

GB Forced draught gas burners
E Quemadores de gas
P Queimadores a gás

One stage operation
Funcionamiento a una llama
Funcionamento a uma chama



CODE - CÓDIGO	MODEL - MODELO	TYPE - TIPO
3782022	RS 28/1	818 T1
3782023	RS 28/1	818 T1
3782122	RS 38/1	819 T1
3782123	RS 38/1	819 T1

TECHNICAL DATA	page 2
Variants	2
Accessories	2
Burner description	3
Packaging - Weight	3
Max. dimensions	3
Standard equipment	3
Firing rates	4
Test boiler	4
Commercial boilers	4
Gas pressure	5
Gas line	5
INSTALLATION	6
Boiler plate	6
Blast tube length	6
Securing the burner to the boiler	6
Setting the combustion head	7
Gas train	8
Electrical system	9
Adjustments before firing	11
Burner starting	11
Burner firing	11
Burner calibration:	12
1 - Firing output	12
2 - Maximum output	12
3 - Air pressure switch	13
4 - Minimum gas pressure switch	13
Flame present check	13
Burner operation	14
Final checks	15
Maintenance	15
LPG operation	16
Burner start-up cycle diagnostics	17
Resetting the control box and using diagnostics	17
Fault - Probable cause - Suggested remedy	18
Status (optional)	19

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 CO₂ concentration in the flue gases, their temperatures and the average temperature of the water in the boiler.

TECHNICAL DATA

MODEL		RS 28/1		RS 38/1	
TYPE		818 T1		819 T1	
OUTPUT ⁽¹⁾	kW Mcal/h	163 - 349 140 - 300		232 - 465 200 - 400	
FUEL		NATURAL GAS: G20 - G21 - G22 - G23 - G25 LPG: see page 16.			
		G20	G25	G20	G25
- Nec calorific value	kWh/Nm³ Mcal/Nm³	10 8,6	8,6 7,4	10 8,6	8,6 7,4
- Absolute density	kg/Nm³	0,71	0,78	0,71	0,78
- Max delivery	Nm³/h	35	40	49	57
- Pressure at maximum delivery ⁽²⁾	mbar	8,7	12,9	7,7	11,4
OPERATION		- Intermittent (min. 1 stop in 24 hours) - Single-stage (all - nothing)			
STANDARD APPLICATIONS		Boilers: water, steam, diathermic oil			
AMBIENT TEMPERATURE	°C	0 - 40			
COMBUSTION AIR TEMPERATURE	°C max	60			
ELECTRICAL SUPPLY	V Hz	230 ~ +/- 10% 50 - single-phase			
ELECTRIC MOTOR	rpm W V A	2800 250 220 - 240 2,1		2800 420 220 - 240 2,9	
MOTOR CAPACITOR	µF/V	8/450		12,5/450	
IGNITION TRASFORMER	V1 - V2 I1 - I2	230 V - 1 x 8 kV 1 A - 20 mA			
ELECTRICAL POWER CONSUMPTION	W max	370		600	
ELECTRICAL PROTECTION		IP 44			
IN CONFORMITY WITH EEC DIRECTIVES		90/396 - 89/336 - 73/23 - 92/42			
NOISE LEVELS ⁽³⁾	dBA	70		72	
APPROVAL	CE	0063AP6680			

(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 chamber, 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	Blast tube length mm
RS 28	216 351
RS 38	216 351

GAS CATEGORY

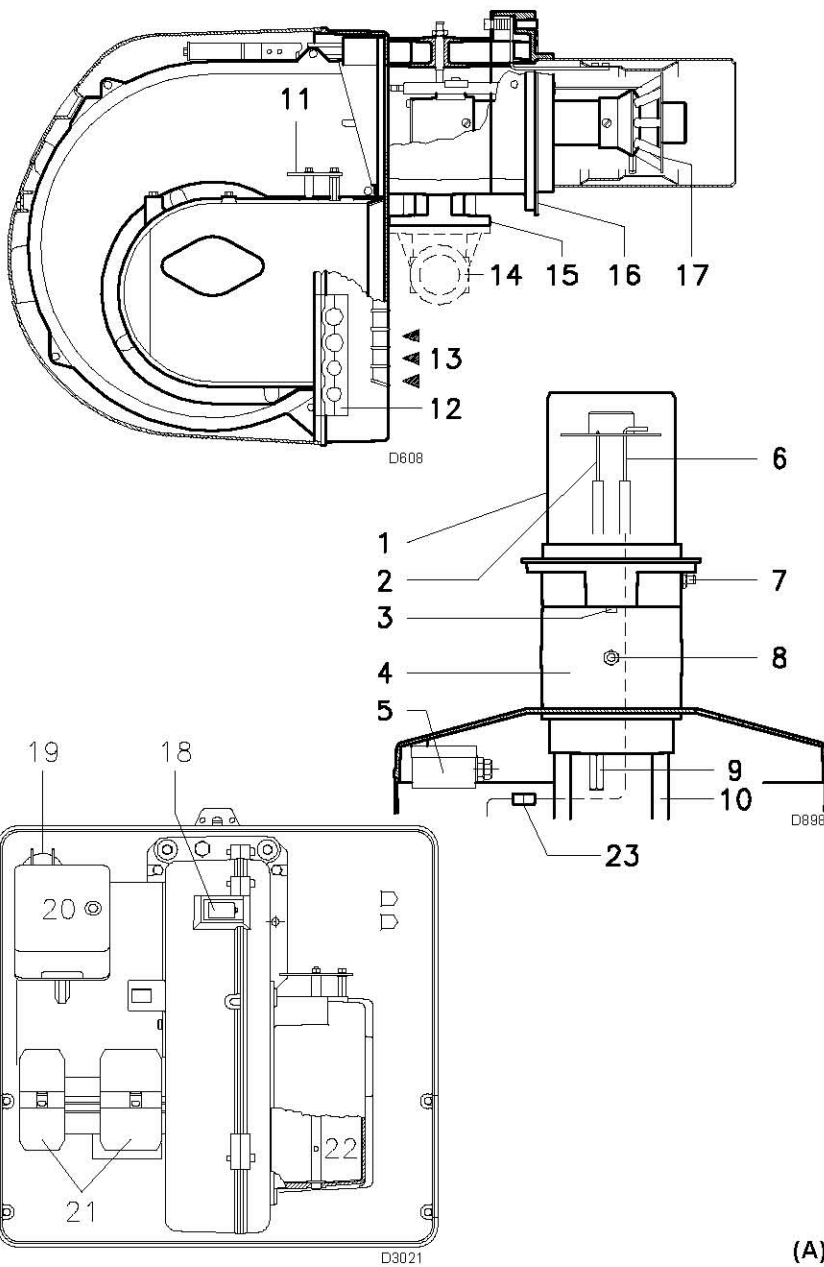
COUNTRY	CATEGORY
IT - AT - GR - DK - FI - SE	II ₂ H3B / P
ES - GB - IE - PT	II ₂ H3P
NL	II ₂ L3B / P
FR	II ₂ Er3P
DE	II ₂ ELL3B / P
BE	I ₂ E(R)B, I ₃ P
LU	II ₂ E 3B/P

ACCESSORIES (optional):

- **GROUND FAULT INTERRUPTER:** code 3010321
- **STATUS** (see page 19): 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 foreseen in the present manual.



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 Screw securing fan to sleeve
- 10 Slide bars for opening the burner and inspecting the combustion head
- 11 Indexed selector.
Opens the fan gate to the value needed by the burner delivery.
- 12 Plate with four hole knock-outs for electrical cable routing
- 13 Air inlet to fan
- 14 Gas input pipework
- 15 Gas train connection flange
- 16 Boiler mounting flange
- 17 Flame stability disk
- 18 Flame inspection window
- 19 Motor capacitor
- 20 Control box with lock-out pilot light and lock-out reset button
- 21 Plugs for electrical connections
- 22 Air gate valve
- 23 Plug-socket on ionisation probe cable

Note

If the control box 20(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.

