

## Forced draught gas burners

Progressive two-stage or modulating operation



# RS

Code	Model
20065627	RS 120/EV LN







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## 1

## Information and general instructions

## 1.1 Information about the instruction manual

## 1.1.1 Introduction



WARNING

Read these instructions and save for reference!

These installation and operating instructions form part of the unit and must be kept in good and legible conditions on site at all times.

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.



DANGER

Maximum danger level!

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



WARNING

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



CAUTION

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

**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 COVER AND ALL THE SAFETY AND PROTECTION DEVICES**

This symbol signals the obligation to reassemble the cover 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;

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

- the date of installation;

- 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 date of installation, 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;
- continuation of use of the burner when a fault has occurred;
- repairs and/or overhauls incorrectly carried out;
- modification of the combustion chamber with inserts that pre-

vent 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;
- 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.**

#### 1.2.1 Owner's responsibility

Please pay attention to the Safety Warnings contained within this instruction manual. Keep this manual for your records and provide it to your qualified service agency for use in professionally setting up and maintaining your burner.

Your burner will provide years of efficient operation if it is professionally installed and maintained by a qualified service technician. If at any time the burner does not appear to be operating properly, immediately contact your qualified service agency for consultation.

We recommend annual inspection/service of your gas heating system by a qualified service agency.

Failure to follow these instructions, misuse, or incorrect adjustment of the burner could lead to equipment malfunction and result in asphyxiation, explosion or fire.



**WARNING**

If you smell gas:

- Do not touch any electrical items.
- Open all windows.
- Close all gas supply valves.
- Contact your local gas authority immediately.
- Do not store flammable or hazardous materials in the vicinity of fuel burning appliances.
- Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or death.
- Refer to this manual for instructional or additional information.
- Consult a certified installer, service representative or the gas supplier for further assistance.
- Burner shall be installed in accordance with manufacturers requirements as outlined in this manual, local codes and authorities having jurisdiction.



**WARNING**

Installation of this burner must conform with local codes requirements or, in the absence of local codes, with the Standard: National Fuel Gas code ANSI Z223.1-1984, and CAN/CGA B149.1 & 2 AND UL 795. If an external electrical source is utilized, the conversion burner, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the national Electrical Code, ANSI/NFPA No. 70-1990 and CSA Electrical Code C22.2 No.0 M1982 & C22.2 No 3. 1988. **Authorities having jurisdiction should be consulted before installations are made. The owner is required to retain this manual for future reference.**



## 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 foreseen by the manufacturer;

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

- Modification of the burner to alter its performance and destinations is not allowed.
- The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- Only those parts envisaged by the manufacturer can be replaced.



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

## 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:



- 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			RS 120/EV LN
RBNA code			
Output <sup>(1)</sup>	MAX.	MBtu/hr kW	2282 - 4924 666 - 1443
	MIN.	MBtu/hr kW	1136 333
Fuel			Natural gas
- Max. delivery		SCFH	4924
- Pressure at max. delivery <sup>(2)</sup>		"WC	8.85
Operation			Low - high or modulating
Standard applications			Boilers: water, steam, thermal oil
Ambient temperature		°F	32 - 104 (0 - 40 °C)
Combustion air temperature		°F max	140 (60 °C)
Noise levels <sup>(3)</sup>		dBA	77

**Tab. A**

- (1) Reference conditions: Ambient temperature 68 °F (20 °C) - Barometric pressure 394 "WC - Altitude 329 ft a.s.l.  
 (2) Pressure at test point 21)(Fig. 6), with zero pressure in the combustion chamber, with open gas ring 5)(Fig. 17) at maximum burner output.  
 (3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output.

#### 3.2 Electrical data

##### 3.2.1 Fan motor IE1

Three phase burner

Model		RS 120/EV LN		
RBNA code				
Control circuit power supply	V/Ph/Hz		120/1/60	
Main electrical supply	V/Ph/Hz	208 - 220/3/60	460/3/60	575/3/60
Fan motor	rpm	3400	3400	3400
	HP	3	3	3
	V	208 - 230	460	575
	A	8.5	4.9	3.7
Ignition transformer	V1 - V2	120 V - 1 X 8 kV		
	I1 - I2	1.6 A - 20 mA		
Electrical power consumption	W max	2750	3150	2900
Electrical control circuit coms.	W		750	
Total electrical consumption	W	3500	3900	3650
Electrical protection		NEMA 1		



## 3.2.2 Fan motor IE2/EPACT

Model		RS 120/EV LN		
RBNA code				
Control circuit power supply	V/Ph/Hz	120/1/60		
Main electrical supply	V/Ph/Hz	208 - 220/3/60	460/3/60	575/3/60
Fan motor	rpm	3500	3500	3500
	HP	3	3	3
	V	208-230	460	575
	A	7.8	3.9	3.1
Ignition transformer	V1 - V2 I1 - I2		120 V - 1 X 8 kV 1.6 A - 20 mA	
Electrical power consumption	W max	2600		
Electrical control circuit coms.	W	750		
Total electrical consumption	W	3350		
Electrical protection		NEMA 1		

Tab. B

## 3.3 Burner models designations

Model	Code	RBNA Code	Voltage	Flame safeguard
RS 120/EV LN			208 - 220/3/60	Burner mounted
			460/3/60	Burner mounted
	20065627		575/3/60	Burner mounted

Tab. C



### 3.4 Packaging

- The packaging of the burner (Fig. 1) rests on a wooden platform that is particularly suitable for lift trucks.  
The overall dimensions of the packaging are shown in the table.
- The weight of the burner complete with its packaging is shown in table.

inch	A <sub>(1)</sub>	B	C	lbs
RS 120/EV LN	55 1/8"	31 7/64"	27 9/16"	154

Tab. D

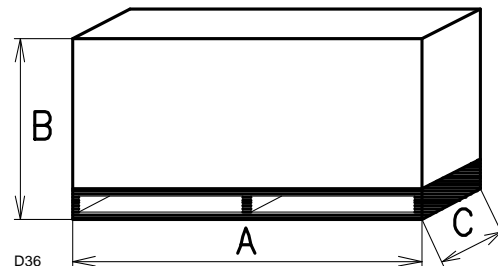


Fig. 1

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

### 3.5 Overall dimensions

The dimensions of the burner are shown in Fig. 2.

Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part drawn back on the guides.

The dimensions of the open burner are indicated by position I.

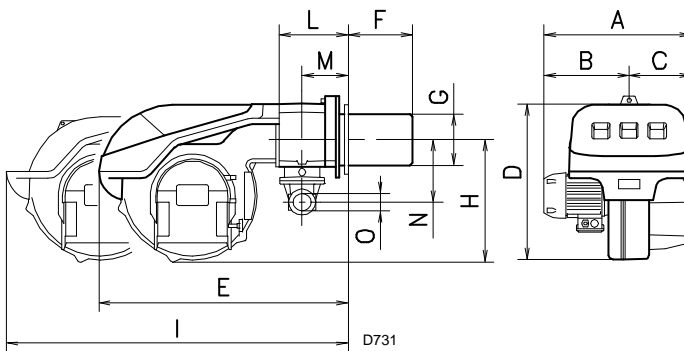


Fig. 2

inch	A	B	C	D	E	F <sub>(1)</sub>	G	H	I <sub>(1)</sub>	L	M	N	O
RS 120/EV LN	21 25/32"	13 5/16"	8 15/32"	21 27/32"	33 1/16"	10 - 15 3/8"	7 7/16"	16 29/32"	45 11/16" - 51 1/32"	8 13/32"	5 9/32"	8 11/16"	2"

Tab. E

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

### 3.6 Burner equipment

The burner is supplied complete with:

- 1 - Gas train flange
- 1 - Flange gasket
- 4 - Flange fixing screws M10x35
- 1 - Connector for pilot line
- 2 - Extensions for slide bars (for kit)
- 1 - Instruction manual and spare parts list



The equipment shall be installed in accordance with the Provincial Installation Requirements, or in their absence, the CGA B149.1 and B149.2 Installation Codes shall prevail. Authorities having jurisdiction should be consulted before installations are made. The owner is required to retain this manual for future reference.



## 3.7 Firing rate

During operation, burner output varies between:

- MAXIMUM OUTPUT, selected within area A or B (RS 120/E LN) (Fig. 3);
- MINIMUM OUTPUT, which must not be lower than the minimum limit in the diagram.

Model	MBtu/hr
RS 120/EV LN	1136

Tab. F

In order to use also area B (RS 120/E LN) it is necessary to perform the calibration of the combustion head as explained on paragraph "Combustion head calibration" page 18.



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 22.

### NOTE:

The FIRING RATE areas given in Fig. 3 have been reduced by 10% with respect to the maximum range that can be reached. Consult Procedure on page 24 to refer burner operating condition in high altitude plants.

The firing rates were set in relation to certified test boilers.

Fig. 4 indicates the diameter and length of the test combustion chamber.

Example:

Output 2579 MBtu/hr:

diameter = 24 inch; length 6.6 ft

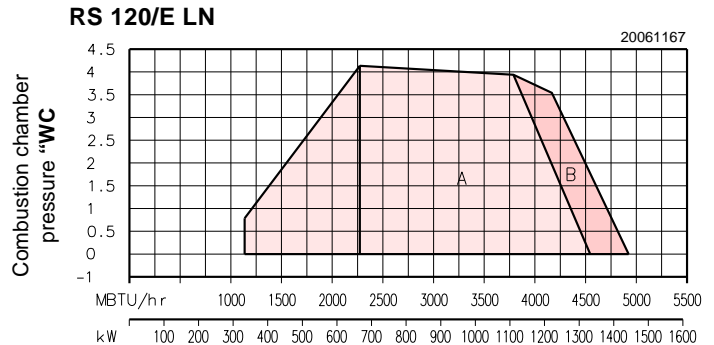


Fig. 3

### 3.7.1 Minimum furnace dimensions

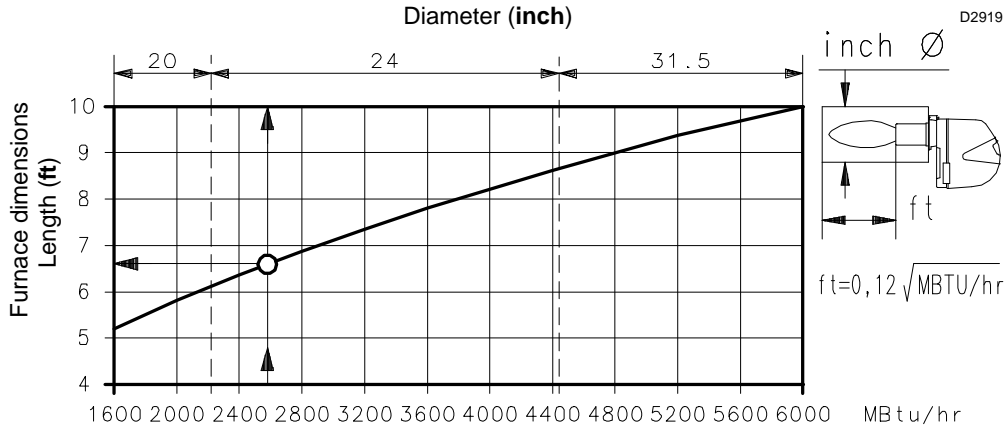


Fig. 4

## 3.8 Commercial boilers

The RS 120/EV LN burners are suitable for operation on either flame-inversion boilers\* or boilers with combustion chambers featuring flow from the base (three flue passes) on which the best results are obtained in terms of low NOx emissions.

The maximum thickness of the boiler's front door must not exceed 8" (see Fig. 5).

(\*) For flame inversion boilers, a kit is available to reduce CO emissions if required.

The kit includes 5 gas pipes, identical to the other 5 already fitted to the burner head. In standard conditions, the burner head is fitted with a second group of pipes, with gas outlet in a different direction with respect to the others.

