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# **User manual and Installation instructions**

## **GARDA**

Models:

**M90F.24S**

**M90F.28S**

**M90F.32S**

**M90F.24SR**

**M90F.28SR**





Congratulations on your choice.

Your boiler is electronically controlled and has electronic ignition.

The materials it is made of and the control systems it is equipped with give you safety, a high level of comfort and energy savings to allow you to get the greatest benefit out of independent heating.

## Remember that...

✓ **The manual** must be read thoroughly, so that you will be able to use the boiler in a safe and sensible way;  
must be carefully kept. It may be necessary for reference in the future.

✓ **First lighting up** must be carried out by competent and responsible engineer.

✓ **The manufacturer** disclaim all liability for any translations of the present manual from which incorrect interpretation may occur; cannot be held responsible for non-observance of instructions contained in this manual or for the consequences of any procedure not specifically described.

## Using the boiler...

✓ **Before lighting the boiler**, you are advised to have a professionally qualified person check that the installation of the gas supply:

- is gas-tight;
- is of the correct gauge for the flow to the boiler;
- is fitted with all the safety and control devices required by the current Regulations;

Ensure that the installer has connected the pressure relief valve outlet to a drain pipe. The manufacturers are not responsible for damage caused by opening of the pressure relief valve and consequent escape of water, if not connected correctly to the drain.

### ✓ **On detecting the smell of gas**

- don't operate any electrical switches, the telephone or any device that may produce sparks;
- open the windows and doors at once to create a draught of air which will purge the area;
- shut off the gas cocks;
- get the assistance of a qualified person.

✓ **Do not touch the appliance** with parts of the body that are wet or damp and/or bare feet.

✓ **In case of structural work** or maintenance near the exhaust duct and/or fume exhaust devices or their attachments, turn off the appliance. On completion of the work, have a professionally qualified person check their efficiency.

✓ **Repairs** (under guarantee) must be carried out only by an approved engineer, using genuine spare parts. Thus do no more than switching off the boiler yourself (see the instructions).

✓ **Your boiler** allows heating up of water to a temperature less than boiling point;

- must be connected to a central heating system and/or a hot water supply system, compatible with its performance and output;
- can be used only for those purposes for which it has been specially designed;
- must not be touched by children or by those unfamiliar with its operation;
- must not be exposed to weather conditions.



## Safe handling of substances

Biasi products are manufactured in accordance with ISO 9000 and do not, and will not, contain any hazardous materials or substances such as asbestos, mercury or C.F.C.'s.

The appliance packaging does not contain any substances, which may be considered a hazard to health.

### Combustion chamber panels

Material: mineral fibers

Known hazards – Some people can suffer reddening and itching of the skin. Fibre entry into the eye will cause foreign body irritation, which can cause severe irritation to people wearing contact lenses. Irritation to respiratory tract.

Precautions – Dust goggles will protect eyes. People with a history of skin complaints may be particularly susceptible to irritation. High dust le-

vels are only likely to arise following harsh abrasion. In general, normal handling and use will not present high risk, follow good hygiene practices, wash hands before, touching eyes, consuming food, drinking or using the toilet.

First aid – Medical attention must be sought following eye contact or prolonged reddening of the skin.

### Thermostat / Temperature gauge

Description – Sealed phial and capillary containing liquid.


Known hazards – irritating to skin, eyes and throat. Vapour is harmful. Inflammable – do not extinguish with water.

Precautions – Do not incinerate. Avoid contact with broken/leaking phials. Do not purposely puncture.

First aid medical attention must be sought following eyes/skin contact, wash with clean water.

**Appliance category II<sub>2H3+</sub> Gas G20 20 mbar, G30 29 mbar, G31 37 mbar**

**Country of destination: United Kingdom**

This appliance conforms with the EEC directive 90/396 and, consequently, it has the right to make use of the  brand name

Moreover, the appliance conforms with the EEC directive 87/308 relative to the prevention and elimination of radio disturbances.

The appliance is built to comply with the regulation now in force regarding gas appliance's safety and the European regulation now in force relative to safety of household and similar electrical appliances.

The manufacturer, in the continuous process to improve his products, reserves the right to modify the data expressed in the present documentation at any time and without prior notice.

The present documentation is an informative support and it cannot be considered as a contract towards third parties.

# Boiler installation and commissioning tips

✓ **The installation** must be carried out by a qualified person who will be responsible for observing the current Regulations.

## Installing the boiler...

✓ Do not forget to remove the transit caps and plugs from the boiler connections these are fitted to every boiler.

✓ Keep the boiler clear of dust during installation and in particular do not allow any dust or debris to enter the top of the boiler where the flue connection is made. It is recommended that you put a dust sheet over the top of the boiler until you are ready to make the flue connection.

✓ Because every boiler is fired and tested live at the factory, a small amount of water remains within the boiler. It is possible for this water to initially cause the pump to seize. It is therefore recommended that the pump rotor be manually turned to free its rotation before turning the boiler on.

✓ Remember to release the auto air purge before filling the boiler. See the instructions to identify the location of this device.

✓ Do not remove the cap of the pressure test points of the air switch (top left side of the boiler).

✓ You are strongly advised to flush out the system both cold and hot in order to remove system and installation debris.

✓ It is also sensible to initially fire and commission the boiler before connecting any external controls such as a room thermostat. By this method if you have a subsequent problem following the addition of an external control you can eliminate the boiler from your fault analysis.

✓ Do not forget to range rate the boiler to suit the system requirements. This procedure is covered in the commissioning section of the installation manual.

✓ If the boiler is fitted with a digital programmer, when setting the times for automatic operation, remember that for every "ON" time there must be an "OFF" time to follow and that on every occasion you enter a time you must also indicate which days that you want the boiler to follow the timed settings.

✓ Some products incorporate an anti cycling time delay. It is normal when first switching the boiler on for the boiler to operate on heating for a few seconds then switch off. After 3–4 minutes has elapsed the boiler will then re ignite and operate perfectly normally. The ignition delay cycle does not prevent normal operation of the boiler to provide d.h.w.

✓ If you are in any doubts as to the installation or operation of the boiler please read the instruction manuals thoroughly and then if necessary contact Biasi UK for advice and assistance.

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Abbreviations used in the manual

C.h. = Central heating

D.h.w. = Domestic hot water

D.c.w. = Domestic cold water

Combi = combination boilers

(models M90F.24S, M90F.28S)

C.h. only = system boilers

(models M90F.24SR, M90F.28SR)

# 1 APPLIANCE DESCRIPTION

## 1.1 Overview

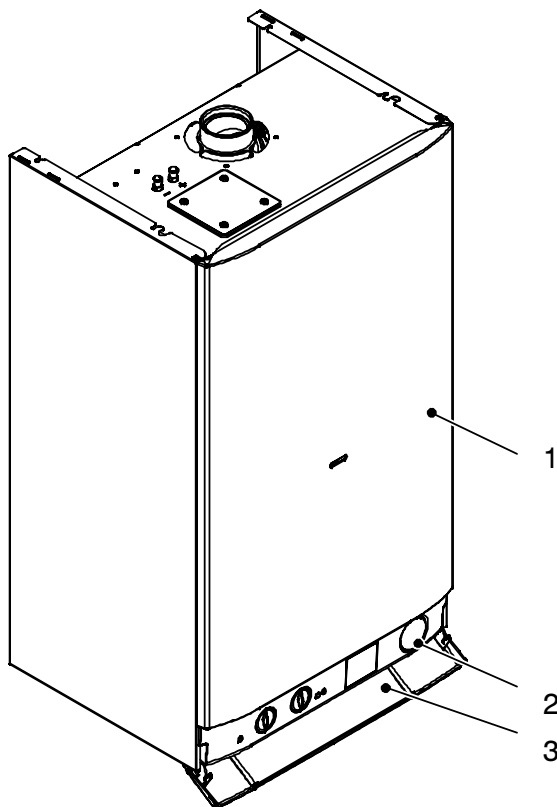


Fig. 1.1

- 1 Case front panel
- 2 Control panel
- 3 Control panel cover

## 1.2 Control panel

- 4 C.h. circuit temperature and pressure gauge
- 5 Time switch (c.h. control) \*
- 6 Lock-out signal lamp
- 7 Lockout reset button

- 8 Function selector and c.h. temperature control knob
- 9 D.h.w. temperature control knob \*
- 10 Appliance operation light

## 1.3 Isolation valves

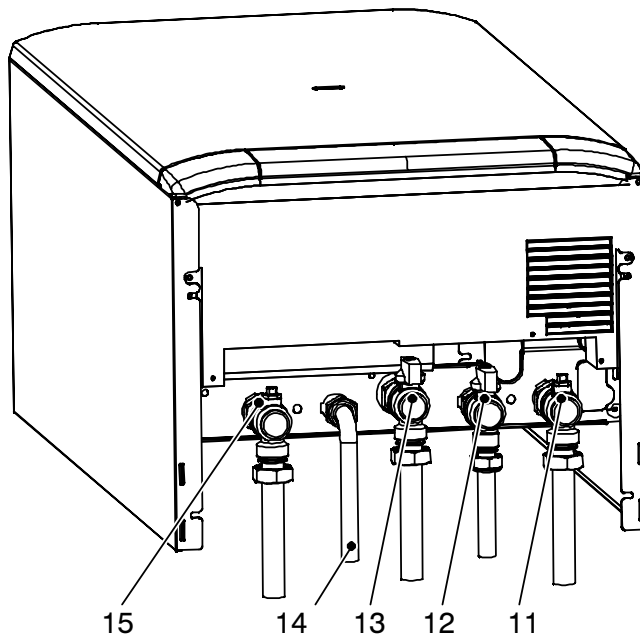


Fig. 1.2 (bottom view of the boiler)

- 11 C.h. return valve
- 12 D.c.w. inlet valve \*
- 13 Gas inlet valve
- 14 D.h.w. outlet pipe \*
- 15 C.h. flow valve

## 1.4 Technical data

For detailed technical data see section 4.6 or 4.7 of this manual.

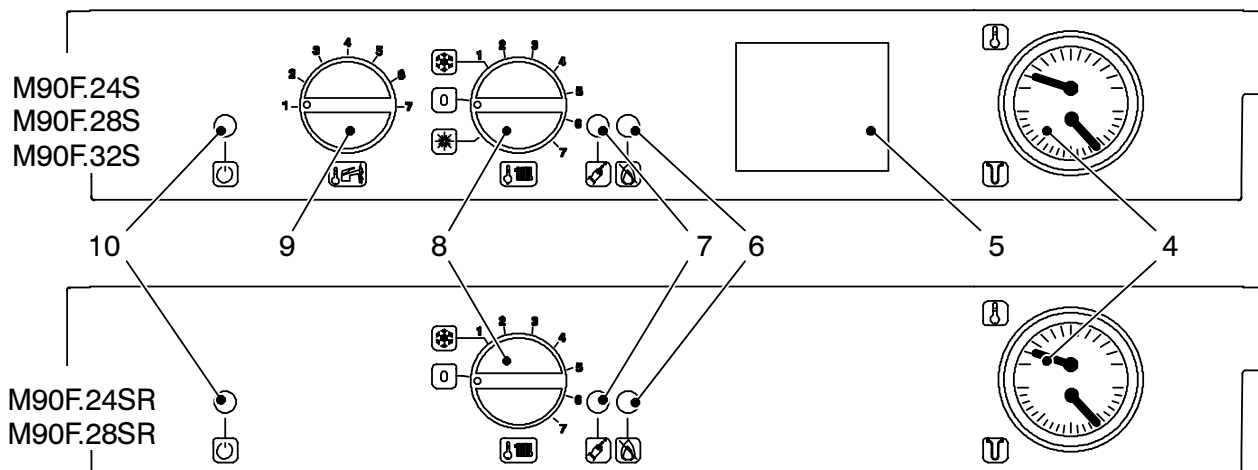


Fig. 1.3

\* not on M90F.24SR and M90F.28SR boilers

USE

## 2 INSTRUCTIONS FOR USE

### 2.1 Warnings

Biasi UK Ltd support the Benchmark initiative. Within the information pack, you will find a Benchmark Log Book. It is very important that this is completed correctly by the installer and/or the commissioning engineer at the time of installation, commissioning and hand over to the user.

All CORGI Registered Installers carry a CORGI ID card, and have a registration number. Both should be recorded in your Benchmark Log Book. You can check your installer is registered by calling CORGI direct on 01256 372300.

In order to guarantee safety and correct operation, it is essential that all the tests are carried out by a competent and responsible service engineer before lighting up the boiler.

The tests are described in the *installation instructions* in section 7 *commissioning*.

Ensure that the c.h. circuit is regularly filled with water (even if the boiler is only used for d.h.w. supply) checking that the pressure indicated on the temperature and pressure gauge 4 is not lower than that shown in Fig. 2.2.

If the pressure reading on the pressure gauge is below that shown in Fig. 2.2, then the system will require topping up. A filling loop is normally provided by the installer for this purpose.

**If you are in any doubt regarding this procedure you are advised to contact your Installer or an Approved Engineer.**

This appliance is provided with a built in anti-freeze system that operates the boiler when the temperature is below 4 °C

Therefore, when the boiler is not lit or used in cold weather, with consequent risk of freezing **do not switch off the boiler at the fused spur isolation switch or close the gas inlet cock.**

When you do not expect to use the boiler for a long period and the boiler is not to be used for frost protection then follow the instructions given in section 2.6 on page 4.

### 2.2 Refilling procedure

- 1 Isolate the boiler from the electrical supply at the fused spur. Reconnect the filling loop as demonstrated in Fig. 2.1.

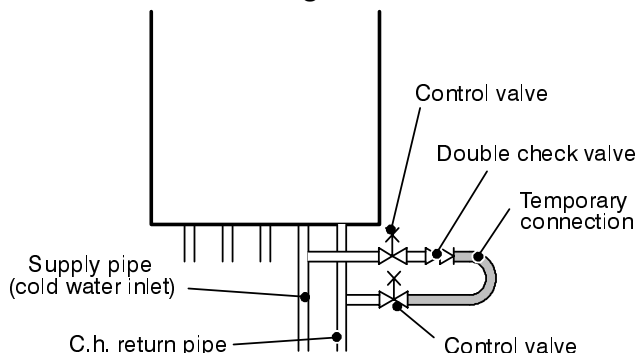


Fig. 2.1

- 2 Open the valves of the filling loop and watch the gauge until it reaches normal filling pressure as shown in Fig. 2.2.

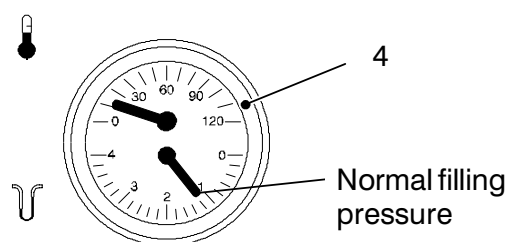


Fig. 2.2

- 3 Close the valves and remove the filling loop.

**If you experience any difficulty with the operation of the boiler, switch off the boiler immediately at the fused spur isolation switch and contact your Installer or an approved Service Engineer**

Air introduced into the boiler during this filling process will vent through the automatic air purger fitted to the boiler. You may also find it necessary to vent air from your radiator circuit using your radiator key, however be aware that excessive venting will cause the pressure in the system to drop.

Always ensure that the pressure gauge is set at the required pressure.



## 2.3 Ignition

- 1 Check that the valves located in the lower part of the boiler are open (Fig. 2.3).

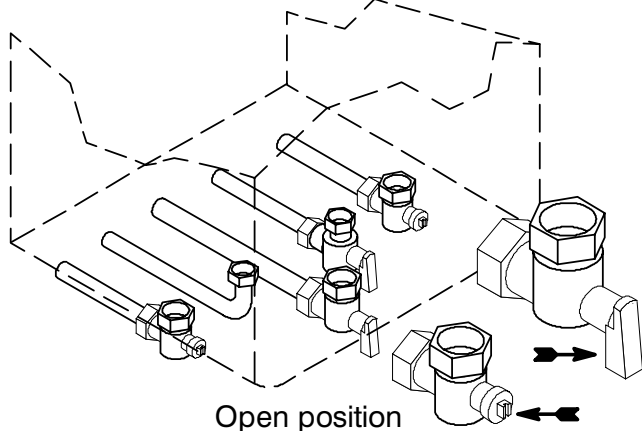


Fig. 2.3

- 2 Turn on the electricity supply to the boiler, switching on the fused spur isolation switch. The appliance operation light 10 (Fig. 2.4) will flash every 4 seconds (stand-by condition).
- 3 If the boiler is to be used for c.h. and d.h.w position the function selector 8 as in Fig. 2.4. (combi) or in Fig. 2.5 (c.h. only). The appliance operation light 10 will flash every 2 seconds (operating boiler).

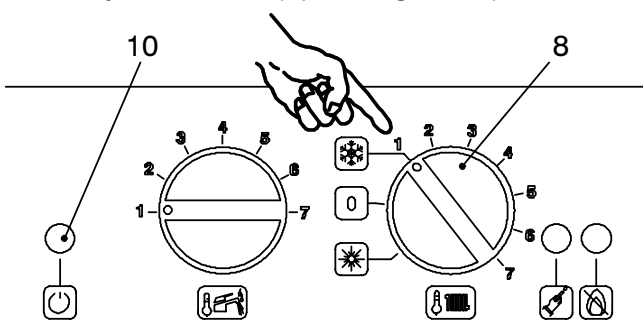


Fig. 2.4

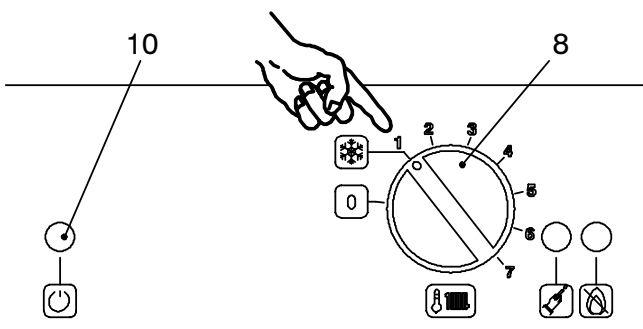


Fig. 2.5

- 4 If d.h.w. supply only is required (combi), position the function selector 8 as in Fig. 2.6.

The appliance operation light 10 will flash every 2 seconds (operating boiler).

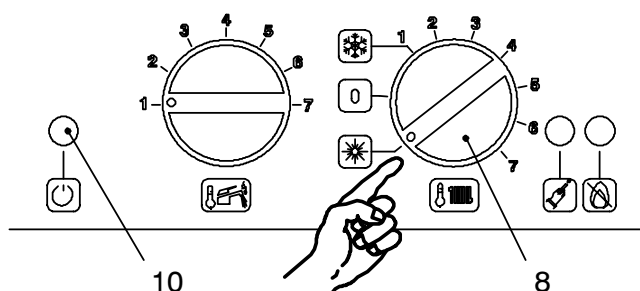


Fig. 2.6

## 2.4 C.h. circuit temperature

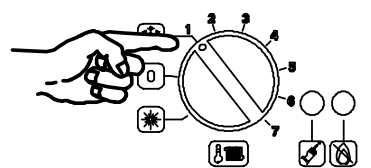
The output temperature of c.h. water is adjustable from a minimum of about 38°C to a maximum of about 85°C (Fig. 2.7), by turning the function selector (8).

Adjustment of c.h. output on the boiler is automatic. The greatest output pre-set in the factory can, however, be reduced in level according to actual system requirements; this does not affect the maximum output in d.h.w. operation.

Such adjustments must be carried out by a qualified person; therefore we advise you to contact your installer or Service Agent.

Adjustment of the boiler temperature alters the gas flow at the burner according to the thermal demand in the system. So it is usual to see the burner lit at the minimum level for more or less long periods.

Minimum



Maximum

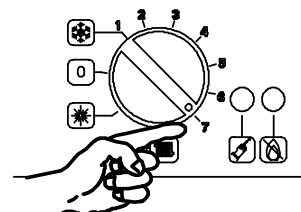


Fig. 2.7

Adjustment

## Instructions for use

In order to achieve optimal settings for economy and comfort, we recommend adjusting the operating temperature of the c.h. water according to the outside temperature, positioning the knob as follows:

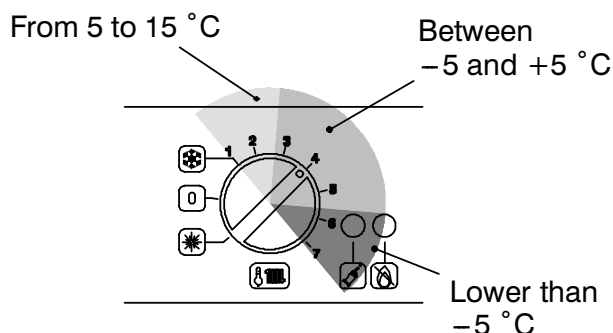


Fig. 2.8

Your qualified installer will be able to recommend the most suitable adjustment for your system.

The temperature and pressure gauge (4, Fig. 1.3 on page 1) will allow you to check that the set temperature is obtained.

### 2.5 D.h.w. temperature (combi)

The temperature of the d.h.w. leaving the boiler can be varied from a minimum of about 35°C to a maximum of about 55°C (Fig. 2.9), by turning the temperature control knob 9.

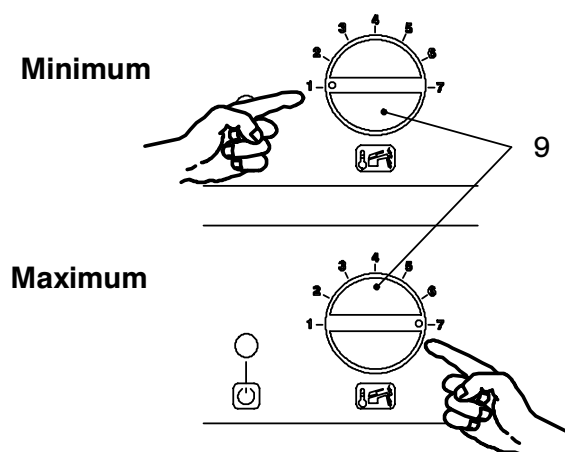


Fig. 2.9

Adjustment of the d.h.w. temperature is completely separate from that of the c.h. circuit.

The adjustment system integrated within the boiler automatically controls the flow of gas to the burner in order to keep the temperature of d.h.w. delivered constant, between the limits of maximum and minimum output.

Where the demand is at a low level or with the temperature set to the minimum, it is normal to see a cycle of lighting and extinguishing of the burner when running.

### Adjustment

It is advisable to adjust the d.h.w. temperature to a level commensurate with the demand, minimising the need to mix with cold water. In this way, the automatic control facilities will be fully exploited.

Moreover, where the amount of limescale present in the water may be particularly great, not exceeding the position in **Fig. 2.10** of the d.h.w. temperature control knob 9 corresponding to about 50°C (Fig. 2.10), minimises annoying incidences of scale deposits and clogging.

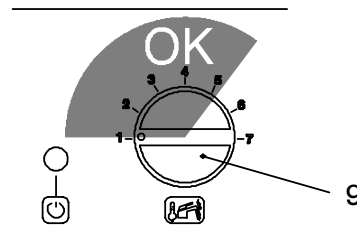


Fig. 2.10

In these cases, however, it is advisable to install a small water treatment device or softener. With such a device you should avoid periodic descaling.

Consequently, the d.h.w. heat exchanger will keep its performance consistent for a longer period of time with resulting gas savings.

If the demand for d.h.w. is so great as to prevent reaching a high enough temperature, have the appropriate output limiting valve installed by your installer or an Authorised Service Engineer.

### 2.6 Extinguishing

To turn the boiler off set the function selector 8 to the position shown in Fig. 2.11 (combi) or Fig. 2.12 (c.h. only).

The appliance operation light 10 will flash every 4 seconds.

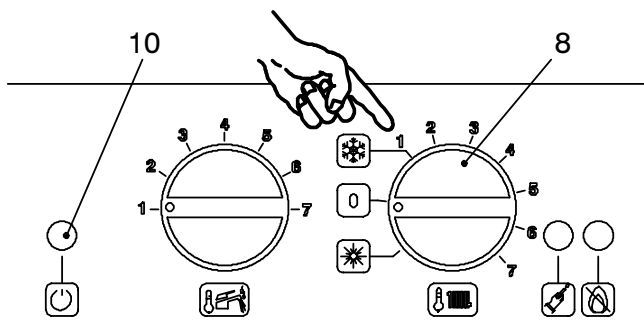


Fig. 2.11

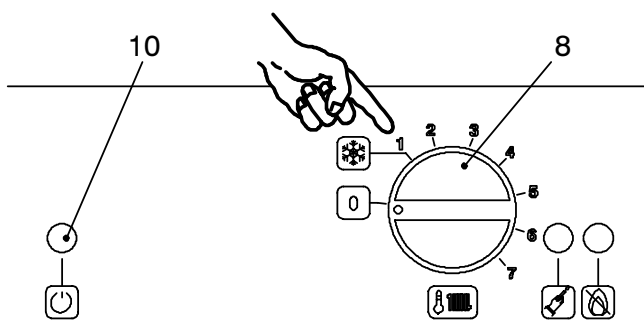


Fig. 2.12

When you do not expect to use the boiler for a long period:

- 1 Switch off the electricity supply to the boiler, by means of the fused spur isolation switch;
- 2 Shut off the gas supply cock 13 and the valves for the water circuits fitted under the boiler (Fig. 2.13).
- 3 Empty the water circuits, if necessary, as shown in the *installation instructions* in the section *maintenance*.

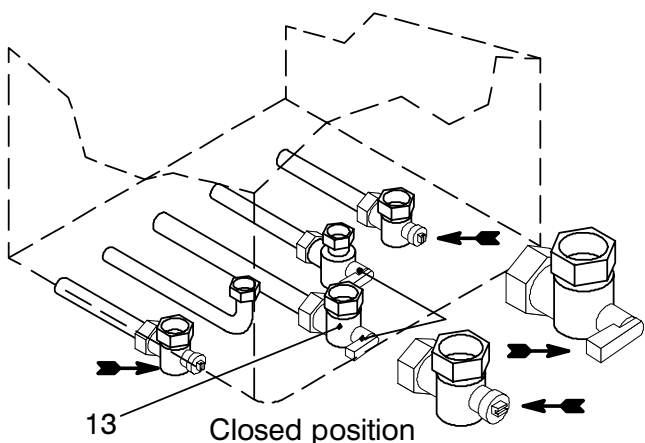


Fig. 2.13

## 2.7 Built in time switch (combi)

The combi boilers are equipped with a built in electronic time switch (5, Fig. 1.3 on page 1) which

controls the c.h. operation.

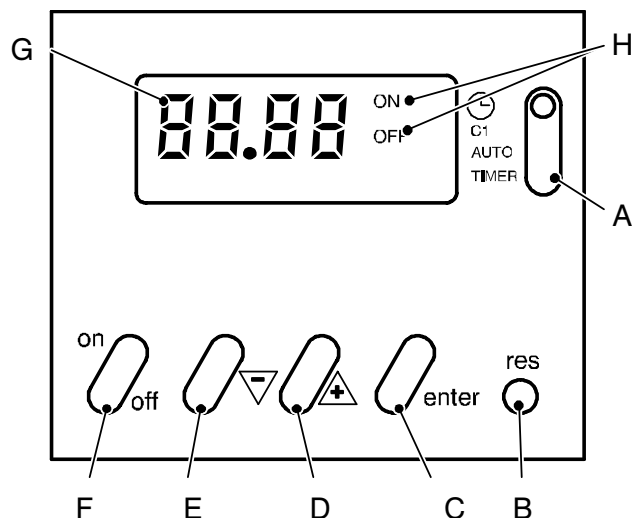


Fig. 2.14

### Display and control panel

- A Mode selector switch
- B Reset button
- C Enter button
- D Increase “+” setting button
- E Decrease “-” setting button
- F On-off button
- G Time display
- H ON-OFF display

### Setting the current time and weekday

Note: with a new unit or when the reset button B has been pressed, the first day indicator NO TAG on the left and the time display G are flashing.

Set the mode selector switch A to the position and press the buttons D or E until the current time appears in the display G.

The clock starts by moving the switch A to the AUTO position.

Setting example shown in Fig. 2.15:  
Current time 16.30.



Fig. 2.15

USE

## Instructions for use

USE

### Setting the switching time

20 memory locations are available, corresponding to 10 on – off sequences.

Set the mode selector switch A to the **C1** position. The symbols shown in Fig. 2.16 appears in the display.

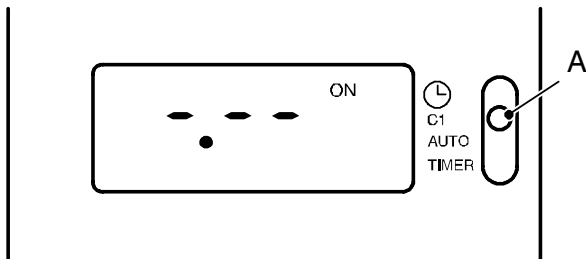


Fig. 2.16

Press the buttons D or E to set the desired ON time.

Press the “enter” button C to confirm the setting and to continue programming the OFF time.

Set the OFF time as explained above for the ON setting and confirm by pressing the “enter” button C. Proceed in the same way for other settings.

Setting example shown in Fig. 2.17:

A – ON time 7.45.

B – OFF time 10.30.

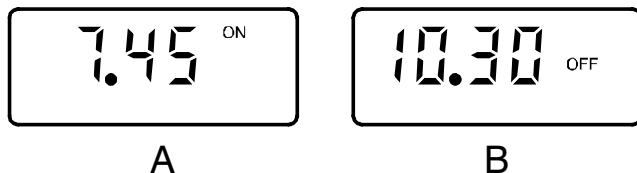


Fig. 2.17

### Activating the timed settings

Set the mode selector switch A to the **AUTO** position shown in Fig. 2.18.

The current time appears in the display. The ON – OFF display H indicates the current state of operation (according to the settings).

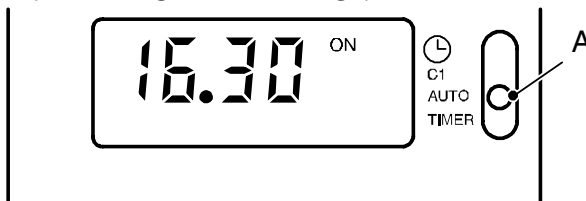


Fig. 2.18

Note: when the mode selector switch A is in the **AUTO** position and the boiler is switched off at the fused spur isolation switch, the display H indicates only the OFF state. The other indications are blanked.

### Reading the timed settings

Set the mode selector switch A to the **C1** position. The symbols shown in Fig. 2.16 appears in the display.

Press the “enter” button C. Each time the button is pressed the display shows the details of the next setting.

### Changing or deleting the timed settings

Set the mode selector switch A to the **C1** position. The symbols shown in Fig. 2.16 appears in the display.

Press the “enter” button C until the display shows the setting to be modified or deleted.

The time setting can be modified now by pressing button D or E and the operation can be switched on or off by pressing the button F.

To delete a time set press the button D or E until the symbols shown in Fig. 2.16 appears in the time display G.

The new settings are memorized by moving the switch A to a different position.

### Manual operation

The operation of the time switch can be forced on or off constantly or for a timed period.

To force **constantly** on or off the timer operation set the mode selector switch A to the **TIMER** position. The symbols shown in Fig. 2.19 appears on the display.

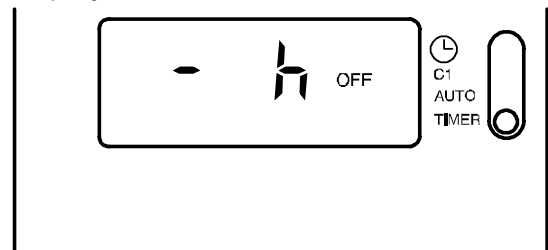


Fig. 2.19

The operation can be switched permanently on or off by pressing the button F and leaving the switch A in the **TIMER** position.

To force a **timed delay** on or off operation, set the mode selector switch A in the **TIMER** position.

Set the time delay by pressing the button D or E and the operation can be forced on or off by pressing the button F.

The time delay can be set within the following ranges:

## Instructions for use

1 to 23 hours with steps of 1 hour

1 to 27 days with steps of 1 day

The time delay setting is activated by moving the switch A to the **AUTO** position.

The ON – OFF display H flashes indicating that the current state of operation has been forced.

To delete the timed delay setting, set the mode selector switch A in the **TIMER** position, press the button D or E until the symbols shown in Fig. 2.19 appears in the display and then set the mode selector switch A to the **AUTO** position

Setting example shown in Fig. 2.20:  
forced ON state for 4 hours.

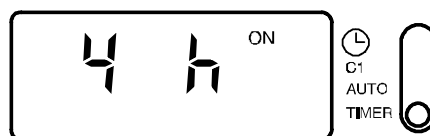


Fig. 2.20

### Resetting

To completely reset the timer, press the reset button with a pointed object (pencil).

**CAUTION:** pushing the reset button will completely erase the settings as well as all the data, including the current time and day.

USE

## 3 USEFUL ADVICE

### 3.1 Central heating

USE

For reasonably economical service install a room thermostat.

Never shut off the radiator in the area where the room thermostat is installed.

If a radiator (or a convector) does not heat up, check that no air is present in it and that its valve is open.

If the ambient temperature is too high, do not alter the radiator valves. Reduce the central heating temperature instead by means of the room thermostat and the function selector (8 in Fig. 3.1).

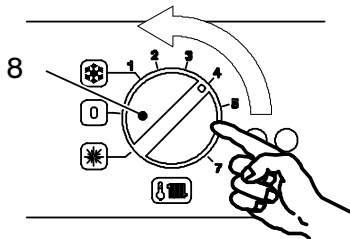


Fig. 3.1

### 3.2 Frost protection

This appliance is provided with a built in anti-freeze system that operates the boiler when the temperature is below 4 °C

Therefore, when the boiler is not lit and used in cold weather, with consequent risk of freezing **do not switch off the boiler at the fused spur isolation switch or close the gas inlet cock.**

### 3.3 Periodic maintenance

For efficient and continuous operation of the boiler, it is advisable to arrange maintenance and cleaning by an Authorised Service Centre Engineer, at least once a year.

During the service, the most important components of the boiler will be inspected and cleaned. This service can be part of a maintenance contract.

In particular, you are advised to have the following checks carried out:

- primary heat exchanger;
- domestic hot water heat exchanger;
- burner;
- exhaust fume duct and flue;
- pressurisation of the expansion tank;
- filling up of the central heating circuit;
- bleeding of air from the central heating system;

- general check of the appliance's operation.

### 3.4 External cleaning

Before carrying out any cleaning, disconnect the appliance from the electrical mains, using the fused spur isolation switch fitted adjacent to the appliance.

To clean the external panels, use a cloth soaked in soapy water. Do not use solvents, abrasive powders or sponges.

Do not carry out cleaning of the appliance and/or its parts with readily flammable substances (for example petrol, alcohols, naphtha, etc.).

### 3.5 Operational faults

#### If the lock-out signal lamp comes on

this indicates that the safety lock-out 6 (Fig. 3.2) has stopped the boiler

To re-start the boiler, it is necessary to press the boiler reset button 7 (Fig. 3.2).

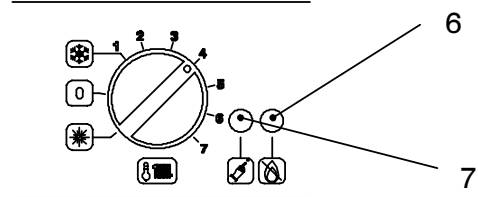


Fig. 3.2

For the first lighting up and following maintenance procedures for the gas supply, it may be necessary to repeat the resetting operation several times so as to remove the air present in the pipework.

#### If noises due to air bubbles are heard during operation...

you should check that the pressure on the temperature and pressure gauge (Fig. 2.2 on page 2) is not below the correct setting.

If required, top up the system correctly, as described in the section 2.2 of this manual.

Bleed any air present in the radiators, if necessary.

#### If the pressure on the temperature and pressure gauge (4 on page 1) has gone down...

it is necessary to top up the appliance with water again, so as to raise the pressure to an adequate level as described in the section 2.2 of this manual.

If topping up with water has to be done very frequently, have the system checked for leaks.

---

## Useful advice

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### If water comes out of the pressure relief valve

Check on the temperature and pressure gauge (4 on page 1) that the pressure in the central heating circuit is not close to 3 bars. In this case, temperature rise in the circuit can cause the pressure relief valve to open.

So that this does not happen and to decrease the pressure to a normal value, it is advisable to vent some of the water in the appliance through the bleed valves present in the radiators.

### If in time, a reduction in domestic hot water supply is observed...

The likely causes may be impurities caught in the domestic hot water flow switch filter or limescale deposited in the domestic hot water heat exchanger. It is advisable to have the appliance cleaned out by an Authorised Service Centre Engineer.

### If water should occasionally leak from the boiler...

shut off the valves positioned under the boiler (Fig. 2.13 on page 5) and call an Authorised Service Centre Engineer.

### If the appliance operation light 10 (Fig. 3.3) flashes very quickly the boiler is faulty.

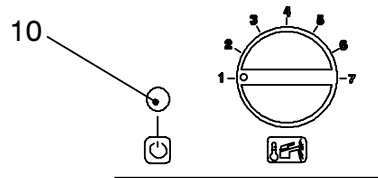


Fig. 3.3

**In this case or in case of problems other than those mentioned here, switch off the boiler, as described in section 2.6 on page 4 and call a competent and responsible service engineer.**

## 4 TECHNICAL INFORMATION

### 4.1 Overview

INSTALLATION

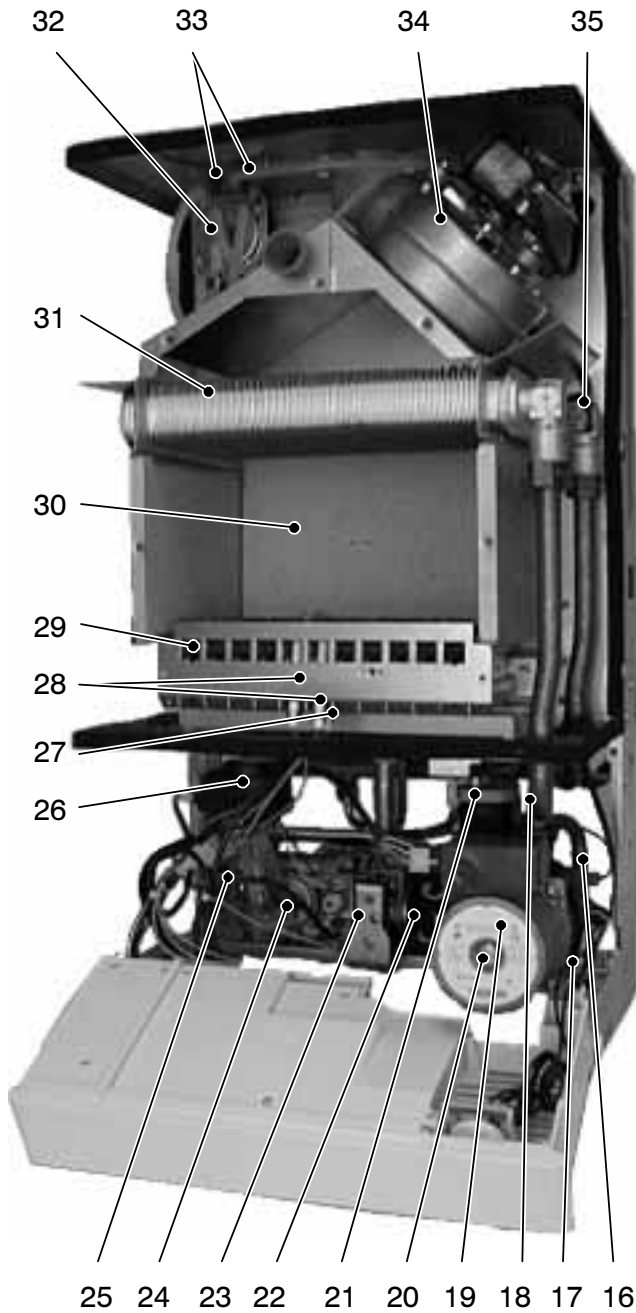


Fig. 4.1

11 C.h. return valve

12 Domestic cold water inlet valve

13 Gas inlet valve

14 D.h.w. outlet pipe

15 C.h. flow valve

16 D.h.w. temperature probe NTC

17 Main circuit drain valve

18 C.h. pressure relief valve

19 Pump

20 Pump vent plug

21 Automatic air purger valve

22 D.h.w. flow switch

23 Modulation gas valve

24 Primary circuit flow switch

25 C.h. temperature probe NTC

26 Three-way diverter valve

27 Flame-detecting electrode

28 Ignition electrodes

29 Burner

30 Combustion chamber

31 Primary heat exchanger

32 Air pressure switch

33 Air switch pressure test points

34 Fan

35 Safety thermostat

36 Modulation operator

37 Gas valve outlet pressure test point

38 Gas valve inlet pressure test point

39 D.h.w. heat exchanger

40 C.h. expansion tank

41 By-pass valve

42 Venturi device

43 Domestic water circuit filter

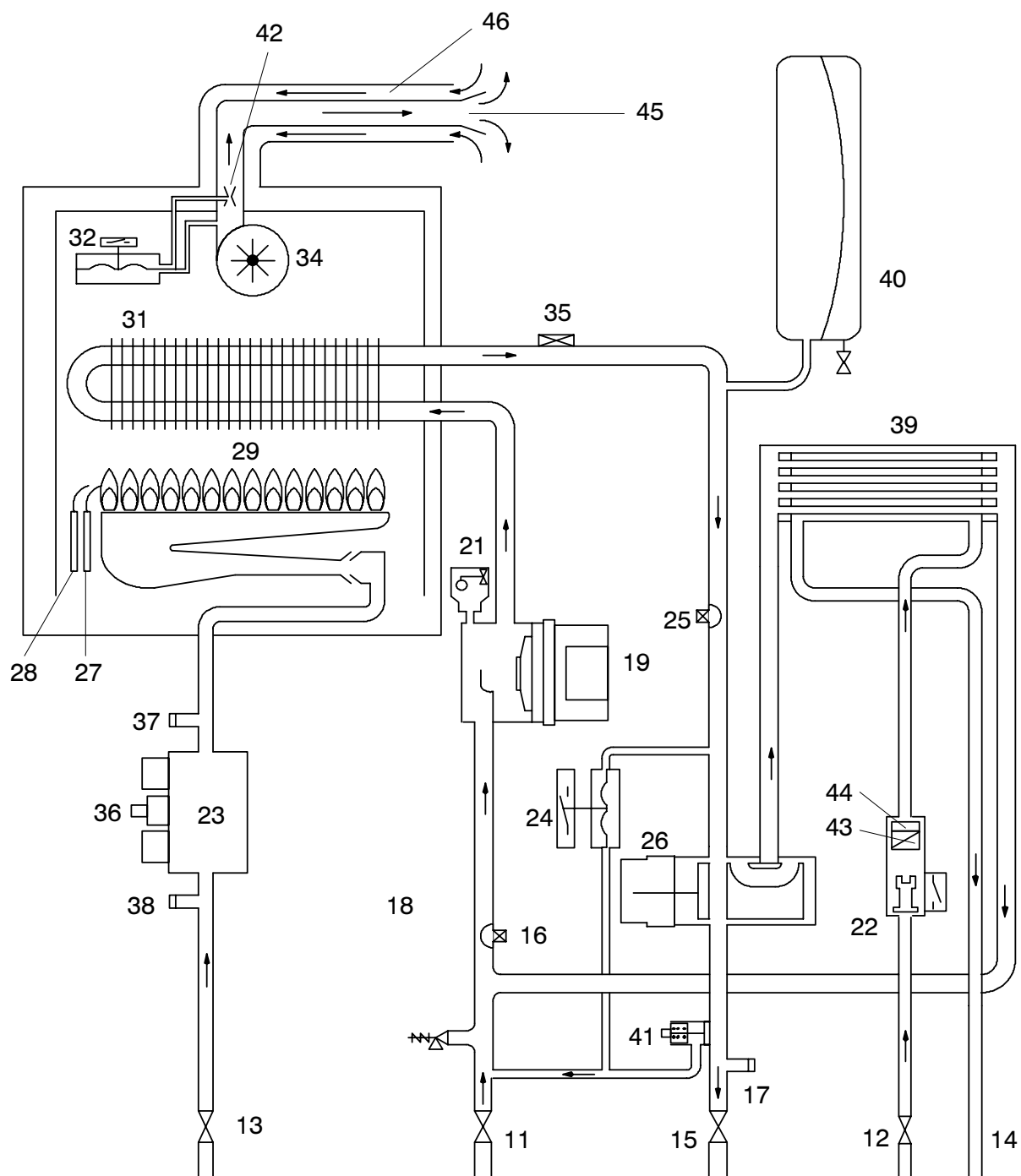
44 D.h.w. flow limiter

45 Flue outlet pipe

46 Air intake pipe



## 4.2 Main diagram mod. M90F.24S M90F.28S M90F.32S



INSTALLATION

Fig. 4.2

### 4.3 Main diagram mod. M90F.24SR M90F.28SR

INSTALLATION

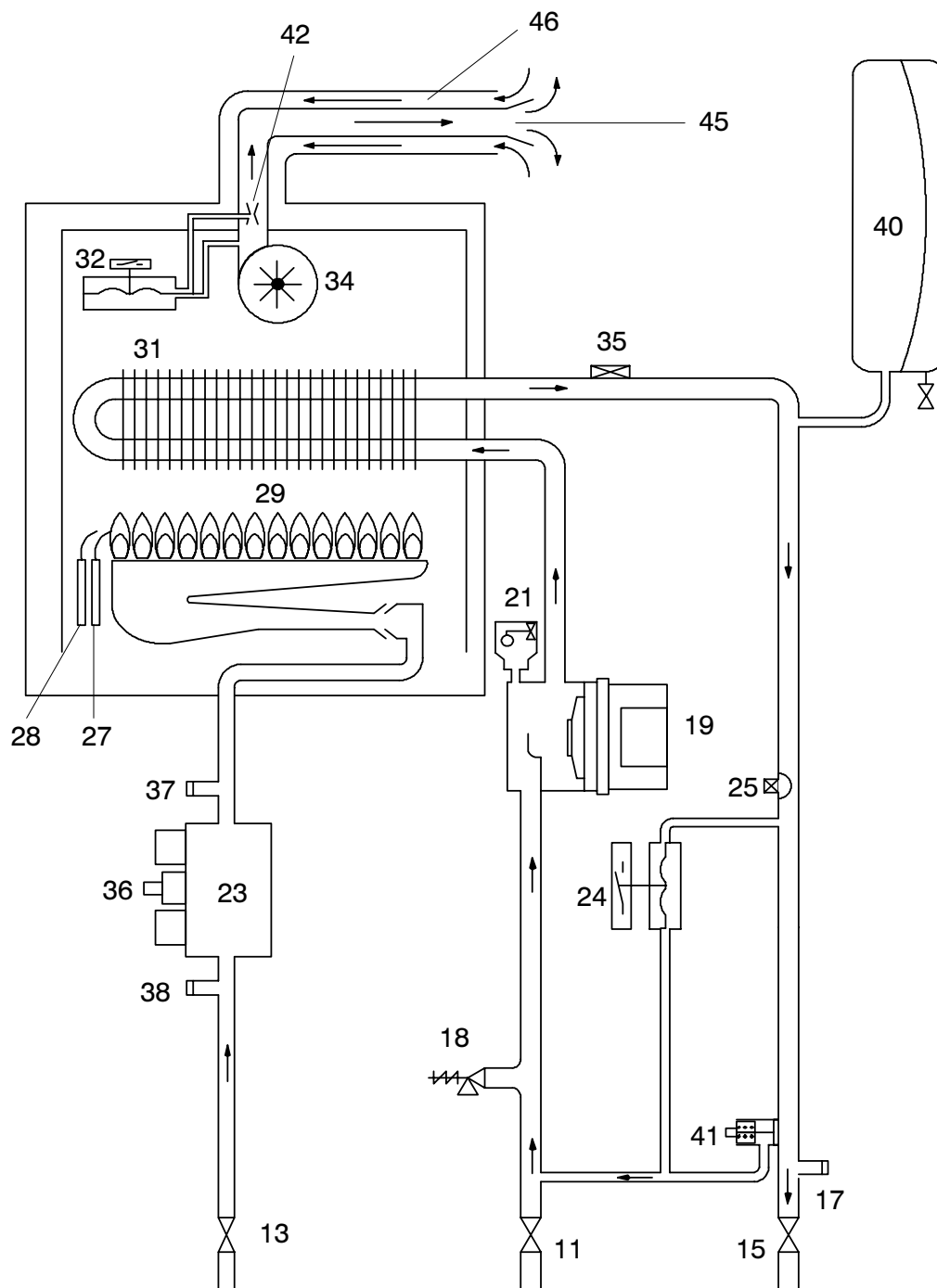


Fig. 4.3

4.4 Hydraulic specifications

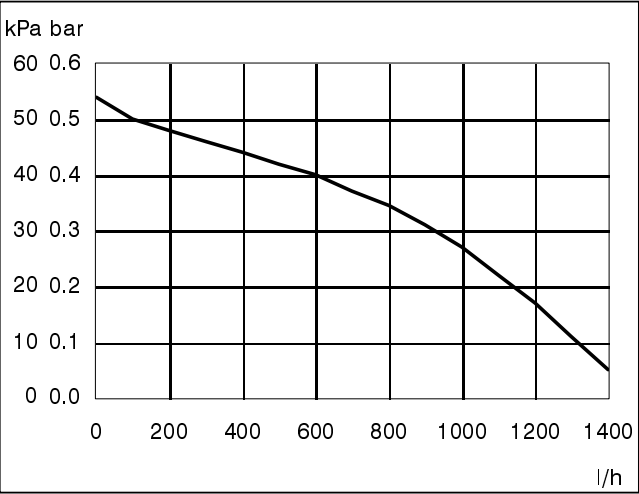


Fig. 4.4

The hydraulic specifications in Fig. 4.4 represent the pressure (available head for the central heating system) as a function of the flow rate.

