometry of the flame. Fuel and comburent are routed into separated ways as far as the zone of flame generation (combustion chamber).

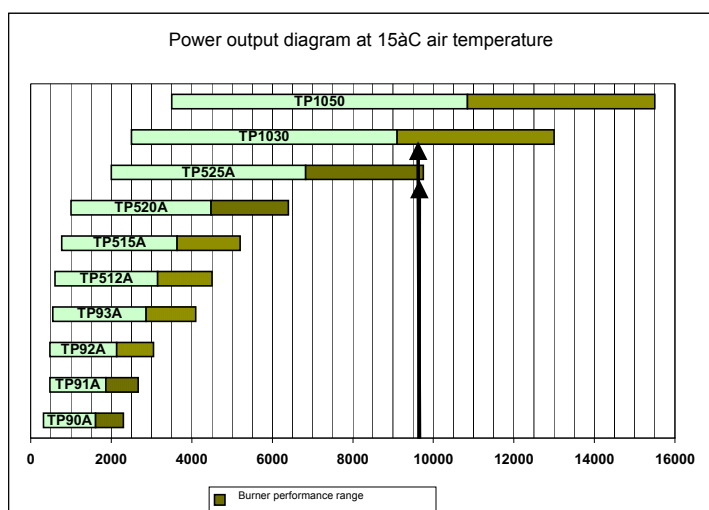
The control panel, placed on the burner front side, shows each operating stage.

## How to select the burner

To check if the burner is suitable for the boiler to which it must be installed, the following parameters are needed:

- fuel
- furnace input, in kW or kcal/h (kW = kcal/h / 860);
- boiler type;
- combustion chamber type (3-smoke pass, reverse flame, other)
- temperature or pressure of the thermal carrier fluid
- Comburent air temperature
- Air duct positioning
- Pressure in the combustion chamber
- Elevation (altitude) of burner installation
- Gas train (only for gas burners)
- Pumping unit (only for light-oil or heavy-oil burners)
- Air fan
- Bilt-in or separated control panel
- backpressure (data are available on the boiler's ID plate or in the user's manual).

Burners provided with built-in control panel are designed for IP40 index of protection. For other values of IP, please contact the manufacturer Technical Dpt.



### Data requested:

- furnace input;
- air temperature
- altitude
- generator pressure or temperature

### Example:

- furnace input: 9600kW
- air temperature: 15°C
- altitude: 0m

Fig. 2

See the diagram in Fig. 2, as to find the burners that better suite the power range requested in the exmple (9600kW). Once the models are founded out, the choice regards technical and economical features. Technical features can be summarised in a higher modulation ratio (fewer start-ups, less consumption, fewer swigings in the generator temperature and pressure values.

## Burner model identification

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

| Type                               | TG92                                                                                   | Model | G-. | PR. | S.  | .   | A.  |
|------------------------------------|----------------------------------------------------------------------------------------|-------|-----|-----|-----|-----|-----|
|                                    | (1)                                                                                    |       | (2) | (3) | (4) | (5) | (6) |
| (1) BURNER TYPE                    | TG90-TG91-TG92-TG510-TG515-TG520-TG525                                                 |       |     |     |     |     |     |
| (2) FUEL                           | G - Light oilA - Biodiesel                                                             |       |     |     |     |     |     |
| (3) OPERATION (Available versions) | PR - ProgressiveMD - Fully modulating                                                  |       |     |     |     |     |     |
| (4) BLAST TUBE                     | S - StandardL - Extended                                                               |       |     |     |     |     |     |
| (5) DESTINATION COUNTRY            | * - see data plate                                                                     |       |     |     |     |     |     |
| (6) BURNER VERSION                 | G - Separate control panel and junction box<br>E - No control panel, junction box only |       |     |     |     |     |     |

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**Technical specifications**

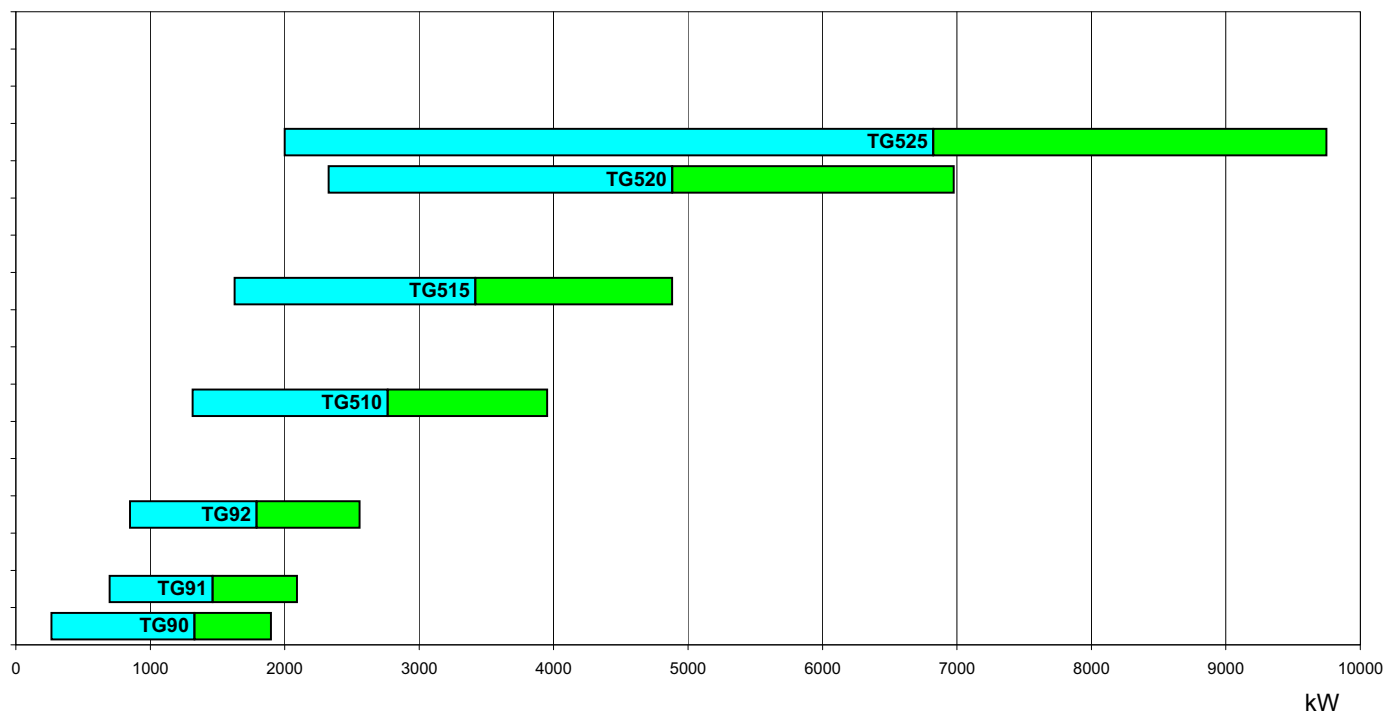
| BURNERS                 |                 | TG90                           | TG91       | TG92       |
|-------------------------|-----------------|--------------------------------|------------|------------|
| Output                  | min. -max. kW   | 264 - 1900                     | 698 - 2093 | 849 - 2558 |
| Light oil rate          | min. -max. kg/h | 22 - 160                       | 59 - 176   | 72 - 215   |
| Fuel                    |                 | Light oil                      |            |            |
| Viscosity               |                 | 1.3 °E @20°C                   |            |            |
| Power supply            |                 | 400V 3N ~ 50Hz                 |            |            |
| Fan motor               | kW              | see fan ID plate               |            |            |
| Pump motor              | kW              | 1.1                            | 0.55       | 1.1        |
| Total power consumption | kW              | 1.6                            | 1.05       | 1.6        |
| Index of protection     |                 | IP40                           |            |            |
| Operation               |                 | Progressive - Fully modulating |            |            |
| Operating temperature   | °C              | -10 ÷ +50                      |            |            |
| Storage temperature     | °C              | -20 ÷ +60                      |            |            |
| Working service *       |                 | Intermittent                   |            |            |

| BURNERS                 |                 | TG510                          | TG515       | TG520       | TG525       |
|-------------------------|-----------------|--------------------------------|-------------|-------------|-------------|
| Output                  | min. -max. kW   | 1314 - 3953                    | 1628 - 4884 | 2326 - 6977 | 2000 - 9750 |
| Light oil rate          | min. -max. kg/h | 111 - 331                      | 137 - 411   | 196 - 588   | 168 - 821   |
| Fuel                    |                 | Light oil                      |             |             |             |
| Viscosity               |                 | 1.3 °E @20°C                   |             |             |             |
| Power supply            |                 | 400V 3N ~ 50Hz                 |             |             |             |
| Fan motor               | kW              | see fan ID plate               |             |             |             |
| Pump motor              | kW              | 1.1                            | 1.5         | 1.5         | 4           |
| Total power consumption | kW              | 1.6                            | 2           | 2           | 4.5         |
| Operation               |                 | Progressive - Fully modulating |             |             |             |
| Index of protection     |                 | IP40                           |             |             |             |
| Operating temperature   | °C              | -10 ÷ +50                      |             |             |             |
| Storage temperature     | °C              | -20 ÷ +60                      |             |             |             |
| Working service *       |                 | Intermittent                   |             |             |             |

**\* NOTE ON THE WORKING SERVICE:** the Siemens LMO.. control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically. If the burner is provided with Siemens LOA.. or LAL.. control box one controlled shutdown must be performed after 24 hours of continuous operation, for safety reasons.



Output diagram (air temperature = 15°C)



Burner performance range

 Performance range

To get the input in kcal/h, multiply value in kW by 860. Data are referred to standard conditions: 1013mbar, 15°C

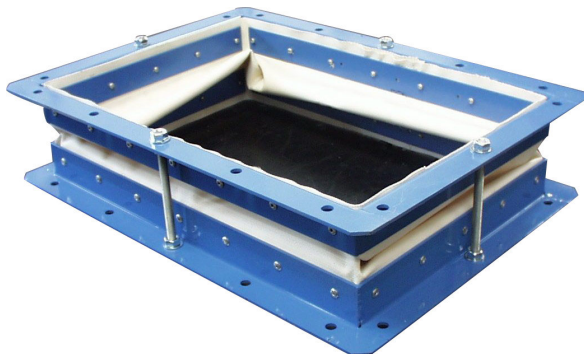
### Fan installation

**ATTENTION!** The bellows unit provided is made of canvas and is provided with blocking spacers to avoid breaking it during installation: first place the bellows unit between flanges, then remove the spacers. Canvas has to be stretched after the installation, but not stressed.

**ATTENTION!** the air duct dimensioning must be performed according to the flow rate, the temperature, the distance between the fan and the burner and according to the fan features as well..

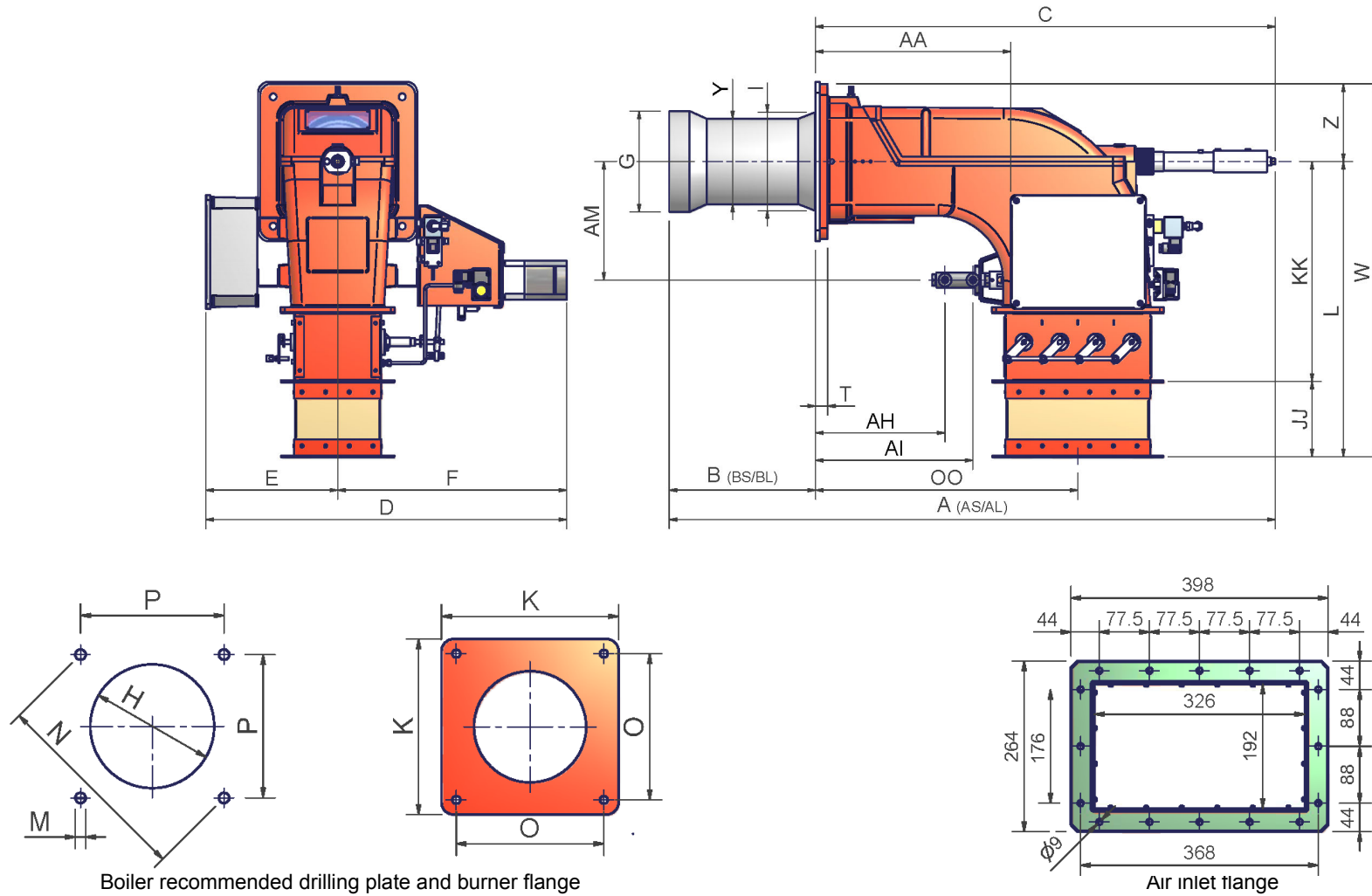
**ATTENTION!** It is suggested to install the fan on vibration-damping supports in order to reduce vibration propagation.

Connect the air duct to the burner by means of the bellows unit provided together with the burner (see the picture below).





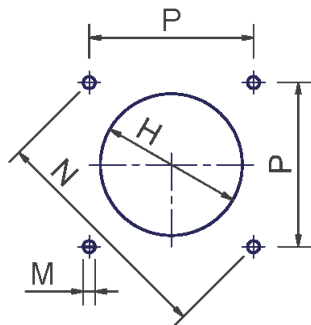
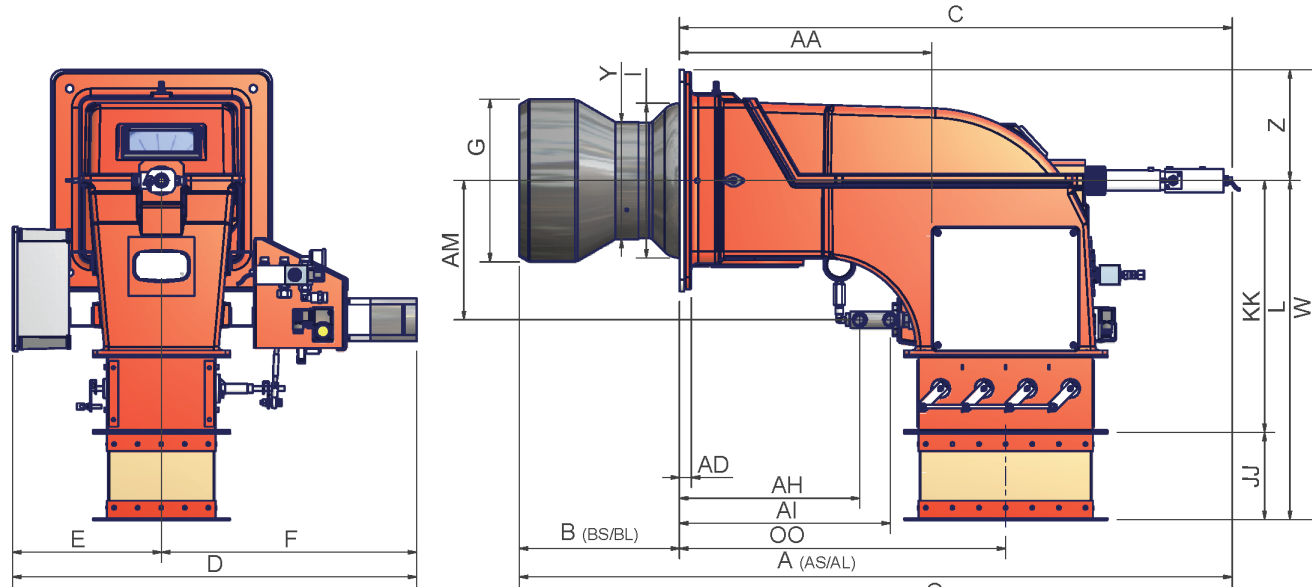
# Overall dimensions (mm)



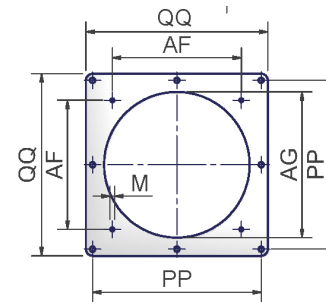
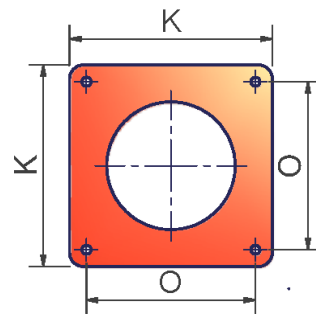
|             | A(S*) | A(L*) | AA  | AH  | AI  | AM  | B(S*) | B(L*) | C    | CC  | D   | E   | F   | G   | H   | I   | JJ  | K   | KK  | L   | M   | N   | Omin | Omax | OO  | P   | T  | W   | Y   | Z   |
|-------------|-------|-------|-----|-----|-----|-----|-------|-------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|----|-----|-----|-----|
| <b>TG90</b> | 1356  | 1506  | 454 | 301 | 366 | 275 | 340   | 490   | 1090 | 307 | 840 | 307 | 533 | 234 | 276 | 228 | 175 | 360 | 510 | 685 | M14 | 424 | 300  | 300  | 610 | 300 | 35 | 865 | 228 | 180 |
| <b>TG91</b> | 1317  | 1490  | 454 | 301 | 366 | 275 | 300   | 488   | 1017 | 307 | 840 | 307 | 533 | 238 | 268 | 228 | 175 | 360 | 510 | 685 | M12 | 417 | 280  | 310  | 610 | 295 | 28 | 865 | 228 | 180 |
| <b>TG92</b> | 1311  | 1484  | 454 | 301 | 366 | 275 | 294   | 491   | 1017 | 307 | 840 | 307 | 533 | 266 | 296 | 228 | 175 | 360 | 510 | 685 | M12 | 417 | 280  | 310  | 610 | 295 | 28 | 865 | 228 | 180 |

\* S: measure referred to burner provided with standard blast tube

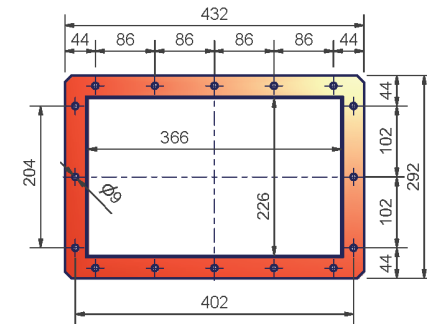
\* L: measure referred to burner provided with extended blast tube



Boiler recommended drilling template and burner flange



Counterflange and air inlet flange



|              | A(S*) | A(L*) | AA  | AD | AF    | AG    | AH  | AI  | AM  | B(S*) | B(L*) | C    | D   | E   | F   | G   | H     | I   | JJ  | K   | KK  | L   | M   | N   | O   | OO  | P   | PP    | QQ    | W   | Y   | Z   |
|--------------|-------|-------|-----|----|-------|-------|-----|-----|-----|-------|-------|------|-----|-----|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|-------|-----|-----|-----|
| <b>TG510</b> | 1485  | 1705  | 536 | 25 | x     | x     | 383 | 448 | 295 | 300   | 520   | 1175 | 858 | 316 | 542 | 329 | 369   | 328 | 185 | 460 | 534 | 719 | M14 | 552 | 390 | 693 | 390 | x     | x     | 954 | 328 | 235 |
| <b>TG515</b> | 1485  | 1705  | 536 | 25 | x     | x     | 383 | 448 | 295 | 300   | 520   | 1175 | 858 | 316 | 542 | 350 | 390   | 328 | 185 | 460 | 534 | 719 | M14 | 552 | 390 | 693 | 390 | x     | x     | 954 | 328 | 235 |
| <b>TG520</b> | 1485  | 1705  | 536 | 25 | x     | x     | 383 | 448 | 295 | 300   | 520   | 1175 | 858 | 316 | 542 | 370 | 410   | 328 | 185 | 460 | 534 | 719 | M14 | 552 | 390 | 693 | 390 | x     | x     | 954 | 328 | 235 |
| <b>TG525</b> | 1705  | x     | 536 | 25 | 390** | 440** | x   | x   | x   | 520   | x     | 1175 | 858 | 316 | 542 | 434 | 484** | 328 | 185 | 460 | 534 | 719 | M14 | 552 | 390 | 693 | 390 | 510** | 550** | 954 | 340 | 235 |

\* S: measure referred to burner provided with standard blast tube

\* L: measure referred to burner provided with extended blast tube

\*\* Fit a counterflange between burner and boiler

## MOUNTINGS AND CONNECTIONS

### Packing

The burners and accessories are dispatched in wooden packages.

