GB

Forced draught gas burners

Modulating operation

CODE	MODEL
20101135	RS 650/EV
20101140 - 20113385	RS 800/EV

20109898 (7) - 10/2022



Original instructions

1 Information and general instructions . . . 3
1.1 Information about the instruction manual . . . 3
1.1.1 Introduction . . . 3
1.1.2 General dangers . . . 3
1.1.3 Other symbols . . . 3
1.1.4 Delivery of the system and the instruction manual . . . 4
1.2 Guarantee and responsibility . . . 4

2 Safety and prevention . . . 5
2.1 Introduction . . . 5
2.2 Personnel training . . . 5

3 Technical description of the burner . . . 6
3.1 Technical data . . . 6
3.2 Electrical data . . . 6
3.3 Burner models designation . . . 7
3.4 Burner dimensions . . . 7
3.5 Packaging - weight - Approximate measurements . . . 8
3.6 Firing rates . . . 8
3.7 Minimum furnace dimensions . . . 9
3.8 Standard equipment . . . 9
3.9 Burner description . . . 10
3.10 Panel board description . . . 11
3.11 Control box for the air/fuel ratio (LMV52...) . . . 12
3.12 Actuators . . . 17

4 Installation . . . 18
4.1 Notes on safety for the installation . . . 18
4.2 Handling . . . 18
4.3 Preliminary checks . . . 18
4.4 Operation position . . . 19
4.5 Removal of the locking screws from the shutter . . . 19
4.6 Boiler plate . . . 19
4.6.1 Blast tube length . . . 20
4.7 Securing the burner to the boiler . . . 20
4.8 Accessibility to the interior of the combustion head . . . 20
4.9 Combustion head setting . . . 21
4.10 Electrode and ignition pilot adjustment . . . 22
4.11 Adjustment at the maximum output . . . 22
4.12 Gas feeding . . . 23
4.12.1 Gas train . . . 23
4.12.2 Gas pressure . . . 24
4.13 Electrical wiring . . . 25
4.13.1 Supply cables and external connections passage . . . 25
4.13.2 Cable shielding . . . 26
4.13.3 Other connection . . . 26
4.13.4 Inverter connection . . . 27

5 Start-up, calibration and operation of the burner . . . 28
5.1 Notes on safety for the first start-up . . . 28
5.2 Adjustments before first firing . . . 28
5.3 Burner firing . . . 28

5.4 Burner start-up . . . 29
5.5 Combustion air adjustment . . . 29
5.5.1 Air adjustment for maximum output . . . 30
5.5.2 Adjusting gas/air delivery . . . 30
5.5.3 Air/fuel control and power modulation system . . . 30
5.6 Final calibration of the pressure switches . . . 31
5.6.1 Air pressure switch . . . 31
5.6.2 Maximum gas pressure switch . . . 31
5.6.3 Minimum gas pressure switch . . . 31
5.7 Final checks (with the burner working) . . . 32

6 Maintenance . . . 33
6.1 Notes on safety for the maintenance . . . 33
6.2 Maintenance programme . . . 33
6.2.1 Maintenance frequency . . . 33
6.2.2 Safety test - with gas ball valve closed . . . 33
6.2.3 Checking and cleaning . . . 33
6.2.4 Safety components . . . 34
6.3 Adjustment fan motor covering with external rpm . . . 35
6.4 Opening the burner . . . 36
6.5 Closing the burner . . . 36

7 Faults - Possible causes - Solutions . . . 37

A Appendix - Spare parts . . . 38

B Appendix - Accessories . . . 41

C Appendix - Burner start up report . . . 42

1 Information and general instructions

1.1 Information about the instruction manual

1.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

1.1.2 General dangers

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



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



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



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

1.1.3 Other symbols



DANGER: LIVE COMPONENTS

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



DANGER: FLAMMABLE MATERIAL

This symbol indicates the presence of flammable materials.



DANGER: BURNING

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



DANGER: CRUSHING OF LIMBS

This symbol indicates the presence of moving parts: danger of crushing of limbs.



WARNING: MOVING PARTS

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



DANGER: EXPLOSION

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



PERSONAL PROTECTION EQUIPMENT

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



OBLIGATION TO ASSEMBLE THE HOOD AND ALL THE SAFETY AND PROTECTION DEVICES

This symbol signals the obligation to reassemble the hood and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.



ENVIRONMENTAL PROTECTION

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



IMPORTANT INFORMATION

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

➤ This symbol indicates a list.

Abbreviations used

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

1.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

➤ the instruction manual is delivered to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.

➤ The instruction manual shows:
– the serial number of the burner;

.....

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

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

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

1.2 Guarantee and responsibility

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



WARNING

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

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

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

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

2 Safety and prevention

2.1 Introduction

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

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

It is a good idea to remember the following:

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

In particular:

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

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

➤ Modification of the burner to alter its performance and destinations is not allowed.

➤ The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.

➤ Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.

➤ Only those parts envisaged by the manufacturer can be replaced.



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

2.2 Personnel training

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

The user:

➤ undertakes to entrust the machine exclusively to suitably trained and qualified personnel;

➤ undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;

➤ Personnel must observe all the danger and caution indications shown on the machine.

➤ Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.

➤ Personnel must inform their superiors of every problem or dangerous situation that may arise.

➤ The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

In addition:



➤ the user must take all the measures necessary to prevent unauthorised people gaining access to the machine;

➤ the user must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.

➤ Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.

3 Technical description of the burner

3.1 Technical data

Model			RS 650/EV	RS 800/EV
Output (1)	min - max	MBtu/hr (4) SCFH	5416/11362 - 24807 (22325*)	4545/13255 - 30670 (27882*)
Fuel			Natural gas	
Gas pressure at maximum delivery (2) Gas: natural gas		"WC	22.8	17.9
Operation			Low-high or modulating	
Standard applications			Boilers: water, steam, thermal oil	
Ambient temperature		°F	32 - 104 (0 - 40 °C)	
Combustion air temperature		°F max	140 (60 °C)	
Noise levels (3)	Sound pressure Sound power	dB(A)	80 91	88 99

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 5)(Fig. 5 at page 10) 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 SCFH = 1000 Btu.

3.2 Electrical data

Model		RS 650/EV		
Code RBNA		C9144400	C9144410	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	rpm V HP A	3550 230 25 57.6	3550 460 25 28.8	3550 575 25 23
Ignition transformer	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA		
Electrical power consumption	W	19950		19900
Electrical control circuit consumption	W max	750		750
Total electrical consumption	W	20700		20650
Electrical protection		NEMA 1		

Tab. B

Model		RS 800/EV		
Code RBNA		C9145400	C9145410	C9145401
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	rpm V HP A	3540 230 30 71.4	3540 460 30 35.7	3540 575 30 28.6
Ignition transformer	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1,6 A - 20 mA		
Electrical power consumption	W	23900	23900	23950
Electrical control circuit consumption	W max	750	750	750
Total electrical consumption	W	24650	24650	24700
Electrical protection		NEMA 1		

Tab. C

3.3 Burner models designation

Model	Code	Code RBNA	Voltage	Flame safeguard
RS 650/EV	20101135	C9144400	230/3/60	Burner mounted
		C9144410	460/3/60	
	tbd	tbd	575/3/60	
RS 800/EV	20101140	C9145400	230/3/60	Burner mounted
		C9145410	460/3/60	
	20113385	C9145401	575/3/60	

Tab. D

3.4 Burner dimensions

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

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.

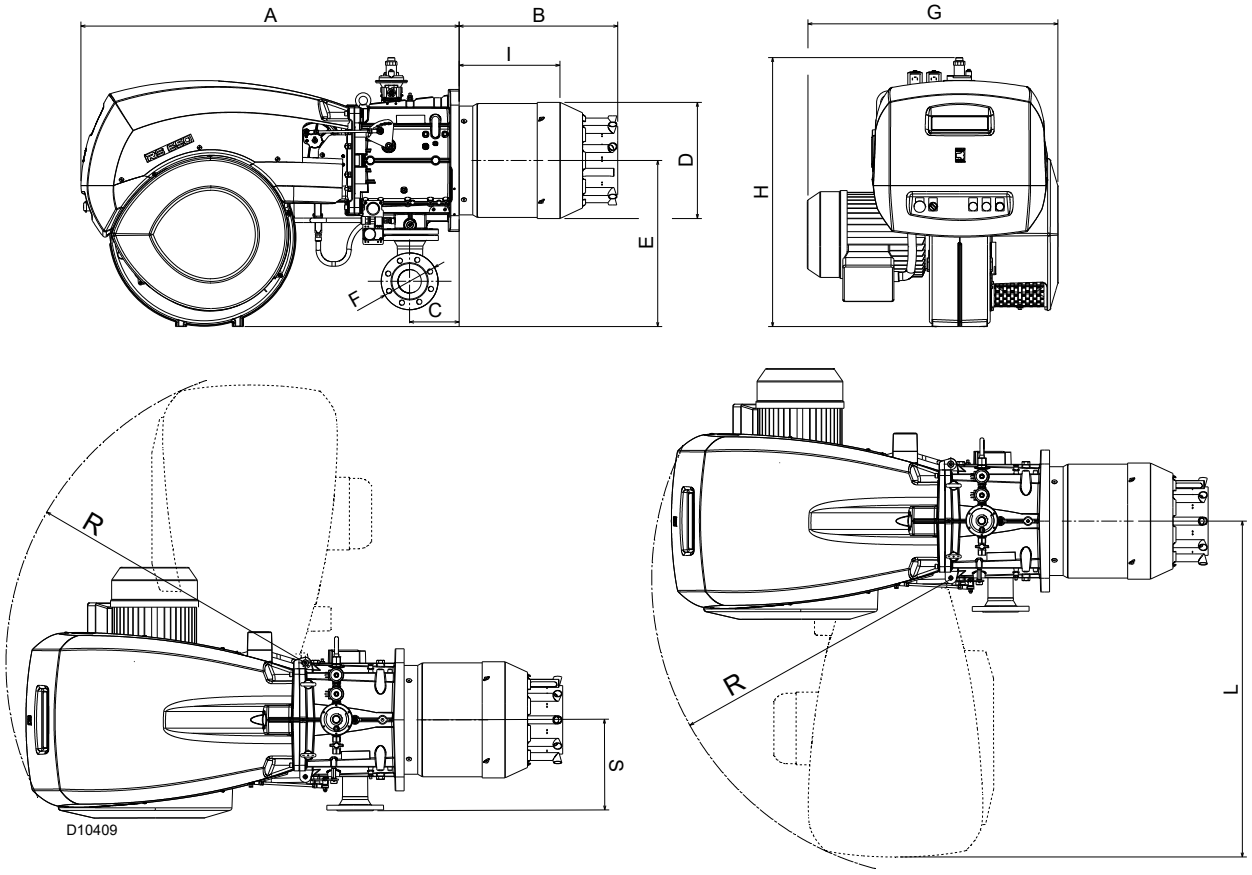


Fig. 1

inch	A	B	C	D	E	F	G	H	I	L	R	S
RS 650/EV	52 3/16"	22 29/32"	6 7/16"	16 9/64"	23 5/32"	ANSI 3"	34 21/32"	34 9/64"	14 3/16"	46 1/4"	41 17/32"	12 19/32"
RS 800/EV	52 3/16"	22 29/32"	6 7/16"	14 19/64"	23 5/32"	ANSI 3"	32 7/8"	34 9/64"	16 15/32"	46 1/4"	41 17/32"	12 19/32"

Tab. E

3.5 Packaging - weight - Approximate measurements

The packaging of the burner (Fig. 2) rests on a wooden platform that is particularly suitable for lift trucks. The overall dimensions of the packaging are shown in the Tab. F.

