LO140
LO200

Light oil burners

MANUAL OF INSTALLATION, USE AND MAINTENANCE

CIB UNIGAS

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

M039154CE Rel. 4.3 01/2013

DANGERS, WARNINGS AND NOTES OF CAUTION

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

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

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

CAREFULLY KEEP THIS MANUAL FOR FUTURE REFERENCE.

1) GENERAL INTRODUCTION

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

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

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

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

Contact qualified personnel only.

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

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

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

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

The manufacturer shall not be held liable, by agreement or otherwise, for damages resulting from improper installation, use and failure to comply with the instructions supplied by the manufacturer.The occurrence of any of the following circustances may cause explosions, polluting unburnt gases (example: carbon monoxide CO), burns, serious harm to people, animals and things:

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

2) SPECIAL INSTRUCTIONS FOR BURNERS

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

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

a Remove the power supply by disconnecting the power cord from the mains.

b Disconnect the fuel supply by means of the hand-operated shut-off valve and remove the control handwheels from their spindles.

Special warnings

- Make sure that the burner has, on installation, been firmly secured to the appliance, so that the flame is generated inside the appliance fire-box.
- Before the burner is started and, thereafter, at least once a year, have qualified personnel perform the following operations:

a set the burner fuel flow rate depending on the heat input of the appliance;

b set the flow rate of the combustion-supporting air to obtain a combustion efficiency level at least equal to the lower level required by the regulations in force;

c check the unit operation for proper combustion, to avoid any harmful or polluting unburnt gases in excess of the limits permitted by the regulations in force;

d make sure that control and safety devices are operating properly;

e make sure that exhaust ducts intended to discharge the products of combustion are operating properly;

f on completion of setting and adjustment operations, make sure that all mechanical locking devices of controls have been duly tightened;

g make sure that a copy of the burner use and maintenance instructions is available in the boiler room.

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

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

GENERAL

- The burner shall be installed by qualified personnel and in compliance with regulations and provisions in force; wrong installation can cause injuries to people and animals, or damage to property, for which the manufacturer cannot be held liable.
- Before installation, it is recommended that all the fuel supply system pipes be carefully cleaned inside, to remove foreign matter that might impair the burner operation.
- Before the burner is commissioned, qualified personnel should inspect the following:

a the fuel supply system, for proper sealing;
b the fuel flow rate, to make sure that it has been set based on the firing rate required of the burner;
c the burner firing system, to make sure that it is supplied for the designed fuel type;
d the fuel supply pressure, to make sure that it is included in the range shown on the rating plate;
e the fuel supply system, to make sure that the system dimensions are adequate to the burner firing rate, and that the system is equipped with all the safety and control devices required by the regulations in force.

- When the burner is to remain idle for some time, the fuel supply tap or taps should be closed.

SPECIAL INSTRUCTIONS FOR USING GAS

Have qualified personnel inspect the installation to ensure that:

a the gas delivery line and train are in compliance with the regulations and provisions in force;
b all gas connections are tight;
c the boiler room ventilation openings are such that they ensure the air supply flow required by the current regulations, and in any case are sufficient for proper combustion.

- Do not use gas pipes to earth electrical equipment.
- Never leave the burner connected when not in use. Always shut the gas valve off.
- In case of prolonged absence of the user, the main gas delivery valve to the burner should be shut off.

Precautions if you can smell gas

a do not operate electric switches, the telephone, or any other item likely to generate sparks;
b immediately open doors and windows to create an air flow to purge the room;
c close the gas valves;
d contact qualified personnel.

- Do not obstruct the ventilation openings of the room where gas appliances are installed, to avoid dangerous conditions such as the development of toxic or explosive mixtures.

DIRECTIVES AND STANDARDS

Gas burners

European directives

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

Harmonized standards

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

Light oil burners

European directives

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

Harmonized standards

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

Heavy oil burners

European Directives

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

Harmonized standards

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

Gas - Light oil burners

European Directives

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

Harmonized standards

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

Gas - Heavy oil burners

European directives:

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

Harmonized standards

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

Industrial burners

European directives

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

Harmonized standards

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

Burner data plate

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

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

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

SYMBOLS USED



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



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



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

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

BURNER SAFETY

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



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

Residual risks deriving from misuse and prohibitions

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



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



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



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

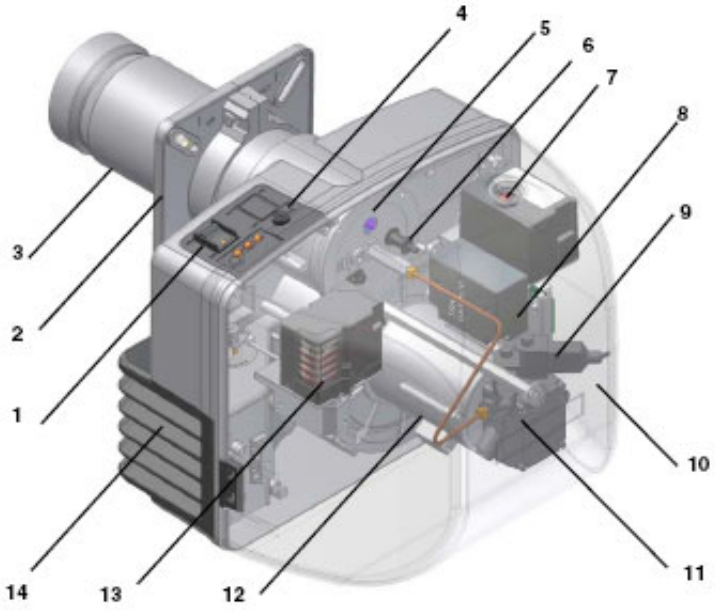
PART I: INSTALLATION

GENERAL FEATURES

This series is characterised by high performaces and width of the performance curves, when the pressure in the combustion chamber is high. They are also characterised for other important functional features: there are plugs which can be easily connected to the boiler and to the detecting probes, a pressure plug in the combustion chamber, all mechanical components are mounted on a plate which can be quickly taken off for maintenance. The head is adjustable through a graduated screw. They can be provided as Single-stage or Double-stage burners.

Single-stage: the burner operates at one output level

Double-stage: the burner operates at two output levels: high flame and low flame.



Keys

1. Control panel with startup switch (only for double-stage models)
2. Flange
3. Blast tube
4. Fuse (only for double-stage models)
5. Combustion head (inside)
6. Photoresistor
7. Unlock pushbutton for control box
8. Transformer
9. Solenoid valve
10. Cover
11. Pump
12. Pump motor
13. Actuator (double-stage burners)
14. Air inlet

The fuel coming from the supply line, is pushed by the pump (11) 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 bertween 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 (11) 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).

In the double-stage burners, the electric servocontrol (13), 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's 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 installled, the following parameters are needed:

furnace input, in kW or kcal/h (kW = kcal/h / 860);

backpressure (data are available on the boiler's ID plate or in the user's manual).

Example:

Furnace input: kW 600

Backpressure: mbar 4

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.

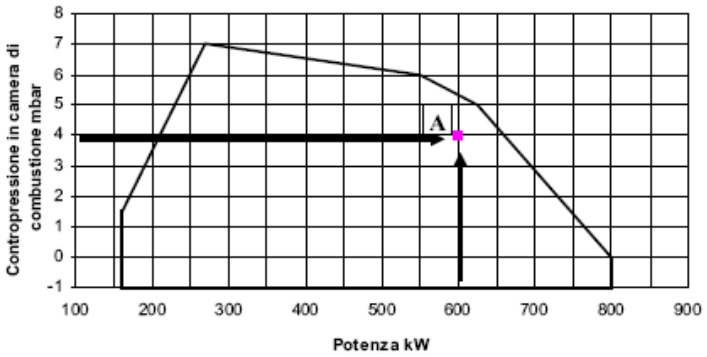


Fig. 1

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 LO140 (1) **Model**	G-. (2) AB. (3) S. (4) *. (5) A. (6)
(1) BURNER TYPE	LO140 – LO200
(2) FUEL	G – Light oil A - Biodiesel
(3) OPERATION	TN – Single-stage AB – Double-stage
(4) BLAST TUBE	S - Standard
(5) DESTINATION COUNTRY	* - see burner ID plate
(6) VERSION	A – Standard Y - Special

Specifications

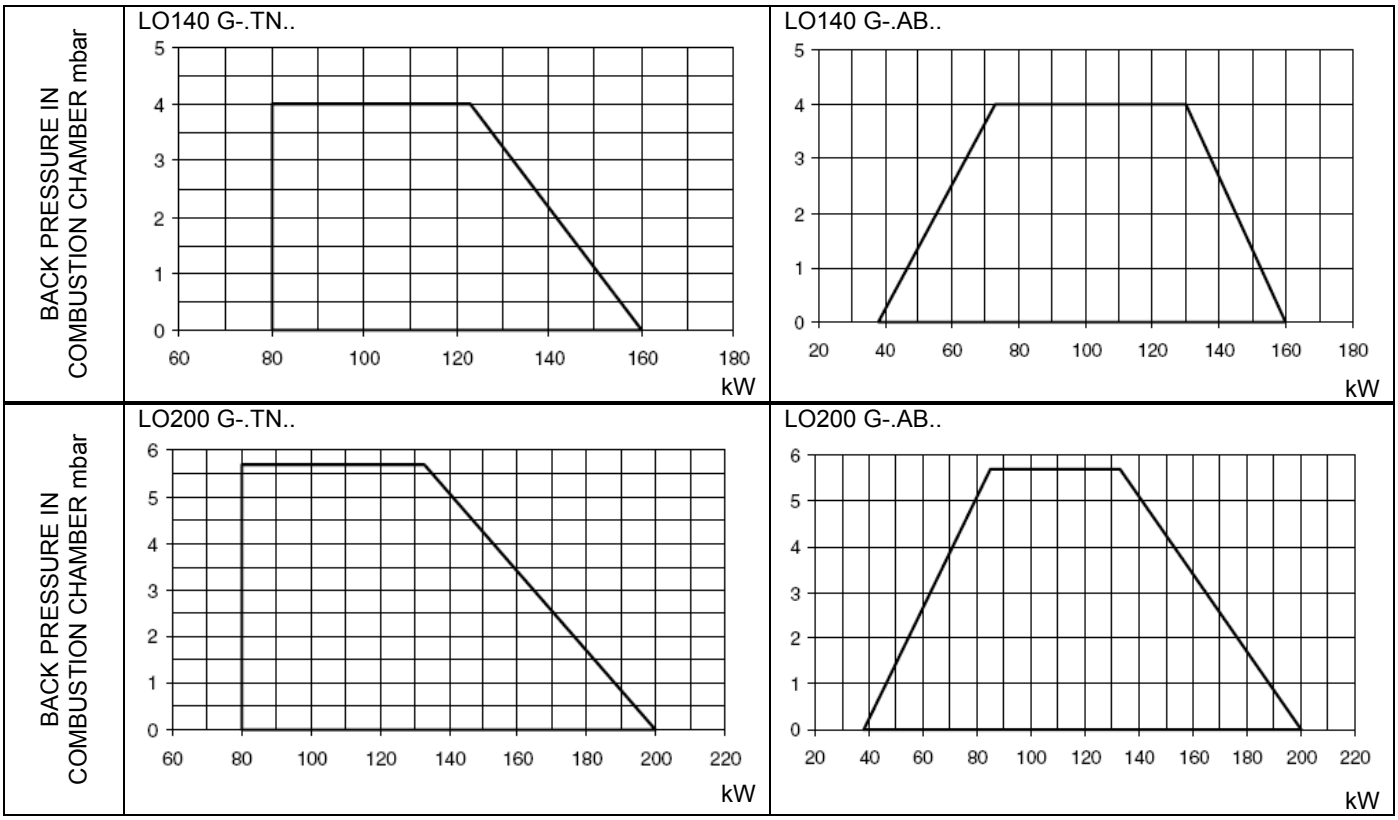
BURNERS		**LO140 G-.TN..**	**LO140 G-.AB..**	**LO200 G-.TN..**	**LO200 G-.AB..**
Output	min. -max. kW	80 - 160	38 - 160	80 - 200	38 - 200
Fuel		Light oil			
Oil flow rate	min. -max. kg/h	7 - 14	3 - 14	7 - 17	3 - 17
Viscosity	cSt @ 40 °C	2 – 7.4			
Pressure at the oil train inlet	bar	1			
Power supply		230V - 50Hz			
Motor	kW	0.18			
Total power consumption	kW	0.48			
Protection		IP40			
Regulation		Single-stage	Double-stage	Single-stage	Double-stage
Approx. weight	kg	18	18	19	19
Operating temperature	°C	-10 ÷ +50			
Storage temperature	°C	-20 ÷ +60			
Working service*		Intermittent			