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

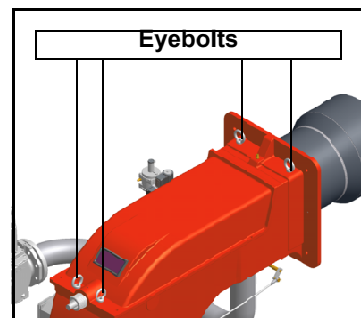
- burner;
- light oil flexible hoses;
- control panel
- oil pumping unit;
- gasket to be inserted between the burner and the boiler;
- envelope containing this manual.

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

### Handling the burner

|  |                                                                                                                                                                                                                                      |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>ATTENTION!</b> the lifting and moving operations must be carried out by specialised and trained personnel. If these operations are not carried out perfectly, there is the residual risk of the burner to overturn and fall down. |
|  | As for moving the burner, use means suited for the weight to sustain (see paragraph "Technical specifications").                                                                                                                     |

The burner is provided with eyebolts, for handling operations.



### Fitting the burner to the boiler

- 1 To perform the installation, it is necessary to drill the boiler door as described on paragraph "Overall dimensions";
- 2 screw the studbolts (5) on the boiler door, according to the drilling plate (see paragraph "Overall dimensions");
- 3 move the burner towards the boiler: lift the burner by means of the eyebolts placed on its top side;
- 4 remove the blast tube, by loosening the three screws beside the burner flange;
- 5 place the ceramic fibre plait on the burner flange;
- 6 replace the blast tube: before fastening completely the screws, avoid any misalignment between the blast tube axis and the combustion head axis;
- 7 install the burner to the boiler;
- 8 fix the burner to the stud bolts, by means of the fixing nuts, according to Fig. 3.
- 9 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).

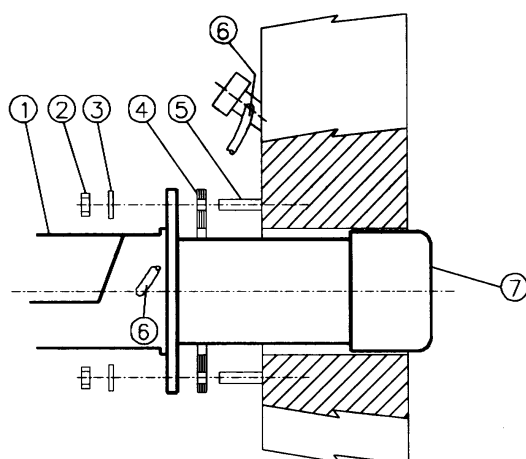
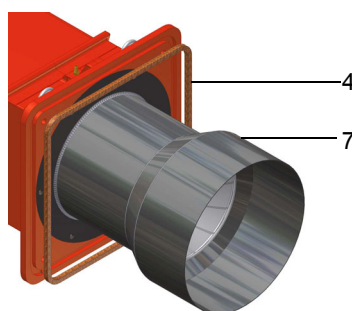


Fig. 3

#### Keys

- |   |                     |
|---|---------------------|
| 1 | Burner              |
| 2 | Fixing nut          |
| 3 | Washer              |
| 4 | Ceramic fibre plait |
| 5 | Stud bolt           |
| 7 | Blast tube          |



### Fan installation

Pay attention when designing the air duct: dimensioning must be performed according to the flow rate, the temperature, the distance between the fan and the burner and according to the fan features as well.

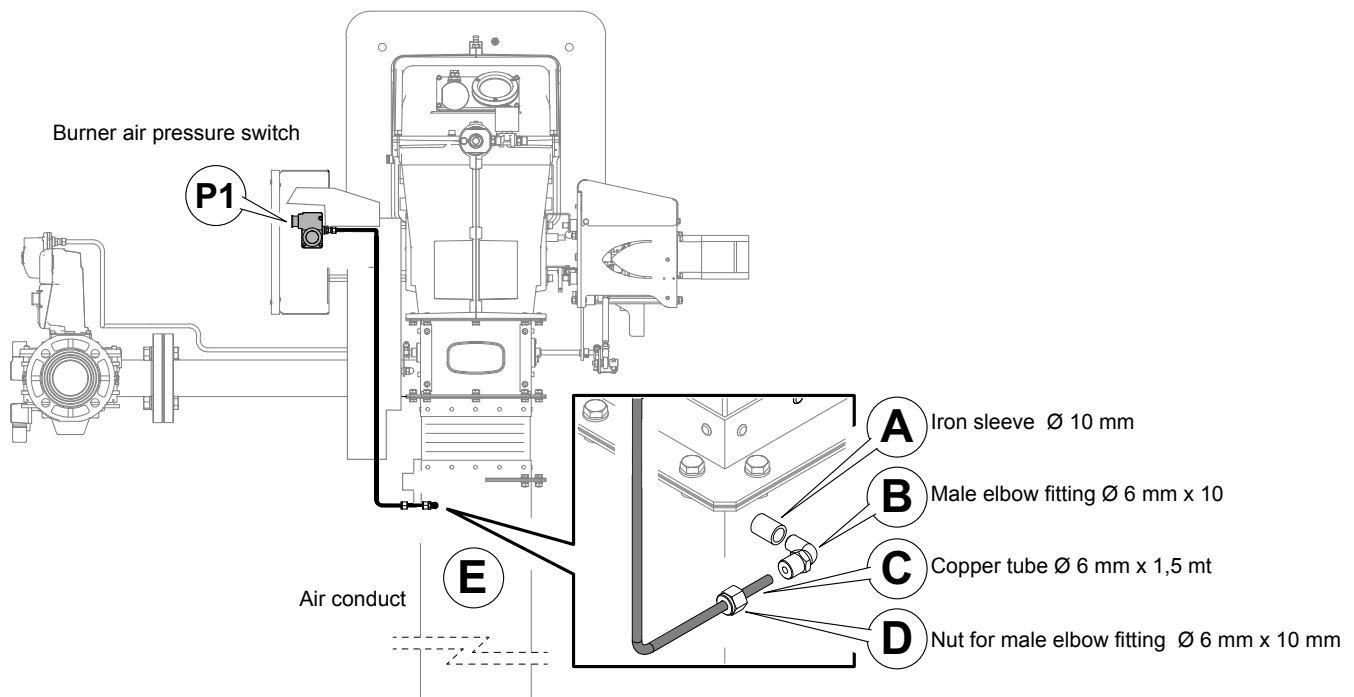
|  |                                                                                                                                                                                                                                                                                                         |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>ATTENTION!</b> The bellows unit provided is made of canvas and is provided with blocking spacers to avoid breaking it during installation: <b>first</b> place the bellows unit between flanges, <b>then</b> remove the spacers. Canvas has to be stretched after the installation, but not stressed. |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN676 regulation and whose dimensions are described in the diagram. In case the burner must be coupled with boilers with a combustion chamber smaller in diameter or shorter than those described in the diagram, please contact the supplier, to verify that a correct matching is possible, with respect of the application involved. To correctly match the burner to the boiler verify the necessary input and the pressure in combustion chamber are included in the burner performance curve; otherwise the choice of the burner must be revised consulting the burner manufacturer. To choose the blast tube length follow the instructions of the boiler manufacturer. In absence of these consider the following:

- Cast-iron boilers, three pass flue boilers (with the first pass in the rear part): the blast tube must protrude no more than 100 mm into the combustion chamber.
- Pressurised boilers with flame reversal: in this case the blast tube must penetrate at least 50 - 100 mm into combustion chamber in respect to the tube bundle plate.
- The length of the blast tubes does not always allow this requirement to be met, and thus it may be necessary to use a suitably-sized spacer to move the burner backwards or to design a blast tube that suits the utilisation (please, contact the manufacturer).

### Connection diagram of the air pressure switch to the burner air conduct



Copper tube connection Ø 6 mm:

- Drill the air duct (with hole from Ø 10 mm);
- Fit sleeve **A** (Ø 10 mm) and weld it on channel **E**;
- Assemble in sequence the **B-D** details on the tube (Ø 6 mm) **C** appropriately shaped up to the connection on the air pressure switch (**P1**).

Fig. 4 - Gravity circuit

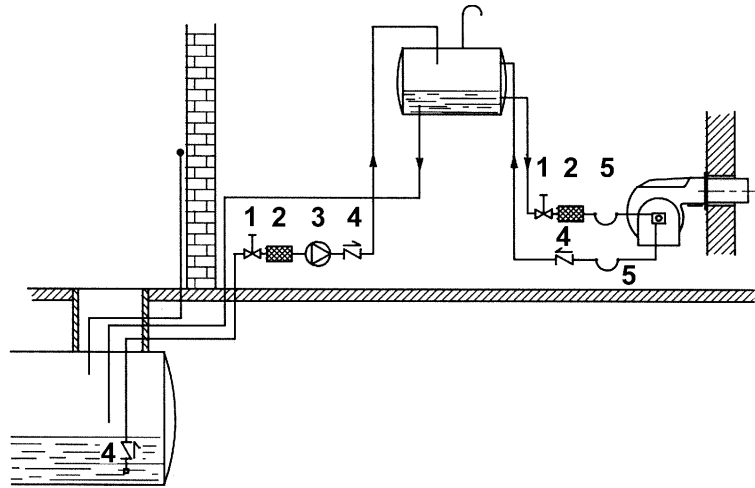


Fig. 5 - Ring circuit

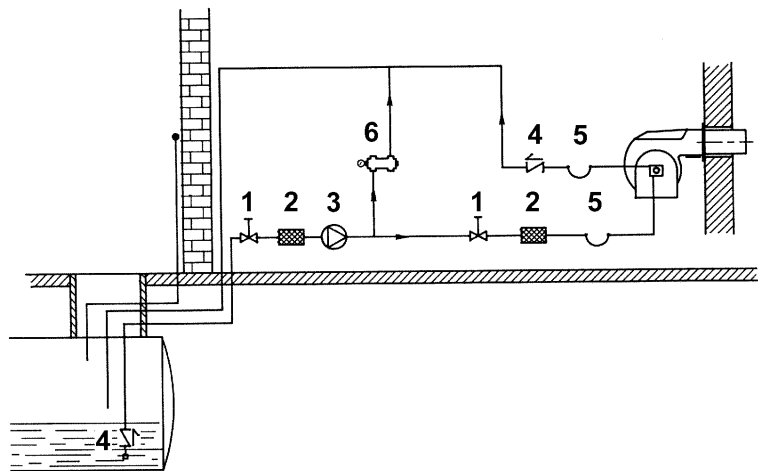
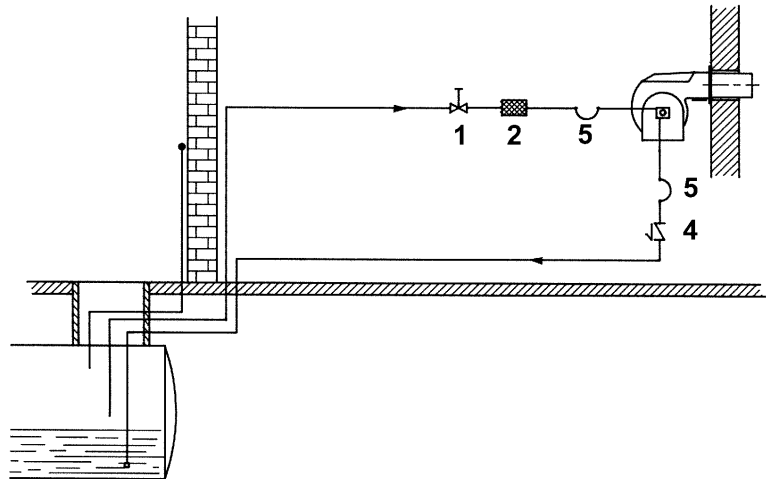


Fig. 6 - Suction circuit



### Key

- 1 Manual valve
- 2 Light oil filter
- 3 Light oil feeding pump
- 4 One way valve
- 5 Flexible hoses
- 6 Relief valve

**NOTE:** in plants where gravity or ring feed systems are provided, install an automatic interception device (see n. 4 - Fig. 7).

## Installation diagram of light oil pipes



PLEASE READ CAREFULLY THE “WARNINGS” CHAPTER AT THE BEGINNING OF THIS MANUAL.

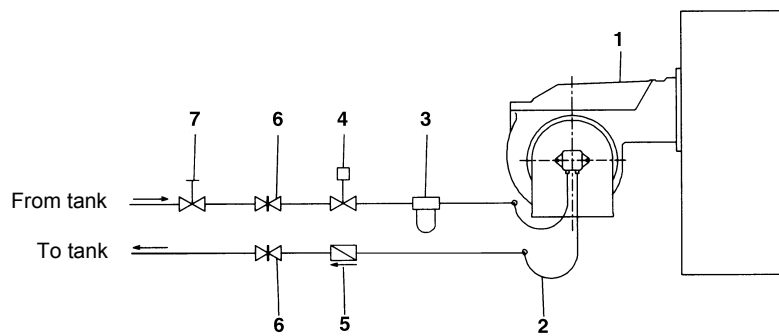


Fig. 7 - Double-pipe system

The burner is supplied with filter and flexible hoses, all the parts upstream the filter and downstream the return flexible hose, must be installed by the customer. As far as the hoses connection, see the related paragraph.

### Key

- 1 Burner
- 2 Flexible hoses (fitted)
- 3 Light oil filter (fitted)
- 4 Automatic interceptor (\*)
- 5 One-way valve (\*)
- 6 Gate valve
- 7 Quick-closing gate-valve (outside the tank or boiler rooms)

(\*) Only for installations with gravity, siphon or forced circulation feed systems. If the device installed is a solenoid valve, a timer must be installed to delay the valve closing.

The direct connection of the device without a timer may cause pump breaks.

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

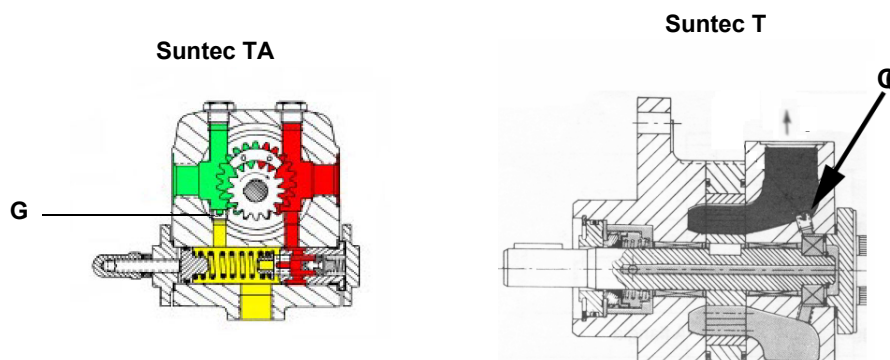
**Single-pipe system:** a single pipe drives the oil from the tank to the pump's inlet. Then, from the pump, the pressurised oil is driven to the nozzle: a part comes out from the nozzle while the other part goes back to the pump. In this system, the by-pass plug, if provided, must be removed and the 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.

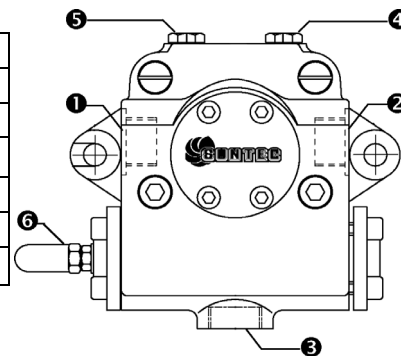
### Light oil pumps

The pumps provided with these burners can be

- Suntec TA
- Suntec T

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

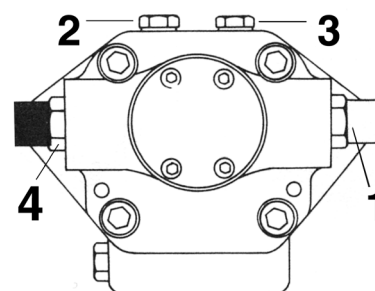
- 1 Inlet G1/2
- 2 To the nozzle G1/2
- 3 Return G1/2
- 4 Pressure gauge port G1/4
- 5 Vacuum gauge port G1/4
- 6 Pressure governor



| Suntec T..               |                              |
|--------------------------|------------------------------|
| Viscosity                | 3 - 75 cSt                   |
| Oil temperature          | 0 - 150 °C                   |
| Minimum suction pressure | - 0.45 bar to prevent gasing |
| Maximum suction pressure | 5 bar                        |
| Rated speed              | 3600 rpm max.                |

#### Key

- 1 Inlet G3/4
- 2 Pressure gauge port G1/4
- 3 Vacuum gauge port to measure the inlet vacuum G1/4
- 4 To pressure adjusting valve G3/4



"Note: pump with "C" rotation.

