

GB **Forced draught gas burners**

Progressive two-stage or modulating operation



CODE	MODEL	TYPE
20044638 - 20044639	RS 150/M	890T



Translation of the original instructions

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1 Declarations**Declaration of conformity in accordance with ISO / IEC 17050-1**

Manufacturer: RIELLO S.p.A.
 Address: Via Pilade Riello, 7
 37045 Legnago (VR)
 Product: Forced draught gas burners
 Model: RS 150/M
 These products are in compliance with the following Technical Standards:
 EN 676
 EN 12100
 and according to the European Directives:

GAR	2016/426/EU	Gas Appliances Regulation
MD	2006/42/EC	Machine Directive
LVD	2014/35/UE	Low Voltage Directive
EMC	2014/30/UE	Electromagnetic Compatibility

Such products are marked as follows:



CE-0085CS0427

The quality is guaranteed by a quality and management system certified in accordance with ISO 9001:2015.

Legnago, 03.05.2021

Research & Development Director
 RIELLO S.p.A. - Burner Department

Mr. F. Maltempo

2 Information and general warnings

2.1 Information about the instruction manual

2.1.1 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.

2.1.2 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.

2.1.3 Other symbols



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



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



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



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



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



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



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



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



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



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

- This symbol indicates a list.

Abbreviations used

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

2.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

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

.....

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

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.....

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

2.2 Guarantee and responsibility

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



WARNING

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

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

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

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

3 Safety and prevention

3.1 Introduction

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

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

It is a good idea to remember the following:

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

In particular:

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

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

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



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

3.2 Personnel training

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

The user:

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

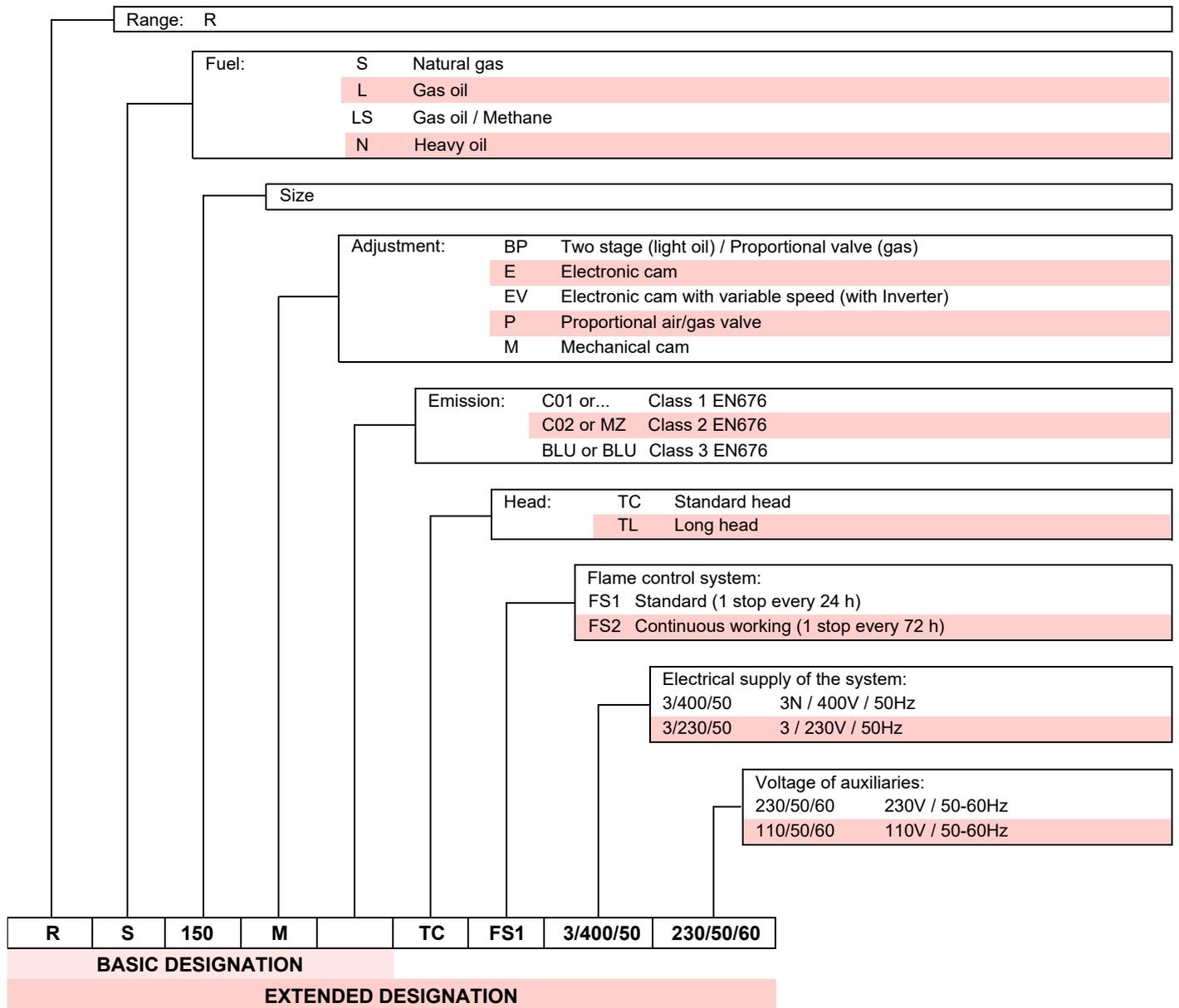
In addition:



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

4 Technical description of the burner

4.1 Burner designation



4.2 Models available

Designation		Voltage	Start-up	Code
RS 150/M	TC	3/400/50	Direct	20044638
RS 150/M	TL	3/400/50	Direct	20044639

Tab. A

4.3 Burner categories - Countries of destination

Country of destination	Gas category
SE - FI - AT - GR - DK - ES - GB - IT - IE - PT - IS - CH - NO	I _{2H}
DE	I _{2ELL}
NL	I _{2E} - I ₂ (43,46 ÷ 45,3 MJ/m ³ (0°C))
FR	I _{2Er}
BE	I _{2E(R)B}
LU - PL	I _{2E}

Tab. B

4.4 Technical data

Model			RS 150/M
Power ₍₁₎ Delivery ₍₁₎	min - max	kW	300/900 - 1850
Fuels			Natural gas: G20 (methane gas) - G21 - G22 - G23 - G25
Gas pressure at max. output ₍₂₎ - Gas: G20/G25		mbar	17,5 / 27,1
Operation			<ul style="list-style-type: none"> - Intermittent (min. 1 stop in 24 hours) - Progressive two-stage or modulating by kit (See Accessories).
Standard applications			Boilers: water, steam, diathermic oil
Ambient temperature		°C	0 - 50
Combustion air temperature		°C max	60
Auxiliary circuit electrical supply			1N ~ 230V 50 Hz
Electrical supply			3 ~ 400V +/-10% 50 Hz
Fan motor (IE3)		rpm	2900
		V	400
		kW	3.0
		A	5.6
Ignition transformer		V1 - V2 I1 - I2	230 V - 1x8 kV 1A - 20mA
Absorbed electrical power		kW max	4
Protection level			IP44
Noise levels ₍₃₎	Sound pressure	dB(A)	83.1
	Sound power		94.1

Tab. C

(1) Reference conditions: Room temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.

(2) Pressure at socket 16)(Fig. 6 on page 11) with zero pressure in combustion chamber and at maximum burner output.

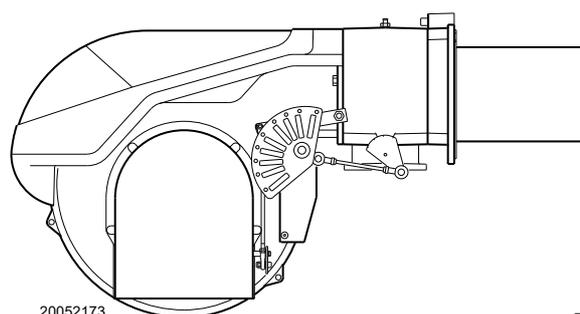
(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the "Free Field" method, as per EN 15036, and according to an "Accuracy: Category 3" measuring accuracy, as set out in EN ISO 3746.

4.5 Burner weight

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

Model	kg
RS 150/M	85

Tab. D



20052173

Fig. 1

4.6 Maximum 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 and the rear part drawn back on the slide bars.

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

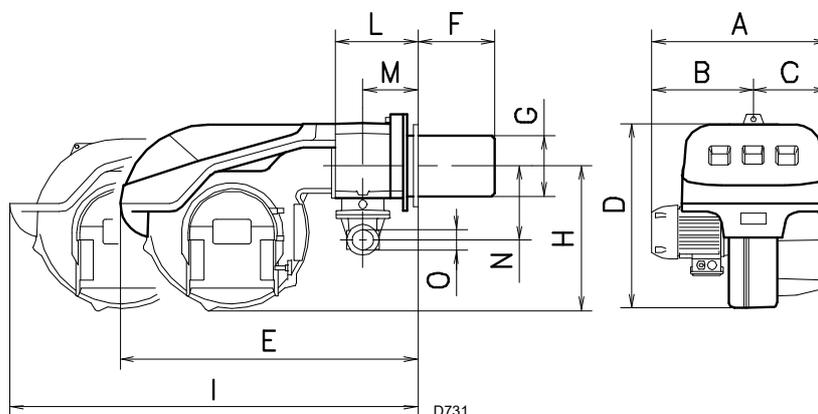


Fig. 2

mm	A	B	C	D	E	F (1)	G	H	I (1)	L	M	N	O
RS 150/M	675	370	305	590	840	280-415	189	435	1180-1315	214	134	221	2"

Tab. E

(1) Blast tube: short-long

4.7 Firing rate

The **maximum output** should be chosen within area A of the diagram (Fig. 3).

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



The firing rate value (Fig. 3) has been obtained considering an ambient temperature of 20°C, an atmospheric pressure of 1013 mbar (approx. 0m above sea level), and with the combustion head adjusted as shown on page 17.

4.7.1 Firing rate based on the air density

It may happen that a burner has to operate with combustion air at a higher temperature and/or higher altitudes.

The heating of the air and the increase in altitude produce the same effect: The expansion of the air volume (i.e. the reduction of its density).

The delivery of the burner fan remains essentially the same, but the oxygen per m³ of air, and the thrust (discharge head) of the fan are reduced.

It is therefore important to know if the maximum output requested from the burner at a determinate combustion chamber pressure remains within the firing rate of the burner even with the changed temperature and altitude conditions.

To check it, proceed as follows:

- 1 find the corrective factor "F", relating to the air temperature and altitude of the system, in Tab. F;
- 2 divide the output "Q" required from the burner by "F" to obtain the equivalent output "Qe": $Q_e = Q : F$ (kW);
- 3 In the firing rate of the burner, mark the work point identified by:

Qe = equivalent output

H1 = pressure in the combustion chamber

point A that must remain within the firing rate

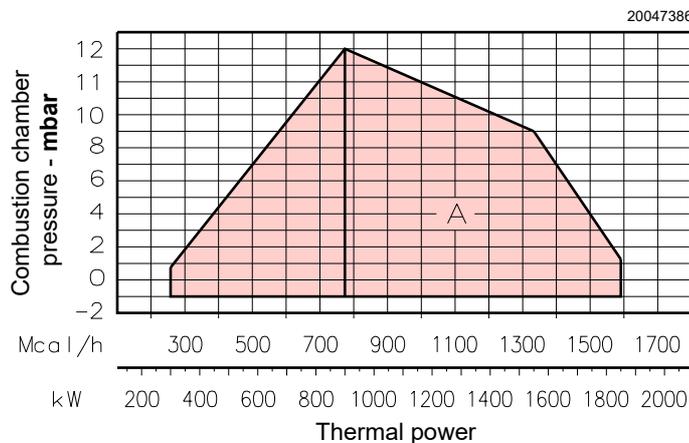


Fig. 3

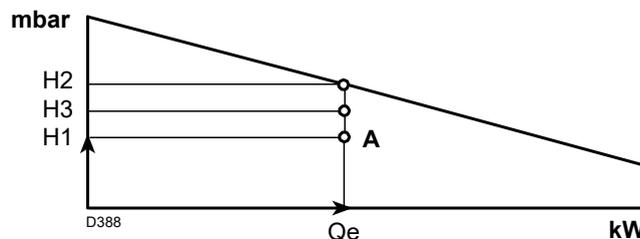


Fig. 4

- 4 Trace a vertical line from **point A** (Fig. 4), and find the maximum pressure "**H2**" of the firing rate.
- 5 Multiply "**H2**" by "**F**" to obtain the maximum lowered pressure "**H3**" of the firing rate
 $H3 = H2 \times F$ (mbar).
- If "**H3**" is greater than "**H1**" (Fig. 4), the burner can supply the required output.
- If "**H3**" is less than "**H1**", it is necessary to reduce the burner output.
 The reduction in output is accompanied by a reduction in the combustion chamber pressure:
Qr = reduced output
H1r = reduced pressure

$$H1r = H1 \times \left(\frac{Qr}{Q}\right)^2$$

Example, 5% reduction in output:

$$Qr = Q \times 0.95$$

$$H1r = H1 \times (0.95)^2$$

With the new values - Qr and H1r - repeat steps 2 - 5.



The combustion head should be adjusted in relation to the equivalent output **Qe**.

