

*Heating and hot water for the professionals*

***Installation and Servicing Instructions***

***THEMA C 23***



THIS IS A CAT II2H3+ APPLIANCE

IN WARRANTY

**TECHNICAL HELPLINE**

**01773 828400**

***HEATCALL***

**01773 828100**



**Saunier Duval**

# INSTALLATION AND SERVICING INSTRUCTIONS

## THEMA C 23

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### Note!

The boiler serial number is marked on the label attached to the inside of the boiler. Refer to the '**Introduction**' section page 3 for a description of the basic functions of the boiler. To safely operate the boiler, refer to the Users Instructions.

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*Mandatory warning for CEE countries*

**Warning:** This appliance is designed, approved and inspected to meet the requirements of the English market. The identification plate located on the inside of the appliance **certifies the origin** where the product was manufactured and the **country** for which it is intended.

If you see any exception to this rule, please contact your nearest **Saunier Duval** dealer.

Thank you in advance for your assistance.

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# INTRODUCTION

The **THEMA C 23** boiler is a wall mounted combination boiler providing central heating and instantaneous domestic hot water.

The boiler is of the **II2H3+** category for use with Natural Gas (G20) as distributed in the United Kingdom, or with Butane or Propane gas (G30/G31) with the appropriate conversion kit.

Conversion kits:

Conversion	Part No.
Natural Gas (G20) to G30/G31	XXXXX

Boilers burning LPG or similar gases **MUST NOT** be fitted in basements or below ground level.



Diagram 1

The boiler is an atmospheric type boiler. This means that the air contained in the room where the boiler is installed, is used for burner combustion. It is essential, therefore, that installation of the boiler is in strict compliance with rules and standards currently in force for this type of boiler.

Both the central heating and domestic hot water temperature are user adjustable from the boiler control panel, **see diagram 1**.

Electrical components have been tested to meet the equivalent requirements of BEAB.

Domestic hot water demand always has priority over heating demand.

The boiler is designed for use as part of a sealed water central heating system with fully pumped circulation. The pump, expansion vessel and associated safety devices are all fitted within the boiler.

The installation must be carried out by a competent person in accordance with the relevant requirements of The Building Regulations, The Water Byelaws, The Building Standards (Scotland) Regulations and any applicable local regulations.

# DIMENSIONS

The boiler is delivered in two separate packages:

- The boiler
- The fixing jig

**Net weight:** 36kg  
**Gross weight:** 38kg

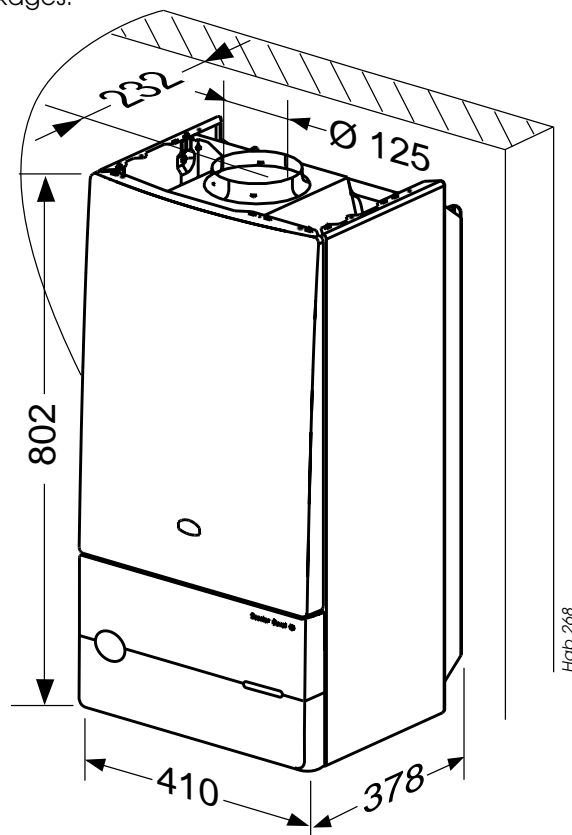


Diagram 2

# TECHNICAL DATA

Heating output	adjustable from 8,7 kW to 23 kW (30,000 Btu/H to 80,000 Btu/H)
Efficiency	81 %
Maximum heating temperature	90°C
Heating adjustment	30 °C to 87 °C
Expansion vessel effective capacity	6,5 l
Expansion vessel charge pressure	0,5 bar
Maximum system capacity at 75°C	140 l
Safety valve, maximum service pressure	3 bar
Flue diameter	125 mm
Hot water output	automatically variable from 8,7 kW to 23 kW (30,000 Btu/H to 80,000 Btu/H)
Operating threshold flow rate in domestic hot water mode	3 l/min
Maximum hot water temperature	65 °C
Specific flow rate (for 35°C temperature rise)	9,6 l/min
Minimum supply pressure	0,5 bar
Maximum supply pressure	10 bar
Maximum domestic hot water flow	12 l/min
Electrical supply	230 V
Maximum absorbed power	100 W

	Natural Gas (G20)	Butane G(30)	Propane G(31)
Burner injector	1,2 mm	0,70 mm	0,70 mm
Inlet pressure	20 mbar	28 mbar	37 mbar
Gas rate (maximum)	2,71 m³/h	2,02 kg/h	1,99 kg/h
Gas rate (minimum)	1,11 m³/h	0,83 kg/h	0,82kg/h

Heat output															
(kW)	8,7	10	11	12	13	14	15	16	17	18	19	20	21	22	23
(Btu/h)	29704	34142	37557	40971	44385	47799	51214	54628	58042	61456	64871	68285	71699	75113	78528

Heat input															
(kW)	11,6	13,1	14,2	15,3	16,4	17,5	18,7	19,9	21,1	22,2	23,4	24,6	25,6	26,8	27,9
(Btu/h)	39764	44631	48410	52326	56042	59742	63794	67819	71897	75872	79910	83836	87545	91412	95358

GAS		1,7	2,0	2,4	2,8	3,2	3,6	4,1	4,7	5,2	5,8	6,5	7,1	7,8	8,5	9,2
G 20	(mbar)	1,7	2,0	2,4	2,8	3,2	3,6	4,1	4,7	5,2	5,8	6,5	7,1	7,8	8,5	9,2
G 30	(mbar)	4,2	5,5	6,5	7,6	8,7	9,9	11,3	12,7	14,3	16,0	17,7	19,5	21,2	23,2	25,2
G 31	(mbar)	5,3	7,1	8,4	9,8	11,2	12,7	14,5	16,4	18,4	20,5	22,8	25,0	27,3	29,8	32,4

## Pump:

The performance of the pump varies according to the pump bypass setting, see diagram 3.

- 1 Bypass fully shut
- 2 Open 1/4 turn
- 3 Open 1/2 turn
- 4 Open 1 turn
- 5 Open 2 turns

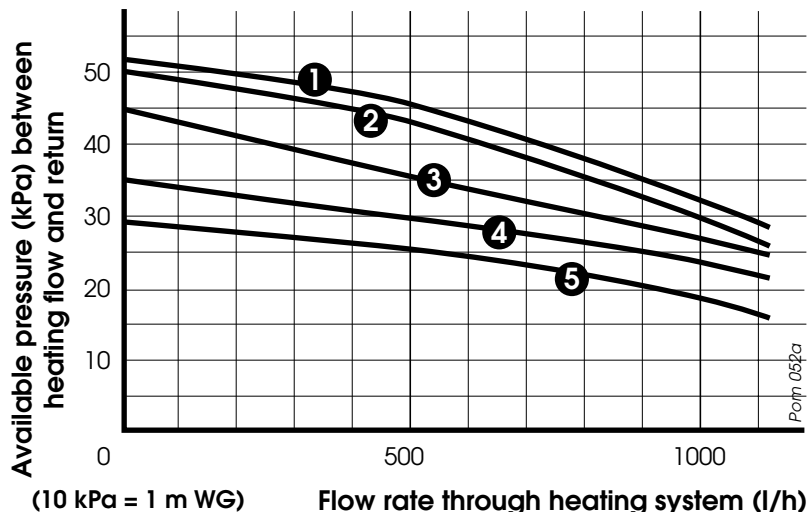


Diagram 3

# BOILER SCHEMATIC

- 1 - On button
- 2 - Off button
- 3 - Piezo igniter
- 4 - Central heating thermostat
- 5 - Domestic hot water temperature adjuster
- 6 - Temperature/pressure gauge
- 7 - Non-return valve
- 8 - Expansion vessel
- 9 - Pump
- 10 - Automatic air vent
- 11 - Burner
- 12 - Heat exchanger bleed pipe
- 13 - Heat exchanger
- 14 - Gas valve

- 16 - Overheat thermostat
- 17 - Ignition electrode
- 18 - Pilot
- 19 - High limit thermostat
- 21 - Loss of water switch
- 22 - Flue safety device

- A - Heating return
- B - Cold water inlet
- C - Heating flow
- D - Domestic hot water flow
- E - Gas supply

