GB

Forced draught gas burner

Modulating operation

CODE	MODEL
20211360	RS 1200/EV

20210313 (3) - 07/2025



Original instructions

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1 Information and general instructions

1.1 Information about the instruction manual

1.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

1.1.2 General dangers

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



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



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



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

1.1.3 Other symbols



DANGER: LIVE COMPONENTS

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



DANGER: FLAMMABLE MATERIAL

This symbol indicates the presence of flammable materials.



DANGER: BURNING

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



DANGER: CRUSHING OF LIMBS

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



WARNING: MOVING PARTS

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



DANGER: EXPLOSION

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



PERSONAL PROTECTION EQUIPMENT

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



OBLIGATION TO ASSEMBLE THE 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 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 users expressly named by the manufacturer;

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

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

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

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

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



WARNING

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 1200/EV
Output(1)	High	kW	5500 - 11100
		MBtu/hr	18766 - 37873
	Low	kW	1500
		MBtu/hr	5118
Fuel			Natural gas
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 (2)		dBA	99
Burner weight (complete with packaging)		lbs	644

Tab. A

(1) Reference conditions: Ambient temperature 68 °F (20 °C) - Barometric pressure 394” wc - Altitude 329 ft.
(2) Sound pressure measured in manufacturer’s combustion laboratory, with burner operating on test boiler and at maximum rated output.

3.2 Electrical data

Model		RS 1200/EV
Control circuit power supply	V/Ph/Hz	120/1/60
Main power supply (+/- 10%)	V/Ph/Hz	460/3/60
Electrical power consumption	kW	32
Electrical control circuit consumption	kW max	0.75
Total electrical consumption	kW	33
Electrical protection		NEMA 1

Tab. B

3.3 Burner models designation

Model	RIELLO Code	RBNA Code	Voltage	Fan Motor Starting	Flame safeguard
RS 1200/EV	20210162	20211360	460/3/60	Inverter	Burner Mounted

Tab. C

3.4 Overall 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 maximum dimensions of the open burner are indicated by the L and R positions.

The B position is reference for the refractory thickness of the boiler door.

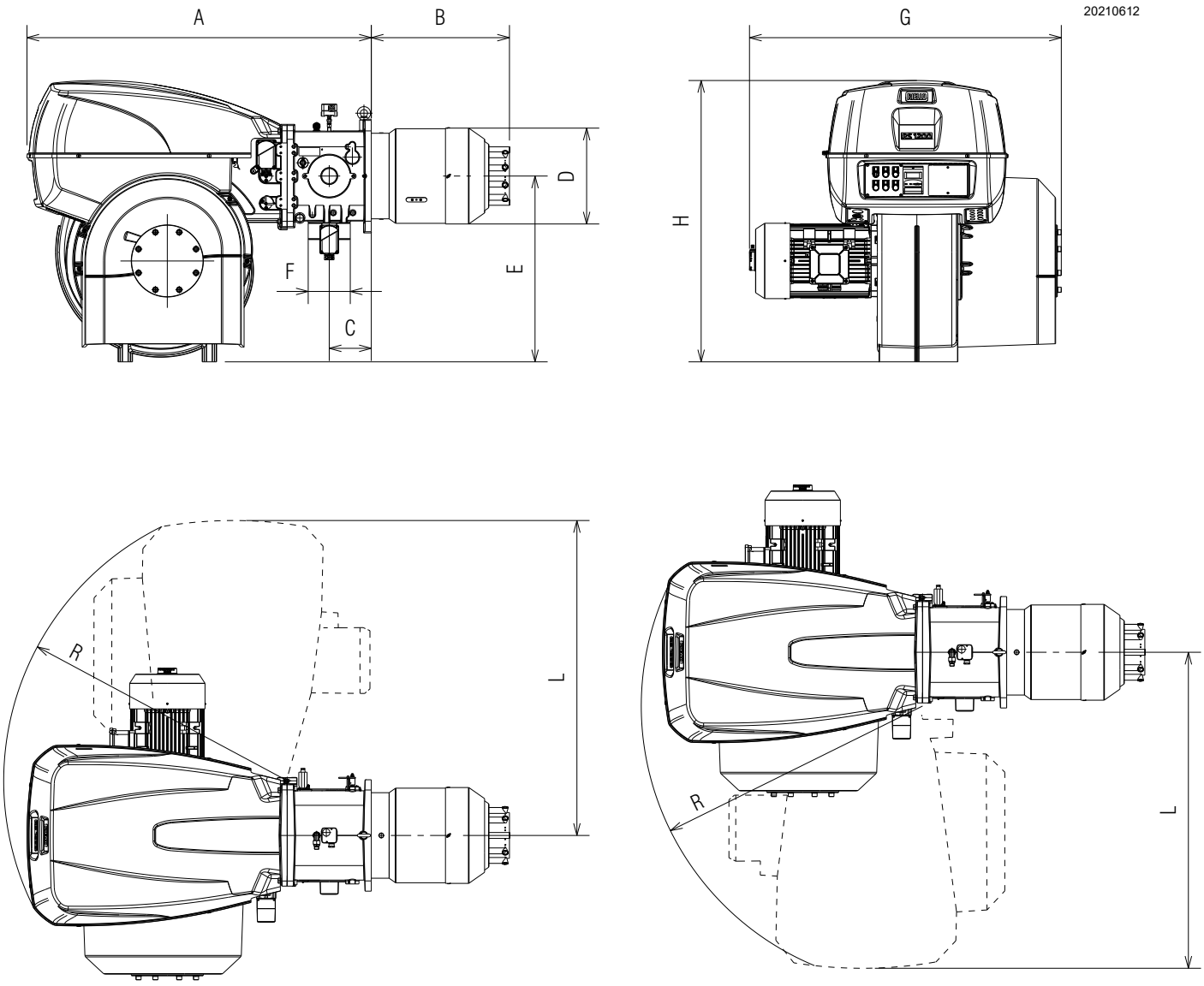


Fig. 1

inch	A	B	C	D	E	F	G	H	L	R
RS 1200/EV	64 15/32“	25 29/32“	7 7/8“	17 61/64“	34 51/64“	DN80	58 9/32“	51 31/32“	58 25/32“	52 23/64“

Tab. D

3.5 Burner capacity

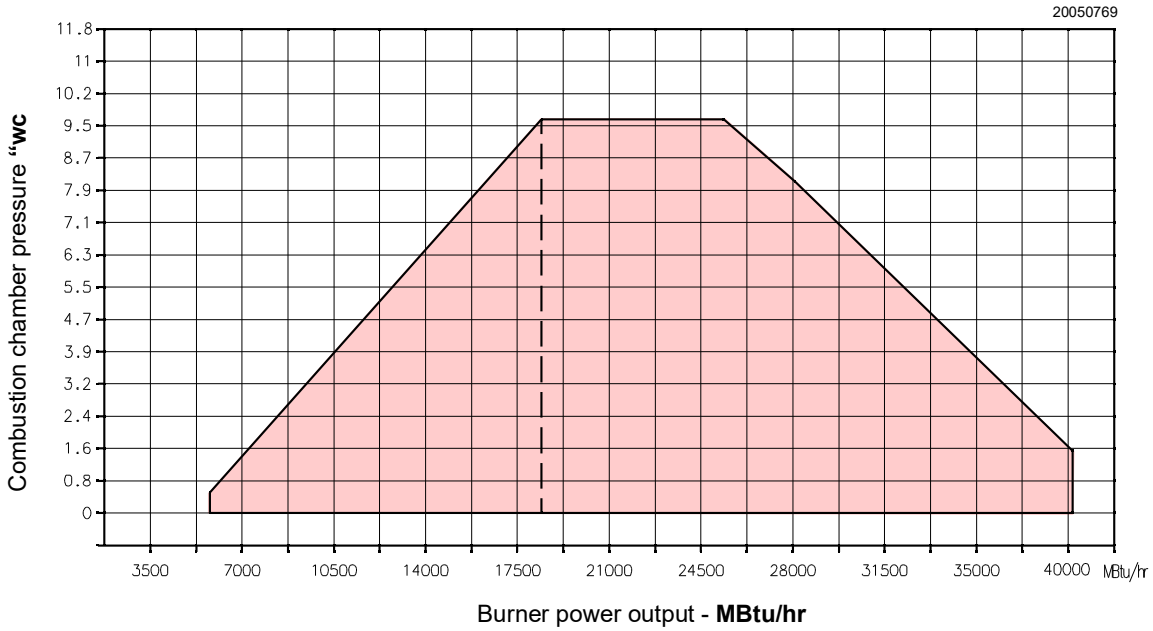


Fig. 2

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

				AIR TEMPERATURE								
Altitude	Altitude	bar. press.	bar. press.	**0**	**5**	**10**	**15**	**20**	**25**	**30**	**40**	**°C**
ft a.s.l.	m a.s.l.	"w.c.	mbar	**32**	**41**	**50**	**59**	**68**	**77**	**86**	**104**	**°F**
0	0	399	1013.00	1.087	1.068	1.049	1.031	1.013	0.996	0.980	0.948	
328	100	394	1000.00	1.073	1.054	1.035	1.017	**1.000**	0.983	0.967	0.936	
1.000	305	385	977.40	1.049	1.030	1.012	0.994	0.977	0.961	0.945	0.915	
2.000	610	371	942.80	1.012	0.994	0.976	0.959	0.943	0.927	0.912	0.883	
3.000	915	358	908.20	0.975	0.957	0.940	0.924	0.908	0.893	0.878	0.850	
4.000	1.220	345	875.80	0.940	0.923	0.907	0.891	0.876	0.861	0.847	0.820	
5.000	1.525	332	843.50	0.905	0.889	0.873	0.858	0.844	0.829	0.816	0.790	
6.000	1.830	320	811.85	0.871	0.856	0.841	0.826	0.812	0.798	0.785	0.760	
7.000	2.135	307	779.80	0.837	0.822	0.807	0.793	0.780	0.767	0.754	0.730	
8.000	2.440	294	747.80	0.803	0.788	0.774	0.761	0.748	0.735	0.723	0.700	

Tab. E

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

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

3.6 Minimum furnace dimensions

The firing rate was obtained in special test boilers.
Fig. 3 indicates the diameter and length of the test combustion chamber.

Example:
Output 26510 Mbtu/hr: - diameter 47.7 inch - length 20 ft.

