

## Light oil burners

Low - high or modulating operation



CODE	MODEL
20011027	RL 190/M
3477870	RL 190/M
3477875	RL 190/M



## CONTENTS

<b>INFORMATION ABOUT THE INSTRUCTION MANUAL</b> . . . . .	page 1
<b>SAFETY AND PREVENTION</b> . . . . .	2
<b>TECHNICAL DATA</b> . . . . .	3
Burner models designations . . . . .	3
Accessories . . . . .	3
Burner description . . . . .	4
Packaging - Weight . . . . .	4
Max. dimensions . . . . .	4
Standard equipment . . . . .	4
Firing rate . . . . .	5
Minimum furnace dimensions . . . . .	5
<b>INSTALLATION</b> . . . . .	6
Boiler plate . . . . .	6
Blast tube length . . . . .	6
Securing the burner to the boiler . . . . .	6
Choice of nozzle . . . . .	7
Nozzle assembly . . . . .	7
Combustion head setting . . . . .	7
Fuel supply . . . . .	8
Hydraulic connections . . . . .	8
Pump . . . . .	9
Air pressure switch . . . . .	9
Servomotor . . . . .	10
<b>BURNER CALIBRATION</b> . . . . .	11
Burner starting . . . . .	12
Burner operation . . . . .	13
Oil pressure switch . . . . .	13
Flame signal measurements . . . . .	14
Final checks . . . . .	15
<b>MAINTENANCE</b> . . . . .	15
Notes on safety for the maintenance . . . . .	15
Maintenance programme . . . . .	15
Opening the burner . . . . .	16
<b>BURNER FAULTS</b> . . . . .	17
<b>ELECTRICAL WIRING</b> . . . . .	18
Calibration of the thermal relay . . . . .	18
Motor connection . . . . .	18
<b>APPENDIX</b> . . . . .	
Spare parts . . . . .	19
Procedure to refer burner operating condition in high altitude plants . . . . .	23
Burner start up reports . . . . .	24

### N.B.

Figures mentioned in the text are identified as follows:

1)(A) = part 1 of figure A, same page as text;

1)(A)p.4 = part 1 of figure A, page number 4.

## INFORMATION ABOUT THE INSTRUCTION MANUAL

### INTRODUCTION

The instruction manual supplied with the burner:

- is an integral and essential part of the product and must not be separated from it; it must therefore be kept carefully for any necessary consultation and must accompany the burner even if it is transferred to another owner or user, or to another system. If the manual is lost or damaged, another copy must be requested from the Technical Assistance Service of the area;
- is designed for use by qualified personnel;
- offers important indications and instructions relating to the installation safety, start-up, use and maintenance of the burner.

### DELIVERY OF THE SYSTEM AND THE INSTRUCTION MANUAL

When the system is delivered, it is important that:

- the instruction manual is delivered to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.
- The instruction manual shows:
  - the serial number of the burner;

.....

- the address and telephone number of the nearest Assistance Centre.

.....

.....

.....

- The system supplier must carefully inform the user about:
  - the use of the system;
  - any further tests that may be required before activating the system;
  - maintenance, and the need to have the system checked at least once a year by a representative of the manufacturer or another specialised technician.To ensure a periodic check, the manufacturer recommends the drawing up of a Maintenance Contract.

## GUARANTEE AND RESPONSIBILITY

The manufacturer guarantees its new products from the installation date, in accordance with the regulations in force and/or the sales contract. At the moment of the first start-up, check that the burner is integral and complete.



Failure to observe the information given in this manual, operating negligence, incorrect installation and carrying out of non authorised modifications will result in the annulment by the manufacturer of the guarantee that it supplies with the burner.

In particular, the rights to the guarantee and the responsibility will no longer be valid, in the event of damage to things or injury to people, if such damage/injury was due to any of the following causes:

- incorrect installation, start-up, use and maintenance of the burner;
- improper, incorrect or unreasonable use of the burner;
- intervention of unqualified personnel;
- carrying out of unauthorised modifications on the equipment;
- use of the burner with safety devices that are faulty, incorrectly applied and/or not working;
- installation of untested supplementary components on the burner;
- powering of the burner with unsuitable fuels;
- faults in the fuel supply system;
- use of the burner even following an error and/or an irregularity;
- repairs and/or overhauls incorrectly carried out;
- modification of the combustion chamber with inserts that prevent the regular development of the structurally established flame;
- insufficient and inappropriate surveillance and care of those burner components most likely to be subject to wear and tear;
- the use of non-original components, including spare parts, kits, accessories and optional;
- force majeure.

**The manufacturer furthermore declines any and every responsibility for the failure to observe the contents of this manual.**

## SAFETY AND PREVENTION

### INTRODUCTION

The burners have been designed and built in compliance with current regulations and directives, applying the known technical rules of safety and envisaging all the potential danger situations.

It is necessary, however, to bear in mind that the imprudent and clumsy use of the equipment may lead to situations of death risk for the user or third parties, as well as the damaging of the burner or other items. Inattention, thoughtlessness and excessive confidence often cause accidents; the same applies to tiredness and sleepiness.

It is a good idea to remember the following:

- The burner must only be used as expressly described. Any other use should be considered improper and therefore dangerous.

In particular:

it can be applied to boilers operating with water, steam, diathermic oil, and to other uses expressly named by the manufacturer;

the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the room temperature must all be within the values indicated in the instruction manual.

- Modification of the burner to alter its performance and destinations is not allowed.
- The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- Only those parts envisaged by the manufacturer can be replaced.



The manufacturer guarantees safety and proper functioning only if all burner components are intact and positioned correctly.

### PERSONNEL TRAINING

The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- Personnel must observe all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel must inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

## TECHNICAL DATA

Model			RL 190/M
Output (1) Delivery (1)	High	MBtu/hr (3) GPH	5376 - 9184 38.4 - 65.6
	Low	MBtu/hr (3) GPH	1792 - 5376 12.8 - 38.4
Fuel			#2 fuel oil
Operation			Low - high or modulating
Nozzle		number	1 (return flow nozzle)
Standard applications			Boilers: water, steam, thermal oil
Ambient temperature		°F	32 - 104 (0 - 40 °C)
Combustion air temperature		°F max	140 (60 °C)
Main power supply (+/- 10%)		V/Ph/Hz	208 - 230 / 460 / 575 / 3 / 60
Fan motor		rpm W - HP V A	3400 4000 - 5.5 208 - 230 / 460 / 575 15.8 - 9.1 - 6
Ignition transformer		V1 - V2 I1 - I2	120 V - 2 x 5 kV 3.7 A - 35 mA
Pump TA2	delivery (at 290 PSI) pressure range fuel temperature	GPH PSI °F max	146 101.5 - 580 284
Electrical power consumption		W max	5500
Electrical protection			NEMA1
Noise levels (2)		dBA	83.9

(1) Reference conditions: Ambient temperature 68 °F (20 °C) - Barometric pressure 394" WC - Altitude 329 ft a.s.l.

(2) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output.

(3) Equivalent Btu values based on 1 USGPH = 140,000 Btu/hr.

### Burner models designations:

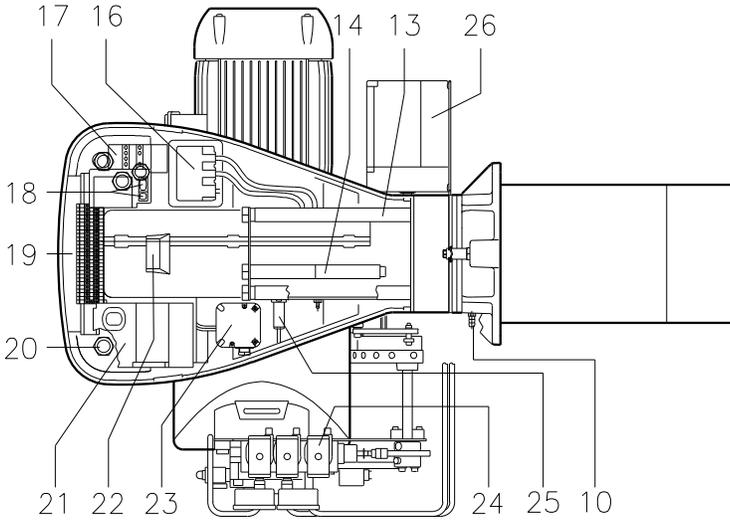
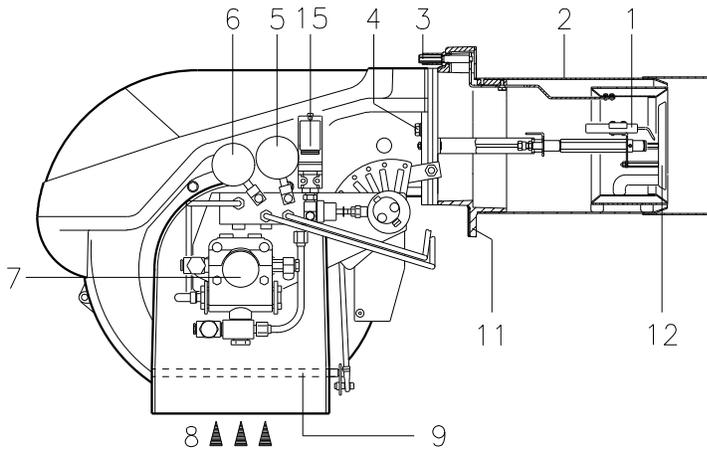
Model	Code	RBNA Code	Voltage	Flame safeguard
RL 190/M	20011027	C9517300	208-230/3/60	Burner mounted
	3477870	C9517310	460/3/60	Burner mounted
	3477875	C9517301	575/3/60	Burner mounted

### ACCESSORIES (optional):

- **Flame inversion boiler kit** cod. 3010241

#### Important:

The installer is responsible for the supply and installation of any safety device(s) not indicated in this manual.



**BURNER DESCRIPTION (A)**

- 1 Ignition electrodes
- 2 Combustion head
- 3 Screw for combustion head adjustment
- 4 Screw for fixing fan to flange
- 5 Pressure gauge for pressure on nozzle return
- 6 Pressure gauge for pressure on nozzle delivery
- 7 Pump
- 8 Air inlet to fan
- 9 Air damper
- 10 Fan pressure test point
- 11 Boiler mounting flange
- 12 Flame stability disk
- 13 Slide bars for opening the burner and inspecting the combustion head
- 14 Extensions for slide bars 13) (with kit)
- 15 High oil pressure switch
- 16 Ignition transformer
- 17 Motor contactor and thermal cut-out with reset button
- 18 Power switch for different operations:  
automatic - manual - off.  
Button for:  
power increase - power reduction
- 19 Terminal strip
- 20 Knockouts for electrical connections by installer
- 21 Flame safeguard with lock-out pilot light and lock-out reset button
- 22 Flame inspection window
- 23 Air pressure switch
- 24 Valve assembly with pressure regulator on nozzle return
- 25 Photocell (cad cell)
- 26 Servomotor, provides adjustment of fuel delivery regulator and of air damper.

Two types of burner failure may occur:

Flame safeguard Lock-out: if the flame relay 21)(A) pushbutton lights up, it indicates that the burner is in lock-out.

To reset, press the pushbutton, no sooner than 10 s after the lock-out.

Motor trip: release by pressing the pushbutton on thermal overload 17)(A).

**PACKAGING - WEIGHT (B) -**

Approximate measurements

• The burners are shipped skid mounted. Outer dimensions of packaging are indicated in (B).

