

MAIOR P 700.1 PR
MAIOR P 800.1 PR
MAIOR P 1000.1 PR
MAIOR P 1200.1 PR



Technical data



Operating instructions



Electric diagrams



Spare parts list



420010663400

MAIOR P 700.1 PR TC NS 230-400-50	
MAIOR P 700.1 PR TL NS 230-400-50	3144192
MAIOR P 800.1 PR TC	
MAIOR P 1000.1 PR TC	3144864
MAIOR P 1200.1 PR TC	

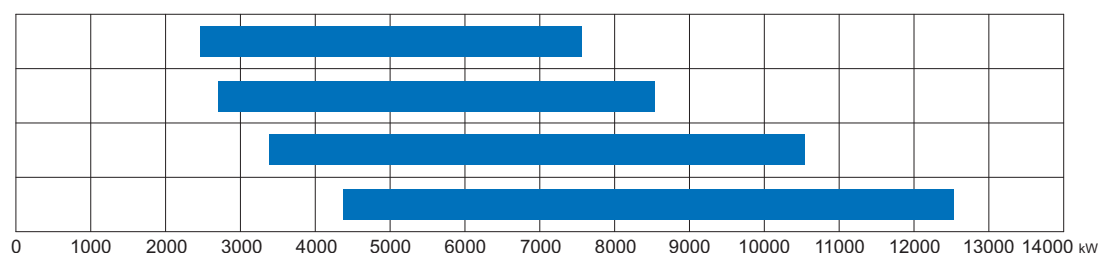
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MAIOR P 700.1

MAIOR P 800.1

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GENERAL WARNINGS - CONFORMITY DECLARATION

MAIOR burners are designed for the combustion of light oil. The design and function of the burners meet the standard EN267. They are suitable for use with all heat generators complying with standard within their respective performance range. Any other type of application requires the approval of ECOFLAM.

Installation, start-up and maintenance must only be carried out by authorised specialists and all applicable guidelines and regulations must be complied with.

BURNER DESCRIPTION

MAIOR burners are progressive mechanical fully automatic monoblock devices. Emissions values may differ, depending on combustion chamber dimensions, combustion chamber load and the firing system (three-pass boilers, boilers with reverse firing).

PACKAGING

The burner, and all the additional components are supplied in a modular system of packages according to the configuration ordered that based on the country of installation shall follow the applicable standards and the local rules and code of practise. The following standards should be observed in order to ensure safe, environmentally sound and energy-efficient operation:

EN 267

Automatic forced draught burners for liquid fuels.

EN 60335-1, -2-102

Specification for safety of household and similar electrical appliances, particular requirements for gas burning appliances

INSTALLATION LOCATION

The burner must not be operated in rooms containing aggressive vapours (e.g. spray, perchloroethylene, hydrocarbon tetrachloride, solvent, etc.) or tending to heavy dust formation or high air humidity. Adequate ventilation must be provided at the place of installation of the furnace system to ensure a reliable supply with combustion air.

Declaration of conformity for light oil burners

We ,
Ecoflam Bruciatori S.p.A.

declare under our sole responsibility that the light oil burners named

MAIOR

conform to the following standards:

EN 267	EN 50156-1
EN 55014-1	EN 55014-2
EN 60335-1	EN 60335-2-102
EN 61000-6-2	EN 61000-6-3

These products bear the CE mark in accordance with the stipulations of the following directives:

2014/35/UE Low Voltage Directive
2014/30/UE EMC Directive
2006/42/EC Machine directive
2011/65/EU RoHS2 directive

April 2016 / Mr. Ruben Cattaneo
R&D manager




BURNER SELECTION: Type of operation and configuration must be done by professional personnel in order to grant correct working of the burner. Installation, start-up and maintenance must be carried out by authorised specialists and all applicable guidelines and regulations (including local safety regulations and codes of practise) must be observed.

We accept no responsibility for damage arising from:

- inappropriate use;
- incorrect installation and/or repair on the part of the buyer or any third party, including the fitting of non-original parts;
- non authorised modifications made on the burner.

Final delivery and instructions for use

The firing system installer must supply the operator of the system with operating and maintenance instructions on or before final delivery. These instructions should be displayed in a prominent location at the point of installation of the heat generator. They should include the address and telephone number of the nearest customer service centre.

Notes for the operator

The system should be inspected by a specialist at least once a year. Depending on the type of installation, shorter maintenance intervals may be necessary. It is advisable to take out a maintenance contract to guarantee regular servicing.

Ecoflam burners have been designed and built in compliance with all current regulations and directives.

All burners comply to the safety and energy saving operation regulations within the standard of their respective performance range. The quality is guaranteed by a quality and management system certified in accordance with ISO 9001:2008.



BURNER DESIGNATION

MAIOR P 300.1 PR TC 230-400-50

RANGE NAME BY FUEL TYPE

MAIOR Light oil

MODEL SIZE (Gas: kW; Oil: kg/h)

MAIOR P 300.1 253 kg/h - 3000 kW

EMISSIONS

- Standard Class 1 - OIL EN267 (<250 mg/kWh)

OPERATION TYPE

PR 2 stages progressive mechanical gas / oil

MD 2 stages modulating mechanical with PID

E 2 stages modulating electronic

HEAD TYPE

TC Short head

TL Long head

FUEL

Light oil

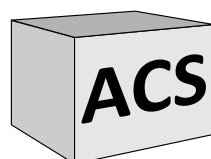
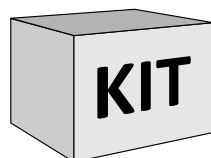
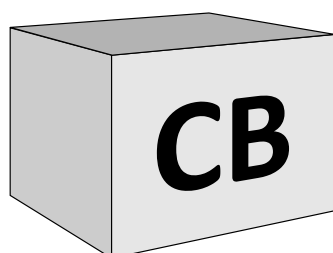
BIODIESEL Biodiesel

KEROSENE Kerosene

ELECTRICAL POWER SUPPLY

230-400V/50Hz 230-400 Volt, 50 Hz

MODULAR DELIVERY SYSTEM



Light oil burners

All light oil burners are delivered complete in one single packaging including filter and flexible hoses up to 6 MW.

Additional accessories and options shall be installed by the installer in accordance to the instruction and local safety regulations and codes of practise.

KITS - Accessories

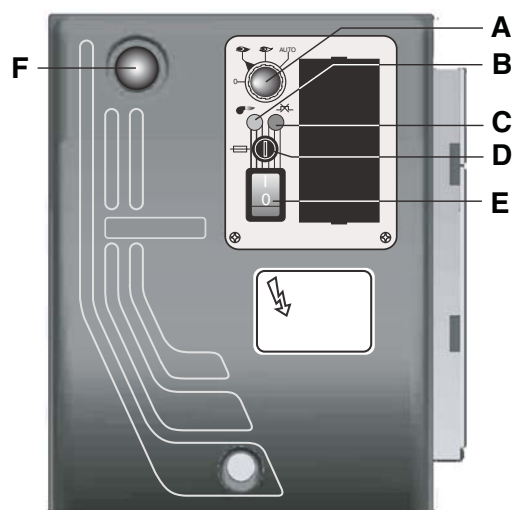
Kits and accessories are managed and delivered separately.

Component type

CB	Complete burner
KIT	Kits
ACS	Accessories

BURNER DESCRIPTION

Control panel

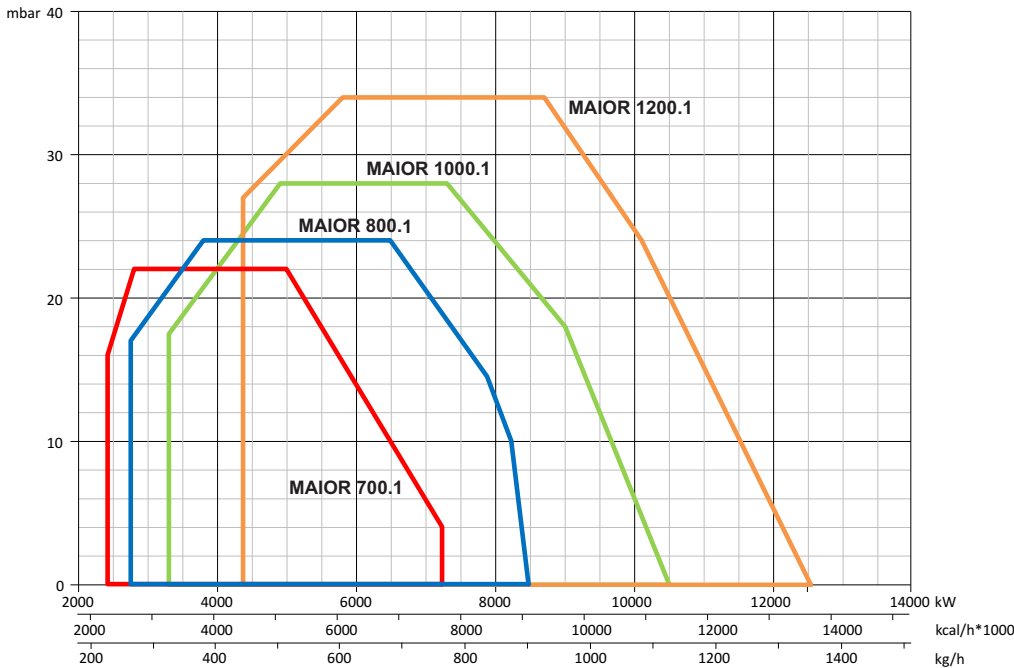


- A - selector :
 - 0 = operating elements locked in an intermediate position
 - 1 = operation on maximum capacity
 - 2 = operation on minimum capacity
 - 3 = automatic operation
- B - working lamp
- C - thermal lock-out lamp
- D - fuse
- E - main switch I / O
- F - reset key

TECHNICAL DATA

MODEL		MAIOR P 700.1	MAIOR P 800.1	MAIOR P 1000.1	MAIOR P 1200.1
Thermal power max.	kW	7.500	8.500	10.500	12.500
	kcal/h	6.465.000	7.328.000	9.052.000	10.776.000
	kg/h	634	718	887	1.053
Thermal power min.	kW	2.417	2.750	3.300	4.367
	kcal/h	2.096.000	2.385.000	2.862.000	3.788.000
	kg/h	205	234	281	371
Operation mode	Type	Progressive mechanical oil - Modulating with PID			
Regulation ratio nominal	Type	1÷3 OIL			
Fuel	Type	Light oil (L.C.V. 10.200 kcal/kg max. visc 1,5°E at 20°C) - EL) Hu = 11,86 kWh/kg			
Emission class	std	Standard Class 1 OIL EN267 (<250 mg/kWh)			
Control unit	Type	LAL			
Air regulation	Type	Air flap	Air flap	Air flap	Air flap
Air flap control with servomotor	Model	SQM50			
Air pressure switch	mbar	N/A	2,5...50 mbar		
Flame monitoring	Type	photoresistor			
Ignitier	Model	BRAHMA			
Motor	kW	15	18,5	22	37
Rpm	N°	2.800	2.800	2.800	2.800
Voltage	V/Hz	230/400 V - 50 Hz			
Total power consumption operation	W	16.500	20.000	28.000	41.000
Weight body BBCH	Kg				
Electrical panel protection level	IP	IP40	IP40	IP40	IP40
Sound pressure level without silencer	dB(A) Lab tests	94,1	94,6	95,6	96,3
Sound pressure level with silencer		86,9	87,8	88,1	88,9
Ambient temperature storage	Min/Ma x	-20°...+70° C			
Ambient temperature use		-10°...+60° C			
Oil pump	Model	TA5	TA5	T5+TV	T5+TV
Oil pump motor	kW	directly coupled	1,5 kW	5,5 kW	5,5 kW
Nozzles	Type	according to the output requested			

WORKING DIAGRAMS



Calculation of burner output

Q_F = Burner output (kW)

Q_N = Rated boiler output (kW)

η = Boiler efficiency (%)

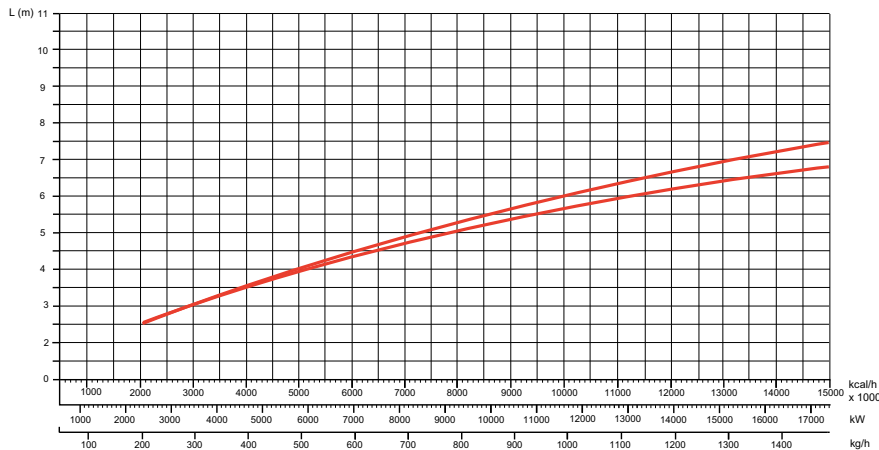
$$Q_F = \frac{Q_N}{\eta} \times 100$$

Working diagrams

The working diagram shows burner output as a function of combustion chamber pressure. It corresponds to the maximum values specified by EN 276 measured at the test fire tube. Boiler efficiency should be taken into consideration when selecting the burner.

TEST BOILER - FLAME DIMENSIONS

FLAME LENGTH LIGHT OIL BURNERS



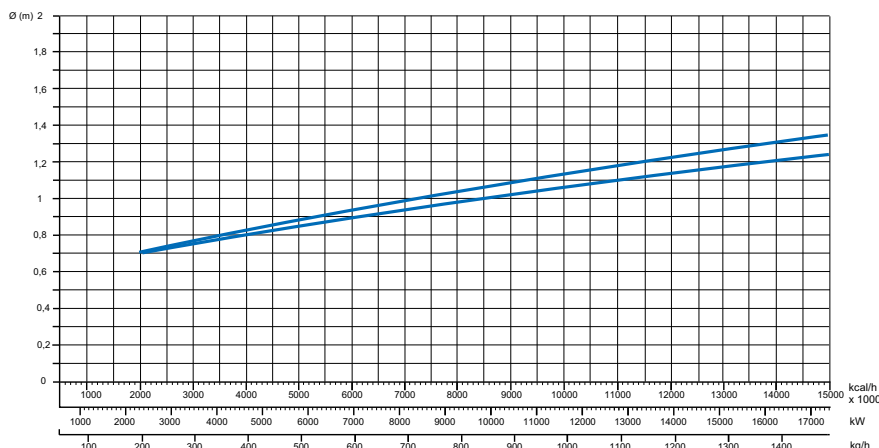
The burner/boiler matching does not pose any problem if the boiler is CE type-approved.

If the burner must be combined with a boiler that has not been CE type-approved and/or its combustion chamber dimensions are clearly smaller than those indicated in diagram, consult the manufacturer.

The firing rates were set in relation to special test boilers, according to EN 267 regulations.

The sizes are indicative and depend on the configuration, to the combustion chamber pressure and to the draught. The values have been taken out from tests executed with flame tubes.

FLAME DIAMETER LIGHT OIL BURNERS



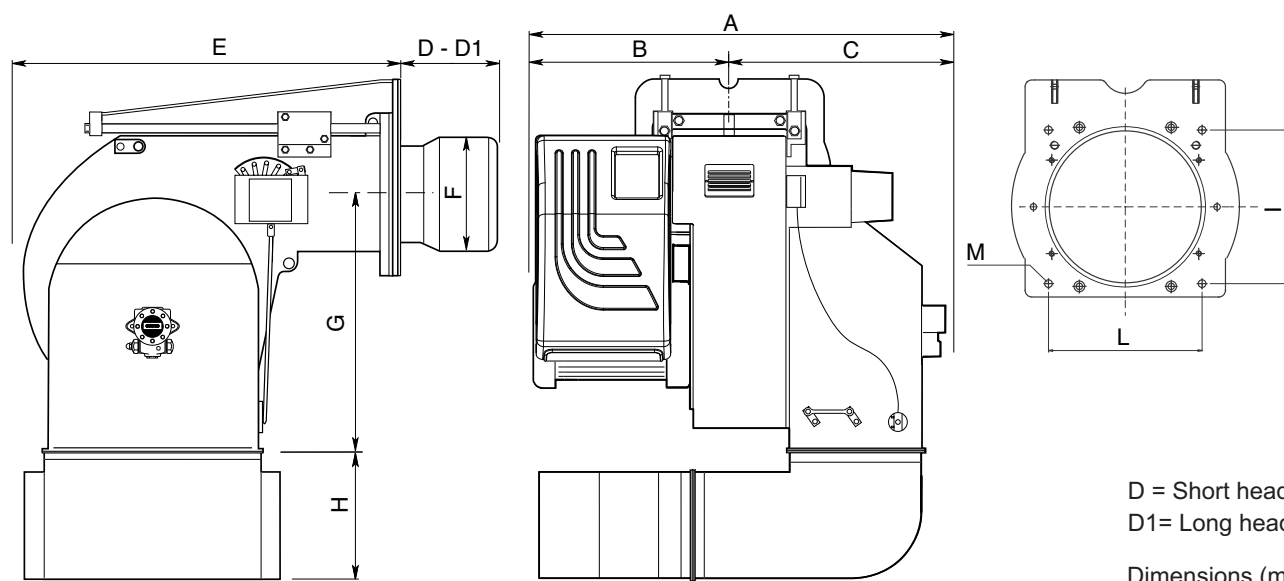
The dimensions of the flame are made in test boiler in laboratory without resistance therefore exists max and min length that take into account the difference in length that comes from the boiler backpressure.

