GB

Forced draught gas burners

Progressive two-stage operation

CODE	MODEL	TYPE
3785813	RS 190	835 T1
20030087	RS 190	835 T1

2915943 (16) - 10/2021

GB CONTENTS

N.B.
Figures mentioned in the text are identified as follows:
1)(A) = part 1 of figure A, same page as text;
1)(A)p.3 = part 1 of figure A, page number 3.

TECHNICAL DATA

MODEL			RS 190	
CODE			3785813 20030087	
OUTPUT (1)	2nd stage	kW	1279 - 2290	
		Mcal/h	1100 - 1970	
	min. 1st stage	kW	470	
		Mcal/h	405	
FUEL			NATURAL GAS: G20 - G21 - G22 - G23 - G25	
			G20	G25
- net calorific value		kWh/Sm³ Mcal/Sm³	9.45 8.2	8.13 7.0
- absolute density		kg/Sm³	0.71	0.78
- max. delivery		Sm³/h	230	267
- pressure at max. delivery (2)		mbar	15	22
OPERATION			• On-Off (1 stop min each 24 hours). • Two-stage (high and low flame) and single stage (all - nothing)	
STANDARD APPLICATIONS			Boilers: water, steam, diathermic oil	
AMBIENT TEMPERATUR		°C	0 - 40	
COMBUSTION AIR TEMPERATURE		°C max	60	
IN CONFORMITY WITH DIRECTIVES			2009/142 - 2006/42 - 2014/35 - 2014/30	
NOISE LEVELS (3)	Sound pressure Sound power	dBA	83.1 94.1	
APPROVAL		CE	0085AT0042	

(1) Reference conditions: Ambient temperature 20°C - Gas temperature 15°C - Barometric pressure 1013 mbar - Altitude 0 m s.l.m.
(2) Pressure at test point 17)(A)p.3, with zero pressure in the combustion chambre, with open gas ring 2)(B)p.7 an maximum burner output
(3) Sound pressure measured in manufacturer's combustion laboratory, with burner operating on test boiler and at maximum rated output. The sound power is measured with the “Free Field” method, as per EN 15036, and according to an “Accuracy: Category 3” measuring accuracy, as set out in EN ISO 3746.

ELECTRICAL DATA

Motor IE3

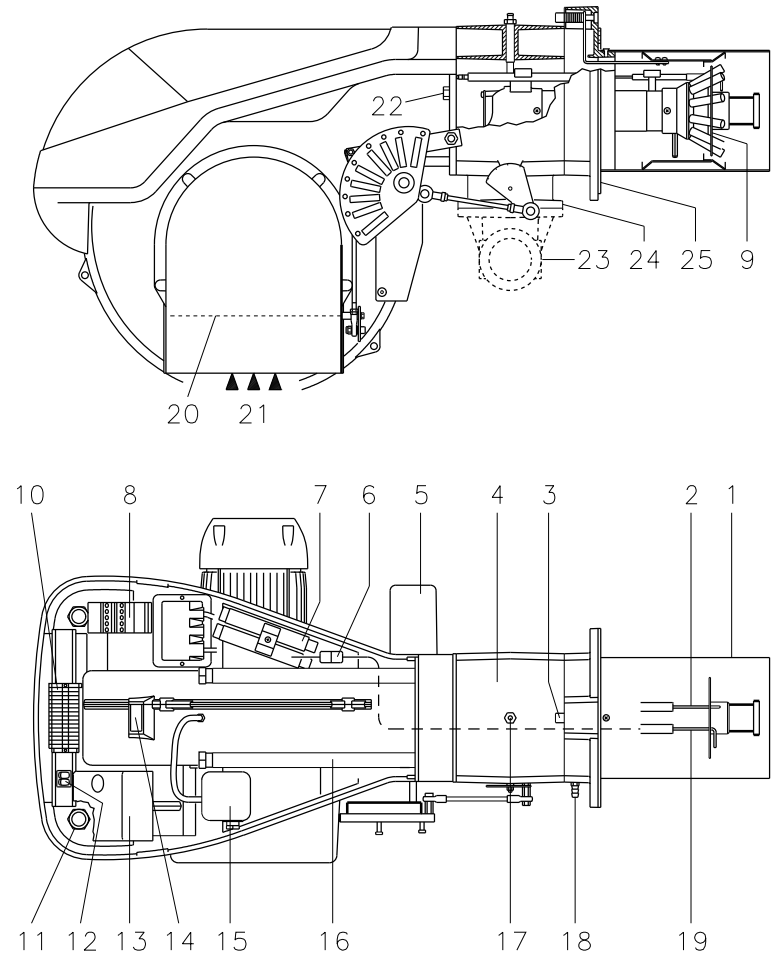
MODEL		RS 190
MAIN ELECTRICAL SUPPLY		3 ~ 400V +/-10% 50Hz
AUXILIARY CIRCUIT ELECTRICAL SUPPLY		1N ~ 230V +/-10% 50Hz
ELECTRIC MOTOR	rpm W V A	2900 4500 400 8.7
IGNITION TRANSFORMER	V1 - V2 I1 - I2	230 V - 1 x 8 kV 1 A - 20 mA
ELECTRICAL POWER CONSUMPTION	W max	5500
ELECTRICAL PROTECTION		IP 44

GAS CATEGORY

COUNTRY	CATEGORY
IT - AT - GR - DK - FI - SE	$II_{2H3B / P}$
ES - GB - IE - PT	II_{2H3P}
NL	I_{2L} - I_{2E} - I_2 (43.46 ÷ 45.3 MJ/m³ (0°C))
FR	II_{2Er3P}
DE	$II_{2ELL3B /P}$
BE	$I_{2E(R)B}$, I_{3P}
LU - PL	$II_{2E 3B/P}$

VARIANTS

Model	Code	Power supply electrical
RS 190	3785813	400 V
RS 190	20030087	400 V



D7861 **(A)**

BURNER DESCRIPTION (A)

1 Combustion head
2 Ignition electrode
3 Screw for combustion head adjustment
4 Sleeve
5 Servomotor controlling the gas butterfly valve and of air gate valve (by means of a variable profile cam mechanism).
When the burner is stopped the air gate valve will be completely closed to reduce heat loss due to the flue draught, which tends to draw air from the fan air inlet.
6 Plug-socket on ionisation probe cable
7 Extension for slide bars 16)
8 Motor contactor and thermal cut-out reset button
9 Flame stability disk
10 Terminal strip
11 Fairleads for electrical connections by installer
12 Two switches:
- one “burner off-on”
- one for “1st - 2nd stage operation”
13 Control box with lock-out pilot light and lock-out reset button
14 Flame inspection window
15 Minimum air pressure switch (differential operating type)
16 Slide bars for opening the burner and inspecting the combustion head
17 Gas pressure test point and head fixing screw
18 Air pressure test point
19 Flame sensor probe
20 Air gate valve
21 Air inlet to fan
22 Screws securing fan to sleeve
23 Gas input pipework
24 Gas butterfly valve
25 Boiler mounting flange

Two types of burner failure may occur:
- **Control box lock-out:** if the control box 13)(A) pushbutton (red led) lights up, it indicates that the burner is in lock-out.
To reset, hold the pushbutton down for between 1 and 3 seconds.
- **Motor trip:** release by pressing the pushbutton on thermal cutout 8)(A).

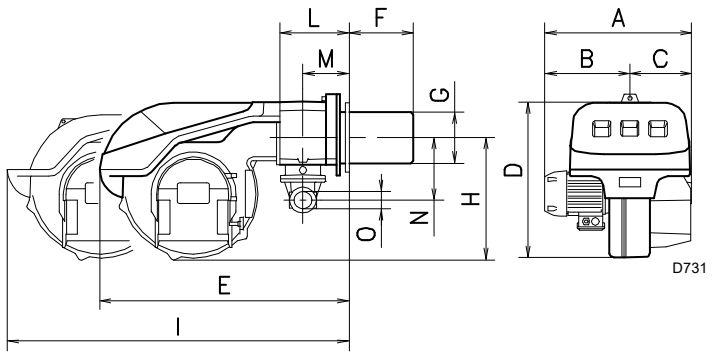
	kg
RS 190	115
RS 190*	120

* Long Combustion Head Version

(B)

WEIGHT (B)

The weight of the burner complete with packaging is indicated in Table (B).



mm	A	B	C	D	E	F	G	H	I	L	M	N	O
RS 190	681	366	315	555	872	370-520*	222	430	1328	246	150	186	2”

* Long Combustion Head Version

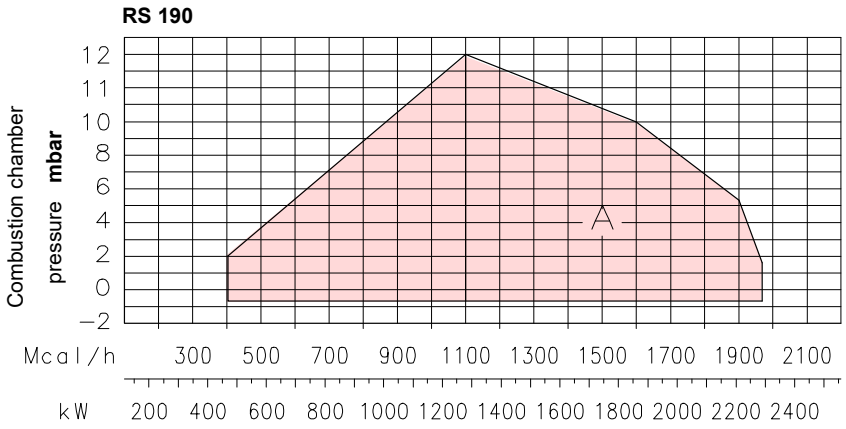
MAX. DIMENSIONS (C)

Approximate measurements
The maximum dimensions of the burner are given in (C).
Bear in mind that inspection of the combustion head requires the burner to be opened by withdrawing the rear part on the slide bars.
The maximum dimension of the burner when open is give by measurement I.

