GB

Light oil burners

Low - High or modulating operation

CODE	MODEL
C9514300 - C9514301 - C9514303	RL 70/M
C9515300 - C9515301 - C9515303	RL 100/M
C9516300 - C9516301	RL 130/M

CONTENTS

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 5.

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 70/M	RL 100/M	RL 130/M
Output (1)	High	MBtu/hr (3) GPH	1792 - 3136 12.8 - 22.4	2688 - 4480 19.2 - 32	3564 - 5824 25.6 - 41.6
	Low	MBtu/hr (3) GPH	756 - 1792 5.4 - 12.8	1260 - 2688 9 - 19.2	1568 - 3584 11.2 - 25.6
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)		
Pump	delivery (at 290 PSI) pressure range fuel temperature	GPH PSI ° F max	60.8 145 - 304.5 194 (90 °C)		
Noise levels (3)		dB(A)	75	77	78.5

(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.

ELECTRICAL DATA

Model		RL 70/M	RL 100/M	RL 130/M
Control circuit power supply	V/Ph/Hz	120/1/60		
Main electrical supply (+/- 10%)	V/Ph/Hz	208-230/3/60		
Fan and pump motor IE2/Epact	rpm W - HP V A	3475 1100 - 1.5 208-230 4	3500 2200 - 3 208-230 7.8	3500 2200 - 3 208-230 7.8
Ignition transformer	V1 - V2 I1 - I2	120 V - 2 X 5 kV 2.7 A - 30 mA		
Electrical power consumption	W max	1350	2600	2600
Electrical control circuit coms.	W	750		
Total electrical consumption	W	2100	3350	3350
Electrical protection		NEMA 1		

Model		RL 70/M	RL 100/M	RL 130/M
Control circuit power supply	V/Ph/Hz	120/1/60		
Main electrical supply (+/- 10%)	V/Ph/Hz	460/3/60		
Fan and pump motor IE2/Epact	rpm W - HP V A	3475 1100 - 1.5 460 2	3500 2200 - 3 460 3.9	3500 2200 - 3 460 3.9
Ignition transformer	V1 - V2 I1 - I2	120 V - 2 X 5 kV 2.7 A - 30 mA		
Electrical power consumption	W max	1350	2600	2600
Electrical control circuit coms.	W	750		
Total electrical consumption	W	2100	3350	3350
Electrical protection		NEMA 1		

Model		RL 70/M	RL 100/M	RL 130/M
Control circuit power supply	V/Ph/Hz		120/1/60	
Main electrical supply (+/- 10%)	V/Ph/Hz		575/3/60	
Fan and pump motor IE2/epact	rpm W - HP V A	3475 1100 - 1.5 575 1.6	3500 2200 - 3 575 3.1	3500 2200 - 3 575 3.1
Ignition transformer	V1 - V2 I1 - I2		120 V - 2 X 5 kV 2.7 A - 30 mA	
Electrical power consumption	W max	1350	2600	2600
Electrical control circuit coms.	W		750	
Total electrical consumption	W	2100	3350	3350
Electrical protection			NEMA 1	

Model		RL 70/M	RL 100/M
Control circuit power supply	V/Ph/Hz	120/1/60	
Main electrical supply (+/- 10%)	V/Ph/Hz	208-220/1/60	
Fan motor	rpm W - HP V A	3400 1100 - 1.5 208-220 7	3450 1800 - 2.4 208-220 11.5
Motor capacitor	µF	50	70
Ignition transformer	V1 - V2 I1 - I2	120 V - 1 X 8 kV 1.6 A - 20 mA	
Electrical power consumption	W max	1540	2530
Electrical control circuit consumption	W	750	
Total electrical consumption	W	2290	3280
Electrical protection		NEMA 1	

BURNER MODELS DESIGNATIONS

Model	Code	RBNA Code	Voltage	Flame safeguard
RL 70/M	3477070 3477075 20094657	C9514300 C9514301 C9514305	208-230/460/3/60 575/3/60 208-220/1/60	Burner mounted Burner mounted Burner mounted
RL 100/M	3477270 3477275 20094658	C9515300 C9515301 C9515303	208-230/460/3/60 575/3/60 208-220/1/60	Burner mounted Burner mounted Burner mounted
RL 130/M	3477470 3477475	C9516300 C9516301	208-230/460/3/60 575/3/60	Burner mounted Burner mounted

ACCESSORIES (optional):

- **Kit for lengthening the combustion head**

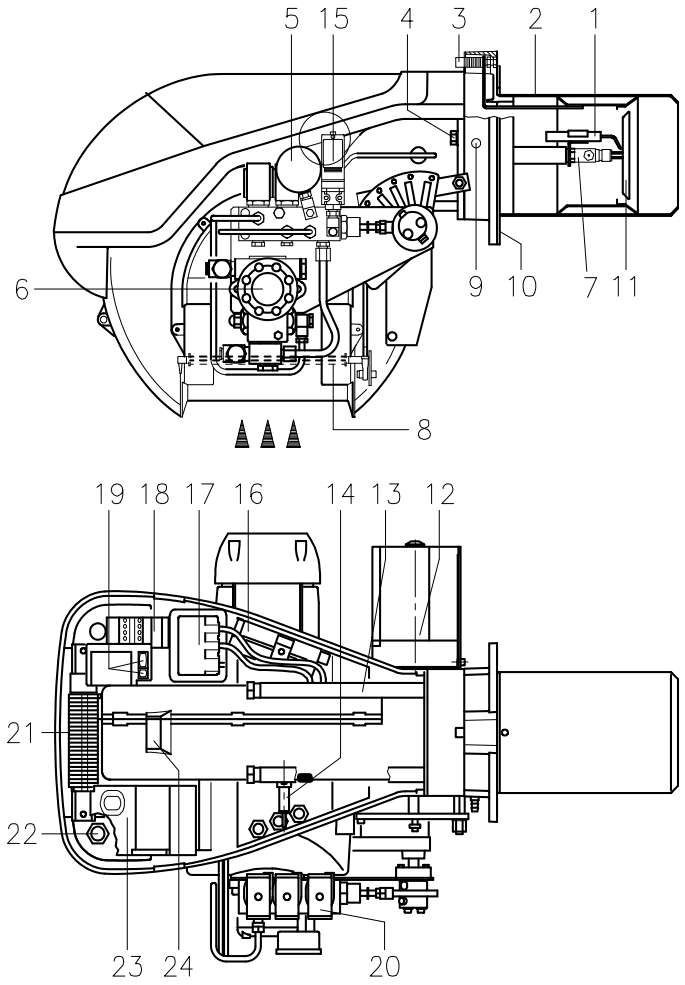
L = Standard length
L1 = Length obtainable with the kit

COD. 3010280	L = 10 23/32"	L1 = 15 5/32"	• RL 70/M
COD. 3010281	L = 10 23/32"	L1 = 15 5/32"	• RL 100/M
COD. 3010282	L = 10 23/32"	L1 = 15 5/32"	• RL 130/M

- **Flame inversion boiler kit**

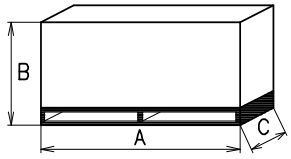
COD. 3010180 • RL 70 - 100/M
COD. 3010183 • RL 130/M

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

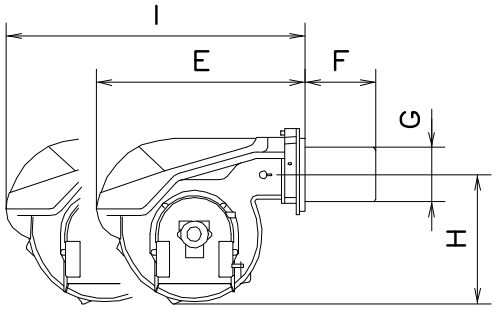


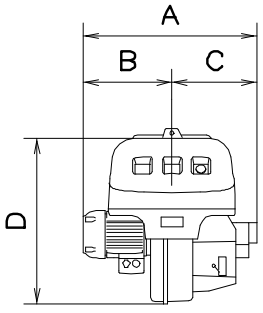
(A) D2349

inch	A	B	C	lbs
RL 70/M	45 9/32“	23 5/8“	31 3/16“	143
RL 100/M	45 9/32“	23 5/8“	31 3/16“	150
RL 130/M	45 9/32“	23 5/8“	31 3/16“	157



(B) D36





RL	A	B	C	D	E	F (1)	G	H	I (1)
70	26 1/8”	11 21/32”	14 15/32”	21 27/32”	26 25/32”	10 23/32” - 15 5/32”	7 1/16”	16 15/16”	37 7/16” - 42 3/4”
100	26 1/8”	12 9/32”	14 15/32”	21 27/32”	26 25/32”	10 23/32” - 15 5/32”	7 1/16”	16 15/16”	37 7/16” - 42 3/4”
130	27 3/4”	13 5/16”	14 15/32”	21 27/32”	26 25/32”	10 23/32” - 15 5/32”	7 7/16”	16 15/16”	37 7/16” - 42 3/4”

(1) Blast tube: short - long (obtainable with the kit)

(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 Pump
7 Non-drip nozzle holder
8 Air damper
9 Fan pressure test point
10 Boiler mounting flange
11 Flame stability disk
12 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.
13 Slide bars for opening the burner and inspecting the combustion head
14 Photocell (cad cell)
15 High oil pressure switch
16 Extensions for slide bars 14) (with kit)
17 Ignition transformer
18 Motor contactor and thermal overload with reset button
19 Power switch for different operations:
automatic - manual - off.
Button for:
power increase - power reduction.
20 Valve assembly with pressure regulator on nozzle return
21 Terminal strip
22 Knockouts for electrical connections by installer
23 Flame safeguard with lock-out pilot light and lock-out reset button
24 Flame inspection window

Two types of burner failure may occur:

Flame safeguard Lock-out: if the Flame relay 23)(A) pushbutton lights up, it indicates that the burner is in lock-out.
To reset, press the pushbutton.
Motor trip: release by pressing the pushbutton on thermal overload 18)(A).

