

GB **Forced draught gas burners**

Progressive two-stage or modulating operation



CODE	MODEL	TYPE
3781622 - 3781623	RS 50/M MZ	826 T1
3781682 - 3781683	RS 50/M MZ	826 T80

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1.1 Information about the instruction manual

Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

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.

DANGER: LIVE COMPONENTS



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

Other symbols



ENVIRONMENTAL PROTECTION

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



This symbol indicates a list.

Abbreviations used

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

Delivery of the system and the instruction manual

When the system is delivered, it is important that:

- The instruction manual is 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 necessary before the system is started up,
 - maintenance and the need to have the system checked at least once a year by the Manufacturer or another specialised technician.

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

1.2 Guarantee and responsibility

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



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

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

- incorrect installation, start-up, use and maintenance of the burner;
- improper, incorrect or unreasonable use of the burner;
- intervention of unqualified personnel;
- carrying out of non authorised modifications on the equipment;

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

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

2.1 Introduction

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

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

It is a good idea to remember the following:

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

In particular:

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

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

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

2.2 Personnel training

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

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- must inform the Manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.

- Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.
- Personnel must follow all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel 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.

3.1 Burner designation

Range : R									
Fuel :		S Natural gas L Light oil LS Light oil / Methane gas N Heavy oil							
Size									
Adjustment :		E Electronic cam EV Electronic cam and variable speed (with Inverter) M Mechanical cam P Proportional air/gas valve							
Emission :		... Class 1 EN267 (light oil) - EN676 (gas) MZ Class 2 EN267 (light oil) - EN676 (gas) BLU Class 3 EN267 (light oil) - EN676 (gas) MX Class 2 EN267 (light oil) Class 3 EN676 (gas)							
Head:		TC Standard head TL Long head							
Flame control system:		FS1 Standard (1 stop every 24h) FS2 Continuous operation (1 stop every 72h)							
Electrical supply of the system:		3/400/50 3N / 400V / 50Hz 3/230/50 3 / 230V / 50Hz 3/400-230/50 3N / 400V-230V / 50Hz							
Voltage of auxiliaries:		230/50/60 230V/50-60Hz 110/50/60 110V/50-60Hz							
R	S	50	M	MZ	TC	FS1	3/400/50	230/50/60	
BASIC DESIGNATION									
EXTENDED DESIGNATION									

3.2 Models available

Designation		Voltage	Code
RS 50/M MZ	TC	3 ~ 400/230V 50Hz	3781622
RS 50/M MZ	TL	3 ~ 400/230V 50Hz	3781623
RS 50/M MZ	TC	3 ~ 380/460/480V 60Hz	3781682
RS 50/M MZ	TL	3 ~ 380/460/480V 60Hz	3781683

3.3 Burner categories - Countries of destination

Country of destination	Gas category
AT - CH - CZ - DK - EE - ES - FI - GB - GR - HU - IE IS - IT - LT - LV - NO - PT - SE - SI - SK - TR	I2E
NL	I _{2L} - I _{2E} - I ₂ (43,46 ÷ 45,3 MJ/m ³ (0°C))
FR	I2Er
DE	I2ELL
BE	I2E(R)B
LU - PL	I2E

3.4 Technical data

Model			RS 50/M MZ	
Type			826T1	826T80
Output ⁽¹⁾	maximum	kW	285 - 630	
		Mcal/h	245 - 542	
	minimum	kW	80	
		Mcal/h	69	
Fuel			Natural gas: G20 - G23 - G25	
Gas pressure at max. output ⁽²⁾ - Gas: G20/G25		mbar	8.5 - 11.3	
Operation			Intermittent (min. 1 stop in 24 hours)	
Standard applications			Boilers: water, steam, diathermic oil	
Ambient temperature		°C	0 - 40	
Combustion air temperature		°C max	60	
Main electrical supply			3 ~ 400/230V 50Hz	3 ~ 380/460/480V 60Hz
Control circuit power supply			1N ~ 230V 50Hz	1N ~ 220V 60Hz
Fan motor (rating)		rpm	2800	3400
		V	220/240 - 380/415	208/230 - 380/460/480
		kW	0.65	0.56
		A	3 - 1.7	3.6 (λλ) - 1.8 (λ)
Operating current		A	13.5 - 7.7	22 - 20.5
Acceleration current		A		
Ignition transformer		V1 - V2	230 V - 1 x 8 kV	
		I1 - I2	1 A - 20 mA	
Absorbed electrical power		kW max	0.75	0.66
Protection level			IP 44	
Noise levels ⁽³⁾	Sound pressure	dB(A)	72	
	Sound power		83	

(1) Reference conditions: Ambient temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m above sea level.

(2) Gas pressure on the pipe coupling test point 8)(Fig. 5) with zero pressure in the 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.

3.5 Burner weight

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

mm	kg
RS 50/M MZ	41

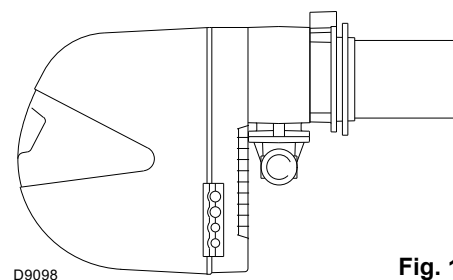


Fig. 1

3.6 Overall dimensions

The dimensions of the burner are shown 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 guides.

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

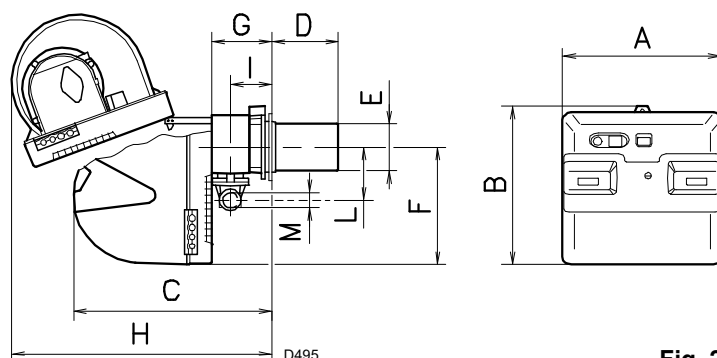


Fig. 2

mm	A	B	C	D ₍₁₎	E	F	G	H	I	L	M
RS 50/M MZ	476	474	580	216 - 351	152	352	164	810	108	168	1"1/2

(1) Blast tube: short-long

3.7 Firing rates

The **maximum output** is chosen within area A.

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

Important

The firing rate was obtained considering an ambient temperature of 20°C and an atmospheric pressure of 1013 mbar (approx. 0 m above sea level), with the combustion head adjusted as shown in Ch. 4.6.

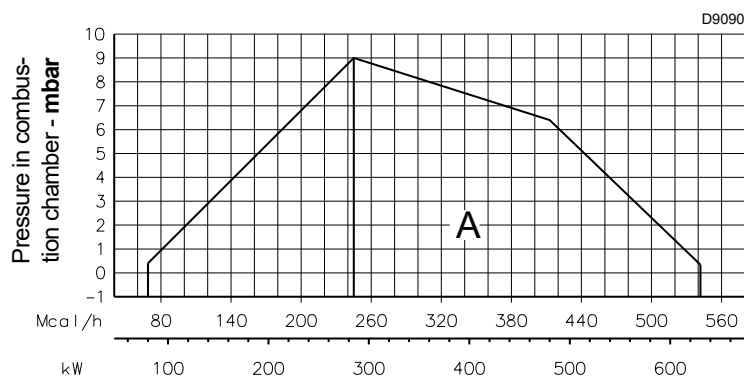


Fig. 3

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

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

Example

Output 407 kW (350 Mcal/h):
diameter 60 cm,
length 1.5 m.

The coupling is ensured when the boiler is EC type-approved; for boilers or ovens with combustion chambers of very different dimensions compared to those shown in the diagram of Fig. 4, preliminary checks are recommended.

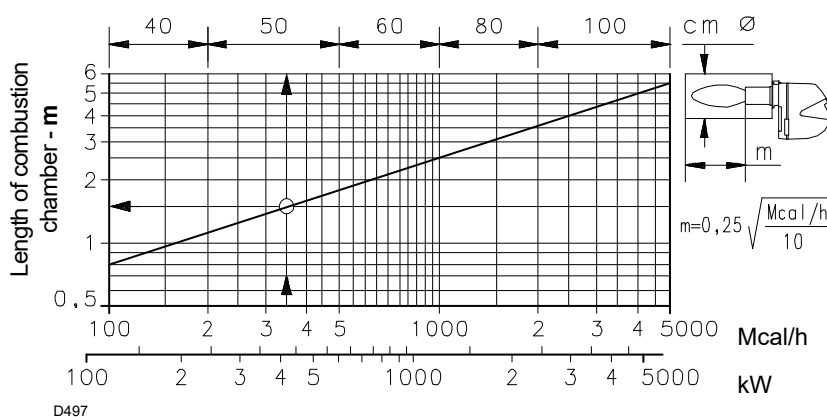


Fig. 4

3.8 Burner components

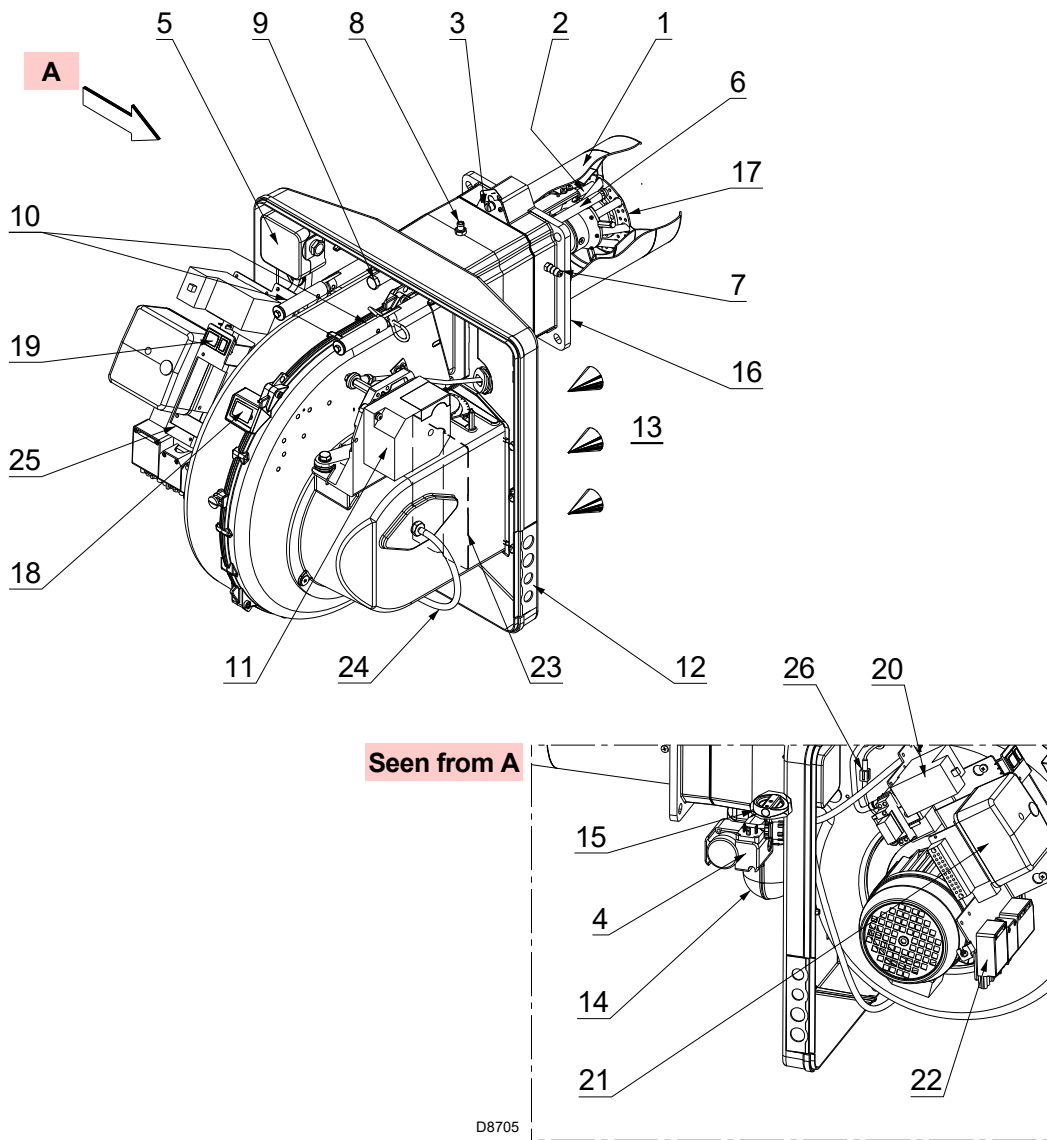


Fig. 5

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

3.9 Burner equipment

The burner is supplied complete with:

- | | |
|---|---|
| ➤ Gas train flange | ➤ Thermal insulation screen |
| ➤ Flange gasket | ➤ N° 6 cable grommets for electrical wiring |
| ➤ 4 screws to fix the M8x25 flange: | ➤ Instruction manual |
| ➤ 4 screws to fix the M8x25 burner flange to the boiler | ➤ Spare parts list |

3.10 Control box for the air/fuel ratio

Introduction

The RMG/M 88.62... control box included in burners of **RS** range is designed to control and start up forced draught gas burners with intermittent operation.

