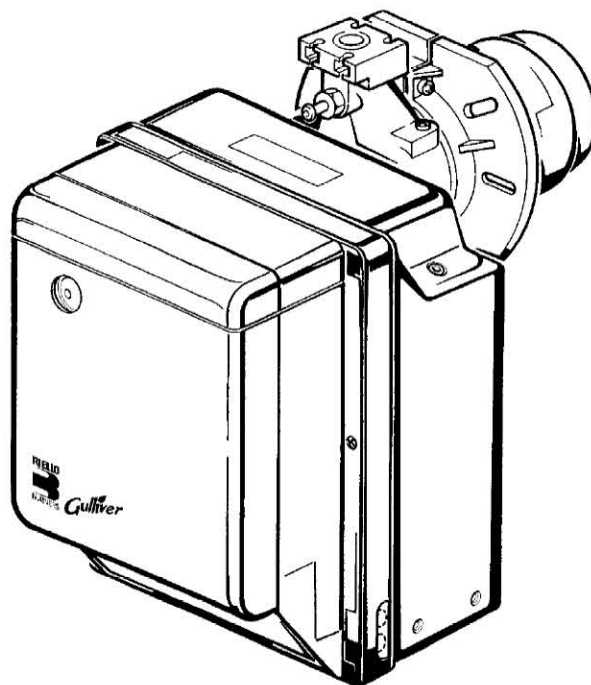


- I Bruciatori di gas ad aria soffiata**
- D Gas-Gebläsebrenner**
- GB Forced draught gas burners**

Funzionamento bistadio progressivo o modulante
Zweistufig-gleitender oder modulierender Betrieb
Two stage progressive or modulating operation



Gulliver



CODICE CODE	MODELLO - MODELL MODEL	TIPO - TYP TYPE
3762250	BS2/M	916M
3762350	BS3/M	917M
3762450	BS4/M	918M

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1. GENERAL INFORMATION

IDENTIFICATION

The Identification Plate on the product gives the serial number, model and main technical and performance data. If the Identification Plate is tampered with, removed or missing, the product cannot be clearly identified thus making any installation or maintenance work potentially dangerous.

GENERAL WARNINGS

The dimension of the boiler's combustion chamber must respond to specific values, in order to guarantee a combustion with the lowest polluting emissions rate.

The Technical Service Personnel will be glad to give you all the information for a correct matching of this burner to the boiler.

This burner must only be used for the application it was designed for.

The manufacturer accepts no liability within or without the contract for any damage caused to people, animals and property due to installation, adjustment and maintenance errors or to improper use.

USER INFORMATION

If faults arise in ignition or operations, the burner performs a "safety stop", which is signalled by the red burner lock out Led. To rearm start up conditions, press the release button.

When the burner starts up again, the red Led goes out. This operation can be repeated for a maximum of 3 times.

If the "safety stop" recurs, then the Technical Assistance Centre must be called out.

BASIC SAFETY MEASURES

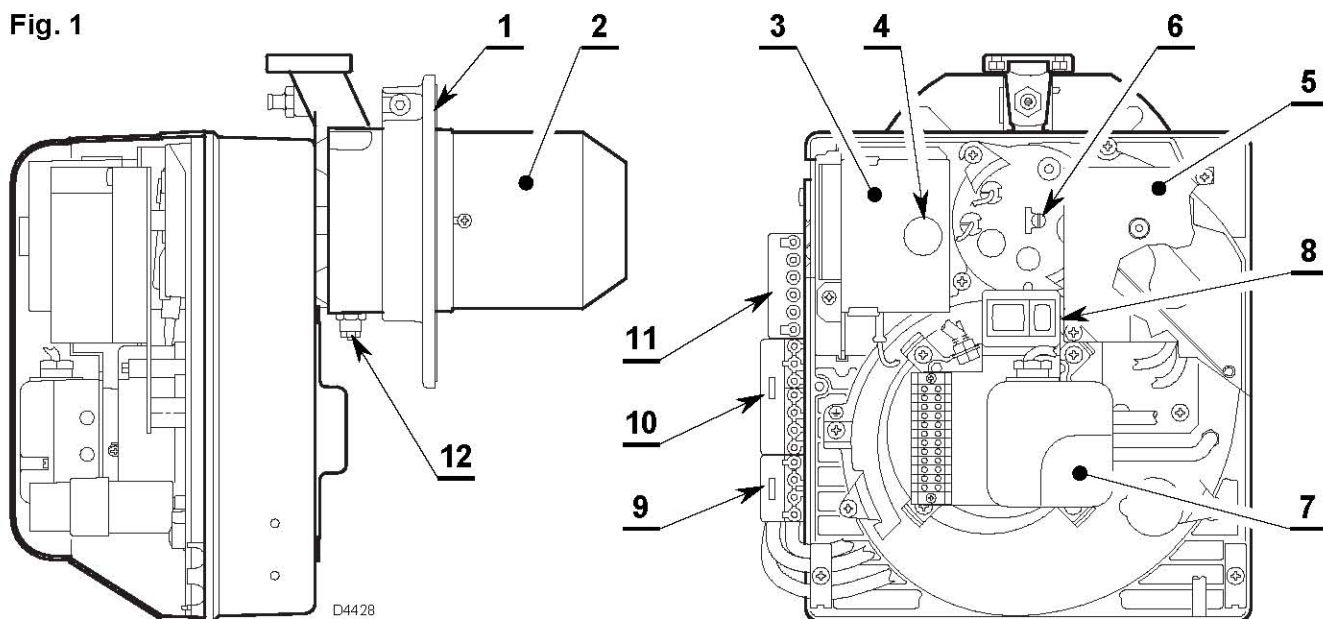
- Children or inexperienced persons must not use the appliance.
- Under no circumstances must the intake grids, dissipation grids and ventilation vents in the installation room be covered up with cloths, paper or any other material.
- Unauthorised persons must not attempt to repair the appliance.
- It is dangerous to pull or twist the electric leads.
- Cleaning operations must not be performed if the appliance is not disconnected from the main power supply.
- Do not clean the burner or its parts with inflammable substances (e.g. petrol, alcohol, etc.). The cover must be cleaned with soapy water.
- Do not place anything on the burner.
- Do not block or reduce the size of the ventilation vents in the installation room.
- Do not leave containers and inflammable products in the installation room.

2. BURNER DESCRIPTION

Gas burner with two stage progressive or modulating operation.

- CE marking according to Gas Appliance directive 90/396/EEC; PIN
- According to directives: EMC 89/336/EEC, Low Voltage 73/23/EEC, Machines 98/37/EEC and Efficiency 92/42/EEC.
- The burner meets protection level of IP 40, EN 60529.
- Gas train according to EN 676.

Fig. 1



- 1 – Flange with insulating gasket
- 2 – Blast tube
- 3 – Control box
- 4 – Reset button with lock-out lamp
- 5 – Air damper adjustment assembly
- 6 – Combustion head setting screw
- 7 – Air pressure switch

- 8 – Operating mode switches for:
automatic / manual mode (AUT / MAN)
increase / decrease output (+/-)
- 9 – 4 pole socket for 2nd stage / modulating
connection
- 10 – 7 pole socket for burner supply
- 11 – 6 pole socket for gas train
- 12 – Air pressure test point

2.1 BURNER EQUIPMENT

Flange with insulating gasket No. 1
Screws and nuts for flange to be fixed to boiler . . No. 4
Screw and nut for flange No. 1
Blue plastic tube No. 1

G1/8 union elbow No. 1
4 pin plug No. 1
7 pin plug with built-in filter No. 1

2.2 ACCESSORIES (optional):

OUTPUT POWER REGULATOR KIT

Under modulating operation, the burner automatically adapts to one of an infinite number of firing rates between the low and high flame output position, thus ensuring stable operating conditions in terms of temperature or pressure. Two components should be ordered

- Power regulator to install to the burner;
- Probe to install to the boiler.