PACKAGING - WEIGHT (B) - Approximate measurements

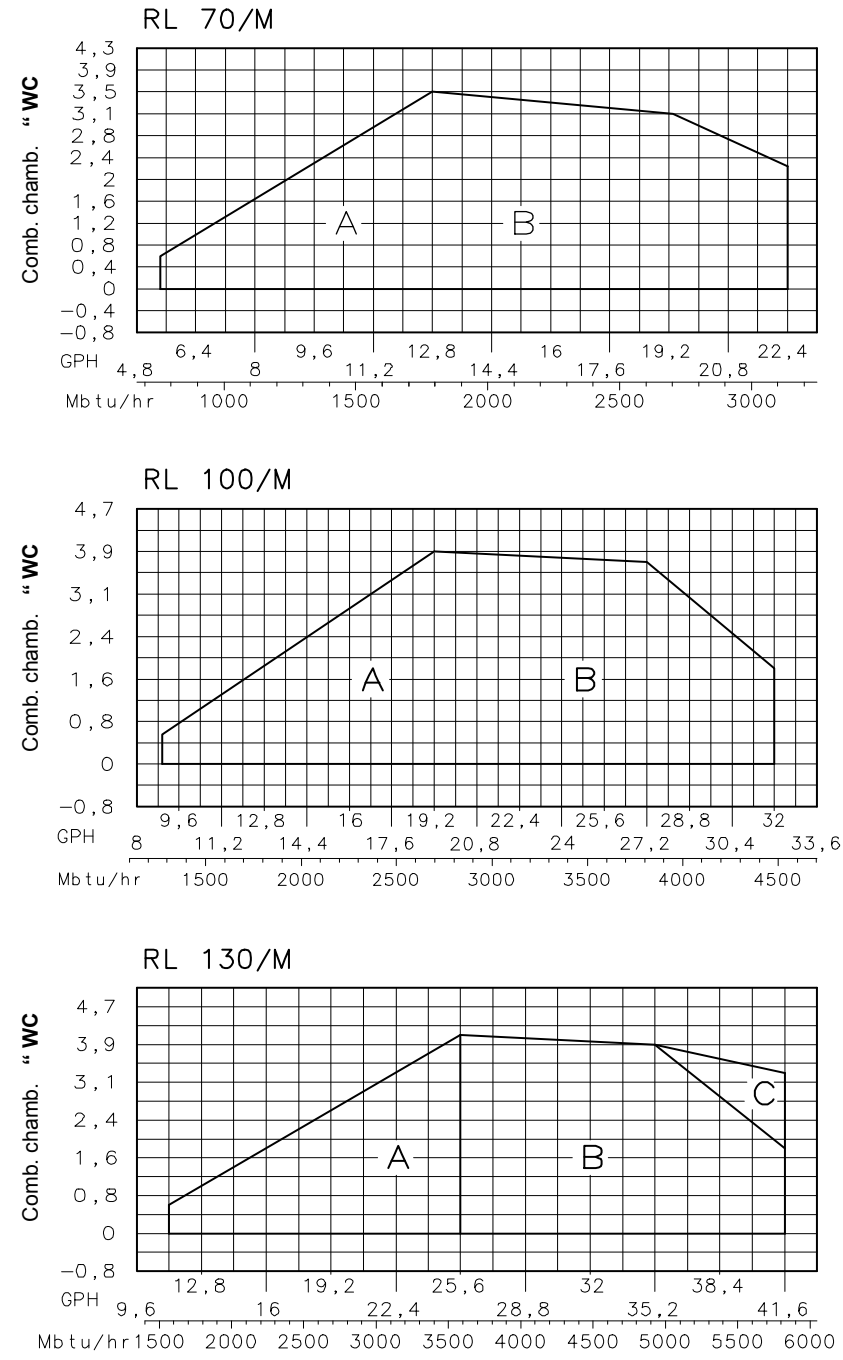
- The burners is supplied skid mounted. Outer dimensions of packaging are indicated in (B).
- The weight of the burner complete with packaging is indicated in Table (B).

MAX. DIMENSIONS (C) - Approximate measurements

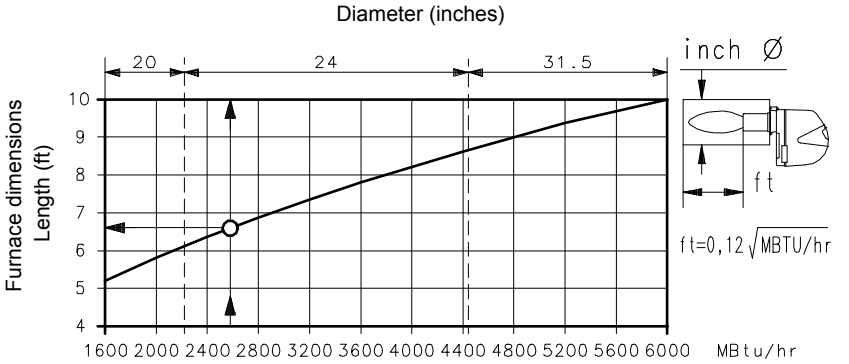
The maximum dimensions of the burners are given in (C).
Keep in mind that inspection of the combustion head requires the burner to be opened and the rear part withdrawn on the slide bars.
The maximum dimension of the burner when open, without casing, is given in measurement I.

STANDARD EQUIPMENT

2 - Flexible hoses
2 - Gaskets for flexible hoses
1 - Burner head gasket
4 - Screws to secure the burner flange to the boiler 1/2 W
1 - Adaptor G 1/8“ / 1/8“ NPT
1 - Instruction booklet
1 - Spare parts list



(A) D2350



(B) D2919

FIRING RATES (A)

During operation, burner output varies between:

- **MINIMUM OUTPUT**: area A;
- **MAXIMUM OUTPUT**: area B (and C for model RL 130/M).

Graphs (A):
Horizontal axis: Burner output
Vertical axis: Combustion chamber pressure

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.
In order to utilize also area C (RL 130/M) it is necessary to perform the calibration of the combustion head as explained on page 9.

Note:
The firing rate areas given in fig. (A) have been reduced by 10% with respect to the maximum range that can be reached.

WARNING

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 9.

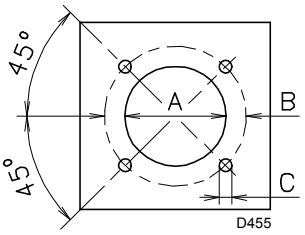
Consult Procedure on page 27 to refer burner operating condition in high altitude plants.

MINIMUM FURNACE DIMENSIONS (B)

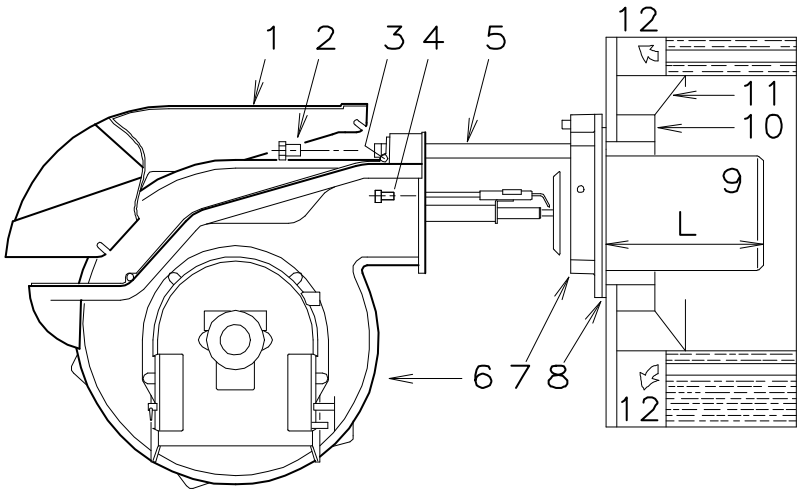
The firing rates were set in relation to certified test boilers.
Figure (B) indicates the diameter and length of the test combustion chamber.

Example
Output 2579 MBtu/hr:
diameter 24 inch - length 6.6 ft.

