



Light oil burners

Low - high or modulating operation



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

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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) | GPH | 146 |
| | pressure range | PSI | 101.5 - 580 |
| | fuel temperature | °F max | 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:

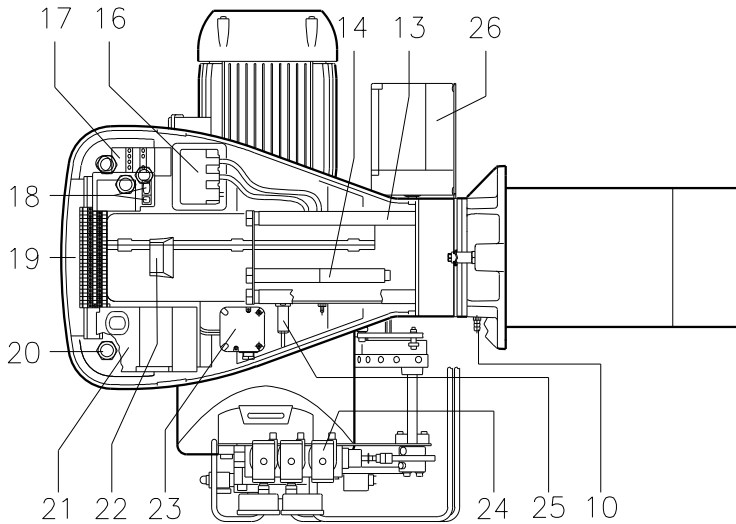
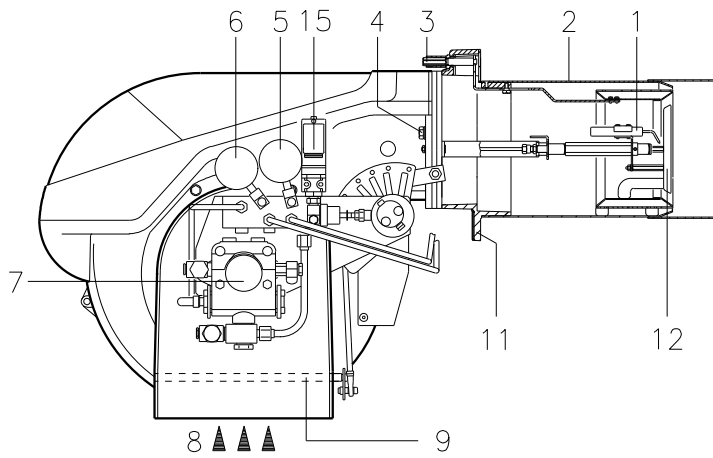
| Model | Code | RBNA Code | Voltage | Flame safeguard |
|----------|----------|-----------|--------------|-----------------|
| RL 190/M | 20011027 | C9517300 | 208-230/3/60 | Burner mounted |
| | 3477870 | C9517310 | 460/3/60 | Burner mounted |
| | 3477875 | C9517301 | 575/3/60 | Burner mounted |

ACCESSORIES (optional):

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

Important:

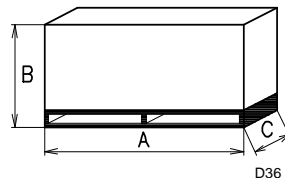
The installer is responsible for the supply and installation of any safety device(s) not indicated in this manual.



(A)

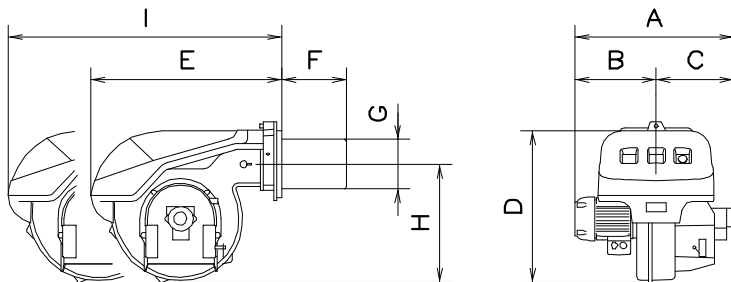
D3932

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



(B)

D36



| | 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

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.

When the burner is not operating the air damper is fully closed in order to reduce to a minimum heat dispersion from the boiler.

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

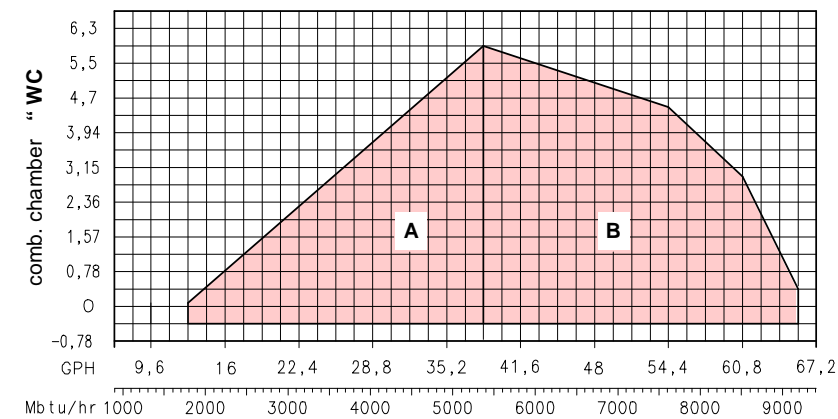
The maximum dimensions of the burners are given in (C).

