



Forced draught gas burners

Progressive two stage or modulating operation



Code	Model
20068988	RS 160/E

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1

Information and general instructions

1.1 Information about the instruction manual

1.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

1.1.2 General dangers

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



DANGER

Maximum danger level!

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



WARNING

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



CAUTION

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

1.1.3 Safety precautions

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



WARNING

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

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

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

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

1.1.4 Danger: live components



DANGER

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

Other symbols

**ENVIRONMENTAL PROTECTION**

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

- This symbol indicates a list.

Abbreviations used

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

Delivery of the system and the instruction manual

When the system is delivered, it is important that:

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

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

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

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

1.2 Guarantee and responsibility

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



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 the manufacturer of the guarantee that it supplies with the burner.

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

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

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

1.2.1 Owner's responsibility

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

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

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

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



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 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 160/E	
Output ⁽¹⁾	High	kW MBtu/hr	1032 - 2065 (1847 *) 3521 - 7046 (6302 *)
	Low	kW MBtu/hr	333 1136
Fuel		Natural gas	
- Max delivery		SCFH	7046
- Pressure at maximum delivery ⁽²⁾ natural gas		" WC	7
Operation		Low - high or modulating	
Standard application		Boilers: water, steam, thermal oil	
Ambient temperature		°F	32 - 104 (0 - 40 °C)
Combustion air temperature		°F max	140 (60 °C)
Noise levels ⁽³⁾		dB(A)	83.1

Tab. A

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

⁽²⁾ Pressure at test point 21)(Fig. 3), with zero pressure in the combustion chamber, with open gas ring 2)(Fig. 21) at 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-UL Canadian Listing

3.2 Electrical data
Fan motor IE1

Model		RS 160/E		
Control circuit power supply	V/Ph/Hz	120/1/60		
Main power supply (+/-10%)	V/Ph/Hz	208-220/3/60	460/3/60	575/3/60
Fan motor	rpm	3430	3430	3430
	HP	5.5	5.5	5.5
	V	208-230	460	575
	A	15.8	9.1	6.3
Ignition transformer	V1 - V2	120 V - 1 x 8 kV		
	I1 - I2	1.6 A - 20 mA		
Electrical power consumption	W	5200	6050	5250
Electrical control circuit cons.	W max	750	750	750
Total electrical consumption	W	5950	6800	6000
Electrical protection		NEMA 1		

Tab. B
Fan motor IE2/EPACT

Model		RS 160/E		
Control circuit power supply	V/Ph/Hz	120/1/60		
Main power supply (+/-10%)	V/Ph/Hz	208-220/3/60	460/3/60	575/3/60
Fan motor	rpm	3540	3540	3540
	HP	5.5	5.5	5.5
	V	208-230	460	575
	A	13.2	6.6	5.3
Ignition transformer	V1 - V2	120 V - 1 x 8 kV		
	I1 - I2	1.6 A - 20 mA		
Electrical power consumption	W	4550	4550	4600
Electrical control circuit cons.	W max	750	750	750
Total electrical consumption	W	5300	5300	5350
Electrical protection		NEMA 1		

Tab. C

3.3 Burner models designation

Model	Code	Code RBNA	Main Voltage	Flame safeguard
RS 160/E	20068988	tbd	460/3/60	Burner mounted

Tab. D

3.4 Packaging - weight - Approximate measurements

- The packaging of the burner (Fig. 1) rests on a wooden platform that is particularly suitable for lift trucks.
The overall dimensions of the packaging are shown in the Tab. E.
- The weight of the burner complete with its packaging is shown in Tab. E.

Inch	A	B	C	lbs
RS 160/E	59	30 ²⁹ / ₃₂	39 ³ / ₈	286

Tab. E

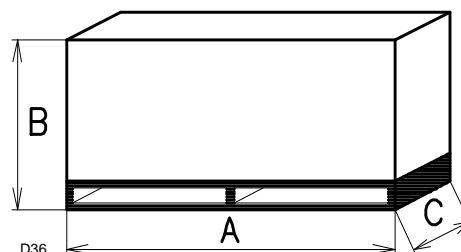


Fig. 1

3.5 Burner dimensions

The dimensions of the burner are shown in Fig. 2.

The dimensions of the open burner are indicated by position I.

Bear in mind that inspection of the combustion head requires the burner to be opened and the rear part drawn back on the sliding bars.

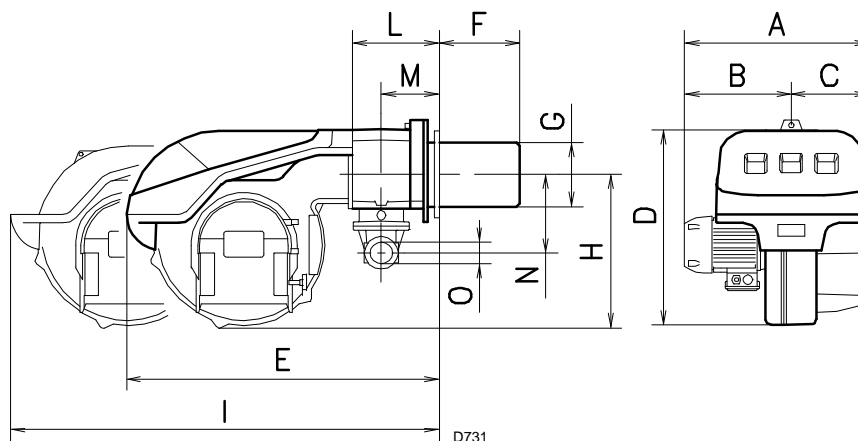


Fig. 2

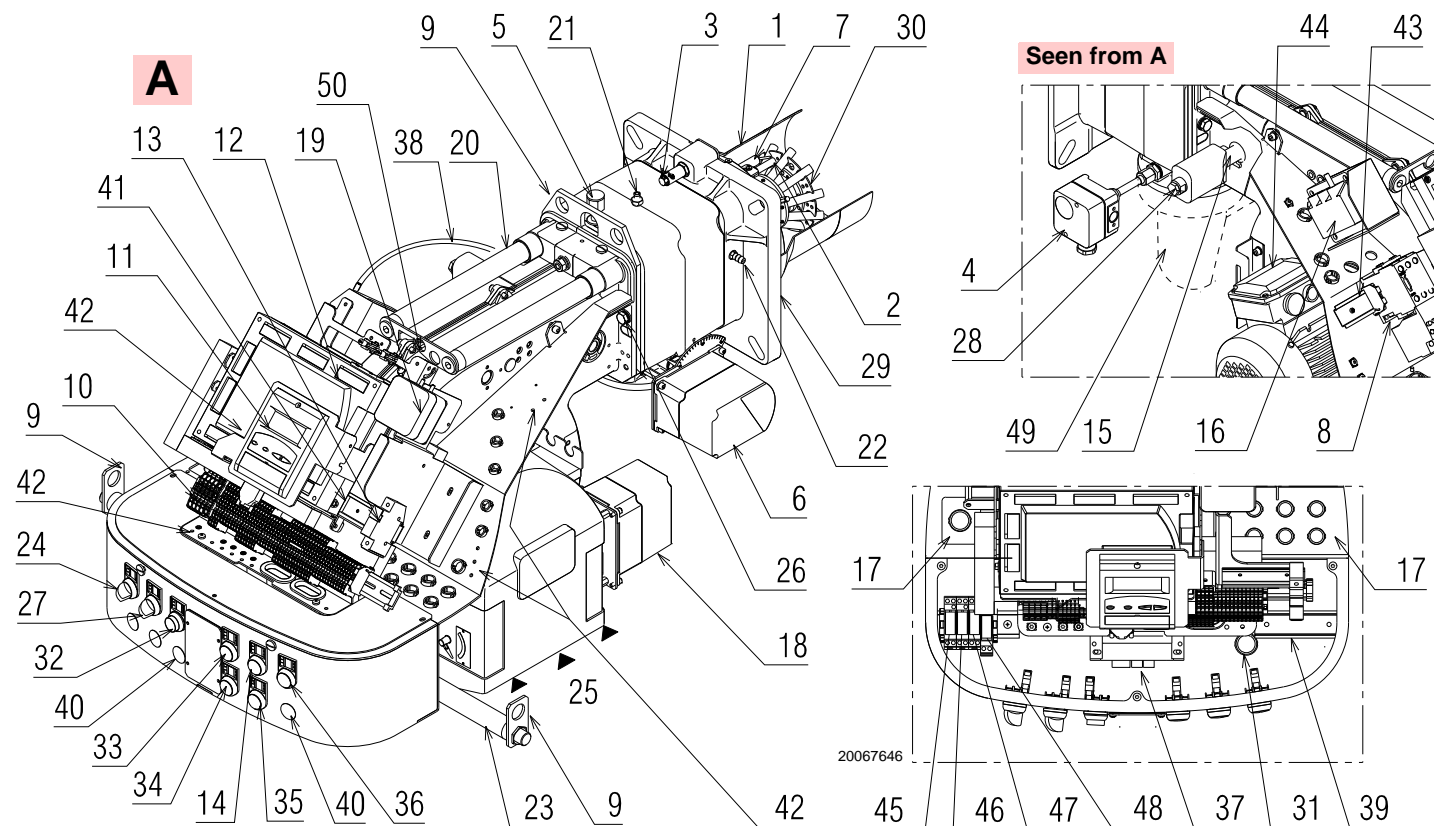
Inch	A	B	C	D	E	F	G	H	I	L	M	N	O
RS 160/E	33 ⁵⁵ / ₆₄	16 ²⁵ / ₃₂	17 ³ / ₃₂	23 ²¹ / ₃₂	41 ¹⁷ / ₆₄	14 ¹¹ / ₁₆	8 ¹¹ / ₁₆	17 ¹¹ / ₆₄	63 ¹⁵ / ₃₂	8 ³¹ / ₃₂	5 ²⁹ / ₃₂	10 ²³ / ₆₄	2

Tab. F

3.6 Burner equipment

The burner is supplied complete with:

Gas train flange	No. 1
Flange gasket	No. 1
Connector for pilot line	No. 1
Screws (M10 x 40) to fix the flange	No. 4
Instruction manual	No. 1

