

# 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 electricians 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 90/396/CEE - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

##### Harmonised standards :

- UNI EN 676 (Gas Burners);
- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

#### *Light oil burners*

##### European directives:

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

##### Harmonised standards :

- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 (Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

##### National standards :

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

#### *Heavy oil burners*

##### European directives:

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

##### Harmonised standards :

- CEI EN 60335-1 Household and similar electrical appliances - SafetyPart 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

##### National standards :

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

#### *Gas - Light oil burners*

##### European directives:

- Directive 90/396/CEE Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

##### Harmonised standards :

- UNI EN 676 Gas Burners
- CEI EN 60335-1(Household and similar electrical appliances - Safety. Part 1: General requirements;
- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

##### National standards :

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

#### *Gas - Heavy oil burners*

##### European directives:

- Directive 90/396/CEE - Gas Appliances;
- Directive 2006/95/EC on low voltage;
- Directive 2004/108/CEE on electromagnetic compatibility

##### Harmonised standards :

- UNI EN 676 (Gas Burners);
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- EN 50165 Electrical equipment of non-electric appliances for household and similar purposes. Safety requirements.

##### National standards :

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

## PART I: INSTALLATION

## 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.

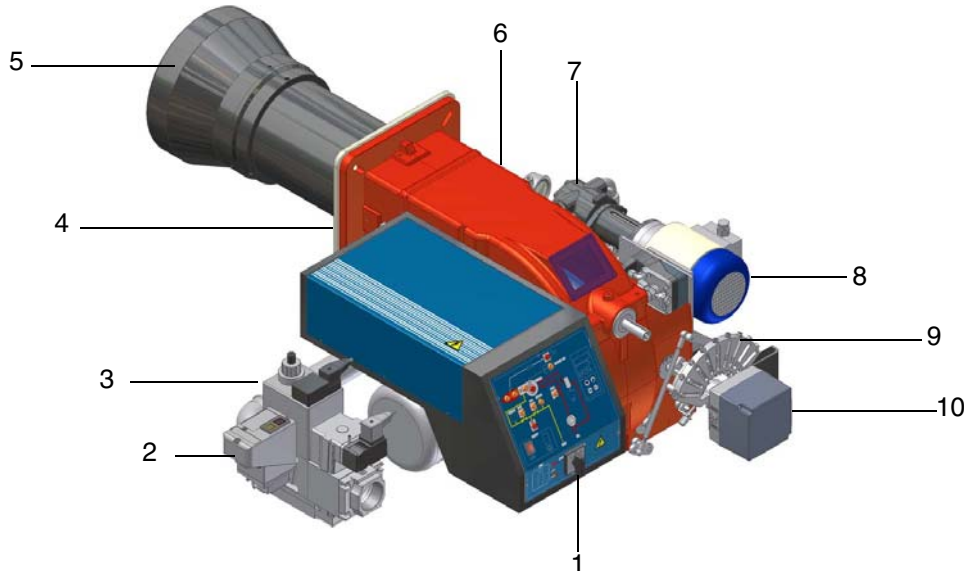


Fig. 1

- 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 ( $\text{kW} = \text{kcal/h} / 860$ );
- 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.

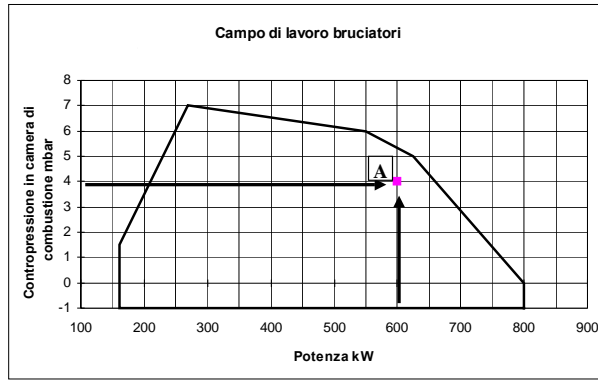


Fig. 2

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<sub>gas</sub>**. 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<sub>gas</sub>** value, calculated before.

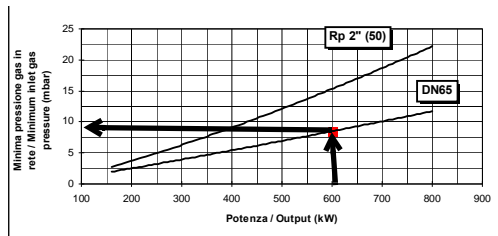


Fig. 3

**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 tha suites the utilisation (please, contact the manufacturer).

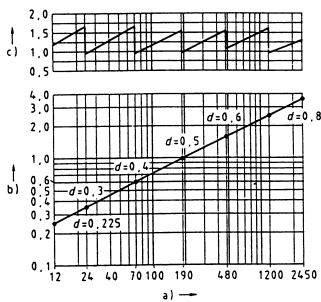


Fig. 4

**Key**

- a) Heat output in kW
- b) Lenght of the flame tube in meters
- c) Flame tube firing intensity in MW/m<sup>3</sup>
- d) Combustion chamber diameter (m)

Fig. 4 - Firing intensity, diameter and lenght 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	<b>HP60</b>											
(2) FUEL	M - Natural gas			G - Light oil								
(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 see Specifications	40 = Rp1 <sub>1/2</sub>			50 = Rp2			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 <sup>3</sup> /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 <sup>3</sup>		
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" <sub>1/2</sub> / Rp1 <sub>1/2</sub>	2" / Rp2	2" <sub>1/2</sub> / DN65
Operating temperature	°C	-10 ÷ +50		
Storage Temperature	°C	-20 ÷ +60		
Working service*		Intermittent		

<b>Note1:</b>	All gas flow rates are referred to Stm <sup>3</sup> /h (1013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value H <sub>i</sub> = 34.02 MJ/Stm <sup>3</sup> ).
<b>Note2:</b>	Maximum gas pressure = 360mbar (with Dungs MBDLE/MBC valves) = 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 <sub>2H</sub>																									
I <sub>2E</sub>	LU	PL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I <sub>2E(R)B</sub>	BE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I <sub>2L</sub>	NL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I <sub>2ELL</sub>	DE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I <sub>2Er</sub>	FR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



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. kW (Stm <sup>3</sup> /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 <sup>3</sup>	
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" <sup>1</sup> / <sub>2</sub> / 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 <sup>3</sup> /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 <sup>3</sup>		
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" <sup>1</sup> / <sub>2</sub> / DN65	3" / DN80
Operating temperature	°C	-10 ÷ +50		
Storage Temperature	°C	-20 ÷ +60		
Working service*		Intermittent		

<b>Note1:</b>	All gas flow rates are referred to Stm <sup>3</sup> /h (1013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value H <sub>i</sub> = 34.02 MJ/Stm <sup>3</sup> ).
<b>Note2:</b>	Maximum gas pressure = 360mbar (with Dungs MBDLE/MBC valves) = 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 <sup>3</sup> /h)	35 - 164		
Gas pressure	min.- max. mbar	(see Note 2)		
Oil train inlet pressure	max. bar	1		
Light oil rate	min.- max. kg/h	28 - 131		
Oil viscosity		2 - 7.4 cSt @40°C		
Oil density		840 kg/m <sup>3</sup>		
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" <sup>1</sup> / <sub>2</sub> / DN65	3" / DN80
Operating temperature	°C	-10 ÷ +50		
Storage Temperature	°C	-20 ÷ +60		
Working service*		Intermittent		

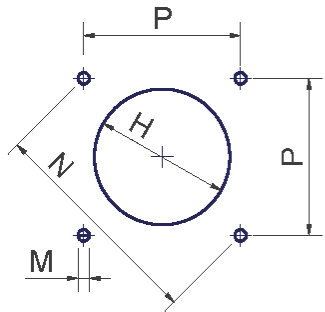
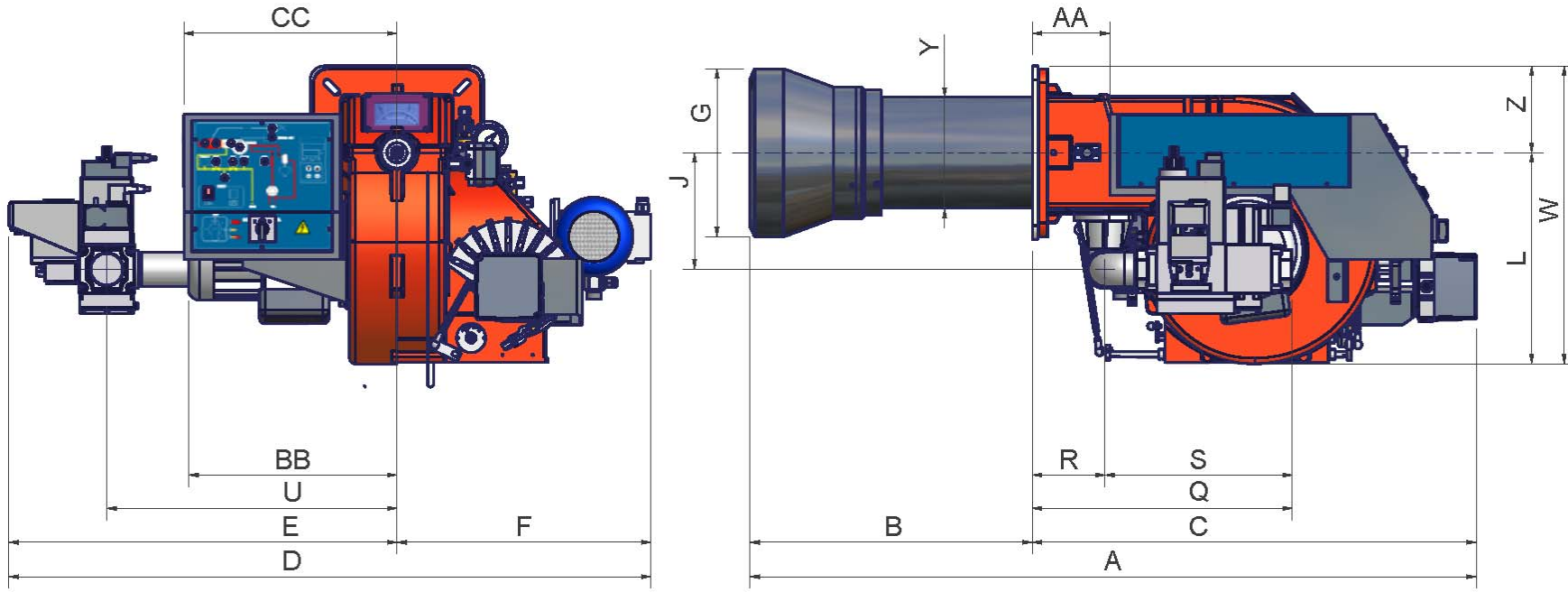
BURNER TYPE		HP73A MG..x.50	HP73A MG..x.65	HP73A MG..x.80
Output	min. - max. kW	320 - 2300		
Fuel		Nat. gas - Light oil		
Gas category		(see next paragraph)		
Gas rate	min.- max. (Stm <sup>3</sup> /h)	34 - 243	34 - 243	34 - 243
Gas pressure	min.- max. mbar	(see Note 2)		
Oil train inlet pressure	max. bar	1		
Light oil rate	min.-max. kg/h	27 - 194	27 - 194	27 - 194
Oil viscosity		2 - 7.4 cSt @40°C		
Oil density		840 kg/m <sup>3</sup>		
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" <sup>1</sup> / <sub>2</sub> / DN65	3" / DN80
Storage Temperature	°C	-10 ÷ +50		
Working service*	°C	-20 ÷ +60		
Operating temperature		Intermittent		

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

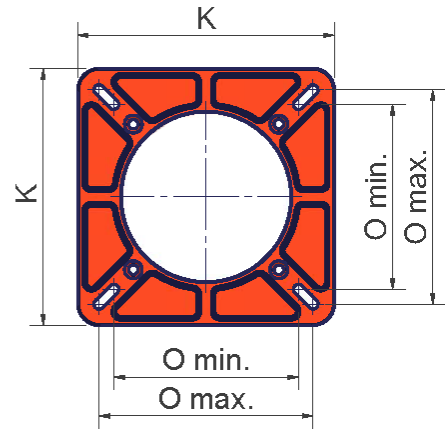
\* **NOTE ON THE BURNER WORKING SERVICE:** for safety reasons, one controlled shutdown must be performed every 24 hours of continuous operation.



Overall dimensions (mm)



Boiler recommended drilling template



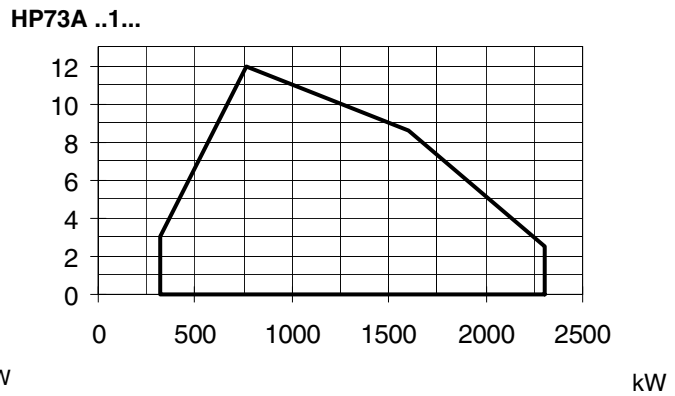
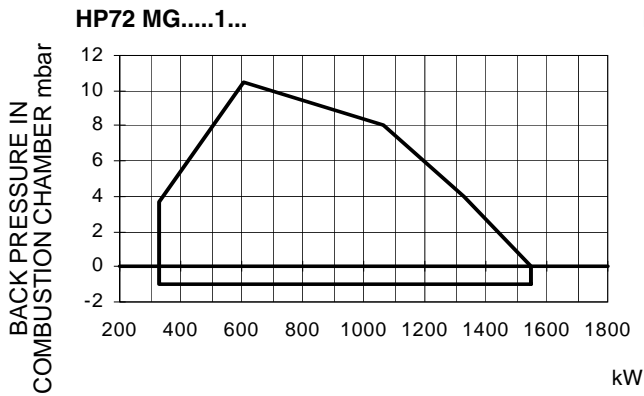
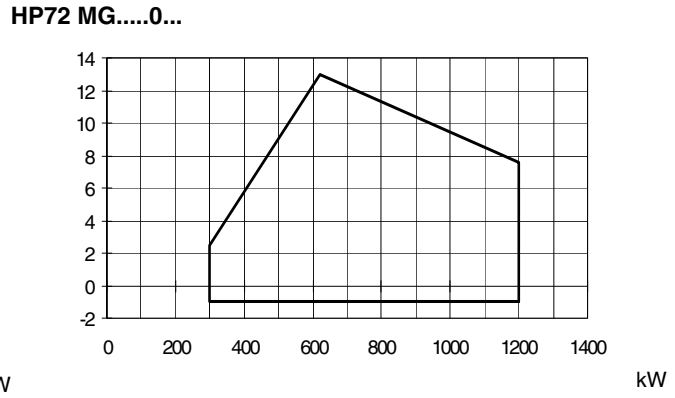
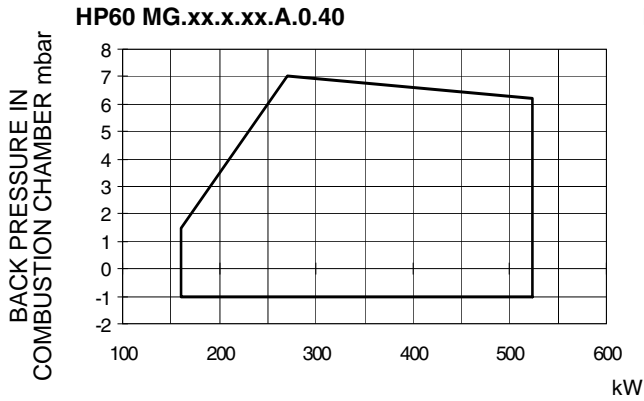
	DN	A	AA	B	BB	C	CC	D	E	F	G	H	J	K	L	M	N	O - min	O - max	P	Q	R	S	U	V	W	Y	Z
HP60 MG..0.40	40	1119	99	383	314	736	362	930	500	430	240	280	210	240	344	M10	269	190	190	190	445	112	327	444	x	464	162	120
HP60 MG.. 0.50	50	1119	99	383	314	736	362	930	500	430	240	280	210	240	344	M10	269	190	190	190	445	112	335	444	x	464	162	120
HP60 MG.. 0.65	65	1119	99	383	314	736	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

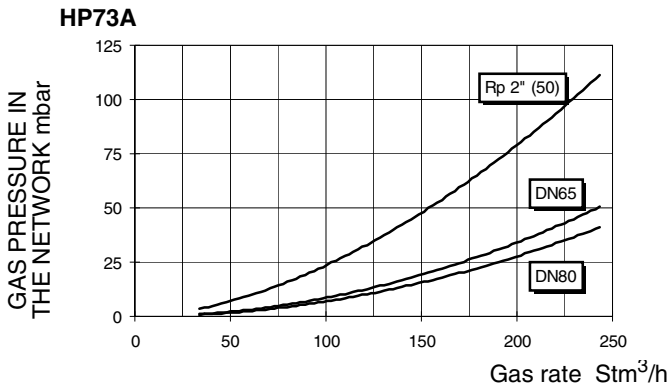
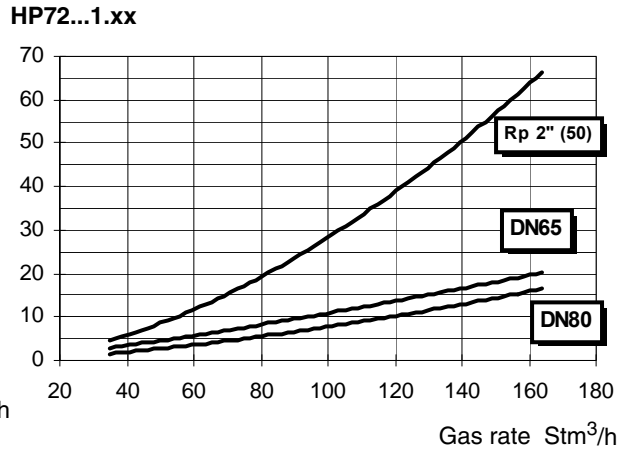
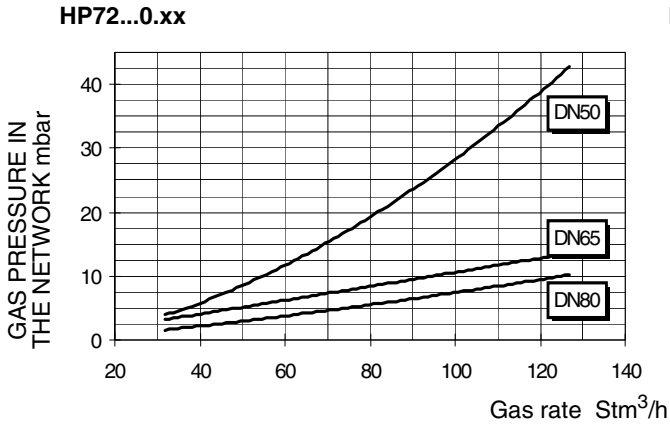
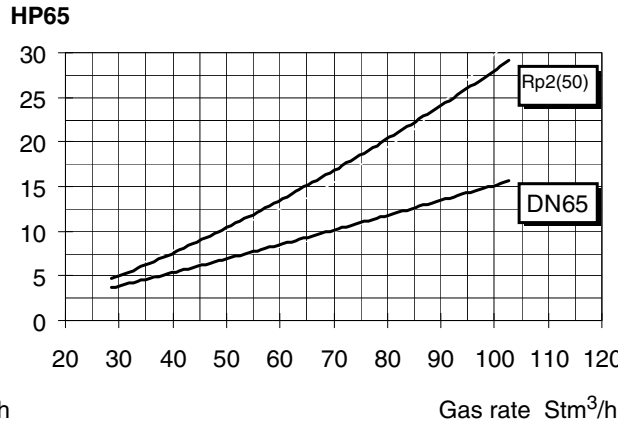
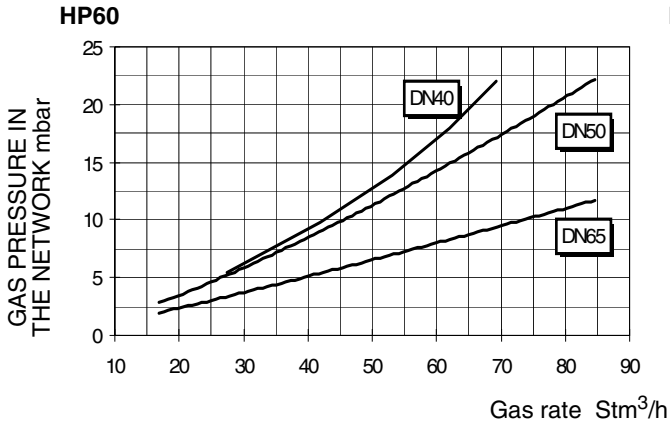



To get the input in kcal/h, multiply value in kW by 860.