In compliance with:

- Technical Standard EN676 (gas burners)
- Technical Standard EN298 (gas appliances)



Fig. 6



All the installation, maintenance and disassembly operations must be carried out with the electricity supply disconnected.
To avoid damaging things or injuring people, do not open or alter the control box.



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

Technical Data

Electrical supply	AC 220.....240V +10% / -15%
Frequency	50.....60 Hz +/- 6%
Internal fuse	T6,3H250V
Operation below the nominal value of electrical supply	
Minimum operation value on reduction of electrical supply below nominal value	approx. AC 160V
Minimum operation value on increase in electrical supply towards nominal value	approx. AC 175V
Maximum load of the contacts:	
Alarm exit	
Nominal power supply	AC 230V, 50/60 Hz
Maximum current	0.5 A
Allowed cable length	
Thermostat	max. 20 m at 100 pF/m
Air pressure switch	max. 1 m at 100 pF/m
CPI	max. 1 m at 100 pF/m
Gas pressure switch	max. 20 m at 100 pF/m
Flame detector	max. 1 m
Remote reset	max. 20 m at 100 pF/m
M4 screws tightening torque	max. 0.8 Nm

3.11 Servomotor

The servomotor provides simultaneous adjustment for the air damper, by means of the adjustable profile cam and the gas butterfly valve.

The angle of rotation of the servomotor is equal to the angle on the graduated sector controlling the gas butterfly valve.

The servomotor rotates by 90° in 24 seconds.



WARNING

Do not alter the factory setting for the 4 cams; simply check that they are set as indicated below:

Cam I: 90°

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: 15°

Adjusts the ignition position and the MIN output.

Cam IV: integrated to cam III.



Fig. 7

4.1 Notes on safety for the installation

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



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



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

4.2 Handling

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



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

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

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



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

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

4.3 Preliminary checks

Checking the consignment



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



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

Checking the characteristics of the burner

Check the identification label of the burner, showing:

- the model (see **A** in Fig. 8) and type of burner (**B**);
 - the year of manufacture, in cryptographic form (**C**);
 - the serial number (**D**);
 - the data for electrical supply and the protection level (**E**);
 - the electrical input power (**F**);
 - the types of gas used and the relative supply pressures (**G**);
 - the data of the burner's minimum and maximum output possibilities (**H**) (see Firing rate)
- Warning.** The output of the burner must be within the boiler's firing rate;
- the category of the appliance/countries of destination (**I**).

RBL	A	B	C
D	E	F	
GAS KAASU ☒	G	H	
GAZ AERIO	G	H	
I		RIELLO SpA I-37045 Legnago (VR)	
		CE 0085	

Fig. 8

D7738



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

4.4 Operating position

The burner is designed to work only in the positions 1, 2, 3 and 4.

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.

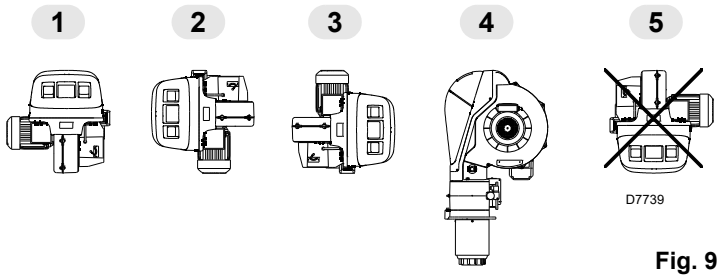


Fig. 9

4.5 Securing the burner to the boiler

Preparing the boiler

Boring the boiler plate

Make holes in the plate shutting off the combustion chamber, as illustrated in Fig. 10. The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

mm	A	B	C
RS 50/M MZ	160	224	M8

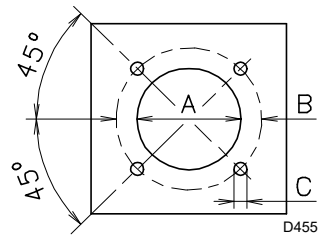


Fig. 10

Length of the blast tube

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 refractory.

The available lengths L are those indicated in the table below.

Blast tube	short	long
RS 50/M MZ	216 mm	351 mm

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

This protection must not compromise the extraction of the blast tube. See Fig. 11.

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

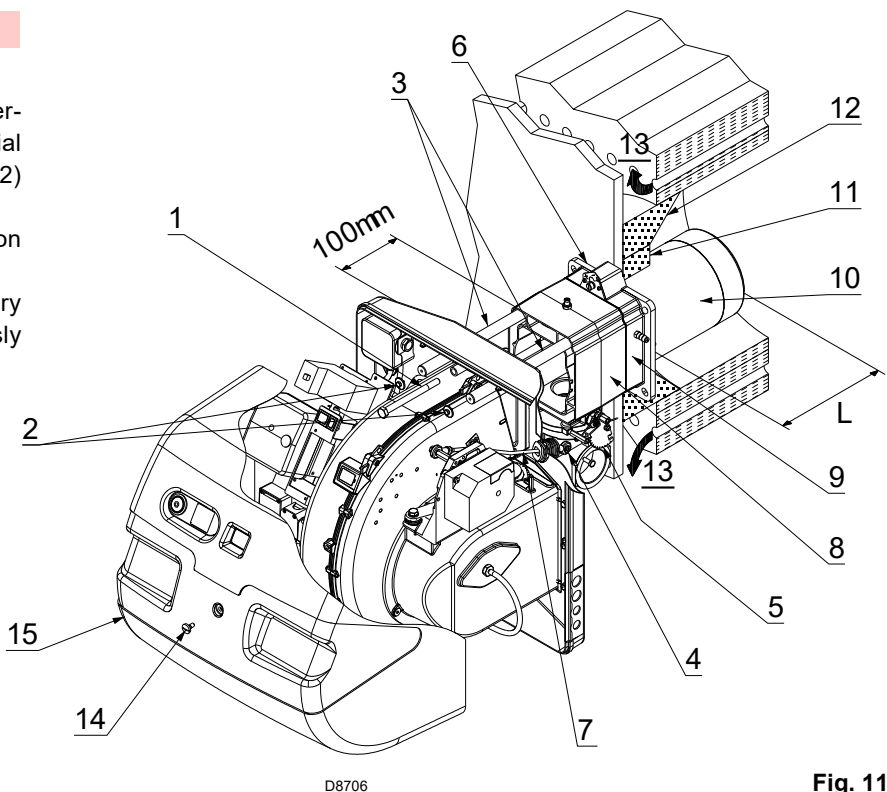


Fig. 11

Securing the burner to the boiler

Before fixing the burner to the boiler, check from the opening of the blast tube that the probe and the electrode are correctly positioned, as in Fig. 12.

If, in the previous check, the position of the probe or electrode was not correct, remove the screw 1)(Fig. 13), extract the inner part 2)(Fig. 13) of the head, and calibrate them.

Do not rotate the probe: leave it as in Fig. 12 since if it is located too close to the ignition electrode, the control box amplifier may be damaged.

Separate the combustion head from the rest of the burner, Fig. 11.

To do this, proceed as follows:

- remove screw 14) and withdraw the cover 15);
- disengage the articulated coupling 4) from the graduated sector 5);
- remove screws 2) from the two slide bars 3);
- remove screw 1) and pull the burner back on slide bars 3) by about 100 mm;
- disconnect the wires from the probe and the electrode and then pull the burner completely off the slide bars, after removing the split pin from the slide bar 3).

Once this operation has been carried out, fix the flange 9)(Fig. 11) to the boiler plate, interposing the insulating gasket 6)(Fig. 11) supplied.

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

The seal between burner and boiler must be airtight. After the start-up (see Ch. 5.3), check there is no leakage of flue gases into the external environment.

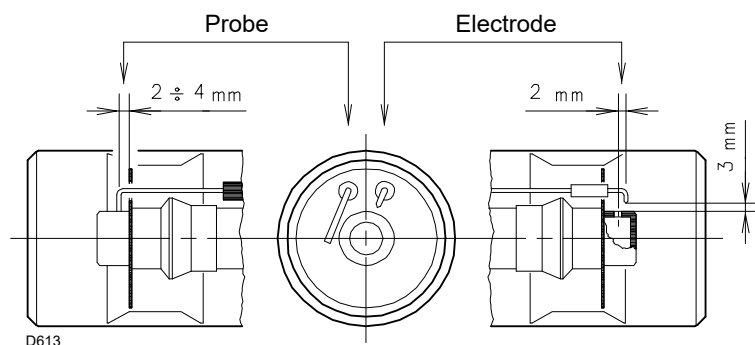


Fig. 12

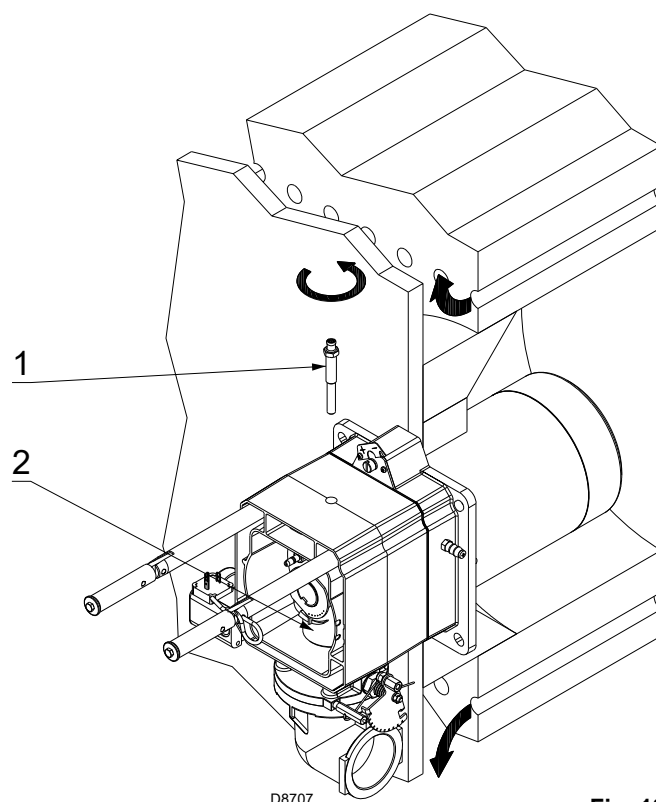


Fig. 13

4.6 Combustion head adjustment

At this stage of installation, the blast tube and the pipe coupling are secured to the boiler as shown in Fig. 15. Therefore it is particularly easy to carry out the combustion head adjustments: air and gas.



MINIMUM OUTPUT MODULATIONS:
when the MIN output is between 80 - 129 kW, the ring nut 2) value must be adjusted to 0.

There are two possible cases:

The MINIMUM burner output is over 130 kW.

In the diagram of Fig. 16, find the notch at which both air and gas can be adjusted according to the MAX output, then:

Air adjustment

Rotate the screw 4) until the notch you have found corresponds with the front surface 5) of the flange.

Central gas adjustment

Loosen the screw 1) and turn ring nut 2) until the notch identified is aligned with index 3).

Tighten the screw 1) fully down.

Example:

the burner varies output between MIN = 130 and MAX = 460 kW.

The gas and air adjustments for this output are carried out on notch 3, like in Fig. 15.

