GB **Forced draught gas burners**

E **Quemadores de gas**

P **Queimadores a gás**

Progressive two-stage operation
Funcionamiento a dos llamas progresivas
Funcionamento a duas chamas progressivas

| CODE - CÓDIGO | MODEL - MODELO | TYPE - TIPO |
|---|---|---|
| 3783302 | RS 28 | 809 T1 |
| 3783303 | RS 28 | 809 T1 |
| 3784402 | RS 38 | 810 T1 |
| 3784403 | RS 38 | 810 T1 |
| 3784502 | RS 38 | 810 T1 |
| 3784503 | RS 38 | 810 T1 |
| 3784702 | RS 50 | 811 T1 |
| 3784703 | RS 50 | 811 T1 |

## 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.

**NOTE**
In conformity with Efficiency Directive 92/42/EEC the application of the burner on the boiler, adjustment and testing must be carried out observing the instruction manual of the boiler, including verification of the CO and $CO_2$ concentration in the flue gases, their temperatures and the average temperature of the water in the boiler.

## TECHNICAL DATA

| MODEL | | | RS 28 | | RS 38 | | RS 38 | | RS 50 | |
|---|---|---|---|---|---|---|---|---|---|---|
| TYP | | | 809 T1 | | 810 T1 | | 810 T1 | | 811 T1 | |
| OUTPUT (1) | 2nd stage | kW<br>Mcal/h | 163 - 325<br>140 - 280 | | 232 - 440<br>200 - 378 | | 232 - 440<br>200 - 378 | | 290 - 581<br>249 - 500 | |
| | min. 1st stage | kW<br>Mcal/h | 81<br>70 | | 105<br>90 | | 105<br>90 | | 116<br>100 | |
| FUEL | | | NATURAL GAS: G20 - G21 - G22 - G23 - G25 | | | | | | | |
| | | | G20 | G25 | G20 | G25 | G20 | G25 | G20 | G25 |
| - Net calorific value | | kWh/Nm³<br>Mcal/Nm³ | 10<br>8,6 | 8,6<br>7,4 | 10<br>8,6 | 8,6<br>7,4 | 10<br>8,6 | 8,6<br>7,4 | 10<br>8,6 | 8,6<br>7,4 |
| - Absolute density | | kg/Nm³ | 0,71 | 0,78 | 0,71 | 0,78 | 0,71 | 0,78 | 0,71 | 0,78 |
| - Max delivery | | Nm³/h | 32 | 38 | 44 | 51 | 44 | 51 | 58 | 68 |
| - Pressure at maximum delivery (2) | | mbar | 7,5 | 11,1 | 6,6 | 9,7 | 6,6 | 9,7 | 7,2 | 10,6 |
| OPERATION | | | • Intermittent (min. 1 stop in 24 hours)<br>• Two-stage (high and low flame) and single-stage (all - nothing) | | | | | | | |
| STANDARD APPLICATION | | | Boilers: water, steam, diethermic oil | | | | | | | |
| AMBIENT TEMPERATURE | | °C | 0 - 40 | | | | | | | |
| COMBUSTION AIR TEMPERATURE | | °C max | 60 | | | | | | | |
| ELECTRICAL SUPPLY | | V<br>Hz | 230 ~ +/-10%<br>50 - single-phase | | | | 230 - 400 with neutral ~ +/-10%<br>50 - three-phase | | | |
| ELECTRICAL MOTOR | | rpm<br>W<br>V<br>A | 2800<br>250<br>220 - 240<br>2,1 | | 2800<br>420<br>220 - 240<br>2,9 | | 2800<br>450<br>220/240-380/415<br>2 - 1,2 | | 2800<br>650<br>220/240-380/415<br>3 - 1,7 | |
| MOTOR CAPACITOR | | µF/V | 8/450 | | 12,5/450 | | | | | |
| IGNITION TRASFORMER | | V1 - V2<br>I1 - I2 | 230 V - 1 x 8 kV<br>1 A - 20 mA | | | | | | | |
| ELECTRICAL POWER CONSUMPTION | | W max | 370 | | 600 | | 560 | | 750 | |
| ELECTRICAL PROTECTION | | | IP 44 | | | | | | | |
| IN CONFORMITY WITH EEC DIRECTIVES | | | 90/396 - 89/336 - 73/23 - 92/42 | | | | | | | |
| NOISE LEVELS (3) | | dBA | 68 | | 70 | | 70 | | 72 | |
| APPROVAL | | CE | 0085AP0733 | | 0085AP0734 | | 0085AP0734 | | 0085AP0735 | |

(1) Reference conditions: Ambient temperature 20°C - Barometric pressure 1000 mbar - Altitude 100 m a.s.l.
(2) Pressure at test point 8)(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.

**VARIANTS**

| Model | Electrical supply | Blast tube length mm |
|---|---|---|
| **RS 28** | single-phase<br>single-phase | 216<br>351 |
| **RS 38** | single-phase<br>single-phase<br>three-phase<br>three-phase | 216<br>351<br>216<br>351 |
| **RS 50** | three-phase<br>three-phase | 216<br>351 |

**GAS CATEGORY**

| COUNTRY | CATEGORY |
|---|---|
| IT - AT - GR - DK - FI - SE | $II_{2H3B / P}$ |
| ES - GB - IE - PT | $II_{2H3P}$ |
| NL | $II_{2L3B / P}$ |
| FR | $II_{2Er3P}$ |
| DE | $II_{2ELL3B /P}$ |
| BE | $I_{2E(R)B,}$ $I_{3P}$ |
| LU | $II_{2E\ 3B/P}$ |

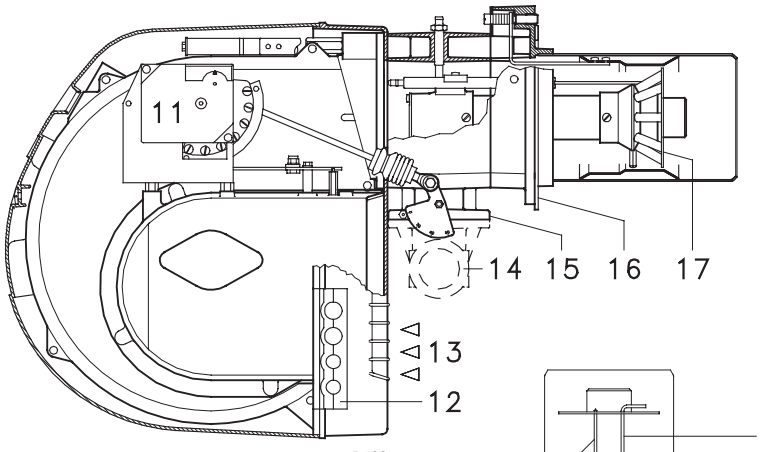
**ACCESSORIES** (optional):

- **KIT FOR LPG OPERATION:** The kit allows the RS 28-38-50 burners to operate on LPG.

| BURNER | | RS 28 | | RS 38 | | RS 50 | |
|---|---|---|---|---|---|---|---|
| OUTPUT | kW | 95 ÷ 325 | | 115 ÷ 440 | | 140 ÷ 581 | |
| BLAST TUBE LENGTH | mm | 216 | 351 | 216 | 351 | 216 | 351 |
| CODE | | 3010079 | 3010080 | 3010081 | 3010082 | 3010083 | 3010084 |

- **GROUND FAULT INTERRUPTER:** code **3010321**
- **STATUS** (see page 20): code **3010322**
- **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.**



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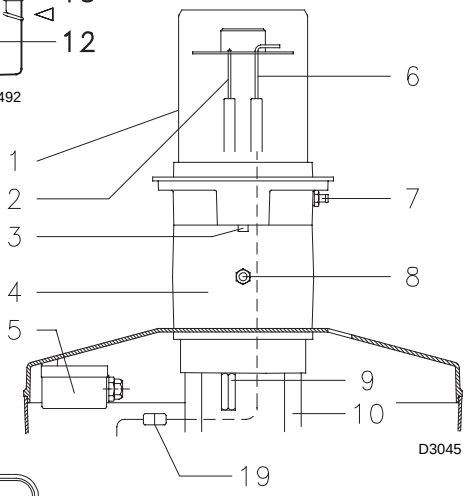

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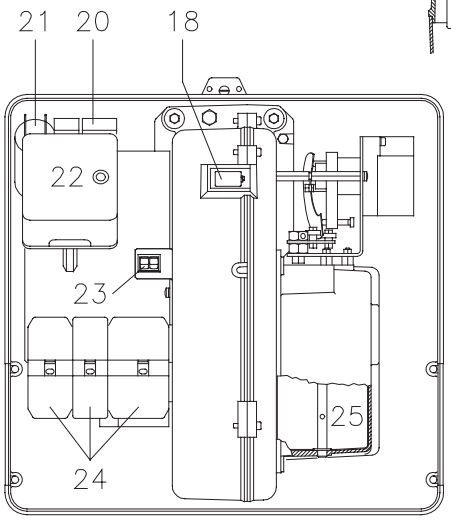
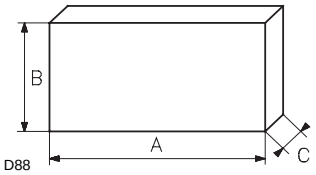


D3026

**(A)**

| mm | A | B | C | kg |
|---|---|---|---|---|
| **RS 28** | 1010 | 625 | 495 | 38 |
| **RS 38** | 1010 | 625 | 495 | 40 |
| **RS 50** | 1010 | 625 | 495 | 41 |



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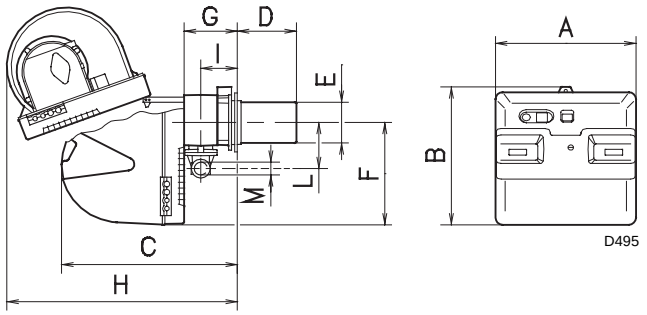
**(B)**






D495

**(C)**

| mm | A | B | C | D (1) | E | F | G | H | I | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **RS 28** | 476 | 474 | 580 | 216 - 351 | 140 | 352 | 164 | 810 | 108 | 168 | 1”1/2 |
| **RS 38** | 476 | 474 | 580 | 216 - 351 | 140 | 352 | 164 | 810 | 108 | 168 | 1”1/2 |
| **RS 50** | 476 | 474 | 580 | 216 - 351 | 152 | 352 | 164 | 810 | 108 | 168 | 1”1/2 |