The load loss due to the boiler has already been subtracted.

Output with thermostat cocks shut off

The boiler is fitted with an automatic by-pass valve (41 on page 10), which protects the primary heat exchanger.

In case of excessive reduction or total blockage of water circulation in the central heating system owing to closure of the thermostatic valves or sys-

tem component cocks, the by-pass valve ensures a minimum flow of water through the primary heat exchanger.

4.5 Expansion vessel

**Note: this boiler is designed for operation only in a sealed central heating system**

The height difference between the pressure relief valve and the highest point in the system may be 7m at most.

For greater differences, increase the pre-load pressure in the expansion vessel (40 on page 10) and the system, when cold, by 0.1 bar for each additional 1m.

Capacity	l	6,0
Pre-load pressure	kPa	100
	bar	1,0
Maximum volume of water in the system *	l	132

Tab. 4.1

\* Where conditions are:

- Average maximum temperature of the system is 80°C
- Initial temperature when filling up the system is 10°C

For systems with volumes greater than 132l, an additional expansion vessel must be provided.

## 4.6 Technical data mod. M90F.24S, M90F.24SR

Nominal heat input	kW	26,6
	BTU/h	90 754
Minimum heat input	kW	11,0
	BTU/h	37 530
Maximum useful output	kW	24,3
	BTU/h	82 906
Minimum useful output	kW	9,1
	BTU/h	31 047

### Central heating

Maximum temperature	°C	85
Minimum temperature	°C	38
Maximum pressure	kPa	300
	bar	3
Minimum pressure	kPa	30
	bar	0,3
Available head (in 1000 l/h)	kPa	27
	bar	0,27

### Domestic hot water (M90F.24S only)

Maximum temperature	°C	55
Minimum temperature	°C	35
Maximum pressure	kPa	1 000
	bar	10
Minimum pressure	kPa	30
	bar	0,3
Flow rate		
minimum	l/min	2,5
30° rise	l/min	11,6*
35° rise	l/min	10,0*
40° rise	l/min	8,7*

### Injectors

Natural G20	130
Butane G30	77
Propane G31	77

### Gas supply pressures

Gas		norm.	min	max
Natural G20	Pa mbar	2 000 20	1 700 17	2 500 25
Butane G30	Pa mbar	2 900 29	2 000 20	3 500 35
Propane G31	Pa mbar	3 700 37	2 500 25	4 500 45

### Gas pressures at the burner

Gas		min	max	Ignition
Natural G20	Pa mbar	180 1,8	1 170 11,7	600 6,0
Butane G30	Pa mbar	500 5,0	2 760 27,6	1 200 12
Propane G31	Pa mbar	610 6,1	3 570 35,7	1 300 13

### Gas rate

Gas		min	max
Natural G20	m <sup>3</sup> /h	1,16	2,82
Butane G30	kg/h	0,87	2,09
Propane G31	kg/h	0,85	2,06

\* calculated values subject to tolerance

Net calorific value at 15 °C and 1013,25 mbar

G 20 34,02 MJ/m<sup>3</sup>

G 30 45,6 MJ/kg

G 31 46,4 MJ/kg

1 mbar approximately equals 10 mm H<sub>2</sub>O

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## Technical information

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Electrical Data		
Voltage	V~	230
Frequency	Hz	50
Power consumption	W	150
Protection degree		IPX4D
External fuse rating	A	3
Internal fuse rating	A	1,6 T

Flue design		
Flue pipe diameter		
Coaxial	mm	60/100
Twin split pipes	mm	80
Roof	mm	80/125
Nominal heat flow rate**	kW	26,6
Exhaust temperature**	°C	145
Smoke production**	kg/h	55,1

Flue gas figures		
Nominal heat input**	kW	26.6
CO <sub>2</sub> content	%	7,0
O <sub>2</sub> content	%	8,4
CO content	ppm	150
Exhaust temperature**	°C	145

Other specifications		
Height	mm	703
Width	mm	400
Depth	mm	325
Weight (dry)	kg	37
Water volume in the boiler (up to 1 bar)	l (kg)	1,0

\*\* Values refer to tests with a 1 m chimney working at the nominal heat input

## 4.7 Technical data mod. M90F.28S, M90F.28SR

Nominal heat input	kW	31,1
	BTU/h	106 107
Minimum heat input	kW	13,0
	BTU/h	44 353
Maximum useful output	kW	28,4
	BTU/h	96 895
Minimum useful output	kW	10,8
	BTU/h	36 847

### Central heating

Maximum temperature	°C	85
Minimum temperature	°C	38
Maximum pressure	kPa	300
	bar	3
Minimum pressure	kPa	30
	bar	0,3
Available head (in 1000 l/h)	kPa	27
	bar	0,27

### Domestic hot water (M90F.28S only)

Maximum temperature	°C	55
Minimum temperature	°C	35
Maximum pressure	kPa	1 000
	bar	10
Minimum pressure	kPa	30
	bar	0,3
Flow rate		
minimum	l/min	2,5
30° rise	l/min	13,6*
35° rise	l/min	11,6*
40° rise	l/min	10,2*

### Injectors

Natural G20	130
Butane G30	77
Propane G31	77

### Gas supply pressures

Gas		norm.	min	max
Natural G20	Pa mbar	2 000 20	1 700 17	2 500 25
Butane G30	Pa mbar	2 900 29	2 000 20	3 500 35
Propane G31	Pa mbar	3 700 37	2 500 25	4 500 45

### Gas pressures at the burner

Gas		min	max	Ignition
Natural G20	Pa mbar	120 1,2	1 170 11,7	600 6,0
Butane G30	Pa mbar	450 4,5	2 760 27,6	1 200 12
Propane G31	Pa mbar	570 5,7	3 570 35,7	1 300 13

### Gas rate

Gas		min	max
Natural G20	m <sup>3</sup> /h	1,37	3,29
Butane G30	kg/h	1,02	2,45
Propane G31	kg/h	1,00	2,41

\* calculated values subject to tolerance

For the net calorific values of G20, G30, G31 see the technical data at page 14

1 mbar approximately equals 10 mm H<sub>2</sub>O

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## Technical information

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Electrical Data		
Voltage	V~	230
Frequency	Hz	50
Power consumption	W	170
Protection degree		IPX4D
External fuse rating	A	3
Internal fuse rating	A	1,6 T

Flue design		
Flue pipe diameter		
Coaxial	mm	60/100
Twin split pipes	mm	80
Roof	mm	80/125
Nominal heat flow rate**	kW	31,1
Exhaust temperature**	°C	165
Smoke production**	kg/h	70,6

Flue gas figures		
Nominal heat input**	kW	31,1
CO <sub>2</sub> content	%	6,3
O <sub>2</sub> content	%	9,7
CO content	ppm	<100
Exhaust temperature**	°C	165

Other specifications		
Height	mm	703
Width	mm	400
Depth	mm	325
Weight (dry)	kg	39
Water volume in the boiler (up to 1 bar)	l (kg)	1,1

\*\* Values refer to tests with a 1 m chimney working at the nominal heat input

## 4.8 Technical data M90F.32S

Nominal heat input	kW	35,2
	BTU/h	120 102
Minimum heat input	kW	15,5
	BTU/h	52 886
Maximum useful output	kW	32,0
	BTU/h	109 184
Minimum useful output	kW	12,7
	BTU/h	43 435

### Central heating

Maximum temperature	°C	85
Minimum temperature	°C	38
Maximum pressure	kPa	300
	bar	3
Minimum pressure	kPa	30
	bar	0,3
Available head (in 1000 l/h)	kPa	27
	bar	0,27

### Domestic hot water

Maximum temperature	°C	55
Minimum temperature	°C	35
Maximum pressure	kPa	1 000
	bar	10
Minimum pressure	kPa	30
	bar	0,3
Flow rate		
minimum	l/min	2,5
30° rise	l/min	15,3*
35° rise	l/min	13,1*
40° rise	l/min	11,5*

### Injectors

Natural G20	130
Butane G30	77
Propane G31	77

### Gas supply pressures

Gas		norm.	min	max
Natural G20	Pa mbar	2 000 20	1 700 17	2 500 25
Butane G30	Pa mbar	2 900 29	2 000 20	3 500 35
Propane G31	Pa mbar	3 700 37	2 500 25	4 500 45

### Gas pressures at the burner

Gas		min	max	Ignition
Natural G20	Pa mbar	150 1,5	1 050 10,5	600 6,0
Butane G30	Pa mbar	500 5,0	2 760 27,6	1 200 12
Propane G31	Pa mbar	670 6,7	3 570 35,7	1 300 13

### Gas rate

Gas		min	max
Natural G20	m <sup>3</sup> /h	1,64	3,73
Butane G30	kg/h	1,22	2,78
Propane G31	kg/h	1,20	2,73

### Electrical Data

Voltage	V~	230
Frequency	Hz	50
Power consumption	W	180
Protection degree		IPX4D
External fuse rating	A	3
Internal fuse rating	A	1,6 T

\* calculated values subject to tolerance

For the net calorific values of G20, G30, G31 see the technical data at page 14

1 mbar approximately equals 10 mm H<sub>2</sub>O



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## Technical information

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Flue design		
Flue pipe diameter		
Coaxial	mm	60/100
Twin split pipes	mm	80
Roof	mm	80/125
Nominal heat flow rate**	kW	35,2
Exhaust temperature**	°C	155
Smoke production**	kg/h	90

Flue gas figures		
Nominal heat input**	kW	35,2
CO <sub>2</sub> content	%	6,5
O <sub>2</sub> content	%	9,3
CO content	ppm	200
Exhaust temperature**	°C	155

Other specifications		
Height	mm	703
Width	mm	400
Depth	mm	325
Weight (dry)	kg	39
Water volume in the boiler (up to 1 bar)	l (kg)	1,1

\*\* Values refer to tests with a 1 m chimney working at the nominal heat input

# 5 GENERAL REQUIREMENTS

Biasi UK Ltd support the Benchmark initiative. Within the information pack, you will find a Benchmark Log Book. It is very important that this is completed correctly at the time of installation, commissioning and hand over to the user.

**This appliance must be installed by a competent person in accordance with the Gas Safety (installation & Use) Regulations.**

## 5.1 Related documents

The installation of this appliance must be in accordance with the relevant requirements of the current Gas Safety (Installation & Use) Regulations, the Local Building Regulations, the current I.E.E. Wiring Regulations, the Regulations and by-laws of the local water undertaking, and in Scotland, in accordance with the Building Standards (Scotland) Regulation. Health and safety document n° 635 "Electricity at work regs."

It should also be in accordance with the British Standard Codes of Practice:

## 5.2 Location of appliance

The appliance may be installed in any room or internal space, although particular attention is drawn to the requirements of the current I.E.E. Wiring Regulations, and in Scotland, the electrical provisions of the Building Regulations applicable in Scotland, with respect to the installation of the combined appliance in a room containing a bath or shower.

**Where a room-sealed appliance is installed in a room containing a bath or shower, any electrical switch or appliance control, utilising mains electricity should be so situated that it cannot be touched by a person using the bath or shower.**

The location must permit the provision of an adequate flue and termination.

For unusual locations special procedures may be necessary and BS 6798 gives detailed guidance on this aspect.

A compartment used to enclose the appliance must be designed specifically for this purpose.

This appliance is not suitable for external installation.

## 5.3 Flue system

The provision for satisfactory flue termination must be made as described in BS 5440 part 1.

The appliance must be installed so that the flue terminal is exposed to external air.

It must not be installed so that the terminal discharges into an other room or space as an out-house or lean-to. It is important that the position of the terminal allows a free passage of air across at all times.

The terminal should be located with due regard for the damage or discoloration that might occur to building products in the vicinity.

In cold and/or humid weather water vapour may condense on leaving the flue terminal; the effect of such "steaming" must be considered.

The minimum acceptable spacing from the terminal to obstructions and ventilation openings are specified in Fig. 5.1.

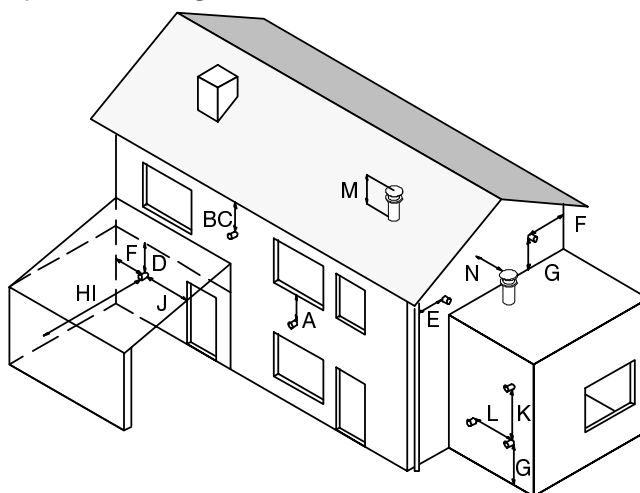


Fig. 5.1

Terminal position

mm

A .	Directly below a window or other opening . . .	300
B .	Below gutters, soil pipes or drain pipes . . . . .	75
C .	Below eaves . . . . .	200
D .	Below balconies or car port roof . . . . .	650*
E .	From vertical drain pipes and soil pipes . . . . .	75
F .	From internal or external corners . . . . .	300*
G .	Above ground or balcony level . . . . .	300
H .	From a surface facing a terminal . . . . .	600
I . .	From a terminal facing a terminal . . . . .	1 200
J .	From an opening in the car port (e.g. door, window) into dwelling . . . . .	1 200
K .	Vertically from a terminal in the same wall . . .	1 500
L .	Horizontally from a terminal in the same wall .	300

*Table follows in next page*

## General requirements

M	Above the roof pitch with roof slope less than or equal to 30°	600
	Above the roof pitch with roof slope more than 30°	1 000
N	From wall face	600

\* specific manufacturer requirements

### 5.4 Gas supply

The Gas meter is connected to the service pipe by the local gas region or a local gas region contractor.

If the gas supply for the boiler serves other appliances ensure that an adequate supply is available both to the boiler and the other appliance when they are in use at the same time.

Pipework must be of adequate size. Pipes of a smaller size than the boiler inlet connection should not be used.

Installation pipes should be fitted in accordance with BS 6891 and the complete installation should be tested for soundness.

### 5.5 Air supply

The room in which the boiler is installed does not require a purpose provided air vent.

### 5.6 Ventilation

If installed in a cupboard or compartment, it is not necessary to provide additional ventilation for cooling for this particular product. However consideration must be given to clearance requirements for maintenance (see section 6.2) and under no circumstances must stored articles be allowed to come into contact with the boiler or flue pipe.

### 5.7 Water circulation (c.h.)

Detailed recommendations are given in BS 6798 and BS 5449; the following notes are given for general guidance.

#### Pipework

Copper tubing to BS EN 1057 is recommended for water pipes. Jointing should be either with capillary soldered or with compression fittings.

Where possible pipes should have a gradient to ensure air is carried naturally to air release points and water flows naturally to drain taps.

The appliance has a built-in automatic air release valve, it should be ensured as far as possible that

the appliance heat exchanger is not a natural collecting point for air.

Except where providing useful heat, pipes should be insulated to prevent heat loss and to avoid freezing.

Particular attention should be paid to pipes passing through ventilated spaces in roofs and under floors.

#### By-pass

The appliance includes an automatic by-pass valve which protects the main heat exchanger in case of reduced or interrupted water circulation through the heating system due to the closing of thermostatic valves or cock-type valves within the system.

The by-pass is calibrated to assure a minimum flow of 500–600 lts/hr through the main heat exchanger.

If you are installing a system that includes thermostatic radiator valves (TRV) and/or small bore (8–10 mm) it may be necessary to fit an external by-pass to facilitate correct operation of the boiler.

#### Air release points

These must be fitted at all high points where air will natural collect and must be sited to facilitate complete filling of the system.

#### Expansion vessel

The appliance has an integral sealed expansion vessel to accommodate the increase of water volume when the system is heated.

Refer to Tab. 4.1 on page 13 for its technical data.

If the heating circuit has an unusually high water content, calculate the total expansion and add an additional sealed expansion vessel with adequate capacity.

#### Mains water feed: central heating

There must be no direct connection to the mains water supply even through a non return valve, without the approval of the Local Water Authority.

#### Mains water feed: hot water supply

The domestic section of the boiler is designed to withstand an internal domestic water pressure of 10 bar. Where it is likely that the mains domestic water pressure may exceed 5 bar, it is possible due to internal “water hammer” effects that the

## General requirements

pressure within the domestic system can increase to a level in excess of the 10 bar limit.

In these circumstances it is therefore recommended that a 3 bar pressure reducing valve be fitted to the incoming mains water supply and a mini expansion vessel installed on the domestic circuit.

These devices will protect the boiler and the domestic system from damage due to excessive domestic water pressure.

### INSTALLATION

#### Filling

A method for initially filling the system and replacing water lost during servicing must be provided and it must comply with local water authority regulations.

The correct method is shown in Fig. 5.2.

**The temporary connection must be removed immediately after filling.**

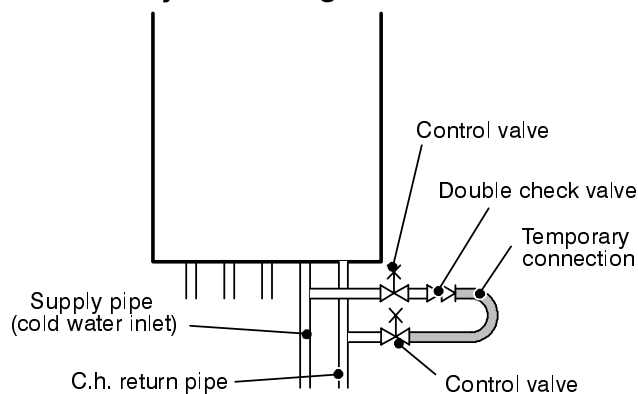


Fig. 5.2

The installer should ensure that no leaks exist either inside the boiler or on the system as frequent filling of the system could cause premature scaling of the heat exchanger.

## 5.8 Domestic water

The domestic water installation must be in accordance with the relevant recommendations of BS 5546. Copper tubing to BS EN 1057 is recommended for water carrying pipework and must be used for pipework carrying potable water.

## 5.9 Water treatment

### Central heating circuit

Where a new boiler is fitted to a new system with either plastic or copper pipes, it is important the system is fully flushed, on completion, to ensure flux residues, swarfs, oils and other installation debris is removed.

Where a new boiler is fitted to an existing system, it is important the debris from the existing system is fully removed in order to ensure the efficiency of the new appliance is maintained.

Details on flushing procedure are given in the section 7.4 of this manual.

### Domestic hot water circuit (scale protection)

In areas where the water is 'hard' (i.e. more than 200 ppm total hardness as defined by BS 7593: 1993 Table 2) it is recommended that a proprietary scale-reducing device is fitted into the boiler cold supply, within the requirements of the local water company.

## 5.10 Electrical supply

**Warning, this appliance must be earthed.**

External wiring to the appliance must be carried out by a competent person and be in accordance with the current I.E.E. Regulations and any local regulations which apply.

The boiler is supplied for connection to a 230 V~ 50 Hz supply. The supply must be fused at 3A.

The method of connection to the electricity supply must facilitate complete electrical isolation of the appliance by the use of a fused double pole isolator having a contact separation of at least 3 mm between poles or alternatively, by the use of a 3A fused three pin plug and unswitched shuttered socket outlet both complying with BS 1363.

The point of connection to the electricity supply must be readily accessible and adjacent to the appliance except where the appliance is installed in a bathroom this must then be sited outside the bathroom.

## 6 INSTALLATION

### 6.1 Warnings

**The use of gas appliances is subject to statutory control; it is essential to observe the current regulations and laws in force (see also chapter 5).**

The appliance must discharge combustion products directly outside or into a suitable exhaust duct designed for this purpose.

Combustion products must be discharged using original flue kits only, since they are integral parts of the boiler.

For LPG, the appliance must also conform with the requirements of the distributors and comply with current Regulations and laws in force.

The safety relief valve must be connected to a suitable drain, or discharge in a safe manner.

The electrical wiring must conform with current Regulations, in particular:

- the boiler **must** be earthed using the correct bonding clamp.
- a fused spur isolation switch, with a gap of at least 3 mm between the contacts must be installed near to the boiler. Refer to section 6.10 in this chapter for the electrical connections.

**In no circumstances will the manufacturer be held responsible if the warnings and instructions contained in this manual have not been complied with.**

### 6.2 Precautions for installation

For the installation proceed as follows:

- The boiler must be fixed to a strong wall.
- The dimensions for the exhaust fume duct detailed in section 6.7 and the correct procedures for installing the duct, depicted in the instruction leaflet included with the flue kit, must be complied with during installation.
- To allow maintenance procedures it is necessary to leave the minimum gaps indicated in Fig. 6.1.

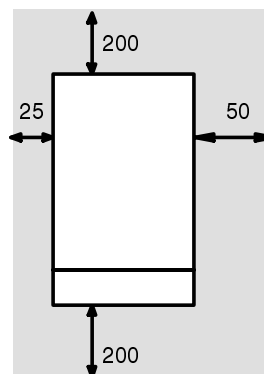


Fig. 6.1 (all dimensions in mm)

- When installing the boiler in a cupboard, cover or alcove allow at least 50mm permanent clearance from the front face of the boiler. Also ensure sufficient clearance to allow free access for servicing and the lowering of the front control panel.
- If the boiler is installed outside, cover the appliance to protect it against the elements and add some special anti-freeze (neutralised) to the c.h. system.
- Before installing the boiler on an existing c.h. system, flush it out thoroughly before fitting the boiler, so as to remove muddy deposits.
- It is advisable to equip the system with a sediment filter, or use a water-treatment product in the circulating water.

The latter option in particular, not only cleans out the system, but also has an anti-corrosive effect by promoting formation of a protective skin on metal surfaces and neutralising gases present in the water.

We recommend the use of a suitable universal inhibitory to protect the c.h. system from corrosion.

### 6.3 Installing the bracket

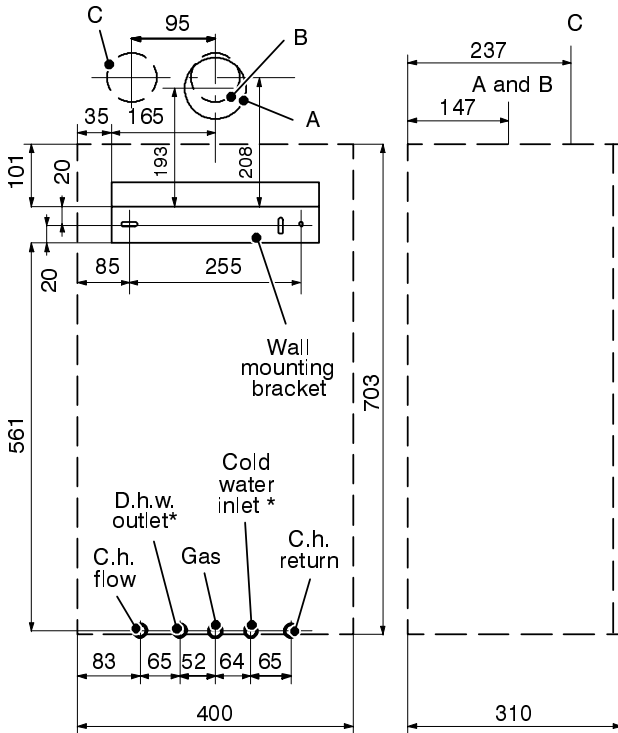
#### Precautions

Before mounting the bracket, check that the dimensions for fitting the exhaust fume duct are complied with (refer to the leaflet included with the flue kit, packed separately).

## Installation

Utilise the paper template supplied with the boiler to determine the fixing position for the bracket and boiler. Securely mount the bracket to the wall using appropriate fixings suitable for the type of wall construction and capable of supporting the total (wet) load. Refer to the weight given in the technical data tables specific for each model.

### 6.4 Overall dimensions



\* not present on c.h. only boilers

A – air intake/flue outlet pipe  $\varnothing$  100 (co-axial)

B – flue outlet pipe  $\varnothing$  80 (twin kit)

C – air intake pipe  $\varnothing$  80 mm (twin kit)

Fig. 6.2 (all dimensions in mm)

### 6.5 Joints

Functions	Pipe sizes
Gas, c.h. return, c.h. flow	$\varnothing$ 22
D.c.w. inlet *	$\varnothing$ 15
D.h.w. outlet *	$\varnothing$ 15
Pressure relief valve	$\varnothing$ 15
* not present on M90F.24SR and M90F.28SR models	

Tab. 6.1 (sizes in mm o.d.)

### 6.6 Mounting the boiler

- 1 Take the protective caps off the boiler pipe-work.
- 2 Thoroughly clean the connections.
- 3 Mount the boiler on its bracket.
- 4 Fix the c.h. valves A and gas cock B ( $\frac{3}{4}$ " ) to the boiler using the  $\frac{3}{4}$ " gaskets (Fig. 6.3)
- 5 Fix the  $\varnothing$  22 mm pipes C (c.h. circuit) to the c.h. valves A and the  $\varnothing$  22 mm pipe D (gas) to the cock B using the  $\frac{3}{4}$ " gaskets.
- 6 Repeat the above procedure for the d.c.w. inlet utilising the  $\frac{1}{2}$ " cold water inlet valve E, the  $\varnothing$  15 mm copper tail F with its connection nut and two  $\frac{1}{2}$ " gaskets.
- 7 Fix the  $\varnothing$  15 mm copper tail G with the  $\frac{1}{2}$ " connection nut and a  $\frac{1}{2}$ " gasket.
- 8 Connect the pipe H (Fig. 6.4) from the pressure relief valve to the safety discharge pipe-work.

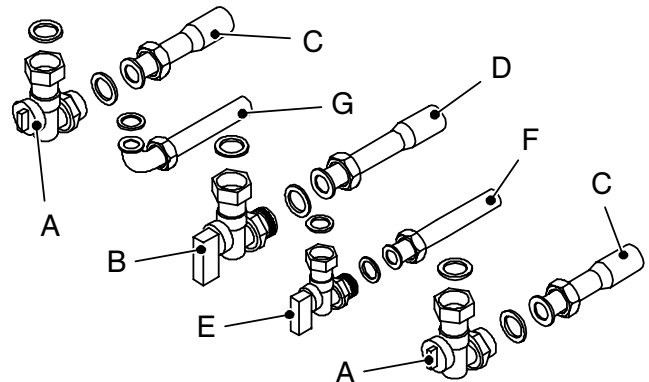


Fig. 6.3



Fig. 6.4

## 6.7 Fitting the flue system

Refer to the assembly instructions contained within the chosen flue kit packaging for the correct assembly and installation.

## 6.8 Flue restrictors

Two restrictors with different size are supplied with the boiler in a separate bag; 44 and 47 mm for models M90F.24S and M90F.28S, 47 and 50 mm for model M90F.32S.

**The size is marked on the restrictor body.**

For the correct use of the restrictors **with co-axial pipes**  $\varnothing$  60/100 mm refer to:

Tab. 6.2 for models M90F.24S, M90F.24SR, M90F.28S and M90F.28SR.

Tab. 6.3 for model M90F.32S.

For the correct use of the restrictors **with vertical roof kit**  $\varnothing$  80/125 mm refer to:

Tab. 6.4 for the models M90F.24S, M90F.24SR, M90F.28S, M90F.28SR

Tab. 6.5 for the model M90F.32S.

For the correct use of the restrictors **with twin pipes** refer to Fig. 6.8 for the models M90F.24S and M90F.24SR; refer to Fig. 6.9 for the models M90F.28S and M90F.28SR, refer to Fig. 6.10 for model M90F.32S.

Models M90F.24S, M90F.24SR, M90F.28S, M90F.28SR	
Equivalent length ( $\varnothing$ 60/100)	Restrictor
Between 0,5 and 1 m	$\varnothing$ 44 mm
More than 1 m up to 2 m	$\varnothing$ 47 mm
More than 2 m up to 3 m	no restrictor

Tab. 6.2 FOR CO-AXIAL STANDARD FLUE

Model M90F.32S	
Equivalent length ( $\varnothing$ 60/100)	Restrictor
Between 0,5 and 1 m	$\varnothing$ 47 mm
More than 1 m up to 2,7 m	no restrictor

Tab. 6.3 FOR CO-AXIAL STANDARD FLUE

Models M90F.24S, M90F.24SR, M90F.28S, M90F.28SR	
Equivalent length ( $\varnothing$ 80/125)	Restrictor
Between 0,5 and 1,5 m	$\varnothing$ 44 mm
More than 1,5 m up to 6,5 m	$\varnothing$ 47 mm
More than 6,5 m up to 8,5 m	no restrictor

Tab. 6.4 FOR VERTICAL ROOF KIT

Model M90F.32S	
Equivalent length ( $\varnothing$ 80/125)	Restrictor
Between 0,5 and 4 m	$\varnothing$ 47 mm
More than 4 m up to 6 m	no restrictor

Tab. 6.5 FOR VERTICAL ROOF KIT

The appropriate restrictor, when necessary, must be fitted in the flue outlet elbow as indicated in Fig. 6.5.

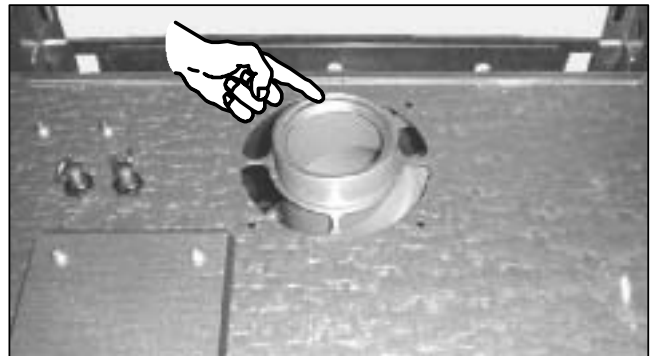


Fig. 6.5

## 6.9 Choice of flue

The following flue kits are available for connecting to the boiler:

### Standard horizontal flue kit (Fig. 6.6A)

Co-axial 60/100mm – nominal length 1m

This kit is normally supplied with the boiler and can be fitted to allow discharge to the rear or either side of the boiler via the flanged boiler adapter elbow. Minimum length required is 0.5 m. Maximum equivalent length of 3 metres can be

## Installation

achieved utilising extensions. This flue system can only be used to discharge horizontally, it is not designed to enable termination in the vertical plane.

### Vertical kit with 90° elbow (Fig. 6.6B)

Co-axial 60/100mm

Supplied with a straight flanged adapter a co-axial elbow and a co-axial pipe with terminal, this kit allows for a vertical rise of 0,5 m from the boiler. In all circumstances the flue terminal must discharge horizontally and the equivalent flue length must not exceed 3 metres.

### Elbows 45° & 90° (Fig. 6.6C)

Co-axial 60/100mm.

Elbow kits enable the standard flue kits to be offset to overcome obstructions or ensure the correct clearances for the flue terminal. Each elbow used in addition to the standard flanged elbow reduces the overall acceptable length of the flue system as follows:

45° reduce length by 0.5m.

90° reduce length by 1m.

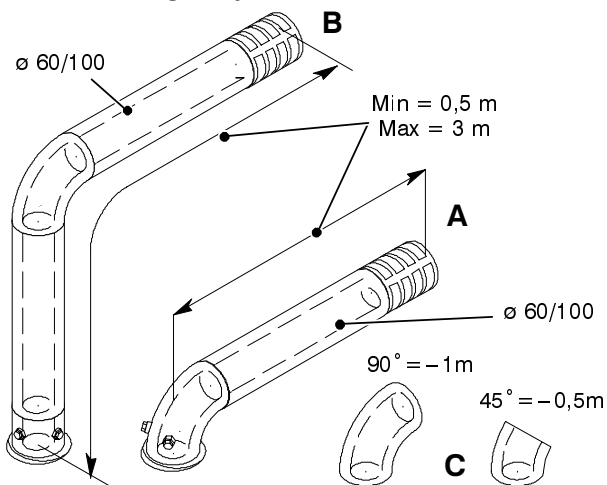


Fig. 6.6

### Twin pipe kits ø 80 mm (Fig. 6.7)

Various twin (split) pipes kits and optional accessories (elbows) are available to assist in the termination of the flue where the boiler is installed in a location remote to an outside wall. These kits allow for separation of the air supply pipe from the pipe that discharges the exhaust gases. Consequently it is possible to extend the flue system to a greater distance than that provided by the standard horizontal co-axial flue.

If either an additional 45° or 90° accessory elbow is used then the maximum permissible length of either pipe must be reduced by 0.5m or 1m respectively.

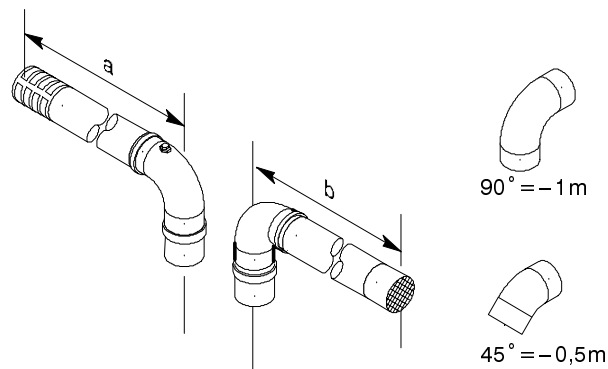


Fig. 6.7

The graph in Fig. 6.8 demonstrates the allowable equivalent lengths for the air supply and flue exhaust pipes of models M90F.24S and M90F.24SR.

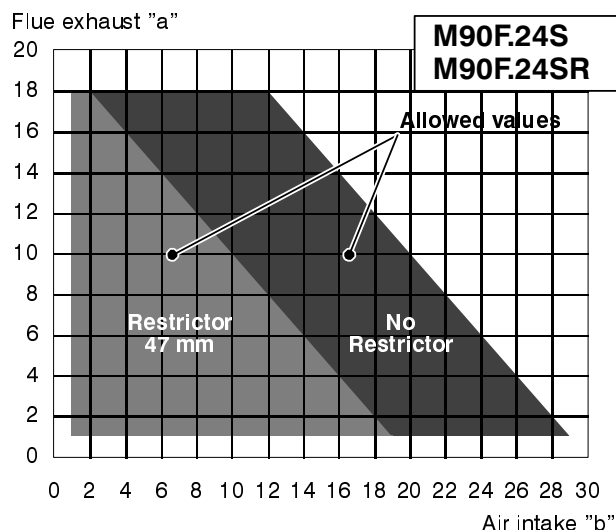


Fig. 6.8 – all dimensions in metres

The graph in Fig. 6.9 demonstrates the allowable equivalent lengths for the air supply and flue exhaust pipes of models M90F.28S and M90F.28SR.

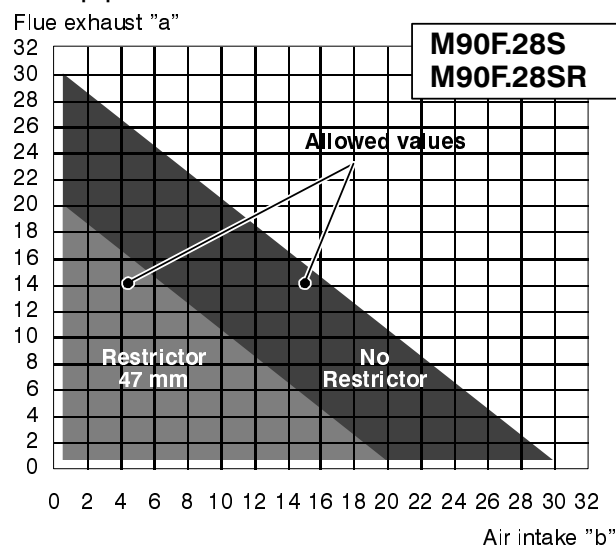


Fig. 6.9 (all dimensions in metres)



## Installation

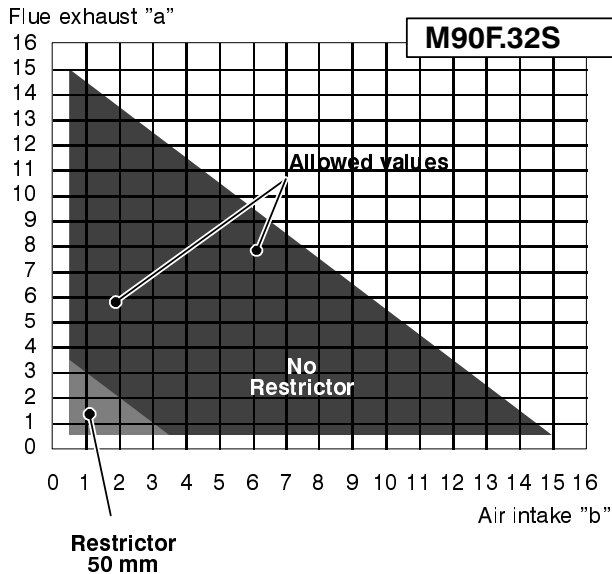


Fig. 6.10 (all dimensions in metres)

### Vertical – roof kit (Fig. 6.11)

This kit allows vertical termination of the flue pipe through the roof. The kit is 1.2 m in length. Extension pieces (Co-axial) are also available which allows the flue system to be extended to a total overall maximum permissible length. Optional 45° and 90° elbows can be used to offset the flue route.

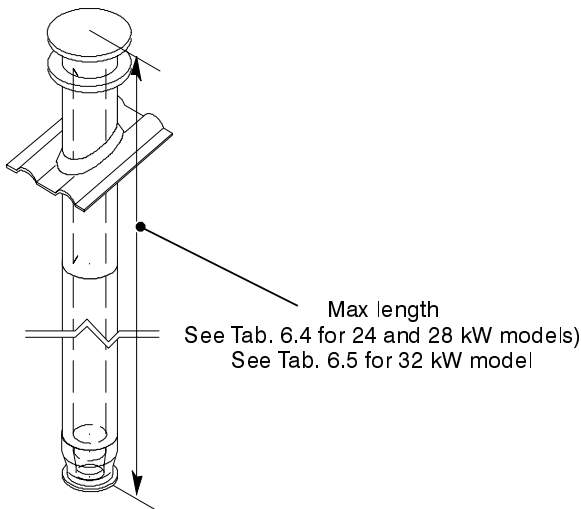


Fig. 6.11

### Vertical flue kit – condensation

When fitting the 80/125 flue kits where the equivalent flue length exceeds 3 m a condensate collector and syphon are required. The syphon must also be connected to a suitable drain.

If the appliance normally operates at minimum output power at very low temperatures (e.g. 40 °C return / 60 °C flow), the above equivalent length should be reduced to 1 m.

Please, see the boiler accessory leaflet available from your Supplier for details or contact Biasi UK Technical Helpline.

## 6.10 Electrical connections

### Connection to the electricity supply

- 1 Remove the front panel of the case (see the section 9.2 in this manual).
- 2 Remove the screws I and J (Fig. 6.12).
- 3 Loosen the screws K.

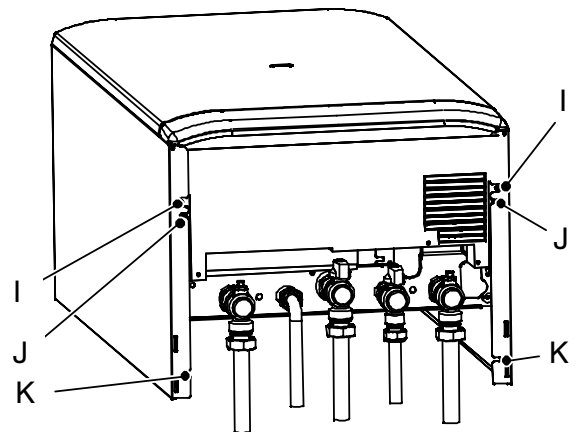


Fig. 6.12

- 4 Remove the side panels or move the lower part of the side panels as indicated in Fig. 6.13 and pull the control panel. When completely pulled out, the panel can rotate 45° downwards to facilitate the operations on the internal parts.

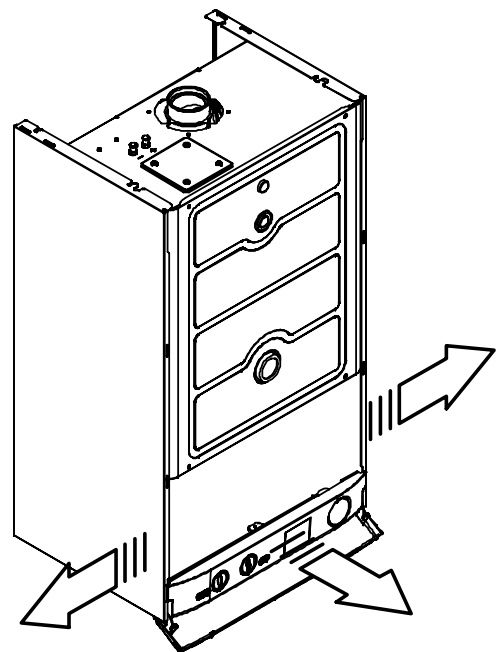


Fig. 6.13

## Installation

- 5 Loosen the screws L and remove the service panel (Fig. 6.14).

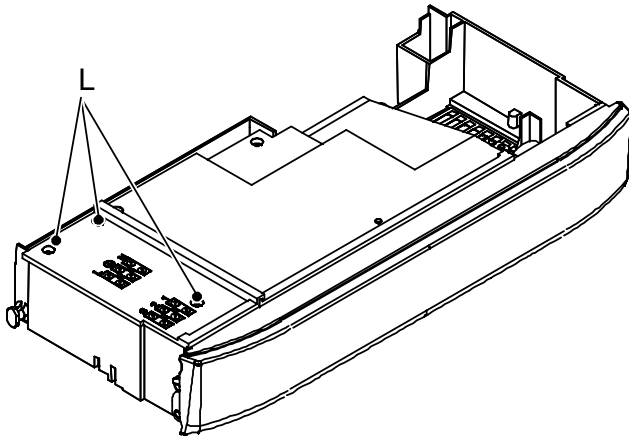


Fig. 6.14

For the electrical connection to the boiler use electric wires which conform to the current regulations, with flexible cord, each core having a cross section area **not less than 0,75 mm<sup>2</sup>**.

