



Dual fuel light oil/gas burner

Progressive two-stage or modulating operation for gas applications

Progressive two-stage operation for light oil applications

CODE	MODEL
20171528	RLS 28/E



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



WARNING

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

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

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

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

2 Safety and prevention

2.1 Introduction

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

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

It is a good idea to remember the following:

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

In particular:

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

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

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



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

2.2 Personnel training

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

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- Personnel must observe all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel must inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

In addition:



- the user must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- the user must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.
- Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.

3
Technical description of the burner
3.1 Technical data

Model			RLS 28/E
Output ⁽¹⁾	2 nd stage	MBtu/hr ⁽³⁾	616 - 1232
Delivery ⁽¹⁾		kW	181 - 361
		GPH	4.4 - 8.8
	min. 1 st stage	MBtu/hr ⁽³⁾	378
		kW	111
		GPH	2.7
Fuel			#2 Light oil Natural gas / Propane gas
Operation			Light oil: low-high-low Gas: low-high-low or modulating
Nozzles	number		2
Ambient temperature	°F		32 - 104 (0 - 40 °C)
Combustion air temperature	°F max		140 (60 °C)
Noise Levels ⁽²⁾	dB(A)		68
Weight (without / with packaging)	lbs		154 / 176

Tab. A

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

⁽²⁾ Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output.

⁽³⁾ Equivalent Btu values based on 1 USGPH = 140,000 Btu/hr.

3.2 Electrical data

Model			RLS 28/E
Control circuit power supply	V/Ph/Hz		120/1/60
Main power supply	V/Ph/Hz		120/1/60
Electrical power consumption	W		600
Electrical control circuit cons.	W max		750
Total electrical consumption	W		1350
Electrical protection			NEMA 1

Tab. B
3.3 Burner models designation

Model	Riello Code	RBNA Code	Voltage	Flame safeguard
RLS 28/E TC FS1	20164154	20171528	120/1/60	Burner mounted

Tab. C

3.4 Burner dimensions

The maximum dimensions of the burners are given in Fig. 1.

Note that if you need to examine the combustion head, the burner must be pulled backward on the slide bars.

The maximum dimension of the burner is given by measurement V.

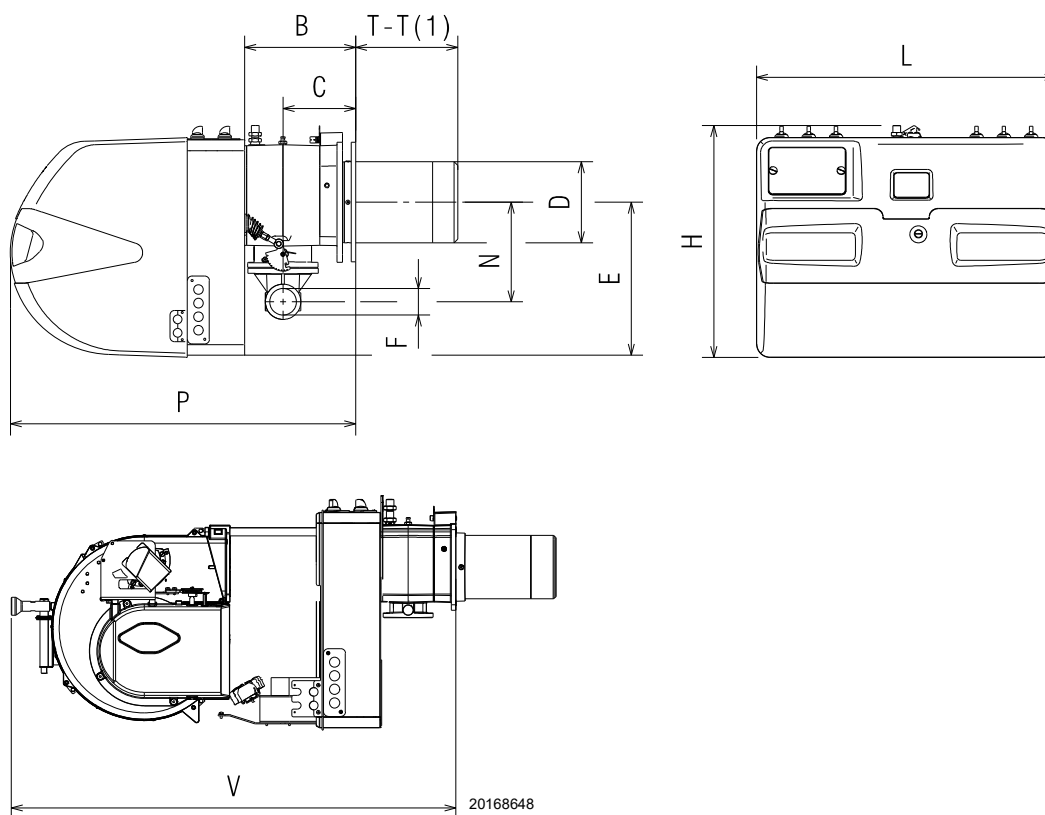


Fig. 1

inch	B	C	D	E	F	H	L	N	P	T-T ⁽¹⁾	V
RLS 28/E	6 1/2"	4 1/4"	5 1/2"	14 1/8"	1 1/2" NPT	20 1/2"	26	6 5/8"	26 3/4"	7 1/2" - 12 27/32"	44 1/4"

Tab. D

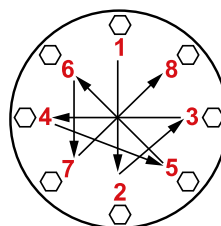
(1) Blast tube: short - long (obtainable with kit)

3.5 Standard equipment

Gas train flange	No. 1
Flange gasket	No. 1
Flange fixing screws	No. 4
Adaptor G1/8" - 1/8" NPT	No. 1
Flexible oil line	No. 2
Adaptor for flexible oil line	No. 4
Instructions manual	No. 1



It is recommended to tighten the screws of the gas flange with a tightening torque of 15 Nm $\pm$ 10% (11 lbf ft).



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

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3.6 Burner description

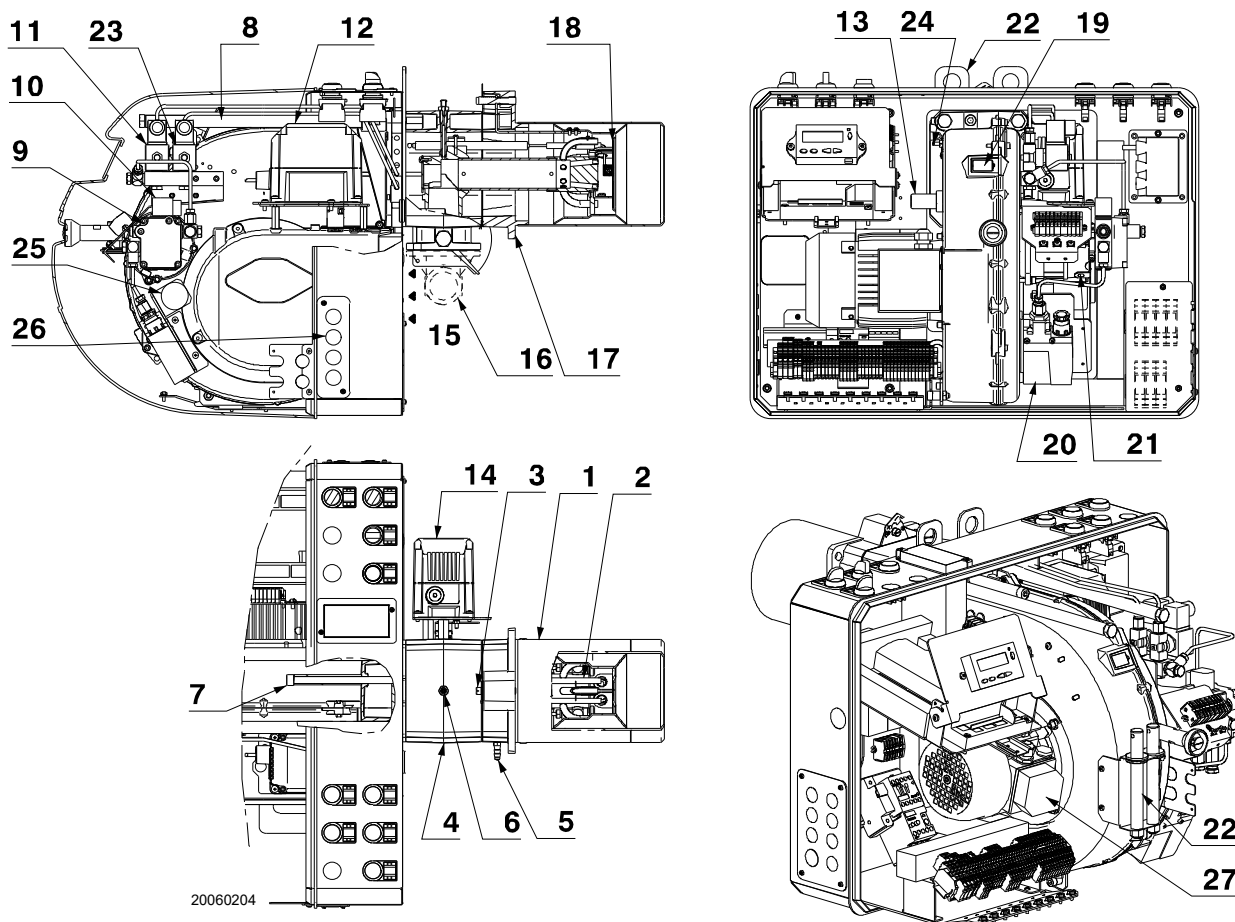


Fig. 2

- 1 Combustion head
- 2 Ignition electrodes
- 3 Screw for combustion head adjustment
- 4 Sleeve
- 5 Air pressure test point-head
- 6 Gas pressure test point and head fixing screw
- 7 Screw securing fan to sleeve
- 8 Slide bars for opening the burner and inspecting the combustion head
- 9 Pump
- 10 Safety solenoid valve
- 11 Low fire oil valve
- 12 Air servomotor
- 13 Flame sensor
- 14 Fuel servomotor
- 15 Air inlet to fan
- 16 Gas input connection
- 17 Boiler mounting flange
- 18 Flame stability disk
- 19 Flame inspection window
- 20 Minimum oil pressure switch
- 21 Pump motor
- 22 Lifting rings
- 23 High fire oil valve
- 24 Air pressure switch test point
- 25 Pump motor capacitor
- 26 Power supply and safety/control device entry cables
- 27 Fan motor

