GB

Light oil burner

Two stage operation

CE

CODE	MODEL	TYPE
20057368	RL 130	57368X

20058178 (1) - 08/2012

Declaration of conformity in accordance with ISO / IEC 17050-1		
Manufacturer:	RIELLO S.p.A.	
Address:	Via Pilade Riello, 7 37045 Legnago (VR)	
Product:	Light oil burner	
Model:	RL 130	
These products are in compliance with the following Technical Standards:		
EN 267		
EN 12100		
and according to the European Directives:		
MD	2006/42/EC	Machine Directive
LVD	2006/95/EC	Low Voltage Directive
EMC	2004/108/EC	Electromagnetic Compatibility

The quality is guaranteed by a quality and management system certified in accordance with UNI EN ISO 9001.

Legnago, 01.07.2012

Mr. Ivan Zinna
Burners Division Department
RIELLO S.p.A.

Mr Ruben Cattaneo

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

TECHNICAL DATA

MODEL			RL 130
TYPE			57368X
OUTPUT (1) DELIVERY (1)	2nd stage	kW Mcal/h kg/h	948 - 1540 816 - 1325 80 - 130
	1st stage	kW Mcal/h kg/h	486 - 948 418 - 816 41 - 80
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-phase (all - nothing)
NOZZLES		numer	2
STANDARD APPLICATIONS			Boilers: water, steam, diathermic oil
AMBIENT TEMPERATURE		°C	0 - 40
COMBUSTION AIR TEMPERATURE		°C max	60
ELECTRICAL SUPPLY		V Hz	3 ~ 220 - 380 V - 60 Hz 1N ~ 220 V - 60 Hz
AUXILARY CIRCUITS SUPPLY		V	220-230
ELECTRICAL MOTOR		rpm W V A	3500 2200 220 - 380 8.1 - 4.7
IGNITION TRASFORMER		V1 - V2 I1 - I2	230 V - 2 x 5 kV 1.9 A - 30 mA
PUMP	delivery (at 12 bar) pressure range fuel temperature	kg/h bar °C max	176 10 - 20 60
ELECTRICAL POWER CONSUMPTION		W max	2600
ELECTRICAL PROTECTION			IP 44
IN CONFORMITY WITH EEC DIRECTIVES			2004/108 - 2006/95 - 2006/42
NOISE LEVELS (2)		dBA	78.5

(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.

VARIANTS

Model	Code	Electrical supply	Blast tube lenght mm
RL 130	20057368	Three-phase	250 385

ACCESSORIES (optional):

- **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 130
Code	3010386

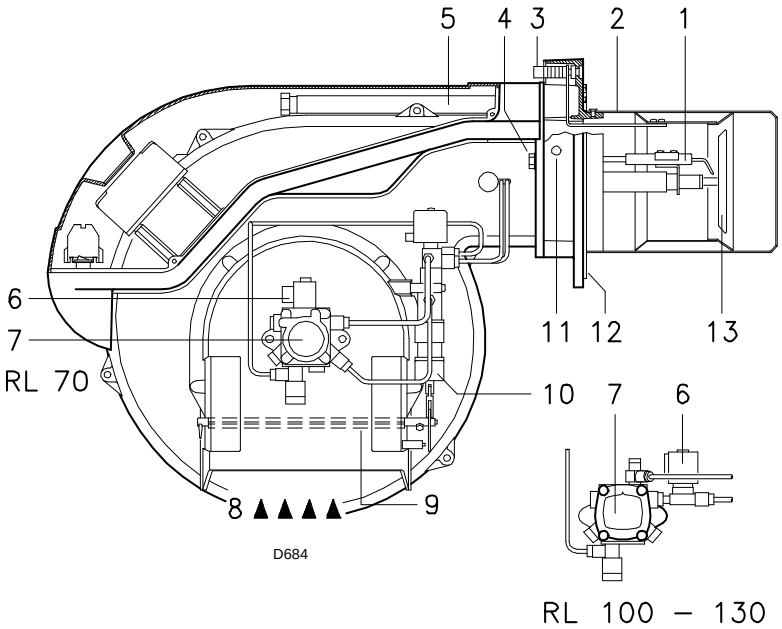
DEGASSING UNIT:

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:

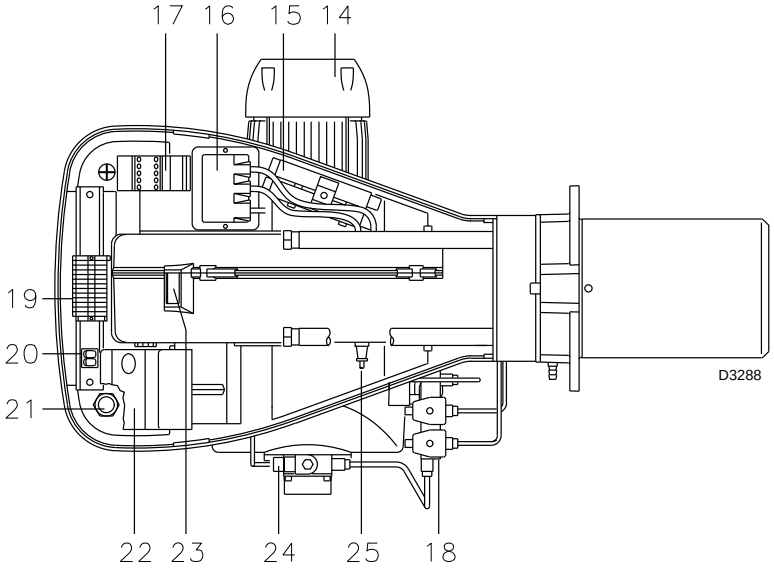
CODE **3010054** without filter
CODE **3010055** with filter

- Burner delivery : max. 80 kg/h
- Light oil pressure : max. 0.7 bar
- Ambient temperature : max. 50 °C (without filter)
- Ambient temperature : max. 40 °C (with filter)
- Light oil temperature : max. 50 °C (without filter)
- Light oil temperature : max. 40 °C (with filter)
- Attachment connectors : 1/4 inch

For burner deliveries higher than 80 kg/h, install two parallel degassing units

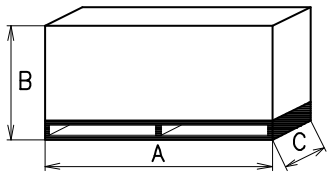


RL 100 – 130

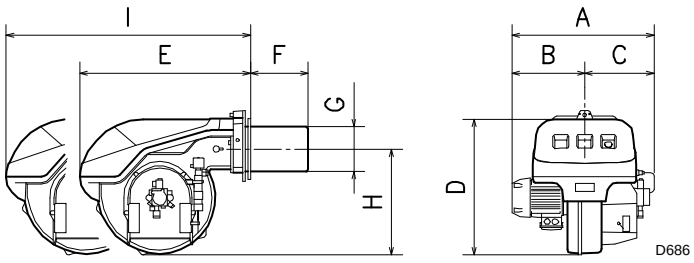


(A)

mm	A	B	C	kg
RL 130	1300	750	700	66



(B)



mm	A	B	C	D	E	F (1)	G	H	I (1)
RL 130	625	338	287	555	680	250 - 385	189	430	951 - 1086

(1) Blast tube: short-lang

(C)

