

MAIOR P 500.1 PR  
MAIOR P 600.1 PR



**Technical data**



**Operating instructions**



**Electric diagrams**



**Spare parts list**



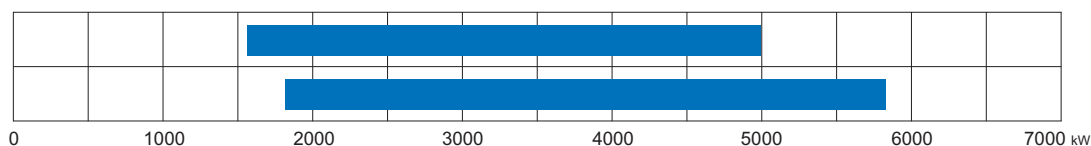
420010467100

MAIOR P 500.1 PR TC 230-400-50	3121049
MAIOR P 500.1 PR TL 230-400-50	3121050
MAIOR P 600.1 PR TC 230-400-50	3121051
MAIOR P 600.1 PR TL 230-400-50	3121052

## INDEX

MAIOR P 500.1

MAIOR P 600.1



<b>General warnings - Conformity declaration</b>	3
<b>Burner designation - Modular delivery system</b>	4
<b>Burner description</b>	5
Electrical control panel	5
<b>Technical data</b>	6
<b>Working fields</b>	7
<b>Test boiler - Flame dimension</b>	7
<b>Overall dimensions</b>	8
<b>Oil operating mode - General safety functions</b>	9
<b>Installation</b>	10
Fitting the burner to the boiler	10
Oil connection	11
Feeding and suction line for light oil	12
Electrical connections	13
<b>Start-up: checking procedure</b>	14
<b>Exhaust gas test</b>	15
<b>Start-up oil side</b>	16
Fuel selection - Start-up	16
Adjusting the max air flow rate	16
Firing head setting	16
Adjusting the max oil flow rate	17
Servomotor SQM50 - Air damper motor pre-setting	17
Adjusting the pump pressure	17
Adjusting the intermediate burner capacity	18
Servomotor SQM50 - Oil side final setting	18
<b>Maintenance program</b>	19
<b>Troubleshooting instructions</b>	20
<b>Operating troubles</b>	21
<b>Appendix</b>	22
Control box - Damper actuators	23
Fluidics nozzle chart	24
Bergonzo nozzle tables	25
Pump and pressure regulators	27
Electrical diagrams	28
Spare parts list	30

## 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 dual fuel burners

We,  
**Ecoflam Bruciatori S.p.A.**

declare under our sole responsibility that the products:

**MAIOR P 500.1 PR**  
**MAIOR P 600.1 PR**

conform to the following standards:  
EN 267: 2010  
EN 60335-1: 2008  
EN 60335-2-30: 2006  
EN 60335-2-102: 2007  
EN 55014-1: 2008 + A1: 2009  
EN 55014-2: 1998 + A1: 2001 + A2: 2008

These products are built in accordance with the following directives  
2006/42/EC Machinery directive  
2004/108/EC EMC directive  
2006/95/EC Low voltage directive

CE certification, when required, must be done at installation site by the end user

Resana, 20th December 2010  
M. PANIZZON



**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 (&lt;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

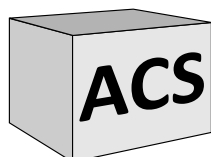
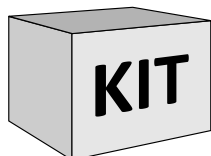
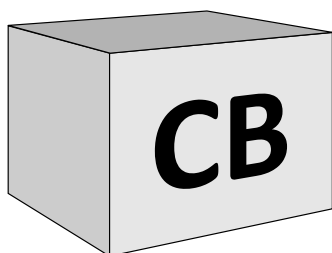
BIODIESEL Biodiesel

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.

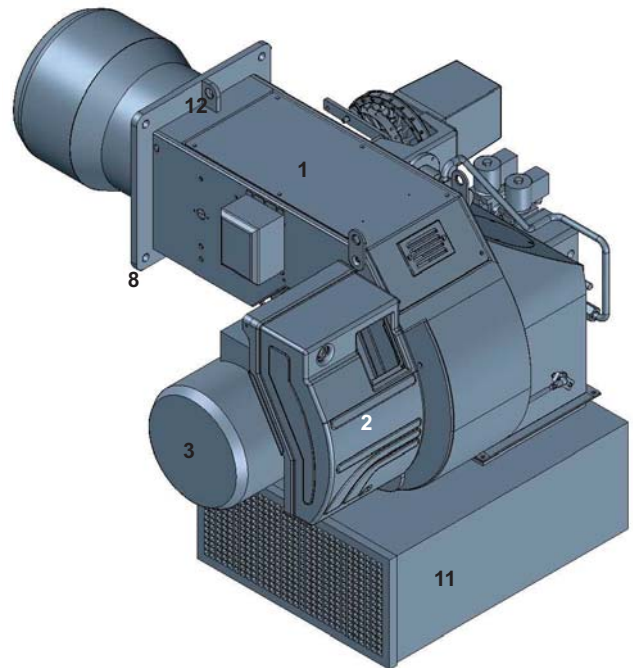
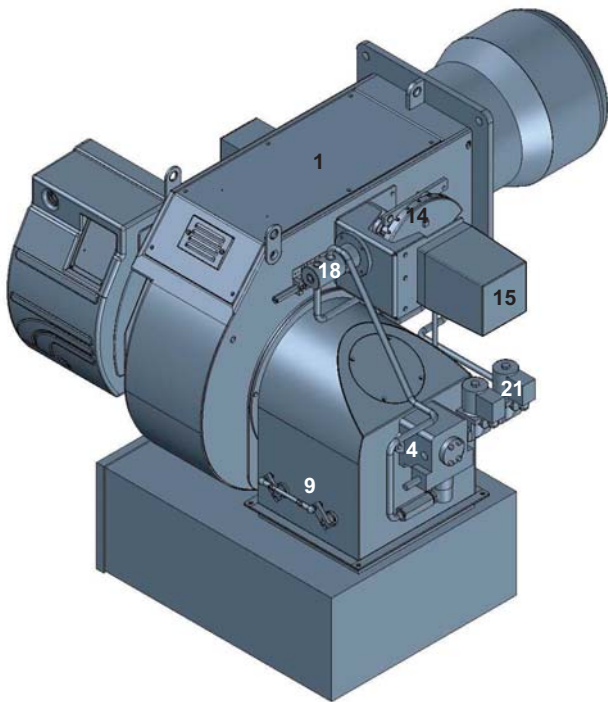
## KITS - Accessories

Kits and accessories are managed and delivered separately.

## Component type

CB	Complete burner
KIT	Kits
ACS	Accessories

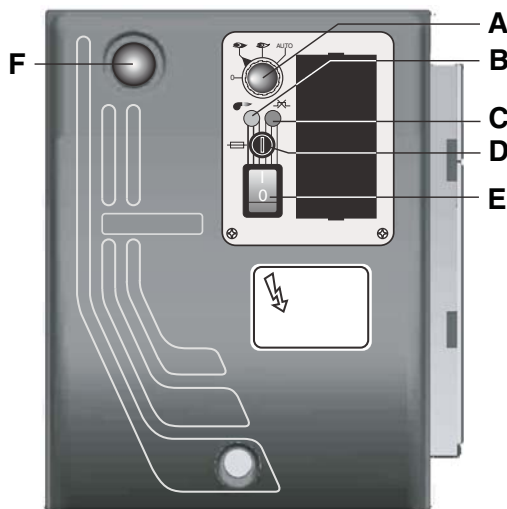
## BURNER DESCRIPTION



### LEGENDA

- |                             |                            |
|-----------------------------|----------------------------|
| 1. Housing                  | 12. Lifting eyebolts       |
| 2. Electrical control panel | 14. Mechanical cam oil     |
| 3. Blower motor             | 15. Servomotor             |
| 4. Pump                     | 18. Oil pressure regulator |
| 6. Blast tube               | 21. Oil coil               |
| 8. Burner fixing flange     |                            |
| 9. Air flap regulation      |                            |
| 11. Silencer                |                            |

### Control panel

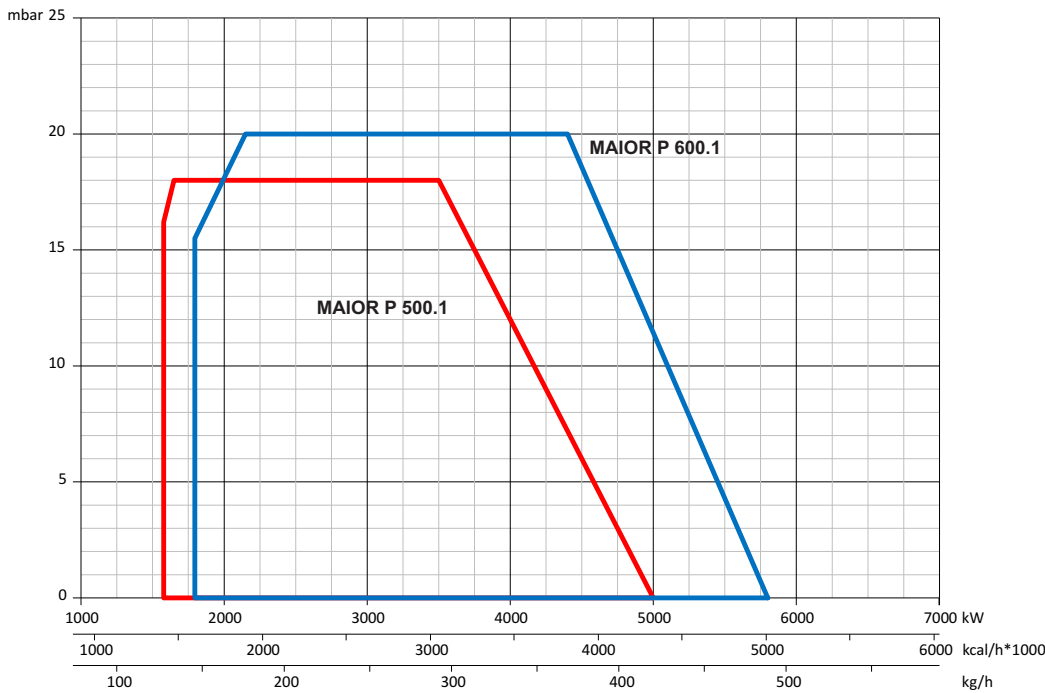


- A - selector :
  - 0 = operating elements locked in an intermediate position
  - 1 = operation on maximum capacity
  - 2 = operation on minimum capacity
  - 3 = automatic operation
- B - working lamp
- C - thermal lock-out lamp
- D - fuse
- E - main switch I / O
- F - reset key