• The weight of the burner complete with packaging is indicated in Table (B).

**MAX. DIMENSIONS (C) -**

Approximate measurements

The maximum dimensions of the burners are given in (C).

Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part withdrawn on the slide bars.

The maximum dimension of the burner when open, without casing, is give in measurement I.

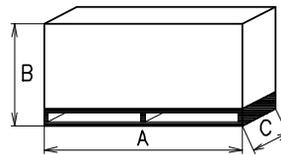
**STANDARD EQUIPMENT**

- 2 - Flexible hoses (L = 36")
- 2 - Gaskets for flexible hoses
- 1 - Head gasket
- 4 - Screws to secure the burner flange to the boiler:  
5/8 W x 137/64"
- 1 - Adaptor G 1/8" / 1/8" NPT
- 1 - Instruction booklet
- 1 - Spare parts list

(A)

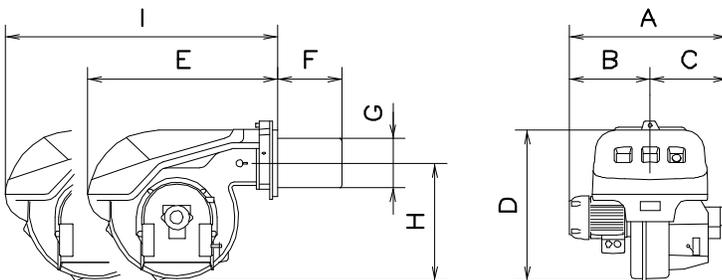
D3932

inch	A	B	C	lbs
RL 190/M	47 1/4"	33 15/32"	31 1/2"	209



D36

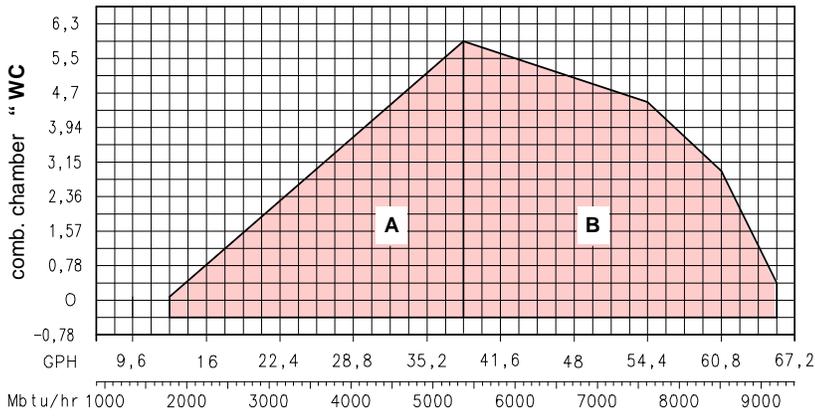
(B)



	A	B	C	D	E	F	G	H	I
RL 190/M	32"	14 13/32"	17 19/32"	21 27/32"	28 1/32"	14 9/16"	8 3/4"	16 15/16"	45 29/32"

(C)

D1217



### FIRING RATE (A)

During operation, burner output varies between:

- **MINIMUM OUTPUT:** area A;
- **MAXIMUM OUTPUT:** area B.

The firing rate may be found by plotting a vertical line from the desired delivery and a horizontal line from the pressure in the combustion chamber. The intersection of these two lines is the firing rate which must lie within area A, for MIN output, and within area B, for MAX output.

#### Note:

The FIRING RATE areas given in figure (A) have been reduced by 10% with respect to the maximum range that can be reached.



The firing rate area values have been obtained considering an ambient temperature of 68 °F (20°C), and an atmospheric pressure of 394" WC and with the combustion head adjusted as shown on page 7.

Consult Procedure on page 23 to refer burner operating condition in high altitude plants.

### MINIMUM FURNACE DIMENSIONS (B)

The firing rates were set in relation to certified test boilers.

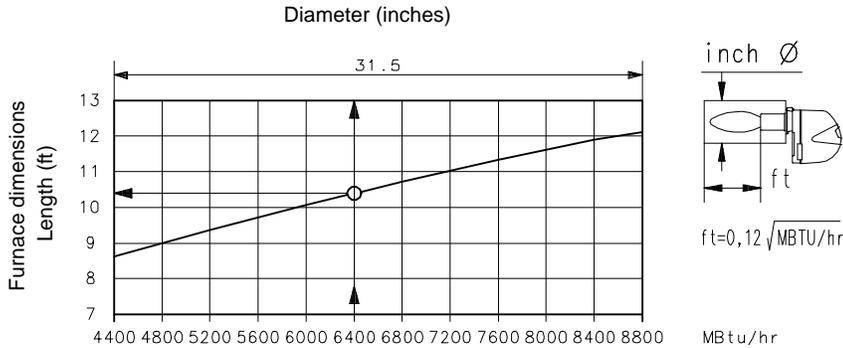
Figure (B) indicates the diameter and length of the test combustion chamber.

#### Example:

Output 6400 MBtu/hr:  
diameter = 31.5 inch; length 10.4 ft

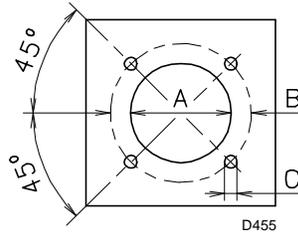
Whenever the burner is operated in a much smaller commercially-available combustion chamber, a preliminary test should be performed to verify operation.

(A) D2422

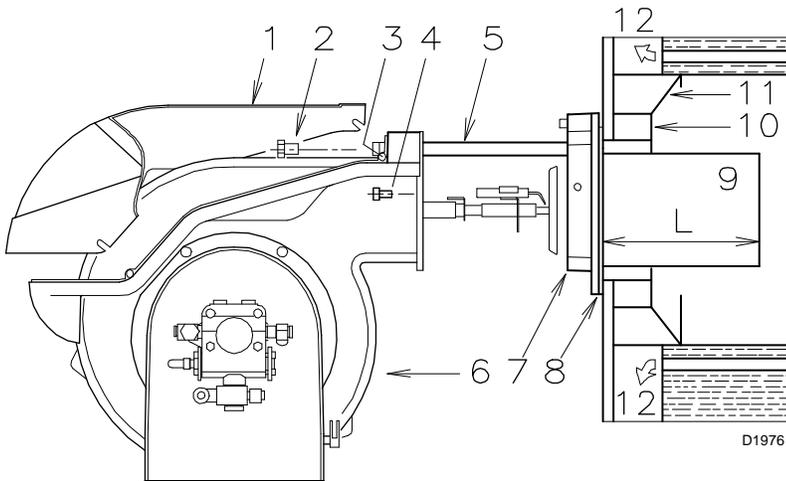


(B) D2920

inch	A	B	C
RL 190/M	9 1/6"	12 25/32" - 14 15/32"	5 8 W



(A)



(B)

## INSTALLATION

### NOTES ON SAFETY FOR THE INSTALLATION

After carefully cleaning all around the area where the burner will be installed, and arranging the correct lighting of the environment, proceed with the installation operations.



All the installation, maintenance and disassembly operations must be carried out with the electricity supply disconnected.



The installation of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.



After removing all the packaging, check the integrity of the contents. In the event of doubt, do not use the burner; contact the supplier.

### BOILER PLATE (A)

Drill the combustion chamber mounting plate as shown in (A). The position of the threaded holes can be marked using the head gasket supplied with the burner.

### BLAST TUBE LENGTH (B)

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and it must be greater than the thickness of the boiler door complete with its insulation.

The length available, L (mm), is 149<sup>16</sup>".

For boilers with front flue passes 12) or flame inversion chambers, protective insulation 10) must be inserted between the boiler refractory 11) and the blast tube 9). This protective insulation must not compromise the extraction of the blast tube.

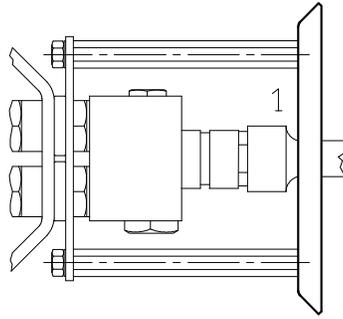
For boilers having a water-cooled front the insulation 11)(B) is not required unless it is required by the boiler manufacturer.

### SECURING THE BURNER TO THE BOILER (B)

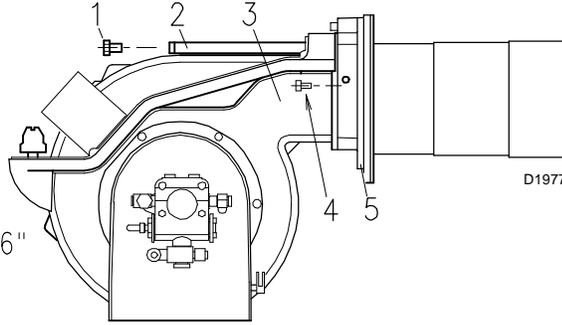
Disassemble the blast tube 9) from the burner 6) by proceeding as follows:

- Loosen the four screws 3) and remove the cover 1).
- Remove the screws 2) from the two slide bars 5).
- Remove the two screws 4) fixing the burner 6) to the flange 7).
- Withdraw the blast tube 9) complete with flange 7) and slide bars 5).

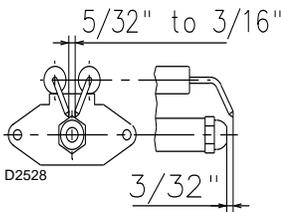
Secure flange 7)(B) to the boiler plate inserting the supplied gasket 8)(B). Use the 4 screws provided after having protected the thread with an anti-seizing product. The burner-boiler seal must be airtight.



(A) D1220

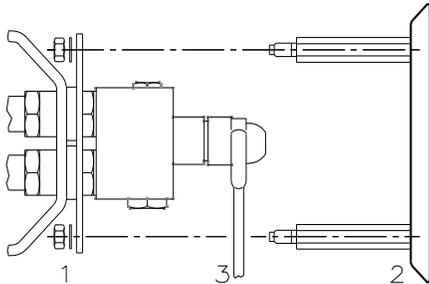


D1977



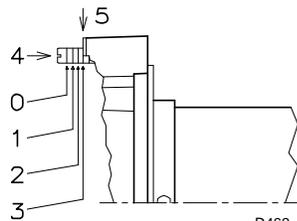
D2528

(B) (C)



D1222

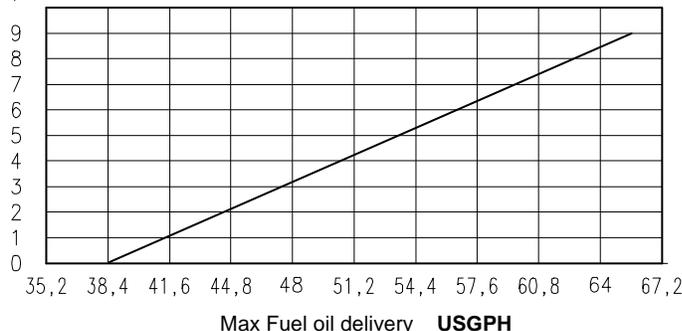
(D)



D462

(E)

↓ N° Notches



(F) Max Fuel oil delivery USGPH

D2424

### CHOICE OF NOZZLE (A)



WARNING

It is advisable to replace nozzles every year during regular maintenance operations.



