

HP60 - HP65 HP72 - HP73A

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

MANUAL OF INSTALLATION - USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

WARNINGS

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

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

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

CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.

1) GENERAL INTRODUCTION

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

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

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

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

Contact qualified personnel only.

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

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

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

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

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

2) SPECIAL INSTRUCTIONS FOR BURNERS

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

burner has stopped.

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

- a Remove the power supply by disconnecting the power cord from the mains.
- b) Disconnect the fuel supply by means of the hand-operated shut-off valve and remove the control handwheels from their spindles.

Special warnings

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

3) GENERAL INSTRUCTIONS DEPENDING ON FUEL USED

3a) ELECTRICAL CONNECTION

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

In case of damage to the cable, switch off the unit and contact qualified

personnel to replace.

When the unit is out of use for some time the electric switch supplying all the power-driven components in the system (i.e. pumps, burner, etc.) should be switched off.

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

GENERAL

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

SPECIAL INSTRUCTIONS FOR USING GAS

Have qualified personnel inspect the installation to ensure that:

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

Precautions if you can smell gas

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

DIRECTIVES AND STANDARDS

Gas burners

European directives:

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

Harmonised standards :

- UNI EN 676 (Gas Burners;-EN 55014-1Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus.
- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.
- EN 60335-2-102 (Household and similar electrical appliances. Safety. Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections)

Light oil burners

European directives:

- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

Harmonised standards :

- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- UNI 267 Automatic forced draught burners for liquid fuels
- EN 55014-1Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus.
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

- UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Heavy oil burners

European directives:

- Directive 2006/95/EC on low voltage;
- Directive 2004/108/EC on electromagnetic compatibility

Harmonised standards :

- CEI EN 60335-1 Household and similar electrical appliances - SafetyPart 1: General requirements;
- EN 55014-1Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus.
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

- UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Gas - Light oil burners

European directives:

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

Harmonised standards :

- UNI EN 676 Gas Burners
- EN 55014-1Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus.
- UNI 267 Automatic forced draught burners for liquid fuels
- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

- UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Gas - Heavy oil burners

European directives:

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

Harmonised standards :

-EN 55014-1 Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus.

-UNI EN 676 (Gas Burners;

-CEI EN 60335-1 (Household and similar electrical appliances - Safety. Part 1: General requirements;

- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

National standards :

-UNI 7824: Monobloc nebulizer burners for liquid fuels. Characteristics and test methods

Industrial burners

European directives:

- Directive 2009/142/EC - Gas Appliances;

- Directive 2006/95/EC on low voltage;

- Directive 2004/108/EC on electromagnetic compatibility

Harmonised standards :

-EN 55014-1 Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus.

-EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

-UNI EN 746-2: Industrial thermoprocessing equipment

GENERAL FEATURES

This series represents monobloc gas burners made in die-cast aluminium housing, that can burn either gas or light oil, thanks to the adjustable combustion head which allows a good performance with both fuels. They can be provided in progressive or fully-modulating version.

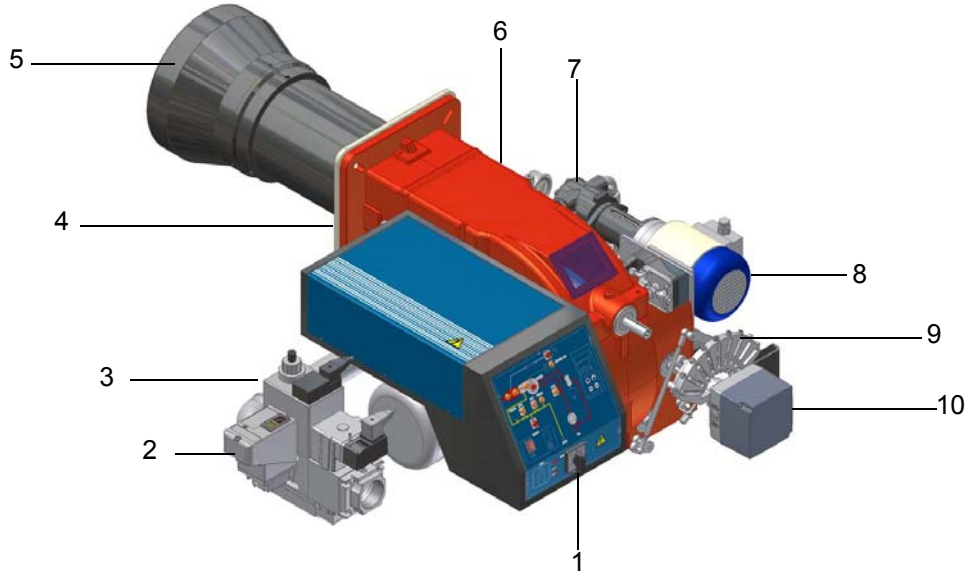


Fig. 1

- 1 Mimic panel with startup switch
- 2 Gas proving system
- 3 Gas valve group
- 4 Burner flange
- 5 Blast tube-Combustion head ass.y
- 6 Cover
- 7 Light oil pump
- 8 Pump motor
- 9 Gas adjusting cam
- 10 Actuator

Gas operation: the gas coming from the supply line, passes through the valves group provided with filter and stabiliser. This one forces the pressure in the utilisation limits. The actuator (10) moves proportionally the air damper and the gas butterfly valve. It drives an adjusting cam (13) with variable shape. This one allows the optimisation of the gas flue values, as to get an efficient combustion.

Light oil operation: the fuel coming from the supply line, is pushed by the pump (8) 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 (8) 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 (5) 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 (1), placed on the burner front side, shows each operating stage.

How to interpret the burner “Performance curve”

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

- furnace input, in kW or kcal/h (kW = kcal/h / 860);
- backpressure (data are available on the boiler’s ID plate or in the user’s manual).

Example:

Furnace input: 600kW

Backpressure: 4mbar

In the “Performance curve” diagram (Fig. 2), draw a vertical line matching the furnace input value and an horizontal line matching the backpressure value. The burner is suitable if the intersection point A is inside the performance curve.

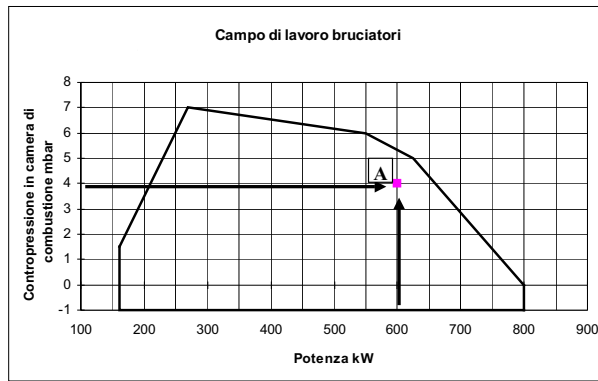


Fig. 2

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

Checking the proper gas train size

To check the proper gas train size, it is necessary to know the available gas pressure value upstream the burner's gas valve. Then subtract the backpressure. The result is called p_{gas} . Draw a vertical line matching the furnace input value (600kW, in the example), quoted on the x-axis, as far as intercepting the network pressure curve, according to the installed gas train (DN65, in the example). From the interception point, draw an horizontal line as far as matching, on the y-axis, the value of pressure necessary to get the requested furnace input. This value must be lower or equal to the p_{gas} value, calculated before.

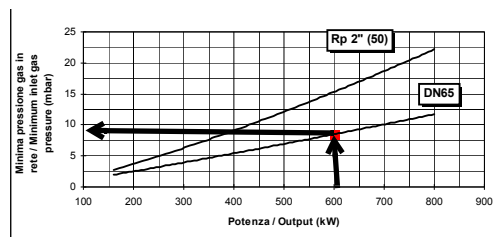


Fig. 3

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 lenght follow the instructions of the boiler manufacturer. In absence of these consider the following:

- Cast-iron boilers, three pass flue boilers (with the first pass in the rear part): the blast tube must protrude no more than 100 mm 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 suites the utilisation (please, contact the manufacturer).

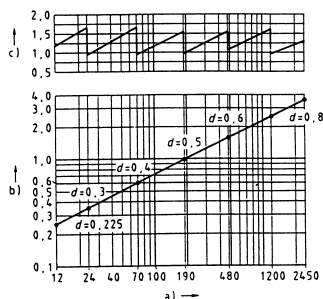


Fig. 4

Key

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

Fig. 4 - Firing intensity, diameter and length of the test flame tube as a function of the heat input in kW.

Burner model identification

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

| Type | HP60 | Model | MG. | PR. | S. | * | A. | 1. | 50 |
|------------------------------------|---|-------|---------------|-----------------------|-----|-----|-----|-----|-----|
| (1) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (8) |
| (1) BURNER TYPE | HP60 | | | | | | | | |
| (2) FUEL | M - Natural gas | | G - Light oil | | | | | | |
| | B - Biogas | | | | | | | | |
| (3) OPERATION (Available versions) | PR - Progressive | | | MD - Fully modulating | | | | | |
| (4) BLAST TUBE | S - Standard | | | L - Extended | | | | | |
| (5) DESTINATION COUNTRY | * - see data plate | | | | | | | | |
| (6) BURNER VERSION | A - Standard | | | | | | | | |
| | Y - Speciale | | | | | | | | |
| (7) EQUIPMENT | 0 = 2 gas valves | | | | | | | | |
| | 1 = 2 gas valves + gas proving system | | | | | | | | |
| | 7 = 2 gas valves + maximum gas pressure switch | | | | | | | | |
| | 8 = 2 gas valves + gas proving system + maximum gas pressure switch | | | | | | | | |
| (8) GAS CONNECTION | 40 = Rp1 _{1/2} | | | 50 = Rp2 | | | | | |
| see Specifications | 65 = DN65 | | | 80 = DN80 | | | | | |

Specifications

| BURNER TYPE | | HP60...0.40 | HP60...0.50 | HP60...0.65 |
|--------------------------------|-----------------------------------|---------------------------------------|-------------|-------------------------|
| Output | min. - max. kW | 170 - 523 | 170 - 880 | 170 - 880 |
| Fuel | | Natural gas - Light oil | | |
| Gas category | | (see next paragraph) | | |
| Gas rate | min. - max. (Stm ³ /h) | 18 - 55 | 18 - 93 | 18 - 93 |
| Gas pressure | min. - max. mbar | (see Note 2) | | |
| Light oil train inlet pressure | max. bar | 2 | | |
| Oil viscosity | min. - max.kg/h | 14 - 44 | 14 - 74 | 14 - 74 |
| Oil density | | 2 - 7.4 cSt @ 40°C | | |
| Oil density | | 840 kg/m ³ | | |
| Power supply | | 230V 3~ / 400V 3N ~ 50Hz | | |
| Total power consumption | kW | 2.15 | | |
| Fan motor | kW | 1.1 | | |
| Pump motor | kW | 0.55 | | |
| Protection | | IP40 | | |
| Approx. weight | kg | 65 | 70 | 80 |
| Operation | | Progressive - Fully modulating | | |
| Gas Train | | 40 | 50 | 65 |
| Valves size / Gas connection | | 1 ^{1/2} / Rp1 _{1/2} | 2" / Rp2 | 2 ^{1/2} / DN65 |
| Operating temperature | °C | -10 ÷ +50 | | |
| Storage Temperature | °C | -20 ÷ +60 | | |
| Working service* | | Intermittent | | |

NOTE ON THE BURNER WORKING SERVICE: for safety reasons, one controlled shutdown must be performed every 24 hours of

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

continuous operation.

| BURNER TYPE | | HP65...0.50 | HP65...0.65 |
|--------------------------------|-----------------------------------|--------------------------------|---------------------------------------|
| Output | min. - max. kW | 270 - 970 | |
| Fuel | | Nat. gas - Light oil | |
| Gas category | | (see next paragraph) | |
| Gas rate | min. - max. (Stm ³ /h) | 29 - 103 | |
| Gas pressure | min. - max. mbar | (see Note 2) | |
| Light oil train inlet pressure | max. bar | 2 | |
| Oil viscosity | min.- max.kg/h | 23 - 82 | |
| Oil density | | 2 - 7.4 cSt @40°C | |
| Oil density | | 840 kg/m ³ | |
| Power supply | | 230V 3~ / 400V 3N ~ 50Hz | |
| Total power consumption | kW | 2.6 | |
| Fa motor | kW | 1.5 | |
| Pump motor | kW | 0.55 | |
| Protection | | IP40 | |
| Approx. weight | kg | 105 | 115 |
| Operation | | Progressive - Fully modulating | |
| Gas Train | | 50 | 65 |
| Valves size / Gas connection | | 2" / Rp2 | 2" ¹ / ₂ / DN65 |
| Operating temperature | °C | -10 ÷ +50 | |
| Storage Temperature | °C | -20 ÷ +60 | |
| Working service* | | Intermittent | |

| BURNER TYPE | | HP72...0.50 | HP72...0.65 | HP72...0.80 |
|--------------------------------|----------------------------------|--------------------------------|---------------------------------------|-------------|
| Output | min. - max. kW | 330 - 1200 | | |
| Fuel | | Nat. gas - Light oil | | |
| Gas category | | (see next paragraph) | | |
| Gas rate | min.- max. (Stm ³ /h) | 35 - 127 | | |
| Gas pressure | min. - max. mbar | (see Note 2) | | |
| Light oil train inlet pressure | max. bar | 2 | | |
| Oil viscosity | min.- max. kg/h | 28 - 101 | | |
| Oil density | | 2 - 7.4 cSt @40°C | | |
| Oil density | | 0.84 kg/m ³ | | |
| Power supply | | 230V 3~ / 400V 3N ~ 50Hz | | |
| Total power consumption | kW | 3.25 | | |
| Fan motor | kW | 2.2 | | |
| Pump motor | kW | 0.55 | | |
| Protection | | IP40 | | |
| Approx. weight | kg | 110 | 120 | 130 |
| Operation | | Progressive - Fully modulating | | |
| Gas Train | | 50 | 65 | 80 |
| Valves size / Gas connection | | 2" / Rp2 | 2" ¹ / ₂ / DN65 | 3" / DN80 |
| Operating temperature | °C | -10 ÷ +50 | | |
| Storage Temperature | °C | -20 ÷ +60 | | |
| Working service* | | Intermittent | | |

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

* **NOTE ON THE BURNER WORKING SERVICE:** for safety reasons, one controlled shutdown must be performed every 24 hours of continuous operation.

| BURNER TYPE | | HP72...1.50 | HP72...1.65 | HP72...1.80 |
|--------------------------------|-----------------------------------|--------------------------------|---------------------------------------|-------------|
| Output | min. - max. kW | 330 - 1550 | | |
| Fuel | | Nat. gas - Light oil | | |
| Gas category | | (see next paragraph) | | |
| Gas rate | min. - max. (Stm ³ /h) | 35 - 164 | | |
| Gas pressure | min.- max. mbar | (see Note 2) | | |
| Light oil train inlet pressure | max. bar | 2 | | |
| Oil viscosity | min.- max. kg/h | 28 - 131 | | |
| Oil density | | 2 - 7.4 cSt @40°C | | |
| Oil density | | 840 kg/m ³ | | |
| Power supply | | 230V 3~ / 400V 3N ~ 50Hz | | |
| Total power consumption | kW | 3.25 | | |
| Fan motor | kW | 2.2 | | |
| Pump motor | kW | 0.55 | | |
| Protection | | IP40 | | |
| Approx. weight | kg | 110 | 120 | 130 |
| Operation | | Progressive - Fully modulating | | |
| Gas Train | | 50 | 65 | 80 |
| Valves size / Gas connection | | 2" / Rp2 | 2" ¹ / ₂ / DN65 | 3" / DN80 |
| Operating temperature | °C | -10 ÷ +50 | | |
| Storage Temperature | °C | -20 ÷ +60 | | |
| Working service* | | Intermittent | | |

| BURNER TYPE | | HP73A MG..x.50 | HP73A MG..x.65 | HP73A MG..x.80 |
|--------------------------------|----------------------------------|--------------------------------|---------------------------------------|-------------------|
| Output | min. - max. kW | 320 - 2300 | | |
| Fuel | | Nat. gas - Light oil | | |
| Gas category | | (see next paragraph) | | |
| Gas rate | min.- max. (Stm ³ /h) | 34 - 243 | 34 - 243 | 34 - 243 |
| Gas pressure | min.- max. mbar | (see Note 2) | | |
| Light oil train inlet pressure | max. bar | 2 | | |
| Oil viscosity | min.-max. kg/h | 27 - 194 | 27 - 194 | 27 - 194 |
| Oil density | | 2 - 7.4 cSt @40°C | | |
| Oil density | | 840 kg/m ³ | | |
| Power supply | | 230V 3~ / 400V 3N ~ 50Hz | | |
| Total power consumption | kW | 4.05 | | |
| Fan motor | kW | 3 | | |
| Pump motor | kW | 0.55 | | |
| Index of Protection | | IP40 | | |
| Approx. weight | kg | 115 | 125 | 135 |
| Operation | | Progressive - Fully modulating | | |
| Gas train | | 50 | 65 | 80 |
| Valves size/Gas connection | | 2" / Rp2 | 2" ¹ / ₂ / DN65 | 3" / DN80 |
| Storage Temperature | °C | -10 ÷ +50 | | |
| Working service* | °C | -20 ÷ +60 | | |
| Operating temperature | | Intermittent | | |

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

* **NOTE ON THE BURNER WORKING SERVICE:** for safety reasons, one controlled shutdown must be performed every 24 hours of continuous operation.