- 6 Connect the electrical supply flexible cord coming from the fused spur isolation switch to the power supply terminal block of the boiler (Fig. 6.15) keeping the same connections for the live (brown wire) and the neutral (blue wire). External 3 A fuse or fused plug with same current rating is recommended.

**Do not connect live wires to terminals to which the room thermostat must be connected.**

- 7 Connect the earth wire (yellow/green).

### Connection of a room thermostat

The room thermostat must be connected to the terminal block situated next to the control panel.

**When connecting any type of external control, the link M in Fig. 6.15 must be removed.**

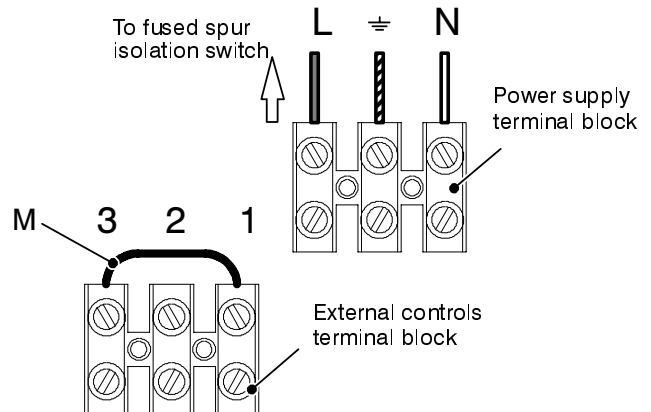


Fig. 6.15

- 8 Connect the room thermostat between terminals 1 and 3 as shown in Fig. 6.16.

**Do not connect live wires to terminals to which the room thermostat must be connected.**

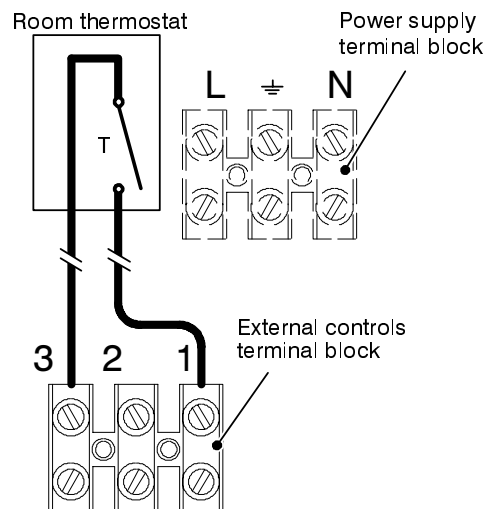


Fig. 6.16

- 9 Route the electrical supply flexible cord and the external control flexible cord as illustrated in Fig. 6.17.

Lock the flexible cords in place with the flexible cord clamps

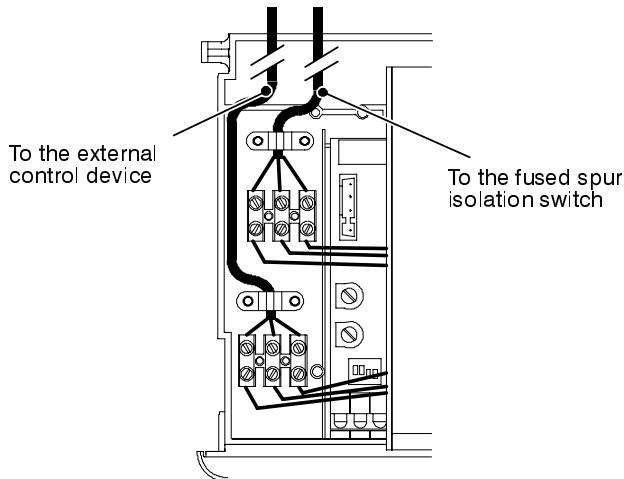


Fig. 6.17

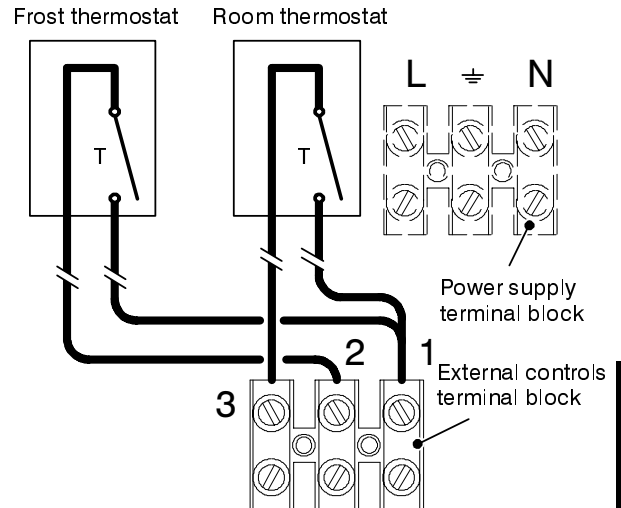


Fig. 6.18

## 6.11 External frost protection

- 10 Connect the frost thermostat between terminals 1 and 2 as shown in Fig. 6.18.  
**Do not connect live wires to terminals to which the room thermostat must be connected.**

## 6.12 Connecting a M90F.24SR or M90F.28SR system boiler to a cylinder

Two schematic wiring diagrams are given in this section showing two possible ways to connect an external programmer to a mid-position diverter valve to provide independent timed and thermostatic control of heating and hot water.

In both diagrams the earth wires are not shown for clarity. Earth wiring **must** be fitted as necessary.

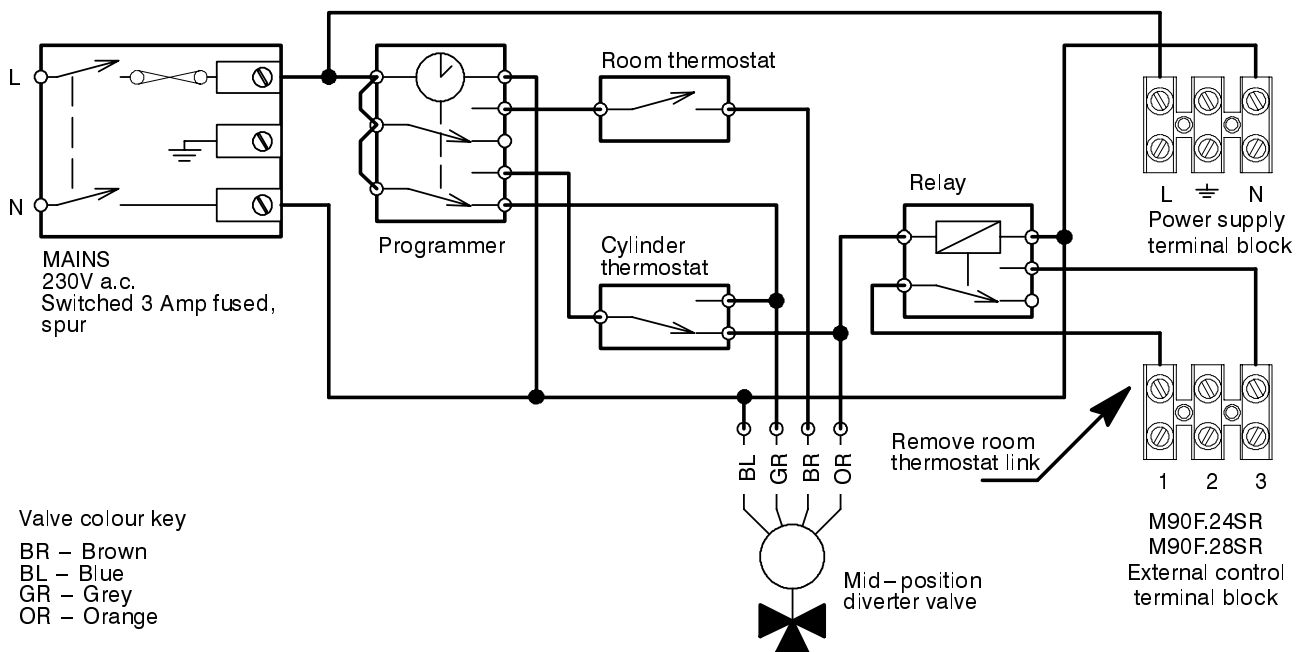


Fig. 6.19 – relay controlled boiler

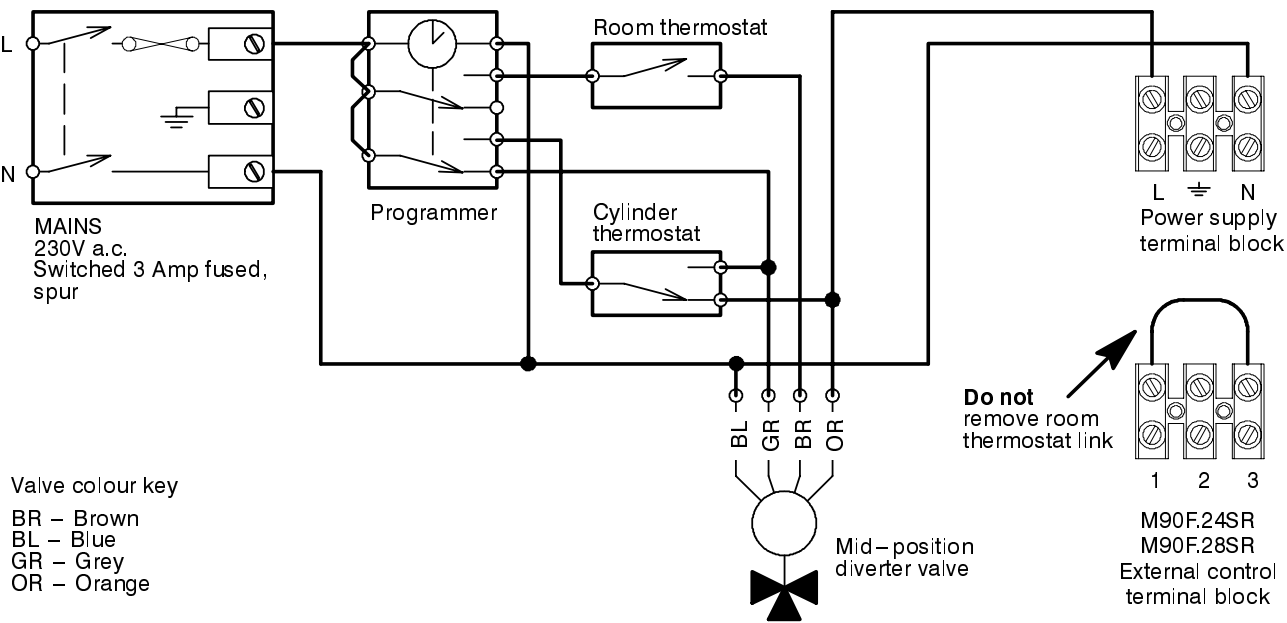


Fig. 6.20 – directly controlled boiler

## 7 COMMISSIONING

Ensure that the Benchmark logbook is satisfactorily completed during the commissioning process.

### 7.1 Electrical installation

Preliminary electrical system checks to ensure electrical safety shall be carried out by a competent person. i.e. polarity, earth continuity, resistance to earth and short circuit.

If a fault has occurred on the appliance the fault finding procedure should be followed as specified in the service manual.

### 7.2 Gas supply installation

- 1 Inspect the entire installation including the gas meter, test for soundness and purge, all as described in BS 6891;
- 2 Open the gas cock 13 (Fig. 7.1) on the appliance and check the gas connector on the appliance for leaks.

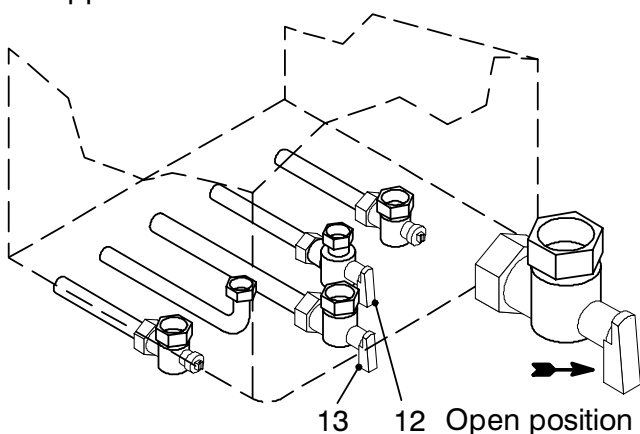


Fig. 7.1

### 7.3 Filling the d.h.w. system

- 1 Close all hot water draw-off taps.
- 2 Open the cold water inlet valve 12 (Fig. 7.1).
- 3 Slowly open each draw-off tap and close it only when clear water, free of bubbles, flows out.

### 7.4 Initial filling of the system

- 1 Open the c.h. flow and return valves.
- 2 Remove the front panel of the case (see the section 9.2 in this manual).
- 3 Unscrew the cap on the automatic air purger-valve 21 (Fig. 7.2) one full turn and leave open permanently.

- 4 Gradually open stopcock at the filling point connection to the c.h. system until water is heard to flow; do not open fully.

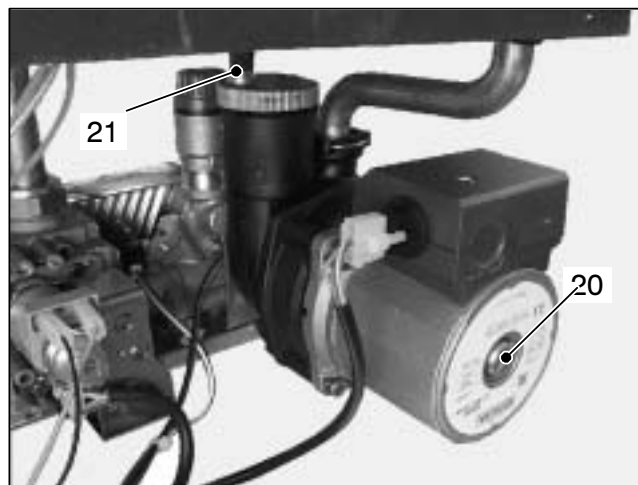


Fig. 7.2

- 5 Open each radiator air vent starting at the lowest point of the system and close it only when clear water, free of bubbles, flows out.
- 6 Purge the air from the pump by unscrewing the pump plug 20 (Fig. 7.2); release the pump shaft by turning in the direction indicated by the arrow on the information plate.
- 7 Replace the pump plug.
- 8 Continue filling the system. The actual reading should ideally be 1,3 bar and not less than 0,3 bar.
- 9 Close all air release valves on the c.h. system.
- 10 Inspect the boiler and the system for water soundness and remedy any leaks discovered.
- 11 Cold flush the system to remove any loose particles and any system debris before starting the boiler for the first time

The flushing procedure must be in line with **BS7593 Treatment of Water in d.h.w. c.h. Systems.**

When the installation and second filling are completed turn on the c.h. system and run it until the temperature has reached the boiler operating temperature. The system must then be immediately flushed through.

This procedure must be repeated twice more.

During this operation we highly recommend the use of a c.h. flushing detergent in the quantities as specified by the appropriate manufacturer, whose function it is to dissolve any

foreign matter which may be in the system.

The above operation could save the invalidation of your boilers guarantee and will also prevent problems which you may experience in the future if an inhibitory is not used.

### 7.5 Lighting the boiler

Some products incorporate an anti cycling time delay. It is normal when first switching the boiler on for the boiler to operate on heating for a few seconds then switch off. After 3–4 minutes has elapsed the boiler will then re ignite and operate perfectly normally. The ignition delay cycle does not prevent normal operation of the boiler to provide d.h.w..

If external controls are fitted (e.g. Timeclock, room thermostat) ensure they "call for heat".

- 1 Turn on the electricity supply to the boiler, switching on the fused spur isolation switch. The appliance operation light 10 will flash every 4 seconds.
- 2 Turn the function selector 8 as in Fig. 7.3 (combi) or Fig. 7.4 (c.h. only). The appliance operation light 10 will flash every 2 seconds.

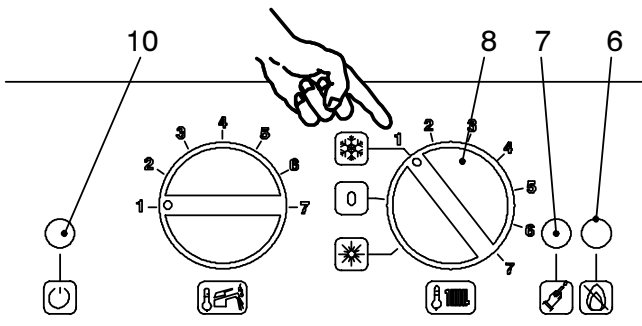


Fig. 7.3

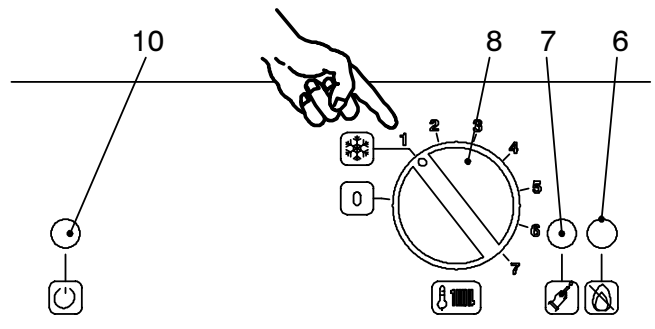


Fig. 7.4

The boiler will now go through an ignition sequence and the burner will light.

If during the ignition attempt period the boiler fails to light, the full sequence control p.c.b. will go to lockout and the lock-out signal lamp 6 will appear.

To reset the boiler press and release the boiler reset button 7 (Fig. 7.3).

### 7.6 Checking the gas pressure at the burner

**This boiler has been tested to the highest quality control standards.**

**The maximum and minimum gas pressures are already set during this quality control process however the checking procedure must be followed to ensure maximum operating efficiency from the boiler.**

- 1 Remove the front panel of the case (see section 9.2 in this manual).
- 2 Loosen the internal screw 37 (Fig. 7.5) on the Outlet Pressure Test Point of the Gas Valve and

## Commissioning

connect a pressure gauge using a suitable hose.

- 3 Set the d.h.w. and c.h. temperature control knobs to their maximum position.
- 4 Switch on the boiler and open at least one hot water tap fully.
- 5 Check the maximum gas pressure and compare the value on the gauge with the value indicated in the sections 4.6 or 4.7 (gas pressures at the burner), accordingly with the model of boiler installed.
- 6 Check the maximum gas flow at the gas meter and compare the value indicated in the sections 4.6 or 4.7 (gas rate), accordingly with the model of boiler installed.
- 7 Switch off the boiler.
- 8 Disconnect the gas modulator coil by removing the electrical connector A (Fig. 7.5).

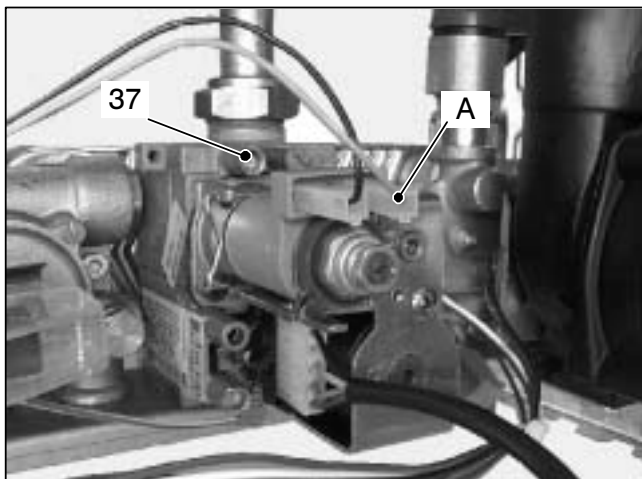


Fig. 7.5

- 9 Switch on the boiler.
- 10 Check the minimum gas pressure and compare the value on the gauge with the value indicated in the sections 4.6 or 4.7 (gas pressures at the burner), accordingly with the model of boiler installed.
- 11 Switch off the boiler and re-connect the electrical connector A to the modulator coil.
- 12 Access the main control panel (see section 6.10, follow steps 2 – 5)
- 13 Switch on the boiler.
- 14 Check the ignition gas pressure by setting dip-switch "3" (Fig. 7.8) to the OFF position.

Compare the value on the gauge with the value indicated in the sections 4.6 or 4.7 (gas pressures at the burner), accordingly with the model of boiler installed.

If the ignition gas pressure is not set correctly see section 7.7 in this manual for the adjustment procedure. If ignition gas pressure is correct switch dip-switch "3" to the ON position.

- 15 Switch off the boiler, turn off the hot water tap(s) and disconnect the pressure gauge.

**If the maximum and minimum gas pressures measured above are not in accordance with the technical data (sections 4.6 or 4.7) then adjustment will be necessary. A full explanation of the gas pressure adjustment procedure is given in the Gas Valve section of the service manual. If maximum and/or minimum gas pressures are adjusted then the ignition gas pressure must be checked and adjusted if necessary.**

INSTALLATION

**Important: after the gas pressure checks and any adjustment operations, all of the test points and adjustment devices must be sealed.**

## 7.7 Adjusting the burner ignition

- 1 Turn off the boiler by means of the fused spur isolation switch provided adjacent to the appliance.
- 2 Make sure that the function selector 8 is set to the position in Fig. 7.6 and that the timer selector switch and room thermostat, if fitted, is set to "demand heat".

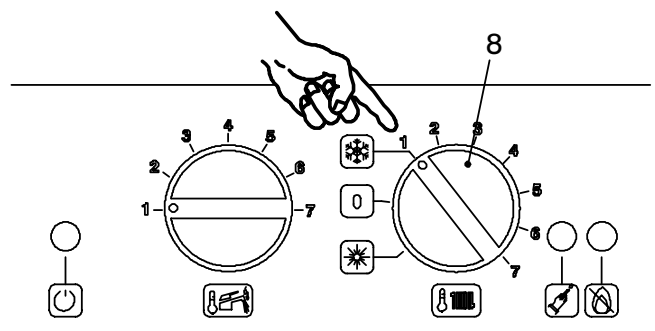


Fig. 7.6

- 3 Unscrew the gas valve's outlet pressure test point 37 (Fig. 7.5) and connect a pressure gauge.

## Commissioning

- Loosen the screws B and remove the service panel (Fig. 7.7).

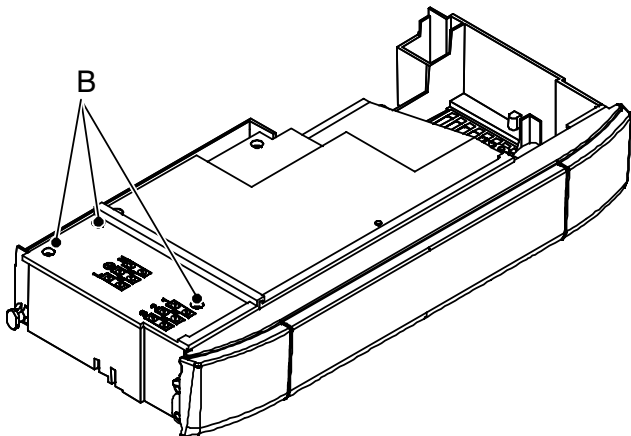


Fig. 7.7

- Turn on the boiler.
- Check that the boiler lights up uniformly and adjust the ignition gas pressure, if necessary.

To adjust the ignition gas pressure, set dip-switch "3" (Fig. 7.8) to the OFF position and adjust potentiometer marked "ACC" with a screwdriver until correct ignition gas pressure is obtained.

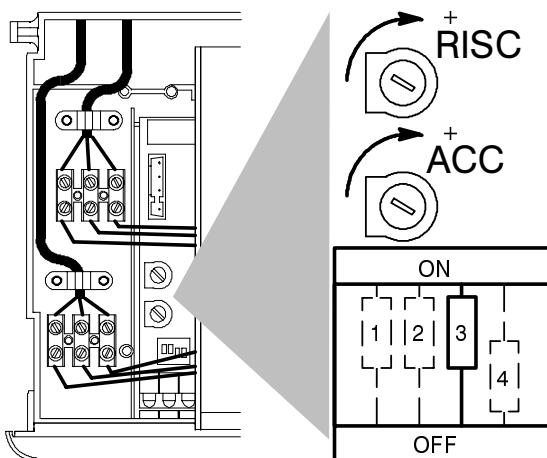


Fig. 7.8

Refer to the table *gas pressures at the burner* in the sections 4.6 or 4.7 for appropriate value.

- Having finished this procedure, reset dip-switch "3" to the ON position.

### 7.8 Adjustment of useful c.h. output

If the burner function selector (dipswitch number 4 on the main P.C.B.) is set to the 'ON' position it will activate the re-ignition delay period of approximately 4 minutes. When dipswitch number 4

is set to the 'OFF' position there will be approximately 30 seconds re-ignition delay period.

Whilst checking or adjusting the c.h. output, and fault finding on the boiler it may be necessary to switch the re-ignition delay mechanism (dip-switch 4) to the 'OFF' position.

Refer to the diagrams shown in Fig. 7.9, Fig. 7.10 or Fig. 7.11 and select the correct central heating output gas pressure to meet with the central heating system requirements.

With the boiler operating in c.h. mode, use a suitable screwdriver to turn the adjustment potentiometer marked "RISC" (Fig. 7.8). Rotating the potentiometer anti-clockwise reduces the maximum supply current to the gas modulator device, and thus reduces the gas pressure to the burner.

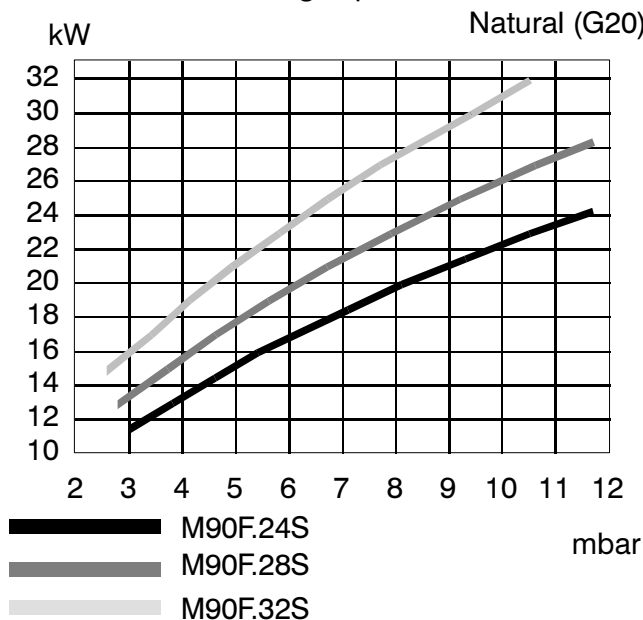


Fig. 7.9



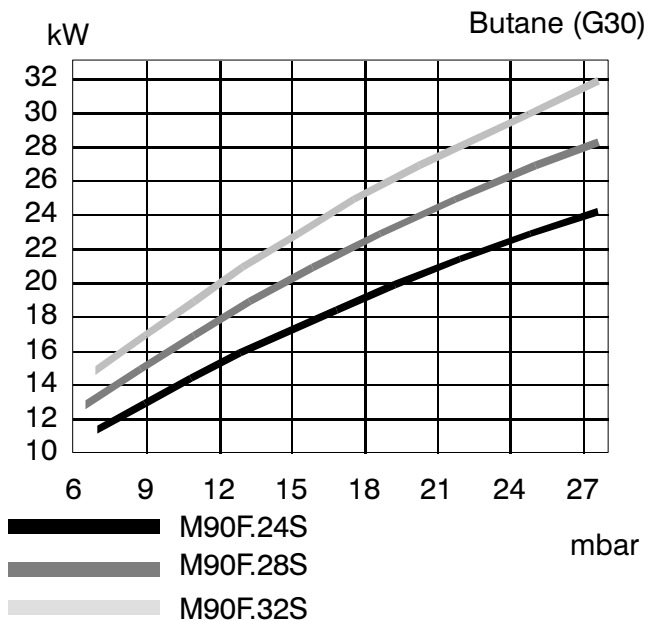


Fig. 7.10

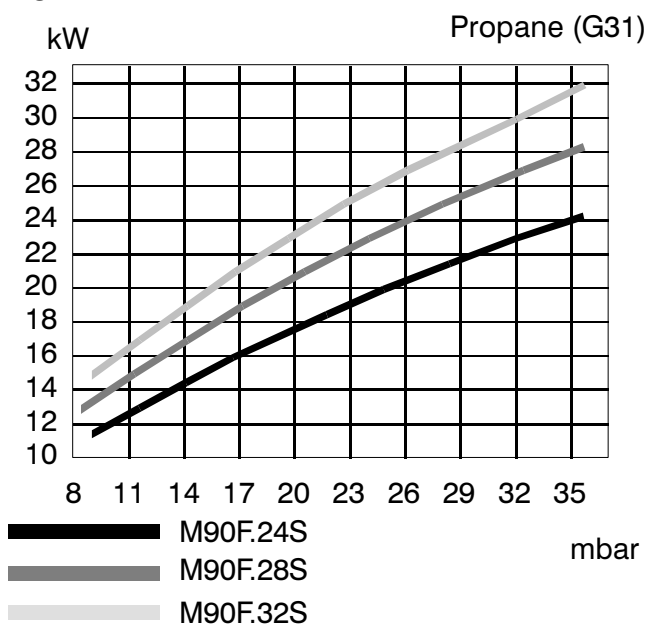


Fig. 7.11

## 7.9 Checking the ignition device

With the burner on high flame close the gas cock. About 10 seconds after, the lock-out signal lamp 6 (Fig. 1.3 on page 1) must appear. To reset the boiler press and release the boiler reset button 7 (Fig. 1.3 on page 1).

## 7.10 Checking the flue system

The flue system should be visually checked for soundness. Check all clamps, gaskets and fixings are secure and tight.

Ensure that the flue terminal is sited correctly in accordance with the flue fitting instructions and Fig. 5.1 on page 20 of this manual.

To carry out a combustion check refer to the instructions given in the section 9.5 of this manual.

Reference figures are given in the sections 4.6 or 4.7 of this manual (Flue gas figures).

## 7.11 Instructing the user

Hand over this combined User & Installation manual and the Service manual to the end user and explain how to use the unit in both c.h. and d.h.w. modes.

Take the User step by step through the lighting instructions.

Show the User how to switch off the appliance quickly and indicate the position of the electric supply isolator.

Explain the proper use and adjustment of all system controls; this will ensure the greatest possible fuel economy.

Explain the function and use of the function selector.

Explain and demonstrate the function of time and temperature controls (if fitted).

Explain how to turn off the appliance for both short and long periods and advise on the precautions necessary to prevent damage should the appliance be inoperative when freezing conditions may occur.

Fill in the details required on the Boiler Guarantee Certificate and hand to the User advising them to return the correct section for boiler Guarantee registration.

Finally, advise the User that, for continued safe and efficient operation, the appliance must be serviced by a competent person at least once a year.

## 8 GAS CONVERSION

### 8.1 Warnings

Procedures to adapt the boiler to the type of gas available **must be carried out** by a competent and responsible person.

Components used to adapt it to the type of gas available must be genuine parts only.

### 8.2 Procedures

- 1 Check that the gas cock (13 in Fig. 9.3) fitted under the boiler is turned off and the appliance is switched off at the mains isolating spur.
- 2 Remove the front and side panels of the case (see the section *General access and emptying hydraulic circuits* in the service manual).
- 3 Take off the lid of the sealed chamber.
- 4 Take the front panel of the combustion chamber off and remove the burner (29 on page 10). See section *Ignition and detection electrodes* in the service manual for detailed instructions.
- 5 Carry out the conversion for the type of gas, replacing the burner injectors correctly.
- 6 Re-assemble the burner, the front panel of the combustion chamber and the lid of the sealed chamber.
- 7 Extract the control panel as explained in the section 6.10 of this manual.
- 8 Loosen the screws C and remove the service panel (Fig. 8.1).

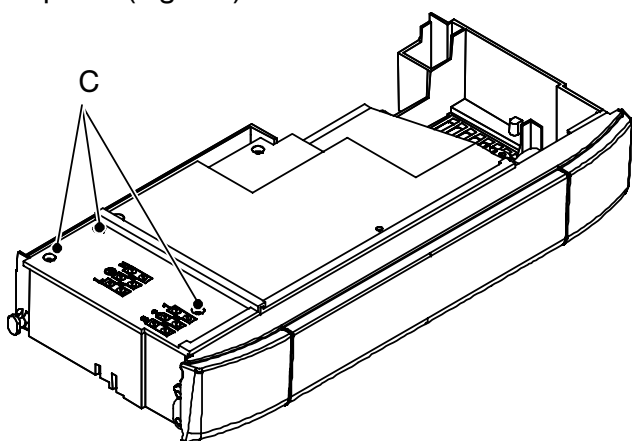


Fig. 8.1

- 9 set correctly the dip-switch "2" to the correct position (Fig. 8.2) in accordance with the following table.

Gas supply	Position of dip-switch 2
Natural gas	On
L.P.G.	Off

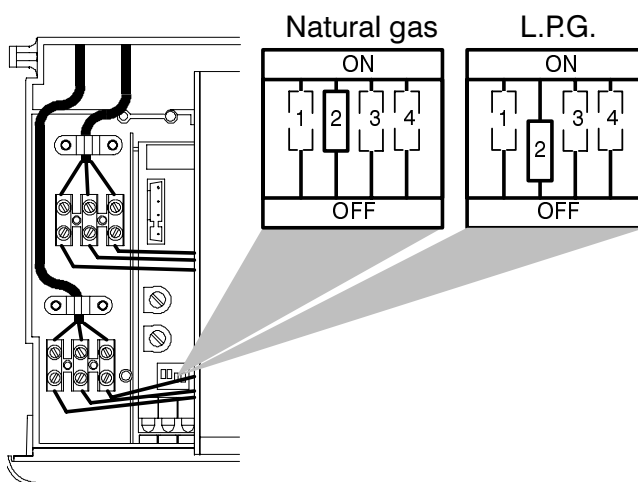


Fig. 8.2

- 10 Calibrate the gas valve according to the instructions given in the service manual, section *Modulating gas valve – Adjustment*.
- 11 Set the correct gas pressure for central heating output required, see section 7.8 in this manual.
- 12 Stick on the inside of the left hand side panel adjacent to the data badge the self-adhesive label (included with the conversion kit) indicating the type of gas, and the gas pressures to which the appliance has been set.
- 13 Replace the service panel, the front and side panels of the case.

## 9 MAINTENANCE

### 9.1 Warnings

The procedures detailed in this chapter **must be carried out only by a professionally qualified person**. Thus you are advised to contact an Authorised Service Agent.

For efficient and continuous operation of the boiler you are advised to have, at least once a year, maintenance and cleaning done by an Approved Service engineer.

**Isolate the appliance from the electricity supply** by turning off the fused spur isolation switch adjacent to the appliance and **turn off the gas cock**, before carrying out any procedures, whatsoever, for cleaning, maintenance, opening or dismantling boiler panels.

### 9.2 Dismantling the external panels

#### Front panel

- 1 Loosen the two screws A (Fig. 9.1).
- 2 Lift and remove the panel.

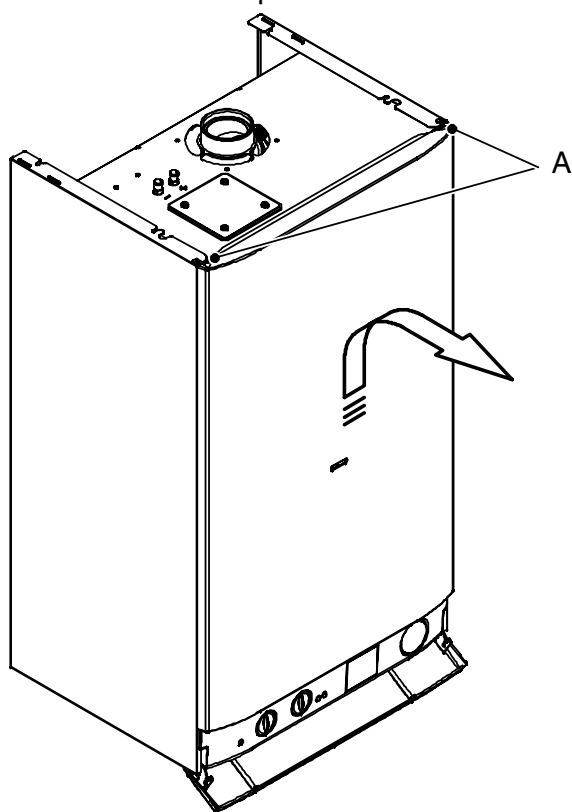


Fig. 9.1

#### Side panels

- 3 Loosen the screws B. Bring the bottom of the panels away from the boiler and lift them, freeing them from the top hooks (Fig. 9.2).

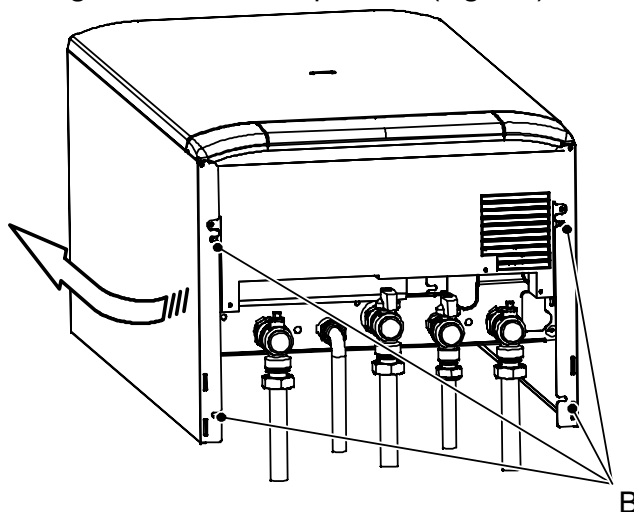


Fig. 9.2

### 9.3 Emptying the d.h.w. system (combi)

- 1 Turn off the d.c.w. inlet isolating valve (12 in Fig. 9.3) and turn on the hot water taps and any drain cocks.

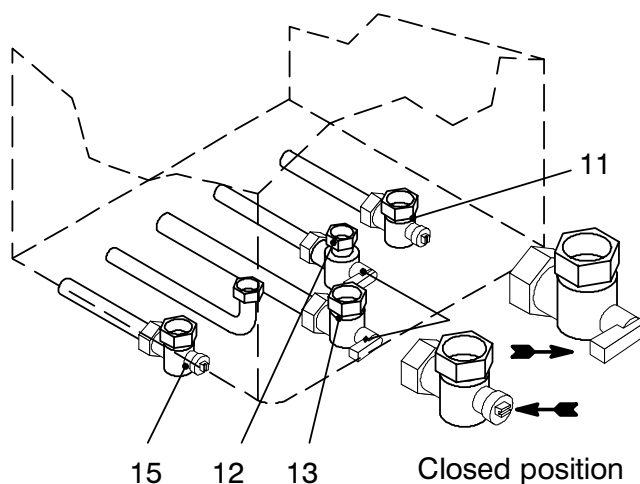


Fig. 9.3

### 9.4 Emptying the c.h. system

- 1 Close the c.h. isolating valves (11 and 15 in Fig. 9.3).

## Maintenance

- 2 Open the central heating drain cock (17 in Fig. 9.4).

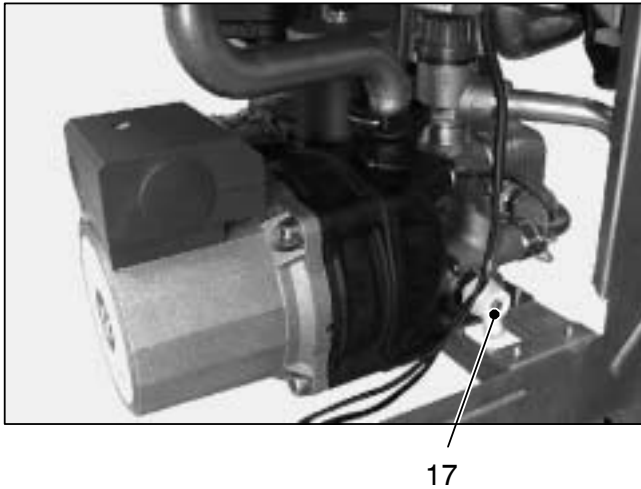


Fig. 9.4

- 3 A small quantity of water will remain in the d.h.w. heat exchanger after draining. If the boiler is being drained to prevent freezing, the d.h.w. heat exchanger must be removed and inverted to drain fully or an antifreeze solution added.

### MAINTENANCE

## 9.5 Combustion analysis check

To carry out a combustion analysis:

- 1 remove the front panel of the case (see the section 9.2 in this manual).
- 2 Remove the plugs indicated in Fig. 9.5.

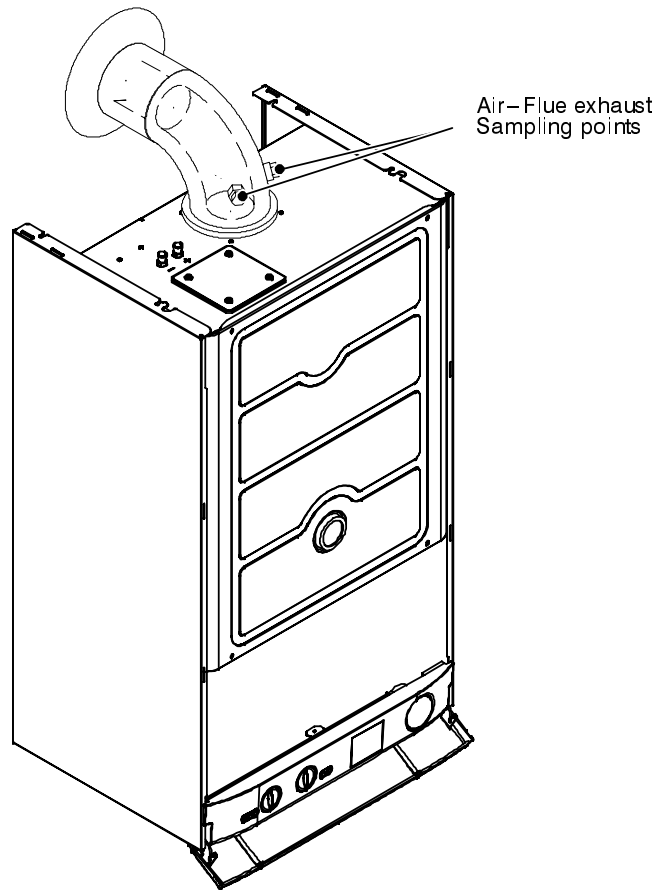


Fig. 9.5

Reference figures are given in the sections 4.6 or 4.7 of this manual (Flue gas figures).

## 9.6 Cleaning the primary heat exchanger

- 1 Take off the front of the case.
- 2 Take off the removable front of the air-tight chamber and the front panel of the combustion chamber.

If you notice dirt on the fins of the primary heat exchanger (31 on page 10):

- 3 cover the sloping surfaces of the burner (29 on page 10) entirely in a protective layer (sheets of newspaper or similar).
- 4 Brush out the primary heat exchanger (31 on page 10) with a bristle paintbrush.

NOTE – When removing the airtight chamber cover it is not necessary to remove the screws located at the top edge on either side.

### **9.7** Checking the pressurisation in the expansion vessel

Empty the central heating system as described in section 9.4 of this chapter and check that the pressure in the expansion vessel is not less than 1 bar. See also section 4.5 page 13 of this manual.

If the pressure is lower, take steps to correct the pressure level.

### **9.8** Cleaning the burner

The sloping and multi-gas type burner (29 on page 10) does not need special maintenance, but it is sufficient to dust it with a bristle paintbrush.

To reach the burner:

- 1 Take off the front of the case.
- 2 Take off the removable front of the air-tight chamber and the front panel of the combustion chamber.
- 3 Brush out the burner with a bristle paintbrush.

**NOTE** – When removing the airtight chamber cover it is not necessary to remove the screws located at the top edge on either side.

### **9.9** Checking the flue

Have the integrity of the flue outlet pipe (45 on page 11) air intake pipe (46 on page 11), checked periodically, the venturi device\* (42 on page 11) cleaned and the efficiency of the flue safety circuit checked at least once a year.

\* For details see the section *Fan, venturi device and air pressure switch* in the service manual.

For all the above maintenance operations it is advisable to call an approved Service Engineer.

### **9.10** Visual inspection of appliance

Visually inspect all water joints, seals and connections for any evidence of leakage and retighten, grease or replace them as necessary.

### **9.11** Gas pressures and soundness

Check appliance for gas soundness. Recheck operational pressures and adjust as necessary as described in section 7.6 page 32 of this manual.







17962.0917.5 3803 48A5 UK

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# Spare Parts List

M90E.24S

M90E.28S

M90E.32S

**Issue 10/2003**

Table description	Issue	n. of pages
Overall view	06/2003	1
C.h. return group and d.h.w. heat exchanger	06/2003	1
C.h. flow group and three way diverter valve	06/2003	1
Pump and main circuit assembly	06/2003	1
Gas assembly	09/2003	1
Valves and connection pipes	06/2003	1
Control panel and ignition device	06/2003	1
Wiring	06/2003	1
Fan, combustion chamber and case panels M90E.24S up to serial no. N238421202 M90E.28S up to serial no. N241681202	12/2002	1
Fan, combustion chamber and case panels M90E.24S from serial no. N238431202 M90E.28S from serial no. N241691202	06/2003	1
List of parts	10/2003	11

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Wall hung, fan flue, room sealed gas boiler

## **SERVICE MANUAL**

### **GARDA**

Models: G.C. Appl. No.

