

SERVICE MANUAL

Models covered by these instructions

120MFS	(G.C.NO. 47 970 02)
124MFS	(G.C.NO. 47 970 03)
120RFS	(G.C.NO. 41 970 01)

ACQUAPIU'

Wall hung, fan flue, room sealed gas boiler

British Gas service listed

Leave this manual adjacent to the gas meter

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1 Overall information

1.1 Overall View

fig. 1

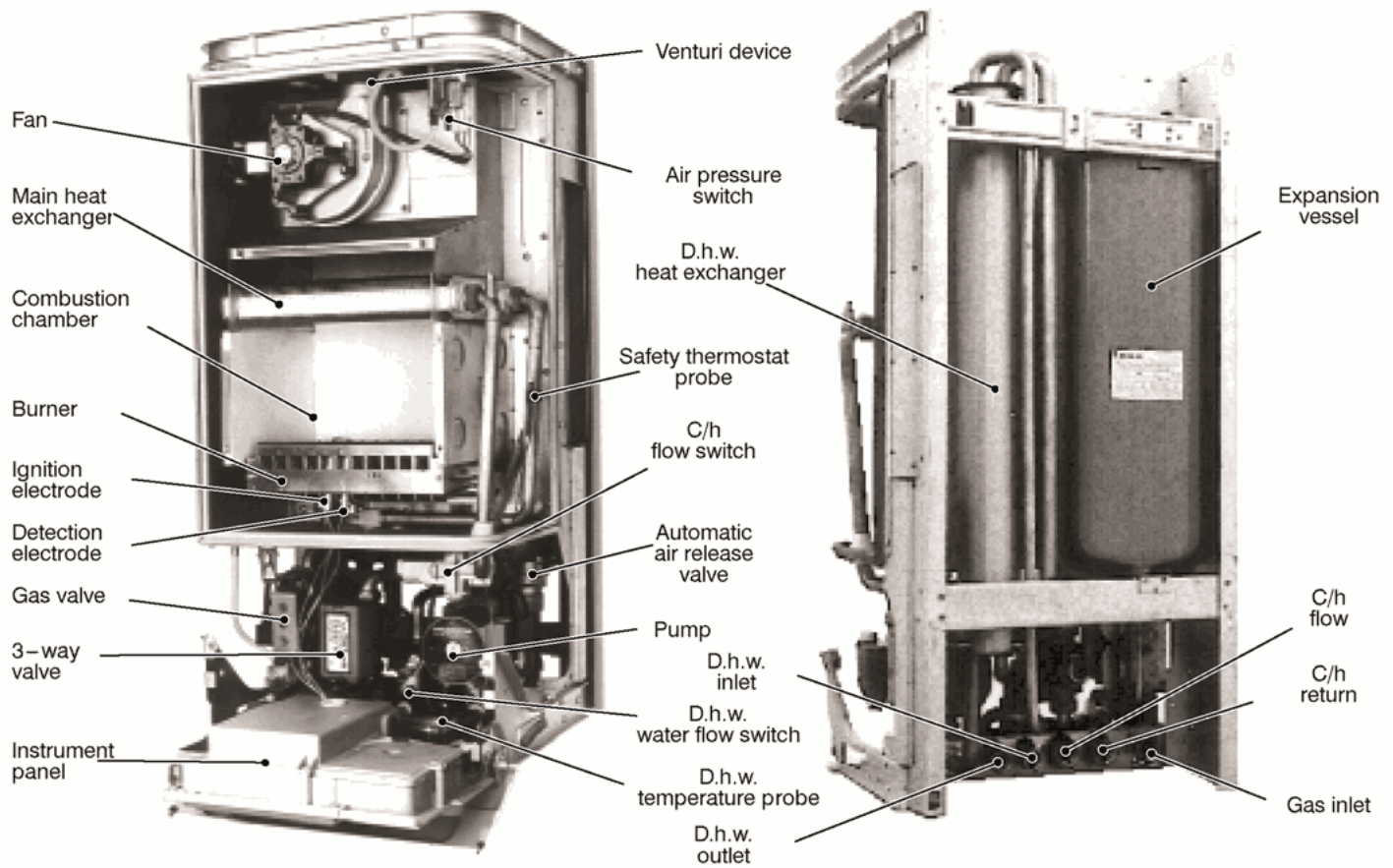


fig. 1

1.2 Hydraulic diagram

fig. 2

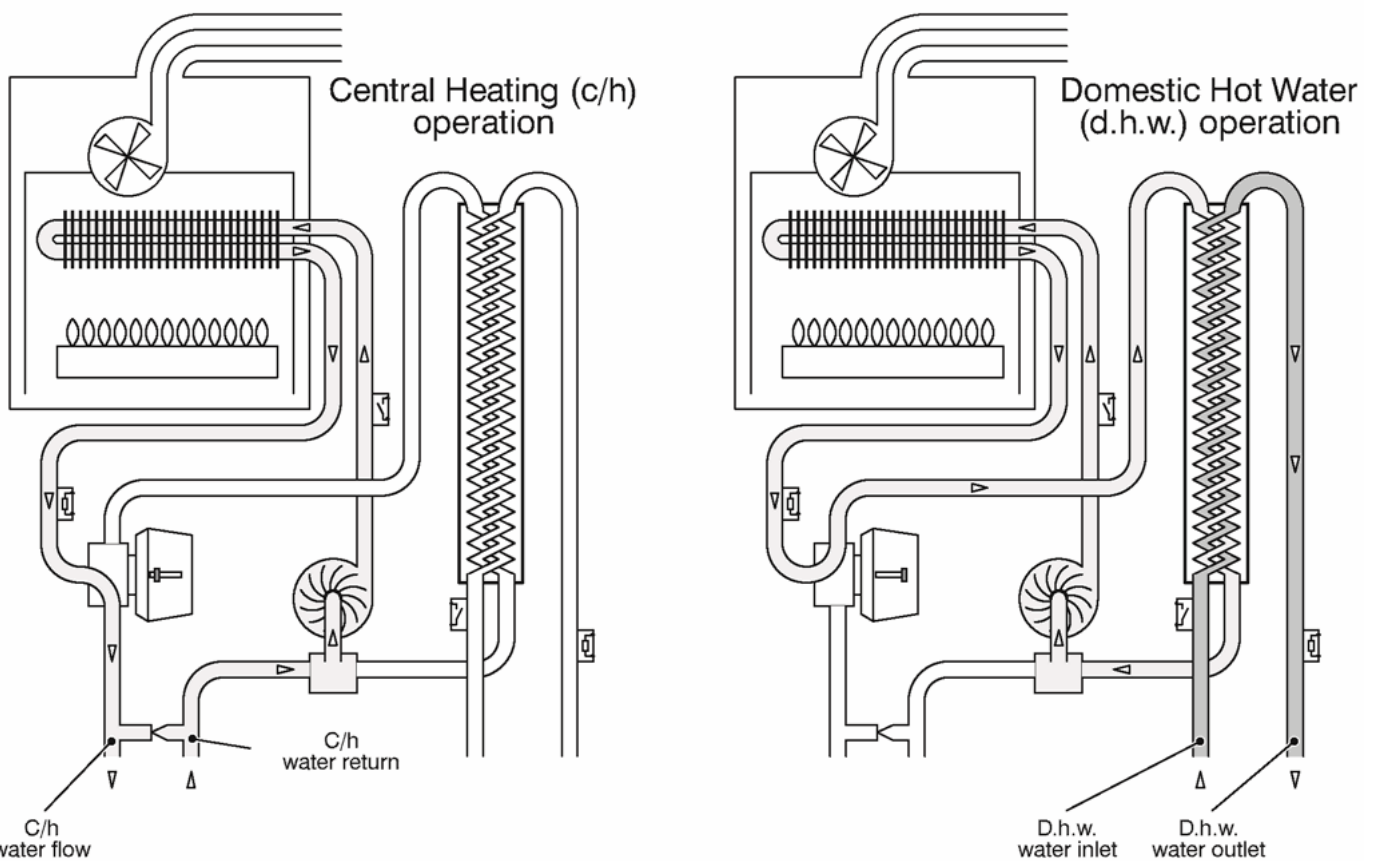


fig. 2

2 General access and emptying hydraulic circuits

2.1 Nomenclature

fig. 3

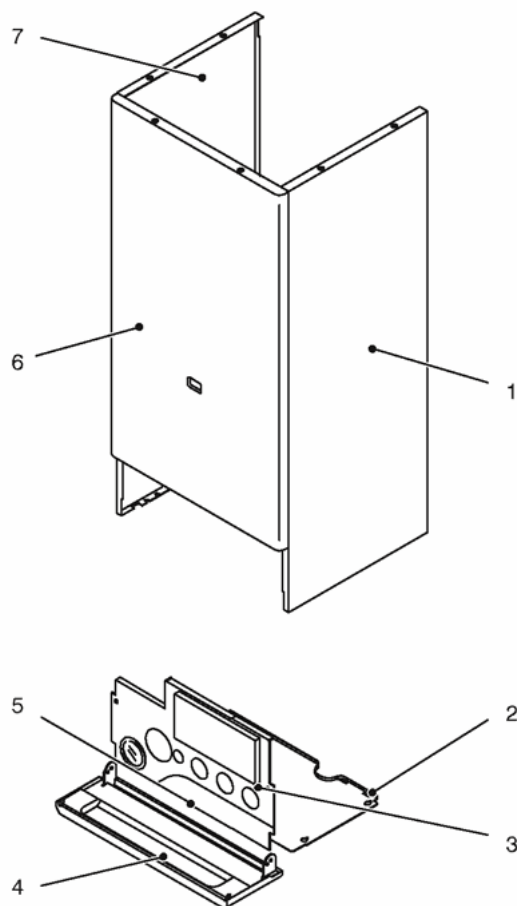


fig. 3

- 1 Right side panel
- 2 Lower protection plate
- 3 Instrument panel
- 4 Control-panel cover
- 5 Service panel
- 6 Front panel
- 7 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 body.

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

To remove the front panel remove screws A ([fig. 4](#)), bring the base of the panel far from the boiler and lift it, freeing it from the top hooks.

fig. 4

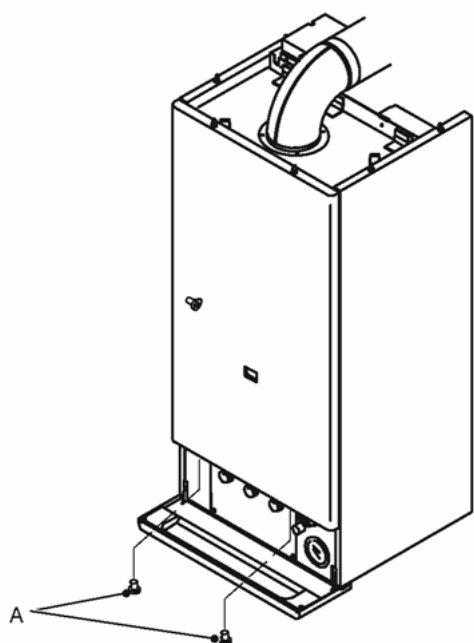


fig. 4

To remove the side panels loosen screws *B* ([fig. 5](#)) bring the base of the panels far from the boiler and lift them, freeing them from the top hooks.

fig. 5

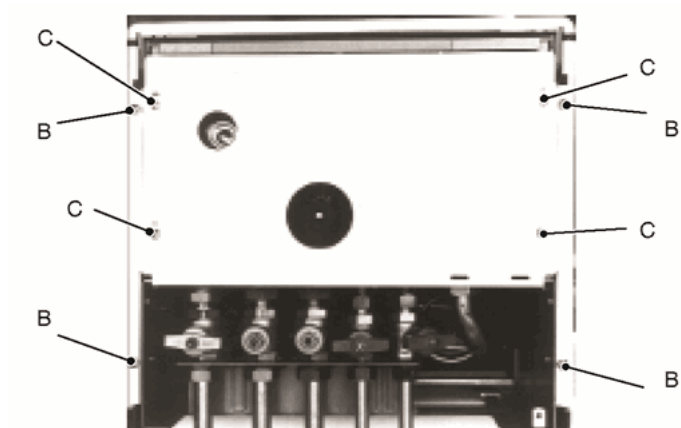


fig. 5

To remove the lower protection loosen the four screws *C* ([fig. 5](#)) and move the protection towards the rear part of the boiler.

2.3 Control panel

To gain access to the parts located behind the instrument panel proceed as follows:

1. Remove the front panel of the body
2. Remove the two screws *D* ([fig. 6](#)) and lower the instrument panel.

fig. 6

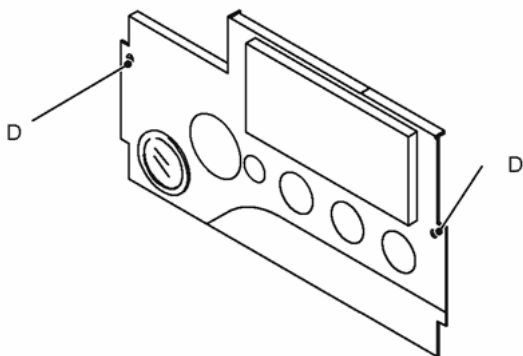


fig. 6

2.4 Access to the electronic circuits

WARNING:

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

To remove the service panel "5":

1. Place a small screwdriver with a blade in the two slots indicated in [fig. 7](#);
2. Delicately lever with a screwdriver upwards in order to unhook the panel, rotating it downwards.

fig. 7

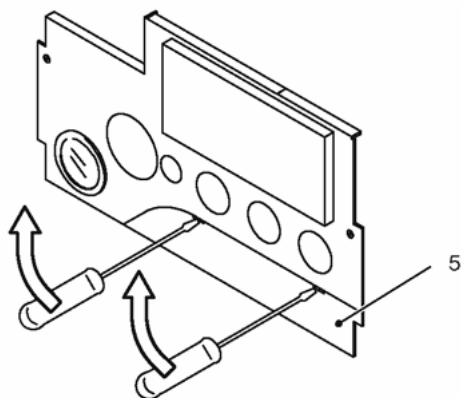


fig. 7

To gain access to the electronic regulation and ignition PCB

1. Lower the control panel as illustrated in [section 2.3](#) of this chapter.
2. Remove the rear lid of the control panel clearing it from the hooks at the rear positioned as shown by the arrows printed on the lid ([fig. 8](#));

fig. 8

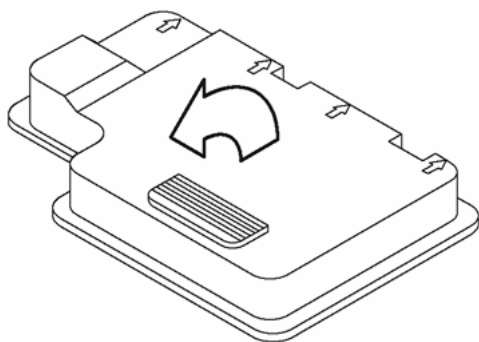


fig. 8

2.5 Access to the sealed chamber

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

For this purpose, remove the front panel and the right side panel of the body, completely unscrew the Allen Keys (4 mm) *E* ([fig. 9](#)), located in the areas indicated in [fig. 10](#).

fig. 9

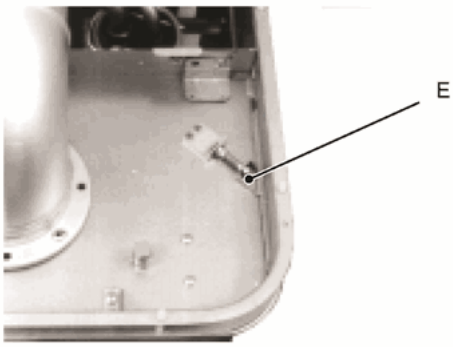


fig. 9

fig. 10

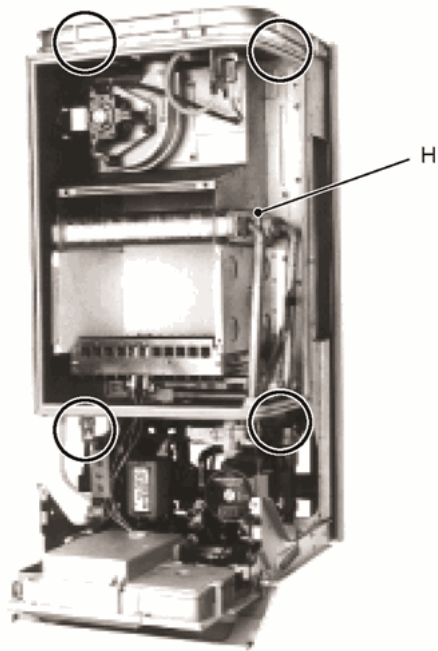


fig. 10

2.6 Emptying the main circuit

1. Remove the lower protection of the boiler
2. Close the c/h circuit isolation valves *F* ([fig. 11](#));
3. Loosen the plugs *G* until the boiler is completely emptied.

fig. 11

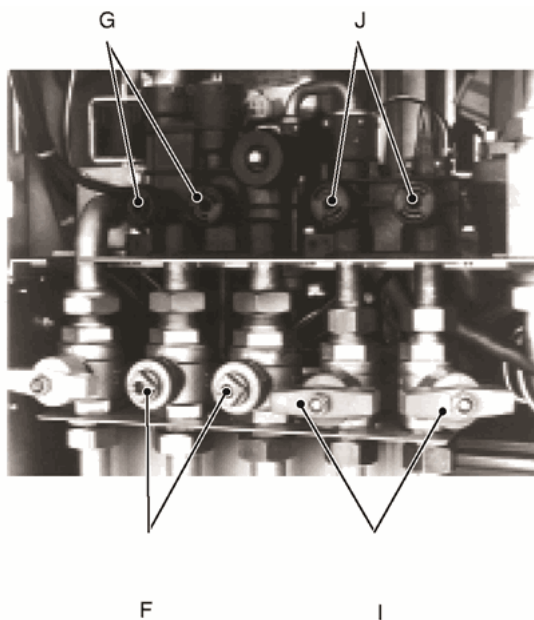


fig. 11

To facilitate the downflow of water, remove the front panel, also remove the sealed chamber lid) and loosen the manual bleed valve. *H* ([fig. 10](#)) placed near the inlet pipe fitting of the main heat exchanger.

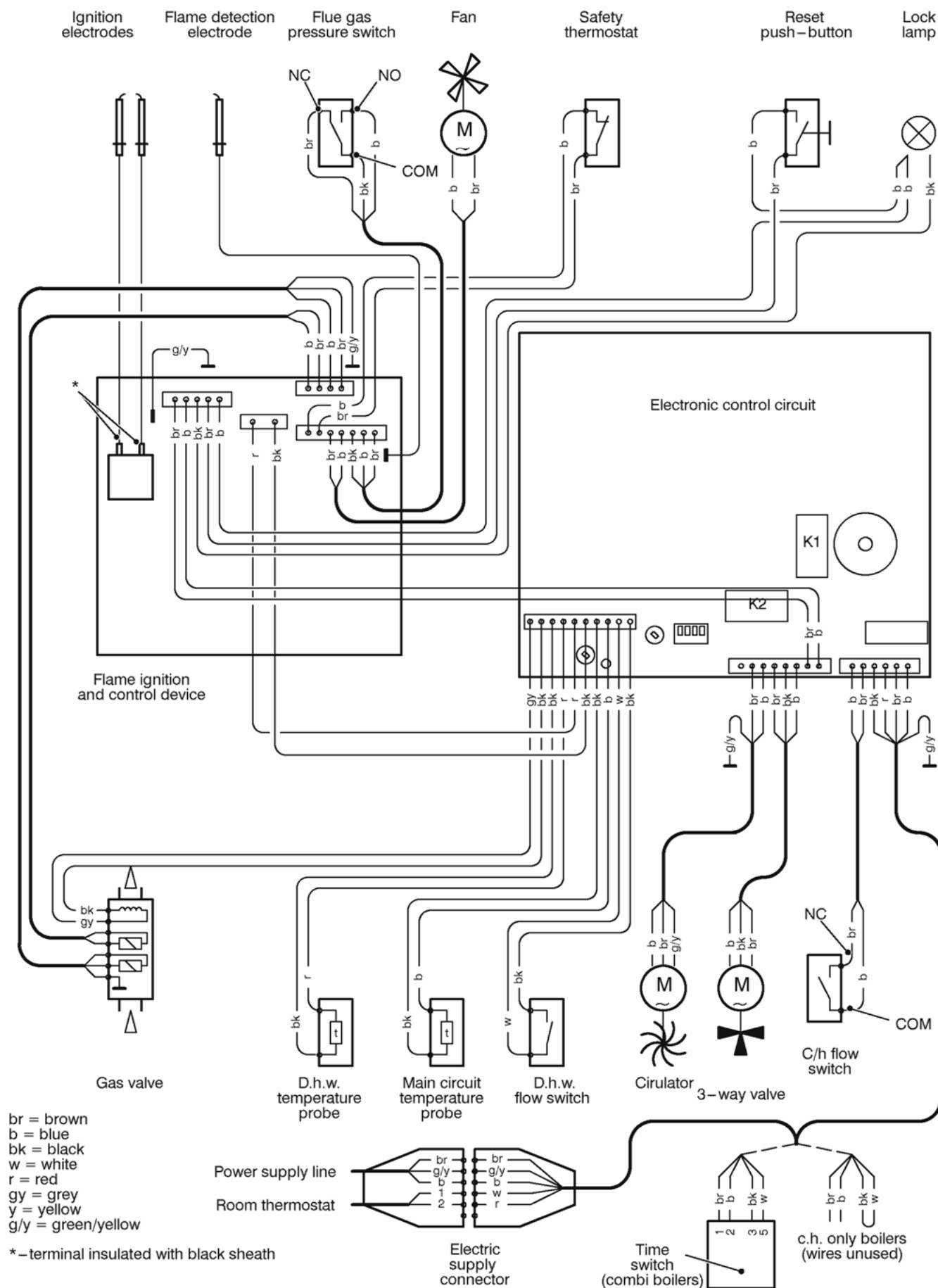
Close it again once the emptying has been completed.

