RIELLO

GB **Light oil burners**

E **Quemadores de gasóleo**

P **Queimadores a gasóleo**

Two stage operation
Funcionamiento a dos llamas
Funcionamento a duas chamas

CE

CODE - CÓDIGO	MODEL - MODELO	TYPE - TIPO
3470400 - 3470410	RL 64 MZ	974 T
3470401 - 3470411	RL 64 MZ	974 T

2916278 (8) - 03/2012

GB CONTENTS

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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.3 = part 1 of figure A, page number 3.

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 RIELLO 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 supplied 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 carefully informs the user about:
  - the use of the system,
  - any further tests that may be necessary before the system is started up,
- maintenance and the need to have the system checked at least once a year by the manufacturer or another specialised technician.

To ensure a periodic check, RIELLO recommends the drawing up of a Maintenance Contract.

Manufacturer's Declaration

RIELLO S.p.A. declares that the following products comply with the NOx emission limits specified by German standard "**1. BImSchV release 26.01.2010**".

Product	Type	Model	Power
Light oil burner	974 T	RL 64 MZ	206 - 830 kW

Legnago, 01.02.2012

Mr. G. Conticini
Burners Division Department
RIELLO S.p.A.

TECHNICAL DATA

MODEL			RL 64 MZ
TYPE			974 T
OUTPUT (1)	2nd stage	kW	391 - 830
DELIVERY (1)		Mcal/h	336 - 714
		kg/h	33 - 70
	1st stage	kW	206 - 391
		Mcal/h	177 - 296
		kg/h	17,4 - 33
FUEL			LIGHT OIL
- Net calorific value		kWh/kg Mcal/kg	11.8 10.2 (10,200 kcal/kg)
- Density		kg/dm^3	0.82 - 0.85
- Viscosity at 20 °C		mm^2/s max	6 (1.5 °E - 6 cSt)
OPERATION			• Intermittent (min. 1 stop in 24 hours). • Two-stage (high and low flame) and single-stage (all - nothing).
PUMP	delivery (at 20 bar) pressure range fuel temperature	kg/h bar ° C max	107 10 - 20 60
NOZZLES		number	2
STANDARD APPLICATIONS			Boilers: water, steam, diathermic oil
AMBIENT TEMPERATURE		°C	0 - 40
COMBUSTION AIR TEMPERATURE		°C max	60
IN CONFORMITY WITH EEC DIRECTIVES			2004/108 - 2006/95 - 92/42 - 2006/42
NOISE LEVELS (2)		dBA	76
APPROVAL		CE	0036 0382/07

(1) Reference conditions: Ambient temperature 20°C - Barometric pressure 1000 mbar - Altitude 100 m a.s.l.
(2) Sound pressure measured in manufacturers combustion laboratory, with burner operating on test boiler and at maximum rated output.

ELECTRICAL DATA

MOTOR IE1

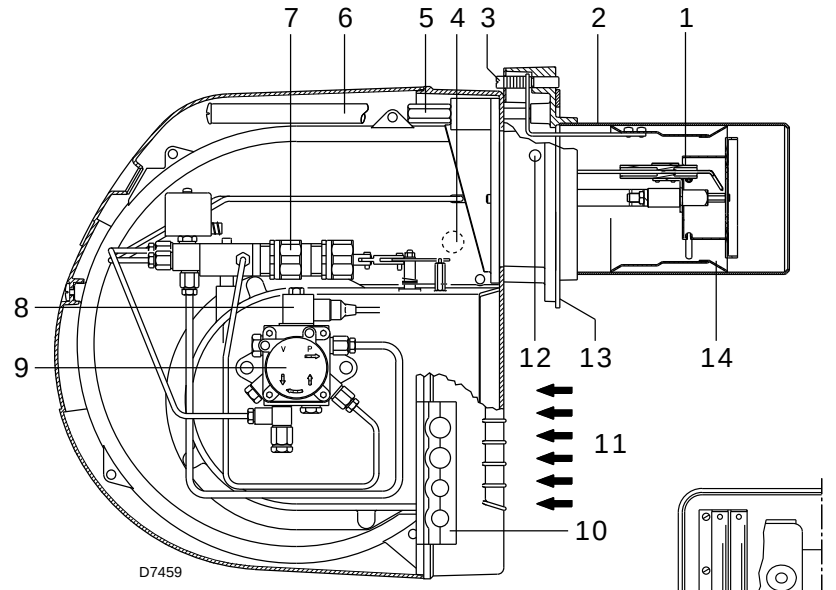
MODEL		RL 64 MZ
ELECTRICAL SUPPLY	V Hz	230 - 400 with neutral ~ +/-10% 50 - three-phase
ELECTRIC MOTOR	rpm W V A	2800 1100 220/240 - 380/415 4.7 - 2.7
IGNITION TRASFORMER	V1 - V2 I1 - I2	230 V - 2 x 12 kV 0.2 A - 30 mA
ELECTRICAL POWER CONSUMPTION	W max	1800
ELECTRICAL PROTECTION		IP 44

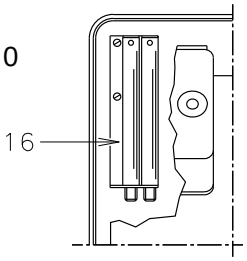
MOTOR IE2

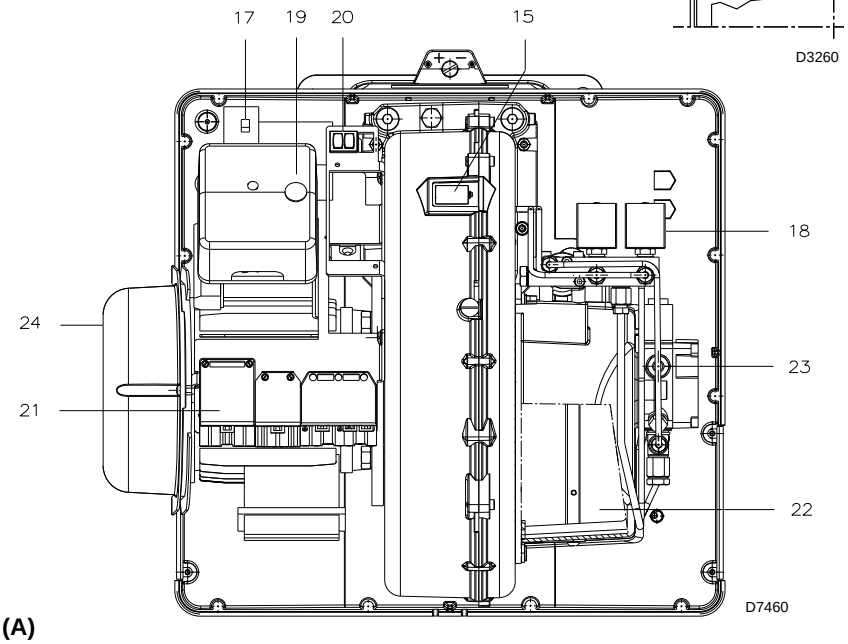
MODEL		RL 64 MZ
ELECTRICAL SUPPLY	V Hz	230 - 400 with neutral ~ +/-10% 50 - three-phase
ELECTRIC MOTOR	rpm W V A	2880 1100 230/400 4.3 - 2.5
IGNITION TRASFORMER	V1 - V2 I1 - I2	230 V - 2 x 12 kV 0.2 A - 30 mA
ELECTRICAL POWER CONSUMPTION	W max	1650
ELECTRICAL PROTECTION		IP 44

VARIANTS

Model	Code	Blast tube lenght mm
RL 64MZ	3470400 - 3470410 3470401 - 3470411	250 385

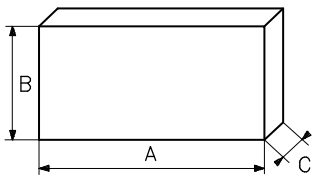




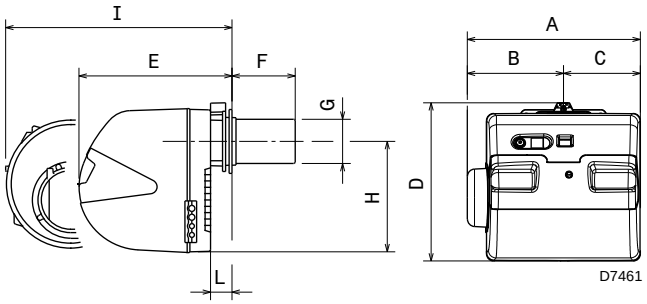


(A)

mm	A	B	C	kg
RL 64 MZ	1200	520	580	42



(B)



mm	A	B	C	D	E	$F_{(1)}$	G	H	$I_{(1)}$	L
RL 64 MZ	533	300	238	490	477	250 - 385	179	335	680 - 815	60

(1) Blast tube: short - lang

(C)

BURNER DESCRIPTION (A)

1 Ignition electrodes
2 Combustion head
3 Screw for combustion head adjustment
4 Photocell for flame presence control
5 Screw for fixing fan to flange
6 Slide bars for opening the burner and inspecting the combustion head
7 Hydraulic cylinder for regulation of the air gate valve in 1st and 2nd stage positions. When the burner is not operating the air gate valve is fully closed in order to reduce heat dispersion from the boiler due to the flue draught which draws air from the fan suction inlet.
8 Safety solenoid valve
9 Pump
10 Plate prearranged to drill 4 holes for the passage of hoses and electrical cables.
11 Air inlet to fan
12 Fan pressure test point
13 Boiler mounting flange
14 Flame stability disk
15 Flame inspection window
16 Extensions for slide bars 6)
17 Motor contactor and thermal cut-out reset button
18 1st and 2nd stage valve assembly
19 Control box with lock-out pilot light and lock-out reset button
20 Two switches:
- one “burner off - on”
- one for “1st - 2nd stage operation”
21 Plugs for electrical connections
22 Air gate valve
23 Pump pressure adjustment
24 Engine protection

Two types of burner failure may occur:
Control box lock-out: if the control box 19)(A) pushbutton (**red led**) lights up, it indicates that the burner is in lock-out.
To reset, hold the pushbutton down for between 1 and 3 seconds.
Motor trip: release by pressing the pushbutton on thermal cutout 17)(A).