PARAMETER TO BE REGULATED	PROBE			REGULATOR	
	Range	Type	Code	Type	Code
Temperature	– 100...+ 500 °C	PT 100	3010110	RWF40	3001078
Pressure	0...2.5 bar	Output probe 4...20 mA	3010213		
	0...16 bar	Output probe 4...20 mA	3010214		

3. TECHNICAL DATA

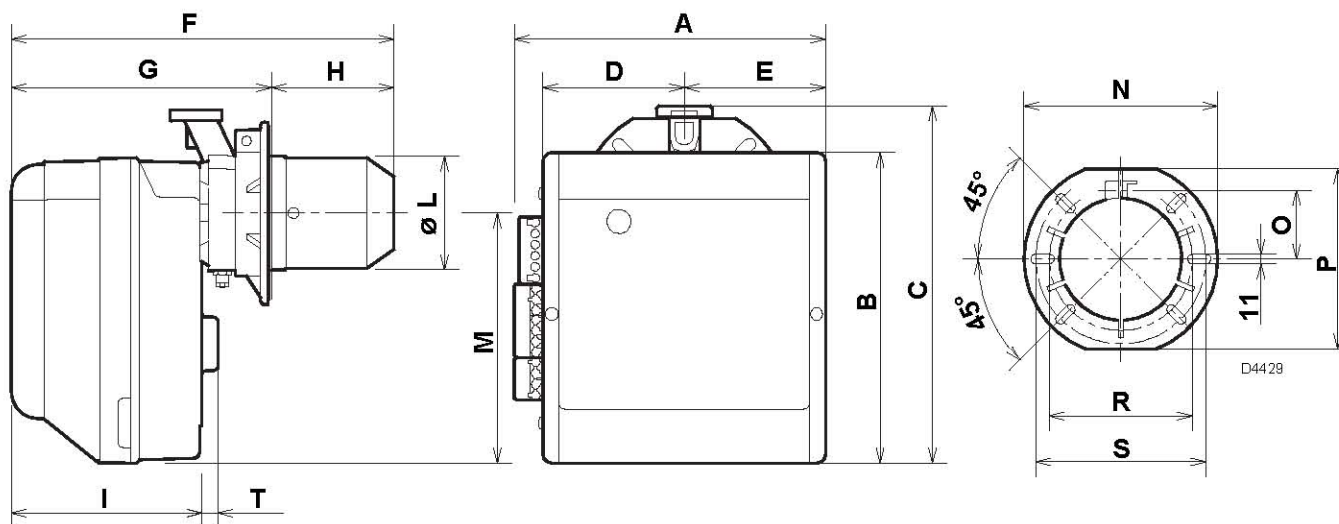
3.1 TECHNICAL DATA

TYPE		916M	917M	918M
Thermal power (1)	kW	26/51 – 91	48/75 – 190	68/143 – 240
	Mcal/h	22.4/43.8 – 78.2	41.3/64.5 – 163.4	58.5/123 – 206.4
Natural gas (Family 2)		Net heat value: 8 – 12 kWh/Nm ³ = 7000 – 10.340 kcal/Nm ³		
		Pressure: min. 20 mbar – max. 100 mbar		
Electrical supply		Single phase, 230V ± 10% ~ 50Hz		
Motor	Run current 0.67A		Run current 1.4A	Run current 2A
	2750 rpm – 289 rad/s			
Capacitor		4 µF	6.3 µF	8 µF
Ignition transformer		Primary 230V – 45 VA Secondary 1 x 15 kV – 25 mA		
Absorbed electrical power		0.18 kW	0.35 kW	0.53 kW
(1) Reference conditions: Temperature 15°C - Barometric pressure 1013 mbar – Altitude 0 m above sea level				

For gas family 3 (LPG) ask for separate kit.

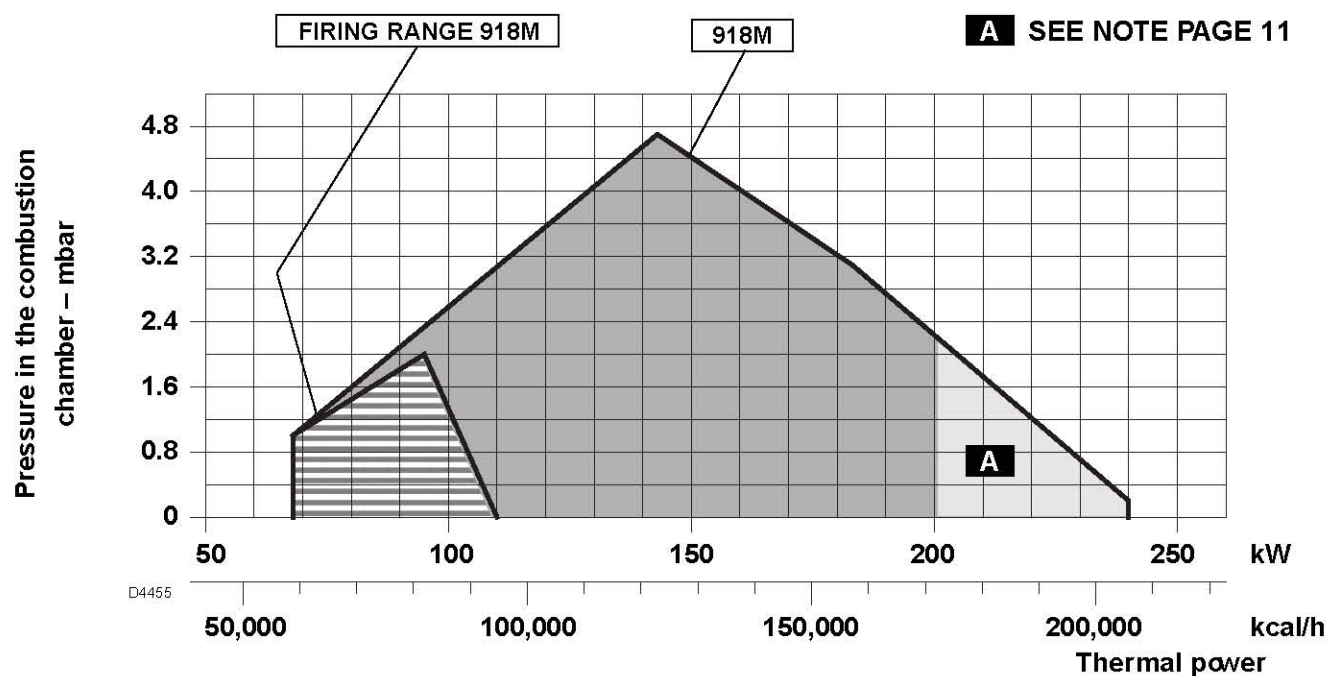
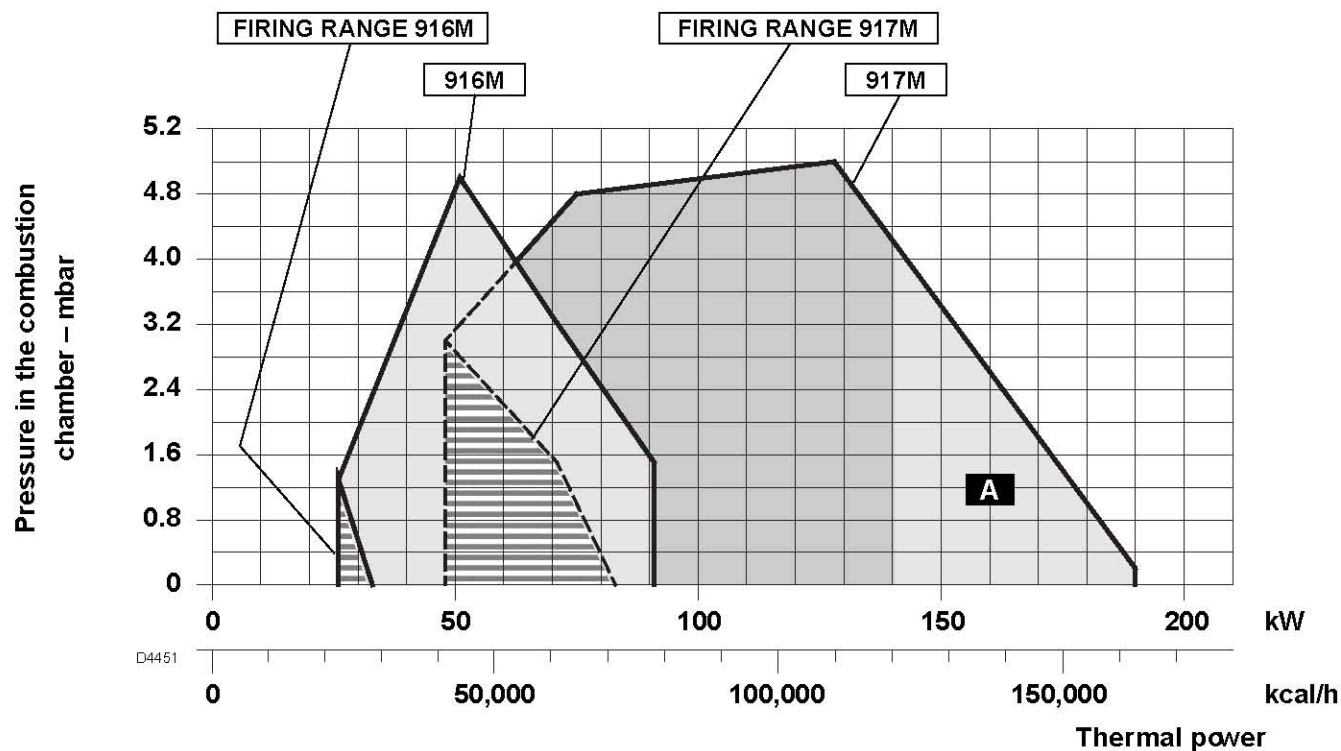
COUNTRY			IT - AT - DK	GB - IE	DE	FR	NL	BE
GAS CATEGORY			I12H3B/P	I12H3P	I12ELL3B/P	I12Er3P	I12L3B/P	I2E(R)B, I3P
GAS PRESSURE	G20	H	20	20	–	–	–	–
	G25	L	–	–	20	–	25	–
	G20	E	–	–	20	20/25	–	20/25

