GB

Dual fuel light oil/ gas burners

Progressive two stage or modulating operation

CODE	MODEL
20121980 C9161410 20114841	RLS 300/EV FGR
20112654 C9162410 C9162401 20114853	RLS 400/EV FGR
20144501 20143350	RLS 500/EV FGR
20101061	RLS 650/EV FGR
20121979 20075884 20101057	RLS 800/EV FGR

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 Safety precautions

Good safety practices must be used when working on burner equipment. The potential energy in the electrical supply, fuel and related equipment must be handled with extreme care to prevent equipment failures, injuries and potential death.

If you smell gas, open window, extinguish any open flames, stay away from electrical switches, evacuate the building and immediately call the gas company.

If this equipment is not installed, operated, operated and maintained in accordance with the manufacturers instructions, this product could expose you to substances in fuel or from fuel combustion which can cause death or serious illness.

Improper servicing of this equipment may create a potential hazard to equipment and operators.

Servicing must be done by a fully trained and qualified personnel.

1.1.4 Danger: live components

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

Other symbols

ENVIRONMENTAL PROTECTION

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

➤ This symbol indicates a list.

Abbreviations used

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

Delivery of the system and the instruction manual

When the system is delivered, it is important that:

- ➤ The instruction manual is supplied 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 carefully informs the user about:
  - – the use of the system,
  - – any further tests that may be necessary before the system is started up,
  - – maintenance and the need to have the system checked at least once a year by 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.

Failure to observe the information given in this manual, operating negligence, incorrect installation and the 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 non authorised 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 power 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 flame, as structurally established;
- ➤ insufficient and inappropriate surveillance and care of those burner components most subject to wear and tear;
- ➤ use of non-original components, including spare parts, kits, accessories and optionals;
- ➤ force majeure.

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

1.2.1 Owner's responsibility

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

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

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

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

If you smell gas:

- ➤ Do not touch any electrical items.
- ➤ Open all windows.
- ➤ Close all gas supply valves.
- ➤ Contact your local gas authority immediately.

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

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 users 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.

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.
- Must take all the measures necessary to prevent unauthorised people gaining access to the machine.
- 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.
- 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.
- Personnel must follow 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 are obliged to 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 all responsibility for any damage that may be caused by the use of non-original parts.

3 Technical description of the burner

3.1 Technical data

Model			RLS 300/EV FGR	RLS 400/EV FGR	RLS 500/EV FGR
Output (1) Delivery (1)	High	kW MBtu/hr (4) GPH	1387 – 4220 (3834*) 4732 – 14390 (13082*) 33.6 – 102.7 (93.4*)	1998 – 4995 (4541*) 6817 – 17042 (15494*) 47.8 – 121.7 (110.6*)	2775 – 5740 (5217*) 9468 – 19692 (17800*) 67.6 – 140.6 (127.1*)
	Low	kW MBtu/hr (4) GPH	666 2272 16.0	888 3030 21.8	1243 4241 30.4
Fuel			# 2 Fuel oil - Natural gas		
Gas maximum delivery Gas pressure at maximum delivery (2)		SCFH “WC	14,390 9.0	17,042 13.0	19,692 15.0
Operation			Low-high or modulating		
Nozzle		number	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) pressure range fuel temperature		GPH PSI ° F max	218 102 - 580 302 (150 °C)	218 102 - 580 302 (150 °C)	290 102 - 580 302 (150 °C)
Noise levels (3)		dB(A)	82	85	86

Model			RLS 650/EV FGR	RLS 800/EV FGR
Output (1) Delivery (1)	High	kW MBtu/hr (4) GPH	3330 – 7270 (6543*) 11362 – 24807 (22325*) 81.1 – 177.1 (159.4*)	3885 – 8990 (8172*) 13256 – 30670 (27882*) 94.5 – 219 (199.1*)
	Low	kW MBtu/hr (4) GPH	1587 5415 38.7	1942 6626 47.1
Fuel			# 2 Fuel oil - Natural gas	
Gas maximum delivery Gas pressure at maximum delivery (2)		SCFH “WC	24,807 13.1	30,299 19.9
Operation			Low-high or modulating	
Nozzle		number	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) pressure range fuel temperature		GPH PSI ° F max	403 102 - 435 302 (150 °C)	
Noise levels (3)	Sound pressure Sound power	dB(A)	80 91	89.6 100.6

Tab. A

(*) 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 20)(Fig. 3 at 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 “Accuracy: Category 3” measuring accuracy, as set out in EN ISO 3746.
(4) Equivalent Btu values based on 1 USGPH = 140,000 Btu/hr.

3.2 Electrical data

Model		RLS 300/EV FGR		
RBNA Code		**20121980**	**C9161410**	**tbd**
Control circuit power supply	V/Ph/Hz		120/1/60	
Main power supply (+/- 10%)	V/Ph/Hz	230/3/60	460/3/60	575/3/60
Fan motor NEMA Premium Efficiency IE3	rpm HP V A	3540 10 230 24	3540 10 460 12	3540 10 575 9.6
Pump motor NEMA Premium Efficiency IE3	rpm HP V A	3515 2 230 5.6	3515 2 460 2.8	3515 2 575 2.2
Ignition transformer Oil/Gas	V1 - V2 I1 - I2		120 V - 1 x 8 kV 1.6 A - 20 mA	
Electrical power consumption	W	10050	10050	10050
Electrical control circuit consumption	W max		750	
Total electrical consumption	W	10800	10800	10800
Electrical protection			NEMA 1	

Model		RLS 400/EV FGR		
RBNA Code		**tbd**	**C9162410-20112654**	**C9162401**
Control circuit power supply	V/Ph/Hz		120/1/60	
Main power supply (+/- 10%)	V/Ph/Hz	230/3/60	460/3/60	575/3/60
Fan motor NEMA Premium Efficiency IE3	rpm HP V A	3545 12.4 230 29	3545 12.4 460 14.5	3545 12.4 575 11.6
Pump motor NEMA Premium Efficiency IE3	rpm HP V A	3515 2 230 5.6	3515 2 460 2.8	3515 2 575 2.2
Ignition transformer Oil/Gas	V1 - V2 I1 - I2		120 V - 1 x 8 kV 1.6 A - 20 mA	
Electrical power consumption	W		11900	
Electrical control circuit consumption	W max		750	
Total electrical consumption	W		12650	
Electrical protection			NEMA 1	

Model		RLS 500/EV FGR		
RBNA Code		**tbd**	**20144501**	**tbd**
Control circuit power supply	V/Ph/Hz	120/1/60		
Main power supply (+/- 10%)	V/Ph/Hz	230/3/60	460/3/60	575/3/60
Fan motor NEMA Premium Efficiency IE3	rpm HP V A	3555 25 230 62	3555 25 460 31	3555 25 575 24.8
Pump motor NEMA Premium Efficiency IE3	rpm HP V A	3515 2 230 5.6	3515 2 460 2.8	3515 2 575 2.2
Ignition transformer Oil/Gas	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA		
Electrical power consumption	W	22000		
Electrical control circuit consumption	W max	750		
Total electrical consumption	W	22750		
Electrical protection		NEMA 1		

Model		RLS 650/EV FGR		
RBNA Code		**tbd**	**tbd**	**tbd**
Model		**RLS 800/EV FGR**		
RBNA Code		**20121979**	**20075884**	**tbd**
Control circuit power supply	V/Ph/Hz	120/1/60		
Main power supply (+/- 10%)	V/Ph/Hz	230/3/60	460/3/60	575/3/60
Fan motor NEMA Premium Efficiency IE3	rpm HP V A	3540 30 230 71.6	3540 30 460 35.8	3540 30 575 28.6
Pump motor NEMA Premium Efficiency IE3	rpm HP V A	3515 2 230 5.6	3515 2 460 2.8	3515 2 575 2.2
Ignition transformer Oil/Gas	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA		
Electrical power consumption	W	25700		25650
Electrical control circuit consumption	W max	750		
Total electrical consumption	W	26450		26400
Electrical protection		NEMA 1		

Tab. B

3.3 Burner models designation

Model	Code	Code RBNA	Voltage	Fan motor starting	Flame safeguard
RLS 300/EV FGR	20114841	20121980 C9161410 tbd	230/3/60 460/3/60 575/3/60	Inverter	Burner mounted
RLS 400/EV FGR	20114853	tbd C9162410-20112654 C9162401	230/3/60 460/3/60 575/3/60	Inverter	Burner mounted
RLS 500/EV FGR	20143350	tbd 20144501 tbd	230/3/60 460/3/60 575/3/60	Inverter	Burner mounted
RLS 650/EV FGR	20101061	tbd tbd tbd	230/3/60 460/3/60 575/3/60	Inverter	Burner mounted
RLS 800/EV FGR	20101057	20121979 20075884 tbd	230/3/60 460/3/60 575/3/60	Inverter	Burner mounted

Tab. C

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. D.

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

inch	A	B	C	lbs
RLS 300/EV FGR	80 $^{7}/_{64}$“	42 $^{29}/_{32}$“	47 $^{3}/_{64}$“	496
RLS 400/EV FGR	80 $^{7}/_{64}$“	42 $^{29}/_{32}$“	47 $^{3}/_{64}$“	520
RLS 500/EV FGR	80 $^{7}/_{64}$“	42 $^{29}/_{32}$“	47 $^{3}/_{64}$“	551
RLS 650/EV FGR	80 $^{7}/_{64}$“	42 $^{29}/_{32}$“	47 $^{3}/_{64}$“	661
RLS 800/EV FGR	80 $^{7}/_{64}$“	42 $^{29}/_{32}$“	47 $^{3}/_{64}$“	661

Tab. D

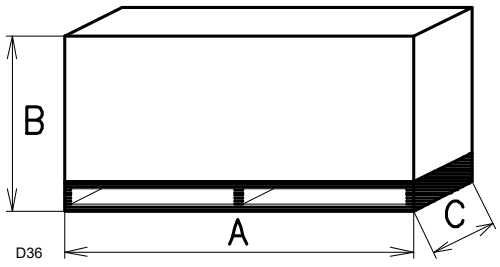


Fig. 1

3.5 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.

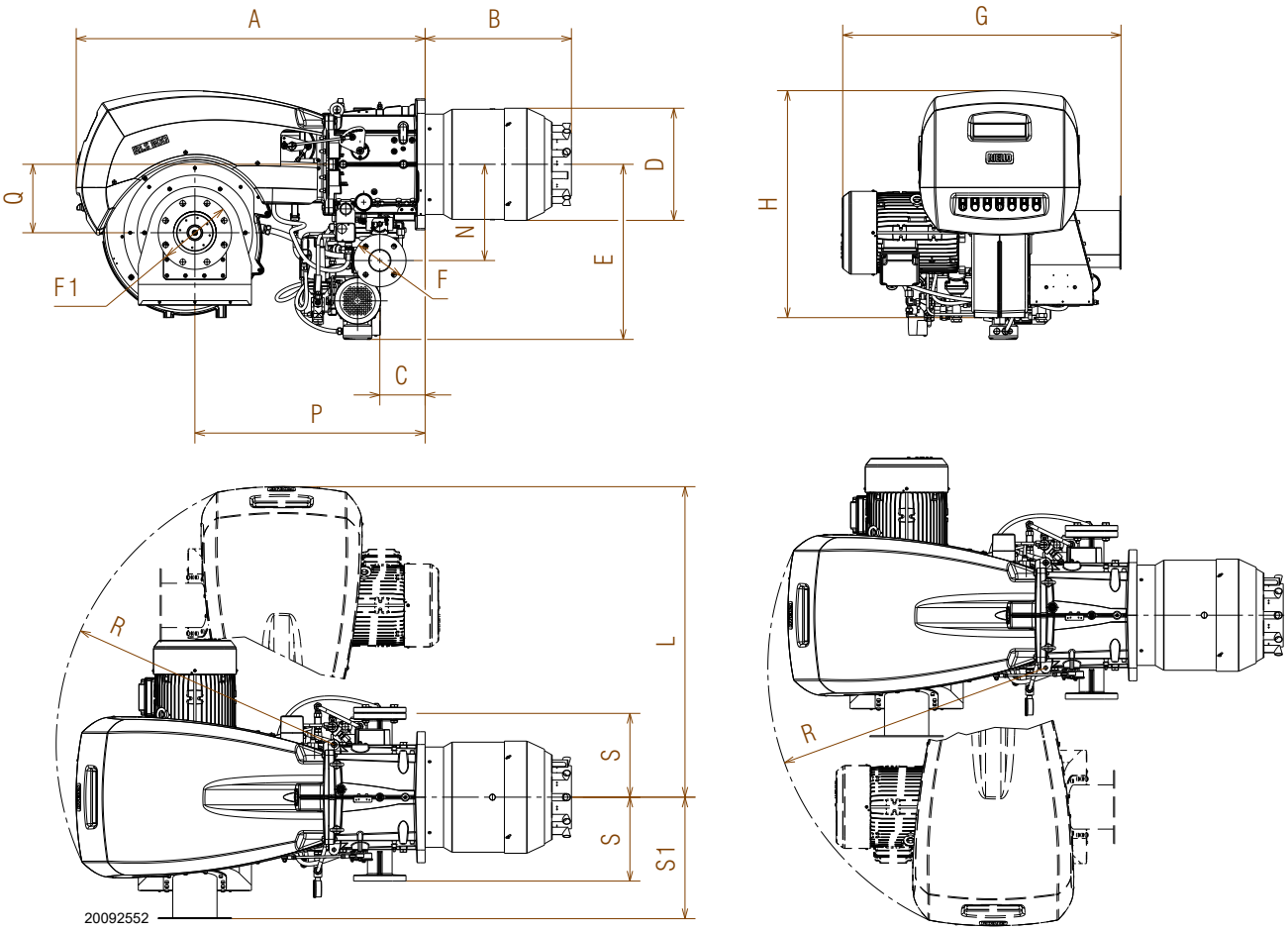


Fig. 2

inch	A	B	C	D	E	F	F1	G	H
RLS 300/EV FGR	52 3/16“	20 1/2“	6 7/16“	12 5/16“	23 5/32“	ANSI 3”	ANSI 4”	36 17/32“	34 9/64“
RLS 400/EV FGR	52 3/16“	20 1/2“	6 7/16“	12 5/16“	23 5/32“	ANSI 3”	ANSI 4”	39 21/64“	34 9/64“
RLS 500/EV FGR	52 3/16“	20 1/2“	6 7/16“	14 17/32“	23 5/32“	ANSI 3”	ANSI 6”	46 7/8“	34 9/64“
RLS 650/EV FGR	52 3/16“	22 29/32“	6 7/16“	16 9/64“	23 5/32“	ANSI 3”	ANSI 6”	41”	34 9/64“
RLS 800/EV FGR	52 3/16“	22 29/32“	6 7/16“	16 27/32“	23 5/32“	ANSI 3”	ANSI 6”	43 13/16“	34 9/64“

inch	I	L	N	P	Q	R	S	S1
RLS 300/EV FGR	14 1/32“	46 1/4“	13 7/16“	34”	10 29/32“	41 17/32“	12 19/32“	17 1/4“
RLS 400/EV FGR	14 1/32“	46 1/4“	13 7/16“	34”	10 59/32“	41 17/32“	12 19/32“	17 1/4“
RLS 500/EV FGR	14	46 1/4“	13 7/16“	34”	10 9/32“	41 17/32“	12 19/32“	17 1/4“
RLS 650/EV FGR	14 3/16“	46 1/4“	14 29/64“	34”	10 9/32“	41 17/32“	12 19/32“	17 1/4“
RLS 800/EV FGR	16 15/32“	46 1/4“	14 29/64“	34”	10 9/32“	41 17/32“	12 19/32“	17 1/4“

Tab. E

3.6 Burner description

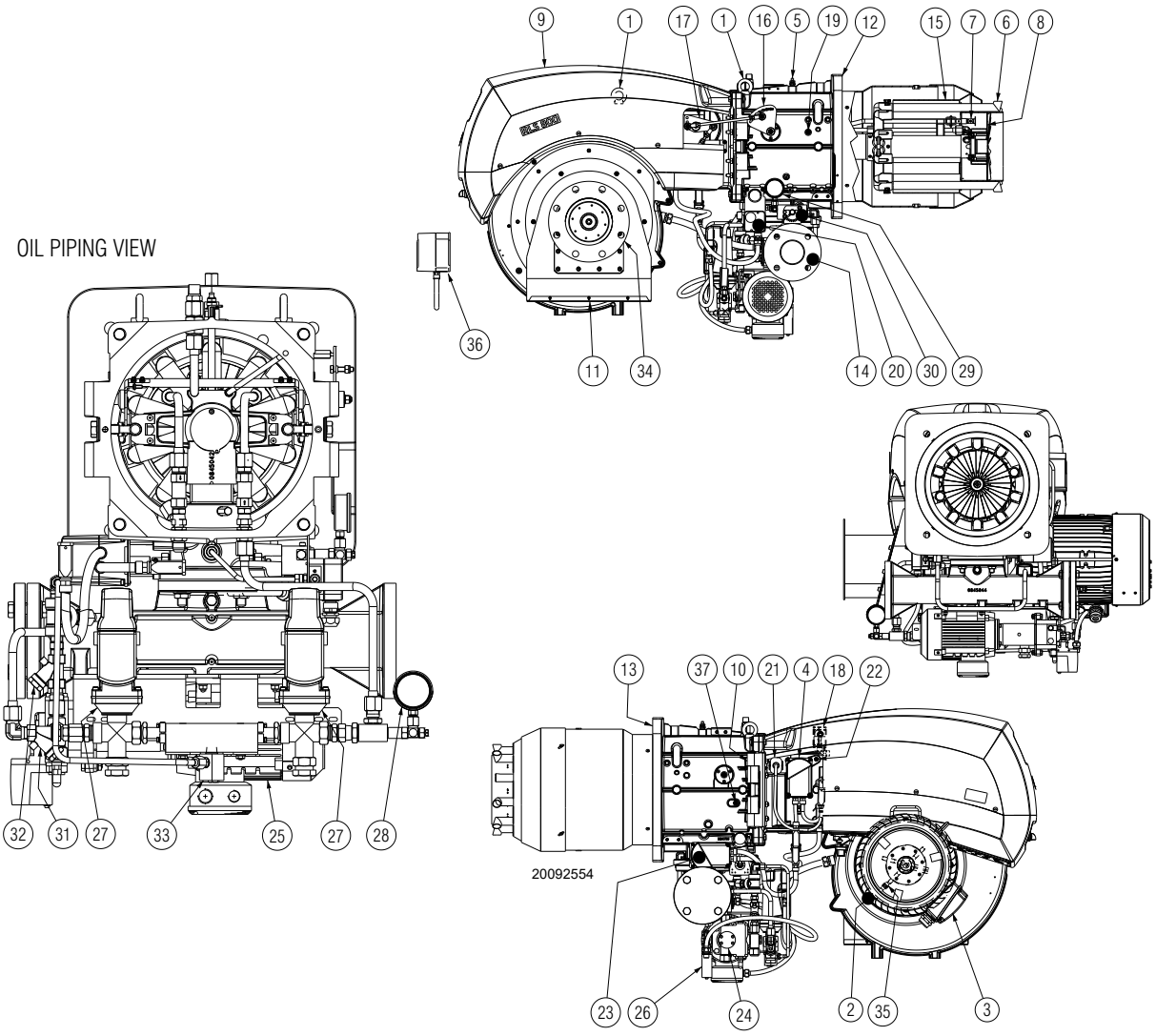


Fig. 3

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 Lever for movement of combustion head
17 Gears for movement of air damper
18 Air pressure switch (differential operating type)
19 Air pressure test point
20 Maximum gas pressure switch with pressure test point
21 QRI flame sensor
22 Air pressure test point “+”
23 Oil modulator and gas butterfly valve servomotor
24 Pump
25 Pump motor
26 Minimum oil pressure switch
27 Oil shut-off valve
28 Nozzle delivery pressure gauge
29 Nozzle return pressure gauge
30 Oil modulator
31 Strainer
32 Check valve
33 Security relief valve
34 Inlet exhaust gas flange
35 Speed sensor
36 Flue gas butterfly valve servomotor (supplied as equipment)
37 Air pressure test point “-”

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.