Light oil net calorific value Hi = 10210 kcal/kg

***. 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.

Biodiesel:
Viscosity = 1.9 - 6 cSt @ 40 °C
Net calorific value Hi = 8950 kcal/kg

Performance range

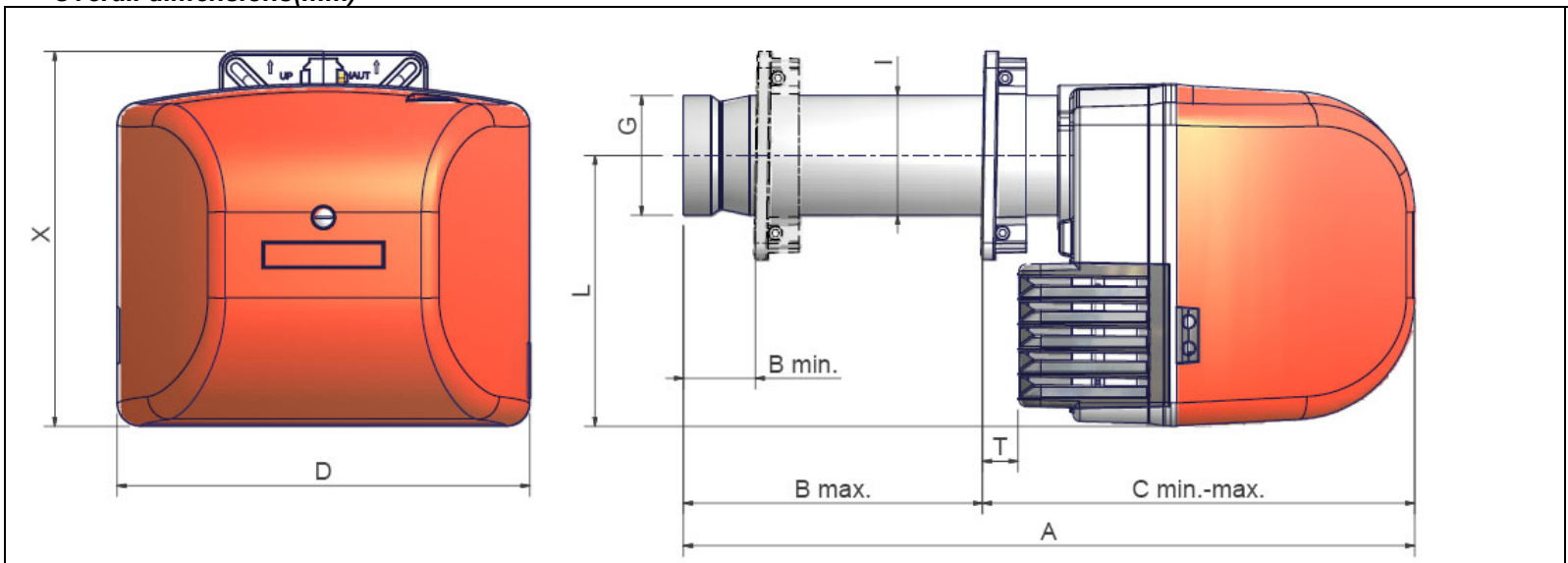


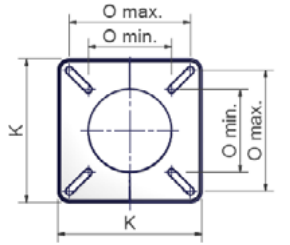
To get the input in kcal/h, multiply value in kW by 860.

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

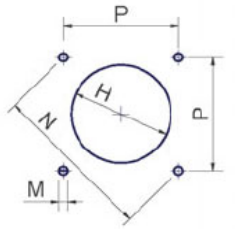
NOTE: The performance curve is a diagram that represents the burner performance in the type approval phase or in the laboratory tests, but does not represent the regulation range of the machine. On this diagram the maximum output point is usually reached by adjsuting the combustion head to its “MAX” 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.

Overall dimensions(mm)





Burner flange



Boiler recommended drilling tempelate

	AS*	AL*	BS*		BL*		CS*		CL*		D	G	H	I	K	L	M	N	O		P	T	X
			min.	max.	min.	max.	min.	max.	min.	max.									min.	max.			
LO140	560	660	80	170	80	270	390	475	390	575	373	108	128	108	188	244	M8	188	108	158	133	32	338
LO200	560	660	65	170	65	270	390	475	390	575	373	108	128	108	188	244	M8	188	108	158	133	32	338

*AS/BS/CS: measures referred to burner with standard blast tube

*AL/BL/CL: measures referred to burner with extended blast tube

MOUNTINGS AND CONNECTIONS

Packing

The burners are dispatched in cardboard packages whose dimensions are:

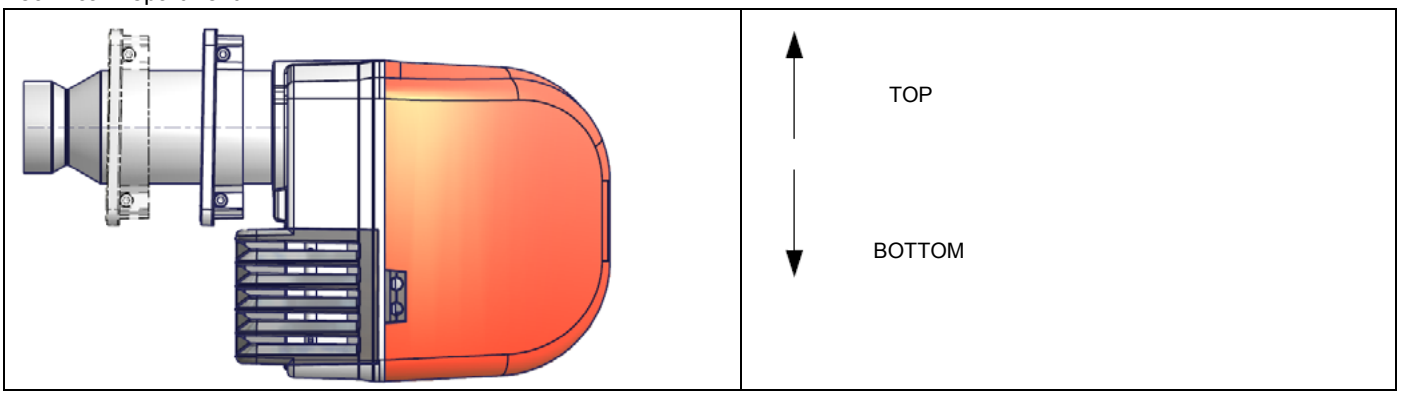
- Standard blast tube: mm 600 x 370 x 400 (W x H x D)
- Extended blast tube: mm 750 x 370 x 400 (W x H x D)
- Packing cases of this kind are affected by humidity and are not suitable for stacking. The following are placed in each packing case.
- burner;
- light oil flexible hoses;
- light oil filter;
- gasket to be inserted between the burner and the boiler;
- envelope containing documentation.

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

Handling the burner

⚠	**WARNING!** The handling operations must be carried out by specialised and trained personnel. If these operations are not carried out correctly, the residual risk for the burner to overturn and fall down still persists
	To move the burner, use means suitable to support its weight (see paragraph "Technical specifications").

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



Montaggio del bruciatore alla caldaia

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

1 on the boiler's door hole, fix the 4 stud bolts according to the drilling template shown on paragraph "Overall dimensions"
2 fix the flange of the burner to the boiler;
3 install the burner into the boiler;
4 according to the reference showed on Fig. 2, fix the flange to the boiler's stud bolts D, without completely fastening;
5 loosen the VS screws in order to let the blast tube move back and forth;
6 install the burner making the blast tube move into the flange as to reach the right position according to the boiler/utilisation
7 fasten the VS screws:
8 tighten the 4 stud blolts D completely;
9 seal the space between the blast tube and the refractory lining with appropriate insulating material (ceramic fibre cord or refractory cement).

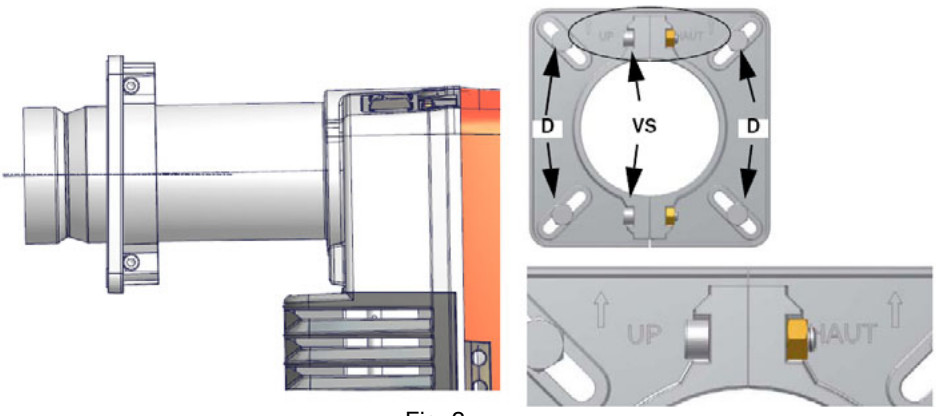


Fig. 2

Once the burner is installed into the boiler, go on with the electrical and hydraulic connections, according to the diagrams shown on the following paragraphs.

Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN267 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 (values between 0 and 100mm) 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 manifacturer).

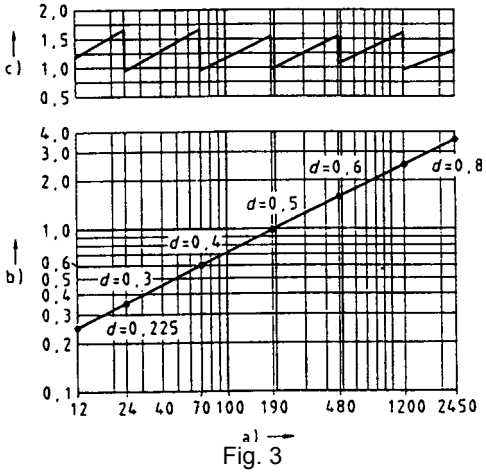


Fig. 3

Keys

a) Heat output in kW

b) Length of the flame tube in meters

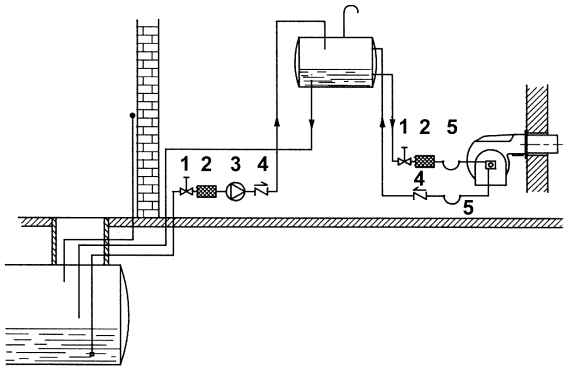
c) Flame tube firing intensity in MW/m3

d) Combustion chamber diameter (m)

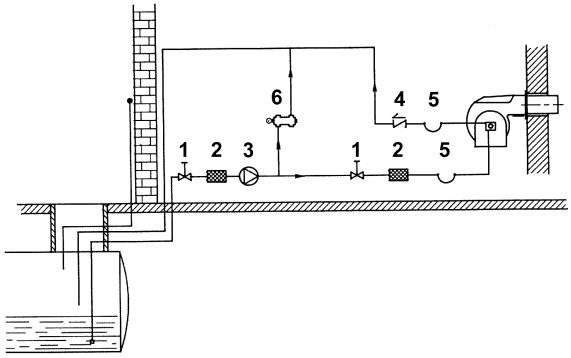
Fig.3:Firing intensity, diameter and lenght of the test flame tube as a function of the heat input in kW.

