RG91 - RG92 - RG93
RG510 - RG515
RG520 - RG525

Light oil burners

Progressive, Fully-modulating

MANUAL OF INSTALLATION - USE - MAINTENANCE

BURNERS - BRUCIATORI - BRULERS - BRENNER - QUEMADORES - ГОРЕЛКИ

M039214CE 2.3 07/2024

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.

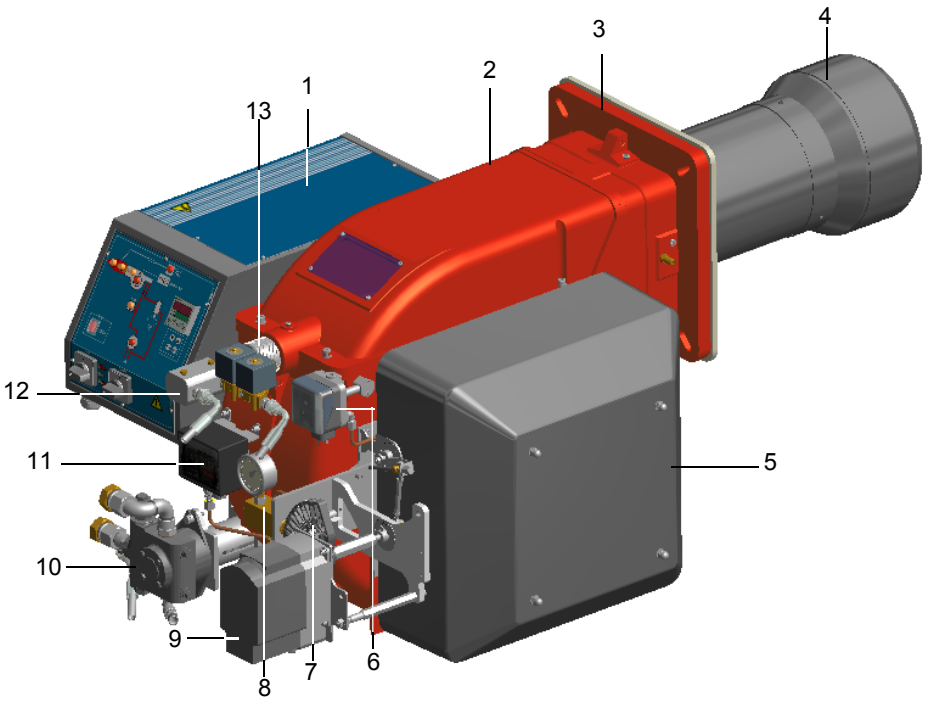
After any maintenance, it is important to restore the protection devices before restarting the machine.
All safety devices must be kept in perfect working order.
Personnel authorized to maintain the machine must always be provided with suitable protections.

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

The burners of this series represent monoblock burners made in die-cast aluminium housing with relative flange to work on heating generators. The maximum output range is from 2100kW to 8000kW (according to the model).They can be provided in progressive or fully-modulating version.



Note: the figure is indicative only

Keys
1 Mimic panel with startup switch
2 Cover
3 Flange
4 Blast tube-Combustion head group
5 Air intake
6 Air pressure switch
7 Adjusting cams
8 Oil pressure governor
9 Actuator
10 Pump
11 Oil pressure switch
12 Oil manifold
13 Head adjusting ring nut

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 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 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 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 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: 600kW

Backpressure: 4mbar

In the "Performance curve" diagram (Fig. 4), 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.

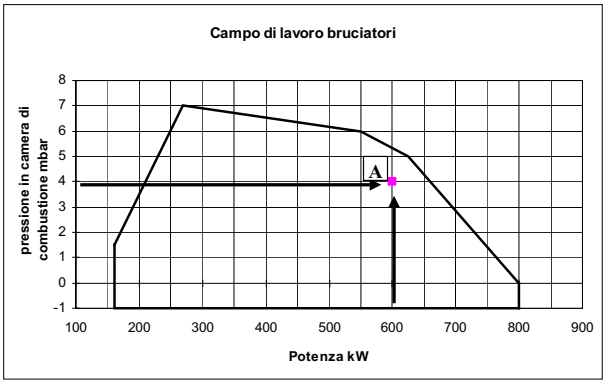


Fig. 4

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	**RG91**	Model	**G-.**	**MD.**	**S.**	***.**	**A.**
	(1)		**(2)**	**(3)**	**(4)**	**(5)**	**(6)**

1	BURNER TYPE	**RG91, RG92, RG93, RG512, RG515, RG520, RG525**
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, Y - Special

Burner performance

		RG91	**RG92**	**RG93**	**RG510**	**RG515**	**RG520**	**RG525**
Output	min. - max. kW	698 - 2093	849 - 2558	550 - 4100	1314 - 3953	1628 - 4884	2326 - 6977	2000 - 8000
Fuel		G - Light oil						
Protection		IP40						
Operation		Progressive - Fully modulating						
Operating temperature	°C	-10 ÷ +50						
Storage Temperature	°C	-20 ÷ +60						
Working service		(5)						

Electrical data 50 Hz

Possible voltages, check the actual three-phase and single-phase supply voltage on the burner nameplate.

Power supply triphase	V	380 400 415 +/-10% 50HZ 3 a.c.						
Auxiliary power supply Mono Phase	V	110 120 230V +/-10% 50HZ 2 a.c.						
	Hz	50						
Electric motor	kW	4,0	5,5	7,5	7,5	11,0	15,0	18,5
Pump motor	kW	1,1	1,1	1,1	1,1	1,5	1,5	3,0
Total power consumption	kW	5,6	7,1	9,1	9,1	13,0	17,0	22,0

Electrical data 60 Hz

Possible voltages, check the actual three-phase and single-phase supply voltage on the burner nameplate.

Power supply triphase	V	220 / 230 / 265 / 277 / 380 / 440 / 460 / 480 / 525 / 690 3 a.c.						
Auxiliary power supply Mono Phase	V	110 / 120 / 220 / 230 2 a.c.						
	Hz	60						
Electric motor	kW	4,8	6,6	9,0	9	13,2	18	22,2
Pump motor	kW	1,32	1,32	1,32	1,32	1,8	1,8	3,6
Total power consumption	kW	6,62	8,42	10,82	10,82	15,5	20,3	26,3

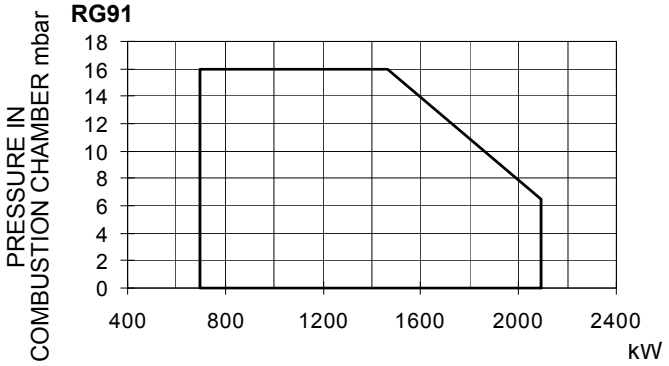
Fuel data

Light oil rate min.- max.	(Stm^3/h)	59 - 176	72 - 215	46 - 345	111 - 333	137 - 411	196 - 588	169 - 674
Biodiesel rate min.- max.	(Stm^3/h)	67 - 201	67 - 246	53 - 394	126 - 380	156 - 469	224 - 670	192 - 769
Gas pressure (2)	mbar	(see Note 2)						

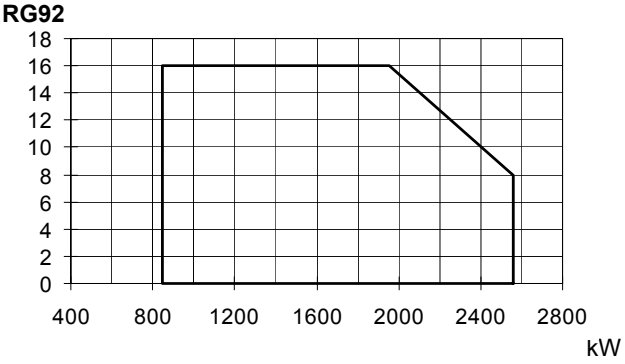
Note 1:	All gas flow rates are referred to Stm^3 / h (1.013 mbar absolute pressure, 15 °C temperature) and are valid for G20 gas (net calorific value H_i = 34,02 MJ / Stm^3); for L.P.G. (net calorific value H_i = 93,5 MJ / Stm^3).	
Note 2:	Maximum gas pressure	360 mbar (with Dungs MBDLE).
		500 mbar (with Siemens VGD or Dungs MultiBloc MBE).
	Minimum gas pressure	see gas curves
Note 3:	Burners are suitable only for indoor operation with a maximum relative humidity of 80 %.	
Note 4:	With electrode: for safety reasons the burner must stop automatically every 24 hours.	
Note 5:	The type of service can be continuous (flame signal presence for more than 24 h without any stop) or intermittent (at least once every 24 h there is a work stoppage and the flame is extinguished) depending on the configuration ordered. Operation can be continuous in the presence of flame detection via ION ionisation or Siemens QRI..., QRA5..., QRA7... or Lamtec FSS... with Siemens LMV37x or LMV5x flame control equipment (BMS) and Lamtec BT3...	

Performance curves

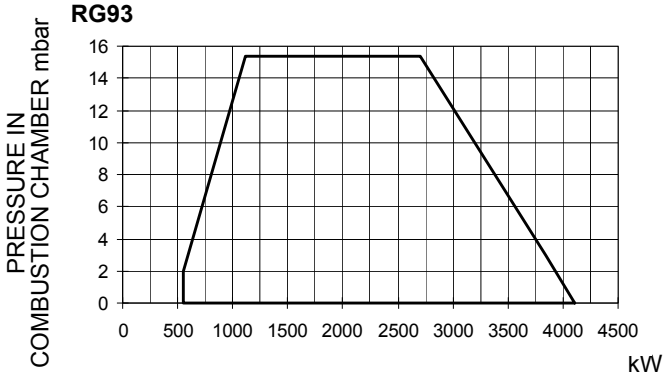
RG91



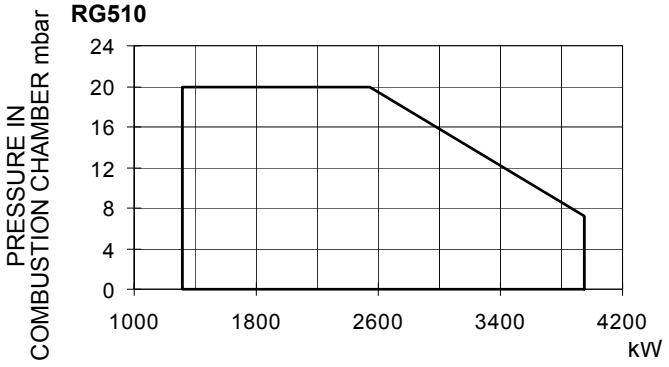
RG92



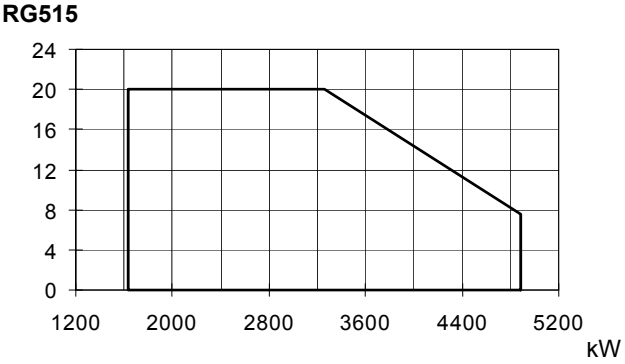
RG93



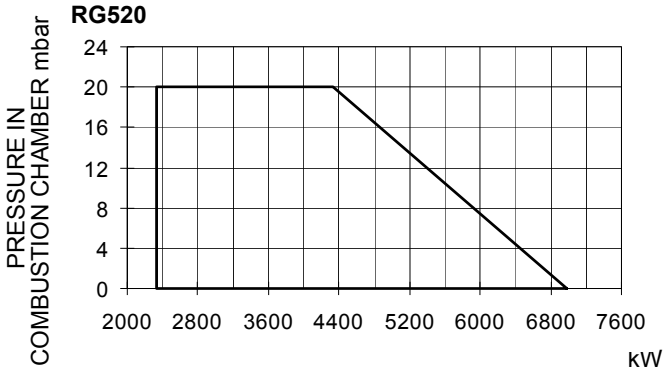
RG510



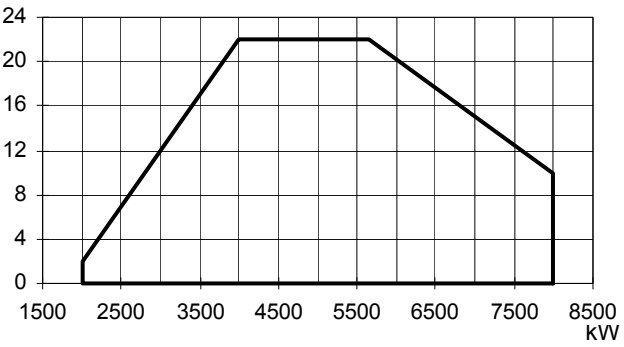
RG515



RG520



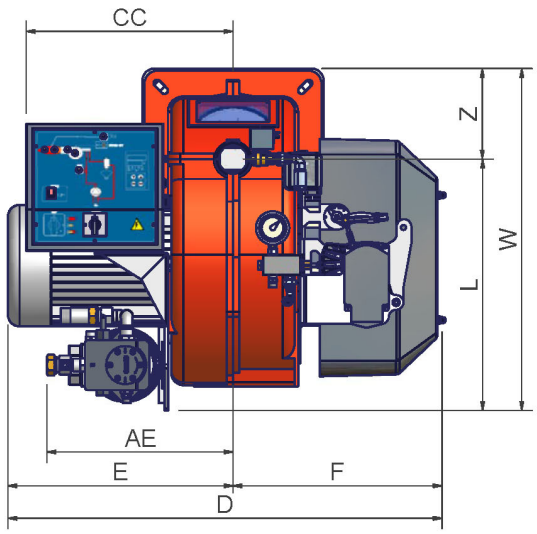
RG525

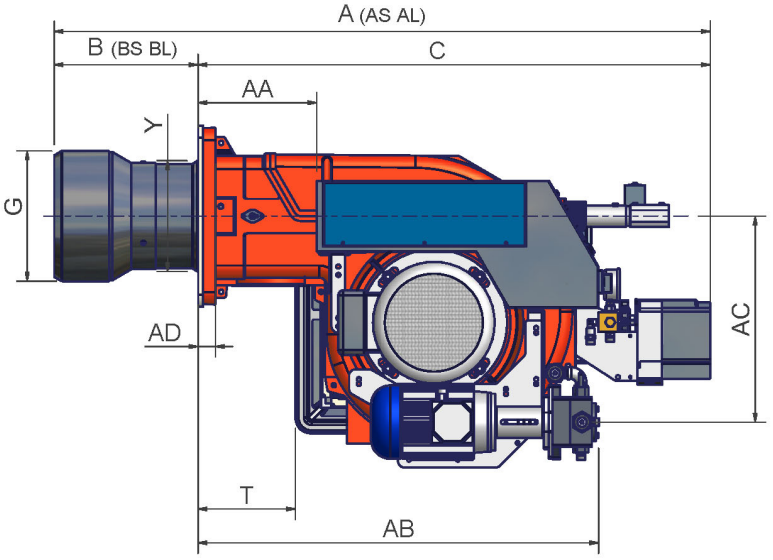


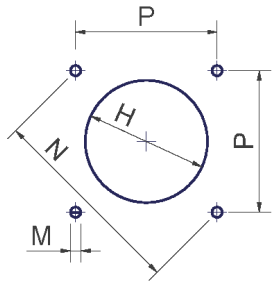
To get the input in kcal/h, multiply value in kW by 860.. Data are referred to standard conditions: atmospheric pressure at 1013mbar, ambient temperature at 15°C.

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.

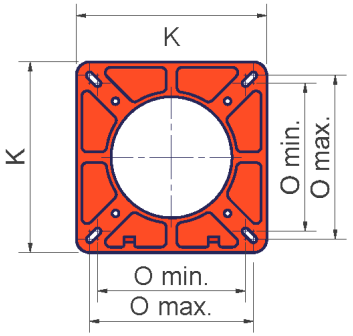
Overall dimensions (mm)







boiler recommended drilling template

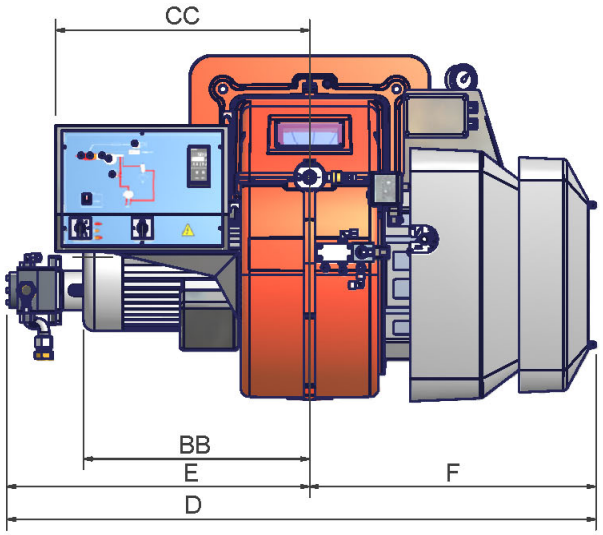


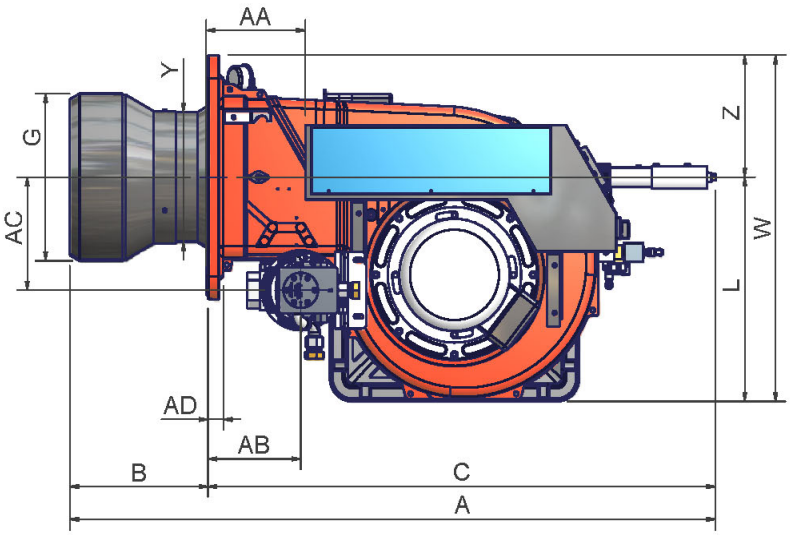
burner flange

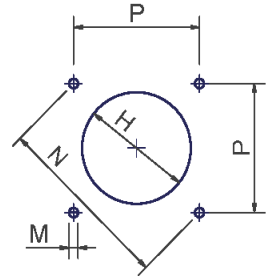
B*: SPECIAL blast tube lengths must be agreed with **Cib Unigas**