BURNER DESCRIPTION (A)

1 Ignition electrodes
2 Combustion head
3 Screw for combustion head adjustment
4 Screw for fixing fan to flange
5 Slide bars for opening the burner and inspecting the combustion head
6 Safety solenoid valve
7 Pump
8 Air inlet to fan
9 Air gate valve
10 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.
11 Fan pressure test point
12 Boiler mounting flange
13 Flame stability disk
14 Electrical motor
15 Extensions for slide bars 5)
16 Ignition transformer
17 Motor contactor and thermal cut-out with reset button
18 1st and 2nd stage valve assembly
19 Terminal strip
20 Two switches:
- one "burner off - on"
- one for "1st - 2nd stage operation"
21 Fairleads for wiring carried out by the installer
22 Control box with lock-out pilot light and lock-out reset button
23 Flame inspection window
24 Pump pressure adjustment
25 Photocell for flame presence control

Two types of burner failure may occur:
Control box lock-out: if the control box 22)(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)

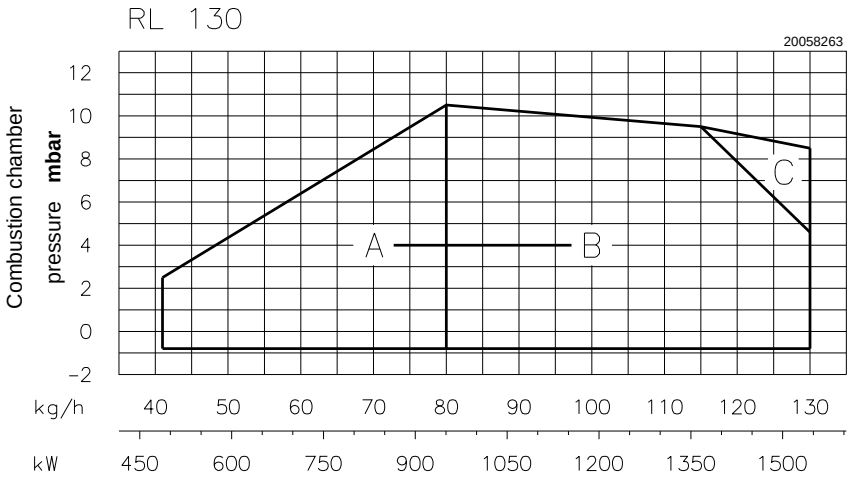
Approximate measurements
- The burner stands on a wooden base which can be lifted by fork-lifts. Outer dimensions of packaging are indicated in (B)
- The weight of the burner complete with packaging is indicated in table (B).

MAX. DIMENSIONS (C)

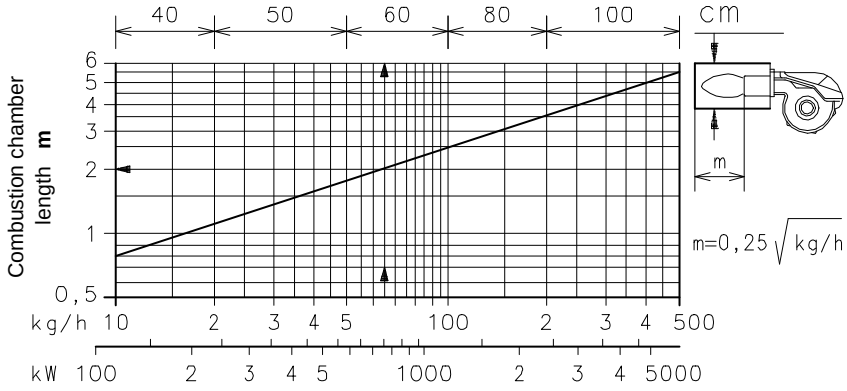
Approximate measurements
The maximum dimensions of the burner are given in (C).
Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part withdrawn on the slide bars.
The maximum dimension of the burner when open is give by measurement I.

STANDARD EQUIPMENT

2 - Flexible hoses
2 - Gaskets for flexible hoses
2 - Nipples for flexible hoses
1 - Thermal insulation screen
2 Extensions 15)(A) for slide bars 5)(A) (for models with 385 mm blast tube)
4 - Screws to secure the burner flange to the boiler: M 12 x 35
1 - Instruction booklet
1 - Spare parts list



(A)



(B) D688

FIRING RATES (A)

The RL 130 Model 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 (and C for model RL 130). 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. In order to utilize also area C (RL 130) it is necessary to perform the calibration of the combustion head as explained on page 5.

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 rates were 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.

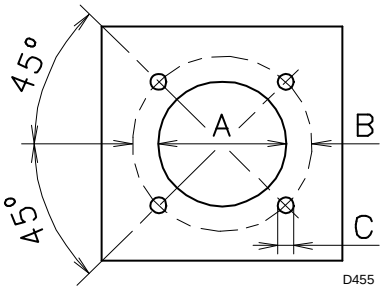
Example:

delivery 65 kg/hour:

diameter = 60 cm; length = 2 m.

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

mm	A	B	C
RL 130	195	275-325	M 12



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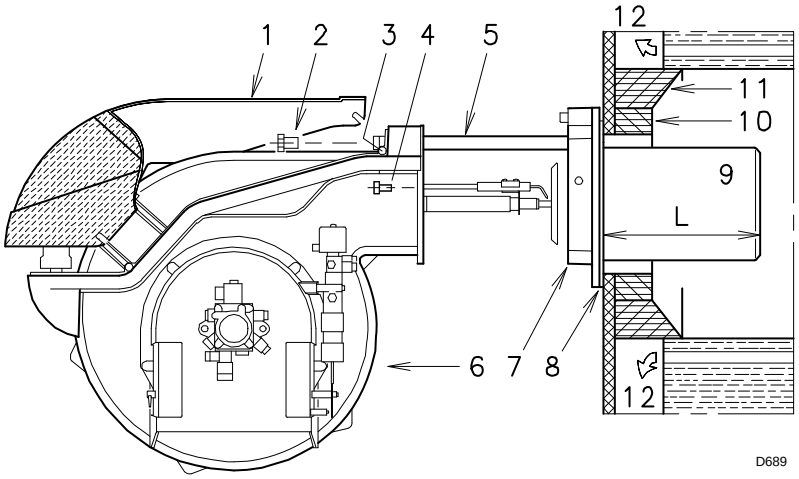

