

PG60

PG70

PG81



**Progressive / Fully-modulating
Light oil burners**

MANUAL OF INSTALLATION - USE - MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

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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 repeated burner shut-downs, do not continue re-setting the unit manually. Contact qualified personnel to take care of such defects.
- 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. Requisiti di sicurezza impianti elettrici).

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 :

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Gas - Heavy oil burners

European directives:

- Directive 90/396/CEE - Gas Appliances;
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National standards :

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

PART I: INSTALLATION

GENERAL FEATURES

Monobloc burners of this series are made in die-cast aluminium housing with relative flange to work on heating generators. The output range is from 150kW to 1900kW (according to the model).

They can be provided in progressive or fully-modulating version.

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

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

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

In the double-stage burners, the electric actuator, that moves the air damper, allows the optimisation of the gas flue values, as to get an efficient combustion. The position of the combustion head determines the burner output. The air (comburent) and fuel (light oil) are forced into the combustion chamber, as to let the flame light up.

How to interpret the burner's "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 ID plate or in the user's manual).

Example:

Furnace input: 600kW

Backpressure: 4mbar

In the "Performance curve" diagram (Fig. 1), 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.

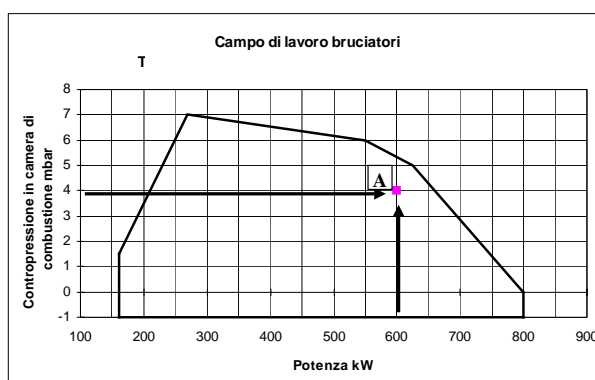


Fig. 1

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

Burner model identification

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

Type PG60	Model	G-	PR.	S.	*	A.
(1)	(2)	(3)	(4)	(5)	(6)	(6)
(1) BURNER TYPE	PG60-PG70-PG81					
(2) FUEL	G - Light oil			A - Biodiesel		
(3) OPERATION (Available versions)	PR - Progressive			MD - Fully modulating		
(4) BLAST TUBE	S - Standard			L - Extended		
(5) DESTINATION COUNTRY	* - see data plate*					
(6) BURNER VERSION	A - Standard					

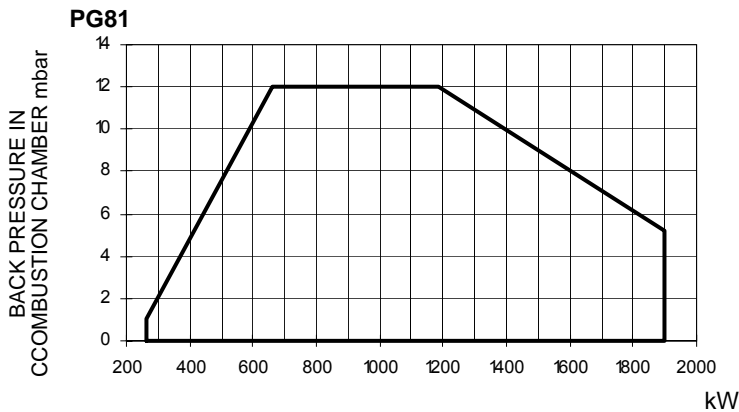
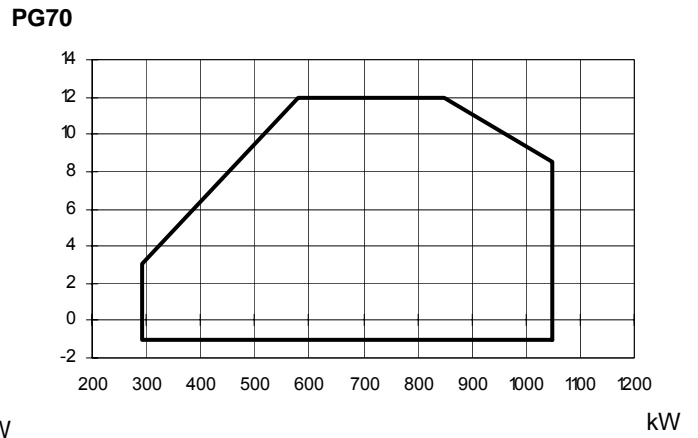
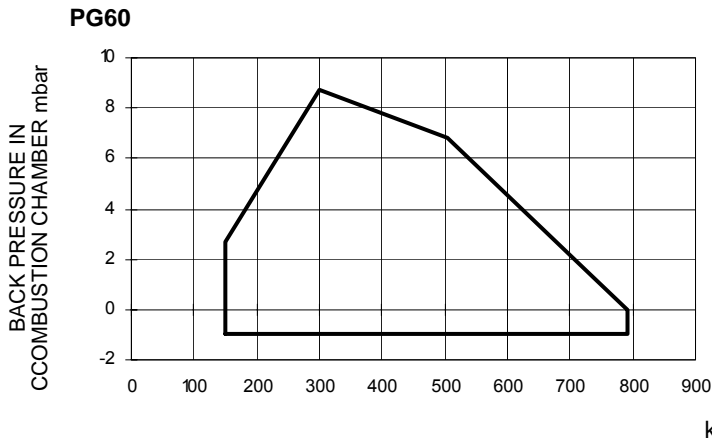
Technical specifications

BURNERS		PG60	PG70	PG81
Output	min. -max. kW	151 - 791	291 - 1047	264-1900
Light oil rate	min. -max. kg/h	13 - 67	25 - 88	22-160
Fuel		Light oil		
Viscosity		1.3 °E @20°C		
Power supply		400V 3N ~ 50Hz		
Electric motor	kW	1.1	2.2	3
Total power consumption	kW	1.6	2.7	3.5
Approx. weight	kg	55	85	85
Operation		Progressive - Fully modulating		
Operating temperature	°C	-10 ÷ +50		
Storage temperature	°C	-20 ÷ +60		
Working service *		Intermittent		

***NOTE ON THE BURNER WORKING SERVICE:**

- Burners provided with Siemens LOA24 control box: for safety reasons, one controlled shutdown must take place every 24 hours.
- Burners provided with Siemens LMO24-44 control box: the control box automatically stops after 24h of continuous working. The control box immediately starts up, automatically.

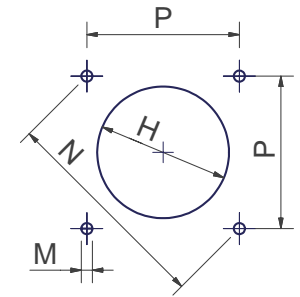
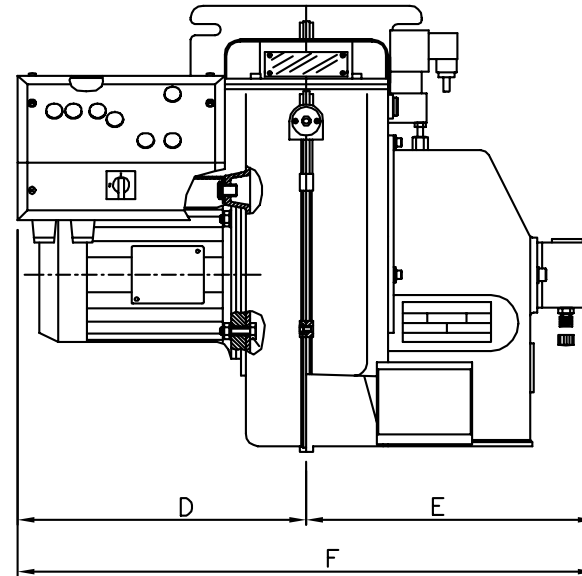
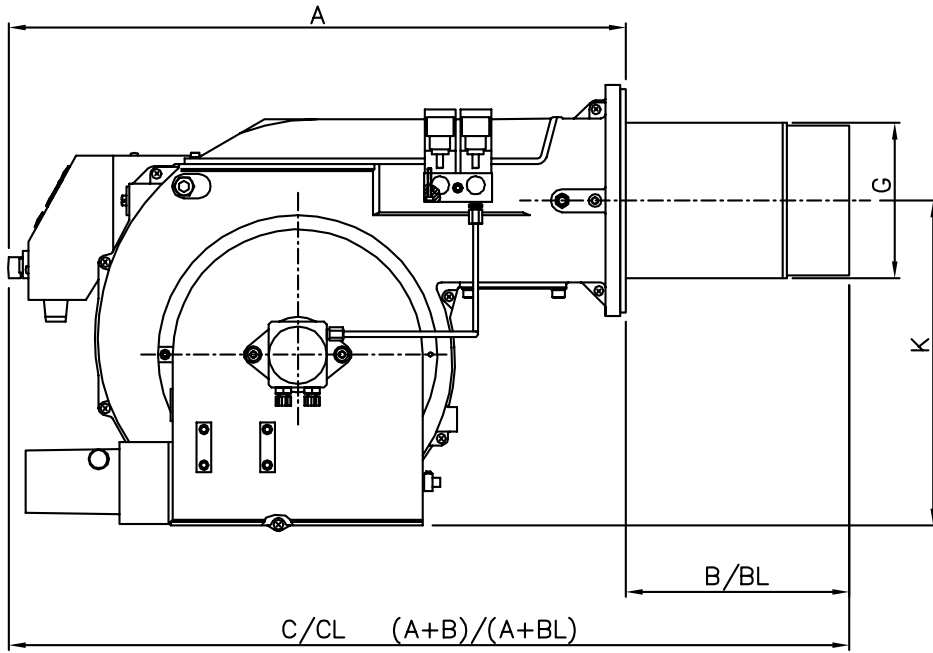
Performance curves



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.

OVERALL DIMENSIONS (mm)



boiler drilling plate

	A	B	BL	C	CL	D	E	F	G	K	H	P	M	N
PG60	760	244	442	1004	1202	270	300	570	153	240	182	190	M10	269
PG70	725	310	460	1035	1185	355	420	775	198	300	228	233	M10	330
PG81	825	340	490	1165	1315	355	420	775	234	300	264	233	M10	330

MOUNTINGS AND CONNECTIONS

Packing

The burners are dispatched in wooden packages whose dimensions are:

PG60: 1200 x 670 x 540 mm

PG70-PG81: 1280 x 850 x 760 mm

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

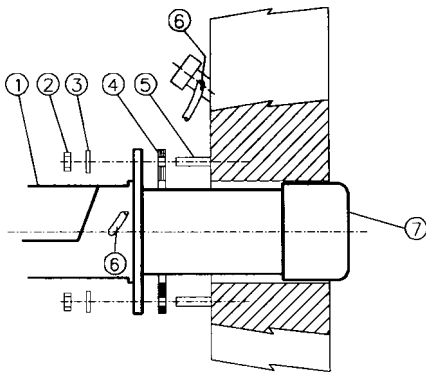
- 1 burner;
- 2 light oil flexible hoses;
- 1 light oil filter;
- 1 gasket to be inserted between the burner and the boiler;
- 1 envelope containing this manual.

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

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 the hole of the boiler's door, according to the burner's drilling plate 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

Handling the burner



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

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

Hydraulic diagrams for light oil supplying circuits

Fig. 2 - Gravity circuit

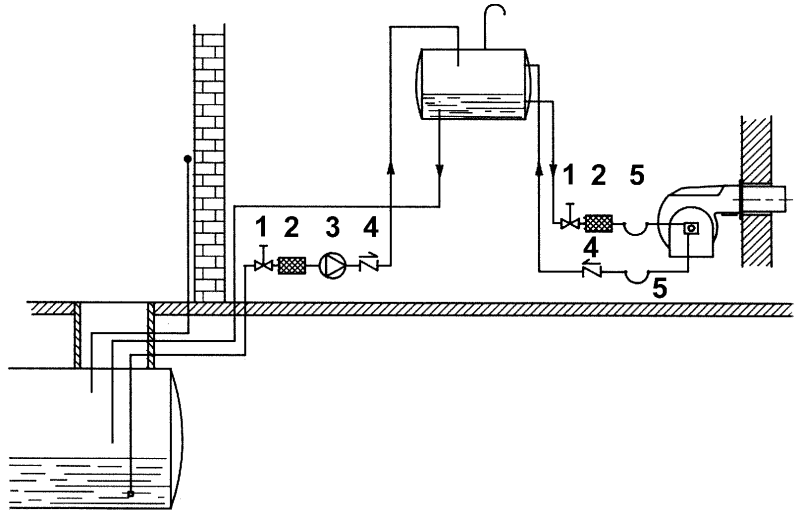


Fig. 3 - Ring circuit

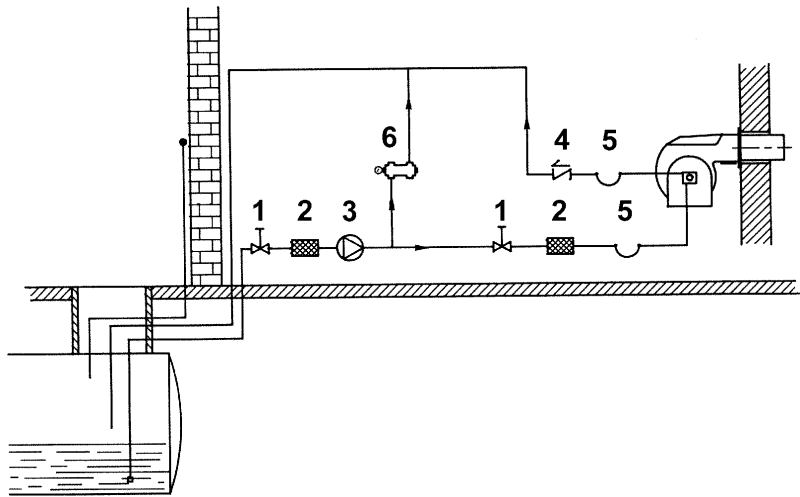
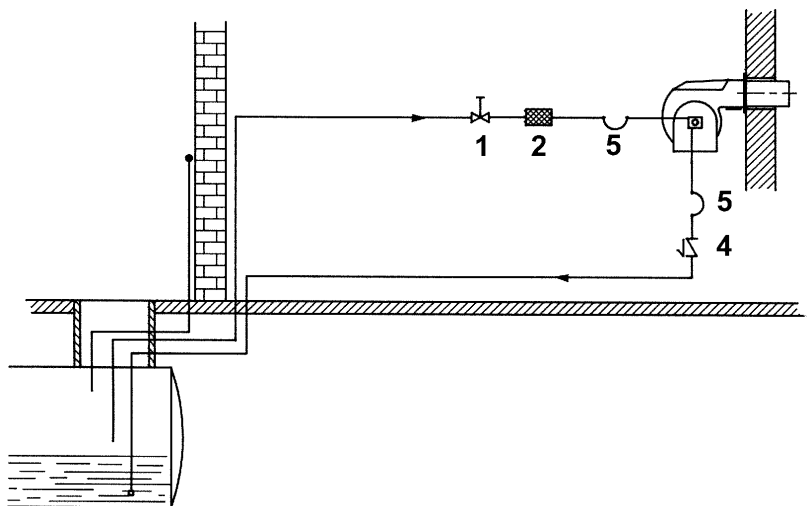


Fig. 4 - Suction circuit



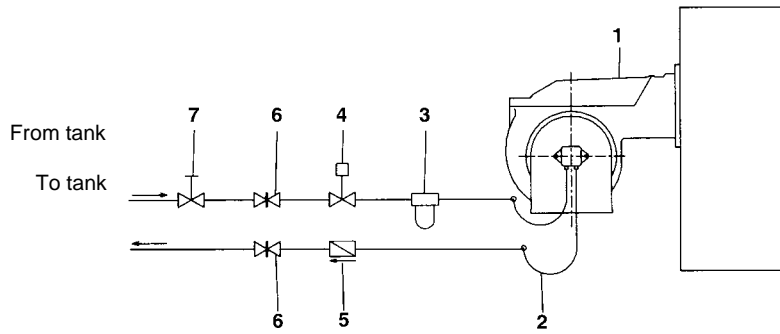
Key

- 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).