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

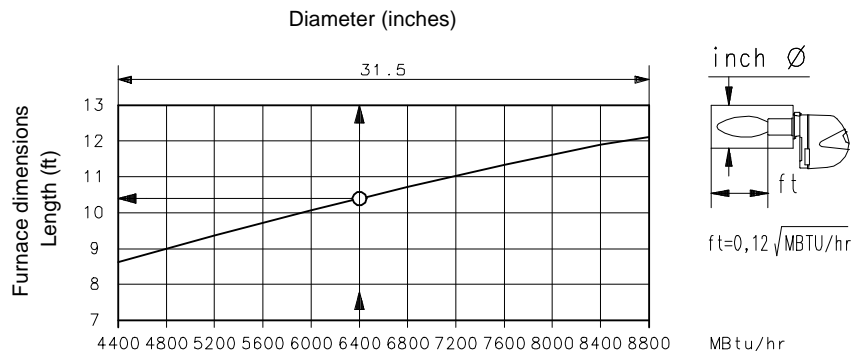
The maximum dimension of the burner when open, without casing, is give in measurement I.

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) D2422



(B) D2920

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.

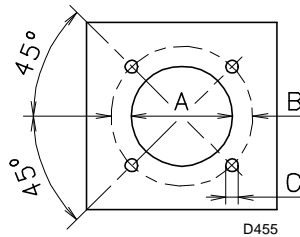
Figure (B) indicates the diameter and length of the test combustion chamber.

Example:

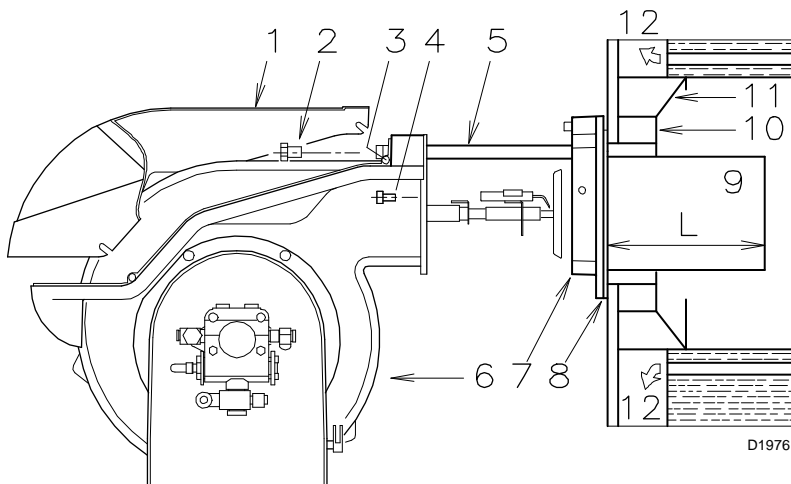
Output 6400 MBtu/hr:
diameter = 31.5 inch; length 10.4 ft

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

| 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.



DANGER

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



WARNING

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.



CAUTION

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 14 9/16".

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.

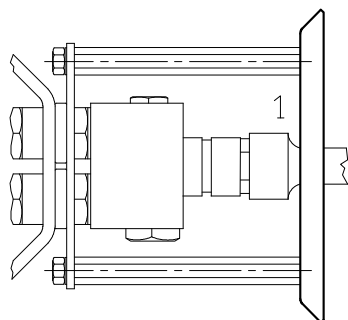
For boilers having a water-cooled front the insulation (11)(B) is not required unless it is required by the boiler manufacturer.

SECURING THE BURNER TO THE BOILER (B)

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

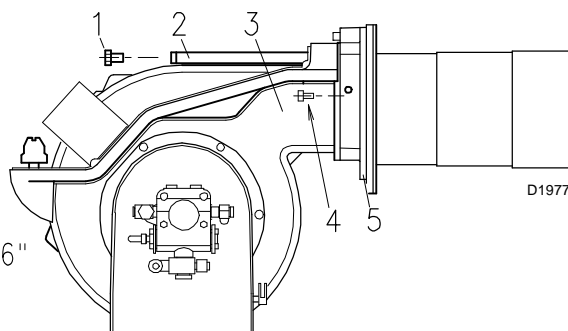
- Loosen the four screws (3) and remove the cover (1).
- Remove the screws (2) from the two slide bars (5).
- Remove the two screws (4) fixing the burner (6) to the flange (7).
- Withdraw the blast tube (9) complete with flange (7) and slide bars (5).

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.