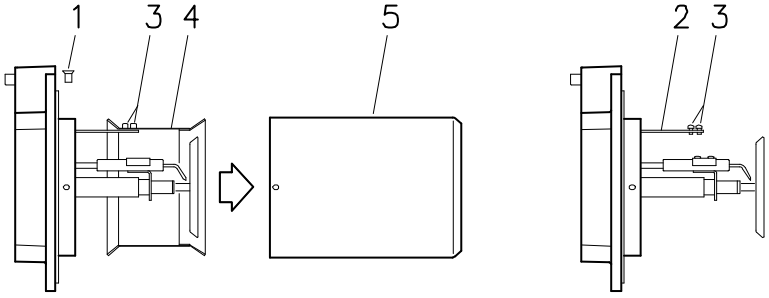
inch	A	B	C
RL 70/M	7 9/32“	10 27/32“ - 12 13/16“	1/2 W
RL 100/M	7 9/32“	10 27/32“ - 12 13/16“	1/2 W
RL 130/M	7 21/32“	10 27/32“ - 12 13/16“	1/2 W



(A)



(B) D1219



(C) D690

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 range of lengths available, L (inch), is as follows:

Blast tube 9):	RL 70/M	RL 100/M	RL 130/M
• short	10 23/32”	10 23/32”	10 23/32”
• long	15 5/32”	15 5/32”	15 5/32”

For boilers with front flue passes 12) or flame inversion chambers, protective insulation material 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 10)-11)(B) is not required unless it is required by the boiler manufacturer.

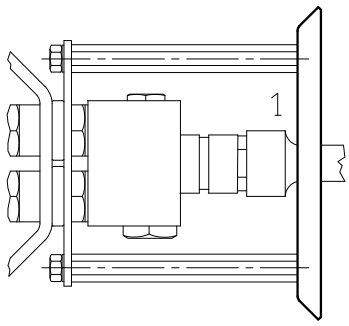
SECURING THE BURNER TO THE BOILER (B)

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).

COMBUSTION HEAD CALIBRATION

At this point check, for model RL 130/M, whether the maximum delivery of the burner is contained in area B or in area C of the firing rate. See page 7.
If it is in area B then no operation is required.
If, on the other hand, it is in area C:
- Unscrew the screws 1)(C) and disassemble the blast tube 5);
- Unscrew the screws 3) and remove the shutter 4);
- Tighten the screws 3) on the rod 2);
- Now refit the blast tube 5) and the screws 1).

Once this operation has been carried out (if required), 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-seize product.
The burner-boiler seal must be airtight.



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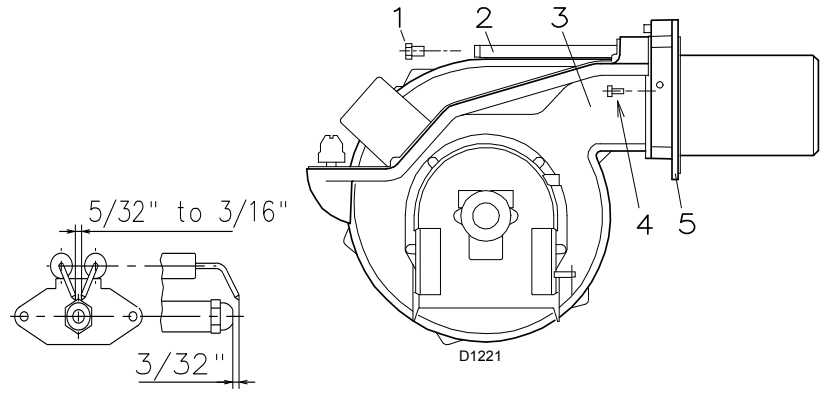
(A)



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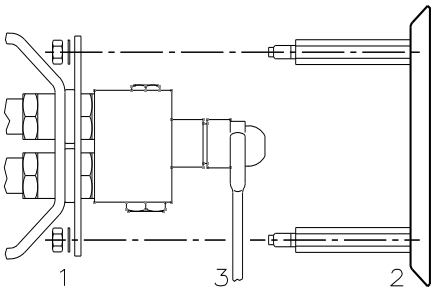
(B) **(C)**



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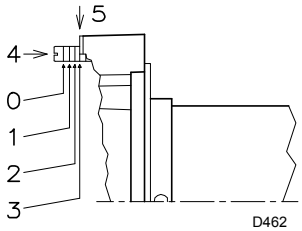
(D)



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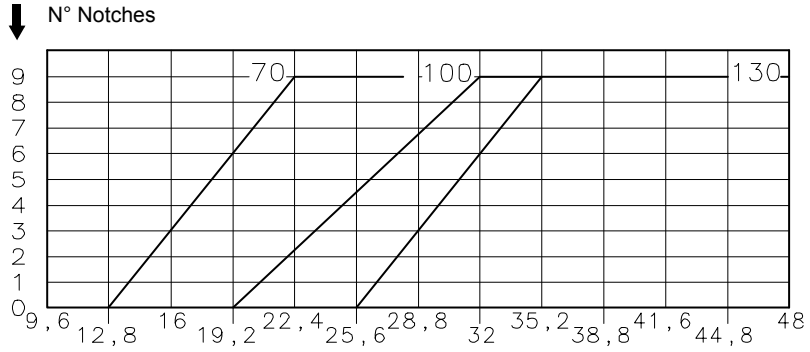
(E)



D2351

(F)

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 13.
In case an intermediate delivery between the two values indicated in the diagrams (B) page 13 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; it is therefore possible to fit the nozzle with the box wrench 1)(A), inserting 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).

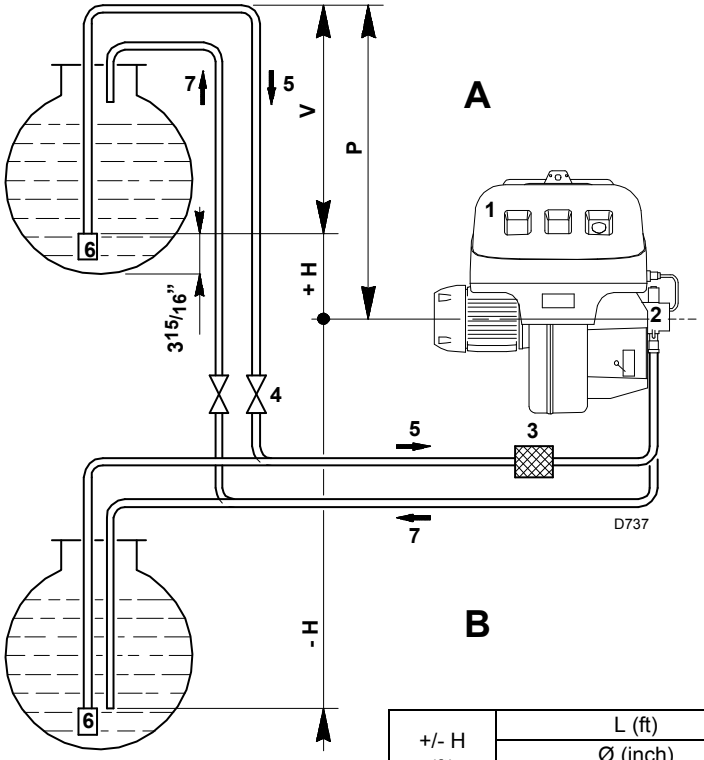
Finally remount the burner 3)(C) on the slide bars 2) and slide it up to the flange 5), keeping it slightly raised to prevent the flame stability disk from pressing against the blast tube.
Tighten the screws 1) on the slide bars 2) and screws 4) fixing the burner to the flange.

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. (B)p.8.
- 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 70/M, maximum light oil delivery = 16 GPH
Diagram (F) indicates that for a delivery of 16 GPH the RL 70/M Model requires the combustion head to be set to approx. three notches, as shown in Figure (E).

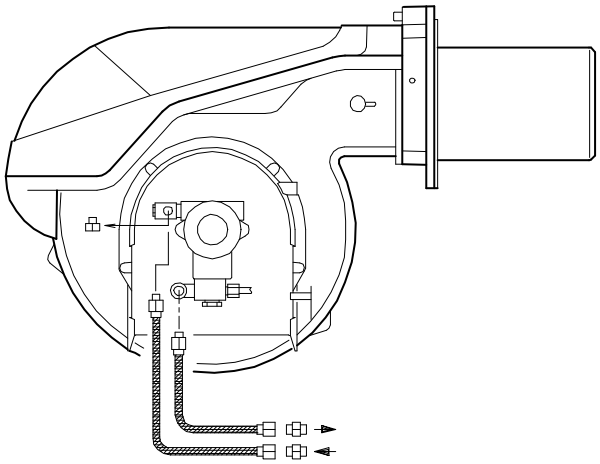


Key

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 (ft)	L (ft) Ø (inch)		
	3/8”	1/2”	5/8”
+ 13	234	454	493
+ 10	204	401	493
+ 6.6	174	399	493
+ 3.3	145	296	493
+ 1.6	132	270	493
0	118	243	451
- 1.6	105	217	405
- 3.3	92	191	359
- 6.6	63	138	266
- 10	33	86	174
- 13	–	33	82

(A)



(B)

D1224

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.

