

## **GB** Forced draught gas burners

Progressive two-stage or modulating operation



Code	Model	Type
3781632	RS 50/E MZ	826 T2
3781633	RS 50/E MZ	826 T2

Manufacturer: RIELLO S.p.A.  
Address: Via Pilade Riello, 7  
37045 Legnago (VR)  
Product: Forced draught gas burner  
Model: RS 50/E MZ

These products are in compliance with the following Technical Standards:

EN 676  
EN 292

According to the European Directives:

GAD	2009/142/EC	Gas Devices Directive
MD	2006/42/EC	Machine Directive
LVD	73/23/EEC - 2006/95/EC	Low Voltage Directive
EMC	89/336/EEC - 2004/108/EC	Electromagnetic Compatibility

Such products are marked as follows:



CE-0085XXXXXX

Legnago, 22.06.2007

Mr. G. Conticini  
Burners Division Department

A handwritten signature in black ink, appearing to read 'G. Conticini', with a horizontal line underneath.

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

Section		Page
<b>1</b>	<b>Information and general warnings</b>	<b>4</b>
	1.1 Information about the instruction manual	4
	1.2 Guarantee and responsibility	4
<b>2</b>	<b>Safety and prevention</b>	<b>5</b>
	2.1 Introduction	5
	2.2 Personnel training	5
<b>3</b>	<b>Technical description of the burner</b>	<b>6</b>
	3.1 Burner designation	6
	3.2 Models available	6
	3.3 Burner categories - Countries of destination	6
	3.4 Technical data	7
	3.5 Burner weight	7
	3.6 Overall dimensions	7
	3.7 Firing rate	8
	3.8 Burner components	9
	3.9 Burner equipment	9
	3.10 Control box for the air/fuel ratio	10
	3.11 Servomotors	11
<b>4</b>	<b>Installation</b>	<b>12</b>
	4.1 Notes on safety for the installation	12
	4.2 Handling	12
	4.3 Preliminary checks	12
	4.4 Operating position	13
	4.5 Securing the burner to the boiler	13
	4.6 Combustion head adjustment	15
	4.7 Assembly of the gas train	17
	4.8 Electrical wiring	18
	4.9 Calibration of the thermal relay	19
<b>5</b>	<b>Start-up, calibration and operation of the burner</b>	<b>20</b>
	5.1 Notes on safety for the first start-up	20
	5.2 Operations before start-up	20
	5.3 Burner start-up	21
	5.4 Final calibration of the pressure switches	21
	5.5 Operator panel with LCD display	23
	5.6 Visualisation and programming modes	24
	5.7 Operation sequence of the burner	29
	5.8 Start-up procedure	30
	5.9 CALC function	32
	5.10 Burner adjustment	32
	5.11 Steady state operation	33
	5.12 Ignition failure	33
	5.13 Burner flame goes out during operation	33
	5.14 Stopping of the burner	33
	5.15 Measuring the ionisation current	33
	5.16 Checking the air and gas pressure on the combustion head	33
	5.17 Final checks (with burner operating)	34
	5.18 List of parameters	34
<b>6</b>	<b>Faults - Probable causes - Solutions</b>	<b>38</b>
	6.1 List of error codes	38
<b>7</b>	<b>Maintenance</b>	<b>42</b>
	7.1 Notes on safety for the maintenance	42
	7.2 Maintenance programme	42
	7.3 Opening the burner	43
	7.4 Closing the burner	43
<b>A</b>	<b>Appendix - Electrical panel layout</b>	<b>44</b>
<b>B</b>	<b>Appendix - Accessories (on request)</b>	<b>51</b>
<b>C</b>	<b>Appendix - Gas supply pressure</b>	<b>53</b>
<b>D</b>	<b>Appendix - Firing rate on basis of air density</b>	<b>54</b>

## 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 for 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 consigned 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 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

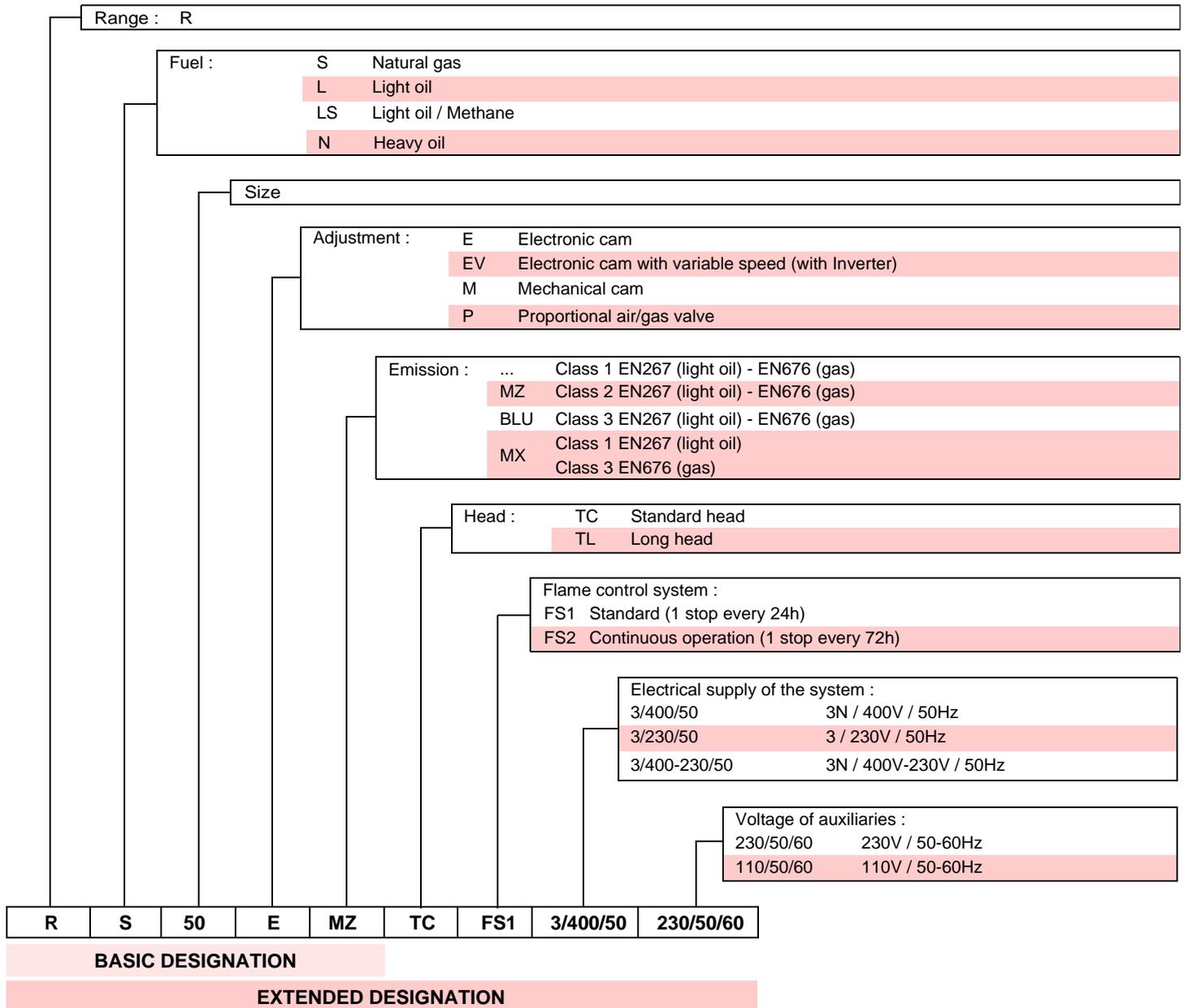
The user is the person, body or company that has acquired the machine and intends to use it for the specific purpose. He is responsible for the machine and for the training of the people working around it.

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 are obliged to inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and every responsibility for any damage that may be caused by the use of non-original parts.

## 3.1 Burner designation



## 3.2 Models available

Designation	TC	TL	Voltage	Code
RS 50/E MZ	TC		3 ~ 400 / 230V - 50Hz	3781632
RS 50/E MZ		TL	3 ~ 400 / 230V - 50Hz	3781633

## 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	I <sub>2</sub> H
DE	I <sub>2</sub> ELL
NL	I <sub>2</sub> L
FR	I <sub>2</sub> Er
BE	I <sub>2</sub> E(R)B
LU	I <sub>2</sub> E

## 3.4 Technical data

Model			RS 50/E MZ
Type			826 T2
Output <sup>(1)</sup>	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 <sup>(2)</sup> - 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
Electrical supply			3 ~ 400V / 230 V 1N ~ 230V +/-10% 50 Hz (See Chap. 3.2)
Fan motor (rating)		rpm	2800
		V	230/400
Operating current		kW	0,65
		A	3 - 1.7
Acceleration current	A		15 - 8.5
Ignition transformer	V1 - V2	220/240 V - 1 x 15 kV	
		I1 - I2	45 VA - 25 mA
Absorbed electrical power	kW max		1.09
Protection level			IP 44
Noise level <sup>(3)</sup>	dBA		72,0
Type-approval	class 2 (EN 676)	EC	in progress

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

<sup>(2)</sup> Gas pressure on the pipe coupling test point 20) (Fig. 5) with zero pressure in the combustion chamber and at maximum burner output.

<sup>(3)</sup> Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum output.

## 3.5 Burner weight

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

mm	kg <sup>(1)</sup>
RS 50/E MZ	41 - 43

(1) Blast tube: short-long

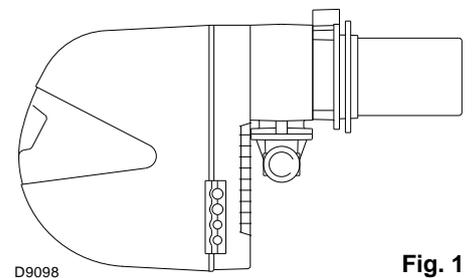


Fig. 1

## 3.1 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.

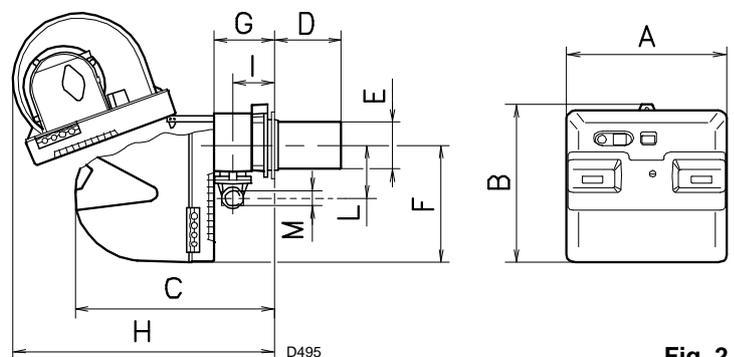


Fig. 2

mm	A	B	C	D <sup>(1)</sup>	E	F	G	H	I	L	M
RS 50/E MZ	476	474	565	240 - 375	152	352	140	800	86	168	1"1/2

(1) Blast tube: short-long

3.1 Firing rate

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.

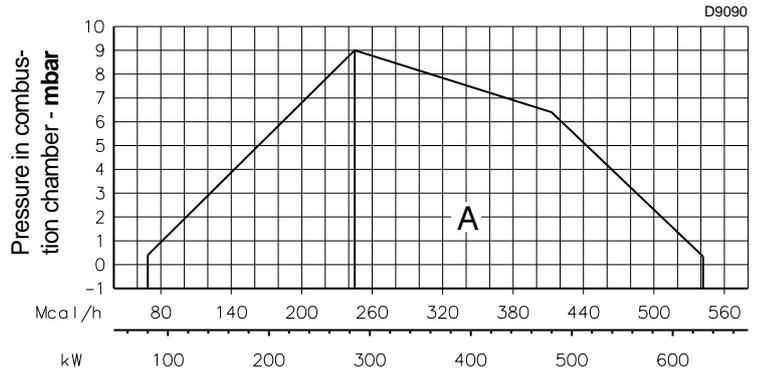


Fig. 3

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.

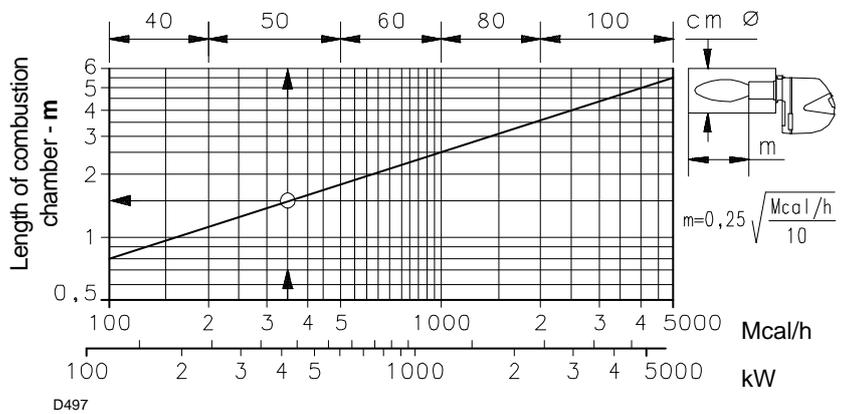


Fig. 4

## 3.8 Burner components

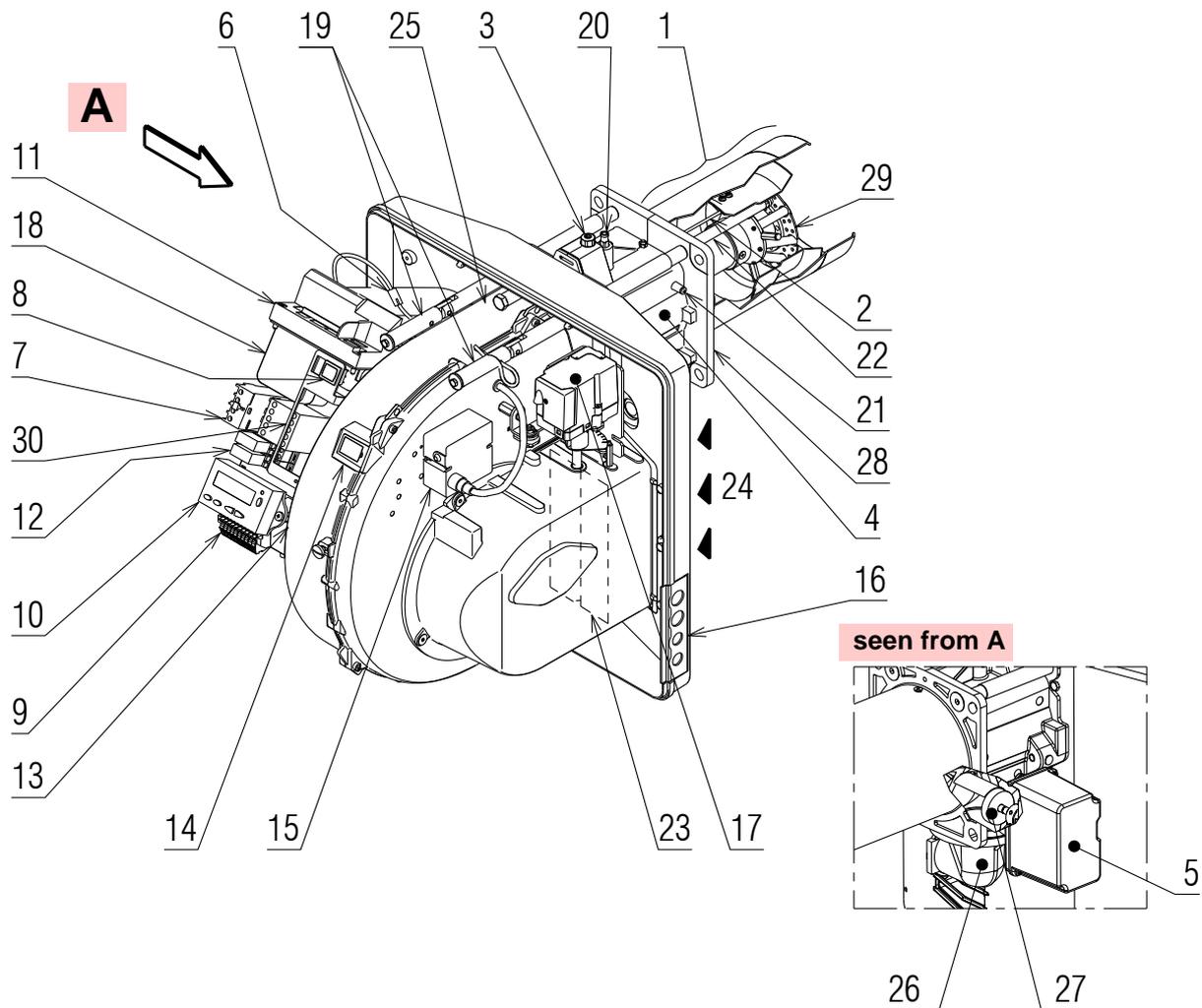


Fig. 5

D8741

- |  |  |  |
|--|--|--|
| 1 Combustion head                                    | 13 Filter to protect against radio disturbance                               | 21 Air pressure socket                                     |
| 2 Ignition electrode                                 | 14 Flame inspection window   | 22 Flame sensor probe                                      |
| 3 Screw for combustion head adjustment               | 15 Ignition transformer  | 23 Air damper  |
| 4 Pipe coupling                                      | 16 Cable grommets for electrical wiring (to be carried out by the installer) | 24 Fan air inlet   |
| 5 Gas servomotor                                     | 17 Air servomotor  | 25 Screw securing fan to pipe coupling                     |
| 6 Plug-socket on ionisation probe cable              | 18 Air pressure switch   | 26 Gas input pipe  |
| 7 Motor relay  | 19 Slide bars for opening the burner and inspecting the combustion head      | 27 Gas regulator   |
| 8 1-0 Operation on/off switch                        | 20 Gas pressure test point and head fixing screw                             | 28 Boiler fixing flange                                    |
| 9 Terminal board for electrical wiring               |  | 29 Flame stability disc                                    |
| 10 Operator panel with LCD display                   |  | 30 Bracket for application of output power regulator RWF40 |
| 11 Control box for checking flame and air/fuel ratio |  |  |
| 12 Clean contacts relay                              |  |  |

## 3.9 Burner equipment

The burner is supplied complete with:

- Gas train flange
- Flange gasket
- 4 screws to fix the flange: M8 x 25
- 4 screws to fix the burner flange to the boiler: M8 x 25
- Thermal insulation screen
- N° 4 plugs for electrical wiring
- Instruction manual
- Spare parts list



### 3.11 Servomotors

#### Introduction

The servomotors that equip the burners of the **RS** range work directly on the air damper and the gas butterfly valve, without mechanical lever-ages but via the interposition of a coupling.

They are commanded by the control box, which constantly checks their position by means of a return signal from the optic sensor inside the servomotor.

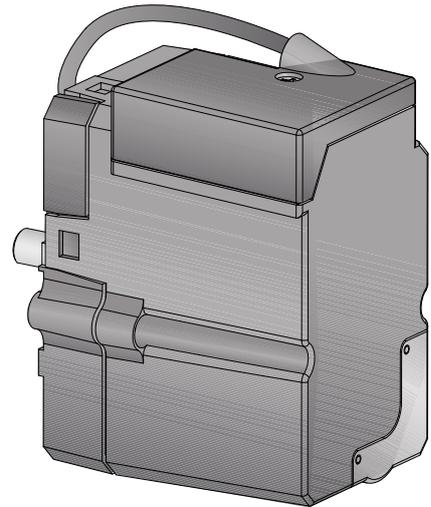


**For this reason it is absolutely forbidden to remove the cover of the servomotors.**

The position (in degrees) of the servomotors can be seen on the display of the operator panel. See Ch. 5.18, Parameter 922, index “0” for fuel servomotor, index “1” for air servomotor.