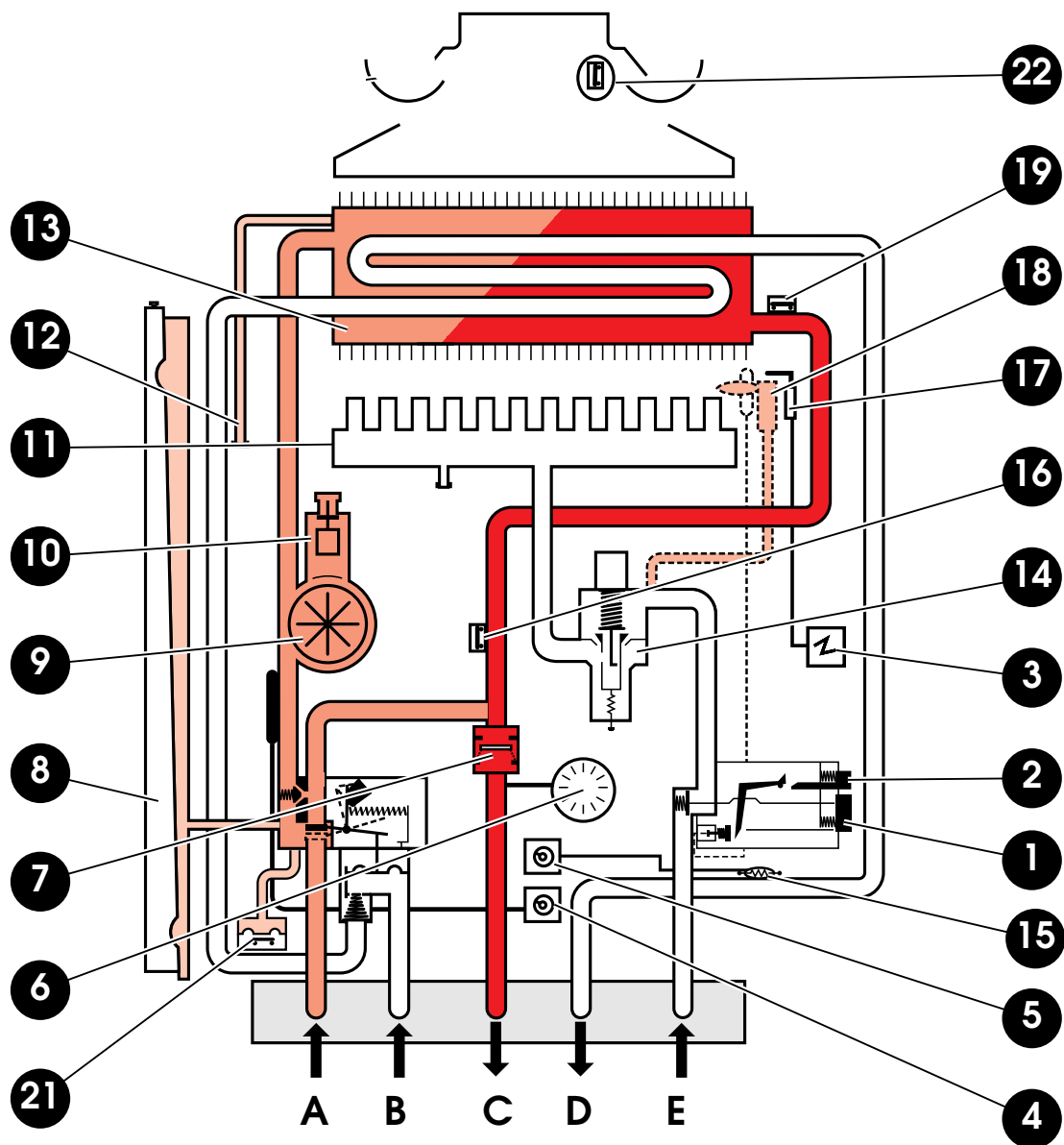


Diagram 4

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## FIXING JIG

From left to right, the fixing jig comprises:

- A - Heating return with isolating valve (m).
- B - Cold water inlet with isolating valve (p).
- C - Heating flow with isolating valve (q), drain screw (r) and safety valve (s).
- D - Domestic hot water out.
- E - Gas service cock.

### Filters and washers:

- 1 - Fibre washer
- 2 - Metal filter
- 3 - Flow regulator
- 4 - Plastic filter
- 5, 6 & 7 - Black graphite washers

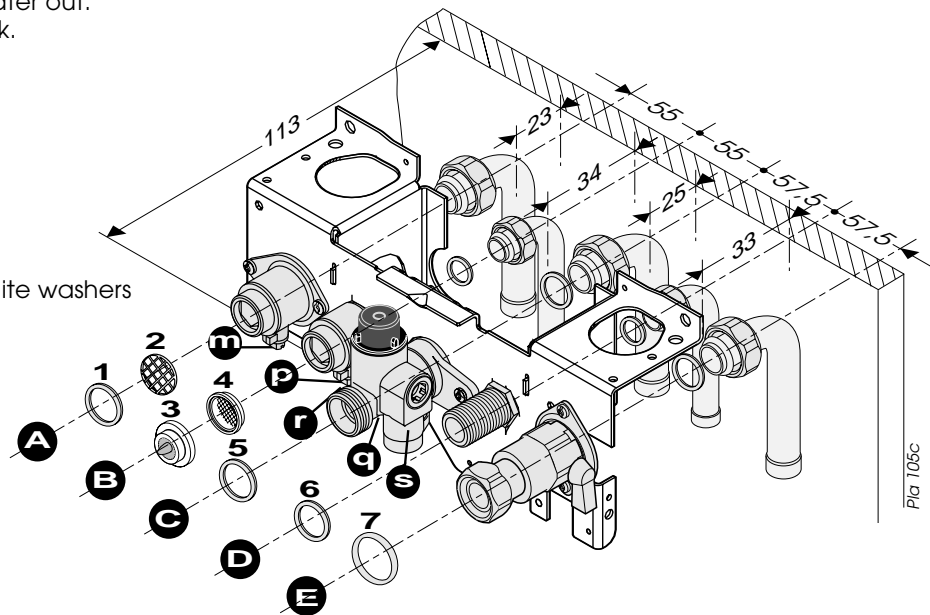


Diagram 5

## PIPING SYSTEM INSTALLATION

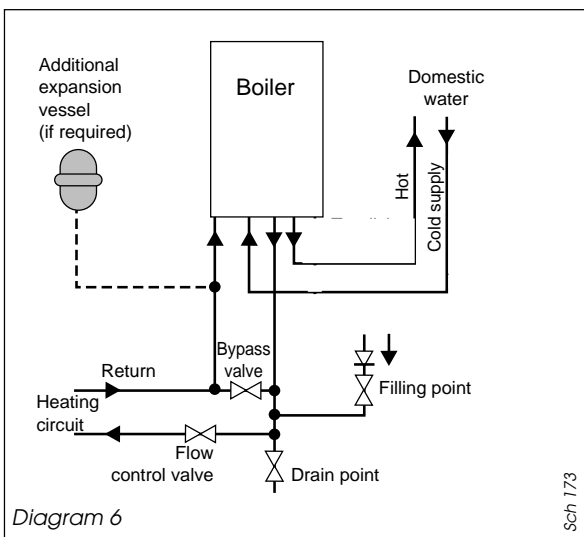
- Heating system connections - Pipe diam 22 mm
- Hot water system connections - Pipe diam 15 mm
- Gas connection - Pipe diam 22 mm
- Safety valve discharge - Pipe diam 15 mm

### Water connection

Connect the water pipes to the fixing jig using the copper tails supplied, **see diagram 5**.

**Warning:** To prevent damage to the isolating cocks, do not solder joints or fittings with the copper tails connected.

Connect the system pipework to the boiler observing the correct flow and return format as shown in **diagram 6**.



### Safety valve discharge

**WARNING.** It must not discharge above an entrance or window or any type of public access area.

Connect the safety valve discharge pipe to the boiler, the discharge must be extended using not less than 15 m o.d. pipe, to discharge in a visible position outside the building, facing downward preferably over a drain. The pipe must have a continuous fall and be routed to a position so that any discharge of water, possibly boiling or steam, cannot create any danger to persons, damage to property or external electrical components and wiring. Tighten all pipe connection joints.

### Gas connection

- The supply from the governed gas meter must be of adequate size to provide a constant inlet working pressure of 20 mbar (8 in w.g.).

To avoid low gas pressure problems, it is recommended that the gas supply is connected using 22 mm pipe.

- On completion, the gas installation must be tested using the pressure drop method and purged in accordance with the current issue of BS6891.

### Gas Safety (Installation and Use) Regulations

In your interests and that of gas safety, it is the law that ALL gas appliances are installed and serviced by a competent person in accordance with the above regulations.

## HEATING SYSTEM DESIGN

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- The **THEMA C 23** boiler is compatible with any type of installation.
- Heating surfaces may consist of radiators, convectors or fan assisted convectors.
- Pipe sectional areas shall be determined in accordance with normal practices, using the output/pressure curve (**diagram 3**). The distribution system shall be calculated in accordance with the output requirements of the actual system, not the maximum output of the boiler. However, provision shall be made to ensure sufficient flow so that the temperature difference between the flow and return pipes be less than or equal to 20°C. The minimum flow is 450l/h.
- The piping system shall be routed so as to avoid any air pockets and facilitate permanent venting of the installation. Bleed fittings shall be provided at every high point of the system and on all radiators.
- The total volume of water permitted for the heating system depends, amongst other things, on the static head in the cold condition. The expansion vessel on the boiler is pressurised at 1 bar (corresponding to a static head of 5 m w.g.) and

allows a maximum system volume of 140 litres for an average temperature of 75°C and a maximum service pressure of 3 bar. This pressure setting can be modified at commissioning stage if the static head differs. An additional expansion vessel can be fitted to the system if required, see **diagram 6**.

- Provision shall be made for a drain valve at the lowest point of the system.
- Where thermostatic radiator valves are fitted, not all radiators must be fitted with this type of valve, and in particular, where the room thermostat is installed.
- In the case of an existing installation, it is **ESSENTIAL** that the system is thoroughly flushed prior to installing the new boiler using a product such as **Ferrox** or **Sentinel**. Contact the product manufacturers for specific details.

### Filling the system

Provision must be made for filling the system at low level. The use of a WRC approved filling loop is strongly recommended, connected as shown in **diagram 6**.