3.7 Burner description

Fig. 3

- | | |
|--|--|
| 1 Combustion head | 31 Horn |
| 2 Burner pilot | 32 Button "ALARM SILENCE" |
| 3 Screw for combustion head adjustment | 33 "POWER ON" signal |
| 4 Maximum gas pressure switch | 34 "IGNITION ON" signal |
| 5 Burner pilot attachment | 35 "FUEL ON" signal |
| 6 Gas actuator | 36 "ALARM ON" signal |
| 7 Ignition electrode | 37 "T1" control box transformer |
| 8 Motor contactor and thermal overload with reset button | 38 High voltage lead |
| 9 Lifting ring | 39 Din bar available for accessories |
| 10 Burner terminal board for electrical wiring "X1" | 40 Optional holes |
| 11 Operator panel with LCD display | 41 Din bar for fuse holder step-down transformer and OCI 412.10 |
| 12 Control box for checking flame and air/fuel ratio | 42 Ground terminals |
| 13 Auxiliary fuse | 43 Din bar for thermal relay, fan motor contactor and terminal strip for QRI |
| 14 "CALL FOR HEAT" signal | 44 Fan motor |
| 15 QRI flame sensor | 45 "K1" relay |
| 16 Ignition transformer "TA" | 46 "K2" relay |
| 17 Holes for cable grommets for electrical wiring for accessories (to be carried out by the installer) | 47 "K3" relay |
| 18 Air actuator | 48 "K5" relay |
| 19 Air pressure switch | 49 Gas train flange |
| 20 Sliding bars for opening the burner and inspecting the combustion head | 50 Air pressure switch test point |
| 21 Gas pressure test point and head fixing screw | |
| 22 Combustion head air pressure test point | |
| 23 Extension sliding bars | |
| 24 Switch "OFF - ON" | |
| 25 Fan air inlet | |
| 26 Screws to secure fan to pipe coupling | |
| 27 "LOCAL REMOTE" switch | |
| 28 Gas butterfly valve | |
| 29 Boiler fixing flange | |
| 30 Flame stability disc | |

One type of burner failure may occur:

- **Flame safeguard lock-out:** if the flame safeguard alarm 36)(Fig. 3) lights up, it indicates that the burner is in lock-out. To reset, press the reset pushbutton.

3.8 Firing rate

The **maximum output** is chosen within area **A** of the diagram (Fig. 4).

The **minimum output** must not be lower than the minimum limit of the diagram.



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.

3.8.1 Procedure to refer burner operating condition in high altitude plants

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

Check in the firing rate graph of the burner (Fig. 4), if the working point defined by the values above is within the range limits.

If not, higher burner size is needed.

Note

- Charts are based only on altitude variation (reference temperature = 68°F, 20°C)
- To get the combined correction in case of different air temperature, a compensation of 1000 ft each 20°F (305 m each 11°C) is applicable (100 ft = 2°F).

Example

Rated capacity = 3000 MBtu/hr - Rated air pressure = 1.5" WC

Real altitude = 5000 ft - Real temperature = 108°F

Δ = 108°F - 68°F (reference temp.) = 40°F
(equivalent 2000 ft variation)
40 : 2 = 20 x 100 = 2000 ft

Proceeding as described above and considering a "virtual altitude" of (5000 + 2000) ft:

- 3000 MBtu/hr at 7000 ft, the corrected capacity is 3847 MBtu/hr
- 1.5" WC at 7000 ft, the corrected burner air pressure is 1.92

Reference conditions:

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

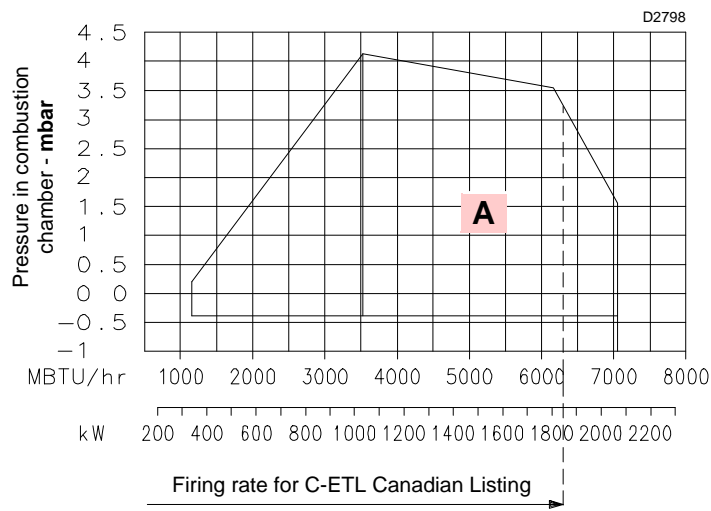


Fig. 4

1 CORRECTED BURNER CAPACITY ACCORDING TO ALTITUDE

Rated Capacity	Altitude										
	m a.s.l.	0	100	305	610	915	1220	1525	1830	2135	2440
	ft a.s.l.	0	328	1000	2000	3000	4000	5000	6000	7000	8000
500		494	500	512	530	551	571	593	616	641	669
1000		987	1000	1023	1061	1101	1142	1186	1232	1282	1337
1500		1481	1500	1535	1591	1652	1713	1778	1848	1924	2006
2000		1974	2000	2046	2121	2202	2284	2371	2464	2565	2675
2500		2468	2500	2558	2652	2753	2855	2964	3079	3206	3343
3000		2962	3000	3069	3182	3303	3425	3557	3695	3847	4012
3500		3455	3500	3581	3712	3854	3996	4149	4311	4488	4680
4000		3949	4000	4092	4243	4404	4567	4742	4927	5130	5349
4500		4442	4500	4604	4773	4955	5138	5335	5543	5771	6018
5000		4936	5000	5116	5303	5505	5709	5928	6159	6412	6686
5500		5429	5500	5627	5834	6056	6280	6520	6775	7053	7355
6000		5923	6000	6139	6364	6606	6851	7113	7391	7694	8024
6500		6417	6500	6650	6894	7157	7422	7706	8006	8335	8692
7000		6910	7000	7162	7425	7708	7993	8299	8622	8977	9361
7500		7404	7500	7673	7955	8258	8564	8892	9238	9618	10029
8000		7897	8000	8185	8485	8809	9135	9484	9854	10259	10698
8500		8391	8500	8697	9016	9359	9705	10077	10470	10900	11367
9000		8885	9000	9208	9546	9910	10276	10670	11086	11541	12035
9500		9378	9500	9720	10076	10460	10847	11263	11702	12183	12704
10000		9872	10000	10231	10607	11011	11418	11855	12318	12824	13373
Average barometric pressure (20°C)	mbar	1013	1000	977.4	942.8	908.2	875.8	843.5	811.85	779.8	747.8
Average barometric pressure (68°F)	"w.c.	399	394	385	371	358	345	332	320	307	294

2 CORRECTED BURNER AIR PRESSURE ACCORDING TO ALTITUDE

Rated Pressure	Altitude										
	m a.s.l.	0	100	305	610	915	1220	1525	1830	2135	2440
	ft a.s.l.	0	328	1000	2000	3000	4000	5000	6000	7000	8000
0.50		0.49	0.50	0.51	0.53	0.55	0.57	0.59	0.62	0.64	0.67
1.00		0.99	1.00	1.02	1.06	1.10	1.14	1.19	1.23	1.28	1.34
1.50		1.48	1.50	1.53	1.59	1.65	1.71	1.78	1.85	1.92	2.01
2.00		1.97	2.00	2.05	2.12	2.20	2.28	2.37	2.46	2.56	2.67
2.50		2.47	2.50	2.56	2.65	2.75	2.85	2.96	3.08	3.21	3.34
3.00		2.96	3.00	3.07	3.18	3.30	3.43	3.56	3.70	3.85	4.01
3.50		3.46	3.50	3.58	3.71	3.85	4.00	4.15	4.31	4.49	4.68
4.00		3.95	4.00	4.09	4.24	4.40	4.57	4.74	4.93	5.13	5.35
4.50		4.44	4.50	4.60	4.77	4.95	5.14	5.33	5.54	5.77	6.02
5.00		4.94	5.00	5.12	5.30	5.51	5.71	5.93	6.16	6.41	6.69
5.50		5.43	5.50	5.63	5.83	6.06	6.28	6.52	6.77	7.05	7.35
6.00		5.92	6.00	6.14	6.36	6.61	6.85	7.11	7.39	7.69	8.02
6.50		6.42	6.50	6.65	6.89	7.16	7.42	7.71	8.01	8.34	8.69
7.00		6.91	7.00	7.16	7.42	7.71	7.99	8.30	8.62	8.98	9.36
7.50		7.40	7.50	7.67	7.96	8.26	8.56	8.89	9.24	9.62	10.03
8.00		7.90	8.00	8.18	8.49	8.81	9.13	9.48	9.85	10.26	10.70
8.50		8.39	8.50	8.70	9.02	9.36	9.71	10.08	10.47	10.90	11.37
9.00		8.88	9.00	9.21	9.55	9.91	10.28	10.67	11.09	11.54	12.04
9.50		9.38	9.50	9.72	10.08	10.46	10.85	11.26	11.70	12.18	12.70
10.00		9.87	10.00	10.23	10.61	11.01	11.42	11.86	12.32	12.82	13.37
Average barometric pressure (20°C)	mbar	1013	1000	977.4	942.8	908.2	875.8	843.5	811.85	779.8	747.8
Average barometric pressure (68°F)	"w.c.	399	394	385	371	358	345	332	320	307	294

3.9 Minimum furnace dimensions

The firing rate was obtained in special test boilers.

Example: output 6400 Mbtu/hr - diameter 31.5 inch - length 10.4 ft.

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

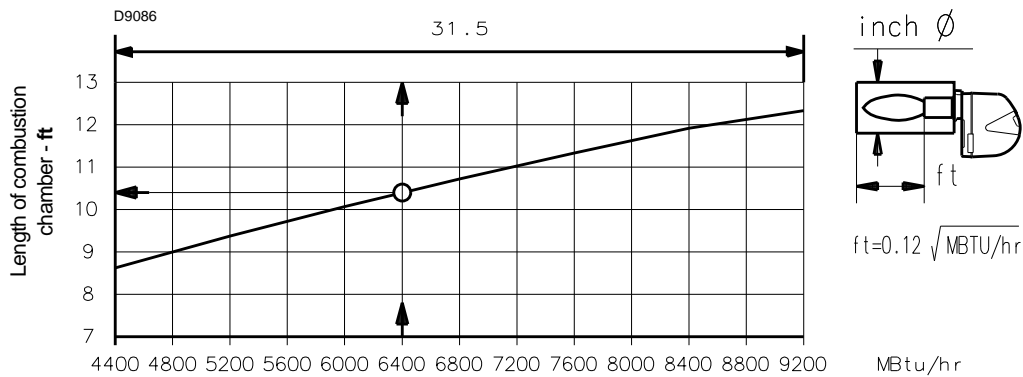


Fig. 5

3.10 Commercial boilers



WARNING

The burner is suitable for operation on either flame-inversion boilers* or boilers with combustion chambers featuring flow from the base (three flue passes) on which the best results are obtained in terms of low NOx emissions.