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**



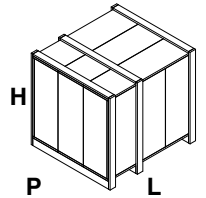
 Caution: the gas rate value is quoted on the x-axis, the related network pressure is quoted on the y-axis (pressure value in the combustion chamber is not included). To know the minimum pressure at the gas train inlet, necessary to get the requested gas rate, add the pressure value in the combustion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

## 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

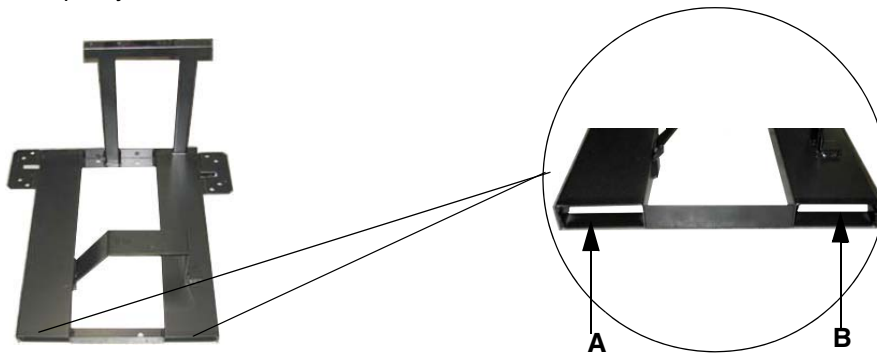


To get rid of the burner's packing, follow the procedures laid down by current laws on disposal of materials

### Handling the burner

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

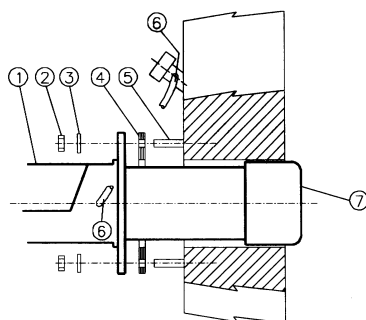
The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A and B ways. Remove the stirrup only once the burner is installed to the boiler.



### Fitting the burner to the boiler

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

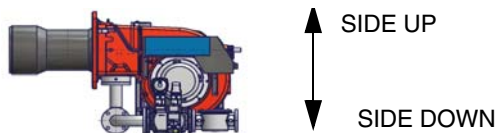
- 1 make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions")
- 2 place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
- 3 place the 4 stud bolts (5) on boiler's door, according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



#### Keys


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

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

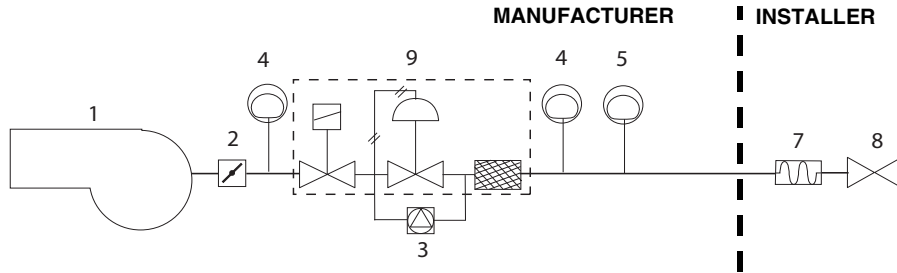


**Gas train connections**

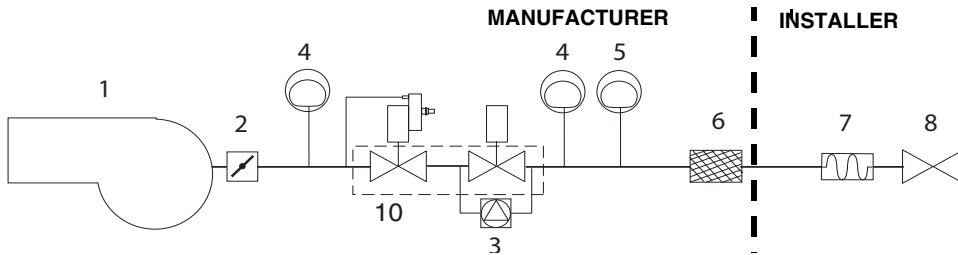
The next diagrams show the components of the gas train included in the delivery and which must be fitted by the installer. The diagrams are in compliance with the current laws.

	<p><b>ATTENTION:</b> 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.</p>
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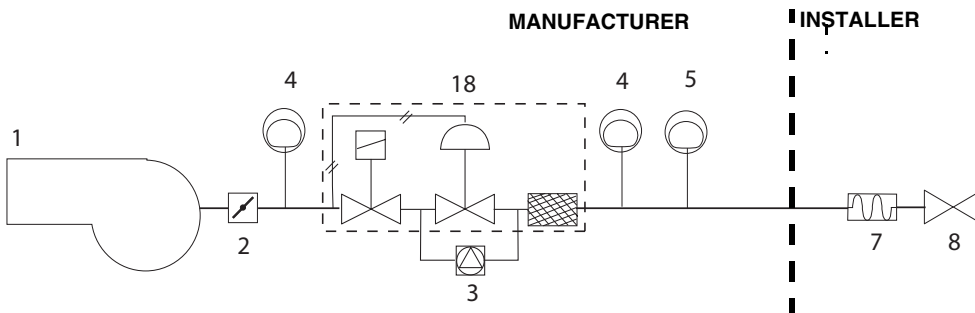
**Gas train - 1** Gas train with valves group MB-DLE with built-in gas pressure governor + VPS504 gas proving system



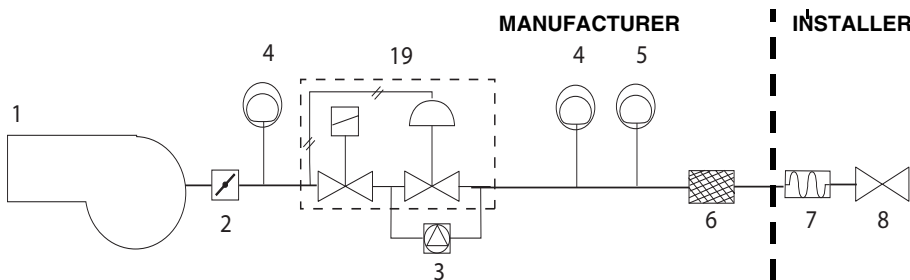
**Gas train - 2** Gas train with valves group VGD 20/40.. with built-in gas pressure governor + VPS504 gas proving system



**Gas train - 3** Gas train with valves group MBC 1200SE (2 valves + gas filter + pressure governor) + VPS504 gas proving system



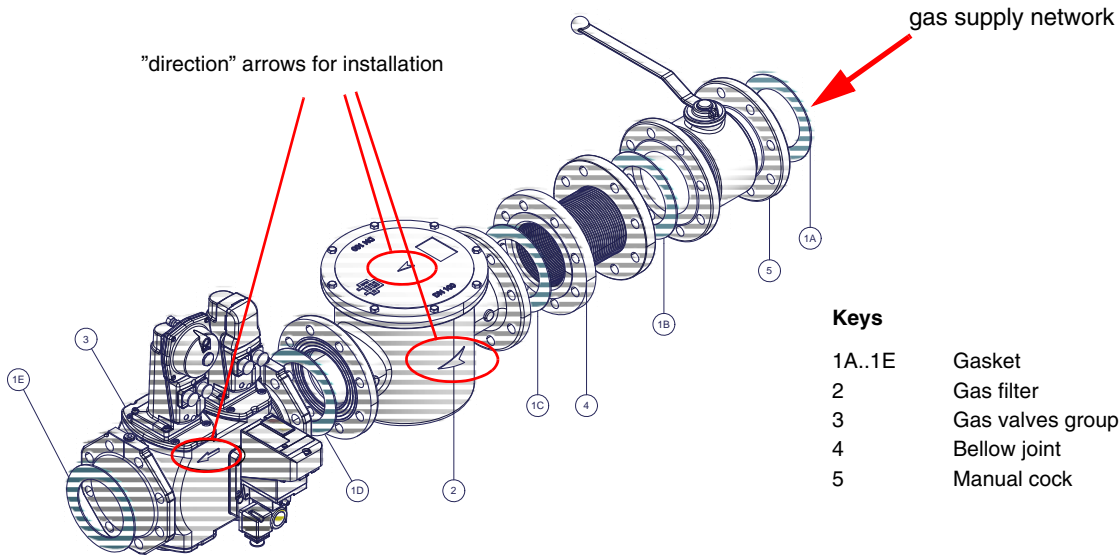
**Gas train - 4** Gas train with valves group MBC 1900/3100/5000SE (2 valves + gas filter + pressure governor) + VPS504 gas proving system



- Key**
- |   |   |
|---|---|
| 1 Burner                                | 8 Manual cutoff valve                         |
| 2 Butterfly valve                       | 9 MB-DLE Valves group                         |
| 3 Gas proving system (option)           | 10 VGD Valves group                           |
| 4 Maximum gas pressure switch (option*) | 18 MBC Valves group (2" with filter provided) |
| 5 Minimum gas pressure switch           | 19 MBC Valves group (DN65/80/100)             |
| 6 Gas filter                            |   |
| 7 Bellow joint                          |   |

\*Note: the high gas pressure switch can be mounted either upstream the gas valve or downstream the gas valves but upstream the butterfly gas valve.

**Assembling the gas grain**



**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.

	<b>ATTENTION:</b> 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.
--	--

	<b>ATTENTION:</b> 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.

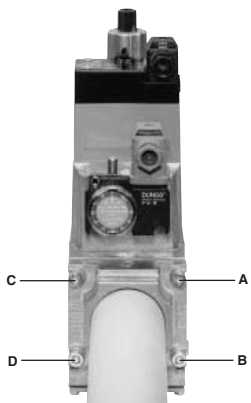


Fig. 6

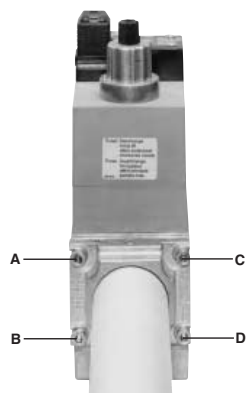


Fig. 7

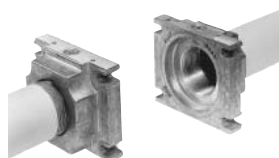


Fig. 8

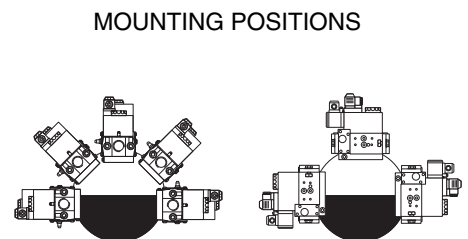


Fig. 9



**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

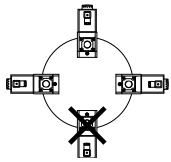
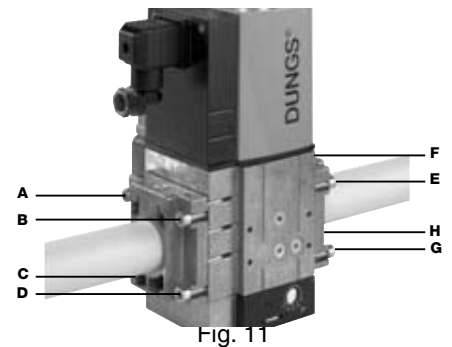
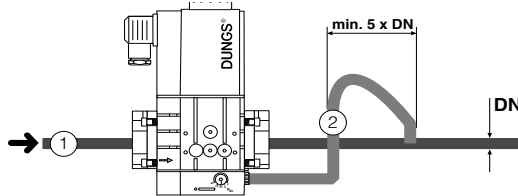
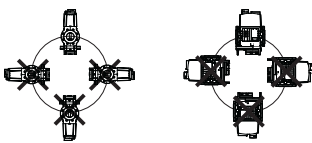
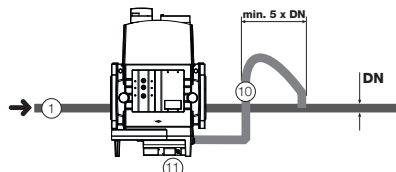
**MOUNTING****POSITIONS****OPTION**

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

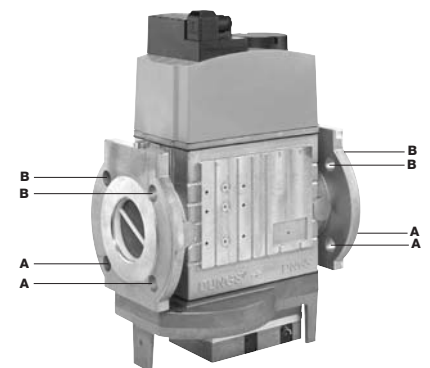


Fig. 12

**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), 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!

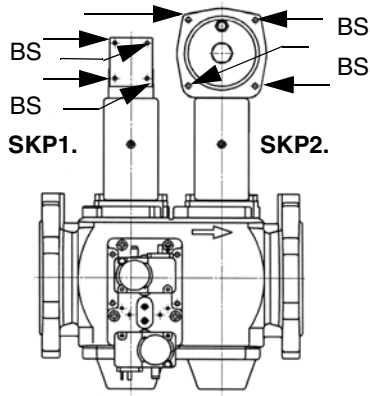


Fig. 13

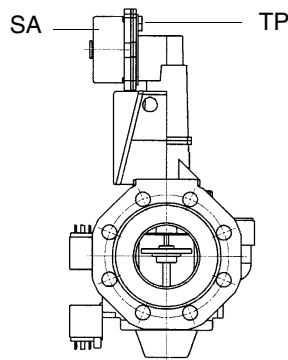


Fig. 14

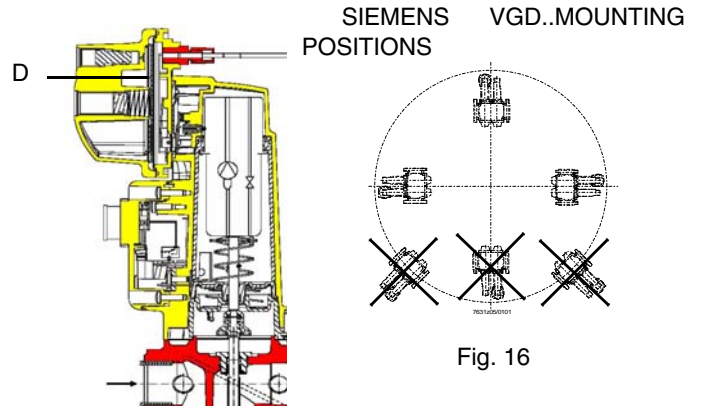
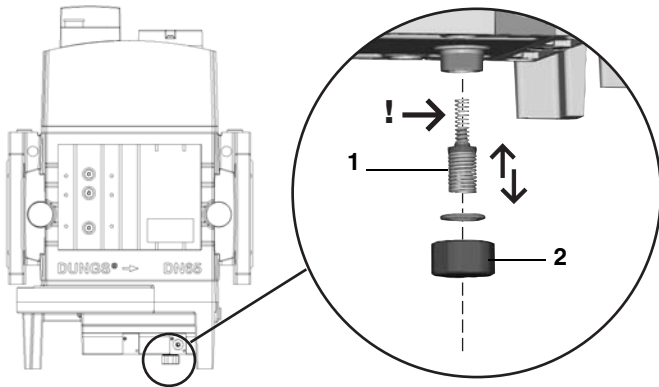


Fig. 15

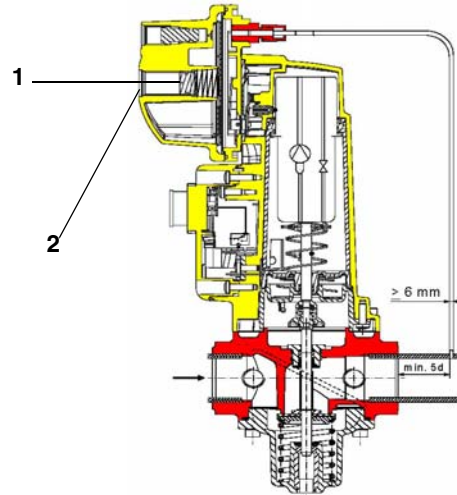
Fig. 16

**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:**

<b>Performance range (mbar)</b>	4 - 20	20 - 40	40 - 80	80 - 150
<b>Spring colour</b>	-	red	black	green

**Siemens VGD valves with SKP actuator :**

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

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

**⚠ ATTENTION:** once the gas train is mounted according to the diagram on Fig. 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. 17 - Gravity circuit

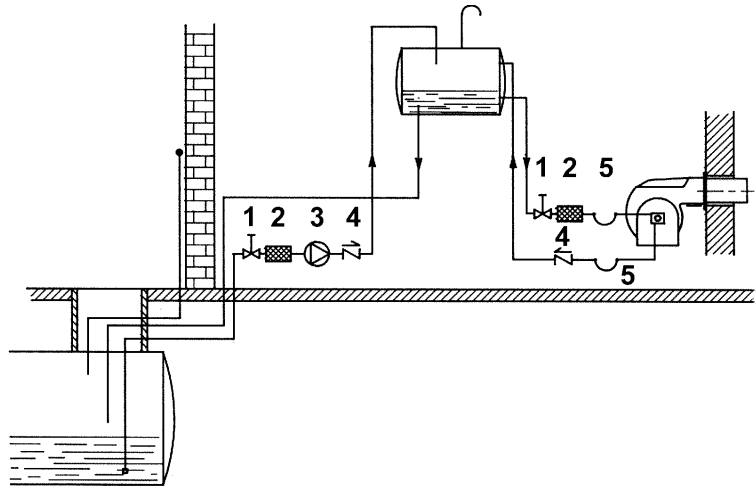


Fig. 18 - Ring circuit

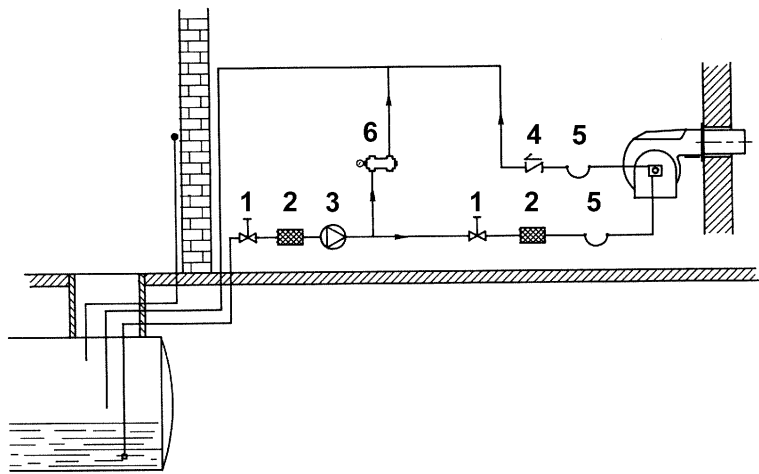
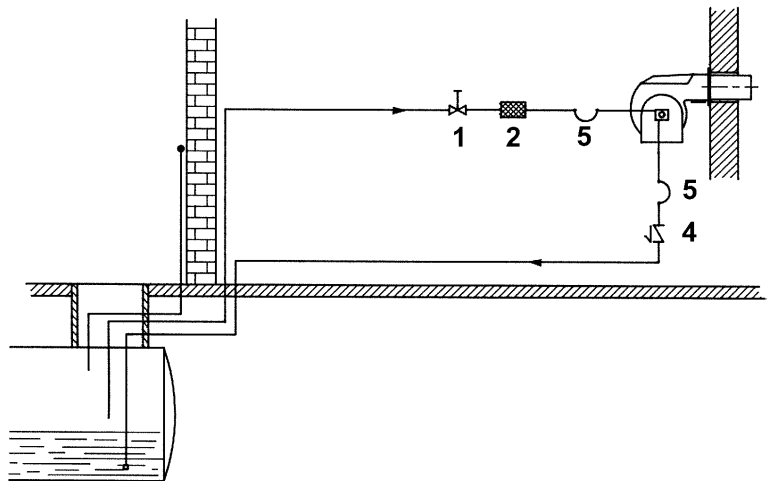


Fig. 19 - Suction circuit



**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. 20).

## Light oil piping installation diagram

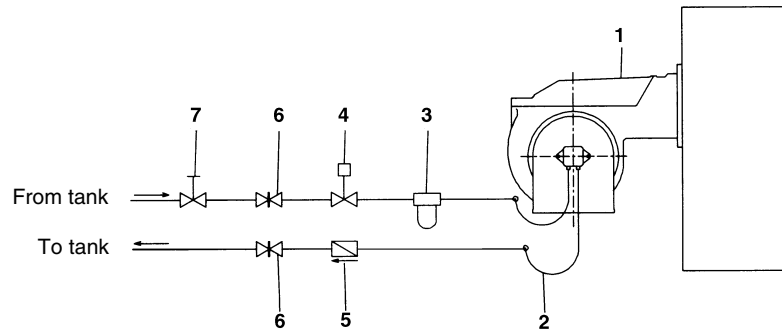


Fig. 20

### 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.

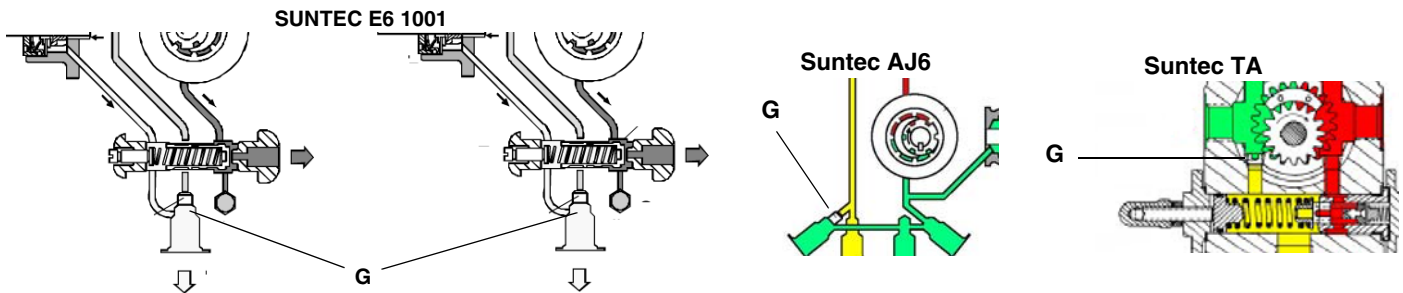
The pumps that are used can be installed both into single-pipe and double-pipe systems.