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

inch	A	B	C	lbs
RS 650/EV	80 7/64"	42 29/32"	47 3/64"	661
RS 800/EV	80 7/64"	42 29/32"	47 3/64"	670

Tab. F

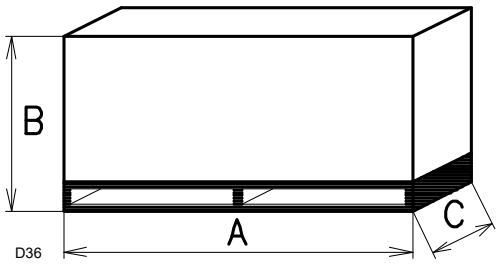


Fig. 2

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.

Model	MBtu/hr
RS 650/EV	5416
RS 800/EV	4545

Tab. G

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 pag. 21.

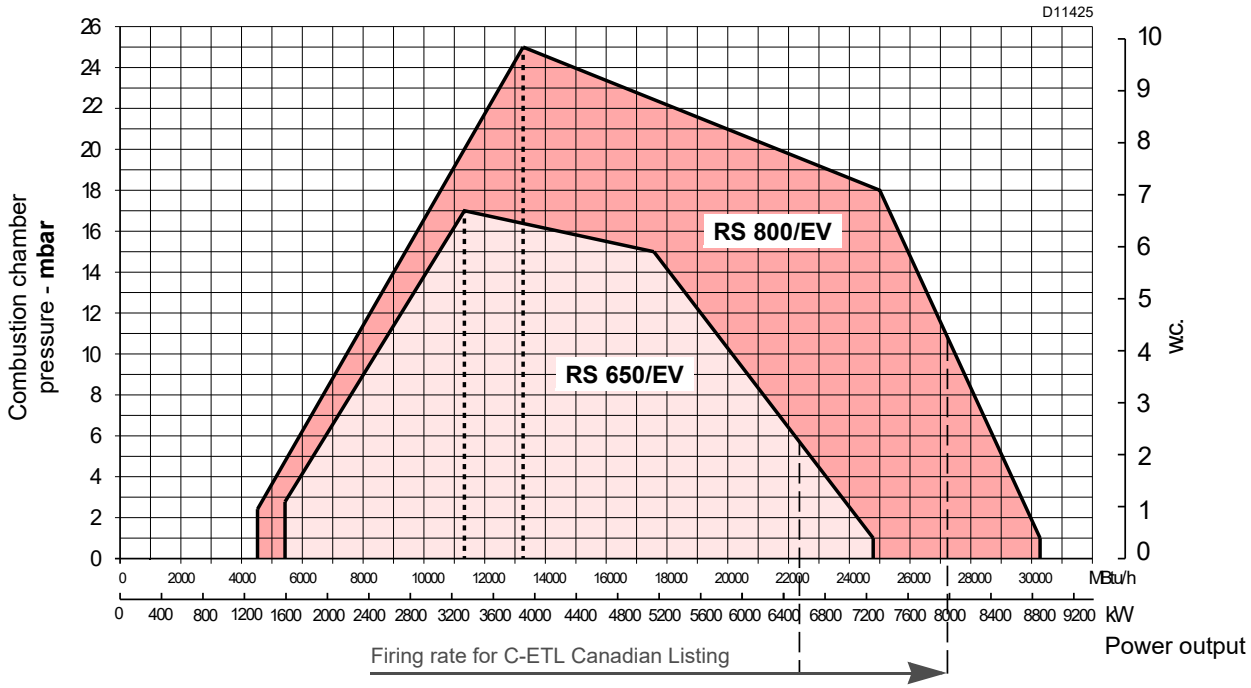


Fig. 3

3.7 Minimum furnace dimensions

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

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

Example:

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

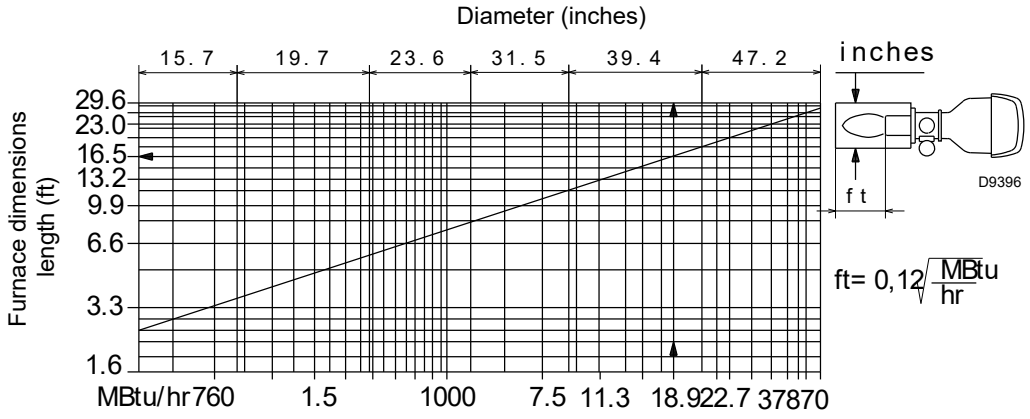


Fig. 4

3.8 Standard equipment

Flange gasket . . . . . No. 1
Flange fixing screws M16x50 . . . . . No. 4
Screws M18x70 to secure the burner flange to the boiler . . . No. 4
Spacers . . . . . No. 2
Instruction booklet . . . . . No. 1

3.9 Burner description

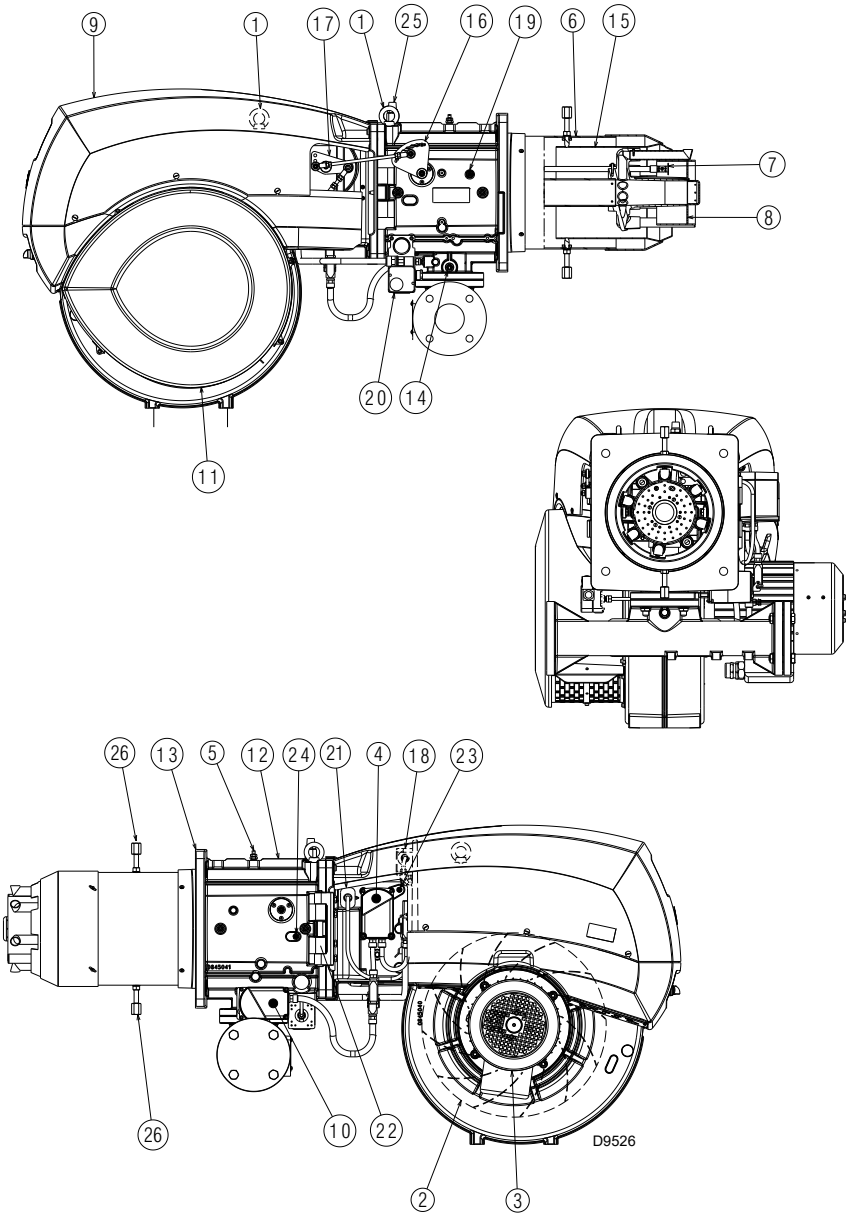


Fig. 5

1 Lifting eyebolts
2 Fan
3 Fan motor with speed sensor
4 Air servomotor
5 Gas pressure test point
6 Combustion head
7 Ignition pilot
8 Flame stability disk
9 Electric panel board - cover
10 Gas servomotor
11 Air inlet to fan
12 Manifold
13 Thermal insulation screen for securing burner to boiler
14 Gas butterfly valve
15 Shutter
16 Lever for movement of combustion head
17 Gears for movement of air damper
18 Air pressure switch
19 Air pressure test point
20 Maximum gas pressure switch with pressure test point
21 Flame sensor
22 Hinge for opening burner
23 Air pressure test point pressure test point “+”
24 Air pressure test point pressure test point “-”
25 Ignition pilot attachment
26 Locking screws of the shutter during the transport (replace them with the screws M12x16 supplied with the burner)