The loss of pressure in the combustion head is shown in column 1 on page 35.

NOTE

The diagram shows the ideal settings for the ring nut 2).

If ring nut 2) is only partially opened, the ring nut can be further opened 1-2 notch if pressure in the gas feeding network is very low and pressure indicated on page 35 in MAX gas cannot be reached.

To continue the preceding example, on page 35, it can be seen that 5.4 mbar of pressure in socket 6) are needed for a burner with 460 kW of power. If this pressure is not available, open 4-5 notch ring nut 2).

Check that the combustion is satisfactory and without pulsations.

The MINIMUM burner output is lower than 130 kW.

Air adjustment

The same as the previous case: follow the diagram.

Central gas adjustment

The ring nut 2) is always adjusted to position 0, irrespective of the MAX burner output.

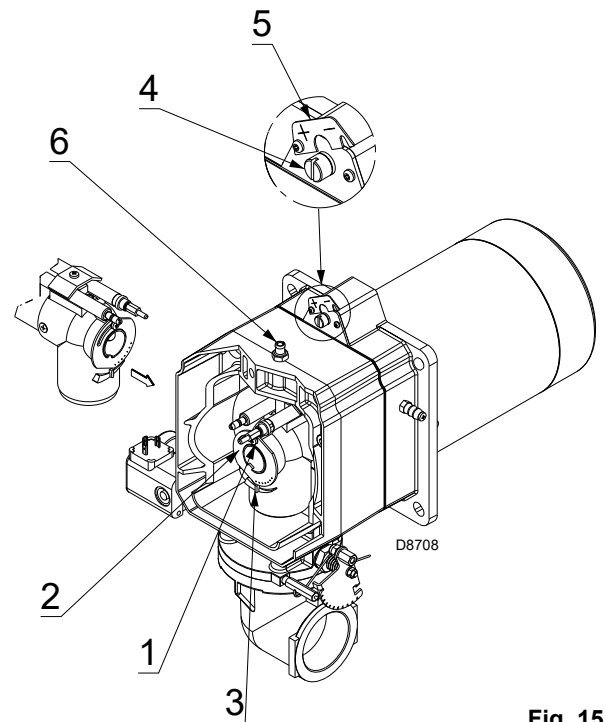


Fig. 15

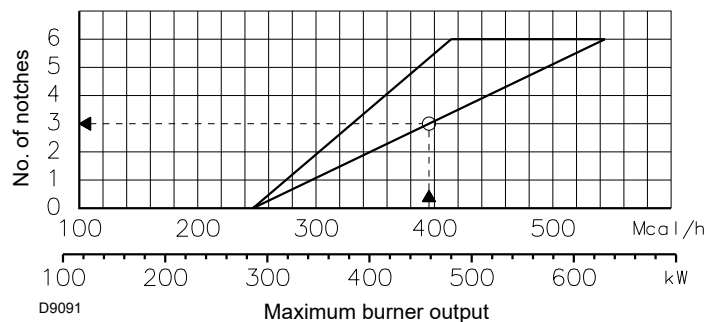


Fig. 16

Once the combustion head adjustment is completed:

- reassemble the burner 4) on the slide bars 3) at about 100 mm from the pipe coupling 5) - burner in the position shown in Fig. 11;
- insert the probe and electrode cables, then slide the burner as far as the pipe coupling - burner in the position shown in Fig. 17;
- refit the screws 2) on the slide bars 3);
- fix the burner to the pipe coupling with the screw 1).

- refit the split pin into one of two slide bars 3).
- re-couple the articulated coupling 6) to the graduated sector 7).



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

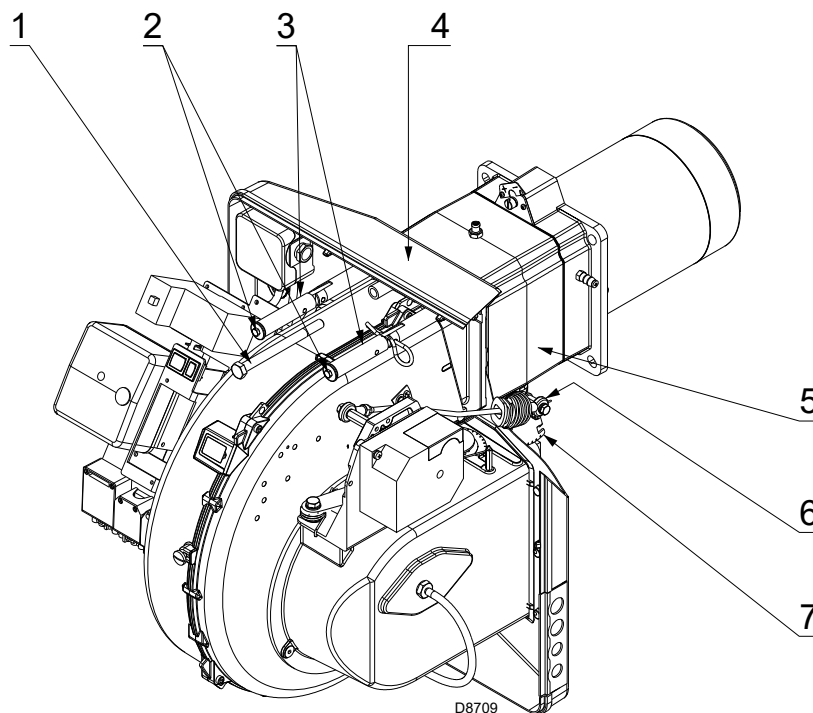


Fig. 17

4.7 Assembly of the gas train

- The gas train is type-approved according to standard EN 676 and is supplied separately from the burner, with the code indicated in Appendix B.
- The gas train can enter the burner from the right or left side, depending on which is the most convenient, see Fig. 18.
- The gas train must be connected to the gas attachment 1)(Fig. 18) with the flange 2), the gasket 3) and the screws 4) supplied with the burner.
- The gas solenoids must be as close as possible to the burner, to ensure that the gas reaches the combustion head within the safety time of 3s.
- Ensure that the maximum pressure necessary for the burner is included in the calibration field of the pressure adjuster (colour of the spring).

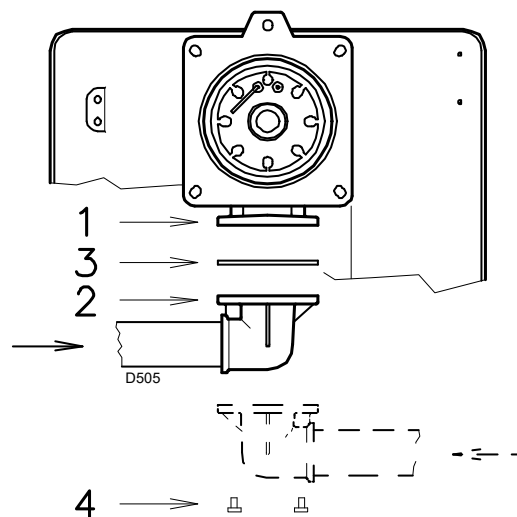


Fig. 18



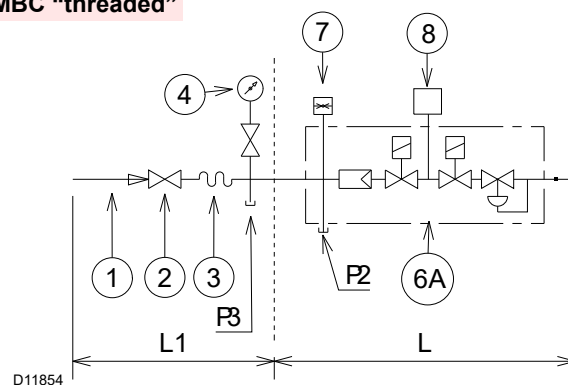
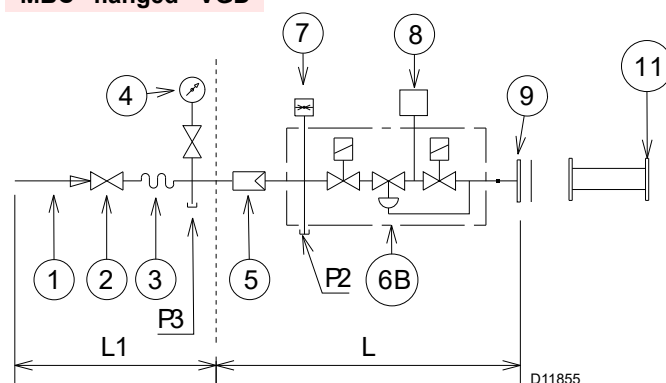
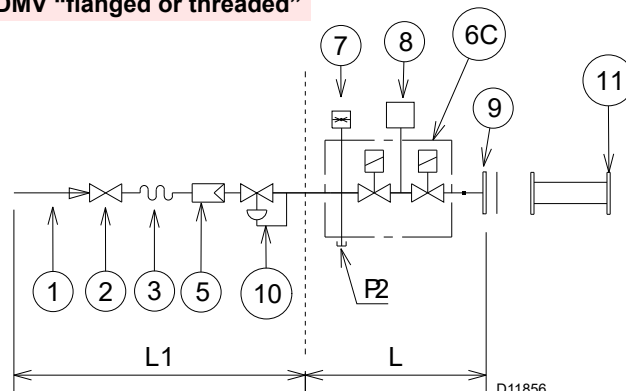
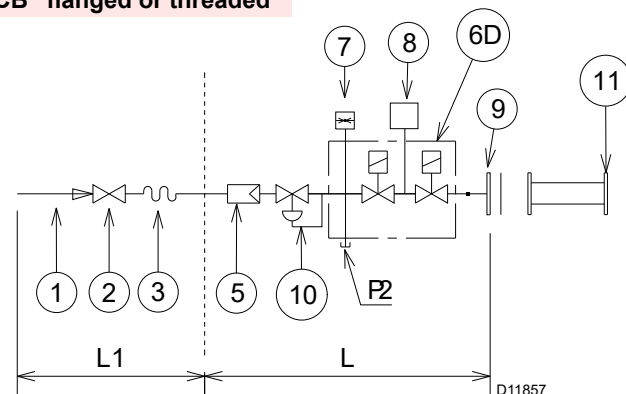
See the accompanying instructions for the adjustment of the gas train.

Gas feeding line

Key (Fig. 19)

- 1 Gas input pipe
- 2 Manual valve
- 3 Vibration damping joint
- 4 Pressure gauge with 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, supplied as an accessory or built-in, based on the gas train code. In compliance with the EN 676 standard, gas valve leak detection control devices are 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 Pressure upstream of valves/adjuster
- P3 Pressure upstream of the filter
- L Gas train, supplied separately
- L1 Responsibility of the installer

The losses of load along the gas supply line are indicated in Appendix C.

MBC “threaded”**MBC “flanged”-VGD****DMV “flanged or threaded”****CB “flanged or threaded”****Fig. 19**

4.8 Electrical wiring

Notes on safety for the electrical wiring



- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination. Refer to the electrical layouts given in Appendix A.
- **Riello** declines all responsibility for modifications or connections different from those shown in the electrical layouts.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual. See Fig. 8.
- Do not invert the neutral with the phase in the electrical supply line. Any inversion would cause a lockout due to ignition failure.
- RS50/M MZ burners have been approved for intermittent operation. 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 IN to provide for burner shutdown at least once every 24 hours. Refer to the electrical layouts given in Appendix A.
- 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 appliances.
- The electrical system must be suitable for the maximum input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the appliance.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - use an omnipolar switch with an opening of at least 3 mm between the contacts, as indicated by the current safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

If the hood is still present, remove it and proceed with the electrical wiring according to the layouts shown in Appendix A.

