

**GB** **Forced draught gas burners**

One stage operation



CODE	MODEL	TYPE
3751918	GAS 3	519 T1
3751617	GAS 4	516 T1
3751717	GAS 5	517 T1
3751817	GAS 6	518 T1



**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 and type: GAS 3 519 T1  
 GAS 4 516 T1  
 GAS 5 517 T1  
 GAS 6 518 T1

These products are in compliance with the following Technical Standards:

EN 676

EN 12100

and according to the European Directives:

GAR	2016/426/EU (only 519 T1)	Gas Devices Directive
MD	2006/42/EC	Machine Directive
LVD	2014/35/EU	Low Voltage Directive
EMC	2014/30/EU	Electromagnetic Compatibility

Such products are marked as follows:



CE-0085AQ0707 (only 519 T1)

**Quality is ensured by means of a quality and management system that is certified ISO 9001:2015.**

Legnago, 03.05.2021

Research and Development Director  
 RIELLO S.p.A. - Burners Department

Eng. F. Maltempi

**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 Centre 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 COVER AND ALL THE SAFETY AND PROTECTION DEVICES**  
This symbol signals the obligation to reassemble the cover and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.



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



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

- This symbol indicates a list.

**Abbreviations used**

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

**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.

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

- 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 appliance;
- use of the burner with safety devices that are faulty, incorrectly applied and/or not working;
- installation of untested supplementary components on the burner;
- powering of the burner with unsuitable fuels;
- faults in the fuel supply system;
- use of the burner even following an error and/or an irregularity;
- repairs and/or overhauls incorrectly carried out;
- modification of the combustion chamber with inserts that prevent the regular development of the structurally established flame;
- insufficient and inappropriate surveillance and care of those burner components most likely to be subject to wear and tear;
- 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.**

**3 Safety and prevention**

**3.1 Background**

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.

Namely:

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

the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the ambient 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, the user undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- 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 manufacturing company therefore accepts no responsibility whatsoever for any which may result from the use of non-original parts.

In addition:



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



**4 Technical description of the burner**

**4.1 Models available**

Designation		Voltage	Start-up	Code
GAS 3	TC	1/230/50	Direct	3751918
GAS 4	TC	1/230/50	Direct	3751617
GAS 5	TC	3/230-400/50	Direct	3751717
GAS 6	TC	3/230-400/50	Direct	3751817

**4.2 Burner categories - Countries of destination**

Country of destination	Gas category
SE - FI - AT - GR - DK - IT - IS - CH - NO - CZ - EE - HU - LT - RO - SI - SK - TR	II <sub>2</sub> H3B/P
DE	II <sub>2</sub> ELL3B/P
NL	II <sub>2</sub> EK3B/P
FR	II <sub>2</sub> Er3P
BE	I <sub>2</sub> P
LU - PL	II <sub>2</sub> E3B/P
LV	I <sub>2</sub> H
CY - MT	I <sub>3</sub> B/P
ES - GB - IE - PT	II <sub>2</sub> H3P

**4.3 Technical data**

MODEL		GAS 3		GAS 4		GAS 5		GAS 6					
Type		519 T1		516 T1		517 T1		518 T1					
Output <sup>(1)</sup>		kW Mcal/h		130 - 350 112 - 301		185 - 465 160 - 400		325 - 660 280 - 570		525 - 1050 450 - 900			
Fuel		NATURAL GAS: G20 - G25 - G31											
		G20		G25		G20		G25		G20		G25	
- Net Calorific Value		kWh/Nm <sup>3</sup>		10 8,6		10 8,6		10 8,6		10 8,6		10 8,6	
		Mcal/Nm <sup>3</sup>		8,6 7,4		8,6 7,4		8,6 7,4		8,6 7,4		8,6 7,4	
- Absolute density		kg/Nm <sup>3</sup>		0,71 0,78		0,71 0,78		0,71 0,78		0,71 0,78		0,71 0,78	
- Max output		Nm <sup>3</sup> /h		35 43		47 54		66 77		105 122			
- Pressure at maximum output <sup>(2)</sup>		mbar		11,1 16,4		9,8 14,5		9,8 14,5		12,3 18,2			
OPERATION		- Intermittent (min. 1 stop in 24) - One-stage											
Standard applications		Boilers: water, steam, diathermic oil											
Ambient temperature		°C		0 - 40									
NOISE LEVELS <sup>(3)</sup>		Sound pressure		75		77		82		84			
		Sound power		85		87		92		94			
Combustion air temperature		°C max		60									

**Tab. A**

- (1) Reference conditions: Ambient temperature 20°C - Gas temperature 15°C - Barometric pressure 1,013 mbar - Altitude 0 m a.s.l.
- (2) Pressure at test point 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 accurate "Accuracy 3" measurement, as described in EN ISO 3746.

### 4.4 Electrical data

MODEL		GAS 3	GAS 4	GAS 5	GAS 6
Type		519 T1	516 T1	517 T1	518 T1
Electrical supply 1 PH		1N ~ 230V 50 Hz			
Electrical supply 3 PH		==		3 ~ 230 - 400V +/- 10% 50 Hz	
Electrical motor	rpm	2750	2800	2890	2850
	kW	0,250	0,370	0,750	1,5
	V	230	230	230/400	200-240/346-415
	A	1.9	2.8	2.6 - 1.5 8 (IE3)	7.1 - 4.1 (IE3)
Motor capacitor	µF	8	12.5	==	==
	V	450/500	400/450		
Ignition transformer	V1 - V2	230 V - 1x 8 kV			
	I1 - I2	1.8A - 30 mA			
Absorbed electric power	kW max	0.4	0.54	0.85	1.7
Protection level		IP 40			

Tab. B

### 4.5 Maximum dimensions

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

Note that to inspect the combustion head the burner must be moved backward and turned upward. The maximum dimension of the burner when open, without cover, is given by measurement I.

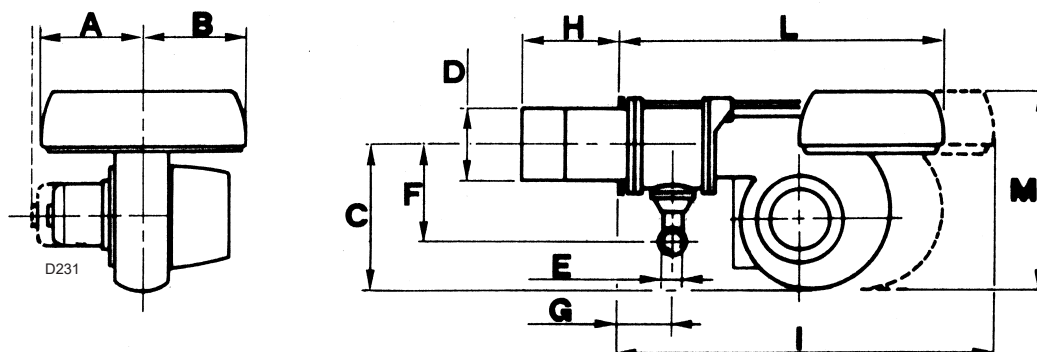


Fig. 1

mm	A	B	C	D	E	F	G	H	I	L	M
GAS 3	205	205	292	140	Rp11/2	165	97	185	775	610	397
GAS 4	205	205	292	150	Rp11/2	165	97	187	775	610	397
GAS 5	226	205	332	155	Rp11/2	165	97	207	810	645	437
GAS 6	258	205	370	175	Rp2	195	131	227	966	770	485

Tab. C

(1) Blast tube: short-long

### 4.6 Burner equipment

Flange for gas train	No. 1
Gasket for flange	No. 1
Screws	No. 8
Thermal insulation screen	No. 1
Instruction booklet	No. 1
Spare parts list	No. 1

**4.7 Firing rates**

The burner output is selected from within the area of the diagrams.

This area is known as the FIRING RATE and provides the burner output according to the pressure in the combustion chamber.

The work point may be found by plotting a vertical line from the desired output and a horizontal line from the corresponding pressure in the combustion chamber. The intersection of these two lines is the work point which must lie within the FIRING RATE.

**Example:**

for GAS 3 the area is delimited by:

- the axis of the 130 - 350 kW outputs
- the axis of the pressures in the comb. chamber 0 + 7 mbar
- the maximum pressure curve in comb. chamber

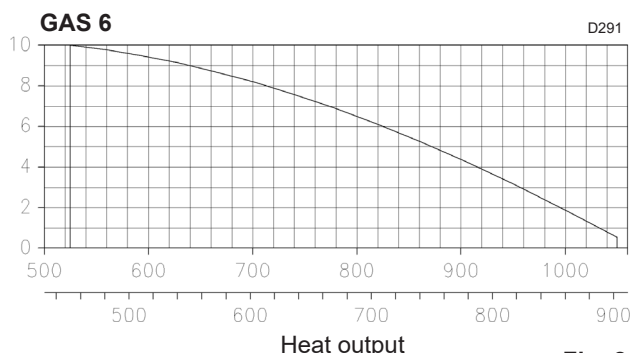
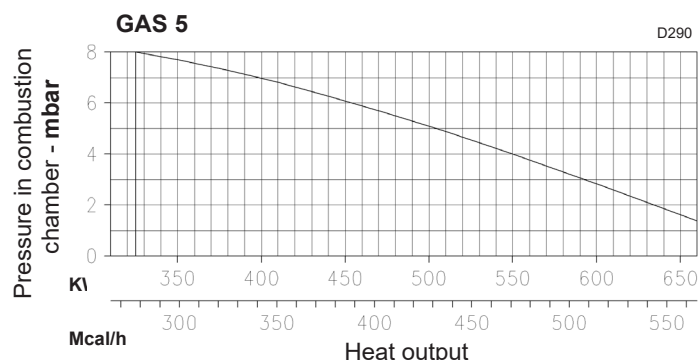
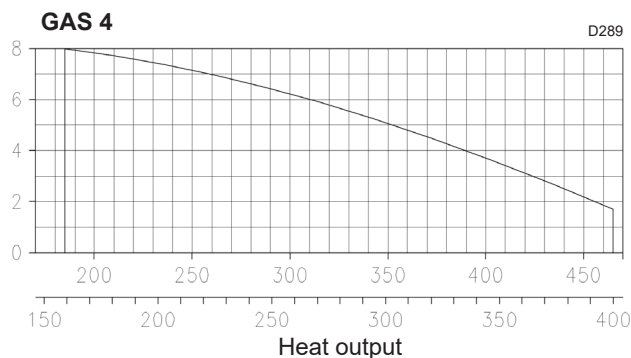
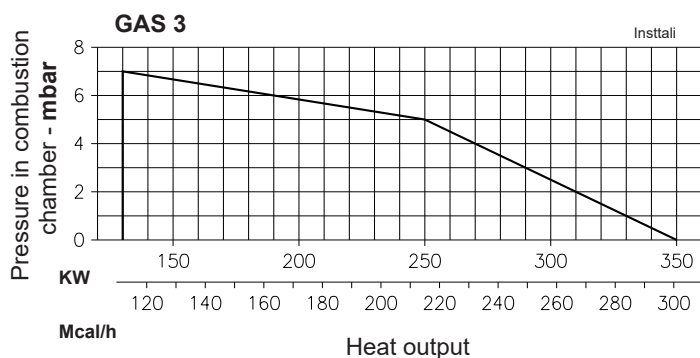
If the burner develops an output of 240 kW at a pressure in combustion chamber of 5 mbar, the work point is found on the maximum pressure curve. This curve has been established with safety margins and therefore it is possible to use the entire area of the FIRING RATE beneath this curve.