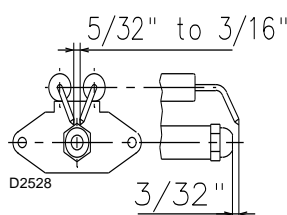


(A)

D1220



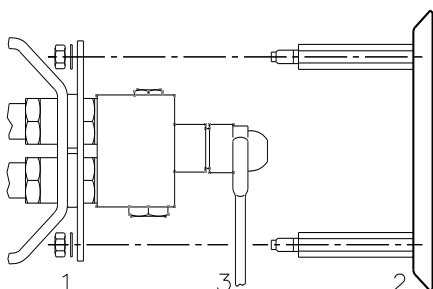
D1977



D2528

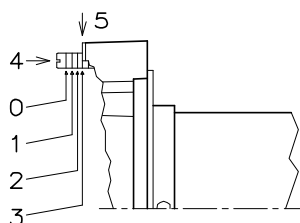
(B)

(C)



D1222

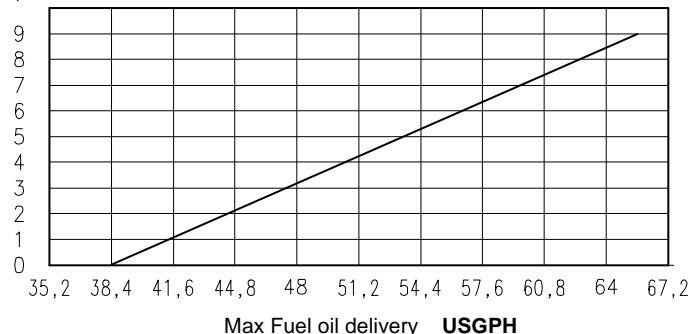
(D)



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.

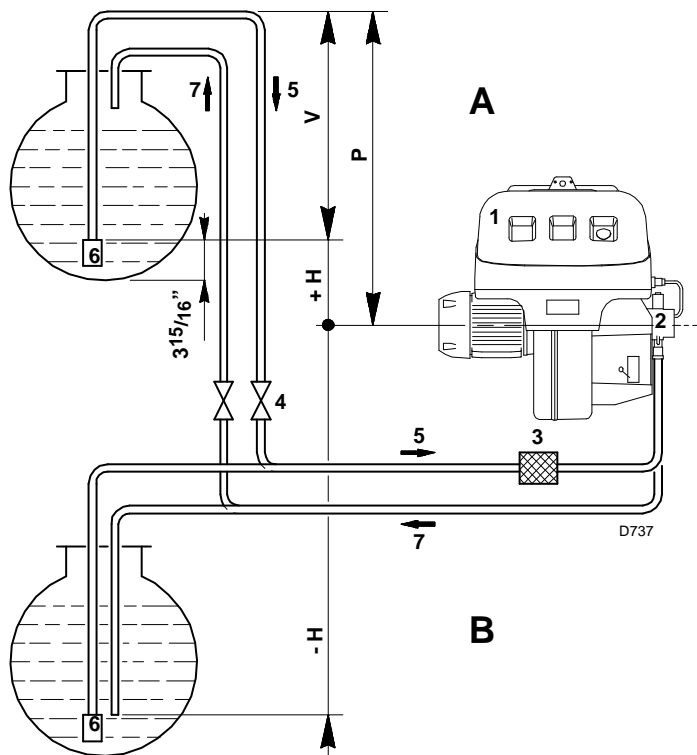
COMBUSTION HEAD SETTING

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 |

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.

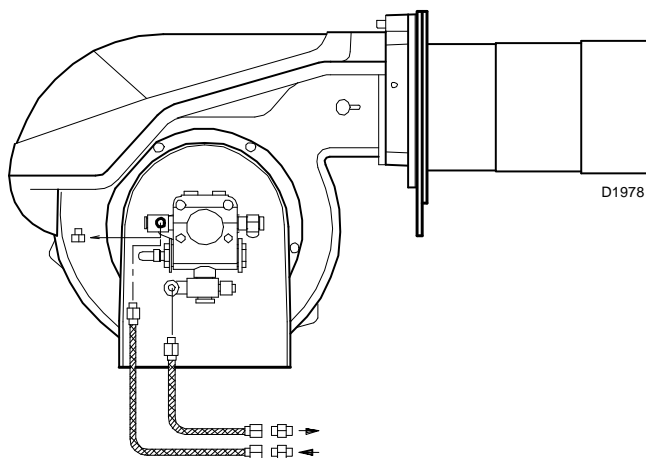
Insert the hose connections with the supplied seals into the connections and screw them down.



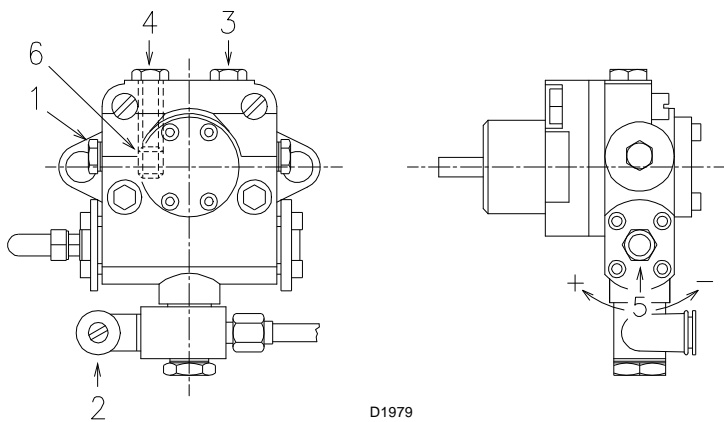
Take care that the hoses are not stretched or twisted during installation.