Example:

Burner thermal output = 8000 kW;
L flame (m) = 5 m (medium value)
D flame (m) = 1 m (medium value)

WARNING: Some flame modifications can be done in our FLEXSHOP in the factory in order to shape the flame and adapt it to some special boiler or application.

OVERALL DIMENSIONS

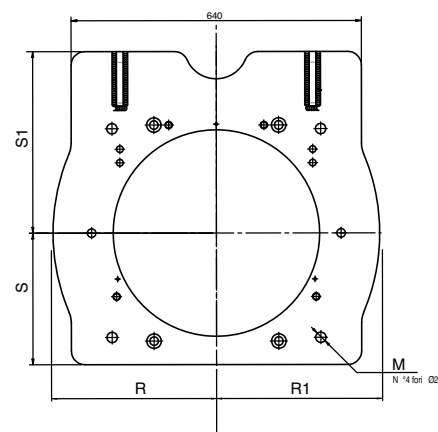


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Burner-boiler mounting flange

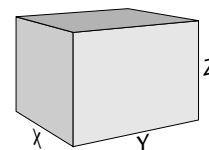
Fixing hole dimensions are "I" and "L" as per dimension table.
Boiler hole shall be done according to the blast tube dimension "F" plus 15-25 mm in order to be able to extract it during maintenance.

WARNING: Please follow the suggested dimension for the hole on the boiler flange in order to fit the burner. Make sure that between the boiler and the blast tube proper insulation is fitted.



Packaging (only burner)

Model	X	Y	Z	kg
MAIOR P 700.1	1750	2380	1460	
MAIOR P 800.1	1750	2380	1460	
MAIOR P 1000.1	1750	2380	1460	
MAIOR P 1200.1	1750	2380	1460	



OIL OPERATING MODE - GENERAL SAFETY FUNCTIONS

START-UP MODE

As soon as the furnace system is required to supply heat the burner control circuit will close and the program be started. After the program has run down the burner will start. The air damper is closed when the burner is out of operation.

The automatic furnace controller controls and monitors the starting function.

The electric actuator opens the closed air damper to its full-load position so that the burner will sweep the furnace compartment and exhaust ports at the required air flow rates. At the end of the specified pre-ventilation time the air damper will be moved into its partial load position. This operation will be followed by the pre-ignition procedure and the oil feed start.

The solenoid valves will open and thus allow the pressurized oil to flow to the nozzle and to the return line.

The oil will be atomized, mixed with the combustion air and ignited.

A safety period is provided to allow the flame to develop a proper and steady pattern.

On the termination of the safety period, a flame signal must have been received by the automatic furnace controller via the flame monitor and remain on until the regular shut-off.

The startup program of the burner has now been completed.

OIL OPERATING MODE

After the flame has developed the load regulator will be enabled which brings the burner into its operating position.

The load regulator will now control the burner automatically between its partial-load and full-load stages.

Depending on the heat demand, the electric actuator of the mechanical compound control system will be fed with the OPEN or CLOSE signal via the regulator and thus increase or decrease the oil and air flow rates.

This compound control system will vary the positions of the oil control valve and air damper and thus regulate the oil flow rate in conjunction with the air flow rate. The burner can either be controlled in two-stage sliding mode or, if a respective controller is provided, in stepless control mode.

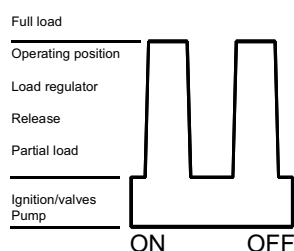
The stepless control will allow the burner to be operated at any desired stage between its partial-load and full-load positions. The burner will be turned off from its partial-load position. The air

damper will be closed when the burner is out of operation and will thus prevent cold air flowing through the burner chamber, heat exchanger and chimney.

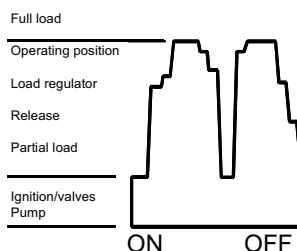
The interior cooling losses will be greatly minimized.

Oil control:

2-stage sliding



Stepless



GENERAL SAFETY FUNCTIONS

In case a flame does not develop when starting the burner (fuel release) the burner will shut off at the end of the safety period (safety lock-out).

A safety lock-out will also occur in the case of flame failure during operation, air flow failure during the pre-ventilation phase and pressure failure during the whole period of burner operation.

Any failure of the flame signal at the end of the safety period and a flame signal during

the pre-ventilation phase (external light control) will result in a safety lock-out with the control box being locked.

The trouble is indicated by the trouble signal lamp lighting up.

The control box can be unlocked immediately after a safety lock-out by pressing the unlocking key. The program unit will return to its starting position and proceed with the restart of the burner.

A voltage failure will result in a regular shut-off of the burner. Upon voltage

recovery there may be an automatic restart unless another interlock is provided, e.g. by the safety system. In any case of trouble the fuel oil supply will be shut off right away. The program unit will stop at the same time causing also the trouble location indicator to stop. The symbols will indicate the kind of trouble.

INSTALLATION

Fitting the burner to the boiler



WARNING: handling and moving operations must be carried out by specialised personnel. Use the eyebolts to lift the burner in order that it will not overturn and fall down.

To perform the installation of the burner into the boiler drill the boiler plate according to the dimension given on this manual and place the burner towards it by lifting and moving the burner by means of eyebolts.

Place the gasket on the burner flange and install the burner into the boiler by fixing nuts into the bolts.

The space between the blast tube and the boiler lining must be sealed with appropriate insulating material.

Burner blast tube insertion depth and brickwork

Unless otherwise specified by the boiler manufacturer, heat generators without a cooled front wall require brickwork or insulation 5 as shown in the illustration. The brickwork must not protrude beyond the leading edge of the blast tube, and should have a minimum conical angle of 60°. Gap 6 must be filled with an elastic, non-combustible insulating material. For boilers with reverse firing, the minimum burner tube insertion depth A as specified in the boiler manufacturer's instructions must be observed.

On boilers the blast tube insertion depth should be observed as per the boiler manufacturer's instructions.

Reverse flame boiler :

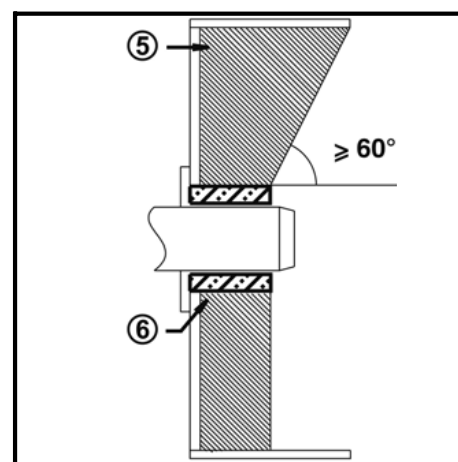
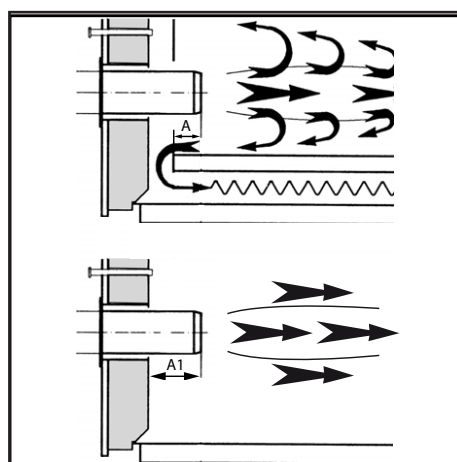
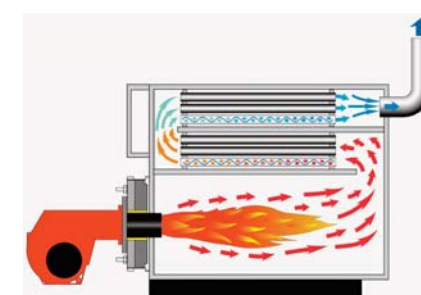
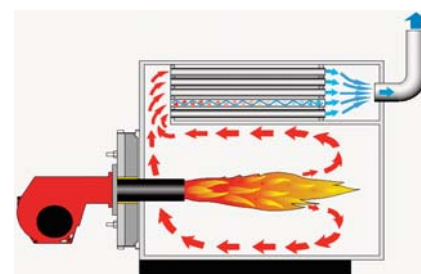
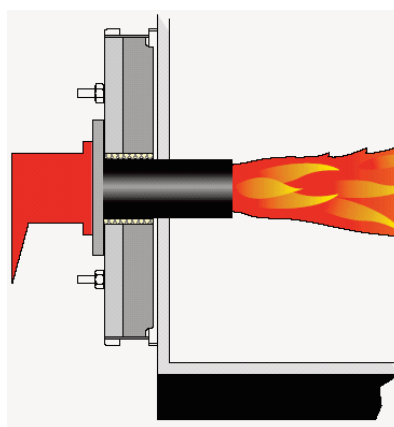
A = 50-100 mm.

Three pass boilers :

A1 = 50-100 mm.

Exhaust system

To avoid unfavourable noise emissions, right-angled connectors should not be used on the flue gas side of the boiler.

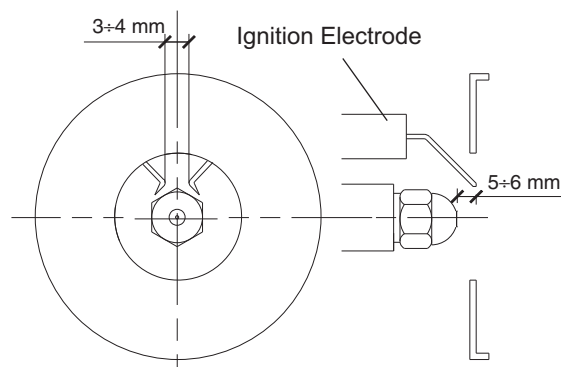


BURNER LINING

Check before burner installation:

1. Depending on the type of boiler (reverse flame or three pass) check the burner blast tube installation depth according to the data specified by the boiler manufacturer or consult the burner producer.
2. From the factory the nozzle for progressive version must be specified from the customer according to boiler output and combustion chamber geometry, otherwise we will select the nozzle for the 80% capacity of the burner.
3. Check the ignition electrodes and the nozzle on the burner head as per factory setting (see figures). The setting of the mixing and ignition unit according to the boiler output will be performed during commissioning procedure.
4. Check that the head is preset at 50%.

Position of the electrodes - nozzle installation



INSTALLATION

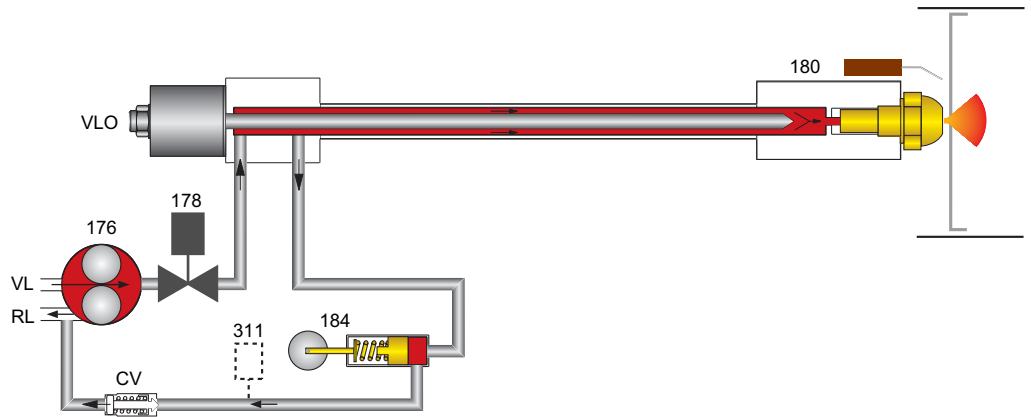
Oil connection



WARNING: make sure that the feeding line is properly dimensioned and is in compliance with the local safety rules and code of practise in the country of installation

HYDRAULIC CIRCUIT LIGHT OIL FEEDING

- 176: oil pump
- 178: solenoid valve
- 180: nozzle rod
- 184: output control valve
- 311: return oil pressure switch
- CV: check valve
- RL: return line
- VL: suction line
- VLO: working oil valve



OIL PRESSURE CONTROL (FEED)

The feed pressure is controlled by means of the pressure regulator installed in the pump and should be set at 25 bar. The pressure regulator is operated by turning its screw. Make sure to fill the pump with oil prior to taking into operation.

PUMP BLEEDING

Open the feed and return stop valves and ensure the ring line (if any) is in operation. Reduce the oil pressure at the pressure regulating valve. Turn on the pump by pressing the contactor. Check the pump for proper direction of rotation. Check for proper oil delivery and absence of leaks in the hydraulic oil system. For bleeding the pump open the pressure gauge connection, for example. When taking the burner into operation pro

ceed by gradually increasing the pressure to operating level (25 bar).

CHECKING THE PRESSURE (OIL SUCTION PRESSURE)

The maximum permissible vacuum is 0,4 bar. At higher vacuum levels the fuel oil will tend to separate air from oil which may lead to operating trouble. In the ring line mode of operation the recommended oil pressure is 2 bar.

OIL CONNECTION

Hoses are used for connection to the oil lines and stop valves. The hoses must be installed according to the applicable standards (relieved of tensile load, free of distortion) to avoid kinking and exclude the danger of breakage. Take care when mounting the oil lines to bring their ends as

close to the burners as possible and to arrange them in a way that the boiler door and the burner can be swing out without any obstruction. Refer to the technical documentation for the line dimensions for the feed and return lines from the stop valves to the tank.

OIL FILTER

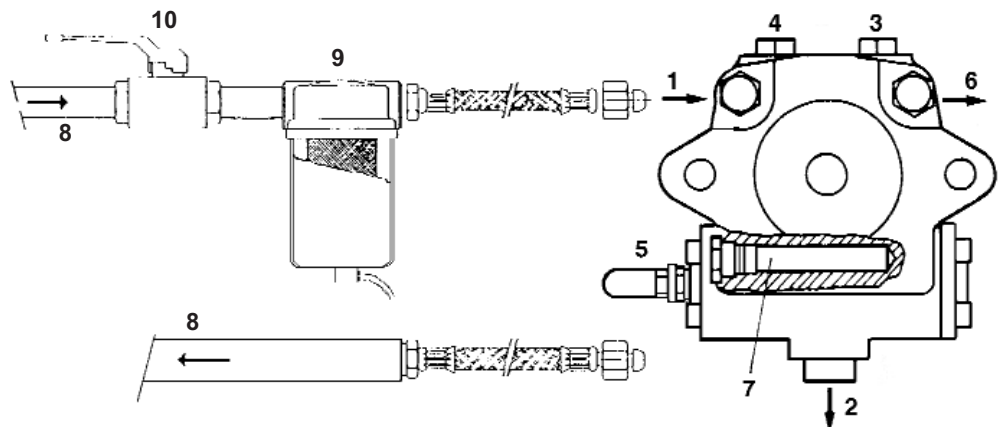
A filter must be installed upstream of the pump to protect the oil pressure pump and the hydraulic system.

INSTALLATION OPTIONS

- Two-line installation (separate feed and return lines without delivery pump).
- Ring line system (with delivery pump and gas-air separator).

