

GB Forced draught gas burner

Progressive two-stage operation

**UK
CA**

| CODE | MODEL |
|----------|-------|
| 20195755 | RS 50 |



Translation of the original instructions

| | | |
|----------|--|-----------|
| 1 | Information and general warnings..... | 3 |
| 1.1 | Information about the instruction manual | 3 |
| 1.1.1 | Introduction..... | 3 |
| 1.1.2 | General dangers..... | 3 |
| 1.1.3 | Other symbols | 3 |
| 1.1.4 | Delivery of the system and the instruction manual | 4 |
| 1.2 | Guarantee and responsibility..... | 4 |
| 2 | Safety and prevention..... | 5 |
| 2.1 | Introduction..... | 5 |
| 2.2 | Personnel training | 5 |
| 3 | Technical description of the burner | 6 |
| 3.1 | Burner designation | 6 |
| 3.2 | Model available | 6 |
| 3.3 | Technical data | 7 |
| 3.4 | Electrical data..... | 7 |
| 3.5 | Maximum dimensions..... | 8 |
| 3.6 | Burner equipment..... | 8 |
| 3.7 | Firing rates | 9 |
| 3.8 | Test boiler..... | 9 |
| 3.8.1 | Commercial boilers..... | 9 |
| 3.9 | Burner description | 10 |
| 3.10 | Control box RMG88..... | 11 |
| 3.11 | Servomotor SQN9..... | 12 |
| 4 | Installation | 13 |
| 4.1 | Notes on safety for the installation | 13 |
| 4.2 | Handling | 13 |
| 4.3 | Preliminary checks | 13 |
| 4.4 | Operating position | 14 |
| 4.5 | Preparing the boiler..... | 14 |
| 4.5.1 | Boring the boiler plate | 14 |
| 4.5.2 | Blast tube length..... | 14 |
| 4.5.3 | Securing the burner to the boiler | 14 |
| 4.6 | Access to head internal part..... | 15 |
| 4.7 | Positioning the probe - electrode..... | 15 |
| 4.8 | Combustion head adjustment..... | 16 |
| 4.9 | Gas supply | 17 |
| 4.9.1 | Gas feeding line | 17 |
| 4.9.2 | Gas train..... | 18 |
| 4.9.3 | Gas train installation..... | 18 |
| 4.9.4 | Gas pressure..... | 18 |
| 4.10 | Electrical connections..... | 20 |
| 4.11 | Thermal relay adjustment..... | 21 |
| 5 | Start-up, calibration and operation of the burner | 22 |
| 5.1 | Notes on safety for the first start-up | 22 |
| 5.2 | Adjustments prior to ignition | 22 |
| 5.3 | Burner start-up | 22 |
| 5.4 | Burner ignition | 23 |
| 5.5 | Burner adjustment..... | 23 |
| 5.5.1 | Output upon ignition | 23 |
| 5.5.2 | Output in 2nd stage..... | 23 |
| 5.5.3 | Output in 1st stage | 24 |
| 5.5.4 | Intermediate outputs..... | 24 |
| 5.6 | Pressure switch adjustment | 25 |

| | | |
|----------|---|-----------|
| 5.6.1 | Air pressure switch..... | 25 |
| 5.6.2 | Gas minimum pressure switch | 25 |
| 5.6.3 | Flame presence check | 25 |
| 5.7 | Servomotor adjustment..... | 26 |
| 5.8 | Burner operation | 27 |
| 5.8.1 | Burner start-up | 27 |
| 5.8.2 | Full-running operation - System equipped with TR remote control | 27 |
| 5.8.3 | Ignition failure..... | 27 |
| 5.9 | Burner start-up cycle diagnostics | 28 |
| 5.9.1 | Resetting of control box and diagnostics use | 28 |
| 5.9.2 | Control box reset..... | 28 |
| 5.9.3 | Visual diagnostics | 28 |
| 5.9.4 | Software diagnostics | 28 |
| 6 | Maintenance | 29 |
| 6.1 | Notes on safety for the maintenance | 29 |
| 6.2 | Maintenance programme | 29 |
| 6.2.1 | Maintenance frequency..... | 29 |
| 6.2.2 | Safety test - with no gas supply | 29 |
| 6.2.3 | Checking and cleaning..... | 29 |
| 6.2.4 | Combustion control (gas)..... | 30 |
| 6.2.5 | Safety components | 30 |
| 6.3 | Opening the burner | 31 |
| 6.4 | Closing the burner..... | 31 |
| 7 | Faults - Possible causes - Solutions..... | 32 |
| A | Appendix - Accessories | 34 |
| B | Appendix - Electrical panel layout..... | 35 |

1 Information and general warnings

1.1 Information about the instruction manual

1.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

1.1.2 General dangers

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



DANGER

Maximum danger level!

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



ATTENTION

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



CAUTION

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

1.1.3 Other symbols



DANGER

DANGER: LIVE COMPONENTS

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



DANGER: FLAMMABLE MATERIAL

This symbol indicates the presence of flammable materials.



DANGER: BURNING

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



DANGER: CRUSHING OF LIMBS

This symbol indicates the presence of moving parts: danger of crushing of limbs.



WARNING: MOVING PARTS

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



DANGER: EXPLOSION

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



PERSONAL PROTECTION EQUIPMENT

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



OBLIGATION TO ASSEMBLE THE COVER AND ALL THE SAFETY AND PROTECTION DEVICES

This symbol signals the obligation to reassemble the cover and all the safety and protection devices of the burner after any maintenance, cleaning or checking operations.



ENVIRONMENTAL PROTECTION

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



IMPORTANT INFORMATION

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



This symbol indicates a list.

Abbreviations used

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

1.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

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

- the address and telephone number of the nearest Assistance Centre

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

1.2 Guarantee and responsibility

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



ATTENTION

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

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

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

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

2 Safety and prevention

2.1 Introduction

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

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

It is a good idea to remember the following:

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

Specifically:

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

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

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



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

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

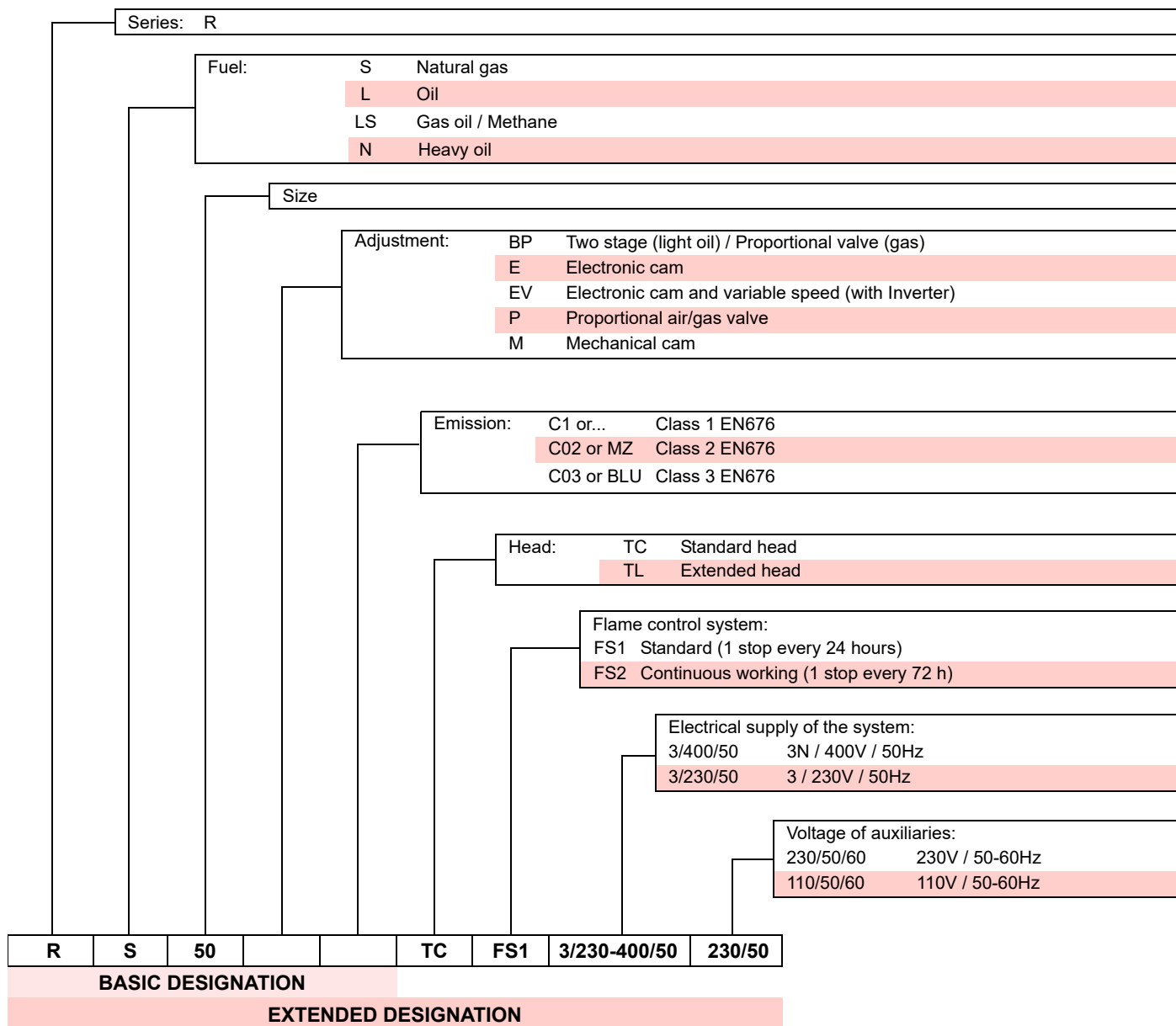
In addition:



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

3 Technical description of the burner

3.1 Burner designation



3.2 Model available

| Designation | | Voltage | Start-up | Code |
|-------------|----|--------------|----------|----------|
| RS 50 | TC | 3/230-400/50 | Direct | 20195755 |

3.3 Technical data

| Model | | RS 50 | |
|------------------------------------|----------------|---|-----------|
| Output ⁽¹⁾ | 2nd stage | kW | 295 - 600 |
| | | Mcal/h | 254 - 516 |
| | 1st stage min. | kW | 115 |
| | | Mcal/h | 99 |
| Fuel | | Natural gas: G20 - G25 | |
| | | G20 | G25 |
| - Net calorific value | | kWh/Nm ³ | 10 |
| | | Mcal/Nm ³ | 8.6 |
| - Absolute density | | kg/Nm ³ | 0.71 |
| - max delivery | | Nm ³ /h | 68 |
| - pressure at maximum delivery (2) | | mbar | 10.6 |
| Operation | | • Intermittent (min. 1 stop in 24 hours). • Two-stage (high and low flame) and one-stage (all - nothing) | |
| Standard use | | Boilers: water, steam, diathermic oil | |
| Ambient temperature | | °C | 0 - 40 |
| Combustion air temperature | | °C max | 60 |
| Noise levels ⁽³⁾ | Sound pressure | dB(A) | 72 |
| | Sound power | | 83 |