The maximum thickness of the boiler's front door must not exceed 10" (see Fig. 6).

(*) For flame inversion boilers, a kit is available to reduce CO emissions if required.

The kit includes 5 gas pipes, identical to the other 5 already fitted to the burner head.

In standard conditions, the burner head is fitted with a second group of pipes, with gas outlet in a different direction with respect to the others.

With this Kit, the second group of pipes is replaced, so that all the pipes are the same.

After fitting the kit, ensure they work correctly by measuring the CO and flue gases emissions.

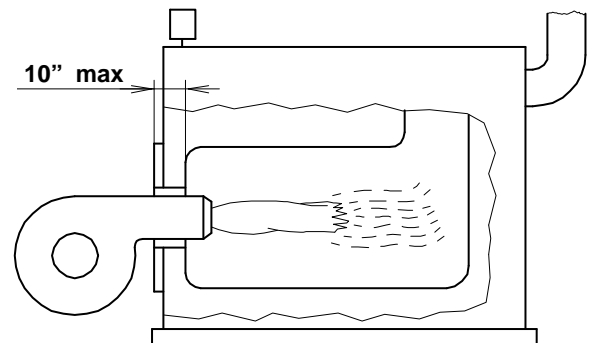


Fig. 6

3.11 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 control box 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 control box, 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 control box 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 control box, 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.



D8301

Fig. 7

Mechanical design

The control box 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 control box:

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

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.

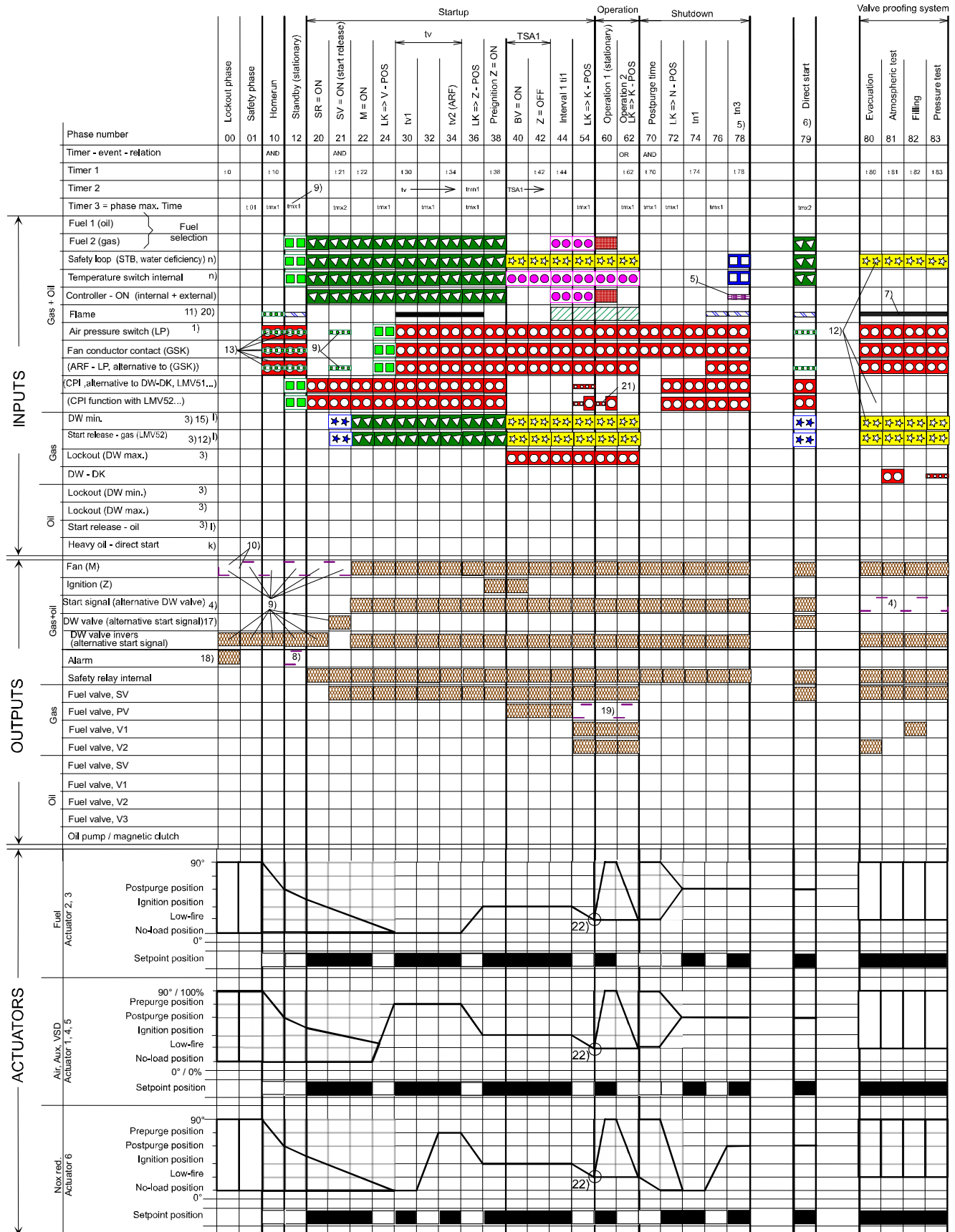
- The ionization probe is not protected against electrical shock hazard. The mainspowered ionization probe must be protected against accidental contact.
- Locate the ignition electrode and the ionization probe such that the ignition spark cannot arc over to the ionization probe (risk of electrical overloads).

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	< AC 96 V
	• Restart on rise in mains voltage	> AC 100 V
	Oil pump / magnetic clutch (nominal voltage)	
Terminal loading 'Outputs'	• Nominal current	1.6A
	• Power factor	cosφ > 0.4
	Air pressure switch test valve (nominal voltage)	
	• Nominal current	0.5A
	• Power factor	cosφ > 0.4
	Total contact loading:	
	• Mains voltage	AC 120 V -15 % / +10 %
	• Input current of unit (safety loop) total load on contacts resulting from:	Max. 5 A
	- Fan motor contactor	
	- Ignition transformer	
	- Valve	
	- Oil pump / magnetic clutch	
	Single contact loading:	
	Fan motor contactor (nominal voltage)	
	• Nominal current	1A
	• Power factor	cosφ > 0.4
	Alarm output (nominal voltage)	
	• Nominal current	1 A
	• Power factor	cosφ > 0.4
	Ignition transformer (nominal voltage)	
	• Nominal current	1.6 A
	• Power factor	cosφ > 0.2
	Fuel valve gas (nominal voltage)	
	• Nominal current	1.6 A
	• Power factor	cosφ > 0.4
	Fuel valve oil (nominal voltage)	
	• Nominal current	1.6 A
	• Power factor	cosφ > 0.4
Cable lengths	Main line	Max. 100 m (100 pF/m)
Environmental conditions	Operation	DIN EN 60721-3-3
	Climatic conditions	Class 3K3
	Mechanical conditions	Class 3M3
	Temperature range	-20...+60 °C
	Humidity	< 95 % r.h.

Tab. G

Operation sequence of the burner



D9507

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 $\begin{cases} \rightarrow 00, \text{Rep} = 0 \\ \rightarrow 12, \text{Rep} > 0 \end{cases}$
		Parameter direct start Checking with controller on Deviation \rightarrow 10 No Rep. decrement
		10
		70
		Without VP70 with VP80
		62
		Stop, up to Ph – max. time \rightarrow 01
		Stop, up to Ph – max. time \rightarrow 10
		01 $\begin{cases} \rightarrow 00, \text{Rep} = 0 \\ \rightarrow 12, \text{Rep} > 0 \end{cases}$
		01 $\begin{cases} \rightarrow 00, \text{Rep} = 0 \\ \rightarrow 12, \text{Rep} > 0 \end{cases}$
		01 $\begin{cases} \rightarrow 00, \text{Rep} = 0 \\ \rightarrow 12, \text{Rep} > 0 \end{cases}$
		Param. $\begin{cases} \rightarrow 79 \\ \rightarrow 10 \end{cases}$
		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

3.12 Actuator

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.

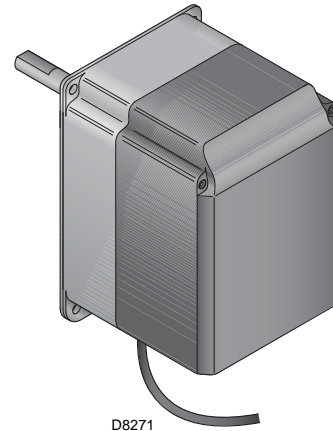
Installation notes

- Always run the high-voltage ignition cables separate from the unit and other cables while observing the greatest possible distance.
- 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.



D8271

Fig. 9

Technical data

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.
Holding torque (max.)	1.5 Nm
Nominal torque (max.)	3 Nm
Weight	approx. 1 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.

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.



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



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

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.



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

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

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



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

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

4.3 Preliminary checks

Checking the consignment



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



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



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



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

4.4 Operation position

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

Installation 1 is preferable, as it is the only one that allows the maintenance operations as described in this manual.

Installations 2, 3 and 4 permit operation but make maintenance and inspection of the combustion head more difficult.



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

Installation 5 is prohibited for safety reasons.

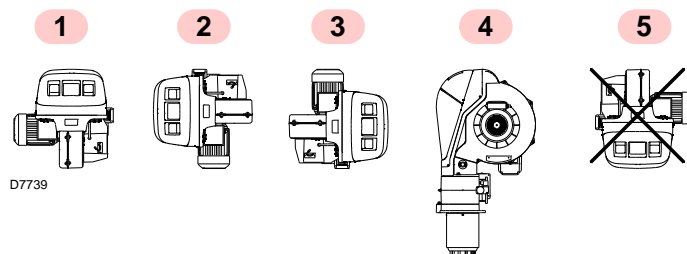


Fig. 10

4.5 Boiler plate

Make holes in the plate shutting off the combustion chamber, as illustrated in Fig. 11.

The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

- For boilers with front flue passes 13)(Fig. 12) or flame inversion chambers, a protection in refractory material 11) must be inserted between the boiler refractory 12) and the blast tube 10).

This protection must not compromise the extraction of the blast tube.

- For boilers with a water-cooled frontal, a refractory lining is not necessary 11)-12)(Fig. 12) unless expressly requested by the boiler manufacturer.