LEGENDA

- 1. Inlet
- 2. Return
- 3. Bleed and pressure gauge port
- 4. Vacuum gauge port
- 5. Pressure adjustment
- 6. Nozzle outlet
- 7. Heater
- 8. Hose
- 9. Oil filter
- 10. Oil ball valve



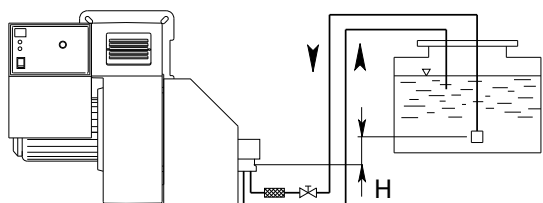
WARNING: Check that the pump rotation is correct and before start up it has been pre-filled

INSTALLATION

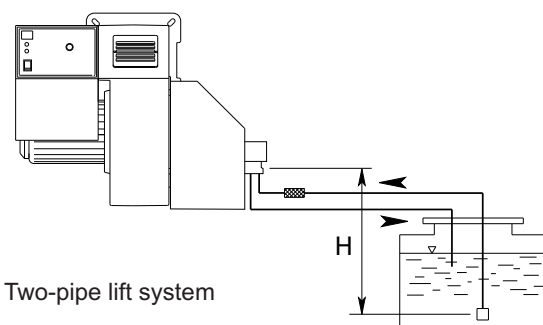
Feeding and suction line for light oil

SUCTION LINE LENGTHS FOR PIPE SYSTEMS

- Two-pipe siphon feed system



- Two-pipe lift system



The burner is equipped with a self-priming pump which is capable of feeding itself within the limits listed in the table at the side.

H (m)	PIPE LENGTH (m)			
	TA5		T5	
	ø 20 mm	ø 30 mm	ø 20 mm	ø 30 mm
3	35	150	--	35
2,5	30	150	--	32
2	25	150	--	28
1,5	22	150	--	23
1	20	150	--	18
0,5	17	150	--	14
0	15	150	--	10
-0,5	10	150	--	5
-1	4	150	--	--
-1,5	--	140	--	--
-2	--	120	--	--
-2,5	--	80	--	--
-3	--	60	--	--
-3,5	--	33	--	--
-4	--	8	--	--

WARNING: To calculate the length of the pipework all the straight parts, curves, up and down pipes must be taken into consideration. The static suction height is the distance between the standing valve and the axis of the burner pump.

Negative pressure must not exceed 0,45 bar; if negative pressure is greater pump operation may become faulty, leading to an increase in mechanical noise and perhaps even breakage.

All oil ring installations must comply with the local safety rules existing in the country of installation

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 that deliver the pressurized oil to the nozzle and part of the oil not used goes back to the pump. With this single pipe the by-pass plug must be removed and the return port must be sealed with steel plug and washer.

Double-pipe system: this is the default solution from the factory. The return pipe send the excess oil from the pump to the tank. Depending on the type of pump used to change from a 1-pipe system to a 2-pipe-system, insert the by-pass plug (as for ccw-rotation referring to the pump shaft).

Note for commissioning: during commissioning, the filter, pipelines and pumps must be pre-filled with fuel oil and vented.

The direction of rotation of the motor should be checked. When commissioning it must be ensured that pump never run dry.

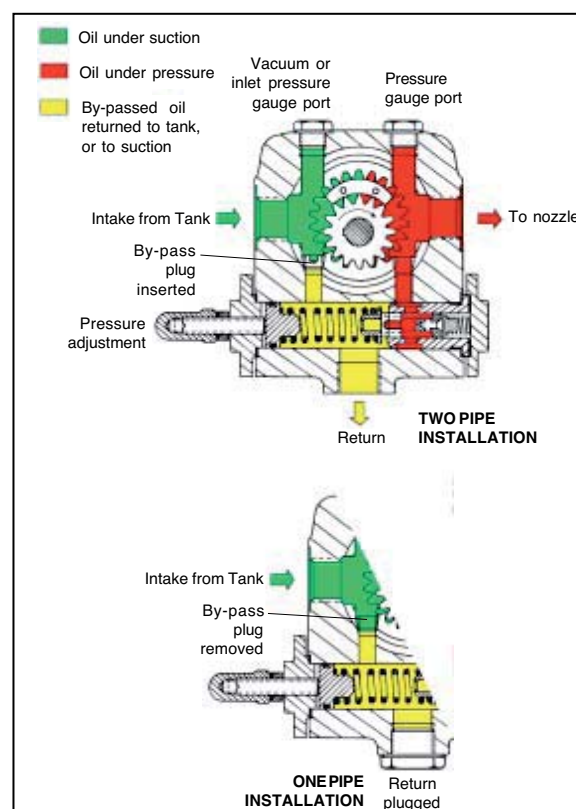
NOZZLE SELECTION

Please refer to diagram to select Ecoflam recommended nozzle for the output that is required given the output necessary in the installation.

Regular maintenance is highly recommended. Nozzle has to be cleaned in petrol or paraffin and if filter or other parts are defective or damaged the nozzle must be replaced.

NOZZLE CHART IS AVAILABLE ON APPENDIX PAGE

SUNTEC TA



Electrical connections



APPLICABLE STANDARD

The electrical connection of the burner and instruments shall be entrusted to authorized specialists only.

Make sure after the completion of the electrical connection work to check the wiring of the electrical system of the burner. This should include a check of the direction of rotation of the burner motor (fan).

GENERAL WARNINGS:

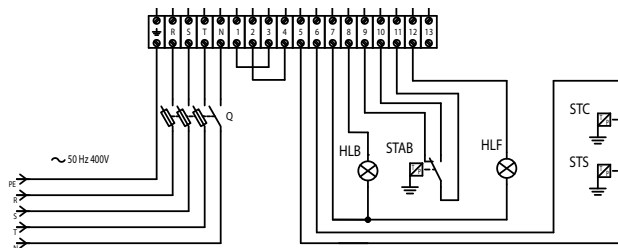
An omnipolar switch in accordance with current safety regulations is required for the mains supply connection.

ELECTRICAL CONNECTION

1) of the burner

- Built-in electrical cabinet

Use cable gland in order to secure the required level of protection. All the links, power and control, are connected to the terminal block of the cabinet.



Provide cables in sufficient length to secure the rotation of the burner body according to the assembly. Check and adjust the size of the contactors and thermal relays and the wires section according to the motor and supply voltage specs.

ATTENTION: Wiring is not supplied.

The burners are produced with connections suitable for power supply 380-400 V three-phase.

The burners with electric motors of an output lower or equal to 3 kW can be adapted to 220-230 V (please follow the instructions on the backside); motors with higher output can only work 380-400 V three-phase.

In case of request of burners different from the above mentioned standard, it is recommended to make specific mention in the order.

Instructions: how to adapt electric motors of an output lower or equal to 3 kW to 220-230 V power supply

It is possible to change the voltage of the burner by operating as follows:

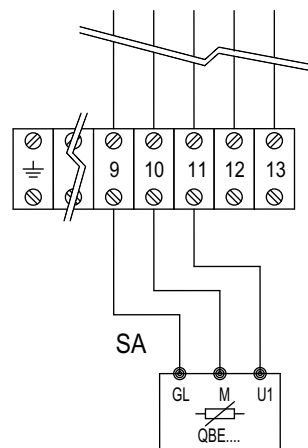
1. change the connection inside the electric box of the motor, from star to delta (see picture 1);
2. change the setting of the thermal relay, referring to the absorption values indicated in the motor nameplate. If necessary, replace the thermal relay with another one of suitable scale.

This operation is not possible on motors above 3 kW.

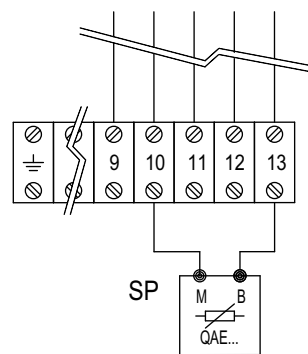
For more information, please contact the Ecoflam staff.

PROBES CONNECTION

ACTIVE PROBE CONNECTION (FOR MODULATING VERSION)



PASSIVE PROBE CONNECTION (FOR MODULATING VERSION)



LEGENDA

HLB: lock-out lamp
STAB: two stages thermostat
HLF: burner on flame lamp
STC: boiler thermostat
STS: safety thermostat
SA: active probe
SP: passive probe

START-UP: CHECKING PROCEDURE

CHECKS BEFORE COMMISSIONING:

- That the burner is assembled in accordance with the instructions given here.
- Setting the combustion components.
- All electrical connections must be correct.
- Check the burner motor for correct direction of rotation.
- The heat generator must be ready for operation, and the operating regulations for the heat generator must be observed.
- The heat generator and heating system must be filled with water and the circulating pumps must be in operation.
- The temperature regulator, pressure regulator, low water detectors and any other safety or limiting devices that might be fitted must be connected and operational.
- The exhaust gas duct must be unobstructed and the secondary air system, if available, must be operational.
- An adequate supply of fresh air must be guaranteed.
- Check tank, lines and oil pump are filled with oil and correct oil nozzle is fitted.
- With burner in starting position check that air damper is in "CLOSED" position.
- Check that control box is unlocked and in its original position.
- A standard-compliant measuring point must be available, the exhaust gas duct up to the measuring point must be free of leaks to prevent anomalies in the measurement results.

OIL START-UP

Open all shut-off valves of oil supply system.

- Set fuel selector switch to its "Oil" position.
- Fill pump with oil.
- Mount pressure gauge in the feed line and return line.
- Mount the pressure gauge for checking the pump suction pressure.
- Make sure that the nozzle is size and mounted correctly.

Bleeding of oil system

Shortly start the burner and check for proper direction of rotation. Bleed the oil line and oil pump.

CAUTION: The hydraulic system has been filled with oil by the manufacturer. This may cause ignition trouble when initially operating the system. When starting the burner take care to increase the oil pressure slowly to the operating level.

Prior to the initial fuel feed start make a functional test of the burner program flow:

Oil system:

- Open all shut-off valves of the oil supply system.
- The oil solenoid valve in the feed line disconnect on the terminal strip (see Circuit Diagram).
- Start burner and check program flow for correct start-up sequence:
 1. Fan starts.
 2. Pre-ventilating damper.
 3. Air pressure check.
 4. Partial-load air damper.
 5. Ignition.
 6. Valves open (disconnected valve remains closed).
 7. Safety lock-out after expiry of safety period (see control box).
- Reconnect the valve.
- Unlock the control box.

EXHAUST GAS TEST

To ensure an economically efficient and trouble-free operation of the system it will be necessary to adjust the burner specifically in accordance with the furnace system. This is achieved by means of a fuel-combustion air compound control unit which adjusts the burner to ensure a proper combustion. Exhaust gas tests are required for this purpose.

The percentage CO₂ and O₂ and the exhaust gas temperature will have to be measured to determine the efficiency and combustion quality.

Prior to any measurement make sure to check the boiler and exhaust gas system for absence of leaks.

Secondary air will falsify the measured results

Check that the exhaust gases have a residual oxygen (O₂) content as low as possible and a carbon dioxide (CO₂) content as high as possible.

The carbon monoxide content of the exhaust gases must be below the currently applicable specifications in all load stages. In the fuel oil combustion mode the permissible soot number in the exhaust gas is not allowed to be exceeded

Recommended combustion parameters

Fuel	Recommended (%) CO ₂	Recommended (%) O ₂
Natural gas	10 ÷ 9	3,1 ÷ 4,8
Light oil	13 ÷ 11,5	3,3 ÷ 5,3
Heavy oil	12,5 ÷ 11	4,2 ÷ 6,2

Ratio between O₂- and CO₂-
for natural gas H (CO₂max = 11,7%)

Ratio between O₂- and CO₂-
for light oil EL (CO₂max = 15,40%)

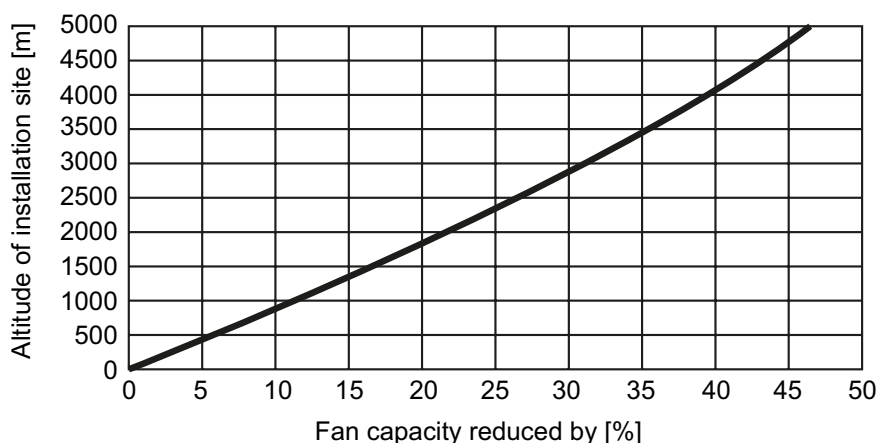
Ratio between O₂- and CO₂-
for heavy oil S (CO₂max = 15,60%)

$$O_2 = 21 \frac{CO_{2max} - CO_{2gem}}{CO_{2max}} = \%$$

CO₂ gem = % CO₂ measured on dry flue gases

WARNING: if the installation is above sea level the output of the burner vary base on the diagram.
The regulation of the burner in this case shall take into account the reduced power of the burner due to the missing air.

Mean air pressure vs. altitude above sea-level



START-UP OIL SIDE

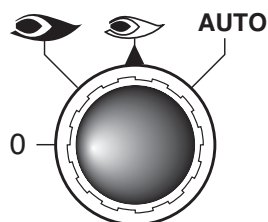
Fuel selection - Start-up

Select the oil operation in order to proceed with start up on the oil side. On the selector put the operation on minimum capacity.

MAIN SWITCH

0 - OFF

1 - ON



0 : operating elements locked in an intermediate position

1 : operation on maximum capacity

1 : operation on minimum capacity

AUTO : automatic operation



KMV



KMV contactor: check the air fan motor rotation.
If the rotation is not correct invert the two phases on the power supply.

START UP THE BURNER

The control box starts the pre-purge cycle, the fan motor and the oil motor and opens the air flaps in full open position.

At the end of pre-purging, the control box drives the servomotor into the ignition position and starts the ignition transformer.

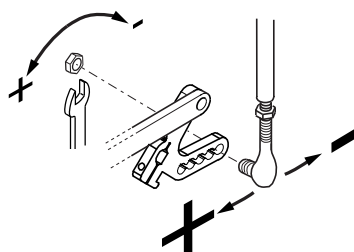
After a few seconds the control box opens the oil valve and starts the flame. After the flame stabilisation the control box drives the servomotor in the low flame.

In case of faulty ignition, the control box switches the burner into safety condition, in such a case you must rearm the burner.

Gradually go step by step using the selector on position 0 to stop the flame, from the low flame to the high flame in order to have a stable flame. For each position from 0 to 90° do oil setting adjusting oil return pressure as described in the next pages. When the servomotor arrives at 90° you have completed first tuning of air and oil flow according to the boiler capacity required. Check the combustion values and adjust the oil pressure.

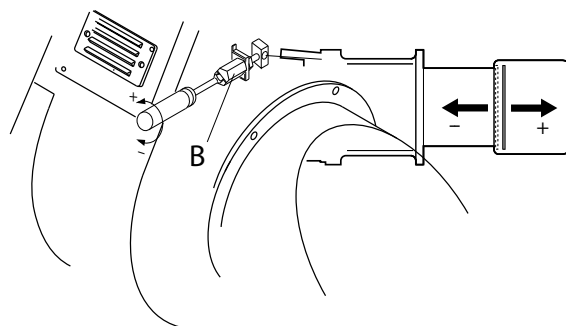
Adjusting the maximum air flow rate

In order to adjust the maximum air flow rate see figure with selector in maximum operation. Loosen the nut holding the air damper transmission rod and correct air flow till you reach the combustion values suggested by reading the value on the combustion analyser. If you do not reach acceptable air flow rate you shall adjust the firing head. Move the head forward to increase air flow backwards to reduce.



Firing head setting

The firing head is pre-adjusted at the 50% from the factory. The setting fully open enables to reach the full power of the burner and full close to reach the minimum power of the burner. The optimal position depends on the output that we need to reach but the default setting shall be modified only when you are not able to reach the suggested combustion value by adjusting the air flow in the maximum flame.



Adjusting the maximum oil flow rate

Put the selector on the maximum operation. Adjust the oil pressure reading the value on the return manometer / pressure gauge according to the nozzle tables provided in the appendix.

NOTE: the pump pressure is set from the factory at the pressure required nozzle pressure required as per table of nozzle selection in appendix. If the output required is different from the one set from the factory the pressure can be adjusted according to the instruction below.

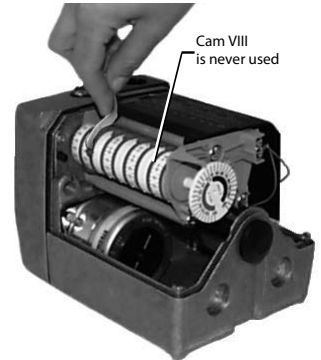
START-UP OIL SIDE

Servomotor SQM50 - Air damper motor pre-setting

The cams of the servomotor are set from the factory in order to start the burner and reach the maximum output.

