GB

Dual fuel light oil/ gas burners

Progressive two stage or modulating operation

CODE	MODEL
20124937 - 20124938 - 20124940	RLS 310/EV
20124941 - 20124942 - 20124943	RLS 410/EV
20124954 - 20124956 - 20124959	RLS 510/EV

20120900 (8) - 10/2023

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;

.....

– the address and telephone number of the nearest Assistance Centre

.....
.....
.....

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

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 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;
➤ 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 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 Burner models designation

Model	Code	Code RBNA	Voltage	Fan motor starting	Flame safeguard
RLS 310/EV	20114123	20124937	230/3/60	Inverter	Burner mounted
		20124938	460/3/60		
	20122422	20124940	575/3/60		
RLS 410/EV	20114124	20124941	230/3/60	Inverter	Burner mounted
		20124942	460/3/60		
	20122423	20124943	575/3/60		
RLS 510/EV	20114125	20124954	230/3/60	Inverter	Burner mounted
		20124956	460/3/60		
	20122426	20124959	575/3/60		

Tab. A

3.2 Technical data

Model			RLS 310/EV		
Output delivery (1)	High	kW	1,026	3,986	3,587*
		Mbtu/hr (4)	3,500	13,600	12,240*
		GPH	25.0	97.1	87.4*
	Low	kW	403	-	-
		Mbtu/hr (4)	1,375	-	-
		GPH	9.8	-	-
Fuel			Oil n°2		
			Natural gas		
Gas max. delivery		SCFH	13,465		
Gas pressure at max delivery (2)		"WC	19.5		
Operation			Low-high or modulating		
Nozzles			1		
Standard applications			Boilers: water, steam, thermail oil		
Ambient temperature		°F	32-104 (0-40°C)		
Combustion air temperature		°F Max.	140 (60°C)		
Pump: - Delivery (at 300 PSI)		GPH	218		
- Pressure range		PSI	102 - 580		
- Fuel temperature		°F Max.	302 (150°C)		
Noise level (gas) (3) Noise level (oil) (3)		dBA	78.7 79.3		

Tab. B

Model			RLS 410/EV			RLS 510/EV		
Output delivery (1)	High	kW	1,172	4,719	4,247*	1,465	5,627	5,064*
		Mbtu/hr (4)	4,000	16,100	14,490*	5,000	19,200	17,280*
		GPH	28.6	115	103.5*	35.7	137.1	123.4*
	Low	kW	479	-	-	586	-	-
		Mbtu/hr (4)	1,635	-	-	2,000	-	-
		GPH	11.7	-	-	14.3	-	-
Fuel			Oil n°2					
			Natural gas					
Gas max. delivery		SCFH	15,941			19,010		
Gas pressure at max delivery(2)		"WC	26.0			32.6		
Operation			Low-high or modulating					
Nozzles			1					
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 300 PSI)		GPH	290			403		
- pressure range		PSI	102 - 580			102 - 435		
- fuel temperature		°F Max.	302 (150°C)					
Noise level (3)	Sound pressure Sound power	dBA	82.9 83.4			83.6 84.1		

Tab. C

(*) Firing Rate for C-ETL Canadian Listing

(1) Reference conditions: ambient temperature 68 °F (20°C) - Barometric pressure 394” WC - Altitude 329 ft.

(2) Pressure at test point 5)(Fig. 3 on page 11) with zero pressure in the combustion chamber and maximum burner output.

(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 accurate “Accuracy: Category 3”, as described by EN ISO 3746”.

(4) Equivalent Btu values based on 1 USGPH = 140,000 Btu/hr.

3.3 Electrical data

Fan motor and pump motor IE3/NEMA PREMIUM EFFICIENCY

Model		RLS 310/EV	
Control circuit power supply	V/Ph/Hz	120/1/60	
Main power supply (+/- 10%)	V/Ph/Hz	230-460/3/60	575/3/60
Fan motor	rpm HP V A	3540 10.2 230/460 24-12	3540 10.2 575 9.6
Pump motor	rpm HP V A	3515 2 230/460 5.6-2.8	3515 2 575 2.3
Ignition transformer Gas Pilot	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1,6 A - 20 mA	
Electrical power consumption	W	10,050	10,050
Electrical control circuit consumption	W max	750	
Total electrical consumption	W	10,800	10,800
Electrical protection		NEMA 3	

Model		RLS 410/EV		RLS 510/EV	
Control circuit power supply	V/Ph/Hz	120/1/60			
Main power supply (+/- 10%)	V/Ph/Hz	230-460/3/60	575/3/60	230-460/3/60	575/3/60
Fan motor	rpm HP V A	3545 12.4 230/460 29/14.5	3545 12.4 575 11.6	3535 14.8 230/460 35.4/17.7	3535 14.8 575 14.2
Pump motor	rpm HP V A	3515 2 230/460 5.6/2.8	3515 2 575 2.3	3515 2 230/460 5.6/2.8	3515 2 575 2.3
Ignition transformer Gas Pilot	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA			
Electrical power consumption	W	11,950	11,950	13,950	13,950
Electrical control circuit consumption	W max	750			
Total electrical consumption	W	12,700	12,700	14,700	14,700
Electrical protection		NEMA 3			

Tab. D

3.4 Packaging - weight - Approximate measurements

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 Tab. E.

The weight of the burner complete with its packaging is shown in Tab. E.

inch	A	B	C	lbs
RLS 310/EV	$94^{1}/_{2}$"	$62\ ^{13}/_{16}$"	$60^{1}/_{4}$"	660
RLS 410/EV	$94^{1}/_{2}$"	$62\ ^{13}/_{16}$"	$60^{1}/_{4}$"	660
RLS 510/EV	$94^{1}/_{2}$"	$62\ ^{13}/_{16}$"	$60^{1}/_{4}$"	660

Tab. E

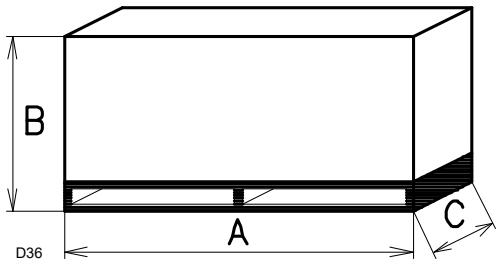
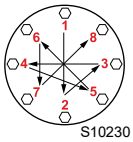


Fig. 1

3.5 Standard equipment

Flange gasket . . . . . No. 1
Flange fixing screws (M18 x 60) . . . . . No. 4
Gas train flange gasket . . . . . No. 1
Gas train flange gasket . . . . . No. 2
Gas train flange fixing screws (M16x70) . . . . . No. 8
Instructions . . . . . No. 1

It is recommended to tighten the screws of the gas flange with a tightening torque of **40** Nm ±10%.



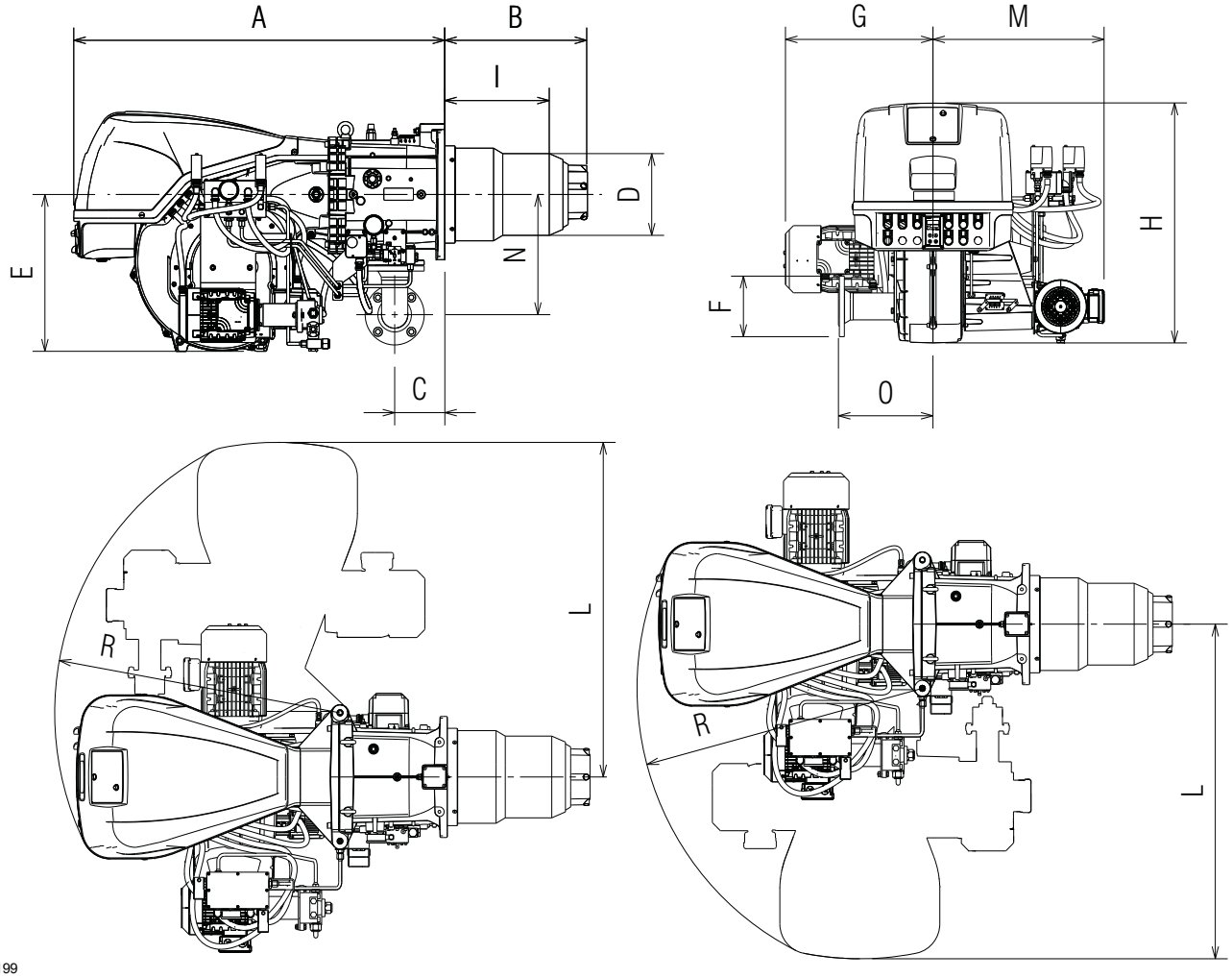
Tighten the nuts gradually (first to 30%, then to 60% up to 100%) according to the cross pattern shown in the figure.

3.6 Burner dimensions

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

Bear in mind that inspection of the combustion head requires the burner to be opened by rotating the rear part on the hinge.

The overall dimensions of the burner when open are indicated by L and R.



20123199

Fig. 2

inch	A	B	C	D	E	F	G	H	I	L	M	N	O	R
RLS 310/EV	49 3/4"	20 23/64"	6 11/16"	12 21/64"	20 1/2"	ANSI 3"	20 1/4"	31"	14 11/16"	43 25/32"	25 11/16"	15 5/8"	12 19/32"	38"
RLS 410/EV	49 3/4"	20 23/64"	6 11/16"	12 21/64"	20 1/2"	ANSI 3"	22 1/4"	31"	14 11/16"	43 25/32"	25 11/16"	15 5/8"	12 19/32"	38"
RLS 510/EV	49 3/4"	20 23/64"	6 11/16"	12 21/64"	20 1/2"	ANSI 3"	22 1/4"	31"	14 11/16"	43 25/32"	25 11/16"	15 5/8"	12 19/32"	38"

Tab. F

3.7 Burner description

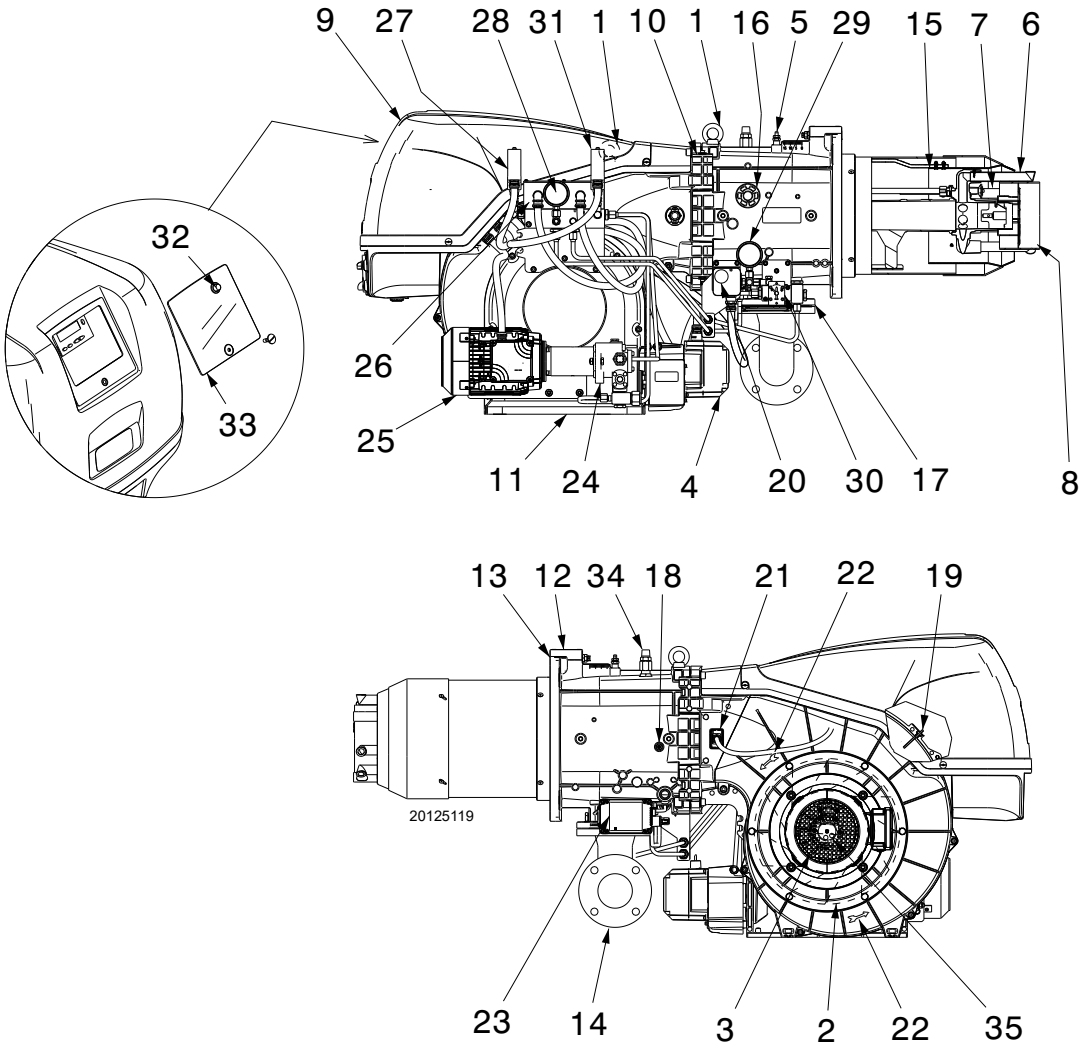


Fig. 3

1 Lifting eyebolts
2 Fan
3 Fan motor
4 Air gate valve servomotor
5 Gas pressure test point
6 Combustion head
7 Ignition pilot
8 Flame stability disk
9 Electric panel board - cover
10 Hinge for opening burner
11 Air inlet to fan
12 Manifold
13 Thermal insulation screen for securing burner to boiler
14 Gas train flange
15 Shutter
16 Flame inspection window
17 Gas butterfly valve
18 Combustion head air pressure test point
19 Air pressure test point “+”
20 Max gas pressure switch with pressure test point
21 Flame detector
22 Indication for checking the fan motor rotation
23 Oil modulator and gas butterfly valve servomotor
24 Pump
25 Pump motor
26 Valve group (see Fig. 4 on page 12)
27 Minimum oil pressure switch
28 Nozzle delivery pressure gauge
29 Nozzle return pressure gauge
30 Oil modulator
31 Maximum oil pressure switch
32 Reset button
33 Transparent protection
34 Pilot gas train attachment
35 Motor speed sensor

WARNING

The burner can be opened either on the right or left sides, irrespective of the side from which fuel is supplied. When the burner is closed, the hinge can be re-positioned on the opposite side.