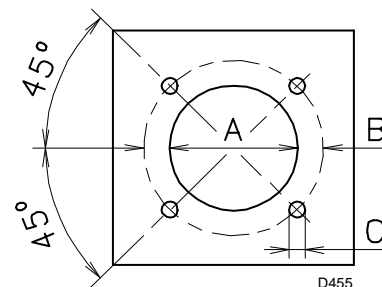


Fig. 11

inch	A	B	C
RS 160/E	9 1/16	12 25/32 - 14 1/2	5/8 W

Tab. I

4.6 Securing the burner to the boiler

- Secure the burner to the boiler, fixing the flange 9)(Fig. 12) to the boiler plate and interposing the insulating gasket 8).
- Use the 4 screws supplied, with a tightening torque of 26-29 Lbf. ft, after protecting their thread with anti-seize products.
- After the start-up, check there is no leakage of flue gases into the external environment.



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

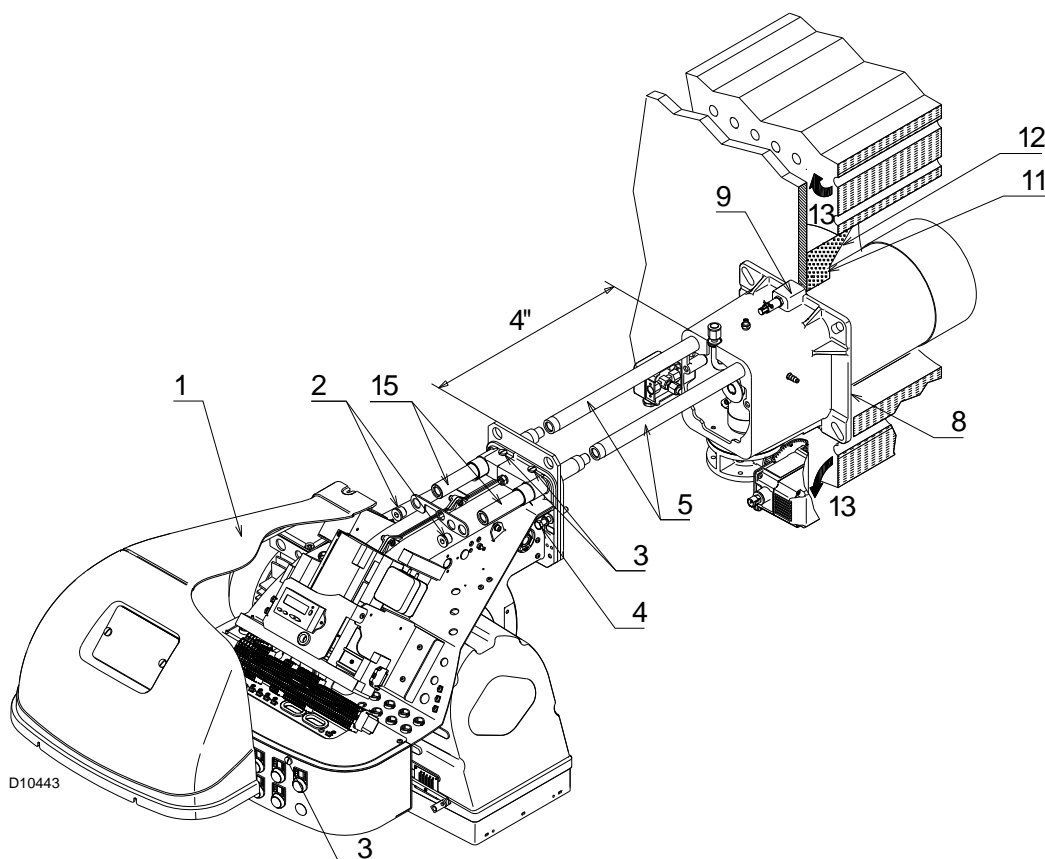


Fig. 12

4.7 Electrode positioning

To verify the correct position of the ignition electrode (Fig. 14), you need to separate the combustion head from the rest of the burner.

Proceed as follows:

- loosen the 4 screws 3)(Fig. 12) and remove the cover 1);
- remove the screws 2) from the two sliding bars 5);
- install the extensions 15) and re-screw the screws 2);
- remove the two screws 4).
- Pull back the burner on the sliding bars 5) of about 4";
- disconnect the electrode lead, then unthread the burner completely from the sliding bars;
- remove the screw 1)(Fig. 13) and extract the inner part 2) of the head.
- Check the correct position of ignition electrode, as shown in Fig. 14.
- Re-install all components with reverse procedure.



Measures must be respected.

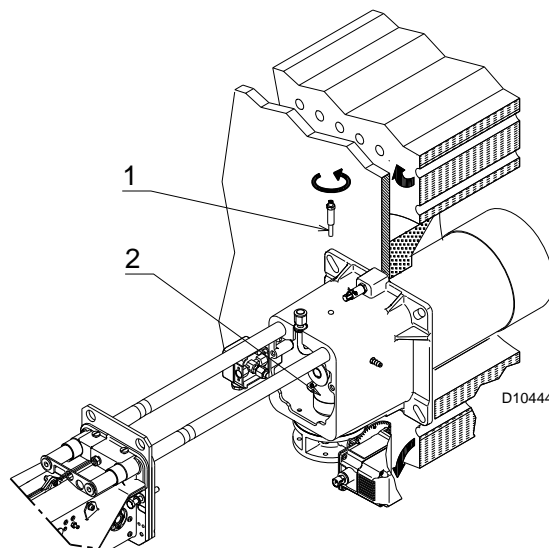


Fig. 13

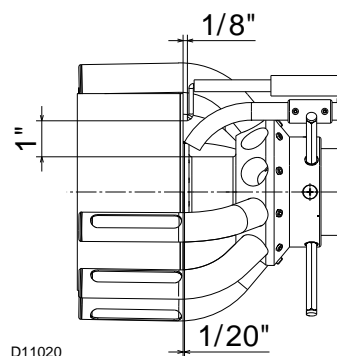


Fig. 14

4.8 Combustion head adjustment

Installation operations are now at the stage where the blast tube and sleeve are secured to the boiler as shown in Fig. 15.

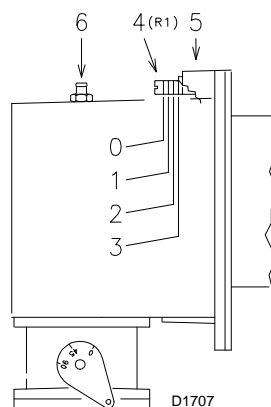
It is now a very simple matter to set up the combustion head, as this depends solely on the maximum output developed by the burner.

It is therefore essential to establish this value before proceeding to set up the combustion head.

There are two adjustments to make on the head:

- outside air R1
- central air R2

OUTSIDE AIR ADJUSTMENT (R1)



CENTRAL AIR ADJUSTMENT (R2)

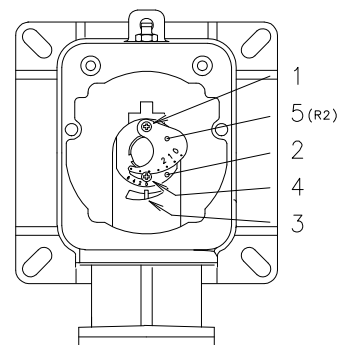


Fig. 15

In diagram (Fig. 16) find the notch for:

Outside air adjustment - R1

- Turn screw 4)(Fig. 15) until the notch identified is aligned with the front surface 5) of the connector.



In order to facilitate adjustment, loosen screw 6)(Fig. 15), adjust and then tighten.

Central air adjustment - R2

- Loosen the 3 screws 1)(Fig. 15) and turn ring 2) until the notch identified is aligned with index 3).
- Tighten the 3 screws 1) fully down.

Example:

Max. burner output = 5681 MBtu/hr

If we consult diagram (Fig. 16) we find that for this output the adjustments are:

- outside air: R1 = notch 8.6;
- central air: R2 = notch 0.

NOTE:

R2 adjustment (Fig. 16) is an indication only.

If possible, always keep the ring nut closed (notch 0); if air recovery is required the nut may be opened following the indications in diagram. Make sure that the combustion characteristics are satisfactory and free of pulsations.

Once the combustion head adjustment is completed:

- push the burner on the sliding bars 3) at approximately 4" from the pipe coupling 4) - burner in the position shown in Fig. 17;
- insert the electrode cable, then slide the burner as far as the pipe coupling - burner in the position shown in Fig. 18;
- unscrew the 2 screws 2) from the extension 5) and reposition them as previously Fig. 18.
- refit the screws 2) on the sliding bars 3);
- fix the burner to the pipe coupling with the screws 1).



When fitting the burner on the two sliding bars, it is advisable to gently draw out the high voltage cable until it is slightly taut.

Key Fig. 17 and Fig. 18

- Screw
- Screw
- Sliding bars
- Pipe coupling
- Extension sliding bars
- Lifting rings