**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.

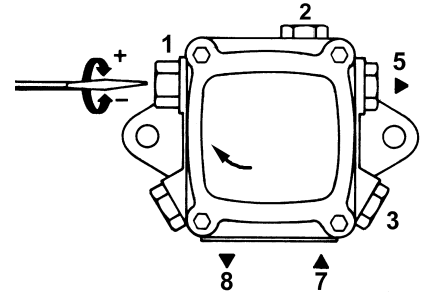
- Do not use PTFE tape on the suction and return line pipes to avoid the possibility that particles enter circulation. These could deposit on the pump filter or the nozzle, reducing efficiency. Always use O-Rings or mechanical seal (copper or aluminium gaskets) junctions if possible.
- An external filter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

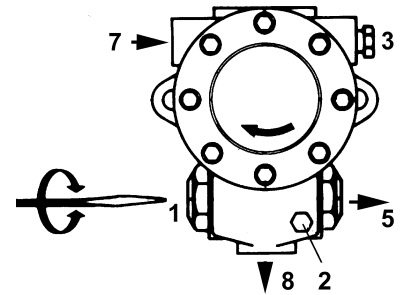
<b>Suntec AJ6</b>	
Viscosity	2 - 75 cSt
Oil temperature	60°C max
Inlet maximum pressure	2 bar
Inlet minimum pressure	- 0.45 bar to avoid gasing
Rated speed	3600 rpm max.



**Key SUNTEC AJ6**

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

<b>Suntec E7 1001</b>	
Oil viscosity	2,8 ÷ 450 cSt
Oil temperature	0 ÷ 90°C
Inlet maximum pressure	1,5 bar
Maximum return pressure	1,5 bar
Minimum inlet pressure	- 0.45 bar to avoid gasing
Rotation speed max.	3600 rpm

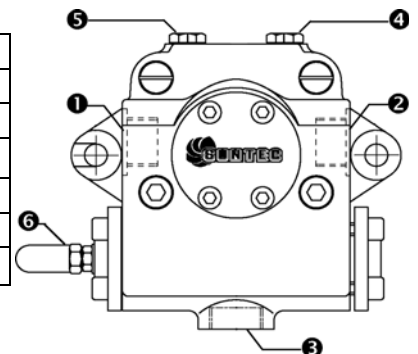


Pump : Suntec E

**Key SUNTEC E**

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

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



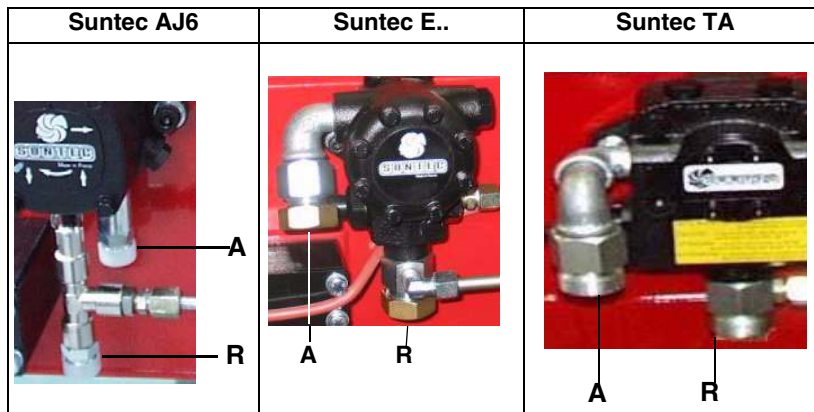
**Keys SUNTEC TA**

- 1 InletPressure governor
- 2 To nozzle
- 3 Return
- 4 Pressure gauge port
- 5 Vacuum or inlet pressure gauge port and internal by-pass plug
- 6 Pressure adjustment
- 7 Preheater cavity

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

To execute the electrical connections, proceed as follows:

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

Connect the three-phase supply to terminals L1, L2, L3 and PE (ground); then shunt the phase and neutral wires (Fig. 22) for the auxiliaries on the printed circuit (N-terminal = neutral; L-terminal = phase)



Fig. 21: Power supply terminal board

- IG: main switch
- KM1: fan motor contactor
- KM2: pump motor contactor
- MP: pump motor
- MV: fan motor
- TP: pump motor thermal cutout
- TV: fan motor thermal cutout

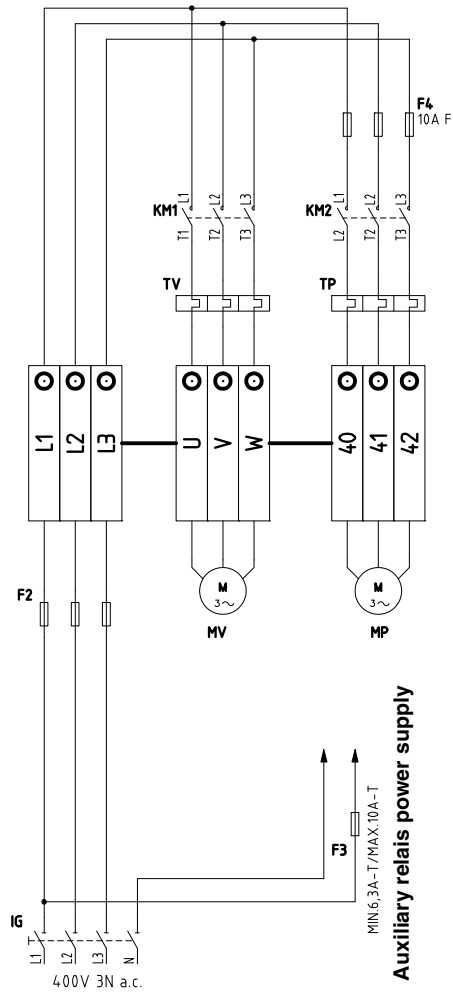


Fig. 22: Motors connectioni

**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.**

	<b>CAUTION: adjust the thermal cut-out according to the motor rated current value.</b>
--	--



**Electrical wiring diagram for burners provided with printed circuit (standard configuration).**

.As far as connections, refer to the terminal block showed on Fig. 23.

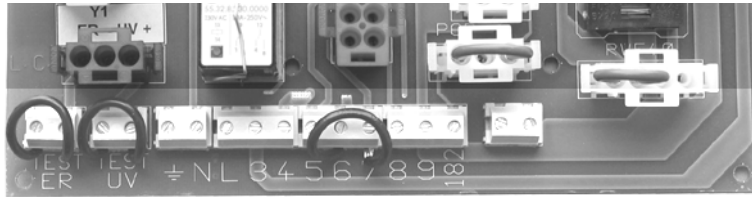


Fig. 23: Terminal board for connections on printed circuit

- 1 Connect the signal conductors from the boiler to the burner, as for the next elements (Fig. 24 - Fig. 26):  
**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. 24 - Fig. 26)  
**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. 25).

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

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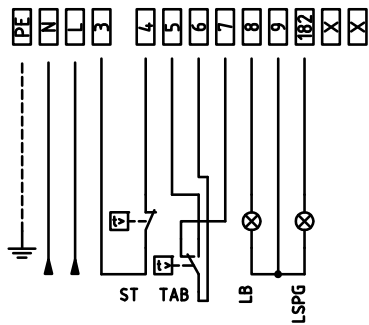


Fig. 24: Progressive burners

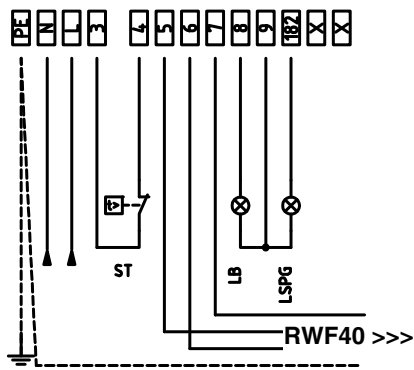


Fig. 26: Fully modulating burners

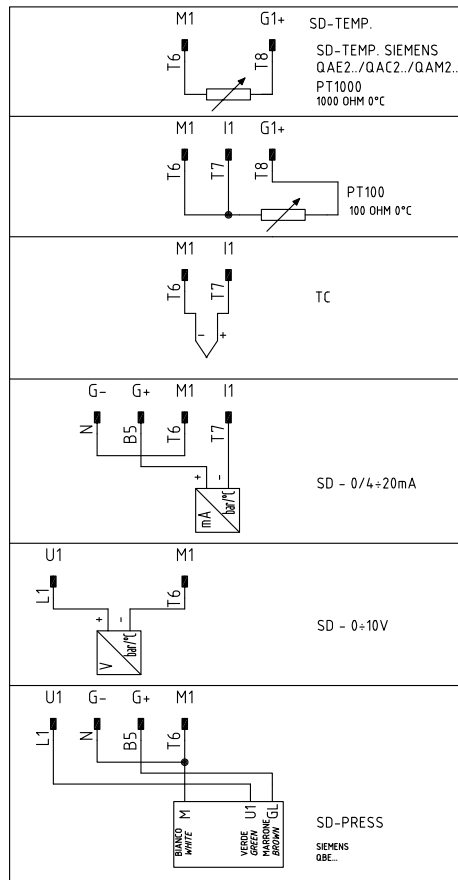


Fig. 25: Probes connection

**Electrical wiring diagram for burners with no printed circuit board provided**

If the burner is ordered without printed circuit board, follow the next connections diagrams.

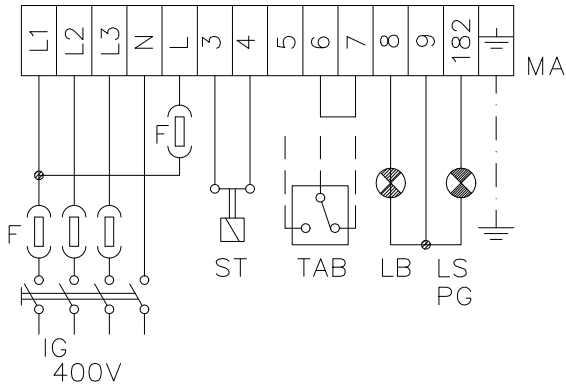


Fig. 27 Progressive burners

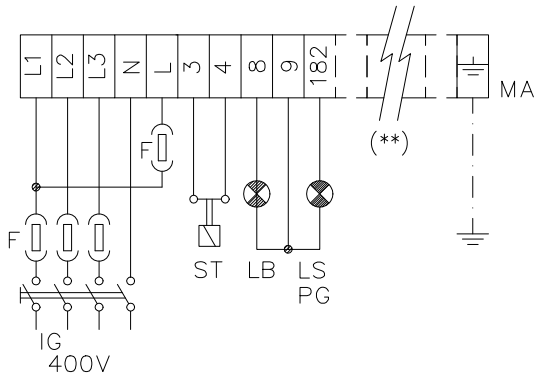


Fig. 29 Fully modulating burners

(\*\*) Probes connection (Fig. 28)

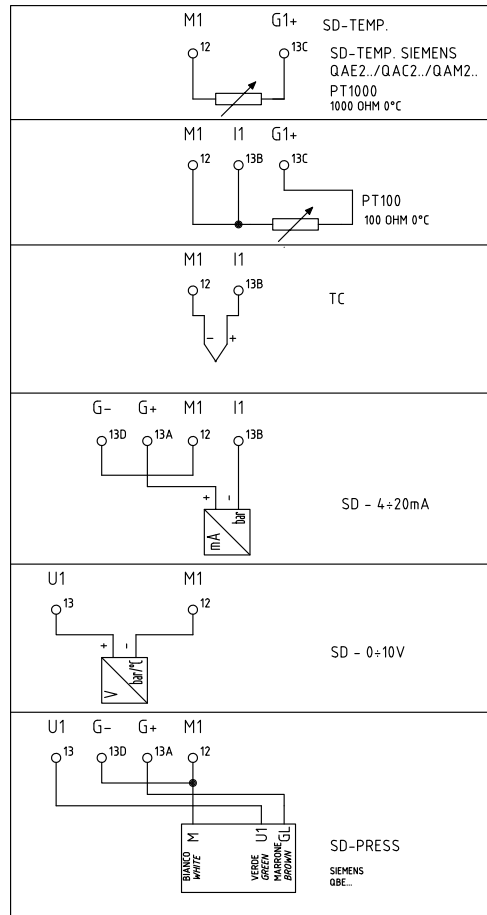


Fig. 28 Probes connection

**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:** the 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.

	<b>CAUTION:</b> adjust the thermal cut-out according to the motor rated current value.
--	--

**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 O<sub>2</sub> 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. 30, 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.

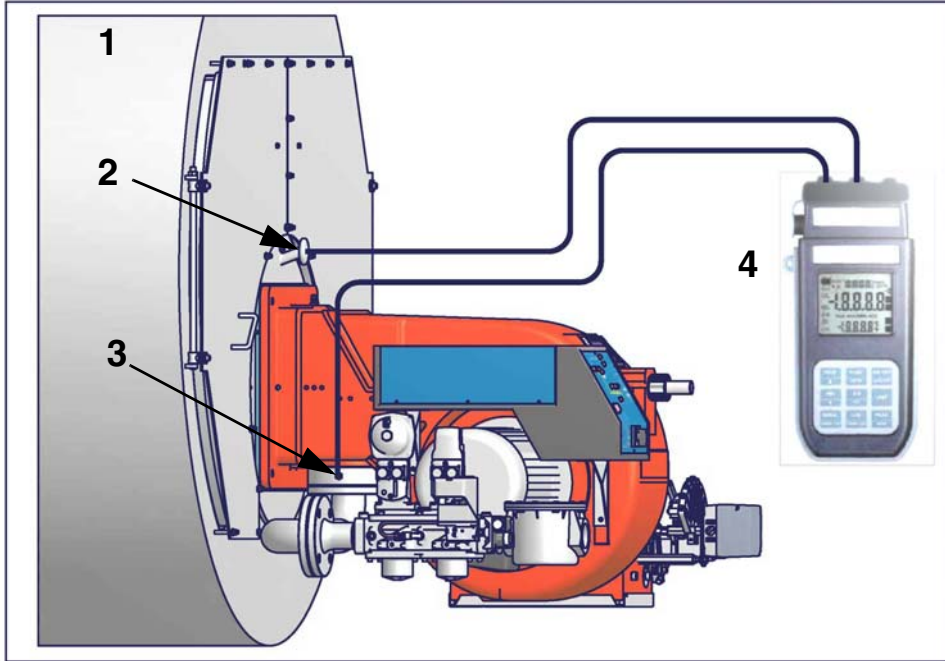


Fig. 30

**Key**

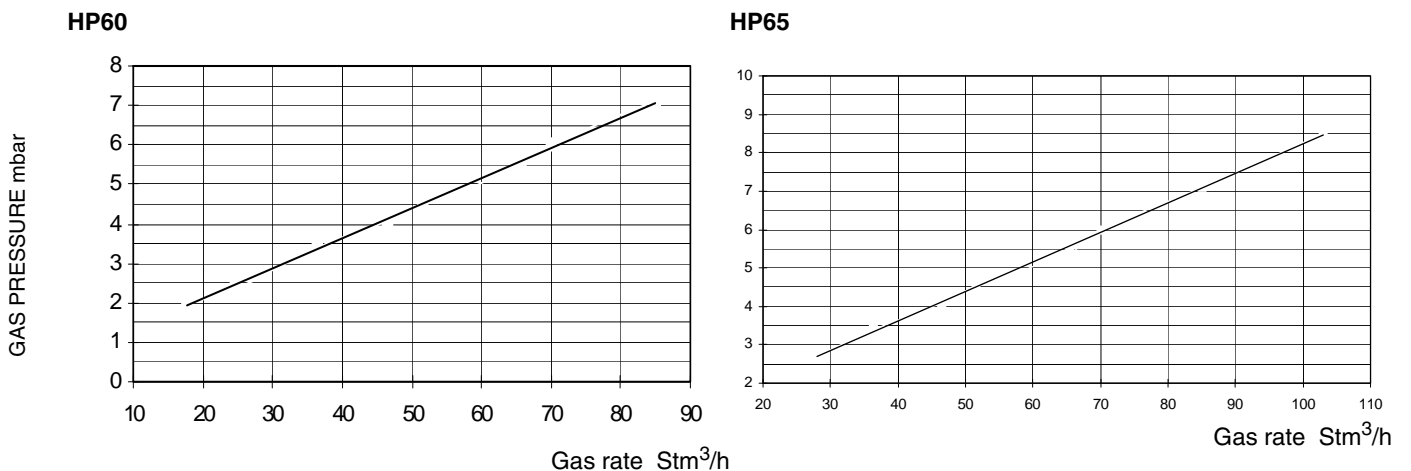
- 1 Generator
- 2 Pressure outlet on the combustion chamber
- 3 Gas pressure outlet on the butterfly valve
- 4 Differential pressure gauge

**Measuring the gas pressure in the combustion head**

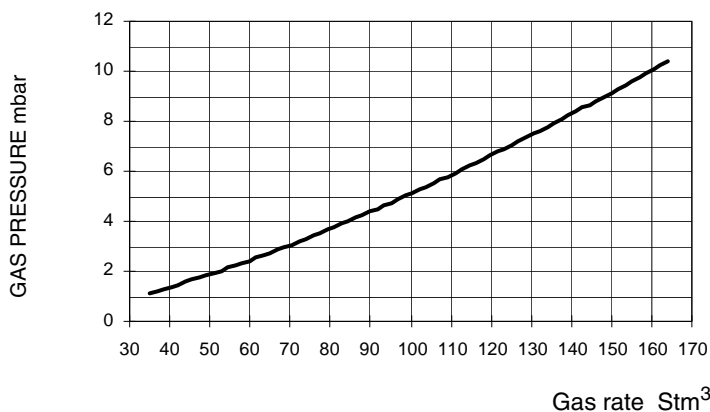
In order to measure the pressure in the combustion head, insert the pressure gauge probes: one into the combustion chamber's pressure outlet (Fig. 30-2) to get the pressure in the combustion chamber and the other one into the butterfly valve's pressure outlet of the burner (Fig. 30-3). On the basis of 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 Stm<sup>3</sup>/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.**

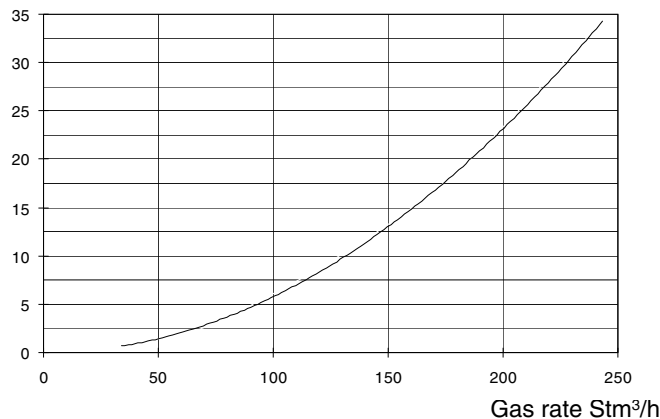
**Pressure in combustion head - gas rate curves**




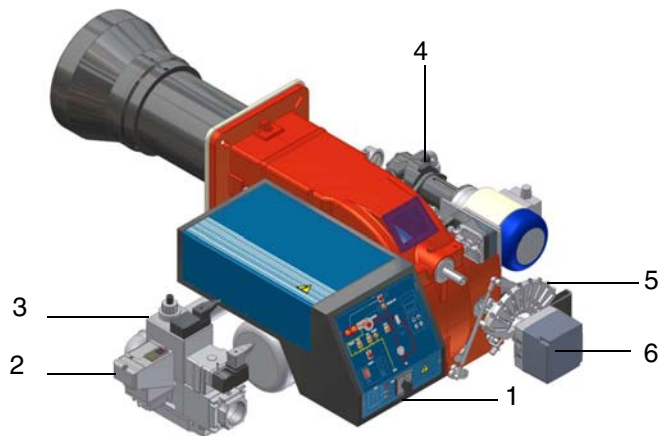
HP72



HP73A



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



**Keys**

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

Fig. 31

**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.

**VPS504 Gas proving system**

The VPS504 check the operation of the seal of the gas shut off valves. This check is carried out as soon as the boiler thermostat gives a start signal to the burner, creating, by means of the diaphragm pump inside it, a pressure in the test space of 20 mbar higher than the supply pressure.

