GB

Light oil burners

Modulating operation

CODE	MODEL
20102371	RL 70/E
20068158 - 20117168	RL 100/E
20057430 - 20117169	RL 130/E

Original instructions

1 Information and general instructions

1.1 Information about the instruction manual

1.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

In some parts of the manual you will see triangular DANGER signs. Pay great attention to these, as they indicate a situation of potential danger.

1.1.2 General dangers

The **dangers** can be of **3 levels**, as indicated below.

Maximum danger level!
This symbol indicates operations which, if not carried out correctly, cause serious injury, death or long-term health risks.

This symbol indicates operations which, if not carried out correctly, may cause serious injury, death or long-term health risks.

This symbol indicates operations which, if not carried out correctly, may cause damage to the machine and/or injury to people.

1.1.3 Other symbols

DANGER: LIVE COMPONENTS

This symbol indicates operations which, if not carried out correctly, lead to electric shocks with lethal consequences.

DANGER: FLAMMABLE MATERIAL

This symbol indicates the presence of flammable materials.

DANGER: BURNING

This symbol indicates the risks of burns due to high temperatures.

DANGER: CRUSHING OF LIMBS

This symbol indicates the presence of moving parts: danger of crushing of limbs.

WARNING: MOVING PARTS

This symbol indicates that you must keep limbs away from moving mechanical parts; danger of crushing.

DANGER: EXPLOSION

This symbol signals places where an explosive atmosphere may be present. An explosive atmosphere is defined as a mixture - under atmospheric conditions - of air and flammable substances in the form of gases, vapours, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

PERSONAL PROTECTION EQUIPMENT

These symbols indicate the equipment that must be worn and kept by the operator for protection against threats against safety and/or health while at work.

OBLIGATION TO ASSEMBLE THE HOOD AND ALL THE SAFETY AND PROTECTION DEVICES

This symbol signals the obligation to reassemble the hood and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.

ENVIRONMENTAL PROTECTION

This symbol gives indications for the use of the machine with respect for the environment.

IMPORTANT INFORMATION

This symbol indicates important information that you must bear in mind.

➤ This symbol indicates a list.

Abbreviations used

Ch.	Chapter
Fig.	Figure
Page	Page
Sec.	Section
Tab.	Table

1.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

➤ the instruction manual is delivered to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.

➤ The instruction manual shows:
– the serial number of the burner;

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

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.....
.....

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

1.2 Guarantee and responsibility

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

WARNING

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

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

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

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

2 Safety and prevention

2.1 Introduction

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

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

It is a good idea to remember the following:

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

In particular:

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

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

➤ Modification of the burner to alter its performance and destinations is not allowed.

➤ The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.

➤ Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.

➤ Only those parts envisaged by the manufacturer can be replaced.

WARNING

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

2.2 Personnel training

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

The user:

➤ undertakes to entrust the machine exclusively to suitably trained and qualified personnel;

➤ undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;

➤ Personnel must observe all the danger and caution indications shown on the machine.

➤ Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.

➤ Personnel must inform their superiors of every problem or dangerous situation that may arise.

➤ The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

In addition:

➤ the user must take all the measures necessary to prevent unauthorised people gaining access to the machine;

➤ the user must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.

➤ Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.

3 Technical description of the burner

3.1 Technical data

Model			RL 70/E	RL 100/E	RL 130/E
Output (1)	High	MBtu/hr (2) GPH	1792 - 3136 12.8 - 22.4	2688 - 4480 19.2 - 32.0	3584 - 5824 25.6 - 41.6
	Low	MBtu/hr (2) GPH	756 - 1792 5.4 - 12.8	1260 - 2688 9.0 - 19.2	1568 - 3584 11.2 - 25.6
Fuel			# 2 fuel oil		
Operation			Low - high or modulating		
Nozzle		number	1 (return flow nozzle)		
Standard applications			Boilers: water, steam, thermal oil		
Ambient temperature		°F	32 - 104 (0 - 40 °C)		
Combustion air temperature		°F max	140 (60 °C)		
Pump	delivery (at 290 PSI) pressure range fuel temperature	GPH PSI ° F max	60.8 145 - 304.5 194 (90 °C)		
Noise levels (3)	Sound pressure Sound power	dB(A)	78.5 89.5	77 88	78.5 89.5

Tab. A

(1) Reference conditions: Ambient temperature 68 °F (20 °C) - Barometric pressure 394 “WC - Altitude 329 ft a.s.l.
(2) Equivalent Btu values based on 1 USGPH = 140,000 Btu/hr
(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the “Free Field” method, as per EN 15036, and according to an “Accuracy: Category 3” measuring accuracy, as set out in EN ISO 3746.

3.2 Burner models designations

Model	Code	Code RBNA	Voltage	Flame safeguard
RL 70/E	20102371	20102536	208-230/3/60 460/3/60	Burner mounted
RL 100/E	20068158	-	208-230/3/60 460/3/60	Burner mounted
	20117168		575/3/60	
RL 130/E	20057430	C9316400 C9316410	208-230/3/60 460/3/60	Burner mounted
	20117169		575/3/60	

Tab. B

3.3 Electrical data

Model				
RBNA Code		20102536		
Control circuit power supply	V/Ph/Hz	120/1/60		
Main power supply	V/Ph/Hz	3/60	460/3/60	575/3/60
Fan motor IE3 NEMA premium efficiency	rpm HP V A	3490 1.5 230 4	3490 1.5 460 2	3475 1.5 575 1.6
Ignition transformer	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA		
Electrical power consumption	W max	1300		
Electrical control circuit consumption	W	750		
Total electrical consumption	W	2050		
Electrical protection		NEMA 1		

Tab. C

Model		RL 100/E		
RBNA Code		tbd	tbd	tbd
Control circuit power supply	V/Ph/Hz	120/1/60		
Main power supply	V/Ph/Hz	3/60	460/3/60	575/3/60
Fan motor IE3 NEMA premium efficiency	rpm HP V A	3480 3 230 7.6	3480 3 460 3.8	3480 3 575 3
Ignition transformer	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA		
Electrical power consumption	W max	2550		
Electrical control circuit consumption	W	750		
Total electrical consumption	W	3300		
Electrical protection		NEMA 1		

Tab. D

Model		RL 130/E		
RBNA Code		C9316400	C9316410	tbd
Control circuit power supply	V/Ph/Hz	120/1/60		
Main power supply	V/Ph/Hz	3/60	460/3/60	575/3/60
Fan motor IE3 NEMA premium efficiency	rpm HP V A	3480 3 230 7.6	3480 3 460 3.8	3480 3 575 3
Ignition transformer	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA		
Electrical power consumption	W max	2550		
Electrical control circuit consumption	W	750		
Total electrical consumption	W	3300		
Electrical protection		NEMA 1		

Tab. E

3.4 Packaging - weight (Approximate measurements)

➤ The burners is supplied skid mounted. Outer dimensions of packaging are indicated in Fig. 1.
➤ The weight of the burner complete with packaging is indicated in Tab. F.

inch	A	B	C	lbs
RL 70/E	58 13/16“	33 19/64“	39 21/64“	182
RL 100/E	58 13/16“	33 19/64“	39 21/64“	190
RL 130/E	58 13/16“	33 19/64“	39 21/64“	198

Tab. F

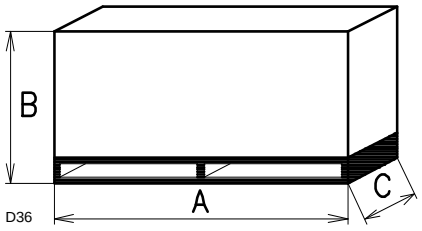


Fig. 1

3.5 Overall dimensions

The maximum dimensions of the burner are given in Fig. 2.

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

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

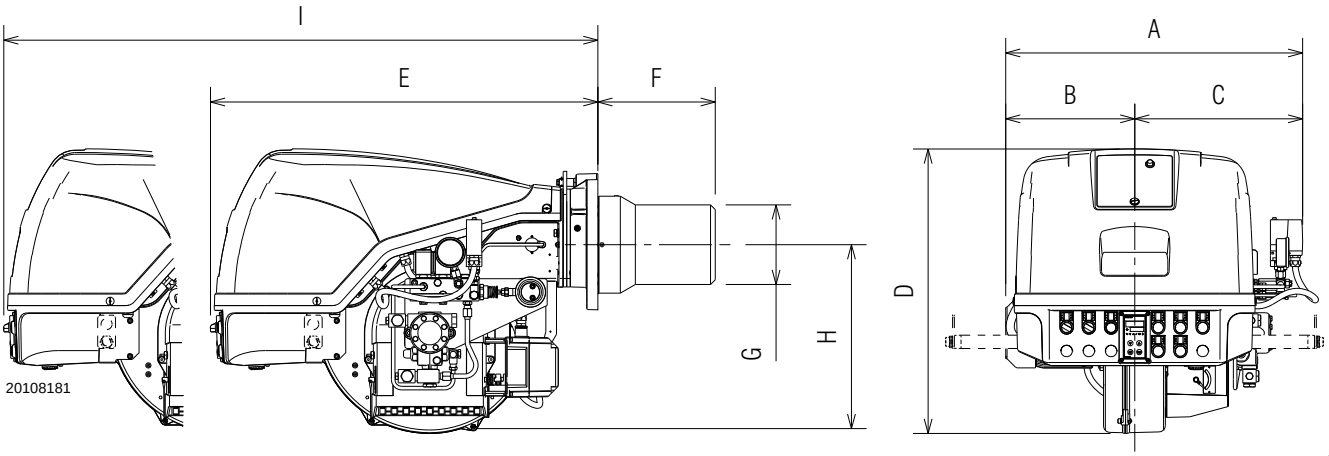


Fig. 2

inch	A	B	C	D	E	F (1)	G	H	I (1)
RL 70/E	26 15/64”	11 25/64”	14 27/32”	25 3/16”	34 1/4”	10 23/32” - 15 5/32”	7 1/16”	16 17/32”	46 35/64” - 51 13/16”
RL 100/E	27 43/64”	12 49/64”	14 57/64”	25 3/16”	34 1/4”	10 23/32” - 15 5/32”	7 1/16”	16 17/32”	46 35/64” - 51 13/16”
RL 130/E	27 43/64”	12 49/64”	14 57/64”	25 3/16”	34 1/4”	10 23/32” - 15 5/32”	7 1/16”	16 17/32”	46 35/64” - 51 13/16”

Tab. G

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

3.6 Standard equipment

The burner is supplied complete with:

Seals . . . . . No. 4
Adaptor G 1/8” / 1/8” NPT . . . . . No. 1
Instruction booklet and spare parts list. . . . . No. 1

3.7 Burner description

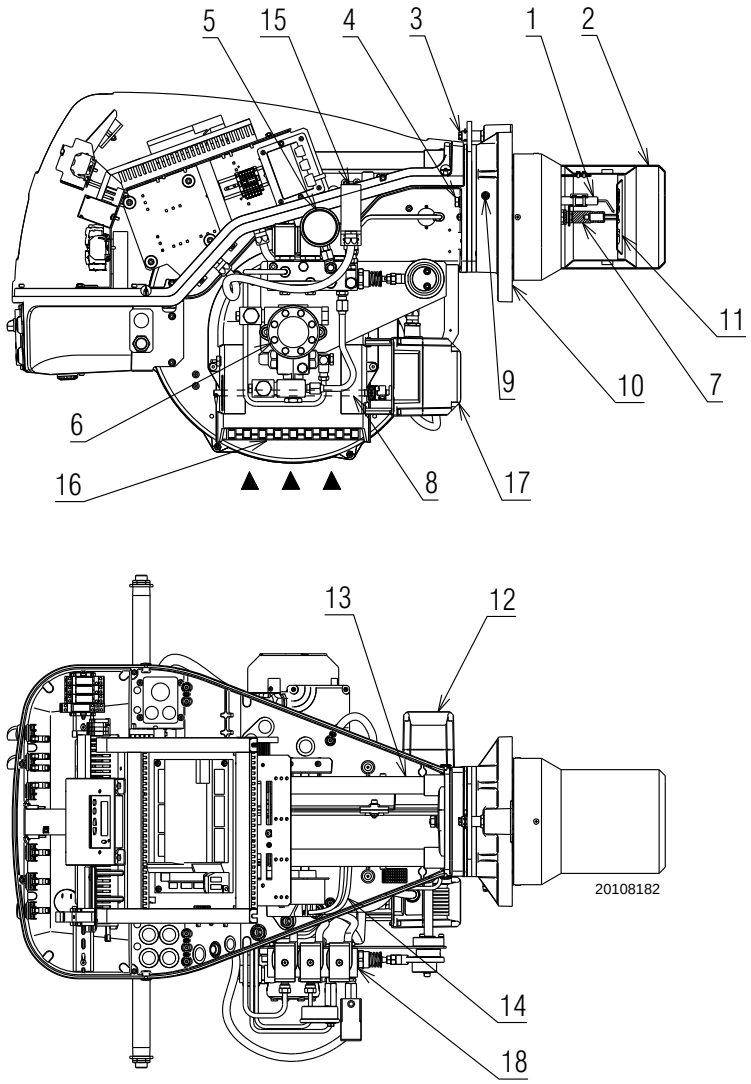


Fig. 3

1 Ignition electrodes
2 Combustion head
3 Screw for combustion head adjustment
4 Screw for fixing fan to flange
5 Pressure gauge for pressure on nozzle return
6 Pump
7 Nozzle holder
8 Air damper
9 Fan pressure test point
10 Boiler mounting flange
11 Flame stability disk
12 Servomotor, provides adjustment of fuel delivery regulator
13 Slide bars for opening the burner and inspecting the combustion head
14 HT lead
15 High oil pressure switch
16 Fan air inlet
17 Servomotor controlling the air damper
18 Valve assembly with pressure regulator on nozzle return