With this Kit, the second group of pipes is replaced, so that all

the pipes are the same.

After fitting the kit, ensure they work correctly by measuring the CO and flue gases emissions.

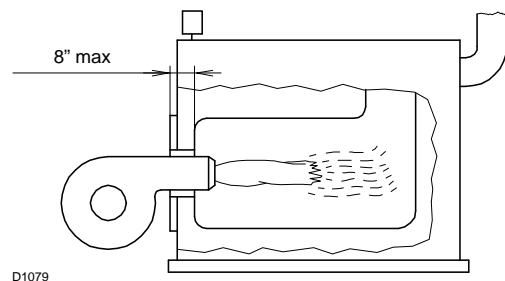
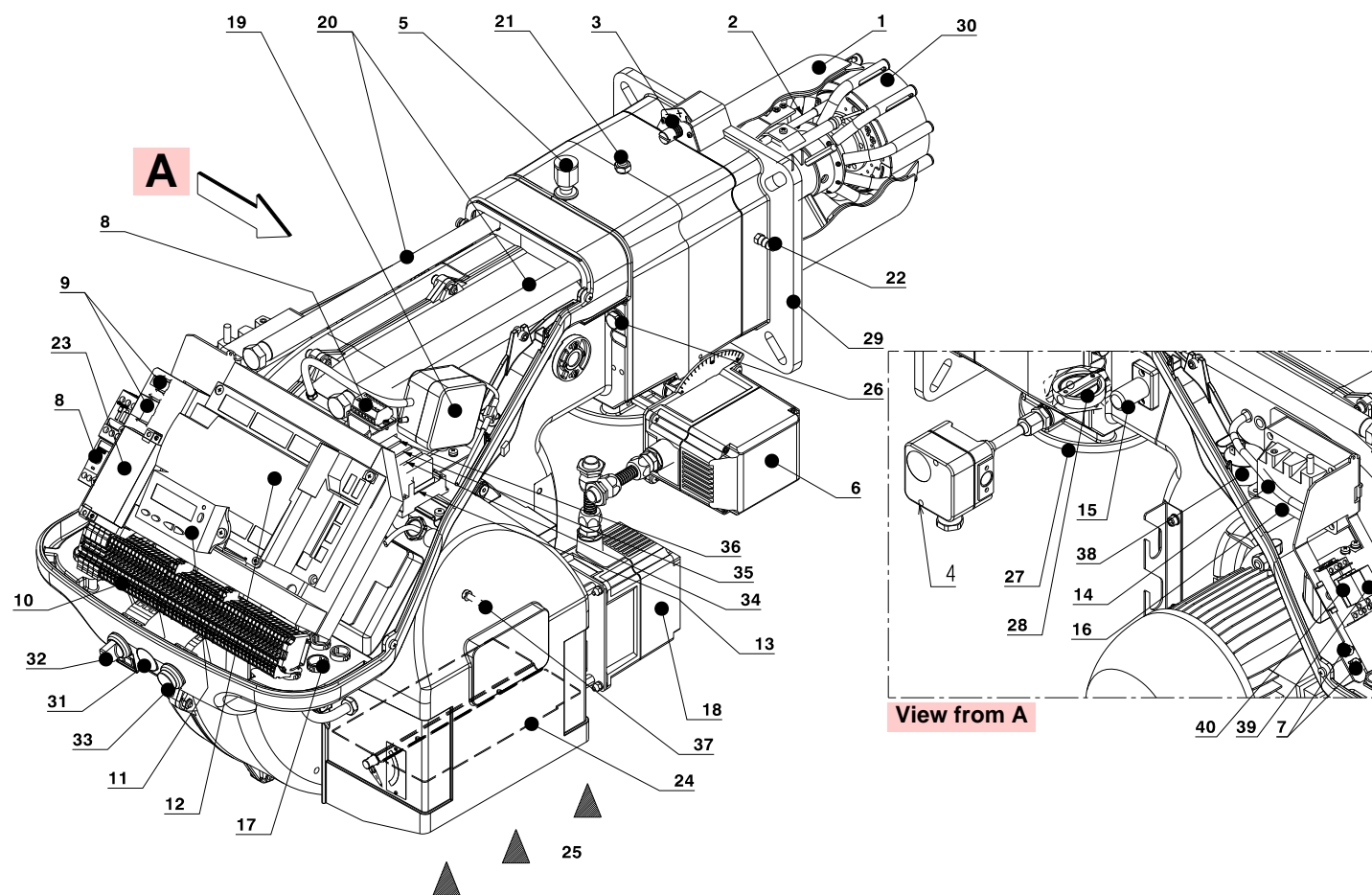


Fig. 5



### 3.9 Burner components



20064179

Fig. 6

- |    |   |    |                                       |
|----|---|----|---------------------------------------|
| 1  | Combustion head   | 26 | Screws to secure fan to pipe coupling |
| 2  | Burner pilot  | 27 | Gas input pipe                        |
| 3  | Screw for combustion head adjustment  | 28 | Gas butterfly valve                   |
| 4  | Maximum gas pressure switch   | 29 | Boiler fixing flange                  |
| 5  | Burner pilot attachment   | 30 | Flame stability disc                  |
| 6  | Gas actuator  | 31 | Optional hole                         |
| 7  | Ground terminals  | 32 | "OFF-LOCAL-REMOTE" switch             |
| 8  | Auxiliary terminal strip for speed sensor   | 33 | "ALARM SILENCE" button                |
| 9  | RWF40 connectors  | 34 | "K2" relay                            |
| 10 | Burner terminal board "X1"  | 35 | "K3" relay                            |
| 11 | Operator panel with LCD display   | 36 | "K4" relay                            |
| 12 | Control box for checking flame and air/fuel ratio   | 37 | Speed sensor                          |
| 13 | "K1" relay  | 38 | Horn                                  |
| 14 | High voltage lead   | 39 | "K5" relay                            |
| 15 | UV scanner  | 40 | "KM" relay                            |
| 16 | Ignition transformer  |    |                                       |
| 17 | Holes for cable grommets for electrical wiring, accessories and power supply (to be carried out by the installer) |    |                                       |
| 18 | Air actuator  |    |                                       |
| 19 | Low air pressure switch (Differential operative type)   |    |                                       |
| 20 | Guides for opening the burner and inspecting the combustion head  |    |                                       |
| 21 | Gas pressure test point and head fixing screw   |    |                                       |
| 22 | Air pressure socket   |    |                                       |
| 23 | RWF40 modulator   |    |                                       |
| 24 | Air damper  |    |                                       |
| 25 | Fan air inlet   |    |                                       |



## 3.10 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).

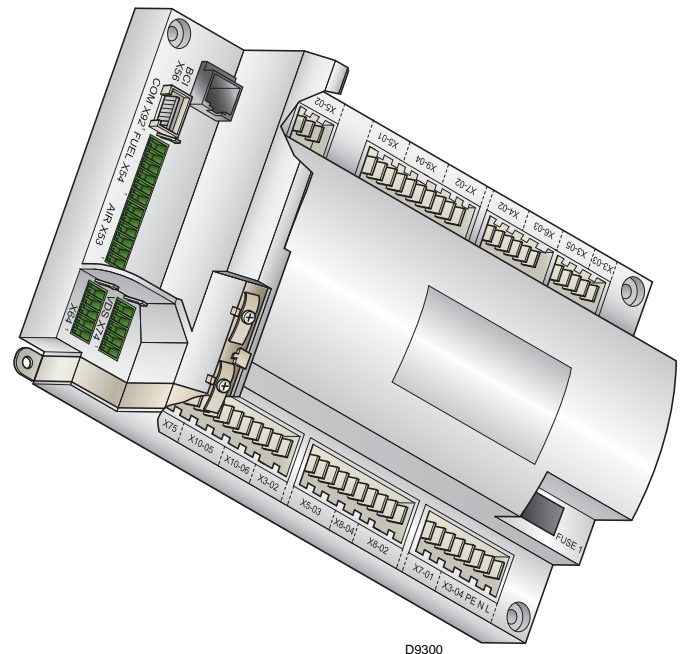
The basic functions carried out by the control box relate to:

- flame control;
- the dosage of air and fuel via the positioning (with direct servo-control) 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:

- Burner control with gas valve proving system
- 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 $\pm 6$ %
	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	
	<ul style="list-style-type: none"> <li>Safety shutdown from operating position at mains voltage</li> <li>Restart on rise in mains voltage</li> </ul>	Approx. AC 93 V Approx. AC 96 V
Terminal loading 'Outputs'	<b>Total contact loading:</b>	
	<ul style="list-style-type: none"> <li>Nominal voltage</li> <li>Unit input current (safety loop) from:               <ul style="list-style-type: none"> <li>Fan motor contactor</li> <li>Ignition transformer</li> <li>Valves</li> <li>Oil pump / magnetic clutch</li> </ul> </li> </ul>	AC 120 V, 50 / 60 Hz Max. 5 A
	<b>Individual contact loading:</b>	
	Fan motor contactor	
	<ul style="list-style-type: none"> <li>Nominal voltage</li> <li>Nominal current</li> <li>Power factor</li> </ul>	AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 $\cos\varphi > 0.4$
	Alarm output	
	<ul style="list-style-type: none"> <li>Nominal voltage</li> <li>Nominal current</li> <li>Power factor</li> </ul>	AC 120 V, 50 / 60 Hz 1 A $\cos\varphi > 0.4$
	Ignition transformer	
	<ul style="list-style-type: none"> <li>Nominal voltage</li> <li>Nominal current</li> <li>Power factor</li> </ul>	AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 or 250 VA ignition load declaration to UL372 $\cos\varphi > 0.2$
	Fuel valves	
	<ul style="list-style-type: none"> <li>Nominal voltage</li> <li>Nominal current</li> <li>Power factor</li> </ul>	AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 $\cos\varphi > 0.4$
	Operation display	
	<ul style="list-style-type: none"> <li>Nominal voltage</li> <li>Nominal current</li> <li>Power factor</li> </ul>	AC 120 V, 50 / 60 Hz 0.5 A $\cos\varphi > 0.4$
Cable lengths	Mains line	Max. 100 m (100 pF/m)
	Display, BCI	For used outside the burner cover or the control panel: Max. 3 m (100 pF/m)
	External lockout reset button	Max. 20 m (100 pF/m)
Environmental conditions	Operation	DIN EN 60721-3-3
	Climatic conditions	Class 3K3
	Mechanical conditions	Class 3M3
	Temperature range	-20...+60 °C
	Humidity	< 95 % r.h.

