GB

Forced draught gas burners

Progressive two stage or modulating operation

RS

Code	Model	Type
20011898	RS 300/E LN	1110 T72
20011900	RS 400/E LN	1111 T72
20011902	RS 500/E LN	1112 T72

20008423 (4) - 04/2012

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 RIELLO 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 Danger: live components

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

Other symbols

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

➤ This symbol indicates a list.

Abbreviations used

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

Delivery of the system and the instruction manual

When the system is delivered, it is important that:

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

    .....

  - the address and telephone number of the nearest Assistance Centre;

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

- ➤ The system supplier carefully informs the user about:
  - the use of the system,
  - any further tests that may be necessary before the system is started up,
  - maintenance and the need to have the system checked at least once a year by the manufacturer or another specialised technician.

    To ensure a periodic check, RIELLO recommends the drawing up of a Maintenance Contract.

1.2 Guarantee and responsibility

RIELLO 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 the carrying out of non authorised modifications will result in the annulment by RIELLO of the guarantee that it supplies with the burner.

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

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

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

1.2.1 Owner's responsibility

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

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

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

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

WARNING

If you smell gas:

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

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

2 Safety and prevention

2.1 Introduction

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

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

It is a good idea to remember the following:

- The burner must only be used as expressly described.
  Any other use should be considered improper and therefore dangerous.
  In particular:
  it can be applied to boilers operating with water, steam, diathermic oil, and to other users expressly named by the manufacturer;
  the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the room temperature must all be within the values indicated in the instruction manual.
- Modification of the burner to alter its performance and destinations is not allowed.
- The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- Only those parts envisaged by the manufacturer can be replaced.

2.2 Personnel training

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

The user:

- Undertakes to entrust the machine exclusively to suitably trained and qualified personnel.
- Must take all the measures necessary to prevent unauthorised people gaining access to the machine.
- Undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties.
- Must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.
- Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.
- Personnel must follow all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel are obliged to inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and all responsibility for any damage that may be caused by the use of non-original parts.

3 Technical description of the burner

3.1 Technical data

Model			RS 300/E LN	RS 400/E LN	RS 500/E LN
Output (1)	max.	kW MBtu/hr	1500 - 4220 (3834*) 5112 - 14390 (13082*)	2000 - 4995 (4541*) 6817 - 17043 (15494*)	2715 - 5740 (5217*) 9468 - 19580 (17800*)
	min.	kW MBtu/hr	555 1893	888 3030	1100 3787
Fuel - max. delivery - pressure at max. delivery (2)		SCFH “ wc	Natural gas 14070 7	Natural gas 16654 13	Natural gas 19138 15
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)		dBA	82	85	88

(1) Reference conditions: Ambient temperature 68 °F (20 °C) - Barometric pressure 394” wc - Altitude 329 ft.
(2) Pressure at test point 5) (Fig. 5), 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.
* Firing rate for C-ETL Canadian Listing

LIST OF AVAILABLE MODELS

Designation		Electrical supply	Starting	Code
RS 300/E LN	TC	230V-60Hz	Direct	20011898
		460V-60Hz		
		575V-60Hz		-
RS 400/E LN	TC	460V-60Hz	Star/Delta	20011900
		575V-60Hz		-
RS 500/E LN	TC	460V-60Hz	Star/Delta	20011902
		575V-60Hz		-

3.2 Electrical data

3.2.1 Fan motor IE1

Model			RS 300/E LN	
RBNA Code			-	-
Control circuit power supply		V/Ph/Hz	120/1/60	
Main power supply (+/- 10%)		V/Ph/Hz	230/3/60	460/3/60
Fan motor		rpm HP V A	3480 7.5 230 19.4	3480 7.5 460 9.7
Ignition transformer	Gas	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA	
Electrical power consumption		W	6550	
Electrical control circuit consumption		W max	750	
Total electrical consumption		W	7300	
Electrical protection			NEMA 1	

Model			RS 400/E LN	RS 500/E LN
RBNA Code			-	-
Control circuit power supply		V/Ph/Hz	120/1/60	
Main power supply (+/- 10%)		V/Ph/Hz	460/3/60	
Fan motor		rpm HP V A	3460 10 460 14.9	3500 20 460 30.5
Ignition transformer	Gas	V1 - V2 I1 - I2	120 V - 1 x 8 kV 1.6 A - 20 mA	
Electrical power consumption		W	10350	19900
Electrical control circuit consumption		W max	750	
Total electrical consumption		W	11100	20650
Electrical protection			NEMA 1	

3.2.2 Fan motor IE2/EPACT

Model		RS 300/E LN		
RBNA Code		-	-	-
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	3500	3500	3500
	HP	7.5	7.5	7.5
	V	230	460	575
	A	18.6	9.3	7.4
Ignition transformer Gas	V1 - V2	120 V - 1 x 8 kV		
	I1 - I2	1.6 A - 20 mA		
Electrical power consumption	W	6300	6300	6250
Electrical control circuit consumption	W max	750		
Total electrical consumption	W	7050	7050	7000
Electrical protection		NEMA 1		

Model		RS 400/E LN		RS 500/E LN	
RBNA Code		-	-	-	-
Control circuit power supply	V/Ph/Hz	120/1/60			
Main power supply (+/- 10%)	V/Ph/Hz	460/3/60	575/3/60	460/3/60	575/3/60
Fan motor	rpm	3510	3510	3545	3545
	HP	10	10	20	20
	V	460	575	460	575
	A	11.5	8.8	23.5	18.8
Ignition transformer Gas	V1 - V2	120 V - 1 x 8 kV			
	I1 - I2	1.6 A - 20 mA			
Electrical power consumption	W	8350	8000	16450	16500
Electrical control circuit consumption	W max	750			
Total electrical consumption	W	9100	8750	17200	17250
Electrical protection		NEMA 1			

3.3 Packaging

➤ The packaging of the burner (Fig. 1) rests on a wooden platform that is particularly suitable for lift trucks.
The overall dimensions of the packaging are shown in the table.

➤ The weight of the burner complete with its packaging is shown in table.

inch	A	B	C	lbs
RS 300/E LN	77 11/64“	37 1/64“	38 3/16“	496
RS 400/E LN	77 11/64“	37 1/64“	38 3/16“	520
RS 500/E LN	77 11/64“	37 1/64“	38 3/16“	551

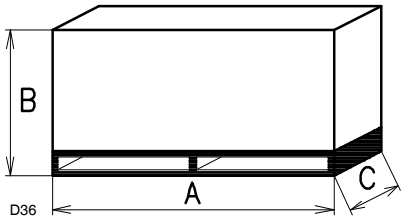

Fig. 1

3.4 Overall dimensions

The maximum dimensions of the burner are given in Fig. 2.
Bear in mind that inspection of the combustion head requires the burner to be opened by rotating the rear part on the hinge.
The overall dimensions of the burner when open are indicated by L and R.

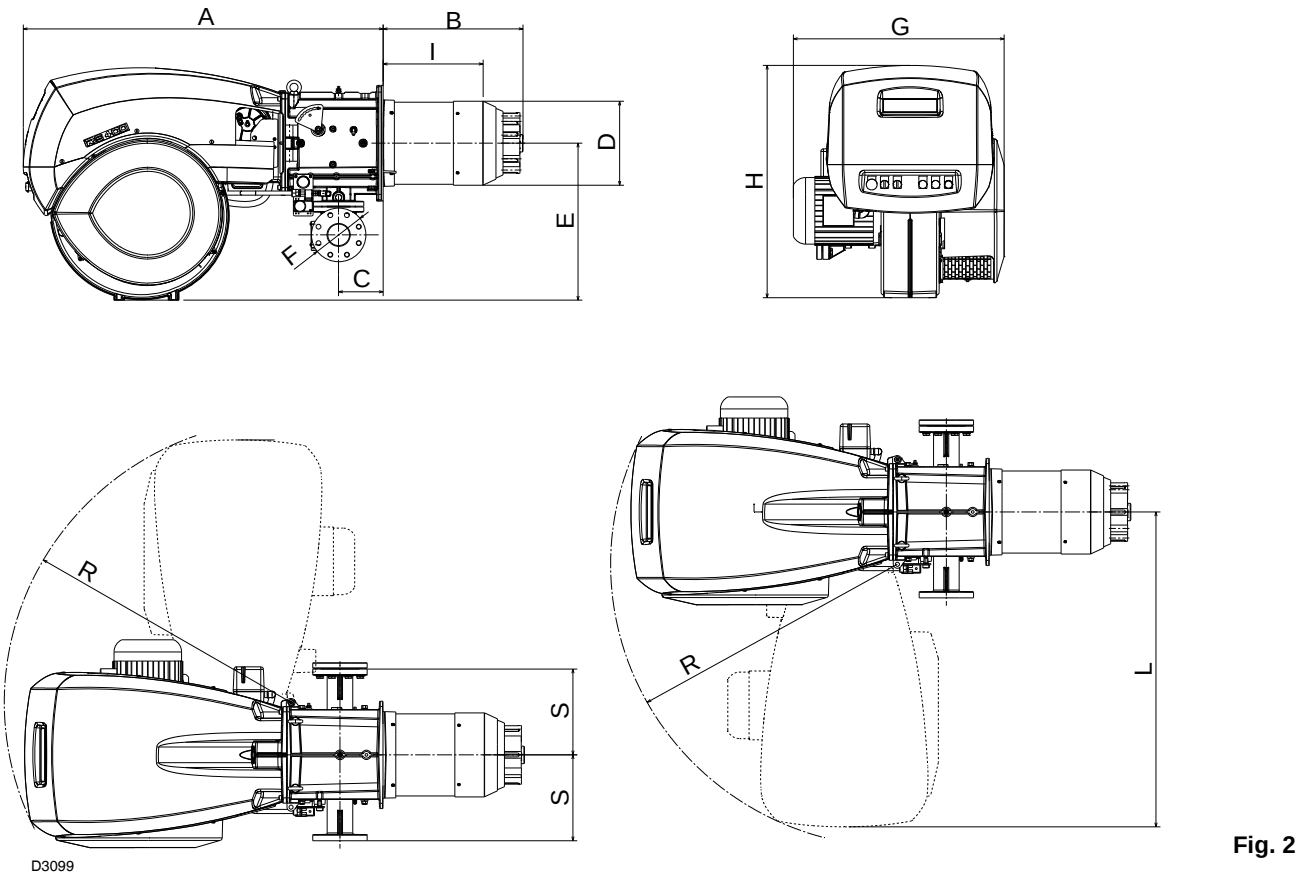

Fig. 2

inch	A	B	C	D	E	F	G	H	I	L	R	S
RS 300/E LN	52 3/16“	20 1/2“	6 7/16“	12 5/16“	23 5/32“	DN80	28 11/32“	34 9/64“	14 1/32“	46 1/4“	41 17/32“	12 19/32“
RS 400/E LN	52 3/16“	20 1/2“	6 7/16“	12 5/16“	23 5/32“	DN80	30 1/2“	34 9/64“	14 1/32“	46 1/4“	41 17/32“	12 19/32“
RS 500/E LN	52 3/16“	20 1/2“	6 7/16“	14 17/32“	23 5/32“	DN80	30 1/2“	34 9/64“	14	46 1/4“	41 17/32“	12 19/32“

3.5 Burner equipment

The burner is supplied complete with:
- Flange gasket
- 4 flange fixing screws M 16 x 50
- 4 screws to secure the burner flange to the boiler: M 18 x 70
- 2 spacers
- Instruction manual and spare parts list

3.6 Firing rates

Maximum output must be selected in the hatched area of the diagram.