When wishing to monitor the test, install a pressure gauge ranged to that of the pressure supply point PA.

If the test cycle is satisfactory, after a few seconds the consent light LC (yellow) comes on. In the opposite case the lockout light LB (red) comes on.

To restart it is necessary to reset the appliance by pressing the illuminated pushbutton LB.

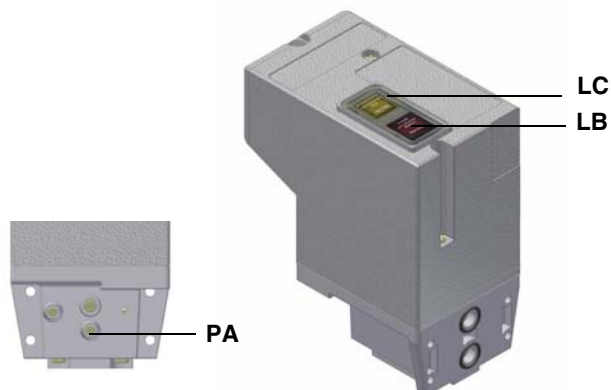


Fig. 32

## Actuator

The actuator provided can be either berger STM30../Siemens SQM40.. (see page 27) 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 <sub>2</sub>	Recommended (%) O <sub>2</sub>
Natural gas	9 ÷ 10	3 ÷ 4.8
Light oil	11.5 ÷ 13	2.9 ÷ 4.9

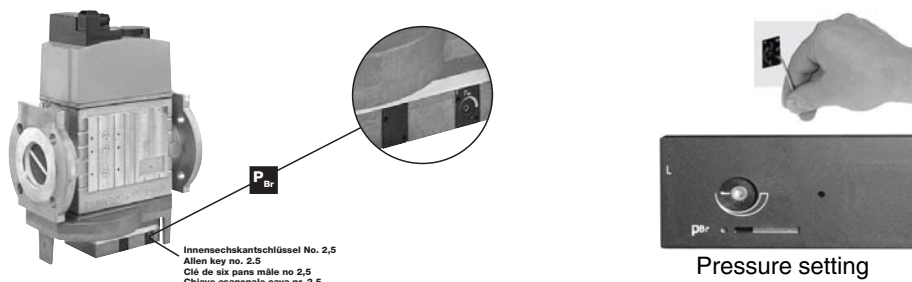
### Adjustments - brief description

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

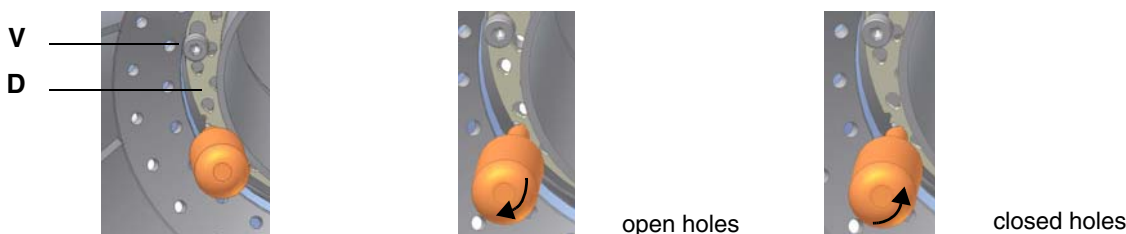


**CAUTION:** perform these adjustments once the burner is turned off and cooled.

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.

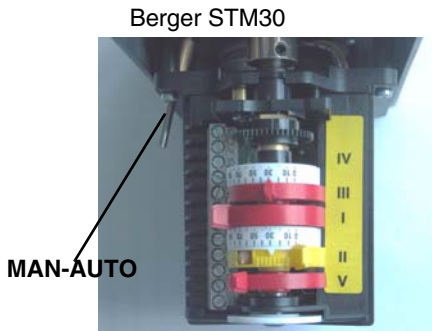
To adjust the gas flow, partially close the holes, as follows:

- 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 adjustmet 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

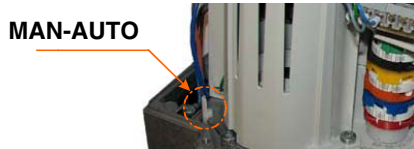


Siemens SQM40



Actuator cams

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

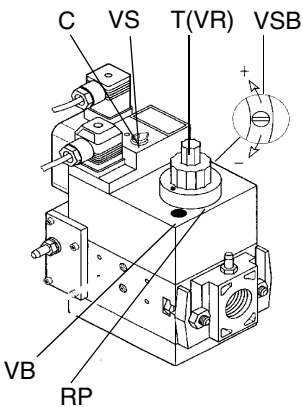


- 1 ;set GAS fuel by means of the burner **CM** switch (it is placed on the burner control panel - see page 39)
  - 2 open the electrical panel to check the fan motor rotation (see paragraph page 24)
  - 3 Only for burners provided with **Multibloc MB-DLE gas valves**: before starting the burner up, 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 **VSB** 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 analisys, 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:

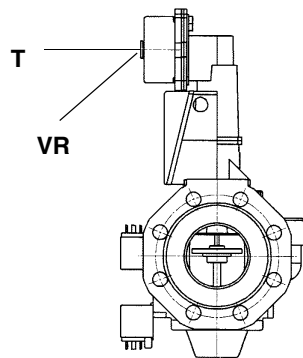
-**Multibloc MB-DLE:**The pressure governor is adjusted by operating the screw **VS** located under the cover **C**. By screwing down the pressure is increased and by unscrewing it is reduced. The valve is adjusted by means of the **RP** regulator after slackening the locking screw **VB** by a number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

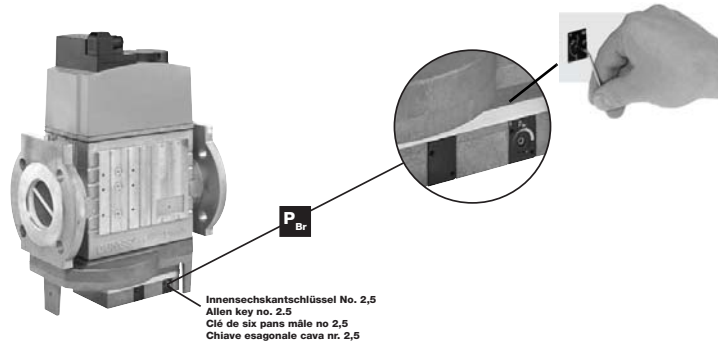
- **Dungs MBC..SE valves group:** act on its pressure governor to increase or decrease the pressure and consequently the gas rate.



Dungs Multibloc MB-DLE



Siemens VGD..



Dungs MBC..SE

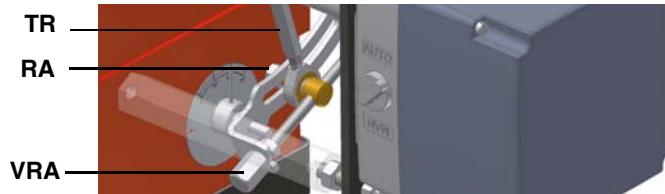
Fig. 33

- 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

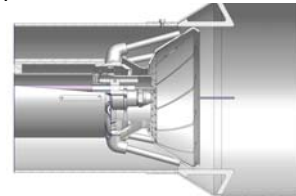
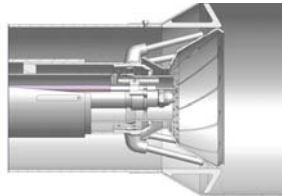
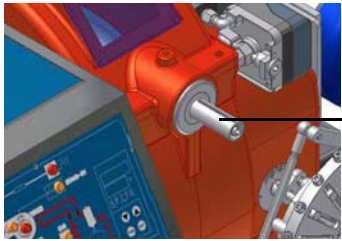


shaft the air damper closes and the air flow rate decreases.

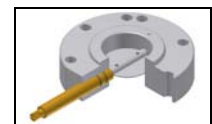
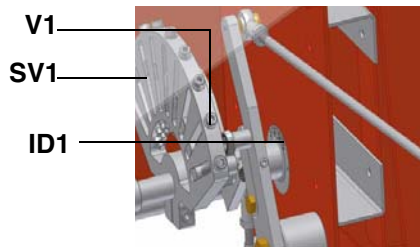
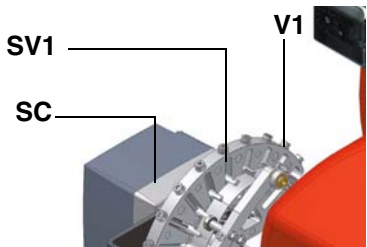
**Note:** once the procedure is performed, be sure that the blocking nut **RA** is fasten. Do not change the position of the air damper rods.



- 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.



- 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.



- 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.).

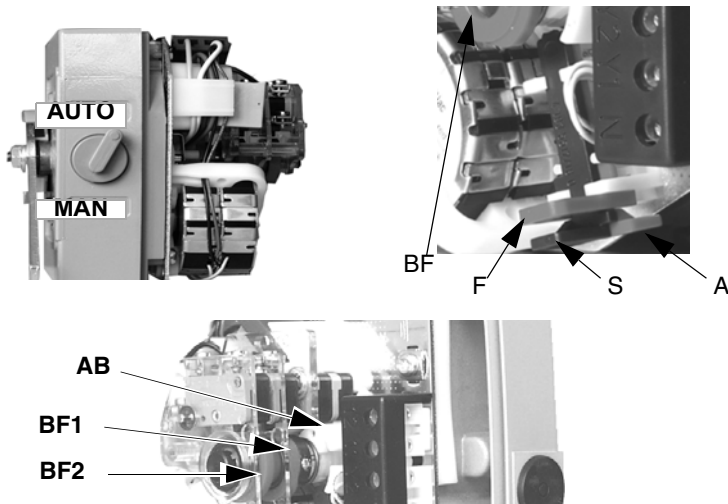


**Settings by means of the Siemens SQL33.. actuator**

- 1 set GAS fuel by means of the burner **CM** switch (it is placed on the burner control panel - see page 39)
- 2 open the electrical panel to check the fan motor rotation and act directly on the related contactor (see next picture)
- 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 Start the burner up by means of the thermostat series and wait until the pre-purge time comes to an end;
- 5 the burner starts up with the actuator on the ignition position, set it to the **MAN** (manual mode), by the **MAN/AUTO** selector (ignition position= read on the air damper index **ID1** - see picture on pag.31);
- 6 Disconnect the **TAB** thermostat removing the wire from the terminal no. 6 or by setting MAN on the burner modulator or by setting 0 by means of the **CMF** switch (only for fully-modulating burners);
- 7 set the actuator on the manual mode (MAN) by means of the MAN/AUTO switch (see next pictures).
- 8 manually drive the adjusting cam **SV1** to the high flame position and set the actuator to the AUTO mode (by the related switch - see picture) to lock the adjusting cam.

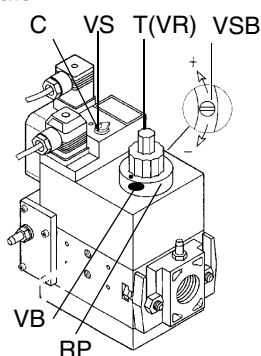


**SQL33.. actuator cams**

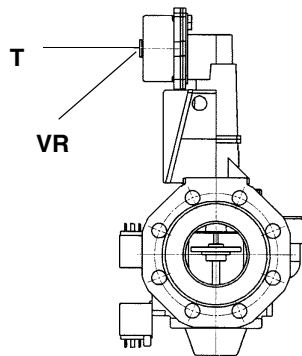
- A = (red) cam locking lever for "high flame"
- S = (green) cam locking lever for "stand-by and ignition"
- F = plastic cam
- BF1 = Low flame (gas)
- BF2 = Low flame (oil)

- 9 go on adjusting air and gas flow rates: check, continuously, the flue gas analysis, as to avoid combustion with little air; dose the air according to the gas flow rate change following the steps below; acting on the pressure stabiliser of the valves group, adjust the **gas flow rate in the high flame stage** as to meet the values requested by the boiler/utilisation:

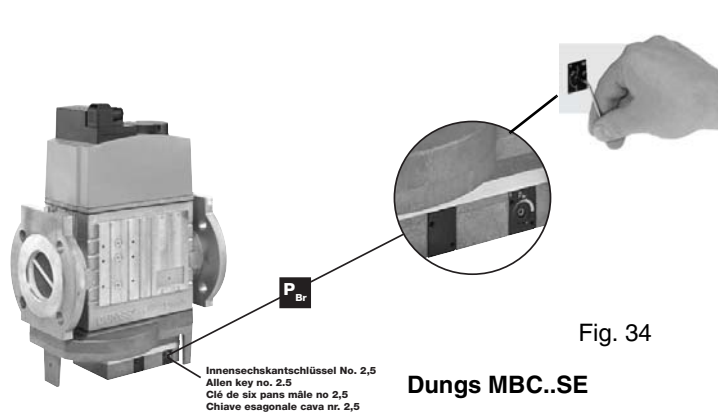
- **Multibloc MB-DLE:**The pressure governor is adjusted by operating the screw **VS** located under the cover **C**. By screwing down the pressure is increased and by unscrewing it is reduced. The valve is adjusted by means of the **RP** regulator after slackening the locking screw **VB** by a number of turns. By unscrewing the regulator **RP** the valve opens, screwing the valve closes.
- **Siemens VGD valves group:** remove cap **T** and act on the **VR** adjusting screw to increase or decrease the pressure and consequently the gas rate; screwing **VR** the rate increases, unscrewing it decreases (see next figure).
- **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..**

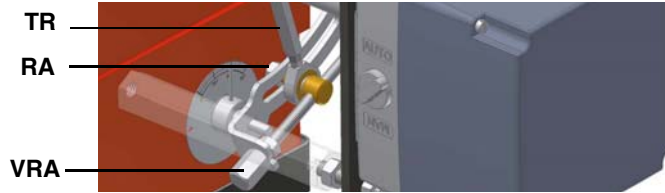


**Fig. 34**

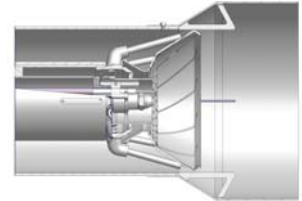
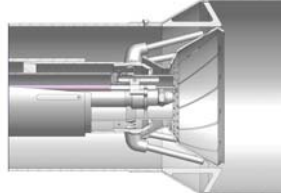
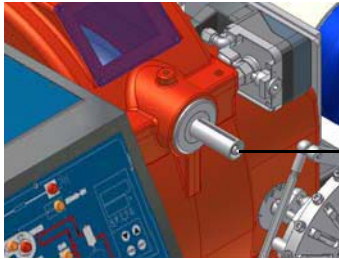
**Dungs MBC..SE**

- 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 fasten. Do not change the position of the air damper rods.

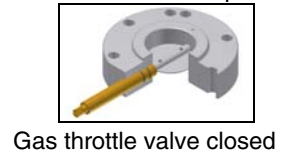
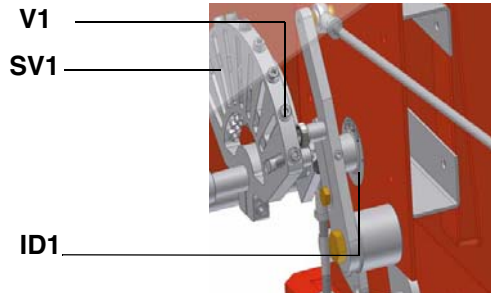
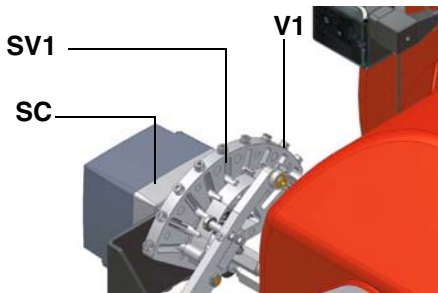


11 The burner is factory-set with the head in its MAX position (maximum output). To let the burner operate at a lower output, turn clockwise the **VRT** screw and move progressively the combustion head back towards the MIN position.

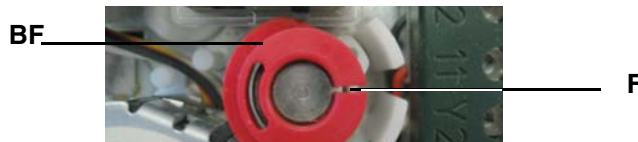


**Attention!** if it is necessary to change the head position, repeat the air and gas adjustments described above.

- 12 the air and gas rate are now adjusted at the maximum output, go on with the point to point adjustment on the **SV1** adjusting cam as to reach the minimum output point: gradually move the adjusting cam in order to adjust each of the **V1** screws as to set the cam foil shape as described on the next steps;
- 13 to change the **SV1** position set the actuator on the manual mode (MAN), turn the adjusting cam **SV1** and set again the actuator to the AUTO mode to lock the adjusting cam;
- 14 act on the **V1** screw that matches the bearings referring to the adjusting cam position;
- 15 to adjust the next screw, set again the actuator mode to MAN, turn the adjusting cam and set the actuator to AUTO mode to lock the adjusting cam on the next screw; adjust it and go on this way to adjust all the screws in order to set the cam foil shape, according to the combustion values read.
- 16 Once the cam foil shape is defined, reconnect the **TAB** thermostat reconnecting the wire to the terminal no.6 or setting the RWF40 burner modulator to AUTO or the CMF switch to 3 (only for fully-modulating burner).



- 17 Turn the burner off, then start it up again.
- 18 Once the pre-purge time comes to end, drive the burner to the high flame stage by the **TAB** thermostat and check the combustion values;
- 19 drive the burner to low flame, if necessary adjust the low flame size (output) by inserting a screwdriver on the slot **F** to move the **BF1** cam.



20 The low flame position must never match the ignition position that is why cam **BF1** must be set 20°- 30° more than the ignition position (see **ID1** index on previous pictures).

Now adjust the pressure switches (see next paragraph).

### 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 high gas pressure switch (when provided)

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

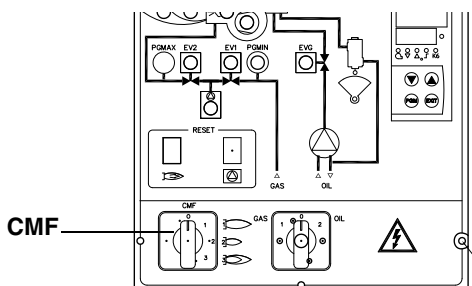
- 1 remove the pressure switch plastic cover;
- 2 if the maximum pressure switch is mounted upstream the gas valves: measure the gas pressure in the network, when flame is off; by means of the adjusting ring nut **VR**, set the value read, increased by the 30%.
- 3 if the maximum pressure switch is mounted 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. 36 (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/dm<sup>3</sup>

**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.

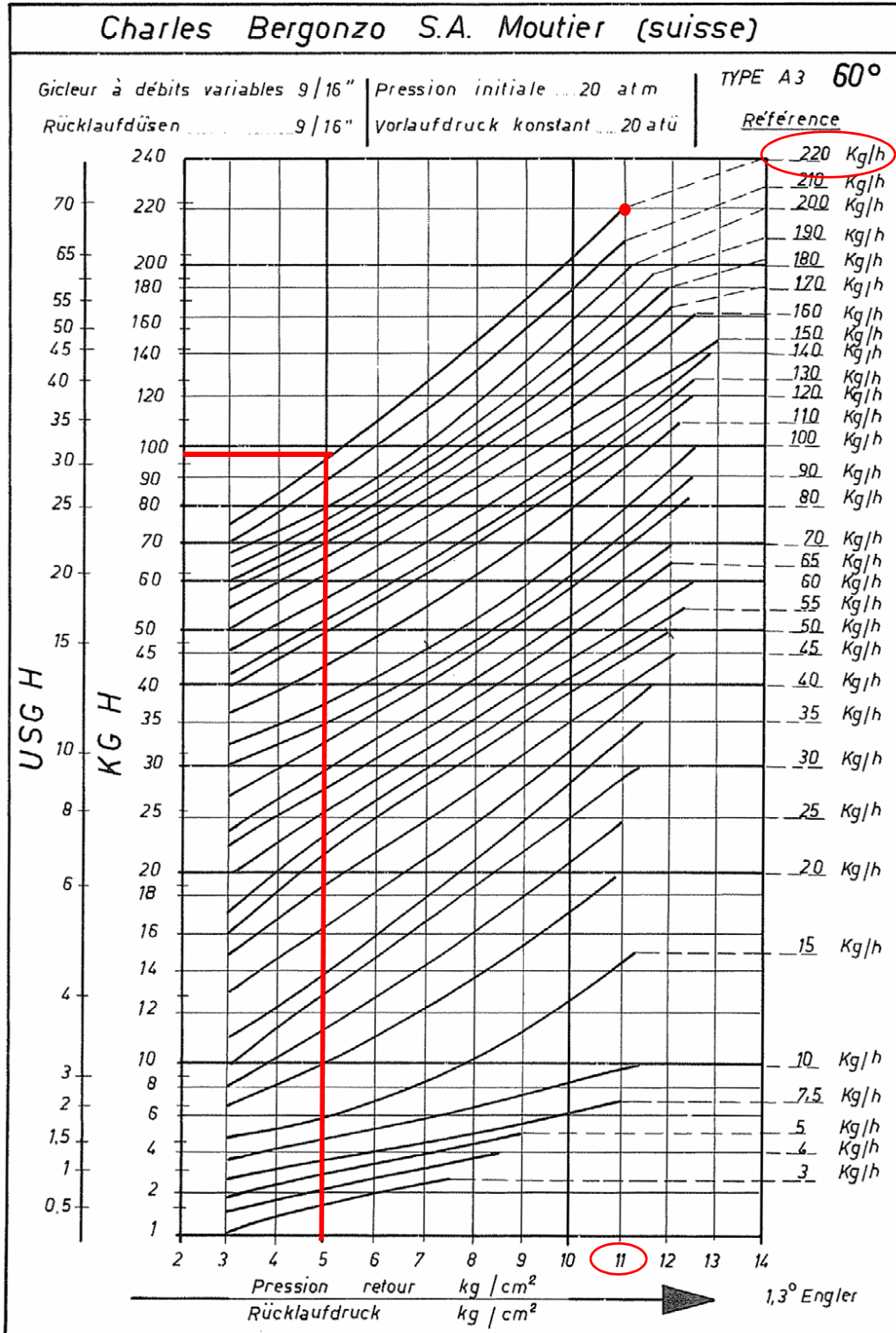


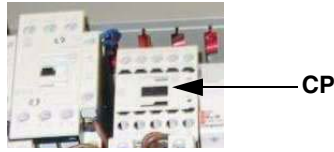
Fig. 36

**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 39).
- 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. 37) by loosening the cap without removing it, then release the contactor.