Warning:



The firing rate value (Fig. 2) has been obtained considering an ambient temperature of 20 °C, an atmospheric pressure of 1,013 mbar (approx. 0 m a.s.l.), and with the combustion head adjusted as shown on page 16.

The burner can also operate with the combustion chamber in depression.



**Fig. 2**

**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. 3).

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 set in relation to special test boilers, according to EN 676 regulations.

In Fig. 3 you can see the diameter and length of the test combustion chamber.

**Example:**

Output 1500 Mcal/h: diameter 80 cm - length 2.5 m.

**4.8.1 Commercial boilers**

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. 3).

If however the burner has to be combined with a commercial boiler that has not been EC approved and/or with combustion chamber dimensions clearly smaller than those indicated in the diagram (Fig. 3), consult the manufacturers.

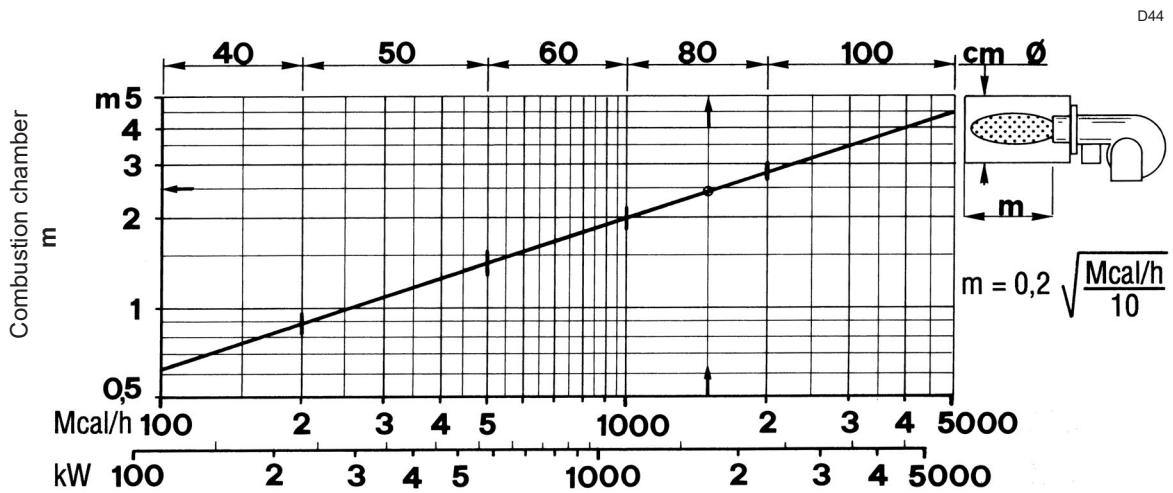


Fig. 3

4.9 Burner description

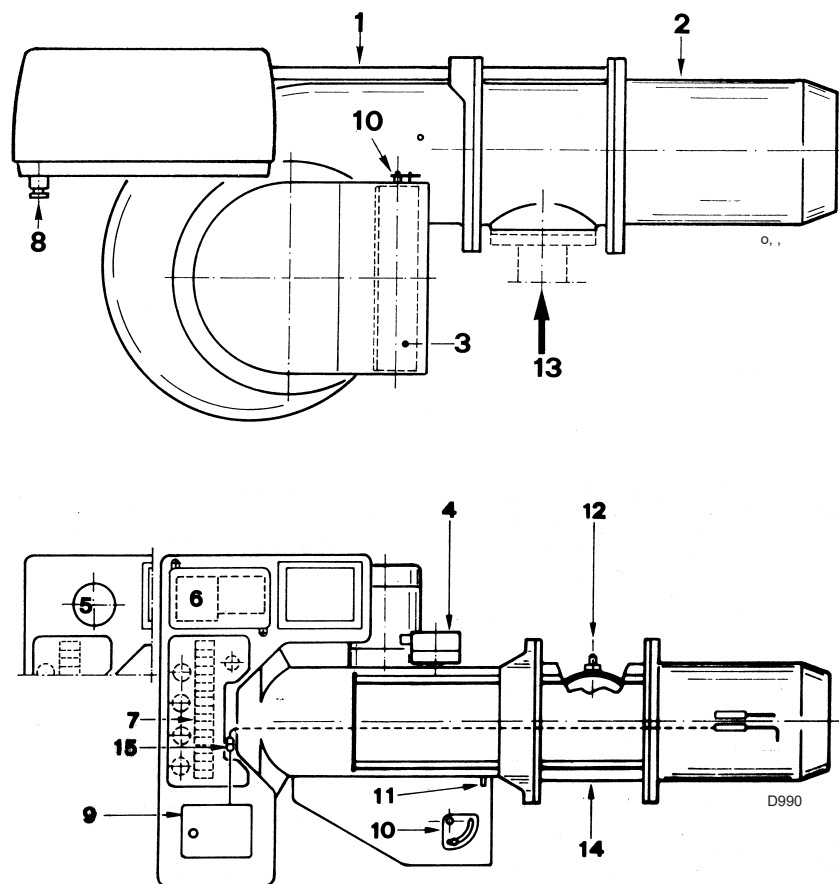


Fig. 4

- 1 Slide bars for opening the burner and inspecting the combustion head
- 2 Combustion head
- 3 Manual damper for adjusting the air
- 4 Air pressure switch
- 5 Capacitor (in GAS 3-4 models)
- 6 Motor contactor and thermal relay (in GAS 5-6 models)
- 7 Terminal board
- 8 Cable grommets (for electrical wiring to be carried out by the installer)
- 9 Control box with lockout pilot light and lockout reset button
- 10 Sector for controlling and locking the air damper
- 11 Fan pressure test point
- 12 Gas pressure test point at the pipe coupling
- 13 Gas input pipe
- 14 Pipe coupling
- 15 Plug-socket on ionisation probe cable

**4.10 Control box RMG88...**

**Important notes**



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

The control box RMG88... 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). Check the system is not powered and cannot be accidentally reconnected. Failure to do this will lead to the risk of electrocution.
- Protection against electrocution from the 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.
- Press the reset button of the burner lockout command or the reset button (by applying a force of not more than 10 N), without the aid of tools or sharp objects.

For the safety and reliability of the control box, comply with the following instructions:

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



**Fig. 5**

S8906

**Technical data**

Mains voltage	AC 220...240 V +10 % / -15 %
Mains frequency	50 / 60 Hz ±6%
Power absorption	20 VA
Protection level	IP20
Safety class	I
Weight	approx. 260g
Cable length	
Thermostat cable	Max. 20 m at 100 pF/m
Air pressure switch	Max. 1 m at 100 pF/m
Gas pressure switch	Max. 20 m at 100 pF/m
Remote reset	Max. 20 m at 100 pF/m
CPI	Max. 1 m at 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.

**Mechanical structure**

The control box is made of plastic to resist knocks, heat and flame propagation.

The control box contains the following components:

- a microprocessor that controls the program sequence, and a relay for controlling the load
- an electronic flame signal amplifier
- a built-in reset button with 3 signalling colours (LED) for status and error messages.

**5 Installation**

**5.1 Notes on safety for the installation**

After carefully cleaning all around the area where the burner is to be installed, and arranging for the environment to be illuminated correctly, 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 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). When 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.

**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 0085

D7738

Fig. 6

**Checking the characteristics of the burner**

Check the identification label of the burner (Fig. 6), 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 possible minimum and maximum output (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

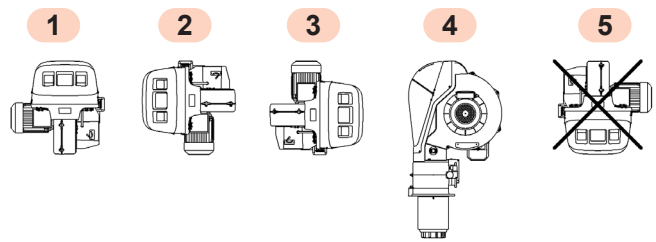
**5.4 Operating position**



- The burner is set up only to operate in positions **1, 2, 3** and **4** (Fig. 7).
- 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.



D7739

**Fig. 7**

**5.5 Preparing the boiler**

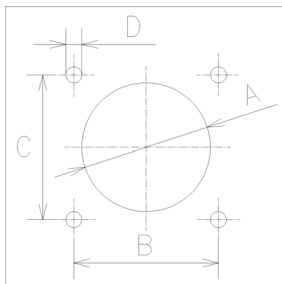
**5.5.1 Boring the boiler plate**

Pierce the closing plate of the combustion chamber, as in Fig. 8. The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

mm	A	B	C	D
GAS 3	155	160	160	M10
GAS 4	165	160	160	M10
GAS 5	165	160	160	M10
GAS 6	185	195	195	M12

**Tab. D**

D46



**Fig. 8**

**5.5.2 Blast tube length**

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its fettling. The range of lengths available, L, is as follows:

Blast tube L mm	GAS 3	GAS 4	GAS 5	GAS 6
Shortened	43	45	65	85
Standard	185	187	207	227
Elongated	320	320	365	360

**Tab. E**

For boilers with a front flue gas wash 9)(Fig. 9) or flame inversion chamber, a protection device in refractory material 7) must be inserted between the boiler refractory 8) and the blast tube 6).

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



**5.5.3 Securing the burner to the boiler**



Provide an adequate lifting system.

- Before fixing the burner to the boiler, through the opening of the blast tube check that the probe and electrode are correctly positioned, as in Fig. 10.
- Then separate the combustion head from the rest of the burner by unscrewing the screws 1)(Fig. 9) and 2) and by removing the fan 4) from the slide bars 3).
- Fix the blast tube 6) to the plate (Fig. 9) of the boiler placing the insulating gasket 5) supplied in between (Fig. 9).
- Use the 4 screws, also supplied with the unit, after protecting the thread with anti-locking product. The seal between burner and boiler must be airtight.
- If the previous control showed that the probe and the electrode are not positioned correctly, remove the two screws 6)(Fig. 12 on page 16), remove the elbow 1)(Fig. 12 on page 16) and calibrate them.

- Finally, put back the fan 4)(Fig. 9) on the slide bars 3), put back the screws 2) and, with the burner open, proceed to the adjustment of the combustion head.