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

All cables to be connected to the plugs 7) (Fig. 20) of the burner are passed through supplied cable grommets that must be inserted into the holes of the left-hand and right-hand plate, after having unscrewed screws 8), opened the plate in part 9) and 10) and removed the thin diaphragm that blocks the holes. The fairleads and hole press-outs can be in various ways; by way of example we indicate the following mode:

- 1-Pg 11 Three-phase power supply
- 2-Pg 11 Single-phase power supply
- 3-Pg 9 Remote control TL
- 4-Pg 9 Remote control TR or probe (RWF)
- 5-Pg 11 Gas valves (when RG1/CT or LDU 11 leak detection control device is not fitted)
- 6-Pg 11 Gas pressure switch or valve leak detection control device

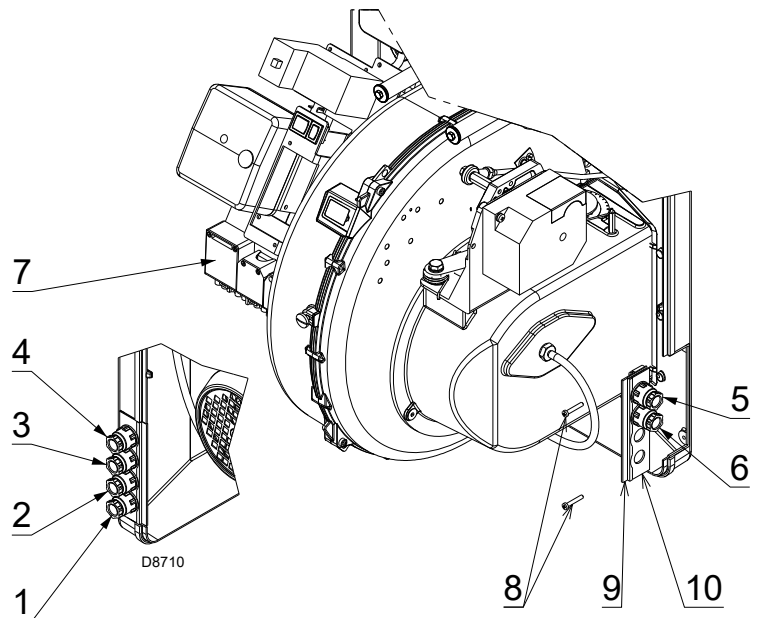


Fig. 20

4.9 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.

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.

To reset, in case of an intervention of the thermal relay, press button 1) of Fig. 21.

Voltage 3 ~ 400/230V - 50Hz

- If the motor is star-driven, **400V**, the cursor must be positioned on "MIN".
 - If it is delta-driven, **230V**, the cursor is positioned on "MAX".
- Even if the scale of the thermal relay does not include rated motor absorption at 400V, protection is still ensured in any case.

NOTE

The RS 50/M MZ models leave the factory preset for **400V** power supply. If **230V** power supply is used, change the motor connection from star to delta and change the calibration of the thermal relay as well.

Voltage 3 ~ 380/460/480V - 60Hz

- If the motor is star-driven, **380/460/480V**, the cursor must be positioned on "MIN".
- Even if the scale of the thermal relay does not include rated motor absorption at **380/460/480V**, protection is still ensured in any case.

NOTE

The burners leave the factory preset for **380/460/480V** power supply.

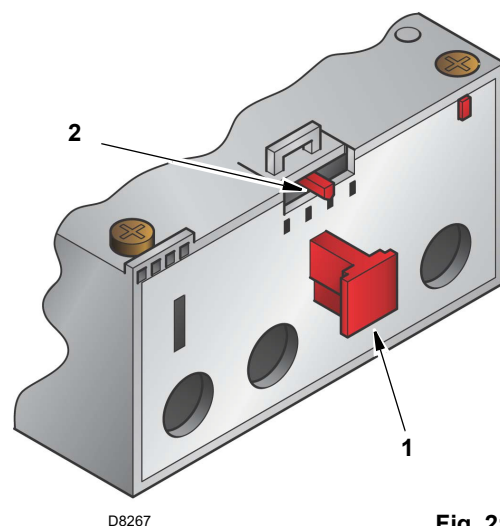


Fig. 21

5.1 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 starting up the burner, refer to section "Safety test - with no gas supply" on page 28.

5.2 Operations before start-up

- Ensure that the gas supply company has carried out the supply line vent operations, eliminating air or inert gases from the piping.
- Slowly open the manual valves situated upstream of the gas train.
- Adjust the minimum gas pressure switch (Fig. 22) to the start of the scale.
- Adjust the maximum gas pressure switch (Fig. 23) to the end of the scale.
- Adjust the air pressure switch (Fig. 24) to the start of the scale.

Minimum gas pressure switch

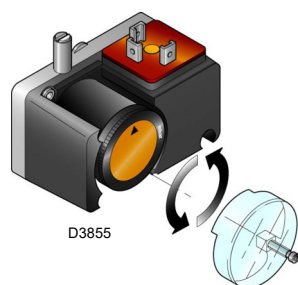


Fig. 22

Maximum gas pressure switch

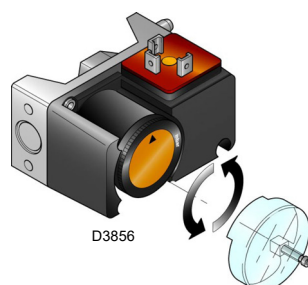


Fig. 23

Air pressure switch

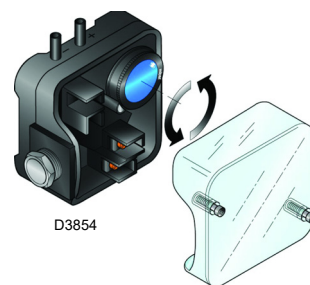


Fig. 24

- Check the gas supply pressure by connecting a pressure gauge to the pressure test point 1)(Fig. 25) 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. 25) 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 at which voltage is supplied. This operation is unnecessary if each of the two solenoids is equipped with an indicator 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.

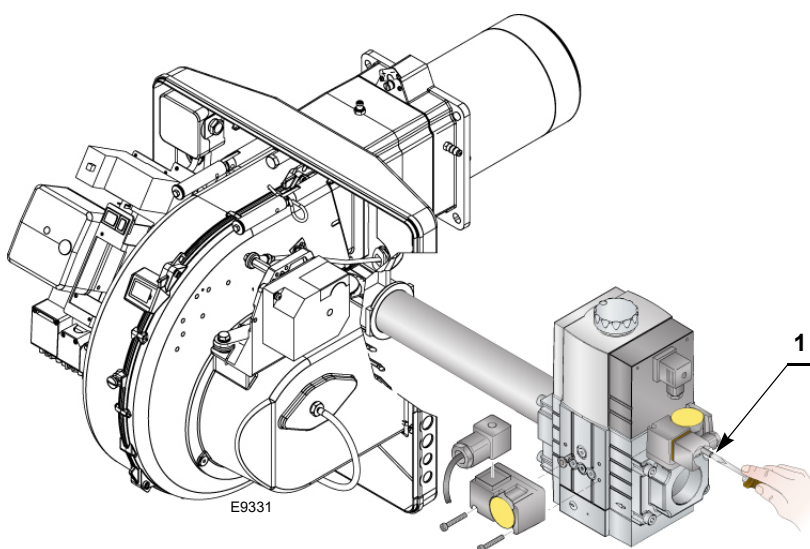


Fig. 25

5.3 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 of Fig. 27 to position "MAN".



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 wiring.

As soon as the burner starts, check the direction of rotation of the fan blade, looking through the flame inspection window.

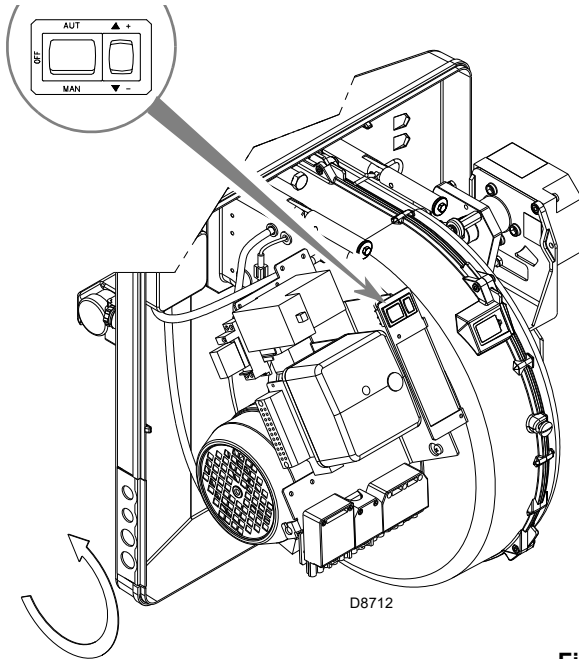


Fig. 26

5.4 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 ignited, proceed with the global adjustment of the burner.

5.5 Burner adjustment

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

Adjust in sequence:

- Output upon ignition
- Maximum output
- Minimum output
- Intermediate outputs between Min. and Max.
- Air pressure switch
- Maximum gas pressure switch
- Minimum gas pressure switch

Output upon ignition

According to EN 676 standard.

Burners with MAX output up to 120 kW

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

- max. operation output: 120 kW
- max. output upon ignition: 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 $t_s = 3s$, 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 $t_s = 3s$.

In order to measure the ignition output:

- disconnect the plug-socket 26)(Fig. 5) on the ionisation probe cable (the burner will fire and then go into lockout after the safety time has elapsed);
- perform 10 ignitions with consecutive 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 $t_s = 3s$:

$$V_g = \frac{Q_a \text{ (max. burner delivery)} \times n \times t_s}{3600}$$

V_g : volume supplied in ignitions carried out (Sm^3)

Q_a : ignition delivery (Sm^3/h)

n : number of ignitions (10)

t_s : safety time (sec)

Example for gas G 20 (9.45 kWh/ Sm^3):

ignition output 150 kW

corresponding to 15.87 Sm^3/h .

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

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

Maximum output

Max. output of the burner must be set within the firing rate range shown on page 7. In the above description, we left the burner switched on, working at MIN output.

Now press the button 2)(Fig. 27) "output increase", and keep it pressed until the servomotor has opened the air damper and the gas butterfly valve at 90°.

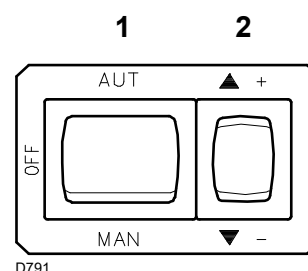


Fig. 27

Adjustment of gas delivery

Measure the gas delivery on the meter.

As a general rule, it can be seen from the table on page 35: just read gas pressure on the pressure gauge, see Fig. 36, and follow the indications given on page 35.

- 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.

Adjusting air delivery

Progressively adjust the end profile of cam 4)(Fig. 28) by turning the cam adjustment screws as they are visible through the access opening 6 (Fig. 28).

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

Minimum output

MIN output must be selected within the firing rate range shown on page 7.

Press the button 2 (Fig. 27) "output reduction", and keep it pressed until the servomotor has closed the air damper and the gas butterfly valve at 15° (adjustment made in the factory).

Adjustment of gas delivery

Measure the gas delivery on the meter.

- If it is necessary to reduce it, reduce slightly the angle of cam III (Fig. 29) with small, regular movements, i.e. bring it from an angle of 15° to 13° - 11°....
 - If it is necessary to increase it, press slightly the button "output increase" 2)(Fig. 27) (open by 10-15° the gas butterfly valve), increase the cam III angle (Fig. 29) with small, regular movements, i.e. bring it from an angle of 15° a 17° - 19°....
- Then press the button "output reduction" until the servomotor is in the position of minimum opening, and measure the gas output.

NOTE

The servomotor follows the adjustment of cam III only when the angle of the cam is reduced. If it is necessary to increase the angle of the cam, you must first increase the angle of the servomotor by means of the "output increase" key, then increase the angle of cam III, and finally bring the servomotor to the position of MIN output, with the "output reduction" key.

If it is necessary to adjust cam III, remove the cover 1)(Fig. 29), inserted with a trigger catch, as indicated in Fig. 29, extract the special key 2)(Fig. 29) from inside, and insert it in the notch of cam III.

Adjusting air delivery

Progressively adjust the end profile of cam 4)(Fig. 28) by turning the cam adjustment screws as they are visible through the access opening 6(Fig. 28).

It is preferable not to turn the first screw since this is used to set the air damper to its fully closed position.

Intermediate outputs**Adjustment of gas delivery**

No adjustment of gas delivery is required.

Adjusting air delivery

Press the key 2)(Fig. 27) "output increase" a little so that a new screw 5)(Fig. 28) appears in the opening 6)(Fig. 28), adjust it until optimal combustion is obtained. Proceed in the same way with the other screws.

Take care that the cam profile variation is progressive.

Switch the burner off with switch 1)(Fig. 27), OFF position. Release the adjustable profile cam by setting the servomotor slot 2)(Fig. 28) in a vertical position and check several times that by rotating the cam forwards and backwards by hand, the movement

is soft and smooth, without sticking.