CAUTION

The use of nozzles other than those specified by the Manufacturer and inadequate regular maintenance may result into emission limits non-conforming to the values set forth by the regulations in force, and in extremely serious cases, into potential hazards to people and objects.

The manufacturing company shall not be liable for any such damage arising from nonobservance of the requirements contained in this manual.

See diagrams (B) page 11.

In case an intermediate delivery between the two values indicated in the diagrams (B) page 11 is required, a nozzle with higher delivery must be chosen. Delivery reduction will be obtained by means of the pressure regulator.

### RECOMMENDED NOZZLES:

Type A4 return flow nozzles - 45° angle

### NOZZLE ASSEMBLY

At this stage of installation the burner is still disassembled from the blast tube; At this point install the nozzle with the box wrench 1)(A), fitting the wrench through the central hole in the flame stability disk.



WARNING

- Do not use any sealing products such as gaskets, sealing compound, or tape.
- Be careful to avoid damaging the nozzle sealing seat.
- Make sure that the electrodes are positioned as shown in Figure (B).

Finally remount the burner 3)(C) on the slide bars 2) and slide it up to the flange 5), keeping it slightly raised to prevent the flame stability disk from pressing against the blast tube.

Tighten the screws 1) on the slide bars 2) and screws 4) fixing the burner to the flange.

If it proves necessary to change a nozzle with the burner already fitted to the boiler, proceed as outlined below:

- Pull back the burner on its slide bars as shown in fig. (D)p.14.
- Remove the nuts 1)(D) and the disk 2)
- Use wrench 3)(D) to change the nozzles.

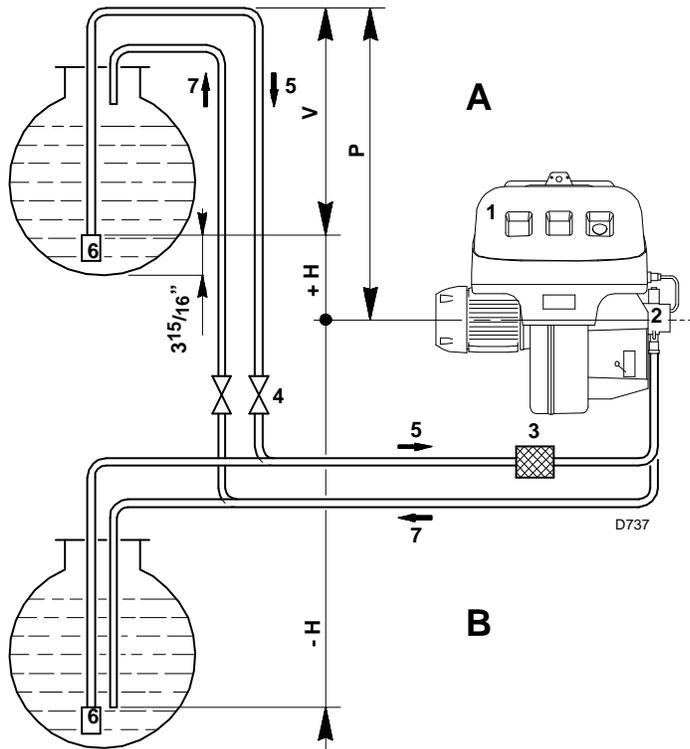
### COMBUSTION HEAD SETTING

The setting of the combustion head depends exclusively on the maximum burner delivery at which it will be operating.

Turn screw 4)(E) until the notch shown in diagram (F) is level with the front surface of flange 5)(E).

### Example:

RL 190/M, maximum light oil delivery = 48 GPH  
Diagram (F) indicates that for a delivery of 48 GPH the RL 190/M Model requires the combustion head to be set to approx. three notches, as shown in Figure (E).

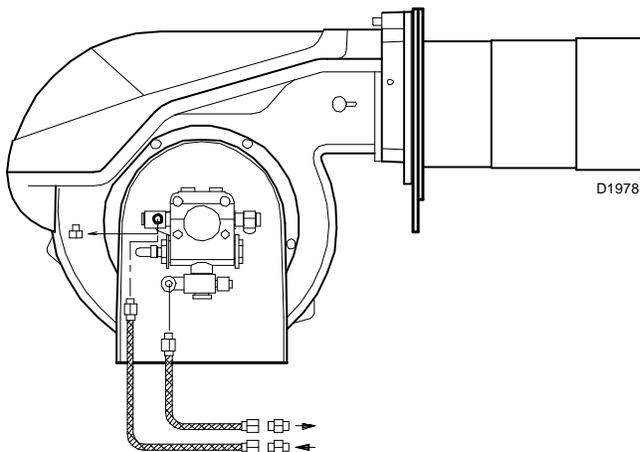


**Key**

- H = Pump/foot valve height difference
- L = Piping length
- Ø = Inside pipe diameter
- 1 = Burner
- 2 = Pump
- 3 = Filter
- 4 = Manual on/off valve
- 5 = Suction line
- 6 = Foot valve
- 7 = Return line

+ H - H (ft)	L (ft)	
	Ø (inch)	
	1/2"	5/8"
+ 13	197	263
+ 10	164	230
+ 6.6	132	197
+ 4.8	115	181
+ 3.3	99	164
+ 1.6	82	148
0	66	132
- 1.6	59	115
- 3.3	49	99
- 4.8	43	82
- 6.6	33	66
- 10	16	33
- 13	-	20

(A)



(B)

**HYDRAULIC SYSTEM**



Explosion danger due to fuel leaks in the presence of a flammable source.

Precautions: avoid knocking, attrition, sparks and heat.

Make sure that the fuel interception tap is closed before performing any operation on the burner.



The fuel supply line must be installed by qualified personnel, in compliance with current standards and laws.

**FUEL SUPPLY**

**Double-pipe circuit (A)**

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.

**The tank higher than the burner A**

Distance "P" must not exceed 33 ft in order to avoid subjecting the pump's seal to excessive strain; distance "V" must not exceed 13 ft in order to permit pump self-priming even when the tank is almost completely empty.

**The tank lower than the burner B**

Pump suction values higher than 13 "Hg must not be exceeded because at higher levels gas is released from the fuel, the pump starts making noise and its working life-span decreases.

It is good practice to ensure that the return and suction lines enter the burner from the same height; in this way it will be less probable that the suction line fails to prime or stops priming.

**The oil loop circuit**

A loop main circuit consists of a loop of piping departing from and returning to the tank with an auxiliary pump that circulates the fuel under pressure. A branch connection from the loop goes to feed the burner. This circuit is extremely useful whenever the burner pump does not succeed in self-priming because the tank distance and/or height difference are higher than the values listed in the Table.

**HYDRAULIC CONNECTIONS (B)**



Make sure that the flexible hoses to the pump supply and return line are installed correctly.

The pumps are equipped with a by-pass that separates return line with suction line. The pumps are installed on the burner with the by-pass closed by screw 6)(A)p.13. It is therefore necessary to connect both hoses to the pump.

**The pump seal will be damaged immediately if it is run with the return line closed and the by-pass screw inserted.**

Remove the plugs from the suction and return connections of the pump.

Insert the hose connections with the supplied seals into the connections and screw them down.

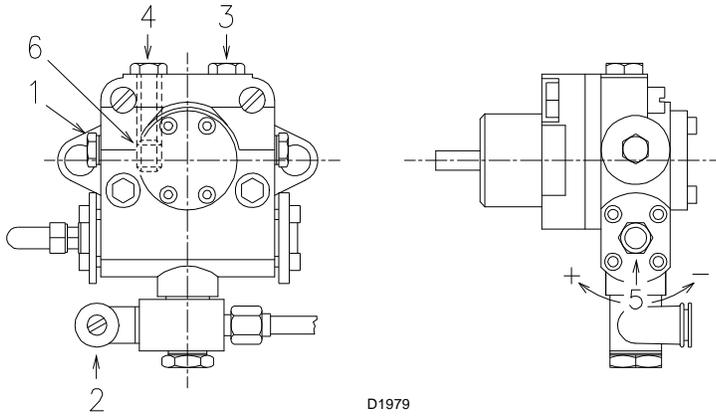


Take care that the hoses are not stretched or twisted during installation.

Install the hoses where they cannot be stepped on or come into contact with hot surfaces of the boiler.

Now connect the other end of the hoses to the suction and return lines.

**PUMP SUNTEC TA2**



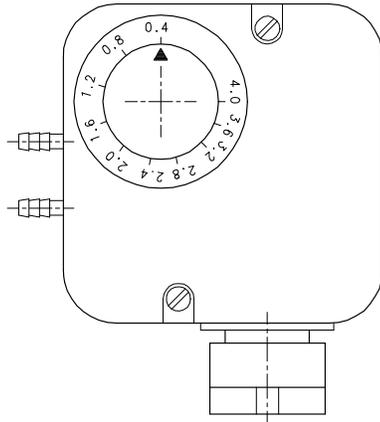
D1979

		TA2
A	GPH	146
B	PSI	101.5 - 580
C	"Hg	13
D	cSt	4 - 800
E	°F	284 (140 °C)
F	PSI	72.5
G	PSI	435

**(A)**

D2352

**AIR PRESSURE SWITCH**



**(B)**

D2548

**PUMP (A)**

- 1 - Suction 1/2" NPT
- 2 - Return 1/2" NPT
- 3 - Pressure gauge attachment G 1/8"
- 4 - Vacuum gauge attachment G 1/8"
- 5 - Pressure adjustment screw
- 6 - By-pass screw

- A - Min. delivery rate at 290 PSI pressure
- B - Delivery pressure range
- C - Max. suction pressure
- D - Viscosity range
- E - Max fuel oil temperature
- F - Max. suction and return pressure
- G - Pressure calibration in the factory

**PUMP PRIMING**



Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause the seal located on the pump shaft to break.

The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the starting operation as often as required. After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

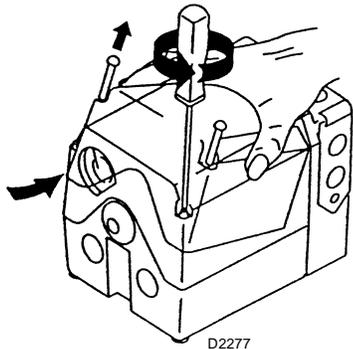
**Important:** the priming operation is possible because the pump is already full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening for the vacuum gauge prior to starting; otherwise, the pump will seize. Whenever the length of the suction piping exceeds 66 - 98 ft, the supply line must be filled using a separate pump.

**AIR PRESSURE SWITCH (B)**

Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (B).

With the burner operating at min. output, increase adjustment pressure by slowly turning the relative dial clockwise until the burner locks out.

Then turn the dial anti-clockwise by about 20% of the set point and repeat burner starting to ensure it is correct. If the burner locks out again, turn the dial anti-clockwise a little bit more.



