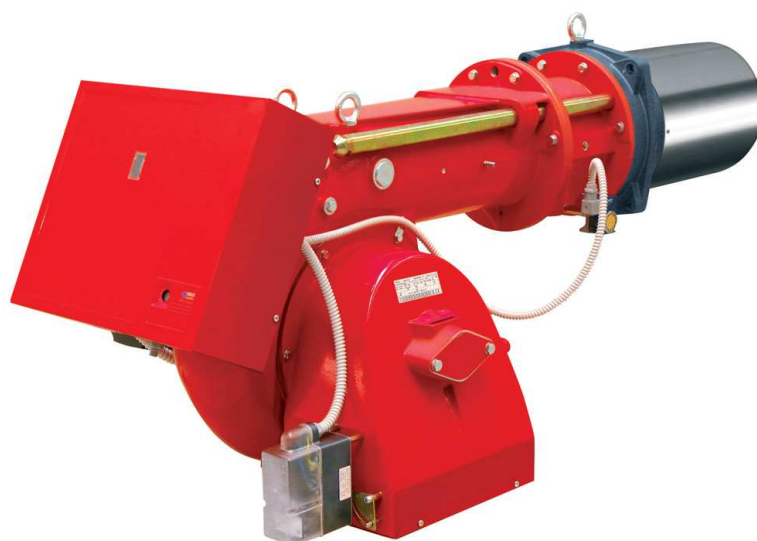


GB Forced draught gas burners

Two-stage operation



CODE	MODEL	TYPE
20014057	GAS 9/2	1114 T
20014058	GAS 9/2	1114 T

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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.6 = part 1 of figure A, page number 6.

INFORMATION ABOUT THE INSTRUCTION MANUAL

INTRODUCTION

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

DELIVERY OF THE SYSTEM AND THE INSTRUCTION MANUAL

- When the system is delivered, it is important that:
- The instruction manual is supplied to the user by the system manufacturer, with the recommendation to keep it in the room where the heat generator is to be installed.
 - The instruction manual shows:
 - the serial number of the burner;
-
- the address and telephone number of the nearest Assistance Centre;
-
.....
.....

- The system supplier carefully informs the user about:
 - the use of the system,
 - any further tests that may be necessary before the system is started up,
 - maintenance and the need to have the system checked at least once a year by the manufacturer or another specialised technician.
- To ensure a periodic check, **RIELLO** recommends the drawing up of a Maintenance Contract.

GUARANTEE AND RESPONSIBILITY

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



Failure to observe the information given in this manual, operating negligence, incorrect installation and the carrying out of non authorised modifications will result in the annulment by **RIELLO** of the guarantee that it supplies with the burner.

In particular, the rights to the guarantee and the responsibility will no longer be valid, in the event of damage to things or injury to people, if such damage/injury was due to any of the following causes:

- incorrect installation, start-up, use and maintenance of the burner;
- improper, incorrect or unreasonable use of the burner;
- intervention of unqualified personnel;
- carrying out of non authorised modifications on the equipment;
- use of the burner with safety devices that are faulty, incorrectly applied and/or not working;
- installation of untested supplementary components on the burner;
- powering of the burner with unsuitable fuels;
- faults in the fuel power supply system;
- use of the burner even following an error and/or an irregularity;
- repairs and/or overhauls incorrectly carried out;
- modification of the combustion chamber with inserts that prevent the regular development of the flame, as structurally established;
- insufficient and inappropriate surveillance and care of those burner components most subject to wear and tear;
- use of non-original **RIELLO** components, including spare parts, kits, accessories and optional;
- force majeure.

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

SAFETY AND PREVENTION

INTRODUCTION

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

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

It is a good idea to remember the following:

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

In particular:

it can be applied to boilers operating with water, steam, diathermic oil, and to other users expressly named by the manufacturer;

the type and pressure of the fuel, the voltage and frequency of the electrical power supply, the minimum and maximum deliveries for which the burner has been regulated, the pressurisation of the combustion chamber, the dimensions of the combustion chamber and the room temperature must all be within the values indicated in the instruction manual.

- Modification of the burner to alter its performance and destinations is not allowed.
- The burner must be used in exemplary technical safety conditions. Any disturbances that could compromise safety must be quickly eliminated.
- Opening or tampering with the burner components is not allowed, apart from the parts requiring maintenance.
- Only those parts envisaged by the manufacturer can be replaced.

PERSONNEL TRAINING

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

The user:

- undertakes to entrust the machine exclusively to suitably trained and qualified personnel;
- must take all the measures necessary to prevent unauthorised people gaining access to the machine;
- undertakes to inform his personnel in a suitable way about the application and observance of the safety instructions. With that aim, he undertakes to ensure that everyone knows the use and safety instructions for his own duties;
- must inform the manufacturer if faults or malfunctioning of the accident prevention systems are noticed, along with any presumed danger situation.
- Personnel must always use the personal protective equipment envisaged by legislation and follow the indications given in this manual.
- Personnel must follow all the danger and caution indications shown on the machine.
- Personnel must not carry out, on their own initiative, operations or interventions that are not within their province.
- Personnel are obliged to inform their superiors of every problem or dangerous situation that may arise.
- The assembly of parts of other makes, or any modifications, can alter the characteristics of the machine and hence compromise operating safety. The manufacturer therefore declines any and all responsibility for any damage that may be caused by the use of non-original parts.

TECHNICAL DATA

Model		GAS 9/2	
Output ⁽¹⁾	2nd stage	kW Mcal/h	1750 - 3200 1500 - 2752
	1st stage	kW Mcal/h	1000 - 1750 860 - 1500
Fuel		NATURAL GAS: G20 - G21 - G22 - G23 - G25	
		G20	G25
- Net calorific value	kWh/Nm ³ Mcal/Nm ³	10	8.6
		8.6	7.4
- Absolute density	kg/Nm ³	0.71	0.78
- Max delivery	Nm ³ /h	320	372
- Pressure at maximum delivery ⁽²⁾	mbar	14	20.3
Operation		<ul style="list-style-type: none"> • Intermittent (min. 1 stop in 24 hours) • Two-stage (high and low fire) and single-stage (on-off) 	
Standard applications		Boilers: water. steam. diathermic oil	
Ambient temperature	°C	0 - 40	
Combustion air temperature	°C max	60	
In conformity with EEC Directives		2006/95 - 2004/108 - 2006/42	

(1) Reference conditions: Ambient temperature 20 °C - Barometric pressure 1000 mbar - Altitude 100 m a.s.l.

(2) Pressure at test point 17)(A)p.5, with zero pressure in the combustion chamber, with open gas ring 2)(A)p.9 and maximum burner output.

ELECTRICAL DATA

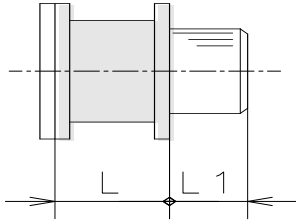
Model		GAS 9/2	
Electrical supply	V Hz	230 - 400 with neutral ~ +/-10% 50 - three-phase	
Electric motor IE2	rpm	2920	
	kW	9.2	
	V	230/400	
	A	29.1/16.8	
Ignition transformer	V1 - V2	230 V - 1 x 8 kV	
	I1 - I2	1.8 A - 30 mA	
Electrical power consumption	kW max	12	
Electrical protection		IP 40	

Model		GAS 9/2	
Electrical supply	V Hz	230 - 400 with neutral ~ +/-10% 50 - three-phase	
Electric motor IE3	rpm	2920	
	kW	9.2	
	V	230/400	
	A	28.6/16.5	
Ignition transformer	V1 - V2	230 V - 1 x 8 kV	
	I1 - I2	1.8 A - 30 mA	
Electrical power consumption	kW max	10.6	
Electrical protection		IP 40	



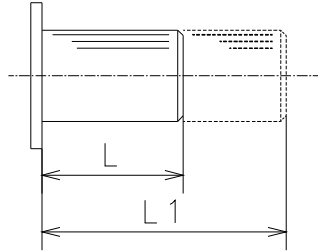
The installer is responsible for the addition of any safety device not included in the present manual.