Altitude	Average barometric pressure	F							
		(Air temperature °C)							
m. above sea level	mbar	0	5	10	15	20	25	30	40
0	1013	1.087	1.068	1.049	1.031	1.013	0.996	0.980	0.948
100	1000	1.073	1.054	1.035	1.017	1.000	0.983	0.967	0.936
200	989	1.061	1.042	1.024	1.006	0.989	0.972	0.956	0.926
300	978	1.050	1.031	1.013	0.995	0.978	0.962	0.946	0.916
400	966	1.037	1.018	1.000	0.983	0.966	0.950	0.934	0.904
500	955	1.025	1.007	0.989	0.972	0.955	0.939	0.923	0.894
600	944	1.013	0.995	0.977	0.960	0.944	0.928	0.913	0.884
700	932	1.000	0.982	0.965	0.948	0.932	0.916	0.901	0.872
800	921	0.988	0.971	0.954	0.937	0.921	0.906	0.891	0.862
900	910	0.977	0.959	0.942	0.926	0.910	0.895	0.880	0.852
1000	898	0.964	0.946	0.930	0.914	0.898	0.883	0.868	0.841
1200	878	0.942	0.925	0.909	0.893	0.878	0.863	0.849	0.822
1400	856	0.919	0.902	0.886	0.871	0.856	0.842	0.828	0.801
1600	836	0.897	0.881	0.866	0.851	0.836	0.822	0.808	0.783
1800	815	0.875	0.859	0.844	0.829	0.815	0.801	0.788	0.763
2000	794	0.852	0.837	0.822	0.808	0.794	0.781	0.768	0.743
2400	755	0.810	0.796	0.782	0.768	0.755	0.742	0.730	0.707
2800	714	0.766	0.753	0.739	0.726	0.714	0.702	0.690	0.668
3200	675	0.724	0.711	0.699	0.687	0.675	0.664	0.653	0.632
3600	635	0.682	0.669	0.657	0.646	0.635	0.624	0.614	0.594
4000	616	0.661	0.649	0.638	0.627	0.616	0.606	0.596	0.577

Tab. F

4.8 Test boiler

The burner/boiler combination does not pose any problems if the boiler is EC approved and its combustion chamber dimensions are similar to those indicated in the diagram (Fig. 5).

If the burner must be combined with a boiler that has not been EC approved and/or its combustion chamber dimensions are clearly smaller than those indicated in the diagram, consult the manufacturer.

The firing rates were established in special test boilers, according to EN 676 regulations.

In Fig. 5 you can see the diameter and length of the test combustion chamber.

Example:

Output 756 kW - diameter 60cm - length 2m.

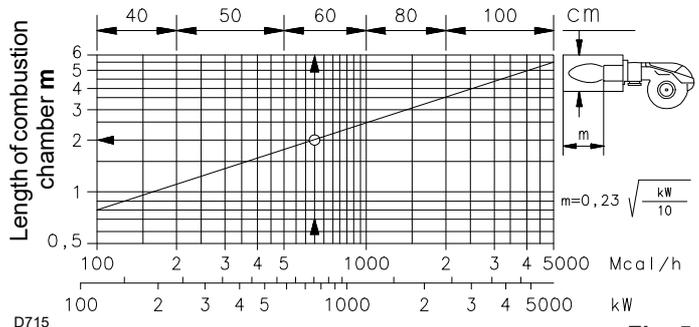


Fig. 5

4.9 Burner description

- 1 Combustion head
- 2 Ignition electrode
- 3 Screw for combustion head adjustment
- 4 Maximum gas pressure switch
- 5 Servomotor controlling the gas butterfly valve and the air damper valve (by means of an adjustable profile cam mechanism).
When the burner is not operating the air gate valve is fully closed in order to reduce heat dispersion from the boiler due to the flue draught which draws air from the fan suction inlet.
- 6 Plug-socket on ionisation probe cable
- 7 Extensions for slide bars 15)
- 8 Motor contact maker and thermal relay with reset button
- 9 Power switch for: automatic - manual - off
Button for: power increase - power reduction
- 10 Terminal board for electrical wiring
- 11 Cable grommets for electrical wiring (to be carried out by the installer)
- 12 Control box with lockout pilot light and lockout reset button
- 13 Flame inspection window
- 14 Minimum air pressure switch (differential operating type)
- 15 Slide bars for opening the burner and inspecting the combustion head
- 16 Gas pressure test point and head fixing screw
- 17 Air pressure test point
- 18 Flame sensor probe
- 19 Air damper
- 20 Fan air inlet
- 21 Screws to secure fan to pipe coupling
- 22 Gas input pipe
- 23 Gas butterfly valve
- 24 Boiler fixing flange
- 25 Flame stability disk
- 26 Bracket for fixing the RWF output power regulator (kit)
- 27 Ignition transformer
- 28 Suppressor
- 29 "K1" relay
- 30 "K2" relay

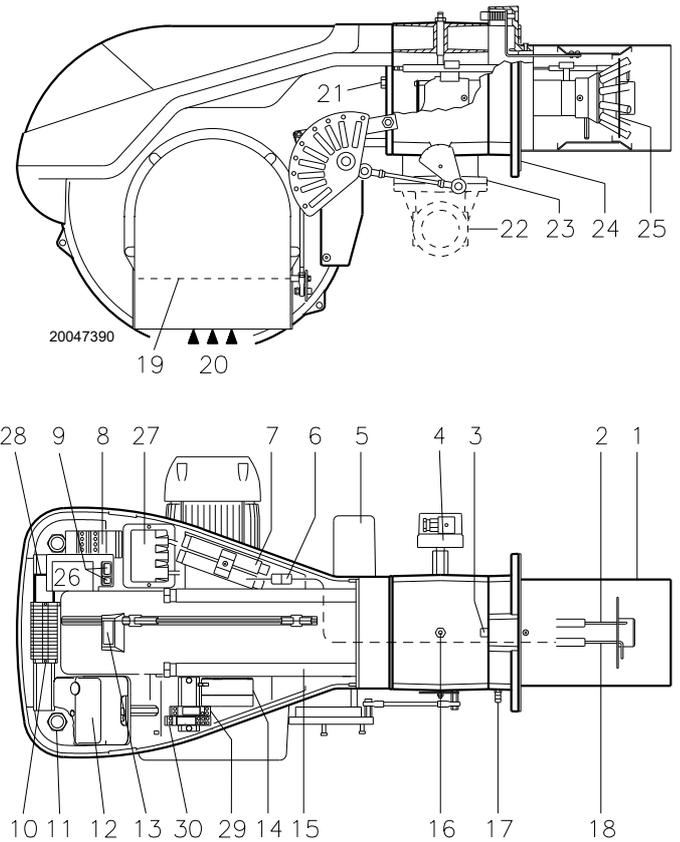


Fig. 6

4.10 Burner equipment

The burner is supplied complete with:

- Flange for gas train No. 1
- Gasket for flange No. 1
- Screws (M8x25) to fix the flange No. 4
- Thermal insulation screen No. 1
- Extensions 7) for guides 15): TL versions only. No. 2
- Screw (M12x35) to fix the burner flange to the boiler. . . . No. 1
- Instruction Manual No. 1
- Spare Parts List No. 1

4.11 Control box (RMG/M 88.62C2)

Warnings



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

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

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the control box connection area, fully disconnect the system from the power supply (omnipolar separation).
- Protection against electrocution from the control box and all connected electric components is obtained with the correct assembly.
- Before any intervention (assembly and installation operations, assistance, etc.), ensure the wiring is in order and that the parameters are correctly set, then make the safety checks.
- Falls and collisions can negatively affect the safety functions. In this case, the control box must not be operated, even if it displays no evident damage.

For safety and reliability, comply with the following instructions:

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

Use

The control box is a control and supervision system of medium and large capacity forced draught burners, for intermittent operation (at least one controlled shutdown every 24 hours).

Installation notes

- Check the electric wiring inside the boiler complies with the national and local safety regulations.
- Install switches, fuses, earth connection etc. in compliance with local regulations.
- Do not confuse the powered conductors with the neutral ones.
- Ensure that spliced wires cannot get into contact with neighbouring terminals. Use adequate ferrules.
- Arrange the H.V. ignition cables separately, as far as possible from the control box and the other cables.
- When wiring the unit, make sure the 230V AC mains voltage cables are run strictly separate from extra low-voltage cables, to avoid the risk of electrocution.



Fig. 7

Electrical wiring of the flame detector

It is important for signal transmission to be almost totally free of any disturbances or loss:

- Always separate the detector cables from the other cables:
 - the line capacity reduces the magnitude of the flame signal;
 - use a separate cable.
- The cable length must not exceed 1m.
- Respect the polarity.
- Insulation resistance:
 - must be at least 50MΩ between the ionisation probe and the earth;
 - a dirty detector reduces the insulation resistance, fostering leakage currents.
- The ionisation probe is not protected against the risk of electrocution. When connected to the electricity supply, the ionisation probe must be protected against any accidental contact.
- Position the ionisation probe so that the ignition spark cannot form an arc on the probe (risk of electric overcharge).

Technical data

Mains voltage	AC 230V -15% / +10%
Mains frequency	50/60 Hz ±6%
Built-in fuse	T6.3H 250V
Energy consumption	20 VA
Weight	approx. 260g
Protection level	IP20
Safety class	I
Tightening torque of M4 screw	Max. 0.8 Nm
Allowed cable length	
Thermostat	max. 20m at 100 pF/m
Air pressure switch	max. 1m at 100 pF/m
CPI	max. 1m at 100 pF/m
Gas pressure switch	max. 20m at 100 pF/m
Flame detector	max. 1m
Remote reset	max. 20m at 100 pF/m
Environmental conditions	
Storage	DIN EN 60721-3-1
Climatic conditions	Class 1K3
Mechanical conditions	Class 1M2
Temperature range	-20...+60°C
Humidity	< 95% RH

Tab. G

4.12 Servomotor (SQN31.76...)

Warnings



To avoid accidents, material or environmental damage, observe the following instructions!
 Avoid opening, modifying or forcing the actuators.

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



The servomotor contains electric and electronic components that must not be disposed of with normal domestic waste.
 Respect all current local legislation.

Assembly notes

- Check the relevant national safety standards are respected.
- When assembling the servomotor and connecting the damper, the gears can be disengaged by means of a lever, allowing the drive shaft to be easily adjusted in both directions of rotation.



Fig. 8

Technical data

Operating voltage	AC 220 V -15 %...AC 240 V +10 % AC 100 V -15 %...AC 110 V +10 %
Mains frequency	50/60 Hz ±6%
Energy consumption	6.5 VA
Angular positioning	up to 160° (base scale)
Assembly position	optional
Protection level	IP40, in accordance with DIN 40050
Switching voltage	24...250V AC
Type of motor	synchronous
Environmental conditions	
Storage	DIN EN 60 721-3-3
Climatic conditions	Class 3K5
Mechanical conditions	Class 3M2
Temperature range	-20...+70°C
Humidity	< 95% RH

Tab. H

5 Installation

5.1 Notes on safety for the installation

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



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



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



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

5.2 Handling

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



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



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



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

5.3 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.

RBL	A	B	C
D	E	F	
GAS-KAASU	<input checked="" type="checkbox"/>	G	H
GAZ-AERIO		G	H
I			RIELLO SpA I-37045 Legnago (VR)
			CE

D10411

Fig. 9

Checking the characteristics of the burner

Check the identification label of the burner (Fig. 9), showing:

- A the burner model;
 - B the burner type;
 - C the cryptographic year of manufacture;
 - D the serial number;
 - E the data for electrical supply and the protection level;
 - F the electrical power consumption;
 - G the types of gas used and the relative supply pressures;
 - H the data of the burner's minimum and maximum output possibilities (see Firing rate)
- Warning.** The burner output must be within the boiler's firing rate;
- I the category of the appliance/countries of destination.



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

5.4 Operating position



- The burner is designed to operate only in positions 1, 2, 3 and 4 (Fig. 10).
- Installation 1 is preferable, as it is the only one that allows the maintenance operations as described in this manual.
- Installations 2, 3 and 4 permit operation but make maintenance and inspection of the combustion head more difficult.



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

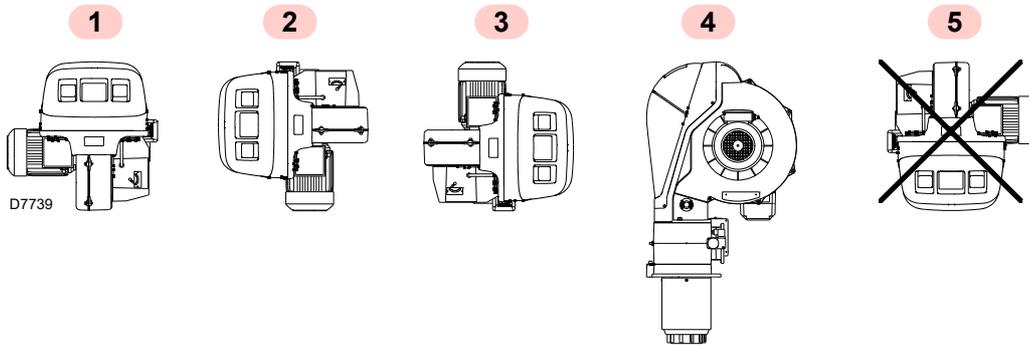


Fig. 10

5.5 Preparing the boiler

5.5.1 Boring the boiler plate

Pierce the closing plate of the combustion chamber, as in Fig. 11. The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

5.5.2 Blast tube length

The length of the blast tube 12)(Fig. 12 on page 16) must be selected according to the indications provided by the boiler manufacturer, and in any case must be greater than the thickness of the boiler door complete with its refractory.