**Tab. G**



## Operation sequence of the burner

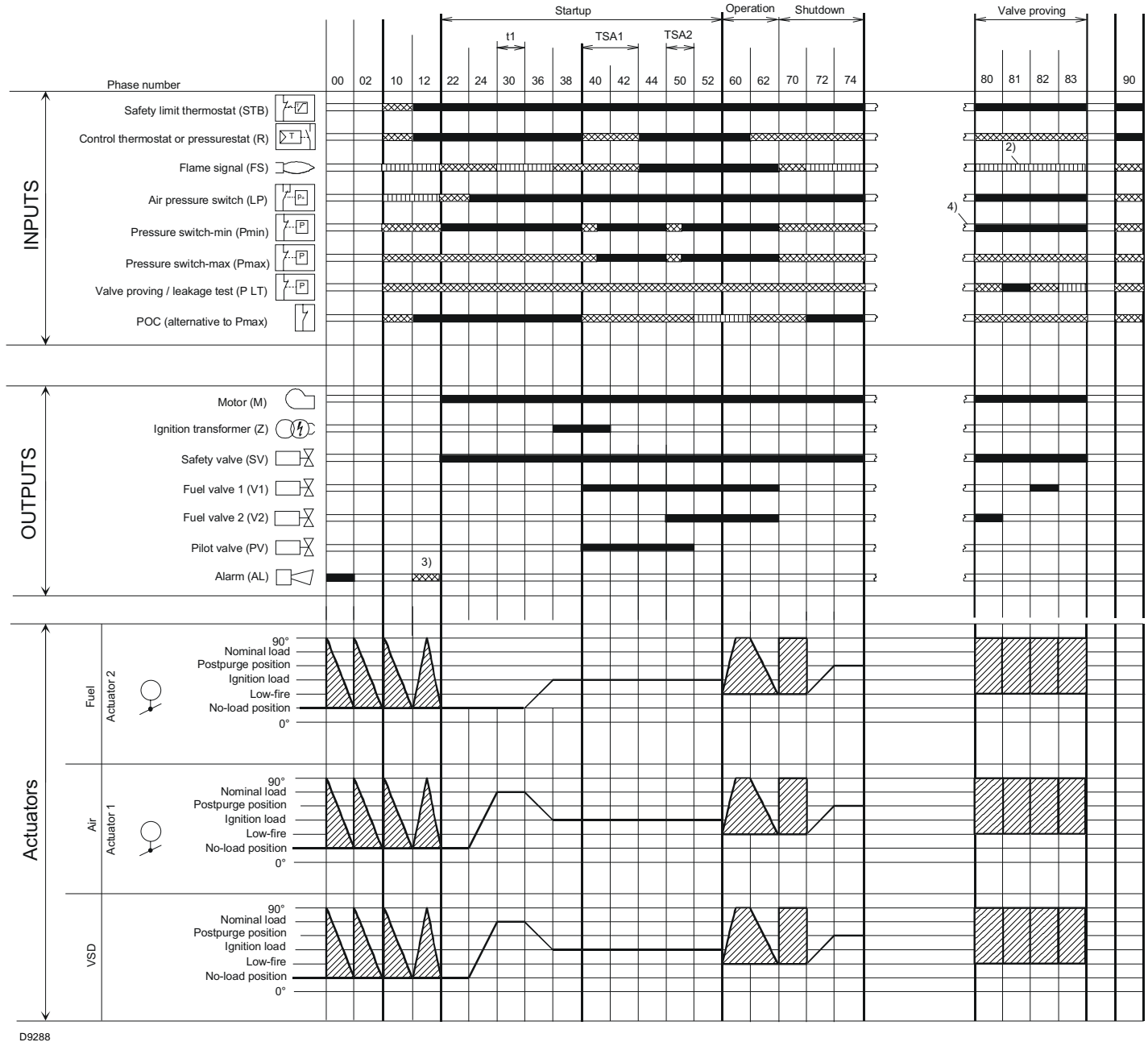


Fig. 8

### Legend to the sequence diagrams:

Valve proving takes place depending on the parameter:

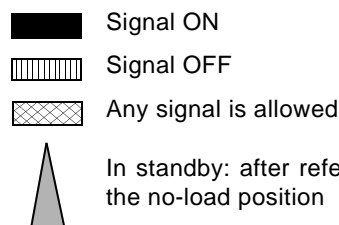
2) Only with valve proving on startup

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

4) In the event of an erroneous signal on startup, followed by phase 10, otherwise phase 70

0° Position as supplied (0°)

90° Actuator fully open (90°)



Assignment of times:

t1 Prepurge time

TSA1 Safety time 1 gas / oil

TSA2 Safety time 2 gas / oil

Tab. H



**3.11 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 the gas butterfly valve, 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.

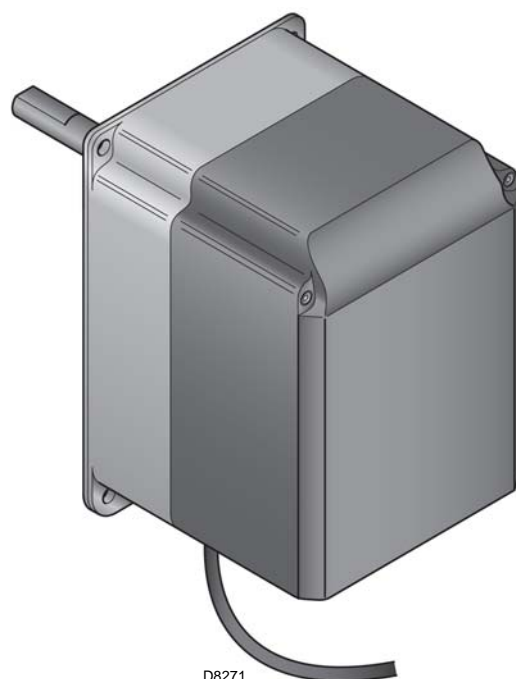
Index "0" for fuel actuator, index "1" for air actuator.

**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 $\pm 20$ % (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	DIN EN 60 721-3-3
Climatic conditions	class 3K5
Mechanical conditions	class 3M4
Temperature range	-20...+60 °C
Humidity	< 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.



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



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.



Combustion air inside the boiler must be free from hazardous mixes (e.g.: chloride, fluoride, halogen); if present, it is highly recommended to carry out cleaning and maintenance more frequently.

**AIR FOR COMBUSTION**

Do not install burner in room with insufficient air for combustion. Be sure there is an adequate air supply for combustion if the boiler room is enclosed. It may be necessary to create a window to permit sufficient air to enter the boiler room. The installer must follow local ordinances in this regard.

**CANADA:** It is suggested that the installer follow CSA standard B139.

**USA:** It is suggested that the installer follow NFPA manual #31.

**CHIMNEY**

Be sure chimney is sufficient to handle the exhaust gases. It is recommended that only the burner be connected to the chimney. Be sure that it is clean and clear of obstructions.

**ELECTRICAL CONNECTIONS**

**CANADA:** All electrical connections should be done in accordance with the C.E.C. Part 1, and all local codes. The system should be grounded.

**USA:** All electrical connections should be done in accordance with the National Electrical Code, and all local ordinances. The system should be grounded.

**CONTROL BURNER OPERATION**

Check out the burner and explain its operation to the homeowner. Be sure to leave the Owner's Instruction sheet with the homeowner.

**ELECTRICAL CONNECTIONS**

In most localities, a number 14 wire should be used inside a metal conduit. The system should be grounded.

A service switch should be placed close to the burner on a fireproof wall in an easily accessible location.

**FIRE EXTINGUISHER**

If required by local codes, install an approved fire extinguisher.

## 4.2 Handling

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



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 suitability 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 10" from the ground.



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



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



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.



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



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

### 4.4 Operating position



- The burner is designed to operate only in positions 1, 2, 4 and 5 (Fig. 10).
- Installation 1 is preferable, as it is the only one that allows the maintenance operations as described in this manual.
- Installations 2, 4 and 5 allow operations to be performed, but make maintenance and inspection of the combustion head more difficult.



- Any other position could compromise the correct operation of the appliance.
- Installation 3 is prohibited for safety reasons.

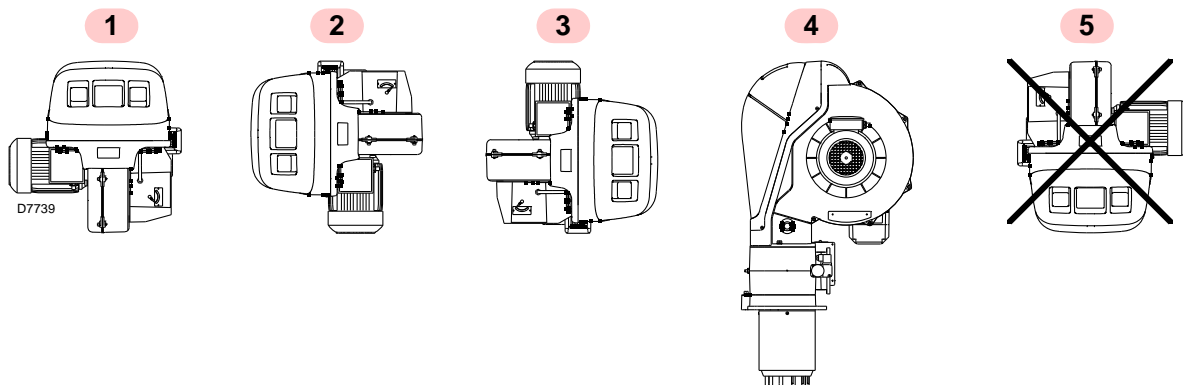


Fig. 10

### 4.5 Securing the burner to the boiler

#### 4.5.1 Boiler plate

Make holes in the plate shutting off the combustion chamber, as illustrated in Fig. 11.

The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

inch	A	B	C
RS 120/EV LN	7 21/32"	10 13/16" - 12 25/32"	1/2 W

Tab. J

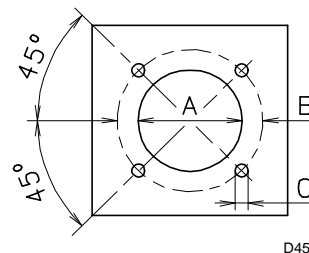


Fig. 11



## 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 table below.

For boilers with front flue passes 13)(Fig. 12) or flame inversion chambers, a protection in refractory material 11) must be inserted between the boiler refractory 12) and the blast tube 10).



**WARNING**

This protection must not compromise the extraction of the blast tube. See Fig. 12.

For boilers with a water-cooled frontal, a refractory lining is not necessary 11)-12)(Fig. 12) unless expressly requested by the boiler manufacturer.

Model	Short blast tube	Long blast tube (with kit)
RS 120/EV LN	10"	15 3/8"

Tab. K

## 4.5.3 Boiler fixing

Provide an adequate lifting system.



Secure the burner to the boiler, fixing the flange 9) (Fig. 12) to the boiler plate and interposing the insulating gasket 8).

Use the 4 screws, with a tightening torque of 26-29 Lbf. ft, after protecting their thread with anti-seize products.



**WARNING**

The seal between burner and boiler must be air-tight.

After the start-up, check there is no leakage of flue gases into the external environment.