Suntec TV Pressure governor

#### Pressure adjustment

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

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

#### Key

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

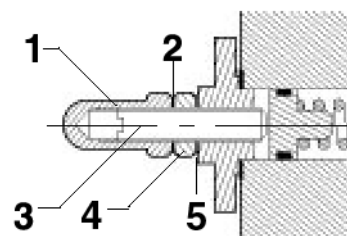


Fig. 8

#### 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).

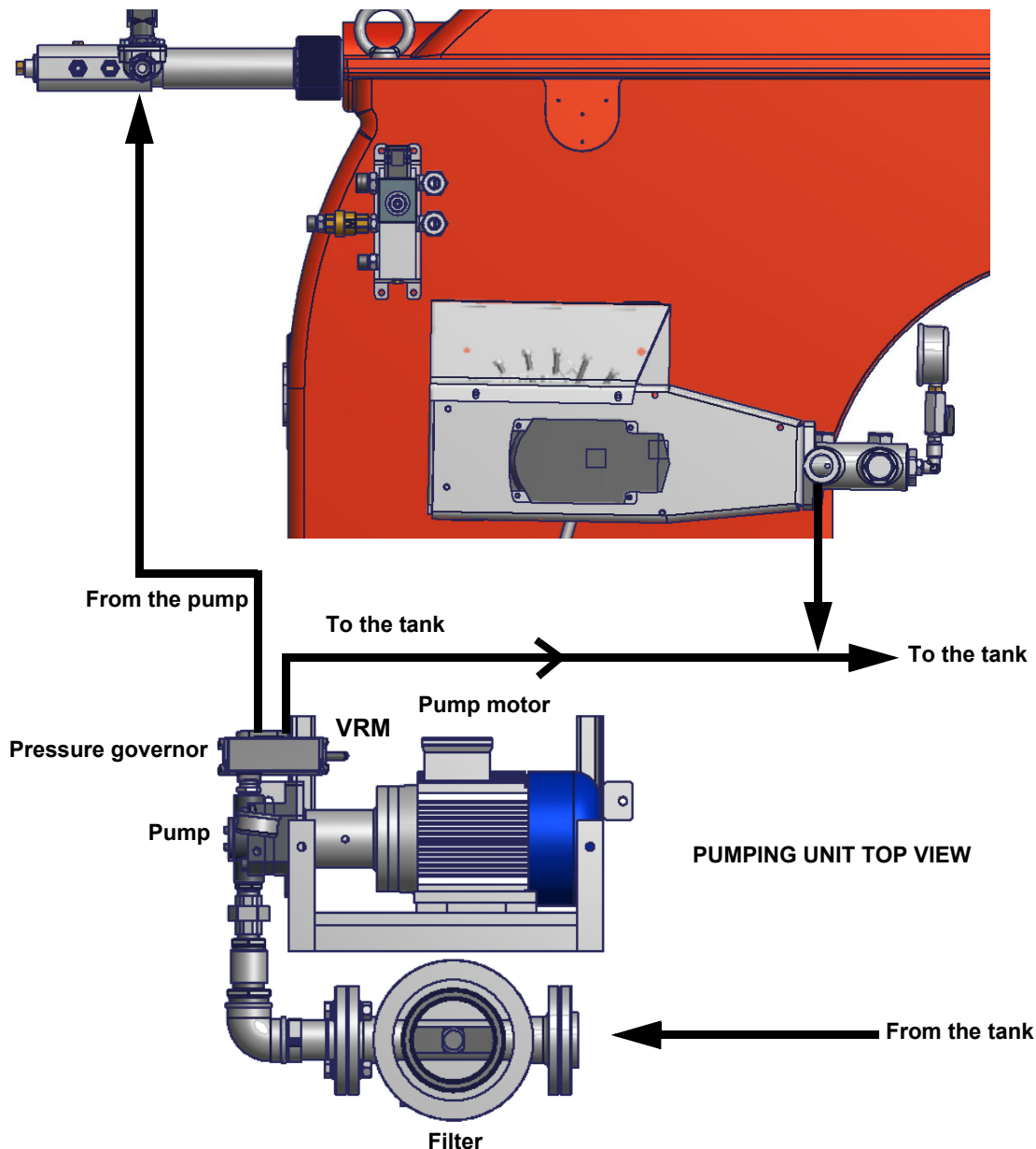


Suntec TA



### Connecting the burner to the light oil pumping unit

Follow the scheme in the picture below to connect the burner to the oil pumping unit. The pump sends the oil coming from the tank to the burner. The pressure governor makes the oil reach the nozzle at the required pressure, while the excess of oil goes back to the tank. To change the delivery pressure act on the VRM adjusting screw of the delivery pressure governor.



### About the use of fuel pumps

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

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

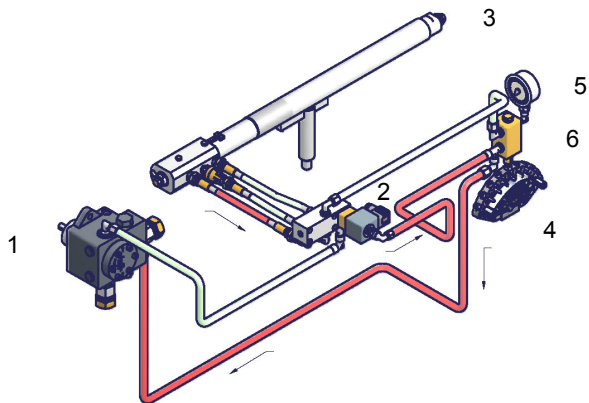


Fig. 9 - Stand-by

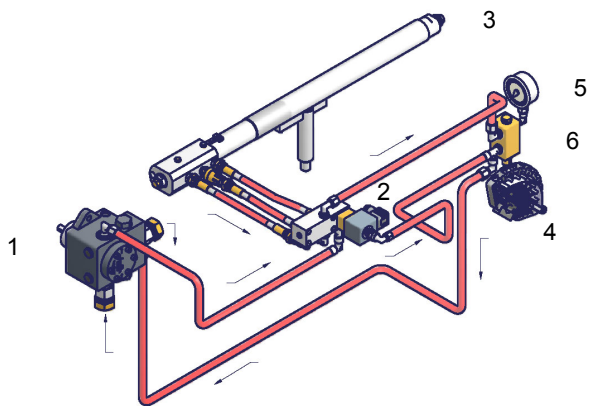


Fig. 10 - Prepurge

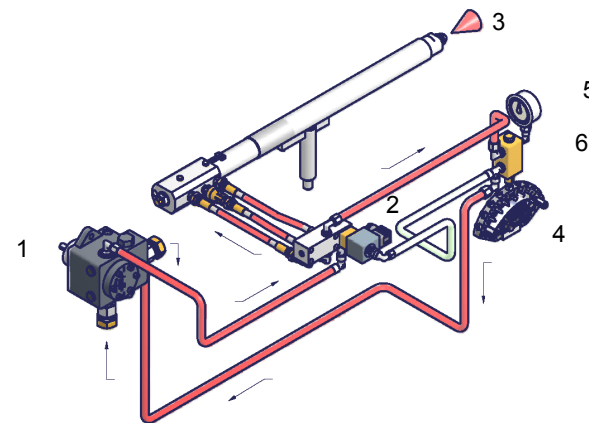


Fig. 11 - Low flame

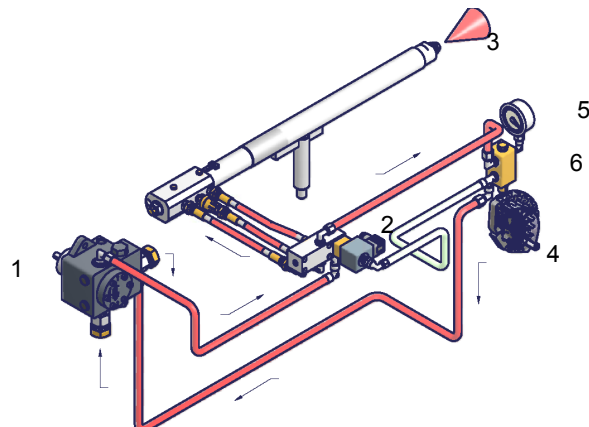


Fig. 12 - High flame

#### Key

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

---

## Electrical connections



**RESPECT THE BASIC SAFETY RULES. MAKE SURE OF THE CONNECTION TO THE EARTHING SYSTEM. DO NOT REVERSE THE PHASE AND NEUTRAL CONNECTIONS. FIT A DIFFERENTIAL THERMAL MAGNET SWITCH ADEQUATE FOR CONNECTION TO THE MAINS. STRICTLY OBSERVE THE DATA PLATE.**

- Remove the cover from the burner electrical panel.
- Execute the electrical connections to the power supply terminal board, check the direction of the motor (see next paragraph) and replace the cover of the electrical panel.



**WARNING: The burner is provided with a jumper between terminals 6 and 7; in the event of connecting the high/low flame thermostat remove this jumper before connecting the thermostat.**

**IMPORTANT: while connecting electric supply wires to burner's terminal block be sure that ground wire should be longer than phase and neutral ones.**

As far as electrical connections, see the attached wiring diagrams.

### Motor rotation

Once the burner electrical connection is accomplished, remember to check the rotation of the fan motor.

The motors must rotate in the direction showed on their casing. In the event of wrong rotation, reverse the three-phase supply and check again the motor rotation.

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

## ADJUSTING LIGHT OIL FOLW RATE

### Light oil nozzles

The light oil flow rate can be adjusted choosing a by-pass nozzle that suits the boiler/utilisation's output and setting the delivery and return pressure values according to the values quoted on diagrams on figure and , according to the burner type. Nozzles provided are the following according to the burner type:

TG90 - TG91 - TG92: Bergonzo A3

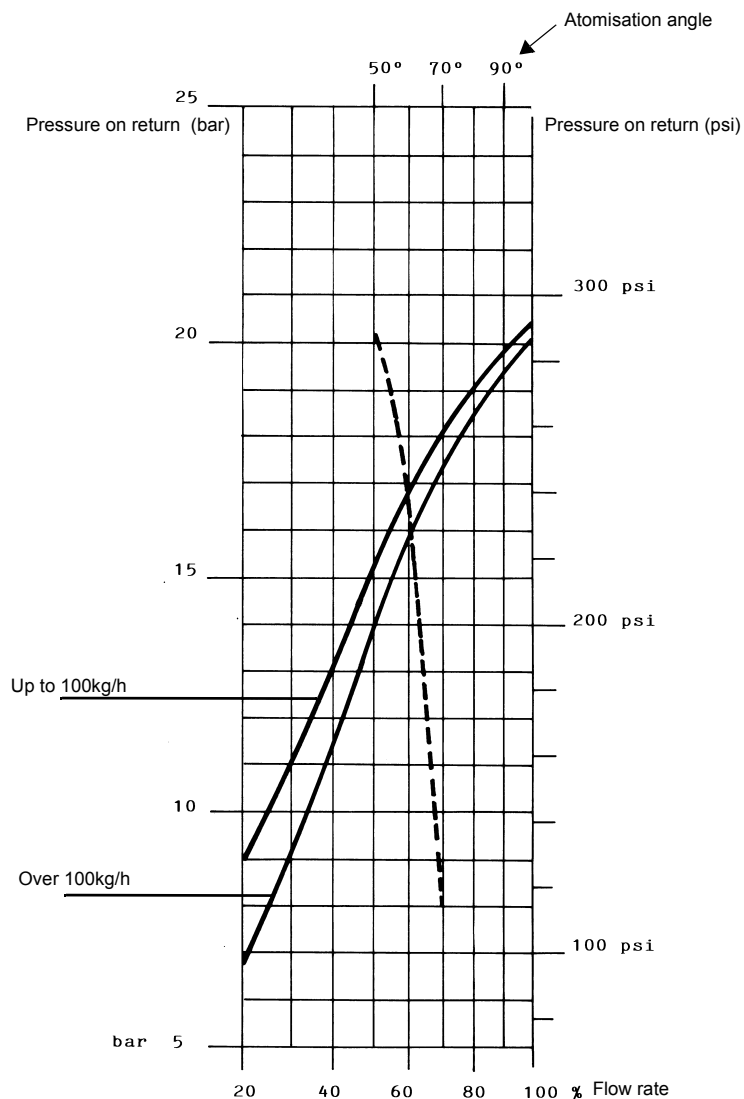
TG93-510-515-520-525: Fluidics WR2/ UNIGAS M3 45°

As far as reading the pressure values, see next paragraphs.

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

| DIMENSIONS | FLOW RATE kg/h |     | Indicative<br>peasure on<br>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                                       |

