

GB Forced draught gas burners

Progressive two stage or modulating operation



CODE	MODEL
20206431 - 20206432	RS 280/EV
20206488 - 20206489	RS 310/EV
20206497 - 20206498	RS 410/EV
20206501 - 20206502	RS 510/EV
20206505 - 20206506	RS 610/EV



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1 Information and general instructions

1.1 Information about the instruction manual

1.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

1.1.2 General dangers

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



DANGER

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



WARNING

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



CAUTION

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

1.1.3 Other symbols



DANGER

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



DANGER: FLAMMABLE MATERIAL
This symbol indicates the presence of flammable materials.



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



DANGER: CRUSHING OF LIMBS
This symbol indicates the presence of moving parts: danger of crushing of limbs.



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



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



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



OBLIGATION TO ASSEMBLE THE COVER AND ALL THE SAFETY AND PROTECTION DEVICES
This symbol signals the obligation to reassemble the cover and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.



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



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

- This symbol indicates a list.

Abbreviations used

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

1.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

- the instruction manual is delivered to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.
- The instruction manual shows:
 - the serial number of the burner;

.....

- the address and telephone number of the nearest Assistance Centre

.....

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

1.2 Guarantee and responsibility

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



WARNING

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

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

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

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

2 Safety and prevention

2.1 Introduction

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

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

It is a good idea to remember the following:

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

In particular:

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

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

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



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

2.2 Personnel training

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

The user:

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

In addition:



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

3

Technical description of the burner

3.1 Technical data

Model		RS 280/EV				RS 310/EV		
Output delivery (1)	High	kW	762	3077	2770*	1026	3986	3587*
		MBtu/hr (3)	2600	10500	9450*	3500	13600	12240*
	Low	kW	308	-	-	403	-	-
		Mbtu/hr (3)	1050	-	-	1375	-	-
Fuel		Natural gas						
Gas max. delivery		SCFH	10396			13465		
Operation		Low-high or modulating						
Standard applications		Boilers: water, steam, thermal oil						
Ambient temperature		°F	32-104 (0-40°C)					
Combustion air temperature		°F Max.	140 (60°C)					
Noise level (2)		dB(A)	82.7			78.7		

Tab. A

Model		RS 410/EV			RS 510/EV			RS 610/EV			
Output delivery (1)	High	kW	1172	4719	4247*	1465	5627	5064*	2517	6831	6148*
		MBtu/hr (3)	4000	16100	14490*	5000	19200	17280*	8590	23308	20977*
	Low	kW	479	-	-	586	-	-	665	-	-
		Mbtu/hr (3)	1635	-	-	2000	-	-	2270	-	-
Fuel		Natural gas									
Gas max. delivery		SCFH	15941			19010			23077		
Operation		Low-high or modulating									
Standard applications		Boilers: water, steam, thermal oil									
Ambient temperature		°F	32-104 (0-40°C)								
Combustion air temperature		°F Max.	140 (60°C)								
Noise level (2)		dB(A)	82.9			83.6			89.4		

Tab. B

(*) Firing Rate for C-ETL Canadian Listing

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

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

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

3.2 Electrical data

Model		RS 280/EV		RS 310/EV	
Control circuit power supply	V/Ph/Hz	120/1/60			
Main power supply (+/- 10%)	V/Ph/Hz	230-460/3/60	575/3/60	460/3/60	575/3/60
Total electrical consumption	W	6800	6800	9100	9100
Electrical protection		NEMA 3			

Tab. C

Model		RS 410/EV		RS 510/EV	
Control circuit power supply	V/Ph/Hz	120/1/60			
Main power supply (+/- 10%)	V/Ph/Hz	460/3/60	575/3/60	460/3/60	575/3/60
Total electrical consumption	W	10900	10900	12900	12900
Electrical protection		NEMA 3			

Tab. D

Model		RS 610/EV			
Control circuit power supply	V/Ph/Hz	120/1/60			
Main power supply (+/- 10%)	V/Ph/Hz	460/3/60		575/3/60	
Total electrical consumption	W	17200			
Electrical protection		NEMA 3			

Tab. E

3.3 Burner models designation

Model	Code RBNA	Voltage	Fan motor starting	Flame safeguard
RS 280/EV	20206431	230/3/60	Inverter	Burner mounted
		460/3/60		
	20206432	575/3/60		
RS 310/EV	20206488	460/3/60	Inverter	Burner mounted
	20206489	575/3/60		
RS 410/EV	20206497	460/3/60	Inverter	Burner mounted
	20206498	575/3/60		
RS 510/EV	20206501	460/3/60	Inverter	Burner mounted
	20206502	575/3/60		
RS 610/EV	20206505	460/3/60	Inverter	Burner mounted
	20206506	575/3/60		

Tab. F

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

inch	A	B	C	lbs
RS 280/EV	80 1/4"	45"	46 1/2"	550
RS 310/EV	80 1/4"	45"	46 1/2"	575
RS 410/EV	80 1/4"	45"	46 1/2"	575
RS 510/EV	80 1/4"	45"	46 1/2"	575
RS 610/EV	80 1/4"	45"	46 1/2"	575

Tab. G

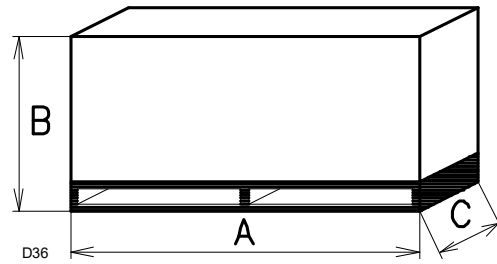


Fig. 1

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.

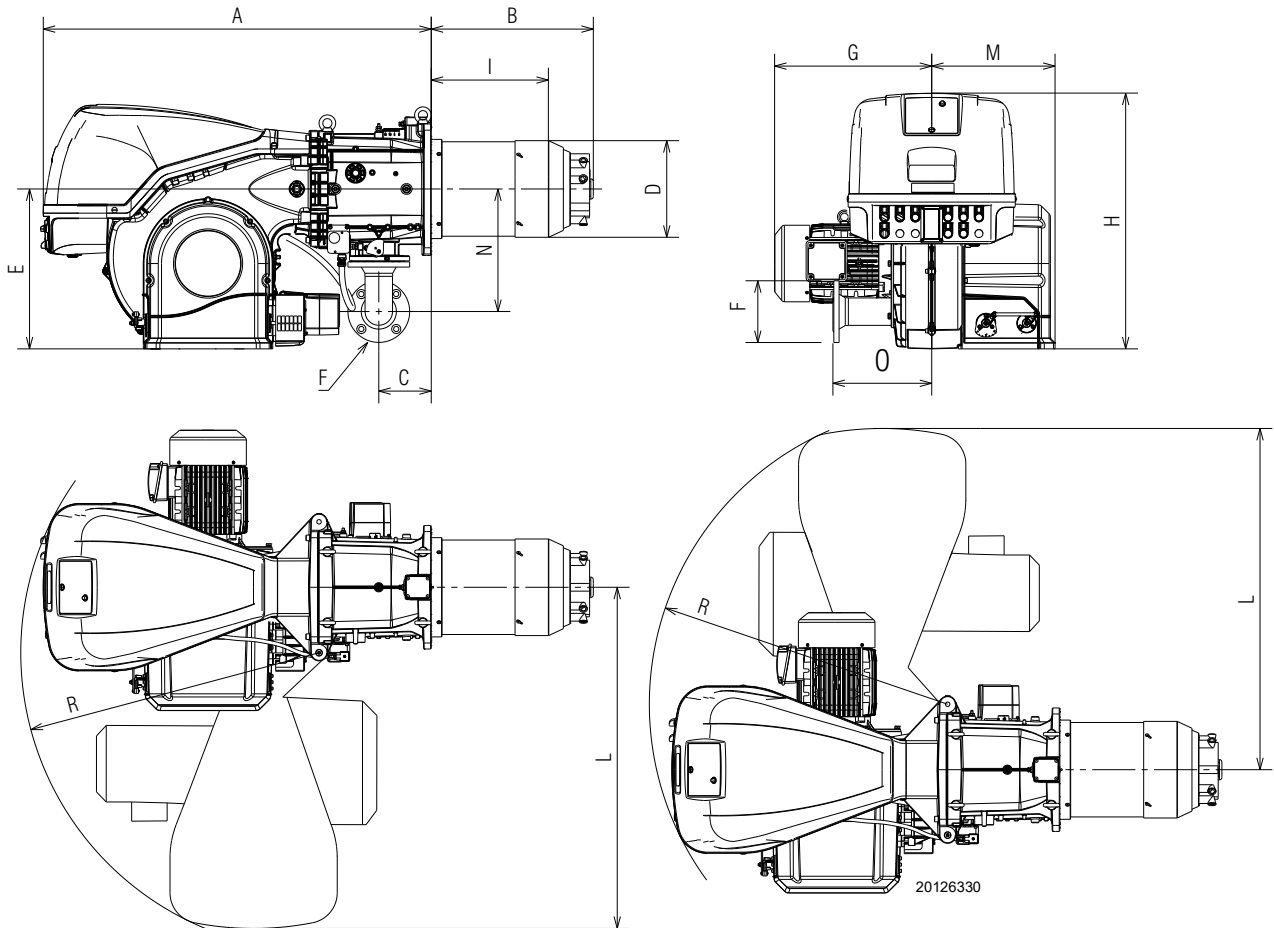


Fig. 2

inch	A	B	C	D	E	F	G	H	I	L	M	N	O	R
RS 280/EV	49 3/4"	19 9/32"	6 11/16"	10 5/8"	20 1/2"	ANSI 3"	20 7/8"	31"	14"	43 25/32"	13 1/2"	15 5/8"	12 19/32"	38"
RS 310/EV	49 3/4"	20 23/64"	6 11/16"	12 21/64"	20 1/2"	ANSI 3"	21 1/4"	31"	14 11/16"	43 25/32"	15 3/4"	15 5/8"	12 19/32"	38"
RS 410/EV	49 3/4"	20 23/64"	6 11/16"	12 21/64"	20 1/2"	ANSI 3"	23 1/4"	31"	14 11/16"	43 25/32"	15 3/4"	15 5/8"	12 19/32"	38"
RS 510/EV	49 3/4"	20 23/64"	6 11/16"	12 21/64"	20 1/2"	ANSI 3"	23 1/4"	31"	14 11/16"	43 25/32"	15 3/4"	15 5/8"	12 19/32"	38"
RS 610/EV	49 3/4"	20 1/2"	6 11/16"	13 3/4"	20 1/2"	ANSI 3"	24 15/16"	31"	14 1/4"	43 25/32"	15 3/4"	15 5/8"	12 19/32"	38"

Tab. H

3.6 Firing rates

Maximum output must be selected in the hatched area of the diagram (Fig. 3).