3.7 Panel board description

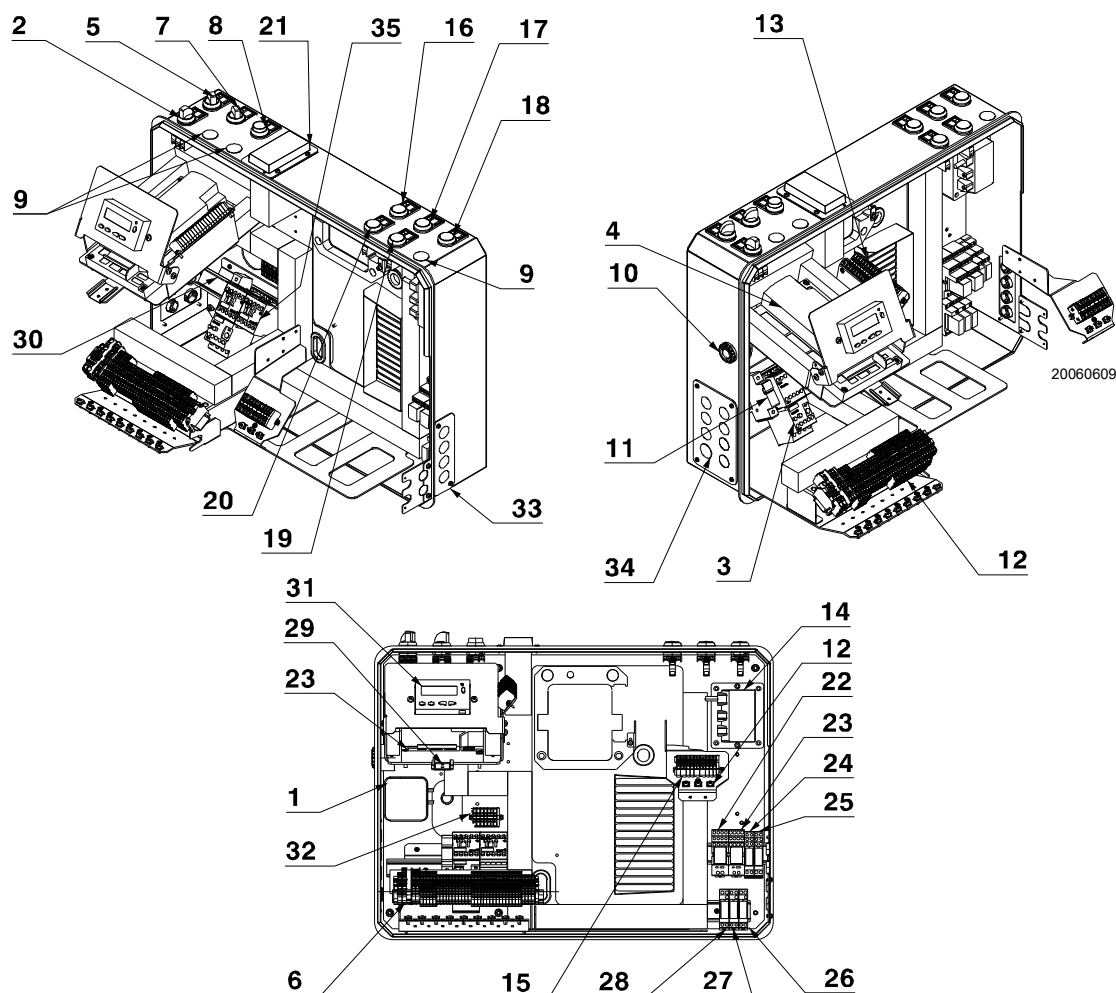


Fig. 3

- | | |
|--|--|
| 1 Air pressure switch (differential operating type) | 26 "K5" relay |
| 2 "OIL-OFF-GAS" switch | 27 "K3" relay |
| 3 Fan motor contactor and thermal overload with reset button | 28 "K1" relay |
| 4 Flame control | 29 DIN bar available for accessories (OCI 412.10) |
| 5 "OFF-ON" switch | 30 DIN bar available for accessories |
| 6 Burner terminal strip "X1" | 31 Operator panel with LCD display and lock-out reset button |
| 7 "LOCAL - REMOTE" switch | 32 Auxiliary terminal strip "X4" |
| 8 "Alarm silence" button | 33 Plate with four hole knock-outs for electrical cable routing |
| 9 Optional holes | 34 Holes for cable grommets for electrical wiring for accessories (to be carried out by the installer) |
| 10 Horn | 35 Pump motor contactor |
| 11 Auxiliary fuse | |
| 12 Ground terminal | |
| 13 RWF55 terminal board | |
| 14 Ignition transformer "TA" (for gas and oil operation) | |
| 15 Terminal strip for oil circuit "X2" | |
| 16 "POWER ON" signal | |
| 17 "CALL FOR HAET" signal | |
| 18 "ALARM ON" signal | |
| 19 "FUEL ON" signal | |
| 20 "IGNITION ON" signal | |
| 21 RWF55 modulator (with analog output 4-20 mA) | |
| 22 Timer module and relay K01 | |
| 23 Timer module and relay KG1 | |
| 24 "KG2" relay | |
| 25 "K2" relay | |
- Two types of burner failure may occur:
- **Flame safeguard lock-out**
If the alarm signal lamp in "ON" 18)(Fig. 3) lights up, it indicates that the burner is in lock-out.
To reset, press the reset pushbutton.
 - **Fan motor trip**
Release by pressing the pushbutton on thermal overload 3)(Fig. 3).

3.8 Firing rate

- The burner can work in two ways: low and high fire.
- **MAXIMUM OUTPUT** must be selected in area **A** (Fig. 4).
 - **MINIMUM OUTPUT** must not be lower than the minimum limit shown in the diagram:

Model	MBtu/hr	GPH
RLS 28/E	378	2.7

Tab. E



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

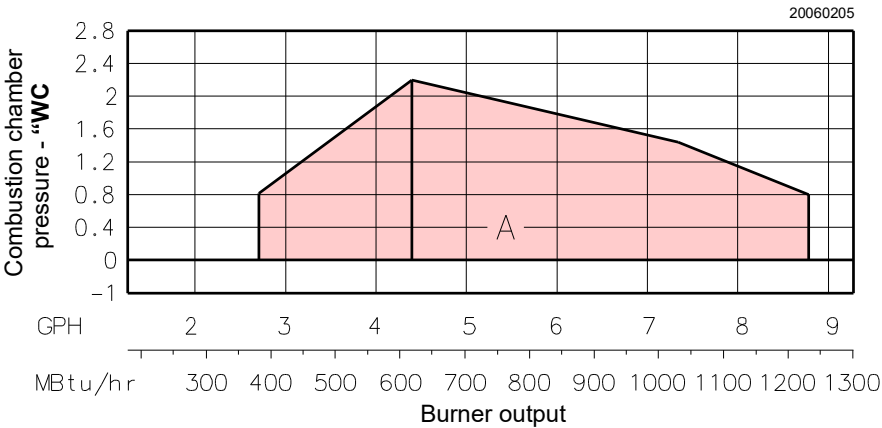


Fig. 4

3.9 Flame control (LMV36.5...)

Warning notes



WARNING

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

The LMV36.5... 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 flame control (Fig. 5), (hereafter referred to simply as the flame control), 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 flame control relate to:

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

Mechanical design

The following system components are integrated in the LMV36.5... basic unit:

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



Fig. 5

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 LMV36.5... to the AZL2... together with other cables.



WARNING

The first start-up, like every further operation for the internal settings of the flame control, 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:

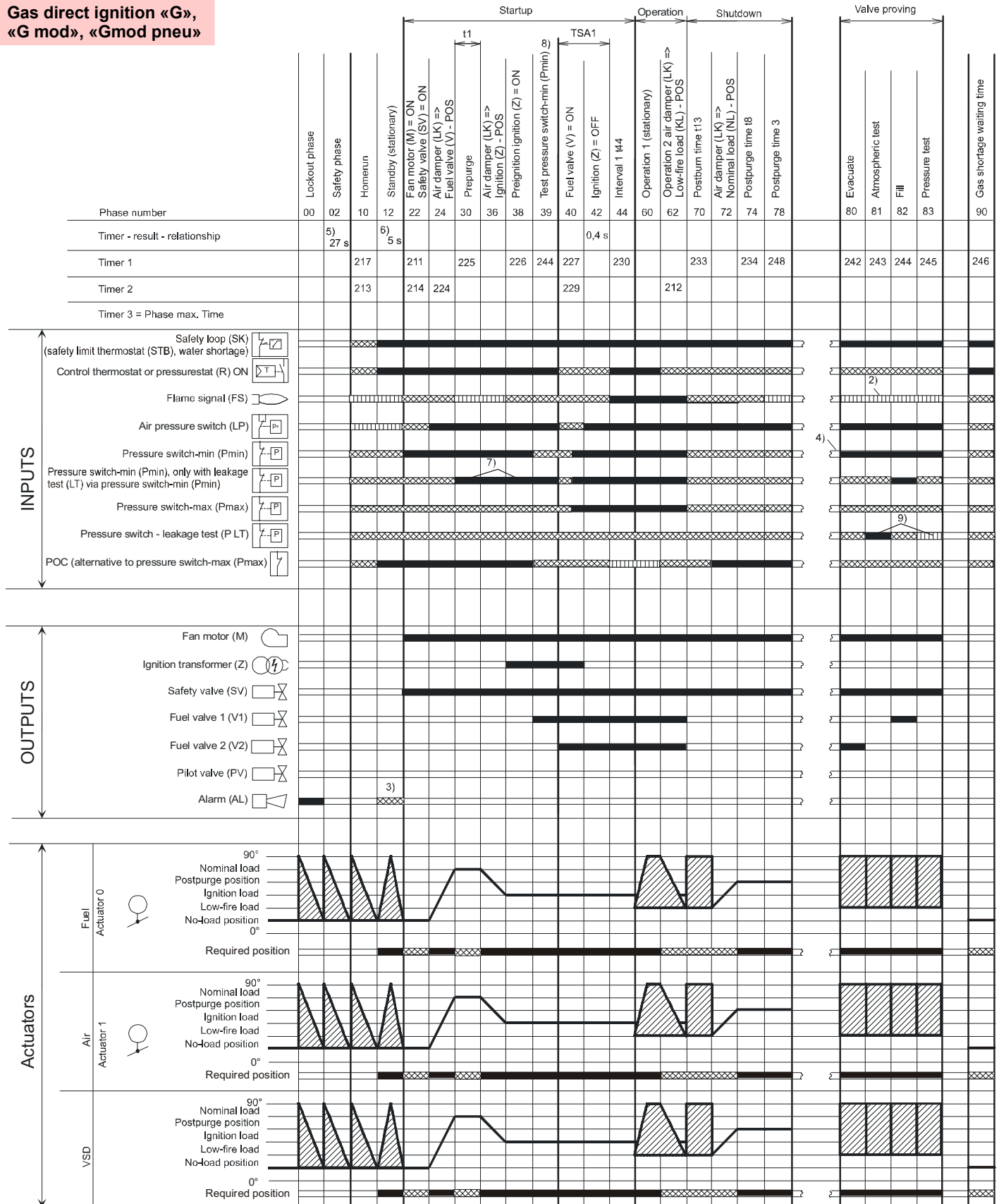
- Never run the detector cable together with other cables.
 - Line capacitance reduces the magnitude of the flame signal.
 - Use a separate cable.
- Observe the maximum permissible detector cable lengths.
- The ionization probe is not protected against electric shock hazard. It is mainspowered and must 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

LMV36.5... 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 95 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 $\cos\varphi > 0.4$
	Alarm output	
	- Nominal voltage - Nominal current - Power factor	AC 120 V, 50 / 60 Hz 1 A $\cos\varphi > 0.4$
	Ignition transformer	
	- Nominal voltage - Nominal - 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 $\cos\varphi > 0.2$
	Fuel valves	
	- Nominal voltage - Nominal current - Power factor	AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 $\cos\varphi > 0.4$
	Operation display	
	- Nominal voltage - Nominal current - Power factor	AC 120 V, 50 / 60 Hz 0.5 A $\cos\varphi > 0.4$
Cable lengths	Mains line	Max. 100 m (100 pF/m)
	Display, BCI	- For used outside the burner cover or the control panel: Max. 3 m (100 pF/m) - For use outside the burner hood or in the control panel: Max. 10 m (100 pF/m)
	External lockout reset button	Max. 20 m (100 pF/m)
Environmental conditions	Operation	DIN EN 60721-3-3
	Climatic conditions	Class 3K3
	Mechanical conditions	Class 3M3
	Temperature range	-20...+60 °C
	Humidity	< 95 % r.h.