PACKAGING-WEIGHT (B)

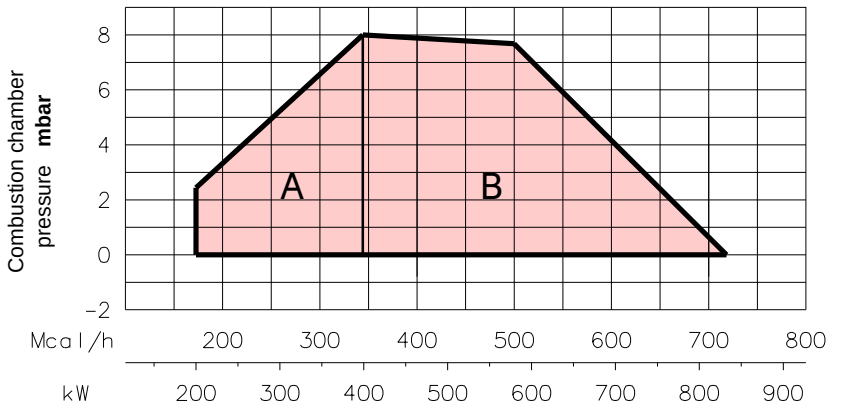
Approximate measurements
- The burner is shipped in cardboard boxe with the maximum dimensions shown in table (B).
- The weight of the burner complete with packaging is indicated in table (B).

MAX. DIMENSIONS (C)

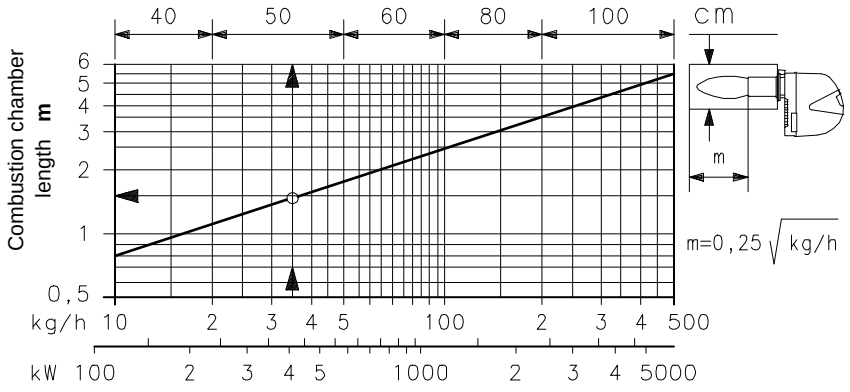
Approximate measurements.
The maximum dimensions of the burner are given in (C).
Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part withdrawn on the slide bars.
The maximum dimension of the burner, without casing, when open is give by measurement I.

STANDARD EQUIPMENT

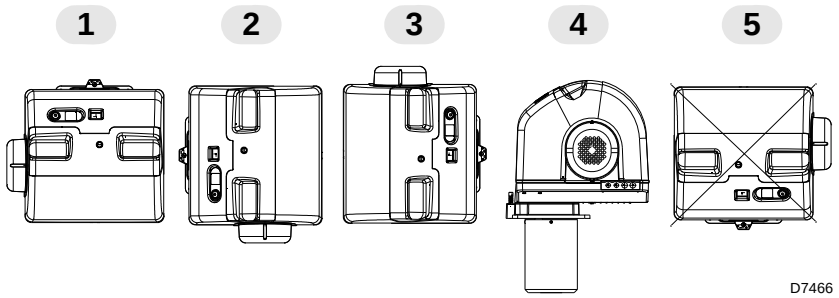
2 - Flexible hoses
2 - Gaskets for flexible hoses
2 - Nipples for flexible hoses
1 - Thermal insulation screen
2 - Extensions 16)(A) for slide bars 6)(A) (for model with 385 mm blast tube)
4 - Screws to secure the burner flange to the boiler: M 12 x 35
4 - Fairleads for electrical connections
1 - Engine protection (with fixing screws)
1 - Plugs unit
1 - Instruction booklet
1 - Spare parts lis



(A) D7465



(B) D454



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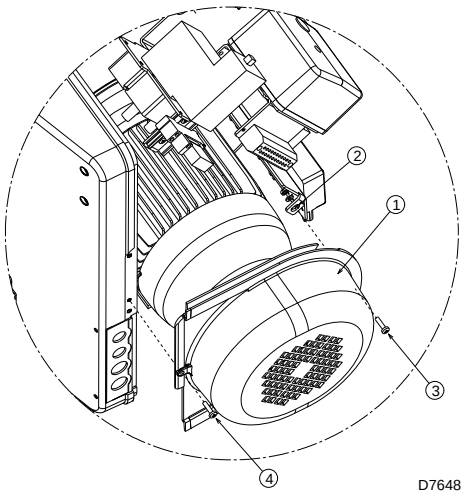
(C)



(D) D7648

FIRING RATES (A)

The burners can work in two ways: one-stage and two-stage.

1st stage DELIVERY must be selected within area A of the adjacent diagrams.

2nd stage DELIVERY must be selected within area B. This area provides the maximum delivery of the burner in relation to the pressure in the combustion chamber.

The work point 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 work point which must lie within area B.

Important

The FIRING RATE area values have been obtained considering a surrounding temperature of 20 °C, and an atmospheric pressure of 1000 mbar (approx. 100 m above sea level) and with the combustion head adjusted as shown on page 6.

TEST BOILER (B)

The firing rate was set in relation to special test boilers in accordance with the methods defined in EN 267 standards.

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

Example: Delivery 35 kg/hour:
diameter = 50 cm; length = 1.5 m.

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

INSTALLATION

⚠ **THE BURNER MUST BE INSTALLED IN CONFORMITY WITH LEGISLATION AND LOCAL STANDARDS.**

WORKING POSITION (C)

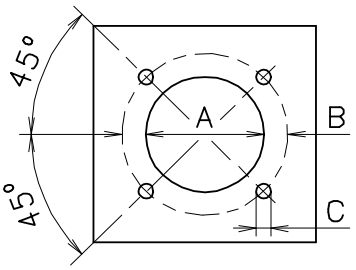
⚠ The burner is designed to work only in the positions **1**, **2**, **3** and **4**.

Installation **1** is preferable, as it is the only one that allows the maintenance operations as described in this manual. Installations **2**, **3** and **4** allow the working, but make the operations of maintenance and checking of the combustion head more difficult page 12.

⛔ Any other position could compromise the correct working of the appliance. Installation **5** is forbidden, for safety reasons.

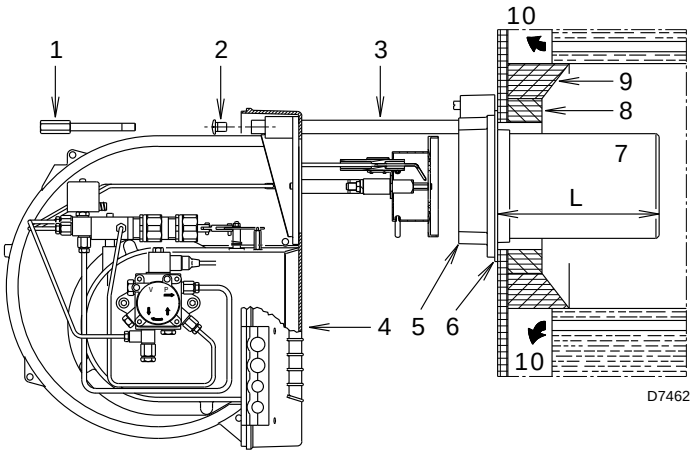
⚠ **BEFORE ASSEMBLING THE CASING, IT IS NECESSARY TO FIX THE ENGINE PROTECTION SUPPLIED (1)(D) ONTO THE BRACKET (2)(D), USING THE APPROPRIATE SCREWS (3)(D) WITH A NUT AND A WASHER. FIX THE BRACKET TO THE FRONT SHIELD OF THE BURNER, USING THE SCREWS (4)(D).**

mm	A	B	C
RL 64 MZ	185	275-325	M12



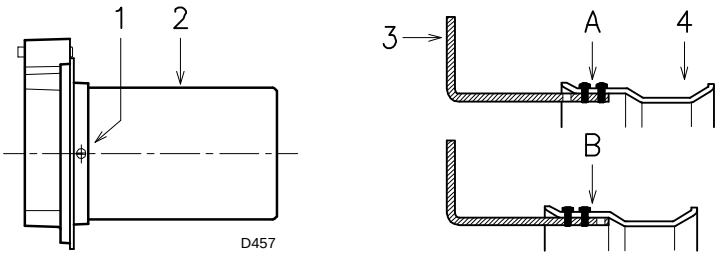
D455

(A)