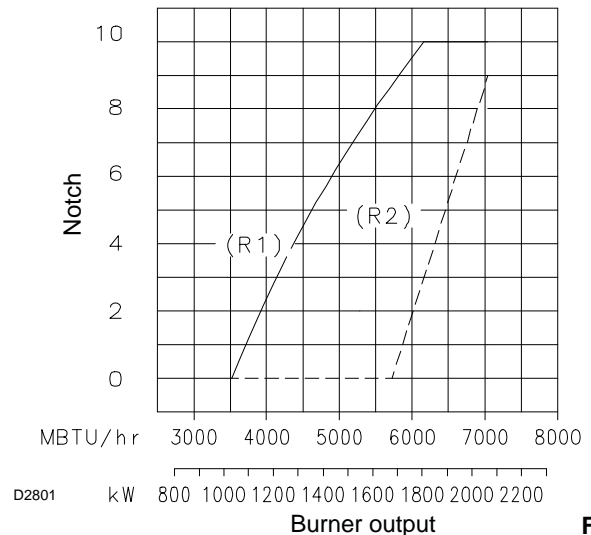


Fig. 16

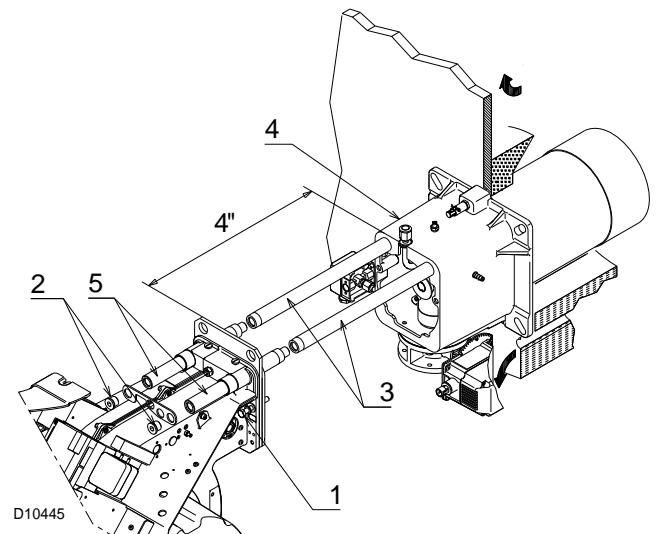


Fig. 17

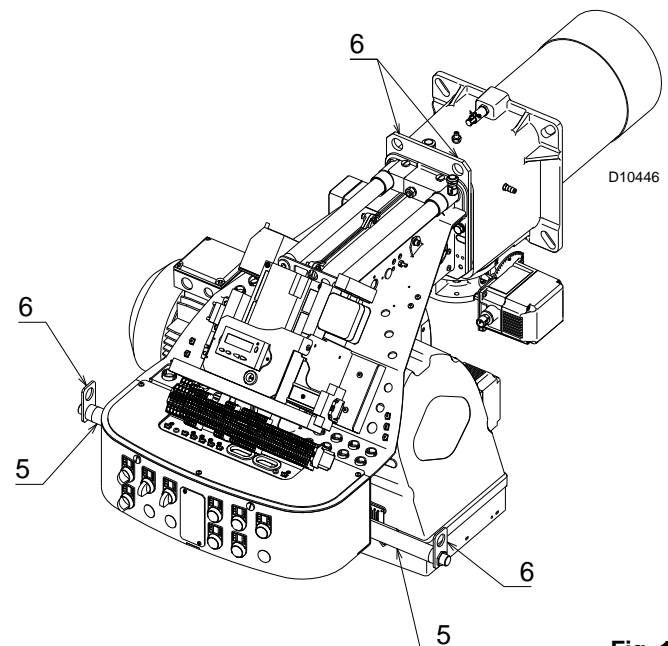


Fig. 18

4.9 Gas supply

4.9.1 Gas train

The gas train is type-approved according to standard UL 795 and is supplied separately from the burner.

The gas train can enter the burner from the right or left side, depending on which is the most convenient.

- The gas train must be connected to the gas attachment 1) (Fig. 19) with the flange 2), the gasket 3) and the screws 4) supplied with the burner.
- The gas solenoids must be as close as possible to the burner, to ensure that the gas reaches the combustion head within the safety time of 3s.
- Ensure that the maximum pressure necessary for the burner is included in the calibration field of the pressure regulator (colour of the spring).



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

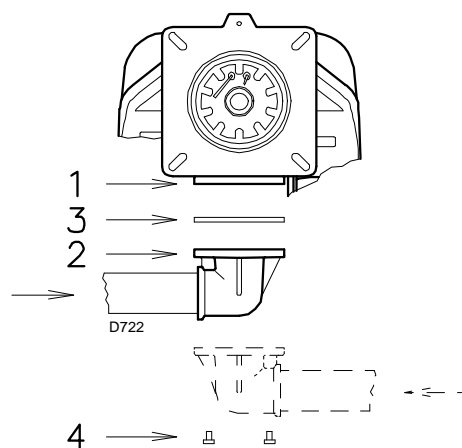


Fig. 19

4.9.2 Gas feeding line

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

Key (Fig. 20)

- 1 Gas input pipe
- 2 Manual valve
- 3 Pressure regulator
- 4 Minimum gas pressure switch
- 5 1st safety shut off valve
- 6 2nd safety shut off valve
- 7 Standard issue burner with flange gasket
- 8 Gas adjustment butterfly valve (on the burner)
- 9 Burner
- 10 Maximum gas pressure switch (on the burner)

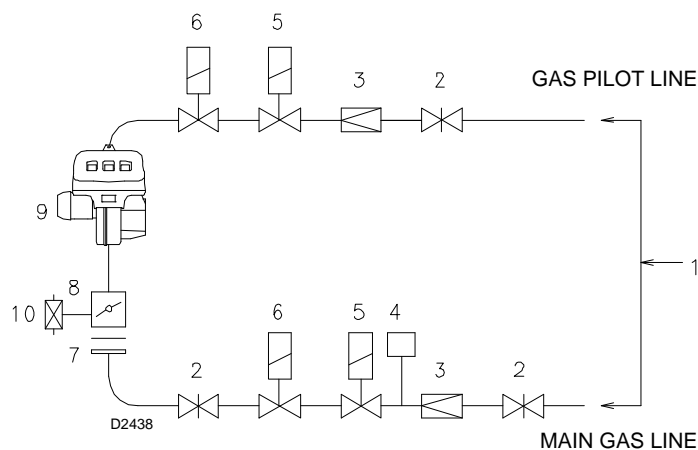


Fig. 20

4.10 Gas pressure

The Tab. J shows minimum load losses at combustion head (Δp_1) and gas butterfly valve (Δp_2) depending on the maximum burner output operation with natural gas and LPG.

Δp_1 - Gas pressure is measured at the test point 1)(Fig. 21), with:

- combustion chamber at 0 mbar
- burner working at maximum output
- combustion head adjustment as indicated in Fig. 16, page 21.

Δp_2 - Load loss at gas butterfly valve 2)(Fig. 21) with maximum opening: 90°.

NOTE

To know the approximate output at which the burner is operating at its maximum:

- subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 21);
- find, in the Tab. J the pressure value closest to the result you want;
- read the corresponding output on the left.

Example with natural gas:

- Maximum output operation
- Gas pressure at test point 1)(Fig. 21) = 4.09" WC
- Pressure in combustion chamber = 1.14" WC
- 4.09 - 1.14 = 2.95" WC

A maximum output of 4166 MBtu/hr shown in Tab. J corresponds to 2.95" WC pressure.

This value serves as a rough guide, the effective delivery must be measured at the gas meter.

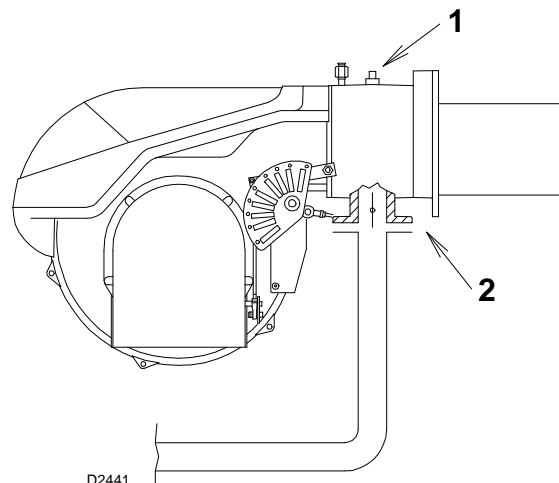


Fig. 21

Mbtu/hr	Δp_1 ("WC)		Δp_2 ("WC)	
	Natural Gas	LPG	Natural Gas	LPG
3522	2.20	0.82	0.39	0.15
3787	2.52	0.93	0.43	0.16
4166	2.95	1.09	0.51	0.19
4545	3.39	1.25	0.63	0.23
4924	3.82	1.41	0.75	0.28
5302	4.25	1.57	0.87	0.32
5681	4.69	1.73	0.98	0.36
6060	5.12	1.89	1.10	0.41
6438	5.75	2.13	1.26	0.47
6817	6.50	2.40	1.42	0.52
7044	6.97	2.58	1.50	0.55

Tab. J

4.11 Electrical wiring

Notes on safety for the electrical wiring

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



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



close the fuel interception tap;



avoid condensate, ice and water leaks from forming.

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. 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 $\frac{3}{4}$ inch cable grommet.
- 2 Available: single phase power supply and other devices with $\frac{1}{2}$ inch cable grommet.
- 3 Horn
- 4 Available: consents/safety, minimum gas pressure switch, gas valves and other devices with $\frac{3}{8}$ inch cable grommet.
- 5 Anchor plate for installation of step down transformer.
- 6 Available for ground terminals



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

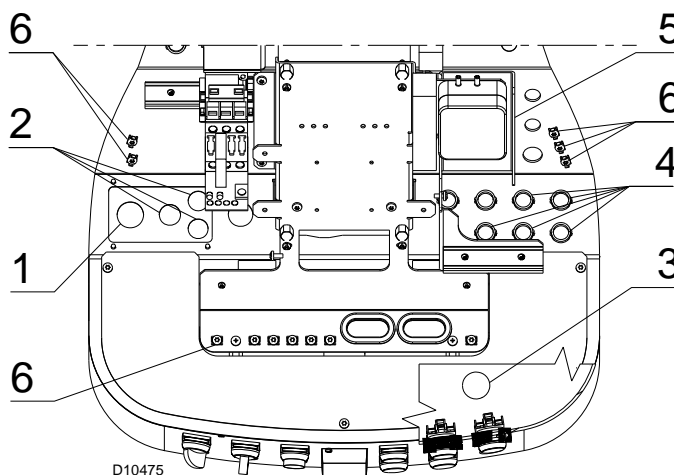


Fig. 22

4.12 Thermal relay calibration

Depending on the burner type, there are two different thermal relays:

- Electro-mechanical thermal relay (used for single phase motors)
- Electronic thermal relay (used for three phase motors)

4.12.1 Electro-mechanical thermal relay

The electro-mechanical thermal relay (Fig. 23) 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 a nominal value.

- To reset, in the case of an intervention of the thermal relay, press the button **"RESET"** (Fig. 23).
- The button **"STOP"** (Fig. 23) opens the NC (95-96) contact and stops the motor.

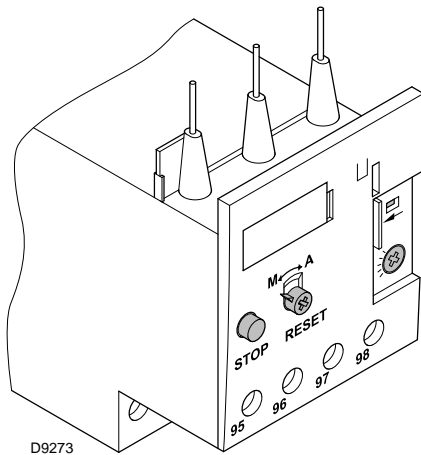


Fig. 23

- To test the thermal relay, insert a screwdriver in the window **"TEST"** (Fig. 24) 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.