	A (AS)	A (AL)	AA	AB	AC	AD	AE	B*(BS)	B*(BL)	BB	C	CC	E	F	G	H	K	L	M	N	Omin	Omax	P	W	Y	Z
RG91	1345	1518	242	820	421	35	380	300	473	419	1045	422	419	434	238	268	360	513	M12	417	280	310	295	698	228	185
RG92	1339	1512	242	820	421	35	380	294	467	419	1045	422	419	434	266	296	360	513	M12	417	280	310	295	698	228	185
RG93	1339	1512	242	820	421	35	380	301	491	460	1045	422	460	434	292	322	360	513	M12	417	280	310	295	698	228	185

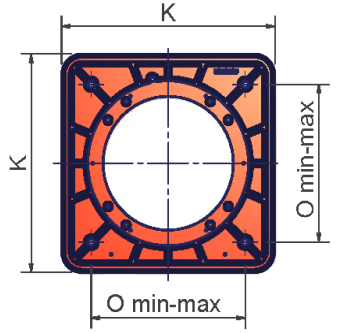
*AS/BS: measure referred to burner with standard blast tube provided
*AL/BL: measure referred to burner with extended blast tube provided







recommended boiler drilling



burner flange

B*: SPECIAL blast tube lengths must be agreed with **Cib Unigas**

	A (AS)	A (AL)	AA	AB	AC	AD	B*(BS)	B*(BL)	BB	C	CC	D	E	F	G	H	K	L	M	N	O	P	UU	W	Y	Z
RG510	1451	1671	219	217	246	35	310	530	468	1141	571	1313	671	642	329	369	540	496	M14	552	390	390	x	766	328	270
RG515	1451	1671	219	217	246	35	310	530	508	1141	571	1323	681	642	350	390	540	496	M14	552	390	390	x	766	328	270
RG520	1451	1671	219	207	250	35	310	530	508	1141	571	1323	681	642	370	410	540	496	M14	552	390	390	114	880	328	270
RG525	1511	1691	219	197	275	35	350	530	650	1161	571	1341	698	642	434	484	540	496	M14	552	390	390	172	938	434	270

*AS/BS: measure referred to burner with standard blast tube providedmeasure referred to burner with standard blast tube provided

*AL/BL: measure referred to burner with extended blast tube providedmeasure referred to burner with extended blast tube provided

MOUNTINGS AND CONNECTIONS

Transport and storage

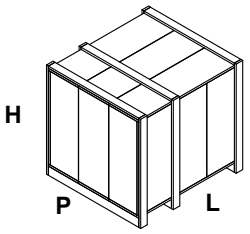
ATTENTION! The equipment must be installed in compliance with the regulations in force, following the manufacturer's instructions, by qualified personnel. All handling operations must be carried out with appropriate resources and qualified personnel

ATTENTION: Use intact and correctly dimensioned hoisting equipment, conforms to the local regulations and health and safety regulations. Do not stand under lifted loads.

If the product must be stored, avoid humid and corrosive places. Observe the temperatures stated in the burner data table at the beginning of this manual. The packages containing the burners must be locked inside the means of transport in such a way as to guarantee the absence of dangerous movements and avoid any possible damage.

In case of storage, the burners must be stored inside their packaging, in storerooms protected from the weather. Avoid humid or corrosive places and respect the temperatures indicated in the burner data table at the beginning of this manual.

Packing



The burners are dispatched in wooden packages whose dimensions are:

series 9x: 1720 mm x 1270 mm x 1020 mm (L x P x H)

series 5xx: 1800 mm x 1500 mm x 1300 mm (L x P x H)

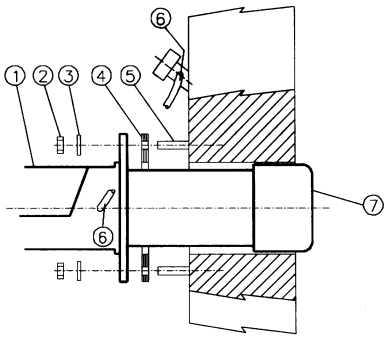
Packing cases of this kind are affected by humidity and are not suitable for stacking. The following are placed in each packing case.

- burner;
- light oil flexible hoses;
- light oil filter;
- gasket to be inserted between the burner and the boiler;
- 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:
make a hole on the closing door of the combustion chamber as described on paragraph "Overall dimensions")
place the burner to the boiler: lift it up and handle it according to the procedure described on paragraph "Handling the burner";
place the 4 stud bolts (5), according to the burner's drilling plate described on paragraph "Overall dimensions";
fasten the 4 stud bolts;
place the ceramic fibre plait on the burner flange;
install the burner into the boiler;
fix the burner to the stud bolts, by means of the fixing nuts, according to the next picture.
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).



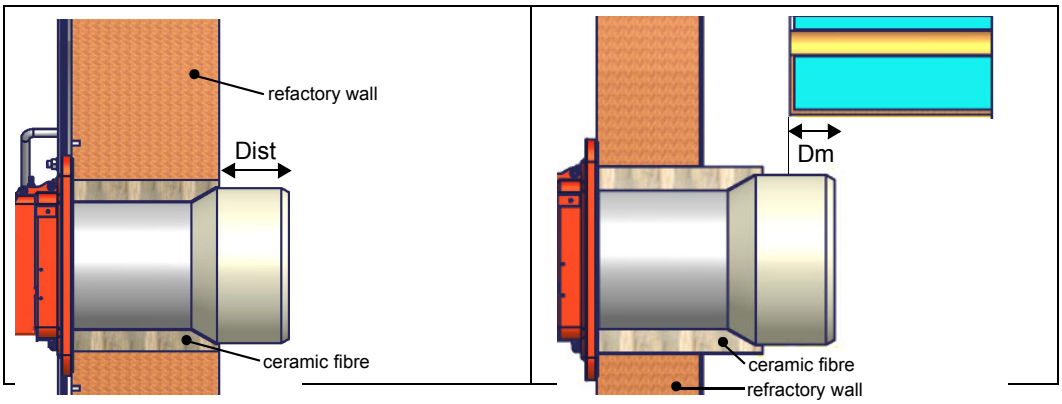
Keys

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

Matching the burner to the boiler

The burners described in this manual have been tested with combustion chambers that comply with EN676 regulation and whose dimensions are described in the diagram . In case the burner must be coupled with boilers with a combustion chamber smaller in diameter or shorter than those described in the diagram, please contact the supplier, to verify that a correct matching is possible, with respect of the application involved. To correctly match the burner to the boiler verify the type of the blast tube . 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 **Dist** = 100 mm into the combustion chamber. (please see the picture below)
- Pressurised boilers with flame reversal: in this case the blast tube must penetrate **Dm** 50 ÷ 100 mm into combustion chamber in respect to the tube bundle plate.(please see the picture below)



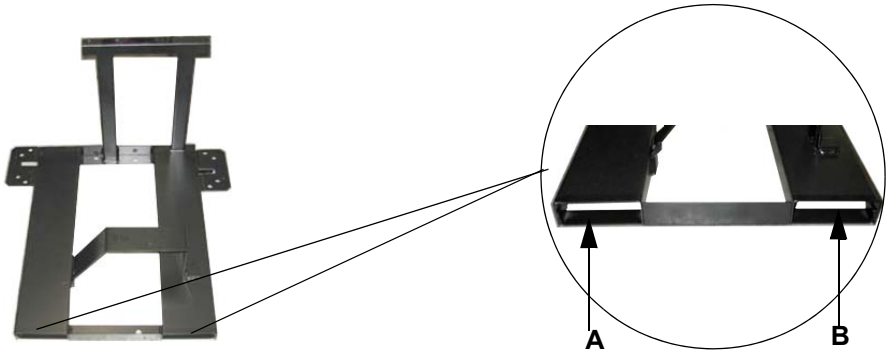
WARNING! Carefully seal the free space between blast tube and the refractory lining with ceramic fibre rope or other suitable means.

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).

Handling the burner

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

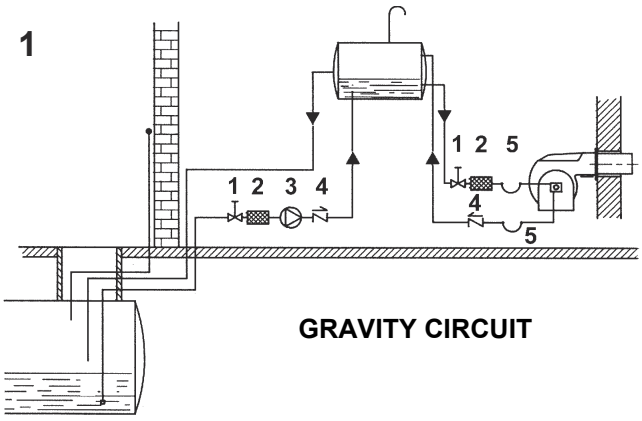
The burner is mounted on a stirrup provided for handling the burner by means of a fork lift truck: the forks must be inserted into the A anb B ways. Remove the stirrup only once the burner is installed to the boiler.



OIL TRAIN CONNECTIONS

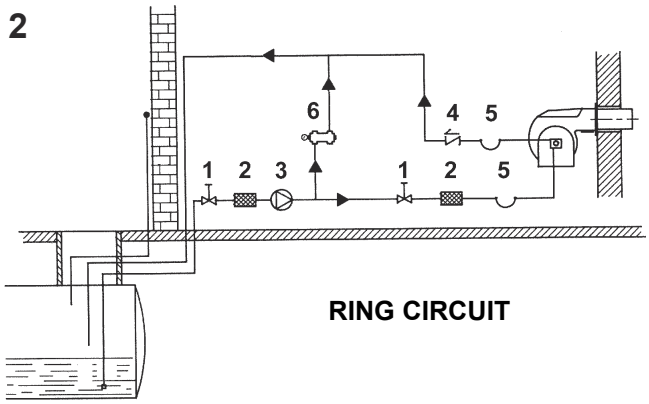
Hydraulic diagrams for light oil supplying circuits

1



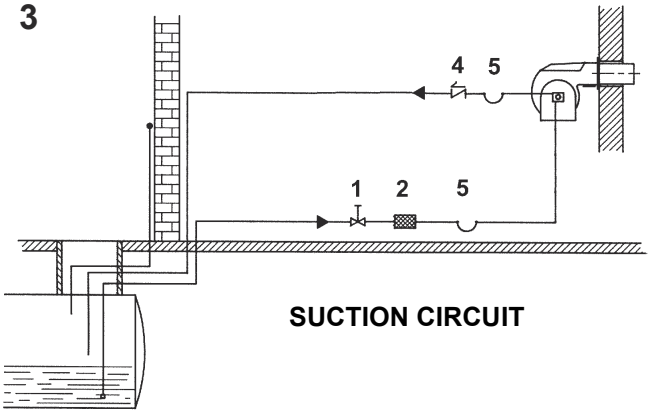
GRAVITY CIRCUIT

2



RING CIRCUIT

3



SUCTION CIRCUIT

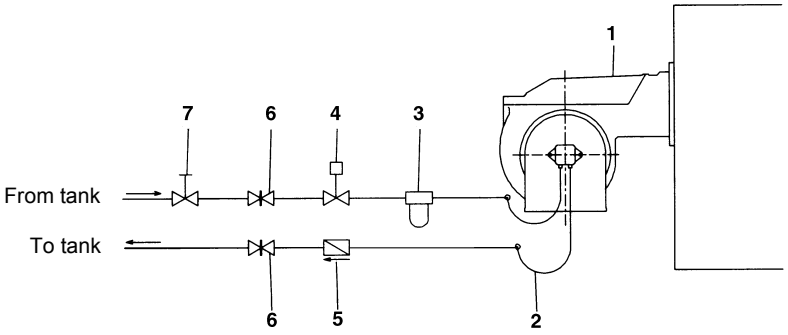
Key

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.

Installation diagram of light oil pipes

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



Double-pipe system

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

Key

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

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

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

Single-pipe system: a single pipe drives the oil from the tank to the pump's inlet. Then, from the pump, the pressurised oil is driven to the nozzle: a part comes out from the nozzle while the othe part goes back to the pump. In this system, the by-pass pulg, if provided, must be removed and the optional return port, on the pump's body, must be sealed by steel plug and washer.

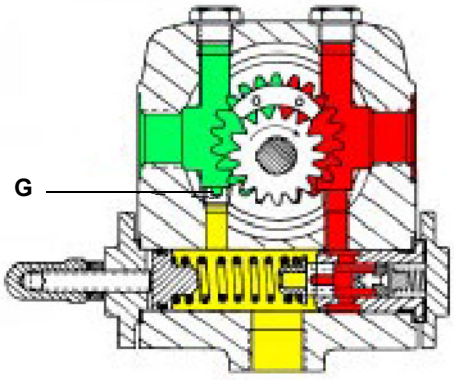
Double-pipe system: as for the single pipe system, a pipe that connects the tank to the pump's inlet is used besides another pipe that connects the pum's return port to the tank, as well. The excess of oil goes back to the tank: this installation can be considered self-bleeding. If provided, the inside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

Burners come out from the factory provided for double-stage systems. They can be suited for single-pipe system (recommended in the case of gravity feed) as decribed before.

- **Suntec TA Pumps**

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).

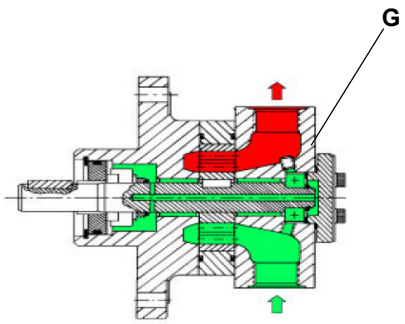
Caution: Changing the direction of rotation, all connections on top and side are reversed.



- **Suntec T Pump**

The bypass plug inserted between the pressure-side and shaft seal is only intended to change the pump rotation, check the presence of this plug by means of a 4 mm Allen key in the pressure outlet of the pump.

Caution: changing the direction of pump rotation involves changing of all pump connections.



About the use of fuel pumps

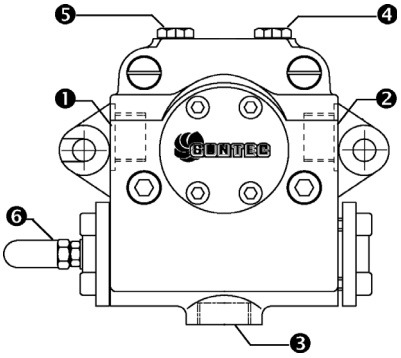
- Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear teeth, thus obstructing them.
- After filling the tank, wait before starting the burner. This will give any suspended impurities time to deposit on the bottom of the tank, thus avoiding 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 the fuel unit.

***ATTENTION**: before the burner first start, it is mandatory to fill the adduction pipes with diesel fuel and bleed out residual air bubbles. Prior to switching on the burner, check direction of rotation of the pump motor by briefly pressing the starter switch; ensure there are no anomalous sounds during equipment operation, and only then turn on the burner. Neglect to comply with this requirement will invalidate the burner warranty.*

Light oil pumps

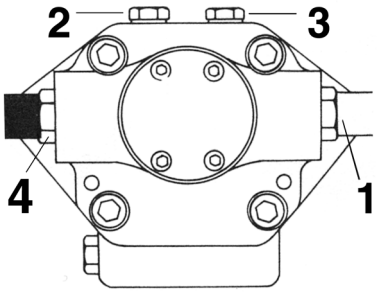
The pumps provided with these burners are Suntec TA (except mod. RG525).
RG525: Suntec T pump and Suntec TV pressure governor are provided.

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



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

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



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

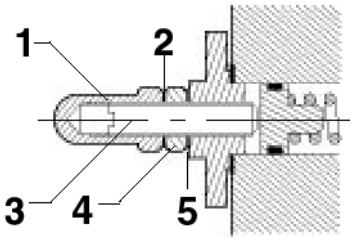
"Note: pump with “C” rotation.

Suntec TV Pressure governor

Pressure adjustment

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

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



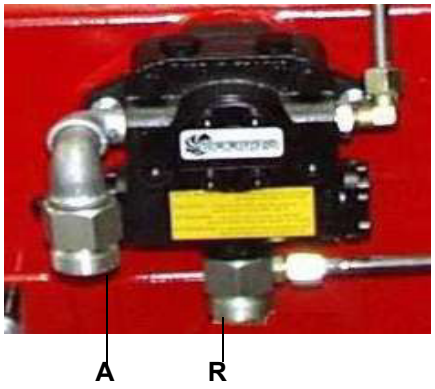
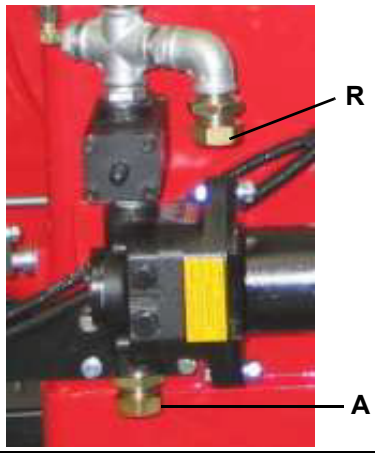
Key
1 Cap nut
2 Gasket
3 Adjusting screw
4 Lock nut
5 Gasket

Assembling the light oil flexible hoses

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

1 remove the closing nuts **A** and **R** on the inlet and return connections of the pump;

2 screw the rotating nut of the two flexible hoses on the pump **being careful to avoid exchanging the inlet and return lines**: see the arrows marked on the pump that show the inlet and the return (see prevoius paragraph).

Suntec TA.	Suntec T..
	