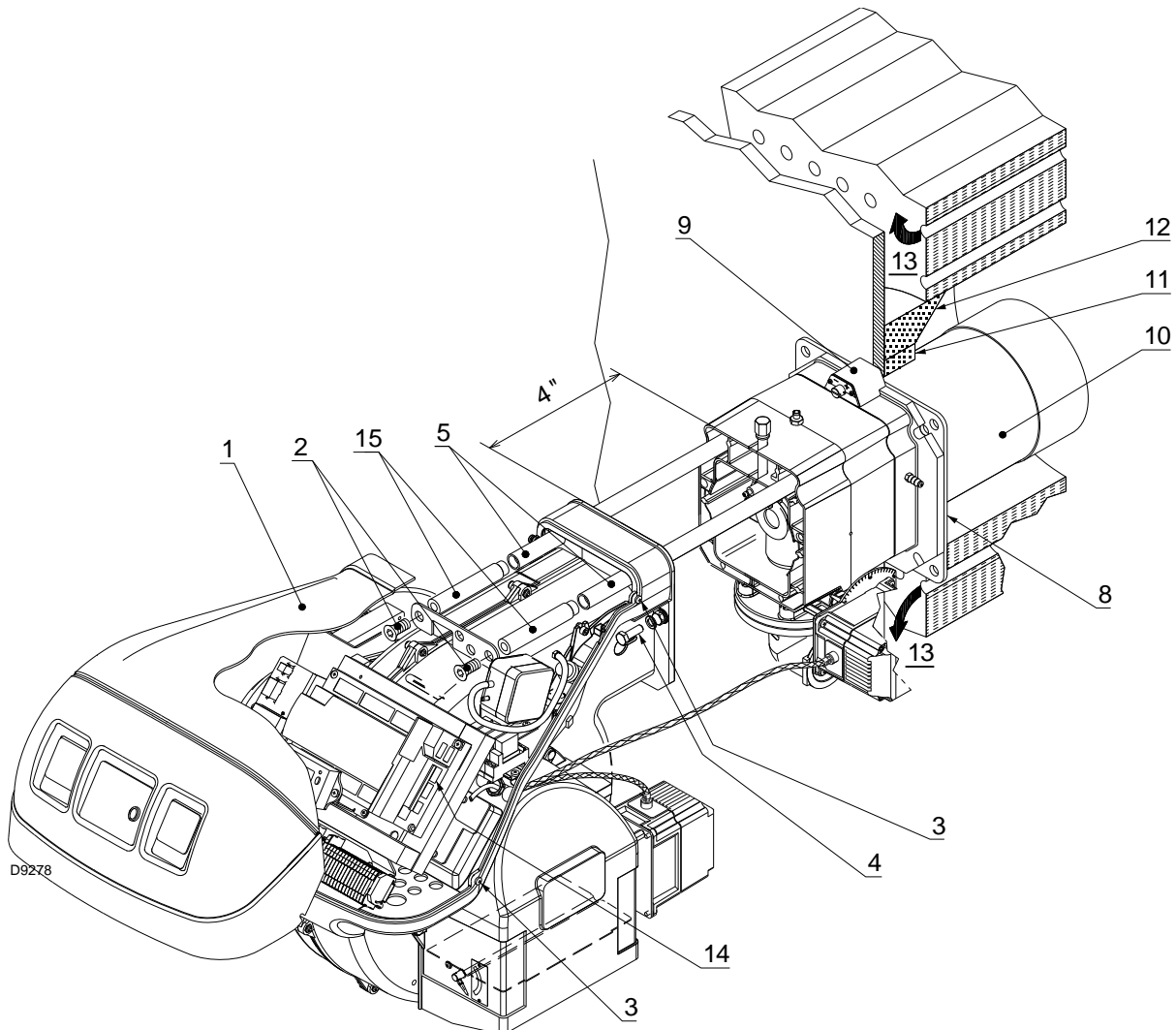


Fig. 12

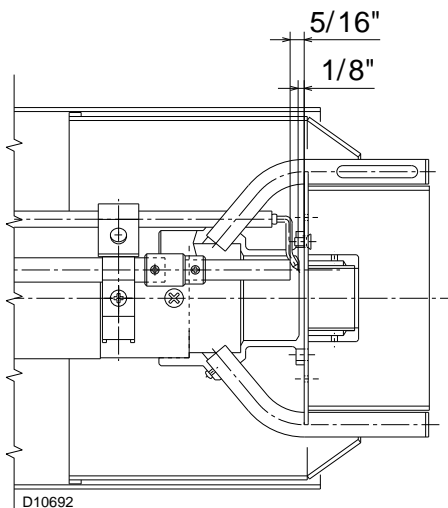


### 4.6 Electrode positioning

To verify the correct position of the ignition electrode (Fig. 14), you need to separate the combustion head from the rest of the burner.



**Measures must be respected.**



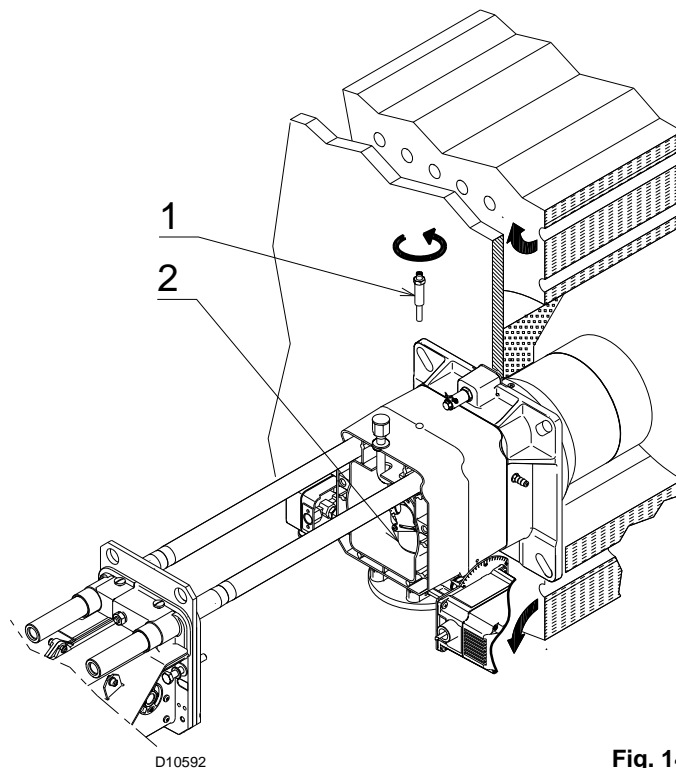
**Fig. 13**

#### 4.6.1 Combustion head calibration

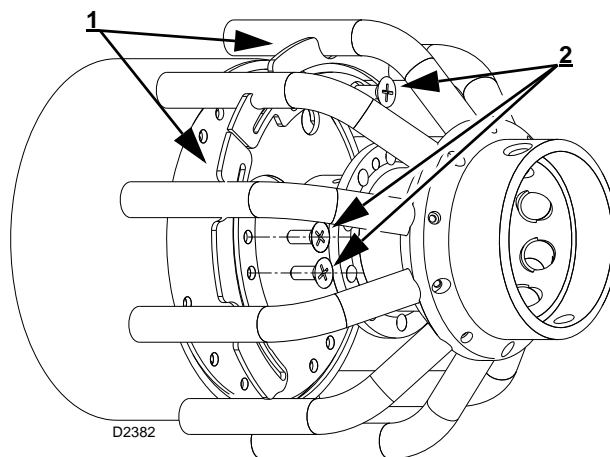
At this point check, for model RS 120/E LN, whether the maximum delivery of the burner at high fire operation is contained in area A or in area B of the firing rate. See Fig. 3, page 9. If it is in area A then no operation is required. If on the other hand, it is in area B, before starting the burner remove the 4 circular sectors 1)(Fig. 15) fastened behind the stabilizing disc by removing the 8 screws 2)(Fig. 15).

Detach the combustion head from the burner, (Fig. 12):

- loosen the 4 screws 3) and remove the cover 1);
- remove the screws 2) from the slide bars 5);
- remove the 2 screws 4) and pull the burner back on slide bars 5) by about 4";
- install the extension bars 15) Fig. 12, page 17 and re-screw the screws 2) including the safety plate 16);
- disconnect the electrode wires and then pull the burner completely off the slide bars.



**Fig. 14**



**Fig. 15**



#### 4.7 Adjustment of the combustion head

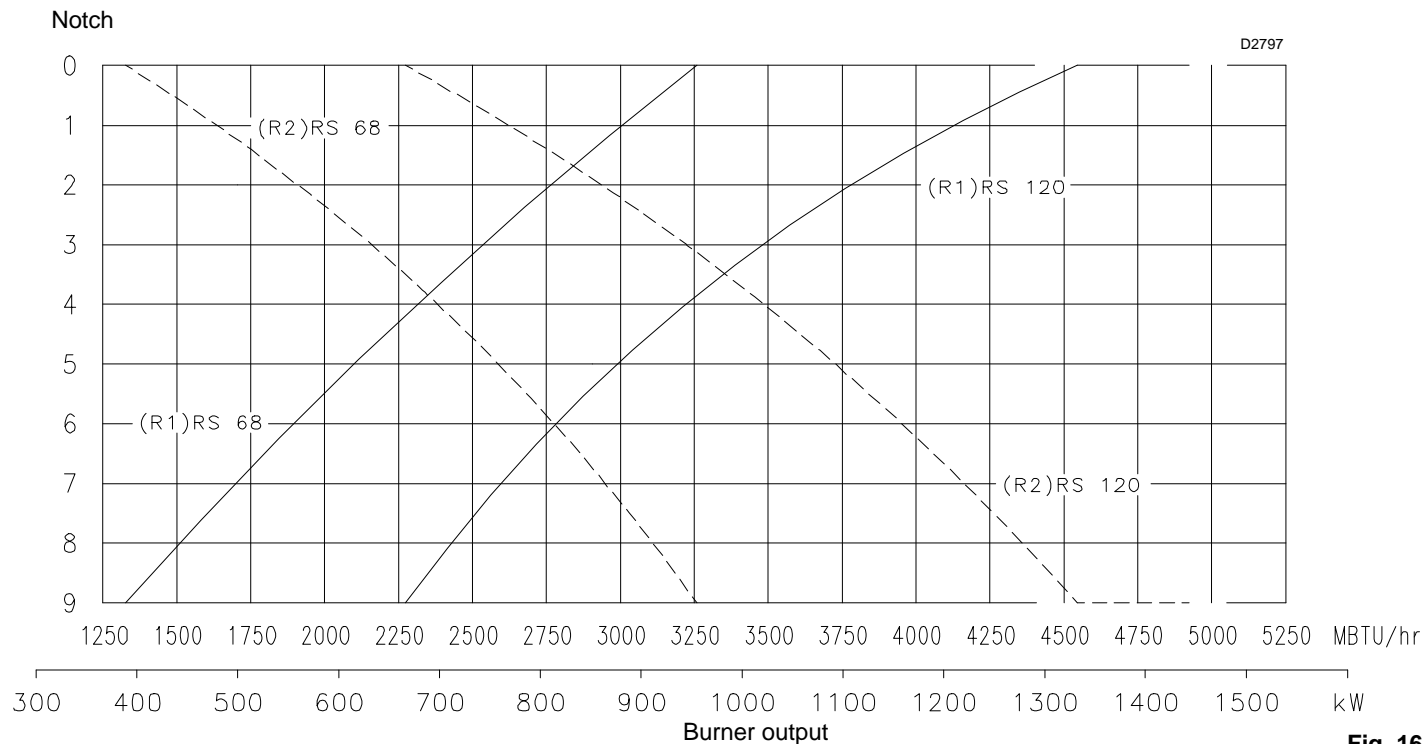
At this point of the installation, the combustion head is fixed to the boiler as shown in Fig. 16.

It is therefore especially easy to adjust, and this adjustment depends only on the maximum output of the burner.

Two adjustments of the head are foreseen:

- air adjustment R1
- gas adjustment R2

In the diagram of Fig. 16, find the notch at which to adjust both air and central gas/air.



**Fig. 16**



### 4.7.1 Air adjustment

Turn screw 4)(Fig. 17) until the notch identified is aligned with the front surface 5)(Fig. 17) of the flange.



**CAUTION**

To facilitate adjustment, loosen the screw 3) (Fig. 17), adjust and then lock.

### 4.7.2 Gas adjustment

- Loosen the 3 screws 4)(Fig. 17) and turn ring 5) until the notch identified is aligned with index 6).
- Tighten the 3 screws 1) fully down.

#### Example

RS 120/E LN, burner output = 3750 MBtu/hr

If we consult diagram (Fig. 17) we find that for this output the adjustments are:

- air: R1 = notch 2;
- gas: R2 = notch 5.

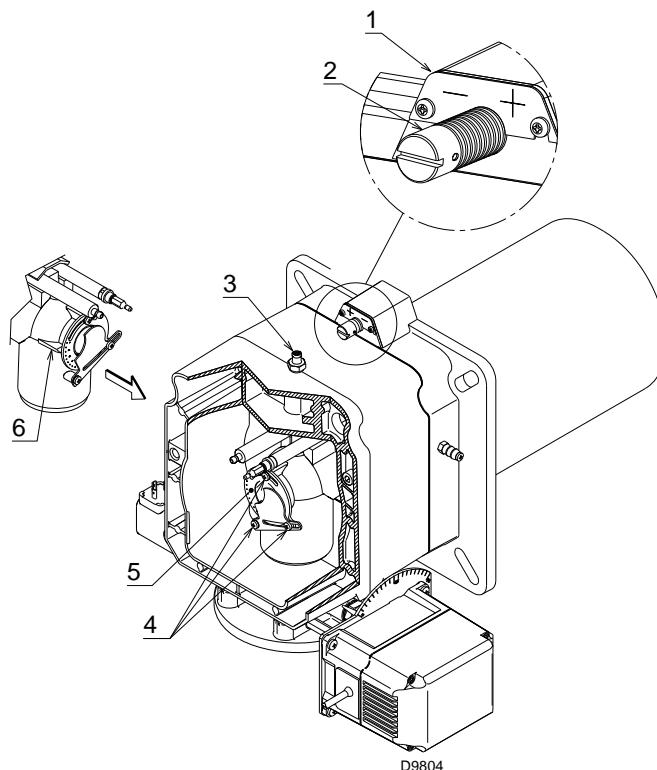
#### Note

Diagram (Fig. 16) indicates an optimal regulation for a type of boiler seen in Fig. 5, page 9.