WARNING

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 loop circuit

A loop circuit consists of a loop of piping exiting 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)

CAUTION

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 connects the return line and suction line.

The pumps are installed on the burner with the by-pass closed by screw 6)(A)p.15.

It is therefore necessary to connect both hoses to the pump.

The pump seal will be dammaged 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.

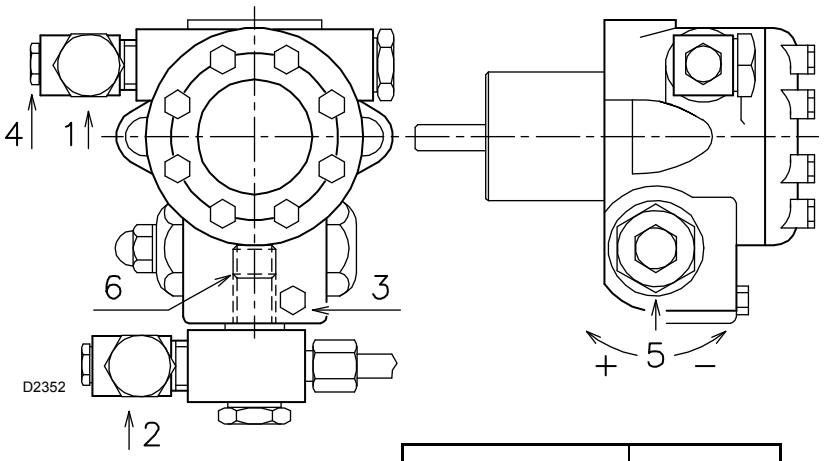
WARNING

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.

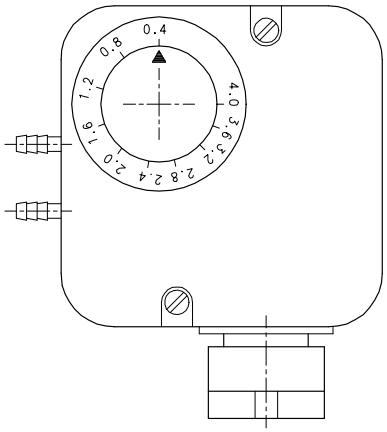
PUMP **SUNTEC J7 C**



		J7 C
A	GPH	60.8
B	PSI	145 - 304.5
C	“Hg	13
D	cSt	2,8 - 200
E	°F	194 (90 °C)
F	PSI	21.8
G	PSI	290
H	inch	0,006

(A)

AIR PRESSURE SWITCH



(B)

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 light oil temperature
F - Max. suction and return pressure
G - Pressure calibration in the factory
H - Filter mesh width

PUMP PRIMING

WARNING

Before starting the burner, make sure that the tank return line is not clogged.

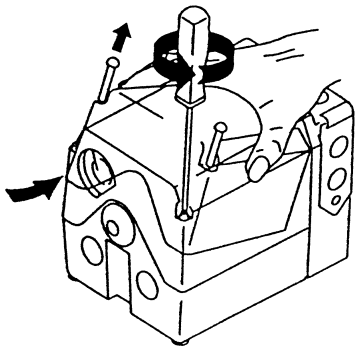
Obstructions in the line could cause the seal located on the pump shaft to break.

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.

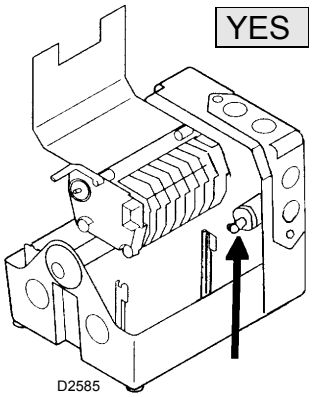
Important: the priming operation is possible because the pump is already full of fuel when it leaves the factory.
If the pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise, the pump will seize.
Whenever the length of the suction piping exceeds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

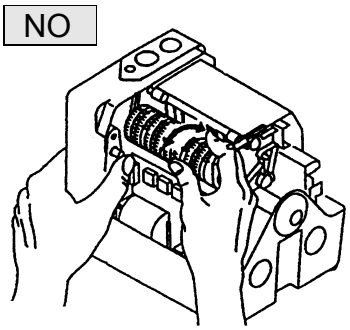
AIR PRESSURE SWITCH (B)

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

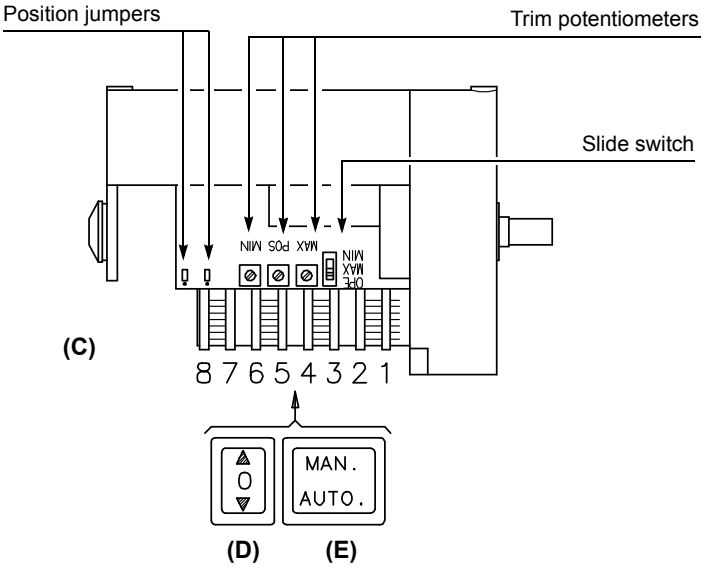




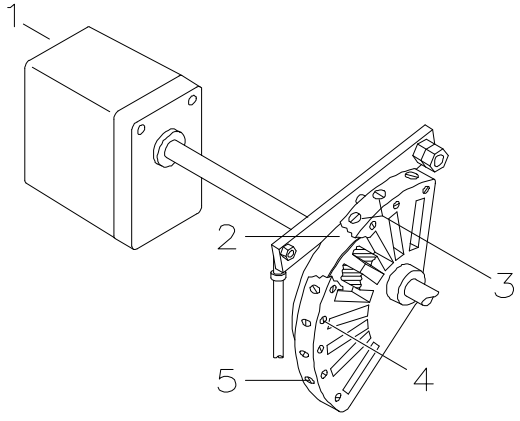
Don't release the button indicated in this figure: the syncronization of the cams made in factory would be changed.

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

(B)



(C) (D) (E)



(F) D1229

SERVOMOTOR (A)

The servomotor gives simultaneous regulation of the air damper through the adjustable profile cam 2)(F) and the pressure controller (A) pag. 13.
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.

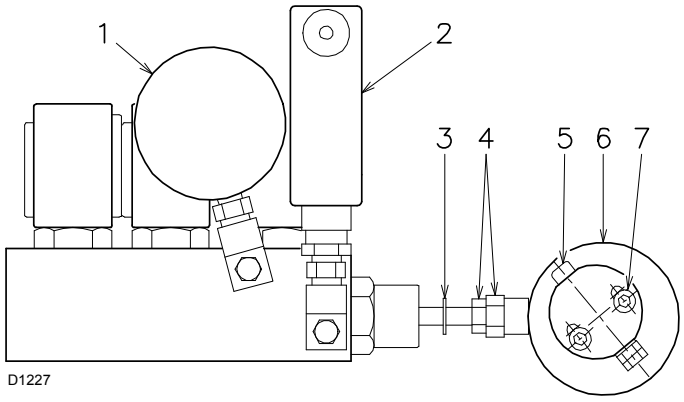
Trim potentiometer MIN
Limits minimum modulation.
It must be set near the stroke end (cam 2) to exploit as far as possible the variable profile cam.

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.

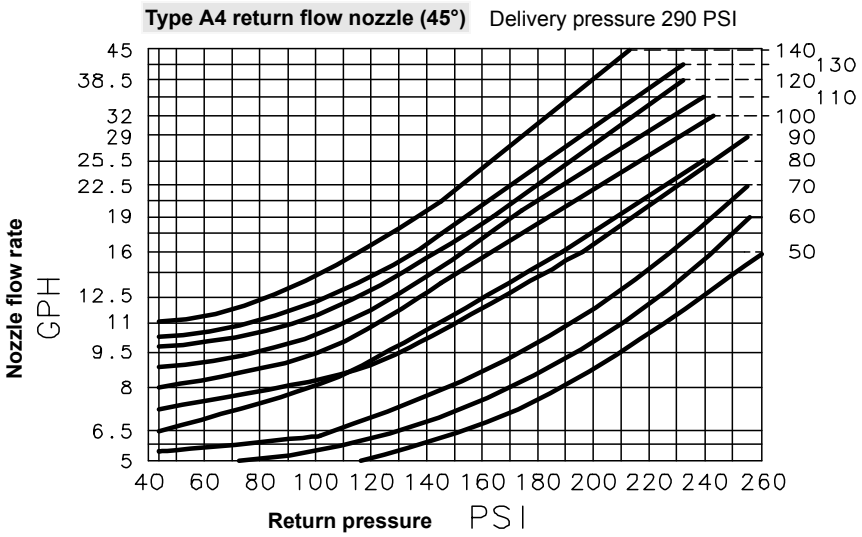
When the settings are complete, place the slide switch on OPE.(operate)

PRESSURE CONTROLLER



1 - Gauge for pressure in return line
2 - 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)



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

(B) D2355

BURNER CALIBRATION

WARNING

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.