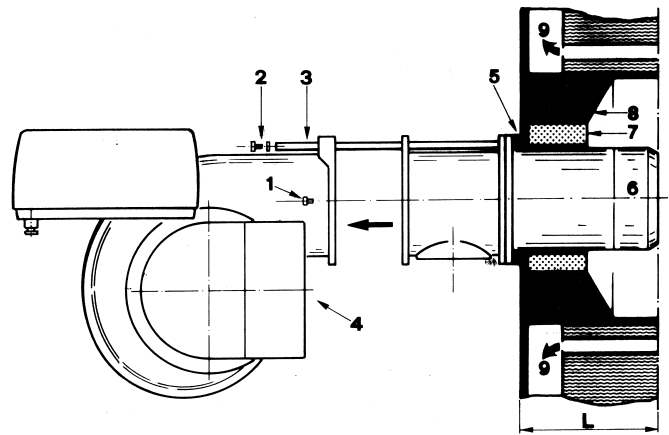


Fig. 9



Do not rotate the probe, leave it as in (Fig. 10); if it is positioned close to the ignition electrode, it could damage the control box amplifier.

CAUTION



The seal between burner and boiler must be airtight.

WARNING

**5.6 Positioning the probe - electrode**



Before securing the burner to the boiler, check (through the opening of the blast tube) that the probe and electrode are correctly positioned, as in Fig. 10.

WARNING

If the previous control showed that the probe and the electrode are not positioned correctly, remove the screws 6)(Fig. 12), remove the internal part 1)(Fig. 12) of the head and calibrate them.



Do not rotate the probe: leave it as in Fig. 10 since if it is located too close to the ignition electrode, the control box amplifier may be damaged.

WARNING



Respect the dimensions shown in Fig. 10.

WARNING

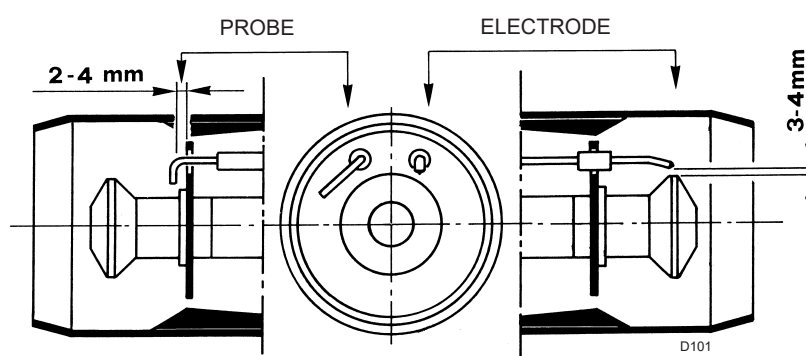


Fig. 10

**5.7 Combustion head adjustment**

The adjustment of the combustion head depends only on the maximum output developed by the burner.

Therefore, this value must be set before adjusting the combustion head.

Two adjustments of the head are envisaged:

for the gas and for the air. They are carried out with the burner open (Fig. 11), when the burner is fixed to the boiler.

**Gas adjustment**

- Loosen the screw 3)(Fig. 12).
- Turn the ring nut 2) so that the index 5) lines up with the desired notch 4).
- Tighten the screw 3) fully down.

**Air adjustment**

- Loosen the two screws 6)(Fig. 12).
- Move the elbow 1) forward or backward so that its rear surface 7) lines up with the desired notch of the label 8).
- Lock the screws 6).



The notch number for gas and air is the same and is gained from the diagram (Fig. 13) in accordance with the burner output.

**Example:**

The GAS 3 burner is installed in a 240 kW boiler. Considering an efficiency of 89%, the burner should deliver about 270 kW.

The diagram (Fig. 13) shows that the gas and air adjustments for this burner output are carried out on notch 4.5.

**NOTE:**

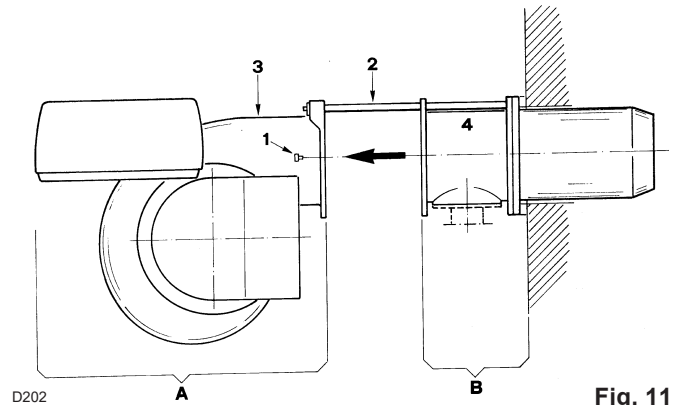
The diagram shows the ideal adjustment of the head. If the pressure in the gas supply network is low and does not allow the desired pressure (and therefore output) to be reached, it is possible to further open the ring nut 2)(Fig. 12) by 1-2 notches. See also the note on page 18.

Finally close the burner:

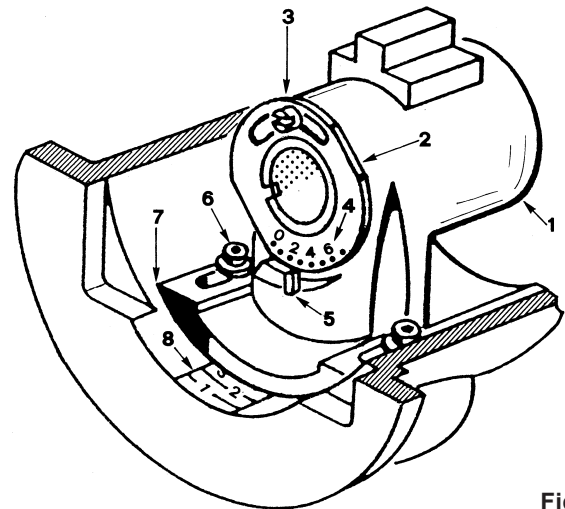
- Slide unit A on the two slide bars 2)(Fig. 11).
- Put back the screws 1).



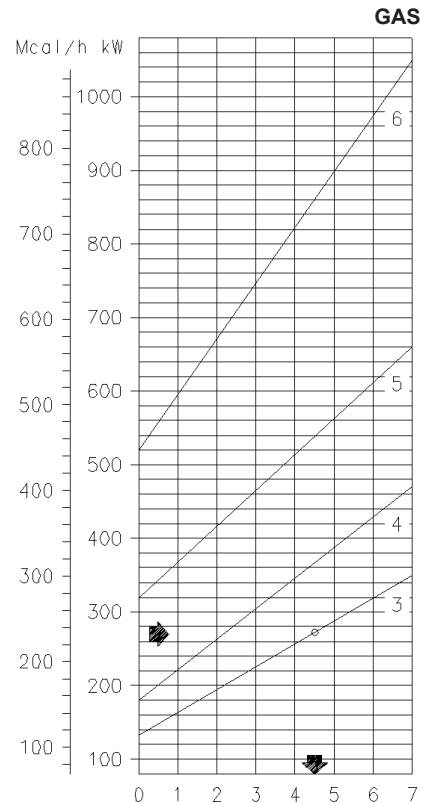
When the burner is closing on the two slide bars, the high voltage cable and the flame detection probe cable should be pulled outwards until they are slightly taut.



**Fig. 11**



**Fig. 12**



Notches on the ring nut 2)(Fig. 12) and on the label 8)(Fig. 12)

**Fig. 13**

**5.8 Gas feeding**



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

Precautions: avoid knocking, attrition, sparks and heat.

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



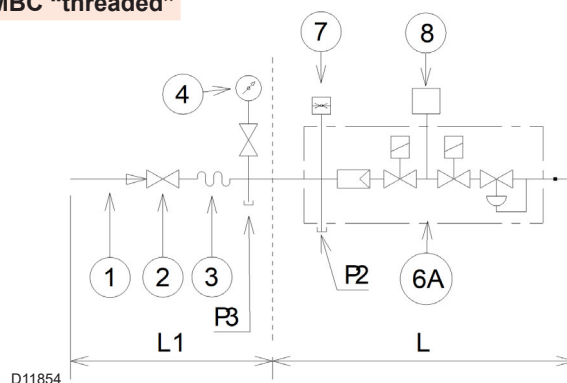
The fuel supply line must be installed by qualified personnel, in compliance with current standards and laws.

**5.8.1 Gas feeding line**

Key (Fig. 14 - Fig. 15 - Fig. 16 - Fig. 17)

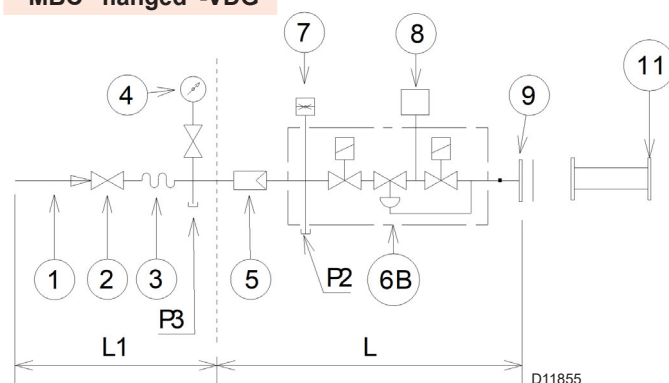
- 1 Gas input pipe
- 2 Manual valve
- 3 Vibration damping joint
- 4 Pressure gauge with push-button cock
- 5 Filter
- 6A Includes:
  - Filter
  - working valve
  - safety valve
  - pressure adjuster
- 6B Includes:
  - working valve
  - safety valve
  - pressure adjuster
- 6C Includes:
  - safety valve
  - working valve
- 6D Includes:
  - safety valve
  - working valve
- 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 Upstream pressure of valves/adjuster
- P3 Upstream pressure of the filter
- L Gas train, supplied separately
- L1 The responsibility of the installer

**MBC "threaded"**



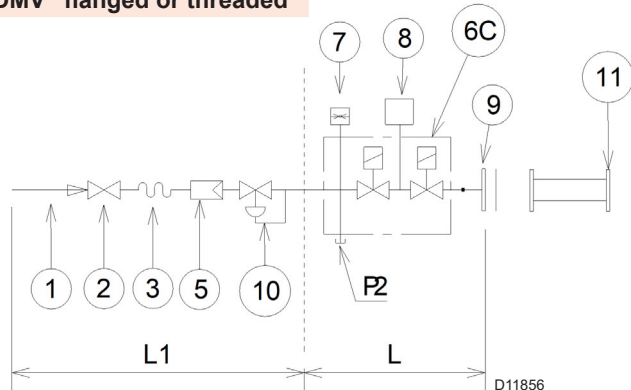
**Fig. 14**

**MBC "flanged"-VDG**



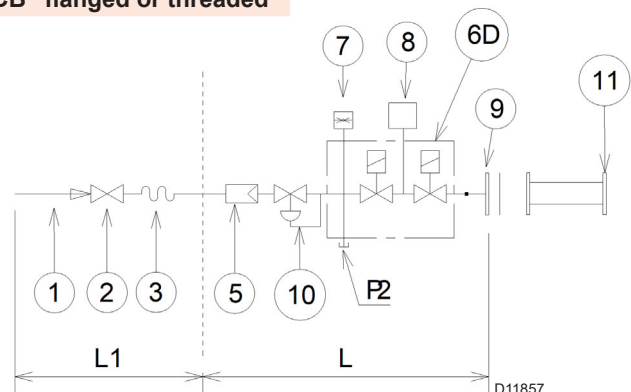
**Fig. 15**

**DMV "flanged or threaded"**



**Fig. 16**

**CB "flanged or threaded"**



**Fig. 17**

### 5.8.2 Gas train

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

### 5.8.3 Gas train installation



DANGER

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 train can enter the burner from the right or left side, depending on which is the most convenient, see Fig. 4.