3.7.1 Panel board description

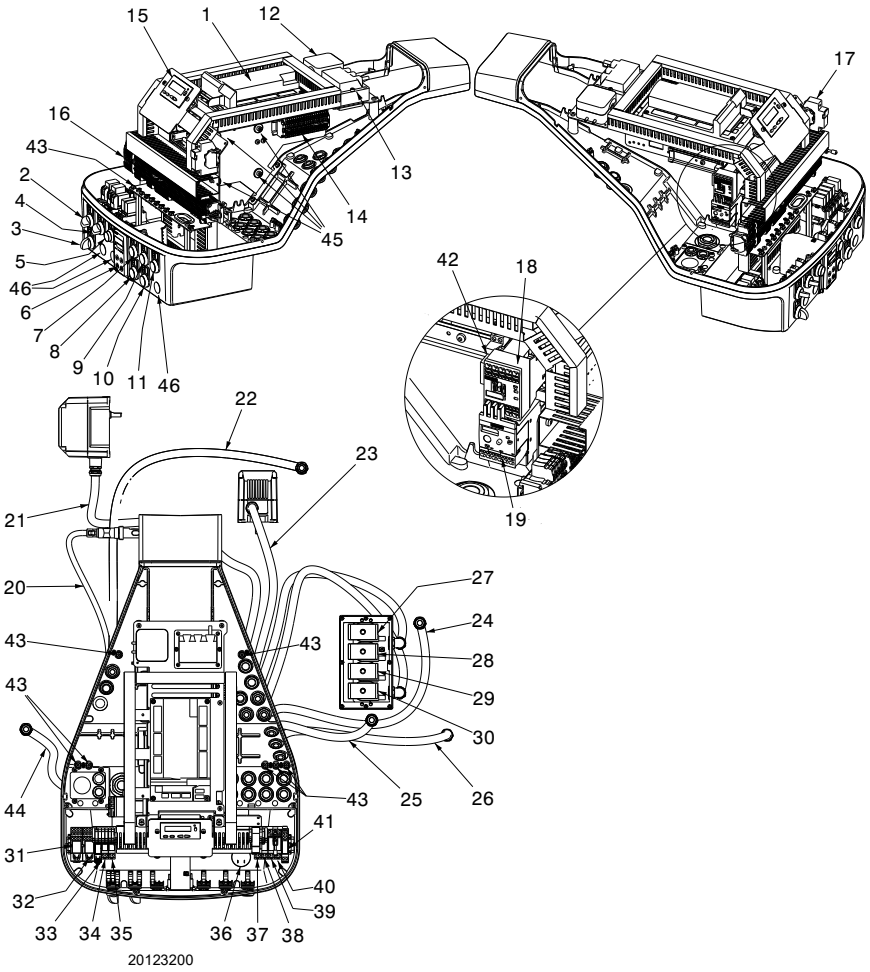


Fig. 4

1 Electronic cam
2 ON/OFF selector
3 OIL/OFF/GAS selector
4 LOCAL/REMOTE selector
5 ALARM SILENCE push-button
6 Output power regulator
7 POWER ON light signal
8 IGNITION ON light signal
9 CALL FOR HEAT light signal
10 FUEL ON light signal
11 ALARM light signal
12 Air pressure switch
13 Ignition transformer
14 Valve group terminal board
15 Operator panel with LCD display
16 Main terminal supply board
17 Auxiliary circuits fuse
18 Pump motor contact maker
19 Pump motor thermal relay (with reset button)
20 Flame sensor sheath
21 Fuel servomotor sheath
22 Maximum gas pressure switch sheath
23 Air servomotor sheath
24 Maximum oil pressure switch sheath
25 Minimum oil pressure switch sheath
26 Pump motor cables sheath
27 VS1Oil return safety solenoid valve
28 VROil return solenoid valve
29 UFOil delivery safety solenoid valve
30 UFOil solenoid valve
31 KO1 oil timer module and relay
32 KG1 gas timer module and relay
33 KP oil pump timer module and relay
34 KG2 auxiliary gas relay
35 KVP auxiliary fan/oil pump relay
36 AH horn
37 K1 auxiliary flame alight relay
38 K3 auxiliary alarm relay
39 K5 auxiliary burner lock out relay
40 K6 auxiliary inverter alarm relay
41 K2 auxiliary remote position relay
42 KMV auxiliary fan relay
43 Earth terminal
44 Fan motor earth sheath
45 Available for step down transformer
46 Available

Three types of burner failure may occur:

➤ **Flame safeguard lock-out**

If the flame safeguard alarm 6)(Fig. 4) lights up, it indicates that the burner is in lock-out. To reset, press the reset pushbutton.

➤ **Pump motor trip**

Release by pressing the push-button on thermal overload 19)(Fig. 4). See “Thermal relay calibration” on page 35

WARNING

The connection of the inverter kits must be carried out by the customer/ installer following the instructions (electrical drawing) provided with the burner and the kits.

3.8 Firing rates

Maximum output must be selected in the hatched area of the diagram (Fig. 5).

Minimum output must not be lower than the minimum limit shown in the diagram.

WARNING

The firing rate area values have been obtained considering an ambient temperature of 68 °F, and an atmospheric pressure of 394" WC and with the combustion head adjusted as shown on page 23.

Model	MBtu/hr
RLS 310/EV	3,500
RLS 410/EV	4,000
RLS 510/EV	5,000

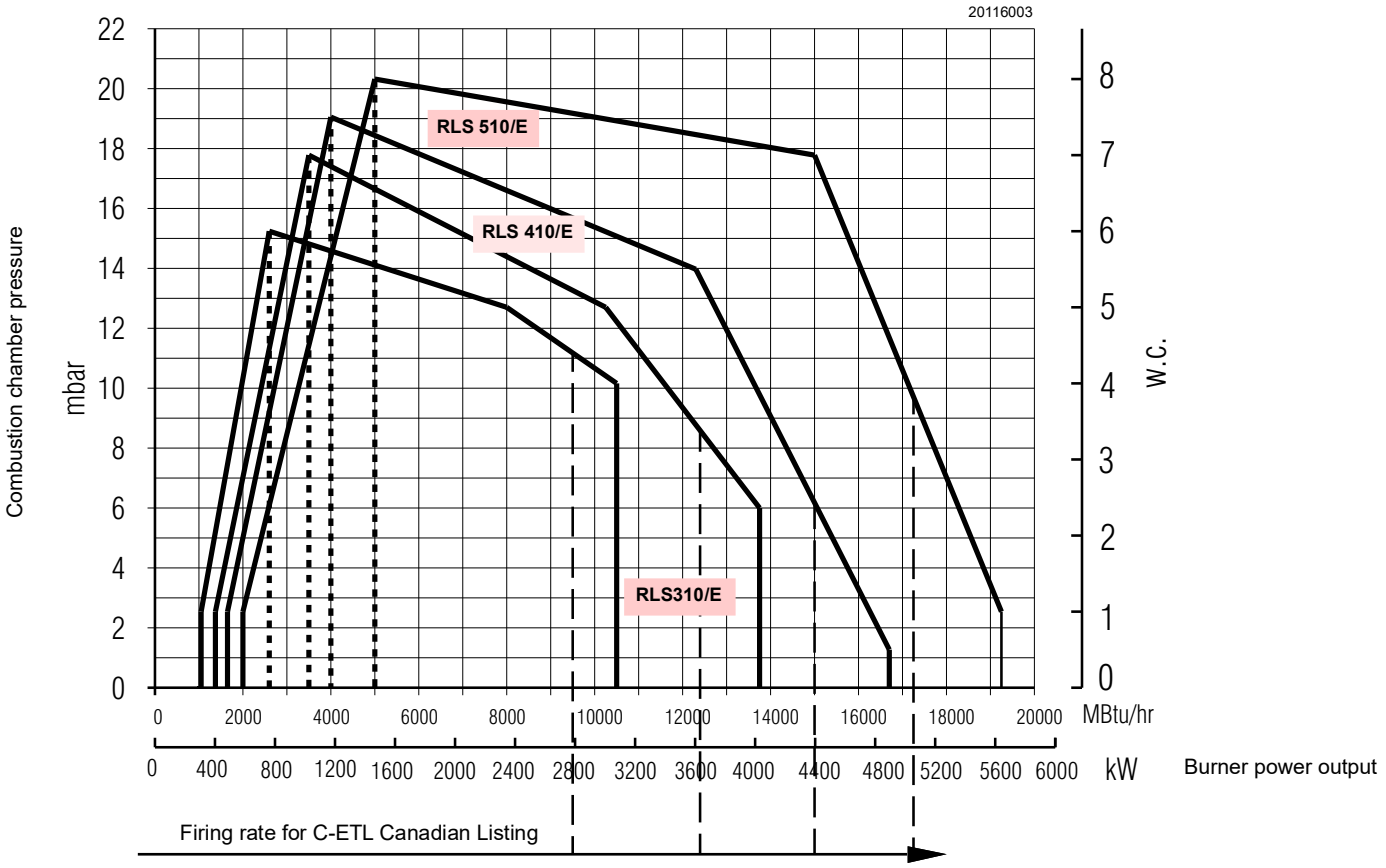


Fig. 5

3.8.1 Procedure to refer burner operating condition at an altitude and/or at a combustion supporter air temperature different to the standard values (328 ft above sea level, 68 °F).

				AIR TEMPERATURE								
Altitude	Altitude	bar. press.	bar. press.	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**40**	**°C**
ft a.s.l.	m a.s.l.	"w.c.	mbar	**32**	**41**	**50**	**59**	**68**	**77**	**86**	**104**	**°F**
0	0	399	1013,00	1,087	1,068	1,049	1,031	1,013	0,996	0,980	0,948	
328	100	394	1000,00	1,073	1,054	1,035	1,017	**1,000**	0,983	0,967	0,936	
1.000	305	385	977,40	1,049	1,030	1,012	0,994	0,977	0,961	0,945	0,915	
2.000	610	371	942,80	1,012	0,994	0,976	0,959	0,943	0,927	0,912	0,883	
3.000	915	358	908,20	0,975	0,957	0,940	0,924	0,908	0,893	0,878	0,850	
4.000	1.220	345	875,80	0,940	0,923	0,907	0,891	0,876	0,861	0,847	0,820	
5.000	1.525	332	843,50	0,905	0,889	0,873	0,858	0,844	0,829	0,816	0,790	
6.000	1.830	320	811,85	0,871	0,856	0,841	0,826	0,812	0,798	0,785	0,760	
7.000	2.135	307	779,80	0,837	0,822	0,807	0,793	0,780	0,767	0,754	0,730	
8.000	2.440	294	747,80	0,803	0,788	0,774	0,761	0,748	0,735	0,723	0,700	

Tab. G

F - correction factor of discharge head and delivery in relation to temperature and altitude.

Reference conditions:

- Air temperature 68 °F (20 °C)
- Barometric pressure 394 "w.c. (1000 mbar)
- Altitude 328 ft a.s.l. (100 m a.s.l.)

Example

Using the Tab. G , for an altitude of 3,000 ft and an air temperature of 68 °F, an **F** factor value is obtained equal to 0.908; if the capacity at the boiler furnace is Qfoc = 4,500 Mbtu/h, the correct output will be equal to:

Qburner = Qfoc / F = 4,500 / 0.908 = 4,956 Mbtu/h

3.9 Minimum furnace dimensions

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

Fig. 6 indicates the diameter and length of the test combustion chamber.

Example RLS 510/EV:

Output 19200 MBtu/hr: diameter 39.4 inch - length 16.5 ft.

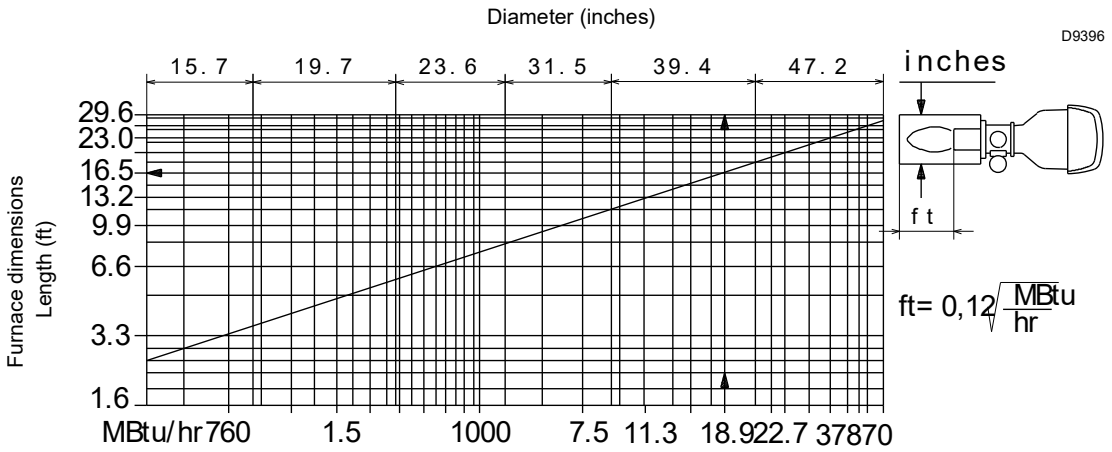


Fig. 6

3.10 Control box for the air/fuel ratio (LMV36...)

Warning notes

WARNING

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

The LMV36... is a safety device! Do not open, interfere with or modify the unit.