## DOMESTIC HOT WATER SYSTEM DESIGN

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- Copper tubing or plastic Hep<sub>2</sub>O may be used for the domestic hot water system. Unnecessary pressure losses should be avoided.
- The boiler may operate with a minimum supply pressure of 0,3 bar but under a reduced flow rate.

Optimum performance will be obtained from a supply pressure of 1 bar.

- The flow restrictor must be fitted in the cold water inlet during installation.

## BOILER LOCATION

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### Clearances

The position of the boiler must be such that there is adequate space for servicing.

The recommended clearances are:

- 5 mm either side of boiler
- 300 mm above boiler
- 250 mm below boiler
- 450 mm in front of boiler

### Fixing jig

The fixing jig comprises three parts:

- 1) The connecting plate which allows the connection and soundness testing of all the pipework before the boiler is fitted and helps support the weight of the boiler.
- 2) The hook which supports the weight of the boiler.
- 3) The template which ensures the hook and connecting plate are correctly fitted relative to one another.

- Place template on wall in required position, making allowances for the necessary clearances etc.

**Note:** It is permissible to install the boiler with reduced clearances at the bottom and sides of the boiler PROVIDING that adequate consideration is given for Servicing/Repairs at a later date. If any doubt exists, contact the **Saunier Duval Technical Helpline 01773 828400**.

- Mark the position of the holes for the hook and connecting plate.
- Drill, plug and fix the connecting plate and hook to the wall using suitable screws.
- Check that both the hook and connecting plate are level.

If the boiler is not installed immediately, protect the various couplings to prevent any ingress of foreign materials e.g. plaster, paint etc.

## BOILER INSTALLATION

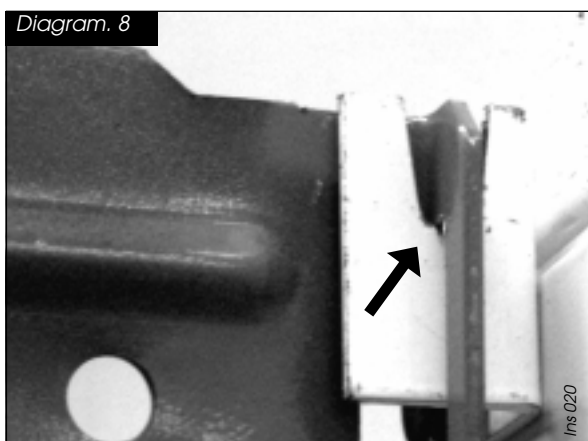
### Statutory requirements

The installation of this boiler must be carried out by a competent person in accordance with the relevant requirements of the current issue of:

The Gas Safety (Installation and Use) Regulations  
The Building Regulations  
The local water company Byelaws  
The Building Standards Regulations (Scotland)  
The Health and Safety at Work Act

### Sheet metal parts

**WARNING.** When installing or servicing this boiler, care should be taken when handling the edges of sheet metal parts to avoid the possibility of personal injury.

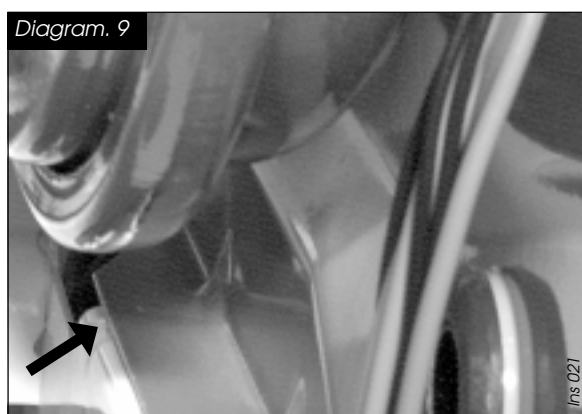


### Installing the boiler

Prior to starting work, the system must be thoroughly flushed so as to eliminate any foreign bodies and contaminants such as filings, solder particles, oil, grease etc.

**Note.** Solvent products could cause damage to the system.

- Engage boiler upper part onto the hanging bracket, **see diagram 8.**
- Allow the boiler to seat down onto support plate, **see diagram 9.**
- Fit filter and washers, strictly adhering to the sequential order and directions shown on **diagram 5.**
- Connect the various couplings between the boiler and the connection plate.



## ELECTRICAL CONNECTION

**Warning.** This boiler must be earthed  
All system components must be of an approved type.

Connection of the whole electrical system and any heating system controls to the electrical supply must be through a common isolator.

Isolation should preferably be by a double pole switched fused spur box having a minimum contact separation of 3 mm on each pole. The fused spur box should be readily accessible and preferably adjacent to the boiler. It should be identified as to its use.

A fused three pin plug and shuttered socket outlet may be used instead of a fused spur box provided that:

- a) They are not used in a room containing a fixed bath or shower.
- b) Both the plug and socket comply with the current issue of BS1363.

The mains electrical supply must be maintained at all times in order to provide domestic hot water. Do not interrupt the mains supply with a time switch or programmer.

**WARNING: ON NO ACCOUNT MUST ANY EXTERNAL VOLTAGE BE APPLIED TO ANY OF THE TERMINALS ON THE EXTERNAL CONTROLS CONNECTION PLUG.**

**Warning:** This appliance must be wired in accordance with these instructions. Any fault arising from incorrect wiring cannot be put right under the terms of the **Saunier Duval** guarantee.

### External controls

The **THEMA C** boiler is designed to operate at maximum efficiency at all times and will benefit by being connected to a programmable electronic room thermostat such as **Saunier Duval** part number 40010. Please contact your supplier.

The boiler will work for heating without a room thermostat and/or timeswitch being connected provided that the wire link fitted between the two terminals of connector **(E)** is left in place, **see diagram 10.**

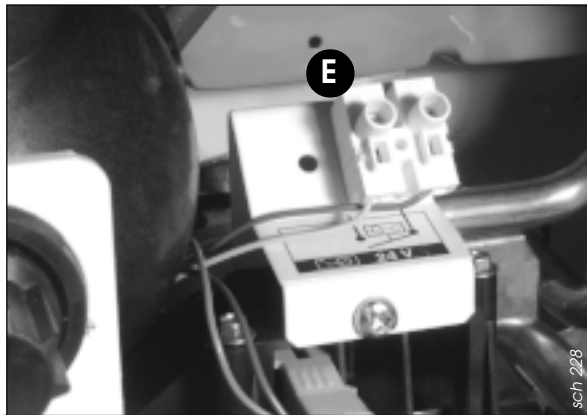
A 230V room thermostat can be used but do not make any connection to the compensating resistor.

**ON NO ACCOUNT** must any electrical voltage be applied to any of the terminals of the external controls plug.

Should any doubt exist about connecting external controls, contact the **Saunier Duval Technical Helpline 01773 828400.**



## ELECTRICAL CONNECTION



The mains electrical cable is supplied with the boiler. It is coiled and tucked inside the boiler

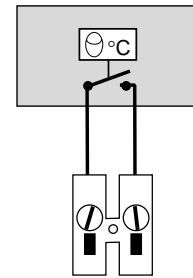
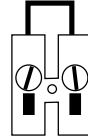


Diagram 10

### THEMA C 23

When fitting room thermostat, remove wire link (E) and connect voltage free thermostat as shown

For no external controls leave wire link (E) in place



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## COMMISSIONING

The commissioning and first firing of the boiler must only be done by a competent person.

### Gas installation

It is recommended that any air is purged from the supply at the gas inlet test point on the lower right hand side of the gas valve, **see diagram 11**.

### Filling the system

- Open shut off valves, **see diagram 12** (slot of screw corresponds to flow direction), and cap on automatic air vent on top of pump.
- Bleed each radiator until a continuous jet of water is obtained.
- Do not close automatic air vent cap on boiler.
- Open various hot water taps to bleed system.
- Make sure that pressure gauge reads between 1 and 2 bar. Re-pressurise system as necessary.

### Important:

- If this procedure is not carried out properly, the boiler will go into safety lock-out until all of the air has been purged.
- When venting air from boiler, do not touch the schrader valve on the expansion vessel, it is NOT a vent.
- Before starting the boiler, turn the pump impellor to make sure it is free to move.
  - Unscrew black cap on front of pump.
  - Using screwdriver, push in pump spindle and turn pump impellor 3 to 4 times. **DO NOT HIT SPINDLE**. Replace black cap.

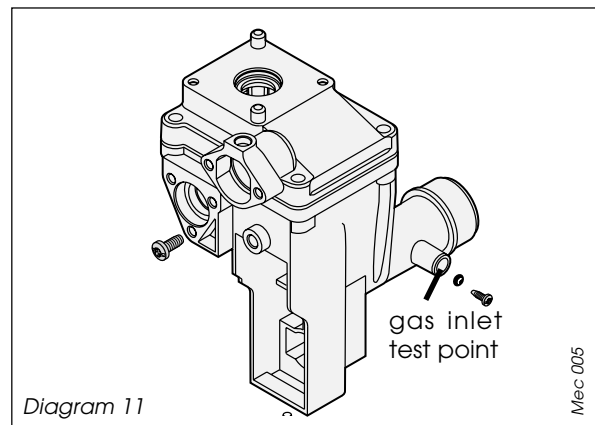


Diagram 11

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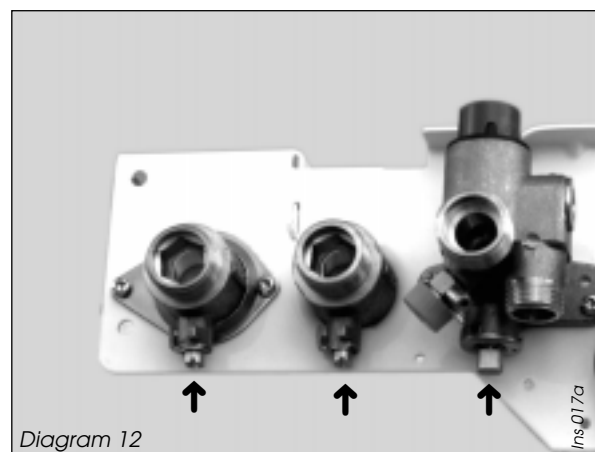


Diagram 12

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# COMMISSIONING

## Starting the boiler

Before starting the boiler check that:

- The gas meter tap is open.
- The boiler gas service cock is open.
- The boiler is connected to the electrical supply.