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



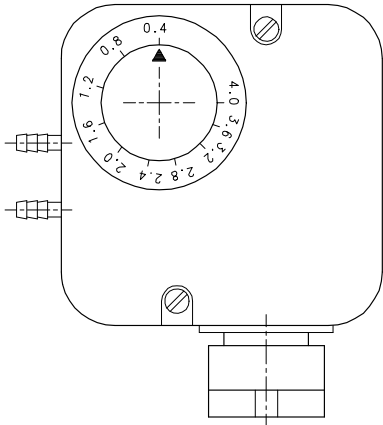
D1979

| | | 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



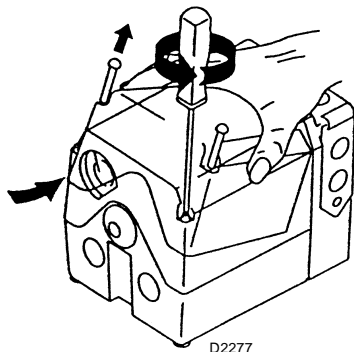
Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause the seal located on the pump shaft to break.

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.

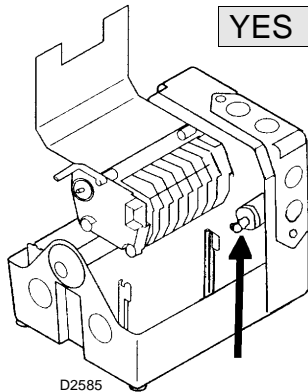
AIR PRESSURE SWITCH (B)

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.

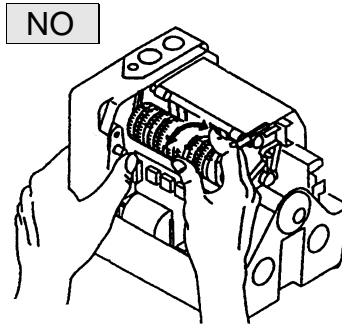


(A)

D2277



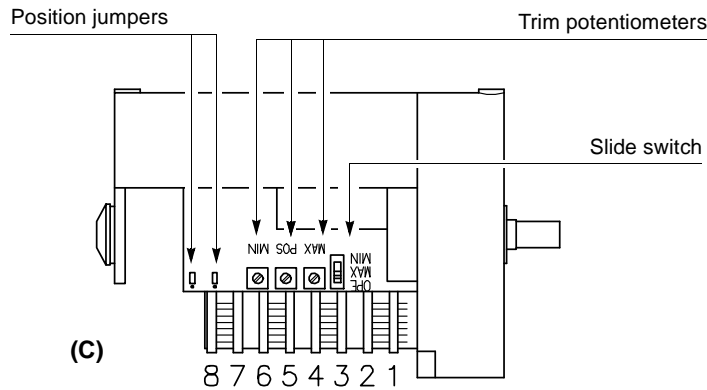
D2585



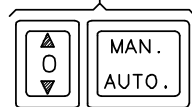
Don't release the button indicated in this figure: the synchronization of the cams made in factory would be changed.

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

(B)

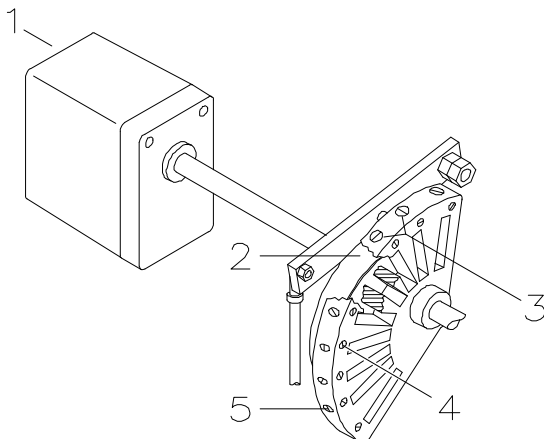


(C)



(D)

(E)



(F)

D1229

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

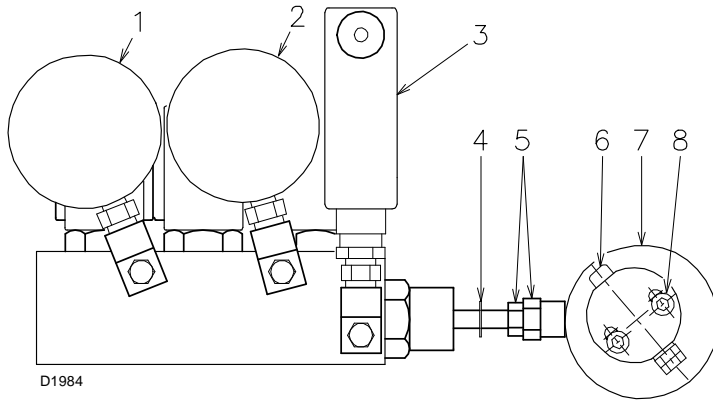
Limits an intermediate operating position between MAX and MIN, supplying power to the "P" terminal in the servomotor (through an external command). This function cuts out any external signals.