Hydraulic diagrams for light oil supplying circuits

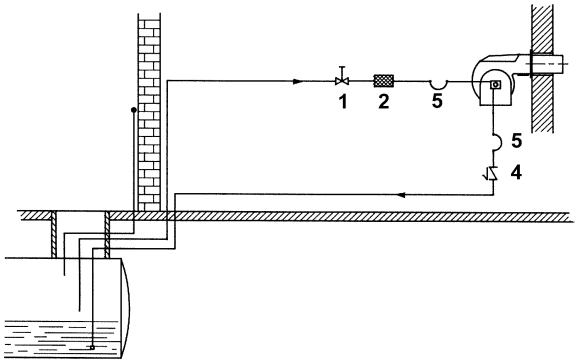
- Gravity circuit



- Ring circuit



- Suction circuit



Keys

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.4).

Installation diagram of light oil pipes

⚠	**PLEASE READ CAREFULLY THE "WARNINGS" CHAPTER AT THE BEGINNING OF THIS MANUAL.**

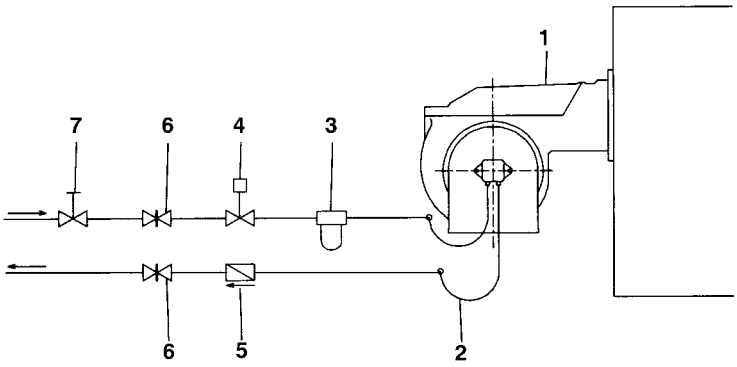


Fig. 4 - Double-pipe system

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

Keys

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

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

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

Single-pipe system: a single pipe drives the oil from the tank to the pump's inlet. Then, from the pump, the pressurised oil is driven to the nozzle: a part comes out from the nozzle while the othe 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-pipe systems. They can be suited for single-pipe system (recommended in the case of gravity feed) as decribed 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.

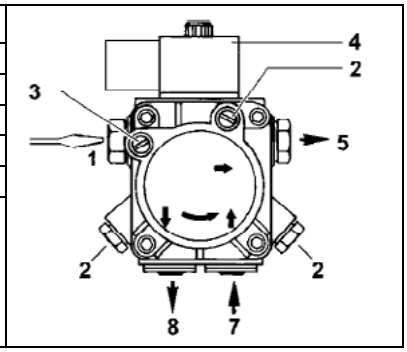
Do not use PTFE tape on the suction and return line pipes to avoid the possibility that particles enter circulation. These could deposit on the pump filter or the nozzle, reducing efficiency. Always use O-Rings or mechanical seal (copper or aluminium gaskets) junctions if possible.

An external filter should always be installed in the suction line upstream of the fuel unit.

Light oil pumps

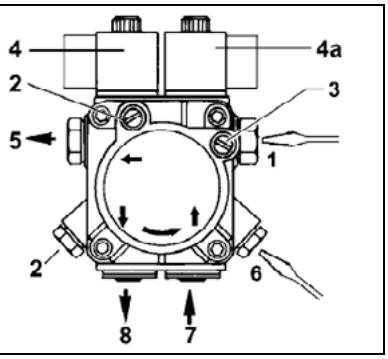
Pumps provided according to the burner model are:
SINGLE-STAGE BURNER: Suntec AS47
DOUBLE-STAGE BURNER: Suntec AT2

Suntec AS47	
Viscosity	2 - 12 cSt
Oil temperature	0 - 60 °C
Min. inlet pressure	- 0.45 bar to avoid gasing
Max. inlet pressure	2 bar
Max. return pressure	2 bar
Rotation speed	3600 rpm max



Keys
1 Pressure governor
2 Pressure gauge port
3 Vacuum gauge port
4 Solenoid valve
5 To the nozzle
7 Inlet
8 Return

Suntec AT2	
Viscosity	2 - 12 cSt
Oil temperature	0 - 60 °C
Min. inlet pressure	- 0.45 bar to avoid gasing
Max. inlet pressure	2 bar
Max. return pressure	2 bar
Rotation speed	3600 rpm max



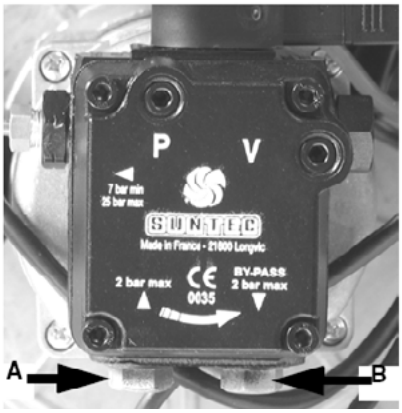
Keys

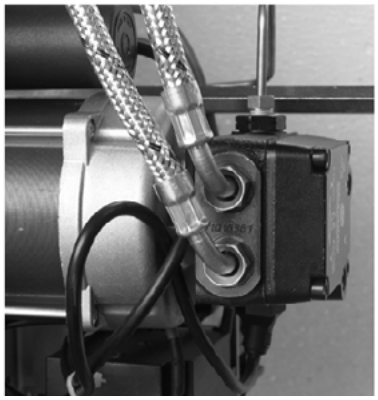
1 Low pressure regulation (first stage)
2 Pressure gauge port
3 Vacuum gauge port
4 Solenoid valve
4a High-low pressure solenoid valve
5 To the nozzle
6 High pressure regulation (second stage)
7 Inlet
8 Return (with internal by-pass plug)

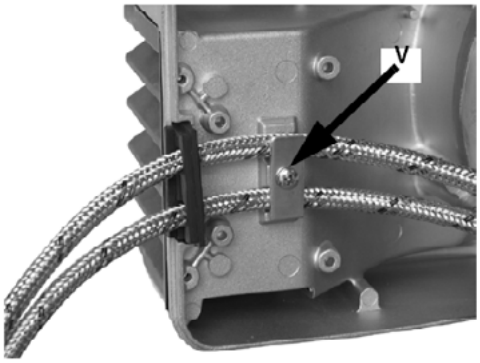
Connecting the oil flexible hoses

To connect the flexible light oil hoses to the pump, proceed as follows :

1. remove the burner cover, unscrewing the fixing screws;
2. remove the closing nuts A and B on the inlet and return connections of the pump;
3. 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 paragraph I see “Double-stage burnersLight oil pumpsLight oil pumpsSingle-stage burners” on page 12);
4. unscrew the V screw, place the flexible hoses as shown in figure, and then tighten it again;
5. replace the cover.







⚠	WARNING: if fuel used is BIODIESEL, some components must be replaced. Please contact our Technical Department for further details.

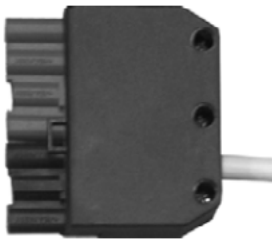
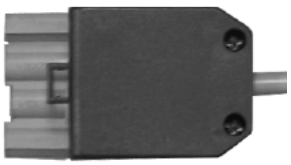
Electrical connections

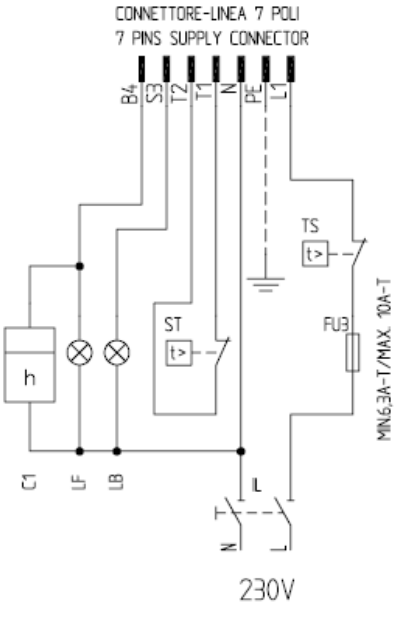
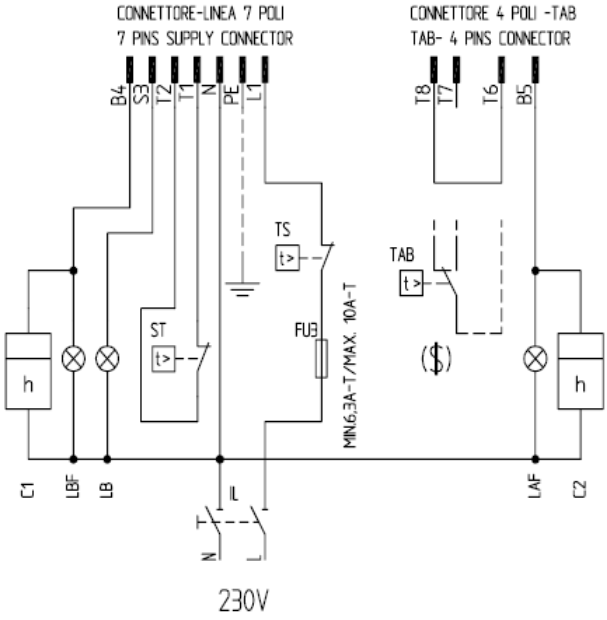
⚠	Respect the basic safety rules. make sure of the connection to the earthing system. do not reverse the phase and neutral connections. fit a differential thermal magnet switch adequate for connection to the mains.
	ATTENTION: before executing the electrical connections, pay attention to turn the plant's 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.

Before connecting the burner to the mains, be sure that its switch is on Off position and find the burner's connectors.

⚠	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 teminal block be sure that ground wire should be longer than phase and neutral ones.

Identification of the connectors

Burner power supply connector	HIGH/LOW flame connector
	

Single stage burner connector	Double-stage burner connectors
	

⚠	IMPORTANT: before operating the burner, be sure all connectors are linked as shown in the diagrams.

As far as connections, see the attached wiring diagrams.

SETTING THE OIL FLOW RATE

	ATTENTION: before starting the burner up, be sure that the manual cutoff valves are open and check that the pressure upstream the gas train complies the value quoted on paragraph "Technical specifications". Be sure that the mains switch is closed.
	ATTENTION: During commissioning operations, do not let the burner operate with insufficient air flow (danger of formation of carbon monoxide); if this should happen, make the fuel decrease slowly until the normal combustion values are achieved.
	WARNING: NEVER LOOSE THE SEALED SCREWS! OTHERWISE, THE DEVICE WARRANTY WILL BE INVALIDATE!
	Prior to start up the burner, make sure that the return pipe to the tank is not obstructed. Any obstruction would cause the pump seal to break.

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

Recommended combustion parameters		
Recommended (%) CO2	**Recommended (%) CO2**	**Recommended (%) CO2**
Light oil	11.5 ÷ 13	2.9 ÷ 4.9

Priming the pump and Oil rate adjustment

Before starting with the adjustments, it is necessary to prime the oil pump as follows:

1. Remove the burner cover;
2. start up the burner; with double-stage models turn the burner main switch A to On (Fig.5)
3. make the ST thermostat contacts close, see chapter "WIRING DIAGRAMS";
4. wait until the EVG solenoid valve opens;
5. remove the photoresistor FR and ligth it up;
6. bleed the air from the pressure port (see paragraph "Light oil pumps").

If the burner locks out, press the unlock pushbutton P (Fig.5) and repeat the procedure. Proceed with the adjustements according to the single-stage or double-stage operation of the burner described below.

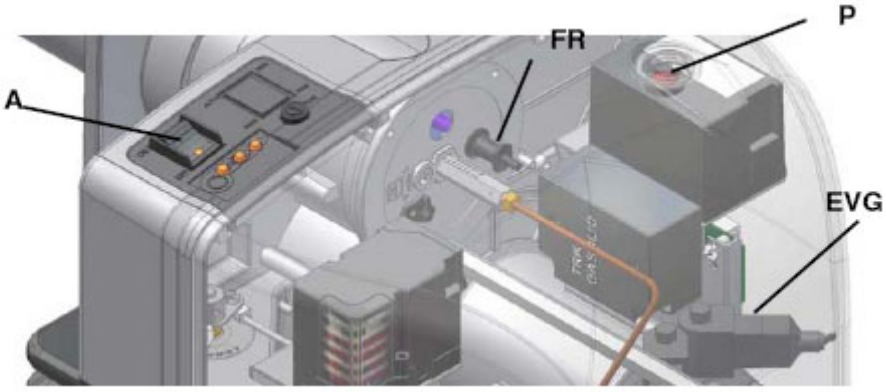


Fig. 5

- **Single-stage burners**

The fuel flow rate is set choosing a nozzle that matches with the boiler output and setting the pump's maximum inlet pressure to 12 bar (see the hydraulic diagram in Fig. 6). To choose the correct nozzle refer to Tab. 1; as for setting the pump pressure, see paragraph "Light oil pumps"

Note: pumps are set to 12 bar. The nozzle rate must be higher than the rate referred to the minimum burner output.