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

Model	MBtu/hr
RS 300/E LN	1893
RS 400/E LN	3030
RS 500/E LN	3787

WARNING

The firing rate was obtained considering a room temperature of 68 °F and an atmospheric pressure of 394 “wc (approx. 0 ft above sea level), with the combustion head adjusted.

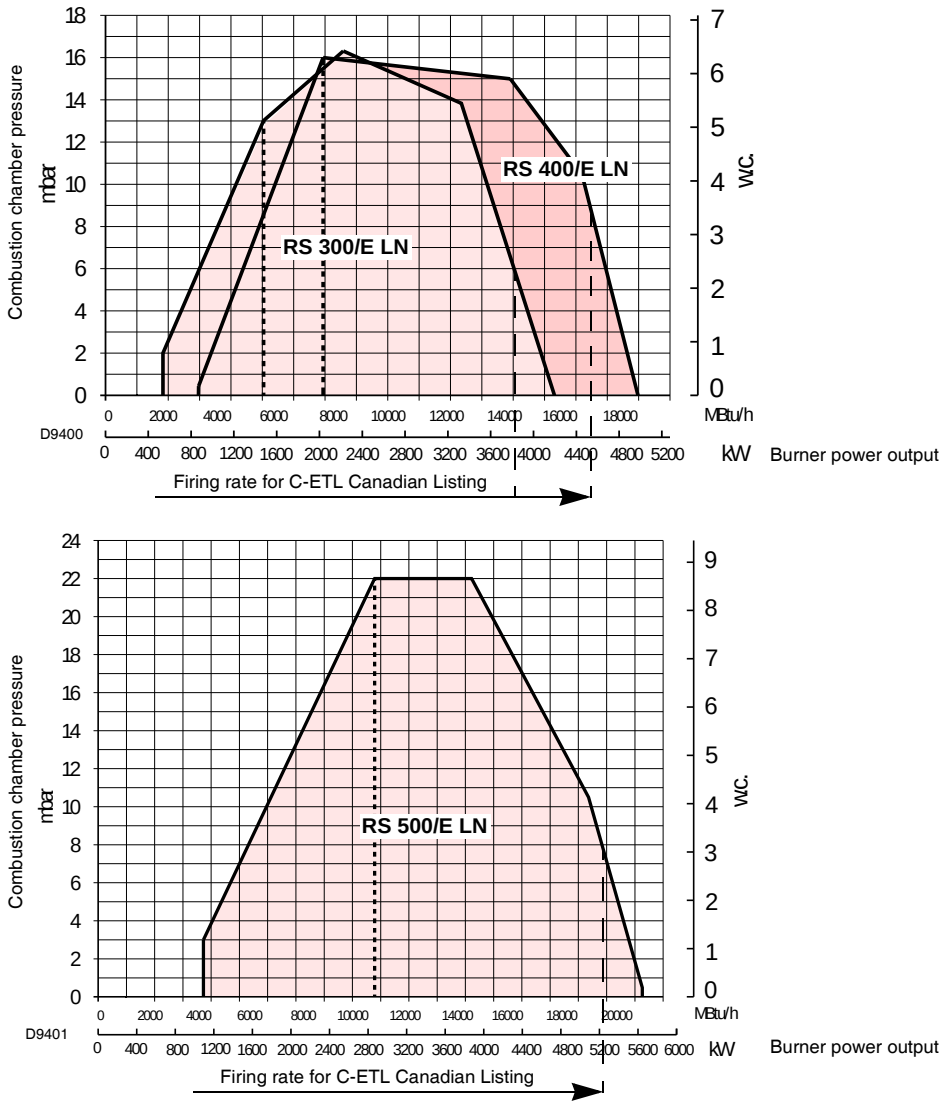

Fig. 3

The firing rates were obtained in special test boilers.

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

Example for RS 500/E LN
Output 18500 Mbtu/hr - diameter 39.4 inch - length 16.5 ft.

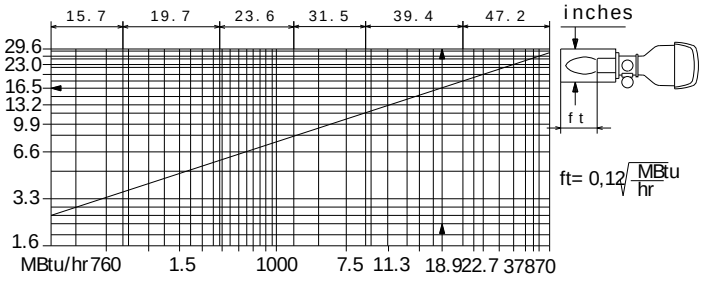

Fig. 4

3.7 Burner components

3.7.1 Burner description

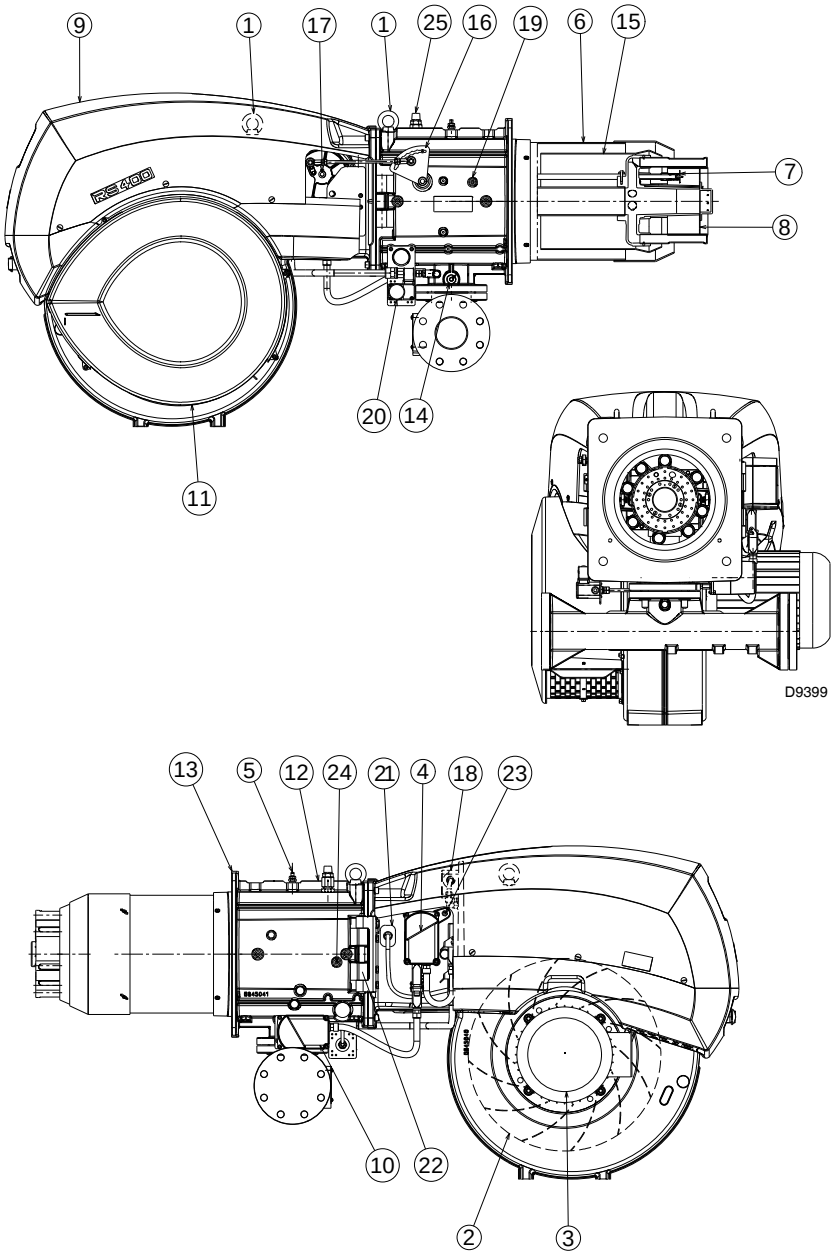

Fig. 5

1 Lifting eyebolts
2 Fan
3 Fan motor
4 Air gate valve servomotor
5 Gas pressure test point
6 Combustion head
7 Ignition pilot
8 Flame stability disk
9 Electric panel board - cover
10 Servomotor for gas butterlfy 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 of combustion head
17 Gears for movement of air damper
18 Air pressure switch (differential operating type)
19 Air pressure test point
20 Maximum gas pressure switch with pressure test point
21 QRI infrared 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

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 repositioned on the opposite side.