If the pressure of gas allows it, by closing ring nut (Fig. 5, page 9) a reduction of the formation of NOx is obtained.

Continuing with the previous example, (Fig. 22, page 23) indicates that for burner with output of 3750 MBtu/hr a pressure of approximately 2.8" is necessary at test point 3)(Fig. 17). If this pressure cannot be reached, open the ring 5)(Fig. 17) to notch 4 or 5.

Make sure that the combustion characteristics are satisfactory and free of pulsations.



**Fig. 17**



### 4.7.3 Gas adjustment

- Loosen the 3 screws 4)(Fig. 18) and turn ring 5) until the notch identified is aligned with index 6).
- Tighten the 3 screws 1) fully down.

#### Example

RS 120/EV LN, burner output = 3750 MBtu/hr

If we consult diagram (Fig. 16) we find that for this output the adjustments are:

- air: R1 = notch 2;
- gas: R2 = notch 5.

#### Note

Diagram (Fig. 16) indicates an optimal regulation for a type of boiler seen in Fig. 4, page 9.

If the pressure of gas allows it, by closing ring nut (Fig. 4, page 9) a reduction of the formation of NO<sub>x</sub> is obtained.

Continuing with the previous example, (Fig. 22, page 23) indicates that for burner with output of 3750 MBtu/hr a pressure of approximately 6.0" is necessary at test point 3)(Fig. 17). If this pressure cannot be reached, open the ring 5)(Fig. 17) to notch 4 or 5.

Make sure that the combustion characteristics are satisfactory and free of pulsations.

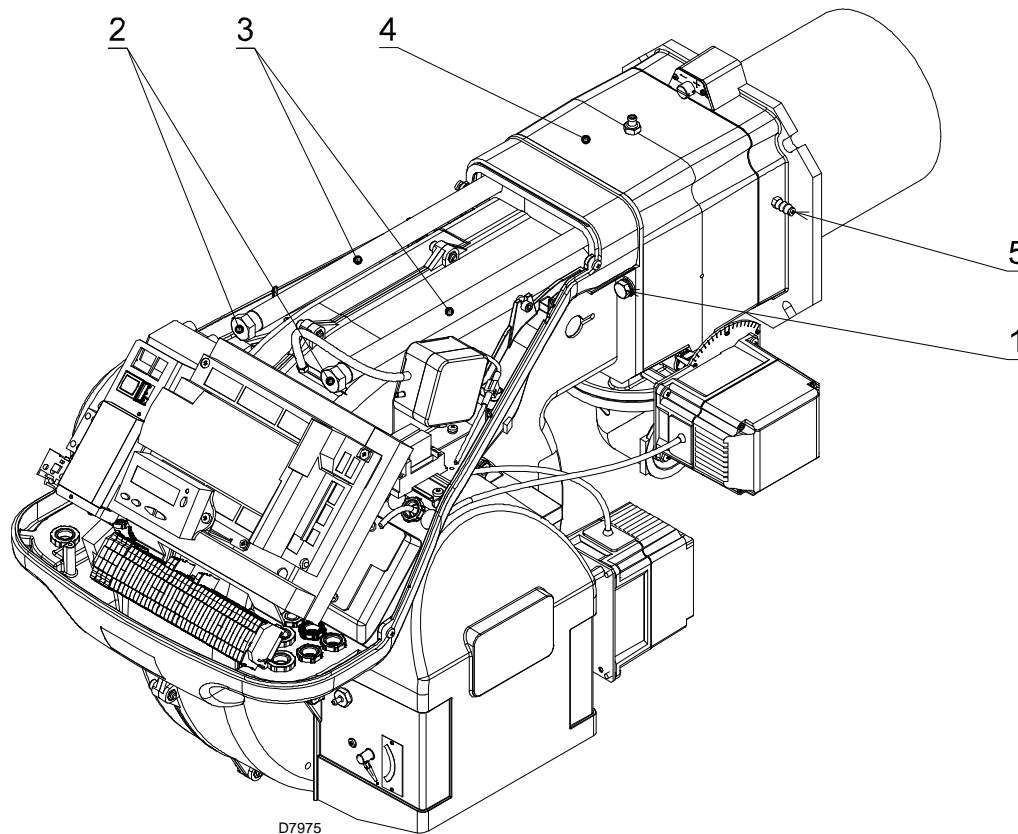
Once the combustion head adjustment is completed:

- slide the burner on the guides 3) at about 4" from the pipe coupling 4) - burner in the position shown in Fig. 12;
- insert the electrode cable, then slide the burner as far as the pipe coupling - burner in the position shown in Fig. 17;
- fix the burner to the pipe coupling with the screws 1).



**CAUTION**

When fitting the burner on the two guides, it is advisable to gently draw out the high voltage cable until they are slightly taut.



D7975

**Fig. 18**



### 4.8 Fuel supply



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 inlet connection 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.

### 4.9 Gas line

This has been type-approved together with the burner, in accordance with regulation NFPA 54/ANSI Z223.1 National Fuel Gas Code, NFPA 58 Liquefied Petroleum Gas Code, and International Fuel Gas Code, and is supplied as standard (for Canadian requirements see CSA 3.4, Cl. 4.2.1.3)(Fig. 21).



Before carrying out maintenance, cleaning or checking operations, identify and close the manual shut-off valve on the gas supply drop-line to the burner.

- The gas train is type-approved according to standard UL 795 and is supplied separately from the burner.
- The gas train can enter the burner from the right or left side, depending on which is the most convenient, see Fig. 19.
- The gas train must be connected to the gas attachment 1) (Fig. 19) with the flange 2), the gasket 3) and the screws 4) supplied with the burner.
- The gas solenoids must be as close as possible to the burner, to ensure that the gas reaches the combustion head within the safety time of 3s.
- Ensure that the maximum pressure necessary for the burner is included in the calibration field of the pressure adjuster (colour of the spring).

The main gas train must be connected to the gas attachment 1) (Fig. 19), using flange 2), gasket 3) and screws 4) supplied with the burner.

The main gas train can enter the burner from the right or left side, see (Fig. 19).

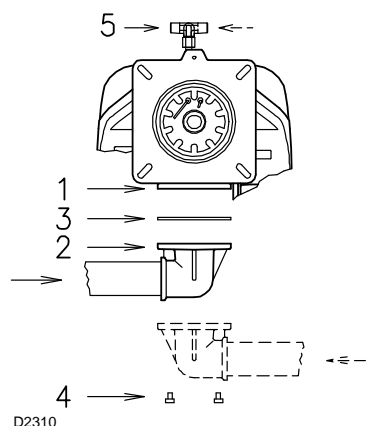
Gas safety shut-off valves 5)-6) (Fig. 20) must be as close as possible to the burner to ensure gas reaches the combustion head within the safety time range.

The pilot gas train must be connected to the gas attachment 5) (Fig. 20) and can enter the burner from the right or left side.



**WARNING**

**See the accompanying instructions for the adjustment of the gas train.**



**Fig. 19**

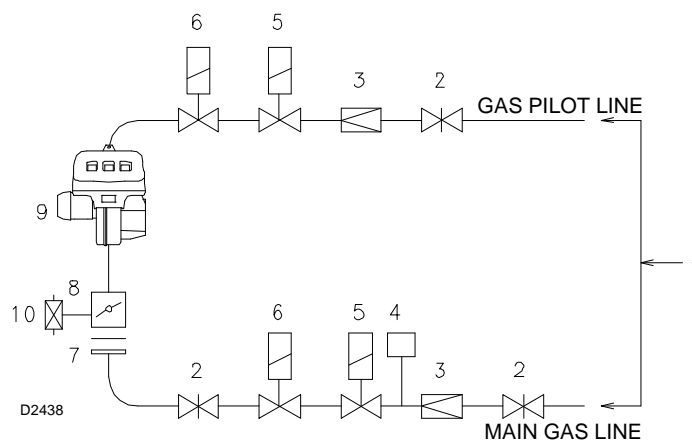
### 4.10 Gas feeding line

It must be type-approved according to required standards and is supplied separately from the burner.

Key (Fig. 20)

- 1 Gas input pipe
- 2 Manual valve
- 3 Pressure regulator
- 4 Minimum gas pressure switch
- 5 1st safety shut off valve
- 6 2nd safety shut off valve
- 7 Standard issue burner with flange gasket
- 8 Gas adjustment butterfly valve (\*)
- 9 Burner
- 10 Maximum gas pressure switch (\*)

(\*) On the burner



**Fig. 20**



#### 4.11 Gas supply pressure

The diagrams (Fig. 22) show minimum load losses at combustion head depending on the maximum burner output operation with natural gas (G 20).

Gas pressure is measured at the test point 1)(Fig. 21), with:

- Combustion chamber at 0 mbar
- Burner working at maximum output
- Ring nut 2) (Fig. 17) adjusted as in the diagram of Fig. 15

##### NOTE

To know the approximate output at which the burner is operating at its maximum:

- subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 21);
- find, in the diagram (Fig. 22) the pressure value closest to the result you want;
- read the corresponding output on the left.

##### Example for RS 120/EV LN

- Maximum output operation
- Natural gas
- Gas ring 2)(Fig. 17, page 20) adjust as indicated in diagram Fig. 16, page 19
- Gas pressure at test point 1)(Fig. 21) = 5.11 "WC
- Pressure in combustion chamber = 1.18 "WC
- 5.11 - 1.18 = 3.93 "WC

A maximum output of 3030 MBtu/hr shown diagrams RS 120/E LN corresponds to 3.93 "WC pressure.

This value serves as a rough guide, the effective delivery must be measured at the gas meter.

##### NOTE

To know the required gas pressure at test point 1) (Fig. 21), set the maximum output required from the burner operation, then:

- find the nearest output value in the table for the burner in question.
- read, on the diagram (Fig. 22), the pressure test point 1) (Fig. 21);
- add this value to the estimated pressure in the combustion chamber.

##### Example for RS 120/EV LN

- Maximum output required: 3750 MBtu/hr
- Ring nut 2) (Fig. 17) adjusted as in the diagram of Fig. 16, page 19
- Gas pressure at output of 2815 MBtu/hr = 6 "WC
- Pressure in combustion chamber = 1.18 "WC
- 6 + 1.18 = 7.15 "WC

pressure required at pressure test point 1) (Fig. 21).