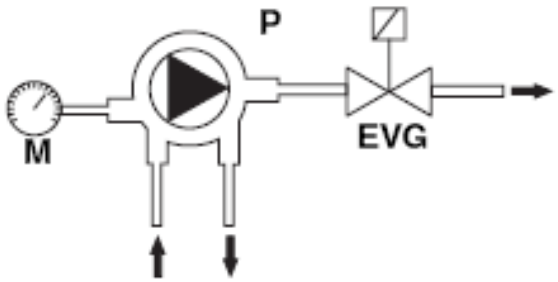


Fig. 6

Keys

EV	Light oil solenoid valve
M	Pressure gauge
P	Pump

Choice of the oil nozze – Single stage burners

Nozzle size(GPH)	10 bar			12 bar			14 bar		
GPH	**kg/h**	**kcal/h**	**kW**	**kg/h**	**kcal/h**	**kW**	**kg/h**	**kcal/h**	**kW**
1.50	5.70	58.000	67.3	6.24	63.600	73.9	6.75	69.000	80.1
1.65	6.27	64.000	74.4	6.86	69.900	81.3	7.42	76.000	88.3
1.75	6.65	68.000	79	7.28	74.200	86.3	7.87	80.000	93
2.00	7.60	77.500	90.1	8.32	84.800	98.6	8.99	92.000	106.9
2.25	8.55	87.200	101.4	9.36	95.400	111	10.12	103.000	119.7
2.50	9.50	97.000	112.8	10.40	106.000	123.3	11.24	115.000	133.7
3.00	11.40	116.000	134.9	12.48	127.200	148	13.49	137.000	159.3
3.50	13.30	135.800	157.9	14.56	148.750	173	15.74	160.700	186.9
4.00	15.20	155.200	180.4	16.65	170.000	197.7	17.99	183.700	213.6
4.50	17.10	174.600	203	18.73	191.250	222.4	20.24	206.650	240.3

Tab. 1

- **Double-stage burners**

The oil flow rate is adusted by choosing the correct nozze whose size matches the boiler/utilisation input and by setting the delivery and return pressure according to the values on diagram in Fig. 7.

Setting the light oil pump

Adjust the ignition stage of the pump, to 8 bar (first stage). After 10 seconds, the control box switches to the second stage: the pump setting must be fixed to 24 bar, by means of the adjusting screw (see paragraph “Light oil pumps).

NOTE: The nozzle oil rate at 8 bar, must be higher than the oil rate at the minimum burner output.

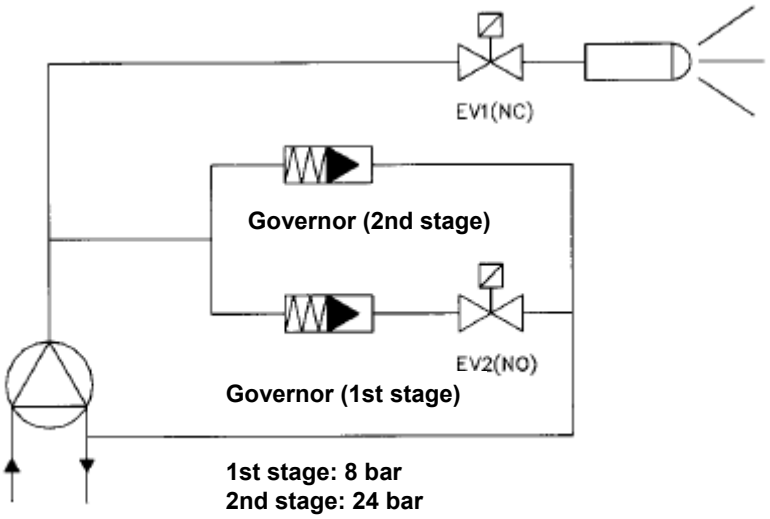


Fig. 7

Choice of the oil nozzle – Double stage burner

Nozzle size(GPH)	PUMP PRESSURE bar																	
	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
GPH	**Flow rate kg/h**																	
1.00	3.40	3.60	3.80	3.98	4.16	4.33	4.49	4.65	4.80	4.95	5.10	5.24	5.37	5.50	5.63	5.76	5.88	6.01
1.25	4.25	4.50	4.75	4.98	5.20	5.41	5.62	5.82	6.01	6.19	6.37	6.54	6.71	6.88	7.04	7.20	7.36	7.51
1.50	5.10	5.41	5.70	5.98	6.24	6.50	6.74	6.98	7.21	7.43	7.64	7.85	8.06	8.26	8.45	8.64	8.83	9.01
1.75	5.95	6.31	6.65	6.97	7.28	7.58	7.87	8.14	8.41	8.67	8.92	9.16	9.40	9.63	9.86	10.08	10.30	10.51
2.00	6.80	7.21	7.60	7.97	8.32	8.66	8.99	9.30	9.61	9.91	10.19	10.47	10.74	11.01	11.27	11.52	11.77	12.01
2.25	7.64	8.11	8.55	8.96	9.36	9.74	10.11	10.47	10.81	11.14	11.47	11.78	12.09	12.39	12.68	12.96	13.24	13.51
2.50	8.49	9.01	9.50	9.96	10.40	10.83	11.24	11.63	12.01	12.38	12.74	13.09	13.43	13.76	14.09	14.40	14.71	15.02
2.75	9.34	9.91	10.45	10.96	11.44	11.91	12.36	12.79	13.21	13.62	14.01	14.40	14.77	15.14	15.49	15.84	16.18	16.52
3.00	10.19	10.81	11.40	11.95	12.48	12.99	13.48	13.96	14.41	14.86	15.29	15.71	16.12	16.51	16.90	17.28	17.65	18.02

Tab. 2

Air rate setting

Single-stage burners

1. Remove the burner cover unscrewing the fixing screws.
2. Slacken the nut DR.
3. Move the index ID through the graduated slot, working on the screw VR, towards + or - to increase or decrease the air flow rat, according to the data measured by the combustion tester.
4. Tighten the nut DR again.
5. The graduated index shows the opening angle of the air damper.

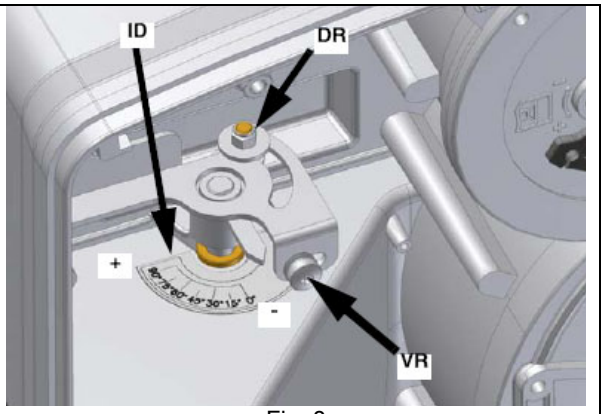
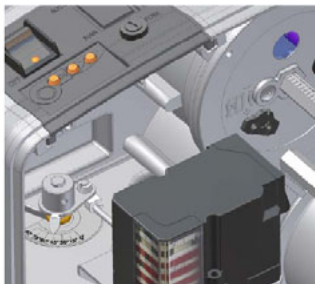


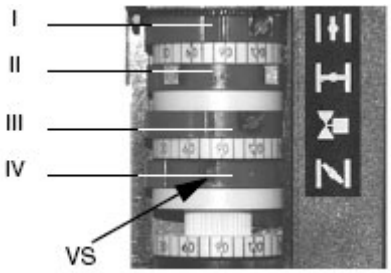
Fig. 8

Double-stage burners

Air damper position is set by means of the actuator cams both in low and high flame. As for the setting, refer to the next table.

During the first setting, set the cam III between the cams I and II. Then, passing from the low to the high flame stage, or viceversa, change the setting according to the flame composition: if cam III is too near to the low flame position (cam II), flue gas can take place, because there is more fuel than air; if cam III is too near to high flame (cam I), the flame could fade because of too much air. The graduated index, connected to the actuator, shows the opening angle of the air damper





Berger STA



Siemens SQN72

Note: to move the cams use:

- Berger STA: the cams adjustement must be performed by means of a screwdriver acting on the VS screw placed inside the cam.
- Siemens SQN72: provided with key for cams I and IV, with scerws for the other cams.

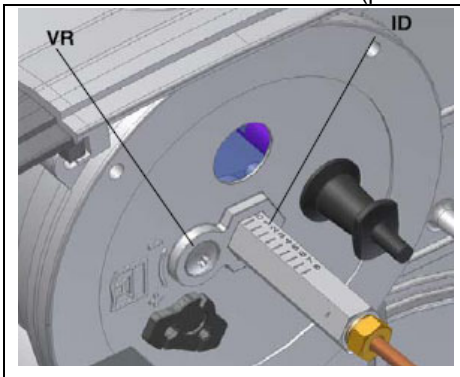
The Berger actuator is not provided with the manual control for the air damper. The Siemens actuator is provided with AUTO/MAN mode (see pictures above).

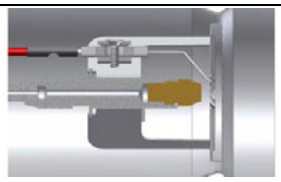
	Berger STA	Siemens SQN72
High flame position	I	I (red)
Stand by, ignition and Low flame position	II	II (blue)
EVG2 opening	III	IV (black)

Combustion head adjustment

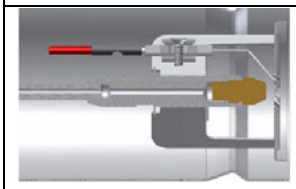
To adjust the combustion head position, and consequently the burner output, proceed as follows:

1. remove the burner cover, unscrewing the fixing screws;
2. by means of a screwdriver, turn counterclockwise to move towards the combustion head (picture below) or clockwise to move the head backwards (picture below). The ID index shows how much the head moves.





”All-backwards” position



”All-forwards” position

ATTENTION: Once the adjustements are accomplished, check that the factory-set values are observed (Tab. 3-page 22). If it was necessary to change that values according to the utilisation, make a note of them in the Tab. 3-page 22, as for the maintenance operations.

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 AUTHORISED 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.

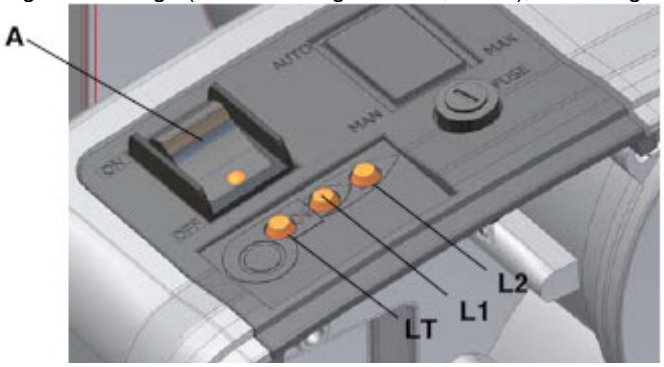
IN CASE OF A BURNER SHUT-DOWN, RESET THE CONTROL BOX BY MEANS OF THE RESET PUSHBUTTON. IF A SECOND SHUT-DOWN TAKES PLACE, CALL THE TECHNICAL SERVICE, WITHOUT TRYING TO RESET FURTHER.

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

⚠	CAUTION: before starting the burner up, be sure that the manual cutoff valves on the feeding line and on the return are open. Be that the mains switch is closed. Read carefully the "WARNINGS" chapter in this manual.