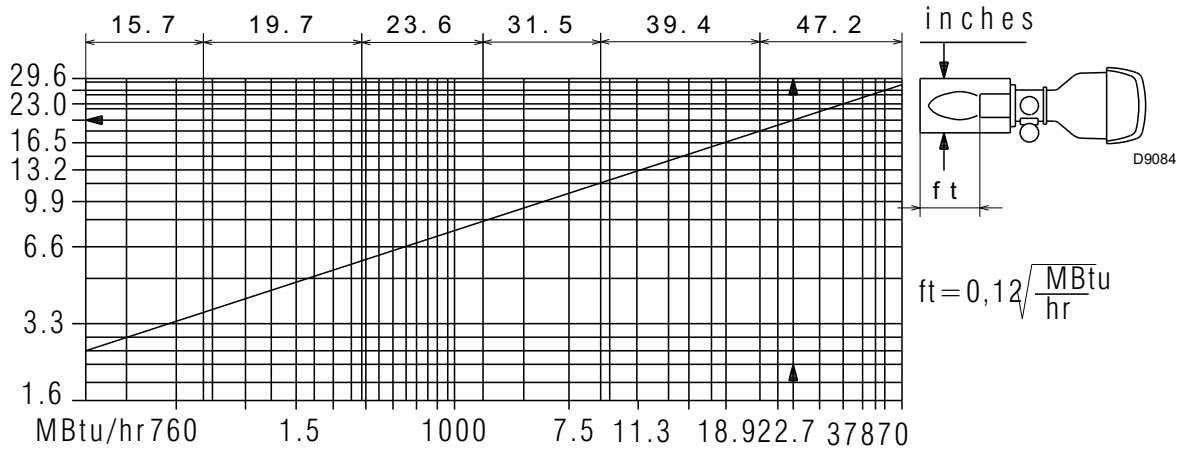


Fig. 3

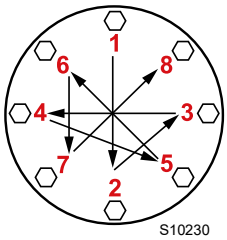
3.7 Burner equipment

The burner is supplied complete with:

Flange gasket . . . . . No. 1
Gas adapter . . . . . No. 1
Gas pipe . . . . . No. 2
Installation, use & maintenance instruction . . . . . No. 1

WARNING

It is recommended to tighten the screws of the gas flange with a tightening torque of
– (DN80) **40** Nm ±10%;
– (DN 100) **50** Nm ±10%;
– (DN 125) **60** Nm ±10%.



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

3.8 Burner components

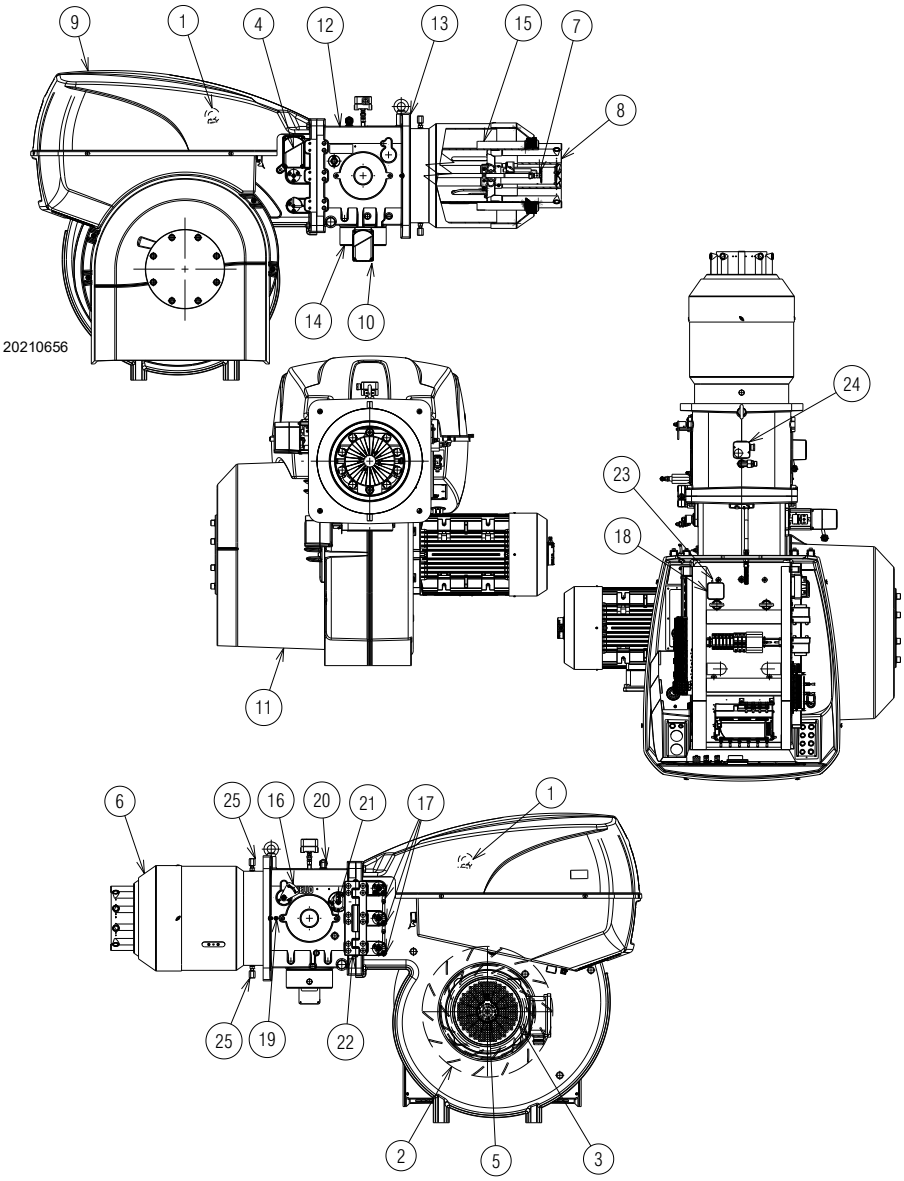


Fig. 4

1 Lifting eyebolts
2 Fan
3 Fan motor
4 Air gate valve servomotor
5 Speed sensor
6 Combustion head
7 Ignition pilot
8 Flame stability disk
9 Electric panel board - cover
10 Servomotor for gas butterfly valve
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 internal air diffuser
17 Tie rods for air damper movement
18 Air pressure switch
19 Air pressure test point
20 Ignition pilot attachment
21 QRI flame sensor
22 Hinge for opening burner
23 Air pressure test point pressure “+”
24 Maximum methane pressure switch with pressure test point
25 Locking bars for the shutter during the transportation (substitute with the two M12x16 screws supplied with the burners)

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.

3.9 Panel board description

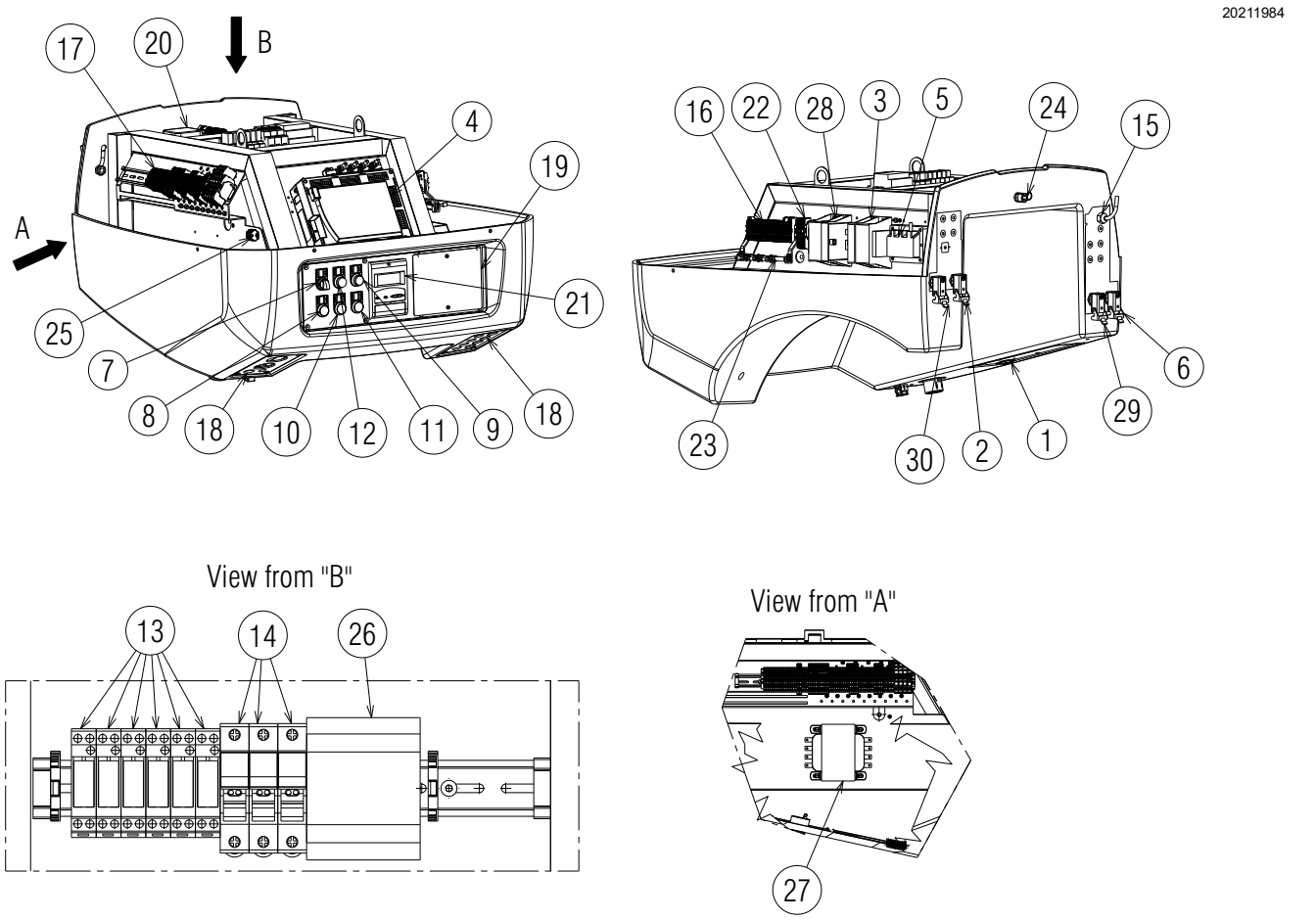


Fig. 5

1 Horn
2 Plug/socket for air servomotor
3 Flame control transformer “T1”
4 Flame control
5 Ignition transformer “TA”
6 Plug/socket for QRI flame sensor
7 “OFF - LOCAL - REMOTE” switch
8 “POWER ON” signal
9 “ALARM SILENCE” button
10 “CALL FOR HEAT” signal
11 “IGNITION ON” signal
12 “Burner lock-out and reset” push button
13 Auxiliary relays
14 Auxiliary fuse
15 Electric joint for air pressure switch pipe
16 “X2” terminal strip
17 “X1” burner terminal board
18 Holes for cables grommets for electrical wirings, accessories and power supply (to be carried out by the installer)
19 Operator panel with LCD display (Customer installation)
20 Low air pressure switch
21 Operator panel with LCD display
22 “XAUX” terminal strip
23 Bracket for shielded cables
Warning: used only to avoid a break in the cable’s shielding, hence do not overtighten.
24 Electric joint for ignition cable
25 Speed sensor terminal strip “X70”
26 Display transformer (available)
27 Step-down transformer (available)
28 “T2” Additional transformer
29 Plug/socket for maximum gas pressure switch
30 Plug/socket for gas servomotor

A type of burner failure may occur:

➤ **Flame safeguard lock-out**
If the flame safeguard alarm 12)(Fig. 5) lights up, it indicates that the burner is in lock-out. To reset, press the reset push-button.