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

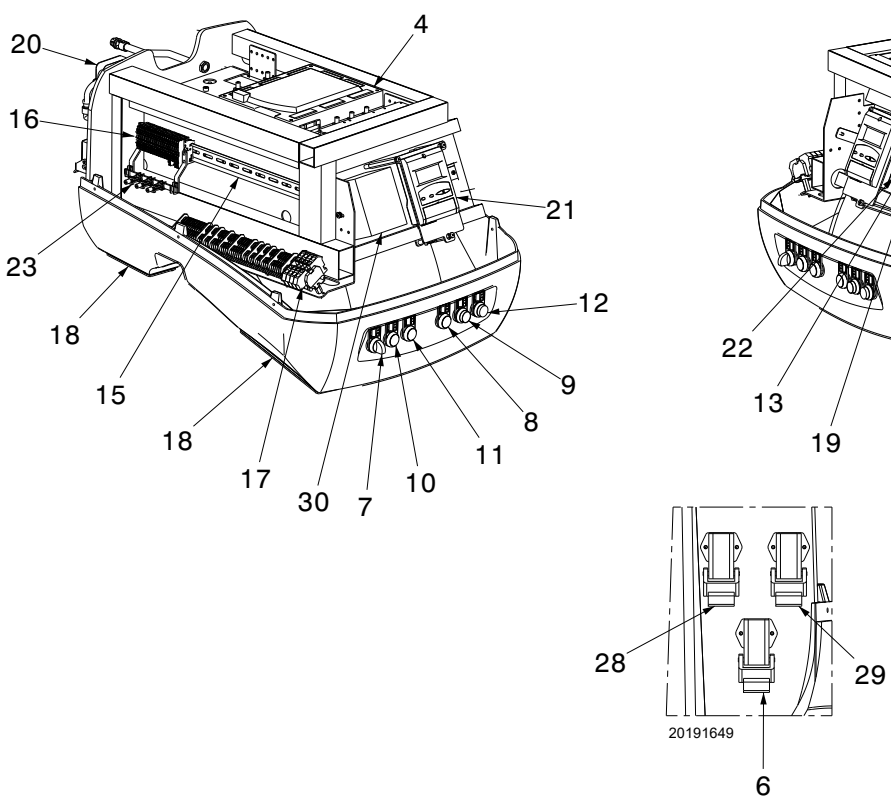


Fig. 6

1 Horn
2 “K5” relay
3 Control box transformer “T1”
4 Control box for checking flame and air/fuel ratio
5 Ignition transformer “TA”
6 Plug/socket for maximum gas pressure switch
7 “OFF - LOCAL - REMOTE” switch
8 “FUEL ON” signal
9 “ALARM SILENCE” button
10 “POWER ON” signal
11 “CALL FOR HEAT” signal
12 “Burner lock-out and reset” push button
13 “K2” relay
14 Auxiliary fuse
15 DIN bar for “X2” terminal strip and available for accessories
16 Terminal strip “X2”
17 Burner terminal board “X1”
18 Holes for cables grommets for electrical wirings, accessories and power supply (to be carried out by the installer)
19 “K7” relay
20 Low air pressure switch
21 Operator panel with LCD display
22 Terminal strip “XAUX”
23 Bracket for shielded cables
Warning: used only to avoid a break in the cable’s shielding, hence do not overtighten.
24 DIN bar for relay, terminal strip “XAUX” and auxiliary fuses
25 “K3” relay
26 “K1” relay
27 Additional transformer (if required for O_2 kit) (available)
28 Plug/socket for flame sensor
29 Plug/socket for air servomotor
30 Step-down transformer (available)

A type of burner failure may occur:

➤ **Flame safeguard lock-out**
If the flame safeguard alarm 9)(Fig. 6) lights up, it indicates that the burner is in lock-out. To reset, press the reset push-button.

3.11 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.



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 moduleMechanical 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.

Tab. H

Operation sequence of the burner

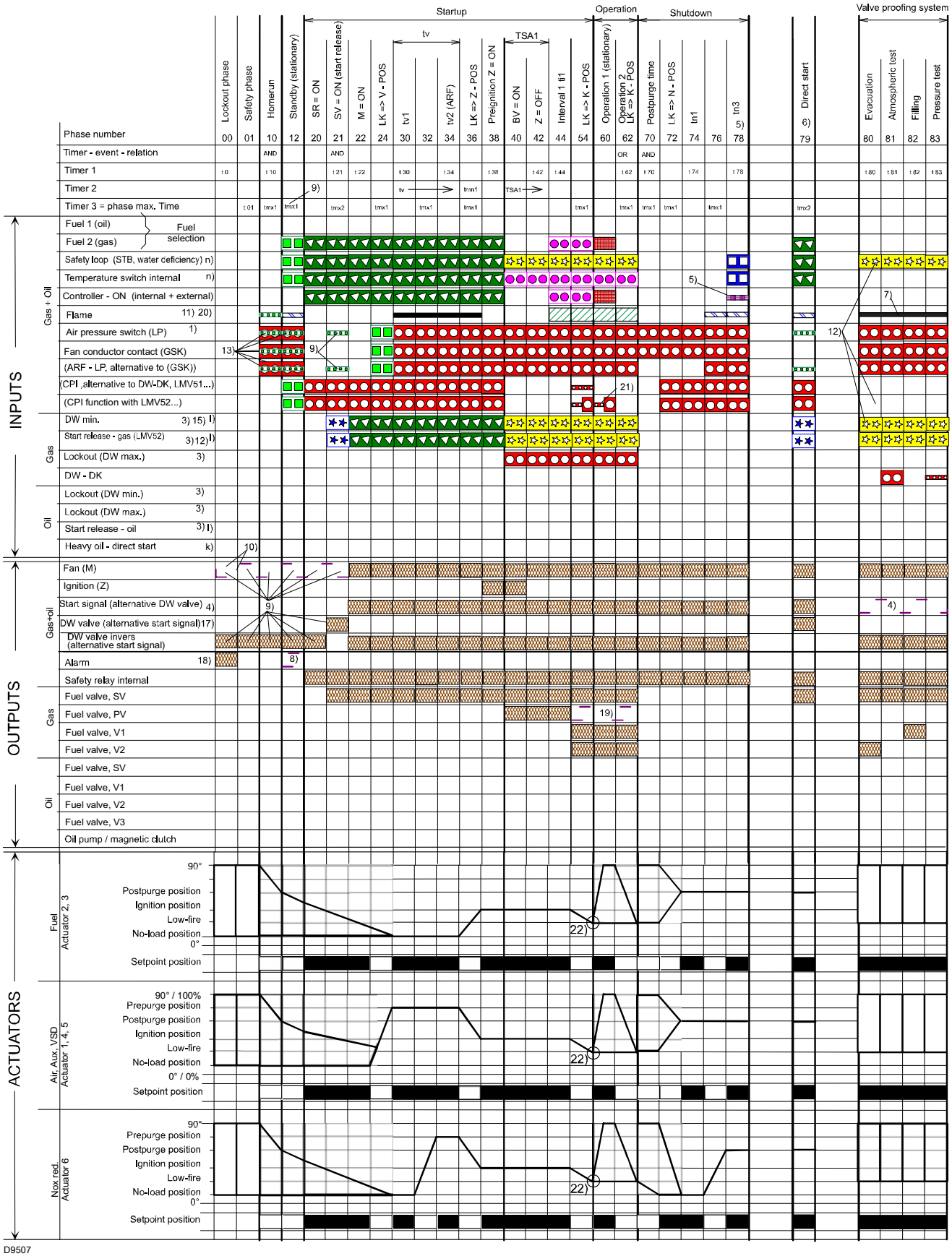


Fig. 8

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

3.12 Actuators

Warnings

To avoid accidents, material or environmental damage, observe the following instructions!

Avoid opening, modifying or forcing 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.

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 120V 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.

During the maintenance or replacement of the actuators, be careful not to invert the connectors.

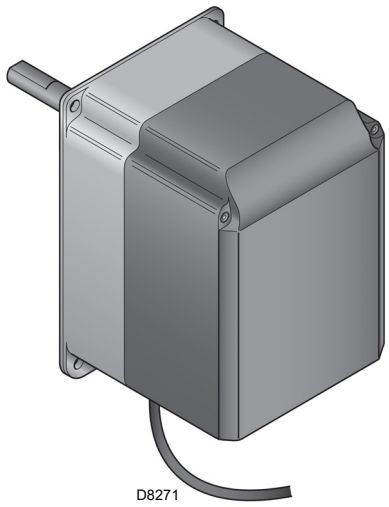


Fig. 9

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 Climatic conditions Mechanical conditions Temperature range Humidity	DIN EN 60721-3-1 class 1K3 class 1M2 -20...+60 ×C < 95 % r.h.	

Tab. I

4 Installation

4.1 Notes on safety for the installation

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


DANGER

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


WARNING

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

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

WARNING

- The burner is designed to operate only in 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.

DANGER

- Any other position could compromise the correct operation of the appliance.
- Installation **5** is prohibited for safety reasons.

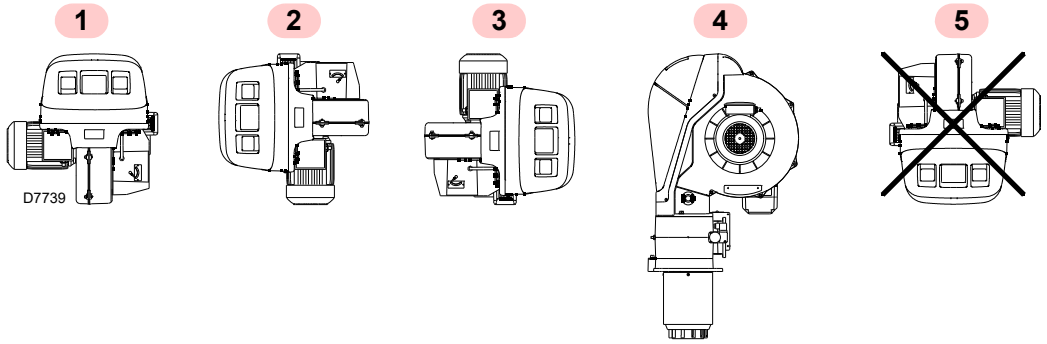


Fig. 10

4.5 Removal of the locking screws from the shutter

WARNING

Remove the screws and the nuts 1)-2)(Fig. 11), before installing the burner on the boiler.

Replace them with the screws 3) M12x16 supplied with the burner.