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).

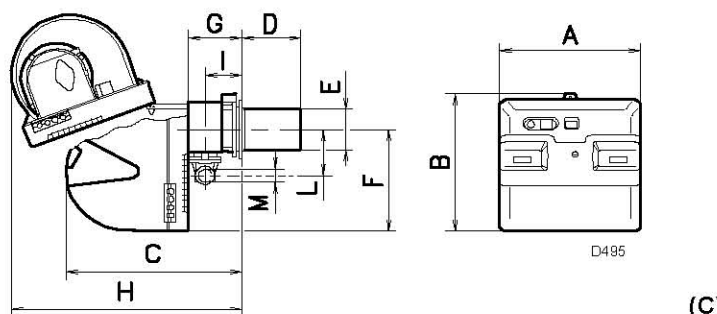
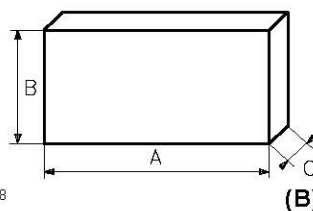
Note that if you need to examine the combustion head, the burner must be pulled backward on the slide bars and turned upward.

The maximum dimension of the burner, without the cover, when open is given 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
- 4 - Fairleads for electrical connections
- 1 - Instruction booklet
- 1 - Spare parts list

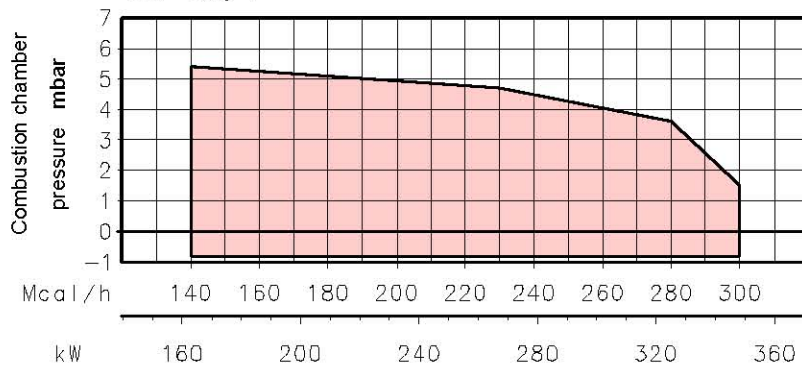
mm	A	B	C	kg
RS 28 /1	1010	625	495	37
RS 38 /1	1010	625	495	39



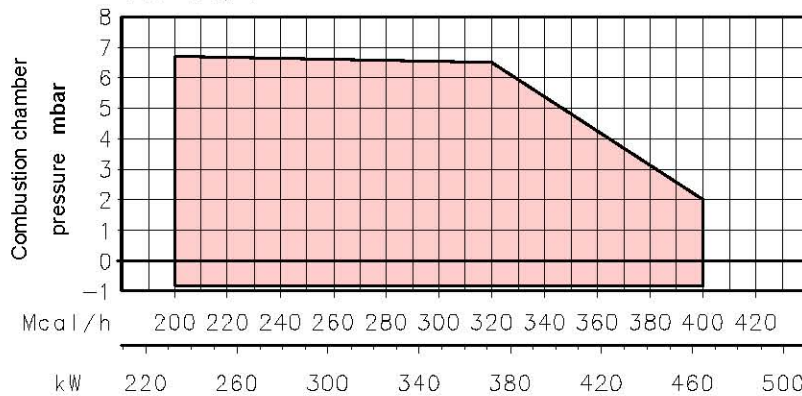
mm	A	B	C	D (1)	E	F	G	H	I	L	M
RS 28 /1	476	474	580	216 - 351	140	352	164	810	108	168	1"1/2
RS 38 /1	476	474	580	216 - 351	140	352	164	810	108	168	1"1/2

(1) Blast tube: short-lang

RS 28/1

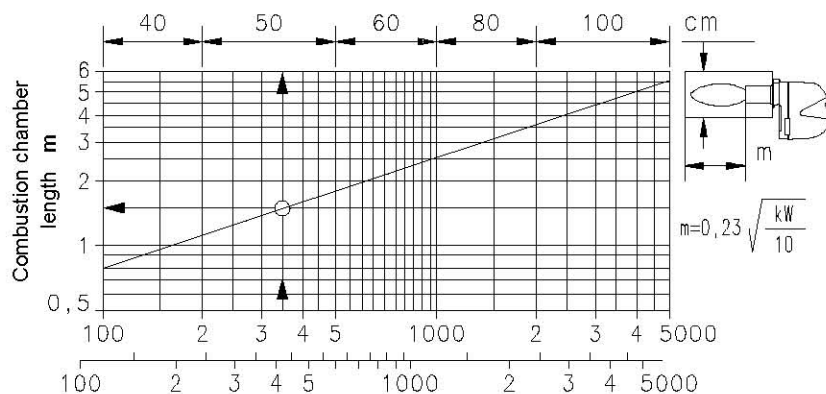


RS 38/1



(A)

D610



(B)

D497

FIRING RATES (A)

The burner delivery must be selected within the area of the adjacent diagram.

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-approved and/or its combustion chamber dimensions are clearly smaller than those indicated in diagram (B), consult the manufacturer.

RS 28 /1

ȳp (mbar)

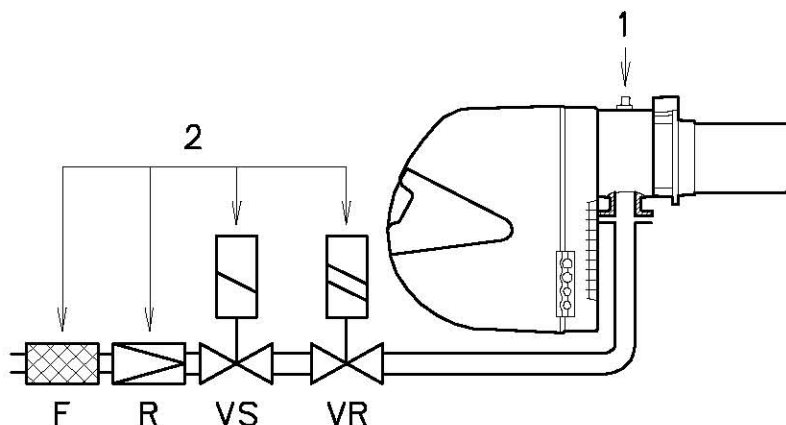
kW	1	2				
		Ø 3/4 3970046 3970076	Ø 1" 3970077 3970079	Ø 1" 1/4 3970144 3970152	Ø 1" 1/2 3970145 3970153	Ø 1" 1/2 3970180 3970183
165	2,5	11,1	5,3	3,2	-	-
185	3,1	13,4	6,4	3,8	-	-
210	4,0	16,5	7,9	4,7	-	-
235	4,7	19,9	9,5	5,6	-	-
260	5,5	23,6	11,2	6,6	-	-
285	6,3	27,5	13,1	7,6	5,2	4,4
310	7,0	31,6	15,0	8,7	6,0	4,7
325	7,5	34,2	16,2	9,4	6,5	4,9
349	8,7	38,5	18,2	10,6	7,3	5,6

RS 38 /1

ȳp (mbar)

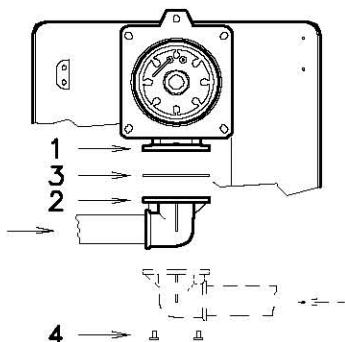
kW	1	2					
		Ø 1" 3970077 3970079	Ø 1" 1/4 3970144 3970152	Ø 1" 1/2 3970145 3970153	Ø 1" 1/2 3970180 3970183	Ø 2" 3970146 3970160 3970154 3970166	Ø 2" 3970181 3970182 3970184 3970185
230	2,6	9,2	5,4	-	-	-	-
260	3,1	11,2	6,6	-	-	-	-
290	3,7	13,4	7,9	5,3	4,4	-	-
320	4,3	15,8	9,2	6,3	4,8	-	-
350	4,8	18,3	10,6	7,4	5,9	-	-
380	5,4	20,9	12,1	8,5	6,6	-	-
410	6,0	23,7	13,7	9,8	7,0	-	-
440	6,6	26,6	15,3	11,0	8,1	-	-
465	7,2	29,3	16,9	12,2	8,5	4,8	5,2

(A)



(B)

D900



(C)

D505

GAS PRESSURE

The adjacent tables show minimum pressure losses along the gas supply line depending on the burner output.