The servomotors are electrically connected to the control box by means of RAST 2.5 type connectors.

**When servicing or replacing the servomotors, take care not to invert the connectors.** Follow the indications given in the electrical layouts or the silkscreen printing on the control box cover.



D8083

Fig. 7

#### Technical data

	Fuel servomotor	Air servomotor
Model	SQN13.1..	SQN13.1..
Type of motor	Stepping motor	
Electrical supply	AC/DC 24V	
Protection level	IP40	
Firing rate	0 - 90°	
Opening time 0 - 90°	min: 5 s, max.: 120 s depending on the type of control box	
Torque	0.7 Nm	0.7 Nm
Input power	7.5W	7.5W
Rotation	Anti-clockwise	

**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.

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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.

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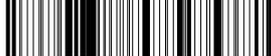


The packaging elements (wooden cage or cardboard box, nails, clips, plastic bags, etc.) must not be abandoned as they are potential sources of danger and pollution; they should be collected and disposed of in the appropriate places.

**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 burner output must be within the boiler's firing rate;
- the category of the appliance/countries of destination (**I**).

R.B.L.	<b>A</b>	<b>B</b>	<b>C</b>
<b>D</b>	<b>E</b>	<b>F</b>	<b>H</b>
GAS-KAASU <input checked="" type="checkbox"/>	<b>G</b>	<b>H</b>	<b>H</b>
GAZ-AEPIO	<b>G</b>	<b>H</b>	<b>H</b>
<b>I</b>			RIELLO S.p.A. 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 operate 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.

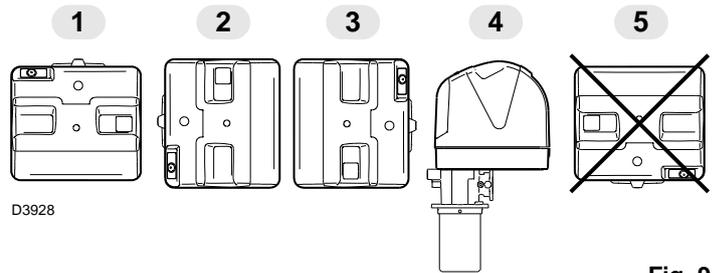


Fig. 9

#### 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.

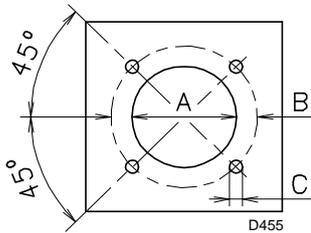


Fig. 10

mm	A	B	C
RS 50/E MZ	160	224	M 8

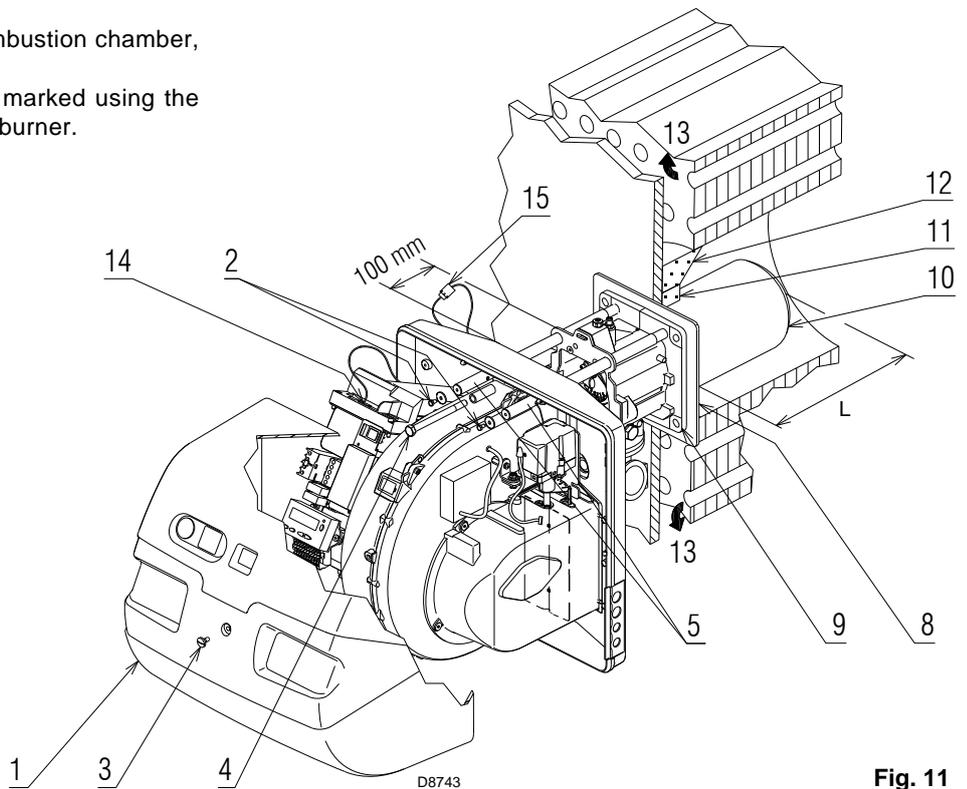


Fig. 11

##### 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 lengths L available are:

Blast tube 10)	RS 50/E MZ
• short	216 mm
• long	351 mm

For boilers with front flue passes 13), a protection in refractory material 11) must be inserted between the boiler refractory 12) and the blast tube 10). This protection must not compromise the extraction of the blast tube. 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.

### 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:

- loosen the screw 3) and remove the hood 1);
- remove the screws 2) from the two guides 5);
- disconnect the plug 14), unscrew the grommet 15);
- remove the screw 4);
- pull back the burner on the guides 5) by about 100 mm;
- disconnect the probe and electrode cables and remove the entire burner from the guides, after having removed the split pin from the guide 5).

Fix the flange 9)(Fig.11) to the boiler plate, interposing the supplied insulating gasket 8)(Fig.11).

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. 5.8), check there is no leakage of flue gases into the external environment.

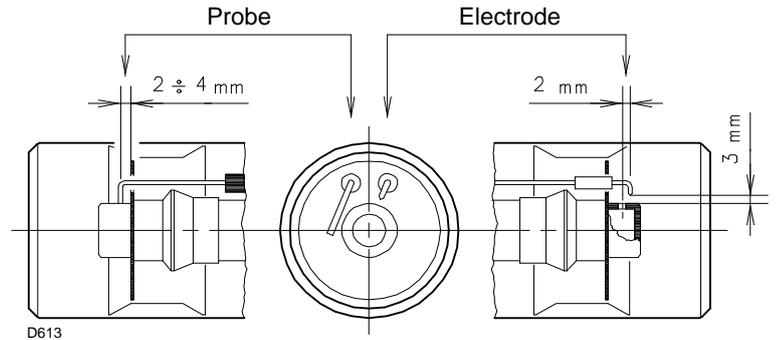


Fig. 12

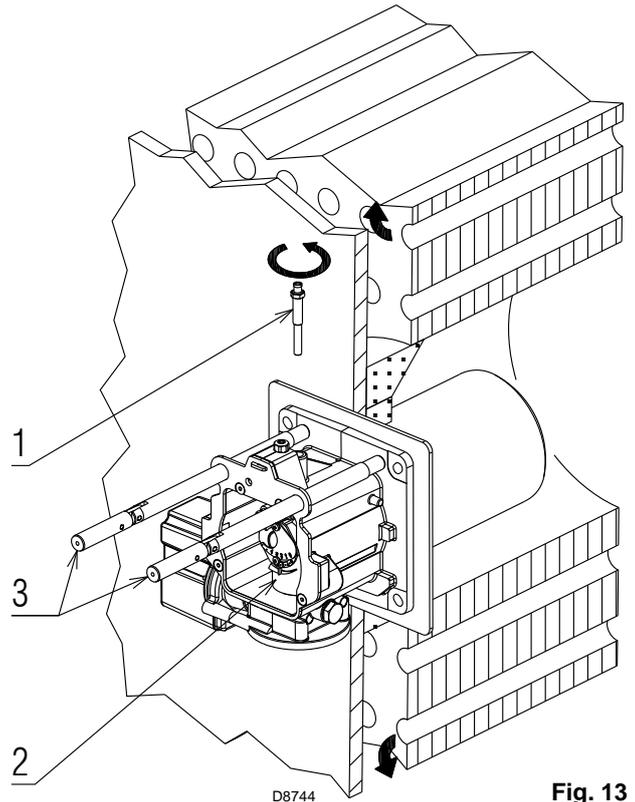


Fig. 13

#### 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. 14  
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. 15, 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.



**Important**  
To facilitate adjustment, loosen the screw 6), adjust and then lock.

##### 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 its 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. 14.

The loss of pressure in the combustion head is shown in column 1 on page 53.

##### **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 the pressure indicated on page 53 in MAX gas cannot be reached.

To continue the preceding example, on page 53, it can be seen that 5.4 mbar of pressure in socket 6) are needed for a burner with a 460 kW output. 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.

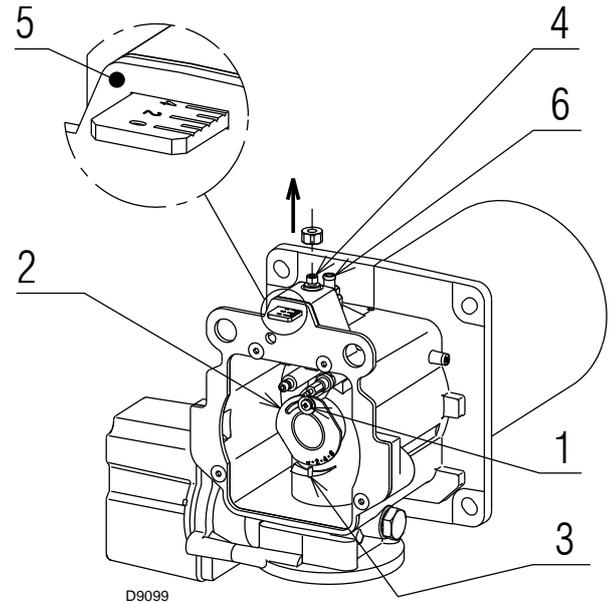


Fig. 14

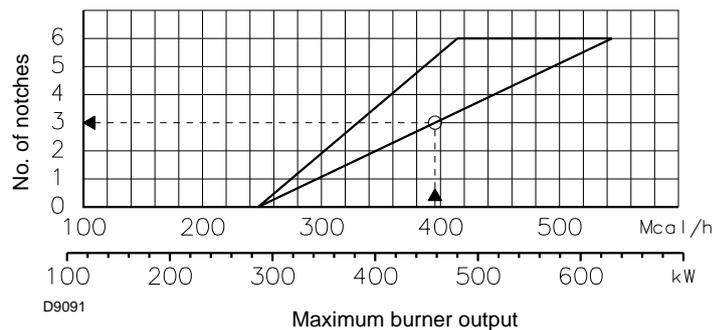


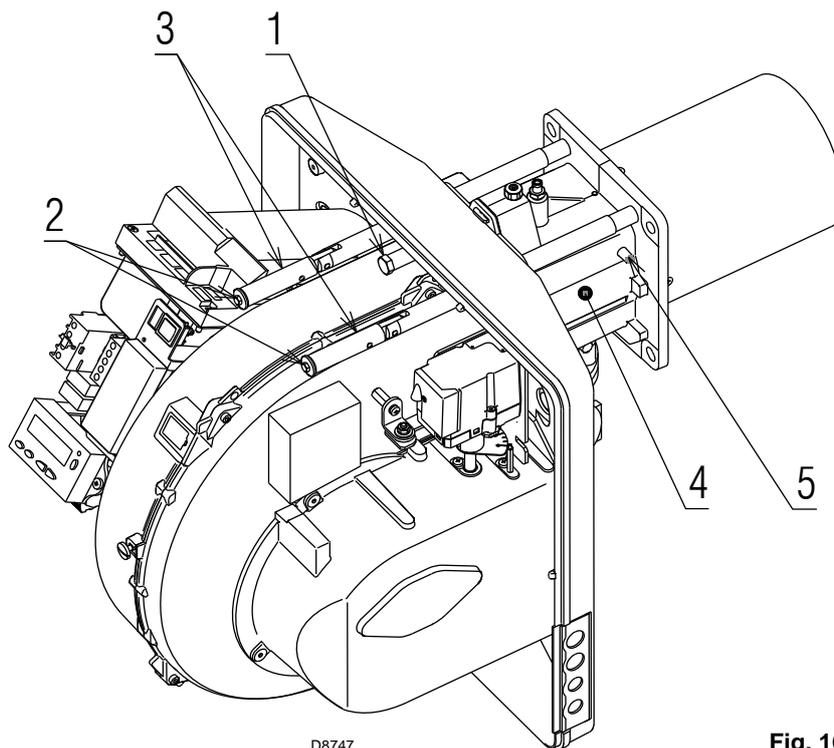
Fig. 15

Once the combustion head adjustment is completed:

- reassemble the burner on the guides 3) at about 100 mm from the pipe coupling 4) - 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. 16;
- connect the plug of the servomotor 14)(Fig. 11) and tighten the cable grommet 15)(Fig. 11);
- refit the screws 2) and the split pin on the guides 3);
- fix the burner to the pipe coupling with the screw 1).



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



D8747

Fig. 16

### 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. 17.
- The gas train must be connected to the gas attachment 1)(Fig. 17) 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 to the burner is within the calibration range of the pressure adjuster.

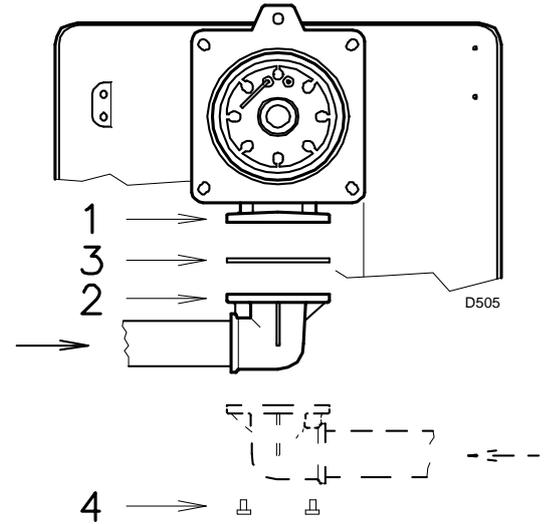


Fig. 17



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

- 1 - Gas input pipe
- 2 - Manual valve
- 3 - Vibration damping joint
- 4 - Pressure gauge with pushbutton cock
- 5 - Filter
- 6 - Pressure adjuster (vertical)
- 7 - Minimum gas pressure switch
- 8 - Safety solenoid VS (vertical)
- 9 - Adjustment solenoid VR (vertical)
- 10 - Two adjustments:
  - ignition delivery (rapid opening)
  - maximum delivery (slow opening)
- 11 - Standard issue burner gasket with flange
- 12 - Gas adjustment butterfly valve
- 13 - Burner
- 14 - Valve 8)-9) leak detection control device. In compliance with the EN 676 standard, gas valve leak detection control devices are compulsory for burners with maximum outputs over 1200 kW.
- 15 - Gas train/burner adaptor
- 16 - Maximum gas pressure switch
- 17 - P1-Pressure at combustion head
- 18 - P2-Pressure down-line from the pressure adjuster
- 19 - P3-Pressure upline the filter
- L - Gas train supplied separately with the code indicated in Appendix B
- L1 - The responsibility of the installer

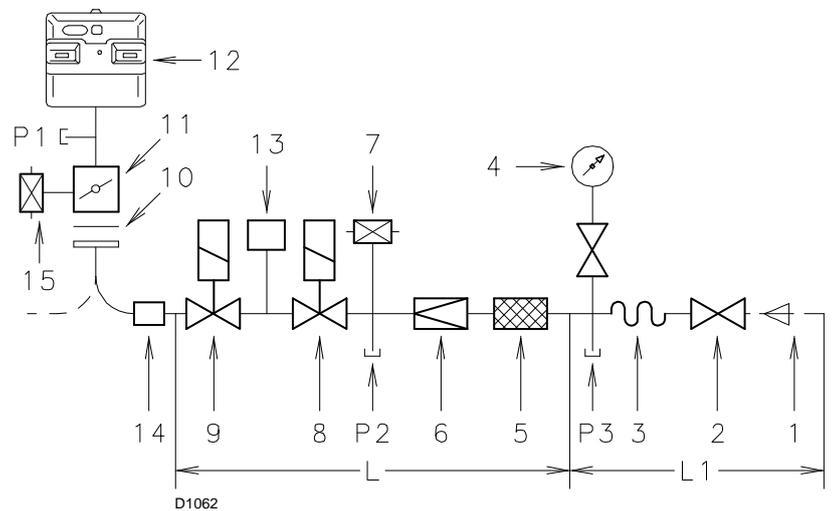


Fig. 18

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

## 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 firing failure.
- The RS 50/E MZ burner has been approved for internal use.  
This means that it 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 stopping 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 devices.
- The electrical system must be suitable for the maximum input power of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for the input power of the device.
- For the main power supply of the device from the electricity mains:
  - do not use adapters, multiple sockets or extensions;
  - use a multiple pole switch with at least a 3 mm gap between the contacts (overvoltage category: III), as foreseen by the present safety standards.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.



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) 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.

See Fig. 19.

The use of the cable grommets and the pre-blanked holes can be done in different manners; By way of example we indicate the following mode:

**RS 50/E MZ**

- 1 - Pg 11 Three-phase power supply
- 2 - Pg 11 Gas valves
- 3 - Pg 9 Thermostat/Pressure switch TL
- 4 - Pg 9 Thermostat/Pressure switch TR
- 5 - Pg 11 Gas pressure switch for valve leak detection

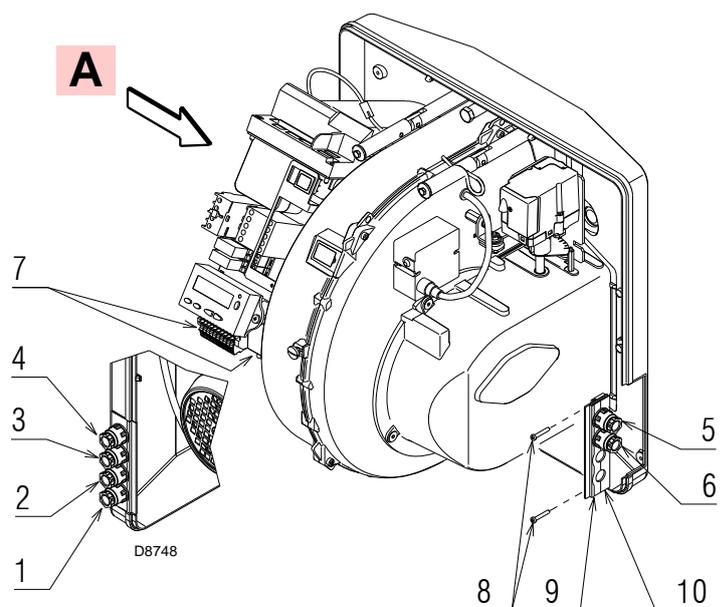


Fig. 19

**NOTE - Modulating operation**

If connecting the output power regulator kit RWF40, the TR thermostat/pressure switch and the TL thermostat/pressure switch must be removed.

#### 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.

Refer to the table in wiring diagram 6 of Appendix A for the calibration.

- If the motor is star-driven, **400 V**, the cursor must be positioned on "MIN".
  - If it is delta-driven, **230 V**, the cursor is positioned 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.