The following setting are the standard one:

- I. High flame position 90° (maximum value 70°).
- II. Air flap position in standby 0° (minimum value 15°).
- III. Ignition position 30°.
- IV. Low flame position 40° (can be modified depending on the minimum output of the boiler).
- V. To VIII not used

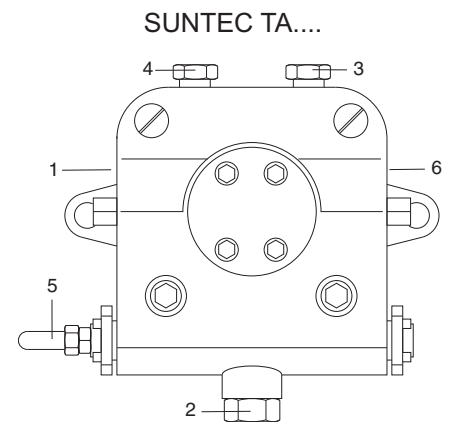


Adjusting the pump pressure

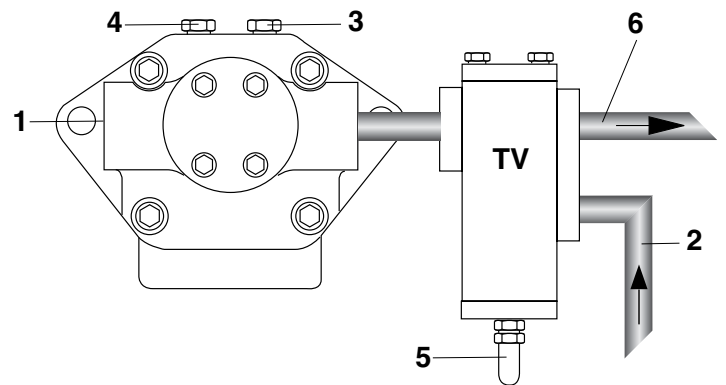
- 1 - INLET
- 2 - RETURN
- 3 - BLEED AND PRESSURE GAUGE PORT
- 4 - VACUUM GAUGE PORT
- 5 - PRESSURE ADJUSTMENT
- 6 - TO NOZZLE

The pump pressure is set at a value of 22-25 bar during the testing of burners. Before starting the burner, bleed the air in the pump through the gauge port. Fill the piping with light oil to facilitate the pump priming. Start the burner and check the pump feeding pressure. In case the pump priming does not take place during the first pre-purging, with a consequent, subsequent lock-out of the burner, rearm the burner's lock-out to restart, by pushing the button on the control box. If, after a successful pump priming, the burner locks-out after the prepurging, due to a fuel pressure drop in the pump, rearm the burner's lock-out to restart the burner.

Do never allow the pump working without oil for more than three minutes.



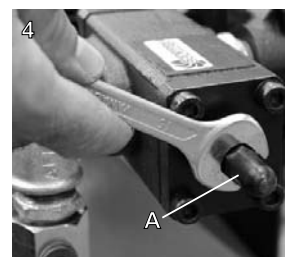
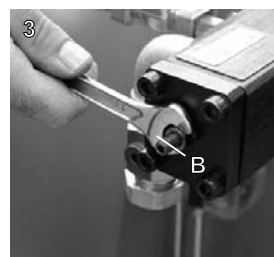
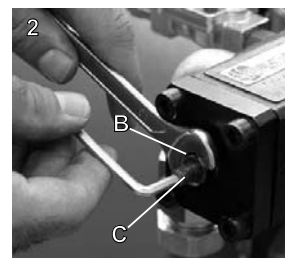
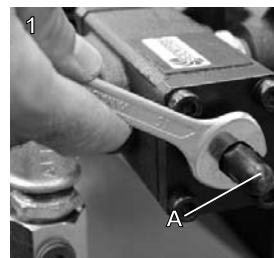
SUNTEC T.... + TV



! **NOTE:** before starting the burner, check that the return pipe is open. An eventual obstruction could damage the pump sealing device.

Adjusting the valve TV

1. Remove the cap A of the pressure regulating valve TV.
2. Loosen the fixing nut B and use an Allen wrench on the screw C to adjust the delivery oil pressure. To increase the pressure turn clockwise, to decrease the pressure turn anticlockwise.
3. Tighten the nut B and pay attention not to turn also the adjusting screw.
4. Screw on the cap A, back to its previous position.



START-UP OIL SIDE

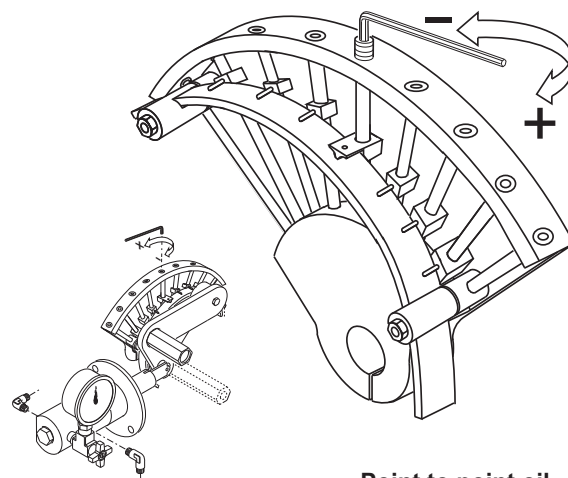
Adjusting the intermediate burner capacity

In order to adjust intermediate capacity of the burner use the selector on position 0 to stop the stroke and regulate the cam on the different screw position.

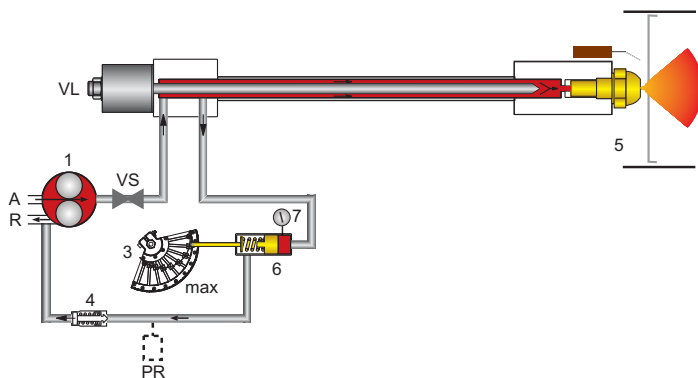
The adjustment shall be done according to the drawing in order to have the correct combustion value in each points “+/-” switch (different screw positions).

Using a suitable Allen wrench, change the position of the cam guide blade; if you screw it down, the flow rate is reduced; if you unscrew it, the flow rate increases.

WARNING: the variable profile of the cam shall have a normal proportional curvature in order to have good combustion values and reduce its mechanical stress breakdown.



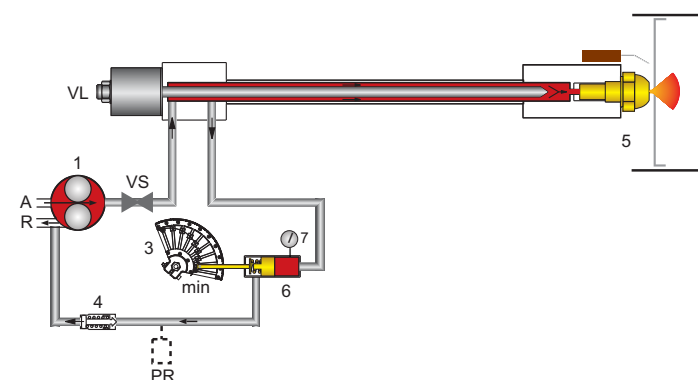
Point to point oil cam configuration



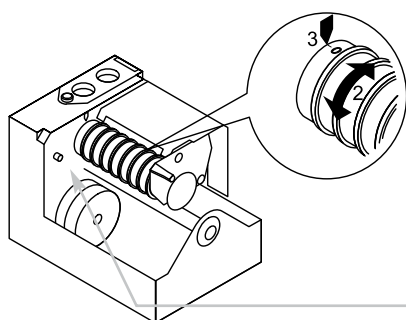
WARNING: Once the setting on the oil has been completed make sure that you close the manometer – pressure switch tap.

LEGENDA

- 1. Oil pump
- VS. Oil safety valve
- 3. Adjusting cam
- 4. Check valve
- VL. Working valve
- PR. Pressostat (optional)
- 5. Nozzle
- 6. Pressure regulator
- 7. Manometer – pressure gauge



Servomotor SQM50 - Oil side final setting



Once the point to point oil cam setting has been completed we need to set the final minimum output of the burner using the servomotor cam VI (low flame oil). Using the suitable key regulate the grades (“+/-” switch). The low flame position must be higher than the ignition position cam on the servomotor. Turn the burner off and start it again in order to check if the burner start properly otherwise adjust the ignition oil cam number IV.

OIL SETTING ENDED: switch the selector to automatic position.



WARNING: Do not use the button cam drum release button.

MAINTENANCE PROGRAM

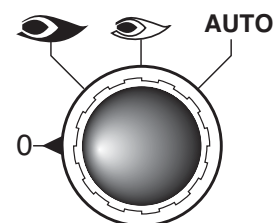
! Burner and boiler servicing must only be carried out by authorised qualified personnel at least once a year. Depending on the type of installation, shorter maintenance intervals may be necessary. The system operator is advised to take out a maintenance contract to guarantee regular servicing.

WARNING: Use original spare parts.

SAFETY WARNINGS:

1. Turn off the power supply and protect the system from accidental start-up
2. Cut oil
3. Make sure there is no residual power in the system and that the actions in points 1 and 2 have been completed
4. Before opening the burner casing, ensure that the fan motor has stopped completely

Failure to observe any of these instructions will result in the risk of death or injury!



WORKS RECOMMENDED AS PART OF ANNUAL BURNER MAINTENANCE:

- Emergency stop button function check
- Check burner start characteristics
- Run burner test and input measurement in the boiler room
- Clean the combustion components and replace defective parts if necessary
- Check the combustion head components and make sure that all components are in good condition otherwise replace them
- Replace ignition electrodes and nozzle if necessary and check their correct position after any intervention
- Flame monitor and automatic combustion control unit function check
- Clean the fan wheel and the housing and grease rotating parts if necessary
- Clean the oil filter cartridge with gasoline periodically and check the tightening of the O rings, replace them if necessary
- Make visual inspection of the burner's electrical components and eliminate malfunctions if necessary
- Burner safety devices function check (air pressure/switches if any)
- Commissioning the burner and correct the adjustment values if necessary

NOTES ON REASSEMBLING: Perform the described step in reverse order and make sure to refit components as they were originally assembled and the system is free from leaks. Use only original spare parts.

DRAW UP A MEASUREMENT REPORT ACCORDING TO THE LOCAL REGULATION AND CODES OF PRACTISE OF THE COUNTRY

EXHAUST GAS LOSS

Exhaust gas loss by way of free heat will occur as a result of the temperature difference between the fuel-air mixture entering the furnace chamber and the gases discharged. Any increase in the excess of air and the resultant higher exhaust gas volume will cause the exhaust gas loss to rise. The exhaust gas loss can be calculated as follows:

$$q_A = (t_A - t_L) \frac{A_1}{CO_2} + B$$

q_A = exhaust gas loss [%]

t_A = exhaust gas temperature [°C]

t_L = combustion air temperature [°C]

CO_2 = volumetric content of carbon dioxide [%]

	Light oil EL	Heavy oil S	Natural gas	Town gas	LPG
A1	0,50	0,490	0,370	0,350	0,420
B	0,007	0,007	0,009	0,011	0,008

Example

Data measured in natural gas mode:
CO₂ content of exhaust gases: 10,8%
Exhaust gas temperature: 195°C
Air intake temperature: 22°C

The exhaust gas loss can be calculated as follows:

$$q_{Af} = (195-22) \left(\frac{0,37}{10,8} + 0,009 \right) = 7,48\%$$

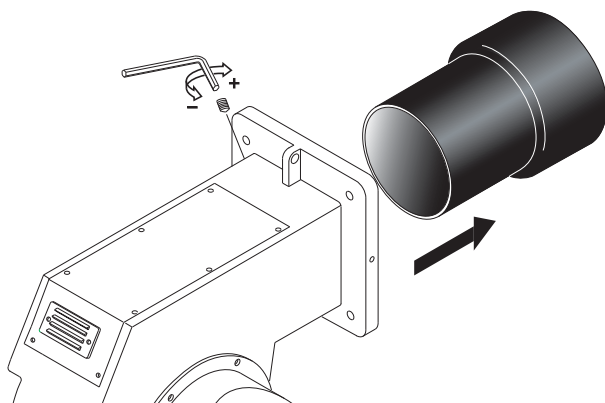
Data measured in fuel oil mode:
CO₂ content of exhaust gases: 12,8%
Exhaust gas temperature: 195°C
Air intake temperature: 22°C

The exhaust gas loss can be calculated as follows:

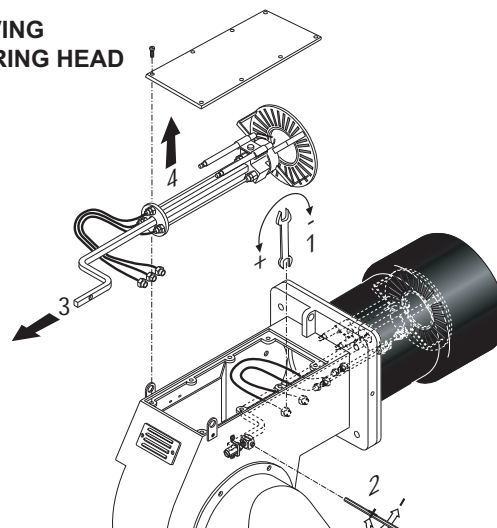
$$q_{Af} = (195-22) \left(\frac{0,49}{12,8} + 0,007 \right) = 7,83\%$$

MAINTENANCE PROGRAM

REMOVING THE BLAST TUBE



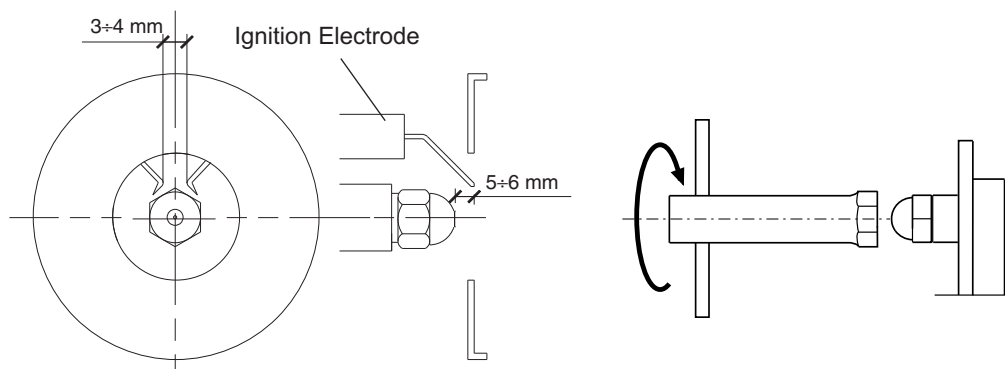
REMOVING THE FIRING HEAD



POSITION OF ELECTRODES

ATTENTION:

to remove the nozzle use the suitable box wrench taking care to not damage the electrodes. Check the position of the electrodes after any intervention as wrong position could cause ignition troubles.



OIL FILTER CLEANING



ATTENTION: Periodically clean oil cartridge with gasoline and replace them if it is necessary!

TROUBLESHOOTING INSTRUCTIONS

The list of faults/causes/possible solutions for a set of main failures is a guideline for professional personell authorised to carry out service and maintenance.

Irregular burner operation or malfunction: check that every adjustment parameter is correctly set as per instruction on this manual.