Tab. A

- (1) Reference conditions: Ambient temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m a.s.l.
 (2) Pressure at test point 7) (Fig. 4) with zero pressure in combustion chamber and at maximum burner output.
 (3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum output. The sound power is measured with the "Free Field" method, as per EN 15036, and according to an "Accuracy: Category 3" measurement, as described in EN ISO 3746.
 (4) Blast tube: short-long

3.4 Electrical data

| Model | | RS 50 | |
|------------------------------|---------|----------------------------|--|
| Electrical supply 1 Ph | | 1N ~ 230 V 50 Hz | |
| Electrical supply 3 Ph | | 3 ~ 230 - 400V +/-10% 50Hz | |
| Fan motor | rpm | 2850 | |
| | W | 650 | |
| | V | 230 - 400 | |
| | A | 3 - 1.7 | |
| Ignition transformer | V1 - V2 | 230 V - 1 x 8 kV | |
| | I1 - I2 | 1A - 20 mA | |
| Electrical power consumption | | 750 | |
| Protection level | | IP 44 | |

Tab. B

3.5 Maximum dimensions

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

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

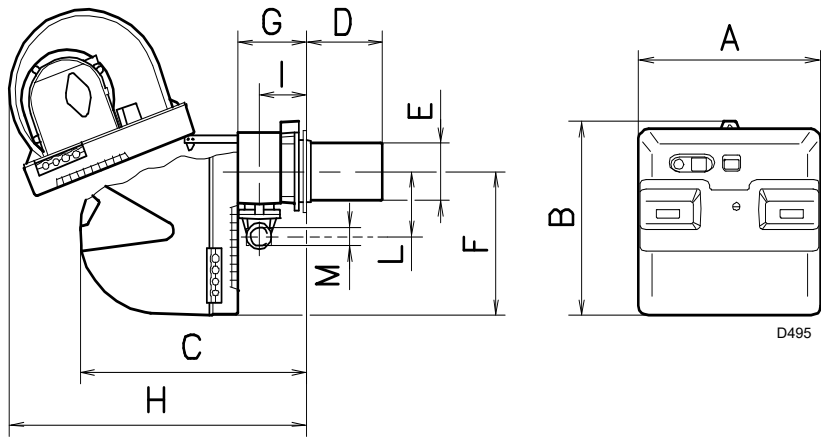


Fig. 1

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

Tab. C

3.6 Burner equipment

- Flange for gas train No. 1
- Seal for flange No. 1
- Flange fixing screws M 8 x 25 No. 4
- Thermal flange gasket No. 1
- Screws to fix the burner flange to the boiler: M 8 x 25 No. 4
- Cable grommets for the electrical wiring No. 6
- Plugs No. 4
- Instruction. No. 1
- Spare parts list No. 1

3.7 Firing rates

The burner RS 50 can work in two ways: one-stage or two-stage.

The **MAXIMUM OUTPUT** is chosen within area A.

The **MINIMUM OUTPUT** must not be lower than the minimum limit of the diagram:

RS 50 = 115 KW



The firing rate value (Fig. 2) has been obtained considering an ambient temperature of 20 °C, an atmospheric pressure of 1013 mbar (approx. 0 m a.s.l.), and with the combustion head adjusted as shown on page 16.

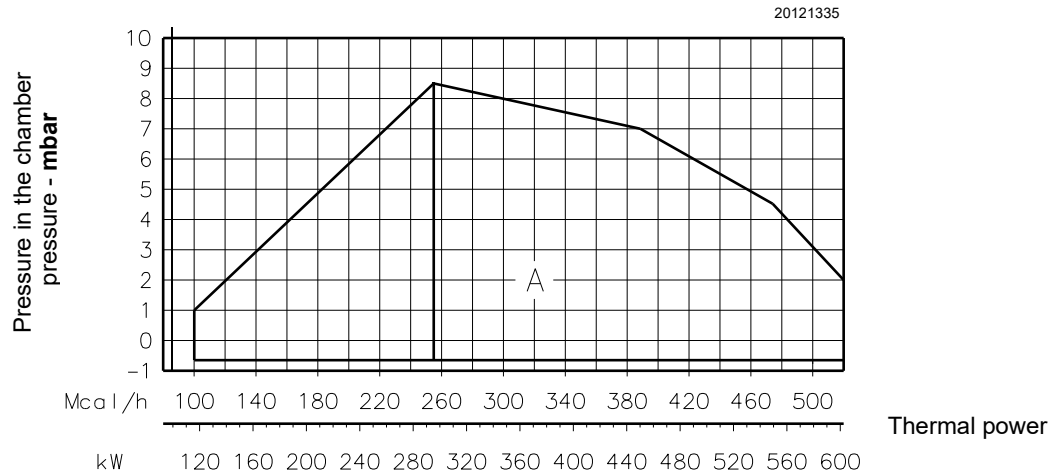


Fig. 2

3.8 Test boiler

The burner/boiler combination does not pose any problems if the boiler is EC approved and its combustion chamber dimensions are similar to those indicated in the diagram (Fig. 3).

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

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

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

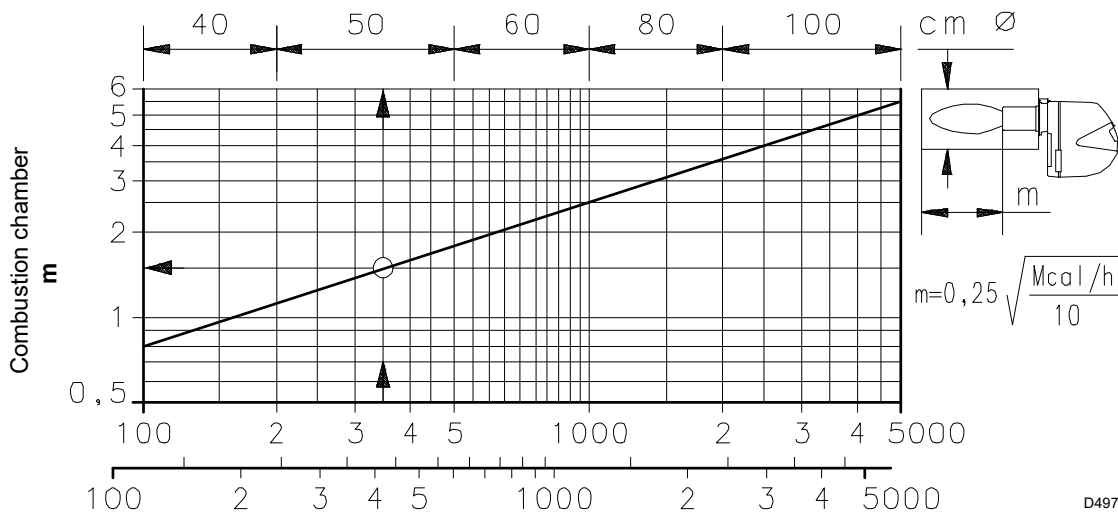
Example:

Output 350 kW: diameter 50 cm - length 1.5 m.

3.8.1 Commercial boilers

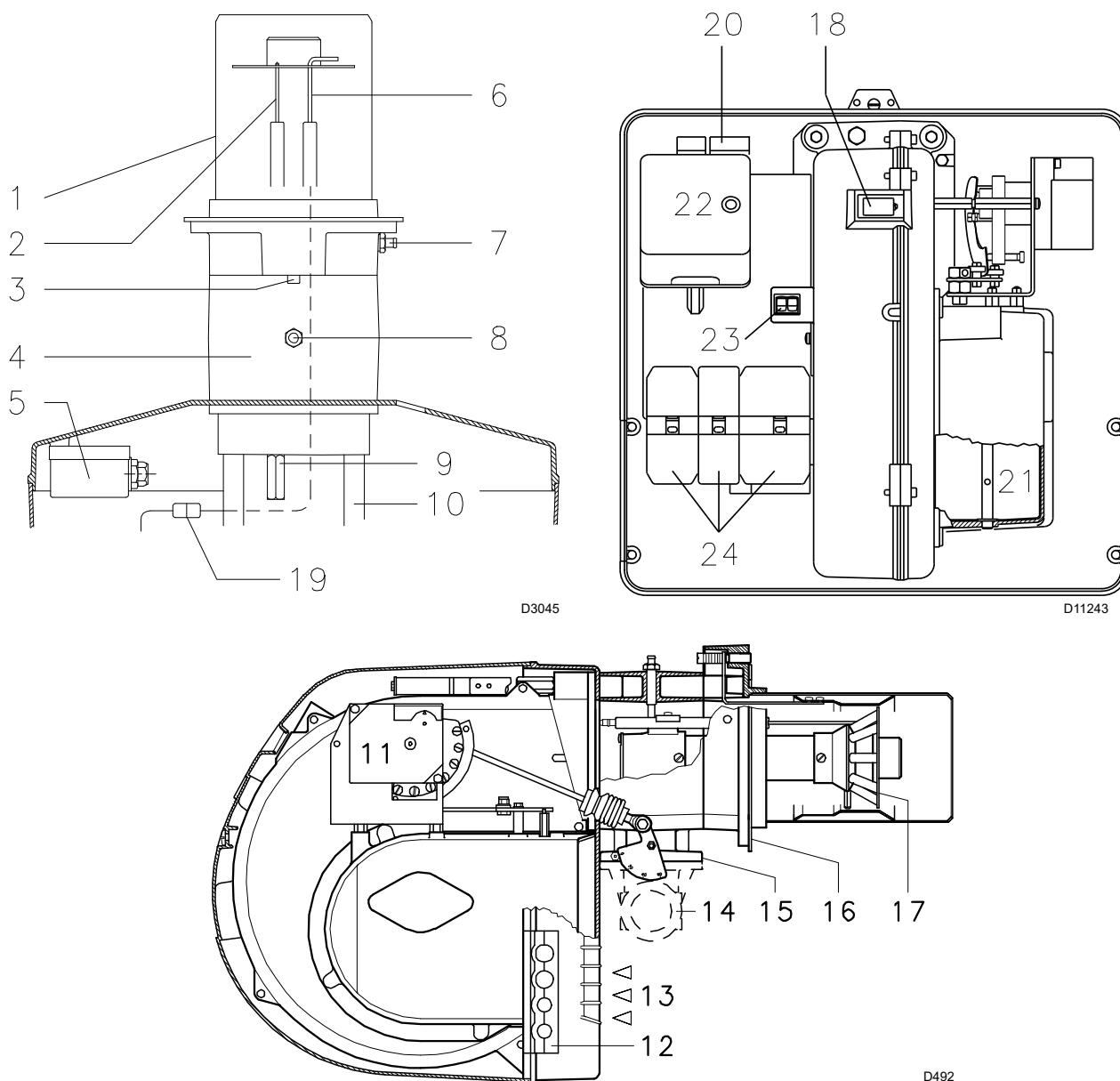
The burner/boiler combination does not pose any problems if the boiler is EC approved and its combustion chamber dimensions are similar to those indicated in the diagram (Fig. 3).