Country and usefulness gas categories

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

Fuel

The burner technical specifications, described in this manual, refer to natural gas (calorific net value $H_i = 9.45 \text{ kWh/Stm}^3$, density $\rho = 0.717 \text{ Kg/Stm}^3$). For different fuel such as LPG, town gas and biogas, multiply the values of flow and pressure by the corrective factors shown in the table below.

| Fuel | H_i (KWh/Stm ³) | ρ (kg/Stm ³) | f_Q | f_p |
|----------|-------------------------------|-------------------------------|-------|-------|
| LPG | 26.79 | 2.151 | 0.353 | 0.4 |
| Town gas | 4.88 | 0.6023 | 1.936 | 3.3 |
| Biogas | 6.395 | 1.1472 | 1.478 | 3.5 |

For example, to obtain the flow and pressure values for the biogas :

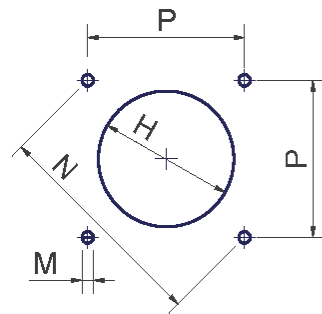
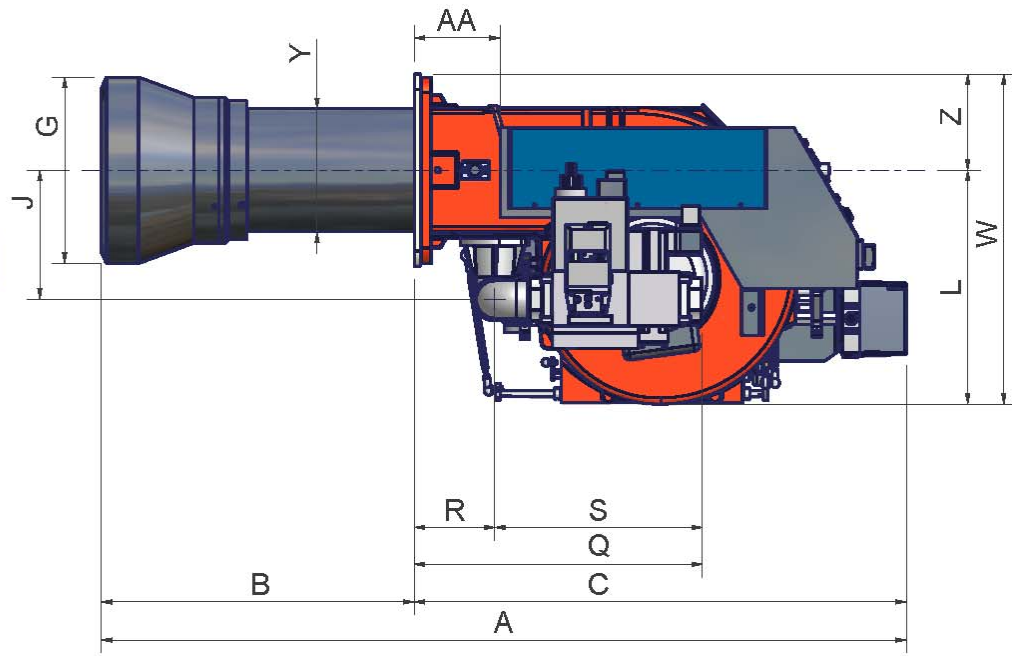
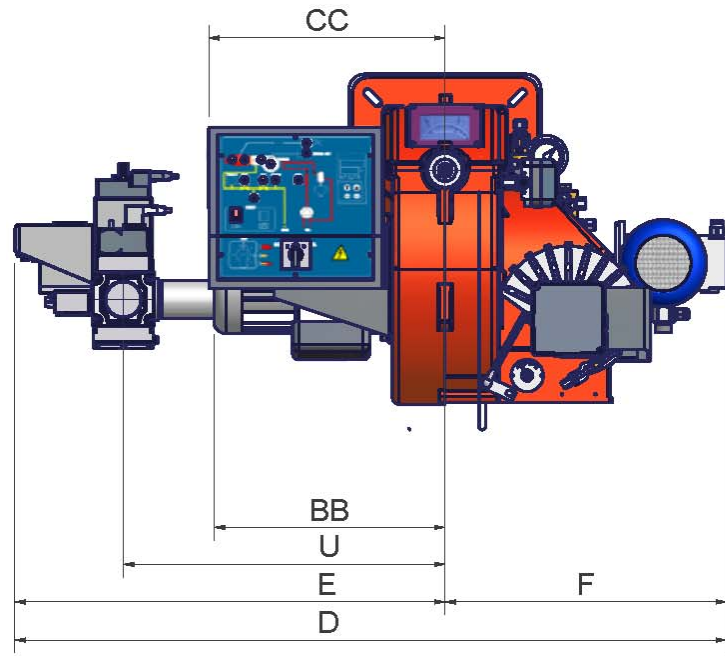
$$Q_{biogas} = Q_{naturalGas} \cdot 1,478$$

$$p_{biogas} = p_{naturalGas} \cdot 3,5$$

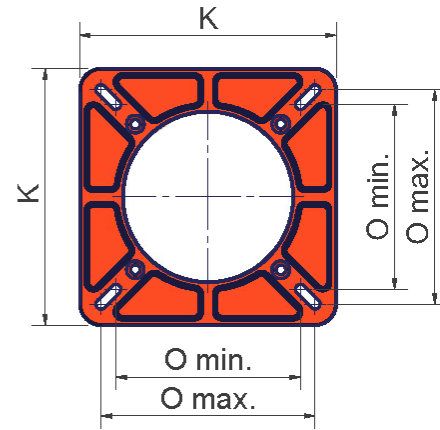


ATTENTION: the corrective factors in the above table depend on the gas composition, so on the calorific value and the density of the gas. The above value can be taken only as reference.

Overall dimensions (mm)



Boiler recommended drilling template



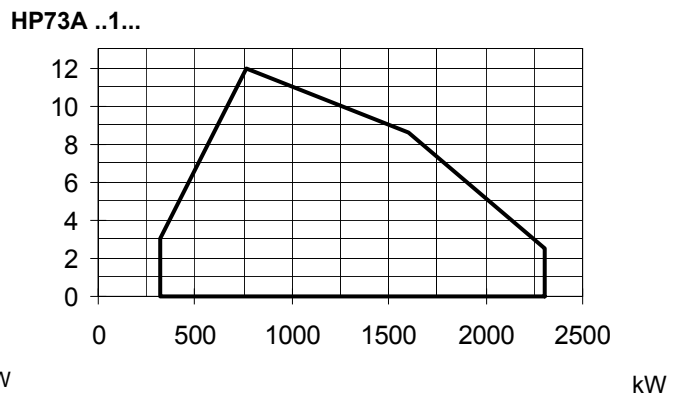
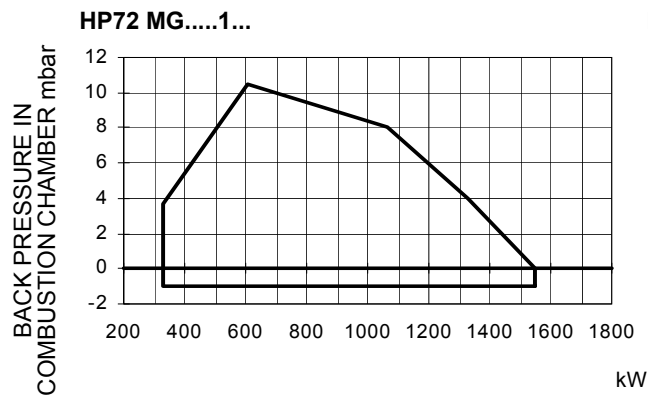
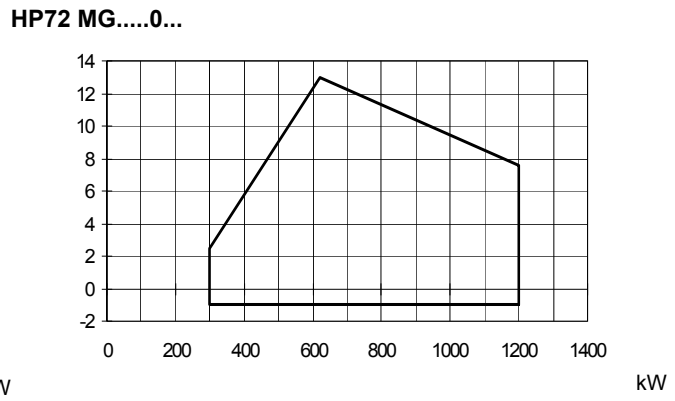
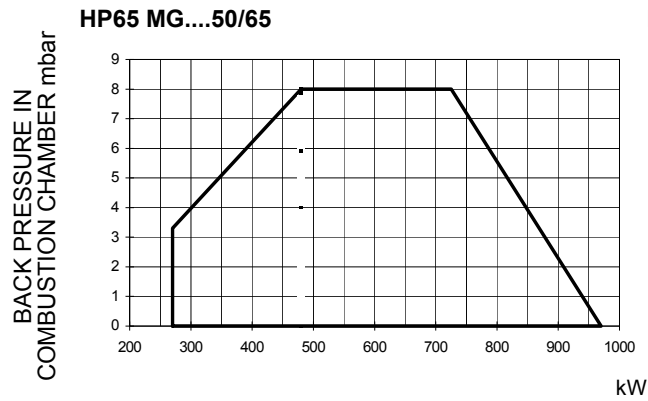
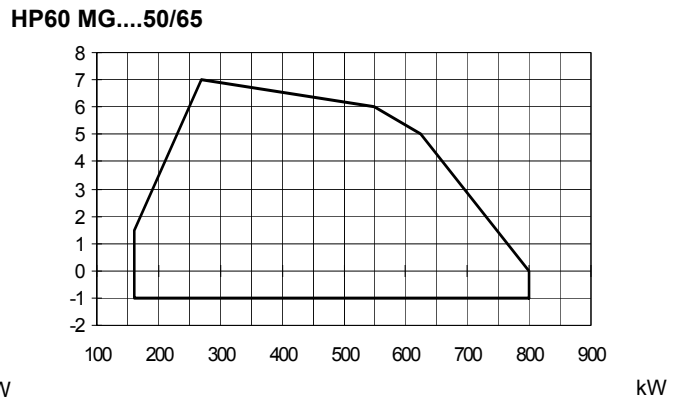
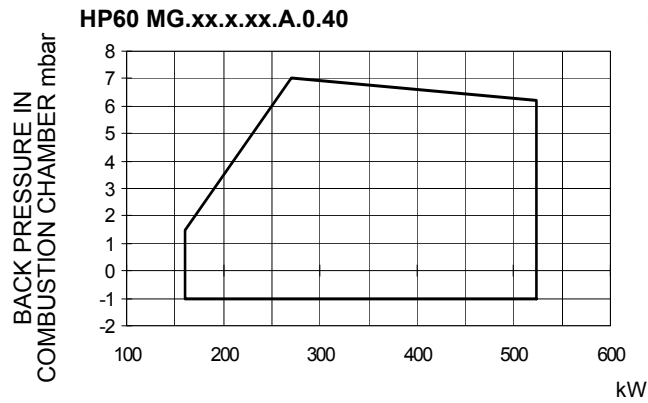
| | DN | A | AA | B | BB | C | CC | D | E | F | G | H | J | K | L | M | N | O - min | O - max | P | Q | R | S | U | V | W | Y | Z | |
|-----------------|-----|------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|-----|-----|-----|-----|---------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| HP60 MG..0.40 | 40 | 1153 | 99 | 383 | 314 | 770 | 362 | 1044 | 500 | 415 | 240 | 280 | 202 | 240 | 344 | M10 | 269 | 190 | 190 | 190 | 439 | 112 | 327 | 444 | x | 464 | 162 | 120 | |
| HP60 MG.. 0.50 | 50 | 1153 | 99 | 383 | 314 | 770 | 362 | 930 | 500 | 430 | 240 | 280 | 210 | 240 | 344 | M10 | 269 | 190 | 190 | 190 | 445 | 112 | 335 | 519 | x | 464 | 162 | 120 | |
| HP60 MG.. 0.65 | 65 | 1153 | 99 | 383 | 314 | 770 | 362 | 1115 | 685 | 430 | 240 | 280 | 250 | 240 | 420 | M10 | 269 | 190 | 190 | 190 | 845 | 112 | 403 | 540 | 313 | 540 | 162 | 120 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HP65 MG.. 0.50 | 50 | 1156 | 139 | 362 | 347 | 794 | 382 | 1022 | 568 | 454 | 240 | 280 | 208 | 300 | 376 | M10 | 330 | 216 | 250 | 233 | 465 | 130 | 335 | 519 | x | 531 | 162 | 155 | |
| HP65 MG.. 1.50 | 50 | 1156 | 139 | 362 | 347 | 794 | 382 | 1148 | 694 | 454 | 240 | 280 | 208 | 300 | 376 | M10 | 330 | 216 | 250 | 233 | 465 | 130 | 335 | 519 | x | 531 | 162 | 155 | |
| HP65 MG..0.65 | 65 | 1156 | 139 | 362 | 347 | 794 | 382 | 1120 | 666 | 454 | 240 | 280 | 275 | 300 | 393 | M10 | 330 | 216 | 250 | 233 | 533 | 130 | 403 | 565 | 313 | 548 | 162 | 155 | |
| HP65 MG..1.65 | 65 | 1156 | 139 | 362 | 347 | 794 | 382 | 1226 | 772 | 454 | 240 | 280 | 275 | 300 | 393 | M10 | 330 | 216 | 250 | 233 | 533 | 130 | 403 | 565 | 313 | 548 | 162 | 155 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HP72 MG.. 0.50 | 50 | 1299 | 139 | 505 | 373 | 794 | 382 | 1022 | 568 | 454 | 300 | 340 | 208 | 300 | 376 | M10 | 330 | 216 | 250 | 233 | 465 | 130 | 335 | 519 | x | 531 | 198 | 155 | |
| HP72 MG.. 1.50 | 50 | 1299 | 139 | 505 | 373 | 794 | 382 | 1148 | 694 | 454 | 300 | 340 | 208 | 300 | 376 | M10 | 330 | 216 | 250 | 233 | 465 | 130 | 335 | 519 | x | 531 | 198 | 155 | |
| HP72 MG..0.65 | 65 | 1299 | 139 | 505 | 373 | 794 | 382 | 1120 | 666 | 454 | 300 | 340 | 275 | 300 | 393 | M10 | 330 | 216 | 250 | 233 | 533 | 130 | 403 | 565 | 313 | 548 | 198 | 155 | |
| HP72 MG..1.65 | 65 | 1299 | 139 | 505 | 373 | 794 | 382 | 1226 | 772 | 454 | 300 | 340 | 275 | 300 | 393 | M10 | 330 | 216 | 250 | 233 | 533 | 130 | 403 | 565 | 313 | 548 | 198 | 155 | |
| HP72 MG.. 0.80 | 80 | 1299 | 139 | 505 | 373 | 794 | 382 | 1120 | 666 | 454 | 300 | 340 | 275 | 300 | 407 | M10 | 330 | 216 | 250 | 233 | 574 | 130 | 444 | 565 | 344 | 562 | 198 | 155 | |
| HP72 MG..1.80 | 80 | 1299 | 139 | 505 | 373 | 794 | 382 | 1228 | 774 | 454 | 300 | 340 | 275 | 300 | 407 | M10 | 330 | 216 | 250 | 233 | 574 | 130 | 444 | 565 | 344 | 562 | 198 | 155 | |
| HP72 MG..0.100 | 100 | 1299 | 139 | 505 | 373 | 794 | 382 | 1395 | 941 | 454 | 300 | 340 | 434 | 300 | 579 | M10 | 330 | 216 | 250 | 233 | 653 | 130 | 523 | 824 | 405 | 734 | 198 | 155 | |
| HP72 MG..1.100 | 100 | 1299 | 139 | 505 | 373 | 794 | 382 | 1503 | 1049 | 454 | 300 | 340 | 434 | 300 | 579 | M10 | 330 | 216 | 250 | 233 | 653 | 130 | 523 | 824 | 405 | 734 | 198 | 155 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HP73A MG..1.50 | 50 | 1294 | 139 | 500 | 373 | 794 | 382 | 1148 | 694 | 454 | 234 | 264 | 208 | 300 | 376 | M10 | 330 | 216 | 250 | 233 | 465 | 130 | 335 | 519 | x | 531 | 198 | 155 | |
| HP73A MG..1.65 | 65 | 1294 | 139 | 500 | 373 | 794 | 382 | 1226 | 772 | 454 | 234 | 264 | 275 | 300 | 393 | M10 | 330 | 216 | 250 | 233 | 533 | 130 | 403 | 565 | 313 | 548 | 198 | 155 | |
| HP73A MG..1.80 | 80 | 1294 | 139 | 500 | 373 | 794 | 382 | 1228 | 774 | 454 | 234 | 264 | 275 | 300 | 407 | M10 | 330 | 216 | 250 | 233 | 574 | 130 | 444 | 565 | 344 | 562 | 198 | 155 | |
| HP73A MG..1.100 | 100 | 1294 | 139 | 500 | 373 | 794 | 382 | 1503 | 1049 | 454 | 234 | 264 | 434 | 300 | 579 | M10 | 330 | 216 | 250 | 233 | 653 | 130 | 523 | 824 | 405 | 734 | 198 | 155 | |

*DN = gas valves size

HP60 - HP72:

it is recommended to fit a counterflange between burner and boiler. As an alternative, make a smaller hole H, but greather than Y and fit the blast tube from the internal side of boiler.