3.8 Panel board description

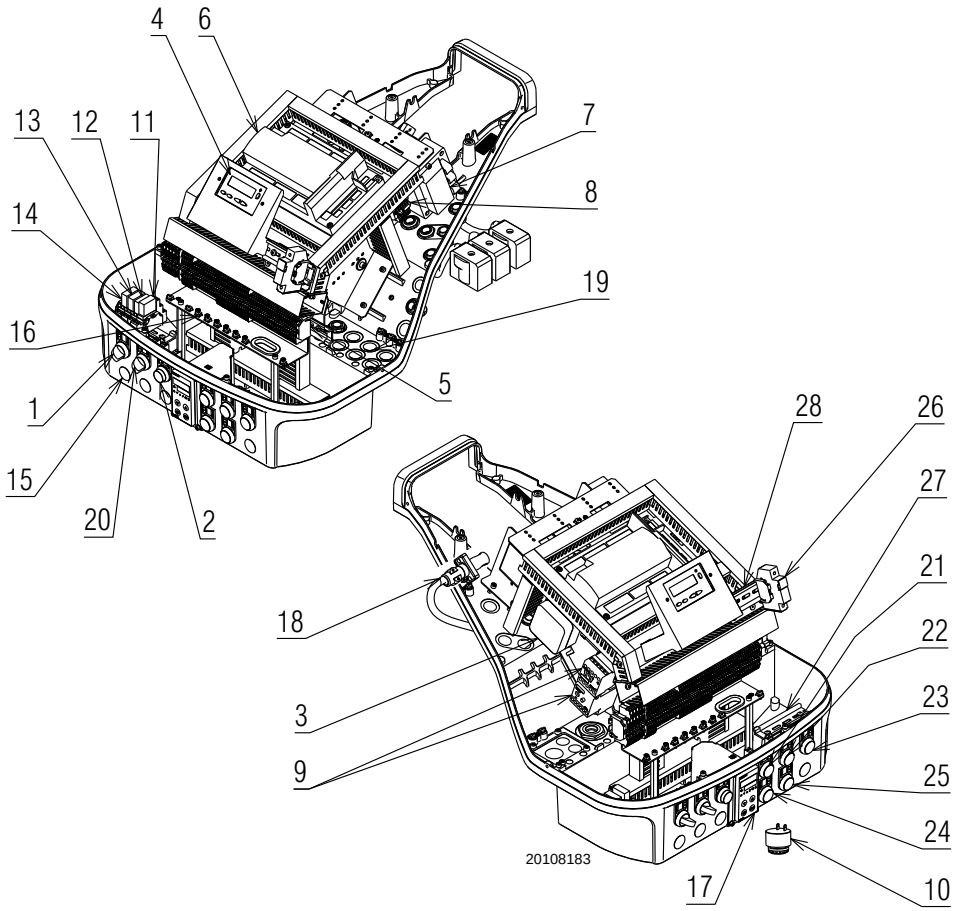


Fig. 4

1 “OFF - ON” switch
2 “ALARM SILENCE” button
3 Low air pressure switch (differential operation type)
4 Operator panel with LCD display
5 Burner terminal board “X1”
6 Control box for checking flame and air/fuel ratio
7 Ignition transformer “TA”
8 Terminal strip “X2” for oil valve
9 Fan motor contactor and thermal relay with reset button
10 Horn
11 “K2” relay
12 “K3” relay
13 “K5” relay
14 “K1” relay
15 Optional hole
16 Ground terminals
17 RWF55.5 modulator (with analog output 4-20 mA)
18 UV flame sensor
19 Holes for cables grommets for electrical wirings, accessories and power supply (to be carried out by the installer)
20 “LOCAL-REMOTE” switch
21 “POWER ON” signal
22 “CALL FOR HEAT” signal
23 “ALARM” signal
24 “IGNITION ON” signal
25 “FUEL ON” signal
26 Auxiliary fuse
27 DIN bar available for accessories
28 DIN bar for fuse holder step-down transformer and OCI 412.10 (available)

Two types of burner failure may occur:

➤ **Flame safeguard lock-out**:
if the flame safeguard alarm 23)(Fig. 4) lights up, it indicates that the burner is in lock-out. To reset, press the reset push-button.

➤ **Motor trip**:
release by pressing the push-button on thermal overload 9)(Fig. 4). See “Thermal relay calibration” on page 27.

3.9 Firing rates

During operation, burner output varies between:
– **minimum output** must be selected in area A;
– **maximum output** must be selected in area B and C.

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

In order to utilize also area C it is necessary to perform the calibration of the combustion head as explained on page 22.

NOTE:

The firing rate areas given in (Fig. 5) have been reduced by 10% with respect to the maximum range that can be reached.

WARNING

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

Consult the Procedure below to refer burner operating condition in high altitude plants.

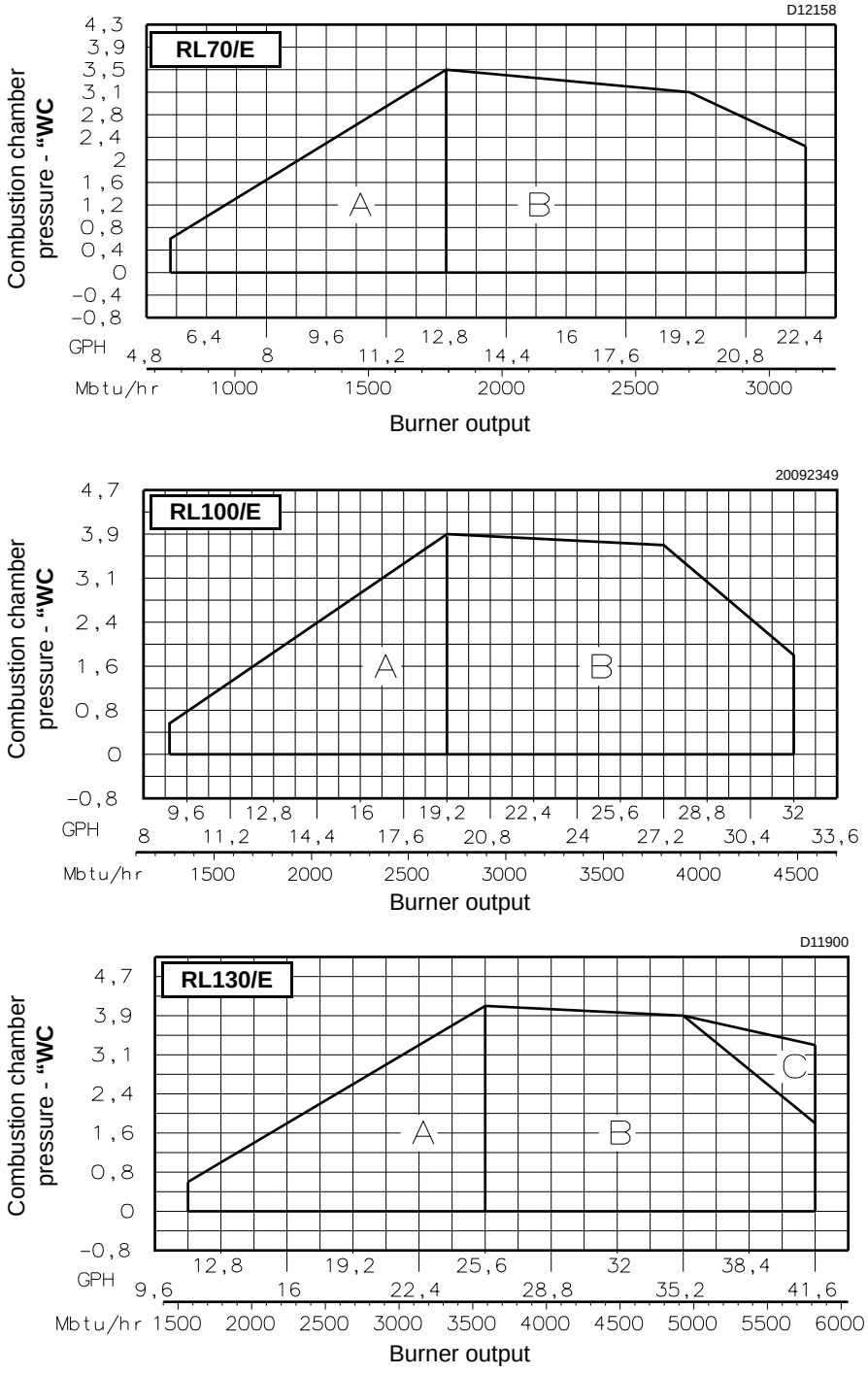


Fig. 5

3.9.1 Procedure to refer burner operating condition in high altitude plants

Find the **corrected burner capacity** for the plant's altitude in chart **1** and the **corrected pressure** in chart **2**.

Check in the firing rate graph of the burner (Fig. 5), if the working point defined by the values above is within the range limits.

If not, higher burner size is needed.

Note

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

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

Example

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

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

Δ = 108°F - 68°F (reference temp.) = 40°F (equivalent 2000 ft variation)

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

– the corrected capacity is 3847 MBtu/hr
– the corrected burner air pressure is 1.92

Reference conditions (Charts 1-2):

– Ambient temperature 68 °F (20 °C)
– Barometric pressure 394" WC (1000 mbar)
– Altitude 328 ft a.s.l. (100 m a.s.l.).

1 CORRECTED BURNER CAPACITY ACCORDING TO ALTITUDE

		Altitude										
Rated Capacity	m a.s.l.	0	100	305	610	915	1220	1525	1830	2135	2440
	ft a.s.l	0	328	1000	2000	3000	4000	5000	6000	7000	8000
500		494	500	512	530	551	571	593	616	641	669
1000		987	1000	1023	1061	1101	1142	1186	1232	1282	1337
1500		1481	1500	1535	1591	1652	1713	1778	1848	1924	2006
2000		1974	2000	2046	2121	2202	2284	2371	2464	2565	2675
2500		2468	2500	2558	2652	2753	2855	2964	3079	3206	3343
3000		2962	3000	3069	3182	3303	3425	3557	3695	3847	4012
3500		3455	3500	3581	3712	3854	3996	4149	4311	4488	4680
4000		3949	4000	4092	4243	4404	4567	4742	4927	5130	5349
4500		4442	4500	4604	4773	4955	5138	5335	5543	5771	6018
5000		4936	5000	5116	5303	5505	5709	5928	6159	6412	6686
5500		5429	5500	5627	5834	6056	6280	6520	6775	7053	7355
6000		5923	6000	6139	6364	6606	6851	7113	7391	7694	8024
6500		6417	6500	6650	6894	7157	7422	7706	8006	8335	8692
7000		6910	7000	7162	7425	7708	7993	8299	8622	8977	9361
7500		7404	7500	7673	7955	8258	8564	8892	9238	9618	10029
8000		7897	8000	8185	8485	8809	9135	9484	9854	10259	10698
8500		8391	8500	8697	9016	9359	9705	10077	10470	10900	11367
9000		8885	9000	9208	9546	9910	10276	10670	11086	11541	12035
9500		9378	9500	9720	10076	10460	10847	11263	11702	12183	12704
10000		9872	10000	10231	10607	11011	11418	11855	12318	12824	13373
Average barometric pressure (20°C)	mbar	1013	1000	977.4	942.8	908.2	875.8	843.5	811.85	779.8	747.8
Average barometric pressure (68°F)	"w.c.	399	394	385	371	358	345	332	320	307	294