WARNING

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

3.10 AZL display...

Warnings

WARNING

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

The AZL... display is a safety device! Avoid opening or modifying it, or forcing its operation. Riello S.p.A. cannot assume any responsibility for damage resulting from unauthorised interventions!

The electronic cam is operated and programmed through the AZL5 interface... or with the aid of a PC.

The AZL5 has a backlit LCD display with clear reading of the menu text and diagnostics.

The Modbus function of the AZL display integrates the electronic cam LMV5 and through data management allows the diagnostic of the burner.

The display shows the operating status, the types of errors and lockouts. Used to parametrize and monitor data.



S9232

Fig. 6

Technical data

Operating voltage	AC 24 V - 15% / +10%
Power consumption	< 5W (typical)
Protection level of the container – Rear – Front	 IP00 according to IEC 529 IP54 according to IEC 529 (if installed)
Safety class	I with parts II and III according to DIN EN 60730-1
Battery - Manufacturer:	**Type reference:**
VARTA DURACELL SANYO ELECTRIC, Osaka/ Japan RENATA AG, Itingen/CH	CR 2430 (LF-1/2 W) DL 2430 CR 2430 (LF-1/2 W) CR 2430

Tab. F

3.11 Flame control (LMV52...)

Warnings

WARNING

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

The flame control is a safety device! Avoid opening or modifying it, or forcing its operation. Riello S.p.A. cannot assume any responsibility for damage resulting from unauthorised interventions!

Risk of explosion!

An incorrect configuration can provoke fuel overcharging, with the consequential risk of 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 interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- ➤ Before modifying the wiring in the flame control connection area, fully disconnect the system from the power supply (omnipolar separation). Check the system is not powered and cannot be accidentally reconnected. Failure to do this will lead to the risk of electrocution.
- ➤ Protection against electrocution from the flame control and all connected electric components is obtained with correct assembly.
- ➤ Before any intervention (assembly and installation operations, assistance, etc.), ensure the wiring is in order and that the parameters are correctly set, then make the safety checks.
- ➤ Falls and collisions can negatively affect the safety functions. In this case, the flame control must not be operated, even if it displays no evident 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. As for automatic operation, the actuators are guided together to the positions requested and, if an actuator does not reach the position requested, adjustments are made until the position is actually 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 absolutely important to set the fuel / air ratio control system. During the time the fuel / air ratio curves are being programmed, the person making the plant settings must continuously monitor the quality of the combustion process (e.g. by means of a flue gas analyser). 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 flame control, the following instructions must also be followed:

– avoid conditions that can favour the development of condensate and humidity. Otherwise, before switching on again, make sure that the entire flame control is perfectly dry!
– Static charges must be avoided since they can damage the flame control's electronic components when touched.



D9301

Fig. 7

Mechanical structure

The flame control is a system to check the burners, based on a microprocessor and equipped with components to adjust and monitor medium and large capacity forced draught burners.
The base flame control incorporates the following components:

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

Electrical connection of ionization probe and flame detector

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

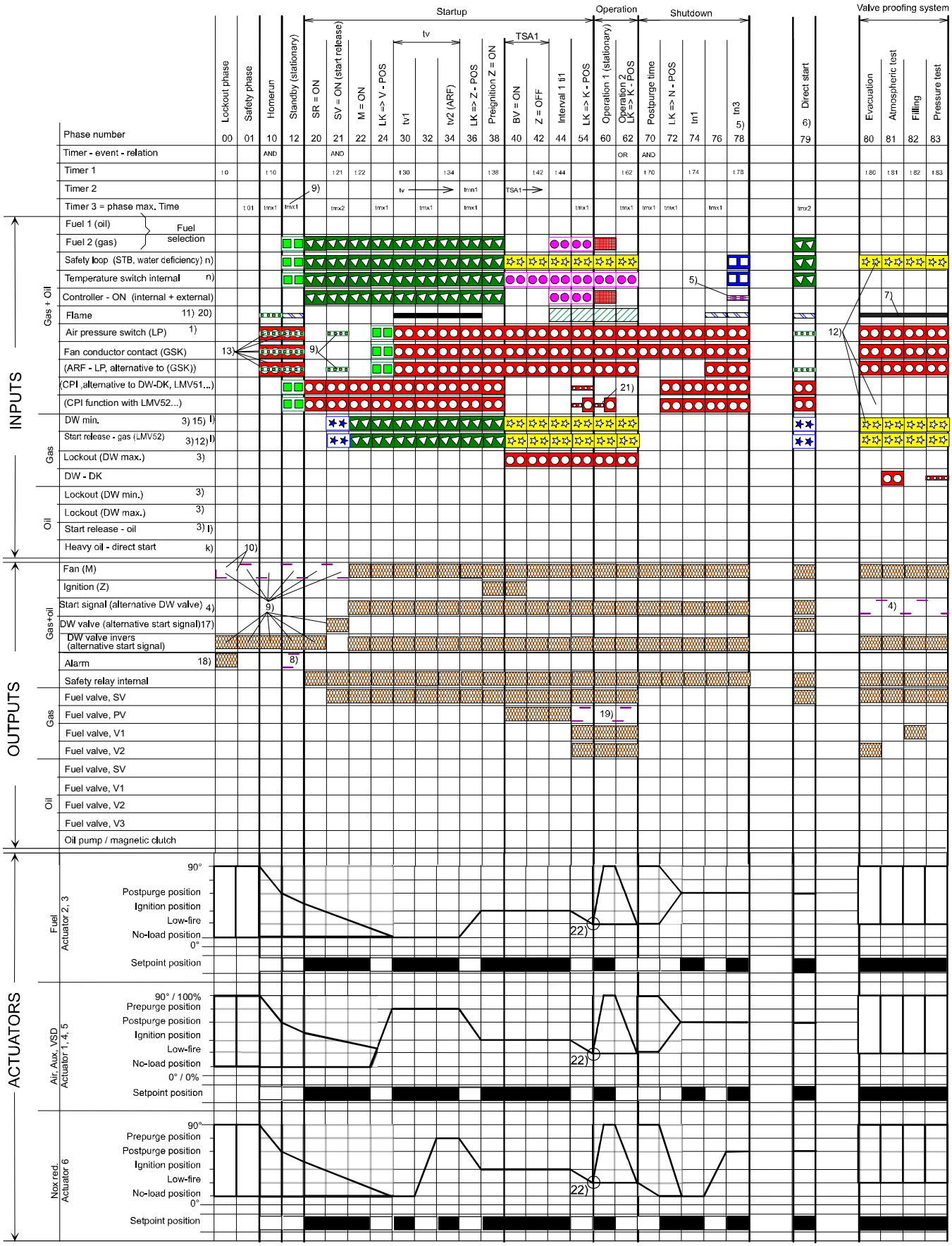
- Never run the detector cables together with other cables:
  – Line capacitance reduces the magnitude of the flame signal.
  – Use a separate cable.
- Observe the permissible cable lengths.

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 shut-down 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. G

Operation sequence of the burner



D9507

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 Servomotor (SQM4...)

Important notes

WARNING

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

Avoid opening, modifying or forcing the actuators.

- ➤ All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- ➤ Before modifying the wiring in the SQM4... system connection area, fully disconnect the burner control device from the power supply (omnipolar separation).
- ➤ To avoid the risk of electrocution, protect the connection terminals in a suitable manner and correctly fix the cover.
- ➤ Check the wiring is in order.
- ➤ Falls and collisions can negatively affect the safety functions. In this case, the unit must not be operated, even if it displays no evident damage.

Assembly notes

- Check the relevant national safety standards are respected.
- The connection between the actuator command shaft and the control element must be rigid, without any mechanical play.
- To avoid an excessive load on the bearings due to rigid hubs, the use of compensation clutches without any mechanical play is recommended (e.g. metal bellows-type clutches).

Installation notes

- Arrange the HV ignition cables separately, as far as possible from the flame control and the other cables.
- To avoid the risk of electrocution, make sure that the 230V AC section of the SQM4... unit is fully separated from the functional low-voltage section.
- The static torque is reduced when the electrical supply of the actuator is switched off.
- The housing cover may only be removed for short periods of time for wiring or when making the addressing. In similar cases, make sure that dust or dirt does not penetrate inside the actuator.
- The actuator comprises a PCB with ESD-sensitive components.
- The top side of the board carries a cover which affords protection against direct contact. This protective cover must not be removed! The underside side of the board must not be touched.

WARNING

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

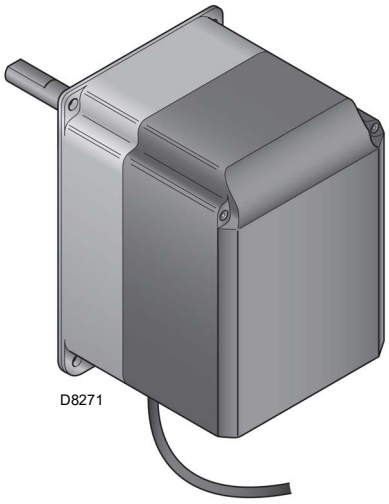


Fig. 9

Technical data

Operating voltage	AC 2 x 12V via bus cable from the base unit or via a separate transformer
Safety class	extra low-voltage with safe isolation from mains voltage
Power absorption	26...34 VA
Protection level	to EN 60 529, IP 54, provided adequate cable entries are used
Cable connection	RAST3,5 connectors
Rotation direction	- Anticlockwise (standard) - Clockwise (inverted rotation)
Rated torque (max.)	20 Nm
Static torque (max.)	20 Nm
Operation time (min.) for 90°	30 s.
Weight	approx. 1.6 kg
Environmental conditions:	
Operation	DIN EN 60 721-3-3
Climatic conditions	Class 3K3
Mechanical conditions	Class 3M3
Temperature range	-20...+60 °C
Humidity	< 95% RH

Tab. H

4 Installation

4.1 Notes on safety for the installation

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


DANGER

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


WARNING

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


DANGER

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

4.2 Handling

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


WARNING

The handling operations for the burner can be highly dangerous if not carried out with the greatest attention: keep any unauthorised people at a distance; check the integrity and suitableness of the available means of handling.
Check also that the area in which you are working is empty and that there is an adequate escape area (i.e. a free, safe area to which you can quickly move if the burner should fall).
When handling, keep the load at not more than 20-25cm from the ground.