L=130 L1 = 314 mm



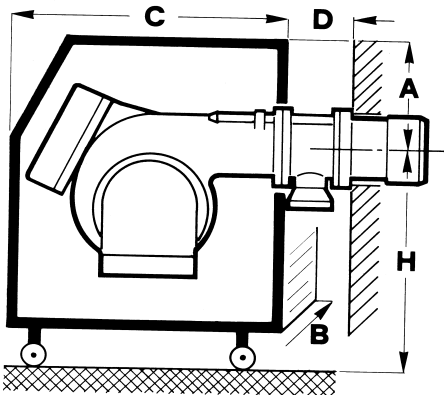
(A) D91

Code 3000876 L = 444 mm C1
 Code 3010028 L1 = 574 mm C2



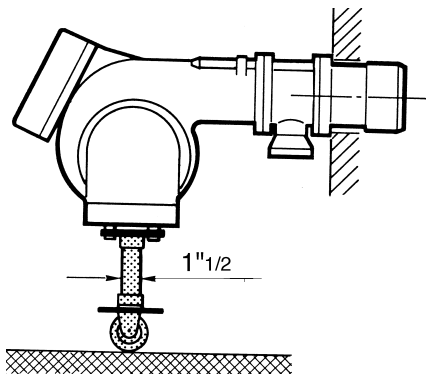
(B) D90

Code 3000781 D1



mm	A	B	C	H		kg
				MIN	MAX	
D1	350	1210	1170	1150	1820	198

(C) D39



(D) D40

ACCESSORIES (optional)

SPACER FOR SHORTENING THE COMBUSTION HEAD (A) Code 3000723

L = Spacer thickness
 L1 = Resulting blast tube length

KIT FOR LPG OPERATION (B)

This kit must be fitted whenever the burner is to be operated on LPG.
 L = kit for standard length head
 L1 = kit for head lengthened with (A)

SOUNDPROOFING (C)

The sound damping casing significantly reduces the noise generated by the burner (-14/18 dBA). The casing is in steel and sound-damping material and fully encloses the burner. The casing is wheel-mounted so that it can be easily removed for burner inspection.

KIT FOR CONTINUOUS VENTILATION

Code 3010030
 The kit comprises a small three-way solenoid to be installed between the air pressure switch 6)(A)p.5 and the fan. It allows the burner to fire again after it has remained under continuous ventilation following flame cut-out.

KIT FOR TOWN GAS OPERATION

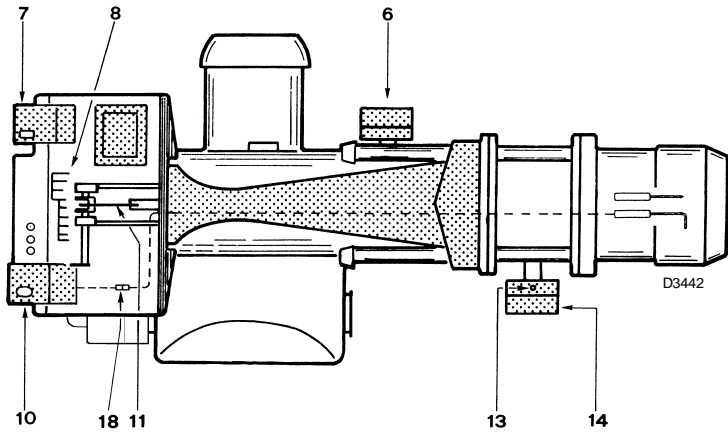
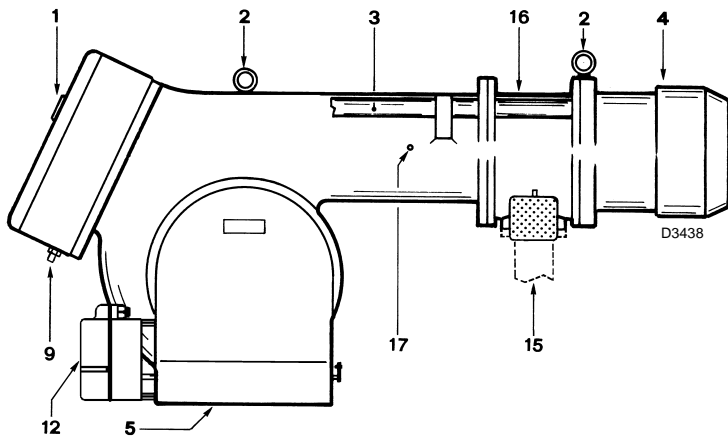
Code 3010298
 This kit must be fitted whenever the the burner is to be operated on town gas. Code is suitable for the both standard and extended head.

UV CELL KIT Code 3010359

SUPPORT (D) Code 3000731
 The support should be fitted to burner with a long head (574). It is designed to bear the wight of the burner during head inspection. For burner wiht a short head, the support is not essential although useful. The 1" 1/2 pipe of the support should be prepared by the installer to a lenght appropriate to that of the system. The base is fitted with a wheels.

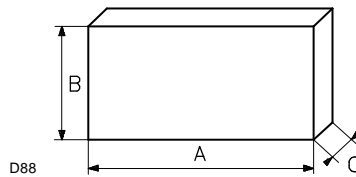
RADIO DISTURBANCE PROTECTION KIT

Code 3010386
 If the burner is installed in places particularly subject to radio disturbance (emission of signals exceeding 10 V/m) owing to the presence of an INVERTER, or in applications where the length of the thermostat connections exceeds 20 metres, a protection kit is available as an interface between the control box and the burner.

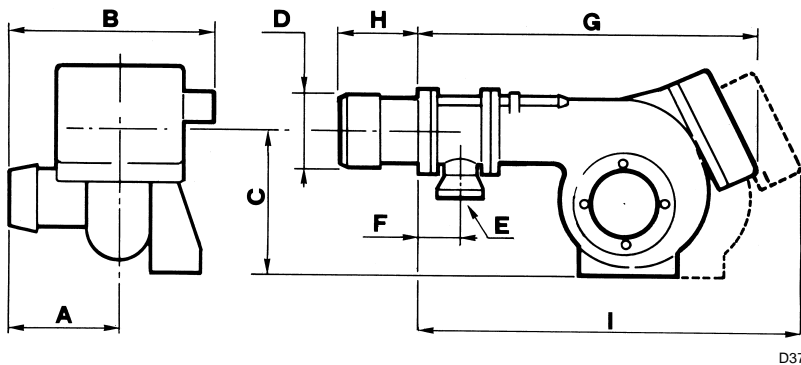


(A)

mm	A	B	C	kg
GAS 9/2	2040	1130	1180	230



(B)



mm	A	B	C	D	E	F	G	H	I	L
GAS 9/2	445	330	495	295	Rp2	225	168	444-574	1627	1200

(C)

BURNER DESCRIPTION (A)

- 1 Flame viewer
- 2 Lifting rings
- 3 Slide bars for opening the burner and inspecting the combustion head (see note)
- 4 Combustion head (two lengths)
- 5 Air gate valve
- 6 Air pressure switch
- 7 Motor contact-maker and thermal relay (GAS 8-9 direct starting)
- 8 Terminal strip
- 9 Fair lead (standard equipment) (Installer-set electrical equipment)
- 10 Control box with lock out pilot light and lock out reset button
- 11 Combustion head drive rod
- 12 Air control servomotor
- 13 Gas pressure test point to sleeve
- 14 MAX gas pressure switch
- 15 (Gas input pipework)
- 16 Sleeve
- 17 Fan pressure test point
- 18 Plug-socket on ionisation probe cable

PACKAGING-WEIGHT (B)

(Approximate measurements)

- The burners are shipped in cardboard boxes with the maximum dimensions shown in Table (B). The burner stands on a wooden base which may be lifted by fork-lifts.
- The weight of the burner complete with packaging is indicated in Table (B).

Checking the consignment



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



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

MAX. DIMENSIONS (C)

(Approximate measurements)

The maximum dimensions of the burner are given in (C).

Bear in mind that inspection of the combustion head requires the burner to be opened by withdrawing the rear part on the slide bars.

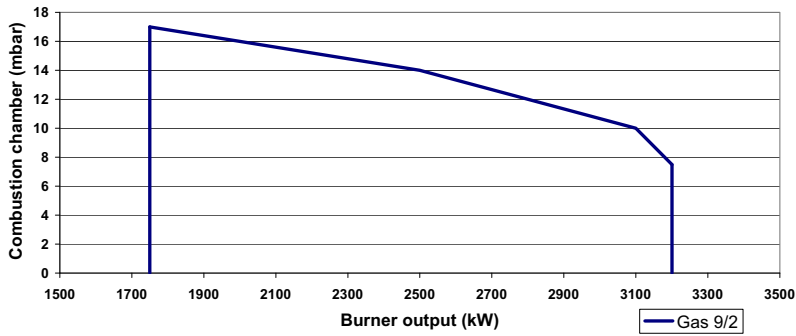
The maximum dimensions of the burner when open are given by measurement I.