2 CORRECTED BURNER AIR PRESSURE ACCORDING TO ALTITUDE

Rated Pressure	Altitude										
	m a.s.l.	0	100	305	610	915	1220	1525	1830	2135	2440
	ft a.s.l	0	328	1000	2000	3000	4000	5000	6000	7000	8000
0.50		0.49	0.50	0.51	0.53	0.55	0.57	0.59	0.62	0.64	0.67
1.00		0.99	1.00	1.02	1.06	1.10	1.14	1.19	1.23	1.28	1.34
1.50		1.48	1.50	1.53	1.59	1.65	1.71	1.78	1.85	1.92	2.01
2.00		1.97	2.00	2.05	2.12	2.20	2.28	2.37	2.46	2.56	2.67
2.50		2.47	2.50	2.56	2.65	2.75	2.85	2.96	3.08	3.21	3.34
3.00		2.96	3.00	3.07	3.18	3.30	3.43	3.56	3.70	3.85	4.01
3.50		3.46	3.50	3.58	3.71	3.85	4.00	4.15	4.31	4.49	4.68
4.00		3.95	4.00	4.09	4.24	4.40	4.57	4.74	4.93	5.13	5.35
4.50		4.44	4.50	4.60	4.77	4.95	5.14	5.33	5.54	5.77	6.02
5.00		4.94	5.00	5.12	5.30	5.51	5.71	5.93	6.16	6.41	6.69
5.50		5.43	5.50	5.63	5.83	6.06	6.28	6.52	6.77	7.05	7.35
6.00		5.92	6.00	6.14	6.36	6.61	6.85	7.11	7.39	7.69	8.02
6.50		6.42	6.50	6.65	6.89	7.16	7.42	7.71	8.01	8.34	8.69
7.00		6.91	7.00	7.16	7.42	7.71	7.99	8.30	8.62	8.98	9.36
7.50		7.40	7.50	7.67	7.96	8.26	8.56	8.89	9.24	9.62	10.03
8.00		7.90	8.00	8.18	8.49	8.81	9.13	9.48	9.85	10.26	10.70
8.50		8.39	8.50	8.70	9.02	9.36	9.71	10.08	10.47	10.90	11.37
9.00		8.88	9.00	9.21	9.55	9.91	10.28	10.67	11.09	11.54	12.04
9.50		9.38	9.50	9.72	10.08	10.46	10.85	11.26	11.70	12.18	12.70
10.00		9.87	10.00	10.23	10.61	11.01	11.42	11.86	12.32	12.82	13.37
Average barometric pressure (20°C)	mbar	1013	1000	977.4	942.8	908.2	875.8	843.5	811.85	779.8	747.8
Average barometric pressure (68°F)	"w.c.	399	394	385	371	358	345	332	320	307	294

3.10 Minimum furnace dimensions

The firing rates were set in relation to certified test boilers.
In the Fig. 6 indicates the diameter and length of the test combustion chamber.

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

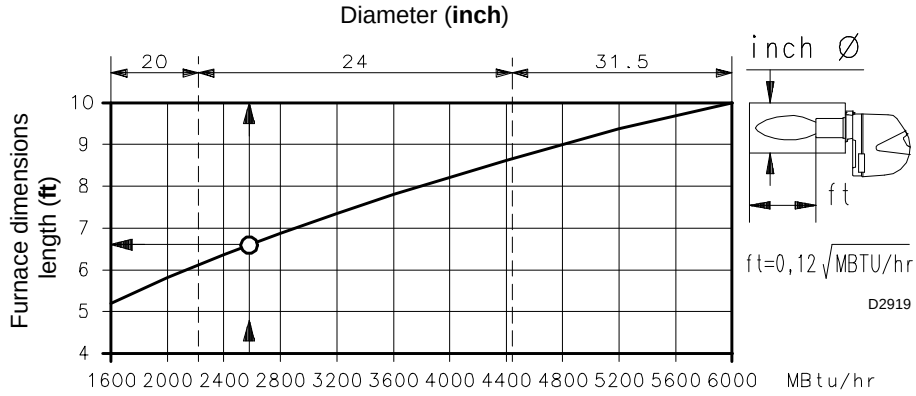


Fig. 6

3.11 Control box for the air/fuel ratio (LMV37.4...)

Warning notes

WARNING

To avoid injury to persons, damage to property or the environment, the following warning notes must be observed!
The LMV37.4... is a safety device!
Do not open, interfere with or modify the unit.
Riello S.p.A. will not assume responsibility for any damage resulting from unauthorized interference!

➤ All activities (mounting, installation and service work, etc.) must be performed by qualified staff.
➤ Before making any wiring changes in the connection area, completely isolate the plant from mains supply (all-polar disconnection). Ensure that the plant cannot be inadvertently switched on again and that it is indeed dead. If not observed, there is a risk of electric shock hazard.
➤ Ensure protection against electric shock hazard by providing adequate protection for the burner control's connection terminals.
➤ Each time work has been carried out (mounting, installation, service work, etc.), check to ensure that wiring and parameters is in an orderly state.
➤ Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage.

Introduction

The control box for the air/fuel ratio (Fig. 7), (hereafter referred to simply as the control box), that equips the burners, carries out a series of integrated functions in order to optimise burner functioning, both for single operation and together with other units (e.g. double furnace boiler or more than one generator at the same time).

The basic functions carried out by the control box relate to:
➤ flame control;
➤ the dosage of air and fuel via the positioning (with direct servocontrol) of the relative valves, excluding the possible play in the mechanical cam calibration systems;
➤ the modulation of burner output, on the basis of the load requested by the system, maintaining the pressure or temperature of the boiler at the working values set;
➤ the safety diagnostic of the air and fuel circuits, via which it is possible to easily identify any causes of malfunctioning.

Mechanical design

The following system components are integrated in the LMV37.4... basic unit:
- Electronic air / fuel ratio control
- Control frequency converter air fan
- Modbus interface

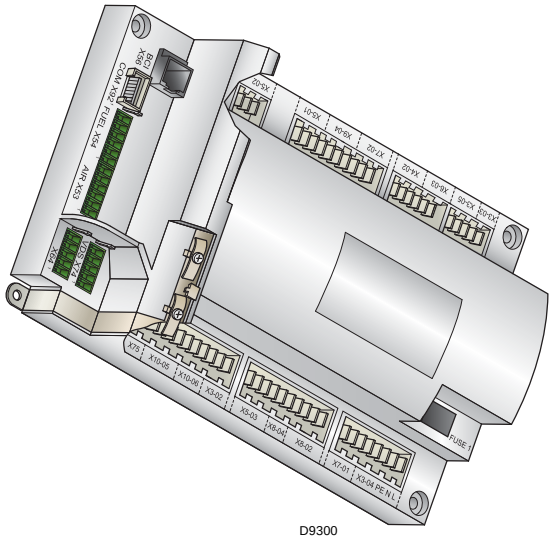


Fig. 7

Installation notes

- Always run high-voltage ignition cables separately while observing the greatest possible distance to the unit and to other cables.
- Do not mix up live and neutral conductors (fire hazard, dangerous failures, loss of protection against electric shock hazard, etc.).
- Do not lay the connecting cable from the LMV37.4... to the AZL2… together with other cables.

WARNING

The first start-up, like every further operation for the internal settings of the control box, requires access by means of a password and is only to be carried out by personnel of the Technical Assistance Service who have been specifically trained in the internal programming of the tool.

Electrical connection of the flame detectors

It is important to achieve practically disturbance- and loss-free signal transmission:

- Never run the detector cable together with other cables.
  – Line capacitance reduces the magnitude of the flame signal.
  – Use a separate cable.
- Observe the maximum permissible detector cable lengths.
- The ionization probe is not protected against electric shock hazard. It is mainspowered and must be protected against accidental contact.
- Locate the ignition electrode and the ionization probe such that the ignition spark cannot arc over to the ionization probe (risk of electrical overloads).

Technical data

LMV37.4... basic unit	Mains voltage	AC 120 V -15 % / +10 %
	Mains frequency	50 / 60 Hz ±6 %
	Power consumption	< 30 W (typically)
	Safety class	I, with parts according to II and III to DIN EN 60730-1
Terminal loading 'Inputs'	Unit fuse F1 (internally)	6.3 AT
	Perm. mains primary fuse (externally)	Max. 16 AT
	Undervoltage • Safety shutdown from operating position at mains voltage • Restart on rise in mains voltage	 Approx. AC 93 V Approx. AC 96 V
Terminal loading 'Outputs'	**Total contact loading:** • Nominal voltage • Unit input current (safety loop) from: - Fan motor contactor - Ignition transformer - Valves - Oil pump / magnetic clutch	 AC 120 V, 50 / 60 Hz Max. 5 A
	Individual contact loading: Fan motor contactor • Nominal voltage • Nominal current • Power factor	 AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 cosφ > 0.4
	Alarm output • Nominal voltage • Nominal current • Power factor	 AC 120 V, 50 / 60 Hz 1 A cosφ > 0.4
	Ignition transformer • Nominal voltage • Nominal current • Power factor	 AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 or 250 VA ignition load declaration to UL372 cosφ > 0.2
	Fuel valves • Nominal voltage • Nominal current • Power factor	 AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 cosφ > 0.4
	Operation display • Nominal voltage • Nominal current • Power factor	 AC 120 V, 50 / 60 Hz 0.5 A cosφ > 0.4
Cable lengths	Mains line Display, BCI External lockout reset button	Max. 100 m (100 pF/m) For used outside the burner cover or the control panel: Max. 3 m (100 pF/m) Max. 20 m (100 pF/m)
Environmental conditions	Operation Climatic conditions Mechanical conditions Temperature range Humidity	DIN EN 60721-3-3 Class 3K3 Class 3M3 -20...+60 °C < 95 % r.h.

Tab. H

Operation sequence of the burner

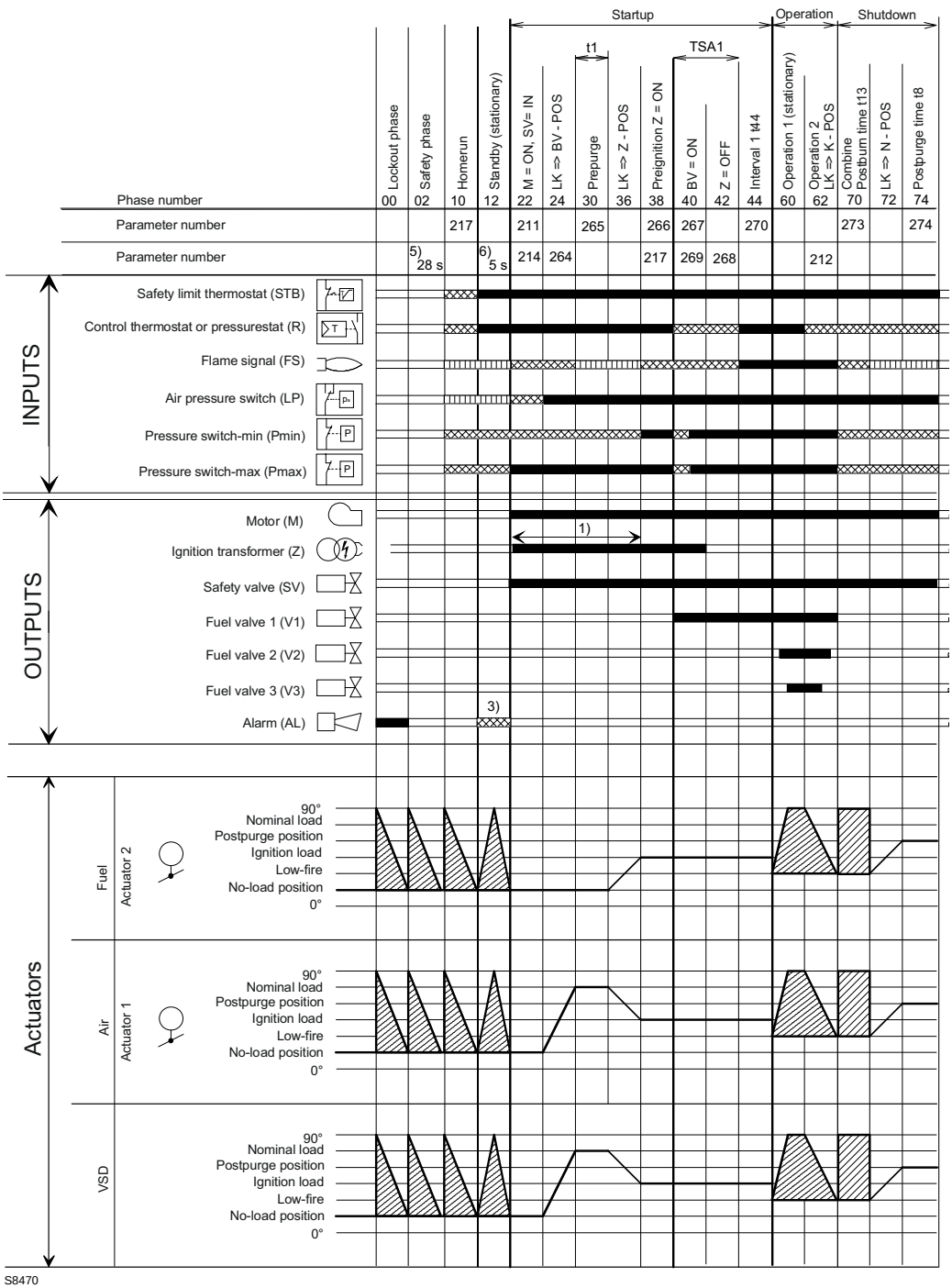


Fig. 8

Legend to the sequence diagrams:

Valve proving takes place depending on the parameter:

1) Parameter: short / long preignition time
short / long oil pump switch - switch-on time - time

3) Parameter: with/without alarm in the event of start prevention

5) 28 s = maximum time safety phase, followed by lockout

6) 5 s = time between occurrence of start prevention and signaling

0° Position as supplied (0°)

90° Actuator fully open (90°)

Assignment of times:

t1 Prepurge time

TSA1 Safety time 1

Signal ON

Signal OFF

Any signal is allowed

In standby: after referencing, the actuator is driven to the no-load position

3.12 Actuators (SQM33.5...)

Warning notes

WARNING

To avoid injury to persons, damage to property or the environment, the following warning notes should be observed!