Column 1

Pressure loss at combustion head.

Gas pressure measured at test point 1)(B), with:

- Combustion chamber at 0 mbar
- Gas ring 2)(B)p.7 adjusted as indicated in diagram (C)p.7.

Column 2

Pressure loss of gas train 2)(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/Nm³ (8.6 Mcal/Nm³).

With:

- natural gas G25 PCI 8.6 kWh/Nm³ (7.4 Mcal/Nm³) multiply tabulated values by 1.3.
- LPG: see page 16.

Calculate the approximate 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 28/1:

- Natural gas G20 PCI 10 kWh/Nm³
- 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
An output of 210 kW shown in Table RS 28/1 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:

- 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 28/1:

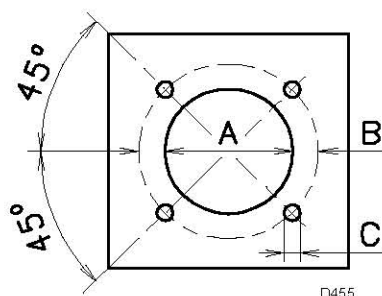
- Required burner output: 210 kW
- Natural gas G20 PCI 10 kWh/Nm³
- Gas ring 2)(B)p.7 adjusted as diagram (C)p.7.
- Gas pressure at burner output of 210 kW, taken from table RS 28/1, column 1 = 4 mbar
- Pressure in combustion chamber = 2 mbar

4 + 2 = 6 mbar
pressure required at test point 1)(B).

GAS LINE

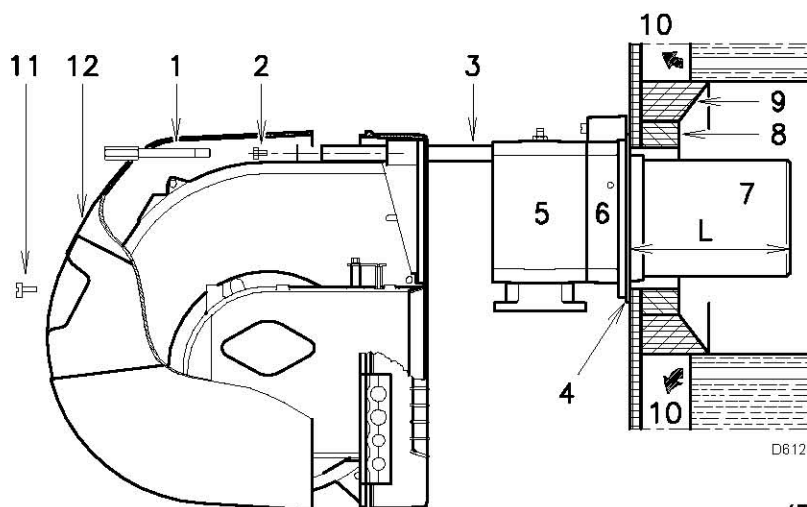
- The gas train must be connected to the gas attachment 1)(C), using flange 2), gasket 3) and screws 4) supplied with the burner.
- The gas train can enter the burner from the right or left side, depending on which is the most convenient, see fig.(C).
- Gas solenoids 8)-9)(B) must be as close as possible 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.

mm	A	B	C
RS 28 /1	160	224	M 8
RS 38 /1	160	224	M 8



D455

(A)

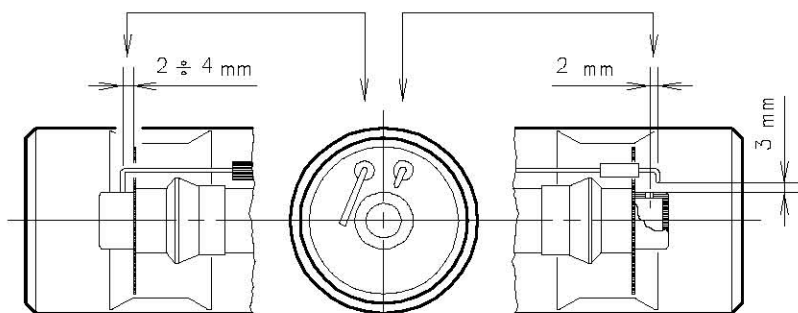


D612

(B)

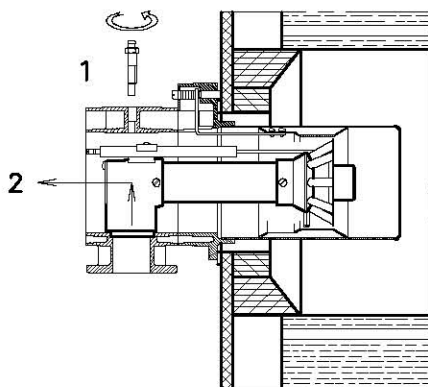
PROBE

ELECTRODE



D613

(C)



D501

(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 7):	RS 28/1	RS 38/1
• short	216	216
• long	351	351

For boilers with front flue passes 10) or flame inversion chambers, protective fettling in refractory material 8) must be inserted between the boiler fettling 9) and the blast tube 7).

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

For boilers having a water-cooled front the refractory fettling 8)-9)(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 11) and withdraw the cover 12)
- 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.

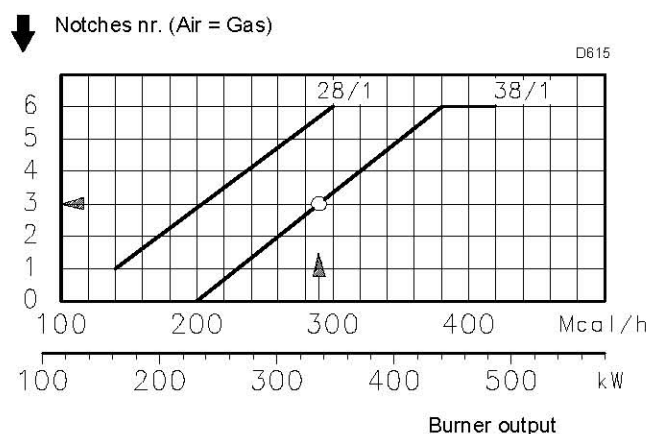
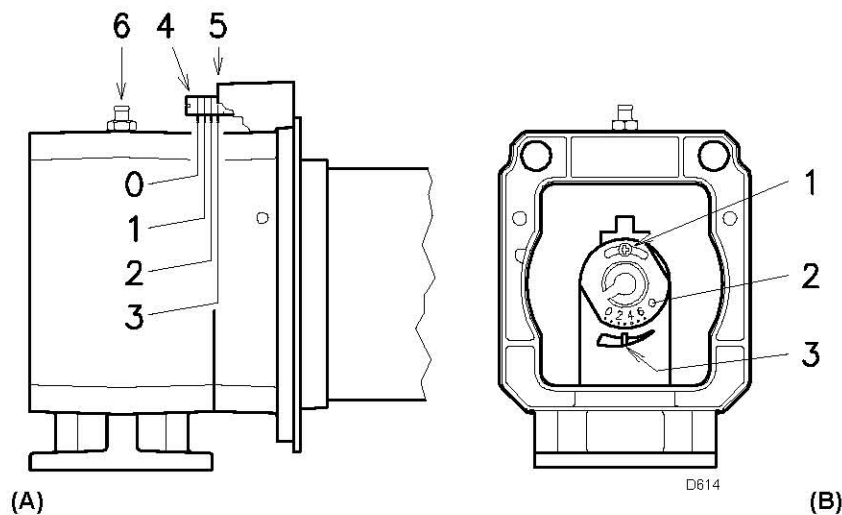
Disconnect the wires from the probe and the electrode and then pull the burner completely off the slide bars, after removing the split pin from the slide bar 3).