Performance Curves

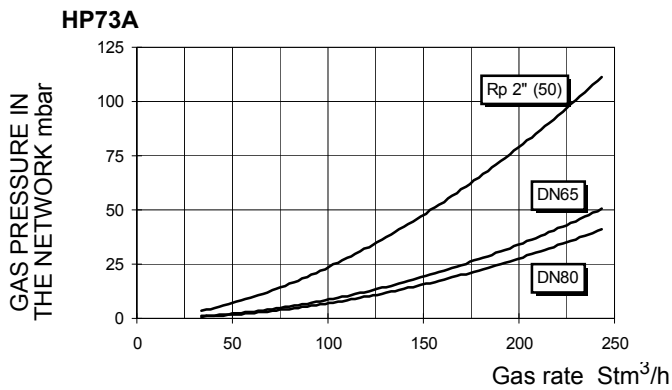
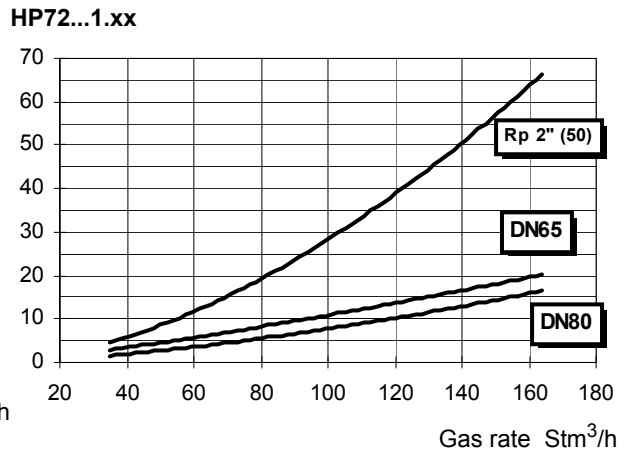
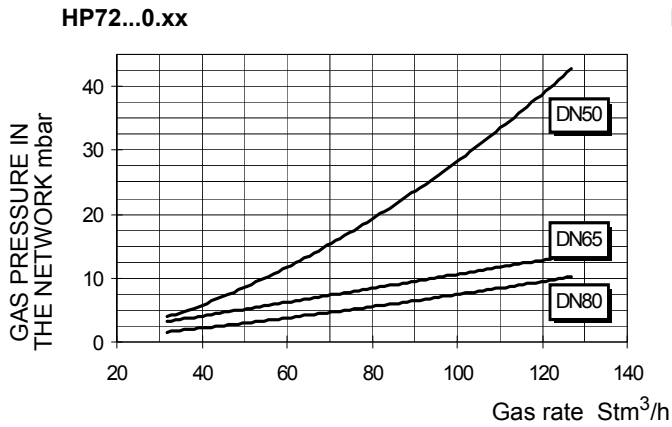
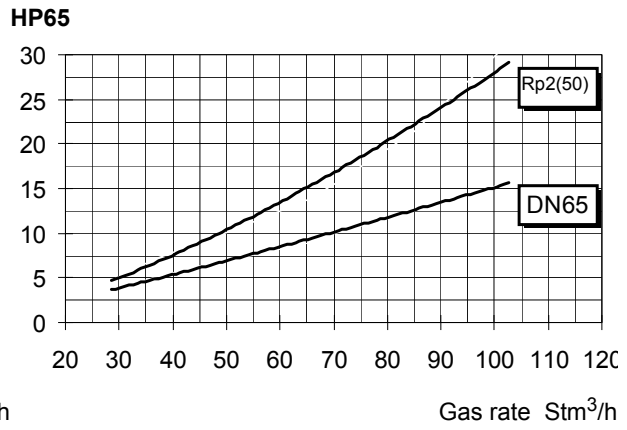
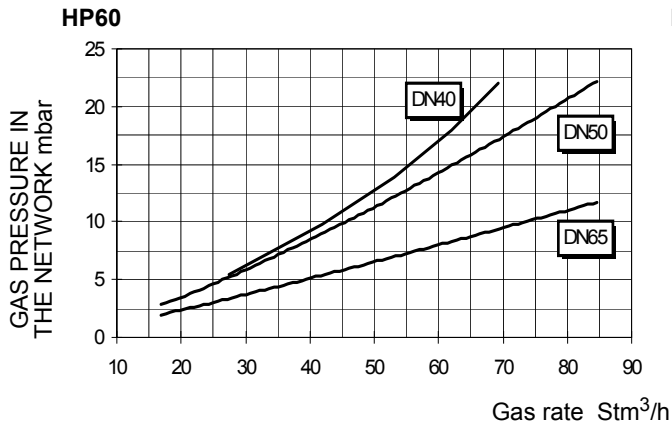


To get the input in kcal/h, multiply value in kW by 860.

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

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

Pressure in the network - gas rate curves



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

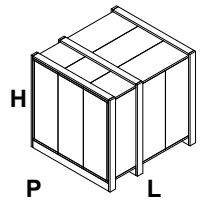


ATTENTION: the diagrams refers to natural gas. For different type of fuel please refer to the paragraph "Fuel".

MOUNTINGS AND CONNECTIONS

Packing

Burners are despatched in cardboard packages and whose dimensions: **1280mm x 850mm x 760mm (L x P x H)**
Packing cases of this kind are affected by humidity and are not suitable for stacking. The following are placed in each packing case:



- burner with gas train detached;
- gasket to be inserted between the burner and the boiler;
- flexible oil pipes;
- oil filter;
- envelope containing this manual

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

Handling the burner

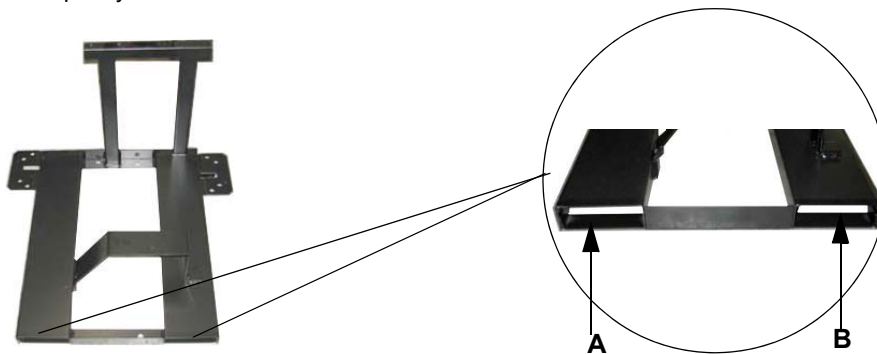


ATTENTION! The handling operations must be carried out by specialised and trained personnel. If these operations are not carried out correctly, the residual risk for the burner to overturn and fall down still persists.

To move the burner, use means suitable to support its weight (see paragraph "Technical specifications").

The unpacked burner must be lifted and moved only by means of a fork lift truck.

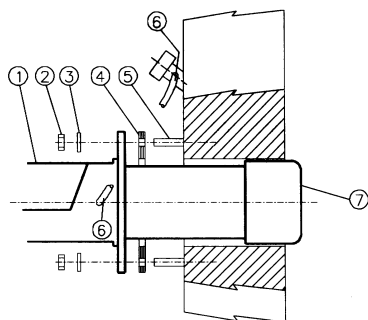
The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A and B ways. Remove the stirrup only once the burner is installed to the boiler.



Fitting the burner to the boiler

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

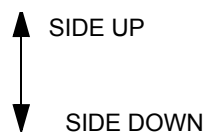
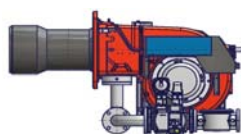
- 1 make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions"
- 2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
- 3 place the stud bolts (5) on boiler's door, according to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



Keys

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

The burner is designed to work positioned according to the picture below. For different installations, please contact the Technical Department.

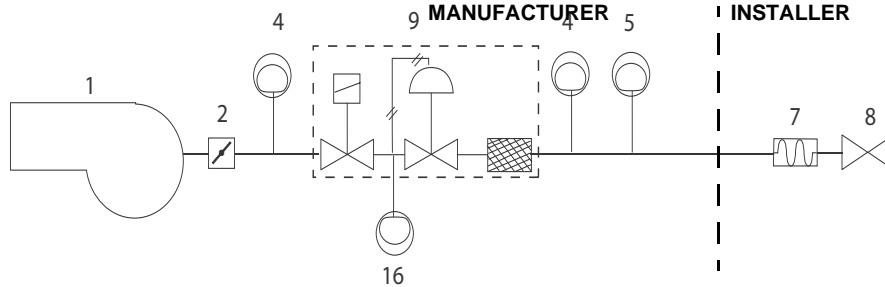


Gas train connections

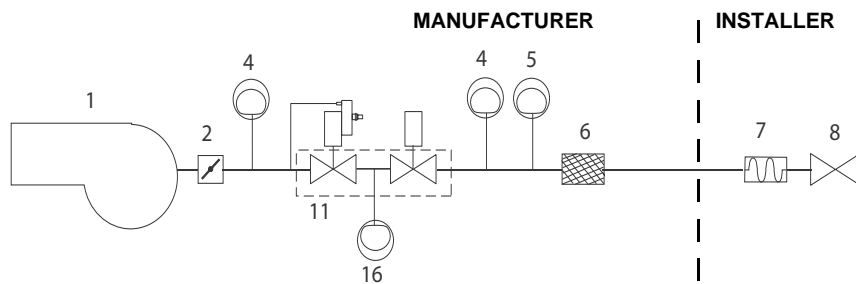
The next diagrams show the components of the gas train included in the delivery and which must be fitted by the installer. The diagrams are in compliance with the current laws.

ATTENTION: BEFORE EXECUTING THE CONNECTIONS TO THE GAS PIPE NETWORK, BE SURE THAT THE MANUAL CUTOFF VALVES ARE CLOSED. READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNING OF THIS MANUAL.

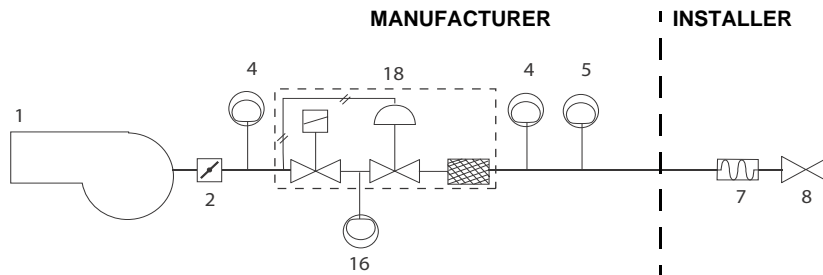
Gas train with valves group MB-DLE (2 valves + gas filter + pressure governor + pressure switch) + gas leakage pressure switch (PGCP)



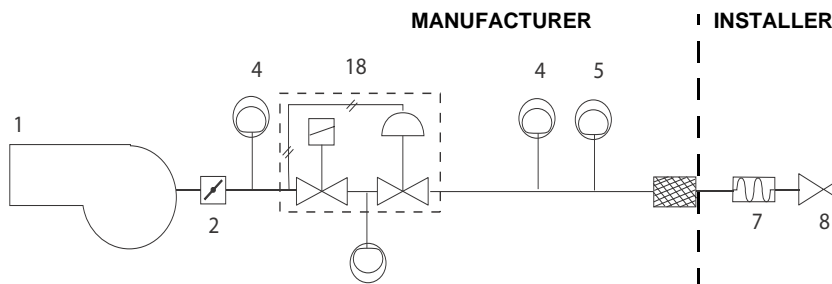
Gas train with valves group VGD with built-in gas pressure governor + gas leakage pressure switch (PGCP)



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



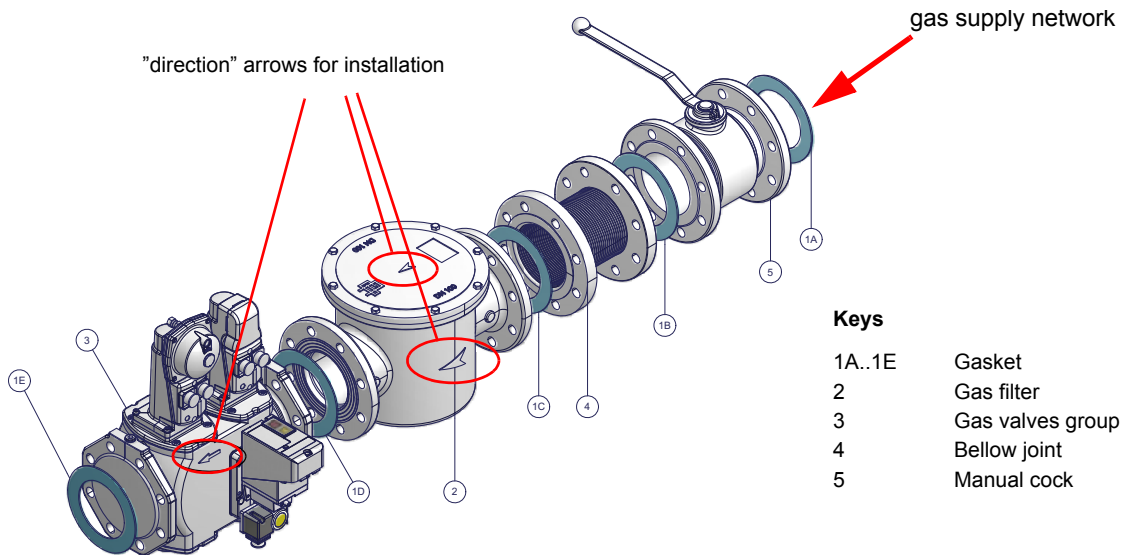
Gas train with valves group MBC (2 valves + pressure governor) + VPS504 gas proving system



Key

- | | |
|---|--|
| 1 Burner | 7 Bellows joint |
| 2 Butterfly valve | 8 Manual valve |
| 4 Maximum gas pressure switch (option*) | 9 MB-DLE Valves group |
| 5 Minimum gas pressure switch | 11 VGD Valves group |
| 6 Gas filter | 16 Gas leakage pressure switch (PGCP) |
| | 18 Valves group MBC (2", provided with filter) |
| | 19 Valves group MBC (an external filter must be installed) |

* Note: the maximum gas pressure switch can be mounted either upstream or downstream the gas valve but upstream the butterfly gas valve (see item no.4 in the scheme above).



Keys

| | |
|--------|------------------|
| 1A..1E | Gasket |
| 2 | Gas filter |
| 3 | Gas valves group |
| 4 | Bellow joint |
| 5 | Manual cock |

Fig. 5 - Example of gas train

To mount the gas train, proceed as follows:

- 1-a) in case of threaded joints: use proper seals according to the gas used;
- 1-b) in case of flanged joints: place a gasket (no. 1A..1E - Fig. 5) between the elements

NOTE: the bellow joint, the manual valve and the gaskets are not part of the standard supply.

ATTENTION: once the gas train is mounted according to the diagram on Fig. 5, the gas proving test must be performed, according to the procedure set by the laws in force.

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

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

- threaded gas trains with Multibloc Dungs MB-DLE, MBC..SE 700 or Siemens VGD20..
- flanged gas trains with Multibloc Dungs MBC..SE 1900-3100-5000 or Siemens VGD40..

MULTIBLOC DUNGS MB-DLE 415..420

Mounting

1. Loosen screws A and B **do not** unscrew (Fig. 6 - Fig. 7).
2. unscrew screws C and D (Fig. 6 - Fig. 7).
3. Remove MultiBloc between the threaded flanges (Fig. 7).
4. After mounting, perform leakage and functional tests.

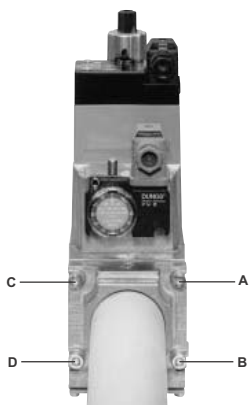


Fig. 6

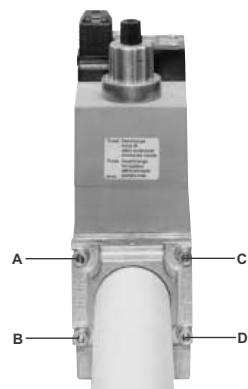


Fig. 7

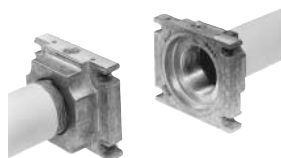


Fig. 8

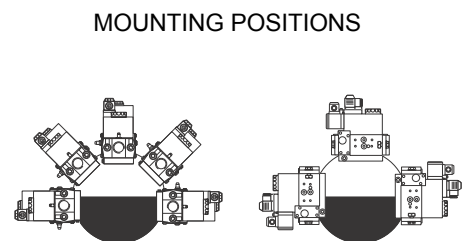


Fig. 9

MULTIBLOC DUNGS MBC300-700-1200SE (Threaded valves group)

Mounting

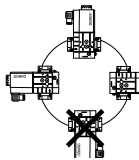
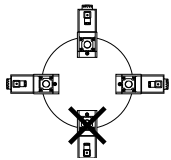
1. Mount flange onto tube lines. Use appropriate sealing agent (see Fig. 10)
2. Insert MBC...SE. Note position of O rings (see Fig. 11).
3. Tighten screws A – H
4. After installation, perform leakage and functional test.
5. Disassembly in reverse order



Fig. 10

MOUNTING

POSITIONS



OPTION

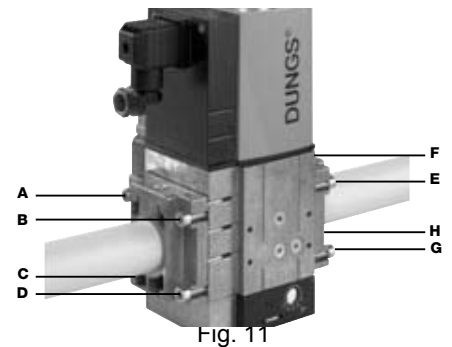
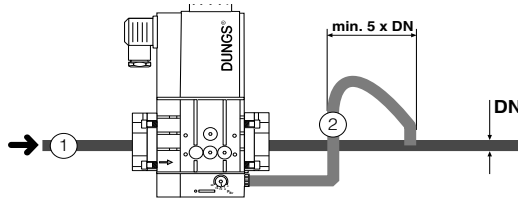


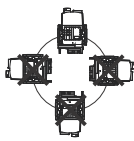
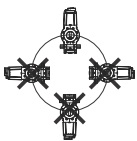
Fig. 11

MULTIBLOC DUNGS MBC1900-3100-5000SE (Flanged valves group)

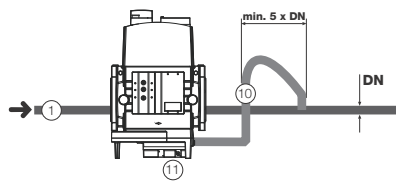
Mounting

1. Insert setscrews A
 2. Insert seals
 3. Insert setscrews B
 4. Tighten setscrews A + B.
- Ensure correct seating of the seal!
6. After installation, perform leakage and functional test.
 7. Disassembly in reverse order.

Mounting positions



OPTION



10 = pulse lines

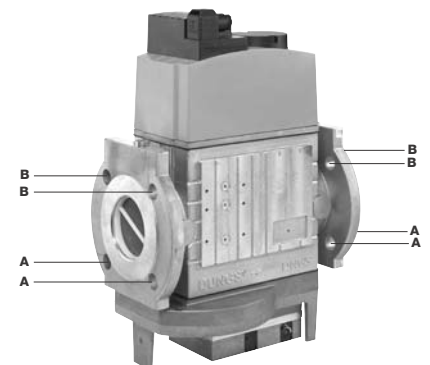


Fig. 12

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

Mounting

- When mounting the VGD.. double gas valve, two flanges are required (as for VGD20.. model, the flanges are threaded);
 - to prevent cuttings from falling inside the valve, first fit the flanges to the piping and then clean the associated parts;
 - install the valve;
 - the direction of gas flow must be in accordance with the direction of the arrow on the valve body;
 - ensure that the bolts on the flanges are properly tightened;
 - ensure that the connections with all components are tight;
 - make certain that the O-rings and gaskets between the flanges and the double gas valve are fitted.
 - Connect the reference gas pipe (TP in figure; 8mm-external size pipe supplied loose), to the gas pressure nipples placed on the gas pipe, downstream the gas valves: gas pressure must be measured at a distance that must be at least 5 times the pipe size.
- Leave the blowhole free (SA in figure). Should the spring fitted not permit satisfactory regulation, ask one of our service centres for a suitable replacement.