Installation diagram of light oil pipes

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



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

Key

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

(*) Only for installations with gravity, siphon or forced circulation feed systems. If the device installed is a solenoid valve, a timer must be installed to delay the valve closing. The direct connection of the device without a timer may cause pump breaks.

The provided pumps 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.

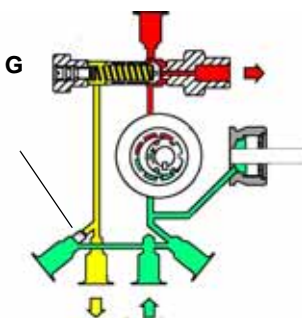
Double-pipe system: as for the single pipe system, a pipe that connects the tank to the pump's inlet is used besides another pipe that connects the pump's return port to the tank, as well. The excess of oil goes back to the tank: this installation can be considered self-bleeding. If provided, the inside by-pass plug must be installed to avoid air and fuel passing through the pump.

Burners are factory-set 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).

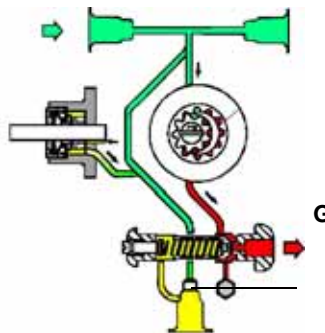
Caution: Changing the direction of rotation, all connections on top and side are reversed.

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Suntec AJ6



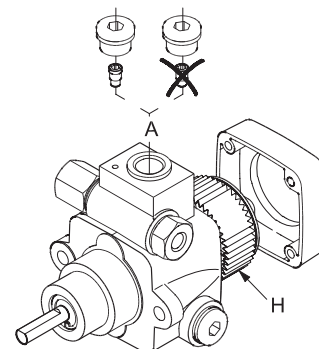
Suntec J6



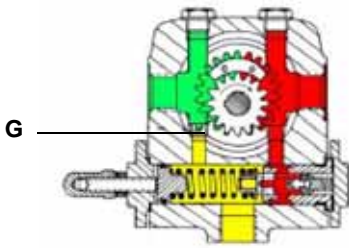
Danfoss RSB30

Twin pipe installation

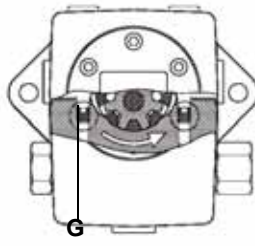
Single pipe installation



Suntec TA



Danfoss KSM..L



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:

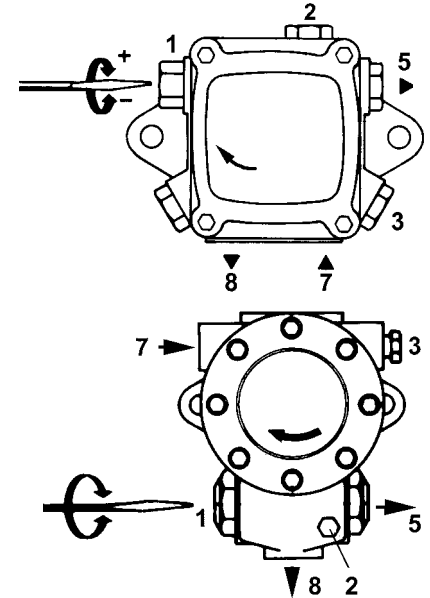
- PG60: Suntec AJ6
- PG70: Suntec J6/Danfoss RSB30
- PG81: Suntec TA2 / Danfoss KSM50

Pump Suntec AJ6	
Viscosity	2.8 - 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.

Suntec J6 - J7	
Oil viscosity	2.8 - 200 cSt
Oil temperature	0 - 90°C
Min. suction pressure	- 0,45 barto avoid gasing
Max. suction pressure	1.5 bar
Max. return pressure	1.5 bar
Rotation speed	3600 rpm max.

Key

- 1 Pressure governor
- 2 Pressure gauge
- 3 Vacuum gauge
- 5 Nozzle
- 7 Suction
- 8 Return

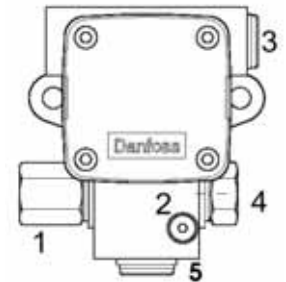


Danfoss RSB

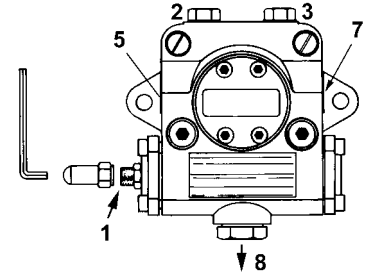
Oil viscosity	2,5 ÷ 200 cSt
Oil temperature	-10 ÷ 120°C
Inlet maximum pressure	4 bar
Maximum return pressure	4 bar
Minimum inlet pressure	- 0,45 to avoid gasing
Rotation speed max.	3600 rpm

Key

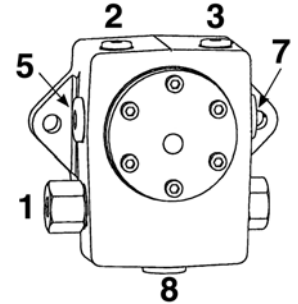
- 1 Pressure governor
- 2 Pressure gauge
- 3 Suction
- 4 To nozzle
- 5 Return



Suntec TA..	
Oil viscosity	4 - 450 cSt
Oil temperature	0 - 140°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.



Danfoss KSM..	
Oil viscosity	2,5 ÷ 450 cSt
Oil temperature	-10 ÷ 160 °C
Max. suction pressure	4 bar
Min. suction pressure	-0,45 to avoid gasing
Max. return pressure	4 bar
Rotation speed	3450 rpm max



Key

- 1 Pressure governor
- 2 Pressure /vacuum gauge port to measure inlet pressure/vacuum
- 3 Pressure gauge port
- 5 Suction
- 7 To nozzle
- 8 Return

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).

Suntec AJ6	Suntec J6	Danfoss RSB30
Danfoss KSM	Suntec TA	

Light 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 set the fuel immission into the combustion chamber. The part of fuel that is not burnt goes back to the tank through the return circuit. The fuel amount to be burnt is adjusted by means of the burner actuator according to the adjustments set (see pag. 22).

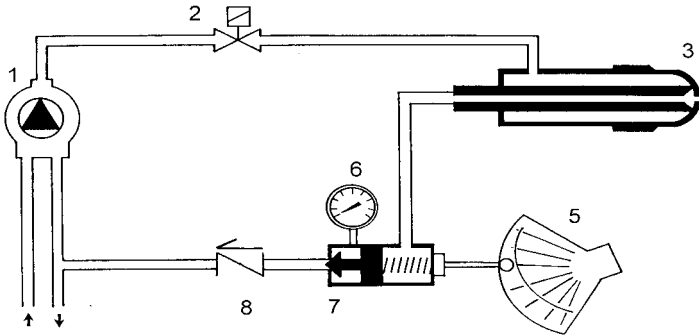


Fig. 6 - Stand-by

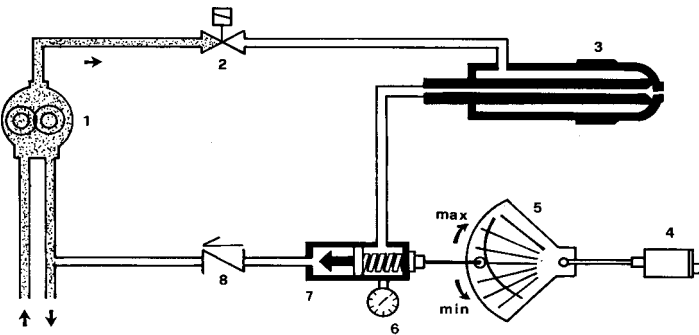


Fig. 7 - Pre-purge

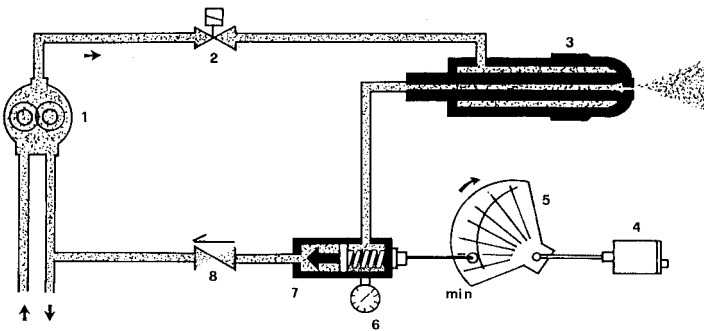


Fig. 8 - Low flame

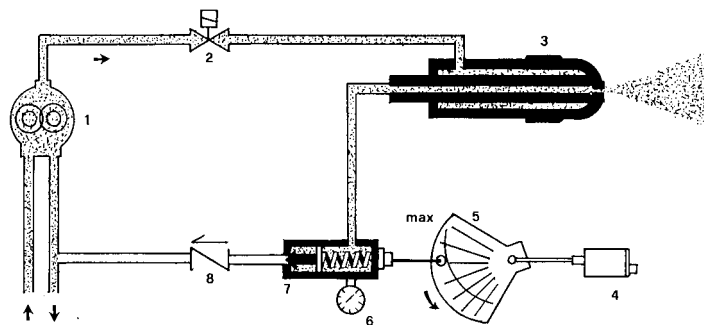


Fig. 9 - High flame

Key

- 1 Light oil pump
- 2 Light oil solenoid valve
- 3 Nozzle
- 4 Servocontrol
- 5 Adjusting cam
- 6 pressure gauge
- 7 Pressure regulator
- 8 One-way valve

Light oil nozzles

The light oil flow rate can be adjusted choosing a by-pass nozzle that suits the boiler/utilisation's output and setting the delivery and return pressure values according to the values quoted on diagram on Fig. 9.

NOZZLE	NOZZLE SUPPLY PRESSURE bar	HIGH FLAME RETURN PRESSURE bar	LOW FLAME RETURN PRESSURE bar (recommended)
BERGONZO A3	20	11 ÷ 13	5 (recommended)

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

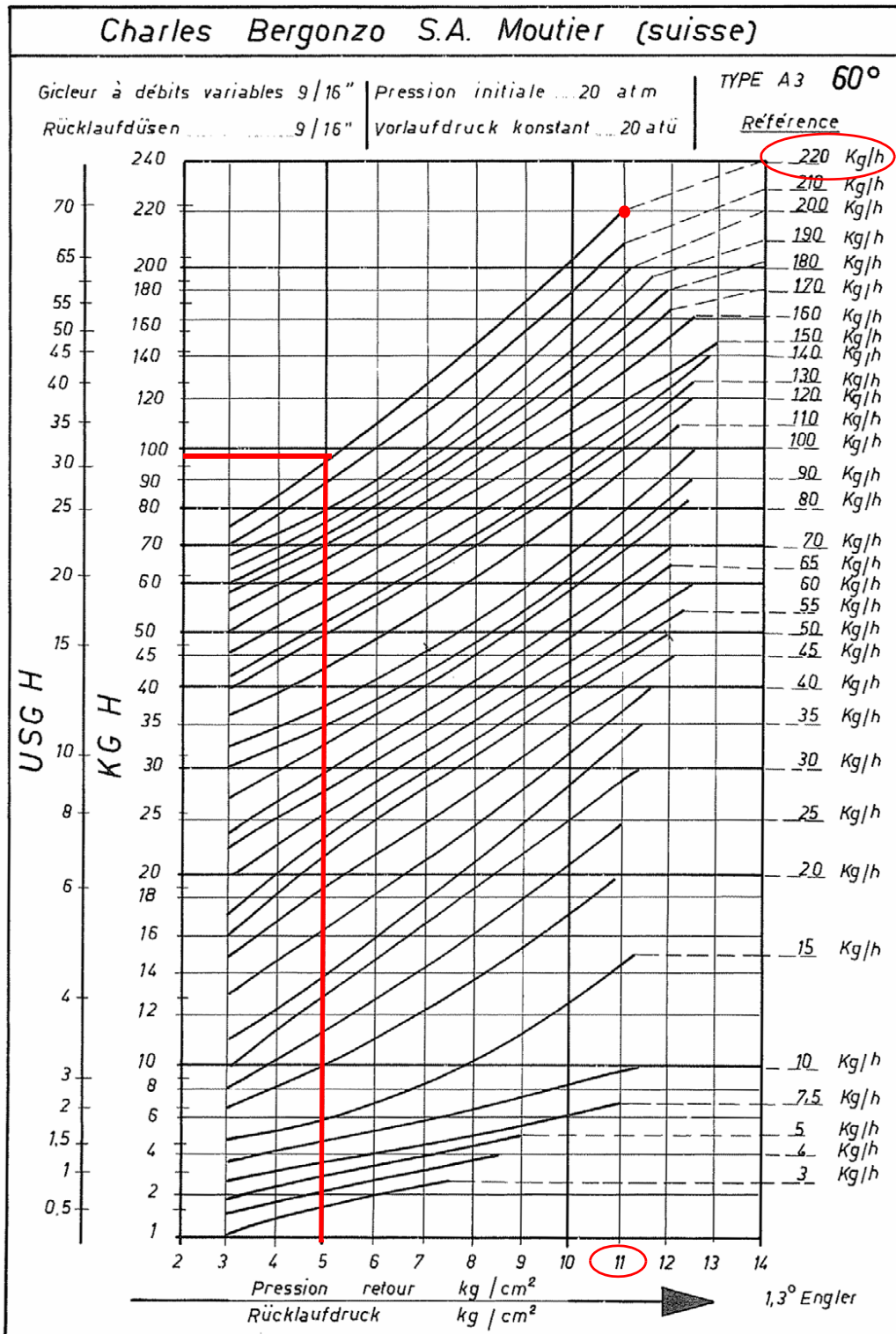


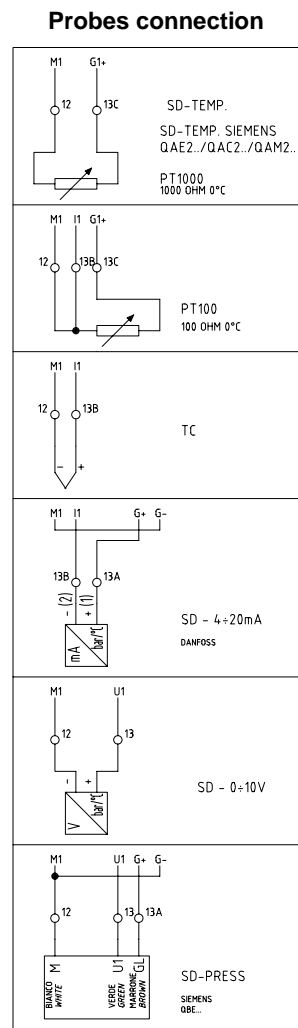
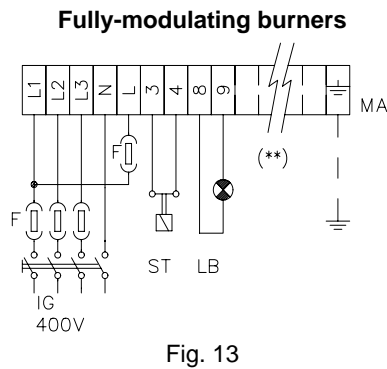
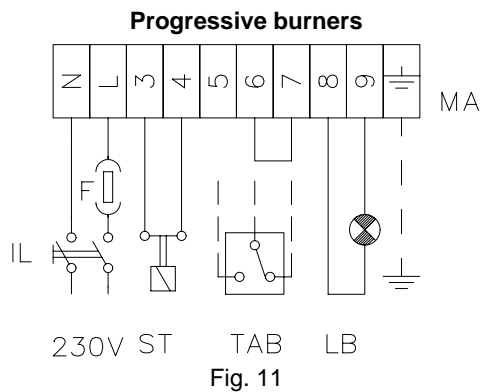
Fig. 10

Electrical connections

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

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

	WARNING: The burner is provided with a jumper between terminals 6 and 7; in the event of connecting the high/low flame thermostat remove this jumper before connecting the thermostat.
	IMPORTANT: while connecting electric supply wires to burner's terminal block be sure that ground wire should be longer than phase and neutral ones.