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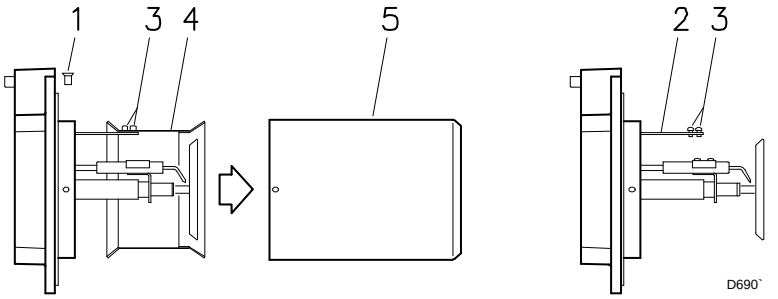


(C)

GPH	kg/h (1)			kW
	10 bar	12 bar	14 bar	12 bar
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
17,5	67,3	74,2	80,7	880,0
18,0	69,2	76,4	83,0	906,1
19,0	73,0	80,6	87,6	956,0
19,5	75,0	82,7	89,9	980,9
20,0	76,9	84,8	92,2	1005,8
21,5	82,7	91,2	99,1	1081,7
22,0	84,6	93,3	101,4	1106,6

(1) light oil: density 0,84 kg/dm^3 - viscosity 4,2 cSt/20 °C - temperature 10 °C **(D)**

INSTALLATION

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 (mm), is as follows:

Blast tube 9):	RL 130
• short	250
• long	385

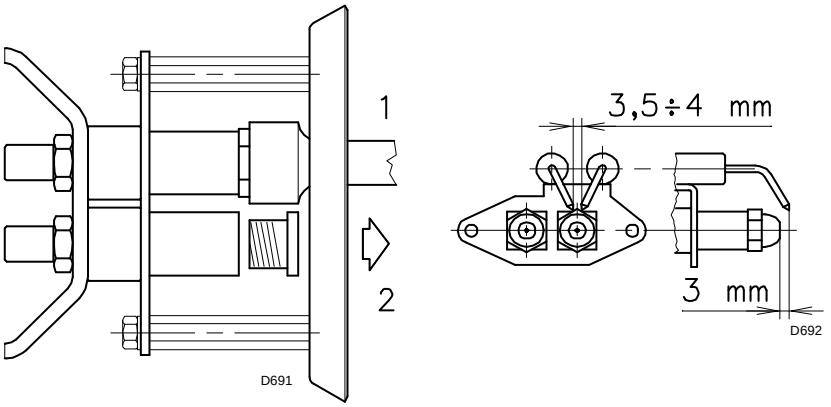
For boilers with front flue passes 12) or flame inversion chambers, protective fettling in refractory material 10) must be inserted between the boiler's fettling 11) and the blast tube 9).
This protective fettling must not compromise the extraction of the blast tube.
For boilers having a water-cooled front the refractory fettling 10)-11)(B) is not required unless it is expressly requested 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 5).
- Withdraw the blast tube 9) complete with flange 7) and slide bars 5).

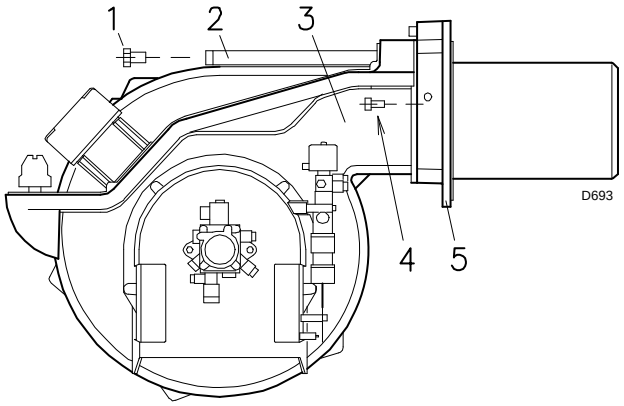
COMBUSTION HEAD CALIBRATION
At this point check, for model RL 130, whether the maximum delivery of the burner in 2nd stage operation is contained in area B or in area C of the firing rate. See page 4.
If it is in area B then no operation is required.
If, on the other hand, it is in area C:
- Unscrew 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 it was required), secure flange 7)(B) to the boiler plate interposing the supplied gasket 8). Use the 4 screws provided after having protected the thread with antiscruffing products (high-temperature grease, compounds, graphite). The burner-boiler seal must be airtight.

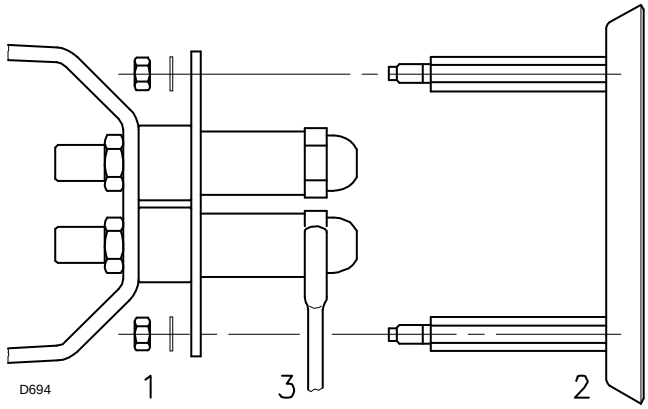
CHOICE OF NOZZLES FOR 1ST AND 2ND STAGE
Both nozzles must be chosen from among those listed in Table (D).
The first nozzle determines the delivery of the burner in the 1st stage.
The second nozzle works together with the 1st nozzle to determine the delivery of the burner in the 2nd stage.
The deliveries 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: the burner allows good combustion values also with a ratio 40 - 100 % between the 1st and 2nd stage;
- a delivery higher than 50% of the total delivery whenever the combustion during the 1st stage must be improved.



(A) **(B)**

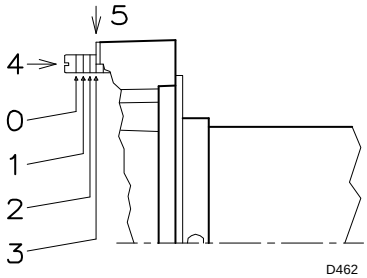


(C)

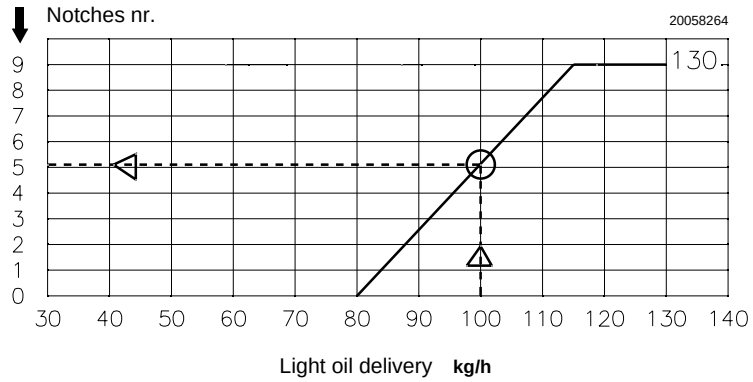


(D)

COMBUSTION HEAD SETTING



(E)



(F)

Example with the RL 130 Model**:**
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° = 7.0 GPH - 2° = 7.0 GPH,

or the following two different nozzles:
1° = 6.0 GPH - 2° = 8.0 GPH,

or:
1° = 8.0 GPH - 2° = 6.0 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).