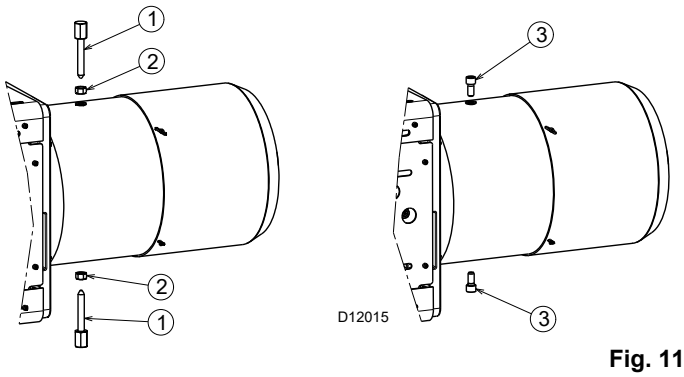


Fig. 11

4.6 Boiler plate

Drill the combustion chamber mounting plate as shown in Fig. 12.

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

inch	A	B	C
RS 650/EV	17 $^{5}/_{16}$"	19 $^{31}/_{64}$"	$^{3}/_{4}$" coarse
RS 800/EV	15 $^{3}/_{4}$"	19 $^{31}/_{64}$"	$^{3}/_{4}$" coarse

Tab. J

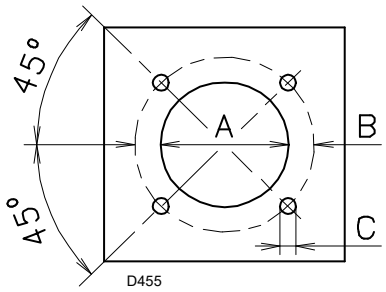


Fig. 12

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.

For boilers with front flue passes 1) or flame inversion chambers, protective fettling in refractory material 5) must be inserted between the boiler fettling 2) and the blast tube 4).

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

For boilers having a water-cooled front the refractory fettling 2)-5)(Fig. 13) is not required unless it is expressly requested by the boiler manufacturer.

4.7 Securing the burner to the boiler

- ➤ Create a suitable hoisting system by hooking onto the rings 3)(Fig. 13), removing the fastening screws 7) securing the cover 8) first.
- ➤ Slip the thermal protection onto the blast tube 4)(Fig. 13).
- ➤ Place entire burner on the boiler hole (arranged previously, see Fig. 12), and fasten with the screws given as standard equipment.

WARNING

The coupling of the burner-boiler must be airtight.

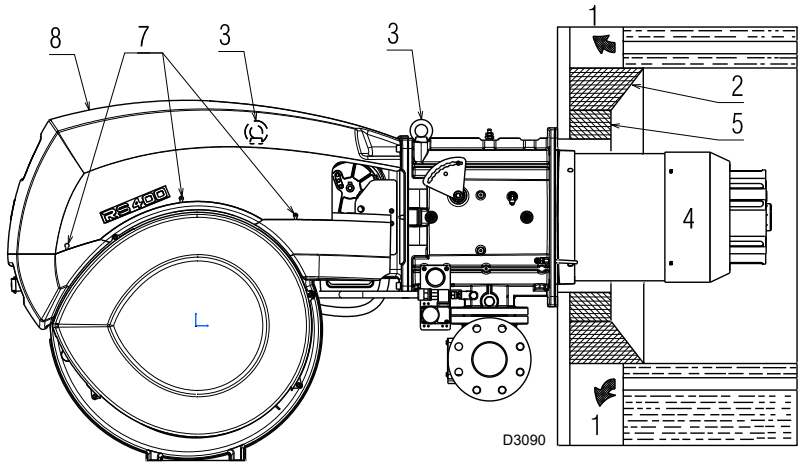


Fig. 13

4.8 Accessibility to the interior of the combustion head

- ➤ Open burner at hinge as illustrated in Fig. 14 after releasing the tie rod of the head movement lever 1) and removing the 4 fastening screws 2).
- ➤ Disconnect the wire 3) from the electrode.
- ➤ Disconnect the tube of ignition pilot 6).
- ➤ Unscrew the under part of the elbow 4) until it comes free of its slot.
- ➤ Extract the internal part 5) of the combustion head.

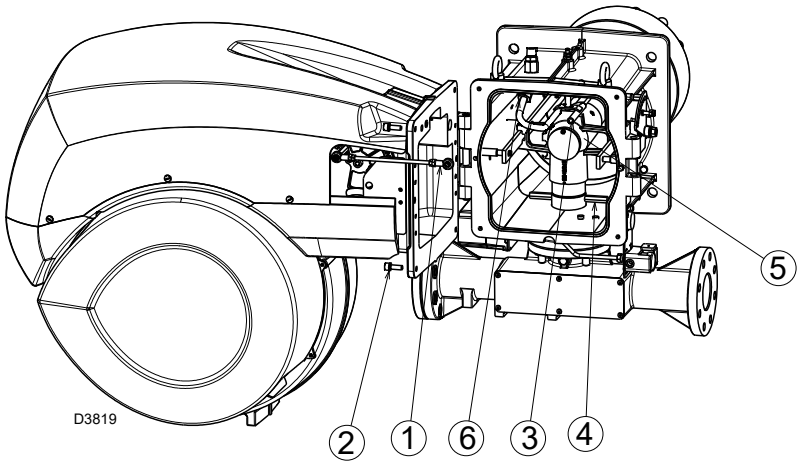


Fig. 14

4.9 Combustion head setting

In addition to varying air flow depending on the output requested, the air gate valve servomotor 4)(Fig. 5) 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. 15).

The choice of the hole (1-2-3) to be used is decided on the basis of diagram (Fig. 16) against the required maximum output.

Setting is pre-arranged in the plant for the maximum run (hole 3) (Fig. 15).

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. 16) do this by moving the tie rod onto the next highest index, thus increasing the combustion head's opening and hence air delivery.

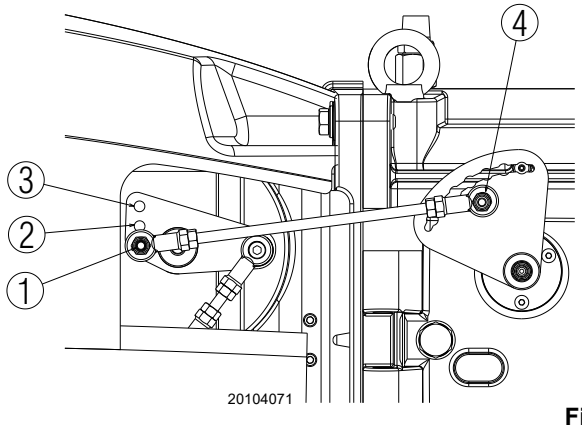


Fig. 15



Fig. 16

If combustion requirements require you to move spacer 1)(Fig. 17) 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. 17) 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.

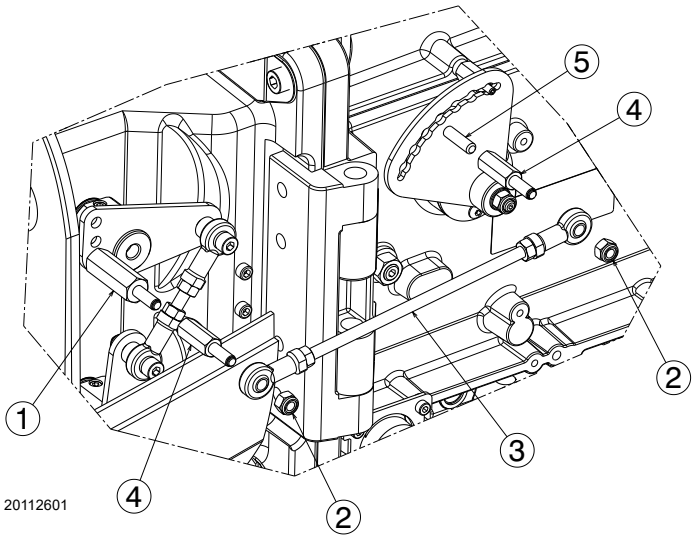


Fig. 17

4.10 Electrode and ignition pilot adjustment

Make sure that the electrode and the ignition pilot are positioned as shown in Fig. 18.

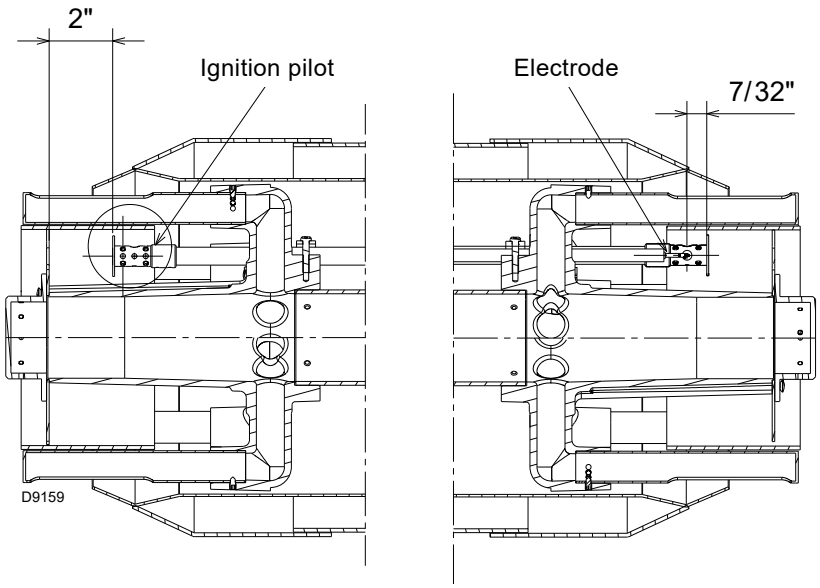


Fig. 18

4.11 Adjustment at the maximum output

The adjustment at the maximum output requires the disassembly of the 6 nozzles as indicated in Fig. 19.

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.