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


CAUTION

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

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 Operating position

WARNING

- The burner is designed to operate only in positions **1** and **4** (Fig. 10).
- Installation **1** is preferable, as it is the only one that allows the maintenance operations as described in this manual.
- Installation **4** permits operation but make maintenance and inspection of the combustion head more difficult.

DANGER

- Any other position could compromise the correct operation of the appliance.
- Installations **2**, **3** and **5** are prohibited for safety reasons.

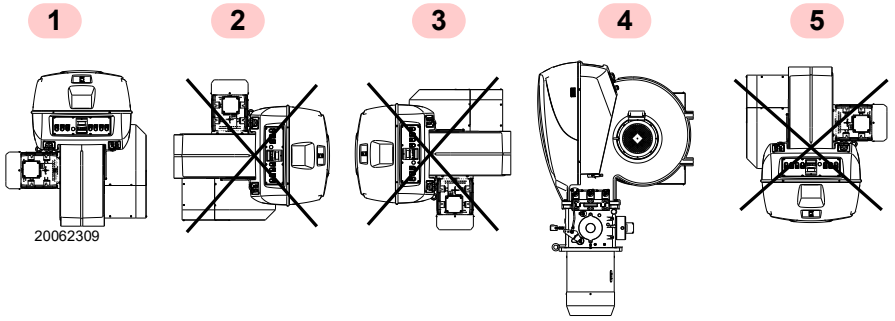


Fig. 10

4.5 Preparing the boiler

4.5.1 Boring the boiler plate

Pierce the closing plate of the combustion chamber, as in Fig. 11. The position of the threaded holes can be marked using the thermal insulation 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. 12) 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.

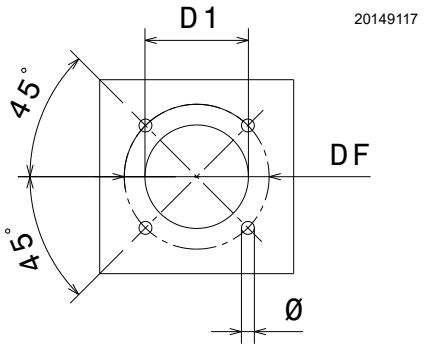


Fig. 11

inch	D1	DF	Ø
RS 1200/EV	19 19/64“	23 15/16“	51/64 W

Tab. I

4.6 Securing the burner to the boiler

Prepare a suitable lifting system.

- ➤ Create a suitable hoisting system by hooking onto the rings 3), removing the fastening screws 7) securing the cover 8) first (Fig. 12).
- ➤ Insert the thermal protection supplied with the blast tube 4).
- ➤ Fit the entire burner onto the boiler hole, prepared previously, as in Fig. 12, and fasten with the screws supplied.

WARNING

The seal between burner and boiler must be air-tight.

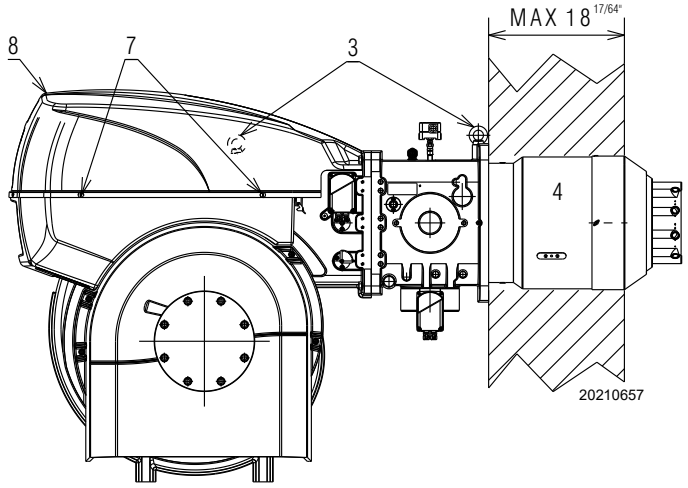


Fig. 12

4.7 Access to head internal part

In order to reach inside the combustion head (Fig. 13) proceed as follows:

- ➤ Disconnect the gas servomotor socket 1);
- ➤ Remove the 4 fixing screws 2);
- ➤ Open the burner on hinge;
- ➤ Disconnect the cable of electrode 3);
- ➤ remove the screw/gas pressure socket 4) of the head;
- ➤ pull out the inner part of the head 6).

Be careful as fuel may leak during this phase.

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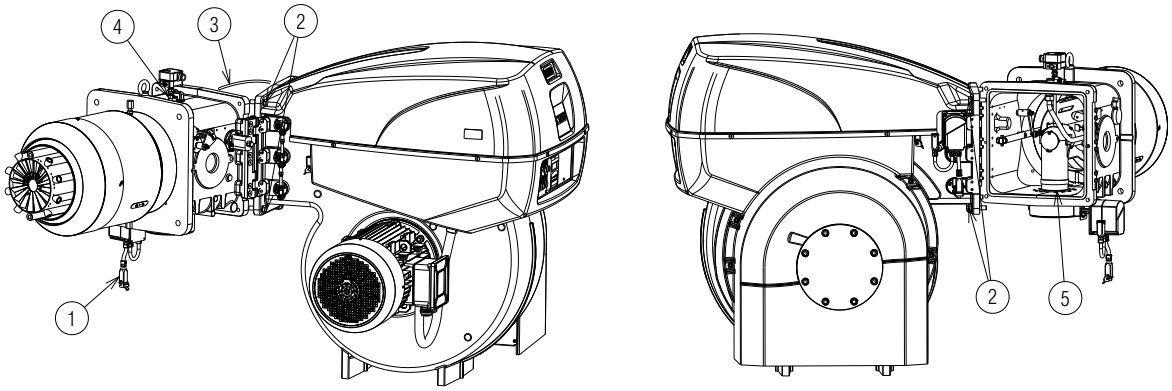


Fig. 13

4.8 Combustion head adjustment

The air damper servomotor 4)(Fig. 4, pag. 10) varies the air output according to the output demand, while manually a leverage varies the combustion head adjustment.

The selection of the hole to be used is determined based on the maximum output requested, as illustrated in Tab. J.

In the factory, the adjustment is adjusted for the minimum stroke (hole 0, Fig. 14).

Leverage hole	Output	
	(kW)	(MBtu/hr)
0	1500	5118
1	2500	8530
2	3700	12624
3	5000	17060
4	6000	20472
5	7000	23884
6	8000	27296
7	9000	30708
8	9800	33438
9	10800	36850
10	11100	37873

Tab. J

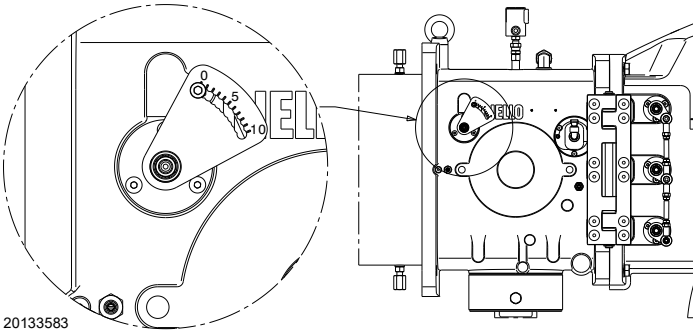


Fig. 14

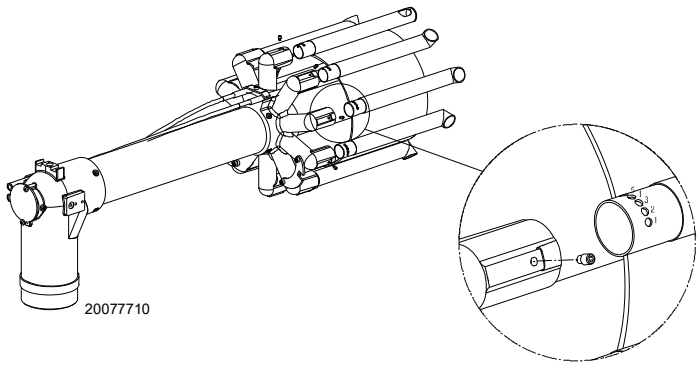


Fig. 15

WARNING

The gas pipes leave the factory calibrated at notch 1. The adjustment shown in Fig. 15 allows the gas pipes to be positioned in the best way for the application on which the burner is installed (e.g. boilers with flame inversion chamber).

4.9 FGR duct system (Customer installation)

– Normally the duct would connect to the stack as shown in Fig. 18, with a 45° cut facing the flue gas flow and with the center of the cut centered in the stack. The duct could be made to the smoke box, but must still be located with the same 45° cut facing the flue gas flow stream and with the center of the cut in the center of the stream.

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

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

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

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

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

CAUTION

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

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

Cold start-up will generate significant amounts of condensation.

– The FGR duct is normally made from 8” pipe because it is easily obtainable and inexpensive.