The available lengths are the ones indicated in Tab. I.

Blast tube	Short	Long
RS 150/M	280mm	415mm

Tab. I

For boilers with a front flue gas passes 15)(Fig. 12 on page 16) or flame inversion chamber, a protection device in refractory material 13) must be inserted between the boiler fettling 14) and the blast tube 12).



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

For boilers with a water-cooled frontal, a refractory lining 13)-14) is not necessary unless expressly requested by the boiler manufacturer.

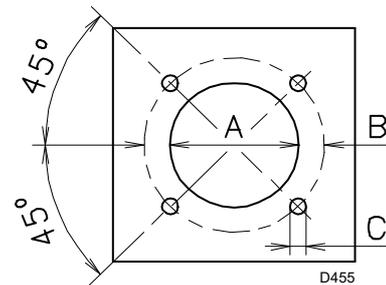


Fig. 11

mm	A	B	C
RS 150/M	195	275-325	M12

Tab. J

5.6 Securing the burner to the boiler



Provide an adequate lifting system.

Separate the combustion head from the rest of the burner, as shown in Fig. 12.

To do this, proceed as follows:

- loosen the four screws 3) and remove the hood 1);
- disengage the articulated coupling 7) from the graduated sector 8);

- remove screws 2) from the two slide bars 5);
- remove the 2 screws 4) and pull the burner back on slide bars 5) by about 100mm;
- disconnect the probe and electrode cables, then slide off the burner completely from the slide bars.



Before fixing the burner to the boiler, check (through the opening of the blast tube) that the probe and electrode are correctly positioned (see Fig. 14).

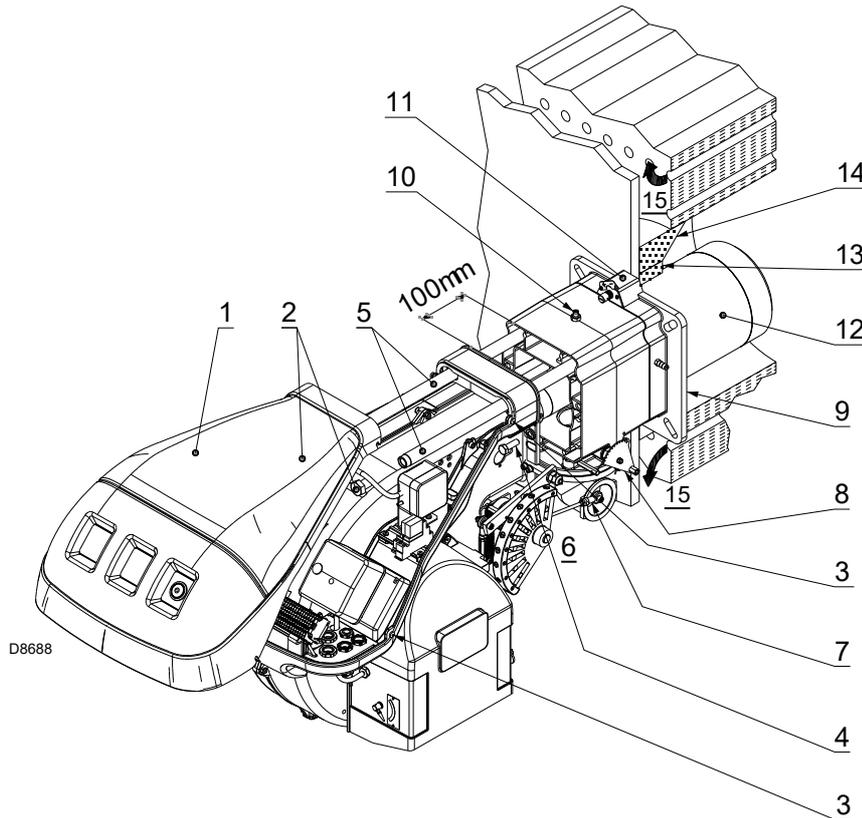


Fig. 12

If the probe or electrode is not correctly positioned, you must:

- remove the screw 1)(Fig. 13);
- take out the inner part 2)(Fig. 13) of the head, and then calibrate them.

Once this operation (if necessary) has been carried out, fix the flange 11)(Fig. 12) to the boiler plate, interposing the insulating gasket 9)(Fig. 12) supplied.

Use the 4 screws supplied, with a tightening torque of 35 - 40 Nm, after protecting their thread with anti-seizing products.



The seal between burner and boiler must be airtight: after the start-up, check there is no leakage of flue gases into the external environment.

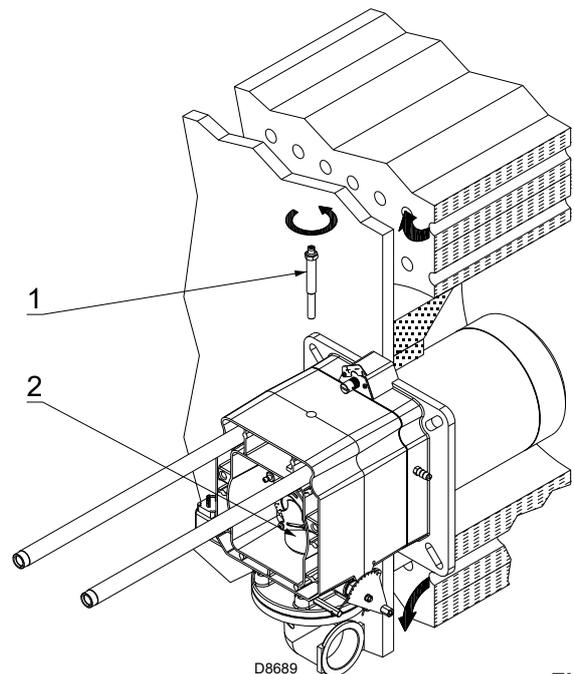


Fig. 13

5.7 Positioning the probe - electrode



When positioning the probe and electrode, respect the dimensions shown in Fig. 14.



Do not rotate the probe: leave it as in Fig. 14. since if it is located too close to the ignition electrode, the control box amplifier may be damaged.

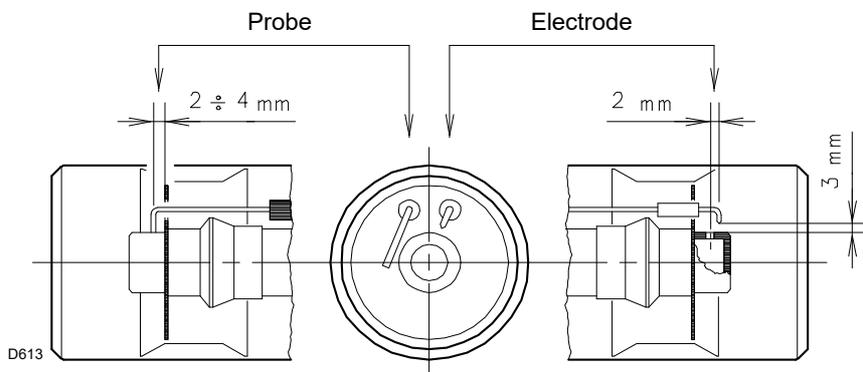


Fig. 14

5.8 Combustion head adjustment

At this point of the installation, the combustion head is fixed to the boiler as shown in Fig. 13.

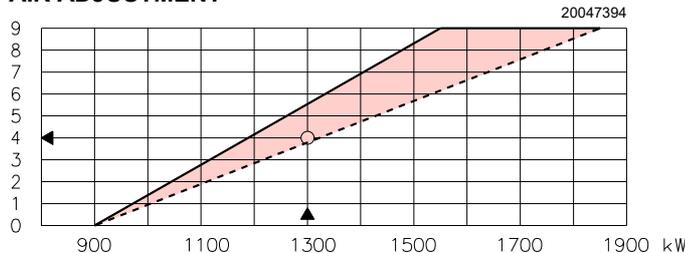
It is therefore especially easy to adjust, and this adjustment depends only on the maximum output of the burner.

You can adjust the air and gas to calibrate the combustion head. In the diagram of Fig. 15, find the notch at which both air and central gas/air should be adjusted.



The diagrams show an optimum adjustment for a type of boiler according to Fig. 5 on page 10.

AIR ADJUSTMENT



GAS ADJUSTMENT

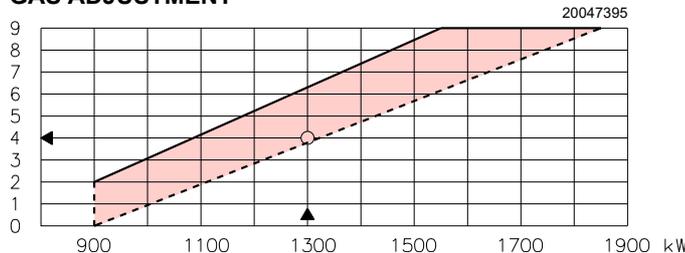


Fig. 15

5.8.1 Air adjustment

Proceed as follows:

- rotate the screw 2)(Fig. 16) until the notch you have found corresponds with the front surface 1) of the flange.



To facilitate the adjustment, loosen the screw 3)(Fig. 16); adjust, then lock in place.

5.8.2 Gas adjustment

Proceed as follows:

- loosen the screws 4) and rotate the ring nut 5)(Fig. 16) until the notch you have found corresponds with the indicator 3);
- tighten the screws 4).

Example:

burner output = 1300 kW and combustion chamber pressure equal to 0 mbar

The diagram (Fig. 15) shows that the gas and air adjustments for this output are carried out on notch 4.



The adjustments indicated can be modified during the initial start-up.

If the pressure in the combustion chamber is 0 mbar, the adjustments are made with reference to the dotted line.

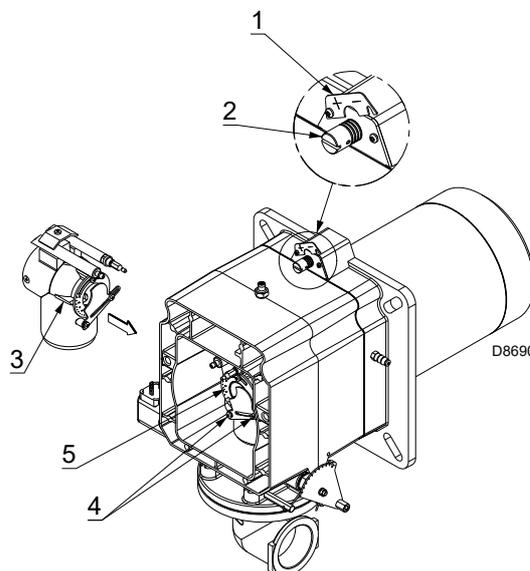


Fig. 16

Once the combustion head adjustment is completed:

- reassemble the burner on the guides 3), about 100mm from the pipe coupling 4) - burner in the position shown in Fig. 12;
- insert the probe and electrode cables, then slide the burner as far as the pipe coupling - burner in the position shown in Fig. 17;
- connect the socket of the maximum gas pressure switch;
- refit the screws 2) on the slide bars 3);
- fix the burner to the pipe coupling with the screws 1);
- reconnect the articulated coupling 7) to the graduated sector 6).



WARNING

When fitting the burner on the two slide bars, it is advisable to gently draw out the high voltage cable and the flame detection probe cable until they are slightly stretched.



Carry out all the operations described above, then reassemble the hood and all the burner safety and protection devices.

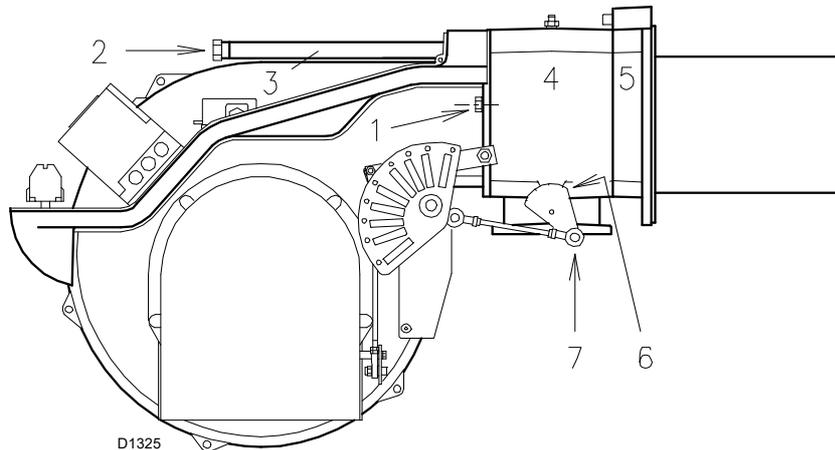


Fig. 17

5.9 Gas feeding



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

Precautions: avoid knocking, attrition, sparks and heat.