STANDARD EQUIPMENT

- 1 Gas train flange
- 1 Flange gasket
- 8 Screws
- 1 Heat shield
- 1 Instruction booklet
- 1 Spare parts list
- 2 Extensions (only for long head version)

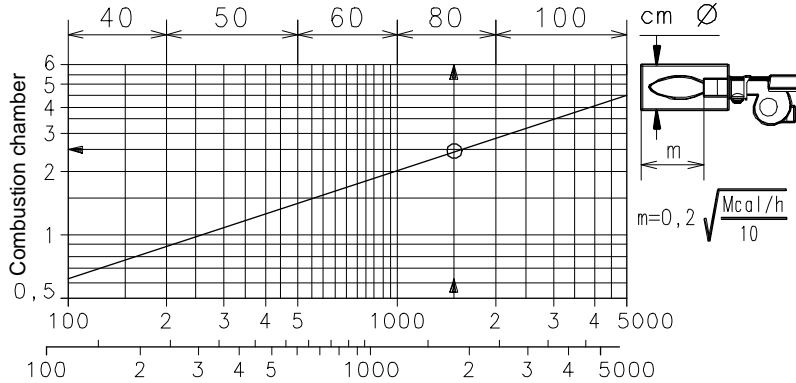


Before opening long-headed burner (574), fit the two extensions supplied as standard equipment with the system on slide bars 3)(A) and support the burner on the wheel-mounted stand supplied as an extra unit, fig.(G)p.4, or other suitable means.



(A)

S8056



(B)

D44

FIRING RATES (A)

During operation, burner output varies between:

- **MINIMUM OUTPUT** in stage 1 and
- **MAXIMUM OUTPUT** in stage 2.
- **MINIMUM OUTPUT (MIN)** is selected from the range of values given on technical data chart.
- **MAXIMUM OUTPUT (MAX)** is selected from the range given in the graphs to the side. This range is referred to as the **FIRING RATES** and provides maximum burner output as a function of combustion chamber pressure. The operating point is given by plotting a vertical from the required output and a horizontal from the corresponding combustion chamber pressure. The crossing point between the two lines gives the operating point, which must lie within the **FIRING RATES**.

Example:

for GAS 9/2 the range is defined by:

- the 1750 - 3200 kW output axis
- the 0 + 17 mbar comb. chamber pressure axis
- the maximum pressure in comb. chamber curve.

If the burner generates an output of 2500 kW at a combustion chamber pressure of 14 mbar, the operating point is found on the maximum pressure curve. This curve incorporates margins of safety and therefore the entire **FIRING RATE** range may be used.



- The firing rates have been obtained at an ambient temperature of 20°C and a barometric pressure of 1000 mbar.
- Burner output should be adapted to boiler output in the **MAX** set range, i.e. within the firing rates.
- The burner can also operate when there is a negative pressure in the combustion chamber.

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 the diagram (B).

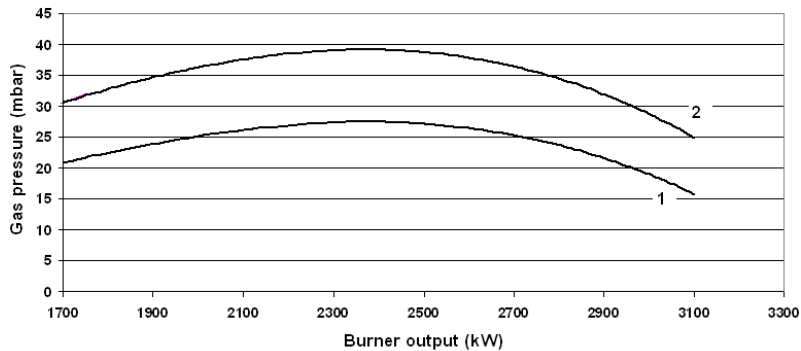
If the burner must be combined with a commercial boiler that has not been CE type-approved and/or its combustion chamber dimensions are clearly smaller than those indicated in the diagram (B), consult the manufacturer.

TEST BOILER (B)

The firing rates were set in relation to special test boilers, according to regulation EN 676.

Figure (B) indicates the diameter and length of the test combustion chamber.

Example: output 1500 Mcal/hour:
diameter = 80 cm; length = 2.5 m.



(A)

S8057

GAS PRESSURE

Curves (to side) show gas pressure as a function of the output generated by the burner in stage 2. They represent the drop in pressure of the combustion head.

The curve:

- 1 = Natural gas 420 PCI 10kWh/Nm³ -8,60Mcal/Nm³
absolute density -0,71kg/Nm³
- 2 = Natural gas 425 PCI 8,1kWh/Nm³-7,40Mcal/Nm³
absolute density -0,78kg/Nm³

Curves were calculated under the following conditions:

- Pressure measured at test point 13)(A)p.5
- Combustion chamber at 0 mbar
- Combustion head set as on page 9.
- Burner operating in stage 2

If the approximate output at which the burner is operating in stage 2 must be known, record the type of gas which was used, its pressure at test point 13)(A)p.5 and the pressure in the combustion chamber and then proceed as follows: subtract combustion chamber pressure from gas pressure and then refer to the graph corresponding to the burner being considered.

Example:

- Burner GAS 9/2
- Natural gas PCI 10 kWh/Nm³ (curve 1)
- Gas pressure at test point 13)(A)p.5 = 24 mbar
- Pressure in combustion chamber = 2 mbar

$$24 - 2 = 22 \text{ mbar}$$

in the GAS 9/2 graph, this corresponds to an output in stage 2 of 1750 kW.

This reading is an initial approximation.

The effective delivery is be read at the meter.

If instead the gas pressure required at test point 13)(A)p.5 must be known, set the output at which the burner is to operate in stage 2, record the type of gas used and the chamber pressure and then proceed as follows:

add the pressure in the combustion chamber to the pressure indicated in graph (to side); both pressures correspond to burner output in stage 2.

Example:

- Burner GAS 9/2
- Output required in stage 2: 2500 kW
- Natural gas PCI 10 kWh/Nm³ (curve 1).
- Gas pressure at output of 2500 kW,
- From GAS 9/2 graph = 26,2 mbar
- Pressure in combustion chamber = 2 mbar

$$26,2 + 2 = 28,2 \text{ mbar}$$

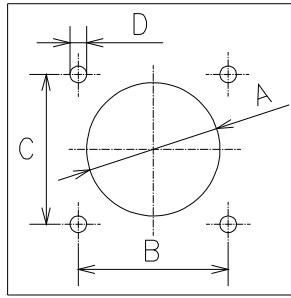
is the pressure required at test point 13)(A)p.5



WARNING

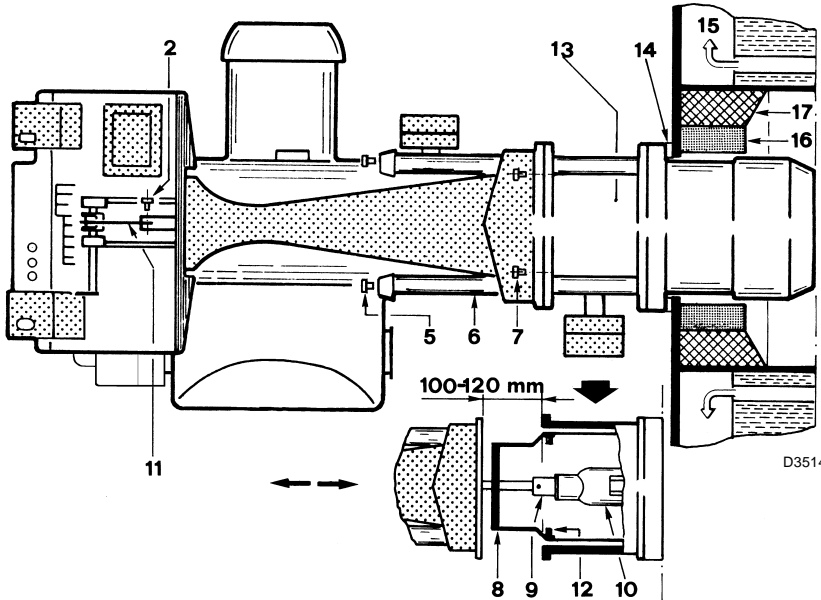
If the gas mains does not permit the pressure indicated in the graphs, open ring nut 2)(B)p. 9 by a further 1-2 notches.

mm	A	B	C	D
GAS 9/2	300	260	260	M18

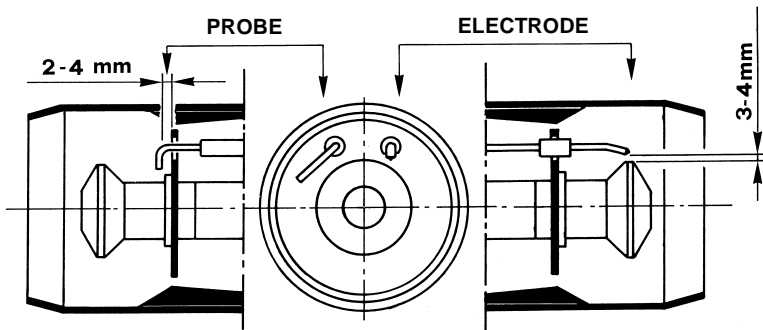


D46

(A)



(B)



(C)

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 should be selected in relation to indications provided by the boiler manufacturer and, in any case, should be greater than the thickness of the boiler door complete with refractory material.