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



D497

Fig. 3

3.9 Burner description

Fig. 4

- 1 Combustion head
- 2 Ignition electrode
- 3 Screw for combustion head adjustment
- 4 Pipe coupling
- 5 Minimum air pressure switch (differential type)
- 6 Flame sensor probe
- 7 Air pressure test point
- 8 Gas pressure test point and head fixing screw
- 9 Screw securing fan to sleeve
- 10 Slide bars for opening the burner and inspecting the combustion head
- 11 Servomotor controlling the gas butterfly valve and the air damper, by means of a variable profile cam mechanism.
When the burner is not operating the air damper is fully closed in order to minimise heat dispersion from the boiler due to the flue draught which draws air from the fan suction inlet.
- 12 Plate with four hole knock-outs for electrical cable routing
- 13 Air inlet to fan
- 14 Gas input pipe
- 15 Gas butterfly valve
- 16 Boiler fixing flange

- 17 Flame stability disc
- 18 Flame inspection window
- 19 Plug-socket on ionisation probe cable
- 20 Motor contactor and thermal relay with reset button
- 21 Air damper
- 22 Control box with lockout pilot light and reset button
- 23 Two electric switches:
- one for "burner on - off"
- one for "1st - 2nd stage"
- 24 Plugs for electrical wiring

Two types of burner lockout may occur:

CONTROL BOX LOCKOUT:

if the control box button (**red LED**) 22)(Fig. 4) lights up, it indicates that the burner is locked out.

To reset, hold the push button down for between 1 and 3 seconds.

MOTOR LOCKOUT:

Release by pressing the button on thermal relay 20)(Fig. 4).

3.10 Control box RMG88...

Important notes



ATTENTION

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

The control box RMG88... is a safety device! Avoid opening or modifying it, or forcing its operation. Riello S.p.A. cannot assume any responsibility for damage resulting from unauthorised interventions!

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Before modifying the wiring in the control box connection area, fully disconnect the system from the power supply (omnipolar separation). Check the system is not powered and cannot be accidentally reconnected. Failure to do this will lead to the risk of electrocution.
- Protection against electrocution from the control box and all connected electric components is obtained with the correct assembly.
- Before any intervention (assembly and installation operations, assistance, etc.), ensure the wiring is in order and that the parameters are correctly set, then make the safety checks.
- Falls and collisions can negatively affect the safety functions.
In this case, the control box must not be operated, even if it displays no evident damage.
- Press the reset button of the burner lockout command or the reset button (by applying a force of not more than 10 N), without the aid of tools or sharp objects.

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

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



Fig. 5

S8906

Technical data

| | |
|---------------------------|------------------------------|
| Mains voltage | AC 220...240 V +10 % / -15 % |
| Mains frequency | 50 / 60 Hz ± 6% |
| Power absorption | 20 VA |
| Protection level | IP20 |
| Safety class | I |
| Weight | approx. 260 g |
| Cable length | |
| Thermostat cable | Max. 20 m at 100 pF/m |
| Air pressure switch | Max. 1 m at 100 pF/m |
| Gas pressure switch | Max. 20 m at 100 pF/m |
| Remote reset | Max. 20 m at 100 pF/m |
| CPI | Max. 1 m at 100 pF/m |
| Environmental conditions: | |
| Operation | DIN EN 60721-3-3 |
| Climatic conditions | Class 3K3 |
| Mechanical conditions | Class 3M3 |
| Temperature range | -20...+60°C |
| Humidity | < 95 % r.h. |

Mechanical structure

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

The control box contains the following components:

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

3.11 Servomotor SQN9...

Important notes

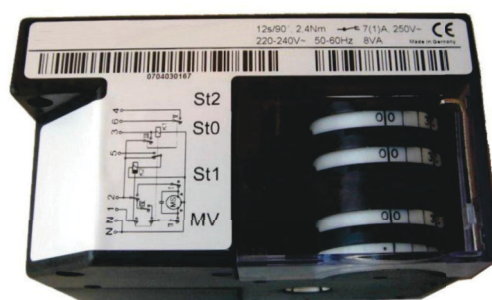


ATTENTION

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

Avoid opening, modifying or forcing the servomotor.

- All interventions (assembly and installation operations, assistance, etc.) must be carried out by qualified personnel.
- Falls and collisions can negatively affect the safety functions. In this case, the servomotor must not be operated, even if it displays no evident damage.
- Fully disconnect the burner from the mains when working near terminals and servomotor connections.
- Condensation and exposure to water are not allowed.
- For safety reasons, the servomotor must be checked after long periods of non-use.



20143391

Fig. 6

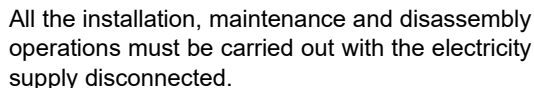
Technical data

| | |
|---------------------------|--|
| Mains voltage | 220 V -15% +10% ... 240 V + 10% |
| Mains frequency | 50 / 60 Hz +/- 6% |
| Power absorption | 8 VA |
| Motor | Synchronous |
| Drive angle | Varying between 0° and 90° |
| Protection level | IP XX |
| Cable connection | terminal board for 0.5mm ² (min.) and 2.5mm ² (max.) |
| Rotation direction | Anticlockwise |
| Rated torque (max.) | 2 Nm |
| Holding torque | 1 Nm |
| Operation time | 12 s. at 90° |
| Weight | approx. 550 kg |
| Environmental conditions: | |
| Operation | -20....+60° C |
| Transport and storage | -20...+60°C |

4

4.1

After carefully cleaning all around the area where the burner is to be installed, and arranging for the environment to be illuminated correctly, proceed with the installation operations.



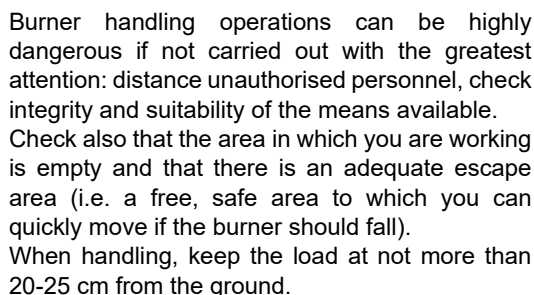
The installation of the burner must be carried out by qualified personnel, as indicated in this manual and in compliance with the standards and regulations of the laws in force.



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

4.2

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



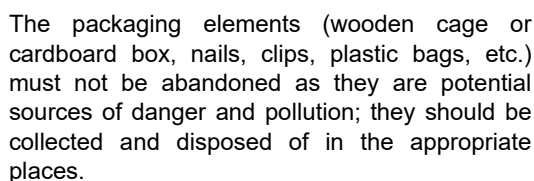
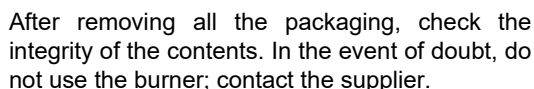
After positioning the burner near the installation point, correctly dispose of all residual packaging, separating the various types of material.




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

4.3

Checking the consignment



| | | | | | | |
|--|---|---|---|---|---|----|
| R.H.E. | A | | | B | | |
| | D | | C | | | |
| E | | | F | | | |
| GAS-KAASU | <input checked="" type="checkbox"/> FAM.2 | G | | | H | |
| GAZ-AEPIO | <input type="checkbox"/> FAM.3 | G | | | H | |
| I | | | | | | |
| I | I | I | I | I | I | |
| I | I | I | I | I | I | |
| | | | | | | CE |
|  | | | | | | |

20186109

Fig. 7

Checking the characteristics of the burner

Check the identification label of the burner (Fig. 7), showing:

- A the burner model
- B the burner type
- C the cryptographic year of manufacture
- D the serial number
- E the data for electrical supply and the protection level
- F the electrical power consumption
- G the types of gas used and the relevant supply pressures
- H the data of the burner possible minimum and maximum output (see Firing rate).

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

- the category of the appliance/countries of destination.



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

4.4 Operating position



- The burner is set up to operate only in positions 1, 2, 3 and 4 (Fig. 8).
- 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 are forbidden for safety reasons.

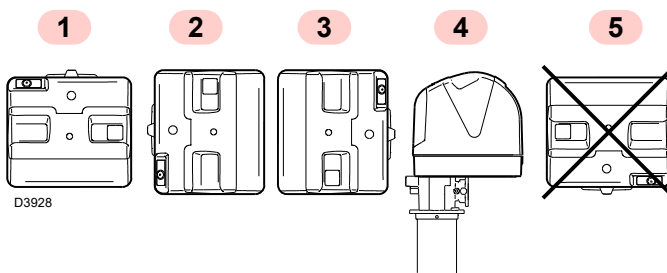


Fig. 8

4.5 Preparing the boiler

4.5.1 Boring the boiler plate

Pierce the closing plate of the combustion chamber, as in Fig. 9. The position of the threaded holes can be marked using the thermal insulation screen supplied with the burner.

| mm | A | B | C |
|-------|-----|-----|-----|
| RS 50 | 160 | 224 | M 8 |

Tab. D

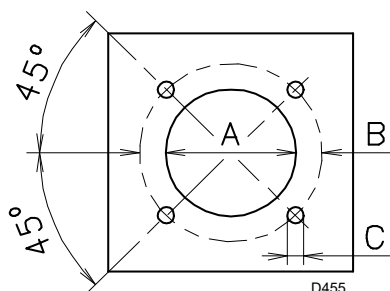


Fig. 9

4.5.2 Blast tube length

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

| mm | RS 50 |
|-----------|-------|
| Standard | 216 |
| Elongated | 351 |

Tab. E

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

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

For boilers with a water-cooled front piece, a refractory lining (13)-(14)(Fig. 10) is not necessary, unless expressly requested by the boiler manufacturer.