(A)

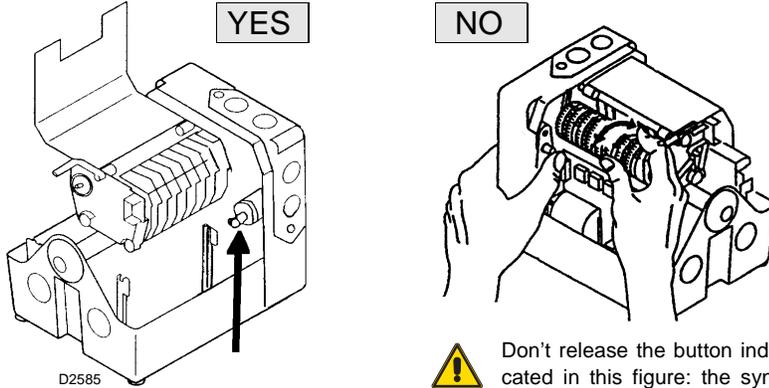
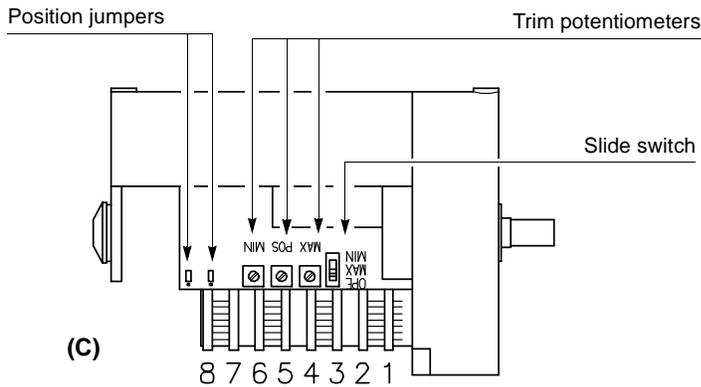
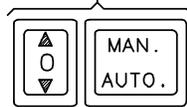


Figure above shows how the servomotor is released to manually check there is no binding through its motion.

(B)

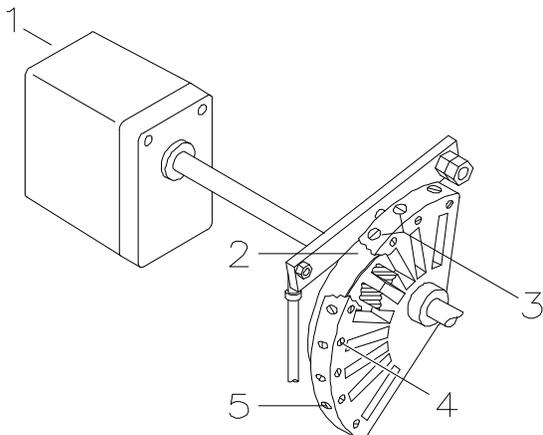


(C)



(D)

(E)



(F)

### SERVOMOTOR (A)

The servomotor gives simultaneous regulation of the air damper through the adjustable profile cam 4)(F) and the pressure controller (A) pag. 11.

It rotates by 130° in approx. 35 s.

The factory settings must not be changed for the first firing, just check that they comply with the details below.

To open the servomotor, remove the screws and pull the cover outward, fig. (A).

Key fig. (F)

- 1 Servomotor
- 2 Adjustable profile cam
- 3 Adjustment screws for cam starting profile
- 4 Adjustment fixing screws
- 5 Adjustment screws for cam and profile

### CAMS AND TRIM POTENTIOMETERS FUNCTIONS

**Cam 1: 130°**

Limits rotation towards maximum.

**Cam 2: 0°**

Limits rotation towards minimum, air damper closed on stand by.

**Cam 3: 20°**

Limits ignition position.

**Cams 4 - 5 - 6 - 7 - 8:** not used

**Trim potentiometer MAX**

Limits maximum modulation.

It must be set near the stroke end (cam 1) to exploit as far as possible the variable profile cam.

**Trim potentiometer MIN**

Limits minimum modulation.

It must be set near the stroke end (cam 2) to exploit as far as possible the variable profile cam.

**Trim potentiometer POS**

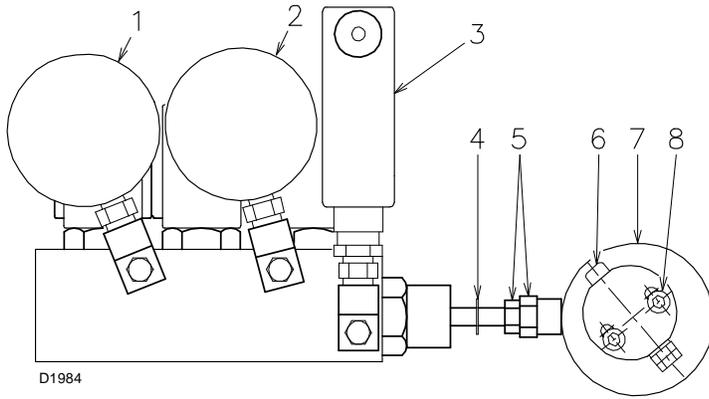
Limits an intermediate operating position between MAX and MIN, supplying power to the "P" terminal in the servomotor (through an external command). This function cuts out any external signals.

**Note**

Using the slide switch to select MAX or MIN, the servomotor goes into the position for the respective settings of the MAX and MIN TRIM POTENTIOMETERS.

When the settings are complete, place the slide switch on OPE.(operate)

## PRESSURE CONTROLLER

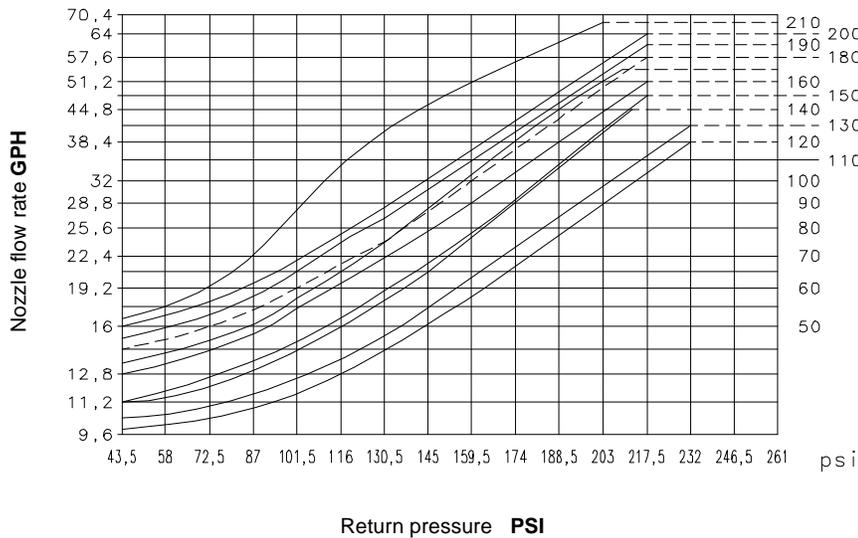


D1984

- 1 - Gauge for pressure in delivery line
- 2 - Gauge for pressure in return line
- 3 - Oil pressure switch
- 3 - Ring for piston stop
- 4 - Nut and lock-nut for piston setting
- 5 - Eccentric adjusting screw
- 6 - Variable eccentric
- 7 - Eccentric locking screws

(A)

**Type A4 return flow nozzle (45°) Delivery pressure 290 PSI**



The values indicated in the right side of the diagram, refer to the data printed on the nozzle.

(B)

D2427

## BURNER CALIBRATION



The first start-up of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.

Check the correct working of the adjustment, command and safety devices.

The optimum calibration of the burner requires an analysis of the flue gases at the boiler outlet.

The following settings that have already been made do not require modification under normal circumstances:

- Combustion head;
- Servomotor, cams I - II - III

### ADJUSTING THE NOZZLE FLOW RATE

The nozzle flow rate varies according to the fuel pressure on the nozzle return.

Diagram (B) indicates this relationship for type A4 return flow nozzles with pump delivery pressure of 290 PSI.

Diagrams (B):

Horizontal axis : PSI, nozzle return pressure  
Vertical axis : GPH, nozzle flow rate

**NOTE:** with a pump delivery pressure of 290 PSI, the pressure on the nozzle return must not exceed 246.5 PSI.

The pressure difference between pump delivery and nozzle return must be at least 43.5 PSI. With smaller pressure differences, the pressure on the nozzle return can be unstable.

The nozzle delivery pressure value is indicated by the pressure gauge 1(A).

The nozzle return pressure value is indicated by the pressure gauge 2(A).

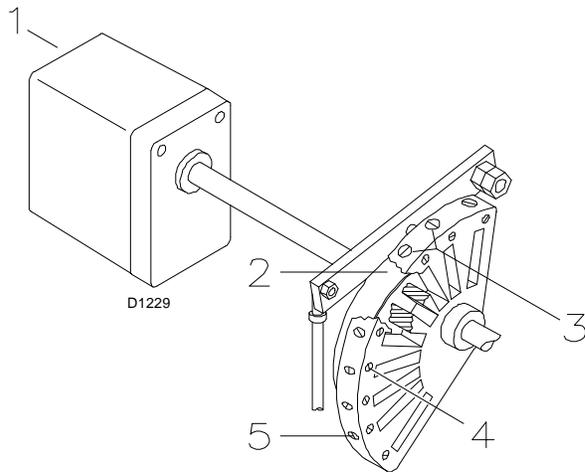
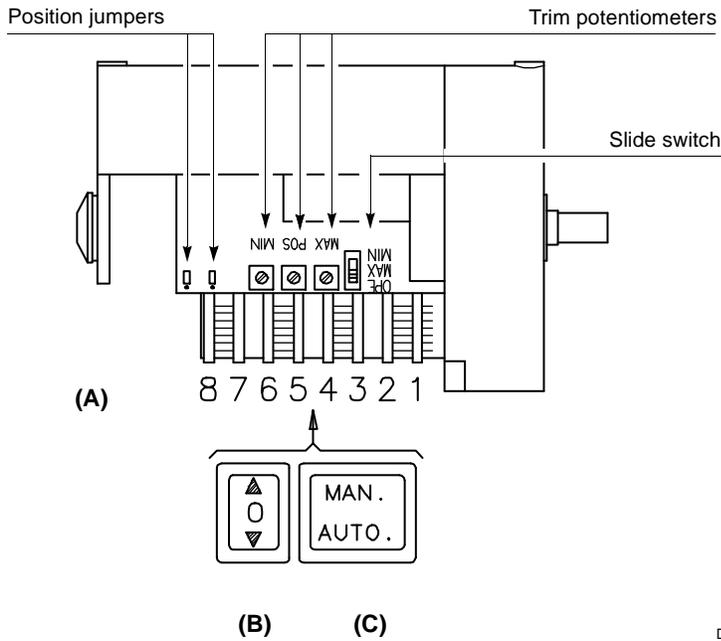
The output and the pressure of the nozzle are at maximum when the servomotor is positioned on maximum.

The fine adjustment of the pressure in the return line may be carried out by changing the setting of the eccentric 7(A), of the nut and lock-nut 5(A).

The eccentric setting should be carried out by loosening screws 8, and turning the screw 6) to obtain the desired eccentricity. Turn clockwise the screw 6) to increase the eccentricity, increasing the difference between the min. and max. capacity of the nozzle; turn counter-clockwise the screw 6) to decrease the eccentricity and, consequently the difference between the min. and max. capacity of the nozzle.

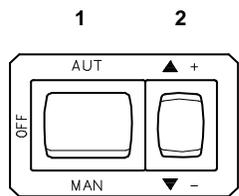
### NOTE

- The proper setting of the eccentric 7) is possible when its operation field follows the servomotor operation field ( $20^\circ \div 130^\circ$ ): so, that every variation of the servomotor position corresponds to a pressure variation.
- **Do not let the piston bottom out repeatedly: the stop ring 4 (A) determines the max. stroke.**
- When the setting is carried out, verify manually that no slow-down occurs between  $0^\circ$  and  $130^\circ$  and that the maximum and minimum pressures correspond to those chosen as per diagrams (B).
- If you wish to check the delivery capacity of the nozzle, open the burner, attach the nozzle, simulate the start-up and then proceed with observation of the maximum and minimum pressures of the fuel.
- If at the maximum capacity of the nozzle (maximum pressure in the return line) pressure fluctuations are detected on the gauge 1), slightly decrease the pressure in the return line until they are completely eliminated.