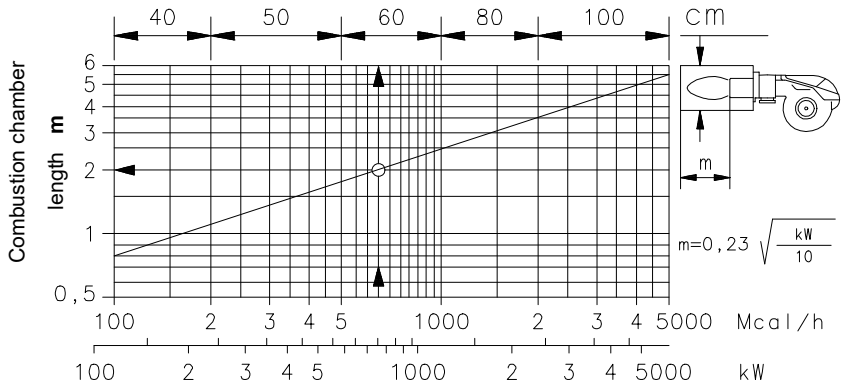
STANDARD EQUIPMENT

1 - Gas train flange
1 - Flange gasket
6 - Flange fixing screws M 10 x 30
1 - Thermal insulation screen
4 - Screws to secure the burner flange to the boiler: M 12 x 35
1 - Instruction booklet
1 - Spare parts list

(C)



(A) D1262



(B) D715

FIRING RATES (A)

The RS 190 model burner can work in two way: one-stage and two-stage.

MAXIMUM OUTPUT must be selected in area A.

MINIMUM OUTPUT must not be lower than the minimum limit shown in the diagram.

RS 190 = 470 kW

Important

The FIRING RATE area values have been obtained considering a surrounding temperature of 20 °C, and an atmospheric pressure of 1013 mbar (approx. 0 m above sea level) and with the combustion head adjusted as shown on page 7.

TEST BOILER (B)

The firing rates were set in relation to special test boilers, according to EN 676 regulations. Figure (B) indicates the diameter and length of the test combustion chamber.

Example:

Output 756 kW:

diameter = 60 cm; length = 2 m.

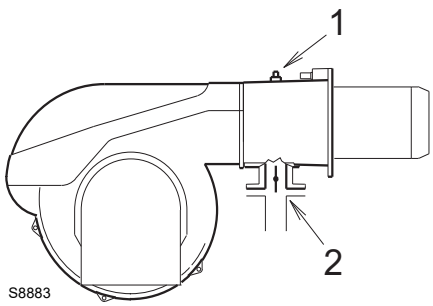
COMMERCIAL BOILERS

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

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

kW	Δp (mbar)	
	G 20	G 25
1280	11.0	16.5
1392	11.0	16.4
1504	11.2	16.7
1617	11.6	17.4
1729	12.3	18.4
1841	13.2	19.7
1953	14.3	21.4
2066	15.7	23.4
2178	17.3	25.8
2290	19.2	28.6

(A)



(B)

GAS PRESSURE

The adjacent table shows minimum pressure losses along the gas supply line depending on the burner output in 2nd stage operation.
Pressure loss at combustion head.
Gas pressure measured at test point 1)(B), with:

- Combustion chamber at 0 mbar
- Burner operating in 2nd stage
- Combustion head adjusted as indicated in diagram (C)p. 7.

The heat output and gas pressure in the head data refer to operating with the gas butterfly valve fully open (90°).

The values shown in the table refer to:
natural gas G 20 NCV 9.45 kWh/Sm^3
(8.2 Mcal/Sm^3).

Calculate the approximate 2nd stage output of the burner thus:

- Subtract the combustion chamber pressure from the gas pressure measured at test point 1)(B).
- Find the nearest pressure value to your result of the table (A).
- Read off the corresponding output on the left.

Example:

- 2nd stage operation
- Natural gas G 20 NCV 9.45 kWh/Sm^3
- Gas pressure at test point 1)(B)

= 14.6 mbar

- Pressure in combustion chamber

= 3 mbar

14.6 - 3 = 11.6 mbar

A 2nd stage output of 1617 kW shown in Table (A) corresponds to 11.6 mbar pressure.
This value serves as a rough guide, the effective delivery must be measured at the gas meter.

To calculate the required gas pressure at test point 1)(B), set the output required from the burner in 2nd stage operation:

- Find the nearest output value in the table (A).
- Read off the pressure at test point 1)(B) on the right.
- Add this value to the estimated pressure in the combustion chamber.

Example:

- Required burner output in 2nd stage operation: 1617 kW
- Natural gas G 20 NCV 9.45 kWh/Sm^3
- Gas pressure at burner output of 1617 kW, taken from table (A)

= 11.6 mbar

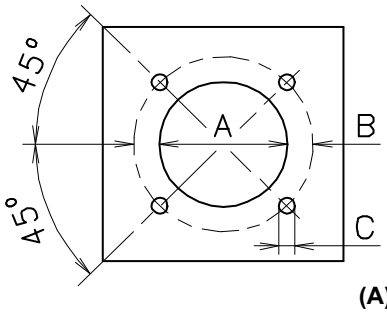
- Pressure in combustion chamber

= 3 mbar

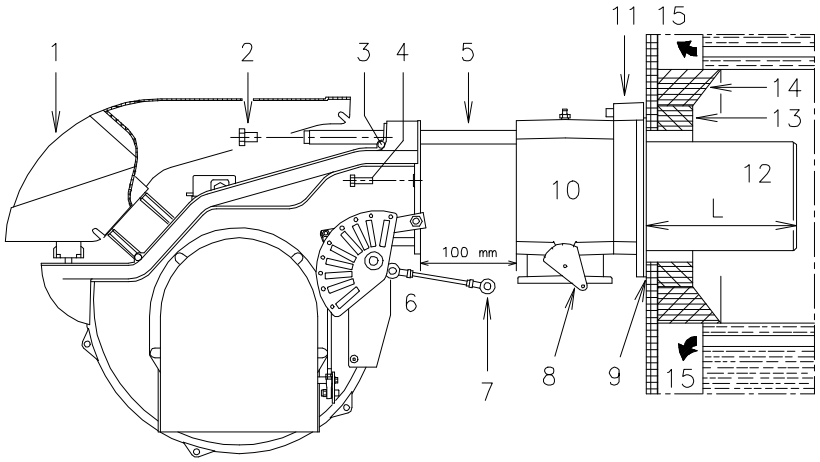
11.6 + 3 = 14.6 mbar

pressure required at test point 1)(B).

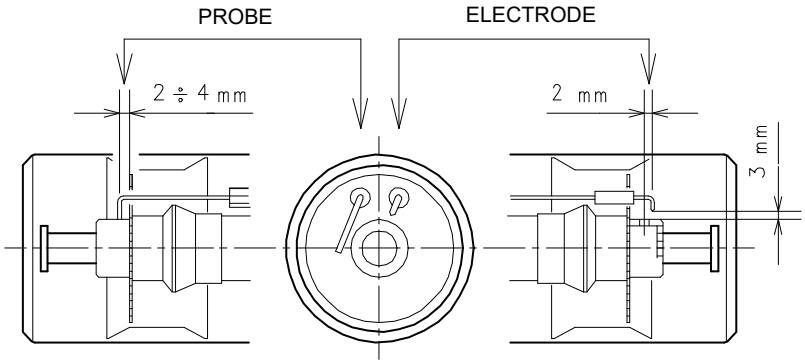
mm	A	B	C
RS 190	230	325-368	M 16



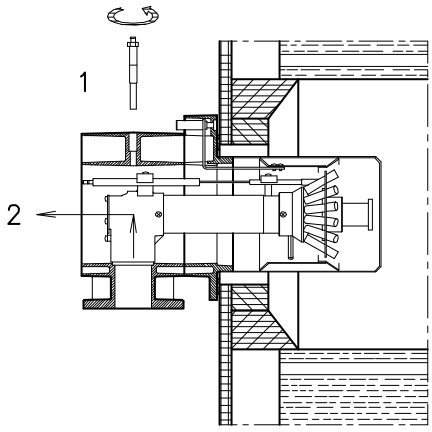
D455 **(A)**



D3036 **(B)**



D1265 **(C)**



D1266 **(D)**

INSTALLATION

BOILER PLATE (A)

Drill the combustion chamber locking plate as shown in (A). The position of the threaded holes can be marked using the thermal screen supplied with the burner.

BLAST TUBE LENGTH (B)

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.

For boilers with front flue passes 15) or flame inversion chambers, protective fettling in refractory material 13) must be inserted between the boiler fettling 14) and the blast tube 12).
This protective fettling must not compromise the extraction of the blast tube.
For boilers having a water-cooled front the refractory fettling 13)-14)(B) is not required unless it is expressly requested by the boiler manufacturer.

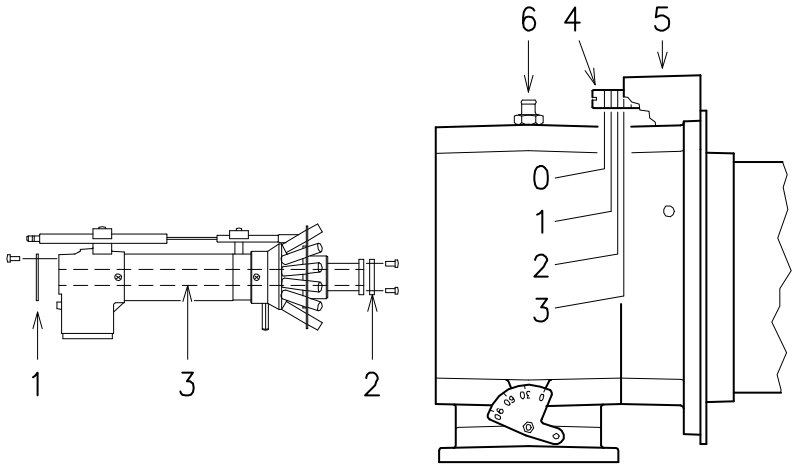
SECURING THE BURNER TO THE BOILER (B)

Before securing the burner to the boiler, check through the blast tube opening to make sure that the flame sensor probe and the ignition electrode are correctly set in position, as shown in (C).