## TECHNICAL DATA

MODEL		MAIOR P 500.1	MAIOR P 600.1
Thermal power max.	kW	5.000	5.800
	kcal/h	4.300.000	4.988.000
	kg/h	422	489
Thermal power min.	kW	1.200	1.500
	kcal/h	1.032.000	1.290.000
	kg/h	101	126
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 control with servomotor	Model	SQM50	
Flame monitoring	Type	photoresistor	
Ignitier	Model	BRAHMA	
Motor	kW	11	15
Rpm	N°	2.800	2.800
Voltage	V/Hz	230/400 V - 50 Hz	
Total power consumption operation	W	12.000	16.500
Weight body BBCH	Kg		
Electrical panel protection level	IP	IP40	IP40
Sound pressure level without silencer	dB(A) Lab tests	91,1	92,8
Sound pressure level with silencer		85,7	86,7
Ambient temperature storage	Min/Max	-20°...+70° C	
Ambient temperature use		-10°...+60° C	
Oil pump	Model	TA3	TA4
Oil pump motor	kW	0,74 kW	1,1 kW
Nozzles	Type	according to the output requested	

## WORKING FIELDS



Calculation of burner output  
 $Q_F$  = Burner output (kW)  
 $Q_N$  = Rated boiler output(kW)  
 $\eta$  = Boiler efficiency (%)

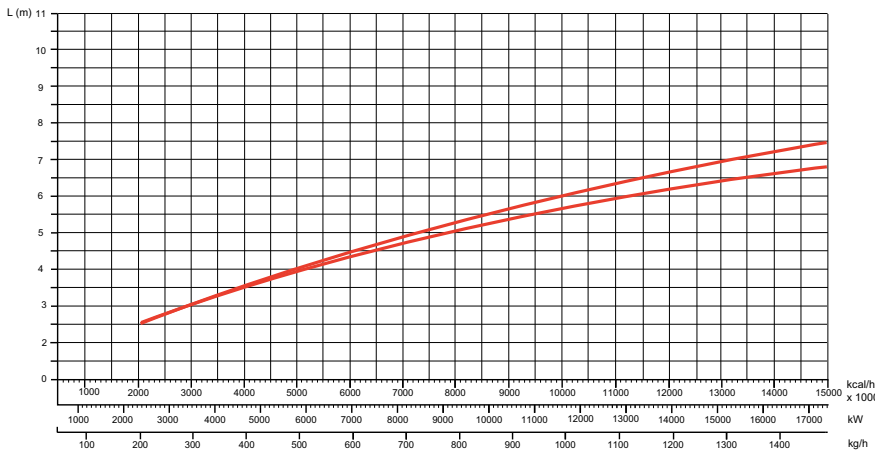
$$Q_F = \frac{Q_N}{\eta} \times 100$$

### Working fields

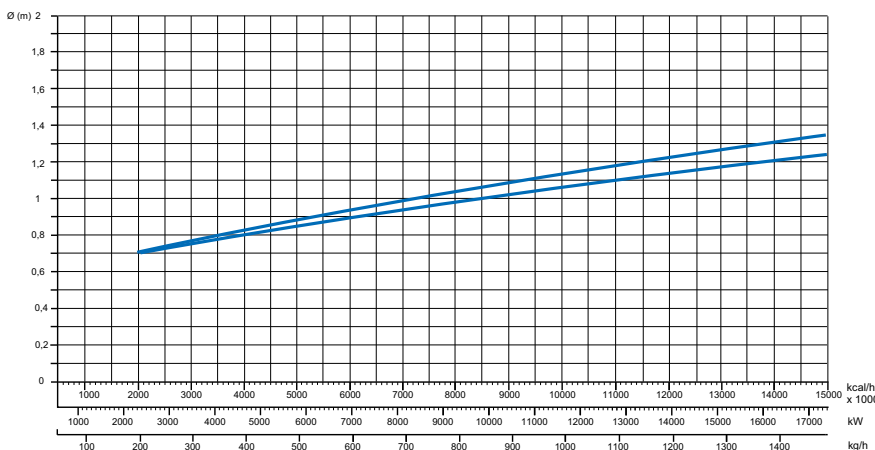
The working field shows burner output as a function of combustion chamber pressure. It corresponds to the maximum values specified by EN 276 measured at the test fire tube. Boiler efficiency should be taken into consideration when selecting the burner.

## TEST BOILER - FLAME DIMENSIONS

FLAME LENGTH LIGHT OIL BURNERS



FLAME DIAMETER 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.

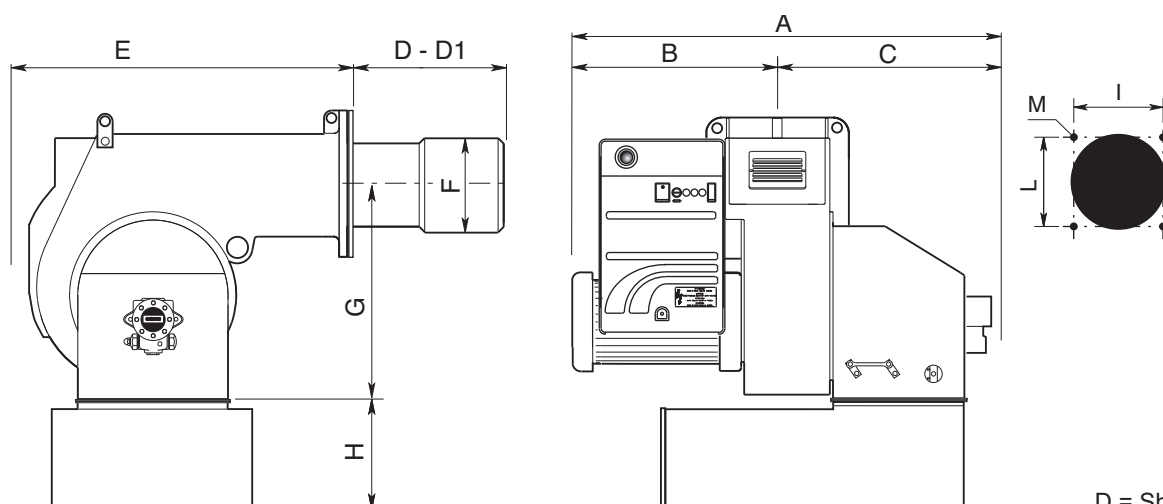
The dimensions of the flame are made in test boiler in laboratory without resistance therefore exists max and min length that take into account the difference in length that comes from the boiler backpressure.

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



D = Short head  
D1= Long head

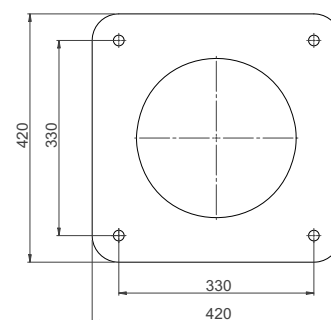
Dimensions (mm)

	A	B	C	D	D1	E	F	G	H1	I	L	M
MAIOR P 500.1	1180	535	645	355	555	970	320	570	965	330	330	M16
MAIOR P 600.1	1190	545	645	355	555	970	320	570	965	330	330	M16

## Burner-boiler mounting flange

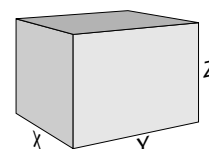
Fixing hole dimensions are "I" and "L" as per dimension table.  
Boiler hole shall be done according to the blast tube dimension "F" plus 15-25 mm in order to be able to extract it during maintenance.

**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)

	X	Y	Z	kg
MAIOR P 500.1 PR	1575	1575	1040	
MAIOR P 600.1 PR	1575	1575	1040	





## 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.

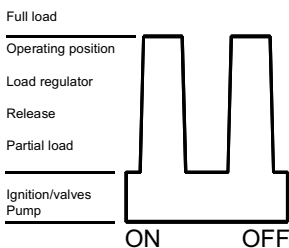
The stepless control will allow the burner to be operated at any desired stage between its partial-load and full-load

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.

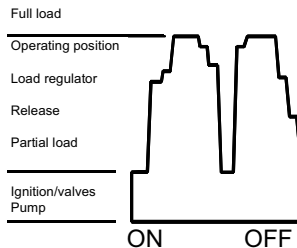
The interior cooling losses will be greatly minimized.

### 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

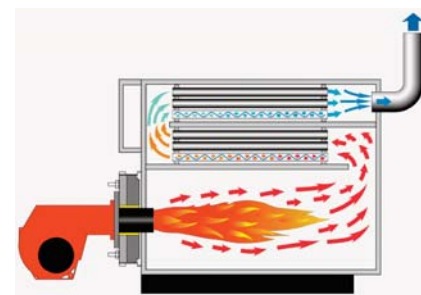
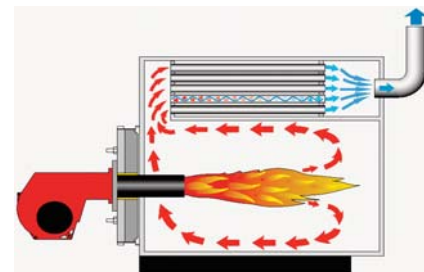
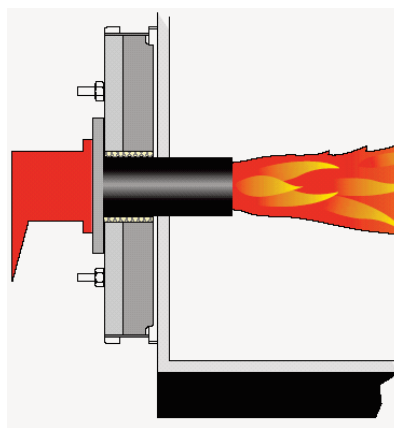
### Fitting the burner to the boiler