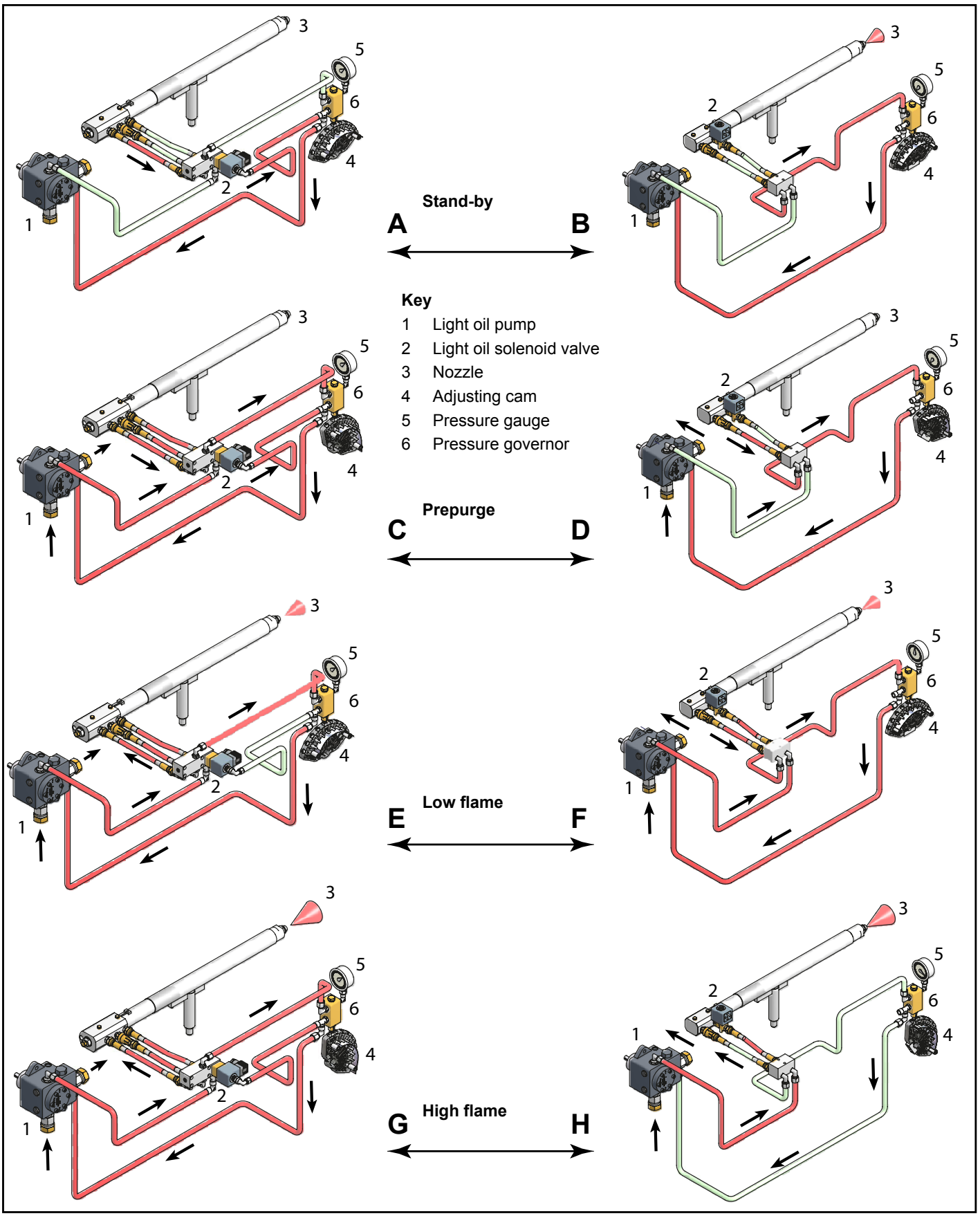
Diesel filters

	Item	Note	Connection	Max. operating pressure	Max. operating temperature	Filtering degree	Protec-tion
5	20151PE (*)	-	3/8”	1 bar	-20, 60 °C	100 µ	-
6	20201PL (*)	-	3/8”	1 bar	-20, 60 °C	100 µ	-
7	GA70501	-	1”	4 bar	90 °C	100 µ	IP65

(*) Supplied per pilot diesel fuel if present

Oil circuit

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



ELECTRICAL CONNECTIONS

WARNING! 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.

WARNING! 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.

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

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

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

Rotation of electric motor

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

CAUTION: check the motor thermal cut-out adjustment

NOTE: the burners are supplied for three-phase 380 V or 400 V supply, and in the case of three-phase 220 V or 230 V supply it is necessary to modify the electrical connections into the terminal box of the electric motor and replace the overload tripped relay.

ADJUSTING AIR AND LIGHT OIL FLOW RATE

Light oil nozzles

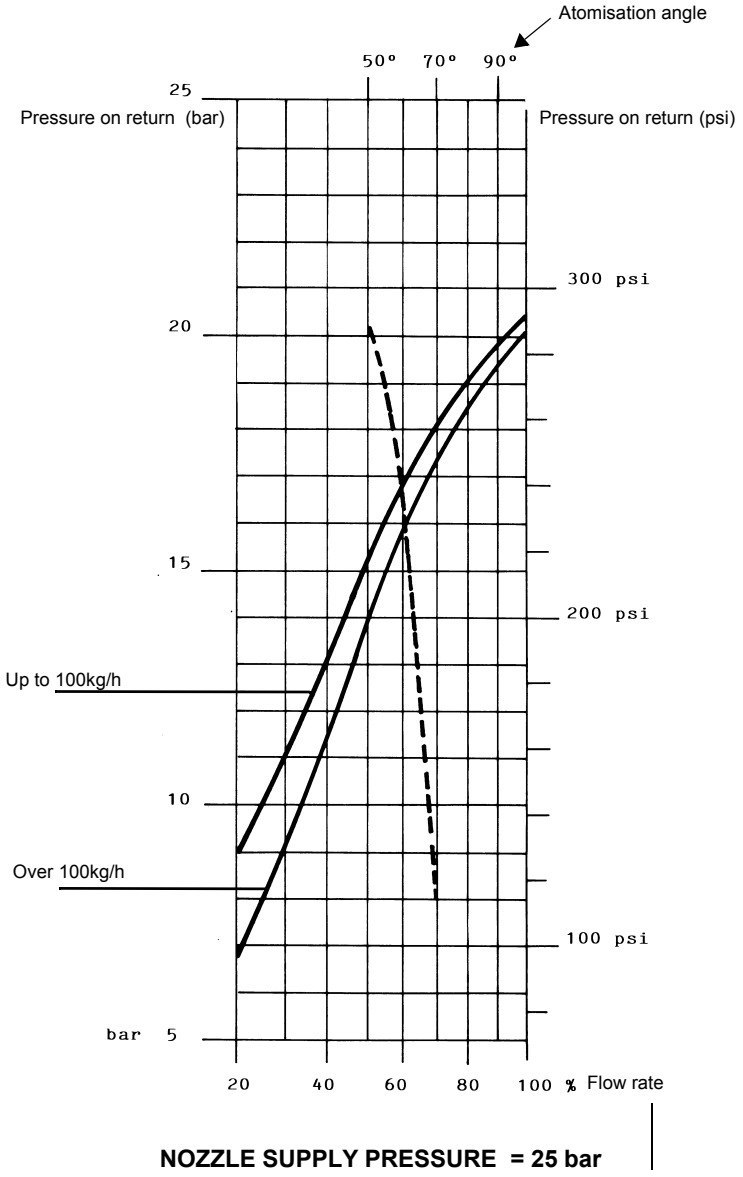
The oil flow rate can be adjusted choosing a nozzle that suits the boiler/utilisation output and setting the delivery and return pressure values according to the ones quoted on the following charts.

NOZZLE	NOZZLE SUPPLY PRESSURE (bar)	HIGH FLAME RETURN PRESSURE (bar)	LOW FLAME RETURN PRESSURE (bar)
BERGONZO A3	20	11 - 13	5 (recommended)
FLUIDICS WR2 nozzle /UNIGAS M3	25	See table below	7 (recommended)

FLUIDICS NOZZLE: REFERENCE DIAGRAM (INDICATIVE ONLY)

DIMENSIONS	FLOW RATE kg/h	
	Min	Max
40	13	40
50	16	50
60	20	60
70	23	70
80	26	80
90	30	90
100	33	100
115	38	115
130	43	130
145	48	145
160	53	160
180	59	180
200	66	200
225	74	225
250	82	250
275	91	275
300	99	300
330	109	330
360	119	360
400	132	400
450	148	450
500	165	500
550	181	550
600	198	600
650	214	650
700	231	700
750	250	750
800	267	800

Tab. 1



NOZZLE SUPPLY PRESSURE = 25 bar

- - - - - Atomisation angle according to the return pressure

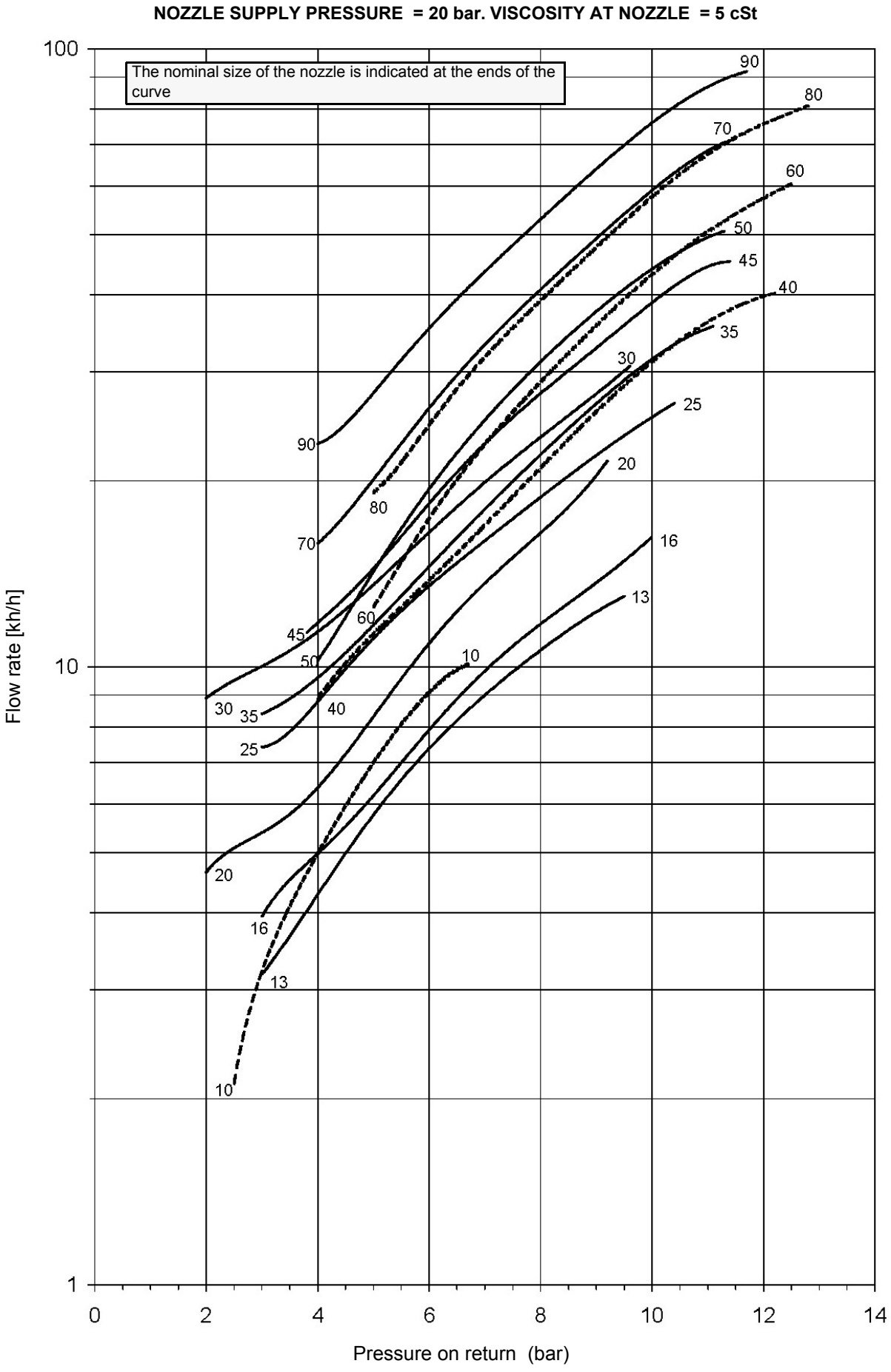
——— % Flow rate

viscosity at nozzle = 5 cSt

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

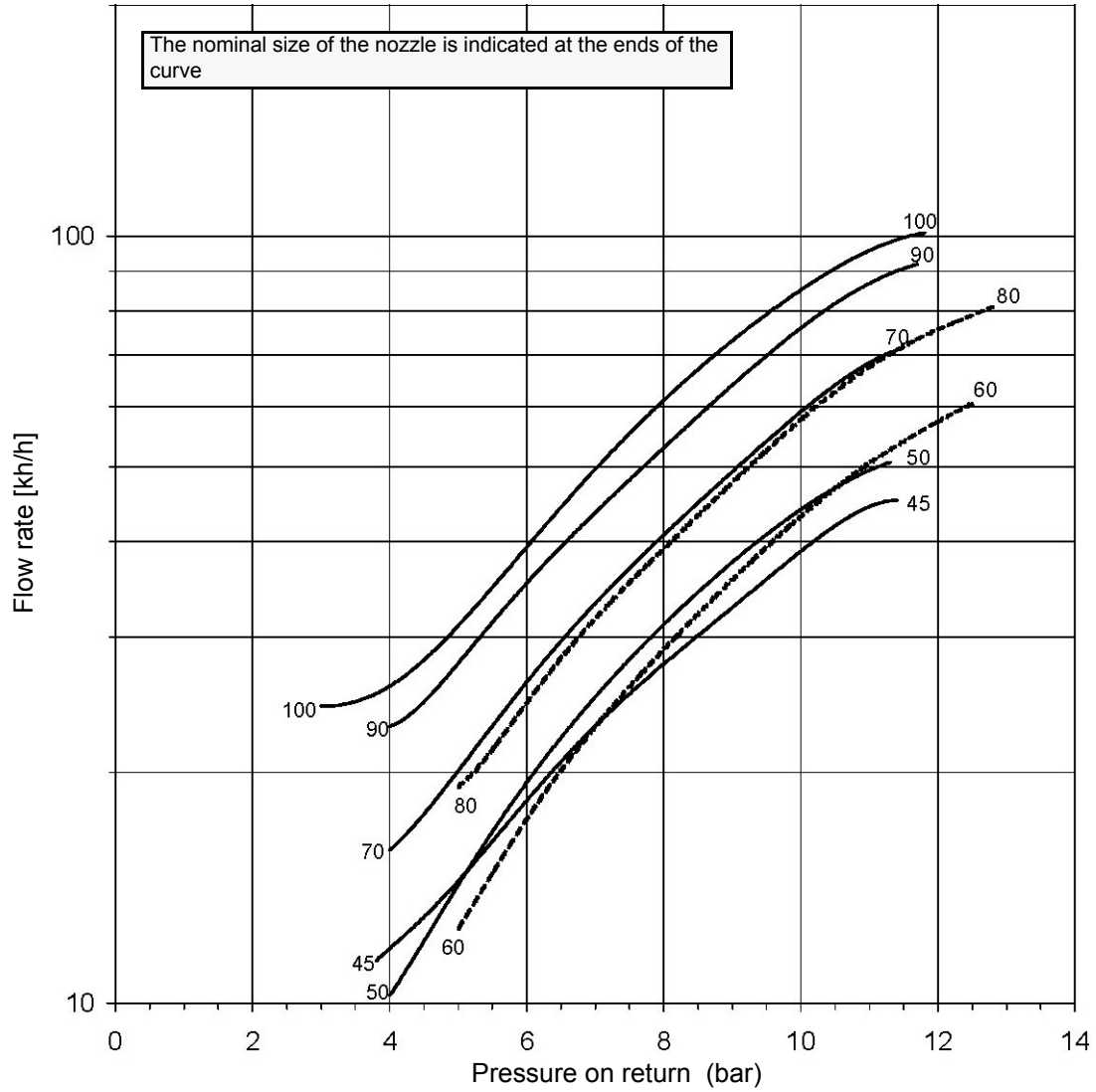
Fig. 5

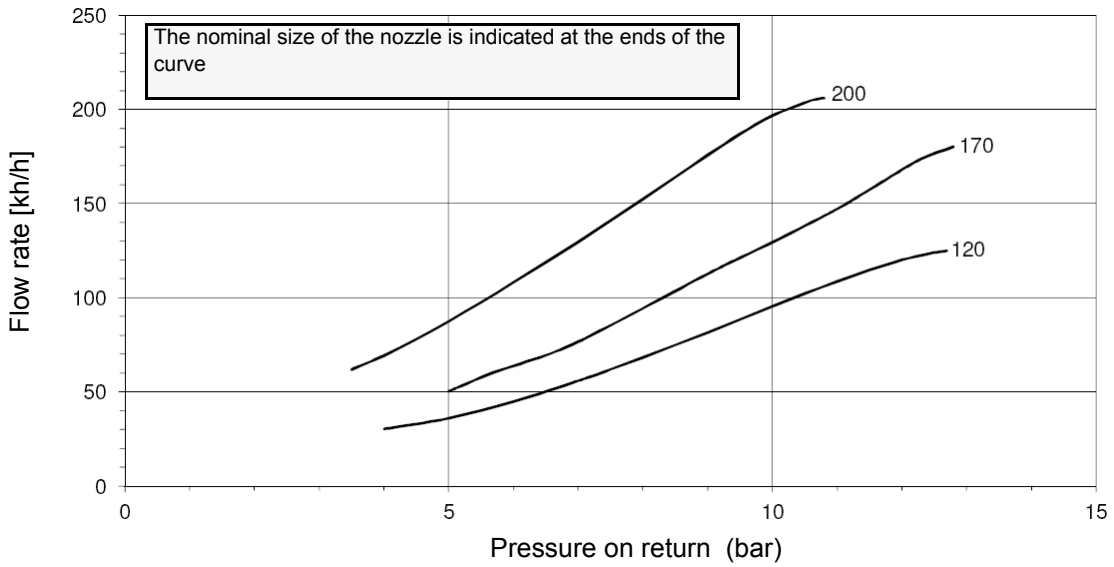
FLUIDICS KW3...60°



FLUIDICS KW3...60°

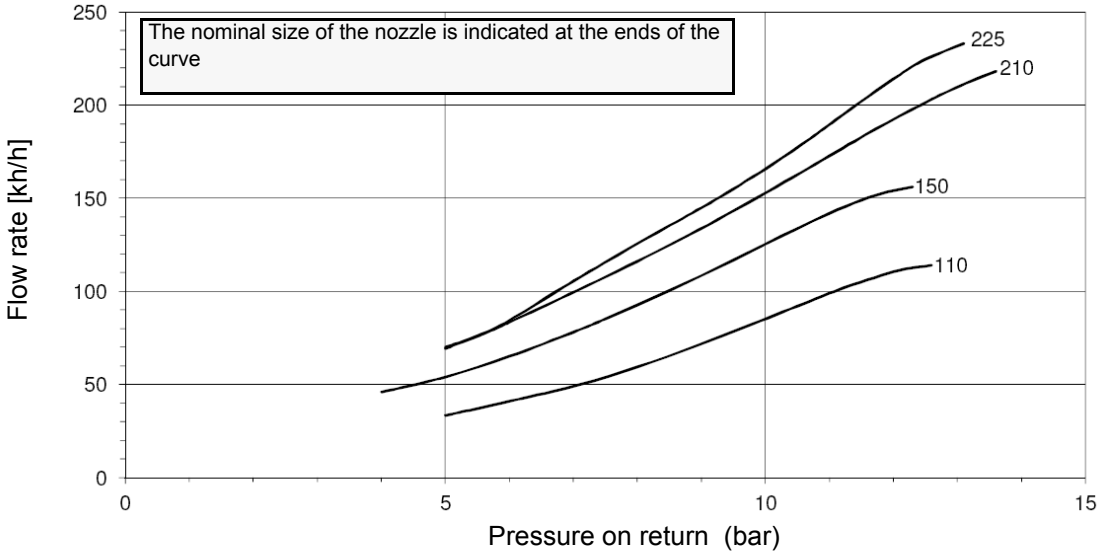
NOZZLE SUPPLY PRESSURE = 20 bar. VISCOSITY AT NOZZLE = 5 cSt