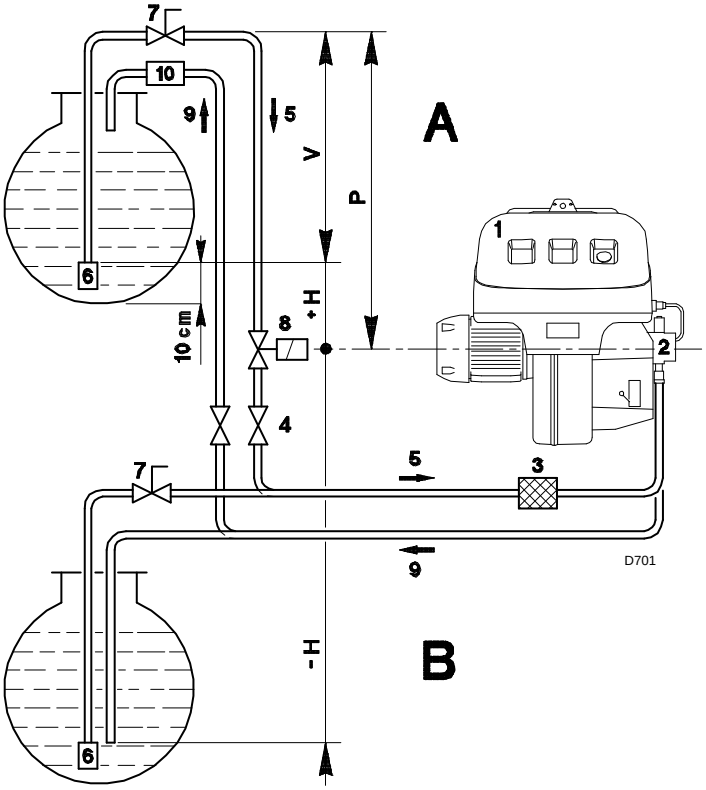
Make sure that the electrodes are positioned as shown in Figure (B).
Finally remount the burner 3)(C) to the slide bars 2) and slide it up to the flange 5), keeping it slightly raised to prevent the flame stability disk from pressing against the blast tube.
Tighten the screws 1) on the slide bars 2) 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:
- 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

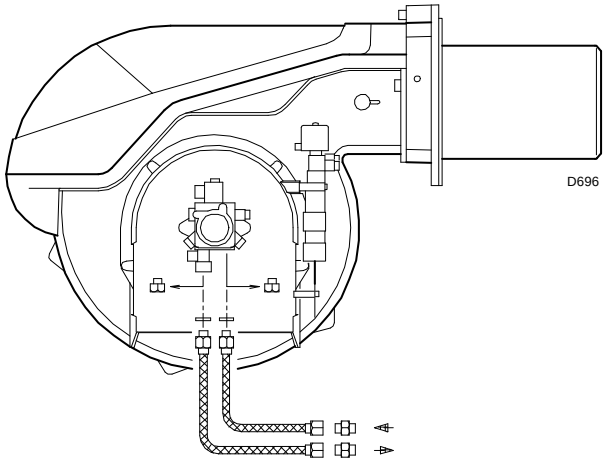
The setting of the combustion head depends exclusively on the delivery of the burner in the 2nd stage - in other words, the combined delivery of the two nozzles selected on page 5.
Turn screw 4)(E) until the notch shown in diagram (F) is level with the front surface of flange 5)(E).

Example:
The RL 130 Model with two 12.0 GPH nozzles and 12 bar pump pressure.
Find the delivery of the two 3.00 GPH nozzles in table (D), page 5:
50.9 + 50.9 = 101.8 kg/h.
Diagram (F) indicates that for a delivery of 51 kg /h the RL 130 Model requires the combustion head to be set to approx. three notches, as shown in Figure (E).



+ H - H (m)	L (m) RL 130 Ø (mm)		
	12	14	16
+ 4,0	71	138	150
+ 3,0	62	122	150
+ 2,0	53	106	150
+ 1,0	44	90	150
+ 0,5	40	82	150
0	36	74	137
- 0,5	32	66	123
- 1,0	28	58	109
- 2,0	19	42	81
- 3,0	10	26	53
- 4,0	-	10	25

(A)



(B)

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.12.

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.

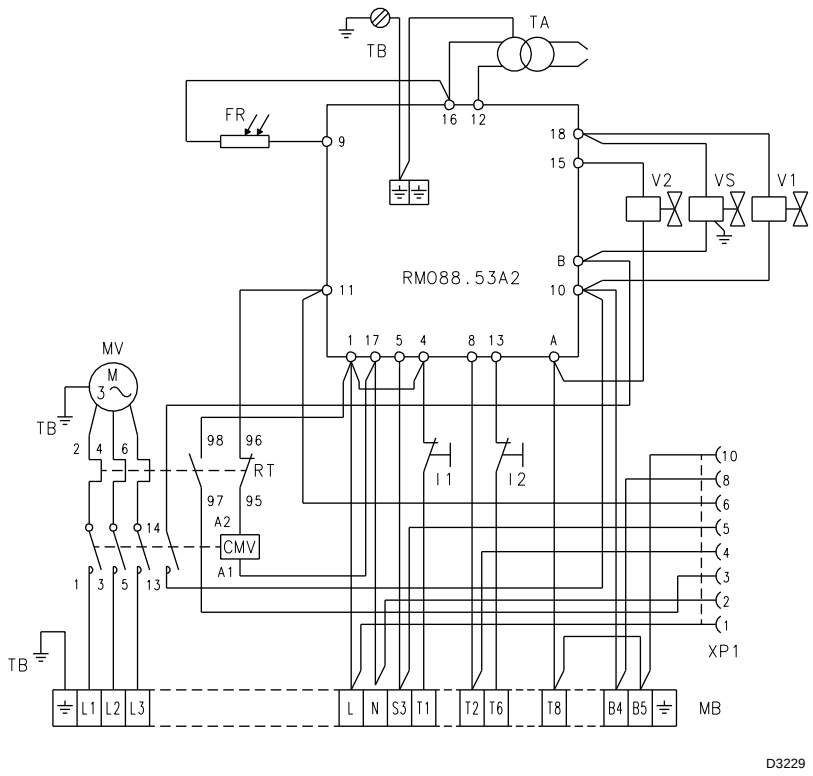
Remove the plugs from the suction and return connections of the pump.

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.

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.



(A)

ELECTRICAL SYSTEM

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.