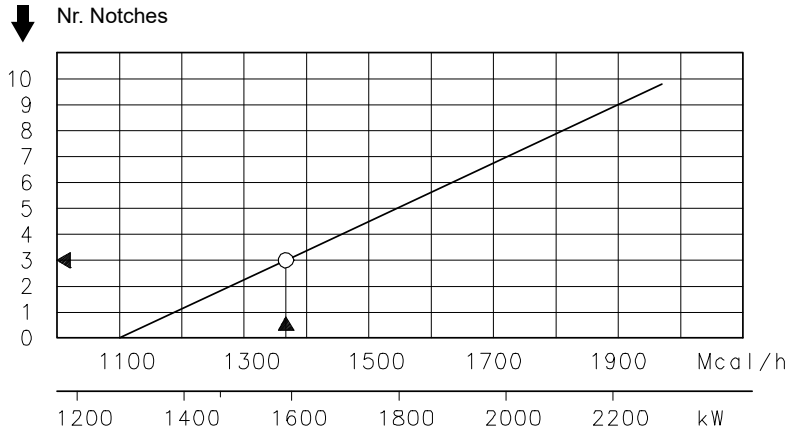
Now detach the combustion head from the burner, fig.(B):
- Loosen the 4 screws 3) and remove the cover 1)
- Disengage the articulated coupling 7) from the graduated sector 8).
- Remove the screws 2) from the slide bars 5).
- Remove the two screws 4) and pull the burner back on slide bars 5) by about 100 mm. Disconnect the wires from the probe and the electrode and then pull the burner completely off the slide bars.

Secure the flange 11)(B) to the boiler plate, interposing the thermal insulating screen 9)(B) supplied with the burner. 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.

If you noticed any irregularities in positions of the probe or ignition electrode during the check mentioned above, remove screw 1)(D), extract the internal part 2)(D) of the head and proceed to set up the two components correctly.
Do not attempt to turn the probe. Leave it in the position shown in (C) since if it is located too close to the ignition electrode the control box amplifier may be damaged.

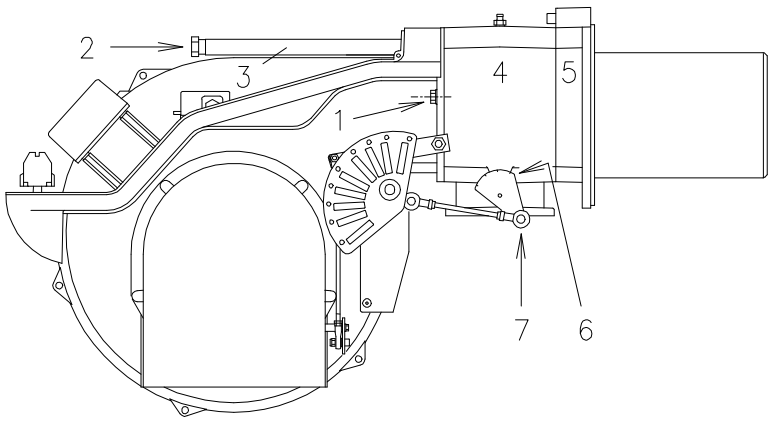


(A) **(B)**



Burner output in 2nd stage operation

(C) D1268



(D) D3037

SETTING THE COMBUSTION HEAD

Installation operations are now at the stage where the blast tube and sleeve are secured to the boiler as shown in fig. (B). It is now a very simple matter to set up the combustion head, as this depends solely on the output developed by the burner in 2nd stage operation.
It is therefore essential to establish this value before proceeding to set up the combustion head.
There are two adjustments to make on the head.

Air adjustment (B) See diagram (C).
Turn screw 4)(B) until the notch identified is aligned with the front surface 5)(B) of the flange.

Gas adjustment (A)
When the burner is installed for an output in 2nd stage ≤ 1300 Mcal/h (about 1500 kW) assemble the supplied disks 1)-2)(A) removing the inner pipe 3)(A). If there is little gas in the network, the head may be left in standard configuration, limiting the minimum modulation to 450 Mcal/h (circa 520 kW).

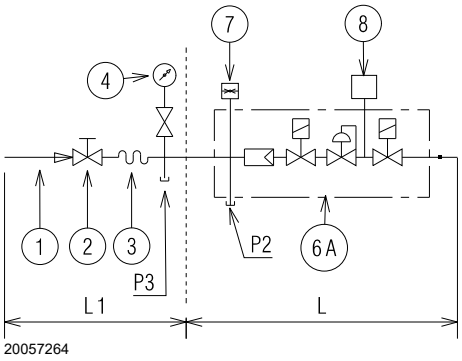
Example
Burner output = 1593 kW (1370 Mcal/h).
If we consult diagram (C) we find that for this output, air must be adjusted using notch 3, as shown in fig. (B).

Continuing with the previous example, page 5 indicates that for burner with output of 1593 kW (1370 Mcal/h) a pressure of approximately 8 mbar is necessary at test point 6)(B).

Once you have finished setting up the head, refit the burner to the slide bars 3)(D) at approximately 100 mm from the sleeve 4)(D) - burner positioned as shown in fig. (B)p. 6 - insert the flame detection probe cable and the ignition electrode cable and then slide the burner up to the sleeve so that it is positioned as shown in fig. (D).
Refit screws 2) on slide bars 3).
Secure the burner to the sleeve by tightening screw 1).
Reconnect the articulation 7) to the graduated sector 6).

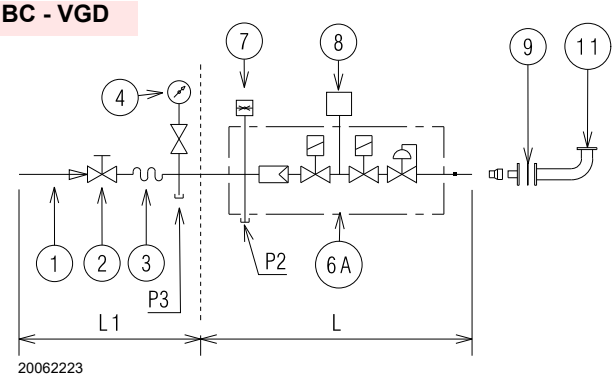
Important
When fitting the burner on the two slide bars, it is advisable to gently draw out the high tension cable and flame detection probe cable until they are slightly stretched.

MB



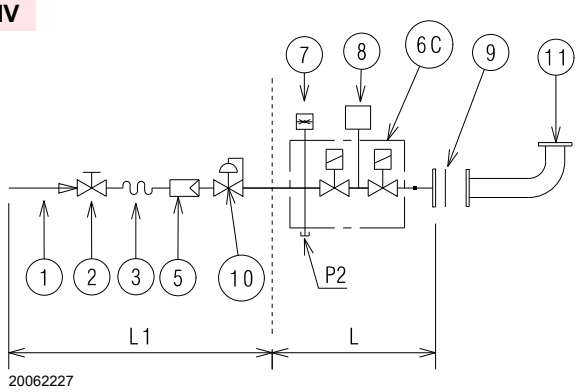
(A)

MBC - VGD



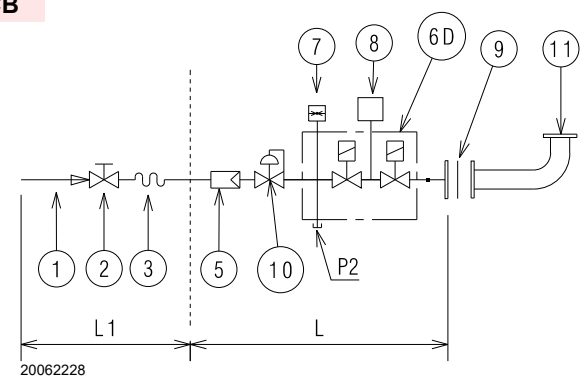
(B)

DMV



(C)

CB



(D)

GAS LINE

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

Precautions: avoid knocking, attrition, sparks and heat.

Make sure that the fuel interception tap is closed before performing any operation on the burner.

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

KEY (A)-(B)-(C)-(D)

1 Gas input pipe

2 Manual valve

3 Vibration damping joint

4 Pressure gauge with pushbutton 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 device, supplied as an accessory or incorporated, 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

10 Pressure adjuster

11 Train-burner adaptor, supplied separately

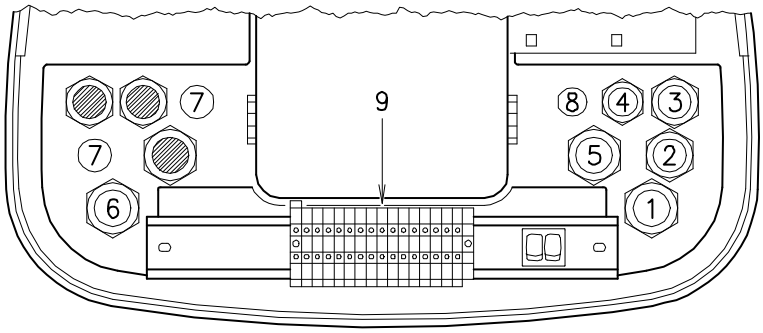
P2 Upstream pressure of valves/adjuster

P3 Upstream pressure of the filter

L Gas train supplied separately

L1 The responsibility of the installer

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



(A) D955

ELECTRICAL CONNECTIONS

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

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

All the wires to connect to the burner terminal strip 9)(A) must enter through the supplied fairleads.

The fairleads and hole press-outs can be used in various ways; the following lists show one possible solution:

1 - Pg 13,5 Three-phase power supply
2 - Pg 11 Single-phase power supply
3 - Pg 11 Remote control device TL
4 - Pg 9 Remote control device TR
5 - Pg 13,5 Gas valves
6 - Pg 13,5 Gas pressure switch or gas valve leak detection control device
7 - Pg 11 Open the hole, if a pipe union is to be added
8 - Pg 9 Open the hole, if a pipe union is to be added

N.B.

The RS 190 burner has been type- approved for intermittent operation. This means it shoulds compulsorily be stopped at least once every 24 hours to enable the control box to perform checks of its own efficiency at start-up. Burner halts are normally provided for automatically by the boiler load control system.

If this is not the case, a time switch should be fitted in series to IN to provide for burner shutdown at least once every 24 hours.

The RS 190 burner is factory set for two-stage operation and must therefore be connected to control device TR.

Alternatively, if single stage operation is required, instead of control device TR install a jumper lead between terminals 6 and 7 of the terminal strip.

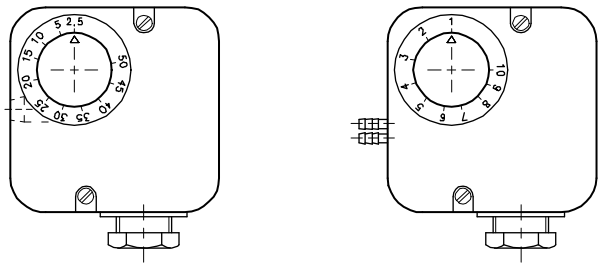
ATTENTION

In the case of phase-phase feed, a bridge must be fitted on the control box terminal strip between terminal 6 and the earth terminal.