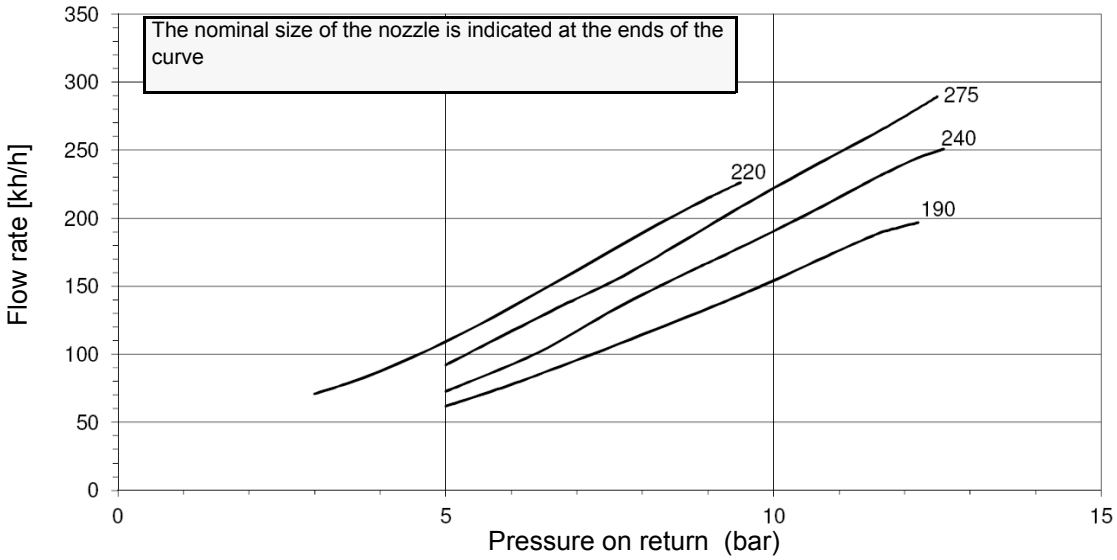


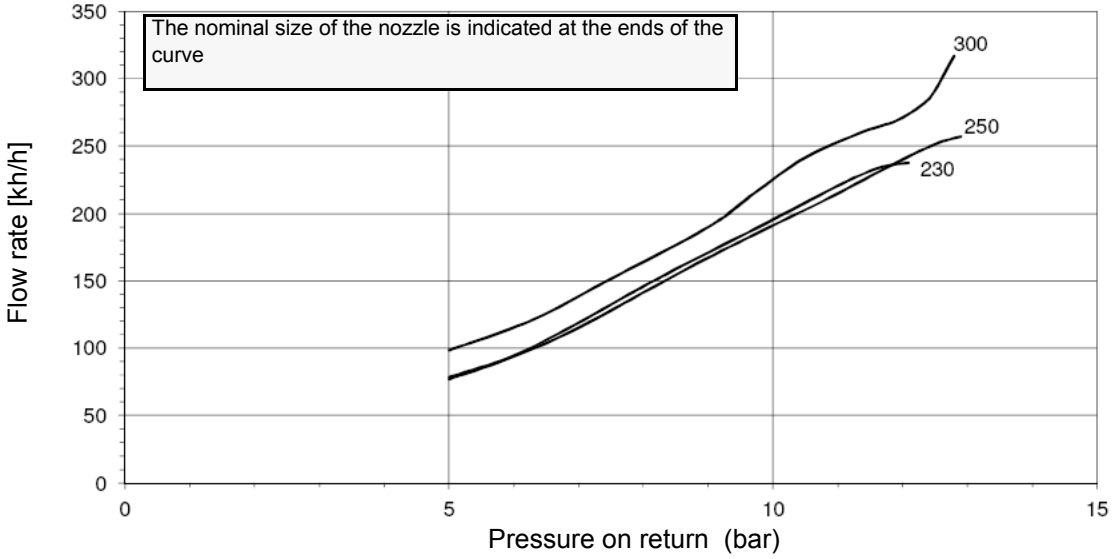


FLUIDICS KW3...60°

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

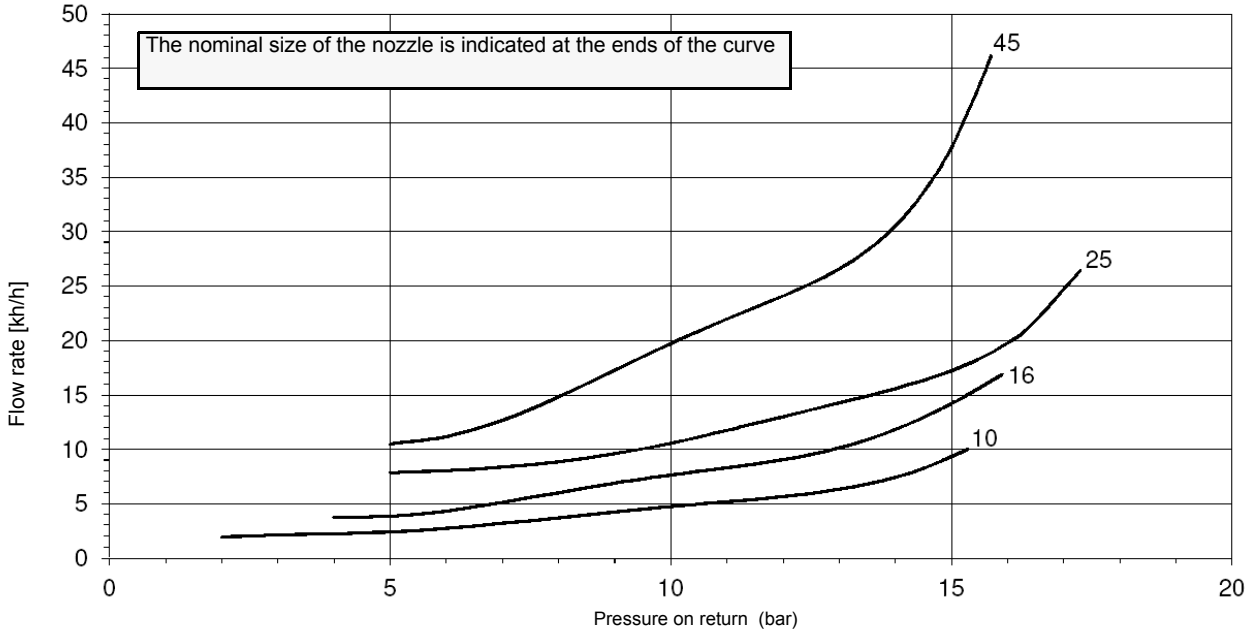


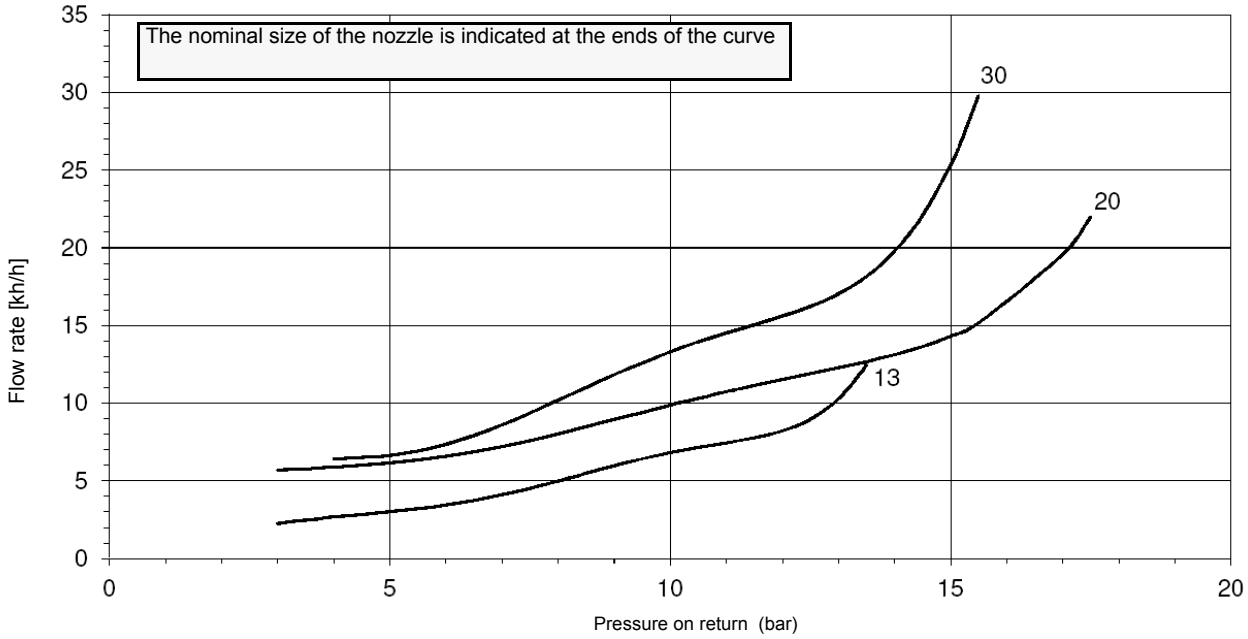


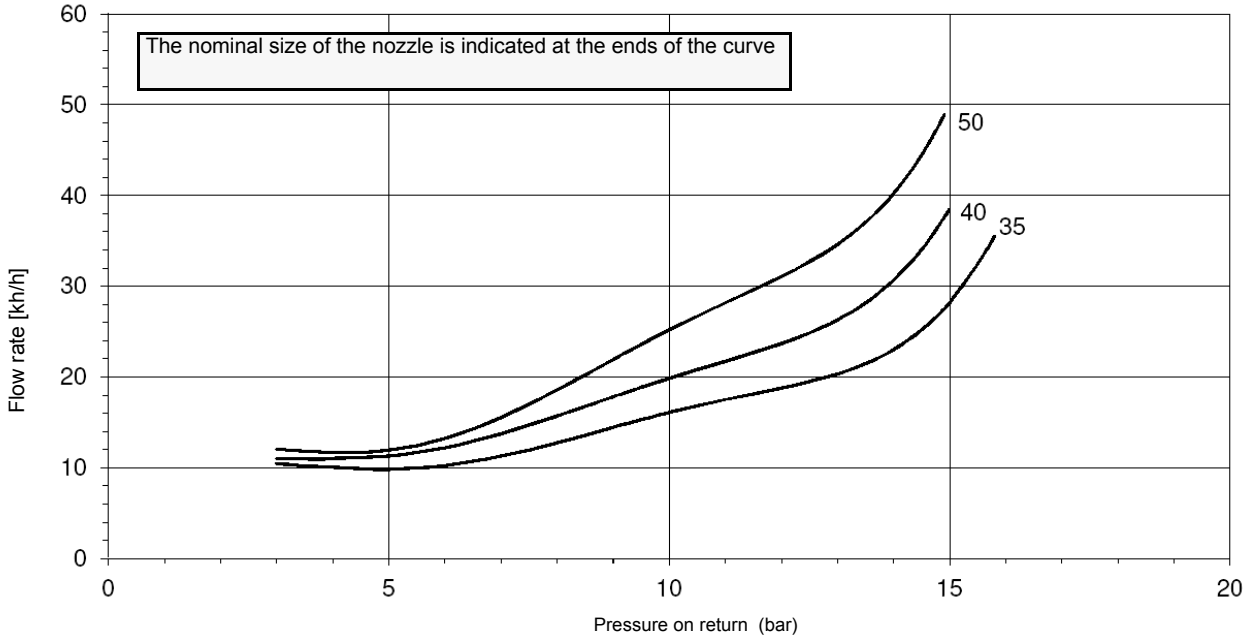


FLUIDICS KW3...45°

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

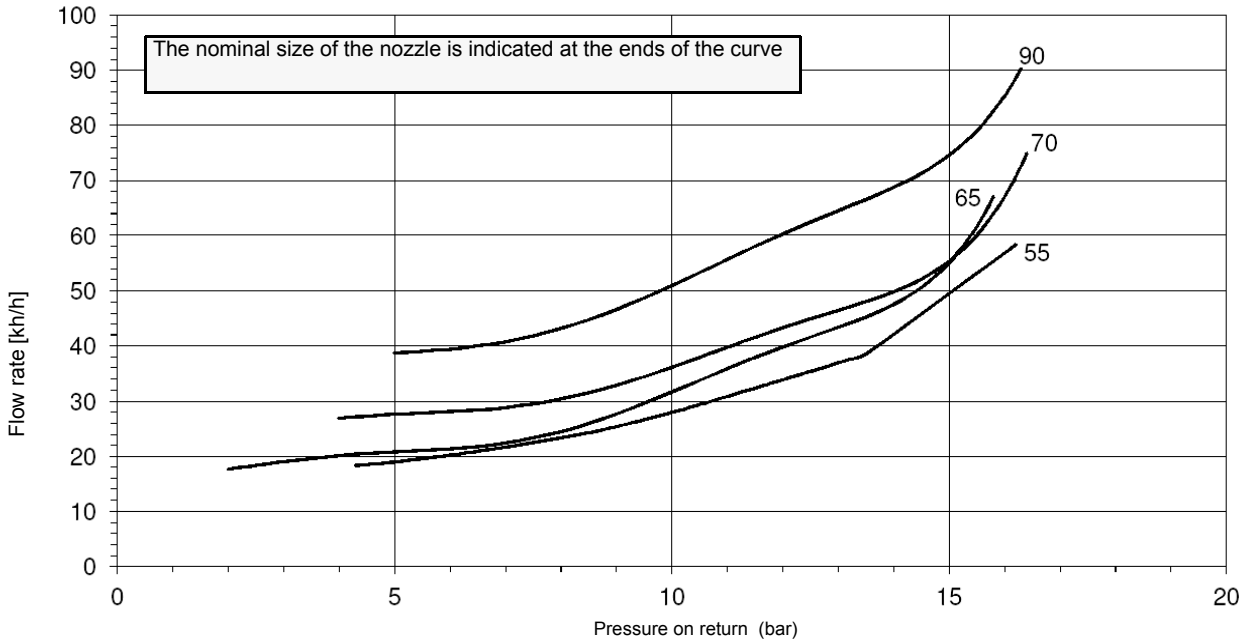


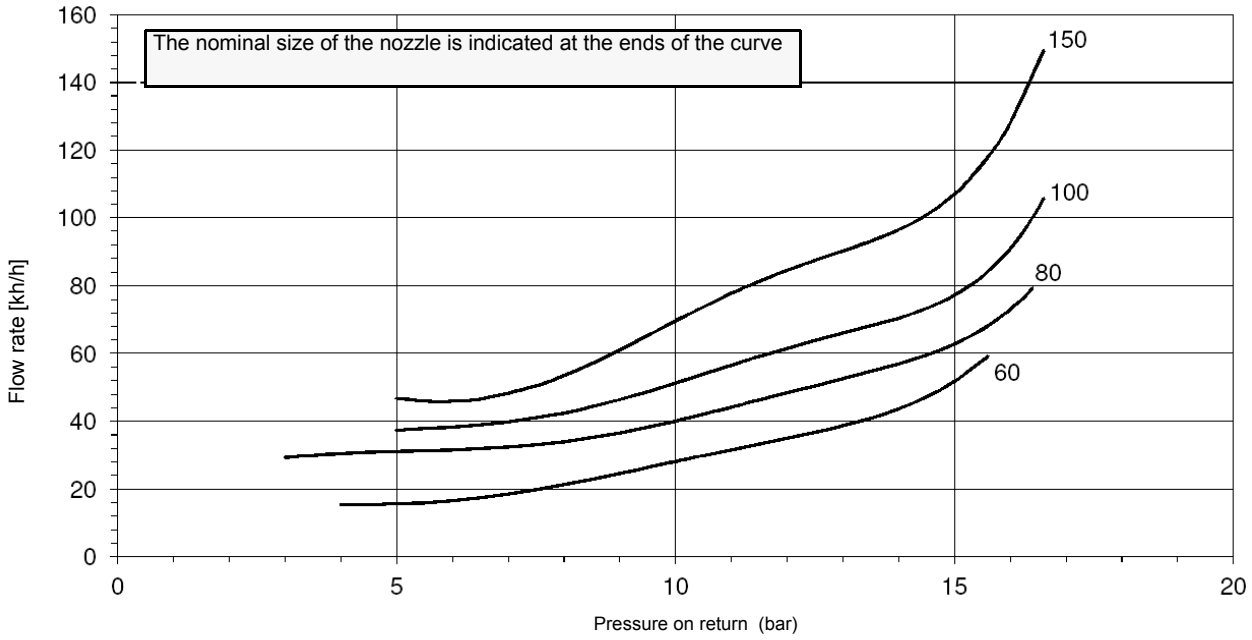


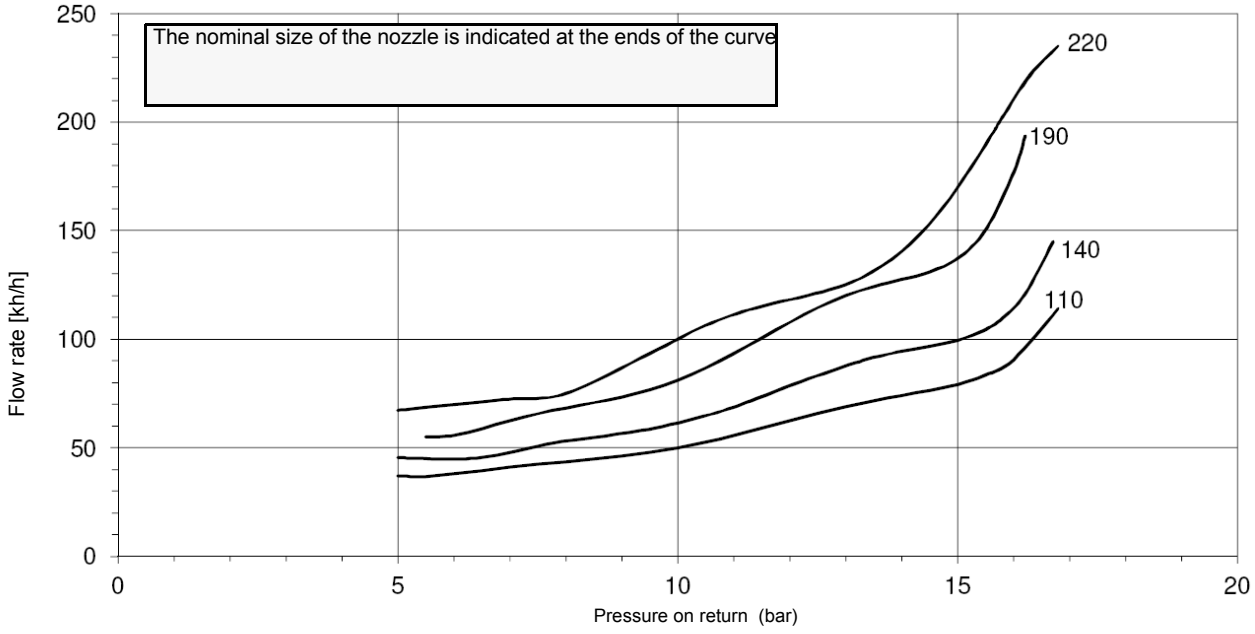


FLUIDICS KW3...45°

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

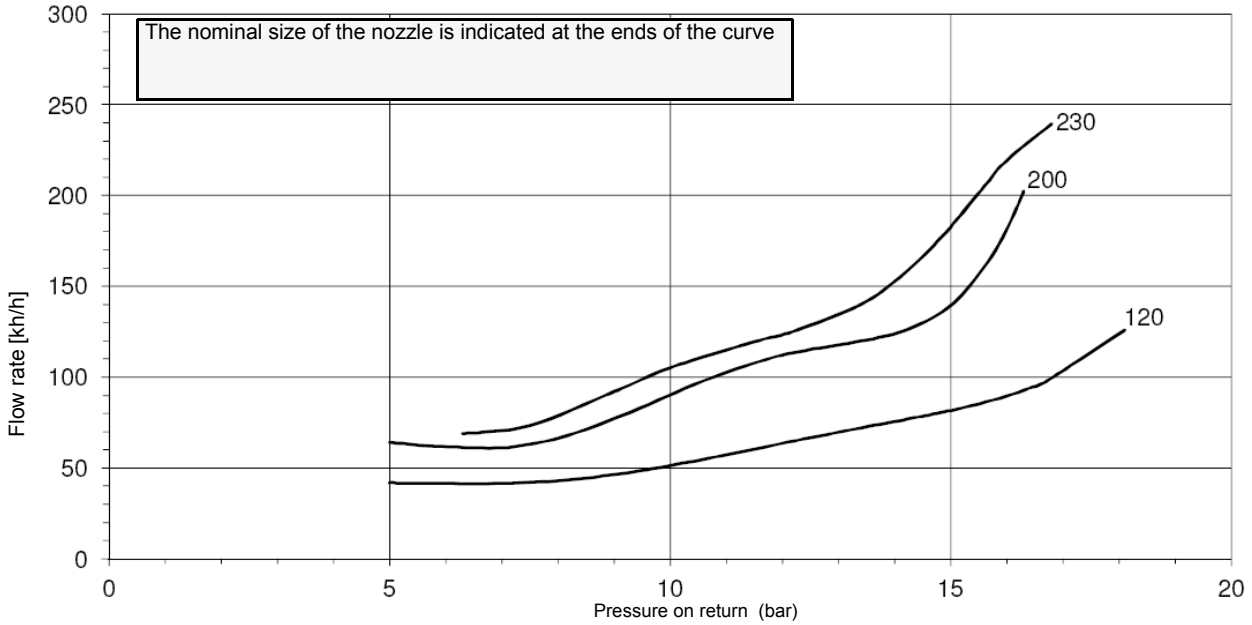


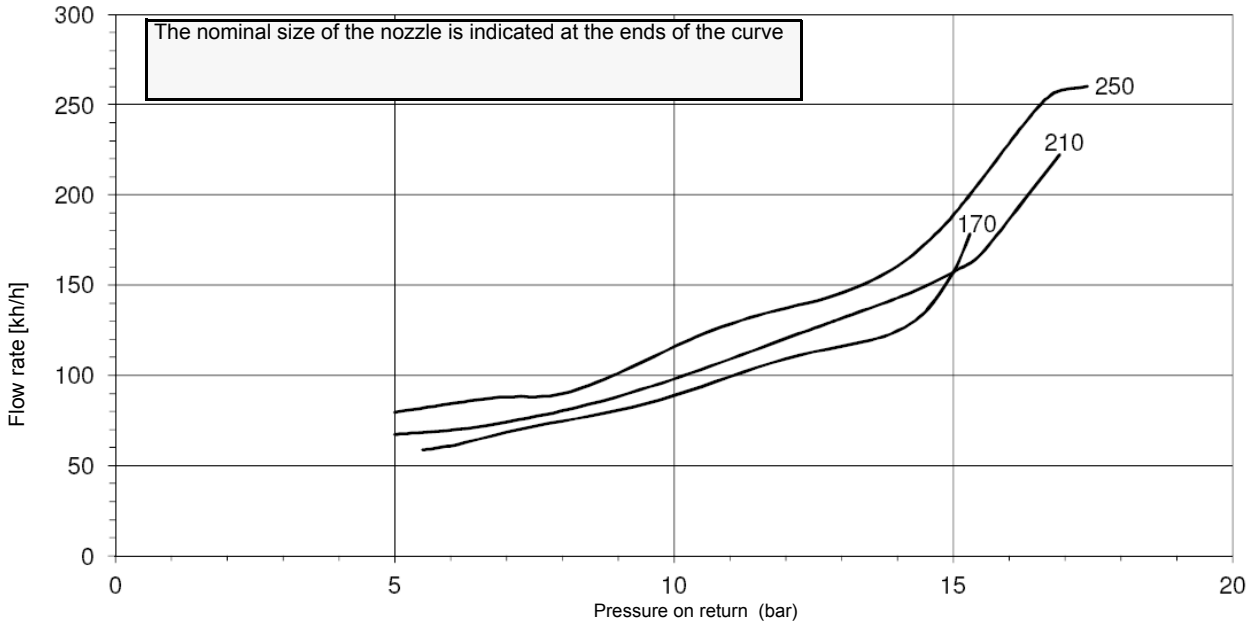


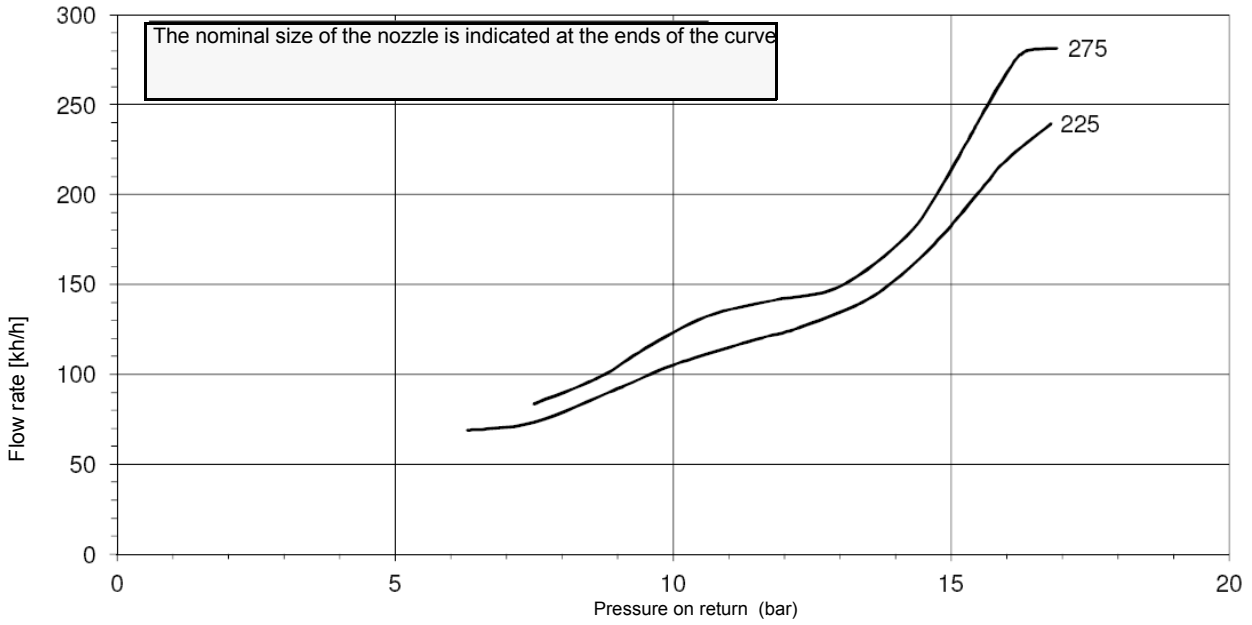


FLUIDICS KW3...45°

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







	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 fuel 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		
Fuel	***Recommended (%) CO_2***	***Recommended (%) O_2***
Light oil	11.5 ÷ 13	2.9 ÷ 4.9

Adjustments - brief description

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.

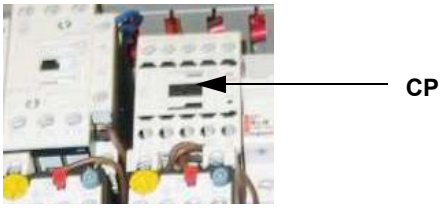
- Check that the combustion parameters are in the suggested limits.
- .Check the nozzle flow rate.
- Then, adjust the combustion values corresponding to the points between maximum and minimum: set the shape of the adjusting cam foil. The adjusting cam sets the air/fuel ratio in those points, regulating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

Adjustment procedure

To change the burner setting during the testing in the plant, follow the next procedure, according to the actuator model provided (mod. Siemens SQM40.. Siemens SQL..).

Oil Flow Rate Settings by means Siemens SQM40.. actuator

1 with the electrical panel open, prime the oil pump acting directly on the related **CP** contactor (see next picture): check the pump motor rotation and keep pressing for some seconds until the oil circuit is charged;Check the fan motor rotation (see page 19).



2 bleed the air from the **M** pressure gauge port (Fig. 6) by loosing the cap without removing it, then release the contactor.

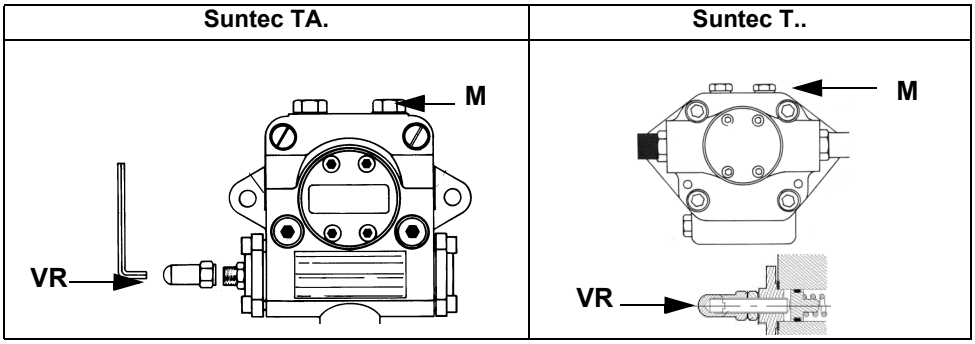