**M90F.24S** 47-970-19

**M90F.28S** 47-970-20

**M90F.32S** 47-970-22

**M90F.24SR** 41-970-10

**M90F.28SR** 41-970-11

**Leave this manual adjacent to the gas meter**

Biasi U.K. Ltd  
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Willenhall, Wolverhampton WV 13 3XB  
Technical helpline: 01902 304 400  
Web site: [www.biasi.co.uk](http://www.biasi.co.uk)



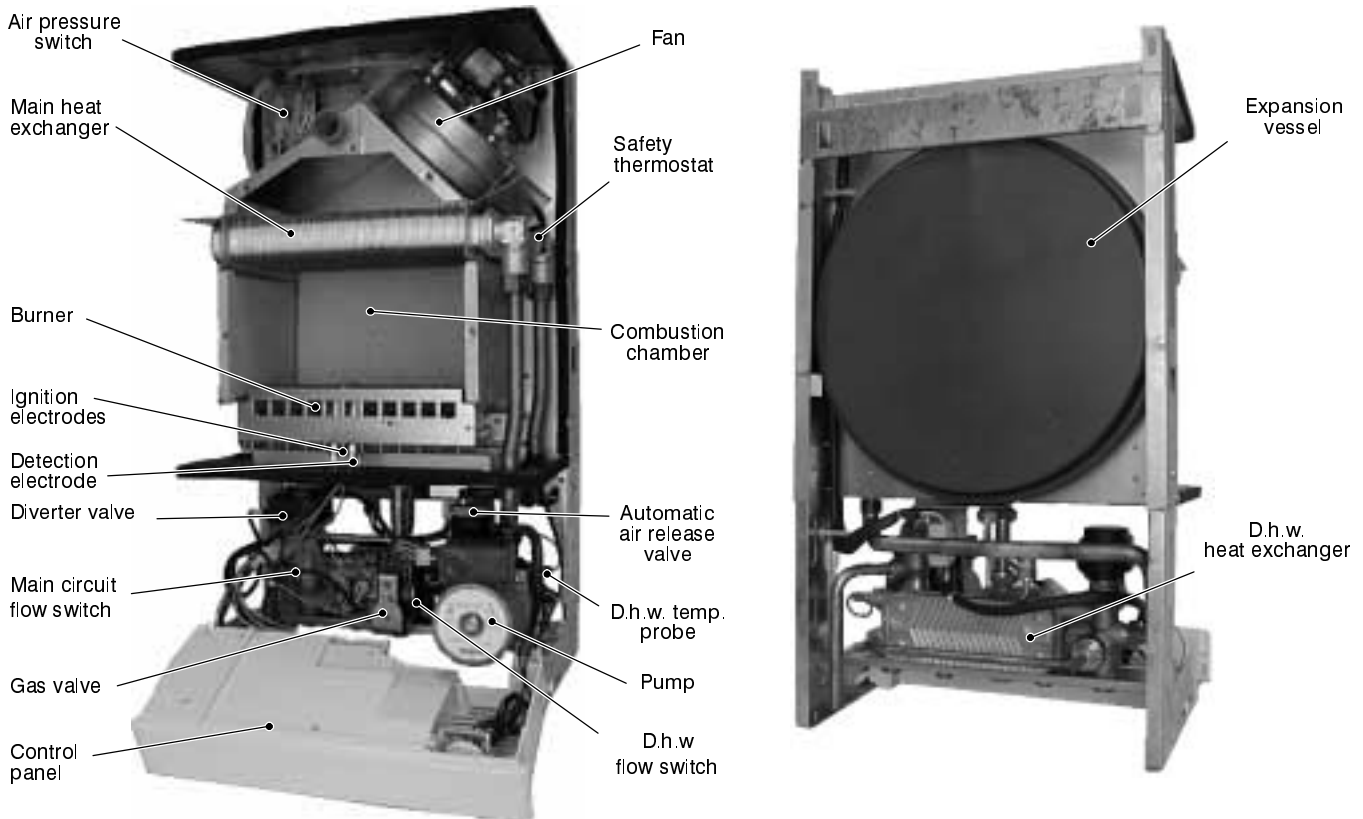


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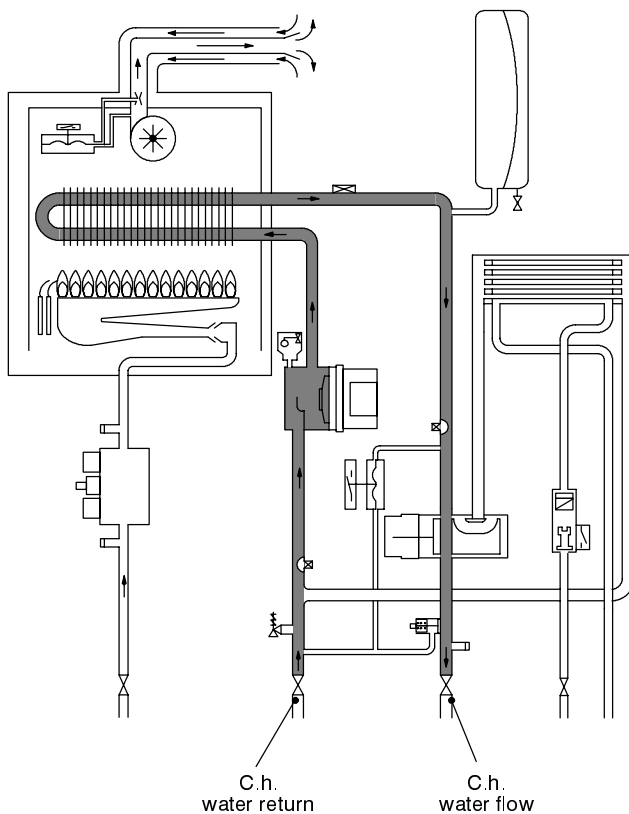
# 1 Overall information

## 1.1 Overall View

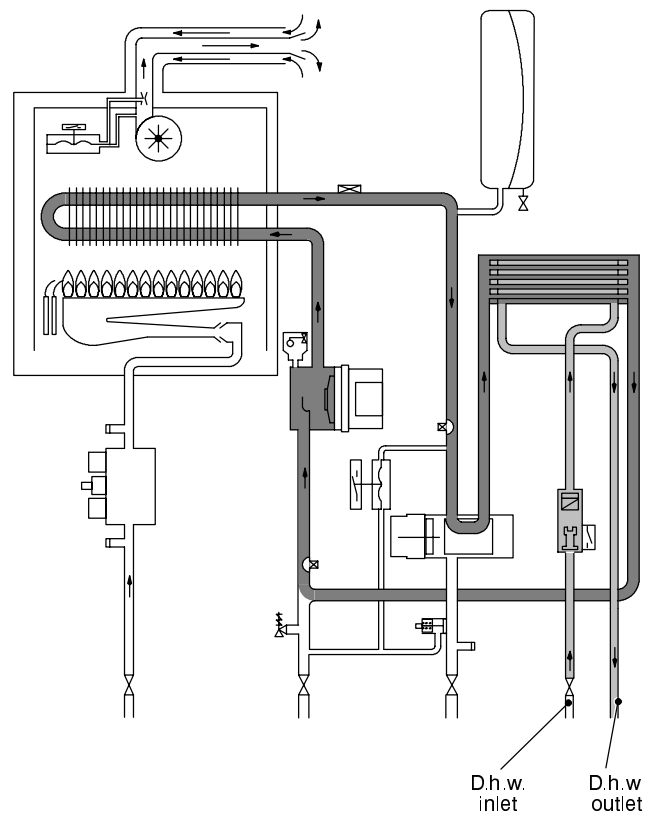


## 1.2 Hydraulic diagram

Central heating (c.h.) operation



Domestic hot water (d.h.w.) operation



## 2 General access and emptying hydraulic circuits

### 2.1 Nomenclature

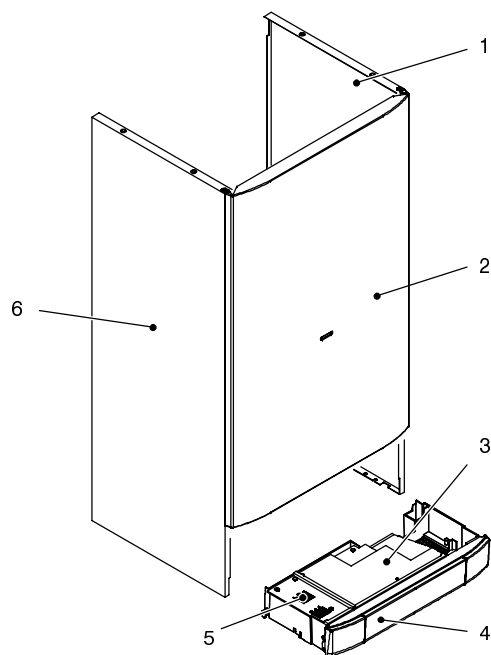


Fig. 1

- 1 Right side panel
- 2 Front panel
- 3 Control panel lid
- 4 Control panel cover
- 5 Service panel
- 6 Left side panel

### 2.2 Body panels

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

For the most part of the check and maintenance operations it is necessary to remove one or more panels of the case.

The side panels can be removed only after the removal of the front panel.

To remove the front panel remove screws A (Fig. 2), lift the panel and remove it.

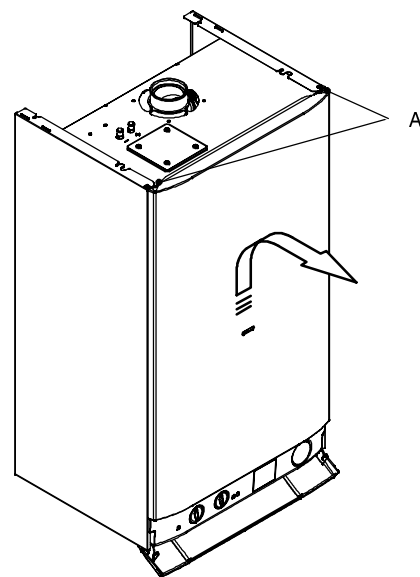


Fig. 2

To remove the side panels loosen the screws B and C (Fig. 3), bring the base of the panels away from the boiler and lift them, freeing them from the top hooks.

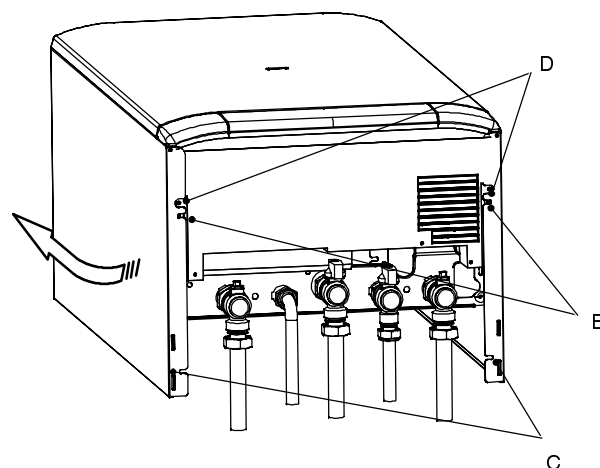


Fig. 3 – bottom view of the boiler

### 2.3 Control panel

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

To gain access to the parts located inside the control panel proceed as follows:

- 1 Remove the front panel of the case
- 2 Loosen the screws B and C (Fig. 3).
- 3 Remove the screws D
- 4 Move the lower part of the side panels as indicated in Fig. 4 and pull the control panel. When completely pulled out, the panel can rotate 45° downwards to facilitate the service operations on the internal parts.

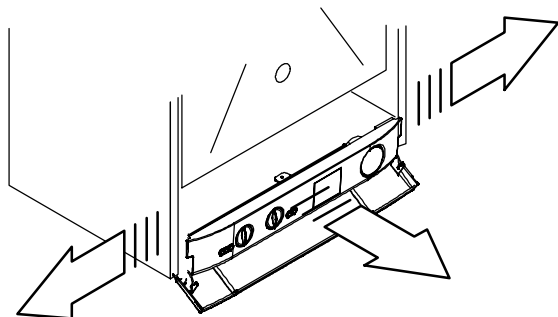


Fig. 4

- 5 Remove the screws *E* and remove the service panel (Fig. 5);
- 6 To gain access to the electronic regulation PCB and the full sequence ignition device remove the screws *F* and remove the control panel lid (Fig. 5);

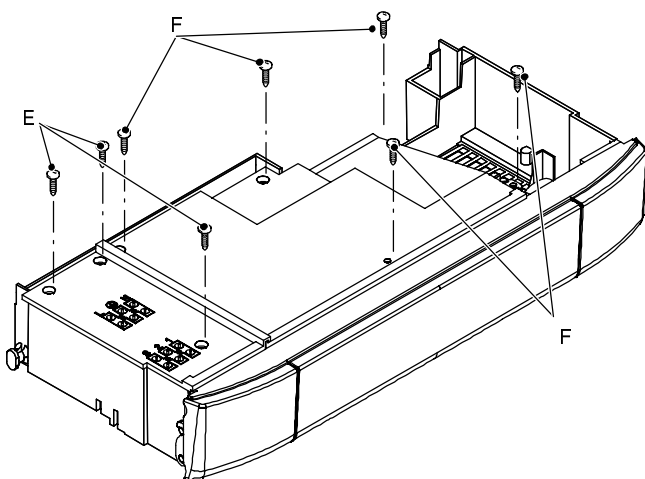


Fig. 5

## 2.4 Access to the sealed chamber

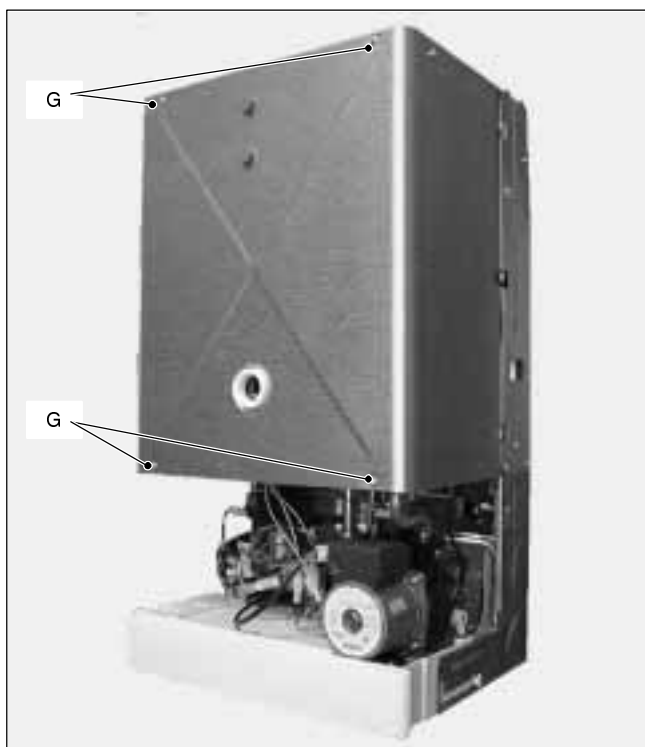


Fig. 6

To gain access to the parts contained in the sealed chamber it is necessary to remove the lid of the sealed chamber.

For this purpose, remove the front and side panels of the case, remove the screws *G* as indicated in Fig. 6 and remove the lid.

## 2.5 Emptying the primary circuit

- 1 Close the c.h. circuit flow and return cocks *H*. (Fig. 7).

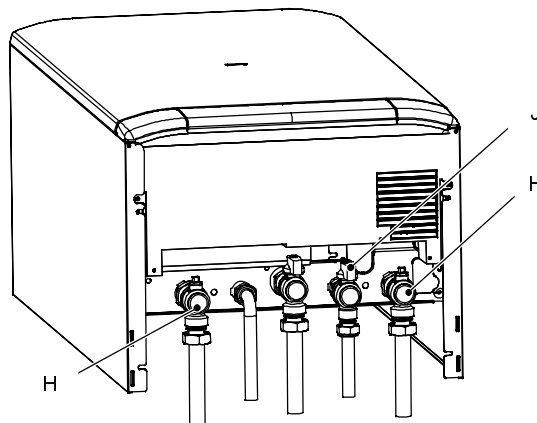


Fig. 7 – bottom view of the boiler

- 2 Remove the front and right panels of the boiler.
- 3 Open the drain tap *I* (Fig. 8) until the boiler is completely emptied.
- 4 Close drain tap again once the emptying has been completed.

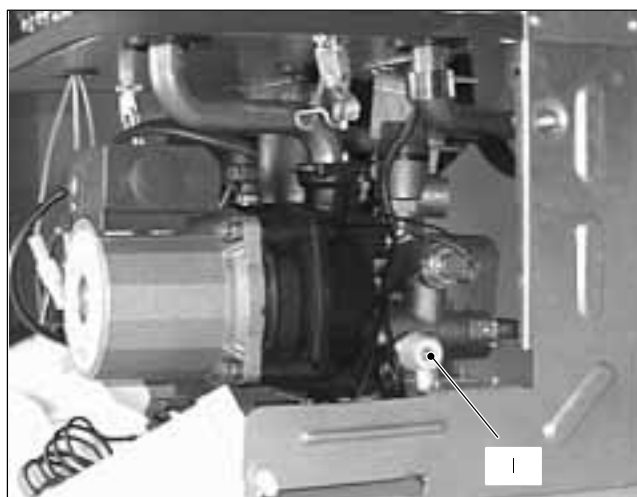


Fig. 8

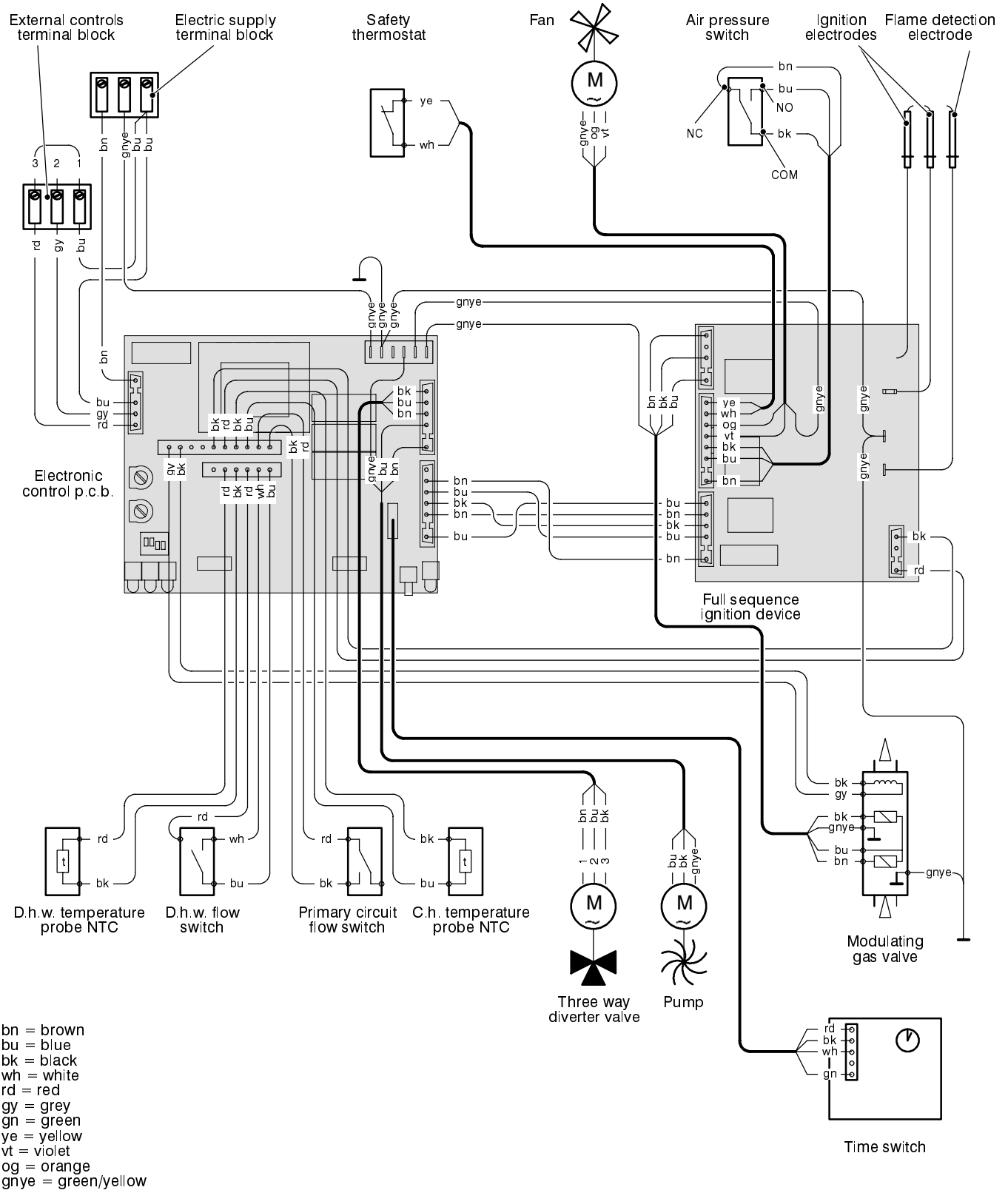
## 2.6 Emptying the d.h.w. circuit

- 5 Close the d.c.w. inlet cock *J* (Fig. 7);
- 6 Open one or more hot water taps until the boiler has been completely emptied.

### 3 Diagrams

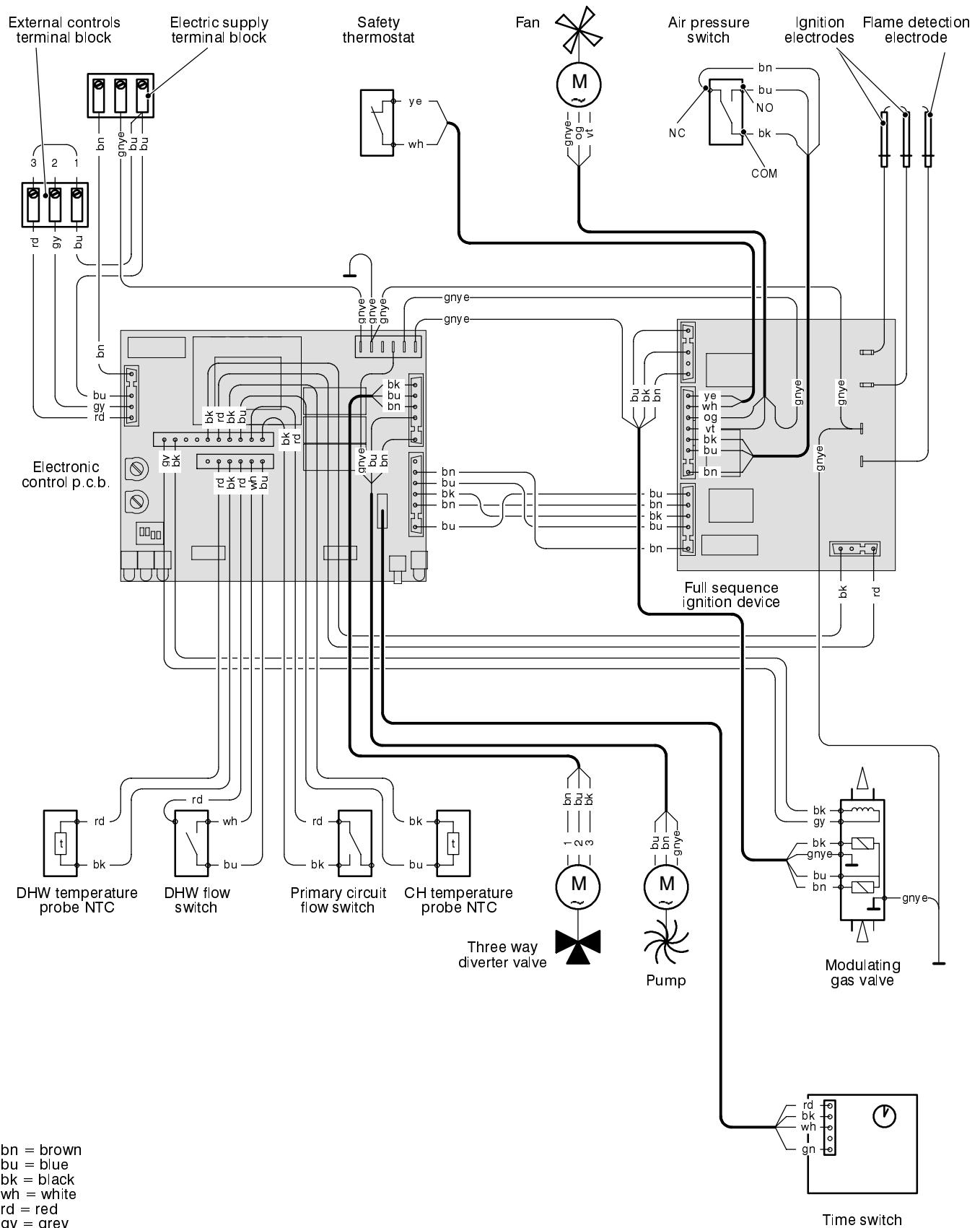
#### 3.1 Wiring diagram M90F.24S M90F.28S, M90F.32S

**Wiring diagram for boiler equipped with full sequence ignition device type: Bertelli & Partners FM30**





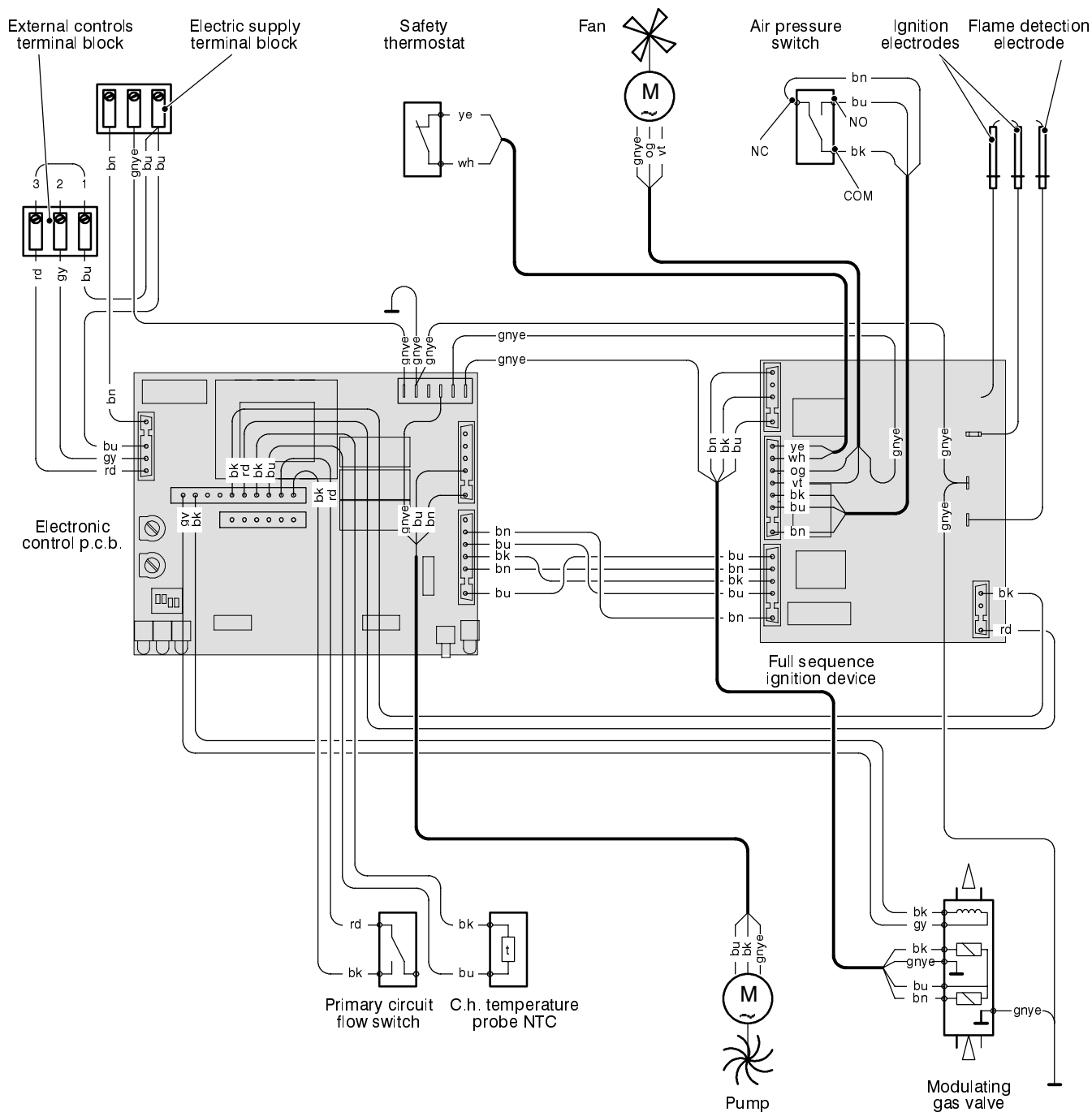
**Wiring diagram for boiler equipped with full sequence ignition device type: Honeywell FPLD**



bn = brown  
 bu = blue  
 bk = black  
 wh = white  
 rd = red  
 gy = grey  
 gn = green  
 ye = yellow  
 vt = violet  
 og = orange  
 gnye = green/yellow

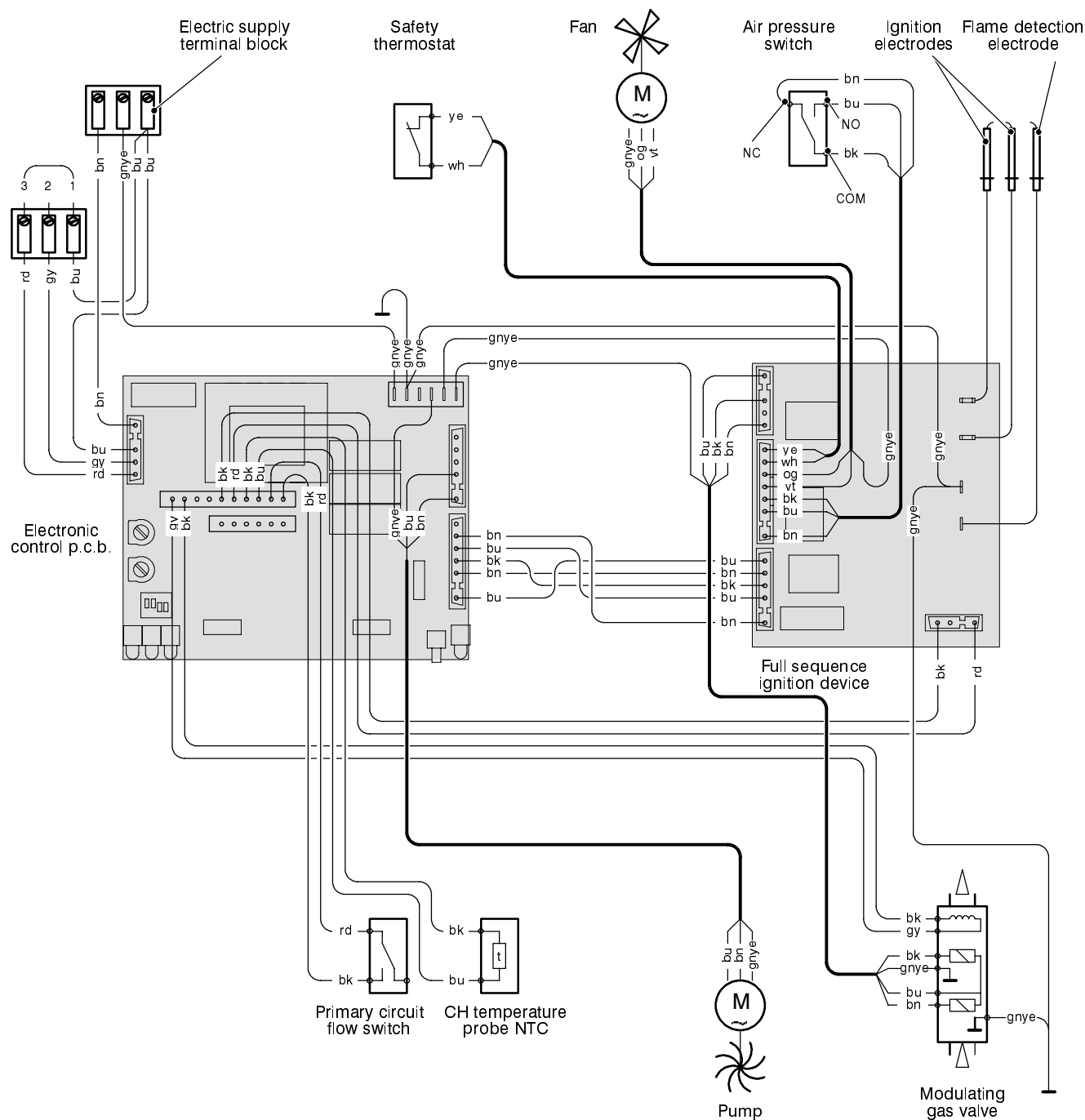
### 3.2 Wiring diagram M90F.24SR, M90F.28SR

**Wiring diagram for boiler equipped with full sequence ignition device type: Bertelli & Partners FM30**



bn = brown  
 bu = blue  
 bk = black  
 wh = white  
 rd = red  
 gy = grey  
 gn = green  
 ye = yellow  
 vt = violet  
 og = orange  
 gnye = green/yellow

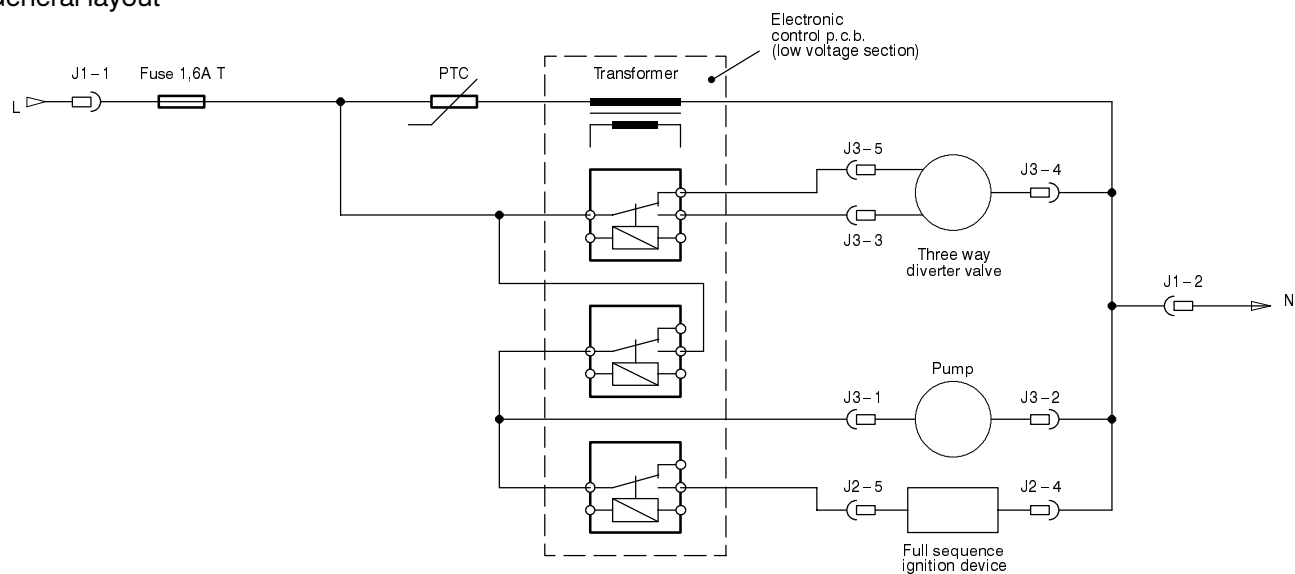
**Wiring diagram for boiler equipped with full sequence ignition device type: Honeywell FPLD**



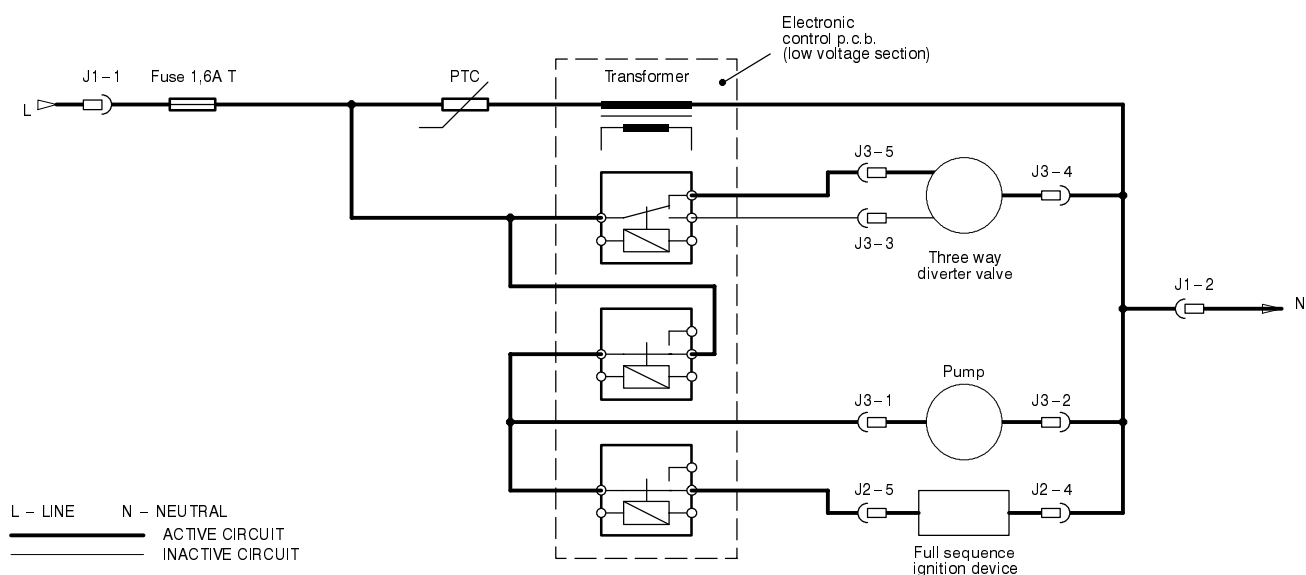
bn = brown  
 bu = blue  
 bk = black  
 wh = white  
 rd = red  
 gy = grey  
 gn = green  
 ye = yellow  
 vt = violet  
 og = orange  
 gnye = green/yellow

### 3.3 Functional flow diagrams

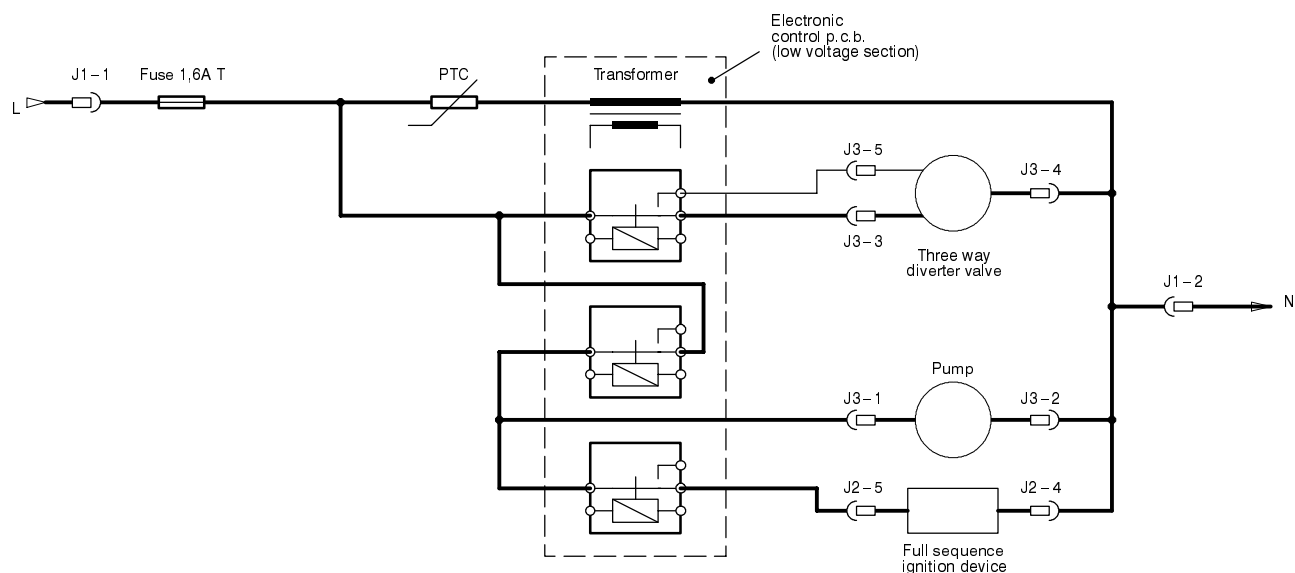
#### General layout



#### Heat request on d.h.w.

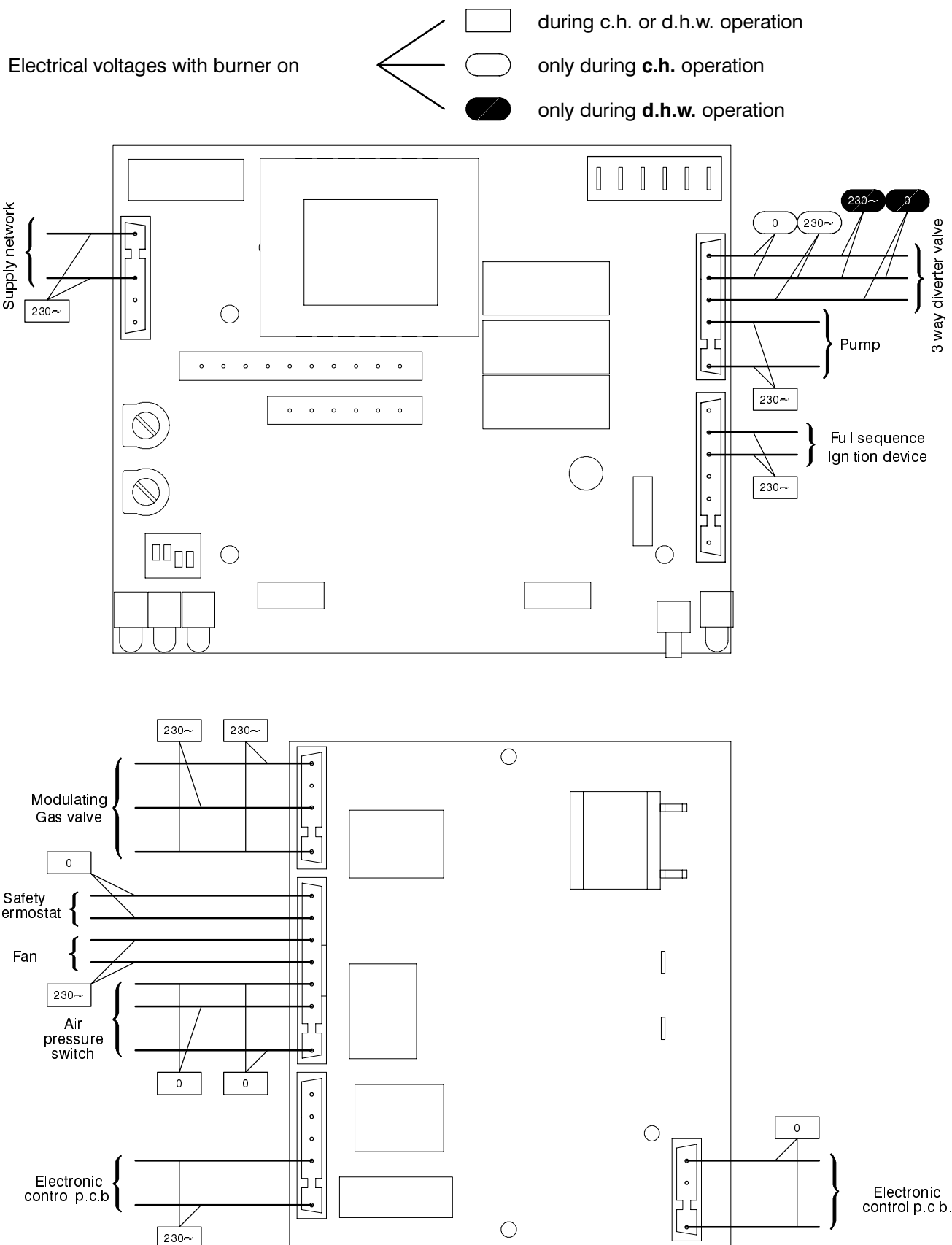


#### Heat request on c.h.



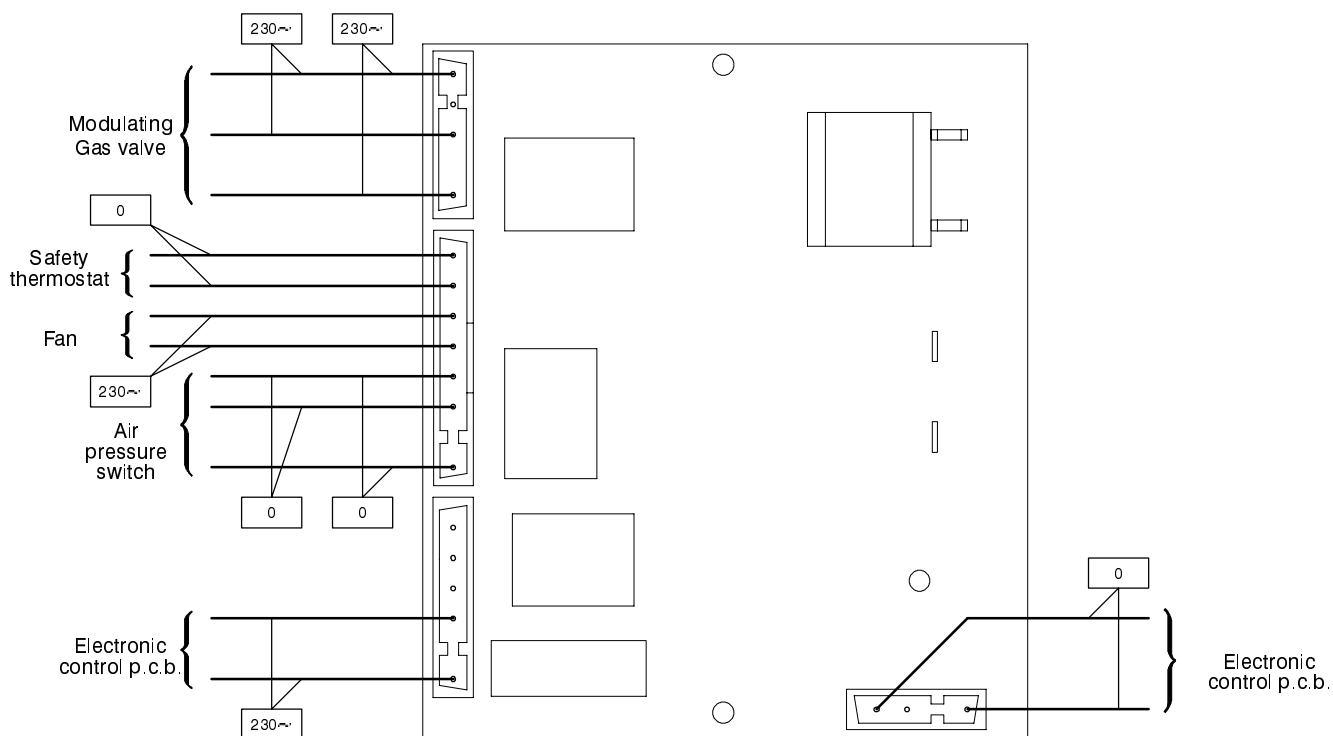
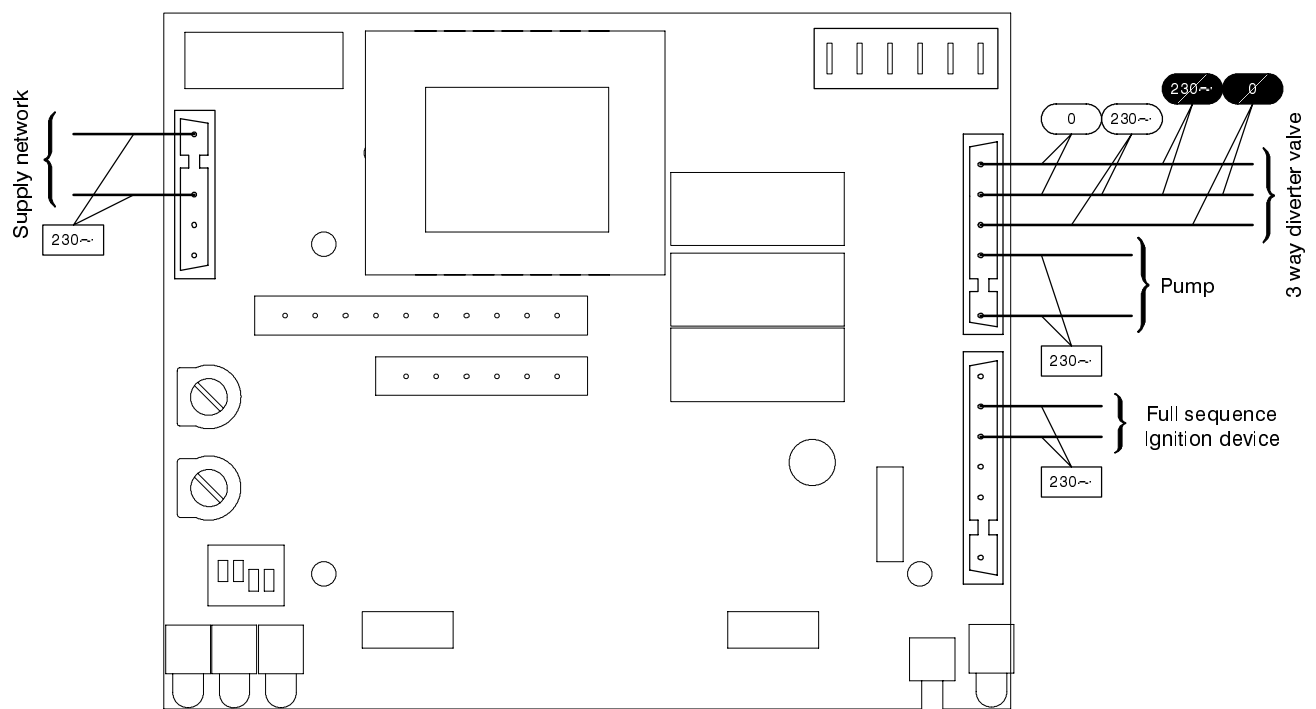
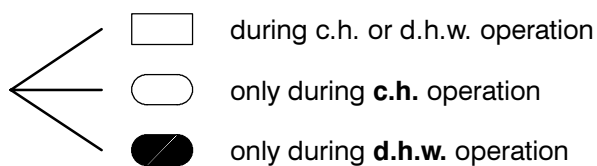
### 3.4 Circuit voltages

#### Diagrams for boiler equipped with full sequence ignition device type: Bertelli & Partners FM30



**Diagrams for boiler equipped with full sequence ignition device type: Honeywell FPLD**

Electrical voltages with burner on



## 4 Fault finding

			Components to check																													
Appliance operation lamp green (1)	Lock – out signal lamp red	Defect ↓	Section of the manual → (note ref. in brackets)	(2)	(3)	(4)	(5)	6	7.2	8.2		9.9			10.2	11.4		12.2	14.5	15.2		16	17.2		18.2	19.2	(8)	(9)	-			
				Power supply line	Gas supply line	Flue pipes	C.h. circuit	D.h.w. circuit	D.h.w. heat exchanger	Pump	Diverter valve	D.h.w. flow switch	Fuse (regulation p.c.b.)	Regulation p.c.b.	Function selectors (reg. p.c.b.)	Full sequence device	Gas valve (on – off operators)	Gas valve (modulating operator)	Main circuit flow switch	D.h.w. filter	Main circuit temp. probe	D.h.w. temp. probe	By – pass valve	Fan and venturi device	Air pressure switch	Ignition electrode	Detection electrode	Safety thermostat	Injectors	Expansion vessel	Safety valve	Pressure gauge
ON – fast pulses	OFF		The boiler does not start either in c/h or d.h.w. mode. Fan still.	■								■				■																
					■																											
ON – fast pulses	ON		By pressing the reset push – button the boiler starts the ignition cycle. The burner <b>doesn't light on</b> , the ignition sparks continue and the boiler locks again.	■	■																											
ON – fast pulses	OFF		The burner doesn't light either in c.h. or d.h.w. mode. Fan turn.			■							■										■									
ON – fast pulses	OFF		The boiler doesn't control the d.h.w. temperature. Turning the d.h.w. temp. adjustment knob hasn't effect on the modulation of the flame. The boiler operates correctly on c.h.										■																			
ON – fast pulses	OFF		The boiler lights for a short while on c.h. Normal operation on d.h.w. function.																													