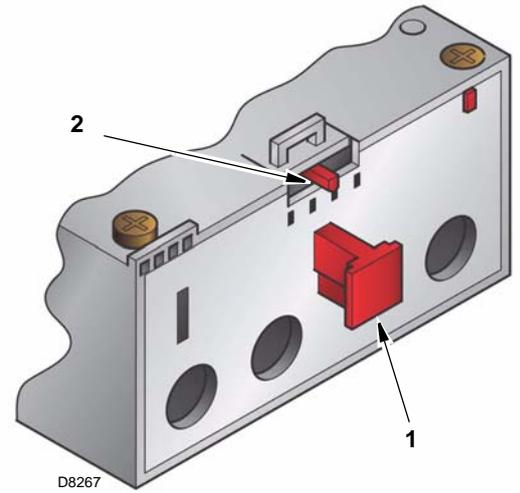


Fig. 20

### 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.

### 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. 21) to the start of the scale.
- Adjust the maximum gas pressure switch (Fig. 22) to the end of the scale.
- Adjust the air pressure switch (Fig. 23) to the start of the scale.
- Adjust the pressure switch for the valve leak detection control device (PVP kit) (Fig. 24), if present, according to the instructions supplied with the kit itself.

Minimum gas pressure switch

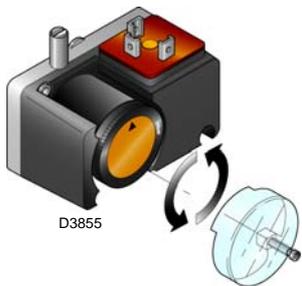


Fig. 21

Maximum gas pressure switch

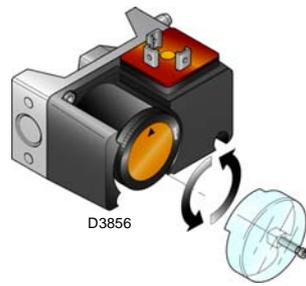


Fig. 22

Air pressure switch



Fig. 23

Pressure switch PVP kit

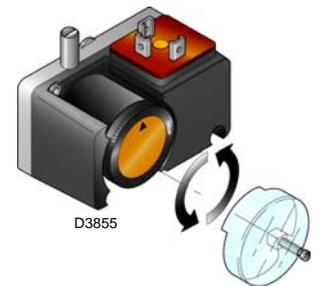


Fig. 24

- 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.**

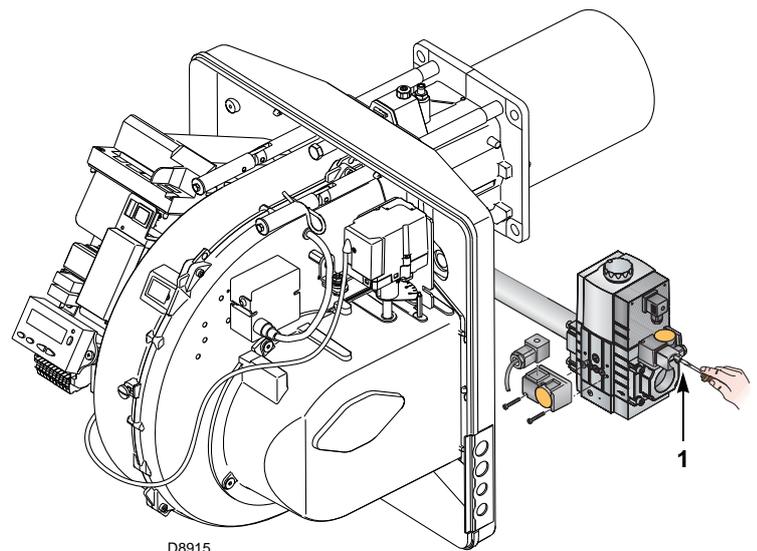


Fig. 25

### 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. 26 to position "1".



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.

Carry out the "Start-up procedure", as described on page 30.

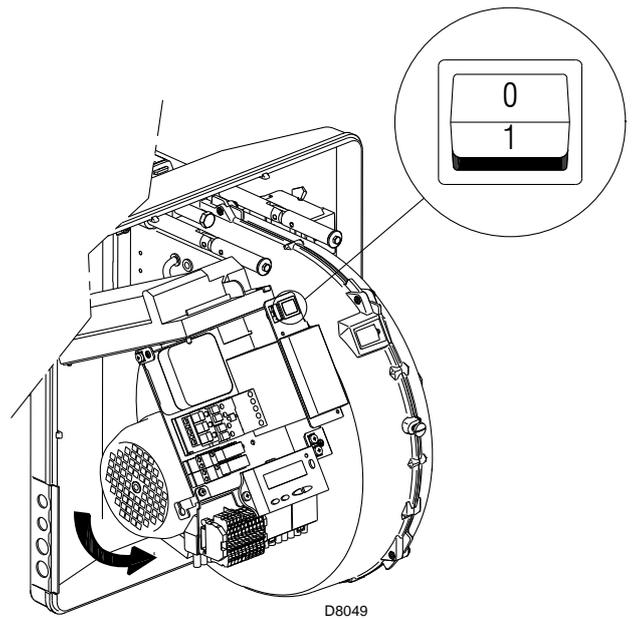


Fig. 26

### 5.4 Final calibration of the pressure switches

#### Air pressure switch

Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (Fig. 27).

With the burner working at MIN output, insert a combustion analyser in the stack, slowly close the suction inlet of the fan (for example, with a piece of cardboard) until the CO value does not exceed 100 ppm.

Slowly turn the appropriate knob clockwise until the burner goes into lockout.

Check the indication of the arrow pointing upwards on the graduated scale (Fig. 27). Turn the knob clockwise again, until the value shown on the graduated scale corresponds with the arrow pointing downwards, and so recovering the hysteresis of the pressure switch (shown by the white mark on a blue background, between the two arrows).

Now check the correct start-up of the burner.

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

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

The connection of the pressure gauge is shown in Fig. 27.

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

In certain applications in strong depression situations, the connection of the pressure switch does not allow it to change over. In this case it is necessary to connect the pressure switch in differential mode, applying a second tube between the air pressure switch and the fan suction line mouth. In this case also, the pressure gauge must be connected in differential mode, as shown in Fig. 27.

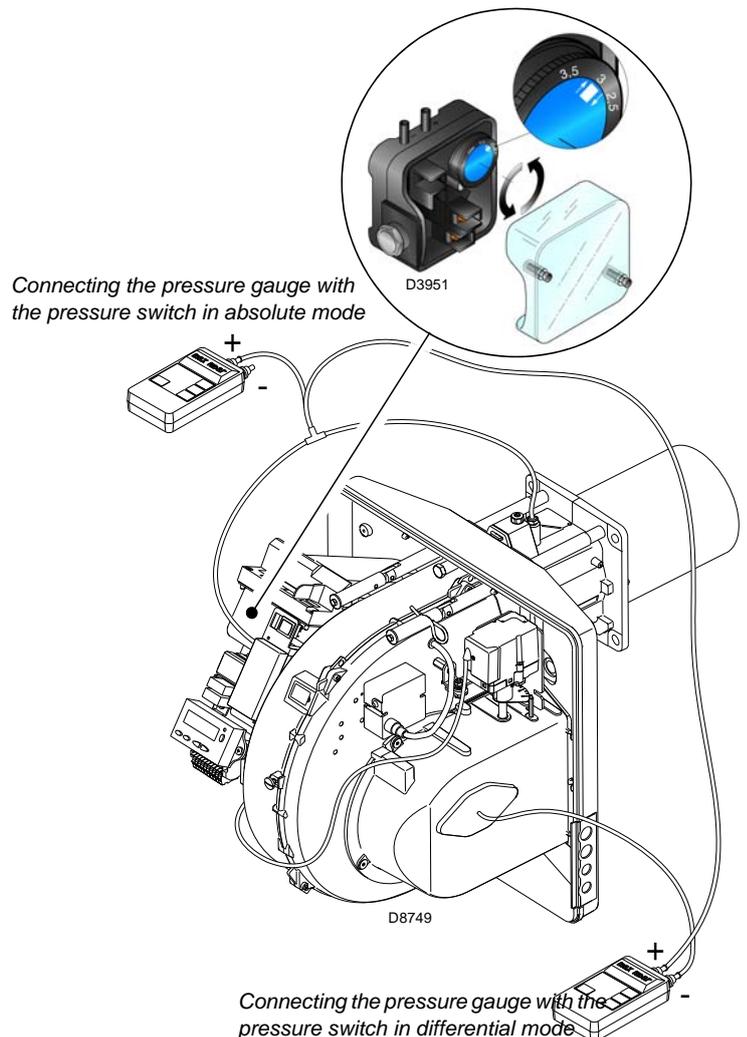


Fig. 27

**Maximum gas pressure switch**

Adjust the maximum gas pressure switch after having performed all other burner adjustments with the maximum gas pressure switch set to the end of the scale (Fig. 28).

With the burner operating at maximum output, lower adjustment pressure by slowly turning the relative knob anticlockwise until the burner locks out. Turn the knob clockwise by 2 mbar and repeat the start-up of the burner. If the burner locks out again, turn the knob clockwise again by 1 mbar.

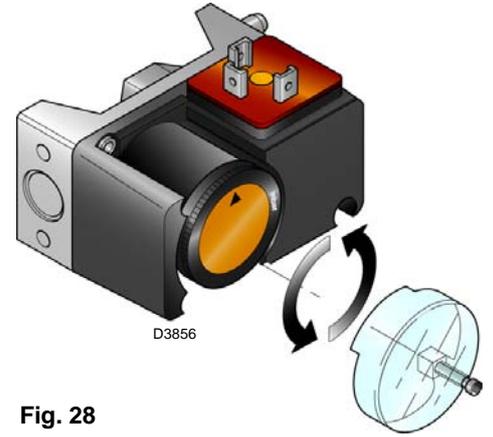


Fig. 28

**Minimum gas pressure switch**

Adjust the minimum gas pressure switch after having performed all other burner adjustments with the pressure switch set to the start of the scale (Fig. 29).

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

Then turn the knob anticlockwise by 2 mbar and repeat burner start-up to ensure it is uniform.

If the burner locks out again, turn the knob anticlockwise again by 1 mbar.

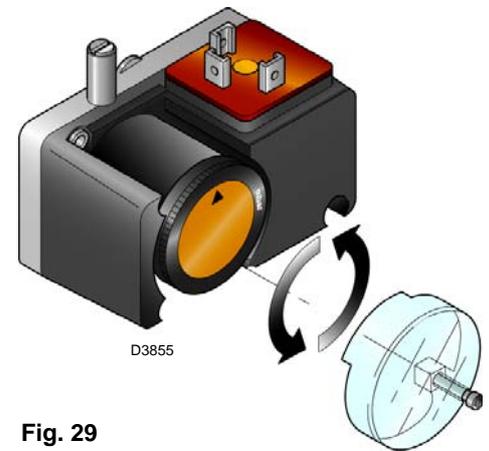
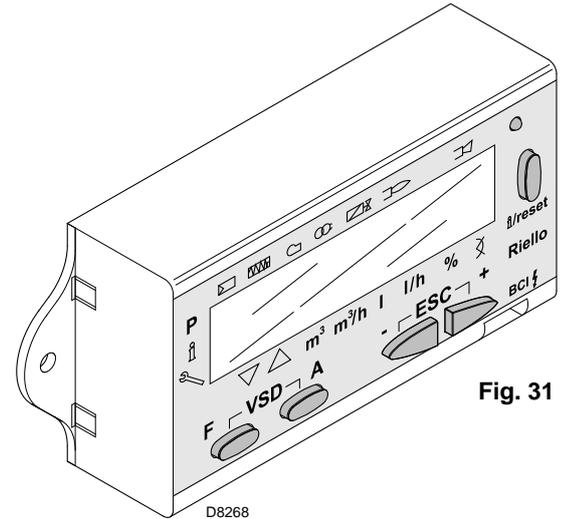
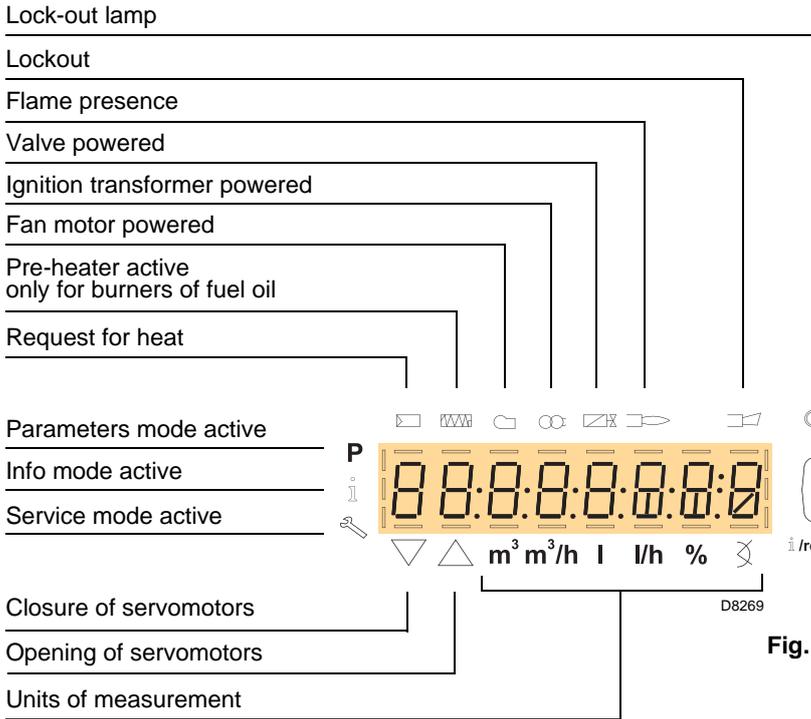


Fig. 29

5.5 Operator panel with LCD display

Description of the symbols



**Key to units of measurement**

- m<sup>3</sup> cubic metre
- m<sup>3</sup>/h cubic metre/hour
- l litre
- l/h litre/hour
- % size as percentage
- ⊗ degree of opening of servomotors

The unit of measurement of the size visualised is identified by the presence of a dash in the corresponding unit of measurement.

Description of the keys

Key	Function
	- Adjustment of the fuel servomotor (keep  pressed and adjust the value by pressing  or  )
	- Adjustment of the air servomotor (keep  pressed and adjust the value by pressing  or  )
	- Access to Parameters mode <b>P</b> (press, at the same time,  and  plus  or  )
	- <b>Enter</b> Parameters mode - <b>Reset</b> in the event of a lockout - Access to a lower level of the menu - In Service mode and Info mode, allows: * the selection of the parameter (flashing symbol) (press the key for <1s) * access to a lower level of the menu (press the key for 1 - 3s) * access to a higher level of the menu (press the key for 3 - 8s) * access to another mode (press the key for > 8s)
	- Reduction of value - Access to a lower point of the modulation curve - Scrolling of the parameters list
	- Increase of value - Access to a higher point of the modulation curve - Scrolling of the parameters list
	<b>Exit function (ESC)</b> (press  and  simultaneously) - Non confirmation of the value - Access to a higher level of the menu

## 5.6 Visualisation and programming modes

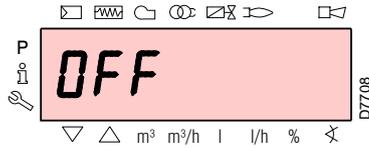
The operator panel, and especially the display visualisation, has 4 working modes:

- ▶ Normal mode
- ▶ Info mode (InFo)
- ▶ Service mode (Ser)
- ▶ Parameters mode (PArA)

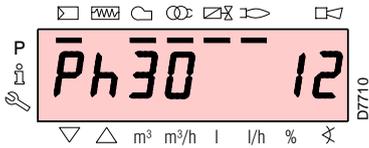
The information for accessing and operating at the various levels is given below.

### Normal mode

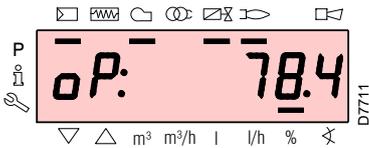
Visualises the operation conditions and allows you to modify the operation point of the burner manually. It does not require any use of the keys of the operator panel. It allows access to the other visualisation and programming modes. Some examples in the standard conditions are given below.



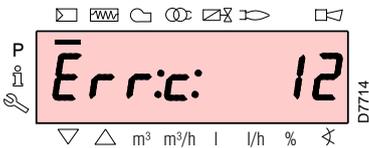
The burner is in the heat request waiting mode, or the selector "1-0" of Fig. 26 is at the "0" position.



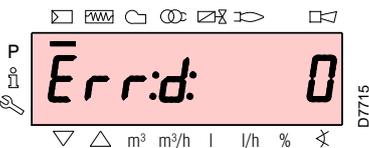
The display visualises the various phases of the start-up, ignition and switch-off of the burner. In the example alongside, the display indicates that the burner is in phase 30 (see the diagram of Fig. 32) and there are 12s until the next phase.



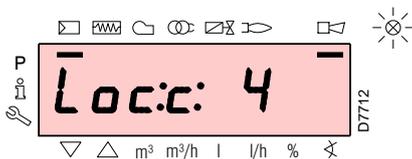
The burner is working in the requested load position (in the example alongside, **78.4%**).



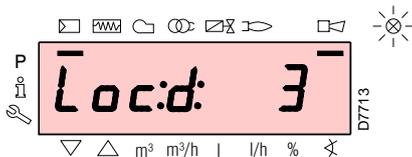
The display visualises alternately the error code (in the example alongside, **c: 12**) and the relative diagnostic (in the example **d: 0**).



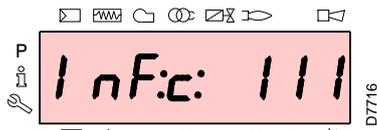
The system goes into safety mode and the message shown in the next figure appears.



The burner goes into lockout. The display visualises alternately the lockout code (in the example alongside **c: 4**) and the relative diagnostic (in the example **d: 3**).

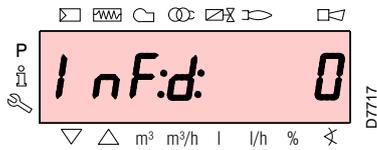


The red lock-out lamp is on.



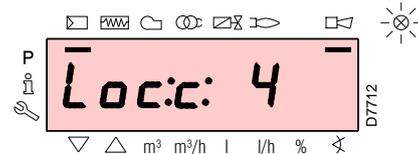
D7716

The display visualises alternately an error code and a diagnostic, which does not take the system into safety mode.



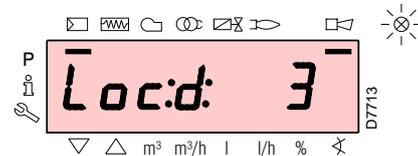
D7717

## Reset procedure

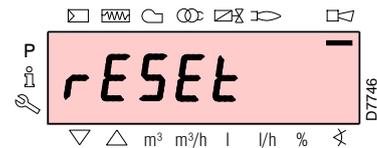


D7712

The burner is in lockout when the red indicator light on the operator panel is switched on and the display visualises alternately the lockout code (in the example alongside **c: 4**) and the relative diagnostic (in the example **d: 3**).



D7713



D7746

To reset, press the “i/reset” key for 1s: the display will show “rESEt”.

When the key is released, the lockout signal will disappear and the red indicator light will switch off.

The control box is reset.

## Manual lockout procedure

If necessary, it is possible to manually block the control box and, consequently, the burner, by pressing the key “i/reset” simultaneously with any other key of the operator panel.

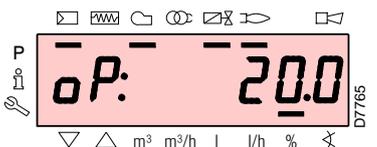


With the switch 1-0 in Fig. 26 the burner does not stop immediately, but the switch-off phase is activated.