The manufacturer 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 LMV36... basic unit:

- Burner control with gas valve proving system
- Electronic air / fuel ratio control
- Control frequency converter air fan
- Modbus interface

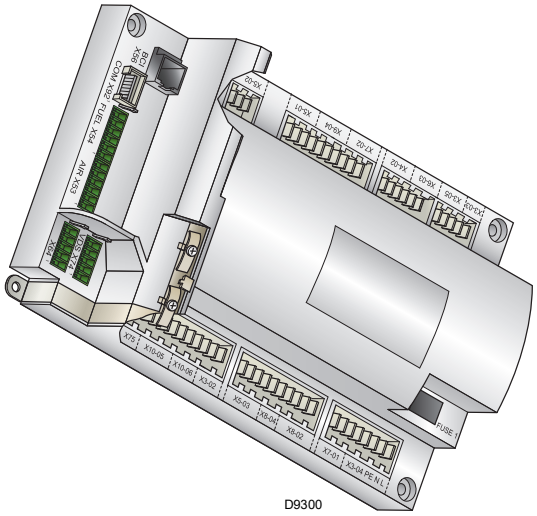


Fig. 7

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 LMV36... 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

LMV36... 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

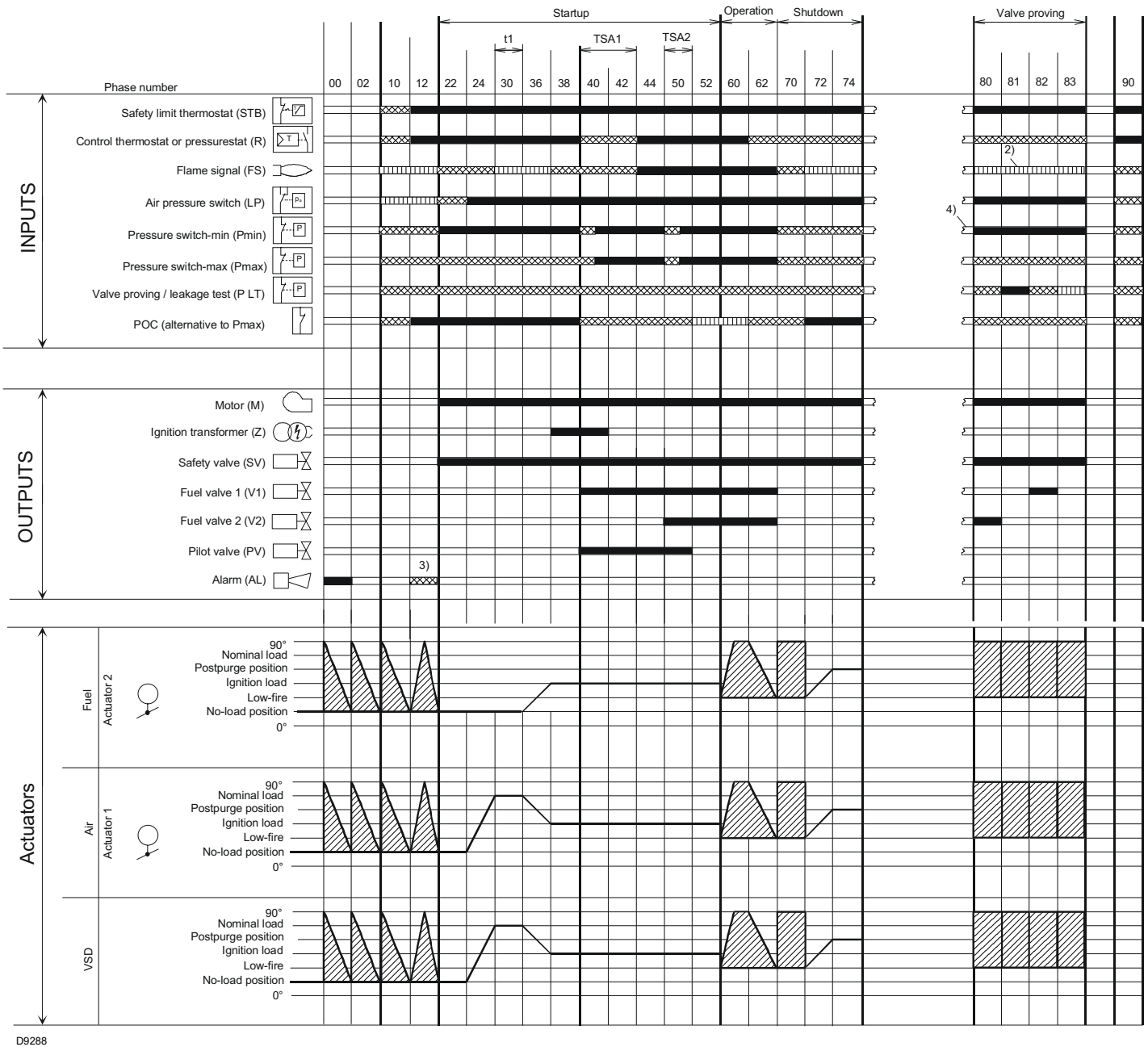


Fig. 8

Key to the sequence diagrams:

Valve proving takes place depending on the parameter:

2) Only with valve proving on start-up
3) Parameter: with/without alarm in the event of start prevention
4) In the event of an erroneous signal on start-up, followed by phase 10, otherwise phase 70
0° Position as supplied (0°)
90° Actuator fully open (90°)

Signal ON

Signal OFF

Any signal is allowed

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

Assignment of times:

t1 Pre-purge time
TSA1 Safety time 1 gas / oil
TSA2 Safety time 2 gas / oil

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.

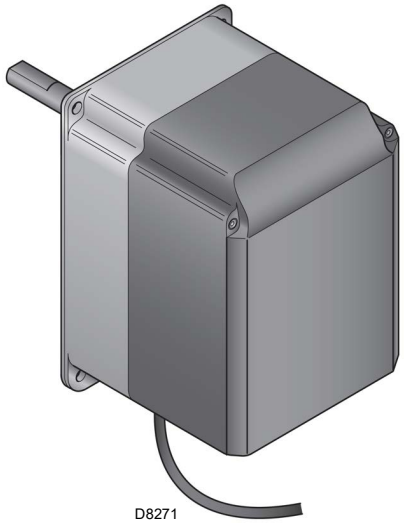


Fig. 9

Technical data

Operating voltage	AC / DC 24 V ±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.

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.

DANGER

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.

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.

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 20-25cm 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.

Release the burner from the wooden platform by removing the bolts/nuts/screws that secure the burner to the platform.

Handle the burner following the safety standards and regulations of the laws in force and using the eyebolts supplied as equipment.

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.

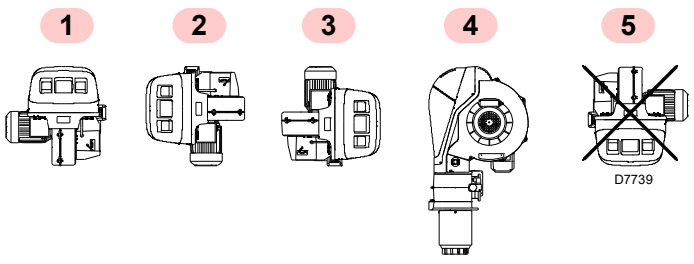


Fig. 10

4.5 Preparing the boiler

4.5.1 Boring the boiler plate

Drill the combustion chamber locking plate as shown in Fig. 11. The position of the threaded holes can be marked using the thermal screen supplied with the burner.

4.5.2 Blast tube length

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its fettling.

For boilers with front flue passes 1)(Fig. 17 on page 23) or flame inversion chamber, a protection in refractory material 5) must be inserted between the boiler fettling 2) and the blast tube 4).

The refractory can have a conical shape (minimum 60°).

This protective fettling must not compromise the extraction of the blast tube.

For boilers with a water-cooled front piece, a refractory lining 2)-5)(Fig. 17 on page 23) is not necessary, unless expressly requested by the boiler manufacturer.

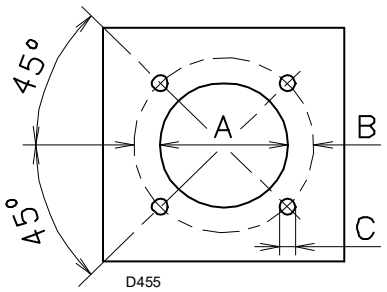


Fig. 11

inch	A	B	C
RLS 310/EV	13 1/4"	17 13/16"	3/4" coarse
RLS 410/EV	13 1/4"	17 13/16"	3/4" coarse
RLS 510/EV	13 13/16"	17 13/16"	3/4" coarse

Tab. J

4.6 Securing the burner to the boiler

Prepare a suitable lifting system using the rings 3)(Fig. 12), after removing the fixing screws 7) of the casing 8).

➤ Fit the heat insulation supplied onto the blast tube 4)(Fig. 12).
➤ Fit the entire burner onto the boiler hole prepared previously, and fasten with the screws supplied.

WARNING

The seal between burner and boiler must be airtight.

WARNING

The manufacturer declines **any and every responsibility** for any possible lifting movements, different from those indicated in **this manual.**

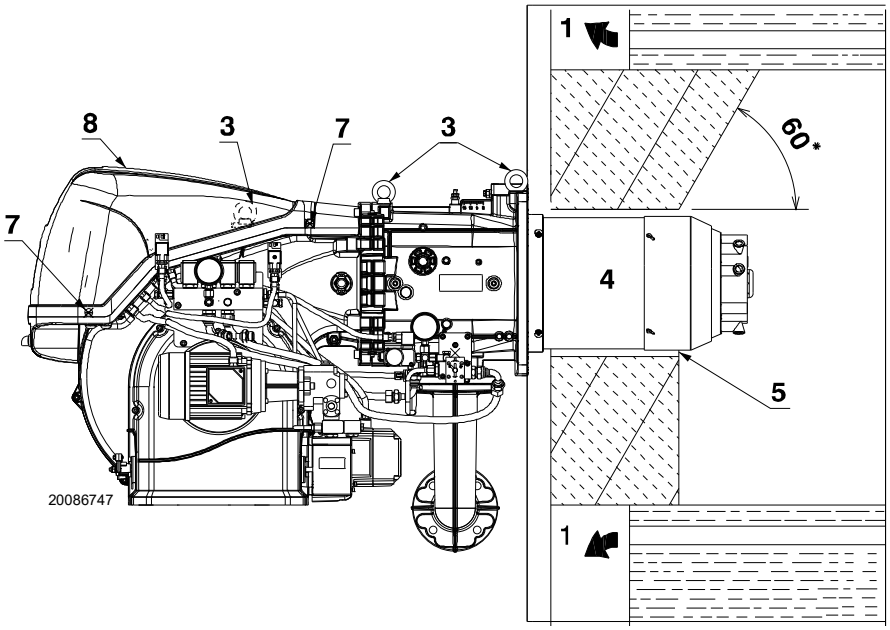


Fig. 12

4.6.1 Accessibility to the interior of the combustion head

The burner leaves the factory set for opening to the right, therefore maintaining the pin 1)(Fig. 13) in its housing.

To open the burner towards the right, proceed as follows:

A remove the screws 2);
B disconnect the two oil pipes by unscrewing the two nuts 3);
C open the burner to a maximum of 100-150 mm by rotating around the hinge and release the cables of the electrodes 4);
D fully open the burner as in Fig. 13;
E disconnect the light oil pipes by unscrewing the two swivel fittings 5);
F undo the screw 6) with pressure test point;
G release the ignition pilot retainer;
H release the head by lifting it from its housing 7), then take out the combustion head.

WARNING

To open the burner from the opposite side, before removing the pin 1)(Fig. 13), make sure that the 4 screws 2) are tight.

Then shift the pin 1) to the opposite side, only then is it possible to remove the screws 2).

Disconnect the socket 8)(Fig. 13) of the maximum gas pressure switch, then proceed as described above at point C).

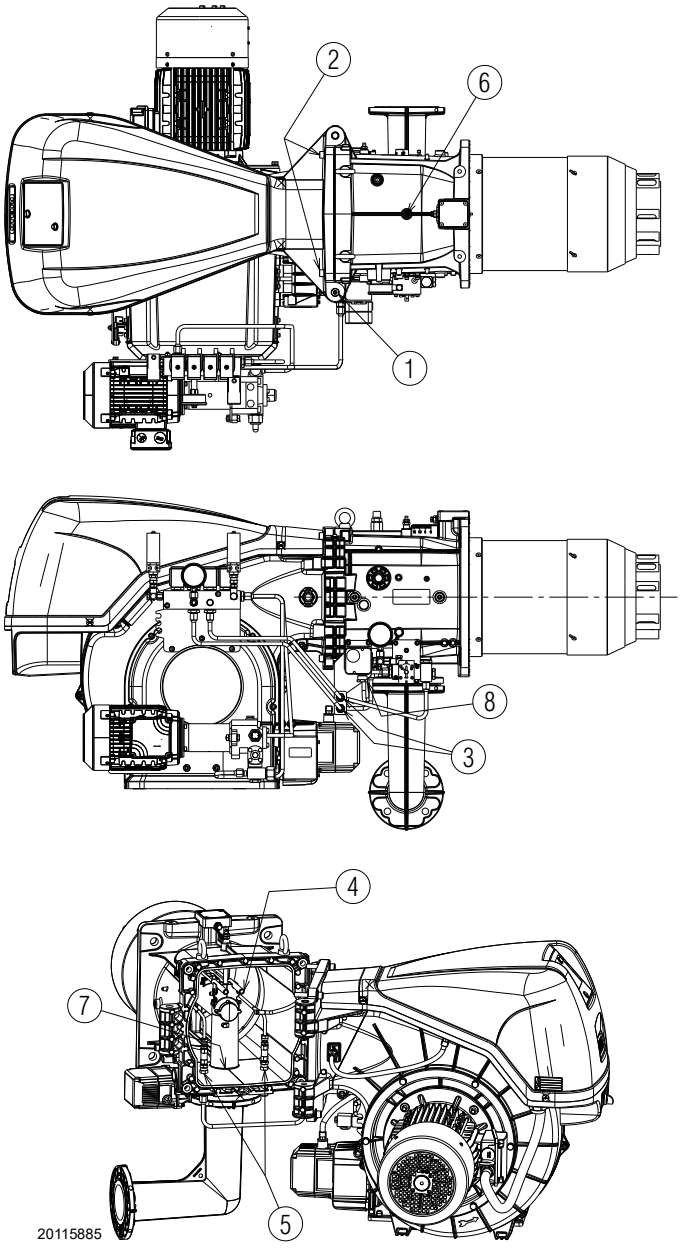


Fig. 13

4.7 Electrode and ignition pilot adjustment

Place the electrode and the ignition pilot observing the dimensions in Fig. 14.

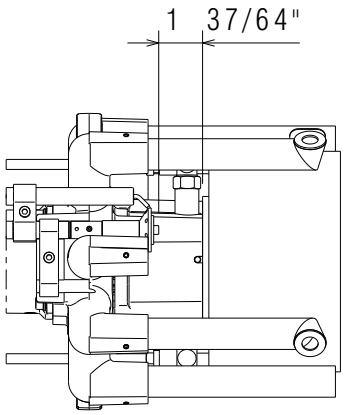


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Fig. 14

4.8 Gas butterfly valve

If necessary, replace the gas butterfly valve.

The correct position is shown in Fig. 16 on page 23.

4.9 Combustion head setting

Rotate the screw 1) until the notch you have found corresponds with the front surface of the screw itself.

The combustion head is opened by turning the screw 1) anticlockwise.

The combustion head is closed by turning the screw 1) clockwise (Fig. 17).

WARNING

The burner leaves the factory with the combustion head adjusted to notch 0 (Fig. 17).

This adjustment allows you to secure the moving parts when the burner is being transported.

Before starting the burner, carry out the adjustments for the output required.

NOTE:
Depending on the specific application, the adjustment can be modified.

WARNING

The combustion head can be adjusted within the following fields:

RLS 310/E: 0 - 11;

RLS 410/E: 0 - 8;

RLS 510/E: 2 - 11.

No adjustment can be made outside these intervals.