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

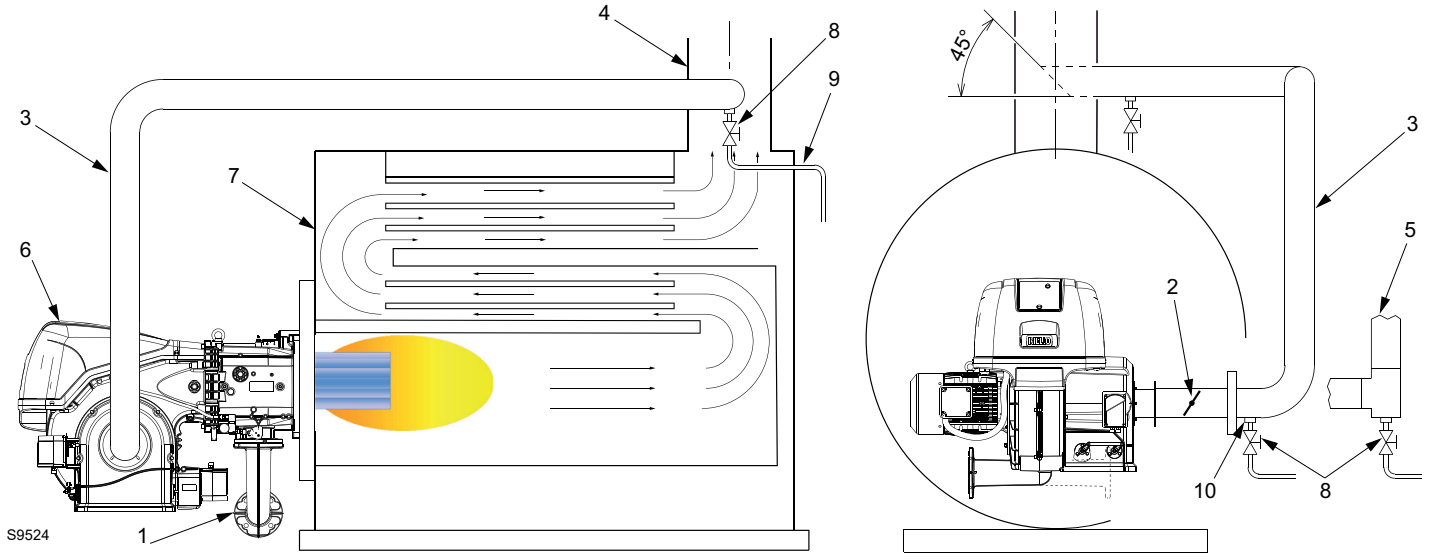


Fig. 16

Key (Fig. 16)
1 Primary gas supply inlet
2 Inducted FGR modulating damper
3 Flue gas recirculation pipe
4 Boiler stack
5 Alternate Construction Using “T”
6 Burner
7 Boiler
8 Drain Valve (Manual Ball Valve, Stainless Steel)
9 Drain line
10 Condensate Trap

4.10 Gas train supplied

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



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.

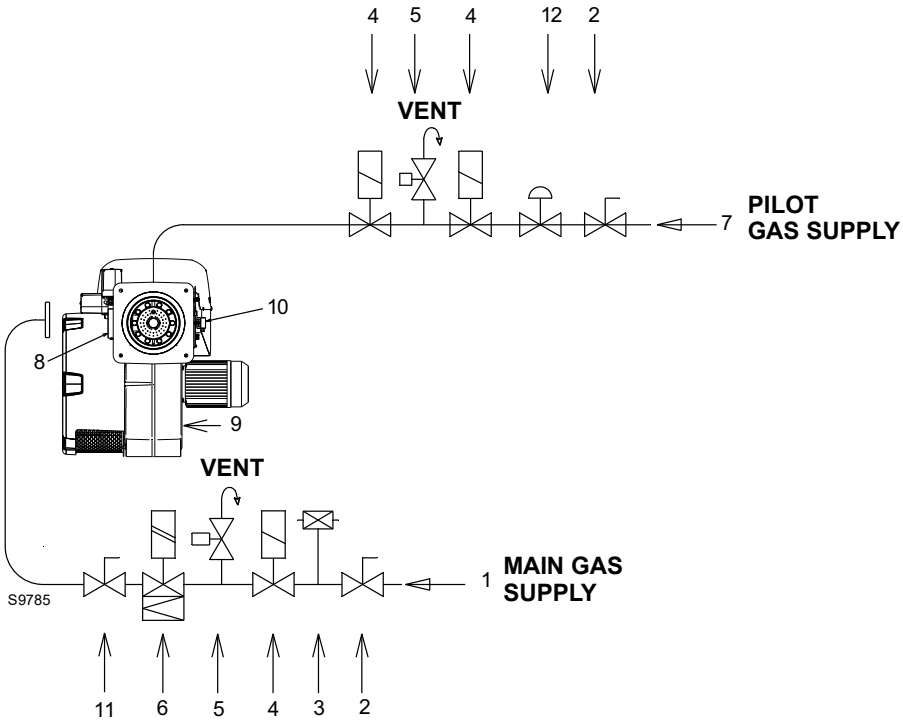


Fig. 17

Key to lay-out (Fig. 17)

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

4.10.1 Gas train

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



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



Check that there are no gas leaks.



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



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



The operator must use the required equipment during installation.

4.10.2 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.

Natural gas

GCV MBtu/hr	Combustion Head "WC	Gas butterfly + Adaptor "WC
13254	4.2	0.35
15148	5.5	0.5
18935	8.6	0.7
22723	12.4	1
26510	16.9	1.4
30297	22	1.8
35900	31.1	2.6
37813	34.4	2.9

Tab. K

WARNING

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

4.11 Electrical wiring

4.11.1 Notes on safety for the electrical wiring

DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be made in accordance with the regulations currently in force in the country of destination and by qualified personnel. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burner has been type-approved for intermittent operation (FS1). This means that it should as a rule be stopped at least once every 24 hours to enable the flame control to perform checks of its own start-up efficiency. Normally, burner stopping is guaranteed by the boiler's thermostat/pressure switch.
  If this is not the case, a time switch should be fitted in series to TL to stop the burner at least once every 24 hours. Refer to the wiring diagrams.
- The burner is factory set for FS1 operation (1 stop every 24 hours); it can be converted to FS2 operation (continuous - 1 stop every 72 hours), by changing the parameters using the menu of the AZL Display.
- 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 power absorption of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for that level of power absorption.
- For the main power supply of the device from the electricity mains:
  - do not use adapters, multiple sockets or extensions;
  - make provisions for an omnipolar switch with a gap between the contacts of at least 3 mm (over-voltage category III), as required by current safety regulations.
- 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

Turn off the burner's electrical supply using 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 according to the wiring diagrams.

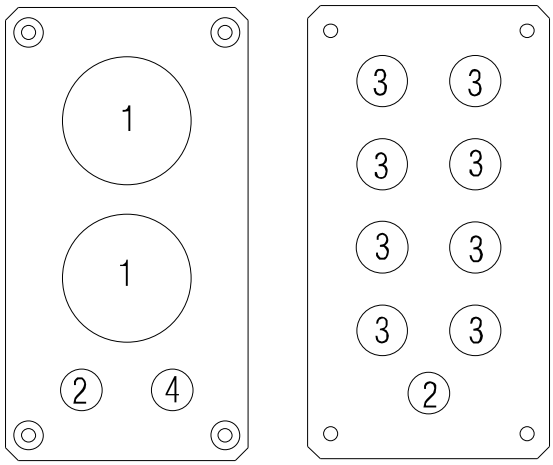
The use of the cable grommets can take various forms. By way of example we indicate the following mode (according to UL795).

4.11.2 Supply cables and external connections passage

All the cables to be connected to the burner are fed through the grommets (Fig. 18). 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" $^1/_2$ cable grommet
2 Available: single phase power supply and other devices with $^3/_8$ inch cable grommet
3 Available: consents/safety, minimum gas pressure switch, gas valves, pressure and temperature probe sensor and other devices with $^1/_2$ inch cable grommet
4 Speed sensor cable (used in the factory)



20083151

Fig. 18

WARNING

The control panel is in compliance with UL508A.

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

4.11.3 Notes on terminals

On the electrical panel there terminals with a “spring” system. The opening of these terminals must be made via a suitable tool, using a flat-blade screwdriver of the correct size.
The clamp uses a pressurised opening system.

Clamp opening

- ➤ insert the correct screwdriver into the opening, pushing down until the hole for the cable is completely open.
- ➤ Insert the previously stripped cable and remove the screwdriver. Make sure the cable is securely fastened Fig. 19.

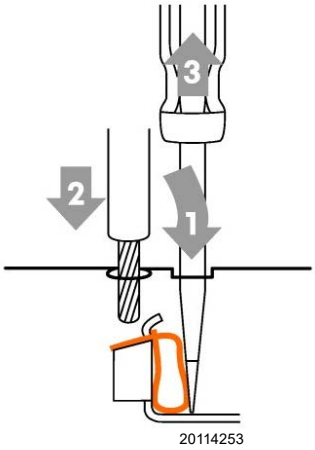


Fig. 19

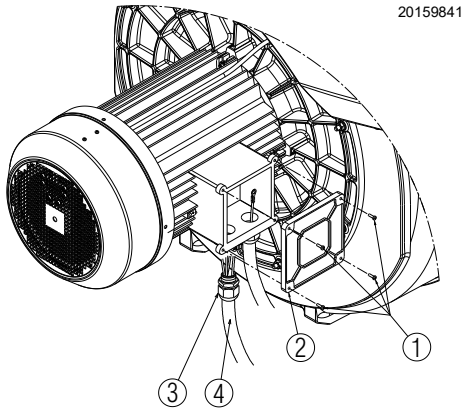


Fig. 20

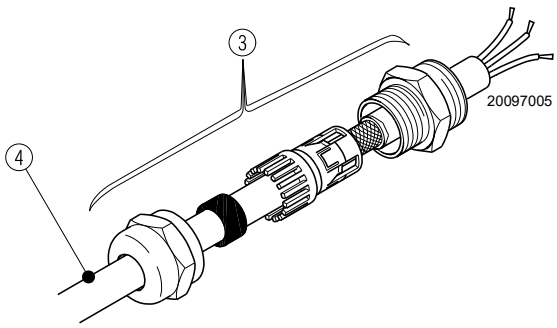


Fig. 21

4.11.4 Shielding the connections

WARNING

For the burner to operate correctly, where required, it is necessary to shield the connections.

To shield the motor connection, proceed as follows:

- ➤ to access the motor casing, loosen the four screws 1)(Fig. 20) and remove the cover 2).

WARNING

To make the correct shielding, it is important to bear in mind the necessary length of the connections inside the motor casing.

- ➤ Shield the cable 4) running from the VSD (inverter), as shown in Fig. 21 and using the coupling 3);
- ➤ install the cable 4) with its connection to the motor casing, securing it carefully.
- ➤ Carry out the motor connection as shown in the wiring diagrams.
- ➤ Fix the grommets/cable terminals of the connections securely and tidily to the terminal board of the motor.
- ➤ Make a final visual check, then close the motor casing by tightening the 4 screws 1)(Fig. 20).

4.11.5 Other connection

WARNING

1 The connection from the Inverter to LMV52.... must be done as shown in Fig. 22.
2 Possible pressure/temperature probes and O_2 sensor connection must be done as shown in Fig. 22.
3 Possible pressure/temperature probes and O_2 sensor connection must be done as shown in Fig. 22.