Fan-pump motor rotation


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


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

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

ADJUSTMENTS

Adjustments - brief description

	ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open. Be sure that the mains switch is closed.
	Before starting up the burner, make sure that the return pipe to the tank is not obstructed. Any obstruction would cause the pump seal to break.
	.ATTENTION: During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the gas decrease slowly until the normal combustion values are achieved.

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

Recommended combustion parameters		
<i>Fuel</i>	<i>Recommended (%) CO₂</i>	<i>Recommended (%) O₂</i>
Light oil	11.5 ÷ 13	2.9 ÷ 4.9

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

- Check that the combustion parameters are in the suggested limits.
- Check the oil flow rate.
- Then, adjust the combustion values corresponding to the points between maximum and minimum: set the foil shape of the adjusting cam. The adjusting cam sets the air/fuel ratio in those points, regulating the opening-closing of the fuel governor.
- Set, now, the low flame output, acting on the low flame microswitch of the actuator in order to avoid the low flame output increasing too much or that the flues temperature gets too low to cause condensation in the chimney.

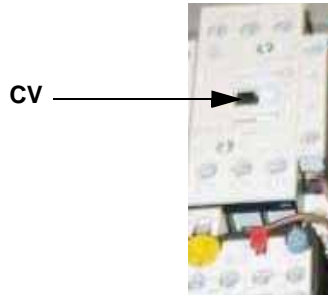
Adjustment procedure

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

- PG60: Berger STA12..
- PG70-PG81: Berger STM30.. / Siemens SQL33..

Adjustment by the Berger ST.. actuator

- 1 Open the electrical panel to check the motor rotation and act directly on its solenoid starter (see next picture): keep pressed until the oil circuit is charged.



- 2 bleed the air from the **M** pressure gauge port (Fig. 14) by loosening the cap without removing it, then release the solenoid starter.

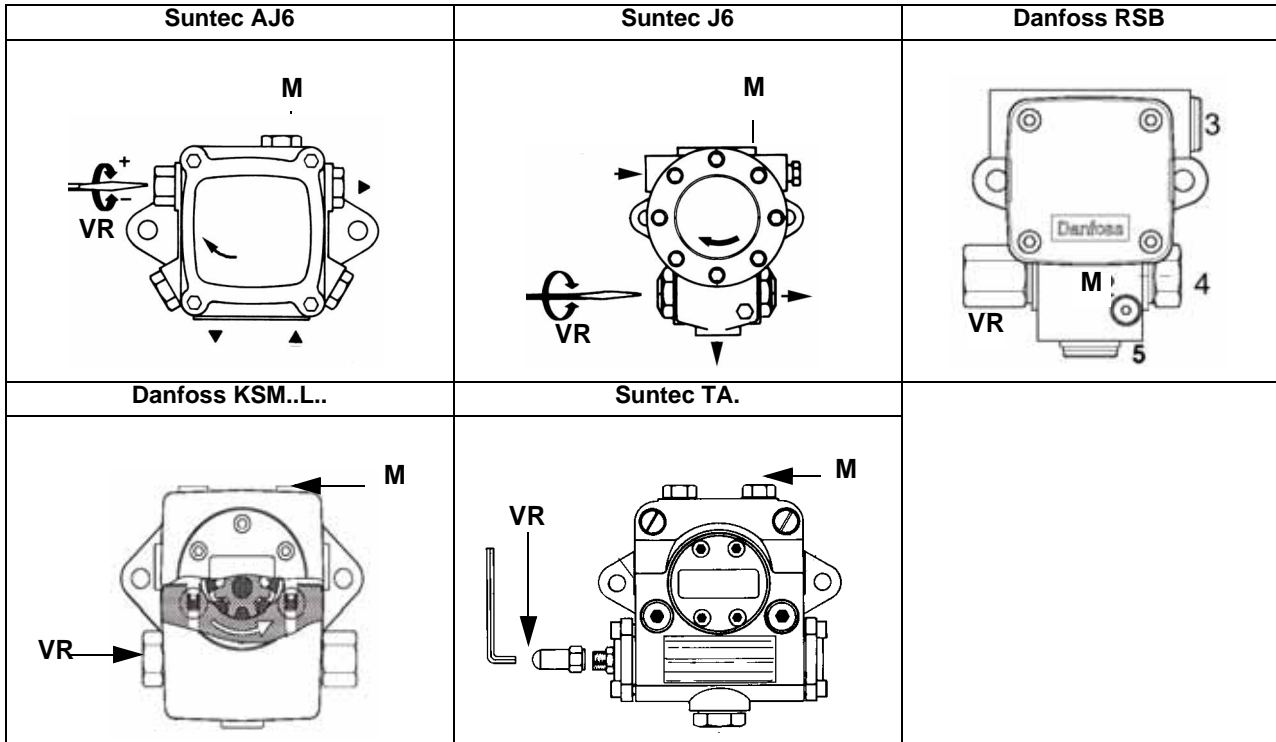
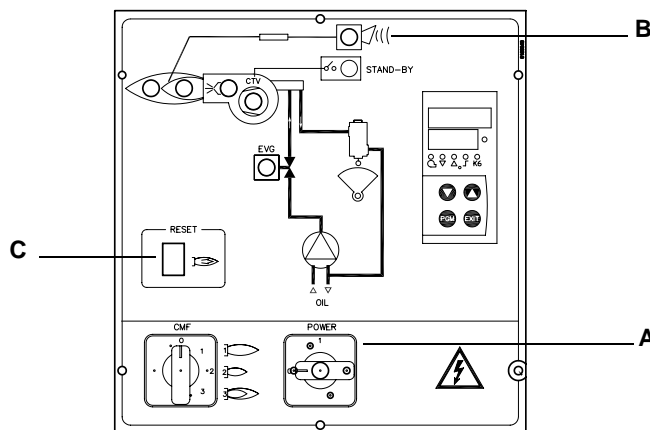


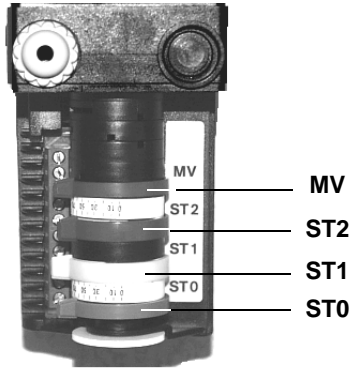
Fig. 14

- 3 Before starting the burner up, drive the high flame actuator microswitch matching the low flame one (in order to let the burner operates at the lowest output) to achieve safely the high flame stage .
- 4 Turn the burner on by means of its main switch **A**: if the burner locks (LED **B** on in the control panel) press the RESET button (**C**) on the control panel (see next picture) - see chapter "OPERATION" on page 26.



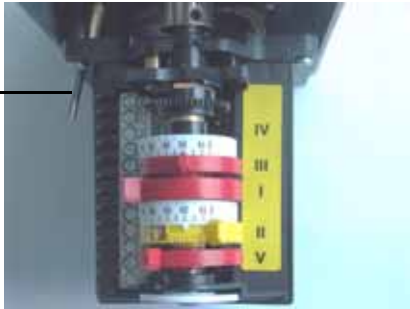
- 5 be sure that the actuator cam for the "Startup enabling signal" (when used) is 5° more than the ignition cam;
- 6 start the burner up by means of the thermostat series and wait until the pre-purge time comes to an end;
- 7 drive the burner to high flame stage, by means to the thermostat **TAB**.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



STA12.. Actuator cams

- ST2 High flame
- ST0 Stand-by and Ignition
- ST1 Low flame
- MV Startup signal



STM30.. Actuator cams

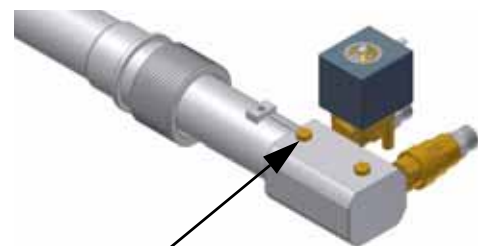
- I High flame
- II Stand-by and Ignition
- III Low flame
- V Startup signal

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 showed on Fig. 15-Fig. 16 and act on on the pump adjusting screw **VR** (see Fig. 14) as to get the nozzle pressure at 20bar (Bergonzo nozzles - see diagram on Fig. 10).



Pressure gauge port

Fig. 15 - Light oil manifold (PG60)



Pressure gauge port

Fig. 16 - Combustion head with light oil gun (PG70 - PG81)

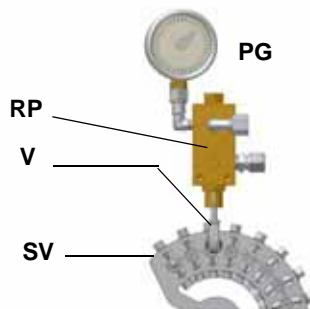
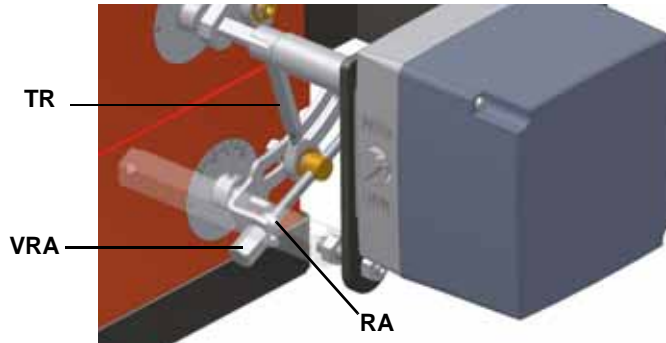


Fig. 17

- 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 **SV** adjusting cam screw (see picture Fig. 17) when the cam has reached the high flame position.
- 11 To adjust the **air flow rate in the high flame stage**, loose the **RA** nut and screw **VRA** as to get the desired air flow rate: moving the rod **TR** towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it far from the shaft the air damper closes and the air flow rate decreases.

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



- 12 The burner is factory-set with the head in its MAX position (maximum output).

PG60:

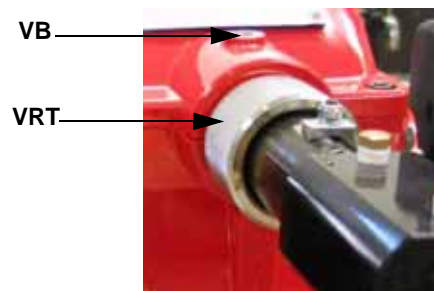
To let the burner operate at a lower output, turn clockwise the **VRT** screw and move progressively the combustion head back towards the MIN position.

PG70-PG81:

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



PG60



PG70-PG81



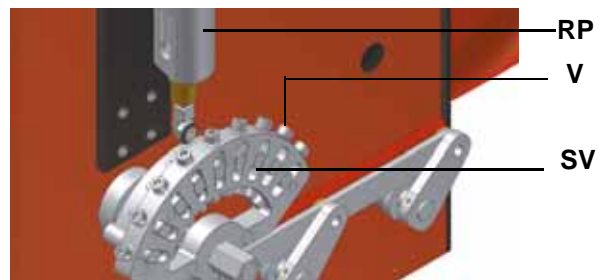
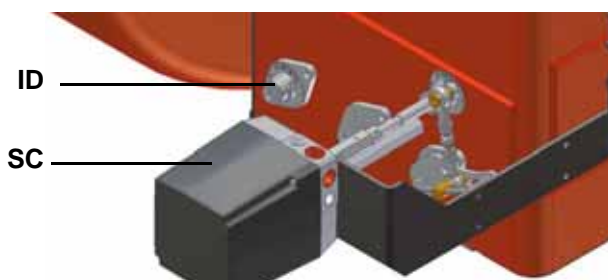
"MIN" position



"MAX" position

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

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



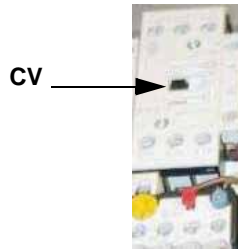
- 14 as for the point-to-point regulation in order to set the cam foil shape, move the low flame microswitch (cam III) a little lower than the maximum position (90°);

- 15 set the **TAB** thermostat to the minimum in order that the actuator moves progressively towards the low flame position;
- 16 move cam III (low flame) towards the minimum to move the actuator towards the low flame until the two bearings find the adjusting screw that refers to a lower position: screw **V** to increase the rate, unscrew to decrease, in order to get the pressure as showed on diagram in Fig. 10, according to the requested rate.
- 17 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.
- 18 The low flame position must never match the ignition position that is why cam **III** must be set 20°- 30° more than the ignition position.

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

Adjustment by the Siemens SQL33.. servocontrol

- 1 Open the electrical panel to check the fam motor rotation and act directly on the related solenoid starter (see next picture): keep pressed until the oil circuit is charged.

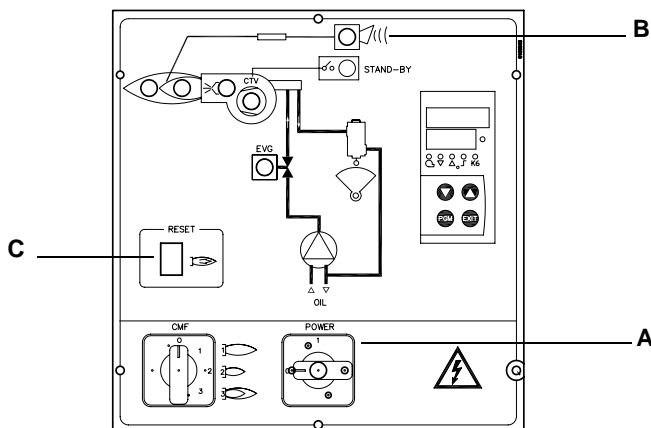


- 2 bleed the air from the **M** pressure gauge port (Fig. 18) by loosening the cap without removing it, then release the solenoid starter.