3.7.2 Panel board description

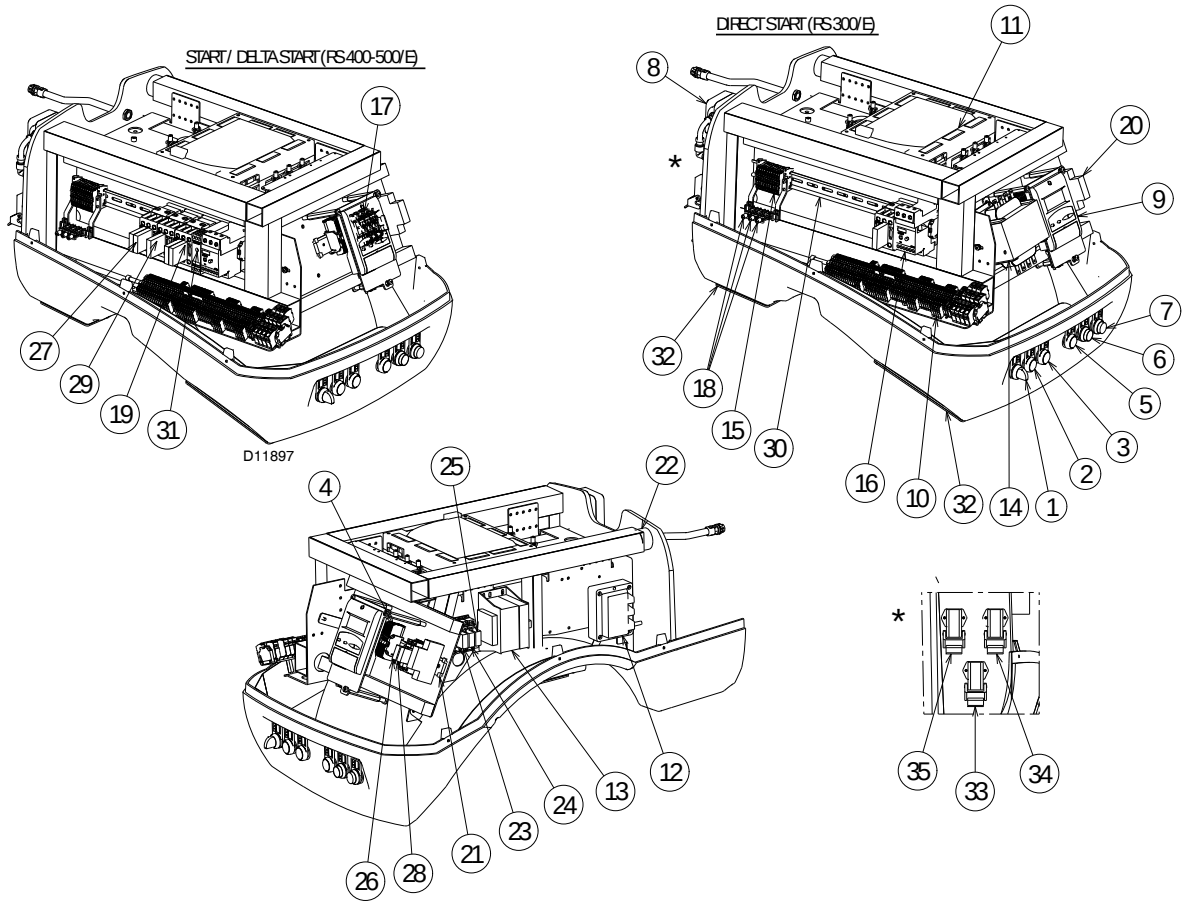

Fig. 6

1 “OFF - LOCAL - REMOTE” switch
2 “POWER ON” signal
3 “CALL FOR HEAT” signal
4 Terminal strip “XAUX”
5 “FUEL ON” signal
6 “ALARM SILENCE” button
7 “BURNER LOCK-OUT and RESET” pushbutton
8 Low air pressure switch
9 Operator panel with LCD display
10 Burner terminal board “X1”
11 Control box for checking flame and air/fuel ratio
12 Ignition transformer “TA”
13 Control box trasformer “T1”
14 Step-down trasformer (available)
15 Terminal strip “X2”
16 Fan motor contactor and thermal relay with reset button
17 “K6” relay (only for star/delta version)
18 Bracket for shielded cables with thumbscrew
Warning: used only to avoid a break in the cable’s shielding, hence do not overtighten.
19 “KS1” contactor (only for star/delta version)
20 Auxiliary fuse
21 DIN bar for: relay, fuse holder and terminal strip “XAUX”
22 Horn
23 ”K1” relay
24 “K3” relay
25 “K5” relay
26 “K2” relay
27 “KL1” contactor (only for star/delta version)
28 “K7” relay
29 “KT1” contactor (only for star/delta version)
30 DIN bar for “X2” terminal strip, thermal relays and contactors
31 “KST1” Star/delta starter timer (only for star/delta version)
32 Holes for cables grommets for electrical wirings, accessories and power supply (to be carried out by the installer)
33 Plug/socket for maximum pressure switch
34 Plug/socket for air actuator
35 Plug/socket for QRI flame sensor

Two types of burner failure may occur:

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

➤ **Fan motor trip**
release by pressing the pushbutton on thermal overload 16)(Fig. 6). See “Thermal relay calibration” on page 25.

3.8 Control box for the air/fuel ratio (LMV51...)

Warning notes

WARNING

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

The LMV51... is a safety device!
Do not open, interfere with or modify the unit.

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

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

- ➤ All activities (mounting, installation and service work, etc.) must be performed by qualified staff.
- ➤ Before making any wiring changes in the connection area of the LMV5..., completely isolate the plant from mains supply (all-polar disconnection). Ensure that the plant cannot be inadvertently switched on again and that it is indeed dead. If not observed, there is a risk of electric shock hazard.
- ➤ Protection against electrical shock hazard on the LMV5... and on all connected electrical components must be ensured through appropriate mounting.
- ➤ Each time work has been carried out (mounting, installation and service work, etc.), check to ensure that wiring is in an orderly state, that the parameters have been correctly set and make the safety checks.
- ➤ Fall or shock can adversely affect the safety functions. Such units must not be put into operation even if they do not exhibit any damage.
- ➤ In programming mode, the position check of actuators and VSD (checking electronic fuel / air ratio control) is different from the check during automatic operation.
  Like in automatic operation, the actuators are still jointly driven to their required positions. If an actuator does not reach the required position, corrections are made until that position is reached. However, in contrast to automatic operation, there are no time limits to these corrective actions.
  The other actuators maintain their positions until all actuators have reached the positions currently required.
  This is essential for setting fuel /air ratio control.
  This means that during the time the fuel / air ratio curves are programmed, the person making the plant settings must continuously monitor the quality of the combustion process (e.g. by means of a flue gas analyzer).
  Also, if combustion levels are poor, or in the event of dangerous situations, the commissioning engineer must take appropriate action (e.g. switching off manually).

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

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

D9301

Fig. 7

Mechanical design

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

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

Installation notes

- Ensure that the electrical wiring inside the boiler is in compliance with national and local safety regulations.
- Do not mix up live and neutral conductors.
- Make certain that strain relief of the connected cables is in compliance with the relevant standards (e.g. as per DIN EN 60730 and DIN EN 60 335).
- Ensure that spliced wires cannot get into contact with neighboring terminals. Use adequate ferrules.
- Always run high-voltage ignition cables separately while observing the greatest possible distance to the unit and to other cables
- The burner manufacturer must protect unused AC 230 V terminals with dummy plugs (refer to sections Suppliers of other accessory items).
- When wiring the unit, ensure that AC 230 V mains voltage cables are run strictly separate from extra low-voltage cables to warrant protection against electrical shock hazard.

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

LMV51... basic unit	Mains voltage	AC 120 V -15 % / +10 %
	Mains frequency	50 / 60 Hz ±6 %
	Power consumption	< 30 W (typically)
	Safety class	I, with parts according to II and III to DIN EN 60730-1
Terminal loading 'Inputs'	Unit fuse F1 (internally)	6.3 AT
	Perm. mains primary fuse (externally)	Max. 16 AT
	Undervoltage • Safety shutdown from operating position at mains voltage • Restart on rise in mains voltage	 < AC 96 V > AC 100 V
	Oil pump / magnetic clutch (nominal voltage) • Nominal current • Power factor	 1.6A cosφ > 0.4
	Air pressure switch test valve (nominal voltage) • Nominal current • Power factor	 0.5A cosφ > 0.4
Terminal loading 'Outputs'	**Total contact loading:** • Mains voltage • Input current of unit (safety loop) total load on contacts resulting from: - Fan motor contactor - Ignition transformer - Valve - Oil pump / magnetic clutch	 AC 120 V -15 % / +10 % Max. 5 A
	Single contact loading: Fan motor contactor (nominal voltage) • Nominal current • Power factor	 1A cosφ > 0.4
	Alarm output (nominal voltage) • Nominal current • Power factor	 1 A cosφ > 0.4
	Ignition transformer (nominal voltage) • Nominal current • Power factor	 1.6 A cosφ > 0.2
	Fuel valve gas (nominal voltage) • Nominal current • Power factor	 1.6 A cosφ > 0.4
	Fuel valve oil (nominal voltage) • Nominal current • Power factor	 1.6 A cosφ > 0.4
Cable lengths	Main line	Max. 100 m (100 pF/m)
Environmental conditions	Operation Climatic conditions Mechanical conditions Temperature range Humidity	DIN EN 60721-3-3 Class 3K3 Class 3M3 -20...+60 °C < 95 % r.h.

Operation sequence of the burner

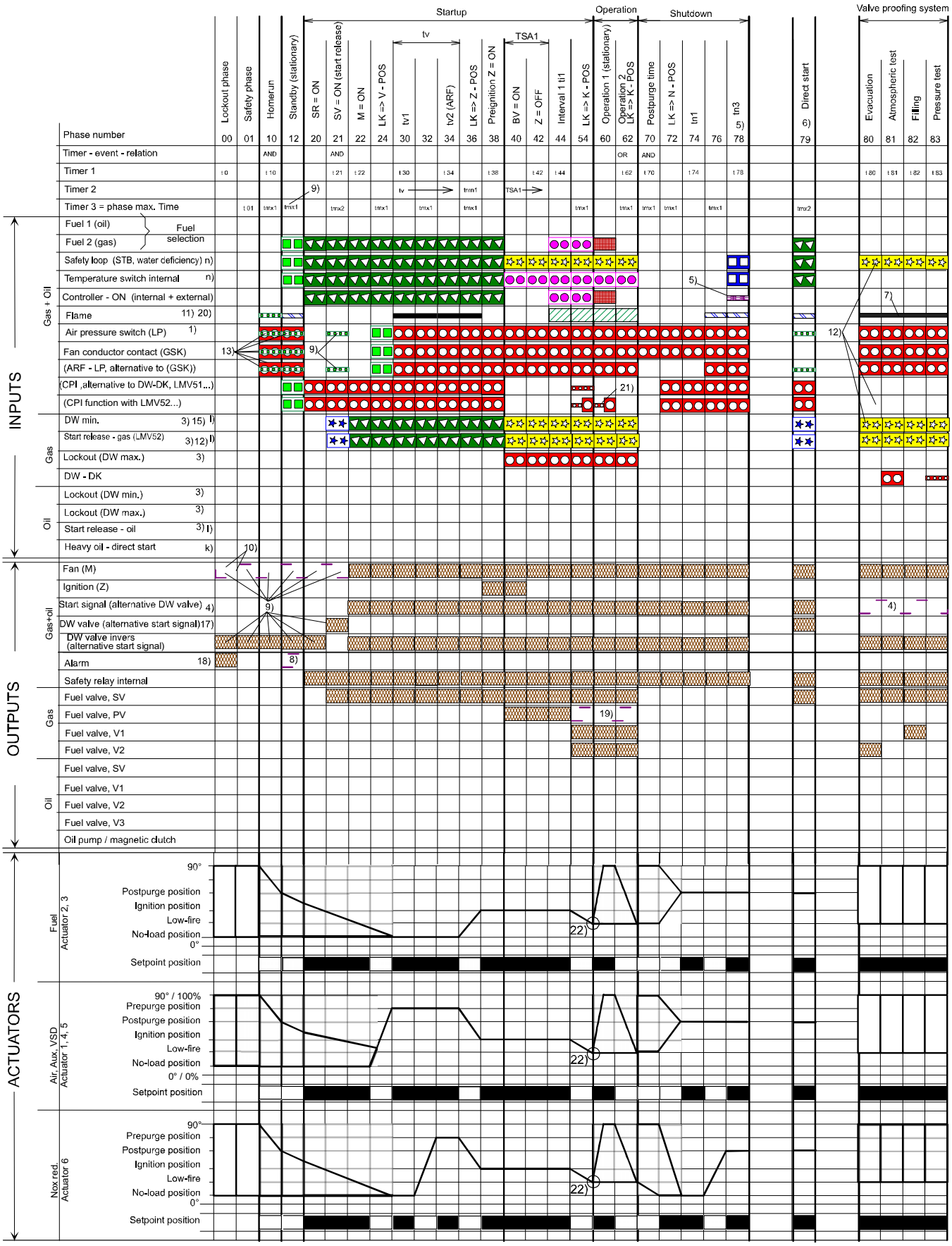

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Fig. 8

Legend 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 pre-purge
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

Legend 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 LMV51...: Continuous pilot gas / oil: Activated → Pilot valve is also activated in operation
20) Parameter: Only with LMV51...: Extraneous light, pilot phase, operating phase gas / oil → Separate flame supervision possible
21) Parameter: Only with LMV51...: 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 LMV51... 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

3.9 Actuators

Warning notes

WARNING

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

Do not open, interfere with or modify the actuators!