TROUBLESHOOTING TABLE OIL OPERATION			Burner doesn't start	Fuel pump noisy / unprimed / leaks	Burner starts with continuous pre-purge	Burner starts and then goes into lock-out	Pilot Ignition failure (1st safety time - LFL only)	Main Ignition failure (2nd safety time)	Burner lock-out after flame appearance / pulsation	Flame control repeats the cycle and doesn't give consent	Smoke in flame - dark Bacharach	Burner doesn't switch into Hi flame	Burner lock-out during operation	LFL	LAL
STATUS	CAUSES	REMEDIES												MULTICOLOR MULTIFLAM	MAJOR OILFLAM
HEAVY OIL	Preheating period too long	Check GEFRA controller, replace if necessary	X								X		X	YES	YES
	Defective Gefran controller	Replace control unit	X								X		X	YES	YES
PRE-START (MISSING SIGNALS)	Defective control box unit	Replace control box unit	X			X	X	X	X	X		X	X	YES	YES
	No electrical power supply Wrong electrical connections	Check switches/contactors Check connections	X											YES	YES
	Air pressure switch not "closed"	Check contacts	X											YES	YES
	Boiler thermostats open	Check contacts	X											YES	YES
	Fan motor overload intervention	Replace fuse	X											YES	YES
	Auxiliaries fuses interrupted	Replace fuse	X											YES	YES
	Servomotor [CLOSE] position switch not reach	Check servomotor settings	X											YES	YES
PRE-START (OIL PUMP)	High vacuum in oil pipe due to dirty filter	Clean filter or replace filter cartridge		X							X			YES	YES
	Burner is higher than oil tank by more than 3 m	Reduce Height or prepare a ringline pump		X							X			YES	YES
	Air in the oil pipeline	Re-tighten pipe connections		X										YES	YES
SEQUENCE START	Servomotor [OPEN] position switch not reach	Check servomotor settings			X									YES	YES
	Servomotor [MIN] position switch not reach	Check servomotor settings			X									YES	YES
	Extraneous Light	Eliminate light source				X								YES	YES
	Fuel solenoid valve fails to close (Light oil Burner - direct ignition)	Clean valves or replace if necessary				X								YES	YES
LACK OF AIR	Air pressure switch fail to connect to Terminal 14	Check contacts				X								YES	NO
	Fan contaminated/dirty	Clean fan				X					X		X	YES	NO
	Fan motor rotation direction not correct	Check direction and contactor				X					X		X	YES	NO
IGNITION & FLAME STABILISATION PERIOD	Flame supervision circuit internal test failed	Replace control unit				X								YES	NO
	Pilot flame failure - Pilot gas valves not open	Check valves contacts / replace if necessary					X							YES	NO
	Pilot flame establish - weak flame signal	Check flame sensor Replace if necessary					X							YES	NO
	Ignition transformer faulty	Replace					X	X						YES	YES
	Ignition cable & electrodes defective	Replace					X	X						YES	YES
	Electrode bad position	Check setting / replace if necessary					X	X						YES	YES
	Fuel oil solenoid valve fails to open	Check contacts and clean valves. Replace solenoid coil if necessary						X						YES	YES
ONLY FOR OIL BURNER	Air pressure switch not close, Oil pump contactor open	Check air pressure switch contacts						X						NO	YES
	No oil supply	Check shut-off valves Check Pump, replace if necessary						X						NO	YES
	Oil pump coupling broken	Replace pump unit						X						NO	YES
COMBUSTION	Flame sensor signal failure	Clean, re-position or replace if necessary				X	X	X	X				X	YES	YES
	Head adjustment not correct	Check settings							X		X		X	YES	YES
	Oil/Air mixture setting not correct	Check settings							X		X		X	YES	YES
	Dirty combustion head	Clean or replace disk if necessary							X		X		X	YES	YES
	Nozzle dirty or damaged	Clean or replace nozzle if necessary							X		X			YES	YES
	Fuel pressure inappropriate	Adjust pressure or replace pump if necessary							X		X		X	YES	YES
	Capacity reduction	Check filter, pump pressure and nozzle. Replace item if necessary									X			YES	YES
	Load control device does not close	Check load control, replace if necessary										X	X	YES	YES

OPERATING TROUBLE

In case of operating trouble it should be checked whether the system is in proper working order.

Make a check for the following:

1. Availability of fuel.
Correct position of fuel selector switch.
2. Availability of electric power in the burner system.
3. Proper functional order and setting of all control and safety instruments such as temperature controller, safety limiter, water failure cut-out, electrical limit switches, etc.

If the trouble is not found to be due to any of the above-mentioned points it will be necessary to test the burner functions very carefully.

Prevailing conditions:

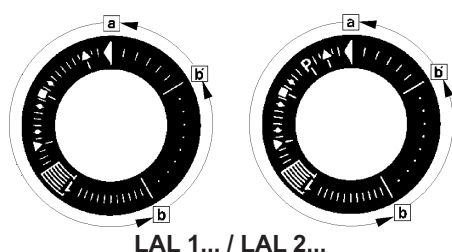
The burner will be found to be out of operation and in faulty and interlocked position. Proceed with searching for the cause of the trouble and eliminate it. Unlock the control box by pressing the fault eliminate key and start the burner.

Do not press the fault eliminate key longer than 10 seconds.

The start-up program will be initiated and should be carefully monitored.

The possible cause of the fault may be quickly found by reference to the fault indicator of the control box and watching the start-up and operating program.

Control program in the case of trouble and fault indicator LAL 1... / LAL 2...



a-b Starting program

b-b' In a number of time versions; idle steps of the program unit to self-stop after burner start-up (b' = operating position of program unit)

b(b')-a After-flushing program after regular stop. In the starting position "a" the program unit will automatically stop or initiate an immediate restart of the burner, e.g. after a fault has been eliminated

- Duration of the safety period for single-tube burners
- Duration of the safety period for burners with ignition gas valve

Basically, any type of trouble will result in the immediate stop of the fuel supply. At the same time, the program unit and consequently the fault indicator will stop. The type of trouble can be identified by the symbol opposite to the reading mark of the indicator:

◀ **No start**, e.g. because the "CLOSED" signal from the "Air Damper CLOSED" limit switch is missing or a contact is not closed between terminals (12) and (4) or (4) and (5); or the contacts of all control and safety units in the controlled system are not closed (e.g. gas pressure or air pressure switches, temperature or pressure regulators).

▲ **Operating stop** because the "OPEN" signal from the "Air Damper OPEN" limit switch is missing. Check and adjust the limit switch concerned.

P **Shut-off on trouble because there is not air pressure** signal at the beginning of the air pressure check (apply only to LAL 2.25).

Any air pressure failure after this time will also lead to a shut-off on trouble.

■ **Shut-off on trouble** because of a fault in the flame monitoring circuit.

▼ **Operating stop** because the position signal of the "Partial Load" limit switch (air damper in "Partial Load" position) is not available on terminal (8). Check and adjust the limit switch concerned.

1 **Shut-off on trouble** because a flame signal is not available on the expiry of the (1st) safety time.

Any failure of the flame signal on the expiry of the safety time will also lead to a shut-off on trouble.

| **Shut-off on trouble** because the flame signal failed during burner operation or a lack of air has occurred.

◀ **Shut-off on trouble** during or after the control program flow due to external light (e.g. by flame not extinguished, leaking fuel valves) or a faulty flame signal (e.g. fault in flame monitoring circuit, or similar); see flame monitor.

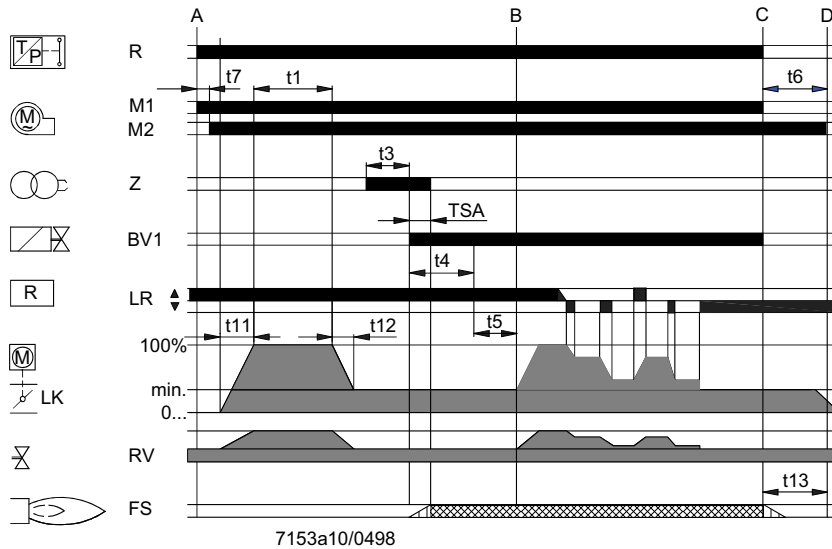
If the shut-off on trouble occurs at any other time between start and pre-ignition that is not identified by a symbol as above, this will normally be due to an early flame signal which is considered to be a faulty flame signal.

The automatic furnace controller may be unlocked immediately after a shut-off on trouble using the unlock button with integrated fault signal lamp or an external switch. After it has been unlocked (and after a defect with resultant operating stop has been eliminated and after a voltage failure), the program unit will in any case return to its starting position with voltage being only supplied to terminals 7, 9, 10 and 11 as preset by the control program. It is only at this stage that the program of the automatic furnace controller will restart the burner.

APPENDIX

Control box - Damper actuators

CONTROL BOX LAL...



- A: Starting type interval
A-B: Flame development interval
B: Burner has reached operating position
B-C: Burner operation (heat generation)
C-D: Regular shut-off
t1: Pre-ventilating time
t2: Safety time
t3: Pre-ignition time
t4: Fuel valve enable
t5: Load regulator enable
t11: "OPEN" run time of air damper
t12: "CLOSE" run time of air damper

- BV: Fuel valve
FS: Flame signal amplifier
LK: Air damper
LR: Load controller
M: Fan or burner motor
R: Control thermostat or pressurestat
RV: Modulating fuel valve
Z: Ignition transformer

DAMPER ACTUATORS SQM50...

Description

The SQM actuator is intended for use with two-stage sliding or modulating oil, gas or dual-fuel burners. The reversible actuator is fitted with a synchronous motor which drives a shaft via a gearbox. The shaft end carries a coupling to drive the fuel and combustion air controlling element.

The SQM actuator has been designed for dual-wire control by controller or switching units with change-over contacts.

Potentiometers can be installed for a range of applications on customer's request.

The limit and auxiliary switches are set by means of manually adjustable latching cam plates. Scales are fitted between the disks to facilitate the selection of the switching points.

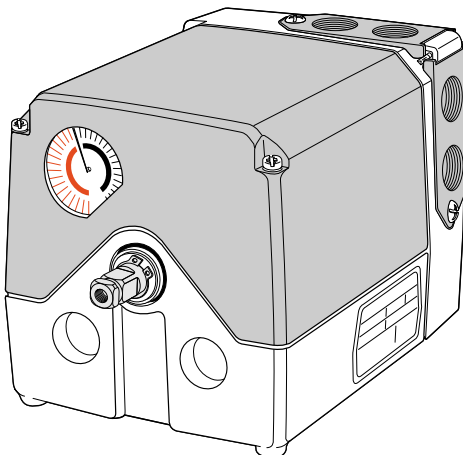
The cam plates are provided with a small pointer for indicating the switching point of a scale between the setting ranges.

An additional scale fitted to the end of the cam roller serves to indicate the position of the actuator.

The drive unit may be disconnected from the controlling element by changing over a rocker arm mounted to the gearbox.

This will allow any desired position of the controller plate to be selected by hand. Drive and output will be coupled in the vertical position of the rocker arm.

The fuel-air curve should be set over the full range of the cam plate so that operating safety will be retained also when the limit switch is overrun.



APPENDIX

Fluidics nozzle chart



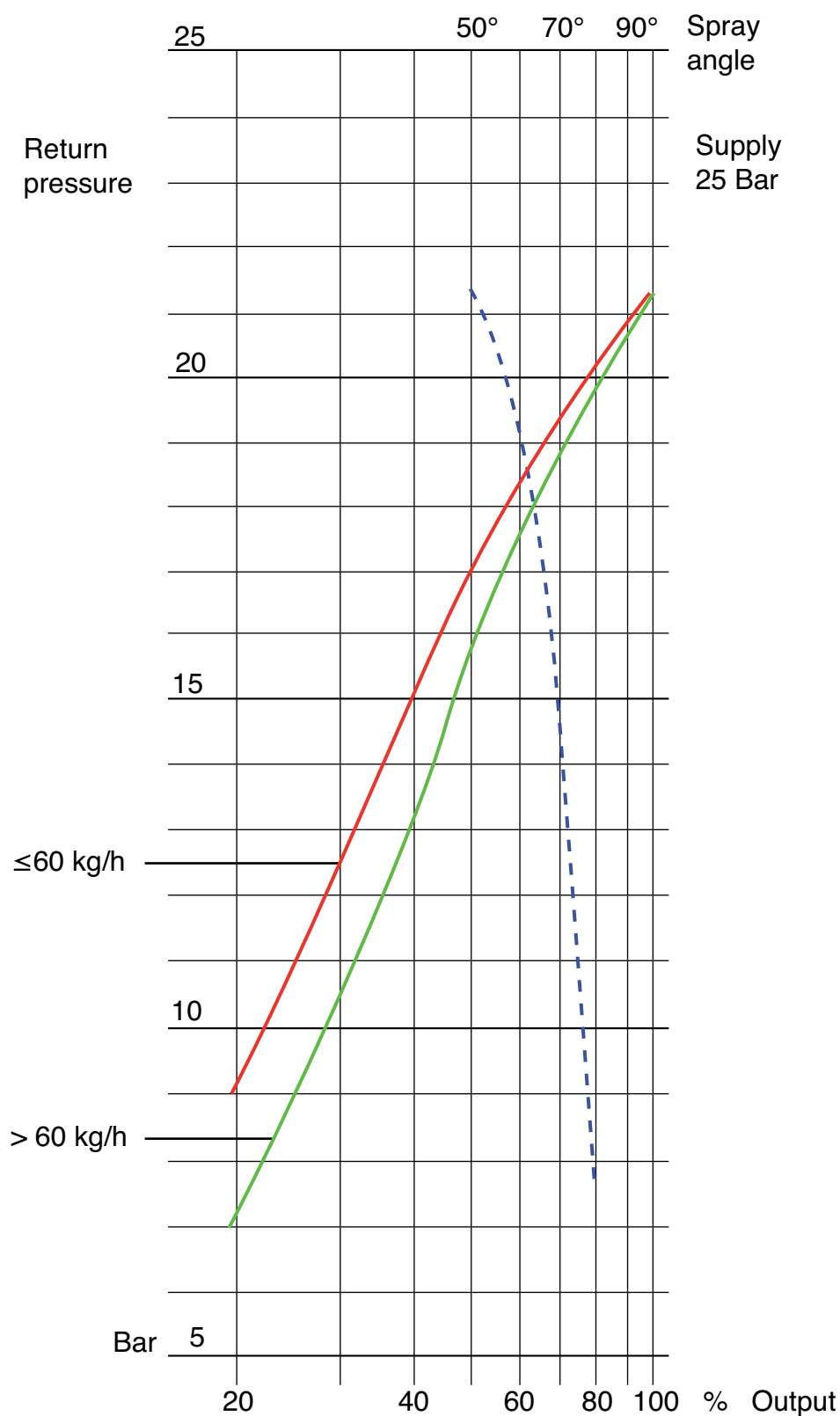
RETURN NOZZLE

The nozzle type Fluidics W is a by-pass nozzle with integrated spring-loaded cut-off needle.

The throughput rate is controlled by varying the return pressure while keeping the supply pressure at a constant level.

Prior to burner start, check the nozzle size against the required output.

It might be necessary to replace the nozzle (see nozzle selection diagram).