4.5.3 Securing the burner to the boiler

Provide an adequate lifting system.



- Separate the combustion head from the rest of the burner (Fig. 10):
- Remove screw 14) and extract cover 15).
- Disengage the articulated coupling 4) from the graduated sector 5).
- Remove the screws 2) from the two slide bars 3).
- Remove the screw 1) and draw the burner back on the slide bars 3) by about 100mm.
- Disconnect the probe and electrode cables and then slide the burner completely out of the slide bars, after removing the split pin from the slide bar 3).

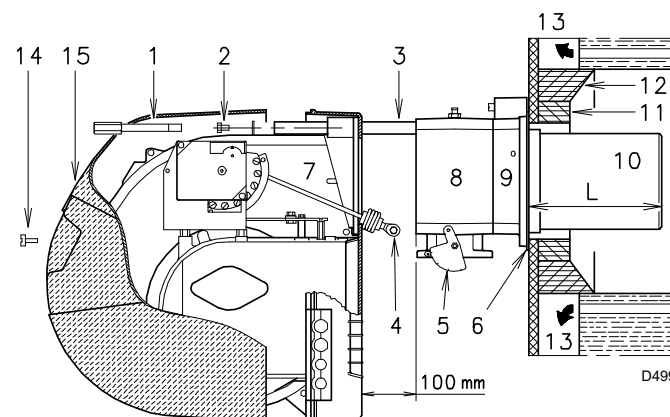


Fig. 10



ATTENTION

The seal between burner and boiler must be airtight.

4.6 Access to head internal part

In order to reach inside the combustion head (Fig. 11) proceed as follows:

- remove the screw 1) and the internal part 2).

Fix the flange 9)(Fig. 10) to the plate of the boiler interposing the insulating flange gasket 6)(Fig. 10) supplied with the unit. Use the 4 screws, also supplied with the unit, after first protecting the thread with an anti-locking product.

The seal between burner and boiler must be airtight.

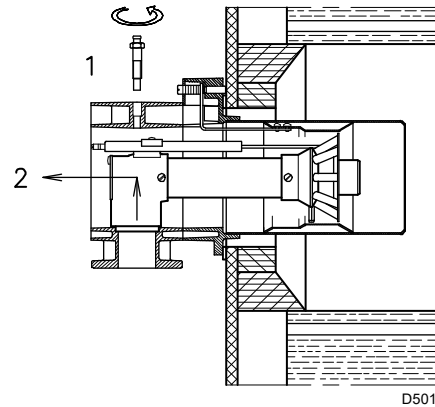


Fig. 11

4.7 Positioning the probe - electrode



ATTENTION

Before securing the burner to the boiler, check (through the opening of the blast tube) that the probe and electrode are correctly positioned, as in Fig. 12.

If in the previous check the position of the probe or electrode was not correct, remove the screw 1) (Fig. 11) extract the inner part 2)(Fig. 11) of the head, and adjust them.



ATTENTION

Do not rotate the probe but leave it as in Fig. 12; if it is too close to the ignition electrode, it could damage the control box amplifier.



ATTENTION

Respect the dimensions shown in Fig. 12.

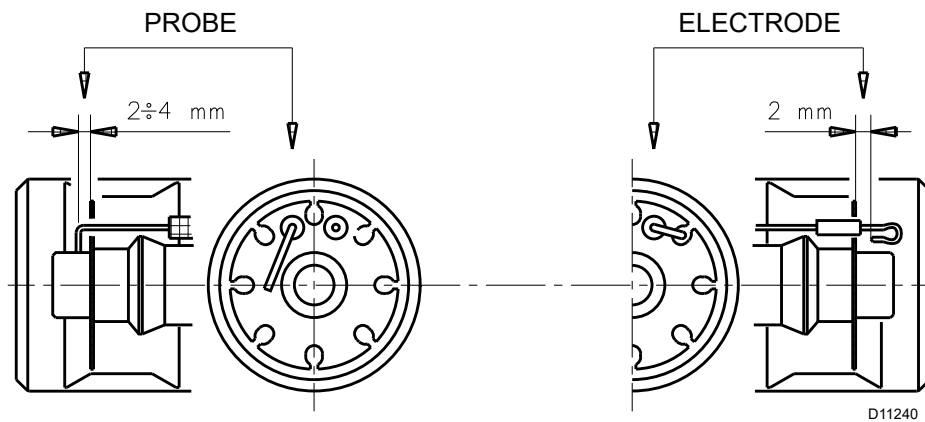


Fig. 12

4.8 Combustion head adjustment

At this point of the installation, the combustion head is fixed to the boiler as shown in Fig. 11.

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

2 combustion head adjustments are available:

- air
- gas

In the diagram of Fig. 14, find the notch at which both air and central gas/air should be adjusted.

Air adjustment

- Turn the screw 4)(Fig. 13) until the notch found lines up with the front surface 5) of the flange.



ATTENTION

To facilitate the adjustment, loosen the screw 6) (Fig. 13), adjust, then block.

Gas adjustment

- Loosen the screws 1)(Fig. 13) and rotate the ring nut 2) until the notch you have found corresponds with the indicator 3).
- Block the 3 screws 4).

Example:

Burner output = 432 kW (373 Mcal/h).

If we consult diagram (Fig. 14) we find that for this output, air and gas must be adjusted using notch 3, as shown in (Fig. 13).

NOTE:

The diagram indicates the optimum adjustment for a type of boiler according to Fig. 3 on page 9.



ATTENTION

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

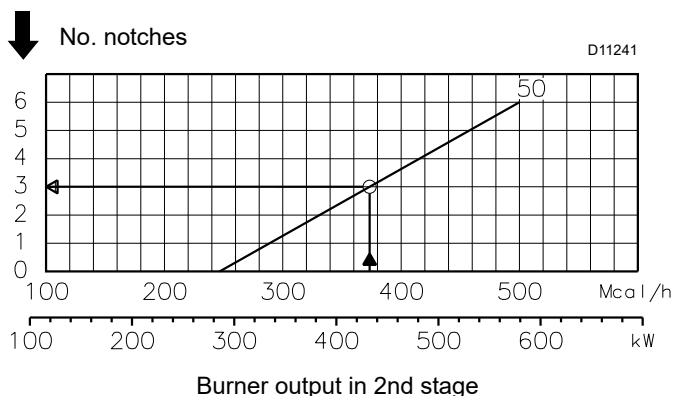


Fig. 14

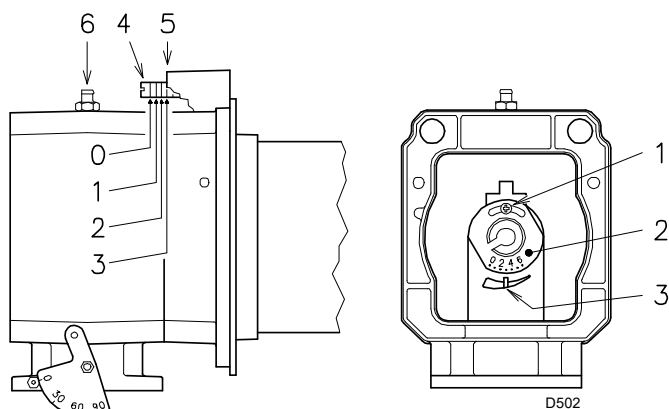


Fig. 13

4.9 Gas supply



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

Precautions: avoid knocking, attrition, sparks and heat.

Make sure the fuel shut-off valve is closed before performing any operation on the burner.



ATTENTION

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

4.9.1 Gas feeding line

Key (Fig. 15 - Fig. 16 - Fig. 17 - Fig. 18)

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

MBC “threaded”

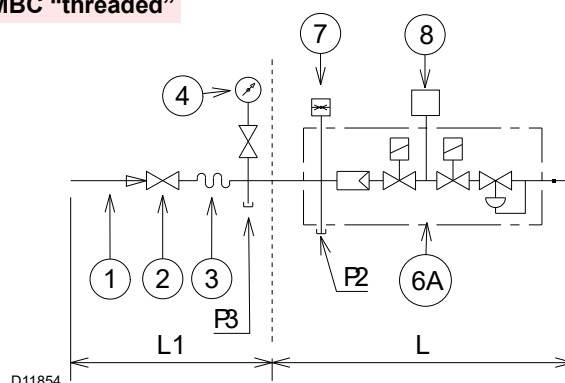


Fig. 15

MBC “flanged” - VGD

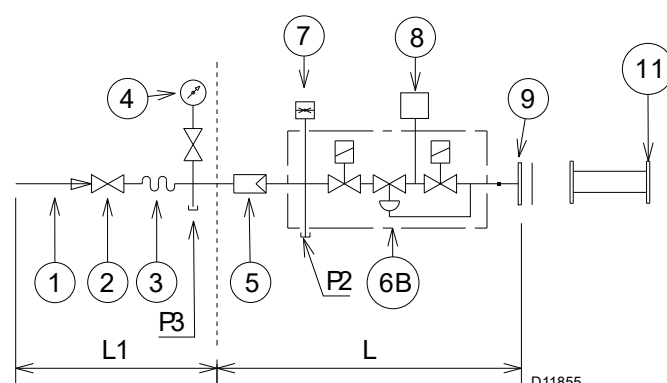


Fig. 16

DMV “flanged or threaded”

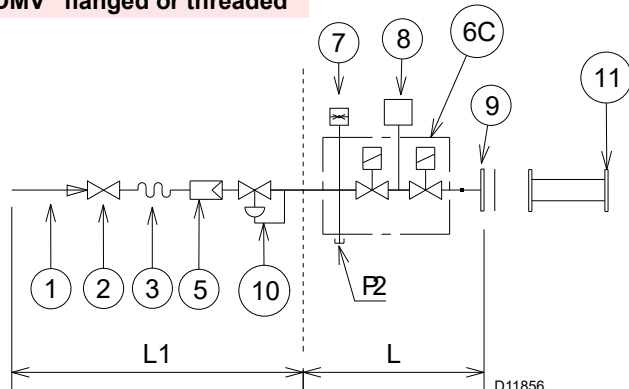


Fig. 17

CB “flanged or threaded”

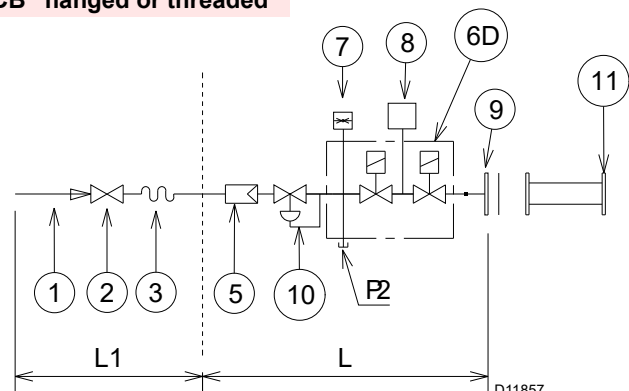


Fig. 18

4.9.2 Gas train

Type-approved in accordance with EN 676 and supplied separately from the burner.