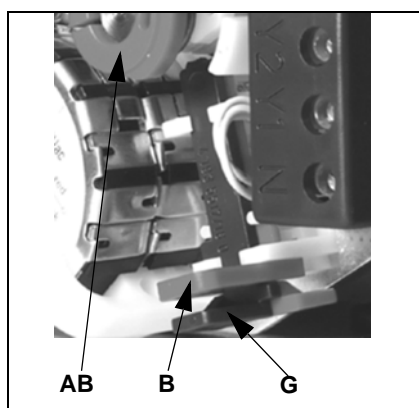
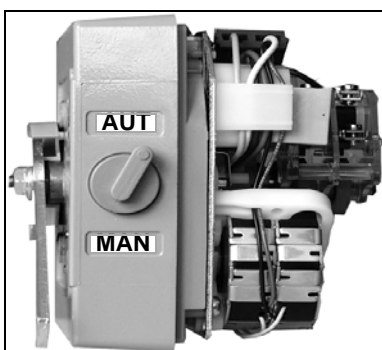
<p>Suntec AJ6</p>	<p>Suntec J6</p>	<p>Danfoss RSB</p>
<p>Danfoss KSM..L..</p>	<p>Suntec TA.</p>	

Fig. 18

- Turn the burner on by means of its main switch **A**: if the burner locks (LED **B** on in the control panel) press the RESET button (**C**) on the control panel (see next picture) - see chapter "OPERATION" on page 26.

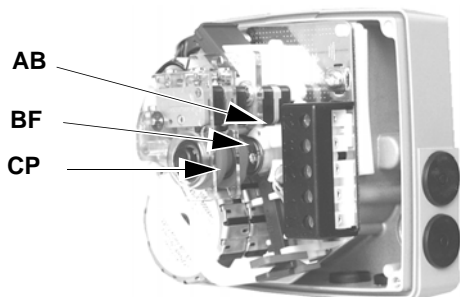


- be sure that the actuator cam for the "Startup enabling signal" (when used) is 5° more than the ignition cam;



SQL330.. actuator cams

- AB = High flame cam
- BF = Low flame cam
- B = plastic cam
- G = cam locking lever
- CP= cam for start-up enabling signal



- Start the burner up by means of the thermostat series and wait until the pre-purge phase comes to end;
- 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.24);
- disconnect the **TAB** thermostat removing the wire from the terminal no. 6 or by setting MAN on the RWF40 modulator or by setting 0 by means of the **CMF** switch (only for fully-modulating burners);
- set the actuator on the manual mode (MAN) by means of the MAN/AUTO switch (see next pictures).
- manually drive the adjusting cam **SV** to the high flame position and set the actuator to the AUTO mode (by the related switch - see picture) to lock the adjusting cam.
- the nozzle supply pressure is already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); insert a pressure gauge into the port showed on Fig. 19-Fig. 20 and act on on the pump adjusting screw **VR** (see Fig. 18) as to get the nozzle pressure at 20bar (Bergonzo nozzles - see diagram on page 15).

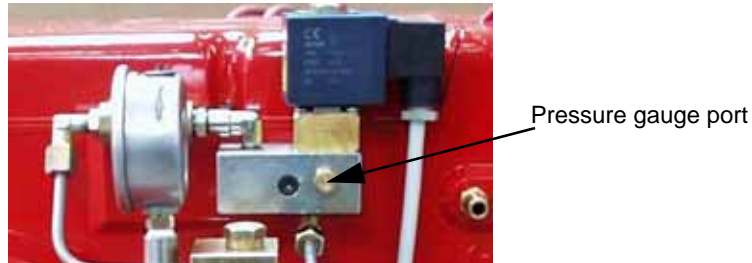


Fig. 19 - Light oil manifold (PG60)

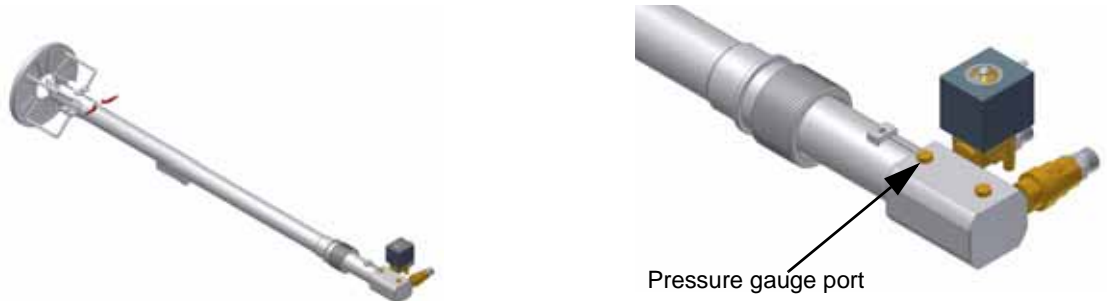


Fig. 20 - Combustion head with light oil gun (PG70 - PG81)

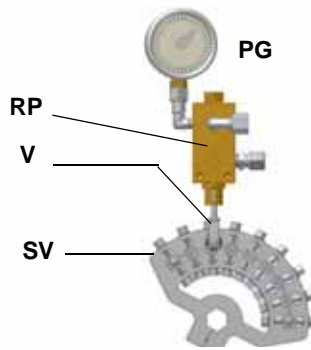
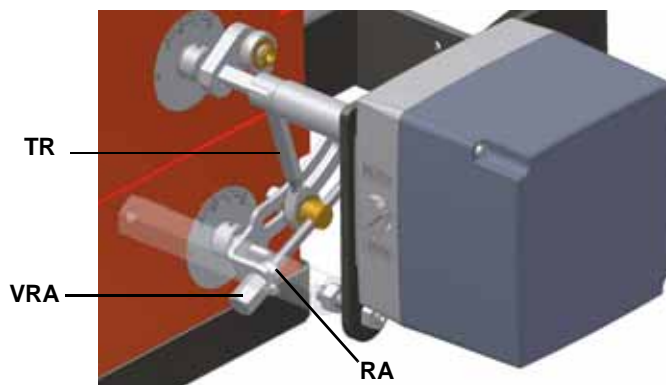


Fig. 21

- 11 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the **PG** pressure gauge) without changing the air flow rate set during the gas operation adjustments (see previous paragraph): checking always the combustion parameters, the adjustment is to be performed by means of the **SV** adjusting cam screw (see picture Fig. 21) when the cam has reached the high flame position.
- 12 To adjust the **air flow rate in the high flame stage**, loose the **RA** nut and screw **VRA** as to get the desired air flow rate: moving the rod **TR** towards the air damper shaft, the air damper opens and consequently the air flow rate increases, moving it far from the shaft the air damper closes and the air flow rate decreases.

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



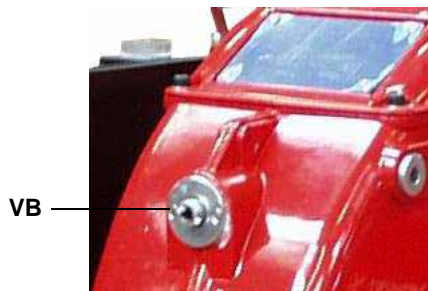
- 13 The burner is factory-set with the head in its MAX position (maximum output).

PG60:

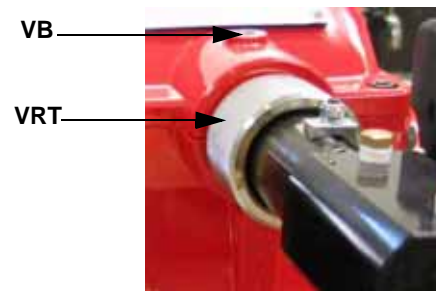
To let the burner operate at a lower output, turn clockwise the **VRT** screw and move progressively the combustion head back towards the MIN position.

PG70-PG81:

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



PG60



PG70-PG81



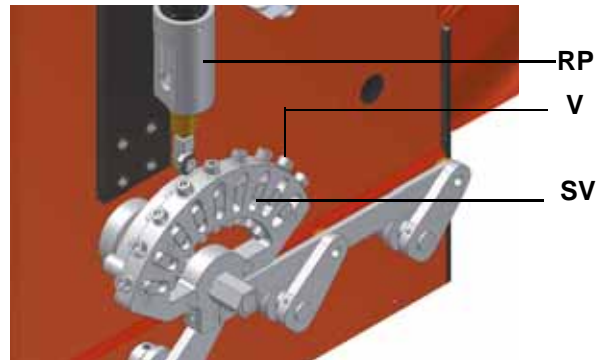
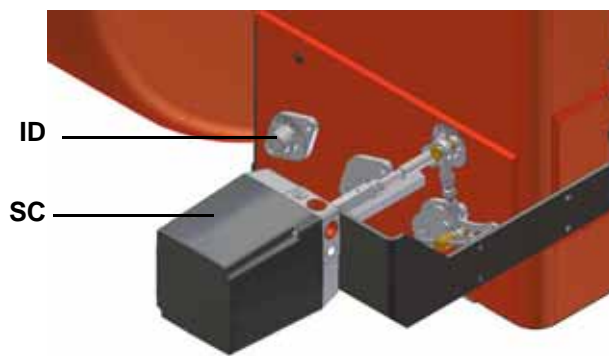
"MIN" position



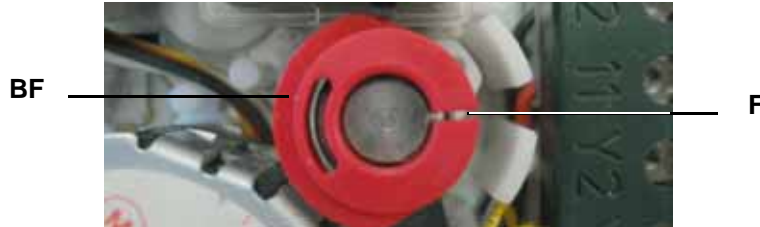
"MAX" position

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

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



- 15 to change the **SV** position set the actuator on the manual mode (MAN), turn the adjusting cam **SV** and set again the actuator to the AUTO mode to lock the adjusting cam;
- 16 act on the **V** screw that matches the bearings referring to the adjusting cam position;
- 17 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.
- 18 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).
- 19 Turn the burner off then start it up again.
- 20 Once the pre-purge time comes to end, drive the burner to the high flame stage by the **TAB** thermostat: check the combustion values;
- 21 drive the burner to low flame, if necessary adjust the low flame size (output) by inserting a screwdriver on the slot **F** to move the **BF** cam.



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

NOTE: to change the low flame position, act exclusively on the actuator cam.

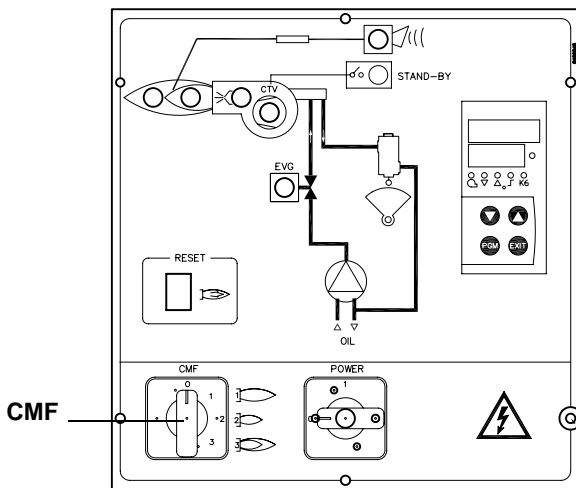
23 Now adjust the pressure switch (when provided - see next paragraphs).

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
 CMF = 1 high flame operation
 CMF = 2 low flame operation
 CMF = 3 automatic operation

To adjust the air rate in low flame and in the intermediate points, proceed as follow.

- 1 Keep pushed for 5 seconds the **EXIT** button on the modulator (for further details, see the burner modulator manual); when the LED with the hand symbol lights up, press the arrow button, driving the actuator to the maximum opening position progressively;
- 2 stop its stroke when it meets each screw **V**: adjust the air rate by adjusting the **V** screw that matches each bearing.
- 3 Push the **EXIT** button to quit the manual mode.

Calibration of air pressure switch (when provided)

To calibrate the air pressure switch, proceed as follows:

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

PART II: OPERATION

LIMITATIONS OF USE

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

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

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

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

NEVER OPEN OR DISMANTLE ANY COMPONENT OF THE MACHINE.

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

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

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

OPERATION



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

- 1 Set to the ON position the switch A on the control panel of the burner.
- 2 Check the control box is not in the lockout position (light **B** must be off); in such a case reset it by the reset pushbutton **C**.
- 3 Check the series of thermostats (or pressure switches) sends the burner the signal to operate.
- 4 The startup sequence begins: the control box ignites the fan motor and energises the ignition transformer as well (signalled by the light **H** on the burner control panel).
- 5 At the end of the pre-purge stage, the light oil solenoid valve EVG1 is energised (signalled by the lamp **G** on the control panel) and the burner is on.
- 6 The ignition transformer is energized for few seconds after the ignition of the flame (post-ignition time) and at the end of this time is de-energised (light **H** off).
- 7 After the ignition the servocontrol moves to the high flame position for some seconds, then the operation begins and the burner switches to high flame or to low flame, according to the plant demand.
- 8 The high/low flame operation is showed by the **F** LED turning on/off.