## Manual operation procedure

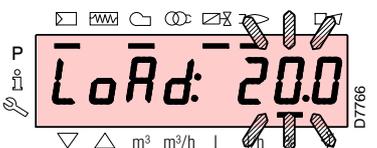
After the adjustment of the burner and the setting of the points on the modulation curve, it is possible to manually check the operation of the burner along the entire curve.

### Example



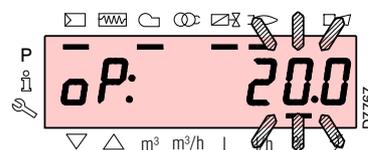
D7765

The burner is working at the requested load percentage: 20%.



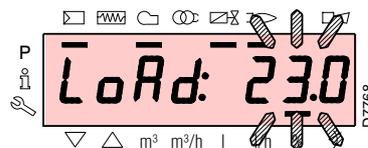
D7766

Press the key “F” for 1 second: “LoAd” is displayed and the load percentage flashes.



D7767

Releasing the key “F”, the standard visualisation appears, with the current load percentage flashing: this means that the burner is working in Manual mode (any outside adjustment is excluded and only the safety devices are active).

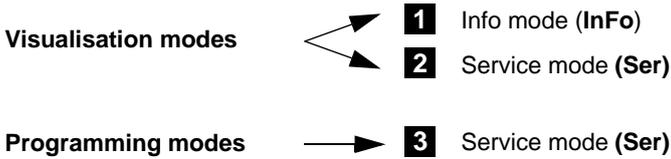


D7768

Keep the key “F” pressed and, with the keys “+” or “-”, increase or decrease the load percentage.

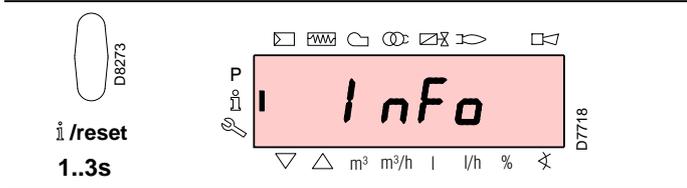
To emerge from Manual mode, press simultaneously the keys “+” and “-” (esc) for 3 seconds: the burner will work in Automatic mode and the output will depend on the thermostat/adjustment pressure switch (TR).

From Normal mode, using the keys of the operator panel, it is possible to activate one of the three visualisation/programming modes:



**Info mode**

Visualises the general system information. The list of the parameters that can be visualised is given in the table below. To access this level, press the key “**i/reset**” for 1 - 3s. Release the key immediately when the display shows “**Info**”.

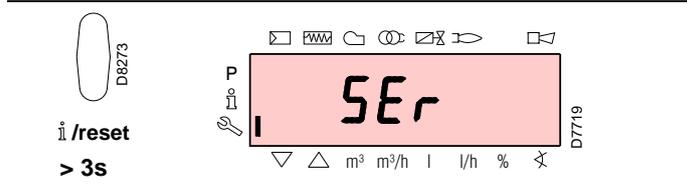


**List of the parameters that can be visualised** (in the sequence in which they are visualised)

<b>167</b>	Volumetric delivery of fuel in the unit of measurement selected
<b>162</b>	Operation time with flame
<b>163</b>	Operation time
<b>164</b>	No. of resettable ignitions
<b>166</b>	Total no. of ignitions
<b>113</b>	Identification code of the burner
<b>107</b>	Software version
<b>102</b>	Control box test date
<b>103</b>	Identification code of the control box
<b>104</b>	Identification number of the group of parameters set
<b>105</b>	Version of the group of parameters
<b>143</b>	Reserved
<b>End</b>	

**Service mode**

Visualises the log of errors and some technical information regarding the system. The list of the parameters that can be visualised is given in the table below. To access this level, press the “**i/reset**” key for more than 3s. Release the key immediately when the display shows “**SER**”.



**List of the parameters that can be visualised** (in the sequence in which they are visualised)

<b>954</b>	Flame intensity (%)
<b>121</b>	Manual setting of output Not defined = automatic operation
<b>922</b>	Position of the servomotors (expressed in degrees, symbol $\curvearrowright$ ) 0 = fuel 1 = air
<b>161</b>	Number of errors
<b>701</b>	Log of the errors: 701-725.01, Code
.	
.	
.	
<b>725</b>	

**Operating procedure in Info and Service modes**

After access to these levels, the display visualises the number of the parameter (flashing) on the left, and the corresponding value on the right.

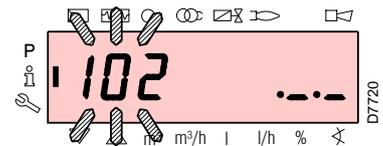
If the value is not visualised, press the key “**i/reset**” for 1 - 3s.

To return to the Parameters List, press the key “**i/reset**” for more than 3s, or press simultaneously the keys “**+**” and “**-**” (esc).

To move on to the next parameter, press the key “**+**” or “**i/reset**” for less than 1s. At the end of the list, the display visualises “**End**”.

To move back to the previous parameter, press the key “**-**”.

To return to the Normal/Standard visualisation mode, press the “**i/reset**” key for more than 3s, or press simultaneously keys “**+**” and “**-**” (esc). For a moment the display will show “**OPeRate**”.



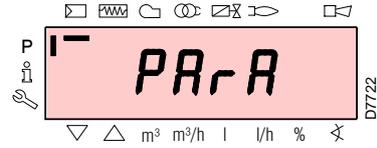
**Parameters mode**

Displays and allows you to modify/program the complete list of parameters, see Chap. 5.18. The factory-set parameters are not visible.

The parameters level is subdivided into groups:

<b>100: ParA</b>	<b>General parameters</b> Information and identification data of the system.
<b>200: ParA</b>	<b>Checks on the burner</b> Type of operation, intervention and safety times of the various phases.
<b>400: Set</b>	<b>Air/fuel modulation curve</b> Setting of air/fuel adjustment points
<b>500: ParA</b>	<b>Positioning of servomotors</b> Choice of positions of the air/fuel servomotors in the various phases.
<b>600: ParA</b>	<b>Servomotors</b> Setting and addressing of the servomotors.
<b>700: HlSt</b>	<b>Log of the errors</b> Choice of different visualisation modes for the errors log.
<b>900: dAtA</b>	<b>Process information</b> Visualisation of information for the remote management of the burner.

To access this level, refer to "Access procedure with password". Once the access procedure has been carried out, the display will show "PArA" for a few seconds.



Select the group of parameters with keys "+" and "-", and confirm by pressing the "i/reset" key.

Within the group you have chosen, scroll through the list with the keys "+" and "-". At the end of the list, the display visualises "End".

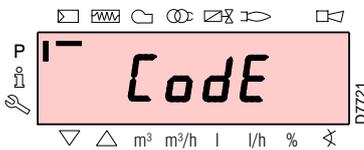
To return to Normal visualisation mode, simultaneously press the keys "+" and "-" (esc) twice.

To modify a parameter, refer to "Parameter modification procedure".

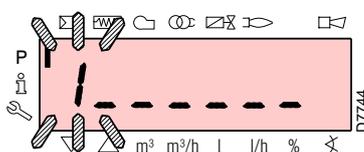
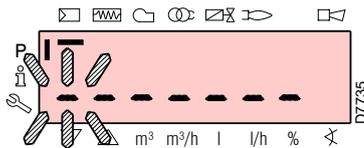


All the parameters are checked in the factory. Modification/tampering may compromise the good operation of the burner and cause injury to people or damage to things. In any case, modifications must be carried out by qualified personnel.

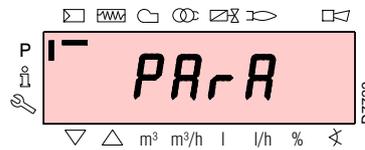
**Access procedure with password**



Press the keys "F" and "A" simultaneously for 1s: for a moment the display will show "CodE", and immediately after you will see 7 dashes, the first one flashing.



With the keys "+" and "-" select the first character of the password (letter or number), and confirm by pressing the key "i/reset".

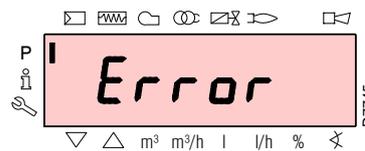
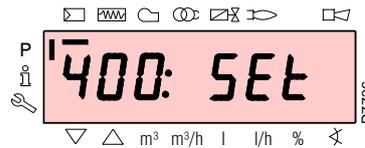


Once you have confirmed, the sign "-" will appear.

Continue in the same way for the other characters.

After inserting the last character of the password, confirm by pressing the key "i/reset": if the password inserted is correct you will see "PArA" for a few seconds, then you can access the various groups of parameters.

With the keys "+" and "-" select the group you require.



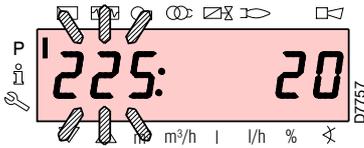
If the password inserted is incorrect, the message "Error" will appear for a moment.

It is then necessary to repeat the procedure.



The password must only be communicated to the qualified personnel or the Technical Assistance Service, and must be kept in a safe place.

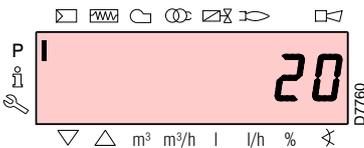
### Parameter modification procedure



After accessing the level and group of parameters, the display visualises the number of the parameter (flashing) on the left, and the corresponding value on the right.

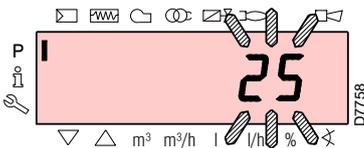
If the value is not visualised, press the key “**i/reset**” for 1 - 3s.

Find below an example of how to modify the parameter relating to the **pre-purging time** (No. 225).

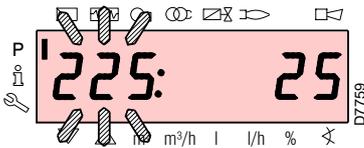


Press the key “**i/reset**”: the value **20** (seconds) will appear.

**Note:** the unit of measurement of the time is not visualised but is understood in seconds.



Press the key “**+**” and increase the value to **25** seconds (flashing). Press the key “**i/reset**” to confirm and store.



To return to the list of parameters, press simultaneously the keys “**+**” and “**-**” (esc).

### Procedure for inserting and adjusting points on the modulation curve

Nine adjustment/calibration points (P1 ÷ P9) can be inserted in the control box for each servomotor, varying their position by degrees and, consequently, the quantity of air and fuel introduced. The **ignition point P0** is independent of the minimum modulation value. This means that, in the event of difficulty, it is possible to switch on the burner at a value other than the modulation minimum (P1).

To insert or adjust a point, proceed as follows:

Access the Parameters level (group 400) referring to “**Access procedure with password**”.

Using the keys “**+**” and “**-**” insert/select the curve point you want and wait for it to flash: this means that the servomotors are now positioned on the values shown on the display and which correspond to the point previously set.

It is now possible to insert/modify the position by degrees.

**Warning:** the set value does not require confirmation.



For the fuel servomotor, keep the key “**F**” pressed (the position in degrees flashes) and press the keys “**+**” or “**-**” to increase or decrease the value.



For the air servomotor, keep the key “**A**” pressed (the position in degrees flashes) and press the keys “**+**” or “**-**” to increase or decrease the value.



Select another point, or exit this area by pressing the keys “**+**” and “**-**” simultaneously (esc).

5.7 Operation sequence of the burner

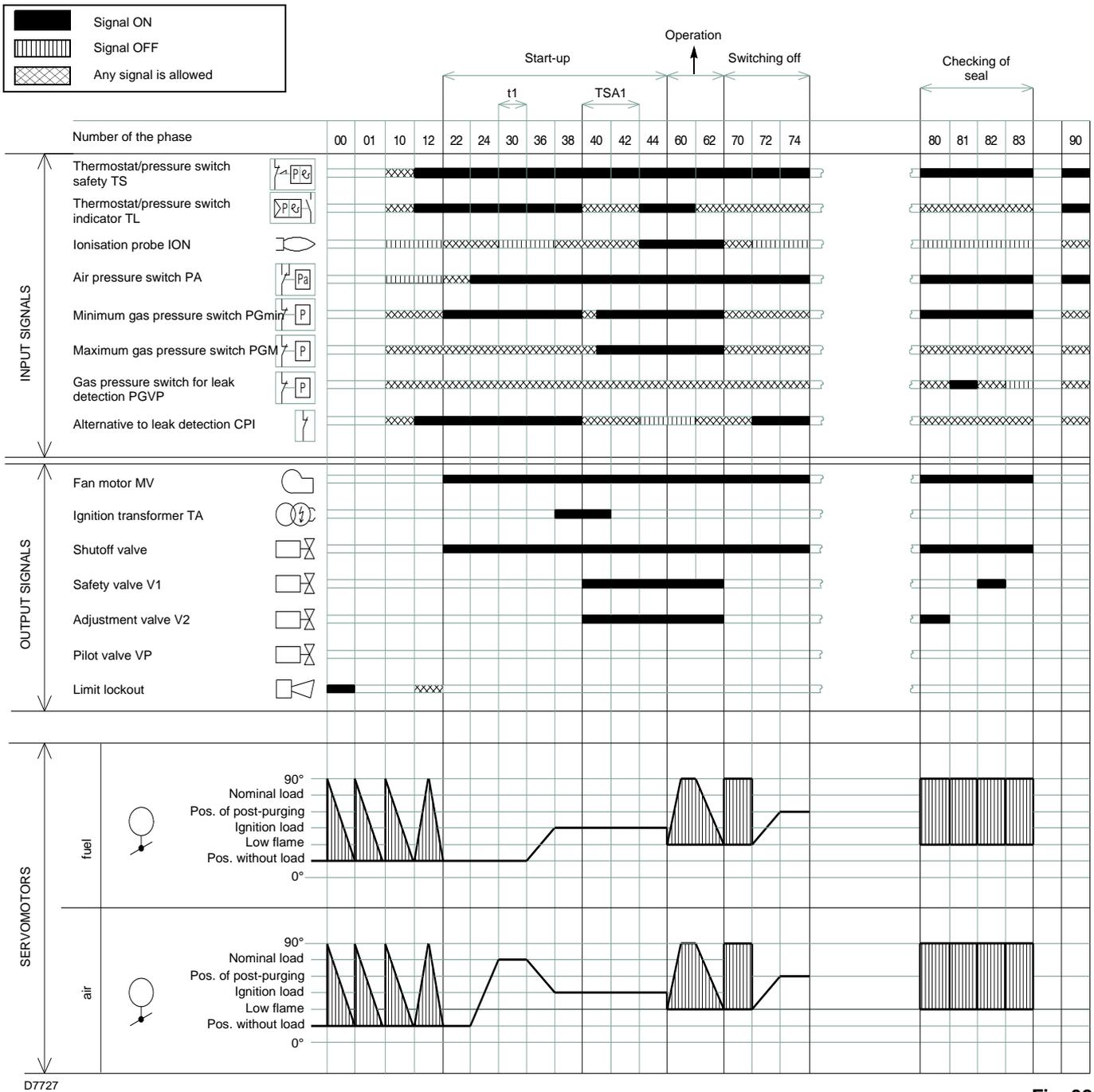


Fig. 32

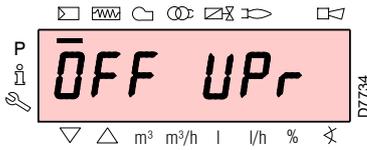
List of the phases

<b>Ph00</b>	Lockout phase
<b>Ph01</b>	Safety phase
<b>Ph10</b>	t10 = closure in pause
<b>Ph12</b>	Standby
<b>Ph22</b>	t22 = Uphill train of the fan motor (fan motor = ON, safety valve = ON)
<b>Ph24</b>	The burner moves to the pre-purging position
<b>Ph30</b>	t1 = pre-purging time
<b>Ph36</b>	The burner moves to the ignition position
<b>Ph38</b>	t3 = pre-ignition time
<b>Ph40</b>	TSA1= safety time 1 (ignition transformer ON)
<b>Ph42</b>	TSA1 = safety time 1 (ignition transformer OFF), t42 = pre-ignition time OFF

<b>Ph44</b>	t44 = interval time 1
<b>Ph60</b>	Operation
<b>Ph62</b>	t62 = max. time to reach the low flame (the burner moves to the switch-off position)
<b>Ph70</b>	t13 = post-combustion time
<b>Ph72</b>	The burner moves to the post-purging position
<b>Ph74</b>	t8 = post-purging time
<b>Ph80</b>	t80 = emptying time (valve leak detection)
<b>Ph81</b>	t81 = atmospheric test time (valve leak detection)
<b>Ph82</b>	t82 = filling time (valve leak detection)
<b>Ph83</b>	t83 = pressure test time (valve leak detection)
<b>Ph90</b>	Standby time due to lack of gas

Ph = Phase

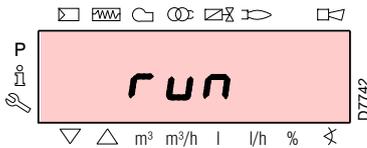
5.8 Start-up procedure



Check that the display of the Operator Panel shows request for heat and “OFF Upr”: this means it is necessary to set the modulation curve of the burner.



Access the Parameters level referring to “Access procedure with password”. The display visualises the parameters group **400**; confirm with the key “i/reset”.



The display visualises “run”.  
Confirm with the key “i/reset”: the burner **starts up**.  
The display visualises in sequence all the various phases and relative times. The phases are those defined on page 29.

- Phase 22:**  
Start of the fan motor.
- Phase 24:**  
The burner goes to the pre-purging position, the air servomotor opens the damper at 90°.
- Phases 80, 81, 82, 83:**  
These phases relate to the valve seal test (this function is not inserted in the factory, as it is optional).
- Phase 30:**  
The count of the pre-purging time pre-set in the factory begins.

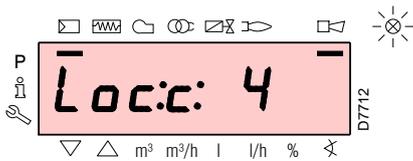


**Phase 36:**  
The burner goes to the ignition position, point “P0”, defined in the table on page 31: the display visualises the indication “P0” flashing. If the value proposed is suitable, confirm. Otherwise, modify the ignition point (see “Procedure for inserting and adjusting points on the modulation curve”).



**WARNING:** the values shown in the figure alongside are purely for indication purposes.

Confirm with the key “+”.



**Phase 38:**  
The ignition phase begins and the spark goes off.

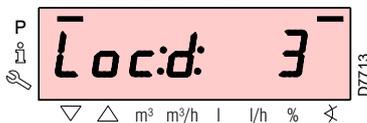
**Phase 40:**  
The gas valves open (the count of the safety time begins).  
Check the presence of the flame from the special inspection window, and the correctness of the combustion parameters; if necessary, vary the degrees of opening/closing of the air and fuel servomotors.

If the control box goes into lockout, press the keys “+” and “-” (esc) simultaneously: the display visualises alternately the lockout code for flame absence **c: 4**) and the relative diagnostic (**d: 3**).

Resolve the problem, referring to Ch. 5.12.  
Reset (see “Reset procedure”): the display visualises “OFF Upr”.

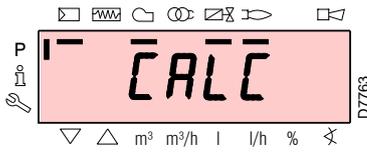
Repeat the start-up procedure.

**Warning:** the values inserted previously remain stored.



After ignition (point “P0”), proceed with the calibration of the modulation curve, starting from the minimum point “P1”.