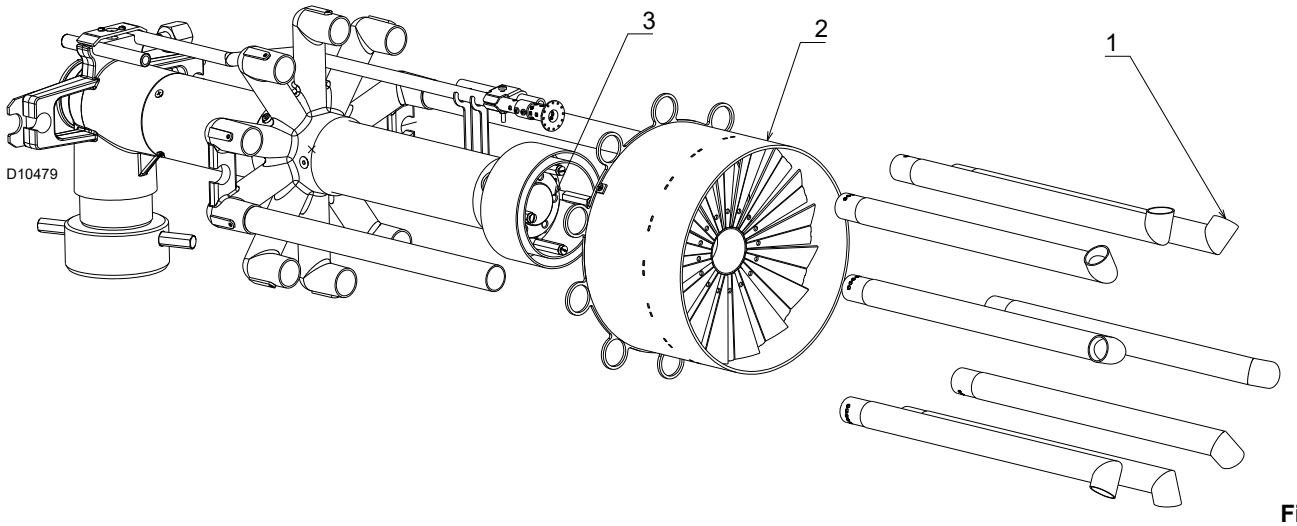


Fig. 19

4.12 Gas feeding



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

Precautions: avoid knocking, attrition, sparks and heat.

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



WARNING

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

The gas train is to be connected on the right of the burner, by flange 1)(Fig. 20).

If necessary:

- ➤ connect it on the left of the burner;
- ➤ 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.

Note

Once assembled the gas train, check for leaks.

4.12.1 Gas train

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



WARNING

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



Check that there are no gas leaks.



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



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



The operator must use the required equipment during installation.

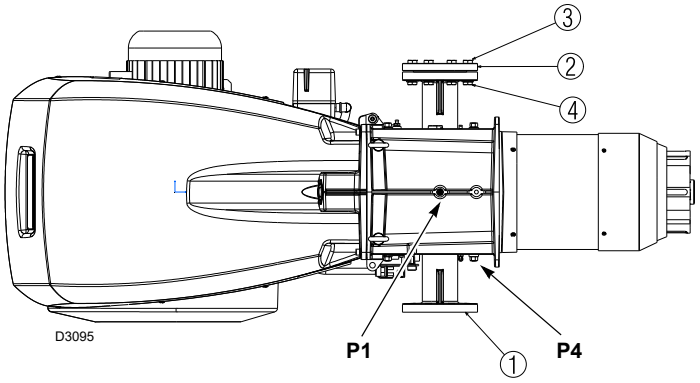


Fig. 20

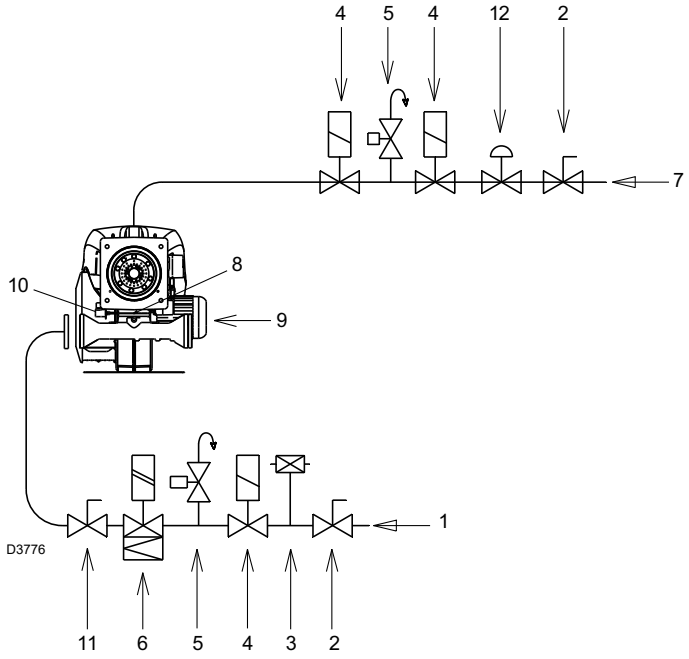


Fig. 21

Key to lay-out (Fig. 21)

1 Gas input pipe for main burner
2 Manual valve
3 Low 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 High gas pressure switch
11 Manual valve (for seal control)
12 Pilot regulator

4.12.2 Gas pressure

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

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

Column 1
Pressure loss at combustion head.
Gas pressure measured at the test point 1)(Fig. 22), with:
– combustion chamber at “WC;
– burner working at maximum output;
– combustion head adjusted as in the diagram of Fig. 16 at page 21.

Column 2
Pressure loss at gas butterfly valve 2)(Fig. 22) 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. 22);
– find, in the Tab. K relating to the burner concerned, the pressure value closest to the result of the subtraction;
– read off the corresponding output on the left.

Example RS 650/EV:
- Maximum output operation
- Gas pressure at test point 1)(Fig. 22) = 11.3 “WC
- Pressure in combustion chamber = 2 “WC

11.7 - 2 = 9.3 “WC

An output of 20830 MBtu/hr shown in Tab. K corresponds to 9.3 “WC pressure, column 1.
This value serves as a rough guide, the effective delivery must be measured at the gas meter.

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

	MBtu/hr (GCV)	1 Δp (“WC)	2 Δp (“WC)
RS 650/EV	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
RS 800/EV	13254	3.5	0.2
	15148	4.8	0.2
	18935	7.4	0.4
	22723	10.1	0.5
	26510	13.8	0.7
	30297	17.6	0.9
	30676	17.9	0.9

Tab. K

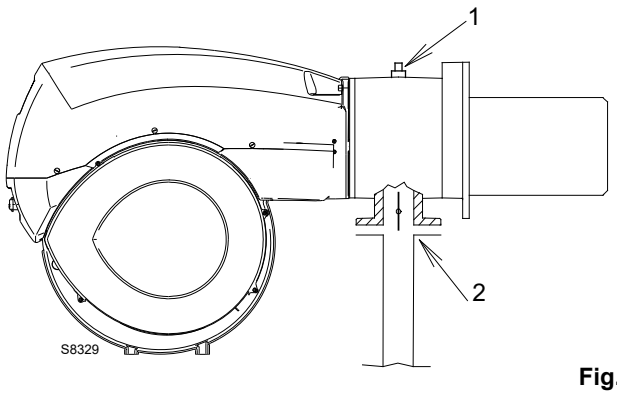


Fig. 22

4.13 Electrical wiring

Notes on safety for the electrical wiring

- ➤ 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.

4.13.1 Supply cables and external connections passage

All the cables to be connected to the burner are fed through the grommets (Fig. 23).

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

1 Three phase power supply with 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

WARNING

The control panel is in compliance with UL508A.

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

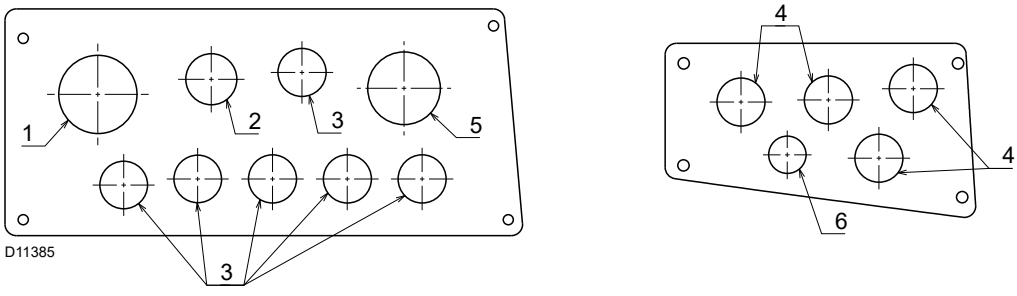


Fig. 23

4.13.2 Cable shielding

WARNING

It is very important to shield the motor cable 1) as shown in Fig. 24.

Key (Fig. 24)
1 Motor supply cable
2 Single phase supply cable

4.13.3 Other connection

1 The connection from the Inverter to LMV52.... must be done as shown in Fig. 25.
2 The connection from the speed sensor to LMV52.... must be done as shown in Fig. 25
3 Possible pressure/temperature probes and O_2 sensor connection must be done as shown in Fig. 25.

