This appliance is for use with Natural Gas or LPG (Cat II 2H3P).

25Si GC NUMBER 47 311 49 (N.G.) CG NUMBER 47 311 50 (L.P.G.)

28Si GC NUMBER 47 311 51 (N.G.) CG NUMBER 47 311 52 (L.P.G.)

**APPLIANCE OUTPUTS**

<table>
<thead>
<tr>
<th></th>
<th>Domestic Hot Water</th>
<th>Central Heating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>8.5 kW</td>
<td>8.5 kW</td>
</tr>
<tr>
<td>Maximum</td>
<td>25.0kW</td>
<td>28.0kW</td>
</tr>
</tbody>
</table>

**IMPORTANT:** THESE INSTRUCTIONS APPLY IN THE UK ONLY AND MUST BE LEFT WITH THE USER OR AT THE GAS METER

Read the instructions before starting work - they have been written to make the installation easier and prevent hold-ups.
### 1. Installation Regulations

It is the law that all gas appliances are installed by a competent person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your interest, and that of safety, to ensure compliance with the law.

1.2 The manufacturer's notes must not be taken, in any way, as overriding statutory obligations.

1.3 The compliance with a British Standard or European Norm does not, in itself, confer immunity from legal obligations.

1.4 The installation of the appliance must be in accordance with the relevant requirements of the Gas Safety Regulations, current IEE Regulations, Building Regulations, Building Standards (Scotland) and local water bye-laws.

1.5 The installation should follow the recommendations of the following British Standards unless otherwise indicated and to any other relevant standards:
- BS5440:1 Flues and ventilation for gas appliances: Flues
- BS5440:2 Flues and ventilation for gas appliances: Air supply
- BS5449 Central heating for domestic premises
- BS5482 Domestic propane gas burning installations
- BS5446:1 Installation of gas hot water supplies
- BS5670 Domestic water supply (when relevant)
- BS5678 Installation of gas fired hot water boilers
- BS56891 Low pressure gas pipework installations up to 28 mm (R1)
- BS7593 Water treatment

1.6 The appliance and/or components must conform, where applicable, to all relevant Directives.

1.7 In accordance with COSSH the appliance does not contain any substances which are harmful to health.

1.8 Product Liability regulations indicate that, in certain circumstances, the installer can be held responsible, not only for mistakes on his part but also for damage resulting from the use of faulty materials. We advise that to avoid any risk, only quality approved branded fittings are used.

1.9 LPG Installation. The appliance shall not be installed in a room or internal space below ground level when it is intended for use with LPG. This does not preclude the installation into rooms which are basements with respect to one side of the building but open to the ground on the opposite side.

1.10 These instructions cover, as far as possible, the foreseeable situations which may arise. Contact Worcester Heat Systems Technical Department, Telephone: 0990 266241, for advice on specific installations.

### 2. Introduction

**Benchmark** The Benchmark initiative is the new code of practice to encourage the correct installation, commissioning and servicing of domestic central heating boilers and system equipment. The 'Log-book' is a vital document that must be completed by the installer at the time of installation. It confirms that the boiler has been installed and commissioned according to the manufacturer's instructions.

Without the completion of the Log-book, manufacturers may refuse to respond to a call-out from a householder, who will be advised that he or she must call back the installer, who has not fulfilled his obligations to record the information required by the initiative.

It is important that:

- The services and the system are properly flushed as specified.
- The user is clearly instructed on the correct operation of the appliance.
- The benefits of regular servicing are explained - to maintain the efficiency and extend the life of the appliance.

2.1 General Information

The appliance is set to give the maximum output of 28 kW [28Si] or 25 kW [25Si] to the domestic hot water and to the heating system. The hot water flow rate is limited to a nominal 10 l/min [28Si] or 9 l/min [25Si] at a maximum temperature rise of 40°C. The sanitary water section of the appliance is suitable for mains water pressure of up to 10 bar.

Kits are available to convert the appliance from Natural Gas to Propane operation and vice versa.

2.2 Electrical Supply

230V - 50Hz. Load 180 watts. External fuse 3A, Internal fuses F1 - 2A, F2 - 1.6A (20mm).

2.3 Gas Supply

The appliance requires a maximum of 3.38 m³/h of natural gas (G20) or 1.25 m³/h of propane (G31) [28Si] or 2.98 m³/h of natural gas (G20) or 1.12 m³/h of propane (G31) [25Si].

The installation and the connection of the gas supply to the appliance must be in accordance with BS56891.

The meter or regulator should deliver a dynamic pressure of 20 mbar (G20) or 37 mbar (G31) at the appliance, which is equivalent to about 18.5 mbar or 36 mbar at the gas valve inlet pressure test point.

2.4 Installation

The appliance is suitable for indoor installation only and for use with a sealed system only.

Do not place anything on top of the appliance.

It is a room sealed appliance and a separate combustion air supply is not required in any room or compartment in which the appliance is fitted.

If the appliance is fitted in a cupboard or a compartment is built around it after installation, then the structure must conform to the requirements of BS6798 and BS5440 Part 2. However, because of the low casing losses, there is not a need for the cooling ventilation openings in the compartment. The spaces specified in Section 6, Air Supply must be provided.

There is space for the service pipes to pass at the back of the appliance.

2.5 Flue

The flue can be to the right, left or rear. A vertical flue system is available. The flue terminal, on the outside wall, must not be obstructed or damaged. An internal flue fitting kit is available. Fitting instructions are given in Section 11.9.
2.6 Controls
Controls for switching the appliance On or Off and for adjusting
the CH and DHW temperatures. The CH control knob also
switches the CH off and on.
A programmable room thermostat or a facia mounted
programmer or clock is available.
A room thermostat and/or an externally mounted programmer
for mains voltage operation may be connected to the appliance.
Only double insulated mains voltage controls not requiring
an earth can be used.

2.7 System
All dirt must be flushed from the system before
connecting the appliance.
The system can be pre-piped and flushed before the appliance is fitted.
The connections in the system must withstand a pressure of
upto 3 bar.
Radiator valves must conform to BS2767: 10:1977.
Table 3 gives the pump head available for the system and the
required temperature differential.
A drain cock must be fitted to the lowest point and an air vent to
the highest point of the system.

2.8 Showers, Bidets, Taps and Mixing Valves
All taps and mixing valves must be suitable for the available
mains pressure and temperatures up to 65°C. It may be
necessary to fit a pressure reducing valve.
Hot and cold mains fed water can be supplied to overrim bidets
but is subject to local water company requirements.
The flow of water from individual outlets varies on all mains fed
systems that are not fitted with flow balancing valves. If a
pressure equalising valve is fitted then the domestic hot water
temperature should be set to maximum.
Thermostatically controlled shower valves give extra comfort and
protection.