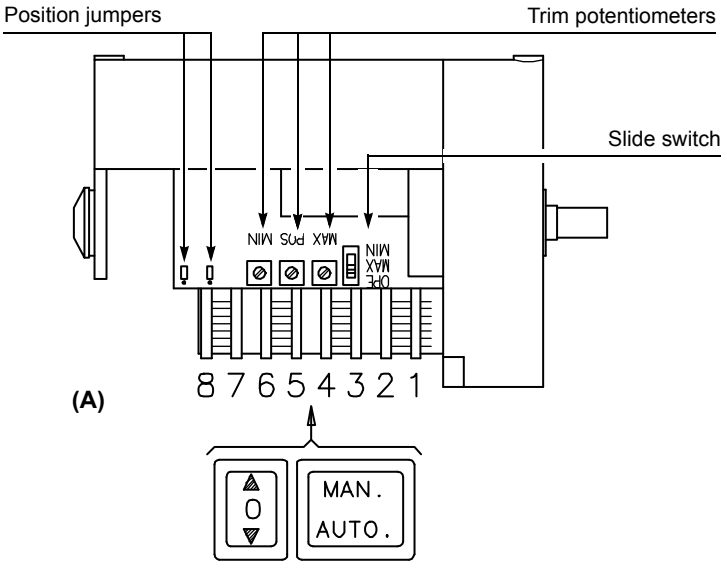
Diagrams (B):
Horizontal axis : PSI, nozzle return pressure
Vertical axis : GPH, nozzle flow rate

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.

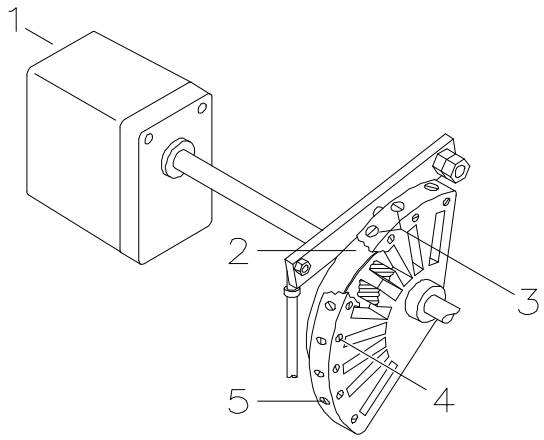
The nozzle return pressure value is indicated by the pressure gauge 1)(A).
The output and the pressure of the nozzle are at maximum when the servomotor is positioned on maximum.
The fine adjustment of the pressure in the return line may be carried out by changing the setting of the eccentric 6)(A), of the nut and lock-nut 4)(A).
The eccentric setting should be carried out by loosening screws 7), and turning the screw 5) to obtain the desired eccentricity.
Turn clockwise, screw 5) to increase the eccentricity, increasing the difference between the min. and max. capacity of the nozzle; turn counter-clockwise, screw 5) to decrease the eccentricity and, consequently the difference between the min. and max. capacity of the nozzle.

NOTE

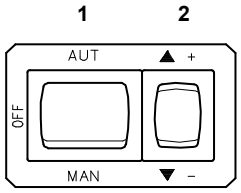
- The proper setting of the eccentric 6) is possible when its operation field follows the servomotor operation field (20° ÷ 130°): so, that every variation of the servomotor position corresponds to a pressure variation.
- **Do not let the piston bottom out repeatedly: the stop ring 3)(A) determines the 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 observing 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.



(A) (B) (C) D2593



(D) D1229



(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 6)(A) page 13 by turning the screw 5)(A) page 13.
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 4)(A)page13 and, if necessary, on the variable eccentric 6)(A) page 13.

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).

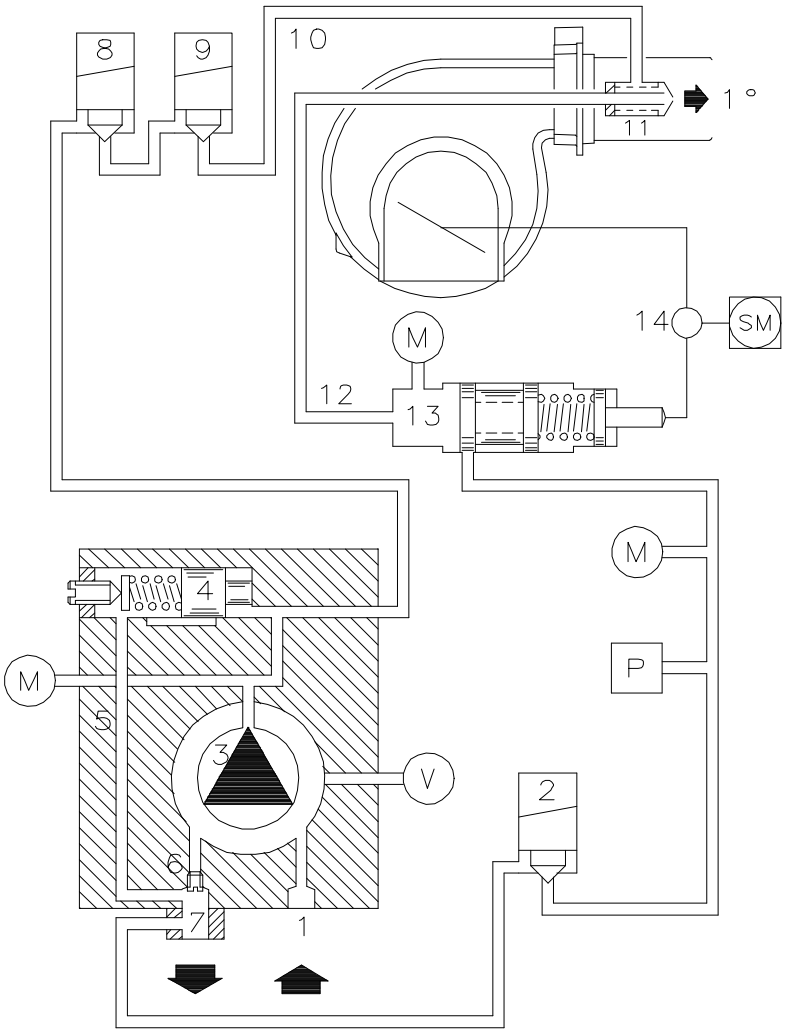
INTERMEDIATE OUTPUTS

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).



(A) D2444

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 8) - 9) - 2) 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 electrode strikes a spark.
- Solenoid valves 8) - 9) - 2) 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 off 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.

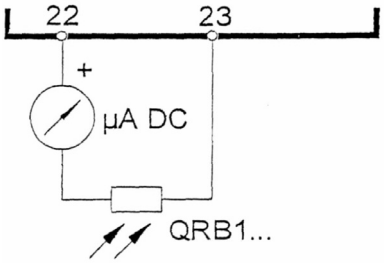
FIRING FAILURE

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

OIL PRESSURE SWITCH

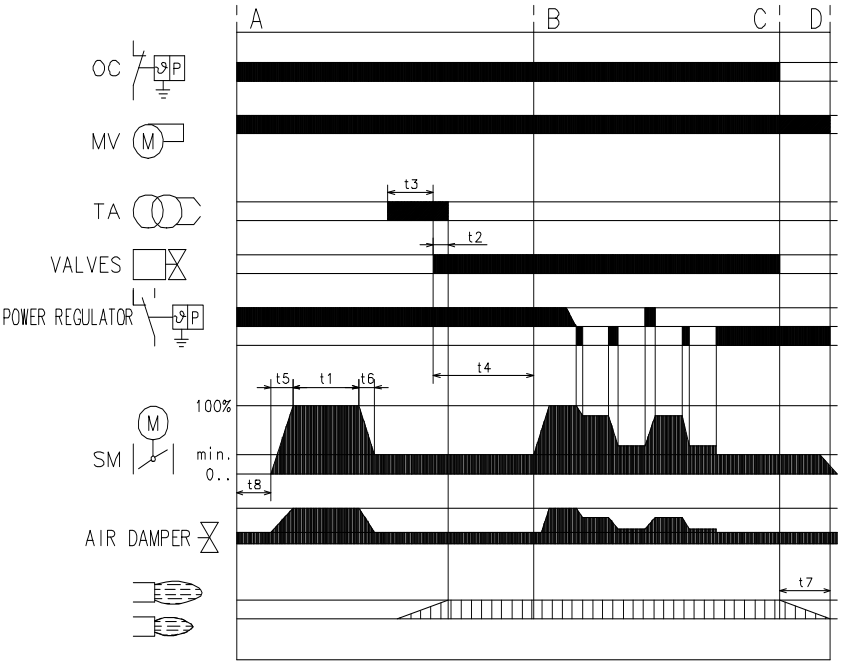
The oil pressure switch 15)(A)p. 6 is factory set to 43.5 PSI (3 bar). If the oil pressure goes above this value in the return piping, the pressure switch stops the burner.
Burner starts again automatically if the pressure goes down under 43.5 PSI (3 bar) after burner shut down.
If a loop circuit with Px pressure feeds the burner, the pressure switch should be adjusted to Px + 43.5 PSI.