Press the key “+”: the display visualises the indication “P1” flashing and proposes the same settings as for point “P0”. It is possible to modify this value and obtain a modulation minimum different from the ignition point.

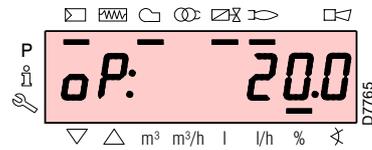


After adjusting point "P1", press the key "+": the display shows "CALC" for a few seconds. The control box will automatically calculate the points from "P2" to "P8", distributing them in a straight line, assuming for point "P9" the factory setting (see the table below). These are theoretical and must be checked.

Press the key "+" to check if the settings of point "P2" are suitable. If not, modify the point. Proceed in sequence until point "P9".



**Important:** before moving on from one point to the next, wait for the servomotors to reach the position visualised on the display.



During the adjustment of each point, work on the air and gas servomotors, without modifying the position of the gas valve stabiliser.

Halfway through the procedure (i.e. around point P4 or P5), you are advised to measure gas delivery and check that the output is about 50% of the maximum output. If this is not the case, work also on the gas valve stabiliser: in this case however, it is necessary to revise the calibrations of all the points previously set.

Once you have arrived at point "P9", if the maximum output is not as you wish, work on the gas valve stabiliser: in this case however, it is necessary to revise the calibrations of all the points previously set.

At this point, confirm by pressing simultaneously the keys "+" and "-" (**esc**): the parameter "546" will appear.

If you want to make the burner work on the entire modulation curve, press simultaneously the keys "+" and "-" (**esc**): in this way, the parameter "546" will automatically be assigned the value of 100% and the parameter "545" will have a value of 20%.

If you want to make the burner work on a part of the modulation curve, modify the parameters "546" and "545" according to "Parameter modification procedure".

Press simultaneously the keys "+" and "-" (**esc**) twice: the display will visualise the current load position.

#### Factory settings

Point of the curve		Burner
		RS 50/E MZ
P0	air	21°
	gas	30°
P9	air	90°
	gas	90°

5.9 CALC function

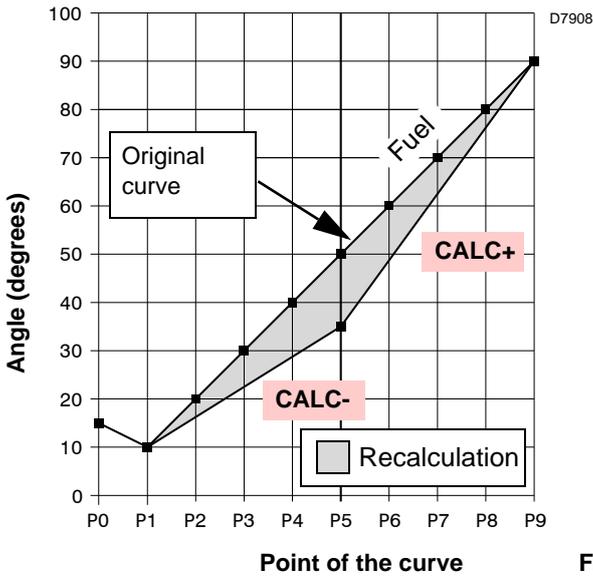


Fig. 33

The diagram of Fig. 33 shows how the fuel modulation curve is modified if the values of point “P5” are changed. By keeping the key “+” pressed for more than 3 s, the points from “P6” to “P8” are recalculated. By keeping the key “-” pressed for more than 3 s, the points from “P4” to “P2” are recalculated.

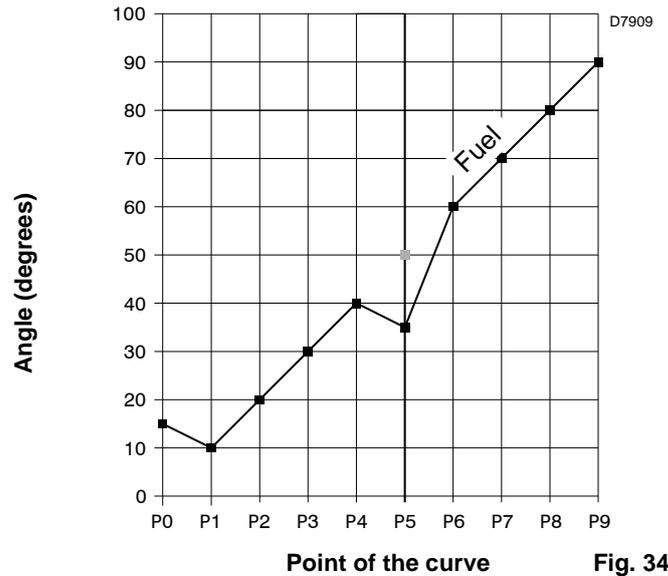


Fig. 34

The diagram of Fig. 34 shows the fuel modulation curve when, after the modification of point “P5”, the recalculations of all the other points is not carried out.

5.10 Burner adjustment

Ignition output

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 “ts” = 3 s, ignition output must be equal to or less than 1/3 of the max. operation output.

**Example**

MAX operation output of 450 kW.

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

In order to measure the ignition output:

- disconnect the plug-socket 6)(Fig. 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 less than the quantity given by the formula, for ts = 3s:

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

**Vg:** volume supplied in ignitions carried out (Sm<sup>3</sup>)

**Qa:** ignition delivery (Sm<sup>3</sup>/h)

**n:** number of ignitions (10)

**ts:** safety time (sec)

**Example** for gas G 20 (9.45 kWh/Sm<sup>3</sup>):

ignition output 150 kW

corresponding to 15.87 Sm<sup>3</sup>/h.

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

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

**Maximum output**

The MAX output must be set within the firing rate of Fig. 3.

**Gas adjustment**

Measure the gas delivery on the gas meter.

As a general rule, this value can be found on the table on page 53: just read the gas pressure on the pressure gauge (Fig. 36) and follow the indications given on page 53.

- If it is necessary to reduce it, lower the output gas pressure via the pressure adjuster located beneath the gas valve.
- If it needs to be increased, increase the output gas pressure via the adjuster.

**Note**

If the gas pressure allows it, by closing the ring nut 2)(Fig.14) you obtain reductions in the formation of NOx.

If, on the other hand, the gas pressure required by the burner (see Appendix C) is insufficient, open the ring nut 2) further compared with the value indicated in the diagram of Fig.15. Check that the combustion is satisfactory and without pulsations.

**Air adjustment**

If necessary vary the degrees of the air servomotor.

**Minimum output**

The MIN output must be set within the firing rate of Fig. 3.

### 5.11 Steady state operation

#### Burner without modulating operation kit

Once the start-up cycle is completed, the servomotor command moves on to the thermostat/pressure switch TR that controls the pressure or the temperature in the boiler.

- If the temperature or the pressure is low (so the thermostat/pressure switch TR is closed), the burner progressively increases the output as far as the MAX value (point "P9").
- If the temperature or the pressure increases as far as the opening of the thermostat/pressure switch TR, the burner progressively reduces the output as far as the MIN value (point "P1"). And so on.
- The burner switches off when the request for heat is lower than the heat supplied by the burner at MIN output. The thermostat/pressure switch TL opens and the control box carries out the switching off phase (see Ch. 5.7). The air damper closes completely to reduce heat losses to a minimum.

#### Burner with modulating operation kit

See the handbook enclosed with the adjuster.

### 5.12 Ignition failure

If the burner does not switch on, there is a lockout within 3 s 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 3 s.

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.

### 5.13 Burner flame goes out during operation

If the flame accidentally goes out during operation, the control box carries out a recycle (i.e. it repeats the start-up phase once, and makes a further ignition attempt).

If the flame is still absent, the control box goes into lockout.

### 5.14 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 switch 1-0 of Fig. 26;
- removing the transparent protection that covers the Operator Panel, after loosening the relative screw, and using the panel itself according to *iManual lockout procedure*".

### 5.15 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 4  $\mu\text{A}$ . The operator panel visualises "30%" (see Parameters list, parameter no. 954).

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 on the ionisation probe cable and insert a direct current microammeter with a base scale of 100  $\mu\text{A}$  - see Fig. 35.

Carefully check the polarities!

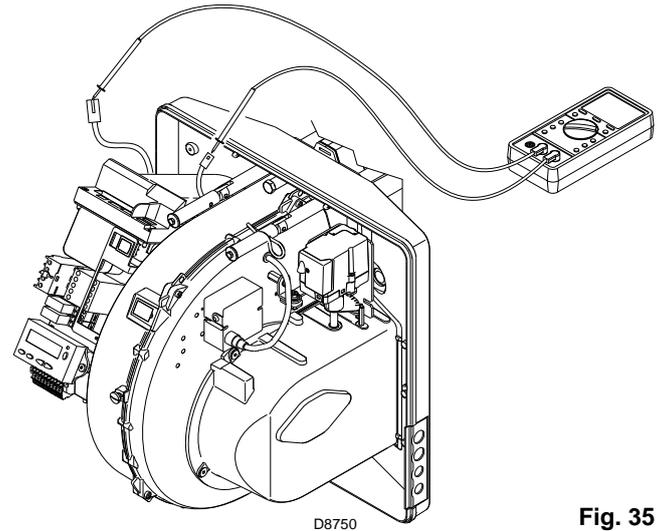


Fig. 35

### 5.16 Checking the air and gas pressure on the combustion head

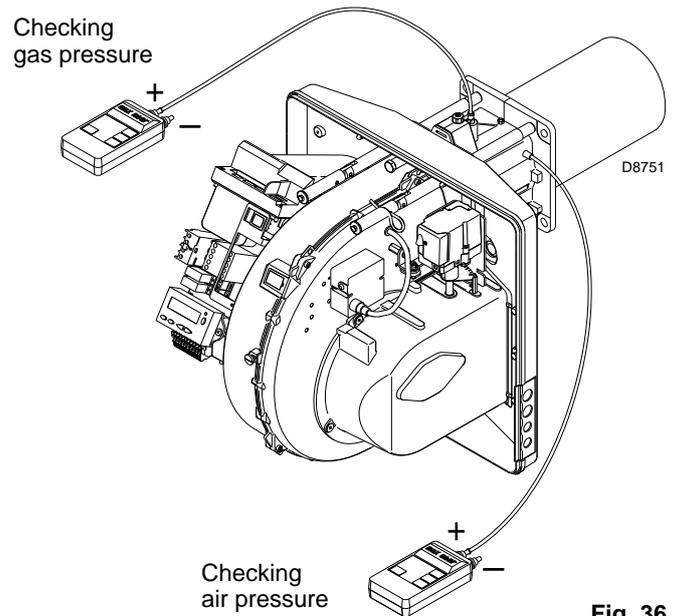


Fig. 36

### 5.17 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.

## 5.18 List of parameters

Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
<b>100</b>	<b>General parameters</b>								
102	Control box identification date	1	-	Reading only	0	255	1		Info mode
103	Control box identification number	1	-	Reading only	0	65535	1		Info mode
104	Identification number of the group of parameters set	1	-	Reading only	0	255	1		Info mode
105	Version of the group of parameters set	1	-	Reading only	0	0xFFFF	1		Info mode
107	Software version	1	-	Reading only	0	0xFFFF	1		Info mode
113	Burner identification	1	-	Modification	0	99999999	1	Not defined	Info mode
121	Manual setting of output Not defined = automatic operation	1	-	Modification / zero setting	0%	100%	0.1%	Not defined	Service Mode
125	Frequency of main power supply 0 = 50 Hz 1 = 60 Hz	1	-	Modification	0	1	1	0	Parameter Mode
126	Brightness of display	1	-	Modification	0%	100%	1%	75%	Parameter Mode
128	Fuel meter: Led pulse valence (led pulses / volumetric flow units)	1	-	Modification	0	400	0.01	0	Parameter Mode
130	Eliminate visualisation error chronology To eliminate the visualisation, set the parameter to 1, then to 2 Answer 0: Process successful Answer -1: Time-out of 1_2 - Sequence	1	-	Modification	-5	2	1	0	Parameter Mode
141	Remote management of control box 0 = off 1 = Modbus 2 = reserved		-	Modification	0	2	1	0	Parameter Mode
142	Standby time before a new attempt in event of fault in communication		s	Modification	0 s	7200s	1s	600s	Parameter Mode
143	Reserved		-	Modification	1	8	1	1	Info Mode
144	Reserved		-	Modification	10s	60s	1s	30s	Parameter Mode
145	Peripheral address for Modbus		-	Modification	1	247	1	1	Parameter Mode
146	Baud Rate for Modbus 0 = 9600 1 = 19200		-	Modification	0	1	1	0	Parameter Mode
147	Parity for Modbus 0 = none 1 = odd 2 = even	1	-	Modification	0	2	1	0	Parameter Mode
148	Selection of the burner operation during the interruption of the switch-over with the system of remote management. 0 = burner switched off  With <b>modulating operation</b> the settings of the values are the following: 0...19.9 = burner switched off 20...100 = 20...100% burner modulation field (20% = low flame) These settings adapt to parameters 545 (modulation minimum) and 546 (modulation maximum)  With <b>stage operation</b> : 0 = burner switched off, 1st, 2nd, 3rd stage according to the values assigned to P1, P2, P3 No setting = no function in the event of communication interruption	1		Modification / zero setting	0%	100%	0.1%	Not defined	Parameter Mode

Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
161	Total number of errors	1	-	Reading only	0	65535	1	0	Service Mode
162	Hours of operation (that can be reset)	1	h	Reset	0h	999999h	1h	0h	Info mode
163	Total hours of power supply to control box	1	h	Reading only	0h	999999h	1h	0h	Info mode
164	Total number of start-ups (that can be reset)	1	-	Reset	0	999999	1	0	Info mode
166	Total number of start-ups	1	-	Reading only	0	999999	1	0	Info mode
167	Volumetric delivery of fuel in the selected unit of measurement (that can be reset)	1	-	Reset	0	99999999	1	0	Info mode
<b>200</b>	<b>Checks on the burner</b>								
201	Burner operation mode (fuel supply line, modulating/stage, servomotors, etc.) -- = not defined (eliminate curves) 1 = Gmod 2 = Gp1 mod 3 = Gp2 mod 4 = Lo mod 5 = Lo 2 stages 6 = Lo 3 stages 7 = Gmod pneu 8 = Gp1 mod pneu 9 = Gp2 mod pneu	1	-	Modification / zero setting	1	9	1	Not defined	Parameter Mode
208	Stopping of the program 0 = deactivated 1 = pre-purging (Ph24) 2 = Ignition (Ph36) 3 = Interval 1 (Ph44) 4 = Interval 2 (Ph52)	1	-	Modification	0	4	1	0	Parameter Mode
210	Alarm/lockout at start	1	-	Modification	0	1	1	0	Parameter Mode
211	Uphill train fan motor	1	s	Modification	2s	60s	0.2s	2s	Parameter Mode
212	Maximum time to reach low flame	1	s	Modification	0.2s	10 min	0.2s	45s	Parameter Mode
215	Maximum repeats of safety circuit	1	-	Modification	1	16	1	16	Parameter Mode
221	Gas: selection of flame sensor 0 = QRB.../ QRC 1 = ION / QRA	1	-	Modification	0	1	1	1	Parameter Mode
222	Gas: Selection of the pre-purging function 0 = deactivated 1 = activated	1	-	Modification	0	1	1	1	Parameter Mode
223	Maximum repeats of minimum gas pressure switch intervention	1	-	Modification	1	16	1	16	Parameter Mode
225	Gas: pre-purging time	1	s	Modification	20s	60 min	0.2s	20s	Parameter Mode
226	Gas: pre-ignition time	1	s	Modification	0.2s	60 min	0.2s	2s	Parameter Mode
230	Gas: interval 1	1	s	Modification	0.2s	60s	0.2s	2s	Parameter Mode
232	Gas: interval 2	1	s	Modification	0.2s	60s	0.2s	2s	Parameter Mode
233	Gas: post-combustion time	1	s	Modification	0.2s	60s	0.2s	8s	Parameter Mode
234	Gas: post-purging time	1	s	Modification	0.2s	108 min	0.2s	0.2s	Parameter Mode
242	Gas: emptying time (valve leak detection)	1	s	Modification	0.2s	3s	0.2s	3s	Parameter Mode
243	Gas: atmospheric test time (valve leak detection)	1	s	Modification	0.2s	60s	0.2s	10s	Parameter Mode

244	Gas: filling time (valve leak detection)	1	s	Modification	0.2s	3s	0.2s	3s	Parameter Mode
Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
245	Gas: pressure test time (valve leak detection)	1	s	Modification	0.2s	60s	0.2s	10s	Parameter Mode
261	Oil: selection of flame sensor 0 = QRB.../ QRC... 1 = ION / QRA	1	-	Modification	0	1	1	0	Parameter Mode
265	Oil: pre-purging time	1	s	Modification	15s	60 min	0.2s	15s	Parameter Mode
266	Oil: pre-ignition time	1	s	Modification	0.2s	60 min	0.2s	2s	Parameter Mode
270	Oil: interval 1	1	s	Modification	0.2s	60 min	0.2s	2s	Parameter Mode
272	Oil: interval 2	1	s	Modification	0.2s	60 min	0.2s	2s	Parameter Mode
273	Oil: post-combustion time	1	s	Modification	0.2s	60s	0.2s	8s	Parameter Mode
274	Oil: post-purging time	1	s	Modification	0.2s	108 min	0.2s	0.2s	Parameter Mode
281	Oil: selection transformer ignition phase TA 0 = brief pre-ignition (Ph38) 1 = long pre-ignition (with fan) (Ph22)	1	-	Modification	0	1	1	0	Parameter Mode
<b>400</b>	<b>Air/fuel modulation curve</b>								
401	Checking fuel servomotor	13	(°)	Modification	0°	90°	0.1°	0°; 0°; 15°; not defined	Parameter Mode
402	Checking air servomotor	13	(°)	Modification	0°	90°	0.1°	0°; 90°; 45°; not defined	Parameter Mode
<b>500</b>	<b>Positioning of servomotors</b>								
501	Position of the fuel servomotor in absence of flame Index 0 = standby position Index 1 = pre-purging position Index 2 = post-purging position	3	(°)	Modification	0°	90°	0.1°	0°; 0°; 15°	Parameter Mode
502	Position of the air servomotor in absence of flame Index 0 = standby position Index 1 = pre-purging position Index 2 = post-purging position	3	(°)	Modification	0°	90°	0.1°	0°; 90°; 45°	Parameter Mode
545	Minimum modulation limit	1	-	Modification / zero setting	20%	100%	0.1%	Not defined	Parameter Mode
546	Maximum modulation limit	1	-	Modification / zero setting	20%	100%	0.1%	Not defined	Parameter Mode
<b>600</b>	<b>Servomotors</b>								
645	Analogical exit configuration 0 = CC 0...10 V 1 = CC 2...10 V 2 = CC 0 / 2...10 V	1	-	Modification	0	2	1	0	Parameter Mode
<b>700</b>	<b>Log of the errors</b>								
701	Error chronology: 701-725.01.Code	25	-	Reading only	0	255	1	0	Service Mode
•	Error chronology: 701-725.02.Diagnostic code	25	-	Reading only	0	255	1	0	Service Mode
•	Error chronology: 701-725.03.Error class	25	-	Reading only	0	6	1	0	Service Mode
•	Error chronology: 701-725.04.Phase	25	-	Reading only	0	255	1	0	Service Mode
•	Error chronology: 701-725.05.Start-up meter	25	-	Reading only	0	99999999	1	0	Service Mode

725	Error chronology: 701-725.06.Load	25	-	Reading only	0%	100%	0.1%	0%	Service Mode
Parameter		Number of elements	Unit of measurement	Modification	Values interval		Degree of precision	Predefined setting	Access mode
No. par.	Description				Min.	Max.			
<b>900</b>	<b>Process information</b>								
903	Current output Index 0 = fuel Index 1 = air	2	-	Reading only	0%	100%	0.1%	0%	Parameter Mode
910	Servomotors active	3	-	Reading only	0	1	1	0	Parameters Mode
922	Position of the servomotors Index 0 = fuel Index 1 = air	2	(°)	Reading only	-50°	150°	150°	0°	Service Mode
942	Heat source active	1	-	Reading only	0	255	1	0	Parameter Mode
947	Result of the sampling of the contact (codified in bits)	2	-	Reading only	0	255	1	0	Parameter Mode
950	Relay request status (coded in bits)	1	-	Reading only	0	255	1	0	Parameter Mode
954	Flame intensity	1	-	Reading only	0%	100%	1%	0%	Service Mode
961	Status of external modules and visualisation	1	-	Reading only	0	255	1	0	Parameter Mode
992	Error indicators	10	-	Reset	0	0xFFFFFFFF FF	1	0	Parameter Mode

If faults arise in ignition or operations, the burner performs a "safety stop", which is signalled by the red burner lockout LED. The display visualises alternately the lockout code and the relative diagnostic.