Sequence diagrams

Gas direct ignition «G»,
«G mod», «Gmod pneu»



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Fig. 6

Light oil direct ignition «Lo»,
«Lo mod», «Lo 2-stage», «Lo 3-stage»

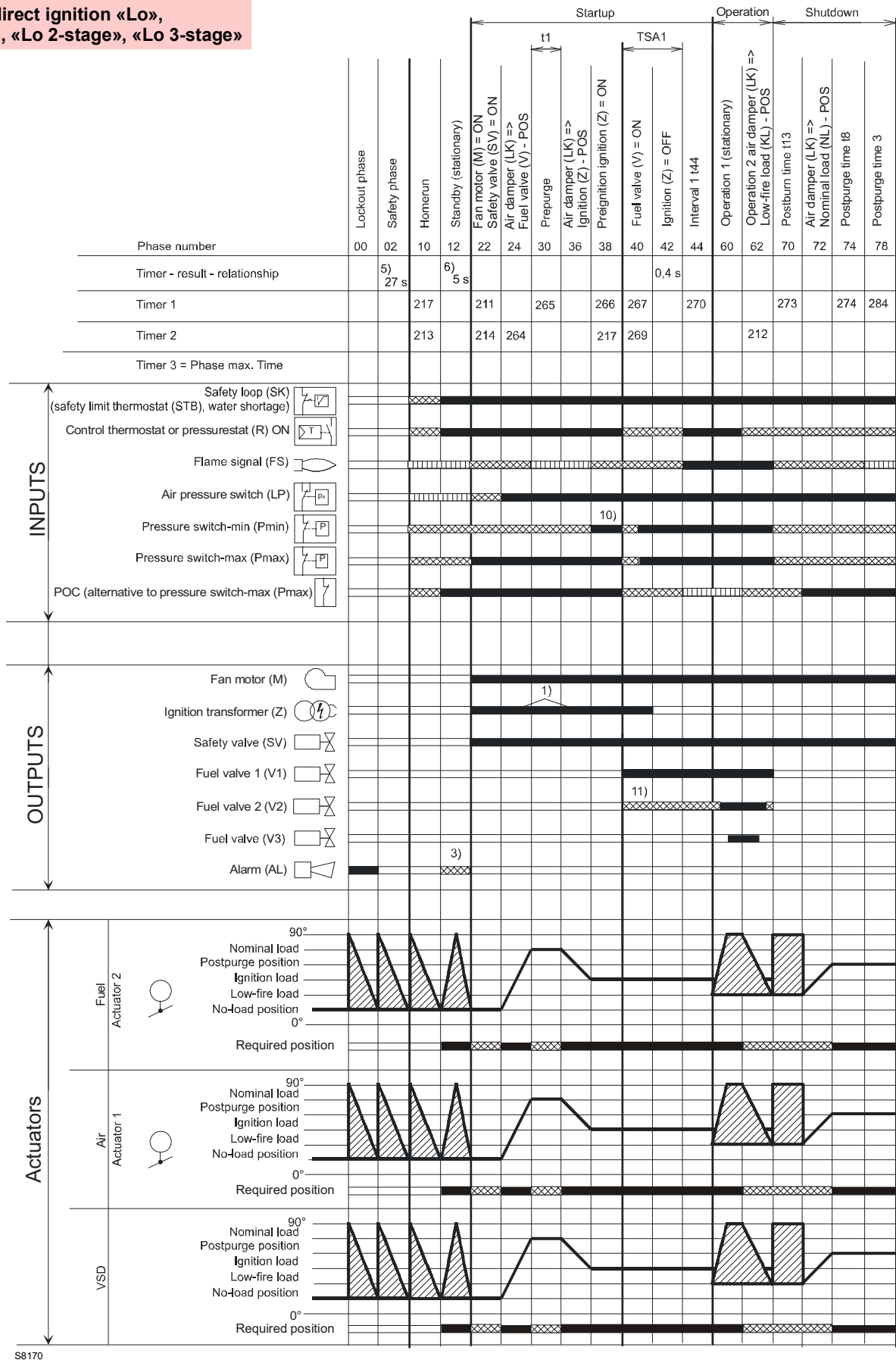


Fig. 7

Key to sequence diagrams (Fig. 6 and Fig. 7)

Valve proving takes place depending on the parameter:

Between phase 62 and phase 70 or / and between phase 24 and phase 30

- 1 Parameter: Short / long pre-ignition time for oil only
Short / long oil pump – switch-on time – time
- 2 Only with valve proving on start-up
- 3 Parameter: With / without alarm in the event of prevention of start-up
- 4 In the event of an erroneous signal on start-up, followed by phase 10, otherwise phase 70
- 5 27 s = maximum time safety phase, followed by lockout
- 6 5 s = time between occurrence of prevention of start-up and indication
- 7 Only with valve proving on start-up (valve proving via pressure switch-min)
- 8 Only in case of start-up without valve proving (valve proving via pressure switch-min)
- 9 Inverse logic in case of valve proving via pressure switch-min
- 10 Parameter: Oil pressure min input
1 = active from phase 38
2 = active from safety time
- 11 Only with fuel train Lo with 2 fuel valves

Assignment of times:

t1 Prepurge time

TSA Safety time



Permissible position range



In standby: the servomotor can travel within the permissible positioning range, but is always driven to the no-load position. When changing phases, it must be in the no-load position.

0° / 10% Position as supplied (0°)

90° / 100% Servomotor fully open (90°)

AL	Alarm
FS	Flame signal
LP	Air pressure switch
M	Fan motor N Postpurging
P LT	Valve proving (pressure switch)
Pmin	Pressure switch-min
Pmax	Pressure switch-max
POC	Proof of closure
PV	Pilot valve
SA...	Servomotor
SB	Safety limiter
SV	Safety shutoff valve
STB	Safety limit thermostat
V	Prepurging
V...	Fuel valve

 Signal ON

 Signal OFF

 Permissible signal

3.10 Servomotors (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 servomotors!

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

Use

The servomotors (Fig. 8) 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 flame control, which constantly checks their position by means of a return signal from the optic sensor inside the servomotor.

The position (in degrees) of the servomotors can be seen on the display of the Operator Panel.

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

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 servomotor is disconnected from power.



WARNING

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

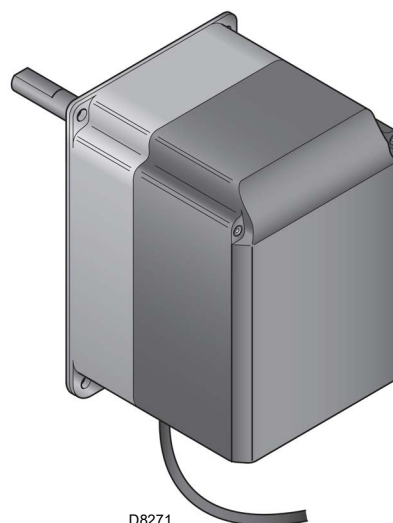


Fig. 8

Technical data

Operating voltage	AC / DC 24 V $\pm$ 20 % (load on interface)
Safety class	2 to EN 60 730 part 1 and parts 2...14
Power consumption	max. 10 W
Degree of protection	IP54 to EN 60 529-1
Opening time 0 - 90°	min: 5s, max.: 120s (depending on the type of flame control)
Firing rate	0 - 90°
Cable connection	RAST2,5 connectors
Direction of rotation	Clockwise/anticlockwise (can be selected from the flame control)
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. F

4

Installation

4.1 Notes on safety for the installation

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



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



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

4.2 Handling

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



The handling operations for the burner can be highly dangerous if not carried out with the greatest attention: keep any unauthorised people at a distance; check the integrity and suitability of the available means of handling.

Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall).

During the handling, keep the load at not more than 20-25 cm from the ground.



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

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

4.3 Preliminary checks

Checking the consignment



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



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



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



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 Preparing the boiler

4.4.1 Boiler plate

Drill the combustion chamber mounting plate as shown in Fig. 9.

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

inch	A	DF	Ø
RLS 28/E	6 $\frac{9}{32}$ "	8 $\frac{13}{16}$ "	$\frac{3}{8}$ W

Tab. G

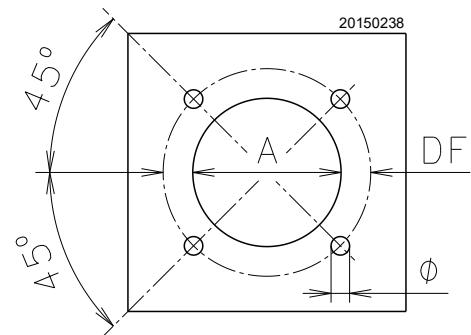


Fig. 9

4.4.2 Blast tube length

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

The range of lengths available, L (inch), is as follows:

Model	L (short blast tube)	L (long blast tube)
RLS 28/E	7 1/2"	12 27/32"

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

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

4.5 Securing the burner to the boiler

Detach the combustion head from the burner (Fig. 10):

- remove screw 14) and withdraw the cover 15);
- disconnect the oil pipes by unscrewing the two connectors 4);
- remove the screws 2) from the slide bars 3);
- remove screw 1) and pull the burner back on slide bars 3) by about 4".

- Disconnect the electrode wires and then pull the burner completely off the slide bars.
- Secure the flange 9) to the boiler plate, inserting the gasket 6).
- Use the 4 screws, also supplied with the unit, after first protecting the thread with an anti-locking product.
- The seal between burner and boiler must be airtight.

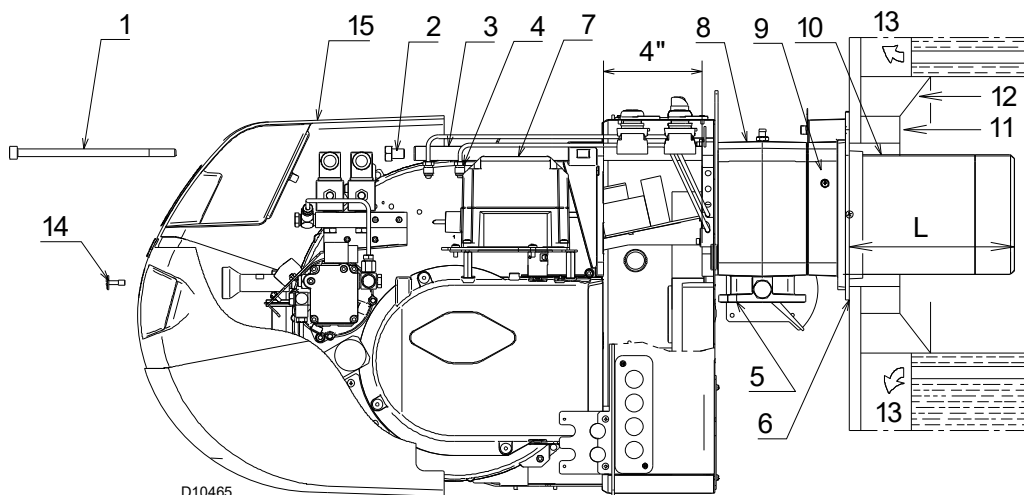


Fig. 10

4.6 Nozzle

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



WARNING

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



CAUTION

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

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

4.6.1 Choice of nozzles for 1st and 2nd stage

Both nozzles must be chosen from among those listed in Tab. H at page 19.