2.7 Emptying the d.h.w. circuit

1. Remove the lower protection of the boiler;
2. Close the d.h.w. circuit cut-off valves *I* ([fig. 11](#));
3. Loosen plugs *J* until the boiler has been completely emptied.

3 Diagrams

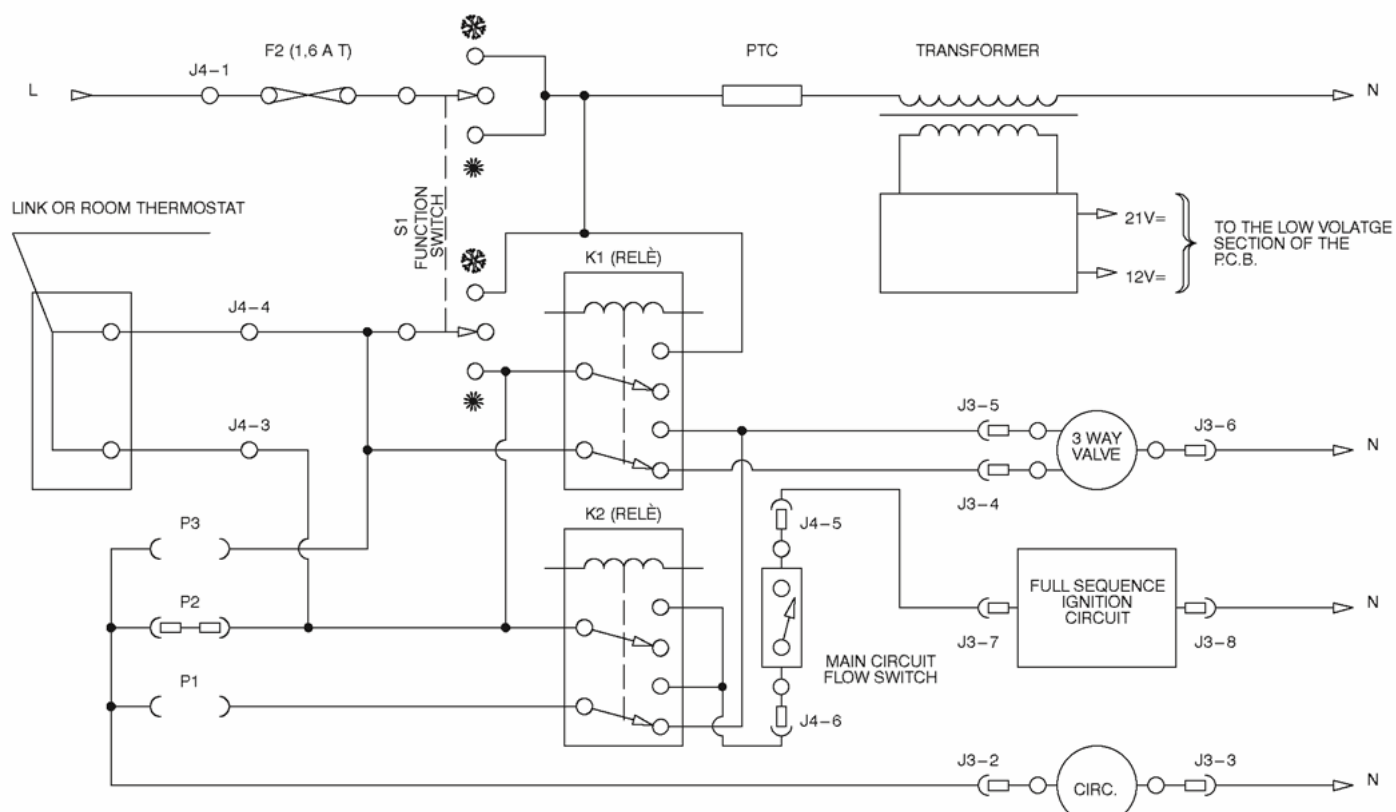
3.1 Wiring diagram



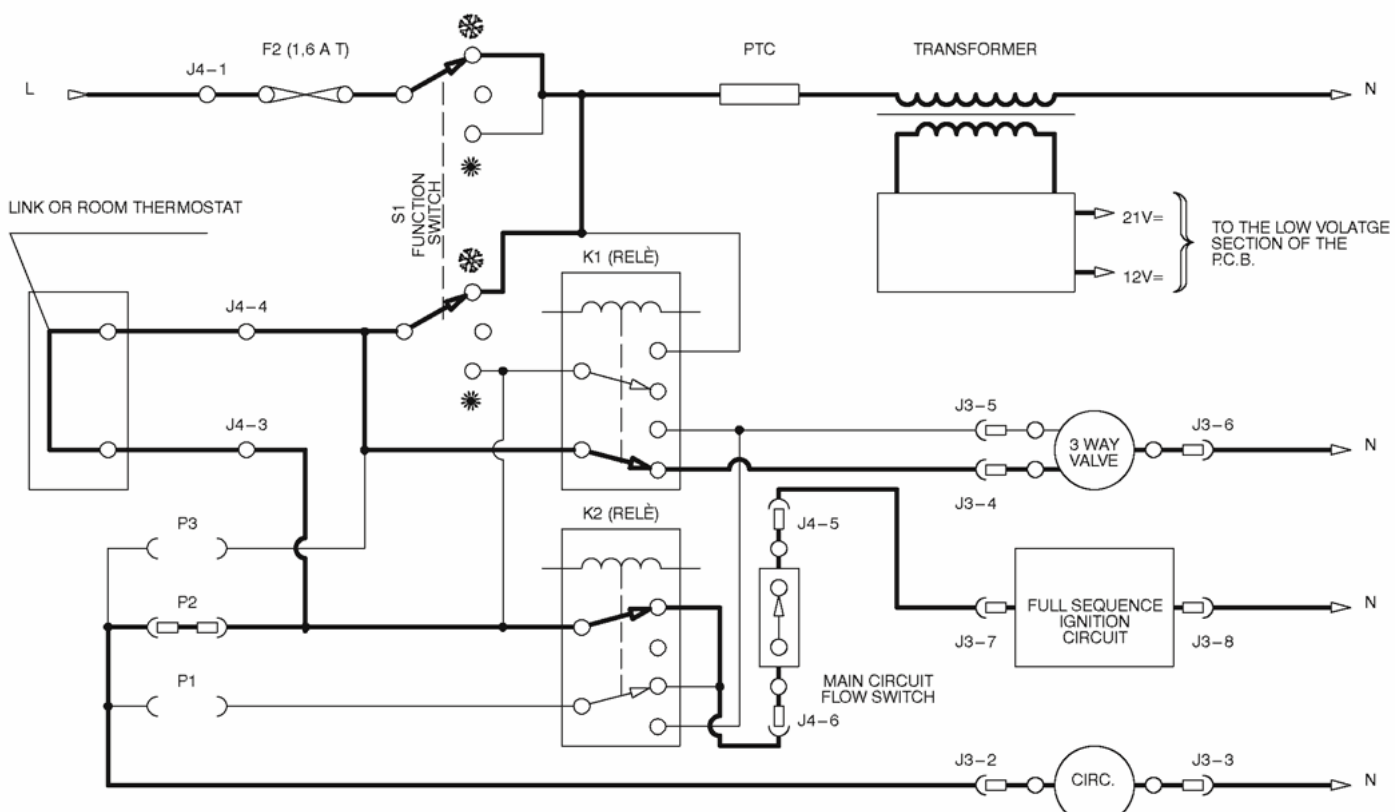
3.2 Functional flow diagrams

General layout Function switch position off

L - LINE N - NEUTRAL
 ——— ACTIVATED CIRCUIT
 - - - - - NON ACTIVATED CIRCUIT

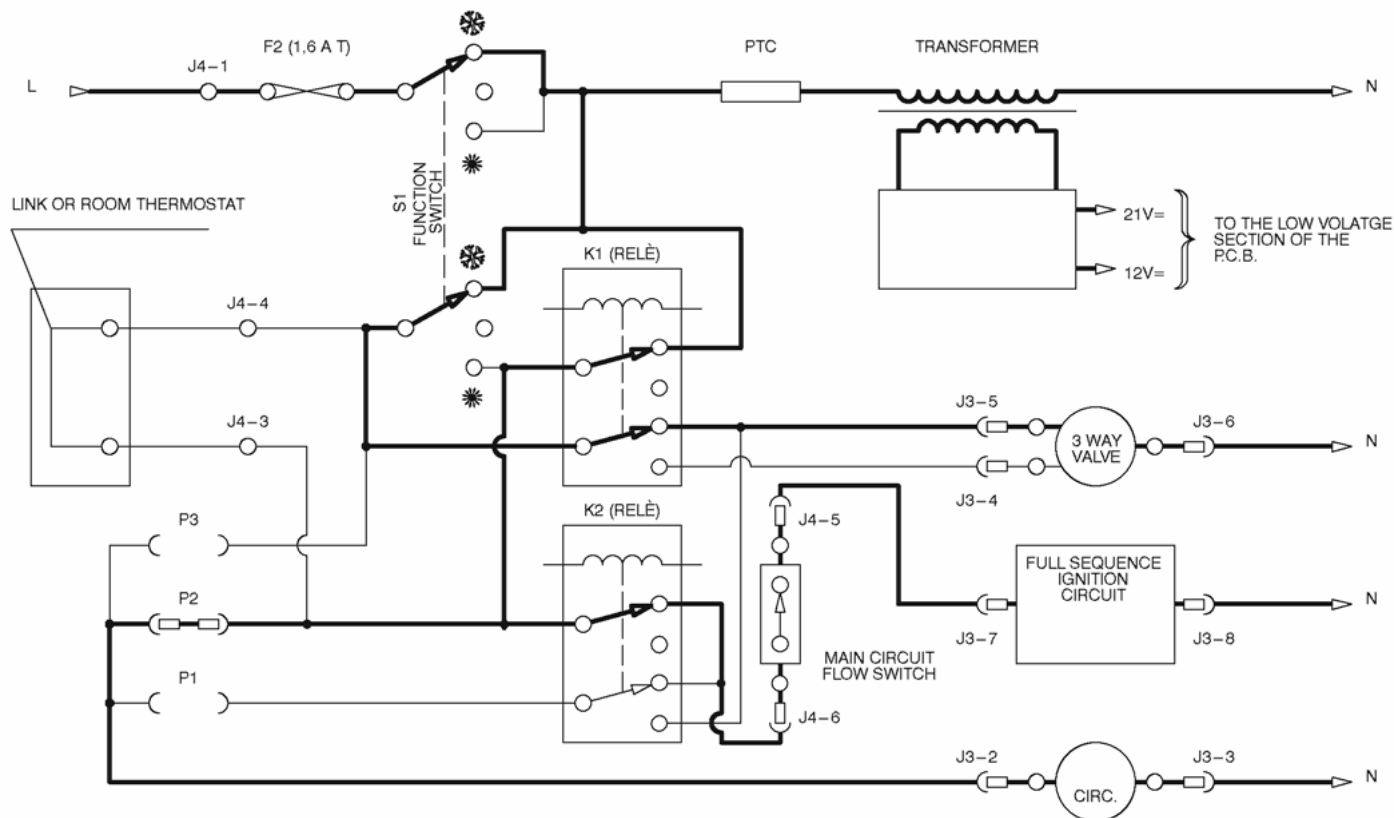


Function switch position Heat request on c/h

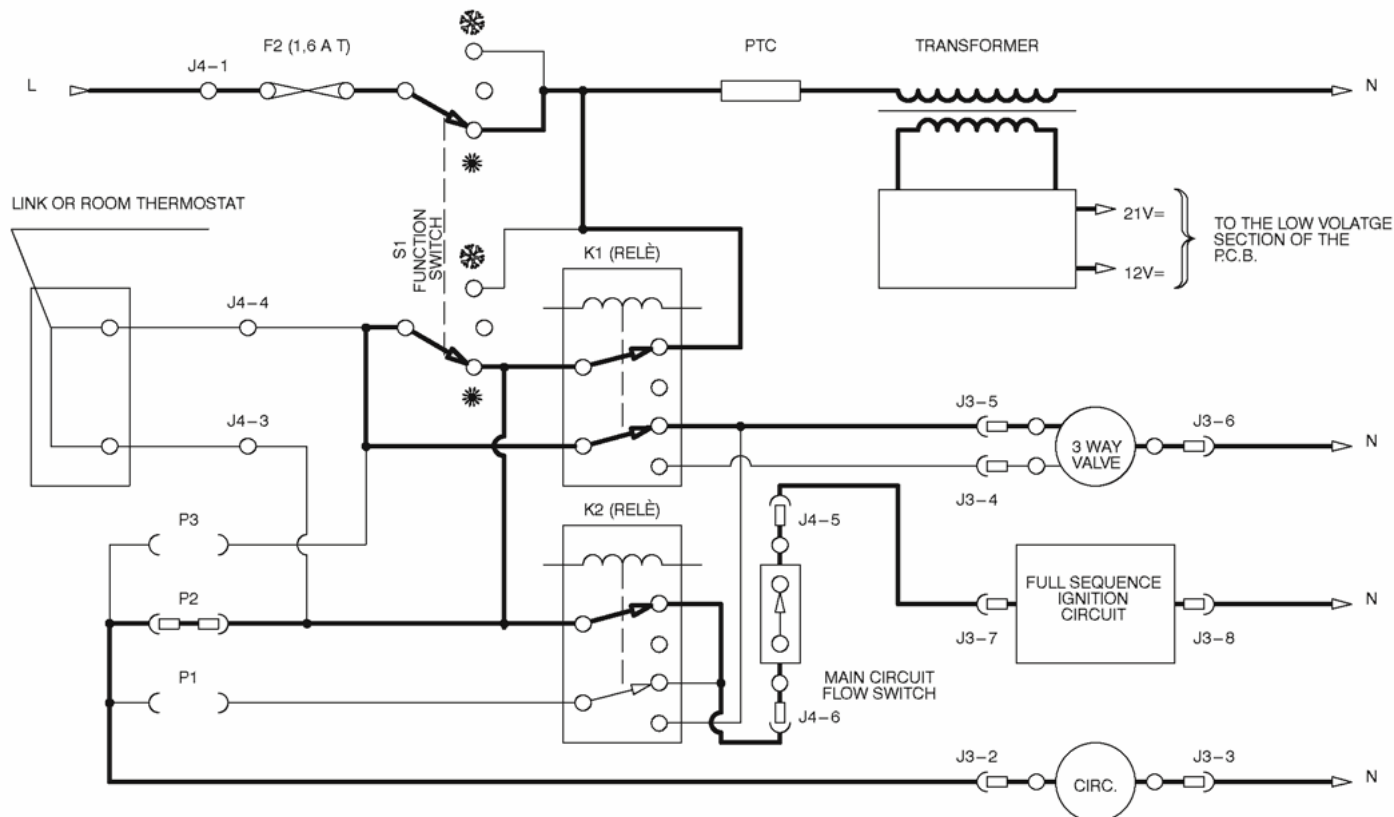


Function switch position *
Heat request on D.h.w.

L - LINE N - NEUTRAL
— ACTIVATED CIRCUIT
--- NON ACTIVATED CIRCUIT



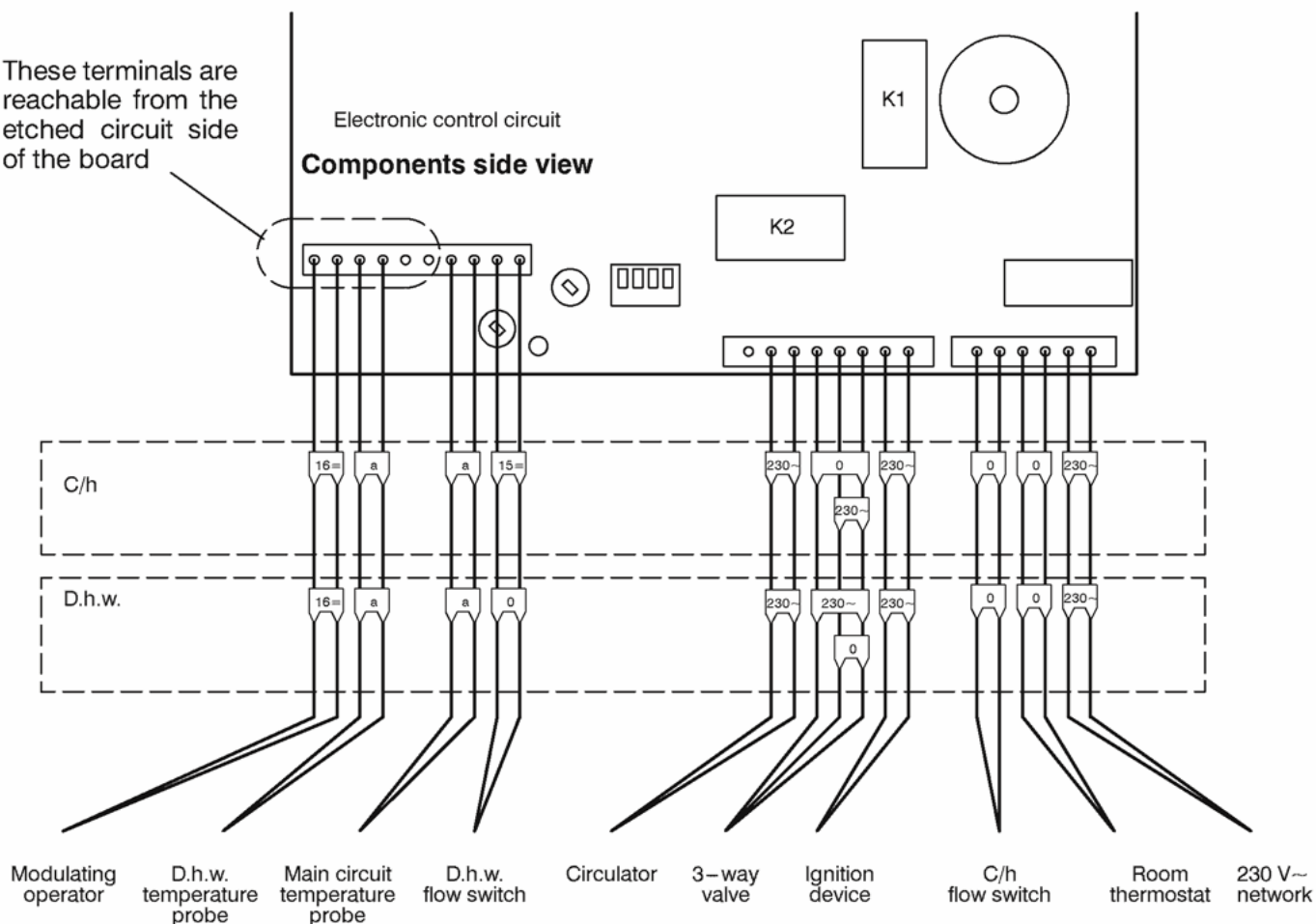
Function switch position *
Heat request on D.h.w.