To reset the start-up conditions, refer to "Reset procedure". When the burner starts up again, the red LED goes out.

### 6.1 List of error codes

Error code	Diagnostics code	Meaning of the system REC27.100A2	Recommended measures
2	4	<b>No flame at the end of TSA1</b>	
3	#	Air pressure error	
	0	Air pressure switch off	
	1	Air pressure switch on	
	4	Air pressure on – Lockout alarm at start	
4	#	<b>Extraneous light</b>	
	0	Extraneous light during start-up	
	1	Extraneous light during switch-off	
	2	Extraneous light during start-up – Lockout alarm at start	
7	3	<b>Loss of flame</b>	
12	#	<b>Valve leak detection / CPI</b>	
	0	V2 leaks / CPI open	<b>Leak test</b> Check if the valve on the side of the burner has any leaks. Check if the pressure switch for the leak test (PGVP) is closed when gas pressure is not present. <b>CPI</b> Check the wiring. Check if the CPI contact is closed.
	1	V1 leaks / CPI closed	<b>Leak test</b> Check if the valve on the side of the gas has any leaks. <b>CPI</b> Check the wiring. Check if the CPI contact opens when the valve is powered.
20	0	<b>Pmin</b> Min. gas/oil pressure absent	
21	0	<b>Pmax</b> Max. gas/oil pressure exceeded	
22	0	Safety circuit open	
50 - 58	#	<b>Internal error</b>	Carry out a reset; if the error arises repeatedly, replace the control box
60	0	<b>Internal error: no valid load checking device</b>	Carry out a reset; if the error arises repeatedly, replace the control box
65 - 67	#	<b>Internal error</b>	Carry out a reset; if the error arises repeatedly, replace the control box
70	#	<b>Fuel/air checking error: Calculation position in modulation</b>	
	21	Invalid load	No valid load
	26	Curve points not defined	Adjust the curve points of all the actuators
71	#	<b>Special position not defined</b>	
	0	Standby position	Set the standby position of all the servomotors used
	1	Post-purging position	Set the post-purging position of all the servomotors used
	2	Pre-purging position	Set the pre-purging position of all the servomotors used
	3	Ignition position	Set the ignition position of all the servomotors used
72	#	<b>Fuel/air internal checking error:</b>	Carry out a reset; if the error arises repeatedly, replace the control box
73	#	<b>Fuel/air internal checking error:</b>	
	21	Position calculation, invalid stage load	No valid load
	26	Position calculation, stage curve points not defined	Adjust the curve points of all the servomotors
75	#	<b>Fuel/air ratio internal checking error:</b>	
	1	Check synchronisation data, different current load	
	2	Check synchronisation data, different target load	
	4	Check synchronisation data, different target positions	
	16	Check synchronisation data, different positions reached	
76	#	<b>Fuel/air internal checking error:</b>	Carry out a reset; if the error arises repeatedly, replace the control box
84	#	<b>Servomotors curve slope</b>	
	Bit 1 Valence 2..3	Fuel servomotor: Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position variation of 31° between 2 points of the modulation curve
	Bit 2 Valence 4..7	Air servomotor: Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position variation of 31° between 2 points of the modulation curve

Error code	Diagnostics code	Meaning of the system REC27.100A2	Recommended measures
<b>85</b>	#	Reference error of a servomotor	
	Bit 0 Valence 1	Reference error of the fuel servomotor	The reference of the fuel servomotor was not successful. It was not possible to reach the reference point. 1. Check if the servomotors have been inverted. 2. Check if the servomotor is blocked or overloaded.
	Bit 1 Valence 2...3	Reference error of the air servomotor	The reference of the air servomotor was not successful. It was not possible to reach the reference point. 1. Check if the servomotors have been inverted. 2. Check if the servomotor is blocked or overloaded.
	Bit 7 Valence $\geq 128$	Reference error owing to parameter modification	The parameterization of an actuator (e.g. the reference position) has been modified. This error will be visualised to start up a new reference.
<b>86</b>	#	<b>Fuel servomotor error</b>	
	0	Position error	It was not possible to reach the target position within the requested tolerance range. 1. Check if the servomotor is blocked or overloaded.
	Bit 0 Valence 1	Circuit open	Circuit open shown on the servomotor connection. 1. Check the wiring.
	Bit 3 Valence $\geq 8$	Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position modification of $31^\circ$ between 2 points of the modulation curve.
	Bit 4 Valence $\geq 16$	Deviation of section compared with the last reference	Overloading of the servomotor or servomotor subjected to mechanical torsion. 1. Check if the servomotor is blocked in any point along its range of action. 2. Check if the torque is sufficient for the application.
<b>87</b>	#	<b>Air servomotor error</b>	
	0	Position error	It was not possible to reach the target position within the requested tolerance range. 1. Check if the servomotor is blocked or overloaded.
	Bit 0 Valence 1	Circuit open	Circuit open shown on the servomotor connection. 1. Check the wiring.
	Bit 3 Valence $\geq 8$	Curve too steep in terms of train ratio	The slope of the curve can correspond to a maximum position modification of $31^\circ$ between 2 points of the modulation curve.
	Bit 4 Valence $\geq 16$	Deviation of section compared with the last reference	Overloading of the servomotor or servomotor subjected to mechanical torsion. 1. Check if the servomotor is blocked in any point along its range of action. 2. Check if the torque is sufficient for the application.
<b>90 - 91</b>	#	<b>Burner internal checking error</b>	
<b>93</b>	#	<b>Flame signal acquisition error</b>	
	3	Short circuit of the sensor	Short circuit in the QRB sensor... 1. Check the wiring. 2. Flame detector probably faulty.
<b>95</b>	#	<b>Relay supervision error</b>	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	External power supply - Contact active	Check the wiring.
<b>96</b>	#	<b>Relay supervision error</b>	
	3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	The relay contacts have joined together	Check the contacts: 1. Control box connected to the power supply: the fan output must be without voltage. 2. Disconnect the power supply. Disconnect the fan. The resistive connection between the fan output and the neutral wire is not allowed. If one of the 2 tests fails, replace the control box because the contacts are definitively joined together and it is no longer possible to guarantee safety.
<b>97</b>	#	<b>Relay supervision error</b>	
	0	The safety relay contacts have joined together or the safety relay has been powered by an external power supply	Check the contacts: 1. Control box connected to the power supply: the fan output must be without voltage. 2. Disconnect the power supply. Disconnect the fan. The resistive connection between the fan output and the neutral wire is not allowed. If one of the 2 tests fails, replace the control box because the contacts are definitively joined together and it is no longer possible to guarantee safety.

Error code	Diagnostics code	Meaning of the system REC27.100A2	Recommended measures
98	#	Relay supervision error	
	2 – Safety valve 3 Ignition transformer 4 Fuel valve 1 5 Fuel valve 2 6 Fuel valve 3	The relay does not start up	Carry out a reset; if the error arises repeatedly, replace the unit
99 - 100	#	Relay internal checking error	Carry out a reset; if the error arises repeatedly, replace the control box
105	#	Contact sampling internal error	
	0 Min. pressure switch 1 Max. pressure switch 2 Valve operation test pressure switch 3 Air pressure 4 Load controller open 5 Load controller on/off 6 Load controller closed 7 Safety loop / burner flange 8 Safety valve 9 Ignition transformer 10 Fuel valve 1 11 Fuel valve 2 12 Fuel valve 3 13 Reset	Blocked upon irregularity	Can be caused by capacitive loads or presence of DC voltage on the main power supply of the control box. The diagnostic code indicates the input in which the problem arose
106 - 108	#	Contact request internal error	Carry out a reset; if the error arises repeatedly, replace the control box
110	#	Voltage monitoring test internal error	Carry out a reset; if the error arises repeatedly, replace the control box
111	0	Low level of power supply	Insufficient mains voltage
112	0	Reset power supply voltage	Error code for the carrying out of a reset in the event of power supply restoration (absence of error)
113	#	Mains voltage supervision internal error	Carry out a reset; if the error arises repeatedly, replace the control box
115	#	Control box meter internal error	
116	0	Life cycle of the control box in the critical interval	The envisaged life cycle of the control box has been exceeded. Replace it.
117	0	Life cycle of the control box exceeded	The switch-off threshold has been reached.
120	0	Interruption of fuel limiting meter input	Too many disturbance impulses on the input of the fuel meter. Improve the electromagnetic compatibility.
121 - 124	#	EEPROM access internal error	Carry out a reset, repeat and check the last setting of the parameters. Restore the group of parameters. If the error arises repeatedly, replace the control box
125	#	EEPROM reading access internal error	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box
126	#	EEPROM writing access internal error	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box
127	#	EEPROM access internal error	Carry out a reset, repeat and check the last setting of the parameters. Restore the group of parameters. If the error arises repeatedly, replace the control box
128	0	EEPROM access internal error - synchronisation during the initialisation	Carry out a reset; If the error arises repeatedly, replace the control box
129	#	EEPROM access internal error – command synchronisation	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box
130	#	EEPROM access internal error - time-out	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box
131	#	EEPROM access internal error - page interrupted	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box
132	#	EEPROM register initialisation internal error	Carry out a reset; If the error arises repeatedly, replace the control box
133 - 135	#	EEPROM access internal error – request synchronisation	Carry out a reset, repeat and check the last setting of the parameters. If the error arises repeatedly, replace the control box
136	1	Restoration started	The restoration of a backup has been started (no error)

Error code	Diagnostics code	Meaning of the system REC27.100A2	Recommended measures
137	#	<b>Internal error – backup / restoration</b>	
	157	Restoration – OK, but backup < compared with set data of current system	Restoration successful, but the backup data installed are fewer than those currently present in the system.
	242	Backup – the backup carried out is contradictory	The backup is irregular and cannot be transferred again
	243	Backup – the data comparison between the internal microprocessors is irregular	Repeat the reset and backup
	244	The backup data are incompatible	The backup data are incompatible with the current version of the software; the restoration is not possible
	245	Error in access to the parameter Restore_Complete	Repeat the reset and backup
	246	Restoration – time-out during logging in EEPROM	Repeat the reset and backup
	247	The data received are contradictory	The series of backup data is not valid; restoration is not possible
	248	The restoration cannot currently be carried out	Repeat the reset and backup
	249	Restoration – interruption caused by inadequate identification of the burner	The backup has an inadequate identification of the burner and must not be transferred to the control box
	250	Backup – the CRC of a page is not correct	The series of backup data is not valid; restoration is not possible
	251	Backup – the identification of the burner is not defined	Define the identification of the burner and repeat the backup
	252	After restoration, the pages are still in INTERRUPTION	Repeat the reset and backup
	253	The restoration cannot currently be carried out	Repeat the reset and backup
	254	Interruption owing to transmission error	Repeat the reset and backup
	255	Interruption owing to time-out during the restoration	Carry out a reset, check the connections and repeat the backup
146	#	<b>Time-out of the system automation interface</b>	Refer to the Modbus User Documentation (A7541)
	1	Modbus time-out	
	2	Reserved	
165	#	<b>Internal error</b>	
166	0	<b>Watchdog reset internal error</b>	
167	#	<b>Manual lockout</b>	The control box has been manually blocked (no error)
	1	Manual lockout from remote reset command	
	2	Manual lockout from operator panel	
	3	Manual lockout from PC interface	
168 - 171	#	<b>Internal error management</b>	Carry out a reset; if the error arises repeatedly, replace the control box
200	#	<b>System free of errors</b>	No error
201	#	<b>Lockout or error at start</b>	Lockout or error due to lack of parameter settings
	1	No operation mode selected	
	2..3	No fuel train defined	
	4..7	No curve defined	
	8..15	Standardisation speed not defined	
	16..31	Backup / restoration impossible	
202	#	<b>Selection of internal operation mode</b>	Redefine the operation mode (parameter 201)
203	#	<b>Internal error</b>	Redefine the operation mode (parameter 201) Carry out a reset; if the error arises repeatedly, replace the control box
204	Phase number	<b>Program stop</b>	The program stop is active (no error)
205	#	<b>Internal error</b>	Carry out a reset; if the error arises repeatedly, replace the control box
206	0	<b>Combination of control box and operator panel not allowed</b>	
207	#	<b>Compatibility of control box with operator panel</b>	
	0	Obsolete version of <b>control box</b>	
	1	Obsolete version of <b>operator panel</b>	
208-209	#	<b>Internal error</b>	Carry out a reset; if the error arises repeatedly, replace the control box
240	#	<b>Internal error</b>	Carry out a reset; if the error arises repeatedly, replace the control box
245	#	<b>Internal error</b>	Carry out a reset; if the error arises repeatedly, replace the control box
250	#	<b>Internal error</b>	Carry out a reset; if the error arises repeatedly, replace the control box

## 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).

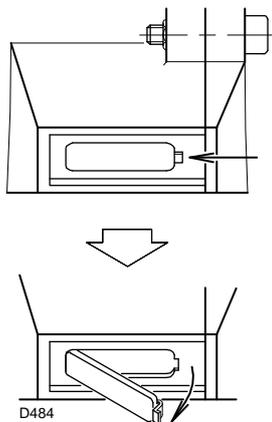


Fig. 37

#### 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).

#### 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.

### 7.3 Opening the burner

- **Disconnect the electrical supply from the burner.**
- Loosen the screw 1) and remove the hood 2).
- Disconnect the plug 14)(Fig.11) and loosen the cable grommet 15)(Fig.11);
- Remove screw 5), the split pin 9) and pull the burner back by about 100 mm on the slide bars 3. Disconnect the probe and electrode leads and then pull the burner fully back.

At this point it is possible to extract the inner part 7)(Fig. 38) after having removed the screw 8)(Fig. 38).

### 7.4 Closing the burner

- Remove the split pin 9)(Fig. 38) 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;
- Connect the plug of the servomotor 14)(Fig. 11) and tighten the grommet 15)(Fig. 11);
- Refit the screw 5)(Fig. 38) and the split pin 9)(Fig. 38) then carefully pull the probe and electrode cables outwards until they are slightly taut.

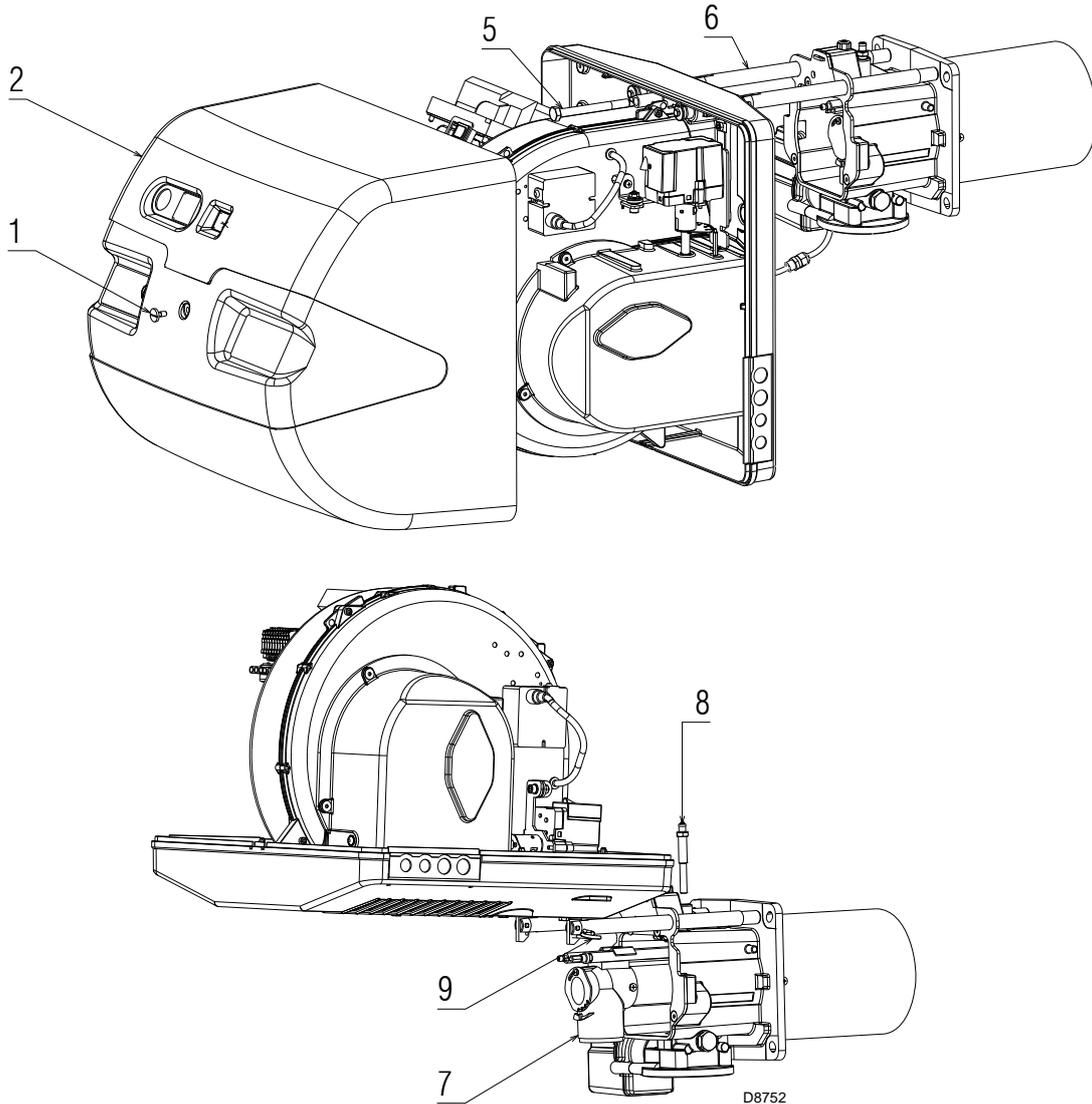
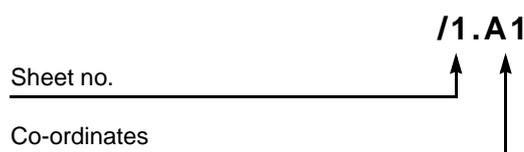