D7462

(B)



(C)

60	GPH	kg/h (1)			kW
		10 bar	12 bar	14 bar	12 bar
RL 64 MZ	4.00	15.4	17.0	18.4	201.6
	4.50	17.3	19.1	20.7	226.5
	5.00	19.2	21.2	23.1	251.4
	5.50	21.1	23.3	25.4	276.3
	6.00	23.1	25.5	27.7	302.4
	6.50	25.0	27.6	30.0	327.3
	7.00	26.9	29.7	32.3	352.3
	7.50	28.8	31.8	34.6	377.2
	8.00	30.8	33.9	36.9	402.1
	8.30	31.9	35.2	38.3	417.5
	8.50	32.7	36.1	39.2	428.2
	9.00	34.6	38.2	41.5	453.1
	9.50	36.5	40.3	43.8	478.0
	10.0	38.4	42.4	46.1	502.9
	10.5	40.4	44.6	48.4	529.0
	11.0	42.3	46.7	50.7	553.9
	12.0	46.1	50.9	55.3	603.7
	12.3	47.3	52.2	56.7	619.1
	13.0	50.0	55.1	59.9	653.5
	13.8	53.1	58.5	63.3	693.8
	14.0	53.8	59.4	64.5	704.5
	15.0	57.7	63.6	69.2	754.3
	15.3	58.8	64.9	70.5	769.7
	16.0	61.5	67.9	73.8	805.3
	17.0	65.4	72.1	78.4	855.1

(1) light oil: density 0.84 kg/dm^3 - viscosity 4.2 cSt/20 °C - temperature 10 °C **(D)**

BOILER PLATE (A)

Drill the combustion chamber locking plate as shown in (A).
The position of the threaded holes can be marked using the thermal screen 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 in any case it must be greater than the thickness of the boiler door complete with its fettling. The range of lengths available, L, is as follows:

Blast tube 7):
- short 250
- long 385

For boilers with front flue passes 10) or flame inversion chambers, protective fettling in refractory material 8) must be inserted between the boiler's fettling 9) and the blast tube 7).
This protective fettling must not compromise the extraction of the blast tube.
For boilers having a water-cooled front the refractory fettling 8)-9)(B) is not required unless it is expressly requested by the boiler manufacturer.

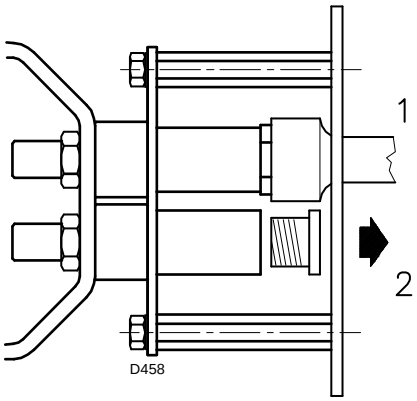
SECURING THE BURNER TO THE BOILER (B)

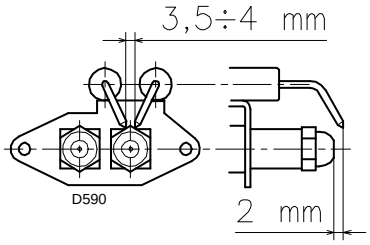
Disassemble the blast tube 7) from the burner 4) by proceeding as follows:
- Remove the screws 2) from the two slide bars 3).
- Remove the screw 1) fixing the burner 4) to the flange 5).
- Withdraw the blast tube 7) complete with flange 5) and slide bars 3).

Secure flange 5)(B) to the boiler plate interposing the supplied gasket 6). Use the 4 supplied screws provided after having protected the thread with antiscruffing products (high-temperature grease, compounds, graphite).
The burner-boiler seal must be airtight.

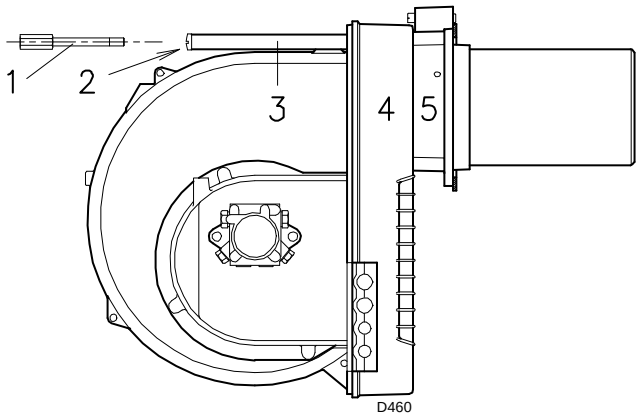
CHOICE OF NOZZLES FOR 1st AND 2nd STAGE

Both nozzles must be chosen from among those listed in table (D).
The first nozzle determines the delivery of the burner in the 1st stage.
The second nozzle works together with the 1st nozzle to determine the delivery of the burner in the 2nd stage.
The deliveries of the 1st and 2nd stages must be contained within the value range indicated on page 2. Use nozzles with a 60° spray angle at the recommended pressure of 12 bar
The two nozzles usually have equal deliveries, but the 1st stage nozzle may have the following specifications if required:
- a delivery less than 50% of the total delivery whenever the back-pressure peak must be reduced at the moment of firing;
- a delivery higher than 50% of the total delivery whenever the combustion during the 1st stage must be improved.





(A) **(B)**



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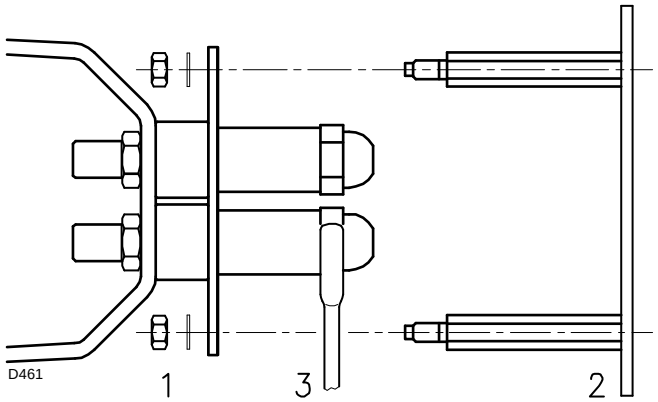
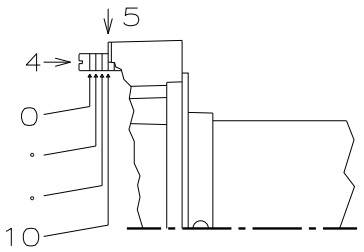
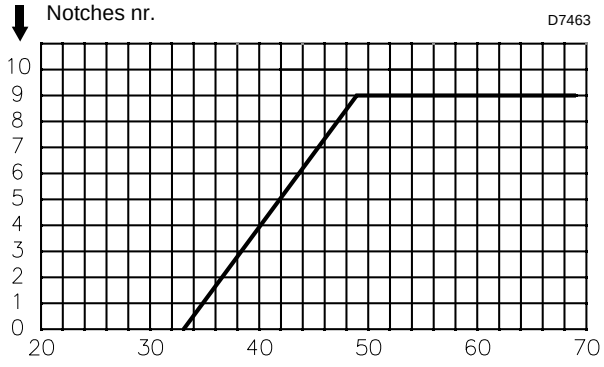


(D)

COMBUSTION HEAD SETTING



(E)



(F)

Example
Boiler output = 635 kW - efficiency 90 %
Output required by the burner =
635 : 0.9 = 705 kW
705 : 2 = 352 kW per nozzle

therefore, two equal, 60°, 12 bar nozzles are required:
1° = 7.00 GPH - 2° = 7.00 GPH,

or the following two different nozzles:
1° = 6.00 GPH - 2° = 8.00 GPH,

or:
1° = 8.00 GPH - 2° = 6.00 GPH.

NOZZLE ASSEMBLY

At this stage of installation the burner is still disassembled from the blast tube; it is therefore possible to fit two nozzles with the box spanner 1)(A) (16 mm), after having removed the plastic plugs 2)(A), fitting the spanner through the central hole in the flame stability disk. Do not use any sealing products such as gaskets, sealing compound, or tape. Be careful to avoid damaging the nozzle sealing seat. The nozzles must be screwed into place tightly but not to the maximum torque value provided by the wrench.
The nozzle for the 1st stage of operation is the one lying beneath the firing electrodes fig. (B).