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)

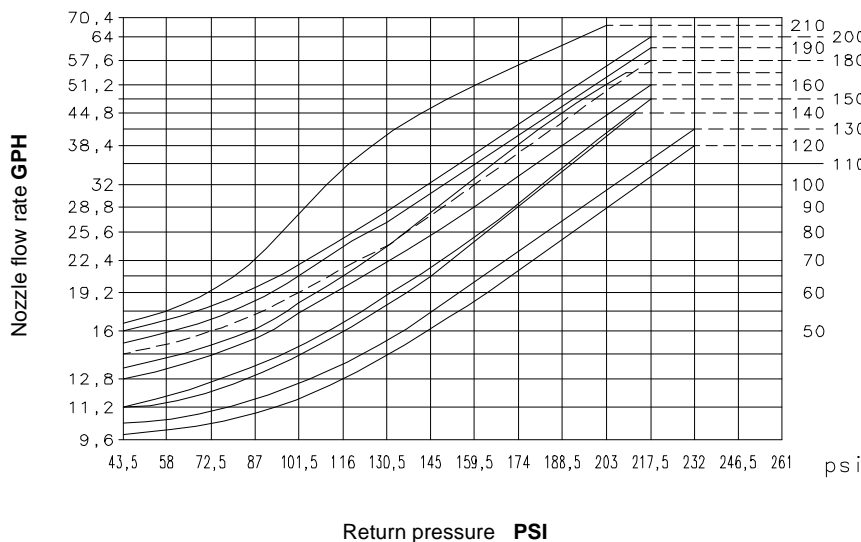
PRESSURE CONTROLLER



- 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° and 130° 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.



- (D)



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

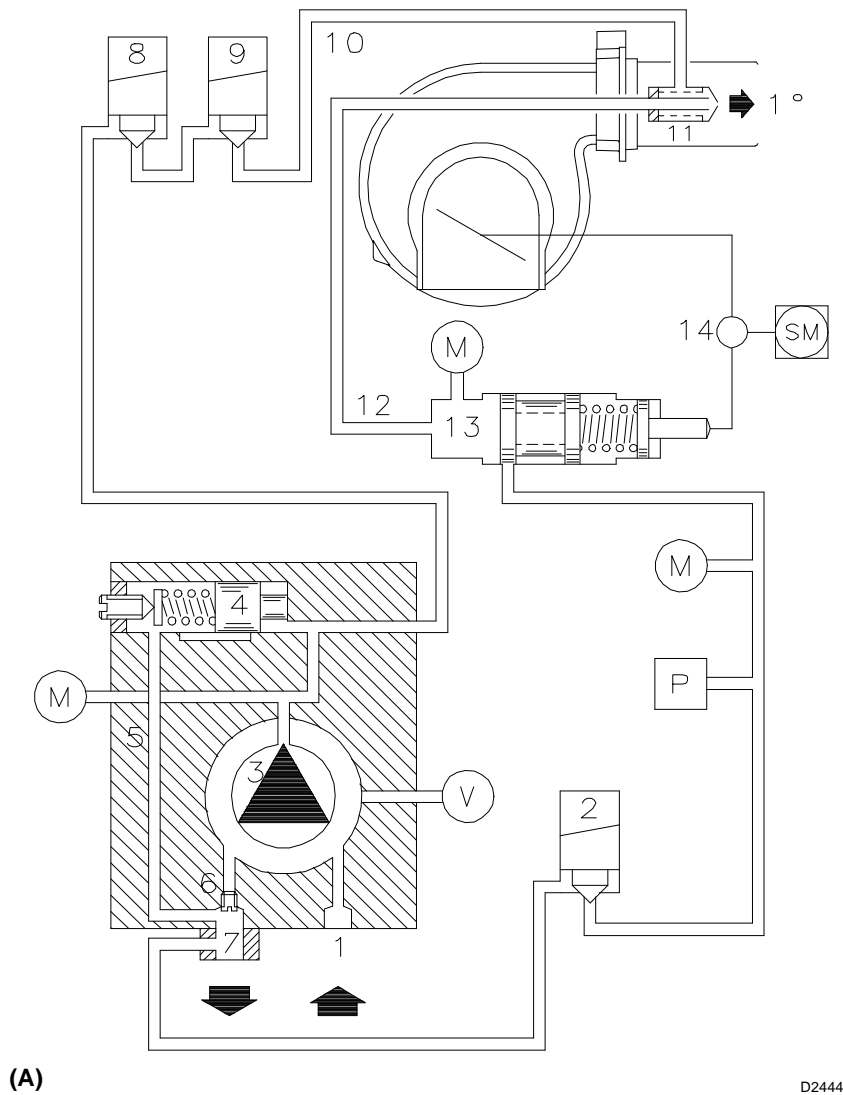
If the burner does not fire, it goes into lock-out within 5 s of the opening of the light oil valve.

FLAME FAILURE

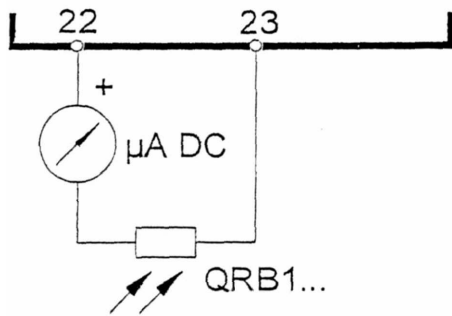
If the flame should go out for accidental reasons during operation, the burner will lock out in 1 s.

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.