3.6.1 Panel board description

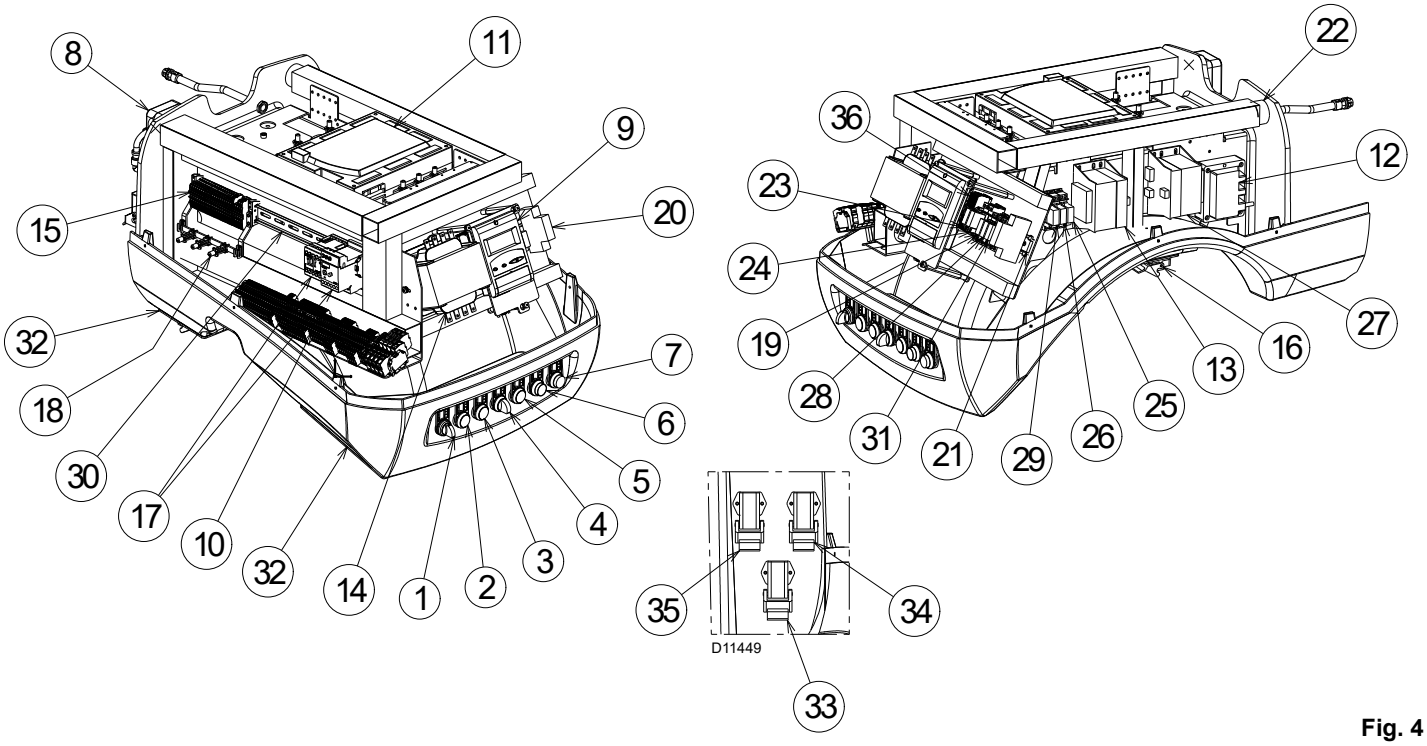


Fig. 4

1 “OFF - LOCAL - REMOTE” switch
2 “POWER ON” signal
3 “CALL FOR HEAT” signal
4 “OIL - OFF - GAS” switch
5 “FUEL ON” signal
6 “ALARM SILENCE” button
7 “BURNER LOCK-OUT and RESET” push-button
8 Low air pressure switch
9 Operator panel with LCD display
10 Burner terminal board “X1”
11 Control box for checking flame and air/fuel ratio
12 Ignition transformer “TA”
13 Control box transformer
14 Step-down transformer (available)
15 Terminal strip “X2”
16 Plug/socket branch unit
17 Pump motor contactor and thermal relay with reset button
18 Bracket for shielded cables with thumbscrew
Warning: used only to avoid a break in the cable’s shielding, hence do not overtighten.
19 “KG2” relay
20 Auxiliary fuse
21 DIN bar for: relay, fuse holder and terminal strip “XAUX”
22 Horn
23 ”KO” relay
24 “KG1” relay
25 “K5” relay
26 “K3” relay
27 Transformer, available for additional actuator or O2 control
28 “K2” relay
29 “K1”relay
30 DIN bar for “X2” terminal strip, thermal relays and contactors
31 “K7” relay
32 Holes for cables grommets for electrical wirings, accessories and power supply (to be carried out by the installer)
33 Plug/socket for maximum pressure switch
34 Plug/socket for air actuator
35 Plug/socket for QRI flame sensor
36 Terminal strip “XAUX”

Two 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 push-button.

➤ **Pump motor trip**
release by pressing the push-button on thermal overload 17)(Fig. 4). See “Thermal relay calibration” on page 39.

WARNING

The connection of the inverter and O_2 kits must be carried out by the client / installer following the instructions (electrical drawing) provided with the burner and the kits.

3.7 Standard equipment

Flange gasket. . . . . No. 1
Flange fixing screws (M16 x 50) . . . . . No. 4
Screws (M18 x 70) to secure the burner flange to the boiler . No. 4
Spacers . . . . . No. 2
Flue gas butterfly valve servomotor. . . . . No. 1
Instruction booklet . . . . . No. 1

3.8 Firing rates

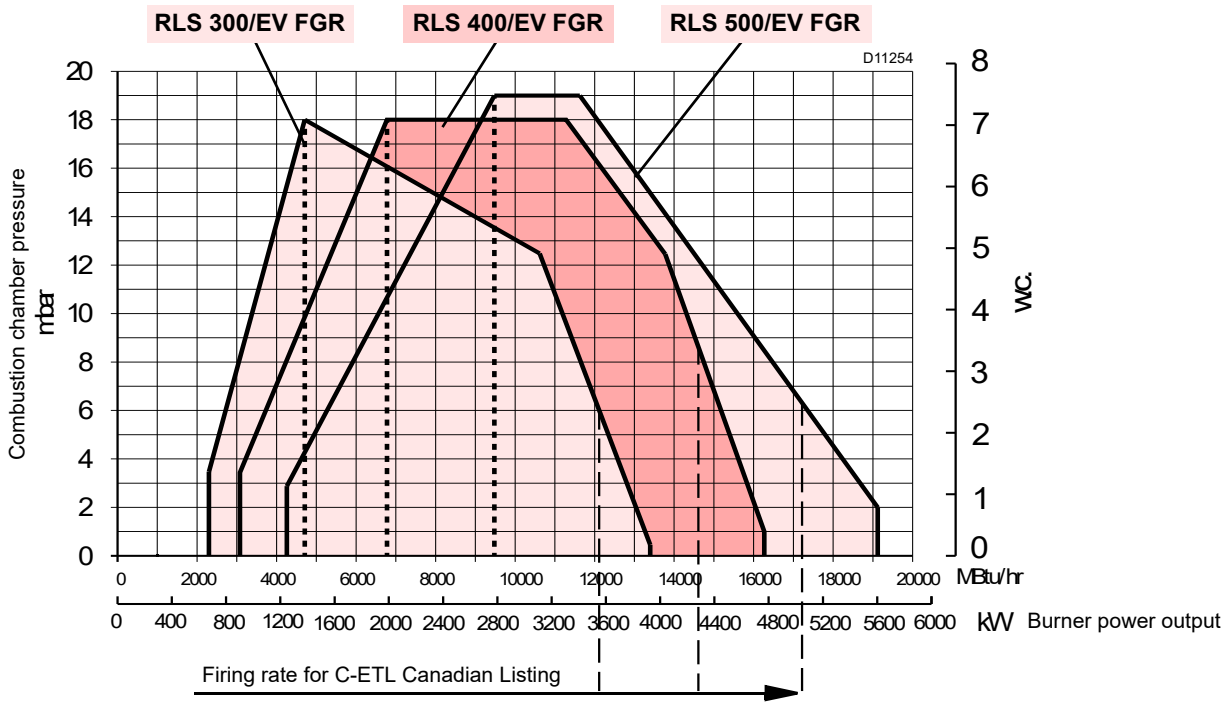
Maximum output must be selected in the hatched area of the diagram (Fig. 5).

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 26.

Model	MBtu/hr
RLS 300/EV FGR	1387
RLS 400/EV FGR	1998
RLS 500/EV FGR	2775
RLS 650/EV FGR	3300
RLS 800/EV FGR	3885



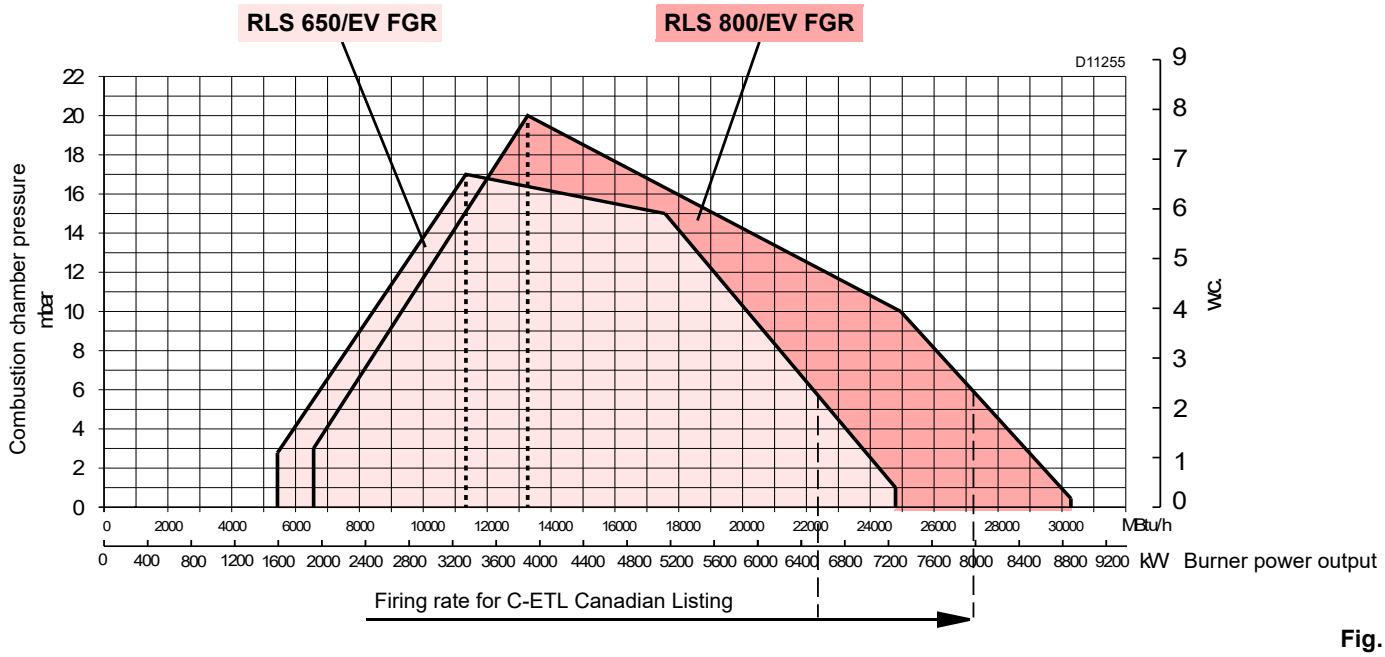


Fig. 5

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. F

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. F , 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 500/EV FGR:

Output 18500 MBtu/hr: diameter 39.4 inch - length 16.5 ft.

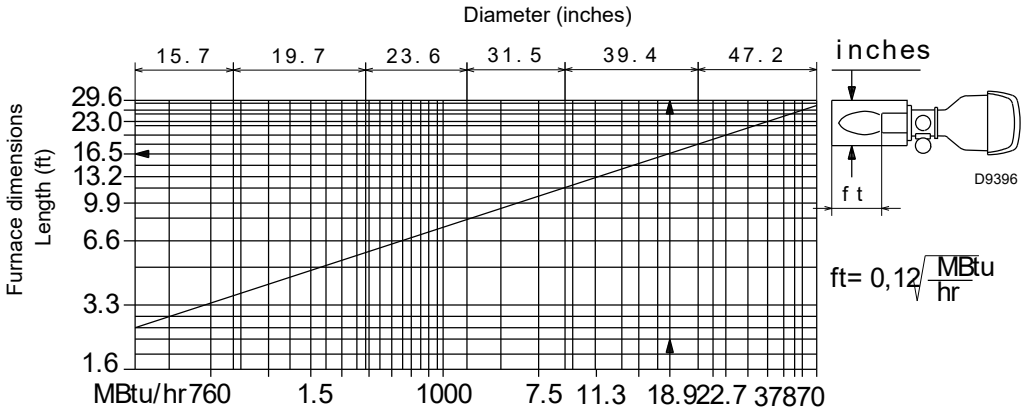


Fig. 6

3.10 Control box for the air/fuel ratio (LMV52...)

Warning notes

WARNING

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

The LMV52... is a safety device! Do not open, interfere with or modify the unit.

Riello S.p.A. will not assume responsibility for any damage resulting from unauthorized interference! Risk of explosion!

Incorrect configuration can lead to excessive fuel supply which might cause an explosion! Operators must be aware that incorrect settings made on the AZL5… display and operating unit and incorrect settings of the fuel and / or air actuator positions can lead to dangerous burner operating conditions.

- ➤ 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 LMV5..., 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.
- ➤ Protection against electrical shock hazard on the LMV5... and on all connected electrical components must be ensured through appropriate mounting.
- ➤ Each time work has been carried out (mounting, installation and service work, etc.), check to ensure that wiring is in an orderly state, that the parameters have been correctly set and make the safety checks.
- ➤ 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.
- ➤ In programming mode, the position check of actuators and VSD (checking electronic fuel / air ratio control) is different from the check during automatic operation.
  Like in automatic operation, the actuators are still jointly driven to their required positions. If an actuator does not reach the required position, corrections are made until that position is reached. However, in contrast to automatic operation, there are no time limits to these corrective actions.
  The other actuators maintain their positions until all actuators have reached the positions currently required.
  This is essential for setting fuel /air ratio control.
  This means that during the time the fuel / air ratio curves are programmed, the person making the plant settings must continuously monitor the quality of the combustion process (e.g. by means of a flue gas analyzer).
  Also, if combustion levels are poor, or in the event of dangerous situations, the commissioning engineer must take appropriate action (e.g. switching off manually).

To ensure the safety and reliability of the LMV5... system, the following points must also be observed:

– Condensation and ingress of humidity must be avoided. Should such conditions occur, make sure that the unit will be completely dry before switching on again!
– Static charges must be avoided since they can damage the unit's electronic components when touched.

D9301

Fig. 7

Mechanical design

The LMV5... is a microprocessor-based burner management system with matching system components for the control and supervision of forced draft burners of medium to large capacity.
The following components are integrated in the basic unit of the LMV5...:

- Burner control with gas valve proving system
- Electronic fuel / air ratio control with a maximum of 4 (LMV51…) or 6 (LMV52…) actuators
- Optional PID temperature / pressure controller (load controller)
- Optional VSD module Mechanical design

Electrical connection of ionization probe and flame detector

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

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

LMV52... 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	 < AC 96 V > AC 100 V
	Oil pump / magnetic clutch (nominal voltage) • Nominal current • Power factor	 1.6A cosφ > 0.4
	Air pressure switch test valve (nominal voltage) • Nominal current • Power factor	 0.5A cosφ > 0.4
Terminal loading 'Outputs'	**Total contact loading:** • Mains voltage • Input current of unit (safety loop) total load on contacts resulting from: - Fan motor contactor - Ignition transformer - Valve - Oil pump / magnetic clutch	 AC 120 V -15 % / +10 % Max. 5 A
	Single contact loading: Fan motor contactor (nominal voltage) • Nominal current • Power factor	 1A cosφ > 0.4
	Alarm output (nominal voltage) • Nominal current • Power factor	 1 A cosφ > 0.4
	Ignition transformer (nominal voltage) • Nominal current • Power factor	 1.6 A cosφ > 0.2
	Fuel valve gas (nominal voltage) • Nominal current • Power factor	 1.6 A cosφ > 0.4
	Fuel valve oil (nominal voltage) • Nominal current • Power factor	 1.6 A cosφ > 0.4
Cable lengths	Main line	Max. 100 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.