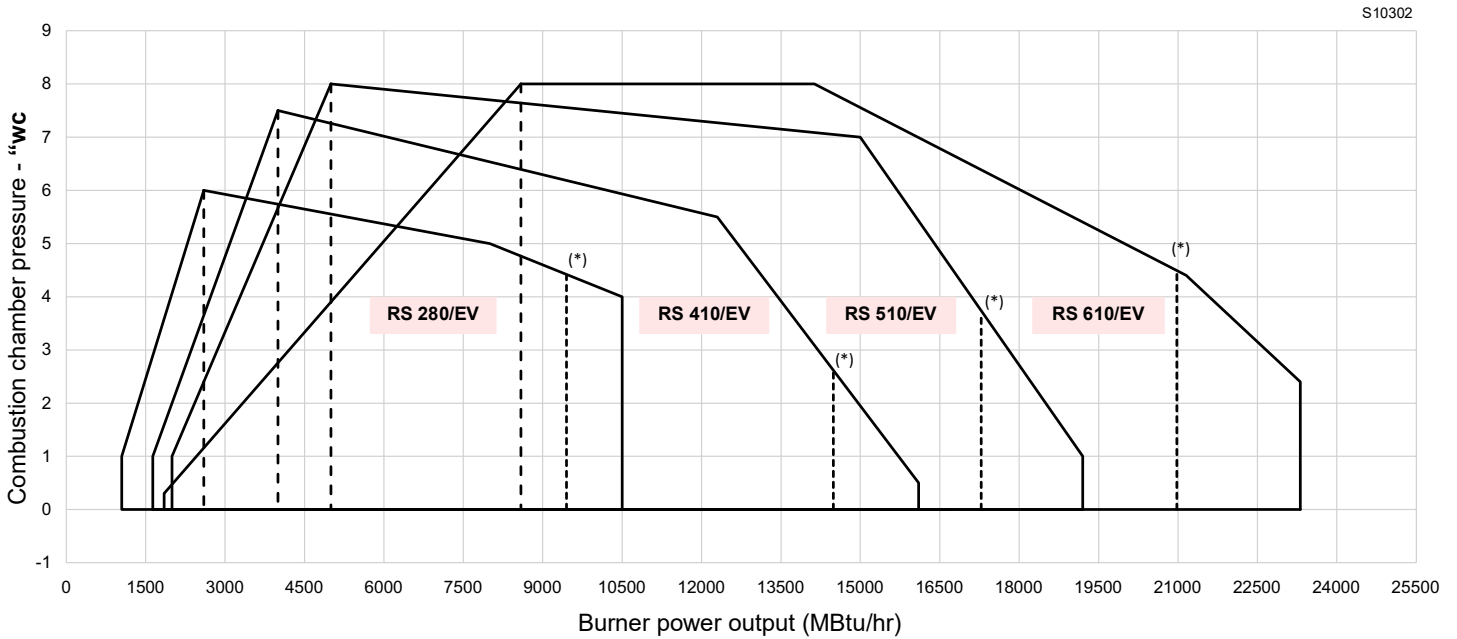
Minimum output must not be lower than the minimum limit shown in the diagram.



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 22.

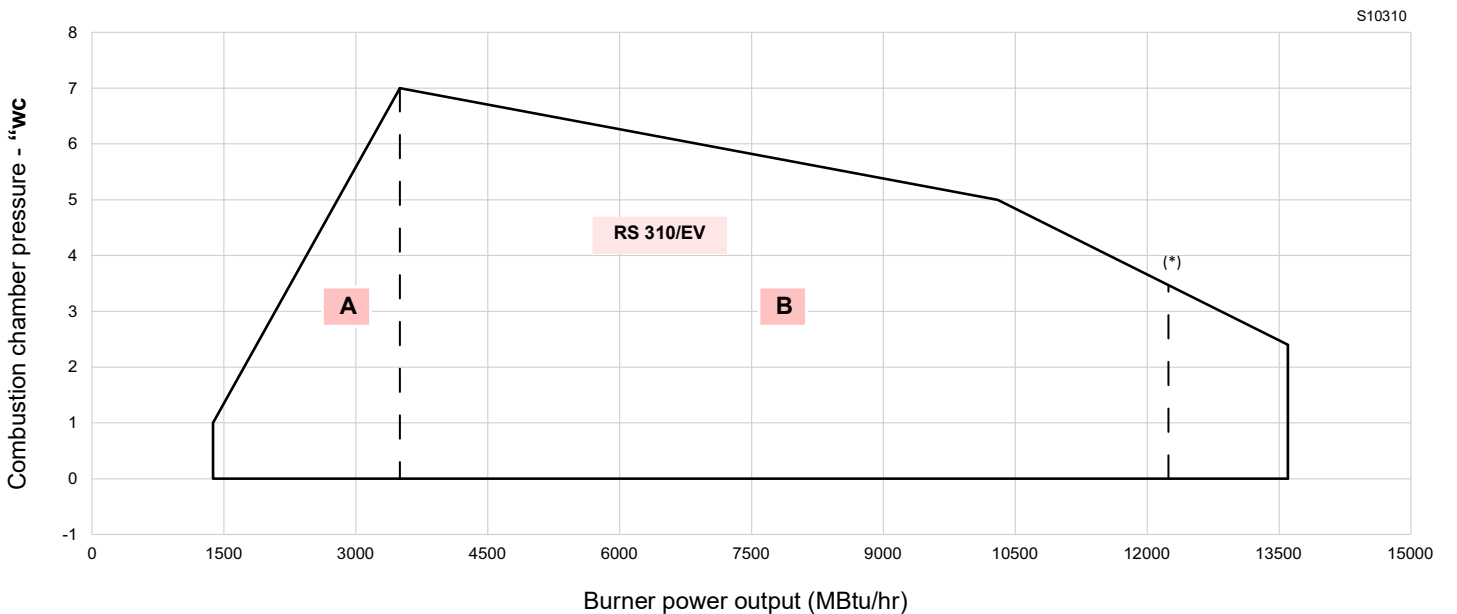
Model	MBtu/hr
RS 280/EV	2,600
RS 310/EV	3,500
RS 410/EV	4,000
RS 510/EV	5,000
RS 610/EV	8,590

Tab. I



(*) Firing Rate for C-ETL Canadian Listing

Fig. 3



(*) Firing Rate for C-ETL Canadian Listing

Fig. 4

3.6.1 Procedure to refer burner operating condition in high altitude plants

Find the **CORRECTED BURNER CAPACITY** for the plant's altitude in chart 1 and the **CORRECTED PRESSURE** in chart 2.

Check in the firing rate graph of the burner (Fig. 3), if the working point defined by the values above is within the range limits.

If not, higher burner size is needed.

Note

- Charts are based only on altitude variation (reference temperature = 68°F, 20°C)
- To get the combined correction in case of different air temperature, a compensation of 1000 ft each 3.6°F (305 m each 2°C) is applicable (100 ft = 0.36°F).

Example

- Rated Capacity = 5000 MBtu/hr
- Rated Air Pressure = 2.61 "WC
- Reference Altitude = 328 ft
- Reference Temperature = 20°C = 68°F
- Real Altitude = 3000 ft
- Real Temperature = 17°C = 62.6°F
- Temperature Difference = 68°F – 62.6°F = 5,4°F
- Virtual Altitude Increment = 5.4°F/3.6°F x 1000 ft = 1500 ft
- Virtual Altitude = (Real Altitude) + (Virtual Altitude Increment) = 3000 ft + 1500 ft = 4500 ft
- Corrected Capacity = (5090+5113)/2 = 5101,5 MBtu/hr
- Corrected Pressure = (4.41+4.87)/2 = 4.64 "WC

Reference conditions:

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

3.6.2 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. J

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. J , 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 $Q_{foc} = 4,500$ Mbtu/h, the correct output will be equal to:

$$Q_{burner} = Q_{foc} / F = 4,500 / 0.908 = 4,956 \text{ Mbtu/h}$$

3.7 Minimum furnace dimensions

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

Fig. 5 indicates the diameter and length of the test combustion chamber.

Example RS 510/EV:

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

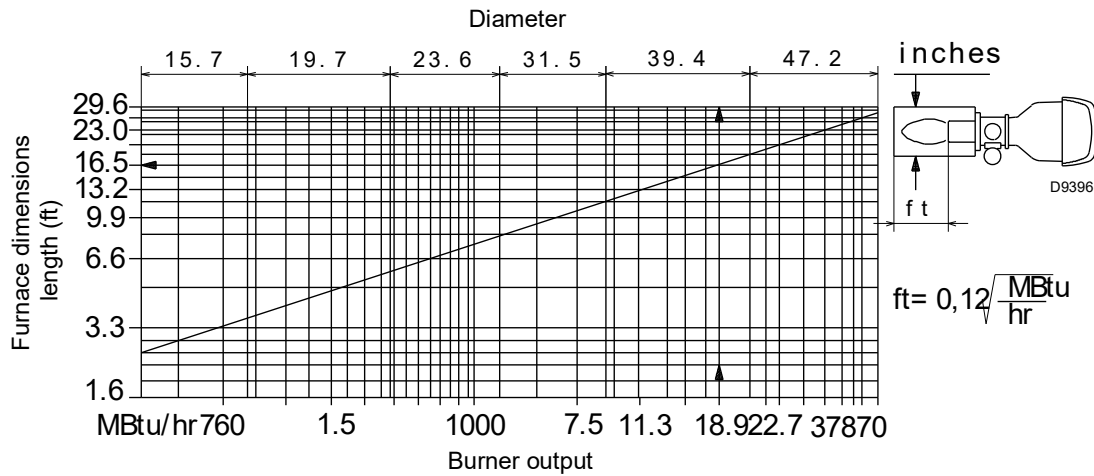


Fig. 5

3.8 Standard equipment

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



It is recommended to tighten the screws of the gas flange with a tightening torque of:

- **20 Nm** ±10% with No. 8 M16;
- **40 Nm** ±10% with No. 4 M16.



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

3.9 Burner description

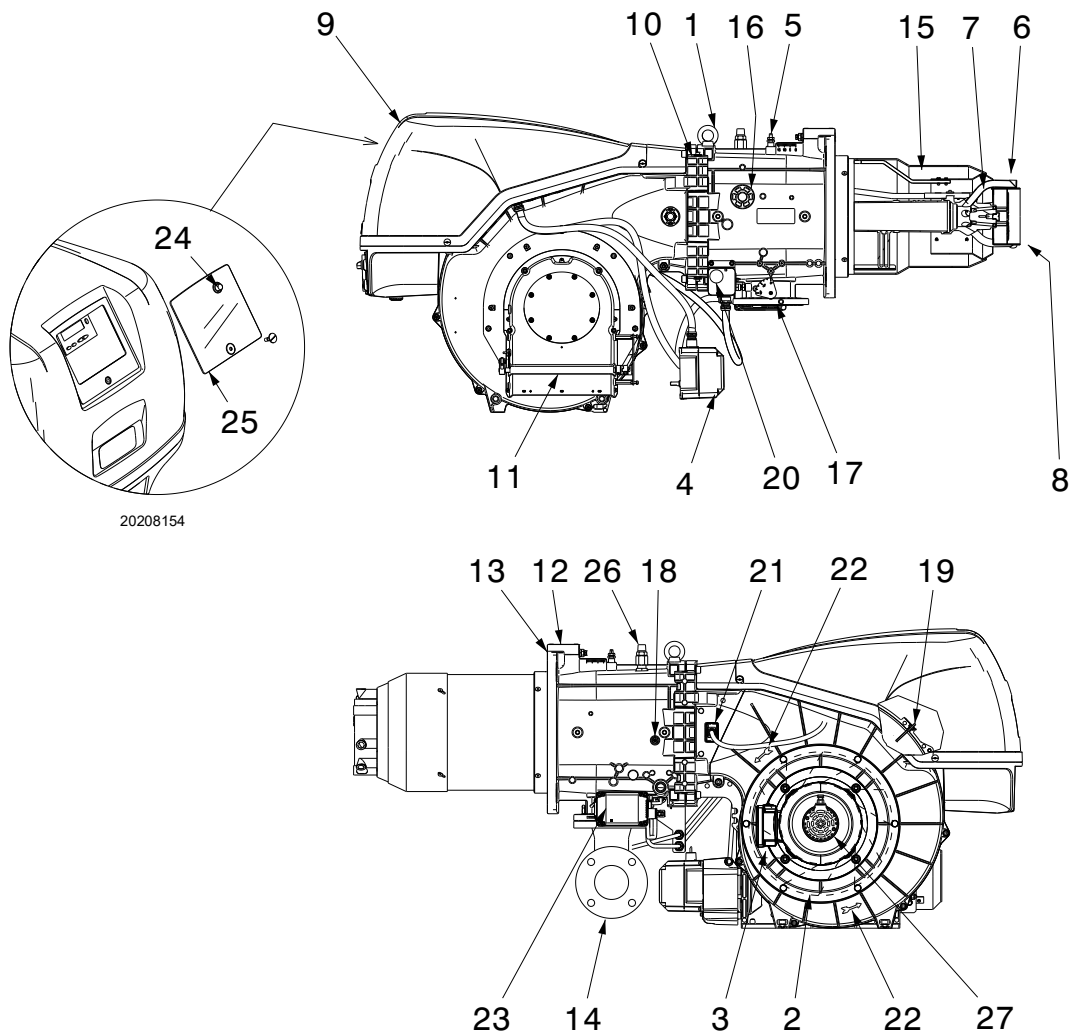


Fig. 6

- | | | | |
|----|---|----|----------------------------|
| 1 | Lifting eyebolts | 24 | Reset button |
| 2 | Fan | 25 | Transparent protection |
| 3 | Fan motor | 26 | Pilot gas train attachment |
| 4 | Air servomotor | 27 | Motor revolution sensor |
| 5 | Gas pressure test point | | |
| 6 | Combustion head | | |
| 7 | Ignition pilot | | |
| 8 | Flame stability disk | | |
| 9 | Electric panel board - cover | | |
| 10 | Hinge for opening burner | | |
| 11 | Air inlet to fan | | |
| 12 | Manifold | | |
| 13 | Thermal insulation screen for securing burner to boiler | | |
| 14 | Gas train flange | | |
| 15 | Shutter | | |
| 16 | Flame inspection window | | |
| 17 | Gas butterfly valve | | |
| 18 | Combustion head air pressure test point | | |
| 19 | Air pressure test point "+" | | |
| 20 | Max gas pressure switch with pressure test point | | |
| 21 | Flame sensor | | |
| 22 | Indication for checking the fan motor rotation | | |
| 23 | Gas servomotor | | |



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.