3.2 OVERALL DIMENSIONS



TYPE	A	B	C	D	E	F	G	H	I	øL	M	N	O	P	R	S	T
916M	285	280	325	125.5	125.5	352	238 – 252	114 – 100	174	106	230	192	66	167	140	170	18
917M	330	345	391	150	150	447	262 – 277	185 – 170	196	129	285	216	76.5	201	160	190	21
918M	330	345	392	150	150	446	278 – 301	168 – 145	212	137	286	218	80.5	203	170	200	21

3.3 FIRING RATES



ATTENTION

For the burner to work properly, starting must always occur within the relevant firing range (see table on page 12).

TEST BOILER

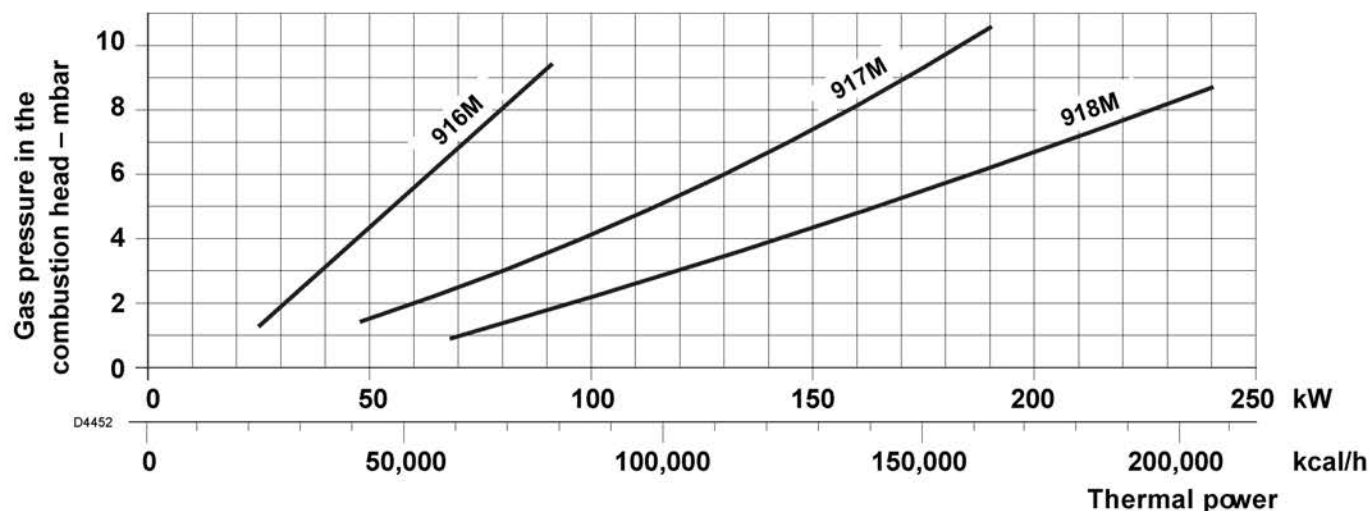
The firing rate has been defined according to EN 676 standard.

COMMERCIAL BOILERS

The burner-boiler matching is assured if the boiler conforms to EN 303 and the combustion chamber dimensions are similar to those shown in the diagram EN 676. For applications where the boiler does not conform to EN 303, or where the combustion chamber is much smaller than the dimensions given in EN 676, please consult the manufacturers.

CORRELATION BETWEEN GAS PRESSURE AND BURNER OUTPUT

To obtain maximum output, you will need a pressure of 9.3 mbar, for model 916M, measured at the head (M2, see chapter 4.3, page 7) with the combustion chamber at 0 mbar and using gas G20 with a net heat value of 9,45 kWh/m³ (8.127 kcal/m³).



4. INSTALLATION

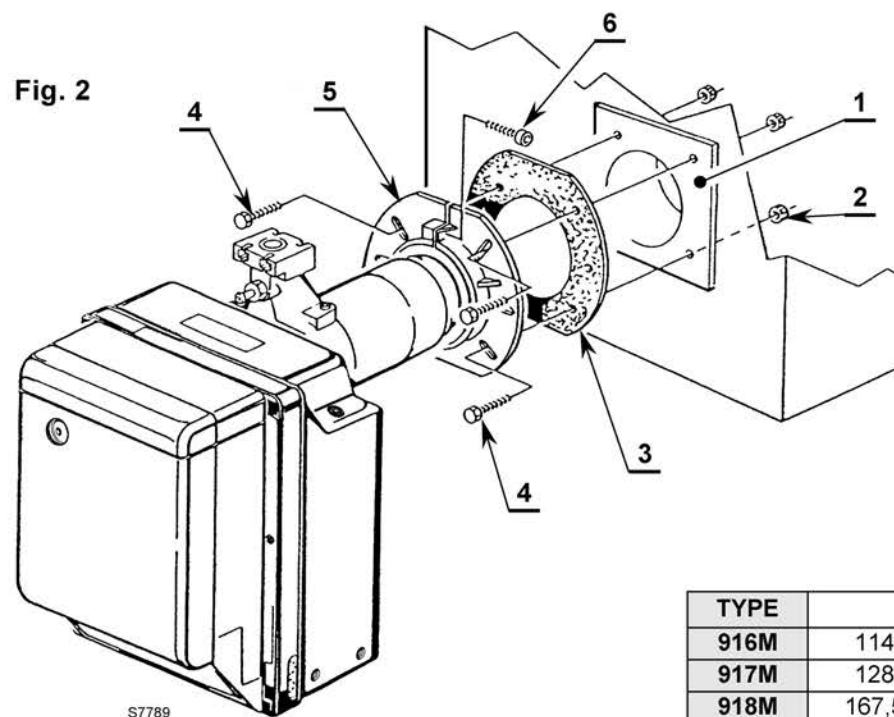
THE BURNER MUST BE INSTALLED IN CONFORMITY WITH LEGISLATION AND LOCAL STANDARDS.