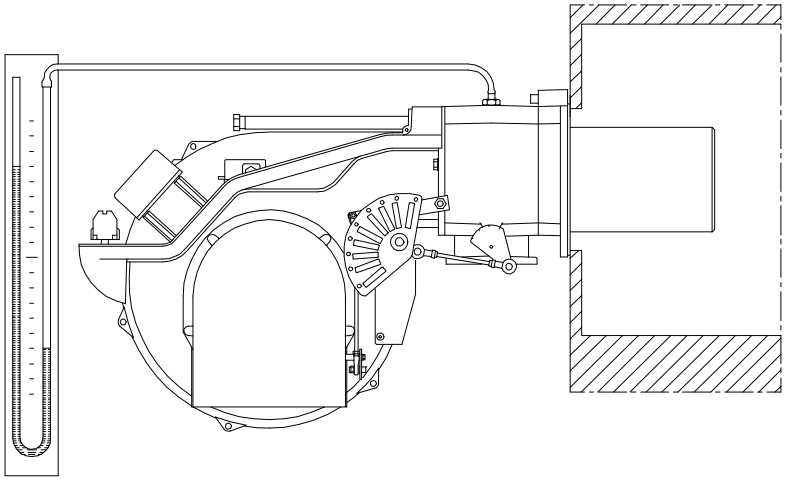
ATTENTION

Do not invert the neutral with the phase wire in the electricity supply line. Inverting the wires will make the burner go into lock-out because of firing failure.

MIN GAS PRESSURE SWITCH AIR PRESSURE SWITCH

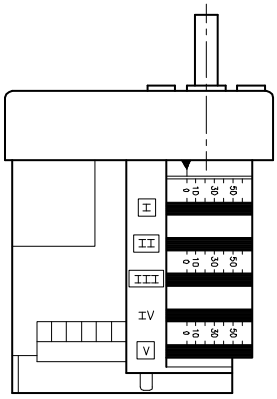


(A) **(B)** D897

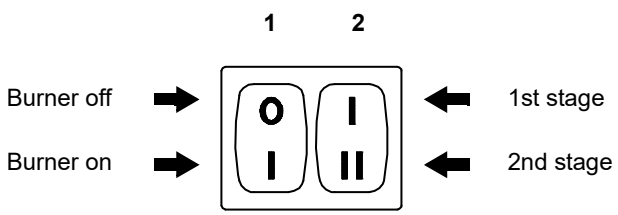


(C) D3038

SERVOMOTOR



(D) D1272



(E) D469

Refer to paragraph "Safety test - with gas ball valve closed" on page 16 before the first start-up.

WARNING

ADJUSTMENTS BEFORE FIRST FIRING

Adjustment of the combustion head, and air and gas deliveries has been illustrated on page 7.
In addition, the following adjustments must also be made:

- open manual valves up-line from the gas train.
- Adjust the minimum gas pressure switch to the start of the scale (A).
- Adjust the air pressure switch to the zero position of the scale (B).
- Purge the air from the gas line.
  Continue to purge the air (we recommend using a plastic tube routed outside the building) until gas is smelt.
- Fit a U-type manometer (C) to the gas pressure test point on the sleeve.
  The manometer readings are used to calculate the 2nd stage operation burner power using the tables on page 5.
- Connect two lamps or testers to the two gas line solenoid valves VR and VS to check the exact moment at which voltage is supplied.
  This operation is unnecessary if each of the two solenoid valves is equipped with a pilot light that signals voltage passing through.

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

SERVOMOTOR (D)

The servomotor provides simultaneous adjustment of the air gate valve, by means of the variable profile cam, and the gas butterfly valve. The servomotor rotates through 130 degrees in 15 seconds.
Do not alter the factory setting for the 4 levers; simply check that they are set as indicated below:

Cam I : 130°
Limits rotation toward maximum position.
When the burner is in 2nd stage operation the gas butterfly valve must be fully open: 90°.
Cam II : 0°
Limits rotation toward the minimum position.
When the burner is shut down the air gate valve and the gas butterfly valve must be closed: 0°.
Cam III : 15°
Adjusts the ignition position and the output in 1st stage operation.
Cam V : 125°
Not used.

BURNER STARTING

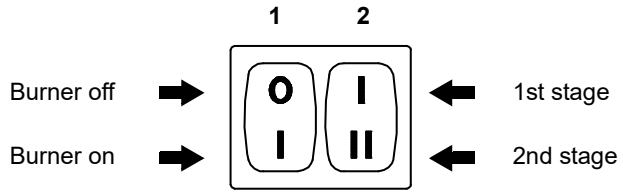
Close the control devices and set:

- switch 1)(E) to "Burner ON" position;
- switch 2)(E) to "1st STAGE" position.

As soon as the burner starts check the direction of rotation of the fan blade, looking through the flame inspection window 14)(A)p.3.
Make sure that the lamps or testers connected to the solenoids, or pilot lights on the solenoids themselves, indicate that no voltage is present. If voltage is present, then **immediately** stop the burner and check electrical connections.

BURNER FIRING

Having completed the checks indicated in the previous heading, the burner should fire. If the motor starts but the flame does not appear and the control box goes into lock-out, reset and wait for a new firing attempt.
If firing 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 firing delivery.
The arrival of gas at the sleeve is indicated by the U-type manometer (C).
Once the burner has fired, now proceed with global calibration operations.



(A) D469

BURNER CALIBRATION

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

Adjust successively:
1 - First firing output
2 - 2nd stage burner output
3 - 1st stage burner output
4 - Intermediate outputs between 1st and 2nd stage
5 - Air pressure switch
6 - Minimum gas pressure switch

1 - FIRING OUTPUT

According to EN 676 Regulations:

Burners with max. output up to 120 kW

Firing can be performed at the maximum operation output level. Example:
- Max. operation output : 120 kW
- Max. firing output : 120 kW

Burners with max. output above 120 kW

Firing must be performed at a lower output than the max. operation output. If the firing output does not exceed 120 kW, no calculations are required. If firing output exceeds 120 kW, the regulations prescribe that the value be defined according to the control box safety time "ts":
- for "ts" = 2s, firing output must be equal to or lower than 1/2 of max. operation output.
- For "ts" = 3s, firing output must be equal to or lower than 1/3 of max. operation output.

Example: MAX operation output of 600 kW.
Firing output must be equal to or lower than:
- 300 kW with "ts" = 2s
- 200 kW with "ts" = 3s

In order to measure the firing output:
- disconnect the plug-socket 6)(A)p.3 on the ionization probe cable (the burner will fire and then go into lock-out after the safety time has elapsed).
- Perform 10 firings with consecutive lock-outs.
- 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 ts = 3s:

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

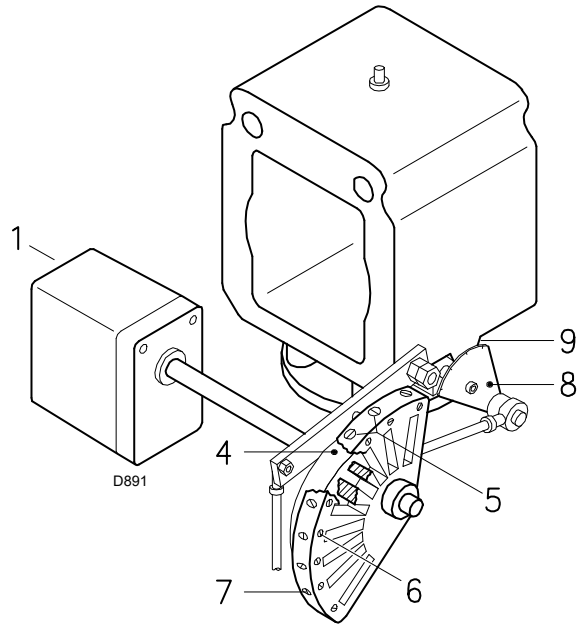
Example: for gas G 20 (9.45 kWh/Sm^3):
Max. operation output: 600 kW corresponding to 63.5 Sm^3/h.
After 10 firings with lock-outs, the delivery read on the meter must be equal to or lower than:
63.5 : 360 = 0,176 Sm^3

2 - 2ND STAGE OUTPUT

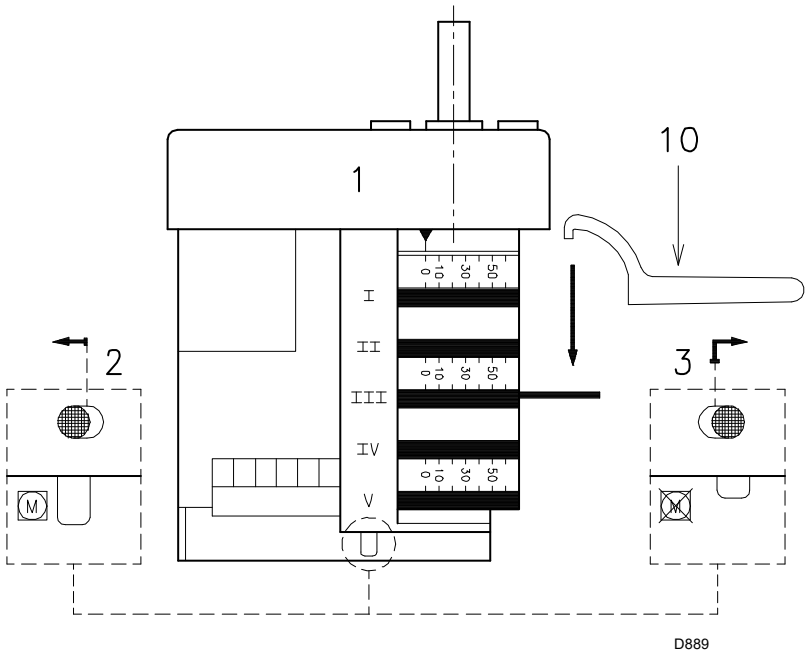
2nd stage output of the burner must be set within the firing rate range shown on page 4.
In the above instructions we left the burner running in 1st stage operation. Now set switch 2)(A) to the 2nd stage position: the servomotor will open, simultaneously, the air gate valve and the gas butterfly valve to 90°.