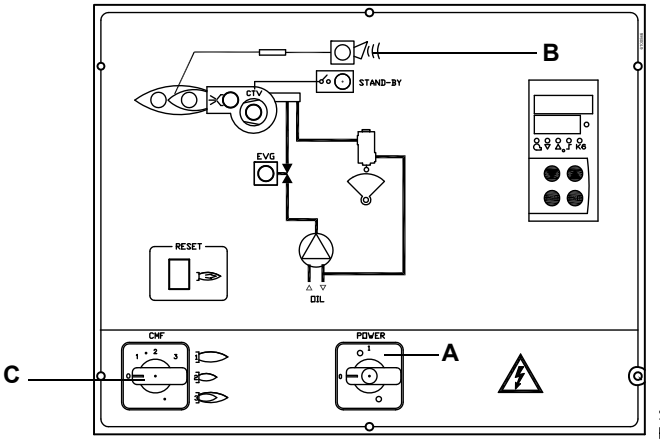


Fig. 6

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 33.



5 be sure that the actuator cam for the “Startup enabling signal” (when used) is about 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 fo the thermostat **TAB** (as far as fully-modulating burners, see the related paragraph).

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).

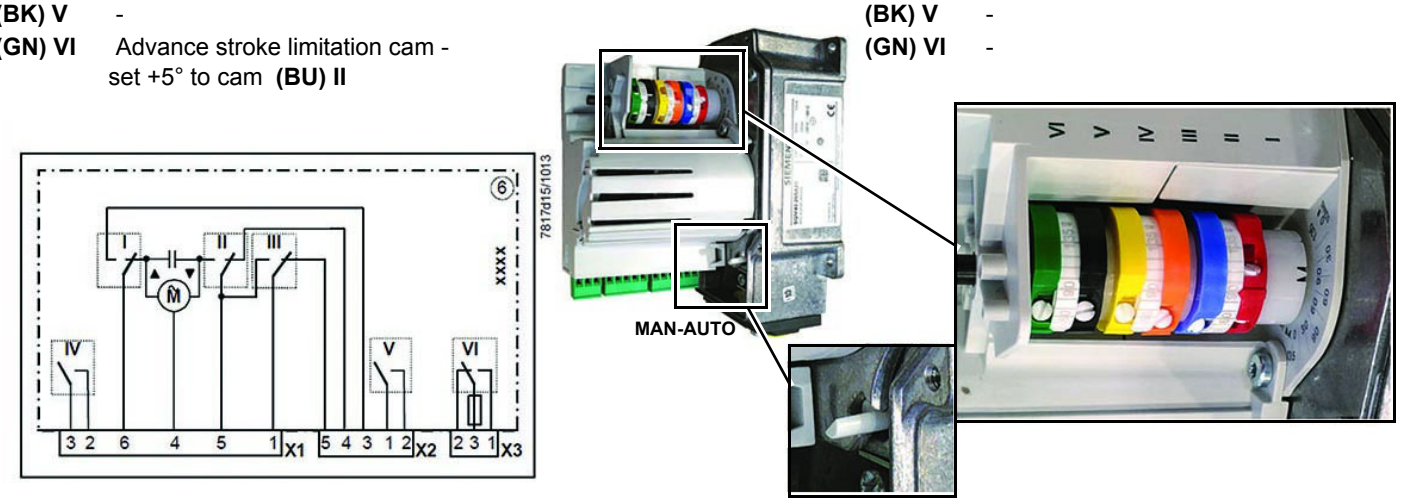
SQM40.265 Actuator cams

Version with flame control LMO 24.255 / 44.255

(RD) I High flame
(BU) II Stand-by
(OG) III Low flame
(YE) IV -
(BK) V -
(GN) VI Advance stroke limitation cam - set +5° to cam **(BU) II**

Version with flame control LAL 2.25

(RD) I High flame
(BU) II Stand-by
(OG) III Low flame
(YE) IV -
(BK) V -
(GN) VI -



9 the nozzle suplly pressureis already factory-set and must not be changed. Only if necessary, adjust the supply pressure as follows (see related paragraph); insert a pressure gauge into the port shown on Fig. 7 and act on on the pump adjusting screw **VR** (see Fig. 6) as to get the nozzle pressure at 25bar (Fluidics nozzles - see diagram on page 20).

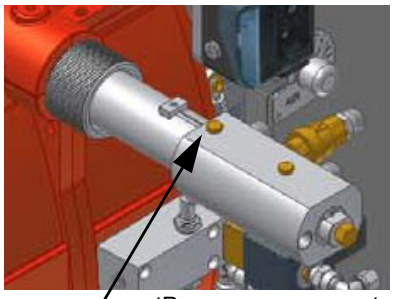


Fig. 7

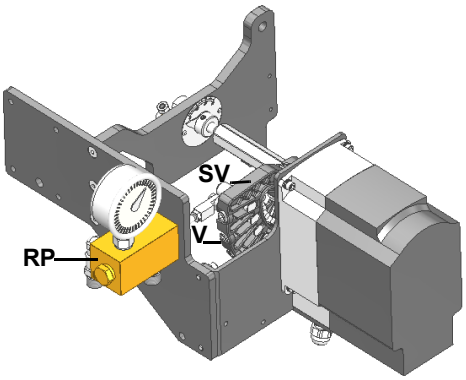
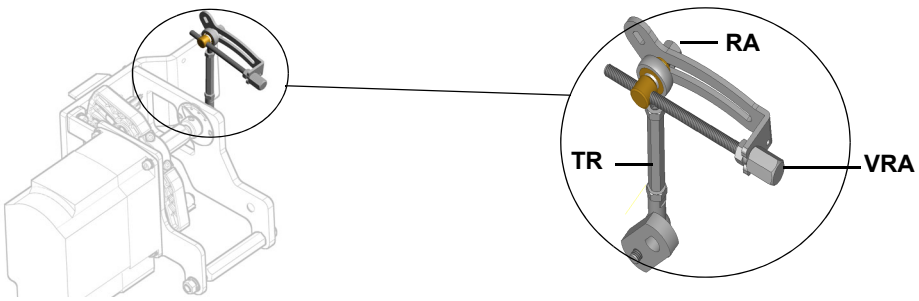


Fig. 8

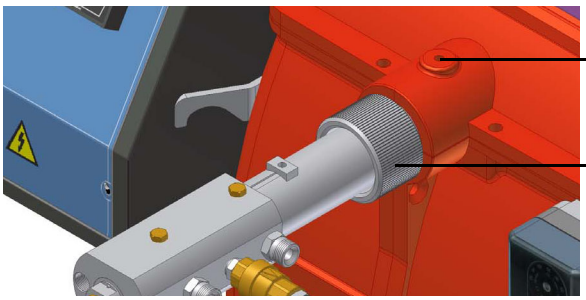
10 in order to get the maximum oil flow rate, adjust the pressure (reading its value on the **PG** pressure gauge) without changing the air flow rate set during the gas operation adjustments (see prevoius paragraph): checking always the combustion parameters, the adjustment is to be performed by means of the **SV** adjusting cam screw (see picture) when the cam has reached the high flame position.

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 perfomed, be sure that the blocking nut **RA** is fasten. Do not change the position of the air damper rods.



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



”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 adjustement 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 shown on diagram in Fig. 18, 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.