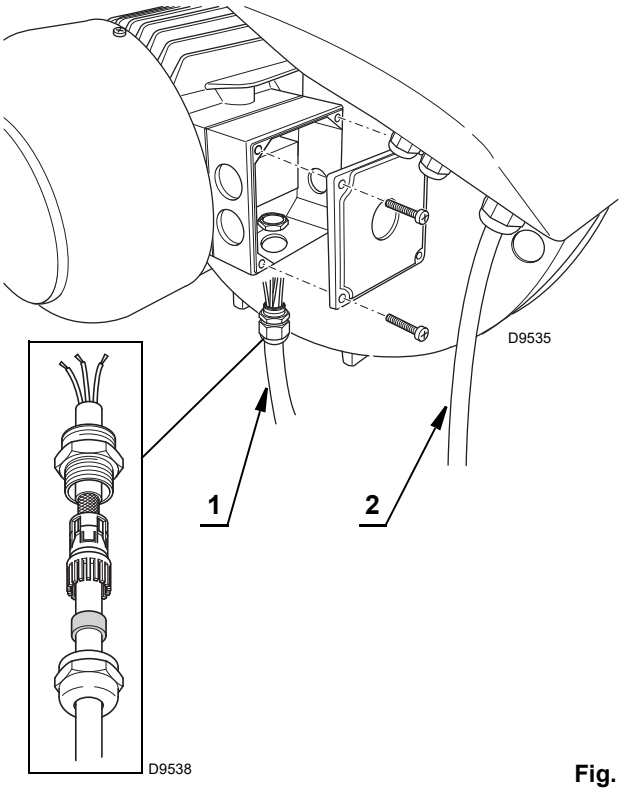


Fig. 24

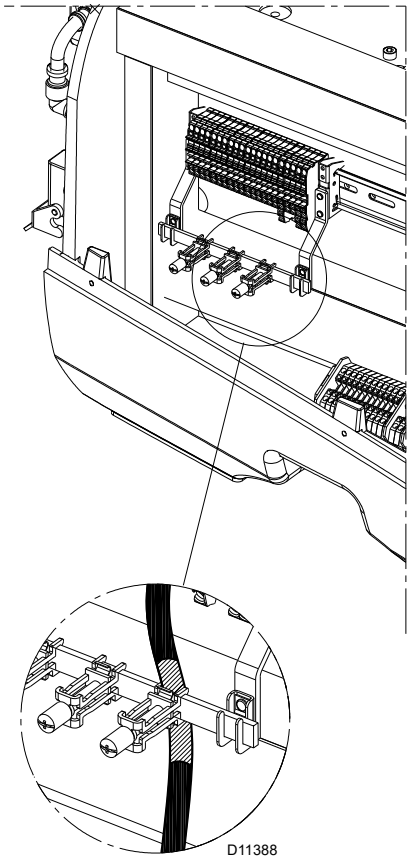


Fig. 25

4.13.4 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

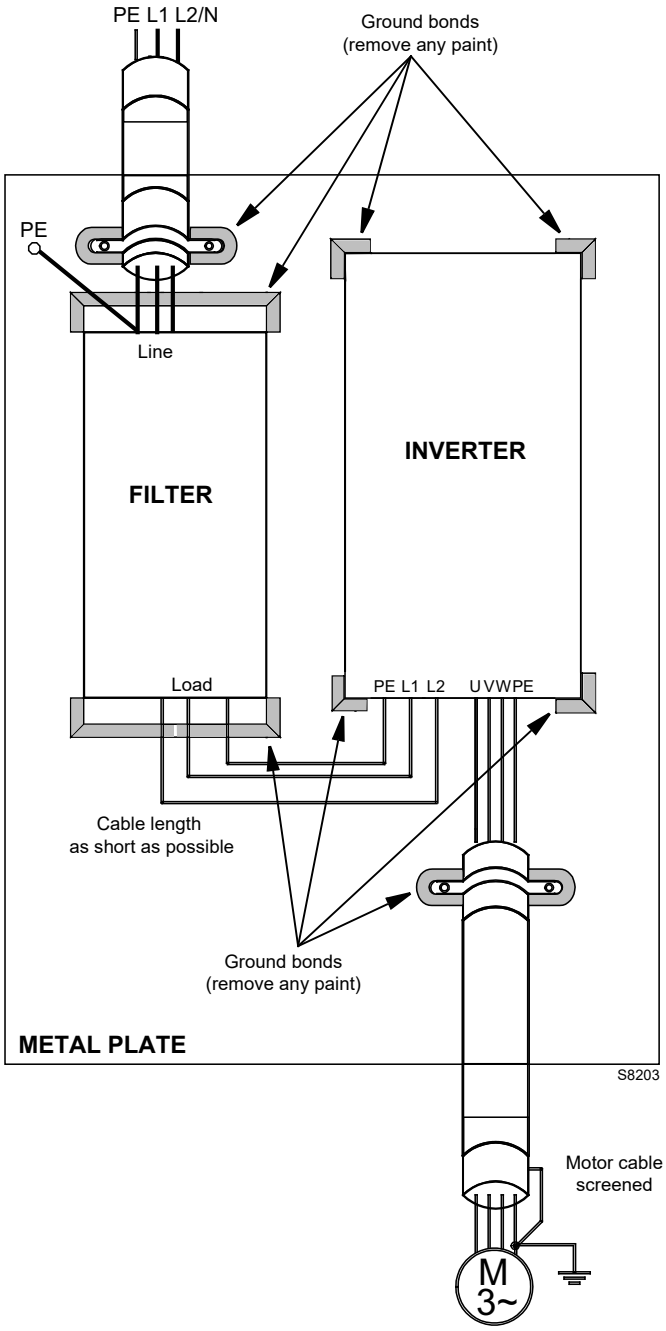


Fig. 26

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).

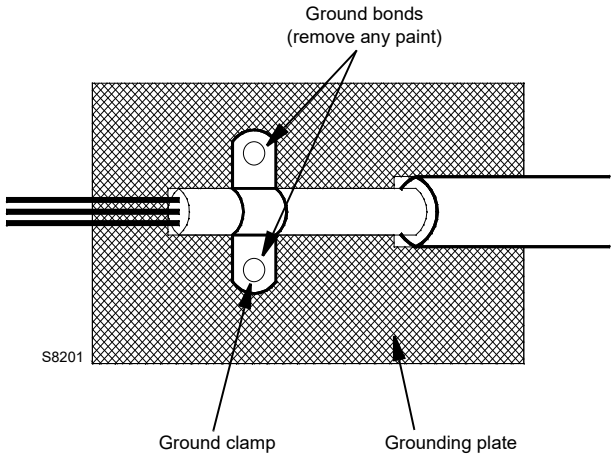


Fig. 27

Examples:

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

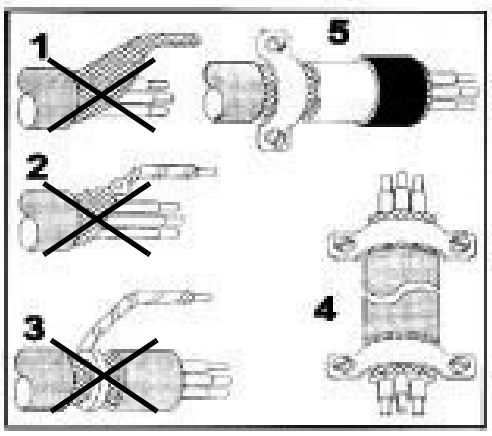


Fig. 28

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 33 before the first start-up.

5.2 Adjustments before first firing

Adjustment of the combustion head has been illustrated on pag. 21.

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. 35 at page 31) to the start of the scale.
- ➤ Adjust the max gas pressure switch (Fig. 34 at page 31) to the upper limit of the scale.
- ➤ Adjust the air pressure switch (Fig. 33 at page 31) to the zero position of the scale.
- ➤ Fit a U-type manometer (Fig. 29) to the gas pressure test point on the sleeve.
  The manometer readings are used to calculate MAX. burner power using the diagrams on page xx.

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.

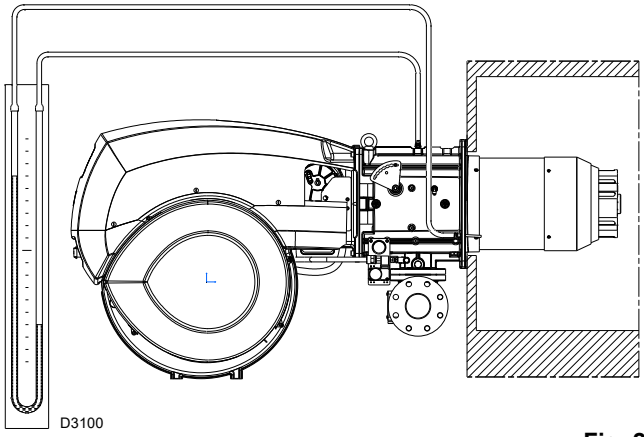


Fig. 29

5.3 Burner firing

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

- ➤ Set switch to "LOCAL" (Fig. 30).

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 pag. 22. Having adjusted the pilot, reconnect the main valve and ignite the main flame; it might require several attempts to purge the air from the gas lines or to adjust the valve with little gas.

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



Fig. 30

5.4 Burner start-up

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

Close the thermostats/pressure switches.

Close the thermostats/pressure switches and turn the switch of Fig. 31 to position “LOCAL”.



DANGER

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

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



WARNING

When the burner starts, check the direction of the motor rotation, as indicated in Fig. 31.

If the burner is not equipped with a device to check the phases sequence, the motor could rotate incorrectly.

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. 31 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.

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

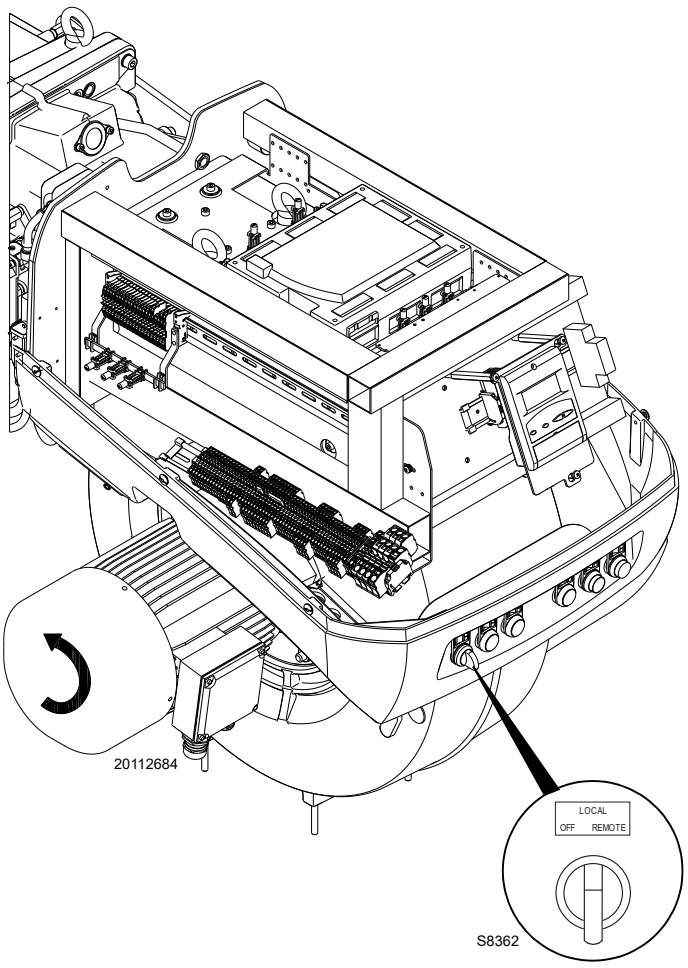


Fig. 31

5.5 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.

5.5.1 Air adjustment for maximum output

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

➤ Loosen screw 2)(Fig. 32) under the burner's intake and close grille 1) progressively until you achieve the required output.

The only time reducing intake to a partial setting is not necessary is when the burner is working at the top of the operating range given in Fig. 16.

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.

5.5.2 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.

5.5.3 Air/fuel control and power modulation system

The air/fuel and power modulation system installed on **RS** 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.