Operation sequence of the burner

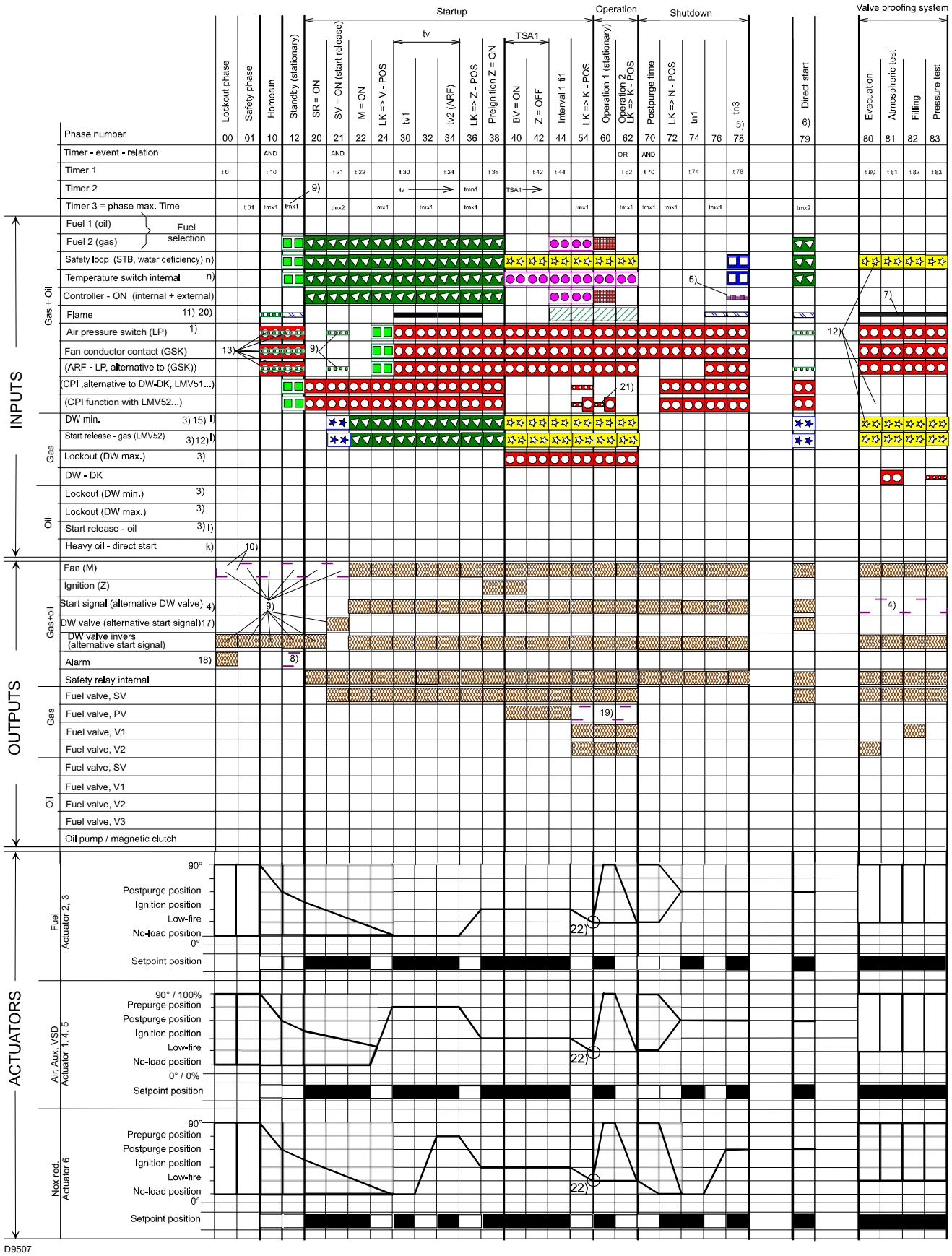


Fig. 8

Key to the sequence diagrams:

Depending on the parameter, valve proving takes place:
between phase 62 and phase 70 or/and
between phase 30 and phase 32.

Signal ON	Signal OFF	Next phase
		01 → 00, Rep = 0 12, Rep > 0
		Parameter direct start Checking with controller on Deviation → 10 No Rep. decrement
		10
		70
		Without VP70 with VP80
		62
		Stop, up to Ph – max. time → 01
		Stop, up to Ph – max. time → 10
	 0-3 s.	01 → 00, Rep = 0 12, Rep > 0
	 0-30 s.	01 → 00, Rep = 0 12, Rep > 0
 0-3 s.		01 → 00, Rep = 0 12, Rep > 0
		Param. → 79 10
		Input: don´t care
		Output: OFF
		Output: ON

Assignment of times:

t0	Postpurge lockout position
t01	Max. time safety phase
t10	Min. time home run
t21	Min. time start release
t22	Fan runup time t30 Prepurge time part 1
t34	Prepurge time part 3
t36	Min. ON time oil pump
t38	Preignition time gas / oil
t42	Preignition time OFF
t44	Interval 1 gas / oil
t62	Max. time low-fire
t70	Afterburn time
t74	Postpurge time 1 gas / oil (tn1)
t78	Postpurge time 3 gas / oil (tn3)
t80	Valve proving evacuate time
t81	Leakage test time atmospheric pressure
t82	Leakage test filling test
t83	Leakage test time gas pressure
tmn1	Min. time extraneous light test (5 s.) after skip over of prepurge
tmx1	Max. damper running time
tmx2	Max. time startup release
tmx3	Max. time circulation heavy oil
tn	Postpurge time
TSA1	Safety time 1
TSA2	Safety time 2
tv	Prepurge time gas / oil

Key to the sequence diagrams:

1) Parameter: With / without pressure switch
2) Parameter: Short / long preignition time for oil only Short / long oil pump – ON – time
3) Delayed shutdown within TSA1 + TSA2
4) Parameter: Output as startup signal / pressure switch relief valve
5) Parameter: Normal / direct startup
   Normal startup → sequential phase = 10
   Direct startup → sequential phase = 79
   (when R = ON)
6) Sequential phase = 24
7) Only with valve proving during startup
8) Parameter: With / without alarm on prevention of startup
9) Parameter: With continuous purging the shown output signals are inverted
10) Fan controlled as before
    Running time when LOCK OUT = T_FanLockout LF
11) Parameter: With / without extraneous light test in STANDBY
12) With valve proving during startup phase 10
13) Parameter: Normal / continuous purging
    Normal purging: Checking for off in 10, stop to Ph-max time → 01
    Continuous purging: Checking for on in 10 and 12, Stop up to phase-max time → 01
14) Parameter: "OilPressureMin", "akt_from_ts" → no check before TSA1 (LO, HO) or TSA2 (LOgp, HOgp)
15) Parameter: "GasPressureMin", "deakt_xOGP" → pressure switch-min can be deactivated for oil programs with gas pilot
16) Parameter: "OilPumpCoupling", "direct_coupl" → shutoff valve oil has to be connected to output "Oil pump / magnetic clutch".
    Output is active when fan is on and for another 15 s after fan is switched off
17) Parameter: "Start / pressure switch valve", "PS_Reli_Inv" → Output pressure switch valve will be logically inverted
18) Parameter: "Alarm act / deact", "deactivated" → The alarm output can temporarily be deactivated (for current error only)
19) Parameter: Only with LMV52...: Continuous pilot gas / oil: Activated → Pilot valve is also activated in operation
20) Parameter: Only with LMV52...: Extraneous light, pilot phase, operating phase gas / oil → Separate flame supervision possible
21) Parameter: Only with LMV52...: pressure switch valve proving / CPI or StartReleaseGas → Parameter-dependent ON / OFF test
    CPI Gas: OFF test for gas trains only
    CPI Oil: OFF test for oil trains only
    CPI Gas+Oil: OFF test for gas and oil trains
22) Parameter: After LMV52... software version 04.50 and AZL5... software version 04.40, dependent on parameter *StartPktOperation*

Permissible positioning range

In Standby: actuator can travel within the permissible positioning range, but is always driven to the home position. Must be in the home position before changing the phase.

0°	Position as supplied (0°)
90°	Actuator fully open (90°)
AGR	Fuel gas recirculation
CPI	Closed position indication
DP	Pressure tester
PS-VP	Pressure switch – valve proving
FCC	Fan contactor contact
LF	Air damper
APS	Air pressure switch
N	Postpurging
SR	Safety relay
SLT	Safety limit thermostat
TL	Temperature limiter

Repetition counter:

k) Heavy oil
l) Restricted startup behavior
n) Restricted safety loop

3.11 Actuators

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 actuator, completely isolate the burner control from the mains supply (all-polar disconnection).
- ➤ Ensure protection against electric shock hazard by providing adequate protection for the connection terminals and by securing the housing cover.
- ➤ Check to ensure that wiring 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.

WARNING

The housing cover may only be removed for short periods of time for wiring or when making the addressing.

It must be made certain that dust or dirt will not get inside the actuator while such work is carried out.

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.

When used in connection with burner controls or electronic fuel / air ratio control, the associated controlling elements are controlled depending on burner output.

Installation notes

- Always run the high-voltage ignition cables separate from the unit and other cables while observing the greatest possible distance.
- To ensure protection against electric shock hazard, make certain that the AC 120 V or higher section of the actuator is strictly segregated from the functional low-voltage section.
- The holding torque is reduced when the actuator's power supply is switched off.

WARNING

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

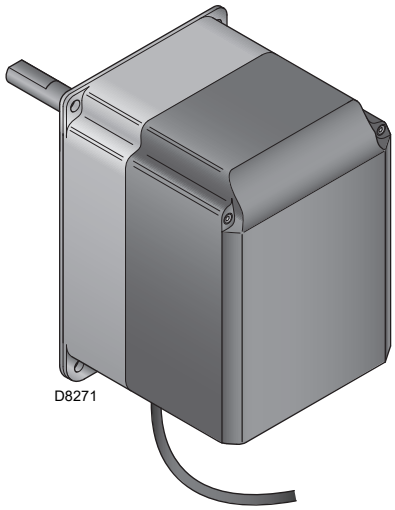


Fig. 9

Technical data

Model	SQM45.295A9	SQM48.497A9
Operating voltage	AC 2 x 12 V via bus cable from the basic unit or via a separate transformer	
Safety class	Extra low-voltage with safe isolation from mains voltage	
Power consumption	9...15 VA	
Degree of protection	To EN 60 529, IP 54, provided adequate cable entries are used	
On time	50 %, max. 3 min. continuously	
Electrical connections	RAST3.5 terminals	
Direction of rotation (when facing the shaft)	- Standard: counterclockwise - Reverse: clockwise	
Running time (min.) for 90°	10 s.	30s.
Holding torque (max.)	1.5 Nm	20 Nm
Nominal torque (max.)	3 Nm	20 Nm
Weight	approx. 1 kg	approx. 1.6 kg
Environmental conditions:		
Operation	DIN EN 60721-3-1	
Climatic conditions	class 1K3	
Mechanical conditions	class 1M2	
Temperature range	-20...+60 °C	
Humidity	< 95 % r.h.	

4 Installation

4.1 Notes on safety for the installation

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

DANGER

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

WARNING

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

4.2 Handling

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

WARNING

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

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

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

CAUTION

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

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.

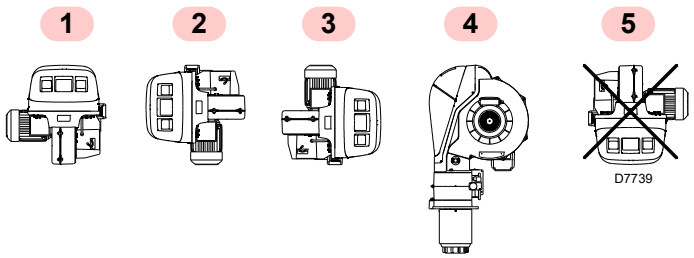


Fig. 10

4.5 Boiler plate

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

inch	A	B	C
RLS 300/EV FGR	13 25/32"	17 51/64"	3/4" coarse
RLS 400/EV FGR	13 25/32"	17 51/64"	3/4" coarse
RLS 500/EV FGR	15 11/32"	17 51/64"	3/4" coarse
RLS 650/EV FGR	17 5/16"	19 31/64"	3/4" coarse
RLS 800/EV FGR	17 5/16"	19 31/64"	3/4" coarse

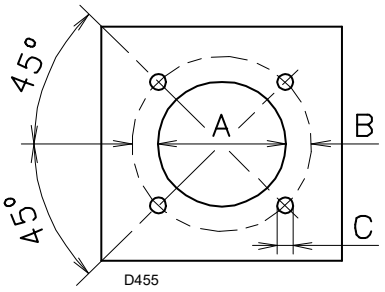


Fig. 11

4.6 Securing the burner to the boiler

4.6.1 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 (the head should not jut out more than 4 ÷ 5 inch Fig. 12).

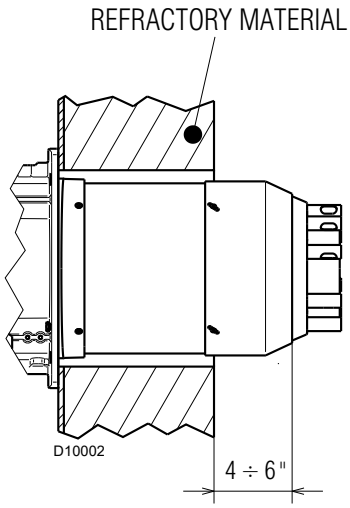


Fig. 12

4.6.2 Burner securing

- ➤ Create a suitable hoisting system by hooking onto the rings 4), removing the fastening screws 1) securing the cover 2) first.
- ➤ Slip the thermal protection onto the blast tube 3).
- ➤ Place entire burner on the boiler hole (arranged previously, see Fig. 11), and fasten with the screws given as standard equipment.
- ➤ The coupling of the burner-boiler must be airtight.

4.6.3 Accessibility to the interior of the combustion head

In order to reach inside the combustion head proceed as follows:

RLS 300 - 400 - 500/EV FGR model (Fig. 13)

- ➤ open burner at hinge (Fig. 13) after removing the 4 screws 1);
- ➤ disconnect the wires 2) from the electrodes;
- ➤ disconnect the oil pipes by unscrewing the two connectors 3);
- ➤ unscrew the under part of the elbow 4) until it comes free of its slot.
- ➤ Extract the internal part 5) of the combustion head.

WARNING

While unscrewing, some fuel may leak out.

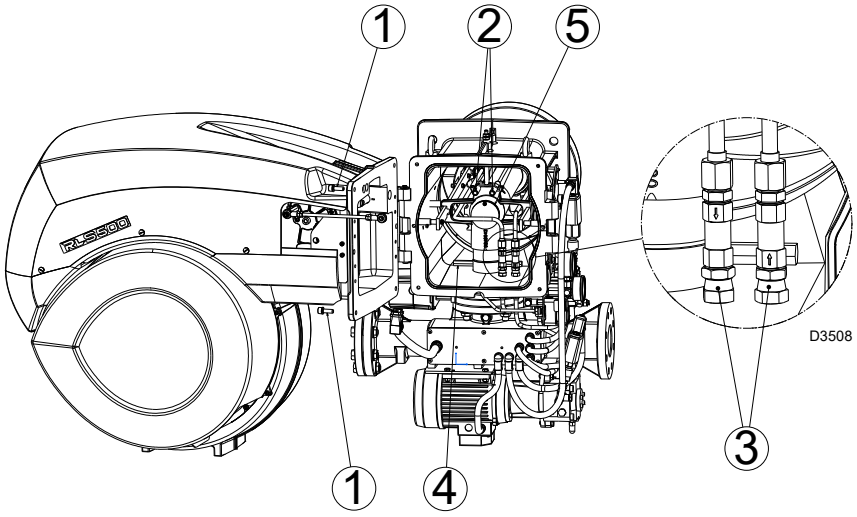


Fig. 13

RLS 650 - 800/EV FGR model (Fig. 14)

- ➤ Disconnect the electrical wiring related to oil pump/servomotor, air servomotor and gas pressure switch;
- ➤ disconnect the leverages related to air damper and head movement;
- ➤ unscrew the 4 x fixing screws 1);
- ➤ release the cable of the electrode 2);
- ➤ disconnect the oil pipes by unscrewing the two connectors 3).

WARNING

While unscrewing, some fuel may leak out.

- ➤ Release the ignition pilot retainer;
- ➤ remove the screw/gas pressure test point 6) of the combustion head;
- ➤ unscrew the under part of the elbow until it comes free of its slot;
- ➤ extract the internal part 5) of the combustion head.

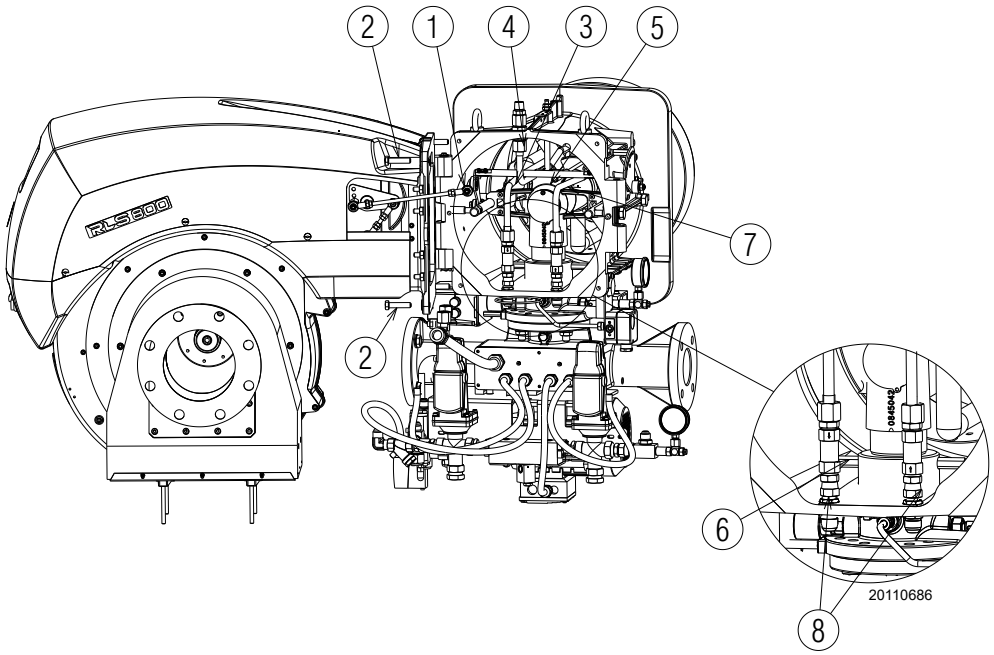


Fig. 14

4.7 Electrode and ignition pilot adjustment

Place the electrode and the ignition pilot observing the dimensions in Fig. 15 and Fig. 16.