- Startup the burner by the boiler's master power switch;
- as for double-stage models, turn the burner main switch A to On;
- make sure that the control box has not shut down and reset if necessary using the reset button pressing the clear rubber seal on the burner cover;
- make sure that the set of thermostats (or pressure-switches) triggers burner operation (in double-stage models L1 LED lights on)
- the burner starting cycle begins: the control box switches on the burner's fan, the ignition transformer switches on at the same time (in double-stage models LT LED lights on);
- at the end of the pre-purge time, the light oil solenoid valve is powered and the burner starts up;
- the ignition transformer stays on for a few seconds after the ignition of the flame (post-ignition time) and at the end of this time it is switched off.
- Double-stage burners: after the start-up, the burner remains in the low flame operation (in double-stage models, L1 on) or switches to the high flame stage (in double-stage models, L2 on), according to the plant needs.



Double-stage version

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 MANAUL CUTOFF VALVES CLOSED!
	ATTENTION: READ CAREFULLY THE “WARNINGS” CHAPTER AT THE BEGINNIG OF THIS MANUAL.

ROUTINE MAINTENANCE

- Inspection and cleaning of the light oil filter cartridge: replace if necessary (see next paragraph);
- check the overall condition of the flexible light oil hoses and make sure there are no signs of leakage;
- inspect and eventually 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;
- disassembly, inspection and cleaning of the combustion head. Respect the measurements listed in Tab. 3 on page 22;
- inspection and cleaning of ignition electrodes and respective ceramic insulators: clean, adjust, and replace if necessary;
- disassemble and clean the light oil nozzle (see “Pulizia della testa di combustione e dell’ugelloCleaning the combustion head and the nozzle” on page 22).

Important: cleaning must be performed using solvent and not metal tools!

- At the end of maintenance operations after first reassembling the burner, 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;
- inspect and thoroughly clean the flame detection photoresistor and replace if necessary. In case of doubt, check the detection current after first starting the burner by following the procedure illustrated in Fig. 12.

Light oil filter maintenance

For correct and proper servicing, proceed as follows: • cutoff the required pipe section; • unscrew the filter cup; • remove the filtering cartridge, wash it with gasoline; if necessary, replace it; check the tightening O-rings and replace them if necessary; • replace the cup and restore the pipe line.	

Cleaning the combustion head and the nozzle

1. Before proceeding to maintenance operations, turn the burner to off;
2. remove the cover, unscrewing the fixing screws;
3. emove the component plate of the burner P by unscrewing the V1, V2, V3 and V4 screws and the F securing pin.

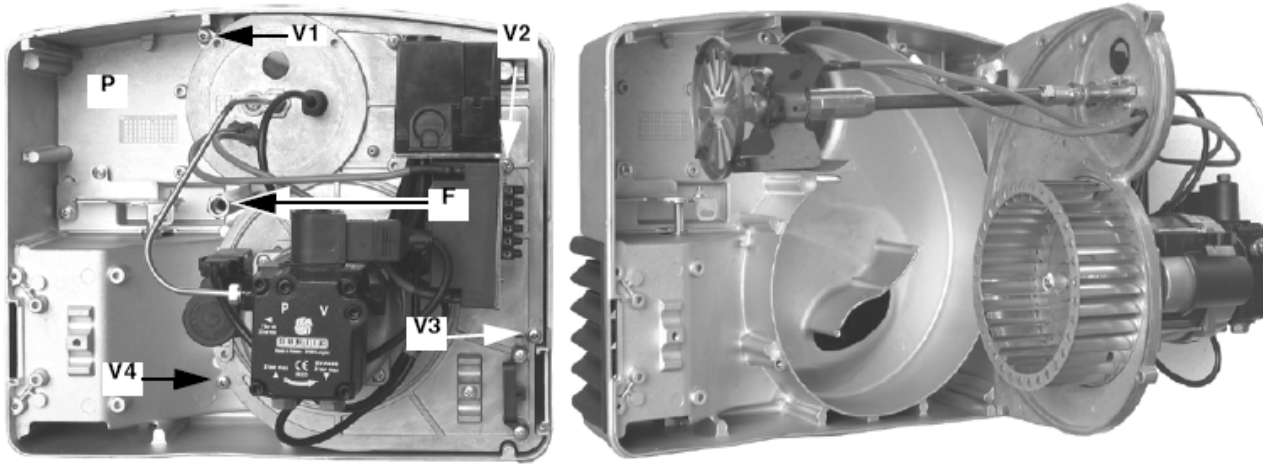


Fig. 9

4. Hang the plate in the way shown in Fig. 9 in order to facilitate maintenance operations.

After the disassembling the burner plate, the combustion head can be removed as follows:

5. unscrew the fixing screw VT
6. disconnect the ignition cable CA; unscrew the fixing nuts D and remove the combustion head from its housing;
7. adjust the electrodes; to replace them, if necessary, disconnect the cables and unscrew VE;
8. remove the electrodes and replace them;
9. clean the combustion head by means of a vacuum cleaner; use a metallic brush to scrape off the scale;
10. reassemble all the items in the reversed order, observing the electrodes position (see next paragraph).

1. Before disassembly the nozzle and the electrodes, disconnect the cables CV (Fig. 10), measure the positions quoted in Fig. 11 and make a note in the table on Tab. 3.
2. Unscrew the V screw that fastens the combustion head and remove the head from the nozzle-holder (Fig. 10)
3. Unscrew the VE screw that fastens the electrodes, remove and clean or replace them;

⚠	In order to remove the nozzle, it is important to use two wrenches as shown in Fig. 10, to avoid damaging the burner component plate!

4. clean or replace the nozzle
5. reassemble tall the elements, remember to fasten the V and VE screws and re-connect the cables CV (Fig. 10), respecting the positions measured previously and quoted on the table below;
6. reassemble the components plate and the burner's cover.

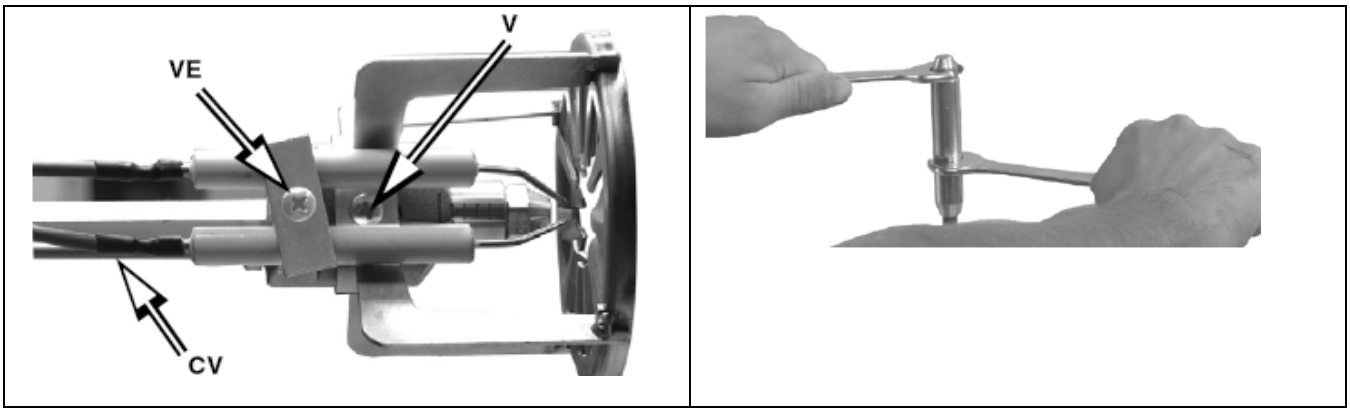


Fig. 10

⚠	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.

⚠	ATTENTION: check that the factory-set values are observed (Tab. 3). If it was necessary to change that values according to the utilisation, make a note of them in the table below, as for the maintenance operations.

	A	**B**	**C**	**D**
60°	8	4	4 ÷ 6	6
45°	10	5	4 ÷ 6	6
....	....	....	....	....
....	....	....	....	....

Tab. 3

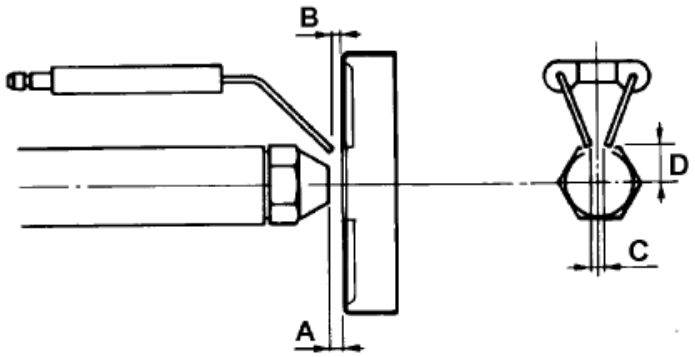


Fig. 11

Cleaning and replacing the detection photoresistor

To clean/replace the photoresistive detector, remove it from its slot. To clean the photoresistor, use a clean cloth, not cleaning sprays.

Check the detection current

To measure the detection current, refer to the diagram in Fig. 12. If the signal doesn't suit the suggested value, verify the electric terminals, the cleaning of the combustion head and the position of the photoelectric cell and replace it if required.

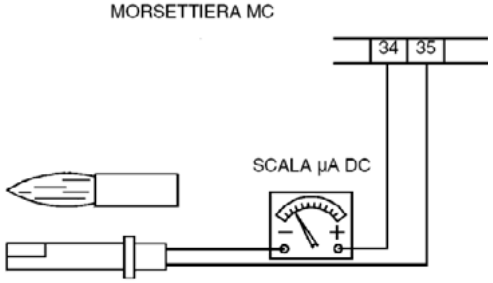


Fig. 12

	LOA24	LMO24	LMO44
Minimum current intensity with flame:	45µA		
Maximun current intensity without flame	5.5µA		
Maximum possible current intensity with flame	45µA	100µA	100µA

Seasonal stop

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

- turn the burner main switch to 0 (Off position)
- disconnect the power mains
- 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

	BURNER DOESN'T START	REPETITION OF PRE-PURGE	NOISY FUEL PUMP	BURNER DOESN'T START AND LOCKS	BURNER STARTS AND LOCKS	BURNER DOESN'T SWITCH TO HIGH FLAME	BURNER LOCK DURING OPERATION	BURNER LOCKS AND REPEATS CYCLE DURING OPERATION
MAINS SWITCH OPEN	●							
FUSES INTERVENTION	●							
MAXIMUM PRESSURE SWITCH FAULT	●							●
AUXILIARIES RELAY FUSES INTERVENTION	●							
CONTROL BOX FAULT	●	●		●	●		●	
SERVOCONTROL FAULT						●		
SMOKY FLAME					●		●	
IGNITION TRANSFORMER FAULT				●				
IGNITION ELECTRODES DIRTY OR BAD POSITION				●				
DIRTY NOZZLE				●				
FUEL SOLENOID VALVE DEFECTIVE				●			●	
PHORESISTANCE DIRTY OR DEFECTIVE					●		●	
HIGH - LOW FLAME THERMOSTAT DEFECTIVE						●		
BAD POSITION OF SERVOCONTROL CAMS						●		
FUEL LOW PRESSURE				●				
FUEL FILTERS DIRTY			●	●			●	

WIRING DIAGRAMS

WARNING:
1 - Electrical supply 230V 50Hz 1N a.c.
2 - Don't reverse phase with neutral
3 - Ensure to the burner a proper earthing

See the attached wiring diagrams.