The first nozzle determines the delivery of the burner at low fire.

The second nozzle works together with the 1st nozzle to determine the delivery of the burner at high fire.

The deliveries at low and high fire must be contained within the value range indicated on page 6.



WARNING

Use nozzles with a 60° spray angle at the recommended pressure of 174 PSI.

The two nozzles usually have equal deliveries.

GPH	GPH			MBTU/h
	145 PSI	174 PSI	203 PSI	
2.00	2.47	2.72	2.95	381
2.25	2.75	3.04	3.33	426
2.50	3.07	3.39	3.68	475
3.00	3.68	4.07	4.42	570
3.50	4.32	4.74	5.16	664

Tab. H

Example:

boiler output = 1360 MBtu/hr efficiency 80 %

Output required by the burner: $1360/0.8 = 1700$ MBtu/hr;

$1700/2 = 850$ MBtu/hr (4.50 GPH) for nozzle

Therefore, two equal, 60°, 174 PSI nozzles are required:

1° = 4.50 GPH with 2° = 4.50 GPH,

or the following two different nozzles:

1° = 5.00 GPH with 2° = 4.00 GPH,

or: 1° = 4.00 GPH with 2° = 5.00 GPH.

4.6.2 Nozzle assembly

- Remove screw 1)(Fig. 11) and extract the internal part 2);
- install two nozzles with the box wrench 1)(Fig. 12), after having removed the plastic plugs 2);
- fitting the wrench through the central hole in the flame stability disk or loosen screws 1)(Fig. 13);
- remove disk 2)(Fig. 13) and replace the nozzles using the wrench 3).

The nozzle for low fire operation is the one underneath the firing electrodes (Fig. 14).



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 carefully.

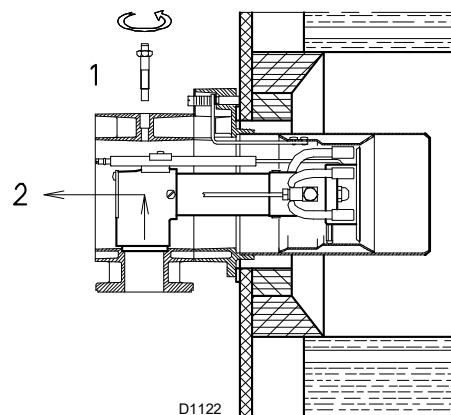


Fig. 11

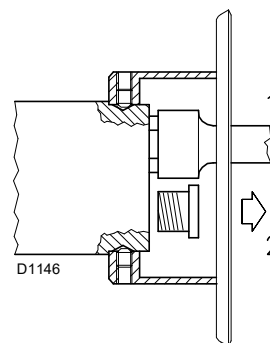


Fig. 12

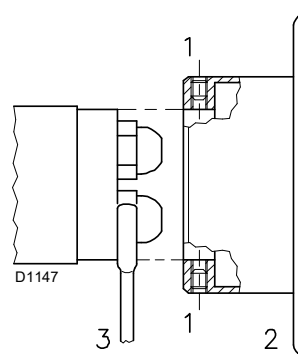


Fig. 13

4.7 Electrodes adjustment



WARNING

Make sure that the electrodes are positioned as shown in Fig. 14.

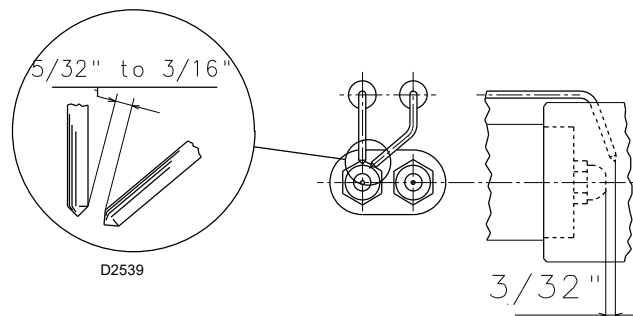


Fig. 14

4.8 Burner refitting

- Refit the burner 4)(Fig. 15) to the slide bars 3) at approximately 4" from the sleeve 5) - burner positioned as shown in Fig. 10 at page 18;
- insert the ignition electrode cables and then slide bars the burner up to the sleeve so that it is positioned as shown in Fig. 15;
- remove extension bars;
- refit screws 2) on slide bars 3);

- secure the burner to the sleeve by tightening screw 1);
- connect the oil pipes again by screwing on the two connectors 4)(Fig. 10 at page 18).



When fitting the burner on the two slide bars, it is advisable to gently draw out the high tension cables until they are slightly stretched.

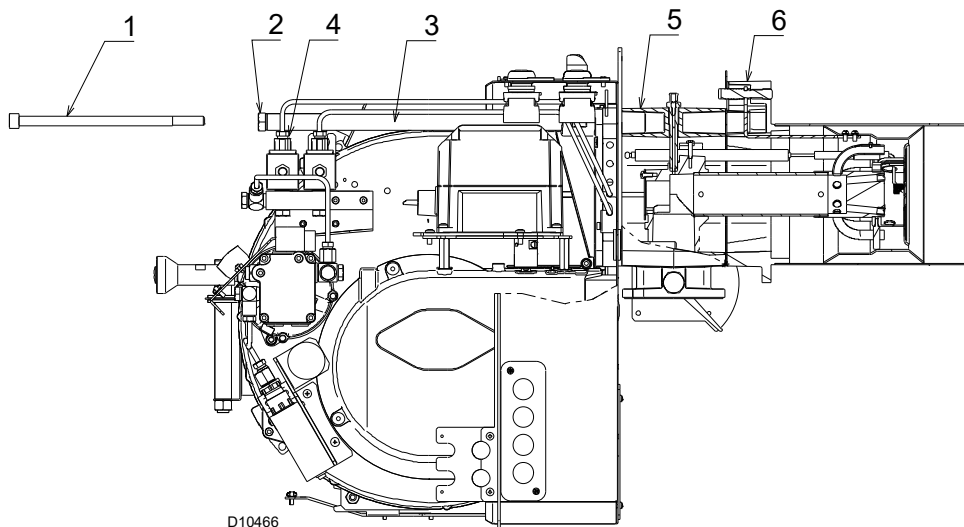


Fig. 15

4.9 Combustion head adjustment

The setting of the combustion head depends exclusively on the delivery of the burner at high fire.

Turn screw 5)(Fig. 16) until the notch shown in diagram (Fig. 17) is level with the front surface of flange 6).

Example:

high fire burner delivery = 7.3 GPH

If diagram (Fig. 17) is consulted it is clear that for this delivery, the combustion head must be adjusted using notch 4.

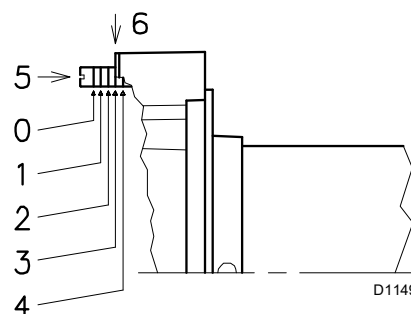


Fig. 16

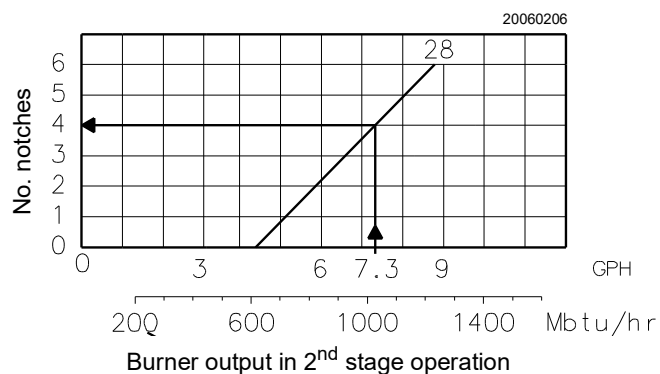


Fig. 17

4.10 Light oil supply



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

Precautions: avoid knocking, attrition, sparks and heat.

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



WARNING

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

4.10.1 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. I.

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 13 ft in order to permit pump self-priming even when the tank is almost completely empty.

The tank lower than the burner B

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

It is good practice to ensure that the return and suction lines enter the burner from the same height.

In this way it will be more improbable that the suction line fails to prime or stops priming.

± H ft	L (ft)		
	Ø 5/16"	Ø 3/8"	Ø 1/2"
+ 13	115	296	500
+ 10	99	263	500
+ 6.6	86	227	500
+ 3.3	69	194	428
+ 1.6	63	174	391
0	56	158	355
- 1.5	49	141	319
- 3.3	43	122	283
- 6.6	30	89	211
- 10	13	53	138
- 13	-	20	66

Tab. I

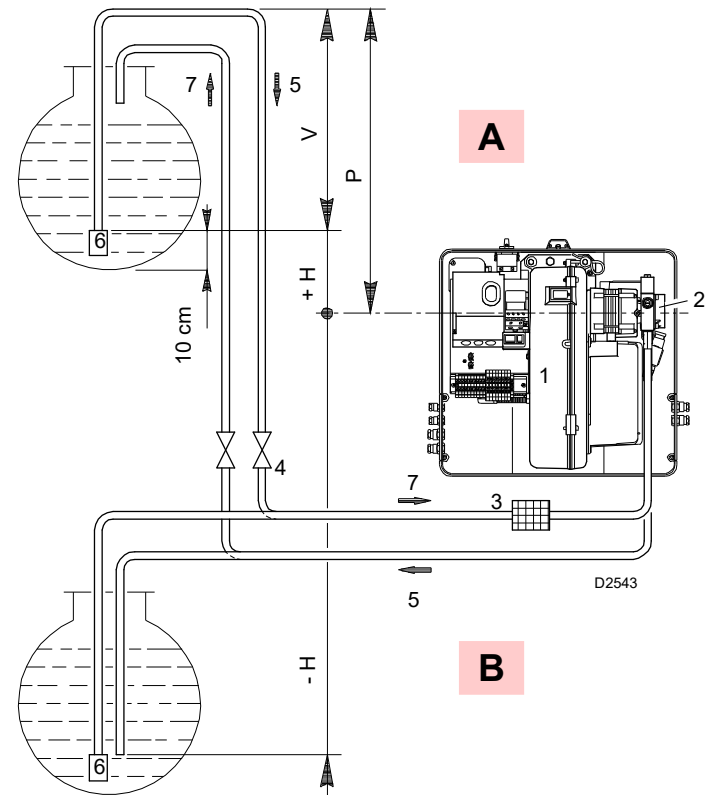


Fig. 18

Key (Fig. 18)

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

4.10.2 Hydraulic system

Key (Fig. 19)

- 1 Pump suction
- 2 Filter
- 3 Pump
- 4 Pressure regulator
- 5 Return pipe
- 6 By-pass screw
- 7 Pump return
- 8 Safety solenoid
- 9 Low fire valve
- 10 High fire valve
- 11 Filter
- M Pressure gauge
- P Min. oil pressure switch
- V Vacuum gauge

4.10.3 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. 19).

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



WARNING

The pump seal will be damaged 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 connectors into the connections and screw them down.



CAUTION

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

- Route the hoses through the holes in the plate, preferably using those on the right side (Fig. 20): unscrew the screws 1), now divide the insert piece into its two parts 2) and 3).
- 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.