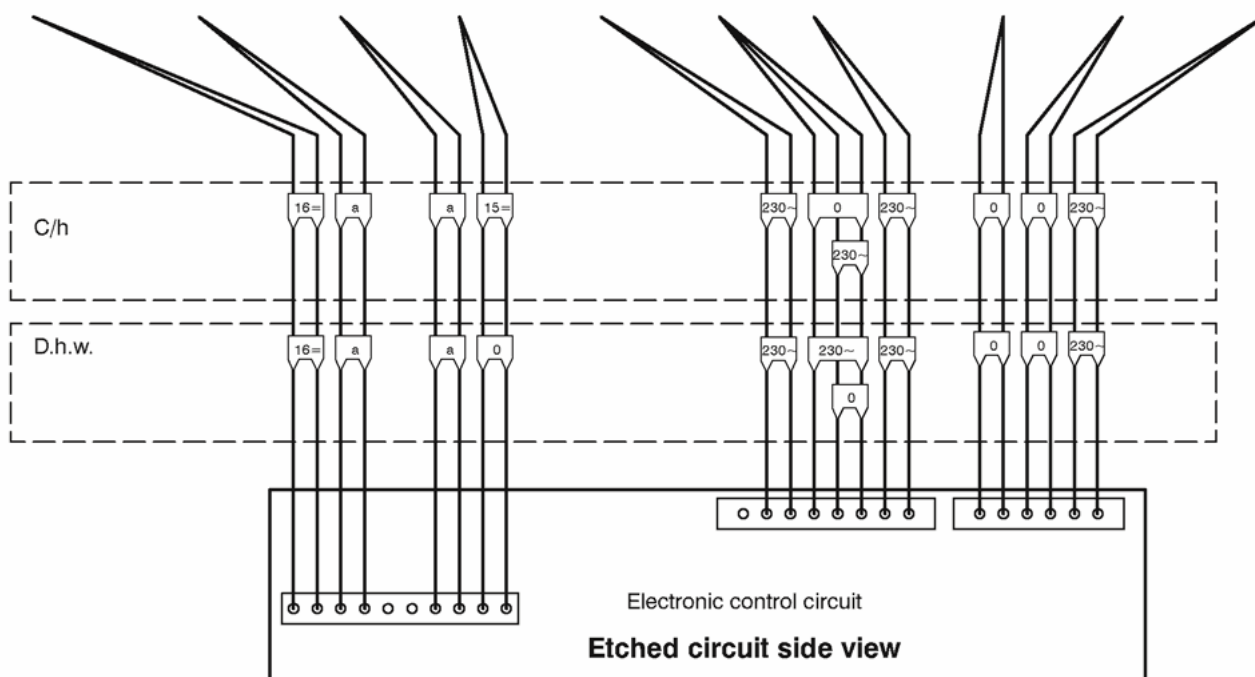
3.3 Control circuit voltages

These terminals are reachable from the etched circuit side of the board

Electronic control circuit
Components side view



Electronic control circuit
Etched circuit side view



a: never zero (short circuit) never 12V= (open circuit)

Electrical voltages in Volts during normal operation with burner on at maximum power

4 Fault finding

	Components to check																		
Section of the manual → (note ref. in brackets)	– (1)	– (2)	– (3)	– (4)	7.2		8.2		9.8			10.2	11.5		12.2	13.2	14.2		
Defect ↓	Power supply line	Gas supply line	Flue pipes	C.h. circuit	D.h.w. circuit	Pump (windings)	Pump (rotor – impeller)	3 way valve (windings)	3 way valve (diverter mechanism)	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. flow switch	Main circuit temp. probe	D.h.w. temp. probe
The boiler does not start either in c/h or d.h.w. mode. Fan still. Instrument panel light (green) off . Lockout lamp (red) off .	■									■	■								
The boiler does not start either in c/h or d.h.w.. mode. Fan still. Instrument panel light (green) on . Lockout lamp (red) off .				■	■	■	■				■		■			■		■	
Lockout lamp (red) on . By pressing the reset push – button the boiler turns on and operates correctly.		■													■ (5)				
Lockout lamp (red) on . By pressing the reset push – button the boiler starts the ignition cycle. The burner lights on , the ignition sparks continue and the boiler locks again.	■	■											■						
Lockout lamp (red) on . By pressing the reset push – button the boiler starts the ignition cycle. The burner doesn't light on , the ignition sparks continue and the boiler locks again.		■									■			■				■	
The boiler runs but the combustion is noisy and there is flame lift effect.			■																
Incorrect modulation											■	■			■				
The boiler switches on and off the burner to a fixed gas pressure											■	■			■				

[illegible]

	Components to check																		
Section of the manual → (note ref. in brackets)	– (1)	– (2)	– (3)	– (4)	7.2		8.2		9.8			10.2	11.5		12.2	13.2	14.2		
Defect ↓	Power supply line	Gas supply line	Flue pipes	C.h. circuit	D.h.w. circuit	Pump (windings)	Pump (rotor – impeller)	3 way valve (windings)	3 way valve (diverter mechanism)	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. flow switch	Main circuit temp. probe	D.h.w. temp. probe
Water leaks from the safety valve during operation on c/h				■															
Water leaks from the safety valve when the boiler is off.																			

Note

- | | | |
|--|--|-------------------------------------|
| <p>1 Check for 220–240V~ between line (L) and neutral (N). Verify the integrity of supply cable, plug and external fuses. Check the polarity of line and neutral connection.</p> <p>2 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.</p> | <p>3 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.</p> <p>4 Check for soundness of the circuit and verify its correct filling (see also installation manual).</p> | <p>5</p> <p>6</p> <p>7</p> <p>8</p> |
|--|--|-------------------------------------|

5 Main heat exchanger

5.1 Characteristics

The main heat exchanger (A in [fig. 12](#)) has the function of transferring heat of the gas produced by combustion to the water circulating in it.

fig. 12

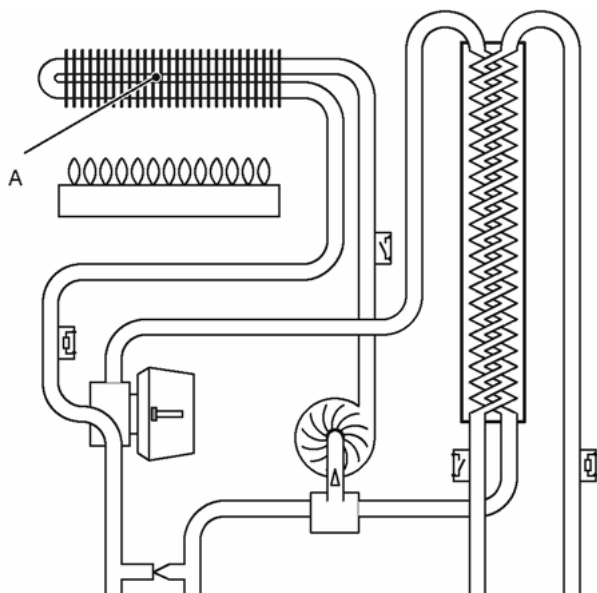


fig. 12

The hydraulic circuit is composed of 8 elliptical pipes connected in parallel ([fig. 13](#)).

fig. 13

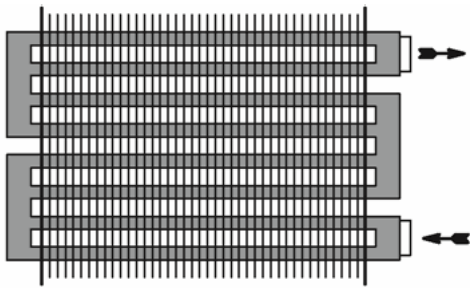


fig. 13

5.2 Removal

WARNING:

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

- 1 Empty the main circuit of the boiler
- 2 Remove the front panel of the body
- 3 Remove the right side panel of the body and the sealed chamber cover.
- 4 Remove the cover of the combustion chamber
- 5 Separate the heat exchanger from the hydraulic circuit, loosening the inlet and outlet pipe fittings *B* ([fig. 14](#));

fig. 14

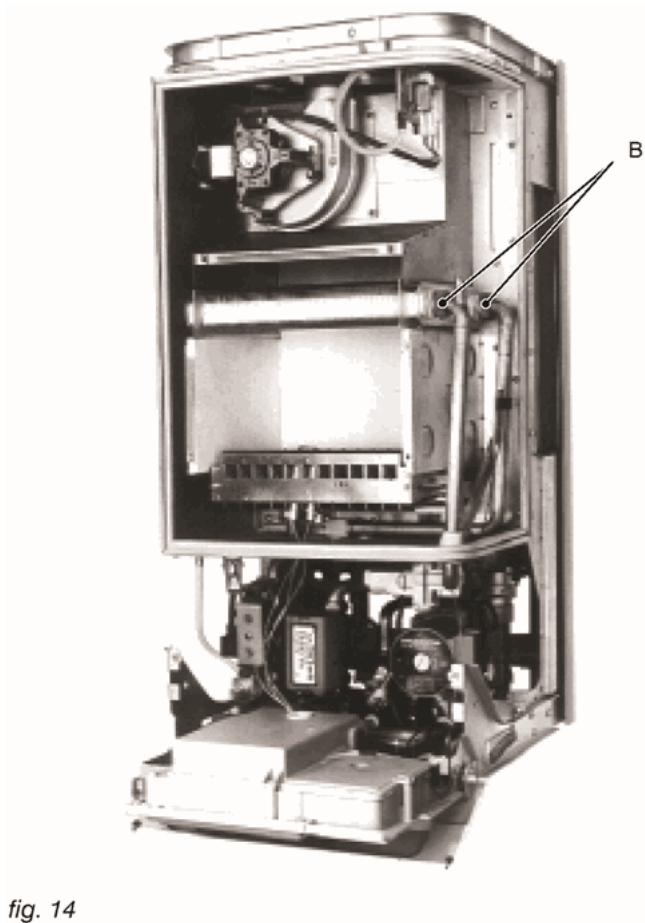


fig. 14

- 6 Extract the heat exchanger, from the front
- 7 Assemble the heat exchanger carrying out the removal operations in reverse sequence.

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.

6 D.h.w. heat exchanger

6.1 Function

The d.h.w heat exchanger (A in [fig. 15](#)) allows the instantaneous transferral of heat from the primary hydraulic circuit to the water destined for d.h.w use.

fig. 15

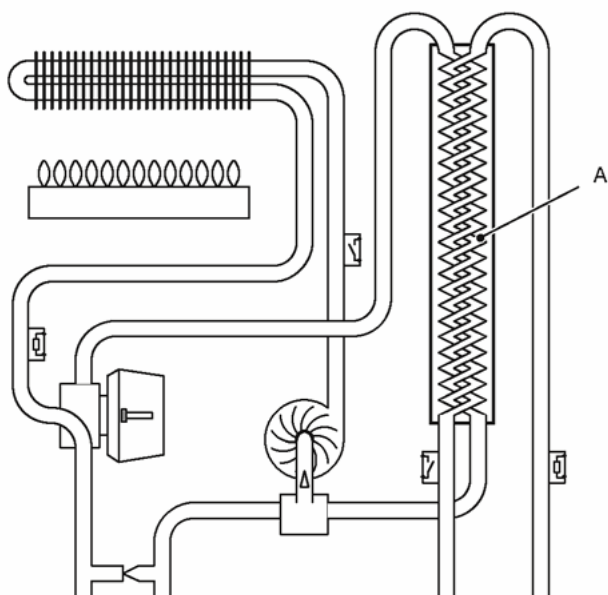


fig. 15

The water structure and flow paths are shown in [fig. 20](#).

The primary circuit runs along the heat exchanger from the top towards the bottom and inside the heat exchanger there are two parallel flows. Between these two flows the d.h.w circuit water circulates against the current.

The shape of the components of the heat exchanger causes the water to flow in a helical manner.

6.2 Removal

The d.h.w heat exchanger can be removed from the boiler in three different manners on the basis of the free adjacent space available.

From the top: at least 40 cm;

from the right side: at least 13 cm;

from the bottom: at least 60 cm;

WARNING:

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

- 1 Empty the primary circuit and the d.h.w circuit of the boiler
- 2 Remove the front panel of the body and lower the instrument panel
- 3 Remove the motor of the 3-way valve (see [3-way valve](#))
- 4 Completely unscrew the top pipe fitting B of the 3-way valve and remove the forks C and D ([fig. 16](#));

fig. 16

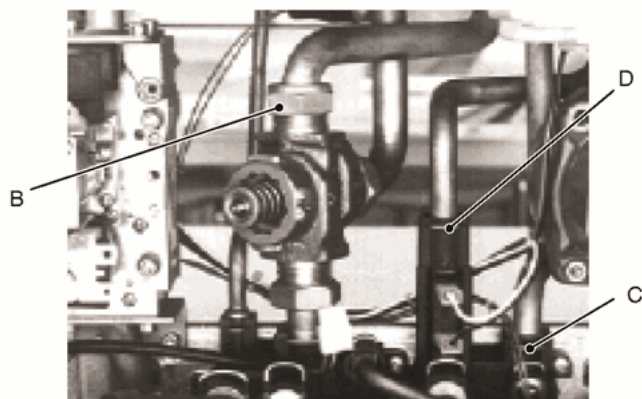


fig. 16

- 5 Remove the forks that hold the pipes E and F ([fig. 17](#)) to the top plug of the d.h.w heat exchanger and disconnect the pipes (it is not necessary to remove them from the boiler).

fig. 17



fig. 17

6 Remove the bracket that holds the heat exchanger to the frame (top plug side) by unscrewing the screw that fastens it to the frame

7 loosen the lower pipe fitting G ([fig. 18](#));

fig. 18

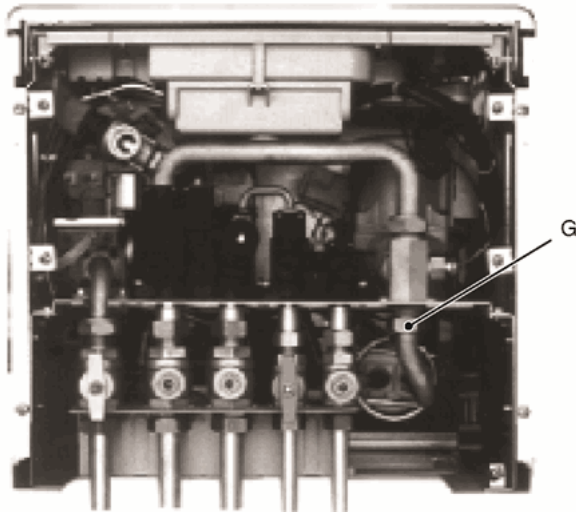


fig. 18

8 Remove the d.h.w heat exchanger together with the two lower pipes, extracting it:

- from the top (400 mm clearance minimum)
- from the side window beginning from the lower extremity (130 mm clearance minimum)
- from the bottom (600 mm clearance minimum)

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

6.3 Mounting the exchanger

WARNING:

to lubricate the O-ring gaskets exclusively use a silicone base grease compatible to be in contact with foods and approved by the local water Authorities.

1. Insert the d.h.w heat exchanger together with the two lower pipes.
2. Fit the pipe connection G ([fig. 18](#)).
3. Install the bracket that holds the heat exchanger to the frame (top plug side).

4. Fit the pipes *E* and *F* ([fig. 17](#)) to the top plug of the d.h.w heat exchanger, to the d.h.w flow switch ([fig. 19](#)) and to the outlet connection of the boiler.
5. fix them with the forks.
6. Screw up the top pipe fitting *H* ([fig. 19](#)) of the 3-way valve.

fig. 19

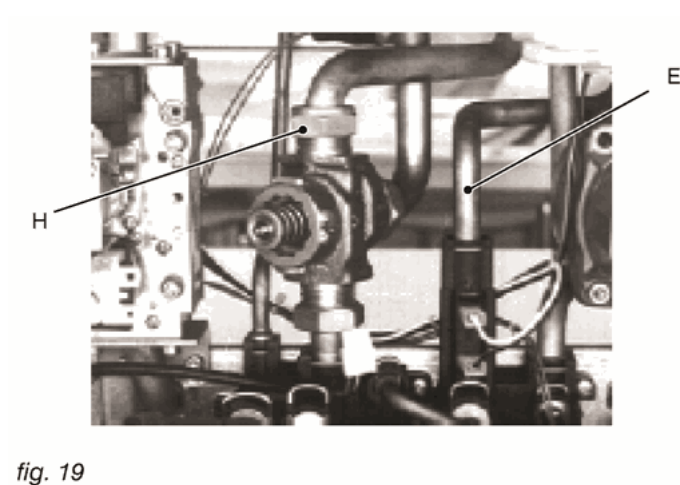


fig. 19

6.4 Hydraulic circuit run

fig. 20

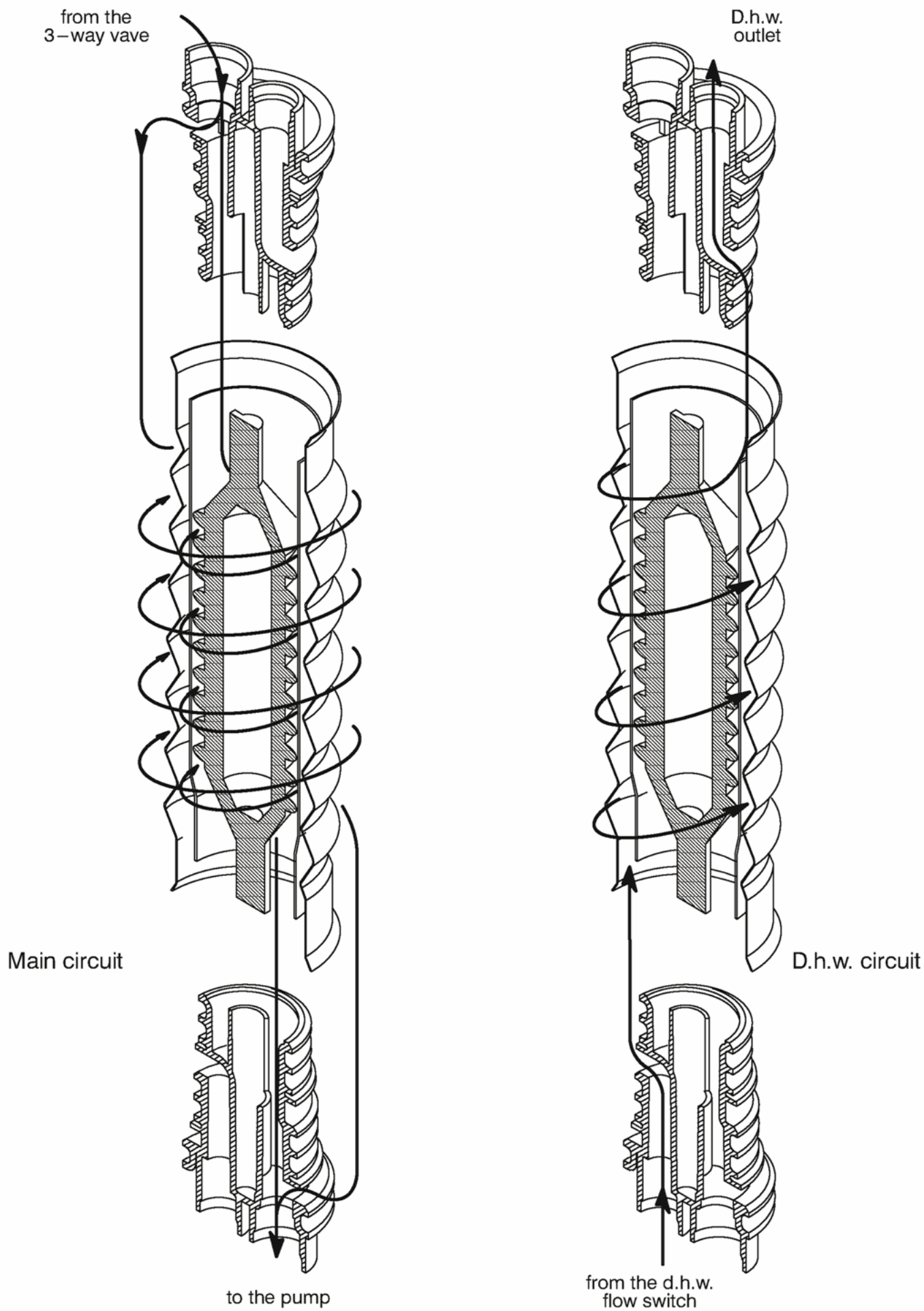


fig. 20

7.1 Function

The pump (A in [fig. 21](#)) 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. 21

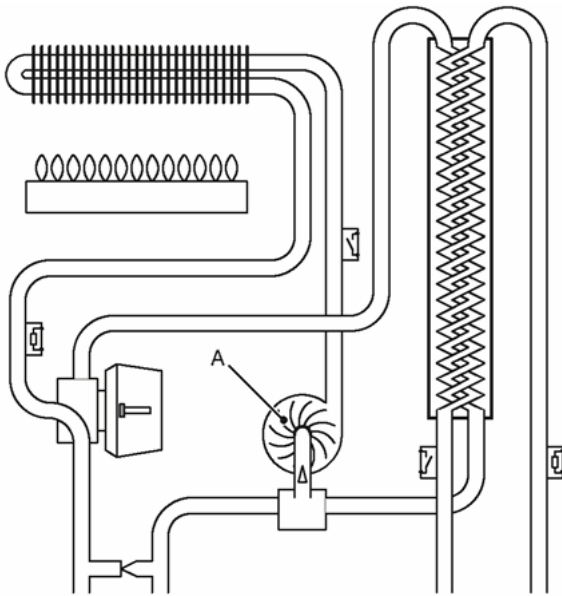


fig. 21

Two different types of pumps can be used ([fig. 22a](#) - [fig. 22b](#)).

fig. 22a



fig. 22a

fig. 22b

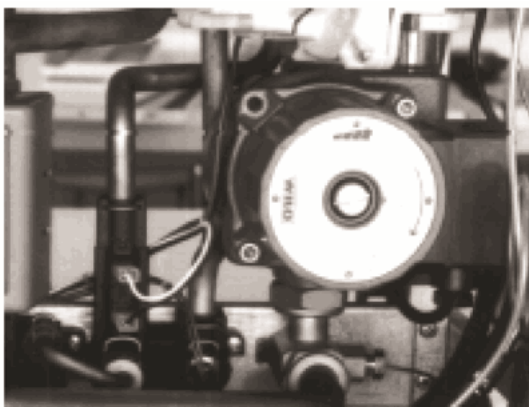


fig. 22b

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 and lower the instrument panel. Remove the air release plug of the pump and turn the rotor with a screwdriver.

Check the electrical completeness.

Remove the service panel, disconnect the connector to the electronic control circuit (see electrical diagram) and measure the electrical resistance between the pump supply conductors. (fig. 23).

fig. 23

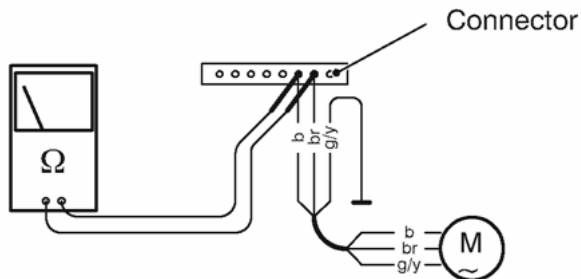


fig. 23

Electrical resistance of the windings; pump in fig. 22a at speed 3 and pump in fig. 22b (fixed speed): about 150 Ω .

Check the absence of starting defects.

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

Remove the pump and check that the impeller is firmly jointed with the rotor.