(1) Blast tube: short-lang

**BURNER DESCRIPTION (A)**

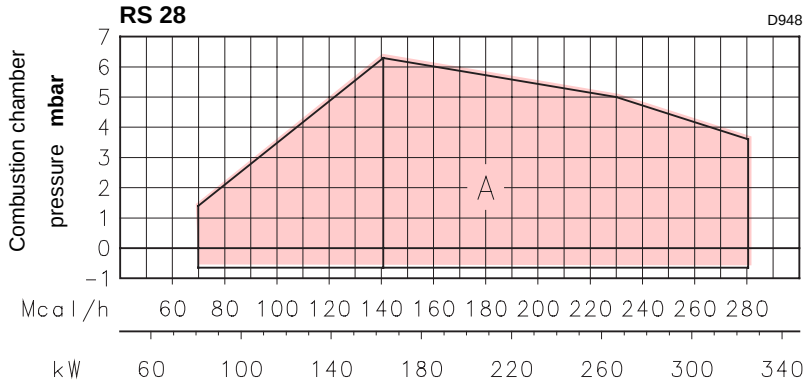
1 Combustion head
2 Ignition electrode
3 Screw for combustion head adjustment
4 Sleeve
5 Minimum air pressure switch (differential operating type)
6 Flame sensor probe
7 Air pressure test point
8 Gas pressure test point and head fixing screw
9 Screws securing fan to sleeve
10 Slide bars for opening the burner and inspecting the combustion head
11 Servomotor controlling the gas butterfly valve and of air gate valve (by means of a variable profile cam mechanism).
When the burner is not operating the air gate valve is fully closed in order to reduce heat dispersion from the boiler due to the flue draught which draws air from the fan suction inlet.
12 Plate with four hole knock-outs for electrical cable routing
13 Air inlet to fan
14 Gas input pipework
15 Gas butterfly valve
16 Boiler mounting flange
17 Flame stability disk
18 Flame inspection window
19 Plug-socket on ionisation probe cable
20 Motor contactor and thermal cut-out reset button (RS 38 - 50 three-phase)
21 Motor capacitor (RS 28 - 38 single-phase)
22 Control box with lock-out pilot light and lock-out reset button
23 Two switches:
- one “burner off - on”
- one for “1st - 2nd stage operation”
24 Plugs for electrical connections
25 Air gate valve

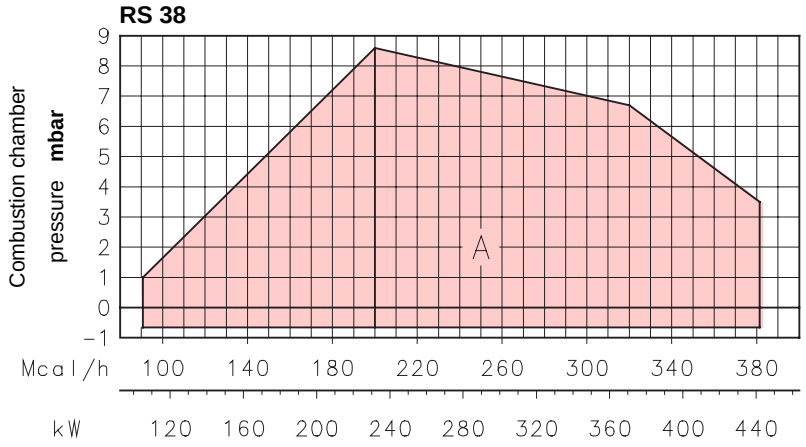
Two types of burner failure may occur:
- **Control box lock-out:** if the control box 22)(A) pushbutton (red led) lights up, it indicates that the burner is in lock-out.
To reset, hold the pushbutton down for between 1 and 3 seconds.
- **Motor trip** (RS 38 three-phase - RS 50): release by pressing the pushbutton on thermal cutout 20)(A).

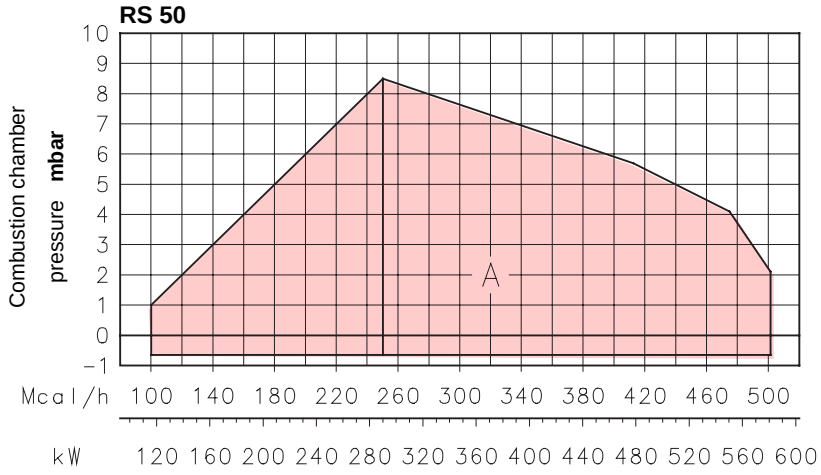
**PACKAGING - WEIGHT (B)** - Approximate measurements
- The burner are shipped in cardboard boxes with the maximum dimensions shown in Table (B).
- The weight of the burner complete with packaging is indicated in table (B).

**MAX. DIMENSIONS (C)**
Approximate measurements
The maximum dimensions of the burner are given in (C).
Note that if you need to examine the combustion head, the burner must be pulled backward on the slide bars and turned upward.
The maximum dimension of the burner, without the cover, when open is give by measurement H.

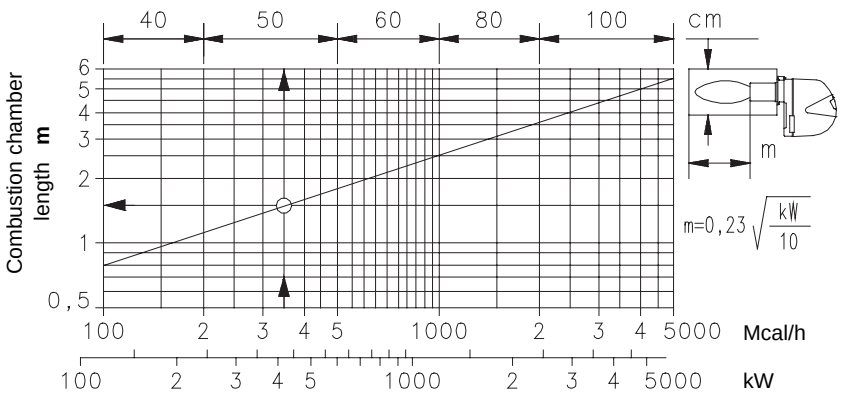
**STANDARD EQUIPMENT**
1 - Gas train flange
1 - Flange gasket
4 - Flange fixing screws M 8 x 25
1 - Thermal insulation screen
4 - Screws to secure the burner flange to the boiler: M 8 x 25
5 - Fairleads for electrical connections (RS 28 - 38 single-phase)
6 - Fairleads for electrical connections (RS 38 - 50 three-phase)
1 - Instruction booklet
1 - Spare parts list




**(A)**




**(B)**

D497

**FIRING RATES (A)**

The RS 28-38-50 burners can work in two ways: 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 28 = 81 kW
RS 38 = 105 kW
RS 50 = 116 kW

**Important:**

The FIRING RATE value range has been obtained considering an ambient temperature of 20 °C, and an atmospheric pressure of 1000 mbar (approx. 100 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 350 Mcal/h:
diameter = 50 cm; length = 1,5 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-tested and/or its combustion chamber dimensions are clearly smaller than those indicated in diagram (B), consult the manufacturer.

**RS 28** Δp (mbar)

| kW | 1 | 2 | 3 | | | | |
|---|---|---|---|---|---|---|---|
| | | | Ø 3/4 3970076 | Ø 1" 3970077 | Ø 1"1/4 3970144 | Ø 1"1/2 3970145 | Ø 1"1/2 3970180 |
| 165 | 2,5 | 0,1 | 11,1 | 5,3 | 3,2 | 2,1 | 1,8 |
| 185 | 3,1 | 0,1 | 13,4 | 6,4 | 3,8 | 2,5 | 2,0 |
| 210 | 4,0 | 0,1 | 16,5 | 7,9 | 4,7 | 3,1 | 2,5 |
| 235 | 4,7 | 0,2 | 19,9 | 9,5 | 5,6 | 3,8 | 3,2 |
| 260 | 5,5 | 0,2 | 23,6 | 11,2 | 6,6 | 4,5 | 3,7 |
| 285 | 6,3 | 0,3 | 27,5 | 13,1 | 7,6 | 5,3 | 4,4 |
| 310 | 7,0 | 0,3 | 31,6 | 15,0 | 8,7 | 6,2 | 4,7 |
| 325 | 7,5 | 0,3 | 34,2 | 16,2 | 9,4 | 6,7 | 4,9 |

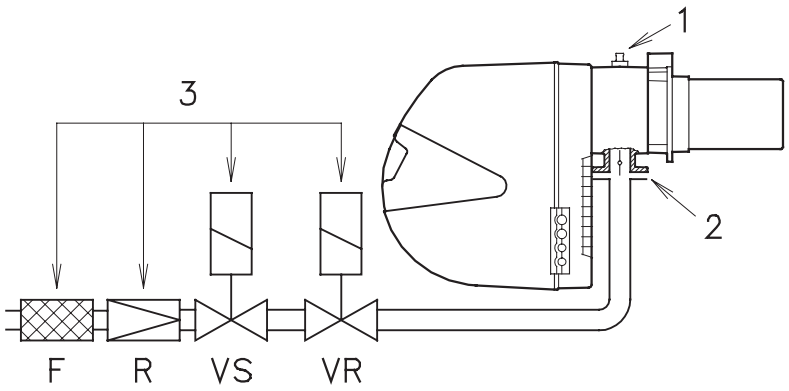
**RS 38** Δp (mbar)

| kW | 1 | 2 | 3 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Ø 1" 3970077 | Ø 1"1/4 3970144 | Ø 1"1/2 3970145 | Ø 1"1/2 3970180 | Ø 2" 3970146 3970160 | Ø 2" 3970181 3970182 |
| 230 | 2,6 | 0,2 | 9,2 | 5,4 | 3,6 | 3,0 | 1,4 | 1,8 |
| 260 | 3,1 | 0,2 | 11,2 | 6,6 | 4,5 | 3,7 | 1,7 | 2,2 |
| 290 | 3,7 | 0,3 | 13,4 | 7,9 | 5,5 | 4,4 | 2,1 | 2,7 |
| 320 | 4,3 | 0,3 | 15,8 | 9,2 | 6,5 | 4,8 | 2,5 | 3,3 |
| 350 | 4,8 | 0,4 | 18,3 | 10,6 | 7,6 | 5,9 | 3,0 | 3,5 |
| 380 | 5,4 | 0,4 | 20,9 | 12,1 | 8,8 | 6,6 | 3,5 | 4,0 |
| 410 | 6,0 | 0,5 | 23,7 | 13,7 | 10,1 | 7,0 | 4,0 | 4,4 |
| 440 | 6,6 | 0,6 | 26,6 | 15,3 | 11,4 | 8,1 | 4,5 | 5,0 |