**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.

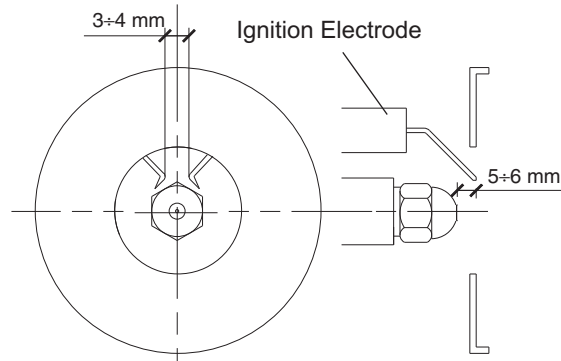


### BURNER LINING

#### 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



### MAIN SWITCH

0 - OFF

1 - ON



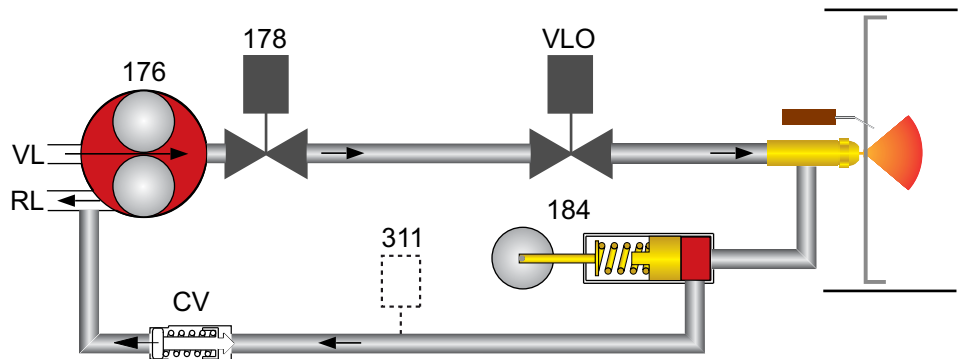
## INSTALLATION

### 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
- 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

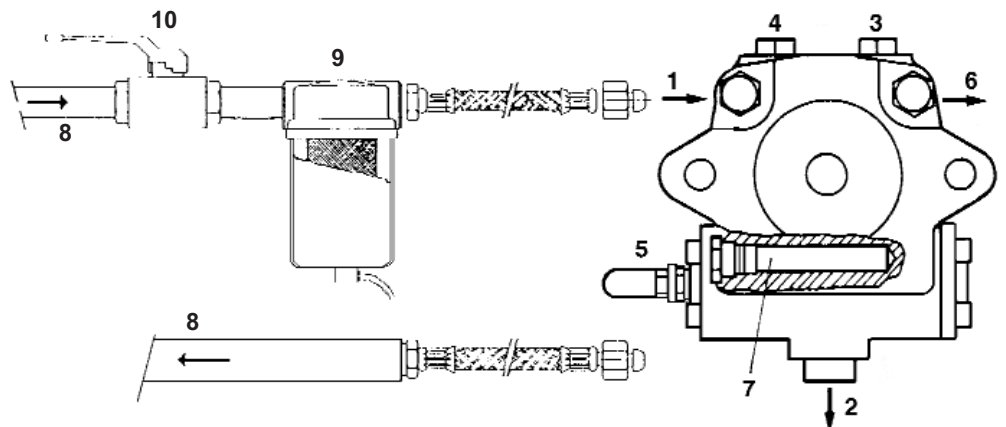
A filter must be installed upstream of the pump to protect the oil pressure pump and the hydraulic system.

#### 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



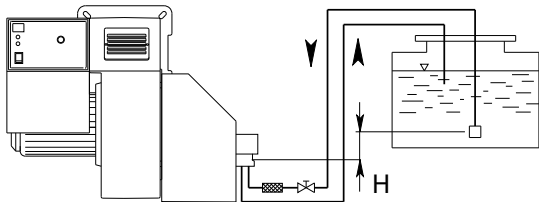
**!** **WARNING:** Check that the pump rotation is correct and before start up it has been pre-filled

## INSTALLATION

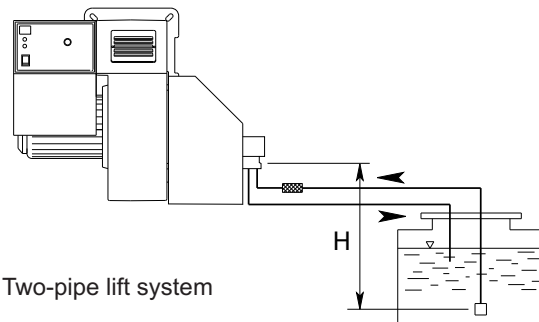
### Feeding and suction line for light oil

#### 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)				
	TA3			TA4	
	ø 14 mm	ø 16 mm	ø 20 mm	ø 20 mm	ø 30 mm
3	10	32	115	65	150
2,5	8	28	110	60	150
2	7	25	100	55	150
1,5	6	22	95	50	150
1	5	20	85	45	150
0,5	--	17	75	40	150
0	--	15	65	35	150
-0,5	--	10	55	28	150
-1	--	5	45	22	150
-1,5	--	--	37	12	150
-2	--	--	30	7	150
-2,5	--	--	22	--	150
-3	--	--	9	--	123
-3,5	--	--	--	--	78
-4	--	--	--	--	38

**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.

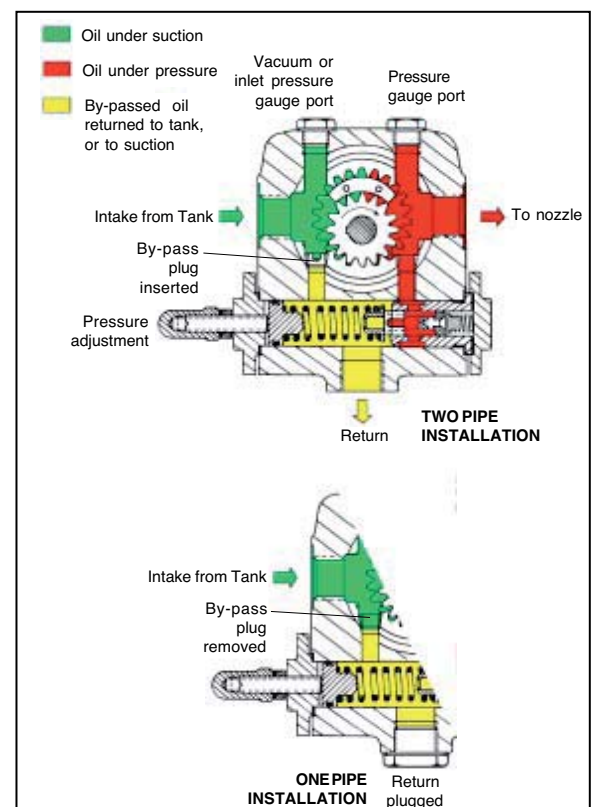
#### NOZZLE SELECTION

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



## INSTALLATION

### Electrical connections

**!** **WARNING:** Electrical wiring must be carried out with electrical supply disconnected and with burner switch in position OFF. Electrical supply must correspond to the one shown on the burner label.

#### APPLICABLE STANDARD

The electrical connection work comprising all the installation materials, terminals and earth connections must be carried out in accordance with the applicable regulations. For the electrical installation of the burner care must be taken to observe the circuit diagram made out for the furnace system. The electrical connection of the burner and instruments shall be entrusted to authorized specialists only.

**NOTE:** For the installation of the connection cables care must be taken to provide cable loops of sufficient length to allow for the swing-out of the boiler door and burner.

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:

All applicable electrical safety regulations must be followed. Failure to correctly dimension the suitable input power and earth the equipment may cause damages to person and compromise the correct function of the burner therefore the electrical system shall be checked by qualified personnel.

The manufacturer declines all responsibility for modifications or connections different from those shown in the electrical scheme.

Adapters, multiple plugs and extension cables may not be used for the equipment's power supply.

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

#### ELECTRICAL CONNECTION

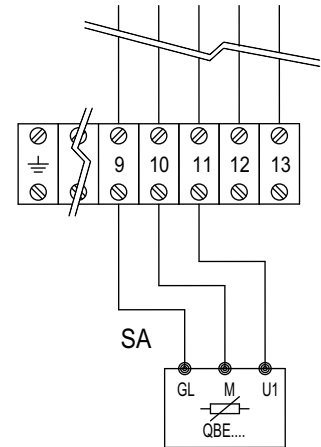
##### 1) of the burner

- 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.

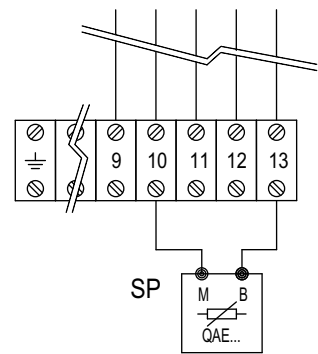
**ATTENTION:** Wiring is not supplied.

#### PROBES CONNECTION

##### ACTIVE PROBE CONNECTION (FOR MODULATING VERSION)

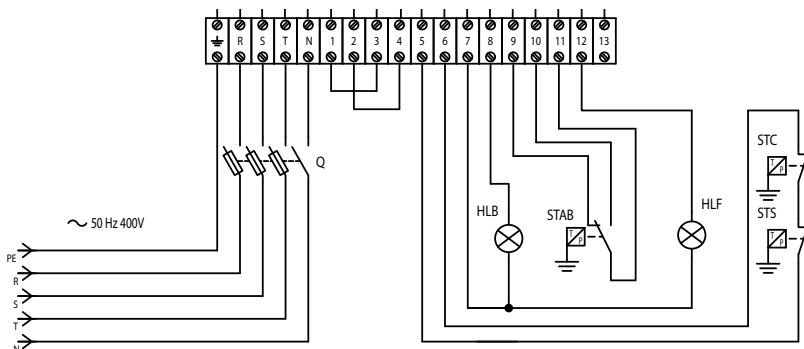


##### PASSIVE PROBE CONNECTION (FOR MODULATING VERSION)



#### 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 CO<sub>2</sub> and O<sub>2</sub> 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 (O<sub>2</sub>) content as low as possible and a carbon dioxide (CO<sub>2</sub>) 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

### DETERMINING THE VOLUMETRIC GAS FLOW RATE

The thermal furnace output of a boiler (Q<sub>F</sub>) is the amount of heat supplied with the gas in a unit of time.

When taking the burner into operation the volumetric fuel flow rate should be selected according to the nominal thermal capacity of the boiler.