7.3 Removal

WARNING:

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

- 1 Empty the main circuit of the boiler
- 2 Remove the front panel of the body, the right side panel and overturn the instrument panel.
- 3 Completely loosen screw B (fig. 24) and remove the protection lid of the electrical connections.

fig. 24

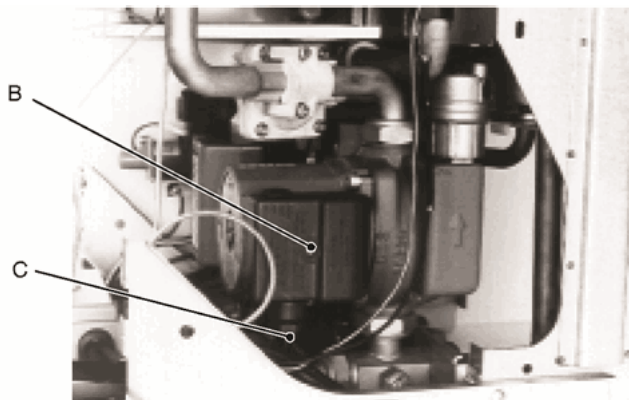


fig. 24

- 4 Loosen the electrical terminals (line-neutral- ground). Loosen the cable protection ring C and extract the electrical supply cable.
- 5 Completely loosen the screws that fix the pump head to the body.
- 6 Before reassembly carefully clean the support seat of the gasket.
- 7 Reassemble the pump carrying out the removal operations in the reverse order.

8 3—way valve

8.1 Function

The 3-way valve (A in fig. 25) has the function of modifying the hydraulic circuit of the boiler by means of an electrical command given by the electronic control circuit in order to send the water that exits the main heat exchanger towards the c/h system or towards the d.h.w. heat exchanger.

fig. 25

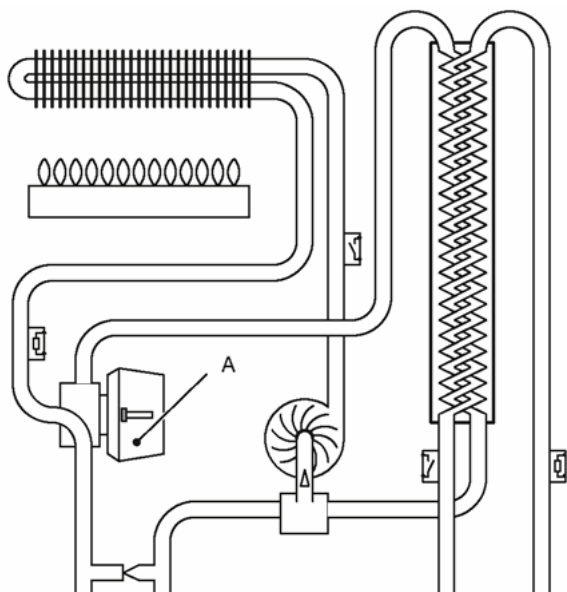


fig. 25

On one side of the motor body an indicator is visible with which it is possible to know the position of the diverter.

[fig. 26](#) and [fig. 27](#) indicate the relationship between the electric command coming from the electronic control circuit, the position of the indicator *B* and the consequent hydraulic function.

fig. 26

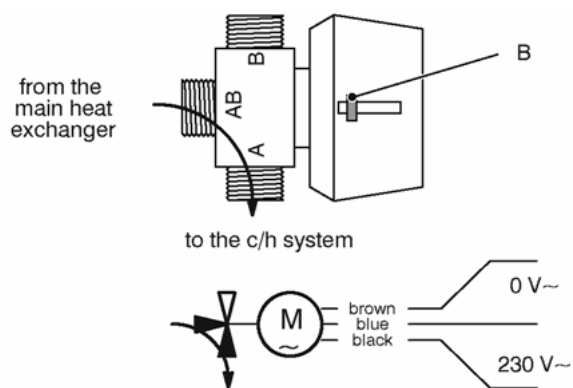


fig. 26

fig. 27

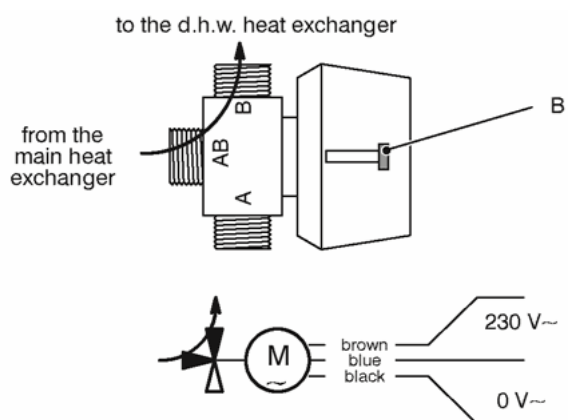


fig. 27

By removing the electrical supply to the boiler the 3 - way valve remains in the work condition in which it finds itself.

8.2 Checks

Check the electrical completeness.

WARNING:

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

[fig. 28](#) demonstrates the relationship between the position of the indicator visible on the motor body of the valve and the electrical resistance of the motor.

fig. 28

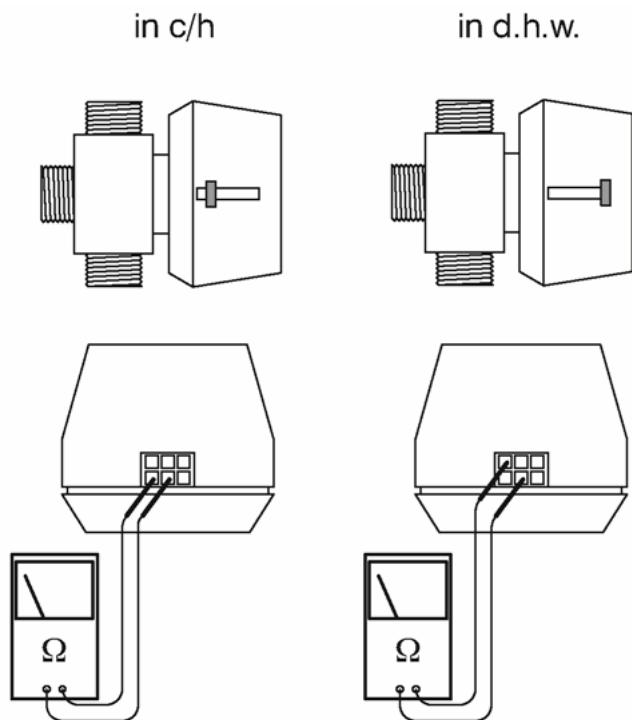


fig. 28

If the valve is complete the resistance measured will be approx. 8 k Ω

Check the diverter mechanism

Remove the front panel, lower the instrument panel and remove the motor group.

Push the stem of the diverter mechanism C ([fig. 29](#)) checking that there are no mechanical impediments.

fig. 29

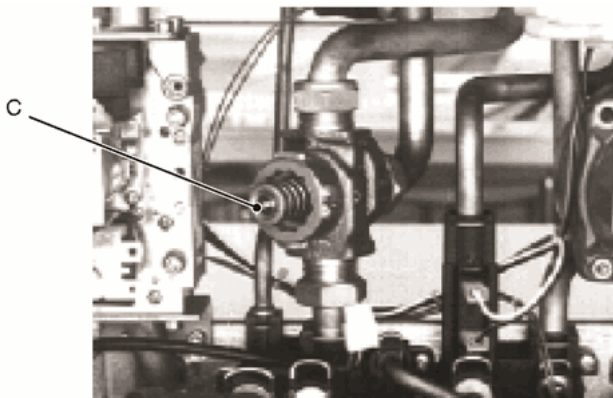


fig. 29

8.3 Removal

WARNING:

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

Removal of the motor group

1 Remove the front panel, lower the instrument panel.

2 Press the push-button D placed in the rear side of the motor ([fig. 30](#)) and rotate the motor group anti-clockwise, releasing it from the hydraulic group.

fig. 30

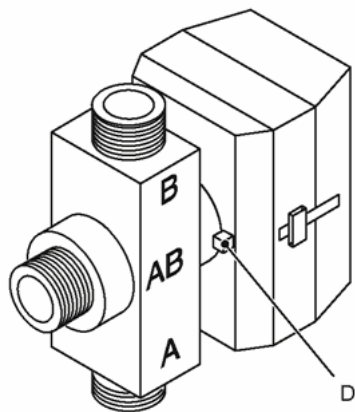


fig. 30

3 Release the electrical connector from the motor group.

Removal of the hydraulic group

1. Empty the primary hydraulic circuit
2. Remove the motor group (see operations 1,2 and 3);
3. Loosen the pipe fitting *E* ([fig. 31](#));
4. completely loosen the pipe fittings *F* ([fig. 31](#)) and remove the hydraulic group together with the pipe connected to the rear pipe fitting
5. Loosen the rear pipe fitting and remove the pipe
6. Reassemble the 3-way valve carrying out the removal operations in reverse order

fig. 31

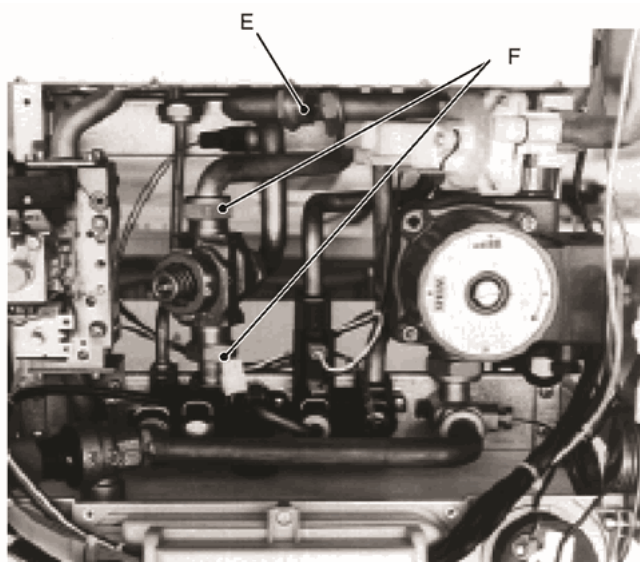


fig. 31

WARNING:

the valve body should fitted with the marking "A" pointing downwards ([fig. 30](#)).

9 Electronic control circuit

9.1 Function

The fundamental function of the control circuit is that of controlling the boiler in relation to the external needs (heating the room, heating the water for d.h.w. use) 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 control circuit receives inlet information coming from the boiler (the sensors) or from the outside (knobs, room thermostat, etc.), processes them and consequently acts with outlet commands on other components of the boiler ([fig. 32](#)).

fig. 32

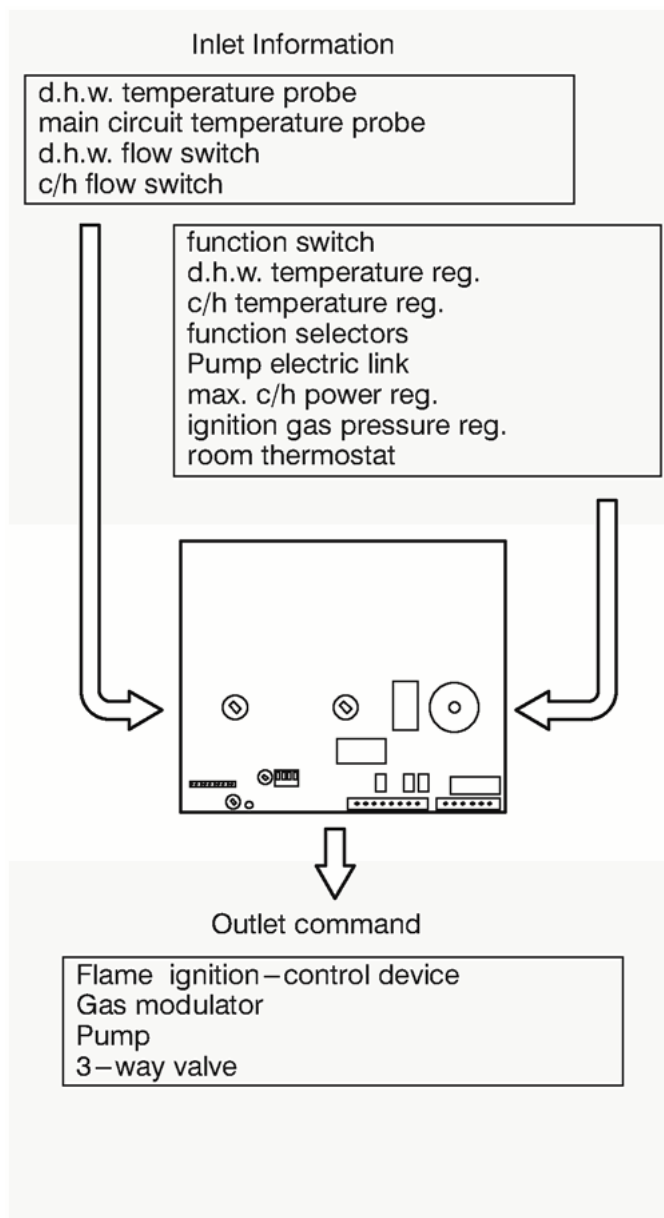


fig. 32

9.2 Selection and adjustment devices

On the control circuit several selection, adjustment and protection devices are located. ([fig. 33](#)).

fig. 33

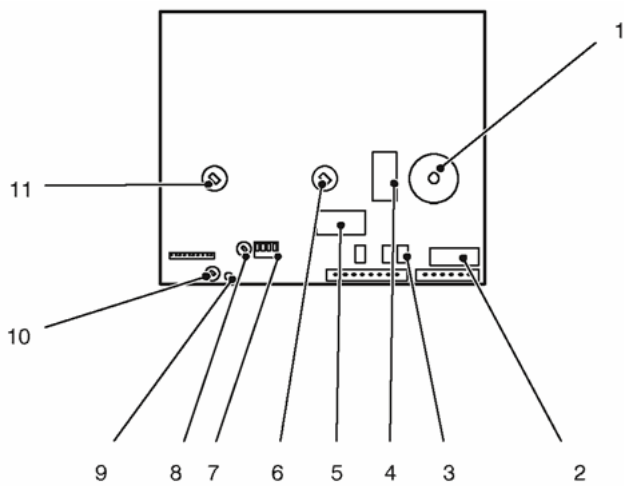


fig. 33

- 1 function switch
- 2 fuse F2 (1,6 A)
- 3 Pump function electric link
- 4 K1 relay (3-way valve control)
- 5 K2 relay (ignition device control)
- 6 d.h.w. temperature reg. potentiometer
- 7 function selectors
- 8 ignition gas pressure adjustment (ACC.)
- 9 green LED (boiler on)
- 10 c/h maximum power adjustment (RISC.)
- 11 c/h temperature reg. potentiometer

Several of these devices are directly accessible by the user (function switch, temperature adjustment potentiometers etc.) others are accessible by removing the service panel.

9.3 Checking the temperature



The control circuit makes it possible to separately adjust the c/h water flow 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 knobs of the instrument panel operates the variable elements (6 and 11 in [fig. 33](#)) of the control circuit.

If the power requested is lower by about 40% of the maximum useful output, the control is done by igniting at the minimum power and turning off the burner (on - off function). If the power is higher the boiler will modulate down to 40% of its maximum power output.

When the boiler functions in c/h ([fig. 34](#)), the signal coming from the primary temperature probe is compared to the signal given by the instrument panel through the adjustment made by the user (knob ²). The result of such a comparison operates the modulation of the gas valve, consequently changing the instantaneous useful output of the boiler.

fig. 34

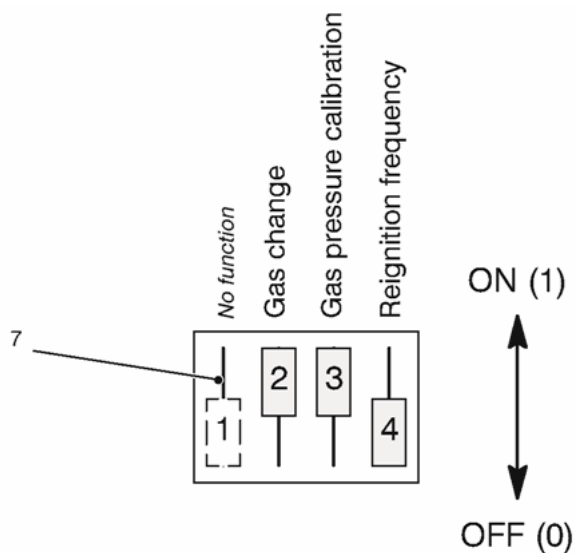


fig. 36

Selector 2

It selects the functioning of the boiler 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 correctly the selector follow the table of [fig. 37](#) referring to the colour of the gas modulating cartridge ([see section "Gas valve"](#) of this manual).

fig. 37

Gas modulating cartridge colour (on the gas valve)	Gas supply	Position of selector n. 2
White	Natural gas	Off
Black	L.P.G.	Off
Red	Natural gas	On
	L.P.G.	Off

fig. 37

Selector 3

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

The adjustment (see [section 9.6](#)) is done by means of the potentiometer "8" ([fig. 33](#)).

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

fig. 38

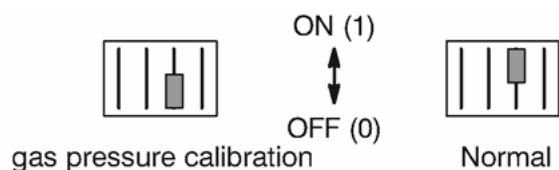


fig. 38

Selector 4

It makes it possible to select the minimum time that must pass between two ignitions of the burner in c/h function.

fig. 39

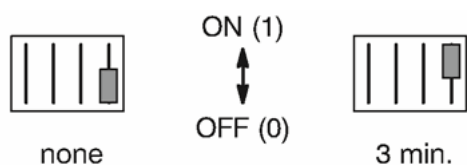


fig. 39

9.5 Pump function mode

During c/h functioning the pump can be controlled in three different manners. The pump functioning mode can be selected using the position of the electric link A in [fig. 40](#).

fig. 40

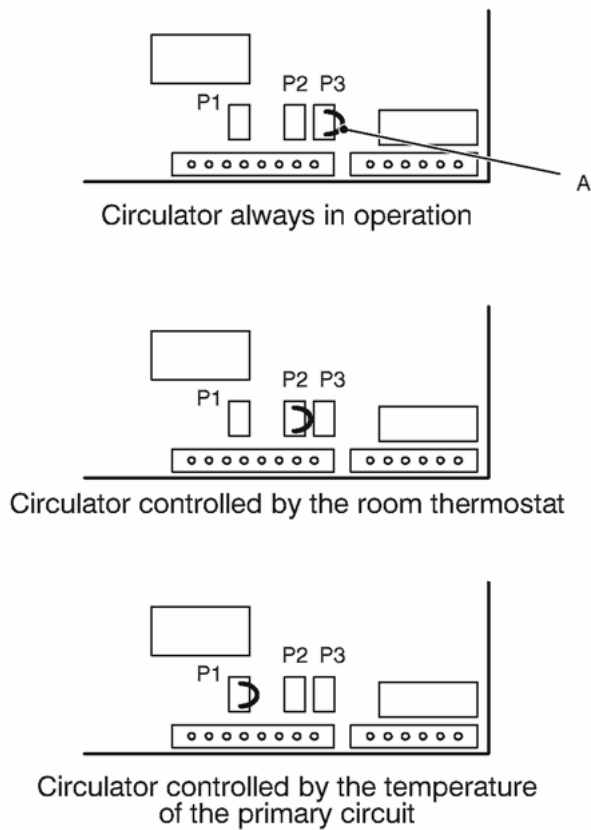


fig. 40

9.6 Ignition gas pressure regulator

By using the device "8" ([fig. 33](#)) marked "ACC." on the circuit board, 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).

To carry out the adjustment move the function selector n° 3 downwards (adjustment) and use the adjustment device "8" (ACC).

Bring the gas pressure at the injectors to the value indicated in the tables "data for gas adjustment" stated for each model in the second part of the manual (ignition pressure).

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 operation move the selector upwards (normal).

fig. 41

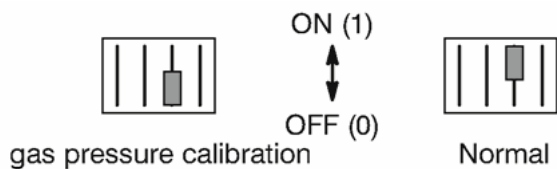


fig. 41

9.7 Max. c/h power regulator

By using device 10 ([fig. 33](#)) marked "RISC." on the circuit board, you can limit the maximum useful output delivered in the c/h function. This adjustment does not influence the maximum useful output delivered in d.h.w. function.

By rotating the device clockwise the pressure increases.

9.8 Checks

Check that the fuse is complete

If the control circuit does not supply any device (pump, 3-way valve, etc.) check that the fuse F2 is complete ([fig. 42](#)).

fig. 42

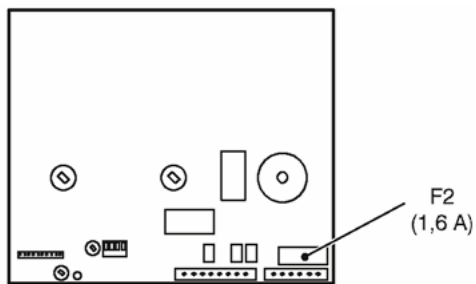


fig. 42

The F2 fuse can be reached by removing the service panel.

If the fuse is blown replace it with one that has the same characteristics after having identified the cause of the interruption.

Check for the presence and the correct positioning of the electric link which selects the functioning mode of the pump, referring to [section 9.5](#).

9.9 Removing operations

WARNING:

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

1 Remove the front panel of the boiler and lower the instrument panel.

2 Remove the rear lid of the instrument panel clearing it from the hooks placed in correspondence with the arrows printed on the lid ([see chapter general access and emptying hydraulic circuits, see section 2.4](#)).