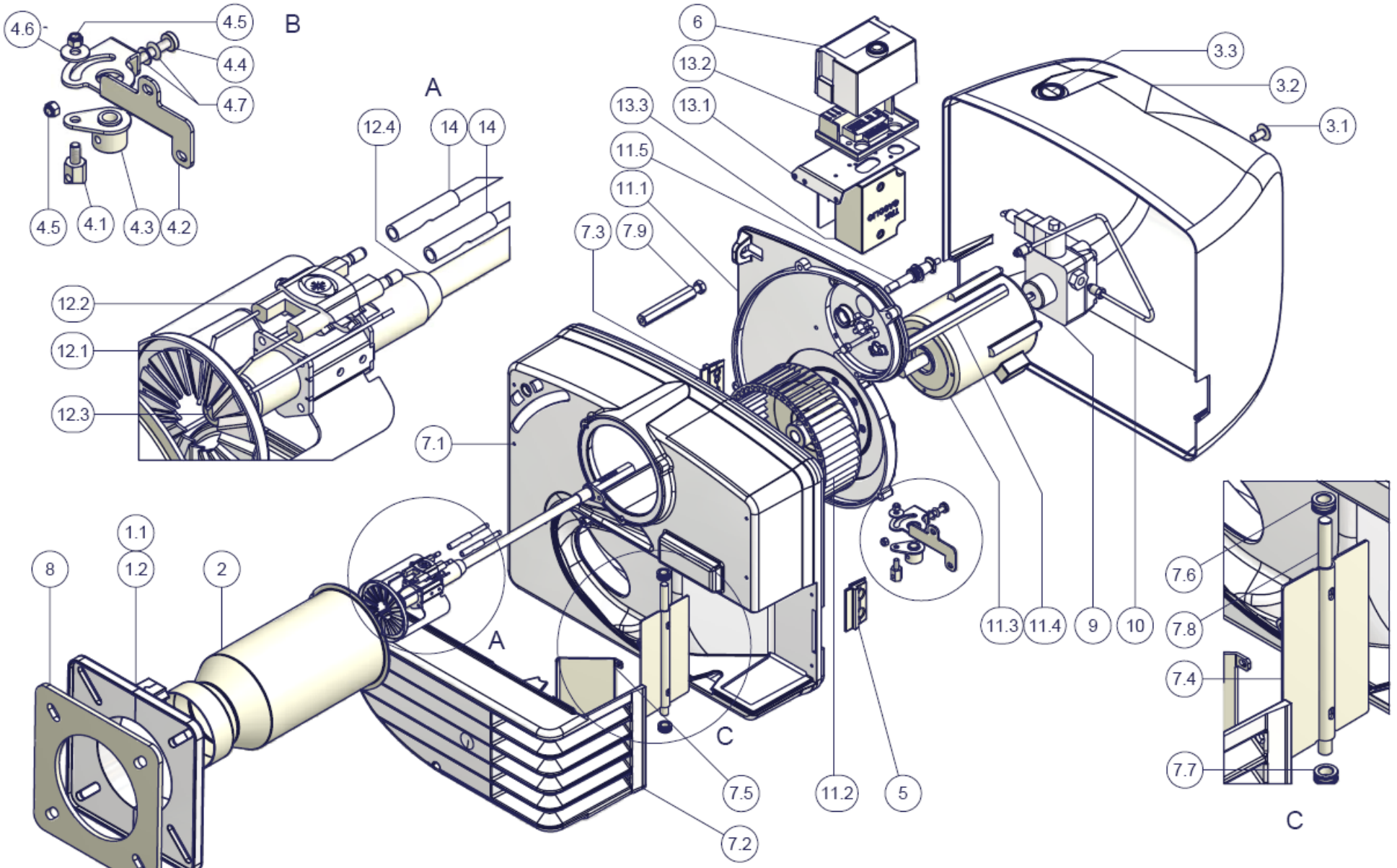
WIRING DIAGRAM SE01-361 Single-stage burner
WIRING DIAGRAM SE18-068 Double-stage burner

BURNERS EXPLODED VIEW

SINGLE-STAGE BURNERS

Position	Description
1.1	FLANGE (UP)
1.2	FLANGE (HAUT)
2	BLAST TUBE
3.1	COVER FIXING SCREW
3.2	COVER
3.3	RUBBER COVER FOR UNLOCKING PUSHBUTTON
4.1	INDEX FIXING SCREW
5	FAIRLEAD
6	CONTROL BOX
7.1	HOUSING
7.2	AIR INLET
7.3	FAIRLEAD
7.4	AIR DAMPER
7.5	AIR FLAP
7.6	BUSH
7.7	BUSH
7.8	AIR DAMPER SHAFT
7.9	PLATE SHAFT
8	GASKET
9	PUMP
10	OIL PIPE

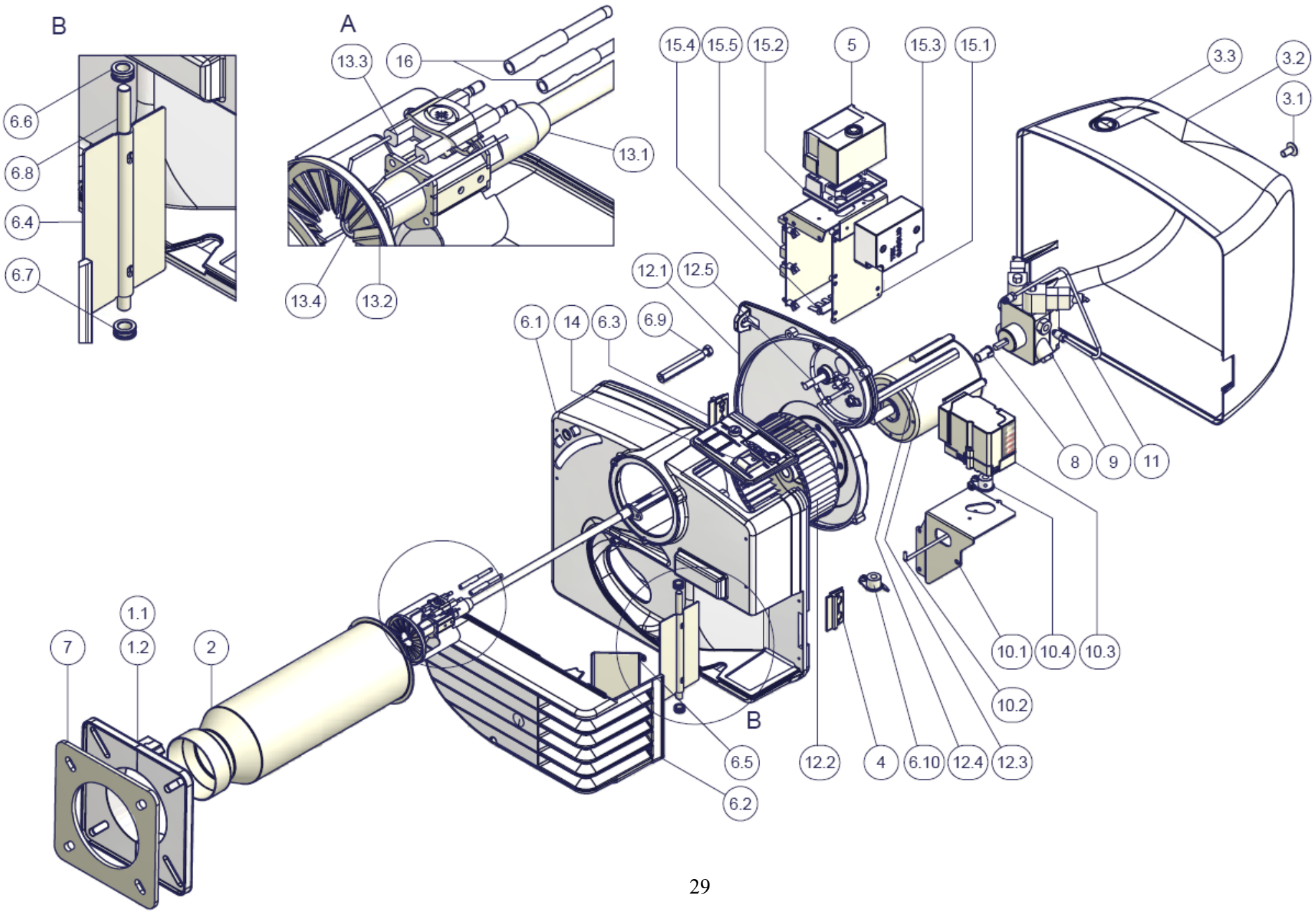
Position	Description
11.1	MOTOR PLATE
11.2	FAN WHEEL
11.3	MOTOR
11.4	PLATE FIXING SHAFT
11.5	PHOTORESISTOR
12.1	SWIRL VANE
12.2	IGNITION ELECTRODE
12.3	NOZZLE
12.4	NOZZLE HOLDER
13.2	SOCKET FOR CONTROL BOX
13.3	TRANSFORMER
14	IGNITION CABLES


4.6
4.5
4.4
4.7
B
4.5
4.1
4.3
4.2
A
12.4
14
14
12.2
12.1
12.3
6
13.2
13.1
13.3
11.5
11.1
7.3
7.9
3.3
3.2
3.1
7.1
1.1
1.2
8
2
A
C
7.5
7.2
11.2
5
11.3
11.4
9
10
7.6
7.8
7.4
7.7
C

DOUBLE-STAGE BURNERS

Position	Description
1	BLAST TUBE
2.1	COVER FIXING SCREW
2.2	COVER
2.3	RUBBER COVER FOR UNLOCKING PUSHBUTTON
3.1	FLANGE
3.2	FLANGE
4	FAIRLEAD
5	CONTROL BOX
6.1	HOUSING
6.2	AIR INLET
6.3	FAIRLEAD
6.4	AIR DAMPER
6.5	AIR FLAP
6.6	BUSH
6.7	BUSH
6.8	AIR DAMPER SHAFT
6.9	PLATE SHAFT
6.10	BUSH
7	GASKET
8	COUPLING
9	PUMP

Position	Description
10.2	STUD
10.3	ACTUATOR
10.4	BUSH
11	OIL PIPE
12.1	MOTOR PLATE
12.2	FAN WHEEL
12.3	MOTOR
12.4	SHAFT
12.5	PHOTORESISTOR
13.1	NOZZLE HOLDER
13.2	SWIRL VANE
13.3	IGNITION ELECTRODE
13.4	NOZZLE
14	CONTROL PANEL ASS.Y
15.2	SOCKET FOR CONTROL BOX
15.3	TRANSFORMER
15.4	GROUND FIXING
15.5	PRINTED CIRCUIT BOARD
16	IGNITION CABLES


B
A
B
6.6
6.8
6.4
6.7
13.3
16
13.1
13.4
13.2
15.4
15.5
15.2
5
15.3
15.1
3.3
3.2
3.1
12.1
12.5
6.1
14
6.3
6.9
8
9
11
1.1
1.2
7
2
10.1
10.4
10.3
10.2
6.5
12.2
4
6.10
12.4
12.3
6.2

SIEMENS OIL BURNERS AUTOMATIC CONTROLLER SIEMENS LMO14 - LMO24 - LMO44

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

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

Preconditions for startup

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

Undervoltage

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

Time supervision oil pre-heater

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

Controlled intermittent operation

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

Control sequence in the event of fault

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

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

Lock-out

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

Resetting the burner

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

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»).

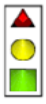
Limitation of repetitions

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.

s red
l yellow
o green

Colour code table		
Status	Colour code	Colour
Oil pre-heater heats, waiting time «tw»	lllllllllll	Yellow
Ignition phase, ignition controlled	lmlmlmlmlml	Yellow-off
Operation, flame o.k.	ooooooooooo	Green
Operation, flame not o.k.	omomomomomo	Green-off
Undervoltage	lslslslslsl	Yellow-red
Fault, alarm	sssssssssss	Red
Output of fault code (refer to Fault code table)	smsmsmsmsm	Red-off
Extraneous light prior to burner start-up	osososososo	Green-red
Interface diagnosis	sssssssssssss	Red flicker light

Key

m Off
l Yellow
o Green
s Red

Diagnosis of cause of fault

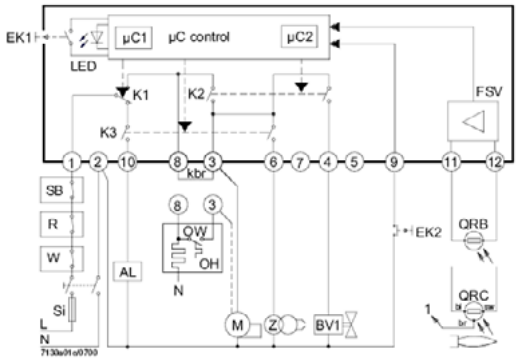
After lock-out, the red fault signal lamp remains steady on.
In that condition, the visual diagnosis of the cause of fault according to the error code table can be activated by pressing the lock-out reset button for more than 3 seconds.