2.9 Safety
The appliance must not be operated with the inner casing cover removed.
The gas and electricity supplies must be turned off before
working on the appliance.
Temperature monitoring controls are fitted to prevent overheating.
Automatic frost protection is provided together with automatic
pump seizure protection.
The gas valve solenoids are automatically checked for gas soundness.
IMPORTANT: Where back-flow prevention devices, including
water meters, are fitted the expansion of hot water into cold
water main can be prevented. This can result in a pressure
build-up that may cause damage to the boiler and household
devices such as showers, washing machines etc.
In these cases we recommend that a mini-expansion vessel be
fitted adjacent to the boiler in the cold water pipe.

2.10 Operation
Central Heating
A demand for heat will ignite the burner. It will operate at
minimum pressure for 2 minutes before increasing to the maximum
pressure over a period of 1 minute and then automatically
match the system requirements. At the end of the demand the burner will go out, the pump will continue to run for up to 4
minutes or the fan for 35 seconds. There is an anti-cycle time of 3
minutes.

Domestic Hot Water
A demand for hot water will ignite the burner. The burner pressure will immediately rise to maximum.
At the end of the demand the fan will continue to run for 35
seconds if there is no heating demand.
The demand for hot water will override the CH function. In winter
it may be necessary to reduce the flow at the taps to maintain
the delivery temperature.

2.11 Conversion Instructions
The appliance can be converted from LPG to NG and vice versa
by replacing the burner and resetting the gas valve.
To replace the burner and transfer the electrodes refer to Section
15.4.2,3 and 4. The burner part numbers are:
- NG (25Si and 28Si) 8 718 120 565 0
- LPG (28Si) 8 718 120 566 0
- LPG (25Si) 8 718 120 569 0

To reset the gas valve refer to Section 15.4.4, Section 12-
Commissioning and , for setting pressures, Table 1 in Section 3-
Technical Data.
Always check for gas soundness after replacing components in
the gas circuit.
The data plate is fixed to the inner casing cover.

### Table 1. 28Si

<table>
<thead>
<tr>
<th>NOMINAL BOILER RATINGS (10 Minutes After Lighting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOILER ADJUSTED FOR G20 (Natural Gas)</td>
</tr>
<tr>
<td>OUTPUT</td>
</tr>
<tr>
<td>kW</td>
</tr>
<tr>
<td>8.5</td>
</tr>
<tr>
<td>28.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOILER ADJUSTED FOR G31 (Propane)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTPUT</td>
</tr>
<tr>
<td>kW</td>
</tr>
<tr>
<td>8.5</td>
</tr>
<tr>
<td>28.0</td>
</tr>
</tbody>
</table>

Natural Gas: Net Input = Gross Input x 0.901

LPG (Propane): Net Input = Gross Input x 0.922

### Table 2.

<table>
<thead>
<tr>
<th>FLUE DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HORIZONTAL FLUE</td>
</tr>
<tr>
<td>WALL HOLE DIAMETER</td>
</tr>
<tr>
<td>EXTERNAL FIX 110</td>
</tr>
<tr>
<td>INTERNAL FIX 150</td>
</tr>
<tr>
<td>STANDARD FLUE</td>
</tr>
<tr>
<td>MINIMUM LENGTH 330/425 *</td>
</tr>
<tr>
<td>MAXIMUM LENGTH 725</td>
</tr>
<tr>
<td>EXTENDED FLUE</td>
</tr>
<tr>
<td>MAXIMUM LENGTH 2975</td>
</tr>
<tr>
<td>FLUE ASSEMBLY DIAMETER</td>
</tr>
<tr>
<td>100</td>
</tr>
</tbody>
</table>

*NOTE: Flue lengths between 330 and 425mm require the flue to be cut*

### Table 3

<table>
<thead>
<tr>
<th>MAXIMUM AVAILABLE PUMP HEAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOILER OUTPUT kW</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>8.5</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>28</td>
</tr>
</tbody>
</table>

### Table 4

<table>
<thead>
<tr>
<th>MECHANICAL SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTRAL HEATING FLOW - COMPRESSION 22mm</td>
</tr>
<tr>
<td>RETURN - COMPRESSION 22mm</td>
</tr>
<tr>
<td>COLD WATER INLET - COMPRESSION 15mm</td>
</tr>
<tr>
<td>DOMESTIC WATER FLOW - COMPRESSION 15mm</td>
</tr>
<tr>
<td>GAS INLET Rp 3/4</td>
</tr>
<tr>
<td>RELIEF VALVE DISCHARGE (PUSH FIT) 15mm</td>
</tr>
<tr>
<td>CASING HEIGHT 800mm</td>
</tr>
<tr>
<td>CASING WIDTH 440mm</td>
</tr>
<tr>
<td>CASING DEPTH 360mm</td>
</tr>
<tr>
<td>WEIGHT - LIFT 42.3kg</td>
</tr>
<tr>
<td>WEIGHT - UNPACKED 45.8kg</td>
</tr>
<tr>
<td>WEIGHT - PACKAGED 52kg</td>
</tr>
</tbody>
</table>
### Table 5

<table>
<thead>
<tr>
<th>PERFORMANCE SPECIFICATIONS</th>
<th>25Si</th>
<th>28Si</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY WATER CAPACITY</td>
<td>litres</td>
<td>2.0</td>
</tr>
<tr>
<td>MAXIMUM MAINS INLET PRESSURE</td>
<td>bar</td>
<td>10</td>
</tr>
<tr>
<td>MINIMUM MAINS INLET PRESSURE (WORKING) FOR MAXIMUM FLOW</td>
<td>bar</td>
<td>1.1</td>
</tr>
<tr>
<td>MINIMUM MAINS INLET PRESSURE (WORKING) FOR OPERATION</td>
<td>bar</td>
<td>0.5</td>
</tr>
<tr>
<td>DOMESTIC HOT WATER TEMPERATURE RANGE</td>
<td>ºC</td>
<td>40 - 62</td>
</tr>
<tr>
<td>MAXIMUM CENTRAL HEATING FLOW TEMPERATURE</td>
<td>ºC</td>
<td>82 (nom)</td>
</tr>
<tr>
<td>MAXIMUM CENTRAL HEATING SYSTEM SET PRESSURE</td>
<td>bar</td>
<td>2.5</td>
</tr>
<tr>
<td>MINIMUM CENTRAL HEATING SYSTEM PRESSURE</td>
<td>bar</td>
<td>1</td>
</tr>
<tr>
<td>OUTPUT TO DOMESTIC HOT WATER</td>
<td>kw</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NATURAL GAS (G20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LPG - PROPANE (G31)</td>
</tr>
<tr>
<td>OUTPUT TO CENTRAL HEATING</td>
<td>kw</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NATURAL GAS (G20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LPG - PROPANE (G31)</td>
</tr>
</tbody>
</table>

### Table 6

<table>
<thead>
<tr>
<th>DOMESTIC HOT WATER TEMPERATURE RISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCHARGE RATE l/min</td>
</tr>
<tr>
<td>TEMPERATURE RISE ºC</td>
</tr>
<tr>
<td>TEMPERATURE RISE ºC</td>
</tr>
</tbody>
</table>

### Table 7

<table>
<thead>
<tr>
<th>GAS SUPPLY SYSTEM - BASED ON NG (G20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL LENGTH OF GAS SUPPLY PIPE (COPPER) metres</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>GAS DISCHARGE RATE - PRESSURE DROP 1mbar m³/h PIPE DIAMETER mm</td>
</tr>
<tr>
<td>8.7</td>
</tr>
<tr>
<td>18.0</td>
</tr>
</tbody>
</table>

### Table 8

<table>
<thead>
<tr>
<th>CLEARANCES (mm)</th>
<th>INSTALLATION</th>
<th>SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABOVE APPLIANCE AND/OR FLUE ELBOW</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>IN FRONT OF APPLIANCE</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>BENEATH APPLIANCE</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>RIGHT AND LEFT HAND SIDE</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Refer to Section 6.