RLS 300 - 400 - 500/EV FGR model (Fig. 15)

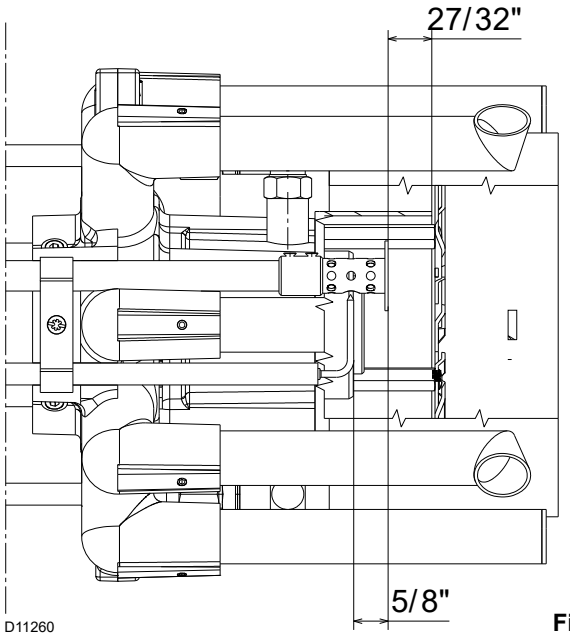


Fig. 15

RLS 650 - 800/EV FGR model (Fig. 16)

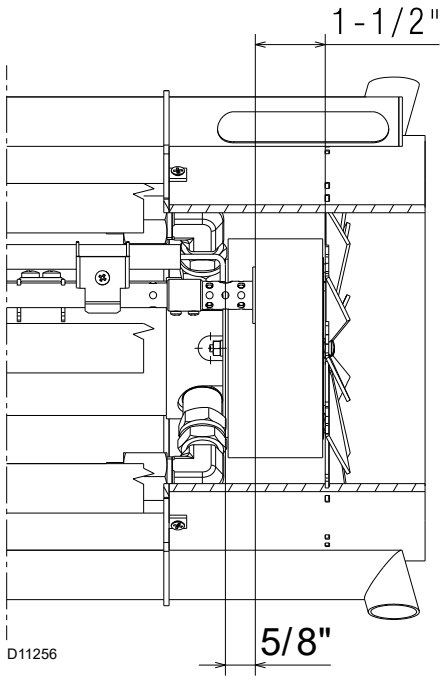


Fig. 16

4.8 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.

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

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.

4.8.1 Recommended nozzles

➤ Fluidics type N2 angle 45°

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

MODULATING PRESSURE BURNER MODEL					NOZZLE		HIGH FIRE			LOW FIRE		
RLS 300	RLS 400	RLS 500	RLS 650	RLS 800	Nominal size	Fluidics N2 45°	By-pass pressure	Flow rate		By-pass pressure	Flow rate	Supply pressure
					kg/h	Code	PSI	kg/h	GPH	PSI	GPH	PSI
X					130	3045477	270	105,0	33,6	100	8,3	300
X					150	3045479	264	125,0	40,0	100	11,8	300
X	X				175	3045481	258	149,4	47,8	100	13,8	300
X	X				175	3045481	260	156,3	50,0	100	13,8	300
X	X				200	3045483	267	187,5	60,0	100	15,0	300
X	X	X			250	3045487	260	211,3	67,6	100	16,6	300
X	X	X			250	3045487	262	218,8	70,0	100	16,6	300
X	X	X			275	3045489	268	250,0	80,0	100	19,2	300
X	X	X	X		300	3045491	257	256,3	82,0	100	21,4	300
X	X	X	X		325	3045493	257	281,3	90,0	100	23,0	300
X	X	X	X	X	325	3045493	261	295,3	94,5	100	23,0	300
X	X	X	X	X	350	3045495	258	304,7	97,5	100	25,6	300
	X	X	X	X	350	3045495	260	312,5	100,0	100	25,6	300
	X	X	X	X	400	3045499	232	343,8	110,0	100	33,6	300
	X	X	X	X	400	3045499	239	368,8	118,0	100	33,6	300
		X	X	X	500	3045503	249	406,3	130,0	100	38,4	300
		X	X	X	500	3045503	254	425,0	136,0	100	38,4	300
			X	X	525	3045504	247	437,5	140,0	100	41,6	300
			X	X	525	3045504	251	468,8	150,0	100	41,6	300
			X	X	575	3045506	245	500,0	160,0	100	42,2	300
			X	X	600	3045507	245	531,3	170,0	100	46,4	300
			X	X	650	3045508	233	552,5	176,8	100	51,2	300
				X	650	3045508	236	562,5	180,0	100	51,2	300
				X	700	3045509	226	593,8	190,0	100	57,6	300
				X	700	3045509	230	625,0	200,0	100	57,6	300
				X	750	3045510	244	656,3	210,0	100	64,0	300
				X	750	3045510	247	674,4	215,8	100	64,0	300

Tab. G

4.8.2 Nozzle installation

– Fit the nozzle with the box spanner, fitting the spanner through the central hole in the flame stability disk (Fig. 17).
– 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. G.

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.

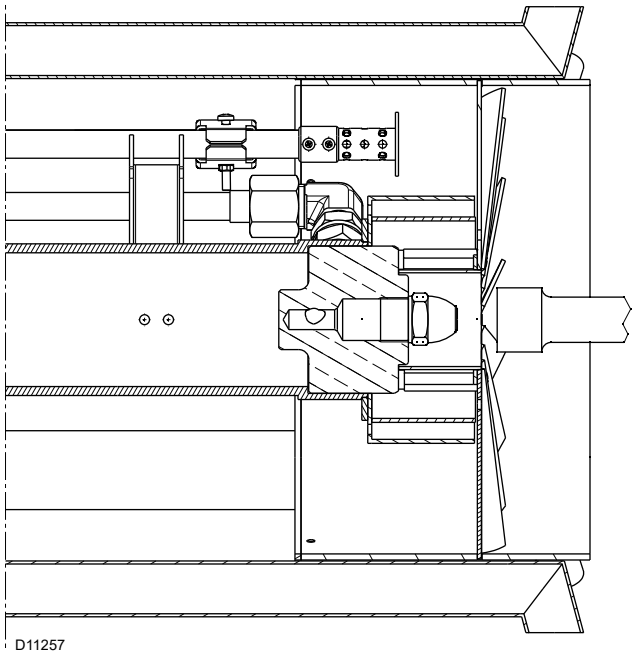


Fig. 17

4.9 Combustion head setting

In addition to varying air flow depending on the output requested, the air gate valve servomotor 4)(Fig. 3) by means of a lifting assembly - varies the setting of the combustion head.

This system allows an optimal setting even at a minimum firing rate.

For the same servomotor rotation, combustion head opening can be varied by moving the tie rod onto holes 1-2-3, Fig. 18.

The choice of the hole (1-2-3) to be used is decided on the basis of diagram (Fig. 20) against the required maximum output.

Setting is pre-arranged in the plant for the maximum run (hole 3) (Fig. 18).

When dealing with boilers featuring a strong back pressure, if air delivery is insufficient even with the damper fully open, you can use a different setting to that illustrated in diagram (Fig. 20) do this by moving the tie rod onto the next highest index, thus increasing the combustion head's opening and hence air delivery.

If combustion requirements require you to move spacer 1)(Fig. 19) onto the 1st or 2nd hole of the gear and, at the same time, the hinge is on the right, you need to fit the spacers 4)(Fig. 19) supplied with the burner.

Proceed as follows:

- ➤ first unscrew nuts 2), remove tie rod 3), unscrew spacer 1) and position it on the hole you want,
- ➤ screw the spacers 4) onto spacer 1) and screw 5) respectively,
- ➤ once done, refit the tie rod and nuts.

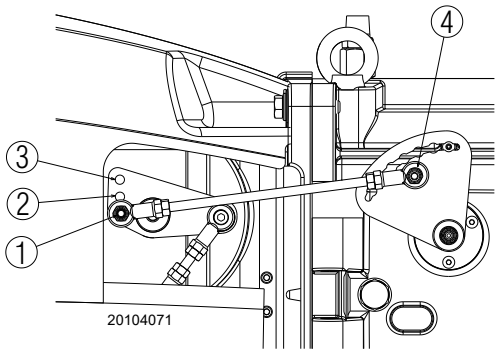


Fig. 18

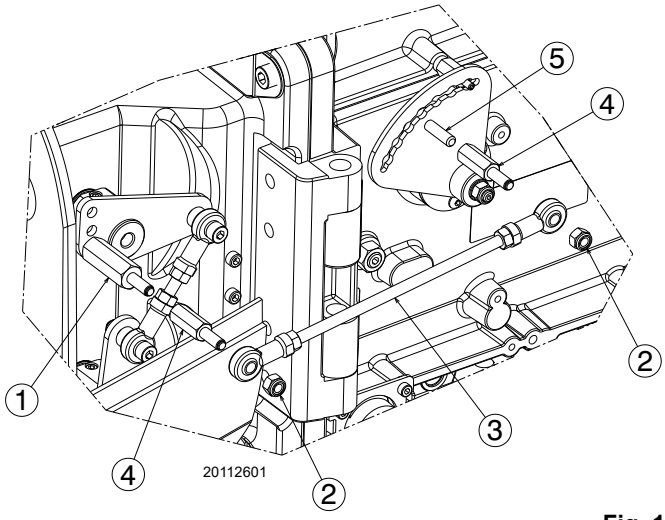
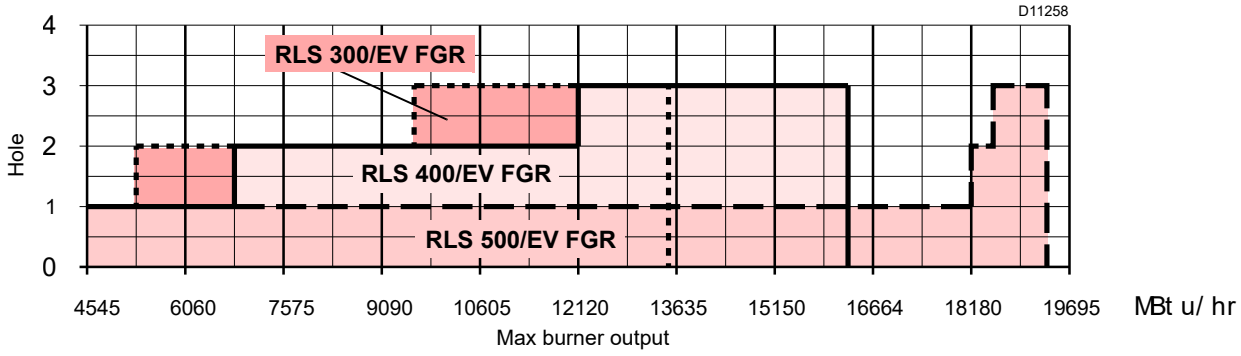


Fig. 19



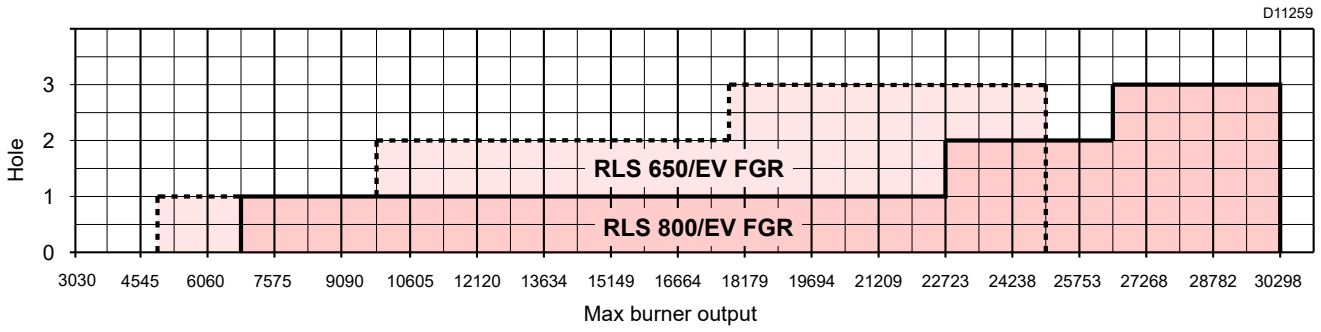


Fig. 20

Only for RLS 400/EV FGR model

WARNING

To achieve operation at minimum output, the combustion head's gas pipes must be adjusted to hole position 5 (Fig. 21).

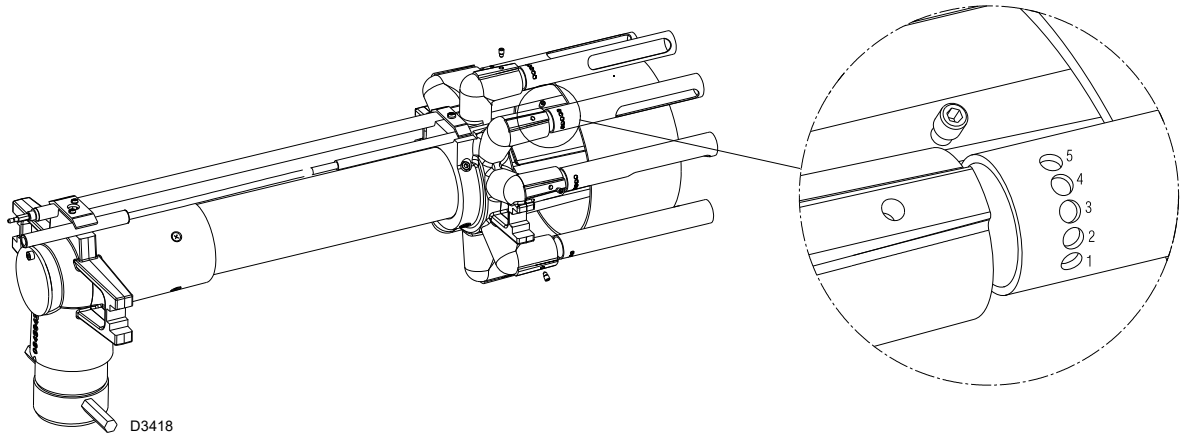


Fig. 21

4.9.1 Adjustment at the maximum output (for gas)

Only for RLS 650/EV FGR model

The adjustment at the maximum output requires the disassembly of the 6 nozzles as indicated in Fig. 22.

Proceed as follows:

➤ disassemble from the burner of the complete combustion head assembly;
➤ unscrew the screws and remove the 8 tangential tubes 1);
➤ unscrew the 4 screws and disassemble the diffuser disc 2);
➤ unscrew and remove the 6 nozzles 3).

Re-assemble with reverse procedure, re-placing all the burner components as originally.

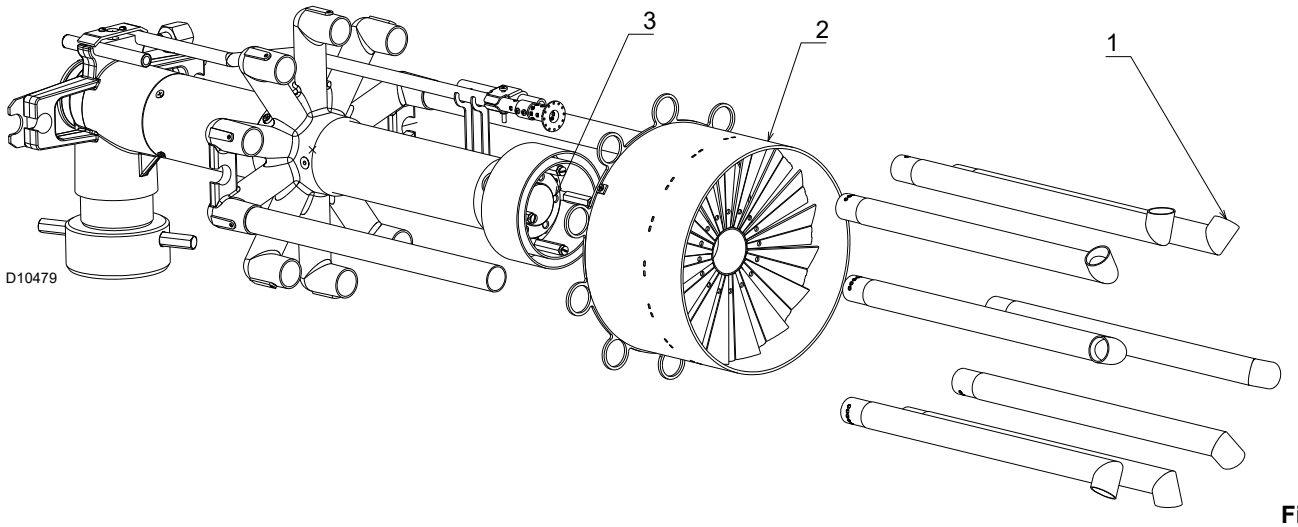


Fig. 22

4.10 FGR duct system

– Normally the duct would connect to the stack as shown in Fig. 23, with a 45° cut facing the flue gas flow and with the center of the cut centered in the stack.
The duct could be made to the smoke box, but must still be located with the same 45° cut facing the flue gas flow stream and with the center of the cut in the center of the stream.

– The duct should be routed in a manner that has the minimum number of elbows and provides for the normal expansion and contraction of the piping.
Long duct runs can change length by over 1” and can put an extreme load on the connecting points that could cause component failures.
The design must include offsets that will allow for the required movement of the piping without undue force on the burner or stack.

– Duct expansion and contraction can be managed by using two relatively long duct runs that are 90° opposed to each other.
A small movement in the angle between these two legs will provide the space needed to absorb the expansion and contraction. The ends of the FGR duct must be securely attached to allow this to work properly, and prevent high loads from being applied to the burner or stack.