ELECTRICAL SYSTEM factory set

LAYOUT (A)

Burners RL 130

- Models RL 130 leave the factory preset for **380 V** power supply.
- If **220 V** power supply is used, change the motor connection from star to delta and change the setting of the thermal cut-out as well.

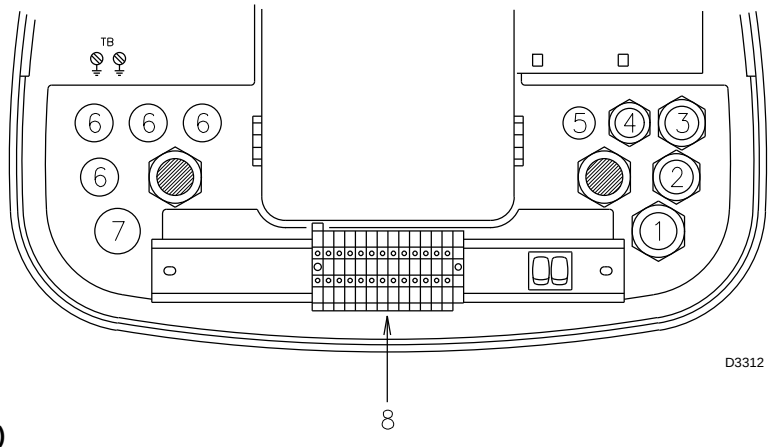
Key to Layout (A)

CMV	- Motor contactor
FR	- Photocell
I1	- Switch: burner off - on
I2	- Switch: 1st - 2nd stage operation
MB	- Terminal strip
MV	- Fan motor
RMO88.53A2	- Control box
RT	- Thermal cut-out
TA	- Ignition transformer
TB	- Burner ground (earth) connection
V1	- 1st stage solenoid valve
V2	- 2nd stage solenoid valve
VS	- Safety solenoid valve
XP1	- Connector for STATUS

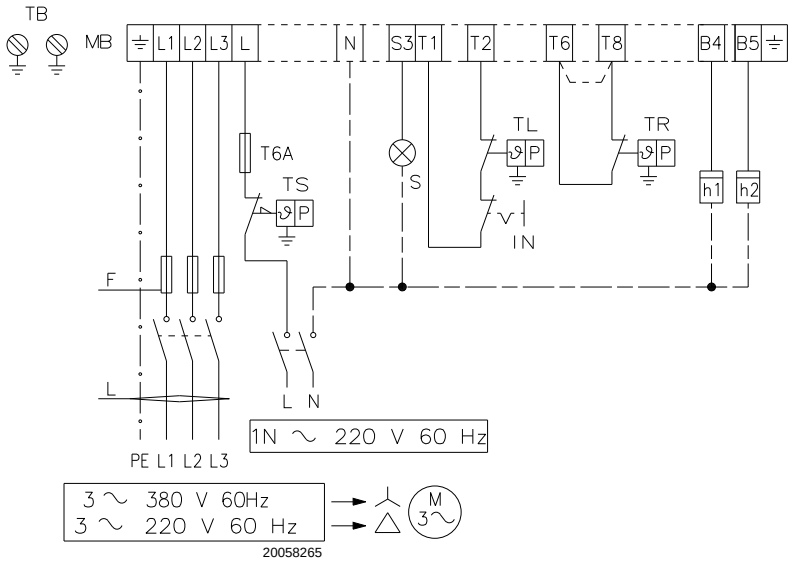
NOTE

For remote-reset, connect a push-button switch (NO) between terminal 3 and neutral of the control box (terminals 15, 16, 17 and 18).

RL 130 ELECTRICAL CONNECTIONS



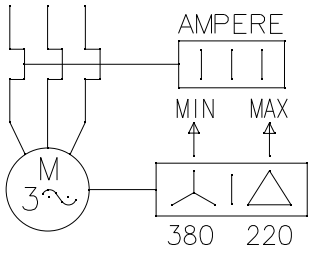
(A)



		RL 130	
		220 V	380 V
F	A gG/gL	16	10
L	mm^2	1,5	1,5

(B)

RL 130 CALIBRATION OF THEREMAL RELAY



(C)

20058266

ELECTRICAL CONNECTIONS (A)

set up by the installer

Use flexible cables according to regulation EN 60 335-1:

- if in PVC boot, use at least H05 VV-F
- if in rubber boot, use at least H05 RR-F.

All the cables to be connected to the burner terminal strip 8)(A) must be routed through the fair-leads.

The fair leads and precut holes can be used in various ways. One example is given below:

1 - Pg 13,5 Three-phase power supply
2 - Pg 11 Single-phase power supply
3 - Pg 11 Control device TL
4 - Pg 9 Control device TR
5 - Pg 9 Fitting hole for fair lead, if required
6 - Pg 11 Fitting hole for fair lead, if required
7 - Pg 13,5 Fitting hole for fair lead, if required

SCHEMA (B)

RL 130 Models electrical connection three-phase 220/380 V power supply with neutral phase wire.

Fuses and cables section layout (B), see table.

Cable section not indicated: 1.5 mm^2.

Key to wiring layout (B)

h1 - 1st stage hourcounter
h2 - 2nd stage hourcounter
IN - Manual burner stop switch
MB - Terminal strip
S - Remote lock-out signal
TB - Burner ground (earth) connection
TL - Limit control device system:
This shuts down the burner when the boiler temperature or pressure exceeds the set-point value.
TR - High-low mode control device system:
This controls operating stages 1 and 2 and is necessary only for two-stage operation.
TS - Safety control device system:
This operates when TL is faulty.

Important: 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 terminal 11 and 12 of the terminal strip.

LAYOUT (C)

Calibration of thermal cut-out 17)(A)p.3

This is required to avoid motor burn-out in the event of a significant increase in power absorption caused by a missing phase.

- If the motor is star-powered, **380 V**, the cursor should be positioned to "MIN".
- If the motor is delta-powered, **220 V**, the cursor should be positioned to "MAX".

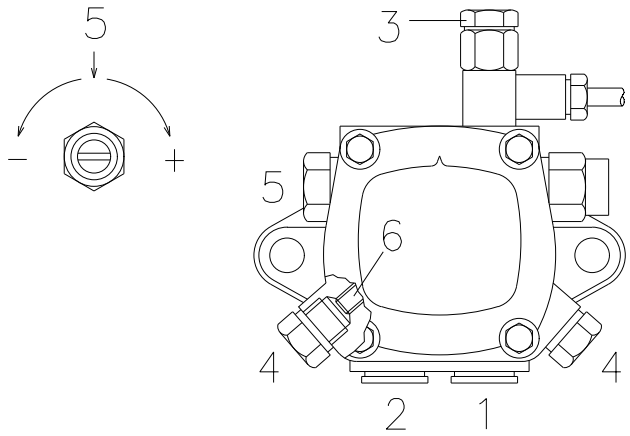
Even if the scale of the thermal cut-out does not include rated motor absorption at **380 V**, protection is still ensured in any case.