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



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

5.9.1 Gas feeding line

Key (Fig. 18 - Fig. 19 - Fig. 20 - Fig. 21)

- 1 Gas input pipe
- 2 Manual valve
- 3 Vibration damping joint
- 4 Pressure gauge with pushbutton cock
- 5 Filter
- 6A Includes:
 - filter
 - working valve
 - safety valve
 - pressure adjuster
- 6B Includes
 - working valve
 - safety valve
 - pressure adjuster
- 6C Includes
 - safety valve
 - working valve
- 6D Includes:
 - safety valve
 - working valve
 - pressure adjuster
 - filter
- 7 Minimum gas pressure switch
- 8 Leak detection control, provided as an accessory or integrated, based on the gas train code. In compliance with the EN 676 standard, the leak detection control is compulsory for burners with maximum outputs over 1200 kW.
- 9 Gasket, for "flanged" versions only
- 10 Pressure adjuster
- 11 Train-Burner adaptor, supplied separately
- P2 Upline pressure of valves/adjuster
- P3 Upstream pressure of the filter
- L Gas train, supplied separately
- L1 The responsibility of the installer

MBC "threaded"

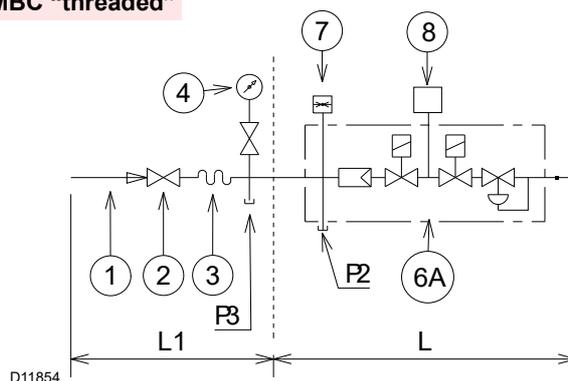


Fig. 18

MBC "flanged"-VGD

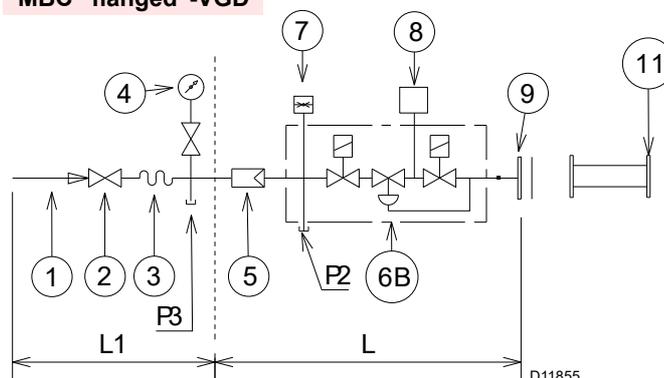


Fig. 19

DMV "flanged or threaded"

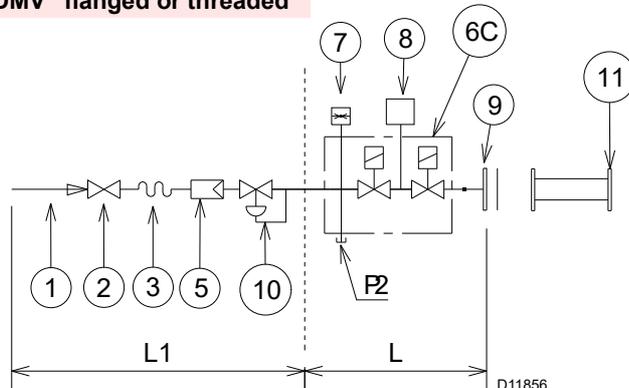


Fig. 20

CB "flanged or threaded"

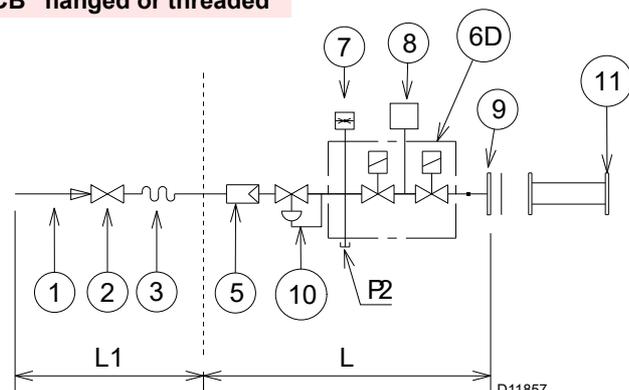


Fig. 21

5.9.2 Gas train

Approved according to standard EN 676 and provided separately from the burner.

5.9.3 Gas train installation



Disconnect the electrical power using the main switch.



Check that there are no gas leaks.



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



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



The operator must use the required equipment during installation.

The gas train can be connected to the right or left side of the burner, as the situation requires (see Fig. 22).

The gas train must be connected to the gas connection 1) (Fig. 22) using the flange 2), gasket 3) and 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.



Make sure the maximum pressure necessary for the burner is included in the calibration field of the pressure adjuster (colour of the spring).



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

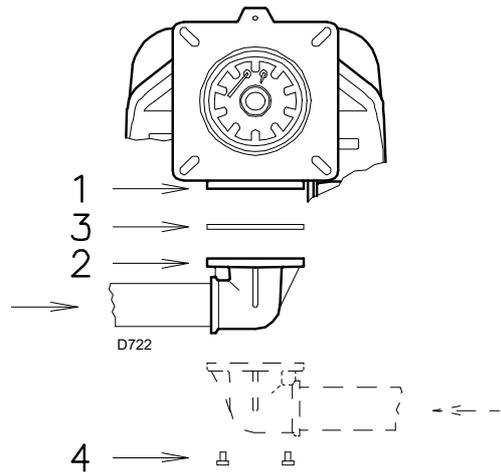


Fig. 22

5.9.4 Gas pressure

Tab. K indicates the pressure drops of the combustion head and gas butterfly valve, on the basis of the burner operating output.

kW	1 Δp (mbar)		2 Δp (mbar)	
	G 20	G 25	G 20	G 25
900	4.5	6.9	1.4	1.9
1000	5.5	8.6	1.8	2.3
1100	6.6	10.2	2.1	2.8
1200	7.7	11.8	2.5	3.4
1300	8.7	13.5	3.0	4.0
1400	9.9	15.2	3.4	4.6
1500	11.1	17.1	3.9	5.3
1600	12.5	19.4	4.5	6.0
1700	14.2	22.0	5.1	6.8
1800	16.3	25.3	5.7	7.6
1850	17.5	27.1	6.0	8.0

Tab. K

The values shown in Tab. K refer to:

- natural gas G20 NCV 9.45 kWh/Sm³ (8.2 Mcal/Sm³)
- natural gas G25 NCV 8.13 kWh/Sm³ (7.0 Mcal/Sm³)

Column 1

Combustion head pressure drop.

Gas pressure measured at test point 1)(Fig. 23), with:

- combustion chamber at 0 mbar;
- burner working at maximum modulating output;
- combustion head set as on page 17.

Column 2

Pressure loss at gas butterfly valve 2)(Fig. 23) with maximum opening: 90°.

To calculate the approximate output at which the burner operates:

- subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 23).
- Find, in Tab. K related to the burner concerned, the pressure value closest to the result of the subtraction.
- Read off the corresponding output on the left.

Example with natural gas G20:

Operation at maximum modulating output
 Gas pressure at test point 1) (Fig. 23) = 11.7 mbar
 Pressure in combustion chamber = 3 mbar
 $11.7 - 3 = 8.7$ mbar

A pressure of 8.7 mbar (column 1) corresponds in Tab. K to an output of 1300 kW.

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

To calculate the required gas pressure at test point 1) (Fig. 23), set the maximum modulating output required from the burner operation:

- find the nearest output value in Tab. K for the burner in question.
- Read, on the right (column 1), the pressure at the test point 1) (Fig. 23).
- Add this value to the estimated pressure in the combustion chamber.

Example with natural gas G20:

Operation at maximum modulating output
 Gas pressure at an output of 1300 kW = 8.7 mbar
 Pressure in combustion chamber = 3 mbar
 $8.7 + 3 = 11.7$ mbar

pressure required at test point 1)(Fig. 23).

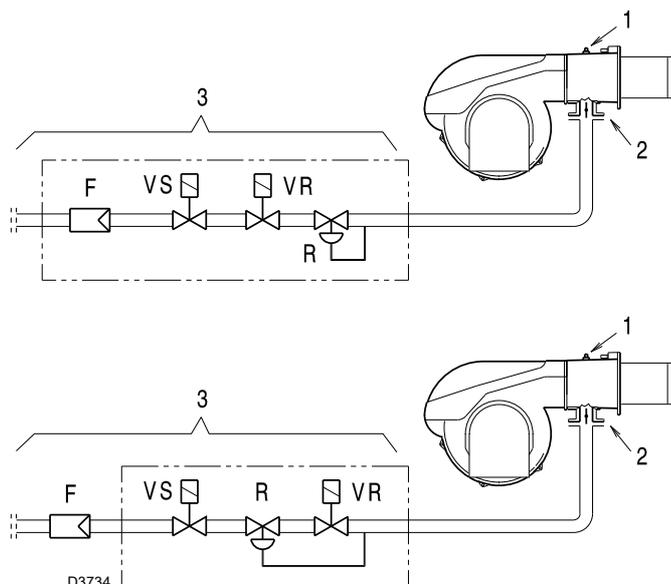


Fig. 23



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

5.10 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 made in accordance with the regulations currently in force in the country of destination and by qualified personnel. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burner has been type-approved for intermittent use. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own start-up efficiency. Normally, burner stopping is guaranteed by the boiler's thermostat/pressure switch.
- If this is not the case, a time switch should be fitted in series to TL to stop the burner at least once every 24 hours. Refer to the wiring diagrams.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum power absorption of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for that level of power absorption.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - use a multiple pole switch with at least a 3mm gap between the contacts (overvoltage category III), as envisaged by the present 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 according to the wiring diagrams.

Use flexible cables in compliance with the EN 60 335-1 standard.

5.10.1 Supply cables and external connections passage

All the cables to be connected to the burner should be passed through cable grommets, as shown in Fig. 24.

Key (Fig. 24)

- 1 Three-phase power supply
- 2 Single-phase power supply
- 3 Gas valves
- 4 Gas pressure switch or valve leak detection device
- 5 consent/safety
- 6 Available



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

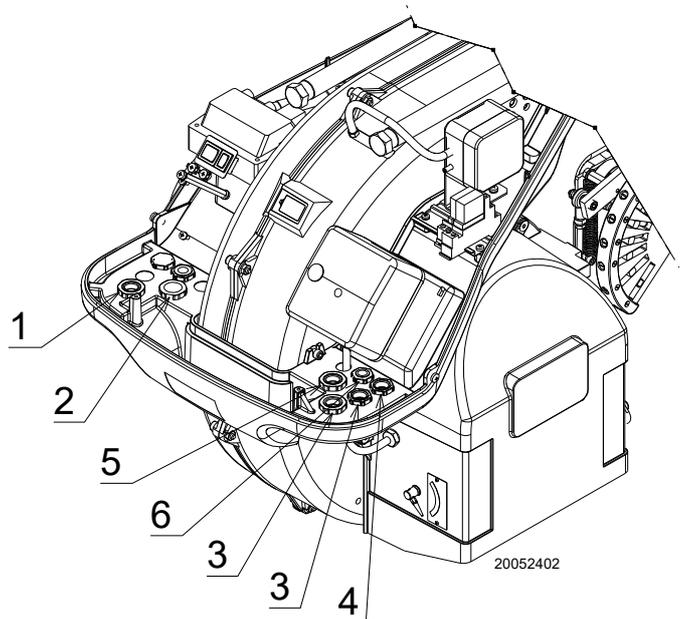


Fig. 24

5.11 Calibration of the thermal relay

The thermal relay serves to avoid damage to the motor due to an excessive absorption increase or if a phase is missing.

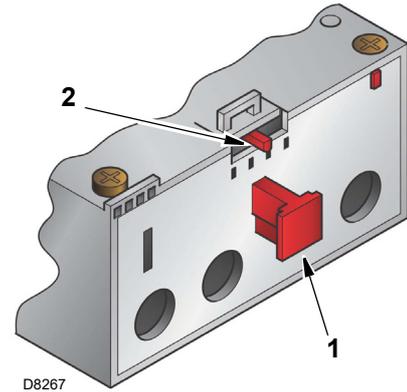
For the calibration, refer to the wiring diagram.

The protection is in any case ensured even if the minimum value of the thermal relay scale is over the rating absorption of the motor. This occurs when the motor power supply is 400V / 460V.

To reset, in case of an intervention of the thermal relay, press button 1)(Fig. 25).



The automatic reset can be dangerous.
This operation is not foreseen in the burner operation.



D8267

Fig. 25

5.12 Measuring the ionisation current

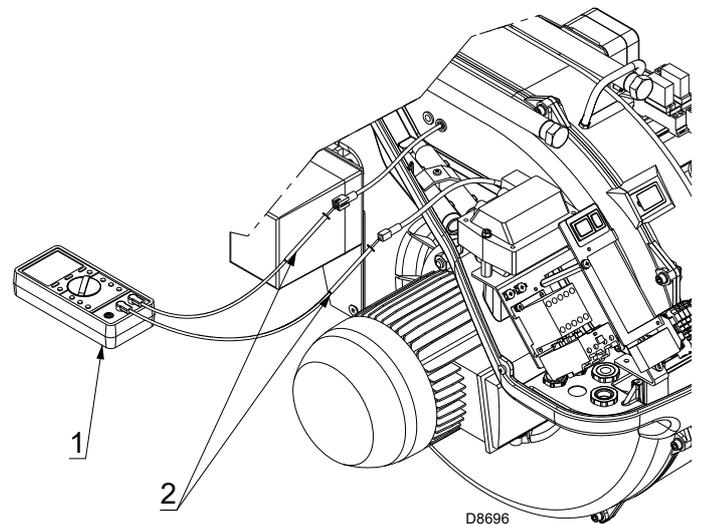
The burner is fitted with an ionisation system to check that a flame is present. The minimum current for control box operation is 6 µA.