**RS 50** Δp (mbar)

| kW | 1 | 2 | 3 | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Ø 1" 3970077 | Ø 1"1/4 3970144 | Ø 1"1/2 3970145 | Ø 1"1/2 3970180 | Ø 2" 3970146 3970160 | Ø 2" 3970181 3970182 |
| 290 | 2,2 | 0,3 | 13,4 | 7,9 | 5,5 | 4,4 | 2,1 | 2,7 |
| 330 | 2,9 | 0,4 | 16,6 | 9,7 | 6,9 | 5,0 | 2,7 | 3,4 |
| 370 | 3,6 | 0,5 | 20,0 | 11,6 | 8,4 | 6,1 | 3,3 | 3,9 |
| 410 | 4,3 | 0,6 | 23,7 | 13,7 | 10,1 | 7,0 | 4,0 | 4,4 |
| 450 | 5,0 | 0,7 | 27,6 | 15,9 | 11,9 | 8,3 | 4,7 | 5,1 |
| 490 | 5,6 | 0,9 | 31,7 | 18,2 | 13,7 | 9,7 | 5,5 | 5,9 |
| 530 | 6,3 | 1,0 | 36,1 | 20,6 | 15,7 | 10,5 | 6,3 | 6,6 |
| 580 | 7,2 | 1,2 | 41,8 | 23,9 | 18,5 | 12,0 | 7,4 | 7,8 |

**(A)**




D934 **(B)**

**GAS PRESSURE**

The adjacent tables show minimum pressure losses along the gas supply line depending on the burner output in 2nd stage operation.

Column 1
Pressure loss at combustion head.
Gas pressure measured at test point 1)(B), with:
- Combustion chamber at 0 mbar
- Burner operating in 2nd stage
- Gas ring 2)(B)p.7 adjusted as indicated in diagram (C)p. 7.

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

Column 3
Pressure loss of gas train 3)(B) includes: adjustment valve VR, safety valve VS (both fully open), pressure governor R, filter F.

The values shown in the various tables refer to:
natural gas G20 PCI 10 kWh/Nm$^3$ (8.6 Mcal/Nm$^3$).
With:
natural gas G25 PCI 8.6 kWh/Nm$^3$ (7.4 Mcal/Nm$^3$) multiply tabulated values by 1.3.

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 in column 1 of the table for the burner in question.
- Read off the corresponding output on the left.

**Example - RS 28:**
- 2nd stage operation
- Natural gas G20 PCI 10 kWh/Nm$^3$
- Gas ring 2)(B)p.7 adjusted as indicated in diagram (C)p.7.
- Gas pressure at test point 1)(B) = 6 mbar
- Pressure in combustion chamber = 2 mbar

6 - 2 = 4 mbar

A 2nd stage output of 210 kW shown in Table RS 28 corresponds to 4 mbar pressure, column 1.
This value serves as a rough guide, the effective delivery must be measured at the gas meter.

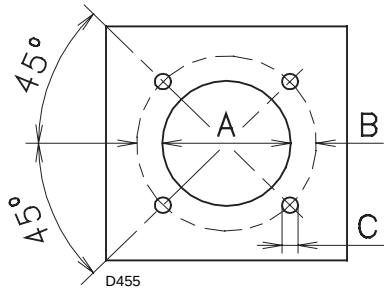
To calculate the required gas pressure at test point 1)(B), set the output required from the burner in 2nd stage operation:
- find the nearest output value in the table for the burner in question.
- Read off the pressure at test point 1)(B) on the right in column 1.
- Add this value to the estimated pressure in the combustion chamber.

**Example - RS 28:**
- Required burner output in 2nd stage operation: 210 kW
- Natural gas G20 PCI 10 kWh/Nm$^3$
- Gas ring 2)(B)p.7 adjusted as diagram (C)p.7.
- Gas pressure at burner output of 210 kW, taken from table RS 28, column 1 = 4 mbar
- Pressure in combustion chamber = 2 mbar

4 + 2 = 6 mbar

pressure required at test point 1)(B).

| mm | A | B | C |
|---|---|---|---|
| **RS 28** | 160 | 224 | M 8 |
| **RS 38** | 160 | 224 | M 8 |
| **RS 50** | 160 | 224 | M 8 |

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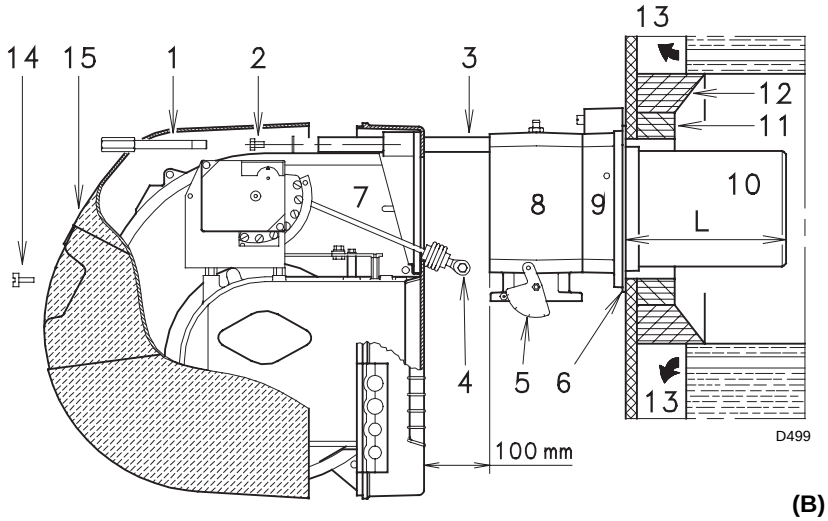


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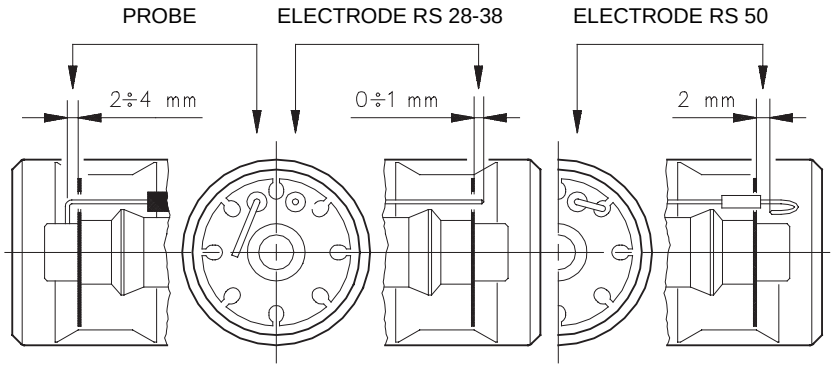
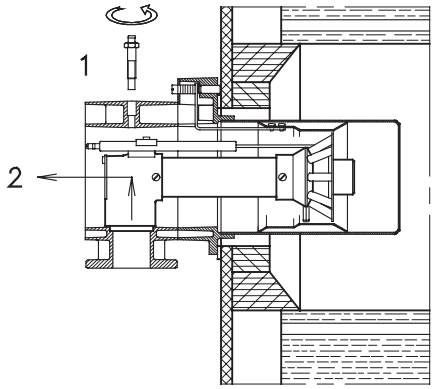



**(C)**




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

| Blast tube 10): | **RS 28** | **RS 38** | **RS 50** |
|---|---|---|---|
| • short | 216 | 216 | 216 |
| • long | 351 | 351 | 351 |

For boilers with front flue passes 13) or flame inversion chambers, protective fettling 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 having a water-cooled front the refractory fettling 11)-12)(B) is not required unless it is expressly requested by the boiler manufacturer.

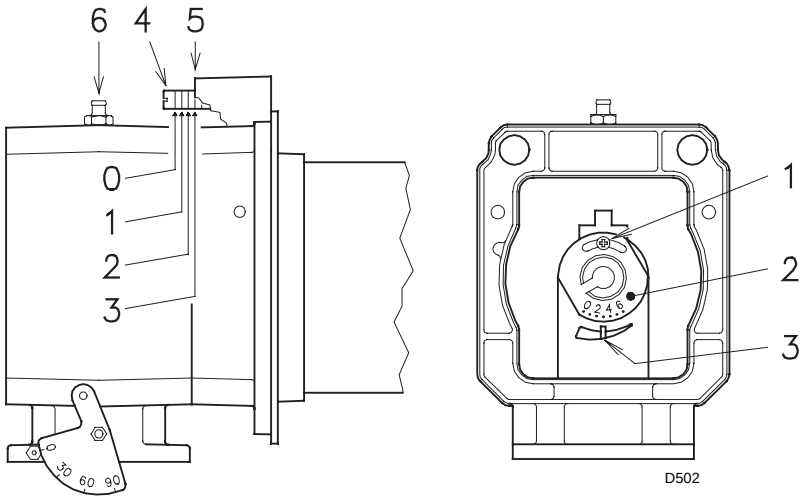
### SECURING THE BURNER TO THE BOILER (B)

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).

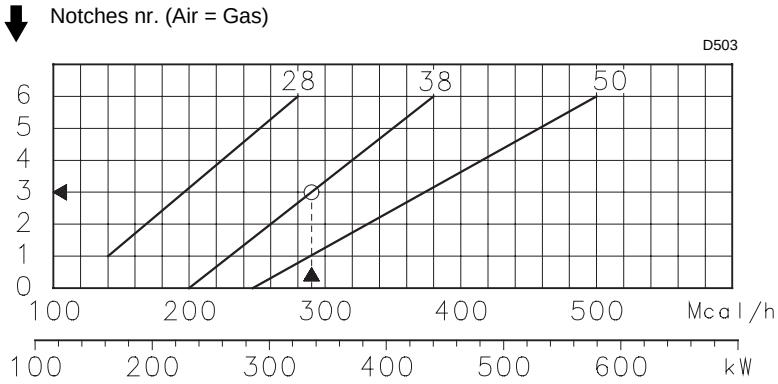
Now detach the combustion head from the burner, fig.(B):
- remove screw 14) and withdraw the cover 15).
- Disengage the articulated coupling 4) from the graduated sector 5).
- Remove the screws 2) from the slide bars 3)
- Remove screw 1) and pull the burner back on slide bars 3) by about 100 mm.
  Disconnect the wires from the probe and the electrode and then pull the burner completely off the slide bars, after removing the split pin from the slide bar 3).