3 delicately flex the hooks *B* in the directions indicated ([fig. 43](#)) in order to release the circuit from the panel

fig. 43

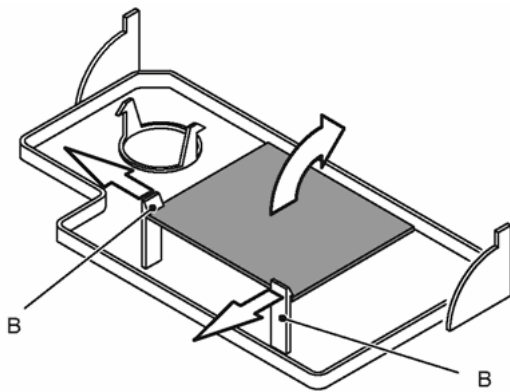


fig. 43

4 delicately flex the hooks indicated and disconnect the connectors *C* ([fig. 44](#));

fig. 44

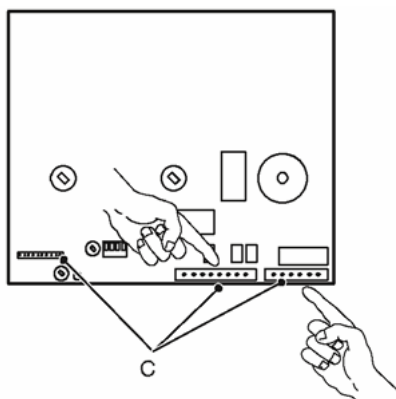


fig. 44

5 remove the control control circuit.

9.10 Mounting operation



Reassemble the control circuit carrying out the removing operations in reverse order.

Before fitting the control circuit, ensure that the control spindles ([fig. 45](#)) are correctly inserted in the c/h² and d.h.w.¹ temperature adjustment knobs.

fig. 45

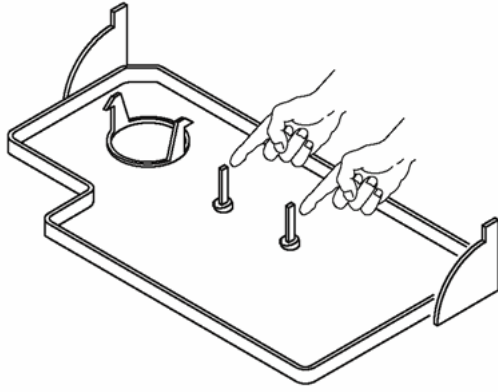


fig. 45

WARNING:

after having installed the control circuit check that the c/h² and d.h.w.¹ temperature adjustment knobs can move freely (half a turn).

9.11 Heat control in function

fig. 46

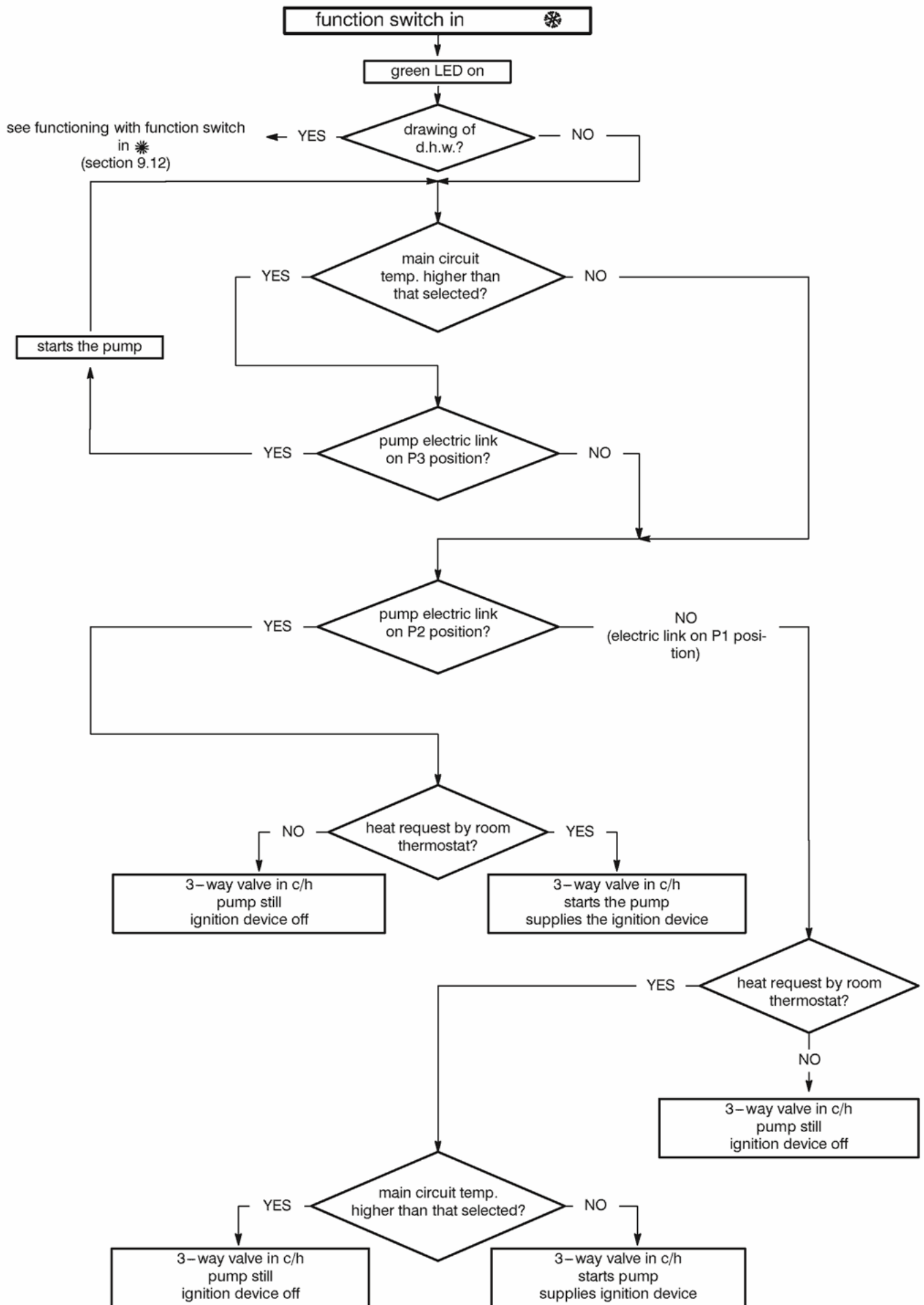
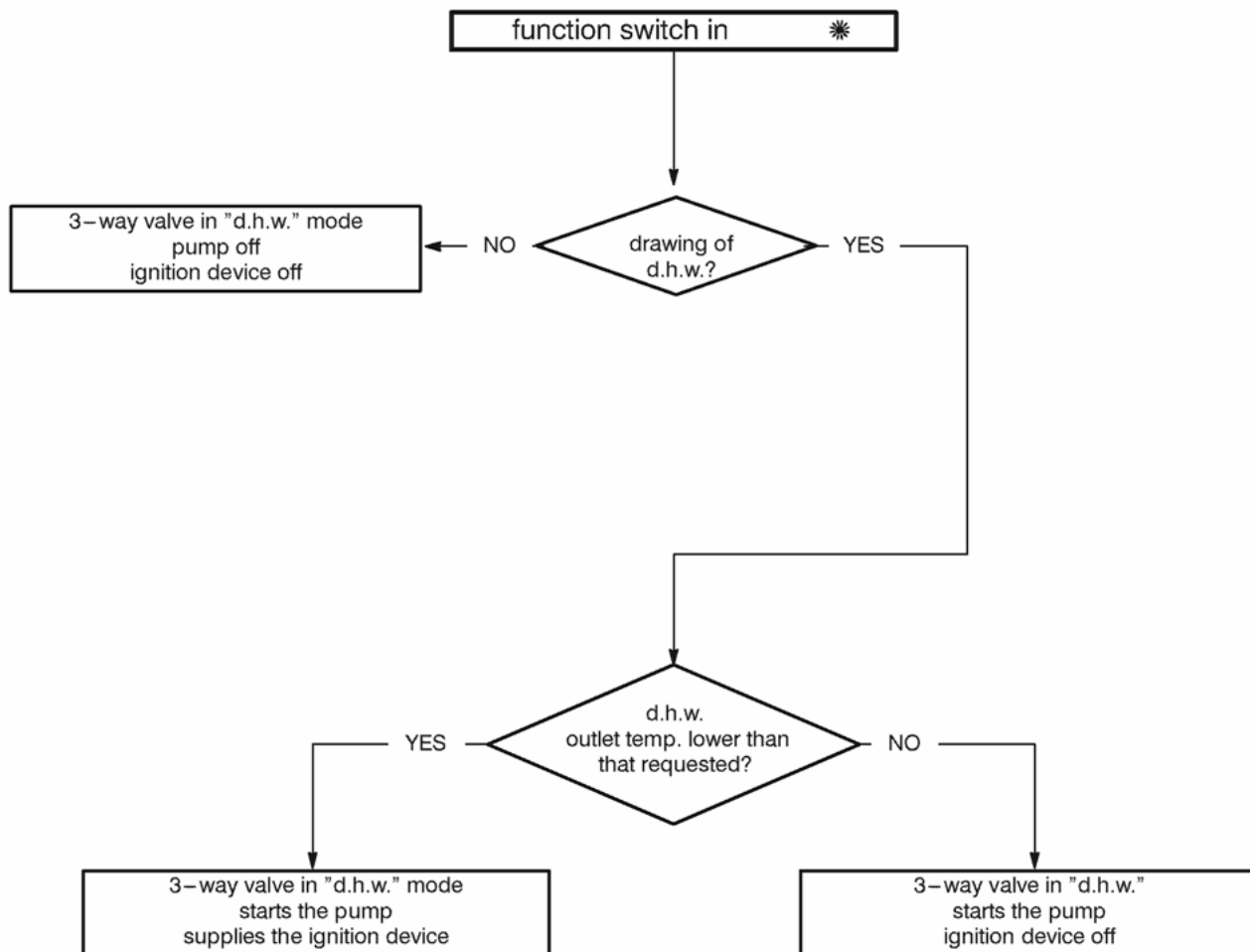


fig. 46

9.12 Heat control in function



10 Full sequence ignition device

10.1 Function

The flame ignition and control device used on electronic ignition boilers with forced flue gas expulsion 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 flue gas pressure switch.

The ignition device is supplied by the electronic control circuit when the ignition of the burner is requested.

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

The 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 ignition of the lock lamp and the device can be reset only by using the reset push-button placed on the instrument panel.

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

1. the intervention of the safety thermostat (primary hydraulic circuit)
2. a fault on gas feeding
3. faulty ignition (ignition electrode, its wiring and connection)
4. faulty flame detection (detection electrode, its wiring and connection)
5. gas injectors plugged
6. faulty gas valve (on-off operators) or not electrically supplied
7. faulty ignition device

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

[fig. 50](#) shows the sequence of the operations that are carried out at the starting of every ignition cycle and during normal functioning.

10.2 Checks

Lock sequence

Start the boiler until the burner is ignited.

With the burner on interrupt the gas supply. The device must carry out a complete ignition cycle and therefore 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.

Control of flue gas expulsion

With the boiler functioning with the burner on, open the 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 Remove the rear lid of the instrument panel, clearing it from the hooks placed in correspondence with the arrows printed on the lid ([see chapter access to and emptying hydraulic circuits](#)).

2 Delicately flex the hooks A in the directions indicated; unhook the control circuit and overturn it without disconnecting it from the wiring ([fig. 47](#));

fig. 47

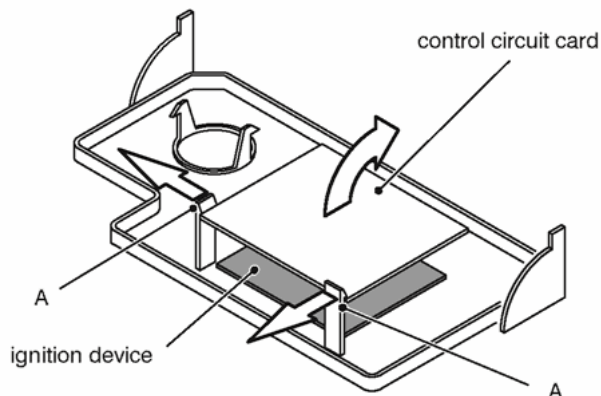


fig. 47

3 delicately flex the hooks indicated and disconnect the connectors ([fig. 48](#));

fig. 48

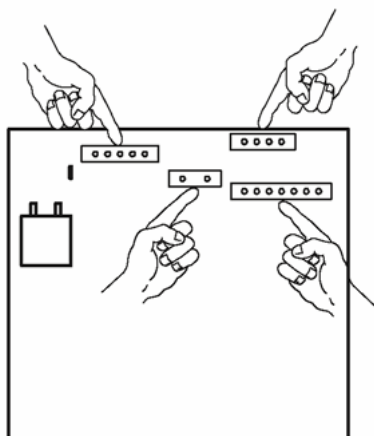


fig. 48

4 In similar fashion as the preceding flex the hooks B in the directions indicated; unhook and remove the ignition device ([fig. 49](#));

fig. 49

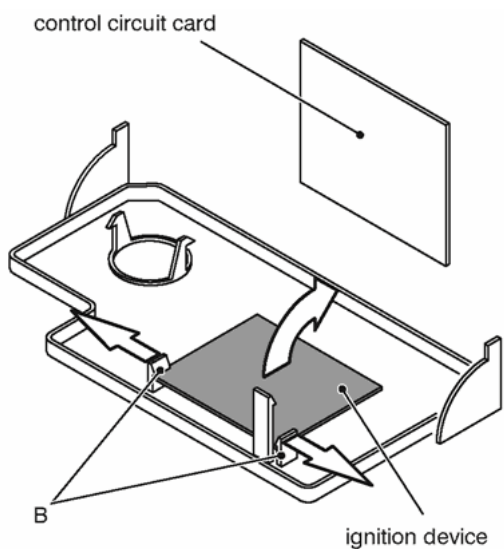


fig. 49

Reassemble the full sequence ignition device carrying out the removing operations in reverse order.

10.4 Ignition and control sequence

fig. 50

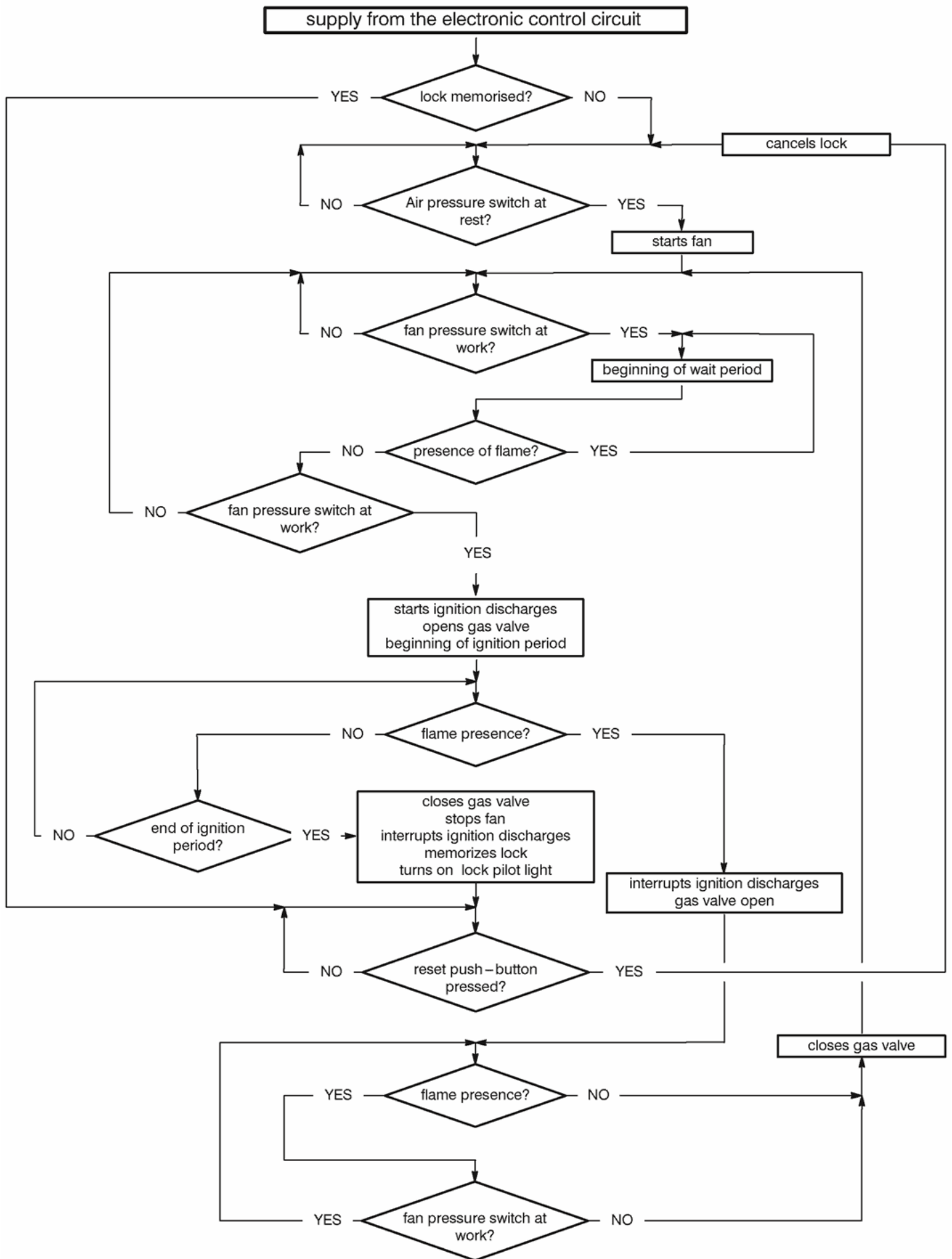


fig. 50

11 Gas valve

11.1 Function

The gas valve controls the gas inflow to the boiler burner.

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

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

11.2 Nomenclature of the parts

1. Lower on-off operator
2. Upper on-off operator
3. Electric connector of the on-off operator
4. Modulating operator
5. Electrical connectors of the modulating operator
6. Valve inlet gas pressure test point
7. Valve outlet gas pressure test point
8. Gas pressure maximum adjuster
9. Gas pressure minimum adjuster

11.3 SIT 827 Valve - adjustment

fig. 51

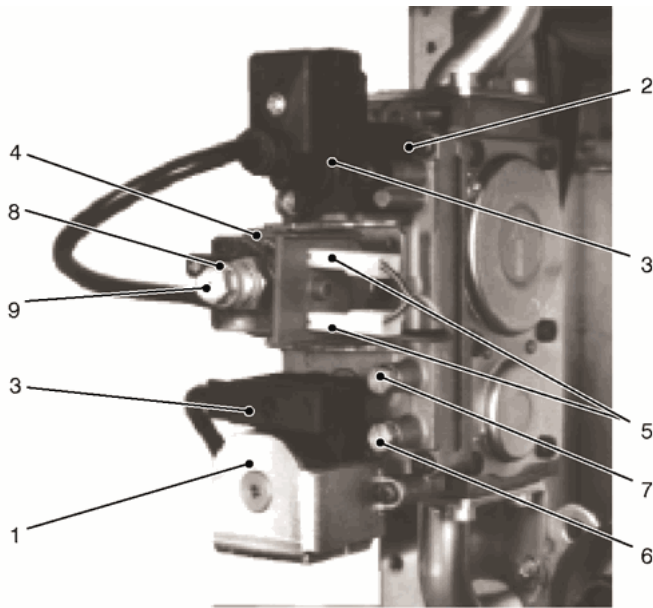


fig. 51

WARNING:

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

1. Open the gas pipe tap "6" at the inlet of the valve, connect a gauge and check the pressure of the supply network
2. Close the gas pipe tap "6";
3. Open the gas pipe tap "7" in the valve outlet and connect a gauge
4. Remove the protection hood from the max/min adjustment
5. Start the boiler at the maximum power
6. Rotate the maximum pressure "8" adjuster until you obtain the expected pressure (by rotating clockwise the pressure increases).
7. turn off the boiler and disconnect one of the two connectors "5" of the modulating operator
8. start the boiler
9. rotate the minimum pressure "9" adjuster until you obtain the expected pressure (by rotating clockwise the pressure increases)
10. Turn off the boiler, connect the modulating operator and disconnect the gauge

At the end of the adjustment ensure to seal the gas test point.

11.4 SIT 827 Valve - modulating operator

The cartridge of the modulating operator is preset to function within a precise field of pressures (range). The pressure field can be determined by the colour of the adjustment cartridge screw according to the table in [fig. 52](#).

fig. 52

Colour	Pressure range	Gas
white	2–20 mbar	natural
red	3–37 mbar	natural and L.P.G.
black	7–50 mbar	L.P.G.

fig. 52

Refer to this table during any gas conversion operations.