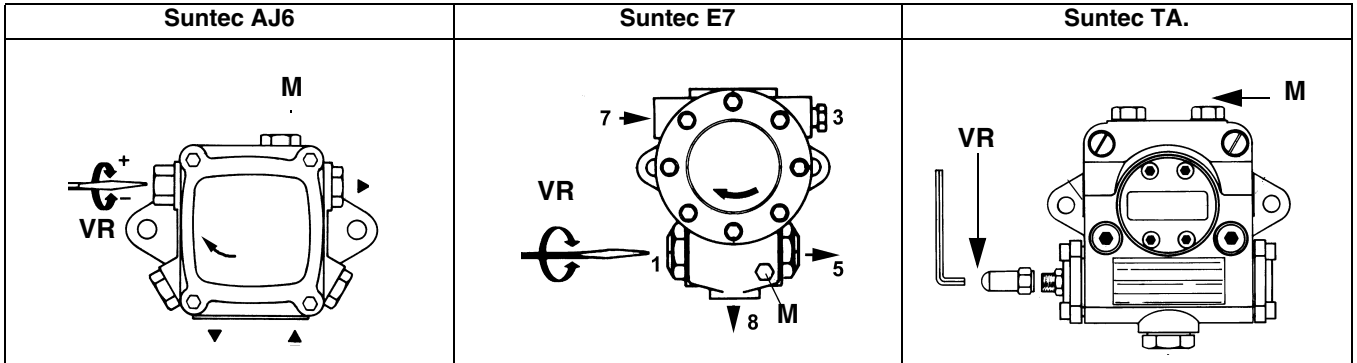


Fig. 37

- 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).

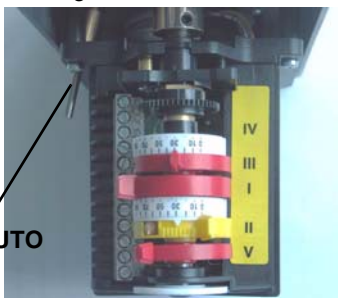
**Siemens SQM40**



**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. 38 and act on on the pump adjusting screw **VR** (see

Fig. 37) as to get the nozzle pressure at 20bar (Monarch or Fluidics nozzles - see page 33-34).

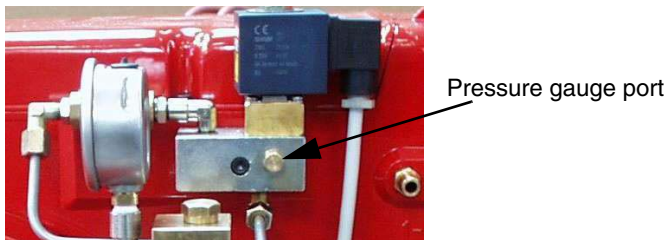


Fig. 38

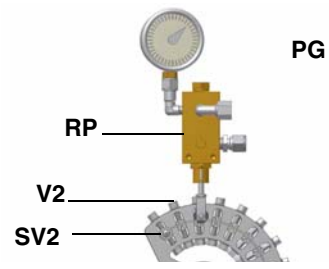


Fig. 39

- 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.

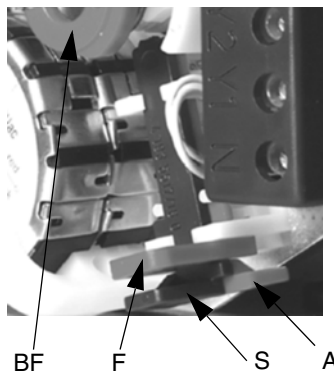
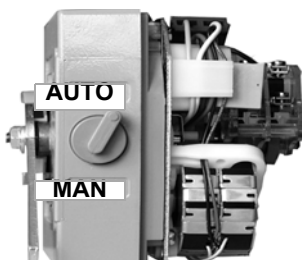
Turn the burner off; then start it up again. If the adjustment is not correct, repeat the previous steps.

**Adjustment by the Siemens SQL33.. 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 39).
- 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;;



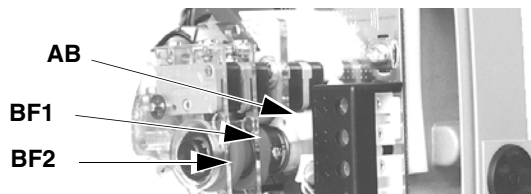
- 3 bleed the air from the **M** pressure gauge port (Fig. 37) by loosening the cap without removing it, then release the contactor.
- 4 record the high flame value set during the gas operation adjustments (see previous paragraphs);
- 5 Start the burner up by means of the thermostat series and wait until the pre-purge phase comes to end and that burner starts up;
- 6 the burner starts up with the actuator on the ignition position, set it to the **MAN** (manual mode), by the **MAN/AUTO** selector (ignition position= read on the air damper index **ID1** - see picture on pag.37);
- 7 disconnect the **TAB** thermostat removing the wire from the terminal no. 6 or by setting MAN on the burner modulator or by setting 0 by means of the **CMF** switch (only for fully-modulating burners);
- 8 manually drive the adjusting cam **SV2** to the high flame position and set the actuator to the AUTO mode (by the related switch - see picture) to lock the adjusting cam.



**SQL33.. actuator cams**

- A = (red) cam locking lever for "high flame"
- S = (green) cam locking lever for "stand-by and ignition"
- F = plastic cam
- BF1 = Low flame (gas)
- BF2 = Low flame (oil)





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. 40 and act on the pump adjusting screw **VR** (see Fig. 37) as to get the nozzle pressure at 20 bar (according to the nozzle model provided: Monarch or Bergonzo nozzles - see page 33-34).

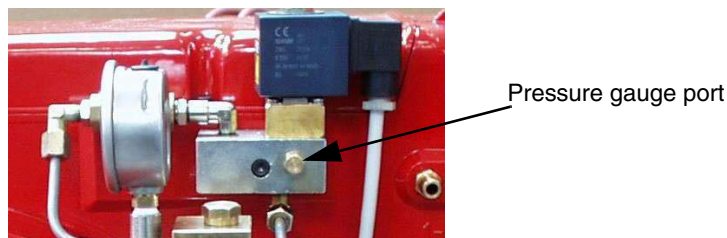


Fig. 40

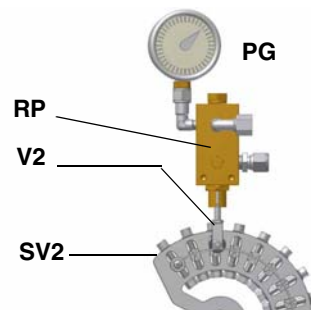


Fig. 41

- 9 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the **PG** pressure gauge) without changing the air flow rate set during the gas operation adjustments (see previous paragraph): checking always the combustion parameters, the adjustment is to be performed by means of the **SV2** adjusting cam screw (see picture) when the cam has reached the high flame position.
- 10 once the air and oil flow rate have been adjusted at the maximum output, go on with the point to point adjustment on the **SV2** adjusting cam as to reach the minimum output point: gradually move the adjusting cam in order to adjust each of the **V2** screws as to describe the cam foil shape.
- 11 to change the **SV2** position set the actuator on the manual mode (MAN), turn the adjusting cam **SV2** and set again the actuator to the AUTO mode to lock the adjusting cam;
- 12 act on the **V2** screw that matches the bearings referring to the adjusting cam position;
- 13 to adjust the next screw, set again the actuator mode to MAN, turn the adjusting cam and set the actuator to AUTO mode to lock the adjusting cam on the next screw; adjust it and go on this way to adjust all the screws in order to set the cam foil shape, according to the combustion values read.
- 14 Once the cam foil shape is defined, reconnect the **TAB** thermostat reconnecting the wire to the terminal no.6 or setting the RWF40 burner modulator to AUTO or the CMF switch to 3 (only for fully-modulating burner).
- 15 Turn the burner off then start it up again.
- 16 Once the pre-purge time comes to end, drive the burner to the high flame stage by the **TAB** thermostat: check the combustion values;
- 17 drive the burner to low flame, if necessary adjust the low flame size (output) by inserting a screwdriver on the slot **F** to move the **BF2** cam.



- 18 The low flame position must never match the ignition position that is why cam **BF2** must be set 20°- 30° more than the ignition position.
  - 19 Turn the burner off; then start it up again. If the adjustment is not correct, repeat the previous steps.
- As far as fully-modulating burners see paragraph on page 32.

**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).

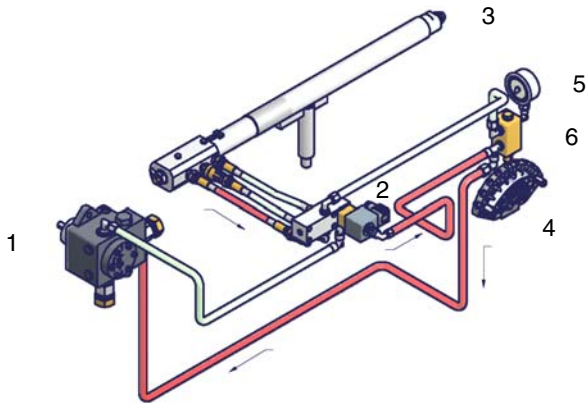


Fig. 42 - Stand-by

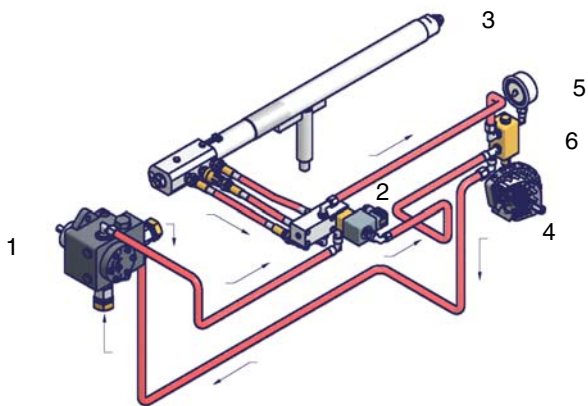


Fig. 43 - Pre-purge

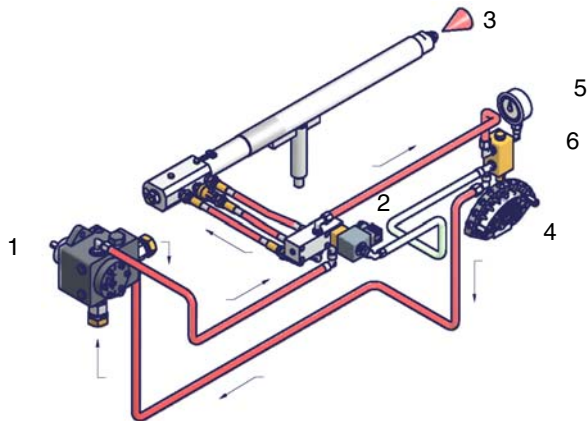


Fig. 44 - Low flame

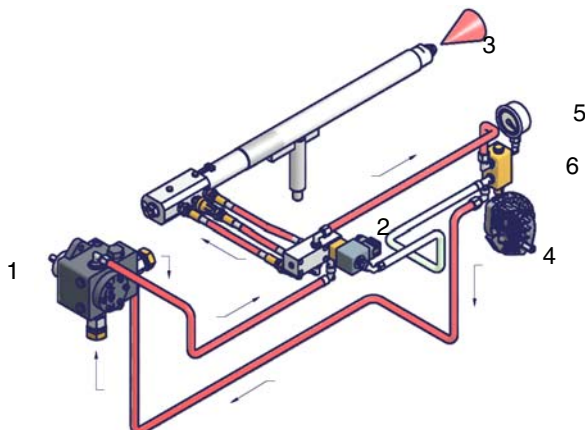


Fig. 45 - High flame

**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.



**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.

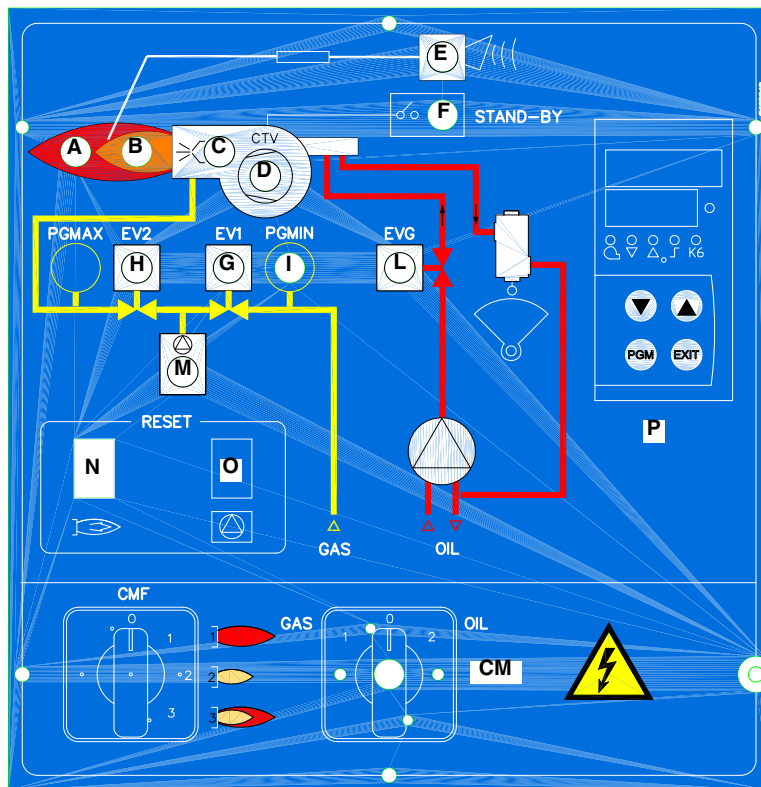
**Light oil operation**

- 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 burner 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 thermal 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 43);
- Check ignition electrodes, clean, adjust and, if necessary, replace them (see page 44);
- 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. 46-Fig. 47)  $\Delta p > 10$  mbar.
- Change the filter if the pressure difference between pressure connection 1 and 2 (Fig. 46-Fig. 47) 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. 48).
- 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.



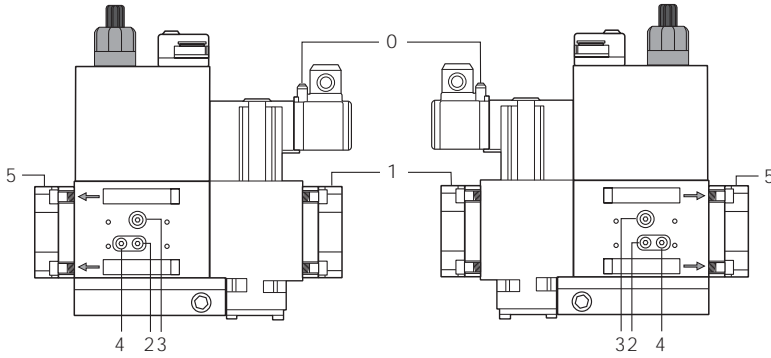


Fig. 46

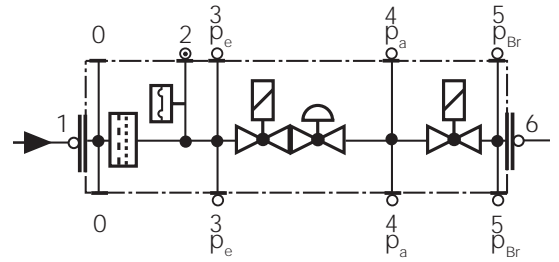


Fig. 47

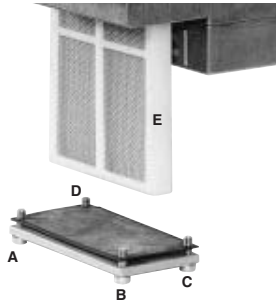


Fig. 48

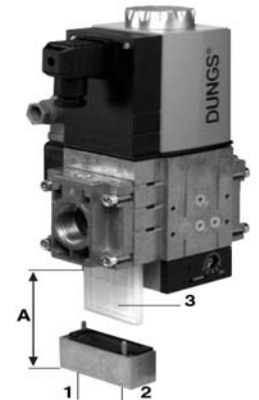
**Inspection and replacement of the MULTIBLOC DUNGS MBC..SE filter (Threaded valves group)**

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.49

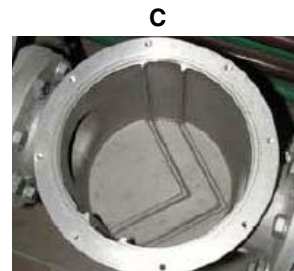
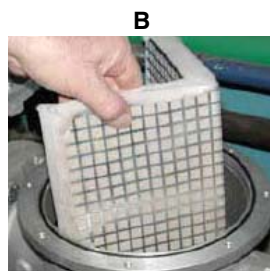
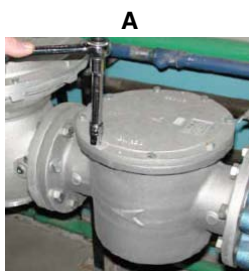


**Gas filter maintenance**

 **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:

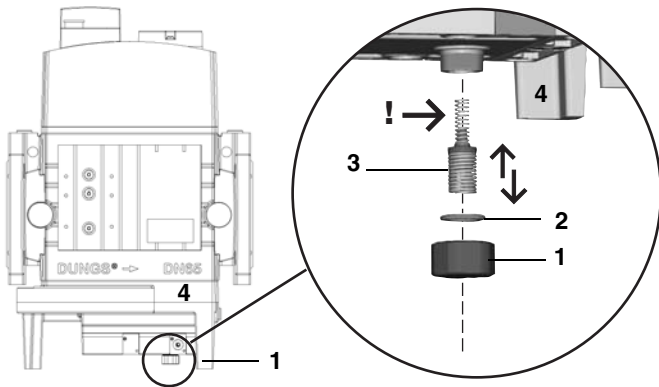
- 1 remove the cap unscrewing the fixing screws (A);
- 2 remove the filtering cartridge (B), clean it using water and soap, blow it with compressed air(or replace it, if necessary)
- 3 replace the cartridge in its proper position taking care to place it inbetween the guides as not to hamper the cap replacement;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



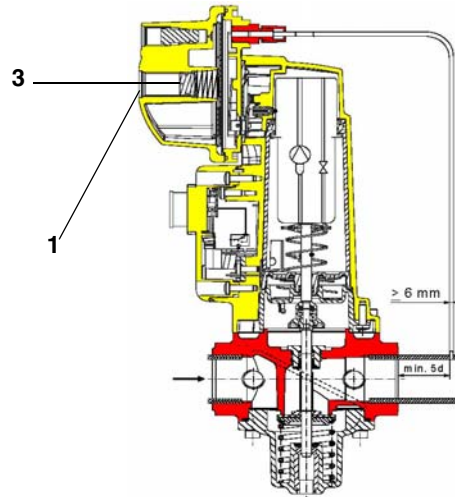
### Replacing the spring in the gas valve group

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

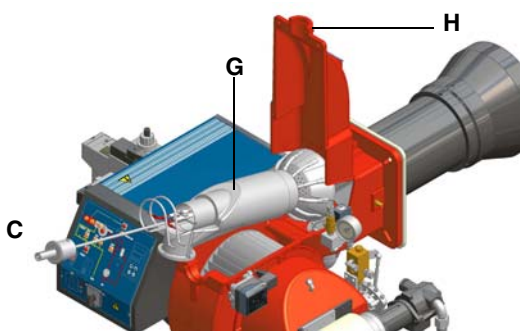
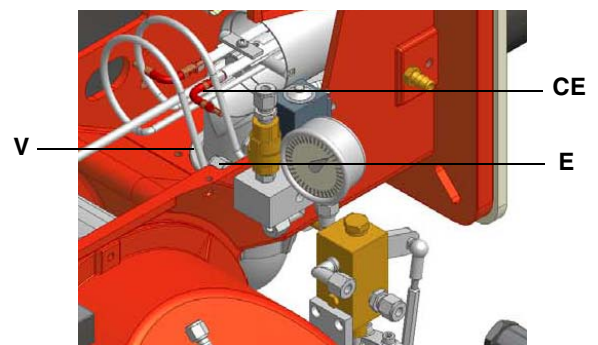
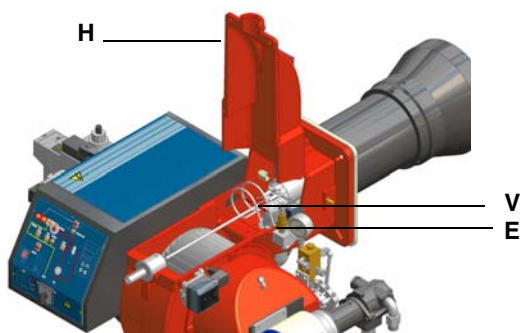