 **Caution:** the SKP2 diaphragm D must be vertical (see Fig. 15).

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

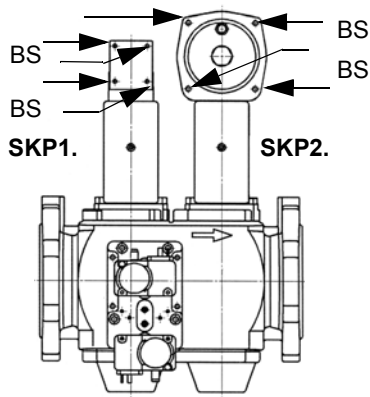


Fig. 13

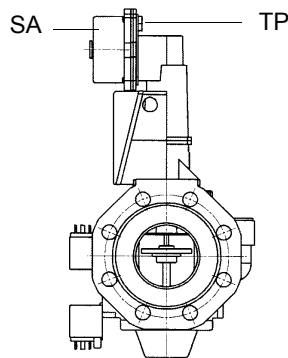


Fig. 14

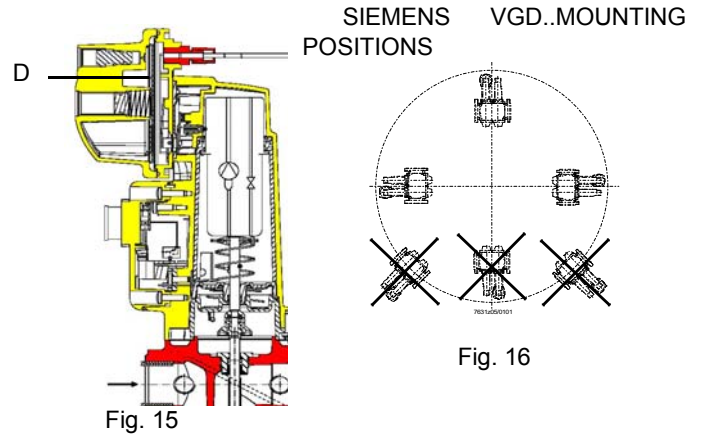


Fig. 15

Fig. 16

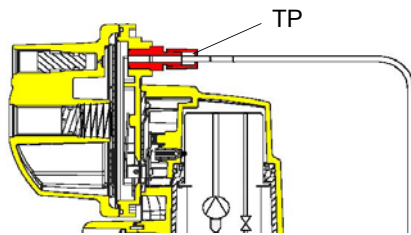
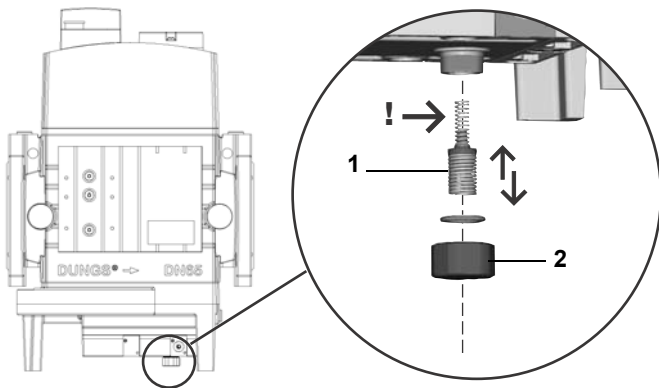


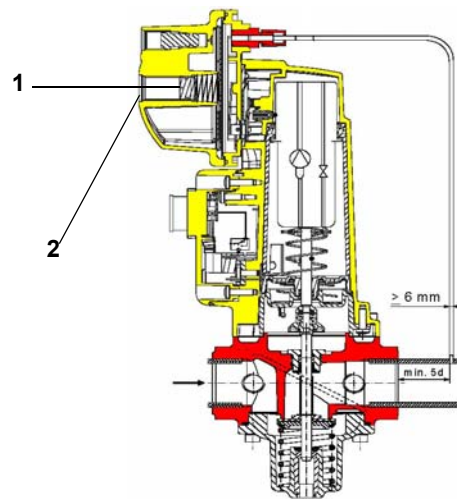
Fig. 17

Pressure adjusting range

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



DUNGS MBC..SE



Siemens SKP actuator

Keys

- 1 spring
- 2 cap

DUNGS MBC valves:

| | | | | |
|---------------------------------|--------|---------|---------|----------|
| Performance range (mbar) | 4 - 20 | 20 - 40 | 40 - 80 | 80 - 150 |
| Spring colour | - | red | black | green |

Siemens VGD valves with SKP actuator :

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

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

⚠ ATTENTION: once the gas train is mounted according to the diagram on Fig. 5, the gas proving test must be performed, according to the procedure set by the laws in force.

Hydraulic diagrams for light oil supplying circuits

Fig. 18 - Gravity circuit

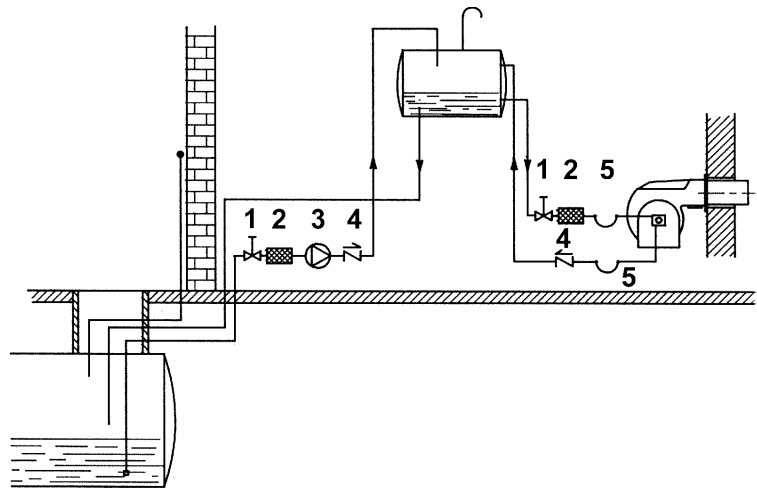


Fig. 19 - Ring circuit

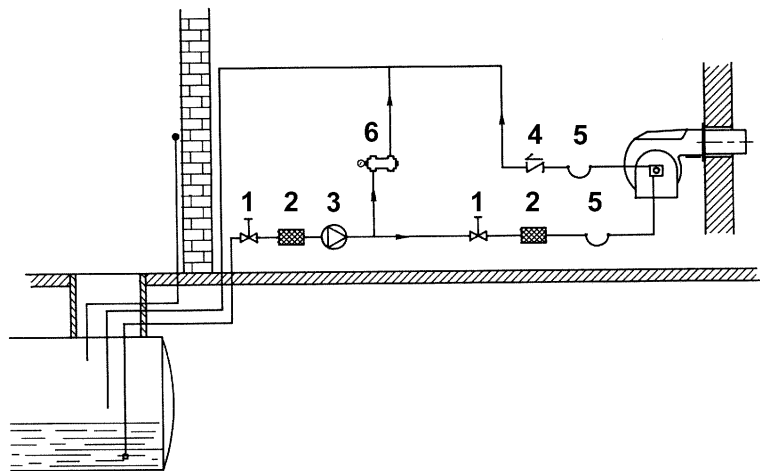
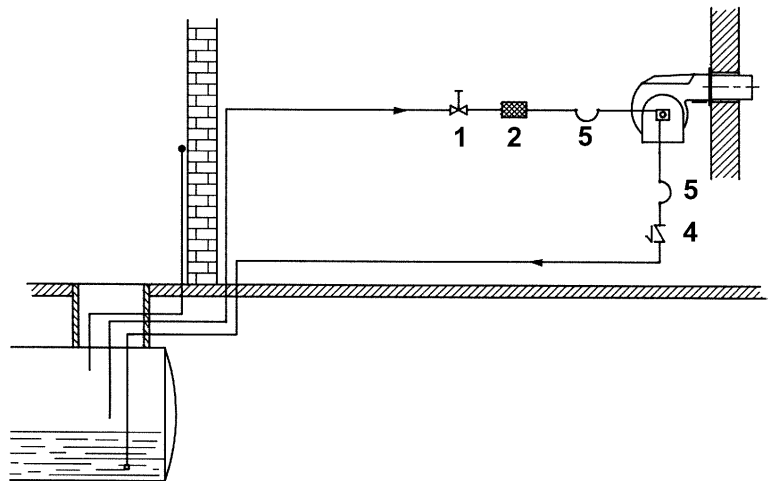


Fig. 20 - Suction circuit



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. 21).

Light oil piping installation diagram

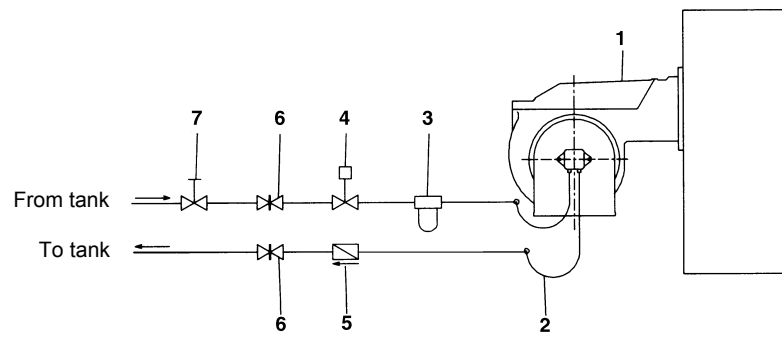


Fig. 21

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 (not in vicinity of tank or boiler)

(*) 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.

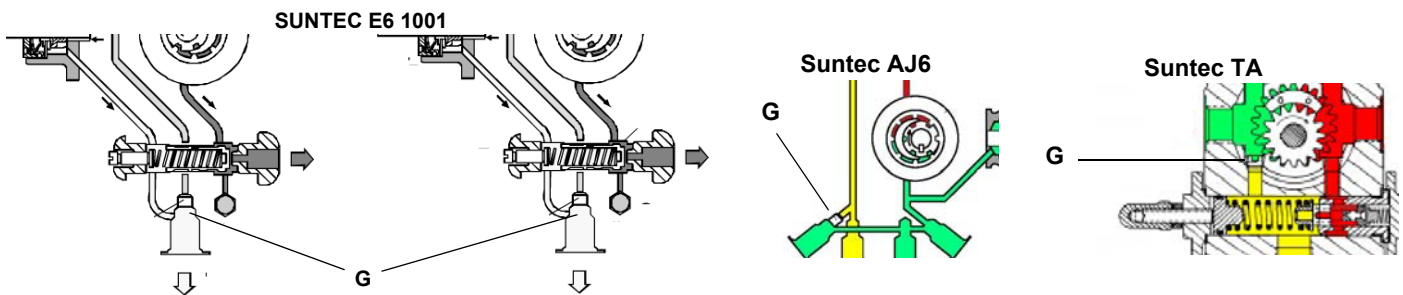
The pumps that are used can be installed both into single-pipe and double-pipe systems.

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.

About the use of fuel pumps

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

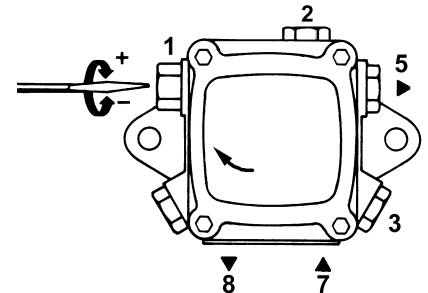
- Do not use PTFE tape on the suction and return line pipes to avoid the possibility that particles enter circulation. These could deposit on the pump filter or the nozzle, reducing efficiency. Always use O-Rings or mechanical seal (copper or aluminium gaskets) junctions if possible.
- An external filter should always be installed in the suction line upstream of the fuel unit.

Light oil pumps

The pumps provided with these burners can be:

- HP60 - HP65: Suntec AJ6
- HP72: Suntec E7
- HP73A : Suntec TA2

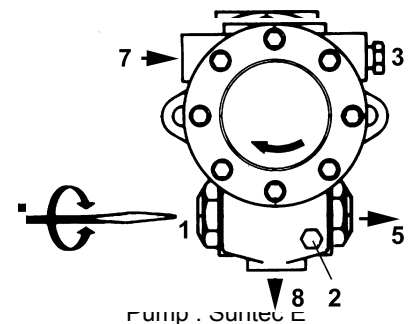
| Suntec AJ6 | |
|------------------------|----------------------------|
| Viscosity | 2 - 75 cSt |
| Oil temperature | 60°C max |
| Inlet maximum pressure | 2 bar |
| Inlet minimum pressure | - 0.45 bar to avoid gasing |
| Rated speed | 3600 rpm max. |



Key SUNTEC AJ6

- 1 Pressure governor
- 2 Pressure gauge
- 3 Vacuum gauge
- 5 To the Nozzle
- 7 Inlet
- 8 Return

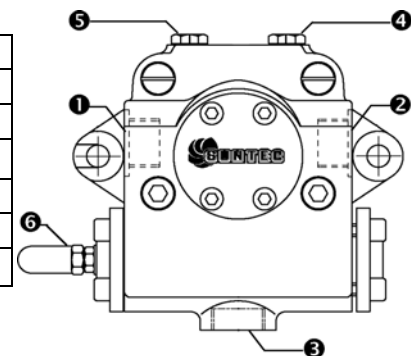
| Suntec E6 - E7 1001 | |
|----------------------------|------------------------|
| Oil viscosity | 3 - 75 cSt |
| Oil temperature | 90°C max |
| Inlet maximum pressure | 3,5 bar |
| Maximum return pressure | 3,5 bar |
| Minimum inlet pressure | - 0,45 to avoid gasing |
| Rotation speed | 3600 rpm max. |



Key

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

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

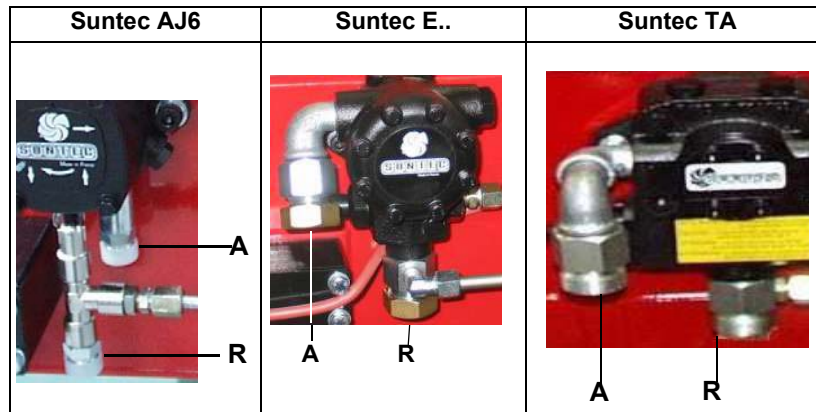


- 1 Inlet G1/2
- 2 To the nozzle G1/2
- 3 Return G1/2
- 4 Pressure gauge port G1/4
- 5 Vacuum gauge port G1/4
- 6 Pressure governor

Connecting 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).



Electrical connections

Respect the basic safety rules. make sure of the connection to the earthing system. do not reverse the phase and neutral connections. fit a differential thermal magnet switch adequate for connection to the mains.



ATTENTION: before executing the electrical connections, pay attention to turn the plant's switch to OFF and be sure that the burner's main switch is in 0 position (OFF) too. Read carefully the chapter "WARNINGS", and the "Electrical connections" section.

IMPORTANT: Connecting electrical supply wires to the burner terminal block MA, be sure that the ground wire is longer than phase and neutral ones.



WARNING: (only for double stage and progressive burners) The burner is provided with an electrical bridge between terminals 6 and 7; when connecting the high/low flame thermostat, remove this bridge before connecting the thermostat.

To execute the electrical connections, proceed as follows:

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

Rotation of fan motor and pump motor

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

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



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

- 1 Connect the signal conductors from the boiler to the burner, as for the next elements (Fig. 25 - Fig. 27):
ST: thermostat/pressure switch series
TAB: High/low flame thermostat
- 2 Connect the signal conductors from the burner to the boiler, as for the next elements (Fig. 25 - Fig. 27)
LB: Burner's lockout signalling LED
LSPG: Gas proving system' lockout signalling LED
- 3 In case of modulating burners, the 5, 6 and 7 terminals, on the **MA** terminal block, are already connected to the regulating modulator (mod. **RWF40**). A 4-pole plug coming out from the electrical panel is provided for the temperature and pressure probes connections (see Fig. 26).

Note: the regulating modulator is provided according to the ordered probe.

ADJUSTMENTS

Combustion head gas pressure curves depending on the flow rate

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

The curves referred to the gas pressure in the combustion head, depending on the gas flow rate, are referred to the burner properly adjusted (percentage of residual O₂ in the flues as shown in the "Recommended combustion values" table and CO in the standard limits). During this stage, the combustion head, the gas butterfly valve and the actuator are at the maximum opening. Refer to Fig. 22, showing the correct way to measure the gas pressure, considering the values of pressure in combustion chamber, surveyed by means of the pressure gauge or taken from the boiler's Technical specifications.