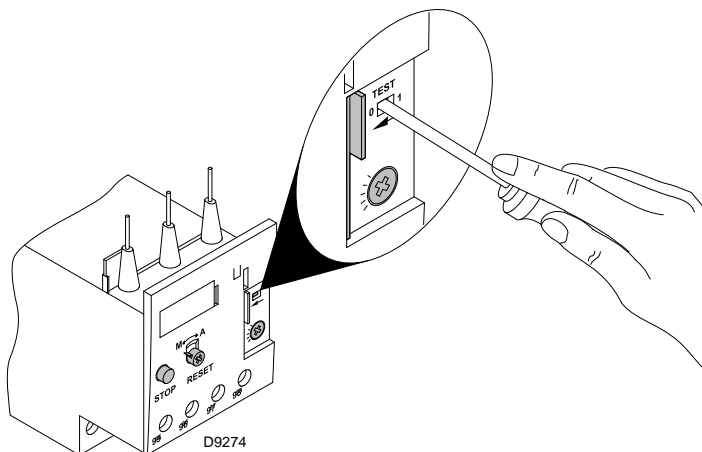


Fig. 24

4.12.2 Electronic thermal relay

- To reset, in the case of an intervention of the thermal relay, press the button **"RESET"** (Fig. 25).

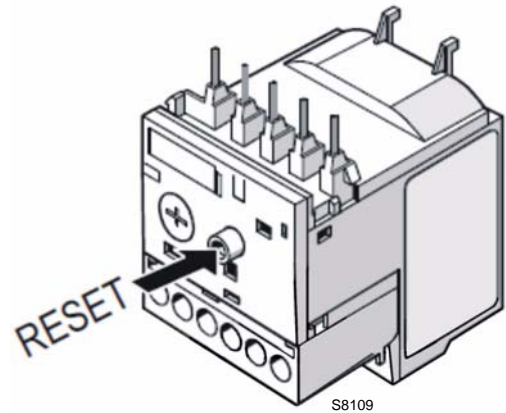


Fig. 25

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

- **Device test (Fig. 26)**

Push slowly the button in the window with a little screwdriver.

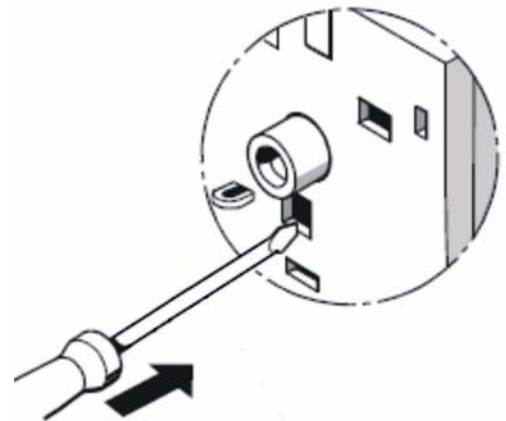


Fig. 26

- **Contact test NC (95-96) and NO (97-98)(Fig. 27)**

Insert in the window a little screwdriver and move it in the sense of the arrow.

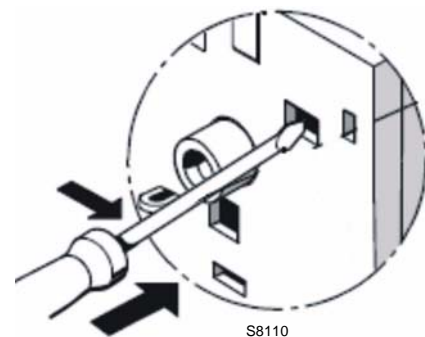


Fig. 27

4.13 Motor connection at 208-230 or 460V

WARNING:

the motors, manufactured for 208-230/460 **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.

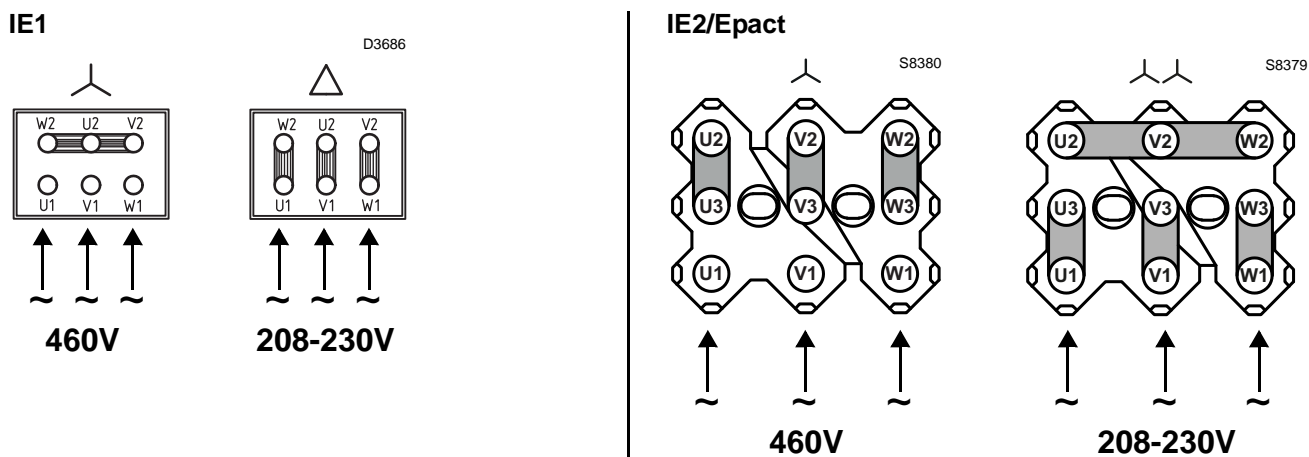


Fig. 28

4.14 Motor connection at 575V

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.

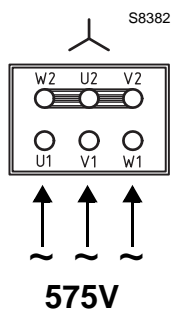


Fig. 29

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**.

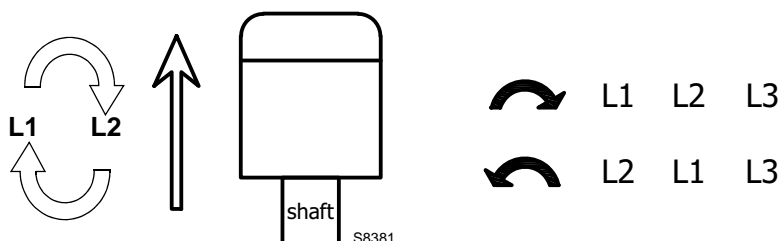


Fig. 30

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

Ensure that the gas supply company has carried out the supply line vent operations, eliminating air or inert gases from the piping.

- Slowly open the manual valves situated upstream of the gas train.
- Adjust the minimum gas pressure (Fig. 35) switch to the start of the scale.
- Adjust the maximum gas pressure switch (Fig. 34) to the end of the scale.
- Adjust the air pressure switch (Fig. 33) to the start of the scale.
- Purge the air from the gas line. Fit a U-type manometer (Fig. 31) to the gas pressure test point on the sleeve. The manometer readings are used to calculate the MAX. burner power using the Tab. J.



CAUTION

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

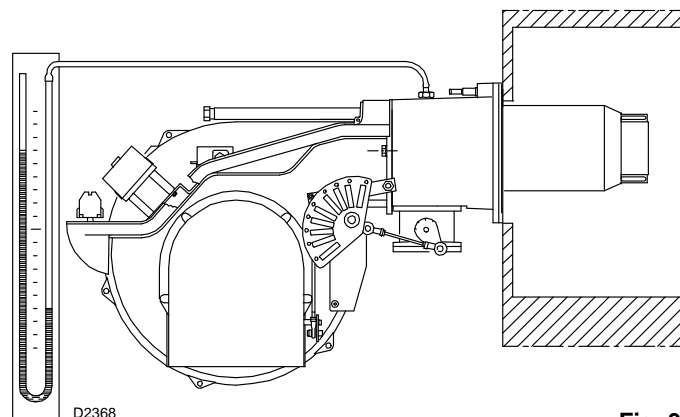


Fig. 31

5.3 Burner start-up

- Feed electricity to the burner via the disconnecting switch on the boiler panel.
- Close the thermostats/pressure switches.
- Please refer to the specific manual for this operation.
- Turn the switch of Fig. 32 to position "ON" and turn the switch to position "LOCAL".



DANGER

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

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



WARNING

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

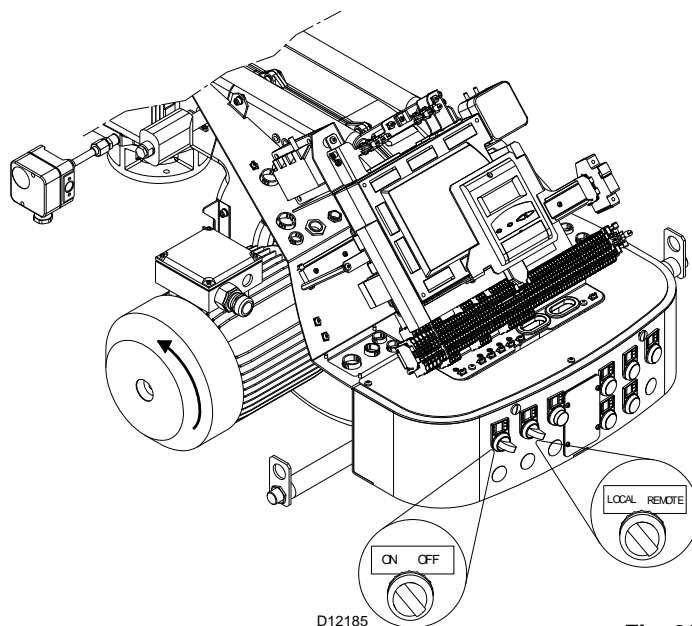


Fig. 32

5.4 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.

With O₂ control via the relative kit, follow the instructions about commissioning in the specific handbook for the LMV36.5... instrument provided at the Technical Service Training.

5.4.1 Adjusting gas/air delivery

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

5.4.2 Air/fuel control and power modulation system

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

The system includes the following basic functions:

- air and fuels are supplied in correct quantities by positioning the valves by direct servo-control, thus avoiding the possibility of play typical of systems used for traditional modulating burners, in which settings are obtained by levers and a mechanical cam;
- burner power is modulated according to the load required by the system, while boiler pressure or temperature is maintained at set operating values;
- fine, continuous correction of the airflow according to the analysis of the flue gases at the stack (O₂); this function is associated with the O₂ kit containing the PLL module and the QGO2 sensor;
- measurement of the combustion efficiency; this function is associated with the O₂ kit;
- a sequence (cascade control) of several boilers by suitably connecting different units.