Error code table	
Blink code	**Possible cause**
2 blinks **	No establishment of flame at the end of TSA l Faulty or soiled fuel valves l Faulty or soiled flame detector l Poor adjustment of burner, no fuel l Faulty ignition
3 blinks ***	Free
4 blinks ****	Extraneous light on burner startup
5 blinks *****	Free
6 blinks ******	Free
7 blinks *******	Too manny losses of fleme during operation (limitattion og the number of repetitions) l Faulty or soiled fuel valves l Faulty or soiled flame detector l Poor adjustment of burner
8 blinks ********	Time supervision oil pre-heater
9 blinks *********	Free
10 blinks **********	Wiring error or internal error, output contacts

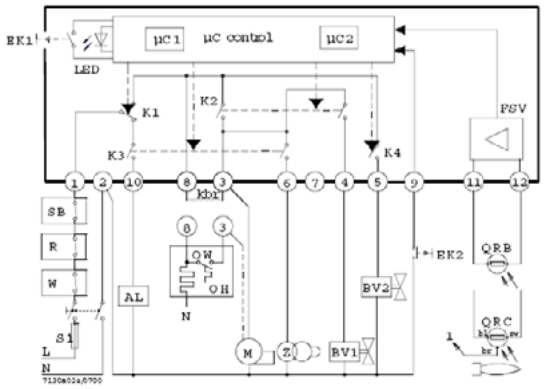
During the time the cause of fault is diagnosed, the control outputs are deactivated.
Burner remains shut down
Fault status signal «AL» at terminal 10 is activated
The diagnosis of the cause of fault is quit and the burner switched on again by resetting the burner control.
Press lock-out reset button for about 1 second (< 3 seconds).

Connection diagram and internal diagram

LMO14

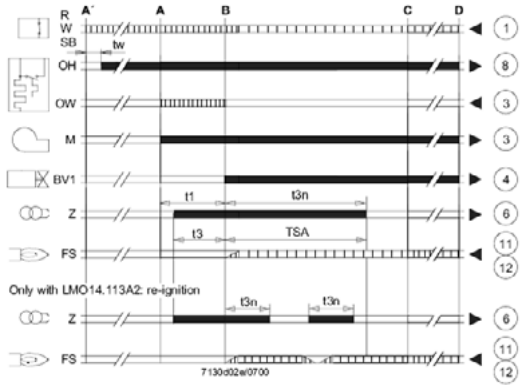


LMO24-LMO44

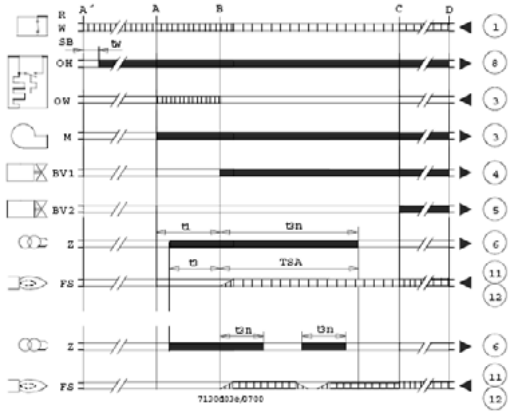


Control sequence

LMO14



LMO24-LMO44



Key

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



Controller output signal

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

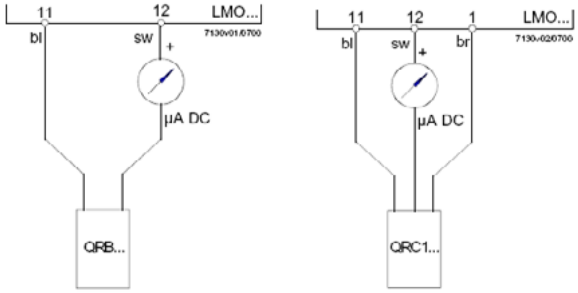
Mains voltage AC 230 V +10 % / -15 %
AC 120 V +10 % / -15 %
Mains frequency 50...60 Hz ±6 %
External primary fuse (Si) 6.3A (slow)
Power consumption 12 VA
Mounting orientation optional
Weight approx. 200 g
Degree of protection IP40 (to be ensured through mounting)
Perm. cable lengths max. 3m at line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

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

Flame supervision with QRB and QRC

	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 (tipically)	100 µA	100 µA

Measurement circuit for detector current

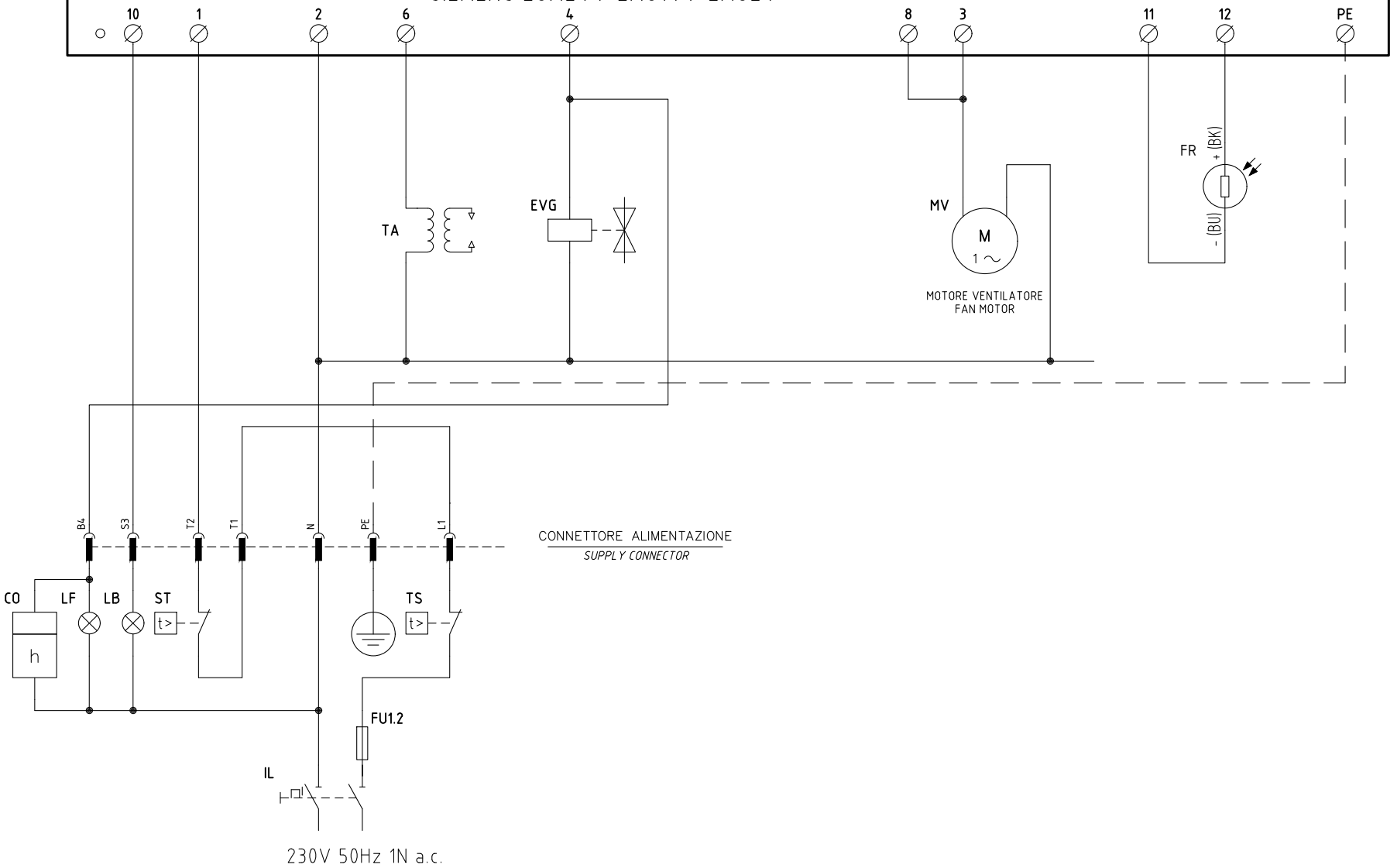


Key

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

SIEMENS LOA24/LOA44 >> FR = QRB1xx
SIEMENS LMO24.xxx/LMO44.255 >> FR = QRB4

SIEMENS LOA24 / LMO14 / LMO24

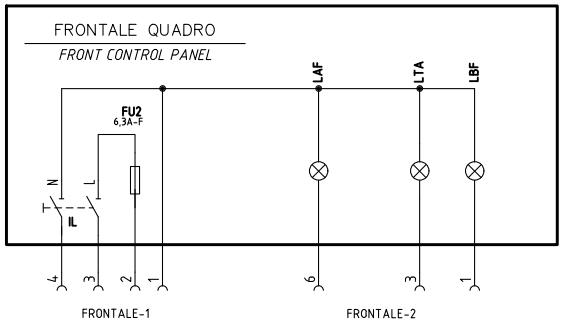


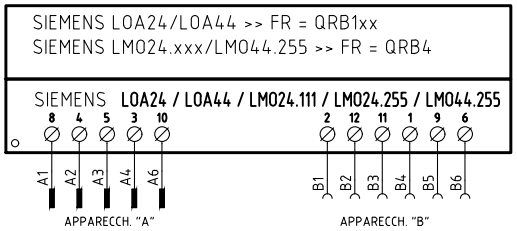
Data 13/05/1997		PREC.	FOGLIO
Revisione 03		/	1
Dis. N. 01 – 0361		SEGUE	TOTALE
		2	2

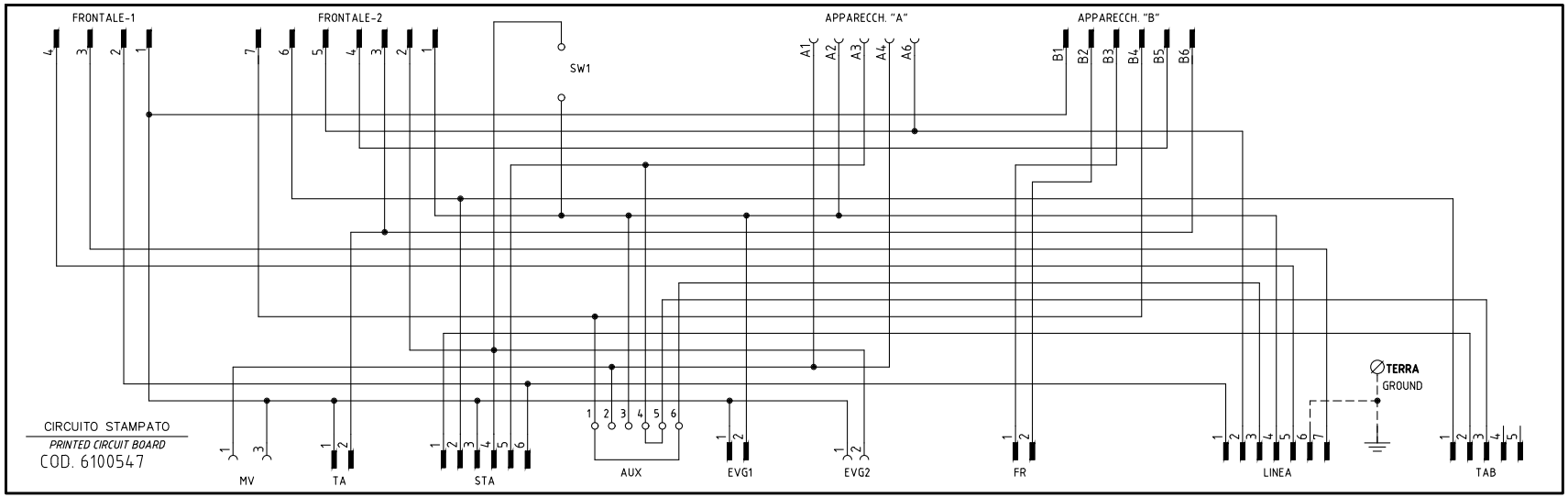
0	1	2	3	4	5	6	7	8	9

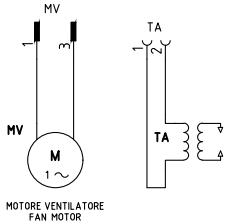
Sigla/Item	Funzione	Function
CO	CONTAORE DI FUNZIONAMENTO (OPTIONAL)	OPERATION TIME COUNTER (OPTIONAL)
EVG	ELETTROVALVOLA GASOLIO	LIGHT OIL SOLENOID VALVE
FR	SONDA RILEVAZIONE FIAMMA	FLAME DETECTOR PROBE
FU1.2	FUSIBILE DI LINEA	LINE FUSE
IL	INTERRUTTORE GENERALE	MAINS SWITCH
LB	LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LF	LAMPADA SEGNALAZIONE FUNZIONAMENTO BRUCIATORE	INDICATOR LIGHT BURNER OPERATION
MV	MOTORE VENTILATORE	FAN MOTOR
SIEMENS LOA... / LMO...	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX
ST	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
TA	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER
TS	TERMOSTATO/PRESSOSTATO DI SICUREZZA	SAFETY THERMOSTAT OR PRESSURE SWITCH