Secure the flange 9)(B) to the boiler plate, interposing the thermal insulating screen 6)(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.

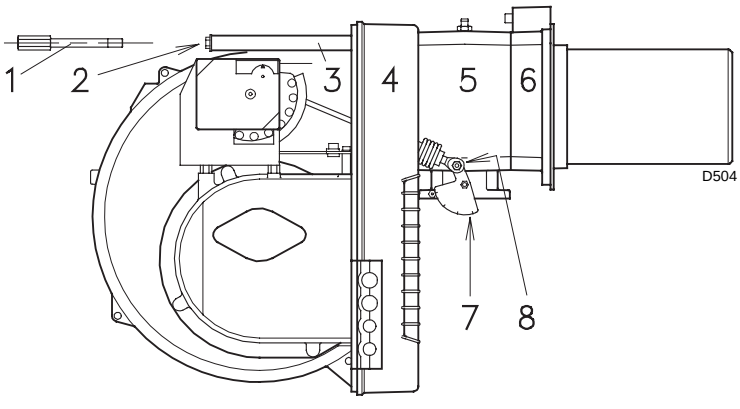



**(A)** **(B)**




Burner output in 2nd stage operation

**(C)**




**(D)**

**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.(A). 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 and gas deliveries.

In diagram (C) find the notch to use for adjusting the air and the gas, and then proceed as follows:

**Air adjustment (A)**
Turn screw 4)(A) until the notch identified is aligned with the front surface 5)(A) of the flange.
**Gas adjustment (B)**
Loosen screws 1)(B) and turn ring 2) until the notch identified is aligned with index 3).
Tighten the screw 1) fully down.

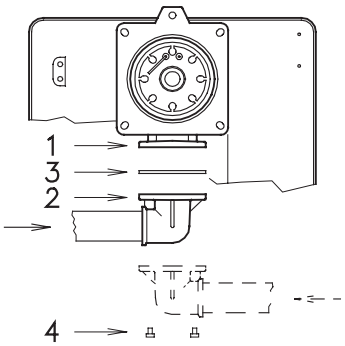
**Example RS 38:**
burner output = 337 kW (290 Mcal/h).
If we consult diagram (C) we find that for this output, air and gas must be adjusted using notch 3, as shown in figs.(A) and (B).

**Note**
Diagram (C) shows the ideal settings for the combustion head. If the gas mains pressure is too low to reach the 2nd stage operation pressure indicated on page 5, and if the ring 2)(B) is not fully open, it can be opened wider by 1 or 2 notches.

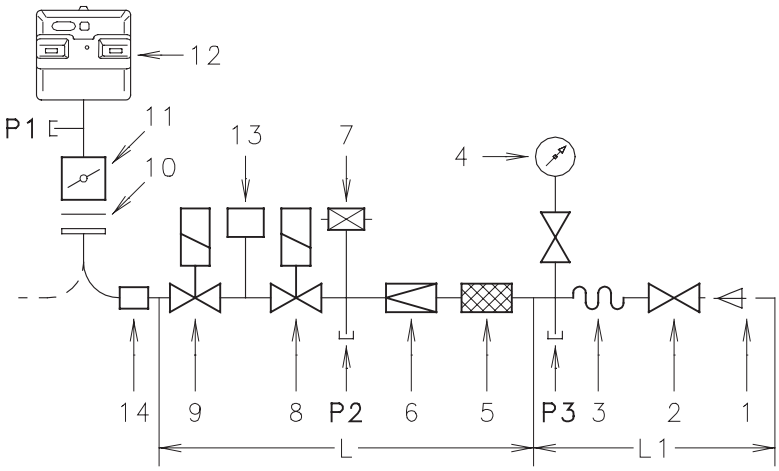
Continuing with the previous example, page 5 indicates that for burner RS 38 with output of 337 kW (290 Mcal/h) a pressure of approximately 4,6 mbar is necessary at test point 6)(A).
If this pressure cannot be reached, open the ring 2)(B) to notch 4 or 5.
Make sure that the combustion characteristics are satisfactory and free of pulsations.

Once you have finished setting up the head, refit the burner 4)(D) to the slide bars 3) at approximately 100 mm from the sleeve 5) - 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) and then refit the split pin into one of two slide bars 3).
Reconnect the articulation 8) to the graduated sector 7).

**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.




**(A)** D505




**(B)** D935

**GAS BURNERS AND RELEVANT GAS TRAINS APPROVED ACCORDING TO EN 676**

| Gas train L | | | Burner | | | 13 | 14 |
|---|---|---|---|---|---|---|---|
| Ø | C.T. | Code | RS 28 | RS 38 | RS 50 | Code | Code |
| 3/4" | – | 3970076 | • | – | – | 3010123 | 3000824 |
| 1" | – | 3970077 | • | • | • | 3010123 | 3000824 |
| 1"1/4 | – | 3970144 | • | • | • | 3010123 | – |
| 1"1/2 | – | 3970145 | • | • | • | 3010123 | – |
| 1"1/2 | – | 3970180 | • | • | • | 3010123 | – |
| 2" | – | 3970146 | – | • | • | 3010123 | 3000822 |
| 2" | – | 3970181 | – | • | • | 3010123 | 3000822 |
| 2" | ♦ | 3970160 | – | • | • | – | 3000822 |
| 2" | ♦ | 3970182 | – | • | • | – | 3000822 |

**(C)**

**GAS TRAIN COMPONENTS**

| Code | Components | | |
|---|---|---|---|
| | Filter 5 | Pressure governor 6 | Solenoids 8 - 9 |
| 3970076 | Multiblock MB DLE 407 | | |
| 3970077 | Multiblock MB DLE 410 | | |
| 3970144 | Multiblock MB DLE 412 | | |
| 3970145 | GF 515/1 | FRS 515 | DMV DLE 512/11 |
| 3970180 | Multiblock MB DLE 415 | | |
| 3970146<br>3970160 | GF 520/1 | FRS 520 | DMV DLE 520/11 |
| 3970181<br>3970182 | Multiblock MB DLE 420 | | |

**GAS LINE**

- The gas train must be connected to the gas attachment 1)(A), using flange 2), gasket 3) and screws 4) supplied with the burner.
- The gas train can enter the burner from the right or left side, depending on which is the most convenient, see fig.(A).
- Gas solenoids 8)-9)(B) must be as close as possible to the burner to ensure gas reaches the combustion head within the safety time range of 3 s.
- Make sure that the pressure governor calibration range (colour of the spring) comprises the pressure required by the burner.

**GAS TRAIN (B)**

It is type-approved according to EN 676 Standards and is supplied separately from the burner with the code indicated in Table (C).

**KEY (B)**

1 - Gas input pipe
2 - Manual valve
3 - Vibration damping joint
4 - Pressure gauge with pushbutton cock
5 - Filter
6 - Pressure governor (vertical)
7 - Minimum gas pressure switch
8 - Safety solenoid VS (vertical)
9 - Adjustment solenoid VR (vertical)
Two adjustments:
• ignition delivery (rapid opening)
• maximum delivery (slow opening)
10 - Standard issue burner gasket with flange
11 - Gas adjustment butterfly valve
12 - Burner
13 - Gas valve 8)-9) leak detection control device.
In accordance with EN 676 Standards, gas valve leak detection control devices are compulsory for burners with maximum outputs of more than 1200 kW.
14 - Gas train/burner adaptor.

P1 - Pressure at combustion head
P2 - Pressure down-line from the pressure governor
P3 - Pressure up-line from the filter

L - Gas train supplied separately with the code indicated in Table (C)
L1 - The responsibility of the installer

**KEY TO TABLE (C)**

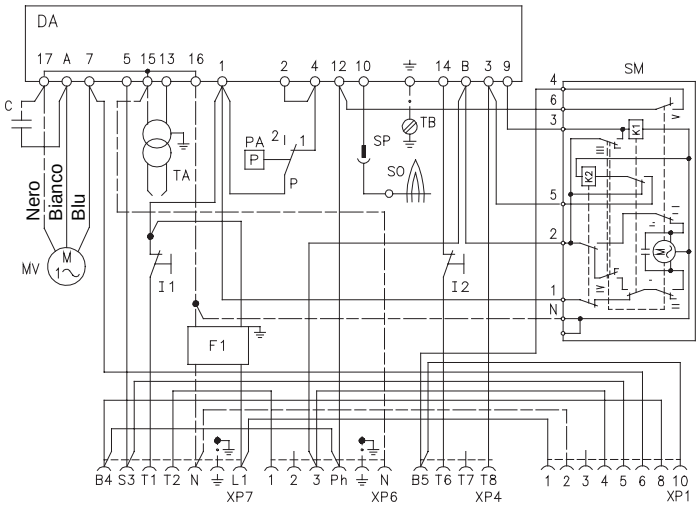
C.T. = Gas valves 8) - 9) leak detection control devices:
- = Gas train without gas valve leak detection control device; device that can be ordered separately and assembled subsequently (see Column 13).
♦ = Gas train with assembled VPS valve leak detection control device.

13 = VPS valve leak detection control device. Supplied separately from gas train on request.
14 = Gas train/burner adaptor. Supplied separately from gas train on request.

**Note**

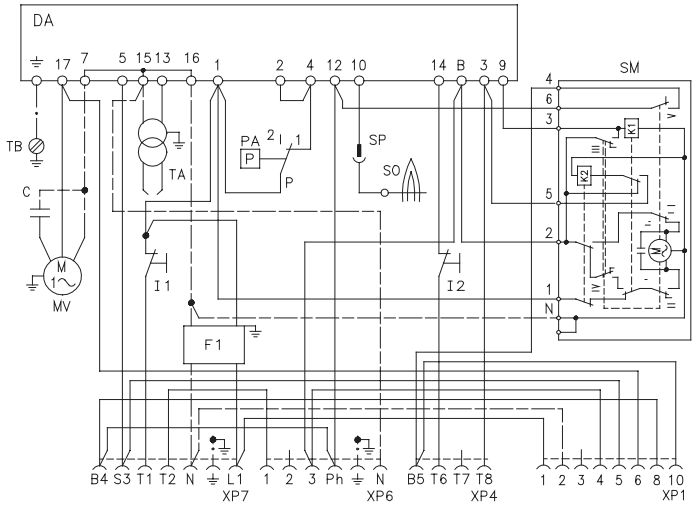
See the accompanying instructions for the adjustment of the gas train.