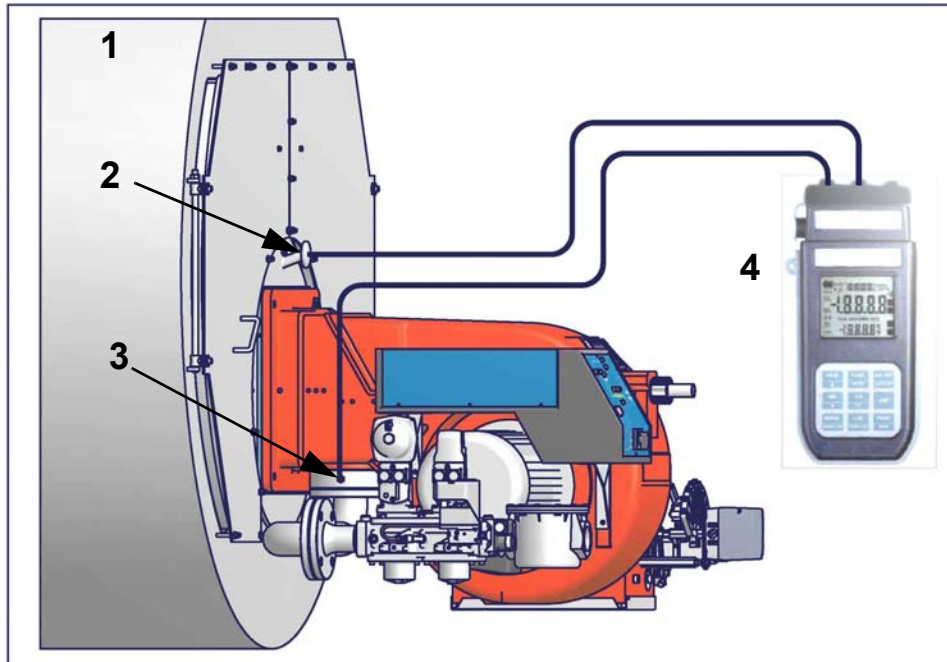


Fig. 22

Key

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

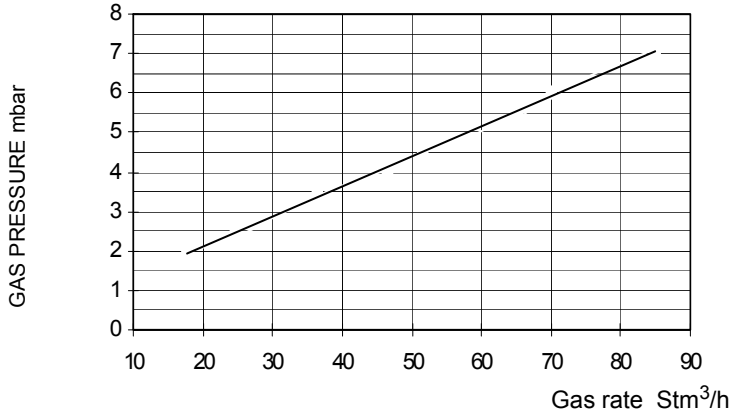
Measuring the gas pressure in the combustion head

In order to measure the pressure in the combustion head, insert the pressure gauge probes: one into the combustion chamber's pressure outlet (Fig. 22-2) to get the pressure in the combustion chamber and the other one into the butterfly valve's pressure outlet of the burner (Fig. 22-3). On the basis of the measured differential pressure, it is possible to get the maximum flow rate: in the pressure - rate curves (showed on the next paragraph), it is easy to find out the burner's output in Stm³/h (quoted on the x axis) from the pressure measured in the combustion head (quoted on the y axis). The data obtained must be considered when adjusting the gas flow rate.

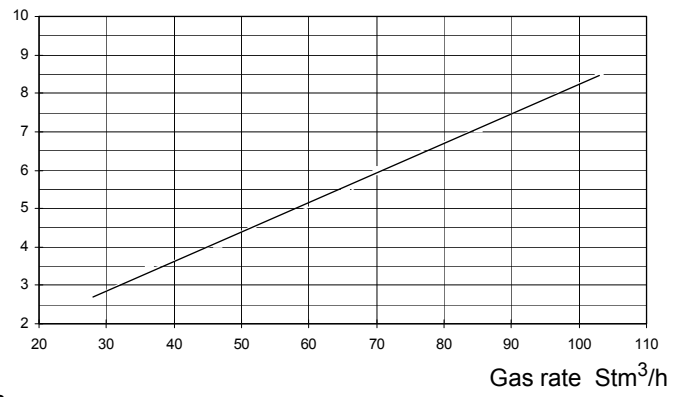
NOTE: THE PRESSURE-RATE CURVES ARE GIVEN AS INFORMATION ONLY; FOR A PROPER SETTING OF THE GAS RATE, PLEASE REFER TO THE GAS METER READING.

Pressure in combustion head - gas rate curves

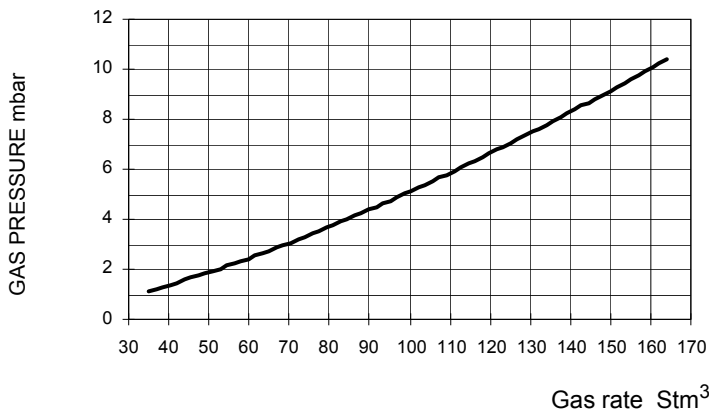
HP60



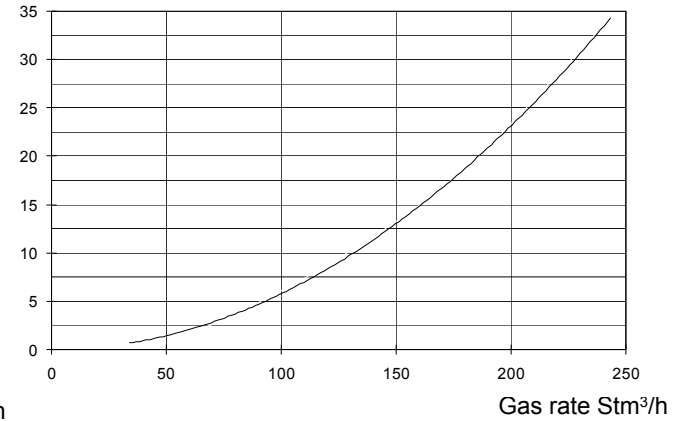
HP65




HP72

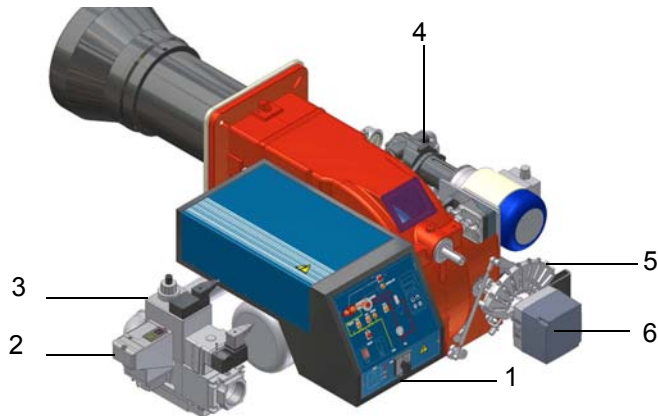


HP73A



ATTENTION: the diagrams refers to natural gas. For different type of fuel please refer to the paragraph "Fuel".

| | |
|---|---|
|  | <p>ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open and check that the pressure upstream the gas train complies the value quoted on paragraph “Technical specifications”. Be sure that the mains switch is closed.</p> |
| | <p>ATTENTION: During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the fuel decrease slowly until the normal combustion values are achieved.</p> |
| | <p>WARNING: NEVER LOOSE THE SEALED SCREWS! OTHERWISE, THE DEVICE WARRANTY WILL BE IMMEDIATELY INVALIDATE!</p> |



Keys

- 1 Gas filter
- 2 Gas proving system
- 3 Gas valves
- 4 Fuel pump
- 5 Gas Adjusting cam
- 6 Actuator

Fig. 23

Gas Filter

The gas filters remove the dust particles that are present in the gas, and prevent the elements at risk (e.g.: burners, counters and regulators) from becoming rapidly blocked. The filter is normally installed upstream from all the control and on-off devices.

Integrated proving system (burners equipped with LME7x, LMV, LDU)

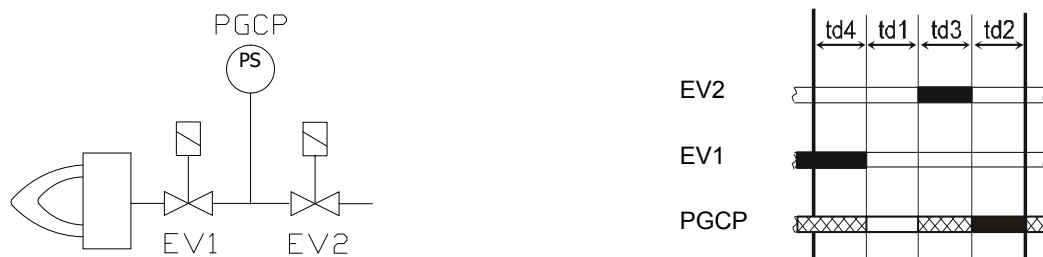
This paragraph describes the integrated proving system operation sequence:

- At the beginning both the valves (EV1 and EV2) must be closed.
- Test space evacuating: EV1 valve (burner side) opens and keep this position for a preset time (td4), in order to bring the test space to ambient pressure. Test atmospheric pressure: EV1 closes and keep this position for a preset time (test time td1). The pressure switch PGCP has not to detect a rise of pressure.
- Test space filling: EV2 opens and keep this position for a preset time (td3), in order to fill the test space.
- Test gas pressure: EV2 closes and keep this position for a preset time (td2). The pressure switch PGCP has not to detect a pressure drop down.

If all of the test phases are passed the proving system test is successful, if not a burner lockout happens.

On LMV5x and LMV2x/3x and LME73 (except LME73.831BC), the valve proving can be parameterized to take place on startup, shut-down, or both.

On LME73.831BC the valve proving is parameterized to take place on startup only.



Actuator

The actuator provided can be either berger STM30../Siemens SQM40.. (see page 30) or Siemens SQL33.. (see page 30).



IMPORTANT! the combustion air excess must be adjusted according to the in the following chart:

| Recommended combustion parameters | | |
|-----------------------------------|---------------------------------|--------------------------------|
| Fuel | Recommended (%) CO ₂ | Recommended (%) O ₂ |
| Natural gas | 9 ÷ 10 | 3 ÷ 4.8 |
| Light oil | 11.5 ÷ 13 | 2.9 ÷ 4.9 |

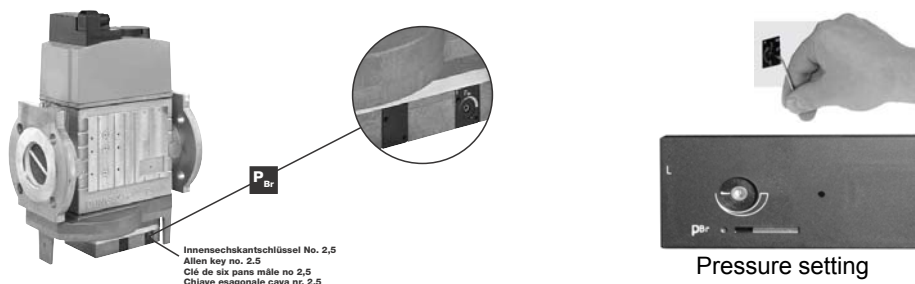
Adjustments - brief description

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

- Check that the combustion parameters are in the suggested limits.
- Check the flow rate measuring it on the counter or, if it was not possible, verifying the combustion head pressure by means of a differential pressure gauge, as described on par. “Measuring the gas pressure in the combustion head” on page 26.
- Then, adjust the combustion values corresponding to the points between maximum and minimum: set the shape of the adjusting cam foil. The adjusting cam sets the air/gas ratio in those points, regulating the opening-closing of the throttle gas valve.
- Set, now, the low flame output, acting on the low flame microswitch of the actuator in order to avoid the low flame output increasing too much or that the flues temperature gets too low to cause condensation in the chimney.

Adjustment procedure for gas operation

To change the burner setting during the testing in the plant, follow the next procedure. On the DUNGS MBC..SE gas valves group, set the pressure regulator to 1/3 of its stroke, using a 2.5 allen key.



HP73A only

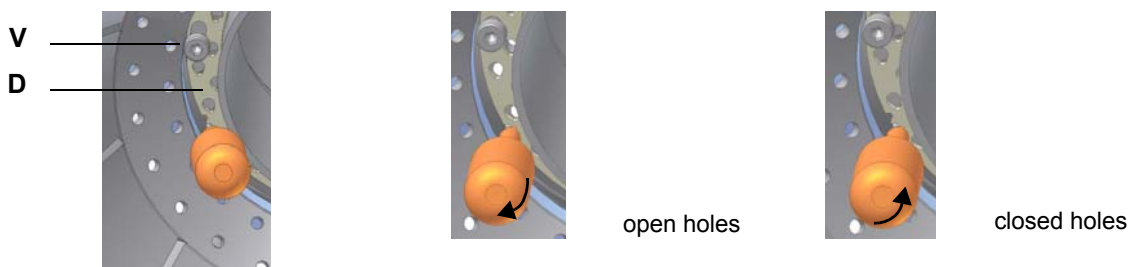


CAUTION: perform these adjustments once the burner is turned off and cooled.

The burner is factory-set with the adjusting plate holes fully open, and the combustion head at its MAX position, so it is fit to work at the maximum output.

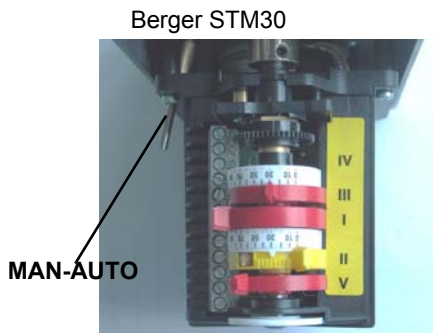
To adjust the gas flow, partially close the holes, as follows:

- 1 loosen the three **V** screws that fix the adjusting plate **D**;
- 2 insert a screwdriver on the adjusting plate notches and let it move CW/CCW as to open/close the holes;
- 3 once the adjustment is performed, fasten the **V** screws.



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

Settings by means of Berger STM30../Siemens SQM40.. actuator

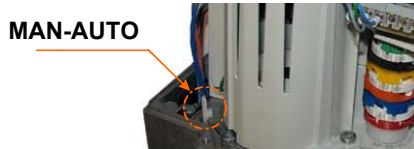


Siemens SQM40



Actuator cams

- I High flame
- II Stand-by and Ignition
- III Low flame - gas
- IV Low flame - oil (SQM40..)
- V Low flame - oil (STM30..)

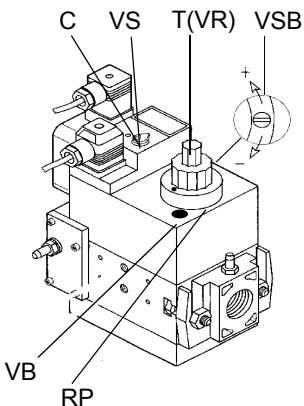


- 1 ;set GAS fuel by means of the burner **CM** switch (it is placed on the burner control panel - see page 38)
 - 2 open the electrical panel to check the fan motor rotation (see paragraph page 24)
 - 3 Only for burners provided with **Multibloc MB-DLE gas valves**: before starting the burner up, set the slow opening. To set the slow opening, remove cover **T**, reverse it upside down and use it as a tool to rotate screw **VR**. Clockwise rotation reduces start flow rate, anticlockwise rotation increases it. Do not use a screwdriver on the screw **VR**!
- Note:** the screw **VS** must be removed only in case of replacement of the coil.
- 4 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to safely achieve the high flame stage.
 - 5 Start the burner up by means of the thermostat series and wait until the pre-purge time comes to an end and that the burner starts up;
 - 6 drive the burner to high flame stage, by means fo the thermostat **TAB** (high/low flame thermostat - see Wiring diagrams), as far as fully-modulating burners, see related paragraph.drive the burner to high flame stage, by means fo the thermostat **TAB**; as far as Fully-modulating burners, see next paragraphs.
 - 7 Then move progressively the microswitch to higher values until it reaches the high flame position; always check the combustion values and eventually adjusting the gas by means of the valves group stabiliser.
 - 8 go on adjusting air and gas flow rates: check, continuously, the flue gas analysys, as to avoid combustion with little air; dose the air according to the gas flow rate change following the steps quoted below;
 - 9 acting on the pressure stabiliser of the valves group, adjust the **gas flow rate in the high flame stage** as to meet the values requested by the boiler/utilisation:

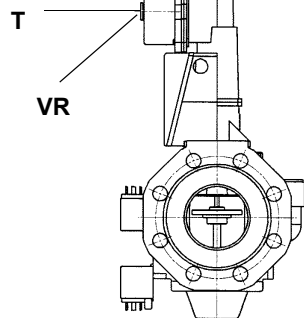
-**Multibloc MB-DLE**:The pressure governor is adjusted by operating the screw **VS** located under the cover **C**. By screwing down the pressure is increased and by unscrewing it is reduced. The valve is adjusted by means of the **RP** regulator after slackening the locking screw **VB** by a number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

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

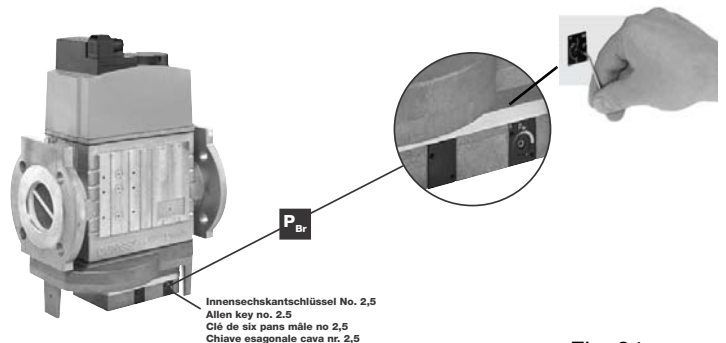
- **Dungs MBC..SE valves group**: act on its pressure governor to increase or decrease the pressure and consequently the gas rate.



Dungs Multibloc MB-DLE



Siemens VGD..

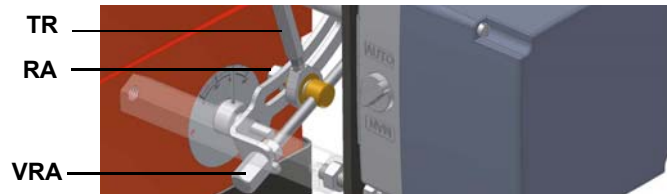


Dungs MBC..SE

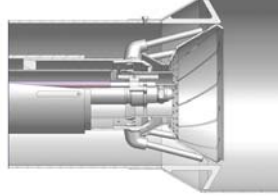
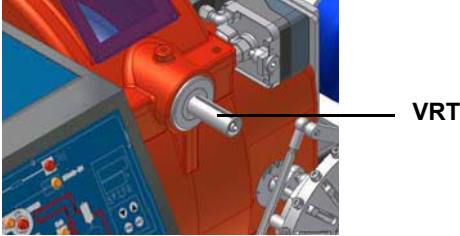
Fig. 24

- 10 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.