### Table 9

<table>
<thead>
<tr>
<th>SYSTEM CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL SYSTEM VOLUME litres</td>
</tr>
<tr>
<td>INITIAL PRESSURE bar</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>1.5</td>
</tr>
</tbody>
</table>
The appliance may be installed in any room but refer to the requirements of the current IEE Regulations and, in Scotland, the relevant electrical provisions of the Building Regulations with respect to the installation of appliances in rooms containing baths or showers.

Where a room sealed appliance is installed in a room containing a bath or shower, any switch or appliance control using mains electricity must NOT be able to be touched by a person using the bath or shower.

The appliance is NOT suitable for external installation.
No special wall protection is required.
The wall must be able to support the weight of the appliance. Refer to Table 4.
The specified clearances must be available for installation and servicing. Refer to Table 8, Fig. 3, 4 and Section 6. Air Supply.
The appliance can be installed in a cupboard/compartment to be used for airing clothes providing that the requirements of BS6798 and BS5440 Part 2 are followed. Refer to Section 2.4.
The airing space must be separated from the boiler space by a perforated non-combustible partition. Expanded metal or rigid wire mesh is acceptable provided that the major dimension is less than 13mm.
The clearance between the front of the appliance and the cupboard/compartment door should be not less than 75mm.
LPG Installation. Refer to Section 1.9.

4. Siting The Appliance

The appliance may be installed in any room but refer to the requirements of the current IEE Regulations and, in Scotland, the relevant electrical provisions of the Building Regulations with respect to the installation of appliances in rooms containing baths or showers.

Where a room sealed appliance is installed in a room containing a bath or shower, any switch or appliance control using mains electricity must NOT be able to be touched by a person using the bath or shower.

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No special wall protection is required.
The wall must be able to support the weight of the appliance. Refer to Table 4.
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The appliance can be installed in a cupboard/compartment to be used for airing clothes providing that the requirements of BS6798 and BS5440 Part 2 are followed. Refer to Section 2.4.
The airing space must be separated from the boiler space by a perforated non-combustible partition. Expanded metal or rigid wire mesh is acceptable provided that the major dimension is less than 13mm.
The clearance between the front of the appliance and the cupboard/compartment door should be not less than 75mm.
LPG Installation. Refer to Section 1.9.
The flue system must be installed following the requirements of BS5440: 1.
Standard flue kit length is 330 - 725mm (as measured from the centre of the flue turret) with extension kits for flues up to 2975mm measured from the centre line of the flue turret.
The terminal must not cause an obstruction or the combustion products a nuisance.
Under some conditions the terminal might steam and positions where this might be a nuisance should be avoided. Refer to Fig 7
If the terminal is less than 2m above a surface to which people have access then a guard must be fitted. The guard must be evenly spaced about the terminal and fixed with plated screws. A Type K2 guard is available from Tower Flue Components, Vale Rise, Tonbridge, TN9 1TB.

5. Flue terminal positions

The appliance does not require a separate vent for combustion air.

6.1 The appliance can be fitted in a cupboard with no vents for cooling but the minimum clearances must be increased to those given below (note the clearances at the front are for a removable panel e.g. a door).

<table>
<thead>
<tr>
<th></th>
<th>NG</th>
<th>LPG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above the Turret</td>
<td>30mm</td>
<td>30mm</td>
</tr>
<tr>
<td>In front</td>
<td>75mm</td>
<td>250mm</td>
</tr>
<tr>
<td>Below</td>
<td>200mm</td>
<td>200mm</td>
</tr>
<tr>
<td>Right-hand side</td>
<td>10mm</td>
<td>75mm</td>
</tr>
<tr>
<td>Left-hand side</td>
<td>10mm</td>
<td>75mm</td>
</tr>
</tbody>
</table>

6.2 The appliance does not require a separate vent for combustion air.

6.3 If the appliance is to be fitted in a cupboard or compartments with less clearance than those above (minimum clearances given in Section 4. Siting The Appliance) then permanent vents for cooling are required. One at high level and one at low level, either direct to outside air or to a room. Both vents must pass to the same room or be on the same wall to the outside air.

6.4 The minimum free areas required are:

<table>
<thead>
<tr>
<th>POSITION OF AIR VENTS</th>
<th>AIR FROM THE ROOM</th>
<th>AIR DIRECT FROM OUTSIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH LEVEL</td>
<td>315cm$^2$</td>
<td>158cm$^2$</td>
</tr>
<tr>
<td>LOW LEVEL</td>
<td>315cm$^2$</td>
<td>158cm$^2$</td>
</tr>
</tbody>
</table>

6.5 The terminals must not be directly below openable windows, roof or wall lights or domestic ventilation outlets.

Fig. 7. Siting of the flue terminal.
The system must comply with requirements of BS6798 and BS5449 and must not be operated without being full of water and correctly pressurised. Refer to Fig 8.
The pressure relief valve will operate at 3 bar. The discharge pipe must be directed away from any electrics or from where it might be a hazard.
The expansion vessel, to BS4814, has a capacity of 8 litres charged to 0.5 bar, which is suitable for a static head of 5 metres. A schraider type valve allows the pressure to be increased if the static head is greater than 5 metres.
If the expansion vessel fails then it must be replaced with the designated spare part.
Refer to BS 7074:1, BS5449 and Table 9 for a guide to the available system capacity.
The maximum system design pressure is 1.5 bar. If the pressure is above 2.65 bar when the appliance is at maximum temperature then another expansion vessel must be fitted as near to the appliance as possible in the return pipe. The pressure gauge shows the system pressure.
Fill and pressurise the system through a WRc approved filling kit. Refer to Fig 9.

**Fig. 8. Sealed primary water system.**

The system and the appliance must be properly vented. Repeated venting loses water from the system, which must be replaced. The make-up connection must be close to the appliance in the heating return pipe through an approved non-return valve. Refer to Fig 10.
The connection to the mains water supply must have the approval of the local Water Company.
The integral by-pass is not adjustable.
The pump is set at maximum and should not be adjusted.
All connections in the system must withstand a pressure of up to 3 bar.
The radiator valves must confirm to BS 2767:10 and other valves to BS1010.