SKP Siemens actuator

### 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

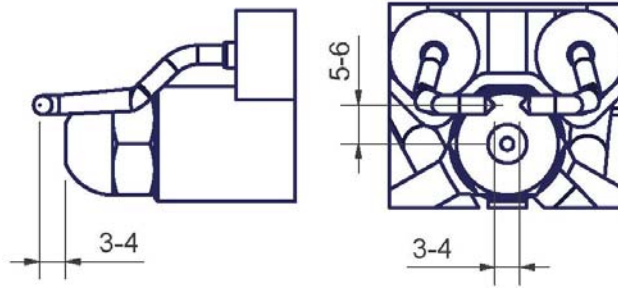


Fig. 50

HP73A

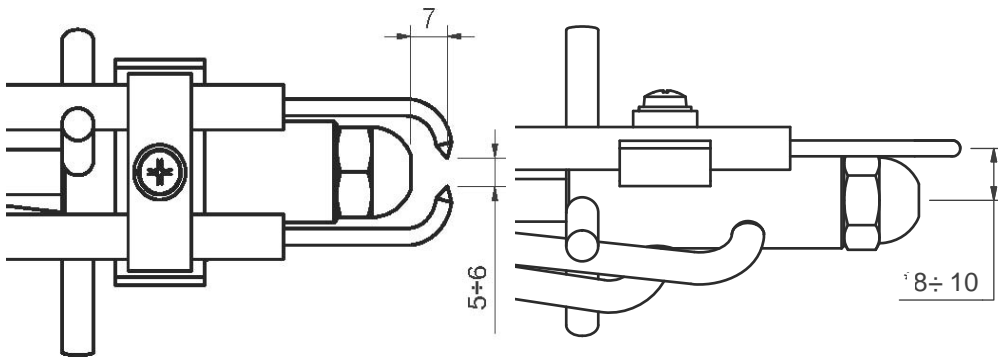


Fig. 51

**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.

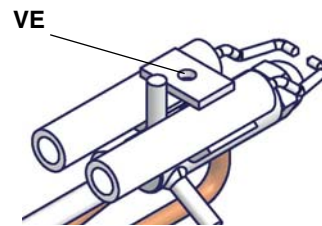
To clean/replace the electrodes, proceed as follows:

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

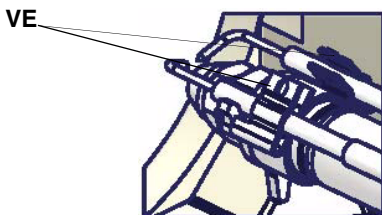
2 remove the electrodes ass.y and clean them;

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 probe**

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

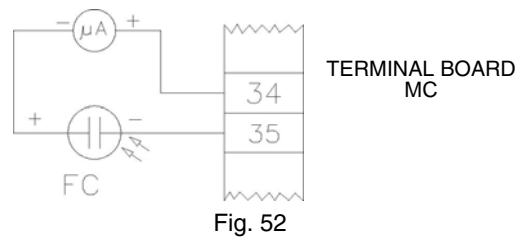
- 1 Disconnect the system from the electrical power supply.
- 2 Shut off the fuel supply
- 3 remove the photocell from its slot (see next picture);
- 4 clean the bulbe if dirty, taking care not to touch it with bare hands;
- 5 if necessary, replace the bulb;
- 6 replace the photocell into its slot.



### **Checking the detection current**

To check the detection current follow the diagram on Fig. 52. If the signal is less than the value indicated, check the position of the detection electrode or detector, the electrical contacts and, if necessary, replace the electrode or the detector.

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



### **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	URNS 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													●	

## SPARE PARTS

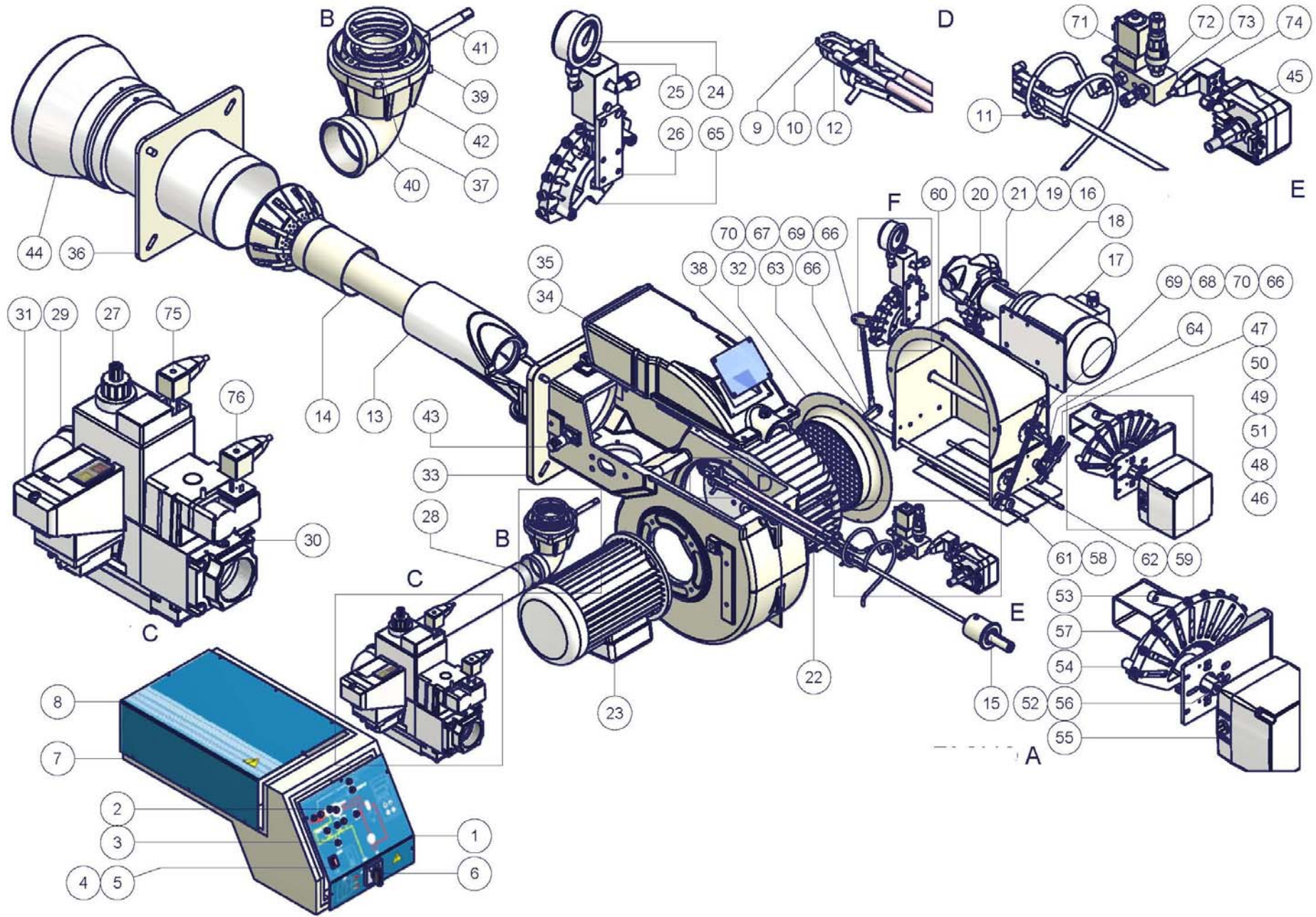
Description	Code			
	HP60	HP65	HP72	HP73A
CONTROL BOX	2020448	2020448	2020448	2020448
IGNITION ELECTRODES	20802B1	20802B1	2080280	2080278
OIL FILTER	2090018	2090018	2090018	2090018
GAS FILTER - Rp 2	2090119	2090119	2090119	2090119
GAS FILTER - DN65	2090117	2090117	2090117	2090117
GAS FILTER - DN80	-	-	2090112	2090112
GASKET	2110013	2110033	2110033	2110033
FAN WHEEL	2150044	2150038	2150038	2150068
AIR PRESSURE SWITCH	2160065	2160065	2160065	2160065
MINIMUM GAS PRESSURE SWITCH- Rp1 1/2 - Rp2	2160077	2160077	2160077	2160077
MINIMUM GAS PRESSURE SWITCH- DN65-DN80	2160076	2160076	2160076	2160076
IGNITION TRANSFORMER	2170302	2170302	2170302	2170302
PUMP MOTOR	2180201	2180201	2180201	2180201
FAN MOTOR	218025501	218020301	218021101	218025601
GAS VALVE GROUP - Rp2 - Siemens VGD20..	2190171	2190171	2190171	2190171
GAS VALVE GROUP - DN65 - Siemens VGD40..	2190172	2190172	2190172	2190172
GAS VALVE GROUP - DN80 - Siemens VGD40..	-	-	2190169	2190169
GAS VALVE ACTUATOR SKP15	2190181	2190181	2190181	2190181
GAS VALVE ACTUATOR SKP25	2190183	2190183	2190183	2190183
GAS VALVE GROUP - Rp1 1/2 - Dungs MB-DLE415	21903L3	-	-	-
GAS VALVE GROUP - Rp2 - Dungs MB-DLE420	21903L4	21903L4	21903L4	21903N2
GAS VALVE GROUP - Rp2 - Dungs MBC700SE	21903N0	21903N0	21903N0	21903N0
GAS VALVE GROUP - DN65 - Dungs MBC1900SE	21903M6	21903M6	21903M6	21903M6
GAS VALVE GROUP - DN80 - Dungs MBC3100SE	-	-	21903M7	21903M7
OIL SOLENOID VALVE	2190420	2190420	2190403	2190403
GAS PROVING SYSTEM	2191604	2191604	2191604	2191604
FLEXIBLE HOSE L=1200	2340002	2340002	-	-
FLEXIBLE HOSE L=1500	-	-	2340003	2340003
SMALL ADJUSTING CAM FOIL	2440013	2440013	2440013	2440013
BIG ADJUSTING CAM FOIL	2440014	2440014	2440014	2440014
ACTUATOR SIEMENS SQL33.03	2480040	2480040	2480040	2480040
ACTUATOR BERGER STM30/24	2480090	2480090	2480090	2480090
ACTUATOR SIEMENS SQM40	24800A5	24800A5	24800A5	24800A5
UV PROBE	2510001	2510001	2510001	2510001
MOTOR-PUMP COUPLING	2540125	2540125	2540125	2540010
LIGHT OIL GOVERNOR	2570054	2570054	2570054	2570054
BURNER MODULATOR (only for fully-modulating burners)	2570112	2570112	2570112	2570112
PUMP SUNTEC	2590103	2590103	2590106	2590118
PUMP DANFOSS	-	2590316	2590316	2590310
NOZZLE	2610101	2610101	2610101	2610202
COMBUSTION HEAD	3060238	3060238	3060239	30600R1
BLAST TUBE	30900M9	30900N6	30910Q7	30910P8
IGNITION CABLE	6050133	6050133	6050108	6050108
PRINTED CIRCUIT BOARD	6100533	6100533	6100533	6100533

**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****Burners not fitted with printed circuit board**

## Complete key

BP	Light oil pump contactor coil
BV	Fan motor contactor coil
CAP	Auxiliary contacts on light oil pump motor contactor
CM	Operation selector 0) Off - 1) Gas - 2) Light oil
CMF	Manual operation selector 0) Stop - 1) High flame - 2) Low flame - 3) Automatic
CP	Contacts on light oil pump motor contactor
CR1/2	Contacts on auxiliary relays
CTP	Contacts on light oil pump motor thermal cutout
CTV	Contacts on fan motor thermal cutout
CV	Contacts on fan motor contactor
EV1	Gas solenoid valve, network side (or valves group)
EV2	Gas solenoid valve, burner side (or valves group)
EVG	Light oil solenoid valve
F÷F3	Fuses
F÷F4	Fuses
FC	UV probe
IG	Main switch
IL	Auxiliaries main switch
L	Phase
LAF	High flame operation signaling lamp
LB	Burner lockout signaling lamp
LBF	Low flame operation signaling lamp
LEV1	Opening of EV1 signaling lamp
LEV2	Opening of EV2 signaling lamp
LEVG	Opening of EVG signaling lamp
LFL1.3..	SIEMENS control box
LFL1...	SIEMENS control box
LPGMIN	Low gas pressure in the network signaling lamp
LS	Burner in stop position (STAND-BY) signaling lamp
LSPG	Gas valves leakage signaling lamp
LT	Intervention of thermal cutout signaling lamp
LTA	Ignition transformer in operation signaling lamp
MA	Burner power supply terminal board
MC	Burner components terminal board
MP	Pump motor
MV	Fan motor
N	Neutral
PA	Air pressure switch
PGMAX	Maximum gas pressure switch (optional, if fitted remove the connection between terminals 156 e 158 in terminal board MC)
PGMIN	Minimum gas pressure switch
PS	Reset pushbutton for LFL1.3xx
Pt100	Connection for Pt100
R1/2	Auxiliary relays
RWF40.000	SIEMENS modulator
SD 0/4÷20mA	Probe connection with signal 0÷20 mA / 4÷20 mA
SD-0÷10V	Probe connection with signal 0÷10V
SD-PRESS	Pressure probe connection (SIEMENS QBE620...)
SD-TEMP	Temperature probe connection (Pt1000 or SIEMENS QAE2...-QAC2..)
SQL/SQM/STM	Actuator for air damper
ST	Serie of thermostats or pressure switches
TA	Ignition transformer
TAB	Hi-Lo flame thermostat (if fitted remove the connection between terminals 6 and 7 on terminal board MA)
TC	Thermocoupling
TP	Light oil pump motor thermal cutout
TV	Fan motor thermal cutout
VPS504	DUNGS gas proving system (optional, if fitted remove the connection between 177 and 178 on terminal board MC)

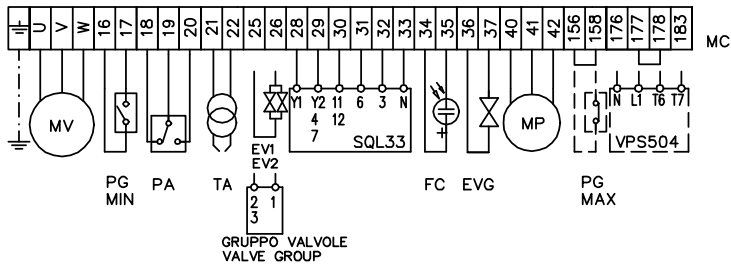
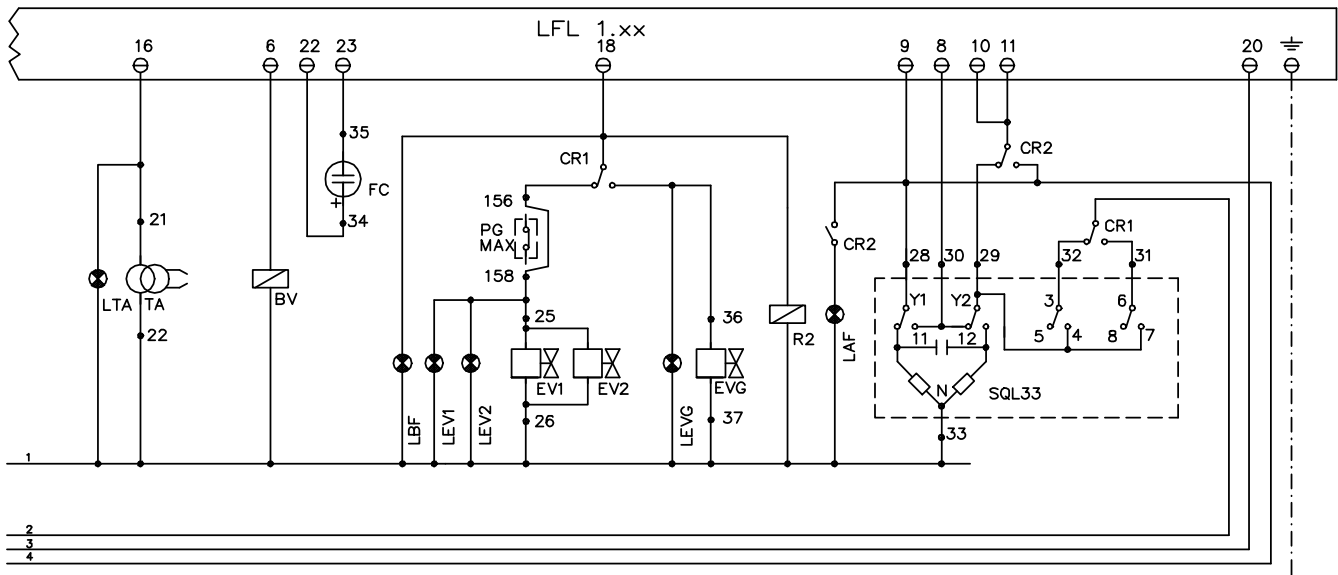
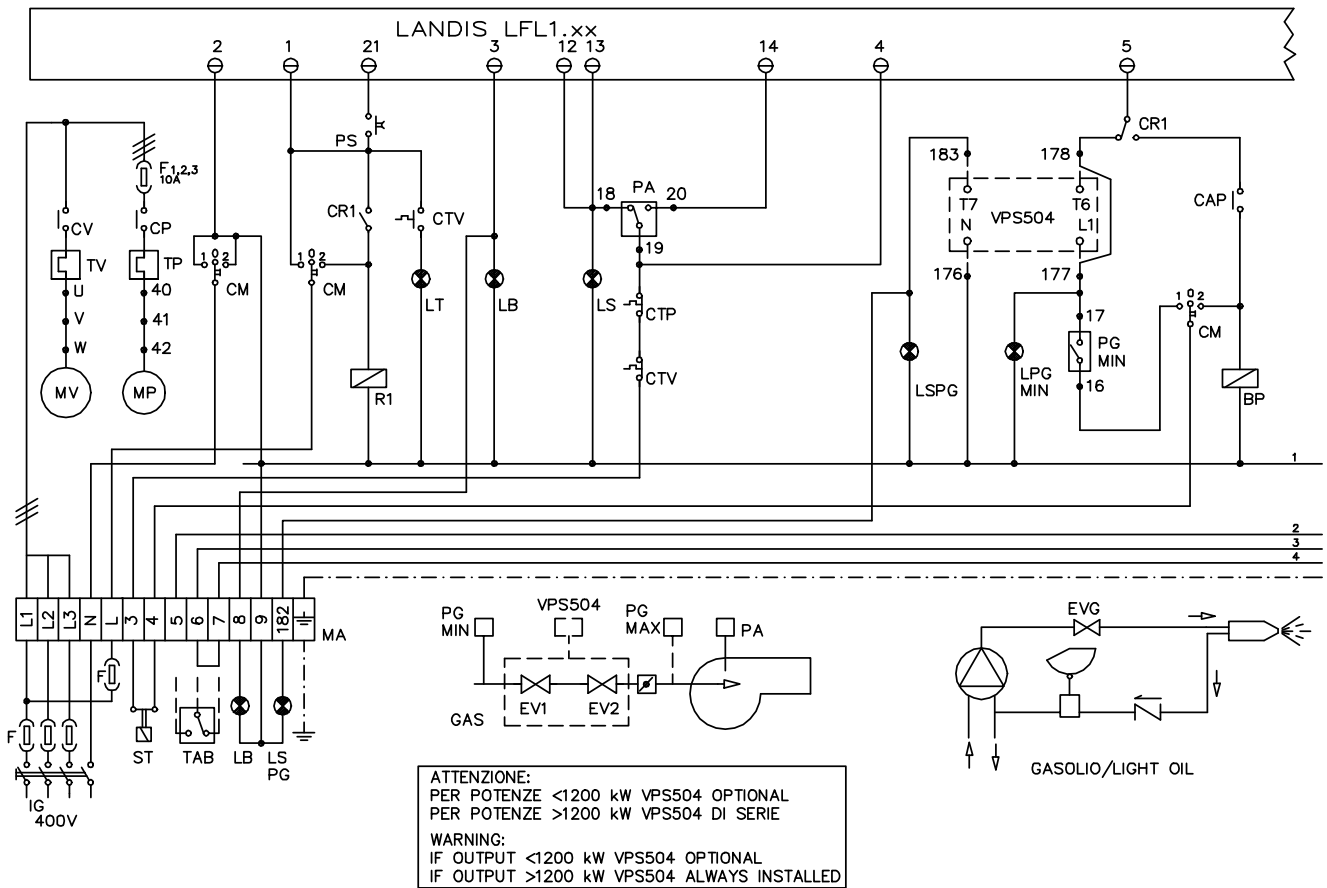
Terminals Q13 and Q14 are contacts of a limit switch that stops the burner if the set parameters overcome the fixed differential.