#### Example:

Nom. thermal output	Q <sub>N</sub>	1000 kW
Boiler efficiency	η <sub>K</sub>	0,88
Calorific value of gas	H <sub>u</sub>	9,1 kWh/m <sup>3</sup>
Gas pressure	p <sub>U</sub>	100 mbar
Barometer reading	p <sub>amb</sub>	980 mbar
Gas temperature relative	t <sub>gas</sub>	15°C
Gas temperature absolute	T	(t <sub>gas</sub> +273)
Standard atmospheric pressure	p <sub>n</sub>	1013 mbar

$$Q_F = \frac{Q_N}{\eta_K} = \frac{1000}{0,88} = 1136 \text{ kW}$$

Volumetric gas flow rate at STP:

$$V_{Bn} = \frac{Q_N}{H_u \cdot \eta_K} = \frac{1000}{9,1 \cdot 0,88} = 125 \text{ m}^3/\text{h}$$

Volumetric gas flow rate in operating condition:

$$V_{BB} = V_{Bn} \frac{T}{273} = \frac{p_n}{p_{amb} + p_u} = 125 \frac{273+15}{273} \frac{1013,25}{980+100} = 123,9 \text{ m}^3/\text{h}$$

### Recommended combustion parameters

Fuel	Recommended (%) CO <sub>2</sub>	Recommended (%) O <sub>2</sub>
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

**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.

Ratio between O<sub>2</sub>- and CO<sub>2</sub>- for natural gas H (CO<sub>2</sub>max = 11,7%)

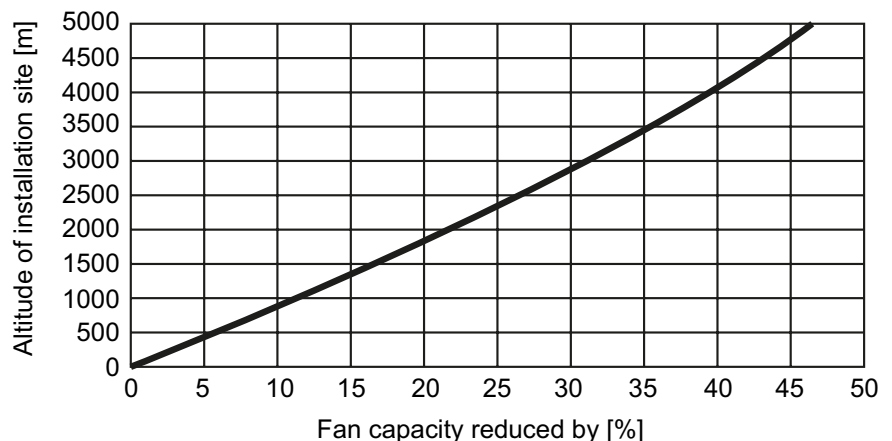
Ratio between O<sub>2</sub>- and CO<sub>2</sub>- for light oil EL (CO<sub>2</sub>max = 15,40%)

Ratio between O<sub>2</sub>- and CO<sub>2</sub>- for heavy oil S (CO<sub>2</sub>max = 15,60%)

$$O_2 = 21 \frac{CO_2\text{max} - CO_2\text{gem}}{CO_2\text{max}} = \%$$

CO<sub>2</sub> gem = % CO<sub>2</sub> measured on dry flue gases

Mean air pressure vs. altitude above sea-level



## START-UP OIL SIDE

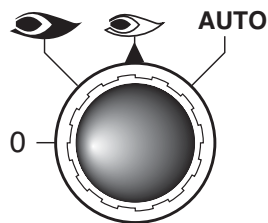
### Fuel selection - Start-up

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

 : operation on maximum capacity

 : operation on minimum capacity

AUTO : automatic operation



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



KMV

### 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.

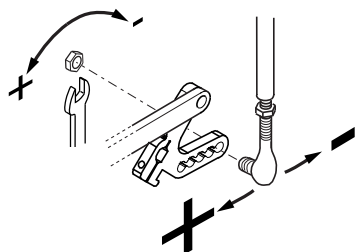
After a few seconds the control box opens the oil valve and starts the flame. After the flame stabilisation the control box drives the servomotor in the low flame.

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

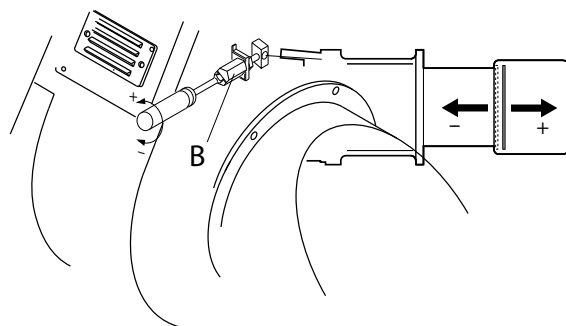
In order to adjust the maximum air flow rate see figure with selector in maximum operation. Loosen the nut holding the air damper transmission rod and correct air flow till you reach the combustion values suggested by reading the value on the combustion analyser. If you do not reach acceptable air flow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





## START-UP OIL SIDE

### 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.

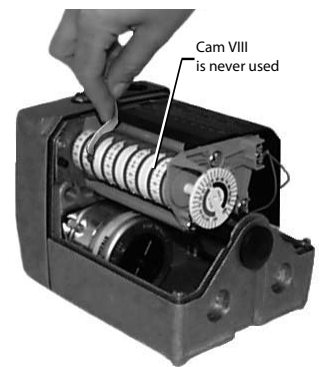
**NOTE:** the pump pressure is set from the factory at the pressure required nozzle pressure required as per table of nozzle selection in appendix. If the output required is different from the one set from the factory the pressure can be adjusted according to the instruction below.

### 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.

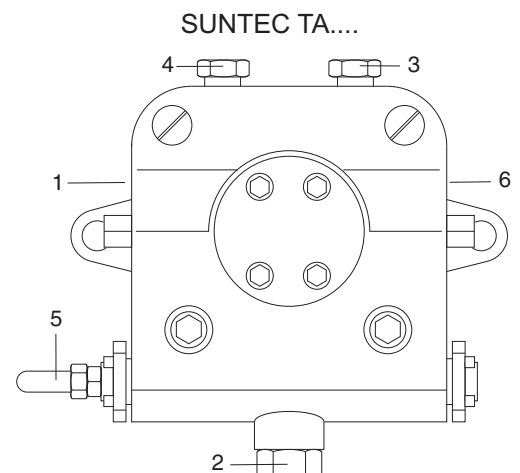
The following setting are the standard one:

- 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.



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

## START-UP OIL SIDE

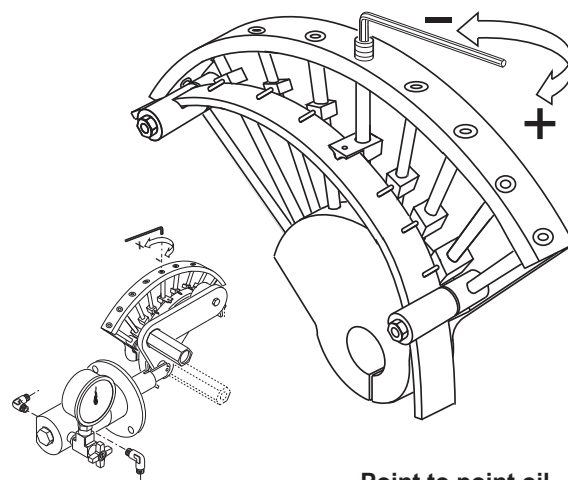
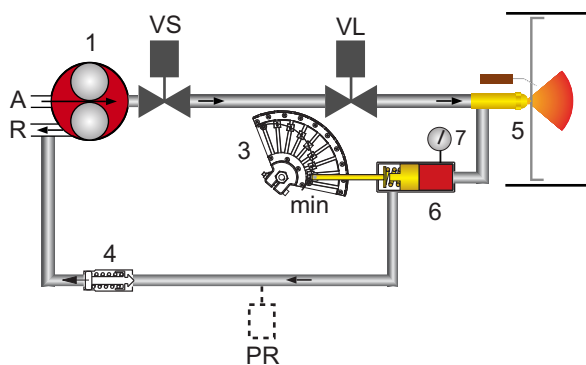
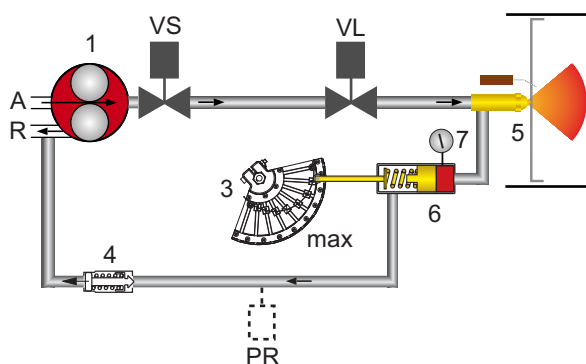
### Adjusting the intermediate burner capacity

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

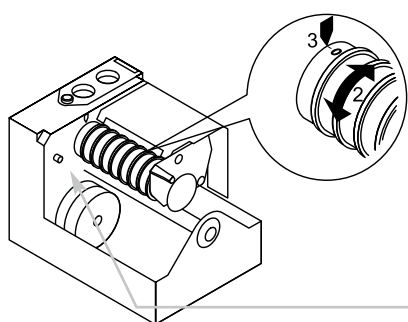


**WARNING:** Once the setting on the oil has been completed make sure that you close the manometer – pressure switch tap.

#### 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

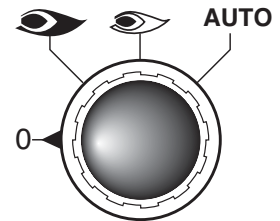


Burner and boiler servicing must only be carried out by authorised qualified personnel at least once a year. Depending on the type of installation, shorter maintenance intervals may be necessary. The system operator is advised to take out a maintenance contract to guarantee regular servicing.  
**WARNING:** 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:  
 CO<sub>2</sub> 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:

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

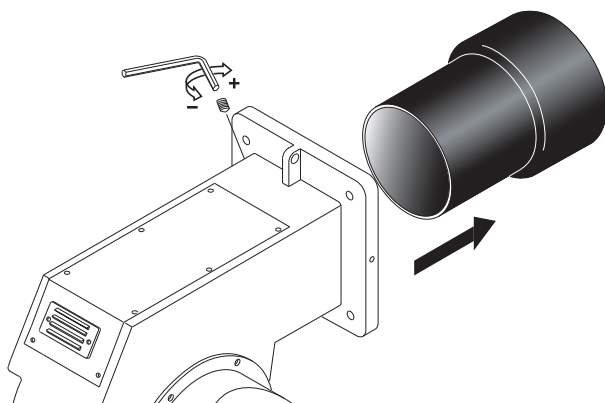
Data measured in fuel oil mode:  
 CO<sub>2</sub> content of exhaust gases: 12,8%  
 Exhaust gas temperature: 195°C  
 Air intake temperature: 22°C

The exhaust gas loss can be calculated as follows:

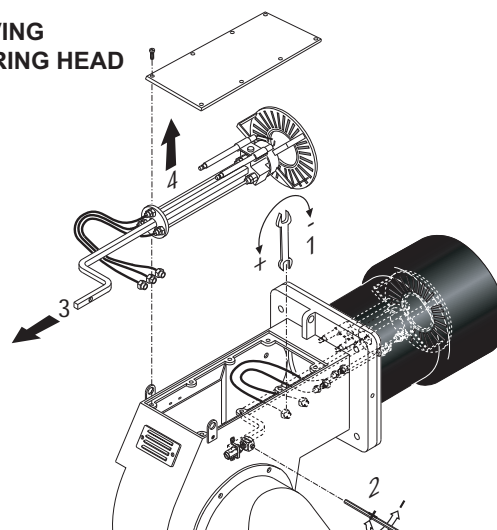
$$q_{Af} = (195-22) \left( \frac{0,49}{12,8} + 0,007 \right) = 7,83\%$$