**Open Vent System**
This appliance is NOT suitable for connection to an open vent system.

**Fig 9 - System Fill**

1. Central Heating Return
2. Auto Air vent
3. Non-return Valve
4. Make-up Vessel
5. Stop Cock
6. Fill Point

**Fig 10 - System make up**

**NOTE:** A drain cock should be installed at the lowest point of the heating circuit and beneath the appliance.
It may be necessary to contact the local Water Company before connecting the appliance. Devices, which would prevent the flow of expansion water, must not be fitted unless separate arrangements have been made. A mini-expansion vessel kit is available as an optional extra. The last 600mm of mains water pipe before the appliance must be in copper. The domestic hot water circuit of the appliance is suitable for a mains pressure of up to 10 bar. A pressure reducing valve must be fitted if necessary. A mains water supply isolating valve is fitted. The maximum hot water flow rate is set at the factory to 10 l/min [28Si] or 9 l/min [25Si] giving a nominal temperature rise of 40°C with the temperature control at maximum. Refer to Table 6. The temperature rise, up to the maximum set by the user is automatically maintained by the modulation of the heat input. In winter it may be necessary to reduce the water flow at the tap or shower to maintain the required delivery temperature. It is recommended that long pipe runs to taps or showers are insulated to prevent the rapid cooling of the water. Hot and cold taps and mixing valves must be suitable for the available mains pressure. If necessary, a pressure reducing valve should be fitted.

No anti-syphonage arrangements are necessary for fixed head showers. The hose of a loose-head shower must be fixed so that the shower head cannot get closer than 25mm to the top edge of the bath to prevent its immersion in the water. Alternatively the shower can be fitted with an anti-syphonage device at the flexible hose connection. Thermostatically controlled or pressure balancing shower valves should be used where possible to give extra comfort and guard against extreme temperature. Hot and cold mains water direct to a bidet is, subject to the approval of the local water company, permissible provided that the bidet is of the overrim flushing type. The outlets must be shrouded and unable to be fitted with a hand-held spray. No anti-syphon arrangements are needed.

LIME SCALE: In areas of temporary hardness [greater than 200ppm of calcium bicarbonate] it is suggested that a proprietary scale reducer is fitted in the mains cold water connection to the appliance. Installation of a scale inhibitor assembly should be in accordance with the requirements of the local Water Company. An isolating valve should be fitted to allow servicing. The water hardness can be determined by reference to the local Water Company.

The appliance requires a maximum of 3.38 m³/h of natural gas (G20) or 1.2 m³/h of propane (G31) [28Si] or 2.98 m³/h of natural gas (G20) or 1.25 m³/h of propane (G31) [25Si]. Refer to Table 7. A natural gas appliance must be connected to a governed meter. The installation and connection of the gas supply to the appliance must be in accordance with BS6891. The meter (NG) and the pipework to the appliance must be checked, preferably by the gas supplier, to ensure that a dynamic pressure of 20mbar for natural gas and 37mbar for propane is available at the appliance [equivalent to about 18mbar or 35mbar at the gas valve inlet pressure connection] and that the gas flow is adequate for all the installed gas appliances operating together.

Mains supply: 230V ~ 50 Hz 180watts. External fuse 3A. Internal fuses F1-2A, F2-1.6A (20mm). Spare internal fuses are supplied with the appliance. Refer to Fig 13. The appliance must be earthed and it must be possible to completely isolate the appliance. The mains cable must be 0.75mm² (24x0.20 mm) to BS6500 · Table 15 or 16. The mains cable must be connected to the terminal ST12 marked L (red or brown lead), N (black or blue lead) and the Earth stud (green or green/yellow lead) and secured with the cable clamp. The Earth lead must be still be slack when the other leads are taut. Refer to Fig 14. The connection to the mains must be either: A 3A fused three-pin plug and unswitched socket outlet (both complying with BS1363) or a double pole isolator with a contact separation of 3mm in all poles and supplying the appliance and controls only. A room thermostat or an externally mounted programmer must be suitable for mains voltage operation, the leads must be secured in the cable clamps. Only double insulated mains voltage controls not requiring an earth lead may be used. The control board is accessed by removing the controls connections cover. Refer to Fig 29. A programmer or clock is available to fit into the facia. Full instructions are sent with the control. On very rare occasions an external frost thermostat might be considered where parts of the system are remote from the appliance. Refer to WHS Technical Department for more information, Tel: 08705 266241.

Safety Check: If there is an electrical fault after installation check for fuse failure, short circuits, incorrect polarity of connections, earth continuity or resistance to earth.
Fig. 11. Wiring diagram.
Fig. 12. Functional flow diagram.
11. Installing The Appliance

Note: READ THIS SECTION FULLY BEFORE COMMENCING THE INSTALLATION

11.1 General
The appliance is only suitable for fitting to a sealed system.
The flue must be installed as specified in BS5440:1.

11.2 Unpacking
Remove the appliance from its packaging and check the contents against the packing list.
Lie the appliance on its back and undo the union connections on the manifold assembly. Refer to Fig 16. Slide the appliance off the wall mounting assembly.

11.3 Site Preparation
Check that the correct position for the appliance has been chosen. Refer to Section 4 and Table 8.
Check that the wall is flat and will support the weight of the appliance. Refer to Table 4.

11.4 Fixing Holes and Flue Opening
Hold the wall mounting assembly against the wall. Check that the assembly is level. The diamond cut-out on the assembly indicates the centre-line of the appliance.
Mark the position of the fixing holes and the flue opening. Refer to Fig. 5 and 15.
Mark the centrelines of the pipe connections to aid the pre-plumbing of the system pipework.
Check the position of the fixing points and flue opening before drilling the fixing holes 60mm deep for the No. 12 size plugs and cutting the flue duct hole at 110mm diameter [150mm diameter for internally fitted flues].

11.5 Wall Mounting Plate and Manifold
Fit the plugs and insert the bottom screws. Offer the assembly to the wall utilising the keyhole slots on the manifold assembly and fix to the wall. Refer to Fig 15 and 16.
Check that the assembly is properly aligned before tightening the screws.

11.6 Gas and Water Pipes
Remove the gas cock and fix the appropriate fitting to connect the inlet pipe and refit. Refer Fig 16.
Pre-plumbing is not recommended if no movement in the pipes is available.
If it is necessary for any of the pipes to run up the back of the appliance then they must be arranged to pass behind the expansion vessel. Refer to Fig 3. Pipework must not run horizontally within the limits of the casing.
Support the valves when tightening the connections to prevent distortion of the manifold assembly.
It is important that the pipes are not fixed near the appliance using clips that put a strain on the connections.

Before the appliance is fitted to the wall thoroughly flush the system and mains water supply.