## First starting up

- Following the instructions given in the '**Controls and Lighting**' section, set boiler to run in central heating mode.
  - Set boiler thermostat for maximum temperature and check that any external controls, if fitted, are calling for heat.
  - Allow the temperature to rise to the maximum value, with all radiator valves open. The temperature rise will cause release of the gases contained in the water of central heating system.
  - Gases driven towards the boiler will be automatically released through the automatic air vents.
  - Gases trapped at the highest point of the system must be released by bleeding the radiators.
- On reaching maximum temperature, the boiler should be turned off and the system drained as rapidly as possible whilst still hot.

- Refill system to a pressure of 1 bar and vent as before.
- Restart boiler and operate until a maximum temperature is reached. Shut down boiler and vent heating system. If necessary, top up heating system and make sure that a pressure of 1 bar is indicated on the pressure gauge when system is COLD.

## Gas pressures

The main burner pressure should be checked during commissioning to make sure the correct input is obtained. Proceed as follows:

- Shut down boiler.
- Undo screw on burner pressure test point below sealed combustion chamber, **see diagram 14**.
- Connect a suitable pressure gauge.
- Gain access to the rear of the control panel and locate the range rating adjuster screw, **see diagram 13**.
- Start boiler as described in '**Instruction for Use**'.
- Set boiler thermostat to maximum and check that any external controls are calling for heat.
- Check that the reading on the gauge matches that given in '**Technical Data**' for the type of gas being used.
- Adjust the range rating adjuster screw as necessary to obtain the desired input.
- Shut down boiler.

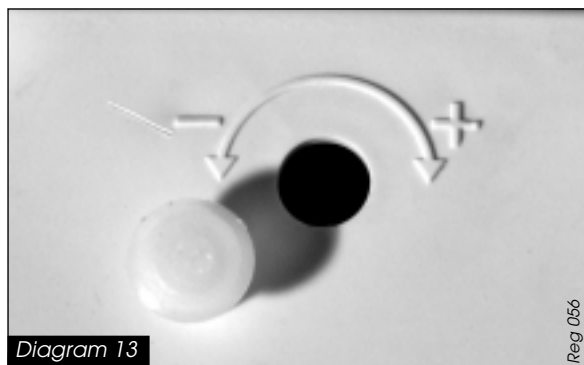


Diagram 13

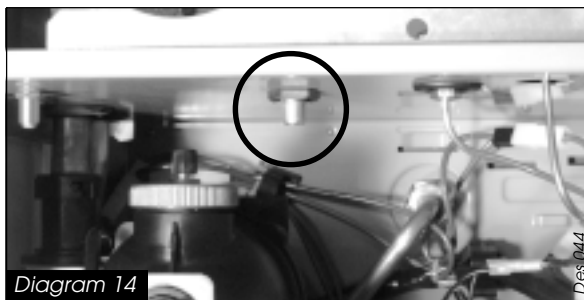


Diagram 14

- Remove pressure gauge, tighten up test point screws and check for gas soundness.
- Using a ball point pen, clearly indicate on the data label the input the boiler is set to.

**Note:** This adjustment does not affect the domestic hot water output.

If measured burner pressure differs greatly from the given figure, check the gas inlet pressure as follows:

- Shut down boiler.
- Remove screw from inlet test point on the side of the gas valve, **see diagram 11**.
- Connect a suitable pressure gauge.
- Start boiler as described in '**Instructions for Use**'.
- Check that the inlet pressure reading matches that given in '**Technical Data**' for the type of gas being used.
- Shut down boiler.
- Remove pressure gauge, tighten up test point screws and check for gas soundness.
- If the gas pressure is incorrect, refer to the Fault Finding section in '**Servicing Instructions**'.
- If the inlet pressure is below that given, the gas supply pipework/meter must be checked and any fault corrected.
- In the case of an LPG installation, check the storage tank or cylinder, regulator and pipework.

## SAFETY DEVICES

### Flue safety device

If an obstruction, even partial, of the flue occurs, for any reason whatsoever, the built in flue safety device will turn the boiler OFF and the warning LED on the boiler control panel will light. If this occurs, contact your Installer/Service Provider.



**Important notice:** Under no circumstances must the flue safety device be bypassed or removed. Any repairs on the flue safety device must be carried out by a qualified engineer using genuine replacement parts only.

### Air in the heating system

Persistent air in the heating system may indicate leaks in the system or corrosion taking place. Call your Installer/Service Provider.

### Gas leak or fault

If a gas leak or fault exists or is suspected, turn the boiler off and consult the local gas undertaking or your Installer/Service Provider.

### In case of power supply failure

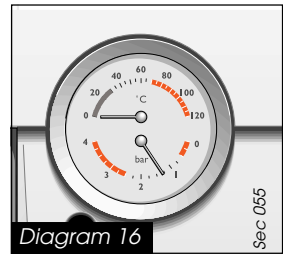
The boiler no longer operates. As soon as power supply is restored, the boiler will be automatically restarted.

**Important notice:** A central heating system cannot operate satisfactorily unless it is properly filled with water and unless the air initially contained in the piping systems has been properly bled off. If these conditions are not satisfied, air noise will occur within the system.

### In case of loss of water in the system

**CAUTION.** The boiler is installed as part of a sealed system which must only be drained and filled by a competent person.

If the pressure shown on the pressure gauge, **see diagram 16**, is less than 1 bar, the system must be filled up immediately. Call your Installer/Service Provider.

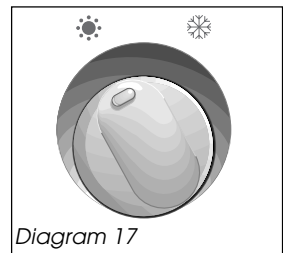


### Overheat safety

In the event of a problem, the overheat safety device cause safety shutdown of the boiler. If this happens, call your Installer/Service Provider.

### Frost protection

The **THEMA C 23** boiler has a built in frost protection device that protects the boiler from freezing. If the boiler is to be left and there is a risk of frost, ensure that the gas and electrical supplies are left connected and that the Summer/Winter switch is in the 'Summer' position.



The frost protection device will light the boiler when the temperature of the boiler water falls below 6°C. When the temperature reaches 16°C, the boiler stops.

**Note:** This device works irrespective of any room thermostat setting and only protects the boiler.

## SETTINGS

### Bypass

The built-in bypass must be adjusted according to the requirements of the system. Refer to the flow rate/pressure curve (**diagram 3**). The boiler is supplied with the bypass open half a turn. It is adjusted by turning the bypass screw, **see diagram 18**. Turn the screw clockwise to close the bypass.

When using thermostatic radiator valves (TRV's), it is advisable to fit a separate, adjustable bypass of 15 mm minimum diameter between the flow and return connections of the heating circuit. Any bypass must be fitted before system controls.

### Pump operation in heating mode

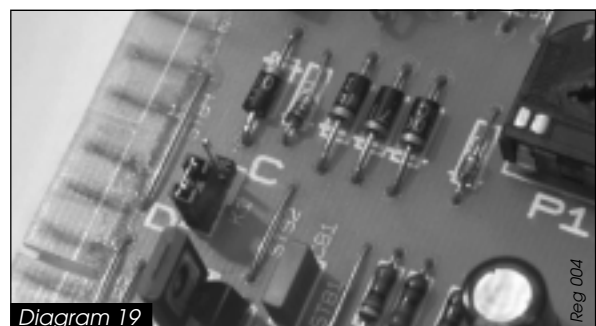
The PCB can be set to operate the pump in two ways, **see diagram 19**.

#### Position D: Intermittent pump operation.

With the jumper set to position 'D', the pump will operate during operation of the room thermostat.

#### Position C: Continuous pump operation.

With the jumper set to position 'C', the pump will operate continuously.



## CHANGING GAS TYPE

Should it become necessary to change the gas type, a modification kit will be required. This modification must only be carried out by a suitably qualified engineer.

Conversion: Natural Gas (G20) to G30/G31

Part No. XXXXX

Conversion: Natural Gas (G20) to G130

Part No. XXXXX

## ROUTINE CLEANING AND INSPECTION

To ensure the continued efficient and safe operation of the boiler it is recommended that it is checked and serviced at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but in general once a year should be enough.

It is the law that any servicing is carried out by a competent person.

### Service Check and Preparation.

- Operate boiler and check for any faults that need to be put right.
- Isolate boiler from the gas and electrical supplies.
- On completion check all gas carrying parts for soundness with leak detection fluid.
- Remove boiler casing as follows:

### Upper front panel

- Hinge down control cover to gain access to control panel.
- Disengage the two 'quarter turn' fasteners by turning the heads of the screws a quarter of a turn towards the centre of the boiler.
- Carefully lower the panel down on its hinge until it is horizontal.
- Turn both plastic catches to release upper front panel.
- Remove upper front panel by pulling forward at the bottom and lifting off.