Burner control panel

PG60

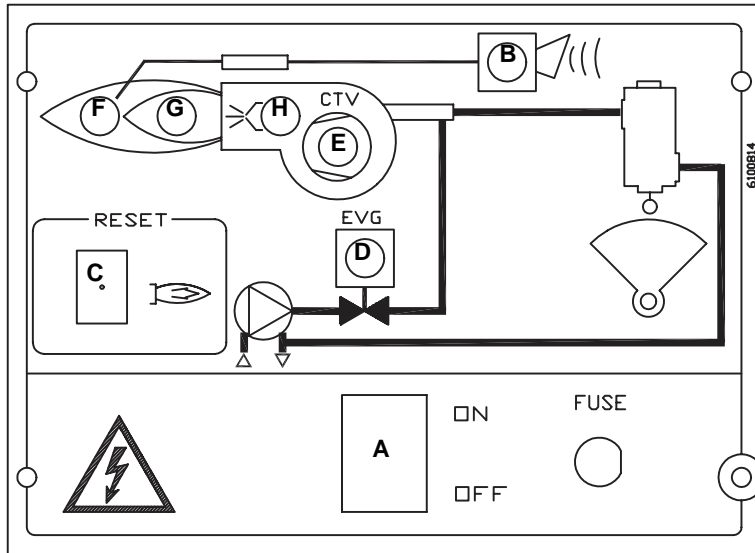
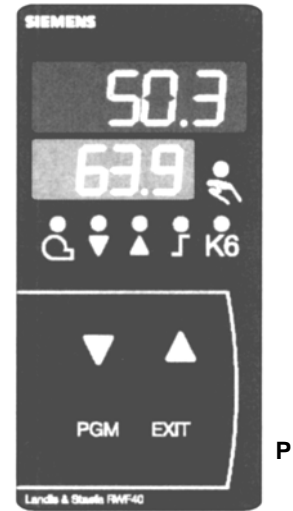


Fig. 22



PG70-PG81

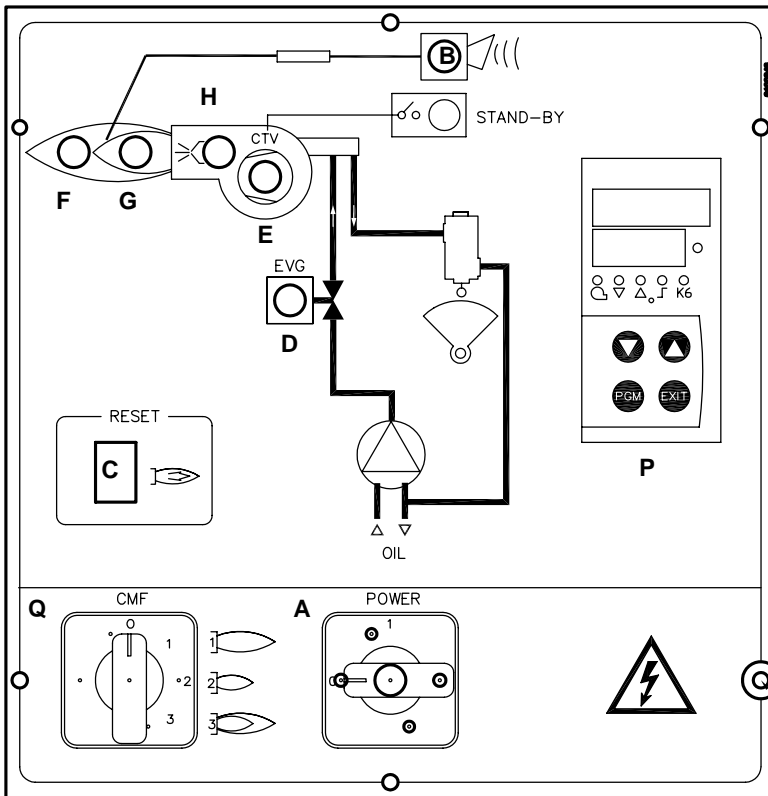
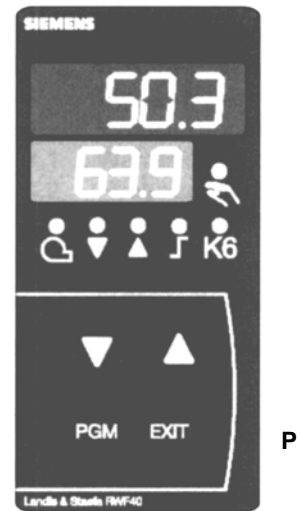


Fig. 23



Keys

- A ON-OFF main switch
- B Lockout signalling lamp
- C Conreol box release pushbutton
- D Signalling lamp for light oil solenoid valve opening
- E Thermal cutout intervention signalling lamp
- F High flame operation signalling lamp
- G Low flame operation signalling lamp
- H Ignition transformer operation signalling lamp
- P Siemens modulator
- Q Manual operation mode switch

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 cartridge of the fuel filter, replace it if necessary (see next paragraph);
- carefully check for leaks, the fuel flexible hoses;
- check and clean the filter on the fuel pump: filter must be thoroughly cleaned at least once in a season to ensure correct working of the fuel unit. To remove the filter, unscrew the four screws on the cover. When reassemble, make sure that the filter is mounted with the feet toward the pump body. If the gasket between cover and pump housing should be damaged, it must be replaced;
- remove, check and clean the combustion head (page 29); when reassembling, carefully observe the measures on page 29;
- check the ignition electrodes and their ceramic insulators, clean, adjust and replace if necessary;
- remove and clean the oil nozzles (IMPORTANT: do not clean the nozzles using metallic or sharp utensils, use only solvents or steam); at the end of maintenance operations, refit the burner, turn it on and check the combustion. If in doubt, replace the defective nozzle/s. In case of intensive use of the burner, the nozzles must be replaced at the end of the working season;
- check and carefully clean the flame detection photoresistor, if necessary replace it and, if in doubt, check the detection current following the diagram on page 31;
- clean and grease levers and rotating parts.

Light oil filter maintenance

For correct and proper servicing, proceed as follows:

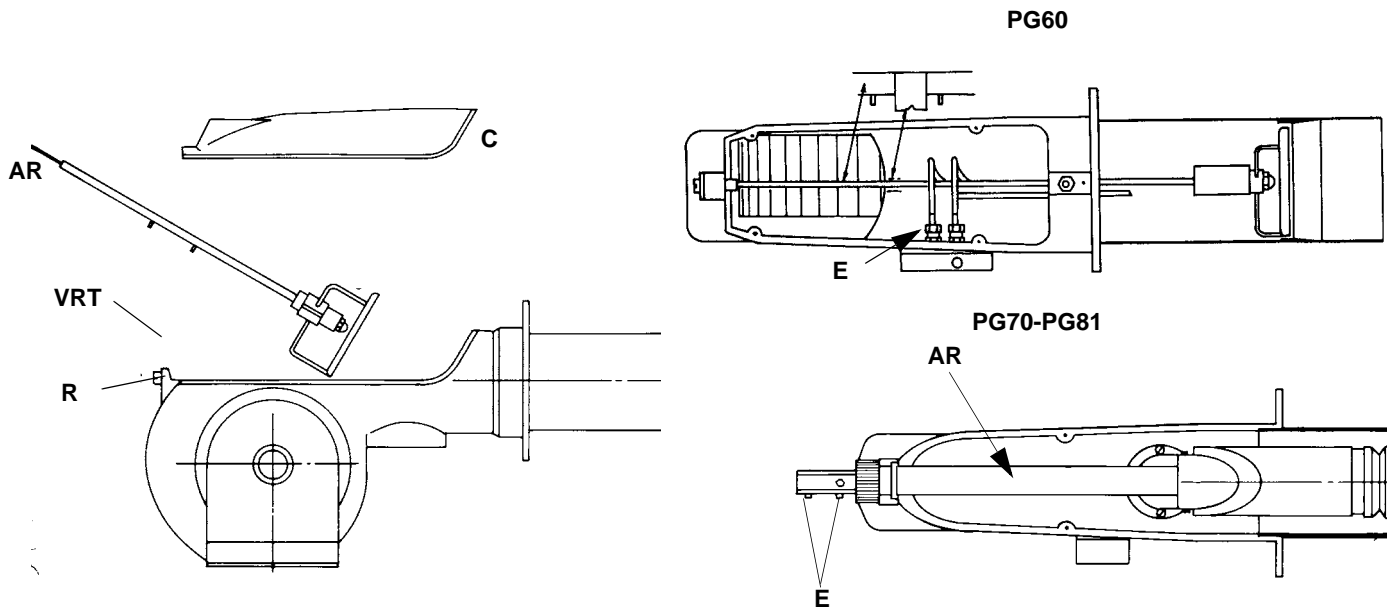
- 1 shut off fuel in the line section being serviced;
- 2 unscrew the tray;
- 3 remove the filter cartridge from its support and wash it with petrol or replace if necessary; check seal O-Ring, replace if necessary;
- 4 reassemble the tray and restore fuel flow.



Removing the combustion head and the oil gun

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

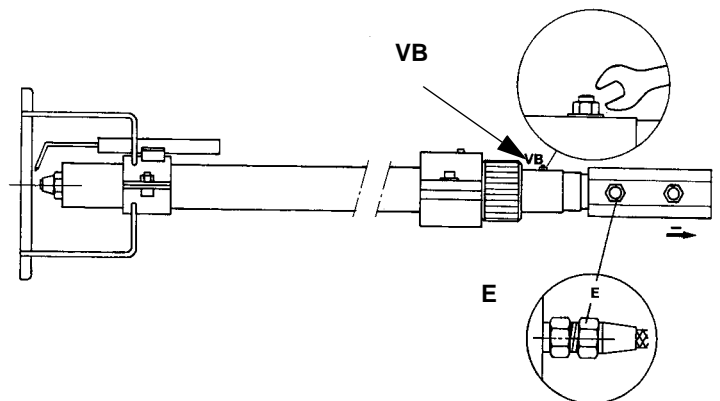
Note: to replace the combustion head reverse the procedure described above.

**Removing the oil gun (PG70-PG81)**

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

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

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



Correct position of electrodes and combustion head



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

To guarantee a good ignition the measures showed on the next picture Fig. 24 must be observed.
Be sure to tight the screw on the electrodes group before reassembling the combustion head.

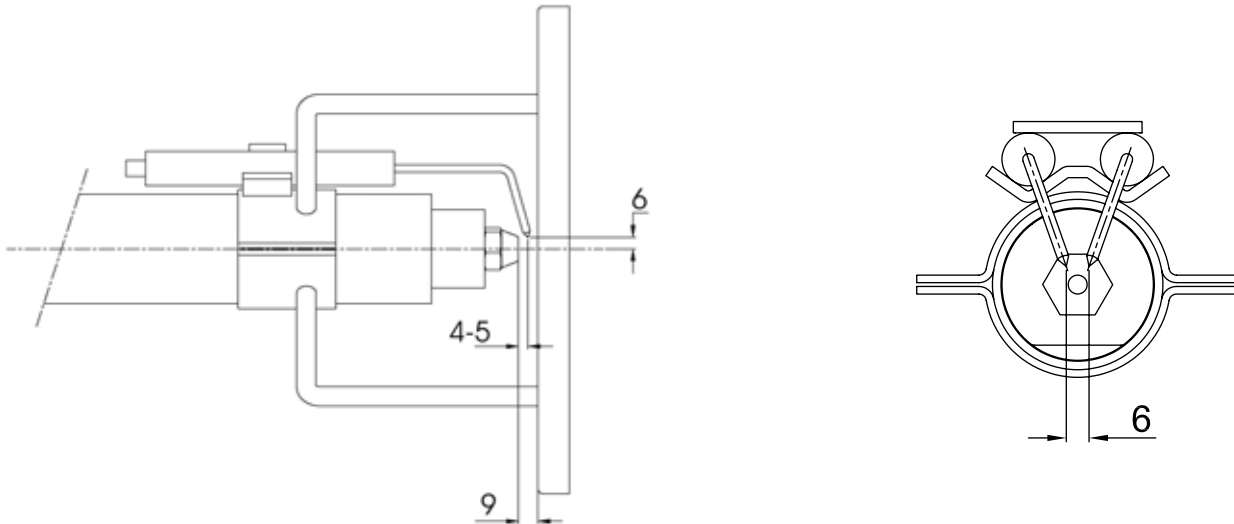


Fig. 24

Replacing the ignition electrodes



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

To replace the ignition electrodes, proceed as follows:

- 1 remove the burner cover;
- 2 disconnect the electrodes cables;
- 3 remove the combustion head (see par. "Removing the combustion head");
- 4 loose screw (B) that fasten the ignition electrodes;
- 5 remove the electrodes and replace them, referring to the values quoted on Fig. 24.

Cleaning and replacing the detection photoresistor

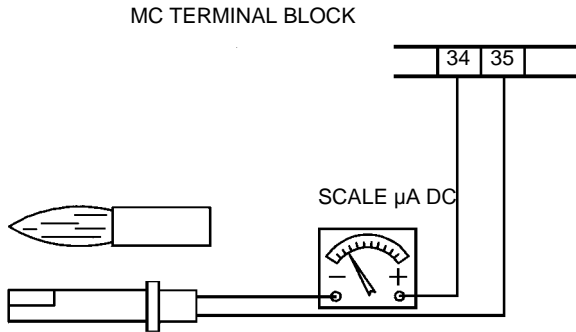
To clean/replace the photoresistor, proceed as follows:

- 1 disconnect the system from the electrical power supply;
- 2 shut off the fuel supply;
- 3 remove the photoresistor from its slot;
- 4 clean it using a clean cloth; do not use any cleansing spray;
- 5 if necessary, replace it;
- 6 insert the photoresistor into its slot.

Checking the detection current

To measure the detection signal follow the diagram on the next picture.

If the signal is not in the advised range, check the electrical contacts, the cleaning of the combustion head, the position of the photoreistor and if necessary replace it.



	LOA24	LMO24	LMO44
Minimum current intensity with flame	45μA		
Maximum current intensity without flame	5.5μA		
Maximum possible current intensit with flamey	45μA	100μA	100μA

Seasonal stop

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

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

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

ELECTRICAL WIRING DIAGRAMS

PG60

CAV	Fan motor contactor auxiliary contacts
CCMF	Operation manual switch
	0) stop - 1) high flame - 2) low flame - 3) automatic
CR1	Auxiliary relay contacts
CRT	Delayed relay contacts
CTV	Fan motor thermal cutout contacts
CV	Fan motor contactor contacts
EVG	Oil solenoid valve
F÷F4	Fuses
FR	Photoresistor
IG	Main switch
IL	Main switch
L	Phase
LAF	"Burner in high flame" signalling lamp
LB	"Burner lockout" signalling lamp
LBF	"Burner in low flame" signalling lamp
LEV	"EVG solenoid valve opening" signalling lamp
LOA24/LMO24	SIEMENS control box
LMO44	SIEMENS control box
LT	"Lockout of fan motor thermal cutout" signalling lamp
LTA	"ignition transformer" signalling lamp
MA	Burner supply terminal block
MC	Components connections terminal block
MV	Fan motor
N	Neutral
PS (*)	Control box release pushbutton (only with LMO24)
Pt100	3 wires temperature probe Pt100
R1	Auxiliary relay
RT	Delayed relay
RWF40.000 **	SIEMENS burner modulator
SD-0/4÷20mA	Probe connection with signal 0÷20mA / 4÷20mA
SD-0÷10V	Probe connection with signal 0÷10V
SD-PRESS.	3 wires pressure probe (SIEMENS QBE620p..)
SD-TEMP.	2 wires temperature probe (Pt1000 - SIEMENS QAE2..,QAC2..)
ST	Thermostats or pressure switches series
STA12B3.41/63N21L	BERGER actuator
STA15B3.41/83N21L	BERGER actuator (alternative)
TA	Ignition transformer
TAB	High-low flame thermostat (if fitted remove the connection between terminals 6 and 7 on terminal block MA)
TC	Thermocoupling connection
TV	Fan motor thermal cutout