- ➤ All activities (mounting, installation and service work, etc.) must be performed by qualified staff.
- ➤ Before making any wiring changes in the connection area of the actuator, completely isolate the burner control from the mains supply (all-polar disconnection).
- ➤ Ensure protection against electric shock hazard by providing adequate protection for the connection terminals and by securing the housing cover.
- ➤ Check to ensure that wiring is in an orderly state.
- ➤ Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage.

WARNING

The housing cover may only be removed for short periods of time for wiring or when making the addressing.
It must be made certain that dust or dirt will not get inside the actuator while such work is carried out.

Use

The actuators (Fig. 9) are used to drive and position the air damper and the gas butterfly valve, without mechanical leverages but via the interposition of an elastic coupling.

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

Installation notes

- Always run the high-voltage ignition cables separate from the unit and other cables while observing the greatest possible distance.
- To ensure protection against electric shock hazard, make certain that the AC 230 V section of the actuator is strictly segregated from the functional low-voltage section.
- The holding torque is reduced when the actuator's power supply is switched off.

WARNING

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

Fig. 9

Technical data

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

4 Installation

4.1 Notes on safety for the installation

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

DANGER

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

WARNING

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

4.2 Handling

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

With regard to the transport in the obligatory passages, refer to the overall dimensions shown in Fig. 2.

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 8-10” from the ground.

CAUTION

After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material.
Before proceeding with the installation operations, carefully clean all around the area where the burner will be installed.

4.3 Preliminary checks

Checking the consignment

CAUTION

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

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

WARNING

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

WARNING

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

4.4 Operation position

The burner is designed to operate only in the positions **1**, **2, 3** and **4** (Fig. 10).

Installation **1** is preferable, as it is the only one that allows the maintenance operations as described in this manual. Installations **2**, **3 and 4** permit operation but make maintenance and inspection of the combustion head more difficult.

Any other position could compromise the correct operation of the appliance.

Installation **5** is prohibited for safety reasons.

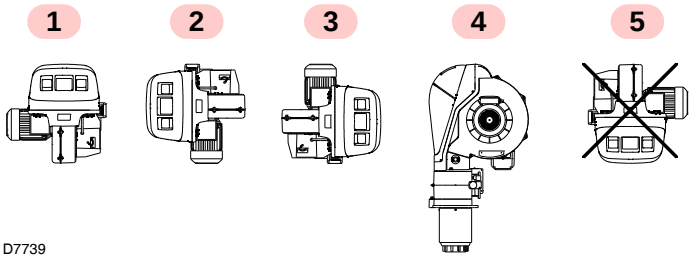


Fig. 10

4.5 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) M12 X 25 supplied with the burner.

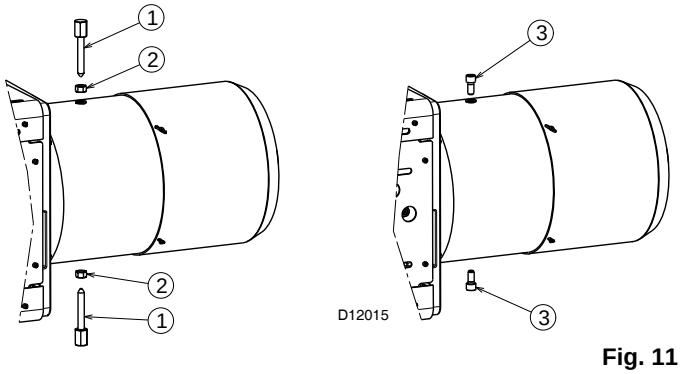


Fig. 11

4.6 Securing the burner to the boiler

4.6.1 Boring the boiler plate

Drill the end plate of the combustion chamber as shown in Fig. 12.

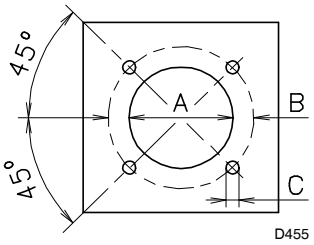


Fig. 12

mm	A	B	C
RS 300/E LN	13 25/32"	17 51/64"	3/4" coarse
RS 400/E LN	13 25/32"	17 51/64"	3/4" coarse
RS 500/E LN	15 11/32"	17 51/64"	3/4" coarse

4.6.2 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) 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.

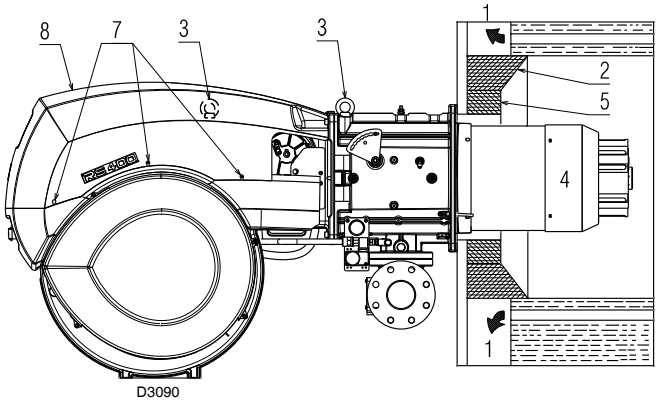


Fig. 13

4.6.3 Burner securing

- ➤ 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.
- ➤ The coupling of the burner-boiler must be airtight.

4.6.4 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.

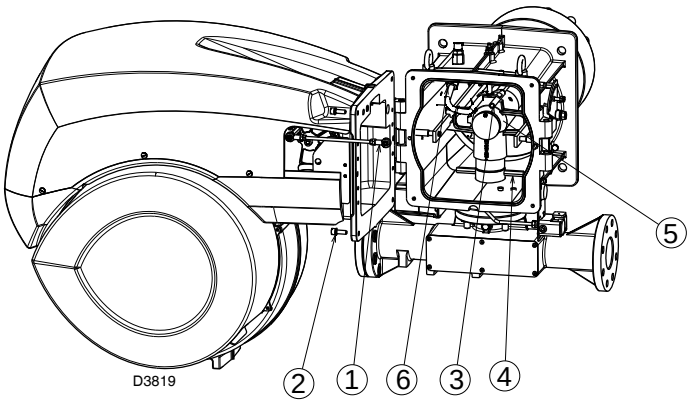


Fig. 14

4.7 Electrode positioning

Make sure that the electrode and the ignition pilot are positioned as shown in figure (Fig. 15).

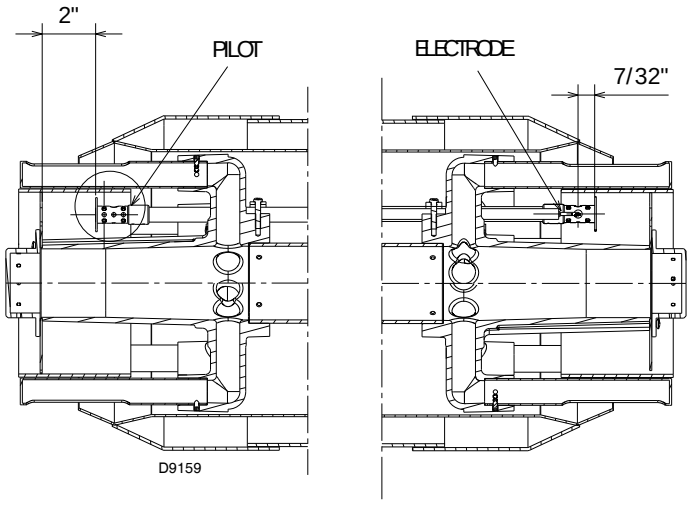


Fig. 15

4.8 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. 16.

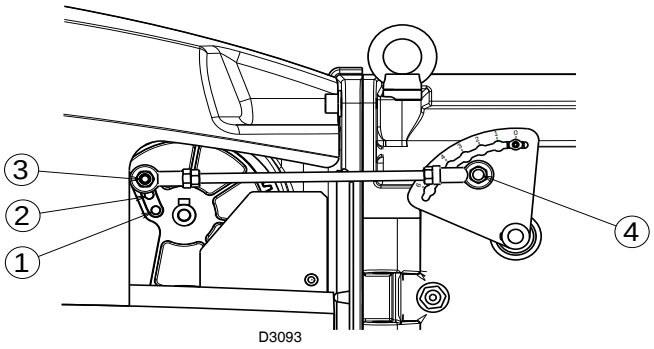


Fig. 16

The choice of the hole (1-2-3) to be used is decided on the basis of diagram (Fig. 17) against the required maximum output.

Setting is pre-arranged in the plant for the maximum run (hole 3) (Fig. 16).

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

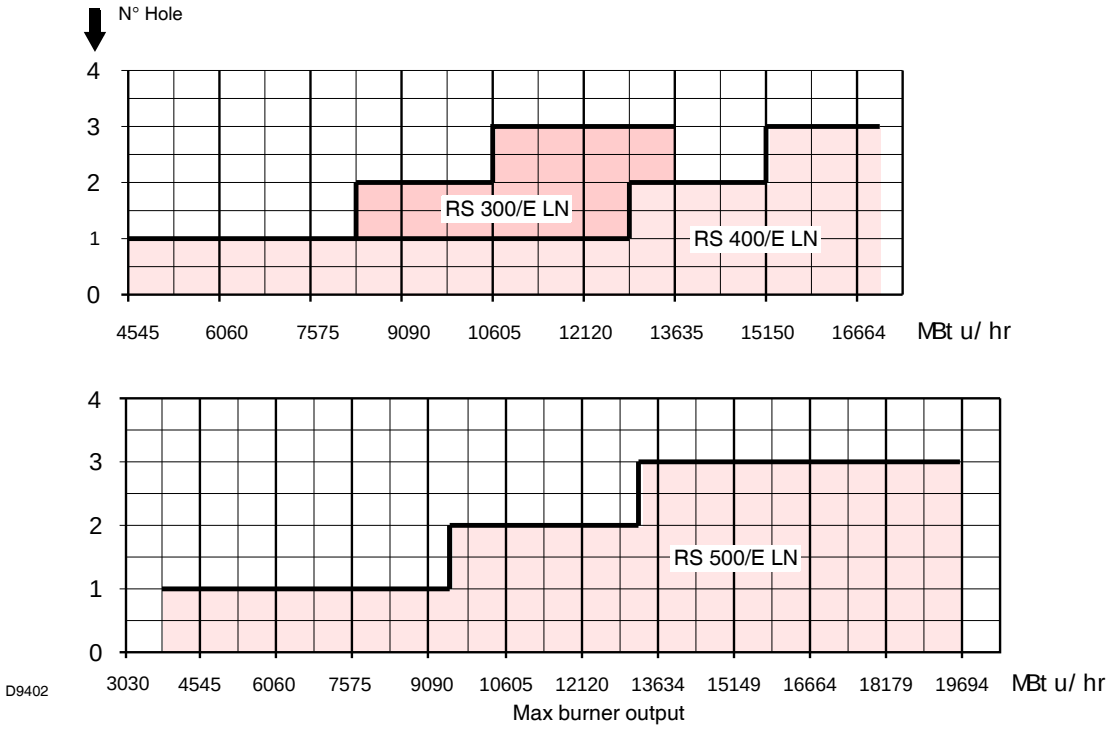


Fig. 17

If combustion requirements require you to move spacer 1) (Fig. 18) 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. 18) supplied with the burner.