ELECTRICAL EQUIPMENT FACTORY-SET
**RS 28** single-phase



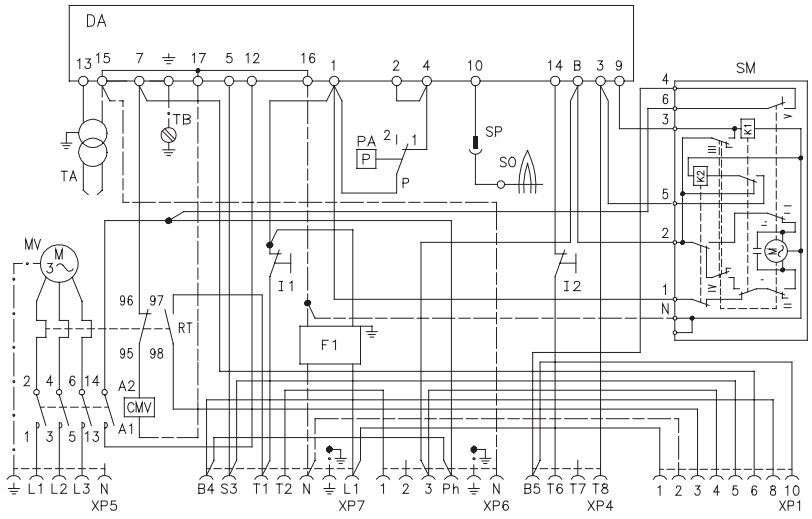

**(A)** D3012

ELECTRICAL EQUIPMENT FACTORY-SET
**RS 38** single-phase




**(B)** D3013

ELECTRICAL EQUIPMENT FACTORY-SET
**RS 38** three-phase **- RS 50**




**(C)** D3014

## ELECTRICAL SYSTEM

**ELECTRICAL SYSTEM** as set up by the manufacturer

**LAYOUT (A)**
**Burner RS 28 (single-phase)**

**LAYOUT (B)**
**Burner RS 38 (single-phase)**

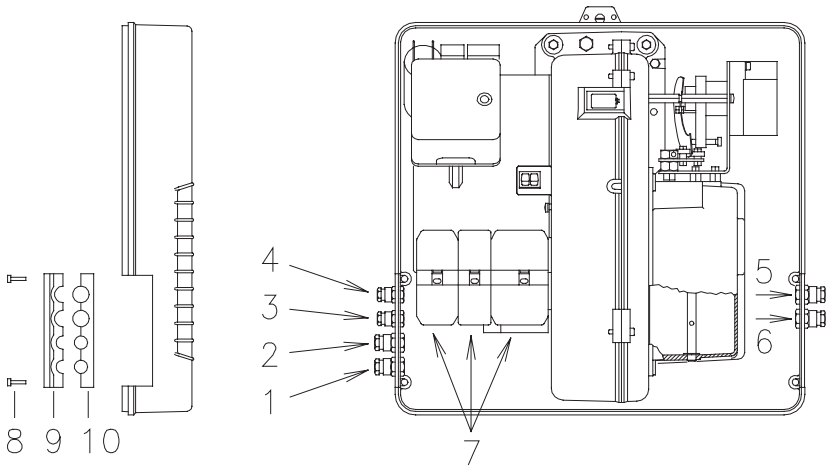
**LAYOUT (C)**
**Burners RS 38 - 50 (three-phase)**

- Models RS 38 and RS 50 leave the factory preset for **400 V** power supply.
- If **230 V** power supply is used, change the motor connection from star to delta and change the setting of the thermal cut-out as well.

**Key to Layouts (A) - (B) - (C)**

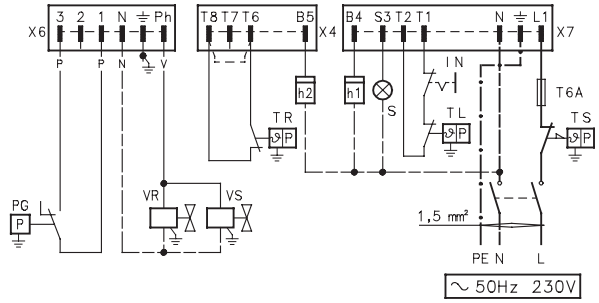
| | |
|---|---|
| C | - Capacitor |
| CMV | - Motor contactor |
| F1 | - Protection against radio interference |
| DA | - Control box (Landis RMG) |
| I1 | - Switch: burner off - on |
| I2 | - Switch: 1st - 2nd stage operation |
| MV | - Fan motor |
| PA | - Air pressure switch |
| RT | - Thermal cut-out |
| SM | - Servomotor |
| SO | - Ionisation probe |
| SP | - Plug-socket |
| TA | - Ignition transformer |
| TB | - Burner ground |
| XP1 | - Connector for STATUS |
| XP4 | - 4 pole socket |
| XP5 | - 5 pole socket |
| XP6 | - 6 pole socket |
| XP7 | - 7 pole socket |

**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.



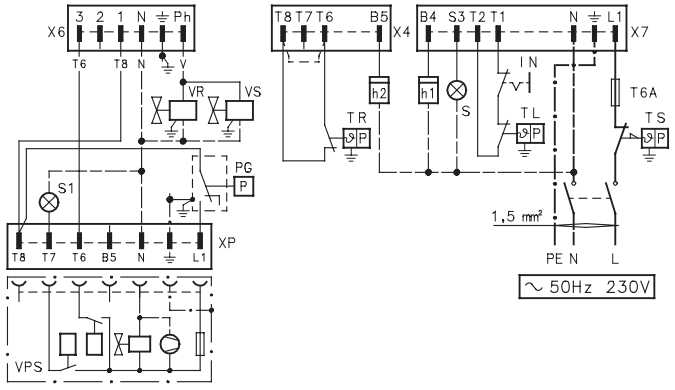

**(A)** D3027

**RS 28 - RS 38 single-phase without leak detection control device**




**(B)** D940

**RS 28 - RS 38 single-phase with leak detection control device VPS**




**(C)** D941

**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 plugs 7)(A) must enter through the supplied fairleads, which must be fitted into the relevant holes in the left hand or right hand plate. To do this, first unscrew screws 8), then split the plate into its parts 9) and 10) and remove the menbrane press-outs from the holes.

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

**RS 28 und RS 38 single-phase**

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

**RS 38 three-phase and RS 50**

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

**LAYOUT (B) - The RS 28 - 38 Models electrical connection single-phase power supply without leak detection control device.**

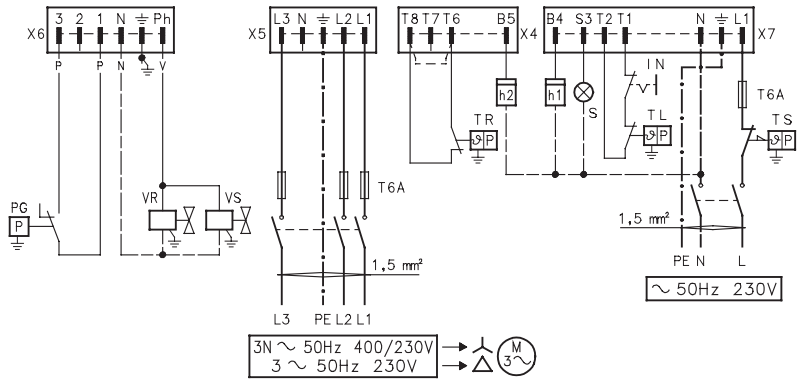
**LAYOUT (C) The RS 28 - 38 Models electrical connection single-phase power supply with VPS leak detection control device.**

Gas valve leak detection control takes place immediately before every burner start-up.

**Key to layouts (B) - (C)**

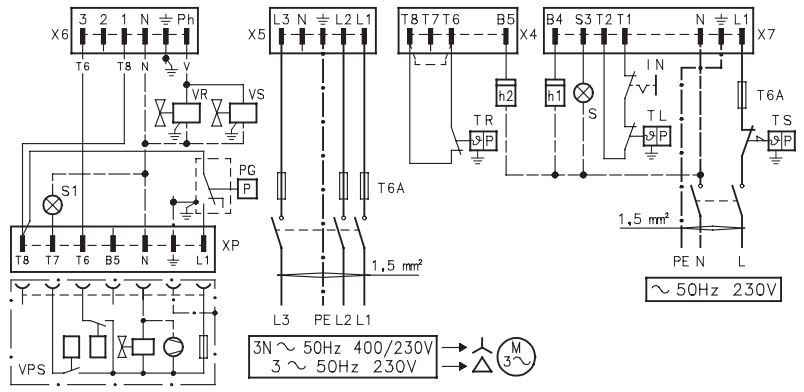
h1 - 1st stage hourcounter
h2 - 2nd stage hourcounter
IN - Burner manual stop switch
XP - Plug for leak detection control device
X4 - 4 pole plug
X6 - 6 pole plug
X7 - 7 pole plug
PC - Gas pressure switch for leak detection control device
PG - Min. gas pressure switch
S - Remote lock-out signal
S1 - Remote lock-out signal of leak detection control device
TR - High-low mode load remote control system: controls operating stages 1 and 2.
If the burner is to be set up for single stage operation, replace of remote control device TR with a jumper.
TL - Load limit remote control system:
shuts down the burner when the boiler temperature or pressure reaches the preset value.
TS - Safety load control system:
operates when TL is faulty
VR - Adjustment valve
VS - Safety valve

**RS 38 - RS 50 three-phase without leak detection control device**




**(A)** D943

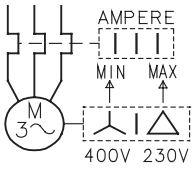
**RS 38 - RS 50 three-phase without leak detection control device VPS**




**(B)** D944

CALIBRATION OF THERMAL RELAY

**RS 38 three-phase - RS 50**




**(C)** D867

**LAYOUT (A) - The RS 38 - 50 Models electrical connection three-phase power supply without leak detection control device**

**LAYOUT (B) - The RS 38 - 50 Models electrical connection three-phase power supply with VPS leak detection control device.**

Gas valve leak detection control takes place immediately before every burner starting.