Fig. 38

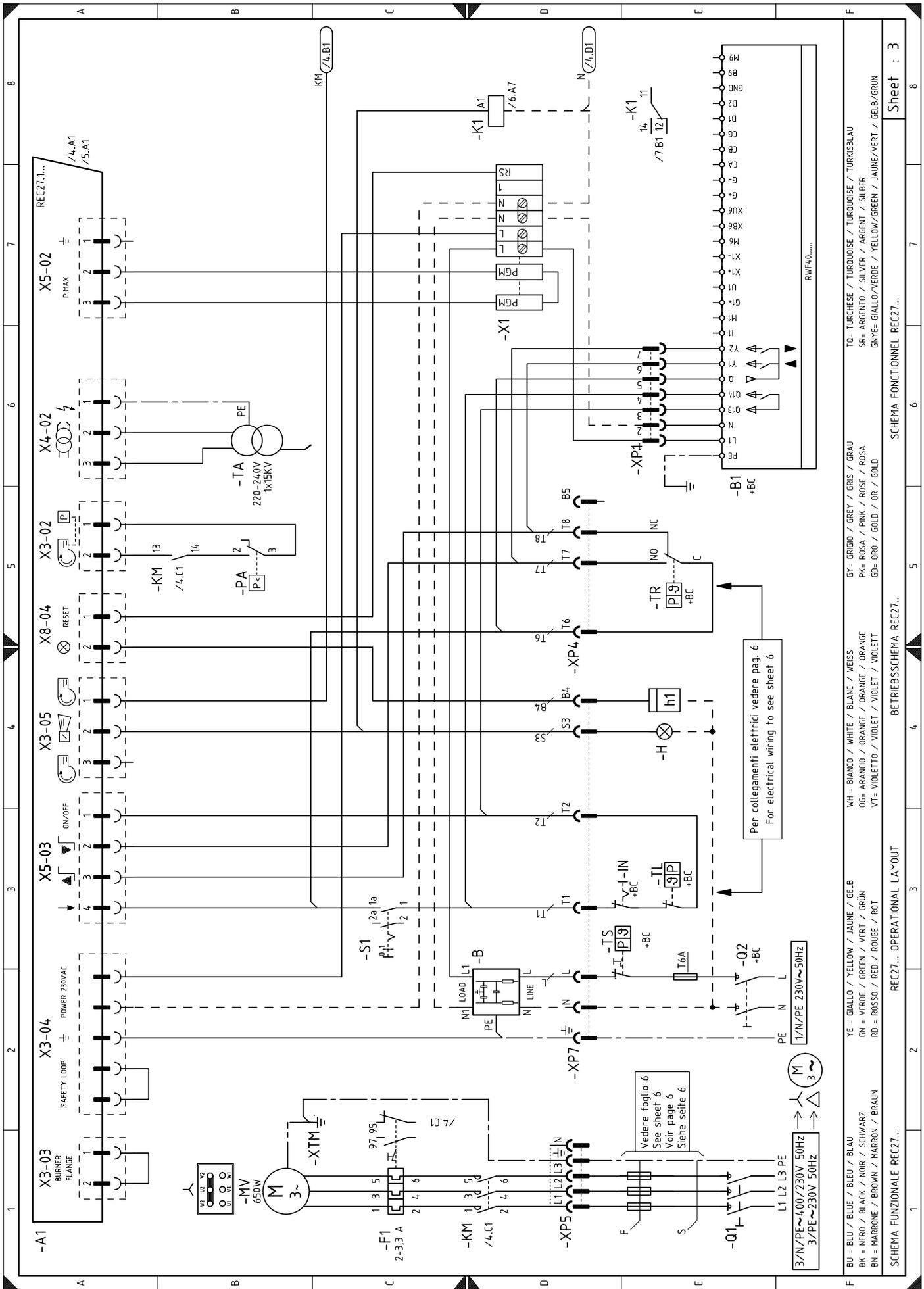
<b>1</b>	<b>Index of layouts</b>
<b>2</b>	Indication of references
<b>3</b>	Functional layout REC27...
<b>4</b>	Functional layout REC27...
<b>5</b>	Functional layout REC27...
<b>6</b>	Electrical wiring that the installer is responsible for
<b>7</b>	Electrical wiring kit
<b>8</b>	Electrical wiring Kit RWF40... external

## 2 Indication of references



### Wiring layout key

<b>A1</b>	- Control box for the air/fuel ratio	<b>PE</b>	- Burner earth
<b>A2</b>	- Operator panel	<b>PGM</b>	- Maximum gas pressure switch
<b>B</b>	- Filter to protect against radio disturbance	<b>PGMin</b>	- Minimum gas pressure switch
<b>+BB</b>	- Burners components	<b>PGVP</b>	- Gas pressure switch for valve leak detection control device
<b>+BC</b>	- Boiler components	<b>Q1</b>	- Three-phase disconnecting switch
<b>B1</b>	- Output regulator RWF40	<b>Q2</b>	- Single phase disconnecting switch
<b>B2</b>	- Fuel meter	<b>RS</b>	- Remote burner reset button
<b>BA</b>	- Input in current DC 4...20 mA	<b>S1</b>	- On/off selector
<b>BA1</b>	- Input in current DC 4...20 mA to modify remote set-point	<b>SM1</b>	- Air servomotor
<b>BP</b>	- Pressure probe	<b>SM2</b>	- Gas servomotor
<b>BP1</b>	- Pressure probe	<b>TA</b>	- Ignition transformer
<b>BR</b>	- Remote setpoint potentiometer	<b>TL</b>	- Limit thermostat/pressure switch
<b>BT1</b>	- Thermocouple probe	<b>TR</b>	- Adjustment thermostat/pressure switch
<b>BT2</b>	- Probe Pt100, 2 wires	<b>TS</b>	- Safety thermostat/pressure switch
<b>BT3</b>	- Probe Pt100, 3 wires	<b>X1</b>	- Burner terminal strip
<b>BT4</b>	- Probe Pt100, 3 wires	<b>X4</b>	- 4 pin plug
<b>BTEXT</b>	- External probe for climatic compensation of the set-point	<b>X5</b>	- 5 pin plug
<b>BV</b>	- Input in voltage DC 0...10V	<b>X6</b>	- 6 pin plug
<b>BV1</b>	- Input in voltage DC 0...10V to modify remote setpoint	<b>X7</b>	- 7 pin plug
<b>CN1</b>	- Ionisation probe connector	<b>XP1</b>	- Connector for output power regulator kit RWF40
<b>F1</b>	- Fan motor thermal relay	<b>XP4</b>	- 4 pole socket
<b>G1</b>	- Load indicator	<b>XP5</b>	- 5 pole socket
<b>G2</b>	- Communication interface for Modbus system	<b>XP6</b>	- 6 pole socket
<b>h1</b>	- Hour counter	<b>XP7</b>	- 7 pole socket
<b>H</b>	- Remote lockout signal	<b>XPD</b>	- Operator panel connector
<b>ION</b>	- Ionisation probe	<b>XPGM</b>	- Maximum gas pressure switch connector
<b>IN</b>	- Burner manual stop switch	<b>XPGVP</b>	- Gas pressure switch connector for valve leak detection control device
<b>K1</b>	- Burner lockout clean contact relay	<b>XRWF</b>	- Terminal board for output power regulator RWF40
<b>K2</b>	- Flame present clean contact relay	<b>XSM1</b>	- Gas servomotor connector
<b>KM</b>	- Fan motor contact maker	<b>XSM2</b>	- Air servomotor connector
<b>MV</b>	- Fan motor	<b>XTM</b>	- Burner shelf
<b>PA</b>	- Air pressure switch	<b>Y</b>	- Gas adjustment valve + gas safety valve



TO= TURCHESE / TURKOISE / TURKOISE / TURKOISE / TURKISBLAU  
 GY= GRIGIO / GREY / GRIS / GRIS / GRAU  
 SR= ARGENTO / SILVER / ARGENT / SILBER  
 GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRUN

WH= BIANCO / WHITE / BLANC / WEISS  
 OG= ARANCIO / ORANGE / ORANGE / ORANGE  
 PK= ROSA / PINK / ROSE / ROSA  
 VT= VIOLETTA / VIOLET / VIOLET / VIOLETT

YE= GIALLO / YELLOW / JAUNE / GELB  
 GN= VERDE / GREEN / VERT / GRUN  
 RD= ROSSO / RED / ROUGE / ROT

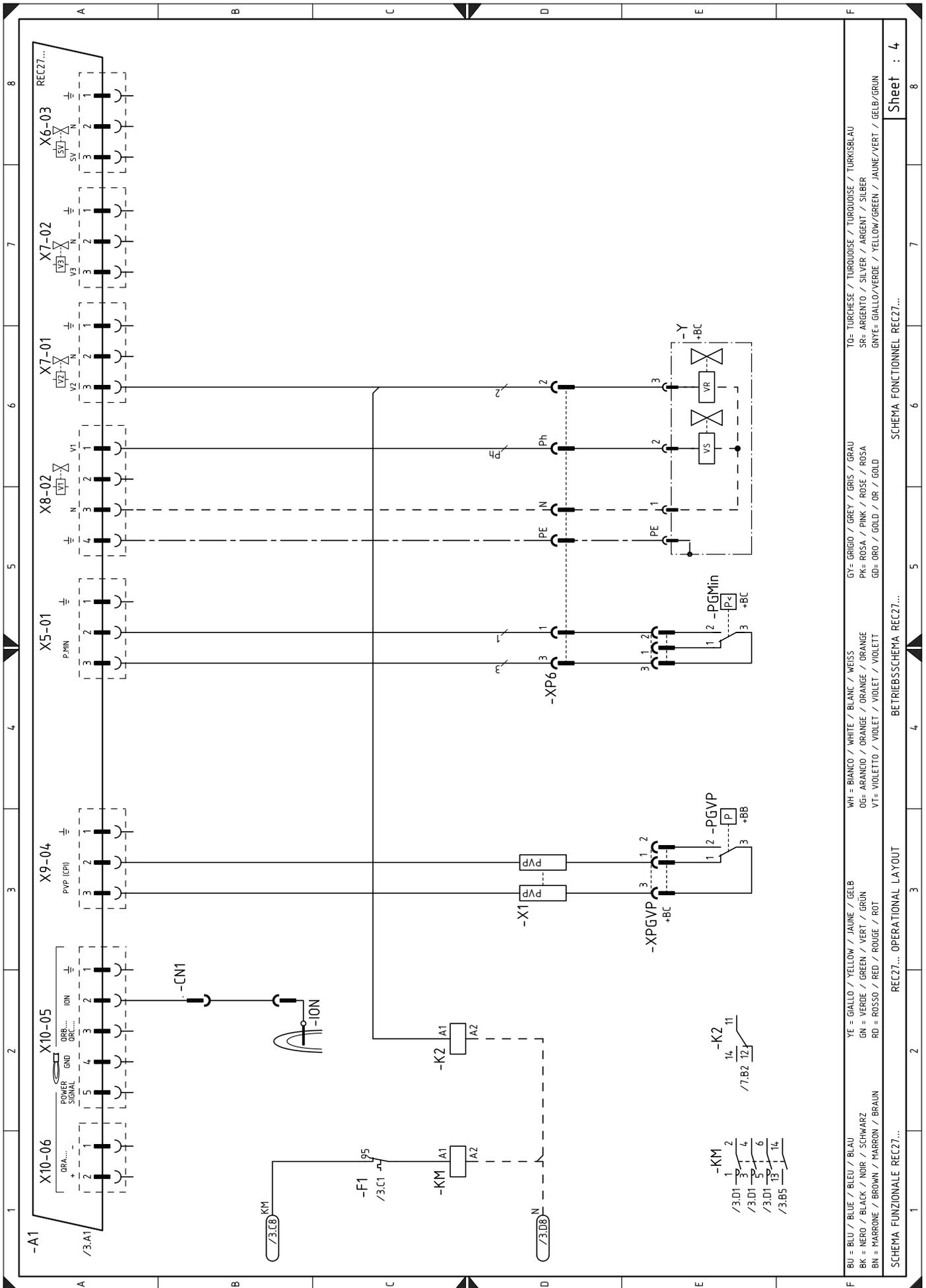
BU= BLU / BLUE / BLEU / BLAU  
 BK= NERO / BLACK / NOIR / SCHWARZ  
 BN= MARRONE / BROWN / MARRON / BRAUN

Per collegamenti elettrici vedere pag. 6  
 For electrical wiring to see sheet 6

Vedere foglio 6  
 See sheet 6  
 Voir page 6  
 Siehe seite 6

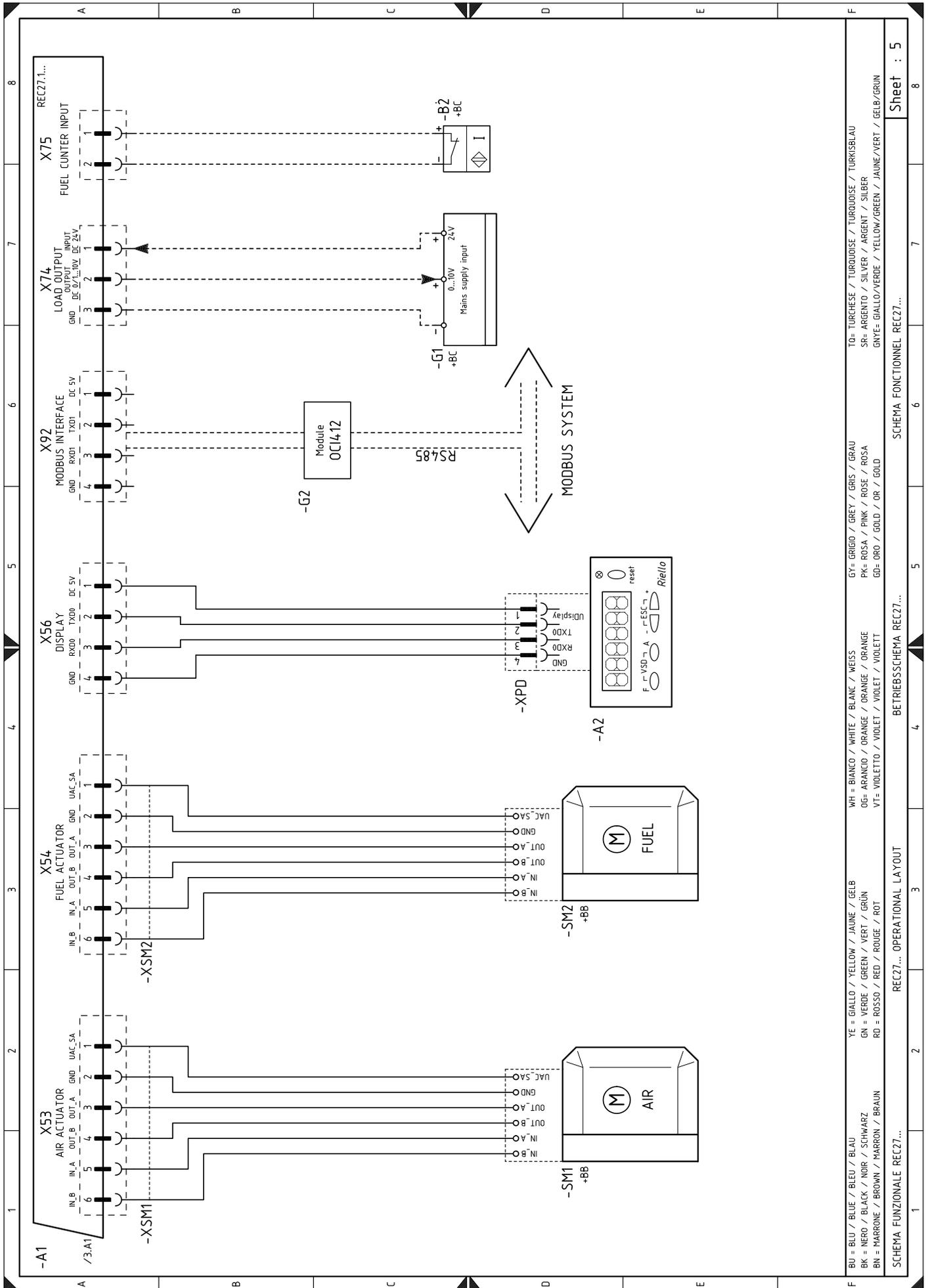
SCHEMA FUNZIONALE REC27...  
 REC27... OPERATIONAL LA'OUT  
 BETRIEBSSCHEMA REC27...  
 SCHEMA FONCTIONNEL REC27...

Sheet : 3

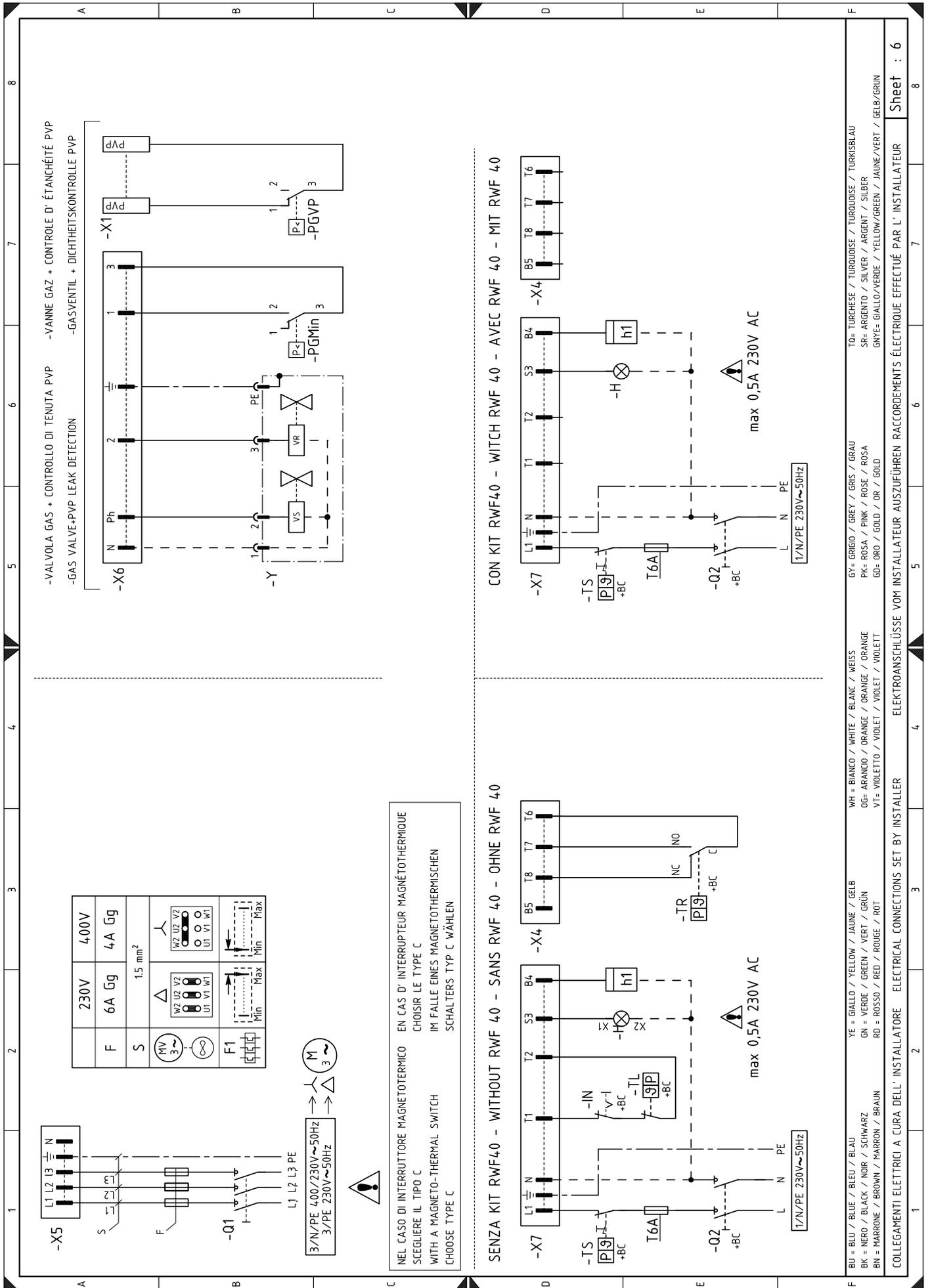


BU = BLU / BLUE / BLEU / BLAU	WH = BIANCO / WHITE / BLANC / WEISS	GY = GRIGIO / GREY / GRIS / GRAU	TO = TURCHESE / TURQUOISE / TURKISBLAU
BK = NERO / BLACK / NOIR / SCHWARZ	OG = ARANCIO / ORANGE / ORANGE / ROSA	PK = ROSA / PINK / ROSE / ROSA	SR = ARGENTO / SILVER / ARGENT / SILBER
BN = MARRONE / BROWN / MARRON / BRAUN	VI = VIOLETTA / VIOLET / VIOLET / VIOLETT	GD = ORO / GOLD / OR / GOLD	GNYE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRUN

SCHEMA FUNZIONALE REC27...      REC27... OPERATIONAL LAYOUT      SCHEMA FONCTIONNEL REC27...      Sheet : 4



F	BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	GY= GRIGIO / GREY / GRIS / GRAU	TO= TURCHESE / TURQUOISE / TURKOISE / TURKSBLAU
	BK = NERO / BLACK / NOIR / SCHWARZ	GN = VERDE / GREEN / VERT / GRÜN	OG= ARANCIO / ORANGE / ORANGE / ORANGE	PK= ROSA / PINK / ROSE / ROSA	SR= ARGENTO / SILVER / ARGENT / SILBER
	BN = MARRONE / BROWN / MARRON / BRAUN	RD = ROSSO / RED / ROUGE / ROT	VT= VIOLETTO / VIOLET / VIOLET / VIOLETT	GD= ORO / GOLD / OR / GOLD	GRYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN
SCHEMA FUNZIONALE REC27...					
REC27... OPERATIONAL LAYOUT					
BETRIEBSSCHEMA REC27...					
SCHEMA FONCTIONNEL REC27...					
Sheet : 5					



-VALVOLA GAS + CONTROLLO DI TENUTA PVP -VANNE GAZ + CONTROLE D'ÉTANCHÉITÉ PVP  
 -GAS VALVE+PVP LEAK DETECTION -GASVENTIL + DICHTHEITSKONTROLLE PVP

230V	400V
F 6A Gg	4A Gg
1.5 mm <sup>2</sup>	
MV 3~	WZ U2 V2
∞	U1 V1 W1
F1	Min Max

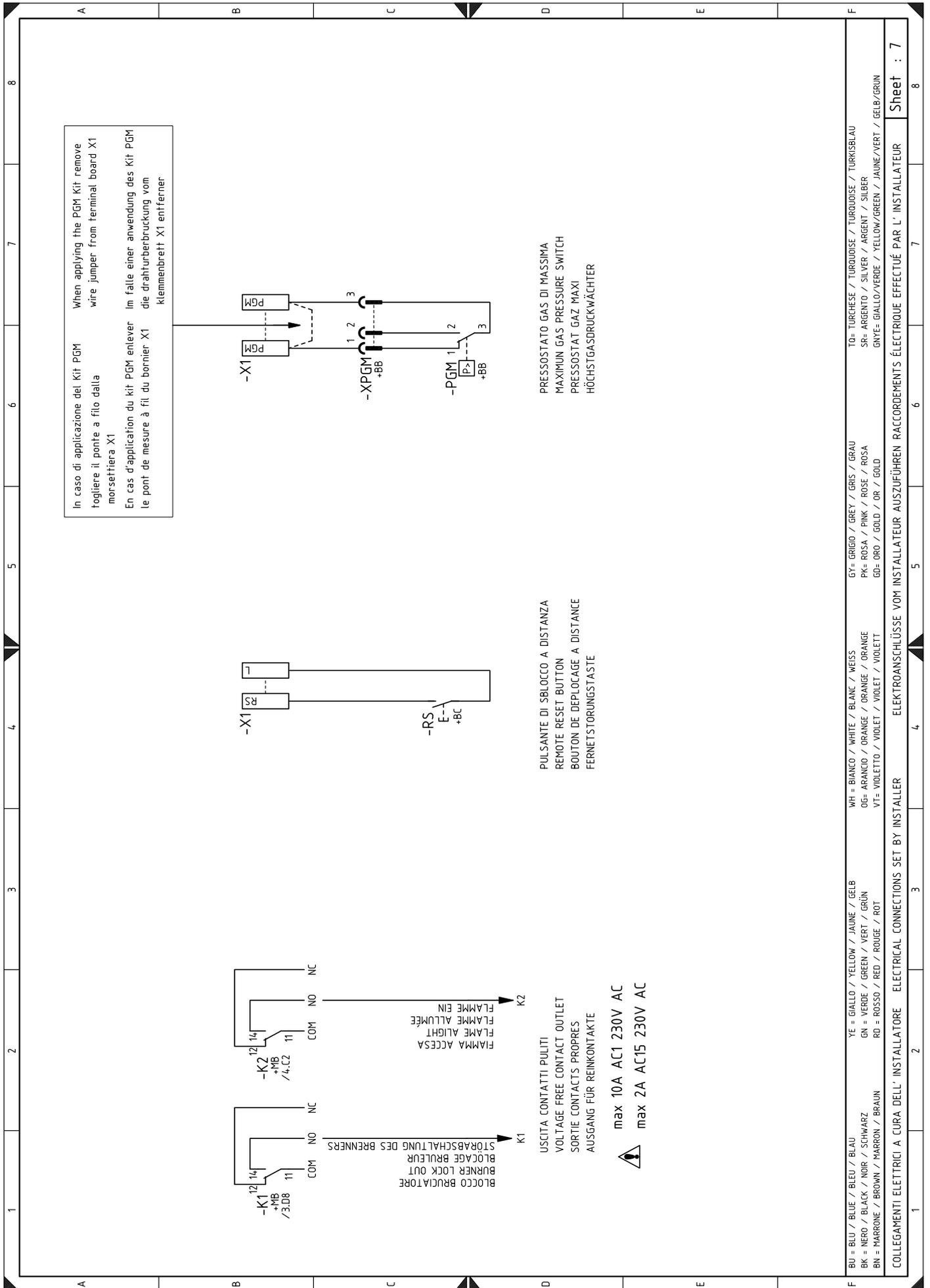
NEL CASO DI INTERRUPTORE MAGNETOTERMICO EN CAS D' INTERRUPTEUR MAGNÉTO-THERMIQUE  
 SCEGLIERE IL TIPO C CHOISIR LE TYPE C  
 WITH A MAGNETO-THERMAL SWITCH IM FALLE EINES MAGNETOTHERMISCHEN  
 SCHALTERS TYP C WÄHLEN

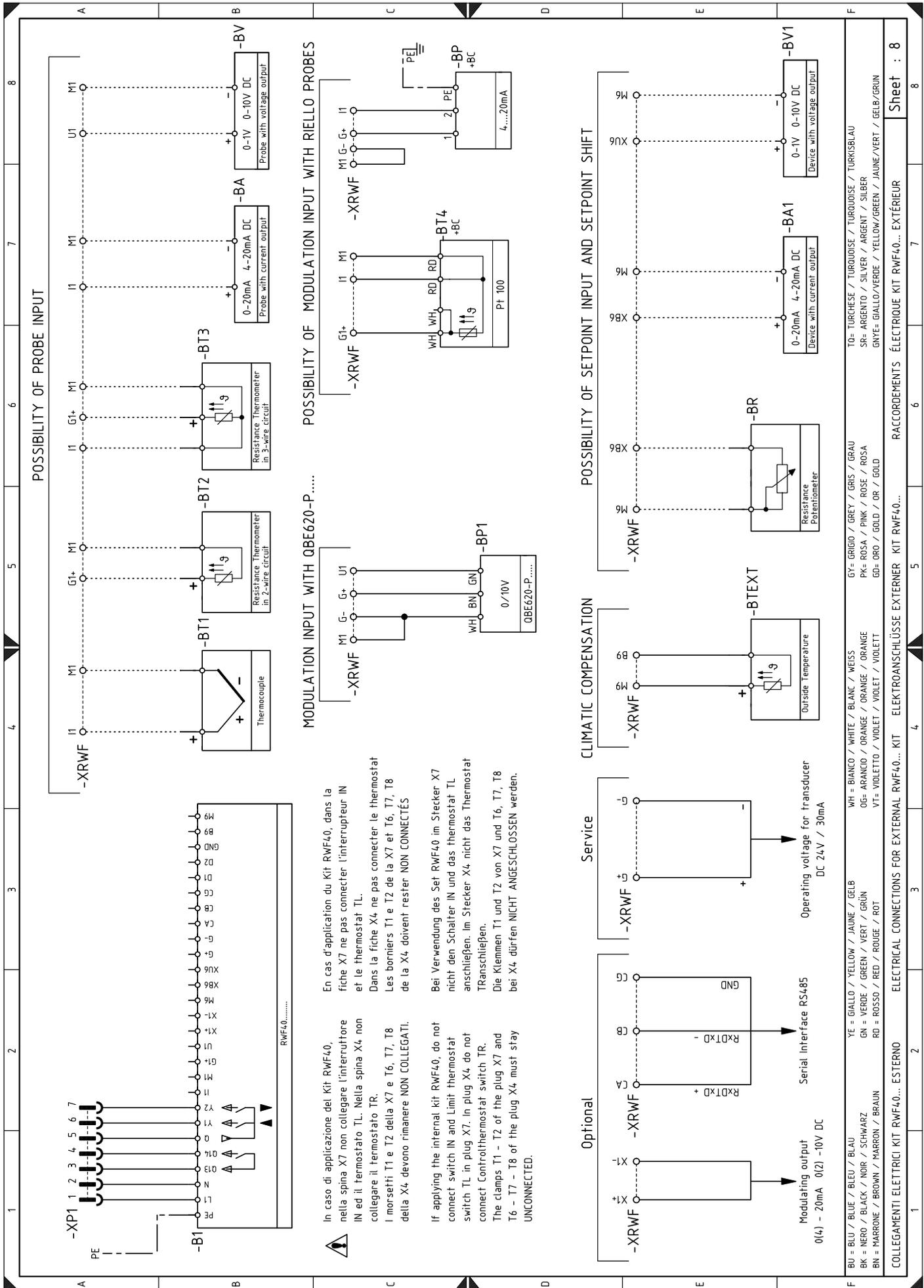
CON KIT RWF40 - WITH RWF 40 - AVEC RWF 40 - MIT RWF 40

SENZA KIT RWF40 - WITHOUT RWF 40 - SANS RWF 40 - OHNE RWF 40

F BU = BLUE / BLEU / BLAU YE = GIALLO / YELLOW / JAUNE / GELB WH = BIANCO / WHITE / BLANC / WEISS TO= TURCHISE / TURKOISE / TURKOISE / TURKSBLAU  
 BK = NERO / BLACK / NOIR / SCHWARZ GN = VERDE / GREEN / VERT / GRÜN OG= ARANCIO / ORANGE / ORANGE / ORANGE SR= ARGENTO / SILVER / ARGENT / SILBER  
 BN = MARRONE / BROWN / MARRON / BRAUN RD = ROSSO / RED / ROUGE / ROT VT= VIOLETT / VIOLET / VIOLET / VIOLETT GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN

COLLEGAMENTI ELETTRICI A CURA DELL'INSTALLATORE ELECTRICAL CONNECTIONS SET BY INSTALLER ELEKTROANSCHLÜSSE VOM INSTALLATEUR AUSZUFÜHREN RACCORDEMENTS ÉLECTRIQUE EFFECTUÉ PAR L'INSTALLATEUR Sheet : 6





POSSIBILITY OF PROBE INPUT

POSSIBILITY OF MODULATION INPUT WITH RIELLO PROBES

MODULATION INPUT WITH QBE620-P.....

CLIMATIC COMPENSATION

Service

Optional

In caso di applicazione del Kit RWF40, nella spina X7 non collegare l'interruttore IN ed il termostato TL. Nella spina X4 non collegare il fermostato TR.

In cas d'application du Kit RWF40, dans la fiche X7 ne pas connecter l'interrupteur IN et le thermostat TL.

Dans la fiche X4, ne pas connecter le thermostat et le fermostato TR.

Les borniers T1 e T2 de la X7 et T6, T7, T8 de la X4 doivent rester NON COLLEGATI.

Bei Verwendung des Set RWF40 im Stecker X7 nicht den Schalter IN und das thermostat TL anschließen. Im Stecker X4 nicht das Thermostat Transchließen.

Die Klemmen T1 und T2 von X7 und T6, T7, T8 bei X4 dürfen NICHT ANGESCHLOSSEN werden.

UNCONNECTED.

BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	GY= GRIGIO / GREY / GRIS / GRAU	TO= TURCHESE / TURQUOISE / TURKOISE / TURKISBLAU
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### 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	RWF40	3010417
Pressure	0...2.5 bar 0...16 bar	Output probe 4...20mA	3010213 3010214		

### 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
3970258	MB-DLE 410 S52	1"1/4	-
3970256	MB-DLE 412 S52	1"1/4	-
3970250	MB-DLE 415 S52	1"1/2	-
3970257	MB-DLE 420 S52	2"	3000822
3970221	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

#### Long head kit

Burner	Kit code	Standard head length	Head length obtained with the kit
RS 50/E MZ	20008182	216 mm	351 mm

#### Software interface kit (ACS410 + OCI410.30) - Service Level

Burner	Kit Code
RS 50/E MZ	3010436

#### Modbus interface Kit (OCI412)

Burner	Kit Code
RS 50/E MZ	3010437

#### VVP kit (Pressure Valve Proving)

Burner	Kit Code
RS 50/E MZ	3010344

**Continuous purging kit**

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Burner	Kit Code
RS 50/E MZ	3010094

**Differential switch kit**

---

Burner	Kit Code
RS 50/E MZ	3010465

**Maximum gas pressure switch kit**

---

Burner	Kit Code
RS 50/E MZ	3010466

**Post-purging function**

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**Note**

A specific kit does not exist, because **the post-purging function is obtained by modifying parameter 234;**  
(see Chap. 5.18)

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

kW	1 Δp (mbar)		2 Δp (mbar)		3 Δp (mbar)									
	G 20	G 25	G 20	G 25	MB-DLE 410 (Rp 1" 1/4)		MB-DLE 412 (Rp 1" 1/4)		MB-DLE 415 (Rp 1" 1/2)		MB-DLE 420 (Rp 2")		MBC-1200-SE (Rp 2")	
					G 20	G 25	G 20	G 25	G 20	G 25	G 20	G 25	G 20	G 25
285	2.5	3.7	0.4	0.5	16.5	22.7	8.0	11.1	4.0	5.3	3.2	3.4	3.4	3.6
330	3.3	4.5	0.5	0.6	21.0	28.4	10.1	14.2	4.9	6.6	3.2	4.2	3.5	3.8
380	4.1	5.3	0.7	0.8	26.0	35.3	13.0	17.7	6.0	8.0	3.8	5.1	3.7	4.0
430	4.9	6.1	0.8	1.0	31.4	42.6	15.7	21.4	7.2	9.6	4.6	6.2	3.9	4.3
480	5.8	7.0	1.0	1.3	37.1	50.6	18.6	25.6	8.5	11.2	5.4	7.3	4.1	4.6
530	6.7	8.4	1.3	1.6	43.2	59.3	21.8	30.1	9.7	12.9	6.2	8.6	4.3	4.9
580	7.6	9.9	1.5	1.9	49.8	68.6	25.2	34.5	11.0	14.6	7.2	9.8	4.5	5.2
630	8.5	11.3	1.8	2.2	56.8		28.8	39.1	12.4	16.4	8.2	11.1	4.8	5.5

The values shown in the tables refer to:

- Natural gas G 20 PCI 9.45 kWh/Sm<sup>3</sup> (8.2 Mcal/Sm<sup>3</sup>)
- Natural gas G 25 PCI 8.13 kWh/Sm<sup>3</sup> (7.0 Mcal/Sm<sup>3</sup>)

#### Column 1

Load loss at combustion head.

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

- Combustion chamber at 0 mbar;
- Burner working at maximum output;
- Combustion head adjusted according to the diagram of Fig. 15.

#### Column 2

Load loss at gas butterfly valve 2)(Fig. 39) with maximum opening: 90°.

#### Column 3

Load loss at train 3)(Fig. 39) including:

- adjustment valve (VR)
- safety valve (VS) (both fully open)
- pressure adjuster (R)
- filter (F)

#### NOTE

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

- Subtract the combustion chamber pressure from the gas pressure measured at test point 1)(Fig. 39).
- Find, in the table relating to the burner concerned, column 1, the pressure value closest to the result you want.
- Read off the corresponding output on the left.

#### Example with natural gas G 20

- Maximum output operation
  - Ring nut 2)(Fig. 14) adjusted as in the diagram of (Fig. 15)
  - Gas pressure at test point 1)(Fig. 39) = 8 mbar
  - Pressure in combustion chamber = 2.2 mbar
- $$8 - 2.2 = 5.8 \text{ mbar}$$

A pressure of 5.8 mbar, column 1, corresponds in the table to an output of 480 kW.

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

#### NOTE

To know the required gas pressure at test point 1)(Fig. 39), set the MAX output required from the burner operation:

- Find the nearest output value in the table for the burner in question.
- Read, on the right, column 1, the socket pressure 1)(Fig. 39).
- Add this value to the estimated pressure in the combustion chamber.

#### Example with natural gas G 20

- Required burner maximum output operation: 480 kW
  - Ring nut 2)(Fig. 14) adjusted as in the diagram of (Fig. 15)
  - Gas pressure at output of 480 kW = 5.8 mbar
  - Pressure in combustion chamber = 2.2 mbar
- $$5.8 + 2.2 = 8 \text{ mbar}$$

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

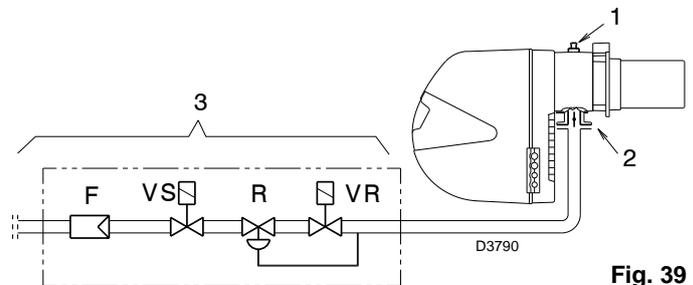


Fig. 39

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 m<sup>3</sup> 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 Qe:

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

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

$$H3 = H2 \times F \text{ (mbar)}$$

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 burner output. The reduction in output is accompanied by a reduction in the combustion chamber pressure:

Qr = reduced output  
 H1r = reduced pressure

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

**Example**, 5% reduction in output:

$$Qr = Q \times 0.95$$

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

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

**Warning:**

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

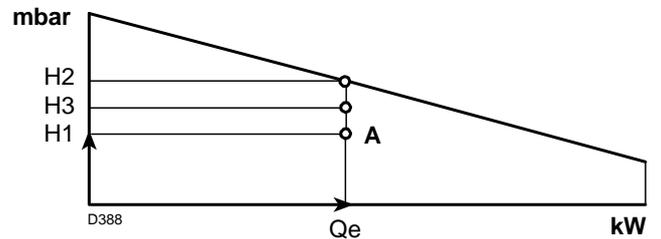


Fig. 40

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



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Subject to modifications