Do not open, interfere with or modify the actuators!

- ➤ All activities (mounting, installation and service work, etc.) must be performed by qualified staff.
- ➤ Before making any wiring changes in the connection area of the units, completely isolate the equipment from mains supply (all-polar disconnection). If not observed, there is a risk of electric shock hazard.
- ➤ Ensure protection against electric shock hazard by providing adequate protection for the connection terminals and by securing the housing cover.
- ➤ After any kind of activity (mounting, installation and service work, etc.), check wiring.
  Also ensure that the parameters are correctly set.
- ➤ Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage.

WARNING

The actuator's housing must not be opened. The actuator contains an optical feedback system.

Use

The actuators (Fig. 9) are used to drive and position the air damper and oil modulator, without mechanical leverages but via the interposition of an elastic coupling.

They are commanded by the control box, which constantly checks their position by means of a return signal from the optic sensor inside the actuator.

The position (in degrees) of the actuators can be seen on the display of the Operator Panel.
Index "0" for fuel actuator, index "1" for air actuator.

Installation notes

- Always run the high-voltage ignition cables separate from the unit and other cables while observing the greatest possible distance.
- The holding torque is reduced when the actuator is disconnected from power.

WARNING

When servicing or replacing the actuators, take care not to invert the connectors.

Fig. 9

Technical data

Operating voltage	AC / DC 24 V ±20 % (load on interface)
Safety class	2 to EN 60 730 part 1 and parts 2…14
Power consumption	max. 10 W
Degree of protection	IP54 to EN 60 529-1
Opening time 0 - 90°	min: 5s, max.: 120s (depending on the type of control box)
Firing rate	0 - 90°
Cable connection	RAST2,5 connectors
Direction of rotation	Clockwise/anticlockwise (can be selected from the control box)
Nominal output torque	3 Nm
Holding torque (when live)	3 Nm
Holding torque (when dead)	2.6 Nm
Weight	approx. 1 kg
Environmental conditions:	
Operation Climatic conditions Mechanical conditions Temperature range Humidity	DIN EN 60 721-3-3 class 3K5 class 3M4 -20...+60 ×C < 95 % r.h.

Tab. I

4 Installation

4.1 Notes on safety for the installation

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

DANGER

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

WARNING

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

4.2 Handling

The packaging of the burner includes a wooden platform, so it is possible to move the burner (still packaged) with a transpallet truck or fork lift truck.

WARNING

The handling operations for the burner can be highly dangerous if not carried out with the greatest attention: keep any unauthorised people at a distance; check the integrity and suitableness of the available means of handling.
Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall).
When handling, keep the load at not more than 20-25 cm from the ground.

After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material.

CAUTION

Before proceeding with the installation operations, carefully clean all around the area where the burner will be installed.

4.3 Preliminary checks

Checking the consignment

CAUTION

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

The packaging elements (wooden cage or cardboard box, nails, clips, plastic bags, etc.) must not be abandoned as they are potential sources of danger and pollution; they should be collected and disposed of in the appropriate places.

WARNING

The output of the burner must be within the boiler's firing rate;

WARNING

A burner label that has been tampered with, removed or is missing, along with anything else that prevents the definite identification of the burner makes any installation or maintenance work difficult.

4.4 Operation position

The burner is designed to operate only in the positions **1**, **2, 3** and **4** (Fig. 10).

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** permit operation but make maintenance and inspection of the combustion head more difficult.

Any other position could compromise the correct operation of the appliance.

Installation **5** is prohibited for safety reasons.

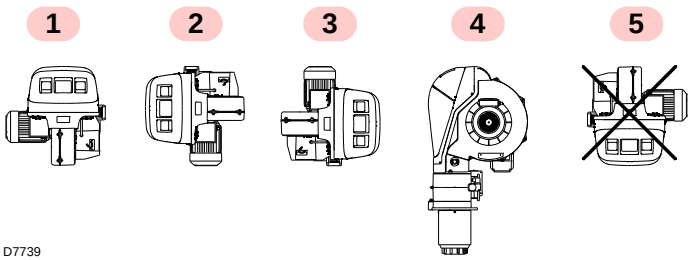


Fig. 10

4.5 Securing the burner to the boiler

4.5.1 Boring the boiler plate

Drill the combustion chamber mounting plate as shown in Fig. 11.

The position of the threaded holes can be marked using the head gasket supplied with the burner.

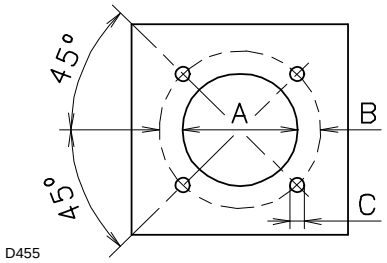


Fig. 11

inch	A	B	C
RL 70/E	8 19/32“	12 13/16” - 14 15/32”	½ W
RL 100/E	8 19/32“	12 13/16” - 14 15/32”	½ W
RL 130/E	8 19/32“	12 13/16” - 14 15/32”	½ W

Tab. J

4.5.2 Length of the blast tube

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 refractory.

The available lengths L are those indicated in the Tab. K.

Model	Short blast tube	Long blast tube (with kit)
RL 70/E	10 23/32“	15 5/32“
RL 100/E	10 23/32“	15 5/32“
RL 130/E	10 23/32“	15 5/32“

Tab. K

For boilers with front flue passes 12)(Fig. 12) or flame inversion chambers, protective insulation material 10) must be inserted between the boiler refractory 11) and the blast tube 9).

This protective insulation must not compromise the extraction of the blast tube (Fig. 12).

For boilers having a water-cooled front the insulation 10)-11)(Fig. 12) is not required unless it is required by the boiler manufacturer.

4.6 Securing the burner to the boiler

Disassemble the blast tube 9)(Fig. 12) from the burner 6) by proceeding as follows:

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

WARNING

The burner-boiler seal must be airtight.

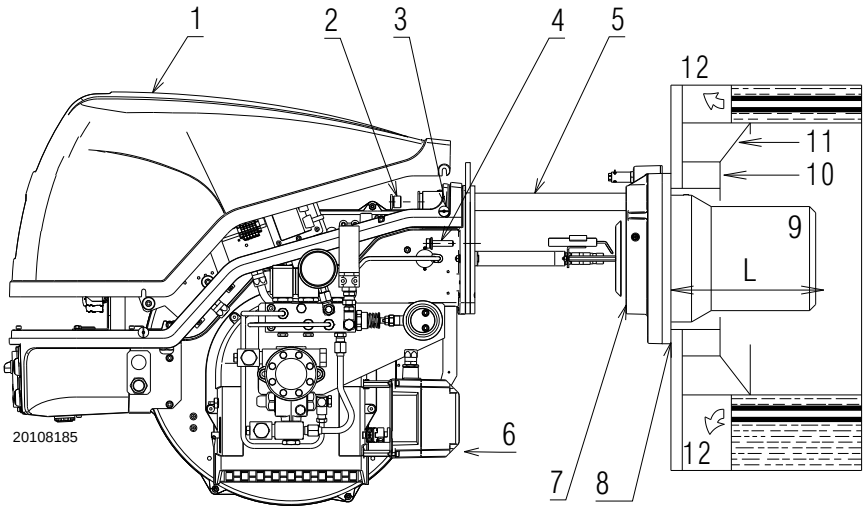


Fig. 12

4.6.1 Combustion head pre-setting (RL 130/E)

At this point check, whether the maximum delivery of the burner is contained in area B or in area C of the firing rate. See Fig. 5.

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)(Fig. 13) and disassemble the blast tube 5);
➤ unscrew the screws 3) and remove the shutter 4);
➤ tighten the screws 3) on the rod 2);
➤ now refit the blast tube 5) and the screws 1).

Once this operation has been carried out (if required):

➤ secure flange 7)(Fig. 12) to the boiler plate inserting the supplied gasket 8)(Fig. 12).

➤ Use the 4 screws provided after having protected the thread with an anti-seize product.

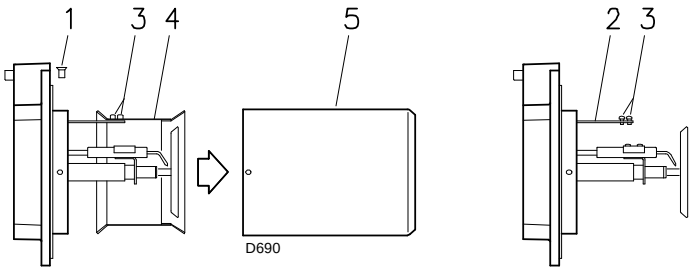


Fig. 13

4.7 Nozzle

The burner complies with the emission requirements of the UL 296 Standard.

In order to guarantee that emissions do not vary, recommended and/or alternative nozzles specified by the manufacturer in the Instruction and warning booklet should be used.

WARNING

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

CAUTION

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

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

4.7.1 Recommended nozzles

Type A4 return flow nozzles - 45° angle.

4.7.2 Nozzle assembly

At this stage of installation the burner is still disassembled from the blast tube; it is therefore possible to fit the nozzle with the box wrench 1)(Fig. 14), inserting the wrench through the central hole in the flame stability disk.

WARNING

Do not use any sealing products such as gaskets, sealing compound, or tape.

Be careful to avoid damaging the nozzle sealing seat.

➤ Finally remount the burner 3)(Fig. 15) on the slide bars 2) and slide it up to the flange 5), keeping it slightly raised to prevent the flame stability disk from pressing against the blast tube.
➤ Tighten the screws 1) on the slide bars 2) and screws 4) fixing the burner to the flange.

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

➤ pull back the burner on its slide bars as shown in Fig. 12, page 19.
➤ Remove the nuts 1)(Fig. 16) and the disk 2).
➤ Use wrench 3)(Fig. 16) to change the nozzles.

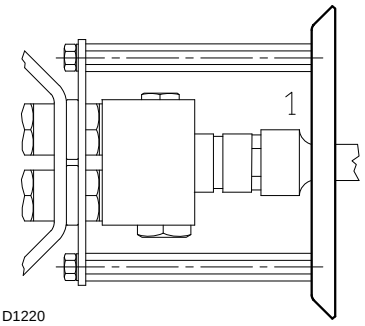


Fig. 14

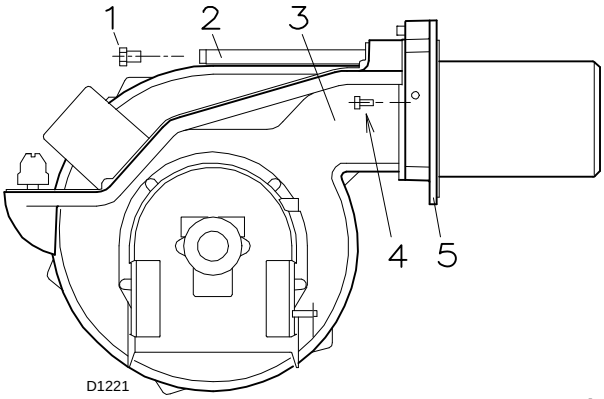


Fig. 15

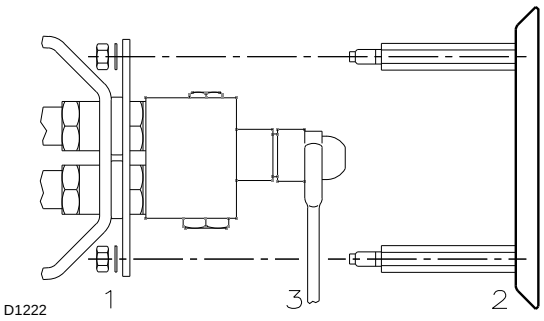


Fig. 16

4.7.3 Choice of nozzle

In case an intermediate delivery between the two values indicated in the diagrams (Fig. 17) is required, a nozzle with higher delivery must be chosen.

Delivery reduction will be obtained by means of the pressure regulator.

4.7.4 Adjusting the nozzle flow rate

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

Diagram (Fig. 17) indicates this relationship for type A4 return flow nozzles with pump delivery pressure of 290 PSI.

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

NOTE:

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

The pressure difference between pump delivery and nozzle return must be at least 43.5 PSI.

With smaller pressure differences, the pressure on the nozzle return can be unstable.

4.7.5 Pressure controller

The nozzle return pressure value is indicated by the pressure gauge 1)(Fig. 18).