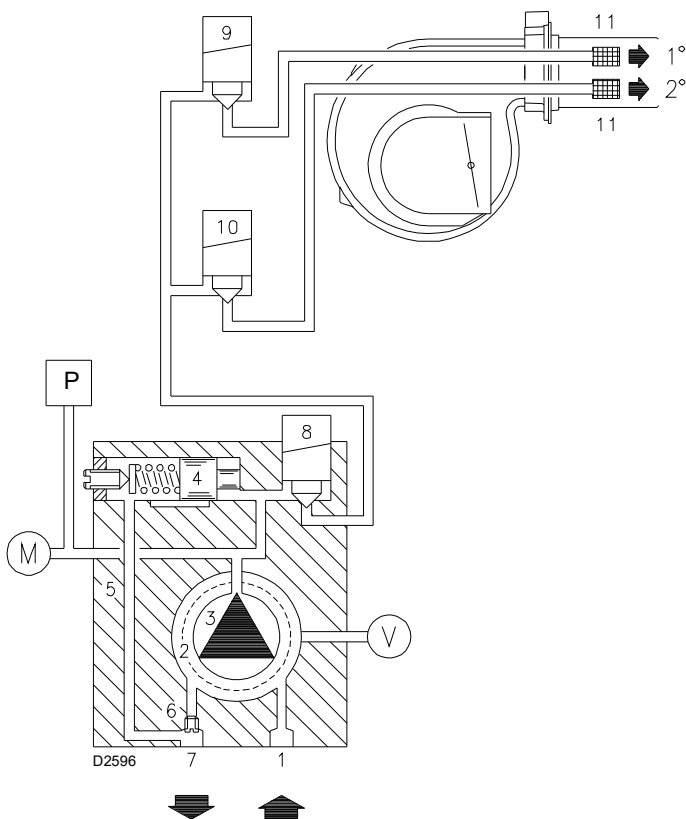


Fig. 19

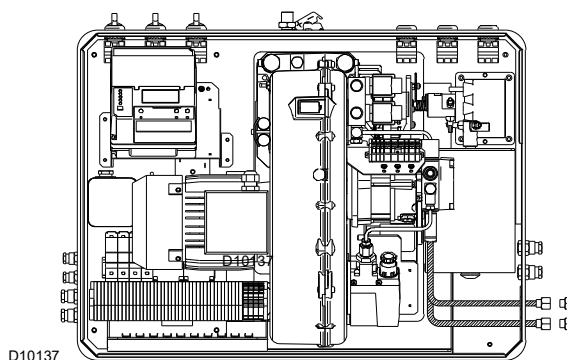
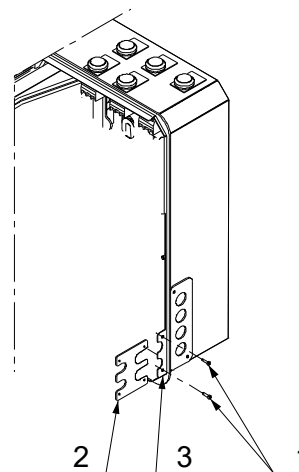


Fig. 20

4.10.4 Pump

Technical data

Pump model SUNTEC AL 65

Min. delivery rate at 174 PSI pressure	GPH	21.5
Delivery pressure range	PSI	58 - 261
Max. suction pressure	"Hg	13
Viscosity range	cSt	2 - 12
Max light oil temperature	°F	140 - 60
Max. suction and return pressure	PSI	29
Pressure calibration in the factory	PSI	174
Filter mesh width	inch	0.006

Tab. J

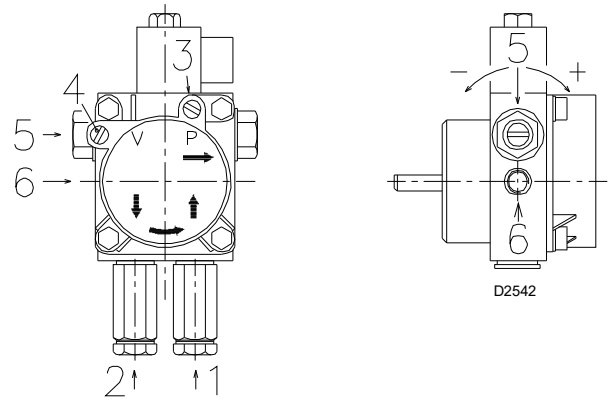


Fig. 21

4.10.5 Pump priming



WARNING

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

Obstructions in the line could cause the seal located on the pump shaft to break (the pump leaves the factory with the by-pass closed).

- Also check to make sure that the valves located on the suction line are open and that there is sufficient fuel in the tank.
- For self-priming to take place, one of the screws 3)(Fig. 21) of the pump, must be loosened in order to bleed off the air contained in the suction line.
- Start the burner by closing the control circuit in the manual position and turn the **"OIL-OFF-GAS"** switch into **"OIL"** position.
- The pump is primed when the fuel oil starts coming out of the screw 3)(Fig. 21).
- Stop the burner.

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

If the pump fails to prime at the first starting of the burner and the burner locks out, reset the burner, and then repeat the starting operation.

Do not illuminate the flame sensor or the burner will lock out.

Key (Fig. 21)

- 1 Suction 1/4" NPT
- 2 Return 1/4" NPT
- 3 Pressure gauge attachment G 1/8"
- 4 Vacuum gauge attachment G 1/8"
- 5 Pressure regulator

4.11 Gas supply



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

Precautions: avoid knocking, attrition, sparks and heat.

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



WARNING

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

4.11.1 Gas feeding line

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

4.11.2 Gas train installation



DANGER

Disconnect the electrical power using the main system switch.



Check that there are no gas leaks.



Beware of train movements: danger of crushing of limbs.



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



The operator must use appropriate tools for installation.



WARNING

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

The gas train must be connected to the gas attachment 1)(Fig. 23), using flange 2), gasket 3) and screws 4) supplied with the burner.

The gas train can enter the burner from the right or left side, depending on which is the most convenient.

Gas solenoid 5)(Fig. 22) must be as close as possible to the burner to ensure gas reaches the combustion head within the safety time period.

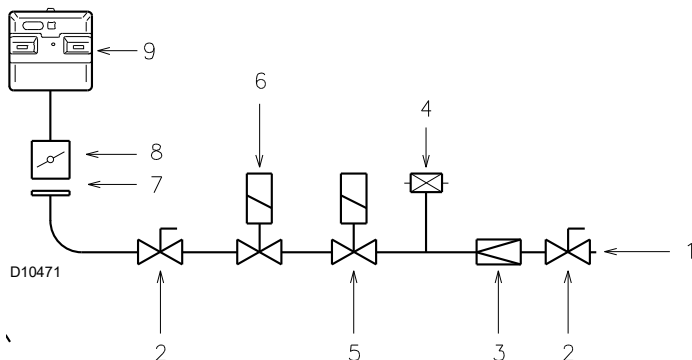


Fig. 22

Key (Fig. 22)

- 1 Gas input pipe
- 2 Manual valve
- 3 Pressure regulator
- 4 Minimum gas pressure switch
- 5 Safety solenoid
- 6 2nd safety shut-off valve
- 7 Standard issue burner gasket with flange
- 8 Gas adjustment butterfly valve
- 9 Burner

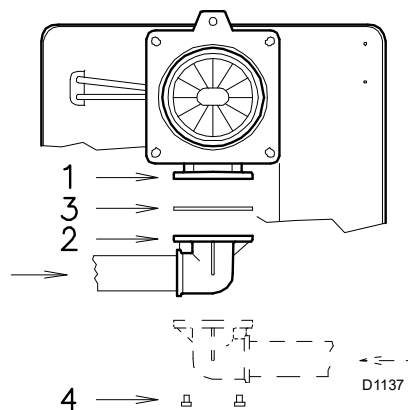


Fig. 23



WARNING

Make sure that the pressure governor calibration range (colour of the spring) comprises the pressure required by the burner.

4.11.3 Gas valve electrical connections



Connections must be respected.



Pay attention to the terminals during the connection of the valves.

The correct terminals are the orange ones, as shown in Fig. 25-A.