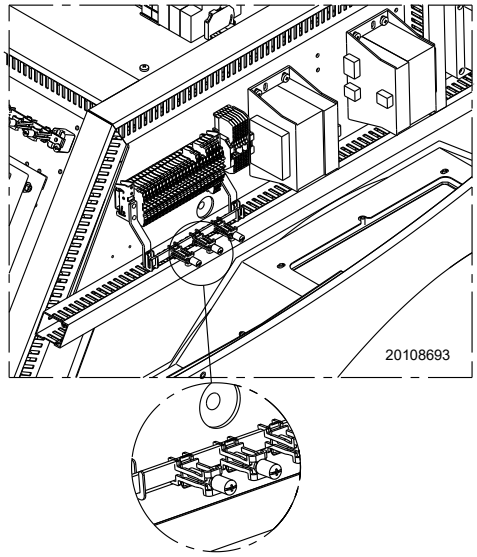


Fig. 22

4.12 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. 23);
- ➤ insert the shielded cable with the shielding inside the clamp A2);
- ➤ screw in the screw until it is completely tightened on the shielding A3).



WARNING

Do not overtighten.

In the case of clamp type **B**:
- ➤ pull the indicated tabs upwards and lift until locked in the open position B1)(Fig. 23);
- ➤ insert the shielded cable with the shielding inside the clamp B2);
- ➤ put pressure on the indicated part until the clamp closes automatically on the shielding B3).

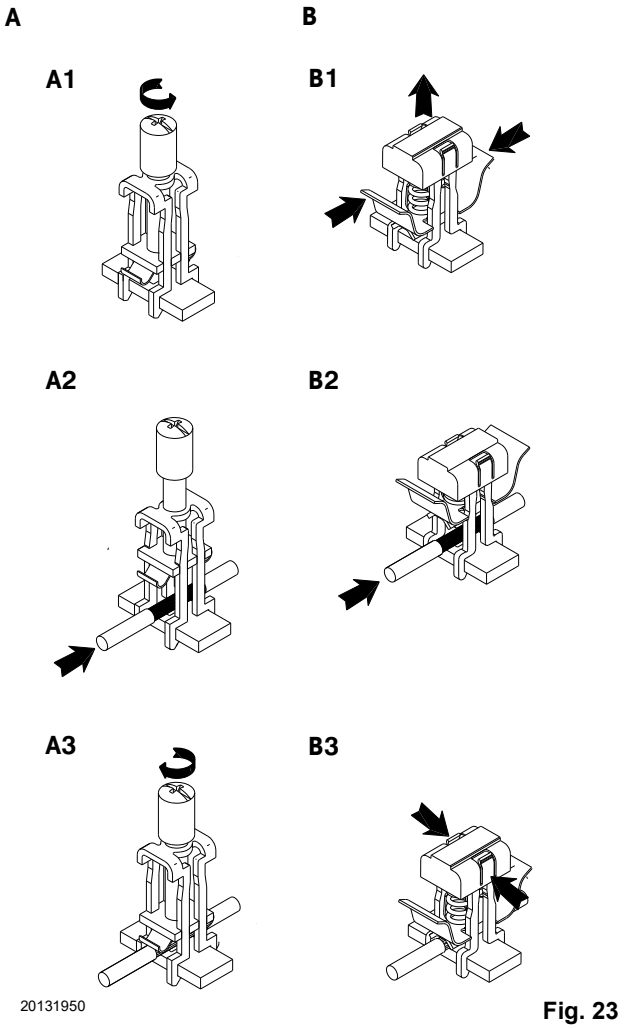


Fig. 23

4.13 Checking the position of the rpm sensor

To calibrate the rpm sensor 6)(Fig. 24), 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 sensor 6) is about 2 mm.;
- ➤ support the rpm detection disc 4) to the nut 5) and fix it by the lock nut 3);
- ➤ close the cover 1) screwing the screws 2).

Key (Fig. 24)

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

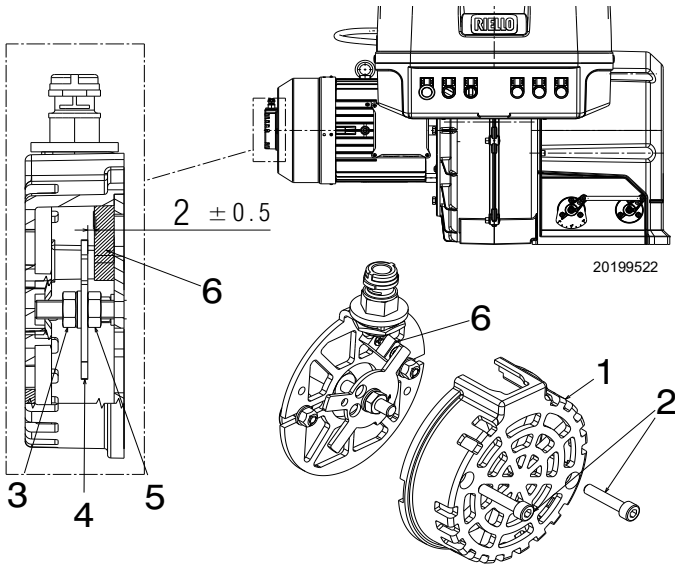


Fig. 24

4.13.1 Inverter connection

WARNING

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

Typical installation

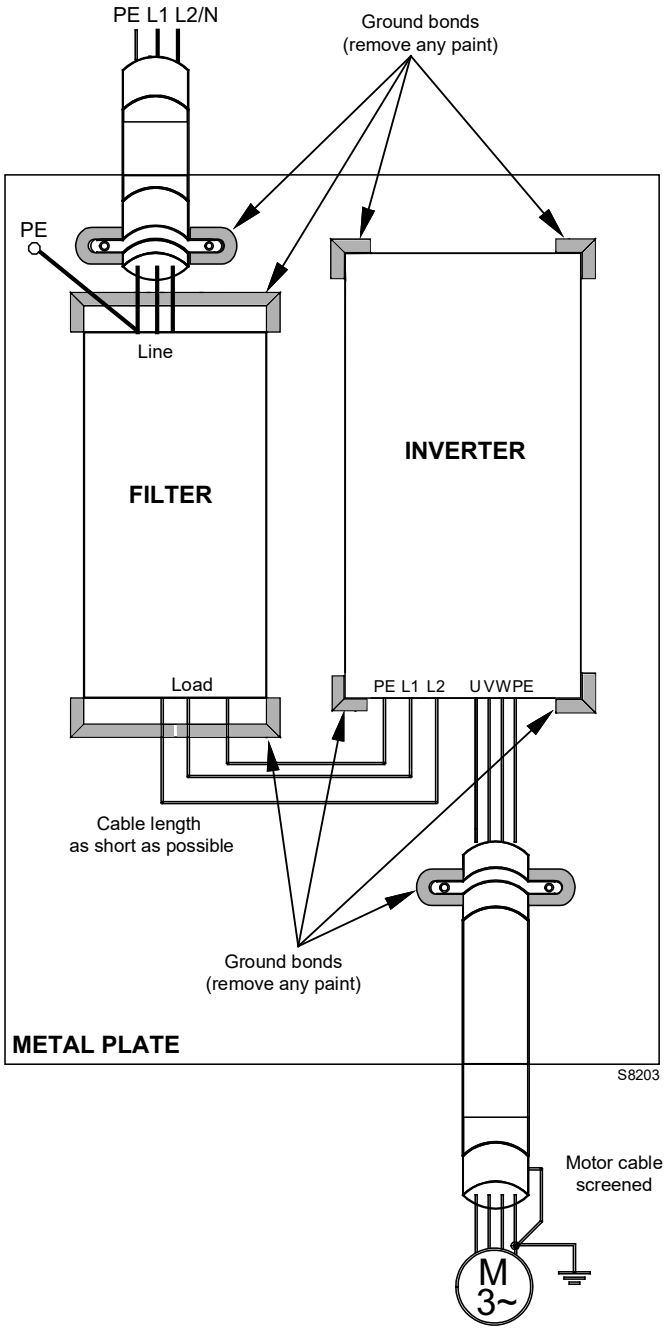


Fig. 25

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).

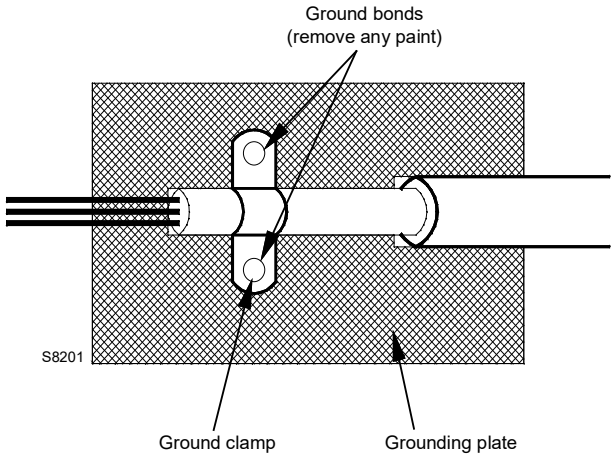


Fig. 26

Examples:

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

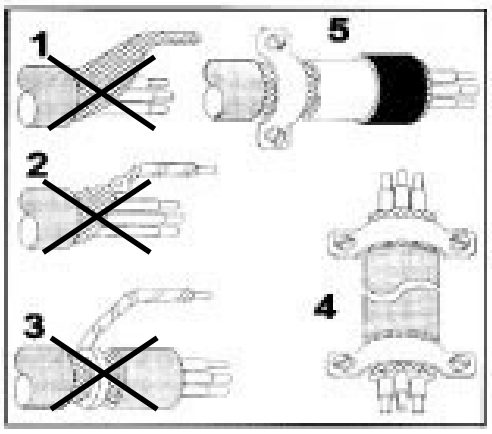


Fig. 27

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 36 before the first start-up.

5.2 Adjustments before first firing

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

5.2.1 Combustion head

The adjustment of the combustion head is via the calibration points of the servomotor inside of the curve combustion.

The setting of the combustion head depends exclusively on the maximum delivery of the burner. In case of high altitude site, head setting must refer to the **"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)."** on page 8

5.3 Adjustments before first firing (gas operation)

In addition, the following adjustments must also be made:

- ➤ open manual valves up-line from the gas train.
- ➤ Adjust the minimum gas pressure switch (Fig. 33, pag. 34) to the start of the scale.
- ➤ Adjust the maximum gas pressure switch (Fig. 32, pag. 34) to the end of the scale.
- ➤ Adjust the air pressure switch (Fig. 31, pag. 34) to the start of the scale.
- ➤ Purge the air from the gas line.
  Continue to purge the air (we recommend using a plastic tube routed outside the building) until gas is smelt.
- ➤ Fit a U-type manometer (Fig. 28) to the gas pressure test point on the sleeve. The manometer readings are used to calculate MAX. burner power.
- ➤ Connect two lamps or testers to the two gas line solenoid valves to check the exact moment at which voltage is supplied. This operation is unnecessary if each of the two solenoid valves is equipped with a pilot light that signals voltage passing through.