**ATTENTION:**

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

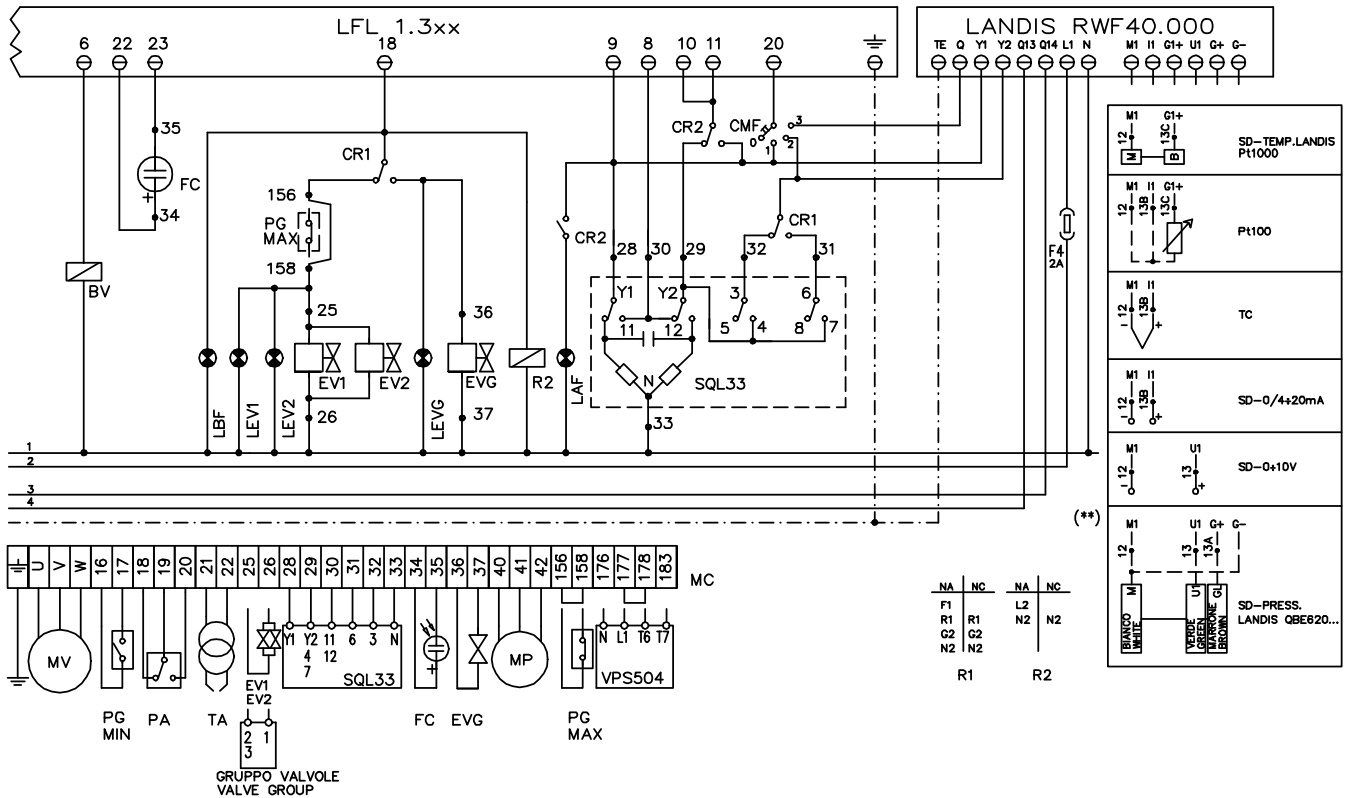
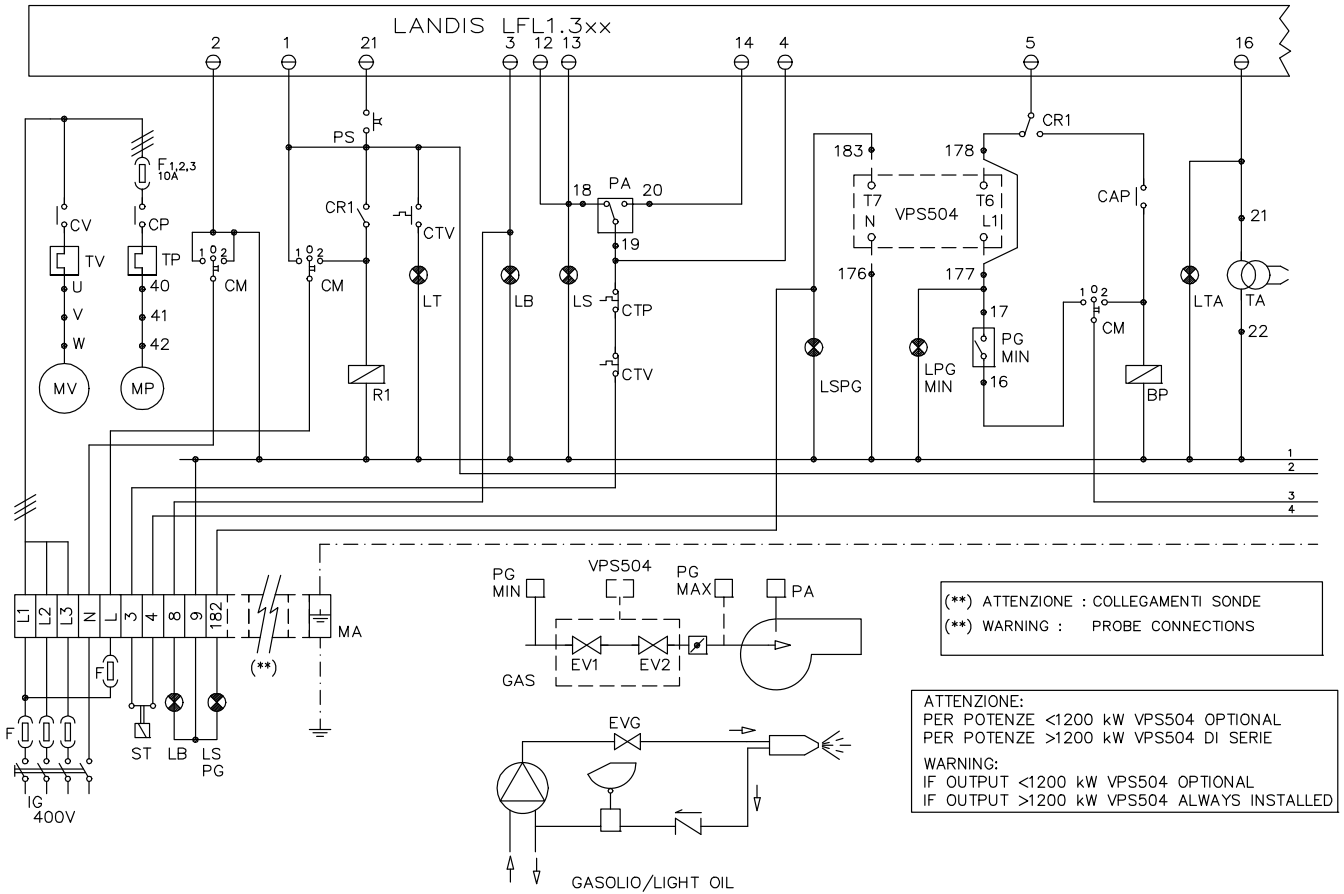


WIRING DIAGRAM Cod. 05-680 - Progressive burners



NA	NC	NA	NC
S1	S1	R2	R2
S2	S2		
R1		R2	

WIRING DIAGRAM Cod. 05-681 - Fully modulating burners



**WIRING DIAGRAMS 21-019 BURNERS FITTED WITH PRINTED CIRCUIT****Complete key**

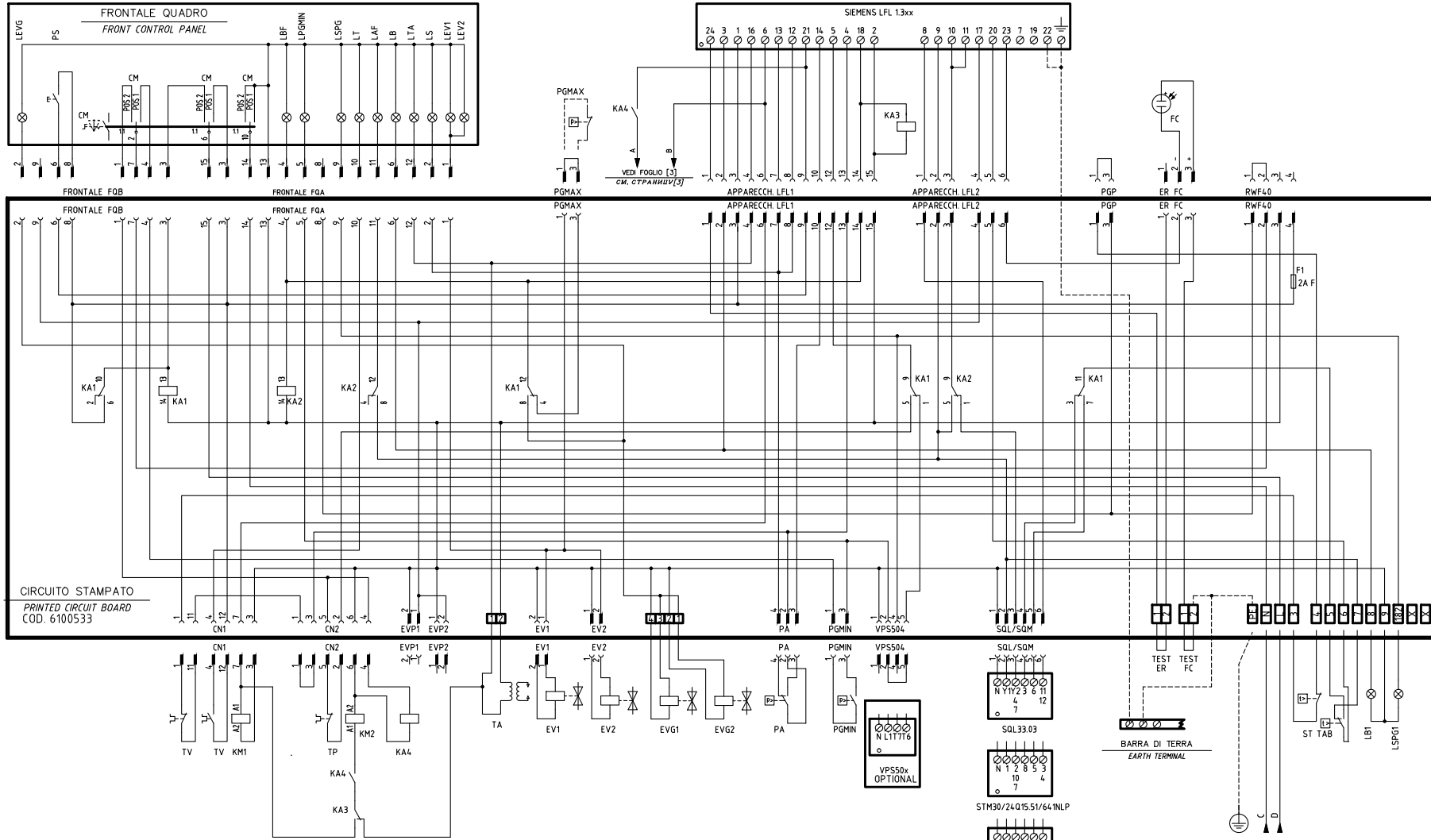
CM	FUEL MANUAL SELECTOR: 0) STOP - 1) GAS - 2) LIGHT OIL
CMF	MANUAL SWITCH 0)OFF 1)HIGH FLAME 2)LOW FLAME 3)AUTOMATIC
ER	FLAME DETECTION ELECTRODE
EV1	GAS ELECTRO-VALVE UPSTREAM (OR VALVES GROUP)
EV2	GAS ELECTRO-VALVE DOWNSTREAM (OR VALVES GROUP)
EVG1/EVG2	LIGHT OIL SOLENOID VALVE
F1	AUXILIARY FUSE
F2	FAN MOTOR LINE FUSES
F3	LINE FUSE
FC	UV FLAME DETECTOR
IG	MAIN DISCONNECTOR
IL	AUXILIARY LINE SWITCH
KA1	AUXILIARY RELAY
KA2	AUXILIARY RELAY
KM1.1	FAN MOTOR CONTACTOR
KM2	PUMP MOTOR CONTACTOR
LAF	BURNER IN HIGH FLAME INDICATOR LIGHT
LB	INDICATOR LIGHT FOR BURNER LOCK-OUT
LBF	BURNER IN LOW FLAME INDICATOR LIGHT
LEV1	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV1]
LEV2	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV2]
LEV3	INDICATOR LIGHT FOR EVG 1/2 OPENING
LPGMIN	INDICATOR LIGHT FOR PRESENCE OF GAS IN THE NETWORK
LS	INDICATOR LIGHT FOR BURNER STAND-BY
LSPG	INDICATOR LIGHT FOR LEAKAGE OF VALVES
LT	INDICATOR LIGHT FOR FAN OVERLOAD TRIPPED
LTA	IGNITION TRANSFORMER INDICATOR LIGHT
MV	FAN MOTOR
MP	LIGHT OIL PUMP MOTOR
PA	COMBUSTION AIR PRESSURE SWITCH
PGMAX	MAXIMUM PRESSURE GAS SWITCH (OPTIONAL)
PGMIN	MINIMUM GAS PRESSURE SWITCH
PS	LOCK-OUT RESET BUTTON
PT100	TEMPERATURE PROBE
SD-0÷10V	TENSION SIGNAL
SD-0/4÷20mA	CURRENT SIGNAL
SD-PRESS	PRESSURE PROBE
SD-TEMP.	TEMPERATURE PROBE
SIEMENS LFL 1.3xx	control box BURNER MODULATOR
SQL33.03	AIR DAMPER ACTUATOR
ST	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
TA	IGNITION TRANSFORMER
TAB	HIGH-LOW THERMOSTAT/PRESSURE SWITCHES (IF FITTED REMOVE THE BRIDGE BETWEEN TERMINALS 6 AND 7 ON TERMINAL BOARD MA)
TC	THERMOCOUPLE
TV	FAN MOTOR THERMAL
VPS504	GAS PROVING SYSTEM (OPTIONAL)

**ATTENTION:**

- 1- Power supply 400V 50 Hz, 3N a.c.
- 2- Don't reverse phase with neutral
- 3- Ensure burner is properly hearted

VERSIONE PROGRESSIVA "PR"

PROGRESSIVE "PR" VERSION



SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)

AIR DAMPER ACTUATOR (ALTERNATIVE)

STM30/24Q15/51/64/NLP

- I ALTA FIAMMA  
HIGH FLAME
- II SOSTA E ACCENSIONE  
STAND-BY AND IGNITION
- III BASSA FIAMMA GAS  
GAS LOW FLAME
- IV BASSA FIAMMA GAS OLIO  
LIGHT OIL LOW FLAME
- V NON USATA  
NOT USED
- VI NON USATA  
NOT USED

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)

AIR DAMPER ACTUATOR

SQL33.03

- Y1 ALTA FIAMMA  
HIGH FLAME
- Y2 SOSTA E ACCENSIONE  
STAND-BY AND IGNITION
- 3 BASSA FIAMMA GAS  
GAS LOW FLAME
- 6 BASSA FIAMMA GAS OLIO  
LIGHT OIL LOW FLAME

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)

AIR DAMPER ACTUATOR (ALTERNATIVE)

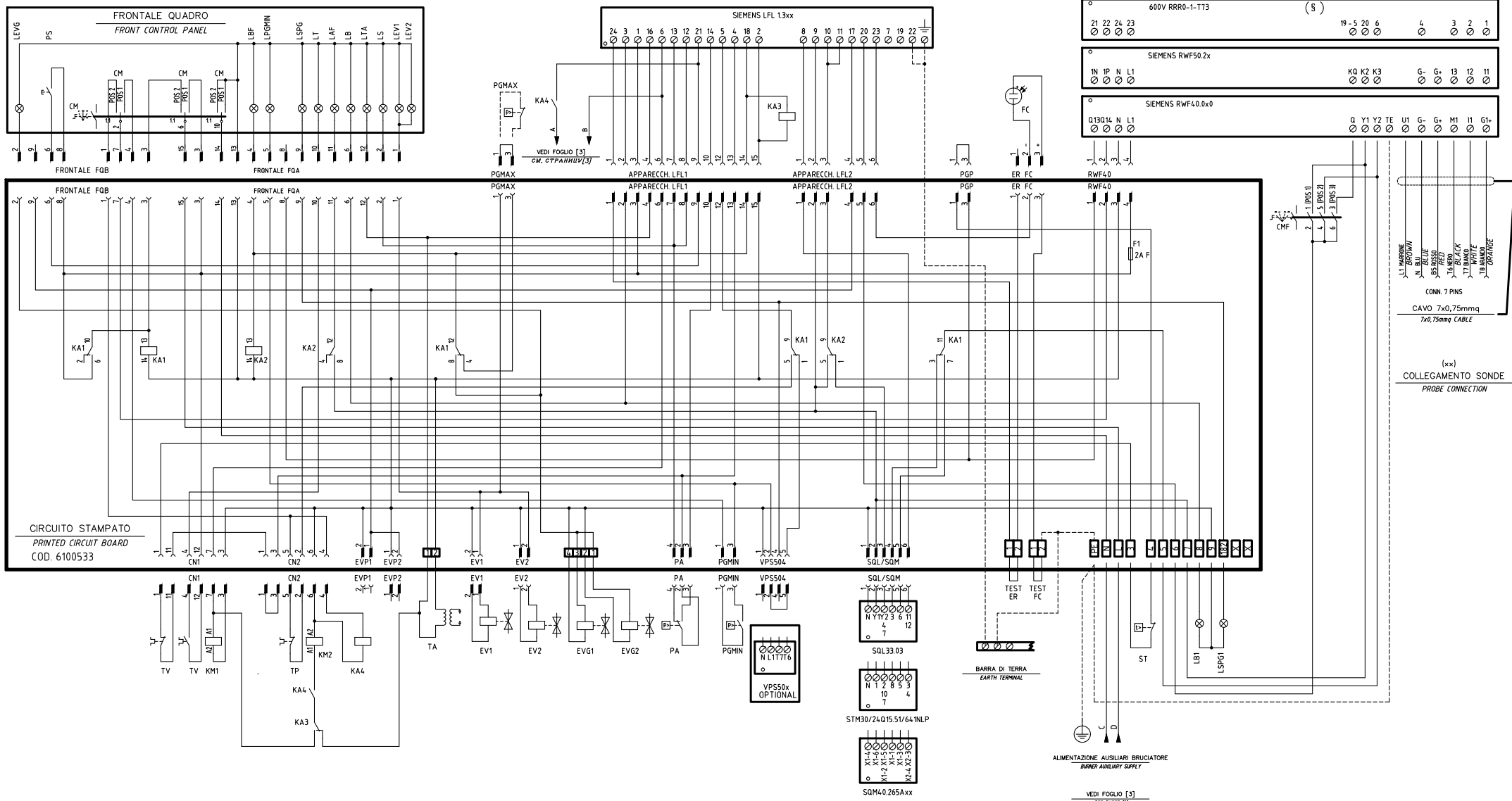
SQM4.0.265Axxx

- I ALTA FIAMMA  
HIGH FLAME
- II SOSTA E ACCENSIONE  
STAND-BY AND IGNITION
- III BASSA FIAMMA GAS  
GAS LOW FLAME
- IV BASSA FIAMMA GAS OLIO  
LIGHT OIL LOW FLAME
- V NON USATA  
NOT USED
- VI NON USATA  
NOT USED

Data	01/10/2008	PREC.	FOGLIO
Revisione	04	/	1
Dis. N.	21 - 019	SEGUE	TOTALE
		2	3

# VERSIONE MODULANTE "MD"

## "MD" MODULATING VERSION



SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
STM30/24Q15/51/64/NLP

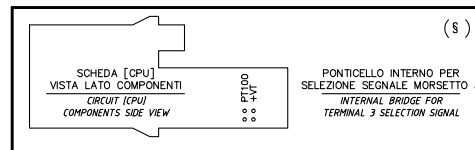
- I ALTA FIAMMA HIGH FLAME
- II SOSTA E ACCENSIONE STAND-BY AND IGNITION
- III BASSA FIAMMA GAS GAS LOW FLAME
- V BASSA FIAMMA GASOLIO LIGHT OIL LOW FLAME

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
SQL33.03

- Y1 ALTA FIAMMA HIGH FLAME
- Y2 SOSTA E ACCENSIONE STAND-BY AND IGNITION
- 3 BASSA FIAMMA GAS GAS LOW FLAME
- 6 BASSA FIAMMA GASOLIO LIGHT OIL LOW FLAME

SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)  
AIR DAMPER ACTUATOR (ALTERNATIVE)  
SQM4.0.265Axx