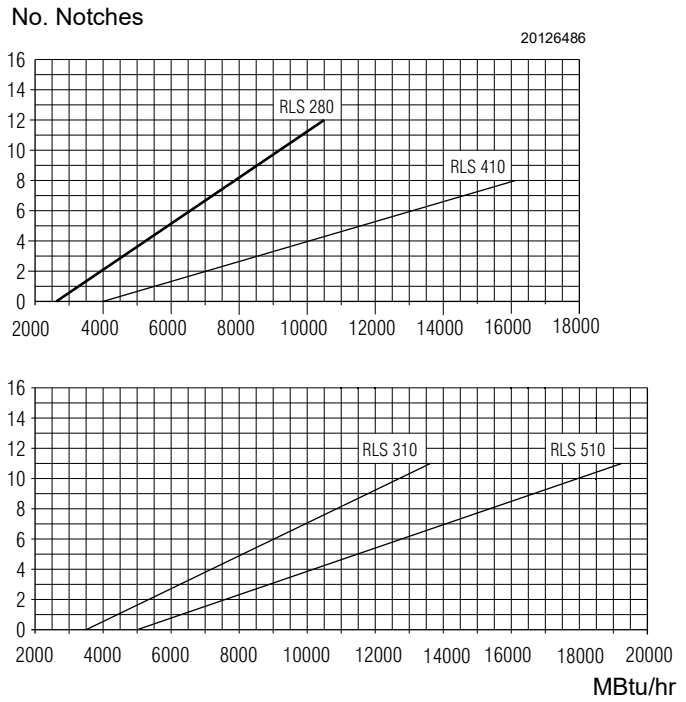


Fig. 15

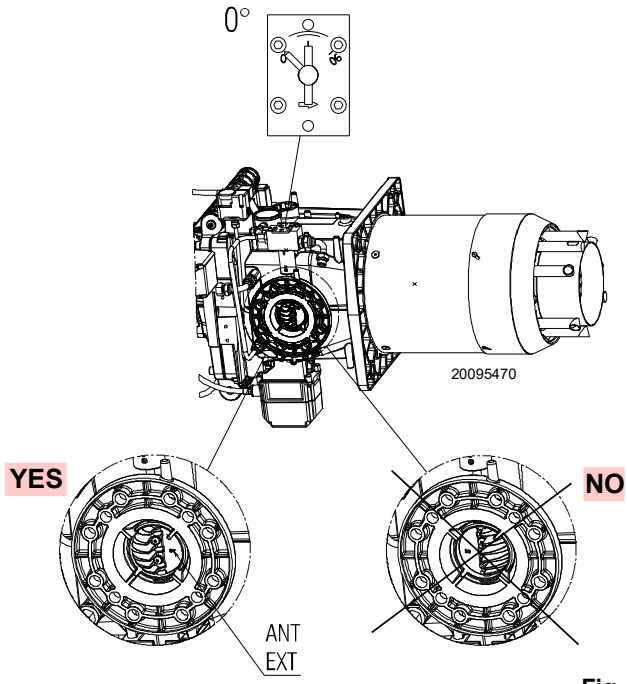


Fig. 16

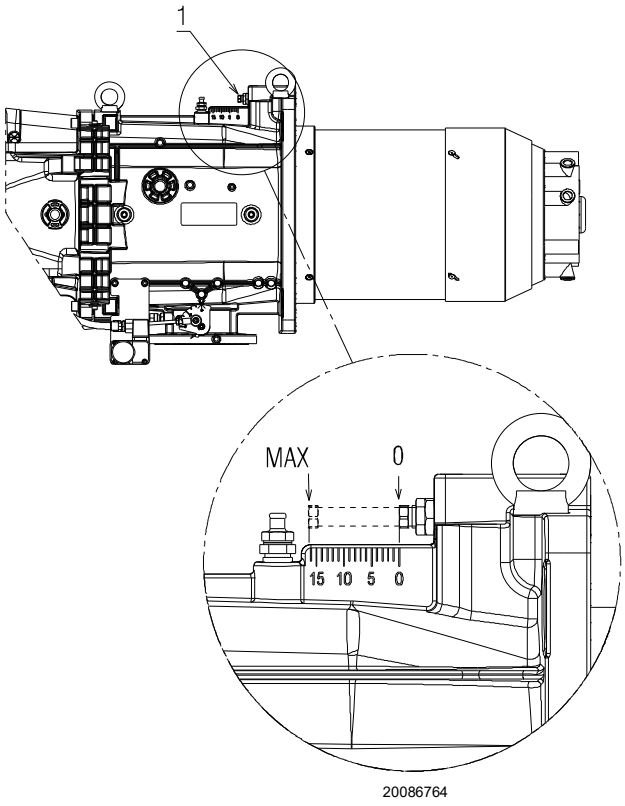


Fig. 17

4.10 Nozzle

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 non observance of the requirements contained in this manual.

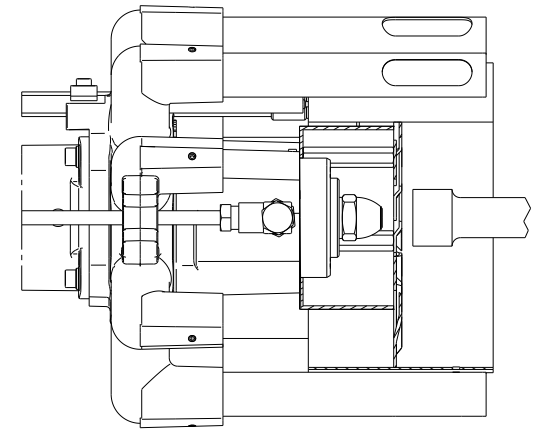


Fig. 18

4.10.1 Nozzle installation

– Fit the nozzle with the box spanner, fitting the spanner through the central hole in the flame stability disk (Fig. 18).
– Nozzles with no fuel shut-off needle must be fitted on the nozzle holder.
– To set the delivery range within which the nozzle must work, nozzle return line fuel pressure must be adjusted according to Tab. K.

WARNING

➤ Do not use any sealing products such as gaskets, sealing compound, or tape.
➤ Be careful to avoid damaging the nozzle sealing seat.
➤ The nozzles must be screwed into place tightly but not to the maximum torque value provided by the wrench.

4.10.2 Recommended nozzles

Intermediate flow rates may be obtained by choosing the nozzle with a nominal flow rate slightly higher than that actually required.

	MBtu/hr (GCV)	Nozzle			Supply Pressure	High Fire		Low Fire	
		Type	GPH	kg/h	PSI	By-pass Pressure	Flow rate GPH	By-pass Pressure	Flow rate GPH
RLS310	3.500	Fluidics N2 & N4 (45° - 60°)		90	300	245	25,0	100	7,4
	4.500			125		160	32,1	100	8,6
	5.500			150		268	39,3	100	11,8
	6.500			175		253	46,4	100	13,4
	7.500			200		253	53,6	100	14,7
	8.500			200		267	60,7	100	14,7
	9.500			225		268	67,9	100	15
	10.500			275		263	75,0	100	18,6
	11.500			300		258	82,1	100	20,8
	12.500			325		258	89,3	100	21,8
	13.600			350		258	98,2	100	23,4
RLS410	4.000	Fluidics N2 & N4 (45° - 60°)		100	300	275	28,6	100	8,3
	5.500			150		268	39,3	100	11,8
	6.500			175		253	46,4	100	13,4
	7.500			200		253	53,6	100	14,7
	8.500			200		267	60,7	100	14,7
	9.500			225		268	67,9	100	15
	10.500			275		263	75,0	100	18,6
	11.500			300		258	82,1	100	20,8
	12.500			325		258	89,3	100	21,8
	13.500			350		255	96,4	100	23,4
	14.500			350		261	103,6	100	23,4
	15.500			375		255	110,7	100	29,5
	16.100			400		240	119,3	100	35,2
RLS510	5.000	Fluidics N2 & N4 45° - 60°)		125	300	268	35,7	100	8,6
	6.500			175		253	46,4	100	13,4
	7.500			200		253	53,6	100	14,7
	8.500			200		267	60,7	100	14,7
	9.500			225		268	67,9	100	15,0
	10.500			275		263	75,0	100	18,6
	11.500			300		258	82,1	100	20,8
	12.500			325		258	89,3	100	21,8
	13.500			350		255	96,4	100	23,4
	14.500			350		261	103,6	100	23,4
	15.500			375		255	110,7	100	29,5
	16.500			400		236	117,9	100	35,2
	17.500			450		261	125,0	100	36,8
	18.500			500		253	132,1	100	38,1
	19.500			500		260	139,3	100	38,1
	19.200			525		253	137.1	100	39,1

Tab. K

4.11 Hydraulic system

4.11.1 Double-pipe circuit

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

The distance "P" must not exceed 33 ft in order to avoid subjecting the pump's seal to excessive strain; the distance "V" must not exceed 4 meters in order to permit pump self-priming even when the tank is almost completely empty.

The tank lower than the burner B

Pump depression values higher than 0.45 bar (35 cm Hg) must not be exceeded because at higher levels gas is released from the fuel, the pump starts making noise and its working life-span decreases. It is good practice to ensure that the return and suction lines enter the burner from the same height; in this way it will be more improbable that the suction line fails to prime or stops priming.

4.11.2 The loop circuit

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

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

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

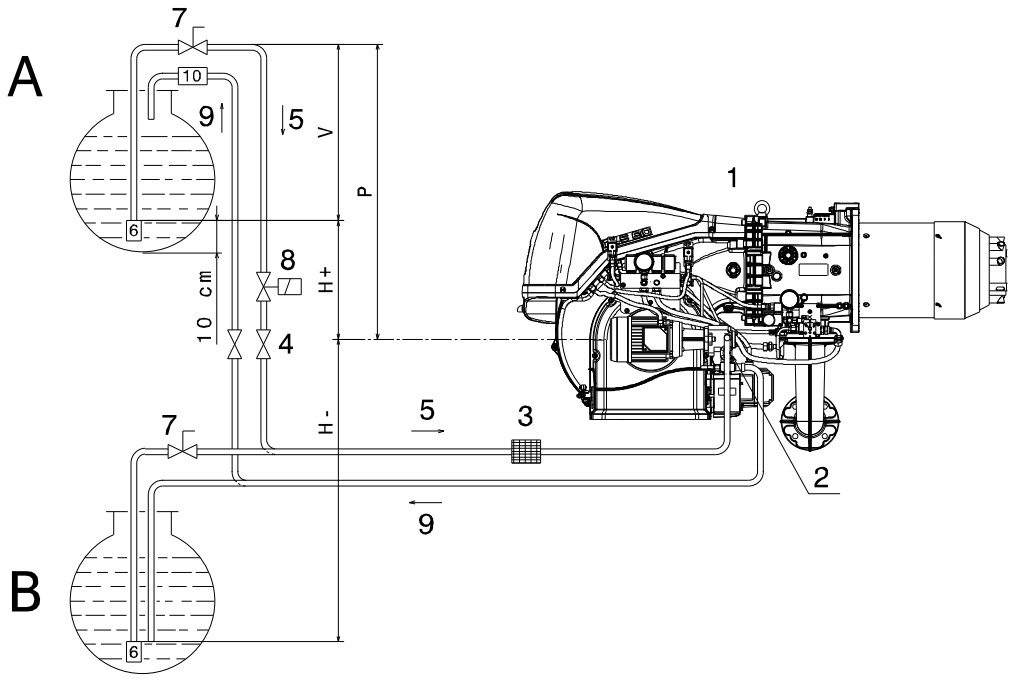


Fig. 19

+/- H (ft)	L (ft)	
	Ø 1/2"	Ø 5/8"
+ 13	197	263
+ 10	164	230
+ 6.6	132	197
+ 4.8	115	181
+ 3.3	99	164
+ 1.6	82	148
0	66	132
- 1.6	59	115
- 3.3	49	99
- 4.8	43	82
- 6.6	33	66
- 10	16	33
- 13	-	20

Tab. L

Key (Fig. 19)
1 Burner
2 Pump
3 Filter
4 Manual on/off valve
5 Suction line
6 Foot valve
7 Rapid closing manual valve remote controlled (only Italy)
8 On/off solenoid valve (only Italy). See layout of electric panel board. Electrical connections set by installer (SV)
9 Return line
10 Check valve (only Italy)

H Pump/foot valve height difference
L Piping length
Ø Inside pipe diameter

4.12 Hydraulic connections

The pumps are equipped with a by-pass that connects return line and suction line.

The pumps are installed on the burner with the by-pass closed by screw 6)(Fig. 20). It is therefore necessary to connect both hoses to the pump.

CAUTION

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

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

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

WARNING

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

➤ Install the hoses where they cannot be stepped on or come into contact with hot surfaces of the boiler and where they do not hamper the opening of the burner.

➤ Now connect the other end of the hoses to the suction and return lines by using the supplied nipples.

4.12.1 Pump

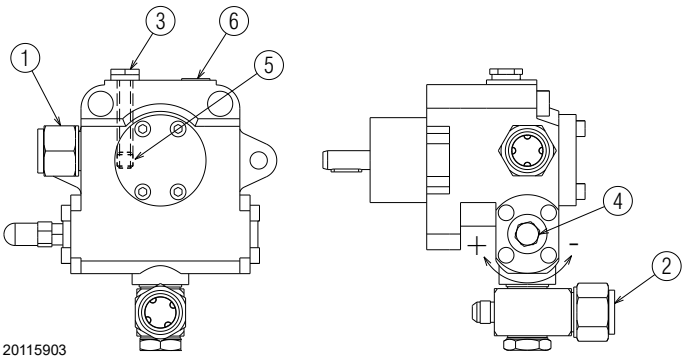


Fig. 20

Key (Fig. 20)

1	Suction line	G 3/4" NPT
2	Return line	G 3/4" NPT
3	Vacuometer connection	G 1/4"
4	Pressure adjuster	
5	By-pass screws	
6	Gauge connection	G 1/4"

Technical data

Pump model		TA3 (RLS 310/EV)	TA4 (RLS 410/EV)	TA5 (RLS 510/EV)
Min. delivery rate at 300 PSI pressure	GPH	218	290	403
Delivery pressure range	PSI	102 - 580		102 - 435
Max. suction pressure	PSI	7.0		
Viscosity range	cSt	3 - 75		
Max. oil temperature	°F	302 (150 °C)		
Max. return pressure	PSI	73.0		
Pressure calibration in the factory	PSI	300		

Tab. M

Priming pump

WARNING

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

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

➤ In order for the pump (Fig. 20) to self-prime, it is vital that the screw 4) of the pump be loosened to vent the air contained in the suction line.

➤ Start the burner by closing the remote controls. As soon as the burner starts, check the direction of rotation of the fan blade.

➤ The pump can be considered to be primed when the light oil starts coming out of the screw 4). Close the burner and undo the screws 4).

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

If the pump fails to prime at first start-up and the burner locks out, wait approx. 15 seconds, reset the burner, and then repeat the start-up operation.

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

Do not light the flame sensor or the burner will lock out; the burner should lock out anyway about 10 seconds after it starts.

4.12.2 Pressure variator

The pressure variator (Fig. 21), allows the pressure on the return line of the nozzle to be varied according to the required output.

The pressure on the return line is adjusted by varying a section by means of the rotation of the servomotor, which also controls the gas butterfly valve at the same time.

➤ Regulator at 0° (maximum opening) = minimum pressure on the nozzle return line.

➤ Regulator at 90° (minimum opening) = maximum pressure on the nozzle return line.

The servomotor is controlled by the electronic cam 1)(Fig. 6 on page 14); thanks to this device, it is possible to set different curves for oil and gas on the same servomotor (also for the air damper servomotor 4)(Fig. 3 on page 11).

➤ In the **oil regulation** the regulation is carried out on the basis of the nozzle that has been mounted and the modulation required.

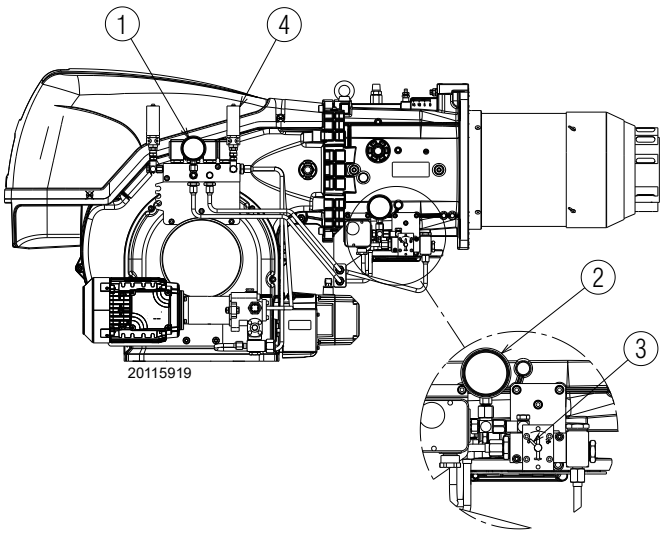


Fig. 21

Key (Fig. 21)
1 Nozzle delivery pressure gauge
2 Nozzle return pressure gauge
3 Position indicator (0 ÷ 90) of the pressure variator
4 Maximum oil pressure switch on return circuit

4.13 Gas feeding

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

Precautions: avoid knocking, attrition, sparks and heat.