**Key to layouts (A) - (B)**

h1 - 1st stage hourcounter
h2 - 2nd stage hourcounter
IN - Burner manual stop switch
XP - Plug for leak detection control device
X4 - 4 pole plug
X5 - 5 pole plug
X6 - 6 pole plug
X7 - 7 pole plug
PC - Gas pressure switch for leak detection control device
PG - Min. gas pressure switch
S - Remote lock-out signal
S1 - Remote lock-out signal of leak detection control device
TR - High-low mode load remote control system: controls operating stages 1 and 2.
If the burner is to be set up for single stage operation, replace of remote control device TR with a jumper.
TL - Load limit remote control system: shuts down the burner when the boiler temperature or pressure reaches the preset value.
TS - Safety load control system: operates when TL is faulty
VR - Adjustment valve
VS - Safety valve

**LAYOUT (C)**

**Calibration of thermal cut-out 20)(A)p.3**

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

- If the motor is star-powered, **400 V**, the cursor should be positioned to "MIN".
- If the motor is delta-powered, **230 V**, the cursor should be positioned to "MAX".

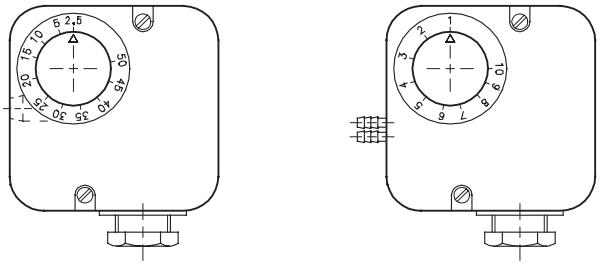
Even if the scale of the thermal cut-out does not include rated motor absorption at 400 V, protection is still ensured in any case.

**N.B.**

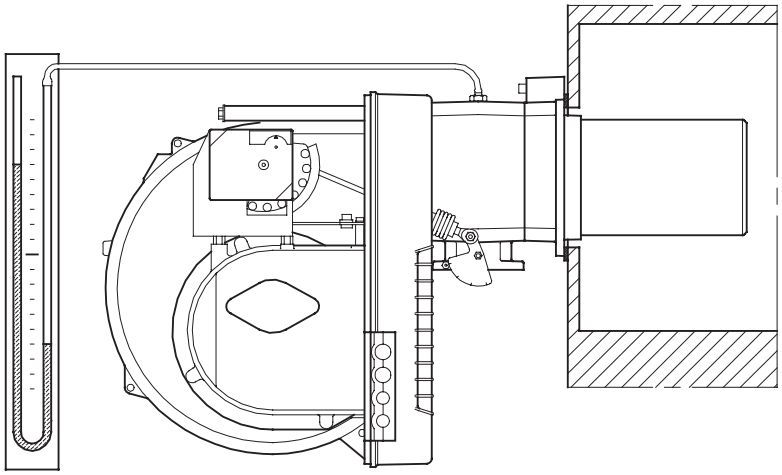
- The RS 38 and RS 50 three-phase leave the factory preset for 400 V power supply. If 230 V power supply is used, change the motor connection from star to delta and change the setting of the thermal cut-out as well.
- The RS 28-38-50 burners have been type-approved for intermittent operation. This means they should compulsorily be stopped at least once every 24 hours to enable the control box to check 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 shut-down at least once every 24 hours.
- The RS 28-38-50 burners are 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 T6 and T8 of connector X4.

**WARNING: 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

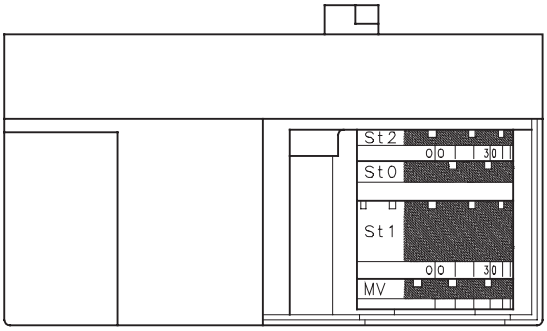


D897 **(A)** **(B)**

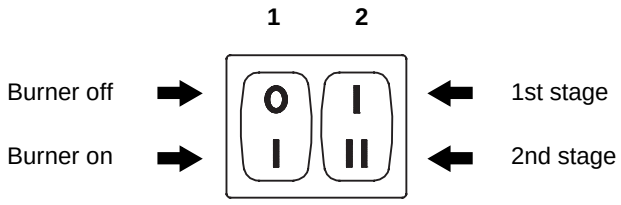


**(C)** D514

SERVOMOTOR




**(D)** D517




**(E)** D469

**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 angle of rotation of the servomotor is equal to the angle on the graduated sector controlling the gas butterfly valve. The servomotor rotates through 90 degrees in 12 seconds.
Do not alter the factory setting for the 4 cams; simply check that they are set as indicated below:

**Cam St2 : 90°**
Limits rotation toward maximum position. When the burner is in 2nd stage operation the gas butterfly valve must be fully open: 90°.
**Cam St0 : 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 St1 : 15°**
Adjusts the ignition position and the output in 1st stage operation.
**Cam MV : 85°**
Lights up the 2nd stage LED (STATUS)

**BURNER STARTING**

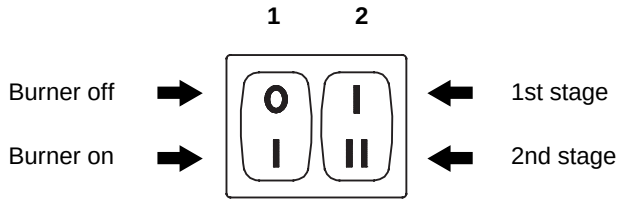
Close the control devices and set:

- 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 18)(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 19)(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:

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

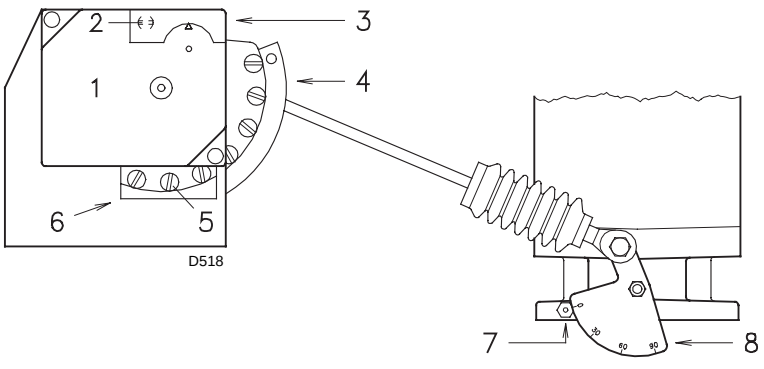
**Example** for G 20 gas (10 kWh/$Nm^3$):
Max. operation output: 600 kW corresponding to 60 $Nm^3$/h.
After 10 firings with lock-outs, the delivery read on the meter must be equal to or lower than:
60 : 360 = 0,166 $Nm^3$.

**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.




1 Servomotor

2 Cam 4 engaged ⊖ /disengages ◍

3 Cam cover

4 Adjustable profile cam

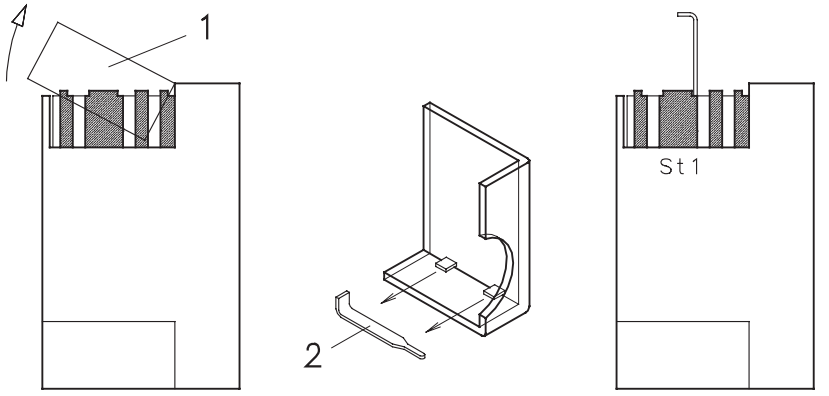
5 Cam profile adjustment screws

6 Opening for access to screws 5

7 Index for graduated sector 8

8 Graduated sector for gas butterfly valve

**(A)**




**(B)**

Adjusting air delivery

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

- 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 cam St1 (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 cam St1, 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 cam St1 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.

If you increase the angle of St1 while the burner is operating in 1st stage, lock-out will result.

In order to adjust cam St1, remove press-fit cover 1), as shown in fig.(B), extract the relevant key 2) from inside, and fit it into the keyway in cam St1.

Adjustment of air delivery

Progressively adjust the starting profile of cam 4)(A) by turning the screws working throught the access hole 6)(A). 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

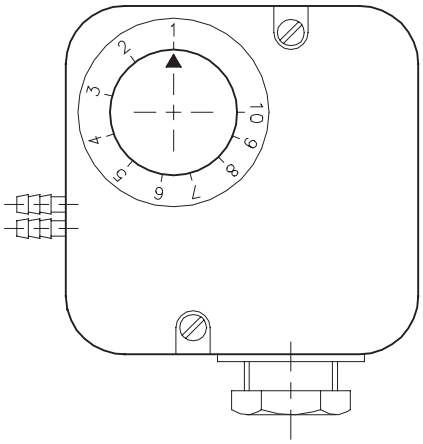
Switch off the burner using switch 1)(A)p.13, disengage the variable profile cam, set the servomotor shaft slot 2)(A) to a vertical position and turn the central screws of the cam so that the cam offers a progressive gradient. Try turning the cam back and forth by hand a few times until the movement is completely smooth with no signs of sticking.

Do not alter the position of the screws at each end of the cam track, which have already been adjusted for 1st and 2nd stage air gate valve control.

**Note**

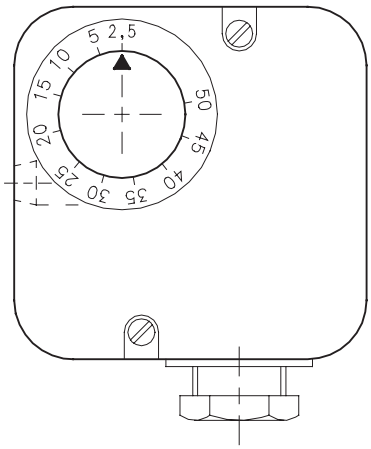
Once you have finished adjusting 2nd stage - 1st stage - intermediate outputs, check ignition once again: noise emission at this stage must be identical to the following stage of operation. If you notice any sign of pulsations, reduce the ignition stage delivery.