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.

5.5 Final calibration of the pressure switches

5.5.1 Air pressure switch

The air pressure switch is connected in differential (see Fig. 33) and is activated by both the negative pressure of the air intake and the air pressure from the fan.

Adjust the air pressure switch 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.

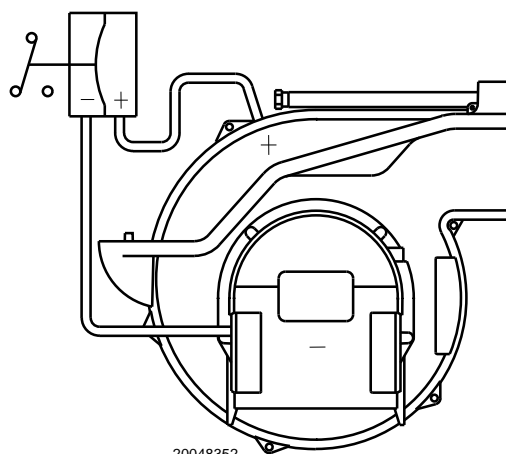


Fig. 33

5.5.2 Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 34) after having performed all other burner adjustments with the maximum gas pressure switch set to the end of the scale.

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.

5.5.3 Minimum gas pressure switch

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

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.

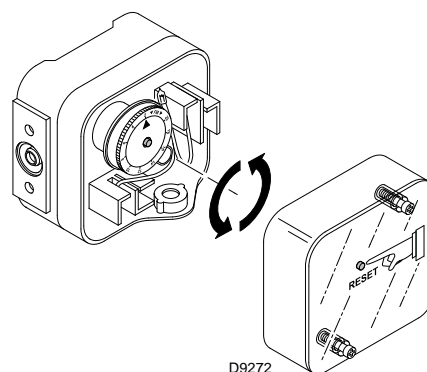


Fig. 34

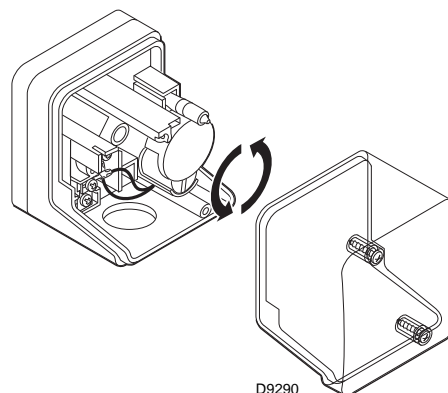


Fig. 35

5.6 Flame signal measurement

Check the flame signal through the parameter 954, as indicated in Fig. 36. The displayed value is expressed in percentage.

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

For further and specific information, please refer to the specific instruction manual. The display (Fig. 36) shows parameter **954**: flashing on the left.

On the right, the flame's intensity is displayed as a percentage.
Example: **954: 0.0**

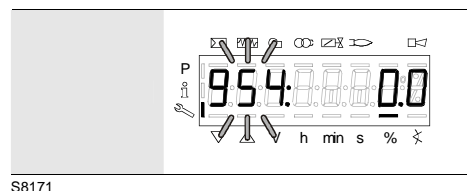


Fig. 36

5.7 Final checks (with the burner working)

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



WARNING

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

6.1 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 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion

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

Combustion head

Open the burner and make sure that all the components of the combustion head are:

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

Make sure that the gas outlet holes for the start-up, on the combustion head distributor, are free of dirt or rust deposits. In case of doubt, disassemble the inner part (Fig. 41, page 32).

Measurement of detector current

Measurement of the detector's signal (Fig. 37) 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:

- photocell 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. 37.

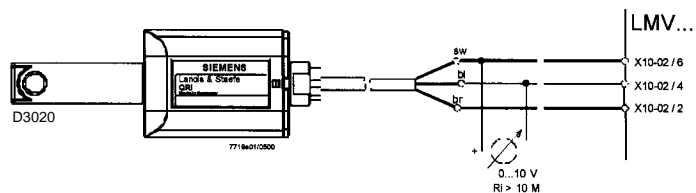
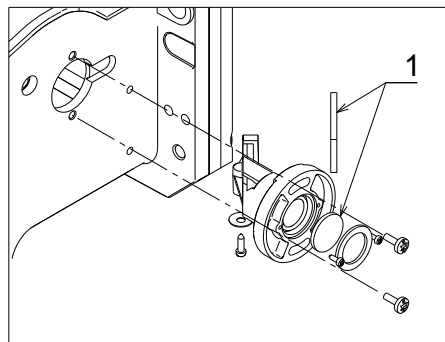


Fig. 37

Flame inspection window

Clean the flame inspection window 1)(Fig. 38).



D10500

Fig. 38

QRI flame detector

In order to reach the QRI flame detector proceed as follows:

- loosen, without removing the screws 1)(Fig. 39);
- extract the QRI flame detector 2);
- clean the glass cover from any dust that may have accumulated.

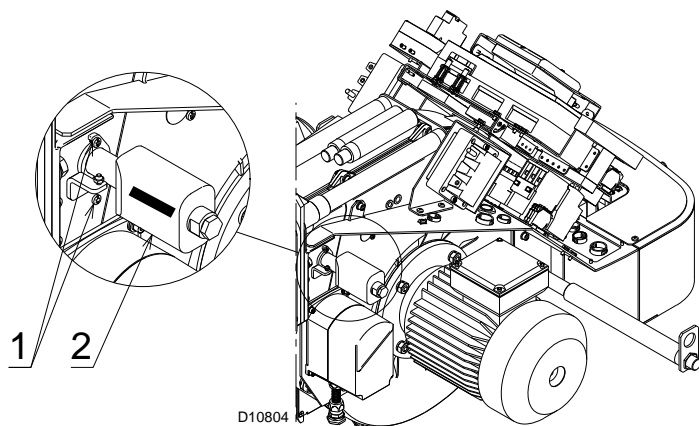


Fig. 39

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.

Boiler

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

Gas leaks

Make sure 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

Adjust the burner if the combustion values found at the beginning of the operation do not comply with the regulations in force or, at any rate, do not produce good combustion.

Use the appropriate card to record the new combustion values; they will be useful for subsequent controls.

6.2.3 Maintenance of burner electrical components under the control box

To carry out in case of possible regulations and maintenance to the underlying control box parts.

Proceed as follows:

- unscrew completely the screw 1)(Fig. 40);
- loosen the three screws 2) and lift the control box as indicated by the arrows.

The screws 3) move inside the slide until reaching the correct position indicated in "View A" (Fig. 40).



WARNING

Fix the screw 3) backwards to the end in order to adjust and maintain in complete safety.

- At the end of maintenance loosen the screws 3), and lower the control box, see "View B" (Fig. 40);
- fix the three screws 2) and screw the screw 1) in order to tighten the control box to the burner.

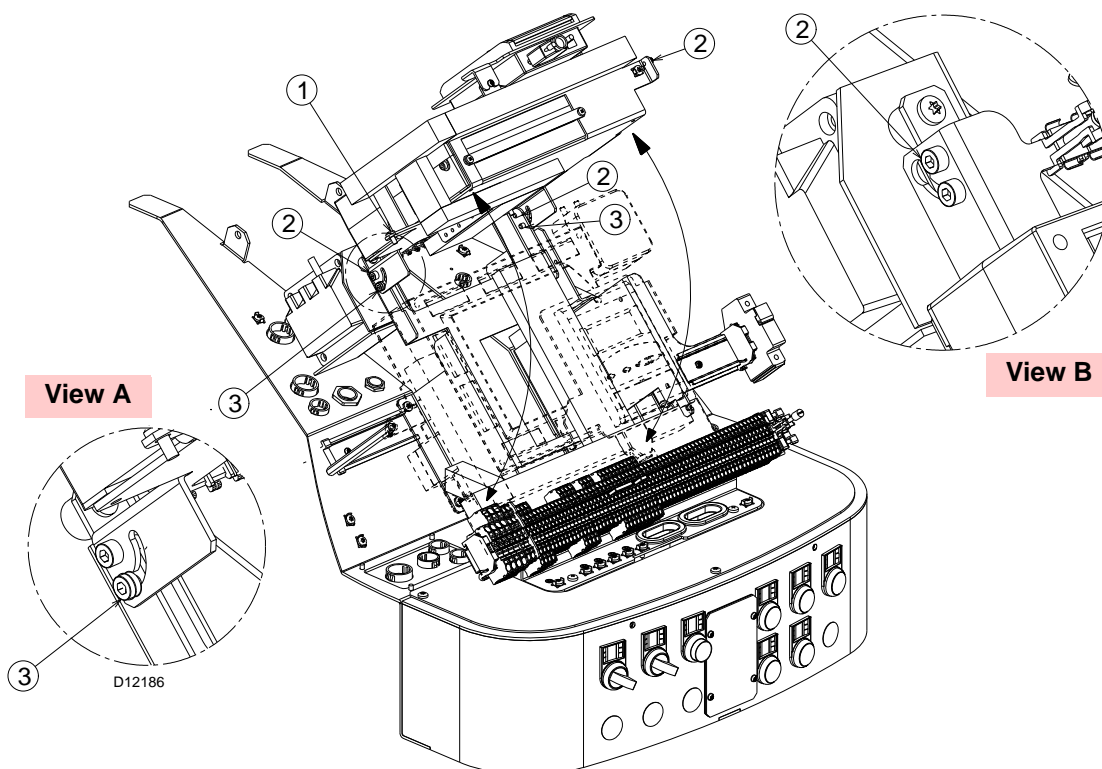


Fig. 40

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.

In order to open the burner, proceed as follows:

- loosen the 4 screws 1) (Fig. 41) and remove the cover 2);
- install the 2 extensions 9) on the sliding bars 4) and re-screw the screws 8);
- remove the screws 3) and pull back the burner on the sliding bars 4) of about 4";
- disconnect the electrode lead, then unthread the burner completely from the sliding bars;
- remove the screw 6) and extract the inner part 5) of the head.