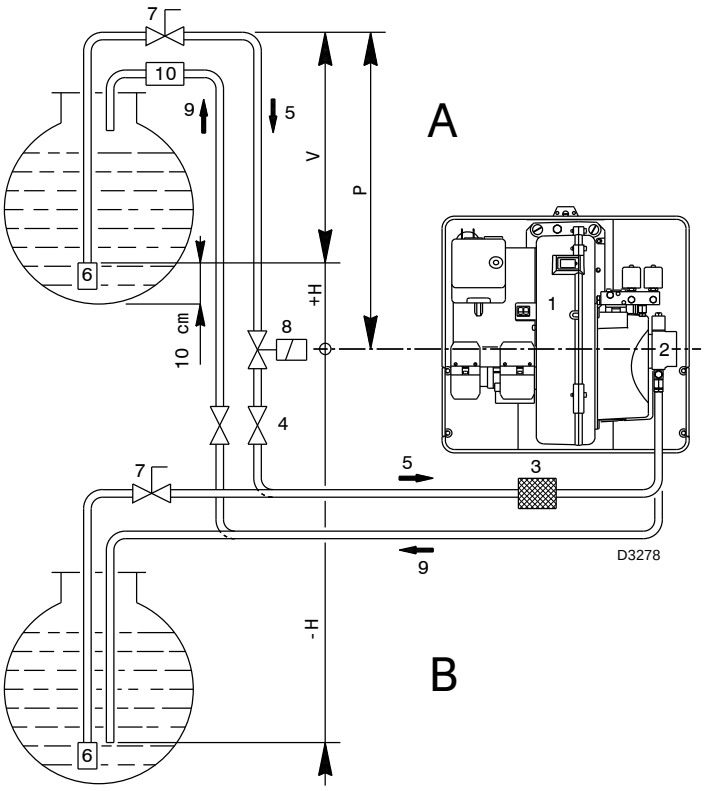
Make sure that the electrodes are positioned as shown in fig. (B).
Finally remount the burner 4)(C) to the slide bars 3) and slide it up to the flange 5), keeping it slightly raised to prevent the flame stability disk from pressing against the blast tube.
Tighten the screws 2) on the slide bars 3) and screw 1) that attaches 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:
- Retract the burner on its slide bars as shown in fig. (B)p.5.
- Remove the nuts 1)(D) and the disk 2).
- Use spanner 3)(D) to change the nozzles.

COMBUSTION HEAD SETTING

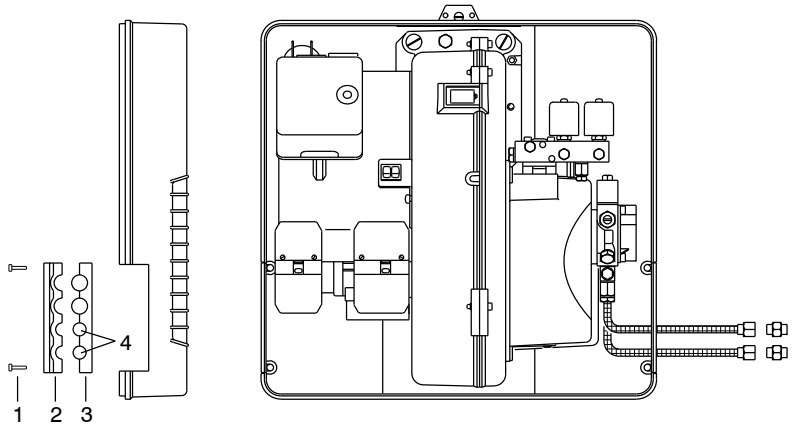
The setting of the combustion head depends exclusively on the delivery of the burner in the 2nd stage - in other words, the combined delivery of the two nozzles selected on page 6.
Turn screw 4)(E) until the notch shown in diagram (F) is level with the front surface of flange 5)(E).

Example:
The RL 64 MZ model with two 7.00 GPH nozzles and 12 bar pump pressure.
Find the delivery of the two 7.00 GPH nozzles in table (D), page 5:
29.7 + 29.7 = 59.4 kg/h.
Diagram (F) indicates that for a delivery of 59.4 kg/h the RL 64 MZ model requires the combustion head to be set to approx. 9 notches, as shown in fig. (E).



+ H - H (m)	L (m) Ø (mm)		
	10	12	14
+ 4.0	51	112	150
+ 3.0	45	99	150
+ 2.0	39	86	150
+ 1.0	32	73	144
+ 0.5	29	66	132
0	26	60	120
- 0.5	23	54	108
- 1.0	20	47	96
- 2.0	13	34	71
- 3.0	7	21	46
- 4.0	-	8	21

(A)



(B)

D3279

HYDRAULIC SYSTEM

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 higer than the burner **A**

The distance "P" must not exceed 10 meters in order to avoid subjecting the pump's seal to excessive strain; the distance "V" must not exceed 4 meters in order to permit pump self-priming even when the tank is almost completely empty.

The tank lower than the burner **B**

Pump depression values higher than 0.45 bar (35 cm 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 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.

Key (A)

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 = Rapid closing manual valve remote controlled (only Italy)
8 = On/off solenoid valve (only Italy)
9 = Return line
10 = Check valve (only Italy)

HYDRAULIC CONNECTIONS (B)

The pumps are equipped with a by-pass that connects return line with suction line. The pumps are installed on the burner with the by-pass closed by screw 6)(B)p.10.

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

The pump will break down immediately if it is run with the return line closed and the bj-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.

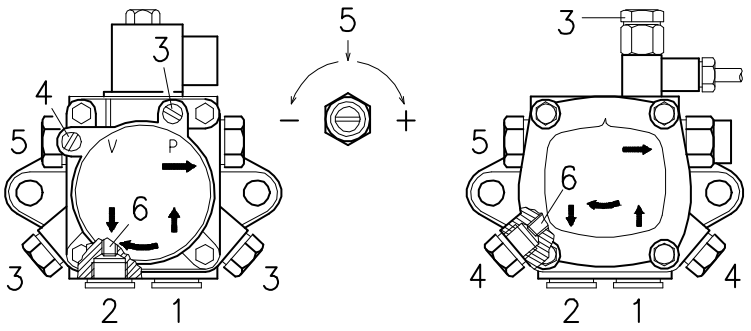
Take care that the hoses are not stretched or twisted during installation.

Route the hoses through the holes in the plate, preferably using those on the rh side, fig. (B): unscrew the screws 1), now divide the insert piece into its two parts 2) and 3) and remove the thin diaphragm blocking the two passages 4).

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 supplied nipples, using two wrenches, one to hold the nipple steady while using the other one to turn the rotary union on the hose.

SUNTEC AL 95 C



D706

PUMP		**AL 95 C**
A	kg/h	107
B	bar	10 - 20
C	bar	0.45
D	cSt	2 - 12
E	°C	60
F	bar	2
G	bar	12
H	mm	0.150

(A)

PUMP (A)

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

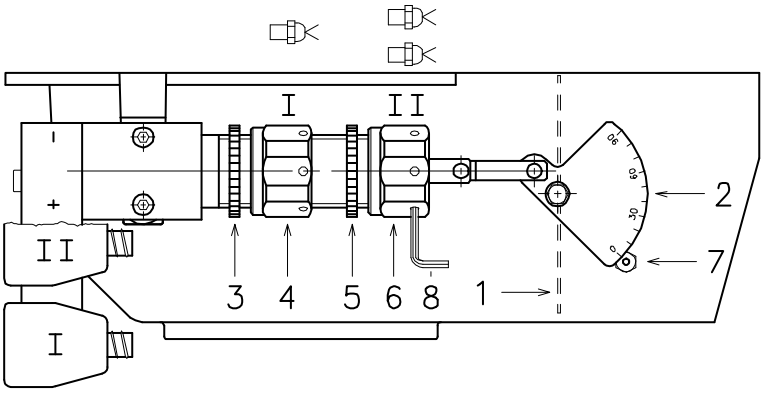
A - Min. delivery rate at 12 bar pressure
B - Delivery pressure range
C - Max. suction depression
D - Viscosity range
E - Light oil max. temperature
F - Max. suction and return pressure
G - Pressure calibration in the factory
H - Filter mesh width

PUMP PRIMING

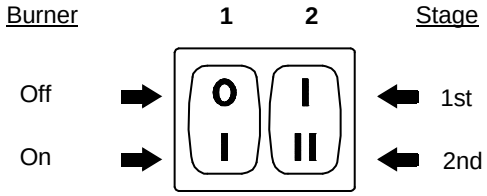
- **Before starting the burner, make sure that the tank return line is not clogged. Obstructions in the line could cause the sealing organ located on the pump shaft to break.** (The pump leaves the factory with the by-pass closed).
- In order for self-priming to take place, one of the screws 3)(A) of the pump must be loosened in order to bleed off the air contained in the suction line.
- Start the burner by closing the control devices and with switch 1)(B)p.9 in the "ON" position. The pump must rotate in the direction of the arrow marked on the cover.
- The pump can be considered to be primed when the light oil starts coming out of the screw 3). Stop the burner: switch 1)(B)p.9 set to "OFF" and tighten the screw 3).

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.
Do not illuminate the photocell or the burner will lock out; the burner should lock out anyway about 10 seconds after it starts.

Important: the a.m. 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 20-30 meters, the supply line must be filled using a separate pump.