NOTE

- Burners RL 130 leave the factory preset for **380 V** power supply. If **220 V** power supply is used, change the motor connection from star to delta and change the setting of the thermal cut-out as well.
- The supply to the auxiliary circuits must be **220 V**.
- The RL 130 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.

WARNING
Do not invert the neutral with the phase wire in the electricity supply line.

RL 130
PUMP SUNTEC AJ4 CC



20058267

PUMP		**AJ4 CC**
A	kg/h	176
B	bar	10 - 20
C	bar	0,45
D	cSt	2,8 - 75
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	- Screw for by-pass	

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

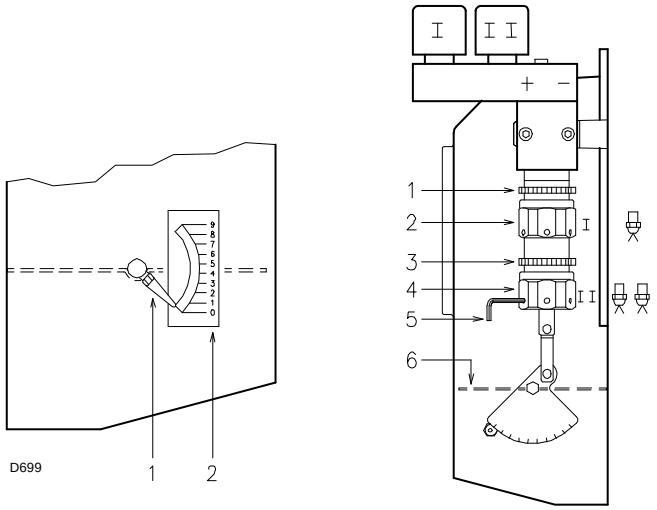
PUMP PRIMING

- **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 thescrews 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)(C)p.11 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)(C)p.11 set to "OFF" and tighten the screw 3).

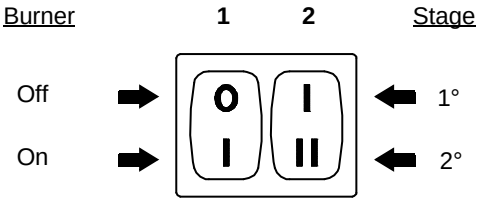
The time required for this operation depends upon the diameter and length of the suction tubing. If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the starting operation as often as required. After 5 or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

FAN AIR GATE VALVE ADJUSTMENT



(A) **(B)**



(C)

RL 130	
GPH	N°
10	2,0
11	2,1
12	2,2
13	2,3
14	2,5
15	2,6
16	2,7
17	2,8
18	2,9
19	3,0

1st STAGE

N° = Notch 2)(A)

(D)

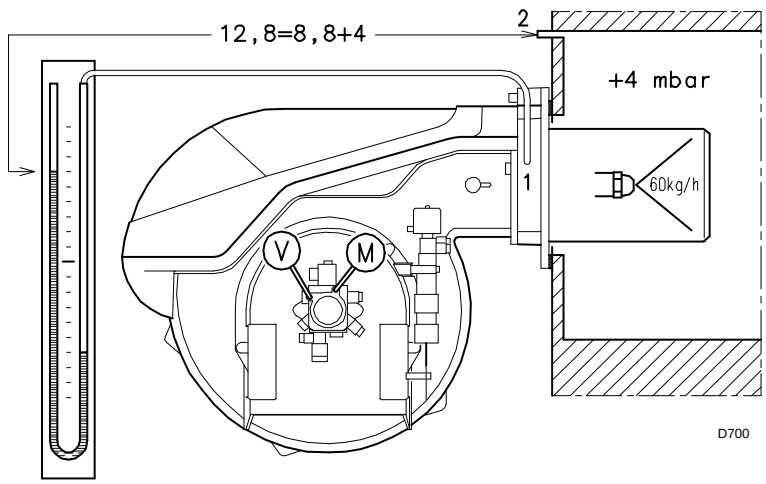
RL 130	
kg/h	mbar
80	7
90	7,2
100	7,6
110	8,1
120	9,0
130	11,0
130	8,5 (1)

2nd STAGE

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

(1) With shutter 4)(C)p.6 retracted

(E)



BURNER CALIBRATION

FIRING

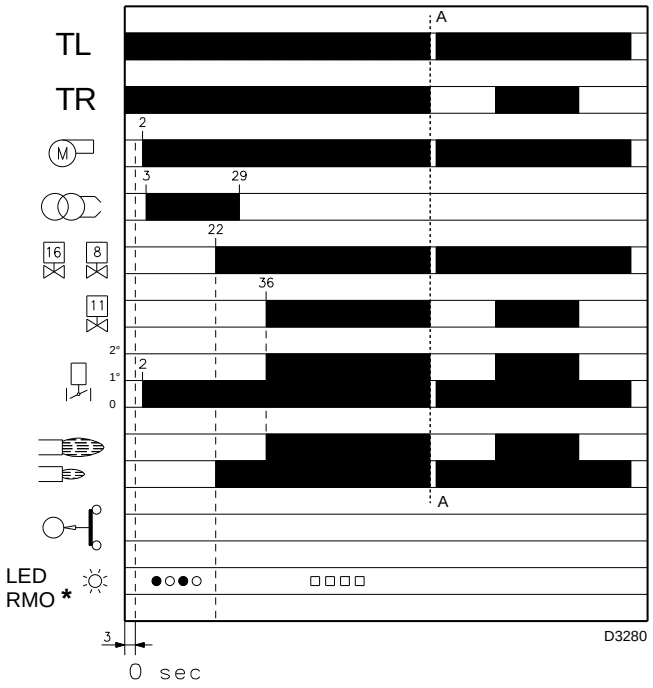
Set switch 1)(C) to "ON".
During the first firing, during the passage from the 1st to the 2nd stage, there is a momentary lowering of the fuel pressure caused by the filling of the 2nd stage nozzle tubing. This lowering of the fuel pressure can cause the burner to lock-out and can sometimes give rise 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. 15: causes 34 to 42.