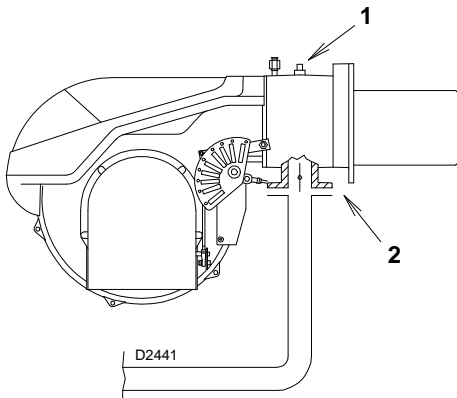


Fig. 21

##### RS 120/EV LN

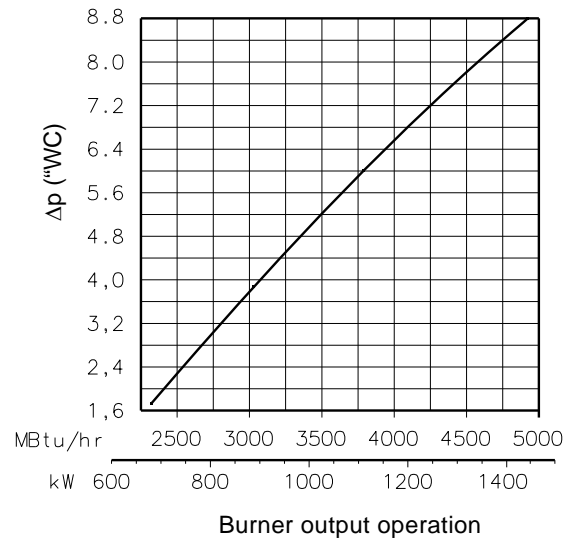


Fig. 22

Δp "wc gas butterfly 2)(Fig. 21)

RS 120/EV LN		
MBtu/hr	kW	Δp "WC
2047	600	0.1
2218	650	0.1
2440	715	0.2
2593	760	0.2
2815	825	0.2
3037	890	0.2
3258	955	0.2
3480	1020	0.3
3719	1090	0.3
3992	1170	0.3
4265	1250	0.4
4335	1300	0.5
4606	1350	0.5
4777	1400	0.5

Tab. L



### 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. 3), 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

$\Delta = 108^{\circ}\text{F} - 68^{\circ}\text{F}$  (reference temp.) = 40°F (equivalent 2000 ft variation)

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

- the corrected capacity is 3847 MBtu/hr

- the corrected burner air pressure is 1.92

#### 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

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



## 2

## CORRECTED BURNER AIR PRESSURE ACCORDING TO ALTITUDE

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

Tab. M



### 4.12 Electrical wiring

#### Notes on safety for the electrical wiring



**DANGER**

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the electrical layouts.
- 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 fuel tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
  - - do not use adapters, multiple sockets or extensions;
  - - use an omnipolar switch with an opening of at least  $\frac{1}{8}$  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.

### 4.13 Electrical connections

Before carrying out any maintenance, cleaning or checking operations:



Before carrying out maintenance, cleaning or checking operations, identify and disconnect the main electrical power to the burner and identify and close the manual shut-off valve on the gas supply drop-line to the burner.



**DANGER**

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



**DANGER**

Close the fuel inlet connection.



**DANGER**

Avoid condensate, ice and water leaks from forming.

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

Use flexible cables in compliance with the National Electrical Code, NFPA 70. (For the Canadian requirements see the statement required in CSA 3.4, Cl. 4.2.1.8).



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



#### 4.13.1 Supply cables and external connections passage

All the cables to be connected to the burner are fed through the grommets. See figure Fig. 23.

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  $\frac{3}{4}$  inch cable grommet
- 2 Available: devices with  $\frac{1}{2}$  inch cable grommet
- 3 Speed sensor cable (used in the factory)
- 4 Available: consents/safety, other devices with  $\frac{3}{8}$  inch cable grommet
- 5 UV cable (used in the factory)
- 6 Available for ground terminals
- 7 Horn
- 8 High gas pressure switch cable (used in the factory)
- 9 Gas actuator cable (used in the factory)
- 10 Air actuator cable (used in the factory)
- 11 Available: devices with  $\frac{1}{4}$  inch grommet
- 12 Air pressure switch negative cable (used in the factory)



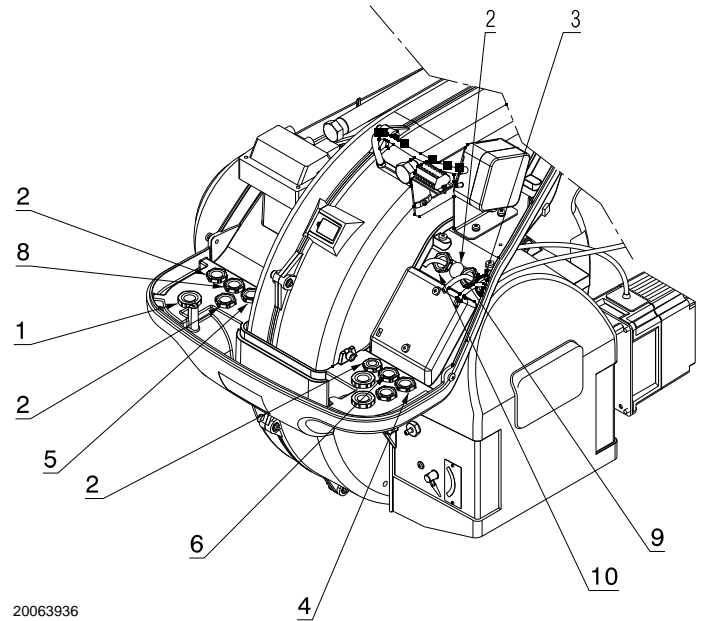
**WARNING**

The control panel is in compliance with UL508A.

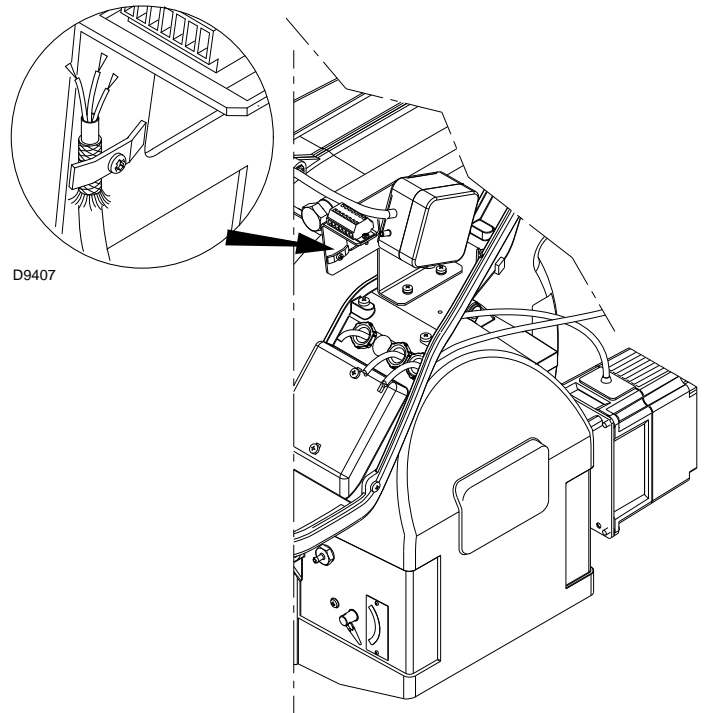


**WARNING**

It is very important to fix the cable shielding as shown in Fig. 24.



**Fig. 23**



**Fig. 24**



### 4.13.2 Adjustment of speed sensor



WARNING

The measurement of speed sensor 1) (Fig. 25) must be respected!



WARNING

It is important that the disc 2) is installed on the burner as shown in the Fig. 26.

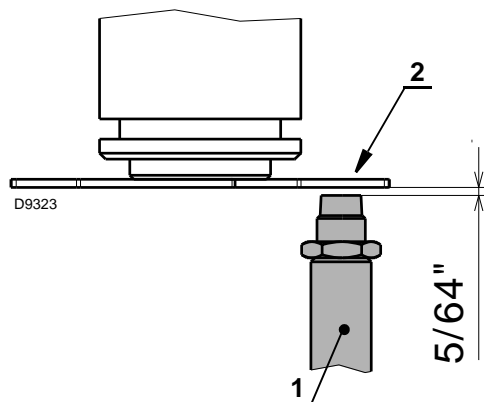
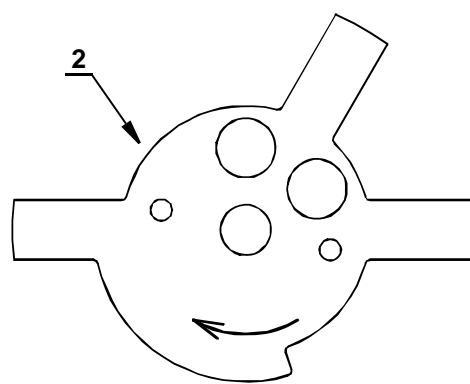


Fig. 25



D9408

Fig. 26



#### 4.14 Motor connection at 208-230 or 460V



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

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

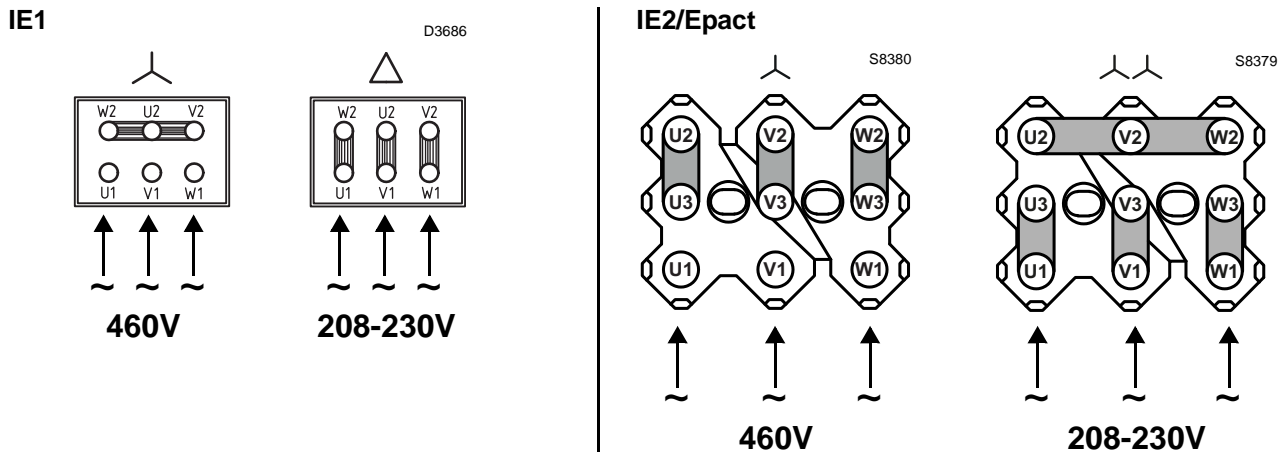


Fig. 27

#### 4.15 Motor connection at 575V



The motors, manufactured for 575V **IE2/Epact** voltage, have the same control box base of the IE1 motors.

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

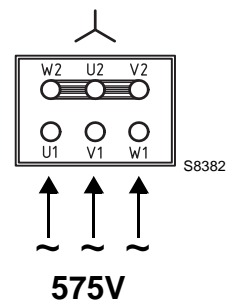


Fig. 28

#### 4.16 Reversible direction



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

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

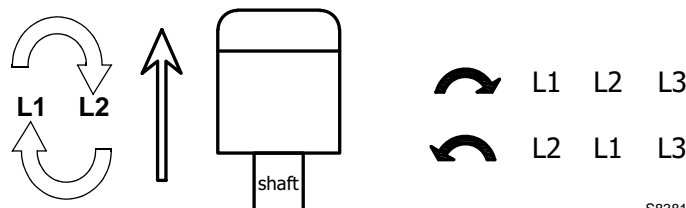


Fig. 29



### 5

### Start-up, calibration and operation of the burner

#### 5.1 Notes on safety for the first start-up



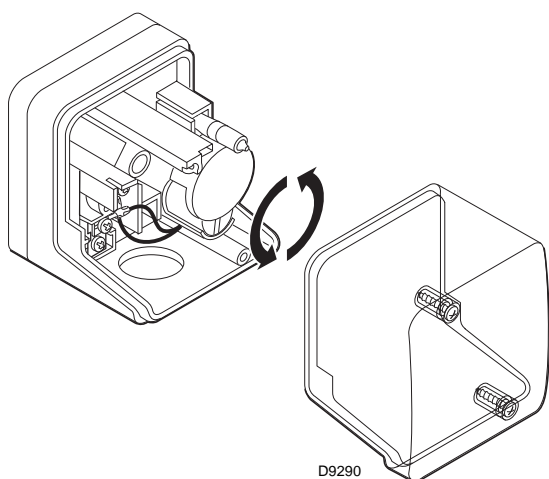
**WARNING**

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.