Make sure 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.

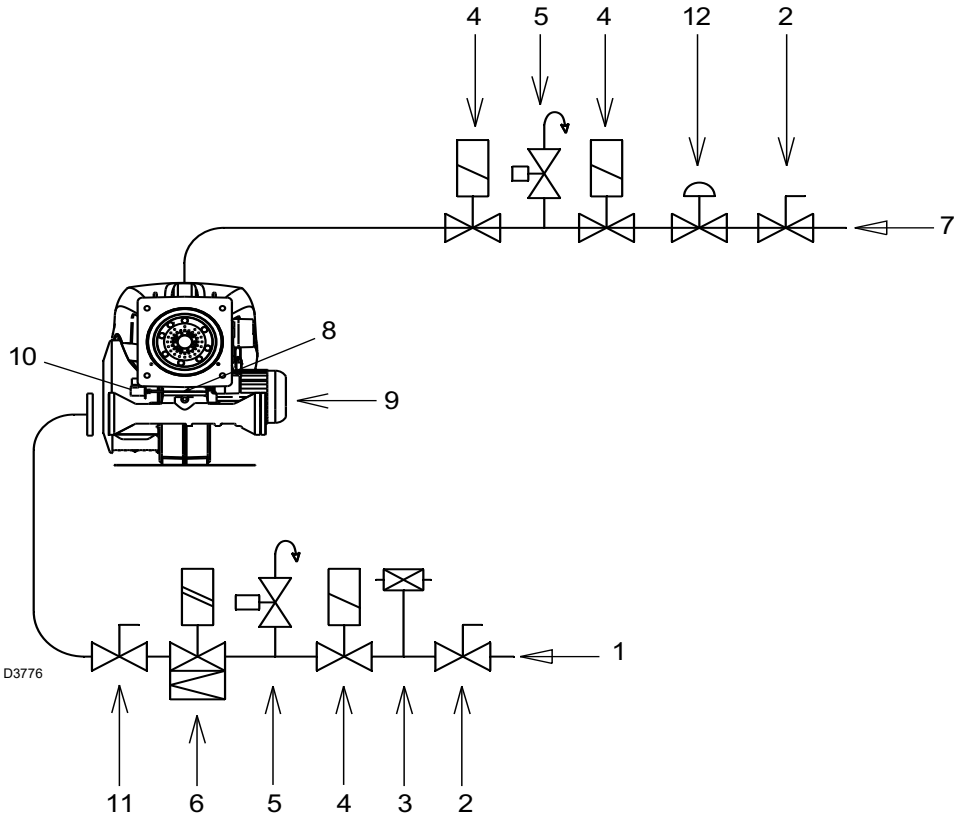


Fig. 22

Key (Fig. 22)

1 Gas input pipe for main burner
2 Manual valve
3 Min gas pressure switch
4 Safety shut-off valve
5 NO vent valve
6 Regulating shut off valve
7 Gas input pipe for pilot
8 Gas adjustment butterfly valve
9 Burner
10 Max gas pressure switch
11 Manual valve (for seal control)
12 Pilot regulator

4.13.1 Gas train

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

WARNING

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

Check that there are no gas leaks.

Pay attention when handling the train: danger of crushing of limbs.

Make sure that the gas train is properly installed by checking for any fuel leaks.

The operator must use the required equipment during installation.

4.13.2 Gas pressure

The Tab. N shows minimum pressure losses along the gas supply line depending on the maximum burner output operation.

The values shown in the Tab. N refer to natural gas (GCV).

Column 1
Pressure loss at combustion head.
Gas pressure measured at the test point 1)(Fig. 23), with:
– combustion chamber at 0" WC;
– burner working at maximum output;
– combustion head adjusted as in the diagram of Fig. 15 on page 23.

Column 2
Pressure loss at gas butterfly valve 17)(Fig. 3 on page 11) with maximum opening: 90°.

Calculate the approximate maximum output of the burner as follows:
– subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 23);
– find, in the Tab. N relating to the burner concerned, the pressure value closest to the result of the subtraction;
– read off the corresponding output on the left.

Example for RLS 510/EV:
- Maximum output operation
- Gas pressure at test point 1)(Fig. 23) = 11.7 "WC
- Pressure in combustion chamber = 2 "WC

11.7 - 2 = 9.7 "WC

An output of 10500 MBtu/hr shown in Tab. N corresponds to 9.7 "WC pressure, column 1.
This value serves as a rough guide, the effective delivery must be measured at the gas meter.

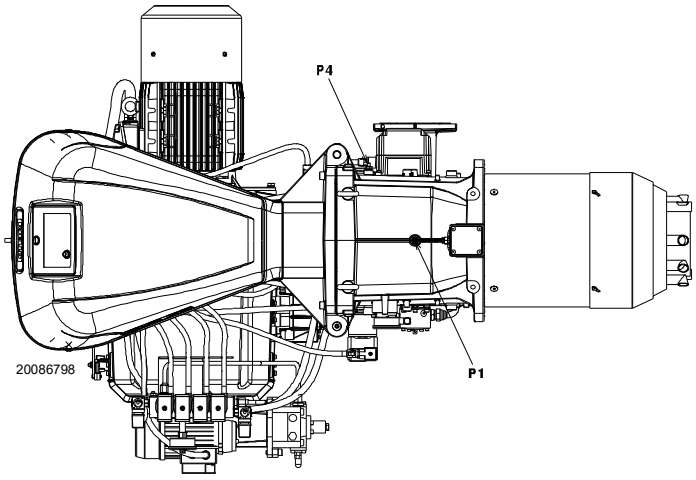


Fig. 23

WARNING

The data of thermal output and combustion head gas pressure are related to full open (90°) gas butterfly valve.

	MBtu/hr (GCV)	1 Δp ("WC)	2 Δp ("WC)
RLS310	3.500	1,2	0,02
	4.500	2,0	0,03
	5.500	3,0	0,07
	6.500	4,2	0,15
	7.500	5,9	0,20
	8.500	7,6	0,40
	9.500	9,5	0,50
	10.500	11,8	0,60
	11.500	14,0	0,80
	12.500	16,5	1,00
	13.600	19,5	1,20
RLS410	4.000	1,5	0
	5.500	2,8	0
	6.500	3,9	0,07
	7.500	5,2	0,17
	8.500	8,1	0,22
	9.500	10,1	0,34
	10.500	12,3	0,50
	11.500	14,8	0,60
	12.500	16,5	0,90
	13.500	18,3	1,10
	14.500	21,0	1,40
	15.500	24,1	1,73
	16.100	26,0	2,00
RLS510	5.000	2,2	0,00
	6.500	3,7	0,07
	7.500	5,0	0,17
	8.500	6,4	0,22
	9.500	8,0	0,34
	10.500	9,7	0,50
	11.500	11,7	0,60
	12.500	13,8	0,90
	13.500	16,1	1,10
	14.500	18,6	1,40
	15.500	21,2	1,73
	17.500	27,0	2,60
	18.500	30,2	3,00
	19.200	33,8	3,50

Tab. N

4.14 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. 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 $^1/_8$" (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:


DANGER

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


DANGER

Turn off the fuel interception tap.


DANGER

Avoid condensate, ice and water leaks from forming.

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

4.14.1 Supply cables and external connections passage

All the cables to be connected to the burner are fed through the grommets. See Fig. 24.

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, minimum gas pressure switch, gas valves and other devices with 3/8 inch cable grommet
4 Available: hole for M20
5 Available for ground terminals
6 Available for inverter three phase power supply with 3/4 inch cable grommet.

A Variable speed sensor
B Maximum gas pressure switch
C Flame sensor
D Air servomotor
E Fuel servomotor
F Air pressure switch
G Oil valve
H Oil pressure switch
I Pump motor
L Motor earth cable

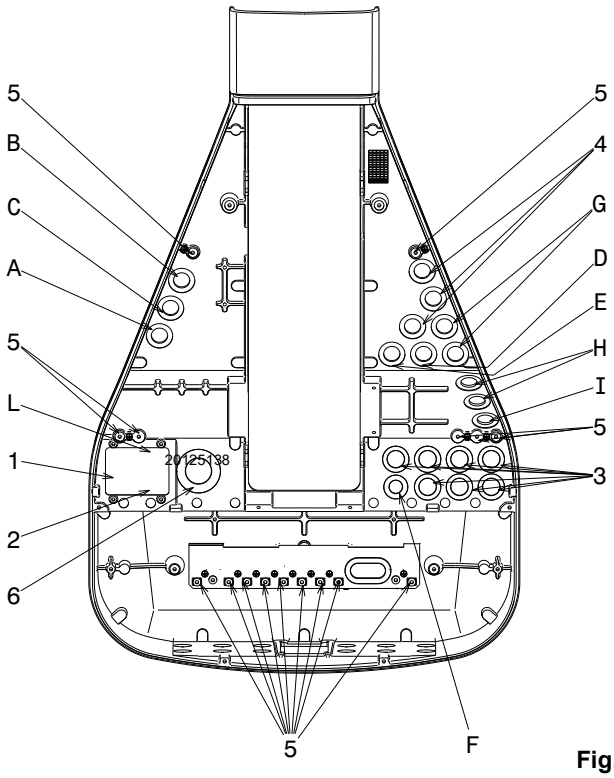


Fig. 24

The control panel is in compliance with UL508A.

WARNING

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

4.14.2 Cable shielding

WARNING

It is very important to shield the motor cable 1) as shown in Fig. 25.

It is very important to fix the cable shielding as shown in Fig. 25.

The connection from the Inverter to LMV36.... must be done as shown in Fig. 25.

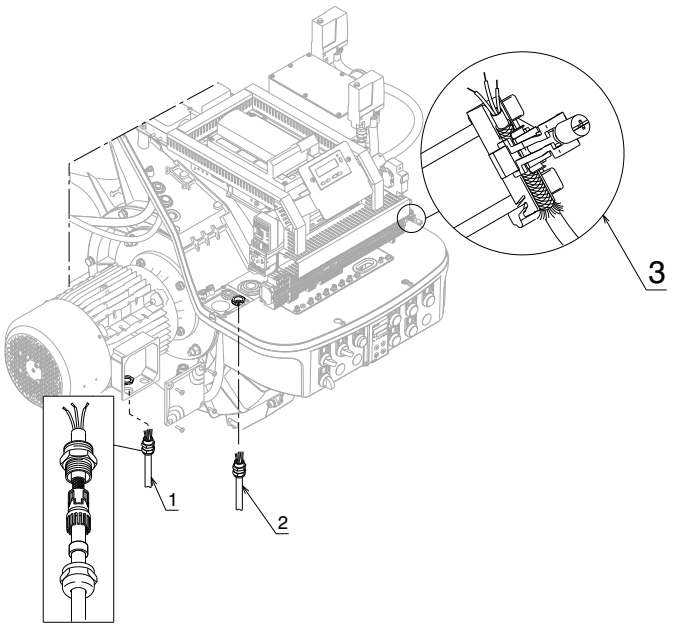


Fig. 25

Key (Fig. 25)
1 Motor supply cable
2 Single phase supply cable
3 Clamp for connection of controls cable shielding from Inverter

4.14.3 Installation of shielded cables

In the case of clamp type **A**:

- ➤ unscrew the screw until space is created for inserting the shielding of the shielded cable A1)(Fig. 26);
- ➤ insert the shielded cable with the shielding inside the clamp A2);
- ➤ screw in the screw until it is completely tightened on the shielding A3).

WARNING

Do not overtighten.

In the case of clamp type **B**:

- ➤ pull the indicated tabs upwards and lift until locked in the open position B1)(Fig. 26);
- ➤ insert the shielded cable with the shielding inside the clamp B2);
- ➤ put pressure on the indicated part until the clamp closes automatically on the shielding B3).

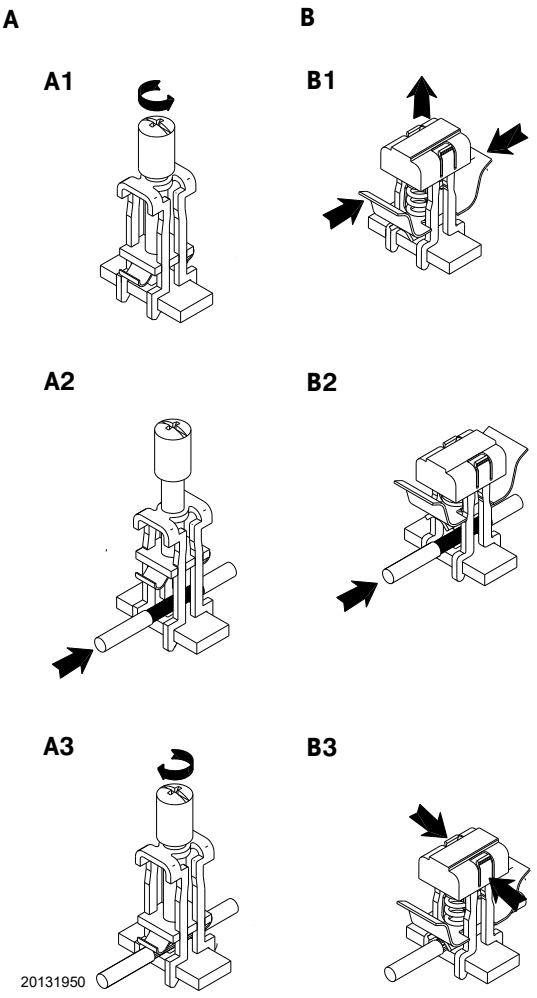


Fig. 26

4.14.4 Inverter connection

WARNING

Following, it is reported an example how to connect the Inverter.
For further information, please refer to the relevant Inverter instruction manual.

Typical installation

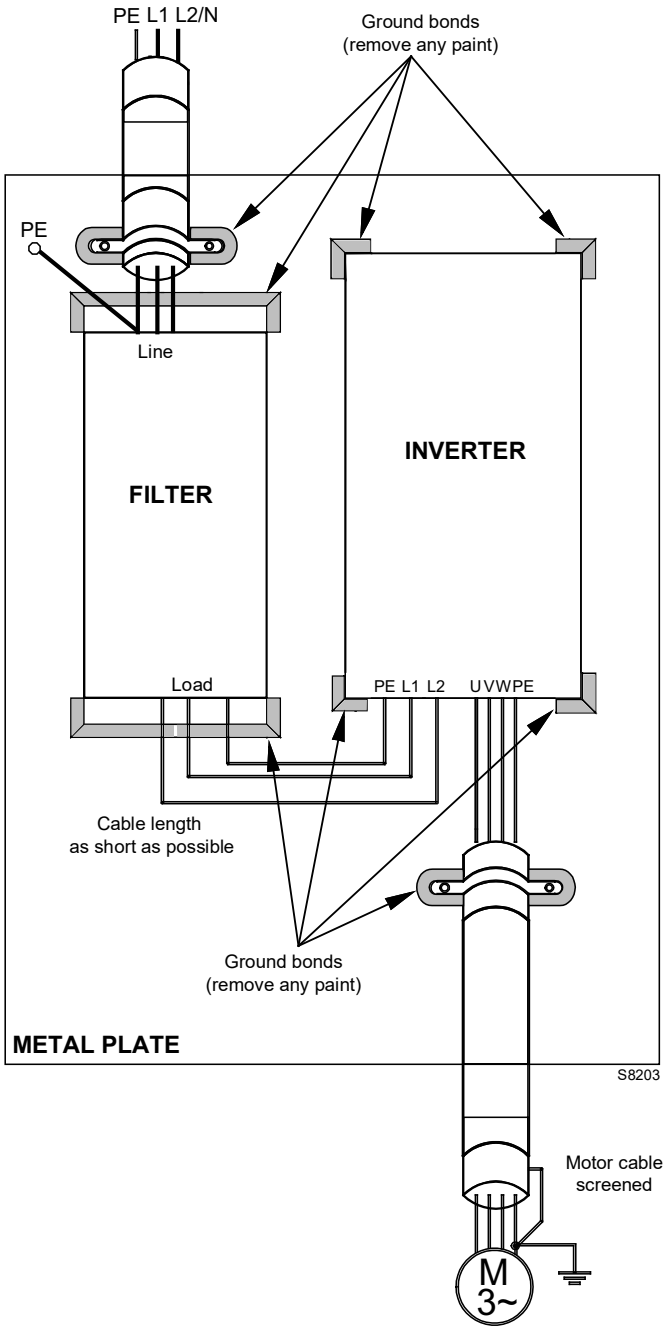


Fig. 27

Treatment of cables

Countermeasures against cable noise

The treatment of cables is the most important countermeasure. The machinery manufacturers are requested

to examine the current structure of the cable lead - in.