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Fig 13 - Replacement internal fuses

![Diagram of replacement internal fuses]

**NOTE:** Check the size of the fuse before fitting

1. Fuse - F1 T2A
2. Fuse - F2 T1.6A
3. Connections Cover
4. Connections Cover Fixing Screw
5. Clip on Facia cover

Fig.14 . Mains electricity connections.

![Diagram of mains electricity connections]

**Note:** When the mains ON/OFF switch on the facia is turned OFF the 2amp fuse is still live. Refer to Fig.12.

Fig.15 . Wall mounting assembly

![Diagram of wall mounting assembly]

All dimensions in mm
11.7 Install the Boiler
Remove the cabinet by unscrewing the screw at the top front and releasing the sides. Lift from the top location. Refer to Fig. 18.
Check that the gas and water valves are closed. Refer to Fig.16.
Fit the new seals, in the hardware pack, to the service valves on the manifold.
Lift the appliance to the wall, engage in the top support and lower onto the manifold assembly. Tighten the gas and water connections.
Fit a discharge pipe to the relief valve leading it away from any electrics or where it might be a hazard. Lower the facia to gain access. The pipe must not be less than 15mm in diameter and must run continuously downward outside the appliance. Refer to Fig 17.

11.8 Air and Flue Duct Preparation
The method of installation of the flue system may be varied to suit the actual site conditions. The instructions for connecting and fixing the ducts must, however, be strictly followed.
Remove all packing material from the flue components.
Fit the flue restrictor ring by unscrewing and removing the flue spigot from the boiler. Refer to Fig.19.

Restrictor Size 79mm to all Horizontal and Vertical flues upto 725mm long.
The standard telescopic flue assembly is suitable (without cutting) for flues from 425mm up to 725mm measured from the centre-line of the boiler flue outlet to the outer face of the wall. Refer to Fig.20.
The minimum length of the standard flue, after cutting is 330mm.
If $L$ is greater than 725mm then extension duct kit/s will be required - each kit extends the flue by 750mm up to a maximum of 2975mm. See table below.

<table>
<thead>
<tr>
<th>EXTENSION</th>
<th>MAXIMUM FLUE LENGTH mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1475</td>
</tr>
<tr>
<td>2</td>
<td>2225</td>
</tr>
<tr>
<td>3</td>
<td>2975</td>
</tr>
</tbody>
</table>

11.9 Measure and Cut the Ducts.

**General.** Cut the ducts as necessary, ensuring that the ducts are square and free from burrs. Always check the dimensions before cutting.

Measure the distance $L$. Refer to Fig. 22 and 23.

The standard flue can be telescopically adjusted to any length between 425mm and 725mm measured from the centre of the turret.

Fix the flue assembly together using the self-tapping screws provided. Refer to Fig. 20.

It will only be necessary to cut the standard assembly if $L$ is less than 425mm. Cut the flue turret assembly and the terminal assembly by the same amount i.e. $L = 350$ - remove 75mm from each assembly.

Minimum side flue length = 330mm (accommodating a 10mm Service clearance and a 100mm wall)

Minimum rear flue length = 330mm (accommodating a 100mm wall)

- If $L$ is between 725 - 1175mm (1 extension)
- 1175 - 1475mm (1 extension)
- 1475 - 1925mm (2 extension)
- 1925 - 2225mm (2 extension)
- 2225 - 2675mm (3 extension)
- 2675 - 2975mm (3 extension)

It is not necessary to cut the ducts.

It is necessary to shorten the assembly by cutting the first extension duct assembly i.e. $L = 1000mm$ - remove 175mm from the air and flue ducts.
NOTE: Extension duct measurements do not include the socketed end. Unless specifically instructed the socketed end must not be removed.

Fix the flue ducts together before fixing the surrounding air duct, the cut ducts fit into the flue assembly.

11.10 Fitting the Flue Assembly with Access to the Terminal.
Prepare the flue duct assembly as described in Section 11.8.
Apply the plastic tape to the air duct in contact with the external brickwork.
From inside push the assembly through the wall. Align the flue turret and push fully onto the spigot on the appliance. Tighten the clamping ring and fix with the screw provided. Refer to Fig. 24.
Make good the internal wall face and the external brickwork or rendering.

11.11 Fitting of the Flue Assembly without access to the Terminal.
A rubber gasket kit is available from Worcester Heat Systems.
NOTE: A larger diameter opening in the wall is required. Refer to Table 2.
Prepare the flue assembly as described in Section 11.8.
Fit the rubber sealing gasket centrally onto the terminal assembly and tighten the clamp. Refer to Fig. 25.
Apply the plastic tape to the air duct in contact with the external brickwork.
From inside push the assembly through the wall so that the gasket flange is against the outer face. Refer to Fig. 25. It may be necessary to adjust the legs of the flue centering ring. Align the flue turret and push fully onto the socket on the appliance. Tighten the clamping ring and fix with the screw provided. Refer to Fig. 24. Seal the gap around the duct at the inner wall face with the flexible seal provided and make good.

11.12 Flue Bends.
90° and 45° bends are available. A maximum of two bends may be used in addition to the first bend on the flue turret. A 90° bend is equivalent to 1m of straight duct.
A 45° bend is equivalent to 0.5m of straight duct.
A maximum flue assembly of 2m is possible with 1 X 90° bend and 1m with 2 X 90° bends.
Measure the lengths X, Y and Z. Refer to Fig. 26.
The maximum value of X using the turret assembly only is 506mm. Reduce the ducts to the appropriate length i.e. X = 406mm, cut 100mm from the air duct and 120mm (to cover the entry into the 45° or 90° elbow) from the flue duct. Refer to Fig. 27.

NOTE: The flue system ducts between the elbows, dimension Y, requires the socketed ends (of the first extension if two or more are used) to be removed and the air and flue tubes to be cut to the same length.
Cut the ducts to a length Y = 162mm. Refer to Fig. 26.
The final section, dimension Z, of the flue system must include a section of plain duct assembly i.e. an extension assembly with the sockets removed. Reduce the final section, including the terminal assembly, by the appropriate amount i.e. Air duct Z = 81mm and the flue duct Z = 51mm. Refer to Fig. 26.
If Z is less than 425mm it will be necessary to cut the air and flue ducts of the extension to a plain length of 100mm and reduce the length of the terminal assembly i.e Z = 350mm - remove 75mm from the terminal assembly.
If Z is 425 - 725mm it is not necessary to cut the terminal assembly or use a second extension duct as the length can be set telescopically.
If Z is greater than 725mm then two extension duct assemblies will be required, the first assembly being cut to length as plain tubes.
If more than two extension ducts are needed in any section to achieve the required length then the final section of the assembly must not be less than 325mm without cutting the terminal assembly.

NOTE: The flue duct of the final extension must be 30mm longer than the air duct.

Each section must be connected to the previous section of the flue bend by fixing the flue ducts together and then similarly fixing the air ducts which engage the elbows.

Fit the assembly as described in Section 11.9, 11.10 as appropriate.