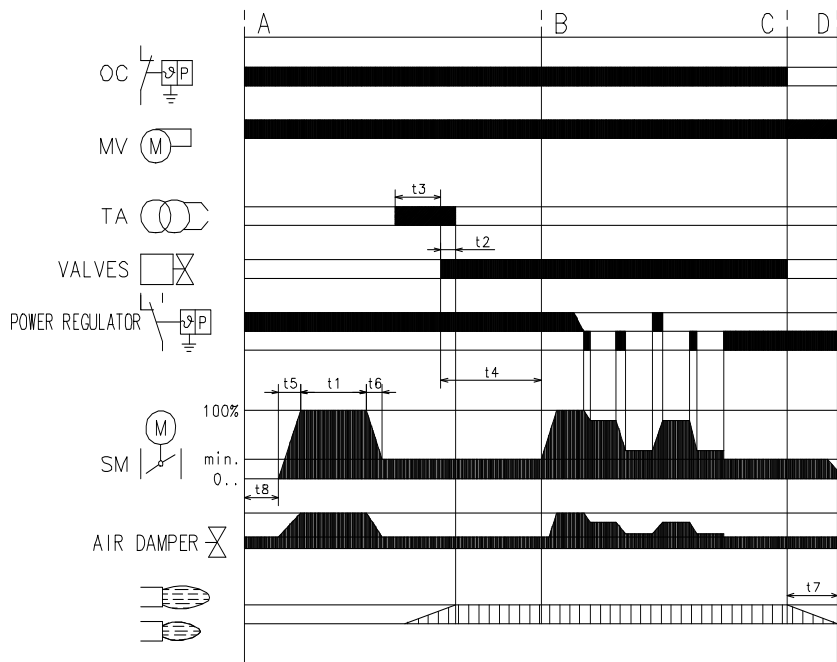
LAL2... Sub-base



D3206

(A)

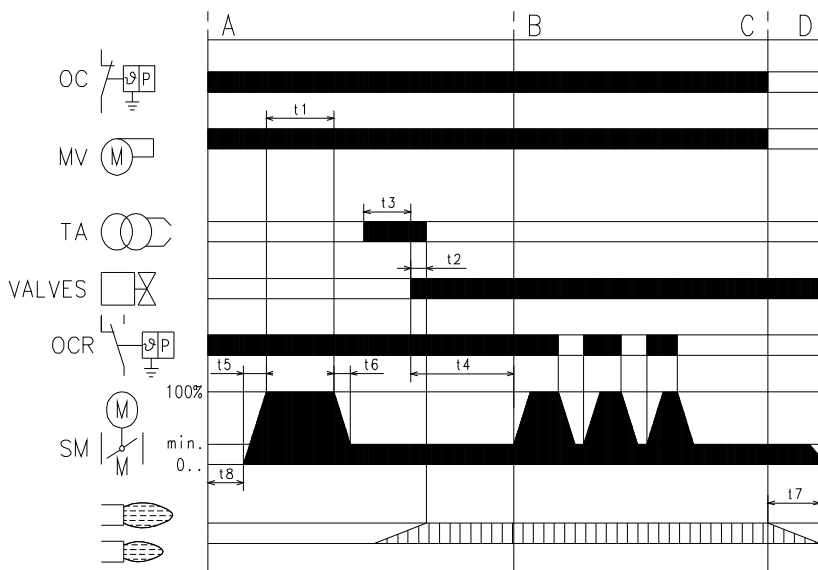
Full modulation



(B)

D2871

High - low



(C)

D2883

FLAME SIGNAL MEASUREMENT (A)

Min value for a good signal: 8 μ A.

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 μ A c.c., connected to the scanner, as in the diagram.

| | |
|---|-------------|
| Min. detector current required at AC 230 V | 8 μ A |
| Max. detector current required without flame | 0.8 μ A |
| Max. detector current that can occur | 35 μ A |
| 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 |