(A) D468



(B) D469

RL 64 MZ	
GPH	α
4.00	26
4.50	28
5.00	31
5.50	33
6.00	35
6.50	36
7.00	37

1st STAGE

α = Notch Nr.

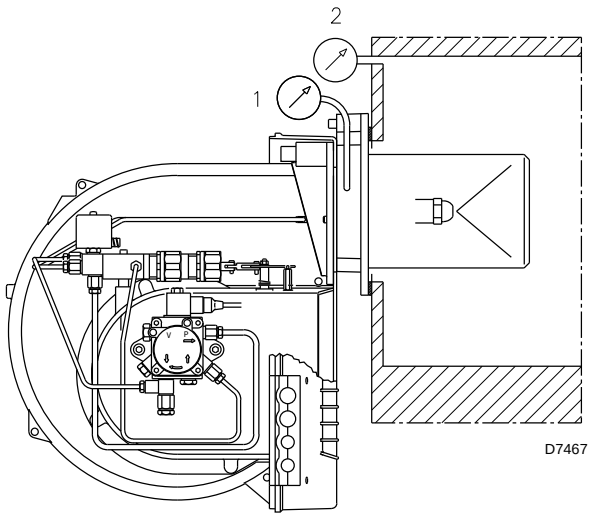
(C)

RL 64 MZ	
kg/h	mbar
33	4.7
37	4.2
41	3.7
45	3.2
49	2.6
53	3.2
57	4.2
60	5.1
63	6.0
66	6.4
69	7.3

2nd STAGE

mbar = air pressure in 1) with zero pressure in 2)

(D)



(E)

BURNER CALIBRATION

FIRING

Set switch 1)(B) to "ON".
During the first firing, during the passage from the 1st to the 2nd stage, there is a momentary lowering of the fuel pressure caused by the filling of the 2nd stage nozzle tubing. This lowering of the fuel pressure can cause the burner to lock-out and can sometimes give rise to pulsations.
Once the following adjustments have been made, the firing of the burner must generate a noise similar to the noise generated during operation. If one or more pulsations or a delay in firing in respect to the opening of the light oil solenoid valve occur, see the suggestions provided on p. 14: causes 34 to 42.

OPERATION

The optimum calibration of the burner requires an analysis of the flue gases at the boiler outlet and interventions on the following points:

• 1st and 2nd nozzles
See the information listed on page 5.

• Combustion head
The adjustment of the combustion head already carried out need not be altered unless the 2nd stage delivery of the burner is changed.

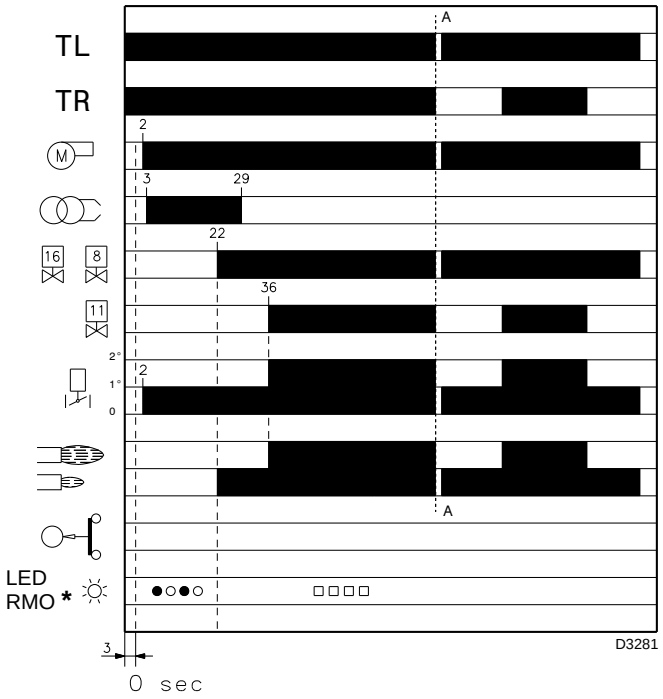
• Pump pressure
12 bar: This is the pressure calibrated in the factory which is usually sufficient for most purposes. Sometimes, this pressure must be adjusted to:
10 bar in order to reduce fuel delivery. This adjustment is possible only if the surrounding temperature remains above 0°C. Never calibrate to pressures below 10 bar, at which pressures the cylinders may have difficulty in opening;
14 bar in order to increase fuel delivery or to ensure firings even at temperatures of less than 0°C.
In order to adjust pump pressure, use the screw 5)(A), p. 8.

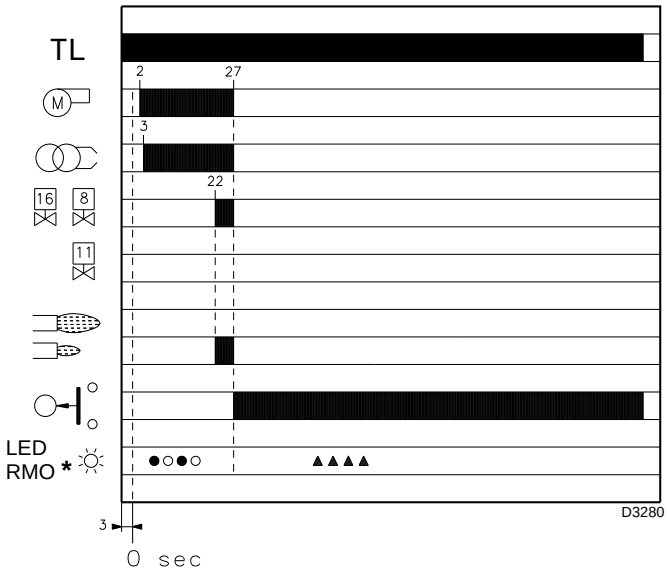
• 1st stage fan air gate valve
Keep the burner operating at 1st stage by setting the switch 2)(B) to the 1st stage position. Opening of the air gate valve 1)(A) must be adjusted in proportion to the selected nozzle: the index 7)(A) must be aligned with the specified in table (C). This adjustment is achieved by turning the hex element 4):
- in rh direction (- sign) the opening is reduced;
- in lh direction (+ sign) the opening increases.

Example
1st stage nozzle 4.00 GPH:
26° notch aligned with index 7(A).
When the adjustment is terminated lock the hex element 4) with the ring nut 3).

• 2nd stage fan air gate valve
Set switch 2)(B) to the 2nd stage position and adjust the air gate valve 1)(A) by turning the hex element 6)(A), after having loosened the ring nut 5)(A).
Air pressure at attachment 1)(E) must be approximately the same as the pressure specified in table (D) plus the combustion chamber pressure measured at attachment 2)(E).
Refer to the example in the adjacent figure.

NOTE: in order to facilitate adjustment of hex elements 4) and 6)(A), use a 3 mmc Allen key 8)(A).

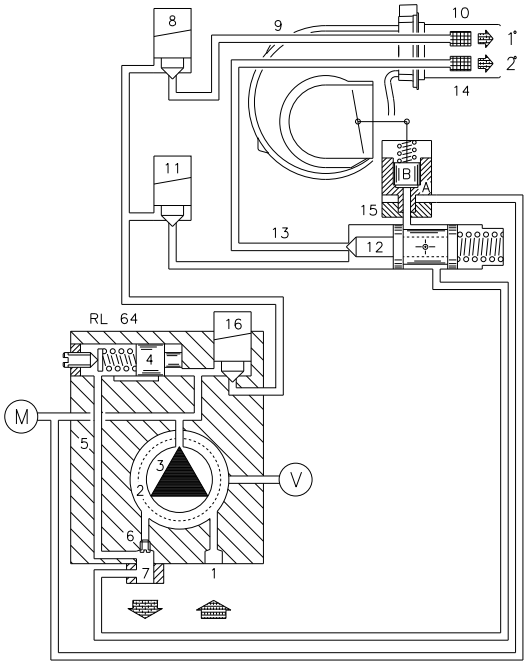




* ○ Off ● Yellow □ Green ▲ Red

For further details see page 13.

(A)



(B)

BURNER OPERATION

BURNER STARTING (A) - (B)

Starting phases with progressive time intervals shown in seconds:

- Control device TL closes.
  After about 3s:
- **0 s :** The control box starting cycle begins.
- **2 s :** The fan motor starts.
- **3 s :** The ignition transformer is connected.
  The pump 3) sucks the fuel from the tank through the piping 1) and the filter 2) and pumps it under pressure to 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 solenoid valves 8) - 11) - 16), de-energized, close the passage to the nozzles.
  The hydraulic cylinder 15), piston A, opens the air gate valve: pre-purging begins with the 1st stage air delivery.
- **22 s :** Solenoid valves 8) and 16) open and the fuel passes through the piping 9) and filter 10) and is then sprayed out through the nozzle, igniting when it comes into contact with the spark. This is the 1st stage flame.
- **29 s:** The ignition transformer switches off.
- **36 s:** If the control device TR is closed or has been replaced by a jumper wire, the 2nd stage solenoid valve 11) is opened and the fuel enters the valve 12) and raises the piston which opens two passages: one to piping 13), filter 14), and the 2nd stage nozzle, and the other to the cylinder 15), piston B, that opens the fan air gate valve in the 2nd stage.
  The starting cycle comes to an end.