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.

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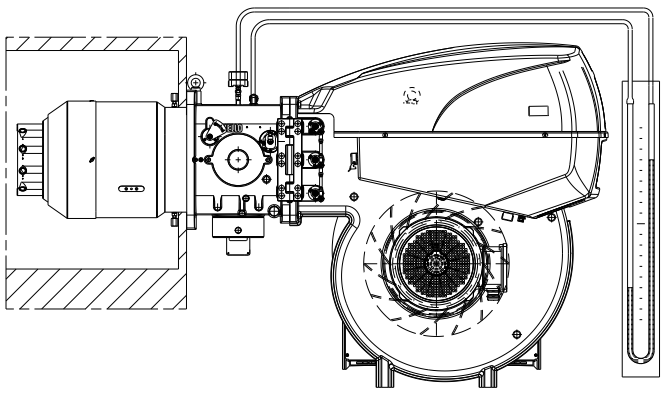


Fig. 28

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 local controls and position the selector 1)(Fig. 29) to "**LOCAL**".

DANGER

Make sure that the lights or testers connected to the solenoids, or the pilot lights on the solenoids themselves, indicate that no voltage is present. If voltage is present, stop the burner immediately and check the electrical connections.

➤ When the limit thermostat (TL) is closed, the "**CALL FOR HEAT**" 2)(Fig. 29) signal must be on and the burner starts the starting cycle.

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

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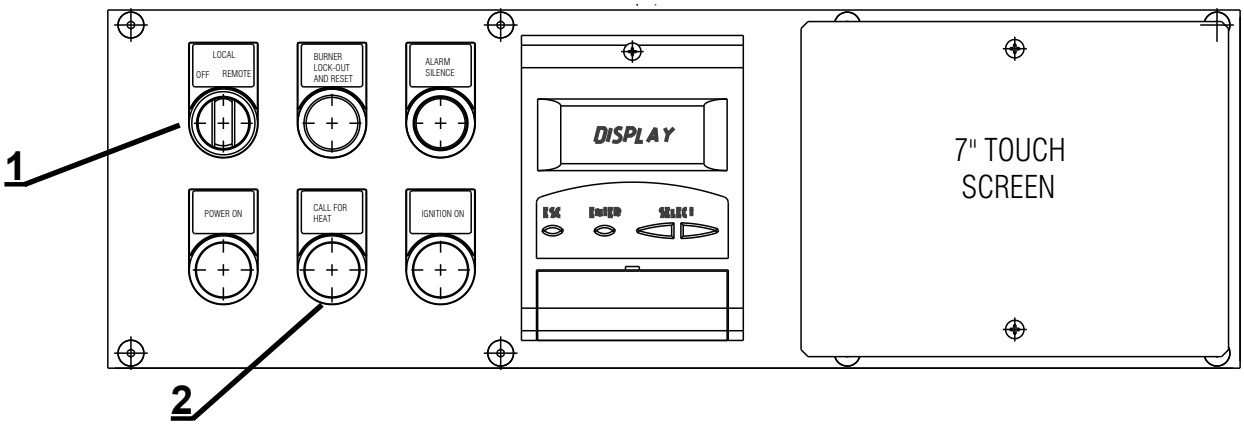


Fig. 29

5.5 Burner firing

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

Set switch 1)(Fig. 29) to "LOCAL".

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.

Check the control/ adjustment of the pilot (valve).

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.

5.5.1 Direction of motor rotation

WARNING

When the burner starts, check the direction of the motor rotation, as indicated in Fig. 30.

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 anticlockwise.

If this is not the case:

- ➤ place the switch 1) of Fig. 29, pag. 31 in position **"OFF"** and wait for the flame control to carry out the switch-off phase;
- ➤ disconnect the electrical supply from the burner;
- ➤ invert the phases on the inverter output.

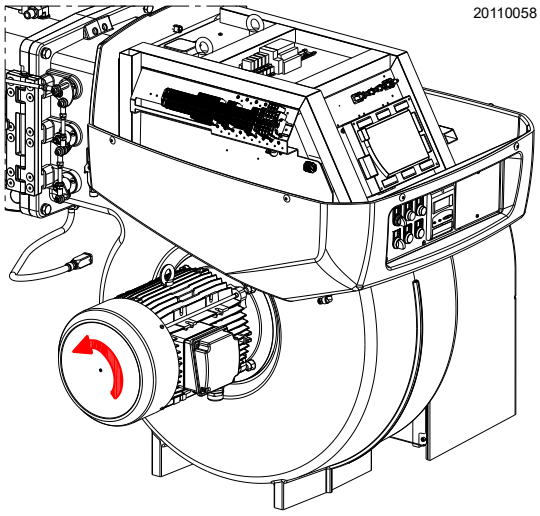


Fig. 30

5.6 Burner ignition

Once the above steps are complete, the burner should light.

If the motor starts up, but the flame does not appear and the flame control goes into lockout, reset it and wait for a new ignition attempt.

If ignition is still not achieved, it may be that gas is not reaching the combustion head within the safety time period of 3 seconds. In this case increase gas ignition delivery.

The arrival of gas at the pipe coupling is indicated by the U-type pressure gauge (Fig. 28, pag. 30).

If further burner lockouts occur, refer to the "Release procedure" given in the equipment manual supplied.

Once the burner has ignited, proceed with the global adjustment of the burner.

5.6.1 Air / gas adjustment and output modulation

The air/gas regulator and output modulation system equipping **RS** series burners performs a number of integrated functions to optimise burner function, in both individual installations and in combination with other units (e.g. double furnace boiler or multiple heat generators in parallel).

The basic system functions control:

1 The dosage of the air and fuel through positioning using direct servocommands of the relevant valves eliminating the possible play in the calibration systems with mechanical cam lever mechanisms, used on traditional modulating burners.

2 The modulation of the burner output in accordance with the load required by the system, with maintenance of the pressure or temperature of the boiler at the operating values set.

3 The sequence (cascade adjustment) of more than one boiler through the suitable connection of the various units and the activation of the internal software of the individual systems (option).

Further interfaces and communication functions with computers, for remote control or integration in central supervision systems are available on the basis of the configuration of the system.

WARNING

The first start up and every further internal setting operation of the adjustment system or the expansion of the base functions require access by means of password and are to be carried out by service personnel who are especially trained for the internal programming of the instrument and the specific application created with this burner.

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

At request, the complete manual for the control and setting of all parameters is available.

5.7 FGR commissioning (Customer installation)

The flue gas recirculation (FGR) function is used to reduce the NOx content of flue gases. This is accomplished by feeding a certain proportion of the flue gas back to the combustion chamber, causing the flame's temperature to drop.

The amount of recirculated flue gas is set via actuator's channel 3.


WARNING

When making the setting, it must be observed that excessive amounts of recirculated flue gas can cause the flame to lift off the burner's head (stability limit of flame).

NOTE:

Reduction of maximum burner output

Use of the flue gas recirculation (FGR) function or the flue gas mass introduced to the supply air duct might lower the burner's maximum output.

This means that the maximum amount of combustion air that can be introduced will be reduced.

Hence, the amount of fuel for high-fire operation must be reduced to ensure correct combustion values.

The flame control supports flue gas recirculation (FGR) function: without temperature compensation.

With these operating principles, the positions of FGR actuator's channel 3 can only change between CLOSED (ignition position) and the positions on the ratio control curves.

First time set up

Commission the plant with no influence from flue gas recirculation.

This enables the fuel-air ratio control system to be set as if the plant operated without flue gas recirculation.

After completing the settings of the fuel-air ratio control curves without flue gas recirculation, the actual settings with an FGR actuator's channel 3 can now be made.

Since this might have an impact on the combustion settings, the fuel- and air-regulating actuators may have to be readjusted.

First time FGR set up

FGR actuator's channel 3 is held in the ignition position until an adjustable time reaches.

During the operation mode, check value of temperature of flue gas recirculation (FGR). It must be 100-130 °C to reduce condensation in burner or intake duct.

Operation FGR set up

FGR actuator's channel 3 is held in the ignition position until a delay time and an adjustable temperature is reached.

After first time FGR commissioning, we suggest to setup the flame control FGR delay time. Use a value from 5-15 minutes.

Sure that the flue gas temperature reaches the value within the set time.

In this case it is necessary to install a LCM regulator kit and the FGR probe kit.

– Default factory time: 300 sec.
– Default FGR temperature: 50° C


WARNING

Check air temperature where is mounted flame sensor. If temperature is more than 50-60°, the flame sensor can be damaged.



While burner is working with flue gas recirculation, it's possible reach high surface temperature.

5.8 Final calibration of the pressure switches

5.8.1 Air pressure switch

For the RS1200 burner model, the air pressure switch is connected in absolute mode and is activated by the positive pressure from the fan (Fig. 31).

Adjust the air pressure switch (Fig. 31) 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.

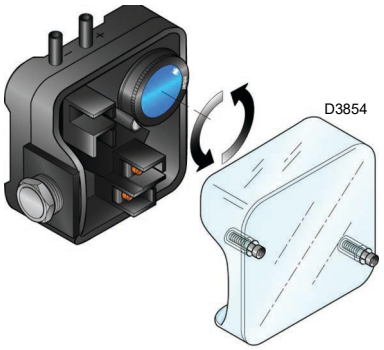


Fig. 31

5.8.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 32) after making all other burner adjustments with the maximum gas pressure switch set to the end of the scale.
To calibrate the maximum gas pressure switch, open the tap and then connect a pressure gauge to its pressure test point.
The maximum gas pressure switch must be regulated to a value no higher than 30% of the measurement read on the gauge when the burner is working at maximum output.