4.1 BOILER FIXING

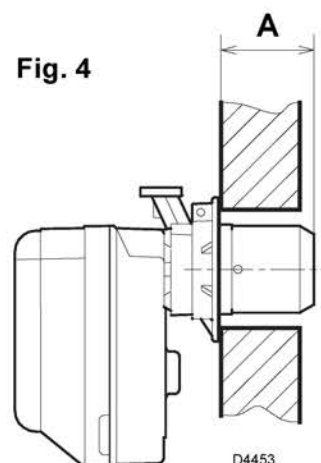
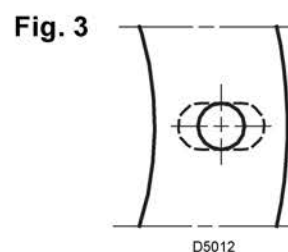
- Widen, if necessary, the insulating gasket holes (3, fig. 3), taking care not to damage them.
- Fix the flange (5) to the boiler door (1) using four screws (4) and (if necessary) the nuts (2) **interposing the insulating gasket (3)** but keep unloosing one of the two upper screws (4) (see fig. 2).
- Put on the flange (5) the burner combustion head, tighten the flange with the screws (6) and lock the loose screw (4).

ATTENTION

The burner can be fixed with the variable dimension **(A)** (see fig. 4).
Anyway, make sure that the combustion head crosses completely the boiler door thickness.



TYPE	A
916M	114 – 100
917M	128 – 110
918M	167,5 – 145



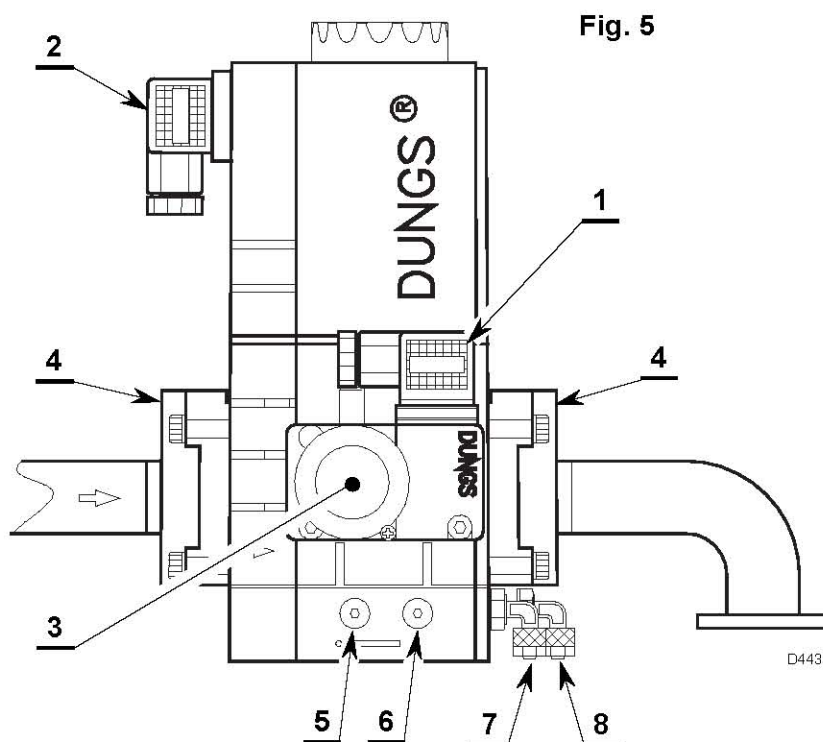
4.2 GAS TRAIN (according to EN 676)

The gas train is supplied separately, for its adjustment see the enclosed instructions.

GAS TRAIN		MATCHED BURNER	CONNECTIONS		USE
TYPE	CODE		INLET	OUTLET	
MB-VEF 407 C01	3970584	BS2/M	Rp 3/4"	Flange 2	Natural gas and LPG
MB-VEF 407 C01	3970585	BS3/M	Rp 3/4"	Flange 3	Natural gas and LPG
MB-VEF 412 C01	3970586	BS4/M	Rp 1" 1/2	Flange 3	Natural gas and LPG

Key ti lay-out

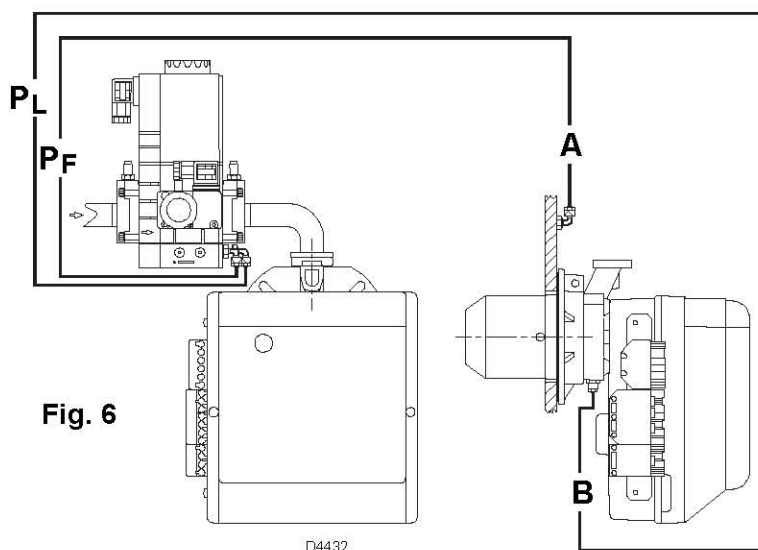
- 1 - Electrical connection for pressure switch
- 2 - Electrical connection for valves
- 3 - Gas Pressure switch
- 4 - Flange
- 5 - "ZERO POINT" (0 - PUNKT) setting screw
- 6 - "GAS/AIR RATIO" (G-L-VERH) setting screw
- 7 - Pressure connection (combustion chamber) "PF"
- 8 - Pressure connection (air) "PL"



CONNECTION OF PRESSURE TAPS TO GAS TRAIN

Connect proceeding as follows:

- Secure the three G1/8 connectors (one supplied with the burner and two with the train) at points **A**, **Pf** and **Pl**.
- Cut the blue plastic tube supplied with the burner into two.
- Connect boiler tap **A** with valve tap **Pf** and sleeve tap **B** with valve tap **Pl** using the previously cut pipes.



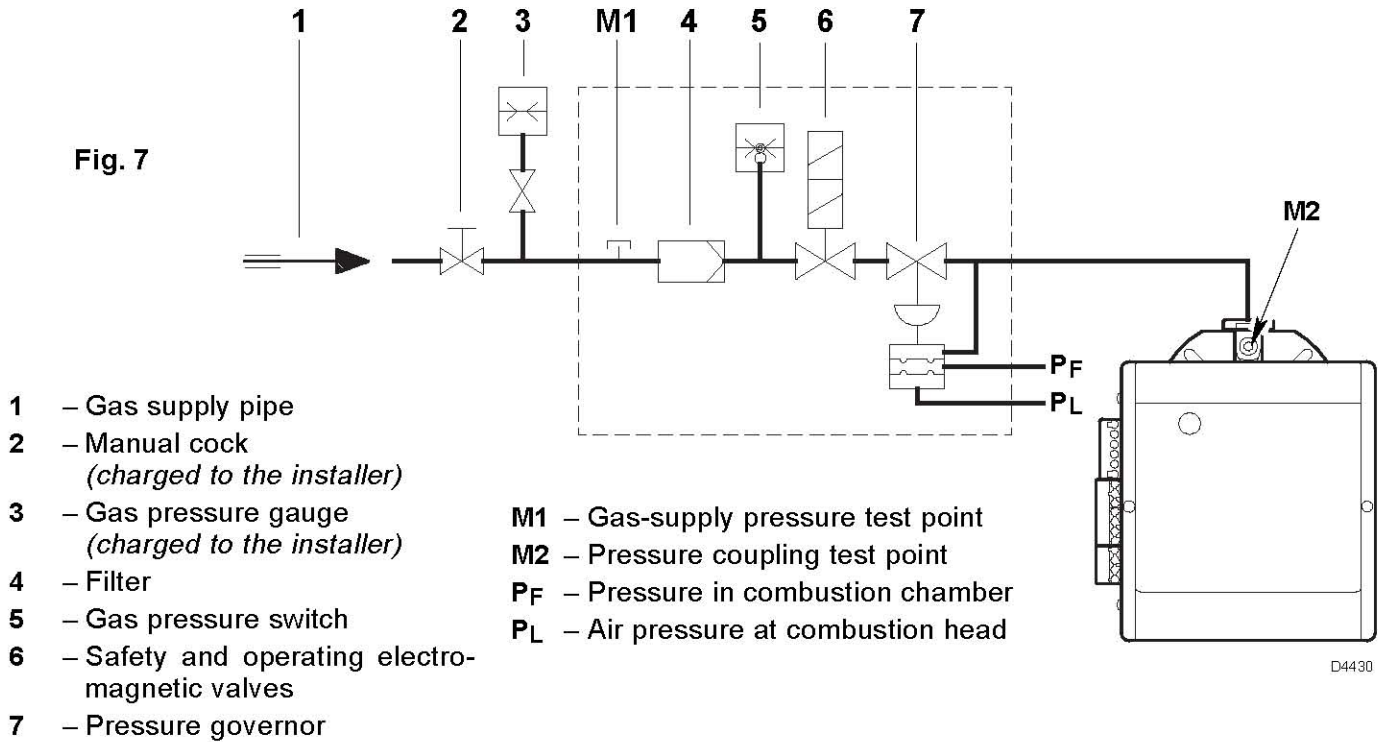
ATTENTION

The tube connecting valve tap **Pf** with boiler tap **A** must be positioned so that any condensate is drained into the combustion chamber and not inside the valve.