Proceed as follows:

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

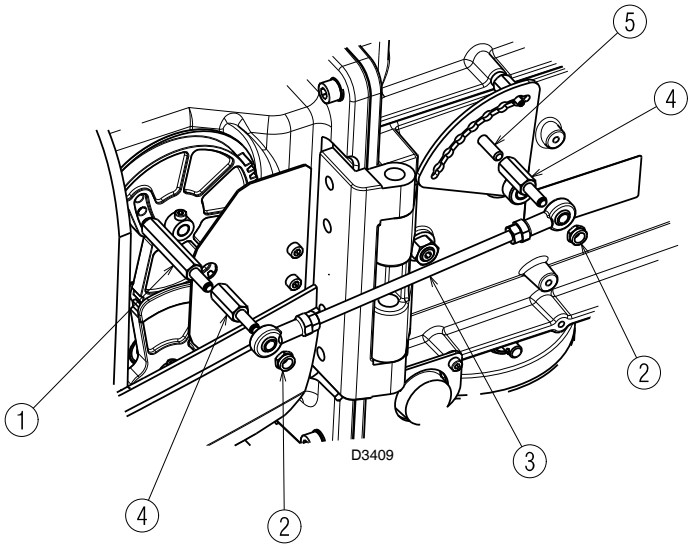


Fig. 18

4.9 Rotation of fan motor

The correct motor rotation direction is indicated by the phase sequence relay 16) (Fig. 6).

After turning the power on to the burner, check the green led lights up on the phase sequence relay.

If the phase sequence is not correct, the burner does not fire.

4.10 Gas train

4.10.1 Gas train assembly

The gas train is to be connected on the right of the burner, by flange 1) (Fig. 19).

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.

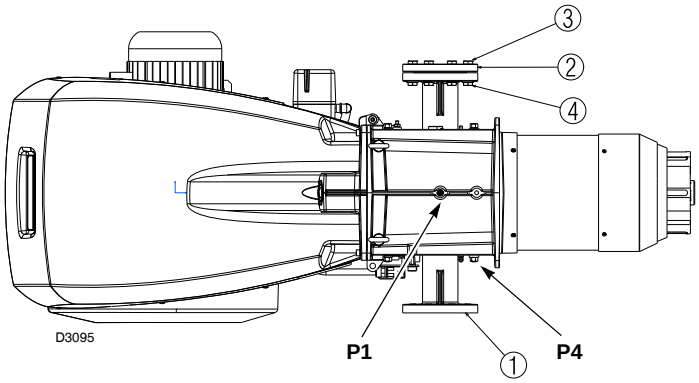


Fig. 19

4.10.2 Gas feeding line

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

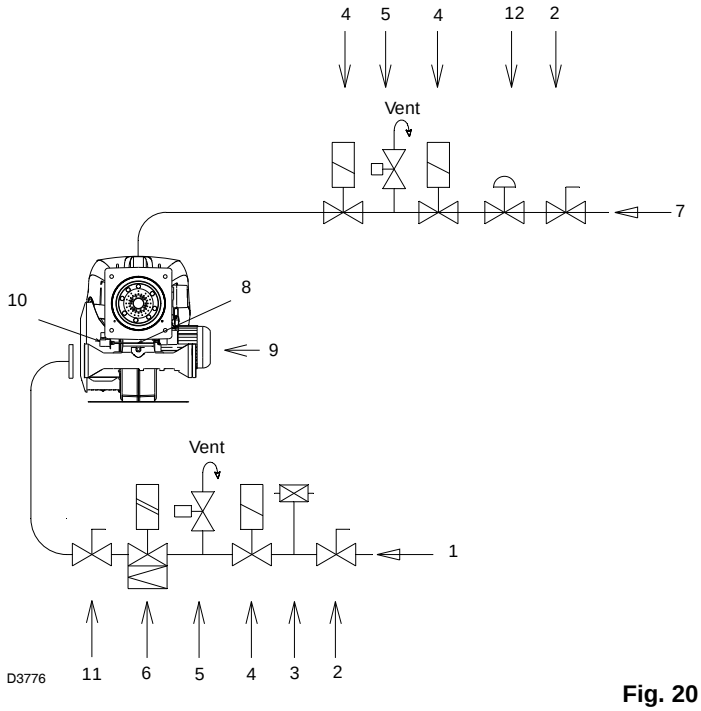


Fig. 20

Key to lay-out (Fig. 20)

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

4.10.3 Gas pressure

Important

The pressure at the head of the burner from table refers to zero in the combustion chamber; to obtain true pressure, measured by a U-type manometer, (Fig. 36) add the counter-pressure of the boiler.

Note

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

	GCV MBtu/hr	Combustion Head "WC	Gas butterfly + Adaptor "WC
RS 300/E LN	5112	3.3	0.63
	5680	3.7	0.79
	7574	4.9	1.38
	9467	5.4	2.13
	11361	5.9	3
	13254	7.9	4.2
	14390	9	5.1
RS 400/E LN	6816	2.3	1.1
	7574	3	1.38
	9467	4.7	2.13
	11361	6.4	3
	12307	7.3	3.62
	13254	8.3	5.17
	15148	10.8	5.47
	17042	13	7
RS 500/E LN	9467	4.4	1.81
	11361	6	2.64
	13254	7.7	3
	15148	9.7	3.82
	17042	11.8	4.64
	18935	14.1	5.55
	19692	15	5.9

4.11 Electrical wiring

Notes on safety for the electrical wiring

DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the electrical layouts.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the electrical layouts.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- Do not invert the neutral with the phase in the electrical supply line.
  Any inversion would cause a lockout due to firing failure.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards.
  It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel.
  Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum input power of the device,as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
- - do not use adapters, multiple sockets or extensions;
- - use an omnipolar switch with an opening of at least $^1/_8$" (overvoltage category) between the contacts, as indicated by the current safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:

DANGER

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

WARNING

close the fuel interception tap.

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

All the cables to be connected to the burner are fed through the grommets (Fig. 21).

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
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 Fan motor cable (used in the factory)
6 Available

DANGER

The control panel is in compliance with UL508A.

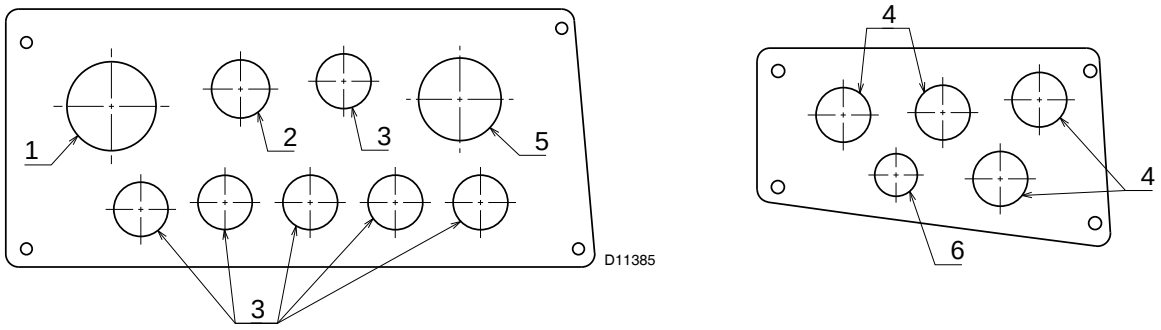


Fig. 21

4.12 Thermal relay calibration

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

4.12.1 Electro-mechanical thermal relay

The electro-mechanical termal relay (Fig. 22) is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase.

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

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

➤ To reset, in the case of an intervention of the thermal relay, press the button “**RESET**” (Fig. 22).
➤ The button “**STOP**” (Fig. 22) opens the NC (95-96) contact and stops the motor.

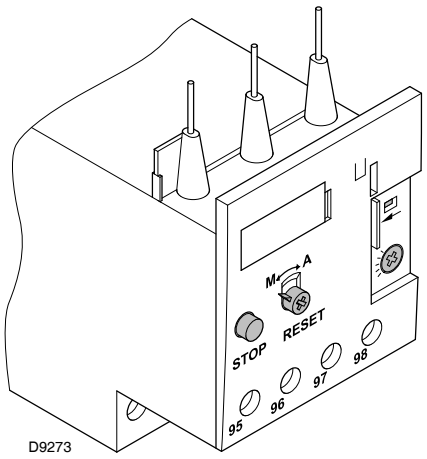


Fig. 22

➤ To test the thermal relay, insert a screwdriver in the window “**TEST**” (Fig. 23) and move it in the sense of the arrow (towards right).

WARNING

Automatic resetting can be dangerous.

This action is not provided for the burner operation.

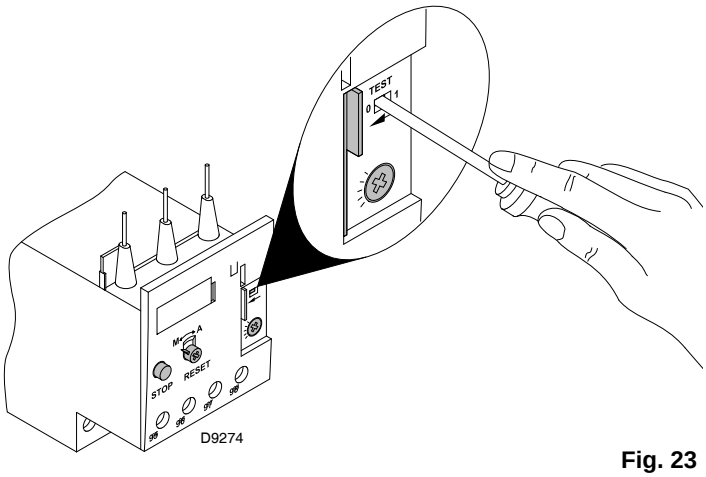


Fig. 23

4.12.2 Electronic thermal relay

➤ To reset, in the case of an intervention of the thermal relay, press the button “**RESET**” (Fig. 24).

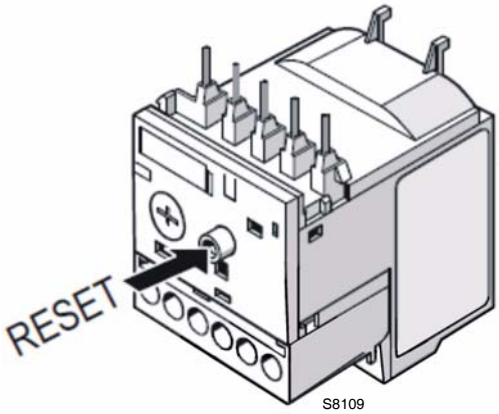


Fig. 24

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

➤ **Device test (Fig. 25)**
Push slowly the button in the window with a little screwdriver.