## MAINTENANCE PROGRAM

### REMOVING THE BLAST TUBE



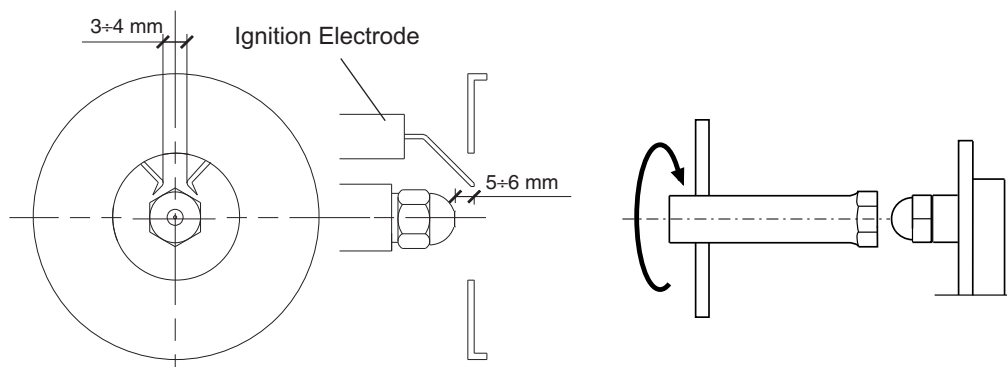
### REMOVING THE FIRING HEAD



### 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 / unprimes / 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													
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:

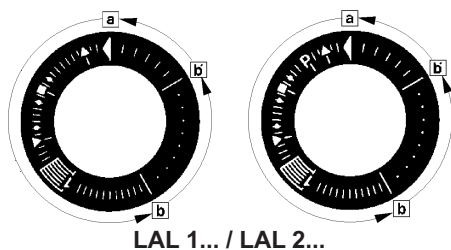
The burner will be found to be out of operation and in faulty and interlocked position. Proceed with searching for the cause of the trouble and eliminate it. Unlock the control box by pressing the fault eliminate key and start the burner.

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...



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.

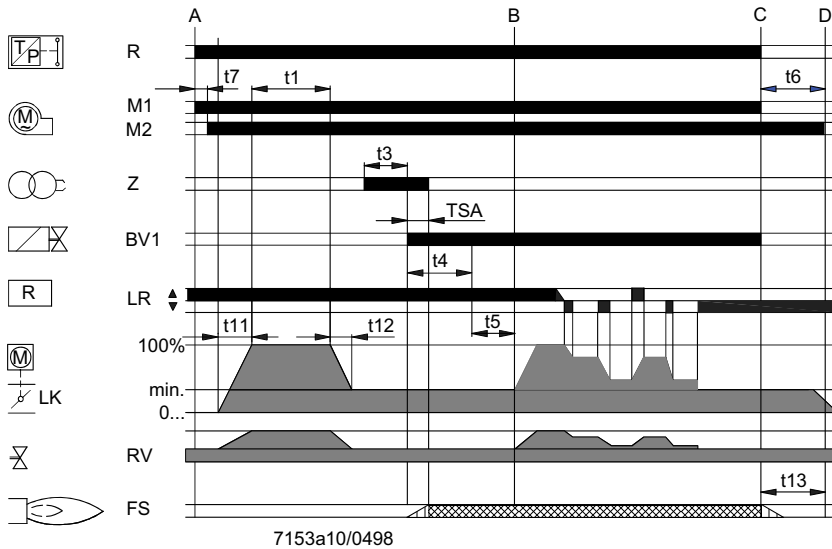
**If the shut-off on trouble occurs at any other time between start and pre-ignition that is not identified by a symbol as above, this will normally be due to an early flame signal which is considered to be a faulty flame signal.**

**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.

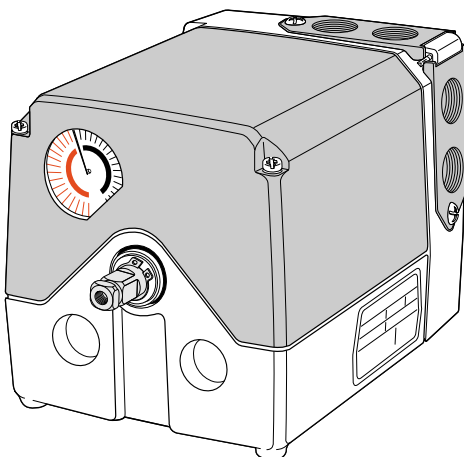
The cam plates are provided with a small pointer for indicating the switching point of a scale between the setting ranges.

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



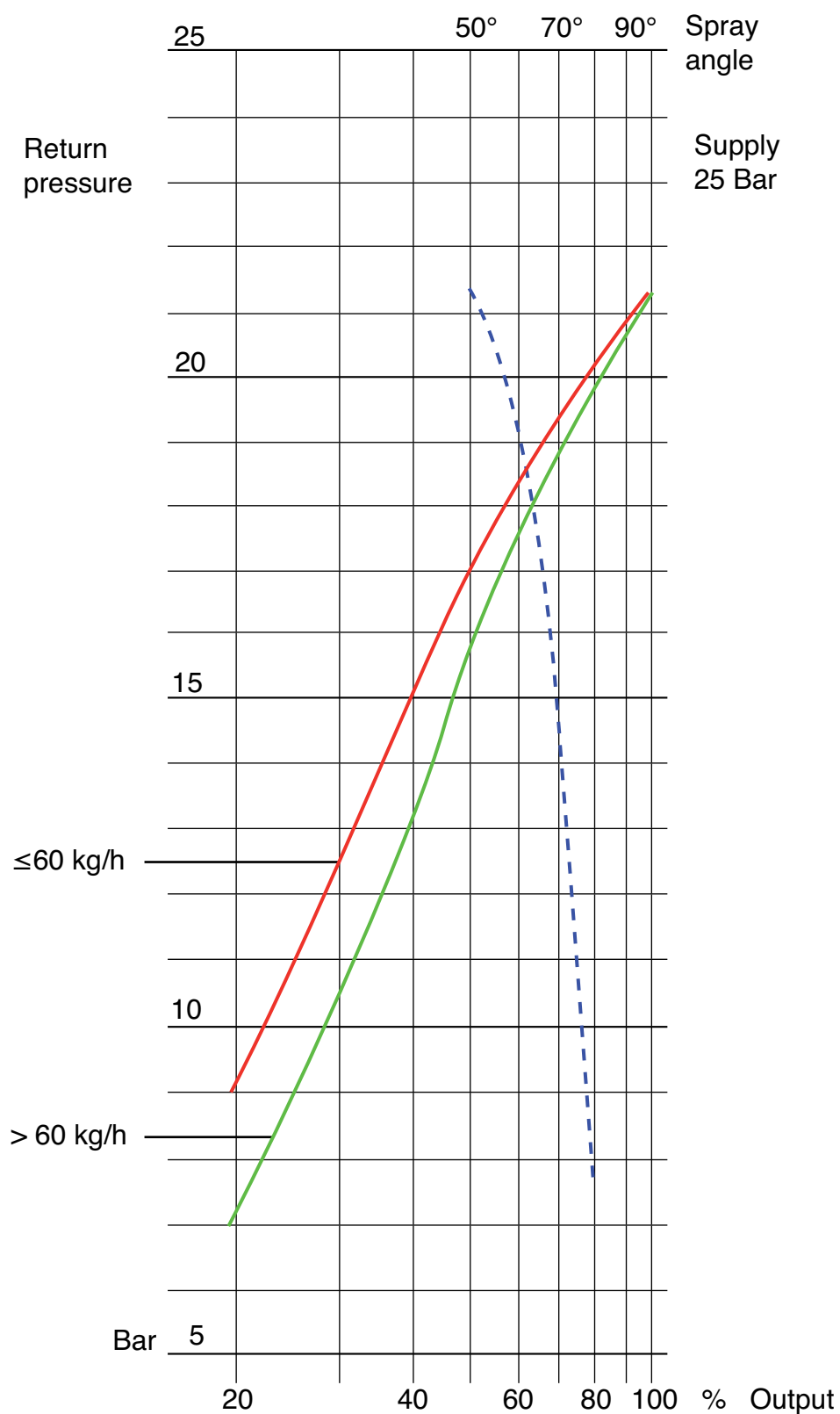
**RETURN NOZZLE**

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).





## APPENDIX

### Bergonzo nozzle tables

Return pressure [bar]

