

GB Forced draught gas burners

Progressive two-stage or modulating operation



CODE	MODEL	TYPE
20159209	RS 45/M C05	S028T
20159210	RS 45/M C05	S028T



Translation of the original instructions

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

Manufacturer: RIELLO S.p.A.

Address: Via Pilade Riello, 7
37045 Legnago (VR)

Product: Forced draught gas burners

Model: RS 45/M C05

These products are in compliance with the following Technical Standards:

EN 676

EN 12100

and according to the European Directives:

GAR 2016/426/EU

Gas Appliances Regulation

MD 2006/42/CE

Machine Directive

LVD 2014/35/EU

Low Voltage Directive

EMC 2014/30/EU

Electromagnetic Compatibility

Such products are marked as follows:



CE-0123CT1607

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

Legnago, 21.04.2018

General Manager
RIELLO S.p.A. - Burners Department
Eng. U. Ferretti

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

2 Information and general warnings

2.1 Information about the instruction manual

2.1.1 Introduction

The instruction manual supplied with the burner:

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

Symbols used in the manual

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

2.1.2 General dangers

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



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.

2.1.3 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

2.1.4 Delivery of the system and the instruction manual

When the system is delivered, it is important that:

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

- the address and telephone number of the nearest Assistance Centre

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

2.2 Guarantee and responsibility

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



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.

3 Safety and prevention

3.1 Introduction

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

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

It is a good idea to remember the following:

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

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.



ATTENTION

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

3.2 Personnel training

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

The user:

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

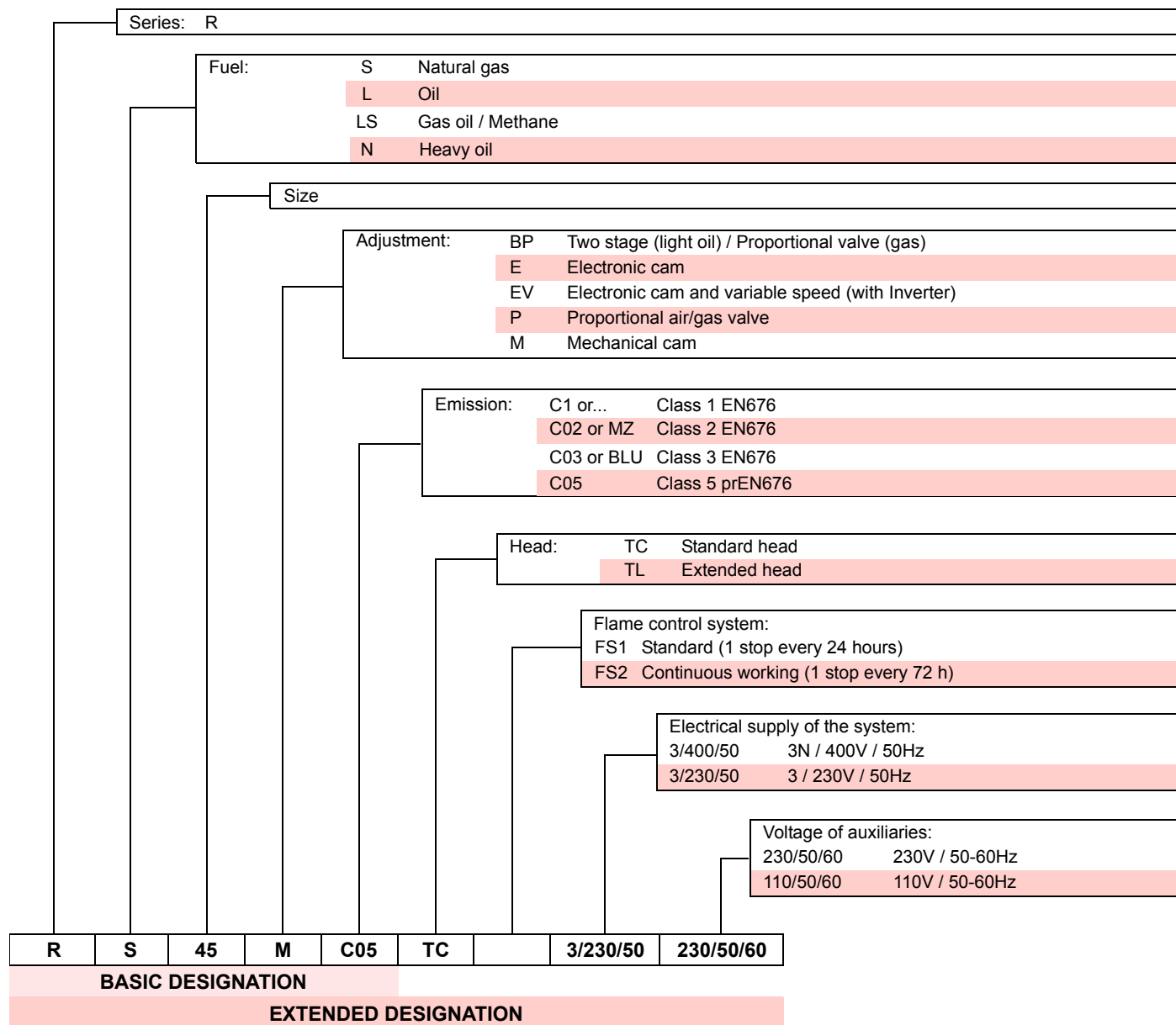
In addition:



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

4 Technical description of the burner

4.1 Burner designation



4.2 Models available

Designation		Voltage	Start-up	Code
RS 45/M C05	TC	1/230 50Hz	Direct	20159209
RS 45/M C05	TL	1/230 50Hz	Direct	20159210

4.3 Burner categories - Countries of destination

Country of destination	Gas category
SE - FI - AT - GR - DK - ES - GB - IT - IE - PT - IS - CH - NO	I _{2H}
DE	I _{2ELL}
NL	I _{2L} - I _{2E} - I ₂ (43.46 ÷ 45.3 MJ/m ³ (0°C))
FR	I _{2Er}
BE	I _{2E(R)B}
LU - PL	I _{2E}

4.4 Technical data

Model			RS 45/M C05	
Type			S028T	
Output (1)	2nd stage	kW	190 - 570	
		Mcal/h	164 - 491	
	1st stage (min.)	kW	90	
		Mcal/h	78	
Fuel			Natural gas: G20 - G25 - G31	
Gas pressure at max. output (2) - Gas: G20/G25		mbar	18	27
Operation			• Intermittent (min. 1 stop in 24 hours). • Progressive two-stage or modulating with kit (see ACCESSORIES).	
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)	70	
	Sound power		81	

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. 5) 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.

4.5 Electrical data

Model			RS 45/M C05	
Electrical supply			1N ~ 230 V 50 Hz	
Fan motor	g/min W V A		2800	
			420	
			220 - 240	
			2.6	
Motor capacitor	μF/V		12.5/420	
Ignition transformer	V1 - V2		230 V - 1 x 15 kV	
	I1 - I2		1 A - 25 mA	
Electrical power consumption	W max		760	
Protection level			IP 40	

Tab. B

4.6 Maximum dimensions

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

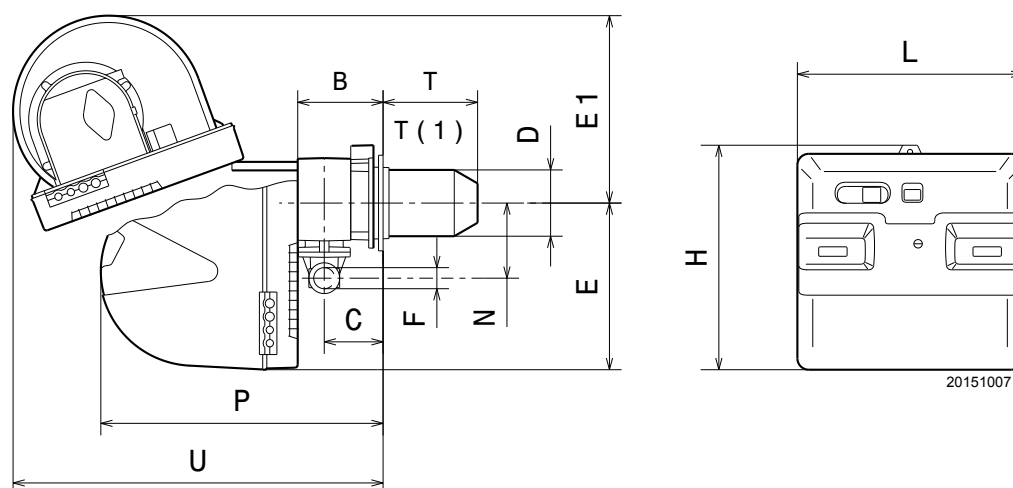


Fig. 1

mm	B	C	D	E	E1	F	H	L	N	P	T	T ₍₁₎	U
RS 45/M C05	164	108	140	352	367	11/2"	474	476	168	580	192	327	810

Tab. C

(1) Blast tube: short-long

4.7 Burner equipment

Flange for gas train	No. 1	Instruction	No. 1
Seal for flange	No. 1	Spare parts list	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		
Plugs for electrical wiring	No. 3		

4.8 Firing rate

The burners RS 45/M C05 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 45/M C05 = 90 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.