4.9.3 Gas train installation



Disconnect the electrical power using the main switch.



Check that there are no gas leaks.



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



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



The operator must use the required equipment during installation.

The gas train must be connected to the gas connection 1) (Fig. 19), using the flange 2), the gasket 3) and the screws 4) supplied with the burner.

The train can enter the burner from the right or left side, depending on which is the most convenient, see Fig. 19.

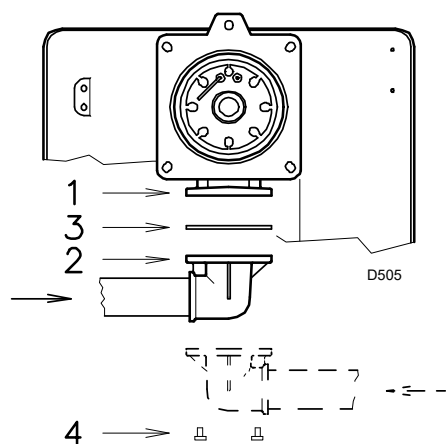


Fig. 19

4.9.4 Gas pressure

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

| kW | 1 Δp (mbar) | |
|-----|-------------|-----|
| | 1 | 2 |
| 290 | 2.2 | 0.3 |
| 330 | 2.9 | 0.4 |
| 370 | 3.6 | 0.5 |
| 410 | 4.3 | 0.6 |
| 450 | 5.0 | 0.7 |
| 490 | 5.6 | 0.9 |
| 530 | 6.3 | 1.0 |
| 580 | 7.2 | 1.2 |

Tab. F



ATTENTION

Data of head thermal power and gas pressure refer to operation with gas butterfly valve fully open (90°).

The values shown in Tab. F refer to:

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

Column 1

Combustion head pressure drop.

Gas pressure measured at test point 1) (Fig. 20), with:

- combustion chamber at 0 mbar;
- burner working at maximum output

Column 2

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

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

- subtract the combustion chamber pressure from the gas pressure measured at test point 1) (Fig. 20).
- Find in Tab. F related to the burner concerned, the pressure value closest to the result of the subtraction.
- Read the corresponding output on the left.

Example:

Natural gas G 20 NCV 10 kWh/Nm³

Gas ring nut 2) (Fig. 13 on page 16) adjusted as per diagram (Fig. 14 on page 16).

| | | |
|---|---|----------|
| Gas pressure at test point 1) (Fig. 20) | = | 6.3 mbar |
| Pressure in combustion chamber | = | 2.0 mbar |
| 6.3 - 2.0 | = | 4.3 mbar |

A pressure of 4.3 mbar, column 1, corresponds in table to a 2nd stage output of 410 kW.

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

To calculate the required gas pressure at test point 1) (Fig. 20), set the maximum modulating output required from the burner operation:

- find the nearest output value in the table Tab. F for the burner in question.
- read, on the right (column 1), the pressure at the test point 1) (Fig. 20).
- Add this value to the estimated pressure in combustion chamber.

Example:

Desired output in 2nd stage: 410 kW

Natural gas G 20 NCV 10 kWh/Nm³

Gas ring nut 2)(Fig. 13 on page 16) adjusted as per diagram (Fig. 14 on page 16).

| | | |
|-------------------------------------|---|----------|
| Gas pressure at an output of 410 kW | = | 4.3 mbar |
| Pressure in combustion chamber | = | 2.0 mbar |
| 4.3 + 2.0 | = | 6.3 mbar |

pressure required at test point 1)(Fig. 20).

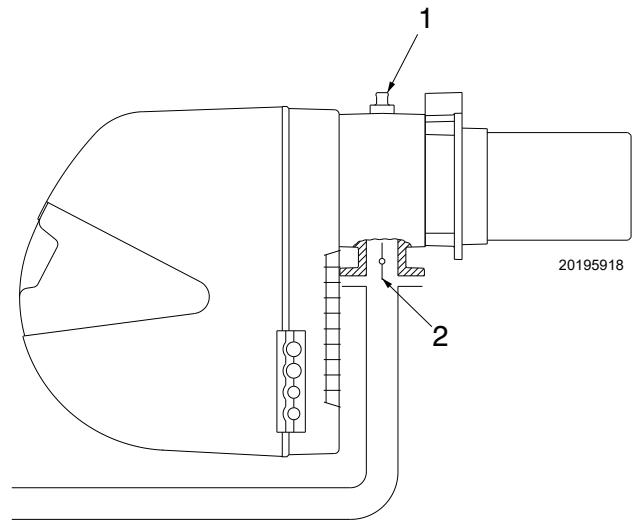


Fig. 20

4.10 Electrical connections

Notes on safety for the electrical wiring



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

Before carrying out any maintenance, cleaning or checking operations:



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

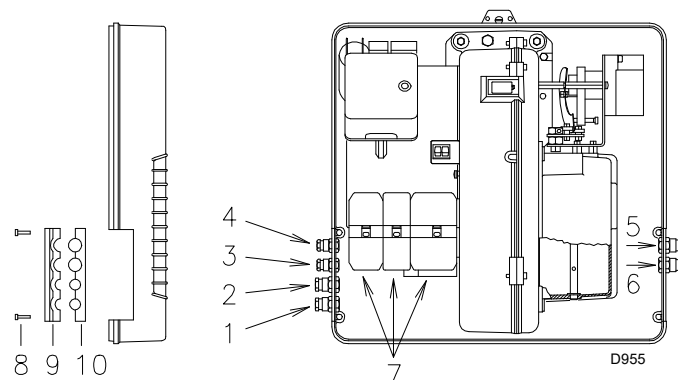


Close the fuel shut-off valve.



Avoid condensate, ice and water leaks from forming.

The use of the cable grommets and the pre-blanked holes can be done in different manners; for example:



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

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

All the cables to be connected to the plugs 7) (Fig. 21) of the burner are passed through cable grommets supplied with the unit to be inserted in the holes of the plate, left or right, after having unscrewed the screws 8), opened the plate at parts 9 and 10 and removed the thin diaphragm that closes the holes.

- | | | |
|---|-------|--|
| 1 | Pg 11 | Three-phase power supply |
| 2 | Pg 11 | Single-phase power supply |
| 3 | Pg 9 | TL remote control |
| 4 | Pg 9 | TR remote control |
| 5 | Pg 11 | Gas valves |
| 6 | Pg 11 | Gas pressure switch or valve leak detection control device |



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

Fig. 21

4.11 Thermal relay adjustment

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

- If the motor is star-powered, 400 V, the cursor 2) should be positioned to "MIN".
- If it is delta-powered, 230 V, the cursor 2) should be positioned to "MAX".
- In case of an intervention of the thermal relay, press button 1).

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

The burner leave the factory pre-set for **400 V** power supply. If **230 V** power supply is used, change the motor connection from star to delta and change the calibration of the thermal relay as well.

The burner leave the factory ready for two-stage operation and must therefore be connected to the TR remote control.

Instead, if burner single-stage operation is required, replace the TR remote control with a jumper between terminals T6 - 78 of plug X4.

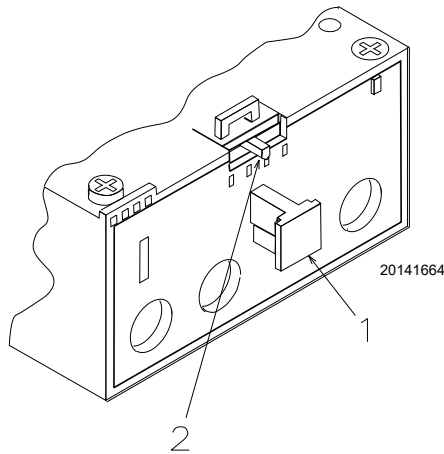


Fig. 22

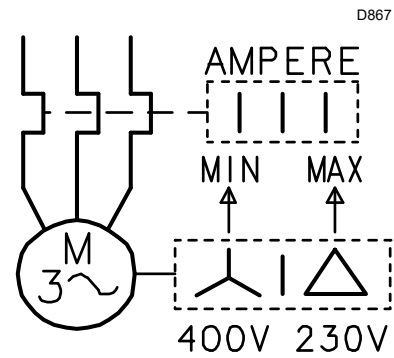


Fig. 23

5 Start-up, calibration and operation of the burner

5.1 Notes on safety for the first start-up



ATTENTION

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.



ATTENTION

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



ATTENTION

Before starting up the burner, refer to section "Safety test - with no gas supply" on page 29.

5.2 Adjustments prior to ignition

Combustion head adjustment is already described on page 16.

In addition, the following adjustments must also be made:

- open the manual valves upstream of the gas train.
- Adjust the minimum gas pressure switch to the start of the scale (Fig. 28).
- Adjust the air pressure switch to the start of the scale (Fig. 27).
- Purge the air from the gas line. We recommend using a plastic tube routed outside the building and to purge air until gas is smelt.
- Fit a U-type pressure gauge (Fig. 24) to the gas pressure test point on the pipe coupling.
- Used to approximately calculate burner output in the 2nd stage using the Tab. F on page 18.
- Connect two lamps or testers in parallel to the two gas line solenoid valves VR and VS in order to check the exact moment at which voltage is supplied. This operation is not required if each of the two solenoid valves is equipped with a pilot light that signals voltage passing through.

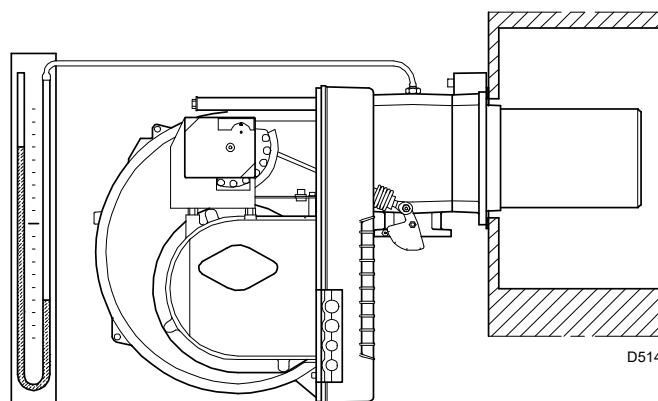


Fig. 24



CAUTION

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

5.3 Burner start-up

Close the remote controls and turn:

- switch 1)(Fig. 25) in "**BURNER ON**" position;
- switch 2)(Fig. 25) in "**1st STAGE**" position.