3.10 Panel board description

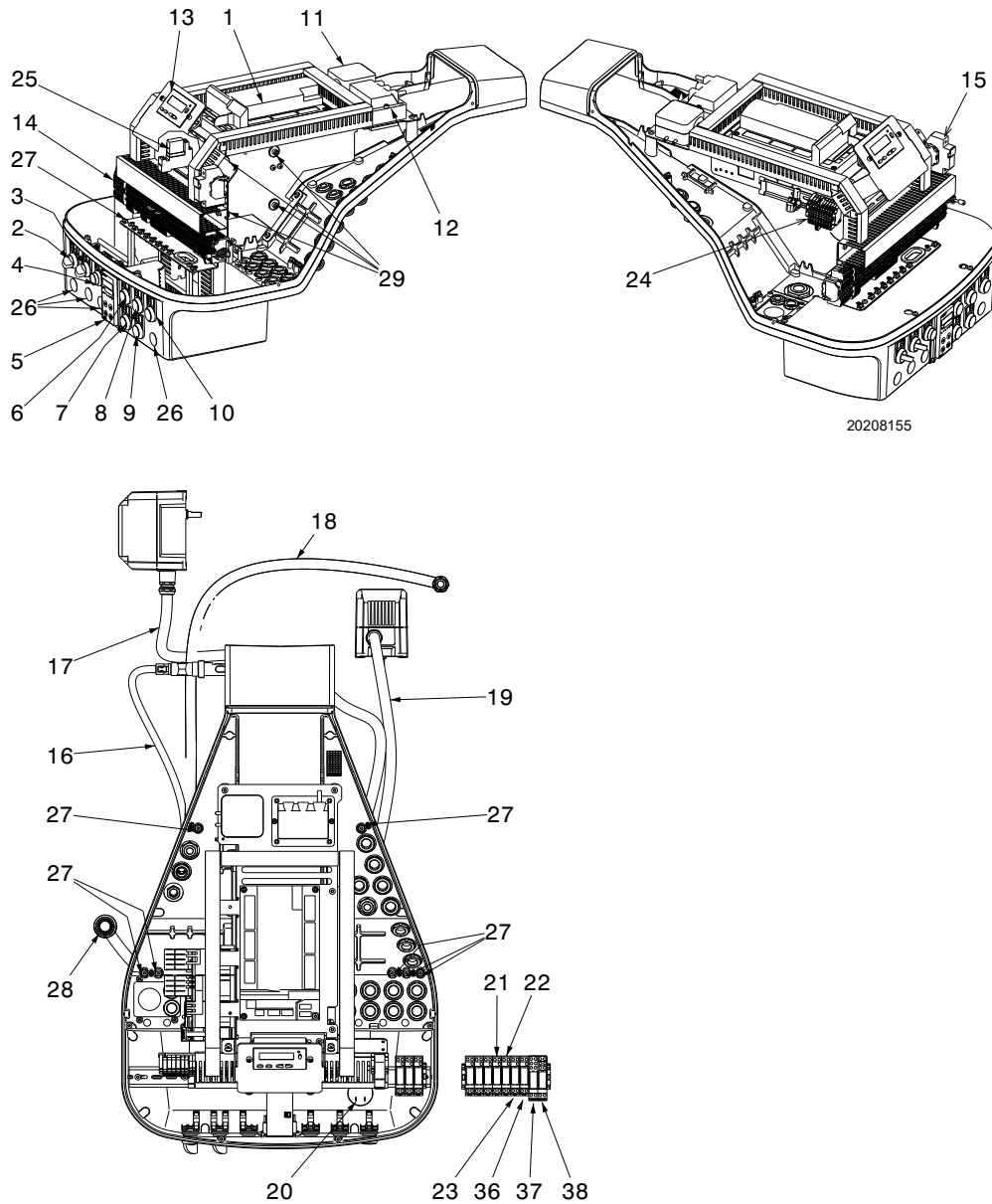


Fig. 7

- | | |
|------------------------------------|--|
| 1 Flame control | 18 Maximum gas pressure switch sheath |
| 2 ON/OFF selector | 19 Air servomotor sheath |
| 3 LOCAL/REMOTE selector | 20 AH horn |
| 4 ALARM SILENCE push-button | 21 K4 relay |
| 5 Output power regulator | 22 K5 relay |
| 6 POWER ON light signal | 23 K6 relay |
| 7 IGNITION ON light signal | 24 Variable speed terminal board |
| 8 CALL FOR HEAT light signal | 25 K7 relay |
| 9 FUEL ON light signal | 26 Available |
| 10 ALARM AND RESET push-button | 27 Earth terminal |
| 11 Air pressure switch | 28 Fan motor sheath |
| 12 Ignition transformer | 29 Available for step down transformer |
| 13 Operator panel with LCD display | |
| 14 Main terminal supply board | |
| 15 Auxiliary circuits fuse | |
| 16 Flame sensor sheath | |
| 17 Fuel servomotor sheath | |

Burner failure may occur:

► **Flame safeguard lock-out**

If the flame safeguard alarm 10)(Fig. 7) lights up, it indicates that the burner is in lock-out. To reset, press the reset push-button.

3.11 Flame control (LMV37.4...)

Warning notes



WARNING

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

The LMV37.4... is a safety device!
Do not open, interfere with or modify the unit.

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

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

Introduction

The flame control for the air/fuel ratio (Fig. 8), (hereafter referred to simply as the flame control), that equips the burners, carries out a series of integrated functions in order to optimise burner functioning, both for single operation and together with other units (e.g. double furnace boiler or more than one generator at the same time).

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

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

Mechanical design

The following system components are integrated in the LMV37.4... basic unit:

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

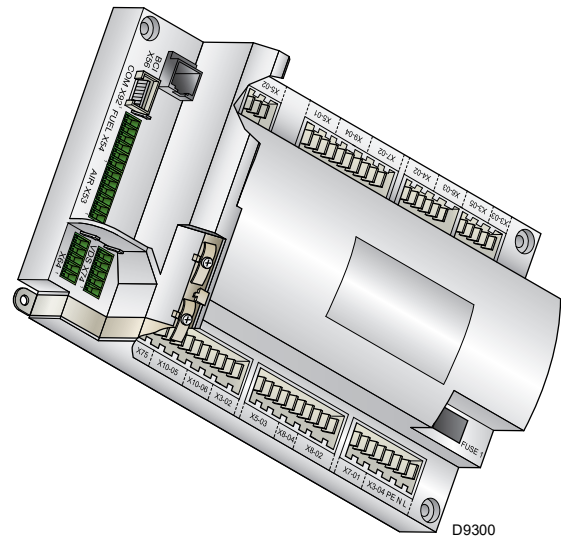


Fig. 8

Installation notes

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



WARNING

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

Electrical connection of the flame detectors

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

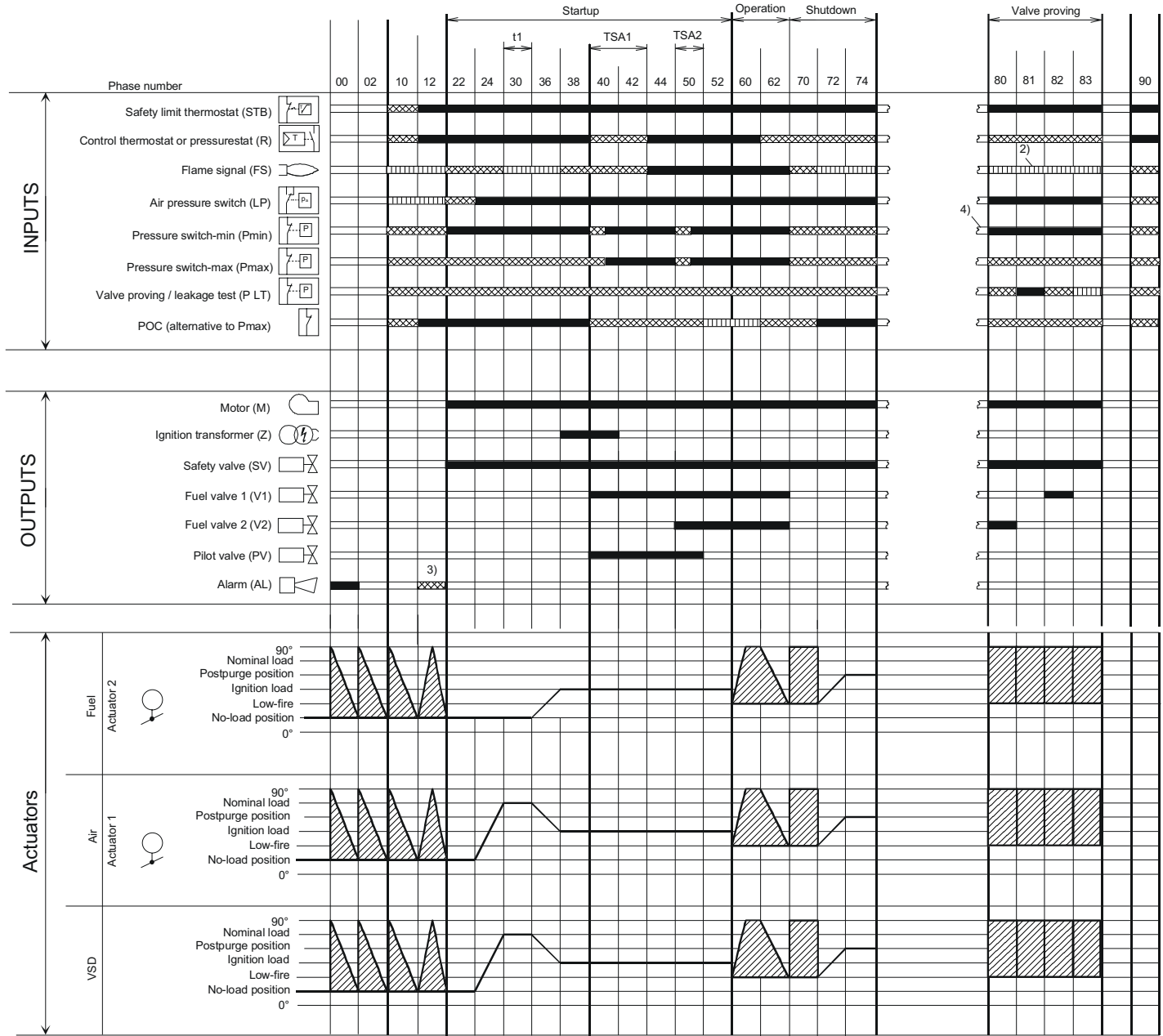
- Never run the detector cable together with other cables.
 - Line capacitance reduces the magnitude of the flame signal.
 - Use a separate cable.
- Observe the maximum permissible detector cable lengths.
- The ionization probe is not protected against electric shock hazard. It is mainspowered and must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

Technical data

LMV37.4... basic unit	Mains voltage	AC 120 V -15 % / +10 %	
	Mains frequency	50 / 60 Hz \pm 6 %	
	Power consumption	< 30 W (typically)	
	Safety class	I, with parts according to II and III to DIN EN 60730-1	
Terminal 'Inputs'	loading	Unit fuse F1 (internally)	6.3 AT
		Perm. mains primary fuse (externally)	Max. 16 AT
		Undervoltage	
		<ul style="list-style-type: none"> • Safety shutdown from operating position at mains voltage • Restart on rise in mains voltage 	Approx. AC 93 V Approx. AC 96 V
Terminal 'Outputs'	loading	Total contact loading:	
		<ul style="list-style-type: none"> • Nominal voltage • Unit input current (safety loop) from: <ul style="list-style-type: none"> - Fan motor contactor - Ignition transformer - Valves - Oil pump / magnetic clutch 	AC 120 V, 50 / 60 Hz Max. 5 A
		Individual contact loading:	
		Fan motor contactor	
		<ul style="list-style-type: none"> • Nominal voltage • Nominal current • Power factor 	AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 $\cos\phi > 0.4$
		Alarm output	
		<ul style="list-style-type: none"> • Nominal voltage • Nominal current • Power factor 	AC 120 V, 50 / 60 Hz 1 A $\cos\phi > 0.4$
		Ignition transformer	
		<ul style="list-style-type: none"> • Nominal voltage • Nominal current • Power factor 	AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 or 250 VA ignition load declaration to UL372 $\cos\phi > 0.2$
		Fuel valves	
		<ul style="list-style-type: none"> • Nominal voltage • Nominal current • Power factor 	AC 120 V, 50 / 60 Hz 1.6 A pilot duty load declaration to UL372 $\cos\phi > 0.4$
		Operation display	
		<ul style="list-style-type: none"> • Nominal voltage • Nominal current • Power factor 	AC 120 V, 50 / 60 Hz 0.5 A $\cos\phi > 0.4$
	Cable lengths	Mains line	Max. 100 m (100 pF/m)
Display, BCI		For used outside the burner cover or the control panel: Max. 3 m (100 pF/m)	
	External lockout reset button	Max. 20 m (100 pF/m)	
Environmental conditions	Operation	DIN EN 60721-3-3	
	Climatic conditions	Class 3K3	
	Mechanical conditions	Class 3M3	
	Temperature range	-20...+60 °C	
	Humidity	< 95 % r.h.	