Failure to do so may cause the valve to malfunction, and to be damaged.

4.3 GAS FEEDING LINE

Fig. 7

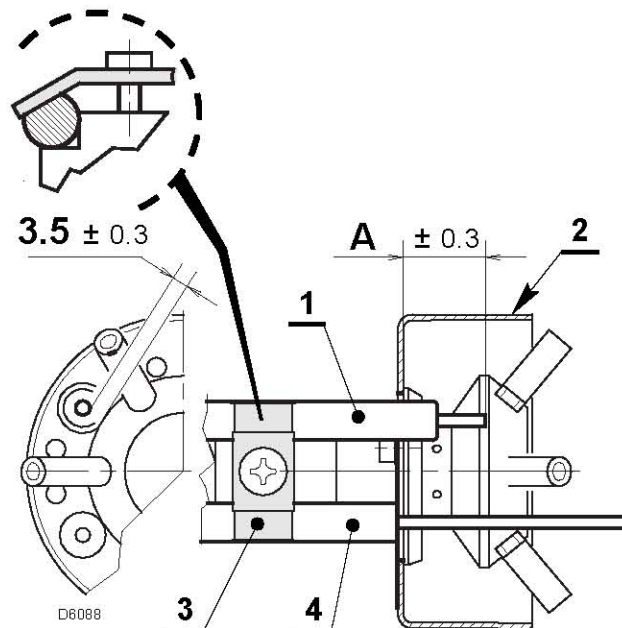


4.4 PROBE - ELECTRODE POSITIONING

ATTENTION

- Verify that the plate (3, fig. 8) is always inserted in the flattening of the electrode (1).
- Lean the probe insulator (4) against the cup (2).

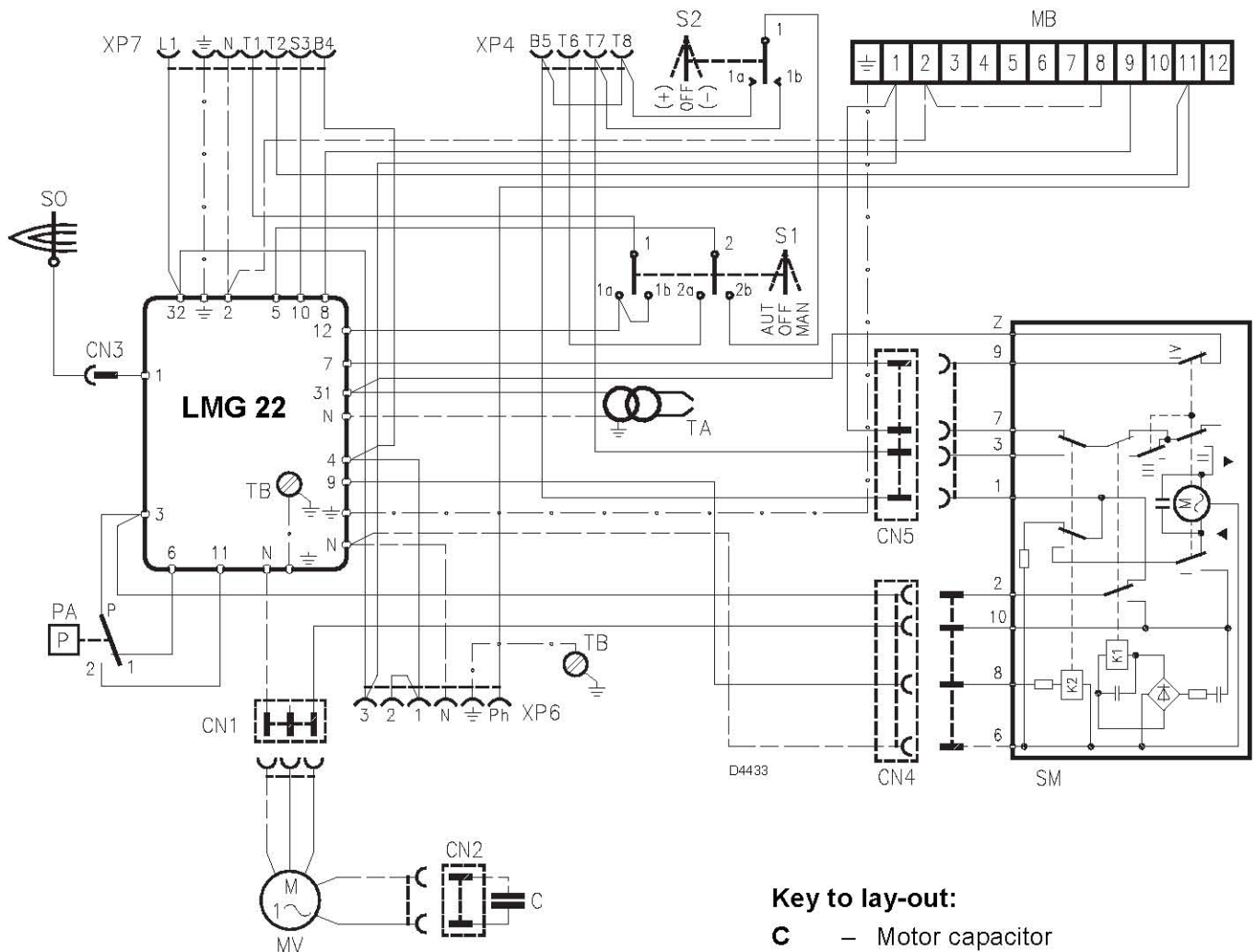
Fig. 8



TYPE	A
916M	30
917M	31
918M	31

5. ELECTRICAL WIRING

5.1 ELECTRICAL SYSTEM (As set up by the manufacturer)



ATTENTION

DO NOT EXCHANGE NEUTRAL WITH PHASE.

NOTES:

- Wires of min. 1 mm² section. (Unless requested otherwise by local standards and legislation).
- The electrical wiring carried out by the installer must be in compliance with the rules in force in the country.

TESTING

Check the shut-down of the burner by opening the thermostats, and the lock-out by opening the connector (CN3) inserted in the red cable of the probe placed outside of the control box.