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

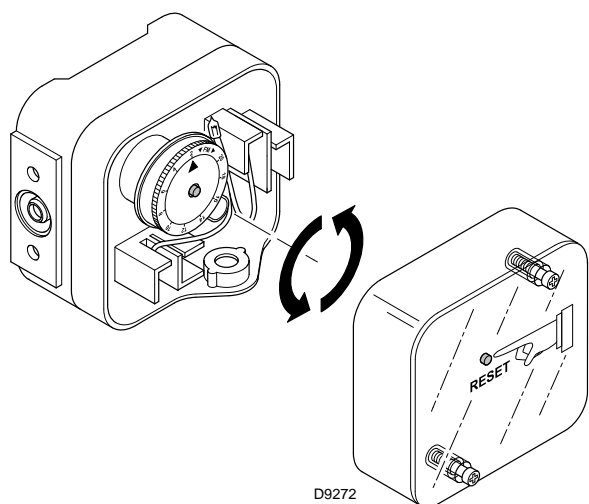
#### 5.2 Operations before start-up

- Ensure that the gas supply company has carried out the supply line vent operations, eliminating air or inert gases from the piping.
- Slowly open the manual valves situated upstream of the gas train.
- Adjust the minimum gas pressure (Fig. 30) switch to the start of the scale.



**Fig. 30**

- Adjust the maximum gas pressure switch (Fig. 31) to the end of the scale.



**Fig. 31**

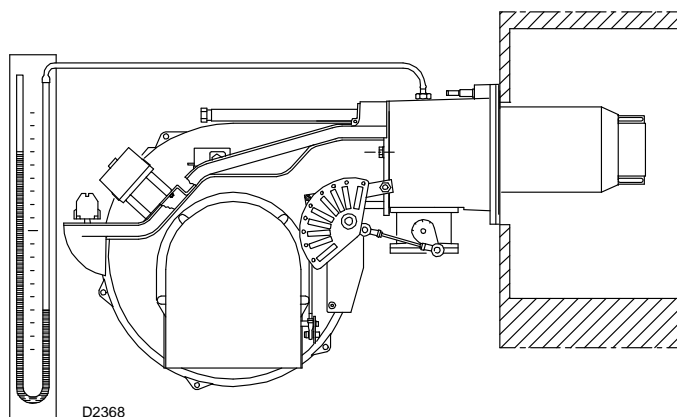
- Adjust the air pressure switch (Fig. 32) to the start of the scale.



**Fig. 32**

- Purge the air from the gas line.  
Fit a U-type manometer (Fig. 33) to the gas pressure test point on the sleeve.  
The manometer readings are used to calculate the MAX. burner power using the diagram on page 23.

Before starting up the burner it is good practice to adjust the gas train so that ignition takes place in conditions of maximum safety, i.e. with gas delivery at the minimum.



**Fig. 33**



## 5.3 Burner start-up

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

Close the thermostats/pressure switches and turn the switch of Fig. 34 to position “LOCAL”.



**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. 34. As soon as the burner starts up, look at the cooling fan of the fan motor and check it is rotating anticlockwise.

If this is not the case:

- place the switch of Fig. 34 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 inverter output.



**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.

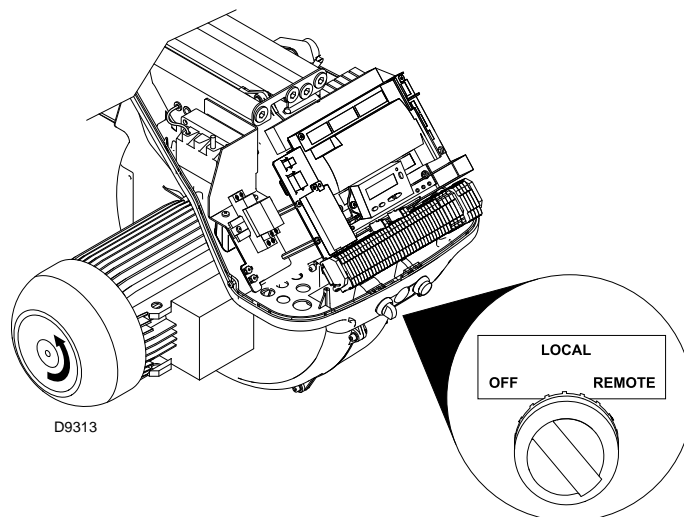


Fig. 34

## 5.4 Final calibration of the pressure switches

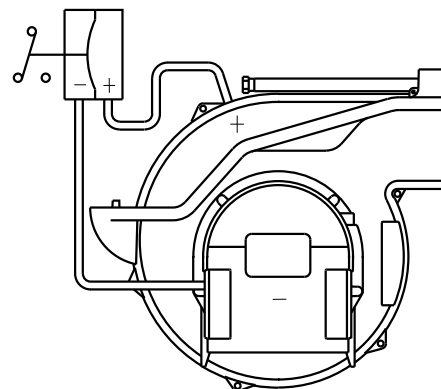
### 5.4.1 Air pressure switch

The air pressure switch is connected in differential (see Fig. 35) and is activated by both the negative pressure of the air intake and the air pressure from the fan.

Adjust the air pressure switch 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.



20048352

Fig. 35



### 5.4.2 Maximum gas pressure switch

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

With the burner operating at MAX output, reduce the adjustment pressure by slowly turning the adjustment dial anticlockwise until the burner locks out.

Then turn the dial clockwise by 0.8" WC and repeat burner firing.

If the burner locks out again, turn the dial again clockwise by 0.4" WC. Minimum gas pressure switch

Adjust the minimum gas pressure switch after having performed all the other burner adjustments with the pressure switch set at the start of the scale (Fig. 37).

With the burner operating at MAX output, increase adjustment pressure by slowly turning the relative dial clockwise until the burner locks out.

Then turn the dial anti-clockwise by 0.8" WC and repeat burner starting to ensure it is uniform.

If the burner locks out again, turn the dial anti-clockwise again by 0.4" WC.

### 5.4.3 Minimum gas pressure switch

Adjust the minimum gas pressure switch (Fig. 37) after having performed all the other burner adjustments with the pressure switch set at the start of the scale.

With the burner operating at MAX output, increase adjustment pressure by slowly turning the relative dial clockwise until the burner locks out.

Then turn the dial anti-clockwise by 0.8" WC and repeat burner starting to ensure it is uniform.

If the burner locks out again, turn the dial anti-clockwise again by 0.4" WC.

## 5.5 Flame signal measurement

Check the flame signal through the parameter 954, as indicated in Fig. 38. 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. 38) shows parameter **954**: flashing on the left.

## 5.6 Final checks (with the burner working)

- Open the thermostat/pressure switch TL:
- Open the thermostat/pressure switch TS:

#### The burner must stop

- Rotate the maximum gas pressure switch knob to the minimum end-of-scale position.
- Rotate the air pressure switch knob to the maximum end-of-scale position.

#### The burner must stop in lockout

- Switch off the burner and disconnect the voltage.
- Disconnect the minimum gas pressure switch connector.

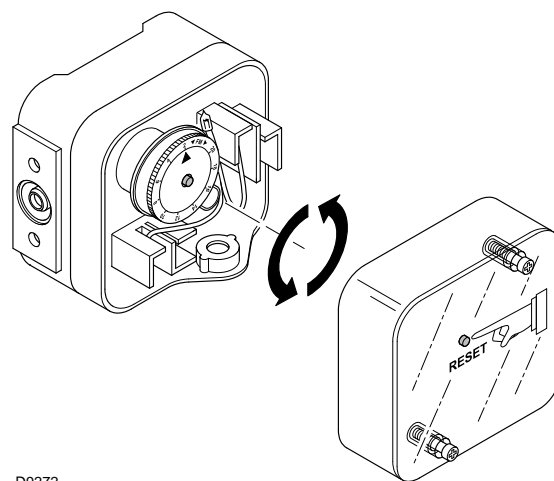
#### The burner must not start

- Cover the UV flame sensor.

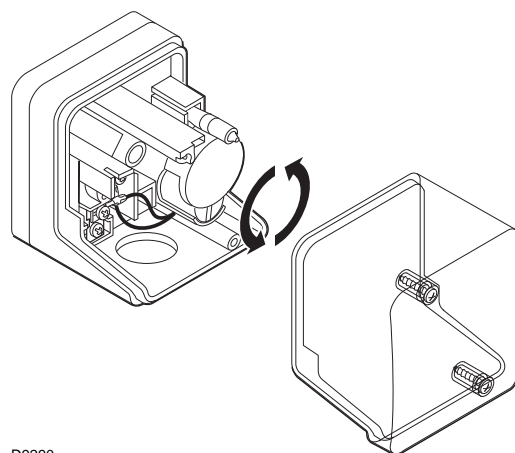
#### The burner must stop in lockout due to firing failure

On the right, the flame's intensity is displayed as a percentage.

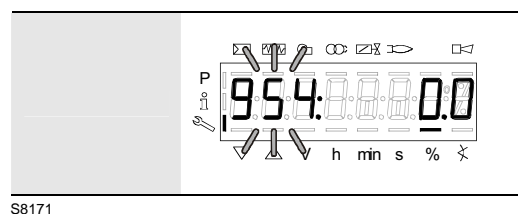
Example: **954: 0.0**



**Fig. 36**



**Fig. 37**



**Fig. 38**

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



**WARNING**

After the installation, verify all the safety conditions: pipe-line leakage, draft, adequacy and stability of main flame at all allowable firing rates and sudden changes in firing rate, performance and gas tightness of all safety shut-off valves.



Cover plates, enclosures, and guards must be maintained in place at all times, except during maintenance and servicing.



## 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.



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

Before carrying out any maintenance, cleaning or checking operations:



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



Close the fuel inlet connection.



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.

**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 most care should be exercised during maintenance.

**Combustion head**

Open the burner and make sure that all components of the combustion head are in good condition, not deformed by the high temperatures, free of impurities from the surroundings and correctly positioned.

**Burner**

Check that there are not excess wear or loosen screws.  
Clean the outside of the burner.

**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.

**Electrical Wiring**

Check that the burner and gas train electrical connections are correct.

**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.

**Gas leaks**

Make sure that there are no gas leaks in the following areas:

- on the meter-burner pipework
- on the mixer/valve connection
- on the burner fastening flange where the seal is fitted.

**Electrode unit**

Make sure neither the electrodes nor probe feature marked warping or oxidation on surfaces. Make sure distances are still in line with those indicated in this manual, readjusting to the right values where necessary. Where necessary, remove oxide from the surface of the probe with abrasive paper.

**Gas train**

Check valve setting and proportionality of operation by analysing flue gases. Check the valve/manifold compensation pipe.

**Gas filter**

Change the gas filter when it is dirty.

**Combustion**

In case the combustion values found at the beginning of the intervention do not respect the standards in force or, in any case, do not correspond to a proper combustion, contact the Technical Assistant in order to carry out the necessary adjustments.



### 6.3 Recommended preventive maintenance schedule

Operation and maintenance instructions are intended for general applications. For specific operating and maintenance instructions, consult the equipment manufacturer.