Secure the flange 6)(B) to the boiler plate, interposing the thermal insulating screen 4)(B) supplied with the burner. Use the 4 screws, also supplied with the unit, after first protecting the thread with an anti-locking product.

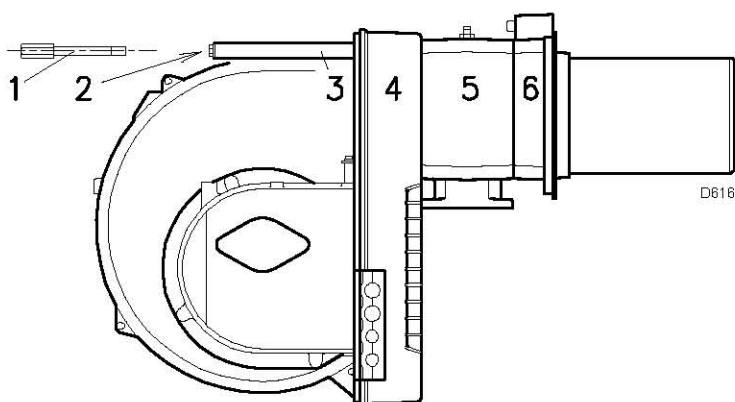
The seal between burner and boiler must be airtight.

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.



(C)



(D)

SETTING THE COMBUSTION HEAD

(With LPG operation see page 16).

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.

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 38/1:

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 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 38/1 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.

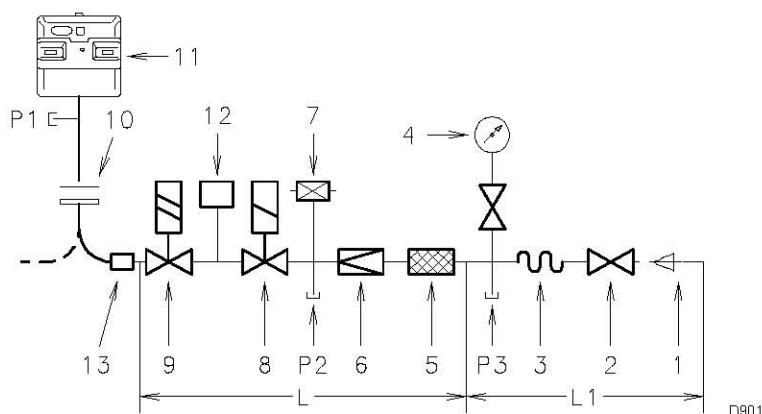
Once you have finished setting up the head, refit the burner 4)(D) to the slide bars 3) at approximately 100 mm from the sleeve 5) - burner positioned as shown in fig.(B)p.6 - insert the flame detection probe cable and the ignition electrode cable and then slide the burner up to the sleeve so that it 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).

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)

GAS BURNERS AND RELEVANT GAS TRAINS APPROVED ACCORDING TO EN 676

Gas train L			Burner		12	13
Ø	C.T.	Code	RS 28 /1	RS 38 /1	Code	Code
3/4"	-	3970046	•	-	3010123	3000824
1"	-	3970079	•	•	3010123	3000824
1" 1/4	-	3970152	•	•	3010123	-
1" 1/2	-	3970153	•	•	3010125	-
1" 1/2	-	3970183	•	•	3010125	-
2"	-	3970154	-	•	3010125	3000822
	♦	3970166	-	•	-	3000822
2"	-	3970184	-	•	3010125	3000822
	♦	3970185	-	•	-	3000822

(B)

GAS BURNERS AND RELEVANT GAS TRAINS APPROVED ACCORDING TO EN 676

Gas train L			Burner		12	13
Ø	C.T.	Code	RS 28 /1	RS 38 /1	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
	-	3970181	-	•	3010123	3000822
2"	♦	3970160	-	•	-	3000822
	♦	3970182	-	•	-	3000822

(C)

GAS TRAIN COMPONENTS L - TWO STAGE VERSION

Code	Components		
	Filter 5	Pressure governor 6	Solenoids 8 - 9
3970046		Multiblock MB ZRDLE 407	
3970079		Multiblock MB ZRDLE 410	
3970152		Multiblock MB ZRDLE 412	
3970153	GF 515/1	FRS 515	MVD 515/5 + ZRDLE 415/5
3970183		Multiblock MB ZRDLE 415	
3970154	GF 520/1	FRS 520	MVD 520/5 + ZRDLE 420/5
3970166			
3970184		Multiblock MB ZRDLE 420	
3970185			

(D)

GAS TRAIN COMPONENTS L - ONE STAGE VERSION

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

(E)

GAS TRAIN - Tables (D) - (E)

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

GAS LINE

The gas train in fig.(E) (safety valve + slow adjustment valve) may be used by limiting the ignition capacity according to standards, with the aid of the brake alone, as specified on page 12.

Use of this type of train is valid for

- RS 28/1: all the firing rate;
- RS 38/1: up to a capacity of 350 kW.

KEY (A)

- 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)
- Three adjustments:
 - ignition delivery (rapid opening)
 - 1st stage delivery VR1 (slow opening)
 - 2nd stage delivery VR2 (slow opening)
- 10 - Standard issue burner gasket with flange
- 11 - Burner
- 12 - 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.

- 13 - 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 (B) - (C)

L1 - The responsibility of the installer

KEY TO TABLE (B) - (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 12).
- ♦ = Gas train with assembled VPS valve leak detection control device.

12 = VPS valve leak detection control device. Supplied separately from gas train on request.

13 = Gas train/burner adaptor. Supplied separately from gas train on request.

Note

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

ELECTRICAL SYSTEM as set up by the manufacturer

LAYOUT (A)
Burner RS 28 /1

LAYOUT (B)
Burner RS 38 /1

Key to Layouts (A) - (B)

- C - Capacitor
- DA - Control box (Landis RMG)
- F1 - Protection against radio interference
- MV - Fan motor
- PA - Air pressure switch
- SO - Ionisation probe
- SP - Plug-socket
- TA - Ignition transformer
- TB - Burner ground
- XP1 - Connector for STATUS
- XP6 - 6 pole socket
- XP7 - 7 pole socket

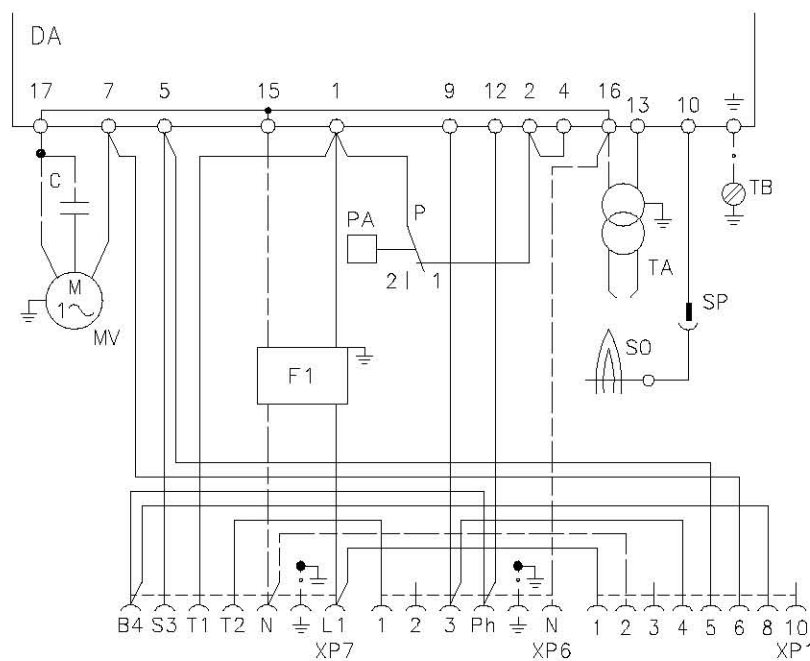
ATTENTION

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)