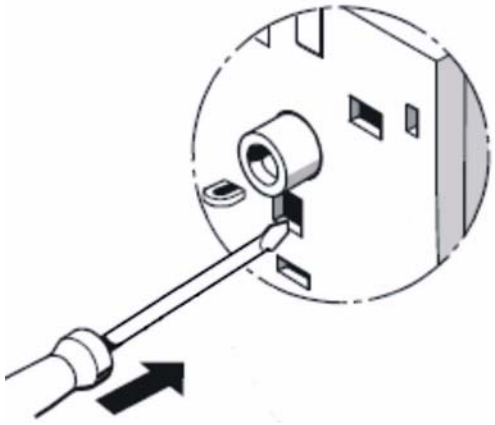


Fig. 25

➤ **Contact test NC (95-96) and NO (97-98)(Fig. 26)**
Insert in the window a little screwdriver and move it in the sense of the arrow.

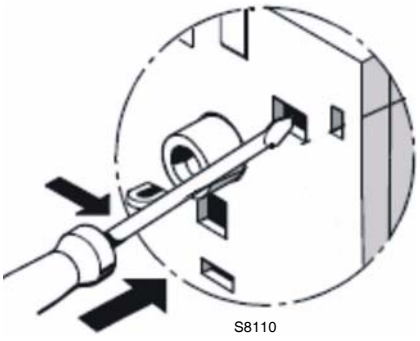


Fig. 26

4.13 Motor connection at 208-230 or 460V only for RS 300/E LN

WARNING:
the motors, manufactured for 208-230/460V **IE2/Epact** voltage, have a different connection than **IE1** motors, no more star/delta but star/double star.
Please, pay attention to the indications in case of modification of voltage, maintenance, or substitution.

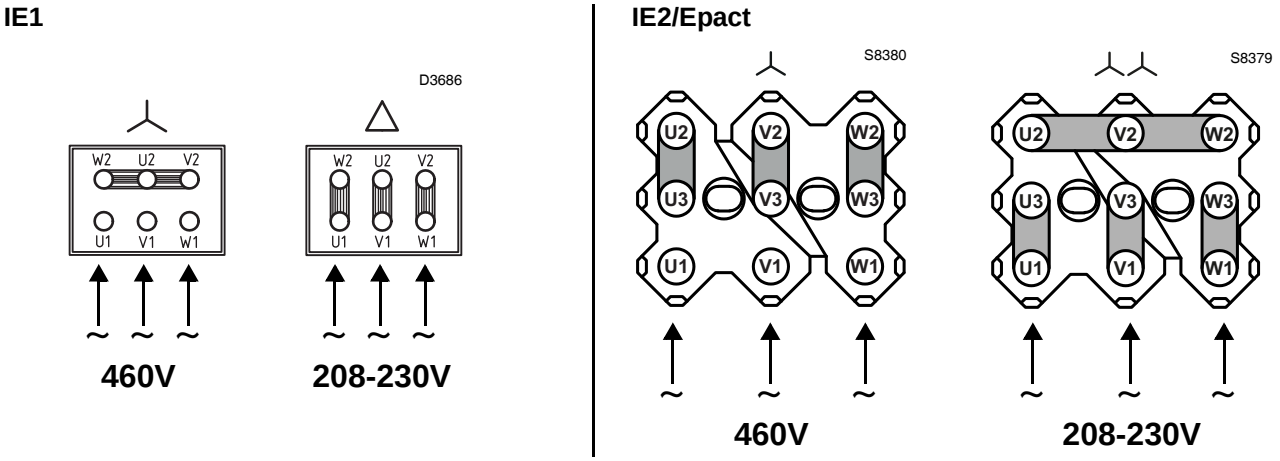


Fig. 27

4.14 Motor connection at 575V only for RS 300/E LN

WARNING:
the motors, manufactured for 575V **IE2/Epact** voltage, have the same control box base of the IE1 motors.
Please pay attention to the indications in case of maintenance or substitution.

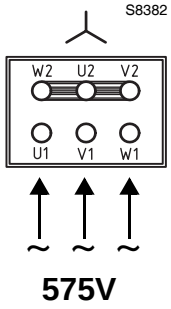


Fig. 28

4.15 Reversible direction

WARNING:
If it is necessary to reverse the direction then reverse the two main supply phases.
For example: L1 with L2, there is not difference between **IE1** and **IE2/Epact.**

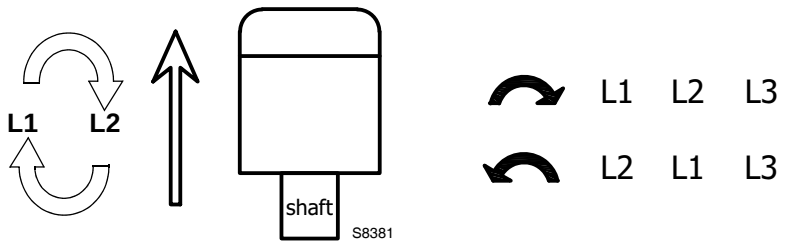


Fig. 29

4.16 Motor connection at 208-230 or 460V only for RS 400/E LN - RS 500/E LN

WARNING:
the motors, manufactured for 208-230/460V **IE2/Epact** voltage, have a different connection than **IE1** motors, no more star/delta but star/double star.
Please, pay attention to the indications in case of modification of voltage, maintenance, or substitution.

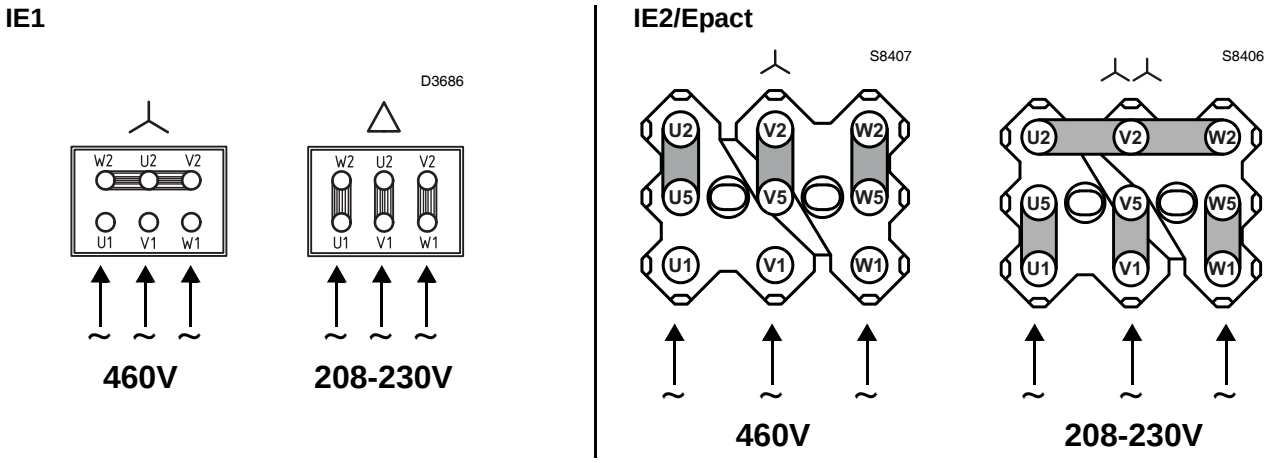


Fig. 30

4.17 Motor connection at 575V only for RS 400/E LN - RS 500/E LN

WARNING:
the motors, manufactured for 575V **IE2/Epact** voltage, have the same control box base of the IE1 motors.
Please pay attention to the indications in case of maintenance or substitution.

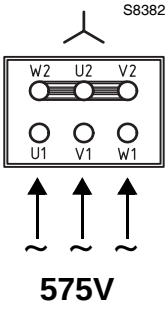


Fig. 31

4.18 Reversible direction

WARNING:
If it is necessary to reverse the direction then reverse the two main supply phases.
For example: L1 with L2, there is not difference between **IE1** and **IE2/Epact.**

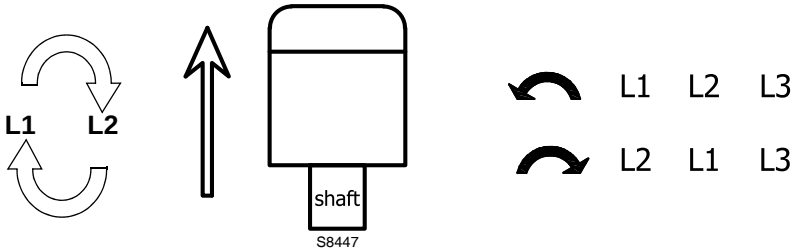


Fig. 32

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.

5.2 Adjustments before first firing

Adjustment of the combustion head has been illustrated in Fig. 16 and Fig. 18.

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) to the start of the scale.

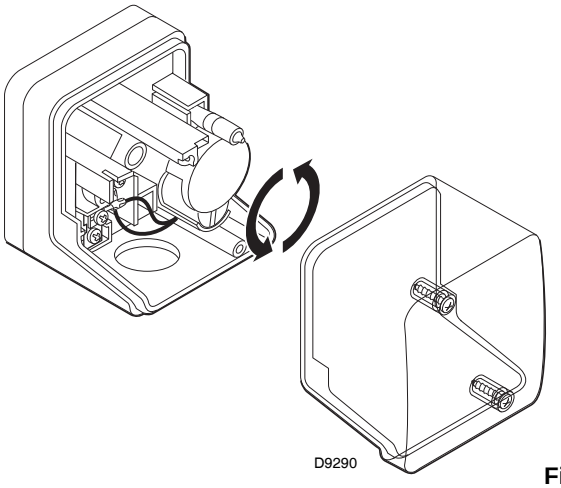


Fig. 33

➤ Adjust the maximum gas pressure switch (Fig. 34) to the end of the scale.

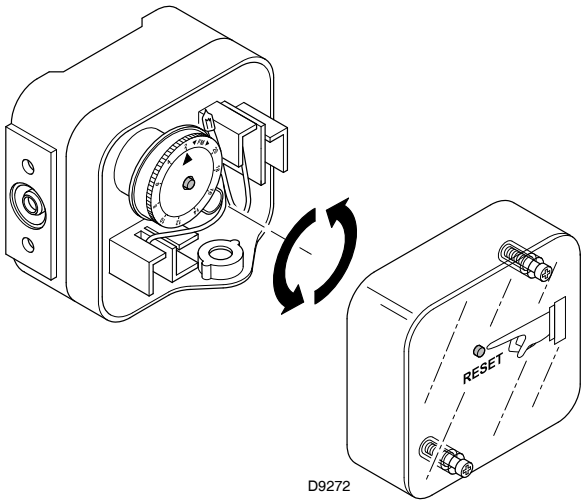


Fig. 34

➤ Adjust the air pressure switch (Fig. 35) to the start of the scale.

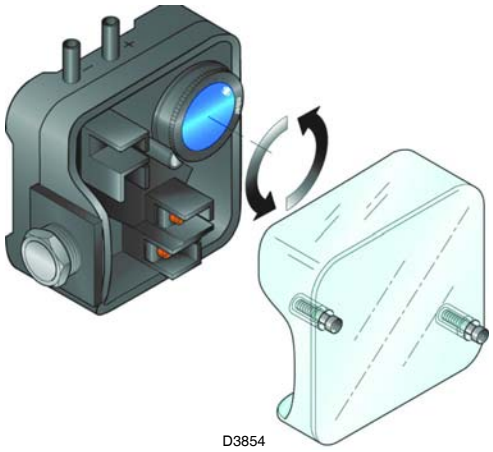


Fig. 35

➤ 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. 36) to the gas pressure test point on the sleeve.
The manometer readings are used to calculate MAX. burner power using the table on pag. 23.