STEADY STATE OPERATION

System equipped with one control device TR

Once the starting cycle has come to an end, the command of the 2nd stage solenoid valve passes on to the control device TR that controls boiler temperature or pressure.

- When the temperature or the pressure increases until the control device TR opens, solenoid valve 11) closes, and the burner passes from the 2nd to the 1st stage of operation.
- When the temperature or pressure decreases until the control device TR closes, solenoid valve 11) opens, and the burner passes from the 1st to the 2nd stage of operation, and so on.
- The burner stops when the demand for heat is less than the amount of heat delivered by the burner in the 1st stage. In this case, the control device TL opens, and solenoid valves 8)-16) close, the flame immediately goes out. The fan's air gate valve closes completely.

Systems not equipped with control device TR (jumper wire installed)

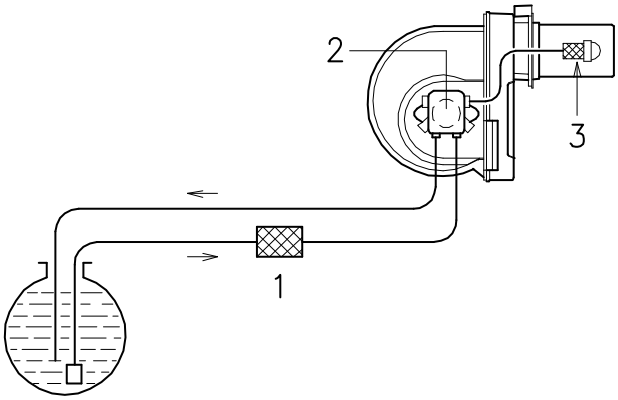
The burner is fired as described in the case above. If the temperature or pressure increase until control device TL opens, the burner shuts down (Section A-A in the diagram).
When the solenoid valve 11) de-energizes, the piston 12) closes the passage to the 2nd stage nozzle and the fuel contained in the cylinder 15), piston B, is discharged into the return piping 7).

FIRING FAILURE

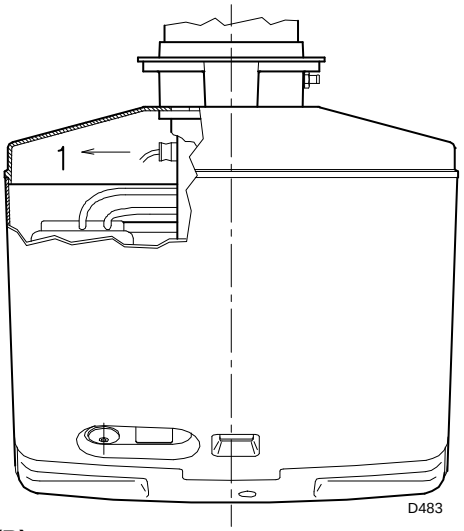
If the burner does not fire, it goes into lock-out within 5 s of the opening of the 1st nozzle valve and 30 s after the closing of control device TL.
The control box red pilot light will light up.

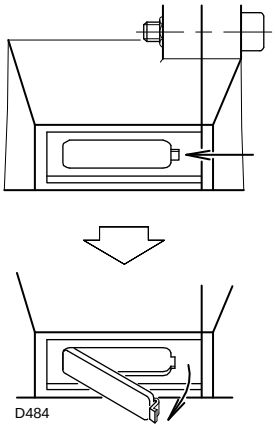
UNDESIRED SHUTDOWN DURING OPERATION

If the flame goes out during operation, the burner shuts down automatically within 1 second and automatically attempts to start again by repeating the starting cycle.



(A) D482





(B) **(C)**

FINAL CHECKS

- Obscure the photocell and switch on the control devices: the burner should start and then lock-out about 5 s after opening of the 1st nozzle operation valve.
- Illuminate the photocell and switch on the control devices: the burner should start and then go into lock-out after about 10 s.
- Obscure the photocell while the burner is in 2nd stage operation, the following must occur in sequence: flame extinguished within 1 s, pre-purging for about 20 s, sparking for about 5 s, burner goes into lock-out.
- Switch off control device TL followed by control device TS while the burner is operating: the burner should stop.

MAINTENANCE

⚠ The burner requires periodic maintenance carried out by a qualified and authorised technician **in conformity with legislation and local standards**.

⚠ Periodic maintenance is essential for the reliability of the burner, avoiding the excessive consumption of fuel and consequent pollution.

⚠ Before carrying out any cleaning or control, always switch off the electrical supply to the burner, using the main switch of the system.

Combustion
The optimum calibration of the burner requires an analysis of the flue gases. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

Pump
The delivery pressure must be stable at 12 bar.
The depression must be less than 0.45 bar.
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 piping or the pump.
If the pump is found to be responsible, check to make sure that the filter is not dirty. The vacuum meter is installed upstream from the filter and consequently will not indicate whether the filter is clogged or not.
Contrarily, 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 filter boxes:
• on line 1) • in the pump 2) • at the nozzle 3), and clean or replace as required.
If rust or other impurities are observed inside the pump, use a separate pump to lift any water and other impurities that may have deposited on the bottom of the tank.
Then clean the insides of the pump and the cover sealing surface.

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 provoke 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.

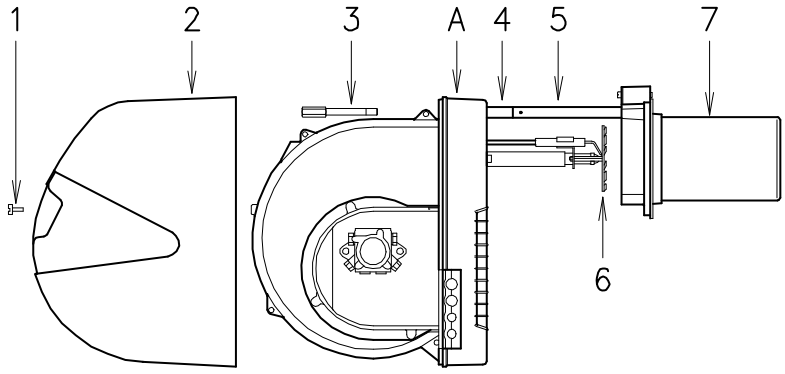
Nozzles
Do not clean the nozzle openings; do not even open them. The nozzle filters however may be cleaned or replaced as required.
Replace the nozzles every 2-3 years or whenever necessary.

Photocell (B)
Clean the glass cover from any dust that may have accumulated. Photocell 1) is held in position by a pressure fit and can therefore be removed by pulling it outward forcefully.

Flame inspection window (C)
Clean the glass whenever necessary.

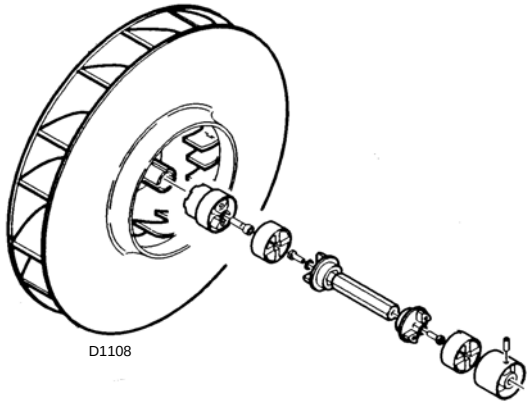
Flexible hoses
Check to make sure that the flexible hoses are still in good condition and that they are not crushed or otherwise deformed.

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



(D)

D486



D1108

(E)

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.

TO OPEN THE BURNER (D)

- Switch off the electrical power
- Remove screw 1 and withdraw the casing 2)
- Unscrew screw 3)
- Fit the two extensions 4) supplied with the burner onto the slide bars 5) (model with 385 mm blast tube)
- Pull part A backward keeping it slightly raised to avoid damaging the disk 6) on blast tube 7).

Fuel pump and/or couplings replacement (E)

In conformity with fig. (E).

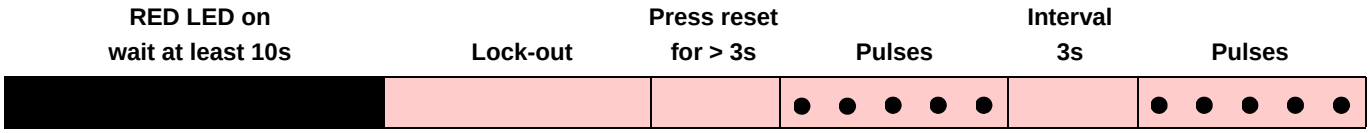
BURNER START-UP CYCLE DIAGNOSTICS

During start-up, indication is according to the followin table:

COLOUR CODE TABLE	
Sequences	**Colour code**
Pre-purging	●○●○●○●○●
Ignition phase	●○●○●○●○●
Operation, flame ok	□□□□□□□□□
Operating with weak flame signal	□○□○□○□○□
Electrical supply lower than ~ 170V	●▲●▲●▲●▲●
Lock-out	▲▲▲▲▲▲▲▲▲
Extraneous light	▲□▲□▲□▲□▲
Key: ○ Off	● Yellow □ Green ▲ Red

RESETTING THE CONTROL BOX AND USING DIAGNOSTICS

The control box features a diagnostics function through which any causes of malfunctioning are easily identified (indicator: **RED LED**).
To use this function, you must wait at least 10 seconds once it has entered the safety condition (**lock-out**), and then press the reset button.
The control box generates a sequence of pulses (1 second apart), which is repeated at constant 3-second intervals.
Once you have seen how many times the light pulses and identified the possible cause, the system must be reset by holding the button down for between 1 and 3 seconds.