GPH	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	
100	A	20	20	22	23	24	25	27	30	32	35	38	40	44	48	52	60	70	90										
100	B	20	250	248	245	238	230	225	215	200	185	175	160	150	140	128	115	100	90										
100	A	25	22	23	24	25	25	26	28	30	32	33	35	37	40	42	45	48	52	55	62	75	90						
100	B	25	290	288	286	284	280	275	265	255	248	240	225	215	200	190	175	165	150	140	125	110							
100	A	30	23	24	25	25	26	27	28	30	31	32	33	35	37	38	40	42	44	45	48	50	55	60	65	75	90		
100	B	30	300	300	300	300	295	295	288	285	282	280	275	270	265	255	250	240	230	220	200	190	170	165	150	140	130	115	
125	A	20	22	23	25	26	27	29	32	34	37	40	44	50	57	65	77	95											
125	B	20	285	280	275	274	272	271	245	235	220	205	190	175	160	145	130	115											
125	A	25	24	25	26	27	28	29	30	31	32	34	35	37	40	43	45	52	60	68	80	95	115						
125	B	25	330	328	325	320	315	307	300	285	280	275	260	250	235	220	190	180	170	168	150	135							
125	A	30	25	26	26	27	28	28	29	30	31	32	33	35	37	38	42	43	46	50	54	60	65	72	80	90	108	130	
125	B	30	370	365	360	355	350	348	345	340	335	328	320	305	300	290	280	270	260	245	240	225	210	190	180	165	150	130	
150	A	20	30	33	34	35	37	39	43	46	50	55	60	68	75	85	100	120											
150	B	20	325	320	315	308	300	290	285	275	260	250	240	220	190	180	160	140											
150	A	25	32	33	34	35	37	37	38	42	45	47	50	55	60	65	70	78	83	94	110	120	150						
150	B	25	375	370	365	363	358	355	350	345	330	320	310	300	285	275	260	250	240	220	195	180	150						
150	A	30	35	36	36	37	37	37	39	41	42	45	46	48	50	54	58	62	65	70	75	80	88	95	110	120	140	180	
150	B	30	420	420	415	410	405	400	400	395	390	380	375	365	350	345	340	330	320	300	290	280	270	250	240	220	200	180	
175	A	20	35	37	39	42	44	46	48	55	58	68	75	84	95	118	155												
175	B	20	350	349	348	348	330	325	315	300	290	280	265	248	225	195	175	155											
175	A	25	35	36	37	41	42	44	45	47	50	52	58	62	65	70	78	88	95	110	120	140	170						
175	B	25	395	390	385	382	380	378	370	360	350	348	330	325	315	300	280	275	260	240	225	200	170						
175	A	30	42	43	44	45	46	47	48	50	52	55	58	60	62	65	70	72	78	85	90	100	110	118	135	158	190		
175	B	30	440	440	435	430	425	420	415	410	408	400	390	380	370	360	350	330	320	300	285	275	260	250	235	220	200	190	
200	A	20	38	40	42	44	47	50	55	60	65	70	80	90	100	120	140	170											
200	B	20	400	398	388	380	370	360	350	340	330	320	300	280	275	250	230	210											
200	A	25	42	43	44	44	45	47	50	52	55	60	65	70	78	85	95	105	115	130	150	170	220						
200	B	25	450	448	448	445	440	430	425	412	405	400	390	380	375	360	345	325	315	290	280	260	220						
200	A	30	48	49	50	51	52	53	55	56	58	62	64	68	70	75	80	85	92	100	110	120	130	150	175	200			
200	B	30	500	500	495	490	485	480	475	470	460	450	440	430	420	410	395	385	375	350	340	325	315	300	290	275	260		
225	A	20	42	43	45	47	48	52	56	60	65	70	80	90	100	115	140	180											
225	B	20	420	410	405	400	395	380	375	365	350	345	335	320	300	280	265	250											
225	A	25	45	46	47	48	50	52	55	58	60	63	68	73	80	90	98	108	120	140	160	180	225						
225	B	25	475	468	460	455	450	445	445	437	425	410	400	380	375	360	350	340	315	300	280	260	240						
225	A	30	50	50	51	52	52	53	54	55	57	60	62	66	68	75	80	88	94	100	110	120	130	140	155	175	200	240	
225	B	30	510	510	505	505	503	500	495	490	480	460	440	430	420	410	400	390	380	370	360	350	340	325	310	300	285	275	
250	A	20	42	44	46	47	50	55	60	65	70	80	90	100	115	140	160	220											
250	B	20	425	415	408	403	400	380	375	365	350	338	325	300	280	265	250	240											
250	A	25	46	47	49	50	52	55	58	60	63	66	72	78	85	92	100	110	130	140	165	200							
250	B	25	480	475	475	470	465	450	445	440	425	410	400	380	375	355	340	330	310	300	280	275							
250	A	30	52	52	52	53	54	55	58	60	62	65	68	72	78	82	90	95	105	125	135	150	165	180	220	260			
250	B	30	520	515	515	510	510	505	500	490	480	475	460	450	440	430	420	400	380	370	360	350	340	325	310	300	280	280	

A = nozzle output B = pump output

Output [kg/h]

Supply: 25 bar

## APPENDIX

## Bergonzo nozzle tables

Return pressure [bar]

GPH	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	
275	A	20	52	53	55	58	60	63	68	75	80	90	100	115	125	150	170	225											
275	B	20	540	530	520	510	500	490	475	450	440	420	400	375	350	325	300	275											
275	A	25	55	56	57	58	60	64	68	70	75	80	85	95	100	115	125	135	150	170	190	225	265						
275	B	25	600	600	595	590	580	570	560	550	540	525	510	500	480	460	440	425	400	375	350	325	300						
275	A	30	60	61	62	63	64	65	66	67	70	74	78	82	88	95	100	110	118	125	135	150	165	180	200	240	275		
275	B	30	680	675	668	662	658	650	640	630	620	610	600	590	580	565	555	545	525	500	480	460	440	425	400	375	350		
300	A	20	55	58	60	64	65	70	76	85	92	105	118	135	145	175	200	270											
300	B	20	550	535	525	515	500	485	470	450	430	410	380	375	360	330	310	280											
300	A	25	24	25	26	27	28	29	30	31	32	34	35	37	40	43	45	52	60	68	80	95	115						
300	B	25	330	328	325	320	315	307	300	285	280	275	260	250	235	220	190	180	170	168	150	135							
300	A	30	25	26	26	27	28	28	29	30	31	32	33	35	37	38	42	43	46	50	54	60	65	72	80	90	108	130	
300	B	30	370	365	360	355	350	348	345	340	335	328	320	305	300	290	280	270	260	245	240	225	210	190	180	165	150	130	
325	A	20	58	62	65	68	72	78	88	95	110	118	135	150	170	200	240	290											
325	B	20	570	560	550	530	510	500	485	475	450	440	425	400	370	350	330	300											
325	A	25	65	67	69	72	74	75	80	85	90	98	105	115	125	140	160	170	190	225	270	320							
325	B	25	650	643	638	630	628	620	610	600	590	580	565	540	520	500	475	450	425	400	375	350							
325	A	30	68	69	70	71	73	75	78	82	88	92	98	105	110	120	130	140	150	165	180	200	225	250	280	320	360		
325	B	30	720	715	710	705	702	700	700	690	680	670	655	620	610	600	580	570	550	520	500	480	460	440	420	400	380		
350	A	20	64	68	70	75	80	90	98	105	118	130	145	160	180	210	250	310											
350	B	20	620	600	590	580	570	550	530	500	480	460	440	420	400	375	360	340											
350	A	25	68	69	70	75	80	85	90	98	105	112	120	130	145	160	170	190	210	240	270	300	350						
350	B	25	700	700	690	680	670	660	650	630	610	590	580	550	520	500	480	465	450	430	410	380	360						
350	A	30	68	69	70	73	78	82	88	92	98	105	110	120	128	138	145	160	170	190	210	225	250	275	300	350	375		
350	B	30	790	780	770	760	750	740	720	710	700	690	680	665	650	625	610	590	570	550	520	505	490	475	440	425	400		
375	A	20	72	76	82	88	94	105	115	125	140	155	170	195	225	250	300												
375	B	20	630	615	600	590	580	565	550	520	490	475	450	425	400	375	360												
375	A	25	78	80	85	90	95	100	105	110	120	130	140	155	170	190	200	230	250	280	325	375							
375	B	25	700	690	680	670	660	650	640	625	615	600	580	565	550	520	500	480	460	440	420	400							
375	A	30	90	92	93	95	98	100	105	110	115	120	130	140	150	160	170	180	200	220	240	260	280	320	350	400			
375	B	30	800	790	786	778	770	760	750	730	710	700	690	670	650	630	610	600	590	570	550	530	510	490	470	440			
400	A	20	85	90	98	105	115	125	135	150	165	185	210	240	270	320													
400	B	20	610	605	595	585	575	565	550	520	500	480	460	440	420	400													
400	A	25	85	90	98	104	110	118	125	135	145	155	170	190	200	225	250	280	310	360	400								
400	B	25	710	705	700	695	690	680	670	650	630	610	590	580	560	540	520	500	480	450	425								
400	A	30	100	102	106	110	114	117	120	130	138	148	158	170	180	195	210	230	250	275	300	340	360	400	440				
400	B	30	800	790	786	778	770	760	750	730	710	700	690	670	650	630	610	600	590	570	550	530	510	490	470				
425	A	20	78	80	85	90	95	100	110	120	135	150	170	190	220	250	300	350											
425	B	20	700	690	680	670	650	630	615	600	590	570	530	510	490	450	410	380											
425	A	25	85	88	90	93	95	100	105	110	120	130	140	150	165	180	195	225	250	280	325	380							
425	B	25	750	745	740	730	720	710	700	685	675	665	650	630	610	600	580	560	540	515	490	430							
425	A	30	91	92	94	96	98	99	100	104	110	118	128	138	145	158	168	180	195	210	235	260	280	320	350	400	450		
425	B	30	820	816	812	808	804	800	790	780	770	760	750	740	730	720	710	695	680	650	625	600	590	570	540	515	490		

Supply: 25 bar

Output [kg/h]

A = nozzle output

B = pump output

## APPENDIX

### Bergonzo nozzle tables

Return pressure [bar]

GPH	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
450	A	20	86	90	94	98	105	115	125	135	150	170	195	225	250	280	340	380										
450	B	20	700	685	660	645	635	620	605	585	570	545	530	515	490	470	440	410										
450	A	25	92	95	100	105	110	115	120	130	140	150	165	175	190	210	230	260	280	325	375	425						
450	B	25	805	800	790	775	760	745	730	715	700	690	670	650	625	605	580	560	540	520	500	480						
450	A	30	100	102	105	108	111	114	117	120	130	140	150	160	170	180	190	220	240	260	280	310	350	380	425	475		
450	B	30	860	856	850	842	834	826	818	810	790	760	750	740	730	720	700	680	660	640	620	600	580	540	520	500		
475	A	20	82	88	95	100	110	120	130	145	160	170	195	225	260	300	360											
475	B	20	800	780	760	740	720	700	680	655	625	600	580	560	520	480	440											
475	A	25	98	102	108	112	116	120	130	140	150	160	170	180	195	225	250	275	300	350	400	475						
475	B	25	910	905	900	880	860	840	820	800	780	750	730	710	690	670	650	620	590	560	530	500						
475	A	30	104	107	110	113	117	120	125	135	145	155	163	170	180	190	200	225	250	275	300	325	360	390	440	480		
475	B	30	1000	990	975	965	945	930	915	900	890	880	860	840	820	800	780	760	730	700	680	660	640	620	590	460		
500	A	20	94	102	106	113	120	130	150	170	190	210	230	250	280	325	380											
500	B	20	800	780	760	740	720	710	680	660	640	610	580	560	520	500	475											
500	A	25	100	104	108	116	120	130	140	150	160	170	190	210	230	250	270	325	350	400	475							
500	B	25	900	895	880	865	850	845	830	815	800	780	750	720	700	670	650	620	600	580	550							
500	A	30	110	113	117	120	125	130	135	140	150	160	170	180	190	220	250	280	300	325	350	380	425	480	520			
500	B	30	1000	990	980	970	960	950	940	925	910	900	880	860	840	820	800	775	750	725	700	775	750	725	600	575		

Supply: 25 bar

Output [kg/h]