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.

NOTE

Once you have finished adjusting outputs MAX - MIN - INTERMEDIATE, 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 stage delivery.

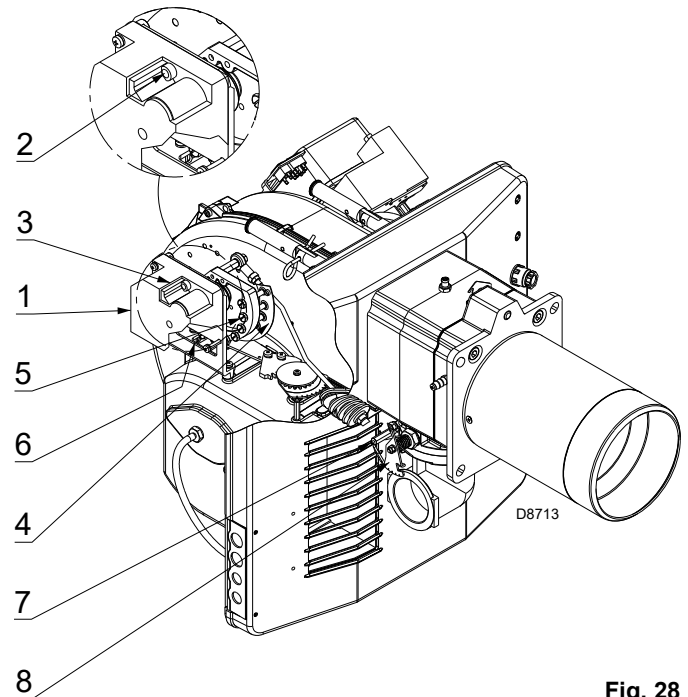


Fig. 28

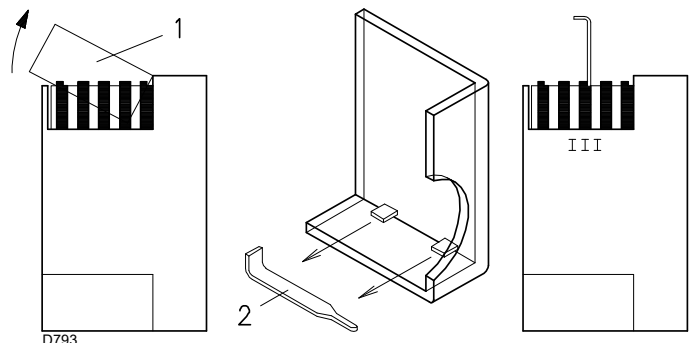


Fig. 29

- 1 Servomotor
- 2 ⊖ Cam 4 engaged/ ⊕ disengaged
- 3 Cam cover
- 4 Adjustable profile cam
- 5 Screws for adjusting the adjustable profile
- 6 Opening for access to screws 5
- 7 Index for graduated sector 8
- 8 Graduated sector for gas butterfly valve

Air pressure switch

The air pressure switch can be connected in differential mode, see B)(Fig. 30), i.e. it is under pressure either by the depression or pressure generated by the fan. In this way the burner can operate even in combustion chambers in depression and with high modulation ratios: MIN / MAX outputs of up to 1/6. In this case the air pressure switch needs no adjustment and its function is limited to controlling fan operation.

Warning: 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.

In civil applications the pipe from the fan air inlet should be removed, see A)(Fig. 30), and adjust the pressure switch as follows.

Air pressure switch connected as in A)(Fig. 30):

The air pressure switch is set after all other adjustments have been made. Begin with the switch at the start of the scale.

With the burner operating at MIN output, increase adjustment pressure by slowly turning the relative knob clockwise until the burner locks out.

Then turn the knob anticlockwise by about 20% of the set point and repeat burner start-up to ensure it is correct.

If the burner locks out again, turn the knob anticlockwise a little bit more.

Warning: as a rule, the air pressure switch must limit the CO in the fumes to less than 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%.

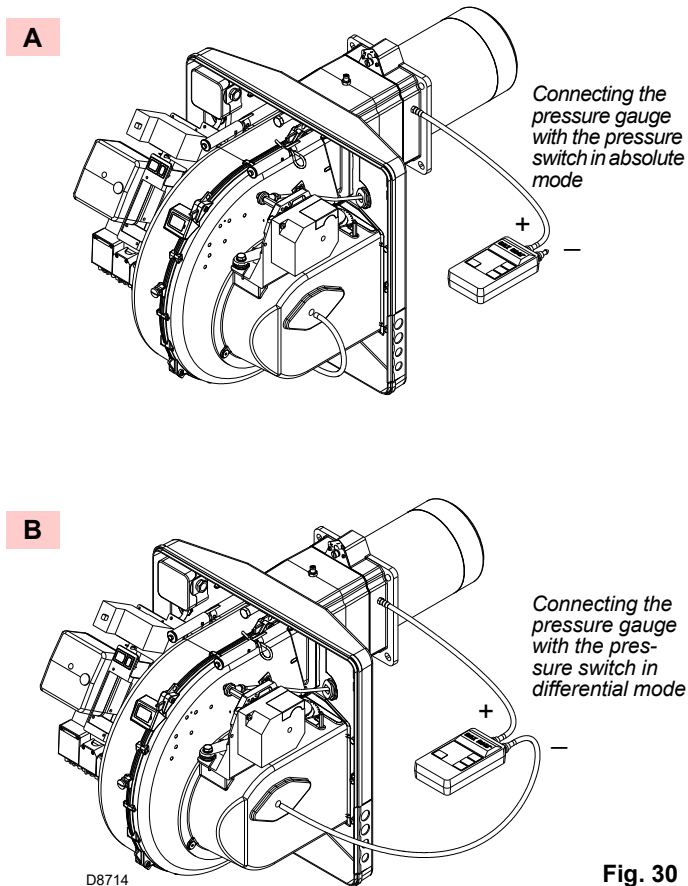


Fig. 30

Maximum gas pressure switch

Adjust the maximum gas pressure switch (Fig. 31) 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.

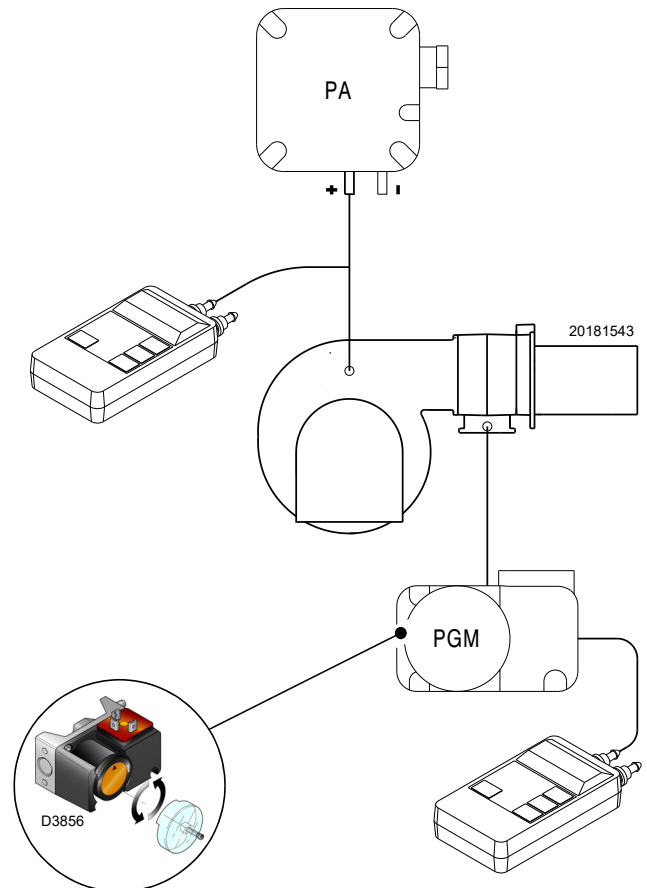


Fig. 31

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. 32) 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.

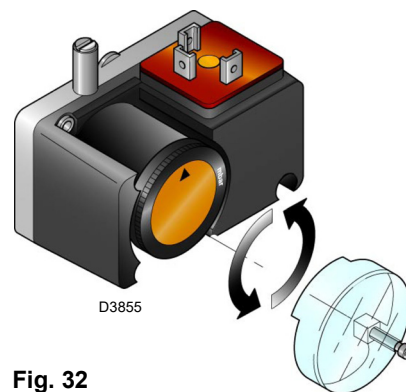


Fig. 32



1 kPa = 10 mbar

5.6 Operation sequence of the burner

Burner start-up

- 0s: TL closed.
- 0s: TL thermostat/pressure switch closes.
- 2s: The control box starting cycle begins. Servomotor starts: rotate to the left by 90°, i.e. until the contact intervenes with cam I (Fig. 7).
- 26s: The air damper arrives to the MAX. output position. The fan motor starts up. Start of the pre-purging phase.
- 57s: the servomotor rotates towards the right, as far as the angle set on cam III (Fig. 7) for the MIN output.
- 77s: The air damper and the gas butterfly valve adopt the MIN output position (with cam III) (Fig. 7) at 65°.
- 92s: Ignition electrode strikes a spark. The safety valve VS opens, along with the adjustment valve VR, quick opening. The flame is ignited at a low output level, point A. Delivery is then progressively increased, with the valve VR opening slowly up to MIN. output, point B.
- 94s: The spark goes out.
- 118s: The starting cycle comes to an end.

STANDARD IGNITION

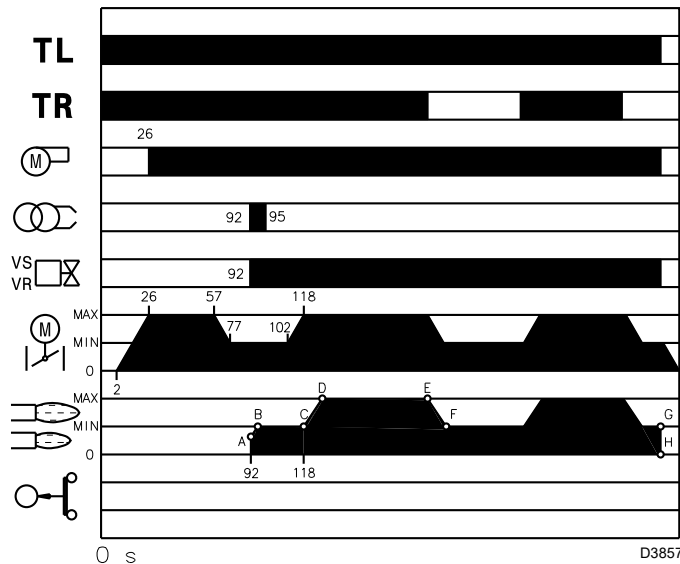


Fig. 33

Steady state operation

Burner without themodulating operation kit

Once the start-up cycle is completed, the servomotor command moves on to the TR thermostat/pressure switch that controls the pressure or the temperature in the boiler, point C. (The electrical control box still continues to check the presence of the flame and the correct position of the air and gas maximum pressure switches).

- If the temperature or the pressure is low so the thermostat/pressure switch TR is closed, the burner progressively increases the output up to the MAX value (section C-D).
- If subsequently the temperature or pressure increases until TR opens, the burner progressively decreases its output to the MIN. value (section E-F). The sequence repeats endlessly.

- The burner locks out when the heat request is less than the heat supplied by the burner at MIN. output, (section G-H). The TL thermostat/pressure switch 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.

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 the gas at the pipe coupling is shown on the pressure gauge of Fig. 36.

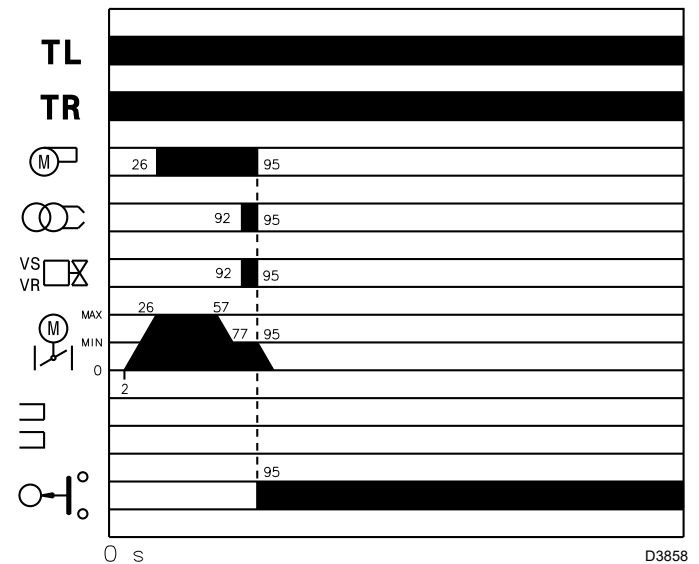


Fig. 34

5.7 Burner flame goes out during operation

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

5.8 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 working on the "AUT/MAN" switch of Fig. 27.