Three different blast tube lengths are available:

Blast tube L mm	9/2
Shortened	314
Standard	444
Lengthened	574

For boilers with front flue passes as shown in 15) or a flame inversion chamber, the space between the front plate quartz 17) and the burner blast tube, must be properly sealed with appropriate refractory material 16).

Afterwards, it must still be possible to pull out the blast tube.

SECURING THE BURNER TO THE BOILER (B)

- Detach the combustion head, as follows:
 - remove screws 5)(B) from the two slide bars 6);
 - detach head drive rod 11) by removing pin 2);
 - remove screws 7), which secure the fan housing to the combustion head;
 - withdraw the burner by about 100-120 mm;
 - detach drive fork 8) by removing screws 12);
 - at this stage, slide the burner fully out from slide bars 6);
- Before securing the combustion head to the boiler, make sure the probe and the electrode are correctly positioned, as shown in (C). If positioning is incorrect, disassemble elbow 10) from sleeve 13).



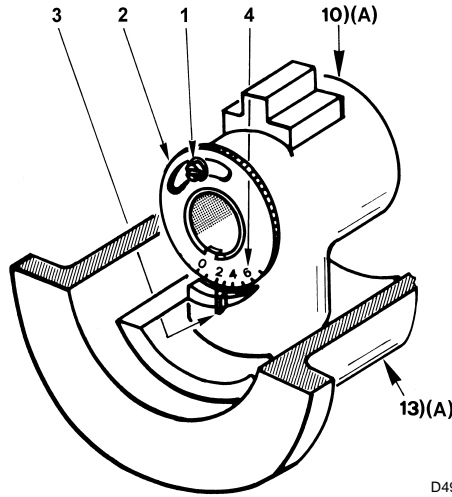
Do not rotate the probe but leave it in position as shown in (C); positioning the probe near the firing electrode could damage the control box amplifier.

- Secure the blast tube to the boiler plate, installing the burner heat shield 14) supplied as standard equipment. To do this, use the four standard-issue screws, having first protected the threads with an anti-grip product. The burner-boiler installation must be hermetically sealed.
- Adjust the combustion head as described below.
- Mount the fan housing on to slide bars 6).
- Leave the burner open by about 100-120 mm.
- Refit fork 8) securing it with screws 12).
- Close the burner.
- Tighten screws 7) which secure the fan housing to the combustion head.
- Fit stops to slide bars 6) with screws 5).



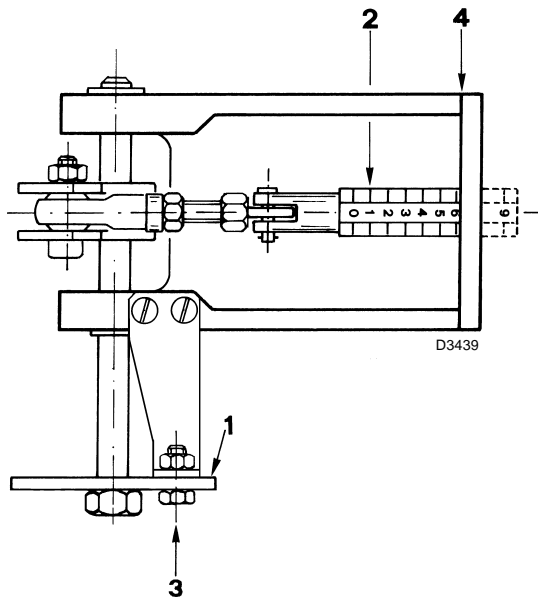
When fitting the burner on the two slide bars, it is advisable to gently draw out the high tension cable and flame detection probe cable until they are slightly stretched.

SETTING THE COMBUSTION HEAD



(A)

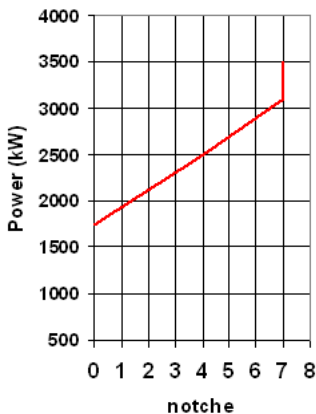
D49



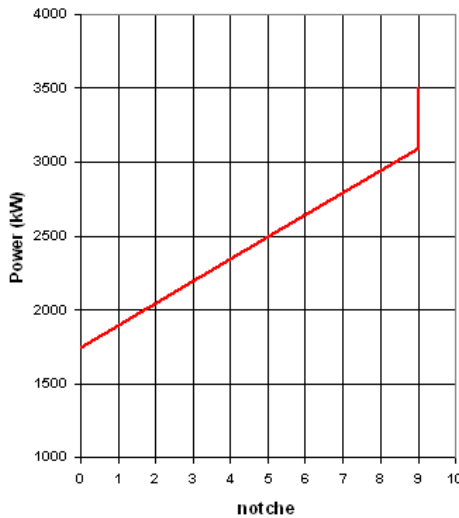
(B)

D3439

GAS



AIR



(C)

S8058

SETTING THE COMBUSTION HEAD

Combustion head adjustment depends exclusively on MAX output generated by the burner in stage 2.

This value must therefore be set before adjusting the combustion head.

Two head settings are available, i.e. the gas setting and the air setting.

Gas setting is done with the burner open (fig. B) page 8, when securing the burner to the boiler; while air setting is done after burner closing.

Gas side adjustment

- Loosen screw 1)(A).
- Rotate the ring nut 2) so that indicator 3) coincides with the required notch 4).
- Fasten screw 1).

Air side adjustment

The combustion head adjuster (air side) is located under the control panel cover.

The adjustment shall be according to the setting graph. Proceede as follows (see fig. B):

- Loosen the fixing bolt 3)(B).
- Rotate the sector 1) to the reference notch position, defined by the chart, thus moving rod and shutter mounted inside the combustion head.
- Positioning can be read by the index on the sector itself or on the graduated cylinder (2) which refers to the surface (4).
- Fasten the belt (3) to fix the reached position.



WARNING

The notch number for gas and air are taken from graphs (C) according to the output at which the burner is set in stage 2.

Example:

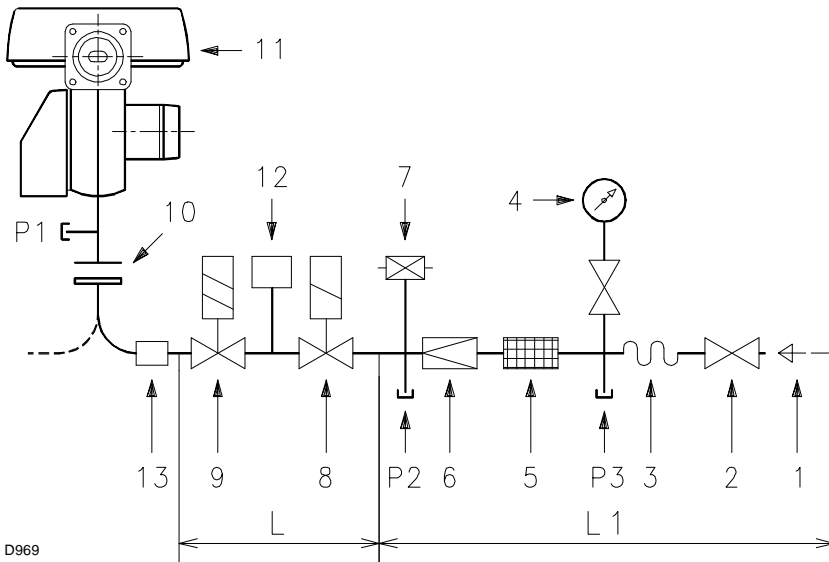
a GAS 9/2 burner is installed on a 2250 kW boiler. If a 90 % efficiency rate is considered, the burner should deliver approximately 2500 kW in stage 2.

Graphs (C) indicates that for this capacity, the gas and air should be set on notch 4 and 5 respectively.



WARNING

The graph indicates the optimum ring nut 2)(A) setting. If mains pressure is very low and does not permit the required pressure (and so the required output), the ring nut may be opened by a further 1-2 notches. See also the note on page 13.



D969

A			
Gasarmaturen Gas train - Rampe gaz			GAS
Ø	C.T.	Cod.	9/2
2"	*	3870154	•
DN 65	*	3809901	•
DN 80	*	3809902	•

* For seal control kit the code is 3809900

B			
Ø	BESTANDTEILE - COMPONENTS - COMPOSANTS		
	5	6	8 - 9
2"	GF 520/1	FRS 520	MVD 520/5+ZRDLE 420/5
DN 65	GF 40065/3	FRS 5065	MVD 5065/5+ZRDLE 420/5
DN 80	GF 40080/3	FRS 5080	MVD 5080/5+MVD5065/5+MVDLE 415/5

C mbar		
Ø	GAS 9/2	
	G20	G25
2"	145	
DN 65	85	
DN 80	40	

GAS LINE

- The gas train can enter the burner from the right or left side, depending on which is the most convenient.
- The gas solenoids 8)-9) 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 (spring colour) comprises the pressure required by the burner.