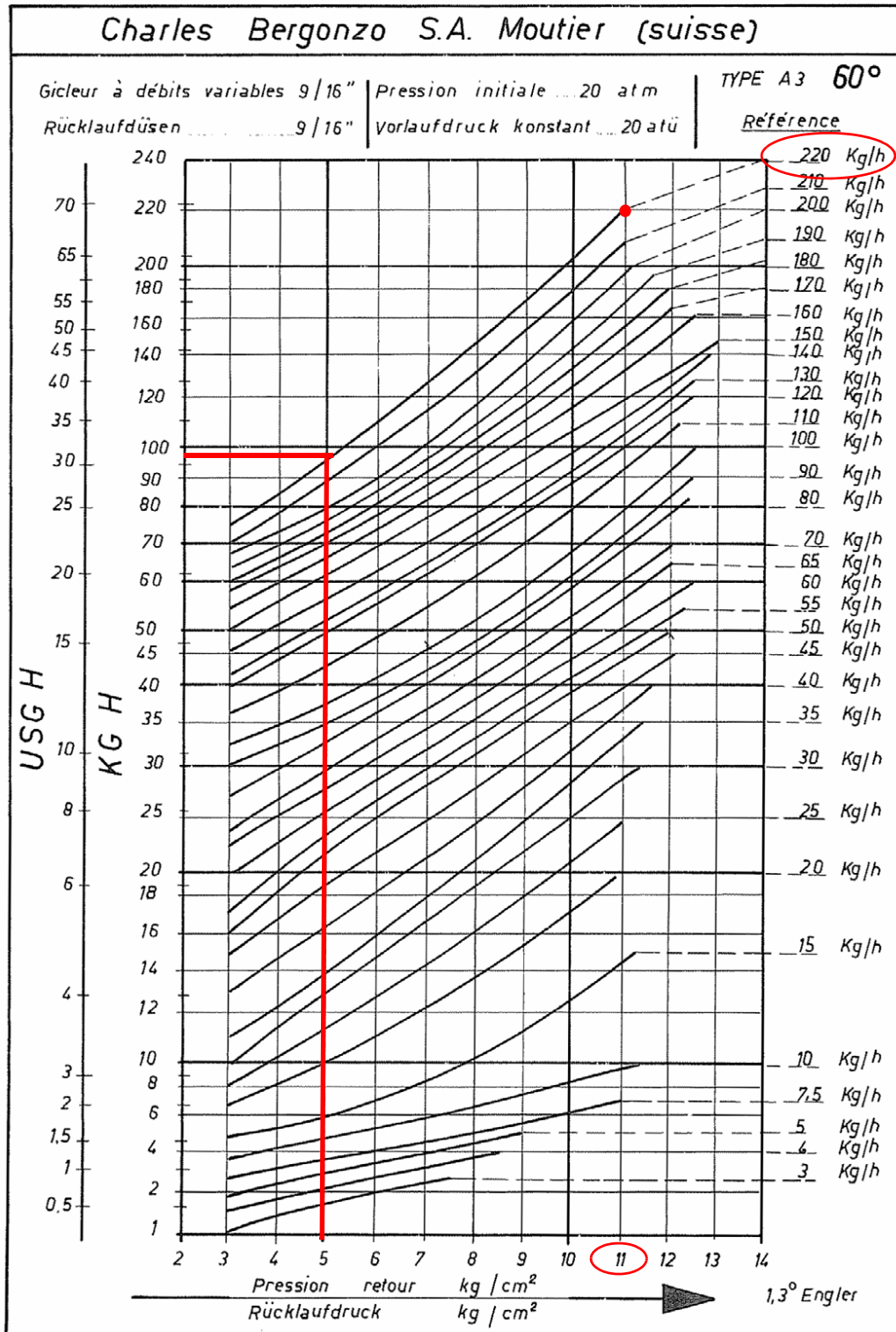
Tab. 1



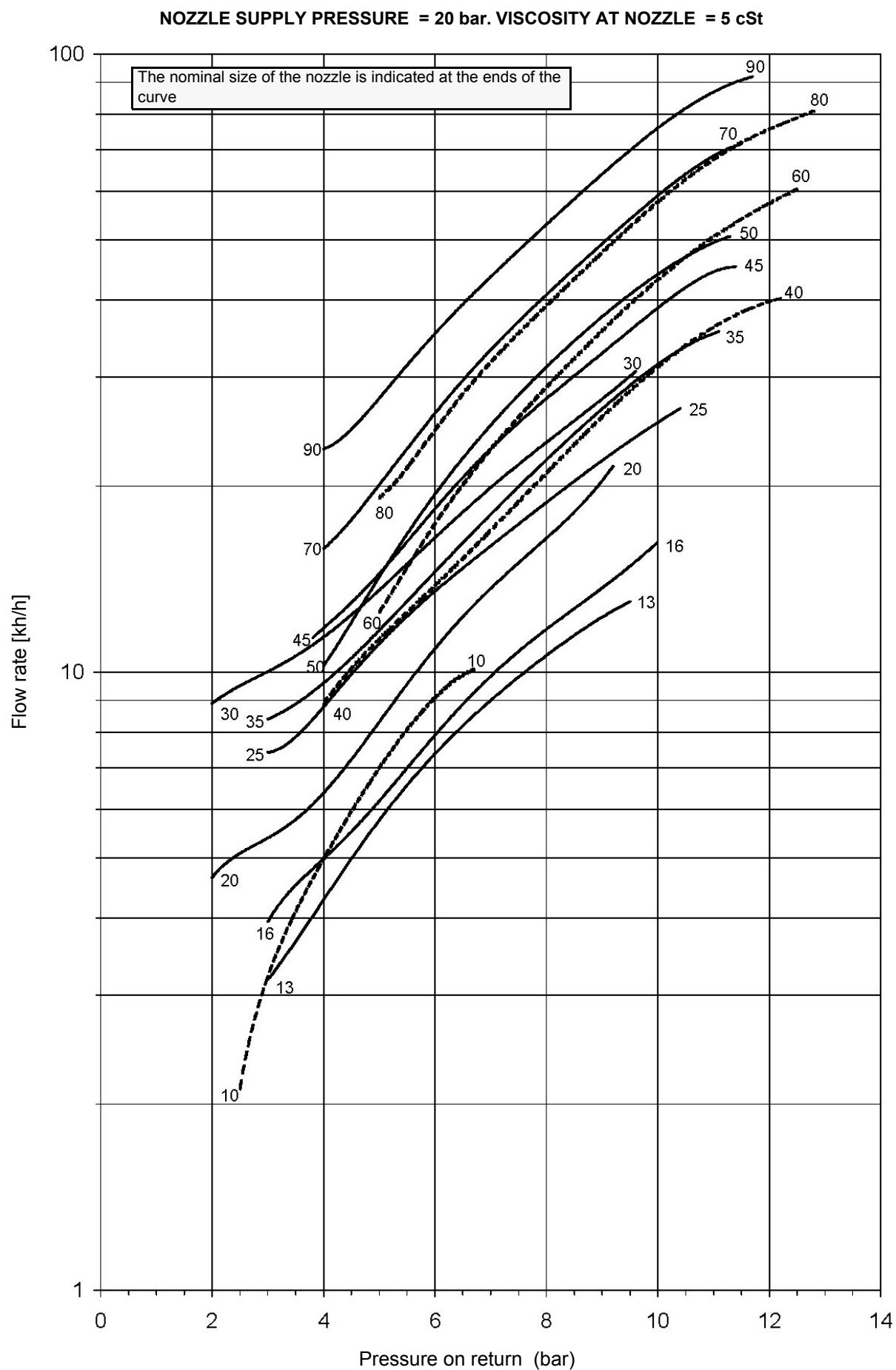
**NOZZLE SUPPLY PRESSURE = 25 bar**

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

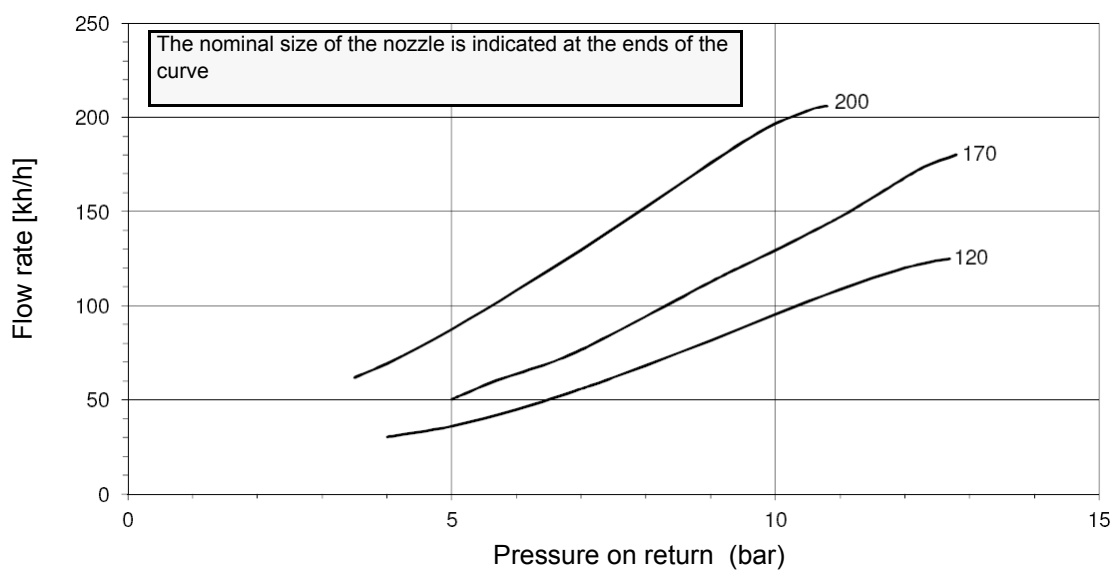
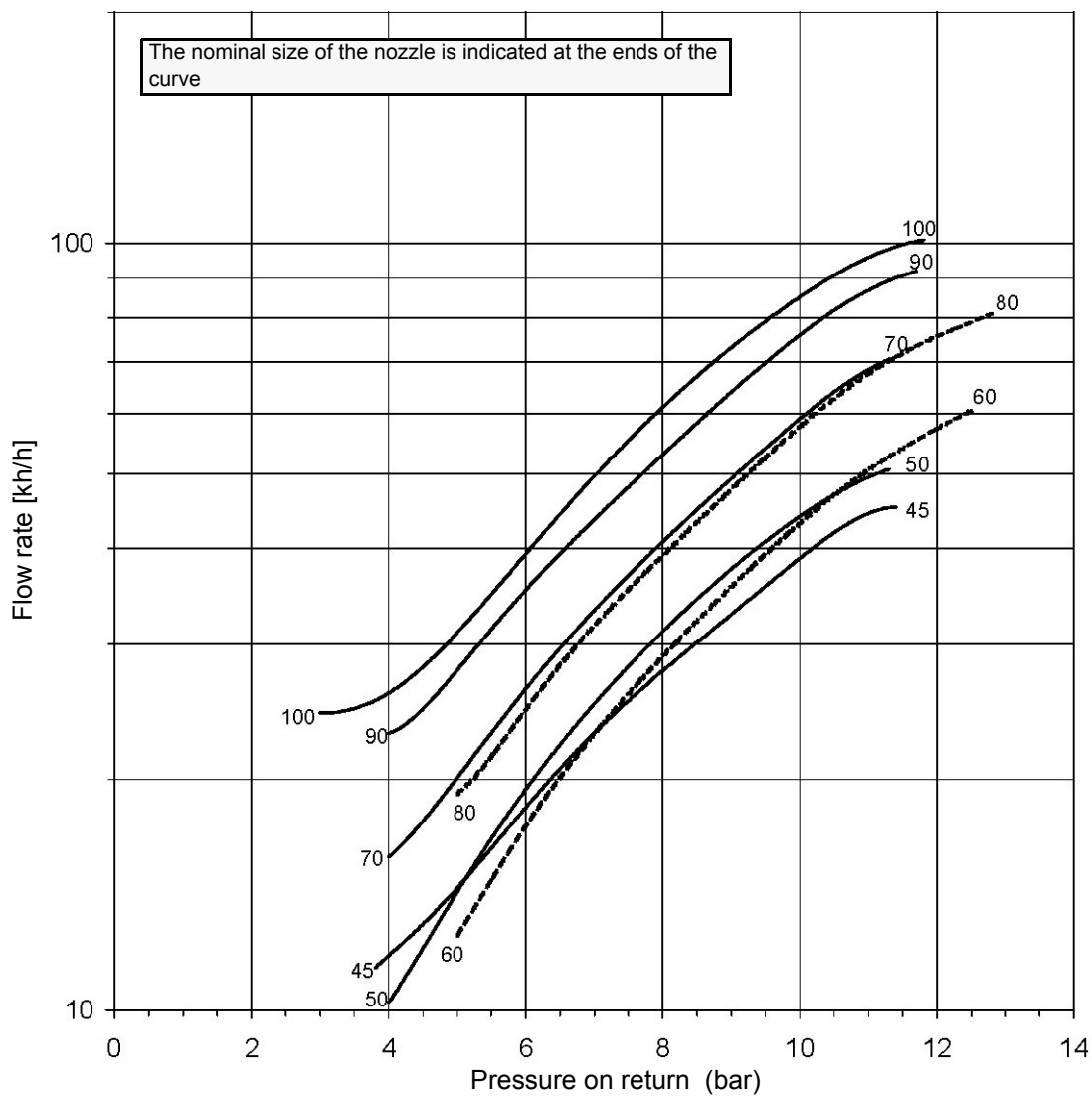
**ATTENTION! To achieve the maximum flow rate close completely the return line.**



**Example (Bergonzo):** if a 220kg/h flow rate BERGONZO nozzle is provided, set the return pressure at 11bar, supply at 20bar on the delivery to get a 220kg/h flow rate. If the return pressure needed is 5bar, instead, act on the **V** adjusting screw on the pressure governor. The flow rate will then be about 95kg/h (see the example showed on the Bergonzo diagram).

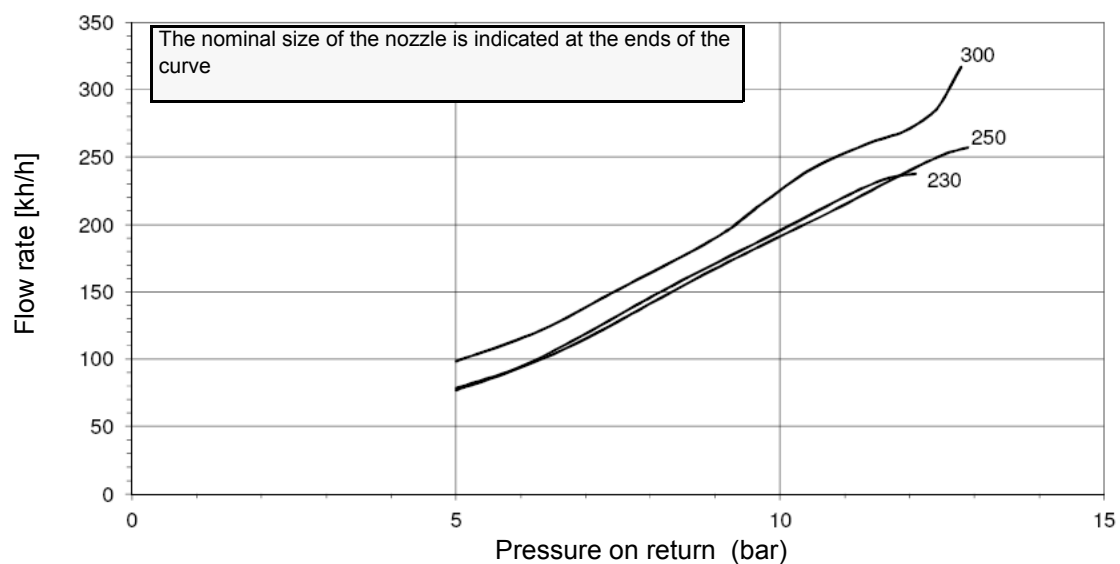
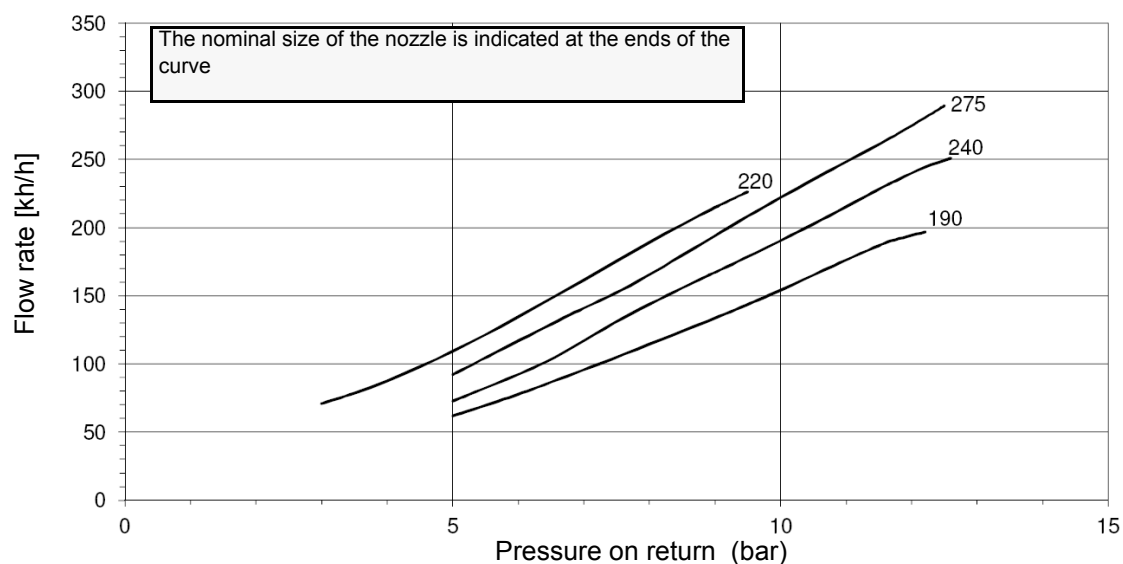
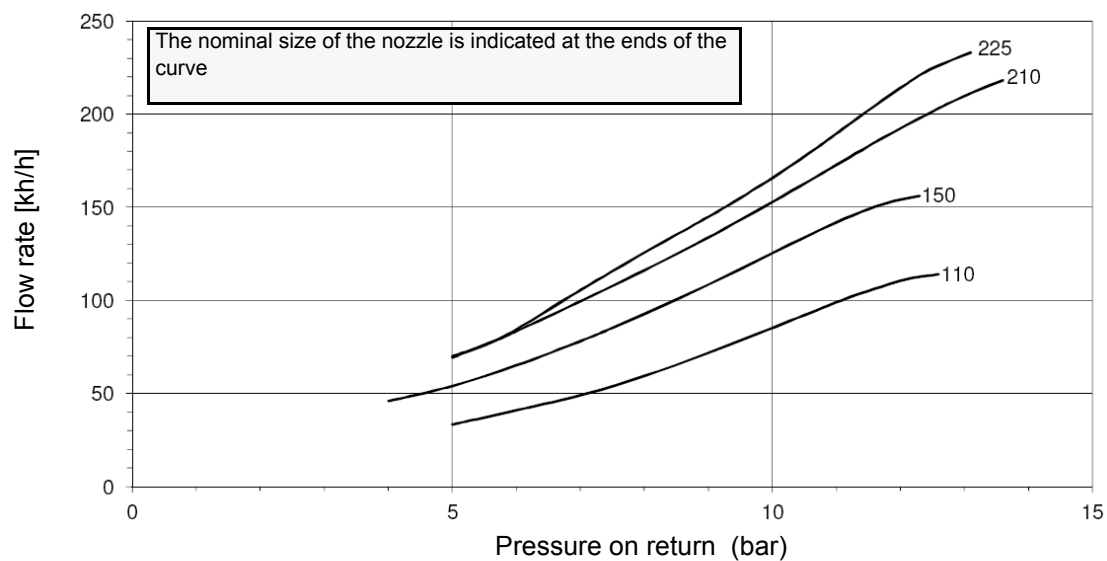


NOZZLE SUPPLY PRESSURE = 20 bar. VISCOSITY AT NOZZLE = 5 cSt





NOZZLE SUPPLY PRESSURE = 20 bar. VISCOSITY AT NOZZLE = 5 cSt



## Adjustments - brief description

|                                                                                  |                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>ATTENTION:</b> before starting the burner up, be sure that the manual cutoff valves are open and check that the pressure upstream the gas train complies the value quoted on paragraph "Technical specifications". Be sure that the mains switch is closed. |
|                                                                                  | 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.                                                                                                               |
|                                                                                  | <b>ATTENTION:</b> 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.    |

|                                                                                   |                                                                                                       |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|  | <b>IMPORTANT!</b> the combustion air excess must be adjusted according to the in the following chart: |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|

| Recommended combustion parameters |                                 |                                |
|-----------------------------------|---------------------------------|--------------------------------|
| Fuel                              | Recommended (%) CO <sub>2</sub> | Recommended (%) O <sub>2</sub> |
| Light oil                         | 11.5 ÷ 13                       | 2.9 ÷ 4.9                      |

Adjust the air and fuel flow rates at the maximum output ("high flame") first, by means of the air damper and the adjusting cam respectively.

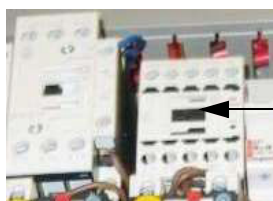
- Check that the combustion parameters are in the suggested limits.
- Check the flow rate measuring it on the counter.
- Then, adjust the combustion values corresponding to the points between maximum and minimum: set the shape of the adjusting cam foil. The adjusting cam sets the air/fuel ratio in those points, regulating the opening-closing of the fuel governor.
- 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.

### Adjustment procedure

To change the burner setting during the testing in the plant, follow the next procedure, according to the actuator model provided (mod. Berger STM30.. or mod. Siemens SQL..).

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

- 1 Check the fan motor rotation.
- 2 With the electrical panel open, prime the oil pump acting on the related **CP** contactor (see next picture): check the pump motor rotation and keep pressed for some seconds until the oil circuit is charged;



CP

- 3 bleed the air from the **M** pressure gauge port (Fig. 13) by loosening the cap without removing it, then release the contactor.

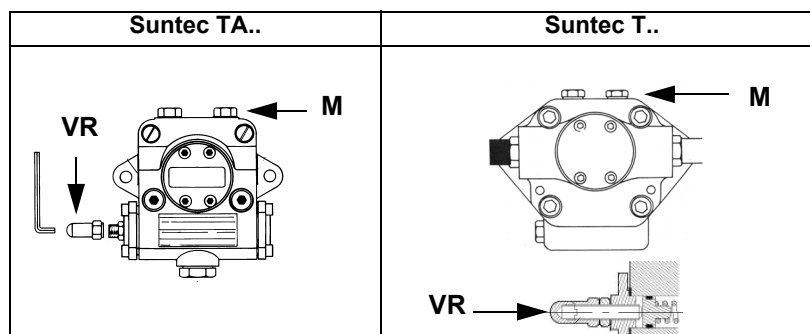
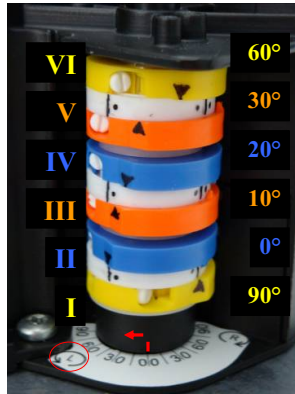


Fig. 13

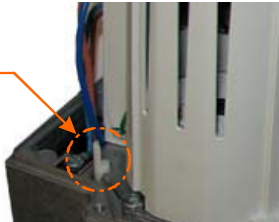
- 4 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operate at the lowest output) to achieve safely the high flame stage .
- 5 Turn the burner on by means of its main switch: if the burner locks (LED on in the control panel) press the RESET button on the

control panel - see chapter "OPERATION" on page 28.

- 6 be sure that the actuator cam for the "Startup enabling signal" (when used) is about 5° more than the ignition cam;
- 7 start the burner up by means of the thermostat series and wait until the pre-purge time comes to an end;
- 8 drive the burner to high flame stage, by means of the thermostat **TAB**.
- 9 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).



MAN-AUTO



**Actuator cams**

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

Siemens SQM40

- 10 the nozzle supply pressure is already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); insert a pressure gauge into the port showed on Fig. 14 and act on on the pump adjusting screw **VR** (see Fig. 13) as to get the nozzle pressure at 20bar or 25bar (according to the nozzle model: Bergonzo or Fluidics nozzle - see page 24).

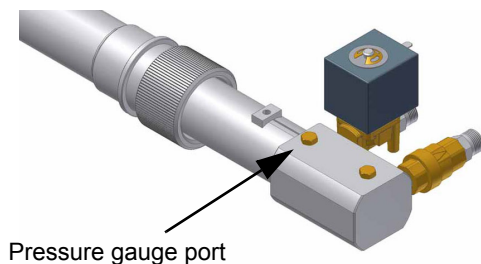


Fig. 14

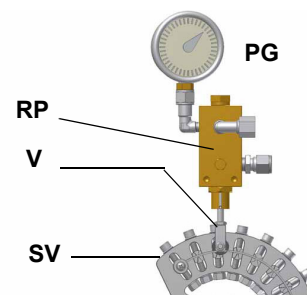
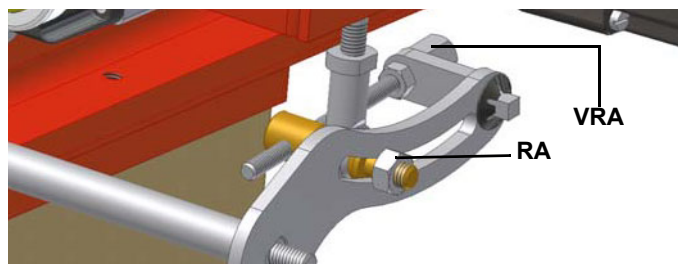


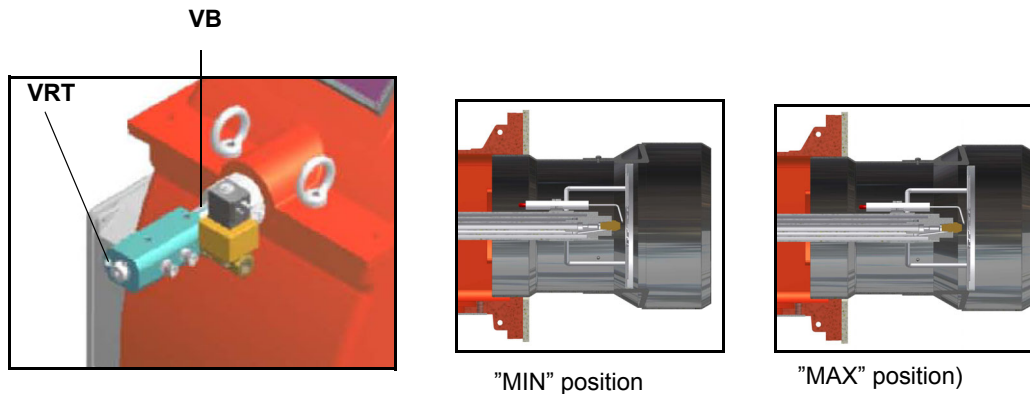
Fig. 15

- 11 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 **SV** adjusting cam screw (see picture) when the cam has reached the high flame position.
- 12 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.

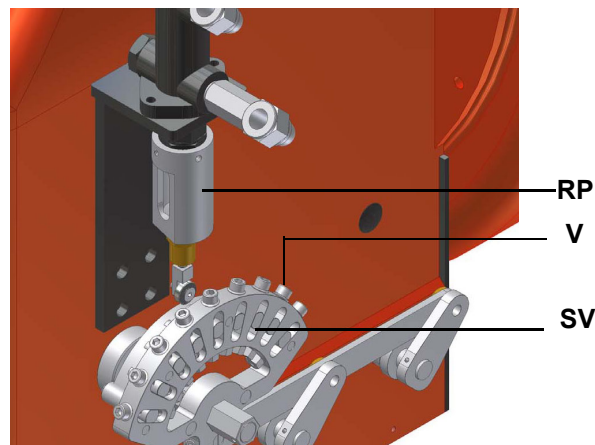


- 13 Only if necessary, change the combustion head position: to let the burner operate at a lower output, loose the **VB** screw and move progressively back the combustion head towards the MIN position, by turning clockwise the **VRT** ring nut. Fasten **VB** screw when the adjustment is accomplished.