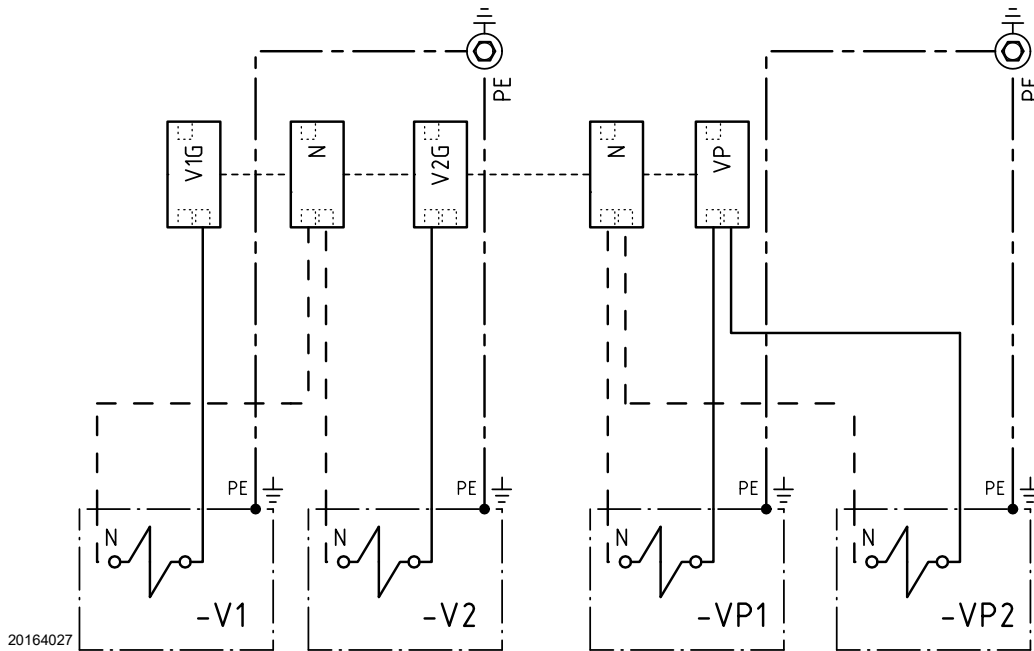


Fig. 24

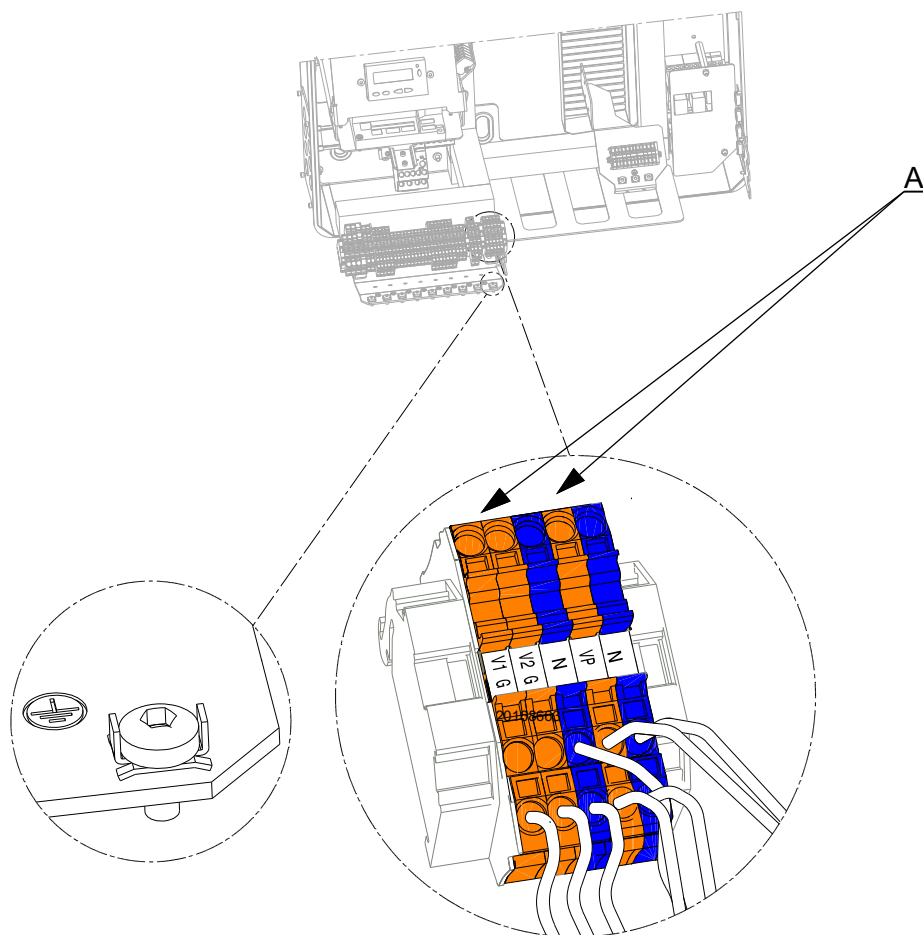


Fig. 25



WARNING

In case of installation of the vent valves (VV and VV1), the configuration will be that shown in Fig. 26.

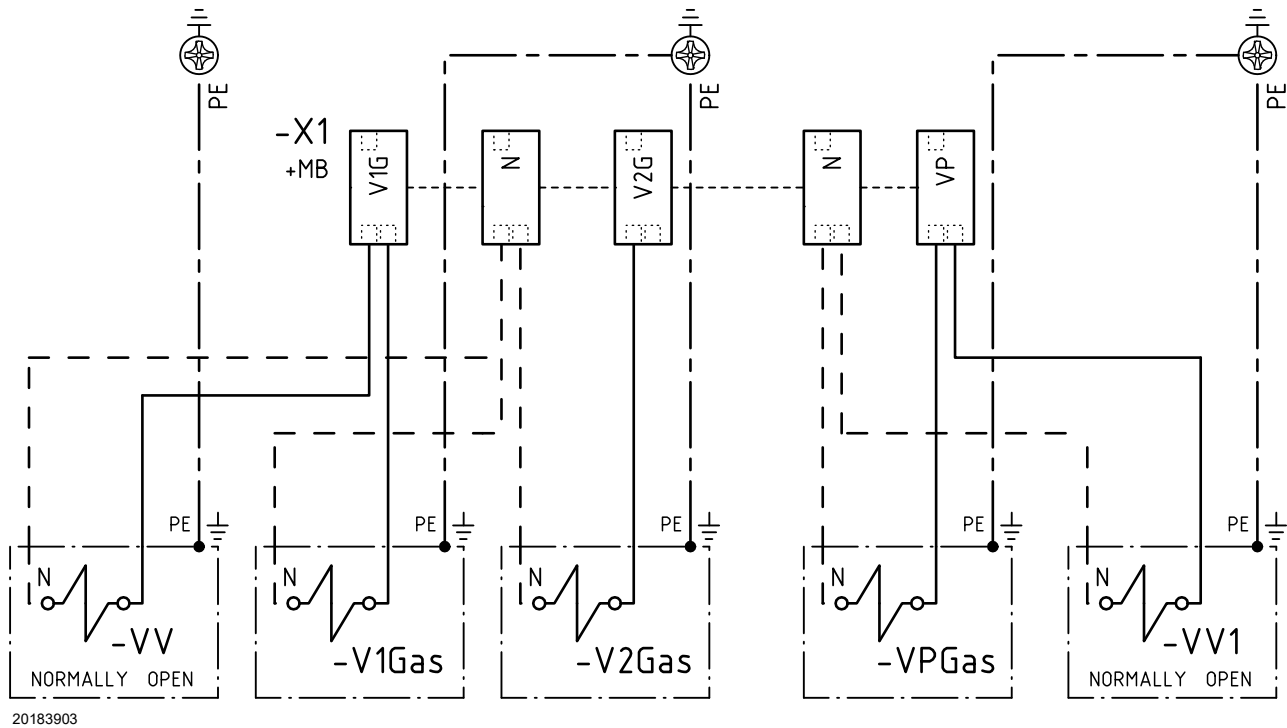


Fig. 26

4.11.4 Gas pressure

The Tab. K are used to calculate manifold pressure taking into account combustion chamber pressure.

Gas manifold pressure measured at test point 1)(Fig. 27), with:

- Combustion chamber at 0" WC
- Burner operating at high fire
- Natural gas

Calculate the approximate high fire output of the burner as follows:

- subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 27).
- Find the nearest pressure value to your result in the table for the burner in question.
- Read off the corresponding output on the left.

Example with natural gas:

- High fire operation
- Gas pressure at test point 1)(Fig. 27) = 3.66" WC
- Pressure in combustion chamber = 0.79" WC
- $3.66 - 0.79 = 2.87" \text{ WC}$

A high fire output of 796 MBtu/hr shown in Tab. K corresponds to 2.87" WC pressure, natural gas.

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

MBtu/hr	Δp (" WC)
616	2.56
700	2.68
796	2.87
890	3.15
985	3.43
1079	3.78
1174	4.09
1232	4.33

Tab. K

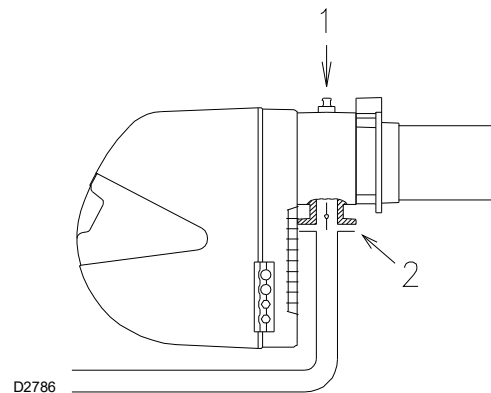


Fig. 27



WARNING

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

4.12 Electrical wiring

Notes on safety for the electrical wiring



DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. 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 $\frac{1}{8}$ " (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

Close the fuel interception tap.



DANGER

Avoid condensate, ice and water leaks from forming.

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

4.12.1 Supply cables and external connections passage

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

The use of the cable grommets can take various forms.

By the way of example we indicate the following mode (Fig. 28)(according to **UL795**):

- 1 Three phase power supply with $\frac{1}{2}$ " cable grommet (no single phase);
- 2 Single phase power supply with $\frac{1}{2}$ " cable grommet.
Available:
Consents/safety, minimum gas pressure switch, gas valves and other devices with $\frac{3}{8}$ " cable grommet.
- 3 Available: maximum gas pressure switch (kit) and other
- 4 Horn
- 5 Available: step down transformer

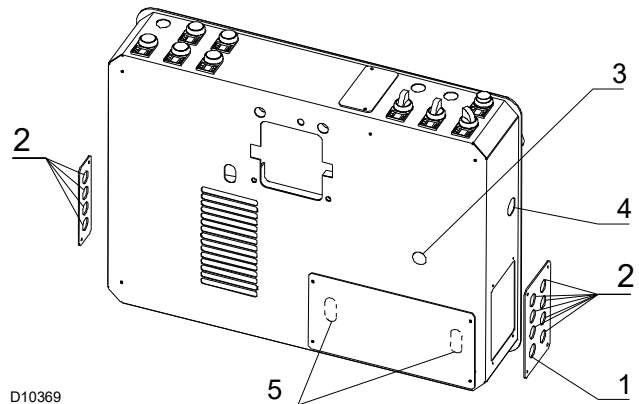


Fig. 28



WARNING

The control panel is in compliance with **UL508A**.



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

4.13 Overload relay calibration

Depending on the burner type, there are two different overload relays:

- Electro-mechanical overload relay (used for single phase motors).
- Electronic relay (used for three phase motors).

4.13.1 Electro-mechanical overload relay

The electro-mechanical overload relay (Fig. 29) is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase.

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

- To reset, in the case of an intervention of the overload relay, press the button **"RESET"** (Fig. 29).
- The button **"STOP"** (Fig. 29) opens the NC (95-96) contact and stops the motor.

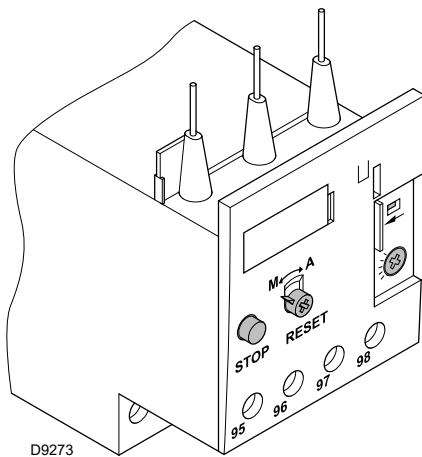


Fig. 29

- To test the overload relay, insert a screwdriver in the window **"TEST"** (Fig. 30) and move it in the sense of the arrow (towards right).



WARNING

Automatic resetting can be dangerous.

This action is not provided for the burner operation.

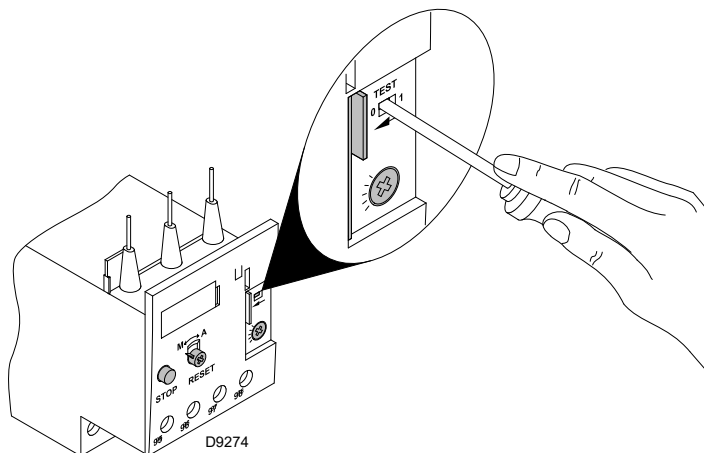


Fig. 30

4.13.2 Electronic relay

- To reset, in the case of an intervention of the electronic relay, press the button **"RESET"** (Fig. 31).

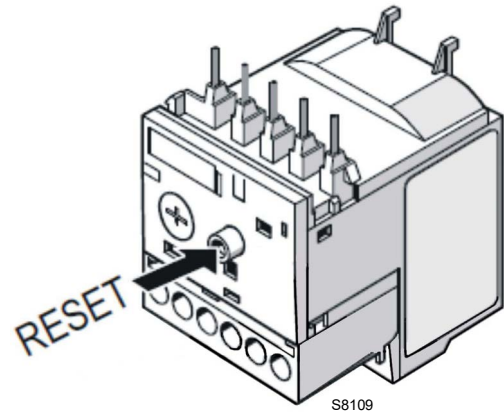


Fig. 31

There are two different solution to test the electronic relay:

- **Device test (Fig. 32)**
Push slowly the button in the window with a little screwdriver.