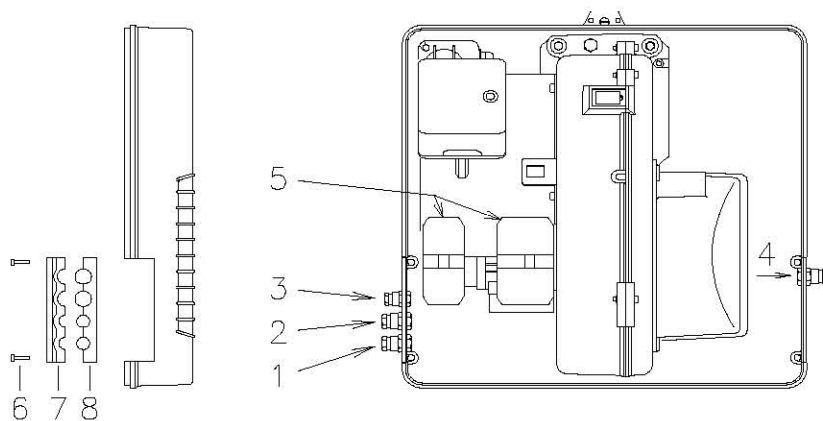
D3008

ELECTRICAL EQUIPMENT FACTORY-SET
RS 38 /1



(B)

D3009



(A)

D3022

RS 28 /1 - RS 38 /1 without leak detection control device

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 5)(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 6), then split the plate into its two parts 7) and 8) and remove the membrane press-outs from the holes.

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

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

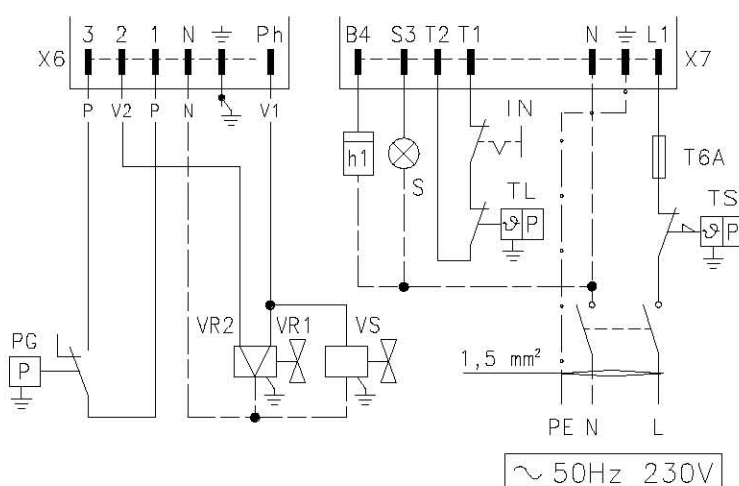
LAYOUT (B)

The RS 28/1 - RS 38/1 Models electrical connection without leak detection control device.

LAYOUT (C)

The RS 28/1 - RS 38/1 Models electrical connection with VPS leak detection control device.

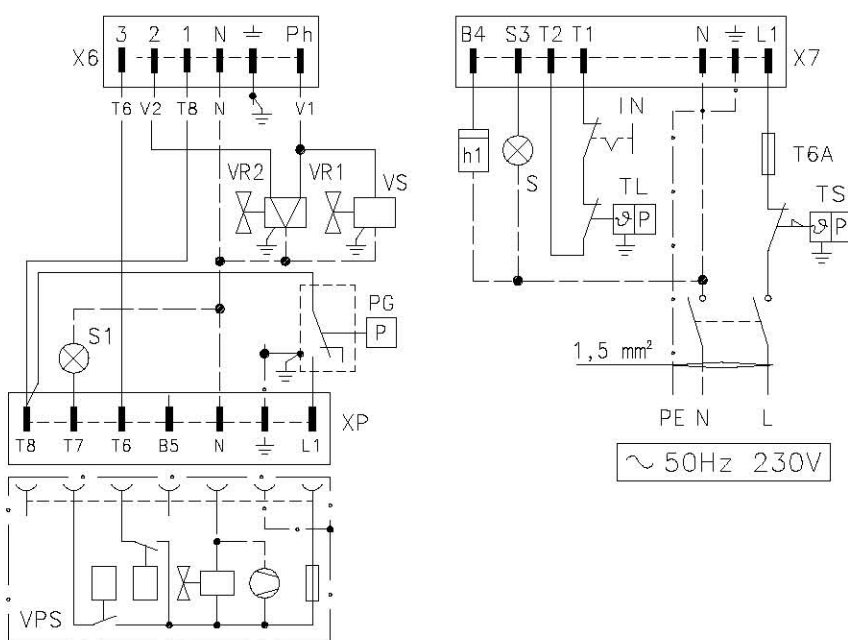
Gas valve leak detection control takes place immediately before every burner start-up.



(B)

D3010

RS 28 /1 - RS 38 /1 with leak detection control device VPS



(C)

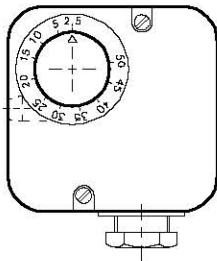
D3011

KEY TO LAYOUTS (B - C)

- h1 - Hourcounter
 IN - Burner manual stop switch
 PG - Min. gas pressure switch
 S - Remote lock-out signal
 S1 - Remote lock-out signal of leak detection control device
 TB - Burner ground
 TL - Load limit remote control system:
 shuts down the burner when the boiler temperature or pressure reaches the pre-set value.
 TS - Safety load control system:
 operates when TL is faulty
 VR1 - 1st adjustment valve
 VR2 - 2nd adjustment valve
 VS - Safety valve
 XP - Plug for leak detection control device
 X6 - 6 pole plug
 X7 - 7 pole plug

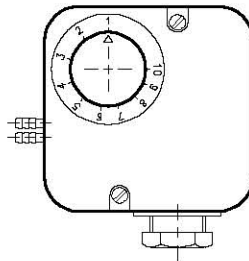
ATTENZIONE: Non invertire il neutro con la fase nella linea di alimentazione elettrica. L'eventuale inversione comporterebbe un arresto in blocco per mancata accensione.

MIN GAS PRESSURE SWITCH



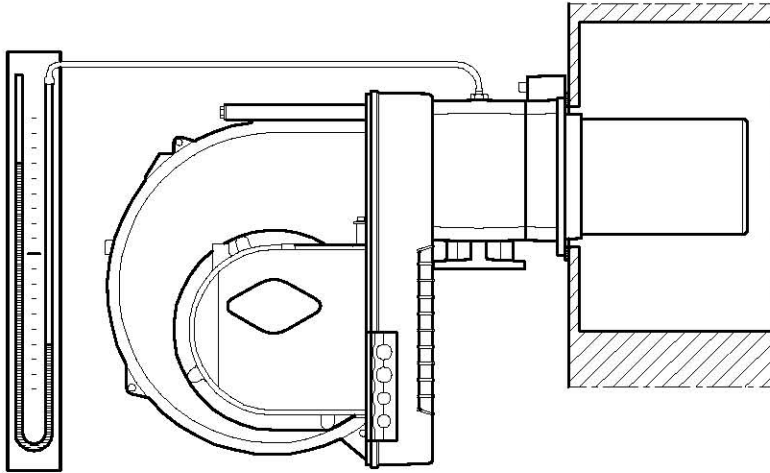
(A)

AIR PRESSURE SWITCH



(B)

D887



(C)

D623

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 burner power using the tables on page 5.
- Connect two lamps or testers to the two gas line solenoid valves 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.
- Fan air gate valve: leave at the factory setting.