Key to lay-out:

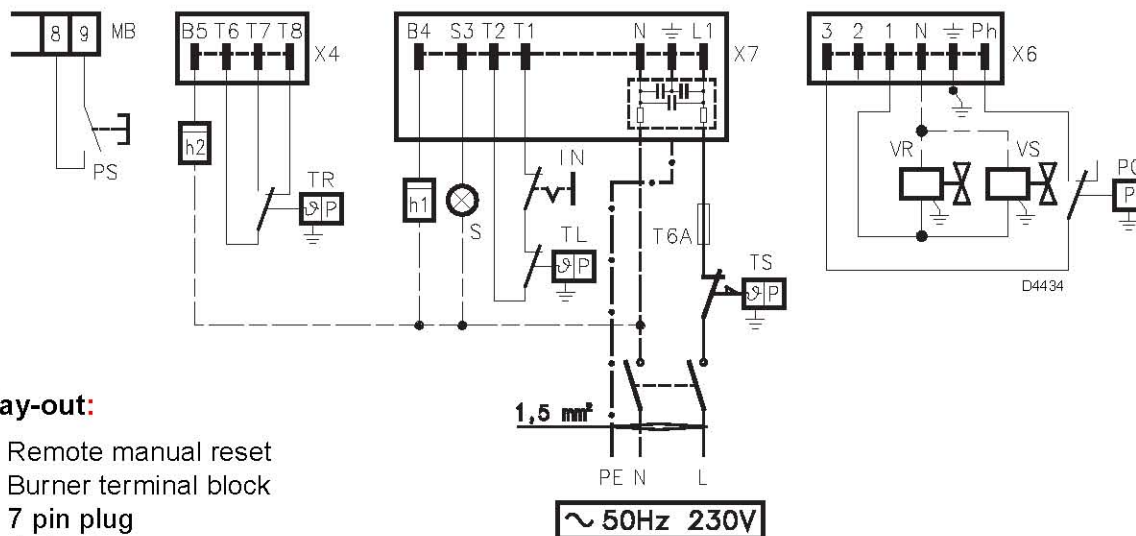
- C** – Motor capacitor
- CN...** – Connectors
- MB** – Auxiliary terminal block
- MV** – Motor
- PA** – Min. air pressure switch
- SM** – Servomotor
- SO** – Ionisation probe
- S1** – Switch for:
 - MAN** = manual operation
 - AUT** = automatic operation
 - OFF** = stand by
- S2** – Button for:
 - = power reduction
 - +** = power increase
- TA** – Ignition transformer
- TB** – Burner-earth
- XP4** – 4 pole socket
- XP6** – 6 pole socket
- XP7** – 7 pole socket

5.2 ELECTRICAL CONNECTION (As set up by the installer)

WARNING

If the boiler has a the 7 pin plug, it should be replaced with the one supplied with the burner.

WITHOUT REGULATOR (high-low progressive mode operation)



Key to lay-out:

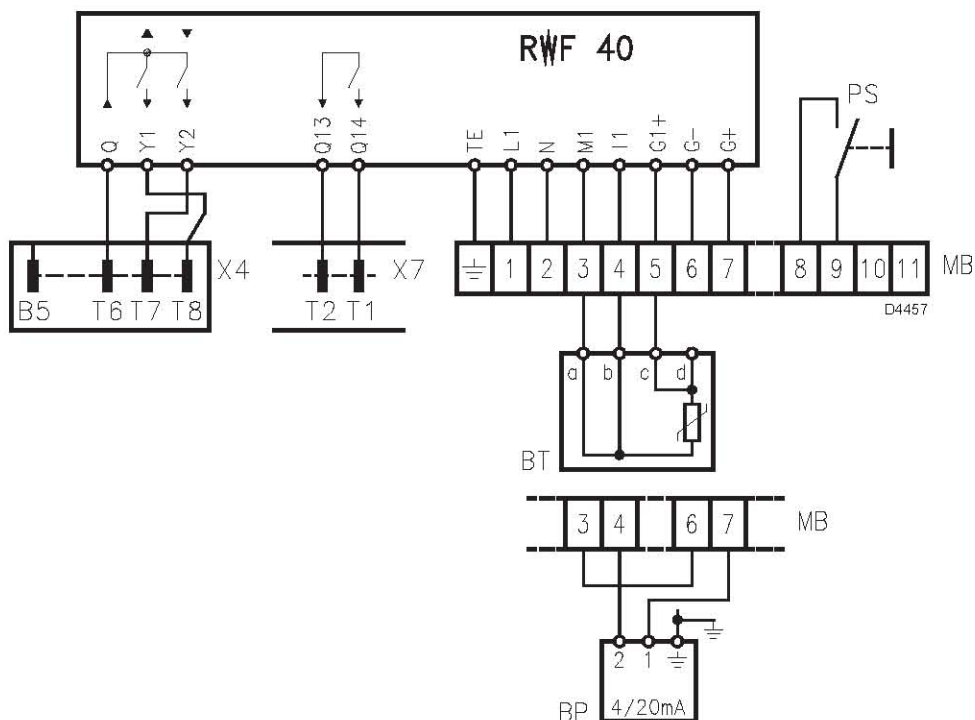
- PS** – Remote manual reset
- MB** – Burner terminal block
- X7** – 7 pin plug
- X4** – 4 pin plug
- X6** – 6 pin plug
- h2** – 2nd stage hourcounter
- TR** – High-low mode control device system
- h1** – 1st stage hourcounter
- S** – Remote lock-out signal
- IN** – Manual burner stop switch

- TL** – Limit control device system
T6A – Fuse
TS – Safety control device system
PG – Min. gas pressure switch
VR – Adjustment valve
VS – Safety valve

WITH REGULATOR (fully modulating mode operation)

ATTENTION

Do not connect any contact between **T6** and **T8** at the 4 pin plug and between **T1** and **T2** at the 7 pin plug, in order to avoid interference with the regulator.



Key to lay-out:

- PS** – Remote manual reset
MB – Burner terminal block
X4 – 4 pin plug
X7 – 7 pin plug
BT – Temperature probe
BP – Pressure probe

6. WORKING

6.1 COMBUSTION ADJUSTMENT

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. To suit the required appliance output, choose the proper setting of the combustion head, and the air damper servomotor.

6.2 COMBUSTION HEAD SETTING, (see fig. 9)

Combustion head adjustment varies depending on burner delivery.

It is carried out by rotating clockwise or counter-clockwise the setting screw (6) until the set-point marked on the regulating rod (2) is level with the outside plane of the head assembly (1). In figure 9, the head's regulating rod is set to set-point 3.5.

Example for burner type 917M:

The diagram is orientative and indicates combustion head setting depending on required thermal power. To assure a good working of the burner, we suggest to adjust the combustion head according to the boiler.

The burner is installed in a 100 kW boiler. considering an efficiency of 90%, the burner will have to deliver about 110 kW; for this output, adjustment should be made to setpoint 3.5.

HEAD ASSEMBLY REMOVING

To remove the head assembly, carry out the following operations:

- Make sure servomotor (7) is in the closing position (CAM II = 0).
- Disconnect the connections (3 and 5).
- Loosen the screws (4) and remove the servomotor (7).

ATTENTION

Rotation shaft (10) managed by the servomotor (7) features a safety mechanism (11) that prevents it turning accidentally whilst maintenance work is in progress.

- Loosen the screw (9), loosen screws (8) and remove head-holder assembly (1) by rotating slightly to the right.