GAS TRAIN

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

KEY TO LAYOUT

- 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 filter
- P3 - Pressure up-line from the filter

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

TABLE :

A = GAS BURNERS AND RELEVANT GAS TRAINS APPROVED ACCORDING TO EN 676

B = GAS TRAIN COMPONENTS

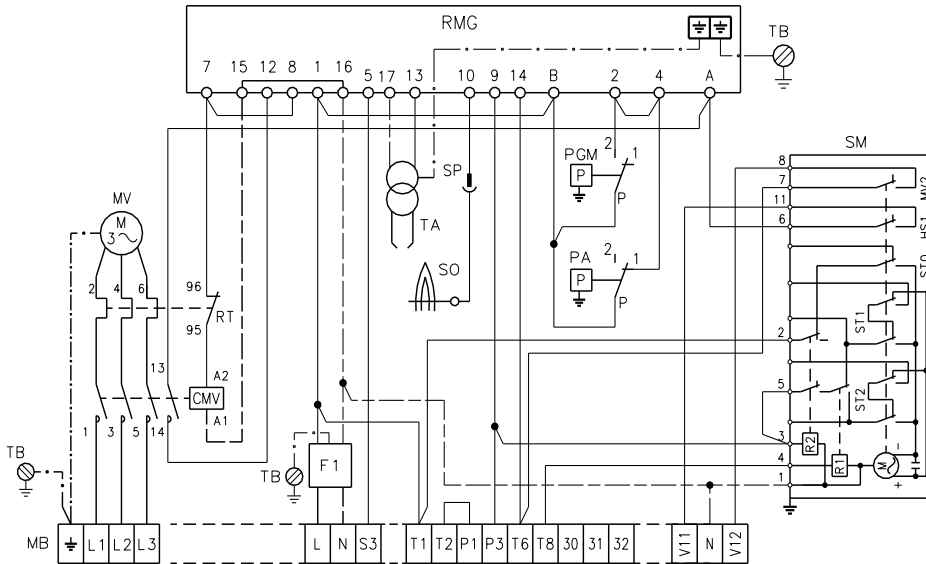
C = GAS TRAIN PRESSURE LOSS L at maximum burner output

KEY TO TABLE (A)

- C.T. = Gas valves 8) - 9) leak detection control devices:
- 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

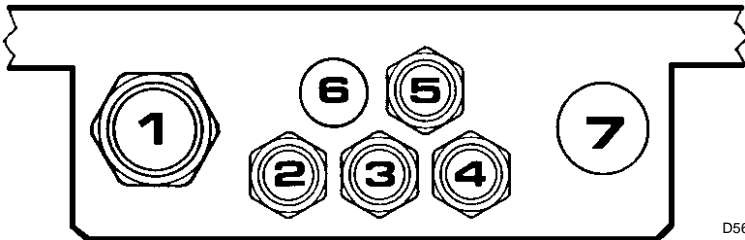
See the accompanying instructions for the adjustment of the gas train.



(A)

D3440

CABLE SECURING



D56

(B)

ELECTRICAL SYSTEM

as set up by the manufacturer



- The electrical wiring must be carried out with the electrical supply disconnected.
- Electrical wiring must be carried out by qualified personnel and in compliance with the regulations currently in force in the country of destination.
- Do not touch the device with wet or damp body parts and/or in bare feet.
- Do not pull the electric cables.

LAYOUT (A)

Burners GAS 9/2 (3-phase)

- These models 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)

- CMV - Motor contactor
- F1 - Protection against radio interference
- RMG - Control box
- MB - Burner terminal strip
- 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
- PGM - Max gas pressure switch



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.

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

- if in PVC boot, use at least HO5 VV-F
- if in rubber boot, use at least H05 RR-F.

CABLE SECURING (B)

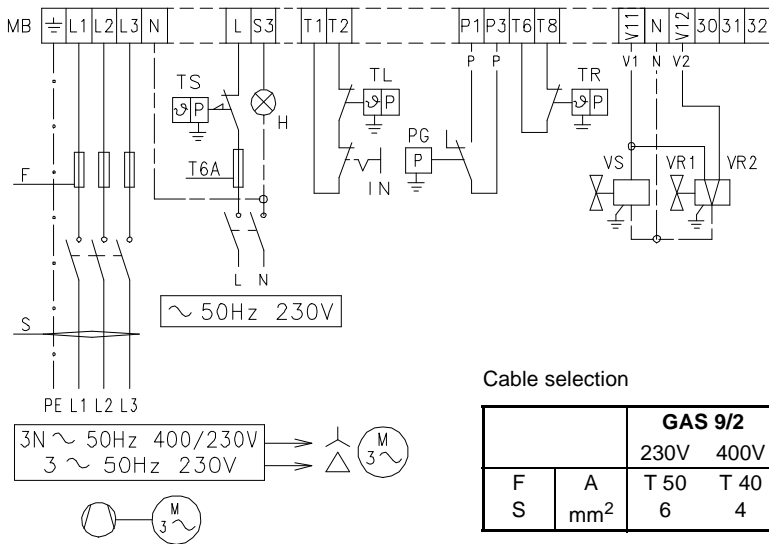
All cables to be connected to the burner terminal strip 8)(A)p.5 should pass through fair leads 9)(A)p.5. The fair leads and precut holes can be used in various ways. One example is given below:

GAS 9/2

- 1 - Three-phase power supply Pg 11
- 2 - Single-phase power supply Pg 7
- 3 - Remote control device TR Pg 7
- 4 - Remote control device TL Pg 7
- 5 - Gas valves Pg 7
- 6 - Gas pressure switch or Pg 7
gas valve leak detection control device
- 7 - Fair lead fitting hole, if required. Pg 7

To ensure that the IP 40 protection classification is maintained, close all unused fair lead fitting holes.

**ELECTRICAL CONNECTION OF BURNER BY INSTALLER
Without leak detection control device**



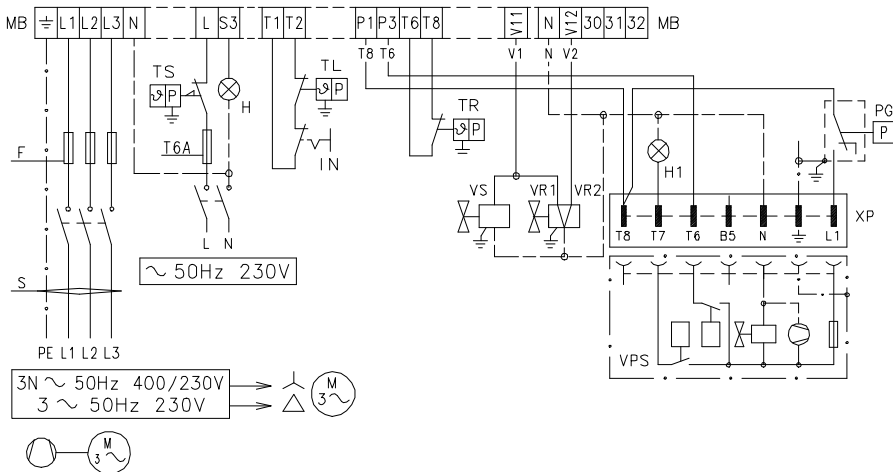
Cable selection

		GAS 9/2	
		230V	400V
F	A	T 50	T 40
S	mm ²	6	4

(A)

D2901

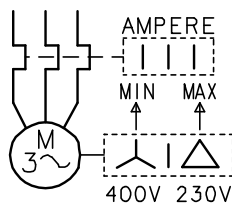
**ELECTRICAL CONNECTION OF BURNER BY INSTALLER
With VPS leak detection control device**



(B)

D2903

CALIBRATION OF THERMAL RELAY



(C)

D867

LAYOUT (A) - The GAS 9/2 Models electrical connection three-phase power supply without leak detection control device.

LAYOUT (B) - The GAS 9/2 Models electrical connection three-phase power supply with VPS leak detection control device.

Gas valve 8)-9)p. 10 leak detection control takes place immediately before every burner starting.

KEY TO LAYOUTS (A) - (B)

- IN - Manual burner stop switch
- MB - Burner terminal strip
- PG - Min. gas pressure switch
- H - Remote lock-out signal
- H1 - Remote lock-out signal of leak detection control device
- TR - High-low mode load 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 pre-set value.
- TS - Safety load control system: operates when TL is faulty
- VR1 - Gas valve, stage 1
- VR2 - Gas valve, stage 2
- VS - Safety valve
- XP - Plug for leak detection control device

LAYOUT (C)

Calibration of thermal cut-out 7)(A) p. 5

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.