### 5.8.4 Gas pressure

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

Model	kW	1 Δp (mbar)	
		G20	G25
GAS 3	130	3.6	5.3
	154	4.1	6.1
	179	4.8	7.1
	203	5.5	8.1
	228	6.3	9.4
	252	7.2	10.8
	277	8.3	12.3
	301	9.4	13.9
	326	10.6	15.8
	350	11.9	17.7
GAS 4	180	3.4	5.1
	212	4	6
	244	4.7	7
	277	5.3	8
	309	6	9
	341	6.7	10
	373	7.4	11.1
	406	8.2	12.2
	438	9	13.3
470	9.7	14.5	
GAS 5	320	5.8	9.8
	358	6.5	10.4
	396	7.1	11.1
	433	7.6	11.6
	471	8.1	12.2
	509	8.6	12.7
	547	9	13.3
	584	9.3	13.7
	622	9.6	14.2
	660	9.8	14.6
GAS 6	500	9	13.4
	561	9.5	14.1
	622	9.9	14.7
	683	10.3	15.3
	744	10.7	15.9
	806	11	16.4
	867	11.4	17
	928	11.7	17.4
	989	12	17.9
	1050	12.2	18.3

Tab. F



WARNING

The heat output and gas pressure in the head data refer to operating with the gas butterfly valve fully open (90°).

The values shown in Tab. F on page 18 refer to:

- Natural gas G 20 NCV 10 kWh/Sm<sup>3</sup> (8.6 Mcal/Sm<sup>3</sup>)
- Natural gas G 25 NCV 8.6 kWh/Sm<sup>3</sup> (7.4 Mcal/Sm<sup>3</sup>)

**Column 1**

Combustion head pressure drop.

Gas pressure measured at test point 12)(Fig. 4 on page 11), with:

- combustion chamber at 0 mbar;
- Gas G20 (methane)

To calculate the approximate output at which the burner operates:

- subtract the pressure in combustion chamber from the gas pressure measured at test point 12)(Fig. 4 on page 11).
- Find in Tab. F related to the burner concerned, the pressure value closest to the result of the subtraction.
- Read the corresponding output on the left.

**Example GAS 3 with natural gas G20:**

Pressure of the gas at the socket	=	10.3 mbar
Pressure in combustion chamber	=	2 mbar
10.3 - 2	=	8.3 mbar

A pressure of 5.3 mbar, column 1, corresponds in Tab. F to an output of 277 kW.

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

To find out on the other hand the gas pressure required at the socket 12)(Fig. 4 on page 11), having fixed the output at which you want the burner to operate:

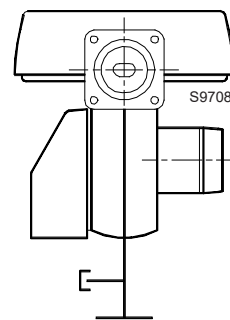
- find the nearest output value in Tab. F for the burner in question.
- Read on the right, column 1, the pressure at the test point 12)(Fig. 4 on page 11).
- Add this value to the estimated pressure in combustion chamber.

**Example GAS 3 with natural gas G20:**

Desired output: 277 kW

Gas pressure at an output of 277 kW	=	8.3 mbar
Pressure in combustion chamber	=	2 mbar
8.3 + 2	=	10.3 mbar

pressure required at test point 12)(Fig. 4 on page 11).



**Fig. 18**

## 5.9 Electrical wiring

## Notes on safety for the electrical wiring



DANGER

- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be 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;
  - make provisions for an omnipolar switch with a gap between the contacts of at least 3 mm (over-voltage category III), as required by current safety regulations.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:



DANGER

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



DANGER

Close the fuel interception tap.



DANGER

Avoid condensate, ice and water leaks from forming.

Use flexible cables according to EN 60 335-1 Regulations:

- if in PVC sheath, use at least H05 VV-F
- if in rubber sheath, use at least H05 RR-F.

All the cables to be connected to the plugs 7)(Fig. 19) of the burner are passed through cable grommets to be inserted in the holes of the plate, left or right, after having unscrewed the screws 8), opened the plate at parts 9 and 10 and removed the thin diaphragm that closes the holes.

The fairleads and hole press-outs can be in various ways; by way of example we indicate the following mode:

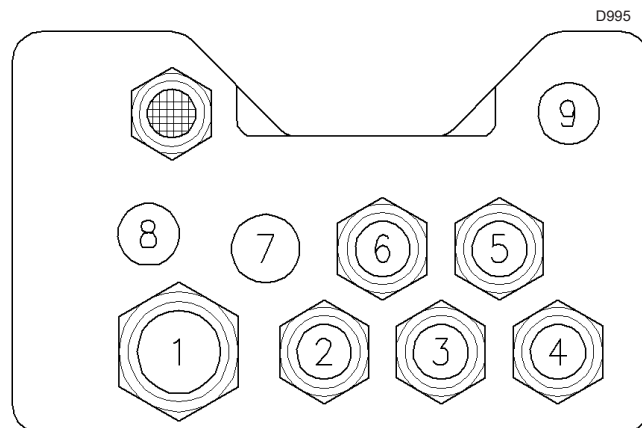
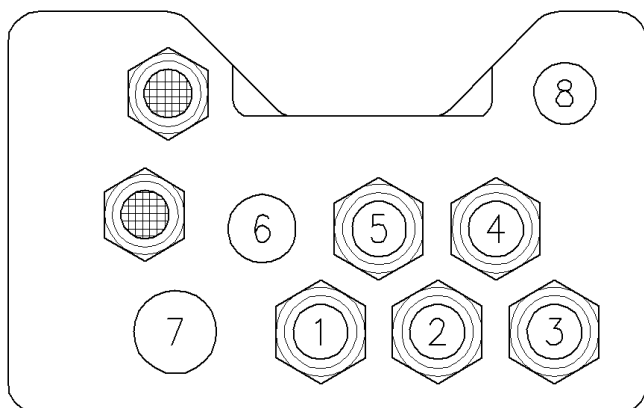


Fig. 19

**GAS 3 and GAS 4**

- 1 Pg 13,5 Single-phase power supply
- 2 Pg 13,5 TL remote control
- 3 Pg 13,5 Gas valves
- 4 Pg 13,5 Gas pressure switch or valve leak detection device
- 5 Pg 13,5 Available cable entry
- 6 Pg 13,5 Hole for cable entry
- 7 Pg 21 Hole for cable entry
- 8 Pg 11 Hole for cable entry

**GAS 4 and GAS 6**

- 1 Pg 21 Three-phase power supply
- 2 Pg 13,5 Single-phase power supply
- 3 Pg 13,5 TL remote control
- 4 Pg 13,5 Gas valves
- 5 Pg 13,5 Gas pressure switch or valve leak detection device
- 6 Pg 13,5 Available cable entry
- 7 Pg 13,5 Hole for cable entry
- 8 Pg 11 Hole for cable entry
- 9 Pg 11 Hole for cable entry

**CABLE SECTIONS**

		GAS 5		GAS 6	
		230 V	400 V	230 V	400 V
F	A	6	6	16	10
L	mm <sup>2</sup>	1.5	1.5	1.5	1.5

Section not indicated: 1.5 mm<sup>2</sup>

Tab. G



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

**5.10 Calibration of the thermal relay (only 3pH versions)**

This is required to avoid motor burn-out in the event of a significant increase in power absorption caused by a missing phase.

- If the motor is star-powered in, 400 V, the cursor "2" should be placed on "MIN".
- If it is delta-driven, 230 V, the cursor "2" should be placed on "MAX".

Even if the scale of the thermal relay does not include rated motor absorption at 400 V, protection is still ensured in any case.

To reset, in case of an intervention of the thermal relay, press button "1".

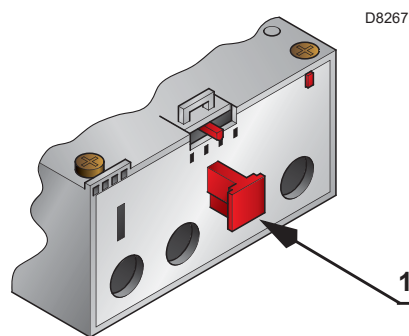


Fig. 20



The automatic reset can be dangerous.

This operation is not foreseen in the burner operation.

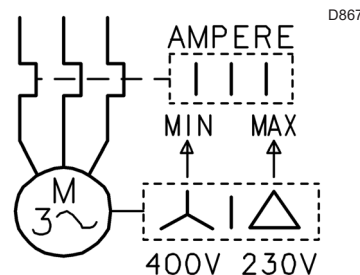


Fig. 21

**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.



Before igniting the burner, refer to paragraph "Safety test - with gas supply closed" on page 27.

**6.2 Adjustments prior to ignition**

Combustion head adjustment is already described on page 16.

In addition, the following adjustments must also be made:

- open the manual valves upline of the gas train.
- Adjust the minimum gas pressure switch to the start of the scale (Fig. 24).
- Adjust the air pressure switch to the start of the scale (Fig. 23).
- Purge the air from the gas line. We recommend using a plastic tube routed outside the building and to purge air until gas is smelt.
- Fit a U-type pressure gauge (Fig. 22) to the gas pressure test point on the pipe coupling.
- Used for getting an approximation of the burner output in the 2nd stage using Tab. F on page 18.
- Connect two lamps or testers parallel to the two gas line solenoids VR and VS in order to check the exact moment at 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.