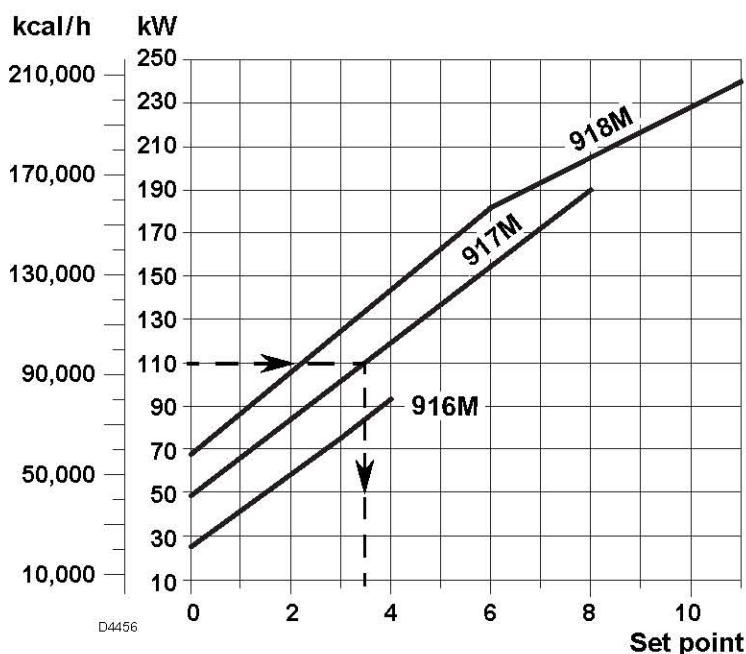
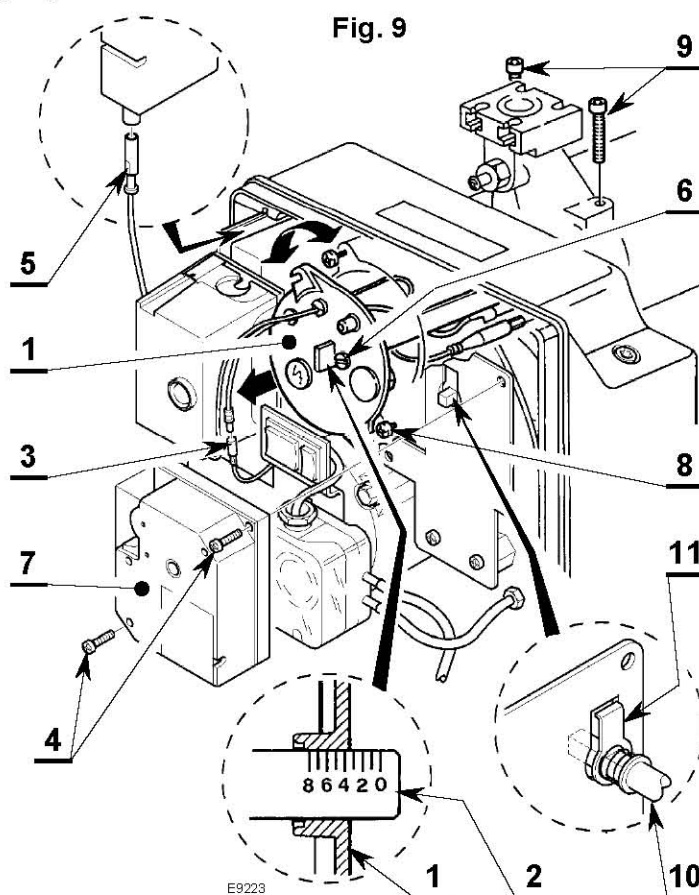
Take care not to alter the regulating rod-elbow (2) position while disassembling.

REASSEMBLY OF THE HEAD SYSTEM

Refit following the above procedure in the reverse order, restoring the head assembly (1) to its original position.

ATTENTION

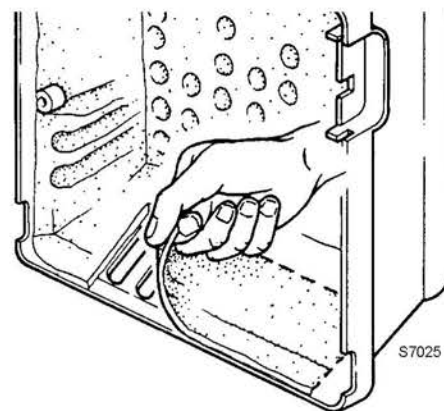
- Tighten the screws (9) (without locking them) completely; then lock them with a torque wrench setting of 3 - 4 Nm.
- Control that, during the working, there are not gas losses coming from the screws.



A For the burner to operate over a given output, in the model type 917M e 918M, you must remove the blank deadening to free the supplementary slits of the air inlet on the cover, as illustrated in figure 10.

TYPE	Thermal power - kW
917M	> 140
918M	> 200

Fig. 10



6.3 SETTING OF THE AIR DAMPER SERVOMOTOR, (see fig. 11)

STAND-BY

CAM II

CAM II assures the fully closed position of the air damper, when the burner is shut down (stand by). It is adjusted by the factory at 0°. **DO NOT ALTER.**

FIRST STAGE

CAM III

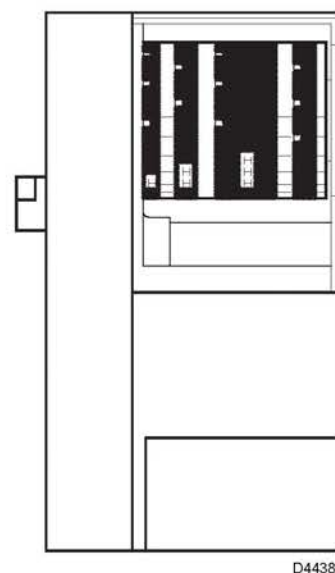
CAM III adjusts the air damper for the ignition and for the minimum output. It can be adjusted whilst it is being put into service. **CAM IV** is integral with **CAM III**.

SECOND STAGE

CAM I

I limits the rotation at the maximum output. It is adjusted at 90° by the factory. **DO NOT INCREASE THAT VALUE:** the burner can be damaged.

Fig. 11

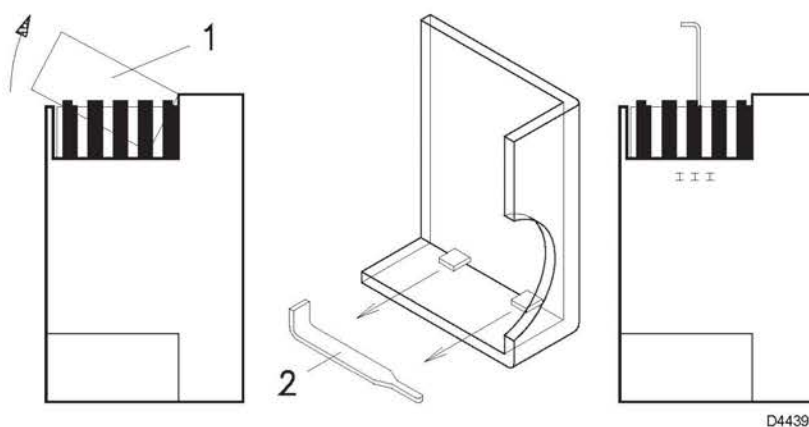


The servomotor only follows adjustment of **CAM III** when the cam's angle is reduced.

If the cam's angle needs increasing, you must first increase the servomotor angle with the "increase output (+)" key, then increase the angle of **CAM III** and, lastly, return the servomotor to the MIN output position with the "decrease output (-)" key.

Where necessary, **CAM III** can be adjusted by removing cover (1), which is snapped on, as illustrated in fig. 12, removing the relevant key (2) from inside, and inserting it in the slot on **CAM III**.

Fig. 12



6.4 FIRST START-UP, (see fig. 13 and fig. 5 page 6)

Once you have made sure wiring is correct, and checked hydraulic connections for leaks, set the air pressure switch to the minimum value.

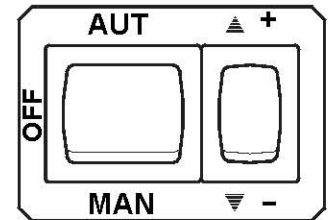
Connect the pressure gauge to the gas pressure test point at the burner head (M2, fig. 7 page 7).

The following table gives start-up settings with reference to a burner fuelled with methane gas.

Reference values are:

- firing power;
- air damper preset position (**CAM III**);
- preset position of Multibloc **POINT 0** setting screw;
- the type of Multibloc to be used.

Fig. 13



D4468

TYPE	Firing power	Adjustment CAM III	Adjustment 0 POINT	Adjustment GAS/AIR RATIO	MULTIBLOC
	kW	Set point	Set point	Set point	Type
916M	26 – 33	20° – 30°	0.1 – 0.2	Depends on maximum output	MB-VEF 407 C01
917M	48 – 83	30° – 40°	0.1 – 0.25		MB-VEF 407 C01
918M	68 – 110	30° – 35°	-0.7 – -0.5		MB-VEF 412 C01

- 1 - Depending on required maximum output, adjust the combustion head as indicated on page 10.
- 2 - Select manual operating mode “**MAN**” and calibrate the servomotor’s **CAM III** and adjust the **0 POINT** setting screw as indicated in the table, then start the burner.
- 3 - Once it has fired, move the servomotor by hand towards the second flame position by pressing switch (+). During this operation, check flame stability: if it looks unstable, adjust the **GAS/AIR RATIO** setting screw to increase or decrease the setting **until you reach the maximum desired output and correct CO₂ values for fumes**. Next, set **CAM I** to the value reached by the servomotor.
- 4 - Move the servomotor by hand towards the first flame position by pressing switch (-). Check combustion and, where necessary, use the **0 POINT** setting screw only to achieve correct CO₂ values for fumes.
- 5 - If first flame output needs altering, adjust **CAM III**.
All **0 POINT** setting screw adjustments will also cause the maximum gas delivery to be varied.
- 6 - Return the servomotor to maximum opening and check maximum output again, adjusting with the **GAS/AIR RATIO** setting screw.
- 7 - Turn the servomotor to first flame position again and adjust output again, adjusting with the **0 POINT** setting screw only.
- 8 - Repeat steps (6) and (7) until **GAS/AIR RATIO** and **0 POINT** setting screws no longer need adjusting.
- 9 - Check combustion values at intermediate output and, where necessary, adjust further with **GAS/AIR RATIO** and **0 POINT** setting screws.
Once you have done, and have made sure the burner features good firing and good flame stability, select automatic mode by setting the selector to “**AUT**”. modulation will occur between the setting position of **CAM III** and that of **CAM I**.