ACTUATOR CAMS

BERGER STM30	
ST2	High flame
ST0	Stop
ST1	Low flame
MV	Enabling signal

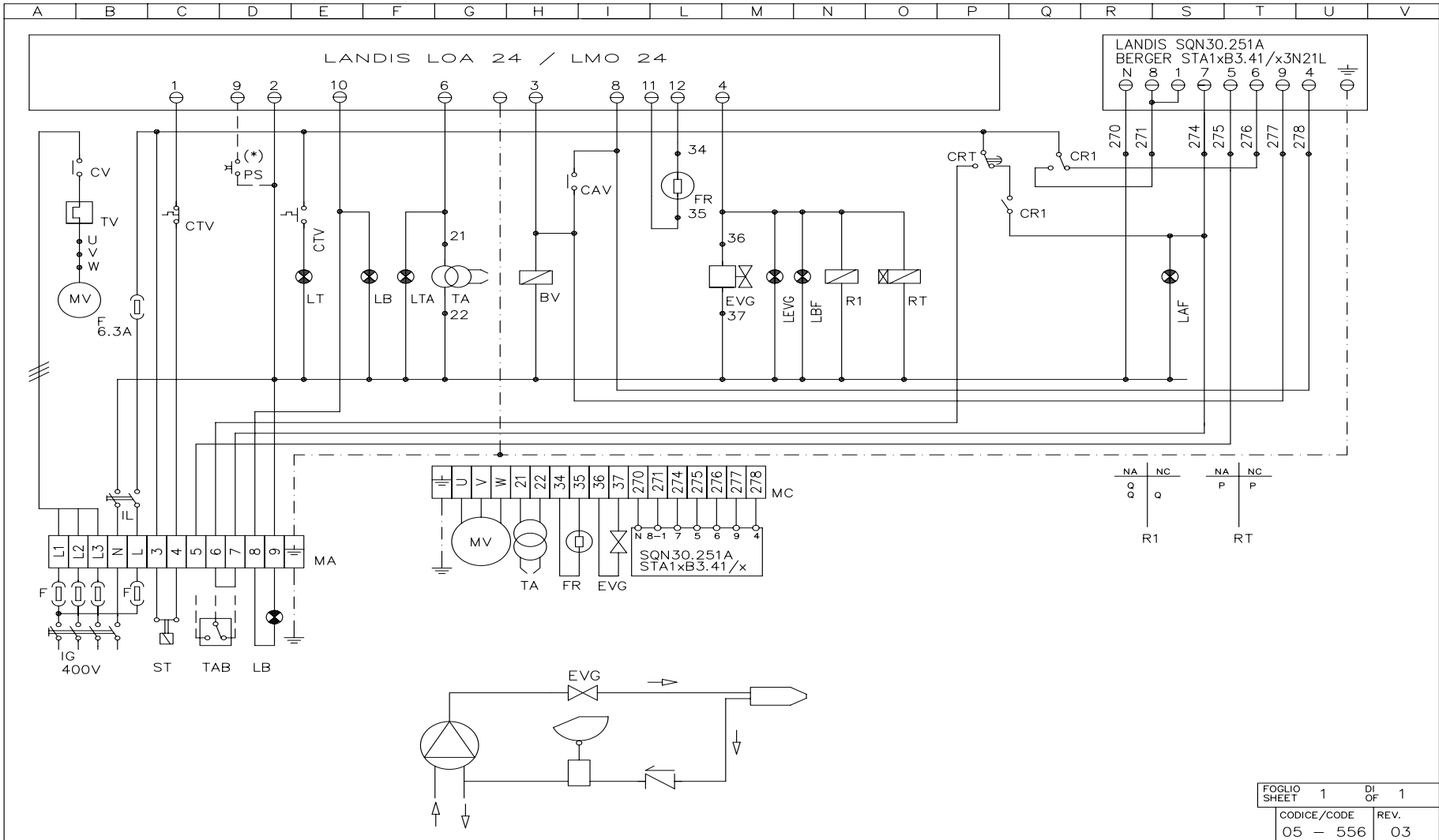
* The modulator includes a limit switch (terminals Q13 and Q14), it stops the burner if the work parameter overcomes set differential.

ATTENTION:

- 1 - Electric supply 400V 50Hz 3N a.c.
- 2 - Don't reverse phase and neutral
- 3 - Make sure that the burner is properly hearted

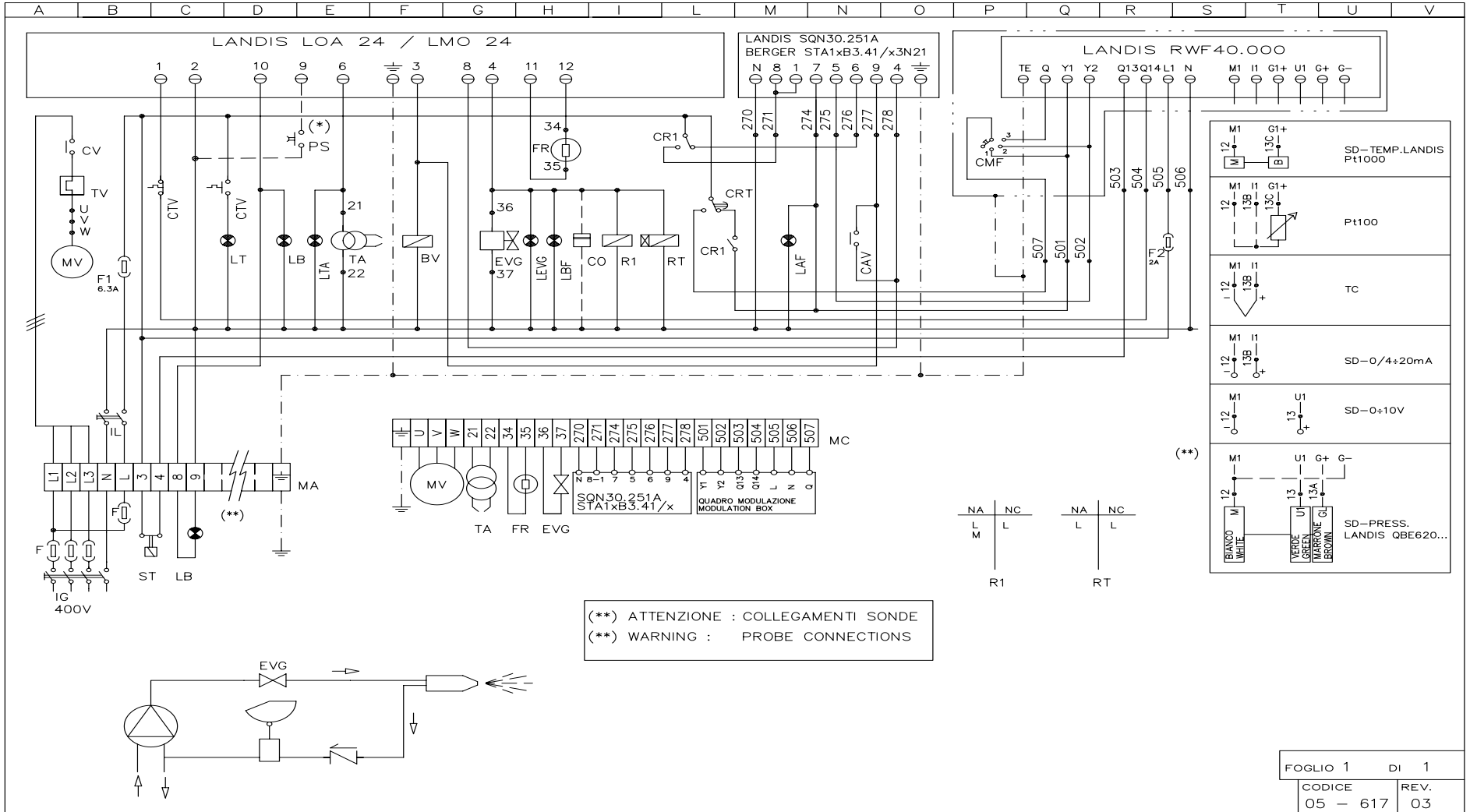
Wiring diagram 05-556 Rev. 3 - Progressive Burners - PG60

33



Wiring diagram 05-617 Rev. 3 - Fully-modulating Burners - PG60

34



PG70 - PG81: Complete keys

BERGER STM30	BERGER actuator (alternative)
CMF	Operation manual switch
	0) stop - 1) high flame - 2) low flame - 3) automatic
EVG	Oil solenoid valve
FR	Photoresistor
FU1.0	Line Fuse
FU1.2	Line Fuse
FU1.3	Auxiliary Line Fuse
IG	Main switch
IL	Main switch
KA2.3	Auxiliary relay
KM1.7	Fan motor contactor
KT2.4	Delayed relay
L	Phase
LAF	"Burner in high flame" signalling lamp
LB	"Burner lockout" signalling lamp
LBF	"Burner in low flame" signalling lamp
LEVG	"EVG solenoid valve opening" signalling lamp
LPGmin	"Gas in the network" signalling lamp
LT	"Lockout of fan motor thermal cutout " signalling lamp
LTA	"ignition transformer" signalling lamp
MV	Fan motor
N	Neutral
PS	Control box release pushbutton
Pt100	3 wires temperature probe Pt100
RWF40.000 **	SIEMENS Burner modulator
SD-0/4±20mA	Probe connection with signal 0÷20mA / 4÷20mA
SD-0±10V	Probe connection with signal 0÷10V
SD-PRESS.	3 wires pressure probe (SIEMENS QBE620p..)
SD-TEMP.	2 wires temperature probe (Pt1000 - SIEMENS QAE2...QAC2..)
SIEMENS LMO44	Control box
SIEMENS SQL	SIEMENS Air damper actuator
ST	Thermostats or pressure switches series
TA	Ignition transformer
TAB	High-low flame thermostat (if fitted remove the connection between terminals 6 and 7 on terminal block MA)
TC	Thermocoupling connection
TV	Fan motor thermal cutout

ACTUATOR CAMS

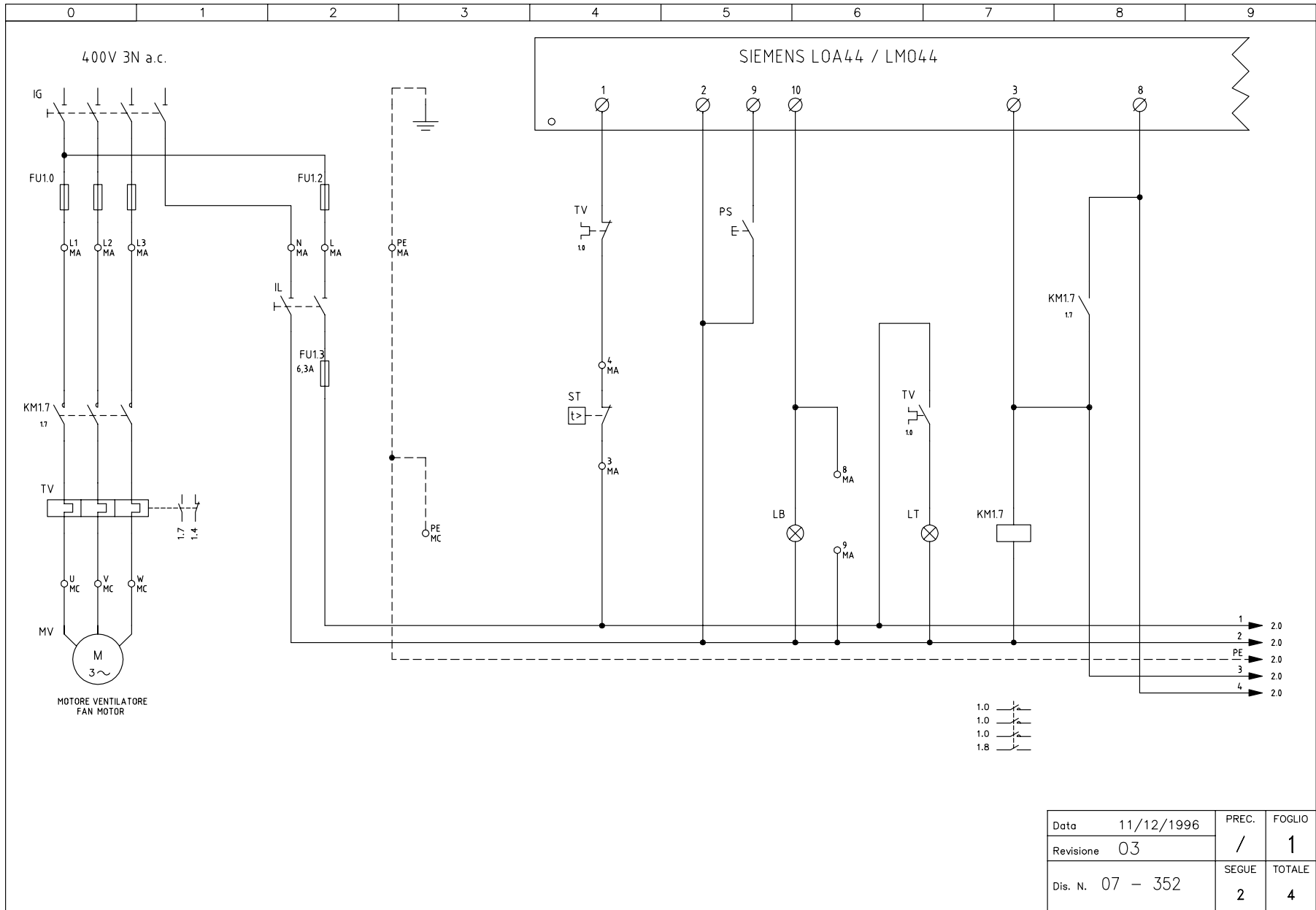
BERGER STM30	SIEMENS SQL33	
I	Y1	High flame
II	Y2	Stop / Ignition
III	3	Low flame
V	6	Startup signal

* The modulator includes a limit switch (terminals Q13 and Q14), it stops the burner if the work parameter overcomes set differential.