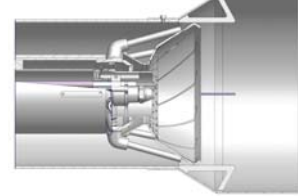
Note: once the procedure is performed, be sure that the blocking nut **RA** is fastened. Do not change the position of the air damper rods.



- 11 The burner is factory-set with the head in its MAX position (maximum output). To let the burner operate at a lower output, turn clockwise the **VRT** screw and move progressively the combustion head back towards the MIN position.



“MAX” head position



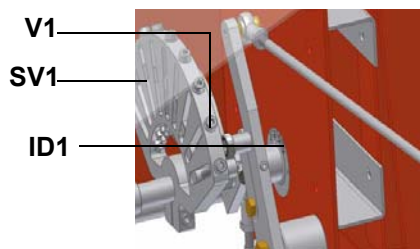
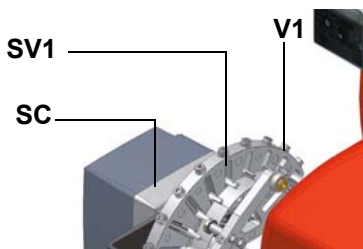
“MIN” head position

- 12 **Attention!** if it is necessary to change the head position, repeat the air and gas adjustments described above. The air and gas rate are now adjusted at the maximum power stage, go on with the point to point adjustment on the **SV1** (gas side) adjusting cam as to reach the minimum output point.

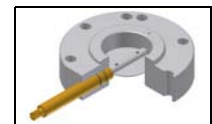
- 13 as for the point-to-point regulation, move the gas low flame microswitch (cam III) a little lower than the maximum position (90°);

- 14 set the **TAB** thermostat to the minimum (as far as Fully-modulating burners, see next paragraphs) in order that the actuator moves progressively towards the low flame position;

- 15 move cam III to the minimum to move the actuator towards the low flame until the two bearings find the adjusting screw that refers to the lower position: screw **V1** to increase the rate, unscrew to decrease.



Gas throttle valve open



Gas throttle valve closed

- 16 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.

Now adjust the pressure switches (see next par.).

Calibration of air and gas pressure switches

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

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



Calibration of air pressure switch

To calibrate the air pressure switch, proceed as follows:

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

Calibration of low gas pressure switch

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

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

Adjusting the maximum gas pressure switch (when provided)

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

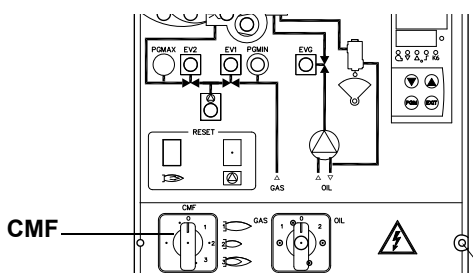
- 1 remove the pressure switch plastic cover;
- 2 if the maximum pressure switch is mounted upstream the gas valves: measure the gas pressure in the network, when flame is off; by means of the adjusting ring nut **VR**, set the value read, increased by the 30%.
- 3 if the maximum pressure switch is mounted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

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 2 and then CMF=0.



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

Adjustment procedure for light oil operation

The light oil flow rate can be adjusted choosing a by-pass nozzle that suits the boiler/utilisation output and setting the delivery and return pressure values according to the ones quoted on the table below and the diagram on Fig. 25 (as far as reading the pressure values, see next paragraphs).

| NOZZLE | NOZZLE SUPPLY PRESSURE bar | HIGH FLAME RETURN PRESSURE bar | LOW FLAME RETURN PRESSURE bar |
|-------------|----------------------------|--------------------------------|-------------------------------|
| MONARCH BPS | 20 | See table below | See table below |
| BERGONZO A3 | 20 | 11 ÷ 13 | 6 (recommended) |

| RETURN PRESSURE bar | | | | | | | | | | | | | | Flow rate in kg/h with close return | Pressure with close return to use in the nozzle choice) |
|----------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|-------------------------------------|---|
| Nozzle size Nozzle size (GPH) | 0 | 1,4 | 2,8 | 4,1 | 5,5 | 6,9 | 8,3 | 9,6 | 11 | 12,4 | 13,8 | 15,2 | | | |
| 0,75 | 1,3 | 1,6 | 2,1 | 2,5 | | | | | | | | | | 3,2 | 5,5 |
| 1,0 | 2,1 | 2,1 | 2,4 | 3,0 | 3,7 | 4,6 | 5,2 | | | | | | | 5,4 | 8,6 |
| 1,5 | 2,9 | 3,0 | 3,3 | 4,1 | 4,9 | 6,0 | 7,0 | | | | | | | 7,9 | 9,3 |
| 2,0 | 4,6 | 5,1 | 5,4 | 6,4 | 7,5 | 8,7 | 9,9 | | | | | | | 10,5 | 9,3 |
| 2,5 | 3,5 | 4,1 | 4,9 | 5,9 | 7,5 | 9,1 | 10,8 | 12,4 | | | | | | 13,5 | 10,7 |
| 3,0 | 5,6 | 5,9 | 6,2 | 7,2 | 8,7 | 10,0 | 11,9 | 13,8 | | | | | | 15,3 | 11,0 |
| 3,5 | 7,0 | 7,2 | 7,8 | 8,7 | 9,9 | 11,3 | 12,4 | 13,7 | 18,4 | | | | | 19,7 | 12,1 |
| 4,0 | 7,8 | 7,9 | 8,3 | 8,6 | 10,3 | 11,6 | 13,0 | 14,1 | 17,3 | 20,2 | | | | 21,0 | 12,8 |
| 4,5 | 9,2 | 9,4 | 10,0 | 11,0 | 11,9 | 12,9 | 14,3 | 15,3 | 17,2 | 24,5 | | | | 24,8 | 14,1 |
| 5,0 | 10,8 | 11,0 | 11,3 | 11,6 | 13,0 | 14,3 | 15,6 | 17,0 | 18,6 | 24,3 | | | | 26,2 | 13,4 |
| 5,5 | 9,7 | 10,0 | 10,2 | 11,1 | 12,1 | 13,4 | 14,8 | 16,4 | 18,1 | | | | | 29,7 | 12,4 |
| 6,0 | 9,2 | 9,5 | 9,9 | 10,0 | 10,8 | 12,4 | 14,1 | 15,7 | 17,5 | 18,9 | 29,3 | | | 33,1 | 14,8 |
| 6,5 | 10,5 | 10,8 | 11,1 | 11,4 | 12,1 | 13,8 | 15,3 | 16,5 | 18,4 | 20,0 | 22,4 | 36,2 | | 36,7 | 15,5 |
| 7,0 | 8,7 | 9,4 | 10,0 | 11,4 | 13,2 | 14,9 | 17,2 | 19,6 | 23,1 | 25,1 | 33,2 | | | 33,7 | 15,2 |
| 7,5 | 11,3 | 11,8 | 10,3 | 13,0 | 14,3 | 15,3 | 17,2 | 19,2 | 21,8 | 24,2 | 30,4 | | | 39,3 | 14,1 |
| 8,0 | 9,9 | 9,9 | 10,2 | 11,3 | 12,6 | 14,3 | 16,1 | 18,4 | 21,1 | 24,3 | | | | 39,7 | 13,8 |
| 9,0 | 10,8 | 11,0 | 11,1 | 12,6 | 14,5 | 16,1 | 18,8 | 21,8 | 25,1 | 28,9 | | | | 45,9 | 13,8 |
| 9,5 | 11,4 | 11,6 | 12,2 | 13,7 | 15,3 | 17,3 | 19,7 | 23,2 | 26,5 | 30,0 | 33,5 | | | 49,1 | 14,5 |
| 10,5 | 11,6 | 11,6 | 12,2 | 13,7 | 15,4 | 17,6 | 20,7 | 24,0 | 27,3 | 31,2 | 35,5 | | | 50,9 | 15,2 |
| 12,0 | 13,7 | 14,0 | 14,3 | 15,6 | 18,1 | 21,9 | 25,8 | 30,2 | 34,7 | 39,7 | 44,5 | | | 61,7 | 14,5 |
| 13,8 | 13,4 | 13,4 | 13,7 | 15,6 | 18,1 | 23,2 | 28,3 | 34,7 | 41,0 | 47,7 | 54,7 | | | 71,2 | 15,2 |
| 15,3 | 16,5 | 16,9 | 17,2 | 18,4 | 20,7 | 23,8 | 28,3 | 33,1 | 36,9 | 44,5 | 51,8 | | | 76,0 | 15,2 |
| 17,5 | 21,6 | 21,9 | 21,9 | 23,2 | 25,8 | 29,6 | 34,7 | 40,7 | 46,4 | 54,0 | 62,3 | 71,2 | | 89,7 | 15,5 |
| 19,5 | 19,7 | 20,0 | 20,3 | 21,3 | 23,8 | 28,0 | 32,7 | 39,7 | 47,1 | 55,3 | 66,4 | 75,0 | | 97,3 | 16,2 |
| 21,5 | 24,8 | 24,8 | 25,1 | 26,1 | 28,3 | 33,4 | 37,8 | 45,1 | 53,1 | 61,7 | 73,8 | 83,9 | | 106,5 | 16,6 |
| 24,0 | 26,7 | 27,0 | 27,7 | 29,3 | 31,8 | 36,6 | 45,8 | 55,0 | 65,5 | 77,3 | 90,9 | 106,2 | | 111,6 | 15,9 |
| 28,0 | 28,6 | 28,9 | 30,5 | 35,3 | 43,6 | 42,1 | 67,1 | 85,5 | 107,1 | 127,8 | 151,7 | | | 154,8 | 14,8 |
| 30,0 | 25,8 | 25,8 | 28,6 | 35,9 | 43,2 | 56,3 | 73,8 | 90,6 | 102,4 | 120,8 | 144,0 | 160,9 | | 164,1 | 15,5 |
| 35,0 | 34,3 | 35,0 | 40,7 | 49,9 | 63,6 | 82,7 | 103,6 | 122,1 | 145,9 | 120,8 | | | | 186,0 | 13,8 |
| 40,0 | 52,8 | 53,1 | 60,4 | 70,6 | 86,8 | 106,5 | 128,8 | 149,7 | 179,6 | 172,6 | | | | 217,2 | 13,1 |
| 45,0 | 73,4 | 73,4 | 83,0 | 93,5 | 112,2 | 134,5 | 157,7 | 185,0 | 225,7 | 209,8 | | | | 242,3 | 12,4 |
| 50,0 | 92,5 | 94,4 | 104,6 | 118,9 | 139,9 | 167,2 | 196,8 | 231,8 | 263,3 | | | | | 266,8 | 11,4 |

Tab. 1- Monarch nozzle

N.B. Specific gravity of the light oil: 0.840kg/dm³

Example: If the nozzle provided is mod. MONARCH 10.5 GPH, when the return pressure is 13.8 bar, the flow rate will be 35.5kg/h (see the chart above). If the return pressure is 13.80bar (with the same nozzle), the flow rate value will be 15.4kg/h. The flow rate in the High-flame operation is related to the nozzle provided with close return.

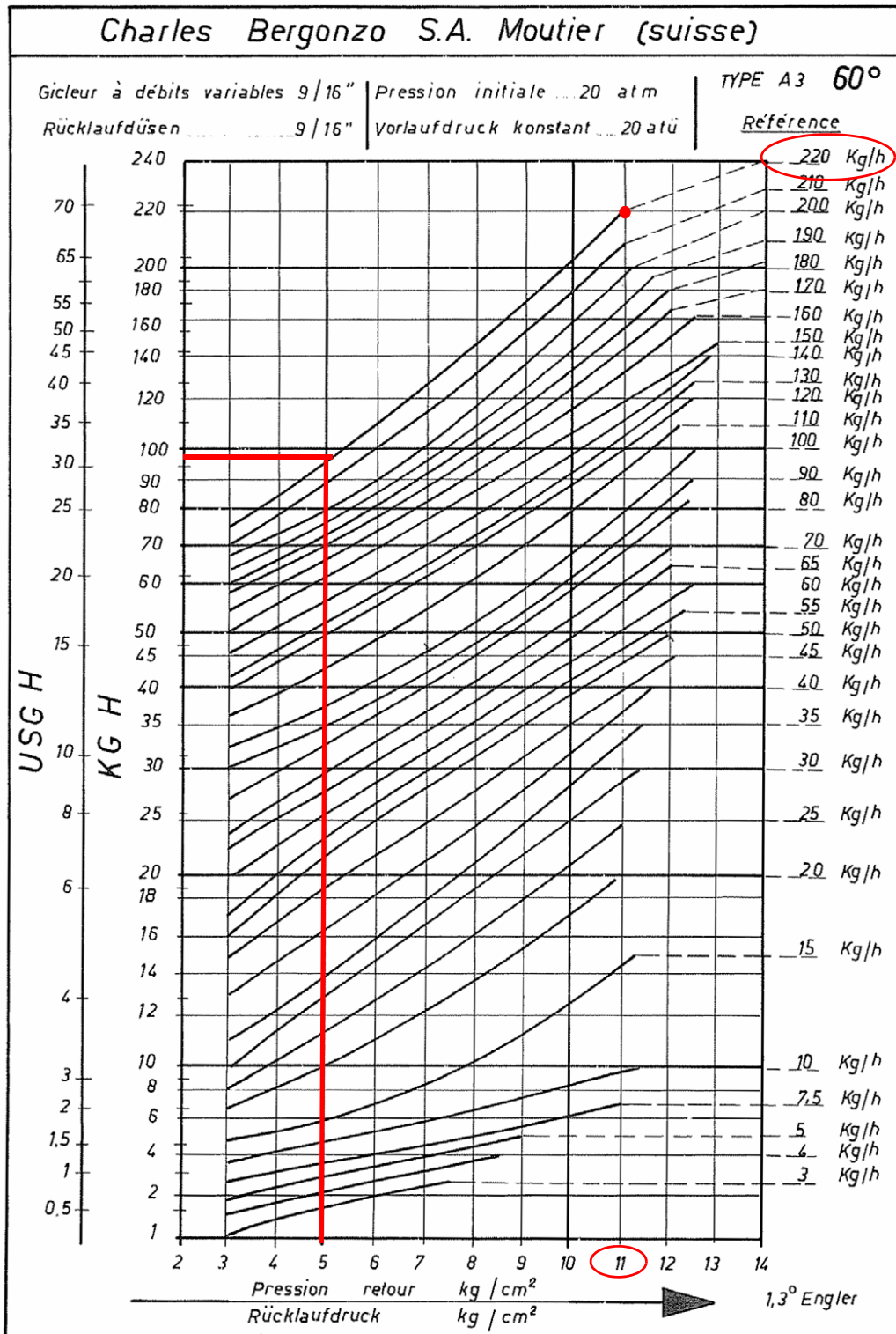
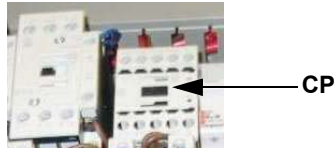


Fig. 25

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 (see chapter on page 33). The flow rate will then be about 95kg/h (see the example showed on the Bergonzo diagram).

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

- 1 Once the air and gas flow rates are adjusted, turn the burner off, switch the **CM** switch to the heavy oil operation (OIL, on the burner control panel (see page 38).
- 2 with the electrical panel open, prime the oil pump acting directly on the related **CP** contactor (see next picture): check the pump motor rotation and keep pressing for some seconds until the oil circuit is charged;



- 3 bleed the air from the **M** pressure gauge port (Fig. 26) by loosening the cap without removing it, then release the contactor.

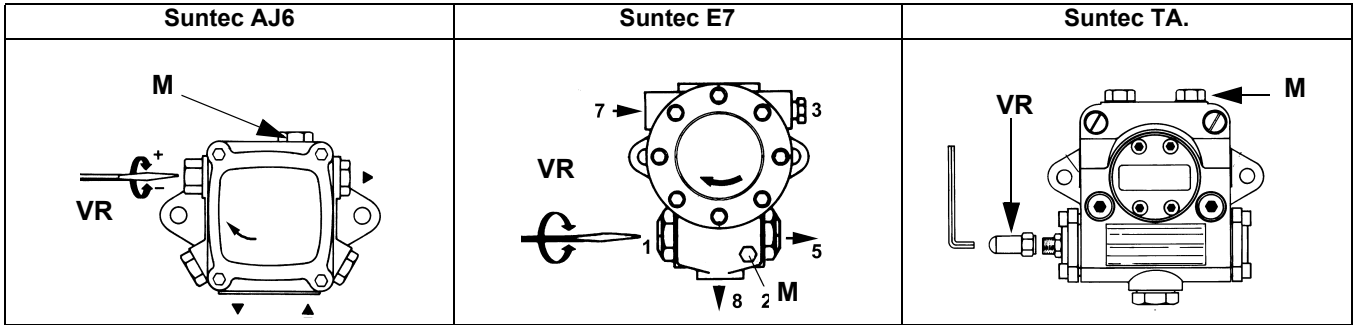


Fig. 26

- 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 record the high flame value set during the gas operation adjustments (see previous paragraphs);
- 6 start the burner up by means of the thermostat series and wait until the pre-purge time comes to an end and that the burner starts up;
- 7 drive the burner to high flame stage, by means of the thermostat **TAB** (high/low flame thermostat - see Wiring diagrams), as far as fully-modulating burners, see related paragraph. drive the burner to high flame stage, by means of the thermostat **TAB**, as for fully-modulating burners, see next paragraphs.
- 8 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).

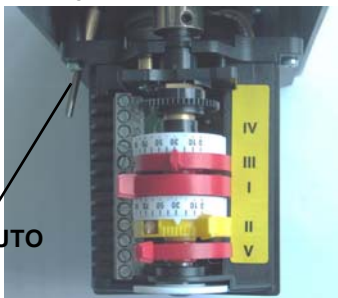
Siemens SQM40



Actuator cams

- I High flame
- II Stand-by and Ignition
- III Low flame - gas
- IV Low flame - oil (SQM40..)
- V Low flame - oil (STM30..)

Berger STM30



MAN-AUTO

MAN-AUTO



- 9 the nozzle supply pressure is already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); insert a pressure gauge into the port shown on Fig. 27 and act on on the pump adjusting screw **VR** (see

Fig. 26) as to get the nozzle pressure at 20bar (Monarch or Fluidics nozzles - see page 33-34).