Make good the internal and external brickwork or rendering.

11.13 Vertical Adapter for Horizontal Flues.

An adapter is available for an initial short section of vertical flue. Refer to Fig. 28.

Measure and cut the flue as described in Section 11.11. The first, vertical, section (equivalent to dimension X) is measured from the top of the boiler casing. Cut the vertical section of the extension duct to 167mm less than the measured distance. Do not remove the socketed ends.

The minimum measured distance is 167mm.

Seal the air duct to the spigot using silicone sealant.

Fix the adaptor with the clamp and screw provided.

11.14 Completion of the Installation.

Check that all the connections on the manifold have been tightened. Refer to Fig. 6.

Remove the facia bottom panel. Refer to Fig. 29.

Connect the mains electricity supply lead to the appliance and secure the cable clamp. Refer to Fig. 14.

Check there is sufficient loose lead to allow the release of the facia panel assembly and that the earth lead of the mains supply cable is longer than the live and neutral leads.

Fit the facia mounted programmer if applicable. Refer to Fig. 31.

Connect any external controls ensuring that the leads pass through the appropriate clamps. Refer to Fig. 32.

Test for gas soundness as described in BS6891.

If the appliance is not commissioned immediately, replace the cabinet and facia bottom panel. Check that the gas and electricity services have been turned off.
Fig.29. Facia connections cover

Fig.30. Programmer cover

Fig.31. Programmer connection

Fig.32. Mains Voltage External Controls Connections

NOTE: Only double insulated controls not requiring an earth can be used

Fig.33. Facia connections

1. Earth screw
2. Mains connection (L N)
3. Fuse F1
4. Mains voltage room thermostat/external control-mains voltage ST8
5. Fuse F2
6. Controls 24V · ST13
7. Mains harness ST16
8. Fan ST1
9. Pump ST5
10. Earth tag
11. Cable clamps (threaded)
**12. Commissioning The Appliance**

Benchmark Water Treatment: For optimum performance after installation, this boiler and its associated central heating system should be flushed in accordance with the guidelines given in BS7593:1992 - Treatment of water in domestic hot water systems. Full instructions are supplied with proprietary cleansers sold for this purpose. If an inhibitor is to be used after flushing, it should be used in accordance with the inhibitor manufacturers instructions.

Suitable flushing agents and inhibitors are available from Betz Dearborn Tel: 0151 4209563 and Fernox Tel: 01799 550811. Instructions for use are supplied with these products.

**Fig. 34. Automatic air vent and combustion test point**

12.1 Remove the appliance cabinet by removing the screw at the top centre of the cabinet.

Check that the electrical supply and the gas supply to the appliance are turned off and that all the water connections throughout the system are tight.

Open the system valves at the appliance. Refer to Fig. 6.

Open all the radiator valves. Remove the automatic air vent cap. Refer to Fig. 34.

Fill the system through the external filling loop. Refer to Section 7, Sealed System.

Vent each radiator in turn. The automatic air vent will vent the appliance. Refer to Fig 34.

Remove the cap from the pump and turn the shaft about half a turn. Replace the cap. Refer to Fig 35.

Check that the pressure relief valve operates by turning the knob anti-clockwise until it releases. Lower the facia to gain access to the relief valve. Refer to Fig 17. Water should be expelled from the discharge pipe.

12.2 Set the Expansion Vessel Pressure

The charge pressure of the expansion vessel as dispatched is 0.5bar, which is equivalent to a static head of 5m [17ft]. The charge pressure must not be less than the static head at the point of connection. A Schraeder type valve is fitted to the expansion vessel to allow the charge pressure to be increased if necessary. Refer to Fig 34. The expansion vessel must be charged to 0.35bar less than the initial system design pressure.

Note: 1bar = 10.2m = 33.5ft of water.

**Fig. 35. Pump venting.**

12.3 Set the System Pressure

Fill the system until the pressure gauge is at 2.5bar and check for leaks.

Release water from the system using the relief valve test knob until the required system pressure is obtained, up to a maximum of 1.5bar.

Set the pointer on the pressure gauge to record the set system pressure.

If the pressure indicated on the gauge is greater than 2.65bar when operating at the maximum central heating temperature, an extra expansion vessel must be fitted to the system as close as possible to the appliance central heating return connection.

The appliance [as despatched] can accommodate a system volume of 100 litres with a system pressure of 0.5bar. Refer to BS7074 Part 1, BS5449 and Table 8. If the system volume is greater then an extra vessel must be fitted as close as possible to the appliance central heating return connection and pressurised to the same figure as the integral vessel.

12.4 Clock/Programmer: The controls fitted to the appliance should be set up at this stage.

12.5 Check that the gas and electricity supplies are turned off.

Connect a pressure gauge to the gas valve burner pressure test point. Refer to Fig 36.

**Fig. 36. Gas valve.**
Remove the clip-on facia bottom cover and controls connections cover. Refer to Fig 29.
Slide down the access panel to display the mode switch and the adjusting tool. Refer to Fig 37.

12.6 Checking the Burner Pressure
Check that all the radiator valves are open.
Check that the system is pressurised and set to the required pressure as indicated on the gauge.
Set the temperature control knobs to maximum and the clock/programmer to operate continuously.
Turn on the gas and electricity supplies.
Set the mode switch to MAX using the mode adjuster tool. Refer to Fig 37 and 38. **NOTE: Two red lights will flash rapidly on the facia.**

Fig.37. Mode control cover

Fig.38. Mode adjustment

A continuous spark will occur until the burner is alight and sensed by the control circuit. The burner will remain at its maximum domestic hot water pressure for one minute. Refer to Table 1.
It should not be necessary for the gas valve to be adjusted.
Note: The burner pressure is factory set and if, after checking that the dynamic (working) supply pressure is sufficient i.e. 18.0mb (NG) approx, or 36mb (LPG) at the gas valve inlet pressure test point, the correct pressure cannot be obtained then Worcester Heat Systems Service Department should be contacted.
If the appliance does not light then check that it is not in the 'lock-out' state by pressing the reset button. Refer to Fig 39.
Set the mode switch to Normal.
The burner pressure will drop to the minimum setting and will ramp up to the maximum central heating pressure appropriate to the appliance and the gas. Refer to Table 1. It should not be necessary for the central heating potentiometer to be adjusted to change the burner pressure. If adjustment is required then the adjusting tool is used to alter the setting of the potentiometer. Refer to Fig 38.
Set the mode switch to MIN. **NOTE: Two red lights will flash rapidly on the facia.**
The burner pressure will drop to the minimum pressure appropriate to the appliance and the gas for both the central heating and domestic hot water modes. Refer to Table 1. It should not be necessary for the central heating potentiometer to be adjusted.
Test for gas soundness at the joint between the burner and the gas valve with leak detection fluid.
Set the mode switch back to Normal.
Turn the electricity supply off and then back on to reset the controls.
Replace the facia cover panels.