LAL2... Sub-base



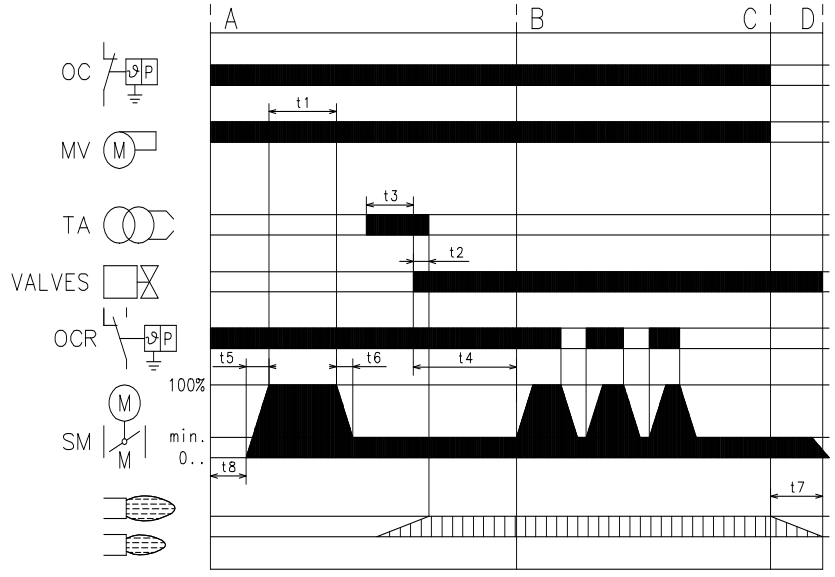
(A) D3206

Full modulation



(B) D2871

High - low



(C) D2883

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

SEQUENCE OF OPERATION - LAL CONTROL

See fig. (B) - (C).

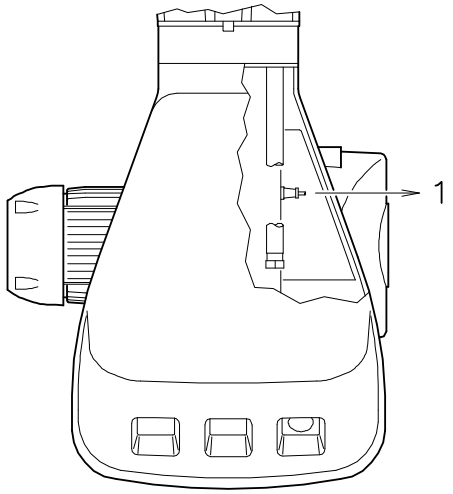
Switching times are given in seconds, in the burner startup sequence.

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



(A) D1232

FINAL CHECKS

- Obscure the photocell and switch on the control devices: the burner should start and then lock-out about 5 s after starting.
- Illuminate the photocell and switch on 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.

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.

Servomotor

Disengage the cam (F)p.12 from the servomotor and turn it backwards and forwards by hand to make sure it moves freely.

Combustion head

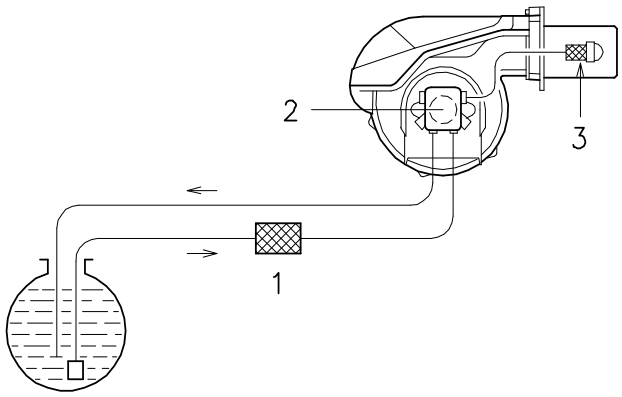
Check to make sure that all the parts of the combustion head are in good condition, positioned correctly, free of all impurities, and that no deformation has been caused by operation at high temperatures.

Nozzle

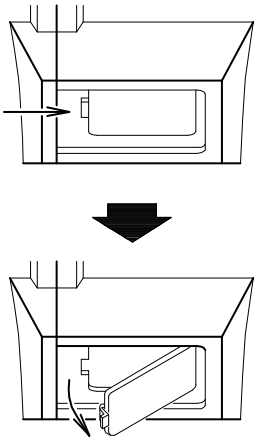
Do not clean the nozzle orifices.
Replace the nozzles every 2-3 years or whenever necessary. Combustion must be checked after the nozzles have been changed.

Photocell (A)

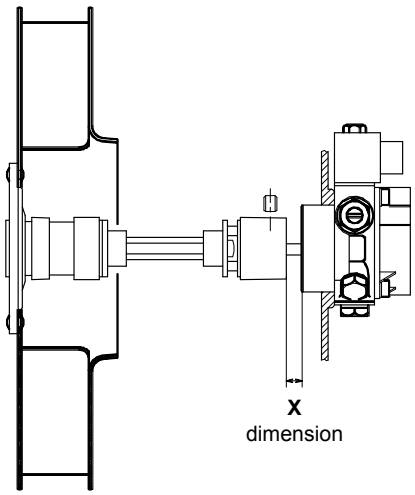
Clean the glass cover from any dust that may have accumulated.
Photocell 1) can be removed by pulling it outward forcefully.



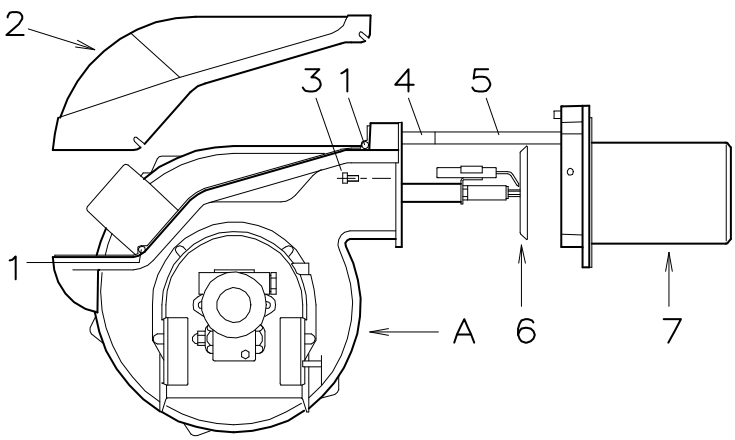
(A) D707



(B) D709



(C) D2854



(D) D1233

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 anomaly to be traced to either the suction line or the pump.
If the pump is found to be responsible, check to make sure that the filter is not dirty. The vacuum gauge is installed up-line from the filter and consequently will not indicate whether the filter is clogged or not. 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.

Filters (A)
Check the following filters:
• on line 1) • in pump 2) • at nozzle 3), 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.

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

Flame inspection window (B)
Clean the glass.

Fuel tank
Every 5 years, or whenever necessary, suck out any water or other impurities present on the bottom of the tank using a separate pump.

Burner
Make sure that the screws are fully tightened.

FUEL PUMP AND/OR COUPLINGS REPLACEMENT

As per fig. (C), dimension X should set as follows:
RL70/M - 1/2”
RL100/M - 5/16”
RL130/M - 7/16”

OPENING THE BURNER (D)

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 on request onto the slide bars 5) (models with long blast tube)
- 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.

BURNER FAULTS

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

- **208-230V** power supply:
  only in this case, if 460 V power supply is required, change the fan motor connection from delta to star for IE1 and double star to star for IE2/EPACT according to the indications of page 21 and change the setting of the thermal overload according to page 20;
- or **575V** power supply;
  depending on the burner model (see page 4).
- The setting of the thermal overload must be according to page 20.

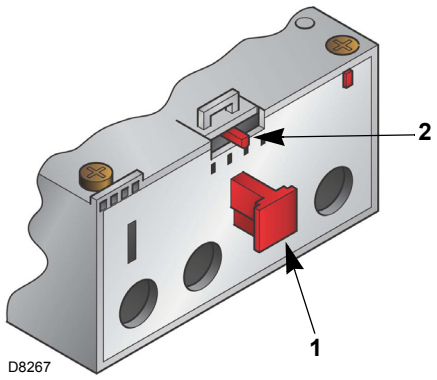
After carrying out maintenance, cleaning or checking operations, reassemble the hood and all the safety and protection devices of the burner.

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).