Bergonzo nozzle tables

B = pump output

A = nozzle output

Output [kg/h]

Supply: 25 bar

APPENDIX

Bergonzo nozzle tables

Return pressure [bar]

Nozzle kg/h	Bar	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
300	A	20	85	90	94	98	100	105	110	115	125	135	145	155	170	190	225	275										
300	B	20	480	480	476	470	465	460	450	435	415	400	375	365	350	325	300	280										
300	A	25	100	100	102	104	106	108	110	113	116	120	125	135	145	155	165	180	200	225	255	310						
300	B	25	550	550	545	540	535	530	520	510	500	490	482	475	463	450	440	430	415	390	370	350	310					
300	A	30	105	106	107	108	110	112	114	116	118	120	124	128	132	136	140	146	152	162	175	182	195	210	230	260	290	340
300	B	30	625	625	625	620	615	610	605	600	590	580	570	560	550	540	530	520	510	495	480	465	450	430	410	390	375	350
325	A	20	95	96	97	98	100	103	106	110	120	130	140	150	165	200	240	260										
325	B	20	550	545	540	535	530	520	510	500	480	460	440	420	400	375	355	325										
325	A	25	108	107	108	109	110	112	114	116	118	125	132	141	150	160	170	180	200	225	250	280	330					
325	B	25	630	630	630	625	620	615	610	605	600	585	570	565	555	520	500	480	460	440	410	385	360					
325	A	30	115	115	116	117	118	119	120	122	126	130	135	140	147	152	160	170	180	190	200	210	225	242	260	280	310	330
325	B	30	720	715	710	705	702	700	690	680	670	655	620	610	600	580	570	550	520	500	480	460	440	420	400	380		
350	A	20	105	107	108	109	110	115	118	125	135	145	155	170	190	215	240	275										
350	B	20	590	580	570	560	550	540	530	500	480	465	450	440	400	375	360	340										
350	A	25	120	122	124	126	128	132	134	136	138	140	145	150	155	165	175	185	200	225	255	275	350					
350	B	25	620	620	620	615	614	612	610	605	600	595	575	565	550	530	510	490	470	450	410	380	360					
350	A	30	125	125	127	129	131	133	135	138	141	143	145	150	155	160	168	174	184	195	210	225	245	265	280	325	370	
350	B	30	710	710	708	704	703	702	700	690	680	670	660	650	640	630	615	600	580	560	540	520	500	475	440	425	400	
375	A	20	110	114	118	127	134	137	140	145	152	162	170	180	195	210	250	290										
375	B	20	600	590	580	575	560	550	540	530	515	500	485	465	450	425	400	370										
375	A	25	130	130	130	132	134	136	138	140	146	150	155	160	170	180	195	210	230	250	275	320	375					
375	B	25	690	690	680	680	670	660	650	630	620	610	600	580	560	540	520	500	485	465	450	425	400					
375	A	30	135	136	137	138	139	140	142	144	148	151	155	160	166	172	180	190	200	210	225	235	250	270	300	340	370	
375	B	30	790	780	770	760	750	740	730	720	710	700	690	682	674	666	658	650	632	615	600	575	545	530	525	480		
400	A	20	130	135	140	145	150	155	160	170	180	190	205	220	240	263	330	370										
400	B	20	650	650	650	640	630	620	610	600	580	560	540	500	475	420	380											
400	A	25	130	135	140	145	150	155	160	170	178	185	195	202	212	225	250	270	290	320	340	375	400					
400	B	25	725	725	720	720	715	710	705	700	690	670	640	630	600	580	565	550	525	480	470	450	425					
400	A	30	152	153	154	155	157	162	165	170	176	180	190	200	210	220	230	245	260	270	285	300	325	365	400	425	450	
400	B	30	845	840	835	830	825	820	815	810	805	800	790	780	760	740	715	690	660	650	620	600	580	560	540	520	500	
425	A	20	120	125	130	135	140	145	150	165	175	185	210	230	250	275	300	350										
425	B	20	700	690	680	670	660	650	635	615	600	575	550	525	505	465	435	400										
425	A	25	145	146	147	148	149	150	154	157	160	170	180	190	210	225	245	265	280	320	360	400						
425	B	25	800	800	800	790	780	770	760	750	725	700	685	670	650	625	600	575	550	510	480	450						
425	A	30	150	150	149	148	147	146	145	148	154	160	168	177	185	195	205	225	238	250	270	290	310	325	360	380	450	
425	B	30	880	875	870	865	860	855	850	840	830	820	810	800	780	760	740	720	700	685	670	650	610	590	570	550	510	
450	A	20	130	135	140	145	150	158	165	175	185	200	210	230	255	280	320	375										
450	B	20	700	690	680	670	660	650	630	615	600	580	550	520	490	460	425	400										
450	A	25	145	145	148	151	154	158	162	165	170	180	190	200	220	240	255	280	310	350	390	450						
450	B	25	810	808	806	803	800	785	767	750	730	710	690	670	650	625	600	580	560	530	500	475						
450	A	30	155	156	157	158	160	162	165	170	175	180	187	194	200	210	220	230	240	260	275	290	310	340	375	420		
450	B	30	890	885	880	875	870	865	860	850	840	830	820	810	800	790	780	770	740	710	690	670	630	610	560	520	500	

Supply: 25 bar

Output [kg/h]

A = nozzle output

B = pump output

Bergonzo nozzle tables

27

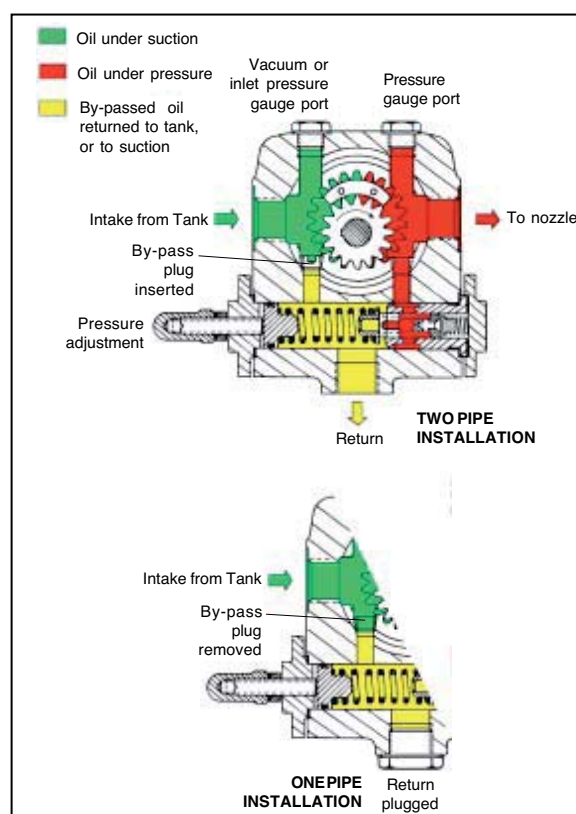
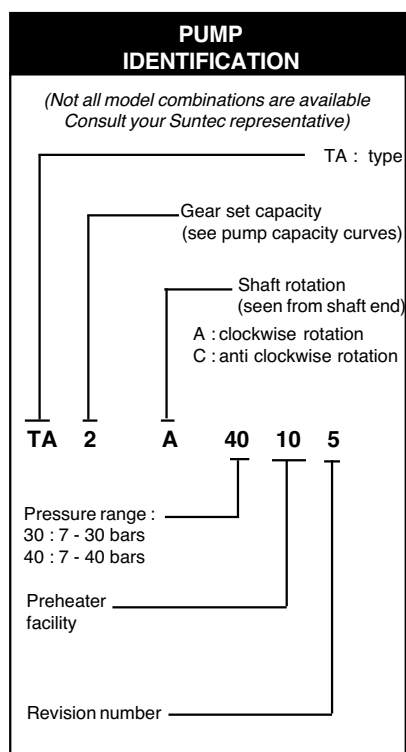
APPENDIX

Pumps and pressure regulators

PUMP SUNTEC TA TECHNICAL DATA

Note: All TA models are delivered for two-pipe system (by-pass plug fitted in vacuum gauge port).

For one-pipe system, the by-pass plug must be removed and the return port sealed by steel plug and washer.



General

Mounting	Flange mounting	
Connection threads	Cylindrical according to ISO 228/1	
Inlet end return	G 1/2"	
To nozzle	G 1/2"	
Pressure gauge port	G 1/4"	
Vacuum gauge port	G 1/4"	
Shaft	Ø 12 mm	
By-pass plug	Inserted in vacuum gauge port for 2 pipe system; to be removed with a 3/16" Allen key for 1 pipe system	
Weight	5,4 kg (TA2)	5,7 kg (TA3)
	6 kg (TA4)	6,4 kg (TA5)

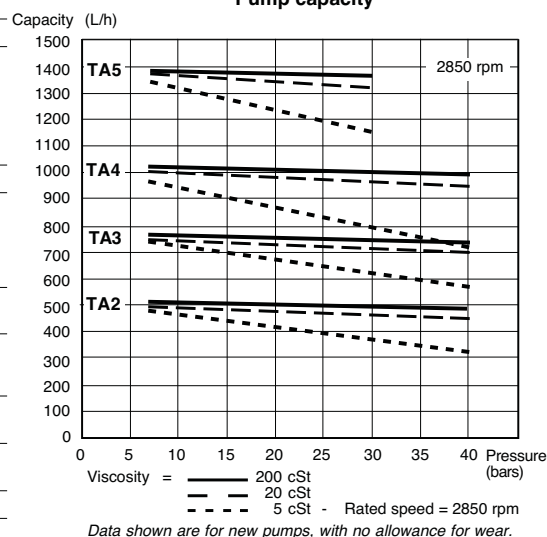
Hydraulic data

Nozzle pressure ranges	30 : 7 - 30 bars 40 : 7 - 40 bars
Delivery pressure setting	30 bars
Operating viscosity	4 - 450 cSt
Oil temperature	0 - 140°C max. in the pump
Inlet pressure	light oil : 0,45 bars max. vacuum to prevent air separation from oil heavy oil : 5 bars max.
Return pressure	light oil : 5 bars max. heavy oil : 5 bars max.
Rated speed	3600 rpm max.
Starting torque	0,3 N.m

Choice of heater

Cartridge	Ø 12 mm
Fitting	according to DIN 40430, NFC 68190 (N°9 elec.)
Rating	80-100 W

Pump capacity



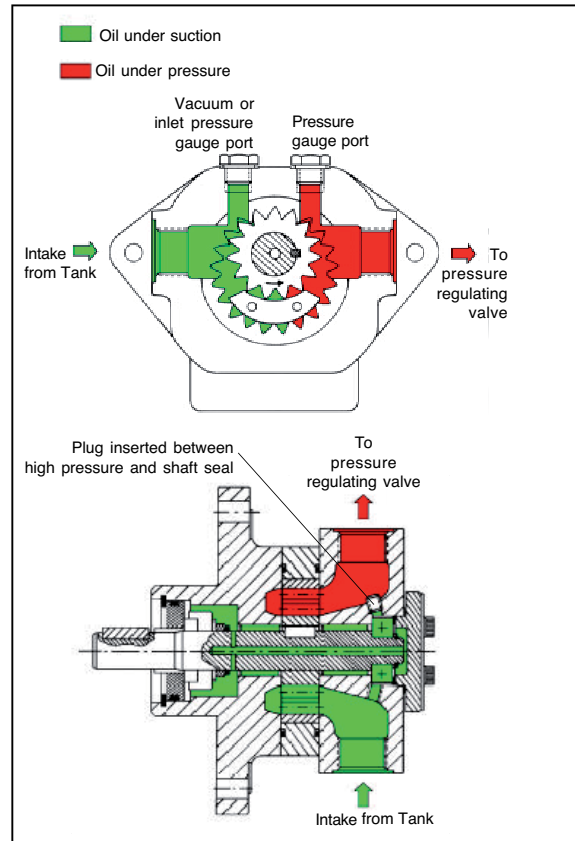
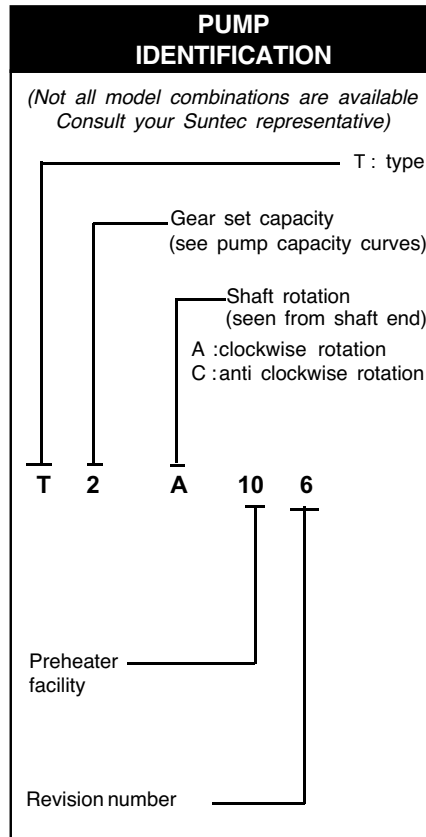
APPENDIX

Pumps and pressure regulators

PUMP SUNTEC T TECHNICAL DATA

Note: The bypass plug inserted between high pressure and shaft seal is only intended to change the pump rotation, check the presence of this plug with 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.



General

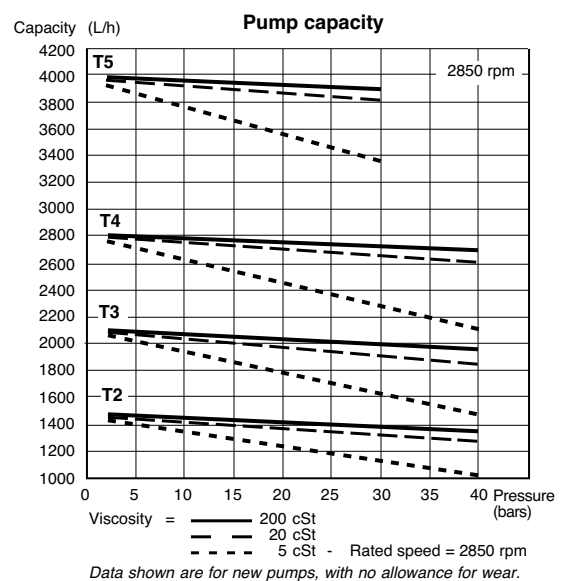
Mounting	Flange mounting		
Connection threads	Cylindrical according to ISO 228/1		
Inlet end return	G 1/2"		
To nozzle	G 1/2"		
Pressure gauge port	G 1/4"		
Vacuum gauge port	G 1/4"		
Shaft	Ø 20 mm		
Weight	7,8 kg (T2)	-	8,1 kg (T3)
	8,7 kg (T4)	-	9,4 kg (T5)

Hydraulic data

Nozzle pressure range	40 bars max. (T2, T3, T4) 30 bars max. (T5)
Operating viscosity	4 - 450 cSt
Oil temperature	0 - 150°C max. in the pump
Inlet pressure	light oil : 0,45 bars max. vacuum to prevent air separation from oil heavy oil : 5 bars max.
Rated speed	3600 rpm max.
Starting torque	0,4 N.m

Choice of heater

Cartridge	Ø 12 mm
Fitting	according to DIN 40430, NFC 68190 (N°9 elec.)
Rating	80-100 W



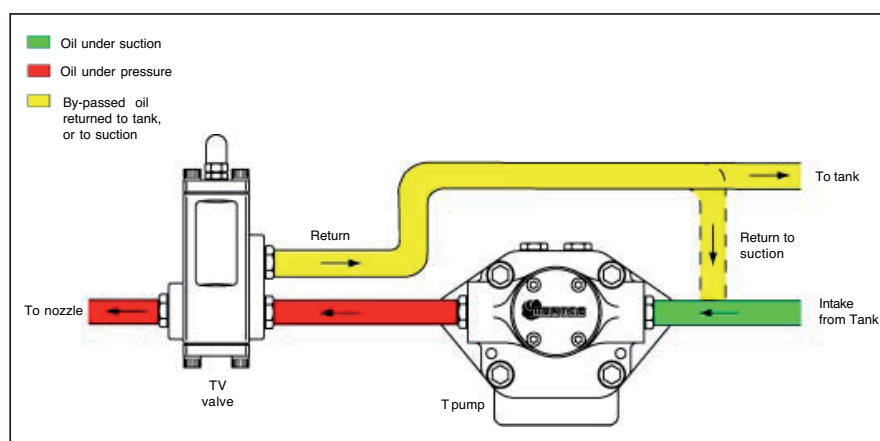
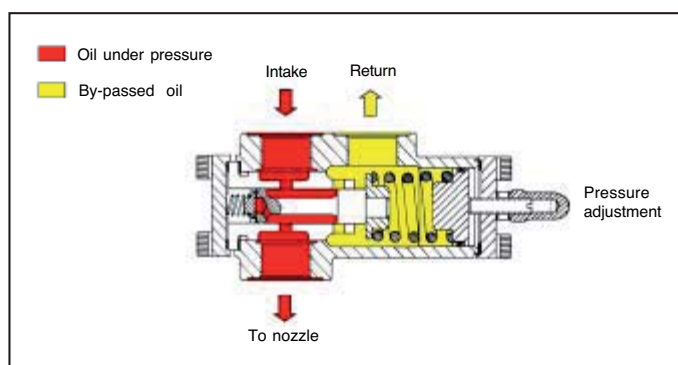
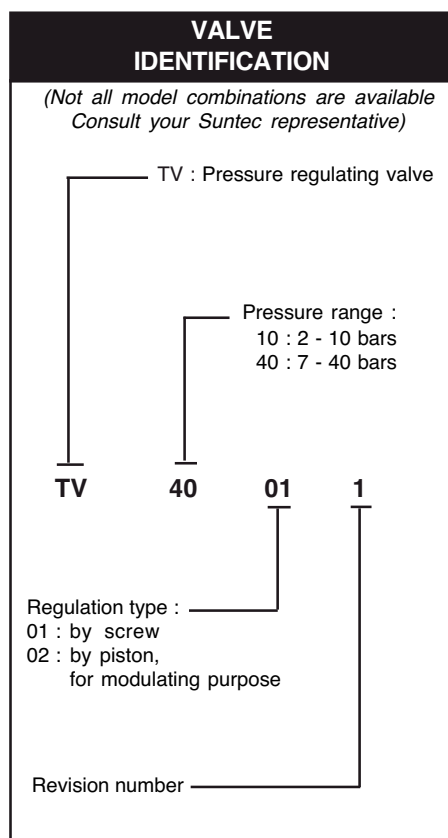
Power consumption

APPENDIX

Pumps and pressure regulators

VALVE SUNTEC TV TECHNICAL DATA

The pressure of the nozzle line is adjusted with the adjusting screw of the TV valve. The oil in excess to nozzle requirement is dumped to the return. Two pipe system : oil in excess is returned to tank. One pipe system : oil in excess is returned to pump suction.