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

- ➤ The fine adjustment of the pressure in the return line may be carried out by changing the setting of the eccentric 6)(Fig. 18), of the nut and lock-nut 4)(Fig. 18).
- ➤ The eccentric setting should be carried out by loosening screws 7), and turning the screw 5) to obtain the desired eccentricity.
- ➤ Turn clockwise, screw 5) to increase the eccentricity, increasing the difference between the min. and max. capacity of the nozzle.
- ➤ Turn counter-clockwise, screw 5) to decrease the eccentricity and, consequently the difference between the min. and max. capacity of the nozzle.

WARNING

The proper setting of the eccentric 6) is possible when its operation field follows the servomotor operation field (20°-130°): so, that every variation of the servomotor position corresponds to a pressure variation.

CAUTION

Do not let the piston bottom out repeatedly: the stop ring 3)(Fig. 18) determines the max. stroke.

When the setting is carried out, verify manually that no slow-down occurs between 0° and 130° and that the maximum and minimum pressures correspond to those chosen as per diagrams (Fig. 17).

If you wish to check the delivery capacity of the nozzle, open the burner, attach the nozzle, simulate the start-up and then proceed with observing of the maximum and minimum pressures of the fuel.

If at the maximum capacity of the nozzle (maximum pressure in the return line) pressure fluctuations are detected on the gauge 1), slightly decrease the pressure in the return line until they are completely eliminated.

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

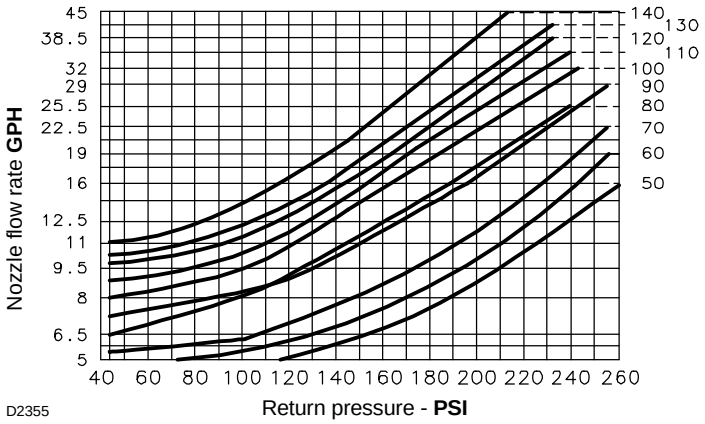


Fig. 17

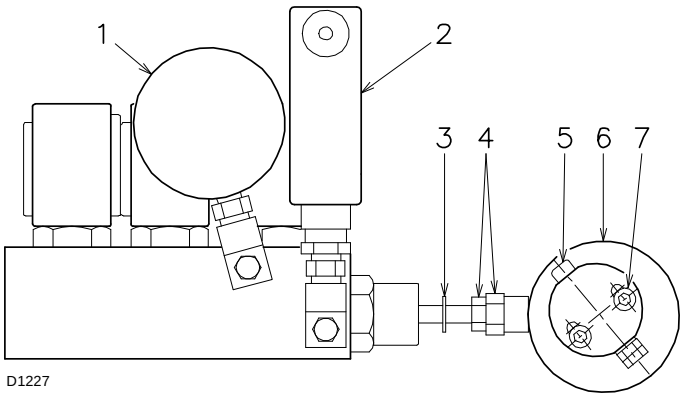


Fig. 18

Key (Fig. 18)

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

4.8 Electrode adjustment

WARNING

Make sure that the electrodes are positioned as shown in Fig. 19.

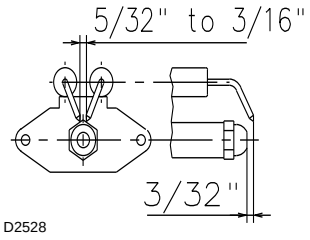


Fig. 19

4.9 Combustion head setting

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

Turn screw 4)(Fig. 20) until the notch shown in diagram (Fig. 21) is level with the front surface of flange 5)(Fig. 20).

Example: maximum light oil delivery = 32 GPH

Diagram (Fig. 21) indicates that for a delivery of 32 GPH requires the combustion head to be set to approx. 6 notches, as shown in Fig. 20.

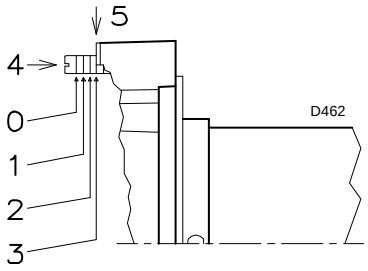


Fig. 20

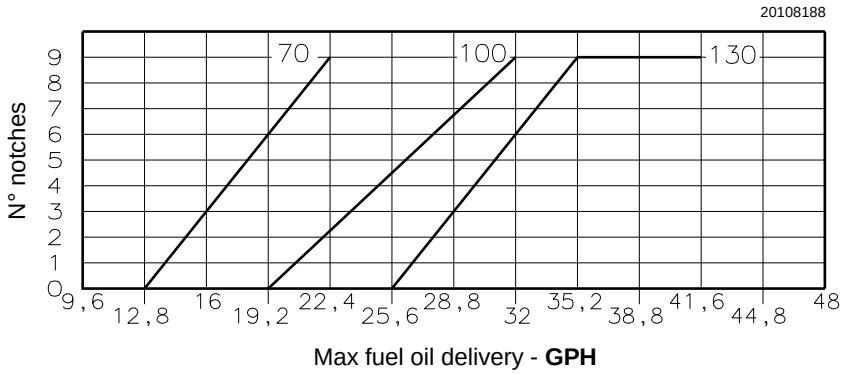


Fig. 21

4.10 Hydraulic system

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

Precautions: avoid knocking, attrition, sparks and heat.

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

WARNING

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

4.10.1 Fuel supply

Double-pipe circuit (Fig. 22)

The burner is equipped with a self-priming pump which is capable of feeding itself within the limits listed in the Tab. L.

The tank higher than the burner A

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

The tank lower than the burner B

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

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

The loop circuit

A loop circuit consists of a loop of piping exiting and returning to the tank with an auxiliary pump that circulates the fuel under pressure.

A branch connection from the loop goes to feed the burner.

This circuit is extremely useful whenever the burner pump does not succeed in self-priming because the tank distance and/or height difference are higher than the values listed in the Tab. L.

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

Tab. L

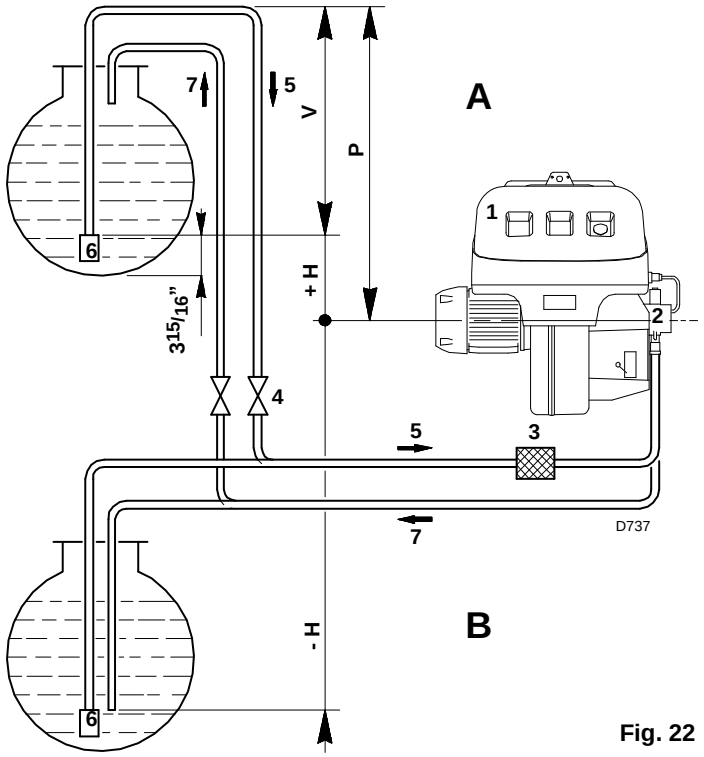


Fig. 22

Key

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

4.10.2 Hydraulic connections

The pumps are equipped with a by-pass that connects the return line and suction line. The pumps are installed on the burner with the by-pass closed by screw 6)(Fig. 24).

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

WARNING

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

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

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

CAUTION

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

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

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

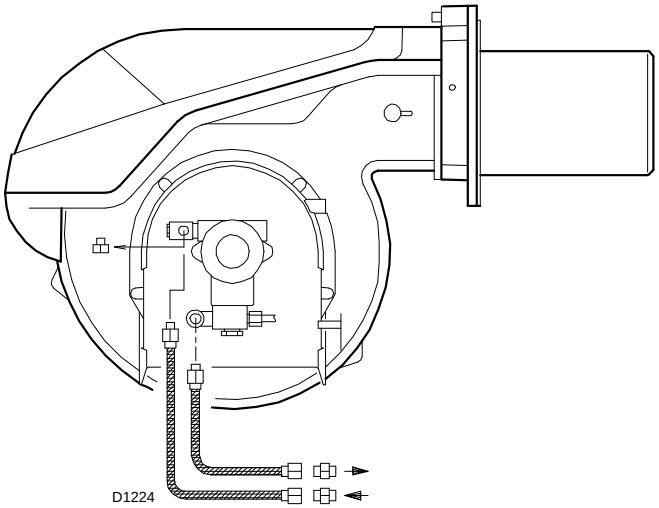


Fig. 23

4.10.3 Hydraulic system layout

Key (Fig. 24)

1 Pump suction
2 Solenoid valve
3 Pump
4 Pressure regulator
5 Return pipe
6 By-pas screw
7 Pump return
8 Solenoid valve
9 Solenoid valve
10 Piping
11 Filter
12 Piping
13 Pressure regulator
14 Servomotor
M Pressure gauge
P Oil pressure switch
SM Servomotor
V Vacuum gauge

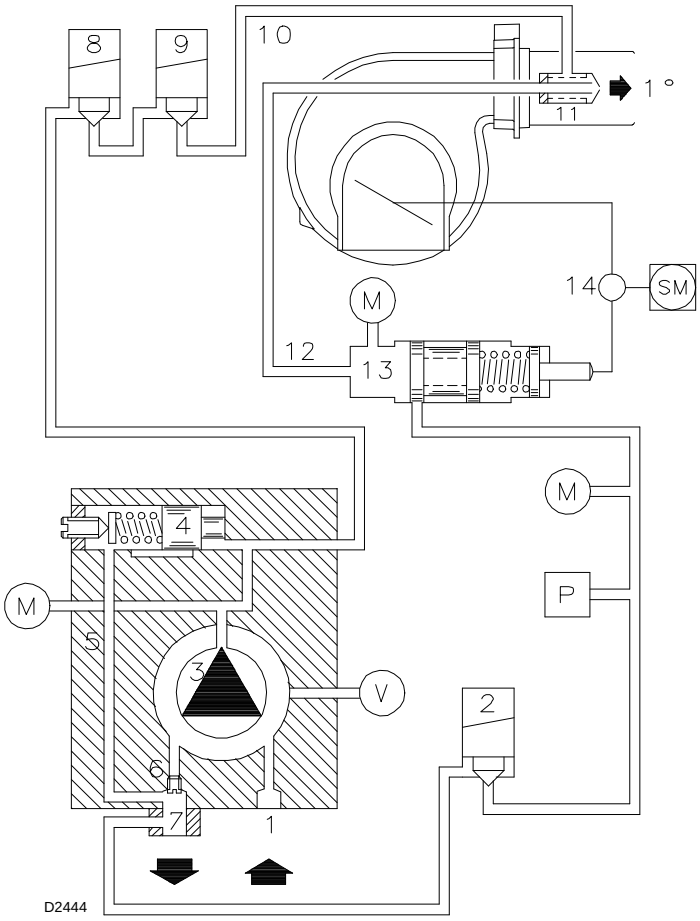


Fig. 24

4.10.4 Pump

Pump model	SUNTEC J7 C	
Min. delivery rate at 290 PSI pressure	GPH	60.8
Delivery pressure range	PSI	145 - 304.5
Max. suction pressure	“Hg	13
Viscosity range	cSt	2.8 - 200
Max light oil temperature	°F	194 (90 °C)
Max. suction and return pressure	PSI	21.8
Pressure calibration in the factory	PSI	290
Filter mesh width	inch	0.006

Tab. M

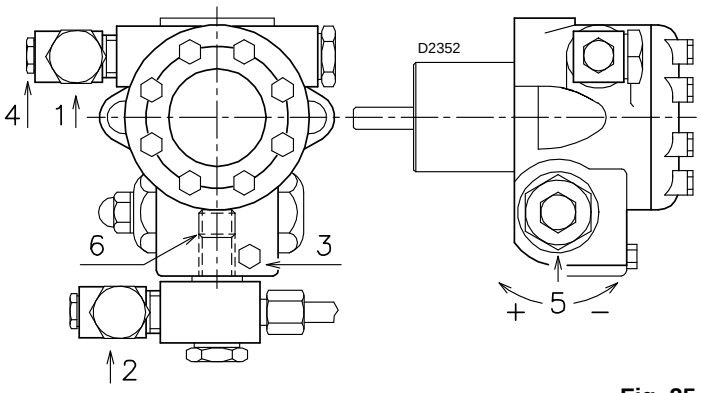


Fig. 25

Key (Fig. 25)

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

Pump priming

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

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

The time required for this operation depends upon the diameter and length of the suction tubing.