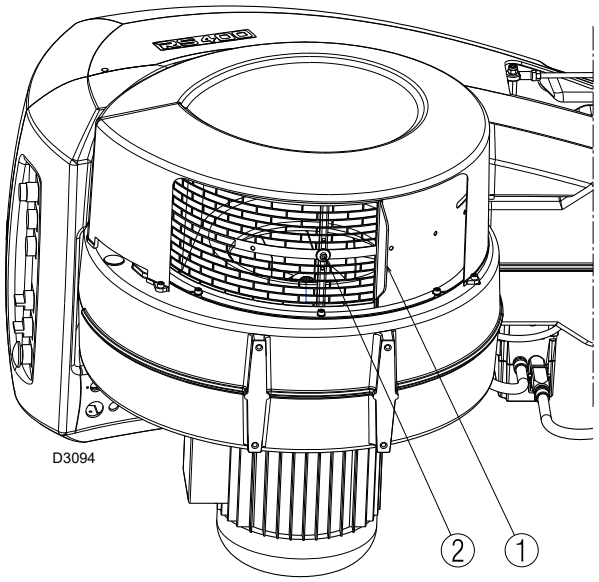


Fig. 32

5.6 Final calibration of the pressure switches

5.6.1 Air pressure switch

Adjust the air pressure switch (Fig. 33) 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%.

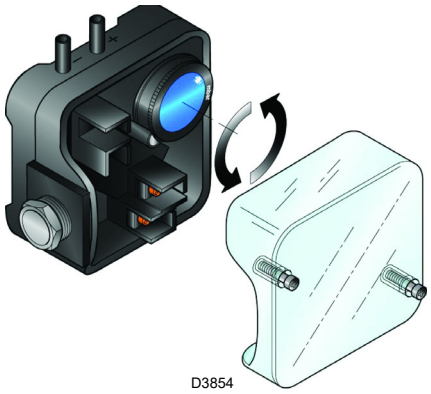


Fig. 33

5.6.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 34) 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.

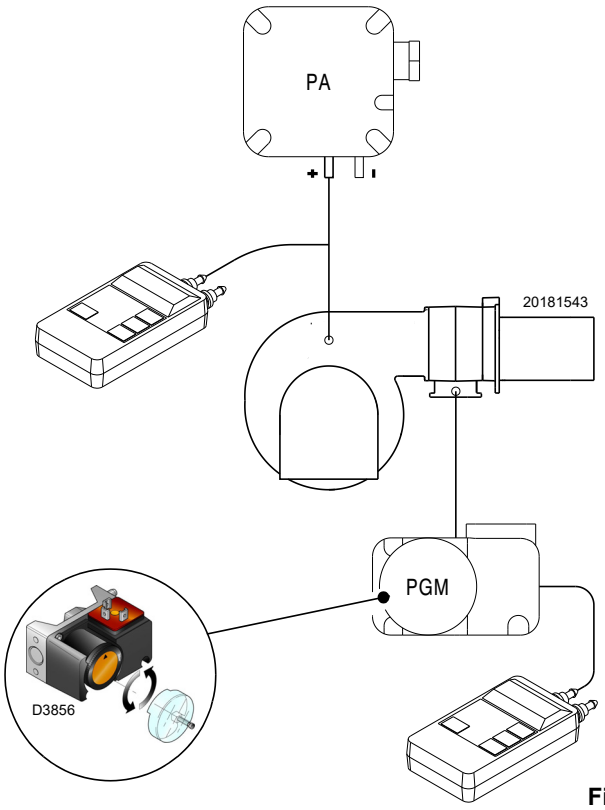


Fig. 34

5.6.3 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. 35) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

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

WARNING

1 kPa = 10 mbar

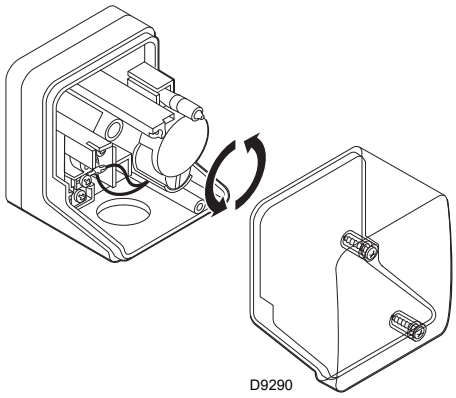


Fig. 35

5.7 Final checks (with the burner working)

➤ Open the control limit operation ➤ Open the high limit operation	⇨	The burner must stop
➤ Rotate the maximum gas pressure switch knob to the minimum end-of-scale position ➤ Rotate the air pressure switch knob to the maximum end of scale position ➤ Rotate the maximum oil pressure switch at the minimum of the scale	⇨	The burner must stop in lockout
➤ Switch off the burner and disconnect the voltage ➤ Disconnect the minimum gas pressure switch ➤ Rotate the minimum low oil pressure switch at the maximum of the scale	⇨	The burner must not start
➤ Cover the flame sensor	⇨	The burner must stop in lockout due to firing failure

Tab. L



WARNING

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

6 Maintenance

6.1 Notes on safety for the maintenance

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

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


DANGER

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

Before carrying out any maintenance, cleaning or checking operations:


DANGER

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


DANGER

Close the fuel interception tap.



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

6.2 Maintenance programme

6.2.1 Maintenance frequency



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

6.2.2 Safety test - with gas ball valve closed

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

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

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

The start-up cycle must be as follows:

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

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

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


WARNING

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

6.2.3 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion

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 the components of the combustion head are:

– undamaged
– not deformed due to high temperature
– free of ambient dirt or dust
– free of rusted materials
– adequately positioned

Make sure that the gas outlet holes for the start-up, on the combustion head distributor, are free of dirt or rust deposits.
In case of doubt, disassemble the elbow.

Measurement of flame sensor current

Measurement of the sensor's signal (Fig. 36) 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 voltometer with a 10 Vdc scale, connected as illustrated in Fig. 36.

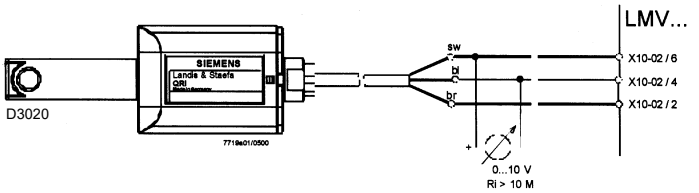


Fig. 36

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.

Gas leaks

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

Gas filter

Replace the gas filter when it is dirty.

Combustion

Adjust the burner if the combustion values found at the beginning of the operation do not comply with the regulations in force or, at any rate, do not produce good combustion. Use the appropriate card to record the new combustion values; they will be useful for subsequent controls.

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 Adjustment fan motor covering with external rpm

To calibrate the rpm sensor 6)(Fig. 37), proceed as follows:
- ➤ remove the cover 1) unscrewing the screws 2);
- ➤ unscrew or screw the nuts 3) - 5) and the rpm detection disc 4) so that its distance from the rpm sensor 6) is about 2 mm.;
- ➤ place the plate 4) on the nut 5) and fix with the lock nut 3);
- ➤ close the cover 1) by screwing the screws 2).

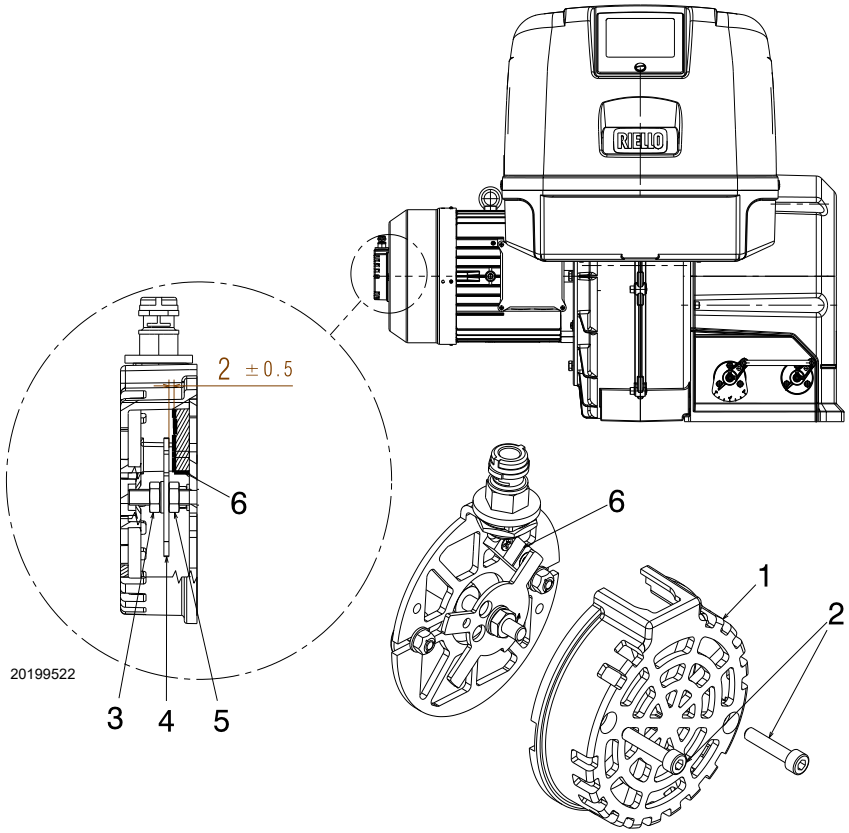


Fig. 37

Key (Fig. 37)
1 - Cover
2 - Screws for cover fixing
3 - Lock nut
4 - Rpm detection disc
5 - Lower nut
6 - Rpm sensor

6.4 Opening the burner

DANGER

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

DANGER

Close the fuel interception tap.

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

➤ Remove the tie rod 1)(Fig. 38) 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.

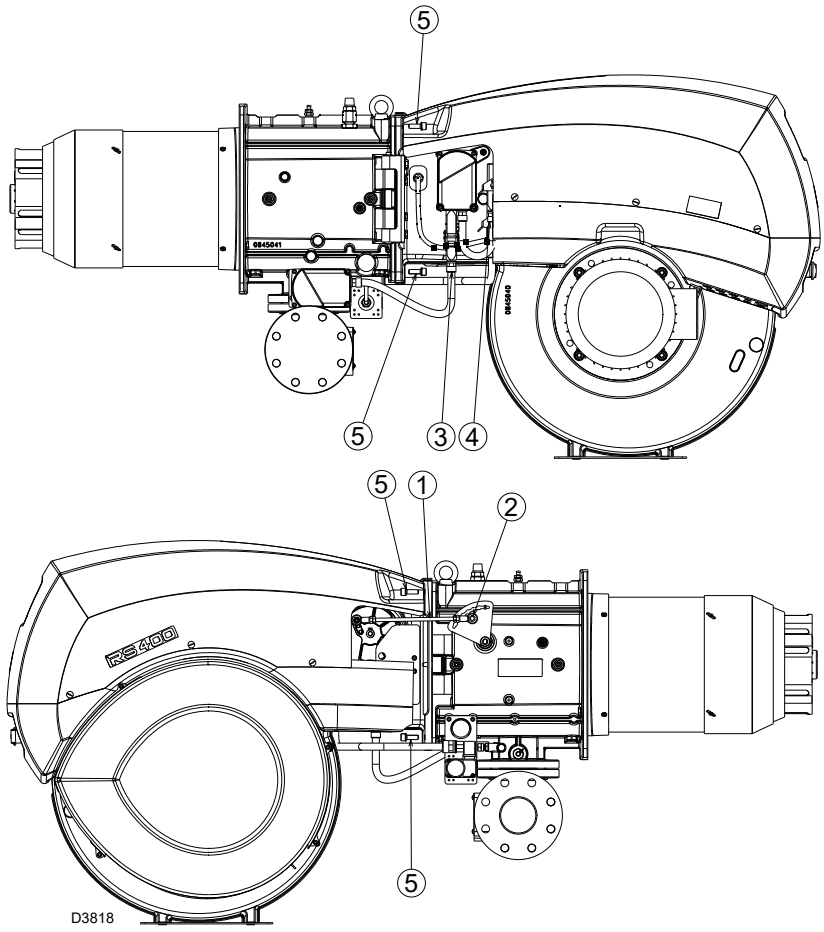


Fig. 38

6.5 Closing the burner

➤ Close the burner at the hinge.
➤ Apply screw 5)(Fig. 38).
➤ 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.