Tab. K

Operation sequence of the burner






D9288

Fig. 9

Legend to the sequence diagrams:

Valve proving takes place depending on the parameter:

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

-  Signal ON
-  Signal OFF
-  Any signal is allowed



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

Assignment of times:

- t1 Purge time
- TSA1 Safety time 1 gas / oil
- TSA2 Safety time 2 gas / oil

3.12 Actuator (SQM33.5...)

Warning notes



WARNING

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

Do not open, interfere with or modify the actuators!

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



WARNING

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

Use

The actuators (Fig. 10) are used to drive and position the air damper and the gas butterfly valve, without mechanical leverages but via the interposition of an elastic coupling.

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

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

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

Installation notes

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



WARNING

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

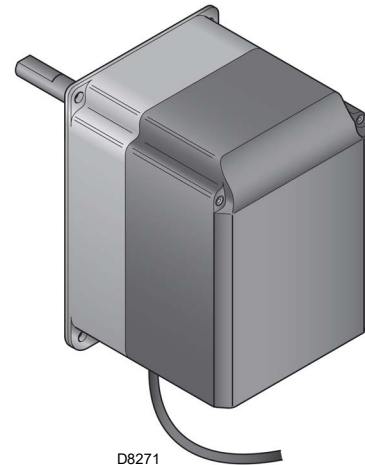


Fig. 10

Technical data

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

Tab. L

4

Installation

4.1 Notes on safety for the installation

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



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



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



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

4.2 Handling

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



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

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

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



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



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



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

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

4.3 Preliminary checks

Checking the consignment



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



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



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



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

4.4 Operation position

The burner is designed to operate only in the positions 1, 2, 3 and 4 (Fig. 11).

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.

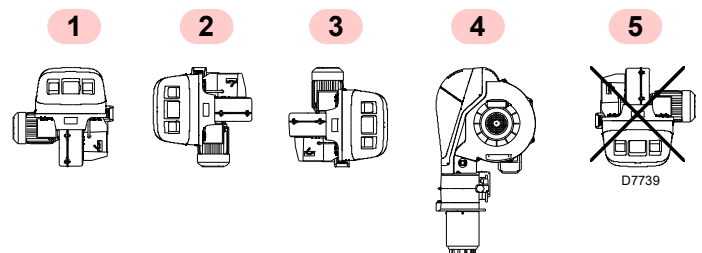


Fig. 11

4.5 Preparing the boiler

4.5.1 Boring the boiler plate

Drill the combustion chamber locking plate as shown in Fig. 12. The position of the threaded holes can be marked using the thermal screen supplied with the burner.

4.5.2 Blast tube length

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

For boilers with front flue passes 1)(Fig. 17 on page 22) or flame inversion chamber, a protection in refractory material 5) must be inserted between the boiler fettling 2) and the blast tube 4).

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

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

For boilers with a water-cooled front piece, a refractory lining 2)-5)(Fig. 17 on page 22) is not necessary, unless expressly requested by the boiler manufacturer.

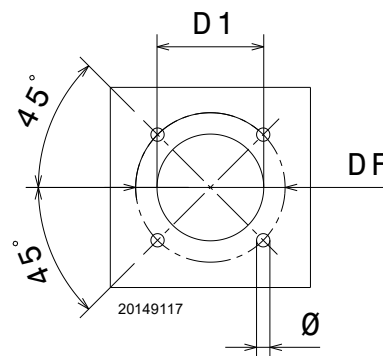


Fig. 12

inch	D1	DF	Fasteners size Ø
RS 280/EV	13 1/4"	17 13/16"	3/4"
RS 310/EV	13 1/4"	17 13/16"	3/4"
RS 410/EV	13 1/4"	17 13/16"	3/4"
RS 510/EV	13 1/4"	17 13/16"	3/4"
RS 610/EV	13 1/4"	17 3/4"	3/4"

Tab. M

4.6 Securing the burner to the boiler



Prepare a suitable lifting system using the rings 3)(Fig. 13), after removing the fixing screws 7) of the casing 8).

- Fit the heat insulation supplied onto the blast tube 4)(Fig. 13).
- Fit the entire burner onto the boiler hole prepared previously, and fasten with the screws supplied.



The seal between burner and boiler must be airtight.

WARNING



Tighten, using a torque wrench, to 48-55 ft. lbs (65-75 Nm). Torque references for 3/4-10 fastener.



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

WARNING

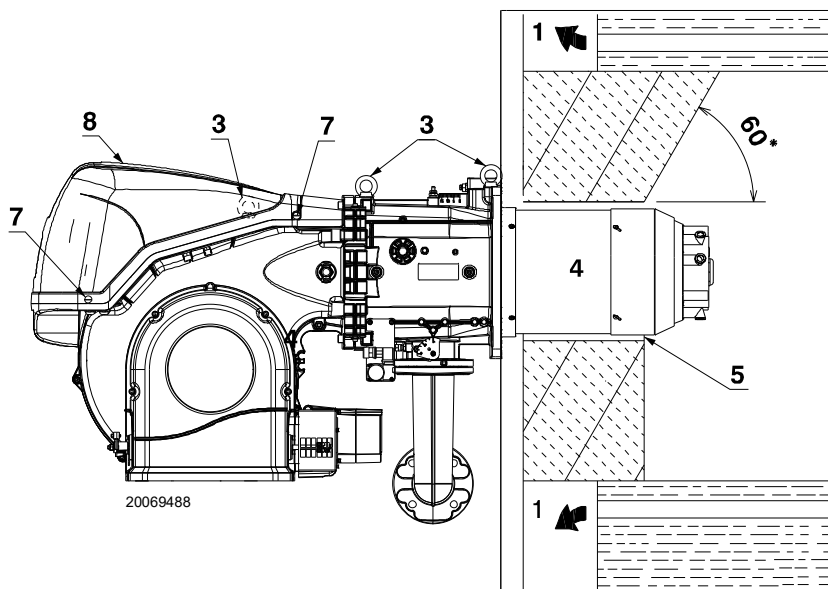


Fig. 13

4.7 Accessibility to the interior of the combustion head

The burner leaves the factory set for opening to the right, therefore maintaining the pin 1)(Fig. 14) in its housing.

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

- A remove the screws 2);
- B open the burner to a maximum of 4-6 inch (100-150 mm) by rotating around the hinge and release the cables of the electrodes 5);
- C fully open the burner as in Fig. 14;
- D undo the screw 4) with pressure test point;
- E release the ignition pilot retainer;
- F release the head by lifting it from its housing 3), then take out the combustion head.



To open the burner from the opposite side, before removing the pin 1)(Fig. 14), make sure that the 4 screws 2) are tight.

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

Disconnect the socket 9)(Fig. 14) of the maximum gas pressure switch, then proceed as described above at point B).

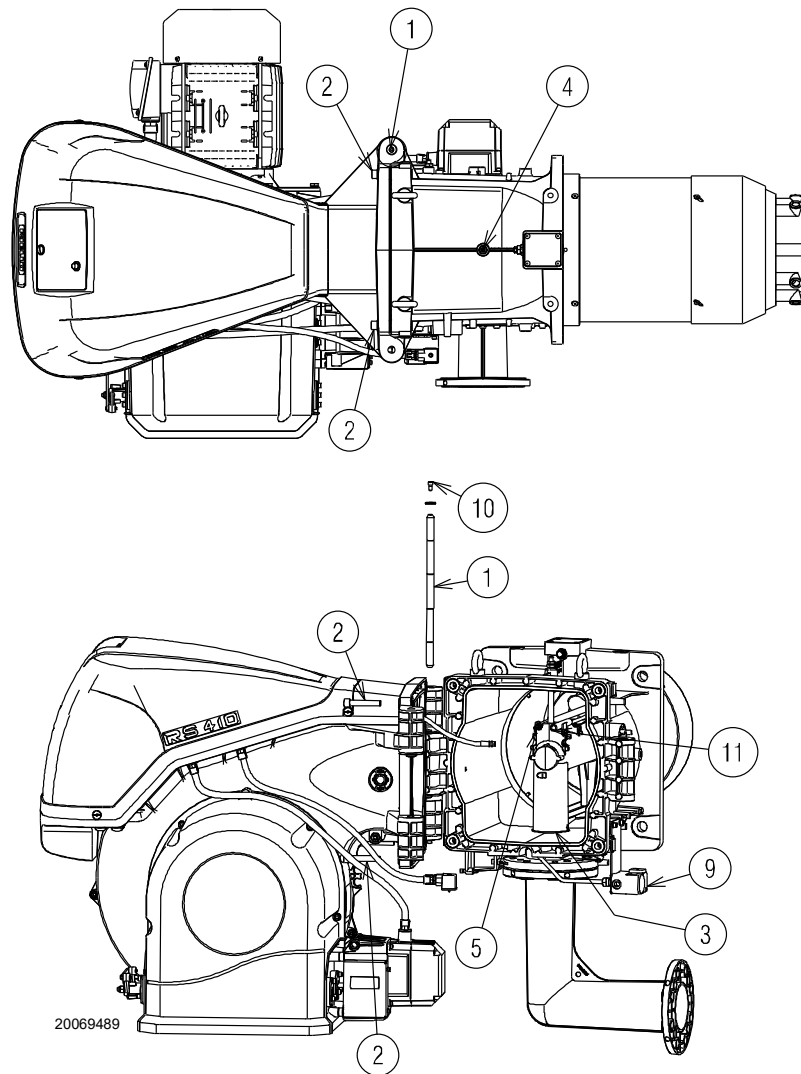


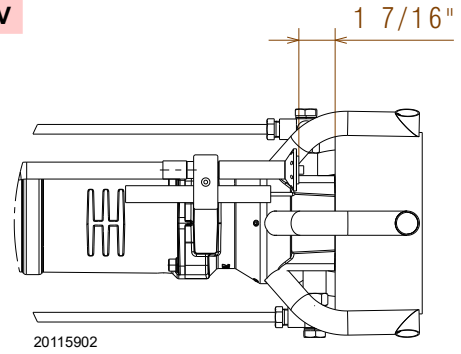
Fig. 14

4.8 Electrode and ignition pilot adjustment



Place the pilot and electrodes observing the dimensions in Fig. 15.