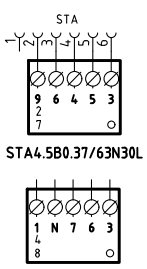
Data 13/05/1997		PREC.	FOGLIO
Revisione 03		1	2
Dis. N. 01 – 0361		SEGUE	TOTALE
		/	2

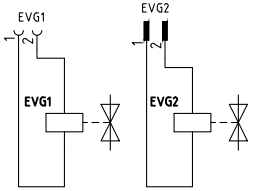


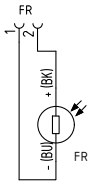


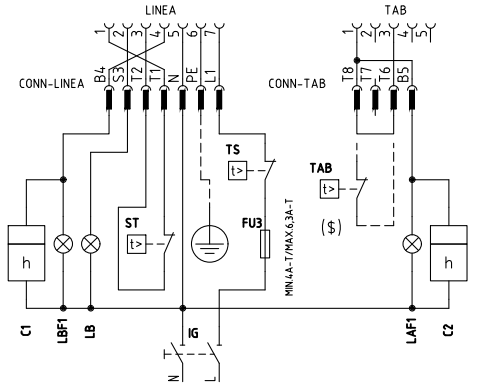












SERVOCOMANDO SERRANDA ARIA
AIR DAMPER SERVO CONTROL
STA4.5B0.37/63N30L

I	ALTA FIAMMA *HIGH FLAME*
II	SOSTA, ACCENSIONE E BASSA FIAMMA *STAND-BY, IGNITION AND LOW FLAME*
III	APERTURA EVG2 *OPEN EVG2*

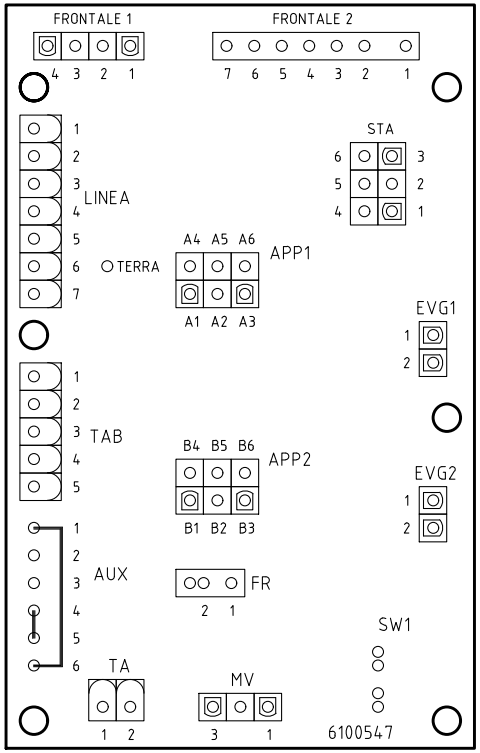
SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)
AIR DAMPER ACTUATOR (ALTERNATIVE)
SQN72.2A4A20

I (ROSSO) *I (RED)*	ALTA FIAMMA *HIGH FLAME*
II (BLU) *II (BLUE)*	SOSTA, ACCENSIONE E BASSA FIAMMA *STAND-BY, IGNITION AND LOW FLAME*
IV (NERO) *IV (BLACK)*	APERTURA EVG2 *OPEN EVG2*

($) SE PREVISTO "TAB", TOGLIERE IL PONTE TRA I MORSETTI T6-T8
IF "TAB" USED REMOVE THE BRIDGE BETWEEN TERMINALS T6-T8

230V 1N a.c.

Data 17/10/2004		PREC.	FOGLIO
Revisione 04		/	1
Dis. N. 18 – 0068		SEGUE	TOTALE
		2	2



Sigla/Item	Funzione	Function
C1	CONTAORE BASSA FIAMMA	LOW FLAME TIME METER
C2	CONTAORE ALTA FIAMMA	HIGH FLAME TIME METER
EVG1	ELETTROVALVOLA GASOLIO BASSA FIAMMA	LOW FLAME LIGHTOIL ELECTRO-VALVE
EVG2	ELETTROVALVOLA GASOLIO ALTA FIAMMA	HIGH FLAME LIGHT OIL ELECTRO-VALVE
FR	SONDA RILEVAZIONE FIAMMA	FLAME DETECTOR PROBE
FU2	FUSIBILE DI LINEA	LINE FUSE
FU3	FUSIBILE LINEA BRUCIATORE	BURNER LINE FUSE
IG	INTERRUTTORE GENERALE	MAIN DISCONNECTOR
IL	INTERRUTTORE LINEA AUSILIARI	AUXILIARY LINE SWITCH
LAF	LAMPADA SEGNALAZIONE ALTA FIAMMA BRUCIATORE	BURNER IN HIGH FLAME INDICATOR LIGHT
LAF1	LAMPADA SEGNALAZIONE ALTA FIAMMA BRUCIATORE	BURNER IN HIGH FLAME INDICATOR LIGHT
LB	LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LBF	LAMPADA SEGNALAZIONE BASSA FIAMMA BRUCIATORE	BURNER IN LOW FLAME INDICATOR LIGHT
LBF1	LAMPADA SEGNALAZIONE BASSA FIAMMA BRUCIATORE	BURNER IN LOW FLAME INDICATOR LIGHT
LOA... / LMO...	APPARECCHIATURA CONTROLLO FIAMMA	FLAME MONITOR DEVICE
LTA	LAMPADA SEGNALAZIONE TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER INDICATOR LIGHT
MV	MOTORE VENTILATORE	FAN MOTOR
SQN72.2A4A20	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER SERVO CONTROL
ST	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
STA4.5B0.37/63N30L	SERVOCOMANDO SERRANDA ARIA	AIR DAMPER SERVO CONTROL
TA	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER
TAB	TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA	HIGH-LOW THERMOSTAT/PRESSURE SWITCHES
TS	TERMOSTATO/PRESSOSTATO DI SICUREZZA	SAFETY THERMOSTAT OR PRESSURE SWITCH

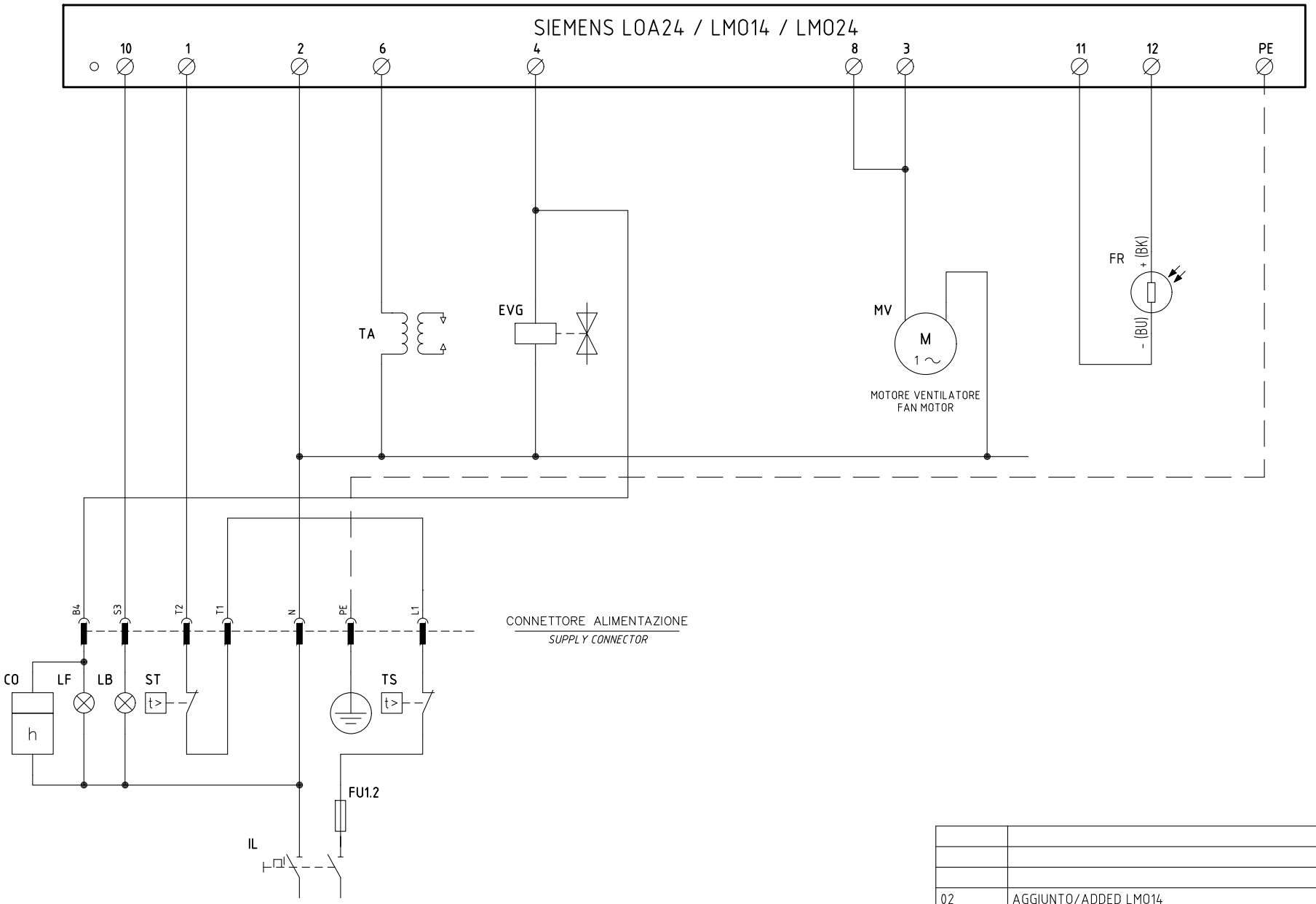
Data 17/10/2004		PREC. 1	FOGLIO 2
Revisione 04			
Dis. N. 18 – 0068		SEGUE /	TOTALE 2



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



REV.	MODIFICA	DATA	FIRME
02	AGGIUNTO/ADDED LM014	27/09/2007	U. PINTON
01	AGGIUNTO/ADDED LM024	14/12/2001	U. PINTON

UNIGAS

Impianto
TIPI/TYPES G4/6/10/18/L035/60/90/140/200
MODELLO/MODEL x–.TN.x.xx.A

Descrizione

Ordine

Commessa

Esecutore U. PINTON

Data Controllato 27/09/2007

Controllato S. MARCHETTI

Data 13/05/1997

Revisione 02

Dis. N. 01 – 0361

PREC. /

FOGLIO 1

SEGUE 2

TOTALE 2

0	1	2	3	4	5	6	7	8	9

SIGLA/ITEM	FOGLIO/SHEET	FUNZIONE	FUNCTION
CO	1	CONTAORE DI FUNZIONAMENTO (OPTIONAL)	OPERATION TIME COUNTER (OPTIONAL)
EVG	1	ELETTROVALVOLA GASOLIO	LIGHT OIL SOLENOID VALVE
FR	1	FOTORESISTENZA RILEVAZIONE FIAMMA	PHOTORESISTOR FLAME DETECTOR
FU1.2	1	FUSIBILE DI LINEA	LINE FUSE
IL	1	INTERRUTTORE GENERALE	MAINS SWITCH
LB	1	LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LF	1	LAMPADA SEGNALAZIONE FUNZIONAMENTO BRUCIATORE	INDICATOR LIGHT BURNER OPERATION
MV	1	MOTORE VENTILATORE	FAN MOTOR
SIEMENS LOA24 / LM014 / LM024	1	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX
ST	1	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
TA	1	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER
TS	1	TERMOSTATO/PRESSOSTATO DI SICUREZZA	SAFETY THERMOSTAT OR PRESSURE SWITCH

Data 13/05/1997		PREC.	FOGLIO
Revisione 02		1	2
Dis. N. 01 – 0361		SEGUE	TOTALE
		/	2