5.9 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 μ A.

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

However, if it is necessary to measure the ionisation current, disconnect the plug-socket (2)(Fig. 35) on the ionisation probe cable and insert a direct current microammeter (1)(Fig. 35) with a base scale of 100 μ A.

Carefully check the polarities!

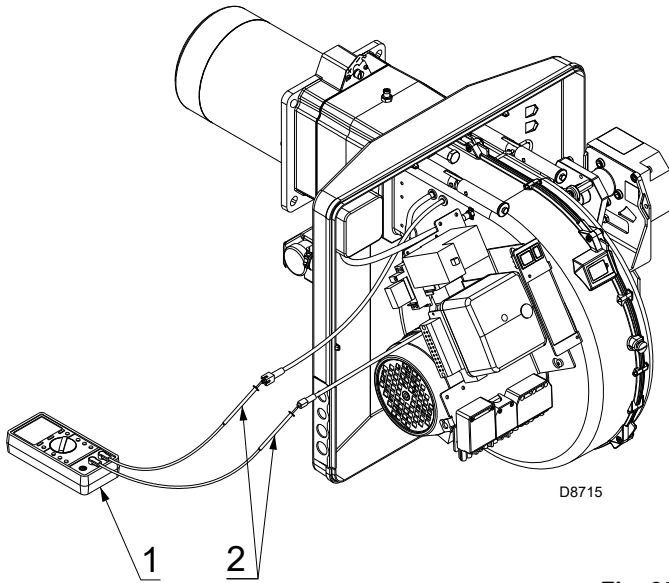


Fig. 35

5.10 Checking the air and gas pressure on the combustion head

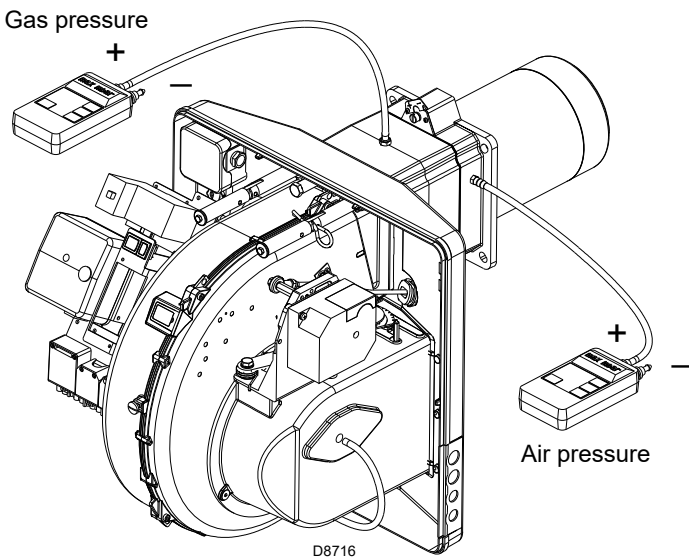


Fig. 36

5.11 Final checks (with burner operating)

- Open the thermostat/pressure switch TL:
- Open the thermostat/pressure switch TS:
the burner must stop
- Rotate the maximum gas pressure switch knob to the minimum end-of-scale position.
- Rotate the air pressure switch knob to the maximum end-of-scale position.
the burner must stop in lockout
- Switch off the burner and disconnect the voltage.
- Disconnect the minimum gas pressure switch connector.
the burner must not start
- Disconnect the ionisation probe wire.
the burner must stop in lockout due to ignition failure
- Make sure that the mechanical locking systems on the different adjustment devices are fully tightened.

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

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.

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

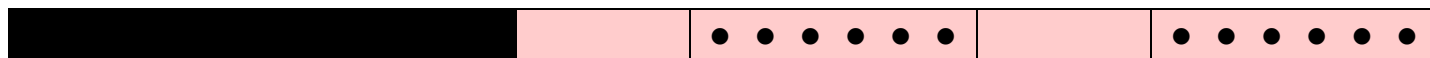
**RED LED on
press reset for 10s**

**Press button
for > 3s**

Signal

**Interval
3s**

Signal



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

The number of pulses will provide the information on the possible faults, according to the table below.

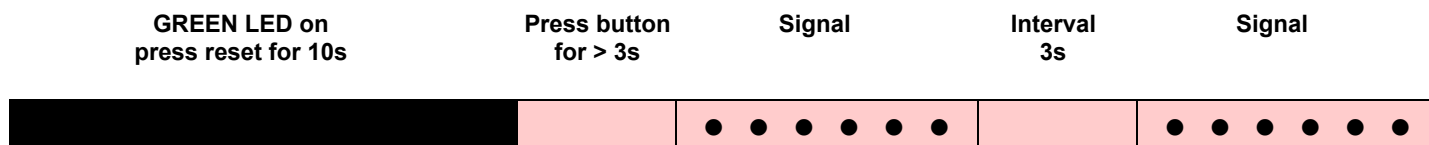
SIGNAL	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
2 blinks ● ●	Once the pre-purging phase and safety time have passed, the burner goes into lock-out without the appearance of the flame	1 - The operation solenoid lets little gas through Increase 2 - One of the two solenoid valves does not open. Replace 3 - Gas pressure too low Increase pressure at regulator 4 - Ignition electrode incorrectly adjusted Adjust, see Fig. 12 5 - Electrode grounded due to broken insulation. Replace 6 - High voltage cable defective Replace 7 - High voltage cable deformed by high temperature. . . Replace and protect 8 - Ignition transformer defective. Replace 9 - Incorrect valve or transformer electrical wiring Check 10 - Defective control box Replace 11 - A closed valve up-line from the gas train Open 12 - Air in pipework Bleed air 13 - Gas trains not connected or with coil blocked Check connections or replace coil	
3 blinks ● ● ●	The burner does not switch on, and the lockout appears	14 - Air pressure switch in operating position Adjust or replace	
	The burner switches on, but then stops in lockout	Air pressure switch inoperative due to insufficient air pressure: 15 - Air pressure switch incorrectly adjusted Adjust or replace 16 - Pressure switch pressure test point pipe blocked . . . Clean 17 - Head incorrectly adjusted. Adjust 18 - High pressure in the furnace Connect air pressure switch to fan suction line	
	Lockout during pre-purging phase	19 - Defective motor control contactor. Replace (only three-phase version) 20 - Defective electrical motor. Replace 21 - Motor lockout (only three-phase version). Replace	
4 blinks ● ● ● ●	The burner switches on, but then stops in lockout	22 - Flame simulation Replace the control box	
	Lockout when burner stops	23 - Permanent flame in the combustion head or Eliminate permanency of flame simulation of flame or flame simulation and replace control box	
6 blinks ● ● ● ● ● ●	The burner switches on, but then stops in lockout	24 - Defective or incorrectly adjusted servomotor Replace or adjust	
7 blinks ● ● ● ● ● ● ●	The burner goes into lockout immediately following the appearance of the flame	25 - The operation solenoid lets little gas through. Increases 26 - Ionisation probe incorrectly adjusted. Adjust it, see Fig. 12 27 - Insufficient ionisation (less than 5 µA) Check probe position 28 - Probe earthed Withdraw or replace cable 29 - Burner poorly grounded Check grounding 30 - Phase and neutral connections inverted Invert them 31 - Defective flame detection circuit. Replace control box	
	Burner locks out when shifting from minimum to maximum output and vice versa	32 - Too much air or too little gas Adjust air and gas	
	Burner goes into lockout during operation	33 - Probe or ionisation cable earthed Replace worn parts	
10 blinks ● ● ● ● ● ● ● ● ● ●	The burner does not switch on, and the lockout appears	34 - Incorrect electrical wiring Check connections	
	The burner goes into lockout	35 - Defective control box Replace 36 - Presence of electromagnetic disturbances in. Filter or eliminate the thermostat lines 37 - Presence of electromagnetic disturbance Use the radio disturbance protection kit	

SIGNAL	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
No blink	The burner does not start	38 - No electrical power supply	Close all switches - Check connections
		39 - A limiter or safety control device is open	Adjust or replace
		40 - Line fuse blocked	Replace
		41 - Defective control box	Replace
		42 - No gas supply.	Open the manual valves between contactor and train
	The burner continues to repeat the start-up cycle, without lockout	43 - Mains gas pressure insufficient	Contact your GAS COMPANY
		44 - Minimum gas pressure switch fails to close	Adjust or replace
		45 - Servomotor fails to move to min. ignition position	Replace
		46 - The gas pressure in the network is near the value.	Reduce the cut in pressure of the min. gas pressure switch
		47 - Head poorly adjusted	Adjust, see Fig. 15
Ignition with pulsations	Burner does not reach maximum output	48 - Ignition electrode incorrectly adjusted	Adjust it, see Fig. 12
		49 - Incorrectly adjusted fan air damper: too much air	Adjust
		50 - Output during ignition phase is too high	Reduce
		51 - Control device TR does not close	Adjust or replace
		52 - Defective control box	Replace
Burner stops with air damper open	Burner stops with air damper open	53 - Defective servomotor	Replace
		54 - Servomotor defective	Replace

6.1 Normal operation / flame detection time

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

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



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 the following table:

SIGNAL	FLAME DETECTION TIME
1 blink ●	0.4 s
2 blinks ● ●	0.8 s
6 blinks ● ● ● ● ● ●	2.8 s

This is updated in every burner start-up.

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

WARNING

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.

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



close the fuel interception tap;

7.2 Maintenance programme

Maintenance frequency

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

Checking and cleaning

Combustion

Carry out 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.

Gas leaks

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

Gas filter

Replace the gas filter when it is dirty.

Flame inspection window

Clean the glass of the flame inspection window.

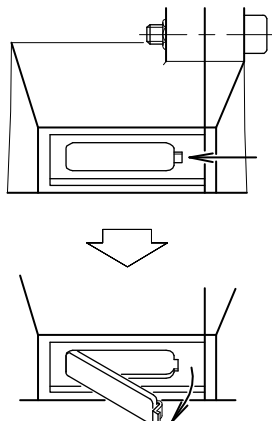


Fig. 37

D484

Combustion head

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

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

Make sure that the gas outlet holes for the start-up, on the combustion head distributor, are free of dirt or rust deposits. If in doubt, disassemble the elbow 7)(Fig. 38).

Servomotor

Release cam 4)(Fig. 28) from the servomotor, rotating notch 2)(Fig. 28) by 90° and manually check that it rotates smoothly backwards and forwards.

Constrain cam 4)(Fig. 28) again.

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 cam 4)(Fig. 28).

Combustion

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

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

Safety test - with no gas supply

To perform commissioning in safety conditions, it is very important to check correct wiring between gas valves and burner.

For this purpose, after checking that connections comply with the burner wiring diagrams, it is necessary to carry out a start-up cycle with gas cock closed (dry test).

- 1 The manual gas valve must be closed using the locking/unlocking device ("Lock-out / tag out" procedure).
- 2 Ensure that burner limit electrical contacts are closed
- 3 Ensure that minimum gas pressure switch contact is closed
- 4 Try to start the burner.

The start-up cycle must occur according to the following steps:

- Fan motor start-up for pre-purging
- Gas valve leak detection control, if applicable.
- Pre-purging completion
- Achievement of the ignition point
- Power supply of the ignition transformer
- Supply of gas valves.

As gas is closed, the burner cannot ignite and its control box will switch to stop or safety lockout condition.

The actual supply of gas valves can be checked by inserting a tester; some valves are equipped with lights (or closing/opening position indicators) that activate as soon as they are powered.



IF POWER SUPPLY OF GAS VALVES OCCURS IN UNEXPECTED MOMENTS, DO NOT OPEN THE MANUAL VALVE, DISCONNECT POWER SUPPLY, CHECK WIRINGS, CORRECT THE ERRORS AND CARRY OUT THE WHOLE TEST AGAIN.