Gas calibration

Measure the gas delivery at the meter.
A guideline indication can be calculated from the tables on page 5, simply read off the gas pressure on the U-type manometer, see fig.(C) on page 12, and follow the instructions on page 5.
- 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.



(A)



(B)

1 Servomotor
2 Servomotor 1) - Cam 4): engaged
3 Servomotor 1) - Cam 4): disengaged
4 Adjustable profile cam
5 Cam starting profile adjustment screws
6 Adjustment fixing screws
7 Cam end profile adjustment screws
8 Graduated sector for gas butterfly valve
9 Index for graduated sector 8
10 Key for cam III adjustment

Adjusting air delivery

Progressively adjust the end profile of cam 4)(A) by turning the screws 7).

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

3 - 1ST STAGE OUTPUT

Burner power in 1st stage operation must be selected within the firing rate range shown on page 4.

Set the switch 2)(A)p.13 to the 1st stage position: the servomotor 1)(A) will close the air gate valve and, at the same time, closes the gas butterfly valve down to 15°, i.e. down to the original factory setting.

Adjusting gas delivery

Measure the delivery of gas from the gas meter.

- If this value is to be reduced, decrease the angle of the orange lever (B) slightly by proceeding a little at a time until the angle is changed from 15° to 13° or 11°....
- If it is necessary to increase the mains pressure, move to 2nd stage operation by altering the setting of switch 2)(A)p.13 and increase the angle of the orange lever, proceeding a little at a time until the angle is changed from 15° to 17° - 19°....
  At this point return to 1st stage operation and measure gas delivery.

Note

The servomotor follows the adjustment of the orange lever only when the angle is reduced.

If, however the angle must be increased, switch to 2nd stage operation, increase the angle and then return to 1st stage operation to check the effect of the adjustment.

In order to adjust cam III, especially for fine movements, the key 10)(B), held by a magnet under the servomotor, can be used.

Adjustment of air delivery

Progressively adjust the starting profile of cam 4)(A) by turning the screws 5). It is preferable not to turn the first screw since this is used to set the air gate valve to its fully-closed position.

4 - INTERMEDIATE OUTPUTS

Adjustment of gas delivery

No adjustment of gas delivery is required.

Adjustment of air delivery

Switch off the burner using switch 1)(A)p.13, disengage the cam 4)(A) from the servomotor, by pressing the button 3)(B) and moving it to the right, and check more than once that the movement is soft and smooth, and does not grip, by rotating the cam 4) forward and backward by hand.

Engage the cam 4) to the servomotor again by moving the button 2)(B) to the left.

As far as is possible, try not to move those screws at the ends of the cam that were previously adjusted for 1st and 2nd stage air gate valve control.

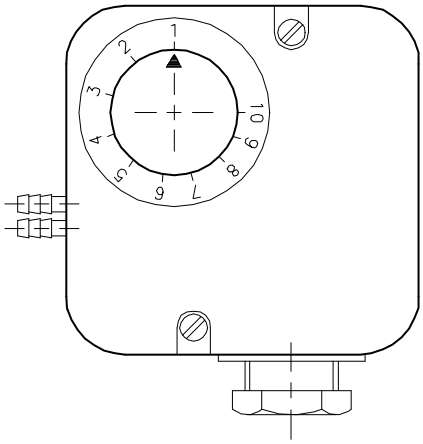
Finally fix the adjustment by turning the screws 6)(A).

Note

Once you have finished adjusting outputs 2ND STAGE - 1ST STAGE - INTERMEDIATE, check ignition once again: noise emission at this stage must be identical to the following stage of operation.

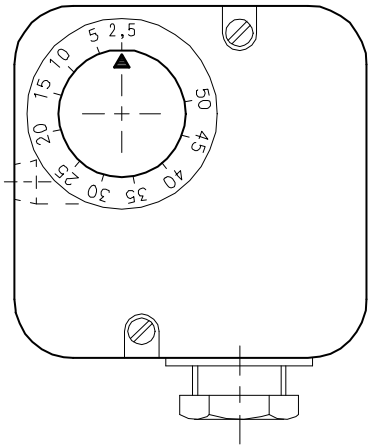
If you notice any sign of pulsations, reduce the ignition stage delivery.

AIR PRESSURE SWITCH 15)(A)p. 3

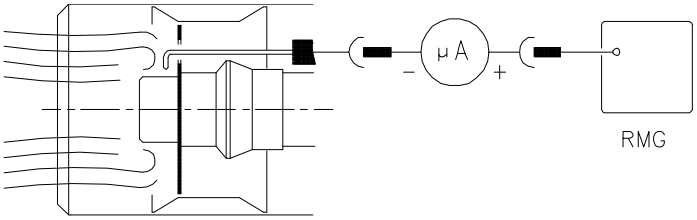


(A) D521

MIN GAS PRESSURE SWITCH (A)p. 10



(B) D896



(C) D3023

5 - AIR PRESSURE SWITCH (A)

Adjust the air pressure switch after having performed all other burner adjustments with the air pressure switch set to the start of the scale (A).
With the burner operating in 1st stage, increase adjustment pressure by slowly turning the relative 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 anti-clockwise a little bit more.

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 air pressure switch may operate in "differential" operation in two pipe system. If a negative pressure in the combustion chamber during pre-purging prevents the air pressure switch from switching, switching may be obtained by fitting a second pipe between the air pressure switch and the suction inlet of the fan. In such a manner the air pressure switch operates as differenzial pressure switch.

Warning

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

6 - MINIMUM GAS PRESSURE SWITCH (B)

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

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

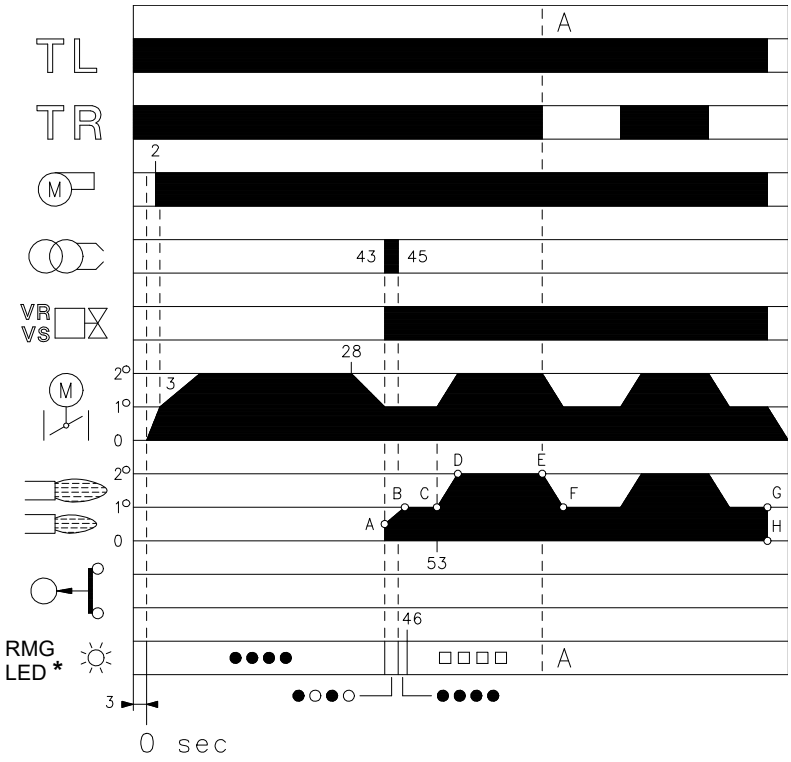
- install a pressure gauge downstream of the gas train stabiliser (for example at the gas pressure test point on the burner combustion head);
- choke slowly the manual gas cock until the pressure gauge detects a decrease in the pressure read of about 0.1 kPa (1 mbar). In this phase, verify the CO value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

WARNING 1 kPa = 10 mbar

FLAME PRESENT CHECK (C)

The burner is fitted with an ionisation system which ensures that a flame is present. The minimum current for plant operation is 5 µA.
The burner provides a much higher current, so that controls are not normally required. However, if it is necessary to measure the ionisation current, disconnect the plug-socket 6)(A)p.3 on the ionisation probe cable and insert a direct current microamperometer with a base scale of 100 µA.
Carefully check polarities!

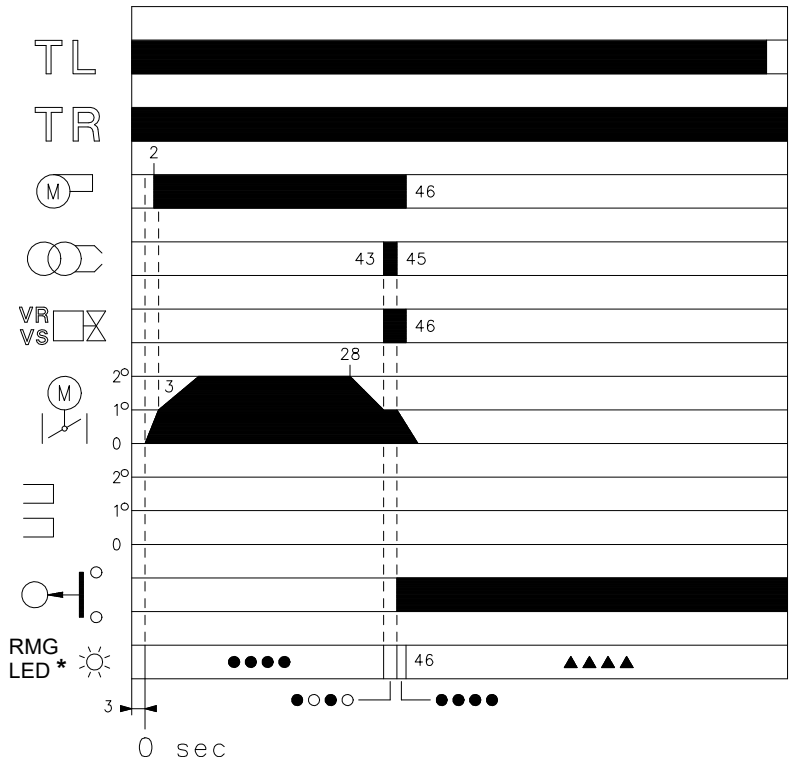
NORMAL FIRING
(n° = seconds from instant 0)



* ○ Off ● Yellow □ Green ▲ Red
For further details see page 18.