- 1 Servomotor
- 2 Adjustable profile cam
- 3 Adjustment screws for cam starting profile
- 4 Adjustment fixing screws
- 5 Adjustment screws for cam end profile

(D)



(E)

D791

## BURNER STARTING

Close the control circuit, with the switches in fig. (C) and (E) in the AUTO position.

On firing turn the switch (C) to MAN.

## MAXIMUM OUTPUT

Using button (B), "increase output" until it stops at app. 130° (cam 1).

Place the slide switch on MAX and set the relative MAX trim potentiometer (setting must be very near to 130°) to exploit as far as possible the variable profile cam 2)(D).

The setting of the oil delivery must be made on the variable eccentric 7)(A) page 11 by turning the screw 6)(A)pag. 11.

The air setting must be made on the variable profile cam 2)(D) after loosening the screws 4) by turning the screws 3).

## MINIMUM OUTPUT

With the slide switch on the OPE position, use button (B) "decrease output" until it stops at app. 20° (cam 3).

Put the slide switch in the MIN position and set the modulation minimum using the relative MIN trim potentiometer.

The setting of the oil delivery must be made on the nut and lock-nut 5)(A)page.11 and, if necessary, on the variable eccentric 7)(A) page 11

## Important

When the eccentricity is modified, it is necessary to bring back to MAX and check the setting again.

The setting must be made on the adjustable profile cam 2)(D).

## INTERMEDIATE OUTPUTS

With the switch (C) in the AUTO position, the slide switch in the OPE position and the switch 1)(E) in the MAN position, move the button 2)(E) in various intermediate levels between maximum and minimum and set the variable profile cam 2)(D) to achieve optimum combustion, by turning the screws 3).

If possible, do not change the previously set maximum and minimum levels.

Do not change the eccentric, already adjusted for MAX and MIN.

Check the various setting levels with a combustion analysis.

## Important

Make a progressive setting of the profile, without sharp changes.

When the setting is complete, lock the cam profile using screws 4)(D).

Turn the burner off, release the servomotor as shown in fig. (B) page 10 and manually turn cam 2)(D) to check for smooth operation.

## BURNER OPERATION

### BURNER STARTING (A) - (B)

- Operating control closes, the motor starts.  
The pump 3) draws the fuel from the tank through the piping 1) and pumps it under pressure for delivery. The piston 4) rises and the fuel returns to the tank through the piping 5) - 7). The screw 6) closes the by-pass heading towards suction and the de-energized solenoid valves 2) - 8) - 9) close the passage to the nozzle.
  - Servomotor starts: 130° rotation to right, until contact is made on cam 1. The air damper is positioned on MAX. output.
  - Pre-purge stage with air delivery at MAX. output.
  - Servomotor rotates to left until contact is made on cam 3.
  - Air damper and pressure regulator are positioned on MIN output.
  - Ignition electrodes spark.
  - Solenoid valves 2) - 8) - 9) open; the fuel passes through the piping 10) and filter 11), and enters the nozzle.
- A part of the fuel is then sprayed out through the nozzle, igniting when it comes into contact with the spark: flame at a low output level; the rest of the fuel passes through piping 12) at the pressure adjusted by the regulator 13), then, through piping 7), it goes back into the tank.
- The spark goes out.
  - The starting cycle ends.

### STEADY STATE OPERATION

At the end of the starting cycle, the servo-motor control then passes to load control for boiler pressure or temperature.

- If the temperature or pressure is low (and the load control is consequently closed), the burner progressively increases output up to MAX.
- If subsequently the temperature or pressure increases until the load control opens, the burner progressively decreases output down to MIN.
- The burner shuts down when demand for heat is less than the heat supplied by the burner in the MIN output. The servomotor returns to the 0° angle limited by contact with cam 2. The air damper closes completely to reduce thermal dispersion to a minimum.

Every time output is changed, the servomotor automatically modifies oil delivery (pressure regulator) and air delivery (fan damper).

### FIRING FAILURE

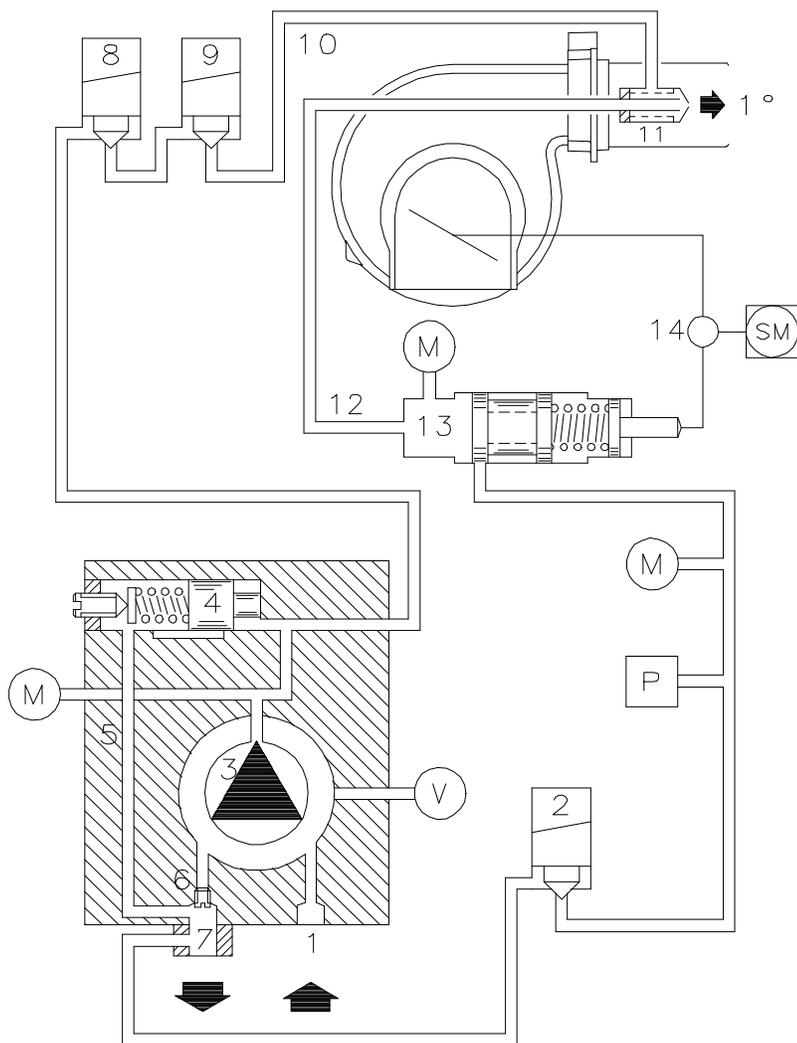
If the burner does not fire, it goes into lock-out within 5 s of the opening of the light oil valve.

### FLAME FAILURE

If the flame should go out for accidental reasons during operation, the burner will lock out in 1 s.

### OIL PRESSURE SWITCH

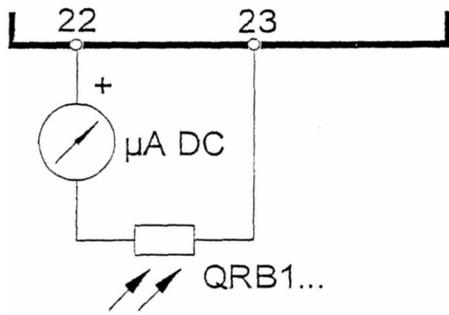
The oil pressure switch 15)(A) page 4 is factory set to 43.5 PSI (3 bar). If the oil pressure reaches this value in the return piping, the pressure switch stops the burner. Burner starts again automatically if the pressure goes down under 43.5 PSI (3 bar) after burner shut down. If a loop circuit with Px pressure feeds the burner, the pressure switch should be adjusted to Px + 43.5 PSI.



(A)

D2444

LAL2... Sub-base



D3206

(A)

**FLAME SIGNAL MEASUREMENT (A)**

Min value for a good signal: 8 μA.

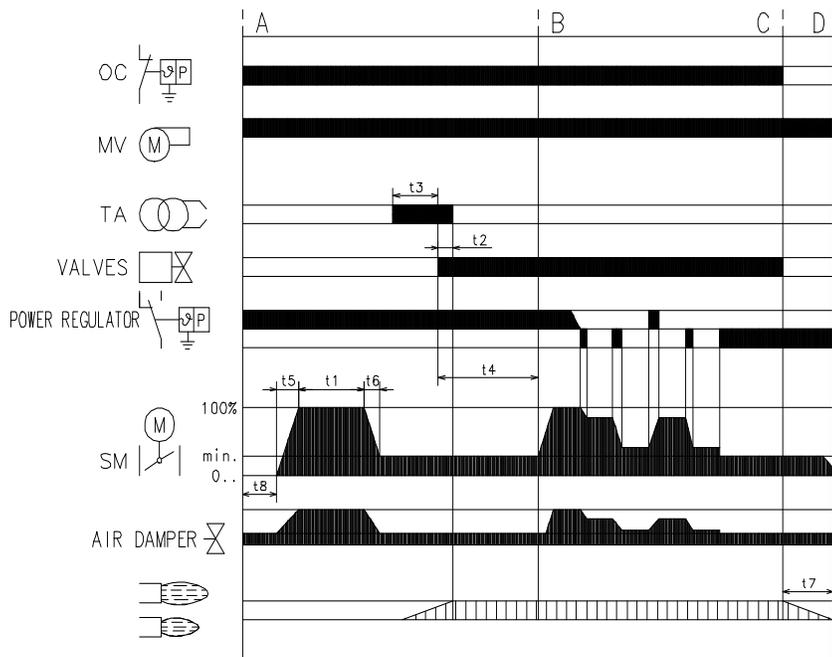
If the value is lower, it can be due to:

- Worn photocell;
- Low current;
- Bad set up of the burner.

In order to measure the current, use a microammeter of 100 μA c.c., connected to the scanner, as in the diagram.

Min. detector current required at AC 230 V	8 μA
Max. detector current required without flame	0.8 μA
Max. detector current that can occur	35 μA
Instrument's + pole	to term. 22
Length of detector line	
In the same cable as the control lines	not perm.
Separate cable in the cable duct	20 m
Three-wire cable	---
Two-wire cable for the detector line (bl, sw); separate single-wire cable for the line (br)	---
Shielded cable (e.g. RG62, shielding insulated)	200 m
Shielding	to term. 23

**Full modulation**



(B)

D2871

**SEQUENCE OF OPERATION - LAL CONTROL**

See fig. (B) - (C).

Switching times are given in seconds, in the burner start-up sequence.