FUSE AND CABLE CALIBRATION

Three phase (IE 2/Epact)

		RL 70/M			RL 100/M			RL 130/M		
		208 - 230 V	460 V	575 V	208 - 230 V	460 V	575 V	208 - 230 V	460 V	575 V
F (A) Fuse	Non time Delay	15 A	6 A	5 A	25 A	10 A	10 A	25 A	10 A	10 A
	Time Delay	7 A	4 A	3 A	15 A	7 A	5 A	15 A	7 A	5 A
S (AWG)		14	14	14	14	14	14	14	14	14

Single phase

		RL 70/M	RL 100/M
		208 - 220 V	208 - 220 V
F (A) Fuse	Non time Delay	40 A	50 A
	Time Delay	20 A	30 A
S (AWG)		12	10

THERMAL OVERLOAD CALIBRATION

Three phase (IE 2/Epact)

	RL 70/M			RL 100/M			RL 130/M		
	208 - 230 V	460 V	575 V	208 - 230 V	460 V	575 V	208 - 230 V	460 V	575 V
Thermal overload Set to Max:	4.6 A	2.3 A	1.8 A	9 A	4.5 A	3.6 A	9 A	4.5 A	3.6 A

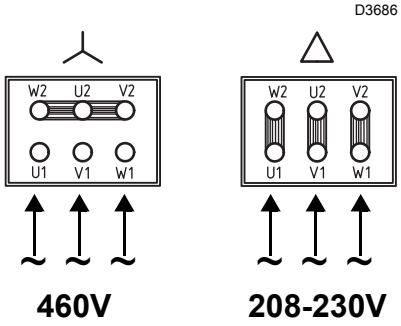
Single phase

	RL 70/M	RL 100/M
	208 - 220 V	208 - 220 V
Thermal overload Set to Max:	8 A	13.2 A

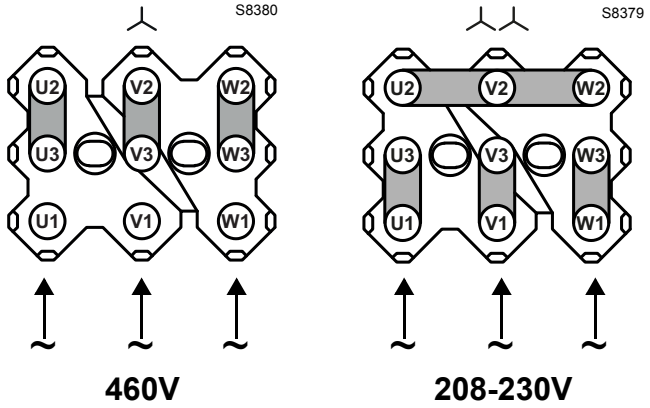
Motor connection at 208-230 or 460V

WARNING:
the motors, manufactured for 208-230/460 **IE2/Epact** voltage, have a different connection than **IE1** motors, no more star/delta but star/double star.
Please, pay attention to the indications in case of modification of voltage, maintenance, or substitution.

IE1

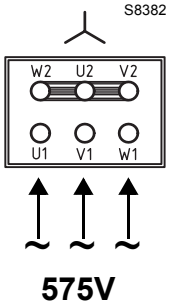


IE2/Epact



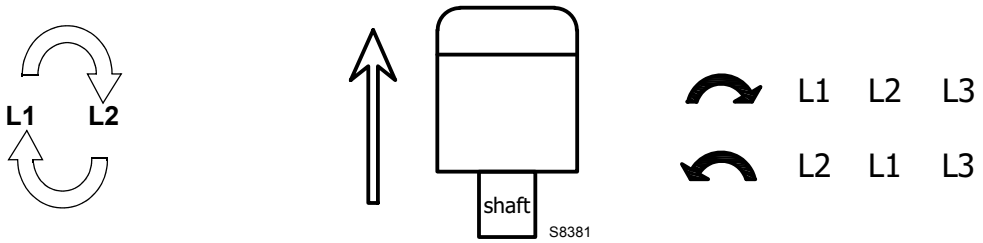
Motor connection at 575V

WARNING:
the motors, manufactured for 575V **IE2/Epact** voltage, have the same control box base of the IE1 motors.
Please pay attention to the indications in case of maintenance or substitution.

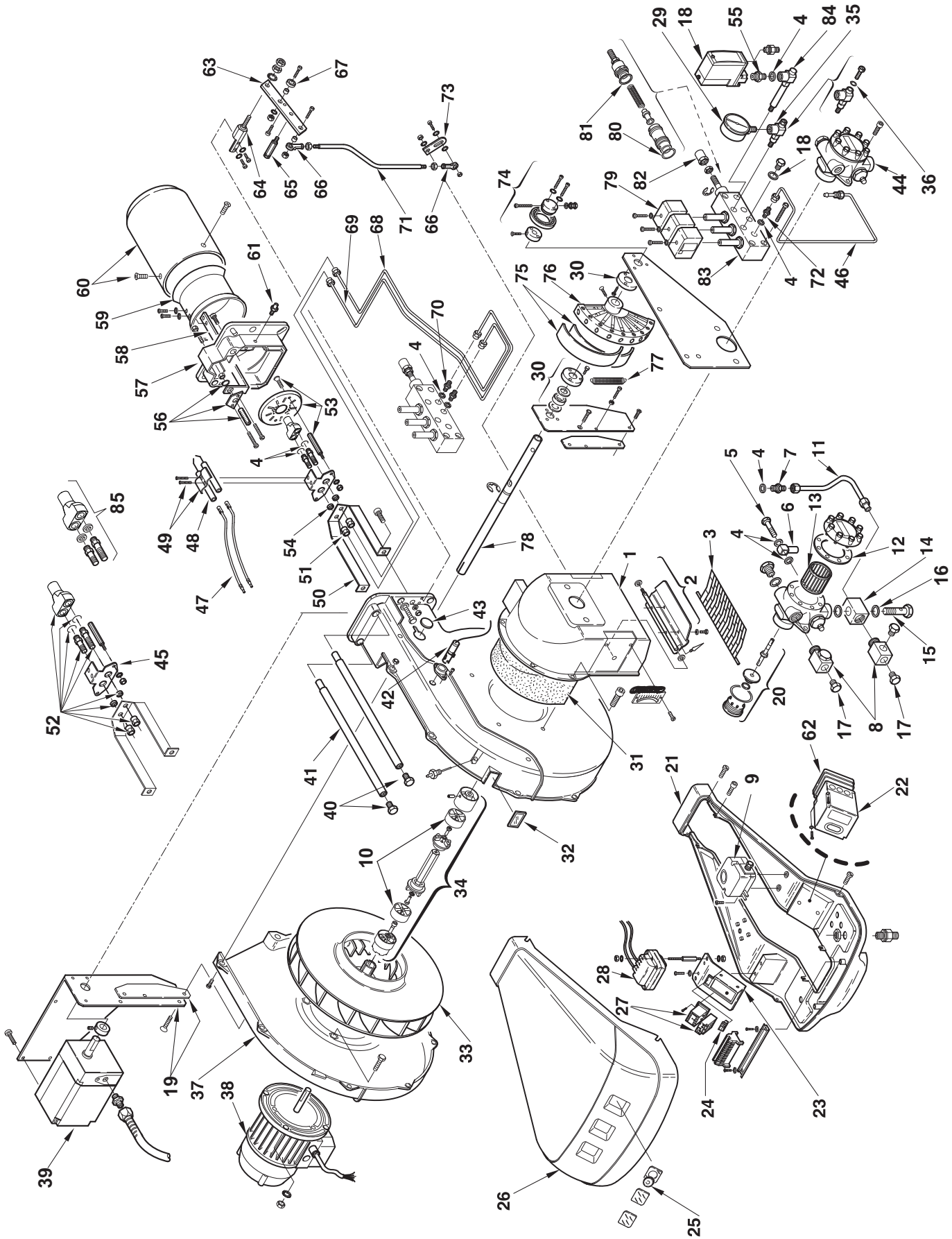


Reversible direction

WARNING:
If it is necessary to reverse the direction then reverse the two main supply phases.
For example: L1 with L2, there is not difference between **IE1** and **IE2/Epact.**