12.7 Domestic Hot Water
Turn the central heating temperature control knob fully anti-clockwise. Refer to Fig. 39.
Open a hot tap near the appliance. The burner will light and go to the maximum burner pressure appropriate to the appliance and the gas. Refer to Table 1.
Gradually close the tap and check that the burner pressure falls. Fully open the tap and check that the pressure rises.
Close the tap and check that the burner goes out.
The fan may continue running until the appliance has cooled to a pre-set temperature.

12.8 Central Heating
Check that all the radiator valves are open.
Check that the system is pressurised and set to the required pressure as indicated on the gauge.
Check that the clock/programmer is set to operate continuously.
Set the room thermostat and the central heating temperature control to maximum.
The burner will light and the appliance will modulate its output from minimum to maximum over a period of about two minutes.
Check that all the radiators are heating up evenly.
Shut down all but one of the radiators and observe the burner pressure fall. Open all the radiators and check that the burner pressure rises.

12.9 Balance the system to give a temperature differential of 11°C. A non-adjustable by-pass is fitted to the appliance.
12.10 Set the room thermostat to minimum and check that the burner goes out. Reset the room thermostat to maximum and the burner will re-light and follow the normal operating procedure.
Turn off the gas service cock. The burner will go out but sparking from the electrode will continue for 10 seconds when the appliance will 'lock-out'. After 60 seconds carefully open the gas service cock, press the reset button and observe the burner re-light and follow the normal sequence of operation. Refer to Fig 9 and 39.
Turn off the gas service cock and the electricity supply to the appliance.

Drain the system while the appliance is hot.
Refill, vent and re-pressurise the system as described in Section 12.1 preceding, adding, if necessary, a suitable proprietary inhibitor. Further information is available from Betz Dearborn 0151 420 9563 or Fernox 01799 550811.

12.11 Domestic Hot Water and Central Heating
Set all controls to maximum.
Turn on the electricity supply to the appliance and open the gas service cock at the appliance.
The burner will light and heat will pass into the system. Turn on a hot tap and check that hot water is soon discharged from the tap. Close the tap.
The appliance will then return to the central heating mode and automatically balance with the system requirements.
Turn off the appliance.
12.12 Completion of Commissioning
Disconnect the pressure gauge and tighten the test point screw.
Restart the appliance and check for gas soundness around the test point screw.
Refit the cabinet.
If the appliance is to be passed over to the user immediately then set the controls to the users requirements. If the appliance is to be left inoperative in frosty conditions then set the programmer, if fitted, to off. Do not turn the electricity or gas supplies off. The appliance will operate under the control of the integral frost protection facility. If there is any possibility of the appliance being left totally unused in freezing conditions then switch off the gas and electricity and drain the appliance and the system.

13. Handover

13.1 Hand over the User Booklet.
13.2 Explain how to operate the appliance safely and efficiently.
13.3 Tell the user what to do if the appliance is not to be used in very cold conditions.
13.4 Tell the user what to do if the system pressure falls.
13.5 Explain that regular servicing will maintain the safe and efficient operation and extend the life of the appliance. WHS can offer a comprehensive maintenance contract.
13.6 Tell the user that any work on the appliance must only be carried out by a competent, CORGI registered, person.
13.7 Complete and hand over to the user the Benchmark Log-Book.

14. Inspection And Service

14.1 The extent of the service is determined by the operating condition of the appliance when tested by a competent person. It is the law that any service work is carried out by a competent CORGI registered person.
14.2 Inspection
Check that the terminal and the terminal guard, if fitted, are clear and undamaged.
If the appliance is in a compartment or cupboard check that the specified service space around the appliance is clear. Refer to Table 8. Check all the joints and connections in the system and remake any that show signs of leakage. Refill and re-pressurise as described in Section 12 Commissioning.
Operate the appliance and take note of any irregularities. Refer to Section 18 Fault Finding for rectification procedures.
Check the combustion performance
Remove the cap from the sample point on the top of the appliance. Refer to Fig 34.
Connect the sampling meter.
With the appliance at maximum rate and stable in the DHW mode expect readings of NG 5.5 - 8.5% CO2, 0.002 - 0.015% CO. These figures cover all flue conditions.
Refit the cap after the test.
If there is any possibility of the appliance being left totally unused in freezing conditions then switch off the gas and electricity and drain the appliance and the system.

starting any service procedures. Always test for gas soundness after the service has been completed.

14.3 Component Access
To service the appliance it may be necessary to remove some or all of the following parts to gain access to components which may need to be checked or replaced.

Cabinet Unscrew the screw at the top of the cabinet, release the sides. Lift up and away from the top locating pegs.
Facia Panel Unscrew the two screws and lower. Refer to Fig 40.
Inner Case Cover Unscrew the four fixing screws and remove the cover. Refer to Fig 40.

14.4 Component Cleaning
Only use a non-metallic brush to clean components.
Clean the fan taking care not to block air flow detector.
Clean the burner to ensure that the blades and injectors are clear. Do not us a metal probe to clean the injectors.
Clean the electrodes, replace if there is any sign of deterioration. Clean the heat exchanger. Cover the gas inlet tube and remove any deposits from the heat exchanger from the top and bottom. Carefully straighten any distorted fins on the heat exchanger.
Check the combustion chamber insulation and replace if there is any sign of damage or deterioration. Refer to Section 15.4.5.
Clean the controls in situ using a non-metallic brush.
Carefully refit any components removed in the reverse order. Check that all screws are tight and the connections properly remade with the appropriate gaskets/O-rings.
Re-commission, as necessary, for correct operation to the users requirements. Refer to Section 12 Commissioning.
Important: Turn off the gas and electricity supplies before replacing any components.

15.1 After the replacement of any components always check for gas soundness where relevant and carry out functional checks as described in Section 12 Commissioning.

Any O-ring or gasket that appears damaged must be replaced. Complete gasket and O-ring packs are available for gas and water connections on the appliance.

15.2 Component Access
Refer to Section 14, Inspection and Servicing for access to components.

15.3 Draining the Appliance
Primary System: Turn off the heating flow and return valves at the appliance. Refer to Fig 16.
Open the drain tap. Refer to Fig 17. Close the drain tap when the flow from the appliance has stopped.
DHW Circuit: Turn off the mains cold water supply at the appliance. Refer to Fig 16.
Open a hot tap below the level of the appliance to drain the domestic hot water from the appliance.

Important: A small quantity of water will remain in some components even after the appliance has been drained. Protect any electrical components when removing items from the water circuits.

15.4 Component Replacement
Refer to Fig 41 and 45 for an indication of the location of the various components.

15.4.1 Gas Valve
Do not remove the inner casing.
Unscrew the union connections above and below the gas valve and remove the assembly. Disconnect/unplug the electrical connections from the valve. Use new gaskets when replacing the valve. Refer to Fig 45.
Set the Gas Valve:
Connect a pressure gauge to the burner pressure test point on the valve. Refer to Fig 36.
Switch on the gas and electricity supplies. Check for gas tightness at the gas valve inlet.
Refer to Section12-Commissioning for the method of checking the pressures.
Check for gas soundness at the gas valve outlet.
Adjust the maximum and start pressure [minimum], as necessary, to obtain the required pressures.
Switch off the appliance and disconnect the pressure gauge.