Safety components

The safety components must be replaced at the end of their life cycle indicated in 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

7.3 Opening the burner

- **Disconnect the electrical supply from the burner.**
- Remove screw 1) and take out hood 2).
- Disengage the articulated coupling 3) from the graduated sector 4).
- Remove screw 5), the split pin 9) and pull the burner back by about 100 mm on the slide bars 6). Disconnect the probe and electrode leads and then pull the burner fully back.
- Turn it as indicated in the diagram, and insert the split pin 9) into the hole of one of the two guides so that the burner remains in that position.

Now extract the gas distributor 7) after having removed the screw 8).

7.4 Closing the burner

- Push the burner up to approximately 100 mm from the pipe coupling.
- Remove the split pin 9) and push the burner until it is approx. 100 mm from the pipe coupling.
- Reinsert the cables and slide the burner as far as the stop.
- Replace the screws 5) and split pin 9) and carefully pull the probe and electrode cables outwards until they are slightly taut.
- Re-couple the articulated coupling 3) to the graduated sector 4).

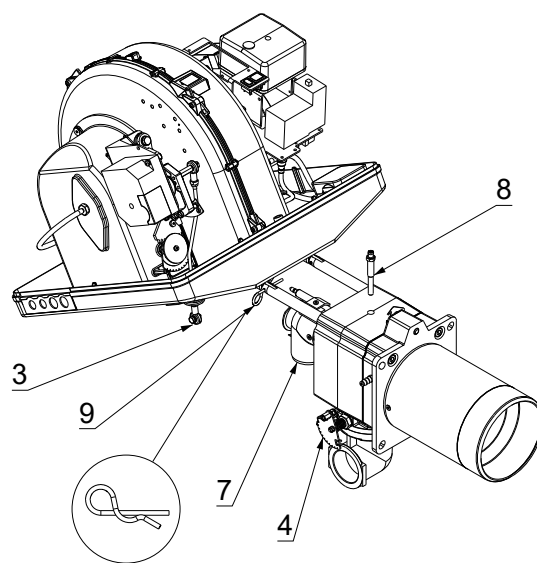
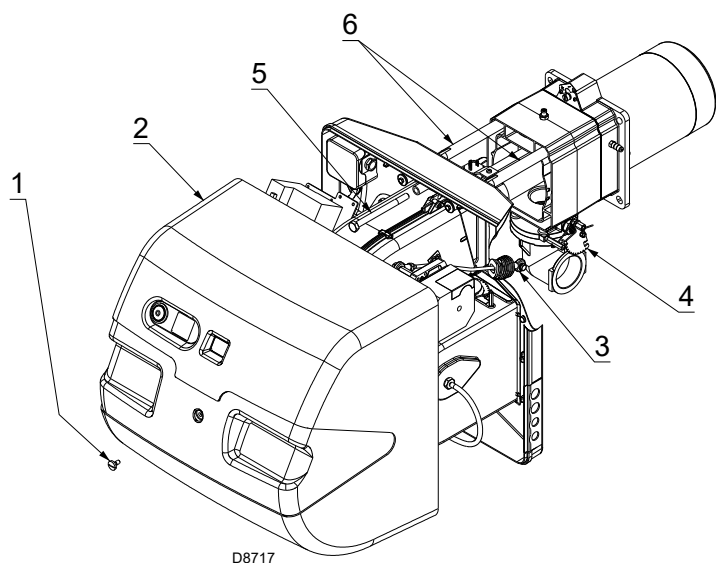
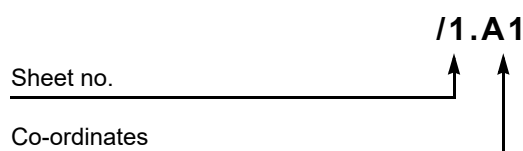


Fig. 38

1	Index of layouts
2	Indication of references
3	Functional layout
4	Functional layout
5	Electrical wiring that the installer is responsible for
6	Functional layout RWF50...