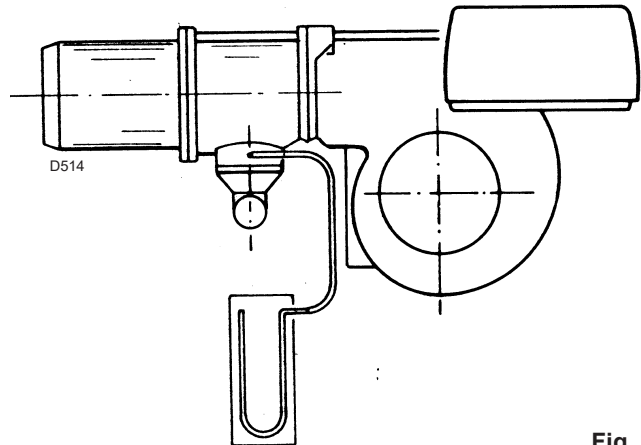


Fig. 22

**6.3 Burner start-up**

Close the remote controls and turn:

As soon as the burner starts make sure that the lamps or testers connected to the solenoids, or indicator lights on the solenoids themselves, show that there is no voltage. If voltage is present, stop the burner **immediately** and check the electrical wiring.

**6.4 Burner ignition**

The burner should light after having performed the above steps. 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 at the sleeve is indicated by the U-type manometer (Fig. 22).

In the event that the burner locks-out again, refer to chapter "Faults - Possible causes - Solutions" on page 30.



In the event the burner stops, in order to prevent any damage to the installation, do not unblock the burner more than twice in a row. If the burner locks out for a third time, contact the customer service.



In the event there are further lockouts or faults with the burner, the maintenance interventions 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.

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



## 6.5 Burner adjustment

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

Adjust in sequence:

- 1 Ignition output
- 2 Maximum burner output
- 3 Air pressure switch
- 4 Minimum gas pressure switch

### 6.5.1 Ignition output

According to EN 676:

#### 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" = 2s, ignition output must be equal to or lower than 1/2 of max. operation output;
- for "ts" = 3s, ignition output must be equal to or less than 1/3 of the max. operation output.

#### Example:

MAX operation output of 600 kW.

Ignition output must be equal to or lower than:

- 300 kW con ts = 2s
- 200 kW con ts = 3s

In order to measure the ignition output:

- Remove the UV sensor 29)(Fig. 4 on page 11) (the burner starts and locks out after the safety time).
- Perform 10 ignitions with consecutive lockouts.
- Read the quantity of gas burned on the meter. This quantity must be equal to or lower than the quantity given by the formula:

$$\frac{\text{Nm}^3/\text{h} \text{ (max. burner delivery)}}{360}$$

**Example** for G 20 gas (10 kWh/Nm<sup>3</sup>):

Max operation output of 600 kW corresponding to 60 Nm<sup>3</sup>/h.

After 10 ignitions with their lockouts, the delivery indicated on the meter must be equal to or less than:

$$60 : 360 = 0.166 \text{ Nm}^3.$$

### 6.5.2 Maximum burner output

#### MAX gas adjustment

Measure the gas flow rate.

-If you need to reduce it, close the 2nd stage gas valve a little.

-If you need to increase it, first fully open the 2nd stage gas valve and then, if that is not enough, increase the gas outlet pressure from the pressure regulator.

#### MAX air adjustment

Operate in sector 10)(Fig. 4 on page 11) with small movements. In the end lock the sector well.

#### NOTE:

- **When modifying the calibration of the pressure regulator to obtain the desired output in the 2nd stage, you need to re-check the ignition.**

- **For guidance purposes the maximum 2nd stage output can be obtained, just read the gas pressure at the pipe coupling 12)(Fig. 4 on page 11) on the U pressure gauge (Fig. 22 on page 22) and follow the instructions on page 18.**

**6.6 Pressure switch adjustment**

**6.6.1 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. 23).

With the burner operating in the 1st stage, increase adjustment pressure by slowly turning the relative knob clockwise until the burner locks out.

Then turn the knob anti-clockwise by about 20% of the set point and repeat burner starting to ensure it is correct.

If the burner locks out again, turn the knob anti-clockwise a little bit more.



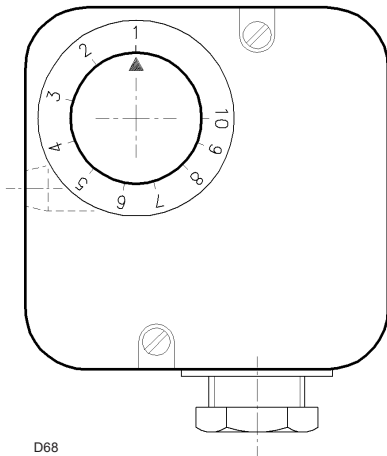
In conformity with the standard, the air pressure switch must prevent the CO in the flue gases from exceeding 1% (10,000 ppm).

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

The incorporated air pressure switch can work in a 'differential' mode if connected with two pipes. If a negative pressure in the combustion chamber during pre-purging prevents the air pressure switch from switching. Switching may be obtained by fitting a second pipe between the air pressure switch and the suction inlet of the fan. In such a manner the air pressure switch operates as differential pressure switch.



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



**Fig. 23**

**6.6.2 Minimum gas pressure switch**

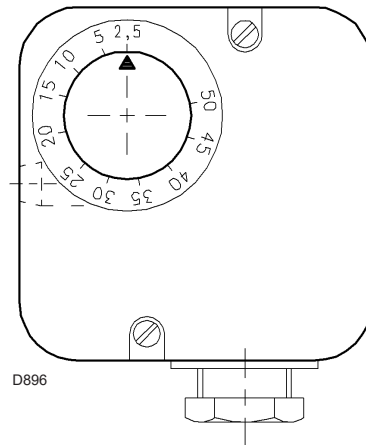
The purpose of the minimum gas pressure switch is to prevent the burner from operating in an unsuitable way due to too low gas pressure.

Adjust the minimum gas pressure switch (Fig. 24) 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.



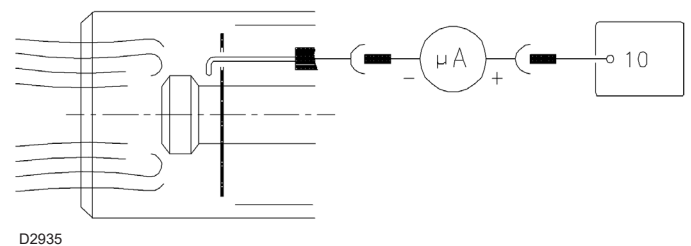
1 kPa = 10 mbar



**Fig. 24**

**6.6.3 Flame presence check**

The burner is fitted with an ionisation system to check that a flame is present. The minimum current for the control box to operate is 5 µA. The burner provides a much higher current, so controls are not normally required. However, if you want to measure the ionisation current, disconnect the plug-socket 15)(Fig. 4 on page 11) on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 µA. Carefully check polarities!



**Fig. 25**

**6.7 Burner operation**

**6.7.1 Burner start-up**

(with gas train in compliance with EN 676)

- **0s:** Control remote control TL closes.  
Electrical control box programme starts.
- **2s:** The fan motor starts.  
The air damper is positioned on the maximum output adjustment.  
The pre-purging phase starts: 38 s.
- **40s:** The ignition electrode strikes a spark.  
The safety valve VS opens, along with the adjustment valve VR, 1st stage, quick opening. The flame is ignited at a low output level, point A.  
The output is then progressively increased, with the valve opening slowly up to MIN. output, 1st stage, point B.
- **42s:** The spark goes out.
- **50s:** The adjustment valve VR opens, 2nd stage. The output passes progressively from the 1st to the 2nd stage, line C-D.  
The electric control box program ends.

**6.7.2 Steady state operation**

Once the start up cycle has ended, the control box still continues to check for the presence of the flame and the correct position of the air pressure switch.

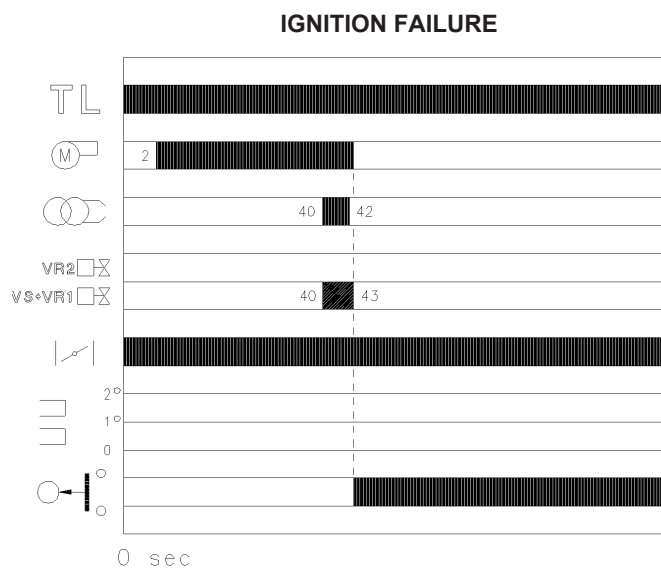
The burner remains operating at a constant output.

If the temperature or the pressure in the boiler continue to rise and the TL remote control opens, the burner stops, line F-G.

If the flame accidentally goes when operating, the burner will lockout within 1 s.

**6.7.3 Ignition failure**

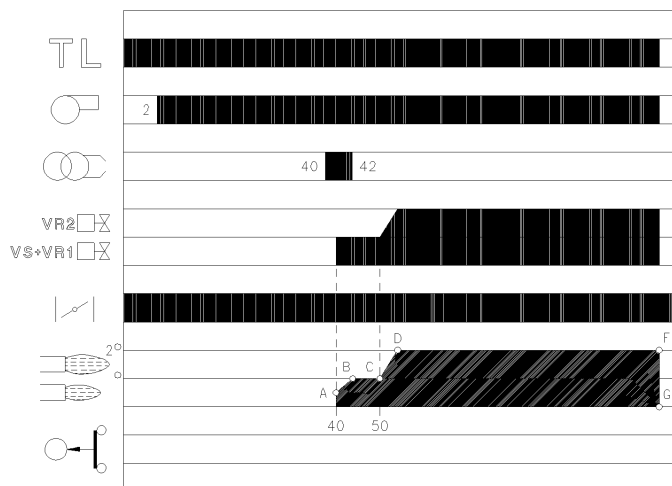
If the burner does not fire, it goes into lockout within 3s from the opening of the gas valve and 43 s from the closure of the TL remote control.



D2937

**Fig. 27**

**STANDARD IGNITION**  
(no. = seconds from instant 0)



D2936

**Fig. 26**

**6.8 Burner start-up cycle diagnostics**

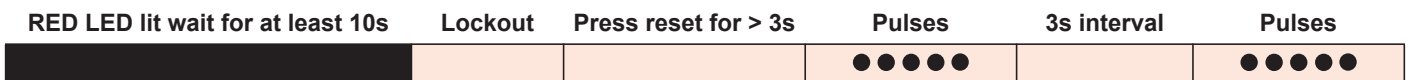
During start-up, indication is according to the colour code table (Tab. H).