		Components to check																															
Section of the manual → (note ref. in brackets)		(2)	(3)	(4)	(5)	6	7.2	8.2		9.9			10.2	11.4		12.2	14.5	15.2		16	17.2	18.2		19.2	(8)	(9)	-						
Appliance operation lamp green (1)	Lock-out signal lamp red	Defect ↑	Power supply line	Gas supply line	Flue pipes	C.h. circuit	D.h.w. circuit	D.h.w. heat exchanger	Pump	Diverter valve	D.h.w. flow switch	Fuse (regulation p.c.b.)	Regulation p.c.b.	Function selectors (reg. p.c.b.)	Full sequence device	Gas valve (on-off operators)	Gas valve (modulating operator)	Main circuit flow switch	D.h.w. filter	Main circuit temp. probe	D.h.w. temp. probe	By-pass valve	Fan and venturi device	Air pressure switch	Ignition electrode	Detection electrode	Safety thermostat	Injectors	Expansion vessel	Safety valve	Pressure gauge		
ON – normal pulses	OFF	The boiler does not supply d.h.w. (cold water from the tap). Regular operation in c/h mode even during a drawing off d.h.w.								■	■	■	■																				
		On c/h mode the temperature of the main circuit reaches 75°C and the c/h system does not heat. The boiler operates correctly on d.h.w. mode.								■				■																			
		Incorrect modulation												■				■															
		Noisy boiler												■				■															
		The boiler operates correctly but the gas pressure to the burner remains at minimum.												■				■															
ON – normal pulses	OFF	Poor d.h.w. temperature		■						■							■	■ (10)															
		Low d.h.w. flow rate			■														■														
		Water leaks from the safety valve during operation on c/h			■																												
-	-	Water leaks from the safety valve when the boiler is off.																															

## Note

- For details see section 9.4 of this manual.  
**Further useful information can be obtained by switching the electronic control p.c.b. in the service operation mode (see section 9.4 of this manual).**
- Check for 230V~ between line (L) and neutral (N)  
Verify the integrity of supply cable, plug and external fuses.  
Check the polarity of line and neutral connection
- Verify the soundness of the gas supply pipe, the position of stop valves.  
Check the gas pressure at the inlet test point of the gas valve (see sect. 11.3) with the boiler at rest and during operation and compare it with the values given on the installation booklet.
- Check for soundness and absence of obstructions. Verify that the flue terminal is correctly installed (see clearances) and ensure that exhaust gas is not sucked back by the boiler.
- Check for soundness of the circuit and verify its correct filling (see also installation manual).
- A jammed by-pass could cause the over-heating of the main circuit and the intervention of the safety thermostat.  
Check the **minimum** gas pressure at the outlet test point of the gas valve (see sect. 11.3) and compare it with the value given on the installation booklet.
- Verify the cleanness of injectors.
- Check the pressurization of the expansion vessel. Refer to the installation manual for proper values.
- d.h.w. pressure too high or flow rate too high. If necessary insert a flow rate limiter (14.6).



## 5 Primary heat exchanger

### 5.1 Characteristics

The primary heat exchanger **A** in Fig. 9 has the function of transferring heat produced from combustion of the gas to the water circulating in it.

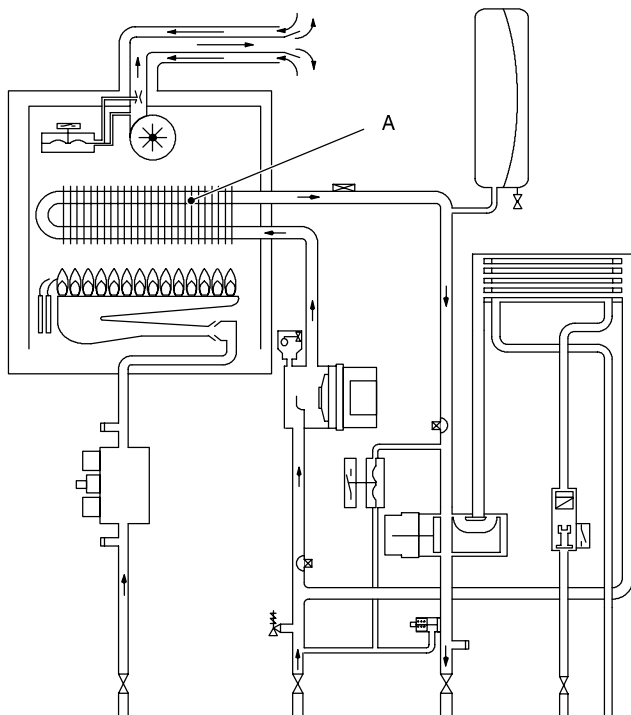


Fig. 9

The hydraulic circuit is composed of 8 elliptical pipes connected in parallel (Fig. 10).

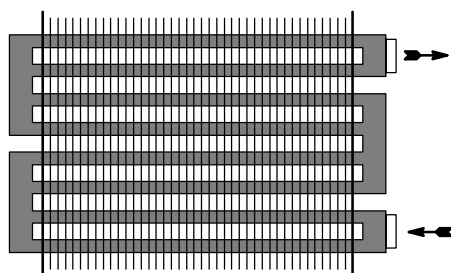


Fig. 10

### 5.2 Removal

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Empty the primary circuit of the boiler.
- 2 Remove the case panels and the sealed chamber lid (see section 2).
- 3 Remove the combustion chamber lid **B** by unscrewing the screws **C** (Fig. 11).
- 3b For model M90F.28S, M90F.28SR and M90F.32S only, remove the screw **D** and the plate **E**.
- 4 Remove the clips **F** and the safety thermostat **G**. It is not necessary to disconnect it from the wiring.

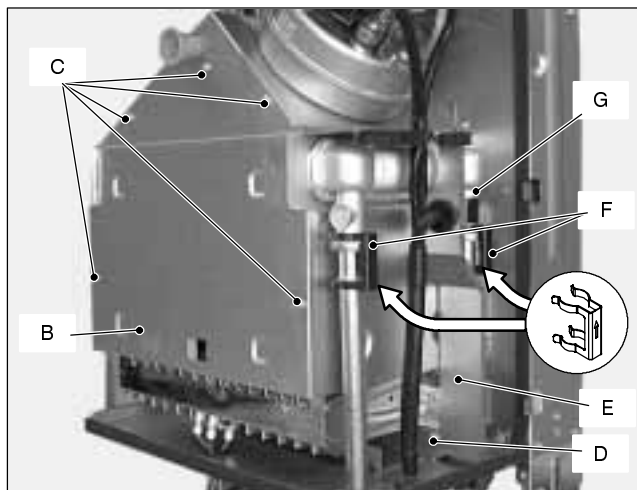


Fig. 11

- 5 Remove the fork **H** (Fig. 12), lift the pipe **I** and rotate it right then move it downwards freeing it from the heat exchanger connection.
- 6 Remove the motor of the three way diverter valve (see section 8.3).
- 7 Loosen the two connection **J** and completely unscrew the connections **K**.
- 8 Rotate the pipe **L** and move the pipe **M** downwards freeing it from the heat exchanger connection.
- 9 Remove the heat exchanger by sliding it forwards.
- 10 Reassemble the boiler carrying out the removal operations in reverse order. **Fit the clips **F** with the arrow pointing upwards as illustrated in Fig. 11.**

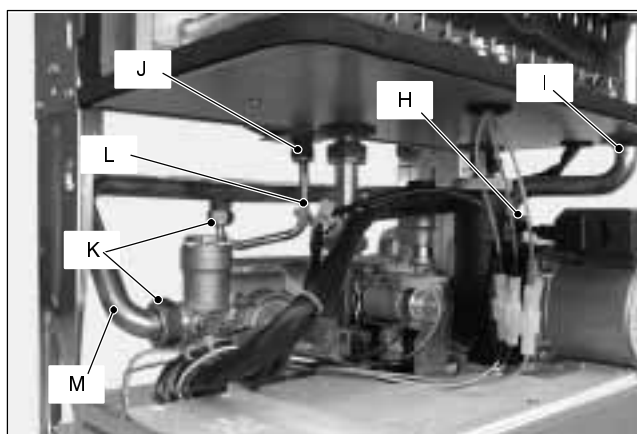


Fig. 12

### 5.3 Cleaning

If there are deposits of soot or dirt between the blades of the heat exchanger, clean with a brush or non-metallic bristle brush.

In any case, avoid any actions that can damage the protective varnish with which the exchanger has been covered.



**Warning:** After cleaning or replacement as detailed above refer to section **Combustion analysis check** in the chapter **Maintenance of the installation instructions manual**.

## 6 D.h.w. heat exchanger

### 6.1 Function

The d.h.w. heat exchanger A in Fig. 13 allows the instantaneous transfer of heat from the primary hydraulic circuit to the water destined for d.h.w. use.

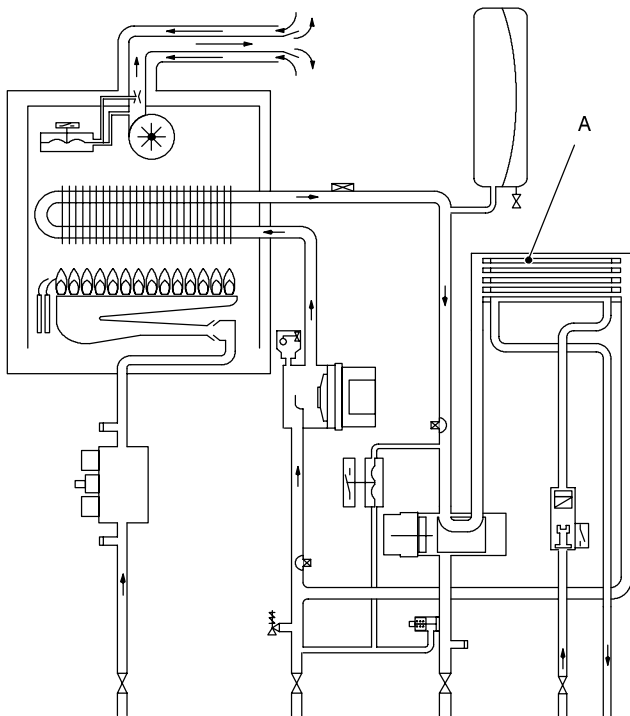
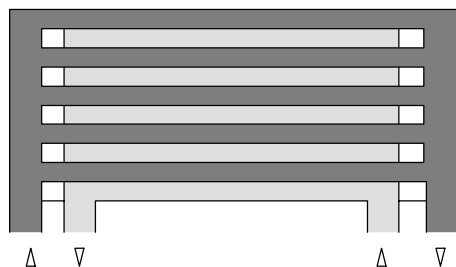


Fig. 13

The schematic structure is shown in Fig. 14.



- Primary hydraulic circuit
- Domestic hot water circuit

Fig. 14

### 6.2 Removal

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove the front and right hand side panels of the case.
- 2 Empty the primary circuit and the d.h.w. circuit of the boiler.

- 3 Remove the motor of the three way diverter valve (see section 8.3).
- 4 Completely unscrew the two connections B and remove the pipe C (Fig. 15).

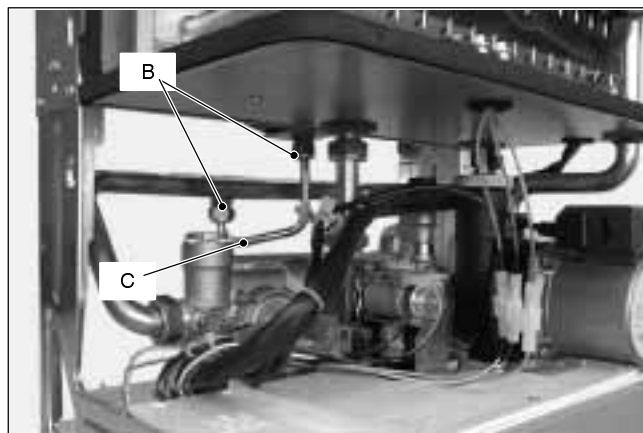


Fig. 15

- 5 Completely unscrew the two Allen key screws D (Fig. 16) which hold the exchanger to the brass groups.



Fig. 16

- 6 Move the exchanger towards the rear of the boiler and extract it.

Reassemble the d.h.w. heat exchanger carrying out the removal operations in the reverse order.

**Attention.** When reassembling the exchanger be sure to put the off center location/securing pin indicated in Fig. 17 towards the left side of the boiler.

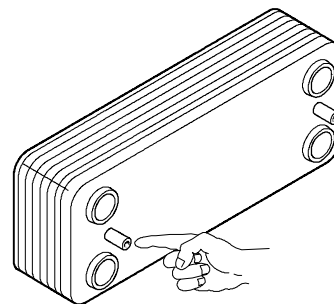


Fig. 17

## 7 Pump

### 7.1 Function

The pump A in Fig. 18 has the function of making the water in the main circuit circulate through the main heat exchanger and therefore through the c.h. system (during the c.h. function) or through the secondary heat exchanger (during the d.h.w. function).

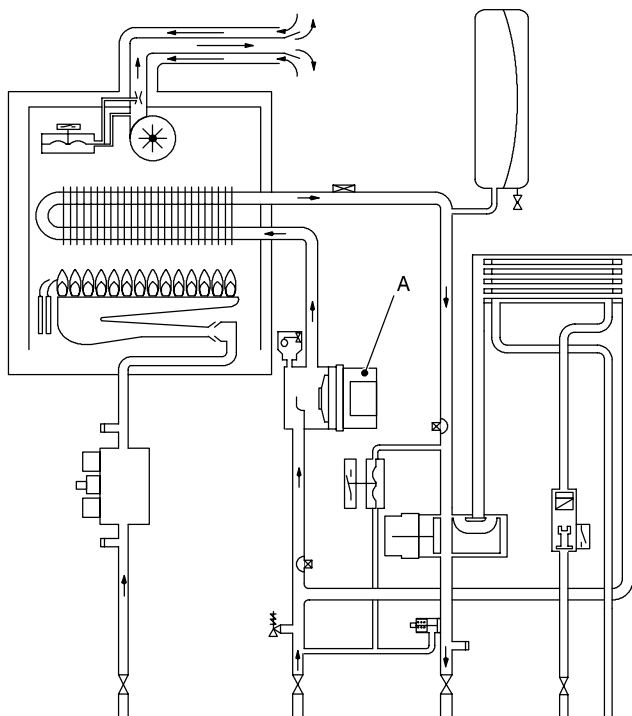


Fig. 18

### 7.2 Checks

**Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

✓ Check that the pump is not seized and that the movement of the rotor is not subject to mechanical impediments.

With the boiler off, remove the front panel. Remove the air release plug of the pump and turn the rotor with a screwdriver.

✓ Check the electrical continuity.

With the boiler off, remove the front panel and disconnect the connector B (Fig. 19).

Measure the electrical resistance between the pump supply connections.

Electrical resistance of the windings (at ambient temperature) must be about 230  $\Omega$

✓ Check the absence of starting defects.

With the boiler off remove the front case panel.

Remove the air release plug from the pump. Start the boiler and with a screwdriver, turn the rotor in the direction of the arrow. If there is a defect in starting, the rotor will begin to turn normally only starting it manually.

✓ Check that the impeller is integral with the rotor.

With the boiler off remove the front and right hand side case panels, lower the control panel and empty the primary circuit.

Remove the pump head by undoing the screws which hold it to the pump body and check that the impeller is firmly joined to the rotor.

### 7.3 Removal

**Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove the front and right hand side case panels
- 2 Empty the primary circuit of the boiler.
- 3 Extract and lower the control panel.
- 4 Disconnect the connector B (Fig. 19).
- 5 Remove the fork C and move the pipe upwards freeing it from the outlet port of the pump.
- 6 Move the locking plate D left until it stops. It is not necessary to extract it completely.
- 7 Unscrew the two screws E that hold the pump on the frame

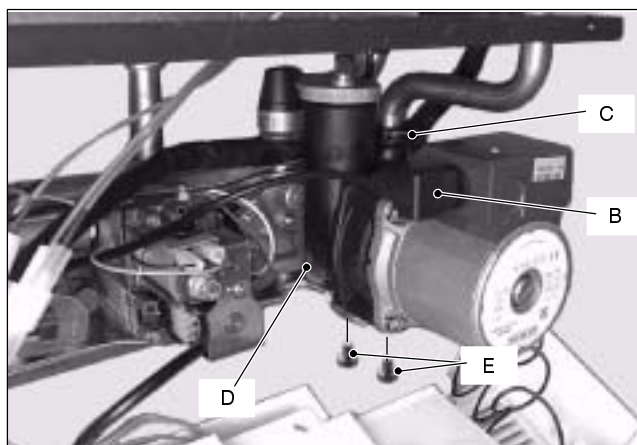


Fig. 19

- 8 Remove the fork F (Fig. 20), the capillary pipe and remove the pump towards the front of the boiler.

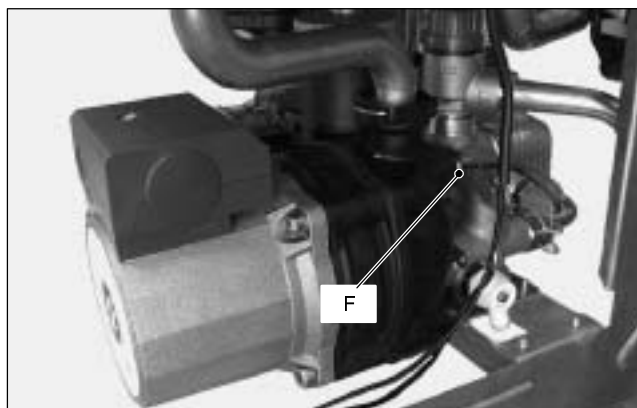


Fig. 20

Reassemble the pump carrying out the removal operations in the reverse order. When reassembling the pump, check the correct location of the O-ring gasket in the inlet port of the pump that seals the connection between the pump and the brass group.

## 8 Three way diverter valve

### 8.1 Function

The diverter valve *A* (Fig. 21) has the function of modifying the hydraulic circuit of the boiler by means of an electric command given by the electronic control p.c.b. in order to send the water that exits the primary heat exchanger towards the c.h. system or towards the d.h.w. heat exchanger.

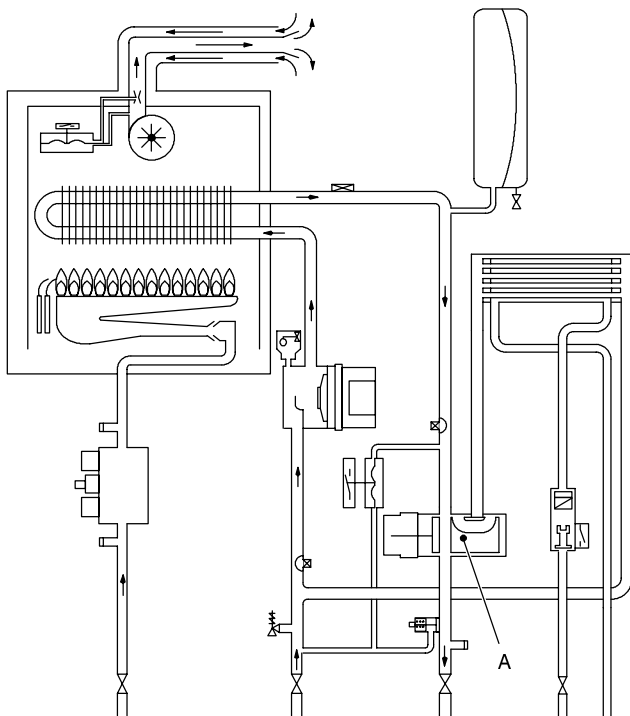


Fig. 21

### 8.2 Checks

✓ Check the electrical continuity

Fig. 22 indicates the relationship between the electric command coming from the electronic control p.c.b. and the position of the actuator *B* (brass spindle) when the boiler operates in **d.h.w. mode**.

Fig. 23 indicates the relationship between the electric command coming from the electronic control p.c.b. and the position of the actuator *B* (brass spindle) when the boiler operates in **c.h. mode**.

In both figures the relationship between the position of the actuator and the resistance of the motor windings (the motor must be disconnected from the wiring) is also given.

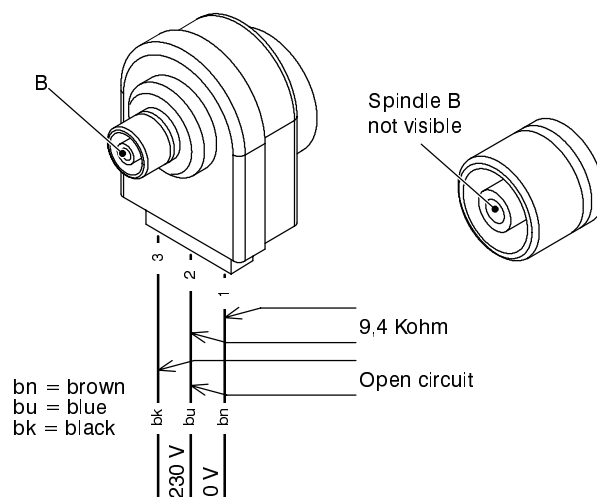


Fig. 22 – D.h.w. mode

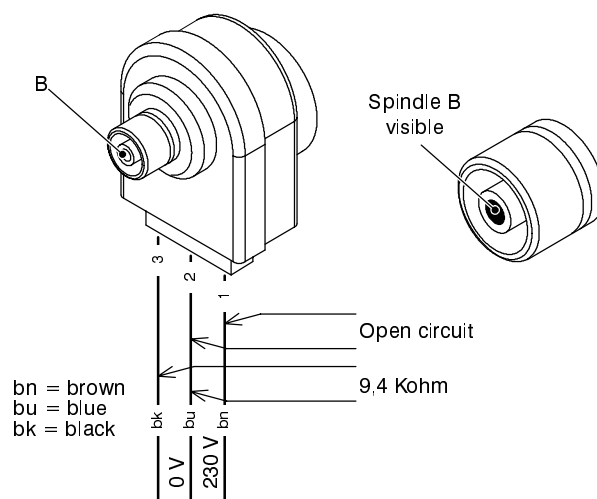


Fig. 23 – C.h. mode

### 8.3 Removal of the electric actuator

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove the front case panel.
- 2 Disconnect the connectors *C* (Fig. 24).
- 3 Remove the fixing spring *D* and remove the actuator *E*.  
Reassemble the actuator carrying out the removal operations in the reverse order.  
When reassembling the actuator, refer to Fig. 22 or to the wiring diagram in section 3.1 for the correct wiring connection.

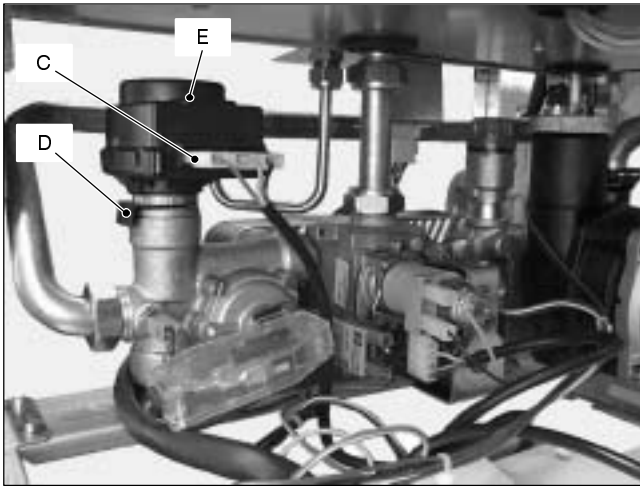


Fig. 24

#### 8.4 Removal of the diverter group and its internal parts

- 1 Remove the front and both side case panels.
- 2 Empty the primary circuit and the d.h.w circuit of the boiler.
- 3 Remove the electric actuator (see section 8.3).
- 4 Remove the fixing spring *F* (Fig. 25) and remove the primary circuit flow switch *G*.
- 5 Disconnect the c.h. temperature probe *H*.
- 6 Unscrew the connector *I*, the c.h. flow connector and the d.h.w. outlet connector.

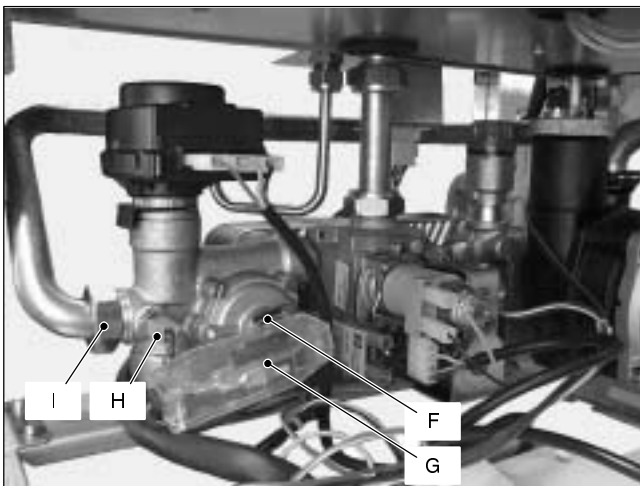


Fig. 25

- 7 Remove the d.h.w. heat exchanger (see section 6.2).

- 8 Remove the fork *J* and move away the pipe *K* (Fig. 26).
- 9 Unscrew the screw *L* and remove the diverter group.

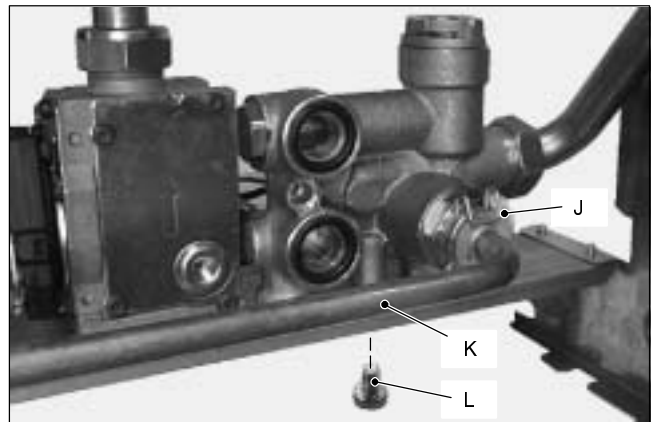


Fig. 26 Rear view of the boiler

- 10 Refer to the exploded view in Fig. 27 to remove the internal parts of the three way diverter valve.



Fig. 27

- 11 Reassemble the diverter group carrying out the removal operations in the reverse order.

## 9 Electronic control p.c.b.

### 9.1 Function

#### Inlet Information

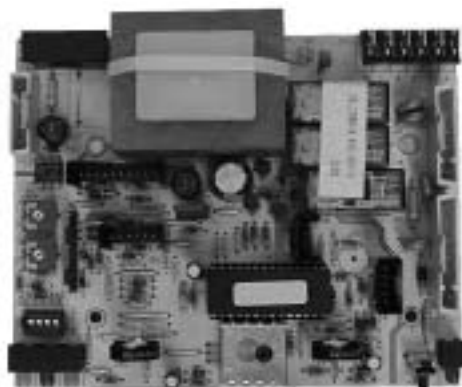
On the Electronic control p.c.b. ....

Function control\*  
C.h. temperature adjustment\*  
D.h.w. temperature adjustment\*  
Function dip-switches  
Max. c.h. gas pressure adjustment  
Ignition gas pressure adjustment  
Boiler reset button\*

\*control panel fascia

From other boiler devices ....

C.h. temperature probe NTC  
D.h.w. temperature probe NTC  
D.h.w. flow switch  
Primary circuit flow switch  
Room thermostat (if fitted)  
Time switch  
Flame presence signal\*  
\*from the full sequence ignition device



#### Outlet command

Pump  
Three way diverter valve  
Full sequence ignition device  
Modulation operator  
Appliance operation light\*  
Operation/service lamps  
Lock-out signal lamp\*

\*control panel fascia

The fundamental function of the Electronic control p.c.b. is that of controlling the boiler in relation to the external needs (i.e. heating the dwelling or heating the water for d.h.w. use) and operating in order to keep the temperature of the hydraulic circuits constant.

This is obviously possible within the useful power and maximum working temperature limits foreseen.

Generally, the Electronic control p.c.b. receives inlet information coming from the boiler (the sensors) or from the outside (knobs, room thermostat, etc.), processes it and consequently acts with outlet commands on other components of the boiler (Fig. 28).

### 9.2 Selection and adjustment devices

On the Electronic control p.c.b. several selection, adjustment and protection devices are located. (Fig. 29).

Some of these devices are directly accessible by the user (function control, temperature adjustment potentiometers etc.) others are accessible by removing the service panel or the control panel lid.

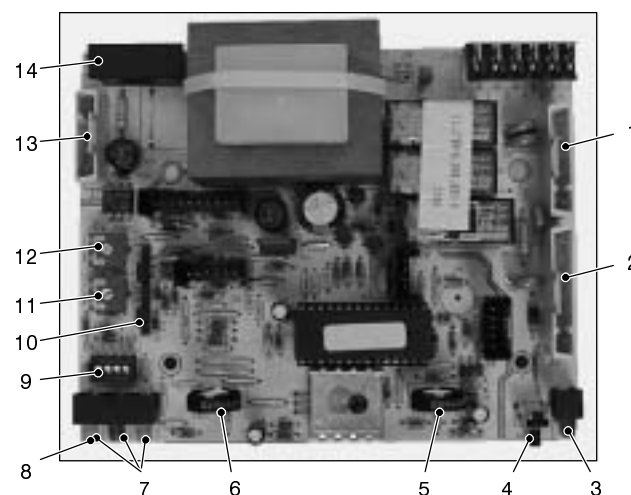


Fig. 29

- 1 J3 connector
- 2 J2 connector
- 3 Lock-out signal lamp
- 4 Boiler reset button
- 5 Function control / C.h. temperature adjustment
- 6 D.h.w. temperature adjustment
- 7 Service lamps (service mode)
- 8 Appliance operation lamp (normal use mode)
- 9 Dip-switch selectors
- 10 Setting jumpers
- 11 Ignition gas pressure adjustment (ACC.)
- 12 Maximum c.h. gas pressure adjustment (RISC.)
- 13 J1 connector
- 14 Fuse 1,6 A T


### 9.3 Checking the temperature

The Electronic control p.c.b. makes it possible to separately adjust the c.h. water flow temperature and d.h.w. outlet temperature.

The temperature of the water is converted into an electric signal by means of temperature probes.

The user, setting the desired temperature with the control panel knobs operates the variable elements (5 and 6 in Fig. 29) of the electronic control p.c.b.

If the power requested is lower than 40% of the maximum power output then control is achieved by switching ON the burner at minimum power, then switching OFF (ON/OFF function). If the power requested is higher, then the burner is switched ON at maximum power and will control by modulating to 40% of the maximum power output.

During the c.h. operation (Fig. 30), the signal coming from the c.h. temperature probe is compared to the signal given by the control panel through the adjustment made by the user (knob ). The result of such a comparison operates the modulation of the gas valve, consequently changing the useful output of the boiler.

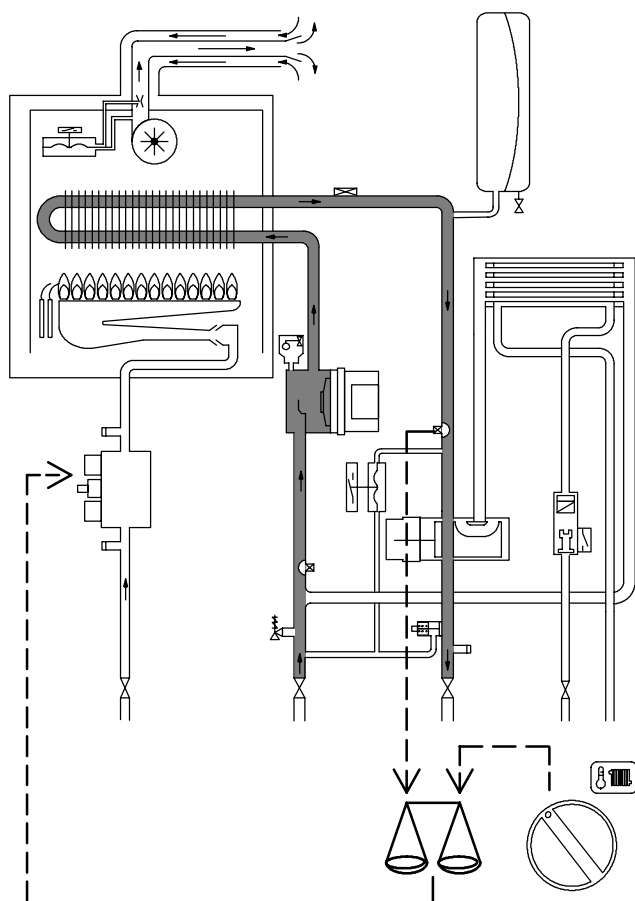



Fig. 30

When the boiler functions in d.h.w. (Fig. 31), the signal coming from the d.h.w. temperature probe is compared with the signal given by the control panel through the adjustment made by the user (knob ).

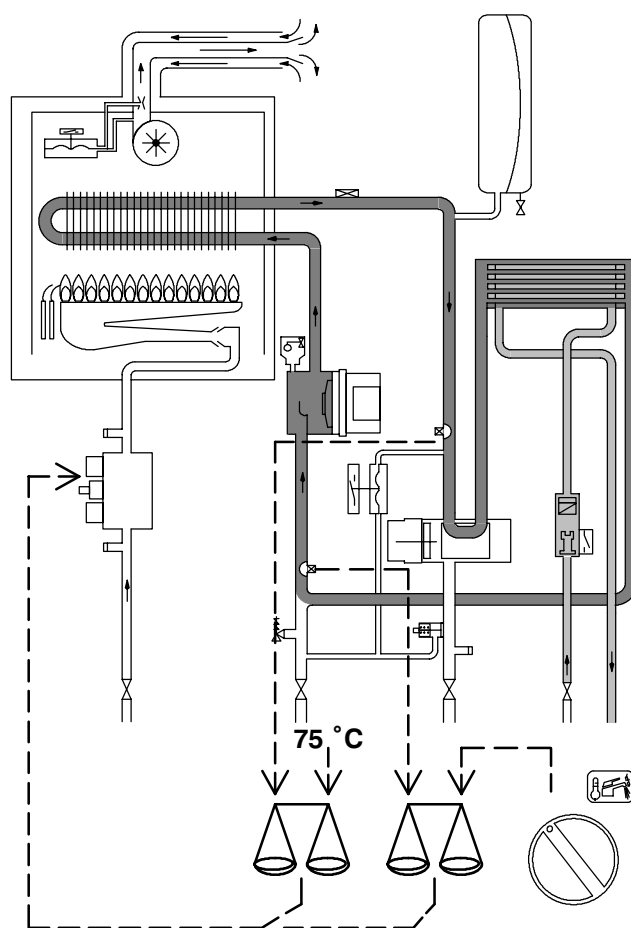


Fig. 31

Normally, the result of the comparison between these two signals directly operates the adjustment elements of the gas valve modulation device, adjusting the useful output generated in order to stabilize the temperature of the exiting water.

If during the d.h.w. mode operation, the temperature of the primary circuit goes over 75°C, the useful output is automatically reduced so that the primary circuit cannot reach excessive temperatures.

The control sequences in  function and in  function are illustrated in detail in sections 9.11 and 9.12.

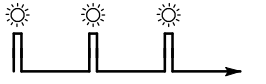
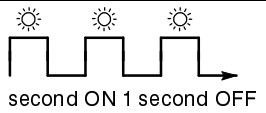


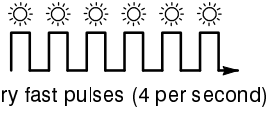
## 9.4 Operation/Service lamps

The Electronic control p.c.b. is provided with three lamps (L.E.D. indicators) 7 in Fig. 29 that give optical information during the normal operation of the boiler or for service purpose.



### ○ Normal operation


Only the green lamp on the left is directly visible on the control panel fascia and it gives information during the normal operation of the boiler. The other two lamps are normally switched off.

The following table gives the relationship between the visible lamp indication and its meaning.



















 <p>A short pulse every 4 seconds</p>	<p>Boiler in stand-by condition. (function control in 0 position).</p> <p>Anti-freeze system active.</p>
 <p>1 second ON 1 second OFF</p>	<p>Boiler ON condition (function control in  or  position)</p>
 <p>Very fast pulses (4 per second)</p>	<p>Faulty boiler or irregular operation as:</p> <ul style="list-style-type: none"> <li>– Empty primary circuit</li> <li>– No primary circuit flow</li> <li>– Lack of burner ignition</li> <li>– Excessive temperature in the primary circuit.</li> <li>– Dip-switch 3 left in the OFF position</li> <li>– Faulty temperature probe</li> </ul>

○ Service operation

With the boiler switched ON ( or ) , by moving and re-setting to its original position any of the function selectors 9 (Fig. 29), the Electronic control p.c.b. goes into service operation mode and all the lamps (7 in Fig. 29) are then activated.

To reset the Electronic control p.c.b. to the normal operation it is necessary to turn the knob  to the 0 position or switch off the boiler for a short while at the fused spur isolation switch.

The following table gives the relationship between each of the possible lamp combinations and their meaning.

	○	○	Normally operating boiler
	○		C.h. operation
	○		D.h.w. operation
		○	Frost protect operation
○	○		D.h.w. operation Excessive temperature on primary circuit
○			Faulty c.h. temperature probe NTC
○		●	Faulty d.h.w temperature probe NTC
	●	○	Faulty primary circuit (no water or absence of flow)
	●		Lack of burner ignition (no ignition signal from the full sequence ignition device)
●		○	Ignition gas pressure adjustment
	●	●	Minimum gas pressure adjustment
○	○	○	Lack of power supply or faulty electronic control p.c.b. *
●	●	●	Faulty electronic control p.c.b. *
○	●		
Lamp OFF	Lamp ON	Flashing lamp, alone or simultaneously with an other lamp.	Flashing lamp, alternate with another lamp.
* These conditions are normal only for a short time when the power supply is applied to the boiler. If permanent they indicate a faulty p.c.b.			

## 9.5 Dip-switch selectors

The function selectors 9 (Fig. 29 and Fig. 32) are micro-switches with which it is possible to select the various boiler control function modes.

In Fig. 32 the selectors are illustrated in the configuration in which the boiler is set in the factory (natural gas boiler).

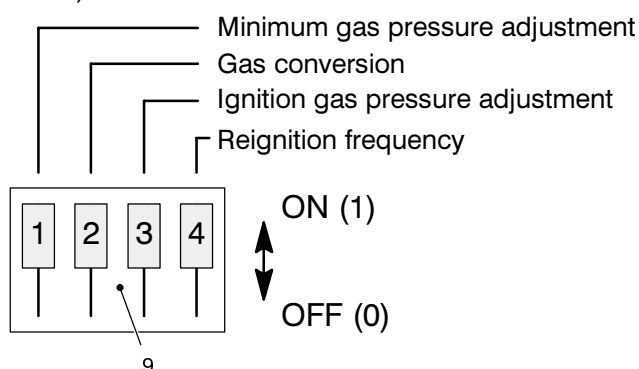


Fig. 32

○ Selector 1

This forces the boiler to operate at the minimum gas pressure in order to allow the adjustment of the minimum gas pressure at the burner (on the modulation operator of the gas valve).



After any adjustment operation the selector has to be brought back to the normal position (ON).

#### ○ Selector 2

This selects the boiler functions on the basis of the type of gas used.

It allows the selection of the maximum supply current given to the modulator device.

To set selector 2 correctly follow the table in Fig. 33.

Gas supply	Position of selector	Approx. Max current through the modulator device
Natural gas	On	120 mA
L.P.G.	Off	165 mA

Fig. 33

#### ○ Selector 3

This forces the functioning of the boiler in order to allow the optimal gas pressure at the burner to be adjusted during the ignition phase.

The adjustment (see section 9.7) is done by means of the potentiometer "11" marked "ACC" (Fig. 29 on page 19).