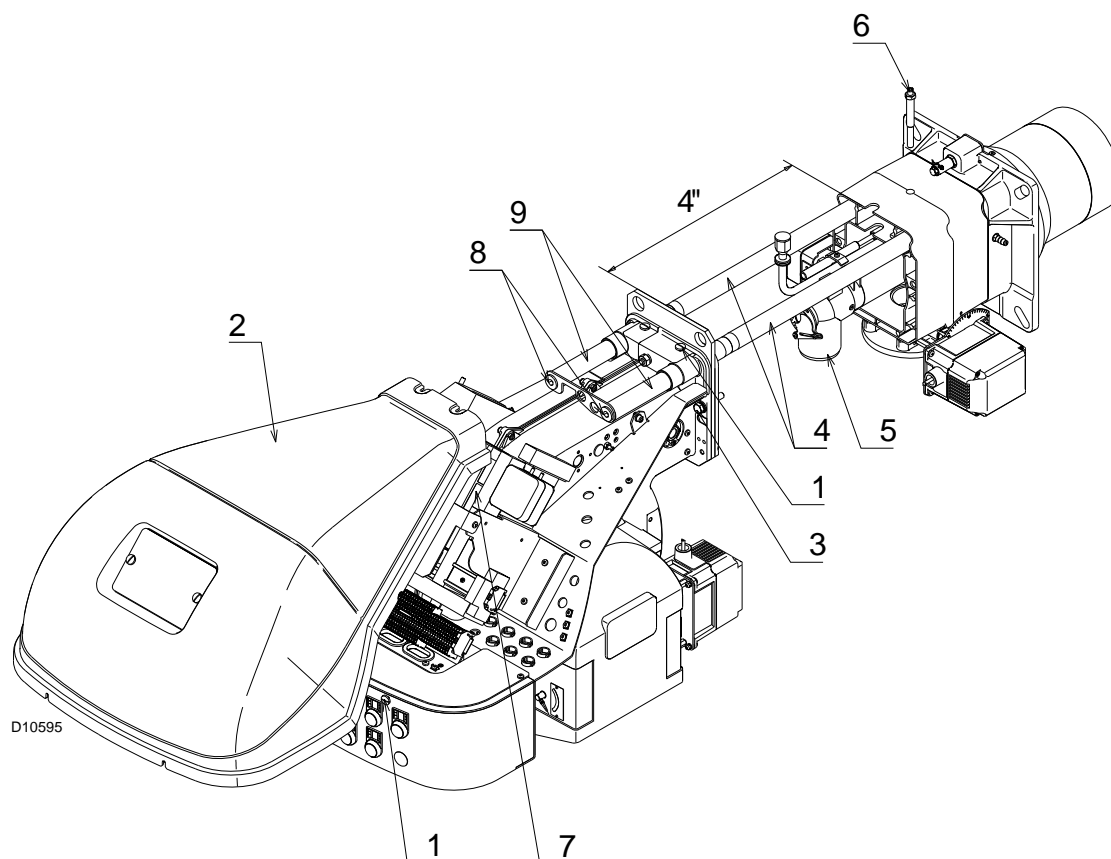


Fig. 41

6.4 Closing the burner

In order to close the burner, re-install all components with reverse procedure:

- remove the 2 extensions 9) and re-screw the screws 8) on the sliding bars 4) ;
- push the burner up to approximately 4" from the pipe coupling;
- reinsert the electrode lead and slide the burner as far as the stop.
- fix the screws 3) to secure the burner to the combustion head;
- fix the 4 screws 1) to install the cover 2).



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

7

Faults - Possible causes - Solutions

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

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

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



WARNING

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

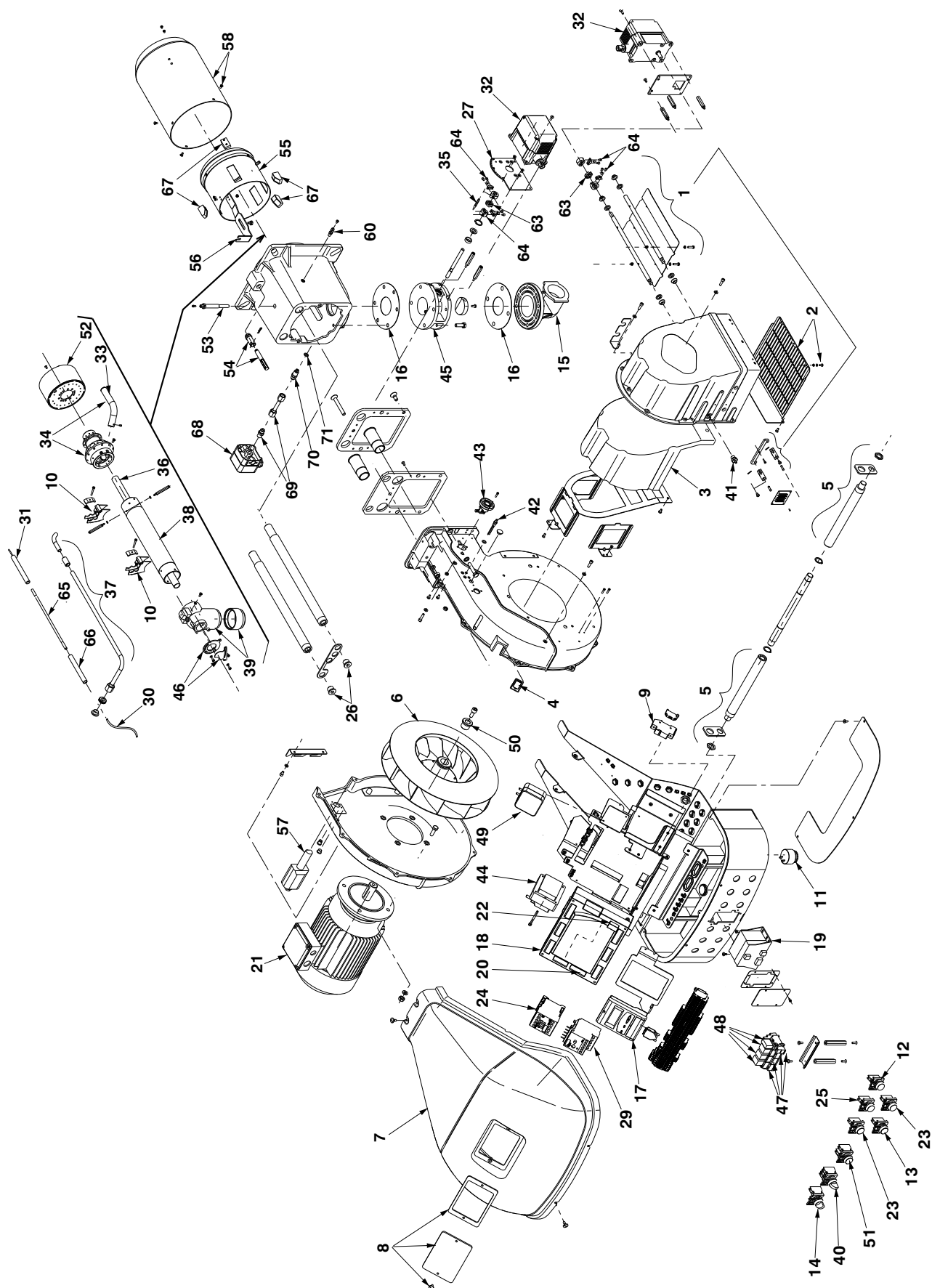


DANGER

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

A

Appendix - Spare parts



N.	CODE	DESCRIPTION	*
1	3014083	AIR DAMPER ASSEMBLY	
2	3013683	GRID	
3	3013682	SOUND DAMPING	C
4	3003763	INSPECTION WINDOW	
5	3013686	BAR EXTENSIONS	
6	3012976	FAN	C
7	20037259	COVER	
8	20026784	INSPECTION WINDOW	
9	20014366	FUSE HOLDER	C
10	3013093	SUPPORT	
11	20031413	HORN	C
12	20027018	RED SIGNAL LIGHT	C
13	20027020	YELLOW SIGNAL LIGHT	C
14	20027021	COMMUTATOR	C
15	3012971	FLANGE AND ELBOW	
16	3005482	SEAL	C
17	3013283	AZL DISPLAY	B
18	3013282	ELECTRONIC CAM	C
19	3013284	TRANSFORMER	C
20	20013932	CONNECTORS ASSEMBLY	C
21	20031014	MOTOR	C
22	3006211	FUSE 6.3A	A
23	20027013	GREEN SIGNAL LIGHT	C
24	20013973	CONTACTOR	C
25	20027014	WHITE SIGNAL LIGHT	C
26	3013681	SCREW	C
27	3014081	BRACKET	
28			
29	20027917	OVERLOAD THERMAL RELAY	C
30	3012393	ELECTRODE CONNECTION	A
31	3013091	ELECTRODE	A
32	3013253	SERVOMOTOR	B
33	3012631	TUBE	
34	3012633	DISTRIBUTOR	
35	3013939	INDEX	
36	3012634	INTERIOR TUBE	
37	3013090	GAS PILOT	
38	3013094	EXTERIOR TUBE	
39	3012637	ELBOW	
40	20027422	COMMUTATOR	C
41	3012088	CONNECTOR	C
42	3003891	CONNECTOR	
43	3012794	INSPECTION WINDOW	B
44	3012956	TRANSFORMER	B
45	3013977	GAS REGULATOR	C
46	3012014	RING NUT	
47	3012841	BASE	
48	20010969	RELAY 110V	C
49	3012948	AIR PRESSURE SWITCH	A
50	3003643	PLUG	
51	20010962	BUTTON	
52	3013092	AIR DIFFUSER	
53	3012049	SCREW	
54	3012639	CONTROL DEVICE	
55	3012640	SHUTTER	C
56	3012641	BRACKET	
57	3013279	QRI FLAME SENSOR	A
58	3012643	END CONE	

N.	CODE	DESCRIPTION	*
59			
60	3003322	CONNECTOR	
62			
63	3013938	DISC	C
64	3013937	HUB	
65	20013159	ELECTRODE CONNECTION	A
66	20013160	INSULATOR	A
67	3012647	CENTERING SUPPORT	C
68	3012969	GAS PRESSURE SWITCH	
69	3013055	TUBE	C
70	3013095	CONNECTOR	
71	3007891	SEAL	

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****WARNING**

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

C
Appendix - Burner start up report

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

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

GAS OPERATION

Gas Supply Pressure:	CO ₂ : Low Fire	High Fire
Main Power Supply:	O ₂ : Low Fire	High Fire
Control Power Supply:	CO: Low Fire	High Fire
Burner Firing Rate:	NO _x : Low Fire	High Fire
Manifold Pressure:	Net Stack Temp - Low Fire:	High Fire
Pilot Flame Signal:	Comb. Efficiency - Low Fire:	High Fire
Low Fire Flame Signal:	Overfire Draft:	
High Fire Flame Signal:		

CONTROL SETTINGS

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

NOTES

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