As soon as the burner starts, check that the lamps or the testers connected to the solenoid valves or the warning lights on the solenoid valves indicate no voltage presence. If voltage is present, stop the burner **immediately** and check the electrical wiring.

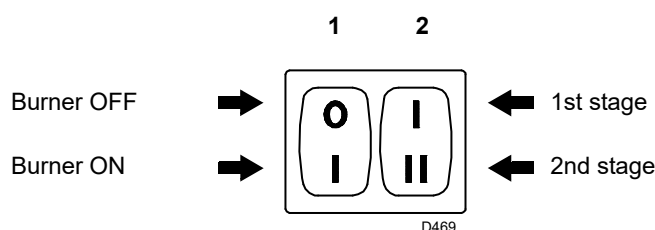


Fig. 25

5.4 Burner ignition

Once the above steps are completed, the burner should ignite. If the motor starts but the flame does not appear and the control box goes into lockout, reset and wait for a new ignition attempt. If ignition does not occur, it is possible that gas is not reaching the combustion head within the safety time period of 3 seconds. Therefore, it is necessary to increase gas ignition delivery. The arrival of gas to the sleeve is indicated by the U-type pressure gauge (Fig. 24).

If the burner locks out again, refer to chapter "Faults - Possible causes - Solutions" on page 32.



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



In the event there are further lockouts or faults with the burner, the maintenance interventions must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

Once ignition has taken place, proceed with global calibration operations.

5.5 Burner adjustment

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

Adjust in sequence:

- 1 Burner output in 2nd stage
- 2 Burner output in 1st stage
- 3 Output upon ignition
- 4 Air pressure switch
- 5 Gas minimum pressure switch

In order to measure the ignition output:

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

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

5.5.1 Output upon ignition

According to standard EN 676:

Burners with MAX output up to 120 kW

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

- max. operation output: 120 kW
- max. 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 the ignition output does not exceed 120 kW, no calculations are required. If ignition output exceeds 120 kW, the regulatory standard sets that the value be defined according to the control box safety time "ts":

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

Example:

MAX operation output of 600 kW.

Ignition output must be equal to or lower than:

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

Example for G 20 gas (10 kWh/Nm³):

Max operation output, 600 kW

corresponding to 60 Nm³/h.

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

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

5.5.2 Output in 2nd stage

2nd stage output must be selected within the firing rate range indicated in page 9.

In the above description, we left the burner running, operating in 1st stage. Now move switch 2)(Fig. 25) to 2nd stage position: the servomotor will open the air damper and, at the same time, the gas butterfly valve at 90°.

Adjustment of gas delivery

Measure the gas delivery on the meter.

A rough indication can be obtained from tables on page 5, just read the gas pressure on the U-shaped pressure gauge, see Fig. 24 on page 22, and follow the instructions given in page 18.

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

If delivery needs to be increased, increase outlet gas pressure.

Air adjustment

Progressively adjust the end profile of cam 3) (Fig. 26) by turning the screws 5).

Turn the screws clockwise to increase air delivery.

Turn the screws anticlockwise to reduce air delivery.

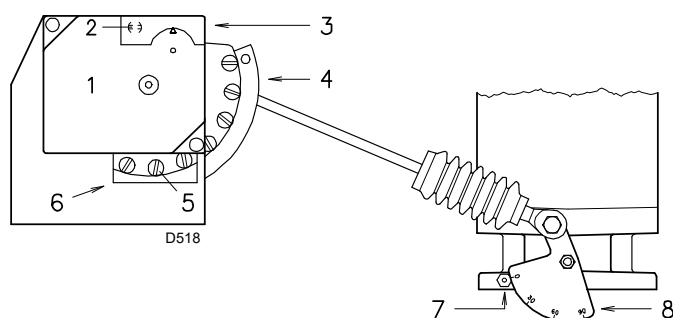


Fig. 26

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

5.5.3 Output in 1st stage

1st stage output must be selected within the firing rate range indicated on page 4.

Move the switch 2)(Fig. 25 on page 22) in "1st STAGE" position: the servomotor 1)(Fig. 26) will close the air damper and, at the same time, will also close the gas butterfly valve to 15°, i.e. to the factory setting.

Adjustment of gas delivery

Measure the gas delivery on the meter.

- If it is necessary to reduce it, slightly decrease the angle of cam St1 (Fig. 30 on page 26) with small, regular movements, i.e. bring it from an angle of 15° to 13° - 11°...
- If it is necessary to increase it, pass to 2nd stage by activating switch 2)(Fig. 25 on page 22) and slightly increase the angle of the cam St1 with small, regular movements, i.e. bring it from an angle of 15° to 17° - 19°...

Then go back to 1st stage and measure the gas delivery.

NOTE:

The servomotor only follows the adjustment of the cam St1 when the angle of the cam is reduced. If the angle needs to be increased, pass to the 2nd stage and increase the angle, then return to the 1st stage to check the effect of the adjustment.

Adjustment of air delivery

Progressively adjust the initial profile of the cam 3)(Fig. 26) by turning the screws 4). If possible, do not turn the first screw, since this is used to set the air damper to its fully closed position.

5.5.4 Intermediate outputs

Adjustment of gas delivery

No adjustment is required

Adjustment of air delivery

Turn off the burner using the switch 1)(Fig. 25 on page 22) and turn the intermediate screws of the cam so that the cam tilt is progressive.

Pay attention not to move the screws at the ends of the cam, previously adjusted to open the air damper in 1st and 2nd stage.

NOTE:

Once adjustment of "2nd stage - 1st stage - intermediate" outputs has been completed, recheck the ignition: its noise must be equal to the one of the following operation.

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

5.6 Pressure switch adjustment

5.6.1 Air pressure switch

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

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

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

If the burner locks out again, turn the knob slightly anticlockwise.



ATTENTION

as a rule, the air pressure switch must limit the CO in the fumes to less than 1% (10,000 ppm).

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

The incorporated air pressure switch can work in a 'differential' mode if connected with two pipes. If a strong depression in the combustion chamber during the pre-purging phase does not allow the air pressure switch to switch, this can be obtained by applying a second tube between the air pressure switch and the suction inlet of the fan. In this way, the pressure switch will work in differential mode.



ATTENTION

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

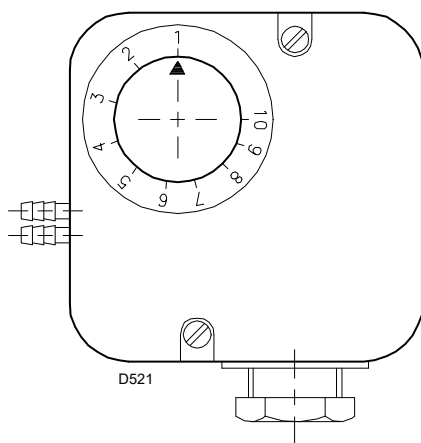


Fig. 27

5.6.2 Gas minimum pressure switch

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

Adjust the minimum gas pressure switch (Fig. 28) after having adjusted the burner, the gas valves and the gas train stabiliser. With the burner operating at maximum output:

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



ATTENTION

1 kPa = 10 mbar

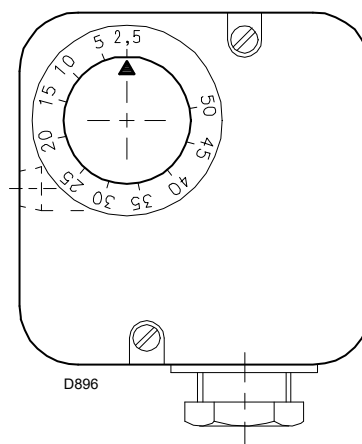


Fig. 28

5.6.3 Flame presence check

The burner is fitted with an ionisation system to check that a flame is present. The minimum current required for the control box operation is 5 μ A. The burner supplies a significantly higher current value, so that no check is usually needed.

However, if it is necessary to measure the ionisation current, disconnect the plug-socket 8)(Fig. 4 on page 10) on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 μ A.

Carefully check polarities.

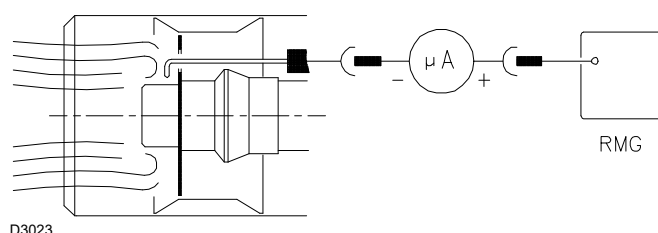


Fig. 29

5.7 Servomotor adjustment

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

The angle of rotation of the servomotor is equal to the angle on the graduated sector controlling the gas butterfly valve. The servomotor rotates 90° in 12 s.

Do not alter the factory setting for the 4 cams; just check that they are as specified below:

Cam St2 : 90°

Limits rotation toward maximum position. When the burner is operating in 2nd stage, the gas butterfly valve must be fully open: 90°.

Cam St0 : 0°

Limits rotation toward minimum position. When the burner is shut down, the air damper and gas butterfly valve must be closed: 0°

Cam St1 : 15°

Adjusts the ignition position and the output of the 1st stage.

Cam MV : not used

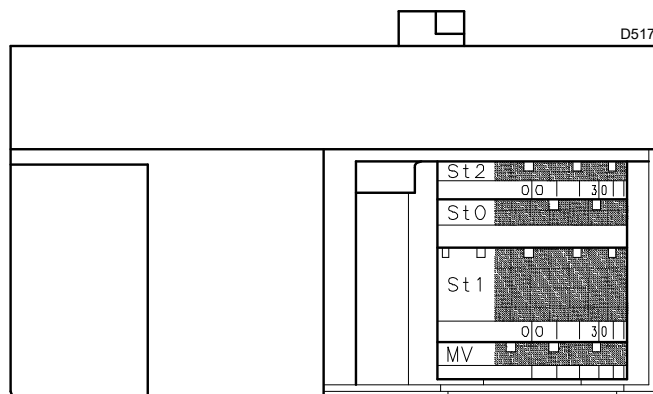


Fig. 30

5.8 Burner operation

5.8.1 Burner start-up

Control remote control TL closes.

Servomotor start-up: turn to the right until the angle set on the cam with the cam St1.