Sequences	Colour code
Pre-purging	●●●●●●●●●●
Ignition phase	●○●○●○●○●○
Operation, flame OK	□□□□□□□□□□
Operation with weak flame signal	□○□○□○□○□○□○
Electrical supply below ~ 170V	●▲●▲●▲●▲●▲●▲
Lockout	▲▲▲▲▲▲▲▲▲▲
Extraneous light	▲□▲□▲□▲□▲□

**Tab. H**

Key (Tab. H):

▲ Off    ○ Yellow    ● Green    □ Red



**Tab. I**

The methods that can be used to reset the control box and use diagnostics are given below.

**6.8.2 Control box reset**

To carry out the control box reset, proceed as follows:

- Hold the button down for between 1 and 3 seconds. The burner restarts after a 2-second pause once the button is released. If the burner does not restart, you must make sure the limit thermostat is closed.

**6.8.3 Visual diagnostics**

Indicates the type of burner malfunction causing lockout. To display the diagnostics proceed as follows:

- Hold the button down for more than 3 seconds once the red LED (burner lockout) remains steadily lit. A yellow light blink to tell you the operation is done.
- Release the button once the light has blinked. The number of blinks indicates the reason for the malfunctioning (refer to the coding in Tab. M on page 31).

**PRESSURE ON THE BUTTON**

**STATE OF CONTROL BOX**

From 1 to 3 seconds	Reset of the control box without visualisation of the visual diagnostics.
More than 3 seconds	Visual diagnostics of the lockout condition: (LED blinks at 1-second intervals).
More than 3 seconds starting from the condition of visual diagnostics	Software diagnostics, with the help of optical interface and PC (possibility to visualise the working hours, irregularities, etc.)

**Tab. J**

The sequence of led pulses issued by the control box identifies the possible types of malfunction, which are listed in the table Tab. M on page 31.

**6.8.1 Resetting of control box and diagnostics use**

The control box features a diagnostics function through which any causes of malfunctioning are easily identified (indicator: **RED LED**).

To use this function, you must wait at least 10 seconds once it has entered the safety condition (**lockout**), and then press the reset button.

The control box generates a sequence of pulses (1 second apart), which is repeated at constant 3-second intervals.

Once you have seen how many times the light blinks and identified the possible cause, the system must be reset by holding the button down for 1 - 3 seconds.

**6.8.4 Software diagnostics**

Gives an analysis of the life of the burner, through optical connections with a PC showing the working hours, number and types of lockout, control box serial number etc...

To display diagnostics, proceed as follows:

- Hold the button down for more than 3 seconds once the red LED (burner lockout) remains steadily lit. A yellow light blink to tell you the operation is done.
- Release the button for 1 second and then press again for over 3 seconds until the yellow light blinks again.
- Once the button is released, the red LED will flash intermittently with a higher frequency: only now can the optical link be activated.

Once the operations are done, the control box's initial status must be restored using the resetting procedure described above.

## 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.



Close 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.



**IF THE ELECTRICAL SUPPLY TO THE GAS VALVES OCCURS AT UNEXPECTED TIMES, DO NOT OPEN THE MANUAL VALVE, DISABLE THE ELECTRICAL SUPPLY, CHECK THE WIRING; CORRECT THE ERRORS AND CARRY OUT THE ENTIRE TEST AGAIN.**

#### 7.2.2 Safety test - with gas supply closed

For a safe start up it is very important to check that the electrical wiring between the gas valves and the burner has been carried out correctly.

To this end, after checking that the wiring has been carried out in conformity with the burner's wiring diagrams, a starting cycle must be carried out with the gas tap closed (dry test).

- 1 The manual gas valve should be closed with the locking/releasing device ("lock-out / tag out" procedure).
- 2 Make sure the limit electric contacts of the burner close
- 3 Make sure that the minimum gas pressure switch contact closes
- 4 Proceed with a burner start up attempt.

The starting cycle should take place with the following phases:

- Starting of the fan motor for the pre-purging
- Control of the gas valve leak detection, if applicable.
- Completion of the pre-purging
- Attainment of the ignition point
- Power supply to the ignition transformer
- Power supply to the gas valves.

Since the gas is closed, the burner will not be able to start and its control box will stop or safely lockout.

The effective powering of the gas valves can be verified with the insertion of a tester; some valves have indicator lights (or opening/closing position indicators) that are activated when they are powered.

#### 7.2.3 Checking and cleaning



The operator must use the required equipment during maintenance.

##### Burner

Check that there are not excess wear or loosen screws. The screws securing the electrical leads in the burner plugs should also be fully tightened.

Clean the outside of the burner.

Clean and grease the adjustable profile of the cams.

##### Fan

Check to make sure that no dust has accumulated inside the fan or on its impellers, 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.

##### 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

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.

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 Assistance Centre in order to carry out the necessary adjustments.

### 7.2.4 Combustion control (gas)

#### CO<sub>2</sub>

It is advisable to adjust the burner with a CO<sub>2</sub> not greater than about 10% (gas con Ncv 8600 kcal/m<sup>3</sup>). In this way it is avoided that a small decalibration (for example a variation in the tension) could cause a combustion with an air defect and with the subsequent formation of CO.

#### CO

It should not exceed 100 mg/kWh.

EN 676		Air excess		CO
		Max. output $\lambda \leq 1.2$	Max. output $\lambda \leq 1.3$	
GAS	Theoretical max CO <sub>2</sub> 0 % O <sub>2</sub>	CO <sub>2</sub> % 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. K

### 7.2.5 Safety components

The safety components should be replaced at the end of their life cycle indicated in the following table.

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. L

### 7.3 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.

- Remove the screws 1) fixing the fan 3) to the pipe coupling 4);
- open the burner, drawing back unit A on the two slide bars 2). Unit B remains fixed to the boiler.

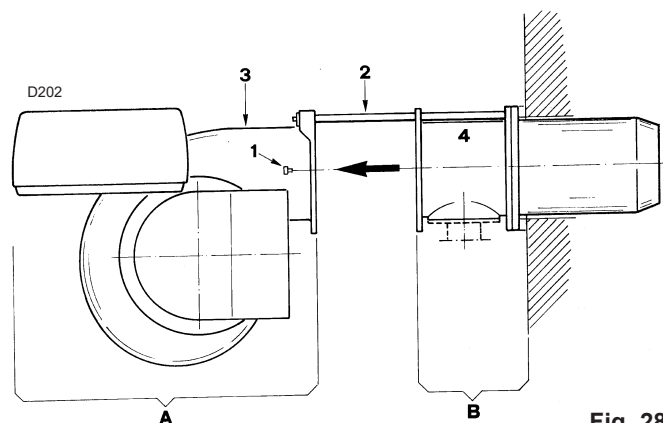


Fig. 28

### 7.4 Closing the burner



When the burner is closing on the two slide bars, the high voltage cable and the flame detection probe cable should be pulled outwards until they are slightly taut.



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

**8 Faults - Possible causes - Solutions**



In the event the burner stops, in order to prevent any damage to the installation, do not unblock the burner more than twice in a row. If the burner locks out for a third time, contact the customer service.



In the event there are further lockouts or faults with the burner, the maintenance interventions 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.

Signal	Problem	Possible cause	Recommended remedy	
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	
		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 flashes ●●●	The burner does not switch on, and the lockout appears	Air pressure switch in operating position	Adjust or replace	
		The burner switches on, but then stops in lockout	Air pressure switch does not switch owing to lack of 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 (only three-phase version)	Replace	
Defective electrical motor		Replace		
Motor lockout (only three-phase version)		Replace		
4 blinks ●●●●	The burner switches on, but then stops in 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	
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 A)	Check probe position	
		Earth probe	Withdraw or replace cable	
		Burner poorly earthed	Check earthing	
		Phase and neutral connections inverted	Invert them	
		Defective flame detection circuit	Replace the control box	
	Burner locks out when shifting from minimum to maximum output and vice versa	Too much air or too little gas	Adjust air and gas	
		Burner goes into lockout during operation	Probe or ionisation cable grounded	Replace worn parts



Signal	Problem	Possible cause	Recommended remedy
10 blinks ●●●●●● ●●●●●●	The burner does not switch on, and the lock-out appears	Incorrect electrical wiring	Check
	The burner goes into lockout	Defective control box	Replace
		Presence of electromagnetic disturbances in the thermostat lines	Filter or eliminate
		Presence of electromagnetic disturbance	Use the radio disturbance protection kit
No blink	The burner does not start	No electrical power supply	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
		Servomotor fails to move to min. ignition position	Replace
	The burner continues to repeat the start-up cycle, without lockout	The gas pressure in the gas mains lies very close to the value to which the gas pressure switch has been set. The sudden drop in pressure after valve opening causes 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. And so on	Reduce the minimum gas pressure switch intervention pressure. 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. M

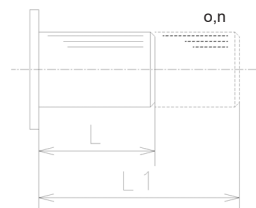
### A Appendix - Accessories

#### Extended head kit

L = standard head

L1 = extended head obtainable with the kit

COD. 3000605	L = 185	L1 = 320 mm	• GAS 3
COD. 3000606	L = 187	L1 = 320 mm	• GAS 4
COD. 3000607	L = 207	L1 = 365 mm	• GAS 5
COD. 3000608	L = 227	L1 = 360 mm	• GAS 6

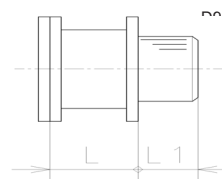


#### Spacer kit for shortening the combustion head

L = Spacer thickness

L1 = Length of the resulting blast tube

COD. 3000755	L = 142	L1 = 43 mm	• GAS 3
		L1 = 45 mm	• GAS 4
		L1 = 65 mm	• GAS 5
		L1 = 85 mm	• GAS 6



#### Kit for operation with LPG

It is indispensable for the burner to operate with LPG.

L = kit for standard head

L1 = kit for extended head

COD. 3000657	L = 185 mm	• GAS 3
COD. 3000807	L1 = 320 mm	• GAS 3
COD. 3000658	L = 187 mm	• GAS 4
COD. 3000808	L1 = 320 mm	• GAS 4
COD. 3000659	L = 207 mm	• GAS 5
COD. 3000809	L1 = 365 mm	• GAS 5
COD. 3000753	L = 227 mm	• GAS 6
COD. 3000810	L1 = 360 mm	• GAS 6

#### Soundproof casing kit

It is used to considerably reduce the noise produced by the burner (— 8/12 dBA). It is made of steel and a sound-damping material and fully encloses the burner.

The casing is mounted on wheels, can be easily moved for burner inspection.

COD. 3010403	• GAS 3-4-5-6
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### Continuous purging kit

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It is composed of a small three-way solenoid valve to be installed between the air pressure switch and the fan. It allows the burner, which has remained in continual purging following a flame cut-out, to fire again.

COD. 3010030

• GAS 3-4-5-6

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### Radio disturbance protection kit

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If the burner is installed in places particularly subject to radio disturbance (emission of signals exceeding 10 V/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.