A = nozzle output

B = pump output

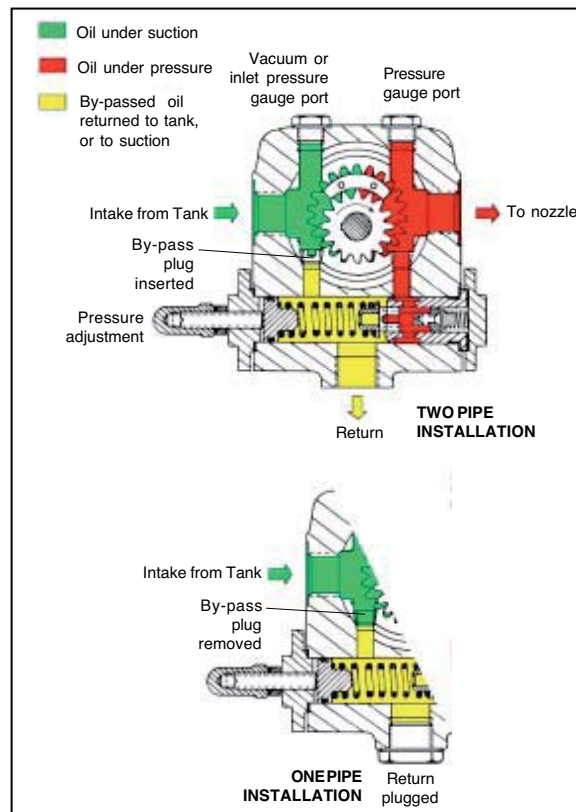
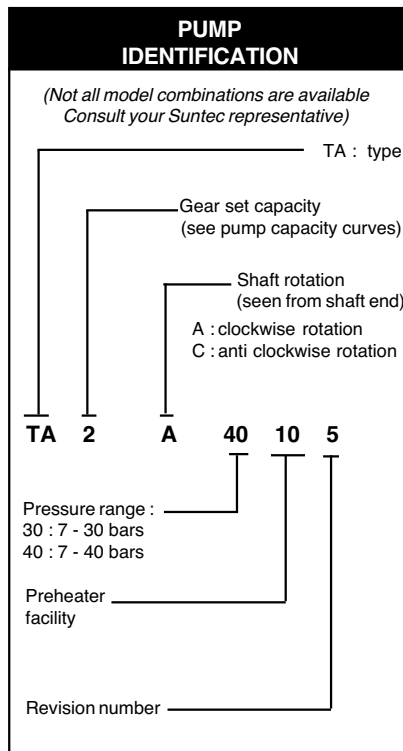
## APPENDIX

## 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) 6 kg (TA4)	5,7 kg (TA3) 6,4 kg (TA5)

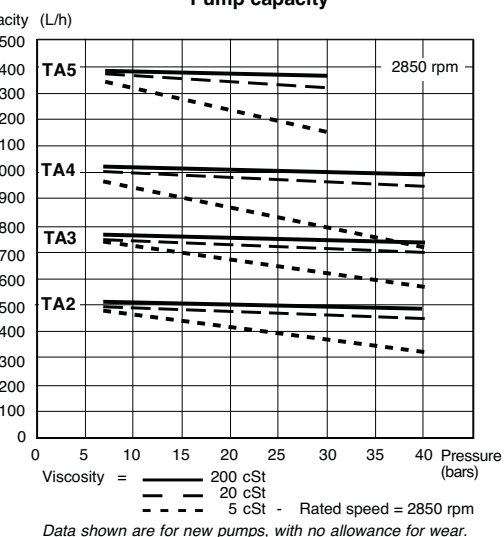
## Hydraulic data

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

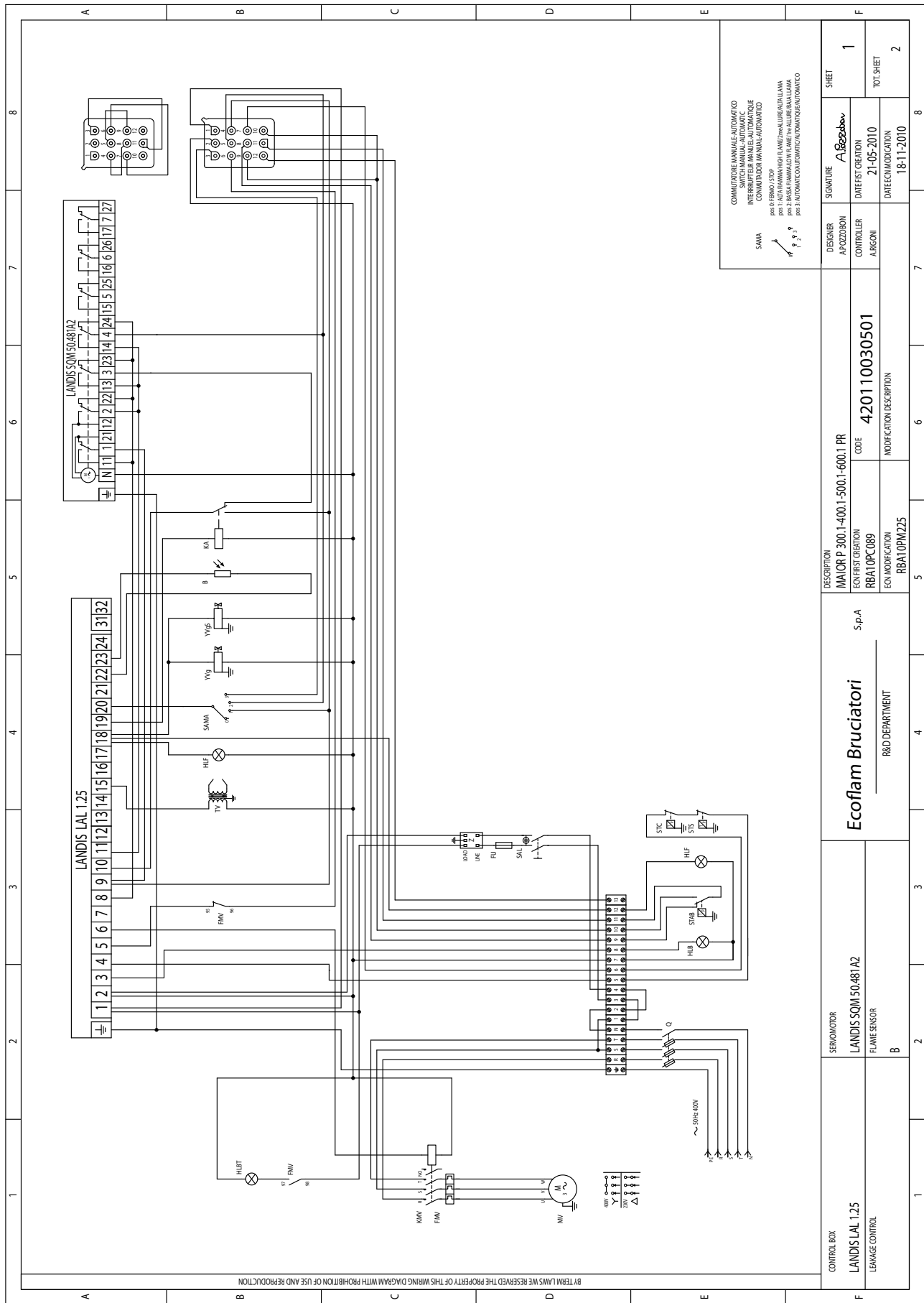
Cartridge	Ø 12 mm
Fitting	according to DIN 40430, NFC 68190 (N°9 elec.)
Rating	80-100 W

## Pump capacity



## APPENDIX

### Electrical diagrams



SAWA 		COMUTATORE MANUALE AUTOMATICO SWITCH MANUAL-AUTOMATIC INTERRUPTOR MANUAL-AUTOMATICO COMUTADOR MANUAL-AUTOMATICO	
pos. 0: FERMO / STOP pos. 1: AUT. A FIANNA HIGH FLAME / AUT. ALL LAMA pos. 2: BASA FIAMMOLO W/FE FLAME ALLURE / LAMA pos. 3: AUTOM. CONTROL AUTOMATIC / AUTOMATICO		SIGNATURE 	
DESCRIBER APPOZZORON CONTROLLER A.PIGNONI		DATE FIRST CREATION 21-05-2010 DATE TECN. MODIFICATION 18-11-2010	
DESCRIPTION MAIOR P. 300.1-400.1-500.1-600.1 PR ECN FIRST CREATION RBA10PC089 ECN MODIFICATION RBA10PM225		CODE 420110030501 MODIFICATION DESCRIPTION	
SEMI-MOTOR LANDIS LAL 1.25 LEAKAGE CONTROL B		SHEET 1 TOT. SHEET 2	

Ecoflam Bruciatori R&D DEPARTMENT		R&D DEPARTMENT	
5pA		R&D DEPARTMENT	

APPENDIX

Electrical diagrams

REGOLAZIONE CAMME MAIOR P 300/600.1 PR

LANDIS SOM 50.481A2

Q	INTERRITTORE GENERALE CON FUSIBILE MAIN SWITCH WITH FUSE INTERRUPTEUR GENERAL AVEC FUSIBLE INTERRUPTOR GENERAL CON FUSIBLE	Ylg S	ELETTROVALVOLA GASOLIO DI SICUREZZA EXTRA SAFETY OIL SOLENOID VALVE ELECTROVALVULA DE GASOLEO DE SEGURIDAD
Z	FILTRO ANTIDISTURBO ANTI-DAMPING FILTER FILTRE ANTI-PARASITES FILTRO DE PROTECCION ANTIDISTURBO	HUF	LAMPADA DI FUNZIONAMENTO WORKING LAMP LAMPE DE FONCTIONNEMENT
FU	FUSIBILE FUSE FUSIBLE FUSIBLE	KA	RELE' RELAY RELAIS RELE'
MW	MOTORE VENTILATORE MOTOR FAN MOTEUR VENTILATEUR MOTOR VENTILADOR		
TV	TRASFORMATORE IGNITION TRANSFORMER TRANSFORMATEUR D'ALLUMAGE TRANSFORMADOR		
B	FOTOCELLULA UV CELL CELLULE UV FOTOCELULA		
FMV	RELE TERMICO MOTORE VENTILATORE MOTOR THERMAL RELAY (FAN MOTOR) RELAIS THERMIQUE MOTEUR VENTILATEUR RELE TERMICO MOTOR VENTILADOR		
HUB	LAMPADA DI BLOCCO LOCK-OUT LAMP LAMPE DE SECURITE ESPALE DE BLOQUEO		
KMV	CONVITTORE MOTORE VENTILATORE REMOTE CONTROL SWITCH (FAN MOTOR) CONTACTEUR MOTEUR VENTILATEUR TELEINTERRUPTOR MOTOR VENTILADOR		
SAL	WORKING SWITCH INTERRUPTEUR DE LIGNE INTERRUPTOR DE LINEA		
STC	TERMOSTATO CALDAIA BOILER THERMOSTAT THERMOSTAT CHAUDIERE TENSOSTATO CALDERA		
STS	TERMOSTATO DI SICUREZZA SAFETY THERMOSTAT THERMOSTAT DE SECURITE TENSOSTATO DE SEGURIDAD		
HBT	LAMPADA DI BLOCCO TERMICO THERMAL LOCK-OUT LAMP LAMPE THERMIQUE DE SECURITE ESPALE DE BLOQUEO PELE TERMICO		
SAMA	COMUTATORE MANUALE AUTOMATICO SWITCH (MANUAL/AUTOMATIC) INTERRUPTEUR MANUEL/AUTOMATIQUE COMUNICADOR MANUAL/AUTOMATICO		
STAB	TERMOSTATO D'ALTA-BASSA FIAMMA HIGH-LOW FLAME THERMOSTAT TENSOSTATO DE ALTA-BAJA LLAMA TENSOSTATO DE ALTA-BAJA LLAMA		
Ylg	ELETTROVALVOLA GASOLIO OIL SOLENOID VALVE ELECTROVALVULA DE GASOLEO		