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

- 14 the air and oil rate are now adjusted at the maximum power stage, go on with the point to point adjustment on the **SV** adjusting cam as to reach the minimum output point.



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

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

### **Fully modulating burners**

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

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

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

- CMF = 0 stop
- CMF = 1 high flame operation
- CMF = 2 high flame operation flame operation
- CMF = 3 automatic operation

### Maximum oil pressure switch

The oil pressure switch on the return line, checks that the pressure does not exceed a default value. This value must not be higher than the maximum acceptable pressure on the return line (this value is reported on the specification table). A pressure change on the return line could affect the combustion parameters: for this reason, the pressure switch must be set, say, at 20% over the pressure recorded during the combustion adjustment. The factory setting is 4 bar.

It is recommended to verify that the combustion parameters are within the range of acceptable values even against a pressure variation that gets close to the limit of the pressure switch.

This check should be carried out along the whole range of the burner output.

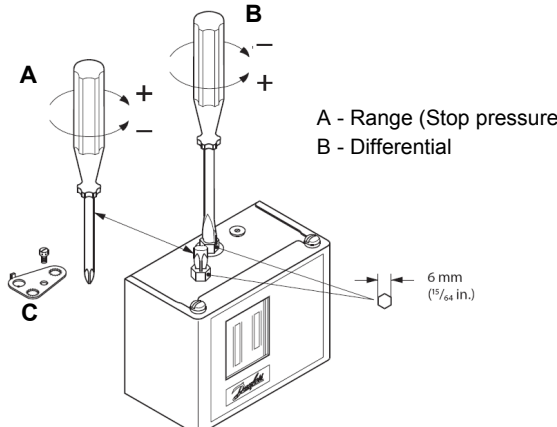
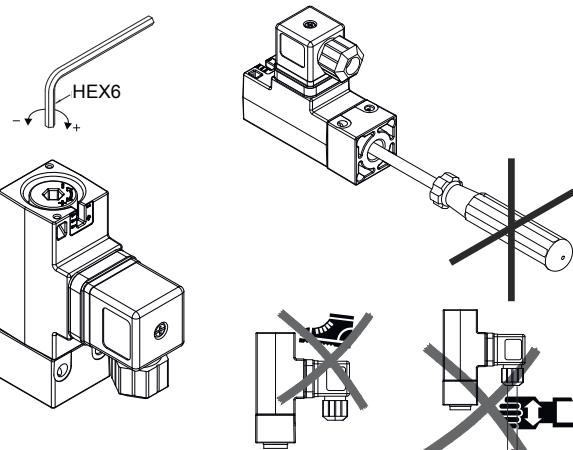
In case of unacceptable values, reduce from 20% to 15% the overpressure; later on, repeat the adjustments described above.

### Minimum oil pressure switch (when provided)

The minimum oil pressure switch on the inlet line, checks that the pressure does not drop below a default value. The pressure switch must be set, say, at 10% under the pressure at the nozzle.

### Oil pressure switch adjustment

Follow the below instruction, according to the pressure switch installed.

|                                                                                                                                                                                                                                                 |                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
|  <p>A - Range (Stop pressure)<br/>B - Differential</p> <p>6 mm<br/>(1/4 in.)</p> <p>NB: Remove lockplate (C) before adjustment</p> <p><b>Danfoss KP..</b></p> |  <p>HEX6</p> <p><b>Trafag Picostat 9B4..</b></p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|

### Calibration of air pressure switch

To calibrate the air pressure switch, proceed as follows:

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

**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 . Be sure that the mains switch is closed.

- 1 Set to the ON position the switch on the control panel of the burner.
- 2 Check the control box is not in the lockout position; in such a case reset it by the reset pushbutton.
- 3 Check the series of thermostats (or pressure switches) sends the burner the signal to operate.
- 4 The startup sequence begins: the control box ignites the fan/pump motor and energises the ignition transformer as well.
- 5 At the end of the pre-purge stage, the light oil solenoid valve EVG is energised and the burner is on.
- 6 The ignition transformer is energized for few seconds after the ignition of the flame (post-ignition time) and at the end of this time is de-energised.
- 7 After the ignition the actuator moves to the high flame position for some seconds, then the operation begins and the burner switches to high flame or to low flame, according to the plant demand.

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

- Check and clean the cartridge of the fuel filter, replace it if necessary (see next paragraph);
- carefully check for leaks, the fuel flexible hoses;
- check and clean the filter on the fuel 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;
- remove, check and clean the combustion head (page 30); when reassembling, carefully observe the measures on page 31;
- check the ignition electrodes and their ceramic insulators, clean, adjust and replace if necessary (page 31);
- remove and clean the oil nozzles (IMPORTANT: do not clean the nozzles using metallic or sharp utensils, use only solvents or steam); at the end of maintenance operations, refit the burner, turn it on and check the combustion. If in doubt, replace the defective nozzle/s. In case of intensive use of the burner, the nozzles must be replaced at the end of the working season;
- check and carefully clean the flame detection photoresistor (page 31), if necessary replace it and, if in doubt, check the detection current;
- clean and grease leverages and rotating parts.

### Light oil filter maintenance

For correct and proper servicing, proceed as follows:

- 1 shut off fuel in the line section being serviced;
- 2 unscrew the tray;
- 3 remove the filter cartridge from its support and wash it with petrol or replace if necessary; check seal O-Ring, replace if necessary;
- 4 reassemble the tray and restore fuel flow.

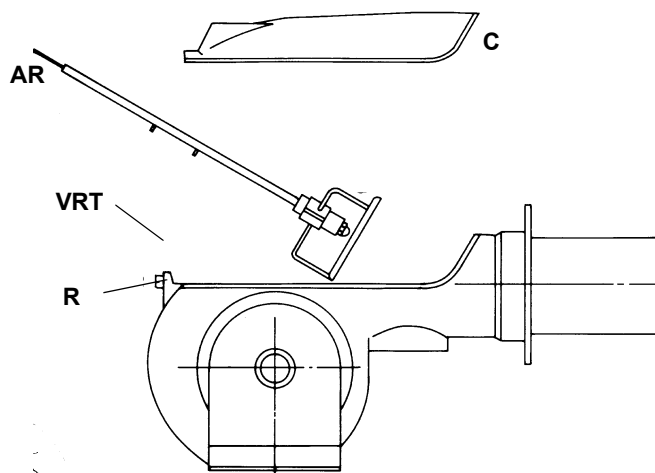




## Removing the combustion head

- 1 Remove the top cover **C**;
- 2 remove the photoresistor from its seat;
- 3 unscrew the revolving connectors (**E** in figure) on the fuel pipes (use 2 spanners to avoid loosening the connections attached to the distributor block);
- 4 loosen **VRT** screw to free the threaded rod **AR**, then screw out the 2 screws **V** holding the washer **R** and the screw **VRT** again;
- 5 remove the whole assembly as shown in figure;
- 6 clean the combustion head by means of a vacuum cleaner; to scrape off the scale use a metallic brush.

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

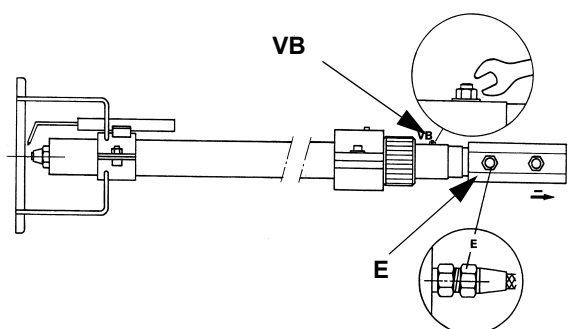


## Removing the oil gun

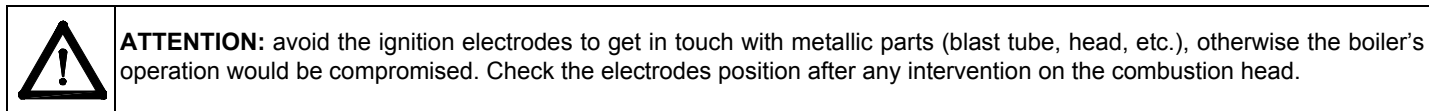
Once the combustion head is removed, as described before, remove the oil gun as follows:

- 1 unscrew the connectors from the 2 oil pipes (**E** in figure) using 2 spanners to avoid loosening the connections attached to the distributor block);
- 2 loosen the screw **VB**
- 3 remove the gun with the light oil nozzle holder.
- 4 clean the oil gun by means of a vacuum cleaner; to scrape off the scale use a metallic brush
- 5 replace the oil gun, if necessary.

**Note:** To re-assemble, follow the procedure above in reversed order.



## Correct position of electrodes and nozzle



To guarantee a good ignition the measures shown on the next picture Fig. 16 must be observed.  
Be sure to tighten the screw on the electrodes group before reassembling the combustion head.

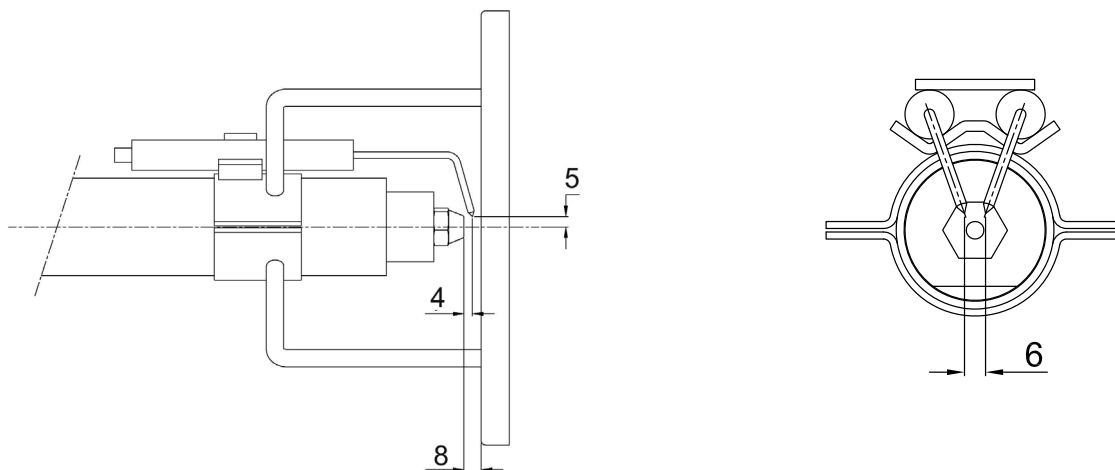
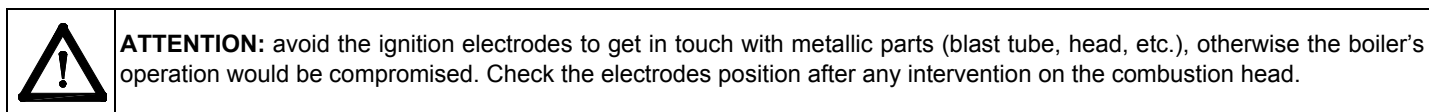


Fig. 16

## Replacing the ignition electrodes



To replace the ignition electrodes, proceed as follows:

- 1 remove the burner cover;
- 2 disconnect the electrodes cables;
- 3 remove the combustion head (see par. "Removing the combustion head");
- 4 loose screw (B) that fasten the ignition electrodes;
- 5 remove the electrodes and replace them, referring to the values quoted on Fig. 16.

## Cleaning and replacing the detection photoresistor

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

### Checking the detection current

To measure the detection signal follow the diagram in Fig. 26. If the signal is not in the advised range, check the electrical contacts, the cleaning of the combustion head, the position of the photoresistor and if necessary replace it.

**series 9x:** LMO

**series 5xx:** LAL25

Minimum current intensity with flame

LMO: 45 $\mu$ A

LAL25: 8 $\mu$ A

Maximum current intensity without flame:

LMO: 5.5 $\mu$ A

LAL25: 0.8 $\mu$ A

Maximum possible current intensity with flame:

LMO: 100 $\mu$ A

LAL25: 30 $\mu$ A

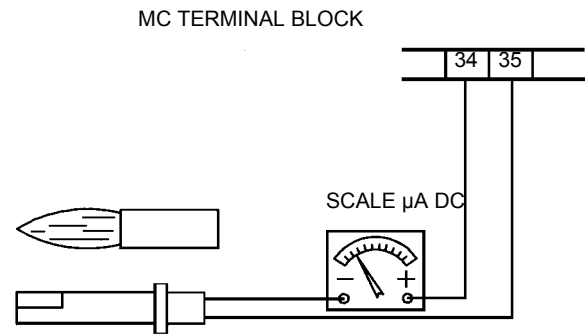


Fig. 17

### Seasonal stop

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

- 1 turn the burner's main switch to 0 (Off position)
- 2 disconnect the power mains
- 3 close the fuel cock 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

|                                                 | 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                              |                             |                                     | ●               | ●                                        |                                   |                                               | ●                                       |                                                                    |

## SIEMENS LAL... CONTROL BOX

### Use

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

### Housing and plug-in base

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

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

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

### Operation

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

### Pre-conditions for burner startup

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

### Startup sequence

Start command by «R»:

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

t1 Prepurge time with air damper fully open:

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

With LAL2:

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

t3 Short preignition time:

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

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

t3n Postignition time:

- «Z» must be connected to terminal 15

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

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

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

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

B Operating position of the burner

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

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

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

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

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

D-A End of control program: start position

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

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

### Lockout and indication of the stop position

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

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

Extraneous light:

Lockout during or after completion of the control program

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

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

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

■ Defect in the flame supervision circuit.

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

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

| Flame signal has been lost during operation.

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

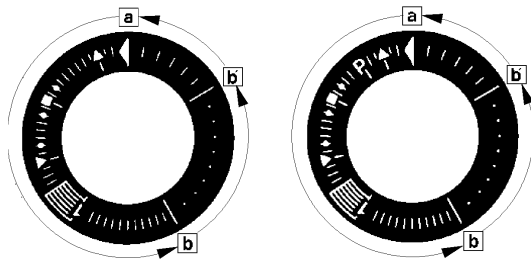
B Operating position of the burner

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

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

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

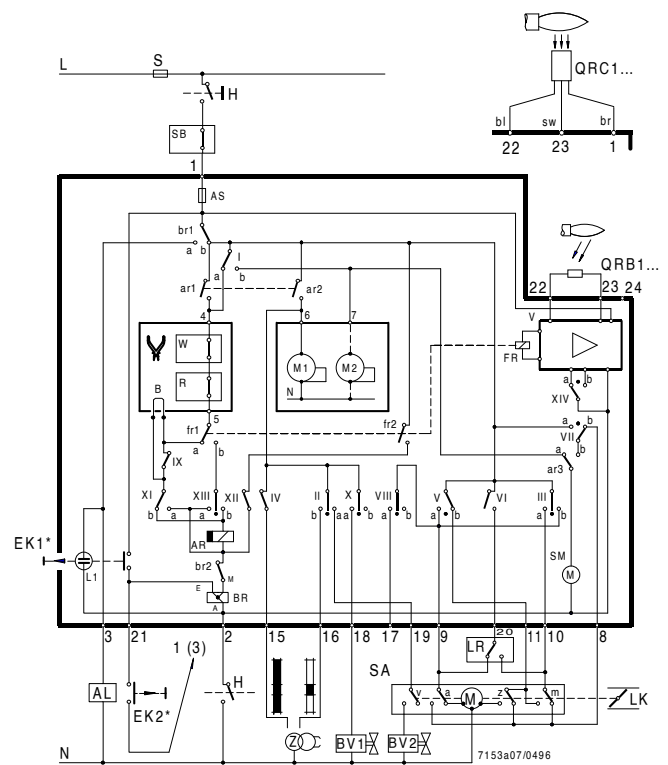
### Lockout indication



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

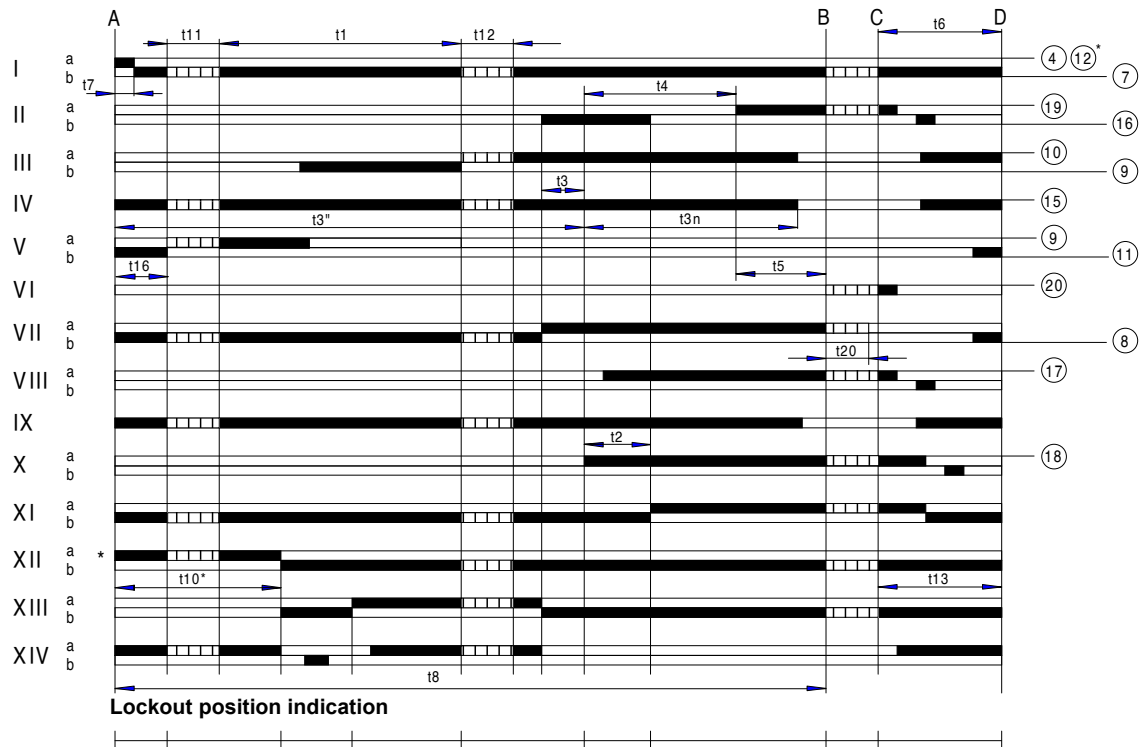
|                                                                    |                                 |
|--------------------------------------------------------------------|---------------------------------|
| Power supply                                                       | AC 230 V -15 / +10 %            |
| for LAL2... on request                                             | AC 100 V -15 %...AC 110 V +10 % |
| Frequency                                                          | 50 Hz -6 %...60 Hz +6 %         |
| Absorption                                                         | AC 3.5 VA                       |
| Mounting position                                                  | optional                        |
| Protection                                                         | IP 40                           |
| Perm. input current at terminal 1                                  | AC 5 A max., 20 A peak          |
| Perm. current rating of control terminals 3, 6, 7, 9...11, 15...20 |                                 |

4 A max., 20 A peak  
T6,3H250V according to IEC 127  
max. 10 A  
Device 1000 g  
Plug-in base 165 g



### Sequence diagram

### Control output at terminal



|    |                                                        |
|----|--------------------------------------------------------|
| t1 | Prepurge time with air damper fully open               |
| t2 | Safety time                                            |
| t3 | Preignition time, short («Z» connected to terminal 16) |

|     |                                                                         |
|-----|-------------------------------------------------------------------------|
| T3' | Preignition time, long («Z» connected to terminal 15)                   |
| t3n | Postignition time («Z» connected to terminal 15)                        |
| t4  | Interval between voltage at terminals 18 and 19 («BV1-BV2»)             |
| t5  | Interval between voltage at terminals 19 and 20 («BV2» load controller) |

|     |                                                                                      |
|-----|--------------------------------------------------------------------------------------|
| t6  | Postpurge time (with «M2»)                                                           |
| t7  | Interval between start command and voltage at terminal 7 (start delay time for «M2») |
| t8  | Duration of startup sequence (excluding «t11» and «t12»)                             |
| t10 | Interval from startup to the beginning of the air pressure check                     |
| t11 | Air damper running time to the OPEN position                                         |
| t12 | Air damper running time to the low-fire position (MIN)                               |
| t13 | Permissible afterburn time                                                           |
| t16 | Interval to the OPEN command for the air damper                                      |
| t20 | For self-shutdown of the sequence switch                                             |