AIR PRESSURE SWITCH 5)(A)p. 3

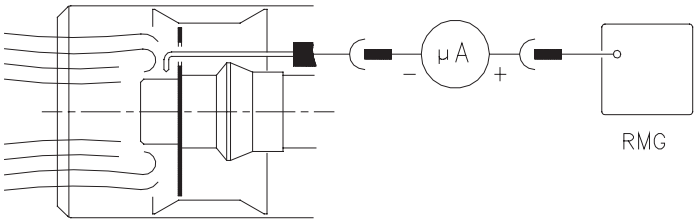



**(A)** D521

MIN GAS PRESSURE SWITCH 7)(B)p. 8




**(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 prepurging 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.

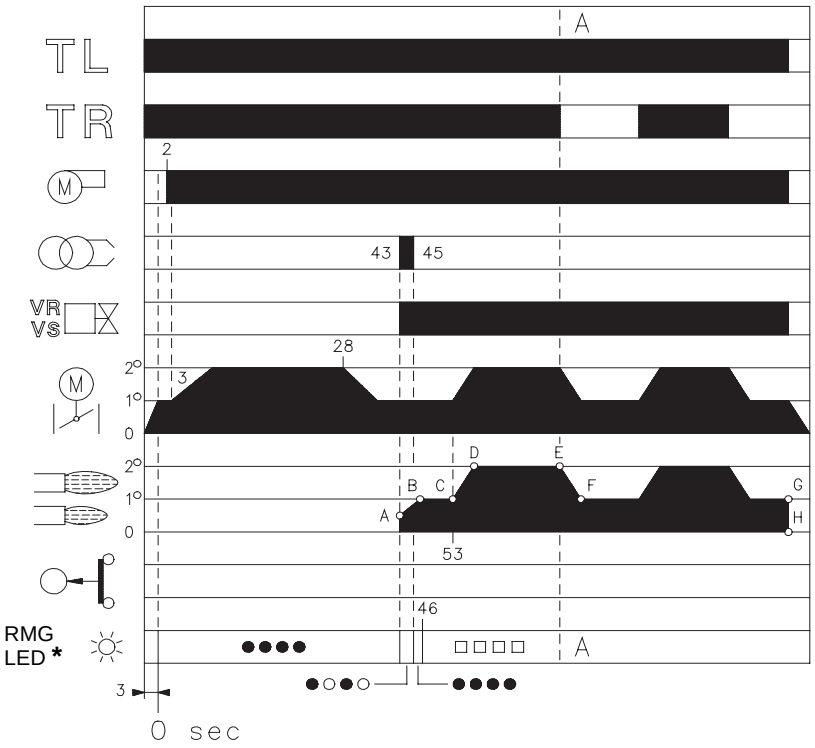
**6 - MINIMUM GAS PRESSURE SWITCH (B)**

Adjust the minimum gas pressure switch after having performed all the other burner adjustments with the pressure switch set at the start of the scale (B).
With the burner operating in 2nd stage, increase adjustment pressure by slowly turning the relative knob clockwise until the burner locks out.
Then turn the knob anti-clockwise by 2 mbar and repeat burner starting to ensure it is uniform.
If the burner locks out again, turn the knob anti-clockwise again by 1 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 19)(A)p.3 on the ionisation probe cable and insert a direct current microamperometer with a base scale of 100 µA.
Carefully check polarities!

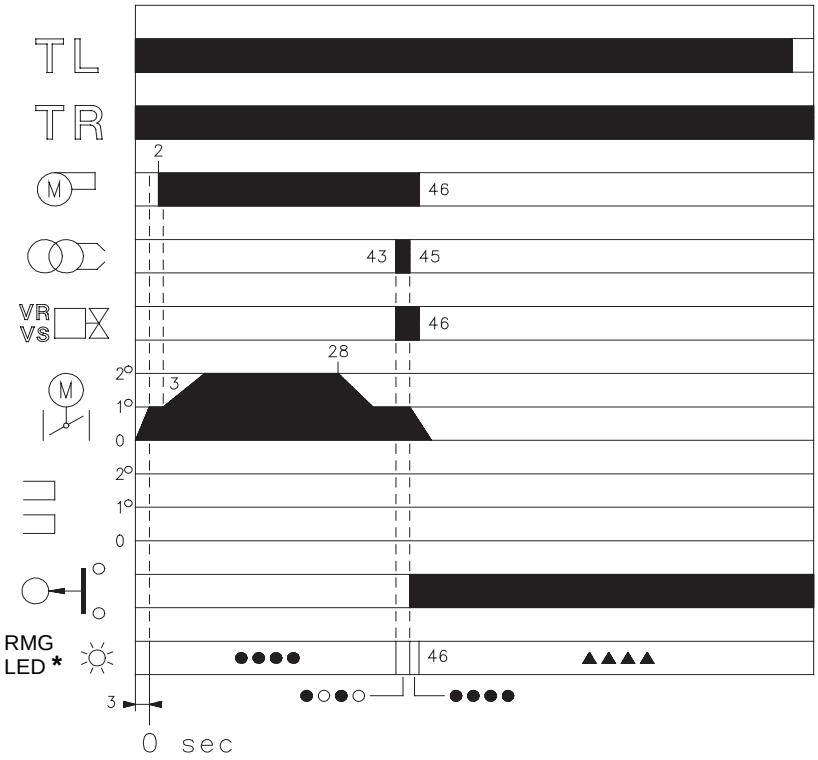
**NORMAL FIRING**
(n° = seconds from instant 0)




* ○ Off ● Yellow □ Green ▲ Red
For further details see page 17.

**(A)** D3028

**NO FIRING**




* ○ Off ● Yellow ▲ Red
For further details see page 17.

**(B)** D3029

## BURNER OPERATION

### BURNER STARTING (A)

- : Control device TL closes.
  Servomotor starts: it rotates during opening up to the angle set on cam St1.
  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 on cam St2 is tripped.
  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 St1.
- 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 St2 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 St0. 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).

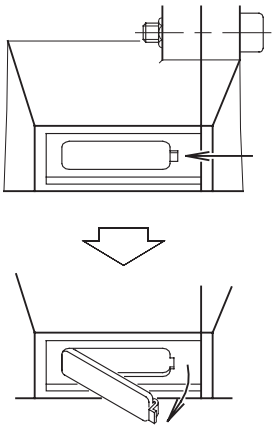
### FIRING FAILURE (B)

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

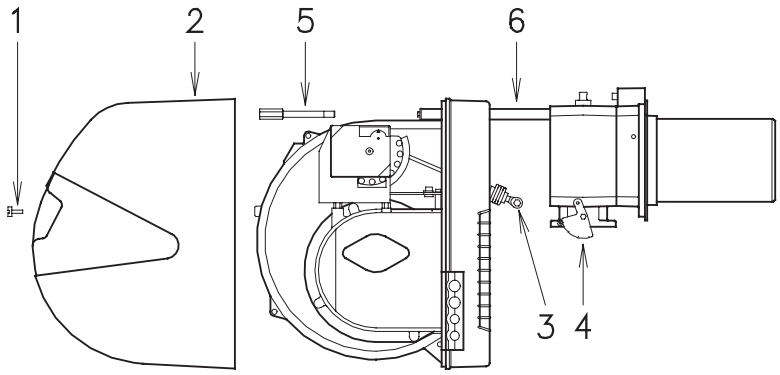
If the flame should accidentally go out during operation, the burner will lock out within 1s.

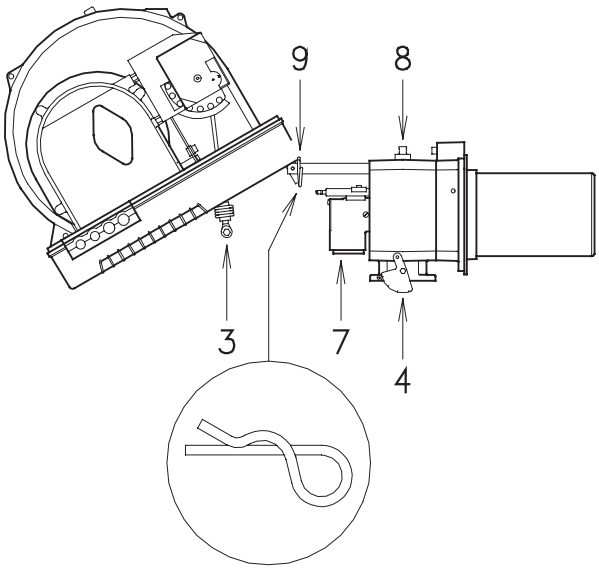
FLAME INSPECTION WINDOW



**(A)** D484

OPENING THE BURNER




**(B)** D535

**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 7)(B).

**Servomotor**
Disengage the cam 4)(A)p.14 from servomotor, by turning slot 2)(A)p.14 through 90° and turn it backward and forward by hand to make sure it is free moving. Now engage cam 4)(A)p.14 again.

**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 connections are fully tightened.
Clean the outside of the burner, taking special care with the transmission joints and cam 4)(A)p.14.

**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.
- Remove screw 1) and withdraw cover 2).
- Disengage the articulated coupling 3) from the graduated sector 4).
- Remove screw 5), the split pin 9) and pull the burner back by about 100 mm on the slide bars 6). Disconnect the probe and electrode leads and then pull the burner fully back.
- Turn the burner as shown in the figure and fit the split pin 9) into one of the slide bar holes so that the burner remains in position.

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

**TO CLOSE THE BURNER (B):**
- Remove the split pin 9) and 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 screw 5), the split pin 9) and pull the probe and electrode leads gently out until they are slightly stretched.
- Re-couple the articulated coupling 3) to the graduated sector 4).

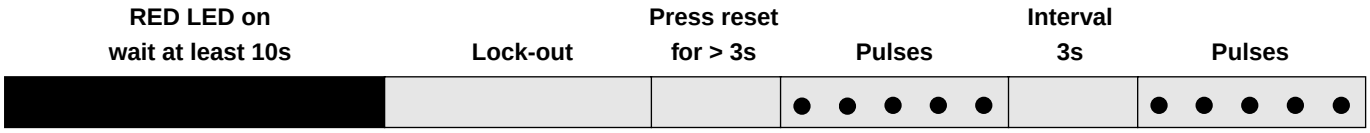
## BURNER START-UP CYCLE DIAGNOSTICS

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 | ▲□▲□▲□▲□▲ |
| **Legenda:** ○ 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 19.