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.

BURNER STARTING

Close the control devices.

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

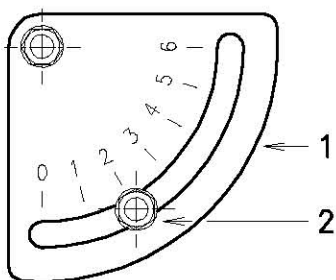
Having completed the checks indicated in the previous heading, the burner should fire. If the motor starts but the flame does not appear and the control box goes into lock-out, reset and wait for a new firing attempt.

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)

D593

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 - Maximum output of the burner
- 3 - Air pressure switch
- 4 - 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 23)(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:

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

Example for G 20 gas (10 kWh/Nm³):

Max. operation output: 600 kW corresponding to 60 Nm³/h.

After 10 firings with lock-outs, the delivery read on the meter must be equal to or lower than:

$$60 : 360 = 0,166 \text{ Nm}^3.$$

2 - MAXIMUM OUTPUT

The maximum output of the burner must be set within the firing rate range shown on page 4.

Adjusting gas delivery

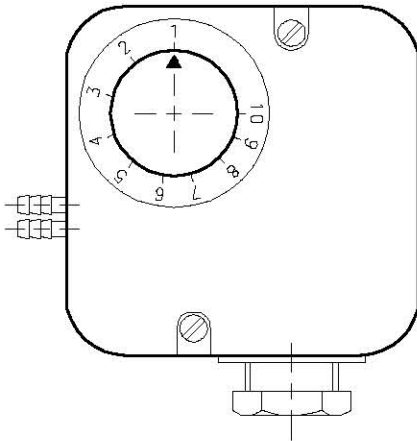
Measure the gas delivery at the meter.

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 11, 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 VR2.
- If delivery needs to be increased, increase outlet gas pressure.

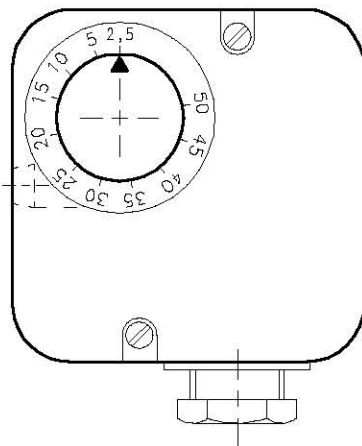
Adjusting air delivery

Adjust the fan air gate valve by using the indexed selector 1)(A) after having loosened the nut 2)(A).



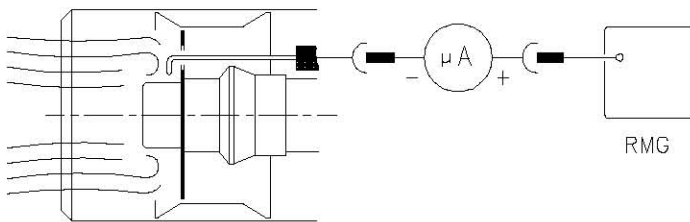
(A)

D521



(B)

D896



(C)

D3023

Note

Once you have finished adjusting maximum output, 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. Also the transition from 1st to 2nd stage operation must be smooth and without pulsations.

3 - 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, 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 differential 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.

4 - 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, 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)

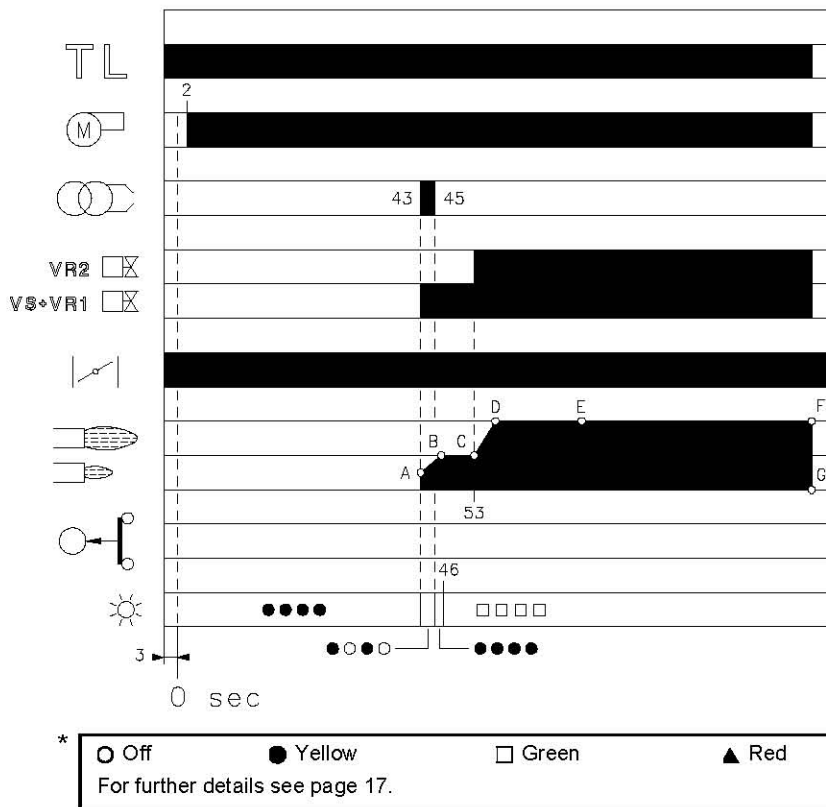
The burner is fitted with an ionisation system which ensures that a flame is present. The minimum current for plant operation is 5 μ A.

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 23)(A)p.3 on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 μ A.

Carefully check polarities!

NORMAL FIRING

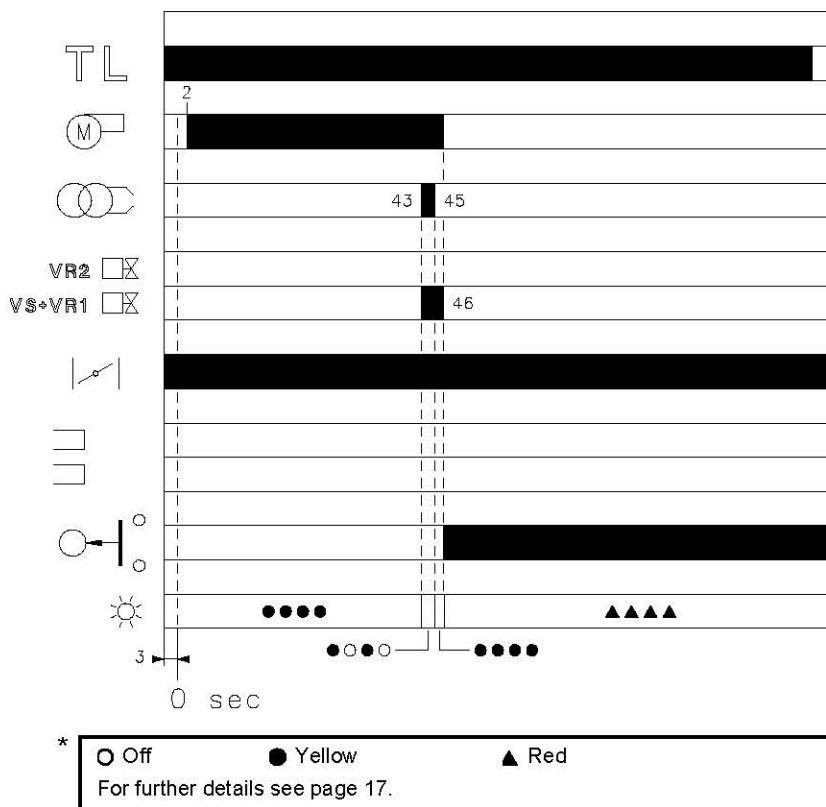
(n° = seconds from instant 0)



(A)

D3024

NO FIRING



(B)

D3025

BURNER OPERATION

BURNER STARTING (A)

- Control device TL closes. After about 3s:
- 0 s : The control box starting cycle begins.
- 2 s : Fan motor starts. The air gate valve is set on maximum adjustment output. The pre-purge stage follows.
- 43 s : Ignition electrode strikes a spark. Safety valve VS and the 1st stage VR1 of the adjustment valve VR open. The shutter of valve VR1 has a first rapid run that determines a low output ignition, point A, which is followed by a slow run. The output increases progressively up to a 1st stage value, section A-B.
- 45 s : The spark goes out.
- 53 s : The second stage VR2 of valve VR opens and the output passes slowly from the 1st stage to the maximum adjustment valve, section C-D.
- The control value box starting cycle ends.