#### SIEMENS OIL BURNERS AUTOMATIC CONTROLLER SIEMENS LMO14 - LMO24 - LMO44

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

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

##### Preconditions for startup

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

##### Undervoltage

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

##### Time supervision oil pre-heater

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

##### Controlled intermittent operation

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

##### Control sequence in the event of fault

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

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

##### Lock-out

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

##### Resetting the burner

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

##### Limitation of repetitions

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

##### Operation



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



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

- s Red  
l Yellow  
o Green

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

##### Key

- m Off  
l Yellow  
o Green  
s Red

##### Diagnosis of cause of fault

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

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

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

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

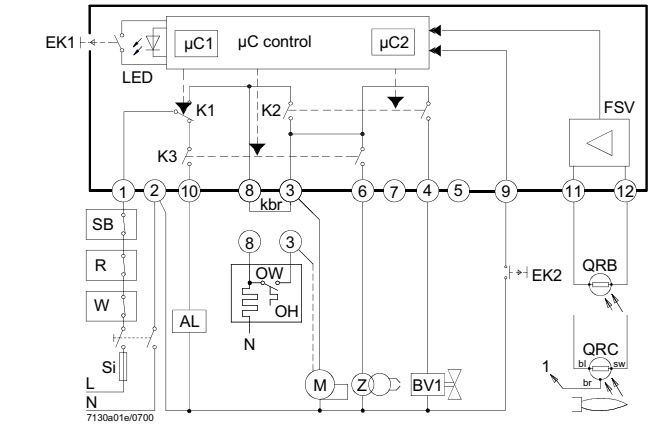
- Burner remains shut down
- Fault status signal «AL» at terminal 10 is activated

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

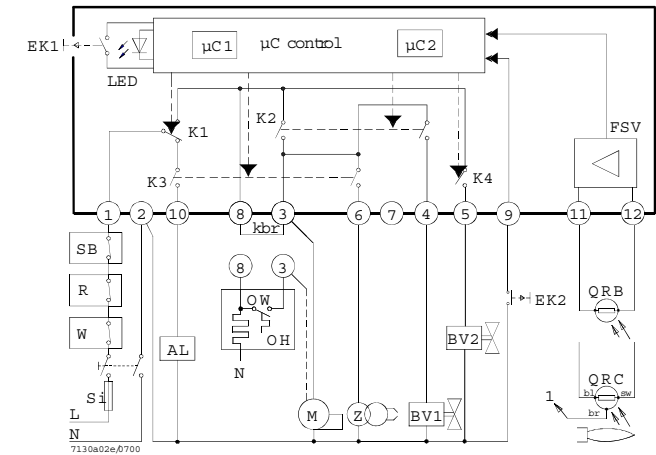
Press lock-out reset button for about 1 second (< 3 seconds).



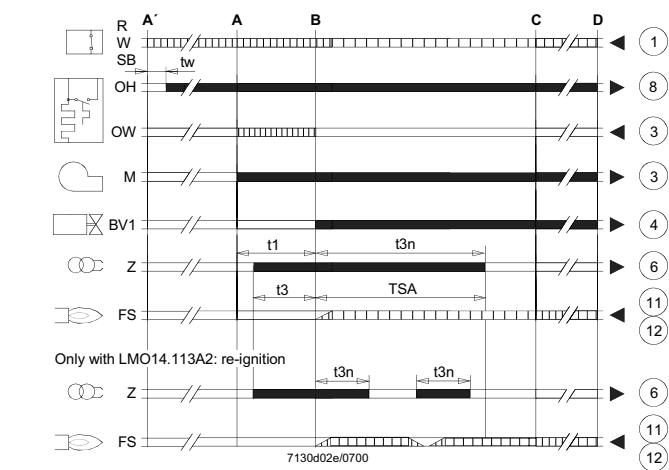
**Connection diagram and internal diagram**  
**LMO14**



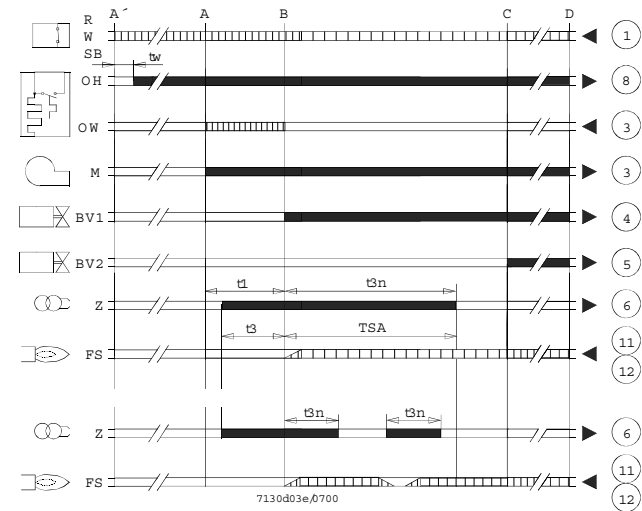
**LMO24 - LMO44**



**Control sequence**  
**LMO14**



**LMO24 - LMO44**



**Key**

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

General unit data

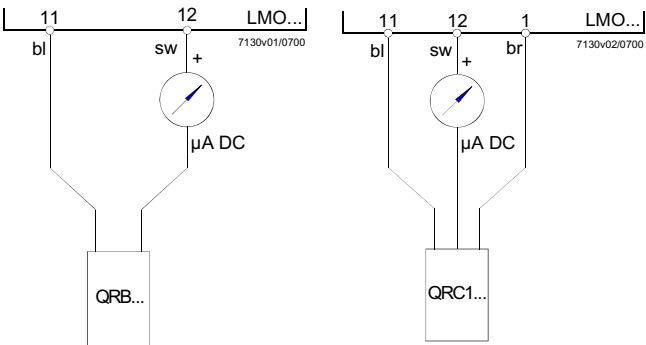
|                                |                                         |
|--------------------------------|-----------------------------------------|
| Mains voltage                  | AC 230 V +10 % / -15 %                  |
|                                | AC 120 V +10 % / -15 %            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

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

Flame supervision with QRB and QRC

|                                                |            |            |
|------------------------------------------------|------------|------------|
|                                                | <b>QRB</b> | <b>QRC</b> |
| Min. detector current required (with flame)    | 45 µA      | 70 µA      |
| Min detector current permitted (without flame) | 5.5 µA     | 5.5 µA     |
| Max. possible with flame (typically)           | 100 µA     | 100 µA     |

Measurement circuit for detector current



Key

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





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

# LME73.000Ax + PME73.831AxBC

## LME73.831AxBC



***Service instruction manual***

M12921CB Rel.1.2 02/2016

## GENERAL FEATURES

LME/ is suitable for gas, light and heavy oil burners

LME7 series has two devices: LME73.000 (hardware) and PME73.831AxBC (programmable unit). The LME73.831AxBC is also available: it has a built in software and it is not programmable.

LME7 is inside the control panel. If supplied, PME73.831BC is inside the LME7;

The display AZL23.. or AZL21.. is available for Service and hardware setup.

LME7... are used for the startup and supervision of 2-stage/progressive, modulating forced draft gas burners in intermittent operation.

The flame is supervised with an ionization probe, optionally with UV flame detector QRA2..., QRA4.U or QRA10....

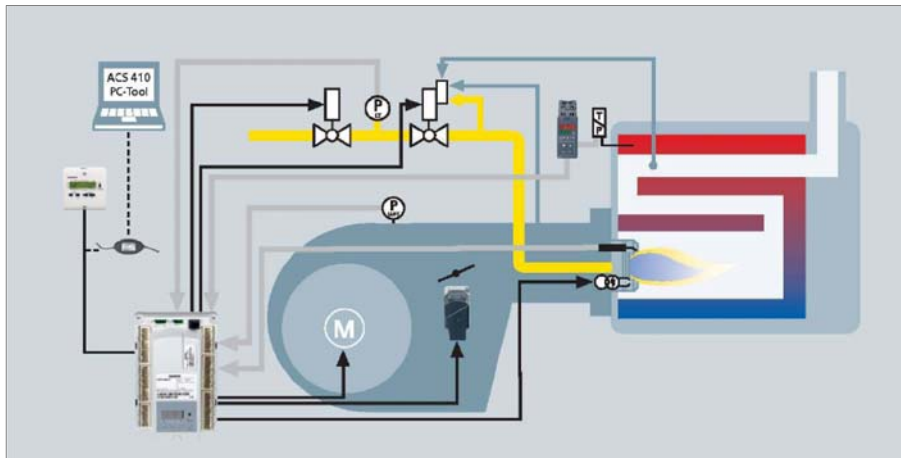
Integrated in the LME7... basic unit are:

- Burner control
- BCI
- Control for one actuator
- Lockout reset button (info button)
- 3 multicolor signal lamp LED for operations and fault notifications
- 3 x 7-segment display for service, fault and operating state information
- Interface for program module (no function)

Passwords protect the different parameter levels against unauthorized access. Basic settings that the plant operator can make on site require no password.

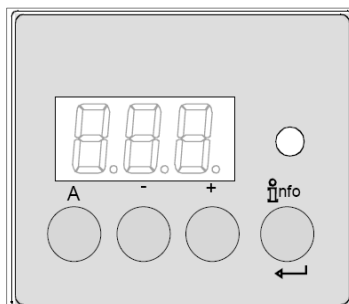
Functions:

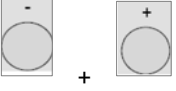
- Undervoltage detection
- Electrical remote reset facility
- Accurate control times thanks to digital signal handling
- Multicolor indication of fault status and operating state messages
- Air pressure supervision with function check of air pressure switch during start and operation (gas)
- Repetition limitation
- Controlled intermittent operation after 24 hours of continuous operation\*
- BCI
- Indication of program sequence



\* after no more than 24 hours of continuous operation, the burner control initiates automatic controlled shutdown followed by a restart.

## User interface :



|                                                                                     |                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <b>Button A</b> <ul style="list-style-type: none"> <li>- Display preset output</li> <li>- In lockout position: Power value to the time of fault</li> </ul>                                                                                             |
|    | <b>Info and Enter button</b> <ul style="list-style-type: none"> <li>- Reset in the event of fault, changeover visual diagnostic of the cause of fault (refer to chapter Diagnostics of cause of fault )</li> </ul>                                     |
|    | <b>- button</b> <ul style="list-style-type: none"> <li>- Display flame signal current 2 or phases display</li> <li>- In lockout position: MMI phase to the time of fault</li> </ul>                                                                    |
|    | <b>+ button</b> <ul style="list-style-type: none"> <li>- Display flame signal current 1 or phases display</li> <li>- In lockout position: MMI phase to the time of fault</li> </ul>                                                                    |
|  | <b>3 multicolor signal lamp</b> <ul style="list-style-type: none"> <li>- Refer to chapter "Blink code table"</li> </ul>                                                                                                                                |
|  | <b>+ and - button: Escape function</b><br>(press + and - simultaneously) <ul style="list-style-type: none"> <li>- No adoption of value</li> <li>- One menu level up</li> <li>- Keep depressed for &gt;1second for backup / restore function</li> </ul> |

## First startup when PME is supplied or PME replacement:

### First startup:

- 1) insert a new PME
- 2) turn the power on; The display shows "rst" and "PrC" one after the other.
- 3) keep pushing the INFO  button more than 3 seconds; "run" appears; PME parameters will be transferred to LME
- 4) at the end, "End" and "rst" appears one after the other; Later (2'), the control box locks out "Loc 138"
- 5) reset the control box by pressing the INFO  button (for less than 3 seconds)  
Now the display shows "OFF"; the burner is ready to be started.

### Replacement:

- 1) Turn off the burner, replace the existing PME with a new one
- 2) For the first startup, repeat the above procedure, from step 2.

**List of phase display on board LME :**

| Phase number of 7-segment display        | LED                   | Function                                                                                                               |
|------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------|
| Standby                                  |                       |                                                                                                                        |
| OFF                                      | Off                   | Standby, waiting for heat demand                                                                                       |
| P08                                      | Off                   | Mains ON / test phase (e.g. detector test)                                                                             |
| <b>Startup</b>                           |                       |                                                                                                                        |
| P21                                      | Yellow                | Safety valve ON, air pressure switch test / POC test (timeout / locking                                                |
| P22                                      | Yellow                | Fan motor ON / air pressure switch test / settling time                                                                |
| P24                                      | Yellow                | Actuator opens in prepurging position                                                                                  |
| P30                                      | Yellow                | Prepurging                                                                                                             |
| P36                                      | Yellow                | Actuator closes in ignition load / low-fire position                                                                   |
| P38                                      | Yellow blinking       | Preignition time                                                                                                       |
| P40                                      | Yellow blinking       | 1st safety time (TSA1) / ignition transformer ON                                                                       |
| P42                                      | Green                 | Safety time (ignition transformer OFF), flame check                                                                    |
| P44                                      | Green                 | Interval: End of safety time and fuel valve 1 (V1) ON<br>Interval: End of safety time and load controller (LR) release |
| P50 Green                                | P50 Green             | 2nd safety time (TSA2)                                                                                                 |
| P54 Green                                | P54 Green             | P259.01: Actuator opens in > low-fire                                                                                  |
| P54 Green                                | P54 Green             | P260: Actuator closes in low-fire                                                                                      |
| oP1 Green                                | oP1 Green             | Interval until release of load controller target (analog or 3-position step input)                                     |
| <b>Operation</b>                         |                       |                                                                                                                        |
| oP                                       | Green                 | Operation, modulating operation                                                                                        |
| <b>Shutdown</b>                          |                       |                                                                                                                        |
| P10                                      | Yellow                | Shutdown, actuator opens in CLOSE position (home run)                                                                  |
| P72                                      | Yellow                | Actuator opens in high-fire position / end of operation                                                                |
| P74                                      | Yellow                | Postpurging                                                                                                            |
| <b>Valve proving</b>                     |                       |                                                                                                                        |
| P80                                      | Yellow                | Test space evacuating                                                                                                  |
| P81                                      | Yellow                | Checking time fuel valve 1                                                                                             |
| P82                                      | Yellow                | Test space filling                                                                                                     |
| P83                                      | Yellow                | Checking time fuel valve 2                                                                                             |
| <b>Waiting phases (start prevention)</b> |                       |                                                                                                                        |
| P01                                      | Red / yellow blinking | Undervoltage                                                                                                           |
| P02                                      | Yellow                | Safety loop open                                                                                                       |
| P04                                      | Red / green blinking  | Extraneous light on burner startup (timeout / locking after 30 s)                                                      |
| P90                                      | Yellow                | Pressure switch-min open                                                                                               |
| <b>Lockout</b>                           |                       |                                                                                                                        |
| LOC                                      | Red                   | Lockout phase                                                                                                          |



## Operation :

|                                                                                   |                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | The lockout reset button (info button) (EK) is the key operating element for resetting the burner control and for activating / deactivating the diagnostics functions. |
|  | The multicolor signal lamp (LED) is the key indicating element for visual diagnostics.                                                                                 |

Both lockout reset button (EK) and signal lamp (LED) are located in the control panel.

There are 2 diagnostics choices:

1. Visual diagnostics: Indication of operating state or diagnostics of cause of fault
2. Diagnostics: Via internal display or to AZL2.. display and operating unit

Visual diagnostics:

In normal operation, the different operating states are indicated in the form of color codes according to the color code table given below.

### Color code table for multicolor signal lamp (LED) :

| State                                           | Color code                          | Color             |
|-------------------------------------------------|-------------------------------------|-------------------|
| Waiting time (tw), other waiting states         | ○ .....                             | OFF               |
| Ignition phase, ignition controlled             | ● ○ ● ○ ● ○ ● ○ ● ○ ● ○             | Blinking yellow   |
| Operation, flame o.k.                           | □ .....                             | Green             |
| Operation, flame not o.k.                       | □ ○ □ ○ □ ○ □ ○ □ ○ □ ○             | Blinking green    |
| Extraneous light on burner startup              | □ ▲ □ ▲ □ ▲ □ ▲ □ ▲ □ ▲             | Green-red         |
| Undervoltage                                    | ● ▲ ● ▲ ● ▲ ● ▲ ● ▲ ● ▲             | Yellow-red        |
| Fault, alarm                                    | ▲ .....                             | Red               |
| Error code output (refer to «Error code table») | ▲ ○ ▲ ○ ▲ ○ ▲ ○ ▲ ○ ▲ ○             | Blinking red      |
| Interface diagnostics                           | ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲             | Red flicker light |
| Heating request                                 | ● .....                             | Yellow            |
| Heating request                                 | ● ● ▲ ● ● ▲ ● ● ▲ ● ● ▲ ● ● ▲ ● ● ▲ | Yellow            |

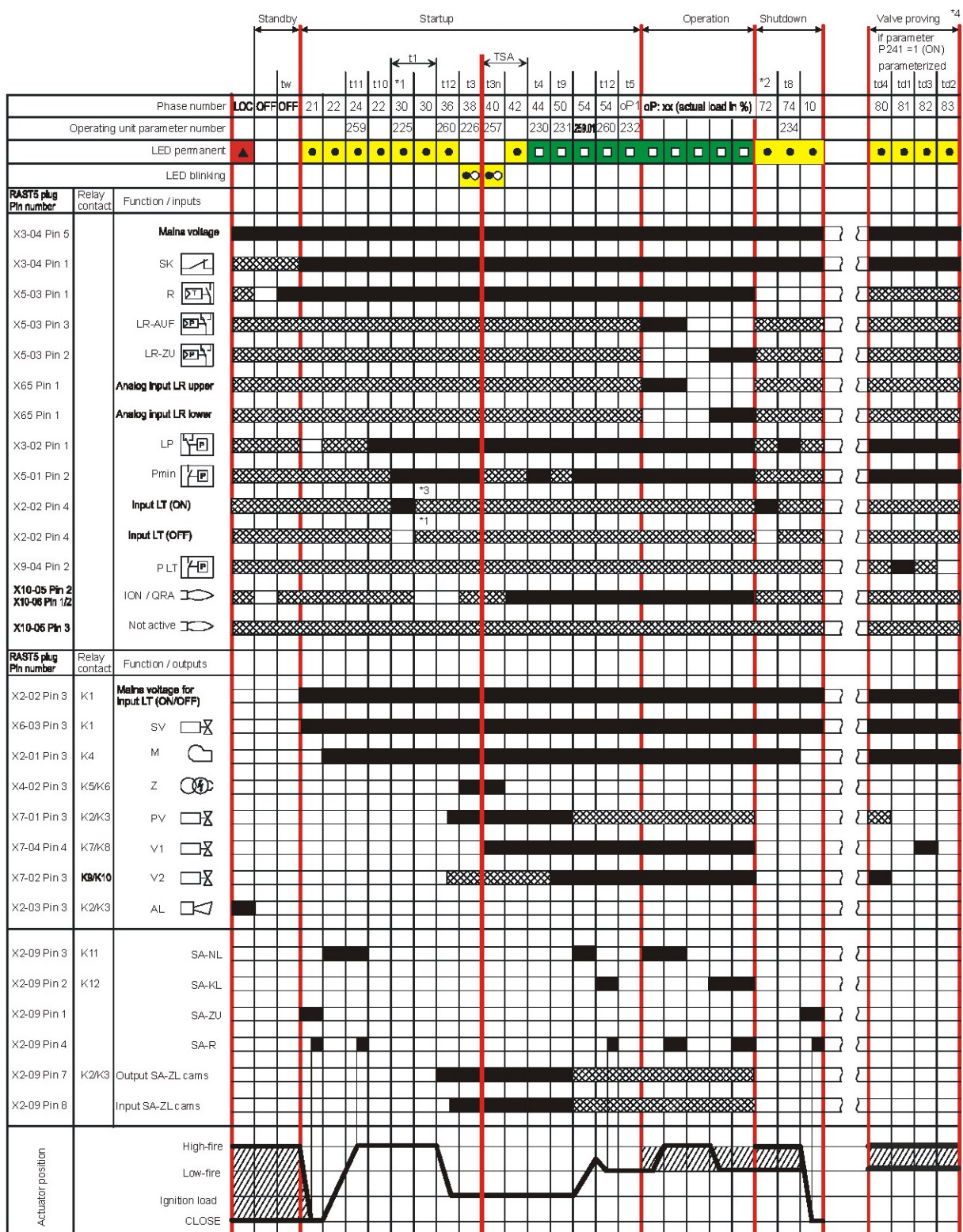
### Key

|       |            |
|-------|------------|
| ..... | Steady on  |
| ○     | Led off    |
| ▲     | Led red    |
| ●     | Led yellow |
| □     | Led green  |