To replace the cartridge, remove the protection hood of the max/min adjustment and with a spanner rotate cartridge A counter-clockwise ([fig. 53](#));

fig. 53

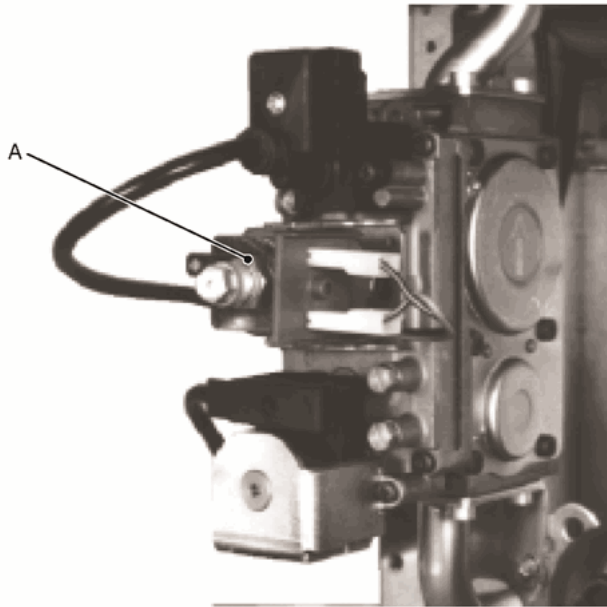


fig. 53

11.5 SIT 827 Valve - check

Check the electrical integrity

WARNING:

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

Disconnect the on-off operators and the modulating operator and measure the electrical resistance between the supply contacts.

Electrical resistance of the operators:

lower on-off operator: about 850 Ω

upper on-off operator: about 4000 Ω

modulating operator: about 125 Ω

11.6 SIT 827 Valve - removal

WARNING:

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

1. Remove the front panel, lower the instrument panel;
2. Remove the lower protection
3. Disconnect the on-off operators and the modulating operator
4. Remove the eight cylindrical head screws that fasten the valve to the flanges and remove the valve
5. Reassemble the valve carrying out the removal operations in reverse order.

Before closing the instrument panel rotate the coil of the modulating operator directing the electrical connectors completely upwards ([fig. 54](#)).

fig. 54

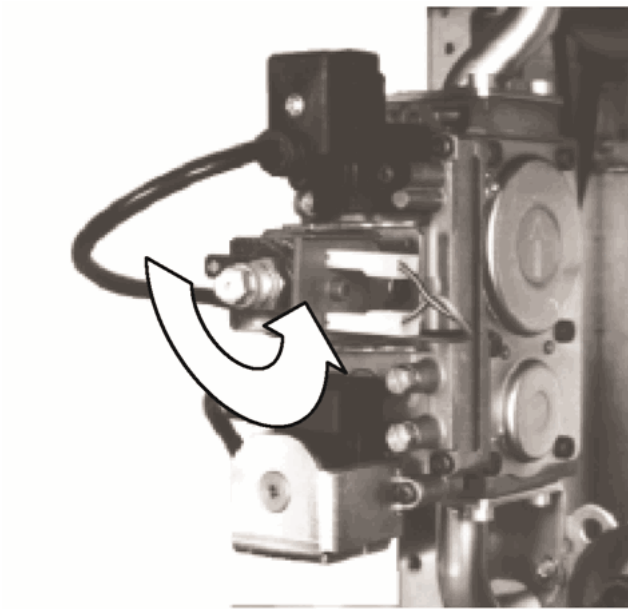


fig. 54

11.7 SIT 837-Valve - adjustment

fig. 55

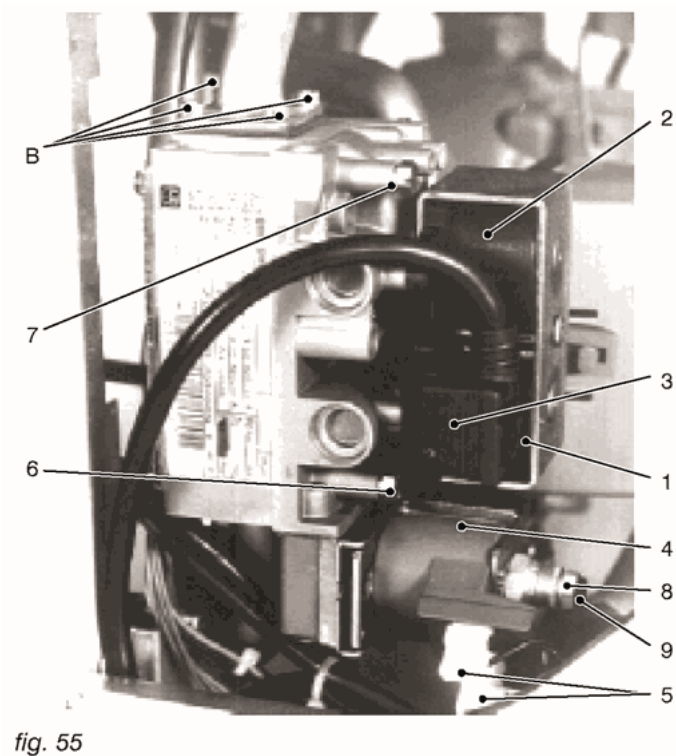


fig. 55

Proceed as described in [section 11.3](#).

11.8 SIT 837 Valve- modulating operator

For the adjustment field as well as for the replacement of the cartridge, refer to [section 11.4](#).

11.9 SIT 837 Valve-check

Check the electrical completeness

WARNING:

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

Disconnect the on-off operators and the modulating operator and measure the electrical resistance between the supply contacts.

The terminals of the connector "3" ([fig. 55](#)) are connected to the operators as illustrated in [fig. 56](#).

fig. 56

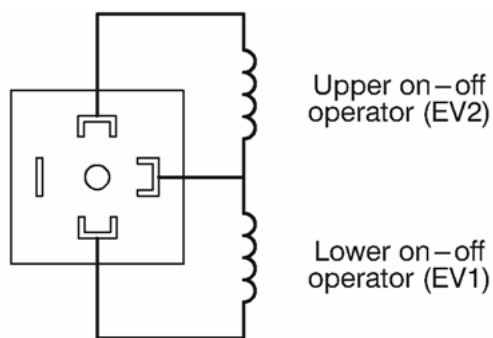


fig. 56

Electrical resistance of the operators:

lower on-off operator: about 900 Ω

upper on-off operator: about 900 Ω

modulating operator: about 125 Ω

11.10 SIT 837 Valve - removal

WARNING:

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

1. Remove the front panel, lower the instrument panel
2. Remove the lower protection
3. disconnect the on-off operators and the modulating operator
4. remove the four cylindrical head screws *B* (fig. 55) that fix the valve to the top flange
5. With a cross screwdriver completely unscrew screws *C* (in fig. 57 the right one is indicated) and remove the valve.
6. Reassemble the valve, carrying out the removal operations in reverse order

fig. 57

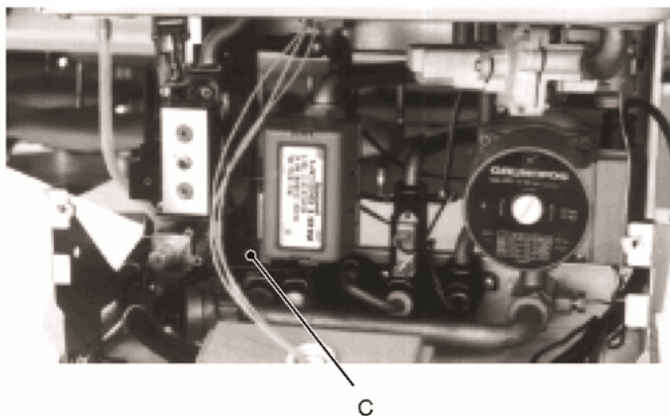


fig. 57

12 Main circuit flow switch

12.1 Function

The main circuit flow switch (A in fig. 58) is a device that controls the speed of water that crosses the main heat exchanger.

fig. 58

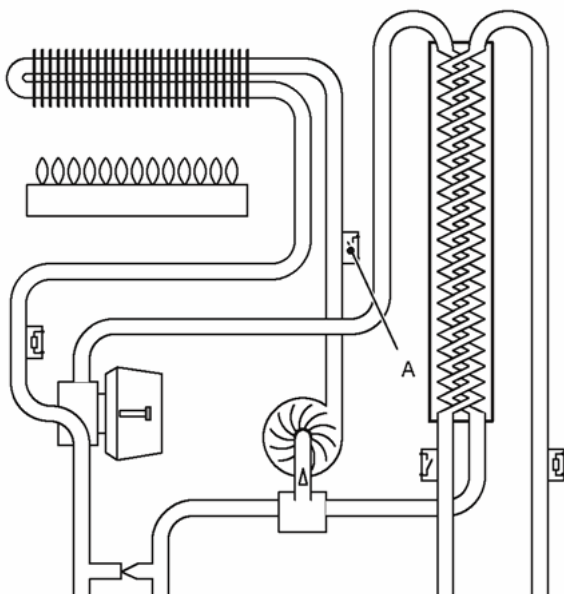


fig. 58

This device controls the regular functioning of the pump, the presence of water in the primary circuit of the boiler and the absence of obstructions of the main heat exchanger during the c/h function as well as during the d.h.w. function.

The main circuit flow switch is connected to the electronic control circuit and its intervention prevents or stops the burner ignition cycle but does not send the boiler in the lock state.

12.2 Checks

WARNING:

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

Electrical function

Remove the front panel of the boiler, lower the control panel and remove the lid *B* of the flow switch ([fig. 60](#)).

Disconnect the microswitch, remove it from the flow switch and check its electrical function.

If the microswitch works correctly, when the push-button *C* is released, the contact between the terminals indicated in [fig. 59](#) must be closed (electrical resistance zero Ω).

fig. 59

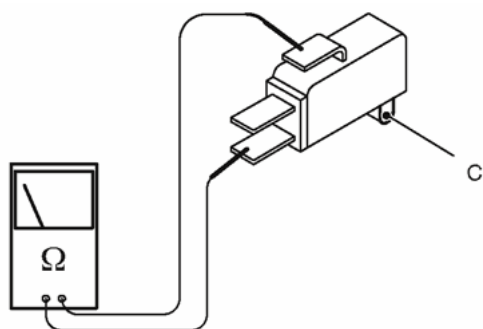


fig. 59

By pressing the push-button the contact must open.

Hydraulic connection

Remove the flow switch from the pipe ([see section 12.3](#)) and check that there are no obstructions in the channels that connect the flow switch chambers to the pipe. If necessary, clean the channels with a screwdriver having a suitable size, being careful not to damage the internal membrane of the flow switch. Check if there are any obstructions in the holes of the pipe.

12.3 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 front panel of the body, the right side panel and lower the control panel
- 3 Loosen the two screws *B* that hold the lid and remove the lid ([fig. 60](#));

fig. 60

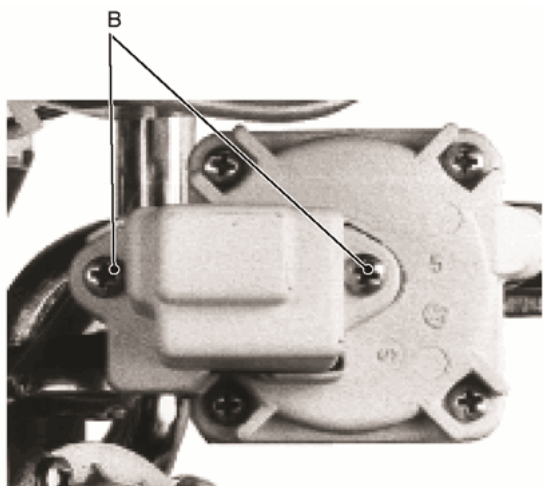


fig. 60

4 Disconnect the electrical terminals from the microswitch

5 Loosen the two screws *D* ([fig. 61](#)) and remove the flow switch body from the pipe

fig. 61

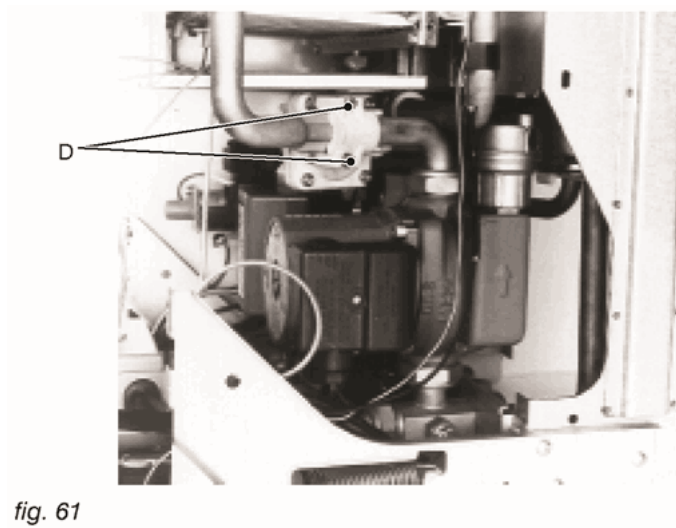


fig. 61

6 Reassemble the flow switch, carrying out the operations in reverse order being careful to make the reference engraved in the pipe correspond with the same reference on the body of the flow switch.

7 Connect the switch using the correct terminals ([fig. 62](#))

fig. 62

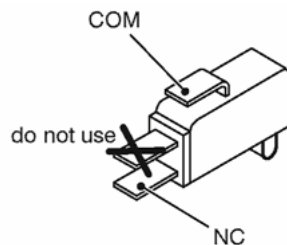


fig. 62

13 D.h.w. flow switch and filter

13.1 Function

The domestic hot water (d.h.w.) flow switch (*A* in [fig. 63](#)) is a device that sends an electric signal to the electronic control circuit at the moment in which hot water is drawn.

fig. 63

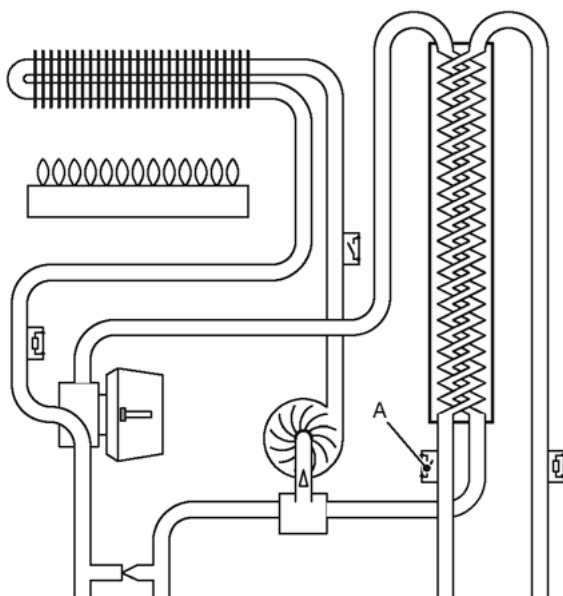


fig. 63

The device is part of the d.h.w. hydraulic body *B* ([fig. 64](#)).

fig. 64

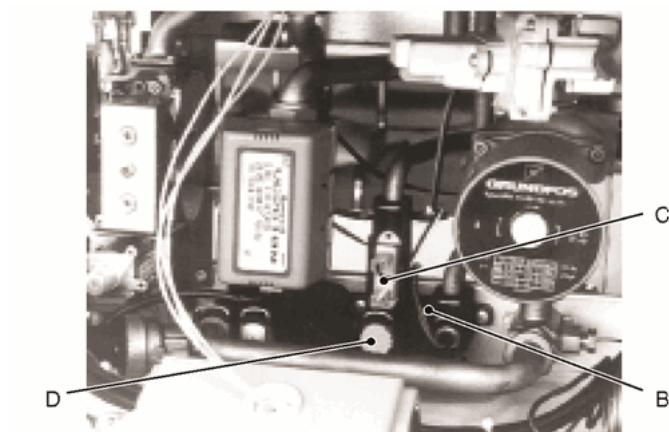


fig. 64

When the flow rate of the hot water drawn goes over about 2 litres/min', the float contained in the flow switch is dragged upwards and the magnet in it, getting closer to the external sensor *C* ([fig. 64](#)) closes the electric contact.

The d.h.w. filter is located behind the pipe fitting *D* ([fig. 64](#)) inserted. Its function is to stop the passage of any impurities through the d.h.w. circuit.

13.2 Check

WARNING:

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

electrical function

Remove the front panel of the boiler, lower the instrument panel and disconnect the connectors *E* ([fig. 65](#)).

fig. 65

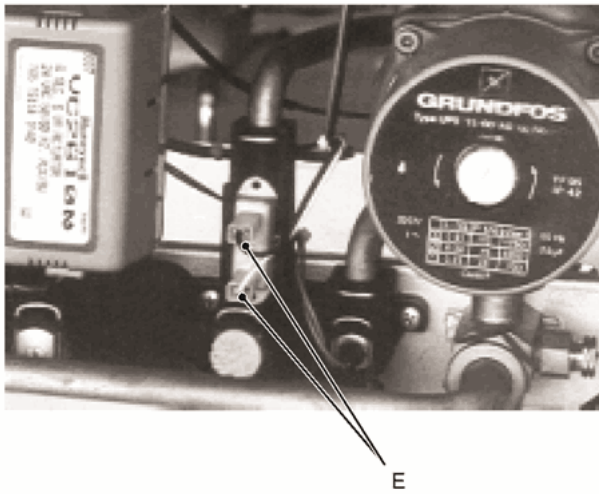


fig. 65

Measure the electrical resistance at the leads of the sensor. Without water being drawn, the contact must be open. By opening a hot water cock the contact must close (electrical resistance zero Ω).

13.3 Removal of the sensor

WARNING:

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

- 1 Remove the front panel of the boiler and lower the instrument panel
- 2 Close the d.h.w. inlet and outlet cocks and empty the d.h.w. circuit
- 3 disconnect the connectors *F* and remove the fork *G* ([fig. 66](#));
- 4 remove the sensor, extracting it upwards
- 5 assemble the sensor carrying out the removal operations in reverse sequence.

To facilitate the insertion of the sensor it is recommended to lightly lubricate its edges.

13.4 Removal of the float

- 1 Remove the front panel of the boiler and lower the instrument panel
- 2 Close the d.h.w. inlet and outlet cocks and empty the d.h.w. circuit
- 3 Remove fork *G*, the fork that holds the pipe *H* to the top plug of the d.h.w. heat exchanger ([fig. 66](#)) and remove the pipe in order to free the outlet hole of the flow switch.

fig. 66

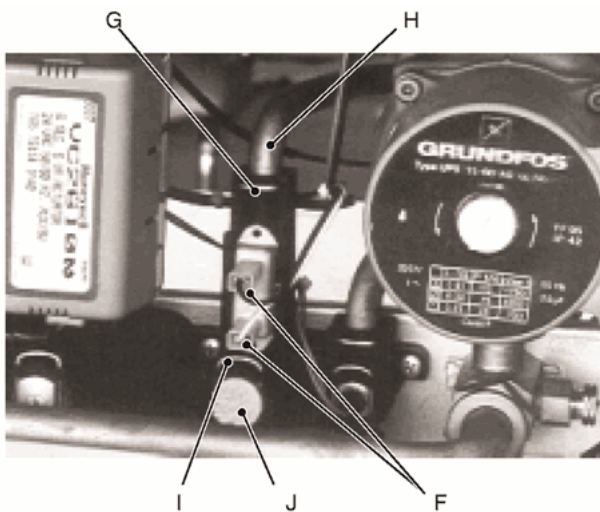


fig. 66

- 4 Remove the emptying plug placed under the flow switch and with a screwdriver having a suitable diameter push the float upwards through the emptying hole
- 5 Insert the float carrying out the removal operations in reverse sequence, keeping in mind the direction of the insertion ([fig. 67](#)).

fig. 67

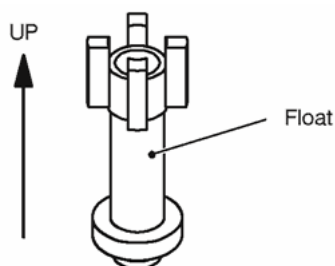


fig. 67

WARNING:

to lubricate the O-ring gaskets exclusively use a silicone base grease compatible to be in contact with foods and approved by the local water Authorities.

13.5 Removal of the filter

1. remove the front panel of the boiler and lower the instrument panel
2. close the d.h.w. inlet and outlet cocks and empty the d.h.w. circuit
3. Remove the fork I and remove the plug J ([fig. 66](#)).
4. extract the filter placed inside the hole at the base of the flow switch
5. insert the filter, carrying out the removal operations in reverse sequence

WARNING:

to lubricate the O-ring gaskets exclusively use a silicone base grease compatible to be in contact with foods and approved by the local water Authorities.

13.6 Flow limiter

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

Nominal flow rate (litres/min)	Colour
8	White
10	Black
12	Gray
14	Green
16	Yellow

To install the flow limiter operate as in the following sequence:

- 1 Remove the front panel of the boiler and lower the instrument panel
- 2 Close the d.h.w. inlet and outlet cocks and empty the d.h.w. circuit
- 3 Remove fork G, the fork that holds the pipe H to the top plug of the d.h.w. heat exchanger ([fig. 66](#)) and remove the pipe in order to free the outlet hole of the flow switch.
- 4 Remove the plastic cylinder K and replace it with the flow limiter L and the plastic gaskets M as shown in [fig. 68](#).

fig. 68

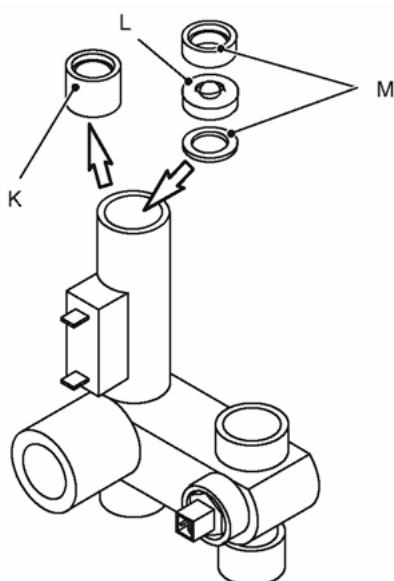


fig. 68

- 5 Reassemble the pipe H fixing it with the forks to the d.h.w. unit and to the d.h.w. heat exchanger.