### Side panels

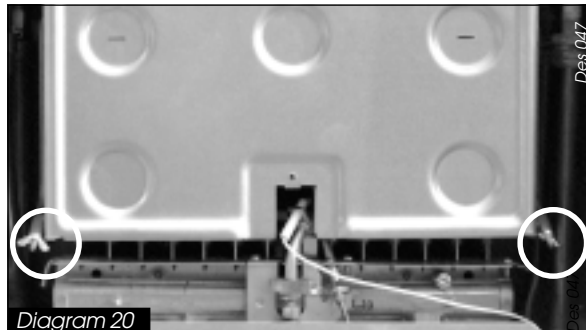
- From below boiler, unscrew and remove black plastic screws securing side panels to the boiler.
- Prise out black plastic inserts and lift panel off boiler.

### Combustion chamber

- Loosen two wing nuts on combustion chamber cover.
- Disengage retaining lugs from holes in either side of combustion chamber and move rods away to clear combustion chamber sides, **see diagram 20**.
- Unclip two toggle clips holding upper part of combustion chamber in place.
- Holding both sides, pull chamber forward to release it from underside of heat exchanger and out of boiler.
- Take care not to damage insulation material on inside faces of combustion chamber.

### Cleaning the burner

- Pull off lead to ignition electrode.
- Disconnect pilot pipe to pilot burner.
- Unclip pilot burner and remove.
- Remove pilot injector from pilot burner. Examine and clean as necessary.



- Undo main gas supply nut from main burner.
  - Unscrew and remove locking nut from both main gas connection and burner pressure tapping point.
  - Lift front edge of burner until tapping point and gas supply connection are free. Remove burner from boiler taking care to retain both fibre washers and seal on gas supply for use on reassembly.
  - Unscrew and remove two injector bar retaining screws and separate injector bar from burner.
  - Examine and clean injectors as necessary.
- Note:** Do not use a wire or sharp instrument on the holes.
- Replace burner in reverse order to removal.

### Heat exchanger

- After removal of burner, examine heat exchanger for any blockages or build up of deposits.
  - Clean using soft brush or vacuum cleaner.
- Important:** Take care not to scratch, or otherwise damage, painted surface of heat exchanger.

### Reassembly of parts removed for servicing

- Replace all parts in reverse order to removal.

### Flue system

- Inspect flue system to make sure all fittings are secure.
- Carry out checks to make sure flue is operating safely and efficiently.

### Cold water inlet filter

- Drain down hot water circuit of boiler as follows:
  - Close isolating valve on cold water inlet connection on fixing jig, **see diagram 5**.
  - Open one or more hot water taps to drain boiler.
  - Undo connecting nut from cold water inlet connection to gain access to filter.
  - Remove white filter from inlet connection.
- Note:** Connecting pipework is telescopic, it may be necessary to slide sleeve back for ease of access to filter.
- Clean and inspect filter, replace if necessary.

## ROUTINE CLEANING AND INSPECTION

- With both flow restrictor and filter in place, re-connect pipe to inlet connection and tighten.
- Fully open isolating cock on cold water inlet connection and check for leaks.

### Operation of water valve

- With the Summer/Winter control in the 'Summer' position, slowly open a convenient tap until boiler lights.
- Measure water flow, it should not be greater than 3,5 litres/minute.

## REPLACEMENT OF PARTS

### To replace microswitch assembly

- Disconnect microswitch by pulling off plug.
- Unclip external controls connector from mounting bracket.
- Undo two screws securing microswitch assembly to reversing valve assembly, **see diagram 21**.
- Remove microswitch assembly from reversing valve.
- Fit replacement microswitch assembly in reverse order to removal.
- Reconnect plug and refit external controls connection to bracket.

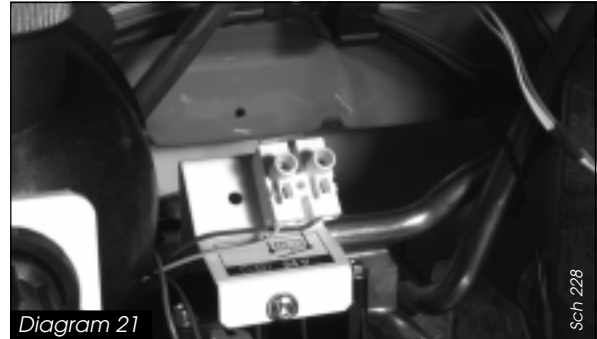


Diagram 21

Sch 228

### To replace main printed circuit board (PCB)

- With lower front panel down as described previously, undo and remove screws securing PCB cover to lower front panel, **see diagram 22**.
- Hinge back PCB cover.
- Pull off connectors HT1, BT2 and BT5 on PCB.
- Remove PCB from housing.
- Fit replacement PCB in reverse order to removal.
- Refit connectors and cover in reverse order to removal.

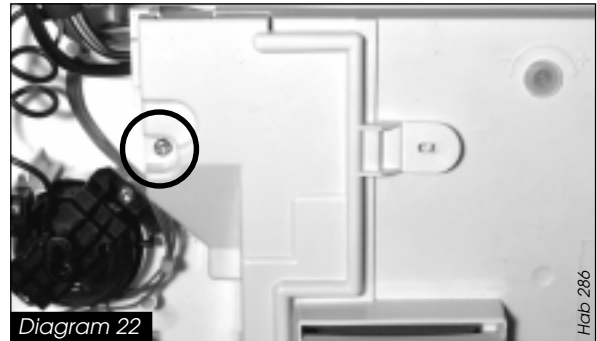


Diagram 22

Hab 286

### To replace pump

- Drain down heating circuit of boiler only as follows :

- Close isolating valves on flow and return connections on fixing jig, **see diagram 5**.

**Note:** These valves are closed when slots are at right angles to direction of flow.

It is not necessary to drain entire heating circuit to carry out this work.

- Drain boiler by attaching a plastic tube to drain outlet and opening drain valve knob anticlockwise, **see diagram 5**.

- Pull off pump connector and earth lead.
- Pull out retaining clip from telescopic pump outlet connection and slide connection upwards to release from pump.
- Undo and remove two fixing screws and remove pump retaining bracket from front of pump.
- Grasp pump body, lift upward to disengage from reversing valve and turn pump to right. Remove pump by pulling forward and over reversing valve assembly.
- Discard old pump inlet 'O' ring.
- Apply silicone grease to new 'O' ring supplied, and fit onto inlet connection on replacement pump.
- Fit replacement pump in reverse order to removal.

**Note:** Apply silicone grease to pump outlet connection 'O' ring before assembly.

- Refit pump electrical connection.
- Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.

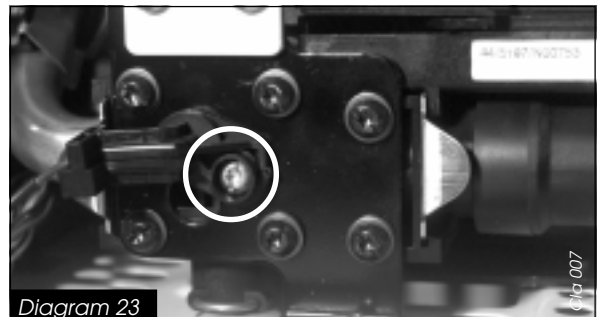


Diagram 23

1/b 007

### To replace temperature/pressure gauge

- Drain down heating circuit of boiler only as described in '**To replace pump**'.
- Undo and remove screw securing pressure gauge capillary to front section, **see diagram 23**.
- Carefully pull capillary from front section.
- Pull off spring clip securing temperature gauge phial to heating pipe.
- Undo and remove two screws securing temperature/pressure gauge to lower front panel and remove gauge.
- Fit replacement gauge in reverse order to removal.
- Apply heat sink compound to temperature phial prior to refitting onto heating pipe.
- Fit capillary of new gauge to front section using new 'O' ring supplied.
- Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.

## REPLACEMENT OF PARTS

### To replace reversing valve assembly

- Remove pressure gauge capillary as described previously.
  - Remove pump as described previously.
  - Remove microswitch assembly as described previously.
  - Remove retaining clip from LHS pipe connection on front section of valve and disengage pipe.
  - Unscrew and disconnect heating flow (centre) connection at fixing jig.
  - Remove retaining clip from heating flow pipe connection on right of front section.
  - Remove flow pipe from boiler.
  - Unscrew and disconnect heating return (left hand) connection at fixing jig.
  - Remove retaining clip from expansion vessel pipe connection at rear of reversing valve assembly and disengage pipe, pushing pipe back and out of reversing valve.
  - Undo and remove large screw holding water valve to back plate of reversing valve assembly, **see diagram 24**.
  - Push water valve back to disengage it from reversing valve.
  - Unclip and remove loss of water pressure switch from left of reversing valve assembly, **see diagram 25**.
  - From below boiler, undo and remove three screws holding reversing valve to bottom plate of boiler. Remove complete reversing valve assembly from boiler.
  - Undo and remove heating return connecting pipe and hose from rear of reversing valve assembly. Fit hose to replacement reversing valve assembly.
  - Fit replacement reversing valve into boiler in reverse order to removal.
- Note:** Use new 'O' rings, retaining clip, filter and washer provided.
- Unscrew and remove microswitch assembly from top of replacement reversing valve assembly to allow refitting of water valve.
- Note:** fit expansion vessel pipe and loss of water switch to reversing valve assembly before pump, to ensure that it is correctly located. Apply silicone grease to all 'O' rings and hoses prior to assembly.
- Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.