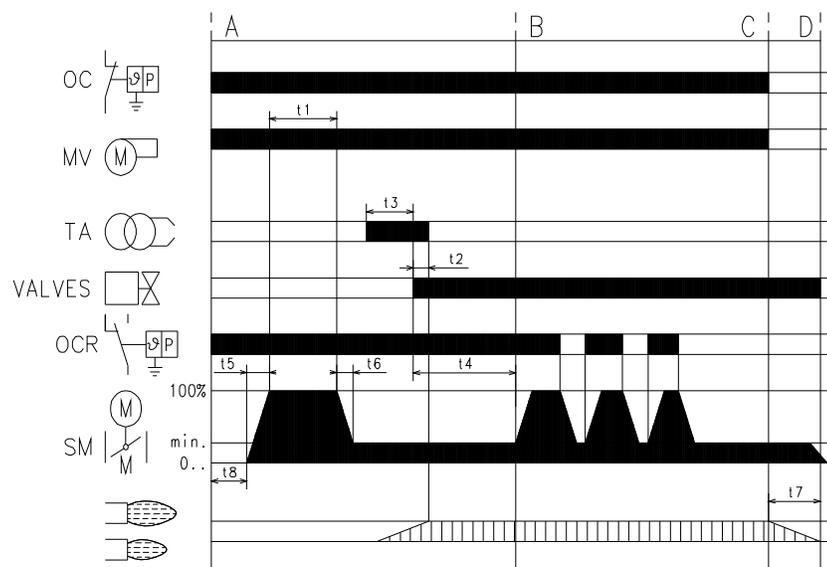
**LAL 2.25**

t1	18	t5	optional
t2	4	t6	optional
t3	2	t7	12
t4	12	t8	4

**Legend for the times**

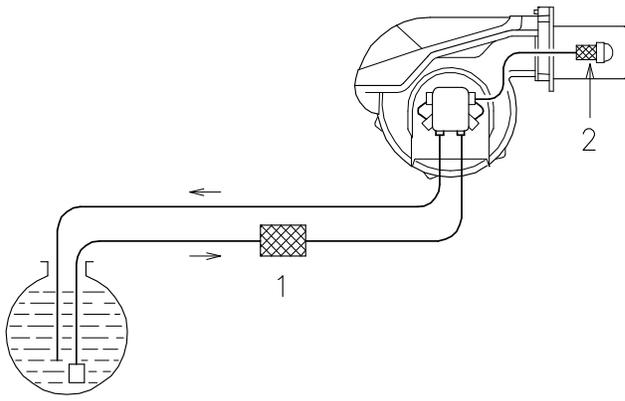
- t1 Pre-purge time with air damper open
- t2 Safety time
- t3 Pre-ignition time, short ("Z" connected to terminal "16")
- t4 Interval between voltage at terminals "18" and "20"
- t5 Air damper running time to OPEN position
- t6 Air damper running time to low-flame position (MIN)
- t7 Permissible after-burn time
- t8 Interval to the OPEN command for the air damper

**High - low**



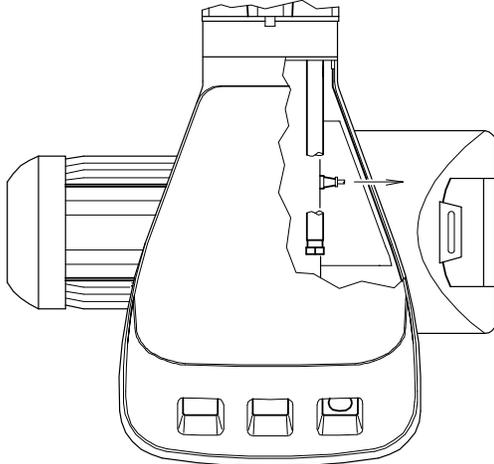
(C)

D2883



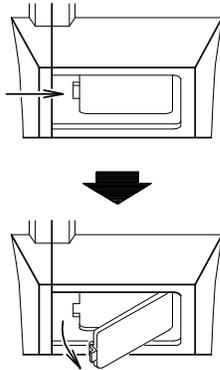
(A)

D2012



(B)

D1254



(C)

D709

## FINAL CHECKS

- Obscure the photocell and switch on the control circuit: the burner should start and then lock-out about 5 s after starting.
- Illuminate the photocell and switch off the control devices: burner should go into lock-out.
- Obscure the photocell while the burner is operating: flame should go out and burner lock out within 1 s.
- Switch off control devices while the burner is operating: the burner should stop.

## MAINTENANCE

### NOTES ON SAFETY FOR THE MAINTENANCE

The periodic maintenance is essential for the good operation, safety, yield and duration of the burner.

It allows you to reduce consumption and polluting emissions and to keep the product in a reliable state over time.



DANGER

The maintenance interventions and the calibration of the burner must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

Before carrying out any maintenance, cleaning or checking operations:



DANGER

Disconnect the electrical supply from the burner by means of the main system switch.



DANGER

Close the fuel interception tap.



DANGER

Wait for the components in contact with heat sources to cool down completely.

### MAINTENANCE PROGRAMME

The gas combustion system should be checked at least once a year by a representative of the manufacturer or another specialised technician.

#### Combustion

An analysis of the flue gases at the boiler outlet is required. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

#### Filters (A)

Check the following filter boxes:

- on line 1)
- at nozzle 2)

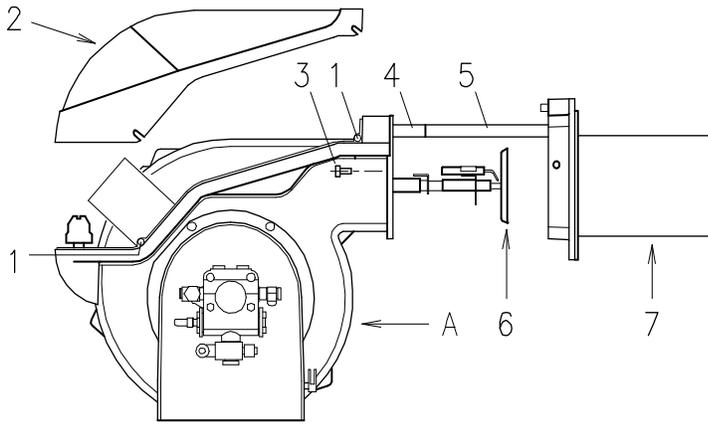
and clean or replace as required. If rust or other impurities are observed inside the pump, use a separate pump to suck out any water and other impurities that may have deposited on the bottom of the tank.

#### Photocell (cad cell) (B)

Clean the glass cover from any dust that may have accumulated. Photocell 1) can be removed by pulling it outward forcefully.

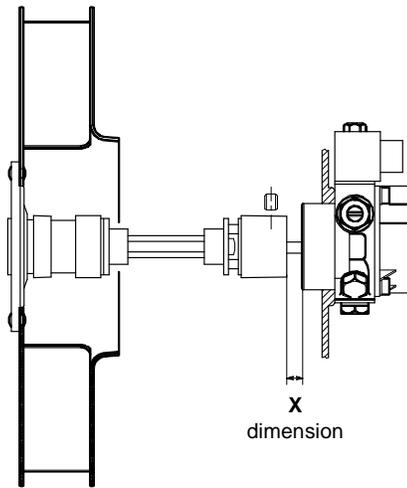
#### Flame inspection window (C)

Clean the glass.



(A)

D1980



(B)

D2854

**Pump**

The pump delivery pressure must be stable at 290 PSI. The suction must be less than 6.5 PSI. Unusual noise must not be evident during pump operation.

If the pressure is found to be unstable or if the pump runs noisily, the flexible hose must be detached from the line filter and the fuel must be sucked from a tank located near the burner. This measure permits the cause of the problem to be traced to either the suction line or the pump.

If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping.

**Fan**

Check to make sure that no dust has accumulated inside the fan or on its blades, as this condition will cause a reduction in the air flow rate and create polluting combustion.

**Combustion head**

Check to make sure that all the parts of the combustion head are in good condition, positioned correctly, free of all impurities, and that no deformation has been caused by operation at high temperatures.

**Nozzles**

Do not clean the nozzle orifices. Replace the nozzles every year or whenever necessary. Combustion must be checked after the nozzles have been changed.

**Flexible hoses**

Check to make sure that the flexible hoses are still in good condition.

**Boiler**

Clean the boiler as indicated in its accompanying instructions in order to maintain all the original combustion characteristics intact, especially the flue gas temperature and combustion chamber pressure. Lastly, check the condition of the flue gas stack.

**OPENING THE BURNER (A)**



Disconnect the electrical supply from the burner by means of the main system switch.



Close the fuel interception tap.



Wait for the components in contact with heat sources to cool down completely.

- Loosen screws 1) and withdraw the cover 2)
- Unscrew screws 3)
- Fit the two extensions 4), supplied with a kit, onto the slide bars 5)
- Pull part A backward keeping it slightly raised to avoid damaging the disk 6) on blast tube 7).



After carrying out maintenance, cleaning or checking operations, reassemble the hood and all the safety and protection devices of the burner.

**FUEL PUMP AND/OR COUPLINGS REPLACEMENT**

As per fig. (B), dimension X should be set at 3/32”.

**BURNER FAULTS**

SYMBOL (1)	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
◀	The burner does not start	1 - A limit or safety control device is open 2 - Control box lock-out 3 - Oil pressure switch tripped 4 - Motor protection tripped 5 - No electrical power supply 6 - Flame safeguard fuse blown 7 - Contact II of servomotor does not operate, flame safeguard terminals 11 - 8 8 - Pump is jammed 9 - Defective motor command control device 10 - Defective Flame safeguard 11 - Defective electrical motor	Adjust or replace Reset control box Adjust pressure switch or eliminate pressure Reset thermal cut-out Close all switches - Check connections Replace Adjust cam II or replace servomotor Replace Replace Replace Replace
	The burner does not start and a function lock-out occurs	12 - Flame simulation 13 - Photocell short-circuit 14 - Missing phase thermal cut-out trips	Replace control box Replace photocell Reset thermal cut-out when third phase is re-connected
▲	The burner starts but stops at maximum air damper setting	15 - Contact I of servomotor does not operate, flame safeguard terminals 9-8	Adjust cam I or replace servomotor
■	The burner starts and then goes into lock-out	16 - Fault in flame detection circuit	Replace flame safeguard
▼	The burner remains in pre-purging phase	17 - Contact III of servomotor does not operate, flame safeguard terminals 10-8	Adjust cam III or replace servomotor
1	After pre-purge and the safety time, the burner goes to lock-out and the flame does not appear	18 - No fuel in tank; water on tank bottom 19 - Inappropriate head and air damper adjustments 20 - Light oil solenoid valves fail to open 21 - Nozzle clogged, dirty, or deformed 22 - Dirty or poorly adjusted firing electrodes 23 - Grounded electrode due to broken insulation 24 - High voltage cable defective or grounded 25 - High voltage cable deformed by high temperature 26 - Ignition transformer defective 27 - Poor electrical connections of valves or transformer 28 - Defective flame safeguard 29 - Pump unprimed 30 - Pump/motor coupling broken 31 - Pump suction line connected to return line 32 - Valves up-line from pump closed 33 - Filters dirty: line - pump - nozzle 34 - Incorrect motor rotation direction	Top up fuel level or suck up water Adjust Check connections; replace coil Replace Adjust or clean Replace Replace Replace and protect Replace Check Replace Prime pump and see "Pump unprimed" Replace Correct connection Open Clean Change motor electrical connections
	The flame ignites normally but the burner locks out when the safety time has elapsed	35 - Defective photocell or flame safeguard 36 - Dirty photocell	Replace photocell or flame safeguard Clean
	Firing with pulsations or flame detachment, (lift off) delayed firing	37 - Poorly adjusted head 38 - Poorly adjusted or dirty firing electrodes 39 - Poorly adjusted fan air gate: too much air 40 - Nozzle unsuited for burner or boiler 41 - Defective nozzle 42 - Inappropriate pump pressure	Adjust Adjust Adjust See Nozzle Table Replace Adjust
2	The burner does not pass to 2nd stage	43 - Control device TR does not close 44 - Defective control box	Adjust or replace Replace
	Uneven fuel supply	45 - Check if cause is in pump or fuel supply system	Feed burner from tank located near burner
	Internally rusted pump	46 - Water in tank	Remove water from tank bottom with separate pump
	Noisy pump, unstable pressure	47 - Air has entered the suction line - Depression value too high (higher than 35 cm Hg) 48 - Tank/burner height difference too great 49 - Piping diameter too small 50 - Suction filters clogged 51 - Suction valves closed 52 - Paraffin solidified due to low temperature	Tighten connectors Feed burner with loop circuit Increase Clean Open Add additive to light oil
	Pump loses prime after prolonged pause	53 - Return pipe not immersed in fuel 54 - Air enters suction piping	Bring to same height as suction pipe Tighten connectors
	Pump leaks light oil	55 - Leakage from sealing organ	Replace pump
	Smoke in flame - dark Bacharach  - yellow Bacharach	56 - Not enough air 57 - Nozzle worn or dirty 58 - Nozzle filter clogged 59 - Erroneous pump pressure 60 - Flame stability disk dirty, loose, or deformed 61 - Boiler room air vents insufficient 62 - Too much air	Adjust head and fan damper Replace Clean or replace Adjust Clean, tighten in place, or replace Increase Adjust head and fan damper
	Dirty combustion head	63 - Nozzle or filter dirty 64 - Unsuitable nozzle delivery or angle 65 - Loose nozzle 66 - Impurities on flame stability disk 67 - Wrong head adjustment or not enough air 68 - Blast tube length unsuited to boiler	Replace See recommended nozzles Tighten Clean Adjust, open air damper Contact boiler manufacturer
I	During operation, the burner stops in lock out	69 - Dirty or defective photocell	Clean or replace