The methods that can be used to reset the control box and use diagnostics are given below.

RESETTING THE CONTROL BOX

To reset the control box, proceed as follows:

- Hold the button down for between 1 and 3 seconds.
  The burner restarts after a 2-second pause once the button is released.
  If the burner does not restart, you must make sure the limit thermostat is closed.

VISUAL DIAGNOSTICS

Indicates the type of burner malfunction causing lock-out.
To view diagnostics, proceed as follows:

- Hold the button down for more than 3 seconds once the red LED (burner lock-out) remains steadily lit.
  A yellow light pulses to tell you the operation is done.
  Release the button once the light pulses. The number of times it pulses tells you the cause of the malfunction, according to the coding system indicated in the table on page 14.

SOFTWARE DIAGNOSTICS

Reports burner life by means of an optical link with the PC, indicating hours of operation, number and type of lock-outs, serial number of control box etc ...
To view diagnostics, proceed as follows:

- Hold the button down for more than 3 seconds once the red LED (burner lock-out) remains steadily lit.
  A yellow light pulses to tell you the operation is done.
  Release the button for 1 second and then press again for over 3 seconds until the yellow light pulses again.
  Once the button is released, the red LED will flash intermittently with a higher frequency: only now can the optical link be activated.

Once the operations are done, the control box's initial state must be restored using the resetting procedure described above.

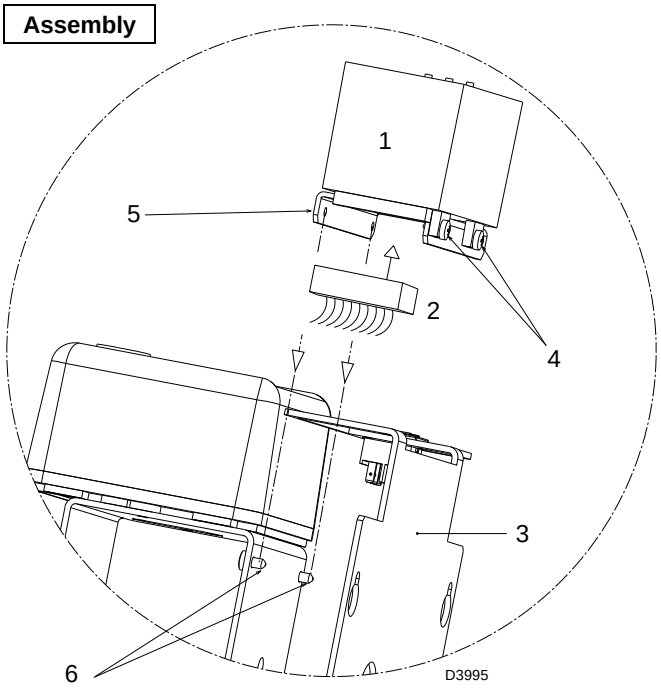
BUTTON PRESSED FOR	CONTROL BOX STATUS
Between 1 and 3 seconds	Control box reset without viewing visual diagnostics.
More than 3 seconds	Visual diagnostics of lock-out condition: (LED pulses at 1-second intervals).
More than 3 seconds starting from the visual diagnostics condition	Software diagnostics by means of optical interface and PC (hours of operation, malfunctions etc. can be viewed)

The sequence of pulses issued by the control box identifies the possible types of malfunction, which are listed in the table on page 14.

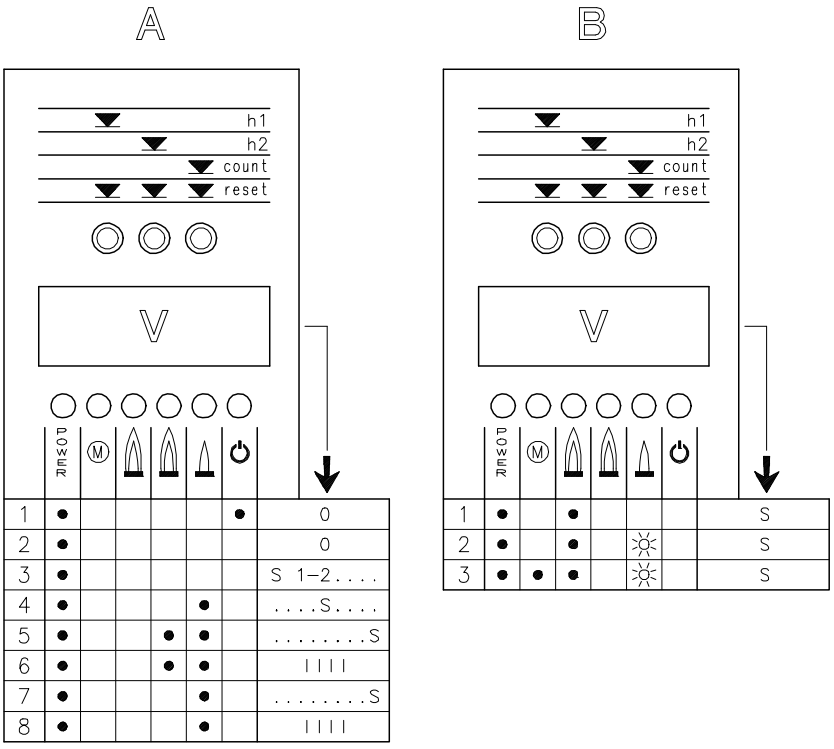
SIGNAL	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
No blink	The burner does not start	1 - No electrical power supply	Close all switches - Check fuses
		2 - A limit or safety control device is open	Adjust or replace
		3 - Control box lock-out	Reset control box (no sooner than 10 s after the lock-out)
		4 - Pump is jammed	Replace
		5 - Erroneous electrical connections	Check connections
		6 - Defective control box	Replace
		7 - Defective electrical motor	Replace
2 x blinks ● ●	After pre-purge and the safety time, the burner goes to lock-out at the end of the safety time	8 - No fuel in tank; water on tank bottom	Top up fuel level or suck up water
		9 - Inappropriate head and air damper adjustments	Adjust, see page 6 and 9
		10 - Light oil solenoid valves fail to open (1st stage or safety)	Check connections; replace coil
		11 - 1st nozzle clogged, dirty, or deformed	Replace
		12 - Dirty or poorly adjusted firing electrodes	Adjust or clean
		13 - Grounded electrode due to broken insulation	Replace
		14 - High voltage cable defective or grounded	Replace
		15 - High voltage cable deformed by high temperature	Replace and protect
		16 - Ignition transformer defective	Replace
		17 - Erroneous valves or transformer electrical connections	Check
		18 - Control box defective	Replace
		19 - Pump unprimed	Prime pump and see “Pump unprimes”
		20 - Pump/motor coupling broken	Replace
		21 - Pump suction line connected to return line	Correct connection
		22 - Valves up-line from pump closed	Open
		23 - Filters dirty: line - pump - nozzle	Clean
		24 - Defective photocell or control box	Replace photocell or control box
		25 - Dirty photocell	Clean
		26 - 1st stage operation of cylinder is faulty	Change the cylinder
		27 - Motor protection tripped	Reset thermal cut-out
		28 - Defective motor command control device	Replace
		29 - Missing phase thermal cut-out trips	Reset thermal cut-out when third phase is re-connected
		30 - Incorrect motor rotation direction	Change motor electrical connections
4 x blinks ● ● ● ●	The burner starts and then goes into lock-out	31 - Photocell short-circuit	Replace photocell
		32 - Light is entering or flame is simulated	Eliminate light or replace control box
7 x blinks ● ● ● ● ● ● ●	Flame detachment	33 - Poorly adjusted head	Adjust, see page 6, fig. (F)
		34 - Poorly adjusted or dirty firing electrodes	Adjust, see page 6, fig. (B)
		35 - Poorly adjusted fan air gate: too much air	Adjust
		36 - 1st nozzle is too big (pulsation)	Reduce 1st nozzle delivery
		37 - 1st nozzle is too small (flame detachment)	Increase 1st nozzle delivery
		38 - 1st nozzle dirty, or deformed	Replace
		39 - Inappropriate pump pressure	Adjust to between 10 and 14 bar
		40 - 1st stage nozzle unsuited to burner or boiler	See Nozzle Table, page 5; reduce 1st stage
		41 - Defective 1st stage nozzle	Replace
	The burner does not pass to 2nd stage	42 - Control device TR does not close	Adjust or replace
		43 - Defective control box	Replace
		44 - 2nd stage sol. valve coil defective	Replace
		45 - Piston jammed in valve unit	Replace entire unit
	Fuel passes to 2nd stage but air remains in 1st	46 - Low pump pressure	Increase
		47 - 2nd stage operation of cylinder is faulty	Change cylinder
	Burner stops at transition between 1st and 2nd stage. Burner repeats starting cycle.	48 - Nozzle dirty	Renew nozzle
		49 - Photocell dirty	Clean
		50 - Excess air	Reduce
	Uneven fuel supply	51 - Check if cause is in pump or fuel supply system	Feed burner from tank located near burner
	Internally rusted pump	52 - Water in tank	Suck water from tank bottom with separate pump
	Noisy pump, unstable pressure	53 - Air has entered the suction line	Tighten connectors
		- Depression value too high (higher than 35 cm Hg):	
		54 - Tank/burner height difference too great	Feed burner with loop circuit
		55 - Piping diameter too small	Increase
		56 - Suction filters clogged	Clean
		57 - Suction valves closed	Open
		58 - Paraffin solidified due to low temperature	Add additive to light oil
	Pump unprimes after prolonged pause	59 - Return pipe not immersed in fuel	Bring to same height as suction pipe
		60 - Air enters suction piping	Tighten connectors
	Pump leaks light oil	61 - Leakage from sealing organ	Replace pump
	Smoke in flame - dark Bacharach	62 - Not enough air	Adjust head and fan gate, see page 6 and 9
		63 - Nozzle worn or dirty	Replace
		64 - Nozzle filter clogged	Clean or replace
		65 - Erroneous pump pressure	Adjust to between 10 - 14 bar
		66 - Flame stability spirat dirty, loose, or deformed	Clean, tighten in place, or replace
		67 - Boiler room air vents insufficient	Increase
	- yellow Bacharach	68 - Too much air	Adjust head and fan gate, see page 6 and 9
	Dirty combustion head	69 - Nozzle or filter dirty	Replace
		70 - Unsuitable nozzle delivery or angle	See recommended nozzles, page 5
		71 - Loose nozzle	Tighten
		72 - Impurities on flame stability spiral	Clean
		73 - Erroneous head adjustment or not enough air	Adjust, see page 9; open gate valve
		74 - Blast tube length unsuited to boiler	Contact boiler manufacturer
10 x blinks ● ● ● ● ● ● ● ● ● ●	The burner goes to lock-out	75 - Connection or internal fault	
		76 - Presence of electromagnetic disturbance	Use the radio disturbance protection kit