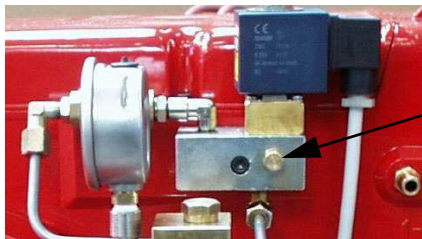


Fig. 27

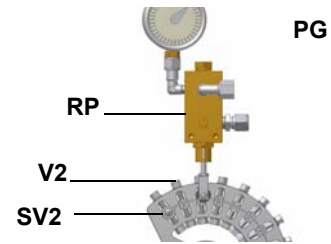


Fig. 28

- 10 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the **PG** pressure gauge) without changing the air flow rate set during the gas operation adjustments (see previous paragraph): checking always the combustion parameters, the adjustment is to be performed by means of the **SV2** adjusting cam screw (see picture) when the cam has reached the high flame position.
- 11 as for the point-to-point regulation in order to set the cam foil shape, move the oil low flame microswitch a little lower than the maximum position (90°);
- 12 set the **TAB** thermostat (as for fully-modulating burners, see next paragraphs) to the minimum in order that the actuator moves progressively towards the low flame position;
- 13 move the oil low flame cam 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 **V2** to increase the rate, unscrew to decrease, in order to get the pressure as showed on chart/diagram on "Adjustment procedure for light oil operation" on page 33, according to the requested rate.
- 14 Move again the oil low flame cam towards the minimum to meet the next screw on the adjusting cam and repeat the previous step; go on this way as to reach the desired low flame point.
- 15 The low flame position must never match the ignition position that is why the related cam must be set 20° - 30° more than the ignition position.

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

Oil circuit

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

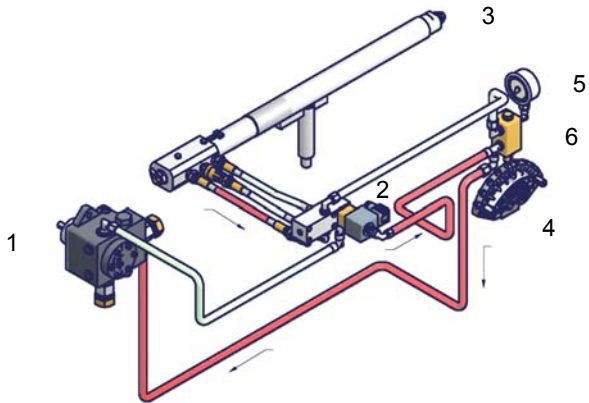


Fig. 29 - Stand-by

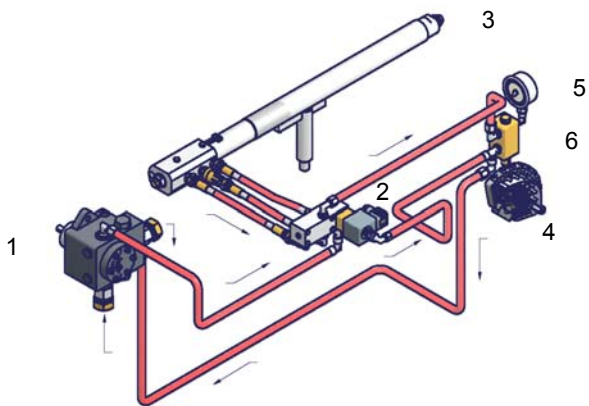


Fig. 30 - Pre-purge

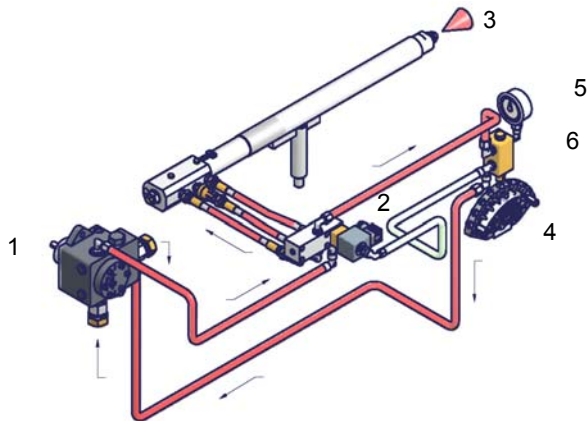


Fig. 31 - Low flame

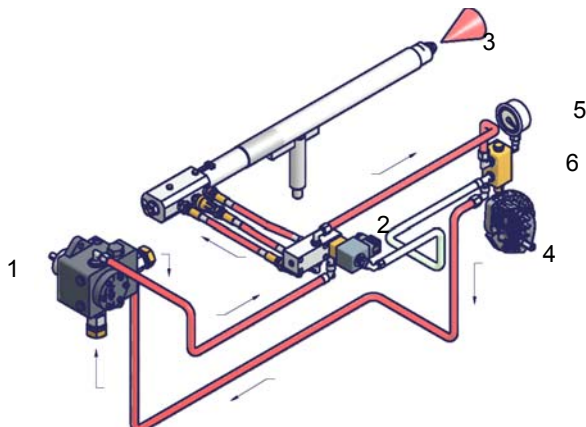


Fig. 32 - High flame

Key

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

PART II: OPERATION

LIMITATIONS OF USE

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

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

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

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

NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

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

IN CASE OF A BURNER SHUT-DOWN, RESET THE CONTROL BOX BY MEANS OF THE RESET PUSHBUTTON. IF A SECOND SHUT-DOWN TAKES PLACE, CALL THE TECHNICAL SERVICE, WITHOUT TRYING TO RESET FURTHER.

WARNING: DURING NORMAL OPERATION THE PARTS OF THE BURNER NEAREST TO THE GENERATOR (COUPLING FLANGE) CAN BECOME VERY HOT, AVOID TOUCHING THEM SO AS NOT TO GET BURNT.

OPERATION



BEFORE STARTING UP THE BURNER, BE SURE THAT THE MAIN SWITCH IS ON AND THE MANUAL SHUTOFF VALVES ARE OPEN.

- Choose the typer of fuel by turning the **A** switch, on the burner control panel.
CAUTION: if the fuel chosen is light oil, be sure the cutoff valves on the feed and return pipes are open.
- Check the control box is not locked (signalling light **O**, on); if so, reset it by means of the pushbutton **C**.
- Check the series of thermostats and pressure switches turn the burner to on.

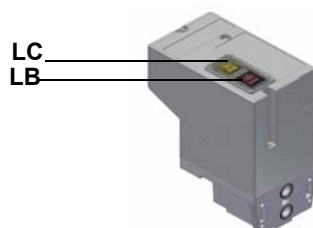
Gas operation

- Check the gas feeding pressure is sufficient (signalling lamp **G** on).

Burners provided with gas proving system: the gas proving system test begins; when the test is performed the proving system LED turns on. At the end of the test, the burner starting cycle begins: in case of leakage in a valve, the gas proving system stops the burner and the lamp **E** turns on. Reset it, by means of the reset pushbutton on the device, in burners with VPS504 (pushbutton **LB** in picture), or by the **D** pushbutton on the burner panel if this one is fitted with LDU11 proving system.

- Check the gas feeding pressure is sufficient (signalling lamp **G** on).

Burners provided with gas proving system: the gas proving system test begins; when the test is performed the proving system LED turns on. At the end of the test, the burner starting cycle begins: in case of leakage in a valve, the gas proving system stops the burner and the lamp **E** turns on. Reset it, by means of the reset pushbutton on the device, in burners with VPS504 (pushbutton **LB** in picture), or by the **D** pushbutton on the burner panel if this one is fitted with LDU11 proving system.



VPS504

NOTE: if the burner is fitted with Dungs VPS504, the pre-purge phase starts once the gas proving system is successfully performed. Since the pre-purge phase must be carried out with the maximum air rate, the control box drives the actuator opening and when the maximum opening position is achieved, the pre-purge time counting starts.

- At the end of the pre-purge time, the actuator drives the complete closing (ignition with gas position) and, as this is achieved the ignition transformer is energised (LED **L** is on).
- Few seconds after the gas valves opening, the transformer is de-energised and lamp **L** turns off.
- The burner is now operating, meanwhile the actuator goes to the high flame position and, after some seconds, the two-stage operation begins; the burner is driven automatically to high flame or low flame, according to the plant requirements.

Operation in high or low flame is signalled by lamp **N** on the frontal panel.

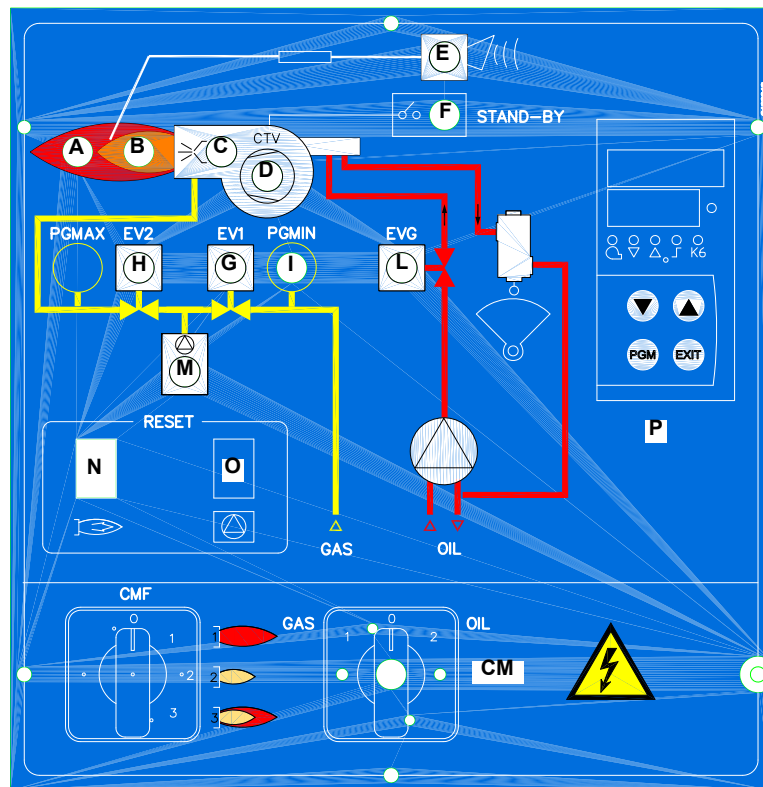
Light oil operation

- The fan motor starts and the pre-purge phase as well. Since the pre-purge phase must be carried out at the maximum air rate, the control box drives the actuator opening and when the maximum opening position is reached, the pre-purge time counting starts.
- At the end of the pre-purge time, the actuator is in the light oil ignition position: the ignition transformer is energised (lamp **L** on). Few seconds after the light oil valves opening, the transformer is de-energised and lamp **L** turns off.
- The burner is now operating, meanwhile the actuator goes to the high flame position; after some seconds, the two-stage operation begins; the burner is driven automatically to high flame or low flame, according to the plant requirements.

Operation in high or low flame is signalled by LED **N** on the burner control panel.

Modulating burners: they are provided with the Siemens RWF40 modulator (**P**-see next picture). As for the modulator operation see the related manual.

Burner control panel



Key

- A High flame mode indicating light
- B Low flame mode indicating light
- C Ignition transformer operation
- CM Main switch/operation mode Gas / Oil
- D Fan motor therma cutout intervention
- E Burner lockout indicating light
- F Stand-by mode indicating light
- G Gas valve EV1 operation
- H Gas valve EV2 operation
- I Gas pressure switch enabling signal
- L Oil solenoid valve operation
- M Gas proving system intervention
- N Control box reset pushbutton
- O Gas proving system reset pushbutton
- P Modulator

PART III: MAINTENANCE


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



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

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

ROUTINE MAINTENANCE

- Check and clean the gas filter cartridge, if necessary replace it (see next paragraphs);
- Check and clean the fuel filter cartridge, replace if necessary.
- Check and clean the filter inside the light oil pump: filter must be thoroughly cleaned at least once in a season to ensure correct working of the fuel unit. To remove the filter, unscrew the four screws on the cover. When reassemble, make sure that the filter is mounted with the feet toward the pump body. If the gasket between cover and pump housing should be damaged, it must be replaced. An external filter should always be installed in the suction line upstream of the fuel unit.
- Check the fuel hoses for possible leaks.
- Remove, check and clean the combustion head (see page 42);
- Check ignition electrodes, clean, adjust and, if necessary, replace them (see page 43);
- Check and carefully clean the **UV** detector, replace it if necessary; if in doubt, check the detection current, once the burner starts up (see on page 45).
- Remove and clean the fuel nozzle  (**Important: cleaning must be performed using solvent, not metal tools!**). At the end of maintenance operations after the burner reassembly, light the flame and check its shape, replacing the nozzle whenever a questionable flame shape appears. Whenever the burner is used intensely, we recommend preventively replacing the nozzle at the start of each heating season.
- Clean and grease sliding and rotating parts.



ATTENTION: when servicing, if it was necessary to disassemble the gas train parts, remember to execute the gas proving test, once the gas train is reassembled, according to the procedure imposed by the law in force.

Light oil filter maintenance

For correct and proper servicing, proceed as follows:

- 1 cutoff the required pipe section;
- 2 unscrew the filter cup;
- 3 remove the filtering cartridge, wash it with gasoline; if necessary, replace it; check the tightening O-rings and replace them if necessary;
- 4 replace the cup and restore the pipe line.



Removing the filter in the MULTIBLOC DUNGS MB-DLE 415 - 420 B01 1" 1/2 - 2"

- Check the filter at least once a year!
- Change the filter if the pressure difference between pressure connection 1 and 2 (Fig. 33-Fig. 34) $\Delta p > 10$ mbar.
- Change the filter if the pressure difference between pressure connection 1 and 2 (Fig. 33-Fig. 34) is twice as high compared to the last check.

You can change the filter without removing the fitting.

- 1 Interrupt the gas supply closing the on-off valve.
- 2 Remove screws 1 ÷ 6 (Fig. 35).
- 3 Change filter insert.
- 4 Re-insert filter housing, screw in screws 1 ÷ 6 without using any force and fasten.
- 5 Perform leakage and functional test, $p_{max.} = 360$ mbar.

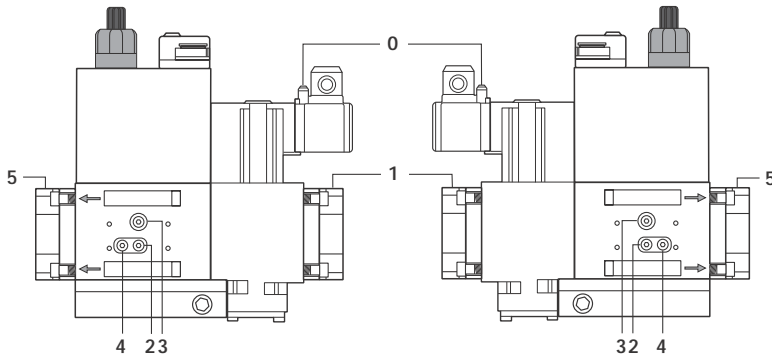


Fig. 33

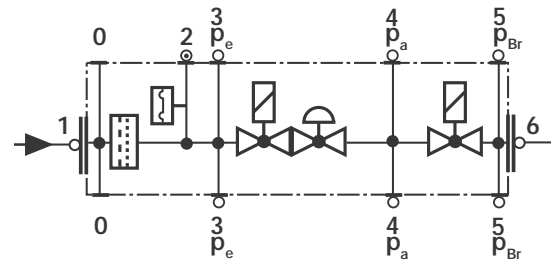


Fig. 34

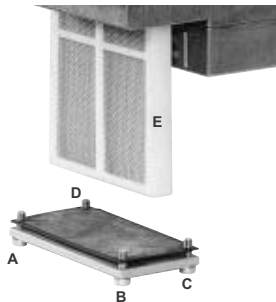


Fig. 35

Inspection and replacement of the MULTIBLOC DUNGS MBC..SE filter (Threaded valves group)

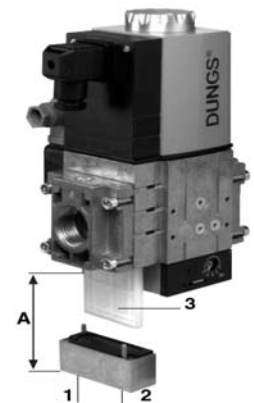
Inspect the filter at least once a year.

- Change the filter, if pressure value between pressure connections 1 and 2 is greater than 10 mbar.
- Change the filter, if pressure value between pressure connections 1 and 2 is twice as high compared to the last inspection.

1. Interrupt gas supply: close ball valve
2. Remove screws 1-2
3. Replace the filter insert 3
4. Screw in screws 1-2 without use force to fasten.
5. Perform leakage and function test.
6. Pay attention that dirt does not fall inside the valve.

Space requirements for fitting filter, A: from 150 to 230 mm.