RS 45/M C05

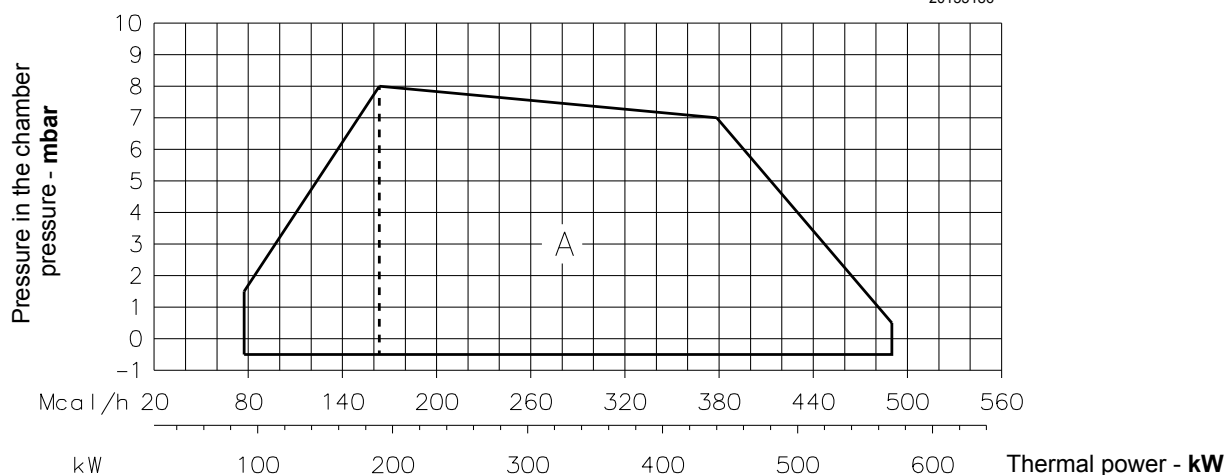


Fig. 2

4.9 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 400 kW: diameter 50 cm - length 1.5 m.

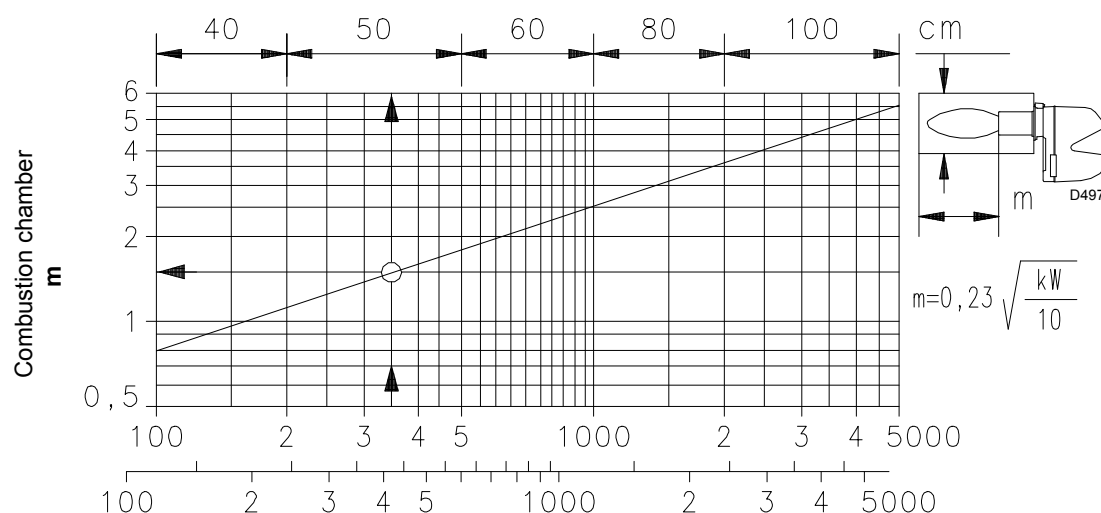


Fig. 3

4.9.1 Commercial boilers

The burner is suitable for operating on both flame inversion boilers as well as on boilers with a combustion chamber with run-off from the bottom (three flue passes) on which the best results for low NO_x emissions are obtained.

The maximum thickness of the boiler front door must not exceed 160 mm (see Fig. 4).

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. 3) preliminary checks are recommended.

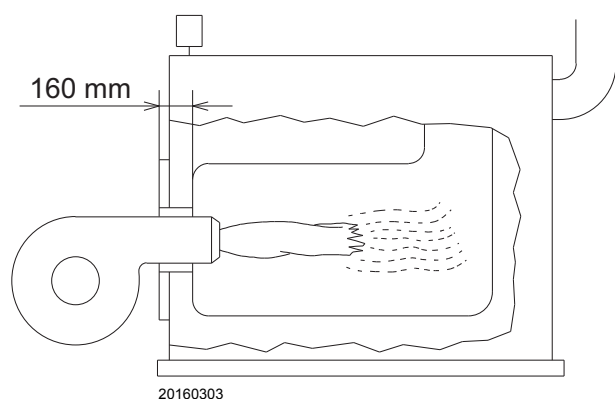


Fig. 4

4.10 Burner description

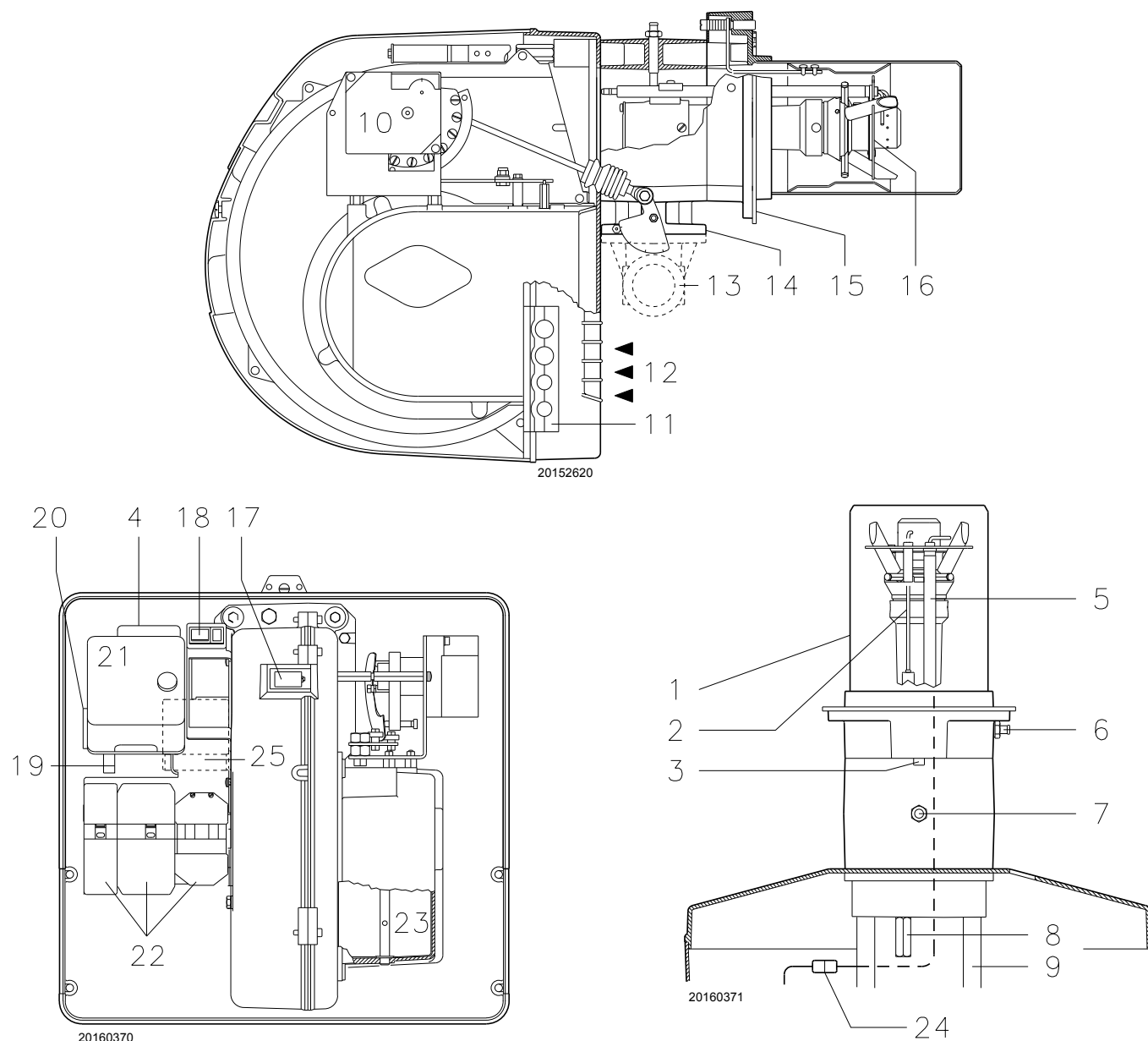


Fig. 5

- | | | | |
|----|---|----|---|
| 1 | Combustion head | 18 | Power switch for: automatic - manual - off |
| 2 | Ignition electrode | | Button for: power increase - power reduction |
| 3 | Screw for combustion head adjustment | 19 | Suppressor |
| 4 | Minimum air pressure switch (differential operating type) | 20 | Relay |
| 5 | Flame sensor probe | 21 | Control box with lockout pilot light and lockout reset button |
| 6 | Air pressure socket | 22 | Sockets for electrical connection |
| 7 | Gas pressure test point and head fixing screw | 23 | Two electric switches: |
| 8 | Screws securing fan to sleeve | | - one for "burner on - off" |
| 9 | Slide bars for opening the burner and inspecting the combustion head | | - one for "1st - 2nd stage" |
| 10 | Servomotor controlling the gas butterfly valve and the air damper (by means of a variable profile cam mechanism).
When the burner is stopped, the air damper will be completely closed to reduce heat loss due to the flue draught, which tends to draw air from the fan air inlet | 24 | Plug-socket on ionisation probe cable |
| 11 | Areas for passage of electric cables | 25 | Ignition transformer |
| 12 | Air inlet to fan | | Two types of burner lockout may occur: |
| 13 | Gas input pipework | | |
| 14 | Gas butterfly valve | | |
| 15 | Boiler mounting flange | | |
| 16 | Flame stability disc | | |
| 17 | Flame inspection window | | |

CONTROL BOX LOCKOUT:

if the control box button (**red LED**) 22)(Fig. 5) lights up, it indicates that the burner is locked out. To reset, hold the push button down for between 1 and 3 seconds.

4.11 Control box for the air/fuel ratio

Introduction

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

In compliance with:

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



Fig. 6



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



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

Technical data

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

4.12 Servomotor SQM..

Important notes



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.

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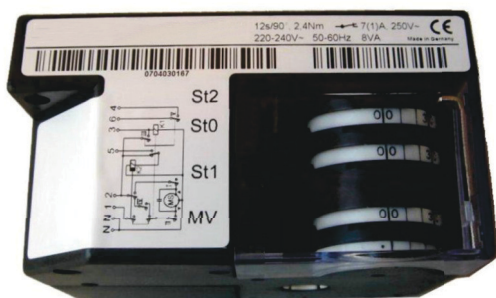


Fig. 7

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	24 s. at 90°
Weight	approx. 550 kg
Environmental conditions:	
Operation	-20....+60° C
Transport and storage	-20...+60°C

5 Installation

5.1 Notes on safety for the installation

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



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



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



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.

5.2 Handling

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.



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



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



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

5.3 Preliminary checks

Checking the consignment



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



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

RBL		A		B		C	
D		E				F	
GAS-KAASU		<input checked="" type="checkbox"/>		G		H	
GAZ-AERO				G		H	
I						RIELLOSpA I-37045 Legnago (VR)	
						CE 0085	

D7738

Fig. 8

Checking the characteristics of the burner

Check the identification label of the burner (Fig. 8), 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.
- I 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

5.4 Operating position



- The burner is set up to operate only in positions 1, 2, 3 and 4 (Fig. 9).
- 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.

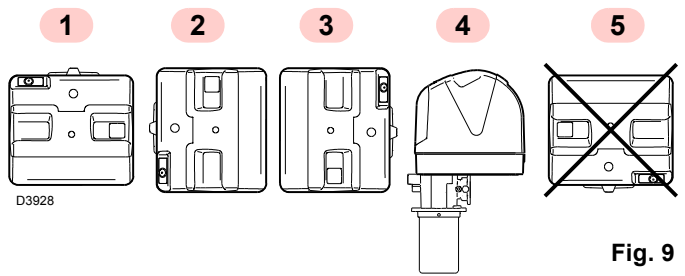


Fig. 9

5.5 Preparing the boiler

5.5.1 Boring the boiler plate

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

mm	A	DF	Ø
RS 45/M C05	165	224	M 8

Tab. D

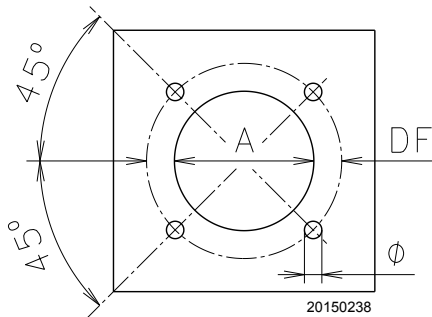


Fig. 10

5.5.2 Blast tube length

The length of the blast tube must be selected according to the indications provided by the manufacturer of the boiler, and in any case it must be greater than the thickness of the boiler door complete with its fettling.

The range of lengths available, L (mm), is as follows:

mm	RS 45/M C05
Standard	192
Elongated	327

Tab. E

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

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

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

5.5.3 Securing the burner to the boiler



Provide an adequate lifting system.

- Separate the combustion head from the rest of the burner (Fig. 11):
- Remove the cover.
- 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.

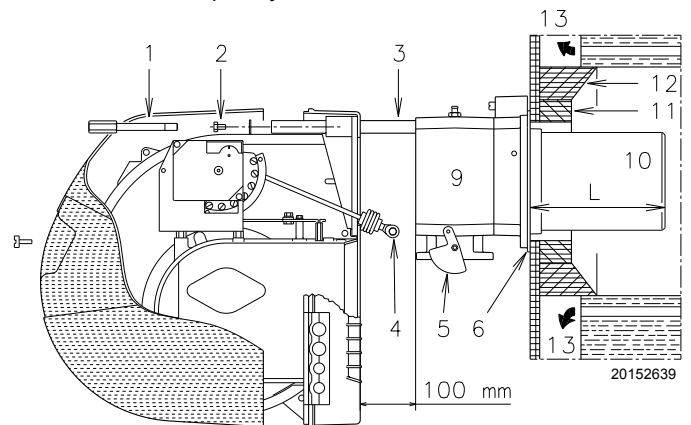


Fig. 11



The seal between burner and boiler must be airtight.

5.6 Access to head internal part

In order to reach inside the combustion head (Fig. 12) proceed as follows:

- remove the screw 1) and the internal part 2).
- Fix the flange 9)(Fig. 11) to the plate of the boiler interposing the insulating flange gasket 6)(Fig. 11) 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.

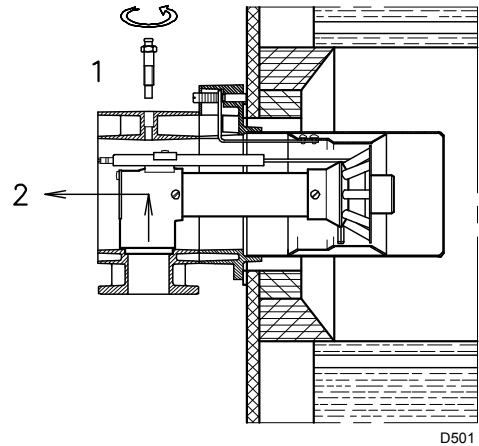


Fig. 12

5.7 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. 13.



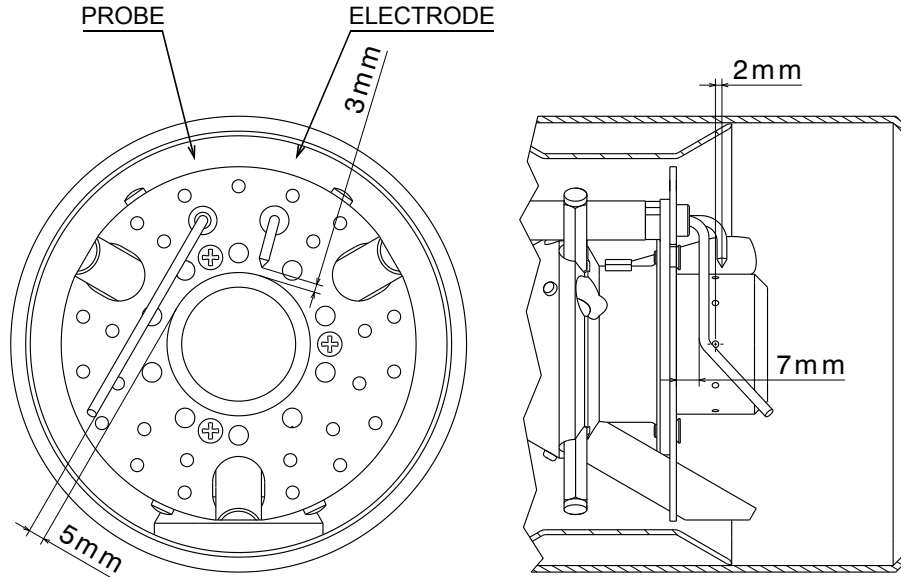
ATTENTION

Do not rotate the probe but leave it as in Fig. 13; if it is too close to the ignition electrode, it could damage the control box amplifier.



ATTENTION

Respect the dimensions shown in Fig. 13.



D10833

Fig. 13

5.8 Combustion head adjustment

Installation operations are now at the stage where the blast tube and sleeve are secured to the boiler as shown in Fig. 14.

It is therefore particularly easy to adjust the combustion head.

Air adjustment (Fig. 14 - Fig. 15)

Rotate the screw (1) until the notch on the lamina (2) corresponds with the surface of the plate (3).

Example:

RS 45/M C05 burner, output = 300 kW.

From diagram (Fig. 15) you can see that, for the MAX output of 300 kW, the air should be adjusted at notch 3, subtracted from the value of the pressure in the chamber.

In this case, the loss of pressure in the combustion head is shown in paragraph "Gas pressure" on page 18.

NOTE:

If the pressure in the chamber is equal to 0 mbar, the air is adjusted with reference to the broken line of the diagram Fig. 15.

Central air/gas adjustment

- Rotate the central air 4) and gas 7) ring nuts (Fig. 14) until notch shown on the diagrams Fig. 15 and Fig. 16.
- In order to carry out this operation, unscrew the screws 5)(Fig. 14) and rotate the ring nuts 4) and 7 (Fig. 14).
- At the end, tighten the screws 5)(Fig. 14) again.
- Once you have finished adjusting the head, reassemble the burner 4)(Fig. 17) on the guides 3)(Fig. 17) at about 100mm from the pipe coupling 5)(Fig. 17) - burner in the position shown in Fig. 11 - insert the cable of the probe and the cable of the electrode, then slide the burner as far as the pipe coupling, burner in the position shown in Fig. 17.
- Refit screws 2)(Fig. 17) on guides 3)(Fig. 17).
- Fix the burner to the pipe coupling with the screw 1)(Fig. 17).



ATTENTION

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



ATTENTION

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

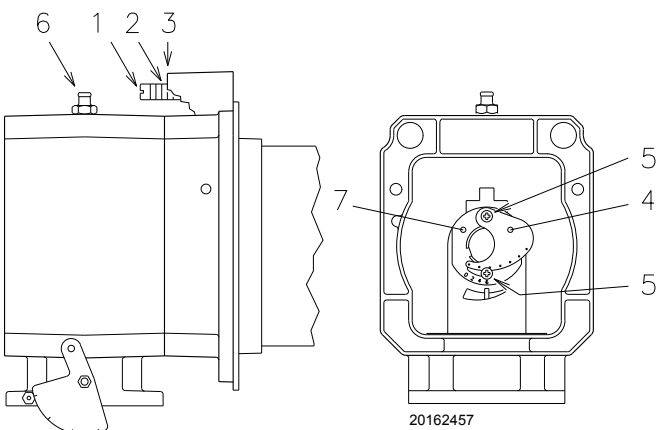


Fig. 14

Combustion head setting

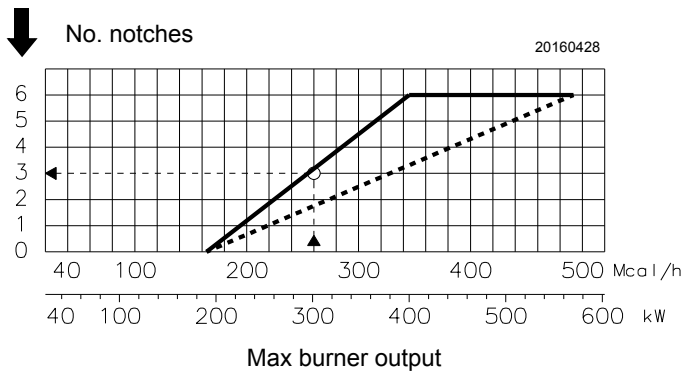


Fig. 15

Central air/gas adjustment

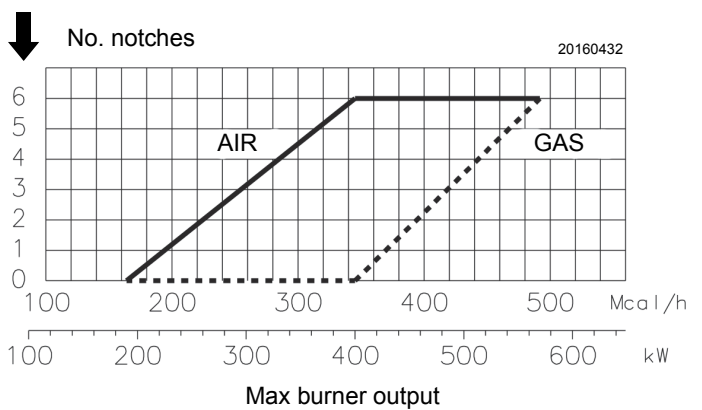


Fig. 16

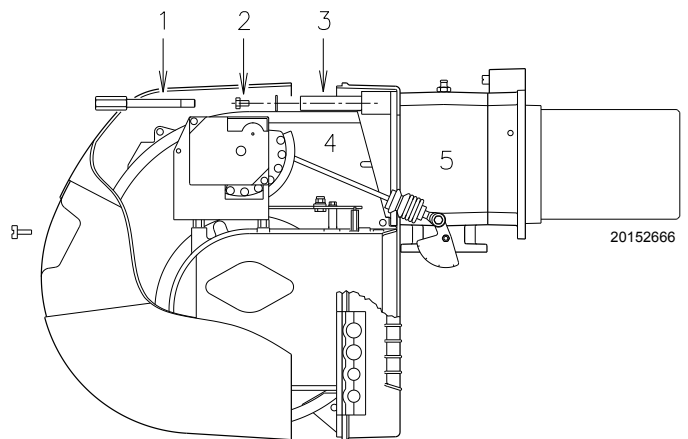


Fig. 17

5.9 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.

5.9.1 Gas feeding line

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

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

MB

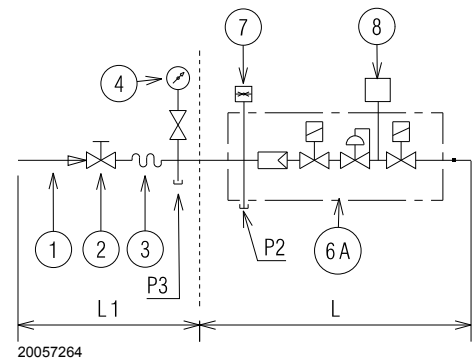


Fig. 18

MBC

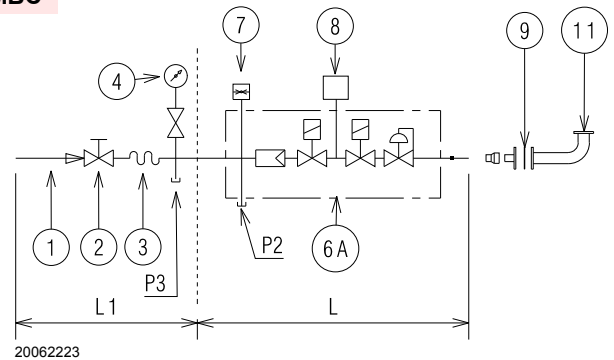


Fig. 19

DMV

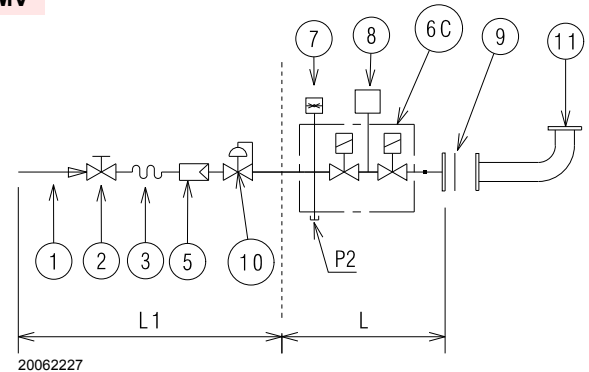


Fig. 20

CB

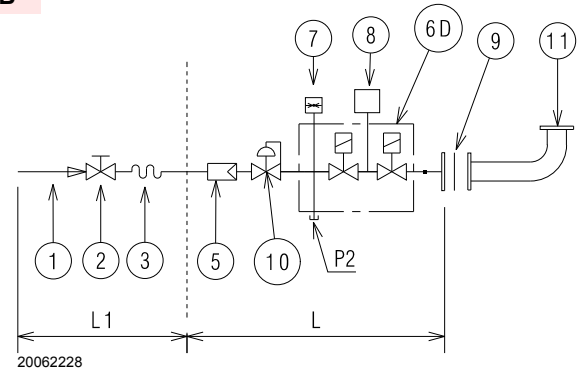


Fig. 21

5.9.2 Gas train

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

To select the correct gas train model, refer to the manual "Burner-gas train combination" supplied with the unit.

5.9.3 Gas train installation



Disconnect the electrical power using the main switch.



Check that there are no gas leaks.



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



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



The operator must use the required equipment during installation.

The gas train must be connected to the gas connection 1) (Fig. 22), 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. 22.

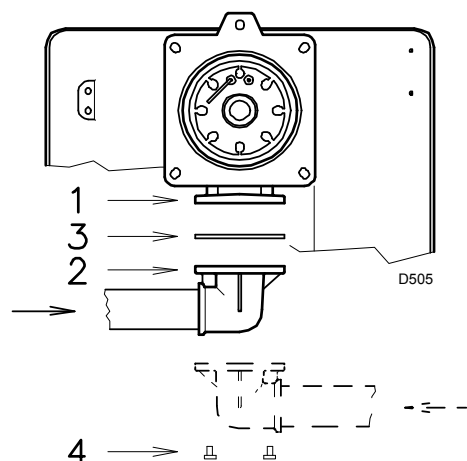


Fig. 22

5.9.4 Gas pressure

indicates the pressure drops of the combustion head on the basis of the burner operating output.

	kW	1 Δp (mbar)		2 Δp (mbar)	
		G 20	G 25	G 20	G 25
RS 45/M C05	90	3.4	5.1	0.4	0.6
	143	5.1	7.7	0.6	0.9
	197	7.3	10.8	0.8	1.2
	250	9.3	13.9	1.0	1.5
	303	11.1	16.6	1.2	1.8
	357	12.5	18.7	1.4	2.1
	410	13.7	20.5	1.5	2.3
	463	15.0	22.4	1.7	2.5
	517	16.9	25.2	1.9	2.8
	570	20.0	29.8	2.2	3.3

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 refer to:

- Natural gas G 20 NCV 9.45 kWh/Sm³ (8.2 Mcal/Sm³)
- Natural gas G 25 NCV 8.13 kWh/Sm³ (7.0 Mcal/Sm³)

Column 1

Combustion head pressure drop.

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

- combustion chamber at 0 mbar;
- adjustments indicated on page 16.

Column 2

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

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

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

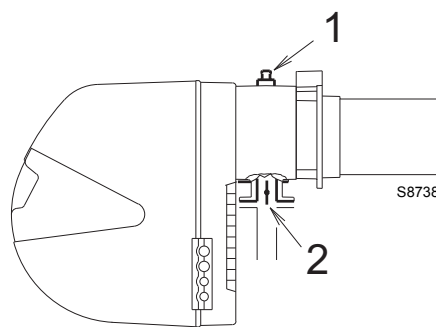


Fig. 23

Example - RS 45/M C05:

Maximum output operation

Natural gas G 20 NCV 9.45 kWh/Sm³

Gas pressure at test point 1)(Fig. 23) = 17.0 mbar

Pressure in combustion chamber = 2.0 mbar

17.0 - 2.0 = 15.0 mbar

A pressure of 15.0 mbar, column 1, corresponds in Tab. F to output of 463 kW.

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

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

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

Example - RS 45/M C05:

Required burner maximum output operation: 463 kW

Natural gas G 20 NCV 9.45 kWh/Sm³

Gas pressure at an output of 463 kW = 15.0 mbar

Pressure in combustion chamber = 2.0 mbar

15.0 + 2.0 = 17.0 mbar

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

5.10 Electrical wiring

Notes on safety for the electrical wiring



- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be made in accordance with the regulations currently in force in the country of destination and by qualified personnel. Refer to the wiring diagrams.
- The manufacturer declines all responsibility for modifications or connections different from those shown in the wiring diagrams.
- Check that the electrical supply of the burner corresponds to that shown on the identification label and in this manual.
- The burner has been type-approved for intermittent operation (FS1). This means they should compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own start-up efficiency. Normally, burner stopping is guaranteed by the boiler's thermostat/pressure switch.
- If this is not the case, a time switch should be fitted in series to TL to stop the burner at least once every 24 hours. Refer to the wiring diagrams.
- The electrical safety of the device is obtained only when it is correctly connected to an efficient earthing system, made according to current standards. It is necessary to check this fundamental safety requirement. In the event of doubt, have the electrical system checked by qualified personnel. Do not use the gas tubes as an earthing system for electrical devices.
- The electrical system must be suitable for the maximum power absorption of the device, as indicated on the label and in the manual, checking in particular that the section of the cables is suitable for that level of power absorption.
- For the main power supply of the device from the electricity mains:
 - do not use adapters, multiple sockets or extensions;
 - make provisions for an omnipolar switch with a gap between the contacts of at least 3 mm (over-voltage category III), as required by current safety regulations.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

Before carrying out any maintenance, cleaning or checking operations:



Turn off the burner's power supply using the main system switch.



Turn off the fuel interception tap.



Avoid condensate, ice and water leaks from forming.

If the cover is still present, remove it and proceed with the electrical wiring according to the wiring diagrams.

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

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

5.10.1 Supply cables and external connections passage

All the cables to be connected to the plugs 7)(Fig. 24) of the burner are passed through cable grommets to be inserted in the holes of the plate, left or right, after having unscrewed the screws 8), opened the plate at parts 9) and 10) and removed the thin diaphragm that closes the holes.

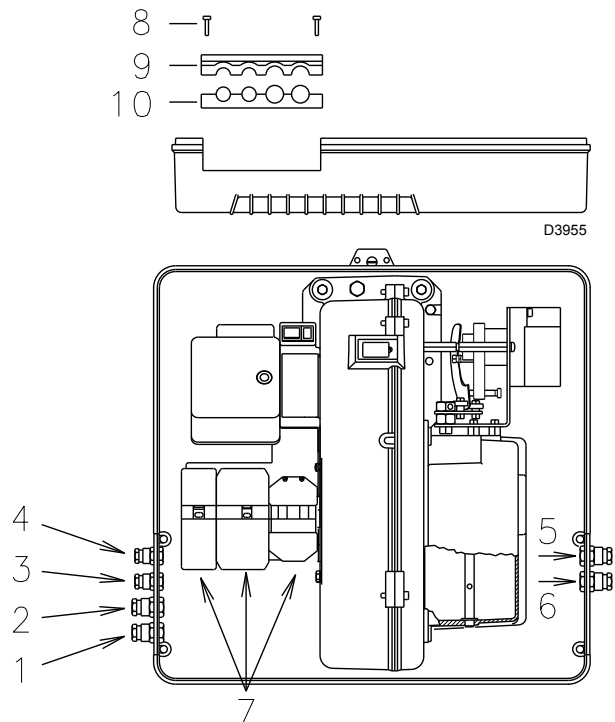


Fig. 24

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:

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

6 Start-up, calibration and operation of the burner

6.1 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 28.

6.2 Adjustments prior to ignition

The adjustment of the combustion head, air and gas has already been described in the paragraph .

In addition, the following adjustments must also be made:

- open the manual valves upline of the gas train.
- Adjust the minimum gas pressure switch to the start of the scale (Fig. 30).
- Adjust the air pressure switch to the start of the scale (Fig. 25).
- 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. 25) to the gas pressure test point on the pipe coupling. Used to roughly calculate MAX burner output using the tables on page 18.
- Connect two lamps or testers parallel to the two gas line solenoids VR and VS in order to check the exact moment at which voltage is supplied. This operation is unnecessary if each of the two solenoids is equipped with a pilot light that signals voltage passing through.



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.

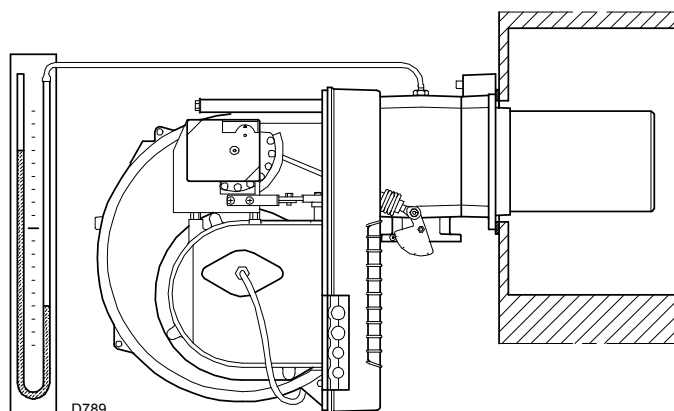


Fig. 25

6.3 Servomotor

The servomotor (Fig. 26) provides simultaneous adjustment for 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 24 s.



ATTENTION

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

Cam I: 90°

Limits rotation toward maximum position.

When the burner is at MAX output, the gas butterfly valve must be fully open: 90°.

Cam II: 0°

Limits rotation toward minimum position.

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

Cam III: 20°

Adjusts the ignition position and the MIN output.

Cam IV: integrated to cam III.

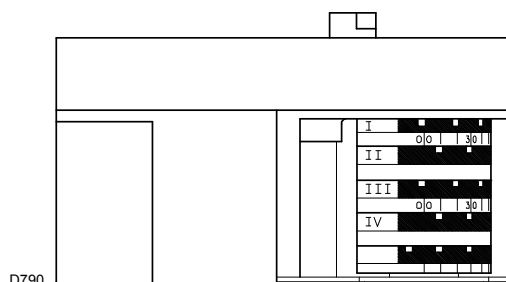


Fig. 26

6.4 Burner start-up

Turn off the remote controls and set the switch 1)(Fig. 27) to "MAN".

As soon as the burner starts, check the direction of rotation of the fan impeller, looking through the flame inspection window 18) (Fig. 5 on page 11).



Make sure that the lights or testers connected to the solenoids, or the pilot lights on the solenoids themselves, indicate that no voltage is present.

If voltage is present, stop the burner immediately and check the electrical connections.

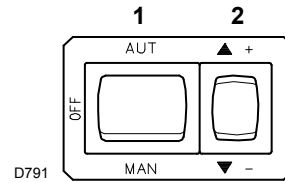


Fig. 27

6.5 Burner ignition

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

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

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

In this case increase gas ignition delivery. The arrival of gas at the pipe coupling is indicated by the U-type pressure gauge (Fig. 25 on page 21).

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

6.6 Burner adjustment

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

Adjust in sequence:

- 1 Output upon ignition
- 2 Maximum output
- 3 Minimum output
- 4 Intermediate outputs between the two
- 5 Air pressure switch
- 6 Minimum gas pressure switch

In order to measure the ignition output:

- disconnect the plug-socket 23)(Fig. 5 on page 11) on the ionisation probe cable (the burner will fire and then go into lockout after the safety time has elapsed);
- perform 10 consecutive ignitions with lockouts;
- on the meter, read the quantity of gas burned: This quantity must be equal to, or lower than, the quantity given by the formula, for $t_s = 3s$:

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

6.6.1 Output upon ignition

According to EN 676.

Burners with MAX output up to 120 kW

Ignition can occur at the maximum operation output level.

Example:

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

Burners with MAX output above 120 kW

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

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

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

Example:

MAX operation output of 600 kW. Ignition output must be equal to or lower than:

- 300 kW con $t_s = 2s$
- 200 kW con $t_s = 3s$

Example for G 20 gas (10 kWh/Nm³):

max. operation output of 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: $60 : 360 = 0.166 \text{ Nm}^3$.

6.6.2 Maximum output

The MAX output must be set within the firing rate (Fig. 2 on page 9).

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

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

Adjustment of gas delivery

Measure the gas delivery on the gas meter.

A rough indication can be obtained from on page 18, just read the gas pressure on the pressure gauge see Fig. 25 on page 21, and follow the indication given in on 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 the adjuster outlet gas pressure.

Air adjustment

Progressively adjust the end profile of cam 4)(Fig. 28) by turning the screws of the cam that appear inside the opening 6)(Fig. 28).

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

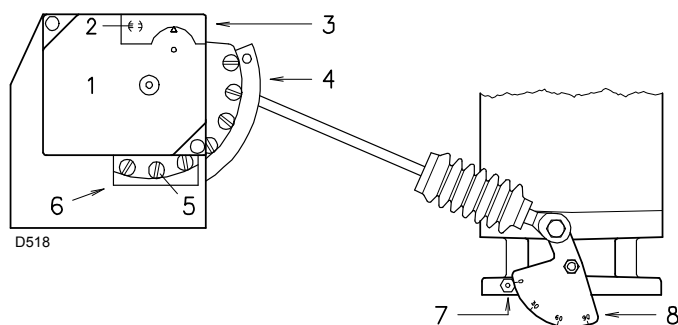


Fig. 28

Key (Fig. 28)

- 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 Graduated sector for gas butterfly valve

6.6.3 Minimum output

The MIN output must be set within the firing rate (Fig. 2 on page 9).

Press the “reduce output” button 2)(Fig. 27 on page 22) and keep it pressed until the servomotor has closed the air damper and the gas butterfly valve is at 20° (adjustment made in the factory).

Adjustment of gas delivery

Measure the gas delivery on the gas meter.

- If it is necessary to reduce it, slightly decrease the angle of cam III (Fig. 29) with small, regular movements, i.e. bring it from an angle of 20° to 18° - 16°....
- If you need to increase it, lightly press the “increase output” button 2)(Fig. 27 on page 22) (open the gas butterfly valve by 10-15°), and increase angle of cam III (Fig. 29) with a series of small movements, i.e. move from angle 20° to 22° - 24°....
- Now press the “power reduction” button until the servomotor returns to the minimum opening position, and measure the gas delivery.

NOTE:

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

If it is necessary to increase the angle of the cam, you must first increase the angle of the servomotor by means of the “output increase” key, then increase the angle of cam III, and finally bring the servomotor to the position of MIN output, with the “output reduction” key.

To adjust cam III, remove the snap action cover 1)(Fig. 29), remove the relative key 2) from inside and insert it into the notch of cam III.

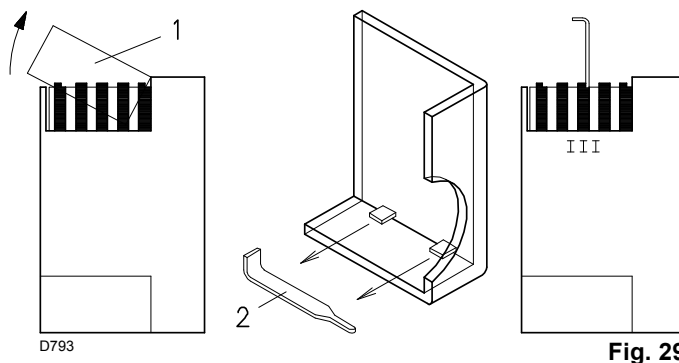


Fig. 29

Air adjustment

Progressively adjust the beginning profile of cam 4)(Fig. 28) by turning the screws of the cam that appear inside the opening 6)(Fig. 28).

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

6.6.4 Intermediate outputs

Adjustment of gas delivery

No adjustment of gas delivery is required.

Air adjustment

Lightly press the “increase output” button 2)(Fig. 27 on page 22) so that a new screw 5)(Fig. 28) appears inside the opening 6)(Fig. 28), adjust it until optimal combustion is obtained.

Proceed in the same way with the other screws.



ATTENTION

Take care that the cam profile variation is progressive.

Switch off the burner using the switch 1)(Fig. 27 on page 22), position OFF, release the variable profile cam from the servomotor putting the notch 2)(Fig. 28) in the vertical position.

Check that the movement is fluid and free of jamming by turning the cam backwards and forwards by hand a few times.



ATTENTION

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

NOTE:

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

6.7 Pressure switch adjustment

6.7.1 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. 30).

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.

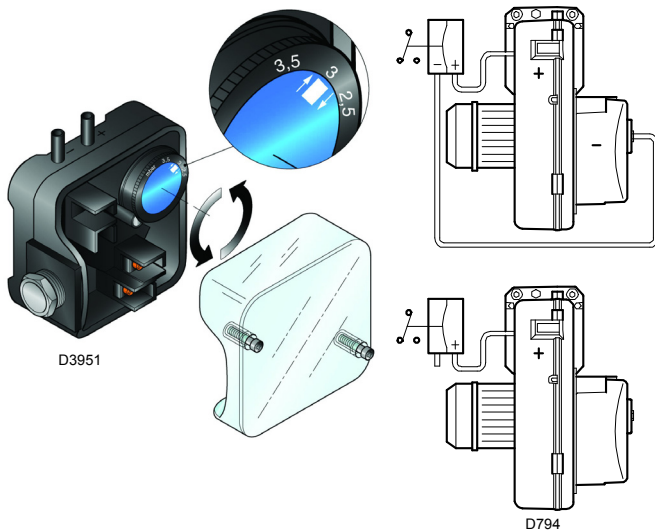


Fig. 30

6.7.2 Gas minimum pressure switch

Adjust the minimum gas pressure switch after performing all the other burner adjustments with the pressure switch set to the start of the scale (Fig. 31).

With the burner operating in 2nd stage, increase adjustment pressure by slowly turning the relevant knob clockwise until the burner stops.

Then turn the knob anticlockwise by 0.2 kPa (2 mbar) and repeat burner start-up to ensure it is operating regularly.

If the burner locks out again, turn the knob again anticlockwise by 0.1 kPa (1 mbar).



ATTENTION

1 kPa = 10 mbar

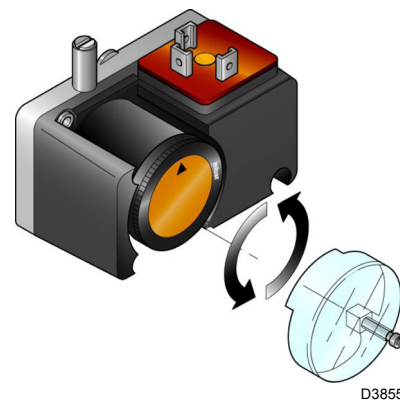


Fig. 31

6.7.3 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 6 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 on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 μ A.

Carefully check polarities.

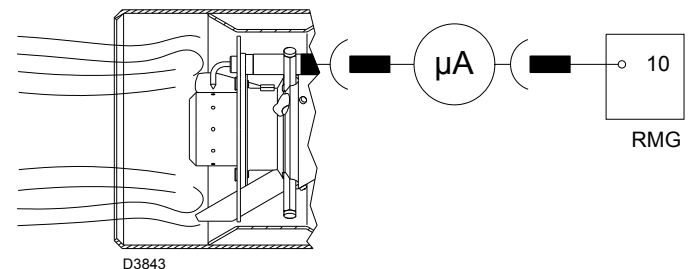


Fig. 32

6.8 Burner operation

6.8.1 Burner start-up

- 0s: TL thermostat/pressure switch closes.
- 2s: Start of electrical control box programme. Servomotor starts: turn 90° to the left, i.e. until the contact on cam I intervenes (Fig. 26 on page 21).
- 26s: The air damper arrives to the MAX. output position. Fan motor starts up. Start of the pre-purging phase.
- 57s: the servomotor rotates towards the right, as far as the angle set on cam III (Fig. 26 on page 21) for the MIN output.
- 77s: The air damper and gas butterfly valve assume the MIN output position (with cam III)(Fig. 26 on page 21) at 15°.
- 92s: Ignition electrode strikes a spark. The safety valve VS opens, along with the adjustment valve VR, quick opening. The flame is ignited at a low output level, point A. Delivery is then progressively increased, with the valve VR opening slowly up to MIN. output, point B.
- 94s: The spark goes out.
- 118s: The starting cycle comes to an end.

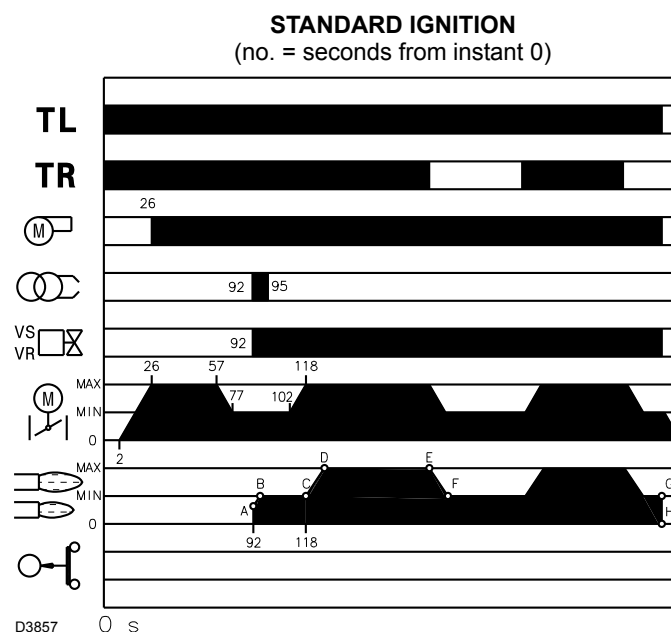


Fig. 33

6.8.2 Operation

Burner without modulating operation kit

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

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

- If the temperature or the pressure is low, the reason why the thermostat/pressure switch TR is in the output request position, the burner progressively increases the output up to the MAX value (section C-D).
- If, then, the temperature or the pressure increases up to the TR switching, the burner gradually decreases the output down to the MIN value, (section E-F). The sequence repeats endlessly.
- The burner locks out when the heat request is less than the heat supplied by the burner at MIN output, (section G-H). The TL thermostat/pressure switch opens, and the servomotor returns to angle 0°. The air damper closes completely to reduce heat losses to a minimum.

Burner with modulating operation kit

See manual enclosed with the adjuster.

6.8.3 Ignition failure

If the burner does not switch on, it goes into lockout within 3s of the gas valve opening.

6.8.4 Burner flame goes out during operation

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

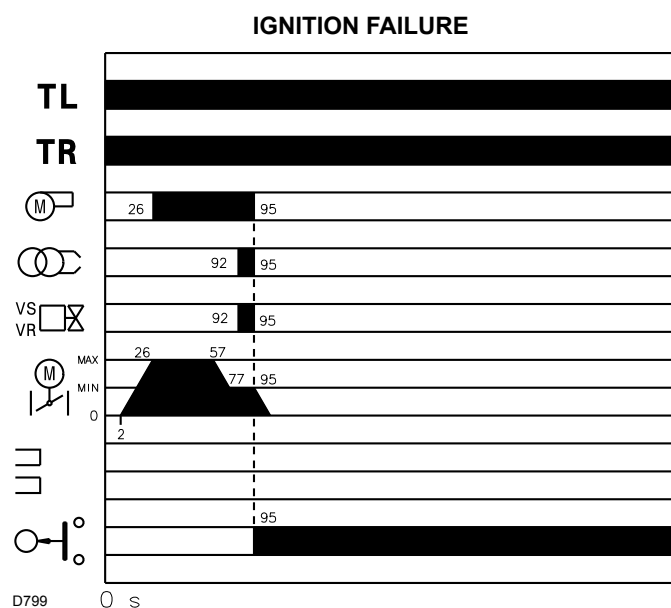


Fig. 34



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.

6.9 Burner start-up cycle diagnostics

During the start-up programme, the indications are set out in Tab. G:

COLOUR CODE TABLE	
Sequences	Colour code
Pre-purging	● ● ● ● ● ● ● ● ● ●
Ignition phase	● ○ ● ○ ● ○ ● ○ ●
Operation, flame OK	□ □ □ □ □ □ □ □ □ □
Operation with weak flame signal	□ ○ □ ○ □ ○ □ ○ □
Electrical supply below ~ 170V	● ▲ ● ▲ ● ▲ ● ▲ ●
Lockout	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲
Extraneous light	▲ □ ▲ □ ▲ □ ▲ □ ▲
Key:	○ Off ● Yellow □ Green ▲ Red

Tab. G

6.10 Resetting of control box and diagnostics use

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

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

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

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

RED LED on wait at least 10s	Lockout	Press reset for > 3s	Pulses	Interval 3s	Pulses
			● ● ● ● ● ● ● ●		● ● ● ● ● ● ● ●

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

6.10.1 Control box reset

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

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

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

6.10.2 Visual diagnostics

Indicates the type of burner malfunction causing lockout.

To view diagnostics, proceed as follows:

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

6.10.3 Software diagnostics

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

To view diagnostics, proceed as follows:

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

Pressing the button	Control box status
From 1 to 3 seconds	Reset of the control box without visualisation of the visual diagnostics.
More than 3 seconds	Visual diagnostics of the lockout condition: (LED blinks at 1-second intervals).
More than 3 seconds starting from the condition of visual diagnostics	Diagnostic software using an optical interface and PC (possibility of displaying the hours the machine has been running, faults, etc...)

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

6.11 Normal operation / flame detection time

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

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

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

GREEN LED on wait at least 10s	Press button for > 3s	Signal	Interval 3s	Signal
		● ● ● ● ● ●		● ● ● ● ● ●

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

The number of pulses will identify the DETECTION TIME of the probe since the opening of gas valves, according to: Tab. H.

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

Tab. H

This is updated in every burner start-up.

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



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

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

7 Maintenance

7.1 Notes on safety for the maintenance

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

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



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

Before carrying out any maintenance, cleaning or checking operations:



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



Close the fuel shut-off valve.



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

7.2 Maintenance programme

7.2.1 Maintenance frequency



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

7.2.2 Safety test - with no gas supply

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

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

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

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

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

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

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



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

7.2.3 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.

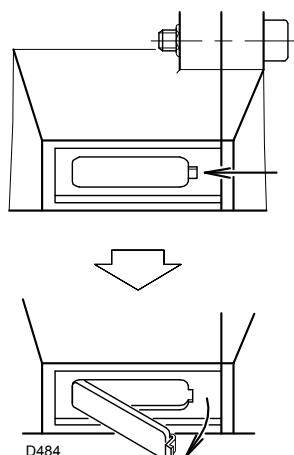


Fig. 35

7.2.5 Safety components

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

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. J

7.2.4 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	≤ 1000
G 25	11.5	9.5	8.8	1000
G 30	14.0	11.6	10.7	1000
G 31	13.7	11.4	10.5	1000

Tab. I

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.

7.3 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.

Proceed as follows (Fig. 36):

- 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) and split pin (9), 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 as shown in the figure and insert the split pin (9) in the hole of one of the two slide bars so that the burner remains in that position.

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

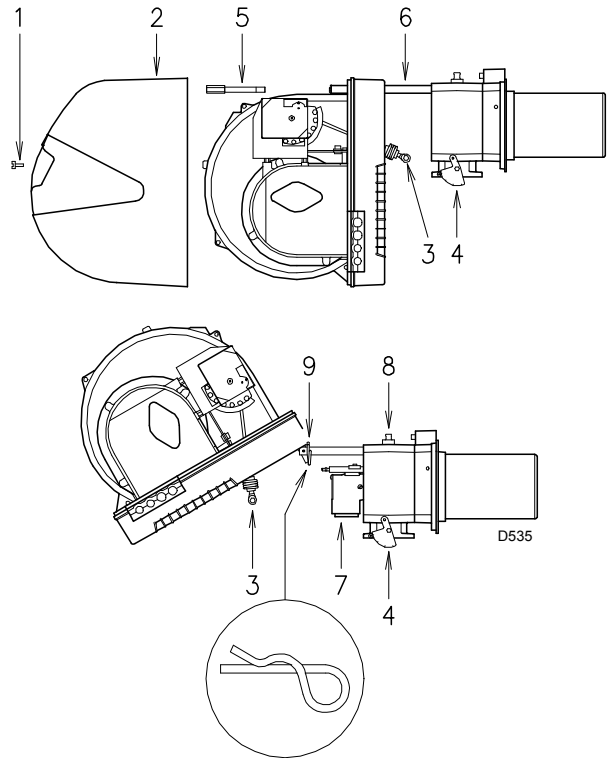


Fig. 36

7.4 Closing the burner

Proceed as follows (Fig. 36):

- remove the split pin (9) and push the burner up to approximately 100 mm from the pipe coupling.
- Reconnect the leads and slide in the burner until it comes to a stop.
- Replace the screw (5) and split pin (9) and carefully pull the probe and electrode cables outwards until they are slightly taut.
- Re-couple the articulated coupling (3) to the graduated sector (4).



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

8 Faults - Possible causes - Solutions



In the event the burner stops, in order to prevent any damage to the installation, do not unblock the burner more than twice in a row.

If the burner locks out for a third time, contact the customer service.



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

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

Signal	Problem	Possible cause	Recommended remedy
10 blinks ● ● ● ● ● ● ● ● ● ●	The burner does not come on and the lock-out appears	Incorrect electrical wiring	Check
	The burner goes into lockout	Defective control box	Replace
		Presence of electromagnetic disturbances in the thermostat lines	Filter or eliminate
		Presence of electromagnetic disturbance	Use the radio disturbance protection kit
No blink	The burner does not start	No electricity supply	Close all switches - 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.	Reduce the minimum gas pressure switch intervention pressure. Replace the gas filter cartridge.
		The sudden drop in pressure after valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner comes to a halt.	
		Pressure increases again, the pressure switch closes again and the ignition cycle is repeated.	
		The sequence repeats endlessly.	
	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. K

A Appendix - Accessories**Long head kit**

Burner	Standard head length (mm)	Long head length (mm)	Code
RS 45/M C05	229	354	In progress

Soundproofing box kit

Burner	Type	dB(A)	Code
RS 45/M C05	C1/3	10	3010403

Output power regulator kit for modulating operation

Burner	Probe	Adjustment field	Code
RS 45/M C05	PT 100 temperature	- 100 + 500°C	3010110
	Pressure 4 ÷ 20 mA	0 ÷ 2.5 bar	3010213
	Pressure 4 ÷ 20 mA	0 ÷ 16 bar	3010214

Burner	Output regulator	Code
RS 45/M C05	RWF50	20082208
	RWF55	20099657

Burner	Signal converter	Code
RS 45/M C05	0/2 - 10V	3010390
	0/4 - 20mA	

Burner	Potentiometer	Code
RS 45/M C05	1000 Ω	3010109

Spacer kit

Burner	Thickness (mm)	Code
RS 45/M C05	100	3010095

Continuous purging kit

Burner	Code
RS 45/M C05	3010094

Gas trains in compliance with EN 676

Please refer to manual.