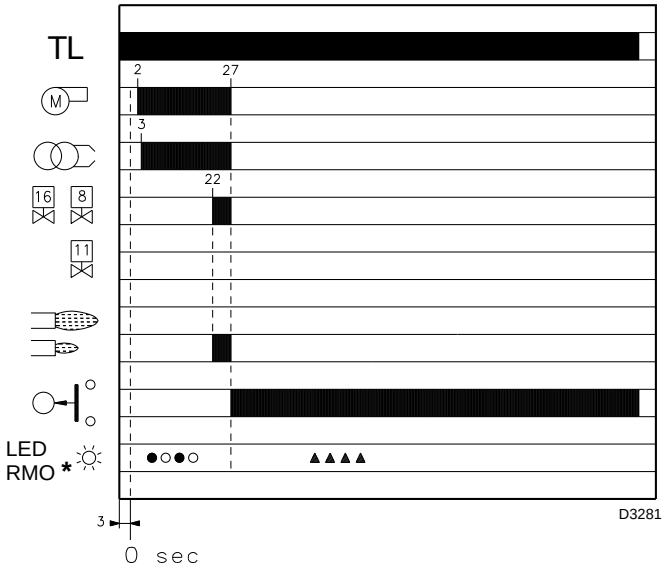
OPERATION

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 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 relevant screw 5)(A)p.10.
- **1st stage fan air gate valve**
  Keep the burner operating at 1st stage by setting the switch 2)(C) to the 1st stage position. Opening of the air gate valve 6)(B) must be adjusted in proportion to the selected nozzle: the index 1)(A) must be aligned with the notch 2)(A) specified in table (D). This adjustment is achieved by turning the hex element 2)(B):
  - in rh direction (- sign) the opening is reduced
  - in lh direction (+ sign) the opening increases.
  Example RL 130 - 1st stage nozzle 6.0 GPH: 2,1(A) notch aligned with index 1)(A).
  When the adjustment is terminated lock the hex element 2)(B) with the ring nut 1).
- **2nd stage fan air gate valve**
  Set switch 2)(C) to the 2nd stage position and adjust the air gate valve 6)(B) by turning the hex element 4)(B), after having loosened the ring nut 3)(B).
  Air pressure at attachment 1)(E) must be approximately the same as the pressure specified in table (E) plus the combustion chamber pressure measured at attachment 2). Refer to the example in the adjacent figure.

NOTE: in order to facilitate adjustment of hex elements 2) and 4)(B), use a 3 mm Allen key 5)(B).

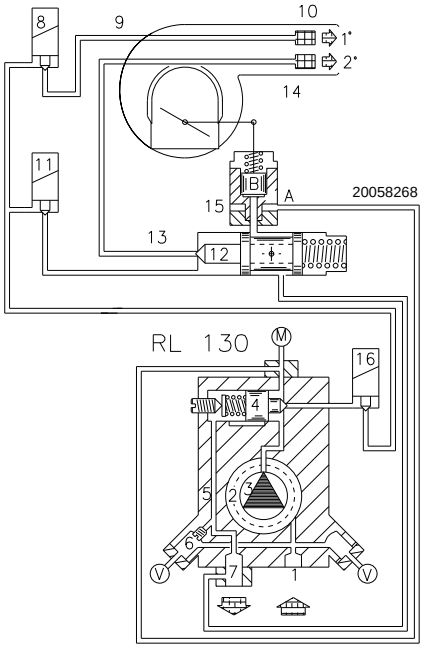




* ○ Off ● Yellow □ Green ▲ Red

For further details see page 14.

(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)

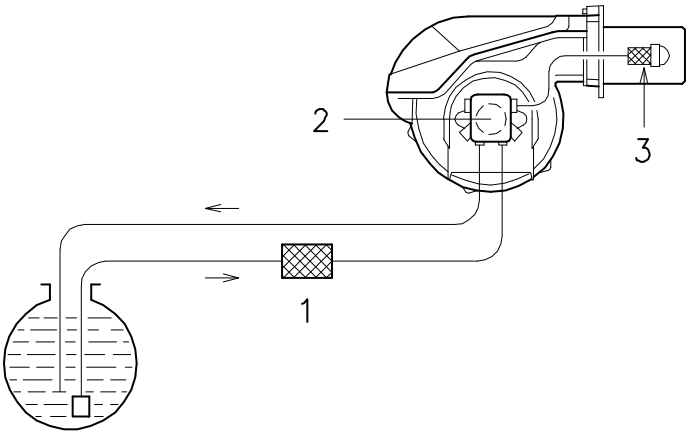
The burner is fired as described in the case above. If the temperature or pressure increase until control device TL opens, the burner shuts down (Section A-A in the diagram).
When the solenoid valve 11) de-energizes, the piston 12) closes the passage to the 2nd stage nozzle and the fuel contained in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

FIRING FAILURE

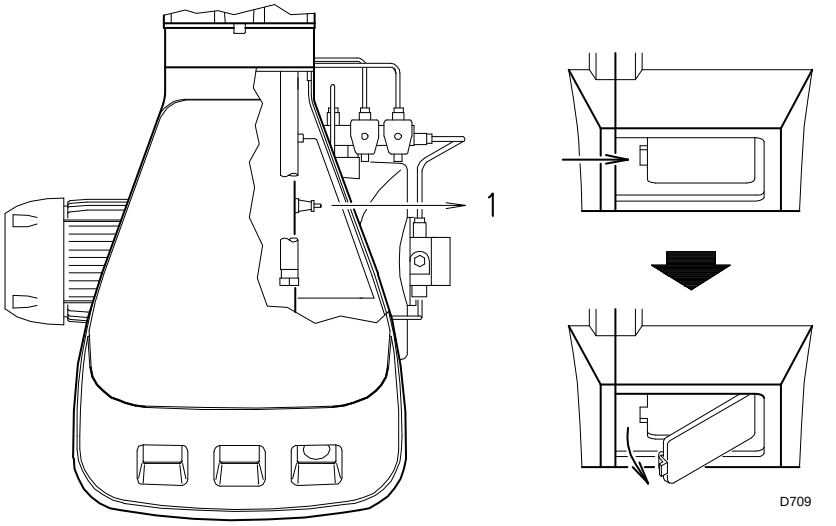
If the burner does not fire, it goes into lock-out within 5 s of the opening of the 1st nozzle valve and 30 s after the closing of control device TL.
The control box red pilot light will light up.

UNDESIRED SHUTDOWN DURING OPERATION

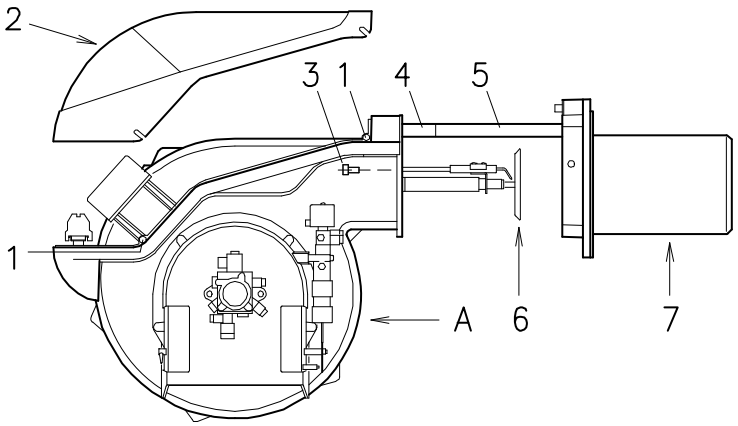
If the flame goes out during operation, the burner shuts down automatically within 1 second and automatically attempts to start again by repeating the starting cycle.