The burner provides a much higher current, so controls are not normally required.

If it is necessary, however, to measure the ionisation current, disconnect the plug-socket 2)(Fig. 26) on the ionisation probe cable and insert a direct current microammeter 1)(Fig. 26) with a base scale of 100 µA.



Carefully check the polarities!



D8696

Fig. 26

6 Start-up, calibration and operation of the burner

6.1 Notes on safety for the first start-up



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



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



Refer to paragraph “Safety test - with gas ball valve closed” on page 32 before the first start-up.

6.2 Adjustments prior to ignition



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 from the gas train.
- Adjust the minimum gas pressure switch (Fig. 35 on page 29) to the start of the scale.
- Adjust the maximum gas pressure switch (Fig. 34 on page 28) to the end of the scale.
- Adjust the air pressure switch (Fig. 33 on page 28) to the start of the scale.
- Check the gas supply pressure by connecting a pressure gauge to the pressure test point 1)(Fig. 27) of the minimum gas pressure switch: it must be lower than the maximum allowed pressure of the gas train, as shown on the characteristics label.



An excessive gas pressure can damage the components of the gas train and lead to a risk of explosion.

- Bleed the air from the piping of the gas train, connecting a plastic tube to the pressure test point 1)(Fig. 27) of the minimum gas pressure switch. Take the vent tube outside the building so you can notice the smell of gas.
- Connect two lamps or testers to the two gas line solenoids to check the exact moment in which voltage is supplied. This operation is unnecessary if each of the two solenoids 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.

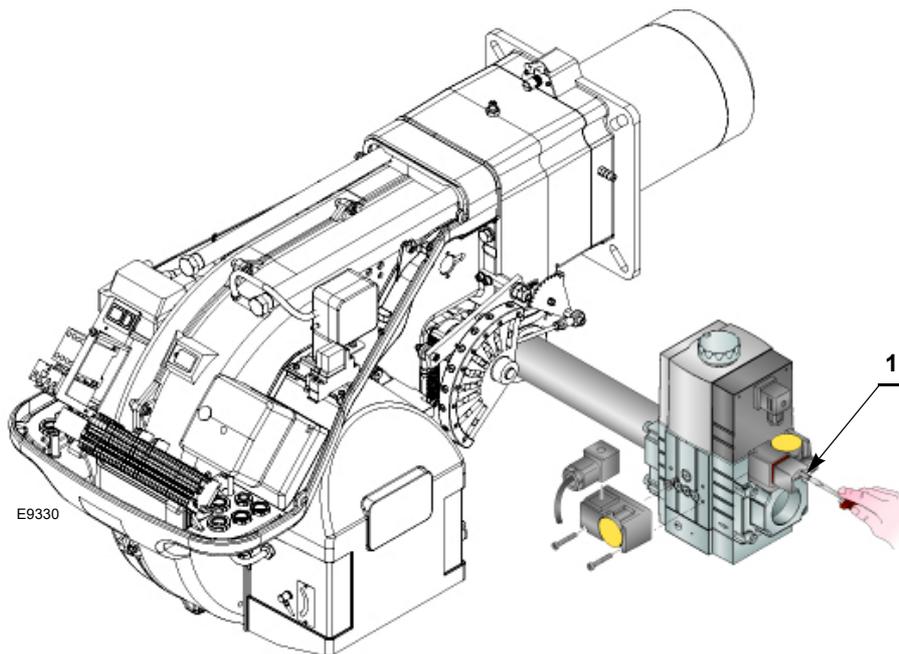


Fig. 27

6.3 Burner start-up

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

Close the thermostats/pressure switches and turn the switch to **MAN** (Fig. 28).



WARNING

- As soon as the burner starts up:
- check the fan rotation direction through the flame inspection window (Fig. 29);
 - check the fan motor rotation direction, as shown in Fig. 29.



DANGER

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

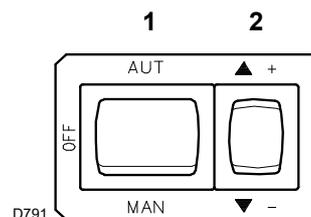


Fig. 28

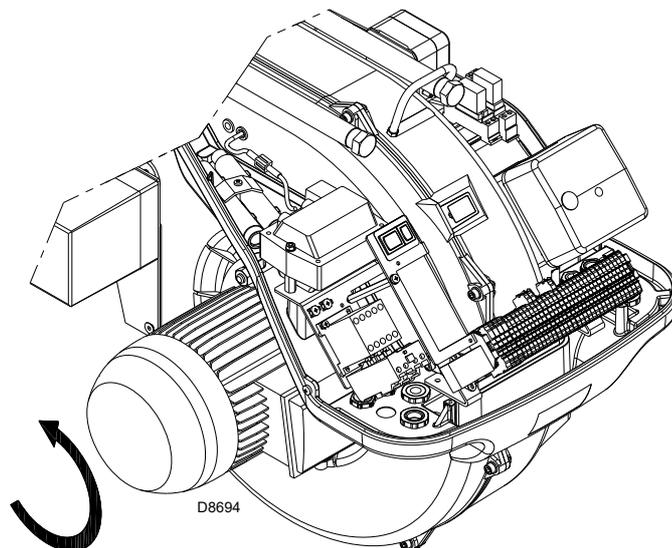


Fig. 29

6.4 Burner ignition

Having completed the checks indicated in the previous heading, ignition of the burner should be achieved.

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

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

The arrival of gas to the pipe coupling is shown by the pressure gauge.

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

6.5 Servomotor adjustment

The servomotor (Fig. 30) simultaneously adjusts the air damper (by means of the variable profile cam) and the gas butterfly valve. The servomotor rotates by 130° in 42 seconds.



WARNING

Do not alter the factory setting for the 5 cams; check only that they are as shown below.

- Cam I: 130°**
Limits rotation toward maximum position. When the burner is at MAX output, the gas butterfly valve must be fully open: 90°.
- Cam II: 0°**
Limits rotation toward minimum position. When the burner is shut down, the air damper and gas butterfly valve must be closed: 0°.
- Cam III: 50°**
Adjusts the ignition position and the MIN output.
- Cam V:** integrated with cam III.

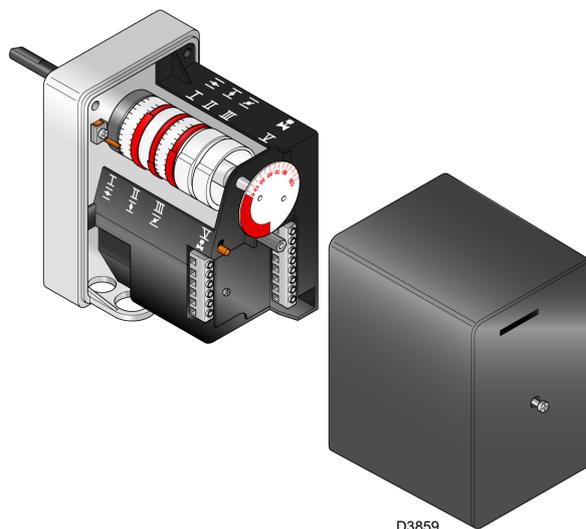


Fig. 30

6.6 Adjusting the burner

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

Adjust in sequence:

- ignition output
- maximum output
- minimum output
- intermediate outputs
- maximum gas pressure switch
- minimum gas pressure switch
- air pressure switch

6.6.1 Output upon ignition

Burners with MAX output up to 120 kW

Ignition can occur at the maximum operation output level. Example:

- max. operation output: 120 kW
- max. ignition output: 120 kW

Burners with MAX output above 120 kW

Ignition must occur at a lower output than the max. operation output.

If ignition output does not exceed 120 kW, no calculations are required.

If ignition output exceeds 120 kW, the regulatory standard sets that the value be defined according to the control box safety time "ts": for "ts" = 3s, ignition output must be equal to or less than 1/3 of the max. operation output.

Example:

MAX operation output of 450 kW.

The ignition output must be equal to or less than 150 kW with ts = 3s

In order to measure the ignition output:

- disconnect the plug-socket 6 (Fig. 6 on page 11) on the ionisation probe cable (the burner will fire and then go into lockout after the safety time has elapsed);
- perform 10 consecutive ignitions with lockouts;
- on the meter, read the quantity of gas burned: this quantity must be equal to, or lower than, the quantity given by the formula, for ts = 3s:

$$Vg = \frac{Qa \text{ (max. burner delivery) } \times n \times ts}{3600}$$

Vg: volume supplied in ignitions carried out (Sm³)

Qa: ignition delivery (Sm³/h)

n: number of ignitions (10)

ts: safety time (sec)

Example for gas G20 (9.45 kWh/Sm³):

ignition output 150 kW corresponding to 15.87 Sm³/h.

After 10 ignitions with lockout, the output read on the meter must be equal to or less than:

$$Vg = \frac{15.87 \times 10 \times 3}{3600} = 0.132 \text{ Sm}^3$$

6.6.2 Maximum output

MAX output must be selected within the firing rate range shown on page 9.

In the above instructions we left the burner running at the MIN output.

Now press the "increase output" button 2)(Fig. 28), and keep it pressed until the servomotor has opened the air damper and the gas butterfly valve.

Adjustment of gas delivery

Measure the gas delivery on the gas meter.

A rough indication can be obtained from Tab. F on page 10; just read the gas pressure on the pressure gauge (see Fig. 33 on page 28) and follow the indications given on page 9.

- If delivery needs to be reduced, diminish outlet gas pressure; if it is already very low, slightly close the VR adjustment valve.
- If delivery needs to be increased, increase the adjuster outlet gas pressure.

Air adjustment

Progressively adjust the end profile of cam 4)(Fig. 31) by turning the screws 7).

- Turn the screws clockwise to increase air delivery.
- Turn the screws anticlockwise to reduce air delivery.

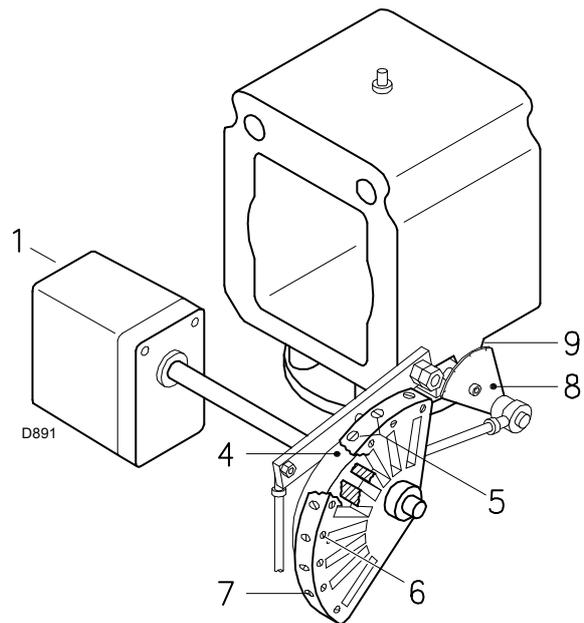


Fig. 31

Key (Fig. 31)

- 1 Servomotor
- 4 Variable profile cam
- 5 Screws for adjusting the initial profile
- 6 Screws for fixing the adjustment
- 7 Screws for adjusting the end profile
- 8 Graduated sector for gas butterfly valve
- 9 Indicator for graduated sector 8)

6.6.3 Minimum output

Min output must be selected within the firing rate range shown on page 9.

Press the "reduce output" button 2)(Fig. 28), and keep it pressed until the servomotor has closed the air damper and the gas butterfly valve at 50° (adjustment made in the factory).

Adjustment of gas delivery

Measure the gas delivery on the gas meter.

- If it is necessary to reduce it, slightly reduce the angle of cam III (Fig. 32) with small, regular movements (i.e. bring it from an angle of 65° to 63° - 61°....).
- If it is necessary to increase it, lightly press the "increase output" button 2)(Fig. 28) (open the gas butterfly valve by 10-15°) and increase the angle of cam III (Fig. 32) with small, regular movements (i.e. bring it from an angle of 65° to 67° - 69°....).

Now press the "reduce output" button until the servomotor is in the minimum opening position, and measure the gas output.

NOTE

The servomotor only follows the adjustment of cam III when the angle of the cam is reduced.

If you need to increase the angle of the cam, you must first increase the angle of the servomotor with the aid of the "increase output" button.

Now increase the angle of cam III, then bring the servomotor back to the MIN output position using the "reduce output" button.

For any necessary adjustment of cam III, especially for small movements, use the specific key 10)(Fig. 32).

Air adjustment

Progressively adjust the initial profile of the cam 4) (Fig. 31) by turning the screws 5).



It is preferable not to turn the first screw, as this one is used to bring the air damper to its fully closed position.