(A) D3051

NO FIRING



* ○ Off ● Yellow ▲ Red
For further details see page 18.

(B) D3052

BURNER OPERATION

BURNER STARTING (A)

- : Control device TL closes.
  Servomotor starts: it rotates during opening up to the angle set on cam with orange lever.
  After about 3s:
- 0 s : The control box starting cycle begins.
- 2 s : Fan motor starts.
- 3 s : Servomotor starts: it rotates during opening until contact is made on cam with red lever.
  The air gate valve is positioned to 2nd stage output.
  Pre-purge stage with air delivery at 2nd stage output.
  Duration 25 seconds.
- 28 s : Servomotor starts: it rotates during closing up to the angle set on cam with orange lever.
- 43 s : The air gate valve and the gas butterfly are positioned to 1st stage output.
  Ignition electrode strikes a spark.
  Safety valve VS and adjustment valve VR (rapid opening) open. The flame is ignited at a low output level, point A. Output is then progressively increased, with the valve opening slowly up to 1st stage output, point B.
- 45 s : The spark goes out.
- 53 s : If remote control device TR is closed or if it has been replaced by a jumper, the servomotor will continue to turn until the cam with red lever come into operation, setting the air gate valve and the gas butterfly valve to the 2nd stage operation position, section C-D.
  The control box starting cycle ends.

STEADY STATE OPERATION (A)

System equipped with one control device TR.
Once the starting cycle has come to an end, control of the servomotor passes on to the control device TR that controls boiler temperature or pressure, point D.
(The control box will continue, however, to monitor flame presence and the correct position of the air pressure switch).

- When the temperature or the pressure increases until the control device TR opens, the servomotor closes the gas butterfly valve and the air gate valve and the burner passes from the 2nd to the 1st stage of operation, section E-F.
- When the temperature or pressure decreases until the control device TR closes, the servomotor opens the gas butterfly valve and the air gate valve and the burner passes from the 1st to the 2nd stage of operation, and so on.
- The burner stops when the demand for heat is less than the amount of heat delivered by the burner in the 1st stage, section G-H. Control device TL now opens, the servomotor returns toward the 0° position, limited in this movement by cam with blue lever. The air gate valve closes completely to reduce heat losses to a minimum.

Systems not equipped with control device TR (jumper wire installed)
The burner is fired as described in the case above. If the temperature or pressure increase until control device TL opens, the burner shuts down (Section A-A in the diagram).

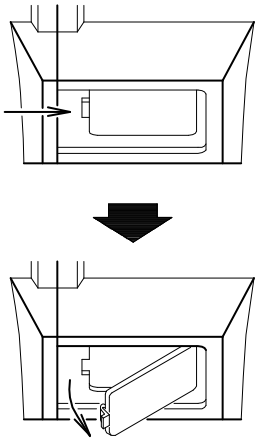
FIRING FAILURE (B)

If the burner does not fire, it goes into lock-out within 3 s of the opening of the gas solenoid valve and 49 s after the closing of control device TL. The control box red pilot light will light up.

BURNER FLAME GOES OUT DURING OPERATION

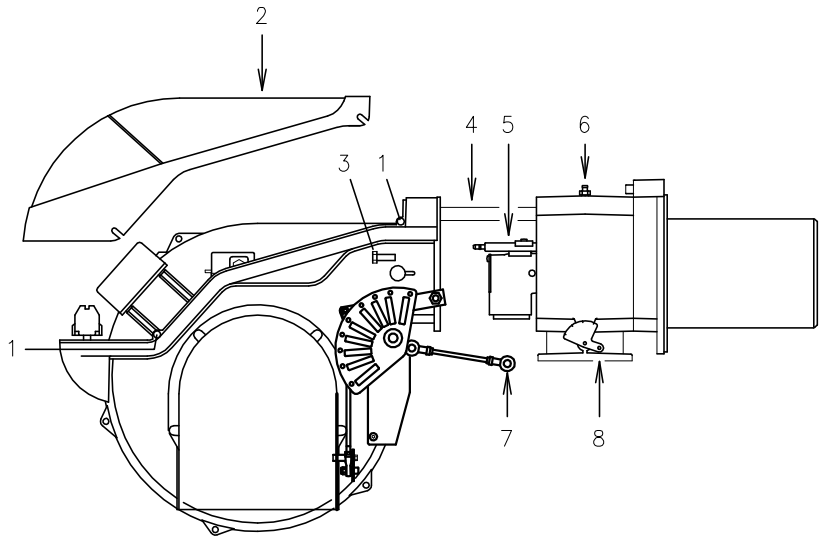
If the flame should accidentally go out during operation, the burner will lock out within 1s.

FLAME INSPECTION WINDOW



(A) D709

OPENING THE BURNER



(B) D3041

FINAL CHECKS (with burner running)
- Disconnect one of the wires on the minimum gas pressure switch:
- Open remote control device TL:
- Open remote control device TS:

the burner must stop

- Disconnect the common wire P from the air pressure switch:
- Disconnect the ionisation probe lead:

the burner must lock out

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

MAINTENANCE

Combustion
The optimum calibration of the burner requires an analysis of the flue gases. Significant differences with respect to the previous measurements indicate the points where more care should be exercised during maintenance.

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

Gas filter
Change the gas filter when it is dirty.

Flame inspection window
Clean the flame inspection window (A).

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. If in doubt, disassemble the elbow fitting 5)(B).

Burner
Check for excess wear or loose screws in the mechanisms controlling the air gate valve and the gas butterfly valve. Also make sure that the screws securing the electrical leads in the burner terminal strip are fully tightened.
Clean the outside of the burner, taking special care with the transmission joints and cam 4)(A)p.12.

Combustion
Adjust the burner if the combustion values found at the beginning of the operation do not comply with the regulations in force, or at any rate, do not correspond to good combustion. Use the appropriate card to record the new combustion values; they will be useful for subsequent controls.

TO OPEN THE BURNER (B):
- switch off the electrical power.
- Loosen screws 1) and withdraw cover 2).
- Disengage the articulated coupling 7) from the graduated sector 8).
- Fit the two standard supplied extensions onto the slide bars 4).
- Remove screws 3), and pull the burner back by about 100 mm on the slide bars 4). Disconnect the probe and electrode leads and then pull the burner fully back.

Now extract the gas distributor 5) after having removed the screw 6).

TO CLOSE THE BURNER (B):
- push the burner until it is about 100 mm from the sleeve.
- Re-connect the leads and slide in the burner until it comes to a stop.
- Refit screws 3), and pull the probe and electrode leads gently out until they are slightly stretched.
- Re-couple the articulated coupling 7) to the graduated sector 8).
- Remove the two extensions from the slide bars 4).

SAFETY TEST - WITH GAS BALL VALVE CLOSED

It is fundamental to ensure the correct execution of the electrical connections between the gas solenoid valves and the burner to perform safely the commissioning.

For this purpose, after checking that the connections have been carried out in accordance with the burner's electrical diagrams, an ignition cycle with closed gas ball valve -dry test- must be performed.

1 The manual ball gas valve must be closed
2 The electrical contacts of the burner limit switch need to be closed
3 Ensures closed the contact of the low gas pressure switch
4 Make a trial for burner ignition.

The start-up cycle must be as follows:

– Starting the fan for pre-ventilation
– Performing the gas valve seal control, if provided
– Completion of pre-ventilation
– Arrival of the ignition point
– Power supply of the ignition transformer
– Electrical Supply of solenoid gas valves

Since the manual gas ball valve is closed, the burner will not light up and its control box will go to a safety lockout condition.

The actual electrical supply of the solenoid gas valves can be verified by inserting a tester.
Some valves are equipped with light signals (or close/open position indicator) that turn on at the same time as their power supply.

IF THE ELECTRICAL SUPPLY OF THE GAS VALVES OCCURS AT UNEXPECTED TIMES, DO NOT OPEN MANUAL GAS BALL VALVE, SWITCH OFF POWER LINE; CHECK THE WIRES; CORRECT THE ERRORS AND REPEAT THE COMPLETE TEST.

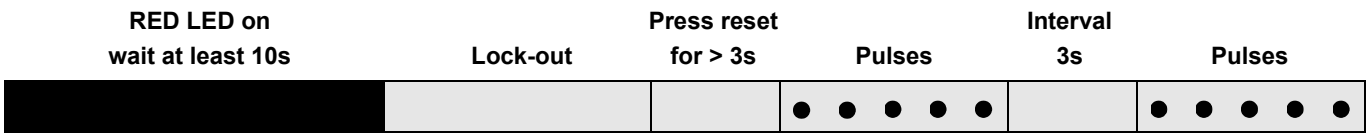
BURNER START-UP CYCLE DIAGNOSTICS

During start-up, indication is according to the followin table:

COLOUR CODE TABLE	
Sequences	**Colour code**
Pre-purging	●●●●●●●●●
Ignition phase	●○●○●○●○●
Operation, flame ok	□□□□□□□□□
Operating with weak flame signal	□○□○□○□○□
Electrical supply lower than ~ 170V	●▲●▲●▲●▲●
Lock-out	▲▲▲▲▲▲▲▲▲
Extraneous light	▲□▲□▲□▲□▲
Key: ○ Off ● Yellow □ Green ▲ Red	

RESETTING THE CONTROL BOX AND USING DIAGNOSTICS

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 (**lock-out**), 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 pulses and identified the possible cause, the system must be reset by holding the button down for between 1 and 3 seconds.



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

RESETTING THE CONTROL BOX

To reset the control box, 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.

VISUAL DIAGNOSTICS

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

- Hold the button down for more than 3 seconds once the red LED (burner lock-out) remains steadily lit.
  A yellow light pulses to tell you the operation is done.
  Release the button once the light pulses. The number of times it pulses tells you the cause of the malfunction, according to the coding system indicated in the table on page 18.

SOFTWARE DIAGNOSTICS

Reports burner life by means of an optical link with the PC, indicating hours of operation, number and type of lock-outs, serial number of control box etc ...
To view diagnostics, proceed as follows:

- Hold the button down for more than 3 seconds once the red LED (burner lock-out) remains steadily lit.
  A yellow light pulses 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 pulses again.
  Once the button is released, the red LED will flash intermittently with a higher frequency: only now can the optical link be activated.