If the pump fails to prime at the first starting of the burner and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the starting operation as often as required.

After 5 or 6 starting operations allow 2 or 3 minutes for the transformer to cool.

The priming operation is possible because the pump is already full of fuel when it leaves the factory. If the pump has been drained, fill it with fuel through the opening on the vacuum meter prior to starting; otherwise, the pump will seize.

Whenever the length of the suction piping exceeds 66 - 98 ft, the supply line must be filled using a separate pump.

4.11 Oil pressure switch

The oil pressure switch 15)(Fig. 3, page 9) is factory set to 43.5 PSI (3 bar). If the oil pressure goes above this value in the return piping, the pressure switch stops the burner.

Burner starts again automatically if the pressure goes down under 43.5 PSI (3 bar) after burner shut down.

If a loop circuit with Px pressure feeds the burner, the pressure switch should be adjusted to Px + 43.5 PSI.

4.12 Electrical wiring

Notes on safety for the electrical wiring

- ➤ The electrical wiring must be carried out with the electrical supply disconnected.
- ➤ Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the electrical layouts.
- ➤ The manufacturer declines all responsibility for modifications or connections different from those shown in the electrical layouts.
- ➤ Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- ➤ Do not invert the neutral with the phase in the electrical supply line.
  Any inversion would cause a lockout due to firing failure.
- ➤ The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards.
  It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel.
  Do not use the gas tubes as an earthing system for electrical devices.
- ➤ The electrical system must be suitable for the maximum input power of the device,as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- ➤ For the main power supply of the device from the electricity mains:
  - do not use adapters, multiple sockets or extensions;
  - use an omnipolar switch with an opening of at least $^1/_8$ inch (overvoltage category) between the contacts, as indicated by the current safety standards.
- ➤ Do not touch the device with wet or damp body parts and/or in bare feet.
- ➤ Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:

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

close the fuel interception tap;

avoid condensate, ice and water leaks from forming.

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

4.12.1 Supply cables and external connections passage

All the cables to be connected to the burner are fed through the grommets. The use of the cable grommets can take various forms.

By way of example we indicate the following mode (according to **UL795**):

1 Three phase power supply with $^3/_4$ inch cable grommet
2 Available: single phase power supply and other devices with $^1/_2$ inch cable grommet
3 Available: consents/safety and other devices with $^3/_8$ inch cable grommet
4 Available: hole for M16
5 Available for ground terminals

A Fan motor
B UV sensor
C Air servomotor
D Oil servomotor
E Oil valve
F Oil pressure switch
G Air pressure switch

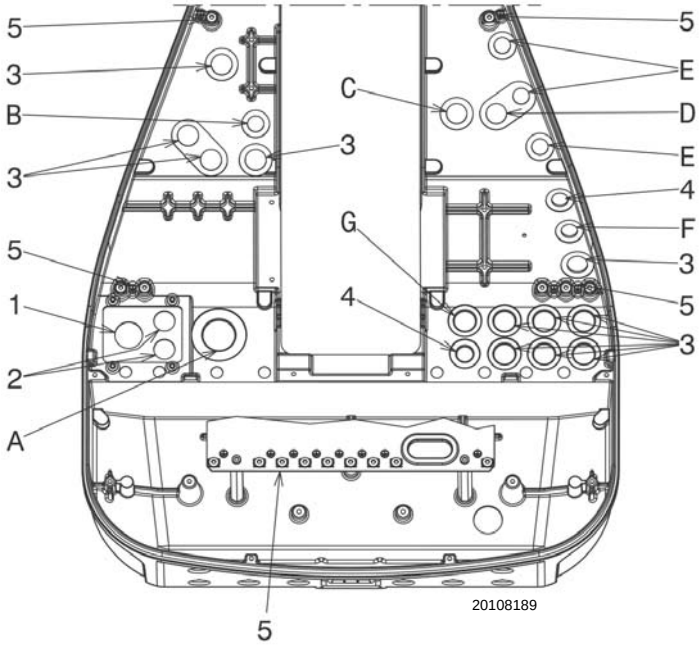


Fig. 26

The control panel is in compliance with UL508A.

4.13 Thermal relay calibration

Depending on the burner type, there are two different thermal relays:
– Electro-mechanical thermal relay (used for single phase motors)
– Electronic thermal relay (used for three phase motors)

4.13.1 Electro-mechanical thermal relay

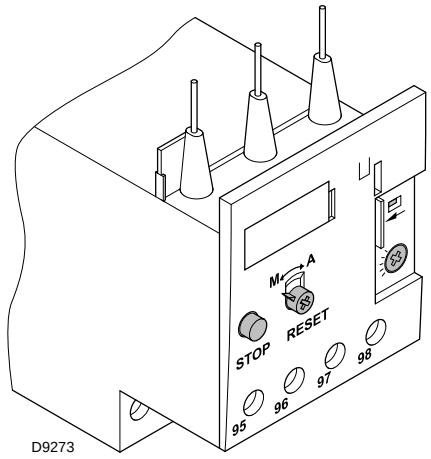
The electro-mechanical thermal relay (Fig. 27) is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase.

For the calibration, refer to the table given in electrical layout. If the minimum value of the scale of the thermal relay is greater than the rating absorption of the motor, protection is still ensured.

This arises when the power supply of the motor is a nominal value.

➤ To reset, in the case of an intervention of the thermal relay, press the button "**RESET**" (Fig. 27).

➤ The button "**STOP**" (Fig. 27) opens the NC (95-96) contact and stops the motor.



D9273

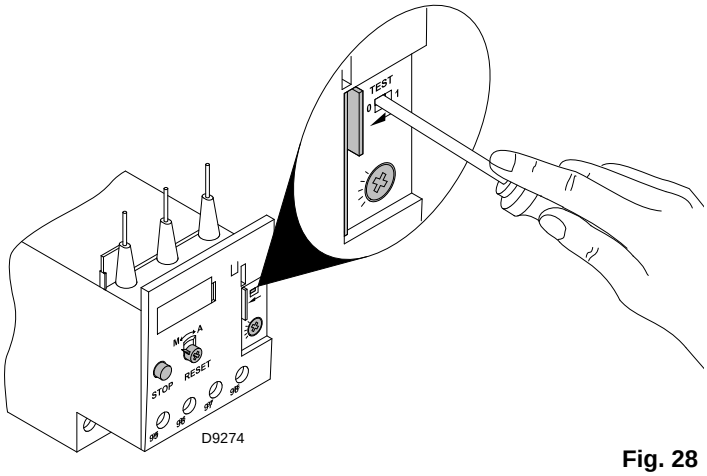
Fig. 27

➤ To test the thermal relay, insert a screwdriver in the window "**TEST**" (Fig. 31) and move it in the sense of the arrow (towards right).

WARNING

Automatic resetting can be dangerous.

This action is not provided for the burner operation.

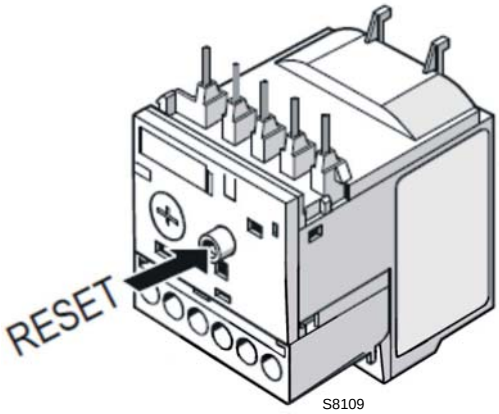


D9274

Fig. 28

4.13.2 Electronic thermal relay

➤ To reset, in the case of an intervention of the thermal relay, press the button "**RESET**" (Fig. 29).



S8109

Fig. 29

There are two different solution to test the electronic thermal relay:

➤ **Device test (Fig. 30)**
Push slowly the button in the window with a little screwdriver.

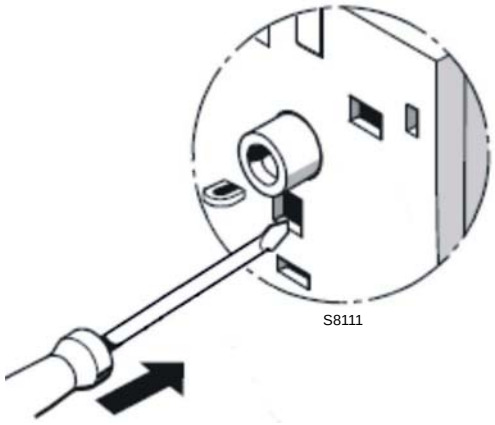

S8111

Fig. 30

➤ **Contact test NC (95-96) and NO (97-98)(Fig. 31)**
Insert in the window a little screwdriver and move it in the sense of the arrow.

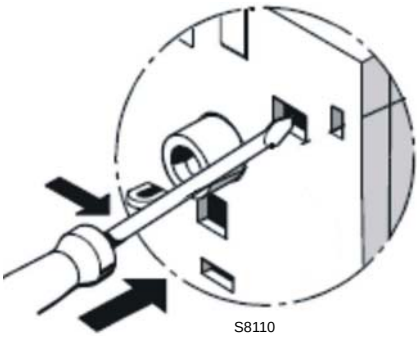

S8110

Fig. 31

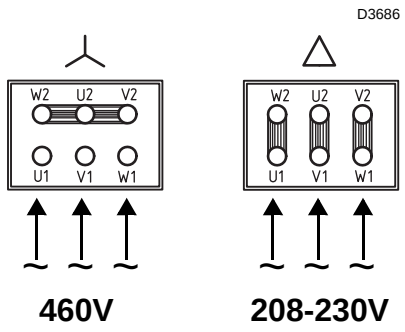
4.14 Motor connection at 208-230 or 460V

WARNING

the motors, manufactured for 208-230/460 **IE3 NEMA Premium Efficiency** voltage, have the same connection than **IE2/Epact** motors, but different connection than **IE1** motors no more star/delta but star/double star.

Please, pay attention to the indications in case of modification of voltage, maintenance, or substitution.

IE1



IE2/Epact - IE3 NEMA Premium Efficiency

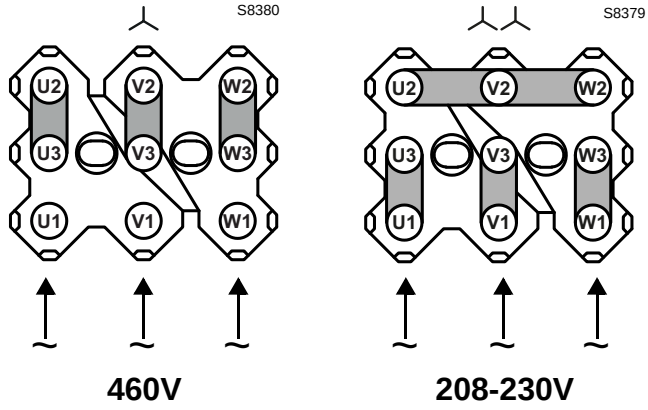


Fig. 32

4.15 Motor connection at 575V

WARNING

the motors, manufactured for 575V **IE3 NEMA Premium Efficiency** voltage, have the same control box base of the **IE1** and **IE2/Epact** motors.

Please pay attention to the indications in case of maintenance or substitution.

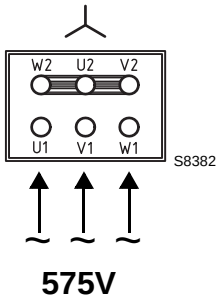


Fig. 33

4.16 Reversible direction

WARNING

If it is necessary to reverse the direction then reverse the two main supply phases.

For example: L1 with L2, there is not difference between **IE1**, **IE2/Epact** and **IE3 NEMA Premium Efficiency.**

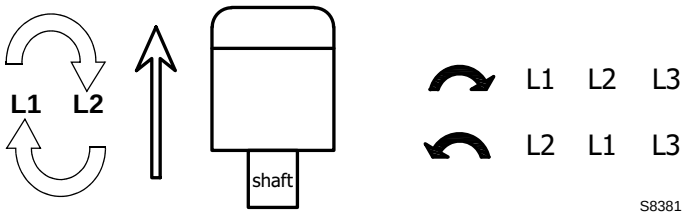


Fig. 34

5 Start-up, calibration and operation of the burner

5.1 Notes on safety for the first start-up

WARNING

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

WARNING

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

5.2 Burner calibration

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

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

5.2.1 Combustion head setting

Refer to page 22.