COD. 3010386

• GAS 3-4-5-6

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### Software interface kit

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COD. 3002719

• GAS 3-4-5-6

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### Gas trains in compliance with EN 676

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Please refer to manual.



WARNING

The installer is responsible for the addition of any safety device not foreseen in this manual.

**B Appendix - Electrical panel layout**

<b>1</b>	<b>Index of layouts</b>
<b>2</b>	Indication of references
	Electrical system carried out by the factory burners GAS 3 - 4 SINGLE-PHASE (DIAGRAM A)
	Electrical system carried out by the factory burner GAS 5 - 6 THREE-PHASE (DIAGRAM A)
	Electrical system external connections without valve leak control burners GAS 3 - 4 SINGLE-PHASE (DIAGRAM B)
	Electrical system external connections with valve leak control burners GAS 5 - 6 THREE-PHASE (DIAGRAM B)
	Electrical system external connections with valve leak control burners GAS 3 - 4 SINGLE-PHASE (DIAGRAM C)
	Electrical system external connections with valve leak control burners GAS 5 - 6 THREE-PHASE (DIAGRAM C)

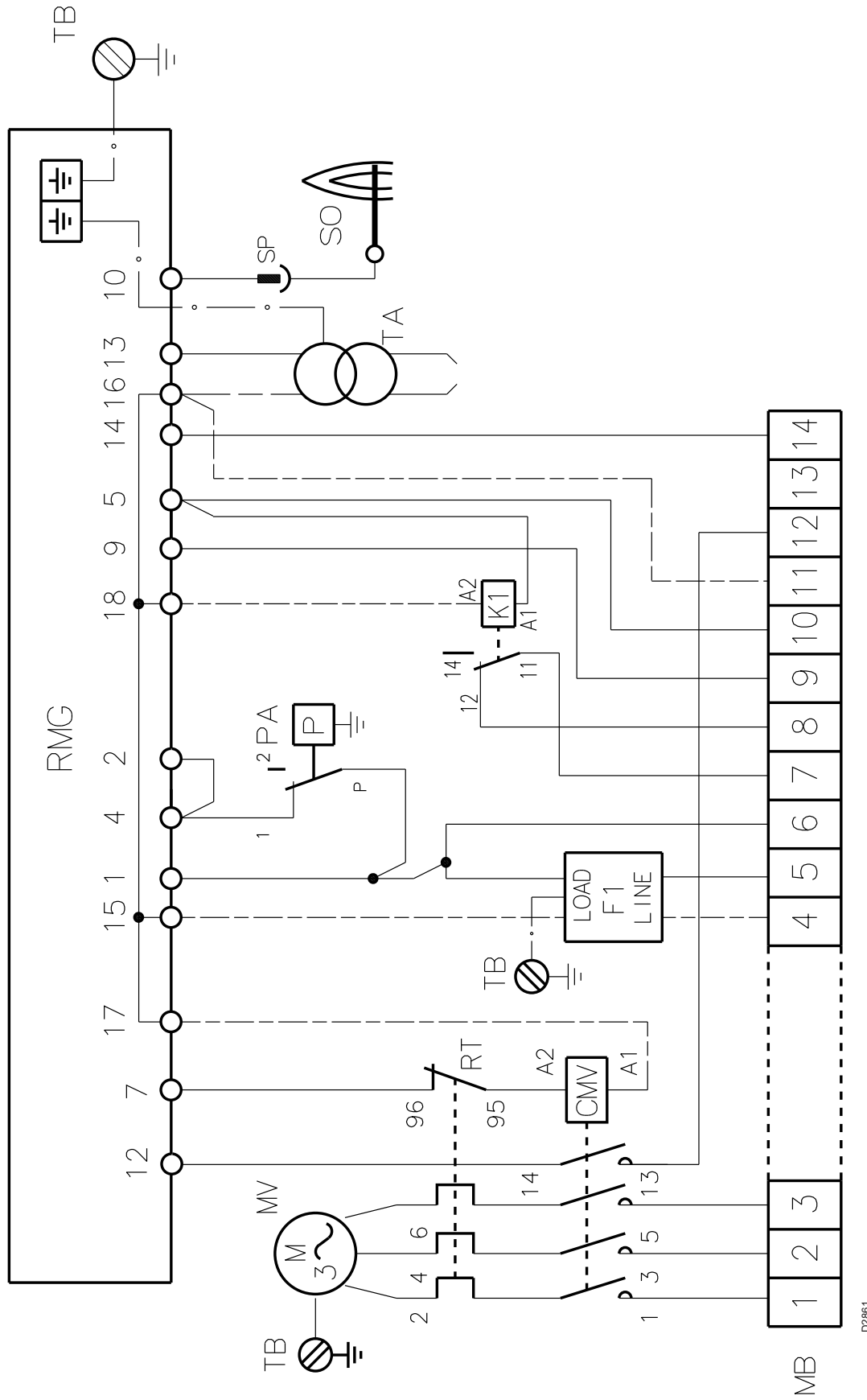
**2 Indication of references**

**/1.A1**

Sheet no. \_\_\_\_\_ ↑

Co-ordinates \_\_\_\_\_ ↑

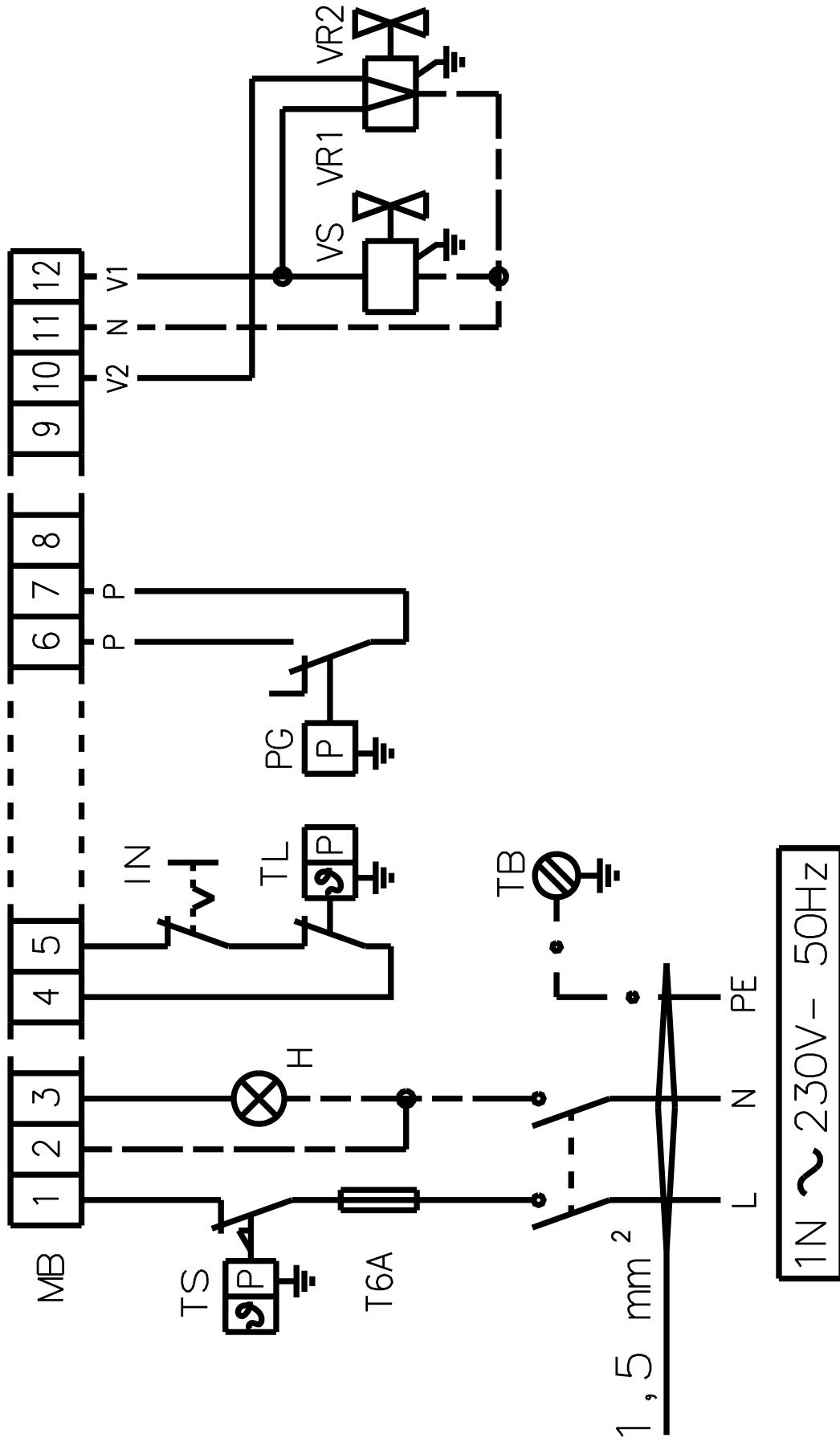




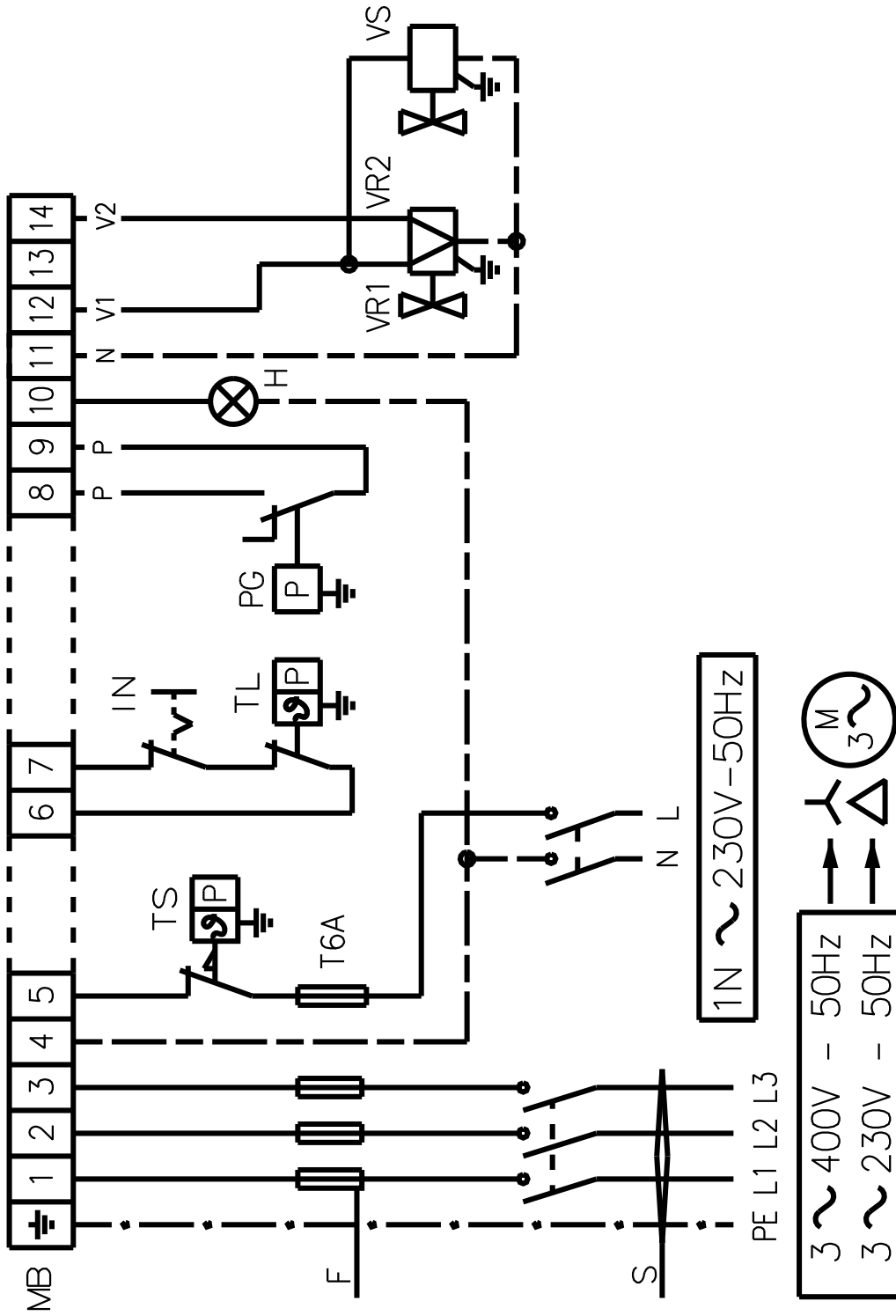
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**GAS 5 - 6 THREE-PHASE**

**DIAGRAM A**



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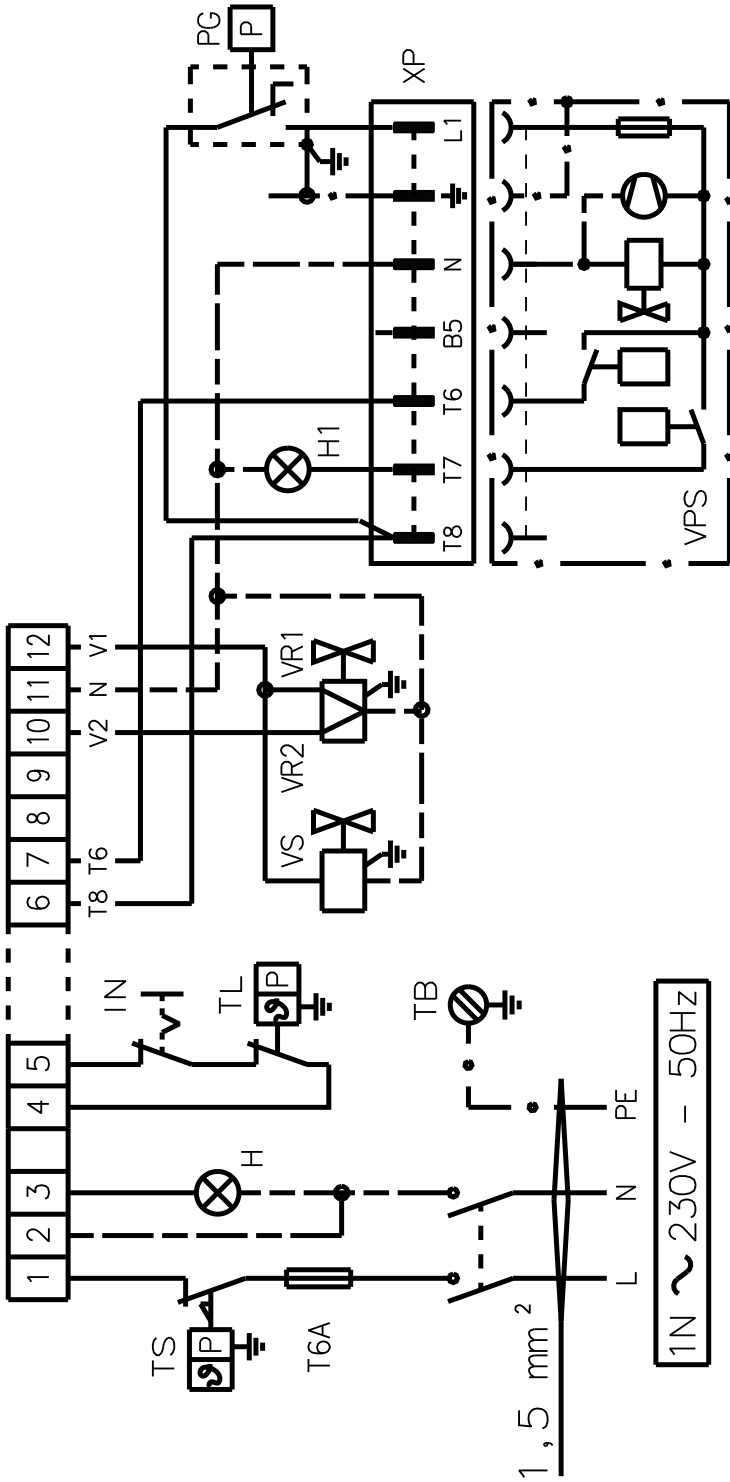