(1) When the burner does not fire or stops following a fault, the symbol which appears on control box after lockout indicates type of problem.

(2) The fuse is located in the rear part of the control box. A spare fuse is also available located under a break off tang.

## ELECTRICAL WIRING

### NOTES ON SAFETY FOR THE ELECTRICAL WIRING



- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the electrical layouts.
- The burners have been type-approved for intermittent operation.  
This means they should be stopped at least once every 24 hours to enable the control box to perform self checks at start-up. Burner halts are normally provided for automatically by the boiler load control system.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- Do not invert the neutral with the phase in the electrical supply line. Any inversion would cause a lockout due to firing failure.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
  - do not use adapters, multiple sockets or extensions;
  - use an omnipolar switch with an opening of at least 1/8" (overvoltage category) between the contacts, as indicated by the current safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:



disconnect the electricity supply from the burner by means of the main switch of the system;



close the fuel interception tap.

If the cover is still present, remove it and proceed with the electrical wiring.

The burners leave the factory preset for:

- **208-230 V** power supply:  
only in this case, if 460 V power supply is required, change the fan and the pump motor connection from delta to star and change the thermal overload as well.
- or **575V** power supply;  
depending on the burner model (see page 3).
- The setting of the thermal overload must be according to the total burner amperage draw.



After carrying out maintenance, cleaning or checking operations, reassemble the hood and all the safety and protection devices of the burner.

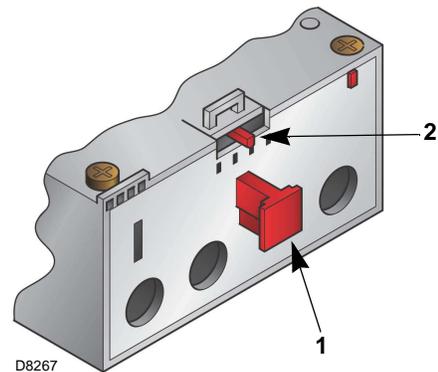
### CALIBRATION OF THE THERMAL RELAY

The thermal relay is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase.

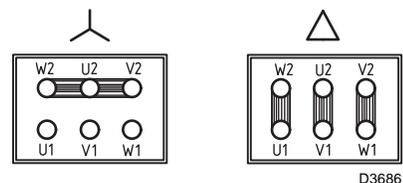
For the calibration, refer to the table below.

To reset, in the case of an intervention of the thermal relay, press the button 1).

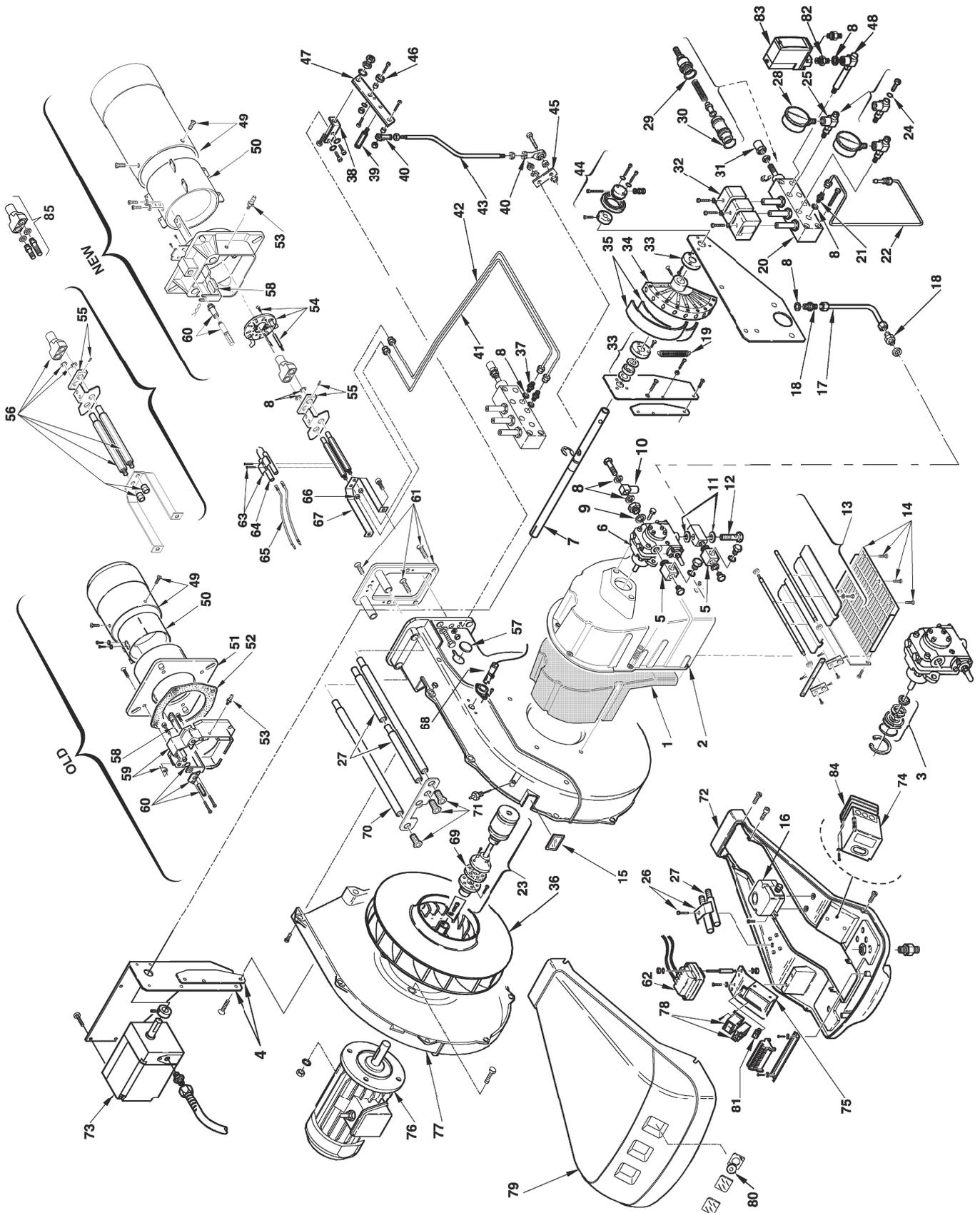
		208 -230 V	460 V	575 V
F	A	T25	T20	T15
S	AWG	12	12	12



### MOTOR CONNECTION



APPENDIX - SPARE PARTS



N.	CODE	20011027	3477870	3477875	DESCRIPTION	BURNER SERIAL NUMBER
1	3013682	•			SOUND DAMPING	
1	3012553		•	•	SOUND DAMPING	≤ 02406xxxxxx
1	3013682		•	•	SOUND DAMPING	≥ 02416xxxxxx
2	3012828		•	•	AIR INTAKE	≤ 02406xxxxxx
3	3000804	•	•	•	PUMP SEAL	
4	3012979	•	•	•	ANCHOR PLATE	
5	3012949	•	•	•	CONNECTOR	
6	3006157	•	•	•	PUMP	
7	3013028	•	•	•	SHAFT	
8	3007079	•	•	•	SEAL	
9	3003006	•	•	•	SEAL	
10	3012455	•	•	•	CONNECTOR	
11	3007164	•	•	•	SEAL	
12	3006184	•	•	•	BAR	
13	3012583	•	•	•	AIR DAMPER ASSEMBLY	≤ 02406xxxxxx
13	3013860	•	•	•	AIR DAMPER ASSEMBLY	≥ 02416xxxxxx
13	3013860	•	•	•	AIR DAMPER ASSEMBLY	≤ 02413xxxxxx
13	20073615	•	•	•	AIR DAMPER ASSEMBLY	≥ 02423xxxxxx
14	3013683	•			GRID	
14	3003086		•	•	GRID	≤ 02406xxxxxx
14	3013683		•	•	GRID	≥ 02416xxxxxx
15	3003763	•	•	•	INSPECTION WINDOW	
16	3012948	•	•	•	AIR PRESSURE SWITCH	
17	3013029	•	•	•	TUBE	
18	3009081	•	•	•	CONNECTOR	
19	3012356	•	•	•	SPRING	
20	3012474	•	•	•	MODULATOR	
21	3006723	•	•	•	CONNECTOR	
22	3012831	•	•	•	TUBE	
23	3013139	•	•	•	DRIVE COUPLING	
24	3007169	•	•	•	O RING	
25	3012476	•	•	•	NEEDLE VALVE	
26	3003409		•	•	U BOLT	≤ 02406xxxxxx
27	3013687	•			BAR EXTENSION	
27	3003956		•	•	BAR EXTENSION	≤ 02406xxxxxx
27	3013687		•	•	BAR EXTENSION	≥ 02416xxxxxx
28	3006140	•	•	•	PRESSURE GAUGE	
29	3003204	•	•	•	SEAL	
30	3007150	•	•	•	O RING	
31	3003200	•	•	•	NUT	
32	3003287	•	•	•	COIL	
33	3012357	•	•	•	BEARING	
34	3012358	•	•	•	CAM	
35	3006097	•	•	•	FLAT SPRING	
36	3012976	•	•	•	FAN	
37	3003005	•	•	•	CONNECTOR	
38	3012602	•	•	•	SUPPORT	
39	3012352	•	•	•	BAR	