5.2.2 Oil pressure switch

Refer to page 25.

5.2.3 Nozzle adjustment

Refer to page 20.

5.2.4 Electrode position

Refer to Fig. 19.

5.2.5 Pump adjustment

No settings are required for the pump, which is set to 290 PSI by the manufacturer.
This pressure must be checked and adjusted (if required) after the burner has been ignited. The only operation required in this phase is the application of a pressure gauge on the appropriate pump attachment.

5.3 Burner start-up

Feed electricity to the burner via the disconnecting switch on the boiler panel.

Close the thermostats/pressure switches, set the parameters on the RWF55.5 regulator. Please refer to the specific manual for this operation.

Turn the switch to position “**ON**” (Fig. 35) and turn the switch to position “**LOCAL**” for “local operation”, or “**REMOTE**” for “remote operation”.

DANGER

Make sure that the lamps or testers connected to the solenoids, or indicator lights on the solenoids themselves, show that no voltage is present.

If voltage is present, stop the burner **immediately** and check the electrical wiring.

WARNING

When the burner starts, check the direction of the motor rotation, as indicated in Fig. 35.

As the burner is not fitted with a device to check the sequence of the phases, the motor rotation may be incorrect. As soon as the burner starts up, go in front of the cooling fan of the fan motor and check it is rotating anticlockwise (Fig. 35).

If this is not the case:

- ➤ place the switch of Fig. 35 in position “**OFF**” and wait for the control box to carry out the switch off phase;
- ➤ disconnect the electrical supply from the burner;
- ➤ invert the phases on the three-phase power supply

WARNING

For the start-up procedure and the parameters calibration, refer to the specific instruction manual of the LMV37... electronic cam supplied with the burner.

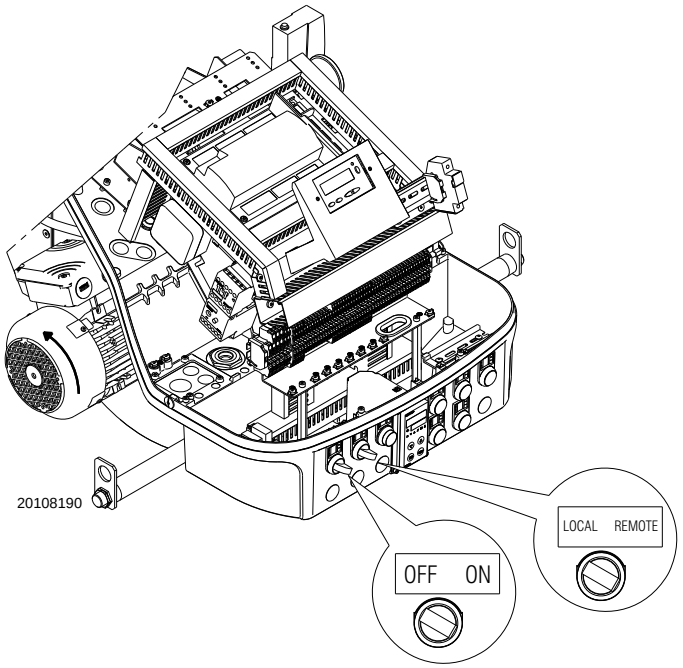


Fig. 35

5.4 Final calibration of the pressure switch

5.4.1 Air pressure switch

The air pressure switch is connected in differential (Fig. 37) and is activated by both the negative pressure of the air intake and the air pressure from the fan.

Adjust the air pressure switch (Fig. 36) after having performed all other burner adjustments with the air pressure switch set to the min. of the scale.

With the burner operating at low fire, adjust the pressure switch by slowly turning the relative knob clockwise until the burner locks out.

Then turn the knob counter-clockwise about 20% of the set point and start-up the burner again to ensure the set point is correct.

If the burner locks out again, turn the knob counter-clockwise a little bit more.

Fig. 36

5.4.2 Maximum oil pressure switch

The high oil pressure switch is factory set to 43.5 PSI (3 bar).

If the oil pressure goes above this value in the return piping, the pressure switch stops the burner.

Burner starts again automatically if the pressure goes down under 43.5 PSI (3 bar) after burner shut down.

If a loop circuit with Px pressure feeds the burner, the pressure switch should be adjusted to Px + 43.5 PSI.

For the adjustment, see (Fig. 38).

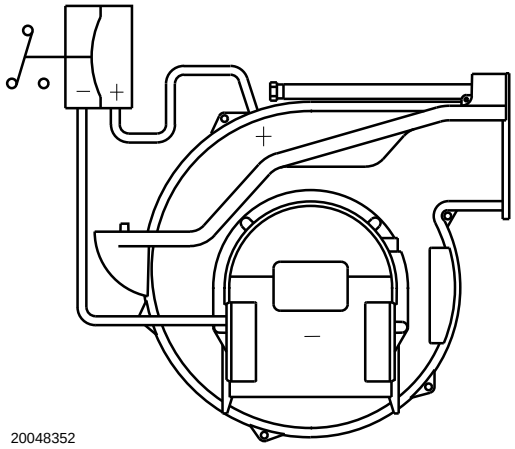


Fig. 37

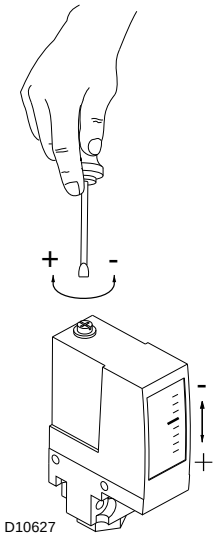


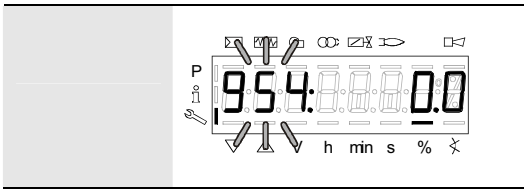
Fig. 38

5.5 Flame signal measurement

Check the flame signal through the parameter 954, as indicated in Fig. 39. The displayed value is expressed in percentage.

The value during the operation must be higher than 24%. If at the burner start-up the value is higher or equal of 18%, the burner locks out due to the extraneous light.

For further and specific information, please refer to the specific instruction manual.
The display (Fig. 39) shows parameter **954**: flashing on the left.
On the right, the flame's intensity is displayed as a percentage.
Example: **954: 0.0**



S8171

Fig. 39

5.6 Final checks (with the burner working)

➤ Open the control limit operation ➤ Open the high limit operation	⇨	The burner must stop
➤ Rotate the air pressure switch knob to the maximum end of scale position ➤ Rotate the maximum oil pressure switch at the minimum of the scale	⇨	The burner must stop in lockout
➤ Switch off the burner and disconnect the voltage	⇨	The burner must not start
➤ Cover the UV flame sensor	⇨	The burner must stop in lockout due to firing failure

Tab. N

WARNING

Make sure that the mechanical locking systems on the different adjustment devices are fully tightened.

6 Maintenance

6.1 Notes on safety for the maintenance

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

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

DANGER

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

Before carrying out any maintenance, cleaning or checking operations:

DANGER

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

DANGER

Close the fuel interception tap.

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

6.2 Maintenance programme

6.2.1 Maintenance frequency

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

6.2.2 Checking and cleaning

The operator must use the required equipment during maintenance.

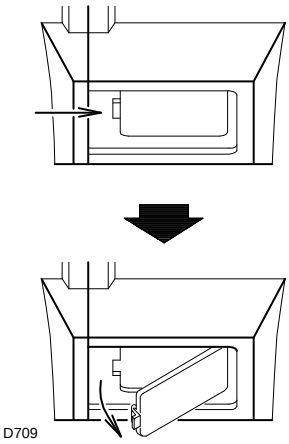


Fig. 40

Combustion

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

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.

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.

Flame inspection window

Clean the flame inspection window (Fig. 40).

Burner

Make sure that the screws securing the electrical leads in the burner connections are fully tightened.

Clean the outside of the burner, taking special care with the linkages joints and cam.

Nozzle

Do not clean the nozzle orifices.

Replace the nozzles every 2-3 years or whenever necessary. Combustion must be checked after the nozzles have been changed.

Pump

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

If the pressure is found to be unstable or if the pump runs noisily, the flexible hose must be detached from the line filter and the fuel must be sucked from a tank located near the burner.

This measure permits the cause of the anomaly to be traced to either the suction line or the pump.

If the pump is found to be responsible, check to make sure that the filter is not dirty.

The vacuum gauge is installed up-line from the filter and consequently will not indicate whether the filter is clogged or not. If the problem lies in the suction line, check to make sure that the filter is clean and that air is not entering the piping.

Filters

Check the following filters: on line 1), in pump 2), at nozzle 3), and clean or replace as required (Fig. 41).

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

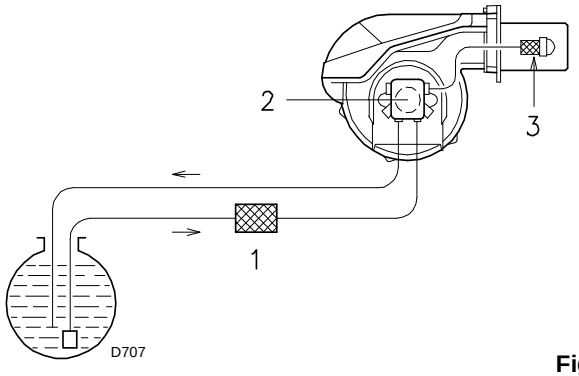


Fig. 41

Flexible hoses

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

UV scanner

In order to reach the UV scanner (Fig. 42), proceed as follows:

➤ extract the UV scanner 2).

➤ Clean the glass cover from any dust that may have accumulated.

WARNING

➤ Be extremely careful while troubleshooting the detector; line voltage is present on some of the terminals when power is on.

➤ Open the master switch to disconnect power before removing or installing the detector.

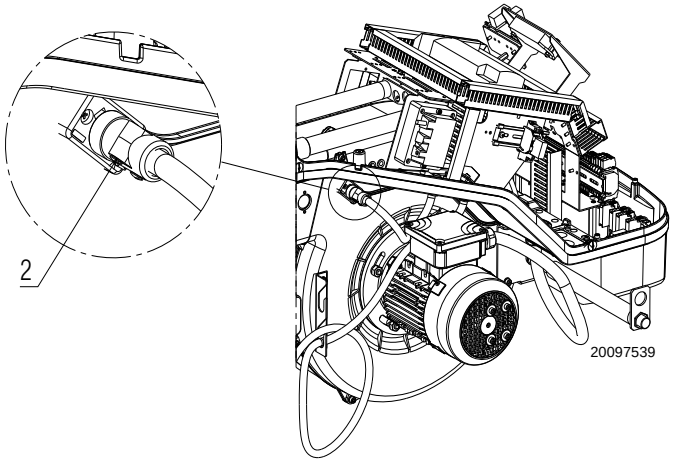


Fig. 42

Fuel tank

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

6.2.3 Fuel pump and/or couplings replacement

As per Fig. 43, dimension A should be set:

Model	A (inch)
RL 70/E	$^{1}/_{2"}$
RL 100/E	$^{33}/_{64"}$ (230/460V)
	$^{13}/_{32"}$ (575V)
RL 130/E	$^{7}/_{16"}$

Tab. O

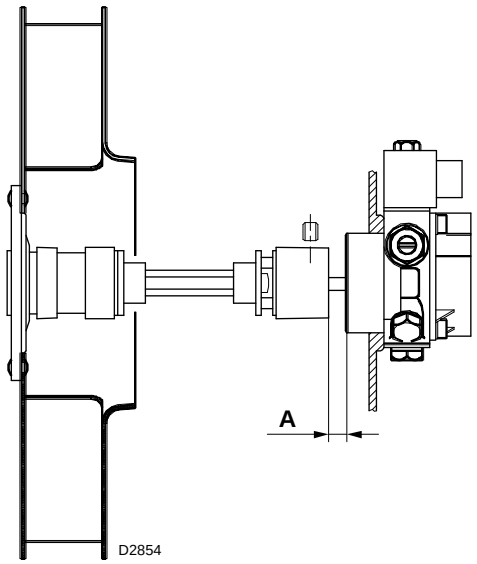


Fig. 43

6.3 Opening the burner

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

Close the fuel interception tap.

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

- ➤ Loosen screws 1)(Fig. 44) and withdraw the cover 2);
- ➤ unscrew screws 3);
- ➤ fit the two extensions 4) supplied with a kit on request onto the slide bars 5) (models with long blast tube);
- ➤ pull part A) backward keeping it slightly raised to avoid damaging the disk 6) on blast tube 7).