- ➤ Use cables with woven screen
- ➤ The screen of the cable should be earthed with a large area.
- ➤ It is desirable to earth the screen of the cable by clamping the cable to the earth plate.
- ➤ The screen must be earthed on both side of the cable (take care for good earthing system).

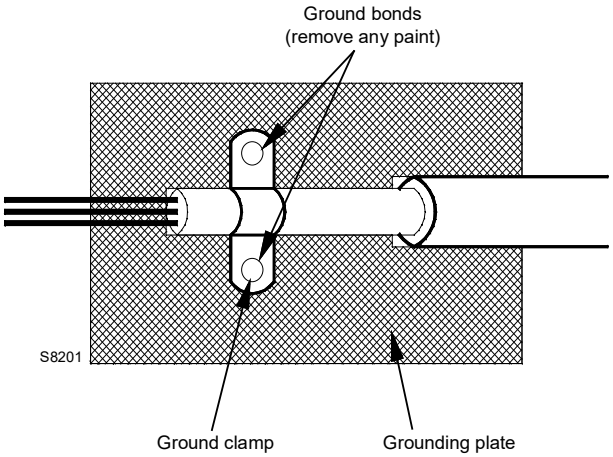


Fig. 28

Example:

Number 1,2,3 show not proper ways to earth a cable screen.

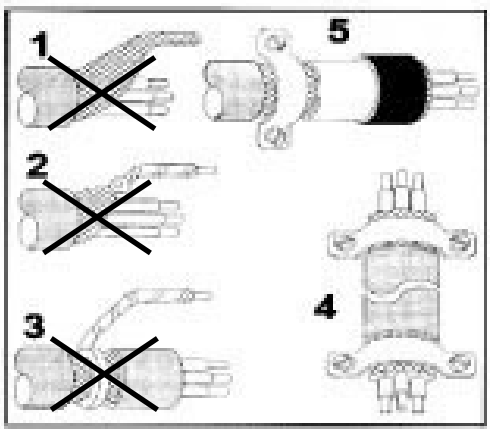


Fig. 29

4.15 Thermal relay calibration

4.15.1 Electronic thermal relay

➤ To reset, in the case of an intervention of the thermal relay, press the button “**RESET**” (Fig. 30).

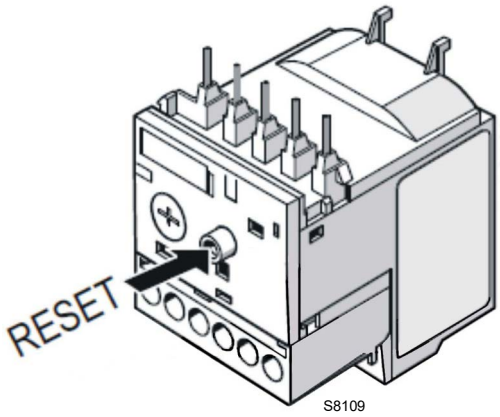


Fig. 30

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

➤ **Device test (Fig. 31)**
Push slowly the button in the window with a little screwdriver.

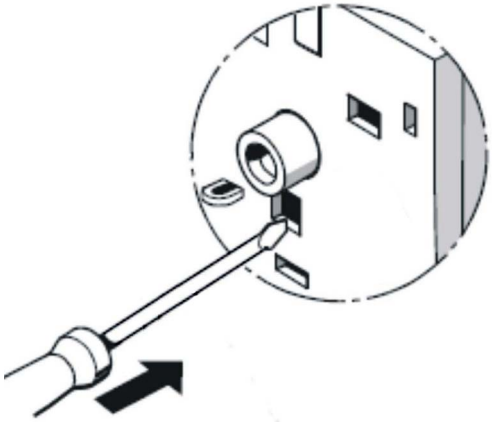


Fig. 31

➤ **Contact test NC (95-96) and NO (97-98)(Fig. 32)**

Insert in the window a little screwdriver and move it in the sense of the arrow.

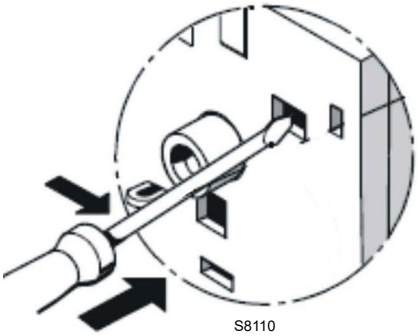


Fig. 32

WARNING

Automatic resetting can be dangerous.

This action is not provided for the burner operation.

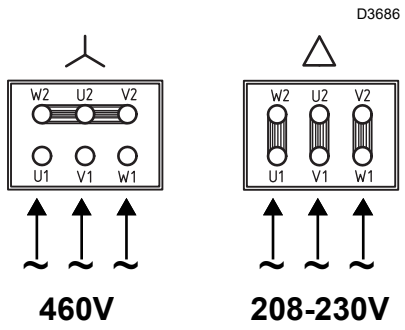
4.16 Motor connection at 208-230 or 460V

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

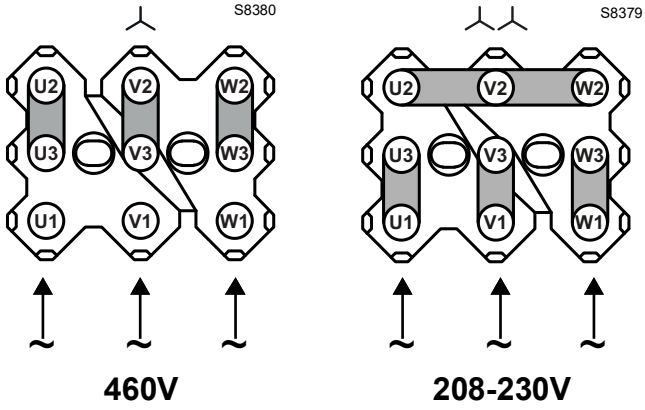


Fig. 33

4.17 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.

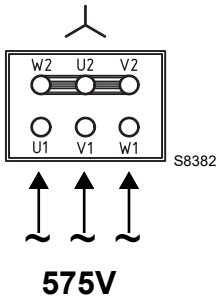


Fig. 34

4.18 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.**

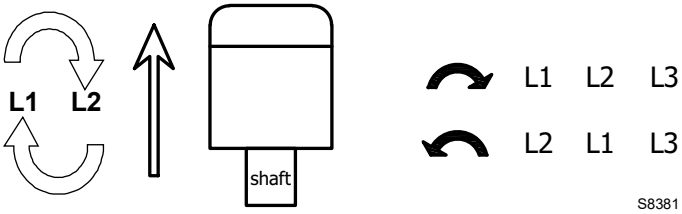


Fig. 35

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.

WARNING

Refer to paragraph “Safety test - with gas ball valve closed” on page 43 before the first start-up.

5.2 Adjustments before first firing

Adjustment of the combustion head has been illustrated on page 23.

In addition, the following adjustments must also be made:

- open manual valves up-stream from the gas train.
- Purge the air from the gas line.
- Adjust the low gas pressure switch to the start of the scale (Fig. 40 on page 40).
- Adjust the high gas pressure switch to the upper limit of the scale (Fig. 39 on page 39).
- Adjust the air pressure switch to the zero position of the scale (Fig. 38 on page 39).
- Fit a U-type manometer (Fig. 36) to the gas pressure test point on the sleeve.
  The manometer readings are used to calculate MAX. burner power using the Tab. N on page 30.

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.

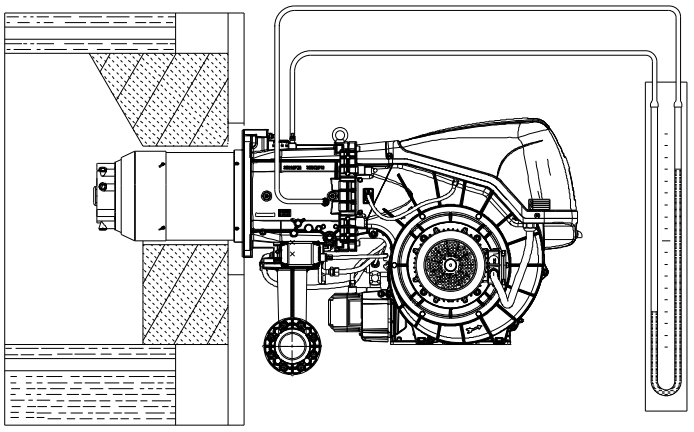


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Fig. 36

5.3 Burner firing

Having completed the checks indicated in the previous heading, the pilot of the burner should fire.

If the motor starts but the flame does not appear and the flame safeguard goes into lock-out, reset and wait for a new firing attempt.

Pilot adjustment has been illustrated on Fig. 14 on page 22.

Having adjusted the pilot, reconnect the main valve and ignite the main flame; it might require several attempts to purge the air from the gas lines or to adjust the valve with little gas.

Once the burner has fired, now proceed with calibration operations.

5.4 Burner calibration

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

Adjust successively:

- Firing output
- Maximum burner output
- Minimum burner output
- Intermediate outputs between low and high fire
- Air pressure switch
- Minimum gas pressure switch

5.5 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 regulator.

Please refer to the specific manual for this operation.

Turn the switch to position **"ON"** (Fig. 37) and turn the switch of to position **"LOCAL"** and turn the switch to position "**OIL**" for oil operation and "**GAS**" for gas 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.

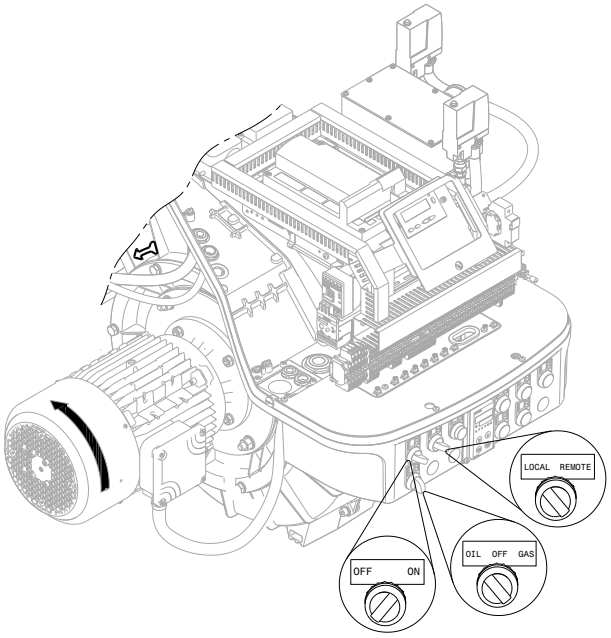

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Fig. 37

5.6 Adjusting gas/air delivery

- ➤ Move slowly towards the maximum output (butterfly gas valve completely open);
- ➤ adjust the required maximum output with the gas pressure stabilizer;
- ➤ adjust the combustion parameters with the air servomotor and store the maximum combustion point;
- ➤ complete the procedure slowly, synchronizing the combustion with the two servomotors and storing the different setting points.

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.

5.7 Adjusting oil/air delivery

- ➤ Switch to the light oil operation.
- ➤ During the ignition, move slowly with an approximate adjustment to the oil servomotor at maximum 90°.
- ➤ Adjust the combustion parameter with the air servomotor and store the maximum combustion point.
- ➤ Complete the procedure slowly, synchronizing the combustion with the two servomotors.
- ➤ Store the different setting points.

5.8 Final calibration of the pressure switches

5.8.1 Air pressure switch

The air pressure switch is connected in absolute mode and is activated by the positive pressure from the fan (Fig. 38).

Adjust the air pressure switch (Fig. 38) 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.

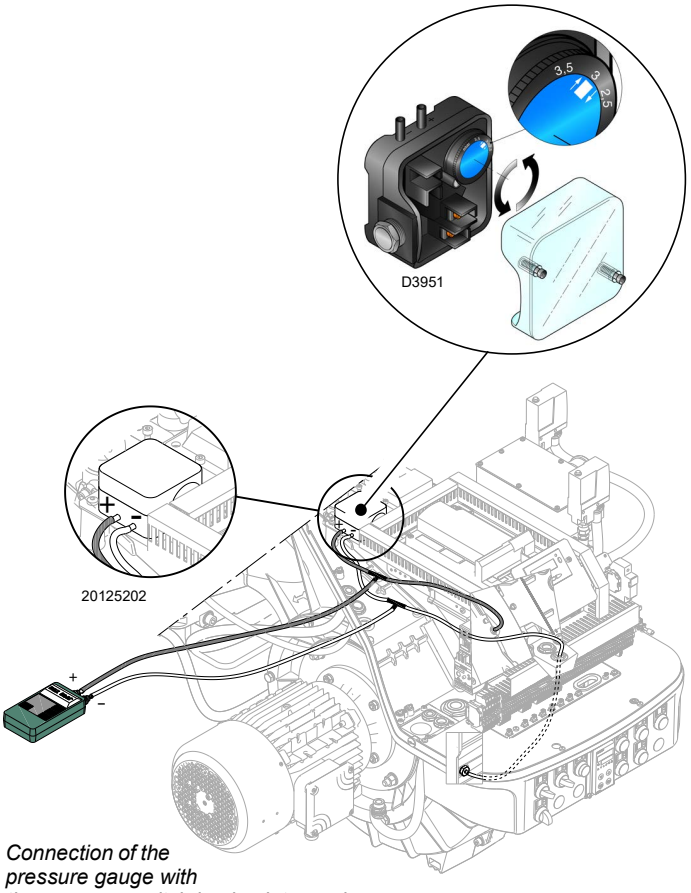
Then turn the knob counter-clockwise about 20% of the set point and start-up the burner again to ensure the set point is correct.

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

5.8.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 39) after making all other burner adjustments with the maximum gas pressure switch set to the end of the scale.
To calibrate the maximum gas pressure switch, open the tap and then connect a pressure gauge to its pressure test point.
The maximum gas pressure switch must be regulated to a value no higher than 30% of the measurement read on the gauge when the burner is working at maximum output.

After making the adjustment, remove the pressure gauge and close the tap.