6.6.4 Intermediate outputs

Adjustment of gas delivery

No adjustment of gas delivery is required.

Air adjustment

Lightly press the "increase output" button 2)(Fig. 28) so the servomotor rotates by about 15°.

Adjust the screws until optimal combustion is obtained. Proceed in the same way with the other screws.



Take care that the cam profile variation is progressive.

- Switch off the burner via the switch 1)(Fig. 28) ("OFF" position).
- Release the cam 4 from the servomotor by pressing the button 3) and moving it to the right.
- Manually rotate the cam 4) backwards and forwards several times to make sure it moves smoothly.
- Now engage cam 4) again to the servomotor by shifting button 2) to the left.



As far as is possible, try not to move those screws at the ends of the cam that were previously adjusted for the opening of the air damper to MAX and MIN output.

Once optimum adjustment has been reached, fix it with the screws 6).

NOTE

Once you have finished adjusting the MAX - MIN - INTERMEDIATE outputs, check ignition once again: noise emission at this stage must be identical to the following stage of operation.

If you notice any sign of pulsations, reduce the ignition output.

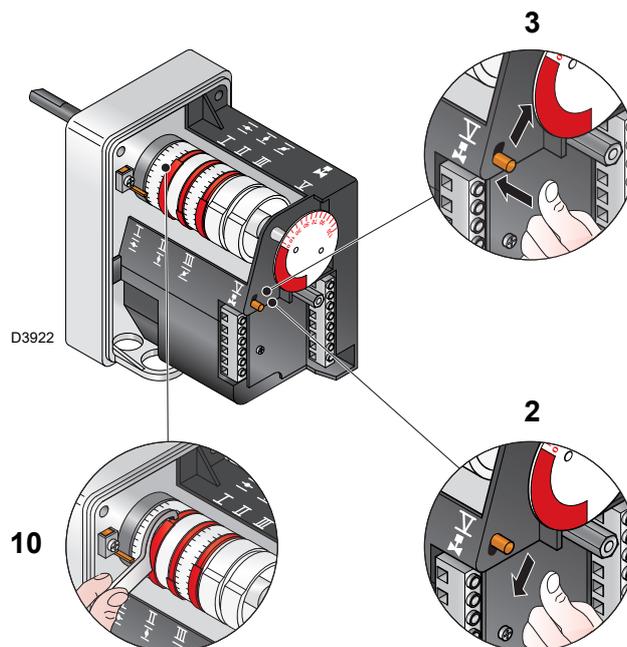


Fig. 32

Key (Fig. 32)

- 1 Servomotor
- 2 Servomotor 1) - cam 4): constrained
- 3 Servomotor 1) - cam 4): released
- 10 Spanner for adjusting cam III

6.6.5 Air pressure switch

Adjust the air pressure switch after performing all other burner adjustments with the air pressure switch set to the start of the scale (Fig. 33).

- With the burner operating at MIN output, insert a combustion analyser in the stack, slowly close the suction inlet of the fan (for example, with a piece of cardboard) until the CO value does not exceed 100 ppm.
- Slowly turn the appropriate knob clockwise until the burner goes into lockout.
- Check the indication of the arrow pointing upwards on the graduated scale.
- Turn the knob clockwise again, until the value shown on the graduated scale corresponds with the arrow pointing downwards, and so recovering the hysteresis of the pressure switch (shown by the white mark on a blue background, between the two arrows).
- Now check the correct start-up of the burner.
- If the burner locks out again, turn the knob anticlockwise a little bit more.

During these operations it may be useful to measure the air pressure with a pressure gauge.

The connection of the pressure gauge is shown in Fig. 33. The standard configuration is that with the air pressure switch connected in absolute mode. Note the presence of a "T" connection, not supplied.

In certain applications in strong depression situations, the connection of the pressure switch does not allow it to change over.

In this case it is necessary to connect the pressure switch in differential mode, applying a second tube between the air pressure switch and the fan suction line mouth.



WARNING

The use of the air pressure switch with differential operation is only allowed in industrial applications and where rules enable the air pressure switch to merely control fan operation (without any reference to CO limits).

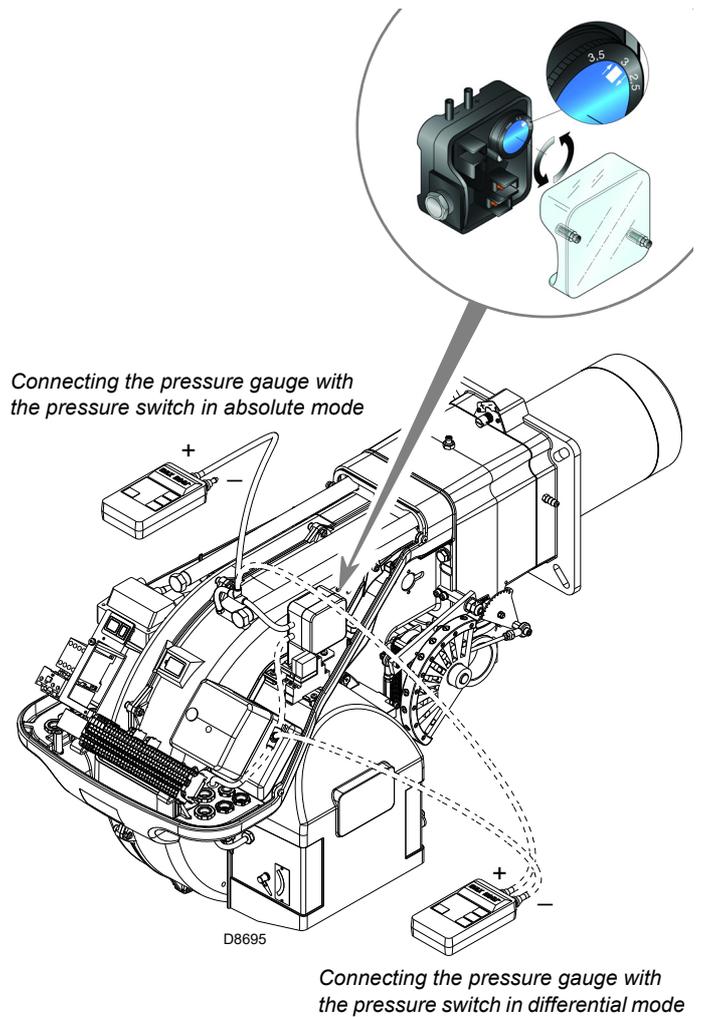
6.6.6 Maximum gas pressure switch

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

To calibrate the maximum gas pressure switch, open the tap and then connect a pressure gauge to its pressure test point.

The maximum gas pressure switch must be regulated to a value no higher than 30% of the measurement read on the gauge when the burner is working at maximum output.

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



Connecting the pressure gauge with the pressure switch in differential mode

Fig. 33

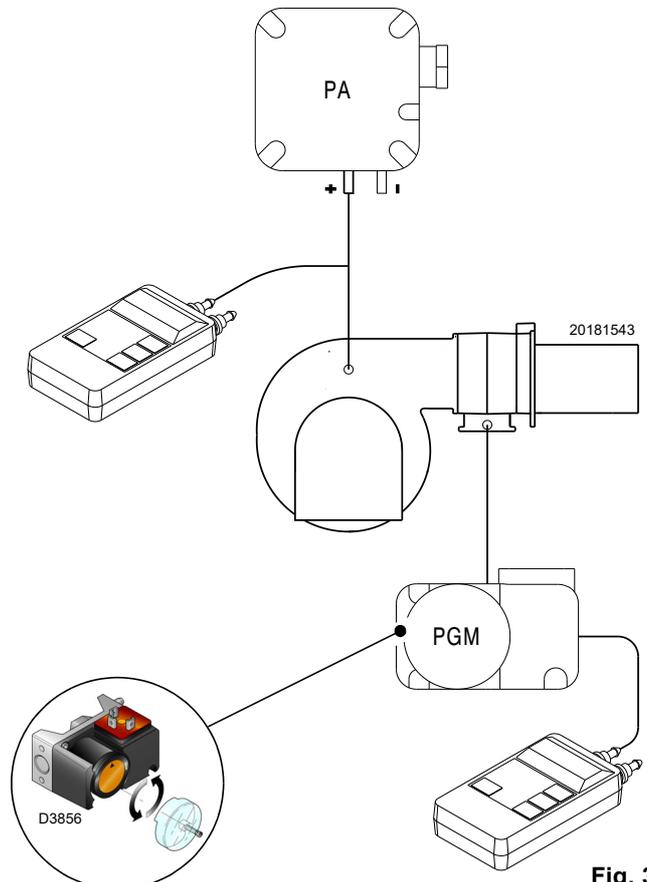


Fig. 34

6.6.7 Minimum gas pressure switch

The purpose of the minimum gas pressure switch is to prevent the burner from operating in an unsuitable way due to too low gas pressure.

Adjust the minimum gas pressure switch (Fig. 35) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

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

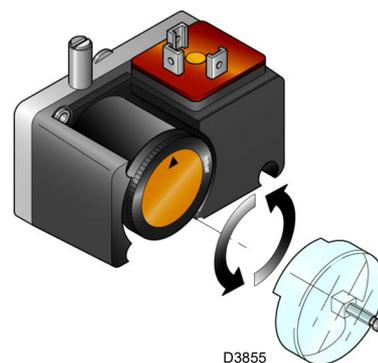


Fig. 35



WARNING

1 kPa = 10 mbar

6.7 Operation sequence of the burner

6.7.1 Burner start-up

- 0s TL thermostat/pressure switch closes.
- 5s Control box program starts up.
Servomotor starts: rotate 130° to the right, until the contact intervenes on cam I (Fig. 30).
- 35s The air damper reaches the MAX output position.
The fan motor starts up.
Start of the pre-purging phase.
- 75s The servomotor rotates towards the left as far as the angle set on cam III (Fig. 30) for the MIN output.
- 95s The air damper and gas butterfly valve assume the MIN output position (with cam III at 65°)(Fig. 30).
- 105s The ignition electrode strikes a spark.
The safety valve VS opens, along with the adjustment valve VR, quick opening. The flame ignites with a small output - point A.
The output gradually increases, and the VR valve slowly opens, until MIN output is reached - point B.
- 108s The spark goes out.
- 115s The starting cycle comes to an end.

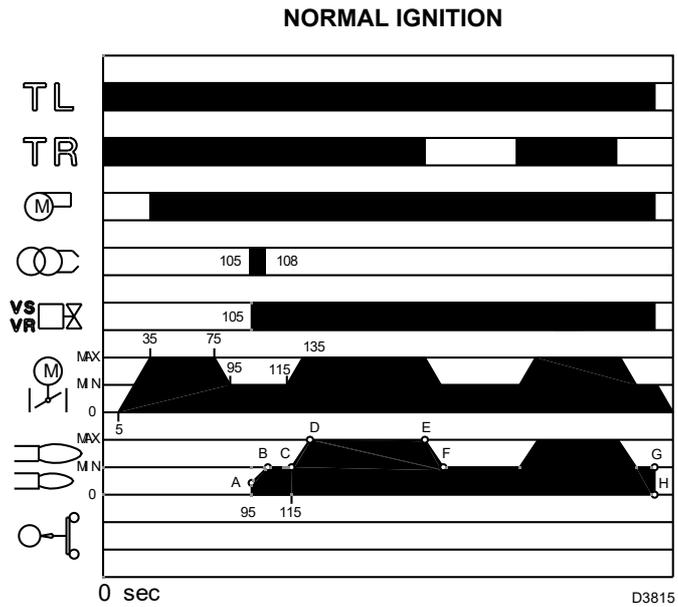


Fig. 36

6.7.2 Operation

Burner without modulating operation kit

Once the starting cycle is terminated, the servomotor command passes to the TR that controls the pressure or the temperature in the boiler - point C. (The control box still checks the presence of the flame and the correct position of the air and maximum gas pressure switches).

- If the temperature or pressure is low (so the TR is closed), the burner progressively increases the output up to the MAX value (tract C-D).
- If the temperature or pressure then increases until the TR opens, the burner progressively decreases its output to the MIN value (section E-F). The sequence repeats endlessly.
- The burner stops when the heat request is less than the heat supplied by the burner at MIN. output (tract G-H).
The TL opens, and the servomotor returns to angle 0°. The air damper closes completely to reduce heat losses to a minimum.

Burner with modulating operation kit

See manual enclosed with the adjuster.

6.7.3 Ignition failure

If the burner does not switch on, there is a lockout within 3s of the electrical supply reaching the gas valve.

It may be that the gas does not arrive at the combustion head within the safety time of 3s.

In this case increase gas ignition delivery.

The arrival of gas to the pipe coupling is shown by the pressure gauge in Fig. 38.