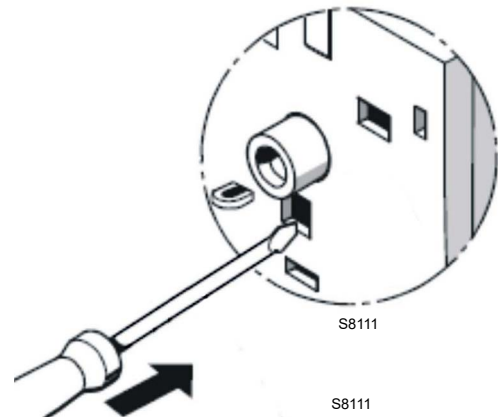


Fig. 32

- **Contact test NC (95-96) and NO (97-98)(Fig. 33)**
Insert in the window a little screwdriver and move it in the sense of the arrow.

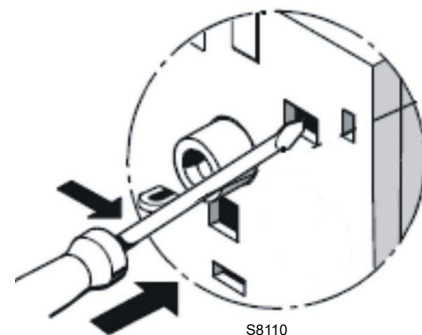


Fig. 33

5

Start-up, calibration and operation of the burner

5.1 Notes on safety for the first start-up



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.



Refer to paragraph “Safety test - with gas ball valve closed” on page 35 before the first start-up.



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

5.2 Adjustments before first firing (light oil operation)

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

5.2.1 Nozzles

See the information listed on page 18.

5.2.2 Combustion head

The adjustment of the combustion head already carried out (page 20) need not be altered unless the high fire input of the burner is changed.

5.2.3 Pump adjustment

No settings are required for the pump, which is set to 174 PSI by the manufacturer.

This pressure must be checked and adjusted (if required) after the burner has been ignited.

The only operation required in this phase is the application of a pressure gauge on the appropriate pump connection.

5.2.4 Minimum oil pressure switch

The minimum oil pressure switch (Fig. 34) is factory set to 145 PSI (10 bar).

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

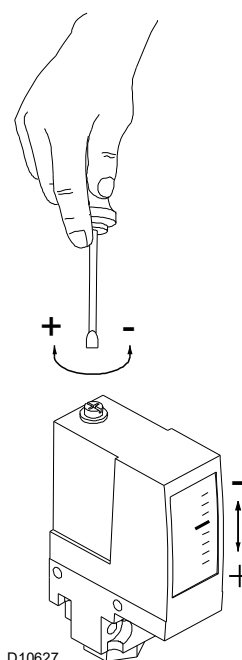


Fig. 34

5.3 Burner calibration (light oil operation)



It is advisable to first set the burner for operation on oil and then for gas.

Turn burner off prior to switching fuels.

5.3.1 Firing

Set the AZL (Display) in the manual position.

During the first firing, and the change from low to high fire, there is a momentary lowering of the fuel pressure caused by the filling of the high fire nozzle tubing.

This lowering of the fuel pressure can cause the burner to lock-out.

5.3.2 Operation

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

Low and high fire nozzles

See the information listed on page 18.

Pump pressure

174 PSI: this is the pressure calibrated in the factory which is usually sufficient for most purposes.

Sometimes, this pressure must be adjusted to:

145 PSI: in order to reduce fuel delivery. This adjustment is possible only if the surrounding temperature remains above 0 °C;

203 PSI: in order to increase fuel delivery or to ensure firings even at temperatures of less than 0 °C.

In order to adjust pump pressure, use the screw 5)(Fig. 21 at page 23).

Low fire fan air damper

Keep the burner operating at low fire. The fan air damper is adjusted by moving the servomotor to drive from the air/fuel ratio.

High fire fan air damper

Increase output and keep it pressed until the high fire position. The fan air damper is adjusted by moving the servomotor to drive from the air/fuel ratio. Store the two points of low fire/high fire.

5.4 Adjustments before first firing (gas operation)

Adjustment of the combustion head has been illustrated on page 20.

In addition, the following adjustments must also be made:

- open manual valves down stream and up stream from the gas train.
- Adjust the minimum gas pressure switch (Fig. 38 at page 33) to the start of the scale.
- Adjust the air pressure switch (Fig. 39 at page 33) to the zero position of the scale.
- Purge the air from the gas line. Fit a U-type manometer (Fig. 35) to the gas pressure test point on the sleeve. The manometer readings are used to calculate the high fire burner firing rate using the tables on Tab. K at page 27.

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

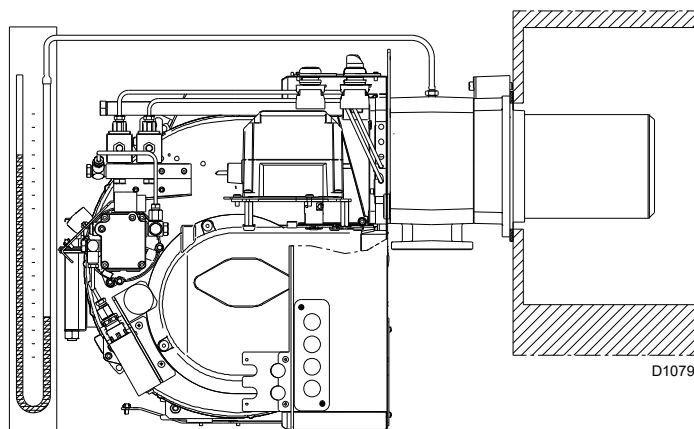


Fig. 35

5.5 Burner firing

Having completed the checks indicated in the previous heading, 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. If the burner doesn't start, purge and remove the air front the gas train and repeat the starting.

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

5.6 Burner calibration (gas operation)

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

5.7 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. 36) and turn the switch of to position “LOCAL”;
- 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.

When the burner starts, check the direction of the motor rotation, as indicated in Fig. 36.

As the burner is not fitted with a device to check the sequence of the phases, the motor rotation may be incorrect.

As soon as the burner starts up, go in front of the cooling fan of the fan motor and check it is rotating anticlockwise.

If this is not the case:

- place the switch in position “0” and wait for the flame control to carry out the switch-off phase;
- disconnect the electrical supply from the burner;
- invert the phases on the three-phase power supply.



WARNING

For the start-up procedure and the parameters calibration, refer to the specific instruction manual of the LMV36.5... electronic cam supplied with the burner.

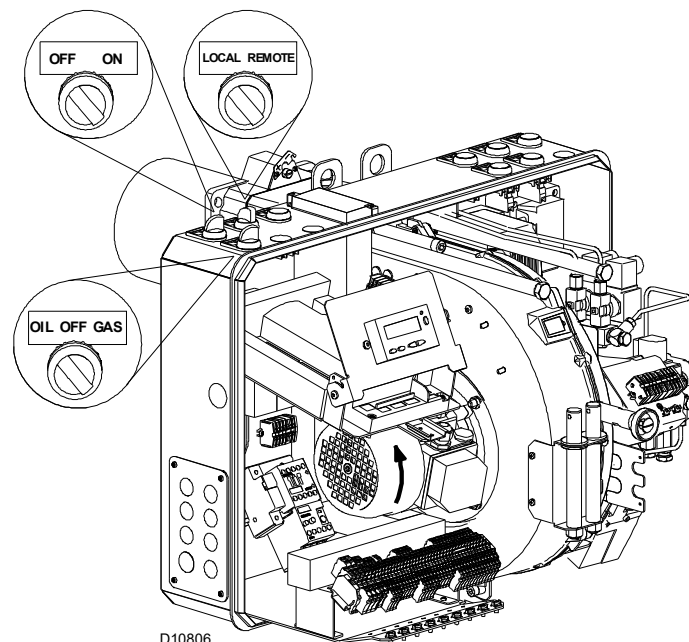


Fig. 36

5.7.1 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.

5.7.2 Flame signal measurement

Check the flame signal through the parameter 954, as indicated in Fig. 37. The displayed value is expressed in percentage.

For further and specific information, please refer to the specific instruction manual.

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.

The display (Fig. 37) shows parameter **954**: flashing on the left.

On the right, the flame's intensity is displayed as a percentage. Example: **954: 0.0**

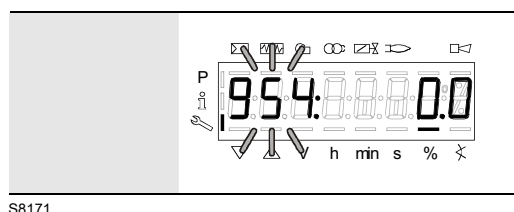


Fig. 37

5.8 Final calibration of the pressure switches

5.8.1 Minimum gas pressure switch

The purpose of the minimum gas pressure switch is to prevent the burner from operating in an unsuitable way due to too low gas pressure.

Adjust the minimum gas pressure switch (Fig. 38) 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.



1 kPa = 10 mbar

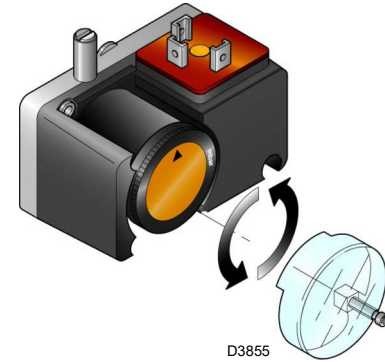


Fig. 38



Fig. 39

5.8.2 Air pressure switch

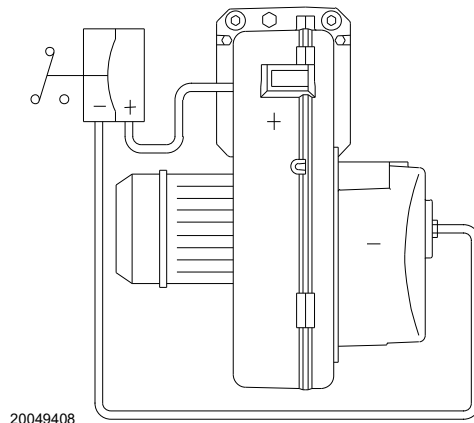
The air pressure switch is connected in differential (Fig. 40) and is activated by both the negative pressure of the air intake and the air pressure from the fan.

Adjust the air pressure switch (Fig. 39) 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.



20049408

Fig. 40

5.9 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 (if installed) ➤ Rotate the air pressure switch knob to the maximum end of scale position	➡	The burner must stop in lockout
➤ Switch off the burner and disconnect the voltage ➤ Rotate the minimum gas pressure switch ➤ Regulate the minimum oil pressure switch	➡	The burner must not start
➤ Cover the flame sensor	➡	The burner must stop in lockout due to firing failure



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.



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

Before carrying out any maintenance, cleaning or checking operations:



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



Close the fuel 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 flame control 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.



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

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.

Flame inspection window

Clean the flame inspection window (Fig. 41 at page 36).

Flame sensor

Clean the glass cover from any dust that may have accumulated. In order to reach the flame sensor, unscrew the screw 1)(Fig. 42 at page 36) and extract the flame sensor with the relevant support 2).

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.