14 Temperature probes

14.1 Function

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

The relation between temperature and electrical resistance is stated in [fig. 69](#).

fig. 69

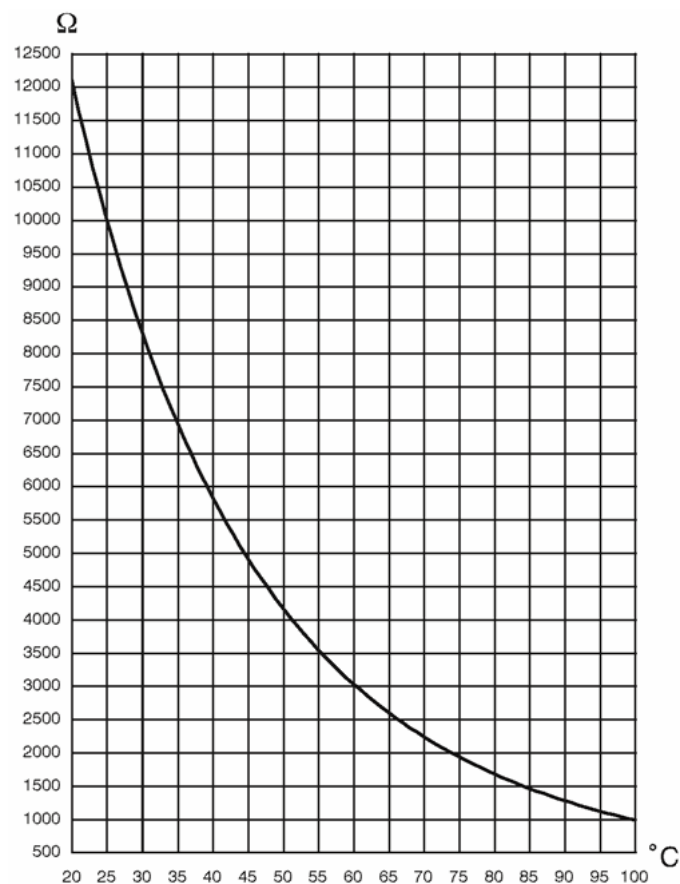


fig. 69

In the boilers with mixed function (c/h + d.h.w.) two temperature probes are assembled, one on the outlet pipe from the main heat exchanger (main circuit temperature probe) A, one at the outlet of the d.h.w. heat exchanger (d.h.w. temperature probe) B ([fig. 70](#)).

fig. 70

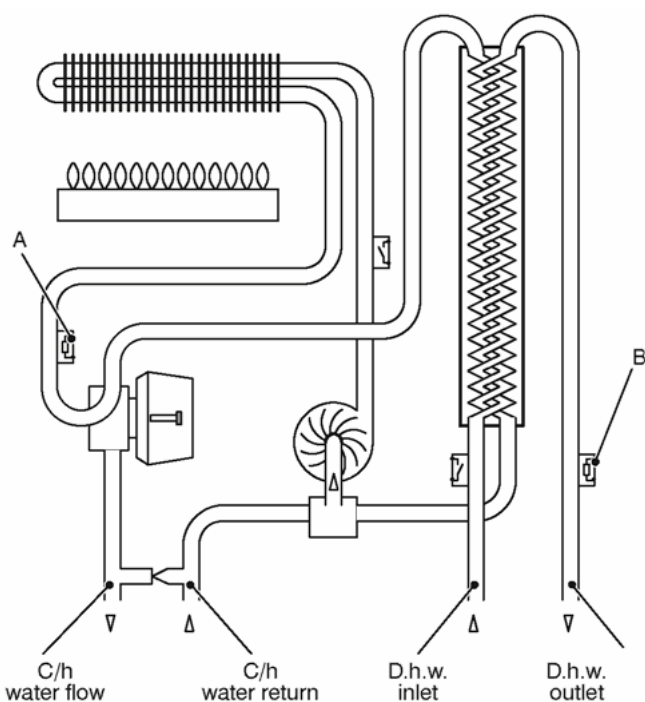


fig. 70

14.2 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 pipe near the temperature probe and check the electrical resistance according to the graph in [fig. 69](#).

Remember that a temperature probe failed in short circuit sends a signal to the control circuit at a temperature equivalent to 100°C. A disconnected or interrupted temperature probe sends a signal at a temperature equivalent 0°C thus the burner will always be on maximum power.

14.3 Removal of the main circuit temperature probe

WARNING:

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

1. remove the front panel of the body, the right side panel and lower the instrument panel
2. close the c/h water flow and return cocks and empty the primary circuit of the boiler
3. remove the electric connector of the temperature probe
4. Remove the fork, remove the temperature probe from the outlet pipe of the main heat exchanger
5. assemble the temperature probe carrying out the removal operations in reverse order.

14.4 Removal of the d.h.w. temperature probe

WARNING:

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

1. remove the front panel of the body, the right side panel and lower the instrument panel
2. Close the d.h.w. inlet and outlet cocks and empty the d.h.w. circuit of the boiler
3. Remove the electric connector C of the temperature probe ([fig. 71](#));
4. remove the fork D and remove the temperature probe from the d.h.w. hydraulic body
5. Assemble the temperature probe carrying out the removal operations in reverse order

fig. 71

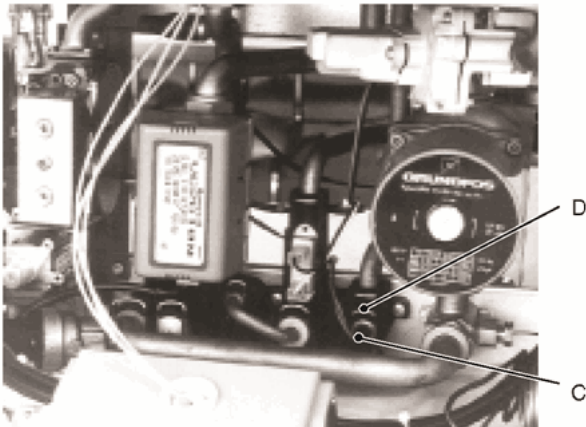


fig. 71

WARNING:

to lubricate the O-ring gaskets exclusively use a silicone base grease compatible to be in contact with foods and approved by the local water Authorities.

15 By-pass valve

15.1 Function

The by-pass valve is located between the c/h water flow and return (A in [fig. 72](#)) and its function is that of guaranteeing a minimum flow across the main heat exchanger also if the circulation across the c/h system is completely closed.

fig. 72

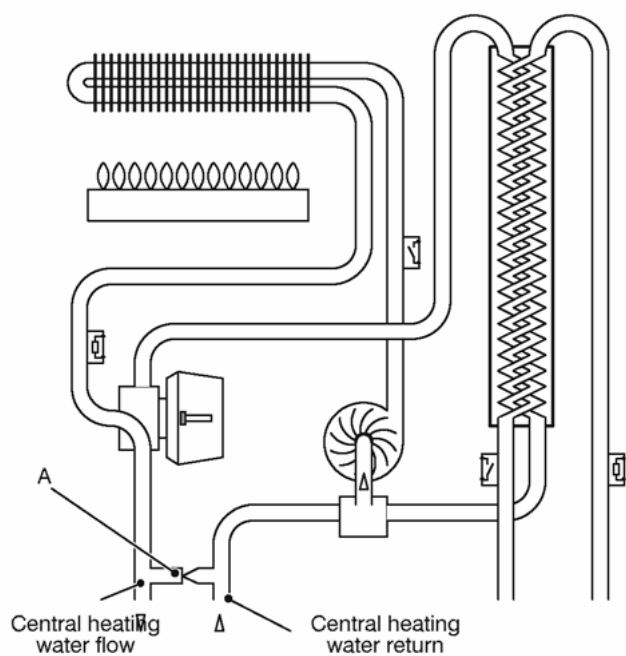


fig. 72

The by-pass valve is adjustable by using screw *B* (fig. 73); rotating it clockwise, the useful head given to the system increases.

fig. 73

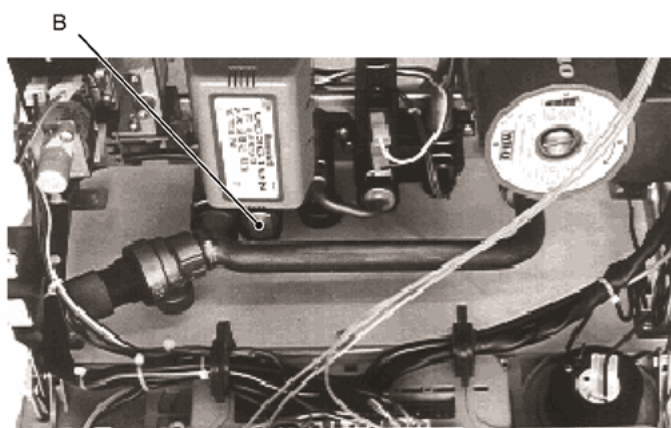


fig. 73

15.2 Adjustment

To ensure that the by-pass valve is suitably adjusted and carries out its function giving the c/h circuit the maximum useful head, proceed as follows:

WARNING:

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

- 1 remove the front panel of the body and lower the instrument panel.
- 2 Close the water flow and return cocks of the c/h circuit
- 3 completely rotate the adjustment screw of the by-pass counter-clockwise
- 4 remove the lid C of the c/h flow switch (fig. 74);

fig. 74

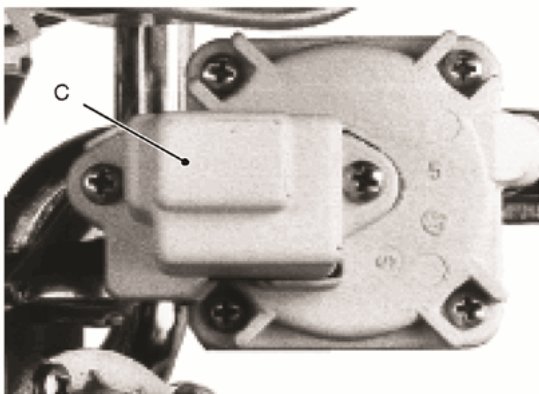


fig. 74

- 5 Start the boiler in c/h (the operation can be done with the gas supply closed and boiler locked).
- 6 Rotate the adjustment screw of the by-pass valve until the microswitch of the c/h flow switch clicks
- 7 Rotate the adjustment screw one turn counter-clockwise.

15.3 Removal

WARNING:

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

- 1 remove the front panel of the body and lower the instrument panel.
- 2 close the c/h water flow and return valves and empty the primary circuit of the boiler
- 3 remove forks *D* and *E* and completely loosen the pipe fitting *F* ([fig. 75](#));

fig. 75

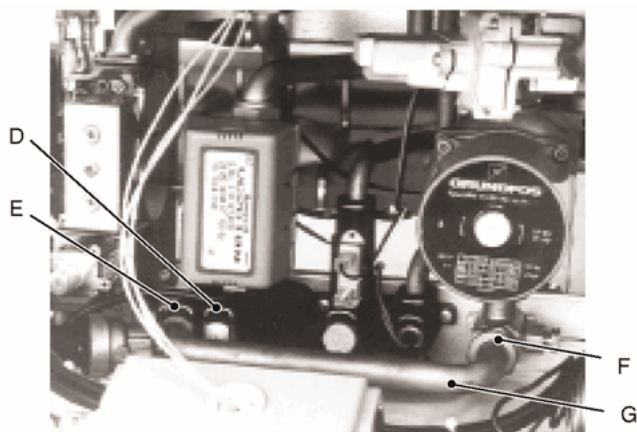


fig. 75

- 4 remove the pipe *G* and the by-pass valve
- 5 reassemble the valve carrying out the removal operations in reverse sequence.

WARNING:

to lubricate the O--ring gaskets exclusively use a silicone base grease compatible to be in contact with foods and approved by the local water Authorities.

16 Flue fan, venturi, air pressure switch

16.1 Function

Sealed chamber boilers have a fan whose function is that of forcing the expulsion of the products of combustion.

The fan is supplied by the flame ignition and control device at the beginning of the ignition cycle.

Its correct functioning is controlled by means of a system of a venturi device and air pressure switch.

Two different types of fans can be used ([fig. 76a](#) - [fig. 76b](#)).

fig. 76a

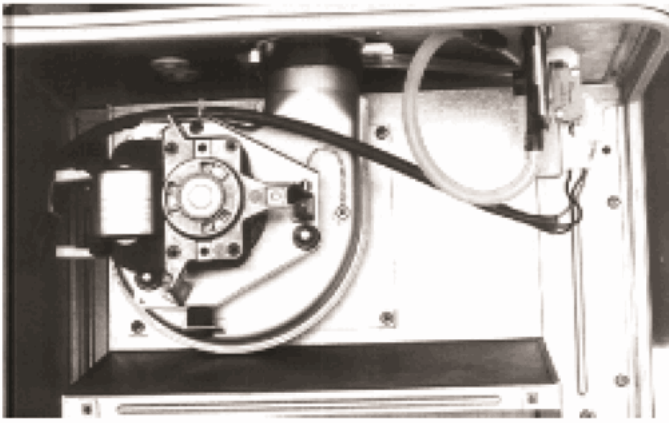


fig. 76a

fig. 76b

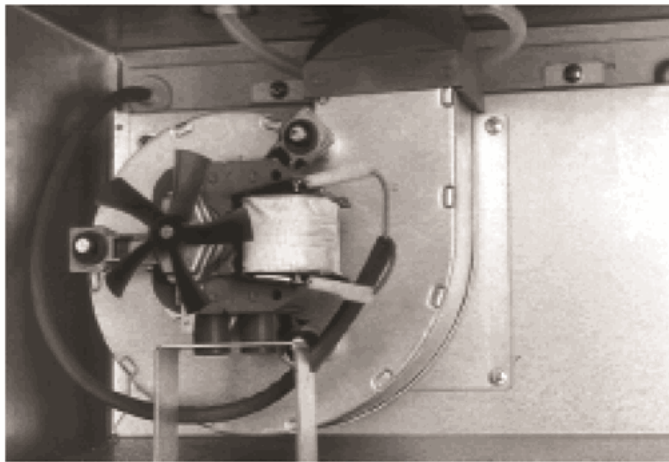


fig. 76b

16.2 Checks

Check the venture pressure

WARNING:

this test must be carried out with the lid of the sealed chamber cover correctly in place.

Remove the plug of the pressure test point A placed on the upper side of the boiler ([fig. 77](#)).

fig. 77

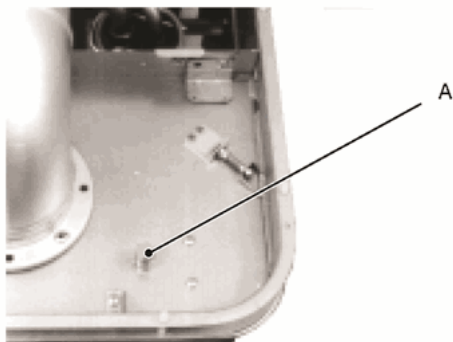


fig. 77

Connect a suitable pressure meter to the test point and run the boiler.

Measure the pressure (negative) and ensure that its absolute value is not less than the minimum indicated on the *Installation and Commissioning booklet* (technical data section).

Check of the fan

WARNING:

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

Remove the front panel of the body, the right side panel and the lid of the sealed chamber.

Disconnect the connectors *B* ([fig. 78](#)) and measure the electrical resistance of the motor.

fig. 78

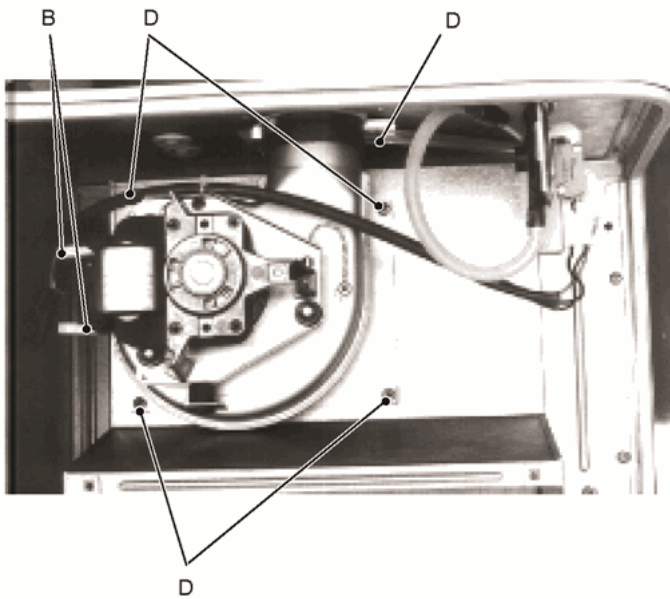


fig. 78

Electrical resistance of the motor:

fan of [fig. 76a](#) about 90 Ω

fan of [fig. 76b](#) about 40 Ω .

Check of the air pressure switch operation

WARNING:

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

Remove the front panel of the body, the right side panel and the lid of the sealed chamber.

With the boiler switched off disconnect the connectors *C* ([fig. 79](#)) and measure the electrical resistance of the contacts.

fig. 79

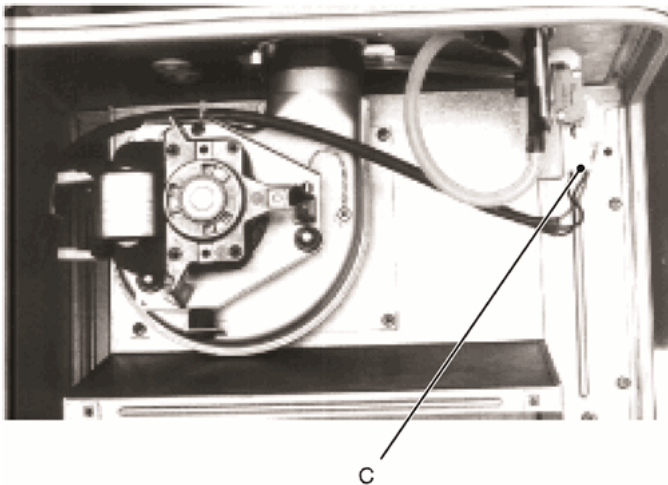


fig. 79

Between COM and NO the contact must be open.

The electrical resistance between COM and NC must be zero.

Without connecting the connectors *C*, run the boiler and measure again the electrical resistance of the contacts.

The electrical resistance between COM and NO must be zero.

Between COM and NC the contact must be open.

16.3 Removal of the fan and venturi device

WARNING:

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

1. Remove the front panel of the body, the right side panel and the lid of the sealed chamber
2. Disconnect the connectors *B* ([fig. 78](#));
3. Disconnect pipe *D* which connects the venturi device to the pressure test point
4. completely loosen the four screws *E* and remove the fan extracting it downwards
5. remove the venturi device from the outlet mouth of the fan
6. assemble the fan carrying out the removal operations in reverse sequence.

WARNING:

fitting the venturi device on the outlet mouth of the fan be sure to direct the internal pipe as shown in [fig. 80](#).

fig. 80

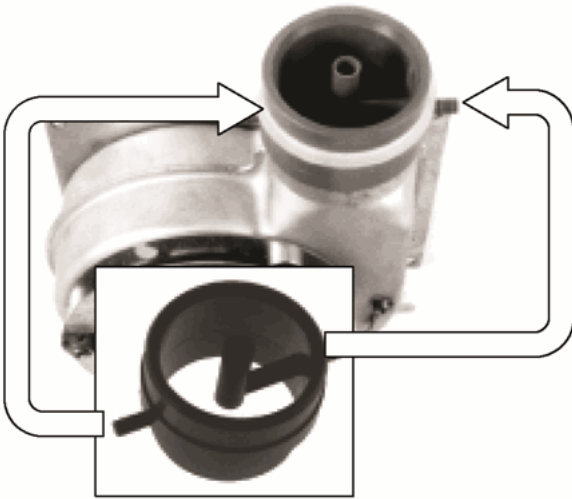


fig. 80

16.4 Removal of the air pressure switch

- 1 Remove the front panel of the body, the right side panel and the lid of the sealed chamber
- 2 Disconnect the connectors *F* ([fig. 81](#));
- 3 Disconnect pipe *G* ([fig. 81](#)) which connects the air pressure switch to the air pressure test point.

fig. 81

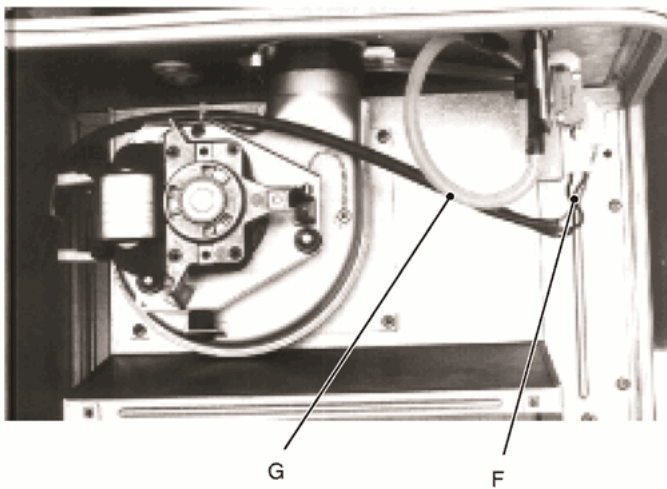


fig. 81

- 4 Unscrew the screws which hold the air pressure switch and remove it.
- 5 reassemble the air pressure switch carrying out the removal operations in reverse sequence.