6.5 COMBUSTION CHECK

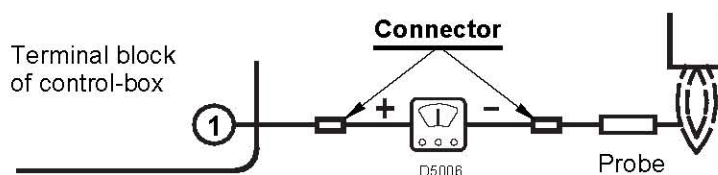
In conformity with Efficiency Directive 92/42/EEC the application of the burner on the boiler, adjustment and testing must be carried out observing the instruction manual of the boiler, including verification of the CO and CO₂ concentration in the flue gases, their temperatures and the average temperature of the water in the boiler. It is advisable to set the burner according to the type of gas used and following the indications of the table:

EN 676		AIR EXCESS: max. output $\lambda \leq 1.2$ – min. output $\lambda \leq 1.3$			
GAS	Theoretical max. CO ₂ 0 % O ₂	Setting $\lambda = 1.2$	CO ₂ % $\lambda = 1.3$	CO mg/kWh	NO _x mg/kWh
G 20	11.7	9.7	9.0	≤ 100	≤ 170
G 30	14.0	11.6	10.7	≤ 100	≤ 230
G 31	13.7	11.4	10.5	≤ 100	≤ 230

IONIZATION CURRENT

The minimum current necessary for the control box operation is 2 μ A.

The burner normally supplies a higher current value, so that no check is needed. Anyway, if you want to measure the ionization current, you have to open the connector (CN3) (see electrical scheme page 8) fitted on the wire and insert a microammeter.



6.6 AIR PRESSURE SWITCH

Adjust the air pressure switch once you have performed all the other burner adjustments with the air pressure switch set to the start of the scale. With the burner operating at minimum output, turn the knob slowly clockwise until the burner locks out. Next, turn the knob anticlockwise by a value of approx. 20% of the set value and then make sure the burner starts properly. If the burner locks out again, turn the knob just a bit further anticlockwise.

Attention:

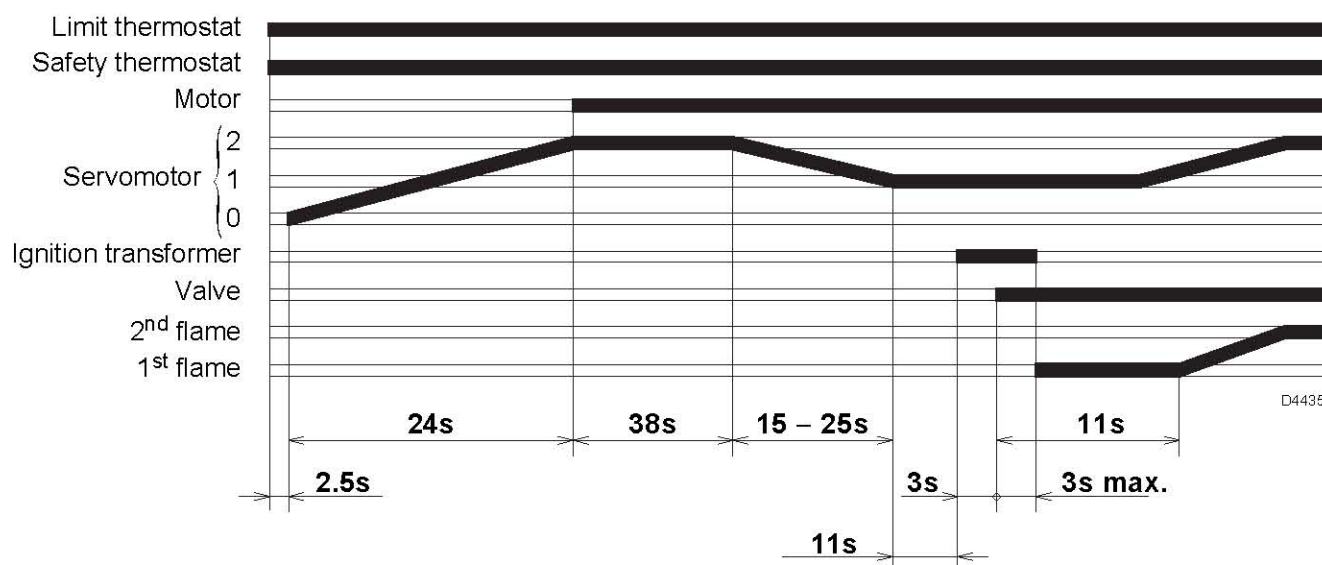
As a rule, the air pressure switch must prevent the air pressure from lowering below 80 % of the adjustment value as well as preventing the CO in the fumes from exceeding 1% (10,000 ppm).

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 %.

6.7 GAS PRESSURE SWITCH

Set the gas pressure switch to the start of the scale before adjusting it. With the burner operating at maximum output, turn the knob slowly clockwise until the gas train safety valve trips. Next, turn the knob anticlockwise by a value of approx. 30% of the set value and then make sure the burner starts properly.

6.8 BURNER START-UP CYCLE



7. MAINTENANCE

The burner requires periodic maintenance carried out by a qualified and authorised technician **in conformity with legislation and local standards**.

Maintenance is essential for the reliability of the burner, avoiding the excessive consumption of fuel and consequent pollution.

Before carrying out any cleaning or control always first switch off the electrical supply to the burner acting on the main switch of the system.

THE BASIC CHECKS ARE:

Leave the burner working without interruptions for 10 min. and checking the right 1st and 2nd stage settings of all the components stated in this manual.

Then carry out a combustion check verifying:

- Content of CO₂ (%)
- Content of CO (ppm)
- Flue gas temperature (°C)

8. FAULTS / SOLUTIONS

The control box has a self-diagnostic system, by which it is possible to easily check the faults and find the solutions.

To use this function, wait for a minimum of 10 sec after the lock out, then push the reset button for 3 sec. After releasing the button, the RED LED will begin to flash, as shown in the following schedule.

Red fault LED waiting time 10s	Press lockout reset button for > 3s	Blink code	Approx. 3s	Blink code
		● ● ● ● ●		● ● ● ● ●

The LED provide a blink code each 3sec.

The blink codes give the information of the possible faults, as follows:

BLINK CODE	POSSIBLE CAUSE
2 ● ●	The flame does not stabilize at the end of the safety time: – faulty or soiled ionization probe; – faulty or soiled fuel valves; – neutral/phase exchange; – poor burner regulation.
3 ● ● ●	Minimum air pressure switch does not close: – air pressure switch faulty; – air pressure switch incorrectly regulated; – fan motor does not run; – maximum air pressure switch operating.
4 ● ● ● ●	Minimum air pressure switch does not open or extraneous light on burner start-up: – air pressure switch faulty; – air pressure switch incorrectly adjusted.
5 ● ● ● ● ●	Extraneous light during pre-purging, or control box faulty.
7 ● ● ● ● ● ● ●	Loss of flame during operation: – poor burner regulation; – faulty or soiled fuel valves; – short circuit between ionization probe and earth.
18 ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	Minimum air pressure switch opens during pre-purging or operation: – air pressure switch incorrectly regulated.
19 ●	Faulty on output contacts of control box: – wiring error.
20 ●	Control box faulty.