- I ALTA FIAMMA HIGH FLAME
- II SOSTA E ACCENSIONE STAND-BY AND IGNITION
- III BASSA FIAMMA GAS GAS LOW FLAME
- IV BASSA FIAMMA GASOLIO LIGHT OIL LOW FLAME
- V NON USATA NOT USED
- VI NON USATA NOT USED

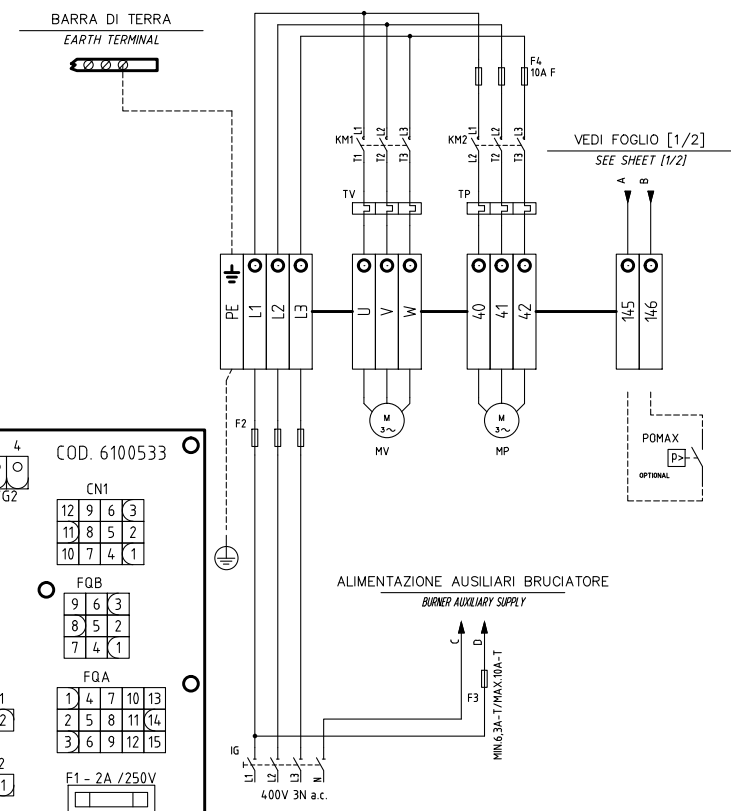


Data	01/10/2008	PREC.	FOGLIO
Revisione	04	1	2
Dis. N.	21 - 019	SEGUE	TOTALE
		3	3

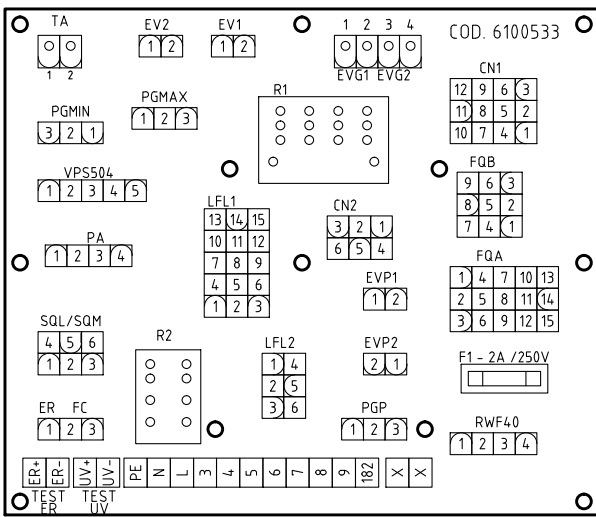
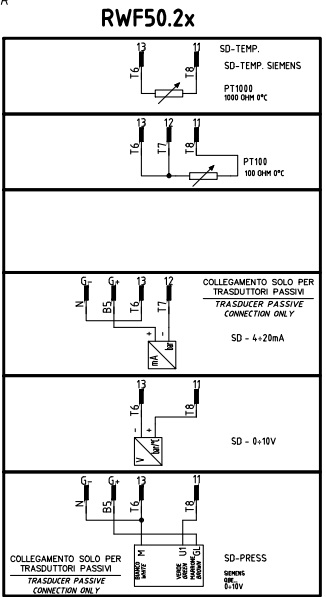
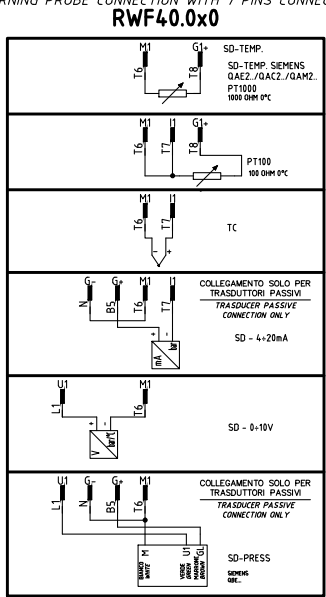
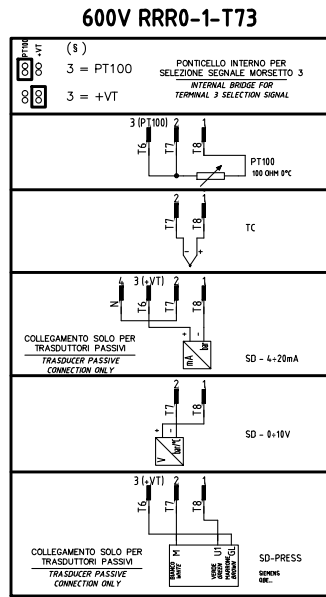
SIGLA/ITEM	FUNZIONE	FUNCTION
CM	SELETTORE MANUALE COMBUSTIBILE 1) GAS 0) OFF 2) GASOLIO	COMBUSTIBLE SELECTOR 1)GAS 0)OFF 2)LIGHT OIL
CMF	COMUT. MANUALE FUNZ. DIFERMO 1)ALTA FIAMMA 2)BASSA FIAMMA 3)AUTOMATICO	MANUAL SWITCH 0)OFF 1)HIGH FLAME 2)LOW FLAME 3)AUTOMATIC
EV1	ELETTROVALVOLA GAS LATO RETE (0 GRUPPO VALVOLE)	UPSTREAM GAS SOLENOID VALVE (OR VALVES GROUP)
EV2	ELETTROVALVOLA GAS LATO BRUCIATORE (0 GRUPPO VALVOLE)	DOWNSTREAM GAS SOLENOID VALVE (OR VALVES GROUP)
EVG1	ELETTROVALVOLA GASOLIO	LIGHT OIL SOLENOID VALVE
EVG2	ELETTROVALVOLA GASOLIO	LIGHT OIL SOLENOID VALVE
F1	FUSIBILE AUSILIARIO	AUXILIARY FUSE
F2	FUSIBILI LINEA MOTORE VENTILATORE	FAN MOTOR LINE FUSES
F3	FUSIBILE DI LINEA	LINE FUSE
F4	FUSIBILI LINEA POMPA	PUMP LINE FUSES
FC	SONDA UV RILEVAZIONE FIAMMA	UV FLAME DETECTOR
600V RRR0-1-T73	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
IG	INTERRUTTORE GENERALE	MAINS SWITCH
KA1	RELE' AUSILIARIO	AUXILIARY RELAY
KA2	RELE' AUSILIARIO	AUXILIARY RELAY
KA3	RELE' AUSILIARIO	AUXILIARY RELAY
KA4	RELE' AUSILIARIO	AUXILIARY RELAY
KM1	CONTATTORE MOTORE VENTILATORE	FAN MOTOR CONTACTOR
KM2	CONTATTORE MOTORE POMPA GASOLIO	LIGHT OIL PUMP MOTOR CONTACTOR
LAF	LAMPADA SEGNALE ALTA FIAMMA BRUCIATORE	BURNER IN HIGH FLAME INDICATOR LIGHT
LB	LAMPADA SEGNALE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LB1	LAMPADA SEGNALE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LBF	LAMPADA SEGNALE BASSA FIAMMA BRUCIATORE	BURNER IN LOW FLAME INDICATOR LIGHT
LEV1	LAMPADA SEGNALE APERTURA [EV1]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV1]
LEV2	LAMPADA SEGNALE APERTURA [EV2]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EV2]
LEV3	LAMPADA SEGNALE APERTURA [EVG1/2]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVG1/2]
LEV4	LAMPADA SEGNALE APERTURA [EVG1/2]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVG1/2]
LPGMIN	LAMPADA SEGNALE PRESENZA GAS IN RETE	INDICATOR LIGHT FOR PRESENCE OF GAS IN THE NETWORK
LS	LAMPADA SEGNALE SOSTA BRUCIATORE	INDICATOR LIGHT FOR BURNER STAND-BY
LSPG	LAMPADA SEGNALE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES
LSPG1	LAMPADA SEGNALE BLOCCO CONTROLLO TENUTA VALVOLE	INDICATOR LIGHT FOR LEAKAGE OF VALVES
LT	LAMPADA SEGNALE BLOCCO TERMICO MOTORE VENTILATORE	INDICATOR LIGHT FOR FAN OVERLOAD TRIPPED
LTA	LAMPADA SEGNALE TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER INDICATOR LIGHT

SIGLA/ITEM	FUNZIONE	FUNCTION
MP	MOTORE POMPA GASOLIO	LIGHT OIL PUMP MOTOR
MV	MOTORE VENTILATORE	FAN MOTOR
PA	PRESSOSTATO ARIA	AIR PRESSURE SWITCH
PGMAX	PRESSOSTATO GAS DI MASSIMA PRESSIONE (OPZIONALE)	MAXIMUM PRESSURE GAS SWITCH (OPTIONAL)
PGMIN	PRESSOSTATO GAS DI MINIMA PRESSIONE	MINIMUM GAS PRESSURE SWITCH
POMAX	PRESSOSTATO DI MASSIMA PRESSIONE OLIO (OPZIONALE)	MAXIMUM OIL PRESSURE SWITCH (OPTIONAL)
PS	PULSANTE SBLOCCO FIAMMA	LOCK-OUT RESET BUTTON
PT100	SONDA DI TEMPERATURA	TEMPERATURE PROBE
SD-PRESS	SONDA DI PRESSIONE	PRESSURE PROBE
SD-TEMP.	SONDA DI TEMPERATURA	TEMPERATURE PROBE
SD - 4+20mA	TRASDUTTORE USCITA IN CORRENTE	TRANSDUCER CURRENT OUTPUT
SIEMENS LFL 1.3xx	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX
SIEMENS RWF40.0x0	REGOLATORE MODULANTE	BURNER MODULATOR
SIEMENS RWF50.2x	REGOLATORE MODULANTE (ALTERNATIVO)	BURNER MODULATOR (ALTERNATIVE)
SQL3.03	SERVOCOMANDO SERRANDA ARIA	AIR DAMPER ACTUATOR
SQM4.0.265Axx	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
ST	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
STM30/24Q15.51/64NLP	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
TA	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER
TAB	TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA	HIGH-LOW THERMOSTAT/PRESSURE SWITCHES
TP	TERMICO MOTORE POMPA GASOLIO	LIGHT OIL PUMP MOTOR THERMAL
TV	TERMICO MOTORE VENTILATORE	FAN MOTOR THERMAL
VPS50x	CONTROLLO DI TENUTA VALVOLE GAS (OPZIONALE)	GAS PROVING SYSTEM (OPTIONAL)

**QG - MC1**  
 MORSETTIERA COLLEGAMENTO LINEA E MOTORE TRIFASE  
 MOTOR THREE PHASES AND ELECTRIC SUPPLY CONNECTION TERMINAL BOARD



(xx)  
 ATTENZIONE COLLEGAMENTO SONDE CON CONNETTORE 7 POLI  
 WARNING PROBE CONNECTION WITH 7 PINS CONNECTOR



Data	01/10/2008	PREC.	FOGLIO
Revisione	04	2	3
Dis. N.	21 - 019	SEQUE	TOTALE
		/	3

**SIEMENS LFL 1.3.. CONTROL BOX**

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

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

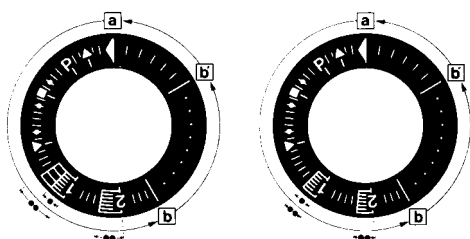
A symbol on the indicator disc shows each time the type of stoppage:

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

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

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

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



- a-b Start-up programme
- b-b' For time variants: move the programmer on to the automatic stop after the burner starts up (b' = position of the programmer during normal burner operation).
- b(b')-a Post-ventilation programme after a regulation stop. At the start-up position "a" the programmer stops automatically.
- . Safety time duration for mono-tube burners
- .. Safety time duration for twin-tube burners

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

**Operation**

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

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

During the regulation stop only terminals 11 and 12 are live and the damper, through the limit contact "Z" of its servo-motor is in the CLOSED position.

The flame detector circuit F is activated (terminals 22 and 23 or 23/4) for the detector test and the paracitic light test.

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

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

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

**Start-up program**

A Start-up

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

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

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

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

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

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

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

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

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

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

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

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

**Mono-tube burner**

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

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

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

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

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

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

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

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

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

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



ratus itself from recovery voltage through the strenght regulator circuit.

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

B Operational position of the burner

B-C Burner operation (production of heat)

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

C Regulation stop for operation of "R"

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

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

t13 Admissible post-ignition time

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

D-A End of automatic programme

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

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

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

### Specifications

Mains voltage 220V -15%...240V +10%  
 Frequency 50Hz -6%...60Hz +6%  
 Absorbed capacity 3.5 VA  
 Built-in fuse T6.3/250E slow action DIN41571 No. 451915070

External fuse max. 16A  
 Interference N-VDE0875  
 Flow permitted at terminal 1 5A (DIN 0660 AC3)  
 Flow permitted at control terminals 4A (DIN 0660 AC3)

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

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

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

### Ionisation monitor

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

UV monitor  
 Voltage in UV detector  
 normal working 330V ±10%  
 test 380V ±10%  
 Detector current, min. request\* 70µA  
 Max. detector current  
 normal working 630 µA  
 test 1300 µA

Max.length of connecting cable  
 normal cable (laid separately\*\*) 100m  
 armoured cable (high frequency) protected at terminal 22 200m

Weight  
 QRA2 60 g  
 QRA10 450 g.

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

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

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

### Operating times

t7 initial delay for ventilator G2 2  
 t16 initial delay of air damper OPEN consent 4  
 t11 opening time for damper any  
 t10 initial delay for air pressure monitor8  
 t1 pre-ventilation time with damper open36  
 t12 travel time for air damper to MIN positionany  
 t3 t3' pre-ignition time t3 4  
 t3 t3' pre-ignition time t3 '-  
 t2 t2' safety time (1st safety time for burners with intermittent pilot lighter t2 2  
 t2 t2' safety time (1st safety time for burners with intermittent pilot lighter t2 '-  
 t4 t4' interval between start of t2 and response to valve at terminal 19 t4 10  
 t4 t4' interval between start of t2 and response to valve at terminal 19 t4 '-

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

### Key

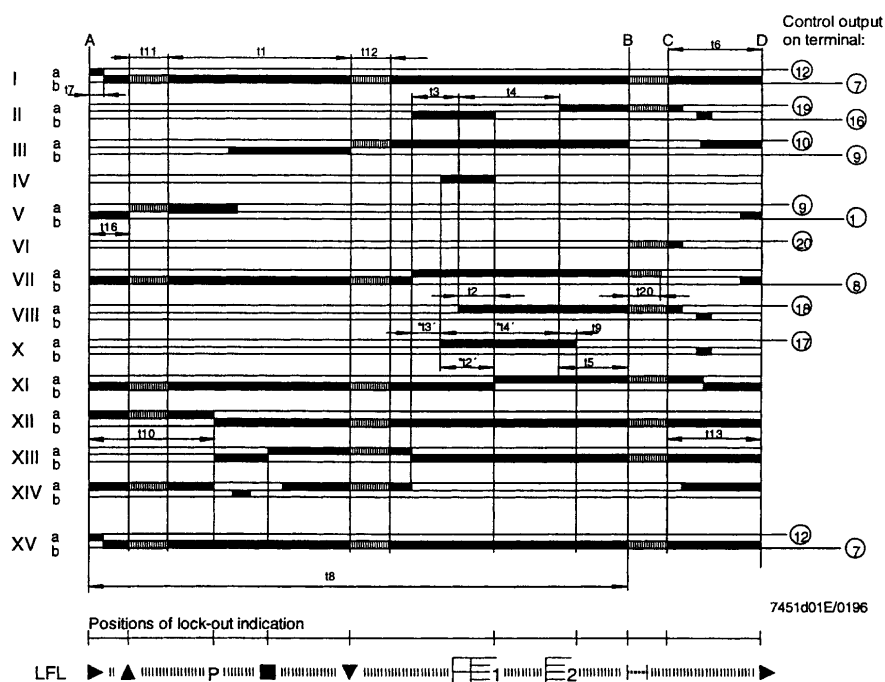
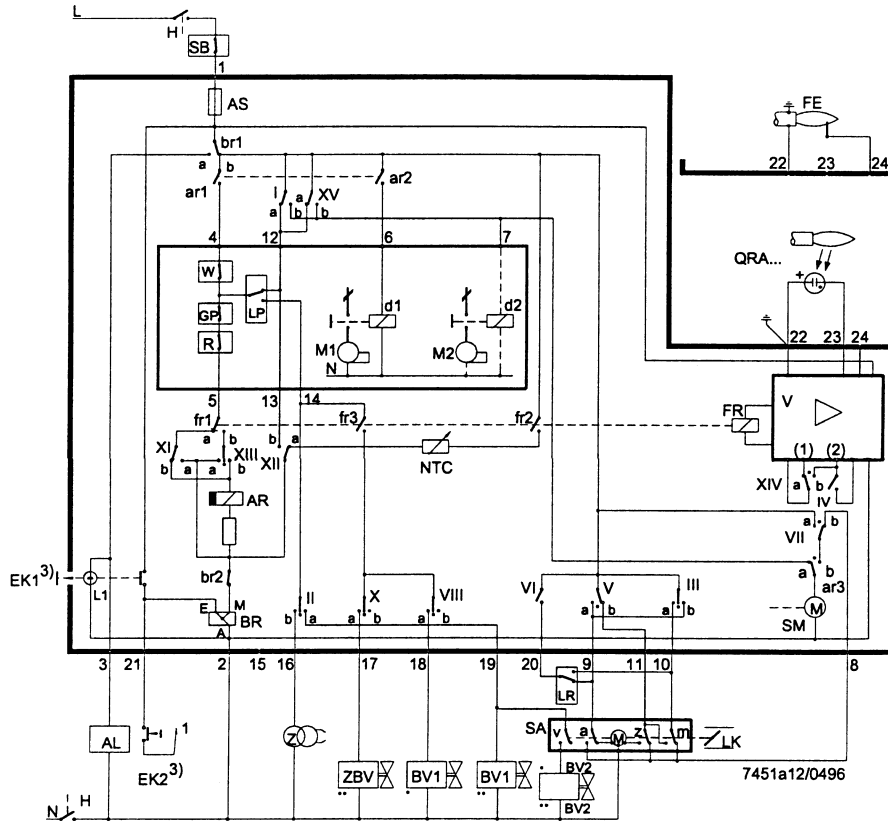
A limit contact switch for damper OPEN position  
 AI block remote signal  
 AR main relay (working network) with contacts "ar"  
 AS Monitor fuse  
 BR block relay with "br" contacts  
 BV fuel valve  
 EK reset button  
 FE detector electrode of ionisation circuit  
 FR flame relay with "fr" contacts  
 G ventilator motor or burner motor  
 GP gas pressure switch  
 H main interruptor switch  
 L block stoppage LED  
 LK air damper  
 LP air pressostat  
 LR safety regulator  
 M auxiliary contact switch for damper "MIN" position  
 QRA UV detector  
 QRE ignition spark detector  
 R thermostat or pressostat  
 S fuse  
 SA damper servo-motor  
 SM synchronous programmer motor  
 V flame signal amplifier  
 V in case of servo-motor: auxiliary contact for response to fuel valve with regard of damper position  
 W safety pressostat or thermostat  
 Z ignition transformer  
 Z in case of servomotor: end of limit contact switch for damper CLOSED position  
 ZBV pilot burner fuel valve  
 ° for mono-tube burners  
 °° for twin-tube burners  
 (1) input for raising QRA detector voltage to test level  
 (2) input for excitation of flame relay during flame detector test circuit (contact XIV) and during safety time (contact IV)  
 (3) Do not press EK for more than 10 seconds

**Programmer diagram**

- t1 pre-ventilation time
- t2 safety time
- \*t2 '1st safety time
- t3 pre-ignition time
- \*t3 'pre-ignition time
- t4 interval for creating current between terminals 18 and 19
- \*t4 'interval for creating current between terminals 17 and 19
- t5 interval for creating current between terminals 19 and 20
- t6 post-ventilation time
- t7 interval between startup consent and current created at terminal 7

- t8 duration of start-up
- \*t9 2nd safety time
- t10 interval before air pressure monitoring begins
- t11 damper opening travel time
- t12 damper closure travel time
- t13 permissible post-combustion time
- t16 initial delay of damper OPEN response
- t20 interval before programmer automatically stops

\* These times are valid with the use of a series O1 safety device for monitoring burners with intermittent pilot lighter.





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