### To replace reversing valve front section

- Remove temperature/pressure gauge as described previously.
- Remove pipe connections from either side of reversing valve front section, refer to previous section.
- Move short selector lever on front of valve to left hand position.
- From below boiler, undo and remove single screw holding reversing valve front plate to bottom plate of boiler.
- Undo and remove six screws holding front section to rear section of reversing valve, **see diagram 26**.
- Remove front plate complete with pump bracket and then front section from reversing valve, along



Diagram 24

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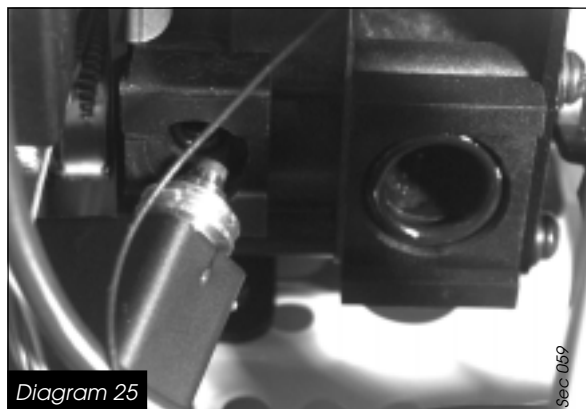


Diagram 25

Sec 059

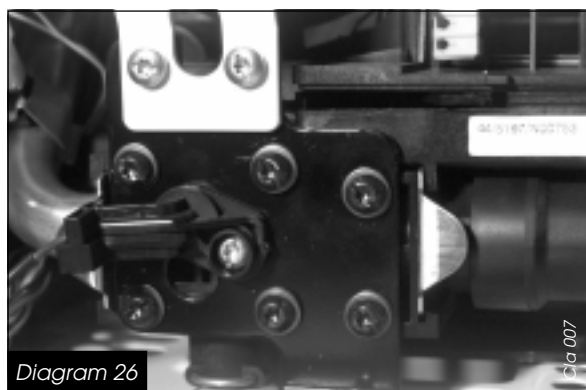


Diagram 26

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with rubber sealing gasket.

- Assemble bypass valve provided and fit into hole in underside of replacement front section. Fit 'U' shaped retaining clip.
- Note:** Use bypass valve fitted to original front section for guidance.
- Fit replacement front section, with gasket, to rear section.
  - Locate front plate and replace six fixing screws. Take care to evenly tighten screws ensuring they are not cross threaded.
  - Refit pipe connections to either side of front section using new 'O' rings provided. Apply silicone grease to 'O' rings before fitting.
  - Refit temperature/pressure gauge in reverse order to removal.
  - Ensure short selector lever on front of valve is set to right hand position.
  - Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.

## REPLACEMENT OF PARTS

### To replace loss of water switch

- Drain down heating circuit of boiler only as described in 'To replace pump'.

**Note:** It is not necessary to drain entire heating circuit to carry out this work.

- Pinch plastic cover to release retaining clips and remove cover from switch. Pull plug lead from switch terminals.
- Remove clip holding switch into left side of reversing valve assembly.
- Pull switch out of reversing valve assembly, **see diagram 27**.
- Fit replacement switch in reverse order to removal, using new 'O' ring provided and applying silicone grease to 'O' ring before fitting.
- Reconnect plug to switch terminals.
- Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.

### To replace water valve or diaphragm

- Drain down hot water circuit of boiler only as described in 'Routine Cleaning and Inspection'.
- Remove microswitch assembly as described previously.
- Unscrew connecting nut from cold water inlet connection, second from left on fixing jig. Keep filter and flow regulator.
- Remove clip holding connecting pipe in rear of water valve. From below boiler, grip clip with long nosed pliers and pull down.

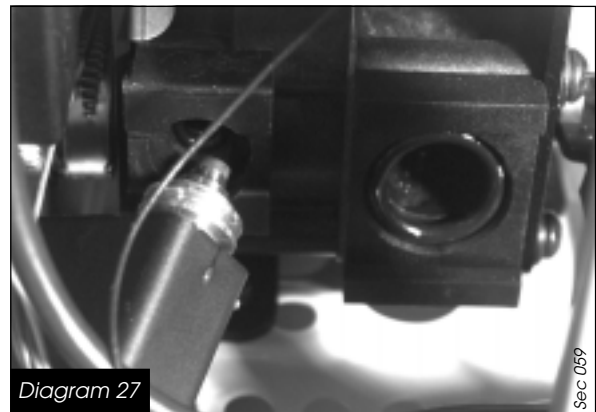
**Note:** This connecting pipe is telescopic, it may be necessary to slide back brass sleeve to facilitate removal.

- Remove clip holding pipe to heat exchanger in rear of water valve. From front of boiler, grip clip with long nosed pliers and pull upwards.
- Unscrew and remove large screw holding water valve to back plate of reversing valve assembly, **see diagram 24**.

- Disengage water valve from reversing valve and remove from boiler.

**Note:** When disengaging water valve from heat exchanger pipe, check that non-return valve is not held on end of pipe. If so, carefully separate pipe from valve to ensure that small spring and plunger do not fly out and are lost.

- To replace diaphragm, undo five screws and separate main components of water valve.
- If white diaphragm cover is to be replaced, separate original from water valve end casting and fit replacement cover.
- Fit replacement diaphragm, making sure that metal disc **FACES** diaphragm cover and beaded edge of diaphragm is correctly fitted in corresponding groove in both cover and plastic housing, **see diagram 28**.
- Reassemble water valve, evenly tightening five screws.
- Fit water valve actuating pin into hole in diaphragm cover, through nose end of valve and push in until flush, or slightly below, nose end of valve.



**Note:** Apply silicone grease to pin before fitting.

- Refit water valve to boiler, locating nose end into rear of reversing valve assembly, 'springing' heat exchanger pipe to gain clearance as necessary. Fit large water valve retaining screw but do not tighten fully at this stage.
- Apply silicone grease to 'O' ring and fit onto end of heat exchanger pipe. Fit pipe into water valve by pulling it forward. Make sure that 'O' ring is correctly located.
- Whilst holding pipe in rear of water valve, fit retaining clip. This should easily clip over pipe and should NOT have to be forced. If resistance is experienced, either pipe is not correctly fitted in rear of water valve or clip is not being fitted properly through slot between back plate and plastic housing of water valve. When clip is fitted, check connection by pushing pipe back away from water valve.
- Refit telescopic connecting pipe to inlet of water valve after applying silicone grease to 'O' ring. Fit retaining clip into groove on connecting pipe, through slot between back plate and water valve plastic housing. Check connection by pulling pipe. Make sure that clip is not loose and likely to fall out at a later date. If in doubt, fit a new clip.
- With both flow regulator and plastic filter washer in place, refit connecting nut to inlet connection and tighten.
- Open isolating valve on cold water inlet connection and check for leaks.
- Replace microswitch assembly.

# REPLACEMENT OF PARTS

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## To replace push-button box

- Disconnect electrical connections from right hand side of push-button box.
- Undo and remove screw securing push-button box to bottom plate of boiler.
- Undo and remove screw securing push-button box to front of gas valve.
- Remove push-button box by pulling forwards and upwards, disengaging it from gas valve.
- Fit replacement push-button box in reverse order to removal.

## To replace thermocouple

- Ensure gas supply is off.
- Remove push-button box as described previously.
- Remove pilot burner as described in '**Routine Cleaning and Inspection**'.
- Disengage thermocouple from pilot burner assembly and pull downwards through sealing grommet in base of combustion chamber..
- Unscrew thermocouple nut from solenoid at back of gas valve.
- Fit replacement thermocouple in reverse order to removal.

## To replace thermocouple solenoid

- Ensure gas supply is off.
- Unscrew thermocouple nut from solenoid at back of gas valve.
- Remove thermocouple interrupter connection from solenoid.
- Unscrew and remove thermocouple solenoid from back of gas valve casting.
- Fit replacement solenoid in reverse order to removal.

## To replace gas valve

- Ensure gas supply is off.
- Remove push-button box as described previously.
- Disconnect thermocouple from thermocouple solenoid, as described previously.
- Disconnect electrical connections to gas valve modulating coil.
- Undo two screws and remove pilot pipe retaining plate and cork gasket from front of gas valve. Carefully disengage pilot pipe from top of gas valve by pulling upwards and out of 'O' ring seal.
- Undo gas supply nut from main burner.
- Remove three screws fastening triangular plate to front of gas valve. Pull pipe forward to disengage from gas valve and then down to disengage from burner.

**Note:** Seal at burner must be kept for use on reassembly.

- Undo gas union between gas valve and fixing jig isolating valve.
- From below boiler, remove two screws securing gas valve to bottom panel.
- Remove gas valve from boiler.
- Remove solenoid from rear of gas valve and fit to replacement gas valve.
- Refit replacement gas valve in reverse order to removal.

**Note:** Use new 'O' ring provided between gas valve and burner supply pipe.

- Refit push-button box and thermocouple.
- Refit electrical connections to replacement gas valve.

## To replace modulating coil

- Ensure gas supply is off.
- Disconnect two electrical leads from gas valve modulating coil.
- Unscrew and remove two screws holding modulating coil to gas valve and remove coil from gas valve.
- Fit replacement modulating coil in reverse order to removal.
- Reconnect electrical leads to replacement coil.

## To replace safety valve

- Drain down entire heating system.
- From below boiler, disconnect heating flow pipe from rear of fixing jig.
- Undo heating flow connection on front of fixing jig. Remove clip from heating flow pipe connection on right of front section of reversing valve. Pull pipe towards right and out of reversing valve. Remove pipe from boiler and keep.
- From below boiler, disconnect safety valve discharge pipe.
- Working through boiler from the front using a long screwdriver, undo and remove screw holding safety valve assembly to fixing jig.
- Remove complete safety valve assembly from fixing jig and remove from boiler.
- Fit replacement safety valve in reverse order to removal.