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

5.8.3 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. 33) 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

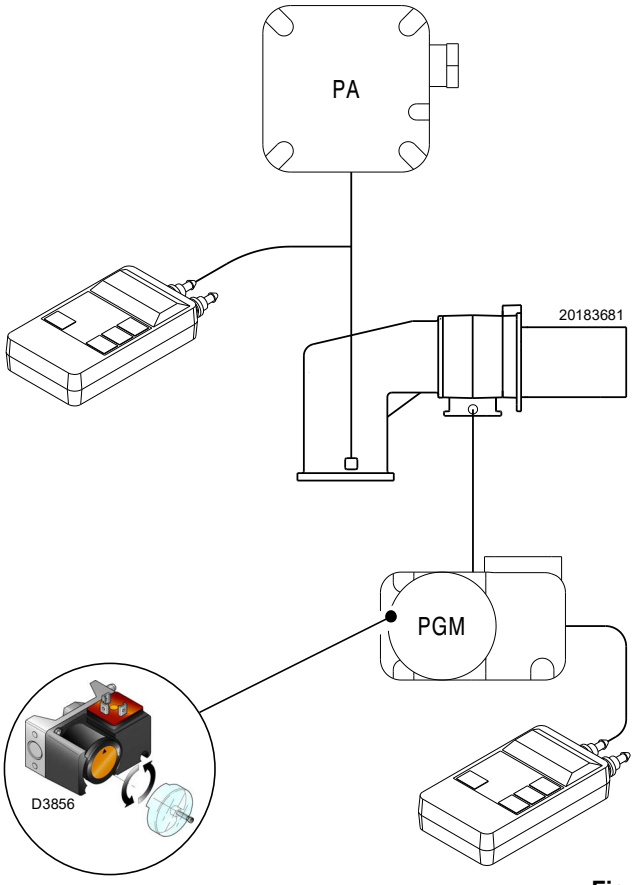


Fig. 32

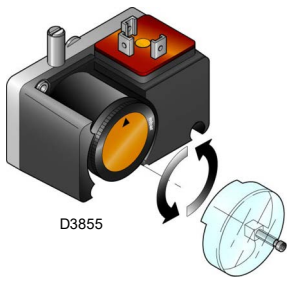


Fig. 33

5.9 Final checks (with the burner working)

➤ Open the control limit operation ➤ Open the high limit operation	⇨	The burner must stop
➤ Rotate the maximum gas pressure switch knob to the minimum end-of-scale position ➤ Rotate the air pressure switch knob to the maximum end of scale position	⇨	The burner must stop in lockout
➤ Switch off the burner and disconnect the voltage ➤ Disconnect the minimum gas pressure switch	⇨	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.

13 The manual ball gas valve must be closed
14 The electrical contacts of the burner limit switch need to be closed
15 Ensures closed the contact of the low gas pressure switch
16 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.


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

Carry out an analysis of the combustion discharge gases. Significant differences with respect to the previous check indicate the points where more care should be exercised during maintenance.

Combustion head

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

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.

Measurement of detector current

Measurement of the detector's signal (Fig. 34) with a Voltmeter is not normally required since the flame signal's intensity is shown on the AZL...display and operating unit.

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

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

To measure power, use a voltmeter with a 10 Vdc scale, connected as illustrated in Fig. 34.

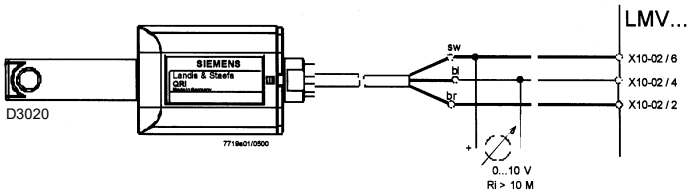


Fig. 34

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 OPERATION

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

Gas filter
Replace the gas filter when it is dirty.

Combustion
If the combustion values found at the start of the intervention do not satisfy current standards or anyway indicate a poor state of combustion (consult the table below), contact the Technical Assistance Service for the necessary adjustments.

6.2.4 Safety components

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

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

Tab. M

6.3 Opening the burner



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



Close the fuel interception tap.



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

For the burner opening, see **“Access to head internal part”** on page 21.

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.

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 flame control manual supplied.

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



WARNING

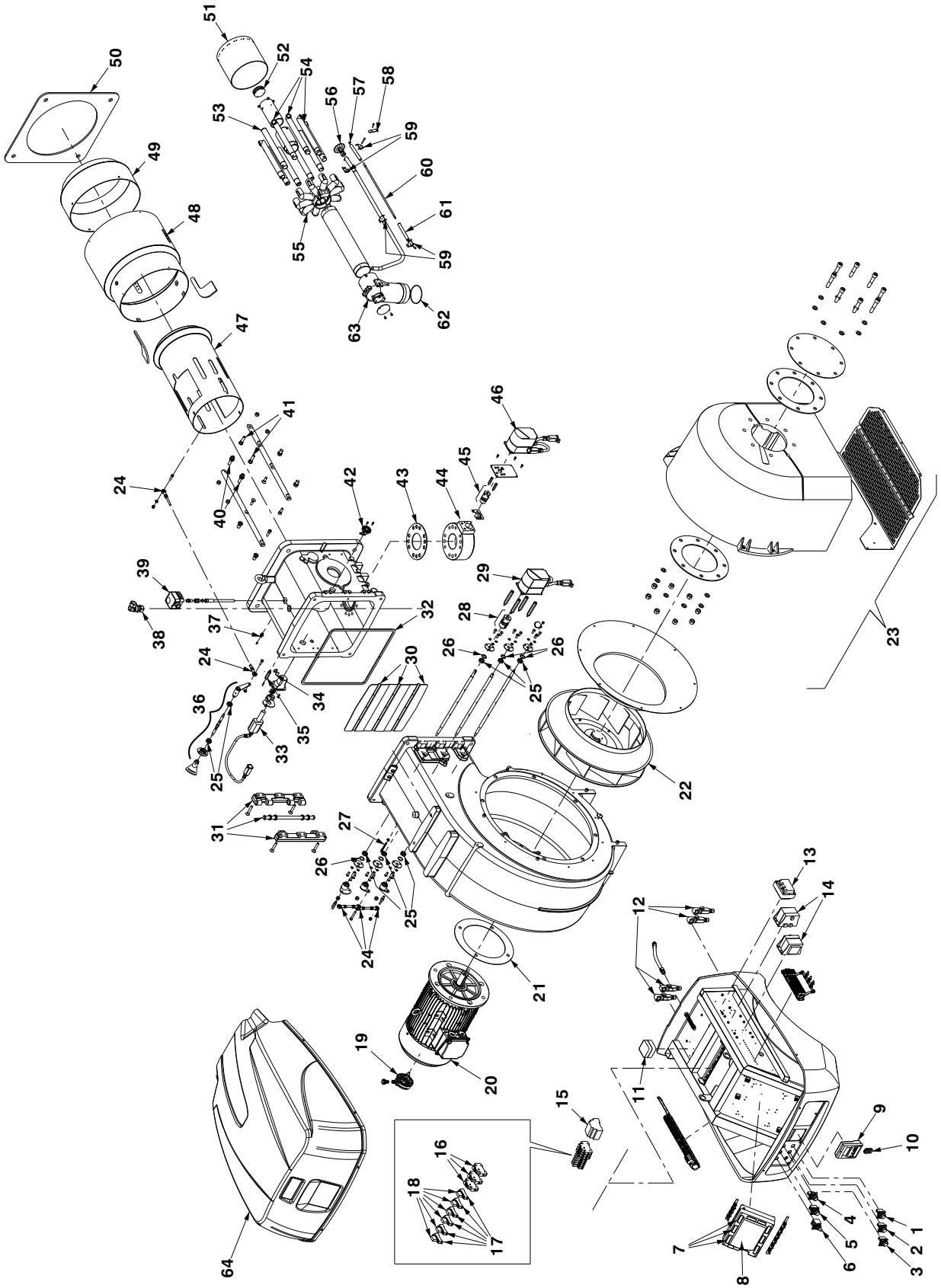
In the event of a burner lockout, more than two consecutive burner reset operations could cause damage to the installation. On the third lockout, contact the Aftersales Service.



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	DESCRIPTION	*
1	**20027020**	YELLOW LAMP	
2	**20036017**	LAMP	
3	**20036019**	LAMP	
4	**20010962**	PUSH-BUTTON	C
5	**3013354**	PUSH-BUTTON	C
6	**20010963**	SWITCH	C
7	**20131761**	CONNECTORS ASSEMBLY	B
8	**20014365**	ELECTRONIC CAM	C
9	**3013283**	DISPLAY	
10	**3014113**	PLUG	C
11	**20013975**	AIR PRESSURE SWITCH	A
12	**3013363**	CONNECTOR	C
13	**3012956**	TRANSFORMER	B
14	**3013284**	TRANSFORMER	B
15	**20133520**	TENSION CONVERTER	
16	**20014366**	FUSE HOLDER	
17	**3012841**	BASE	
18	**20010969**	RELAY	
19	**20201481**	SENSOR	A
20	**20158749**	MOTOR	C
21	**20208003**	SEAL	B
22	**20093001**	FAN	C
23	**20158779**	AIR INTAKE ASSEMBLY	
24	**3012669**	PIN JOINT	C
25	**3012795**	BEARING	
26	**20130408**	SEAL	B
27	**3003891**	CONNECTOR	C
28	**20039351**	COUPLING	A
29	**20029137**	SERVOMOTOR	B
30	**20032625**	AIR DAMPER	
31	**3012797**	HINGE	
32	**20068181**	SEAL	B
33	**20039362**	PROBE	A
34	**20034864**	VIEWING PORT	
35	**20195444**	SPACER	
36	**20069116**	LEVER ASSEMBLY	C
37	**3005447**	TEST POINT	
38	**20014633**	CONNECTOR	C
39	**20014103**	PRESSURE SWITCH	A
40	**20052991**	PIN	C
41	**20052992**	PIN	C
42	**20083954**	INSPECTION WINDOW	

N.	CODE	DESCRIPTION	*
43	**3013430**	SEAL	B
44	**3012761**	GAS REGULATOR	C
45	**20042217**	COUPLING	A
46	**3013253**	SERVOMOTOR	B
47	**20052999**	SHUTTER	C
48	**20090461**	CYLINDER	C
49	**3013391**	FLAME FUNNEL	B
50	**3013392**	FLANGE GASKET	A
51	**20039357**	SHUTTER	
52	**20089742**	TRANSITION PIECE	
53	**20089738**	GAS TUBE	C
54	**20089739**	GAS TUBE	C
55	**3013105**	DISTRIBUTOR	
56	**20086748**	DIFFUSER	C
57	**20050435**	ELECTRODE	A
58	**20090600**	U BOLT	
59	**20029532**	SUPPORT	A
60	**20041203**	ELECTRODE CONNECTION	A
61	**3012258**	INSULATOR	A
62	**3012868**	PISTON SEAL	B
63	**3013118**	ELBOW	
64	**20063409**	COVER	B

*****
ADVISED PARTS
A = Spare parts for minimum fittings
A+B = Spare parts for basic safety fittings
A+B+C = Spare parts for extended safety fittings

B Appendix - Accessories

- **Gas train according to UL Standards**



The installer is responsible for the supply and installation of any required safety device(s) not indicated in this manual.

C Appendix - Burner start up report

Model number:		Serial number:	
Project name:		Start-up date:	
Installing contractor:		Phone number:	

GAS OPERATION

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

OIL OPERATION

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

CONTROL SETTINGS

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

NOTES

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Subject to modifications