RS 280/EV



RS 310-410-510-610/EV

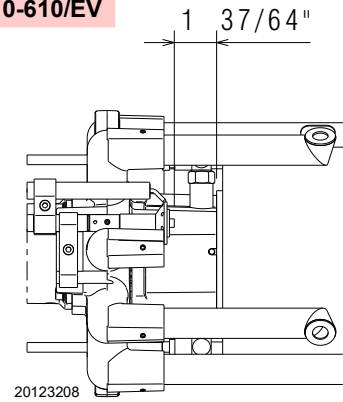


Fig. 15

4.9 Gas butterfly valve



If necessary, replace the gas butterfly valve. The correct position is shown in Fig. 16.

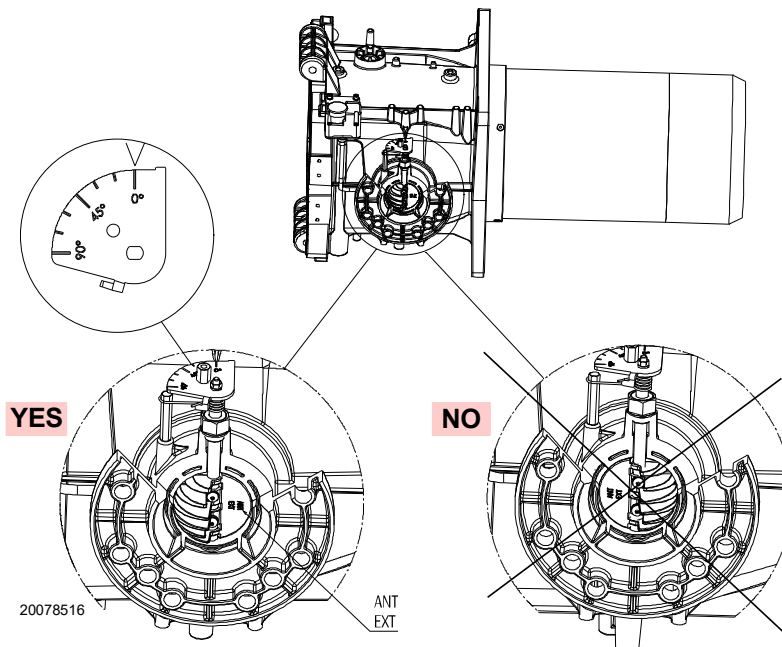


Fig. 16

4.10 Combustion head setting

Rotate the screw 1)(Fig. 17) until the notch you have found corresponds with the front surface of the screw itself.

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

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



WARNING

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

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

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

NOTE:

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



WARNING

The combustion head can be adjusted within the following fields:

RS 280/EV: 0 - 12

RS 310/EV: 0 - 11

RS 410/EV: 0 - 8

RS 510/EV: 0 - 11

RS 610/EV: 0 - 4

No adjustment can be made outside these intervals.

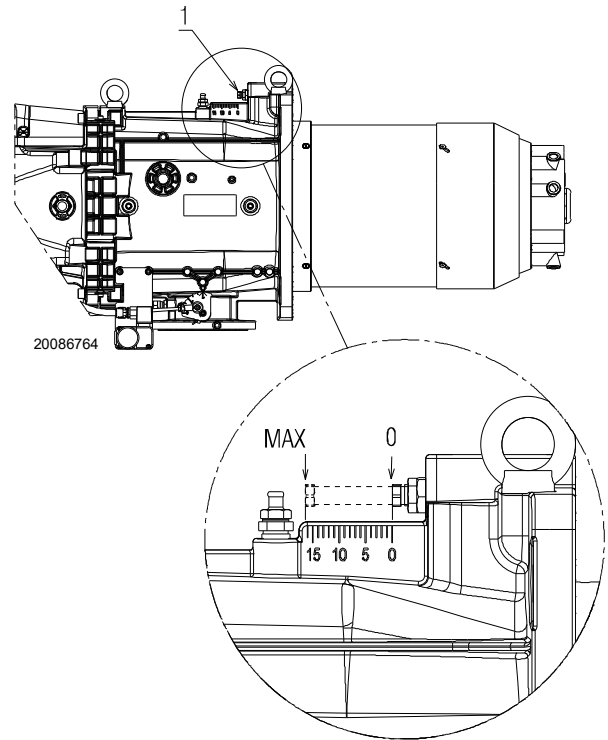


Fig. 17

No. Notches

S10303

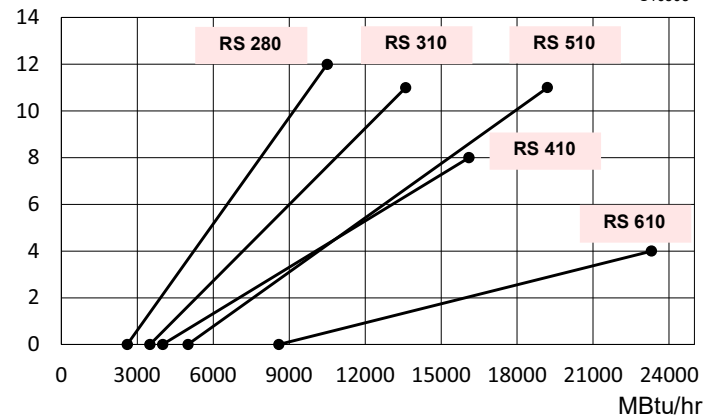


Fig. 18

4.11 Gas feeding



Explosion danger due to fuel leaks in the presence of a flammable source.
 Precautions: avoid knocking, attrition, sparks and heat.
 Make sure the fuel interception tap is closed before performing any operation on the burner.



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

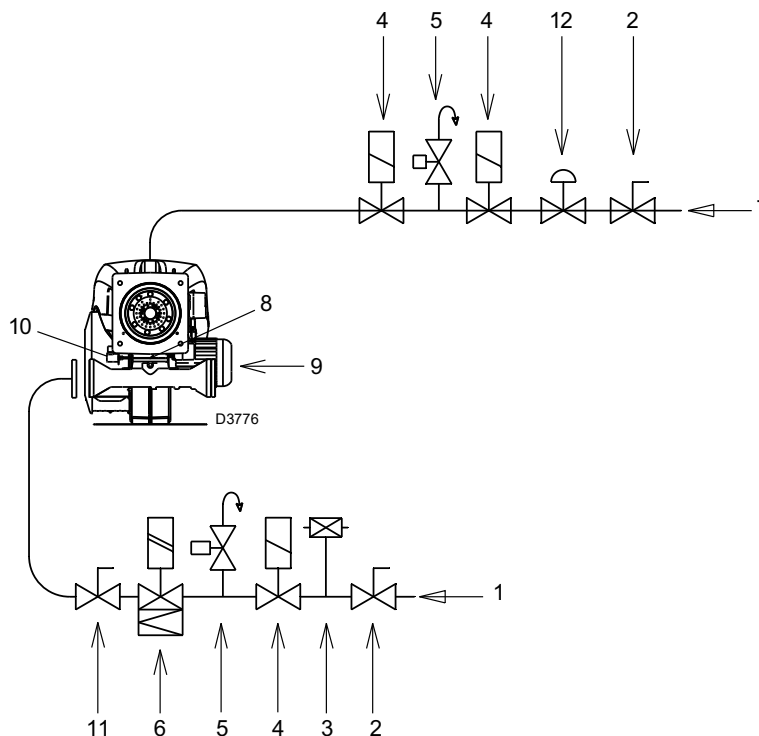


Fig. 19

Key (Fig. 19)

- 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



Check that there are no gas leaks.



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



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



The operator must use the required equipment during installation.



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

4.11.1 Gas train

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

4.11.2 Gas pressure



WARNING

The pressure at the head of the burner from refers to zero in the combustion chamber; to obtain true pressure, measured by a U-type manometer, add the counter-pressure of the boiler.

The charts show the pressure drops along the gas supply line, depending on the maximum burner delivered output.

The values shown refer to:
Natural gas

RS 280/EV

S10311

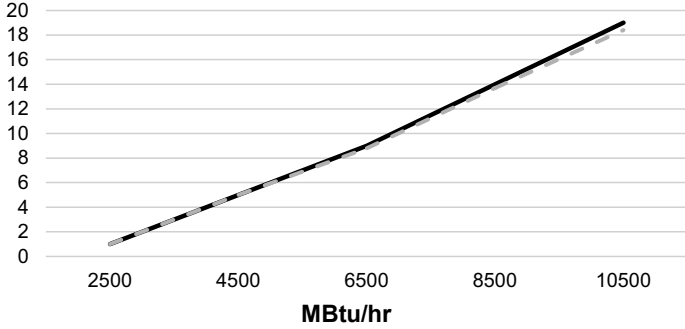


Fig. 20

RS 310/EV

S10312

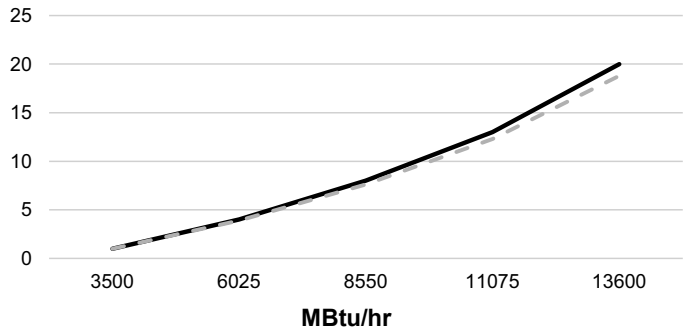


Fig. 21

RS 410/EV

S10313

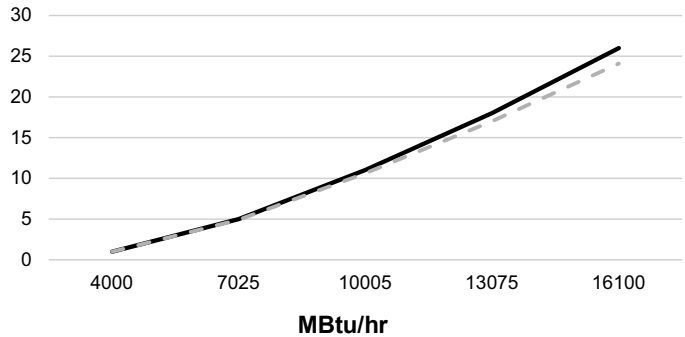


Fig. 22

RS 510/EV

S10314

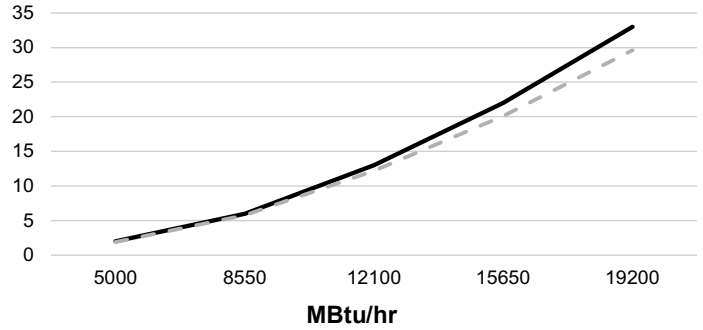


Fig. 23

RS 610/EV

S10315

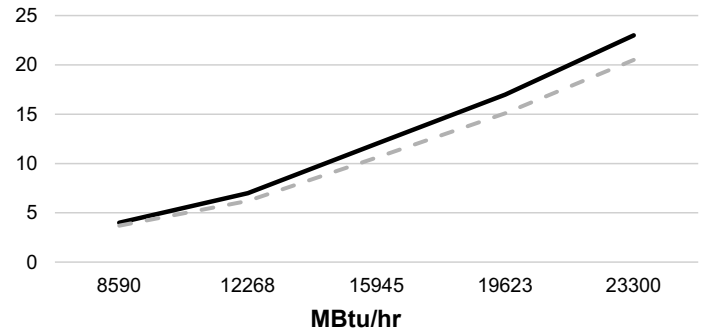


Fig. 24

Dotted line

Combustion head pressure drop.

Gas pressure measured at test point 5)(Fig. 6 on page 12), with:

- Combustion chamber at 0 mbar. If the pressure is higher, add it to the value read in the figure;
- Combustion head adjusted as in page 22.

Solid line

Pressure drop downstream of the safety valves and upstream of the gas butterfly valve.

To calculate the approximate output at which the burner operates:

- subtract the pressure in the combustion chamber from the pressure of the gas at test point 13)(Fig. 6 on page 12).
- Enter the mbar scale (Fig. 20 - Fig. 21 - Fig. 22 - Fig. 23 - Fig. 24 for G20) and read the corresponding output on the dotted line.