➤ 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.

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.

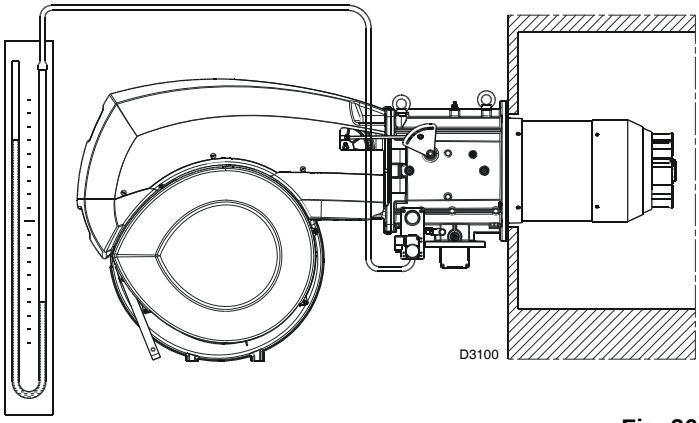


Fig. 36

5.3 Burner start-up

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

Close the thermostats/pressure switches.

Turn the switch to position **"LOCAL"**. (Fig. 37).

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. 37.

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. 37 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 three-phase power supply.

NOTA:

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

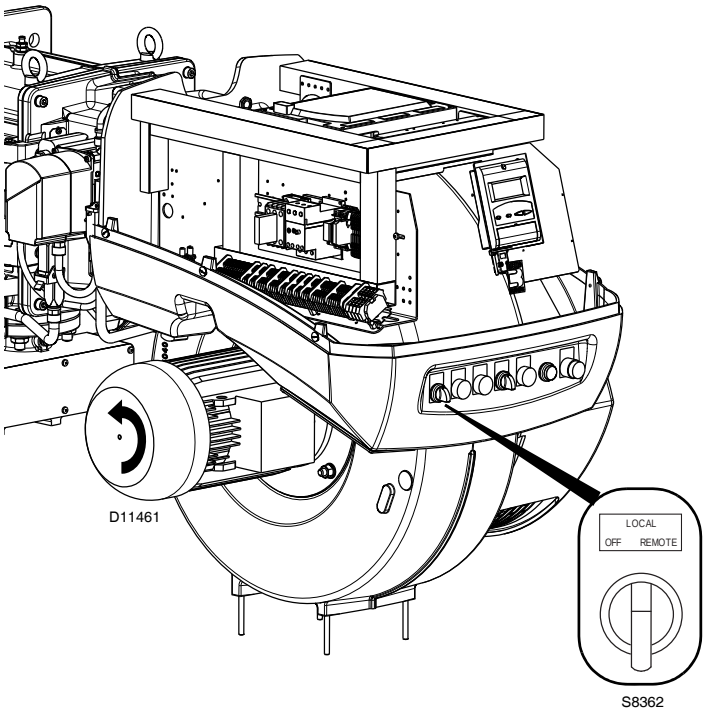


Fig. 37

5.4 Burner firing

Having completed the checks indicated in the previous heading, the burner should fire. If the motor starts but the flame does not appear and the control box goes into lock-out, reset and wait for a new firing attempt.

If firing 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 firing delivery.

The arrival of gas at the sleeve is indicated by the U-type manometer (Fig. 36).

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

Once you have completed adjustments, select AUTOMATIC operating mode on the AZL display.

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. 38) under the burner's intake and close grille 1) (Fig. 38) progressively until you achieve the required output.

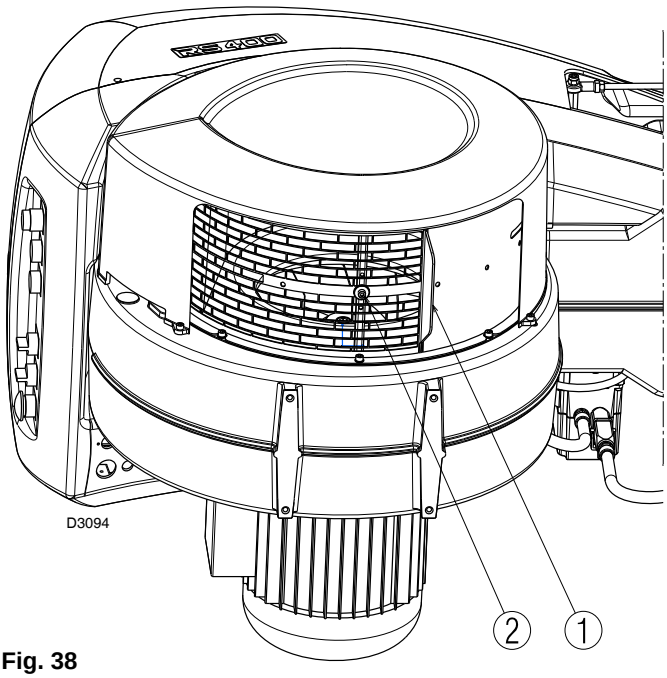


Fig. 38

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. 17.

WARNING

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

5.6 Air/fuel control and power modulation system

5.6.1 General information

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;
- a sequence (cascade control) of several boilers by suitably connecting different units, and activation of internal software in the individual systems (optional item).

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

NOTE

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

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

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

5.7 Final calibration of the pressure switches

5.7.1 Air pressure switch

Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (Fig. 35).
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.

ATTENTION

As a rule, the air pressure switch must prevent the air pressure from lowering below 80% of the adjustment value as well as preventing the CO in the fumes from exceeding 1% (10,000 ppm).

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

On **RS 300-400-500/E burners** the air pressure switch is fitted in a "differential" mode, that is, with two pipes connected to the specific pressure test points “+” and “-” 22) and 23) (Fig. 5).

5.7.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch after having performed all other burner adjustments with the maximum gas pressure switch set to the end of the scale (Fig. 39).
With the burner operating at MAX output, reduce the adjustment pressure by slowly turning the adjustment dial anticlockwise until the burner locks out.
Then turn the dial clockwise by 0.8” WC and repeat burner firing.
If the burner locks out again, turn the dial again clockwise by 0.4” WC.

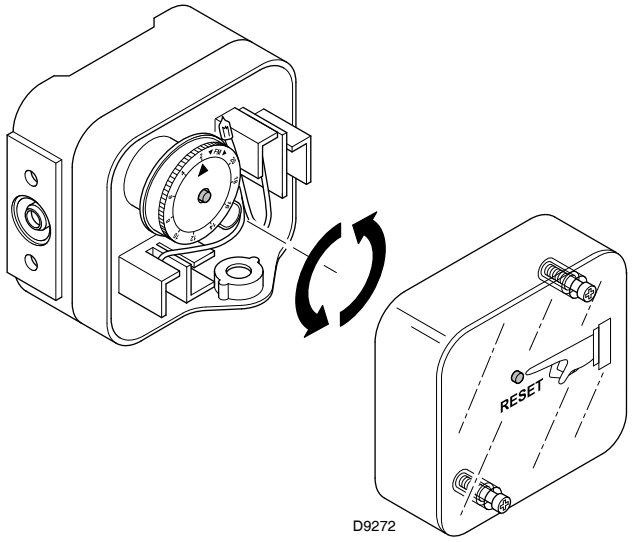


Fig. 39

5.7.3 Minimum gas pressure switch

Adjust the minimum gas pressure switch after having performed all the other burner adjustments with the pressure switch set at the start of the scale (Fig. 40).
With the burner operating at MAX output, increase adjustment pressure by slowly turning the relative dial clockwise until the burner locks out.
Then turn the dial anti-clockwise by 0.8” WC and repeat burner starting to ensure it is uniform.
If the burner locks out again, turn the dial anti-clockwise again by 0.4” WC.

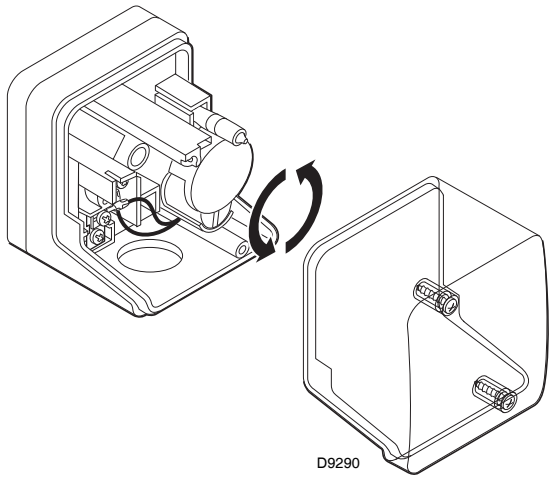


Fig. 40

5.8 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 QRI flame detector	⇨	The burner must stop in lockout due to firing failure

WARNING

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

6 Maintenance

6.1 Notes on safety for the maintenance

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

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

DANGER

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

Before carrying out any maintenance, cleaning or checking operations:

DANGER

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

DANGER

close the fuel interception tap

6.2 Maintenance programme

6.2.1 Maintenance frequency

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

6.2.2 Checking and cleaning

Combustion

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

Combustion head

Open the burner and make sure that all 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 detector current

Measurement of the detector's signal (Fig. 41) 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 dosplay flame approx. 50%).

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

To measure power, use a voltometer with a 10 Vdc scale, connected as illustrated in Fig. 41.

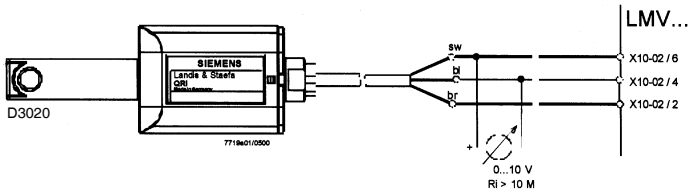


Fig. 41

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.

6.3 Opening the burner

DANGER

Disconnect the electrical supply from the burner

- ➤ Remove the tie rod 1) (Fig. 42) 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.

6.4 Closing the burner

- ➤ Close the burner at the hinge.
- ➤ Apply screw 5).
- ➤ Connect the gas pressure switch test point 4)..
- ➤ Connect the gas servomotor test point 3).
- ➤ Apply the tire rod 1) (Fig. 42) of the head movement lever, loosening nut 2).

Connect the electrical supply from the burner.