After about 3s:

- 0 s** The control box starting cycle begins.
- 2 s** Fan motor start-up.
- 3 s** Servomotor start-up: turn to the right, until the contact intervenes on the cam with the cam St2.
The air damper is positioned to 2nd stage output.
Pre-purging phase with air flow rate of 2nd stage output.
Duration 25 s.
- 28 s** Servomotor start-up: turn to the left until the angle set on the cam with the cam St1.
- 43 s** Ignition electrode strikes a spark.
The air damper and gas butterfly valve are in 1st stage output position.
The safety valve VS opens, along with the adjustment valve VR, quick opening. The flame ignites with a small output, point A. The output gradually increases, and the valve slowly opens, until 1st stage output is reached, point B.
- 45 s** The spark goes out.
- 53 s** If the TR remote control is closed or replaced by a jumper, the servomotor goes on rotating until the cam intervenes with the cam St2, bringing the air damper and gas butterfly valve to the 2nd stage position, tract C-D.
The control box starting cycle ends.
When heat demand (TL) is satisfied, the post-purging phase (*20s) starts.

5.8.2 Full-running operation - System equipped with TR remote control

Once the start-up cycle is completed, the servomotor command moves on to the TR remote control, that controls the pressure or temperature in the boiler, point D.

(The control box still continues to check the presence of the flame and the correct position of the air pressure switch).

- When the temperature or pressure increases and opens the TR, the servomotor closes the gas butterfly valve and air damper, and the burner goes from the 2nd to the 1st operating stage, tract E-F.
- When the temperature or pressure falls and closes the TR, the servomotor opens the gas butterfly valve and air damper, and the burner goes from the 1st to the 2nd operating stage. And so on.
- The burner stops when the heat request is less than the amount of heat delivered by the burner in the 1st stage, tract G-H. The TL remote control opens, the servomotor goes back to angle 0° limited by the cam with cam St0. The air damper closes completely to reduce heat losses to a minimum.

System not equipped with control device TR (jumper wire installed)

The burner is fired as described above. Then, if the temperature or pressure increases until the TL opening, the burner shuts down (tract A-A in the diagram).

STANDARD IGNITION
(no. = seconds from instant 0)

20195915

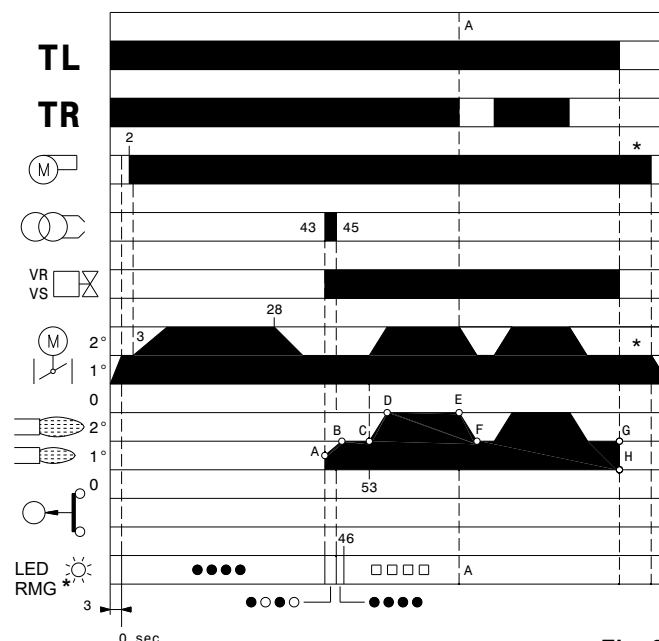


Fig. 31

RMG LED

- Off
- Green
- Yellow
- ▲ Red

5.8.3 Ignition failure

If the burner does not fire, it goes into lockout within 3 s from opening of the gas valve and within 49 s from closure of the TL remote control. The red LED of the control box comes on.

Burner flame goes out during operation

If the flame accidentally goes out during operation, the burner will go into lockout within 1s.

IGNITION FAILURE

20195917

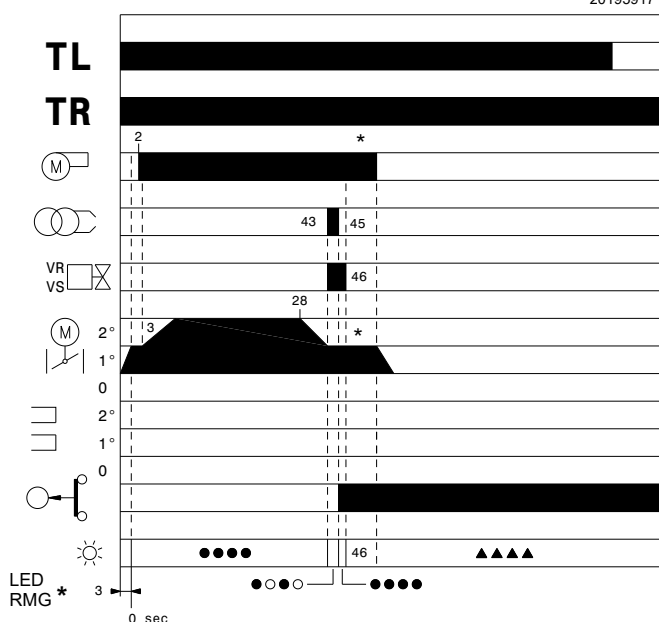


Fig. 32

RMG LED

- Off
- Green
- Yellow
- ▲ Red

5.9 Burner start-up cycle diagnostics

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

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

Tab. G

Key (Tab. G):

○ Off ● Yellow □ Green ▲ Red

| RED LED lit wait for at least 10s | Lockout | Press reset for > 3s | Pulses | 3s interval | Pulses |
|--------------------------------------|---------|----------------------|-----------|----------------|-----------|
| ■ | ■ | ■ | ● ● ● ● ● | ■ | ● ● ● ● ● |

Tab. H

Below is a list of the possible methodologies for carrying out the resetting of the control box and for using the diagnostics.

5.9.2 Control box reset

To reset the control box, proceed as follows:

- Hold the button down for between 1 and 3 seconds.
The burner starts up again, 2 seconds after the button is released.
If the burner does not restart, make sure the limit thermostat is closed.

5.9.3 Visual diagnostics

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

- Press and hold the button for more than 3 seconds from the steady red LED condition (burner lockout).
A yellow light blinks to tell you the operation is done.
- Release the button once the light has blinked.
The number of blinks indicates the reason for the malfunctioning (refer to the coding in Tab. L on page 33).

5.9.1 Resetting of control box and diagnostics use

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

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

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

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

5.9.4 Software diagnostics

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

To view diagnostics, proceed as follows:

- Press and hold the button for more than 3 seconds from the steady red LED condition (burner lockout).
A yellow light blinks to tell you the operation is done.
- Release the button for 1 second and then press again for over 3 seconds until the yellow light blinks again.
- Once the button is released, the red LED will flash intermittently with a higher frequency: it will then be possible to insert the optical connection.

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

| PRESSURE ON THE BUTTON | STATE OF CONTROL BOX |
|--|---|
| Between 1 and 3 seconds | Reset of the control box without displaying the visual diagnostics. |
| More than 3 seconds | Visual diagnostics of the lockout condition: (Led pulses at 1-second intervals). |
| More than 3 seconds starting from the condition of visual diagnostics | Diagnostic software using an optical interface and PC (possibility of displaying the hours the machine has been running, faults, etc.) |

Tab. I

The sequence of led pulses issued by the control box identifies the possible types of malfunction, which are listed in the table Tab. L on page 33.

6 Maintenance

6.1 Notes on safety for the maintenance

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

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



DANGER

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

Before carrying out any maintenance, cleaning or checking operations:



DANGER

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



DANGER

Close the fuel shut-off valve.



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

6.2 Maintenance programme

6.2.1 Maintenance frequency



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

6.2.2 Safety test - with no gas supply

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

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

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

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

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

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

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



ATTENTION

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

6.2.3 Checking and cleaning



The operator must use the required equipment during maintenance.

Combustion head

Open the burner and make sure that all components of the combustion head are in good condition, not deformed by the high temperatures, free of impurities from the surroundings and correctly positioned.

Gas filter

Change the gas filter when it is dirty.

Burner

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

Clean the outside of the burner.

Clean and grease the adjustable profile of the cams.

Fan

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

Boiler

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

Gas leaks

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

Flame inspection window

Clean the glass of the flame inspection window (Fig. 33).

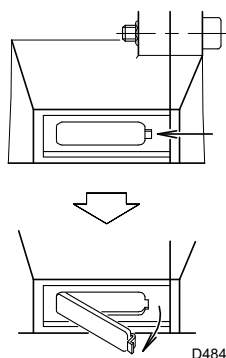


Fig. 33

6.2.4 Combustion control (gas)

Carry out an analysis of the combustion flue gases. Significant differences with respect to the previous measurements indicate the points where most care should be exercised during maintenance.

If the combustion values measured before starting maintenance do not comply with applicable Standards or do not indicate efficient combustion, consult the table below or contact our Technical Support Service to implement the necessary adjustments.

| EN 676 | | Air excess | | CO |
|--------|--|-----------------------------------|-----------------------------------|--------|
| | | Max. output $\lambda \leq 1.2$ | Max. output $\lambda \leq 1.3$ | |
| GAS | Theoretical max CO ₂ 0 % O ₂ | CO ₂ % Calibration | | mg/kWh |
| | | $\lambda = 1.2$ | $\lambda = 1.3$ | |
| G 20 | 11.7 | 9.7 | 9 | ≤ 100 |
| G 25 | 11.5 | 9.5 | 8.8 | ≤ 100 |

Tab. J

CO₂

It is advisable to adjust the burner with a CO₂ not greater than about 10% (gas with Ncv 8600 kcal/m³). In this way it is avoided that a small decalibration (for example a variation in the tension) could cause a combustion with an air defect and with the subsequent formation of CO.

CO

It should not exceed 100 mg/kWh.

6.2.5 Safety components

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

The specified life cycles do not refer to the warranty terms indicated in the delivery or payment conditions.

| Safety component | Life cycle |
|--|--------------------------------------|
| Flame control | 10 years or 250.000 operation cycles |
| Flame sensor | 10 years or 250.000 operation cycles |
| Gas valves (solenoid) | 10 years or 250.000 operation cycles |
| Pressure switches | 10 years or 250.000 operation cycles |
| Pressure adjuster | 15 years |
| Servomotor (electronic cam) (if present) | 10 years or 250.000 operation cycles |
| Oil valve (solenoid)(if present) | 10 years or 250.000 operation cycles |
| Oil regulator (if present) | 10 years or 250.000 operation cycles |
| Oil pipes/ couplings (metallic) (if present) | 10 years |
| Flexible hoses (if present) | 5 years or 30.000 pressurised cycles |
| Fan impeller | 10 years or 500.000 start-ups |

Tab. K

6.3 Opening the burner



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



Close the fuel shut-off valve.