APPENDIX - SPARE PARTS



N.	CODE		RL 70/M			RL 100/M			RL 130/M		DESCRIPTION	*
			C9514300 (3477070)	C9514301 (3477075)	C9514305 (20094657)	C9515300 (3477270)	C9515301 (3477275)	C9515303 (20094658)	C9516300 (3477470)	C9516301 (3477475)		
1	**3012454**		•	•	•	•	•	•	•	•	AIR INTAKE	
2	**3003948**		•	•	•	•	•	•	•	•	AIR DAMPER ASSEMBLY	
3	**3003949**		•	•	•	•	•	•	•	•	GRID	
4	**3007079**		•	•	•	•	•	•	•	•	SEAL	B
5	**3003006**		•	•	•	•	•	•	•	•	CONNECTOR	C
6	**3012455**		•	•	•	•	•	•	•	•	CONNECTOR	C
7	**3009081**		•	•	•	•	•	•	•	•	CONNECTOR	C
8	**3012949**		•	•	•	•	•	•	•	•	CONNECTOR	C
9	**3012948**		•	•	•	•	•	•	•	•	AIR PRESSURE SWITCH	A
10	**3012622**		•	•	•	•	•	•	•	•	DRIVE DISC	
11	**3012458**		•	•	•	•	•	•	•	•	TUBE	
12	**3006292**		•	•	•	•	•	•	•	•	SEAL	B
13	**3006787**		•	•	•	•	•	•	•	•	FILTER	B
14	**3003055**		•	•	•	•	•	•	•	•	CONNECTOR	C
15	**3006184**		•	•	•	•	•	•	•	•	BAR	C
16	**3007164**		•	•	•	•	•	•	•	•	SEAL	B
17	**3012932**		•	•	•	•	•	•	•	•	PLUG	
18	**3012384**		•	•	•	•	•	•	•	•	OIL PRESSURE SWITCH	A
19	**3012957**		•	•	•	•	•	•	•	•	ANCHOR PLATE	
20	**3000805**		•	•	•	•	•	•	•	•	PUMP SEAL	A
21	**3013127**		•	•	•	•	•	•	•	•	BASE PLATE	
22	**3012933**	**C5830009**	•	•	•	•	•	•	•	•	CONTROL BOX	B
23	**3012343**		•	•	•	•	•	•	•	•	SUPPORT	A
24	**3012080**		•	•	•	•	•	•	•	•	SWITCH	
25	**3007627**		•	•	•	•	•	•	•	•	MEMBRAN	
26	**3012934**		•	•	•	•	•	•	•	•	COVER	
27	**3012935**		•								OVERLOAD+CONTACTOR 208-230/460V	C
27	**3012991**			•							OVERLOAD+CONTACTOR 575V	C
27	**3012937**				•						OVERLOAD+CONTACTOR 208-220 (Single Phase)	
27	**3012936**					•					OVERLOAD+CONTACTOR 208-230/460V	C
27	**3013124**						•				OVERLOAD+CONTACTOR 575V	C
27	**3003621**							•			OVERLOAD+CONTACTOR 208-220 (Single Phase)	
27	**3012937**								•		OVERLOAD+CONTACTOR 208-230/460V	C
27	**3013125**									•	OVERLOAD+CONTACTOR 575V	C
28	**3012938**		•	•	•	•	•	•	•	•	TRANSFORMER	B
29	**3006140**		•	•	•	•	•	•	•	•	PRESSURE GAUGE	
30	**3012357**		•	•	•	•	•	•	•	•	BEARING	C
31	**3003952**		•	•	•	•	•	•	•	•	SOUND DAMPING	
32	**3003763**		•	•	•	•	•	•	•	•	INSPECTION WINDOW	
33	**3012939**		•	•	•						FAN	C
33	**3012403**					•	•	•			FAN	C
33	**3012940**								•	•	FAN	C
34	**3003954**		•	•	•						DRIVE COUPLING	A
34	**3013056**					•	•	•	•	•	DRIVE COUPLING	A

N.	CODE		RL 70/M			RL 100/M			RL 130/M		DESCRIPTION	*
			C9514300 (3477070)	C9514301 (3477075)	C9514305 (20094657)	C9515300 (3477270)	C9515301 (3477275)	C9515303 (20094658)	C9516300 (3477470)	C9516301 (3477475)		
35	**3012476**		•	•	•	•	•	•	•	•	NEEDLE VALVE	
36	**3007169**		•	•	•	•	•	•	•	•	O RING	B
37	**3012012**		•	•	•	•	•	•	•	•	HALF-SHELL	
38	**3012941**		•								MOTOR 208-230/460V	C
38	**3013059**			•							MOTOR 575V	C
38	**20032429**				•						MOTOR 208-220V(Single Phase)	
38	**3012943**					•			•		MOTOR 208-230/460V	C
38	**3013060**						•				MOTOR 575V	C
38	**20094157**							•			MOTOR 208-220V(Single Phase)	
38	**3013061**									•	MOTOR 575V	C
39	**3012944**		•	•	•	•	•	•	•	•	SERVOMOTOR	B
40	**3003481**		•	•	•	•	•	•	•	•	SCREW	
41	**3003970**		•	•	•	•	•	•	•	•	BAR	C
42	**3006216**	**C5360027**	•	•	•	•	•	•	•	•	P.E. CELL	A
43	**3003996**		•	•	•	•	•	•	•	•	PLUG	
44	**3006369**		•	•	•	•	•	•	•	•	PUMP	C
45	**3012092**		•	•	•	•	•	•	•	•	SUPPORT	A
46	**3012475**		•	•	•	•	•	•	•	•	TUBE	
47	**3012959**		•	•	•	•	•	•	•	•	ELECTRODE CONNECTION	A
48	**3003796**		•	•	•	•	•	•	•	•	ELECTRODE	A
49	**3003495**		•	•	•	•	•	•	•	•	U BOLT	
50	**3012461**		•	•	•	•	•	•	•	•	SUPPORT	A
51	**3012095**		•	•	•	•	•	•	•	•	NUT	
52	**20066897**		•	•	•	•	•	•	•	•	NOZZLE HOLDER ASSEMNLY	C
53	**3012462**		•	•	•						DIFFUSER DISC	A
53	**3012463**					•	•	•	•	•	DIFFUSER DISC	A
54	**3012127**		•	•	•	•	•	•	•	•	SPACER	
55	**3009075**		•	•	•	•	•	•	•	•	CONNECTOR	C
56	**3003974**		•	•	•	•	•	•	•	•	CONTROL DEVICE	
57	**3003975**		•	•	•	•	•	•			FRONT PIECE	
57	**3003976**								•	•	FRONT PIECE	
58	**3012464**		•	•	•						SQUARE	
58	**3012465**					•	•	•			SQUARE	
58	**3012466**								•	•	SQUARE	
59	**3003983**		•	•	•	•	•	•			SHUTTER	C
59	**3003984**								•	•	SHUTTER	C
60	**3012467**		•	•	•						END CONE	B
60	**3012468**					•	•	•			END CONE	B
60	**3012469**								•	•	END CONE	B
61	**3003322**		•	•	•	•	•	•	•	•	CONNECTOR	C
62	**3012950**	**C5360001**	•	•	•	•	•	•	•	•	CONTROL BOX BASE	C
63	**3012354**		•	•	•	•	•	•	•	•	LEVER	
64	**3012353**		•	•	•	•	•	•	•	•	BAR	C
65	**3012352**		•	•	•	•	•	•	•	•	BAR	C

N.	CODE	RL 70/M			RL 100/M			RL 130/M		DESCRIPTION	*
		C9514300 (3477070)	C9514301 (3477075)	C9514305 (20094657)	C9515300 (3477270)	C9515301 (3477275)	C9515303 (20094658)	C9516300 (3477470)	C9516301 (3477475)		
66	**3006098**	•	•	•	•	•	•	•	•	PIN JOINT	C
67	**3003841**	•	•	•	•	•	•	•	•	BEARING	C
68	**3012470**	•	•	•	•	•	•	•	•	TUBE	
69	**3012471**	•	•	•	•	•	•	•	•	TUBE	
70	**3003005**	•	•	•	•	•	•	•	•	CONNECTOR	C
71	**3012351**	•	•	•	•	•	•	•	•	TIE ROD	
72	**3006723**	•	•	•	•	•	•	•	•	CONNECTOR	C
73	**3012359**	•	•	•	•	•	•	•	•	LEVER	
74	**3012472**	•	•	•	•	•	•	•	•	BEARING	C
75	**3006097**	•	•	•	•	•	•	•	•	FLAT SPRING	
76	**3012358**	•	•	•	•	•	•	•	•	CAM ASSEMBLY	C
77	**3012356**	•	•	•	•	•	•	•	•	SPRING	
78	**3012945**	•	•	•	•	•	•	•	•	SHAFT	
79	**3006767**	•	•	•	•	•	•	•	•	COIL	B
80	**3007150**	•	•	•	•	•	•	•	•	O RING	B
81	**3003204**	•	•	•	•	•	•	•	•	SEAL	B
82	**3003200**	•	•	•	•	•	•	•	•	NUT	
83	**3012474**	•	•	•	•	•	•	•	•	MODULATOR	B
84	**3013065**	•	•	•	•	•	•	•	•	CONNECTOR	C
85	**20088026**	•	•	•	•	•	•	•	•	NOZZLE HOLDER	C

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ADVISED PARTS

A = Spare parts for minimum fittings
A+B = Spare parts for basic safety fittings
A+B+C = Spare parts for extended safety fittings

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
Δ = 108°F - 68°F (reference temp.) = 40°F (equivalent 2000 ft variation)
Proceeding as descripted 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.	0	100	305	610	915	1220	1525	1830	2135	2440
	ft a.s.l	0	328	1000	2000	3000	4000	5000	6000	7000	8000
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.	0	100	305	610	915	1220	1525	1830	2135	2440
	ft a.s.l	0	328	1000	2000	3000	4000	5000	6000	7000	8000
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 Number:	
High Gas Pressure:		Modulating Signal Type:	

NOTES

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