Connection of the pressure gauge with the pressure switch in absolute mode

Fig. 38

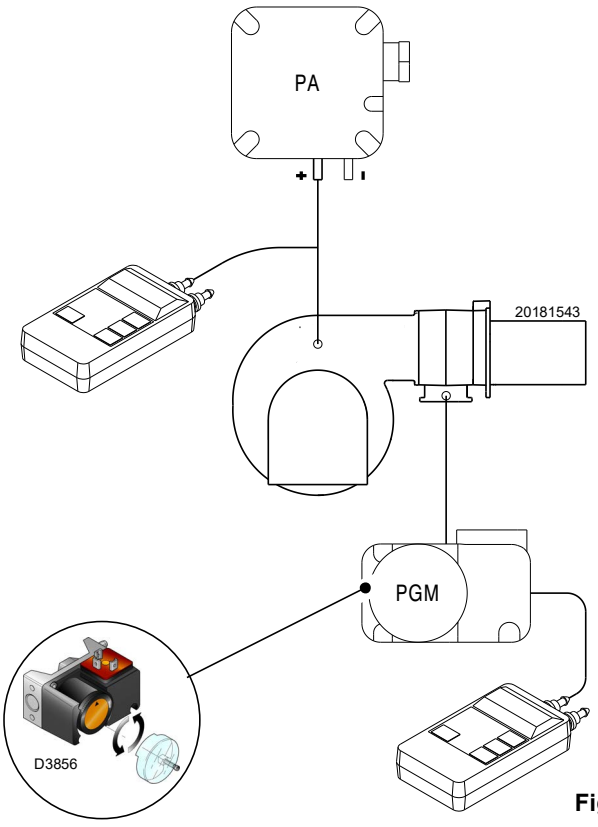


Fig. 39

5.8.3 Minimum gas pressure switch

Adjust the minimum gas pressure switch (Fig. 40) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

– install a pressure gauge downstream of the gas train stabiliser (for example at the gas pressure test point on the burner combustion head);
– choke slowly the manual gas cock until the pressure gauge detects a decrease in the pressure read of about 0.1 kPa (1 mbar). In this phase, verify the CO value which must always be less than 100 mg/kWh (93 ppm).
– Increase the adjustment of the gas pressure switch until it intervenes, causing the burner shutdown;
– remove the pressure gauge and close the cock of the gas pressure test point used for the measurement;
– open completely the manual gas cock.

WARNING

1 kPa = 10 mbar

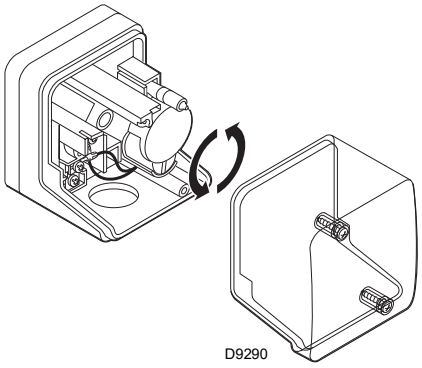


Fig. 40

5.8.4 Low oil pressure switch

The low oil pressure switch (Fig. 41) is factory set to 261 PSI (18 bar).

If the oil pressure goes down this value in the delivery piping, the pressure switch stops the burner.

Burner starts again automatically if the pressure goes above 261 PSI (18 bar) after burner start up.

5.8.5 High 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. 41.

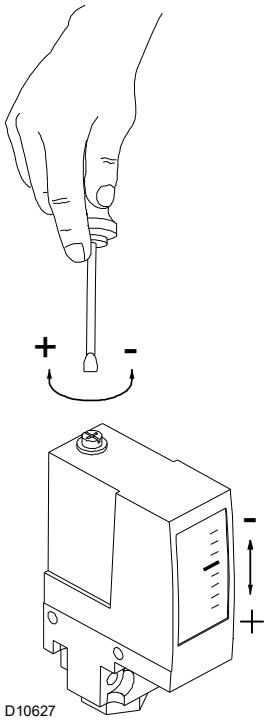


Fig. 41

5.9 Burner starting

- ➤ Operating control closes, the ignition pilot starts and the P.O.C. solenoid valves 16)-17) open (available as accessory), if required.
- ➤ The pump 18)(Fig. 42) draws the fuel from the tank through the piping 1) and pumps it under pressure for delivery. The pump pressure governor 4) rises and the fuel returns to the tank through the piping 2). The screw 3) closes the by-pass heading towards suction and the de-energized solenoid valves 5) - 6) close the passage to the nozzle.
- ➤ Air damper and pressure regulator are positioned on MIN output.
- ➤ Solenoid valves 5) - 6) -13) -14) open; the fuel passes through the piping 19), and enters the nozzle. A part of the fuel is then sprayed out through the nozzle, igniting when it comes into contact with the pilot flame: flame at a low output level; the rest of the fuel passes through piping 20 at the pressure adjusted by the regulator 10), then, through piping 2), it goes back into the tank.
- ➤ The pilot flame goes out.
- ➤ The starting cycle ends.

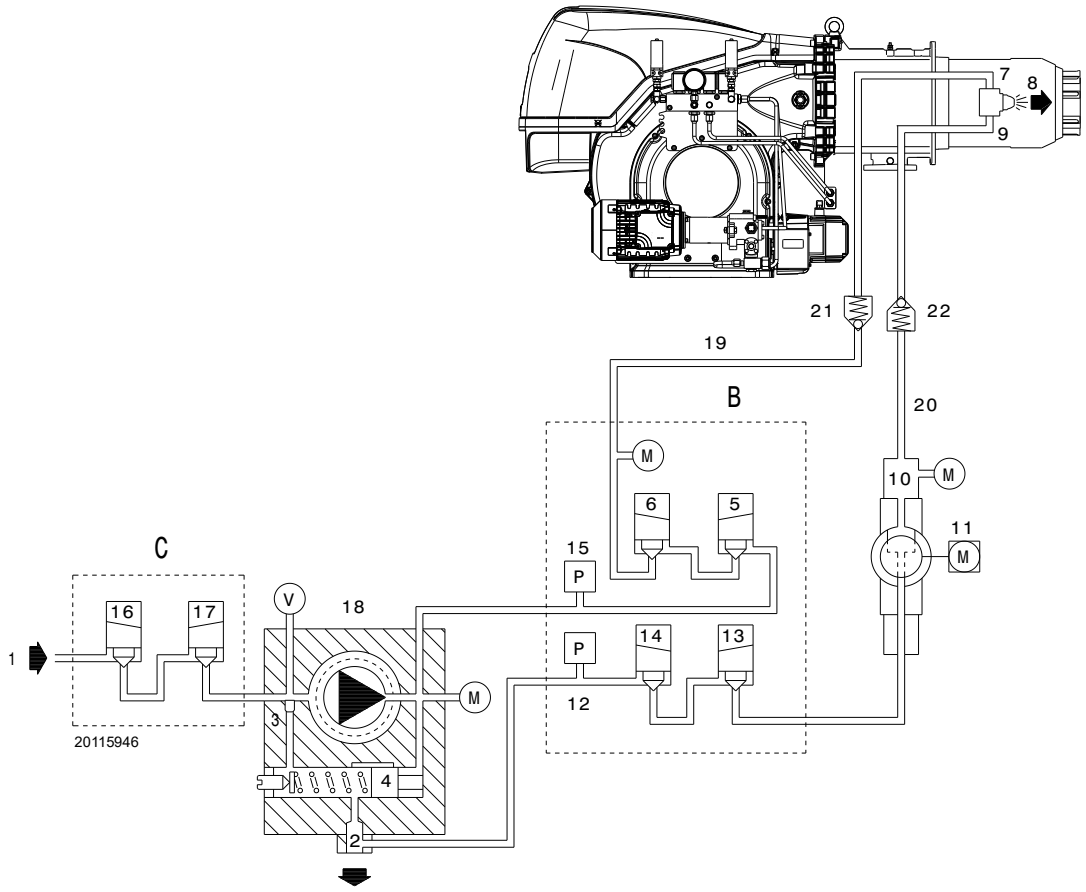


Fig. 42

Key (Fig. 42)

1 Pump suction
2 Pump return line and nozzle return line
3 Pump by-pass screw
4 Pump pressure regulator
5 Safety valve
6 Safety valve
7 Nozzle delivery line
8 Nozzle without interception rod
9 Nozzle return line
10 Pressure variator on nozzle return line
11 Pressure variator servomotor
12 Pressure switch on nozzle return line
13 Safety valve on nozzle return line
14 Safety valve on nozzle return line
15 Pressure switch on pump delivery line
16 POC safety valve
17 POC safety valve
18 Oil pump
19 Delivery piping
20 Return piping
21 Check valve (no dripping function)
22 Check valve (no dripping function
B Oil valve group and pressure variator
C POC Oil valve group (available as accessory)
M Pressure gauges
V Vacuometer connection

NOTE:
The POC (Proof of Closure) valves are required by the NFPA 8501 standard for burners having an output of 12.500 Mbtu/hr or greater.

5.9.1 Steady state operation

At the end of the starting cycle, the servomotor control then passes to load control for boiler pressure or temperature.

- ➤ If the temperature or pressure is low (and the load control is consequently closed), the burner progressively increases output up to MAX.
- ➤ If subsequently the temperature or pressure increases until the load control opens, the burner progressively decreases output down to MIN.
- ➤ The burner shuts off when demand for heat is less than the heat supplied by the burner in the MIN output.
- ➤ The servomotor returns to the 0° angle. The air damper closes completely to reduce thermal dispersion to a minimum.

Every time output is changed, the servomotor automatically modifies oil delivery (pressure regulator) and air delivery (fan damper).

5.10 Firing failure

- ➤ If the burner does not fire, it goes into lock-out within 5 sec. of the opening of the light oil valve.
- ➤ If the flame should go out for accidental reasons during operation, the burner will lock out in 1 s.

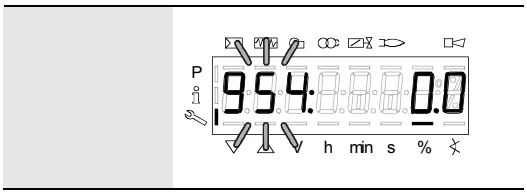
5.11 Flame signal measurement

Check the flame signal through the parameter 954, as indicated in Fig. 43. 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. 43) 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. 43

5.12 Final checks (with the burner working)

➤ Open the control limit operation ➤ Open the high limit operation	⇨	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 ➤ 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 ➤ Disconnect the minimum gas pressure switch ➤ Rotate the minimum low oil pressure switch at the maximum of the scale	⇨	The burner must not start
➤ Cover the flame sensor	⇨	The burner must stop in lockout due to firing failure

Tab. O

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

Turn off 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 Safety test - with gas ball valve closed

It is fundamental to ensure the correct execution of the electrical connections between the gas solenoid valves and the burner to perform safely the commissioning.

For this purpose, after checking that the connections have been carried out in accordance with the burner's electrical diagrams, an ignition cycle with closed gas ball valve -dry test- must be performed.

1 The manual ball gas valve must be closed
2 The electrical contacts of the burner limit switch need to be closed
3 Ensures closed the contact of the low gas pressure switch
4 Make a trial for burner ignition

The start-up cycle must be as follows:

– Starting the fan for pre-ventilation
– Performing the gas valve seal control, if provided
– Completion of pre-ventilation
– Arrival of the ignition point
– Power supply of the ignition transformer
– Electrical Supply of solenoid gas valves

Since the manual gas ball valve is closed, the burner will not light up and its control box will go to a safety lockout condition.

The actual electrical supply of the solenoid gas valves can be verified by inserting a tester. Some valves are equipped with light signals (or close/open position indicator) that turn on at the same time as their power supply.


WARNING

IF THE ELECTRICAL SUPPLY OF THE GAS VALVES OCCURS AT UNEXPECTED TIMES, DO NOT OPEN MANUAL GAS BALL VALVE, SWITCH OFF POWER LINE; CHECK THE WIRES; CORRECT THE ERRORS AND REPEAT THE COMPLETE TEST.

6.2.3 Checking and cleaning

The operator must use the required equipment 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 for excess wear or loose screws. Also make sure that the screws securing the electrical leads in the burner connections are fully tightened.

Clean the outside of the burner.

Flame sensor

In order to reach the flame sensor, proceed as follows:

➤ extract the sensor 2);
➤ clean the glass cover from any dust that may have accumulated.

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.

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.

Flame inspection window

Clean the flame inspection window 1)(Fig. 44).

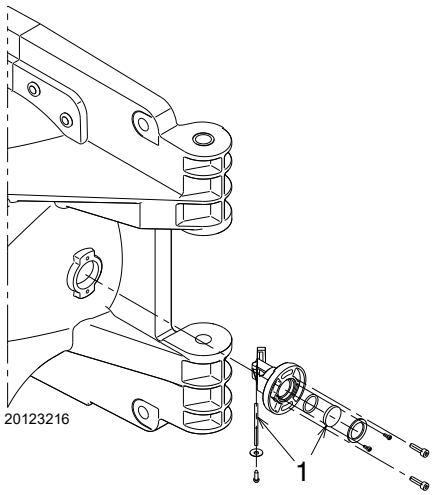


Fig. 44

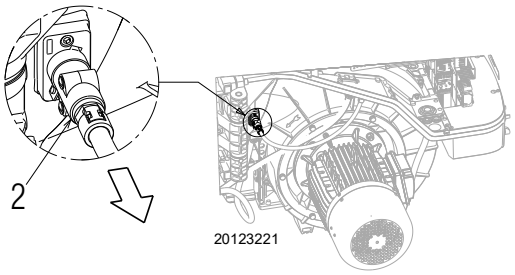


Fig. 45

Combustion

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

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 and have him carry out the necessary adjustments.

LIGHT OIL OPERATION

Pump

Delivery pressure must correspond with the Tab. K on page 25.
The depression must be less than 0.45 bar.
Unusual noise must not be evident during pump operation.
If the pressure is found to be unstable or if the pump runs noisily, the flexible hose must be detached from the line filter and the fuel must be sucked from a tank located near the burner. This measure permits the cause of the anomaly to be traced to either the suction line or the pump.
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 filtering baskets on line and at nozzle present in the system. Clean or replace if necessary.
If rust or other impurities are observed inside the pump, use a separate pump to lift any water and other impurities that may have deposited on the bottom of the tank.

Nozzles

It is advisable to replace nozzles every year during regular maintenance operations.
Do not clean the nozzle openings; do not even open them.
Combustion must be checked after the nozzles have been changed.

Flexible hoses

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

Fuel tank

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

GAS OPERATION

Gas leaks

Make sure that there are no gas leaks on the pipework between the gas meter and the burner.

Gas filter

Change the gas filter when it is dirty.

6.2.4 Safety components

The safety components must be replaced at the end of their life cycle indicated in Tab. P. The specified life cycles do not refer to the warranty terms indicated in the delivery or payment conditions.

Safety component	Life cycle
Flame control	10 years or 250,000 operation cycles
Flame sensor	10 years or 250,000 operation cycles
Gas valves (solenoid)	10 years or 250,000 operation cycles
Pressure switches	10 years or 250,000 operation cycles
Pressure adjuster	15 years
Servomotor (electronic cam) (if present)	10 years or 250,000 operation cycles
Oil valve (solenoid) (if present)	10 years or 250,000 operation cycles
Oil regulator (if present)	10 years or 250,000 operation cycles
Oil pipes/ couplings (metallic) (if present)	10 years
Fan impeller	10 years or 500,000 start-ups

Tab. P

6.3 Adjustment fan motor covering with external rpm

To calibrate the rpm sensor 6)(Fig. 46), proceed as follows:

- ➤ remove the cover 1) unscrewing the screws 2);
- ➤ unscrew or screw the nuts 3) - 5) and the rpm detection disc 4) so that its distance from the rpm sensor 6) is about 2 mm.;
- ➤ place the plate 4) on the nut 5) and fix with the lock nut 3);
- ➤ close the cover 1) by screwing the screws 2).