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

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

Now extract the gas distributor 7) after having removed the screw 8)(Fig. 34).

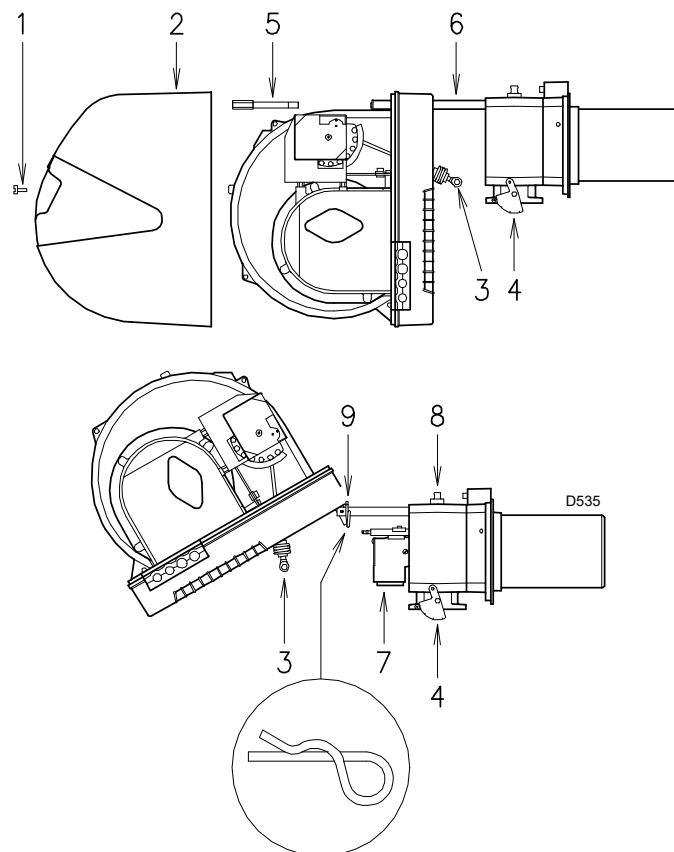


Fig. 34

6.4 Closing the burner

- Remove the split pin 9) and push the burner until it is approx. 100 mm from the pipe coupling. Reconnect the cables and slide in the burner until it comes to a stop. Replace the screws 5) and split pin 9) and carefully pull the probe and electrode cables outwards until they are slightly taut. Reconnect the articulated coupling 3) to the graduated sector 4).



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

7
Faults - Possible causes - Solutions

ATTENTION

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


DANGER

In the event there are further lockouts or faults with the burner, the maintenance interventions must only be carried out by qualified, authorised personnel, in accordance with the contents of this manual and in compliance with the standards and regulations of current laws.

| Signal | Problem | Probable cause | Suggested remedy |
|---------------------------|---|--|---|
| 2 blinks ● ● | Once the pre-purging phase and safety time have passed, the burner goes into lockout without the appearance of the flame. | The operation solenoid valve lets little gas through. | Increase |
| | | One of the two solenoid valves does not open | Replace |
| | | Gas pressure too low | Increase pressure at governor |
| | | Ignition electrode incorrectly adjusted | Adjust it |
| | | Electrode grounded due to broken insulation | Replace |
| | | High voltage cable defective | Replace |
| | | High voltage cable deformed by high temperature | Replace and protect |
| | | Ignition transformer defective | Replace |
| | | Incorrect valve or transformer electrical wiring | Check |
| | | Defective control box | Replace |
| | | A closed valve upstream the gas train | Open |
| | | Air in pipework | Bleed air |
| | | Gas valves unconnected or with interrupted coil | Check connections or replace coil |
| 3 blink ● ● ● | The burner does not switch on, and the lockout appears | Air pressure switch in operating position | Adjust or replace |
| | | | |
| | The burner starts and then goes into lockout | Air pressure switch does not switch owing to lack of air pressure: | |
| | | Air pressure switch poorly adjusted | Adjust or replace |
| | | Pressure switch pressure point pipe clogged | Clean |
| | | Poorly adjusted head | Adjust |
| | | High pressure in the furnace | Connect air pressure switch to fan suction line |
| | Lockout during pre-purging phase | Defective motor control contactor (only three-phase version) | Replace |
| | | Defective electrical motor | Replace |
| | | Motor lockout (only three-phase version) | Replace |
| 4 blinks ● ● ● ● | The burner starts and then goes into lockout | Flame simulation | Replace the control box |
| | Lockout when burner stops | Permanent flame in the combustion head or flame simulation | Eliminate persistence of flame or replace control box |
| 6 blinks ● ● ● ● ● ● | The burner starts and then goes into lockout | Defective or incorrectly adjusted servomotor | Adjust or replace |
| 7 blinks ● ● ● ● ● ● ● | The burner goes into lockout immediately following the appearance of the flame | The operation solenoid lets little gas through | Increase |
| | | Ionisation probe incorrectly adjusted | Adjust |
| | | Insufficient ionisation (less than 5 A) | Check probe position |
| | | Earth probe | Withdraw or replace cable |
| | | Burner poorly earthed | Check earthing |
| | | Phase and neutral connections inverted | Invert them |
| | Burner locks out when shifting from minimum to maximum output and vice versa | Defective flame detection circuit | Replace the control box |
| | | Too much air or too little gas | Adjust air and gas |
| | | | |
| | Burner goes into lockout during operation | Probe or ionisation cable grounded | Replace worn parts |

| Signal | Problem | Probable cause | Suggested remedy |
|-------------------------------|---|---|--|
| 10 blinks ●●●●●● ●●●●●● | The burner does not switch on, and the lockout appears | Incorrect electrical wiring | Check |
| | The burner goes into lockout | Defective control box | Replace |
| | | Presence of electromagnetic disturbances in the thermostat lines | Filter or eliminate |
| | | Presence of electromagnetic disturbance | Use the radio disturbance protection kit |
| No blink | The burner does not start | No electrical power supply | Check connections |
| | | A limiter or safety control device is open | Adjust or replace |
| | | Line fuse blocked | Replace |
| | | Defective control box | Replace |
| | | No gas supply | Open the manual valves between contactor and train |
| | | Mains gas pressure insufficient | Contact your gas company |
| | | Minimum gas pressure switch fails to close | Adjust or replace |
| | | Servomotor fails to move to min. ignition position | Replace |
| | The burner continues to repeat the start-up cycle without lockout | The gas pressure in the gas mains lies very close to the value to which the gas pressure switch has been set. The sudden drop in pressure after valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner stops. Pressure increases again, the pressure switch closes again and the ignition cycle is repeated. And so on | Reduce the minimum gas pressure switch intervention pressure. Replace the gas filter cartridge. |
| | Ignition with pulsations | Poorly adjusted head | Adjust |
| | | Ignition electrode incorrectly adjusted | Adjust it |
| | | Incorrectly adjusted fan air damper: too much air | Adjust |
| | | Output during ignition phase is too high | Reduce |
| | Burner does not reach maximum output | Remote control device TR fails to close | Adjust or replace |
| | | Defective control box | Replace |
| | | Defective servomotor | Replace |
| | Burner stops with air damper open | Defective servomotor | Replace |

Tab. L

A Appendix - Accessories
Kit for LPG operation

| BURNER | RS 50 | |
|------------------|-----------|---------|
| Output kW | 140 ÷ 581 | |
| Nozzle length mm | 216 | |
| Code | 3010083 | 3010084 |

Vibration reduction kit

| BURNER | RS 50 | |
|------------------|-----------|--|
| Output kW | 116 ÷ 580 | |
| Nozzle length mm | 216 | |
| Code | 3010200 | |

Differential circuit breaker kit

| Burner | Code |
|--------|---------|
| RS 50 | 3010329 |

Software interface kit

| Burner | Code |
|--------|---------|
| RS 50 | 3002719 |

Radio disturbance protection kit

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

| Burner | Code |
|--------|---------|
| RS 50 | 3010386 |

Gas trains in compliance with EN 676

Please refer to manual.



ATTENTION

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

B Appendix - Electrical panel layout

| | |
|----------|---|
| 1 | Index of layouts |
| 2 | Indication of references |
| 3 | Operational layout |
| 4 | Operational layout |
| 5 | Electrical connections set by installer |

2 Indication of references

Sheet no. **/1.A1**
Coordinates



WIRING LAYOUT KEY

| | |
|-------|---|
| A1 | Control box |
| B | Filter to protect against radio disturbance |
| CN1 | Ionisation probe connector |
| FU | Fuse |
| F1 | Thermal relay |
| H | Lockout signal lamp |
| H1 | Valve leak detection device lockout signal lamp |
| h1 | 1st stage hour counter |
| h2 | 2nd stage hour counter |
| K1 | Relay |
| KM | Motor contactor |
| IN | Burner manual stop switch |
| ION | Ionisation probe |
| MV | Fan motor |
| PA | Air pressure switch |
| PGmin | Minimum gas pressure switch |
| Q1 | Three-phase line switch/disconnecting switch |
| Q2 | Single-phase line disconnecting switch |
| S1 | "On-Off" and "1st - 2nd stage" |
| SM | Servomotor |
| TA | Ignition transformer |
| TL | Limit pressure switch/thermostat |
| TR | Adjustment thermostat/pressure switch |
| TS | Safety pressure switch/thermostat |
| VR | Regulation valve |
| VS | Safety valve |
| X1 | Burner terminal strip |
| X4 | 4-pole plug |
| X5 | 5-pole plug |
| X6 | 6-pole plug |
| X7 | 7-pole plug |
| XP4 | 4-pole socket |
| XP5 | 5-pole socket |
| XP6 | 6-pole socket |
| XP7 | 7-pole socket |
| YVPS | Valve leak detection device |



Registered Office - 公司注册所在地 :
RIELLO S.p.A.
I-37045 Legnago (VR)
Tel.: +39.0442.630111
[http:// www.riello.it](http://www.riello.it)
[http:// www.riello.com](http://www.riello.com)

Manufacturing site:
Riello Heating Equipment (Shanghai) CO., LTD
No. 388, Jinbai Road - Jinshan Industrial Zone
201506 - Shanghai
CHINA

生产场所 :
Riello Heating Equipment (Shanghai) CO., LTD
利雅路热能设备 (上海) 有限公司
上海市金山工业区金百路 388 号