– A condensation drip leg must be provided upstream of the FGR control valve and the FGR shut-off valve (if used). There must be sufficient condensate drip legs and catch space (volume of drip legs) to prevent the condensation from flowing through the control valves and into the fan.
In cases of heavy condensation, a condensate drip leg may be required on the bottom of the housing, to remove condensate.

– Determine if pipe reducers are needed for the connection to the FGR control valve and the FGR shut-off valve.

– The duct must be properly supported, handling both the weight of the duct and to control the thermal expansion and contraction. The supports may need to be anchored to provide this stability in the FGR duct.

CAUTION

Uncontrolled condensation can cause premature failure of the control valves, fan and motor.

Adequate means must be provided to remove condensation from the system.

Cold start-up will generate significant amounts of condensation.

– The FGR duct is normally made from schedule 40 pipe because it is easily obtainable and inexpensive.
Schedule 20 pipe can also be used for this application.

– The duct components must be seal welded, flanged or screwed together to provide an air tight duct.
Air leakage into the duct will prevent the system from working properly. It is sufficient to only inspect the welds for a proper seal, they do not need to be leak tested.

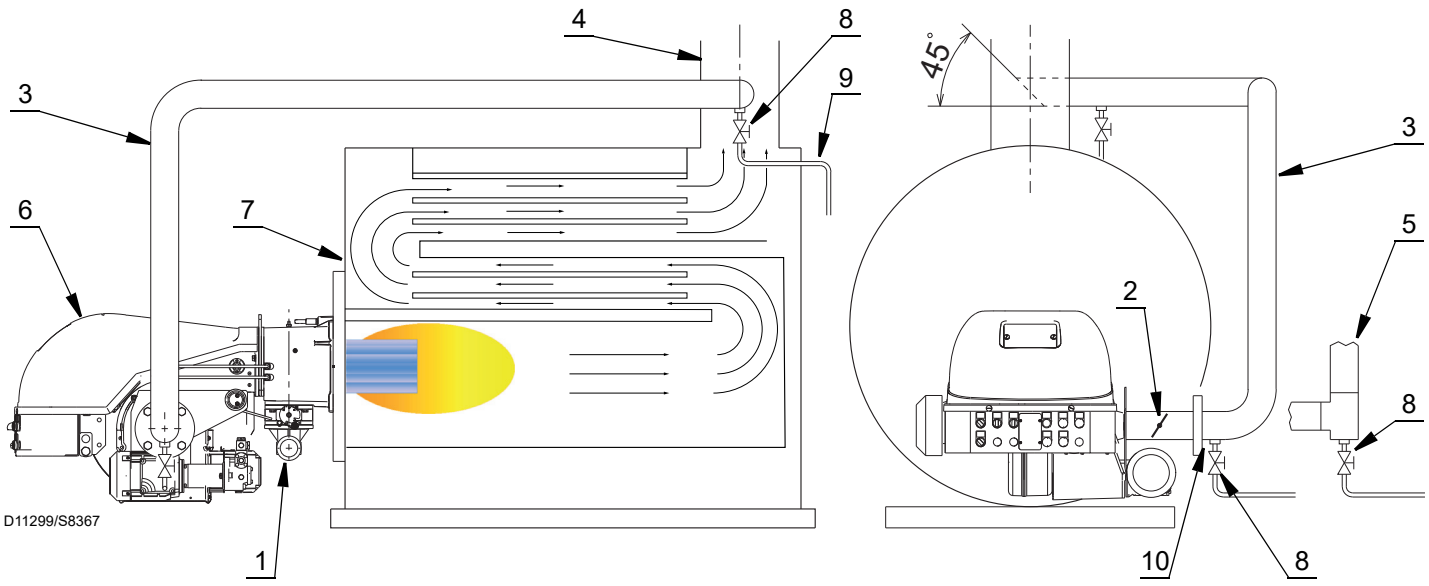


Fig. 23

Key (Fig. 23)
1 Primary gas supply inlet
2 Inducted FGR modulating damper
3 Flue gas recirculation pipe
4 Boiler stack
5 Alternate Construction Using “T”
6 Burner
7 Boiler
8 Drain Valve (Manual Ball Valve, Stainless Steel)
9 Drain line
10 Condensate Trap

4.10.1 Flue gas recirculation line sizing

The Tab. H can be helpful to correctly size the FGR pipes taking flue gases from boiler stack base up to the burner intake port.

Maximum allowed pipe length (considering smooth steel pipes) is specified for every burner and pipe diameter.

To prepare the Tab. H a flue gas maximum temperature of 500°F was considered.

Diameter of FGR pipe	RLS 300/EV FGR	RLS 400/EV FGR	RLS 500/EV FGR	RLS 650/EV FGR	RLS 800/EV FGR
3"	10’	-	-	-	-
4"	30’	20’	16’	10’	-
6"	200’	150’	100’	80’	60’
8"	-	-	250’	200’	150’

Tab. H

To account for the flow resistance at 90° elbows of the flue gas circuit, the following equivalent straight pipe length values can be considered, and shall be deducted from the maximum pipe length values indicated in Tab. H to obtain the maximum length of FGR pipe development in the considered instance:

Size of pipe	Pipe fittings	
	90° elbow	45° elbow
3"	7,5'	4'
4"	10'	5,5'
6"	15'	8'
8"	20'	11'

Tab. I

Exemple RLS 500/EV FGR:

- ➤ foreseen overall pipe development: 80’
- ➤ foreseen number of bends: 3

Start considering a 6” pipe.

In Tab. H you see that maximum allowed length is 100’, then we must take off 3 x 15’ = 45’ to account for bends. We then obtain a maximum pipe value of 55’ that is < 100’ so it is not fine.

You understand that pipe diameter is too small so we must choose a 8” diameter.

Maximum allowed pipe length
FGR = 250’ - 3 x 15 ’= 205’ that is > 100’ so it is fine.

4.10.2 Calculating the percentage of recirculated flue gas

As a general rule, recirculated flue gas quantity must be adjusted so as to recirculate the smallest quantity necessary to obtain the required Nox rate.

Adjustment is carried out through the throttle valve located on FGR pipe. It is necessary to consider that too high a quantity of recirculated flue gas could lead to flame instability and excessively high CO rate. To calculate the % of recirculated flue gas, use the formula below: % IFGR= ($CO_{2\ R}$)/($CO_{2\ f}$) x 100.

Where:

- ➤ ($CO_{2\ R}$) is the percentage of CO_2 measured at the burner coupling
- ➤ ($CO_{2\ f}$) is the percentage of CO_2 measured at the stack

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. J.

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. J.

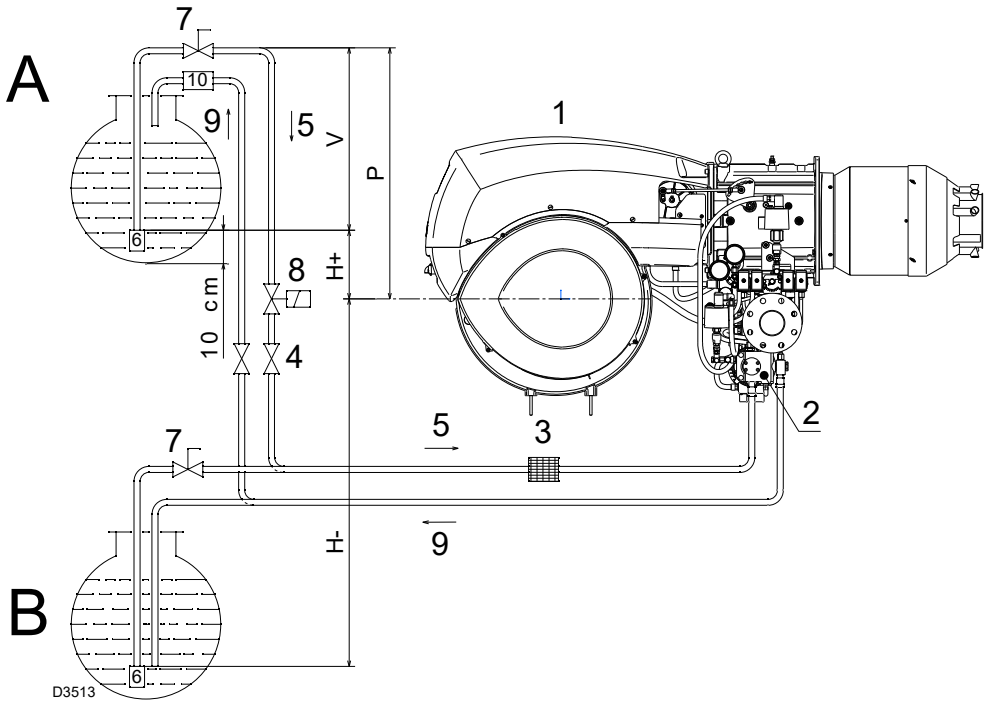


Fig. 24

+/- 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. J

Key (Fig. 24)
1 Burner
2 Pump
3 Filter (delivered by the Installer)*
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

*	cm^2	$inch^2$
Filtering surface	181	28
Filtering degree	100 µ	

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. 26). 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 Pressure variator

The pressure variator (Fig. 25) of the oil circuit makes it possible to vary the pressure on return of the nozzle depending on the flow rate required.

Governing of the pressure on return is obtained with the variation of a section by rotating the servomotor 23)(Fig. 3 at page 11) which simultaneously also controls the gas butterfly valve.

– Pressure governor at 0° (maximum opening) = minimum pressure on nozzle return.
– Pressure governor at 90° (minimum opening) = maximum pressure on nozzle return.

The servomotor is operated by the electronic cam 11)(Fig. 4 at page 12); by means of this device it is possible to set different curves for oil and gas on the same servomotor (the air gate valve servomotor 4)(Fig. 3 at page 11) may be operated in the same way.

- In adjusting with gas it is advisable to set the servomotor at 90° in order to reduce losses from the gas butterfly valve.
- In regulating with oil, setting is made depending on the type of nozzle used and on the modulation required.
  Under the conditions of minimum firing rate, 20° rotation may be sufficient.

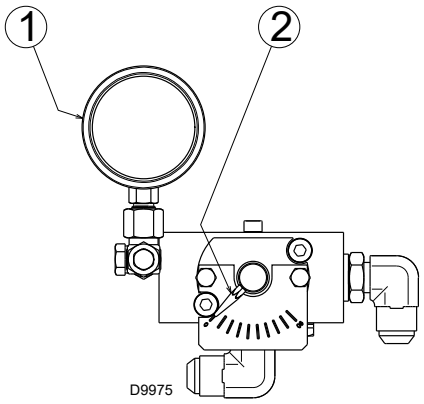


Fig. 25

Key (Fig. 25)
1 Nozzle pressure gauge
2 Position indicator (0 - 90) of pressure variator

4.13 Pump

4.13.1 Technical data

Pump model		TA3 (RLS 300-400/EV FGR)	TA4 (RLS 500/EV FGR)	TA5 (RLS 650-800/EV FGR)
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. K

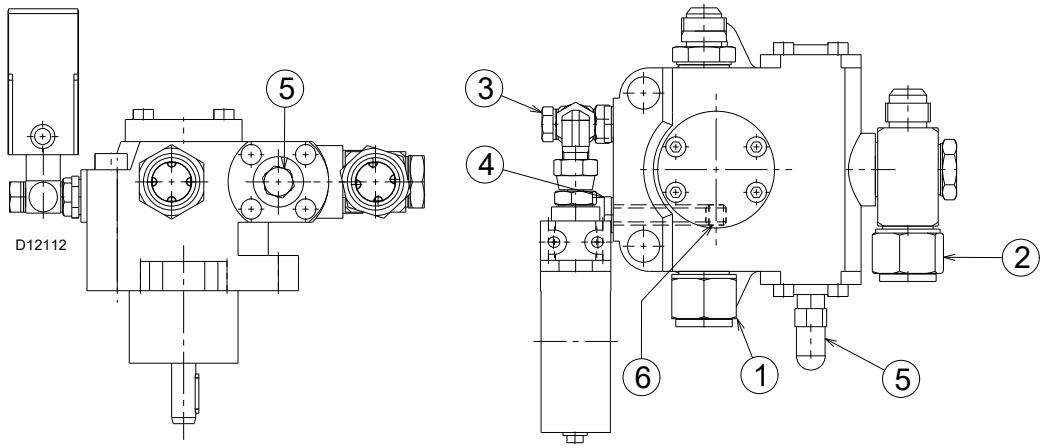


Fig. 26

Key (Fig. 26)

1	Suction	3/4" NPT
2	Return	3/4" NPT
3	Pressure switch attachment	G 1/4"
4	Vacuum meter connection	G 1/4"
5	Pressure governor	
6	By-pass screw	

4.13.2 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.

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

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

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

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

WARNING

The a.m. operation is possible because the pump is already full of fuel when it leaves the factory.

If the pump has been drained, fill it with fuel through the opening on the vacuum meter 4)(Fig. 26) prior to starting; otherwise, the pump will seize.

Whenever the length of the suction piping exceeds 20-30 meters, the supply line must be filled using a separate pump.

4.14 Gas supply

4.14.1 Gas train

The gas train is to be connected on the right of the burner, by flange 1)(Fig. 27). If necessary connect it on the left, proceed as follows:
– loosen nuts and screws 3) and 4);
– remove blind flange 2) together with its gasket;
– fit them to flange 1) tightening the nuts and screws.

WARNING

Once assembled the gas train, check for leaks.

4.14.2 Gas feeding line

It must be type-approved according to required standards and is supplied separately from the burner (Fig. 28).

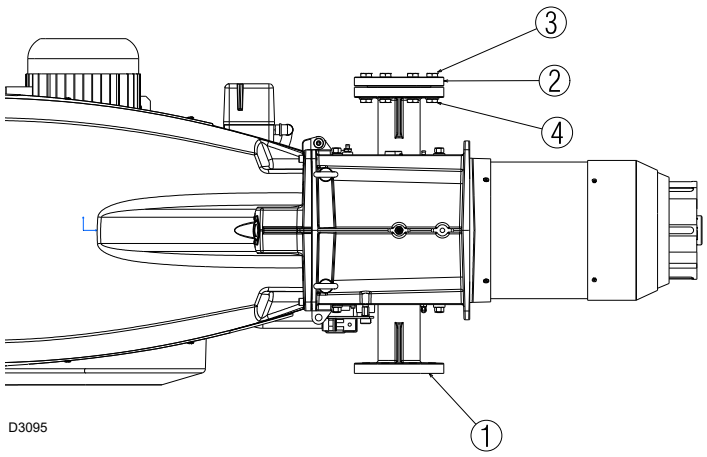


Fig. 27

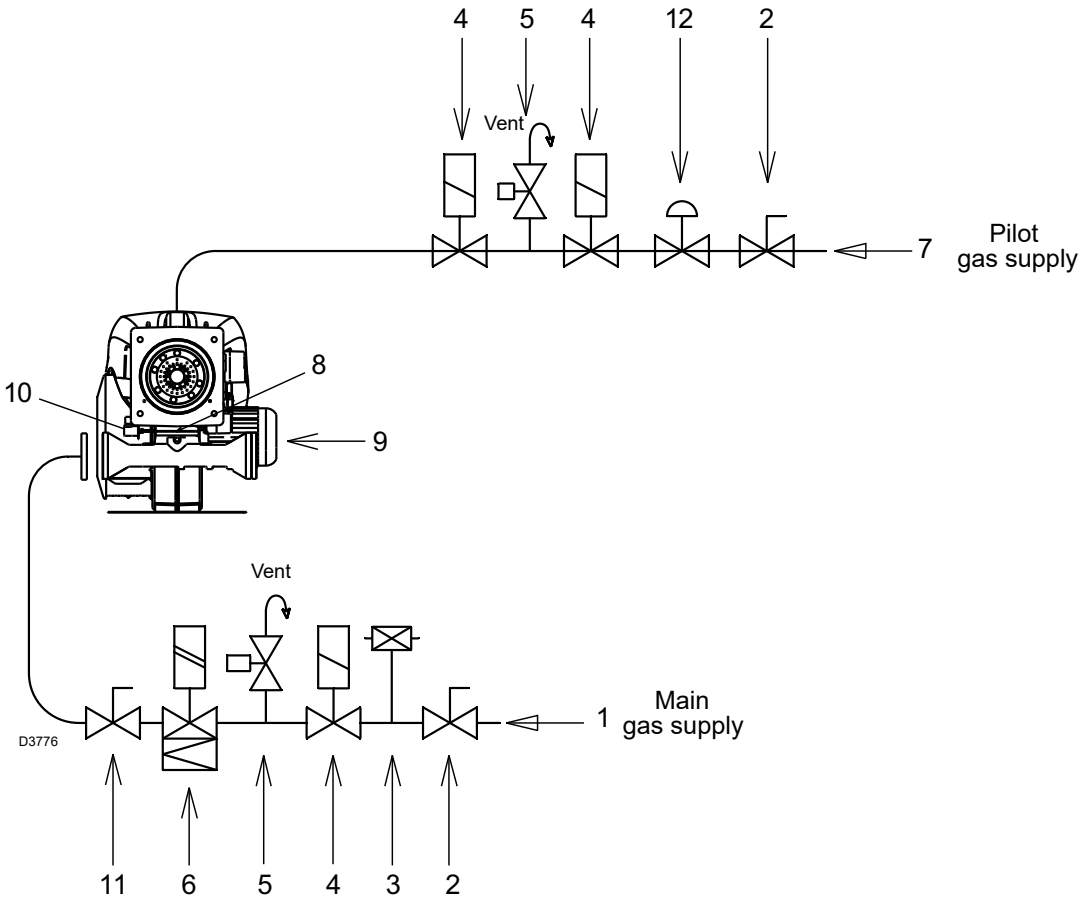


Fig. 28

Key (Fig. 28)

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

4.14.3 Gas pressure

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

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

Column 1
Pressure loss at combustion head.
Gas pressure measured at the test point 1)(Fig. 29), with:
– combustion chamber at “WC;
– burner working at maximum output;
– combustion head adjusted as in the diagram of Fig. 20 at page 26.