WARNING

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

4.12 Electrical wiring

Notes on safety for the electrical wiring



DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the electrical layouts.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the electrical layouts.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- Do not invert the neutral with the phase in the electrical supply line. Any inversion would cause a lockout due to firing failure.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - use an omnipolar switch with an opening of at least $1/8$ " (overvoltage category) between the contacts, as indicated by the current safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:



DANGER

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



DANGER

Turn off the fuel interception tap.



DANGER

Avoid condensate, ice and water leaks from forming.

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

4.12.1 Supply cables and external connections passage

All the cables to be connected to the burner are fed through the grommets. See Fig. 25.

The use of the cable grommets can take various forms. By way of example we indicate the following mode (according to **UL795**):

- 1 Three phase power supply with 3/4 inch cable grommet
- 2 Available: single phase power supply and other devices with 1/2 inch cable grommet
- 3 Available: consents/safety, minimum gas pressure switch, gas valves and other devices with 3/8 inch cable grommet
- 4 Available: hole for M20
- 5 Available for ground terminals
- 6 Available for inverter three phase power supply with 3/4 inch cable grommet

- A Variable speed sensor
- B Flame sensor
- C Available
- D Air servomotor
- E Fuel servomotor
- F Air pressure switch
- G Motor earth cable
- H Max gas pressure switch



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



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

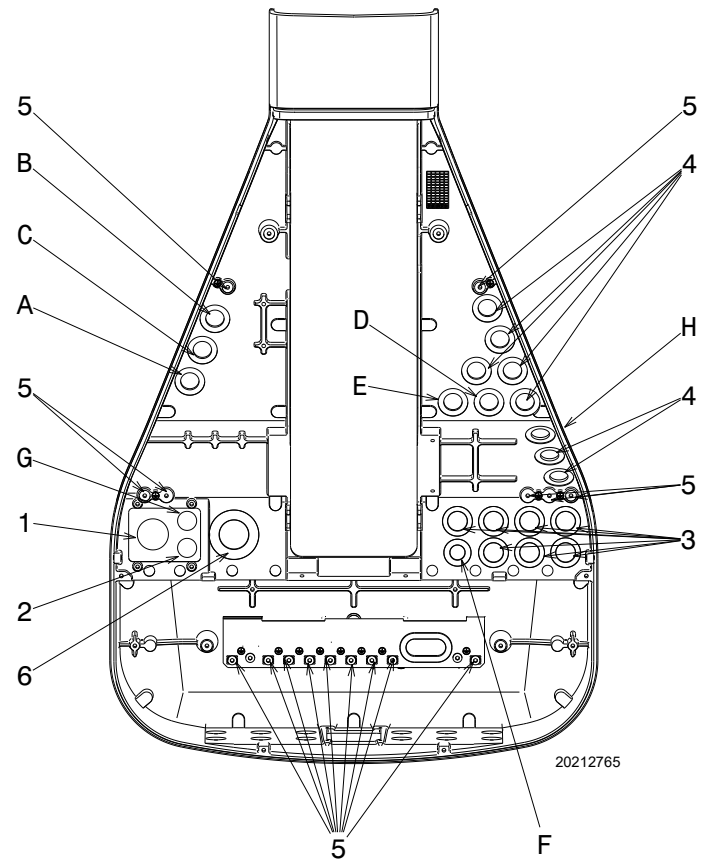


Fig. 25

4.12.2 Cable shielding



It is very important to shield the motor cable 1) as shown in Fig. 26.

It is very important to fix the cable shielding as shown in Fig. 26.

The connection from the Inverter to LMV36.... must be done as shown in Fig. 26.

- 1 Motor supply cable
- 2 Single phase supply cable
- 3 Clamp for connection of controls cable shielding from Inverter

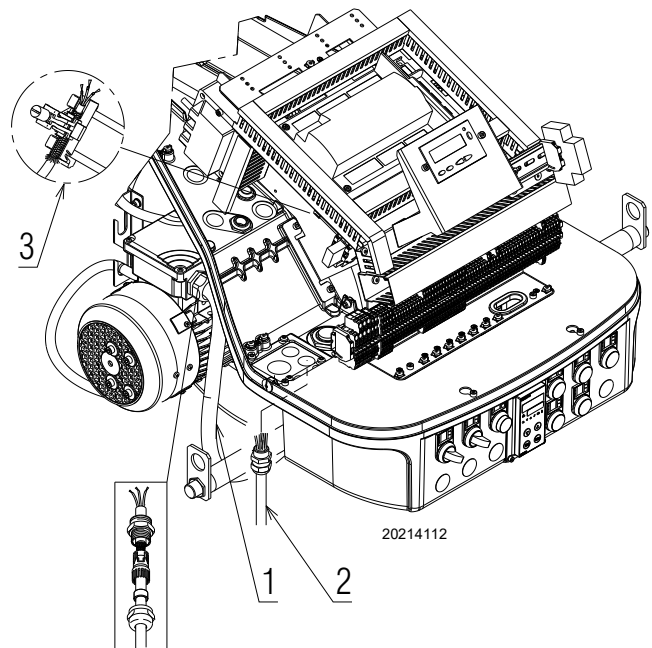


Fig. 26

4.12.3 Installation of shielded cables

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

- unscrew the screw until space is created for inserting the shielding of the shielded cable A1)(Fig. 27);
- insert the shielded cable with the shielding inside the clamp A2);
- screw in the screw until it is completely tightened on the shielding A3).



Do not overtighten.

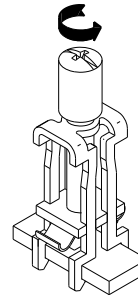
WARNING

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

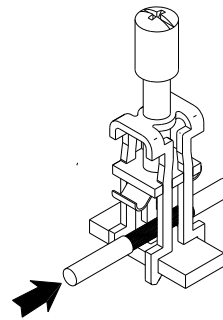
- pull the indicated tabs upwards and lift until locked in the open position B1)(Fig. 27);
- insert the shielded cable with the shielding inside the clamp B2);
- put pressure on the indicated part until the clamp closes automatically on the shielding B3).

A

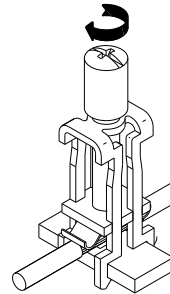
A1



A2



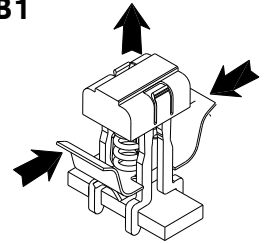
A3



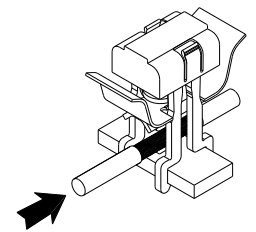
20131950

B

B1



B2



B3

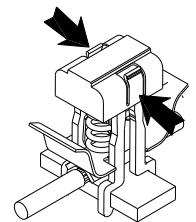


Fig. 27

4.12.4 Inverter connection



WARNING

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

Typical installation

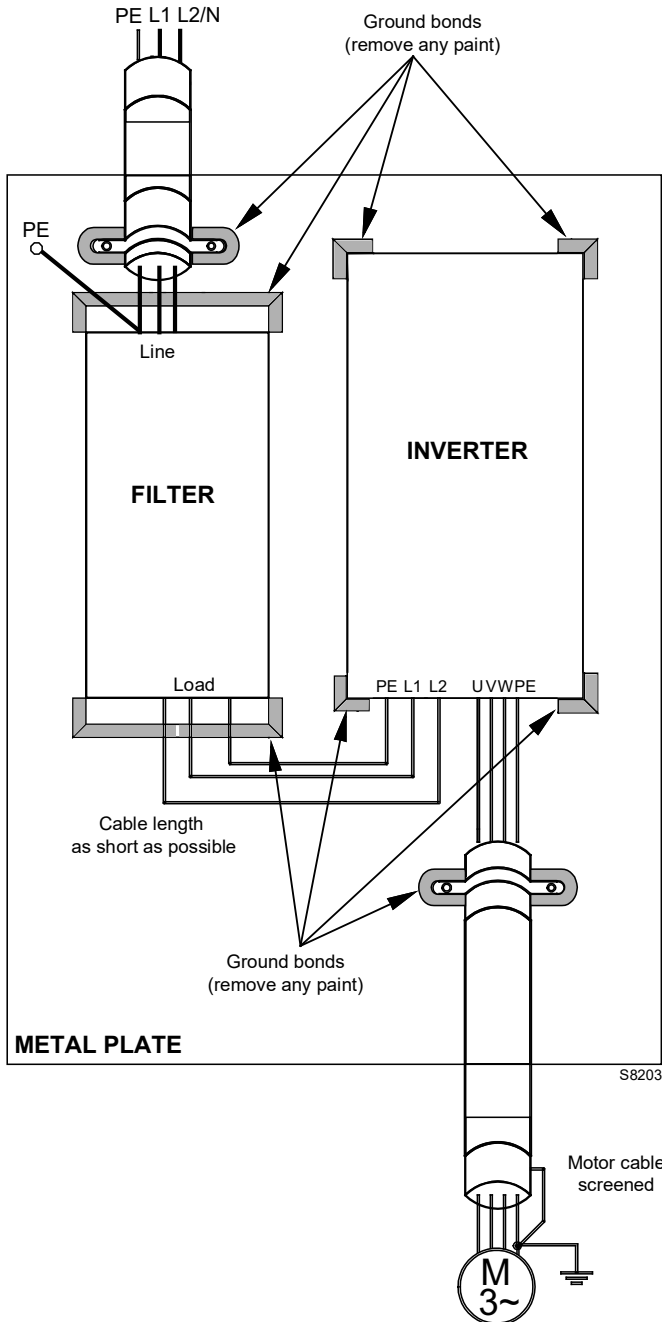


Fig. 28

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).

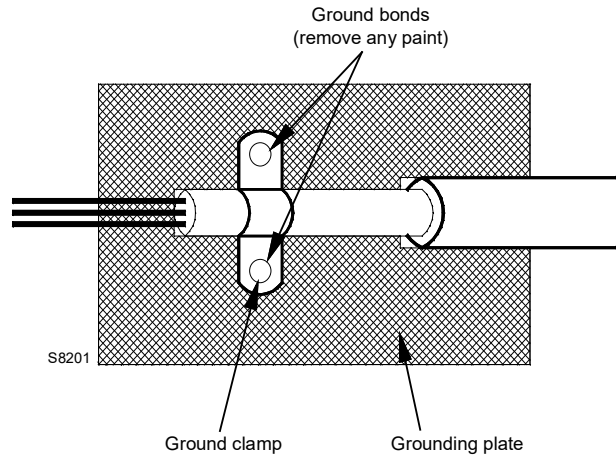


Fig. 29

Example:

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

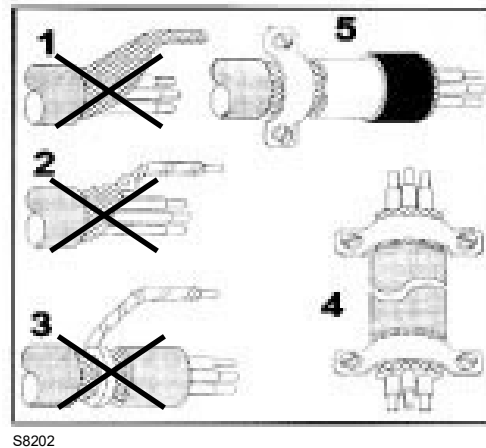


Fig. 30

4.13 Motor connection at 208-230 or 460V



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.