General

Connection threads	Cylindrical according to ISO 228/1
Inlet	G 3/4"
To nozzle	G 3/4"
Return	G 3/4"
Weight	3 kg

Hydraulic data

Pressure ranges	10 : 2 - 10 bars (delivery pressure setting : 7 bars)
	40 : 7 - 40 bars (delivery pressure setting : 20 bars)
Operating viscosity	4 - 450 cSt
Oil temperature	0 - 150°C max. in the valve.

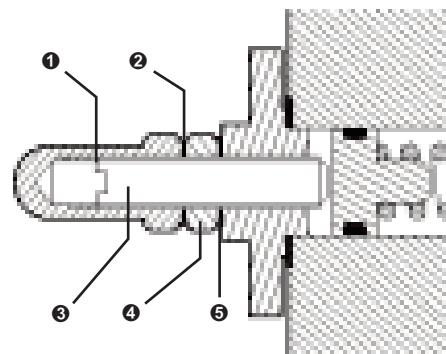
MOUNTING POSITION

TV valve may be mounted in any position.

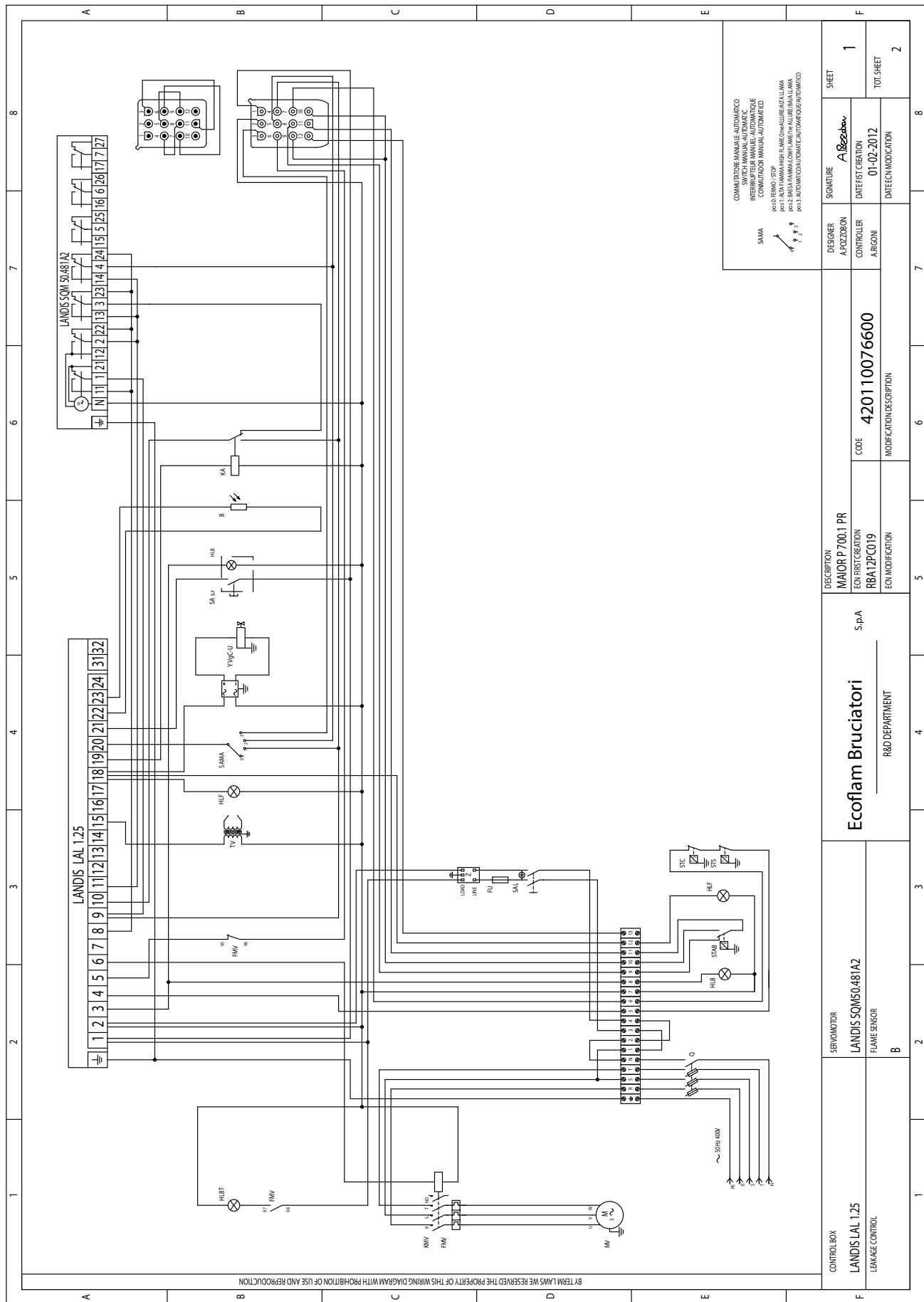
PRESSURE ADJUSTMENT

Remove cap-nut ❶ and washer ❷, unscrew lock-nut ❸.
To increase pressure, turn adjusting screw ❹ clockwise.
To decrease the pressure, turn screw anticlockwise.
Block lock-nut ❸, refasten washer ❷ and cap-nut ❶.

- ❶ cap-nut
- ❷ adjusting screw
- ❸ washer
- ❹ lock-nut
- ❺ washer



Electrical diagrams



APPENDIX

Electrical diagrams

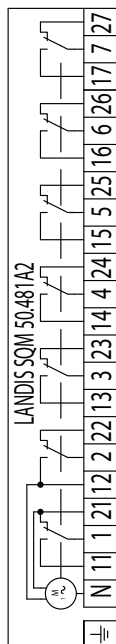
		1	2	3	4	5	6	7	8
A									
B									
C									
D									
E									
F									

CONTROL BOX	SERVOMOTOR	Ecoflam Bruciatori		DESCRIPTION		DESIGNER	SIGNATURE	SHEET
LANDIS LAL 1.25	LANDIS SOM50.481 A2	S.p.A		MAIORP 700.1 PR	CODE	A-POZZOBON	ABEZZANO	2
LEAKAGE CONTROL	FLAME SENSOR			ECONOMIST CREATION	420110076600	CONTROLLER	DATE/FIRST CREATION	TOT. SHEET
	B	R&D DEPARTMENT		RBA12PC019	MODIFICATION DESCRIPTION	ARIGNI	01-02-2012	2
				ECONOMIST CREATION			DATE/FIRST CREATION	
				MODIFICATION			DATE/FIRST CREATION	

Q	INTERUTTORE GENERALE CON FUSIBILE INTERRUPTEUR GENERAL AVEC FUSIBLE ESPIA DE FUNCIONAMIENTO GENERAL CON FUSIBLE	HLF	LAMPADA DI FUNZIONAMENTO LAMPE DE FONCTIONNEMENT ESPIA DE FUNCIONAMIENTO
Z	FILTRO ANTISTURBO ANTI-KAMMERSTÄU FILTRO DE PROTECCION ANTISTURBO	KA	RELAY RELE RELE
FU	FUSIBILE FUSE FUSIBLE	SA.57	PULSANTE DI SBLOCCO APPARECCHIATURA RESET LOCK-OUT BUTTON BOITON DE DEBLOCAGE DU COFFRE DE SECURITE REARME DE LA CENTRALITA
MV	MOTORE VENTILATORE MOTOR-FAN MOTEUR VENTILATEUR MOTOR VENTILADOR		
TV	TRASFORMATORE IGNITION TRANSFORMER TRANSFORMATEUR D'ALLUMAGE TRANSFORMADOR		
B	FOTOCELLULA UV CELL FOTOCELULA		
RMV	RELE TERMICO MOTORE VENTILATORE MOTOR THERMAL RELAY (FAN MOTOR) RELAIS THERMIQUE MOTEUR VENTILATEUR RELE TERMICO MOTOR VENTILADOR		
HLB	LAMPADA DI BLOCCO LOCK-OUT LAMP LAMPE DE SECURITE ESPIA DE BLOQUEO		
KMV	CONVATORE MOTORE VENTILATORE MOTOR THERMAL RELAY (FAN MOTOR) CONTACTEUR MOTEUR VENTILATEUR TELEINTERRUPTOR MOTOR VENTILATOR		
SAL	INTERUTTORE DI LINEA WORKING SWITCH INTERRUPTEUR DE LIGNE INTERUPTEUR DE LINEA		
STC	THERMOSTATO CALDAIA BOILER THERMOSTAT THERMOSTAT CHAUDIERE THERMOSTATO CALDERA		
STS	THERMOSTATO DI SICUREZZA SAFETY THERMOSTAT THERMOSTAT DE SECURITE THERMOSTATO DE SEGURIDAD		
HLBT	LAMPADA DI BLOCCO TERMICO THERMAL LOCK-OUT LAMP LAMPE DE THERMAL DE SECURITE ESPIA DE BLOQUEO RELE TERMICO		
SAMA	COMUTATORE MANUALE-AUTOMATICO SWITCH (MANUAL-AUTOMATIC) THERMOSTAT MANUEL-AUTOMATIQUE COMUTADOR MANUAL-AUTOMATICO		
STAB	THERMOSTATO DI ALTA-BASSA FIAMMA HIGH-LOW FLAME THERMOSTAT THERMOSTAT GRANDE-PETITE FLAMME THERMOSTATO DE ALTA-BASSA LLAMA		
YWG-U	SOLINOIDE CHIUSURA UGELLO OIL SHUT-OFF SOLENOID		

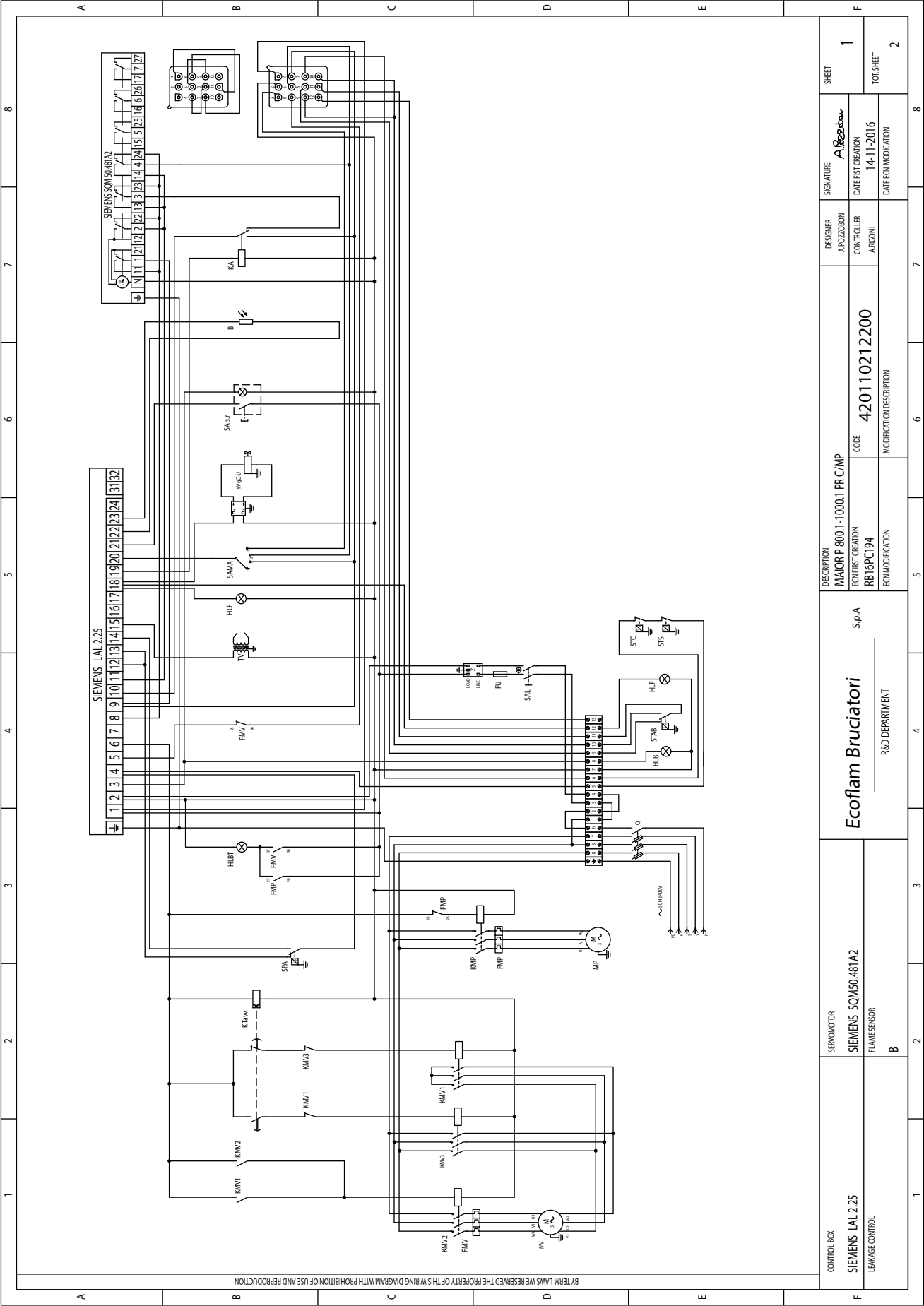
BY TERM LAMS WE RESERVE THE PROPERTY OF THIS WIRING DIAGRAM WITH PROHIBITION OF USE AND REPRODUCTION															
LANDIS SOM 50 481 A2															
(0°) I: CAMMA DI REGOLAZIONE ARIA DI MASSIMA (15°) II: CAMMA DI CHIUSURA TOTALE (30°) III: CAMMA DI REGOLAZIONE ARIA DI ACCENSIONE (0°) IV: CAMMA DI REGOLAZIONE ARIA DI BASSA (0°) V: CAMMA NON UTILIZZATA (0°) VI: CAMMA NON UTILIZZATA (0°) VII: CAMMA NON UTILIZZATA (0°) VIII: CAMMA NON UTILIZZATA															

(1) I: CAMMA DI REGOLAZIONE ARIA DI MASSIMA
(1S) I: CAMMA DI CHIUSURA TOTALE
(1P) I: CAMMA DI REGOLAZIONE ARIA DI ACCENSIONE
(1P) I: CAMMA DI REGOLAZIONE ARIA DI BASSA
(1P) I: CAMMA NON UTILIZZATA
(1P) I: CAMMA NON UTILIZZATA
(1P) VII: CAMMA NON UTILIZZATA
(1P) VIII: CAMMA NON UTILIZZATA