Differential circuit breaker kit

Burner	Code
RS 45/M C05	3010329

PC interface kit

Burner	Code
RS 45/M C05	3002719

Radio disturbance protection kit

Burner	Code
RS 45/M C05	3010386

B Appendix - Electrical panel layout

1	Index of layouts
2	Indication of references
3	RMG/M... operational layout
4	Operational layout
5	Electrical wiring that the installer is responsible for
6	RWF50 kit electrical wiring... external

2

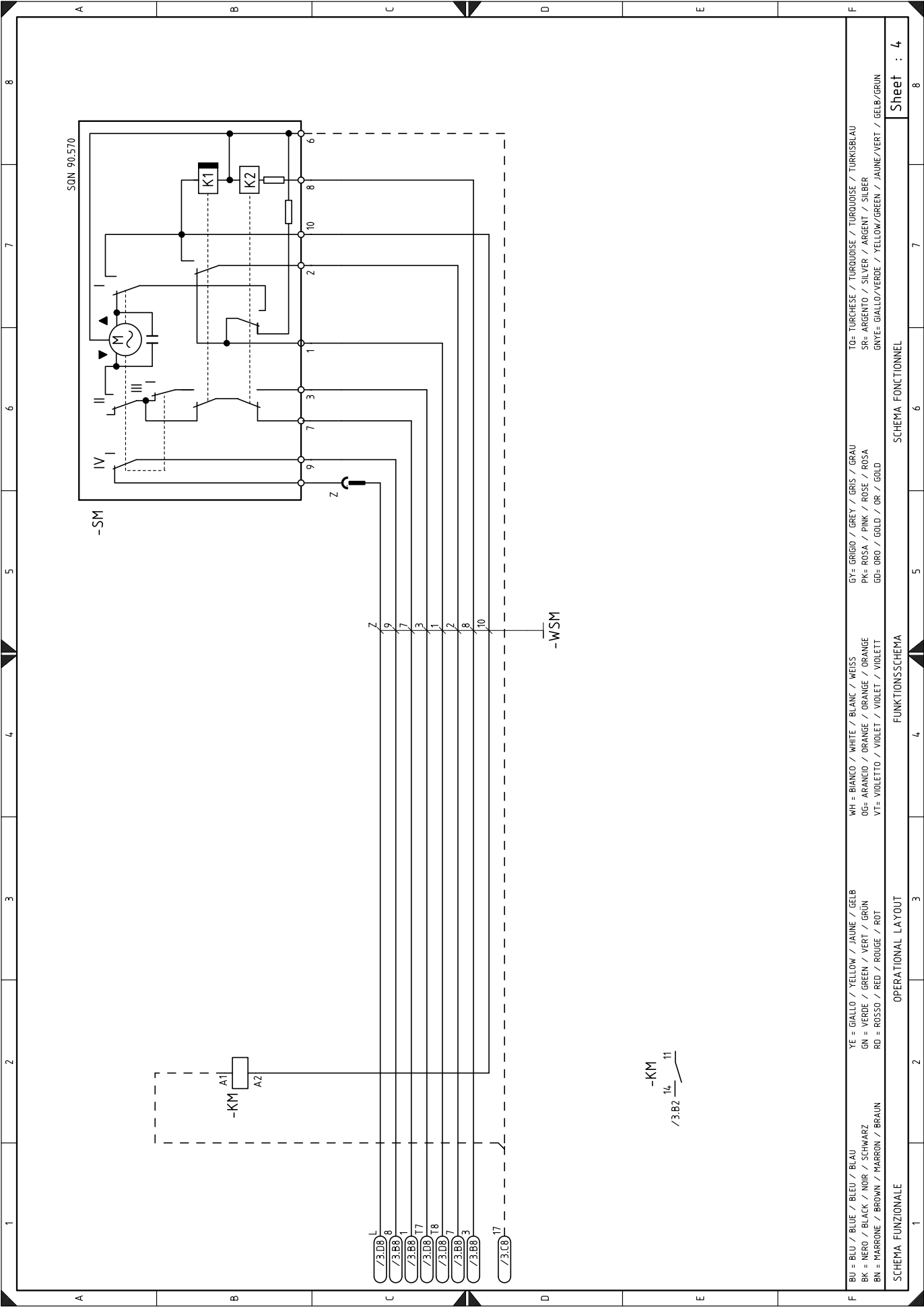
Indication of references

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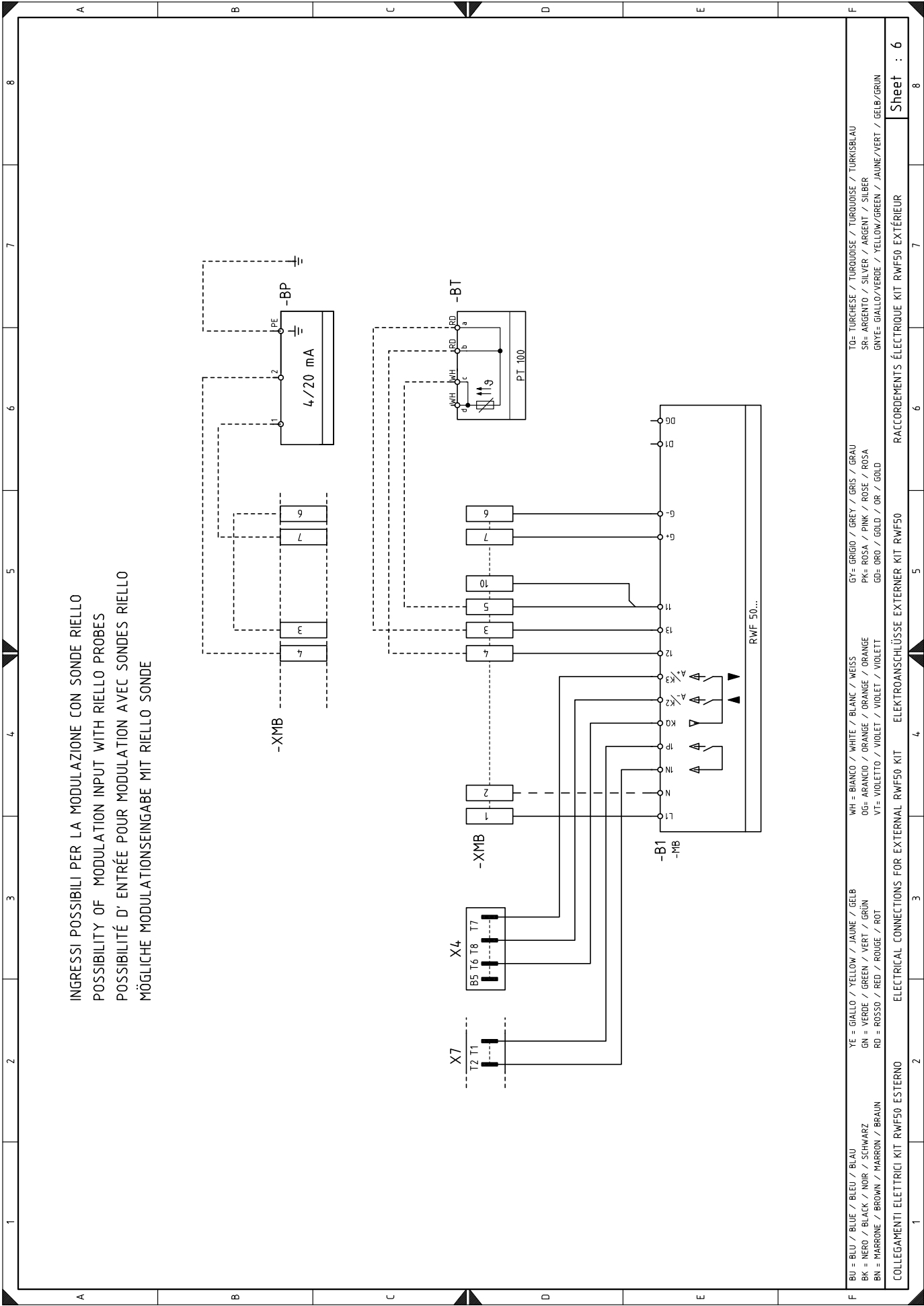
Co-ordinates

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Wiring layout key

+BB	Burners components
+BC	Boiler components
A	Electrical control box
B	Filter to protect against radio disturbance
B1	Output regulator RWF50
BP	Pressure probe
BT	Probe Pt100, 3 wires
C1	Motor capacitor
CN1	Ionisation probe connector
H	Remote lockout signalling
H1	Lockout YVPS
IN	Burner manual stop switch
ION	Ionisation probe
h1	Hour counter
h2	Hour counter
K1	Relay
KM	Motor contactor
MV	Fan motor
PA	Air pressure switch
PGMin	Minimum gas pressure switch
Q2	Single-phase disconnecting switch
RS	Reset button
S1	Off / automatic / manual selector
S2	Power increase / power reduction selector
SM	Servomotor
TA	Ignition transformer
TL	Limit thermostat/pressure switch
TR	Adjustment thermostat/pressure switch
TS	Safety thermostat/pressure switch
Y	Gas regulator valve + gas safety valve
YVPS	Valve leak detection device
XMB	Burner terminal strip
XP4	4-pole socket
XP6	6- pole socket
XP7	7-pole socket
X4	4-pin plug
X6	6-pin plug
X7	7-pin plug

The logo consists of the word "RIELLO" in a bold, red, sans-serif typeface.

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