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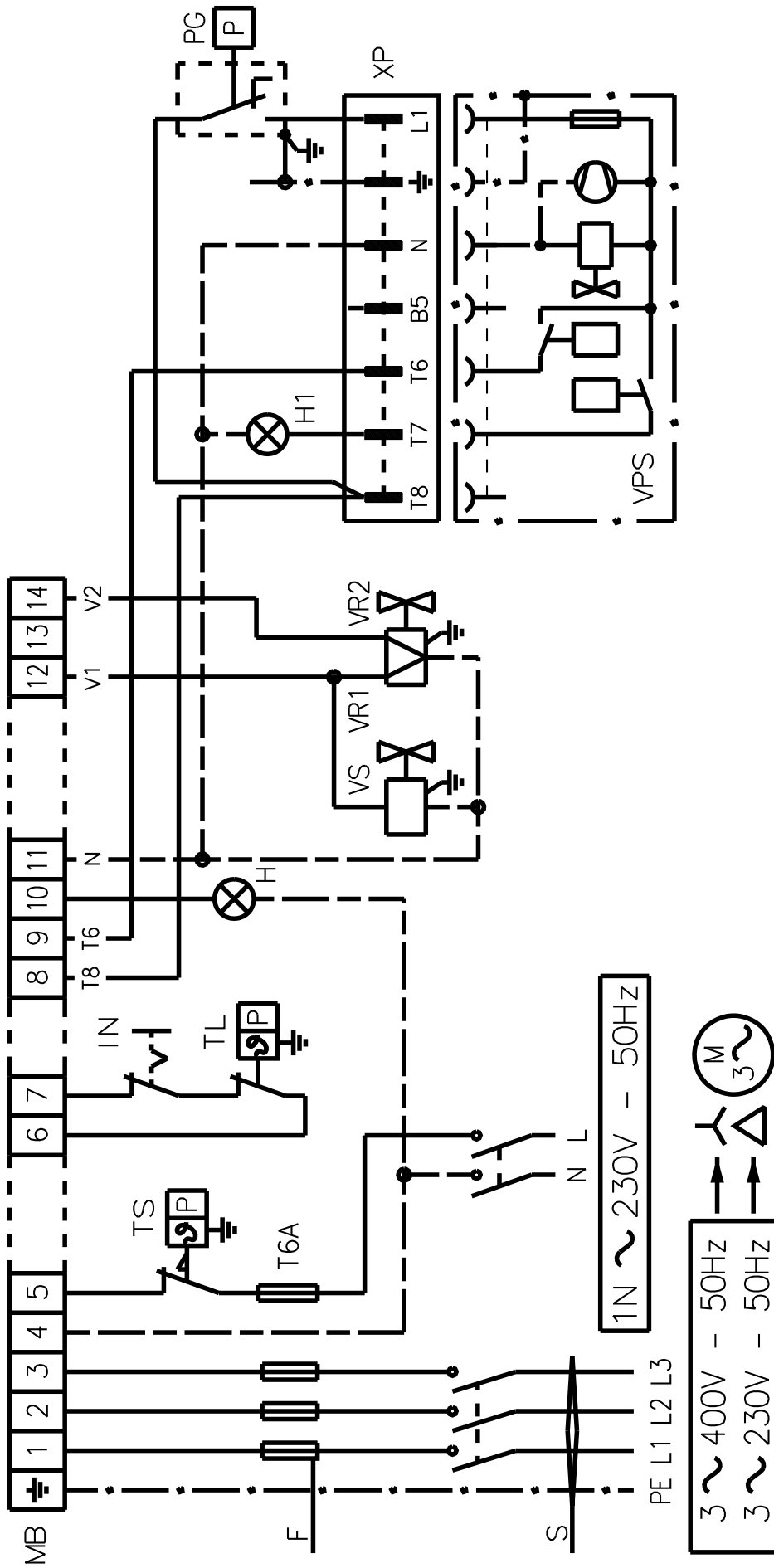
**GAS 5 - 6 THREE-PHASE**

**DIAGRAM B**





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**GAS 5 - 6 THREE-PHASE**

**DIAGRAM C**

**WIRING DIAGRAM KEY****DIAGRAM (A)**

C	Capacitor
CMV	Motor contactor
F1	Filter to protect against radio disturbance
K1	Relay
RMG	Control box
MB	Burner terminal strip
MV	Fan motor
PA	Air pressure switch
RT	Thermal relay
SO	Ionisation probe
SP	Plug-socket
TA	Ignition transformer
TB	Burner earth

**WARNING**

In the case of a phase/phase power supply, it is necessary to install a jumper in the control box terminal board, between clamp 6 and the earthing clamp.

**WARNING**

- These models leave the factory preset for a **400 V** power supply.
- If **230 V** power supply is used, change the motor connection from star to delta and change the calibration of the thermal relay as well.

**DIAGRAM (B)****Electric connection without gas valves leak detection control device****Electrical connection with gas valves leak detection control device**

IN	Burner manual stop switch
MB	Burner terminal strip
PG	Min. gas pressure switch
H	Remote lockout signal
S1	Lockout signal of the remote leak detection control
TL	Limiter control device: shuts down the burner when the temperature or the boiler pressure reaches the pre-set value
TS	Safety limit control device: intervenes in case of TL failure
VR1	1st stage gas valve
VR2	2nd stage gas valve
VS	Safety valve
XP	Plug for leak detection control

**WARNING**

The leak detection control takes place immediately before each burner start-up.

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