STEADY STATE OPERATION (A)

At the end of the starting cycle, the control box continues to check that the flame is present and that the air pressure switch is in the correct position.

The burner continues to operate at constant output. If the temperature or pressure in the boiler continues to rise, and opens load control TL, the burner will stop, section F-G.

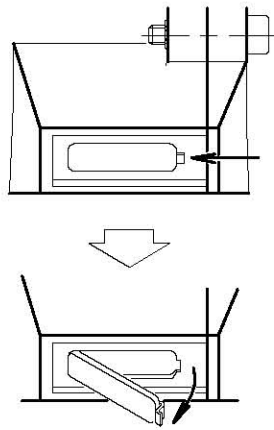
FIRING FAILURE (B)

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.

BURNER FLAME GOES OUT DURING OPERATION

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

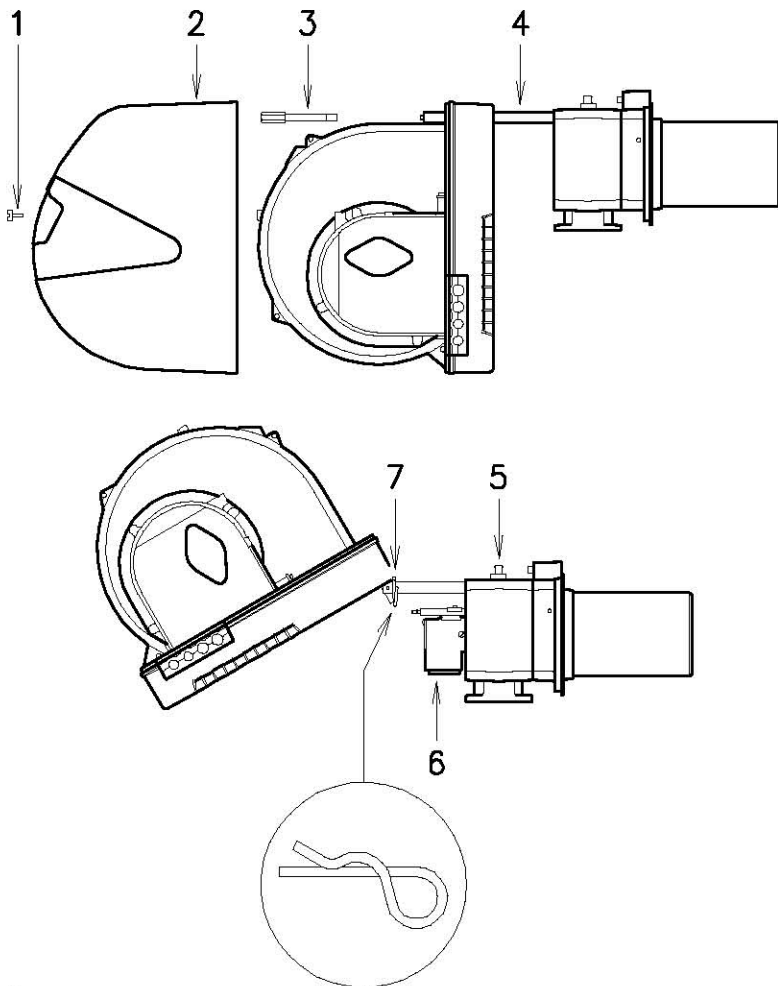
FLAME INSPECTION WINDOW



(A)

D484

OPENING THE BURNER



(B)

D634

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 6)(B).

Burner

Check that the graduated sector that controls the air gate valve is held securely by the nut 2)(A)p.12.

The tightness of the screws that fasten the cables to the burner terminal strip must also be checked.

Clean the outside of the burner.

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.

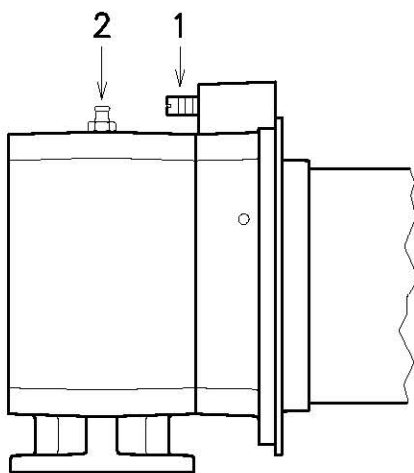
TO OPEN THE BURNER (B):

- switch off the electrical power.
- Remove screw 1) and withdraw cover 2).
- Remove screw 3), the split pin 7) 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.
- Turn the burner as shown in the figure and fit the split pin 7) into one of the slide bar holes so that the burner remains in position.

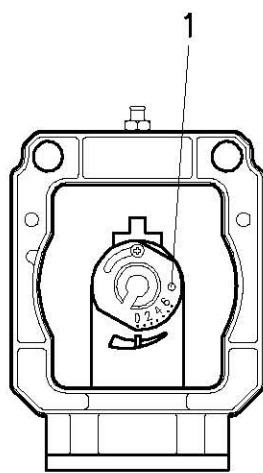
Now extract the gas distributor 6) after having removed the screw 5).

TO CLOSE THE BURNER (B):

- remove the split pin 7) 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 3), the split pin 7) and pull the probe and electrode leads gently out until they are slightly stretched.



(A)



(B)

D635

RS 28 /1 yp (mbar)

kW	1	2	
		Ø 3/4	Ø 1
165	1,2	4,5	-
185	1,7	5,5	-
210	2,2	6,7	-
235	2,7	8,1	-
260	3,2	9,6	-
285	3,8	11,3	-
310	4,3	13,0	-
325	4,7	14,0	-
349	5,3	15,7	-

RS 38 /1 yp (mbar)

kW	1	2	
		Ø 3/4	Ø 1
230	1,3	8,0	3,7
260	1,9	9,6	4,6
290	2,5	11,4	5,5
320	3,2	13,7	6,5
350	3,8	15,7	7,5
380	4,4	18,0	8,5
410	5,0	21,0	9,7
440	5,5	24,0	11,0
465	5,8	25,7	12,1

(C)

LPG OPERATION

The RS 28/1 and 38/1 Models burners can be operated on both natural gas and LPG.

FIRING RATE

It is the same as the one considered for natural gas, see page 8.

SETTING THE COMBUSTION HEAD

Adjusting air delivery

Adjust the screw 1)(A) as was done for natural gas, according to the burner output, see page 7.

Gas calibration

Adjust the ring 1)(B) always to the zero position, as shown in Fig.(B), whatever the burner output is.

GAS PRESSURE

The tables (C) show minimum load losses along the gas supply line in relation to the burner output.

Column 1

Combustion head load loss.

Gas pressure measured at test-point 1)(B), with the:

- Combustion chamber at 0 mbar
- Gas ring 1)(B) set to zero.