Column 2
Pressure loss at gas butterfly valve 2)(Fig. 29) 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. 29);
– find, in the Tab. L 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 500/EV FGR:
- Maximum output operation
- Gas pressure at test point 1)(Fig. 29) = 11.7 “WC
- Pressure in combustion chamber = 2 “WC

11.7 - 2 = 9.7 “WC

An output of 15148 MBtu/hr shown in Tab. L 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.

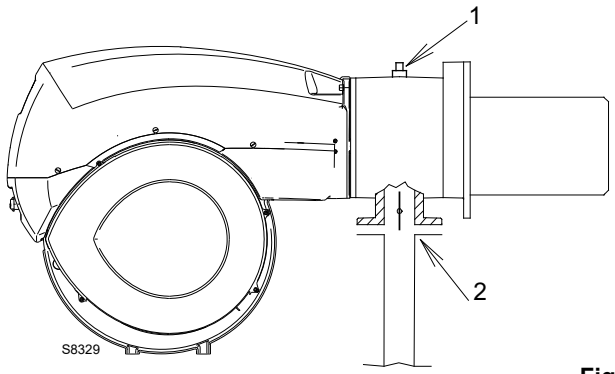


Fig. 29

Note

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

	MBtu/hr (GCV)	1 Δp (“WC)	2 Δp (“WC)
RLS 300/EV FGR	5112	3.3	0.63
	5680	3.7	0.79
	7574	4.9	1.38
	9467	5.4	2.13
	11361	5.9	3
	13254	7.9	4.2
	14390	9	5.1
RLS 400/EV FGR	6816	2.3	1.1
	7574	3	1.38
	9467	4.7	2.13
	11361	6.4	3
	12307	7.3	3.62
	13254	8.3	5.17
	15148	10.8	5.47
	17042	13	7
RLS 500/EV FGR	9467	4.4	1.81
	11361	6	2.64
	13254	7.7	3
	15148	9.7	3.82
	17042	11.8	4.64
	18935	14.1	5.55
	19692	15	5.9
RLS 650/EV FGR	11362	2.8	1
	13255	4	1.4
	15149	5.1	1.8
	17043	6.2	2.2
	18936	7.7	2.8
	20830	9.3	3.3
	22724	10.9	4
	24617	12.6	4.7
	24805	13.1	4.9
RLS 800/EV FGR	13255	4.5	1.1
	15149	6	1.4
	17043	7.5	1.8
	18936	8.9	2.2
	20830	10.4	2.6
	22724	11.9	3.1
	24617	13.9	3.7
	26511	15.3	4.3
	28405	17.6	4.9
	30299	19.9	5.6

Tab. L

WARNING

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

4.15 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 electricity supply from the burner by means of the main switch of the system;

DANGER

close the fuel interception tap.

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

All the cables to be connected to the burner are fed through the grommets (Fig. 30).

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 1 inch cable grommet
1 Single phase power supply with $^1/_2$ 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: variable speed driver, pressure and temperature probe sensor with $^3/_8$ inch cable grommet
5 Motor earth cable
6 Available
7 Entry plug-socket branch unit
8 Speed sensor cable

WARNING

The control panel is in compliance with UL508A.

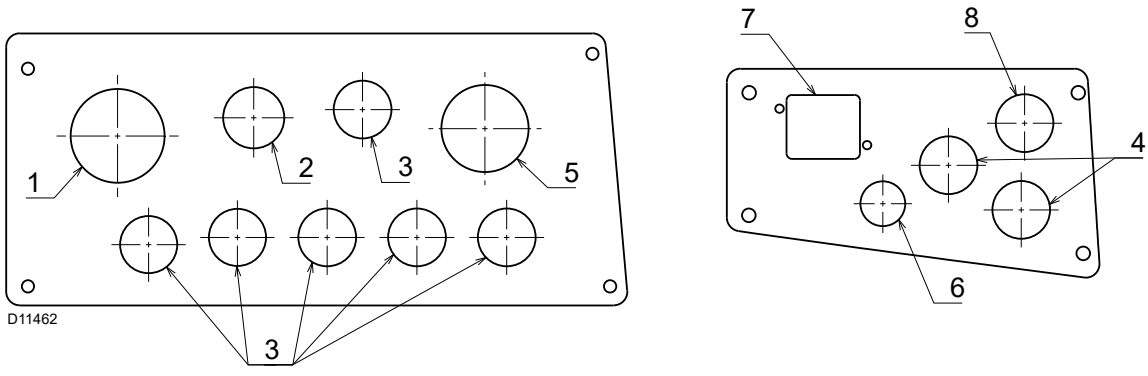


Fig. 30

4.15.1 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. 32);
- ➤ 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. 32);
- ➤ 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).

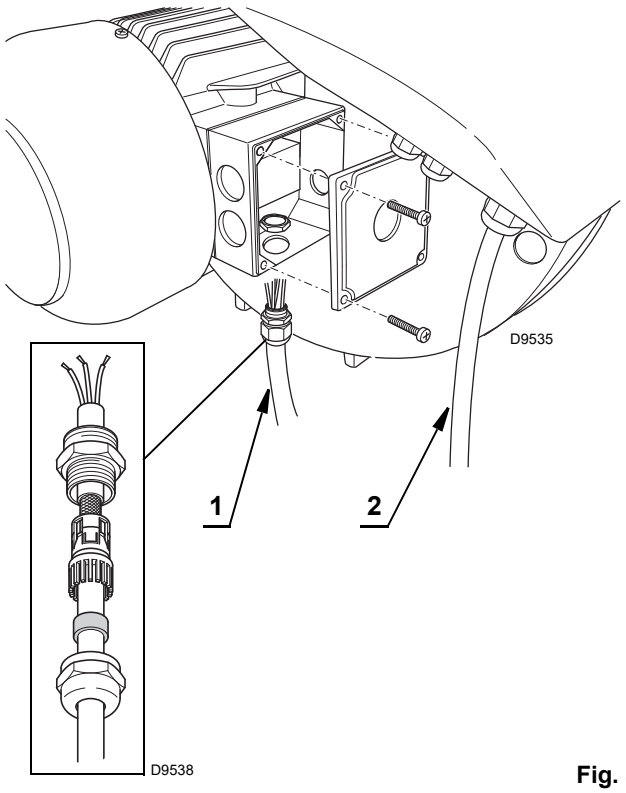


Fig. 31

Key (Fig. 31)
1 Motor supply cable
2 Single Phase supply cable

WARNING

It is very important to shield the motor cable 1) as shown in Fig. 31.

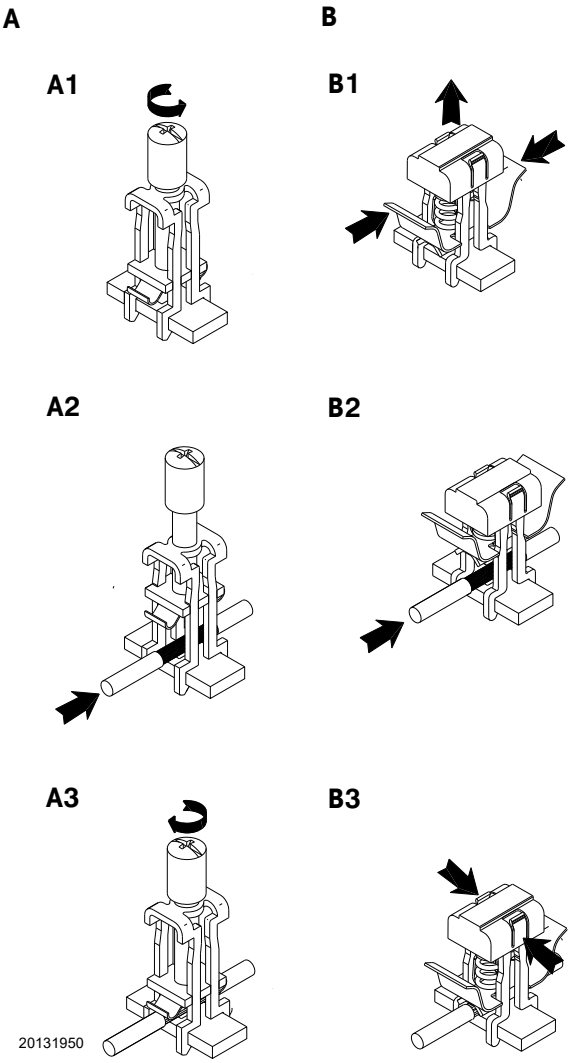


Fig. 32

4.16 Speed sensor adjustment

WARNING

The measurement of speed sensor 1)(Fig. 33) must be respected!

WARNING

It is important that the disc 2) is installed on the burner as shown in the Fig. 33.

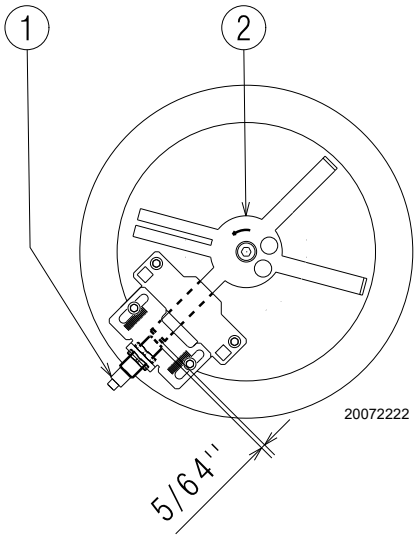


Fig. 33

4.16.1 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

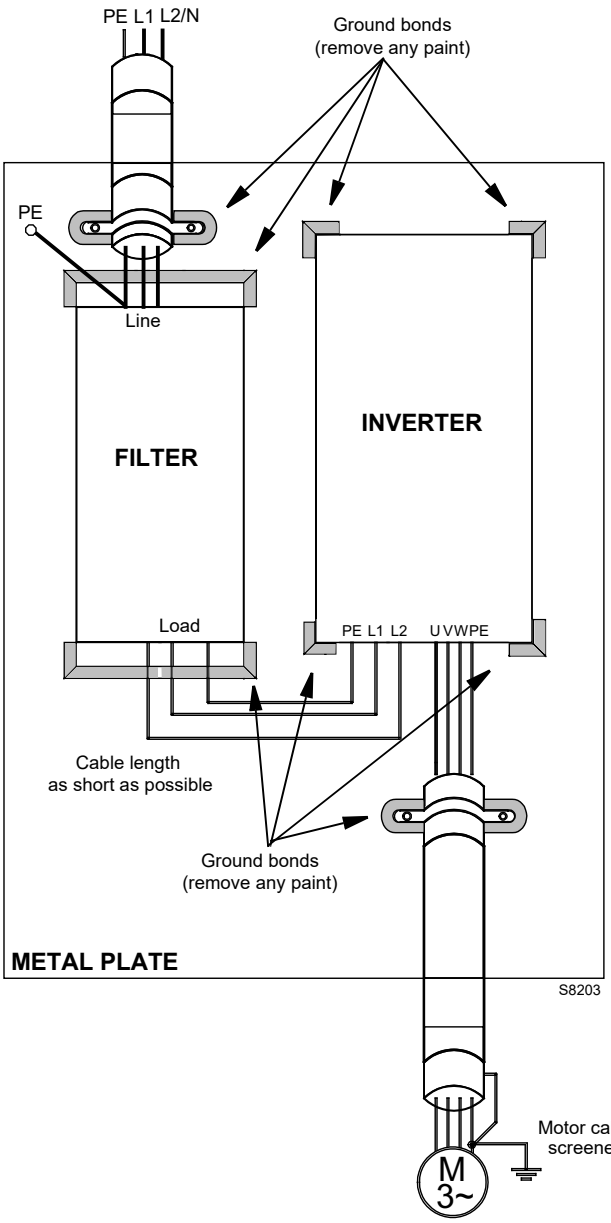


Fig. 34

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).

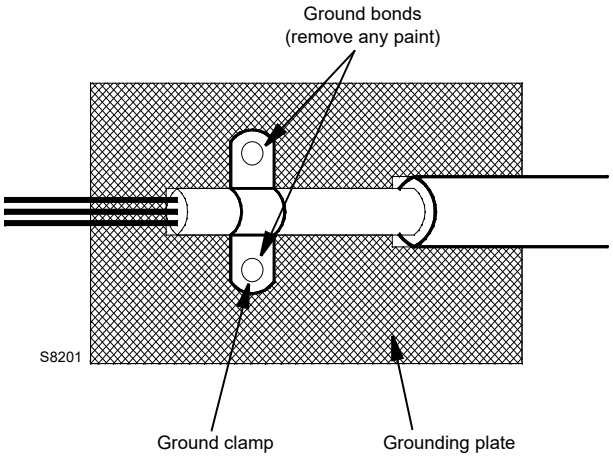


Fig. 35

Examples:

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

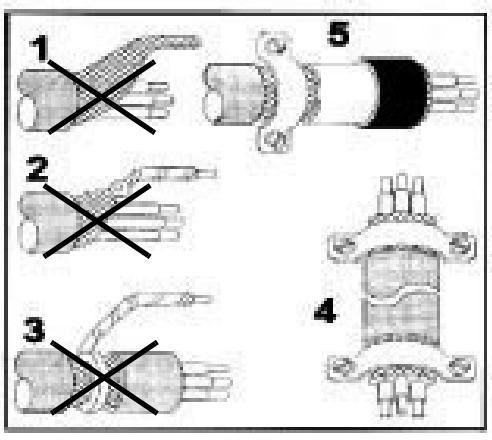


Fig. 36

4.17 Thermal relay calibration

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

4.17.1 Electro-mechanical thermal relay

The electro-mechanical thermal relay (Fig. 37) is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase.

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

This arises when the power supply of the motor is 400V.

➤ To reset, in the case of an intervention of the thermal relay, press the button "**RESET**" (Fig. 37).

➤ The button "**STOP**" (Fig. 37) opens the NC (95-96) contact and stops the motor.

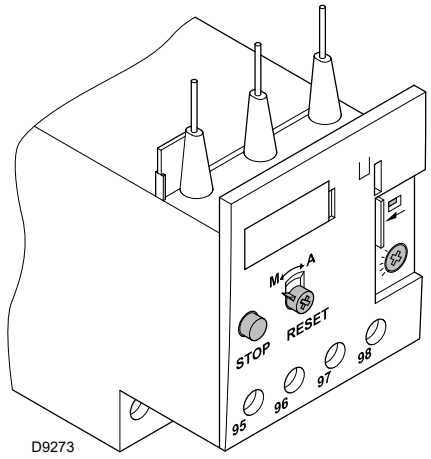


Fig. 37

➤ To test the thermal relay, insert a screwdriver in the window "**TEST**" (Fig. 38) 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.

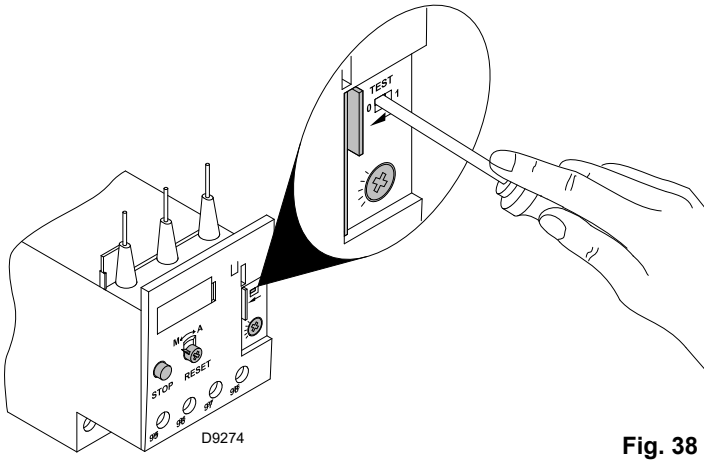


Fig. 38

4.17.2 Electronic thermal relay

➤ To reset, in the case of an intervention of the thermal relay, press the button "**RESET**" (Fig. 39).

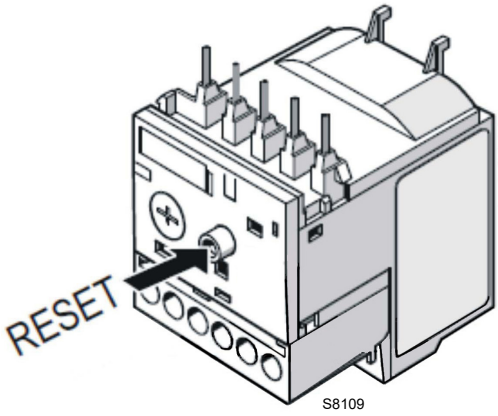


Fig. 39

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

➤ **Device test (Fig. 40)**
Push slowly the button in the window with a little screwdriver.

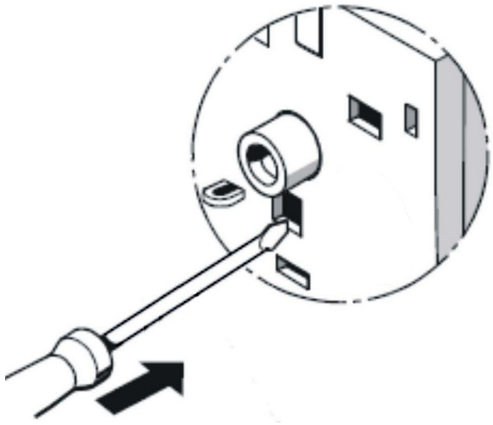


Fig. 40

➤ **Contact test NC (95-96) and NO (97-98)(Fig. 41)**
Insert in the window a little screwdriver and move it in the sense of the arrow.