After the adjustment operations bring the selector back to the normal position (ON).

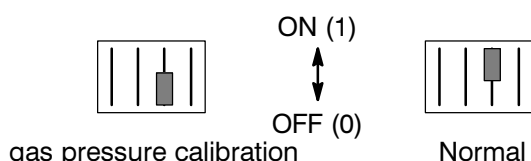


Fig. 34

#### ○ Selector 4

This allows you to select the minimum time that must pass between two ignitions of the burner in c.h. function.

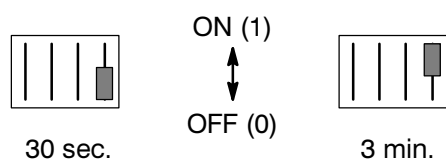


Fig. 35

### 9.6 Setting jumpers

Two setting jumpers are fitted on the Electronic control p.c.b.

Refer to Fig. 36 for the position of the jumpers when the Electronic control p.c.b. is fitted on a M90F.24S or M90F.28S boiler.

Refer to Fig. 37 when the Electronic control p.c.b. is fitted on a M90F.24SR or M90F.28SR boiler.

The numbers refer to the marking printed on the circuit board.



Fig. 36

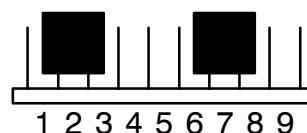


Fig. 37

### 9.7 Ignition gas pressure adjustment

By using the device "11" (Fig. 29) marked "ACC." on the Electronic control p.c.b., it is possible to adjust the gas pressure at the injectors in the ignition phase.

This pressure is maintained at the injectors until ignition occurs (ionization signal from the full sequence ignition device).

To carry out the adjustment move the function selector 3 to the OFF position (Fig. 34) and use the adjustment device "11" (ACC).

Adjust the gas pressure at the injectors to the value indicated in the tables of the User/Installation manual (*Technical information* section, *Gas pressures at the burner* table).

By rotating the device clockwise the pressure increases.

Check the regular ignition of the burner by turning the boiler on and off repeatedly.

After the adjustment operations bring the selector 3 back to the normal position (ON).

### 9.8 Max c.h. power adjustment

By using device 12 (Fig. 29) marked "RISC." on the Electronic control p.c.b., you can limit the maximum useful output delivered during the c.h. operating mode. This adjustment does not influence the maximum useful output delivered during the d.h.w. operating mode.

By rotating the device clockwise the pressure increases.

### 9.9 Checks

✓ Check that the fuse is complete

If the Electronic control p.c.b. does not supply any device (pump, fan, etc.) check that the fuse 14 (Fig. 29) is complete.

If the fuse has blown replace it with one that has the same characteristics after having identified the reason for failure.

✓ Check the setting jumpers position

Two setting jumpers must be fitted on the Electronic control p.c.b. as shown in Fig. 36 and Fig. 37.

### 9.10 Removal of the electronic control p.c.b

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Gain access to the parts located inside the control panel as explained in the section 2.3 of this manual.
- 2 Remove all the wiring connected to the Electronic control p.c.b..  
To disconnect the connectors J1, J2 and J3 (13,

- 2 and 1 in Fig. 29) delicately flex the hook present on one side of each socket.
- 3 Remove the spindles of the c.h. and d.h.w. temperature adjustment knobs by delicately pulling them with pliers in the direction shown by the arrow in Fig. 38.

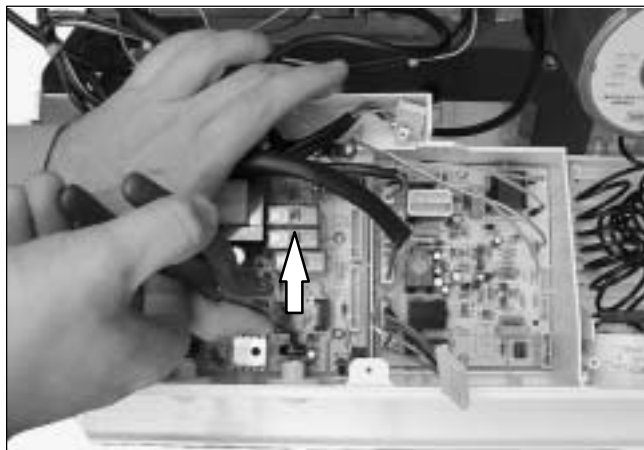


Fig. 38

- 4 Unscrew the four screws that hold the Electronic control p.c.b. on to the control panel.
- 5 Remove it by lifting its rear edge and freeing it from any of the wiring.
- 6 Re-assemble the Electronic control p.c.b. following the removal procedures in the reverse order.

### Important

When re-assembling the Electronic control p.c.b.:

- 7 Fit the p.c.b. into the control panel by first inserting the front lower edge under the control knob shafts. Lower the rear edge and ensure that no wiring is trapped beneath.
- 8 Insert the spindles in the control panel knobs until the notch A (Fig. 39) reaches the potentiometer edge. It is not necessary to force them in the knob.

- 9 While tightening the screws that fix the Electronic control p.c.b. on the control panel, keep the p.c.b. towards the control panel fascia making sure of the contact between the boiler reset button B and the tab C (Fig. 39).

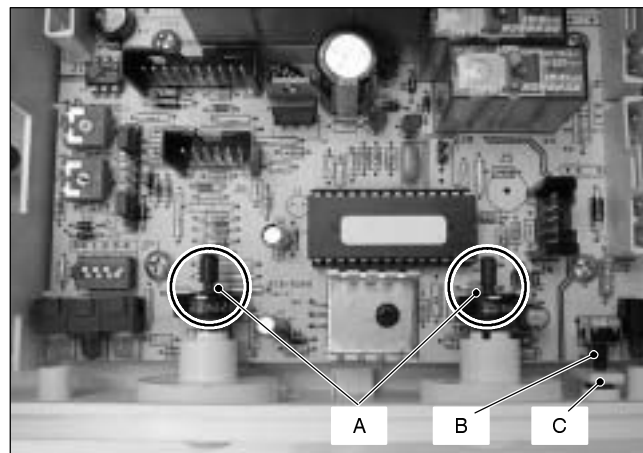


Fig. 39

### Attention

After installing the Electronic control p.c.b. :

- 10 Make sure the c.h. (🔥) and d.h.w. (🚰) temperature adjustment knobs can move freely for the complete range.  
If not, remove the spindle again as described at step 3, turn the knob half a turn and re-insert the spindle.
- 11 Operate the boiler and close the gas inlet cock so that the boiler goes into the safety lock – out state. Verify the correct operation of the boiler reset button by pressing and releasing it.



**Warning: After cleaning or replacement as detailed above refer to section *Combustion analysis check* in the chapter *Maintenance of the installation instructions manual*.**

## 9.11 Thermal control in the "❄️" mode

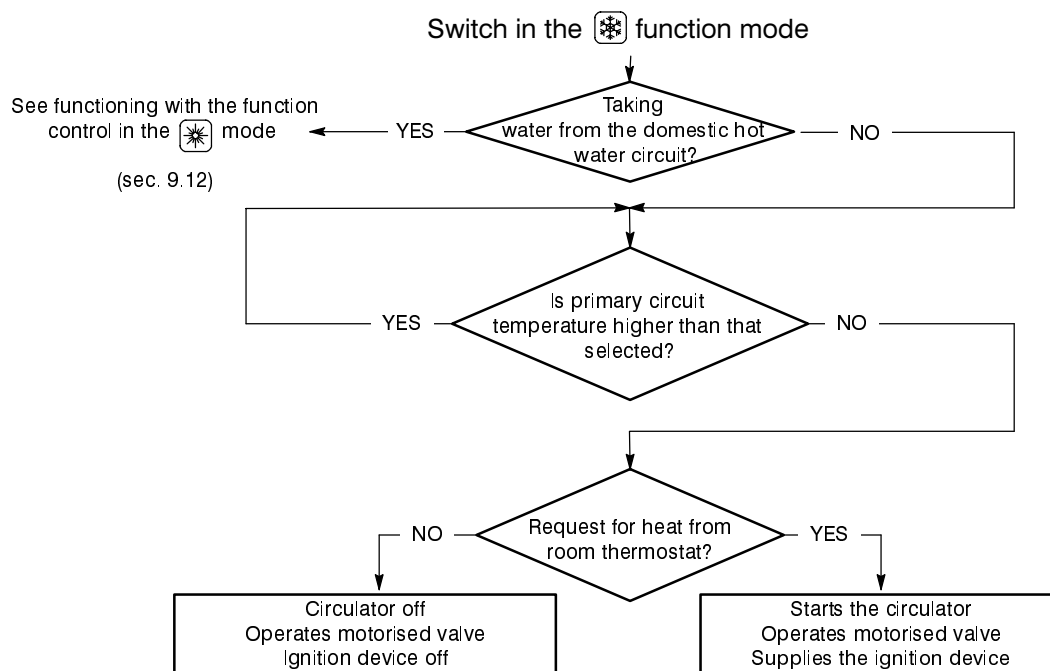


Fig. 40

## 9.12 Thermal control in the "☀️" mode

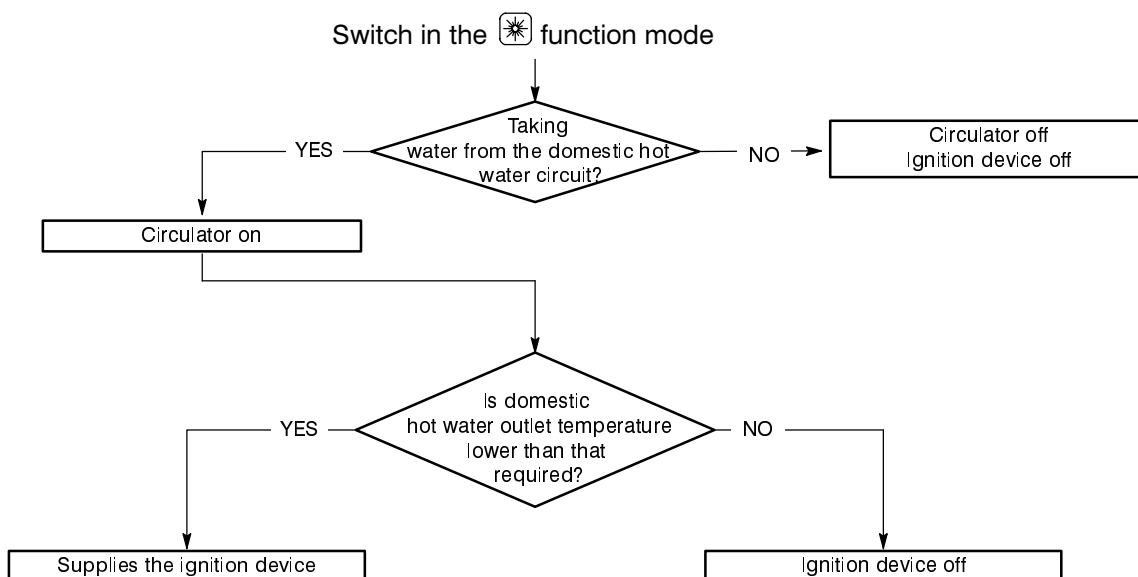


Fig. 41

## 10 Full sequence ignition device

### 10.1 Function

The Full sequence ignition device used on the boiler carries out the following fundamental functions:

- does a sequence of operations (ignition cycle) which lead to the ignition of the gas at the burner
- checks the presence of the flame during the entire period in which it is activated
- supplies the fan and checks its functioning by means of the signal coming from the air pressure switch.

The Full sequence ignition device is supplied by the electronic control p.c.b. when the ignition of the burner is requested.

The Full sequence ignition device has a **safety function** and any incorrect interventions or tampering can result in conditions of dangerous functioning of the boiler.

The Full sequence ignition device can lock the functioning of the boiler (lock state) and stop its functioning up to the resetting intervention. The lock is signalled by the lighting of the lock – out signal lamp and the device can be reset only by using the boiler reset button placed on the control panel fascia.

Some components which are connected to the device can activate the lock state. The causes of a lock state could be:

- The intervention of the safety thermostat (over-heat of the primary circuit).
- A fault on gas supply
- Faulty ignition (faulty ignition electrodes, their wiring or connection).
- Faulty flame detection (faulty detection electrode, its wiring or connection).
- Gas injectors blocked
- Faulty modulation gas valve (faulty on–off operators or not electrically supplied).
- Faulty Full sequence ignition device.

Other components like the air pressure switch can temporarily stop the ignition of the burner but allow its ignition when the cause of the intervention has stopped.

Fig. 43 shows the sequence of the operations that are carried out at the start of every ignition cycle and during normal functioning.

### 10.2 Checks

- ✓ Lock sequence

Start the boiler until the burner is ignited.

With the burner firing, interrupt the gas supply. The Full sequence ignition device must carry out a complete ignition cycle and then stop.

By turning the boiler on and off by means of the function switch the device must not unlock and the burner must not turn on.

- ✓ Fan functioning device

With the boiler operating and the burner on, open the negative pressure test point of the Venturi device. At the moment of opening the burner must turn off.

### 10.3 Removal

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Gain access to the parts located inside the control panel as explained in the section 2.3 of this manual.
- 2 Remove all the wiring connected to the Full sequence ignition device.  
To disconnect the connectors A, delicately flex the hook present on one side of each socket (Fig. 42).
- 3 Unscrew the two screws B that hold the Full sequence ignition device on the panel and remove the component.

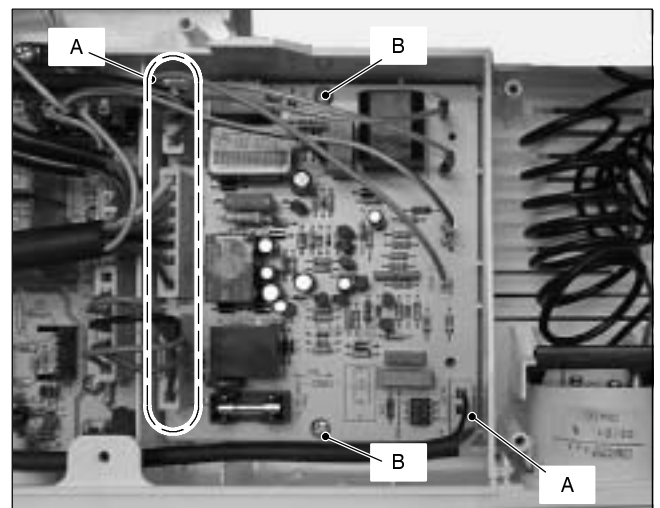


Fig. 42

- 4 Re-assemble the Full sequence ignition device following the removal procedures in the reverse order.

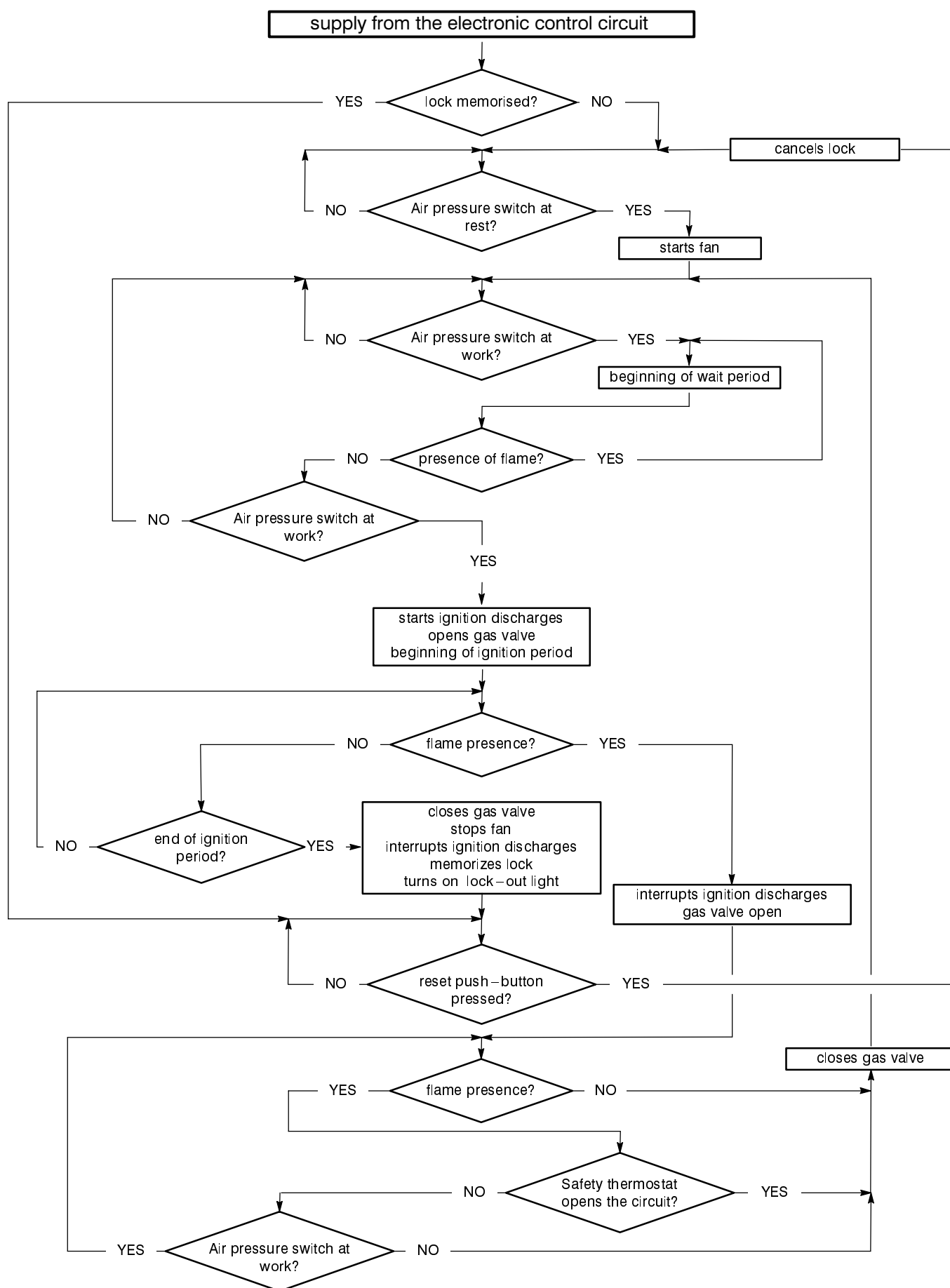
**10.4** Ignition and control sequence

Fig. 43

## 11 Modulating gas valve

### 11.1 Function

The Modulating gas valve A in Fig. 44 controls the gas inflow to the boiler burner.

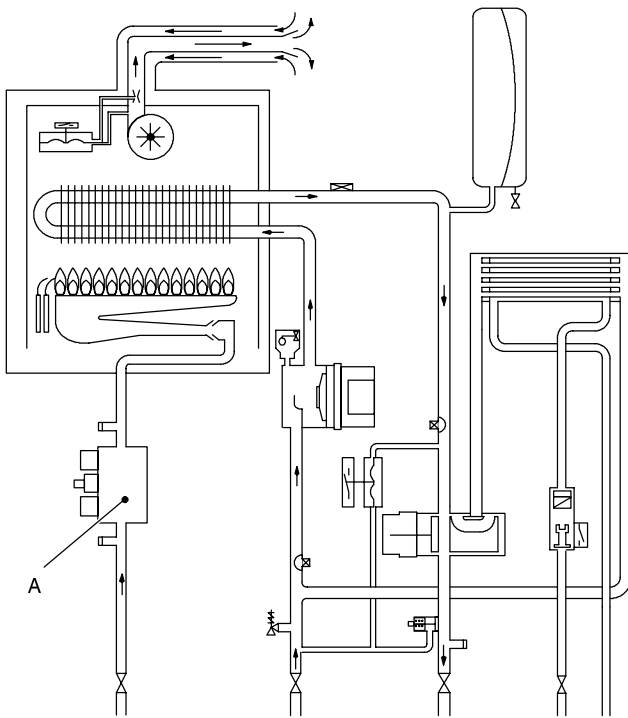


Fig. 44

By means of an electric command given to the on–off operators the passage of the gas through the Modulating gas valve can be opened or closed.

By means of an electric command given to the modulation operator the pressure can be varied and therefore the gas flow rate to the burner (modulation). The modulation operator has mechanical components which allow the adjustment of the minimum and maximum pressure exiting the valve.

### 11.2 Nomenclature of the parts (Fig. 45)

- 1 Modulation operator's electric connectors
- 2 Minimum gas pressure adjustment
- 3 On–off operators
- 4 Maximum gas pressure adjustment
- 5 On–off operators electric connector
- 6 Gas valve inlet pressure test point
- 7 Modulation operator
- 8 Gas valve outlet pressure test point

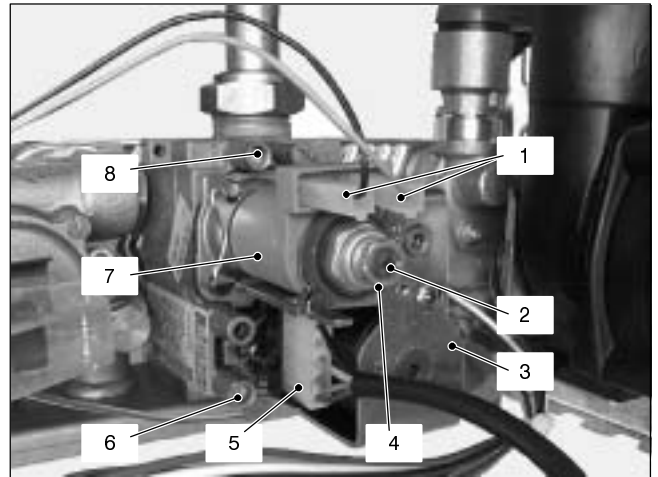


Fig. 45

### 11.3 Adjustment

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove the front panel of the case.
- 2 Open the gas valve inlet pressure test point (6 in Fig. 45) at the valve input, connect a suitable pressure gauge and check the gas pressure of the supply network.
- 3 Remove the gauge and close the pressure test point 6.
- 4 Open the gas valve outlet pressure test point (8 in Fig. 45) and connect the gauge;
- 5 Remove the protection cap from the mechanical pressure adjustment components;
- 6 Start the boiler at its maximum power. Operate the boiler in d.h.w. mode or ensure that the boiler is not range rated if the test is carried out in c.h. mode.
- 7 Rotate the maximum gas pressure adjustment (4 in Fig. 45) until you obtain the required pressure (by rotating clockwise the pressure increases).
- 8 Disconnect one of the two connectors (1 in Fig. 45) or, alternatively, remove the service panel as explained in the section 2.3 of this manual and set the dip–switch selector 1 (see section 9.5) to the OFF position.
- 9 Rotate the minimum gas pressure adjustment (2 in Fig. 45) until you obtain the required pressure (by rotating clockwise the pressure increases).
- 10 Turn the boiler off and re–connect the wire to the modulating operator (or set the dip–switch selector 1 back to the ON position).
- 11 Start the boiler and check again the maximum gas pressure setting.
- 12 Turn the boiler off and disconnect the gauge.

**Important:** after the gas pressure checks and any adjustment operations, all of the test points must be sealed.

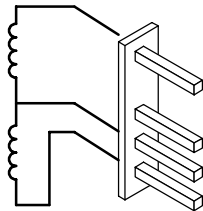
## 11.4 Checks

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- ✓ Check the modulation operator coil
  - 1 Remove the front panel of the case.
  - 2 Disconnect the connectors *B* (Fig. 48) from the modulating operator and measure the electrical resistance of the coil. Its electrical resistance value must be approx.  $80\ \Omega^*$ .
- ✓ Check the on-off operators coils
  - 1 Remove the front panel of the case.
  - 2 Disconnect the electrical connector *C* (Fig. 48).
  - 3 Measure the electrical resistance between the connector pins of the on-off operators as illustrated in Fig. 46.

Upper on-off operator  
approx.  $6\ 400\ \Omega^*$

Lower on-off operator  
approx.  $920\ \Omega^*$



\* at ambient temperature.  
Fig. 46

## 11.5 Removal of the on-off operators coils

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove the front panel of the case as explained in the section 2.3 of this manual.
- 2 Disconnect the connector *D* (Fig. 47).
- 3 Unscrew the screw *E* and remove on-off operator coils.
- 4 Reassemble the coils carrying out the removal operations in reverse order.

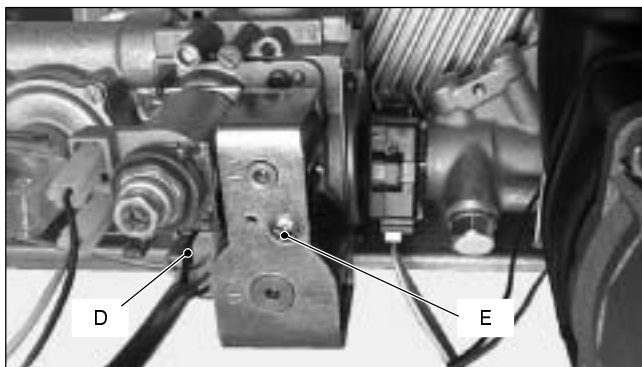


Fig. 47

## 11.6 Removal of the gas valve

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove the front panel of the case as explained in the section 2.3 of this manual.
- 2 Disconnect the connectors *B* and *C* (Fig. 48).
- 3 Turn off the gas supply and disconnect the gas isolation cock connector from the inlet port of the gas valve.
- 4 Unscrew the connectors *F* and remove the pipe *G*.
- 5 Unscrew the screws *H* and remove the valve.
- 6 Reassemble the valve carrying out the removal operations in reverse order.

**After any service operation on the components of the gas circuit check all the connections for gas leaks.**



**Warning:** After cleaning or replacement as detailed above refer to section *Combustion analysis check* in the chapter *Maintenance of the installation instructions manual*.

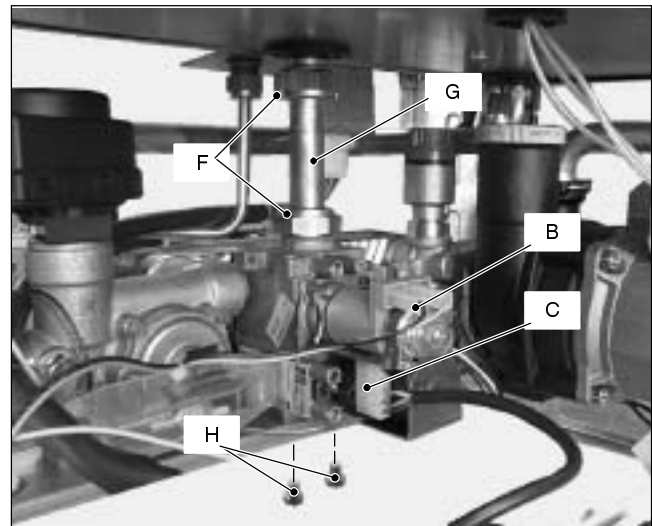


Fig. 48

## 12 Primary circuit flow switch

### 12.1 Function

The Primary circuit flow switch (A in Fig. 49) function is to detect water flowrate through the primary hydraulic circuit of the boiler.

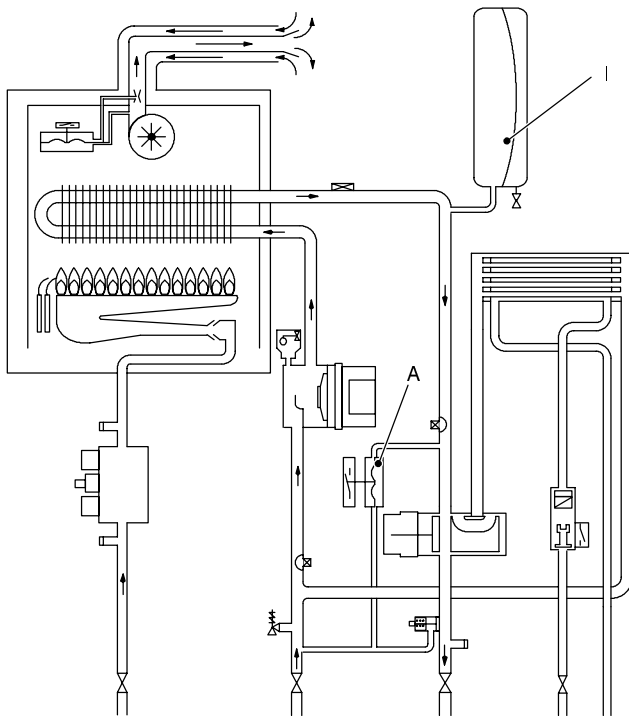


Fig. 49

This hydraulic/membrane operated electrical micro-switch device will control the functioning of the ignition control circuit, providing there is an adequate quantity and flow of water in the primary circuit. Any failure of the pump or obstructions in the primary circuit, whilst in either c.h. or d.h.w. modes, will not allow the device to operate.

This device is connected to the electronic control p.c.b. and if, after the pump operates, it does not activate within 20 seconds the control board will indicate that a fault condition (see section 9.4 of this manual) has occurred.

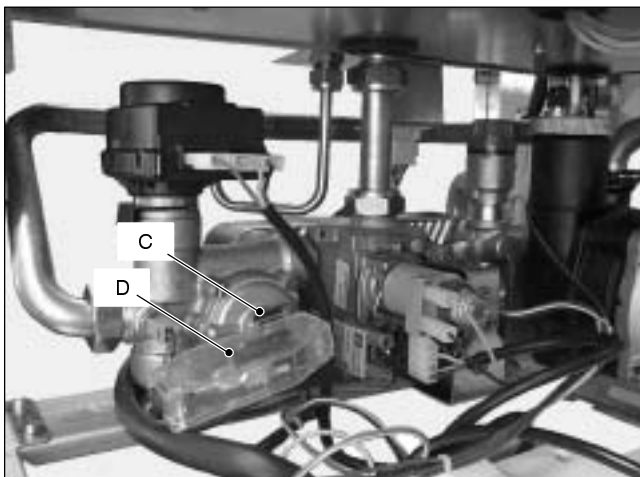


Fig. 50

### 12.2 Checks

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

#### ✓ Mechanical function

- 1 Remove the front panel of the case.
- 2 Start and stop the boiler either in d.h.w. or c.h. mode.
- 3 Looking through the switch box verify the position of the shaft B referring to Fig. 51.

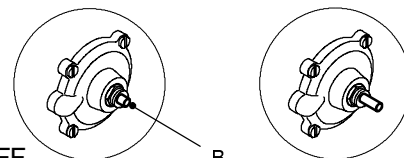


Fig. 51

#### ✓ Electrical check

It is possible to verify the general operation of the switch by measuring the electric resistance between the contacts C. and N.O. of the switch.

- 1 Remove the switch as explained in section 12.3.
- 2 Measure the electrical resistance between the tabs marked C. and N.O. (Fig. 52). The contact must be normally open.
- 3 Operate the switch by hand and verify that the contact is now closed.

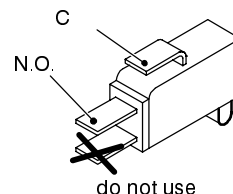


Fig. 52

### 12.3 Removal

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

#### ✓ Removal of the switch

- 1 Remove the front and right hand side panels of the case.
- 2 Remove the fork C (Fig. 50).
- 3 Open the box and disconnect the switch.
- 4 Re-assemble the parts in reverse order of removal. Refer to Fig. 52 for the correct wiring connectors on the switch

#### ✓ Removal of the membrane

- 1 Remove the front and right hand side panels of the case, turn off the flow and return isolation valves and empty the primary circuit.
- 2 Remove the fork C that holds the micro-switch housing D (Fig. 50).
- 3 Unscrew the four screws E (see Fig. 53) open the hydraulic operator and remove the membrane F.



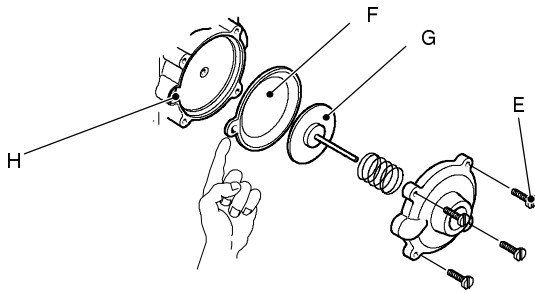


Fig. 53

- 4 Reassemble the parts in reverse order of removal.

**When assembling the membrane, ensure that its concave side faces towards the actuator plate G and the reference indicated aligns with the seat H (see Fig. 53).**

## 13 Expansion vessel and temperature–pressure gauge

### 13.1 Function

The Expansion vessel (I in Fig. 49) function is to allow for the volume expansion of the c.h. circuit water due to the temperature rise.

### 13.2 Checks

- 1 Turn off the flow and return isolation valves and empty the primary circuit of the boiler.
- 2 Remove the protective cap J (Fig. 54) from the valve on the top of the expansion vessel and connect a suitable air pressure gauge.

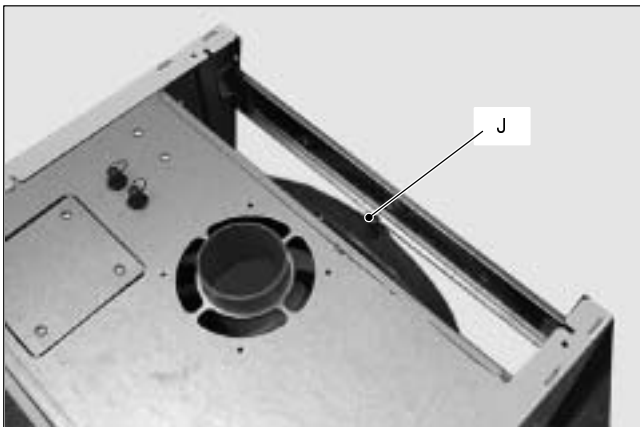


Fig. 54

- 3 Check the pre-load pressure and refer to the section *Expansion vessel* in the *User manual and installation instructions* for the correct value.

### 13.3 Removal of the expansion vessel

If there is at least 400 mm clearance above the boiler and the rear exit flue can be easily removed, the expansion vessel can be changed without removing the boiler.

**Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove the front and left hand side panels of the case, turn off the flow and return isolation valves and empty the primary circuit.
- 2 Completely unscrew the connection K, the lock-nut L (Fig. 55) and remove the expansion vessel from the top of the boiler.

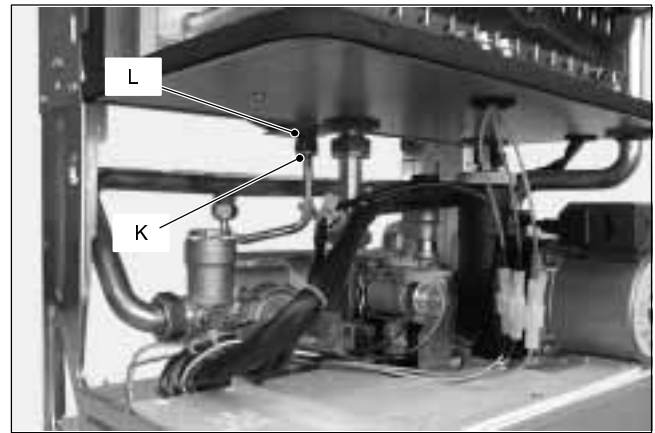


Fig. 55

- 3 Re-assemble the parts in reverse order of removal.

### 13.4 Removal of the temperature–pressure gauge

- 1 Remove the front and right hand side panels of the case, turn off the flow and return isolation valves and empty the primary circuit.
- 2 Remove the fork M and the probe holder spring N (Fig. 56).
- 3 Squeeze the tabs O to release the temperature–pressure gauge P and remove it.
- 4 Re-assemble the parts in reverse order of removal.

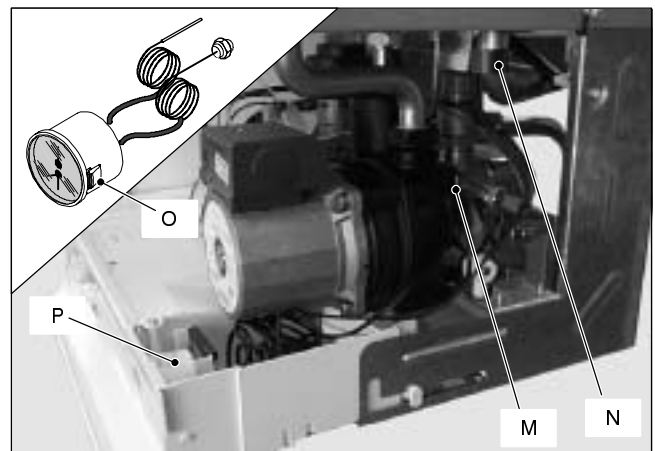


Fig. 56

## 14 D.h.w. flow switch, filter and flow limiter

### 14.1 Function

The d.h.w. flow switch A in Fig. 57 is a device that generates an electrical signal when hot water is drawn.

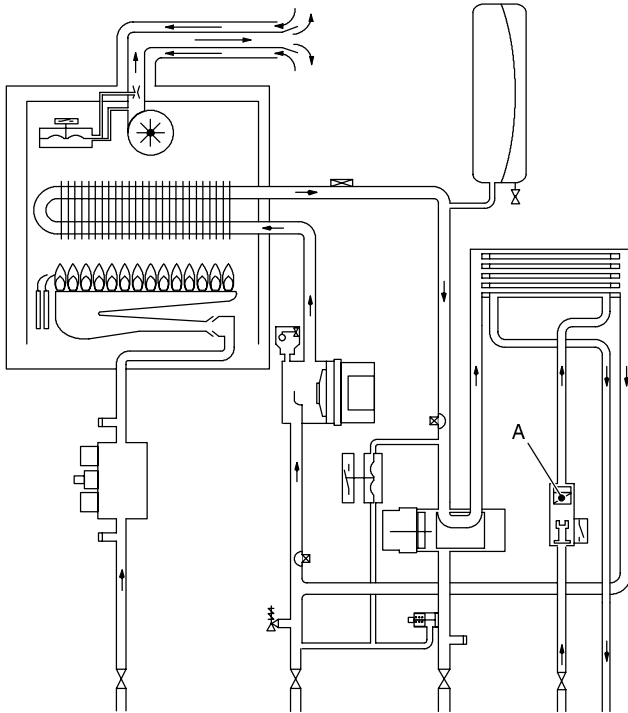


Fig. 57

When the flow rate through the d.h.w. circuit reaches about 2,5 litres/min', the float 4 (Fig. 59) is drawn towards the right.

The resulting magnetic field of ring 3 increases and reaches the flow switch sensor 1.

The sensor generates an electrical signal that switches the boiler d.h.w. operation ON.

The state of the sensor is also indicated by means of the lamp B placed on the sensor body.

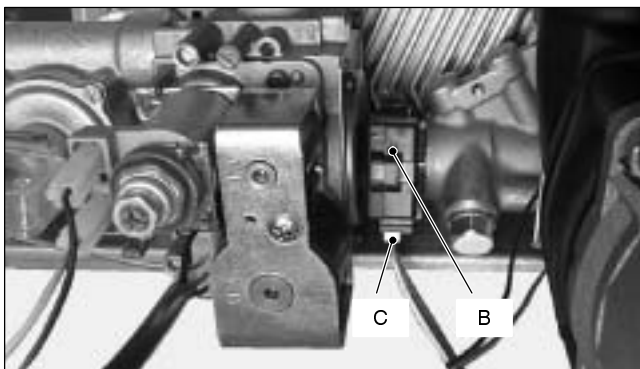


Fig. 58

### 14.2 Nomenclature and location of parts (Fig. 59)

- 1 Flow switch sensor
- 2 Plug
- 3 Magnetic ring
- 4 Float
- 5 Spring
- 6 Filter
- 7 Body
- 8 Spring seat
- 9 Flow limiter (M90F.28S optional accessory)
- 10 Threaded ring

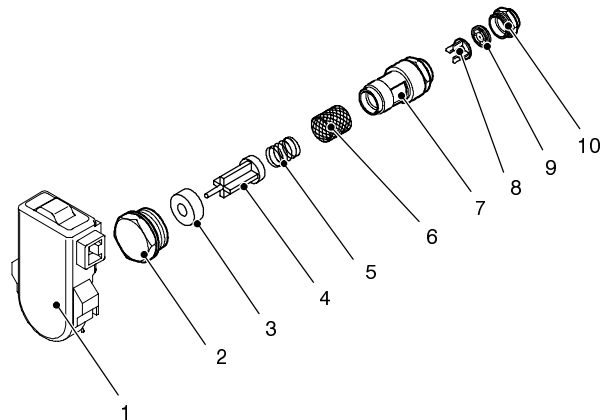


Fig. 59

### 14.3 Checks

**Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

✓ Flow switch sensor operation

- 1 Remove the front panel of the case.
- 2 Switch on the boiler and open a d.h.w. tap. The lamp B (Fig. 58) placed on the sensor body is switched on when the flow rate reaches about 2,5 litres/min'.

### 14.4 Removal of the flow switch sensor

**Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove the front panel of the case.
- 2 Disconnect the connector C (Fig. 58) and remove the sensor by pulling it towards the front of the boiler (the sensor is held in place by means of a spring).

### 14.5 Removal of the flow switch group and d.h.w. circuit filter

**Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove the front panel of the case and empty the d.h.w. circuit.

- 2 Remove the flow switch sensor (see section 14.4).
- 3 Remove the gas valve (see section 11.6).
- 4 Unscrew the plug 2 (Fig. 59) and extract the flow switch group.
- 5 To remove the filter from the flow switch group separate the body 7 from the plug 2 (Fig. 59) by unscrewing it.
- 6 Reassemble the parts following the removing sequence in reverse order.

**Attention: the ring 3 (Fig. 59) has a magnetic polarity and must be correctly coupled with the spindle of the float 4.**

To determine the correct orientation of the ring proceed as follows:

- 1 Set the function selector of the boiler in stand – by mode (Fig. 60).

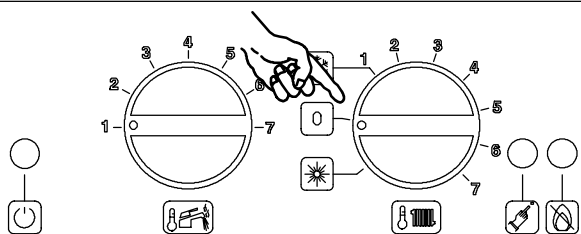


Fig. 60

- 2 Restore the mains electricity supply to the boiler.  
**Warning – ensure that all the electric parts and wirings are dry and do not touch other not mentioned electric parts during the following operations.**
- 3 Hold the flow switch sensor 1 and bring the ring in touch with the sensor as illustrated in Fig. 61.
- 4 Observe the lamp B placed on the sensor body that should light. If not reverse the ring and repeat the previous operation.

- 5 Fit the ring on the spindle of the float in the way that lights the lamp B.
- 6 Isolate the boiler from the mains electricity supply and reassemble the parts following the removing sequence in reverse order.

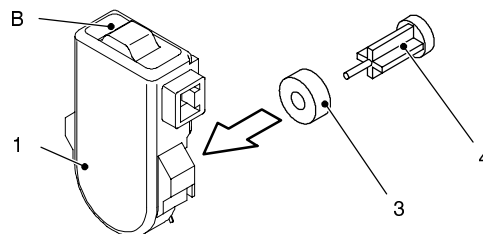


Fig. 61

## 14.6 Flow limiter

The M90F.24S model is factory fitted with a 10 litre/min. flow limiter.

If on the M90F.28S model the flow rate of the d.h.w. circuit is too high, it is possible to limit it by installing a flow limiter. The following sizes are available:

Nominal flow rate (litres/min)	Colour
10	Yellow
12	Brown

To install the flow limiter:

- 1 Remove the flow switch group as explained in the section 14.5.
- 2 Unscrew the threaded ring 10 (Fig. 59) and remove it from the body 7.
- 3 Install the flow limiter 9 putting its smaller diameter side towards the threaded ring.
- 4 Reassemble the group following the above sequence in reverse order.

## 15 Temperature probe

### 15.1 Function

The Temperature probe has the function of converting the temperature of the water in the hydraulic circuit where it is installed into an electrical signal (resistance).

The relation between temperature and electrical resistance is stated in Fig. 62.

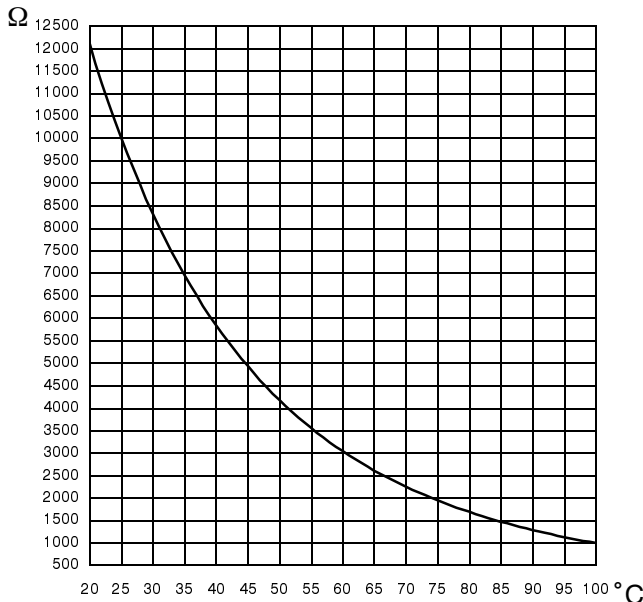


Fig. 62

On the boiler there are two Temperature probes. One on the output of the primary heat exchanger (c.h. Temperature probe) A in Fig. 63 and Fig. 64; one on its input, before the pump (d.h.w. Temperature probe) B in Fig. 63 and Fig. 65.