Column 2

Load loss of gas train 3)(B)p.10 includes: adjustment valve VR, safety valve VS (both fully open), pressure governor R, filter F.

The values shown in the tables (C) refer to:

LPG with PCI 27 kWh/Nm³ (23,2 Mcal/Nm³).

GAS TRAIN

Use the same gas train which is utilized for the natural gas, fig.(B)p.8, with the dimensions in tab. (C).

BURNER START-UP CYCLE DIAGNOSTICS

During start-up, indication is according to the following 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.

RED LED on wait at least 10s	Lock-out	Press reset for > 3s	Pulses	Interval 3s	Pulses
					

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

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.

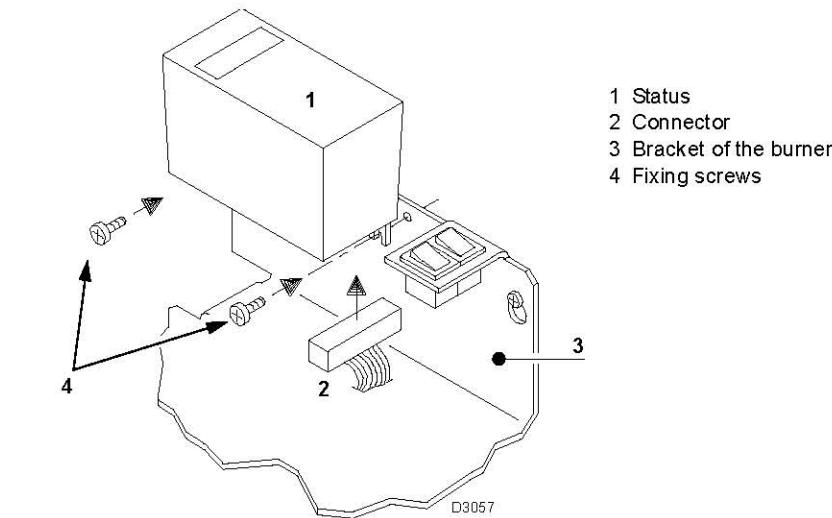
BUTTON PRESSED FOR	CONTROL BOX STATUS
Between 1 and 3 seconds	Control box reset without viewing visual diagnostics.
More than 3 seconds	Visual diagnostics of lock-out condition: (LED pulses at 1-second intervals).
More than 3 seconds starting from the visual diagnostics condition	Software diagnostics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

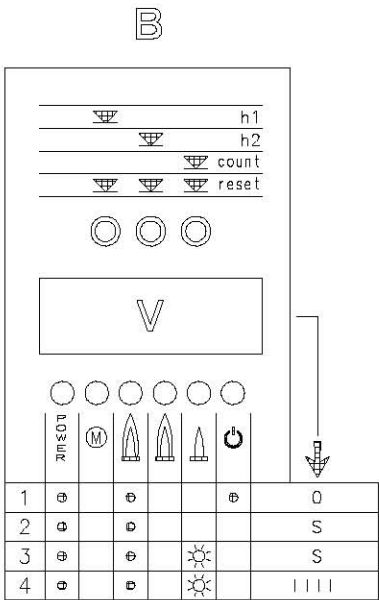
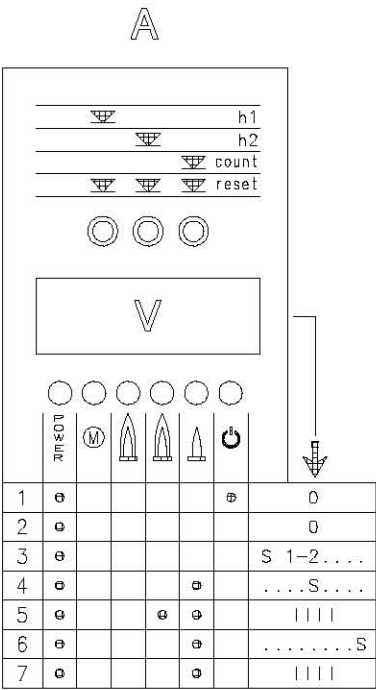
SIGNAL	FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
2 x blinks ● ●	After pre-purge and safety time, the burner goes to lock-out and the flame does not appear	1 - The solenoid VR1 allows little gas through Increase 2 - Solenoid valves VR1 or VS fail to open Renew the coil or rectifier panel 3 - Gas pressure too low Increase pressure at governor 4 - Ignition electrode wrongly adjusted. Adjust, see fig. (C)p. 6 5 - Electrode grounded due to broken insulation Replace 6 - High voltage cable defective Replace 7 - High voltage cable deformed by high temperature Replace and protect 8 - Ignition transformer defective Replace 9 - Erroneous valve or transformer electrical connections Check 10 - Control box defective Replace 11 - A cock down-line of the gas train is closed Open 12 - Air in pipework. Bleed air 13 - VS and VR gas valves unconnected or with interrupted coil 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 Adjust or replace 16 - Pressure switch pressure point pipe blocked Clean 17 - Head wrongly adjusted Adjust 18 - High negative draft in chamber Connect air pressure switch to fan suction inlet	
	Lock-out during pre-purging	19 - Defective capacitor Replace 20 - Defective electrical motor Replace	
4 x blinks ● ● ● ●	The burner starts and then locks out	21 - Flame simulation Replace control box	
	Lock out when burner stops	22 - Flame remains in combustion head Eliminate persistence of flame or flame simulation or flame simulation	
7 x blinks ● ● ● ● ● ● ●	The burner goes to lock-out right after flame appearance	23 - The solenoid VR1 allows little gas through Increase 24 - Ionisation probe wrongly adjusted. Adjust, see fig. (C)p. 6 25 - Insufficient ionisation (less than 5 µA). Check probe position 26 - Probe grounded Withdraw or replace cable 27 - Burner poorly grounded Check grounding 28 - Phase and neutral wires inverted Correct by intervening 29 - Defective control box. Replace	
	During operation, the burner stops in lock out	30 - Probe or ionisation cable grounded Replace worn parts 31 - Fault on air pressure switch Replace	
10 x blinks ● ● ● ● ● ● ● ●	The burner does not start and lock-out warning appears	32 - Erroneous electrical connections Check connections	
	The burner goes to lock-out	33 - Control box defective Replace	
No blink	The burner does not start	34 - No electrical power supply Close all switches - Check connections 35 - A limiter or safety control device is open. Adjust or replace 36 - Control box fuses blown Replace 37 - Control box lock-out Reset control box 38 - No gas supply. Open the manual valves between meter and train 39 - Mains gas pressure insufficient. Contact your GAS COMPANY 40 - Minimum gas pressure switch fails to close Adjust or replace	
	The burner repeats the starting cycle without lock out	41 - 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	42 - Poorly adjusted head Adjust, see p. 7 43 - Ignition electrode wrongly adjusted. Adjust, see fig. (C)p. 6 44 - Poorly adjusted fan air gate: too much air. Adjust 45 - Output during ignition phase is too high Reduce	

STATUS (optional)

Assembly



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



- ⊗ = Led flashing
- ⊗ = Led illuminated
- S = Time in seconds
- |||| = Burner start cycle terminated

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".

"h2" not used.

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 and operation
- 5 - 10 seconds after stage 4 the code |||| 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 and operation
- 6 - 30 seconds after stage 4:
seconds count stops on read-out V
- 7 - 10 seconds after stage 6 the code |||| 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 4 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 18 for interpretation of the numbers.

- 1 (22)
- 2 (15 + 21, 31)
- 3 (1 + 13, 30 + 31, 33)
- 4 (30 + 31)

Key to symbols:

- ⊗ POWER = Power on
- ⊗ M = Fan motor blocked (red)
- ⊗ ⊗ = Burner lock-out (red)
- ⊗ ⊗ = Not used
- ⊗ ⊗ = 1st stage operation
- ⊗ ⊗ = Load level reached (Stand-by),

D478 led: on

D3059