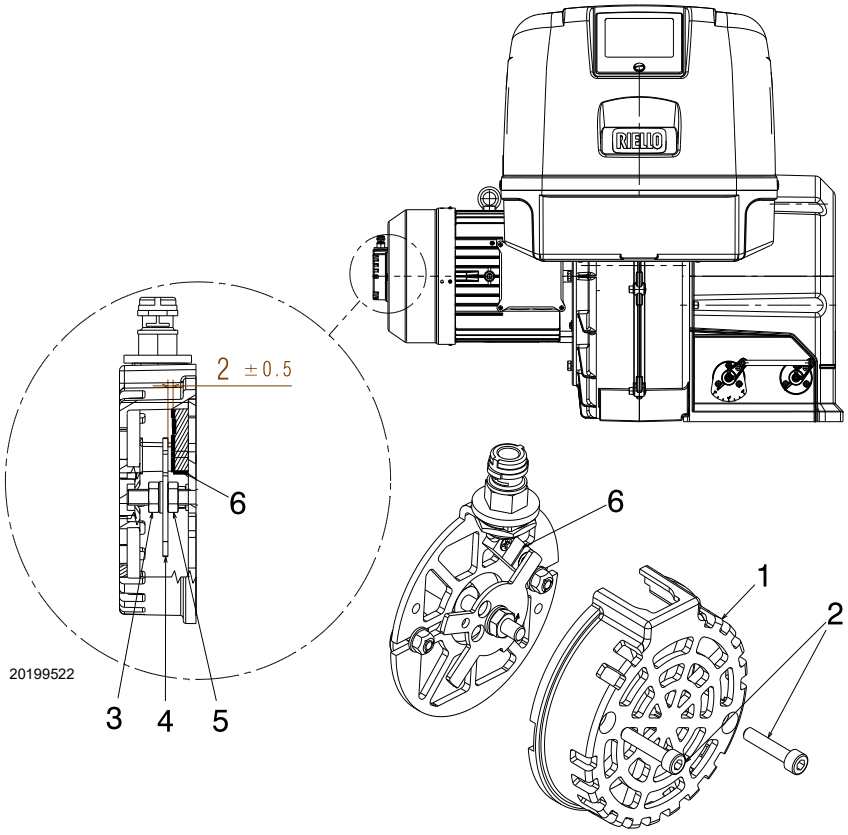


Fig. 46

Key (Fig. 46)

1 - Cover
2 - Screws for cover fixing
3 - Lock nut
4 - Rpm detection disc
5 - Lower nut
6 - Rpm sensor

6.4 Opening the burner

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.

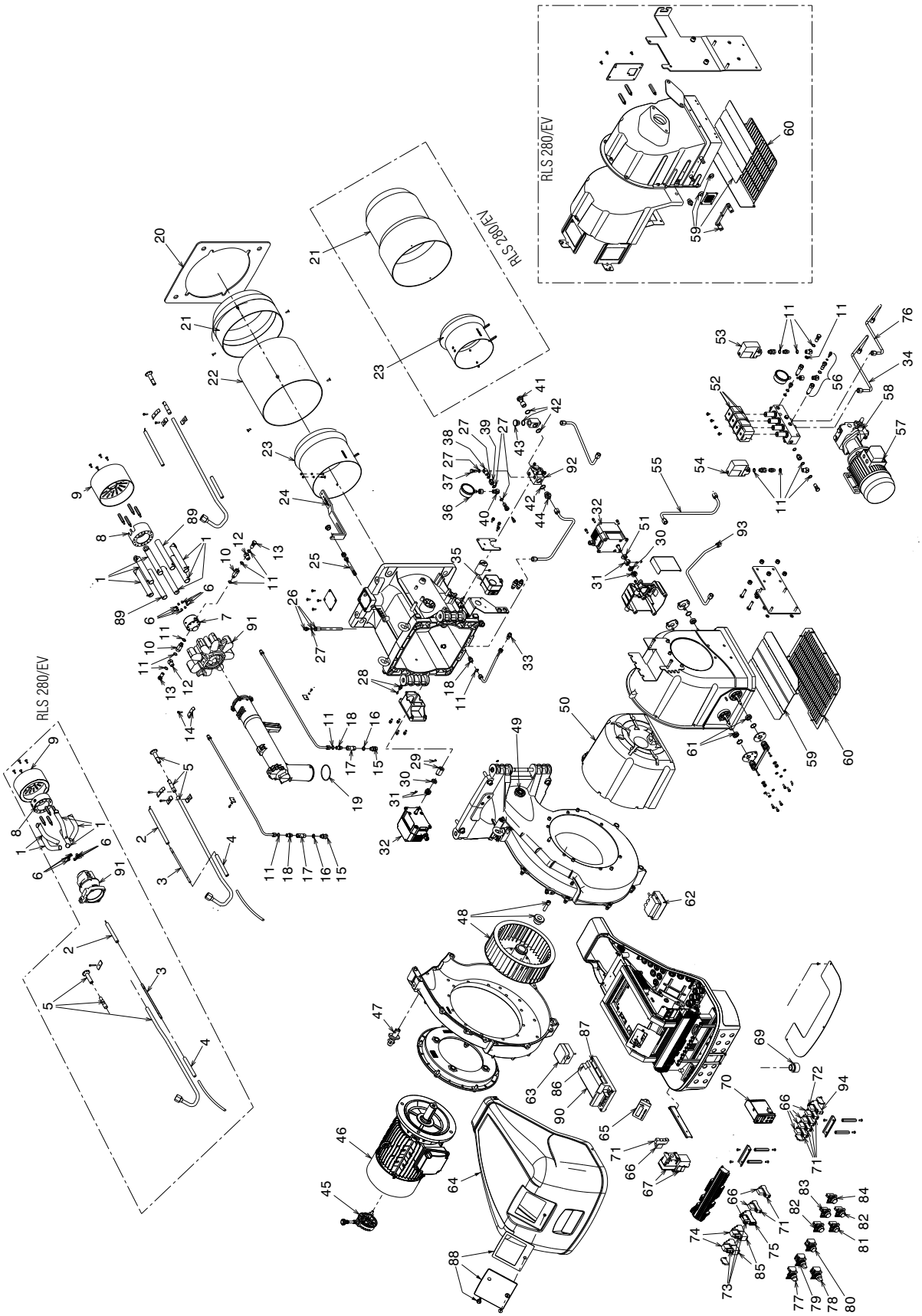
See “Accessibility to the interior of the combustion head” on page 21.

6.5 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 cover and all the safety and protection devices of the burner.

A Appendix - Spare parts



N.		20124937 - RLS 310/EV	20124938 - RLS 310/EV	20124940 - RLS 310/EV	20124941 - RLS 410/EV	20124942 - RLS 410/EV	20124943 - RLS 410/EV	20124954 - RLS 510/EV	20124956 - RLS 510/EV	20124959 - RLS 510/EV	DESCRIPTION	*
1	**20109355**	•	•	•	•	•	•	•	•	•	TUBE	
2	**20032433**	•	•	•	•	•	•	•	•	•	ELECTRODE	A
3	**3012722**	•	•	•	•	•	•	•	•	•	ELECTRODE CONNECTION	A
5	**20123901**	•	•	•	•	•	•	•	•	•	IGNITION PILOT TUBE	C
6	**20123916**	•	•	•	•	•	•	•	•	•	NOZZLE	
7	**20123921**	•	•	•	•	•	•	•	•	•	NOZZLE HOLDER	
8	**20123941**	•	•	•	•	•	•	•	•	•	AIR DIFFUSER	
9	**20123955**	•	•	•	•	•	•	•	•	•	DIFFUSER DISC	
10	**3013460**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
11	**3007079**	•	•	•	•	•	•	•	•	•	SEAL	B
12	**3012455**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
13	**3003006**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
14	**3012626**	•	•	•	•	•	•	•	•	•	PLATE	
15	**3013462**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
16	**20041969**	•	•	•	•	•	•	•	•	•	SEAL	B
17	**3013461**	•	•	•	•	•	•	•	•	•	VALVE NOT RETURN	B
18	**3006723**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
19	**3020191**	•	•	•	•	•	•	•	•	•	O-RING SEAL	B
20	**3013328**	•	•	•	•	•	•	•	•	•	FLANGE GASKET	A
21	**3013314**	•	•	•	•	•	•	•	•	•	END CONE	B
22	**20073781**	•	•	•	•	•	•	•	•	•	CYLINDER	C
23	**20074988**	•	•	•	•	•	•	•	•	•	SHUTTER	C
24	**20073784**	•	•	•	•	•	•	•	•	•	SQUARE	
25	**20075916**	•	•	•	•	•	•	•	•	•	SCREW	
26	**20052434**	•	•	•	•	•	•	•	•	•	GAS PRESSURE GAUGE	
27	**3007077**	•	•	•	•	•	•	•	•	•	SEAL	B
28	**3005447**	•	•	•	•	•	•	•	•	•	TEST POIN	
29	**20075022**	•	•	•	•	•	•	•	•	•	JOINT	C
30	**20073817**	•	•	•	•	•	•	•	•	•	HUB	
31	**3013937**	•	•	•	•	•	•	•	•	•	HUB	
32	**20008601**	•	•	•	•	•	•	•	•	•	SERVOMOTOR	B
34	**20124498**	•	•	•	•	•	•	•	•	•	TUBE	
35	**20014103**	•	•	•	•	•	•	•	•	•	GAS PRESSURE SWITCH	A
36	**3006140**	•	•	•	•	•	•	•	•	•	PRESSURE GAUGE	
37	**3003592**	•	•	•	•	•	•	•	•	•	BAR	C
38	**3012123**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
39	**3012909**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
40	**3013998**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
41	**3003055**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
42	**3007164**	•	•	•	•	•	•	•	•	•	SEAL	B
43	**3013635**	•	•	•	•	•	•	•	•	•	PLUG	
44	**3013559**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
45	**20201481**	•	•	•	•	•	•	•	•	•	SPEED SENSOR	
46	**20201412**	•	•								MOTOR	C
46	**20042608**			•							MOTOR	C

N.		20124937 - RLS 310/EV	20124938 - RLS 310/EV	20124940 - RLS 310/EV	20124941 - RLS 410/EV	20124942 - RLS 410/EV	20124943 - RLS 410/EV	20124954 - RLS 510/EV	20124956 - RLS 510/EV	20124959 - RLS 510/EV	DESCRIPTION	*
46	**20201378**				•	•					MOTOR	C
46	**20124287**						•				MOTOR	C
46	**20201373**							•	•		MOTOR	C
46	**20124359**									•	MOTOR	C
47	**20086579**	•	•	•	•	•	•	•	•	•	FLAME SENSOR	
48	**3003614**	•	•	•							FAN	C
48	**20124069**				•	•	•	•	•	•	FAN	C
49	**3012794**	•	•	•	•	•	•	•	•	•	INSPECTION WINDOW	
50	**20073811**	•	•	•	•	•	•	•	•	•	SOUND DAMPING	
51	**3014079**	•	•	•	•	•	•	•	•	•	SPACER	
52	**3003287**	•	•	•	•	•	•	•	•	•	COIL	B
53	**3012384**	•	•	•	•	•	•	•	•	•	OIL PRESSURE SWITCH	A
54	**3013674**	•	•	•	•	•	•	•	•	•	OIL PRESSURE SWITCH	A
55	**20124499**	•	•	•	•	•	•	•	•	•	TUBE	
56	**20075584**	•	•	•	•	•	•	•	•	•	CONNECTOR	C
57	**20042836**	•	•	•	•	•	•	•	•	•	MOTOR	C
58	**3006158**	•	•	•							PUMP	C
58	**3006236**				•	•	•				PUMP	C
58	**3006410**							•	•	•	PUMP	C
59	**20126622**	•	•	•	•	•	•	•	•	•	AIR DAMPER	
60	**20073814**	•	•	•	•	•	•	•	•	•	PROTECTION	
61	**3012795**	•	•	•	•	•	•	•	•	•	BEARING	C
62	**3012956**	•	•	•	•	•	•	•	•	•	TRANSFORMER	B
63	**3012948**	•	•	•	•	•	•	•	•	•	AIR PRESSURE SWITCH	A
64	**20086561**	•	•	•	•	•	•	•	•	•	COVER	B
65	**3013926**	•	•	•	•	•	•	•	•	•	DISPLAY	
66	**20010969**	•	•	•	•	•	•	•	•	•	RELAY	C
67	**20125063**	•	•	•	•	•	•	•	•	•	STARTER	
69	**20031413**	•	•	•	•	•	•	•	•	•	FUSE HOLDER	
70	**20096592**	•	•	•	•	•	•	•	•	•	POWER REGULATOR	C
71	**3012841**	•	•	•	•	•	•	•	•	•	BASE	C
72	**3020068**	•	•	•	•	•	•	•	•	•	RELAY	C
73	**20043329**	•	•	•	•	•	•	•	•	•	TIMER	B
74	**20030708**	•	•	•	•	•	•	•	•	•	RELAY	C
75	**20125077**	•	•	•	•	•	•	•	•	•	BASE	C
76	**20124500**	•	•	•	•	•	•	•	•	•	OIL TUBE	C
77	**20027021**	•	•	•	•	•	•	•	•	•	SELECTOR SWITCH	
78	**20028411**	•	•	•	•	•	•	•	•	•	SELECTOR SWITCH	
79	**20027422**	•	•	•	•	•	•	•	•	•	SELECTOR SWITCH	
80	**20010962**	•	•	•	•	•	•	•	•	•	PUSH BUTTON	
81	**20027020**	•	•	•	•	•	•	•	•	•	YELLOW SIGNAL LIGHT	A
82	**20036017**	•	•	•	•	•	•	•	•	•	GREEN SIGNAL LIGHT	A
83	**20036019**	•	•	•	•	•	•	•	•	•	WHITE SIGNAL LIGHT	A
84	**20027018**	•	•	•	•	•	•	•	•	•	RED SIGNAL LIGHT	A
85	**20028400**	•	•	•	•	•	•	•	•	•	BASE	C

N.		20124937 - RLS 310/EV	20124938 - RLS 310/EV	20124940 - RLS 310/EV	20124941 - RLS 410/EV	20124942 - RLS 410/EV	20124943 - RLS 410/EV	20124954 - RLS 510/EV	20124956 - RLS 510/EV	20124959 - RLS 510/EV	DESCRIPTION	*
86	**3014106**	•	•	•	•	•	•	•	•	•	FUSE	
87	**3013940**	•	•	•	•	•	•	•	•	•	CONNECTORS ASSEMBLY	
88	**20075921**	•	•	•	•	•	•	•	•	•	VIEWING PORT	
89	**3013493**	•	•	•	•	•	•	•	•	•	TUBE	
90	**20028329**	•	•	•	•	•	•	•	•	•	ELECTRONIC CAM	C
91	**20124446**	•	•	•	•	•	•	•	•	•	DIFFUSER	
92	**20124484**	•	•	•	•	•	•	•	•	•	MODULATOR	B
93	**20124501**	•	•	•	•	•	•	•	•	•	OIL TUBE	C
94	**3020071**	•	•	•	•	•	•	•	•	•	BASE	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

Gas train according to UL Standards

The installer is responsible for the supply and installation of any required 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:	

GAS OPERATION

Gas Supply Pressure:		CO_2: Low Fire		High Fire	
Main Power Supply:		O_2: Low Fire		High Fire	
Control Power Supply:		CO: Low Fire		High Fire	
Burner Firing Rate:		NO_X: Low Fire		High Fire	
Manifold Pressure:		Net Stack Temp - Low Fire:		High Fire	
Pilot Flame Signal:		Comb. Efficiency - Low Fire:		High Fire	
Low Fire Flame Signal:		Overfire Draft:			
High Fire Flame Signal:					

OIL OPERATION

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

CONTROL SETTINGS

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

NOTES

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

RIELLO BURNERS NORTH AMERICA
http://www.riello.ca

35 Pond Park Road
Hingham, Massachusetts,
U.S.A. 02043

1-800-4-RIELLO

2165 Meadowpine Blvd
Mississauga, Ontario
Canada L5N 6H6