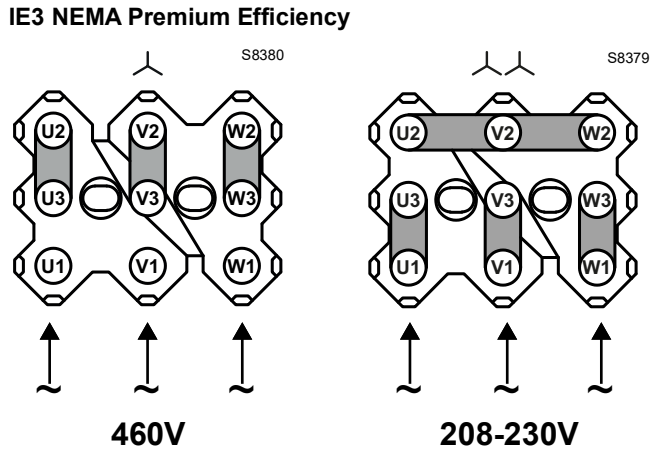


Fig. 31

4.14 Motor connection at 575V



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

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

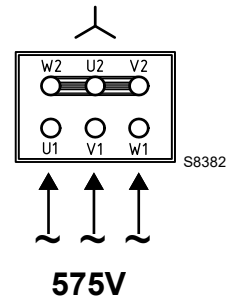


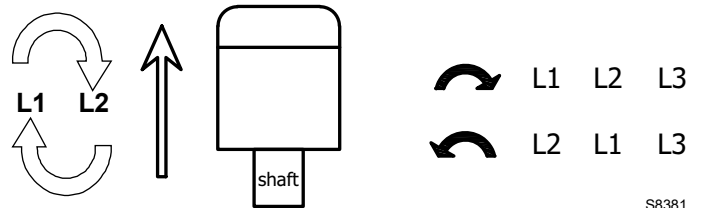
Fig. 32

4.15 Reversible direction



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

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



S8381

Fig. 33

5

Start-up, calibration and operation of the burner

5.1 Notes on safety for the first start-up



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



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



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

5.2 Adjustments before first firing

Adjustment of the combustion head has been illustrated on page 22.

In addition, the following adjustments must also be made:

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

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

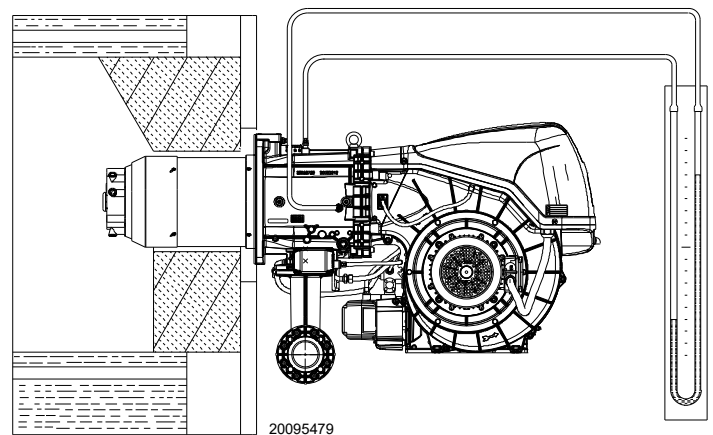


Fig. 34

5.3 Burner firing

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

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

Pilot adjustment has been illustrated on Fig. 15 on page 21.

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

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

5.4 Burner calibration

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

Adjust successively:

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

5.5 Burner start-up

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

Close the thermostats/pressure switches, set the parameters on the RWF55 regulator.

Please refer to the specific manual for this operation.

Turn the switch of Fig. 35 to position “ON” and turn the switch of Fig. 35 to position “LOCAL”.



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.



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

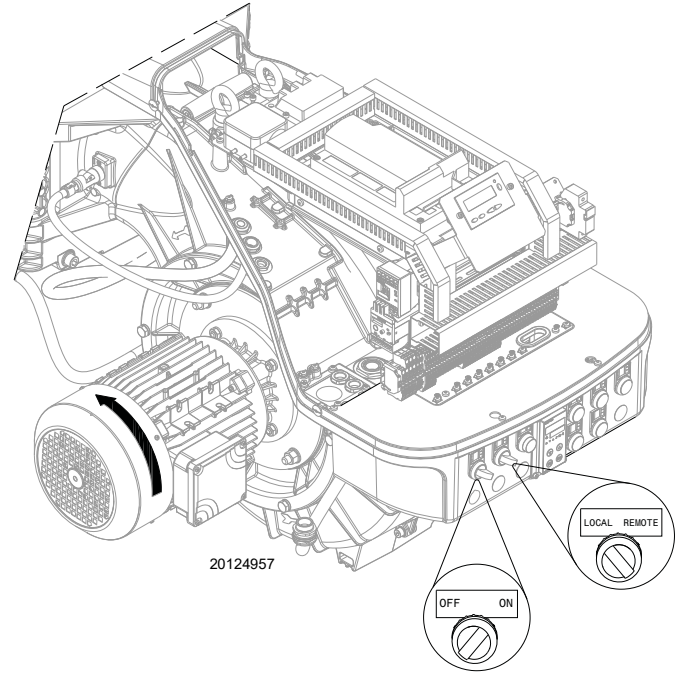


Fig. 35

5.6 Adjusting gas/air delivery

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



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

5.7 Final calibration of the pressure switches

5.7.1 Air pressure switch

For the **RS 280** model, the air pressure switch is connected in differential mode and is activated by both the negative pressure of the air intake and the positive pressure from the fan.

For the **RS 310-410-510** models, the air pressure switch is connected in absolute mode and is activated by the positive pressure from the fan (Fig. 36).

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

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

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

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

5.7.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 37) 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.

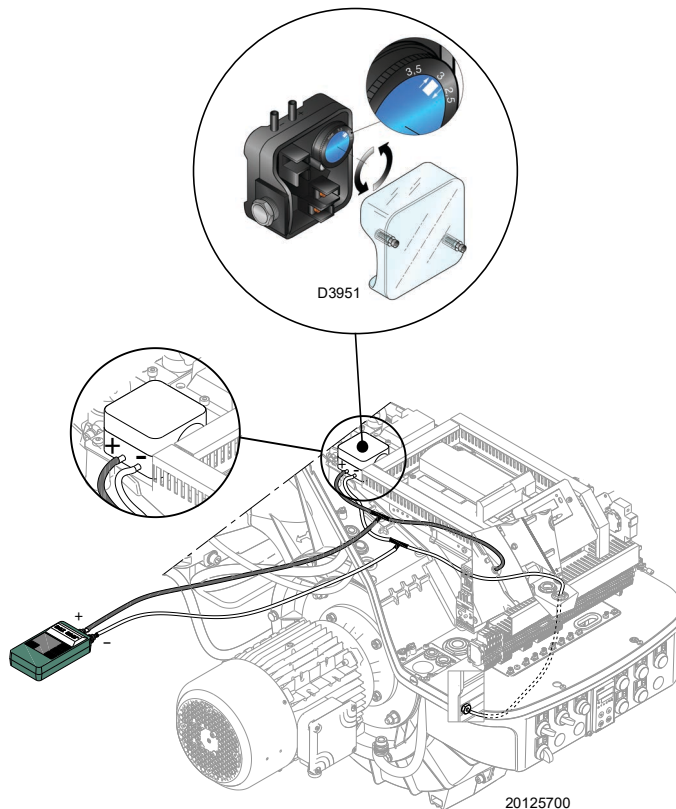


Fig. 36

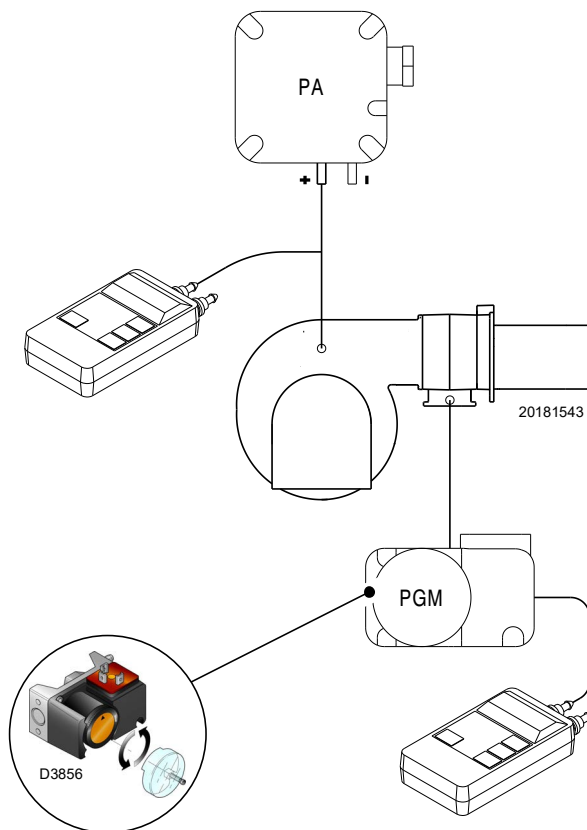


Fig. 37

5.7.3 Minimum gas pressure switch

Adjust the minimum gas pressure switch (Fig. 38) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

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

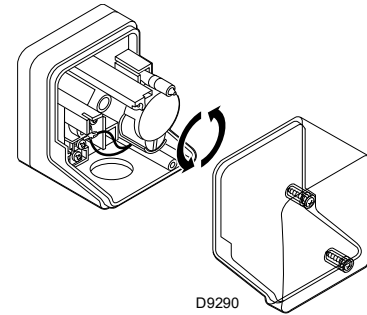


Fig. 38



1 kPa = 10 mbar

WARNING

5.7.4 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 Firing failure

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

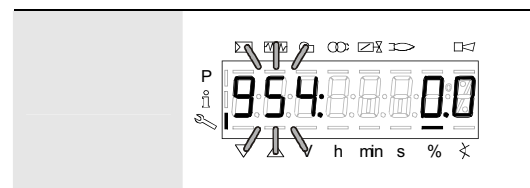
5.9 Flame signal measurement

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

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

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





The display (Fig. 39) shows parameter **954**: flashing on the left. On the right, the flame's intensity is displayed as a percentage.
Example: **954: 0.0**



S8171

Fig. 39

5.10 Final checks (with the burner working)

<ul style="list-style-type: none">➤ Open the control limit operation➤ Open the high limit operation		The burner must stop
<ul style="list-style-type: none">➤ Rotate the maximum gas pressure switch knob to the minimum end-of-scale position➤ Rotate the air pressure switch knob to the maximum end of scale position		The burner must stop in lockout
<ul style="list-style-type: none">➤ Switch off the burner and disconnect the voltage➤ Disconnect the minimum gas pressure switch		The burner must not start
<ul style="list-style-type: none">➤ Disconnect the flame sensor		The burner must stop in lockout due to firing failure

Tab. N**WARNING**

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

6

Maintenance

6.1 Notes on safety for the maintenance

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

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



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

Before carrying out any maintenance, cleaning or checking operations:



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



Turn off the fuel interception tap.



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

6.2 Maintenance programme

6.2.1 Maintenance frequency



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



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.

6.2.2 Safety test - with gas ball valve closed

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

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

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

The start-up cycle must be as follows:

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

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

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

6.2.3 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion head

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

Burner

Check for excess wear or loose screws. Also make sure that the screws securing the electrical leads in the burner connections are fully tightened.

Clean the outside of the burner.

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.

Flame inspection window

Clean the flame inspection window 1)(Fig. 40).

Flame sensor

In order to reach the flame sensor (Fig. 41), proceed as follows:

- loosen the screws 1);
- extract the flame sensor 2);
- clean the glass cover from any dust that may have accumulated.



WARNING

- Be extremely careful while troubleshooting the detector; line voltage is present on some of the terminals when power is on.
- Open the master switch to disconnect power before removing or installing the detector.

Fan

Check to make sure that no dust has accumulated inside the fan or on its blades, as this condition will cause a reduction in the air flow rate and provoke polluting combustion.

Boiler

Clean the boiler as indicated in its accompanying instructions in order to maintain all the original combustion characteristics intact, especially the flue gas temperature and combustion chamber pressure.

Combustion

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

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

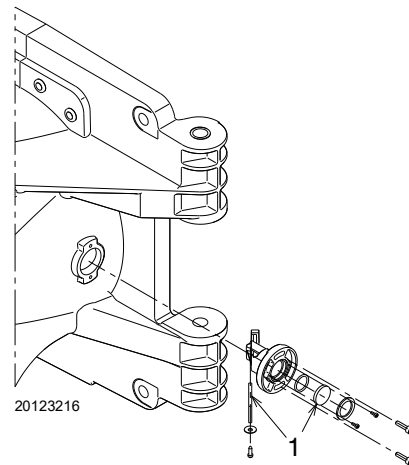


Fig. 40

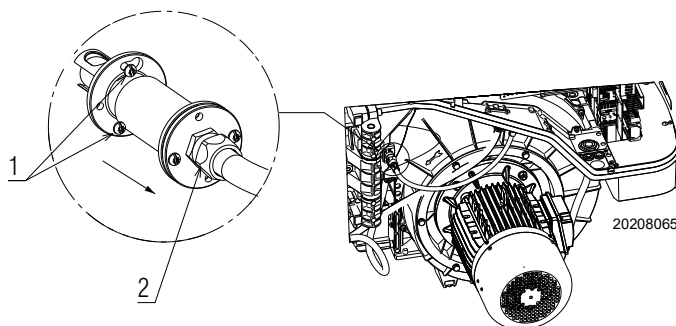


Fig. 41

6.2.4 Safety components

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

6.3 Opening the burner



DANGER

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



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



DANGER

Close the fuel interception tap.