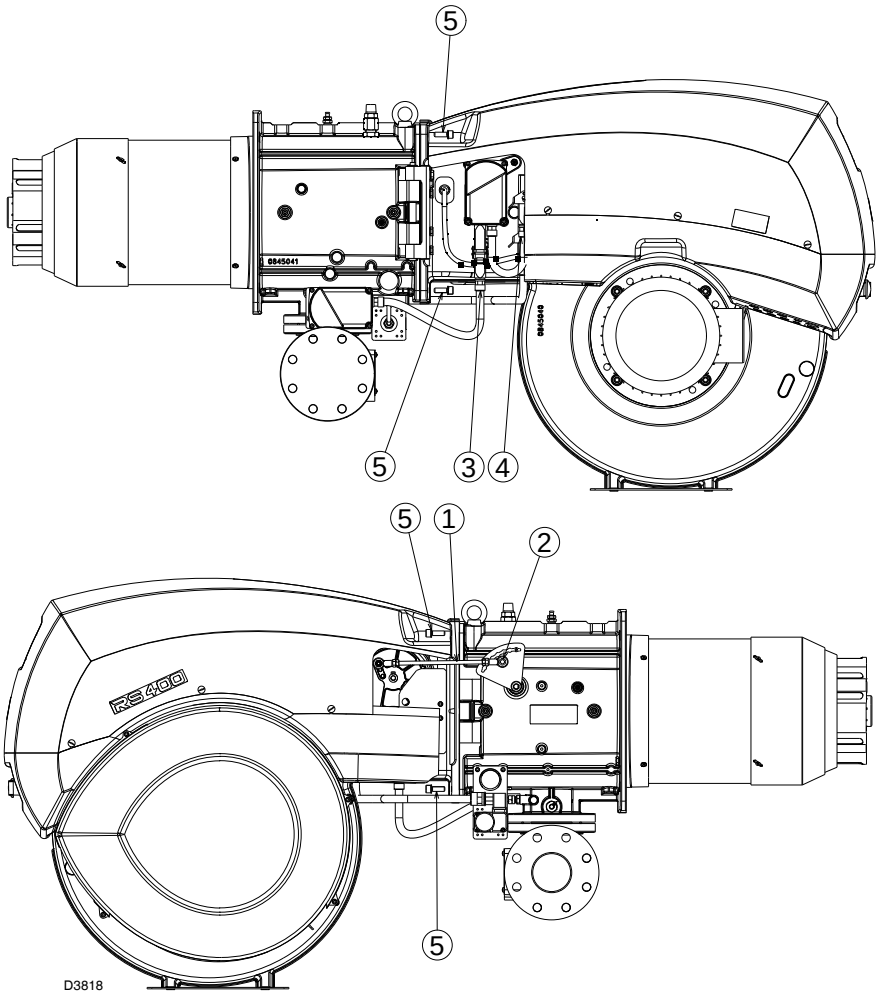
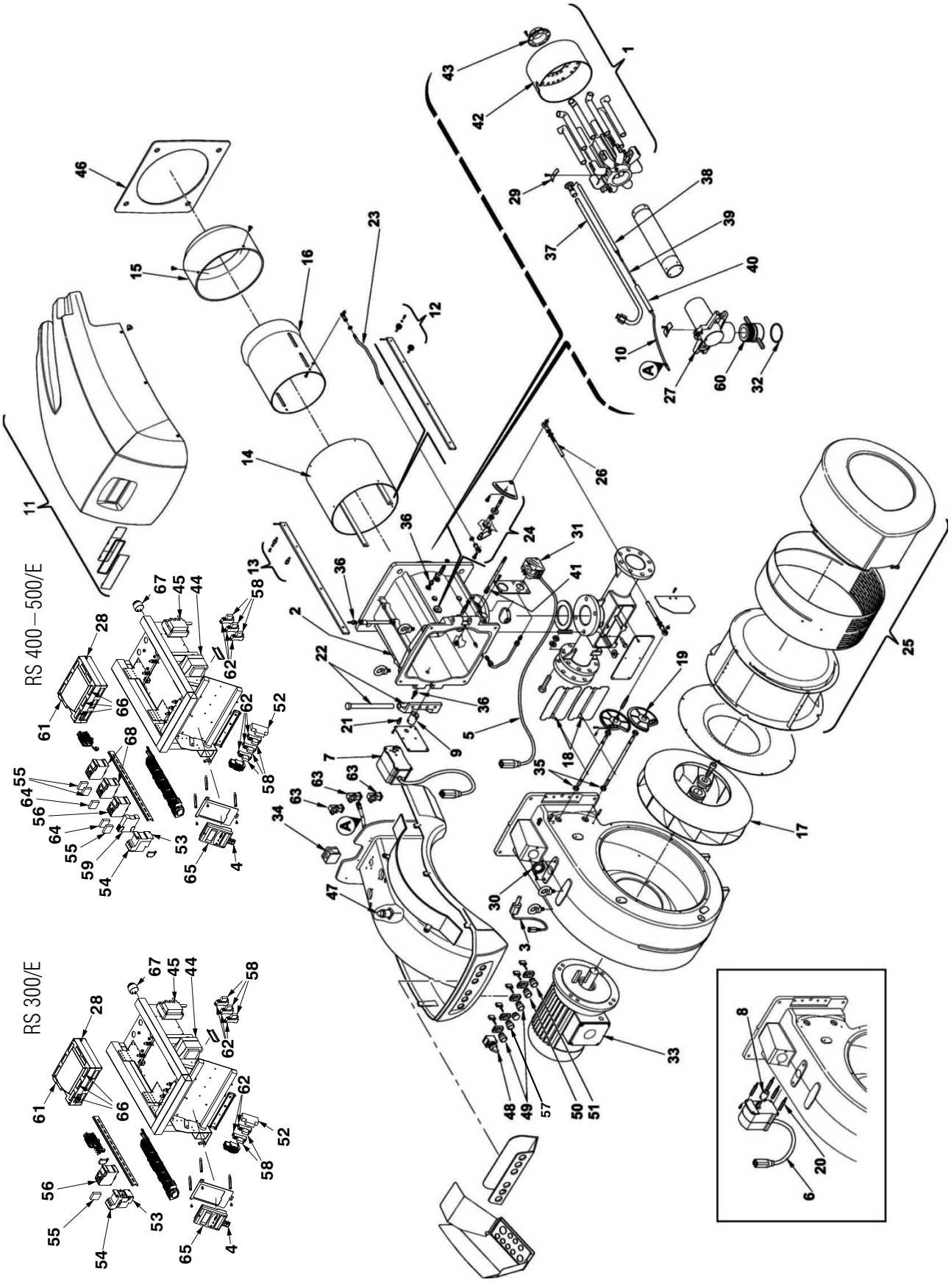


Fig. 42

A Appendix - Spare parts



N.	CODE	RS 300/E LN	RS 400/E LN	RS 500/E LN	DESCRIPTION	*
1	**20013113**	•	•	•	GAS HEAD	A
2	**20013114**	•	•	•	MANIFOLD	
3	**20006151**	•	•	•	QRI INFRARED SENSOR	
4	**3014113**	•	•	•	AZL PLUG	C
5	**20013931**	•	•	•	PRESSURE SWITCH CONNECTION	C
6	**3013304**	•	•	•	AIR SERVOMOTOR	B
7	**3013305**	•	•	•	GAS SERVOMOTOR	B
8	**3013307**	•	•	•	JOINT	
9	**3013308**	•	•	•	JOINT	
10	**20014102**	•	•	•	HIGH VOLTAGE LEAD	A
11	**20013115**	•	•	•	COVER	
12	**3013311**	•	•	•	BAR	C
13	**3013312**	•	•	•	BAR	C
14	**3013313**	•	•		SLEEVE	
14	**3013641**			•	SLEEVE	
15	**3013314**	•	•		END CONE	B
15	**3013642**			•	END CONE	B
16	**20013118**	•			SHUTTER	C
16	**20013116**		•		SHUTTER	C
16	**20013151**			•	SHUTTER	C
17	**20006192**	•			FAN	C
17	**20006205**		•		FAN	C
17	**3013317**			•	FAN	C
18	**3013319**	•	•	•	AIR DAMPER	C
19	**3013320**	•	•	•	GEAR TRAIN	
20	**3013321**	•	•	•	STUD	
21	**3013322**	•	•	•	STUD	
22	**3013323**	•	•	•	HINGE	
23	**3013324**	•	•	•	INTERNAL TIE ROD	C
24	**3013325**	•	•	•	LEVER ASSEMBLY	
25	**3013326**	•	•	•	AIR INTAKE ASSEMBLY	
26	**3013327**	•	•	•	EXTERNAL TIE ROD	C
27	**3013945**	•	•	•	ELBOW	
28	**3013282**	•	•	•	ELECTRONIC CAM	C
29	**3012872**	•	•	•	U BOLT	
30	**3008663**	•	•	•	VIEWING PORT	
31	**3010295**	•	•	•	GAS PRESSURE SWITCH	A
32	**3007170**	•	•	•	O-RING	

N.	CODE	RS 300/E LN	RS 400/E LN	RS 500/E LN	DESCRIPTION	*
33	**20008598**	•			MOTOR 7.5 HP 230V/460V	A
33	**3014152**	•			MOTORE 7.5 HP 575V	A
33	**20013155**		•		MOTOR 10 HP 460V	A
33	**20042608**		•		MOTOR 10 HP 575V	A
33	**20043145**			•	MOTOR 20 HP 460V	A
33	**20043004**			•	MOTOR 20 HP 575V	A
34	**3012948**	•	•	•	AIR PRESSURE SWITCH	A
35	**3012795**	•	•	•	BEARING	C
36	**3005447**	•	•	•	PRESSURE TEST POINT	C
37	**20013157**	•	•	•	GAS PILOT	A
38	**3013106**	•	•	•	ELECTRODE	A
39	**20013159**	•	•	•	HIGH VOLTAGE LEAD	A
40	**20013160**	•	•	•	INSULATOR	A
41	**3007029**	•	•	•	O-RING	B
42	**3013330**	•	•	•	AIR DIFFUSER	A
43	**3013331**	•	•	•	GAS NOZZEL	A
44	**3013284**	•	•	•	ELECTRONIC CAM TRANSFORMER	A
45	**3012956**	•	•	•	TRANSFORMER	B
46	**3013328**	•	•	•	FLANGE GASKET	A
47	**20010961**	•	•	•	HORN	
48	**20010963**	•	•	•	SWITCH OFF-LOCAL-REMOTE	
49	**20036017**	•	•	•	GREEN SIGNAL LIGHT	
50	**20010962**	•	•	•	BUTTON	
51	**3013354**	•	•	•	RED RESET PUSH-BUTTON	
52	**20014366**	•	•	•	FUSE HOLDER	
53	**20043328**	•	•	•	THERMAL RELAY BASE	
54	**20027917**	•	•	•	OVERLOAD	
55	**20013967**	•	•	•	NO AUXILIARY CONTACT	C
56	**20027247**	•			CONTACTOR	B
56	**20043297**		•	•	CONTACTOR	B
57	**20036019**	•	•	•	WHITE SIGNAL LIGHT	B
58	**20010969**	•	•	•	RELAY	B
59	**20013936**		•	•	TIMER	
60	**3014117**	•	•	•	CONTROL WHEEL	B
61	**3006211**	•	•	•	FUSE 6.3	
62	**3012841**	•	•	•	BASE	B
63	**3013363**	•	•	•	7 POLE SOCKET 90°	
64	**20013969**		•	•	NC AUXILIARY CONTACT	B

N.	CODE	RS 300/E LN	RS 400/E LN	RS 500/E LN	DESCRIPTION	*
65	**3013283**	•	•	•	AZL DISPLAY	
66	**20013932**	•	•	•	ELECTRONIC CAM CONNECTOR	C
67	**20031413**	•	•	•	WARNING	
68	**20013973**		•	•	CONTACTOR	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 - 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:					

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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