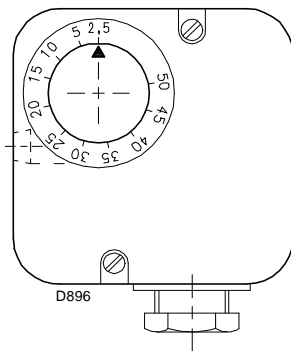
N.B.

- Models GAS 9/2 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 GAS 9/2 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 GAS 9/2 burner is factory set for two-stage operation and must therefore be connected to control device TR. Alternatively, if single stage operation is required, instead of control device TR install a jumper lead between terminals 6 and 7 of the terminal strip.



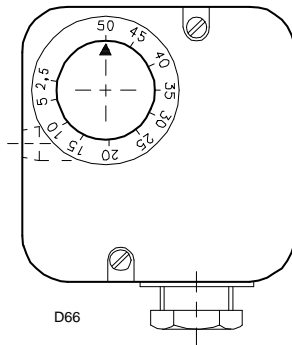
Do not invert the neutral with the phase wire in the electricity supply line. Inverting the wires will make the burner go into lock-out because of firing failure.

MIN GAS PRESSURE SWITCH



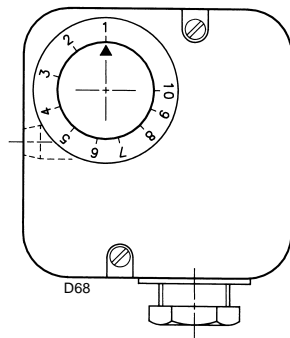
(A)

MAX GAS PRESSURE SWITCH



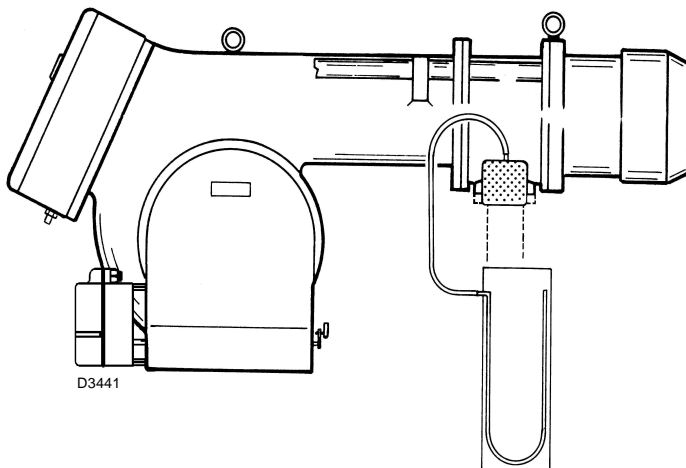
(B)

AIR PRESSURE SWITCH



(C)

U-TYPE MANOMETER



(D)

ADJUSTMENTS BEFORE FIRST FIRING



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



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

Adjustment of the combustion head, and air and gas deliveries has been illustrated on page 9. In addition, the following adjustments must also be made:

- Open manual valves up-line from the gas train.
 - Adjust the air pressure switch to the zero position of the scale (A).
 - Adjust the maximum gas pressure switch to the start of the scale (B).
 - Adjust the minimum gas pressure switch to the start of the scale (C).
 - 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 (D) to the gas pressure test point on the sleeve, (+) and to the combustion chamber:

- pressure test point (-).
The manometer readings are used to calculate the 2nd stage operation burner power using the graphs on page 7.

- 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

The servomotor automatically adjusts the air gate valve, enables the gas valves to open only if the air gate valve is in the correct position and establishes when the stage 2 gas valve will be energized.

It makes a maximum rotation of 90° in 5s.

It is equipped with 7 cams, which can be adjusted by 4 coloured levers. A graduated plate with 4 coloured sectors marks the lever operation point.

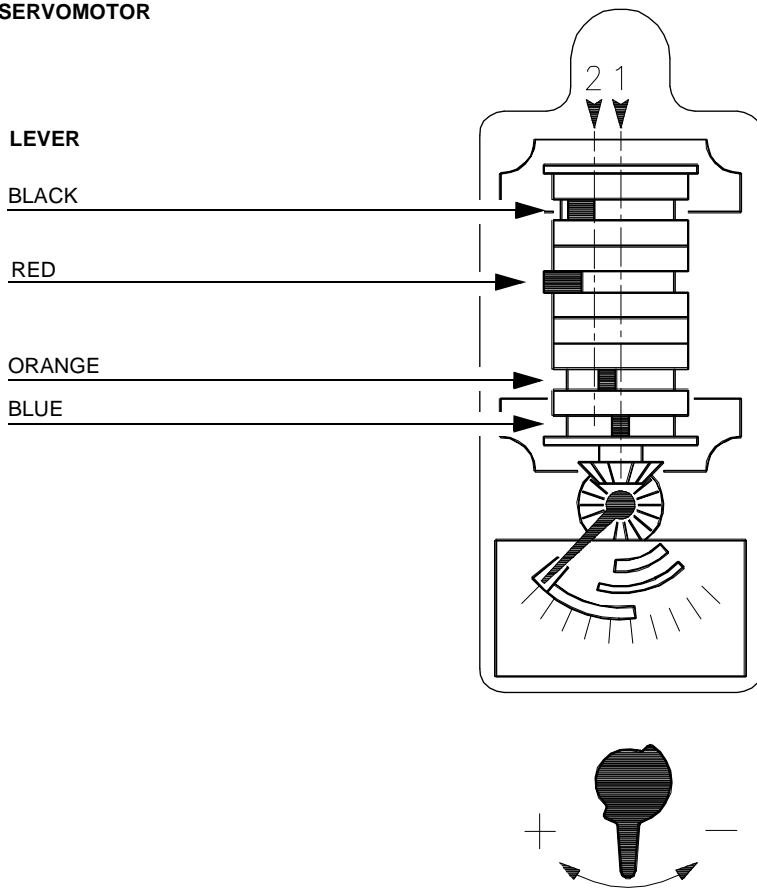
Blue lever

This lever sets the position of the air gate valve 3)(A)p.5 while the burner is at rest. It is factory-set as shown in figure (A)p.14: lever on axis 1. The air gate valve is therefore kept fully closed when the burner is at rest, to minimize heat loss caused by flue draught.

If instead the air gate valve is to be kept partly open while the burner is at rest (e.g. to cool the combustion head), turn the blue lever to the left (+ sign on the plate). The new air gate position may be checked after starting and stopping the burner. Do not, however, go beyond the position of the orange lever, which sets the position of the air gate valve in stage 1.

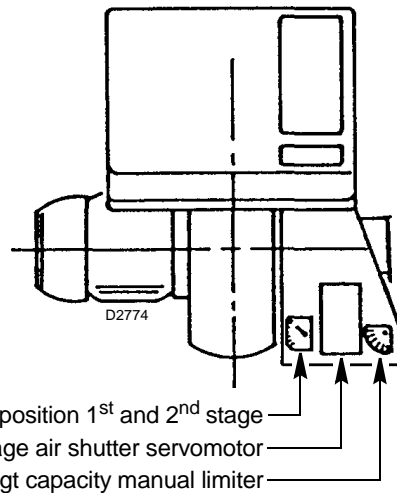
To return the air gate valve to the fully closed position with the burner at rest, turn the blue lever to the right (- sign on the plate) to the position indicated in figure (A)p.14: lever on axis 1. In this case the air gate valve follows lever movement.

SERVOMOTOR



(A)

D177



(B)

Orange lever.

This lever sets the position of the air gate valve 5)(A)p.5 during stage 1 operation.

Open the air gate valve by moving the orange lever to the left (+ sign on the plate) and close it by moving the lever to the right (- sign on the plate). The lever may be adjusted while the burner is operating and air gate movement follows lever movement in both directions.

Red lever.

This lever sets the position of the air gate valve 5)(A)p.5 during stage 2 operation.

Open the air gate valve by moving the red lever to the left (+ sign on the plate) and close it by moving the lever to the right (- sign on the plate). The lever may be adjusted while the burner is operating and air gate valve movement follows lever movement in both directions.

Black lever.

This lever establishes the opening time of the 2nd stage gas valve. It must always operate (just) before the red lever and after the orange lever. It must not operate with the red lever as this may prevent the gas valve from opening at all. It must not operate straight after the orange lever to avoid combustion in the absence of air. **It must never operate at the same time as the orange lever as this would result in stage 1 air delivery and stage 2 gas delivery.**

For gas valve opening to approach that of 2nd stage air gate valve position, rotate the black lever to the left; to delay opening time, rotate the lever to the right.

In brief, the levers must be operated in the following sequence:

1. **Blue lever**
2. **Orange lever**
3. **Black lever**
4. **Red lever**

The straight line 2(A) marks the lever sequence.