## 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.

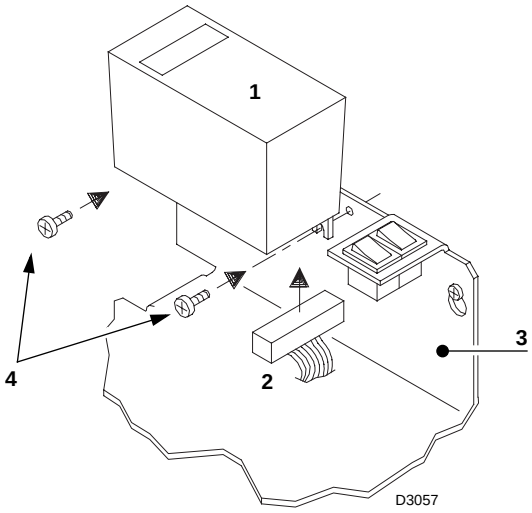
| BUTTON PRESSED FOR | CONTROL BOX STATUS |
|---|---|
| Between 1 and 3 seconds | Control box reset without viewing visual diagnostics. |
| More than 3 seconds | Visual diagnostics of lock-out condition:<br>(LED pulses at 1-second intervals). |
| More than 3 seconds starting from the visual diagnostics 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 19.

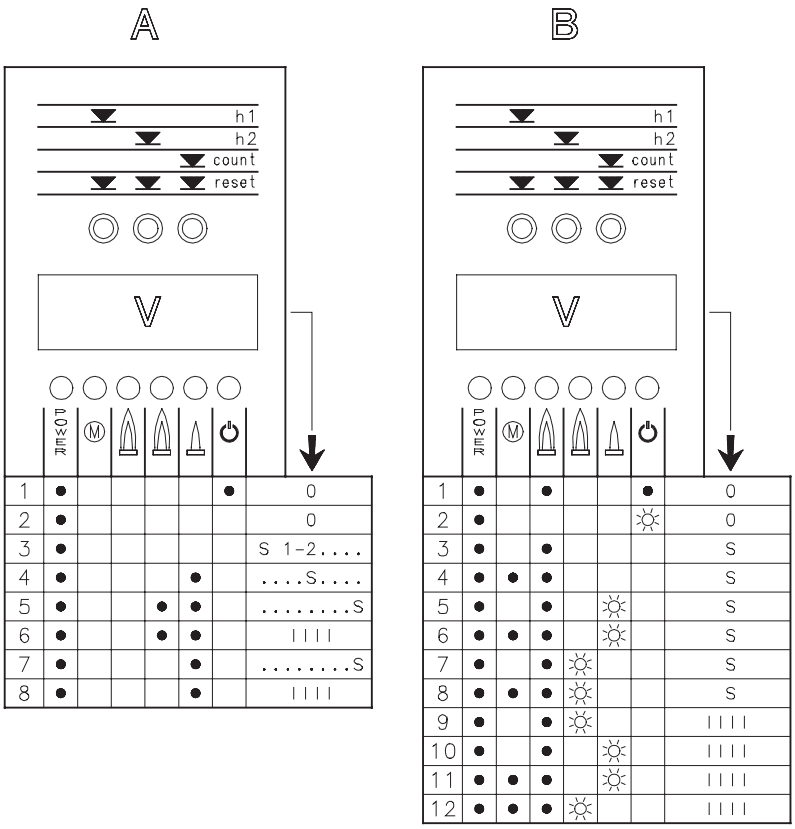
| SIGNAL | FAULT | PROBABLE CAUSE | SUGGESTED REMEDY |
|---|---|---|---|
| 2 x blinks<br>● ● | After pre-purge and safety time, the burner goes tolock-out and the flame does not appear | 1 - The solenoid VR allows little gas through<br>2 - Solenoid valves VR or VS fail to open<br>3 - Gas pressure too low<br>4 - Ignition electrode wrongly adjusted<br>5 - Electrode grounded due to brocken insulation<br>6 - High voltage cable defective<br>7 - High voltage cable deformed by high temperature<br>8 - Ignition trasformer defective<br>9 - Erroneous valve or trasformer electrical connections<br>10 - Control box defective<br>11 - A cock down-line of the gas train is closed<br>12 - Air in pipework<br>13 - VS and VR gas valves unconnected or with interrupted coil | Increase<br>Renew the coil or rectifier panel<br>Increase pressure at governor<br>Adjust, see fig. (C)p. 6<br>Replace<br>Replace<br>Replace and protect<br>Replace<br>Check<br>Replace<br>Open<br>Bleed air<br>Check connections or replace coil |
| 3 x blinks<br>● ● ● | 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:<br>15 - Air pressure switch adjusted badly<br>16 - Pressure switch pressure point pipe blocked<br>17 - Head wrongly adjusted<br>18 - High negative draft in chamber | <br>Adjust or replace<br>Clean<br>Adjust<br>Connect air pressure switch to fan suction inlet |
| | Lock-out during pre-purging | 19 - Defective capacitor (RS 28 - RS 38 single-phase)<br>20 - Defective motor remote control switch (RS 38 - 50 three-phase)<br>21 - Defective electrical motor<br>22 - Motor protection tripped (RS 38 three-phase - RS 50) | Replace<br>Replace<br>Replace<br>Reset thermal cut-out when third phase is re-connected |
| 4 x blinks<br>● ● ● ● | The burner starts and then locks out | 23 - Flame simulation | Replace control box |
| | Lock out when burner stops | 24 - Flame remains in combustion head or flame simulation | Eliminate persistence of flame or replace control box |
| 7 x blinks<br>● ● ● ● ● ● ● | The burner goes to lock-out right after flame appearance | 25 - The solenoid VR allows little gas through<br>26 - Ionisation probe wrongly adjusted<br>27 - Insufficient ionisation (less than 5 µA)<br>28 - Probe grounded<br>29 - Burner poorly grounded<br>30 - Phase and neutral wires inverted<br>31 - Defective control box | Increase<br>Adjust, see fig. (C)p. 6<br>Check probe position<br>Withdraw or replace cable<br>Check grounding<br>Correct by interventing<br>Replace |
| | Burner locks out at transition between 1st and 2nd stage or between 2nd and 1st stage | 32 - Too much air or too little gas | Adjust air and gas |
| | During operation, the burner stops in lock out | 33 - Probe or ionisation cable grounded<br>34 - Fault on air pressure switch | Replace worn parts<br>Replace |
| 10 x blinks<br>● ● ● ● ●<br>● ● ● ● ● | The burner does not start and lock-out warning appears | 35 - Erroneous electrical connections | Check connections |
| | The burner goes to lock-out | 36 - Control box defective | Replace |
| No blink | The burner does not start | 37 - No electrical power supply<br>38 - A limiter or safety control device is open<br>39 - Control box fuses blown<br>40 - Control box lock-out<br>41 - No gas supply<br>42 - Mains gas pressure insufficient<br>43 - Minimum gas pressure switch fails to close<br>44 - Servomotor fails to move to St1 position | Close all switches - Check connections<br>Adjust or replace<br>Replace<br>Reset control box<br>Open the manual valves between meter and train<br>Contact your GAS COMPANY<br>Adjust or replace<br>Replace |
| | The burner repeats the starting cycle without lock out | 45 - 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 | 46 - Poorly adjusted head<br>47 - Ignition electrode wrongly adjusted<br>48 - Poorly adjusted fan air gate: too much air<br>49 - Output during ignition phase is too high | Adjust, see p. 7<br>Adjust, see fig. (C)p. 6<br>Adjust<br>Reduce |
| | The burner does not pass to 2nd stage | 50 - Remote control device TR does not close<br>51 - Defective control box<br>52 - Servomotor faulty | Adjust oe replace<br>Replace<br>Replace |
| | Burner stops with air gate valve open | 53 - Sevomotor faulty<br>54 - | Replace |

# STATUS (optional)

**Assembly**




1 Status
2 Connector
3 Bracket of the burner
4 Fixing screws




☼ = Led flashing
● = Led illuminated
S = Time in seconds
IIII = Burner start cycle terminated

D947

**STATUS**
Accessory available on request.
See page 2.

**ASSEMBLY**
The burners are preset to accept the Status. To assemble, proceed as follows:
- Connect Status 1) using connector 2) fitted on the bracket 3).
- Fasten Status to the bracket using the screws 4) supplied with the kit.

The **STATUS** unit has three functions:

**1 - BURNER OPERATING HOURS AND THE NUMBER OF FIRINGS ARE SHOWN ON DISPLAY V**

Total operating hours
Press button "h1".
2nd stage operating hours
Press button "h2".
1st stage operating hours (calculated)
Total hours - 2nd stage operating hours.
Number of firings
Press button "count".
Resetting operating hours and number of firings
Press the three "reset" buttons simultaneously.
Non-volatile memory
The operating hours and the number of firings will remain in memory even in the case of electrical power failures.

**2 - INDICATES THE TIMES RELATIVE TO THE FIRING STAGE**
The leds illuminate in the following sequence, fig. A:

WITH REMOTE CONTROL THERMOSTAT TR CLOSED:
1 - Burner off, TL open
2 - Control device TL closed
3 - Motor start:
seconds count starts on read-out V
4 - Burner firing
5 - Transition to 2nd stage
seconds count stops on read-out V
6 - 10 seconds after stage 5 the code I I I I will appear on the read-out: this indicates that the starting phase is terminated.

WITH REMOTE CONTROL THERMOSTAT TR OPEN
1 - Burner off, TL open
2 - Control device TL closed
3 - Motor start:
seconds count starts on read-out V
4 - Burner firing
7 - 30 seconds after stage 4:
seconds count stops on read-out V
8 - 10 seconds after stage 7 the code I I I I will appear on the read-out: this indicates that the starting phase is terminated.

The times, in seconds, shown on read-out V, indicate the succession of the various starting stages described on page 16.

**3 - IN THE CASE OF BURNER MALFUNCTIONS, THE STATUS PANEL INDICATES THE EXACT TIME AT WHICH THE FAULT OCCURRED.**
There are 12 possible combinations of illuminated leds, see fig. (B). For the causes of the malfunction refer to the numbers shown between brackets; see the legend on page 19 for interpretation of the numbers.
1 .....(24)
2 .....(44)
3 .....(15 ÷ 23)
4 .....(22)
5 .....(1 ÷ 13, 32 ÷ 34, 36)
6 .....(22)
7 .....(32)
8 .....(22)
9 .....(32 ÷ 34)
10 .....(32 ÷ 34)
11 .....(22)
12 .....(22)

**Key to symbols:**

○ POWER = Power on
○ Ⓜ = Fan motor blocked (red)
○ = Burner lock-out (red)
○ = 2nd stage operation
○ = 1st stage operation
○ = Load level reached (Stand-by), led: on

D978

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