15.4.2 Spark Electrode
Remove the inner casing and the combustion chamber.
Carefully pull off the leads from the electrodes. Loosen the screw and remove the spark electrode assembly. Refer to Fig 46.

15.4.3 Flame Sense Electrode
Remove the inner casing and the combustion chamber.
Carefully pull off the lead from the electrode. Loosen the screw and remove the flame sensing electrode assembly. Refer to Fig 47. Ensure that the electrode is at the correct height above the burner blade.

15.4.4 Burner
Remove the inner casing and the combustion chamber.
Remove the electrode connections.
Release the union connection beneath the burner and remove the burner from the appliance. Refer to Fig 44.
Do not omit the gasket when fitting the new burner.

15.4.5 Combustion Chamber Insulation
Remove the burner as described in 15.3.4 preceding.
Remove the primary heat exchanger as described in 15.4.21 following.
Replace the side and front pads in the combustion chamber assembly. Refer to Fig 48.
Replace the rear insulation pad.
15.4.6 Pressure Gauge
Remove the cabinet and lower the facia panel. Refer to Fig 40. Check that the appliance has been fully drained. Withdraw the clip and remove the pressure-sensing head. Refer to Fig 50. Unclip the gauge head from its mounting bracket and remove. Refer to Fig 49.

Do not omit the O-ring from the pressure capillary when fitting the replacement gauge.

15.4.7 Relief Valve
Remove the cabinet and lower the facia. Check that the appliance has been fully drained. Disconnect the relief valve drainpipe. Unclip and pull out the valve. Refer to Fig 51.

Fig. 48. Combustion Chamber Insulation.

Fig. 49. Pressure Gauge head

Fig. 50. Pressure Gauge capillary fixing

Fig. 51. Relief valve drain connection
15.4.8 Flow Switch
Drain the DHW circuit as described in 15.3 preceding. Remove the cabinet and lower the facia panel. Carefully pull off the connections from the micro-switch. Undo the two union connections on the valve and remove the valve. Refer to Fig 52. Do not omit the gaskets when fitting the replacement switch. The new flow-switch must be set to deliver the correct flow rate to give a temperature rise of 40°C i.e 10 l/min (28Si) or 9 l/min (25Si). The adjustment is made by turning the red adjuster clockwise to reduce the flow rate and anti-clockwise to increase the flow rate. Make the adjustment with the gas turned off.

**Fig. 52. Water Flow switch.**

15.4.9 Inlet Water Filter
Remove the flow switch as described in 15.4.8 preceding. Unscrew the two screws and remove the securing plate. Firmly withdraw the union connection assembly and pull out the filter. Refer to Fig 53. Carefully clean or replace the filter.

**Fig. 53. Inlet water filter**

15.4.10 Control Board
Remove the facia bottom panel and carefully disconnect all the electrical connections. Refer to Fig 33. Remove the cabinet and lower the facia panel as described in Section 14.3, Inspection and Servicing. Disconnect the earth connection at the appliance. Refer to Fig 45. Unscrew the four screws and remove the metal cover. Refer to Fig 54. Lift out the control board. Refer to Fig 55. Pull out and transfer the transformer to the new board together with the plastic locating frame. Re-commission the appliance to check and set the burner pressures. Refer to Section 12, Commissioning.

**Fig. 54. Control board cover**

**Fig. 55. Control board**
15.4.11 Transformer
Remove the cabinet and lower the facia panel as described in Section 14, Inspection and Servicing. Unscrew the four screws and remove the metal cover. Refer to Fig 54. Pull out the transformer. Refer to Fig 56.

**Fig.56. Transformer**

15.4.12 Clock/Programmer
Remove the clock/programmer assembly by carefully pulling it from the facia to release the clips. Unplug the connector at the control board. Comprehensive instructions are sent with the new control. Refer to Fig 57.

**Fig.57. Programmer connection**

15.4.13 Fan
Remove the inner casing. Remove the fan as described in Section 14.3, Inspection and Servicing. Ensure that all the connections are correctly made to the new fan.

15.4.14 Air Flow Detector
Remove the fan as described in 15.3.13 preceding. Unscrew and, through the fan outlet, withdraw the airflow detector. Refer to Fig 42.

15.4.15 Primary [CH] Sensor
Remove the cabinet and inner casing. Carefully pull-off the connections. Unscrew the two screws and remove the sensor. Refer to Fig 58.

15.4.16 Overheat Thermostat
Remove the cabinet and the inner casing. Carefully pull-off the connections. Unscrew the two screws and remove the sensor. Refer to Fig 58.

Do not omit the heat transfer paste when fitting the replacement sensor.

15.4.17 DHW Sensor
Remove the cabinet and lower the facia. Carefully pull off the connections. Unscrew the clip and remove the sensor. Apply a small quantity of heat transfer paste to the face of the replacement sensor. Carefully reposition the sensor so that the connections are away from the flue hood. Reconnect the sensor.

15.4.18 Domestic hot water sensor
Apply a small quantity of heat transfer paste to the face of the replacement sensor. Carefully reposition the sensor so that the connections are away from the flue hood. Reconnect the sensor.
15.4.18 Pump
Check that the primary circuit has been fully drained as described in 15.3 preceding.
Release the water connections and remove the pump. Refer to Fig 45.
Disconnect and transfer the electrical connections to the new pump. Set the pump speed to maximum. Do not forget the gaskets at the connections.
Alternatively the pump head only [Grundfos 15-60] may be replaced by unscrewing the four securing screws. Take care not to scratch the mating surfaces.
15.4.19 Expansion Vessel
The specified replacement can be fitted into the system return as close to the appliance as possible. Re-fill and pressurise the system as described in Section 12 Commissioning.
15.4.20 Auto Air Vent
Drain the primary circuit as described in 15.3 preceding.
Unscrew and remove the auto air vent.
Do not omit the sealant (Loctite 575) when fitting the replacement air vent.
Remove the cap. Refer to Fig 34.
15.4.21 Primary Heat Exchanger
Check that the appliance has been fully drained as described in 15.3 preceding.
Remove the combustion chamber as described in Section 14.3, Inspection and Servicing.
Remove the temperature sensors as described in 15.4, 15, 16 and 17 preceding.
Undo the four union connections and remove the heat exchanger.
Do not omit the sealing washers when fitting the replacement heat exchanger. Refer to Fig 60.
15.4.22 Air Flow Switch
Carefully pull-off the connections from the switch. Unclip and remove the switch. Refer to Fig 61.
Ensure that the connections are correctly made on the replacement switch.

Fig.60. Primary heat exchanger

Fig.61. