

GB Forced draught gas burners

Progressive two-stage or modulating operation



CODE	MODEL	TYPE
20159191	RS 25/M C05	S026T
20159192	RS 25/M C05	S026T
20159193	RS 35/M C05	S027T
20159194	RS 35/M C05	S027T
20159195	RS 35/M C05	S027T
20159196	RS 35/M C05	S027T



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 25/M C05
RS 35/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.

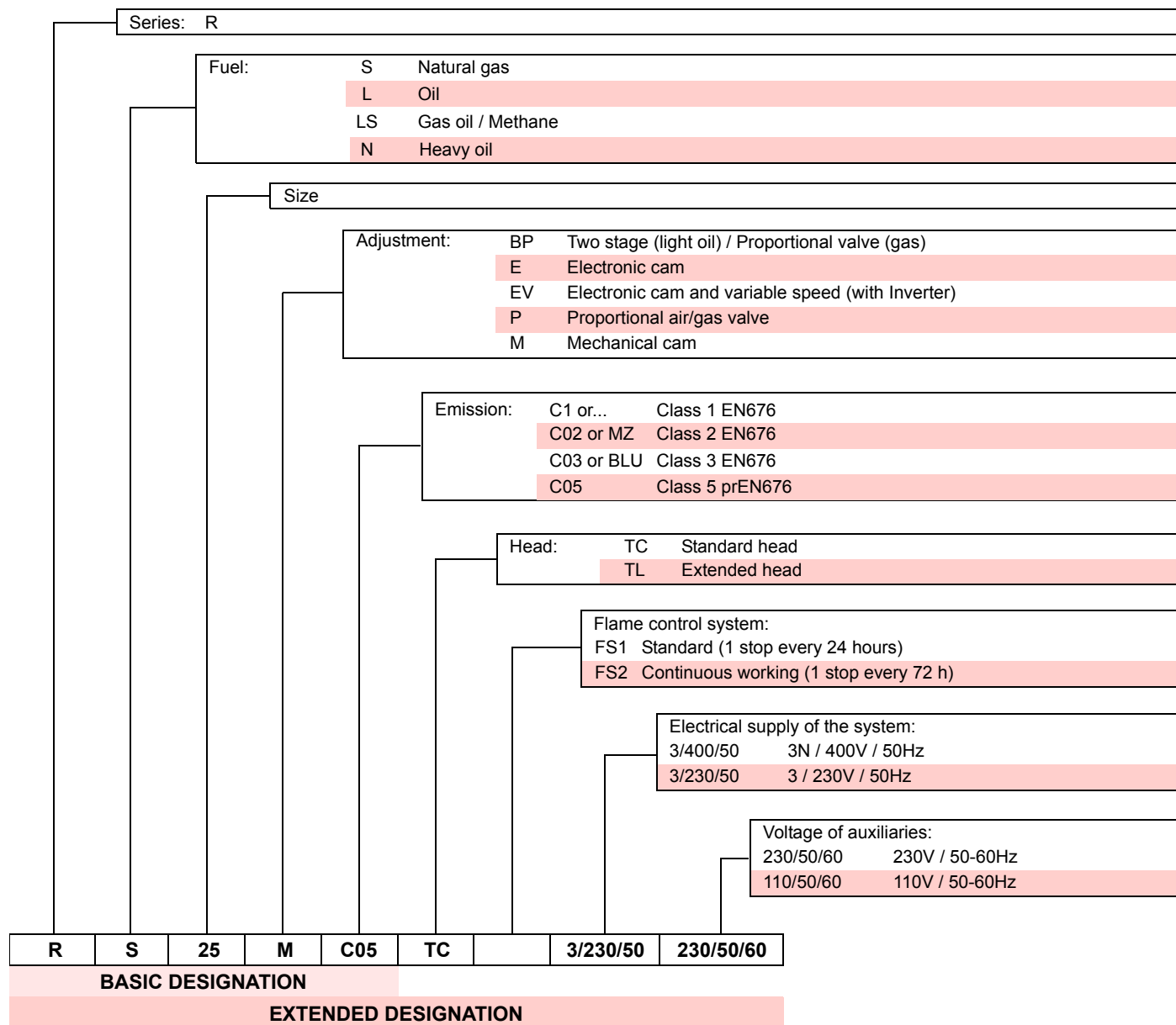
In addition:



- 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 25/M C05	TC	1/230 50-60Hz	Direct	20159191
RS 25/M C05	TL	1/230/50-60Hz	Direct	20159192
RS 35/M C05	TC	1/230/50-60Hz	Direct	20159193
RS 35/M C05	TL	1/230/50-60Hz	Direct	20159194
RS 35/M C05	TC	3/230-400/50-60Hz	Direct	20159195
RS 35/M C05	TL	3/230-400/50-60Hz	Direct	20159196

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 25/M C05		RS 35/M C05	
Type			S026T		S027T	
Output ⁽¹⁾	Max.	kW	125 - 340		200 - 440	
		Mcal/h	108 - 295		190 - 380	
	Min.	kW	70		82	
		Mcal/h	60		71	
Fuel			Natural gas: G20 - G25 - G31			
Pressure at maximum delivery ⁽²⁾		mbar	21.0	30.4	18.5	23.2
Gas: G20 / G25						
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)	68		70	
	Sound power		79		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. 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.

4.5 Electrical data

Model		RS 25/M C05	RS 35/M C05	RS 35/M C05
Electrical supply 1Ph		230V ~ +/-10% 50/60 Hz		1N 230V ~ +/-10% 50/60 Hz
Electrical supply 3Ph		===	===	230/400V with neutral ~ +/-10% 50/60 Hz
Fan motor	Hz	50 - 60	50 - 60	50 - 60
	rpm	2800 - 3400	2800 - 3400	2800 - 3400
	V	230	230	230/400 - 260/460
	kW	0.3	0.42	0.45
	A	2.4 - 2.2	2.6 - 2.46	1.73/1 - 1.55/1.0
Motor capacitor	μF/V	12.5/260	12.5/420	
Ignition transformer		V1 - V2 I1 - I2	230 V - 1 x 15 kV 1 A - 25 mA	
Electrical power consumption		W max	600	700
Protection level			IP 40	

Tab. B

4.6 Maximum dimensions

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

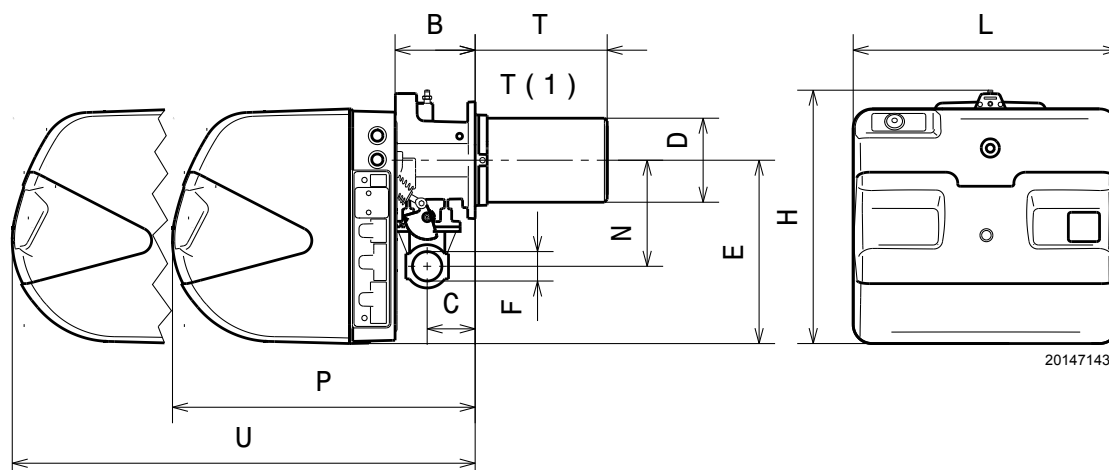


Fig. 1

mm	B	C	D	E	F	H	L	N	P	T	T (1)	U
RS 25/M C05	138	84	140	305	11/2"	422	442	177	508	230	365	780
RS 35/M C05	138	84	140	305	11/2"	422	442	177	508	198	333	780

Tab. C

⁽¹⁾ Blast tube: short-long

4.7 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
Plugs for electrical wiring	No. 3
(RS 25-35/M C05 single-phase)	
Plugs for electrical wiring	No. 4
(RS 35/M C05 three-phase)	
Instruction	No. 1
Spare parts list	No. 1

4.8 Firing rates

The burners RS 25-35/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 25/M C05 = 70 kW

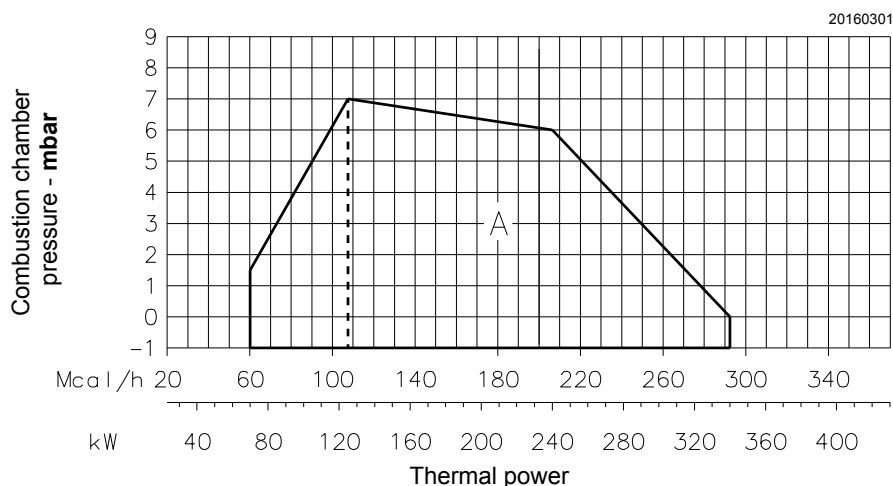
RS 35/M C05 = 82 kW



ATTENTION

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 18.

RS 25/M C05



RS 35/M C05

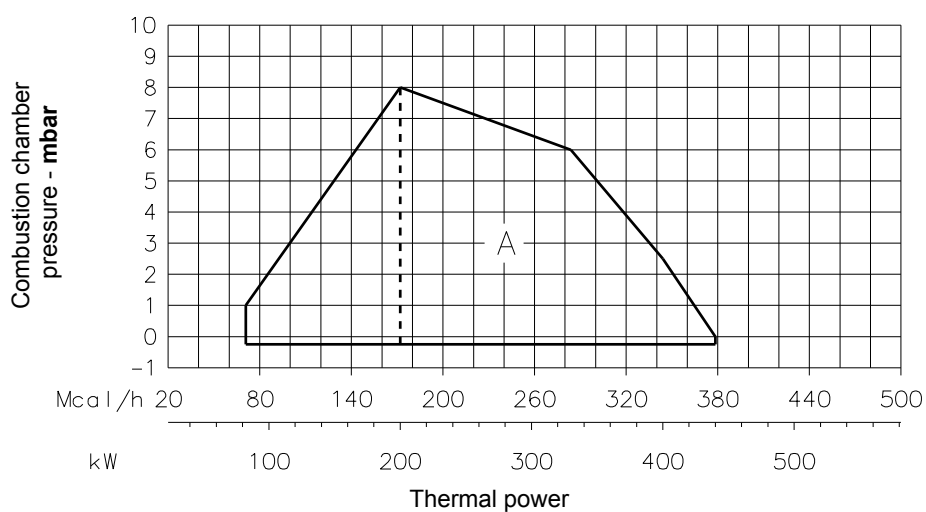


Fig. 2

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.

4.9.1 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.

Furthermore, for boilers it is advisable to check the length of the combustion head must be selected according to the indications provided by the manufacturer of the boiler.

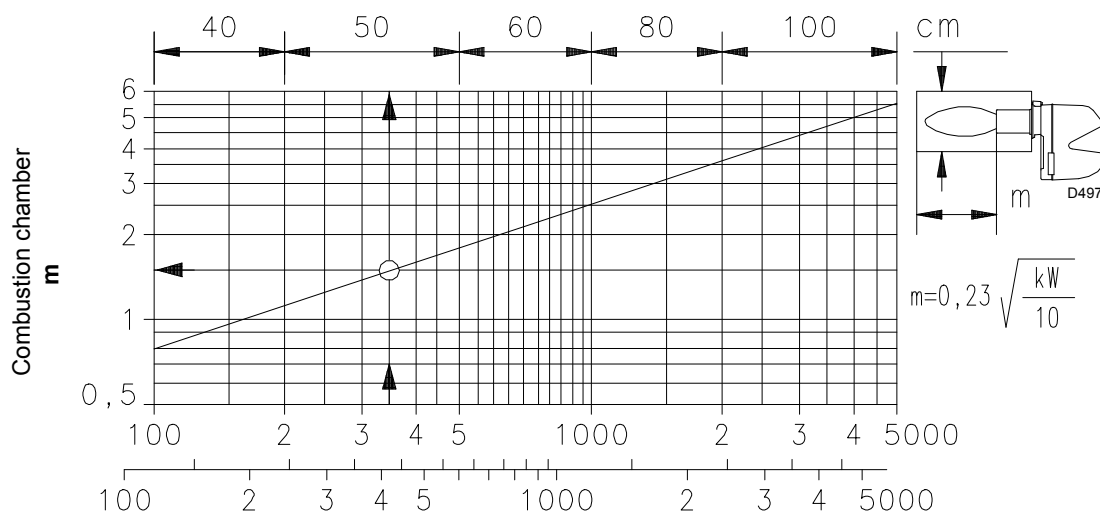
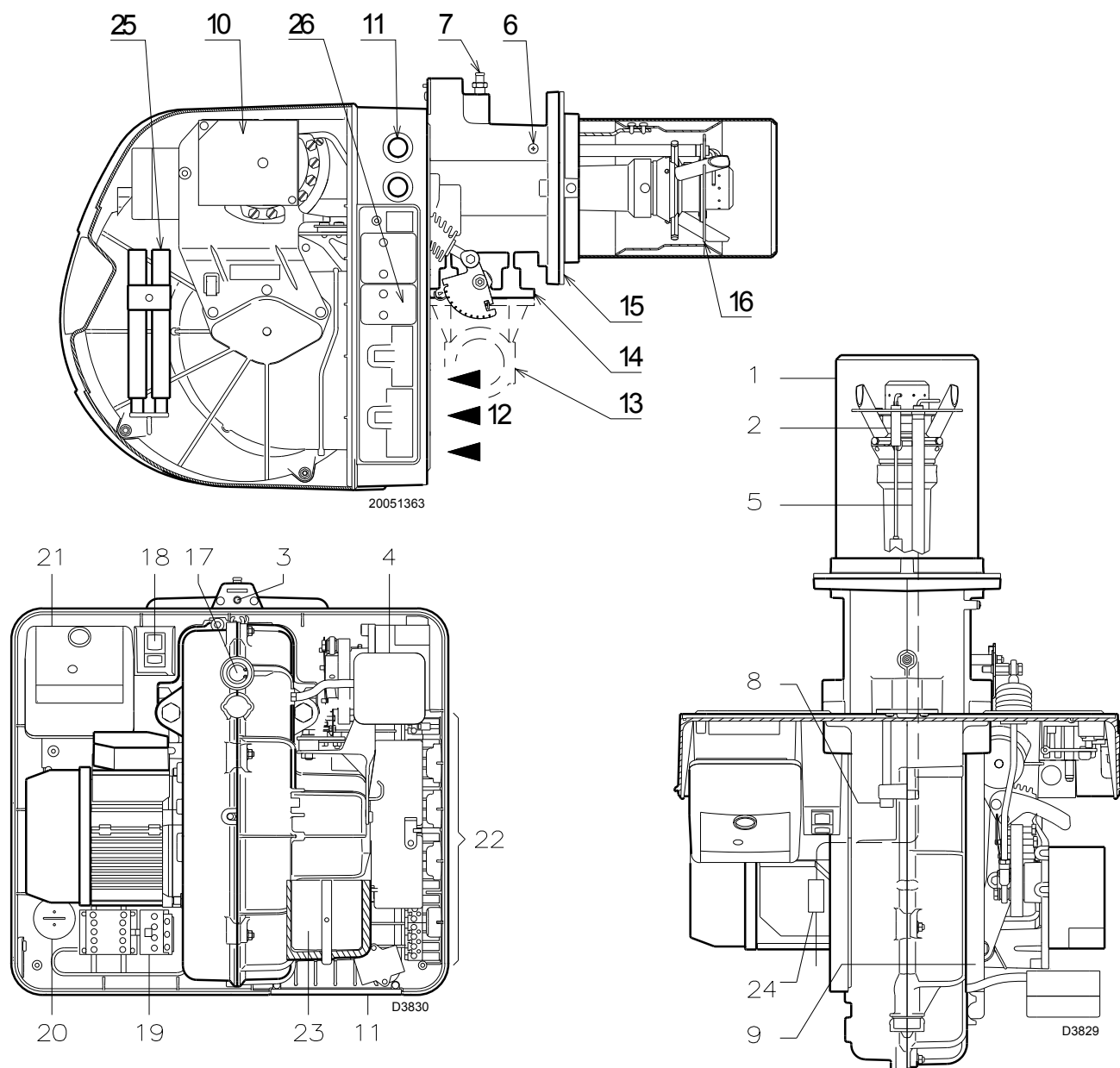


Fig. 3

4.10 Burner description

Fig. 4

- | | |
|--|---|
| <ol style="list-style-type: none"> 1 Combustion head 2 Ignition electrode 3 Screw for combustion head adjustment 4 Minimum air pressure switch (differential operating type) 5 Flame sensor probe 6 Air pressure socket 7 Gas pressure test point and head fixing screw 8 Screws securing fan to sleeve 9 Slide bars for opening the burner and inspecting the combustion head 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. 11 Areas for passage of electric cables 12 Air inlet to fan 13 Gas input pipework 14 Gas butterfly valve 15 Boiler mounting flange 16 Flame stability disc 17 Flame inspection window | <ol style="list-style-type: none"> 18 Power switch for different operations:
automatic - manual - off
Button for: power increase - power reduction 19 Motor contact maker and thermal cut-out with reset button (RS 35/M C05 three-phase) 20 Motor capacitor (RS 25/M C05 single-phase) 21 Control box with lockout pilot light and lockout reset button 22 Sockets for electrical connection 23 Two electric switches:
- one for "burner on - off"
- one for "1st - 2nd stage" 24 Plug-socket on ionisation probe cable |
|--|---|
- 25 Guide extensions (long head version)
26 4-pole socket cover (see electrical panel appendix)

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 (RS 35/M C05 three-phase):

Release by pressing the button on thermal relay 19)(Fig. 4).

4.11 Control box RMG/M88...

Important notes



ATTENTION

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

The control box RMG/M 88.. 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.



S9814

Fig. 5

Technical data

Mains voltage	AC 220...240 V +10 % / -15 %
Mains frequency	50 / 60 Hz $\pm$ 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

4.12 Servomotor SQN..

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.

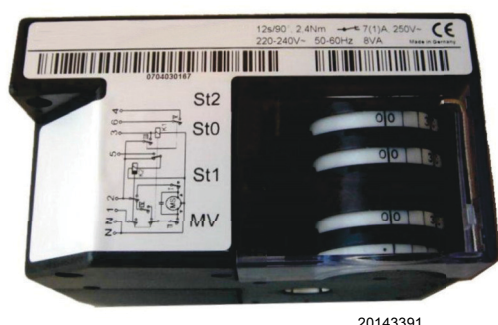


Fig. 6

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	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

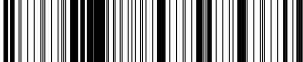
Checking the consignment



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		☒		G		H	
GAZ-AERIO				G		H	
I						RIELLOSpA I-37045 Legnago (VR)	
						CE 0085	

D7738

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.
- 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. 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.

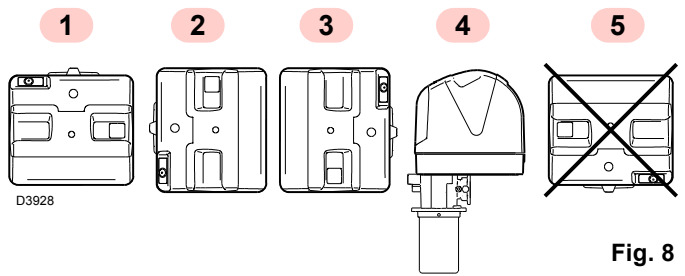


Fig. 8

5.5 Preparing the boiler

5.5.1 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	DF	Ø
RS 25/M C05	160	224	M 8
RS 35/M C05	160	224	M 8

Tab. D

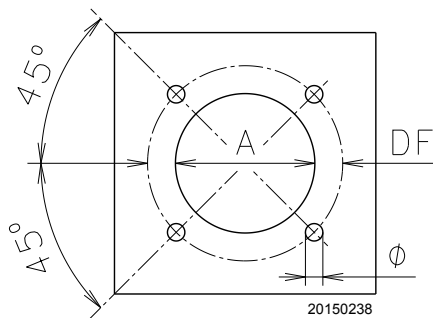


Fig. 9

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 25/M C05	RS 35/M C05
Standard	230	198
Elongated	365	333

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. 10) 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. 10):
- 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.

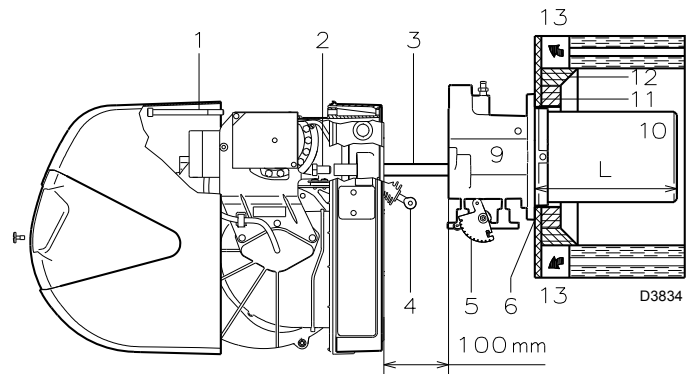


Fig. 10



ATTENTION

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. 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.

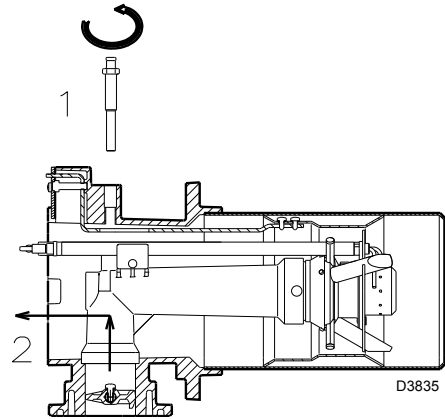


Fig. 11

5.7 Positioning the probe - electrode



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



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.



Respect the dimensions shown in Fig. 12.

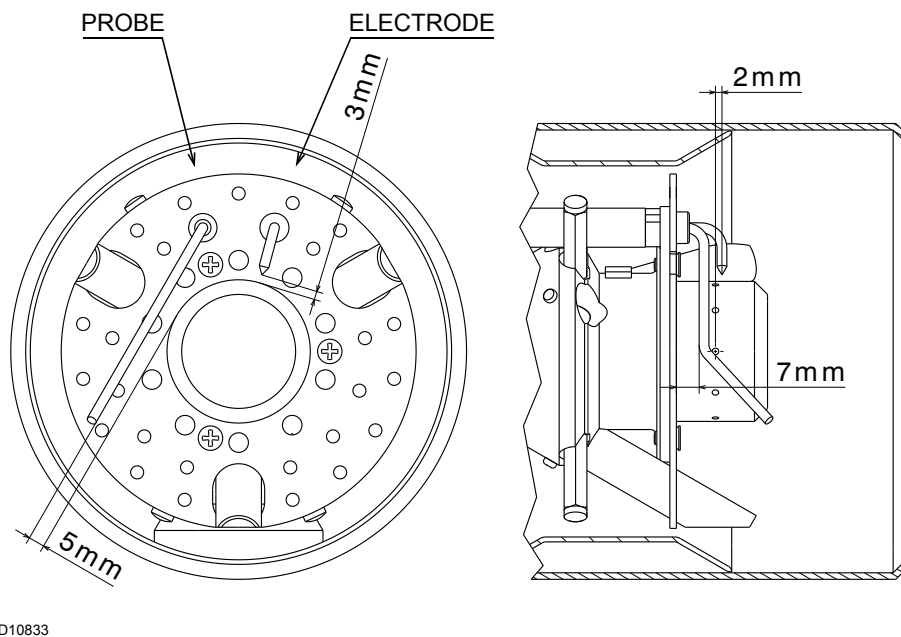


Fig. 12

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. 13.

It is therefore particularly easy to adjust the combustion head.

Air adjustment (Fig. 13 - Fig. 14)

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

Example:

RS 35/M C05 burner, output = 270 kW.

From diagram (Fig. 14) you can see that, for the MAX output of 270 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 Tab. F paragraph "Gas pressure" on page 20.

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. 14.

Central air adjustment

- In case the application needs a particular setup, it is possible to modify the central air delivery using the ring nut 4)(Fig. 13) up to the notch indicated in diagram (Fig. 15).
- In order to carry out this operation, unscrew the screws 5)(Fig. 13) and lift up the ring nut 4)(Fig. 13).
- At the end, tighten the screws 5)(Fig. 13) again.
- Once you have finished adjusting the head, reassemble the burner 4)(Fig. 16) on the guides 3)(Fig. 16) at about 100mm from the pipe coupling 5)(Fig. 16) - burner in the position shown in Fig. 10 - 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. 16.
- Refit screws 2)(Fig. 16) on guides 3)(Fig. 16).
- Fix the burner to the pipe coupling with the screw 1)(Fig. 16).



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.

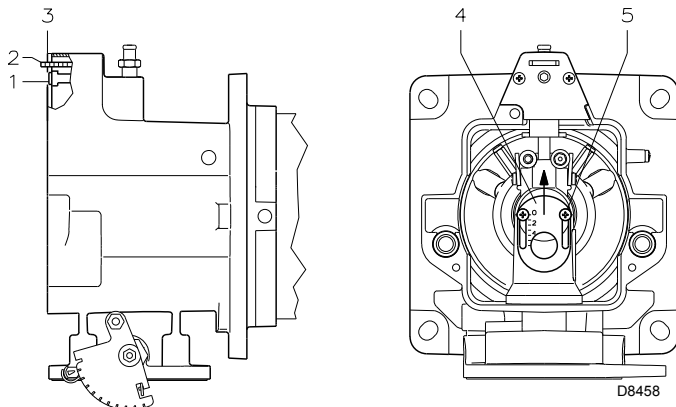


Fig. 13

Combustion head adjustment

↓ No. notches

20160304

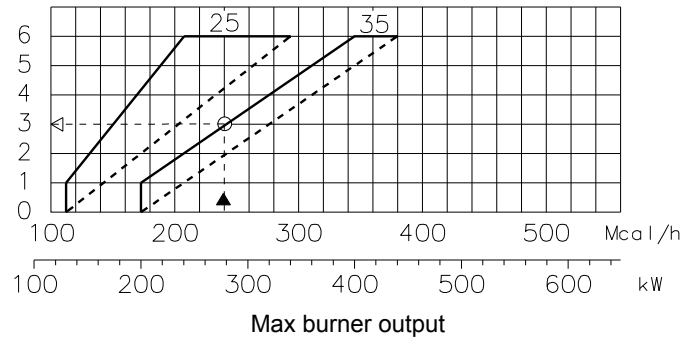


Fig. 14

Central air adjustment

↓ No. notches

20160305

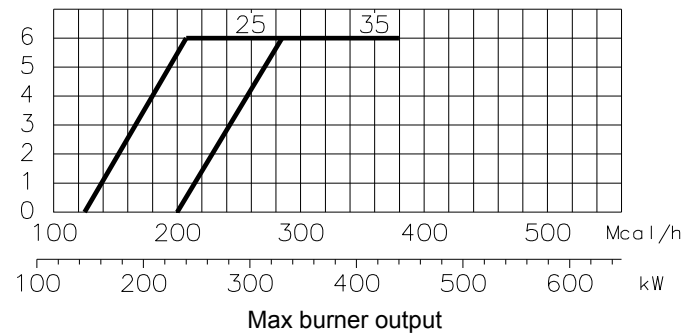


Fig. 15

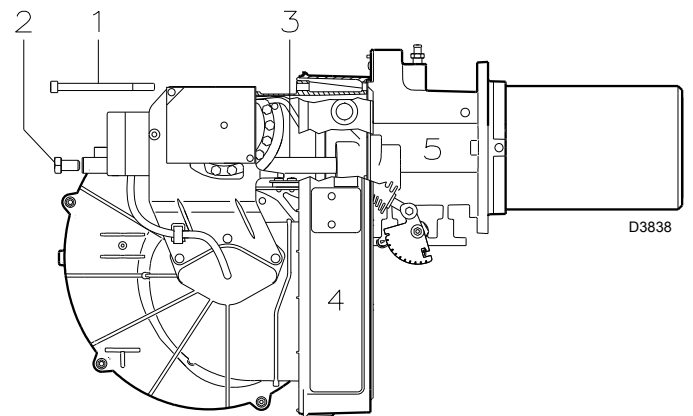


Fig. 16

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. 17 - Fig. 18 - Fig. 19 - Fig. 20)

- 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”

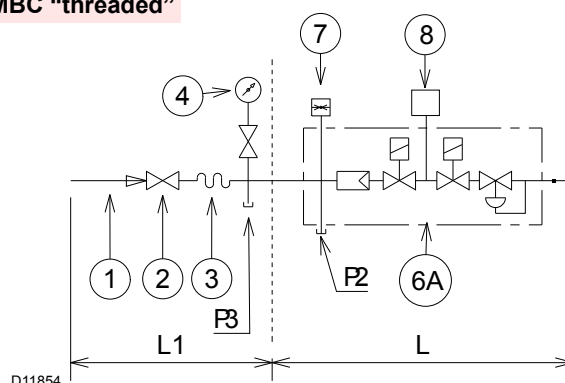


Fig. 17

MBC “flanged”

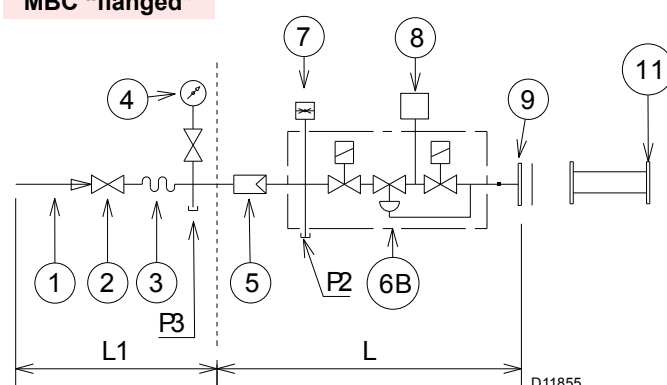


Fig. 18

DMV “flanged or threaded”

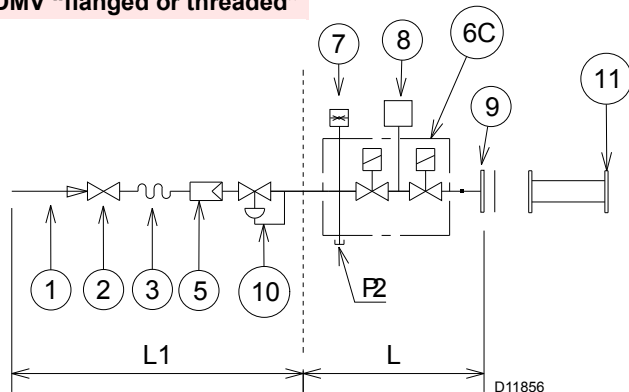


Fig. 19

CB “flanged or threaded”

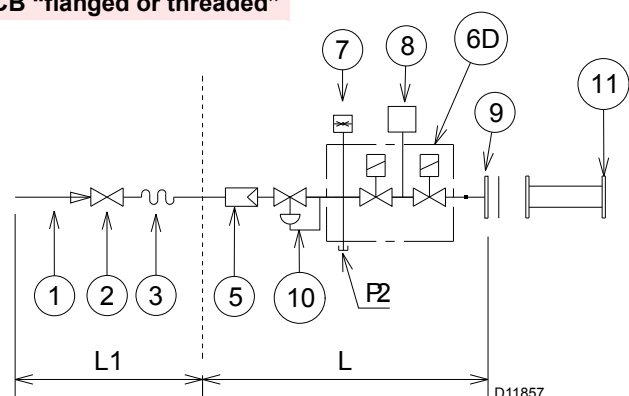


Fig. 20

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. 21), 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. 21.

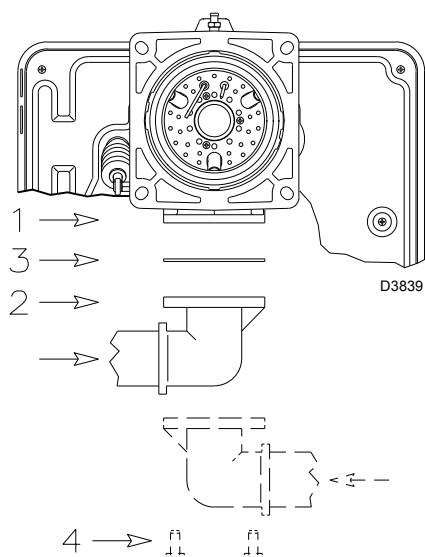


Fig. 21

5.9.4 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)		2 Δp (mbar)	
		G 20	G 25	G 20	G 25
RS 25/M C05	70	0.5	0.6	0.1	0.1
	100	1.0	1.4	0.1	0.2
	130	1.9	2.8	0.2	0.3
	160	3.0	4.4	0.3	0.5
	190	4.3	6.5	0.5	0.7
	220	6.0	9.0	0.7	1.0
	250	7.9	11.8	0.9	1.3
	280	10.1	15.1	1.1	1.7
	310	12.6	18.8	1.4	2.1
	340	15.3	22.9	1.7	2.5
RS 35/M C05	80	3.0	4.4	0.3	0.5
	120	4.4	6.6	0.5	0.7
	160	5.9	8.8	0.7	1.0
	200	7.5	11.1	0.8	1.2
	240	9.0	13.3	1.0	1.5
	280	10.5	15.7	1.2	1.7
	320	12.1	17.9	1.3	2.0
	360	13.6	20.3	1.5	2.3
	400	15.1	22.6	1.7	2.5
	440	16.7	25.0	1.9	2.8

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 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. 22), with:

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

Column 2

Pressure loss at gas butterfly valve 2)(Fig. 22) 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. 22).
- 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.

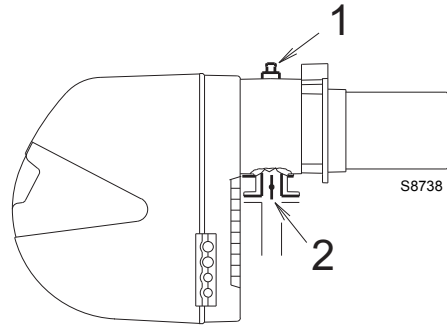


Fig. 22

Example - RS 35/M C05:

Maximum output operation

Natural gas G 20 NCV 9.45 kWh/Sm³

Gas pressure at test point 1)(Fig. 22) = 15.6 mbar

Pressure in combustion chamber = 2.0 mbar

15.6 - 2.0 = 13.6 mbar

A pressure of 13.6 mbar, column 1, corresponds in table

RS 35/M C05 to output of 360 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. 22), 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. 22).
- Add this value to the estimated pressure in combustion chamber.

Example - RS 35/M C05:

Required burner maximum output operation: 360 kW

Natural gas G 20 NCV 9.45 kWh/Sm³

Gas pressure at an output of 360 kW = 13.6 mbar

Pressure in combustion chamber = 2.0 mbar

13.6 + 2.0 = 15.6 mbar

pressure required at test point 1)(Fig. 22).

5.10 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 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 (over voltage 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.

Notes:

- the model RS 35/M C05 three phase leaves the factory with an electrical supply setting of **400V**.
If **230V** power supply is used, change the motor connection from star to delta and change the setting of the thermal relay as well.
- The burners RS 25-35/M C05 have been approved for intermittent operation.
This means they should be compulsorily stopped at least once every 24 hours to enable the control box to perform a check of its own efficiency at start-up.
Normally, the stopping of the burner is guaranteed by the boiler's thermostat/pressure switch.
If this is not the case, a time switch should be fitted in series to IN to provide for burner shut-down at least once every 24 hours.
- The RS 25-35/M C05 burners leave the factory fitted for two stage operation and must therefore be fitted to the TR thermostat/pressure switch.
If on the other hand you require a burner with single stage operation, insert a jumper between clamps T6 - T7 of plug X4.

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.

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 cables to be connected to the burner must be passed through the cable grommets.

Modulating operation

If the output power regulator kit RWF or the converter 0...10V / 4...20mA is connected, in 3-point signal, the thermostat/pressure switch TR must be removed (if the 4-pole socket becomes unhooked, apply the supplied cover).

Using just the regulator RWF also remove the TL thermostat/pressure switch.



- Do not invert the neutral with the phase in the electrical supply line. An inversion would lead to lockout due to ignition failure.
- Replace the components only with original spare parts.

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

RS 25-35/M C05 single-phase

- 1 7-pole socket for single-phase power supply, thermostat/pressure switch TL
- 2 6-pole socket for gas valves, gas pressure switch or device for checking the valve seal
- 3 4-pole socket for thermostat/pressure switch TR
- 4 5-pole socket, not used
- 5 2-pole socket for accessory min. gas pressure switch
- 6 - 6A Fittings for pipe unions
(Pierce, if it is necessary to use the pipe unions 6A)

RS 35/M C05 three-phase

- 1 7-pole socket for single-phase power supply, thermostat/pressure switch TL
- 2 6-pole socket for gas valves, gas pressure switch or device for checking the valve seal
- 3 4-pole socket for thermostat/pressure switch TR
- 4 5-pole socket for three-phase power supply
- 5 2-pole socket for accessory min. gas pressure switch
- 6 - 6A Fittings for pipe unions
(Pierce, if it is necessary to use the pipe unions 6A)



The socket cover must only be removed when the 4-pole socket is in use.

When the 4-pole socket is not in use the cover must be in place.

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

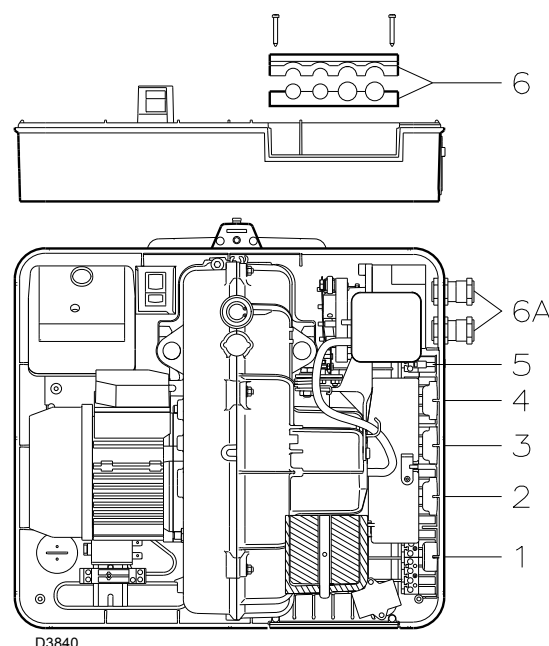


Fig. 23



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

5.11 Calibration of the thermal relay (only for RS 35/M C05 three-phase)

The thermal relay is used to avoid damage to the motor owing to a strong increase in absorption or the lack of a phase. For the calibration, refer to the electrical wiring.

If the minimum value of the scale of the thermal relay is greater than the rating absorption of the motor, protection is still ensured. This arises when the power supply of the motor is 400 V.

To reset, in the case of an intervention of the thermal relay, press the button 1)(Fig. 24).

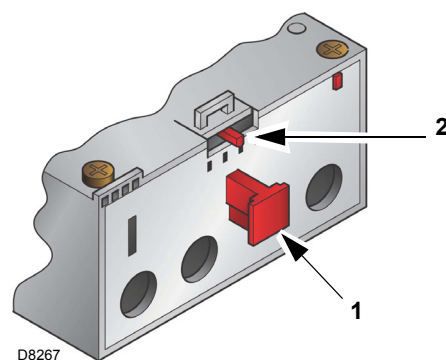


Fig. 24

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 32.

6.2 Adjustments prior to ignition

Combustion head adjustment is already described on page 17.

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. 30).
- Adjust the air pressure switch to the start of the scale (Fig. 29).
- 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 approximately calculate burner maximum output using the Tab. F on page 20.
- 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.



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.

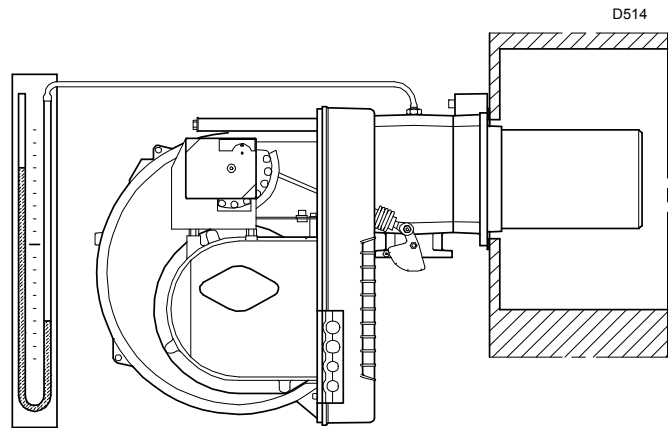


Fig. 25

6.3 Burner start-up

Turn off the remote controls and set the switch 1)(Fig. 26) to "MAN".

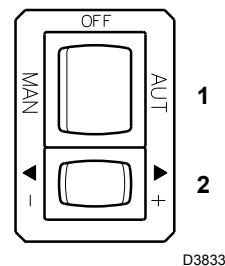
As soon as the burner starts, check the direction of rotation of the fan impeller, looking through the flame inspection window 17) (Fig. 4 on page 12).



DANGER

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.



D3833

Fig. 26

6.4 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. 25). If the burner locks out again, refer to chapter "Faults - Possible causes - Solutions" on page 35. Once ignition has taken place, proceed with global calibration operations.



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.

6.5 Burner adjustment

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

Adjust successively:

- Output upon ignition (minimum)
- Max. burner output
- Intermediate outputs between Min. and Max.
- Air pressure switch
- Minimum gas pressure switch

6.5.1 Determination of output upon ignition (minimum)

According to the regulation EN 676.

Burners with MAX output up to 120kW

Ignition can be performed at the maximum operation output level.

Example:

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

Burners with MAX output above 120kW

Ignition must be performed 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 regulations prescribe that the value be defined according to the control box safety time "ts": for "ts" = 3s, ignition output must be equal to, or lower than, 1/3 of max. operation output.

Example:

MAX operation output of 450 kW.

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

In order to measure the ignition output:

- disconnect the plug-socket 24)(Fig. 4 on page 12) on the ionisation probe cable (the burner will fire and then go into lockout after the safety time has elapsed).
- Perform 10 ignitions with consecutive lockouts.
- Read, on the meter, the quantity of gas burned. This quantity must be equal to, or lower than, the quantity given by the formula, for ts = 3s:

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

Vg: volume supplied in ignitions carried out (Sm³)

Qa: ignition output (Sm³/h)

n: number of ignitions (10)

ts: safety time (sec)

Example for gas G 20 (9.45 kWh/Sm³): ignition output 150 kW corresponding to 15.87 Sm³/h.

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

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

6.5.2 Output upon ignition (minimum)

Min output must be selected within the firing rate range shown on Fig. 2 on page 10.

Press the button 2)(Fig. 26) "output reduction", and keep it pressed until the servomotor has closed the air damper and the gas butterfly valve at 15° (adjustment made in the factory).

Adjusting gas delivery

Measure the gas delivery at the meter.

- If it is necessary to reduce it, reduce slightly the angle of cam III Fig. 28 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, press slightly the button "output increase" 2)(Fig. 26) (open by 10-15° the gas butterfly valve), increase the angle of cam III Fig. 28 on page 26 with small, regular movements, i.e. bring it from an angle of 15° to 17° - 19°....

Then press the button "output reduction" until the servomotor is in the position of minimum opening, and measure the gas output.

Note

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

If it is necessary to adjust cam III Fig. 28, remove the cover 1)(Fig. 28) inserted with a trigger catch, as indicated in Fig. 28, extract the special key 2)(Fig. 28) from inside, and insert it in the notch of cam III.

Adjustment of air delivery

Progressively adjust the starting profile of cam 4)(Fig. 27) by turning the screws working through the access hole 6)(Fig. 27). It is preferable not to turn the first screw since this is used to set the air damper to its fully closed position.

6.5.3 Max. output

Max. output of the burner must be set within the firing rate range shown on Fig. 2 on page 10.

In the above description, we left the burner switched on, working at MIN output. Now press the button 2)(Fig. 26 on page 24) "output increase", and keep it pressed until the servomotor has opened the air damper and the gas butterfly valve at 90°.

Adjusting gas delivery

Measure the gas delivery at the meter.

As a general rule, it can be seen from the Tab. F on page 20, just read the gas pressure on the pressure gauge, see Fig. 25, and follow the indications given on "Gas pressure" on page 20.

- If delivery needs to be reduced, diminish outlet gas pressure and, if it is already very low, slightly close adjustment valve VR.
- If delivery needs to be increased, increase outlet gas pressure.

Adjustment of air delivery

Progressively adjust the end profile of cam 4)(Fig. 27) by turning the cam adjustment screws as they appear through the access opening 6)(Fig. 27).

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

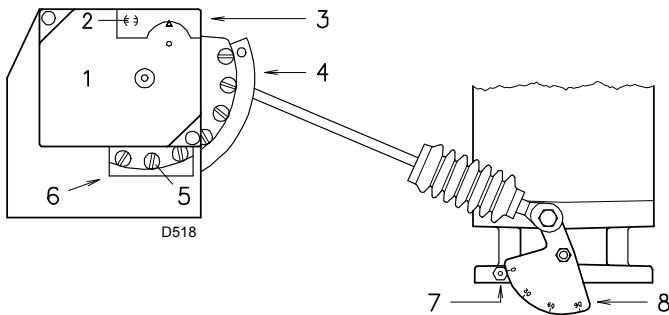


Fig. 27

- 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

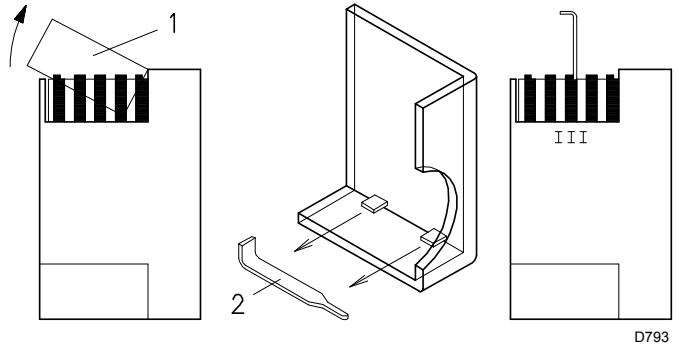


Fig. 28

6.5.4 Intermediate outputs

Adjusting gas delivery

No adjustment of gas delivery is required.

Adjustment of air delivery

Press the key 2)(Fig. 26) "output increase" a little so that a new screw 5)(Fig. 27) appears in the opening 6)(Fig. 27).

Adjust it until optimal combustion is obtained. Proceed in the same way with the other screws.

Take care that the cam profile variation is progressive.

Switch the burner off with the switch 1)(Fig. 26). Release the variable profile cam by putting the servomotor slot 2)(Fig. 27) in a vertical position and check more than once, rotating the cam forward and backward by hand, that the movement is soft and smooth, without sticking.

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

NOTE:

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

6.6 Pressure switch adjustment

6.6.1 Air pressure switch

Adjust the air pressure switch after performing all other burner adjustments with the air pressure switch set to the start of the scale (Fig. 29).

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.

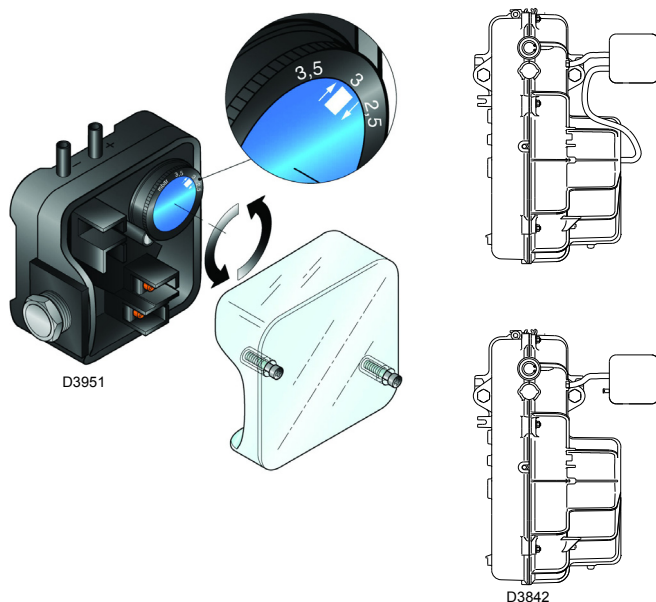


Fig. 29

6.6.2 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. 30).

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

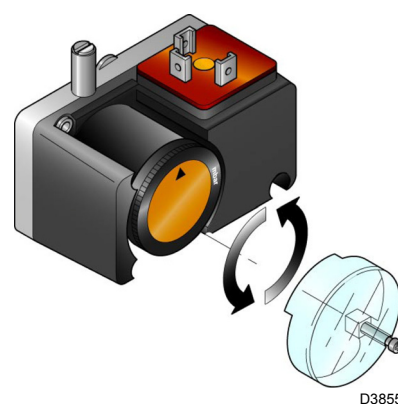


Fig. 30

6.6.3 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 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 8)(Fig. 4 on page 12) on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 μ A.

Carefully check polarities.

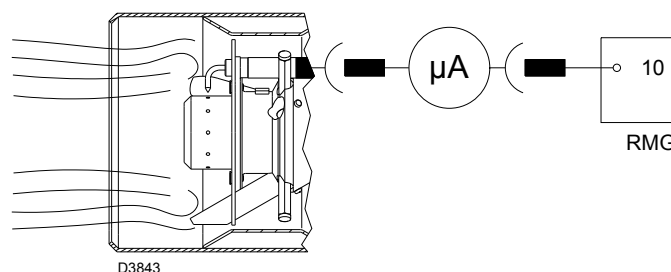


Fig. 31

6.7 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 24 s.

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

Cam I : 90°

Limits rotation toward maximum position.

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

Cam II : 0°

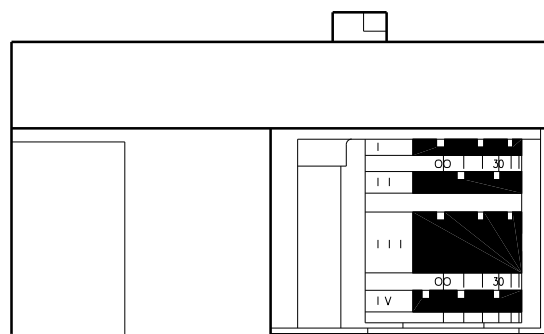
Limits rotation toward minimum position.

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

Cam III : 15°

Adjusts the ignition position and MIN output.

Cam IV : Integral with cam III.



D7679

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. 28 on page 26).
- 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. 28 on page 26) for the MIN output.
- 77s: The air damper and gas butterfly valve assume the MIN output position (with cam III)(Fig. 28 on page 26) 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 (Fig. 33). Delivery is then progressively increased, with the valve VR opening slowly up to MIN. output, point B (Fig. 33).
- 94s: The spark goes out.
- 118s: The starting cycle comes to an end.

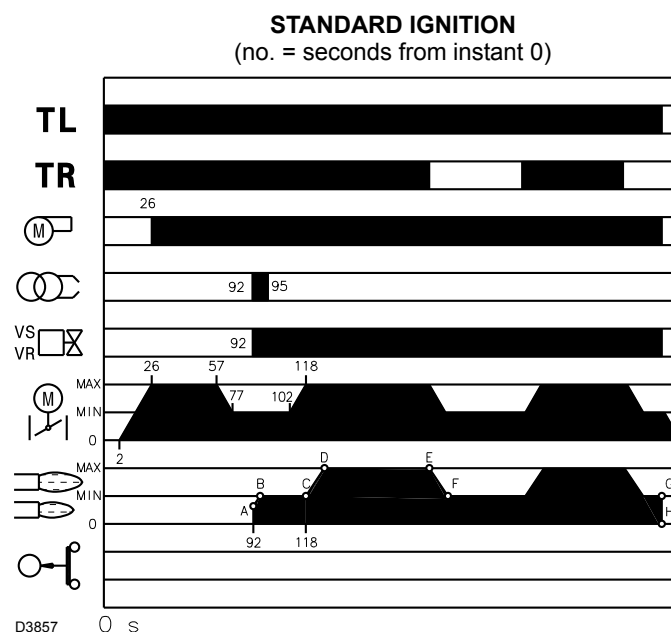


Fig. 33

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 (Fig. 33).

(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)(Fig. 33).
 - 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)(Fig. 33). 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.

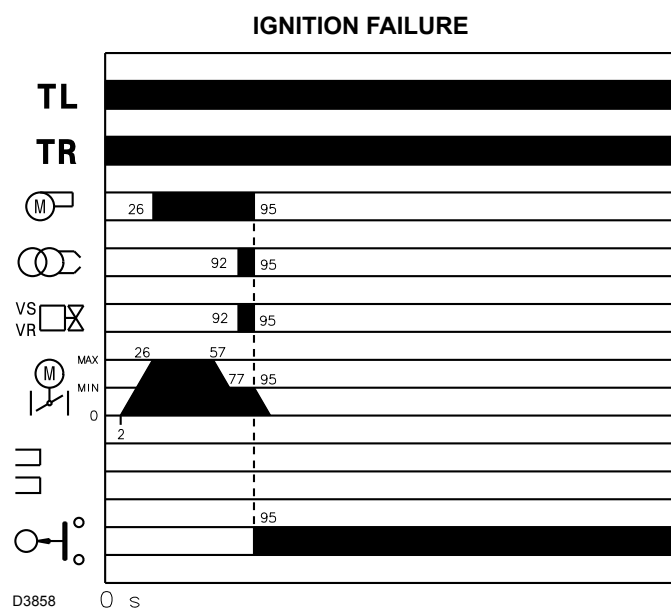


Fig. 34



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.

6.9 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.

6.9.2 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.

6.9.3 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. M on page 36).

6.9.1 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.

6.9.4 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. M on page 36.

6.10 Final checks (with burner operating)

➤ Disconnect a wire of the minimum gas pressure switch ➤ Open the thermostat/pressure switch TL ➤ Open the thermostat/pressure switch TS	➡	The burner must stop
➤ Disconnect the air adduction tube of the pressure switch	➡	The burner must stop in lockout
➤ Turn off the burner and cut off the power ➤ Disconnect the minimum gas pressure switch connector	➡	The burner must not start
➤ Disconnect the ionisation probe wire or shade the flame sensor.	➡	The burner must stop in lockout due to ignition failure

Tab. J



Make sure that the mechanical locking systems on the various adjustment devices are fully tightened.

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.

Switchboard maintenance (Fig. 35)

If it is necessary to carry out maintenance on the switchboard (1) it is possible to remove only the fan unit (2), to allow improved access to the electrical components.

With the burner open as in Fig. 35, unhook the tie-rod (3), removing the screw on the variable profile cam, and extract it from the tip (4).

At this point, disconnect the cables relating to the air pressure switch, the servomotor and fan motor.

Remove the 3 screws (5) positioned on the protective cover.

Removing the 2 screws (6), it is possible to unthread the fan unit (2) from the guides (7).

Finally, you can use 2 of the 3 screws (5) to fix the electrical switchboard to the pipe coupling, in the points indicated in Fig. 36, and then carry out the maintenance operations.

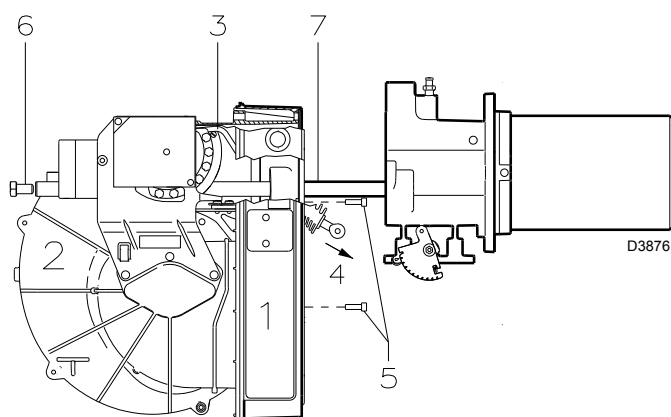


Fig. 35

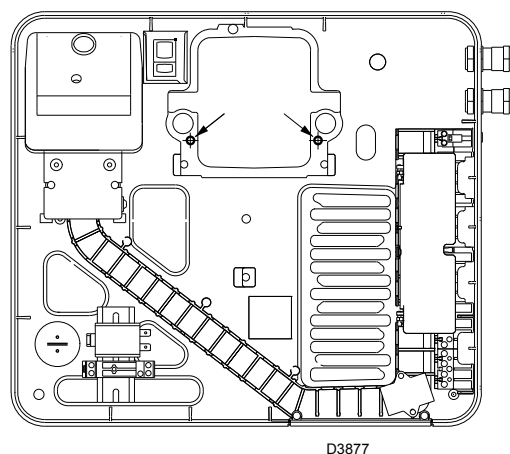


Fig. 36

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. K

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.

7.2.5 Safety components

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

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

Safety component	Life cycle
Flame control	10 years or 250,000 operation cycles
Flame sensor	10 years or 250,000 operation cycles
Gas valves (solenoid)	10 years or 250,000 operation cycles
Pressure switches	10 years or 250,000 operation cycles
Pressure adjuster	15 years
Servomotor (electronic cam) (if present)	10 years or 250,000 operation cycles
Oil valve (solenoid)(if present)	10 years or 250,000 operation cycles
Oil regulator (if present)	10 years or 250,000 operation cycles
Oil pipes/ couplings (metallic) (if present)	10 years
Flexible hoses (if present)	5 years or 30,000 pressurised cycles
Fan impeller	10 years or 500,000 start-ups

Tab. L

7.3 Opening the burner



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



Close the fuel shut-off valve.



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

Proceed as follows (Fig. 37):

- 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 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.

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

Remove the screws 2)(Fig. 10 on page 16) and tighten the two extensions 25)(Fig. 4 on page 12) supplied with the burner.
Retighten the two screws 2)(Fig. 10 on page 16) on the terminal of the extensions.



Proceed with the assembly of the inner part of the combustion head, tightening the screw 8) (Fig. 37) with a tightening torque of $4 \div 6$ Nm.

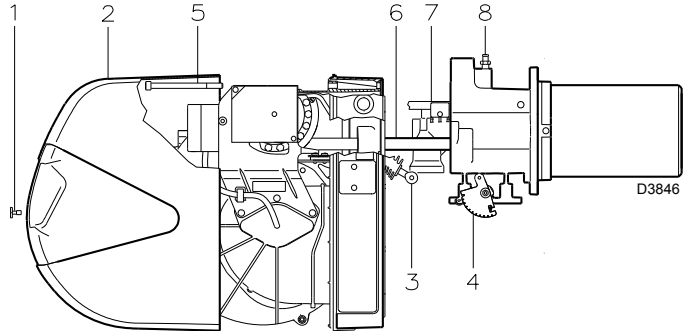


Fig. 37

7.4 Closing the burner

Proceed as follows (Fig. 37):

- 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 carefully pull the probe and electrode cables outwards until they are slightly taut.
- Re-couple the articulated coupling (3) to the graduated sector (4).
- In the long head models, unscrew the extensions and reposition them in the appropriate space; tighten the screws to the guides 2)(Fig. 10 on page 16).
- Reposition the hood (2) and fix with the screw (1).



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	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
		Defective flame detection circuit	Replace the control box
	Burner locks out when shifting from minimum to maximum output and vice versa	Too much air or too little gas	Adjust air and gas
	Burner goes into lockout during operation	Probe or ionisation cable grounded	Replace worn parts

Signal	Problem	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. M

A Appendix - Accessories**Differential circuit breaker kit**

Burner	Code
All models	3010448

Software interface kit

Burner	Code
All models	3002719

Kit hourcounter

Burner	Code
All models	3010450

Kit clean contacts

Burner	Code
All models	3010419

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
All models	3010386

Output power regulator kit for modulating operation

Burner	Probe	Adjustment field	Code
All models	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
All models	RWF50.2	20083339
	RWF55.5	20098541

Burner	Potentiometer	Code
All models	1000 Ω	3010420

Kit continuous purging

Burner	Code
All models	3010449

Maximum gas pressure switch

Burner	Code
All models	3010418

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 RS 25/M C05 RS 35/M C05 1 Ph RS 35/M C05 3 Ph
4	Operational layout RS 25-35/M C05 1 Ph RS 35/M C05 3 Ph
5	Electrical connections set by installer
6	Electrical connections set by installer
7	Operational layout

2

Indication of references

Sheet no.

Coordinates

/1.A1



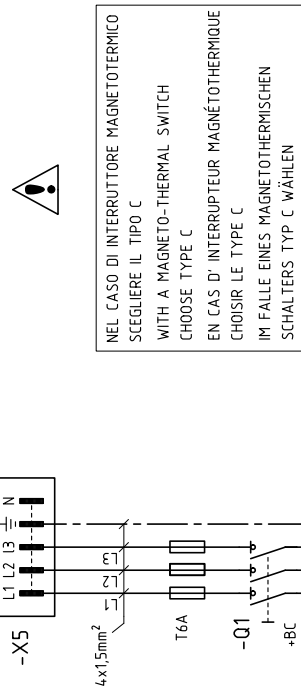




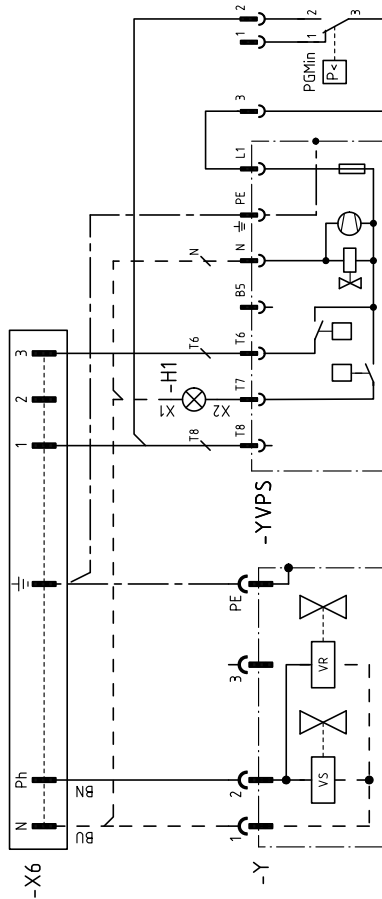




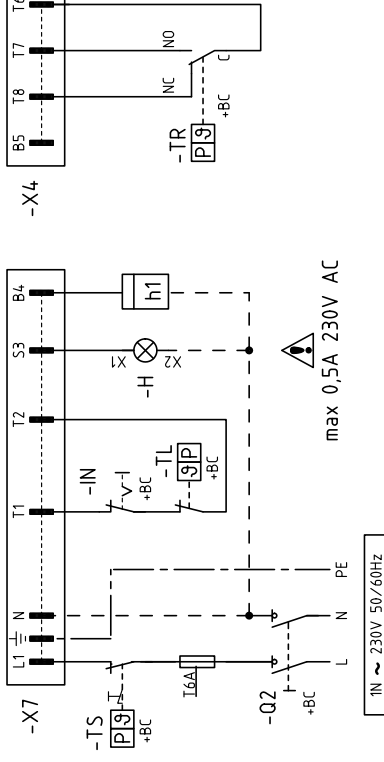
SOLO PER LA VERSIONE TRIFASE - ONLY FOR THE THREE PHASE VERSION



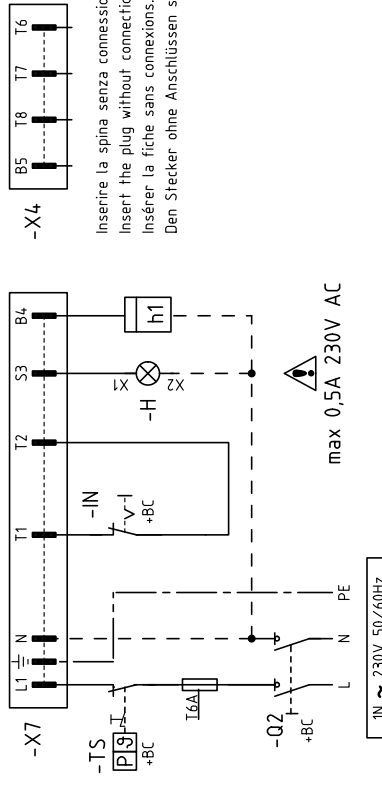
CONTROLLO TENUTA VPS 504 - VPS 504 GAS LEAKAGE DETECTOR
VPS 504 CONTROLE D' ETANCHEITE GAZ - VPS 504 DICHTHEITSKONTROLLE