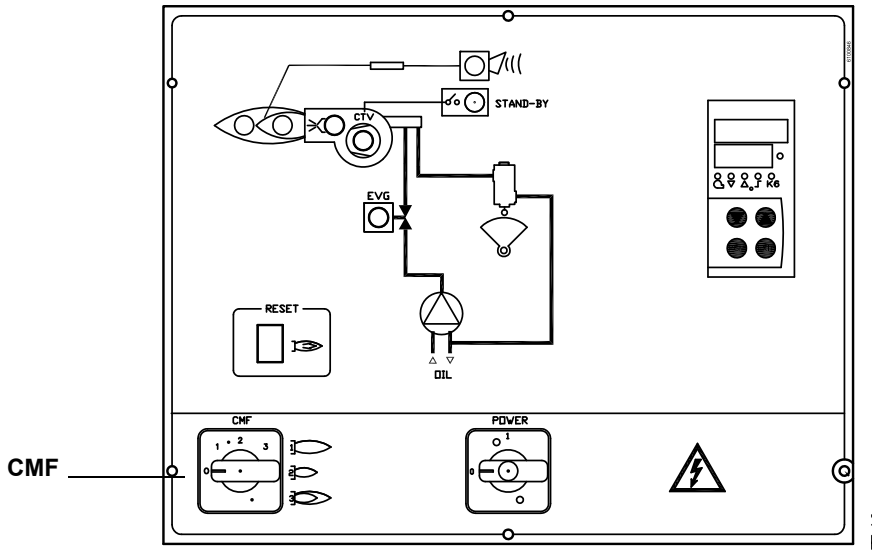
Now adjust the pressure switch (see page 31).

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 intead of **TAB**.

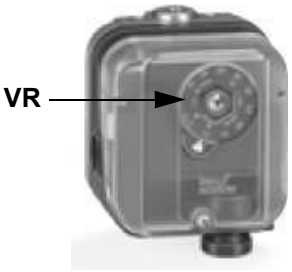
The **CMF** position sets the oprating stages: to drive the burner to the high-flame stage, set CMF=1; to drive it to the low-flame stage, set CMF=2.

To move the adjusting cam set CMF=1 and then CMF=0. For further information about the regulating modulator, see the attached manual.



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

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 o the operation, turn slowly the adjusting ring nut **VR** in the clockwise direction until the burner lockout, then read the value on the pressure switch scale and set it to a value reduced by 15%.
- Repeat the ignition cycle of the burner and check it runs properly.
- Refit the transparent plastic cover on the pressure switch.

Minimum oil pressure switch (when provided)

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

Maximum oil pressure switch

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

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

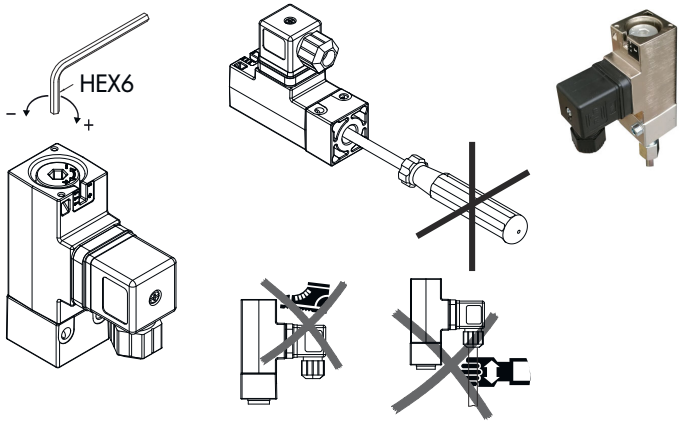
This check should be carried out along the whole range of the burner output.

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

Oil pressure switch adjustment

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

Trafag Picostat 9B4..



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

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

1 Set to the ON position the switch 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 that the series of thermostats (or pressure switches) enables the burner 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 actuator moves to the high flame position for some seconds, then the operation begins and the burner switches to high flame or to low flame, according to the plant demand.
8 The high/low flame operation is shown by the **F** LED turning on/off.

Burner control panel

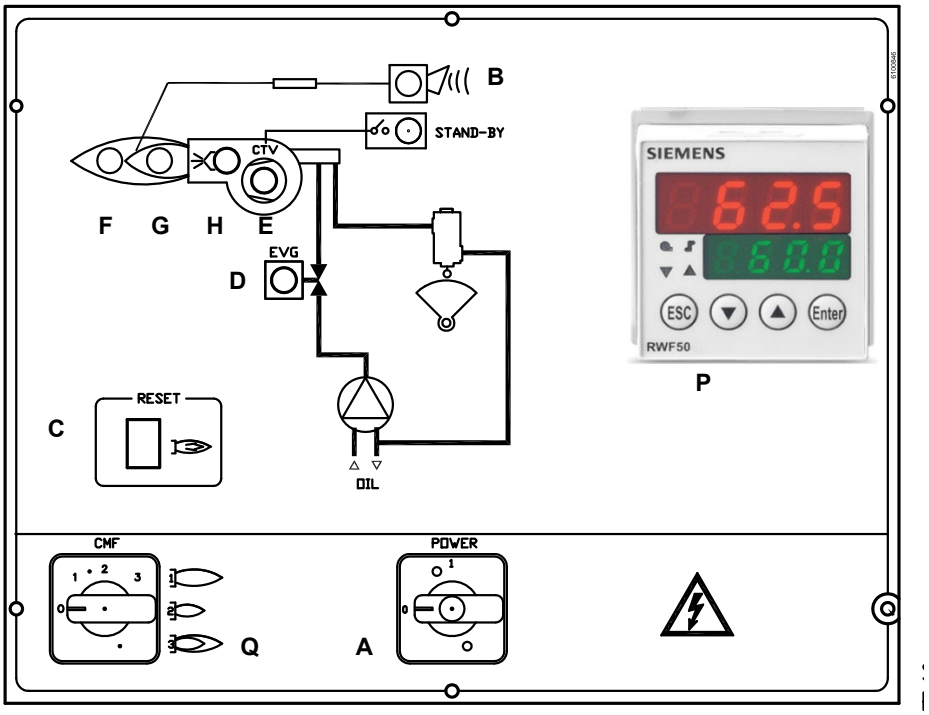


Fig. 9

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

ROUTINE MAINTENANCE

- Check and clean the cartdrige of the fuel filter, replace it if necessary (see next paragraph);
- carefully check the fuel flexible hoses for leaks;
- check and clean the filter on the fuel pump: bilter 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 35); when reassembling, carefully observe the measures on page 36;
- check the ignition electrodes and their ceramic insulators, clean, adjust and replace if necessary page 36;
- 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 scheme in Fig. 11;
- clean and grease levers and rotating parts.

Thecnical procedure of self cleaning filters substitution (valid for all models)

1 Close the bowl valve before the self cleaning filter
2 Switch off any electrical equipment on board on the filter (example motorization or heaters)

WARNING! Drain the system by unscrewing the drain screw on the bottom of the self cleaning filter

3 Disconnect the outlet pipe from the cover of the self cleaning filter
4 Remove the cover with all the filter pack, leaving only the bowl on the line
5 Clean any residue on the bottom of the bowl and clean the seat of the O-ring seal

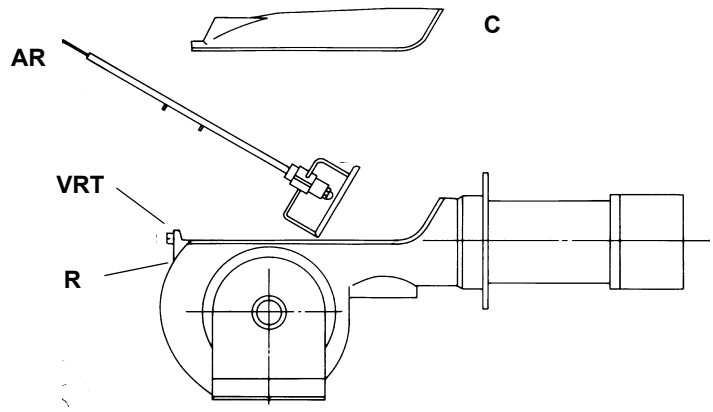
WARNING! Replace the O-ring seal between the bowl and cover

6 Insert the filter pack again making sure to respect the correct inlet/outlet direction or any references on the cover and tray
7 Replace the filter by following the reverse order operations
8 Make sure there is no leakage and give the power to any electrical equipmente on the filter

Removing the combustion head

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

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

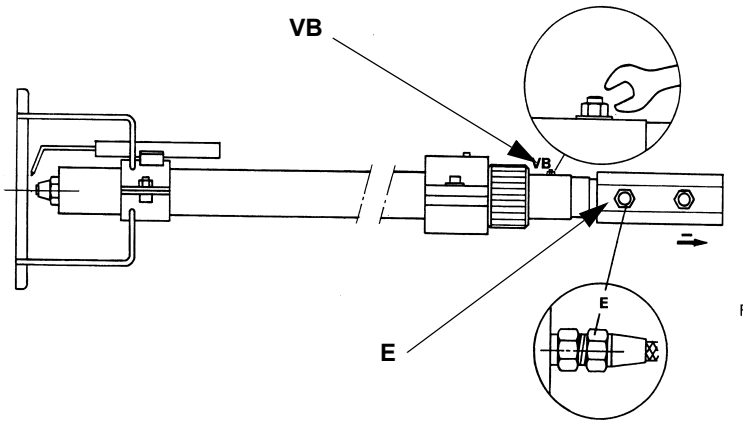


Removing the oil gun

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

1 unscrew the connectors from the 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.

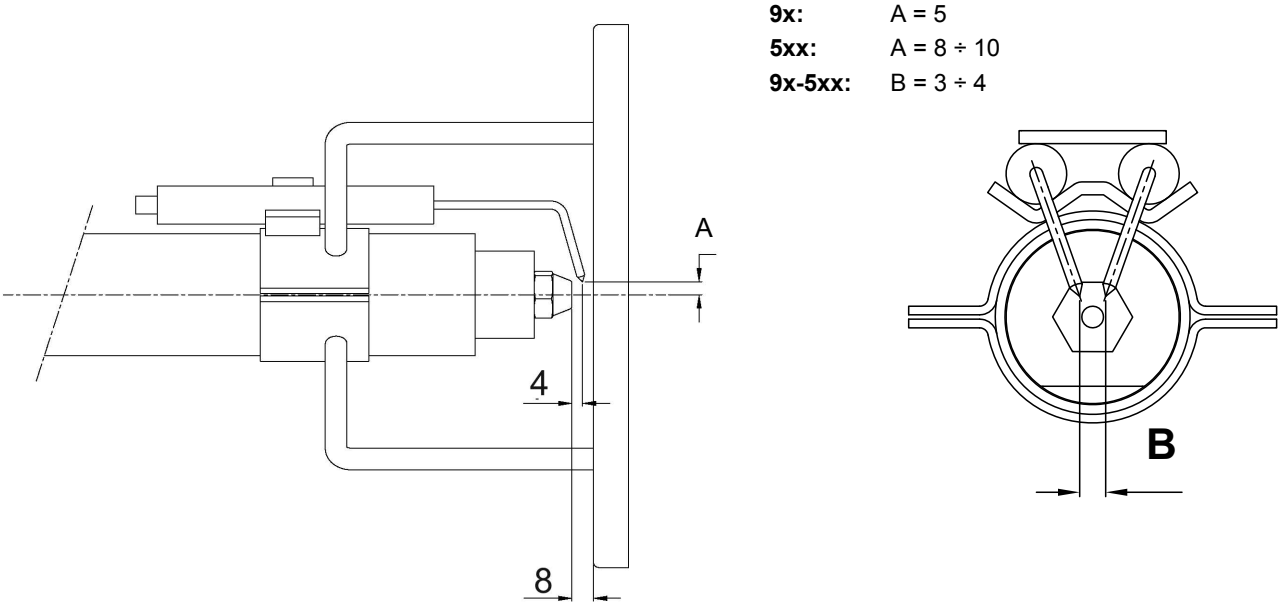
Note: To re-assemble, follow the procedure above in reversed order.



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 (in mm) shown on the next pictures must be observed. Be sure to tight the screw on the electrodes group before reassembling the combustion head.



9x: A = 5
5xx: A = 8 ÷ 10
9x-5xx: B = 3 ÷ 4

Fig. 10

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. 10.

Cleaning and replacing the detection photoresistor

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

Checking the detection current

To measure the detection signal follow the diagram in Fig. 11. If the signal is not in the advised range, check the electrical contacts, the cleaning of the combustion head, the position of the photoresistor and if necessary replace it.

series 9x: LMO
series **5xx**: LAL25

Minimum current intensity with flame
LMO: 45µA
LAL25: 8µA

Maximum current intensity without flame:
LMO: 5.5µA
LAL25: 0.8µA

Maximum possible current intensit with flame:
LMO: 100µA
LAL25: 30µA

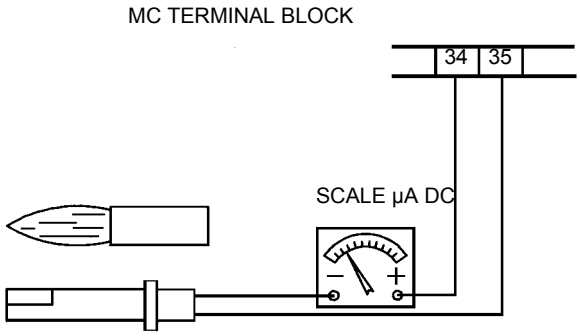


Fig. 11

Apparecchiatura di controllo fiamma	Minimo segnale di rilevazione
Siemens LMO	70µA (con fotocellula)
Siemens LMV2 / 3x	Intensità di fiamma (parametro 954) >16%

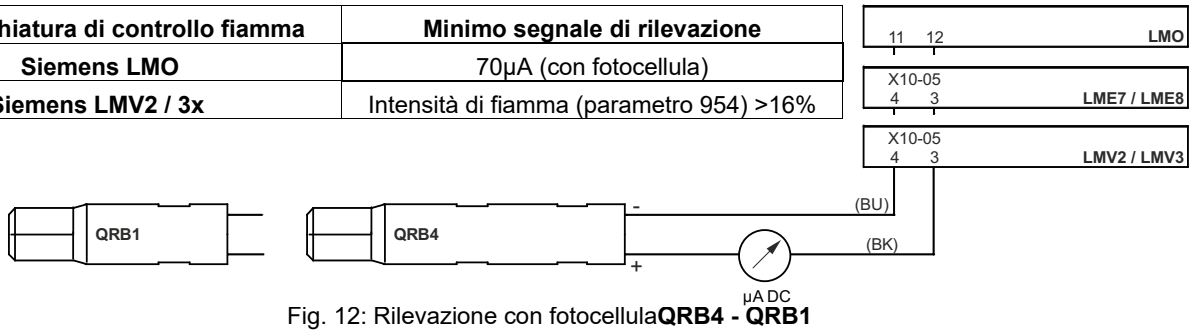


Fig. 12: Rilevazione con fotocellula**QRB4 - QRB1**

Termine di servizio del bruciatore

- In co dizioni ottimali di funzionamento, e con una manutenzione preventiva, la durata di vita del bruciatore può arrivare a 20 anni.
- All scadenza del termine di servizio del bruciatore è necessario effettuare una diagnosi tecnica e in caso di necessità, eseguire una riparazione complessiva.
- Lo st to del bruciatore viene considerato al limite se è tecnicamente impossibile continuare a utilizzarlo a causa della non conformità ai requisiti di sicurezza oppure a causa del calo di prestazioni.
- Il roprietario prende la decisione se terminare l'impiego del bruciatore, oppure la sostituzione e lo smaltimento in base allo stato effettivo dell'apparecchio e alle eventuali spese di riparazione.
- L' tilizzo del bruciatore per altri scopi oltre la scadenza dei termini di utilizzo è severamente vietato.

Fermo stagionale

Per spegnere il bruciatore nel periodo di fermo stagionale, procedere nel modo seguente:

1 portare l'interruttore generale del bruciatore in posizione 0 (OFF - spento)
2 staccare la linea di alimentazione elettrica
3 chiudere il rubinetto del combustibile della linea di distribuzione.

Smaltimento del bruciatore

In caso di rottamazione del bruciatore, seguire le procedure previste dalle leggi vigenti sullo smaltimento dei materiali.

SCHEMI ELETTRICI

Consultare gli schemi elettrici allegati.

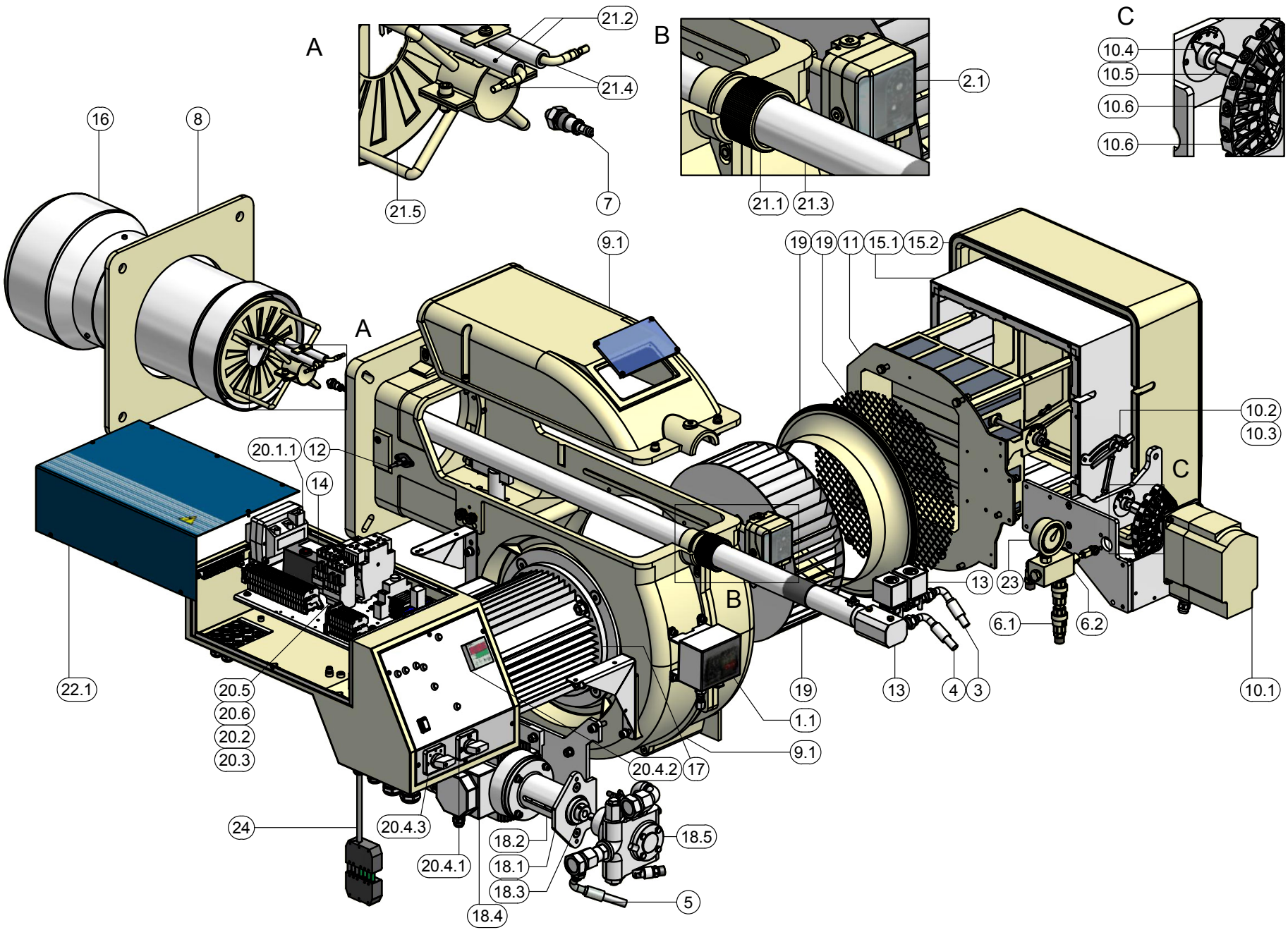
ATTENZIONE

1 - Alimentazione elettrica 230V / 400V 50Hz 3N a.c.
2 - Non invertire fase con neutro
3 - Assicurare una buona messa a terra del bruciatore

TROUBLESHOOTNG GUIDE - Light oil operation

BURNER DOESN'T LIGHT	* No electric power supply	* Wait for electric power supply is back
	* Main switch open	* Close the switch
	* Thermostats open	* Check set points and thermostat connections
	* Bad thermostat set point or broken thermostat	* Set or replace the thermostat
	* No gas pressure	* Restore gas pressure
	* Safety devices (manually operated safety thermostat or pressure switch, and so on ...) open	* Restore safety devices; wait that boiler reaches its temperature then check safety device functionality.
	* Broken fuses	* Replace fuses. Check current absorption
	* Fan thermal contacts open (only three phases)	* Reset contacts and check current absorption
	* Burner control locked out	* Reset and check its functionality
	* Burner control damaged	* Replace burner control
BURNER LOCKS OUT WITH FLAME PRESENCE	* Flame detector dirty or damaged	* Clean or replace flame detector
	* Burner control damaged	* Replace burner control
	* Smoking flame	* Reset combustion air flow rate * Check the nozzle and, if necessary, replace it * Check cleanness of combustion head * Check chimney suction * Check boiler cleanness
	* Combustion head dirty	* Clean combustion head
BURNER LOCKS OUT WITHOUT ANY FUEL FLOW RATE	* No fuel	* Fill the tank
	* Pump joint broken	* Check pump pressure
	* Pump damaged	* Check pump suction
		* Replace pump
	* Compressed air (or steam) too high	* Released compressed air (or steam) pressure
	* Oil metering valve not open far enough	* Check air pressure
		* Check servomotor position
	* Oil valve not energized	* Check wiring path or replace valve
	* Fan motor not efficient	* Adjust or replace the motor
	* Fan or pump motor runs in the wrong way	* Change rotation
	* Obstructed nozzle	* Clean or replace the nozzle
	* Check valve in the tank locked or leaking	* Clean or replace the valve
	* Oil filter dirty * Pump filter dirty	* Clean filter
	* Solenoid valve dirty or broken	* Clean or replace solenoid valve
BURNER LOCKS OUT WITH FUEL FLOW RATE (NO FLAME)	* Oil pressure too low	* Reset oil pressure
	* Nozzle dirty or damaged	* Clean or replace nozzle
	* Water in the tank	* Take off all the water from the tank
		* Clean all filters
	* Suction too high	* Check suction before pump. If necessary clean filters.
	* Ignition electrodes grounded because dirty or damaged	* Clean or replace electrodes
	* Ignition electrodes badly set	* Check electrodes position referring to instruction manual
	* Cables damaged	* Replace cables
	* Bad position of cables in the ignition transformer or into the electrodes	* Improve the installation
	* Ignition transformer damaged	* Replace the transformer
PUMP TOO NOISY	* Suction too high (over 0,35 bar) (dirty filters, check valve in the tank locked, and so on ...)	* Clean filters * Replace check valve in the tank
	* Flexible hoses damaged	* Replace flexible hoses
	* Air infiltration in the pipes	* Take off all infiltration
	* Pipe too long or too narrow	* Increase line size
BURNER RUMBLES WHEN MODULA-TING TO HIGH FIRE	* Burner is too lean	* Adjust air-oil ratio
	* Drawer assembly not set properly	* Check drawer position
	* Oil may be too hot	* Check oil temperature
	* Flame is blowing off head	* Check head position
CARBON BUILD-UP ON THE FIRESIDES OF THE BOILER	* Oil flame not retaining to head	
	* Dirty nozzle	* Clean the nozzle
	* Oil spray impinging on burner head	* Check position of the nozzle respect to the head
	* Spray angle of the nozzle too wide	* Reduce spray angle
FLAME IRREGULAR OR SPARKING	* Oil pressure at nozzle too low	* Reset oil pressure
	* Air flow rate too high	* Adjust air flow rate
	* Oil is too cold	* Adjust oil temperature
	* Dirt in the oil	* Check filters
	* Water in the fuel	* Take off all the water
	* Oil impingement on the combustion head	* Drawer assembly far too rear * Nozzle is not protruding through centerhole of air diffuser * Oil flame not retaining to the head
	* Nozzle dirty or damaged	* Clean or, if necessary, replace the nozzle
BURNER LIGHTS BUT FLAME DOESN'T RETAIN TO BURNER HEAD	* Drawer assembly not positioned correctly	* Move forward or backward
	* Nozzle too far forward through centerhole of diffuser	* Move nozzle backward respect to diffuser
	* Oil or air pressure at nozzle is too low	* Increase oil or air pressure
	* Air louver too open	* Reduce air louver opening
	* Too much spread between oil and air (or steam) pressure	* Set the spread to a proper value
FLAME IRREGULAR OR SMOKING	* Not enough combustion air	* Adjust air flow rate
	* Nozzle dirty or damaged	* Clean or, if necessary, replace the nozzle
	* Flame is too big for furnace or nozzle spray angle is wrong	* Check burner-furnace coupling * Change nozzle with a suitable one
	* Nozzle spray angle wrong (flame too long or too wide)	* Replace nozzle
	* Boiler dirty	* Clean the boiler
	* Not enough suction at chimney	* Check chimney cleanness or size
	* Pressure at nozzle too low	* Reset oil pressure
	* Oil too cold	* Reset oil temperature
	* Combustion air inlet dirty	* Clean the air inlet
	* Flame is too small respect to furnace volume	* Replace nozzle or reset pump pressure
FUEL GAS TEMPERATURE TOO HIGH	* Boiler dirty	* Clean the boiler
	* Oil flow rate too high	* Adjust oil pressure or replace nozzle

BURNER EXPLODED VIEW



1.1	PRESSURE SWITCH	15.1	SILENCER	21.3	COMBUSTION HEAD ADJUSTING PIPE
2.1	AIR PRESSURE SWITCH	15.2	SILENCER	21.4	IGNITION CABLE
3	OIL FLEXIBLE HOSE	16	EXTENDED BLAST TUBE	21.5	COMBUSTION HEAD
4	OIL FLEXIBLE HOSE	17	MOTOR	22.1	COVER
5	OIL FLEXIBLE HOSE	18.1	BRACKET	23	PRESSURE GAUGE
6.1	ONE-WAY VALVE	18.2	BRACKET	24	MODULATOR CONNECTOR
6.2	PRESSURE GOVERNOR	18.3	COUPLING		
7	NOZZLE	18.4	MOTOR		
8	GENERATOR GASKET	18.5	PUMP		
9.1	BURNER HOUSING	19	FAN WHEEL		
10.1	ACTUATOR	20.1.1	IGNITION TRANSFORMER		
10.2	CAM	20.2	BIMETAL RELAY		
10.3	AIR ADJUSTING CAM REGULATING NUT	20.3	RELAY		
10.4	INDEX	20.4.1	SWITCH		
10.5	ADJUSTING CAM SHAFT	20.4.2	OUTPUT CONTROLLER		
10.6	ADJUSTING CAM	20.4.3	SWITCH		
11	AIR DAMPER	20.5	BIMETAL RELAY		
12	PHOTORESISTOR	20.6	CONTACTOR		
13	COMPLETE GUN	21.1	RING NUT		
14	CONTROL BOX	21.2	IGNITION ELECTRODE		

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

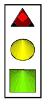
If the flame is lost during «TSA», the burner will be reignited, but not later than at the end of «TSAmax.». This means that several ignition attempts can be made during TSA (refer to «Program sequence»).

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.

♦ 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 ● 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 manny losses of fleme during operation (limitattion og the number of repetitions) ● 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.

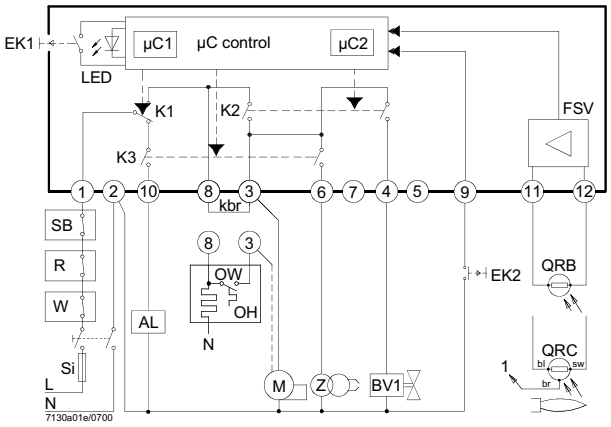
- Burner remains shut down
- Fault status signal «AL» at terminal 10 is activated

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

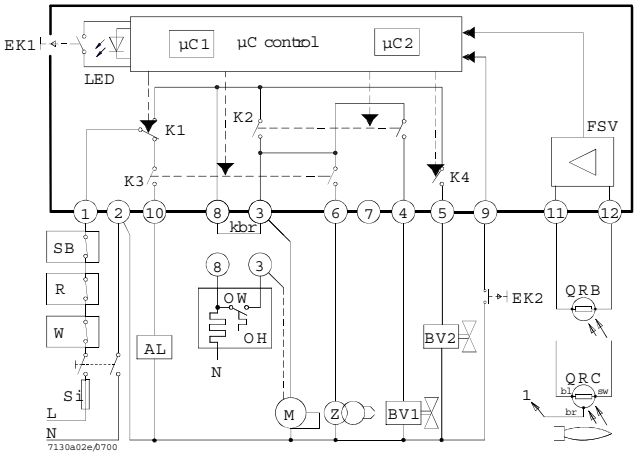
Press lock-out reset button for about 1 second (< 3 seconds).

Connection diagram and internal diagram

LMO14

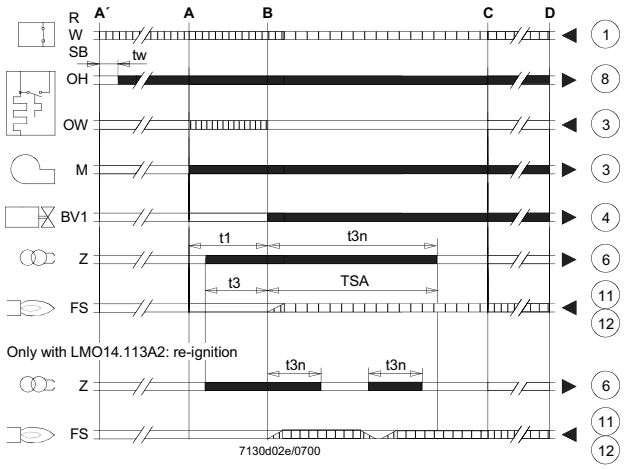


LMO24 - LMO44

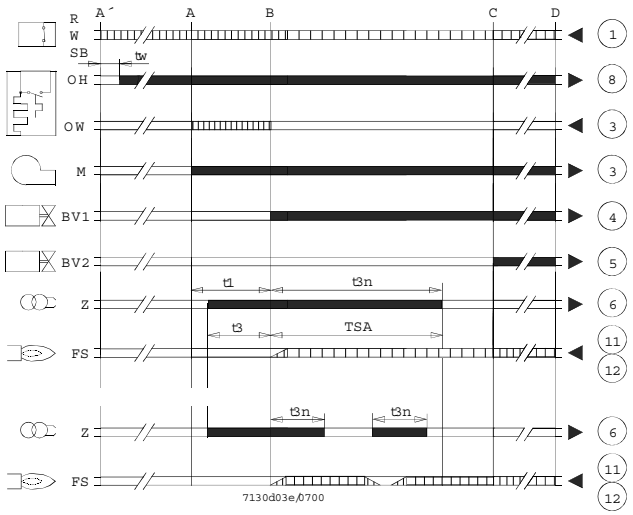


Control sequence

LMO14



LMO24 - LMO44



Key

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

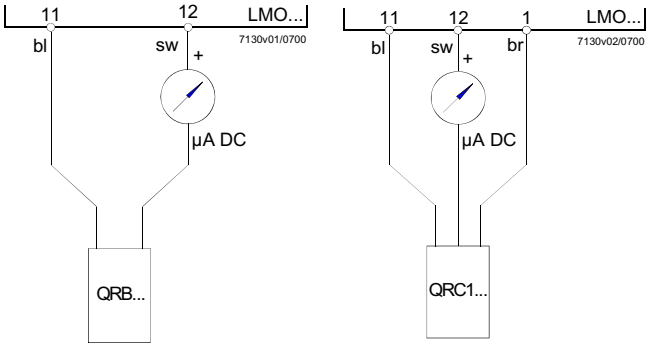
Mains voltage	AC 230 V +10 % / -15 % AC 120 V +10 % / -15 %
Mains frequency	50...60 Hz ±6 %
External primary fuse (Si)	6.3A (slow)
Power consumption	12 VA
Mounting orientation	optional
Weight	approx. 200 g
Degree of protection	IP40 (to be ensured through mounting)
Perm. cable lengths	max. 3m at line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

APPENDIX

SIEMENS LAL.. CONTROL BOX

Use

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

Housing and plug-in base

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

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

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

Operation

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

Pre-conditions for burner startup

- Burner control is not in the lockout position
- Sequence switch is in its start position (with LAL2 voltage is present at terminals 11 and 12.
- Air damper is closed; end switch «z» for the CLOSED position must feed power from terminal 11 to terminal8.
- Contact of the limit thermostat or pressure switch «W» and the contacts of any other switching devices in the control loop between terminals 4 and 5 must be closed e.g. a control contact for the oil preheater's temperature
- Normally closed contact of the air pressure switch must be closed.

Startup sequence

Start command by «R»:

«R» closes the start control loop between terminals 4 and 5

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

t1 Prepurge time with air damper fully open:

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

With LAL2:

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

t3 Short preignition time:

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

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

t3n Postignition time:

- «Z» must be connected to terminal 15

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

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

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

LAL... is now protected against reverse voltages from the load control

circuit. With the release of «LR» at terminal 20, the startup sequence of the LAL... ends. After a few idle steps (steps with no contact position changes), the sequence switch switches itself off.

B Operating position of the burner

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

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

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

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

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

D-A End of control program: start position

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

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

Lockout and indication of the stop position

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

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

Extraneous light:

Lockout during or after completion of the control program

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

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

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

■ Defect in the flame supervision circuit.

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

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

| Flame signa has been lost during operation.

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

B Operating position of the burner

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

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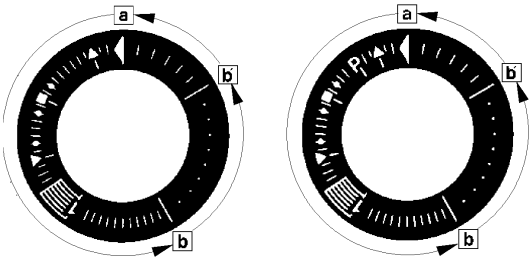
C-D Sequence switch travels to start position «A».

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

Lockout indication

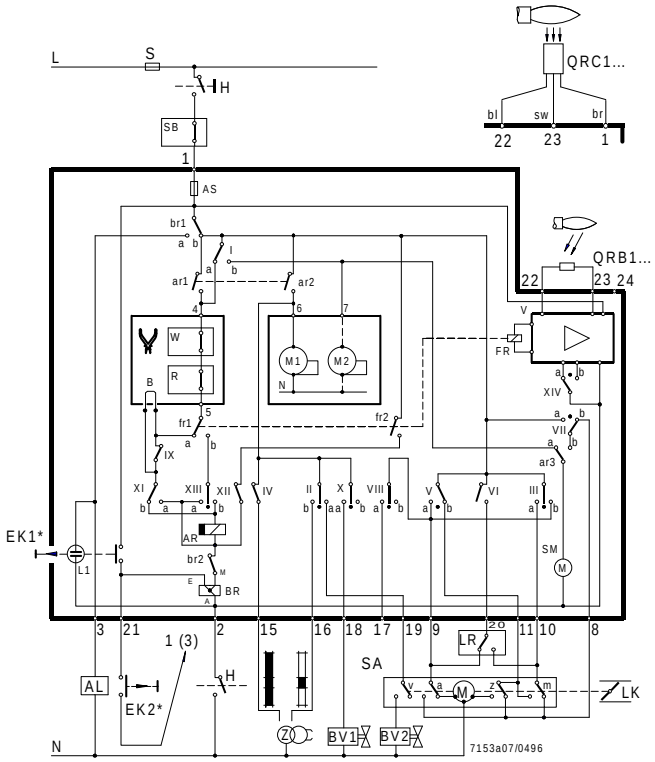


a-b Startup sequence
b-b' Idle step (with no contact confirmation)
b(b')-a Postpurge program

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

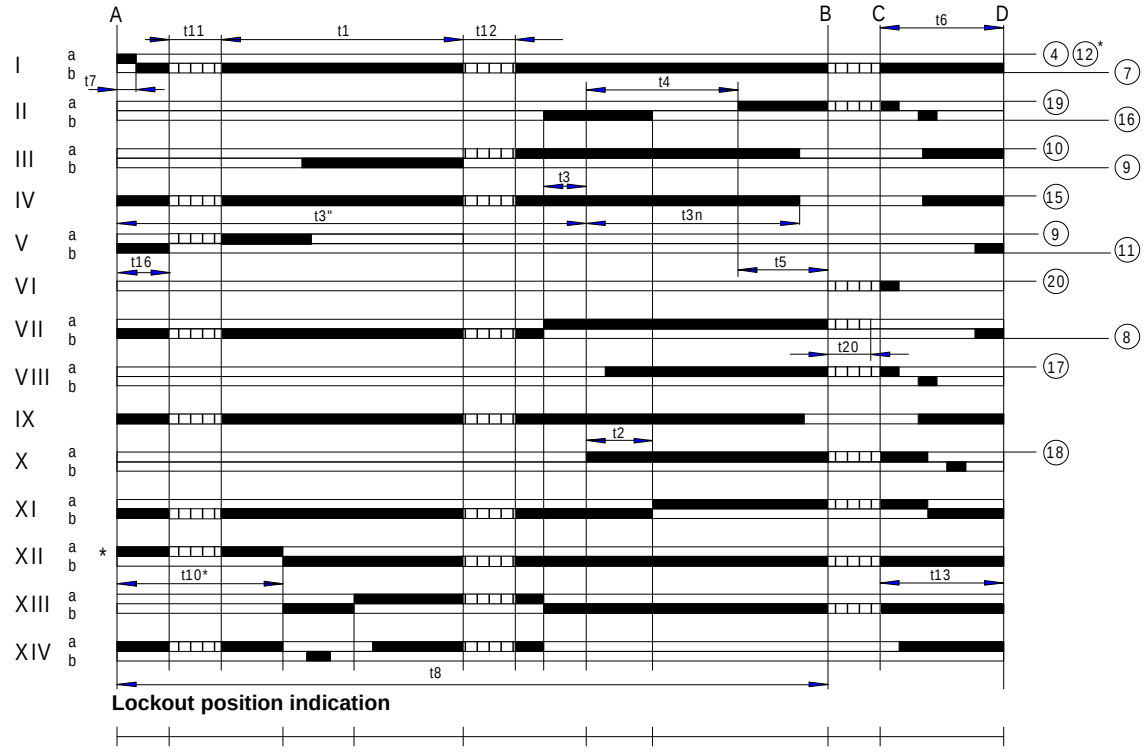
Specifications

Power supply	AC 230 V -15 / +10 %
for LAL2... on request	AC 100 V -15 %...AC 110 V +10 %
Frequency	50 Hz -6 %...60 Hz +6 %
Absorption	AC 3.5 VA
Mounting position	optional
Protection	IP 40
Perm. input current at terminal 1	AC 5 A max., 20 A peak
Perm. current rating of control terminals 3, 6, 7, 9...11, 15...20	4 A max., 20 A peak
Internal fuse	T6,3H250V according to IEC 127
External fuse	max. 10 A
Weight	Device 1000 g
	Plug-in base 165 g



Sequence diagram

Control output at terminal



Lockout position indication

Key

t1 Prepurge time with air damper fully open
t2 Safety time
t3 Preignition time, short («Z» connected to terminal 16)
T3' Preignition time, long («Z» connected to terminal 15)
t3n Postignition time («Z» connected to terminal 15)
t4 Interval between voltage at terminals 18 and 19 («BV1-BV2»)
t5 Interval between voltage at terminals 19 and 20 («BV2» load controller)

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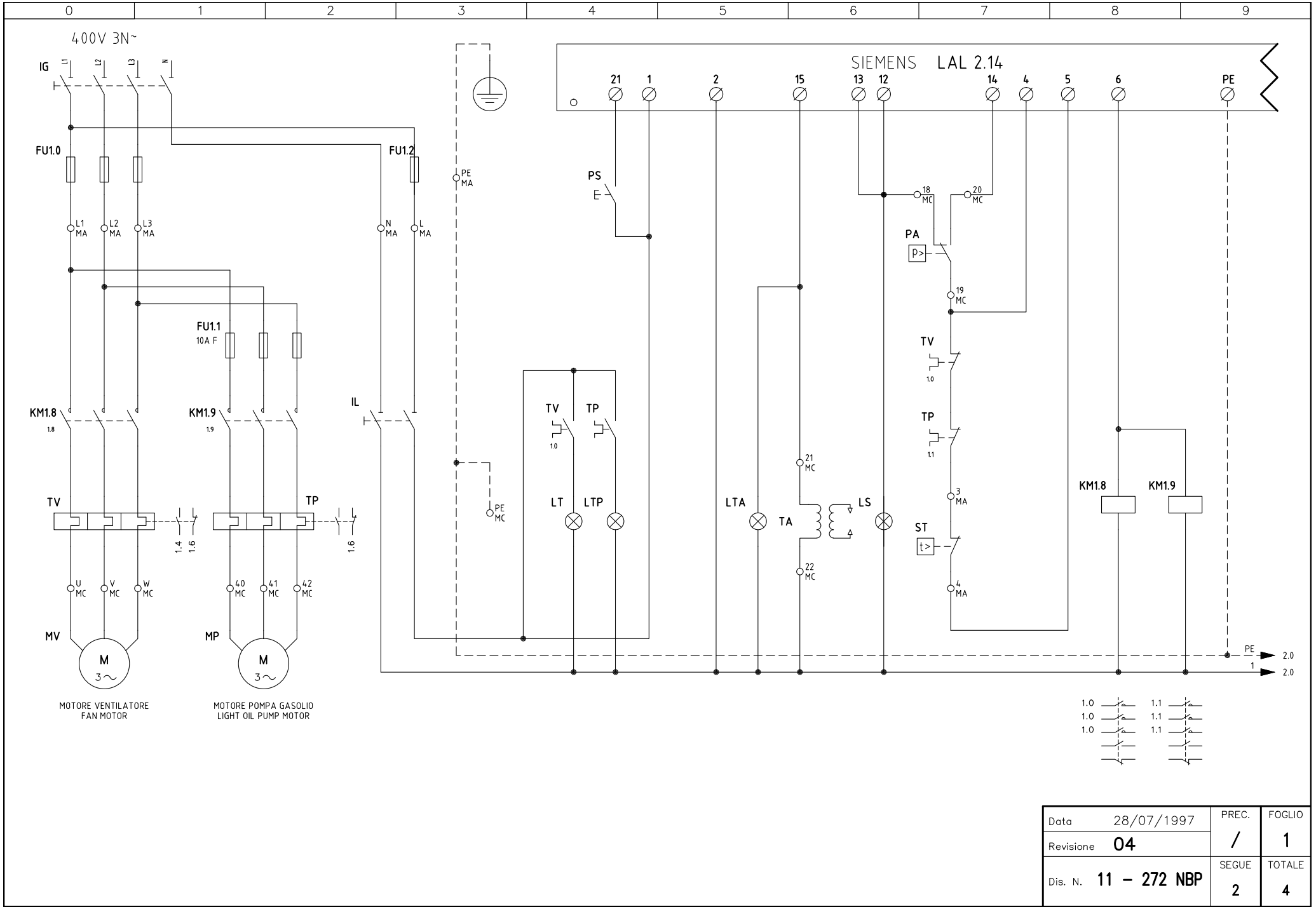
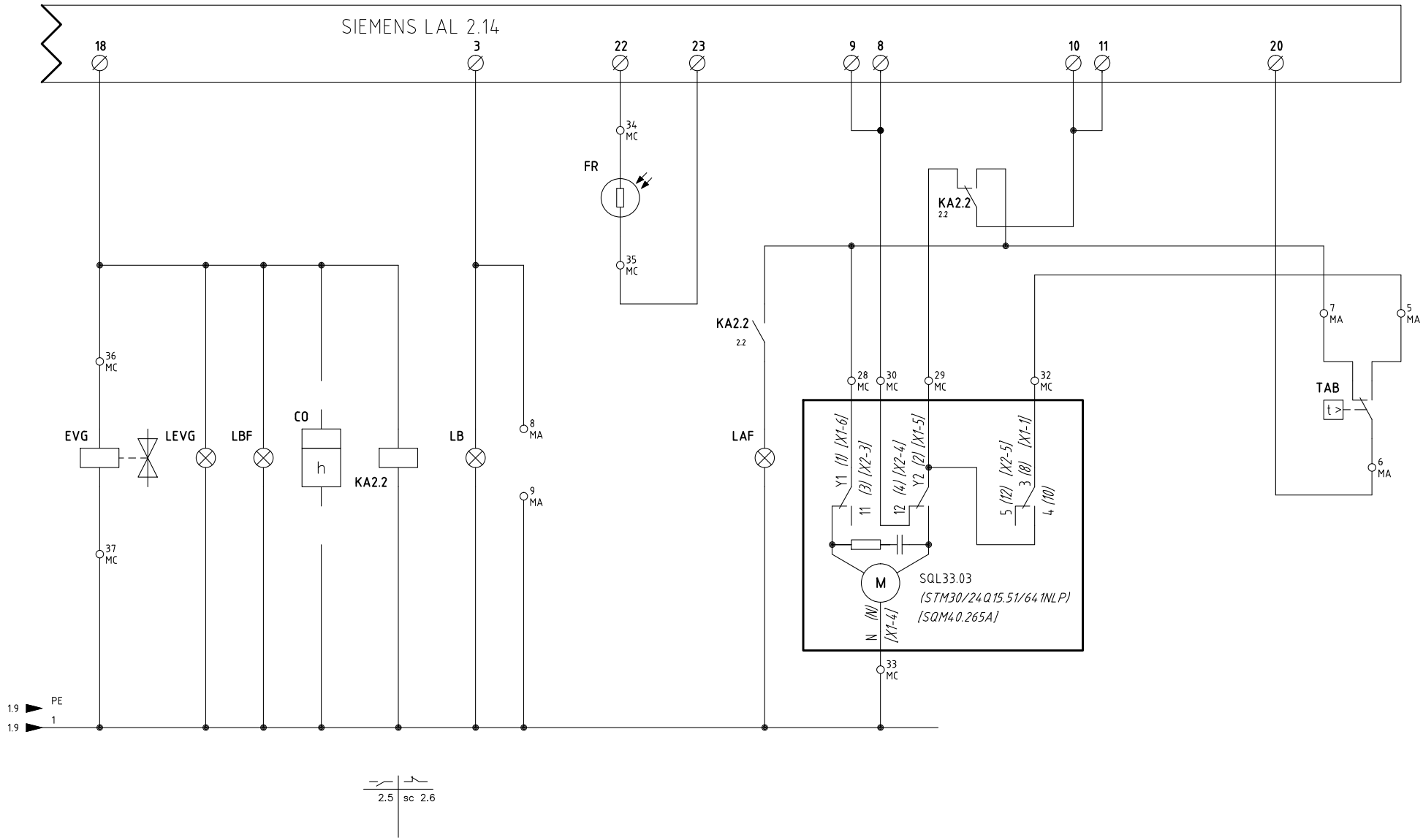
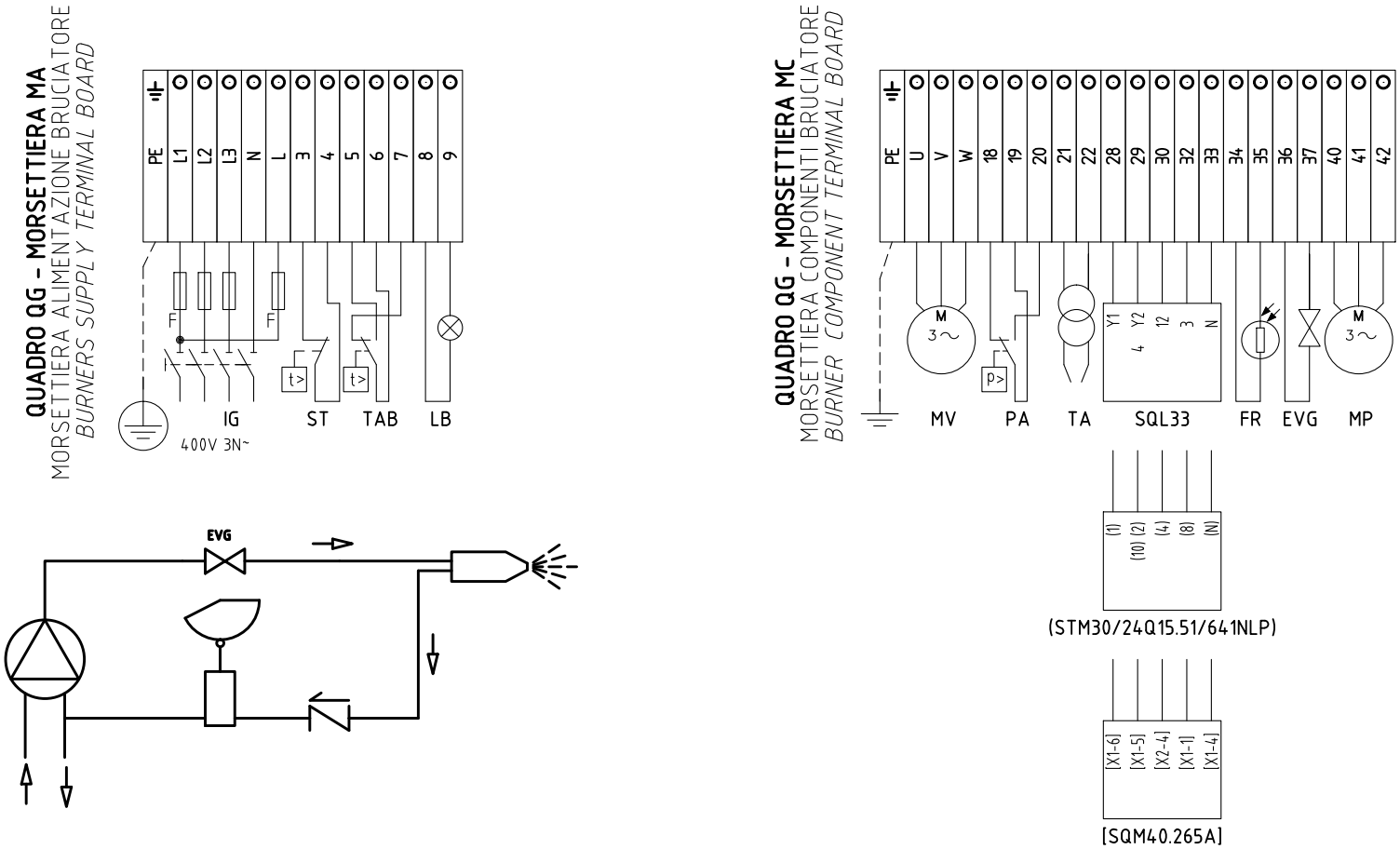


Data 28/07/1997		PREC.	FOGLIO
Revisione 04		/	1
Dis. N. 11 – 272 NBP		SEGUE	TOTALE
		2	4



Data 28/07/1997		PREC.	FOGLIO
Revisione 04		1	2
Dis. N. 11 – 272 NBP		SEGUE 3	TOTALE 4



CAMME SERVOCOMANDO SERRANDA ARIA

CAMS FOR AIR DAMPER ACTUATOR

SQL33

Y1	ALTA FIAMMA *HIGH FLAME*
Y2	SOSTA E ACCENSIONE *STAND-BY AND IGNITION*
3	BASSA FIAMMA *LOW FLAME*

CAMME SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)

CAMS FOR AIR DAMPER ACTUATOR (ALTERNATIVE)

(STM30/24Q15.51/641NLP)

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

CAMME SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)

CAMS FOR AIR DAMPER ACTUATOR (ALTERNATIVE)

[SQM40.265A]

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

Data	28/07/1997	PREC.	FOGLIO
Revisione	04	2	3
Dis. N.	11 – 272 NBP	SEGUE	TOTALE
		4	4

0	1	2	3	4	5	6	7	8	9

SIGLA/ITEM	FOGLIO/SHEET	FUNZIONE	FUNCTION
(STM30/24Q15.51/641NLP)	2	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
[SQM40.265A]	2	SERVOCOMANDO SERRANDA ARIA (ALTERNATIVO)	AIR DAMPER ACTUATOR (ALTERNATIVE)
CO	2	CONTAORE (OPTIONAL)	TIME COUNTER (OPTIONAL)
EVG	2	ELETTROVALVOLA GASOLIO	LIGHT OIL SOLENOID VALVE
FR	2	FOTORESISTENZA RILEVAZIONE FIAMMA	PHOTORESISTOR FLAME DETECTOR
FU1.0	1	FUSIBILI LINEA BRUCIATORE	BURNER LINE FUSES
FU1.1	1	FUSIBILI LINEA POMPA GASOLIO	LIGHT OIL PUMP LINE FUSES
FU1.2	1	FUSIBILE AUSILIARIO	AUXILIARY FUSE
IG	1	INTERRUTTORE GENERALE	MAINS SWITCH
IL	1	INTERRUTTORE LINEA AUSILIARI	AUXILIARY LINE SWITCH
KA2.2	2	RELE' AUSILIARIO	AUXILIARY RELAY
KM1.8	1	CONTATTORE MOTORE VENTILATORE	FAN MOTOR CONTACTOR
KM1.9	1	CONTATTORE MOTORE POMPA GASOLIO	LIGHT OIL PUMP MOTOR CONTACTOR
LAF	2	LAMPADA SEGNALAZIONE ALTA FIAMMA BRUCIATORE	BURNER IN HIGH FLAME INDICATOR LIGHT
LB	2	LAMPADA SEGNALAZIONE BLOCCO BRUCIATORE	INDICATOR LIGHT FOR BURNER LOCK-OUT
LBF	2	LAMPADA SEGNALAZIONE BASSA FIAMMA BRUCIATORE	BURNER IN LOW FLAME INDICATOR LIGHT
LEVG	2	LAMPADA SEGNALAZIONE APERTURA [EVG]	INDICATOR LIGHT FOR OPENING OF ELECTRO-VALVE [EVG]
LS	1	LAMPADA SEGNALAZIONE SOSTA BRUCIATORE	INDICATOR LIGHT FOR BURNER STAND-BY
LT	1	LAMPADA SEGNALAZIONE BLOCCO TERMICO MOTORE VENTILATORE	INDICATOR LIGHT FOR FAN OVERLOAD TRIPPED
LTA	1	LAMPADA SEGNALAZIONE TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER INDICATOR LIGHT
LTP	1	LAMPADA SEGNALAZIONE BLOCCO TERMICO POMPA	INDICATOR LIGHT FOR PUMP OVERLOAD TRIPPED
MP	1	MOTORE POMPA GASOLIO	LIGHT OIL PUMP MOTOR
MV	1	MOTORE VENTILATORE	FAN MOTOR
PA	1	PRESSOSTATO ARIA	AIR PRESSURE SWITCH
PS	1	PULSANTE SBLOCCO FIAMMA	LOCK-OUT RESET BUTTON
SIEMENS LAL 2.14	1	APPARECCHIATURA CONTROLLO FIAMMA	CONTROL BOX
SQL33.03	2	SERVOCOMANDO SERRANDA ARIA	AIR DAMPER ACTUATOR
ST	1	SERIE TERMOSTATI/PRESSOSTATI	SERIES OF THERMOSTATS OR PRESSURE SWITCHES
TA	1	TRASFORMATORE DI ACCENSIONE	IGNITION TRANSFORMER
TAB	2	TERMOSTATO/PRESSOSTATO ALTA-BASSA FIAMMA	HIGH-LOW THERMOSTAT/PRESSURE SWITCHES
TP	1	TERMICO MOTORE POMPA GASOLIO	LIGHT OIL PUMP MOTOR THERMAL
TV	1	TERMICO MOTORE VENTILATORE	FAN MOTOR THERMAL

Data 28/07/1997		PREC.	FOGLIO
Revisione 04		3	4
Dis. N. 11 – 272 NBP		SEGUE	TOTALE
		/	4