Fig.36



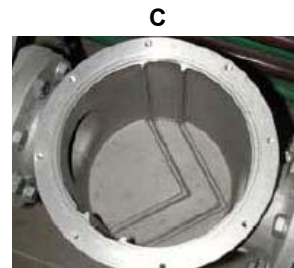
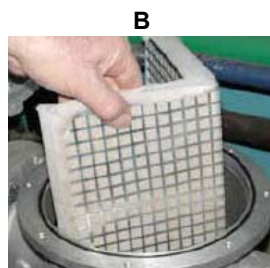
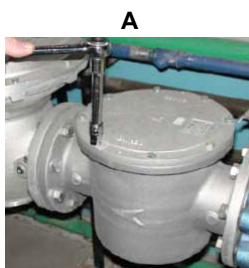
Gas filter maintenance



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

To clean or remove the filter, proceed as follows:

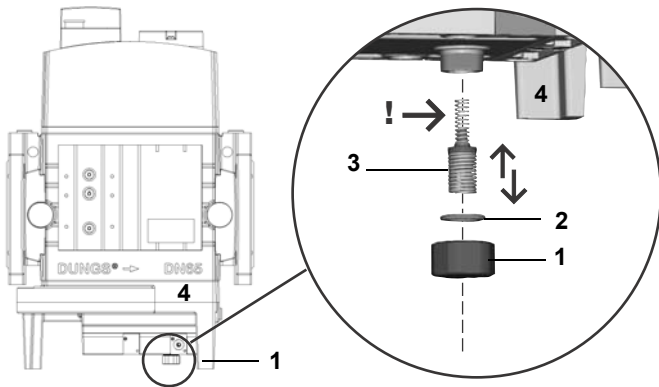
- 1 remove the cap unscrewing the fixing screws (A);
- 2 remove the filtering cartridge (B), clean it using water and soap, blow it with compressed air (or replace it, if necessary)
- 3 replace the cartridge in its proper position taking care to place it inbetween the guides as not to hamper the cap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



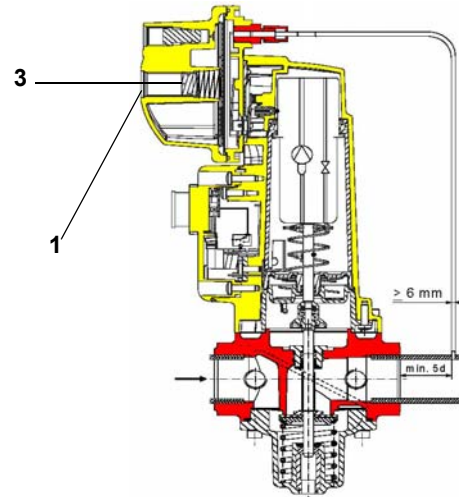
Replacing the spring in the gas valve group

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

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



DUNGS MBC..SE

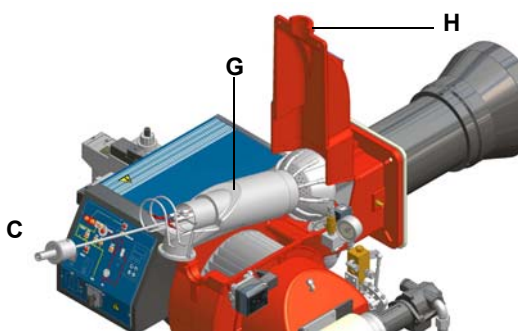
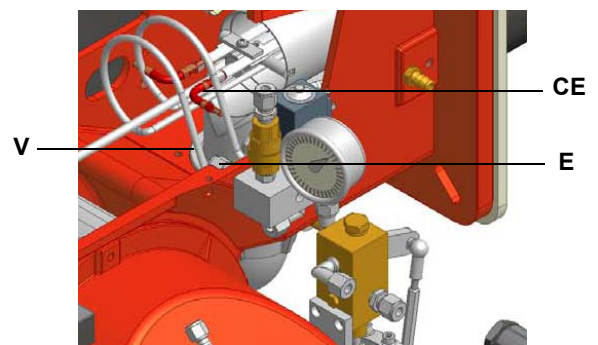
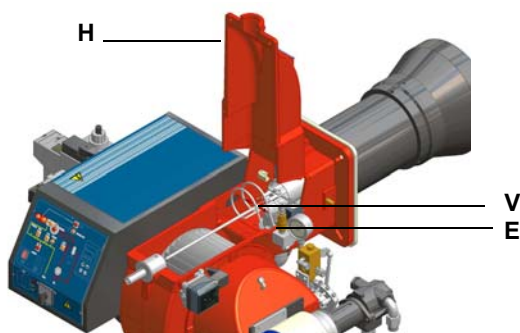


SKP Siemens actuator

Removing the combustion head

- 1 Remove the top H.
- 2 Disconnect the electrode cables CE.
- 3 Remove the UV detector out of its housing: disconnect electrode cables and the light oil flexible hoses.
- 4 Loosen the screws S holding the VR group: screw the VR screw in order to loose the threaded rod C.
- 5 Loosen the screws V holding the gas manifold G, loosen the two connectors E and remove the assembly as shown.
- 6 Clean the combustion head by means of a vacuum cleaner; scrape off the scale by means of a metallic brush.

Note: to replace the combustion head, reverse the operations described above.



Adjusting the electrodes position

Adjust the electrodes position, according to the quotes (in mm) shown on the next picture.

HP60-65-72

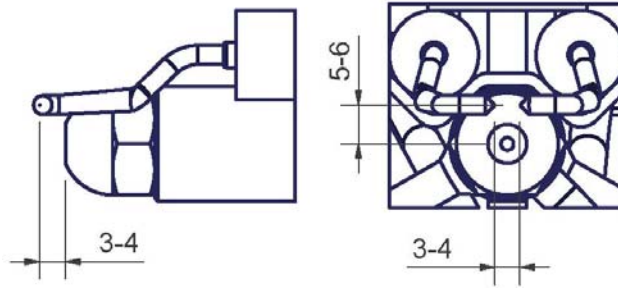


Fig. 37

HP73A

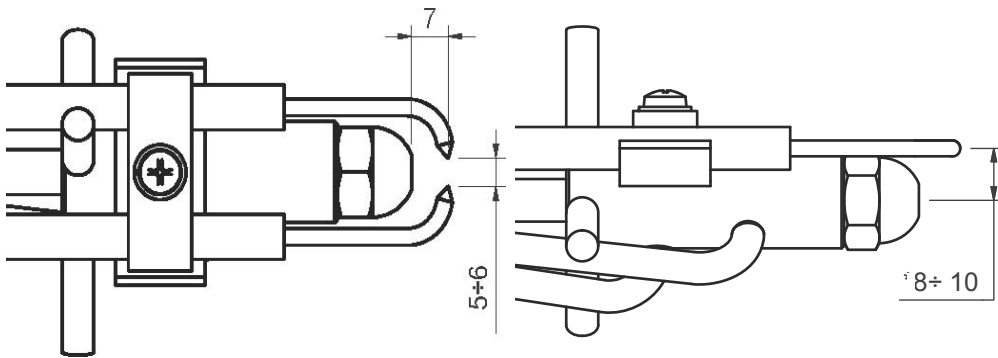


Fig. 38

Cleaning/replacing the electrodes



ATTENTION: avoid the electrodes to get in touch with metallic parts (blast tube, head, etc.), otherwise the boiler operation would be compromised. Check the electrodes position after any intervention on the combustion head.

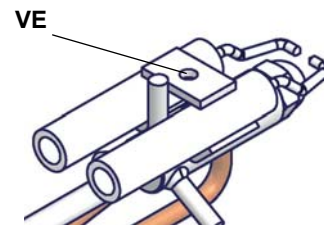
To clean/replace the electrodes, proceed as follows:

1 remove the combustion head as described in the previous paragraph;

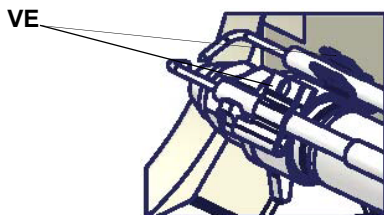
2 remove the electrodes ass.y and clean them;

in order to replace the electrodes, unscrew the **VE** fixing screws and remove them; place the new electrodes being careful to observe the measures in the previous paragraph; reassemble the electrodes and the combustion head following the reversed procedure.

HP60-65-72



HP73A



Cleaning and replacing the detection photocell

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

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



Checking the detection current (for models without printed circuit board)

To check the detection signal follow the scheme in Fig. 39 or Fig. 40. If the signal is less than the value indicated, check the position of the detection electrode or detector, the electrical contacts and, if necessary, replace the electrode or the detector.

| Control box | Minimum detection signal |
|-----------------|-----------------------------|
| Siemens LME7.. | 2 μ A (with electrode) |
| Siemens LME7... | 70 μ A with UV detector |

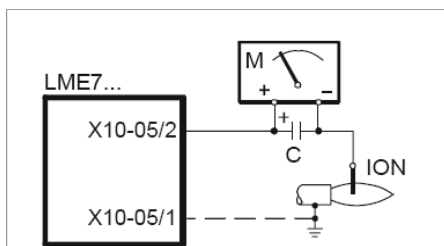


Fig. 39: Detection by electrode

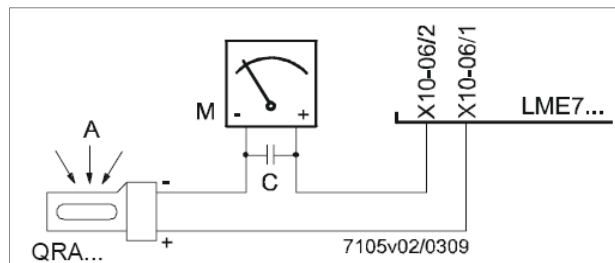


Fig. 40: Detection by photocell QRA..

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

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

Seasonal stop

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

- 1 turn the burner main switch to 0 (Off position)
- 2 disconnect the power mains
- 3 close the fuel valve of the supply line

Burner disposal

In case of disposal, follow the instructions according to the laws in force in your country about the "Disposal of materials".

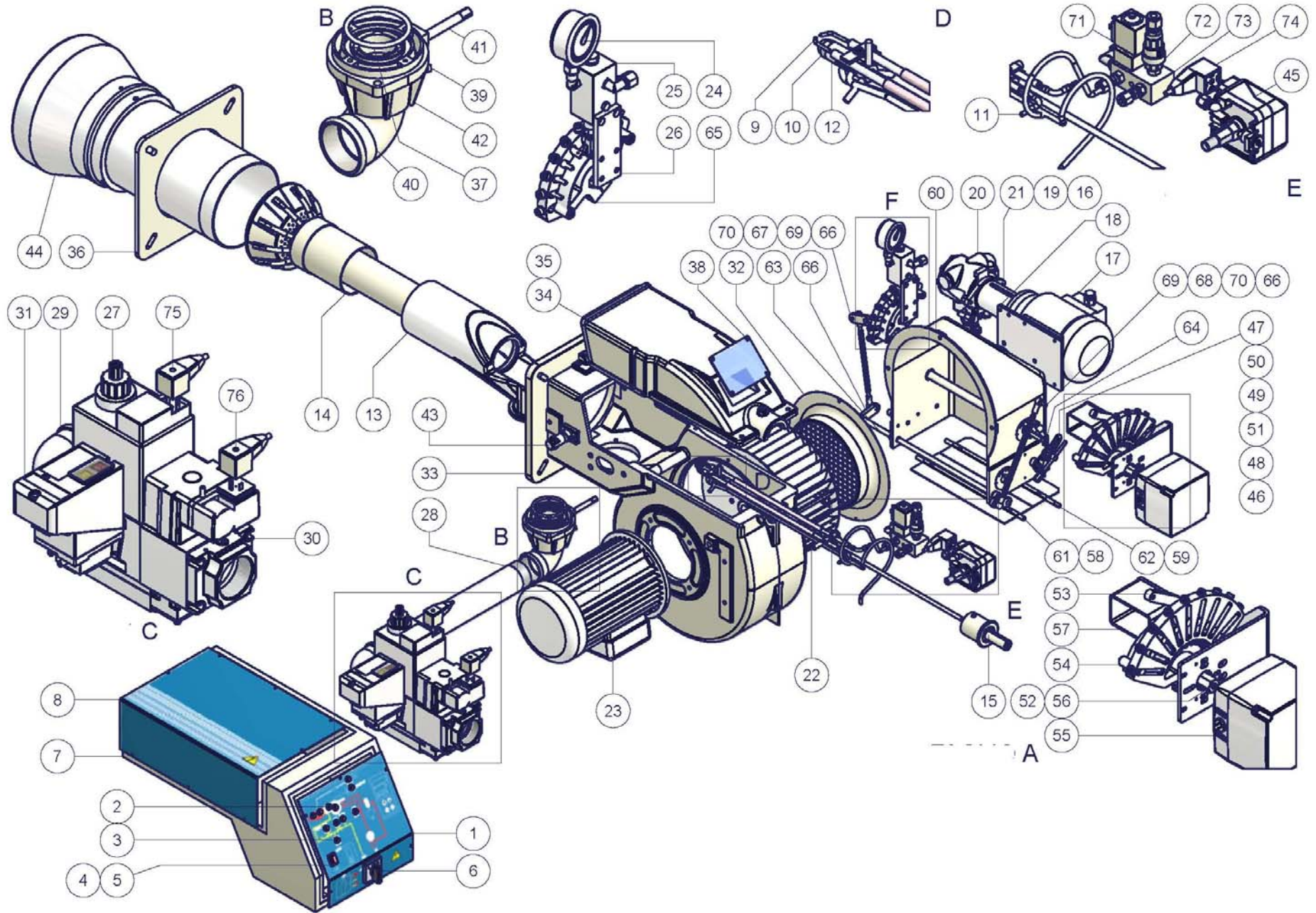
TROUBLESHOOTING

| CAUSE | TROUBLE | | | | | | | | | | | | | |
|--|--------------------------|-------------------------|----------------------------|-------------------------------------|------------------------------|---------------------|--|------------------------------|-----------------------------|---------------------------------------|---------------------------|---|--|--|
| | THE BURNER DOESN'T START | CONTINUE WITH PRE-PURGE | DOESN'T START AND LOCK-OUT | DOESN'T START AND REPEATS THE CYCLE | STARTS AND REPEATS THE CYCLE | STARTS AND LOCK-OUT | THE FLAME MONITOR DEVICE DOESN'T GIVE CONSENT TO START | DOESN'T SWITCH TO HIGH FLAME | DOESN'T RETURN IN LOW FLAME | THE SERVO CONTROL IS LOCK AND VIBRATE | LOCK-OUT DURING OPERATION | TURNS OF AND REPEATS CYCLE DURING OPERATION | URNS OF AND REPEATS CYCLE DURING OPERATION | URNS OF AND REPEATS CYCLE DURING OPERATION |
| MAIN SWITCH OPEN | ● | | | | | | | | | | | | | |
| LACK OF GAS | ● | | | ● | | | | | | | | | | |
| MAXIMUM GAS PRESSURE SWITCH DEFECTIVE (IF PROVIDED) | ● | | ● | | | | | | | | | | | |
| THERMOSTATS/PRESSURE SWITCHES DEFECTIVE | ● | | | ● | | | | | | | | ● | | |
| FAN MOTOR THERMAL CUTOFF INTERVENTION | ● | | | | | | | | | | | | | |
| OVERLOAD TRIPPED INTERVENTION | ● | | | | | | | | | | | | | ● |
| AUXILIARY FUSES INTERRUPTED | ● | | | | | | | | | | | | | |
| CONTROL BOX FAULTY | ● | ● | ● | | | ● | | | | | ● | | | |
| DEFECTIVE ACTUATOR | ● | ● | ● | | | | ● | | | | | | | |
| AIR PRESSURE SWITCH FAULT OR BAD SETTING | ● | | | | | ● | ● | | | | ● | | | |
| MINIMUM GAS PRESSURE SWITCH DEFECTIVE OR GAS FILTER DIRTY | ● | | | ● | ● | | ● | | | | | ● | | |
| IGNITION TRANSFORMER FAULT | | | ● | | | | | | | | | | | |
| IGNITION ELECTRODES BAD POSITION | | | ● | | | | | | | | | | | |
| BUTTERFLY VALVE BAD SETTING | | | ● | | | ● | | | | | | | | |
| DEFECTIVE GAS GOVERNOR | | | ● | ● | ● | | | | | | | ● | | |
| GAS VALVE DEFECTIVE | | | ● | | | | | | | | | | | |
| BAD CONNECTION OR DEFECTIVE HIGH/LOW FLAME THERMOSTAT OR PRESSURE SWITCH | | | | | | | ● | ● | ● | | | | | |
| WRONG SETTING ACTUATOR CAM | | | | | | | ● | ● | ● | | | | | |
| UV PROBE DIRTY OR DEFECTIVE | | | ● | | | ● | | | | | ● | | | |
| OIL FILTER DIRTY | | | | | | | | | | | | | ● | |

BURNER EXPLODED VIEW

| ITEM | DESCRIPTION |
|------|--------------------------------|
| 1 | FRONT CONTROL PANEL |
| 2 | LIGHT |
| 3 | LIGHT |
| 4 | LOCK-OUT RESET BUTTON |
| 5 | PROTECTION |
| 6 | SWITCH |
| 7 | BOARD |
| 8 | COVER |
| 9 | IGNITION ELECTRODE |
| 10 | NOZZLE |
| 11 | IGNITION CABLE |
| 12 | NOZZLE HOLDER |
| 13 | GAS MANIFOLD |
| 14 | STANDARD COMBUSTION HEAD |
| 15 | RING NUT |
| 16 | NET |
| 17 | MOTOR |
| 18 | PLATE |
| 19 | COUPLING |
| 20 | PUMP |
| 21 | BRACKET |
| 22 | FAN WHEEL |
| 23 | MOTOR |
| 24 | PRESSURE GAUGE |
| 25 | PRESSURE GOVERNOR |
| 26 | BRACKET |
| 27 | GAS VALVES GROUP WITH GOVERNOR |
| 28 | THREADED GAS PIPE |
| 29 | ELBOW |
| 30 | FLANGE |
| 31 | GAS PROVING SYSTEM |
| 32 | AIR INLET CONE |
| 33 | BURNER HOUSING |
| 34 | COVER |
| 35 | COVER EXTENSION |
| 36 | GENERATOR GASKET |
| 37 | O RING |
| 38 | INSPECTION GLASS |

| ITEM | DESCRIPTION |
|------|---------------------|
| 39 | PRESSURE PLUG |
| 40 | ELBOW |
| 41 | THROTTLE SHAFT |
| 42 | BUTTERFLY GAS VALVE |
| 43 | PHOTOCELL |
| 44 | STANDARD BLAST TUBE |
| 45 | AIR PRESSURE SWITCH |
| 46 | SCREW |
| 47 | CAM |
| 48 | LEVERAGE |
| 49 | ROD |
| 50 | JOINT |
| 51 | JOINT |
| 52 | BUSH |
| 53 | LEVERAGE |
| 54 | ADJUSTING CAM |
| 55 | ACTUATOR |
| 56 | ACTUATOR SHAFT |
| 57 | BRACKET |
| 58 | AIR INTAKE DAMPER |
| 59 | AIR INTAKE DAMPER |
| 60 | AIR INTAKE |
| 61 | LOUVER SHAFT |
| 62 | LOUVER SHAFT |
| 63 | THROTTLE SHAFT |
| 64 | ADJUSTING CAM SHAFT |
| 65 | ADJUSTING CAM |
| 66 | LEVERAGE |
| 67 | ROD |
| 68 | ROD |
| 69 | JOINT |
| 70 | JOINT |
| 71 | OIL SOLENOID VALVE |
| 72 | ONE-WAY VALVE |
| 73 | OIL MANIFOLD |
| 74 | CONNECTOR |
| 75 | CONNECTOR |
| 76 | CONNECTOR |



WIRING DIAGRAMS

Refer to the attached wiring diagrams.

WARNING

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



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