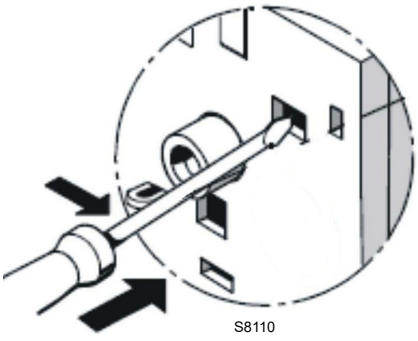


Fig. 41

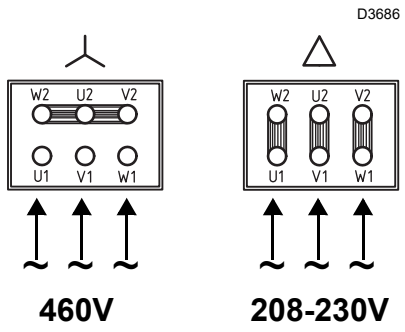
4.18 Motor connection at 208-230 or 460V

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

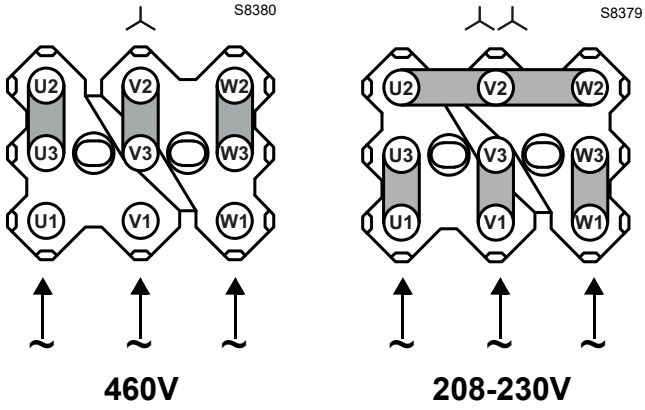


Fig. 42

4.19 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.

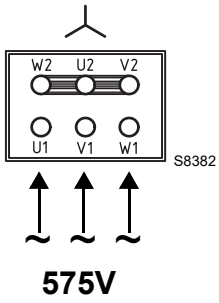


Fig. 43

4.20 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.**

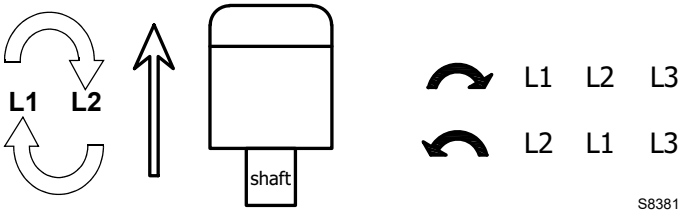


Fig. 44

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 49 before the first start-up.

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 24.

5.2.2 Combustion head

The adjustment of the combustion head already carried out (page 26) need not be altered unless the 2nd stage delivery of the burner is changed.

The setting of the combustion head depends exclusively on the maximum delivery of the burner. In case of high altitude site, head setting must refer to the “corrected capacity” according precedure described at page 14.

5.2.3 Pump pressure

300 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;
- In order to adjust pump pressure, use the screw 5)(Fig. 26).

5.2.4 Fan air gate valve

See adjustments at page 43.

5.3 Burner firing

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

Set switch 1)(Fig. 45) to "LOCAL".

Set switch 2)(Fig. 45) to "GAS".

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 page 23.

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.

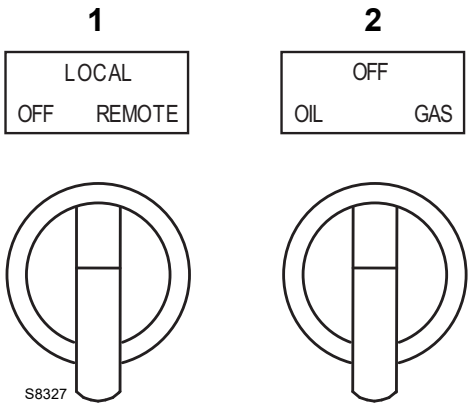


Fig. 45

5.4 Fuel change

There are two possible options for changing fuel:
1 using switch 2)(Fig. 45);
2 using a remote selector connected to the main terminal board.

By setting switch 1)(Fig. 45), to “remote” you activate the remote fuel selection facility.

In this position, if no remote selector is fitted, the display shows the priority fuel.

5.5 Adjustments before first firing (gas operation)

Adjustment of the combustion head has been illustrated on page 26.

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 min gas pressure switch (Fig. 50 at page 44) to the start of the scale.
- ➤ Adjust the max gas pressure switch (Fig. 49 at page 44) to the upper limit of the scale.
- ➤ Adjust the air pressure switch (Fig. 48 at page 44) to the zero position of the scale.
- ➤ Fit a U-type manometer (Fig. 46) to the gas pressure test point on the sleeve. The manometer readings are used to calculate MAX. burner power using the Tab. L at page 34.

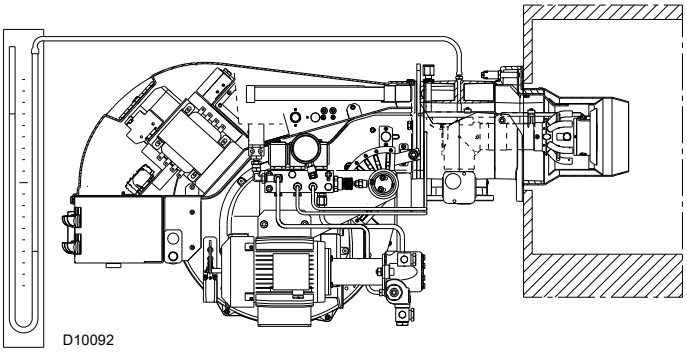


Fig. 46

CAUTION

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.

5.6 Burner start-up

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

Close the thermostats/pressure switches.

Turn the switch to position **"LOCAL"** and turn the switch to position "**OIL**" for oil operation and "**GAS**" for gas operation (Fig. 47).

DANGER

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

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

WARNING

When the burner starts, check the direction of the motor rotation, as indicated in Fig. 47.

As soon as the burner starts up, look at the cooling fan of the fan motor and check it is rotating anti-clockwise.

If this is not the case:

- ➤ place the switch of Fig. 47 in position **"OFF"** and wait for the control box to carry out the switch-off phase;
- ➤ disconnect the electrical supply from the burner;
- ➤ invert the phases on the inverter output.

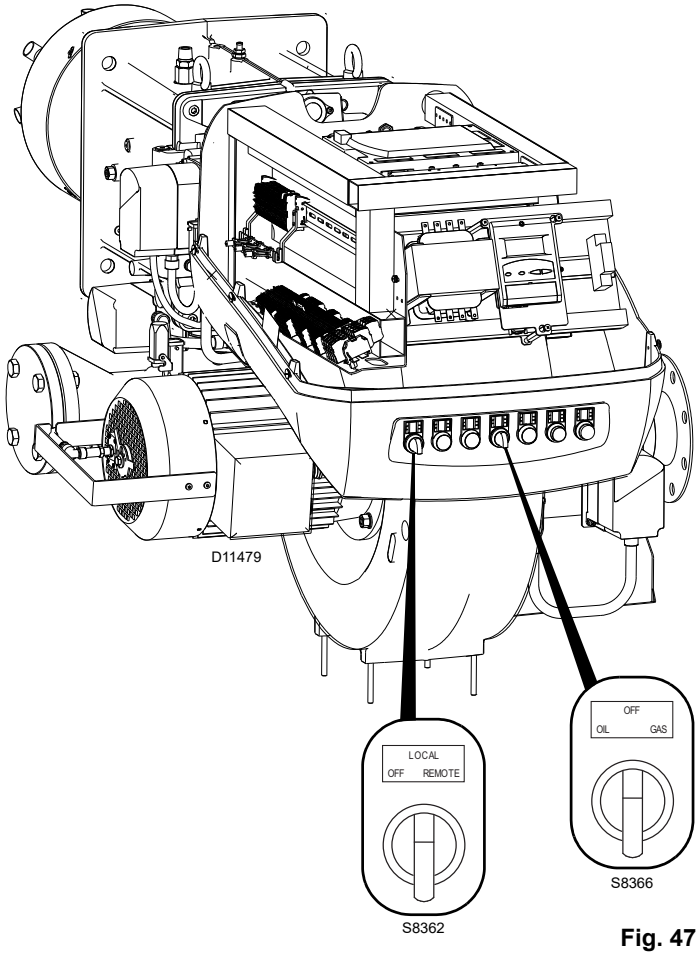


Fig. 47

NOTE:
for further information, please refer to the specific instruction of the control box.

WARNING

For the first ignition, you should not activate the re-circulation gas function. See “FGR duct system” on page 28.

5.6.1 Combustion air adjustment

Fuel/combustion air must be synchronized with the relevant servomotors (air and gas) by storing a setting curve by means of the electronic cam.

To reduce pressure loss and to have a wider adjustment range, it is best to set the servomotor to the maximum output used, as near to maximum opening (90°) as possible.

On the gas butterfly valve, the fuel’s partial setting adjustment based on required output, with the servomotor fully open, is made by using the pressure stabilizer on the gas train.

5.6.2 Air adjustment for maximum output

Set the servomotor to maximum opening (near 90°) so that the air butterfly valves are fully open.

WARNING

We recommend you achieve the maximum output required manually, and adjust intake to the partial setting, define gas pressure and adjust the combustion head before completing the setting and storing the fuel/combustion air synchronization curves.

5.6.3 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.

5.6.4 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.

5.6.5 Air/fuel control and power modulation system

The air/fuel and power modulation system installed on **RLS** burner series provides, a set of integrated functions ensuring top level energy and operational performance from the burner, both for single and grouped burners (e.g. boiler with a double combustion chamber or several generators in parallel).

The system includes the following basic functions:

- ➤ air and fuels are supplied in correct quantities by positioning the valves by direct servo-control, thus avoiding the possibility of play typical of systems used for traditional modulating burners, in which settings are obtained by levers and a mechanical cam;
- ➤ burner power is modulated according to the load required by the system, while boiler pressure or temperature is maintained at set operating values;

Further interfaces and computer communication functions for remote control or integration in centrally supervised systems are available according to the system’s configuration.

NOTE

The first start-up and all further operations concerning internal settings of the control system or expansion of basic functions, are accessed with a password and are reserved for technical service personnel specifically trained for internal programming of the instrument and for the specific application obtained with this burner.

The first start-up and curve synchronization manual is supplied with the burner.

The complete manual for checking and setting all parameters will be provided on application.

5.7 Final calibration of the pressure switches

5.7.1 Air pressure switch

Adjust the air pressure switch (Fig. 48) after having performed all other burner adjustments with the air pressure switch set to the start of the scale.

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

Then turn the dial anti-clockwise by about 20% of the set point and repeat burner starting to ensure it is correct.

If the burner locks out again, turn the dial anti-clockwise a little bit more.

WARNING

As a rule, the air pressure switch must prevent the formation of CO. To check this, insert a combustion analyser into the chimney, slowly close the fan suction inlet (for example with cardboard) and check that the burner locks out, before the CO in the fumes exceeds 400 ppm.

To check this, insert a combustion analyser into the chimney, slowly close the fan suction inlet (for example with cardboard) and check that the burner locks out, before the CO in the fumes exceeds 1%.

On **RLS 300-400-500/EV FGR burners** the air pressure switch is fitted in a "differential" mode, that is, with two pipes connected to the specific pressure test points “+” and “-” 22) and 37)(Fig. 3 at page 11).

5.7.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 49) 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.

5.7.3 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. 50) 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.

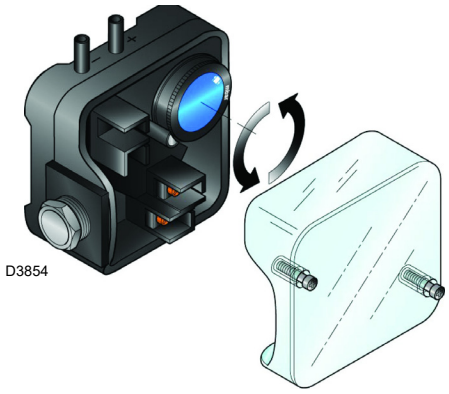


Fig. 48

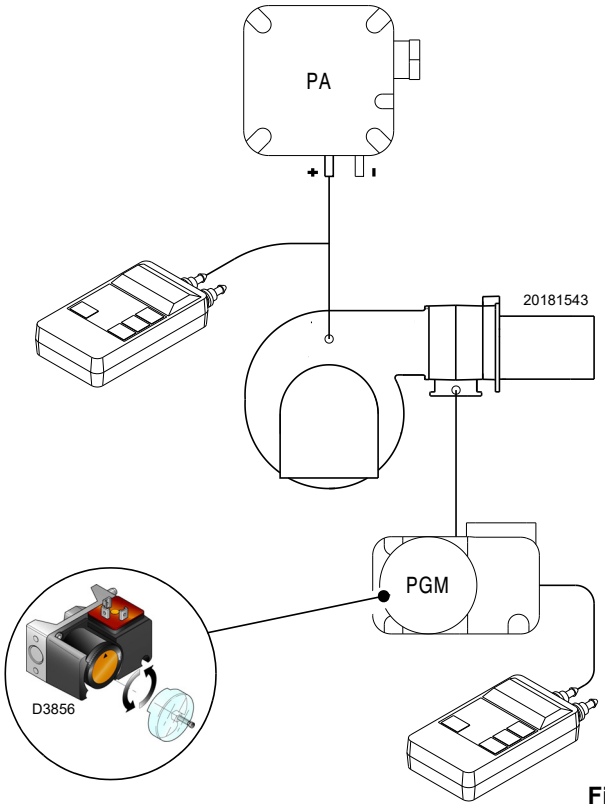


Fig. 49

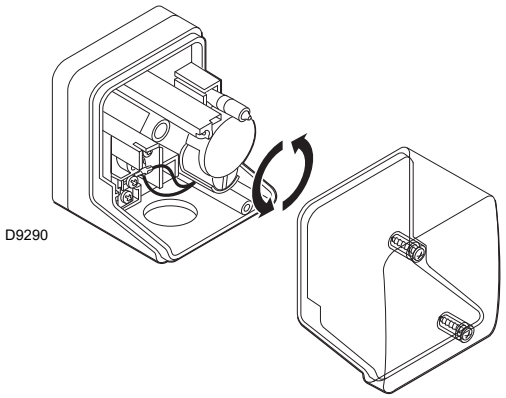


Fig. 50

WARNING

1 kPa = 10 mbar

5.7.4 Low oil pressure switch

The low oil pressure switch (Fig. 51) 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.

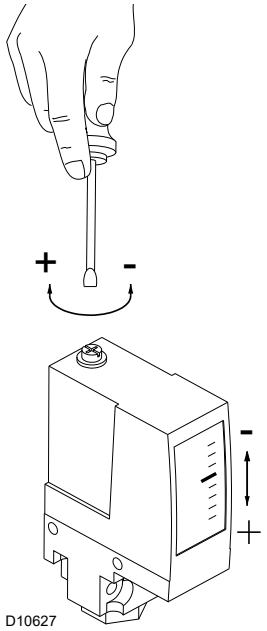


Fig. 51

5.8 Burner starting

- ➤ Operating control closes, the motor starts.
- ➤ The pump 18)(Fig. 52) 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.
- ➤ The ignition pilot starts.
- ➤ Solenoid valves 5) - 6) open; the fuel passes through the piping 19) and filter 12), 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.

Key (Fig. 52)
1 Pump suction
2 Pump and nozzle return
3 By-pass screw in pump
4 Pump pressure governor
5 Safety valve
6 Safety valve
7 Nozzle delivery
8 Nozzle without interception pin
9 Nozzle return
10 Pressure variator on nozzle return
11 Servomotor for pressure variator
12 Check valve (no dripping function)
13 Check valve (no dripping function)
14 Check valve
15 Pressure switch on pump delivery
16 Strainer
17 Security relief valve
18 Pump
19 Piping
20 Piping
M Pressure gauge
V Vacuometer

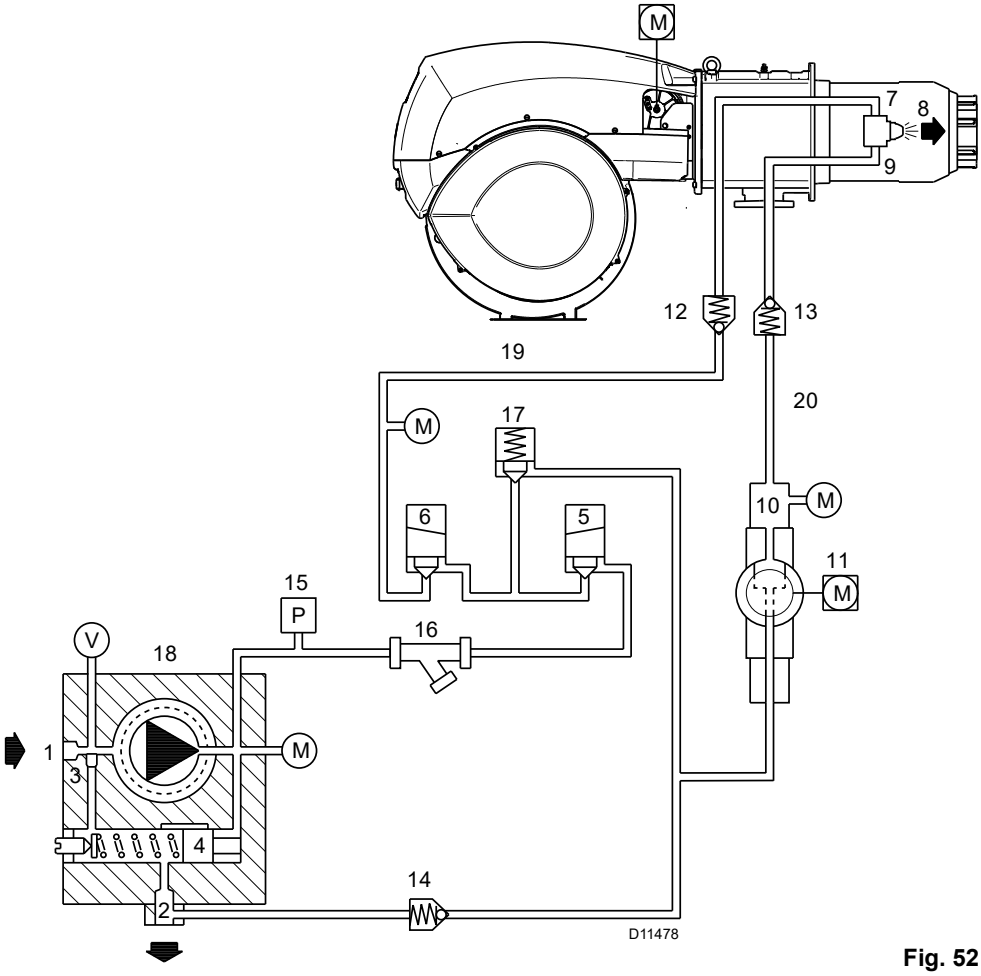


Fig. 52

5.8.1 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).