STATUS (optional)

Assembly



1 Status
2 Connector
3 Bracket of the burner
4 Fixing screws
5 Support
6 Fixing screws



☼ = Led flashing
○ = Led illuminated
S = Time in seconds
IIII = Burner start cycle terminated

(A)

STATUS
Accessory available on request.
See page 16.

ASSEMBLY
The burners are preset to accept the Status. To assemble, proceed as follows:
- Connect Status 1) using connector 2) fitted on the bracket 3).
- Fix the support 5) to the Status using the screws 4) supplied in the kit.
- Fix the assembly to the shelf 3) using the screws 6).

The **STATUS** unit has three functions:

1 - BURNER OPERATING HOURS AND THE NUMBER OF FIRINGS ARE SHOWN ON DISPLAY V
Total operating hours
Press button "h1".
2nd stage operating hours
Press button "h2".
1st stage operating hours
Total hours - 2nd stage operating hours
Number of firings
Press button "count".
Resetting operating hours and number of firings
Press the three “reset” buttons simultaneously.
Non-volatile memory
The operating hours and the number of firings will remain in the memory even in the case of electrical power failures.

2 - INDICATES THE TIMES RELATIVE TO THE FIRING STAGE
The leds illuminate in the following sequence, see fig. A:

WITH CONTROL DEVICE TR CLOSED:
1 - Burner off, TL open
2 - Control device TL closed
3 - Motor start:
seconds count starts on read-out V
4 - 1st stage valve energized
5 - 2nd stage valve energized:
seconds count stops on read-out V
6 - 10 seconds after stage 5 the code IIII will appear on the read-out: this indicates that the starting phase is terminated.

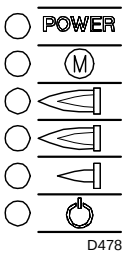
WITH CONTROL DEVICE TR OPEN:
1 - Burner off, TL open
2 - Control device TL closed
3 - Motor start:
seconds count starts on read-out V
4 - 1st stage valve energized
7 - 30 seconds after stage 4:
seconds count stops on read-out V
8 - 10 seconds after stage 7 the code IIII will appear on the read-out: this indicates that the starting phase is terminated.

The times, in seconds, shown on read-out V, indicate the succession of the various starting stages described on page 10.

3 - IN THE CASE OF BURNER MALFUNCTIONS, THE STATUS PANEL INDICATES THE EXACT TIME AT WHICH THE FAULT OCCURRED.
There are 3 possible combinations of illuminated leds, see fig. (B).
For the causes of the malfunction refer to the numbers shown between brackets; see the legend on page 14 for interpretation of the numbers.

1 . . . . . (9 ÷ 10)
2 . . . . . (11 ÷ 29)
3 . . . . . (32)

Key to symbols:



= Power present
= Fan motor blocked (red)
= Burner lock-out (red)
= Not used
= 1st stage operation
= Load level reached (Stand-by), led: on

ACCESSORIES (optional):

- **STATUS** (see page 15): code **3010322**

- **RADIO DISTURBANCEPROTECTION KIT**

If the burner is installed in places particularly subject to radio disturbance (emission of signals exceeding 10 V/m) owing to the presence of an INVERTER, or in applications where the length of the thermostat connections exceeds 20 metres, a protection kit is available as an interface between the control box and the burner.

BURNER	**RL 64 MZ**
Code	3010386

- **DEGASSING UNIT**

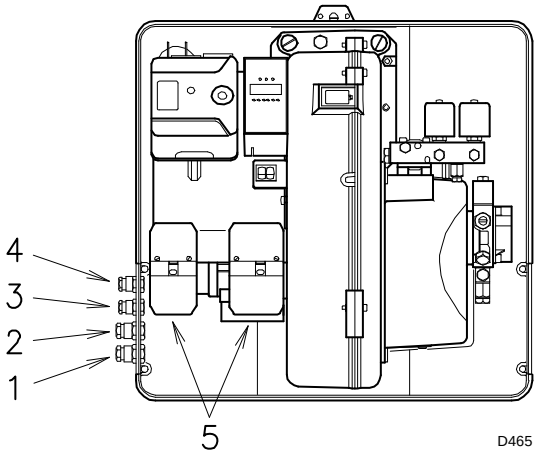
It may occur that a certain amount of air is contained in the light oil sucked up by the pump. This air may originate from the light oil itself as a consequence of depressurization or air leaking past imperfect seals.
In double-pipe systems, the air returns to the tank from the return pipe; in single-pipe systems, the air remains in circulation causing pressure variations in the pump and burner malfunctions.
For this reason, we advise installing a degassing unit near the burner in single-pipe installations.
Degassing units are provided in two versions:

CODE **3010054** without filter
CODE **3010055** with filter

Degassing unit characteristics
- Burner delivery : 80 kg/h max
- Light oil pressure : 0.7 bar max
- Ambient temperature : 40 °C max
- Light oil temperature : 40 °C max
- Attachment connectors : 1/4 inch

- **CLEAN CONTACT KIT: code 3010419**

APPENDIX



Electrical connections

NOTES

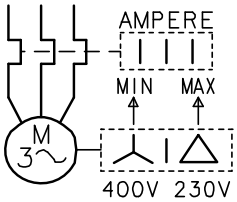
The electrical wirings must be carried out in conformity with the regulations in force in the countries of destination, and by qualified personnel.
Riello S.p.A. cannot accept any responsibility for modifications or connections other than those shown in these diagrams.

Use flexible cables, in accordance with the regulation EN 60 335-1.

All the cables to be connected to the burner must pass through cable grommets.

The use of cable grommets can take various forms; the following way is just one possible solution:

1 - Pg 11Three-phase power supply
2 - Pg 11Single-phase power supply
3 - Pg 9Control device TL
4 - Pg 9Control device TR



ADJUSTMENT OF THERMAL CUTOUT

Used to avoid the burning of the motor owing to a strong increase in the absorption, caused by the lack of a phase.

- If the motor is star-driven, **400V**, the cursor must be positioned on “MIN”.
- If it is delta-driven, **230V**, the cursor is positioned on “MAX”.

If the scale of the thermal cutout does not include the absorption of rating of the motor at 400V, the protection is guaranteed anyway.

NOTES

- Burners leave the factory preset for **400 V** power supply.
  If **230 V** power supply is used, change the motor connection from star to delta and change the setting of the thermal cutout as well.
- The burners have been type-approved for intermittent operation.
  This means they should compulsorily be stopped at least once every 24 houres to enable the control box to perform checks of its own efficiency at start-up. Burner halts are normally provided for automatically by the boiler load control system.
- The burner is factory set for two-stage operation and it must therefore be connected to the TR remove control device to command light oil valve V2.
  Alternatively, if single stage operation is required, instead of control device TR install a jumper lead between terminals T6 and T8 of connector X4.

ATTENTION:
- Do not invert the neutral with the phase in the electrical supply line. An inversion would lead to lockout due to ignition failure.
- Replace the components only with original spare parts.