SEQUENCE OF OPERATION - LAL CONTROL

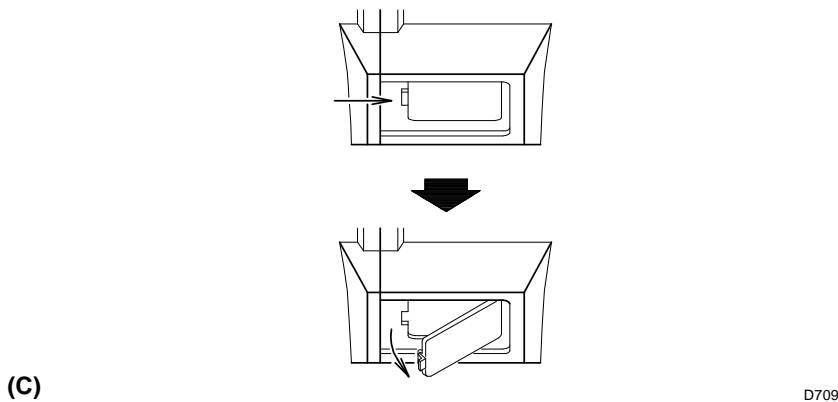
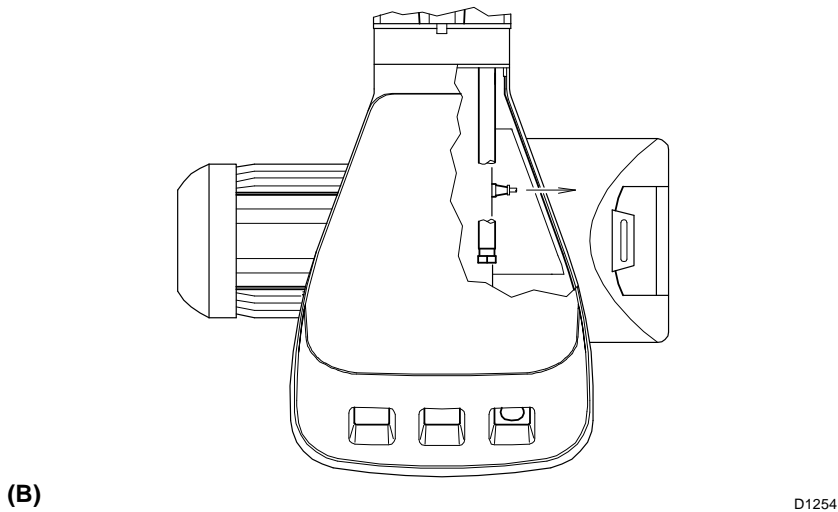
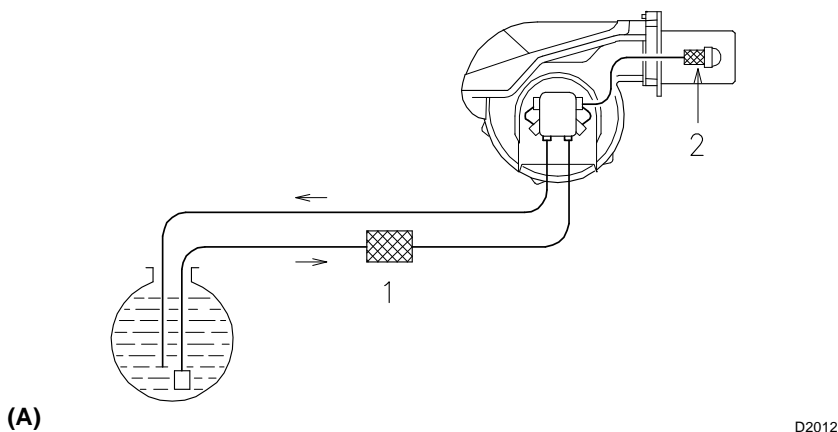
See fig. (B) - (C).

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



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.



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:



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.

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)

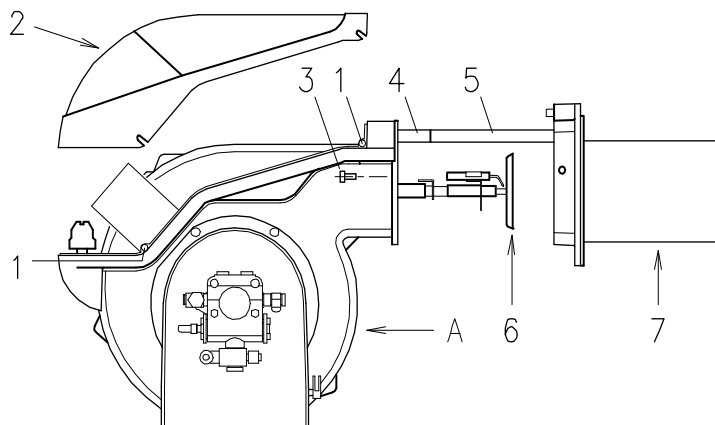
and clean or replace as required. If rust or other impurities are observed inside the pump, use a separate pump to suck out any water and other impurities that may have deposited on the bottom of the tank.

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.

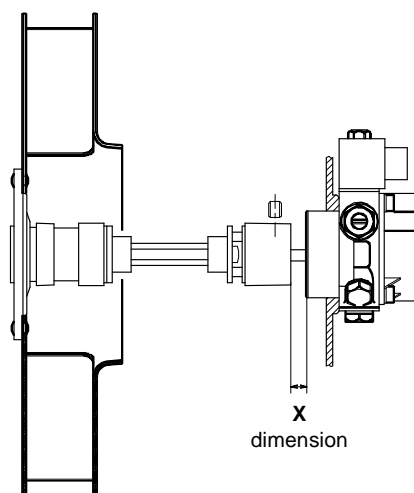
Flame inspection window (C)

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 $\frac{3}{32}$ ".

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 when third phase is re-connected | Replace control box Replace photocell Reset thermal cut-out Replace |
| ▲ | 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 |
| 2 | 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 |
| | 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 | 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 |
| | - yellow Bacharach | | |
| | 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 $\frac{1}{8}$ " (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.

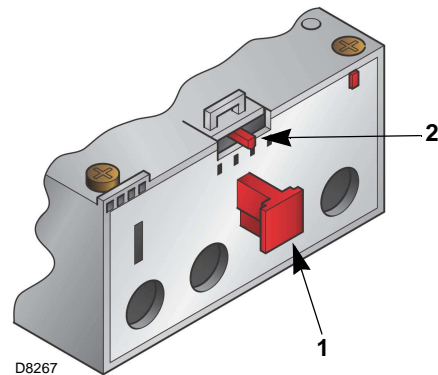
CALIBRATION OF THE THERMAL RELAY

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

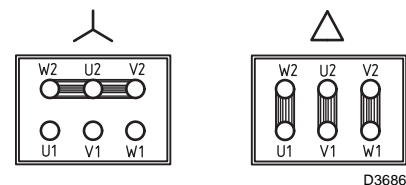
For the calibration, refer to the table below.