## Program sequence :

Version 1:

- Ignition load < low-fire
- Prepurging in high-fire
- Parameter 515 = 1 (condition parameter 259.01 > 0 seconds)

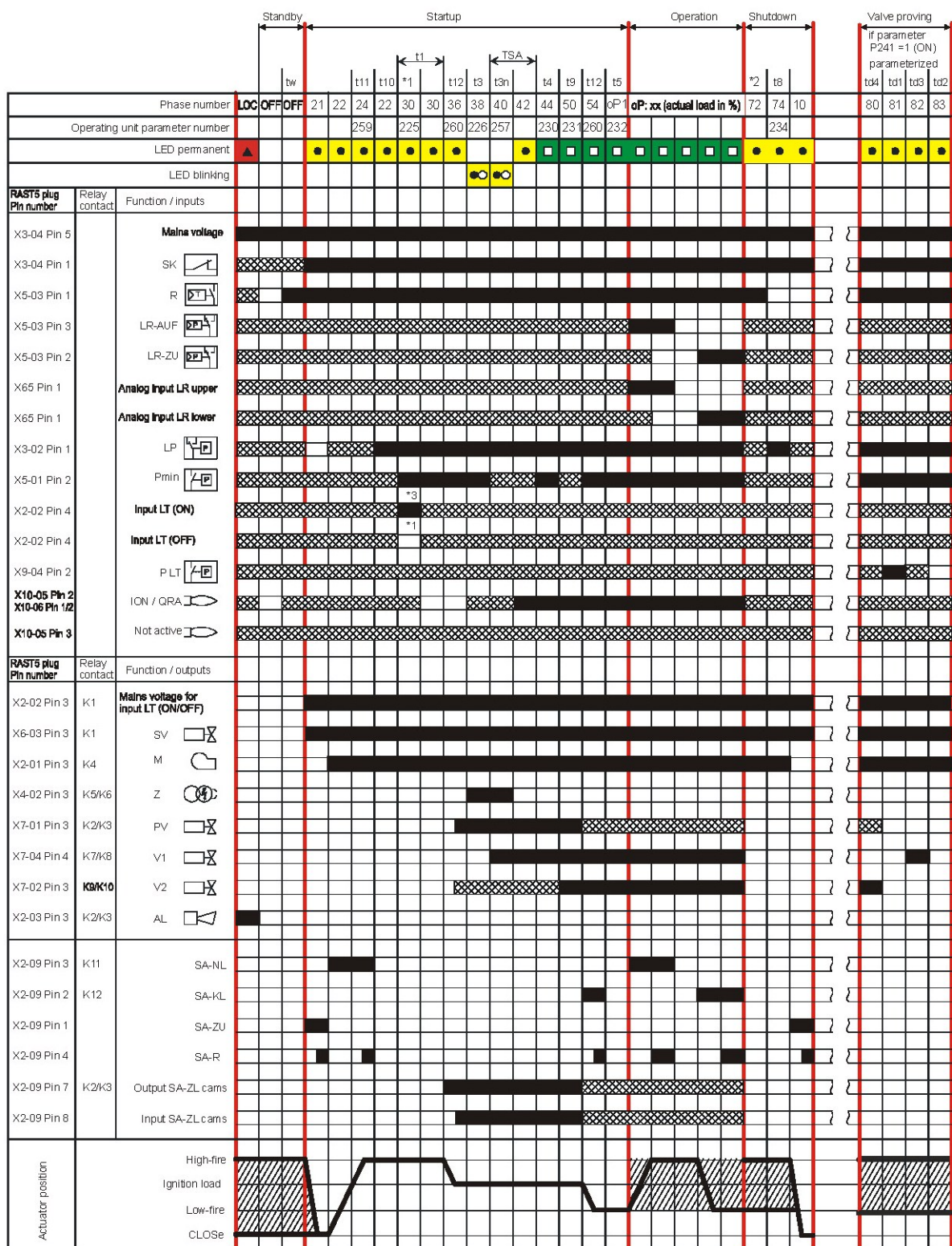


7114d05e/0112

## Program sequence :

Version 2:

- Ignition load > low-fire
- Prepurging in high-fire
- Parameter 515 = 1 (condition parameter 259.01 = 0 seconds)



7114d04e/0112

| Phase number | Function                                                                           |
|--------------|------------------------------------------------------------------------------------|
| LOC          | Lockout phase                                                                      |
| OFF          | Standby, waiting for heat demand                                                   |
| oP           | Operation, modulating operation                                                    |
| oP1          | Interval until release of load controller target (analog or 3-position step input) |
| 01           | Under voltage                                                                      |
| 02           | Safety loop open                                                                   |
| 04           | Extraneous light on burner startup (timeout/locking after 30 seconds)              |
| 08           | Mains ON/test phase (e.g. detector test)                                           |
| 10           | Shutdown, actuator opens in CLOSE position (homerun)                               |
| 21           | Safety valve ON, air pressure switch OFF, actuator opens in CLOSE position         |
| 22           | Part 1: Fan motor ON                                                               |
|              | Part 2: Specified time (t10) air pressure switch (LP)                              |
|              | Message (timeout) stabilization air pressure switch                                |
| 24           | Actuator opens in prepurge position                                                |
| 30           | Part 1: Prepurge time (t1) without extraneous light test                           |
|              | Valve proving after mains ON, lockout                                              |
|              | Part 2: Prepurge time (t1) with extraneous light test                              |
| 36           | Actuator closes in ignition load                                                   |
| 38           | Preignition (t3)                                                                   |
| 40           | Postignition time (t3n), parameter 257 + 0.3 seconds                               |
| 42           | Flame detection                                                                    |
| 44           | Interval (t4): End of safety time (TSA) and burner valve 2 ON                      |
| 50           | 2nd safety time (t9)                                                               |
| 54           | Parameter 259.01: Actuator opens in > low-fire                                     |
|              | Parameter 260: Actuator closes in low-fire                                         |
| 72           | End of operation, checking if valve proving (LT) shall be performed                |
| 74           | Postpurging (t8)                                                                   |
| 80           | Test space evacuation (td4)                                                        |
| 81           | Test time (td1) fuel valve 1 (V1)                                                  |
| 82           | Test space filling (td3)                                                           |
| 83           | Test time (td2) fuel valve 2 (V2)                                                  |
| 90           | Pressure switch-min open safety shutdown                                           |
| *1           | Valve proving is conducted when...                                                 |
|              | - parameter 241.00 = 1 and parameter 241.02 = 1, or                                |
|              | - parameter 241.00 = 1 and parameter 241.01 = 0                                    |
| *2           | Valve proving is conducted when...                                                 |
|              | - parameter 241.00 = 1 and parameter 241.02 = 1, or                                |
|              | - parameter 241.00 = 1 and parameter 241.01 = 1                                    |
| *3           | Valve proving (LT) will not be performed                                           |

**Error code table :**

| <b>Red blink code of fault signal lamp (LED)</b> | <b>Possible cause</b>                                                                                                                                                                                                                  |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 x blinks                                       | No establishment of flame at the end of the safety time (TSA)                                                                                                                                                                          |
|                                                  | <ul style="list-style-type: none"> <li>- Faulty or soiled flame detector</li> <li>- Faulty or soiled fuel valves</li> <li>- Poor adjustment of burner, no fuel</li> <li>- Faulty ignition equipment</li> </ul>                         |
| 3 x blinks                                       | Air pressure switch (LP) faulty <ul style="list-style-type: none"> <li>- Loss of air pressure after specified time (t10)</li> <li>- Air pressure switch (LP) welded in no-load position</li> </ul>                                     |
| 4 x blinks                                       | Extraneous light on burner startup                                                                                                                                                                                                     |
| 5 x blinks                                       | Time supervision air pressure switch (LP) <ul style="list-style-type: none"> <li>- Air pressure switch (LP) welded in working position</li> </ul>                                                                                      |
| 6 x blinks                                       | Actuator position not reached <ul style="list-style-type: none"> <li>- Actuator faulty</li> <li>- Wrong adjustment of cam</li> <li>- Actuator defective or blocked</li> <li>- False connection</li> <li>- Misadjustment</li> </ul>     |
| 7 x blinks                                       | Too many losses of flame during operation (limitation of repetitions) <ul style="list-style-type: none"> <li>- Faulty or soiled flame detector</li> <li>- Faulty or soiled fuel valves</li> <li>- Poor adjustment of burner</li> </ul> |
| 8 x blinks                                       | Free                                                                                                                                                                                                                                   |
| 9 x blinks                                       | Free                                                                                                                                                                                                                                   |
| 10 x blinks                                      | Wiring error or internal error, output contacts, other faults                                                                                                                                                                          |
| 12 x blinks                                      | Valve proving (LT) <ul style="list-style-type: none"> <li>- Fuel valve 1 (V1) leaking</li> </ul>                                                                                                                                       |
| 13 x blinks                                      | Valve proving (LT) <ul style="list-style-type: none"> <li>- Fuel valve 2 (V2) leaking</li> </ul>                                                                                                                                       |
| 14 x blinks                                      | Error in connection with valve closure control POC                                                                                                                                                                                     |
| 15 x blinks                                      | Error code $\geq 15$                                                                                                                                                                                                                   |
|                                                  | Error code 22: Error of safety loop (SL)                                                                                                                                                                                               |

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

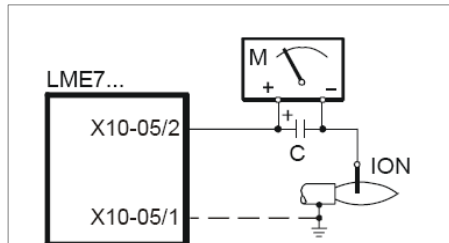
- Burner remains shut down
- External fault indication (AL) at terminal X2-03, pin 3 steady on

Diagnostics of cause of fault is quit and the burner switched on again by resetting the burner control. Press the lockout reset button (info button) for about 1 second (<3 seconds).

## Flame detection – detection electrode :

|                                                        |                                          |
|--------------------------------------------------------|------------------------------------------|
| Short-circuit current                                  | Max. AC 1 mA                             |
| Required detector current                              | Min. DC 2 $\mu$ A, display approx. 45 %  |
| Possible detector current                              | Max. DC 3 $\mu$ A, display approx. 100 % |
| Permissible length of detector cable (laid separately) | 30 m (core-earth 100 pF/m)               |

### Measuring circuit



### Keys

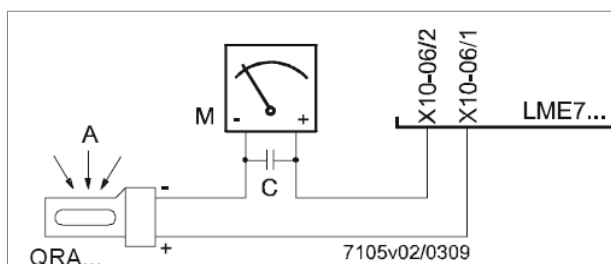
- C - Electrolytic condenser 100...470  $\mu$ F; DC 10...25 V
- ION - Ionization probe
- M - Microammeter Ri max. 5,000  $\Omega$

## Flame detection – UV probe :

Threshold values when flame is supervised by QRA...

|                                               |                                        |
|-----------------------------------------------|----------------------------------------|
| - Start prevention (extraneous light)         | Intensity (parameter 954) approx. 12 % |
| - Operation                                   | Intensity (Parameter 954) approx. 13 % |
| Operating voltage                             | AC 280 V $\pm$ 15 %                    |
| Mains frequency                               | 50...60 Hz $\pm$ 6 %                   |
| Required detector current                     | Min. 70 $\mu$ A                        |
| Possible detector current                     |                                        |
| - Operation                                   | Max. 700 $\mu$ A                       |
| Perm. length of detector cable                |                                        |
| - Normal cable, laid separately <sup>1)</sup> | Max. 100 m                             |

<sup>1)</sup> Multicore cable not permitted



### Keys

- A - Exposure to light
- C - Electrolytic condenser 100...470  $\mu$ F; DC 10...25 V
- M - Microammeter Ri max. 5,000  $\Omega$

### Warning!

Input QRA... is not short-circuit-proof!

Short-circuits of X10-06/2 against earth can destroy the QRA... input

Simultaneous operation of flame detector QRA... and detection electrode is not permitted

To make certain the age of the UV tube can be determined, the LME7... basic unit must always be connected to mains supply.



## Gas proving system :

Valve proving is dependent on input valve proving ON / OFF (X2-02). When a leak is detected, the gas valve proving function ensures that the gas valves will not be opened and that ignition will not be switched on. Lockout will be initiated.

### Valve proving with separate pressure switch (P LT)

Step 1: td4 – Evacuation of test space

Gas valve on the burner side is opened to bring the test space to atmospheric pressure.

Step 2: td1 – Test atmospheric pressure

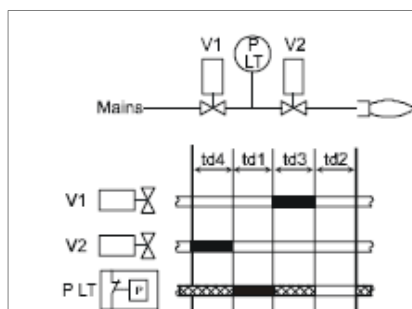
When the gas has closed, the gas pressure in the test space must not exceed a certain level.

Step 3: td3 Filling of test space

Gas valve on the mains side opens to fill the test space.

Step 4: td2 – Test gas pressure

When the gas valve has closed, the gas pressure in the test space must not drop below a certain level.



Controllo tenuta con pressostati separati

#### Keys

td1 Test atmospheric pressure

td2 Test gas pressure

td3 Filling of test space

td4 Evacuation of test space

V... Fuel valve

PLT Pressure switch valve proving

■ Input / output signal 1 (ON)

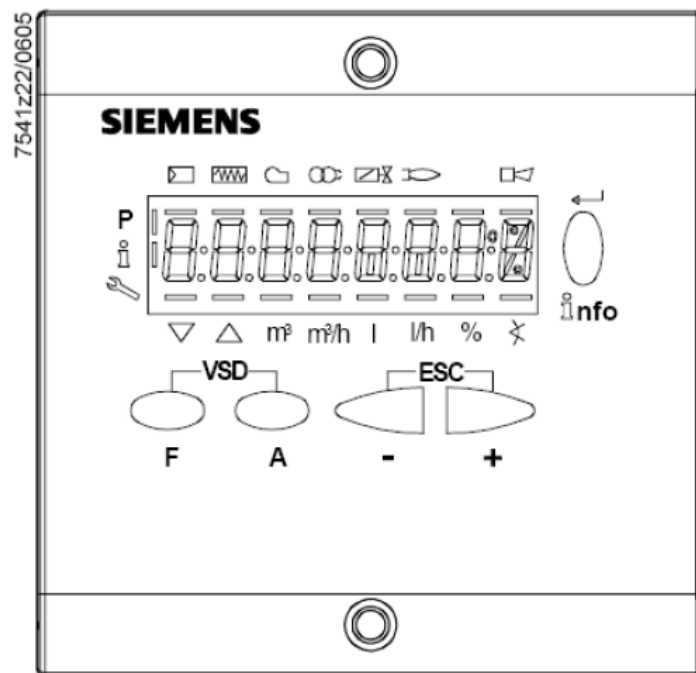
□ Input / output signal 0 (OFF)

▨ Input permissible signal 1 (ON) or 0 (OFF)

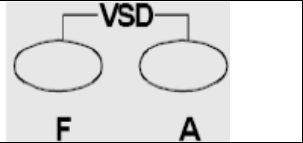
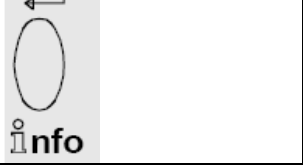
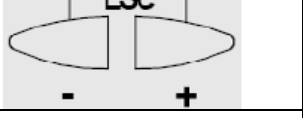
| No. | Parameter                                    |
|-----|----------------------------------------------|
| 242 | Valve proving evacuation of test space       |
| 243 | Valve proving time test atmospheric pressure |
| 244 | Valve proving filling of test space          |
| 245 | Valve proving time test gas pressure         |

## Instruction, control and modify via AZL2x :

The AZL2x.. display/programming unit is shown below:

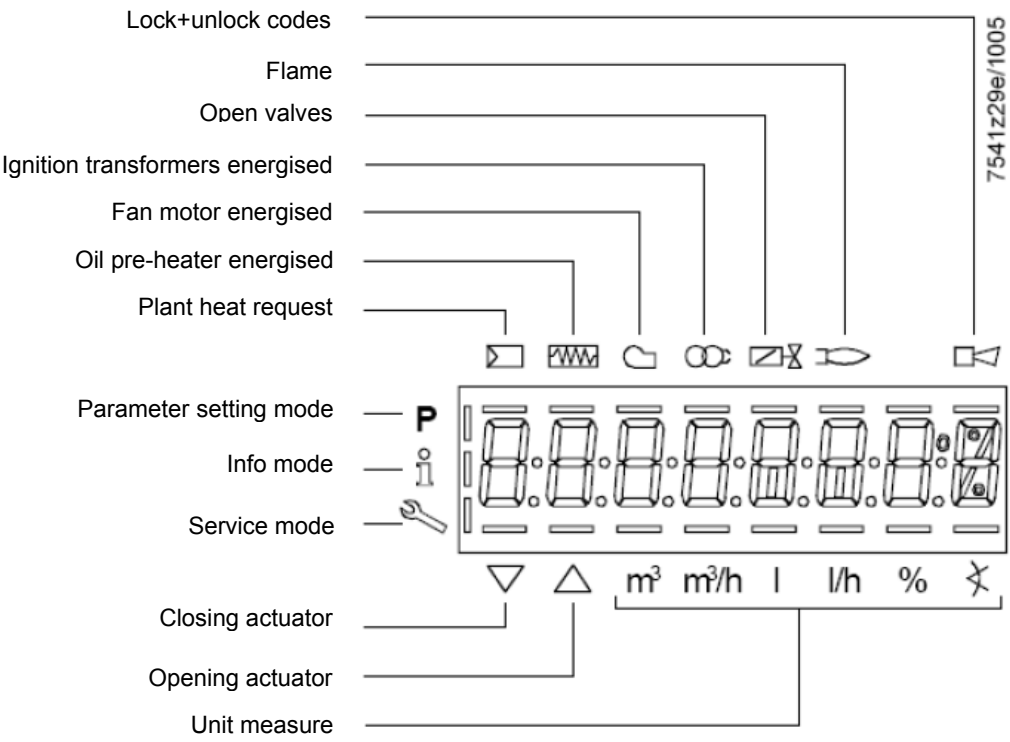


The keys functions are the following:

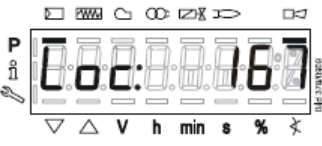
|                                                                                    |                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>Key F + A<br/>While pressing the two keys contemporarily, the code message will appear: by entering the proper password it is possible to access the Service mode.</p>                          |
|  | <p>Info and Enter keys<br/>Used for Info and Service menues<br/>Used as Enter key in the setting modes<br/>Used as Reset key in the burner operation mode<br/>Used to enter a lower level menu</p> |
|  | <p>Key -<br/>Used for one menu level down<br/>Used to decrease a value</p>                                                                                                                         |
|  | <p>Key +<br/>Used for one menu level up<br/>Used to increase a value</p>                                                                                                                           |
|  | <p>Keys (+ &amp; -) = ESC<br/>By pressing + and - at the same time, the ESCAPE function is performed<br/>No adoption of value<br/>One menu level down</p>                                          |
|                                                                                    |                                                                                                                                                                                                    |

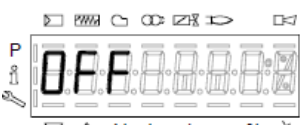


The display will show these data:



While pushing the  button together with whatever else button, LME73 locks out; the display shows



On stand-by position,  appears

On operation, all the phases appears with their number.