ATTENTION:

- 1 - Electric supply 400V 50Hz 3N a.c.
- 2 - Don't reverse phase and neutral
- 3 - Make sure that the burner is properly heated

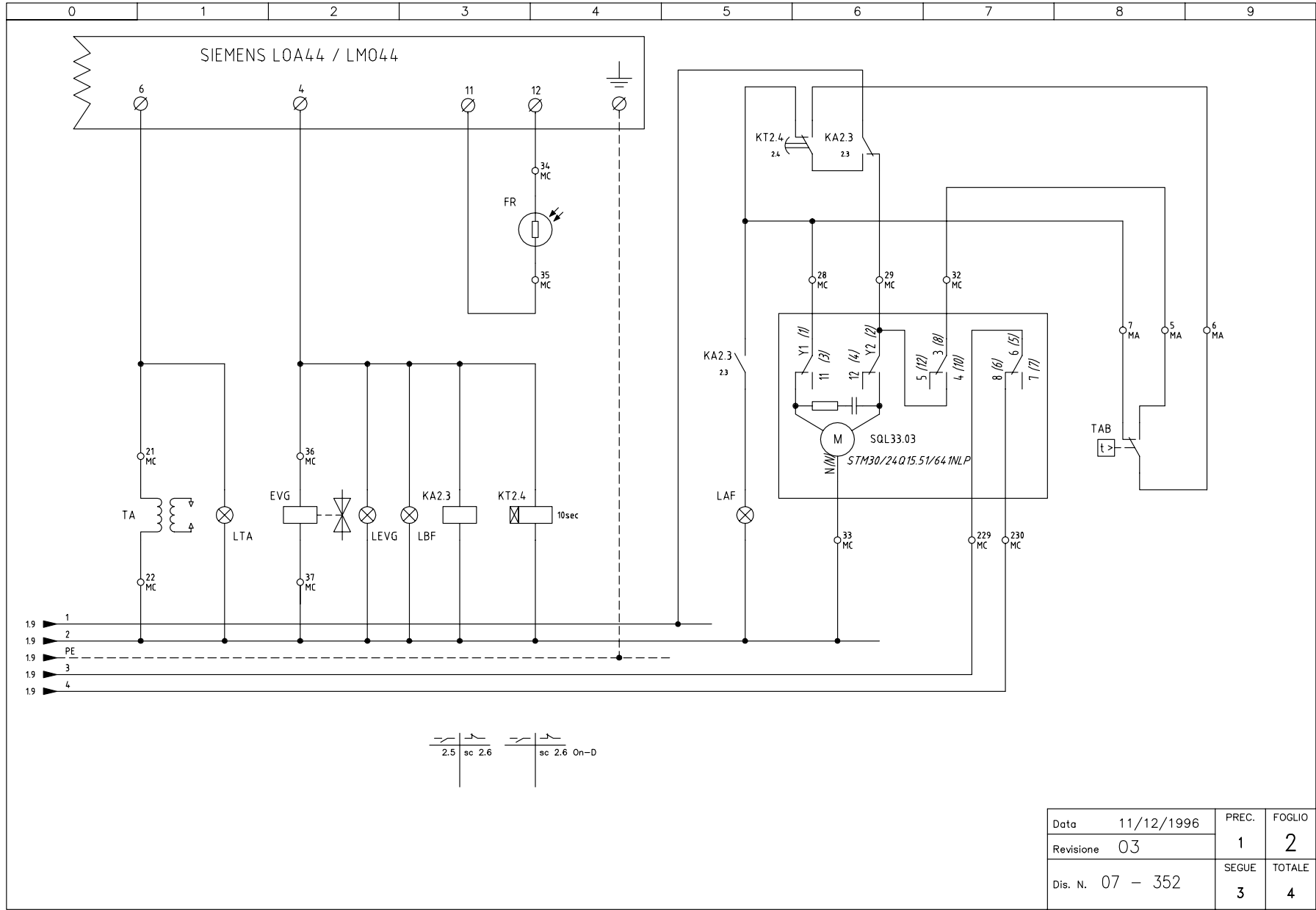
Wiring diagram 07-352 Rev. 3 - Progressive Burners - PG70-PG81

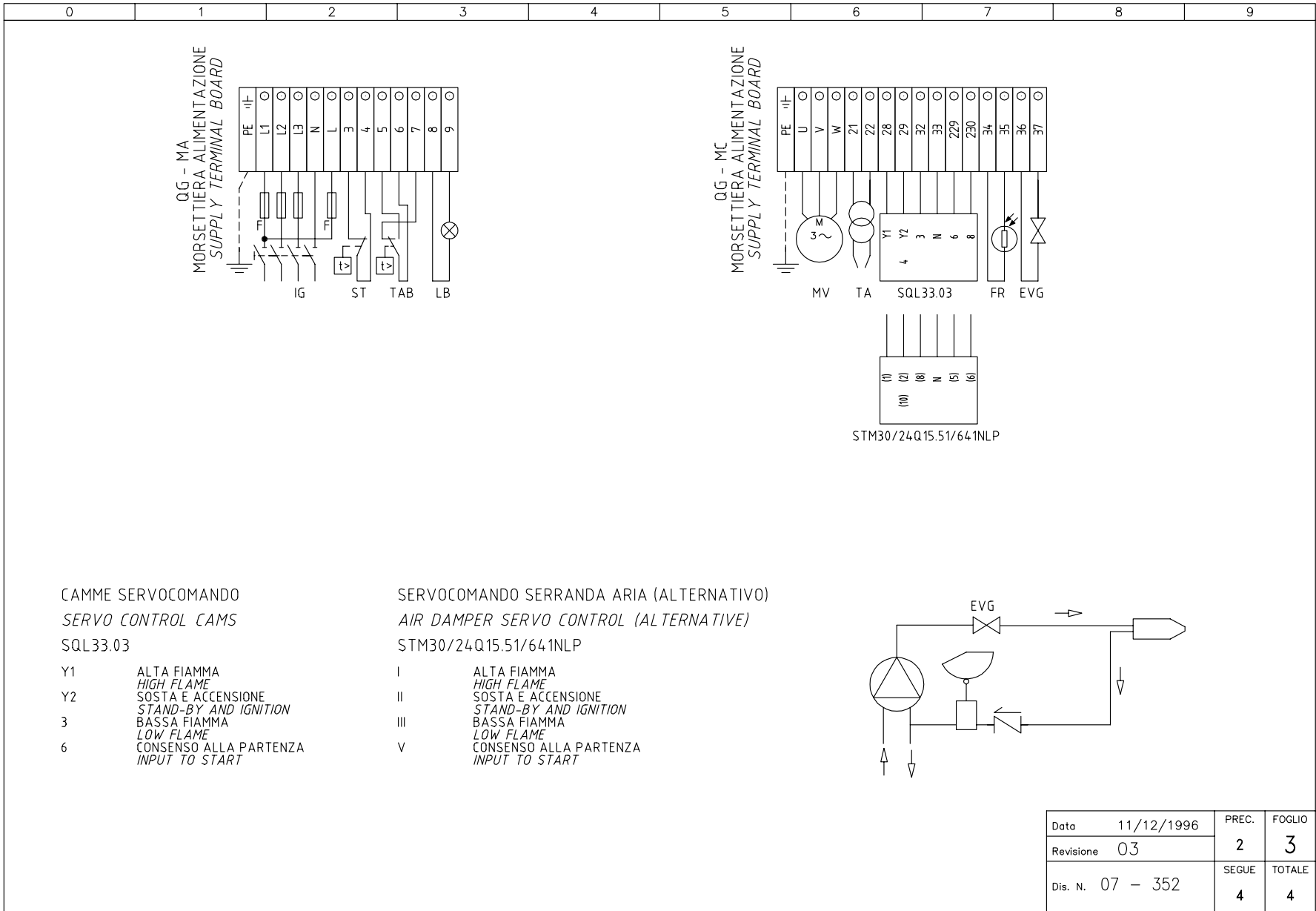


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CIB UNIGAS - M039191CA

Data	11/12/1996	PREC.	FOGLIO
Revisione	03	/	1
Dis. N.	07 - 352	SEGUE	TOTALE
		2	4





CAMME SERVOCOMANDO
 SERVO CONTROL CAMS
 SQL33.03

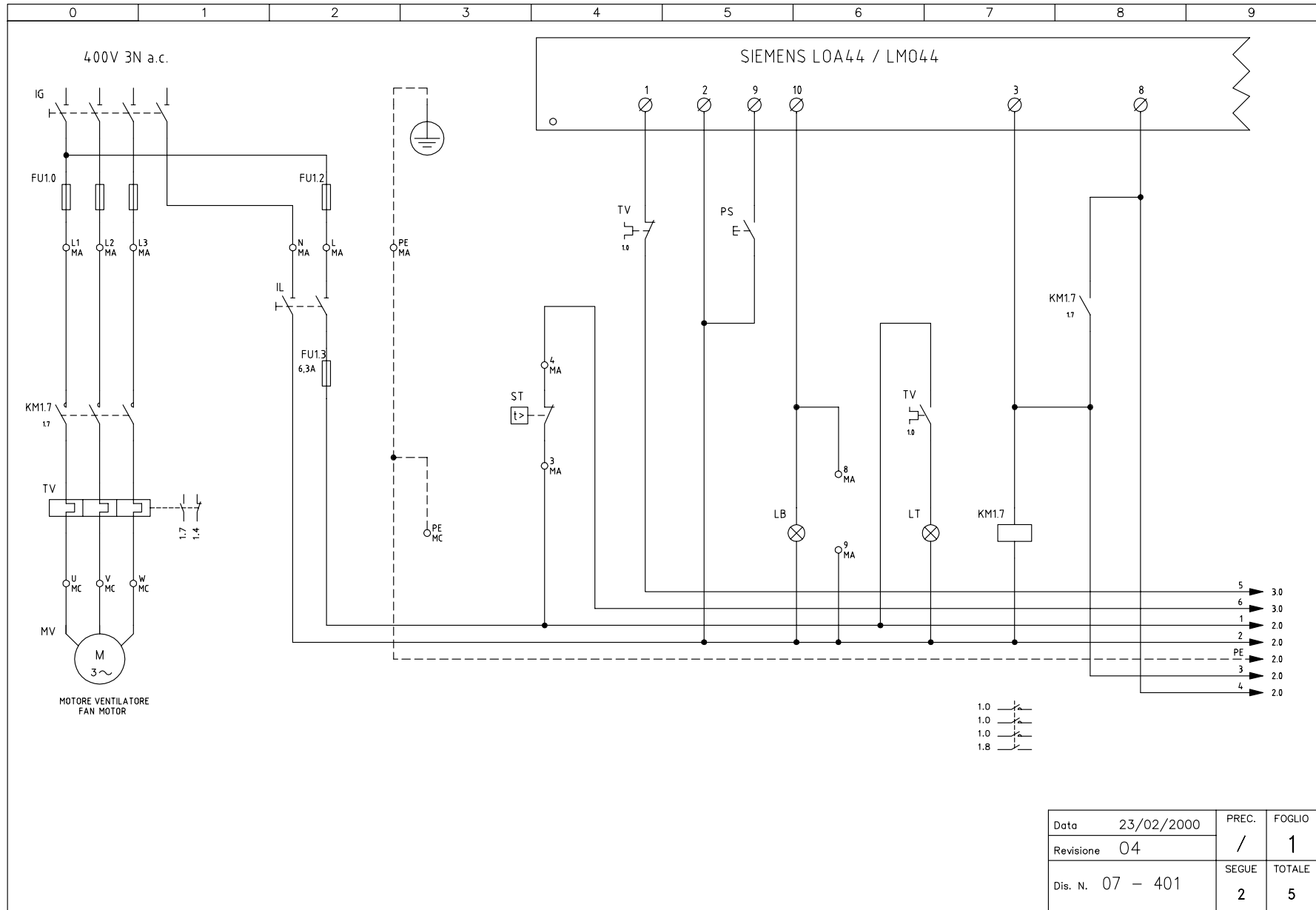
Y1	ALTA FIAMMA HIGH FLAME
Y2	SOSTA E ACCENSIONE STAND-BY AND IGNITION
3	BASSA FIAMMA LOW FLAME
6	CONSENSO ALLA PARTENZA INPUT TO START

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

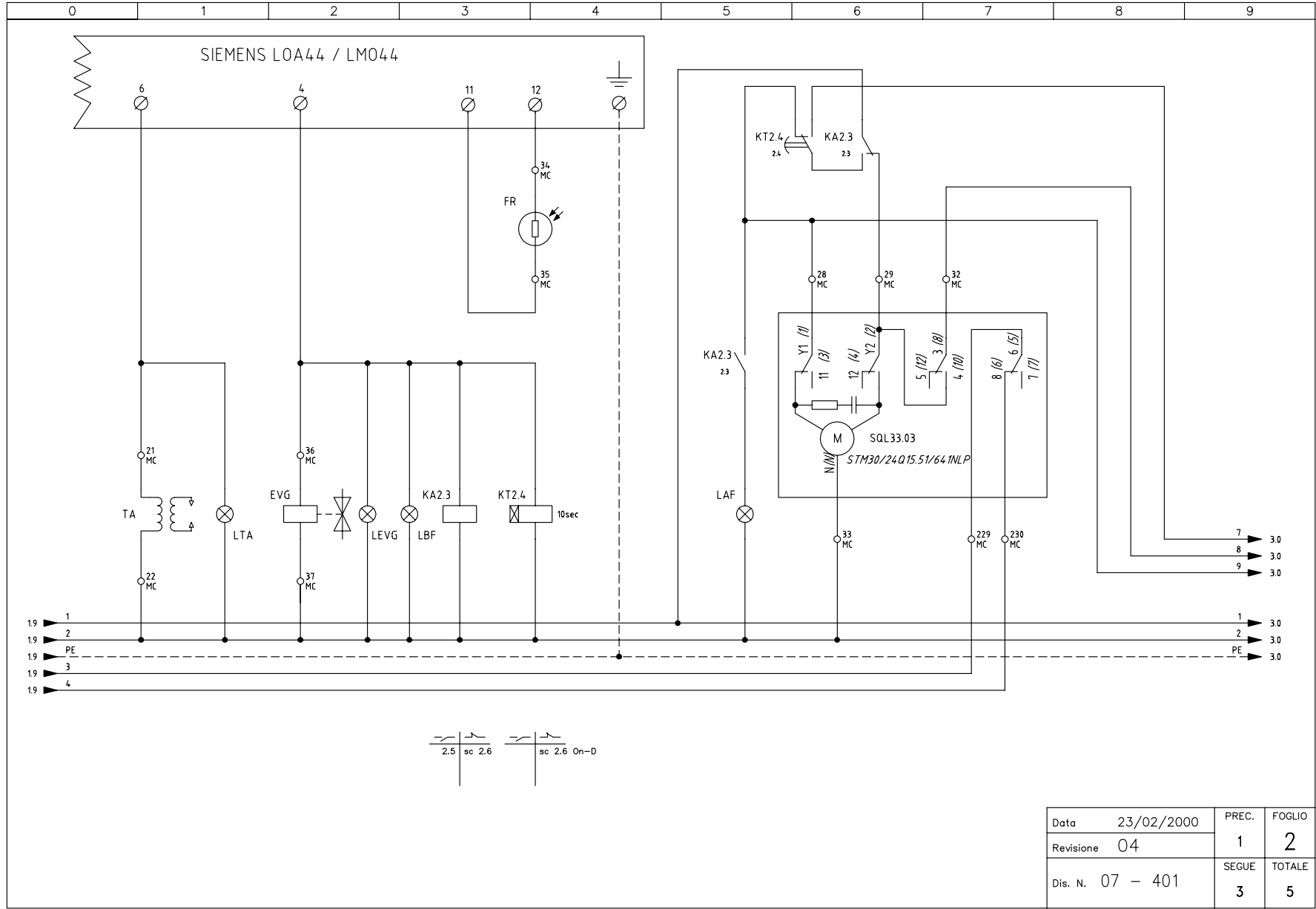
I	ALTA FIAMMA HIGH FLAME
II	SOSTA E ACCENSIONE STAND-BY AND IGNITION
III	BASSA FIAMMA LOW FLAME
V	CONSENSO ALLA PARTENZA INPUT TO START