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

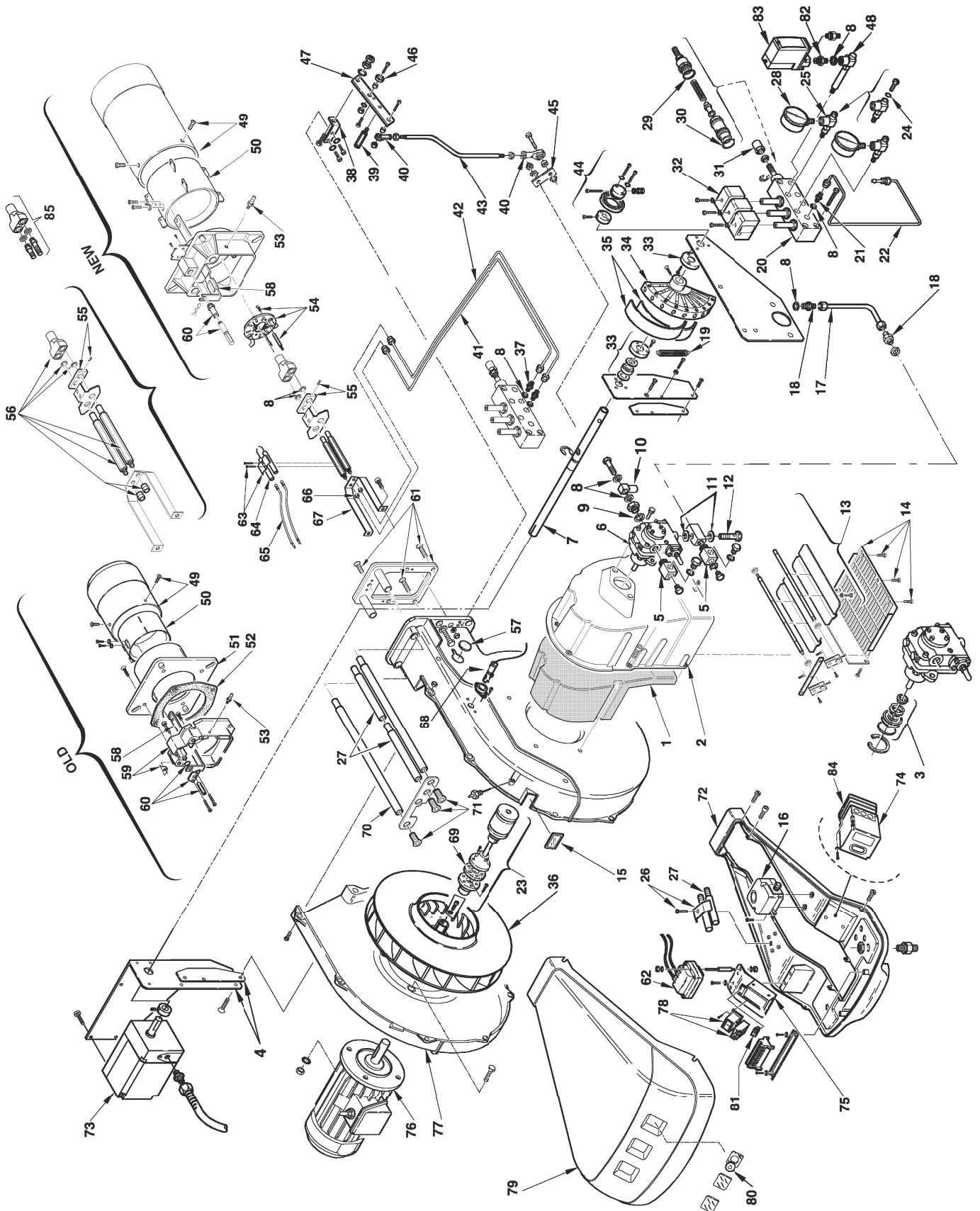
| | | 208 -230 V | 460 V | 575 V |
|---|-----|------------|-------|-------|
| F | A | T25 | T20 | T15 |
| S | AWG | 12 | 12 | 12 |



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

S8369

1

CORRECTED BURNER CAPACITY ACCORDING TO ALTITUDE

| 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: | _____ |

OIL OPERATION

| | | | | | |
|-------------------------|-------|------------------------------|-------|-----------|-------|
| Oil supply pressure: | _____ | CO ₂ : Low Fire | _____ | High Fire | _____ |
| Oil suction pressure: | _____ | O ₂ : Low Fire | _____ | High Fire | _____ |
| Control Power Supply: | _____ | CO: Low Fire | _____ | High Fire | _____ |
| Burner Firing Rate: | _____ | NO _x : 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: | _____ | | |

CONTROL SETTINGS

| | | | |
|----------------------|-------|-------------------------|-------|
| Operating Setpoint: | _____ | Low Oil Pressure: | _____ |
| High Limit Setpoint: | _____ | High Oil Pressure: | _____ |
| Low Gas Pressure: | _____ | Flame Safeguard Model | _____ |
| High Gas Pressure: | _____ | Number: | _____ |
| | | Modulating Signal Type: | _____ |

NOTES

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