List of phase with display AZL2x :

| Phase number                                 | Function                                                                                                                                       |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Standby                                      |                                                                                                                                                |
| OFF                                          | Standby, waiting for heat request                                                                                                              |
| Ph08                                         | Power ON / test phase (e.g. detector test)                                                                                                     |
| <b>Startup</b>                               |                                                                                                                                                |
| Ph21                                         | Safety valve ON, air pressure switch test / POC test (timeout / locking after 5 seconds), actuator opens in low-fire position / CLOSE position |
| Ph22                                         | Fan motor ON or air pressure switch test / settling time                                                                                       |
| Ph24                                         | Actuator travels to the prepurge position                                                                                                      |
| Ph30                                         | Prepurging                                                                                                                                     |
| Ph36                                         | Actuator closes until ignition load / low-fire is reached, and parameter 259.02: Actuator opens to a position > ignition load                  |
| Ph38                                         | Preignition                                                                                                                                    |
| Ph40                                         | 1st safety time (TSA1) / ignition transformer ON                                                                                               |
| Ph42                                         | Safety time (ignition transformer OFF), flame check                                                                                            |
| Ph44                                         | Interval: End of safety time and fuel valve 1 (V1) ON                                                                                          |
| Ph50                                         | 2nd safety time (TSA2)                                                                                                                         |
| Ph54                                         | P259.01: Actuator opens in > low-fire                                                                                                          |
| Ph54                                         | P260: Actuator closes in low-fire                                                                                                              |
| oP1                                          | Interval until release of load controller target (analog or 3-position step input)                                                             |
| <b>Operation</b>                             |                                                                                                                                                |
| oP                                           | Operation, modulating operation                                                                                                                |
| <b>Shutdown</b>                              |                                                                                                                                                |
| Ph10                                         | Shutdown, actuator opens in CLOSE position (home run)                                                                                          |
| Ph72                                         | Actuator opens in high-fire position / end of operation                                                                                        |
| Ph74                                         | Postpurging                                                                                                                                    |
| <b>Valve proving</b>                         |                                                                                                                                                |
| Ph80                                         | Test space evacuating                                                                                                                          |
| Ph81                                         | Checking time fuel valve 1                                                                                                                     |
| Ph82                                         | Test space filling                                                                                                                             |
| Ph83                                         | Checking time fuel valve 2                                                                                                                     |
| <b>Waiting phases<br/>(start prevention)</b> |                                                                                                                                                |
| Ph01                                         | Undervoltage                                                                                                                                   |
| Ph02                                         | Safety loop open                                                                                                                               |
| Ph04                                         | Extraneous light at burner startup (timeout / locking after 30 seconds)                                                                        |
| Ph90                                         | Pressure switch-min open → safety shutdown                                                                                                     |
| <b>Lockout</b>                               |                                                                                                                                                |
| LOC                                          | Lockout phase                                                                                                                                  |

**Error code list with operation via internal AZL :**

| <b>Error code</b> | <b>Clear text</b>                                                                                                                                   | <b>Possible cause</b>                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Loc 2             | No establishment of flame at the end of the safety time (TSA)                                                                                       | <ul style="list-style-type: none"> <li>- Faulty or soiled fuel valves</li> <li>- Faulty or soiled flame detector</li> <li>- Poor adjustment of burner, no fuel</li> <li>- Faulty ignition equipment</li> </ul>                            |
| Loc 3             | Air pressure faulty (air pressure switch (LP) welded in no-load position, decrease to specified time (t10) (air pressure switch (LP) response time) | Air pressure switch (LP) faulty<br><ul style="list-style-type: none"> <li>- Loss of air pressure signal after specified time (t10)</li> <li>- Air pressure switch (LP) is welded in no-load position</li> </ul>                           |
| Loc 4             | Extraneous light                                                                                                                                    | Extraneous light when burner startup                                                                                                                                                                                                      |
| Loc 5             | Air pressure faulty, air pressure switch welded in working position                                                                                 | Time out air pressure switch (LP)<br><ul style="list-style-type: none"> <li>- Air pressure switch (LP) is welded in working position</li> </ul>                                                                                           |
| Loc 6             | Fault of actuator                                                                                                                                   | <ul style="list-style-type: none"> <li>- Actuator faulty or blocked</li> <li>- Faulty connection</li> <li>- Wrong adjustment</li> </ul>                                                                                                   |
| Loc 7             | Loss of flame                                                                                                                                       | Too many losses of flame during operation (limitation of repetitions)<br><ul style="list-style-type: none"> <li>- Faulty or soiled fuel valves</li> <li>- Faulty or soiled flame detector</li> <li>- Poor adjustment of burner</li> </ul> |
| Loc 8             | ---                                                                                                                                                 | Free                                                                                                                                                                                                                                      |
| Loc 9             | ---                                                                                                                                                 | Free                                                                                                                                                                                                                                      |
| Loc 10            | Error not relatable (application), internal error                                                                                                   | Wiring error or internal error, output contacts, other faults                                                                                                                                                                             |
| Loc 12            | Valve proving                                                                                                                                       | Fuel valve 1 (V1) leak                                                                                                                                                                                                                    |
| Loc 13            | Valve proving                                                                                                                                       | Fuel valve 2 (V2) leak                                                                                                                                                                                                                    |
| Loc 22            | Safety loop open                                                                                                                                    | <ul style="list-style-type: none"> <li>- Gas pressure switch-max open</li> <li>- Safety limit thermostat cut out</li> </ul>                                                                                                               |
| Loc 138           | Restore process successful                                                                                                                          | Restore process successful                                                                                                                                                                                                                |
| Loc 167           | Manual locking                                                                                                                                      | Manual locking                                                                                                                                                                                                                            |
| Loc: 206          | AZL2... incompatible                                                                                                                                | Use the latest version                                                                                                                                                                                                                    |

y means of a proper use of the keys, it is possible to enter the various level parameters, as shown in the following flow chart :



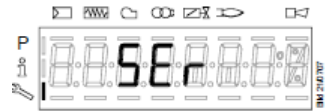
## Info level :

Keep pushing the  button until  appears. Use + or - for scrolling the parameter list. If on the right side a dash-dot appears, it means the display doesn't show the full description. Push  again for 1 to 3 s in order to show the full description.

Below the visible **Info** parameters:

| Parameter number | Parameter list<br>PME73.000Ax + PME73.831AxBC<br>LME73.831AxBC | Edit       | Value range |         | Resolution | Factory setting | Password level reading from level | Password level writing from level |
|------------------|----------------------------------------------------------------|------------|-------------|---------|------------|-----------------|-----------------------------------|-----------------------------------|
|                  |                                                                |            | Min.        | Max.    |            |                 |                                   |                                   |
| 100              | General                                                        |            |             |         |            |                 |                                   |                                   |
| 102              | Identification date                                            | Read only  | ---         | ---     | ---        |                 | Info                              | ---                               |
| 103              | Identification number                                          | Read only  | 0           | 9999    | 1          |                 | Info                              | ---                               |
| 113              | Burner identification                                          | Read only  | x           | xxxxxxx | 1          |                 | Info                              | ---                               |
| 164              | Numbers of startups resettable                                 | Resettable | 0           | 999999  | 1          |                 | Info                              | Info                              |
| 166              | Total number of startups                                       | Read only  | 0           | 999999  | 1          |                 | Info                              | ---                               |
| 170.00           | Switching cycles actuator relay K12                            | Read only  | 0           | 999999  | 1          |                 | Info                              | ---                               |
| 170.01           | Switching cycles actuator relay K11                            | Read only  | 0           | 999999  | 1          |                 | Info                              | ---                               |
| 170.02           | Switching cycles actuator relay K2                             | Read only  | 0           | 999999  | 1          |                 | Info                              | ---                               |
| 170.03           | Switching cycles actuator relay K1                             | Read only  | 0           | 999999  | 1          |                 | Info                              | ---                               |
| 171              | Max. switching cycles actuator relay                           | Read only  | 0           | 999999  | 1          |                 | Info                              | ---                               |

## Service level :

Keep pushing the  button until  appears. Use + or - for scrolling the parameter list. . If on the right side a dash-dot appears, it means the display doesn't show the full description. Push  again for 1 to 3 s in order to show the full description.

Below the visible **Info** parameters:

| Parameter number | Parameter list<br>PME73.000Ax + PME73.831AxBC<br>LME73.831AxBC                                              | Edit      | Value range         |                              | Resolution         | Factory setting | Password level reading from level | Password level writing from level |
|------------------|-------------------------------------------------------------------------------------------------------------|-----------|---------------------|------------------------------|--------------------|-----------------|-----------------------------------|-----------------------------------|
|                  |                                                                                                             |           | Min.                | Max.                         |                    |                 |                                   |                                   |
| 700              | <b>Error history</b>                                                                                        |           |                     |                              |                    |                 |                                   |                                   |
| 701              | Current error:<br>00: Error code<br>01: Startup meter reading<br>02: MMI phase<br>03: Power value           | Read only | 2<br>0<br>---<br>0% | 255<br>999999<br>---<br>100% | 1<br>1<br>---<br>1 |                 | Service                           | ---                               |
| 702              | Error history former 1:<br>00: Error code<br>01: Startup meter reading<br>02: MMI phase<br>03: Power value  | Read only | 2<br>0<br>---<br>0% | 255<br>999999<br>---<br>100% | 1<br>1<br>---<br>1 |                 | Service                           | ---                               |
| •                |                                                                                                             |           |                     |                              |                    |                 |                                   |                                   |
| •                |                                                                                                             |           |                     |                              |                    |                 |                                   |                                   |
| •                |                                                                                                             |           |                     |                              |                    |                 |                                   |                                   |
| 711              | Error history former 10:<br>00: Error code<br>01: Startup meter reading<br>02: MMI phase<br>03: Power value | Read only | 2<br>0<br>---<br>0% | 255<br>999999<br>---<br>100% | 1<br>1<br>---<br>1 |                 | Service                           | ---                               |
|                  |                                                                                                             |           |                     |                              |                    |                 |                                   |                                   |

|     |                  |           |     |                                                |        |  |         |     |
|-----|------------------|-----------|-----|------------------------------------------------|--------|--|---------|-----|
| 900 | Process data     |           |     |                                                |        |  |         |     |
| 936 | Normalized speed | Read only | 0%  | 100%                                           | 0.01 % |  | Service | --- |
| 951 | Mains voltage    | Read only | 0 V | LME73.000A1:<br>175 V<br>LME73.000A2:<br>350 V | 1 V    |  | Service | --- |
| 954 | Flame intensity  | Read only | 0%  | 100%                                           | 1%     |  | Service | --- |

## Parameter level (Heating engineering) :

This level lets the engineer to modify some burner parameters. It is protect with a 4 digit password (SO level) and a 5 digit password (OEM level)

Password input : push **F** and **A** buttons together until the display shows "**code**" and 7 underlines. The left one flashes. By **+** or **-** move the flashing underline until it is on the desired position and push "enter". The underline becomes a dash. By means of **+** or **-**, choose the right character and push "enter". Input the whole password and the **PArA** appears and later on **000 Int**.

Scroll the parameters using **+** or **-**: **000Int, 100, 200, 500, 600 are on the display**. Choose the proper parameter group with the **enter** button and scroll the options with **+** e poi **-** (below the full par set: the two columns on the right give the level access). Choose the parameter to be modified with "enter" is writing is allowed. The parameter now flashes: **+** or **-** modifies the parameter and **enter** confirms. **+** and **-** pushed together move the menu one step back. Push **+** and **-** several times in order to get the home position..

| Parameter number | Parameter list<br>PME73.000Ax + PME73.831AxBC<br>LME73.831AxBC                                                                                                                      | Edit | Value range |          | Resolution | Factory setting | Password level<br>reading from level | Password level<br>writing from level |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|----------|------------|-----------------|--------------------------------------|--------------------------------------|
|                  |                                                                                                                                                                                     |      | Min.        | Max.     |            |                 |                                      |                                      |
| <b>0</b>         | <b>Internal parameter</b>                                                                                                                                                           |      |             |          |            |                 |                                      |                                      |
| 41               | Heating engineers password (4 characters)                                                                                                                                           | Edit | xxxx        | xxxx     | ---        |                 | ---                                  | OEM                                  |
| 42               | OEM's password (5 characters)                                                                                                                                                       | Edit | xxxxx       | xxxxx    | ---        |                 | ---                                  | OEM                                  |
| 60               | Backup / restore                                                                                                                                                                    | Edit | Restore     | Backup   | ---        |                 | ---                                  | SO                                   |
| <b>100</b>       | <b>General</b>                                                                                                                                                                      |      |             |          |            |                 |                                      |                                      |
| 123              | Min. power control step                                                                                                                                                             | Edit | 1%          | 10%      | 0.1        |                 | SO                                   | SO                                   |
| 140              | Mode display of Display and operating unit AZL2...<br>1 = Standard (program phase)<br>2 = Flame 1 (QRA... / ION)<br>3 = Flame 2 (QRB... / QRC...)<br>4 = Active power (power value) | Edit | 1           | 4        | 4          |                 | SO                                   | SO                                   |
| <b>200</b>       | <b>Burner control</b>                                                                                                                                                               |      |             |          |            |                 |                                      |                                      |
| 224              | Specified time (t10) air pressure switch (LP)                                                                                                                                       | Edit | 0 s         | 13.818 s | 0.294 s    | 12,054          | SO                                   | OEM                                  |
| 225              | Gas: Prepurge time (t1)                                                                                                                                                             | Edit | 0 s         | 1237 s   | 4.851 s    | 29,106          | SO                                   | OEM                                  |
| 226              | Gas: Preignition time (t3)                                                                                                                                                          | Edit | 1.029 s     | 37.485 s | 0.147 s    | 2,058           | SO                                   | OEM                                  |
| 230              | Interval (t4): End of safety time (TSA) - fuel valve 1 (V1) ON                                                                                                                      | Edit | 3.234 s     | 74.97 s  | 0.294 s    | 3,234           | SO                                   | OEM                                  |
| 231              | Interval (t9): Fuel valve 1 (V1) ON - pilot valve (PV) OFF                                                                                                                          | Edit | 0 s         | 74.97 s  | 0.294 s    | 2,940           | SO                                   | OEM                                  |
| 232              | Interval (t5): Pilot valve (PV) OFF - load controller (LR) release                                                                                                                  | Edit | 2.058 s     | 74.97 s  | 0.294 s    | 8.820           | SO                                   | OEM                                  |
| 234              | Gas: Postpurge time (t8)                                                                                                                                                            | Edit | 0 s         | 1237 s   | 4.851 s    | 0               | SO                                   | OEM                                  |
| 239              | Gas: Intermittent operation after 24 hours of continuous operation<br>0=OFF<br>1=ON                                                                                                 | Edit | 0           | 1        | 1          | 1               | SO                                   | OEM                                  |



|        |                                                                                                                                                                                 |      |         |          |         |        |    |     |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------|----------|---------|--------|----|-----|
| 240    | Repetition in the event of loss of flame during operation<br>0 = None<br>1 = None<br>2 = 1 x Repetition                                                                         | Edit | 0       | 2        | 1       | 0      | SO | OEM |
| 241.00 | Valve proving<br>0 = Off<br>1 = On                                                                                                                                              | Edit | 0       | 1        | 1       | 1      | SO | OEM |
| 241.01 | Valve proving<br>0 = During prepurge time (t1)<br>1 = During postpurge time (t8)                                                                                                | Edit | 0       | 1        | 1       | 0      | SO | OEM |
| 241.02 | Valve proving<br>0 = According to P241.01<br>1 = During prepurge time (t1) and postpurge time (t8)                                                                              | Edit | 0       | 1        | 1       | 0      | SO | OEM |
| 242    | Valve proving test space evacuating                                                                                                                                             | Edit | 0 s     | 2.648 s  | 0.147 s | 2,646  | SO | OEM |
| 243    | Valve proving time test atmospheric pressure                                                                                                                                    | Edit | 1.029 s | 37.485 s | 0.147 s | 10,290 | SO | OEM |
| 244    | Valve proving test space filling                                                                                                                                                | Edit | 0 s     | 2.648 s  | 0.147 s | 2,646  | SO | OEM |
| 245    | Valve proving time test gas pressure                                                                                                                                            | Edit | 1.029 s | 37.485 s | 0.147 s | 10,290 | SO | OEM |
| 254    | Response time detector error<br>0 = 1 s<br>1 = 3 s                                                                                                                              | Edit | 0       | 1        | 1       | 0      | SO | OEM |
| 257    | Gas: Postignition time (t3n – 0.3 seconds)                                                                                                                                      | Edit | 0 s     | 13.23 s  | 0.147 s | 2,205  | SO | OEM |
| 259.00 | Opening time of actuator (t11) (timeout for lockout)                                                                                                                            | Edit | 0 s     | 1237 s   | 4.851 s | 67,914 | SO | OEM |
| 259.01 | Opening time of actuator from ignition load to low-fire position                                                                                                                | Edit | 0 s     | 37.485 s | 0.147 s | 14,994 | SO | OEM |
| 259.02 | Opening time of actuator from low-fire to ignition load position                                                                                                                | Edit | 0 s     | 37.485 s | 0.147 s | 14,994 |    |     |
| 260    | Closing time of actuator (t12) (timeout for lockout)                                                                                                                            | Edit | 0 s     | 1237 s   | 4.851 s | 67,914 | SO | OEM |
| 500    | <b>Ratio control</b>                                                                                                                                                            |      |         |          |         |        |    |     |
| 515    | Actuator position during prepurge time (t1) and postpurge time (t8)<br>0: Purging in low-fire<br>1: Purging in high-fire                                                        | Edit | 0       | 1        | 1       | 1      | SO | OEM |
| 560    | Pneumatic combustion control<br>0 = off / 3-step modulation<br>1 = PWM fan / analog modulation<br>2 = air damper / analog modulation (feedback potentiometer ASZxx.3x required) | Edit | 0       | 2        | 1       | 1      | SO | SO  |
|        |                                                                                                                                                                                 |      |         |          |         |        |    |     |
|        |                                                                                                                                                                                 |      |         |          |         |        |    |     |

| 600 | Power setting                                                                                                                                                                                            |      |   |   |   |   |    |    |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---|---|---|---|----|----|
| 654 | Analog input (feedback potentiometer ASZxx.3x required)<br>0 = 3-position step input<br>1 = 0...10 V<br>2 = 0...135 $\Omega$<br>3 = 0...20 mA<br>4 = 4...20 mA with lockout at I < 4 mA<br>5 = 4...20 mA | Edit | 0 | 5 | 1 | 0 | SO | SO |

| WARNING                                                                                |                                                                  |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Parameter Num. :<br>41<br>42<br>60<br>123<br>140<br>242<br>243<br>244<br>245<br>259.01 | Adjustable parameters from SO or OEM levels for<br>LME73.831AxBC |



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