NO IGNITION

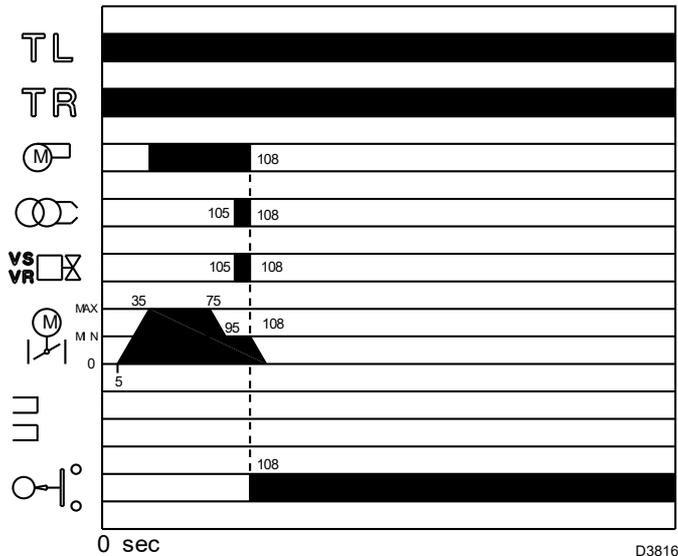


Fig. 37

6.7.4 Burner flame goes out during operation

If the flame should accidentally go out during operation, the burner will lock out within 1s.

6.8 Stopping of the burner

The burner can be stopped by:

- intervening on the disconnecting switch of the electrical supply line, located on the boiler panel;
- removing the hood and intervening on the “AUT/MAN” switch shown in Fig. 28.



Carry out all the operations, then reassemble the hood and all the burner safety and protection devices.

6.9 Final checks (with burner operating)

<ul style="list-style-type: none"> ➤ Open the thermostat/pressure switch TL ➤ Open the thermostat/pressure switch TS 		The burner must stop
<ul style="list-style-type: none"> ➤ Turn the gas maximum pressure switch knob to the minimum end of scale position ➤ Turn the air pressure switch to the maximum end of scale position. 		The burner must stop in lockout
<ul style="list-style-type: none"> ➤ Turn off the burner and cut off the power. ➤ Disconnect the minimum gas pressure switch connector. 		The burner must not start
<ul style="list-style-type: none"> ➤ Disconnect the wire of the ionisation probe. 		The burner must stop in lockout due to ignition failure

Tab. L



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

7 Maintenance

7.1 Notes on safety for the maintenance

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

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



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

Before carrying out any maintenance, cleaning or checking operations:



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



Turn off the fuel interception tap.



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

7.2 Maintenance programme

7.2.1 Maintenance frequency



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

7.2.2 Safety test - with gas ball valve closed

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

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

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

The start-up cycle must be as follows:

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

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

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



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

7.2.3 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion

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

Gas leaks

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

Gas filter

Change the gas filter when it is dirty.

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;
- correctly positioned.

Check the gas outlet holes for the ignition phase (in the distributor of the combustion head) are free of impurities or rust. If in doubt, disassemble the elbow 5)(Fig. 40 on page 34).

Flame inspection window

Clean the glass of the flame inspection window.

Servomotor

Release the cam 4)(Fig. 31 on page 26) from the servomotor, by pressing and shifting the button 3)(Fig. 32 on page 27) to the right. Manually rotate it backwards and forwards to make sure it moves smoothly.

Now engage the cam again by shifting the button 2)(Fig. 31 on page 26) to the left.

Burner

Check for excess wear or loose screws in the mechanisms controlling the air damper and the gas butterfly valve. Also make sure that the screws securing the electrical leads in the burner connections are fully tightened.

Clean the outside of the burner, taking special care with the articulated couplings and the cam 4)(Fig. 31 on page 26).

Fan

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

Boiler

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

7.2.4 Checking the air and gas pressure on the combustion head

To check the air and gas pressure on the burner pipe coupling, install the relative pressure gauges as shown in Fig. 38.

EN 676		Excess air		CO
		Max. output $\lambda \leq 1.2$	Max. output $\lambda \leq 1.3$	
GAS	Theoretical max CO ₂ 0 % O ₂	CO ₂ % Calibration		mg/kWh
		$\lambda = 1.2$	$\lambda = 1.3$	
G 20	11.7	9.7	9	≤ 100
G 25	11.5	9.5	8.8	≤ 100
G 30	14.0	11.6	10.7	≤ 100
G 31	13.7	11.4	10.5	≤ 100

Tab. M

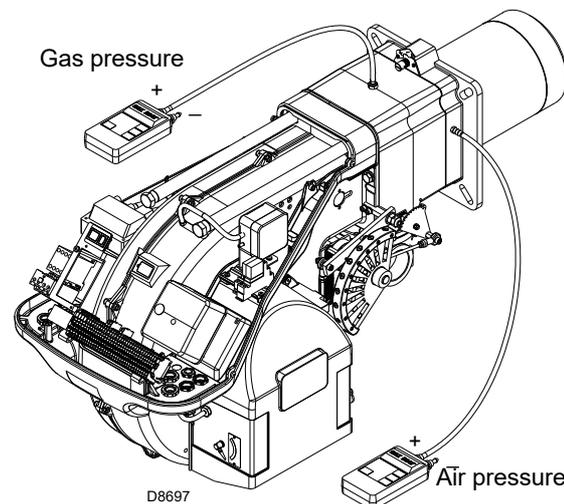
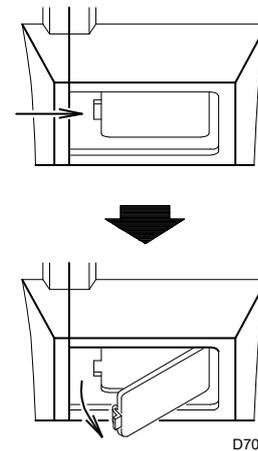


Fig. 38



D709

Fig. 39

Combustion

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

7.2.5 Safety components

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

Safety component	Life cycle
Flame control	10 years or 250,000 operation cycles
Flame sensor	10 years or 250,000 operation cycles
Gas valves (solenoid)	10 years or 250,000 operation cycles
Pressure switches	10 years or 250,000 operation cycles
Pressure adjuster	15 years
Servomotor (electronic cam) (if present)	10 years or 250,000 operation cycles
Oil valve (solenoid)(if present)	10 years or 250,000 operation cycles
Oil regulator (if present)	10 years or 250,000 operation cycles
Oil pipes/ couplings (metallic) (if present)	10 years
Flexible hoses (if present)	5 years or 30,000 pressurised cycles
Fan impeller	10 years or 500,000 start-ups

Tab. N

7.3 Opening the burner



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



Turn off the fuel interception tap.



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

- Loosen the screws 1) and remove the hood 2)(Fig. 40).
 - Disengage the articulated coupling 7) from the graduated sector 8).
 - Remove the screws 3) and move the burner backwards by about 100 mm on the slide bars 4). Disconnect the probe and electrode leads and then pull the burner fully back.
- Now extract the gas distributor 5) after having removed the screw 6).

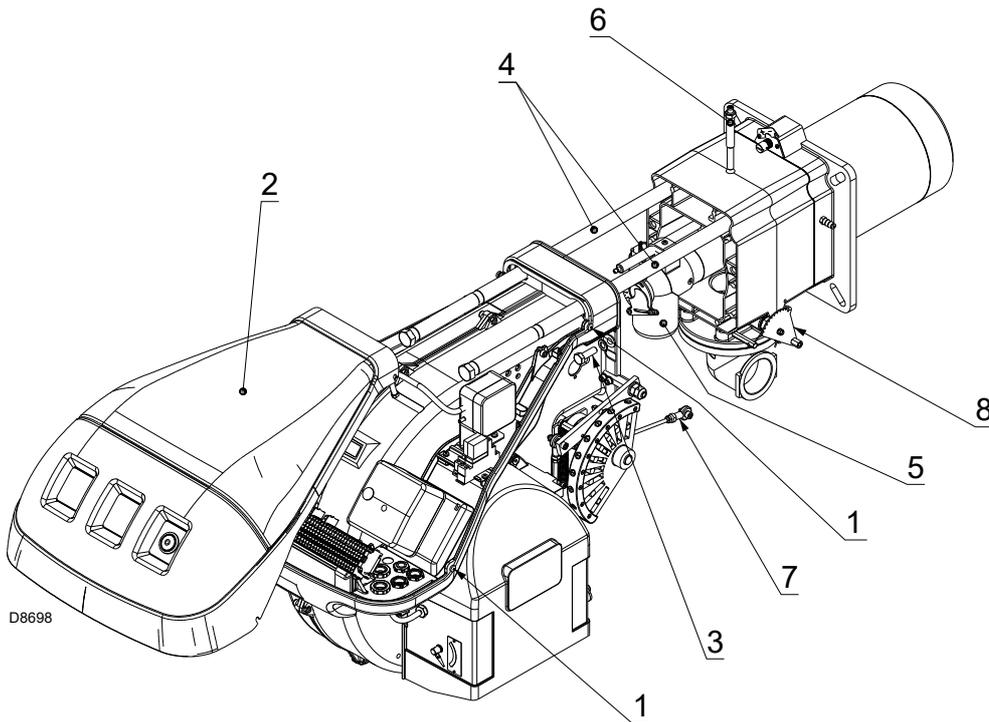


Fig. 40

7.4 Closing the burner

- Push the burner to approximately 100mm from the pipe coupling.
- Reconnect the cables and slide in the burner until it comes to a stop.
- Replace the screws 3)(Fig. 40) and carefully pull the probe and electrode cables out until they are slightly taut.
- Reconnect the articulated coupling 7) to the graduated sector 8).



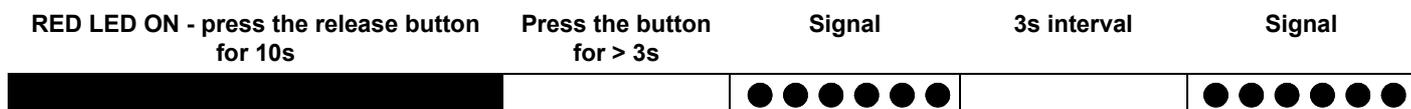
After carrying out maintenance, cleaning or checking operations, reassemble the hood and all the safety and protection devices of the burner.

8 Faults - Possible causes - Solutions

The control box has a self-diagnostic system, which easily allows identifying the operating faults (signal: **RED LED**).

After releasing the button, the RED LED starts flashing as shown in the diagram below.

To use this function, wait at least ten seconds from the safety lock out, and then press the reset button for a minimum of 3 seconds.



The pulses of the LED constitute a signal spaced by approximately 3 seconds. The number of pulses will provide information about the possible faults, according to Tab. O.

SIGNAL	FAULT	PROBABLE CAUSE	RECOMMENDED SOLUTION
2 blinks ● ●	Once the pre-purging phase and safety time have passed, the burner goes into lockout without the appearance of the flame	The operation solenoid lets little gas through	Increase
		One of the two solenoid valves does not open	Replace them
		Gas pressure too low	Increase pressure at governor
		Ignition electrode incorrectly adjusted	Adjust it
		Electrode grounded due to broken insulation	Replace
		High voltage cable defective	Replace
		High voltage cable deformed by high temperature	Replace and protect
		Ignition transformer defective	Replace
		Incorrect valve or transformer electrical wiring	Check
		Defective control box	Replace
		A closed valve upline the gas train	Open
		Air in pipework	Bleed air
Gas valves unconnected or with interrupted coil	Check connections or replace coil		
3 blinks ● ● ●	The burner does not switch on, and the lockout appears	Air pressure switch in operating position	Adjust or replace
	The burner starts and then goes into lockout	Air pressure switch inoperative due to insufficient air pressure:	
		Air pressure switch poorly adjusted	Adjust or replace
		Pressure switch pressure point pipe blocked	Clean
		Poorly adjusted head	Adjust
	High pressure in the furnace	Connect air pressure switch to fan suction line	
	Lockout during pre-purging phase	Defective motor control contactor	Replace
Defective electrical motor		Replace	
Motor lockout		Replace	
4 blinks ● ● ● ●	The burner starts and then goes into lockout	Flame simulation	Replace the control box
	Lockout when burner stops	Permanent flame in the combustion head or flame simulation	Eliminate persistence of flame or replace control box
6 blinks ● ● ● ● ● ●	The burner switches on, but then stops in lockout	Defective or incorrectly adjusted servomotor	Adjust or replace

SIGNAL	FAULT	PROBABLE CAUSE	RECOMMENDED SOLUTION
7 blinks ●●●●● ●●●●●	The burner goes into lockout immediately following the appearance of the flame	The operation solenoid lets little gas through	Increase
		Ionisation probe incorrectly adjusted	Adjust
		Insufficient ionisation (less than 5 µA)	Check probe position
		Earth probe	Withdraw or replace cable
		Burner poorly grounded	Check grounding
		Phase and neutral connections inverted	Invert them
	Burner locks out when shifting from minimum to maximum output and vice versa	Too much air or too little gas	Adjust air and gas
7 blinks ●●●●● ●●●●●	Burner goes into lockout during operation	Probe or ionisation cable grounded	Replace worn parts
	10 blinks ●●●●●●●● ●●●●●●●●	The burner does not switch on, and the lock-out appears	Incorrect electrical wiring
The burner goes into lockout		Defective control box	Replace
		Presence of electromagnetic disturbances in the thermostat lines	Filter or eliminate
No blink	The burner does not start	No electricity supply	Close all switches and check connections
		A limiter or safety control device is open	Adjust or replace
		Line fuse blocked	Replace
		Defective control box	Replace
		No gas supply	Open the manual valves between contactor and train
		Mains gas pressure insufficient	Contact your gas company
		Minimum gas pressure switch fails to close	Adjust or replace
	The burner continues to repeat the start-up cycle, without lockout	Servomotor fails to move to min. ignition position	Replace
		The gas pressure in the gas mains lies very close to the value to which the gas pressure switch has been set. The sudden pressure drop after valve opening causes the temporary opening of the pressure switch itself; the valve immediately closes and the burner comes to a halt. Pressure increases again, the pressure switch closes again and the ignition cycle is repeated. The sequence repeats endlessly.	Reduce the intervention pressure of the minimum gas pressure switch. Replace the gas filter cartridge.
	Ignition with pulsations	Poorly adjusted head	Adjust
		Ignition electrode incorrectly adjusted	Adjust it
		Incorrectly adjusted fan air damper: too much air	Adjust
		Output during ignition phase is too high	Reduce
	Burner does not reach maximum output	Remote control device TR fails to close	Adjust or replace
		Defective control box	Replace
Defective servomotor		Replace	
Burner stops with air damper open	Defective servomotor	Replace	

Tab. O

8.1 Normal operation / flame detection time

The control box has a further function to guarantee the correct burner operation (signal: **GREEN LED** permanently on).