5.8.2 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.

5.9 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 ➤ 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

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 electricity supply from the burner by means of the main switch of the system.

DANGER

Close the fuel interception tap.

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

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.

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.

Measurement of detector current
Measurement of the detector's signal (Fig. 52) with a Voltmeter is not normally required since the flame signal's intensity is shown on the AZL...display and operating unit.

Min. value for a good work: 3.5 Vdc (AZL display flame approx. 50%).

If the value is lower, it can depend on:
– sensor positioned incorrectly;
– low current (lower than 96V);
– bad regulation of the burner.

To measure power, use a voltmeter with a 10 Vdc scale, connected as illustrated in Fig. 52.

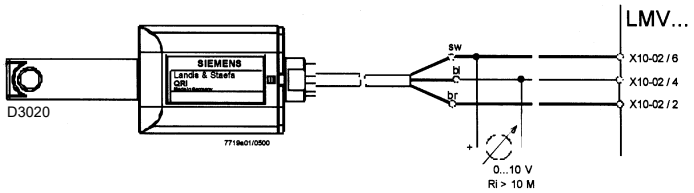


Fig. 52

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.

Burner
Clean the outside of the burner.
Clean and grease the cam variable profile.

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.

LIGHT OIL OPERATION

Pump
Delivery pressure must correspond with the Tab. G at page 24.
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
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.

6.2.4 Safety components

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

6.3 Opening the burner

DANGER

Disconnect the electrical supply from the burner.

➤ Remove the tie rod 1)(Fig. 53) of the head movement lever, loosening nut 2).
➤ Disconnect the gas servomotor test point 3).
➤ Disconnect the gas pressure switch test point 4).
➤ Remove screws 5).

At this point it is possible to open the burner at the hinge.

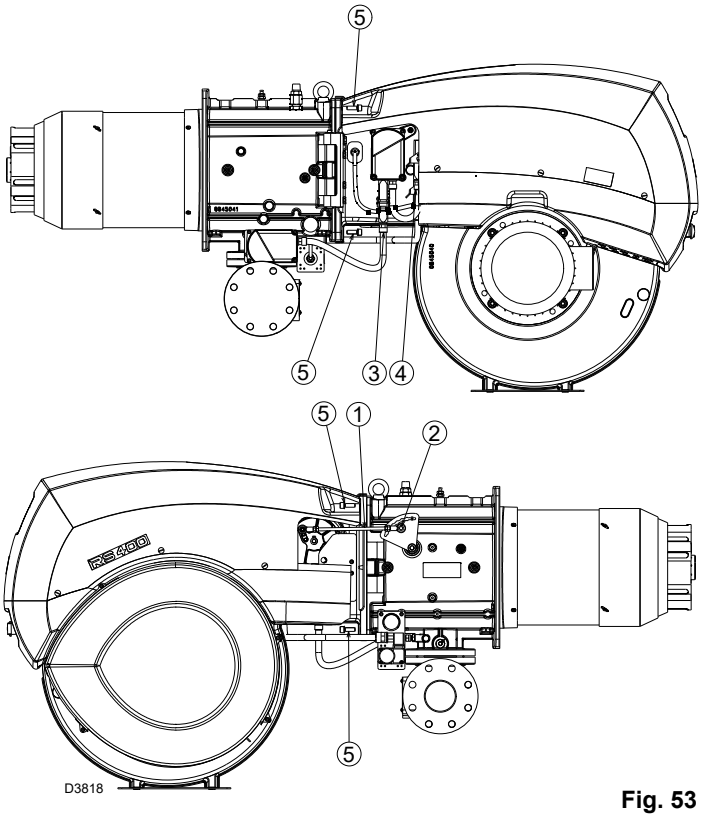
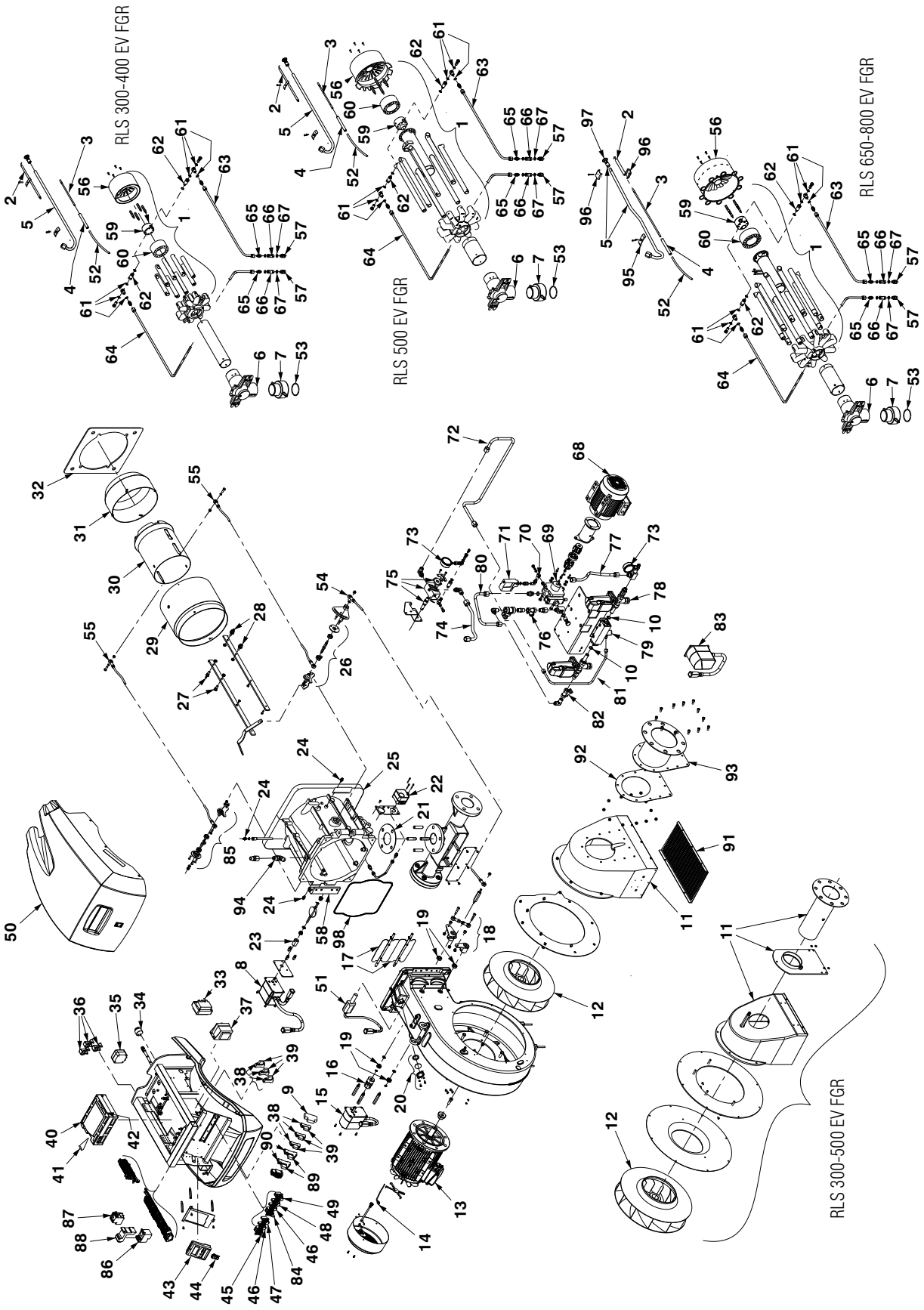


Fig. 53

6.4 Closing the burner

➤ Close the burner at the hinge.
➤ Apply screw 5)(Fig. 53).
➤ Connect the gas pressure switch test point 4)..
➤ Connect the gas servomotor test point 3).
➤ Apply the tire rod 1) of the head movement lever, loosening nut 2).
➤ Connect the electrical supply from the burner.

A Appendix - Spare parts



N.	CODE	RLS 300/EV FGR	RLS 400/EV FGR	RLS 500/EV FGR	RLS 650/EV FGR	RLS 800/EV FGR	DESCRIPTION	*
1	**20042722**	•	•				RLS 300/E US1 HEAD	
1	**20042725**			•			RLS 500/E HEAD	
1	**20042726**				•		RLS 650/E HEAD	
1	**20042727**					•	RLS 800/E HEAD	
2	**3013106**	•	•				ELECTRODE	A
2	**20042714**			•			ELECTRODE	A
2	**20011338**				•		ELECTRODE	A
2	**20050435**					•	ELECTRODE	A
3	**3013794**	•			•	•	HIGH VOLTAGE LEAD	A
3	**20013159**	•	•				HIGH VOLTAGE LEAD	A
3	**3012995**			•			HIGH VOLTAGE LEAD	A
4	**20013160**	•	•	•	•	•	INSULATOR	A
5	**20013157**	•	•				IGNITION PILOT TUBE	C
5	**20104073**			•			IGNITION PILOT TUBE	C
5	**20189690**				•	•	IGNITION PILOT TUBE	C
6	**3013945**	•	•				ELBOW	
6	**3014118**			•			ELBOW	
6	**20152210**				•	•	ELBOW	
7	**3014116**	•			•	•	CONTROL WHEEL	
7	**3014117**	•	•	•			CONTROL WHEEL	
8	**20029137**	•	•	•			SERVOMOTOR	B
8	**20043269**				•	•	SERVOMOTOR	B
9	**20014366**	•	•	•	•	•	FUSE HOLDER	A
10	**3013195**	•	•	•	•	•	O-RING	
11	**20114701**	•	•				AIR INTAKE ASSEMBLY	
11	**20114669**			•			AIR INTAKE ASSEMBLY	
11	**20110747**				•	•	AIR INTAKE ASSEMBLY	
12	**20006205**	•					FAN	C
12	**3013317**		•				FAN	C
12	**3013644**			•			FAN	C
12	**3012287**				•		FAN	C
12	**3006240**					•	FAN	C
13	**20201412**	•					MOTOR	
13	**20201378**		•				MOTOR	
13	**20042611**			•			MOTOR	
13	**20201358**				•	•	MOTOR	
14	**20201481**	•	•	•	•	•	MOTOR REVOLUTION SENSOR	
15	**20029137**	•	•	•			AIR SERVOMOTOR	
15	**3013304**				•	•	AIR SERVOMOTOR	
16	**3013307**	•	•	•	•	•	JOINT	A
17	**3013319**	•	•	•			AIR DAMPER	
17	**20110749**				•	•	AIR DAMPER	
18	**20105802**	•	•	•	•	•	LEVER ASSEMBLY	
19	**3012795**	•	•	•	•	•	BEARING	C
20	**3008663**	•	•	•	•		VIEWING PORT	
20	**20114016**					•	VIEWING PORT	
21	**3000858**	•	•	•			SEAL	B
21	**20049538**				•	•	SEAL	B
22	**20014103**	•	•	•	•	•	GAS PRESSURE SWITCH	
23	**3013308**	•	•	•			JOINT	A
23	**3013545**				•	•	JOINT	A
24	**3005447**	•	•	•	•	•	PRESSURE GAUGE	C
25	**20013114**	•	•	•			ASSEMBLY MANIFOLD	
25	**20106470**				•	•	ASSEMBLY MANIFOLD	
26	**20040697**	•	•	•			LEVER ASSEMBLY	

N.	CODE	RLS 300/EV FGR	RLS 400/EV FGR	RLS 500/EV FGR	RLS 650/EV FGR	RLS 800/EV FGR	DESCRIPTION	*
26	**20123147**				•	•	LEVER ASSEMBLY	
27	**20103497**	•	•				BAR	C
27	**20038375**			•	•	•	BAR	C
28	**20103543**	•	•				BAR	C
28	**20038376**			•	•	•	BAR	C
29	**3013313**	•	•				CYLINDER	C
29	**3013641**			•			CYLINDER	C
29	**20026703**				•		CYLINDER	C
29	**20011084**					•	CYLINDER	C
30	**20041800**	•					SHUTTER	C
30	**20041776**		•				SHUTTER	C
30	**20041804**			•			SHUTTER	C
30	**20038374**				•		SHUTTER	C
30	**20051560**					•	SHUTTER	C
31	**3013314**	•	•				END CONE	B
31	**3013642**			•			END CONE	B
31	**20026702**				•		END CONE	B
31	**20011085**					•	END CONE	B
32	**3013328**	•	•	•			GASKET	A
32	**20011117**				•	•	GASKET	A
33	**3012956**	•	•	•	•	•	TRANSFORMER	
34	**20031413**	•	•	•	•	•	HORN	
35	**3012948**	•	•	•			AIR PRESSURE SWITCH	A
35	**20013975**				•	•	AIR PRESSURE SWITCH	A
36	**3013363**	•	•	•	•	•	7 POLE SOCKET	
37	**3013284**	•	•	•	•	•	TRANSFORMER	
38	**20010969**	•	•	•	•	•	RELAY	C
39	**3012841**	•	•	•	•	•	BASE	C
40	**20014365**	•	•	•	•	•	CONTROL BOX	B
41	**3006211**	•	•	•	•	•	FUSE 6.3A	A
42	**20013932**	•	•	•	•	•	CONNECTORS ASSEMBLY	
43	**3013283**	•	•	•	•	•	DISPLAY	
44	**3014113**	•	•	•	•	•	9 PIN PLUG	C
45	**20010963**	•	•	•	•	•	SWITCH	
46	**20036017**	•	•	•	•	•	GREEN SIGNAL LIGHT	A
47	**20036019**	•	•	•	•	•	WHITE SIGNAL LIGHT	A
48	**20010962**	•	•	•	•	•	BUTTON	C
49	**3013354**	•	•	•	•	•	SIGNAL BUTTON	C
50	**20013115**	•	•	•	•	•	COVER	
51	**20006151**	•	•	•	•	•	FLAME SENSOR	
52	**20014102**	•	•	•			ELECTRODE CONNECTION	A
52	**3013585**				•	•	ELECTRODE CONNECTION	A
53	**3007170**	•	•	•			O-RING	B
53	**3007002**				•	•	O-RING	B
54	**3013327**	•	•	•	•	•	EXTERNAL TIE ROD	C
55	**3013324**	•	•	•	•	•	INTERNAL TIE ROD	C
56	**20041673**	•	•				DIFFUSER DISC	
56	**3014171R**			•			DIFFUSER DISC	
56	**20011119**				•	•	DIFFUSER DISC	
57	**3013462**	•	•	•			SWIVEL FITTING	C
57	**20011190**				•	•	SWIVEL FITTING	C
58	**3013323**	•	•	•			HINGE	
58	**3013960**				•	•	HINGE	
59	**3013549**	•	•				SPRAY NOZZLE	
59	**3014228R**			•			SPRAY NOZZLE	

N.	CODE	RLS 300/EV FGR	RLS 400/EV FGR	RLS 500/EV FGR	RLS 650/EV FGR	RLS 800/EV FGR	DESCRIPTION	*
59	**20011191**				•	•	SPRAY NOZZLE	
60	**20041674**	•	•				SHUTTER	
60	**20042719**			•			SHUTTER	
60	**20011151**				•	•	SHUTTER	
61	**3007079**	•	•	•			SEAL	B
61	**3007166**				•	•	SEAL	B
62	**3013460**	•	•	•			CONNECTOR	C
62	**20011120**				•	•	CONNECTOR	C
63	**3013553**	•	•				TUBE	
63	**3014202**			•			TUBE	
63	**20011196**				•	•	TUBE	
64	**3013554**	•	•				TUBE	
64	**3014203**			•			TUBE	
64	**20011197**				•	•	TUBE	
65	**3012549**	•	•	•			CONNECTOR	C
65	**20011192**				•	•	CONNECTOR	C
66	**3013461**	•	•	•			NON-RETURN VALVE	
66	**20011122**				•	•	NON-RETURN VALVE	
67	**20041969**	•	•	•			SEAL	B
67	**20042959**				•	•	SEAL	B
68	**20042836**	•	•	•	•	•	MOTOR	
69	**3006158**	•	•				PUMP	C
69	**3006236**			•			PUMP	C
69	**3006410**				•	•	PUMP	C
70	**3006896**	•	•	•	•	•	CONNECTOR	C
71	**3012384**	•	•	•	•	•	OIL PRESSURE SWITCH	A
72	**20042844**	•	•	•	•	•	TUBE	
73	**3006140**	•	•	•	•	•	PRESSURE GAUGE	
74	**20042842**	•	•	•			TUBE	
74	**20042846**				•	•	TUBE	
75	**20041353**	•	•	•			MODULATOR	B
75	**20042840**				•	•	MODULATOR	B
76	**20029257**	•	•	•	•	•	VALVE NOT RETURN	
77	**20042847**	•	•	•			TUBE	
77	**20042848**				•	•	TUBE	
78	**20029212**	•	•	•	•	•	SAFETY VALVE	B
79	**20029248**	•	•	•	•	•	SAFETY VALVE	B
80	**20042849**	•	•	•	•	•	TUBE	
81	**20042850**	•	•	•	•	•	TUBE	
82	**20029233**	•	•	•	•	•	OIL SPRING	
83	**20043270**				•	•	SERVOMOTOR	
84	**20028411**	•	•	•	•	•	SELECTOR SWITCH	
85	**20104075**	•	•	•			LEVER ASSEMBLY	
85	**20142775**				•	•	LEVER ASSEMBLY	
86	**20112569**	•	•	•	•	•	THERMAL RELAY	
87	**20118869**	•	•	•	•	•	CONTACTOR	
88	**20043271**	•	•	•			CONNECTOR	
88	**20121507**				•	•	RELAY SUPPORT	
89	**3020068**	•	•	•	•	•	RELAY	C
90	**3020071**	•	•	•	•	•	BASE	C
91	**20110882**				•	•	PROTECTION GRATE	
92	**20110883**				•	•	SEAL	B
93	**20110884**				•	•	GAS TRAIN ADAPTOR	
94	**20033240**				•	•	CONNECTOR	
95	**20075359**				•	•	U BOLT	

N.	CODE	RLS 300/EV FGR	RLS 400/EV FGR	RLS 500/EV FGR	RLS 650/EV FGR	RLS 800/EV FGR	DESCRIPTION	*
96	**20159557**				•	•	SUPPORT	
97	**20033305**				•	•	DIFFUSOR	
98	**20033305**	•	•	•	•	•	SEAL	B

*

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

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