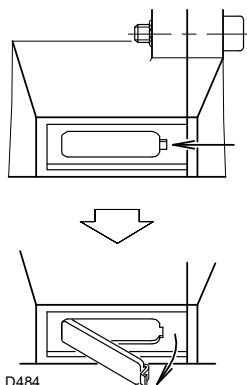


Fig. 41

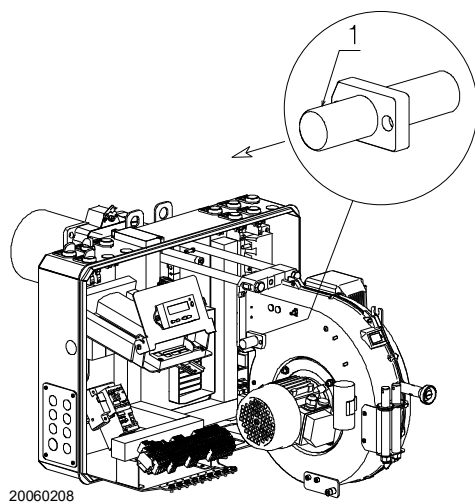


Fig. 42

Burner

Check for excess wear or loose screws in the mechanisms controlling the air damper and the gas butterfly valve.

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

LIGHT OIL OPERATION

Pump

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.

Flexible hoses

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

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.

Combustion

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

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.

Combustion

Adjust the burner if the combustion values found at the beginning of the operation do not comply with the regulations in force, or do not correspond to good combustion.

Combustion checks

CO₂

It is better to set the burner with CO₂ not higher than 10% (with natural gas). In this way avoiding a loss of calibration setting (for example draft variation) that could cause combustion with little air and the production of CO.

CO

It must be not higher than 400 PPM.

6.2.4 Safety components

The safety components must be replaced at the end of their life cycle indicated in Tab. L. 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. L

6.3 Opening the burner



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



Close the fuel interception tap.



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

To open the burner proceed as follows:

- remove screws 1) and withdraw cover 2);
- disconnect the light-oil pipes 3) from the solenoid valves 4);
- install the extension bars;
- remove screw 5), the split pin 9) and pull the burner back by about 4" on the slide bars 6);
- disconnect the electrode wires and then pull the burner fully back.

Now extract the internal extension bars after having removed the screw 8).

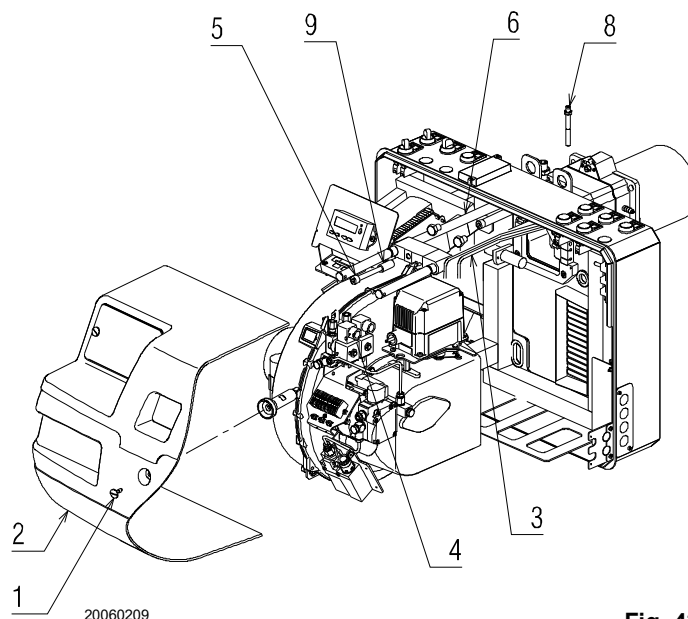


Fig. 43

6.4 Closing the burner

To close the burner proceed as follows:

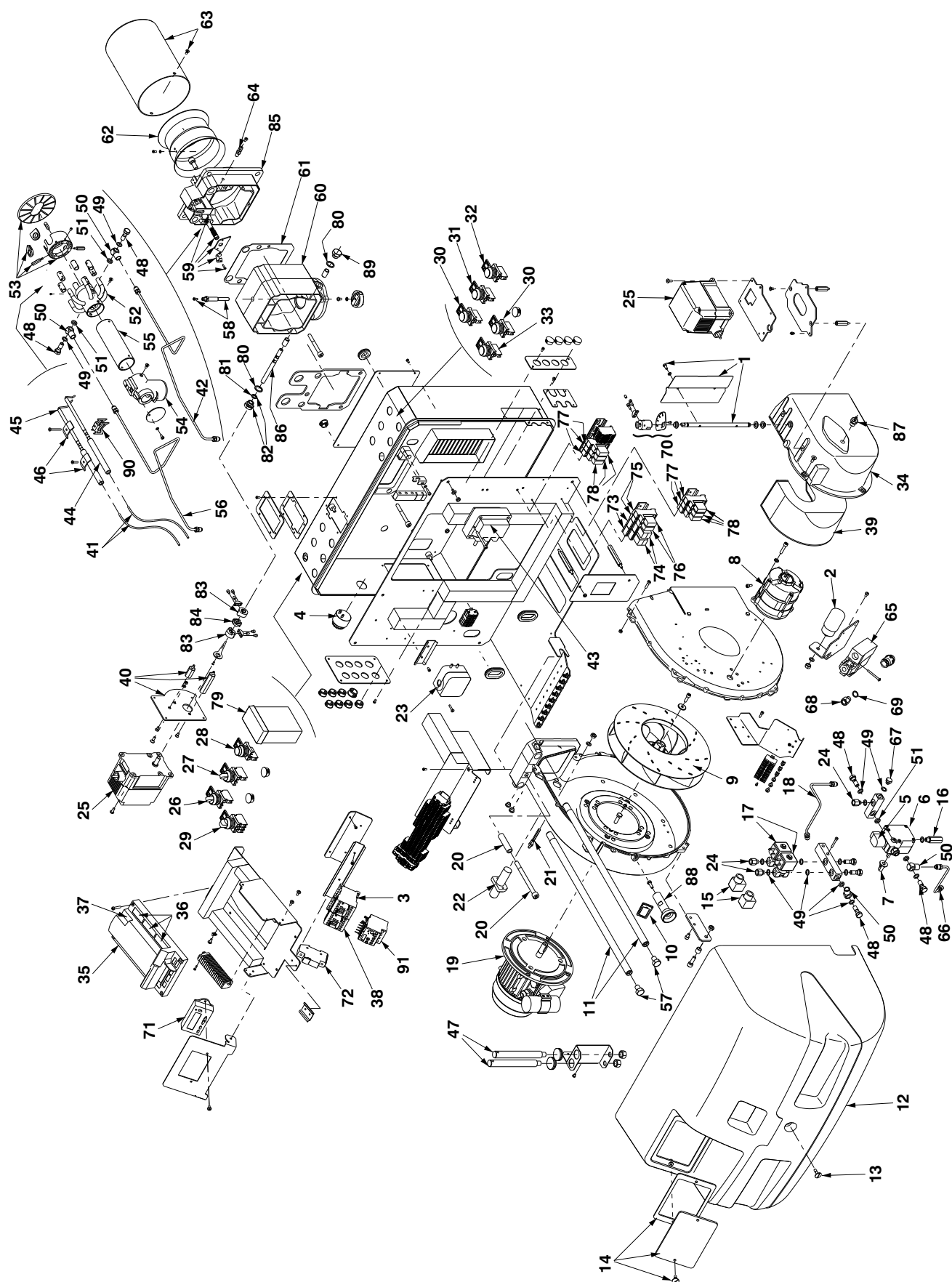
- push the burner until it is about 4" from the sleeve;
- re-connect the leads and slide the burner in until it comes to a stop;
- refit screw 5) and pull the leads gently out until they are slightly stretched;
- reconnect the light-oil pipes.



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

A

Appendix - Spare parts



N.	CODE	DESCRIPTION	*
1	20027030	AIR DAMPER ASSEMBLY	
2	3013014	CAPACITOR	C
3	20118869	CONTACTOR	C
4	20031413	HORN	
5	3013016	COIL	B
6	3013017	PUMP	C
7	3006717	JOINT	A
8	3005843	MOTOR	C
9	3012985	FAN	C
10	3003763	INSPECTION WINDOW	
11	20026772	BAR	C
12	20026773	COVER	B
13	3013727	SCREW	
14	20026784	VIEWING PORT	
15	3012953	CONNECTOR	C
16	3013037	BAR	C
17	3012952	NEEDLE VALVE	B
18	20029633	TUBE	C
19	3012993	MOTOR	C
20	20027028	SCREW+SPACER	
21	3003891	CONNECTOR	C
22	20139966	FLAME SENSOR	
23	3012948	AIR PRESSURE SWITCH	A
24	3006719	CONNECTOR	C
25	20008601	SERVOMOTOR	B
26	20027021	SWITCH	C
27	20027422	SWITCH	C
28	20010962	BUTTON	
29	20028411	SELECTOR SWITCH	
30	20036017	GREEN SIGNAL LIGHT	A
31	20027014	WHITE SIGNAL LIGHT	A
32	20027018	RED SIGNAL LIGHT	A
33	20027020	YELLOW SIGNAL LIGHT	A
34	20060108	AIR INTAKE	
35	20028329	ELECTRONIC CAM	C
36	3013940	CAM CONNECTORS ASSEMBLY	B
37	3006211	FUSE	A
38	20187002	STARTER	C
39	3003830	SOUND DAMPING	
40	20019267	BRACKET	
41	3003794	CONNECTOR	C
42	20029656	TUBE	C
43	3012938	TRANSFORMER	B
44	20162375	ELECTRODE	A
45	20162374	ELECTRODE	A
46	3003409	U BOLT	
47	20236060	OIL TUBE	C
48	3006721	BAR	C
49	3007077	SEAL	B
50	3006722	CONNECTOR	C
51	3003381	SEAL	B

N.	CODE	DESCRIPTION	*
52	3013074	DISTRIBUTOR	
53	3013274	DIFFUSER DISC	
54	3003854	ELBOW	
55	3012304	TUBE	C
56	20236058	OIL TUBE	C
57	3003776	SCREW	
58	3003873	TEST POINT	
59	3013196	CONTROL DEVICE	C
60	20060069	MANIFOLD	
61	3012734	SEAL FOR MANIFOLD	B
62	3003805	SHUTTER	C
63	3012313	FLAME FUNNEL	B
64	3003322	CONNECTOR	C
65	3012384	OIL PRESSURE SWITCH	A
66	20029659	TUBE	C
67	3013603	PLUG + SEAL	B
68	20029662	CONNECTOR	C
69	3007079	SEAL	B
70	3014194	HUB + GRADUATE SECTOR	
71	3013926	DISPLAY	
72	20014366	FUSE HOLDER	
73	20028400	BASE	
74	20030708	RELAY	C
75	3020071	BASE	
76	3020068	RELAY	C
77	3012841	BASE	
78	20010969	RELAY	C
79	20096592	POWER REGULATOR	C
80	3007088	SEAL	B
81	3007029	O-RING SEAL	B
82	20029667	CONNECTOR	C
83	20019263	COUPLING	C
84	3014011	DISC	A
85	3003798	FRONT PIECE	
86	20060068	BUTTERFLY VALVE SHAFT	
87	3012088	CONNECTOR	C
88	20091984	SPACER	
89	3003863	PLUG	
90	20103276	ELECTRODE HANGER	
91	20198607	THERMAL RELAY	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****WARNING**

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

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