WARNING:

*connect the pipe *G* ([fig. 81](#)) to the pressure connection of the air pressure switch marked "L" ([fig. 82](#)).*

Connect the electrical connectors to the air pressure switch as shown in [fig. 82](#)

fig. 82

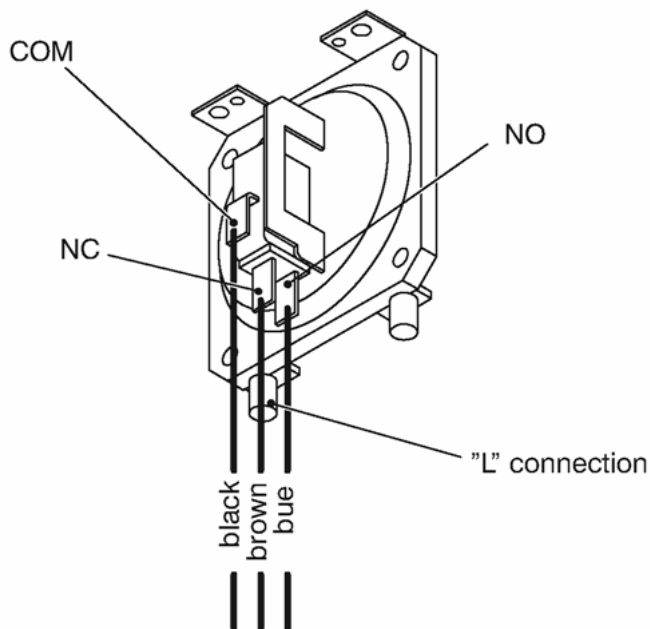


fig. 82

17 Ignition and detection electrodes

17.1 Function

Three electrodes are fitted on the burner. Two of them are the ignition electrodes and are fitted near the front part of the burner. The ignition sparks take place between their metallic edges 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. 83

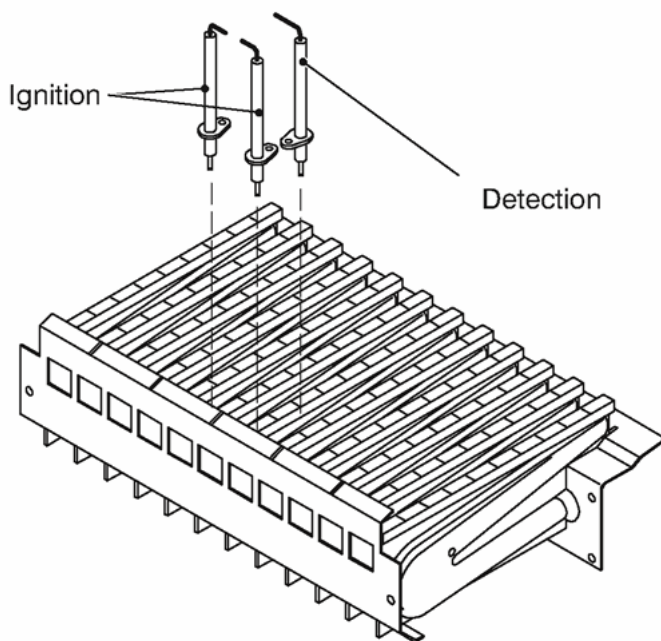


fig. 83

17.2 Checks

Check the position of the electrode edges

WARNING:

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

Remove the front panel of the body, the sealed chamber cover and the combustion chamber panel.

Check for the correct distance between the metallic edges of the ignition electrodes and refer it to the [fig. 84](#).

fig. 84

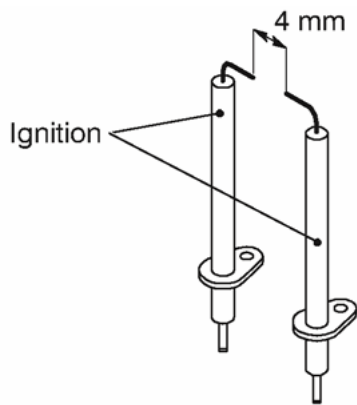


fig. 84

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.

Remove the front panel of the body, the lid of the sealed chamber and the cover of the combustion chamber.

Check for the integrity of the insulation of wires which connect the electrodes to the ignition device.

17.3 Removal

1 Remove the front panel of the body, the sealed chamber cover and the combustion chamber panel.

2 Remove the grid placed under the burner.

3 Remove the burner unscrewing the four screws placed at the right and left sides of the burner.

4 Unscrew the two screws A ([fig. 85](#)) which hold the electrodes to the burner.

fig. 85

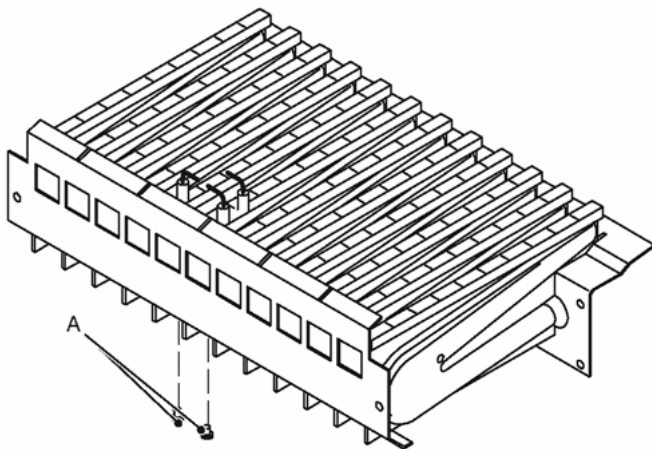


fig. 85

5 Extract the electrodes from the burner.a

6 Remove the rear cover of the instrument panel and disconnect the electrode wires.

7 Assemble the electrodes carrying out the removal operation in reverse order.

In order to recognize the electrodes refer to [fig. 86](#). Insert and fit the electrodes following the sequence indicated in the same figure.

NOTE:

the metallic edge of the detection electrode (indicated in [fig. 86](#)) is longer than the one of the ignition electrodes.

fig. 86

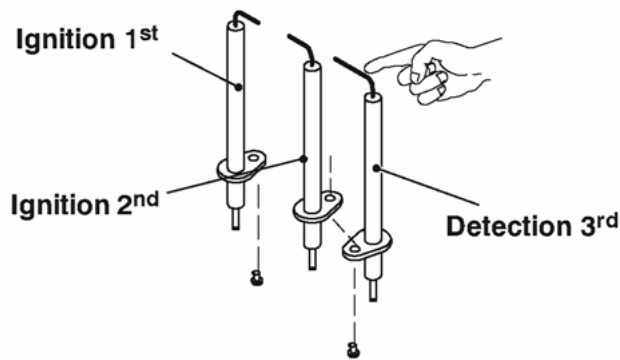


fig. 86

18 Safety thermostat

18.1 Function

The safety thermostat (A in [fig. 87](#)) is a device that senses the temperature of the main circuit water which flows in the outlet pipe of the main heat exchanger.

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

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

fig. 87

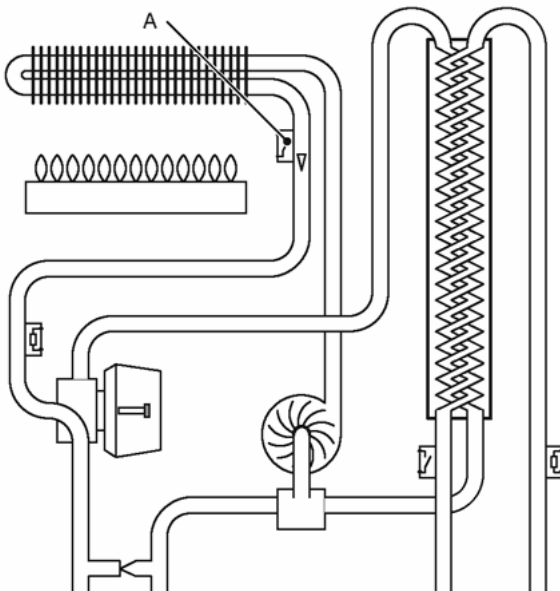


fig. 87

The safety thermostat does not re-set automatically. To reset, it is necessary to push the button B with the help of a tool on the instrument panel ([fig. 88](#)).

fig. 88

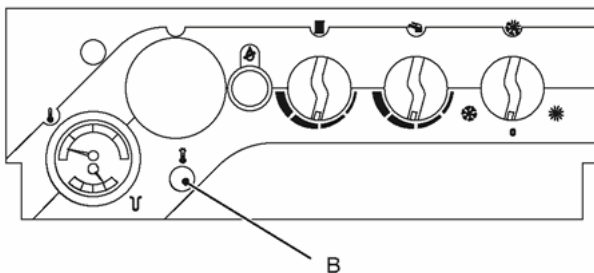


fig. 88

The safety thermostat has two parts:

- the temperature probe C which is fitted on the outlet pipe of the main heat exchanger ([fig. 89](#)) and the electric switch which is fitted on the instrument panel (B in [fig. 88](#));

- the switch *D* which is placed on the instrument panel ([fig. 90](#)).

fig. 89

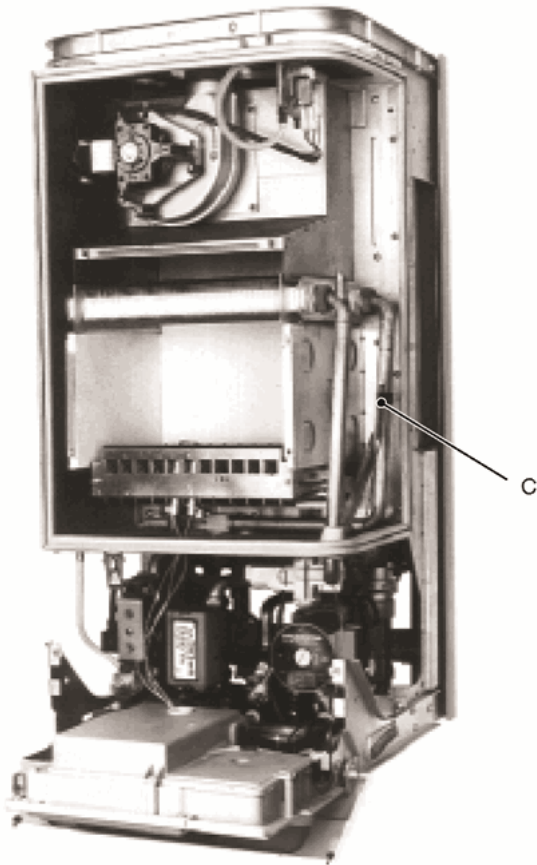


fig. 89

fig. 90

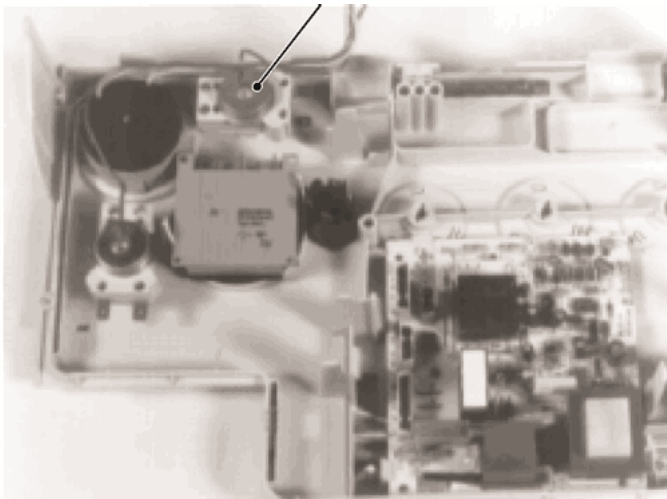


fig. 90

18.2 Checks

WARNING:

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

Position of probe and integrity

Remove the front panel of the body, the right side panel and the sealed chamber cover

Verify the soundness of the fitting between the main circuit pipe and the temperature probe *C* ([fig. 89](#))

Verify the integrity of the capillary which connects the probe to the switch. If the capillary is broken the switch opens automatically.

Overheat temperature value

Set the temperature control knobs to their max. position and run the boiler in d.h.w. and c/h. Allow the boiler to reach its maximum operating temperature (monitor the temperature gauge on the instrument panel). The boiler should operate and maintain a temperature below that of the safety

thermostat and no overheat intervention should occur.

It is not permissible to change the factory setting of the safety thermostat. The safety thermostat must be replaced if its operation temperature is too low and therefore constantly interrupts the correct functioning of the boiler and not allowing it to reach its maximum permissible operating temperatures.

Electrical function

Remove the rear lid of the instrument panel ([see chapter access to and emptying hydraulic circuits](#)).

Disconnect the switch and check its electrical function. Normally (no intervention) the contact must be closed (electrical resistance zero Ω).

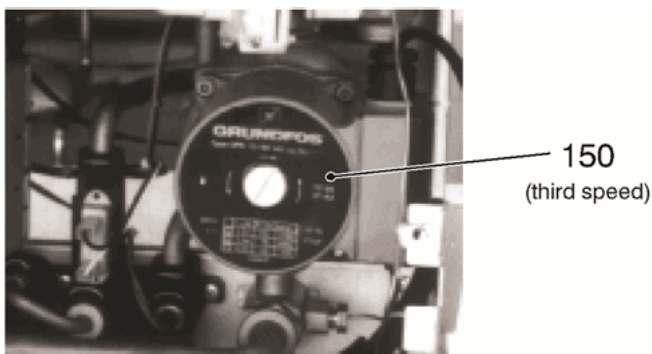
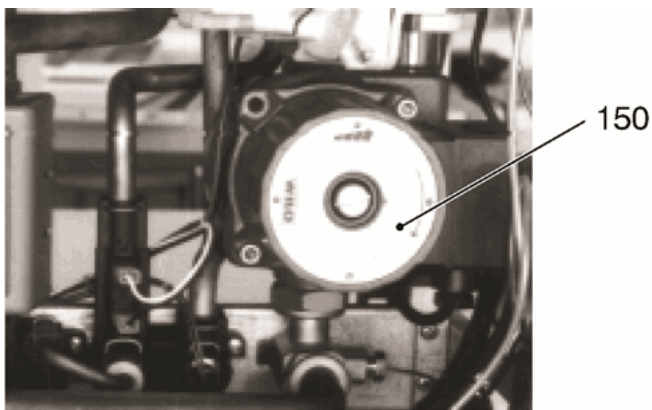
18.3 Removal

1. Remove the front panel of the body, the right side panel and the sealed chamber cover
2. Remove the spring which holds the temperature probe and extract the probe from the sealed chamber
3. Remove the rear lid of the instrument panel ([see chapter access to and emptying hydraulic circuits](#)).
4. Disconnect the switch
5. From the front side of the instrument panel unscrew the cylindrical nut which holds the switch and remove it.
6. Reassemble the switch carrying out the operations in reverse order.

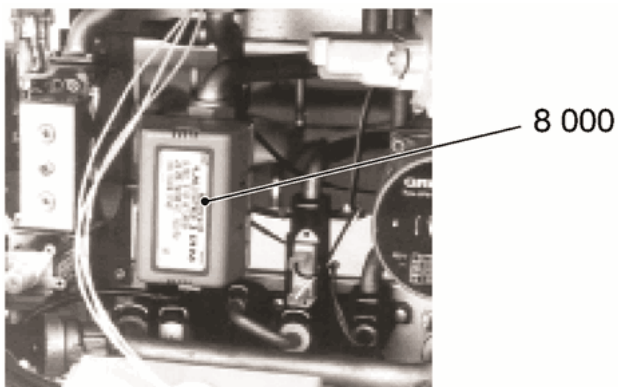
19 Electrical resistances

Summary of the electrical resistances in Ω of the components used in the appliances in the manual.

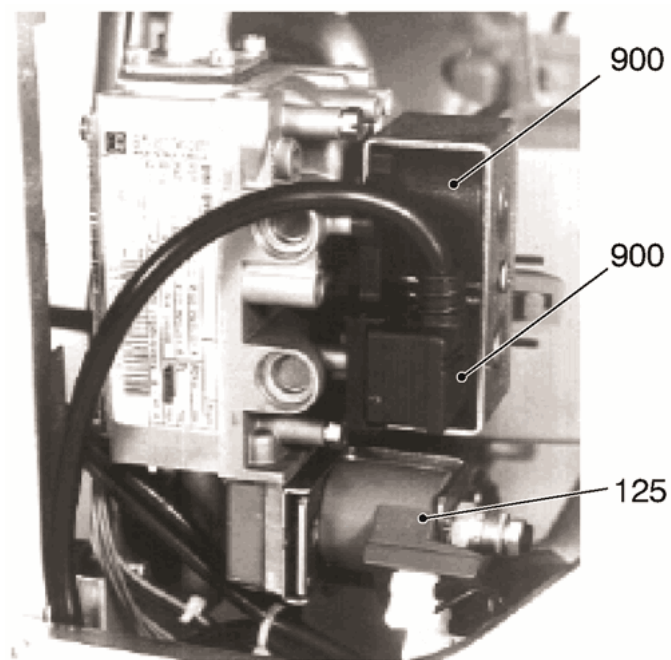
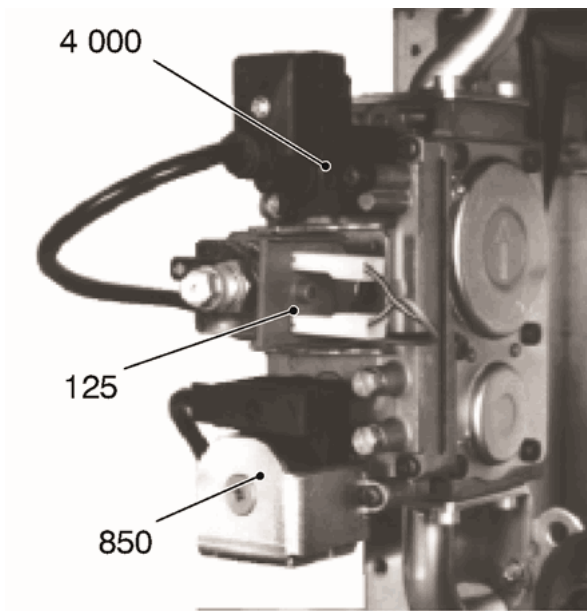
19.1 Circulator



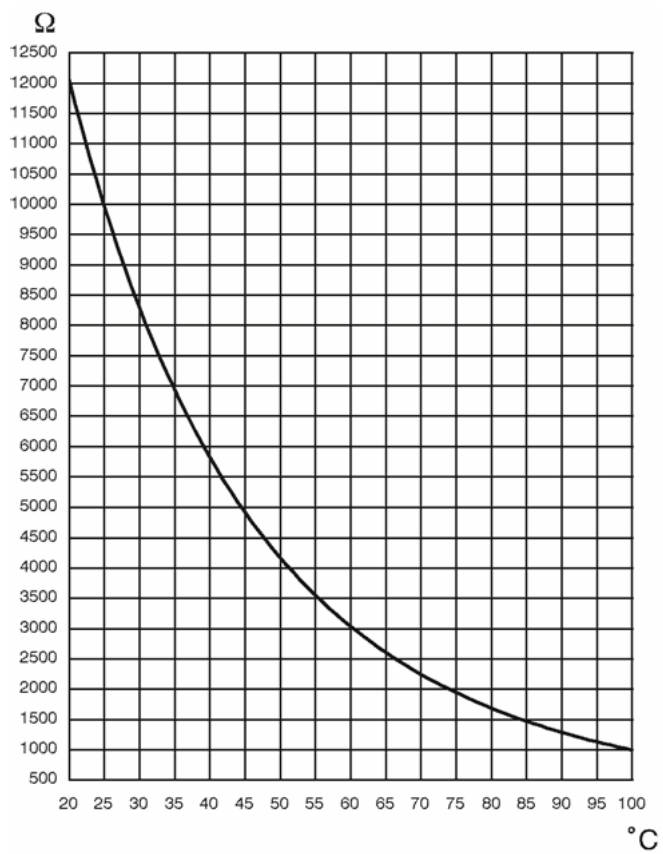
19.2 3-way valve



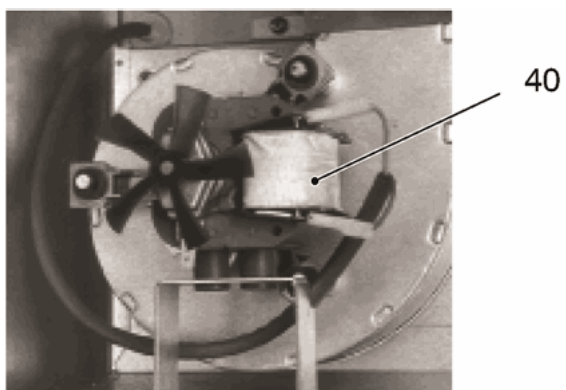
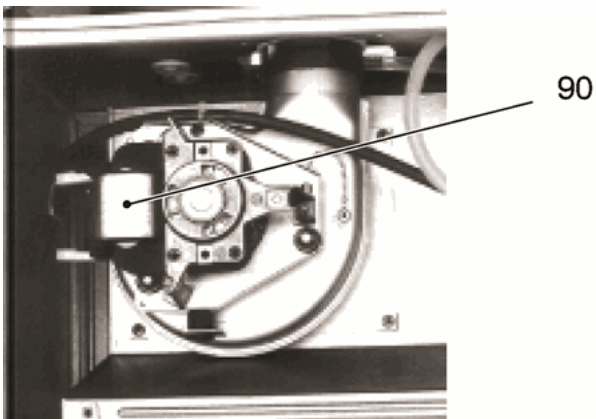
19.3 Gas valve



19.4 Temperature probes



19.5 Fan



20 Short spare parts list