APPENDIX

Electrical diagrams



APPENDIX

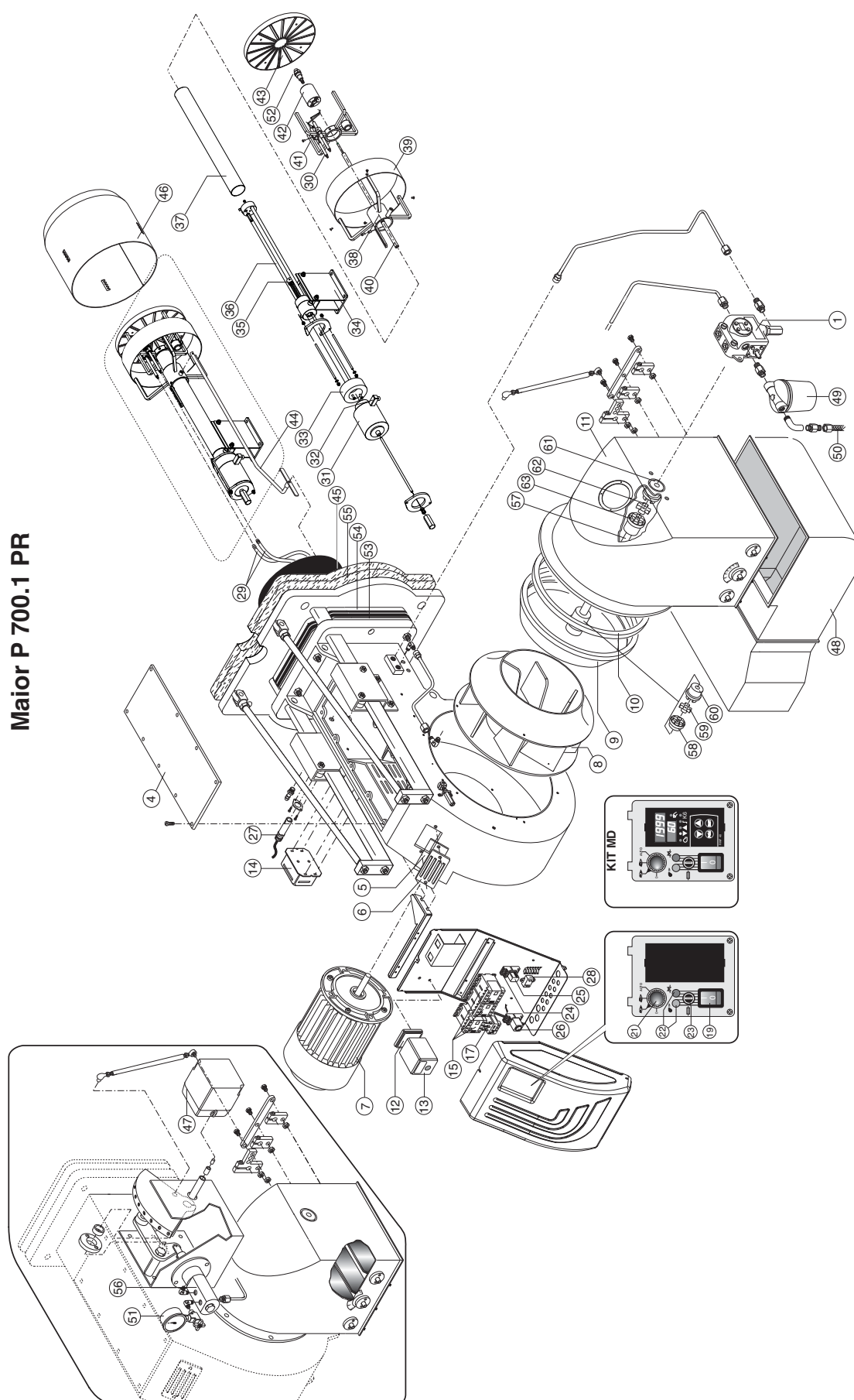
Electrical diagrams

		1	2	3	4	5	6	7	8
A	Q	INTERRUTTORE GENERALE CONFUSIBILE MAIN SWITCH WITH FUSE INTERRUPTEUR GENERAL AVEC FUSIBLE INTERRUPTOR GENERAL CONFUSIBLE	STAB	TERMOSTATO DI ALTA-BASSA FIAMMA HIGH-LOW FLAME THERMOSTAT THERMOSTAT GRANDE-PETITE ALLURE THERMOSTATO DE ALTA-BAJA LLAMA					
	Z	FILTRO ANTIDUSTURBO ANTI-JAMMING FILTER FILTRO DE PROTECCION ANTIDUSTURBO	YWG-U	SOLENOIDE CHIUSURA UGELLO OIL SHUT-OFF SOLENOID					
	FU	FUSIBILE FUSE FUSIBLE FUSIBLE	HLF	LAMPADA DI FUNZIONAMENTO WORKING LAMP LAMPE DE FONCTIONNEMENT ESPALE DE FONCTIONNEMENT					
	MV	MOTORE VENTILATORE MOTOR FAN MOTEUR VENTILATEUR MOTOR VENTILADOR	KA	RELE' RELAY RELAIS RELE'					
	TV	TRASFORMATORE IGNITION TRANSFORMER TRANSFORMATEUR D'ALLUMAGE TRANSFORMADOR	KTBY	TEMPORIZZ. ELETTR. AVVIA/M. STELLA TRIANGOLO ELECTRONIC TIMER WITH STAR DELTA STARTER TEMPORIZADOR ELECTRONICO PREPARADO PARA TEMPORIZADOR ELECTRONICO PREPARADO PARA					
	B	FOTORESISTENZA PHOTO-RESISTOR FOTORESISTENCIA	SA 5.1	PULSANTE DI SBLOCCO APPARECCHIATURA RESET LOCK-OUT BUTTON BOITON DE DBLOCCAGE DU COFFRE DE SECURITE REANIME DE LA CENTRALITA					
	FW	RELE TERMICO MOTORE VENTILATORE MOTOR THERMAL RELAY (FAN MOTOR) RELAIS THERMIQUE MOTEUR VENTILATEUR RELE TERMICO MOTOR VENTILADOR	KMP	CONVATORE MOTORE POMPA PUMP REMOTE CONTROL SWITCH CONTACTEUR MOTEUR POMPE EMPALME MOTOR BOMBA					
	HLB	LAMPADA DI BLOCCO LOCK-OUT LAMP LAMPE DE SECURITE ESPA DE BLOQUEO	FMP	RELE TERMICO MOTORE POMPA MOTOR PUMP THERMAL RELAY RELAIS THERMIQUE MOTEUR POMPE RELE TERMICO MOTOR BOMBA					
	KW1	CONVATORE DI STELLA STAR CONTACTOR CONTACTEUR DETOILE CONVATORE DI STELLA	SRA	PRESSOSTATO ARIA AIR PRESSURE SWITCH PRESSOSTAT AIR PRESSOSTATO AIRE					
	KW2	CONVATORE MOTORE VENTILATORE REMOTE CONTROL SWITCH (FAN MOTOR) CONTACTEUR MOTEUR VENTILATEUR TELEINTERRUPTOR MOTOR VENTILADOR							
	KW3	CONVATORE DI TRIANGOLO DELTA CONTACTOR CONTACTEUR TRIANGLE CONVATORE DI TRIANGOLO							
	SAL	INTERRUTTORE DI LINEA WORKING SWITCH INTERRUPTEUR DE LIGNE INTERRUPTOR DE LINEA							
	STC	TERMOSTATO CALDAIA BOILER THERMOSTAT THERMOSTAT CHAUDIERE TERMOSTATO CALDERA							
	STS	TERMOSTATO DI SICUREZZA SAFETY THERMOSTAT THERMOSTAT DE SECURITE THERMOSTATO DE SEGURIDAD							
	HLBT	LAMPADA DI BLOCCO TERMICO THERMAL LOCK-OUT LAMP LAMPE DE THERMAL DE SECURITE ESPA DE BLOQUEO RELE TERMICO							
	SAMA	COMBUTTORE MANUALE-AUTOMATICO SWITCH (MANUAL-AUTOMATIC) INTERRUPTEUR MANUEL-AUTOMATIQUE COMBUTADOR MANUAL-AUTOMATICO							

APPENDIX

Spare parts

Maior P 700.1 PR



APPENDIX

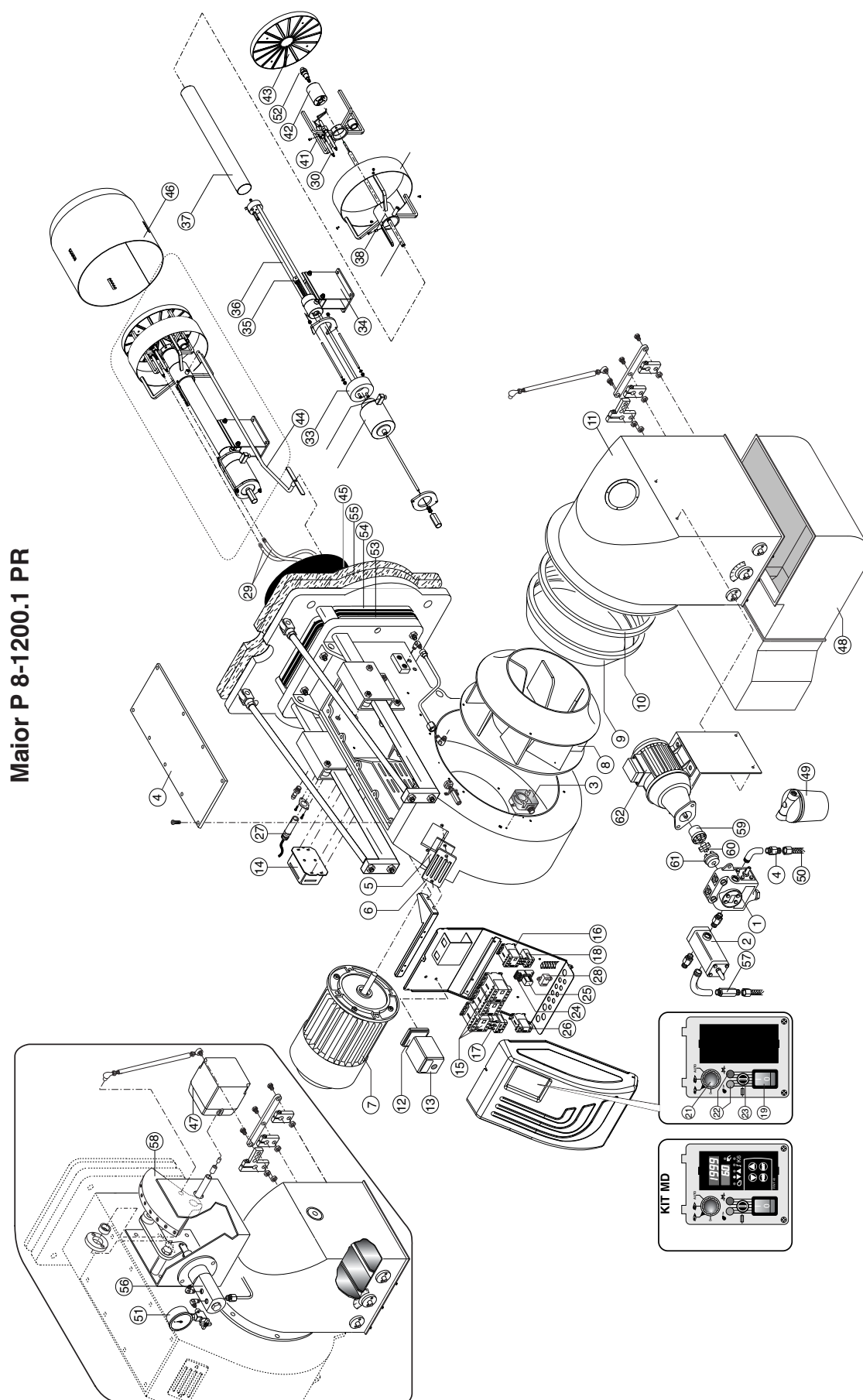
Spare parts list

N°	DESCRIPTION		Maior P 700.1 PR code
1	OIL PUMP	SUNTEC TA5C30106	65322993
2	COIL		-
3	OIL VALVE		-
4	NIPPLE		65324059
5	GLASS		65320487
6	PEEP WINDOW FRAME		65320488
7	MOTOR	15 KW	65325246
8	FAN	GF560R ~530	65325905
9	AIR CONVEYOR		65320648
10	CONVEYOR RING		65320646
11	AIR INTAKE		65324065
12	CONTROL BOX BASE	SIEMENS	65320097
13	CONTROL BOX	SIEMENS LAL1.25 TV22"	65320052
14	IGNITION TRANSFORMER	BRAHMA T8	65323222
15	REMOTE CONTROL SWITCH	AEG LS18K.00	65323137
16	REMOTE CONTROL SWITCH (PUMP)		-
17	MOTOR THERMAL RELAY	AEG B18K-320 25-32A	65324428
18	MOTOR THERMAL RELAY (PUMP)		-
19	MAIN SELECTOR	cod.4010011509	65323064
20	RESET BUTTON	C5559AL	65324068
21	SELECTOR		65323067
22	LAMP	Elettrospring EL/N-SC4	65322053
23	FUSE SUPPORT	FUSIT FH-B528	65322181
24	RELAY BASE	Finder 5532	65323149
25	RELAY	Finder 5532	65323139
26	TIMER		-
27	PHOTORESISTOR	QRB1A-A050B70A	65320076
28	ANTI JAMMING FILTER		65323170
29	IGNITION CABLE	TL	65320948
30	IGNITION ELECTRODES SET		65325004
31	COIL	EL011	65323809
32	CONNECTOR WITH RECTIFIER	EL011	65323571
33	RING		65321721
34	HEAD SUPPORT		65324574
35	SPRING HOLDER		65321720
36	FIRING HEAD	TL	65324575
37	PIPE	TL	65324576
38	HOLDER WAISTBAND		65324577
39	WAISTBAND		65324578
40	ROD NOZZLE HOLDER	TL	65324476
41	DISC SUPPORT		65320697
42	NOZZLE HOLDER		65320709
43	FRONT DISC		65320788
44	ROD FIRING HEAD	TL	65324580
45	BLAST TUBE	TL	65324581
46	BLAST TUBE END		65320462
47	AIR DAMPER MOTOR	SIEMENS SQM50.481A2	65322902
48	SILENCER		65324071
49	OIL FILTER	70501/03	65324103
50	HOSES	25X1500	65323181
51	MANOMETER	CEWAL R1/4 D50-40BAR	65324105
52	NOZZLE		
53	GASKET		65321137
54	GASKET		65321138
55	GASKET		65321139
56	ADJUSTMENT OF OIL PRESSURE		65322351
57	ROD		65321468
58	COUPLING (FAN)		65321792
59	UNION (PUMP)		65321786
60	COUPLING		65321782
61	COUPLING (PUMP)		65325219
62	UNION (FAN)		65321791
63	COUPLING		65321790

TC = SHORT HEAD TL = LONG HEAD

APPENDIX

Spare parts



APPENDIX

Spare parts list

N°	DESCRIPTION		Maio P 1000.1 PR code
1	OIL PUMP	SUNTEC T5C107	65322998
2	OIL VALVE	SUNTEC TV40011	65322995
3	AIR PRESSURE SWITCH	LGW 3 A4 (0,4-3 MBAR)	65323039
4	NIPPLE		65324059
5	GLASS		65320487
6	PEEP WINDOW FRAME		65320488
7	MOTOR	22 KW	65326336
8	FAN	GR630R Ø600	65325907
9	AIR CONVEYOR		65320647
10	CONVEYOR RING		65320646
11	AIR INTAKE		65324065
12	CONTROL BOX BASE	SIEMENS	65320097
13	CONTROL BOX	SIEMENS LAL1.25 TV22"	65320052
14	IGNITION TRANSFORMER	BRAHMA T8	65323222
15	REMOTE CONTROL SWITCH	AEG LS15K.00	65323136
		AEG LS11K.00	65323135
16	REMOTE CONTROL SWITCH (PUMP)	AEG LS7K.10	65324097
17	MOTOR THERMAL RELAY	AEG B18K-320 25-32A	65324428
18	MOTOR THERMAL RELAY (PUMP)	AEG 8-12A B18K-120	65323119
19	MAIN SELECTOR	cod.401001509	65323064
20	RESET BUTTON	C5559AL	65324068
21	SELECTOR		65323067
22	LAMP	Elettrospring EL/N-SC4	65322053
23	FUSE SUPPORT	FUSIT FH-B528	65322181
24	RELAY BASE	Finder 5532	65323149
25	RELAY	Finder 5532	65323139
26	TIMER		65324073
27	PHOTORESISTOR	QRB1A-A050B70A	65320076
28	ANTIJAMMING FILTER		65323170
29	IGNITION CABLE	TC	65320947
30	IGNITION ELECTRODES SET		65325004
31	COIL	EL011	65323809
32	CONNECTOR WITH RECTIFIER	EL011	65323571
33	RING		65321721
34	HEAD SUPPORT		65324574
35	SPRING HOLDER		65321720
36	FIRING HEAD	TC	65324673
37	PIPE	TC	65324267
38	HOLDER WAISTBAND		65324577
39	WAISTBAND		65324578
40	ROD NOZZLE HOLDER	TC	65324269
41	DISC SUPPORT		65320697
42	NOZZLE HOLDER		65324890
43	FRONT DISC		65320788
44	ROD FIRING HEAD	TC	65324579
45	BLAST TUBE	TC	65324788
46	BLAST TUBE END		65320461
47	AIR DAMPER MOTOR	SIEMENS SQM50.481A2	65322902
48	SILENCER		65324071
49	OIL FILTER	70501/03	65324103
50	HOSES	25X1500	65323181
51	MANOMETER	CEWAL R1/4 D50-40BAR	65324105
52	NOZZLE		
53	GASKET		65321137
54	GASKET		65324983
55	GASKET		65321139
56	ADJUSTMENT OF OIL PRESSURE		65322351
57	CHECK VALVE	ART. FZVR1	65325066
58	OIL CAM GROUP		65322356
59	MOTOR COUPLING		65324479
60	COUPLING		65321791
61	PUMP COUPLING		65324364
62	PUMP MOTOR	5,5KW	65325344

TC = SHORT HEAD TL = LONG HEAD

Lined area for notes or drawing.



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