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

7 Faults - Possible causes - Solutions

If faults arise in ignition or operations, the burner performs a “safety stop”, which is signalled by the red burner lockout LED.

The display visualises alternately the lockout code and the relative diagnostic. To reset the start-up conditions, refer to the “Reset procedure” indicated in the control box manual supplied.

When the burner starts again, the red LED goes out and the control box is reset.



WARNING

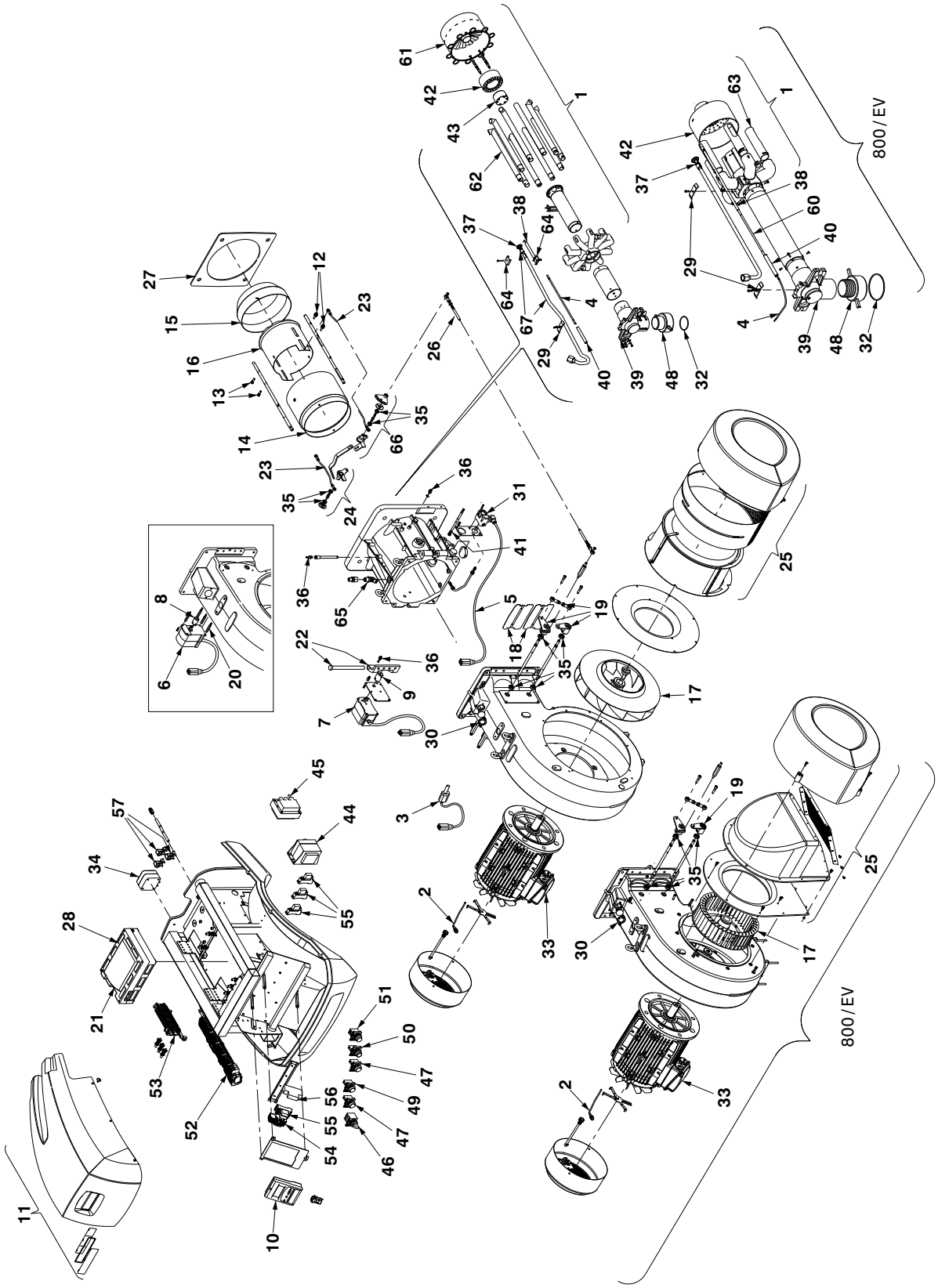
In the event of a burner lockout, more than two consecutive burner reset operations could cause damage to the installation. On the third lockout, contact the Aftersales Service.



DANGER

If further lockouts or burner faults occur, interventions must only be made by qualified, authorised personnel (as indicated in this manual, and in compliance with the laws and regulations currently in force).

A Appendix - Spare parts



N.	CODE	20101135	20101140	20113385	DESCRIPTION	*
1	**20136959**	•			GAS HEAD	
1	**3013966**		•	•	GAS HEAD	
2	**20201481**	•	•	•	MOTOR REVOLUTION SENSOR	C
3	**3013279**	•	•	•	FLAME SENSOR	
4	**3013794**	•			HIGH VOLTAGE LEAD	A
4	**20014102**		•	•	HIGH VOLTAGE LEAD	A
5	**20013931**	•	•	•	PRESSURE SWITCH CONNECTION	C
6	**20029137**	•	•	•	SERVOMOTOR	
7	**3013253**	•	•	•	SERVOMOTOR	
8	**3013307**	•	•	•	JOINT	
9	**3013308**	•	•	•	JOINT	
10	**3013283**	•	•	•	DISPLAY	C
11	**20013115**	•	•	•	COVER	
12	**20038376**	•	•	•	SCREW	
13	**20038375**	•	•	•	SCREW	
14	**20026703**	•			SLEEVE	
14	**3013959**		•	•	SLEEVE	
15	**20026702**	•			END CONE	B
15	**20103645**		•	•	END CONE	B
16	**20038374**	•			SHUTTER	C
16	**20114287**		•	•	SHUTTER	C
17	**20041011**	•			FAN	C
17	**20158250**		•	•	FAN	C
18	**3013319**	•			AIR DAMPER	
18	**20110749**		•	•	AIR DAMPER	
19	**20105802**	•	•	•	LEVER ASSEMBLY	
20	**20109954**	•	•	•	STUD	
21	**3006211**	•	•	•	FUSE 6,3 A	
22	**3013960**	•	•	•	HINGE	
23	**3013324**	•	•	•	TIE ROD	
24	**20142775**	•			LEVER ASSEMBLY	
24	**20114283**		•	•	LEVER ASSEMBLY	
25	**3013326**	•			AIR INTAKE ASSEMBLY	
25	**3013961**		•	•	AIR INTAKE ASSEMBLY	
26	**3013327**	•	•	•	TIE ROD	
27	**20011117**	•			FLANGE GASKET	A
27	**3013956**		•	•	FLANGE GASKET	A
28	**20014365**	•	•	•	ELECTRONIC CAM	C
29	**20075359**	•			U BOLT	
29	**20103872**		•	•	U BOLT	
30	**20114016**	•	•	•	VIEWING PORT	C
31	**20014103**	•	•	•	GAS PRESSURE SWITCH	B
32	**3007002**	•	•	•	SEAL	B
33	**20042611**	•			MOTOR	
33	**20201358**		•		MOTOR	
33	**20042615**			•	MOTOR	
34	**20014073**	•	•	•	AIR PRESSURE SWITCH	A
35	**3012795**	•	•	•	BEARING	C
36	**3005447**	•	•	•	PRESSURE TEST POINT	C
37	**20033305**	•	•	•	GAS DIFFUSER	
38	**20050435**	•			ELECTRODE	A
38	**20014076**		•	•	ELECTRODE	A
39	**20152210**	•	•	•	ELBOW	
40	**20013160**	•	•	•	INSULATOR	A
41	**3007029**	•	•	•	O-RING	B
42	**20011151**	•			AIR DIFFUSER	A
42	**3013955**		•	•	AIR DIFFUSER	A
43	**20026705**	•			PLUG	
44	**3013284**	•	•	•	TRANSFORMER	B
45	**3012956**	•	•	•	TRANSFORMER	B
46	**20010963**	•	•	•	SWITCH	C
47	**20036017**	•	•	•	GREEN SIGNAL LIGHT	A
48	**3014116**	•	•	•	CONTROL WHEEL	

N.	CODE	20101135	20101140	20113385	DESCRIPTION	*
49	**20027014**	•	•	•	WHITE SIGNAL LIGHT	A
50	**20010962**	•	•	•	BUTTON	
51	**3013354**	•	•	•	BUTTON	
52	**20043420**	•	•	•	TERMINAL STRIP	
53	**20144562**	•	•	•	TERMINAL STRIP	
54	**20043421**	•	•	•	TERMINAL STRIP	
55	**3020128**	•	•	•	BASE + RELAY	C
56	**20014366**	•	•	•	FUSE HOLDER	
57	**3013363**	•	•	•	7 POLE SOCKET	C
60	**3013907**		•	•	CONNECTION	
61	**20011119**	•			DISC HOLDER	
62	**20061670**	•			TUBE	
63	**20018826**		•	•	TUBE	
64	**20159557**	•			SUPPORT FOR ELECTRODE PILOT	
65	**20033240**	•			CONNECTOR	
66	**20123147**	•			LEVER ASSEMBLY	
67	**20189690**	•			PILOT TUBE	

*

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:

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:					

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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