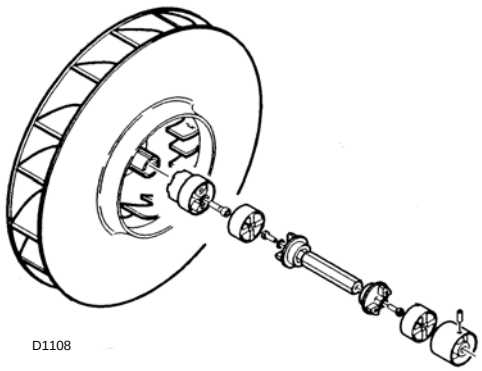
(A) D707



(B) **(C)**



(D) D710



(E)

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 stage 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

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 year or whenever necessary.
Combustion must be checked after the nozzles have been changed.

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.

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).

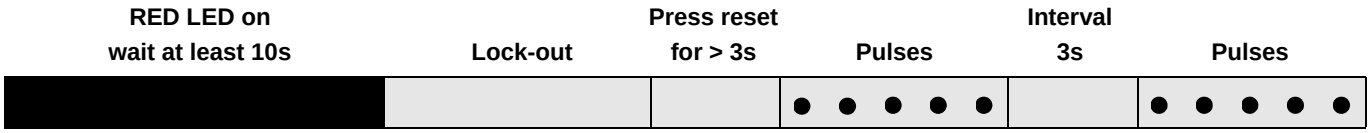
BURNER START-UP CYCLE DIAGNOSTICS

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 15.

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 15.

SIGNAL	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
No blink	The burner does not start	1 - No electrical power supply 2 - Linmit control device TL is open 3 - Safety control device TS is open 4 - Control box lock-out 5 - Pump is jammed 6 - Erroneous electrical connections 7 - Defective control box 8 - Defective electrical motor	Close all switches - Check fuses Adjust or replace Adjust or replace Reset control box (no sooner than 10 s after the lock-out) Replace Check connections Replace Replace
2 led ● ●	After pre-purge and the safety time, the burner goes to lock-out and the flame does not appear	9 - No fuel in tank; water on tank bottom 10 - Inappropriate head and air damper adjustments 11 - Light oil solenoid valves fail to open (1st stage or safety) 12 - 1st stage nozzle clogged, dirty, or deformed 13 - Dirty or poorly adjusted firing electrodes 14 - Grounded electrode due to broken insulation 15 - High voltage cable defective or grounded 16 - High voltage cable deformed by high temperature 17 - Ignition transformer defective 18 - Erroneous valves or transformer electrical connections 19 - Control box defective 20 - Pump unprimed 21 - Pump/motor coupling broken 22 - Pump suction line connected to return line 23 - Valves up-line from pump closed 24 - Filters dirty: line - pump - nozzle 25 - Defective photocell or control box 26 - Dirty photocell 27 - 1st stage operation of cylinder is faulty 28 - Motor protection tripped 29 - Defective motor command control device 30 - Missing phase thermal cut-out trips 31 - Incorrect motor rotation direction	Top up fuel level or suck up water Adjust, see page 6 and 11 Check connections; replace coil Replace Adjust or clean Replace Replace Replace and protect Replace Check Replace Prime pump and see “Pump unprimes” Replace Correct connection Open Clean Replace photocell or control box Clean Change the cylinder Reset thermal cut-out Replace Reset thermal cut-out when third phaseis re-connected Change motor electrical connections
4 led ● ● ● ●	The burner starts and then goes into lock-out	32 - Photocell short-circuit 33 - Light is entering or flame is simulated	Replace photocel Eliminate light or replace control box
7 led ● ● ● ● ● ● ●		34 - Poorly adjusted head 35 - Poorly adjusted or dirty firing electrodes 36 - Poorly adjusted fan air gate: too much air (1st stage) 37 - 1st nozzle is too big (pulsation) 38 - 1st nozzle is too small (flame detachment) 39 - 1st nozzle dirty, or deformed 40 - Inappropriate pump pressure 41 - 1st stage nozzle unsuited to burner or boiler 42 - Defective 1st stage nozzle	Adjust, see page 14, fig. (F) Adjust, see page 14, fig. (B) Adjust Reduce 1st nozzle delivery Increase 1st nozzle delivery Replace Adjust to between 10 and 14 bar See Nozzle Table, page 12; reduce 1st stage Replace
	The burner does not pass to 2nd stage	43 - Control device TR does not close 44 - Defective control box 45 - 2nd stage sol. valve coil defective 46 - Piston jammed in valve unit	Adjust or replace Replace Replace Replace entire unit
	Fuel passes to 2nd stage but air remains in 1st	47 - Low pump pressure 48 - 2nd stage operation of cylinder is faulty	Increase Change cylinder
	Burner stops at transition between 1st and 2nd stage. Burner repeats starting cycle	49 - Nozzle dirty 50 - Photocell dirty 51 - Excess air	Renew nozzle Clean Reduce
	Uneven fuel supply	52 - Check if cause is in pump or fuel supply system	Feed burner from tank located near burner
	Internally rusted pump	53 - Water in tank	Suck water from tank bottom with separate pump
	Noisy pump, unstable pressure	54 - Air has entered the suction line - Depression value too high (higher than 35 cm Hg): 55 - Tank/burner height difference too great 56 - Piping diameter too small 57 - Suction filters clogged 58 - Suction valves closed 59 - Paraffin solidified due to low temperature	Tighten connectors Feed burner with loop circuit Increase Clean Open Add additive to light oil
	Pump unprimes after prolonged pause	60 - Return pipe not immersed in fuel 61 - Air enters suction piping	Bring to same height as suction pipe Tighten connectors
	Pump leaks light oil	62 - Leakage from sealing organ	Replace pump
	Smoke in flame - dark Bacharach - yellow Bacharach	63 - Not enough air 64 - Nozzle worn or dirty 65 - Nozzle filter clogged 66 - Erroneous pump pressure 67 - Flame stability spirat dirty, loose, or deformed 68 - Boiler room air vents insufficient 69 - Too much air	Adjust head and fan gate, see page 6 and 11 Replace Clean or replace Adjust to between 10 - 14 bar Clean, tighten in place, or replace Increase Adjust head and fan gate, see page 6 and 11
	Dirty combustion head	70 - Nozzle or filter dirty 71 - Unsuitable nozzle delivery or angle 72 - Loose nozzle 73 - Impurities on flame stability spiral 74 - Erroneous head adjustment or not enough air 75 - Blast tube length unsuited to boiler	Replace See recommended nozzles, page 5 Tighten Clean Adjust, see page 11; open gate valve Contact boiler manufacturer
10 led ● ● ● ● ● ● ● ● ● ●	The burner goes to lock-out	76 - Connection or internal fault 77 - Presence of electromagnetic disturbance	 Use the radio disturbance protection kit

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