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

BUTTON PRESSED FOR	CONTROL BOX
Between 1 and 3 seconds	Control box reset without viewing visual diagnostics.
More than 3 seconds	Visual diagnostics of lock-out condition: (LED pulses at 1-second intervals).
More than 3 seconds starting from the visual diagnostics condition	Software diagnostics by means of optical interface and PC (hours of operation, malfunctions etc. can be viewed)

The sequence of pulses issued by the control box identifies the possible types of malfunction, which are listed in the table on page 18.

SIGNAL	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
2 x blinks ● ●	After pre-purge and safety time, the burner goes tolock-out and the flame does not appear	1 - The solenoid VR allows little gas through 2 - Solenoid valves VR or VS fail to open 3 - Gas pressure too low 4 - Ignition electrode wrongly adjusted 5 - Electrode grounded due to brocken insulation 6 - High voltage cable defective 7 - High voltage cable deformed by high temperature 8 - Ignition trasformer defective 9 - Erroneous valve or trasformer electrical connections 10 - Control box defective 11 - A cock down-line of the gas train is closed 12 - Air in pipework. 13 - VS and VR gas valves unconnected or with interrupted coil	Increase Renew the coil or rectifier panel Increase pressure at governor Adjust, see fig. (C)p. 6 Replace Replace Replace and protect Replace Check Replace Open Bleed air Check connections or replace coil
3 x blinks ● ● ●	The burner does not start and lock-out warning appears	14 - Air pressure switch in operating position	Adjust or replace
	The burner starts and then locks out	Air pressure switch inoperative due to insufficient air pressure: 15 - Air pressure switch adjusted badly 16 - Pressure switch pressure point pipe blocked 17 - Head wrongly adjusted 18 - High negative draft in chamber	 Adjust or replace Clean Adjust Connect air pressure switch to fan suction inlet
	Lock-out during pre-purging	19 - Defective motor remote control switch 20 - Defective electrical motor 21 - Motor protection tripped	Replace Replace Reset thermal cut-out when third phase is re-connected
4 x blinks ● ● ● ●	The burner starts and then locks out	22 - Flame simulation	Replace control box
	Lock out when burner stops	23 - Flame remains in combustion head or flame simulation	Eliminate persistence of flame or replace control box
7 x blinks ● ● ● ● ● ● ●	The burner goes to lock-out right after flame appearance	24 - The solenoid VR allows little gas through 25 - Ionisation probe wrongly adjusted. 26 - Insufficient ionisation (less than 5 μA). 27 - Probe grounded 28 - Burner poorly grounded 29 - Phase and neutral wires inverted 30 - Defective control box.	Increase Adjust, see fig. (C)p. 6 Check probe position Withdraw or replace cable Check grounding Correct by interventing Replace
	Burner locks out at transition between 1st and 2nd stage or between 2nd and 1st stage	31 - Too much air or too little gas	Adjust air and gas
	During operation, the burner stops in lock out	32 - Probe or ionisation cable grounded 33 - Fault on air pressure switch	Replace worn parts Replace
10 x blinks ● ● ● ● ● ● ● ● ● ●	The burner does not start and lock-out warning appears	34 - Erroneous electrical connections	Check connections
	The burner goes to lock-out	35 - Control box defective 36 - Presence of electromagnetic disturbance	Replace Use the radio disturbance protection kit
No blink	The burner does not start	37 - No electrical power supply 38 - A limiter or safety control device is open. 39 - Control box fuses blown 40 - Control box lock-out 41 - No gas supply. 42 - Mains gas pressure insufficient. 43 - Minimum gas pressure switch fails to close	Close all switches - Check connections Adjust or replace Replace Reset control box Open the manual valves between meter and train Contact your GAS COMPANY Adjust or replace
	The burner repeats the starting cycle without lock out	44 - Mains gas pressure is near the value to which the min. gas pressure switch gas is adjusted. The repeated drop in pressure which follows 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 firing cycle is repeated. The sequence repeats endlessly.	Reduce operating pressure of minimum gas pressure switch. Replace gas filter
	Ignition with pulsation	45 - Poorly adjusted head 46 - Ignition electrode wrongly adjusted 47 - Poorly adjusted fan air gate: too much air. 48 - Output during ignition phase is too high	Adjust, see p. 7 Adjust, see fig. (C)p. 6 Adjust Reduce
	The burner does not pass to 2nd stage	49 - Remote control device TR does not close 50 - Defective control box. 51 - Servomotor faulty	Adjust oe replace Replace Replace
	Burner stops with air gate valve open	52 - Sevomotor faulty	Replace

ACCESSORIES (optional):

- **RADIO DISTURBANCE PROTECTION KIT:** code **3010386**

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

- **KIT LONG HEAD:** code **3010443**

- **KIT FOR LPG OPERATION:** code **3010166**

The kit allows the RS 190 burners to operate on LPG

BURNER		**RS 190**
Output	kW	465 ÷ 2290

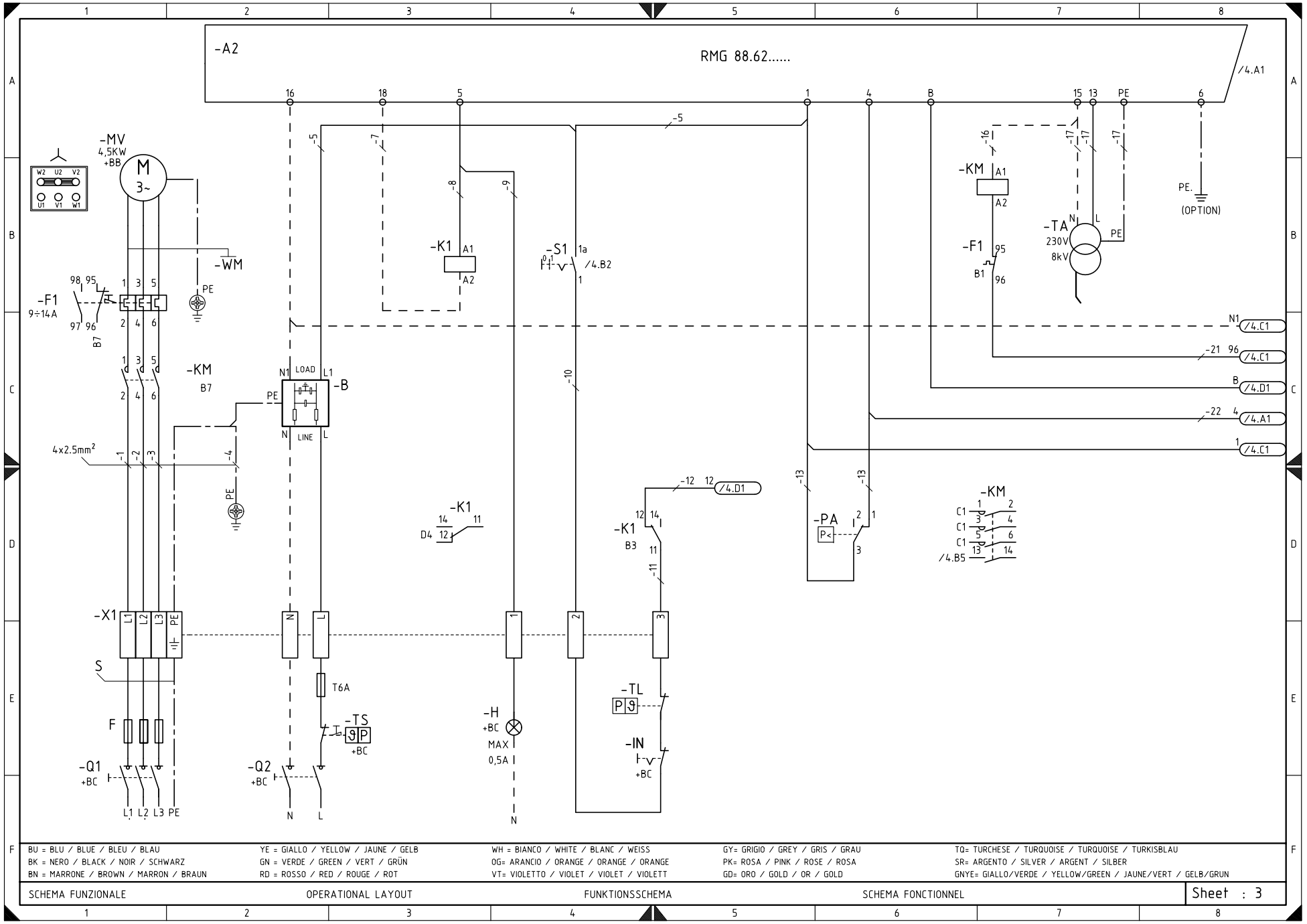
- **VIBRATION REDUCTION KIT:** code **3010375**

BURNER		**RS 190**
Output	kW	470 ÷ 2147

- **GROUND FAULT INTERRUPTER:** code **3010329**

- **GAS TRAIN ACCORDING TO REGULATION EN 676 (with valves, pressure governor and filter)**: see page 8.

Important
The installer is responsible for the addition of any safety device not forseen in the present manual.