N.	CODE	20011027	3477870	3477875	DESCRIPTION	BURNER SERIAL NUMBER
40	3006098	•	•	•	PIN JOINT	
41	3013867	•			TUBE	
41	3012833		•	•	TUBE	≤ 02406xxxxxx
41	3013867		•	•	TUBE	≥ 02416xxxxxx
42	3013868	•			TUBE	
42	3012834		•	•	TUBE	≤ 02406xxxxxx
42	3013868		•	•	TUBE	≥ 02416xxxxxx
43	3012646	•	•	•	TIE ROD	
44	3012472	•	•	•	BEARING	
45	3012601	•	•	•	LEVER	
46	3003841	•	•	•	BEARING	
47	3012354	•	•	•	LEVER	
48	3013065	•	•	•	CONNECTOR	
49	3013760	•	•	•	END CONE	
49	3012561		•	•	END CONE	≤ 02406xxxxxx
49	3013760		•	•	END CONE	≥ 02416xxxxxx
50	3012560	•	•	•	SHUTTER	
51	3012576		•	•	BLAST TUBE	≤ 02406xxxxxx
52	3012572		•	•	FLANGE GASKET	≤ 02406xxxxxx
53	3003322	•	•	•	CONNECTOR	
54	3012835	•	•	•	DIFFUSER DISC	
55	3003790	•	•	•	ANCHOR PLATE	
56	20066897	•	•	•	NOZZLE HOLDER ASSEMBLY	
57	3003996	•	•	•	PLUG	
58	3013698	•			SQUARE	
58	3003982		•	•	SQUARE	≤ 02406xxxxxx
58	3013698		•	•	SQUARE	≥ 02416xxxxxx
59	3012911		•	•	FONT PIECE	≤ 02406xxxxxx
60	3012639	•			CONTROL DEVICE	
60	3003974		•	•	CONTROL DEVICE	≤ 02406xxxxxx
60	3012639		•	•	CONTROL DEVICE	≥ 02416xxxxxx
61	3013685	•				
61	3013685		•	•	PLATES ASSEMBLY	≥ 02416xxxxxx
62	3012938	•	•	•	TRANSFORMER	
63	3003495	•	•	•	U BOLT	
64	3003796	•	•	•	ELECTRODE	
65	3013908	•	•	•	H.T.LEAD	
66	3012095	•	•	•	NUT	
67	3012461	•	•	•	SUPPORT	
68	3006216	C5360027	•	•	P.E.CELL	
69	3004821	•	•	•	DRIVE DISK	
70	3003970		•	•	SCREW	≤ 02406xxxxxx
71	3013681	•			SCREW	
71	3003481		•	•	SCREW	≤ 02406xxxxxx
71	3013681		•	•	SCREW	≥ 02416xxxxxx
72	3013127	•	•	•	BASE PLATE	
73	3012944	•	•	•	SERVOMOTOR	
74	3012933	C5830009	•	•	CONTROL BOX LAL 2.25	

N.	CODE	20011027	3477870	3477875	DESCRIPTION	BURNER SERIAL NUMBER
75	3012748	•	•	•	SUPPORT	
76	3012978	•	•		MOTOR 208-230/460V	
76	3013062			•	MOTOR 575V	
77	3012587	•	•	•	HALF-SHELL	
78	3013137	•	•		OVERLOAD+CONTACTOR 208-230V	
78	3013126			•	OVERLOAD+CONTACTOR 575V	
79	3012934	•	•	•	COVER	
80	3007627	•	•	•	MEMBRAN	
81	3012080	•	•	•	SWITCH	
82	3009075	•	•	•	CONNECTOR	
83	3012384	•	•	•	OIL PRESSURE SWITCH	
84	3012950 C5360001	•	•	•	CONTROL BOX BASE	
85	20088026	•	•	•	NOZZLE HOLDER	

## APPENDIX - PROCEDURE TO REFER BURNER OPERATING CONDITION IN HIGH ALTITUDE PLANTS

- Find the **corrected burner capacity** for the plant's altitude in chart 1 and the **corrected pressure** in chart 2.
- Check in the firing rate graph of the burner (page 7), if the working point defined by the values above is within the range limits.  
If not, higher burner size is needed.

### Note

Charts are based only on altitude variation (reference temperature = 68°F , 20°C)

To get the combined correction in case of different air temperature, a compensation of **1000 ft each 20°F (305 m each 11°C)** is applicable.

### Example

Rated capacity = 3000 MBtu/hr - Rated air pressure = 1.5" w.c.

Real altitude = 5000 ft - Real temperature = 108°F

$\Delta = 108^\circ\text{F} - 68^\circ\text{F}$  (reference temp.) = 40°F (equivalent 2000 ft variation)

Proceeding as described above and considering a "virtual altitude" of (5000 + 2000) ft:

- the corrected capacity is 3847 MBtu/hr;

- the corrected burner air pressure is 1.92.



**Burner RL 100/M is OK**

**1**

## CORRECTED BURNER CAPACITY ACCORDING TO ALTITUDE

S8369

Rated Capacity	Altitude										
	m. a.s.l. ft a.s.l	0	100	305	610	915	1220	1525	1830	2135	2440
500		494	500	512	530	551	571	593	616	641	669
1000		987	1000	1023	1061	1101	1142	1186	1232	1282	1337
1500		1481	1500	1535	1591	1652	1713	1778	1848	1924	2006
2000		1974	2000	2046	2121	2202	2284	2371	2464	2565	2675
2500		2468	2500	2558	2652	2753	2855	2964	3079	3206	3343
3000		2962	3000	3069	3182	3303	3425	3557	3695	3847	4012
3500		3455	3500	3581	3712	3854	3996	4149	4311	4488	4680
4000		3949	4000	4092	4243	4404	4567	4742	4927	5130	5349
4500		4442	4500	4604	4773	4955	5138	5335	5543	5771	6018
5000		4936	5000	5116	5303	5505	5709	5928	6159	6412	6686
5500		5429	5500	5627	5834	6056	6280	6520	6775	7053	7355
6000		5923	6000	6139	6364	6606	6851	7113	7391	7694	8024
6500		6417	6500	6650	6894	7157	7422	7706	8006	8335	8692
7000		6910	7000	7162	7425	7708	7993	8299	8622	8977	9361
7500		7404	7500	7673	7955	8258	8564	8892	9238	9618	10029
8000		7897	8000	8185	8485	8809	9135	9484	9854	10259	10698
8500		8391	8500	8697	9016	9359	9705	10077	10470	10900	11367
9000		8885	9000	9208	9546	9910	10276	10670	11086	11541	12035
9500		9378	9500	9720	10076	10460	10847	11263	11702	12183	12704
10000		9872	10000	10231	10607	11011	11418	11855	12318	12824	13373
Average barometric Pressure (20°C)	mbar	1013	1000	977,4	942,8	908,2	875,8	843,5	811,85	779,8	747,8
Average barometric Pressure (68°F)	"w.c.	399	394	385	371	358	345	332	320	307	294

**2**

## CORRECTED BURNER AIR PRESSURE ACCORDING TO ALTITUDE

Rated Pressure	Altitude										
	m. a.s.l. ft a.s.l	0	100	305	610	915	1220	1525	1830	2135	2440
0,50		0,49	0,50	0,51	0,53	0,55	0,57	0,59	0,62	0,64	0,67
1,00		0,99	1,00	1,02	1,06	1,10	1,14	1,19	1,23	1,28	1,34
1,50		1,48	1,50	1,53	1,59	1,65	1,71	1,78	1,85	1,92	2,01
2,00		1,97	2,00	2,05	2,12	2,20	2,28	2,37	2,46	2,56	2,67
2,50		2,47	2,50	2,56	2,65	2,75	2,85	2,96	3,08	3,21	3,34
3,00		2,96	3,00	3,07	3,18	3,30	3,43	3,56	3,70	3,85	4,01
3,50		3,46	3,50	3,58	3,71	3,85	4,00	4,15	4,31	4,49	4,68
4,00		3,95	4,00	4,09	4,24	4,40	4,57	4,74	4,93	5,13	5,35
4,50		4,44	4,50	4,60	4,77	4,95	5,14	5,33	5,54	5,77	6,02
5,00		4,94	5,00	5,12	5,30	5,51	5,71	5,93	6,16	6,41	6,69
5,50		5,43	5,50	5,63	5,83	6,06	6,28	6,52	6,77	7,05	7,35
6,00		5,92	6,00	6,14	6,36	6,61	6,85	7,11	7,39	7,69	8,02
6,50		6,42	6,50	6,65	6,89	7,16	7,42	7,71	8,01	8,34	8,69
7,00		6,91	7,00	7,16	7,42	7,71	7,99	8,30	8,62	8,98	9,36
7,50		7,40	7,50	7,67	7,96	8,26	8,56	8,89	9,24	9,62	10,03
8,00		7,90	8,00	8,18	8,49	8,81	9,13	9,48	9,85	10,26	10,70
8,50		8,39	8,50	8,70	9,02	9,36	9,71	10,08	10,47	10,90	11,37
9,00		8,88	9,00	9,21	9,55	9,91	10,28	10,67	11,09	11,54	12,04
9,50		9,38	9,50	9,72	10,08	10,46	10,85	11,26	11,70	12,18	12,70
10,00		9,87	10,00	10,23	10,61	11,01	11,42	11,86	12,32	12,82	13,37
Average barometric Pressure (20°C)	mbar	1013	1000	977,4	942,8	908,2	875,8	843,5	811,85	779,8	747,8
Average barometric Pressure (68°F)	"w.c.	399	394	385	371	358	345	332	320	307	294

Reference conditions (Charts 1-2): Ambient temperature 68 °F (20 °C) - Barometric pressure 394" WC (1000 mbar) - Altitude 328 ft a.s.l. (100 m a.s.l.)

**APPENDIX - BURNER START UP REPORT**

Model number: _____	Serial number: _____
Project name: _____	Start-up date: _____
Installing contractor: _____	Phone number: _____

<b>OIL OPERATION</b>			
Oil supply pressure: _____	CO <sub>2</sub> : Low Fire _____	High Fire _____	_____
Oil suction pressure: _____	O <sub>2</sub> : Low Fire _____	High Fire _____	_____
Control Power Supply: _____	CO: Low Fire _____	High Fire _____	_____
Burner Firing Rate: _____	NO <sub>x</sub> : Low Fire _____	High Fire _____	_____
Low Fire Flame Signal: _____	Net Stack Temp - Low Fire: _____	High Fire _____	_____
High Fire Flame Signal: _____	Comb. Efficiency - Low Fire: _____	High Fire _____	_____
Low Fire Nozzle Size: _____	Overfire Draft: _____	_____	_____
High Fire Nozzle Size: _____	Smoke number: _____	_____	_____

<b>CONTROL SETTINGS</b>			
Operating Setpoint: _____	Low Oil Pressure: _____	_____	_____
High Limit Setpoint: _____	High Oil Pressure: _____	_____	_____
Low Gas Pressure: _____	Flame Safeguard Model Number: _____	_____	_____
High Gas Pressure: _____	Modulating Signal Type: _____	_____	_____

<b>NOTES</b>
_____
_____
_____
_____



---

# RIELLO

RIELLO S.p.A.  
I-37045 Legnago (VR)  
Tel.: +39.0442.630111  
[http:// www.riello.com](http://www.riello.com)

---

# RIELLO

35 Pond Park Road  
Hingham, Massachusetts,  
U.S.A. 02043

RIELLO BURNERS NORTH AMERICA

**1-800-4-RIELLO**

1-800-474-3556

<http://www.riello.ca>

2165 Meadowpine Blvd  
Mississauga, Ontario  
Canada L5N 6H6