Manuel air damper section:

Factory is setting at 30%. This damper section shall be in closed position just in case of very low back pressure or negative pressure in the combustion chamber. Thus the whole combustion setting shall be done by the servomotor levers.

BURNER STARTING

Close the remote control devices.

With two stage operation burners keep the remote control TR open, or remove the jumper in the case of single-stage operation burners.

As soon as the burner starts check the direction of rotation of the motor.

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 (D)p.13.

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

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 - 1st stage burner output
- 3 - 2nd stage burner output
- 4 - Air pressure switch
- 5 - Maximum gas 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 18)(A)p.5 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:

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

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 - 1ST STAGE OUTPUT

MIN gas setting

Measure gas delivery at the meter.

- If it is to be reduced, close the 1st stage gas valve a little.
- If it is to be increased, first open the 1st stage gas valve all the way and then, if it is not enough, increase the gas pressure coming from the pressure governor.

MIN air setting

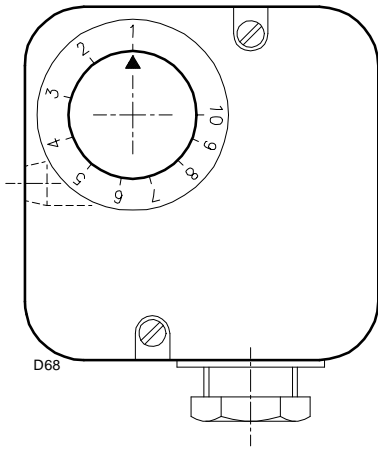
Operate the orange lever of the servomotor to optimize the ratio between the quantity of air and gas.

This is particularly important when the burner is set for two stage operation.

Then close load control TR, or insert the jumper. The servomotor will complete the rotation by opening the air gate valve and the stage 2 gas valve.

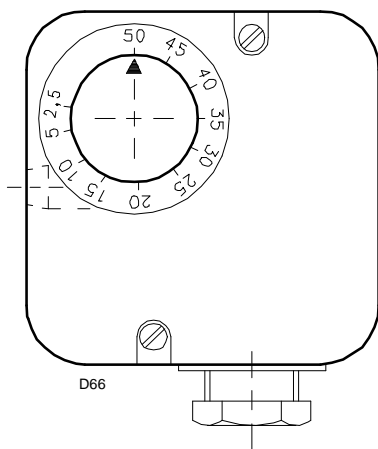
There must be no jerks or pulsations in the passage from stage 1 to stage 2.

AIR PRESSURE SWITCH



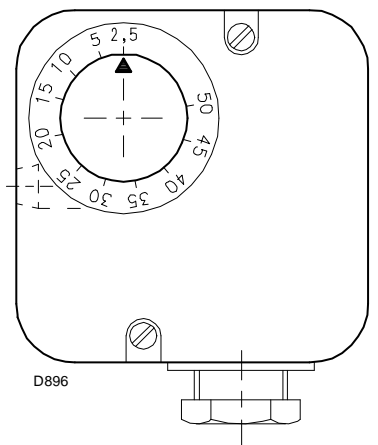
(A)

MAX GAS PRESSURE SWITCH

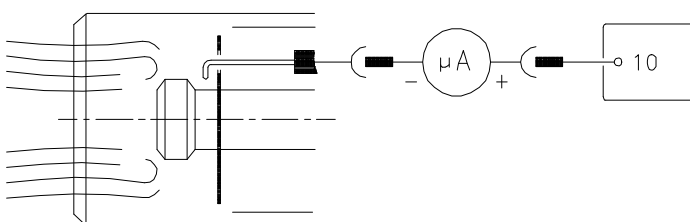


(B)

MIN GAS PRESSURE SWITCH



(C)



(D)

D2935

3 - 2ND STAGE BURNER OUTPUT

MAX gas setting

Measure gas delivery.

- If it is to be reduced, close the 2nd stage gas valve a little.
- If it is to be increased, first open the 2nd stage gas valve all the way and then, if it is not enough, increase the gas pressure coming from the pressure governor.

MAX air setting

Operate the red lever of the servomotor to optimize the ratio between the quantity of air and gas.

After setting the red lever in the correct position, bear in mind that the black lever of the servomotor must be operated only just before the red lever.

N.B.

- Possible adjustment of air manual damper.
- Check combustion analysis at low fire.
- When the pressure governor calibration is to be modified to obtain the first stage required delivery, firing must be checked again. When the governor calibration is to be modified to obtain the second stage required delivery, both firing and stage 1 must be checked again.
- By way of example, maximum gas delivery in stage 2 may be taken from the graphs on page 7. Simply read the gas pressure at sleeve 13)(A)p.5 on the U-type manometer (D)p.13 and follow the indications given on page 7.

4 - 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%.

5 - MAXIMUM GAS PRESSURE SWITCH (B)

Adjust the maximum gas pressure switch after having performed all other burner adjustments with the maximum gas pressure switch set to the end of the scale (B).

With the burner operating at MAX output, reduce the adjustment pressure by slowly turning the adjustment knob anticlockwise until the burner locks out.

Then turn the knob clockwise by 2 mbar and repeat burner firing.

If the burner locks out again, turn the knob again clockwise by 1 mbar.

6 - MINIMUM GAS PRESSURE SWITCH (C)

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 (C).

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.

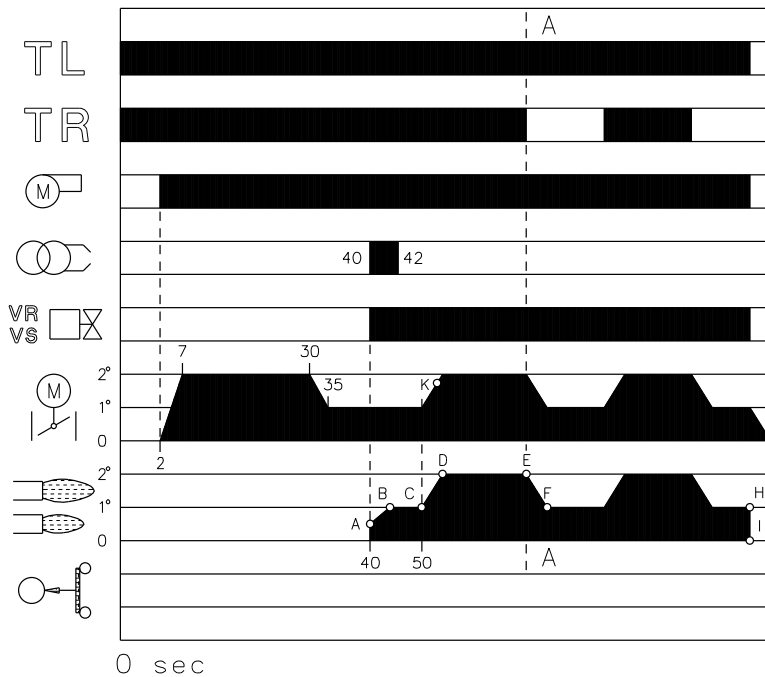
If the burner locks out again, turn the knob anti-clockwise again by 1 mbar.

FLAME PRESENT CHECK (D)

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 18)(A)p.5 on the ionisation probe cable and insert a direct current microammeter with a base scale of 100 mA. Carefully check polarities.

NORMAL FIRING

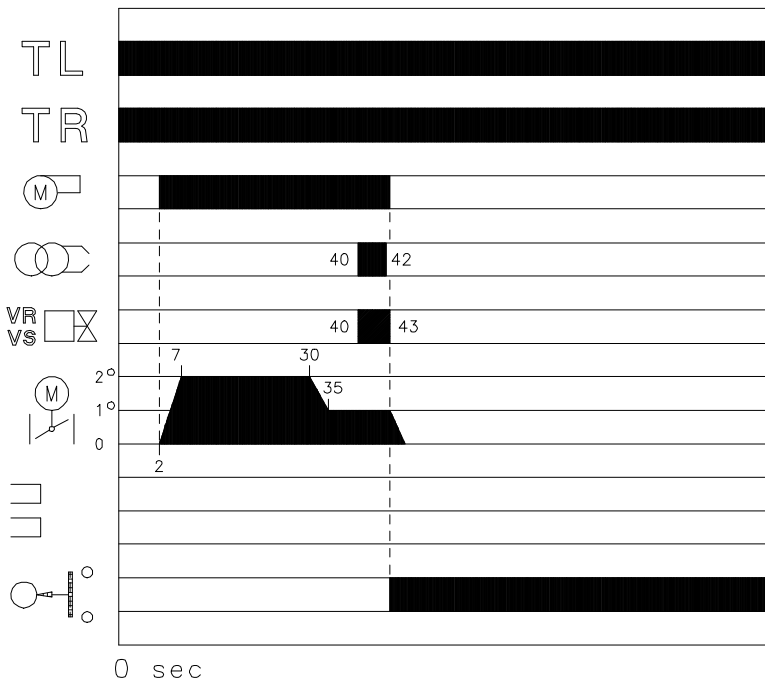
(n° = seconds from instant 0)