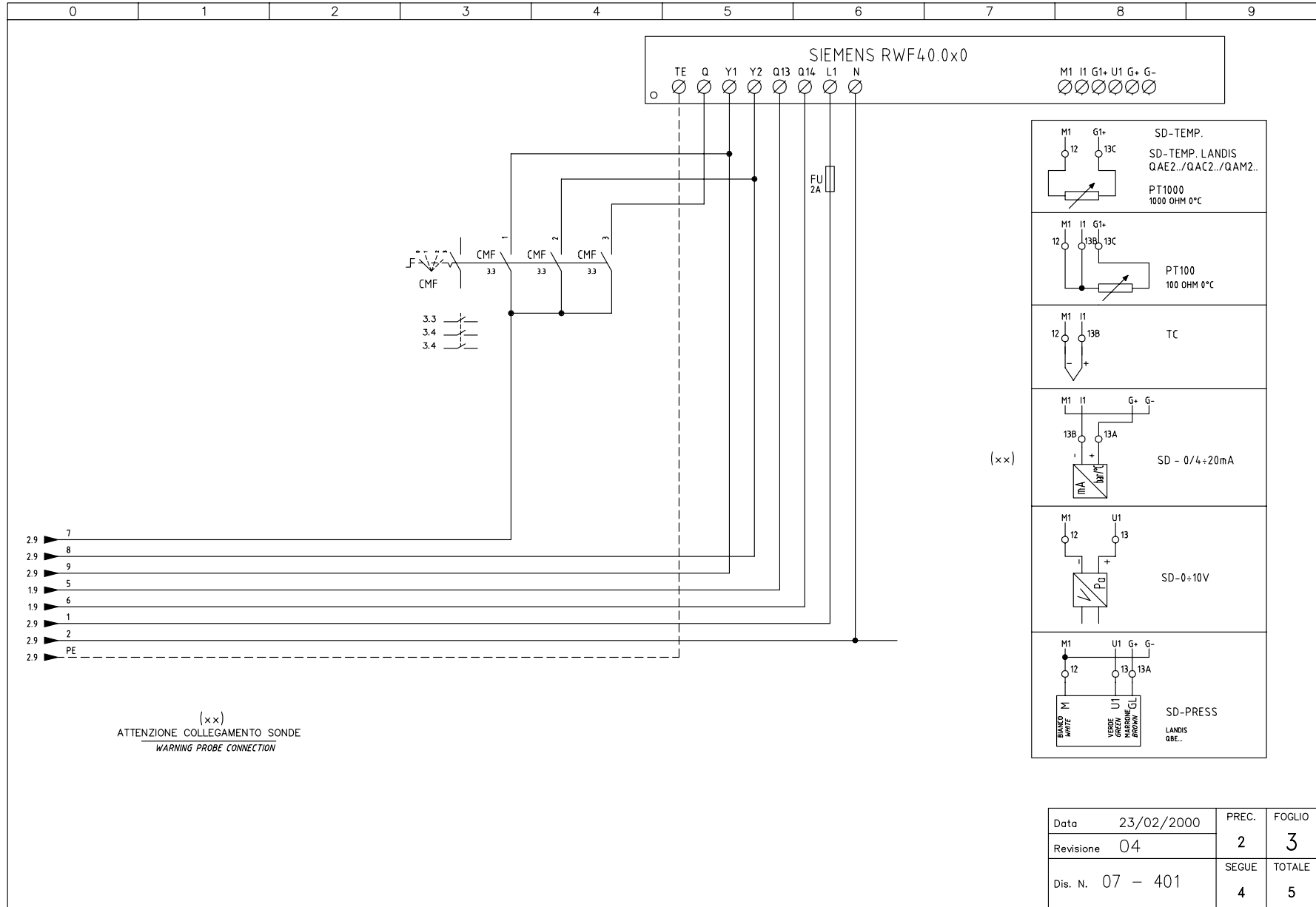
Data	11/12/1996	PREC.	FOGLIO
Revisione	03	2	3
Dis. N.	07 - 352	SEQUE	TOTALE
		4	4

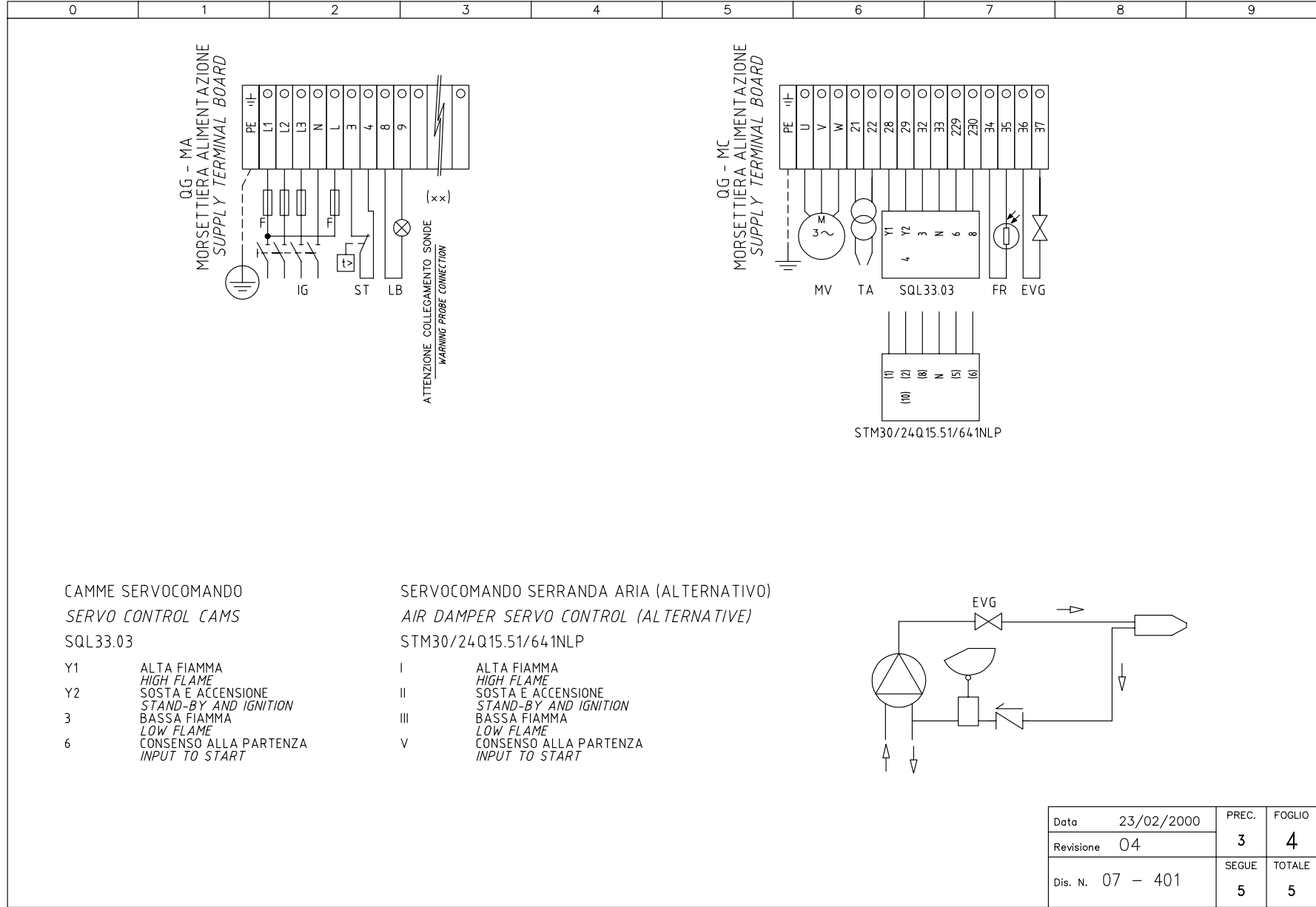
Wiring diagram 07-401 Rev. 4 - Fully-modulating Burners - PG70-PG81



Data	23/02/2000	PREC.	FOGLIO
Revisione	04	/	1
Dis. N.	07 - 401	SEGUE	TOTALE
		2	5







SPARE PARTS

Description	Code			Quantity
	PG60	PG70	PG81	
CONTROL BOX	LOA24: 2020445 LMO24: 2020453	LOA44: 2020412 LMO44: 2020455	LOA44: 2020412 LMO44: 2020455	1
IGNITION ELECTRODES	2080205	2080206	2080206	2
FUEL FILTER	2090016	2090025	2090018	1
GASKET	2110013	2110033	2110033	1
FAN WHEEL	2150013	2150018	2150068	1
IGNITION TRANSFORMER	2170106	2170106	2170302	1
ELECTRIC MOTOR	2180020	218021101	2180206	1
SOLENOID VALVE	2190420	2190403	2190403	1
FLEXIBLE HOSE	2340002	2340002	2340003	2
FLEXIBLE HOSES L = 275	-	2340091	2340091	1
FLEXIBLE HOSES L = 335 3/8"	-	2340087	2340087	1
ADJUSTING CAM FOIL	2440013	2440013	2440013	2
SERVOCONTROL mod. SIEMENS	2480009	2480022	2480022	1
SERVOCONTROL mod. BERGER	2480053	2480090	2480090	1
PHOTORESISTOR mod. SIEMENS QRB..	2510003	2510003	2510003	1
PRESSURE GOVERNOR	2570054	2570054	2570054	1
PUMP mod. SUNTEC	2590103	2590109	2590118	1
PUMP mod. DANFOSS	-	2590320	2590310	1
NOZZLE mod. BERGONZO A3	2610202	2610202	2610202	1
OIL GUN (standard)	-	2700212	-	1
OIL GUN (long)	-	2700215	-	1
COMBUSTION HEAD	3060175	3060147	30601C1	1
BLAST TUBE (standard)	3090034	30900A9	30900G8	1
BLAST TUBE (long)	3090038	3090032	30900G9	1
IGNITION CABLES	6050109	6050010	6050133	2

APPENDIX

SIEMENS OIL BURNERS AUTOMATIC CONTROLLER LMO24 - LMO44

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

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

Preconditions for startup

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

Undervoltage

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

Time supervision oil pre-heater

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

Controlled intermittent operation

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

Control sequence in the event of fault

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

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

Lock-out

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

Resetting the burner

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

Ignition program with LMO24.113A2

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

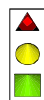
Limitation of repetitions

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

Operation



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



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

- ▲ Red
- Yellow
- Green

Colour code table		
Status	Colour code	Colour
Oil pre-heater heats, waiting time «tw»	●●●●●●●●●●	Yellow
Ignition phase, ignition controlled	●○●○●○●○●○●○	Yellow-off
Operation, flame o.k.	□□□□□□□□□□	Green
Operation, flame not o.k.	□○□○□○□○□○□○	Green-off
Undervoltage	●▲●▲●▲●▲●▲●▲	Yellow-red
Fault, alarm	▲▲▲▲▲▲▲▲▲▲	Red
Output of fault code (refer to Fault code table)	▲○▲○▲○▲○▲○▲○	Red-off
Extraneous light prior to burner start-up	□▲□▲□▲□▲□▲□▲	Green-red
Interface diagnosis	▲▲▲▲▲▲▲▲▲▲▲▲▲▲	Red flicker light

Key

- Off
- Yellow
- Green
- ▲ Red

Diagnosis of cause of fault

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

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

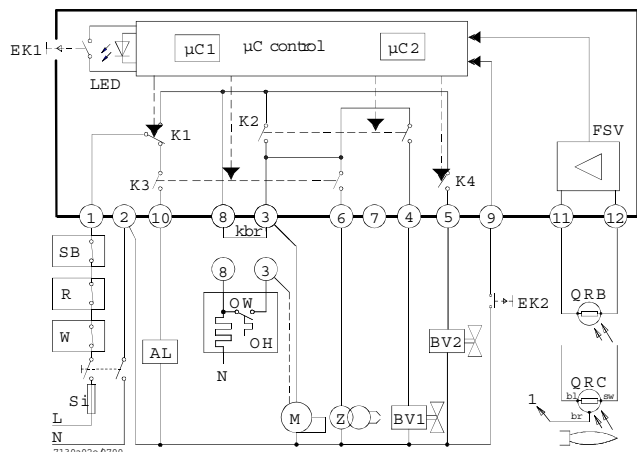
During the time the cause of fault is diagnosed, the control outputs are deactivated.

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

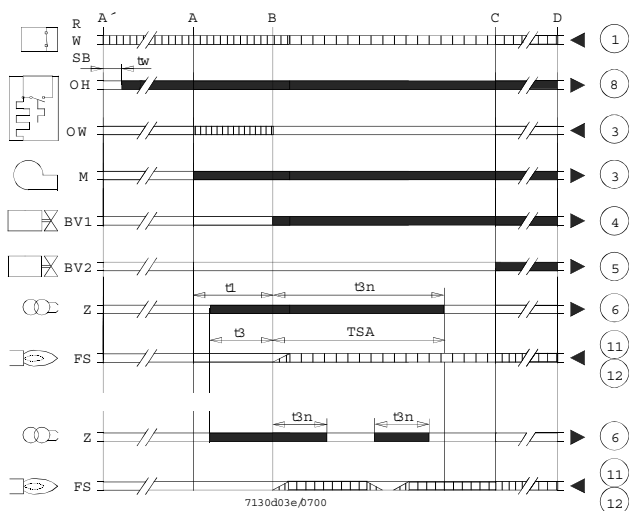
The diagnosis of the cause of fault is quit and the burner switched on again by resetting the burner control.

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

Connection diagram and internal diagram



Control sequence



Key

- AL Alarm device
- kbr... Cable link (required only when no oil pre-heater is used)
- BV... Fuel valve
- EK1 Lock-out reset button
- EK2 Remote lock-out reset button
- FS Flame signal
- FSV Flame signal amplifier
- K... Contacts of control relay
- LED 3-colour signal lamps
- M Burner motor
- OW Release contact of oil pre-heater
- t1 Pre-purge time
- t3 Pre-ignition time
- t3n Post-ignition time
- A' Beginning of start-up sequence with burners using an oil pre-heater
- A Beginning of start-up sequence with burners using no oil pre-heater
- Controller output signals
- Required input signals

- OH Oil pre-heater
- QRB Photoresistive detector
- QRC Blue-flame detector
- bl = blue
- br = brown
- sw = black
- R Control thermostat or pressurestat
- SB Safety limit thermostat
- Si External primary fuse
- W Limit thermostat or pressure switch
- Z Ignition transformer
- t4 Interval from flame signal to release «BV2»
- TSA Ignition safety time
- tw Waiting time for oil pre-heating
- B Time of flame establishment
- C Operating position
- D Controlled shut-down by «R»
- μC1 Microcontroller 1
- μC2 Microcontroller 2

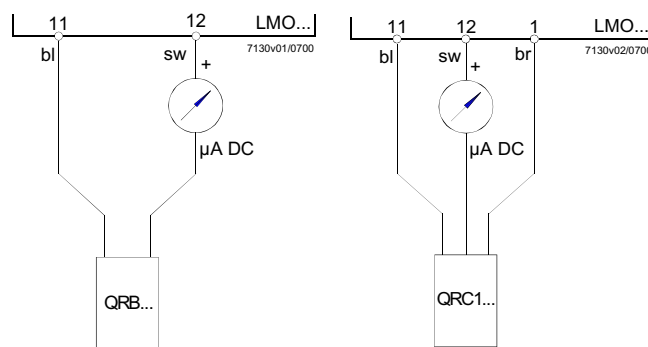
General unit data

Mains voltage	AC 230 V +10 % / -15 % AC 110 V +10 % / -15 %
Mains frequency	50...60 Hz ±6 %
External primary fuse	(Si) 5 A (slow)
Power consumption	12 VA
Mounting orientation	optional
Weight	approx. 200 g
Degree of protection	IP 40
Perm. cable lengths	max. 3 m at a line capacitance of 100 pF/m
Detector cable laid separately	20 m
Remote reset	20m
Max perm. amperage at cosφ ≥ 0.6	
Terminal 1	5 A
Terminals 3 and 8	5 A
Terminals 4, 5, 6 and 10	1 A
Flame supervision with QRB and QRC	

QRB QRC

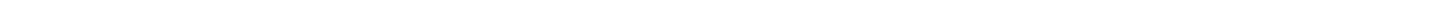
Min. detector current required (with flame)	45 μA	70 μA
Min detector current permitted (without flame)	5.5 μA	5.5 μA
Max. possible with flame (typically)	100 μA	100 μA

Measurement circuit for detector current



Key

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





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