Test/Inspection	Frequency
Check gages, monitors, and indicators	DAILY
Check instrument and equipment settings	DAILY
Check burner flame	DAILY
Check igniter	WEEKLY
Check flame signal strength	WEEKLY
Check flame failure detection system	WEEKLY
Check firing rate control	WEEKLY
Make aural and visual check of pilot and main fuel valves	WEEKLY
Check flue, vent, stack, or outlet dampers	MONTHLY
Test low draft, fan air pressure, and damper position interlocks	MONTHLY
Check low-fire start interlock	MONTHLY
Test high and low gas pressure interlocks	MONTHLY
Recalibrate all indicating and recording gages	SEMI-ANNUALLY
Check flame failure detection system components	SEMI-ANNUALLY
Check firing rate control	SEMI-ANNUALLY
Check piping and wiring of all interlocks and shutoff valves	SEMI-ANNUALLY
Inspect burner components	SEMI-ANNUALLY
Flame failure detection system, test for hot refractory hold-in	ANNUALLY
Replace flame rod in accordance with manufacturer's instructions	ANNUALLY
Conduct a combustion test	ANNUALLY
Check all coils and diaphragms; test other operating parts of all safety shutoff and control valves	ANNUALLY
Test fuel valve interlock switch in accordance with manufacturer's instructions	ANNUALLY
Perform leakage test on pilot and main gas valves	ANNUALLY
Test purge air switch in accordance with manufacturer's instructions	ANNUALLY
Test low-fire start interlock in accordance with manufacturer's instructions	ANNUALLY
For gas-fired burners, check sediment trap and gas strainers	AS REQUIRED
Flame failure detection system, test for hot refractory hold in	AS REQUIRED

Tab. N



## 6.4 Opening the burner



**Disconnect the electrical supply from the burner.**



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



Close the fuel inlet connection.



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

In order to open the burner, proceed as follows:

- loosen the 4 screws 1) (Fig. 39) and remove the hood 2);
- install the 2 extensions 9) on the guides 4) and re-screw the screws 8) (only for long head version);
- remove the screws 3) and pull back the burner on the guides 4) of about 4";
- disconnect the electrode lead, then unthread the burner completely from the guides;
- remove the screw 6) and extract the inner part 5) of the head.

## 6.5 Closing the burner

In order to close the burner, re-install all components with reverse procedure:

- remove the 2 extensions 9) and re-screw the screws 8) on the guides 4) ;
- push the burner up to approximately 4" from the pipe coupling;
- reinsert the electrode lead and slide the burner as far as the stop.
- fix the screws 3) to secure the burner to the combustion head;
- fix the 4 screws 1) to install the hood 2).

Connect the electrical supply from the burner.



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

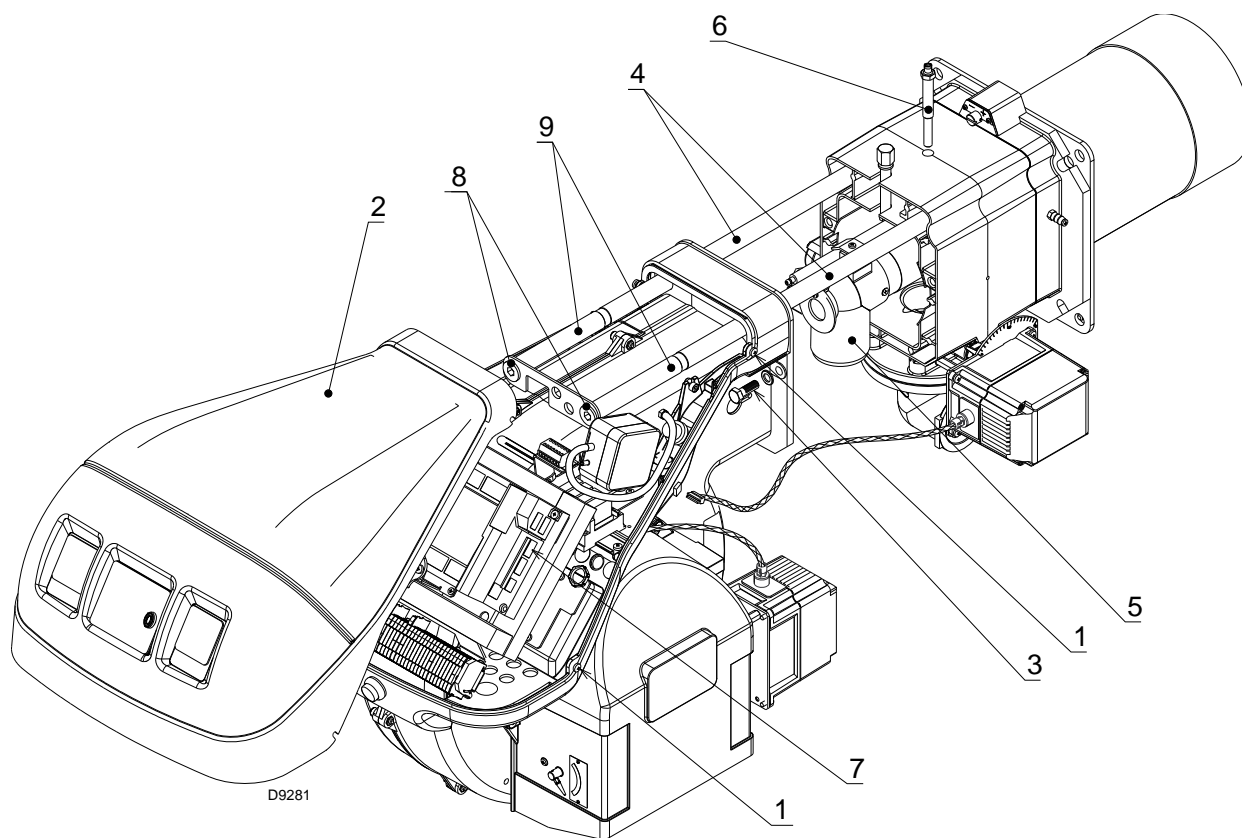
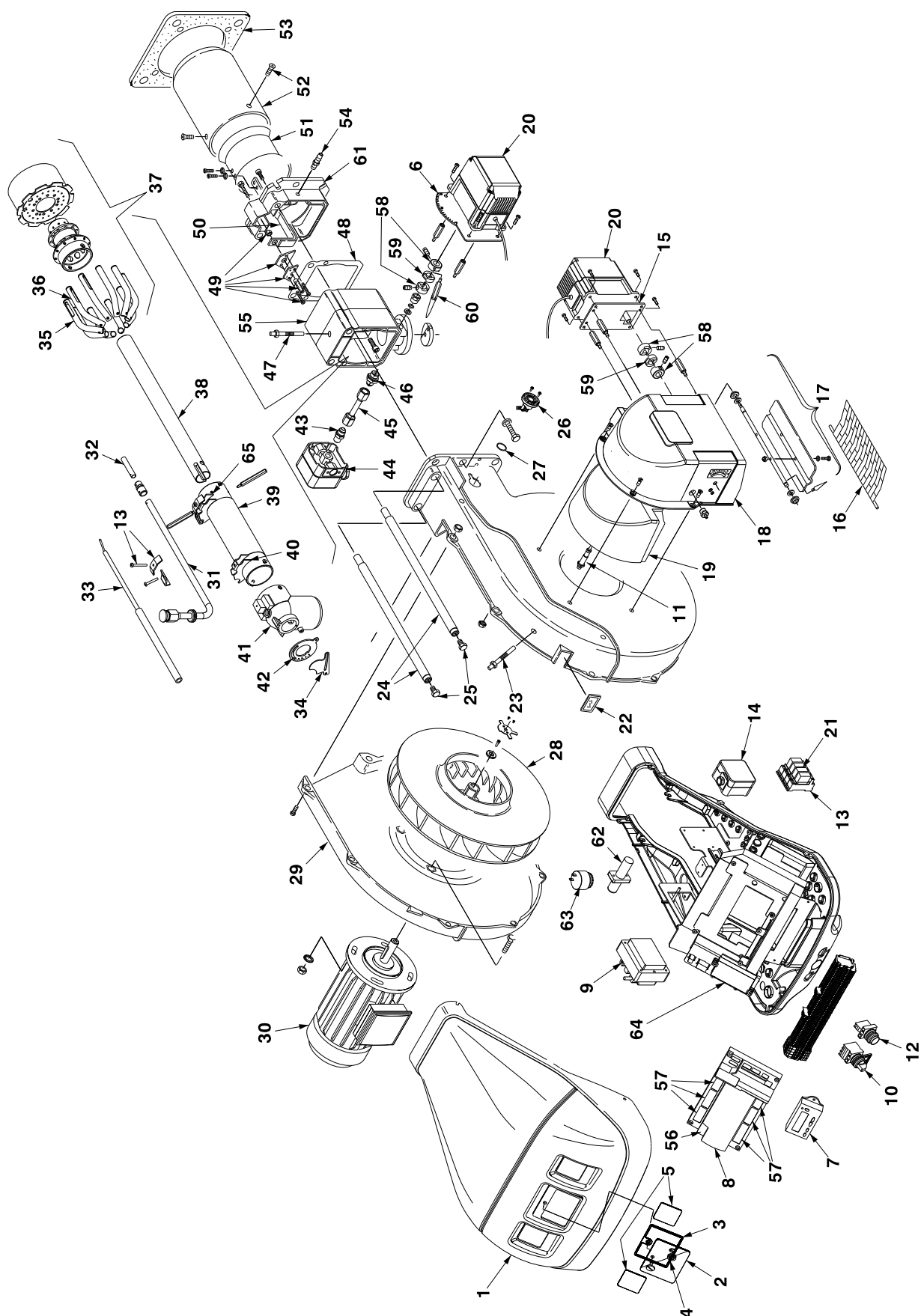


Fig. 39



A

### Appendix - Spare parts





N.	CODE	DESCRIPTION	*
1	3013921	COVER	B
2	3012794	INSPECTION WINDOW	
3	3013924	SEAL	B
4	3013923	BUTTON	
5	3013925	VIEWING PORT	
6	3014081	BRACKET	
7	20010967	AZL DISPLAY	
8	20010968	ELECTRONIC CAM	C
9	3012956	TRANSFORMER	
10	20010963	SWITCH	
11	3013501	SPEED SENSOR	
12	20010962	SWITCH	
13	3012841	BASE	
14	3012948	AIR PRESSURE SWITCH	A
15	3014080	BRACKET	
16	3003949	PROTECTION	
17	3013929	AIR DAMPER ASSEMBLY	
18	3013930	AIR INTAKE	
19	3003952	SOUND DAMPING	
20	20008601	SERVOMOTOR	B
21	20010969	RELAY	C
22	3003763	INSPECTION WINDOW	
23	3003891	CONNECTOR	C
24	3012013	BAR	C
25	3003481	SCREW	
26	3013933	INSPECTION WINDOW	
27	3013934	O-RING	B
28	3012403	FAN	C
29	3012012	HALF-SHELL	
30	20062892	MOTOR	C
31	20039760	TUBE	
32	3012974	IGNITION PILOT TUBE	C
33	3013081	ELECTRODE	A
34	3012014	SHUTTER	
35	3012925	TUBE	
36	3013087	U BOLT	C
36	3013083	TUBE	
37	3013085	DISTRIBUTOR	
38	3012035	INTERIOR TUBE	
39	3013088	EXTERIOR TUBE	
40	20038241	SUPPORT	A
41	3012412	ELBOW	
42	3014135	RING NUT	
43	3013055	SEAL	B
44	3012969	GAS PRESSURE SWITCH	A
45	3013055	TUBE	
46	3003220	CONNECTOR	C
47	3012049	SCREW	
48	3012735	SEAL	B
49	3012618	CONTROL DEVICE	C
50	3012414	SQUARE	



N.	CODE	DESCRIPTION	*
51	3012417	SHUTTER	C
52	3012415	END CONE	B
53	3003991	FLANGE GASKET	A
54	3003322	CONNECTOR	C
55	20043700	MANIFOLD	
56	3006211	FUSE	A
57	3013940	CONNECTORS ASSEMBLY	B
58	3013937	HUB	
59	3014011	DISC	A
60	3013939	INDEX	
61	3012413	FRONT PIECE	
62	3003396	UV PHOTOCELL	A
63	20031413	HORN	
64	20010972	RWF40 ASSEMBLY	
65	3013087	U BOLT	C

**\***

**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 (optional)**

- Tubes kit**

Burner	Code
RS 120/EV LN	3010248

- Gas train according to UL Standards**

**WARNING**

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











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