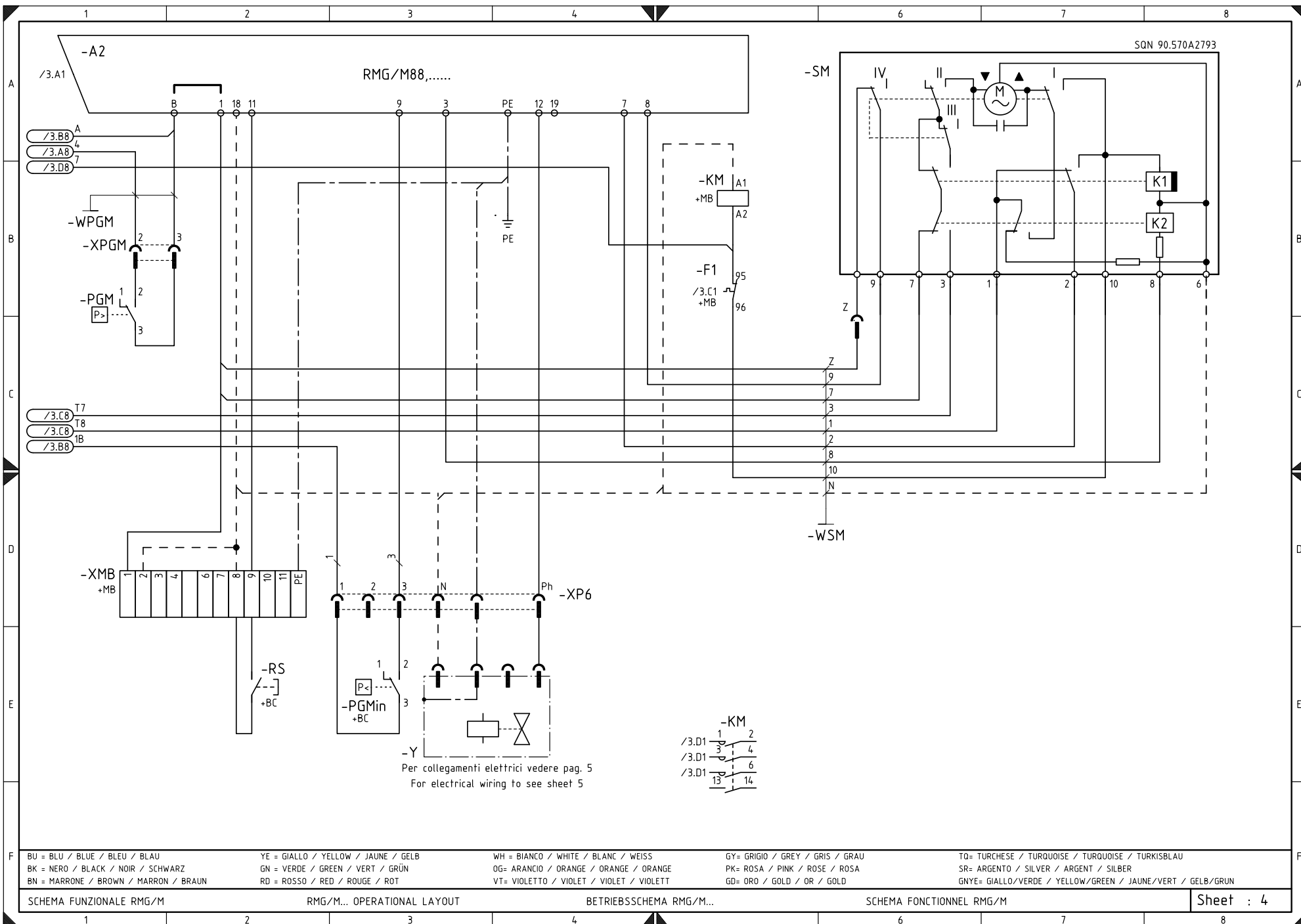
2 Indication of references

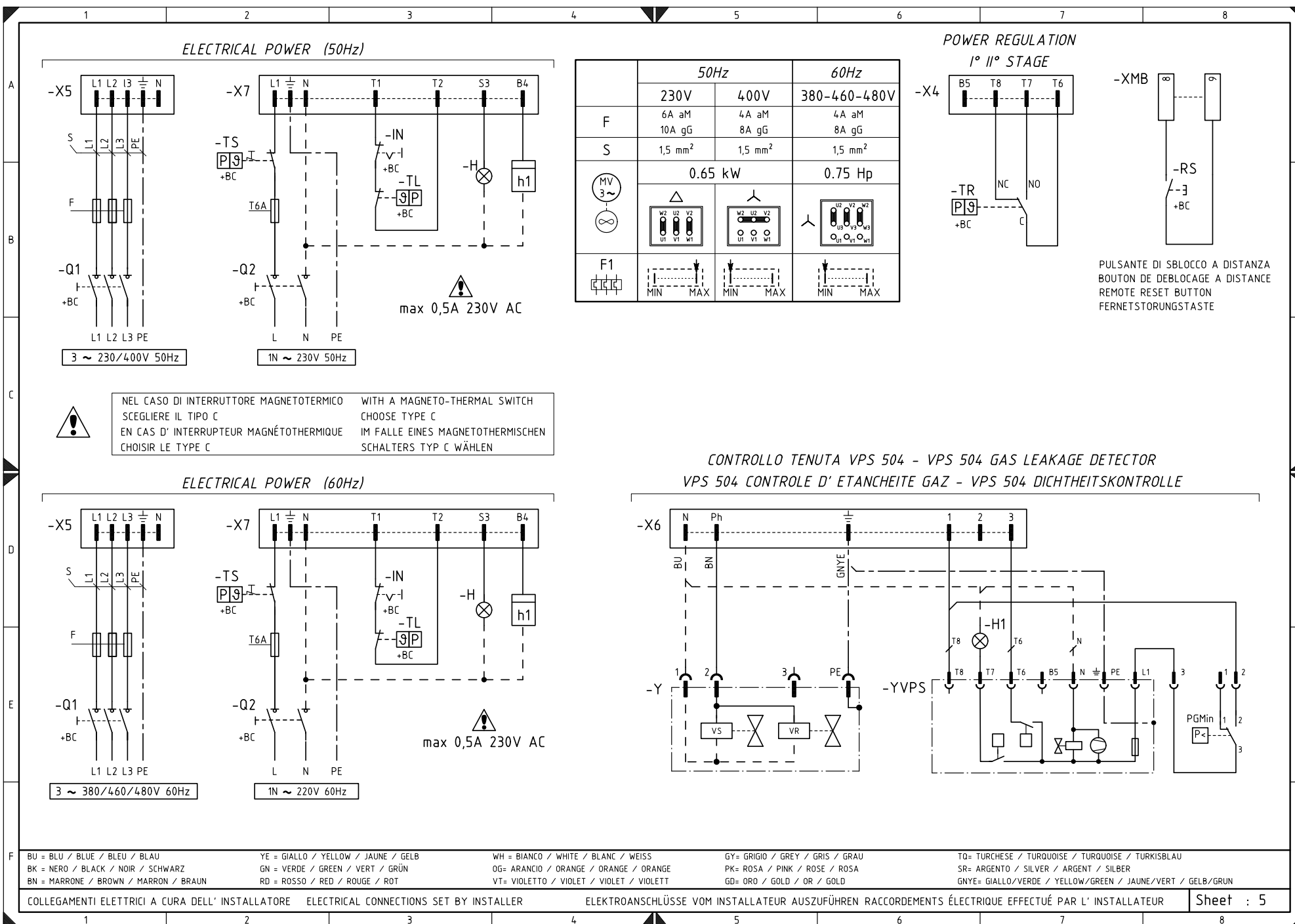


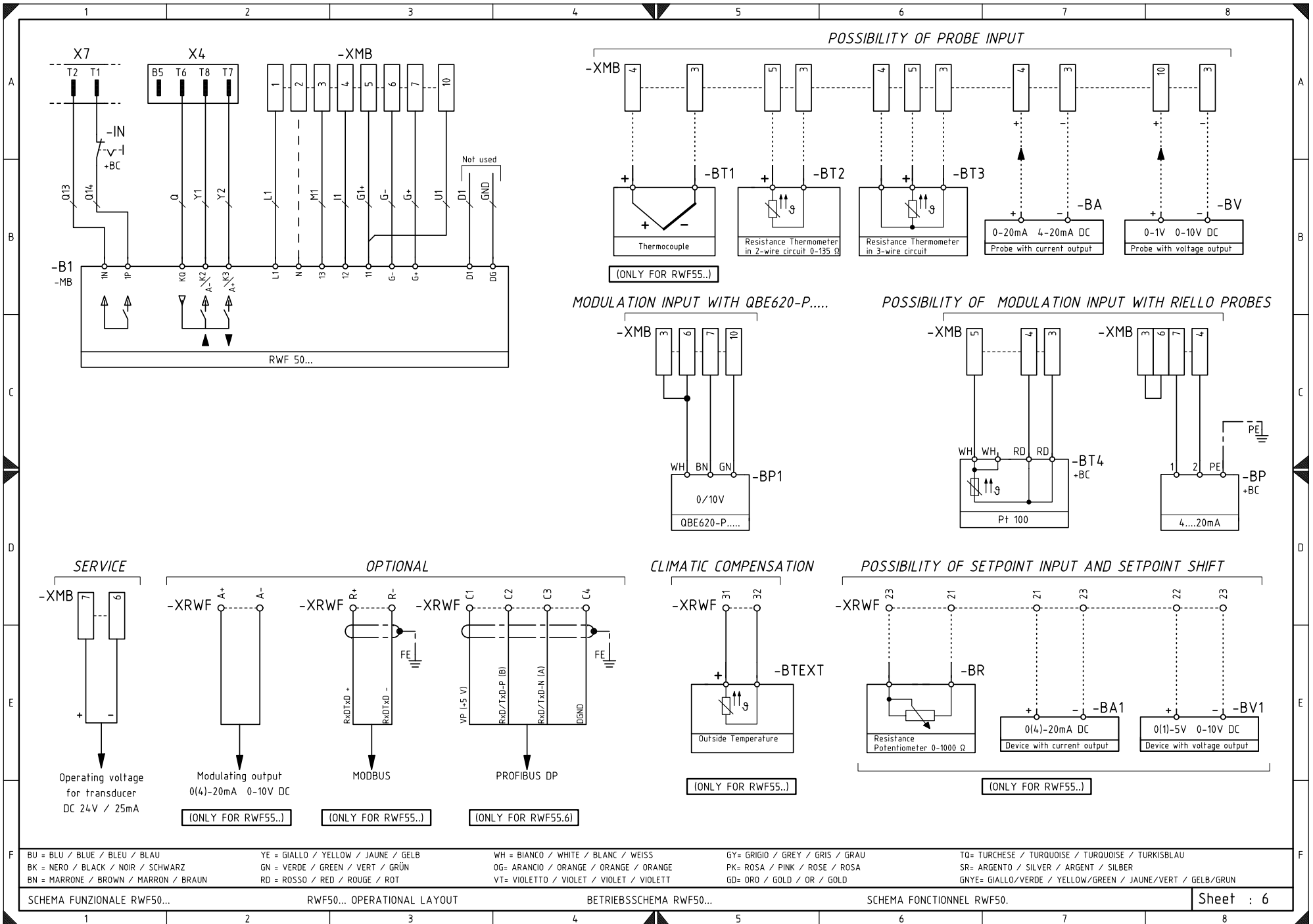
Wiring layout key

A2	- Electrical control box	PA	- Air pressure switch
B	- Filter to protect against radio disturbance	PE	- Burner earth
B1	- Output regulator RWF	PGM	- Maximum gas pressure switch
BA	- Input in current DC 4...20 mA	PGMin	- Minimum gas pressure switch
BA1	- Input in current DC 4...20 mA to modify remote set-point	Q1	- Three-phase disconnecting switch
BP	- Pressure probe	Q2	- Single phase disconnecting switch
BP1	- Pressure probe	RS	- Remote burner reset button
BR	- Remote setpoint potentiometer	S1	- Off / automatic / manual selector
BTEXT	- External probe for climatic compensation of the set-point	S2	- Power increase - power reduction selector
BT1	- Thermocouple probe	SM	- Servomotor
BT2	- Probe Pt100, 2 wires	TA	- Ignition transformer
BT3	- Probe Pt100, 3 wires	TL	- Limit thermostat/pressure switch
BT4	- Probe Pt100, 3 wires	TR	- Adjustment thermostat/pressure switch
BV	- Input in voltage DC 0...10V	TS	- Safety thermostat/pressure switch
BV1	- Input in voltage DC 0...10V to modify remote setpoint	Y	- Gas adjustment valve + gas safety valve
+BB	- Burners components	YVPS	- Valve leak detection device
+BC	- Boiler components	XMB	- Terminal board
CN1	- Ionisation probe connector	XPGM	- Maximum gas pressure switch connector
F1	- Fan motor thermal relay	XP4	- 4 pole socket
H	- Remote lockout signalling	XP5	- 5 pole socket
H1	- Lockout YVPS	XP6	- 6 pole socket
IN	- Burner manual stop switch	XP7	- 7 pole socket
ION	- Ionisation probe	X4	- 4 pin plug
h1	- Hour counter	X5	- 5 pin plug
K1	- Relay	X6	- 6 pin plug
KM	- Motor contact maker	X7	- 7 pin plug
MV	- Fan motor	XRWF	- Terminal board RWF









Output power regulator kit for modulating operation

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

Two components should be ordered:

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

Parameter to be checked		Probe		Output regulator	
	Adjustment field	Type	Code	Type	Code
Temperature	- 100...+ 500°C	PT 100	3010110	RWF50...	20082208
Pressure	0...2.5 bar	Output probe	3010213	RWF55...	20099657
	0...16 bar	4...20mA	3010214		

Potentiometer kit for the indication of load position

Burner	Kit code
RS 50/M MZ	3010109

RMG to PC interface adapter kit

Burner	Kit code
RS 50/M MZ	3002719

Clean contacts kit

Burner	Kit code
RS 50/M MZ	3010419

Gas trains in compliance with standard EN 676 (complete with valves, pressure adjuster and filter)

Gas train - burner adapters

Gas train			Gas train - burner adapter
Code	Model	Ø	Code
3970554	MB-DLE 410	1"1/4	3000824
3970144	MB-DLE 412	1"1/4	-
3970197	MB-DLE 412 CT	1"1/4	-
3970180	MB-DLE 415	1"1/2	-
3970198	MB-DLE 415 CT	1"1/2	-
3970181	MB-DLE 420	2"	3000822
3970182	MB-DLE 420 CT	2"	3000822
3970221	MBC-1200-SE-50	2"	3000822
3970225	MBC-1200-SE-50 CT	2"	3000822

Kit for LPG operation

Burner	Combustion head	Kit code	Obtainable output with the kit
RS 50/M MZ	TC - TL	20008173	125/285 ÷ 630 kW

Kit for TOWN GAS operation - not EC type-approved

Burner	Combustion head	Kit code
RS 50/M MZ	TC	3010285
RS 50/M MZ	TL	

Long head kit

Burner	Kit code	Standard head length	Head length obtained with the kit
RS 50/M MZ	3010078	216 mm	351 mm

Spacer kit

Burner	Kit code	Thickness
RS 50/M MZ	3010095	90 mm

Continuous purging kit

Burner	Kit Code
RS 50/M MZ	3010094

Soundproofing chamber

Burner	Kit code	Type	Reduction of noise average
RS 50/M MZ	3010403	C1/3	10 [dB(A)]

Vibration reduction kit (for flame inversion boilers)

Burner	Kit code
RS 50/M MZ	3010200

Radio disturbance protection kit

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.

Burner	Kit code
RS 50/M MZ	3010386

The table shows minimum load losses along the gas supply line depending on the maximum burner output operation.

kW	1 Δp (mbar)	
	G20	G25
290	2.5	3.5
322	3.1	4.3
354	3.8	5.3
387	4.4	6.2
419	5.1	7.1
451	5.7	8
483	6.4	9
516	7.1	9.9
548	7.7	10.8
580	8.4	11.8

The values shown in Table refer to:

- Natural gas G 20 NCV 10 kWh/Sm³ (8.6 Mcal/Sm³)
- Natural gas G 25 NCV 8.6 kWh/Sm³ (7.4 Mcal/Sm³)

Column 1

Combustion head pressure drop.

Gas pressure measured at test point 1)(Fig. 39), with:

- combustion chamber at 0 mbar;
- burner working at maximum output
A = Gas ring nut 2)(Fig. 15 on page 13) adjusted as per diagram (Fig. 16 on page 13).
B = Gas ring nut 2)(Fig. 15 on page 13) adjusted on zero.

Column 2

Pressure loss at gas butterfly valve 2)(Fig. 14 on page 20) with maximum opening: 90°.

To calculate the approximate output at which the burner operates in the 2nd stage:

- subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 39).
- Find in Table related to the burner concerned, the pressure value closest to the result of the subtraction.
- Read the corresponding output on the left.

Example:

Natural gas G 20 NCV 10 kWh/Nm³

Gas ring nut 2)(Fig. 15 on page 13) adjusted as per diagram (Fig. 16 on page 13).

Gas pressure at test point 1)(Fig. 39) = 6.4 mbar

Pressure in combustion chamber = 2.0 mbar

6.4 - 2.0 = 4.4 mbar

A pressure of 4.4 mbar, column 1, corresponds in table to an output of 387 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. 39), set the maximum output required from the burner operation:

- find the nearest output value in the table.
- Read off the pressure at test point 1)(Fig. 39) on the right in column 1.
- Add this value to the estimated pressure in the combustion chamber.

Example:

Required burner maximum output operation: 387 kW

Natural gas G 20 NCV 10 kWh/Nm³

Gas ring nut 2)(Fig. 15 on page 13) adjusted as per diagram (Fig. 16 on page 13).

Gas pressure at an output of 387 kW (Table) = 4.4 mbar

Pressure in combustion chamber = 2.0 mbar

4.4 + 2.0 = 6.4 mbar

pressure required at test point 1)(Fig. 39).

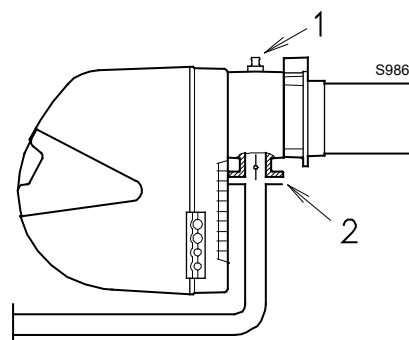


Fig. 39

The firing rate of the burner shown in the manual is valid for an ambient temperature of 20°C and an altitude of 0 m above sea level (barometric pressure around 1013 mbar).

It may be 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 the table alongside.
- 2 -Divide the output Q required from the burner by F to obtain the equivalent output Q_e:

$$Q_e = Q : F \text{ (kW)}$$

- 3 -In the firing rate of the burner, mark the work point identified by:

Q_e = equivalent output

H₁ = pressure in combustion chamber

point A that must remain within the firing rate (Fig. 40).

- 4 -Trace a vertical line from point A, Fig. 40, 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

$$H_3 = H_2 \times F \text{ (mbar)}$$

If H₃ is greater than H₁, as in Fig. 40, the burner can produce the delivery requested.

If H₃ is less than H₁, it is necessary to reduce the output of the burner. The reduction in output is accompanied by a reduction in the combustion chamber pressure:

Q_r = reduced output

H_{1r} = reduced pressure

$$H_{1r} = H_1 \times \left(\frac{Q_r}{Q} \right)^2$$

Example, 5% reduction in output:

$$Q_r = Q \times 0.95$$

$$H_{1r} = H_1 \times (0.95)^2$$

With the new values - Q_r and H_{1r} - repeat steps 2 - 5.

Warning:

the combustion head should be adjusted in relation to the equivalent output Q_e.

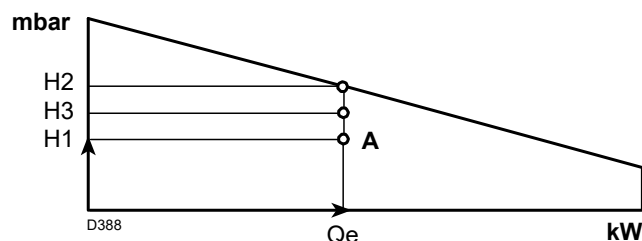


Fig. 40

Altitude m. above sea level	Average barometric pressure mbar	F							
		Air temperature °C							
		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