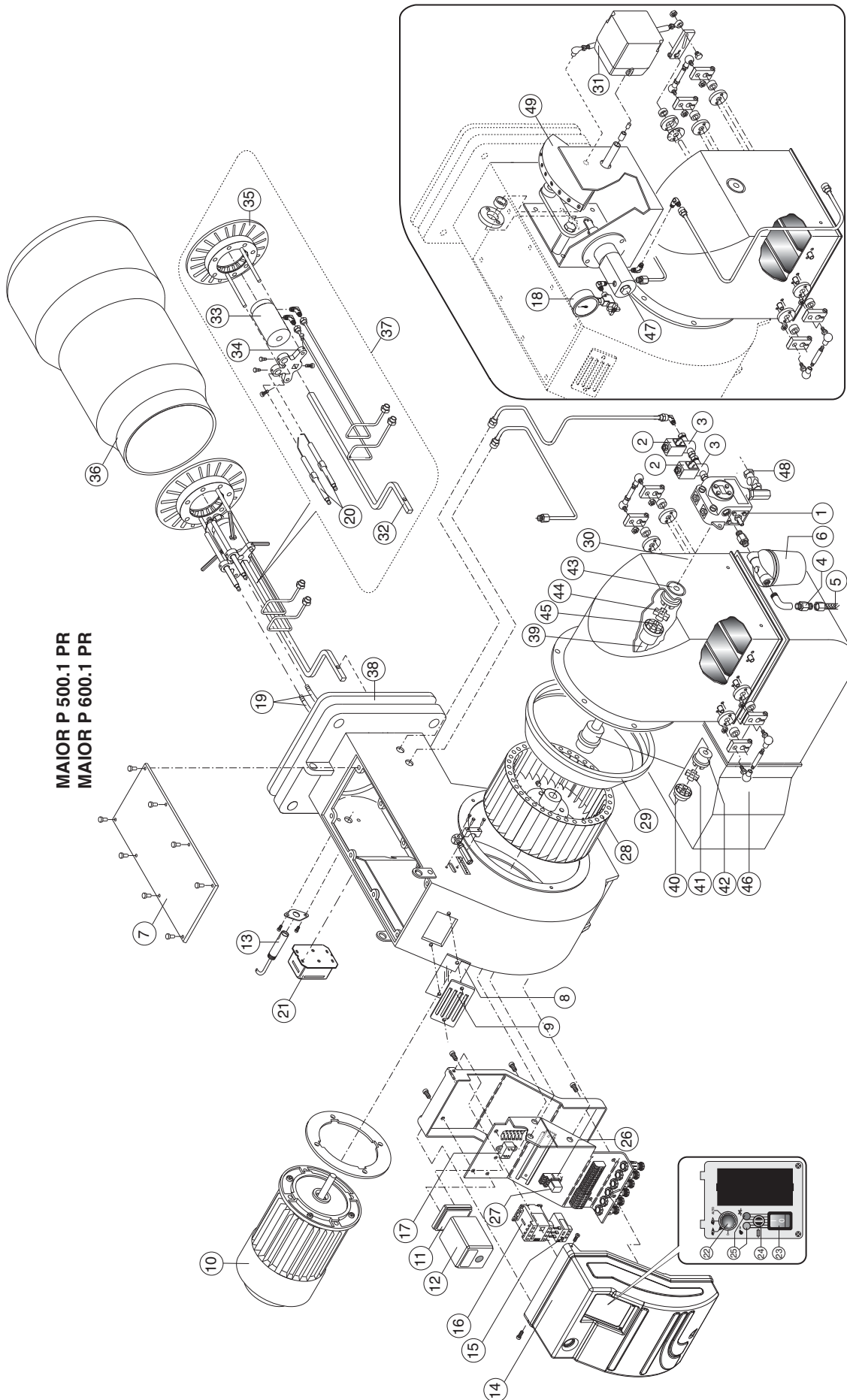
(0<sup>0</sup>) I: CAMMA DI REGOLAZIONE ARIA DI MASSIMA  
 (0<sup>0</sup>) II: CAMMA DI CHIUSURA TOTALE  
 (15<sup>0</sup>) III: CAMMA DI REGOLAZIONE ARIA DI ACCENSIONE  
 (30<sup>0</sup>) IV: CAMMA DI REGOLAZIONE ARIA DI BASSA  
 (0<sup>0</sup>) V: CAMMA NON UTILIZZATA  
 (0<sup>0</sup>) VI: CAMMA NON UTILIZZATA  
 (0<sup>0</sup>) VII: CAMMA NON UTILIZZATA  
 (0<sup>0</sup>) VIII: CAMMA NON UTILIZZATA

BY THESE LAWS WE RESERVE THE PROPERTY OF THIS WIRING DIAGRAM WITH PROHIBITION OF USE AND REPRODUCTION

CONTROL BOX LANDIS LAL 1.25 LEAKAGE CONTROL	SERVO MOTOR LANDIS SOM 50.481A2 FLAME SENSOR B	DESCRIPTION MAIORP 300.1-400.1-500.1-600.1 PR ENGINE CREATION RBA10PC089 EEN MODIFICATION RBA10PM225	CODE 420110030501 MODIFICATION DESCRIPTION	DESIGNER A. POZZONI CONTROLLER A. RIGNI	SIGNATURE <i>A. Pozzoni</i> DATE OF CREATION 21-05-2010 DATE OF MODIFICATION 18-11-2010	SHEET 2 TOT. SHEET 2
<b>Ecoflam Bruciatori</b> S.p.A. R&D DEPARTMENT						

## APPENDIX

### Spare parts



## APPENDIX

## Spare parts list

N°	DESCRIPTION		MAIOR P 500.1 PR	MAIOR P 600.1 PR
			code	code
1	OIL PUMP	SUNTEC TA4C40106	65322994	65322994
2	COIL	LUCIFER 1/2 E321H25	65323810	65323810
3	OIL VALVE	LUCIFER 1/2 E321H25	65323633	65323633
4	NIPPLE	TN 18X1200	65323183	65323183
5	HOSES	TN 18X1500	65323182	65323182
6	FILTER	70501/03	65324103	65324103
7	COVER		65324490	65324490
8	GLASS		65320487	65320487
9	PEEP WINDOW FRAME		65320488	65320488
10	MOTOR	11 kW	65111471	-
		15 kW	-	65325246
11	CONTROL BOX BASE	LANDIS	65320091	65320091
12	CONTROL BOX	LANDIS LAL1.25	65320052	65320052
13	PHOTORESISTOR	LANDIS	65320076	65320076
14	COVER		65320473	65320473
15	MOTOR THERMAL RELAY	AEG 21-26A	65324066	-
		AEG 24-32A	-	65323104
16	REMOTE CONTROL SWITCH	AEG LS18K.00	65323137	-
		BF3800A230	-	65323127
17	ANTIJAMMING FILTER		65323170	65323170
18	MANOMETER	CEWAL R1/4 D50-40 BA R	65324105	65324105
19	CABLE	TC	65320944	65320946
		TL	65320948	65320948
20	ELECTRODES		65325222	65325222
21	IGNITION TRANSFORMER	Brahma T8 13000/35	65323222	65323222
22	SELECTOR		65323067	65323067
23	MAIN SELECTOR	cod.40100I1509	65323064	65323064
24	FUSE SUPPORT	FUSIT FH-B 528	65322181	65322181
25	LAMP	EL/N-SC4 Elettrospring	65322053	65322053
26	RELAY BASE	FINDER 5532	65323149	65323149
27	RELAY	FINDER 5532	65323139	65323139
28	FAN	360 x 135	65321801	-
		380 x 135	-	65321802
29	AIR CONVEYOR		65324264	65324264
30	COVER AIR INLET		65325012	65325012
31	AIR DAMPER MOTOR	SQM50.481A2	65322902	65322902
32	ROD	TC	65325013	65325013
		TL	65325014	65325014
33	NOZZLE HOLDER		65320716	65320716
34	DIFFUSER SUPPORT		65325053	65325053
35	DIFFUSER		65320784	65320784
36	BLAST TUBE	TC	65324815	65324815
		TL	65324816	65324816
37	INNER ASSEMBLY	TC		
		TL		
38	GASKET		65321128	65321128
39	ROD		65321464	65321464
40	COUPLING (FAN)		65321792	65321792
41	UNION (FAN)		65321791	65321791
42	COUPLING		65321790	65321790
43	COUPLING (PUMP)		65324165	65324165
44	UNION (PUMP)		65321786	65321786
45	COUPLING		65321782	65321782
46	SILENCER		65074538	65074538
47	ADJUSTMENT PRESSURE			
48	CHECK VALVE	ART. FZVR1	65325066	65325066
49	OIL CAM GROUP		65322356	65322356

TC = SHORT HEAD TL = LONG HEAD









# Ecoflam

## **Ecoflam Bruciatori S.p.A.**

Via Roma, 64 - 31023 Resana (TV) - Italy

Tel. +39 0423 719500

Fax +39 0423 719580

<http://www.ecoflam-burners.com>

e-mail: [export@ecoflam-burners.com](mailto:export@ecoflam-burners.com)

Società soggetta alla direzione e al coordinamento di Ariston Thermo S.p.A.

Via A. Merloni, 45 - 60044 Fabriano (AN) - CF 01026940427

Ecoflam Bruciatori S.p.A. reserves the right to make any adjustments, without prior notice, which is considered necessary or useful to its products, without affecting their main features

Ecoflam Bruciatori S.p.A. si riserva il diritto di apportare ai prodotti le modifiche che riterrà necessarie o utili, senza pregiudicarne le caratteristiche principali.

La maison Ecoflam Bruciatori S.p.A. se réserve le droit d'apporter les modifications qu'elle jugera nécessaires ou utiles à ses produits sans pour autant nuire à leurs caractéristiques principales

Ecoflam Bruciatori S.p.A. se reserva el derecho a introducir en sus productos todas las modificaciones que considere necesarias o utiles, sin perjudicar sus características

"Ecoflam Bruciatori S.p.A." оставляет за собой право вносить в конструкцию оборудования любые необходимые изменения без особого предупреждения