See “**Accessibility to the interior of the combustion head**” on page 20.

6.4 Closing the burner

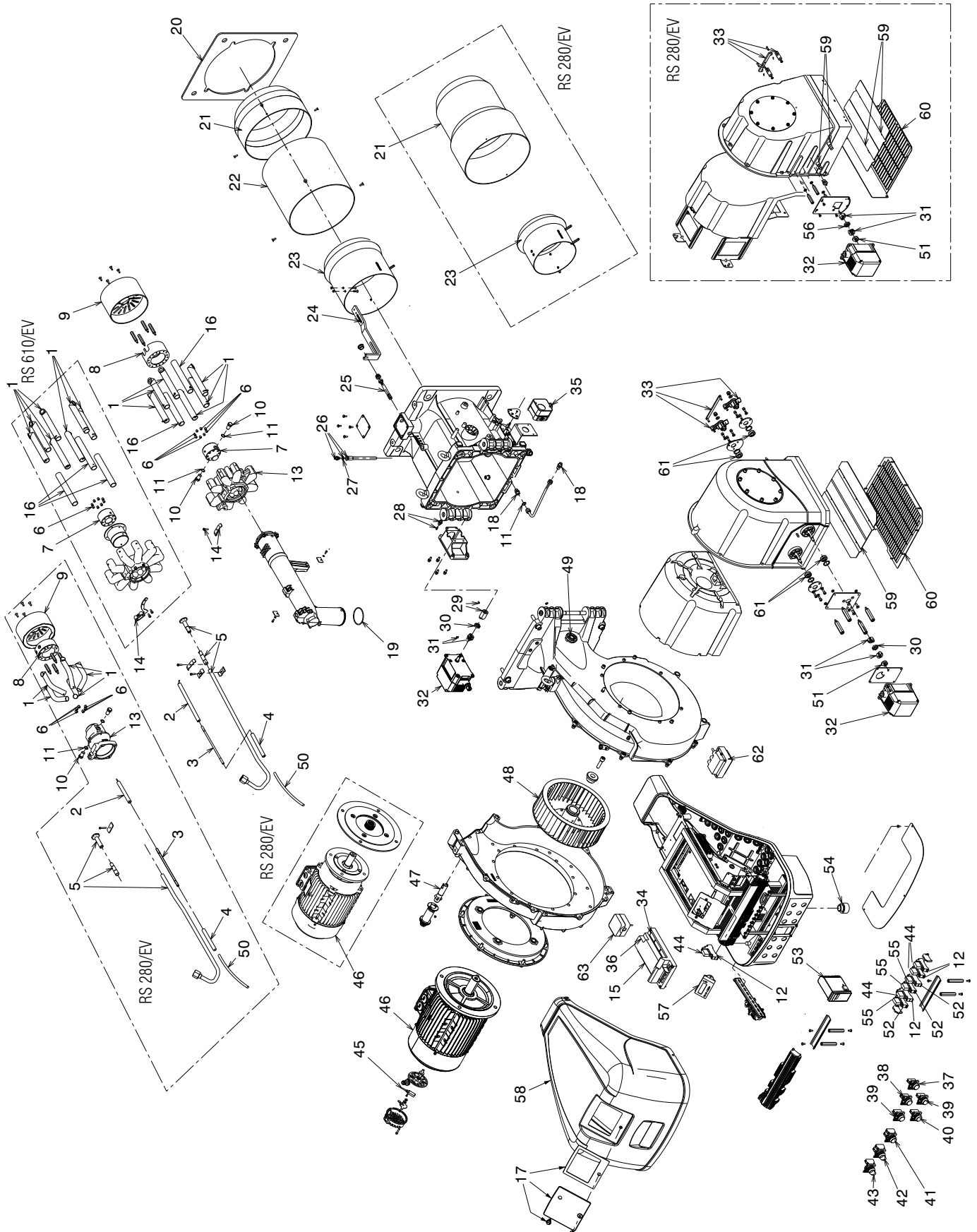
Refit following the steps described but in reverse order; refit all burner components as they were originally assembled.



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

A

Appendix - Spare parts



N.	CODE	20206431	20206432	20206488	20206489	20206497	20206498	20206501	20206502	20206505	20206506	DESCRIPTION	*
1	20075046	•	•									TUBE	
1	20109355			•	•	•	•	•	•			TUBE	
1	20073788									•	•	TUBE	
2	20118164	•	•									ELECTRODE	A
2	20032433			•	•	•	•	•	•	•	•	ELECTRODE	A
3	3012282	•	•									CONNECTION	A
3	3012722			•	•	•	•	•	•	•	•	CONNECTION	A
4	20013160	•		•	•	•	•	•	•	•	•	INSULATOR	A
4	3012258		•									INSULATOR	A
5	20123895	•	•									IGNITION PILOT TUBE	C
5	20123901			•	•	•	•	•	•			IGNITION PILOT TUBE	C
5	20209182									•	•	IGNITION PILOT TUBE	C
6	20123908	•	•									NOZZLE	A
6	20123916			•	•	•	•	•	•			NOZZLE	A
6	20195505									•	•	NOZZLE	A
7	20123921			•	•	•	•	•	•			DIFFUSER	
7	20209183									•	•	DIFFUSER	
8	20123937	•	•									AIR DIFFUSER	
8	20123941			•	•	•	•	•	•			AIR DIFFUSER	
8	20109349									•	•	AIR DIFFUSER	
9	20123947	•	•									DIFFUSER DISC	A
9	20123955			•	•	•	•	•	•			DIFFUSER DISC	A
9	20135065									•	•	DIFFUSER DISC	A
10	3012533	•	•	•	•	•	•	•	•			PLUG	
11	3007079	•	•	•	•	•	•	•	•	•	•	SEAL	B
12	3020071	•	•	•	•	•	•	•	•	•	•	BASE	
13	20123269	•	•									DIFFUSER	C
13	20124446			•	•	•	•	•	•			DIFFUSER	C
13	20109358									•	•	DIFFUSER	C
14	3012626	•	•									U BOLT	
14	3012872			•	•	•	•	•	•			U BOLT	
14	20129610									•	•	U BOLT	
15	20010968	•	•	•	•	•	•	•	•	•	•	CAM	C
16	3013493			•	•	•	•	•	•			TUBE	
16	20074992									•	•	TUBE	
17	20075921	•	•	•	•	•	•	•	•	•	•	VIEWING PORT	
18	3006723	•	•	•	•	•	•	•	•	•	•	CONNECTOR	C
19	3020191	•	•	•	•	•	•	•	•	•	•	O-RING SEAL	B
20	20079332	•		•	•	•	•	•	•	•	•	FLANGE GASKET	A
20	3013328		•									FLANGE GASKET	A
21	20075037	•	•									FLAME FUNNEL	C
21	3013314			•	•	•	•	•	•			FLAME FUNNEL	C
21	20109247									•	•	FLAME FUNNEL	C

N.	CODE											DESCRIPTION	*
		20206431	20206432	20206488	20206489	20206497	20206498	20206501	20206502	20206505	20206506		
22	20073781											CYLINDER	C
22	20075118											CYLINDER	C
23	20075041	•	•									SHUTTER	C
23	20074988			•	•	•	•	•	•			SHUTTER	C
23	20141201									•	•	SHUTTER	C
24	20075043	•	•									SQUARE	
24	20073784			•	•	•	•	•	•			SQUARE	
24	20109250									•	•	SQUARE	
25	20075916	•	•	•	•	•	•	•	•			SCREW	
25	20109183									•	•	SCREW	
26	20052434	•	•	•	•	•	•	•	•	•	•	PRESSURE TEST POINT	
27	3007077	•	•	•	•	•	•	•	•	•	•	SEAL	B
28	3005447	•	•	•	•	•	•	•	•	•	•	TEST POINT	
29	20075022	•	•	•	•	•	•	•	•	•	•	JOINT	C
30	20090029	•	•	•	•	•	•	•	•	•	•	DISC	A
31	3013937	•	•	•	•	•	•	•	•	•	•	HUB	
32	20008601	•	•	•	•	•	•	•	•	•	•	SERVOMOTOR	B
33	20205018	•	•									LINKAGE AIR DAMPER	
33	20133154			•	•	•	•	•	•	•	•	LINKAGE AIR DAMPER	
34	3013940	•	•	•	•	•	•	•	•	•	•	CONNECTORS ASSEMBLY	B
35	20014103	•	•	•	•	•	•	•	•	•	•	GAS PRESSURE SWITCH	A
36	3014106	•	•	•	•	•	•	•	•	•	•	FUSE	
37	3013354	•	•	•	•	•	•	•	•	•	•	BUTTON	C
38	20036019	•	•	•	•	•	•	•	•	•	•	WHITE SIGNAL LIGHT	A
39	20036017	•	•	•	•	•	•	•	•	•	•	GREEN SIGNAL LIGHT	A
40	20027020	•	•	•	•	•	•	•	•	•	•	SIGNAL LIGHT	A
41	20010962	•	•	•	•	•	•	•	•	•	•	BUTTON	
42	20027422	•	•	•	•	•	•	•	•	•	•	SELECTOR SWITCH	
43	20027021	•	•	•	•	•	•	•	•	•	•	SELECTOR SWITCH	
44	3020068	•	•	•	•	•	•	•	•	•	•	RELAY	C
45	20202970	•	•	•	•	•	•	•	•	•	•	MOTOR REVOLUTION SENSOR	C
46	20201368	•										MOTOR	C
46	20207183		•									MOTOR	C
46	20013155			•								MOTOR	C
46	20042608				•							MOTOR	C
46	20013156					•						MOTOR	C
46	20124287						•					MOTOR	C
46	20124588							•				MOTOR	C
46	20124359								•			MOTOR	C
46	20207174									•		MOTOR	C
46	20207131										•	MOTOR	C
47	20212779	•	•	•	•	•	•	•	•	•	•	FLAME SENSOR	
48	20006192	•	•									FAN	C
48	3003614			•	•							FAN	C
48	20124069					•	•	•	•			FAN	C

N.	CODE	20206431	20206432	20206488	20206489	20206497	20206498	20206501	20206502	20206505	20206506	DESCRIPTION	*
48	3006155									•	•	FAN	C
49	3013933	•	•	•	•	•	•	•	•	•	•	INSPECTION WINDOW	
50	3012393	•	•	•	•	•	•	•	•	•	•	ELECTRODE CONNECTION	A
51	3014079	•	•	•	•	•	•	•	•	•	•	SPACER	
52	3012841	•	•	•	•	•	•	•	•	•	•	BASE	
53	20096592	•	•	•	•	•	•	•	•	•	•	POWER REGULATOR	C
54	20031413	•	•	•	•	•	•	•	•	•	•	HORN	
55	20010969	•		•	•	•	•	•	•	•	•	RELAY	C
55	3013526		•									RELAY	C
56	3014011	•	•									DISC	C
57	3013926	•	•	•	•	•	•	•	•	•	•	DISPLAY	
58	20086561	•	•	•	•	•	•	•	•	•	•	COVER	
59	20056809	•	•									AIR DAMPER	
59	20126622			•	•	•	•	•	•			AIR DAMPER	
59	20144750									•	•	AIR DAMPER	
60	3013683	•	•									PROTECTION	
60	20073814			•	•	•	•	•	•	•	•	PROTECTION	
61	3012795			•	•	•	•	•	•	•	•	BEARING	
62	3012956	•	•	•	•	•	•	•	•	•	•	TRANSFORMER	B
63	3012948	•	•	•	•	•	•	•	•	•	•	AIR PRESSURE SWITCH	A

*
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 - 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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