-A2
RMG 88.62.....
-MV
4,5KW
+BB
M
3~
-WM
-F1
9÷14A
-KM
B7
-B
LOAD
LINE
4x2.5mm²
-K1
-S1
/4.B2
-X1
L1 L2 L3 PE
N L
S
F
T6A
-TS
+BC
-Q1
+BC
-Q2
+BC
-H
+BC
MAX
0,5A
-K1
B3
-TL
-IN
+BC
-PA
P<
-KM
-TA
230V
8kV
PE.
(OPTION)
/4.A1
/4.C1
/4.D1
/4.A1
/4.C1
/4.B5
BU = BLU / BLUE / BLEU / BLAU
BK = NERO / BLACK / NOIR / SCHWARZ
BN = MARRONE / BROWN / MARRON / BRAUN
YE = GIALLO / YELLOW / JAUNE / GELB
GN = VERDE / GREEN / VERT / GRÜN
RD = ROSSO / RED / ROUGE / ROT
WH = BIANCO / WHITE / BLANC / WEISS
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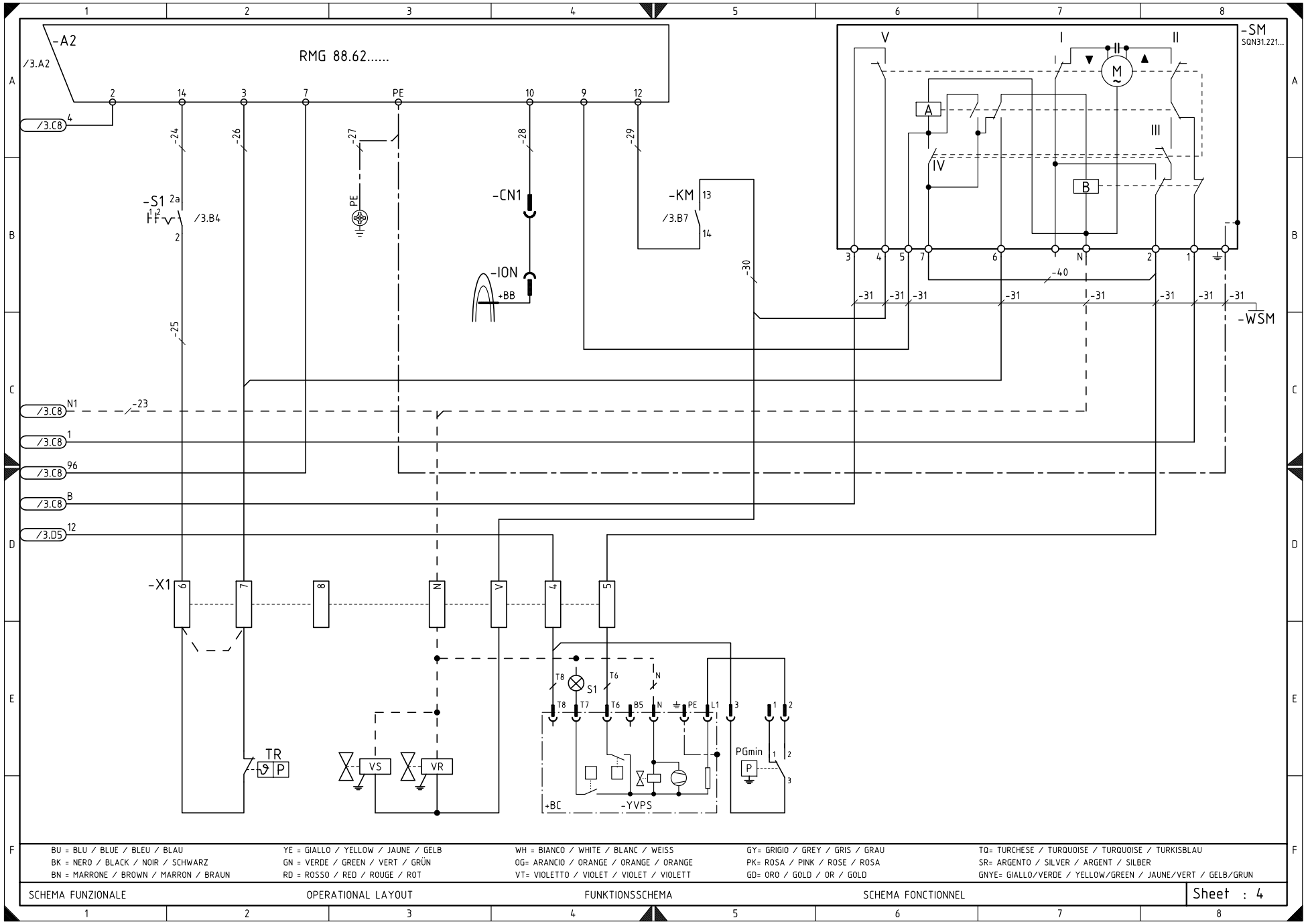
GY= GRIGIO / GREY / GRIS / GRAU
PK= ROSA / PINK / ROSE / ROSA
GD= ORO / GOLD / OR / GOLD
TQ= TURCHESE / TURQUOISE / TURQUOISE / TURKISBLAU
SR= ARGENTO / SILVER / ARGENT / SILBER
GNYE= GIALLO/VERDE / YELLOW/GREEN / JAUNE/VERT / GELB/GRUN
SCHEMA FUNZIONALE
OPERATIONAL LAYOUT
FUNKTIONSSCHEMA
SCHEMA FONCTIONNEL
Sheet : 3


-A2
/3.A2
RMG 88.62.....
-SM
SQN31.221...
-S1
/3.B4
-CN1
-KM
/3.B7
-ION
+BB
-WSM
-X1
TR
VS
VR
S1
PGmin
+BC
-YVPS
BU = BLU / BLUE / BLEU / BLAU
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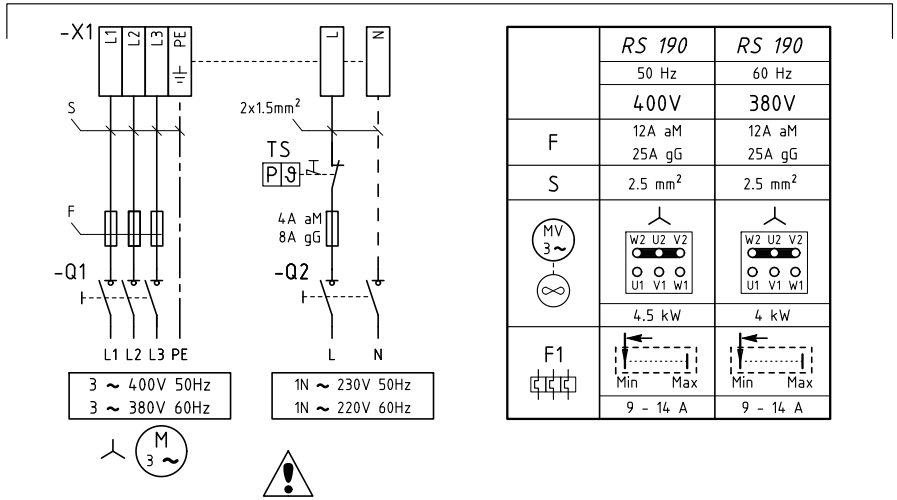
SCHEMA FUNZIONALE
OPERATIONAL LAYOUT
FUNKTIONSSCHEMA
SCHEMA FONCTIONNEL
Sheet : 4

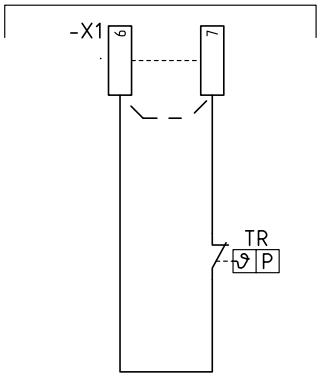
ELECTRICAL POWER (50Hz)



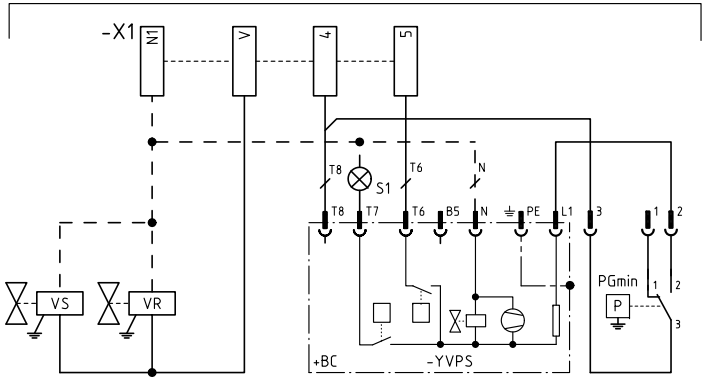
	RS 190	RS 190
	50 Hz	60 Hz
	400V	380V
F	12A aM 25A gG	12A aM 25A gG
S	2.5 mm²	2.5 mm²
MV 3~	W2 U2 V2 U1 V1 W1	W2 U2 V2 U1 V1 W1
	4.5 kW	4 kW
F1	Min Max	Min Max
	9 - 14 A	9 - 14 A

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

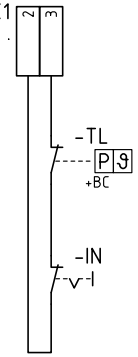
POWER REGULATION WITH 2-POSITION CONTACT



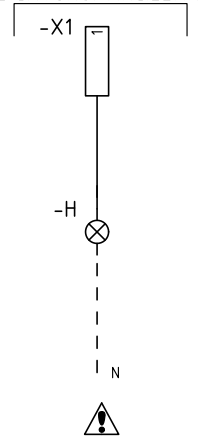
GAS VALVE+VPS504 LEAK DETECTION



TRIGGERING/SAFETY DEVICES



INDICATORS/ANCILLARIES



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

Sheet : 5

Electrical panel layout - Esquema cuadro eléctrico

Key to electrical layout

A2 - Control box
B - Suppressor
+BB - Burners components
+BC - Boiler components
CN1 - Ionisation probe connector
F - Fuse
F1 - Thermal cut-out
H - Remote lock-out signal
K1 - Relay
KM - Contactor motor
IN - Switch
ION - Ionisation probe
MV - Fan motor
PE - Burner ground
Q1 - Three-phase disconnect switch
Q2 - Single-phase disconnect switch
S1 - Switch: burner “on - off” + “1st - 2nd stage operation”
SM - Servomotor
TA - Ignition transformer
TL - Limit pressure switch/thermostat
TR - Control pressure switch/thermostat
TS - Safety pressure switch/thermostat
VS - VR - Gas valve
X1 - Main supply terminal strip
YVPS - Valve leak detection control device

Leyenda esquemas eléctricos

A2 - Caja de control
B - Filtro antiinterferencias
+BB - Componentes de los quemadores
+BC - Componentes de la caldera
CN1 - Conector sonda ionización
F - Fusible
F1 - Relé térmico
H - Señal luminosa bloqueo
K1 - Relé
KM - Contactor motor
IN - Interruptor
ION - Sonda ionización
MV - Motore ventilatore
PE - Tierra del quemador
Q1 - Interruptor seccionador trifásico
Q2 - Interruptor seccionador monofásico
S1 - Interruttore “Acceso-Spento” + “1°-2° stadio”
SM - Servomotor
TA - Transformador de encendido
TL - Termostato/presostato de límite
TR - Termostato/presostato de regulación
TS - Termostato/presostato de seguridad
VS - VR - Válvula gas
X1 - Regleta de conexión quemador
YVPS - Control de estanqueidad