**Note:** Apply silicone grease to 'O' ring before fixing pipe into right hand side of reversing valve.

- Refill heating system and boiler, vent and pressurise as described previously.

## To replace heat exchanger

- Drain down both heating and hot water circuits of boiler only as described previously.

**Note:** It is not necessary to drain entire heating system to carry out this work.

- Remove combustion chamber cover as described in '**Routine Cleaning and Inspection**'.
- Remove two clips from heating connections to left side of heat exchanger.
- Remove clip holding pump outlet connection into pump and slide connection up pump outlet pipe. Pull complete pipe down to disengage from heat exchanger.
- Remove retaining clip from LHS pipe connection on front section of valve and disengage pipe.
- Disengage pipe downwards from heat exchanger.
- Unscrew and disconnect two hot water connections to right side of heat exchanger.
- Grasp both sides of heat exchanger and slide forwards and out of boiler.
- Fit replacement heat exchanger in reverse order to removal.

**Note:** Use new sealing washers and 'O' rings provided.

- Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.



# REPLACEMENT OF PARTS

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## To replace expansion vessel

### 1 Boiler in place

**Note:** The expansion vessel can be replaced with the boiler in place provided that there is a minimum clearance of 400mm on one side of the boiler and that no vertical pipework passes between boiler and wall on that side.

- Drain down the heating circuit of the boiler only as described in **'To replace pump'**.

**Note:** It is not necessary to drain entire heating system to carry out this work.

- Remove pump from boiler as described previously.
- Unscrew pipe connection nut from expansion vessel and disengage pipe from connection. Keep sealing washer.
- Whilst supporting weight of vessel, push bottom of vessel away from boiler, disengaging threaded connection from hole in rear of boiler. Allow vessel to drop out of its two upper retaining brackets.
- Remove vessel to side of boiler.
- Fit replacement expansion vessel in reverse order to removal ensuring that sealing washer is fitted to vessel pipe connection.
- Check that vessel charge pressure is 1 bar. Correct if necessary.
- Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.

### 2 Boiler removed from wall

- Drain down the heating circuit of the boiler only as described in **'To replace pump'**.

**Note:** It is not necessary to drain entire heating system to carry out this work.

- Ensure that gas and electrical supplies to boiler are turned off.
- Disconnect flue.
- Disconnect external controls connections, if fitted.
- Unscrew and disconnect five connections between fixing jig and boiler.
- Disengage pipe connections. Lift boiler off hanging bracket and place on a convenient working surface.
- Remove expansion vessel from boiler as described in previous section.
- Fit replacement vessel in reverse order to removal and check charge pressure.
- Replace boiler on wall, tighten all connections, gas connection first, ensuring that all sealing washers, filters and the cold water flow regulator are fitted before tightening.
- Reconnect flue.
- Open isolating valves on flow and return connections, refill, vent and pressurise boiler. Check for leaks.
- Reconnect external controls connections, if fitted
- Reconnect gas and electrical supplies to boiler.
- Check for gas soundness.

## To replace overheat thermostat

- Locate overheat thermostat on right hand side of heat exchanger.

- Pull off electrical connections from thermostat.
- Unscrew and remove two screws holding thermostat to heat exchanger.
- Fit replacement thermostat in reverse order to removal.
- Refit electrical leads, the polarity is not important.

## To replace high limit thermostat

- Locate high limit thermostat on heating flow pipe on LHS of boiler.
- Pull off electrical connections from thermostat.
- Unclip high limit thermostat from flow pipe.
- Fit replacement thermostat in reverse order to removal.
- Refit electrical leads, the polarity is not important.

## To replace combustion chamber insulation

### Front section

- Remove combustion chamber from boiler as described in **'Routine Cleaning and Inspection'**.
- Slide side panels out of combustion chamber sides.
- Lift front insulation panel free from retaining lugs and away from cover.
- Fit replacement panels in reverse order to removal.

### Rear panel

- Remove burner from boiler as described in **'Routine Cleaning and Inspection'**.
- Remove clip from base of insulation panel.
- Pull bottom edge of insulation panel forward, downward and out from behind heat exchanger.
- Fit replacement panel in reverse order to removal.
- Replace burner into boiler in reverse order to removal.

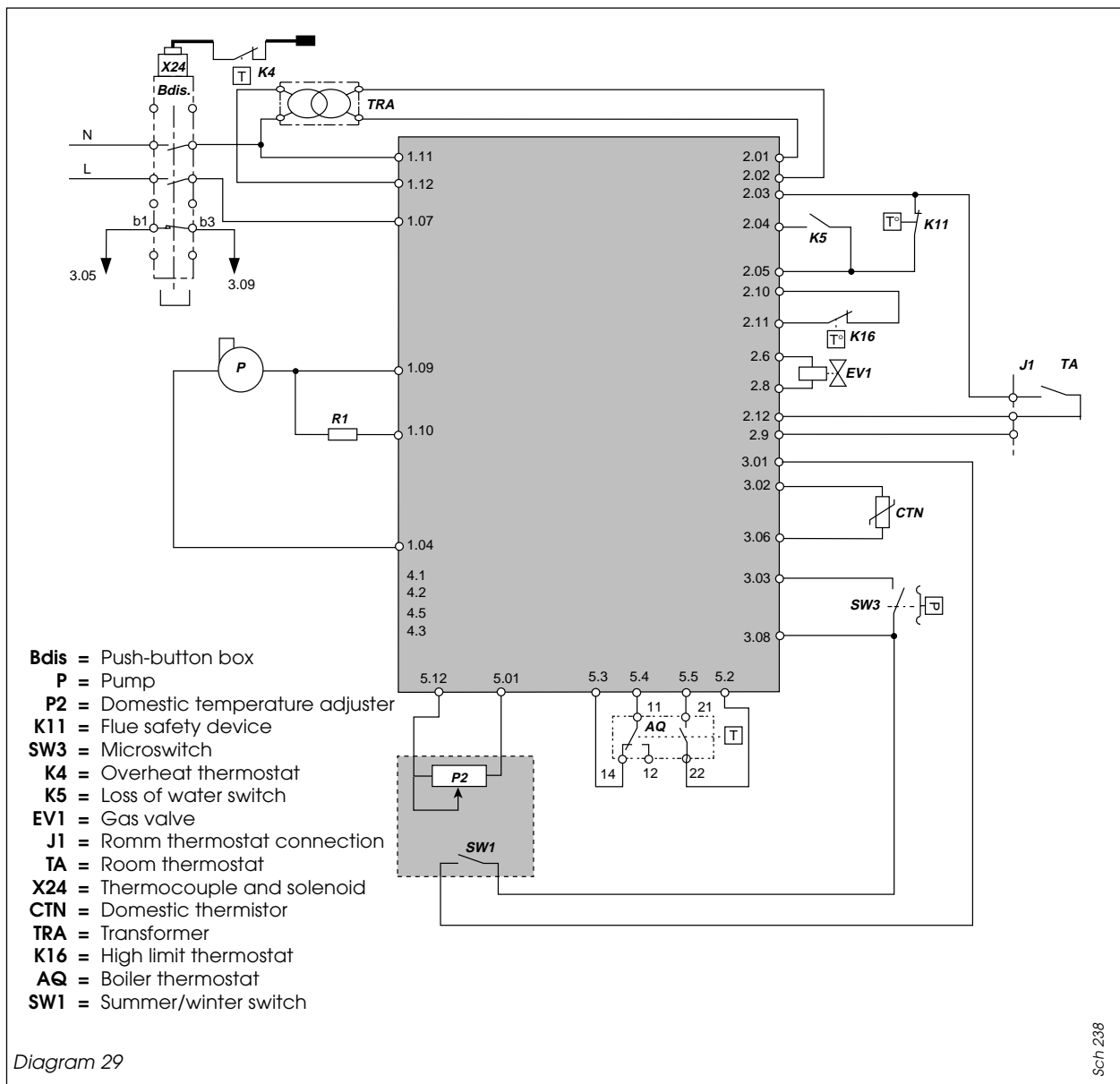
## To replace burner

- Remove burner from boiler as described in **'Routine Cleaning and Inspection'**.
- Remove pilot burner as described previously.
- Unscrew and remove two screws holding burner injector bar to burner and remove injector bar.
- Assemble replacement burner, supplied in parts, as follows:
  - Fit burner injectors to injector bar and tighten.
  - Assemble burner elements (14) into front and rear burner supports with securing pins and rods, using original burner for guidance.
  - Fit burner injector bar to burner.
  - Fit pilot burner assembly to burner.
  - Fit replacement burner to boiler in reverse order to removal.
- Reconnect ignition lead.

## To replace burner injectors

- Remove burner as described previously.
  - Remove pilot burner as described previously.
  - Unscrew and remove two screws holding burner injector bar to burner and remove injector bar.
  - Unscrew and remove burner injectors from burner bar.
  - Fit replacement injectors to injector bar and tighten.
- Note: make sure that injector size, marked on each injector, is the same as that given in **'Technical Data'**.
- Reassemble burner and replace into boiler in reverse order to removal.

# SCHEMATIC WIRING DIAGRAM



## FAULT FINDING

Before fault finding, check :

Inlet gas pressure = 20 mbar

Electrical supply = 240V - 50 Hz

Central heating system is pressurised at 1 - 1,5 bar

Overheat thermostat on RHS of heat exchanger has not tripped. Reset if necessary.

Flue safety device on draught diverter has not tripped. Reset if necessary.

Carry out electrical system checks i.e. earth continuity, resistance to earth, short circuit and polarity with a suitable meter.

Note: These must be repeated after any servicing or fault finding. Ensure that all external controls are correctly wired and calling for heat.

The fault finding charts will enable the majority of faults to be diagnosed. To use the charts effectively, it is

necessary to determine exactly which aspects of the boiler are working correctly and which are not.