(A)

D2933

NO FIRING



(B)

D2934

BURNER OPERATION

BURNER STARTING (A)

- 0s: Remote control device TL closes. The control box starting cycle begins.
- 2s: Fan motor starts. Servomotor starts: it rotates to right, until contact is made on cam St2 (red lever). The air gate valve moves to MAX output position (stage 2).
- 7s: Pre-purge stage with air delivery at 2nd stage output. Duration 27 seconds.
- 30s: Servomotor starts: it rotates to left up to the angle set on cam St1 (orange lever).
- 35s: The air gate valve moves to MIN output position (stage 1).
- 40s: Ignition electrode strikes a spark. Safety valve VS and adjustment valve VR, 1st stage (fast opening) open. The flame is ignited at a low output level (point A). Delivery is then progressively increased, with the valve opening slowly up to MIN output, 1st stage, point B.
- 42s: The spark goes out.
- 50s: If remote control device TR is closed or if it has been replaced by a jumper, the servomotor will continue to turn until cam St2 (red lever) operates. The air gate valve moves to the MAX output position, (stage 2). Before reaching the closed position, the cam with the black lever controls the opening of the adjustment valve VR, 2nd stage, point K. Output gradually increases from stage 1 to 2, 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 remote control device TR that controls boiler temperature or pressure, point C. (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 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 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 H-I. Remote control device TL now opens, the servomotor returns toward the 0° position, limited in this movement by cam St0 (blue lever). The air gate valve closes completely to reduce heat losses to a minimum.

Systems not equipped with remote control device TR

(jumper wire installed)

The burner is fired as described in the case above. If the temperature or pressure increase until remote 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 43 s after the closing of remote control device TL. The control box 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.

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

Notes on safety for the maintenance

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

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



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

Before carrying out any maintenance, cleaning or checking operations:



disconnect the electricity supply from the burner by means of the main switch of the system;



close the fuel interception tap.

Maintenance frequency

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

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.

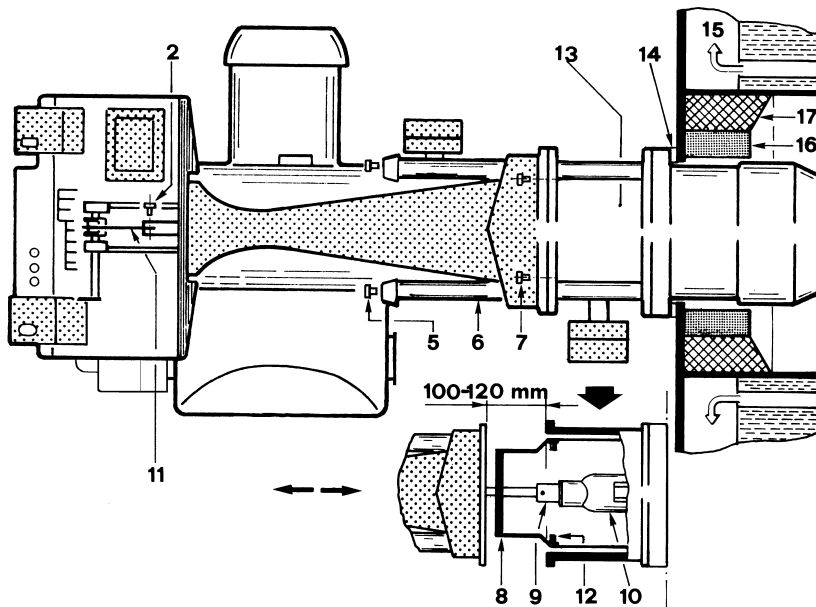
Combustion head

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 10)(A).

Fan

Check that dust has not accumulated inside the fan and on the impeller blades: this will reduce air delivery and, as a result, give rise to dirty combustion.

OPENING THE BURNER



(A)

D3514

Burner

Check that the screws that secure the cables in the terminal strip of the burner are tight.
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.

OPENING THE BURNER



Disconnect the electrical supply from the burner.

- Remove the screws 7) which secure the fan to the sleeve 13).
- Open the burner by moving rear unit A backwards on the two slide bars 6). Front unit remains secured to the boiler.

NOTE:

Before opening long head burner (574), fit the two extensions supplied as standar equipment with the system on slide bars 6)(A) and support the burner on the wheel-mounted stand supplied as an extra unit, fig. (G) page 4, or other svitable meaus.



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.

FAULTS - POSSIBLE CAUSES - SUGGESTED REMEDY

FAULT	PROBABLE CAUSE	SUGGESTED REMEDY
The burner does not start	1 - No electrical power supply 2 - A limiter or safety control device is open 3 - Control box lock-out 4 - Control box fuses blown 5 - Erroneous electrical connections 6 - Defective control box 7 - No gas supply 8 - Mains gas pressure insufficient 9 - Minimum gas pressure switch fails to close 10 - Defective capacitor (GAS 3/2 - 4/2) 11 - Defective motor remote control switch (GAS 5/2 - 6/2 - 7/2 - 9/2) 12 - Defective electrical motor 13 - Motor protection tripped (GAS 5/2 - 6/2 - 7/2 - 9/2)	Close all switches - Check connections Adjust or replace Reset control box Replace Check connections Replace Open the manual valves between meter and train Contact your GAS COMPANY Adjust or replace Replace Replace Replace Reset thermal cut-out when third phase is re-connected
The disk 2) keeps on rotating	14 - Air pressure switch in operating position	Adjust or replace
The burner starts and then locks out	15 - Flame simulation Air pressure switch inoperative due to insufficient air pressure: 16 - Air pressure switch adjusted badly 17 - Pressure switch pressure point pipe blocked 18 - Head wrongly adjusted 19 - High negative draft in chamber 20 - Fault in flame detection circuit 21 - Servomotor does not open the air gate valve in stage 2 22 - VS and VR gas valves unconnected or with interrupted coil	Replace control box Adjust or replace Clean Adjust Ask our technical office Replace control box Replace Check connections or replace coil
After pre-purge and safety time, the burner goes to lock-out and the flame does not appear	23 - The solenoid VR allows little gas through. 24 - Solenoid valves VR or VS fail to open 25 - Gas pressure too low 26 - Ignition electrode wrongly adjusted 27 - Electrode grounded due to broken insulation 28 - High voltage cable defective. 29 - High voltage cable deformed by high temperature. 30 - Ignition transformer defective 31 - Erroneous valve or transformer electrical connections. 32 - Control box defective 33 - A cock down-line of the gas train is closed. 34 - Air in pipework	Increase Renew the coil or rectifier panel Increase pressure at governor Adjust, see fig. (C)p.8 Replace Replace Replace and protect Replace Check Replace Open Bleed air
The burner goes to lock-out right after flame appearance	35 - The solenoid VR allows little gas through. 36 - Ionisation probe wrongly adjusted 37 - Faulty electrical connections for probe 38 - Insufficient ionisation (less than 5 µA) 39 - Probe grounded 40 - Burner poorly grounded 41 - Phase and neutral wires inverted 42 - Servomotor does not open the air gate valve in stage 1 43 - Defective control box	Increase Adjust, see fig. (C)p.8 Repeat connection Check probe position Withdraw or replace cable Check grounding Correct by intervening Replace Replace
The burner repeats the starting cycle without lock out	44 - Mains gas pressure is near the value to which the min. gas pressure switch gas is adjusted. The repeated drop in pressure which follows valve opening causes temporary opening of the pressure switch itself, the valve immediately closes and the burner comes to a halt. Pressure increases again, the pressure switch closes again and the firing cycle is repeated. The sequence repeats endlessly.	Reduce operating pressure of minimum gas pressure switch. Replace gas filter
Ignition with pulsation	45 - Poorly adjusted head 46 - Ignition electrode wrongly adjusted 47 - Poorly adjusted fan air gate: too much air 48 - Output during ignition phase is too high.	Adjust, see p.9 Adjust, see fig. (C)p.8 Adjust Reduce
Burner remain in stage 1	49 - Remote control device TR does not close 50 - Servomotor red lever precedes orange lever 51 - Servomotor does not open the air gate valve in stage 2	Adjust or replace Adjust Replace
Burner operates in stage 1 with gas and in stage 2 with air	52 - Red lever precedes black lever 53 - Defective servomotor	Adjust Replace
Burner locks out at transition between 1st and 2nd stage or between 2nd and 1st stage	54 - Too much air or too little gas.	Adjust air and gas
During operation, the burner stops in lock out	55 - Probe or ionisation cable earthed 56 - Fault on air pressure switch	Replace worn parts Replace
Lock out when burner stops	57 - Flame remains in combustion head	Eliminate persistence of flame or replace control box
Burner stops with air gate valve open	58 - Servomotor faulty.	Replace

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