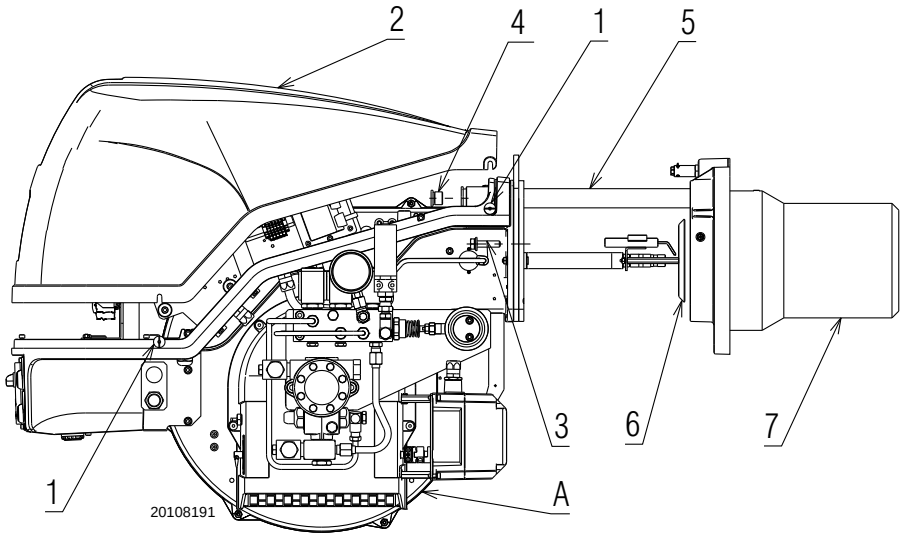


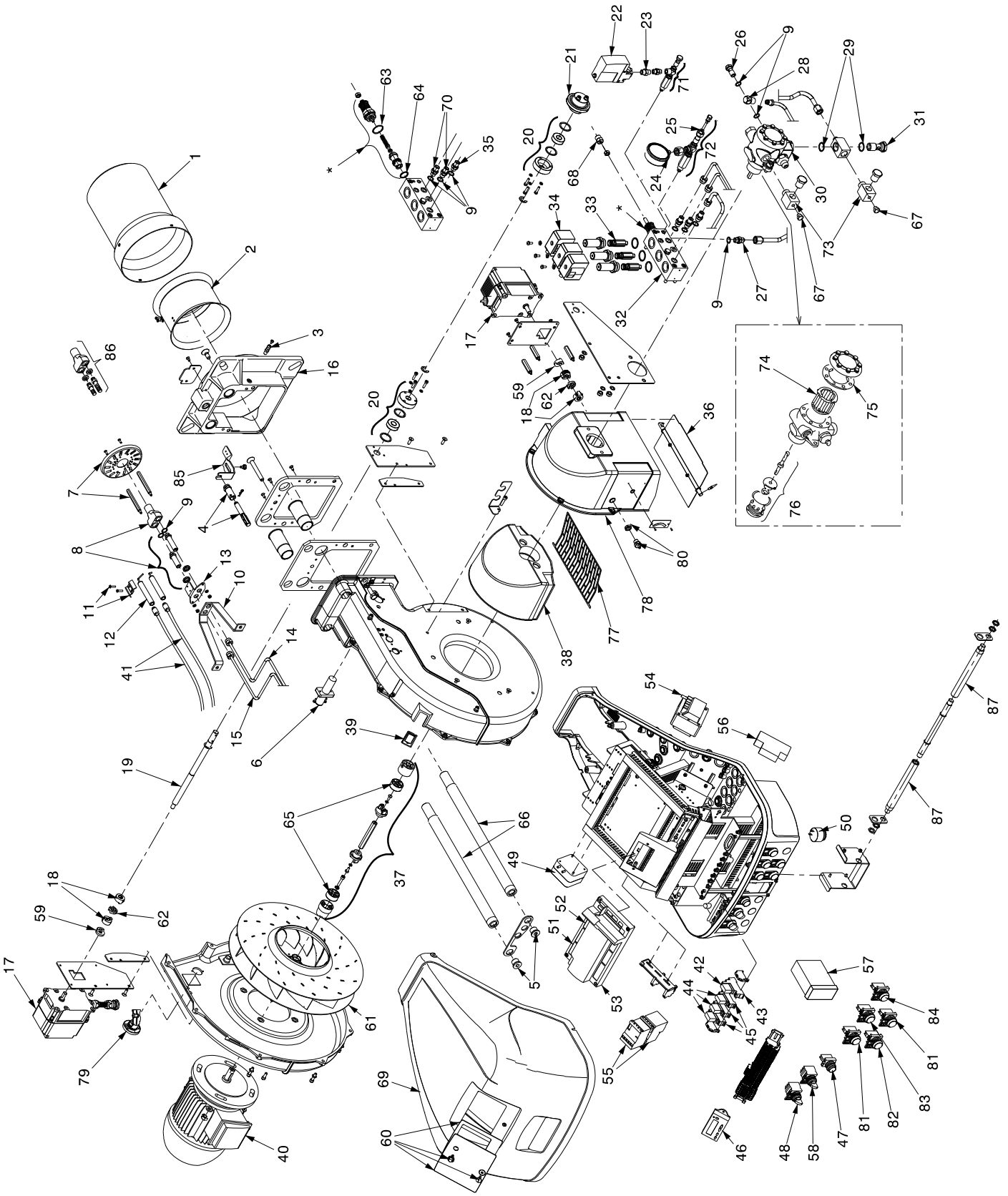
Fig. 44

6.4 Closing the burner

Refit following the steps described but in reverse order; refit all burner components as they were originally assembled.

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

A Appendix - Spare parts



N.	CODE	20102371	20068158 (460V)	20117168 (575V)	20057430 (460V)	20117169 (575V)	DESCRIPTION	*
1	20108317	•					END CONE	B
1	20092359		•	•			END CONE	B
1	20058427				•	•	END CONE	B
2	3003983	•	•	•			SHUTTER	C
2	3003984				•	•	SHUTTER	C
3	3003322	•	•	•	•	•	CONNECTOR	C
4	20108327	•					ADJUSTMENT ASSEMBLY	
4	3003977		•	•	•	•	ADJUSTMENT ASSEMBLY	
5	3013681	•					PLUG	
5	20043399		•	•	•	•	PLUG	
6	20086579	•	•	•	•	•	FLAME SENSOR	
7	3012462	•					DIFFUSER DISC	A
7	3012463		•	•	•	•	DIFFUSER DISC	A
8	20066897	•	•	•	•	•	NOZZLE HOLDER GROUP	C
9	3007079	•	•	•	•	•	SEAL	B
10	3012461	•	•	•	•	•	SUPPORT	A
11	3003495	•	•	•	•	•	U BOLT	
12	3003796	•	•	•	•	•	ELECTRODE	A
13	3012092	•	•	•	•	•	SUPPORT	A
14	20058428	•	•	•	•	•	TUBE	
15	20058429	•	•	•	•	•	TUBE	
16	20049844	•					FRONT PIECE	
16	3003976		•	•	•	•	FRONT PIECE	
17	20008601	•	•	•	•	•	SERVOMOTOR	B
18	3013937	•	•	•	•	•	HUB	
19	20043403	•	•	•	•	•	SHAFT	
20	3012657	•	•	•	•	•	BEARING	C
21	3013259	•	•	•	•	•	BEARING	C
22	3012384	•	•	•	•	•	OIL PRESSURE SWITCH	A
23	3009046	•					CONNECTOR	C
23	3009080		•	•	•	•	CONNECTOR	C
24	3006140	•	•	•	•	•	PRESSURE GAUGE	
25	3007169	•	•	•	•	•	O-RING	B
26	3003006	•	•	•	•	•	CONNECTOR	C
27	3006723	•	•	•	•	•	CONNECTOR	C
28	3012455	•	•	•	•	•	CONNECTOR	C
29	3007164	•	•	•	•	•	SEAL	B
30	3006369	•	•	•	•	•	PUMP	C
31	3006184	•	•	•	•	•	CONNECTOR	C
32	3012474	•	•	•	•	•	MODULATOR	B
33	20034545	•	•	•	•	•	CORE	
34	3003287	•	•	•	•	•	COIL	B
35	3009081	•	•	•	•	•	CONNECTOR	C

N.	CODE	20102371	20068158 (460V)	20117168 (575V)	20057430 (460V)	20117169 (575V)	DESCRIPTION	*
36	3013929	•	•	•	•	•	AIR DAMPER	
37	3013056	•					DRIVE COUPLING	A
37	3003954		•	•	•	•	DRIVE COUPLING	A
38	3003952	•	•	•	•	•	SOUND DAMPING	
39	3003763	•	•	•	•	•	INSPECTION WINDOW	
40	20028608	•					MOTOR	C
40	20030200		•		•		MOTOR	C
40	20062892			•		•	MOTOR	C
41	3003973	•	•	•			HT CONNECTION	A
41	3012393				•	•	HT CONNECTION	A
42	3020068	•	•	•	•	•	RELAY	C
43	3020071	•	•	•	•	•	CONTROL BOX BASE	
44	20010969	•	•	•	•	•	RELAY	C
45	3012841	•	•	•	•	•	CONTROL BOX BASE	
46	3013926	•	•	•	•	•	DISPLAY	
47	20010962	•	•	•	•	•	SILENCE BUTTON	
48	20027021	•	•	•	•	•	SWITCH	C
49	3012948	•	•	•	•	•	AIR PRESSURE SWITCH	A
50	20031413	•	•	•	•	•	HORN	
51	20010968	•	•	•	•	•	ELECTRONIC CAM	C
52	3014106	•	•	•	•	•	FUSE	A
53	3013940	•	•	•	•	•	CONNECTORS ASSEMBLY	B
54	3012938	•	•	•	•	•	TRANSFORMER	
55	20115409	•	•	•	•	•	STARTER	C
56	20014366	•	•	•	•	•	FUSE HOLDER	
57	20096592	•	•	•	•	•	POWER REGULATOR	
58	20027422	•	•	•	•	•	SWITCH	C
59	3014079	•	•	•	•	•	SPACER	
60	20075921	•	•	•	•	•	INSPECTION WINDOW	
61	3012939	•					FAN	C
61	3012403		•	•			FAN	C
61	3012940				•	•	FAN	C
62	3013938	•	•	•	•	•	DRIVE DISK	A
63	3003204	•	•	•	•	•	SEAL	B
64	3003294	•	•	•	•	•	O-RING	B
65	3012622	•	•	•	•	•	DRIVE DISK	A
66	20088718	•	•	•	•	•	BAR	C
67	3012932	•	•	•	•	•	PLUG	
68	3003200	•	•	•	•	•	NUT	
69	20086561	•	•	•	•	•	COVER	B
70	3003005	•	•	•	•	•	CONNECTOR	C
71	20108355	•	•	•	•	•	ELBOW	
72	20108358	•	•	•	•	•	ELBOW	

N.	CODE	20102371	20068158 (460V)	20117168 (575V)	20057430 (460V)	20117169 (575V)	DESCRIPTION	*
73	**3012949**	•	•	•	•	•	CONNECTOR	C
74	**3006787**	•	•	•	•	•	FILTER	B
75	**3006292**	•	•	•	•	•	SEAL	B
76	**3000805**	•	•	•	•	•	PUMP ASSEMBLY	
77	**3003949**	•	•	•	•	•	PROTECTION	
78	**20043413**	•	•	•	•	•	AIR INTAKE	
79	**3012794**	•	•	•	•	•	INSPECTION WINDOW	
80	**3012088**	•	•	•	•	•	CONNECTOR	C
81	**20036017**	•	•	•	•	•	GREEN SIGNAL LIGHT	A
82	**20027020**	•	•	•	•	•	YELLOW SIGNAL LIGHT	A
83	**20027014**	•	•	•	•	•	WHITE SIGNAL LIGHT	A
84	**20027018**	•	•	•	•	•	RED SIGNAL LIGHT	A
85	**20108321**	•					CONTROL DEVICE	C
85	**20092371**		•	•			CONTROL DEVICE	C
85	**20059653**				•	•	CONTROL DEVICE	C
86	**20088026**	•	•	•	•	•	NOZZLE HOLDER	C
87	**3013686**	•	•	•	•	•	BAR EXTENSION	

*

ADVISED PARTS

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

B Appendix - Accessories

- **Flame inversion boiler kit**

Burner	Code
RL 70-100/E	3010180
RL 130/E	3010183

WARNING

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

C Appendix - Burner start up report

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

OIL OPERATION

Oil supply pressure:		CO_2: Low Fire		High Fire	
Oil suction pressure:		O_2: Low Fire		High Fire	
Control Power Supply:		CO: Low Fire		High Fire	
Burner Firing Rate:		NO_X: Low Fire		High Fire	
Low Fire Flame Signal:		Net Stack Temp - Low Fire:		High Fire	
High Fire Flame Signal:		Comb. Efficiency - Low Fire:		High Fire	
Low Fire Nozzle Size:		Overfire Draft:			
High Fire Nozzle Size:		Smoke number:			

CONTROL SETTINGS

Operating Set point:		Low Oil Pressure:	
High Limit Set point:		High Oil Pressure:	
Low Gas Pressure:		Flame Safeguard Model Number:	
High Gas Pressure:		Modulating Signal Type:	

NOTES

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