For example:

If the domestic hot water works correctly but the heating doesn't, refer to **chart No. 1**.

If heating works correctly but the hot water doesn't, refer to **chart No. 3**.

**IMPORTANT:** Always adopt a logical, step by step procedure starting at the beginning of the appropriate fault finding chart.

**WARNING.** Always isolate the boiler from the electrical supply before carrying out any electrical replacement work.

Always check for gas soundness after any service work.

# FAULT FINDING

## Thermistor values



Temperature (°C)	0	5	10	15	20	25	30	35	40	45	50
Nominal resistance $\Omega$ for NTC	32565	25345	19875	15700	12500	10000	8060	6535	5330	4370	3605
Temperature (°C)	55	60	65	70	75	80	85	90	95	100	
Nominal resistance $\Omega$ for NTC	2989	2490	2085	1755	1480	1260	1070	920	785	680	

### NO CENTRAL HEATING

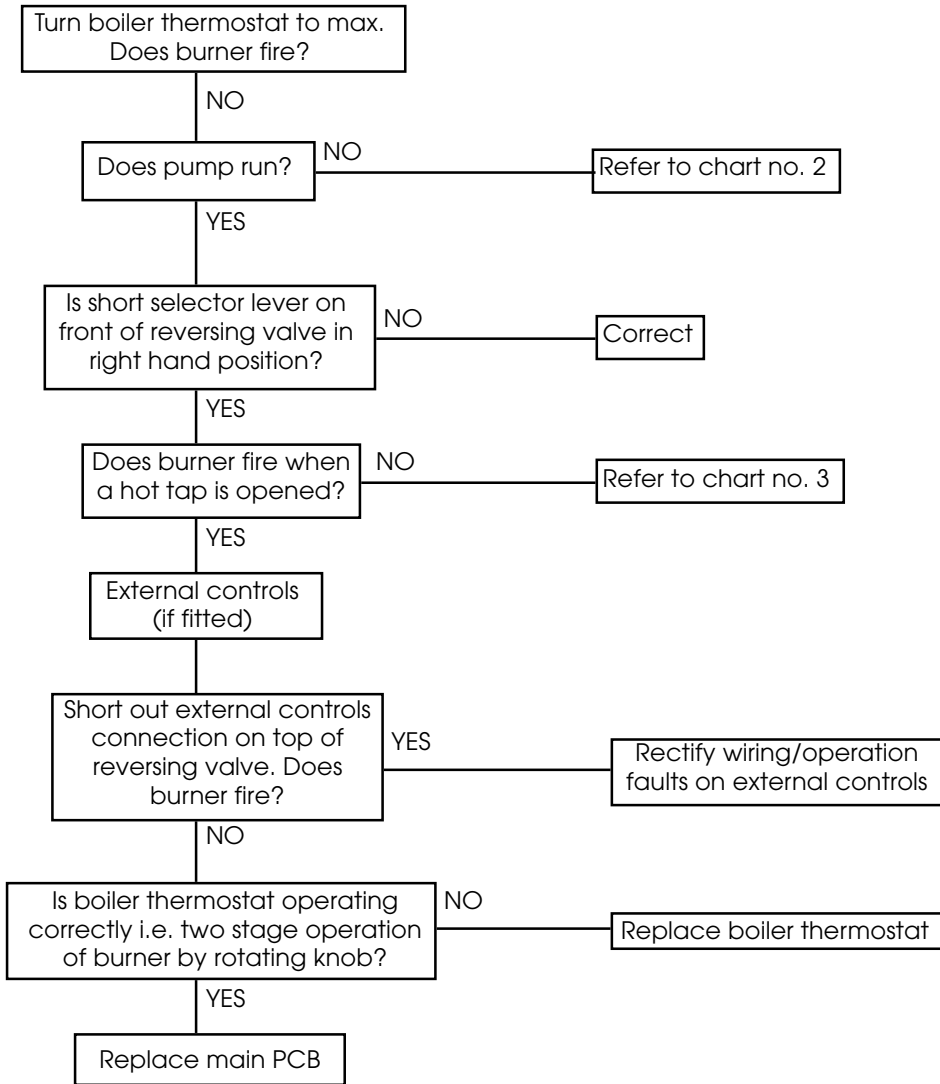


CHART 1

### PUMP NOT RUNNING

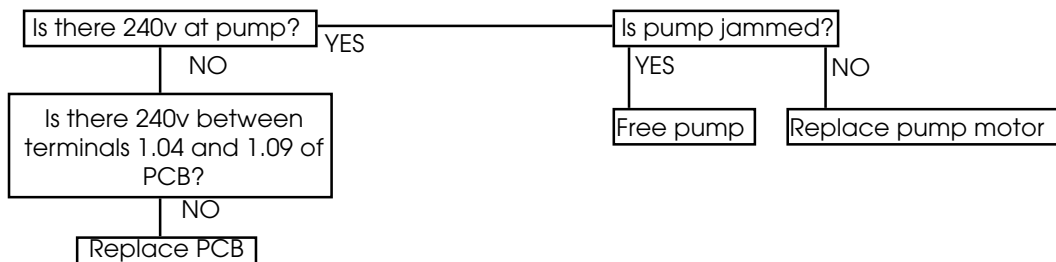
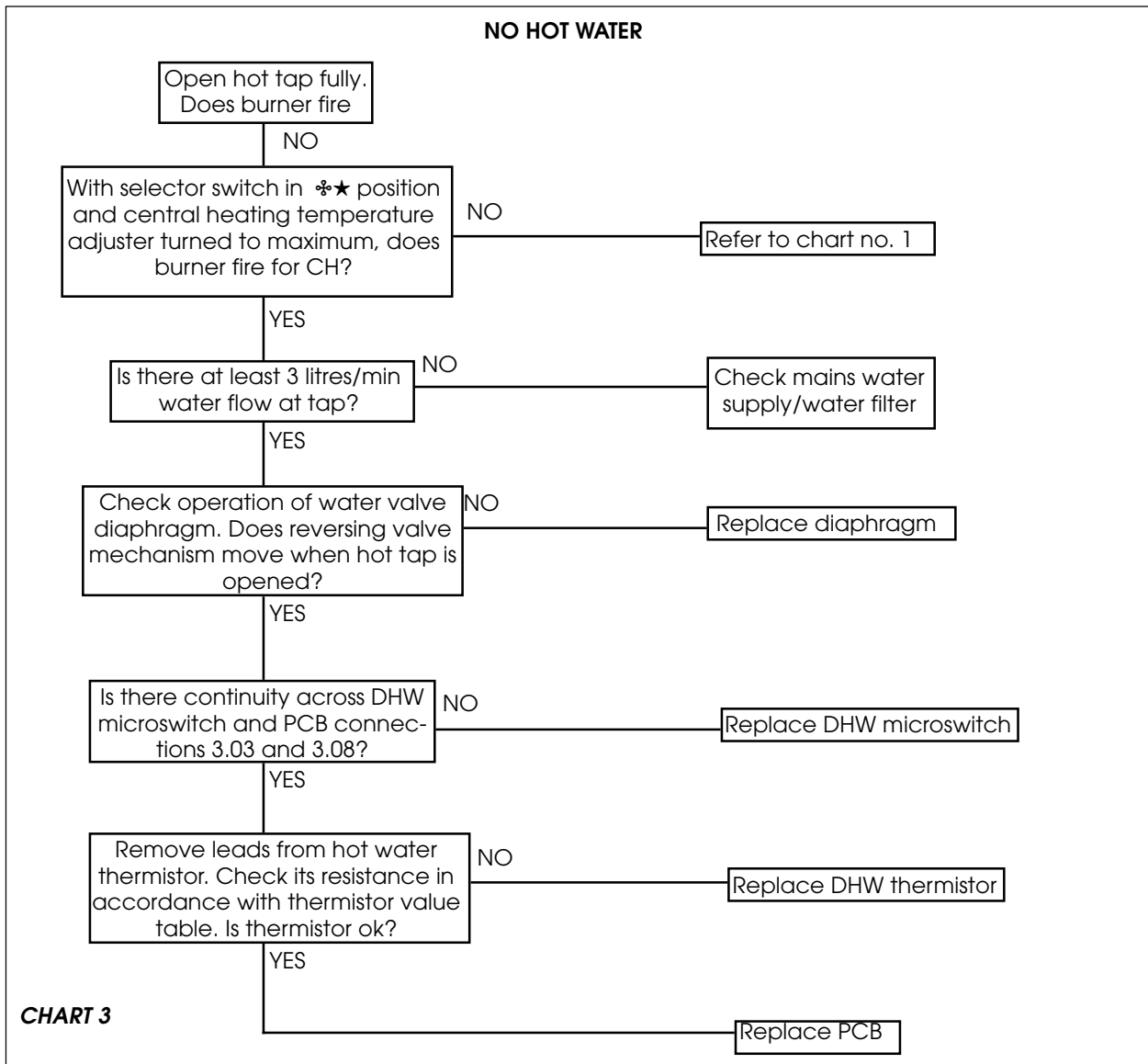


CHART 2

## FAULT FINDING



## SPARE PARTS

When ordering spare parts, quote the part number and description, stating the appliance model number and serial number from the data badge.

### Short parts list

No.	Description	Part No.	No.	Description	Part No.
1	Pump	51236	7	Boiler thermostat	57269
2	Piezo unit	57066	8	Hot water thermistor	57042
3	PCB	57126	9	Overheat thermostat	51511
4	Water valve diaphragm kit	52519	10	Thermocouple	51144
5	Microswitch assembly	51590	11	Thermocouple solenoid	51160
6	Temperature/pressure gauge	57264			