SENZA KIT RWF50 - WITHOUT RWF50 - SANS RWF50 - OHNE RWF50



CON KIT RWF50 - WITH RWF50 - AVEC RWF50 - MIT RWF50

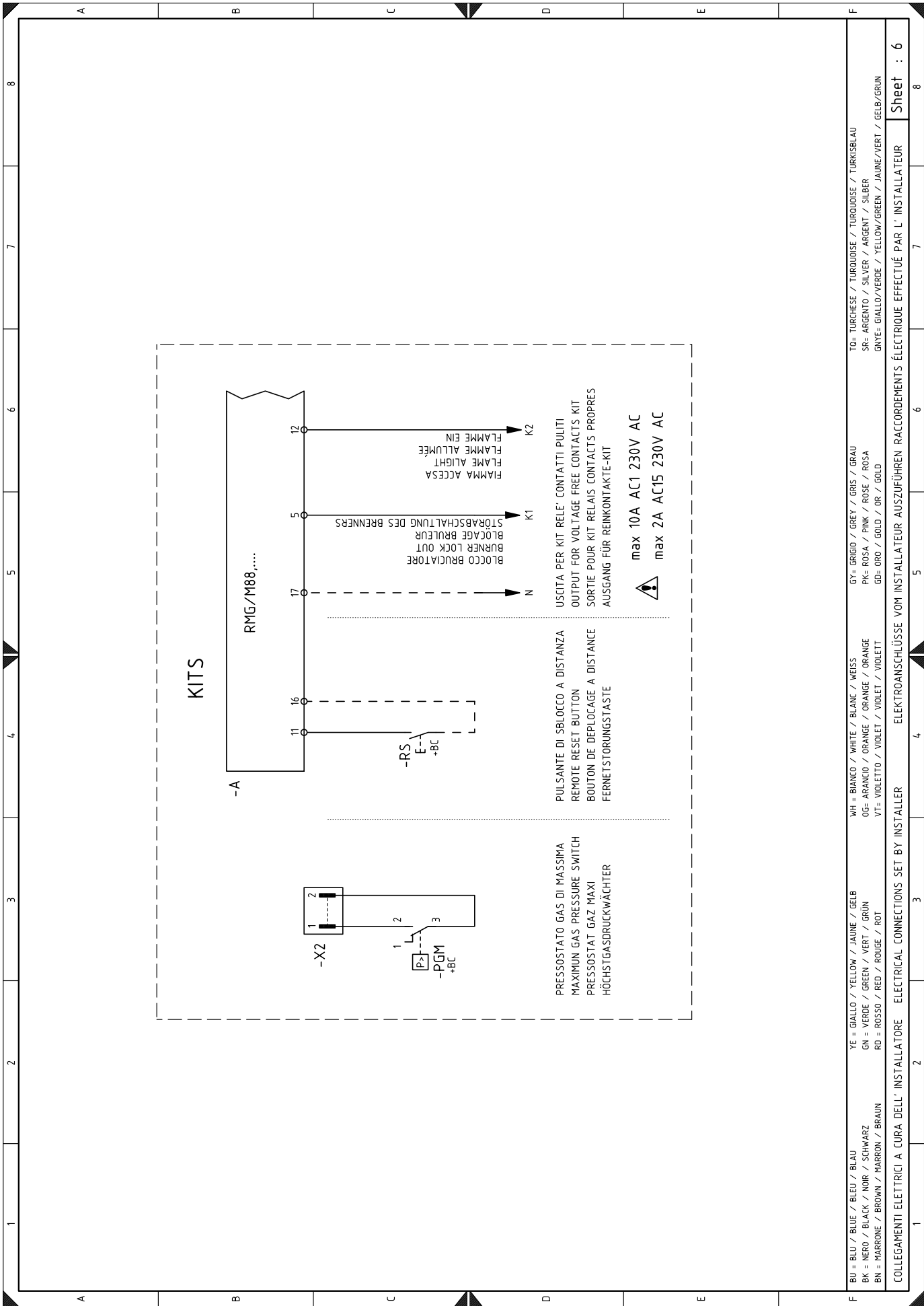


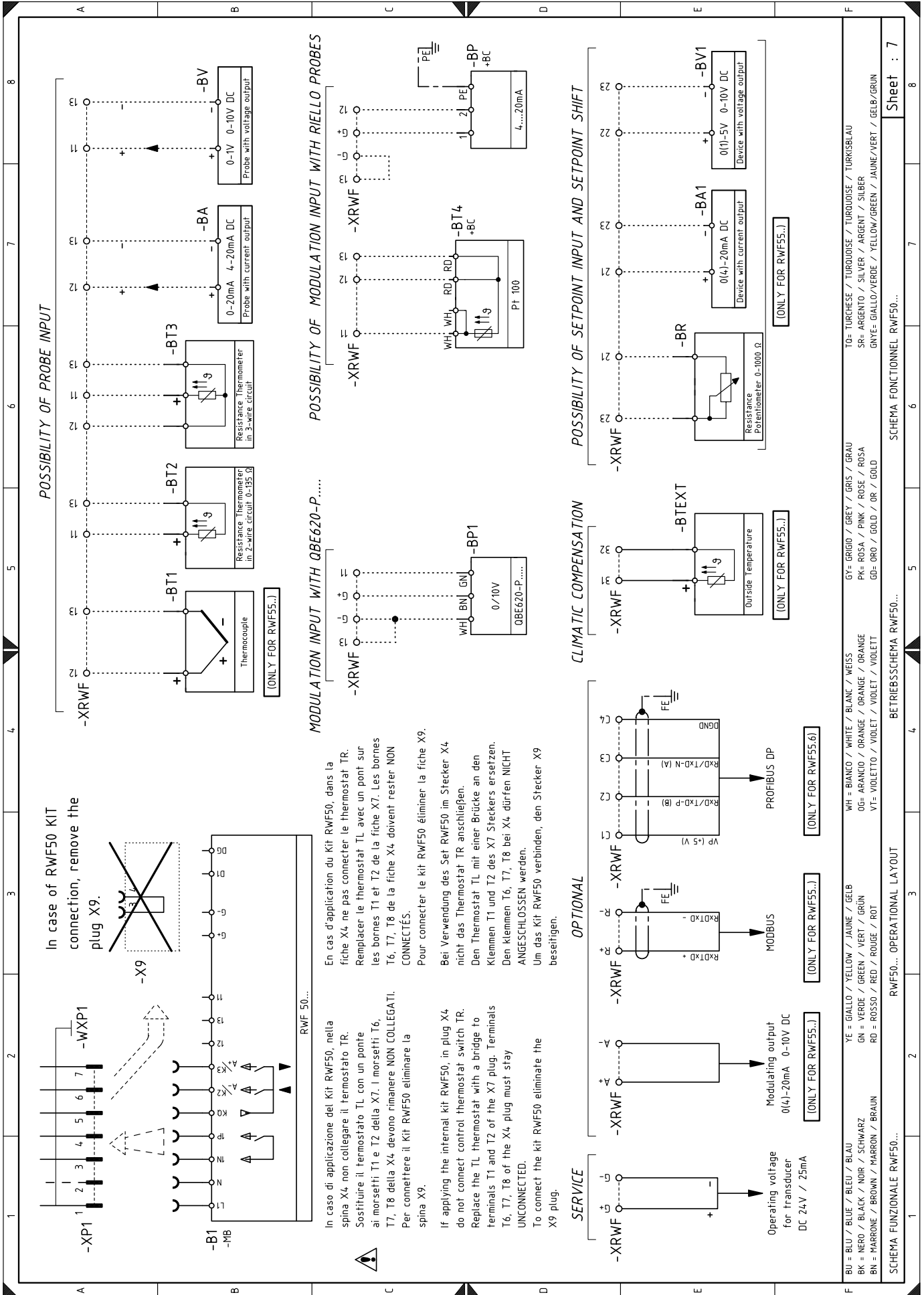
In questa configurazione la funzione del TL viene eseguita dal kit RWF50.
In this configuration, the TL function is performed by RWF50 kit.
Dans cette configuration, la fonction TL est effectuée par kit RWF50.
In dieser Konfiguration, wird die Funktion des TL durch kit RWF50 durchgeführt.

BU = BLU / BLUE / BLEU / BLAU	YE = GIALLO / YELLOW / JAUNE / GELB	WH = BIANCO / WHITE / BLANC / WEISS	GY = GRIGIO / GREY / GRIS / GRAU	TO = TURCHESE / TURQUOISE / TURKISBLAU
BK = NERO / BLACK / NOIR / SCHWARZ	GN = VERDE / GREEN / VERT / GRÜN	OG = ARANCIO / ORANGE / ORANGE / ORANGE	PK = ROSA / PINK / ROSE / ROSA	SR = ARGENTO / SILVER / ARGENT / SILBER
BN = MARRONE / BROWN / MARRON / BRAUN	RD = ROSSO / RED / ROUGE / ROT	VT = VIOLETTO / VIOLET / VIOLET / VIOLETT	GD = ORO / GOLD / OR / GOLD	GNVE = GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRÜN

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

Sheet : 5





Wiring layout key

A	Electrical control box	X5	5-pin plug
B	Radio noise filter	X6	6-pin plug
B1	Output power regulator RWF	X7	7-pin plug
BA	Input under current 4...20 mA DC	X9	9-pin plug
BA1	Input under current 4...20 mA DC to modify the setpoint		
+BB	Components on burners		
+BC	Components on boiler		
BP	Pressure probe		
BP1	Pressure probe		
BR	Remote setpoint potentiometer		
BT1	Thermocouple probe		
BT2	Two-wire probe Pt100		
BT3	Three-wire probe Pt100		
BT4	Four-wire probe Pt100		
BTEXT	External probe for climatic setpoint compensation		
BV	Input under voltage 0...10 V DC		
BV1	Input under voltage 0...10 V DC to modify the remote setpoint		
C1	Capacitor		
CN1	Ionisation probe connector		
CN2	Connector		
CN3	Connector		
F1	Fan motor thermal relay		
H	Remote lockout signalling		
H1	Lockout YVPS		
IN	Manual burner stop switch		
ION	Ionisation probe		
h1	Hour counter		
K1	Relay		
KM	Motor contact maker		
MV	Fan motor		
PA	Air pressure switch		
PGM	Maximum gas pressure switch		
PGMin	Low gas pressure switch		
Q1	Three phase knife switch		
Q2	Single-phase knife switch		
RS	Remote reset button		
S1	Unlit / automatic/ manual selector switch		
S2	Power increase/decrease selector switch		
SM	Servomotor		
TA	Ignition transformer		
TL	Limit thermostat/pressure switch		
TR	Adjustment thermostat/pressure switch		
TS	Safety thermostat/pressure switch		
Y	Gas regulation valve + gas safety valve		
YVPS	Gas valve leak detection control device		
XPA	Air pressure switch connector		
XP1	Modulation kit socket		
XP2	Maximum gas pressure switch connector		
XP4	4-pole socket		
XP5	5-pole socket		
XP6	6-pole socket		
XP7	7-pole socket		
XRWF	Output power regulator RWF terminal strip		
XSM	Servomotor connector		
XTB	Shelf earth		
XTM	Fan assembly earth		
XTS	Servomotor assembly earth		
X2	2-pin plug		
X4	4-pin plug		



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