After releasing the button, the GREEN LED starts flashing, as shown in the diagram below.

To use this function, wait at least ten seconds from the burner ignition and then press the control box button for a minimum of 3 seconds.

GREEN LED ON - press the reset button for 10s

Press the button for > 3s

Signal

3s interval

Signal



The pulses of the LED constitute a signal spaced by approximately 3 seconds.

The number of pulses will measure the probe detection time since the opening of gas valves, according to: Tab. P

Signal	Flame detection time
1 blink ●	0.4 s
2 blinks ● ●	0.8 s
6 blinks ● ● ● ● ● ●	2.8 s

Tab. P

This is updated in every burner start-up.

Once read, the burner repeats the start-up cycle by briefly pressing the control box button.



If the result is > 2 s, ignition will be retarded.

Check the adjustment of the hydraulic brake of the gas valve, the air damper and the combustion head adjustment.



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.



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 - Accessories

Long head kit

Burner	Standard head length (mm)	Extended head length (mm)	Code
RS 150/M	280	415	20052186

Spacer kit

Burner	Thickness (mm)	Code
RS 150/M	135	3010129

Continuous purging kit

Burner	Code
RS 150/M	3010094

Soundproofing chamber

Burner	Type	Reduction of noise average	Code
RS 150/M	C4/5	10 [dB(A)]	3010404

Output power regulator kit for modulating operation

With the modulating operation, the burner continually adapts the power to the heat request, ensuring a high level of stability for the parameter controlled: temperature or pressure.

Two components should be ordered:

- the output power regulator to be installed on the burner;
- the probe to be installed on the heat generator.

Burner	Type	Code
RS 150/M	RWF50	20099869
	RWF55	20099905

Burner	Probe	Type	Adjustment field	Code
RS 150/M	Temperature	PT 100	- 100...+ 500°C	3010110
	Pressure	4 - 20 mA	0 - 2.5 bar	3010213
	Pressure	4 - 20 mA	0 - 16 bar	3010214

Output power regulator kit

Two components should be ordered:

- the analogue signal converter
- the potentiometer

Burner	Type	Signal	Code
RS 150/M	Signal converter	0/2 - 10V 0/4 - 20 mA	3010415
	Potentiometer	-	3010416

PC interface kit

Burner	Code
RS 150/M	3002719

Kit for LPG operation

Burner	Head length (mm)	Code
RS 150/M	TC	20050064
	TL	20050065

Radio disturbance protection kit

Burner	Code
RS 150	3010386

NOTE:

If the burner is installed in places particularly subject to radio disturbance (emission of signals exceeding 10V/m) owing to the presence of an INVERTER, or in applications where the length of the thermostat connections exceeds 20 metres, a protection kit is available as an interface between the control box and the burner.

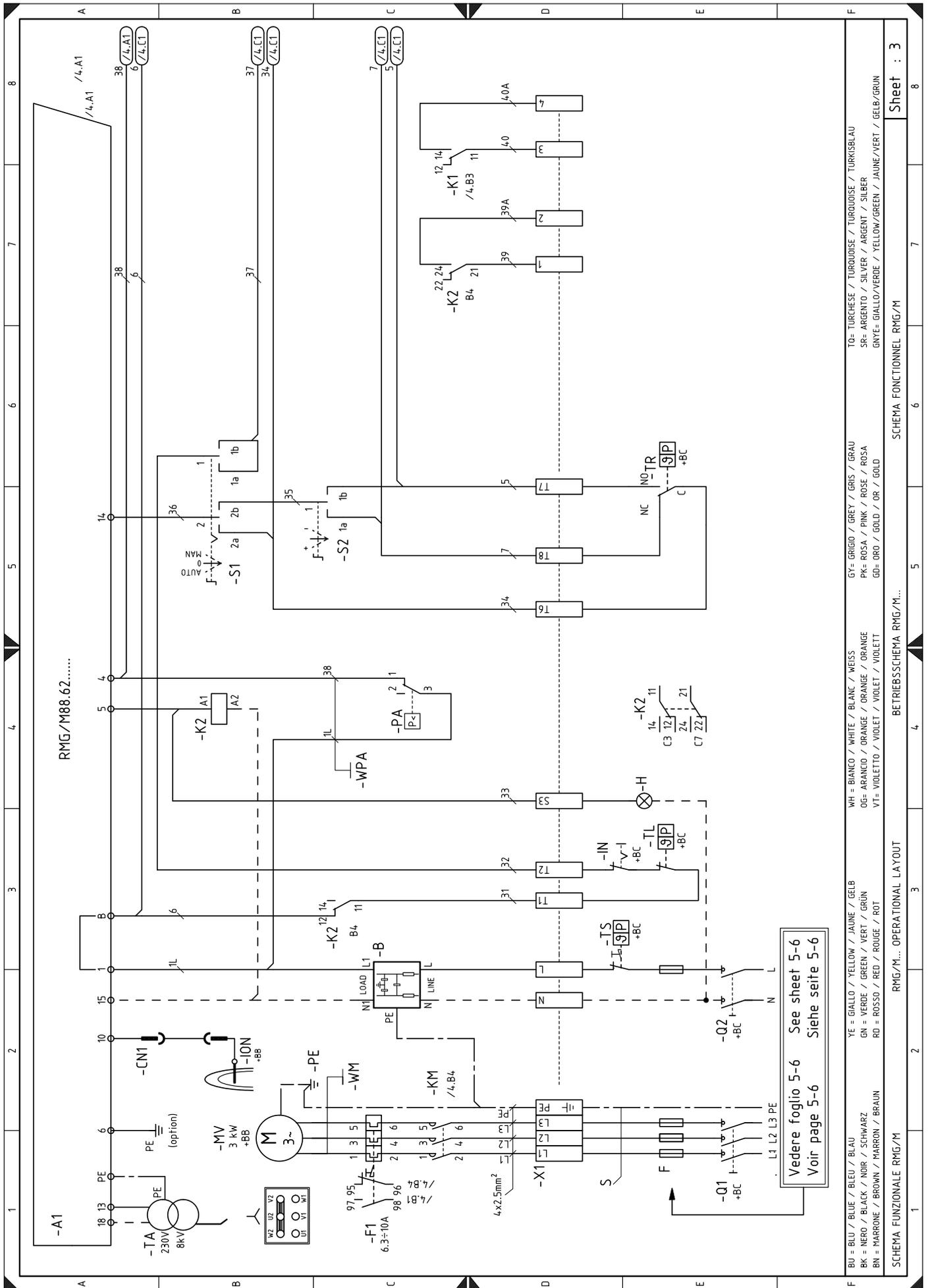
Gas trains in compliance with EN 676

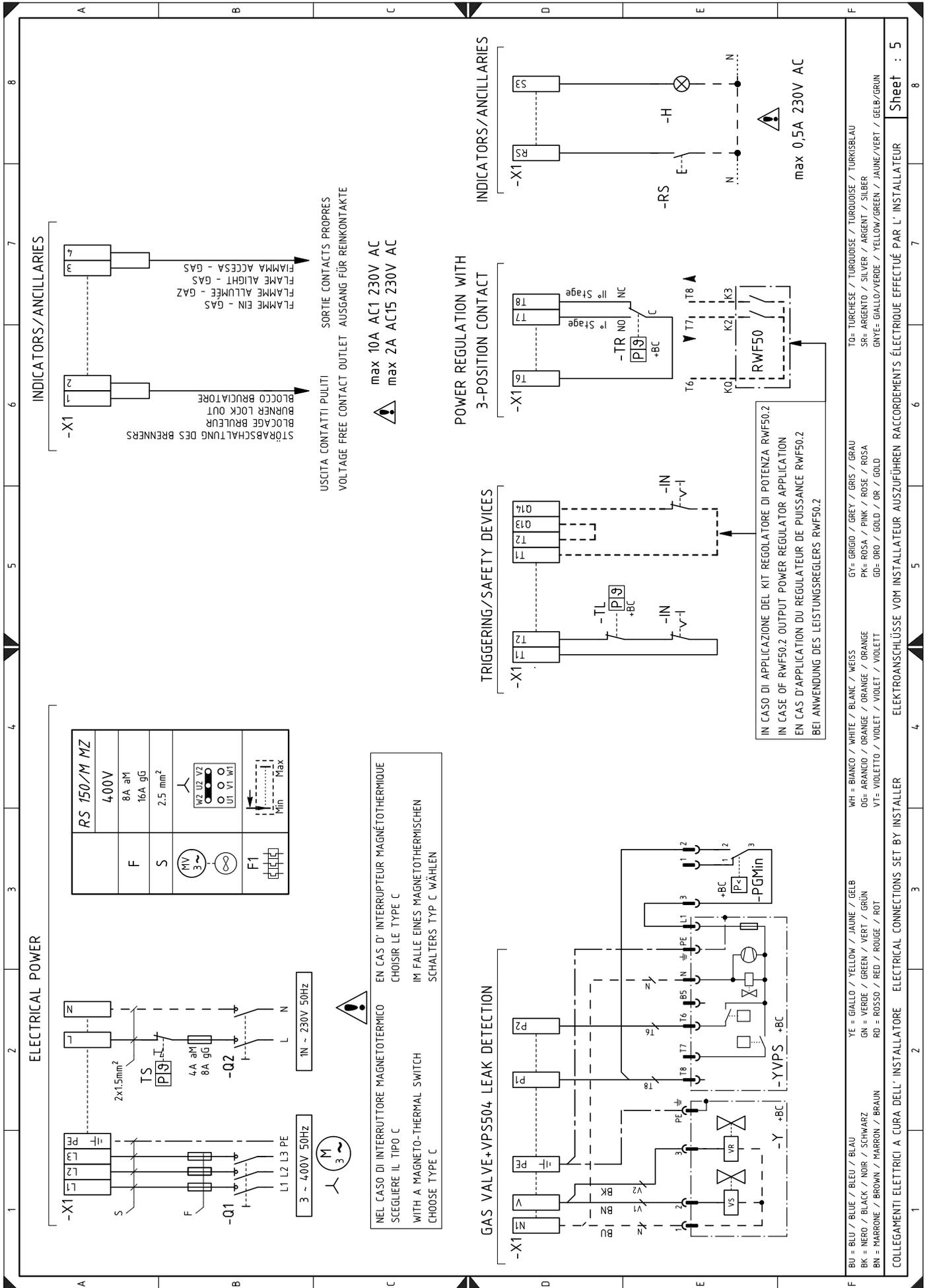
Please refer to manual.

B Appendix - Electrical panel layout

1	Index of layouts
2	Indication of references
3	Functional layout RMG/M (400V)
4	Functional diagram
5	Electrical wiring that the installer is responsible for (400V)
6	Functional layout RWF...

2 Indication of references





Wiring layout key

CN1	Ionisation probe connector
ION	Ionisation probe
+BB	Burner components
+BC	Boiler components
KM	Fan motor contact maker
A1	Electrical control box
B1	Output regulator RWF
BA	Probe with output under current
BA1	Device with output undercurrent, for modifying remote setpoint
BP	Pressure probe
BP1	Pressure probe
BR	Remote setpoint potentiometer
BT1	Thermocouple probe
BT2	Probe Pt100, 2 wires
BT3	Probe Pt100, 3 wires
BT4	Probe Pt100, 3 wires
BTEXT	External probe for climatic compensation of the setpoint
BV	Output probe in voltage
BV1	Output device in voltage to modify remote setpoint
F1	Fan motor thermal relay
H	Remote lockout signal
K1	"K1" relay
K2	"K2" relay
MV	Fan motor
PA	Air pressure switch
PE	Burner earth
PGM	Maximum gas pressure switch
PGMin	Minimum gas pressure switch
S1	Off / automatic / manual selector
S2	Power increase / power reduction selector
SM	Servomotor
TA	Ignition transformer
TL	Limit thermostat/pressure switch
TR	Adjustment thermostat/pressure switch
TS	Safety thermostat/pressure switch
Y	Gas regulator valve + gas safety valve
YVPS	Valve leak detection device
X1	Main terminal supply board
XPGM	Maximum gas pressure switch connector
B	Filter to protect against radio disturbance
F	Protection fuse for three-phase line
IN	Burner manual stop switch
Q1	Three-phase disconnecting switch
Q2	Single-phase disconnecting switch
RS	Remote reset switch
XP1	Connector for output power regulator kit RWF
XRWF	RWF Terminal board

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