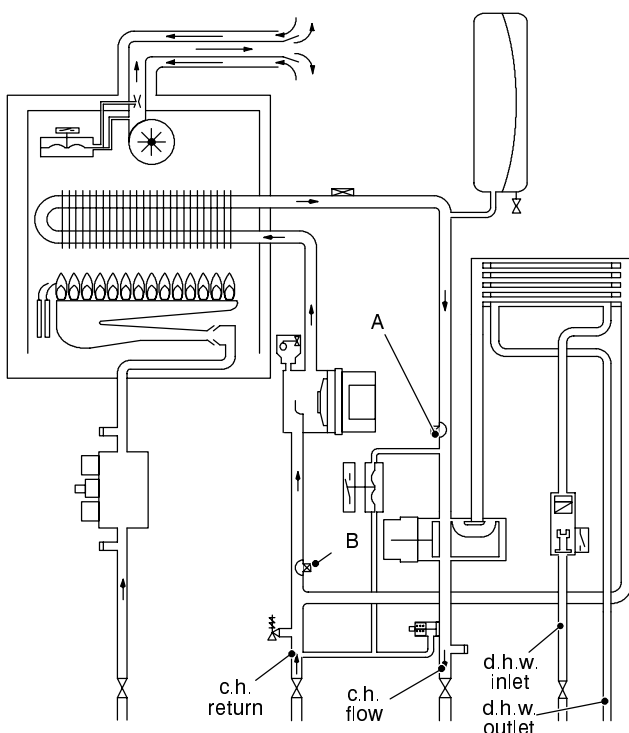


Fig. 63

### 15.2 Checks

✓ Temperature–resistance relationship

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

Disconnect the cable from the Temperature probe.

Measure the temperature of the brass group where the Temperature probe is located and check the electrical resistance according to the graph in Fig. 62.

### 15.3 Removal

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

Refer to Fig. 64 for the c.h. Temperature probe and to Fig. 65 for the d.h.w. Temperature probe.

- 1 To remove the Temperature probes remove the front and right hand side panels of the case.
- 2 Empty the primary circuit of the boiler.
- 3 Remove the electric connector of the Temperature probe and unscrew it.
- 4 Reassemble the Temperature probe carrying out the removal operations in reverse order.



Fig. 64



Fig. 65

## 16 By-pass valve

### 16.1 Function

The By-pass valve A in Fig. 66 is located between the c.h. water flow and return and its function is that of guaranteeing a minimum flow across the primary heat exchanger if the circulation across the c.h. system is completely closed.

The By-pass valve is fitted on the rear side of the diverter group.

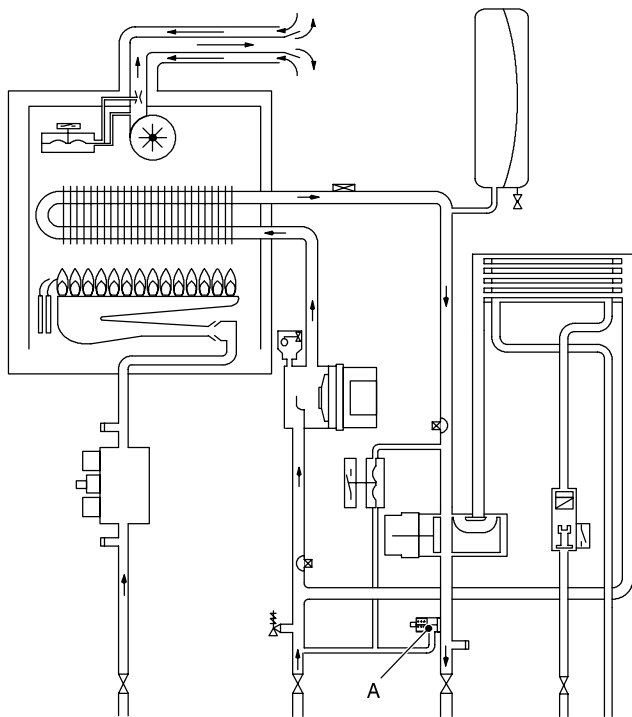


Fig. 66

### 16.2 Removal

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove all the case panels.
- 2 Empty the primary circuit of the boiler.
- 3 Remove the diverter group as described in the section 8.4 of this manual.
- 4 Unscrew the connector B and remove the by-pass valve C (Fig. 67).

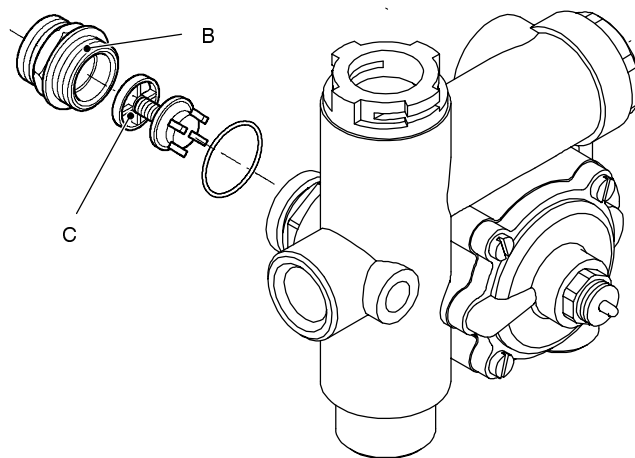


Fig. 67

- 5 Reassemble the by-pass valve as illustrated in Fig. 67 reversing the order of removal.

## 17 Fan, venturi device and Air pressure switch

### 17.1 Function

The function of the Fan is to force the products of combustion to the outside air via the flue system.

The Fan is supplied by the full sequence ignition device at the beginning of the ignition cycle.

Its correct functioning is controlled by means of a system incorporating a built in venturi device (A in Fig. 74) and an Air pressure switch.

### 17.2 Checks

✓ Check of the fan

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove all the case panels and the sealed chamber lid.
- 2 Disconnect the connectors B (Fig. 68) and measure the electrical resistance of the motor that has to be about:  
 $47 \Omega$  – M90F.24S, M90F.24SR  
 $43 \Omega$  – M90F.28S, M90F.28SR  
 $25 \Omega$  – M90F.32S  
 (at ambient temperature).

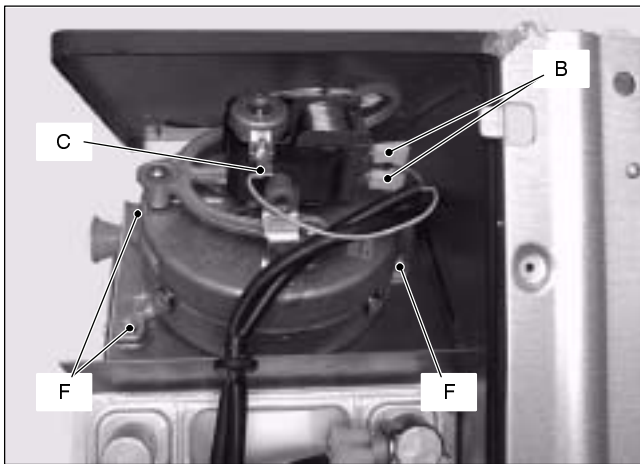


Fig. 68

✓ Check of the Air pressure switch operation

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove all the case panels and the sealed chamber lid.
- 2 Disconnect the wires and check the electrical resistance between the connections of the Air pressure switch. Refer to the Fig. 69a or b in accordance with the type of air pressure switch used.

**Between COM or 3 and N.O. or 2 the contact must be open.**

**Between COM or 3 and N.C. or 1 the contact must be closed (electrical resistance zero).**

- 3 Connect the black wire (COM or 3) and the brown wire (N.C. or 1).
- 4 Run the boiler (the Fan must run) and check the the electric resistance between COM or 3 and N.O. or 2. Between COM or 3 and N.O. or "2" the contact must be closed (electrical resistance zero).

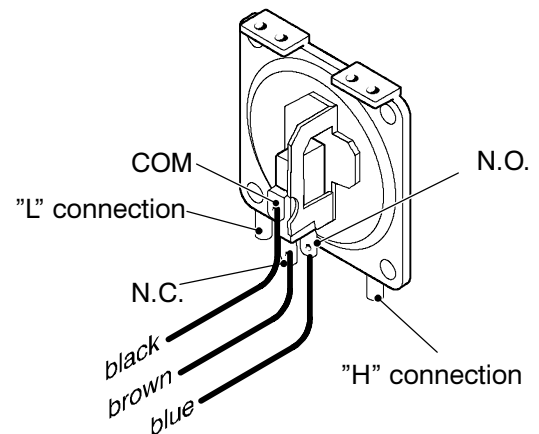


Fig. 69a

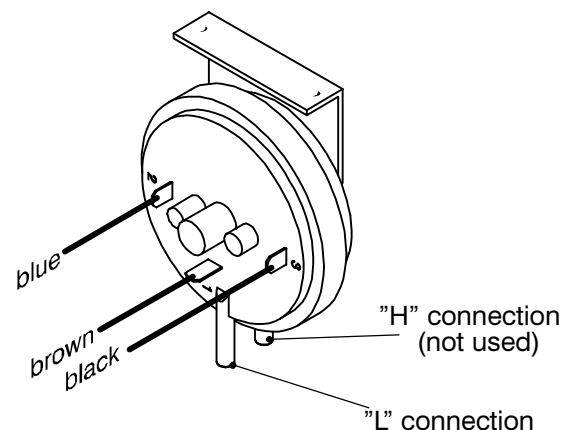


Fig. 70b

✓ Check of the venturi device

**This test must be carried out with the sealed chamber closed**

- 1 Remove the caps of the pressure test points located on the top of the boiler and connect a differential pressure gauge (Fig. 71).
- 2 Switch on the boiler.

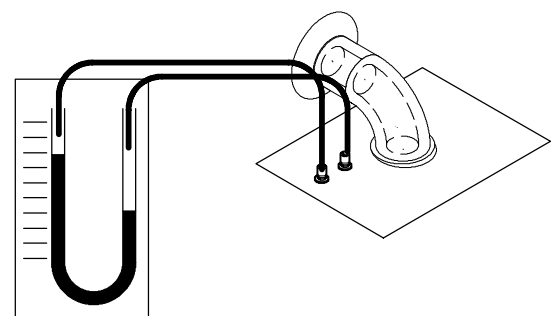


Fig. 71

- 3 Compare the value on the gauge with the following minimum values:

90 Pa (0,9 mbar) – M90F.24S, M90F.24SR  
 100 Pa (1,0 mbar) – M90F.28S, M90F.28SR  
 130 Pa (1,3 mbar) – M90F.32S

### 17.3 Removal of the Fan

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove all the case panels, the sealed chamber lid and the combustion chamber lid.
- 2 Disconnect the connectors *B* and the earth connection *C* (Fig. 68).
- 3 Disconnect the pipe which connect the venturi device to the Air pressure switch.
- 4 Unscrew the screws *D* and remove the clamp *E* (Fig. 72).

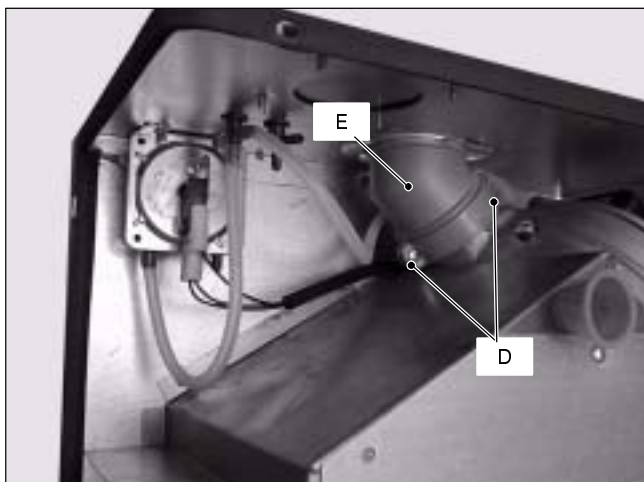


Fig. 72

- 5 Remove the three screws *F* (Fig. 68) securing the Fan to the flue hood and remove the fan.
- 6 Assemble the fan carrying out the removal operations in reverse sequence.

**Warning:** to correctly connect the venturi device to the Air pressure switch, refer to Fig. 73.

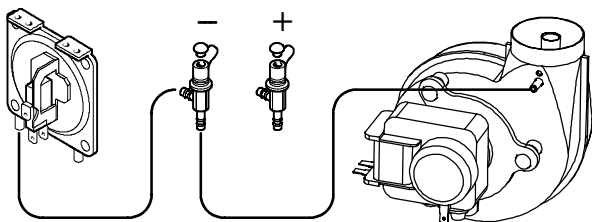


Fig. 73

**Warning:** After cleaning or replacement as detailed above refer to section **Combustion analysis check** in the chapter **Maintenance of the installation instructions manual**.

### 17.4 Inspection and removal of the venturi device

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove the fan (section 17.3).
- 2 Remove the venturi device by unscrewing the screw *G*.
- 3 Inspect the venturi device *A* and the connection pipe *H*. Ensure they are clean.
- 4 Re-assemble the parts in reverse order of removal.

**Warning:** After cleaning or replacement as detailed above refer to section **Combustion analysis check** in the chapter **Maintenance of the installation instructions manual**.

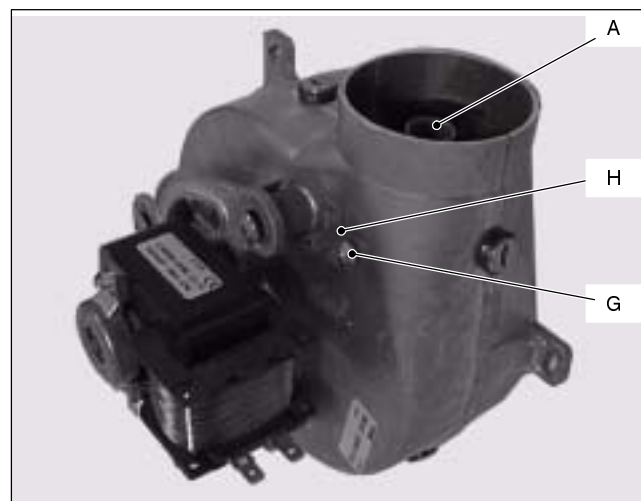


Fig. 74

### 17.5 Removal of the Air pressure switch

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove all the case panels and the sealed chamber lid.
- 2 Disconnect the wires from the Air pressure switch.
- 3 Remove the pipe from the Air pressure switch.
- 4 Unscrew the screws which hold the Air pressure switch to the frame.
- 5 Assemble the Air pressure switch carrying out the removal operations in reverse sequence.

**Warning:** to correctly connect the Air pressure switch, refer to Fig. 73 and Fig. 69a or Fig. 69b for the correct wiring.

**Warning:** After cleaning or replacement as detailed above refer to section **Combustion analysis check** in the chapter **Maintenance of the installation instructions manual**.

## 18 Ignition and detection electrodes

### 18.1 Function

Three electrodes are fitted near the front part of the burner. The ignition sparks take place between the metallic edges of the ignition electrodes over the central ramp of the burner during the ignition sequence.

The third electrode is the detection electrode and it detects the presence of the flame.

Fig. 75 shows the electrodes configuration on the models M90F.24S, M90F.24SR, M90F.28S, M90F.28SR.

Fig. 76 shows the electrodes configuration on the model M90F.32S

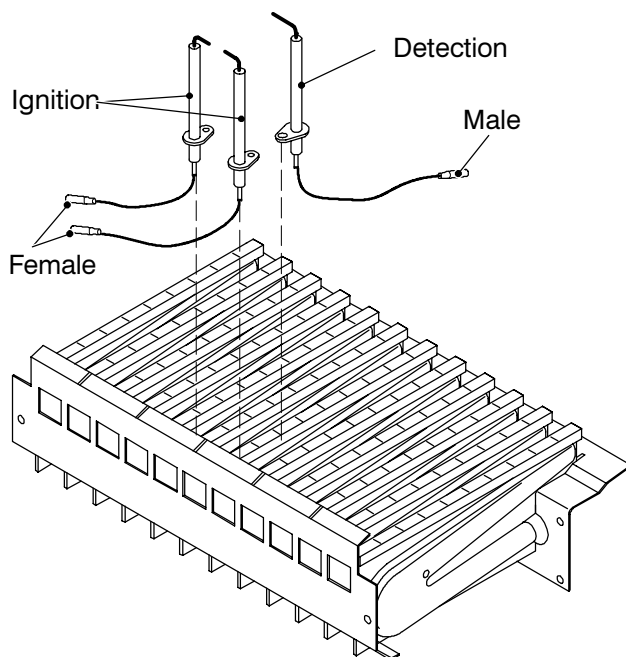


Fig. 75

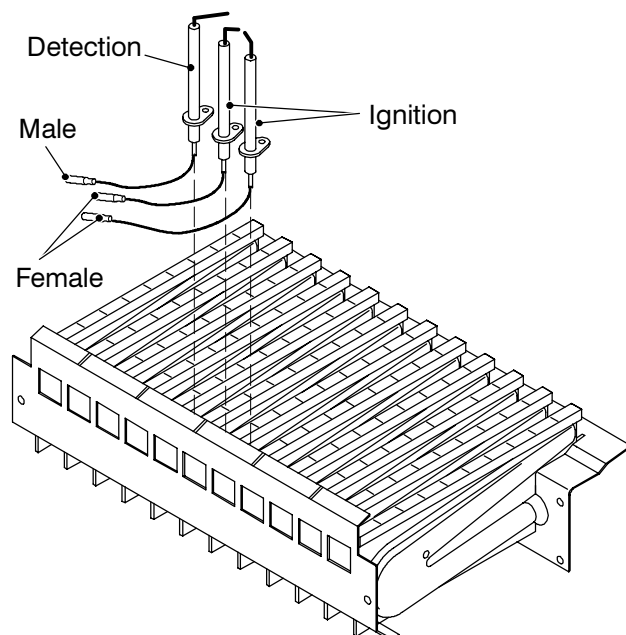


Fig. 76

### 18.2 Checks

✓ Check the position of the electrode edges

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove all the case panels, the sealed chamber lid and the combustion chamber lid.
- 2 Check for the correct distance between the metallic edges of the ignition electrodes (see Fig. 77).

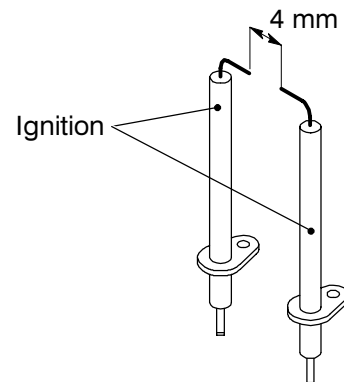


Fig. 77

- 3 Check the integrity of the detection electrode and ensure that its metallic edge is correctly placed over the ramp of the burner.

✓ Check the connection wires.

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove all the case panels, the sealed chamber lid and the combustion chamber lid.
- 2 Check for the integrity of the insulation of wires which connect the electrodes to the ignition device.

### 18.3 Removal

⚡ **Warning: isolate the boiler from the mains electricity supply before removing any covering or component.**

- 1 Remove all the case panels, the sealed chamber lid and the combustion chamber lid.
- 2 Disconnect the electrode wires from the full sequence ignition device.
- 3 Remove the burner by unscrewing the four screws placed at the right and left sides of the burner.
- 3b For models M90F.28S, M90F.28SR and M90F.32S remove also the plate C (see Fig. 80 on page 39).
- 4 Unscrew the screws A (Fig. 78) which hold the electrodes to the burner.  
Two screws are used on the models M90F.24S, M90F.24SR, M90F.28S, M90F.28SR.  
Three screws, one for each electrode, are used on the model M90F.32S.



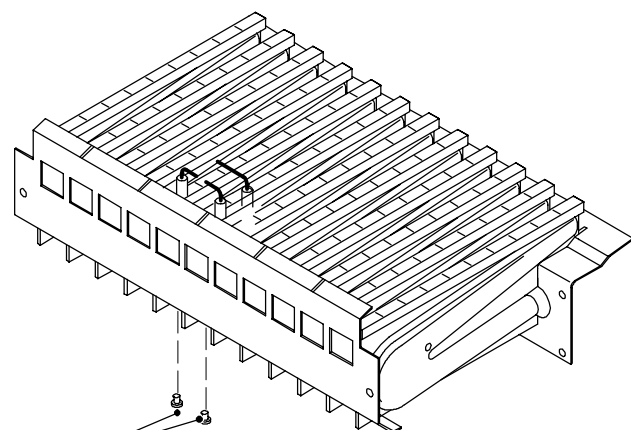


Fig. 78

- 5 Extract the electrodes from the burner.
- 6 Assemble the electrodes carrying out the removal operation in reverse order.  
Refer to Fig. 75 in order to recognise the electrodes and to correctly connect the wiring.

**Note:** the metallic edge of the detection electrode is longer than the one of the ignition electrodes.



**Warning:** After cleaning or replacement as detailed above refer to section *Combustion analysis check* in the chapter *Maintenance* of the installation instructions manual.

## 19 Safety thermostat

### 19.1 Function

The safety thermostat **A** in Fig. 79 is a device that senses the temperature of the primary circuit water which flows in the outlet pipe of the primary heat exchanger.

If the temperature control system of the boiler fails and the temperature of the primary circuit reaches a dangerous temperature, the safety thermostat opens the electric circuit that supplies the on-off operators of the gas valve.

Consequently, the full sequence ignition device attempts to light the burner and, at the end, locks the boiler and lights the lock-out signal lamp.

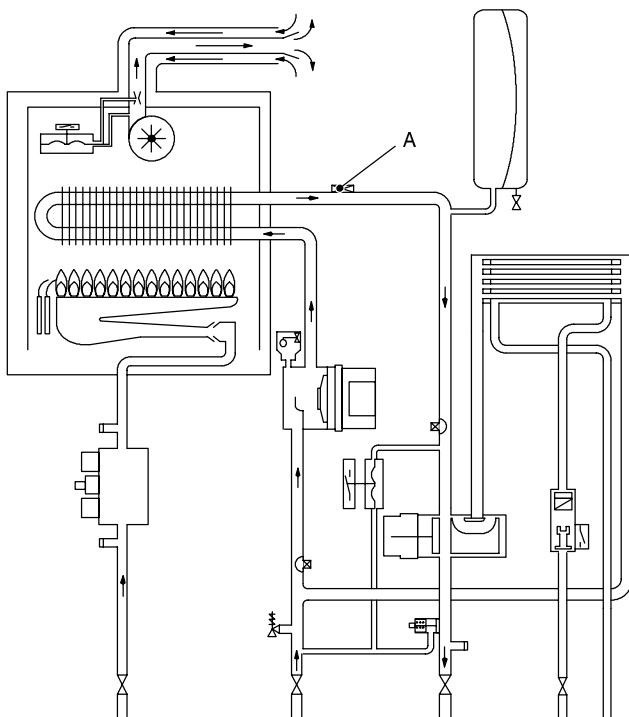


Fig. 79

### 19.2 Checks

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

#### ✓ Overheat temperature value

- 1 Set the temperature control knobs to their max. position and run the boiler in d.h.w. and c.h.
- 2 Allow the boiler to reach its maximum operating temperature (monitor the temperature gauge on the instrument panel). The boiler should maintain a temperature below that of the safety thermostat and no overheat intervention should occur.

#### ✓ Electrical function

- 1 Remove all the case panels and the lid of the sealed chamber.
- 2 Disconnect the safety thermostat and check its electrical function. Normally (no intervention) the

contact must be closed (electrical resistance zero  $\Omega$ ).

### 19.3 Removal

**Warning:** isolate the boiler from the mains electricity supply before removing any covering or component.

- 1 Remove all the case panels and the lid of the sealed chamber.
- 1b For models M90F.28S and M90F.28SR, remove the screw **B** and the plate **C** (Fig. 80).

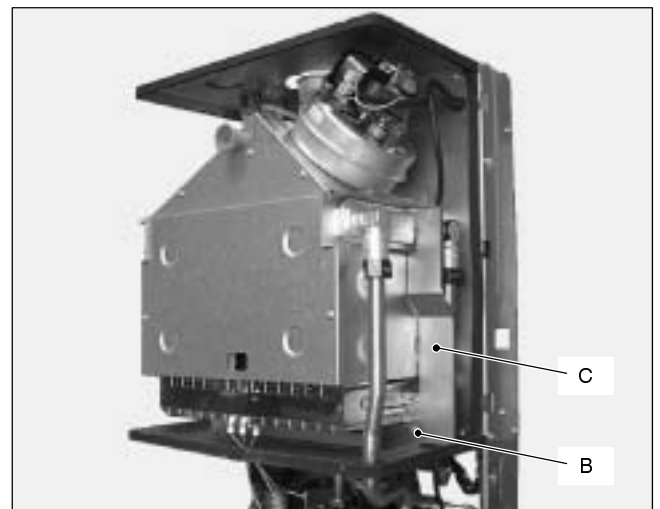


Fig. 80

- 2 Disconnect the wiring **D** (Fig. 81).
- 3 Remove the spring **E** which holds the overheat thermostat on the pipe of the primary heat exchanger and remove it.

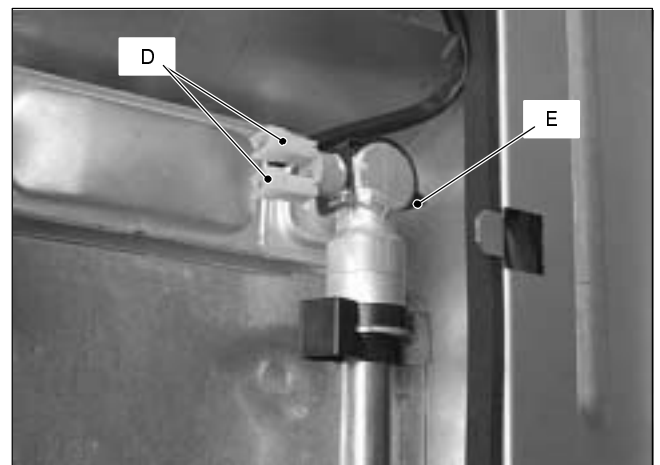


Fig. 81

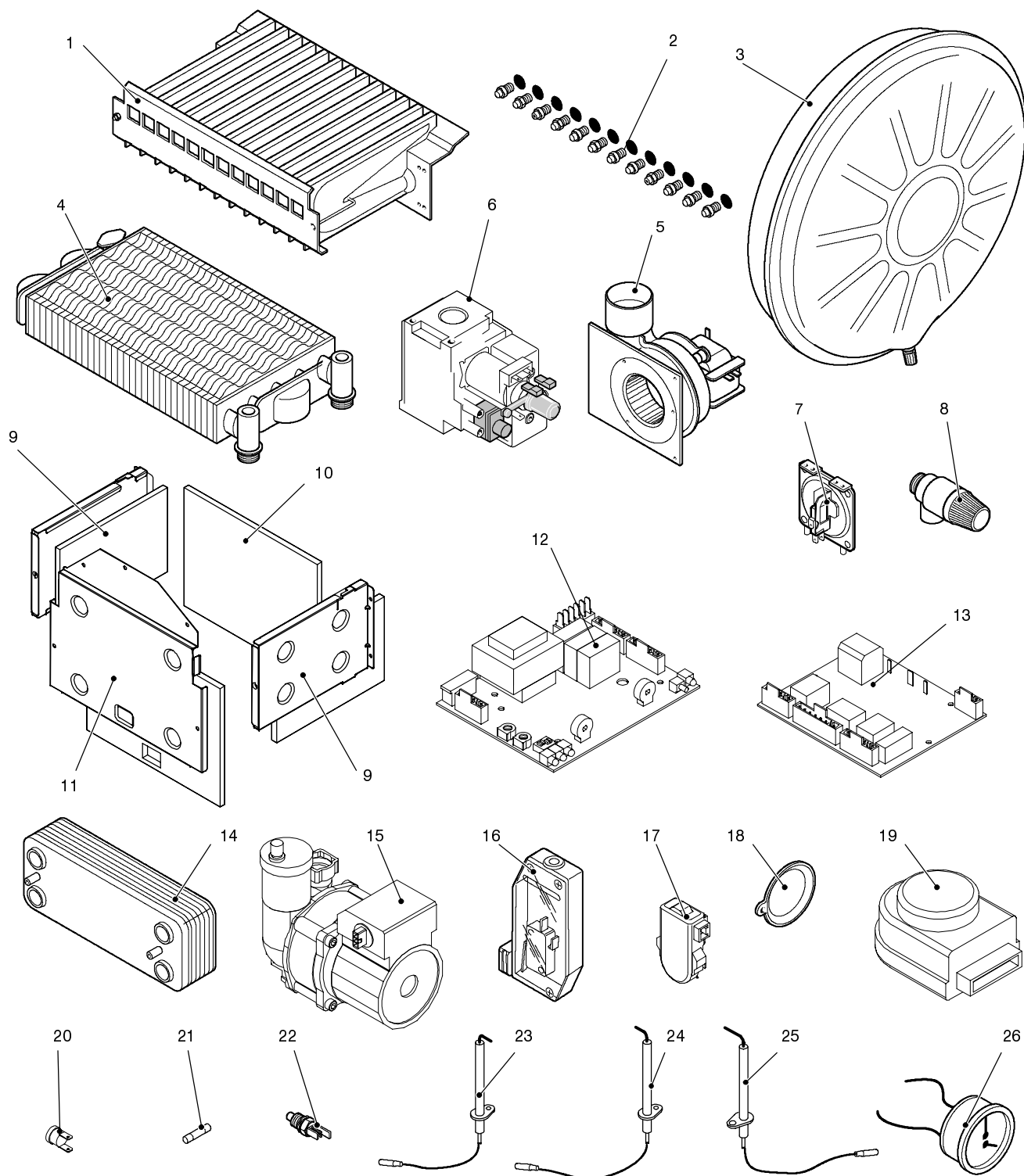
- 4 Reassemble the overheat thermostat carrying out the operations in reverse order.
- 5 Apply an adequate quantity of heat conducting compound between the pipe and the thermostat.

**Warning:** After cleaning or replacement as detailed above refer to section **Combustion analysis check** in the chapter **Maintenance of the installation instructions manual**.

## 20 Short spare parts list

Key	G.C. part no.	Description	Q.ty	Manufac- turer part no.	Manufacturer's reference
1	173–148	Burner (mod. M90F.24S, M90F.24SR)	1	KI1004 102	Polidoro
	173–149	Burner (mod. M90F.28S, M90F.28SR)	1	KI1004 147	
		Burner (mod. M90F.32S)	1	BI1193 100	
2	169–069	Injectors for natural gas (mod. M90F.24S, M90F.24SR)	12	KI1064 505	Polidoro
		Injectors for natural gas (mod. M90F.28S, M90F.28SR)	14		
		Injectors for natural gas (M90F.32S)	16	BI1193 500	
	169–070	Injectors for LPG (mod. M90F.24S, M90F.24SR)	12	KI1064 506	
		Injectors for LPG (mod. M90F.28S, M90F.28SR)	14		
3	E83–121	Expansion vessel	1	BI1172 103	CIMM 6 litres
4		Main heat exchanger (mod. M90F.24S, M90F.24SR)	1	BI1202 101	
		Main heat exchanger (mod. M90F.28S, M90F.28SR)	1	BI1202 102	
		Main heat exchanger (mod. M90F.32S)	1	BI1222 100	
5		Fan (mod. M90F.24S, M90F.24SR)	1	BI1366 102	FIME GR02040 39W
		Fan (mod. M90F.28S, M90F.28SR)	1	BI1366 103	FIME GR02045 47W
		Fan (mod. M90F.32S)	1	BI1376 105	FIME GR02050 60W
6	E83–129	Gas valve	1	BI1193 105	SIT 845 Sigma
7	169 127	Air pressure switch 0,88–0,74 mbar (mod. M90F.24S, M90F.24SR)	1	KI1267 103	Yamatake–Honeywell C6065 SIT 380 (alternative)
		Air pressure switch 1,04–0,92 mbar (mod. M90F.28S, M90F.28SR)	1	BI1366 107	
		Air pressure switch 1,38–1,25 mbar (mod. M90F.32S)	1	BI1376 104	
8	E83–013	Safety valve	1	BI1131 100	Watts Orkly (alternative)
9	E83–178	Combustion chamber side panels	2	BI1326 100	
10	E83–180	Combustion chamber rear panel (mod. M90F.24S, M90F.24SR)	1	BI1326 107	
	E83–181	Combustion chamber rear panel (mod. M90F.28S, M90F.28SR, M90F.32S)	1	BI1326 108	
11	E83–196	Combustion chamber front panel (mod. M90F.24S, M90F.24SR)	1	BI1326 101	
	E83–197	Combustion chamber front panel (mod. M90F.28S, M90F.28SR, M90F.32S)	1	BI1366 109	
12		Electronic regulation p.c.b.	1	BI1515 107	
13	E83–142	Full sequence ignition device	1	BI1305 101	Bertelli & Partners FM30 Honeywell FPLD (alternative)
14	E01–204	D.h.w. heat exchanger (mod. M90F.24S,)	1	BI1001 101	
	E01–205	D.h.w. heat exchanger (mod. M90F.28S, M90F.32S)	1	BI1001 102	
15	E83–111	Pump	1	BI1222 101	Wilo – NFHUL 15/5
16	E00–684	Primary circuit flow switch	1	BI1011 505	
17	E83–082	D.h.w. flow switch	1	BI1091 104	
18	E00–688	Main. flow switch membrane	1	BI1011 103	
19	E83–086	Three way diverter valve (electric actuator)	1	BI1101 102	Elbi
20	E83–101	Overheat thermostat	1	BI1172 105	ELTH – type 261
21	169–083	Fuse 1,6 A T	1	BI1005 105	
22	164–026	Temperature probe (main or d.h.w. circuit)	1	BI1001 117	
23	E83–127	Ignition electrode – left (mod. M90F.24S, M90F.24SR, M90F.28S, M90F.28SR)	1	BI1123 101	
		Ignition electrode – left (mod. M90F.32S)	1	BI1193 102	
24	E83–126	Ignition electrode – right (mod. M90F.24S, M90F.24SR, M90F.28S, M90F.28SR)	1	BI1123 103	
		Ignition electrode – right (mod. M90F.32S)	1	BI1193 103	

25	E83-122	Detection electrode (mod. M90F.28S, M90F.28SR)	1	BI1123 102	
		Detection electrode (mod. M90F.32S)		BI1193 104	
26	E83-145	Temperature-pressure gauge	1	BI1475 108	IMIT





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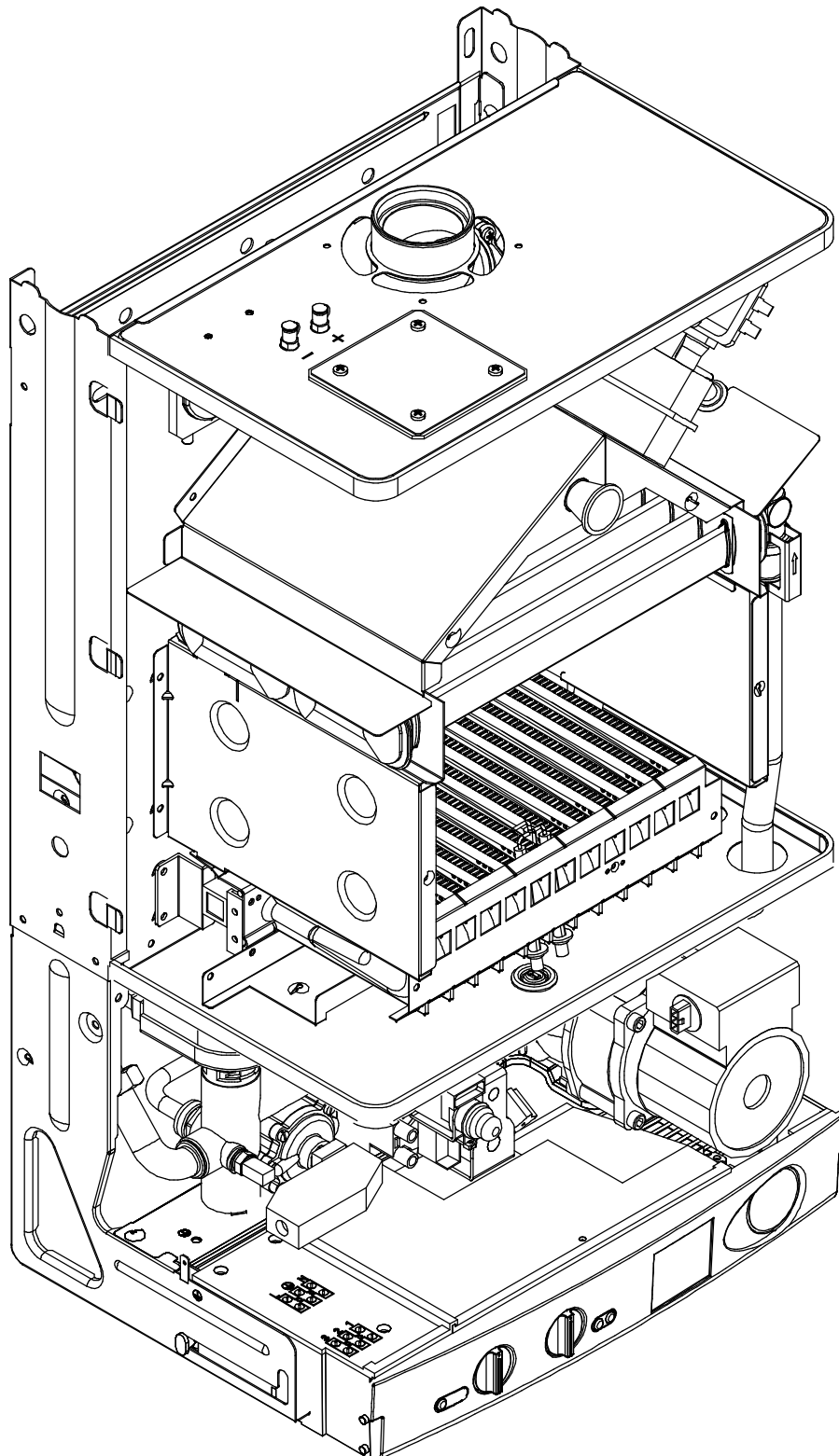


M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

### Overall view

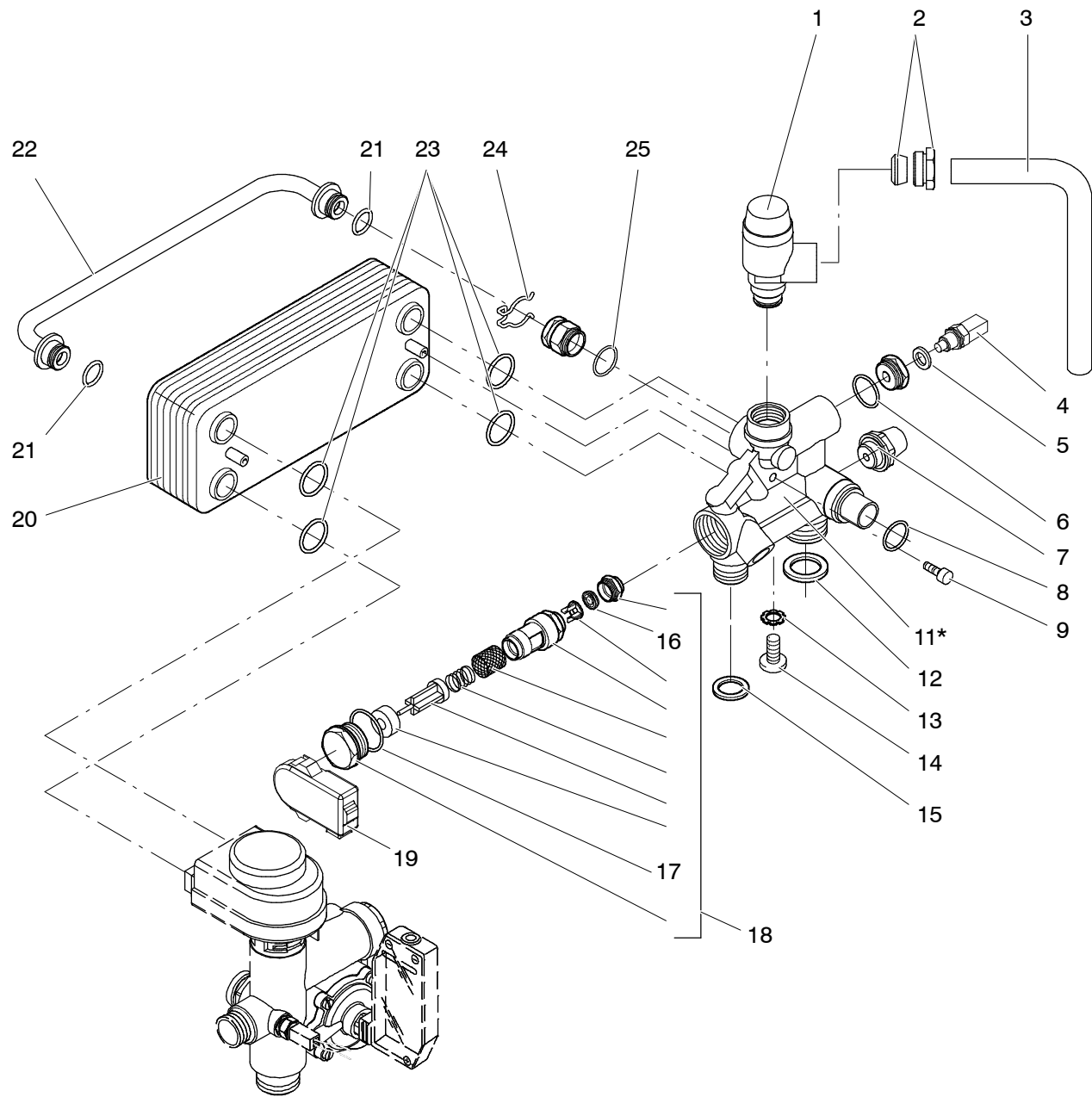
DATA BADGE: inner side of left case panel



M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

C.h. return group and d.h.w. heat exchanger



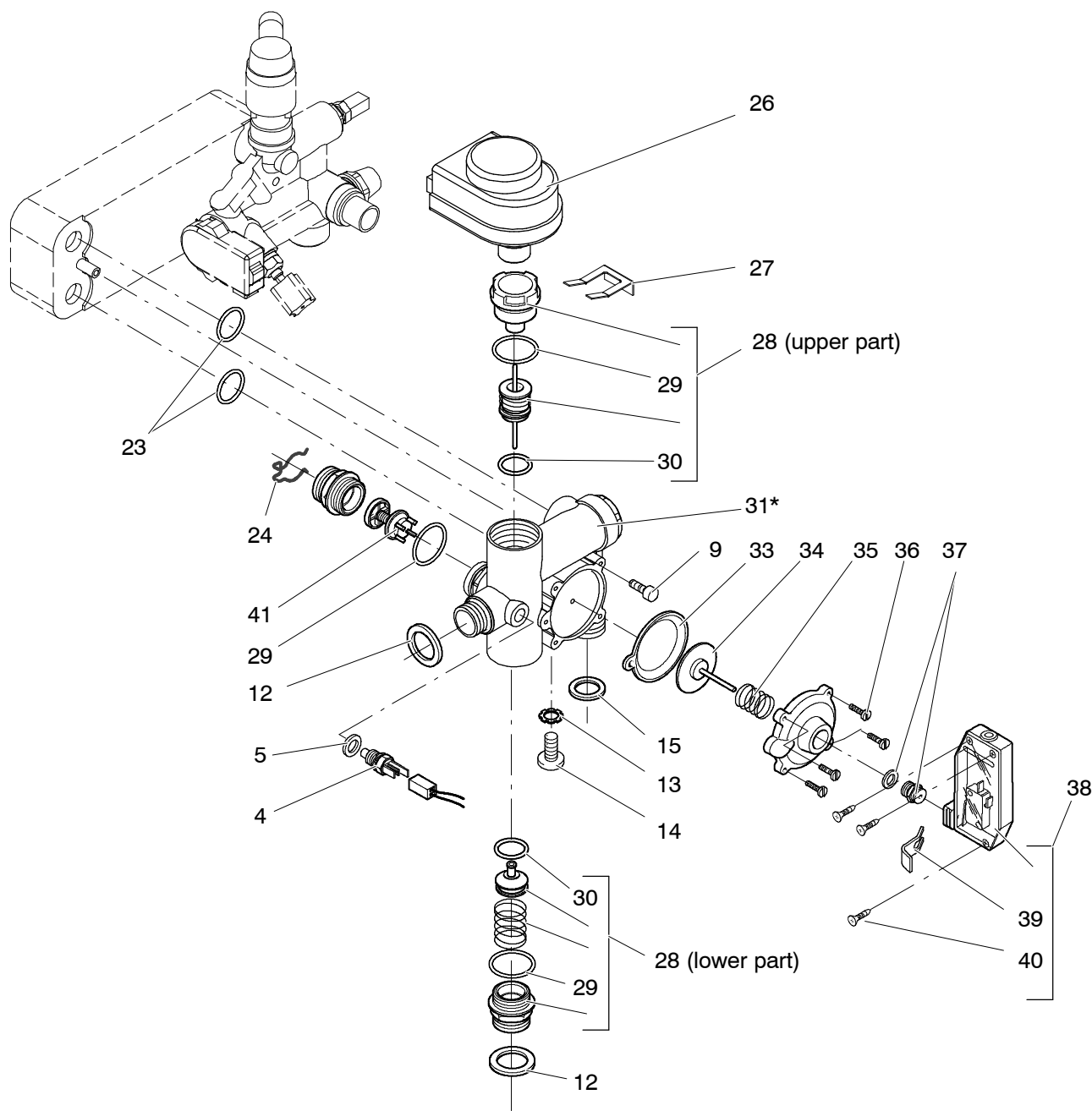
\* Includes items 6, 18, 25



M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

C.h. flow group and three way diverter valve

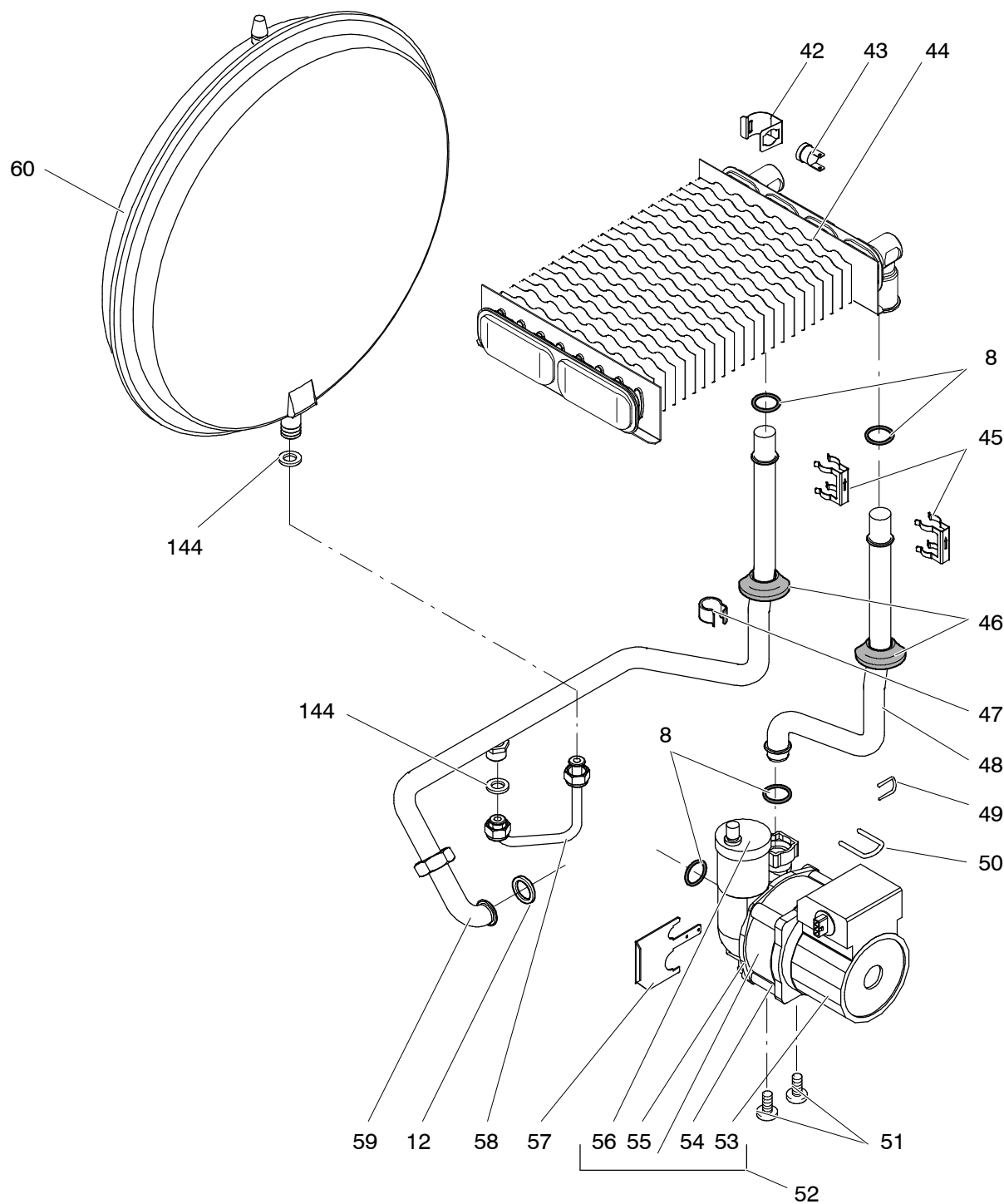


\* Includes items 28, 33, 34, 35, 36, 37, 29, 41

M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

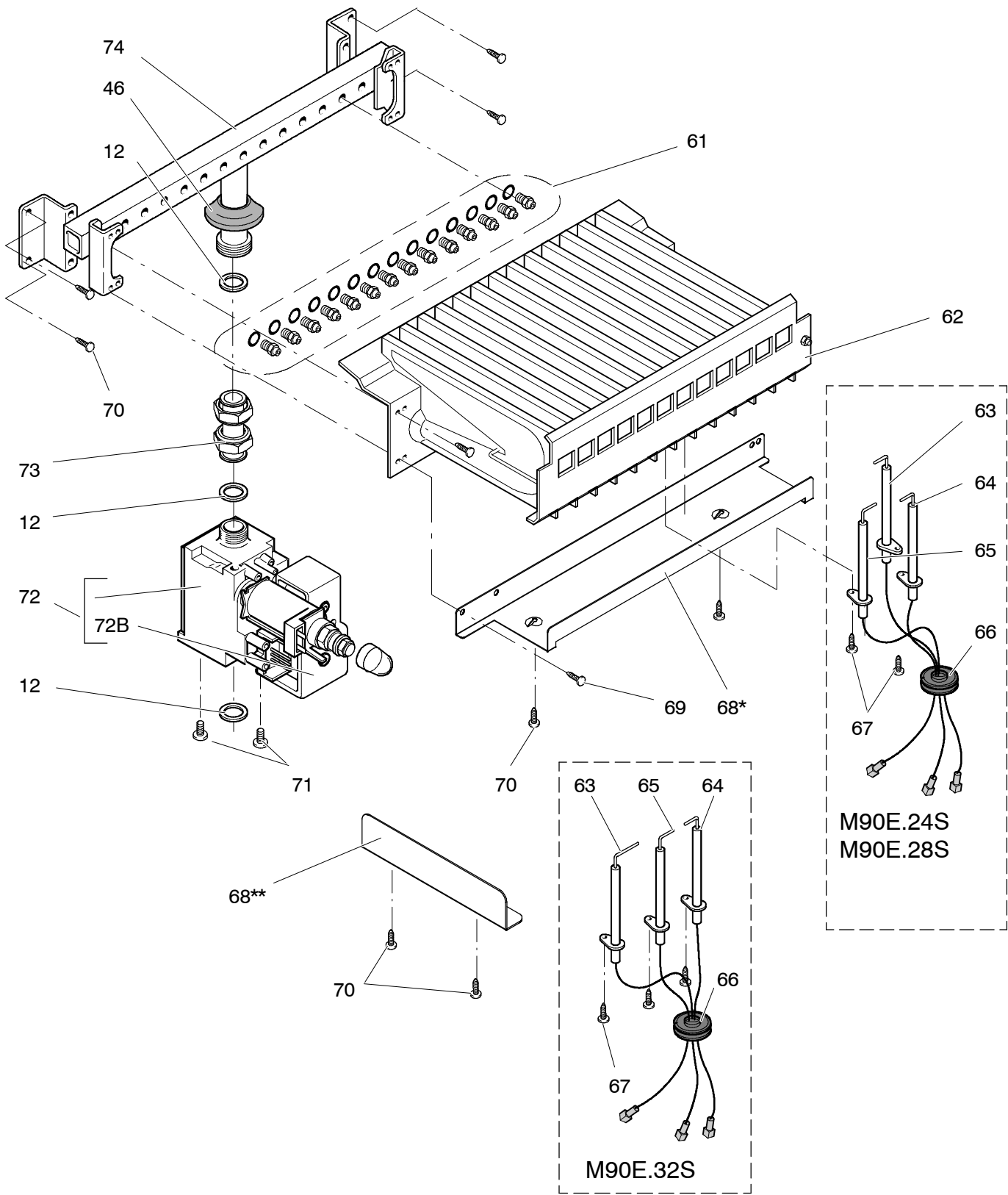
Pump and main circuit assembly



M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

Gas assembly



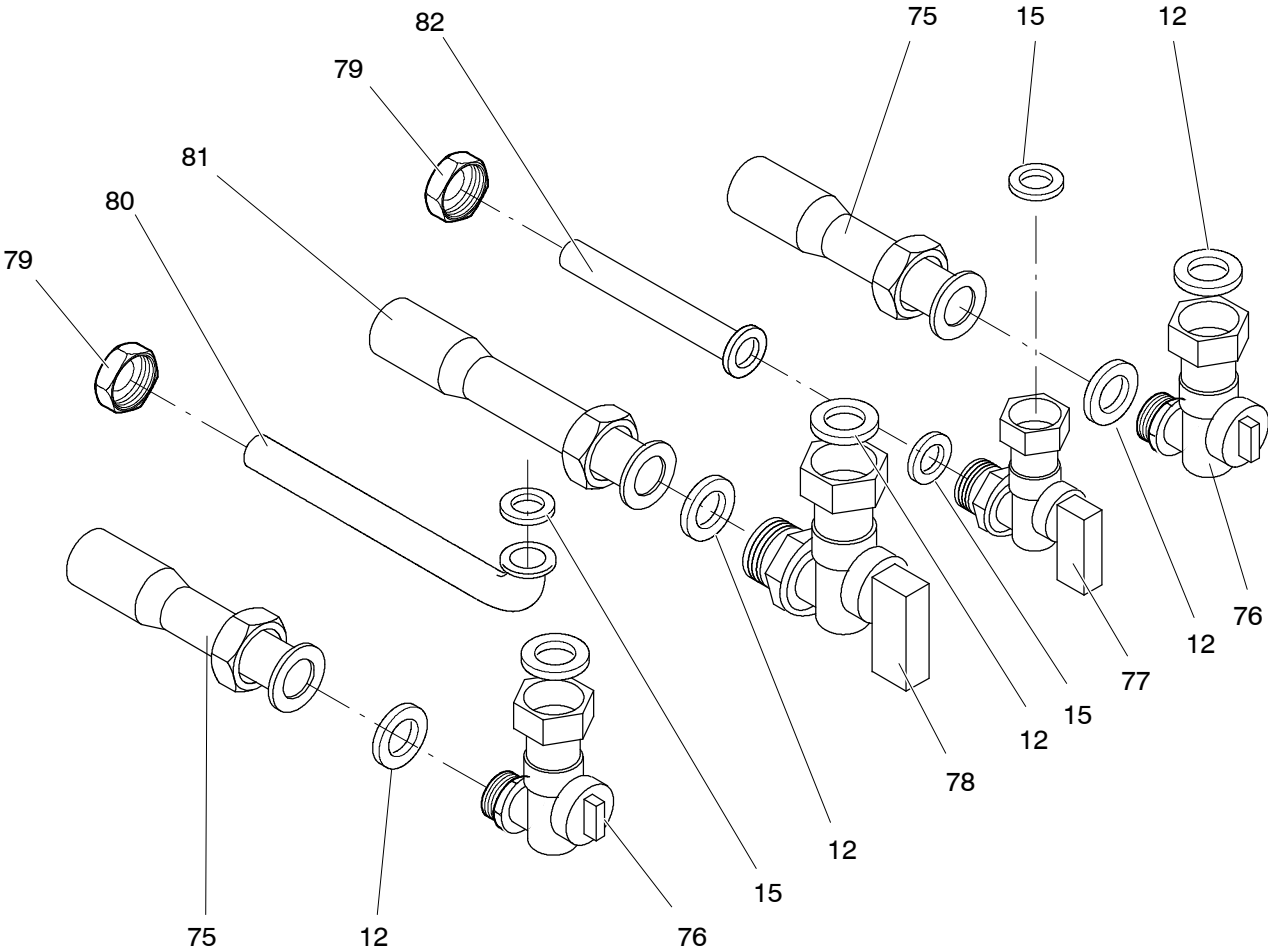
\* For models M90E.28S

\*\* For models M90E.32S

M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

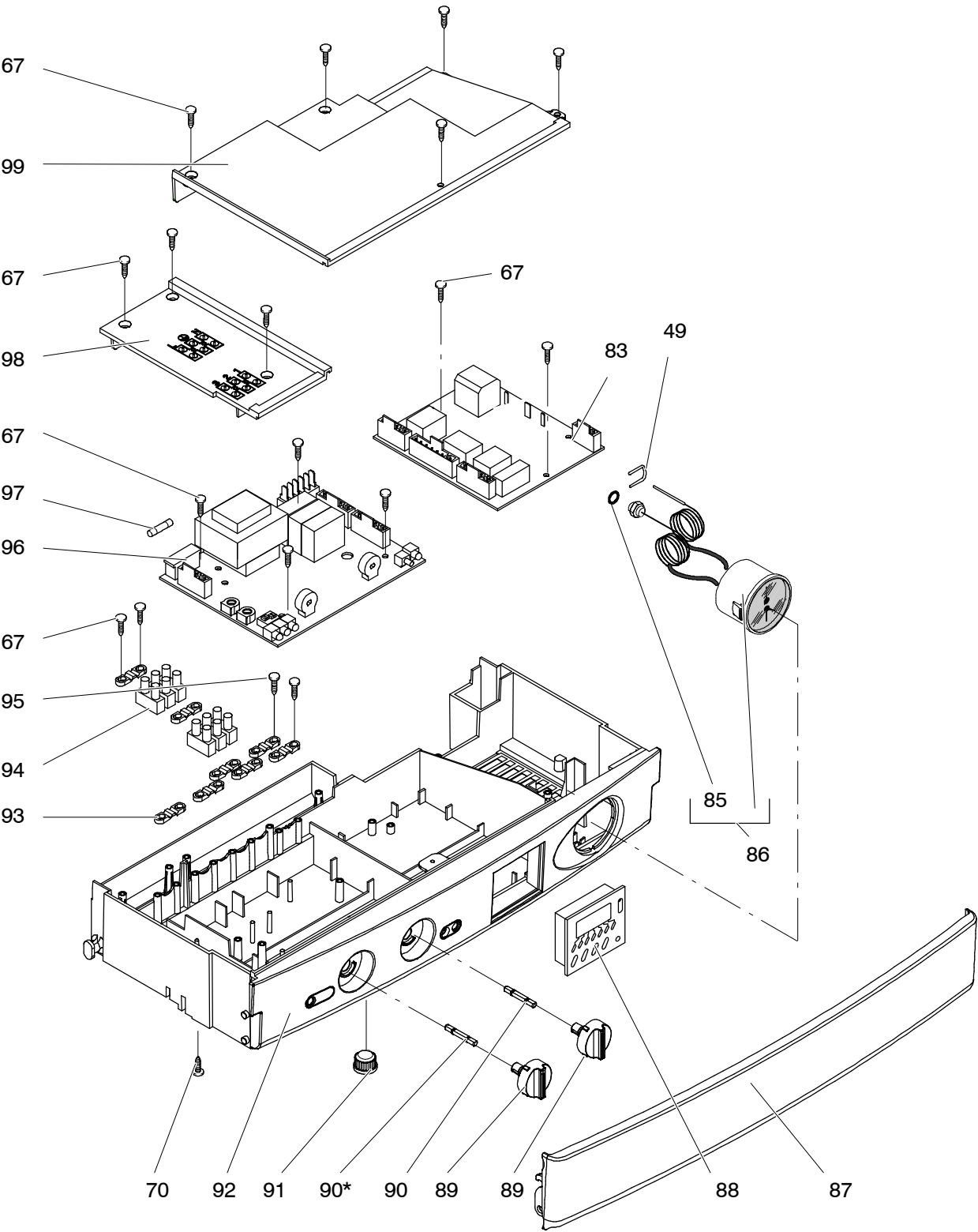
Valves and connection pipes



M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

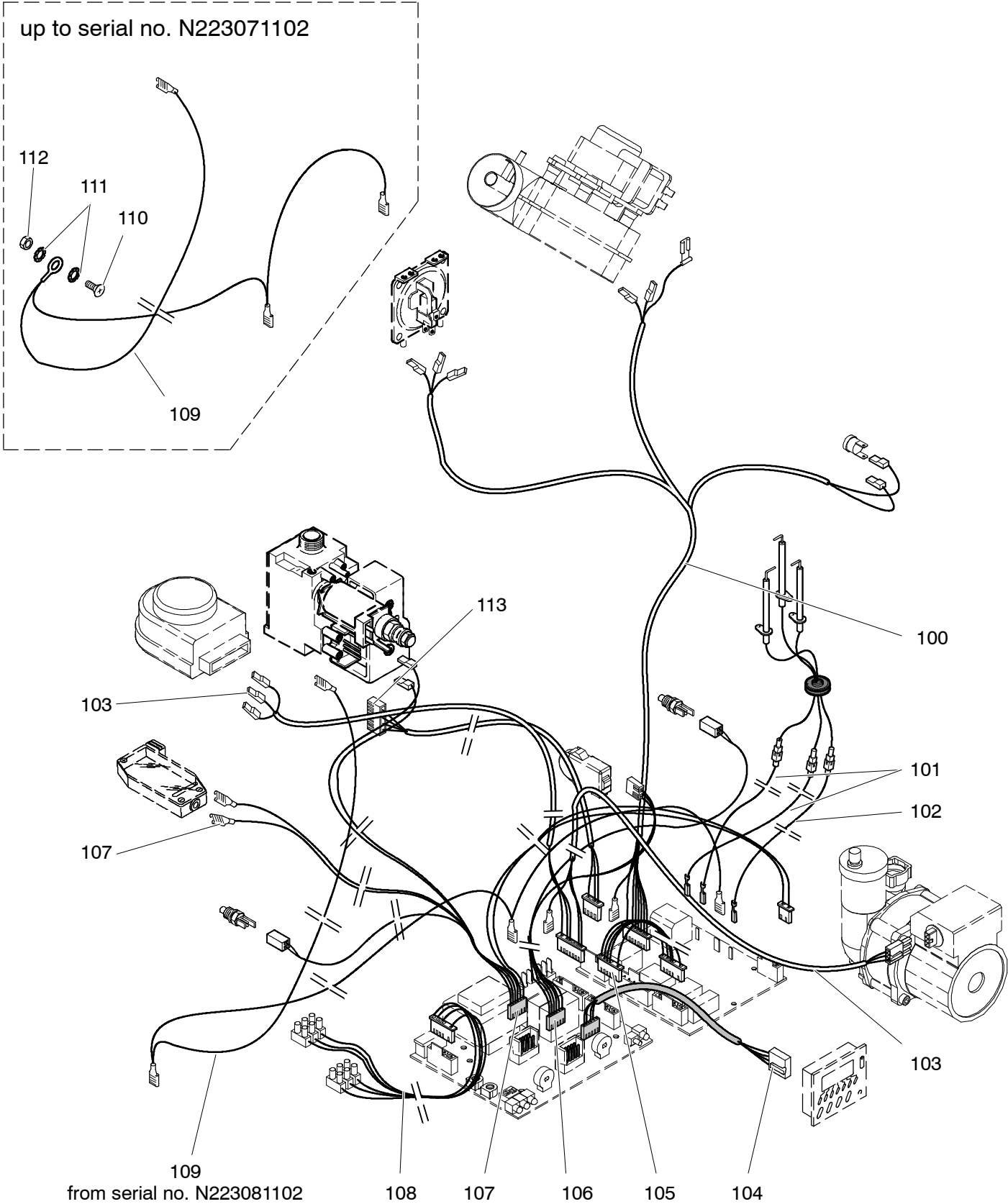
Control panel and ignition device



M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

Wiring

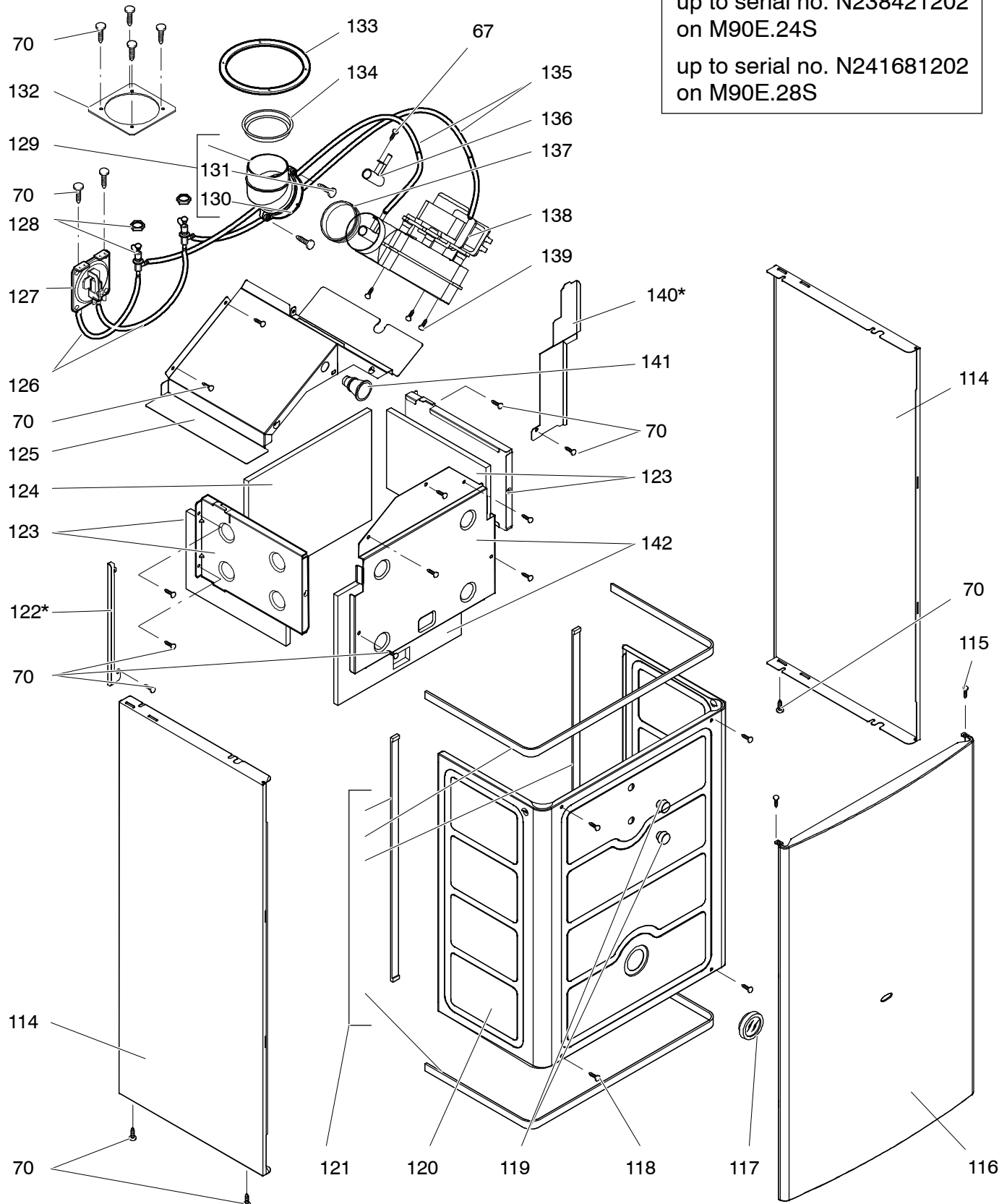


M90E.24S  
M90E.28S

47-970-17  
47-970-18

# Fan, combustion chamber and case panels

up to serial no. N238421202  
on M90E.24S  
up to serial no. N241681202  
on M90E.28S

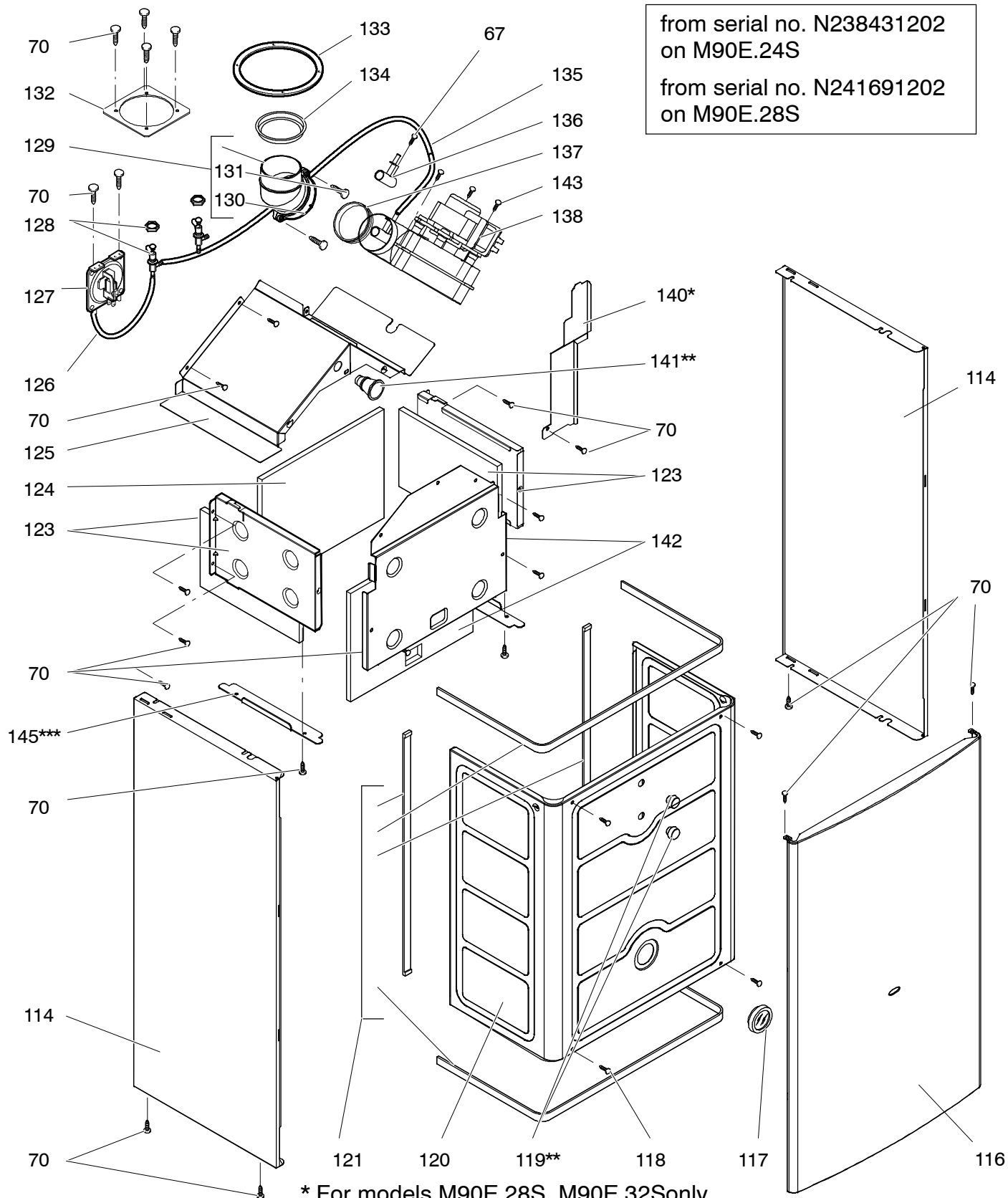


\* For model M90E.28S only

M90E.24S  
M90E.28S  
M90E.32S

47-970-17  
47-970-18  
47-970-21

# Fan, combustion chamber and case panels



\* For models M90E.28S, M90E.32S only  
\*\* Not for model M90E.32S  
\*\*\* For model M90E.32S only



# DRAFT BRITISH GAS PART LIST

Date \_\_\_\_\_  
 Sheet 1 of 11  
 Manufacturer Biasi SpA – Italy  
 Appliance(s) M90E.24S M90E.28S M90E.32S  
 GC Appliance Number(s) 47–970–17 47–970–18 47–970–21  
 Contract Name \_\_\_\_\_  
 Telephone Number \_\_\_\_\_

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
		Position of data badge: inner side of left case panel								
	E83–012	Instructions booklets set	1	BI1911 503			M			
		up to serial no. N238421202 on M90E.24S,								
		up to serial no. N241681202 on M90E.28S,								
		Instructions booklets set M90E.32S	1			BI1911 506	M			
		from serial no. N238431202 on M90E.24S								
		from serial no. N241691202 on M90E.28S								
1	E83–013	Safety valve 3 bar	1	BI1131 100			B	Watts Interme – Caldaro Italy	3 bar	
								Orkli (alternative)	3 bar	
2	E83–014	Safety valve connection	1	BI1001 127			M			
3	E83–015	Safety valve connection pipe	1	BI1131 102			M			
3 A		Safety valve connection pipe	1			BI1131 106	M			
		(replacement for discontinued BI1131 102)								
4	164–026	Temperature probe (special)	2	BI1001 117			M			
5	164–025	Flat gasket 3/8" O.D 15 mm, i.d. 9.7 mm	2	BI1001 109			M			
6	E00–679	O–ring gasket 1,78x15,6	1	BI1001 131			M			
7	E00–669	Drainage valve	1	BI1011 104			B	Watts Interme – Caldaro Italy	RSR8 1/4"	
8	169–025	O–ring gasket 17,04x3,53	5	KI1043 114			M			
9	E00–671	Screw M5x16 – Hexagon socket cap	2	BI1001 125			F			
11	E83–016	Return group kit	1	BI1131 501			M			
12	169–033	Flat gasket 3/4"	9	BI1001 108			M			
13	E23–757	Toothed lock washer external 6,4 mm	2	BI1001 124			F			
14	E00–670	Screw M6x8 – BZP RPH	2	BI1001 123			F			
15	169–141	Gasket 1/2"	3	BI1001 106			M			
16	E83–018	Flow limiter 10 Litres/min	1	BI1091 102			B	Acqua Flow		

# CONTINUATION SHEET

Sheet 2 of 11

Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
16 A	E83-019	Flow limiter 12 Litres/min	1	BI1091 103			B	Acqua Flow		
17	E00-678	O-ring gasket 2,62x20,63	1	BI1001 130			M			
18	E83-081	Magnetic flow switch and filter kit	1	BI1091 502			M			
19	E83-082	D.h.w. flow switch	1	BI1091 104			M			
20	E01-204	Exchanger DHW - M90E.24S	1	BI1001 101			M			
20 A	E01-205	Exchanger DHW - M90E.28S	1	BI1001 102			M			
20 B		Exchanger DHW - M90E.32S	1			BI1161 100	M			
21	E00-668	O-ring gasket 1,78x12,42 by-pass pipe	2	BI1001 115			M			
22	E83-083	By-pass pipe	1	BI1131 101			M			
23	169-060	O-ring gasket 18,64x3,53	4	KI1043 144			M			
24	E00-672	By-pass pipe fixing fork	2	BI1001 111			M			
25	E00-676	O-ring gasket 1,78x14	1	BI1001 129			M			
26	E83-086	Diverter valve actuator	1	BI1101 102			B	Elbi International SpA Collegno italy	1650/6/0	
27	E83-090	Diverter valve actuator fixing spring	1	BI1101 101			M			
28	E83-091	Diverter valve kit	1	BI1141 501			M			
29	E00-680	O-ring gasket 2,62x23,47	3	BI1011 107			M			
30	E83-092	O-ring gasket 2,7x13,6	2	BI1011 117			M			
31	E83-095	Flow group kit	1	BI1141 500			M			
33	E00-688	Central heating pressure switch membrane	1	BI1011 103			M			
34	E00-687	Central heating pressure switch disk	1	BI1011 111			M			
35	E00-686	Central heating pressure switch spring	1	BI1011 110			M			
36	E00-685	Screw M4x12 mm Stainless steel SCH	4	BI1011 109			F			
37	E00-681	Microswitch guide bush	1	BI1011 502			M			
38	E00-684	Microswitch kit	1	BI1011 505			M			
39	E00-683	Microswitch box fixing clip	1	BI1011 105			M			

# CONTINUATION SHEET

Sheet 3 of 11

Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
40	E00-682	Screw 2,9x13 mm AB self tapping BZP – RCH	3	BI1011 108			F			
41	E00-689	By-pass kit	1	BI1011 501			M			
42		Overheat thermostat fixing clip	1			BI1182 100	M			
43	E83-101	Overheat thermostat	1	BI1172 105			B	Elth	261 105° C	
44		Main exchanger M90E.24S	1			BI1182 101	M			
		up to serial no. N224430303								
44		Main exchanger M90E.24S	1			BI1202 101	M			
		from serial no. N224440303								
44 A		Main exchanger M90E.28S	1			BI1182 102	M			
		up to serial no. N255260203								
44 A		Main exchanger M90E.28S	1			BI1202 102	M			
		from serial no. N255270203								
44 B		Main exchanger M90E.32S	1			BI1222 100	m			
45		Main exchanger connection clip	2			BI1182 106	M			
46	169-104	Grommet	3	BI1002 113			M			
47	169-045	Probe holder	1	BI1105 108			M			
48		Main exchanger inlet pipe	1			BI1182 103	M			
		up to serial no. N224430303 on M90E.24S								
		up to serial no. N255260203 on M90E.28S								
48		Main exchanger inlet pipe	1			BI1202 103	M			
		from serial no. N224440303 on M90E.24S								
		from serial no. N255270203 on M90E.28S								
49	169-040	Fork	1	KI1042 115			M			
50	169-039	Fork	1	KI1042 120			M			
51	402-325	Screw M6x10 – BZP RPH	2	BI1172 115			F			

# CONTINUATION SHEET

Sheet 4 of 11

Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
52	E83-111	Pump (complete)	1	BI1172 104			M			
52 A		Pump (complete)	1			BI1222101	M			
		(replacement for discontinued BI1172 104)								
53	E83-113	Pump (motor)	1	BI1172 114			B	Wilo	NFHUL 15/5	
53 A		Pump (motor)	1			BI1222 102	B	Wilo	NFHUL 15/5	
		(replacement for discontinued BI1172 114)								
54	E83-114	Pump gasket (front)	1	BI1172 113			M			
55	E83-116	Pump gasket (rear)	1	BI1172 112			M			
56	E83-117	Automatic air purger valve	1	BI1172 111			M			
57	E83-118	Pump connection fork	1	BI1172 110			M			
58	E83-119	Expansion vessel connection pipe	1	BI1172 109			M			
59		Main exchanger outlet pipe	1			BI1182 104	M			
		up to serial no. N224430303 on M90E.24S								
		up to serial no. N255260203 on M90E.28S								
59		Main exchanger outlet pipe	1			BI1202 104	M			
		from serial no. N224440303 on M90E.24S								
		from serial no. N255270203 on M90E.28S								
60	E83-121	Expansion vessel	1	BI1172 103			B	CIMM Srl – Castello di Godego Italy	CP387 6L	
								Zilmet – Italy (alternative)	13C0000600	
61	169-069	Injectors with gaskets 130 – NG M90E.24S, M90E.28S	14	KI1064 505			B	Polidoro		
61 A	169-070	Injectors with gaskets 77 – LPG M90E.24S, M90E.28S	14	KI1064 506			B	Polidoro		
61 B		Injectors with gaskets 130 – NG M90E.32S	16			BI1193 500	B	Polidoro		
61 C		Injectors with gaskets 77 – LPG M90E.32S	16			BI1193 501	B	Polidoro		
62	173-148	Burner M90E.24S	1	KI1004 102			B	Polidoro		
62 A	173-149	Burner M90E.28S	1	KI1004 147			B	Polidoro		

# CONTINUATION SHEET

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Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
62 B		Burner M90E.32S	1			BI1193 100	B	Polidoro		
63	E83-112	Detection electrode M90E.24S, M90E.28S	1	BI1123 102			M			
63 A		Detection electrode M90E.32S	1			BI1193 104	M			
64	E83-126	Ignition electrode - right M90E.24S, M90E.28S	1	BI1123 103			M			
64 A		Ignition electrode - right M90E.32S	1			BI1193 103	M			
65	E83-127	Ignition electrode - left M90E.24S, M90E.28S	1	BI1123 101			M			
65 A		Ignition electrode - left M90E.32S	1			BI1193 102	M			
66	169-125	Grommet	1	BI1002 115			M			
67	409-736	Tapping screw 3,5x9,5 recessed pan head	24	BI1013 115			F			
68	E83-128	Air deflector M90E.24S	1	BI1183 102			M			
		up to serial no. N241681202 on M90E.28S								
68		Air deflector from serial no. N241691202 on M90E.28S	1			BI1183 109	M			
68 A		Air deflector on M90E.32S	1			BI1193 106	M			
69	409-531	Taptite screw M4x8 Recessed pan head Hardened steel	4	BI1013 111			F			
		Bright Zinc Plated BS3382 Clear passivated and lanolin								
		Dipped								
70	409-722	Tapping Screw ISO No8 B 4,2x9,5 Recessed Pan Head	34	BI1013 110			F			
		Hardened Steel BS4174 Bright Zinc plate BS1706 Clear								
		Passivated								
71	402-124	Machine Screw M4x8 mm Recessed pan head Mild steel	2	BI1013 114			F			
		BS4183 Bright zinc plate BS3382 Clear passiv.								
72	E83-129	Gas valve	1	BI1093 104			B	Sit	845 Sigma	
72 A		Gas valve	1			BI1193105	B	Sit	845 Sigma	
		(replacement for discontinued BI1093104)								
72 B		Gas valve on-off operator coils				BI1093 107	B	Sit	0.967.158	

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Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
73	E83-130	Gas pipe to the manifold	1	BI1183 101			M			
74	E83-131	Gas manifold with injectors NG M90E.24S	1	BI1183 103			B	Polidoro		
74 A	E83-132	Gas manifold with injectors LPG M90E.24S	1	BI1183 104			B	Polidoro		
74 B	E83-133	Gas manifold with injectors NG M90E.28S	1	BI1183 105			B	Polidoro		
74 C	E83-134	Gas manifold with injectors LPG M90E.28S	1	BI1183 106			B	Polidoro		
74 D		Gas manifold with injectors NG M90E.32S	1			BI1193 107	B	Polidoro		
74 E		Gas manifold with injectors LPG M90E.32S	1			BI1193 108	B	Polidoro		
75	E83-135	C.h. connection pipe	2	BI1084 110			M			
76	E83-136	Tap 3/4" - c.h.	2	BI1084 105			B			
77	E83-137	Tap 1/2" - d.h.w.	1	BI1084 101			B			
78	E83-138	Tap 3/4" - gas	1	BI1084 100			B			
79	E01-226	Nut 1/2"	2	BI1004 101			M			
80	E83-139	Pipe 15 mm dia (bent) d.h.w.	1	BI1084 109			M			
81	E83-140	Pipe 22 mm dia gas	1	BI1084 111			M			
82	E83-141	Pipe 15 mm dia (straight) d.h.w.	1	BI1084 107			M			
83	E83-142	Full sequence control device	1	BI1305 101			B	Bertelli & Partners	FM30	
85	E83-144	O-ring gasket 1,78 x 6,75	1	BI1475 119			M			
86	E83-145	Temperature-pressure gauge	1	BI1475 108			M			
87		Cover panel	1			BI1515 100	M			
88		Time switch	1			BI1525 101	B	Flash	Monotron 200 23011	
89		Knob	2			BI1515 101	M			
90	E83-149	Shaft	2	BI1475 105			M			
91	E83-150	Control panel plug	1	BI1475 110			M			
92		Control panel box	1			BI1525 100	M			
93	E83-152	Cable holder	8	KI1066 102			B	Fastpoint S.r.l.	1207.BB01 XS	

# CONTINUATION SHEET

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Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
94	E83-153	Terminal block	2	BI1475 109			B	Elettrogibi	PA27	
								Odoardo Korner (alternative)	OK-433-FV	
95	409-727	Screw 3,5x16 mm self tap RPH	4	BI1165 101			F			
96		Electronic control p.c.b.	1			BI1475 114	M			
96 A		Electronic control p.c.b.	1			BI1515 107	M			
		(replacement for discontinued BI1475114)								
97	169-083	Fuse 1.6A	1	BI1005 105			B			
98	E83-155	Service panel cover	1	BI1475 111			M			
99	E83-156	Control panel cover	1	BI1475 112			M			
100	E83-159	Fan cable	1	BI1485 112			M			
101	E83-160	Ignition electrode cable	2	BI1485 101			M			
102	E83-161	Flame detection electrode cable	1	BI1485 102			M			
103	E83-162	Pump-diverter valve cable	1	BI1485 103			M			
104	E83-163	Time switch cable	1	BI1485 111			M			
105	E83-164	Electronic control p.c.b.-ignition device connection cable	1	BI1485 104			M			
106	E83-165	D.h.w. flow switch and temp. probe cable	1	BI1485 105			M			
107	E83-166	C.h. flow switch, temp. probe cable and modulator cable	1	BI1485 106			M			
108	E83-168	Power supply and external control cable	1	BI1485 107			M			
109	E83-169	Earth wiring (up to serial no. N223071102)	1	BI1485 108			M			
109		Earth wiring (from serial no. N223081102)	1			BI1485 116	M			
110	402-225	Machine Screw M5x10 Recessed Pan Head Mild steel	1	BI1035 109			F			
		BS4183 Bright zinc plate BS3382 Clear Passivated								
111	164-133	Toothed lock washer external 5,3x10 mm stainless	2	BI1035 110			F			
112	404-609	Full nut M5 Hexagon Steel grade 8 BS3692 Bright zinc	1	BI1035 111			F			
		plate BS3382 clear passivated								

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Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
113	E83-170	Gas valve cable	1	BI1485 109			M			
114		Side case panel	2			BI1346 500	M			
115	409-702	Screw 4,2x13 mm AB self tapping RPH BZP	2	BI1336 115			F			
116		Front case panel	1			BI1346 501	M			
117	E69-243	Window (glass + rubber frame)	1	BI1206 118			M			
118	409-747	Screw 4,8x13 mm AB self tapping RPH BZP	4	BI1336 114			F			
119	E83-174	Sampling point plug	2	BI1336 110			M			
120	E83-175	Sealed chamber lid	1	BI1336 100			M			
121	E83-176	Sealed chamber gaskets kit	1	BI1336 500			M			
122	E83-177	Air deflector left M90E.28S	1	BI1336 112			M			
123	E83-178	Combustion chamber side panel	2	BI1326 100			M			
124	E83-180	Combustion chamber rear panel M90E.24S	1	BI1326 107			M			
124 A	E83-181	Combustion chamber rear panel M90E.28S	1	BI1326 108			M			
125	E83-182	Flue hood up to serial no. N238421202 on M90E.24S	1	BI1336 101			M			
125		Flue hood from serial no. N238431202 on M90E.24S	1			BI1366 104	M			
125 A	E83-183	Flue hood up to serial no. N241681202 on M90E.28S	1	BI1336 102			M			
125 A		Flue hood M90E.32S	1			BI1366 105	M			
		from serial no. N241691202 on M90E.28S								
126	E01-187	Flue pressure switch tube	2	BI1016 107			M			
		up to serial no. N238421202 on M90E.24S								
		up to serial no. N241681202 on M90E.28S								
126	E01-187	Flue pressure switch tube	1	BI1016 107			M			
		from serial no. N238431202 on M90E.24S								
		from serial no. N241691202 on M90E.28S								



# CONTINUATION SHEET

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Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
127	E05-422	Air pressure switch	1	BI1036 102			B	Yamatake-Honeywell	C6065 1,4 mbar	
		up to serial no. N238421202 on M90E.24S								
127	169 127	Air pressure switch	1	KI1267 103			B	Yamatake-Honeywell	C6065 0,88 mbar	
		from serial no. N238431202 on M90E.24S						SIT (alternative)	380 0,88 mbar	
127 A	E83-184	Air pressure switch	1	BI1256 114			B	Yamatake-Honeywell	C6065 1,6 mbar	
		up to serial no. N241681202 on M90E.28S								
127 A		Air pressure switch	1			BI1366 107	B	Yamatake-Honeywell	C6065 1,04 mbar	
		from serial no. N241691202 on M90E.28S						SIT (alternative)	380 1,04 mbar	
127 B		Air pressure switch M90E.32S	1			BI1376 102	B	Yamatake-Honeywell	C6065 1,83 mbar	
		up to serial no. N020800903						SIT (alternative)		
127 B		Air pressure switch M90E.32S	1			BI1376 104	B	Yamatake-Honeywell	C6065 1,38 mbar	
		from serial no. N020810903						SIT (alternative)		
128	E05-424	Air switch pressure test point	2	BI1036 101			M			
129	E83-185	Flue elbow (complete)	1	BI1336 108			M			
130	E83-186	Flue elbow clamp	1	BI1336 113			M			
131	402-127	Screw M4x16 mm BZP - RPH	2	BI1015 115			M			
132	E01-184	Gasket - Air intake twin kit	1	BI1016 101			M			
133	169-110	Flue pipe gasket	1	BI1016 104			M			
134	E83-187	Flue restrictor Ø 47	1	BI1336 106			M			
134 A		Flue restrictor Ø 44	1			BI1366 108	M			
		from serial no. N238431202 on M90E.24S								
		from serial no. N241691202 on M90E.28S								
134 B		Flue restrictor Ø 50 M90E.32S	1			BI1376 103	M			

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Appliance number(s) 47-970-17 47-970-18 47-970-21

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Key no.	GC Part Number	Description	No. Off	Makers part number which have a CG number	Maker's old part number which have since been changed	Maker's new part number which DO NOT have a GC number	M B F	Original Supplier	Original Supplier part number	Retail price excl. VAT
135	E83-188	Venturi device tube	2	BI1256 101			M			
		up to serial no. N238421202 on M90E.24S								
		up to serial no. N241681202 on M90E.28S								
135	E83-188	Venturi device tube	1	BI1256 101			M			
		from serial no. N238431202 on M90E.24S								
		from serial no. N241691202 on M90E.28S								
136	E83-189	Venturi	1	BI1036 108			M			
		up to serial no. N238421202 on M90E.24S								
		up to serial no. N241681202 on M90E.28S								
136		Venturi	1			BI1366 100	M			
		from serial no. N238431202 on M90E.24S								
		from serial no. N241691202 on M90E.28S								
137	E83-190	Flue elbow gasket	1	BI1336 103			M			
		up to serial no. N238421202 on M90E.24S								
		up to serial no. N241681202 on M90E.28S								
137		Flue elbow gasket	1			BI1366 101	M			
		from serial no. N238431202 on M90E.24S								
		from serial no. N241691202 on M90E.28S								
138	E83-191	Fan, up to serial no. N238421202 on M90E.24S	1	BI1336 104			B	LN di Natalini - Montecassiano Italy		
138		Fan, from serial no. N238431202 on M90E.24S	1			BI1366 102	B	FIME	GR02040 39W	
138 A	E83-193	Fan, up to serial no. N241681202 on M90E.28S	1	BI1336 116			B	LN di Natalini - Montecassiano Italy		
138 A		Fan, from serial no. N241691202 on M90E.28S	1			BI1366 103	B	FIME	GR02045 47W	
138 B		Fan M90E.32S up to serial no. N020800903	1			BI1376 100	B	FIME	GR1740 55W	
138 B		Fan M90E.32S from serial no. N020810903	1			BI1376 105	B	FIME	GR02050 60W	
139	409-720	Screw 3,5x6,5 mm AB self tapping BZP - RPH	3	KI1267 104			F			

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Appliance number(s) 47-970-17 47-970-18 47-970-21[illegible]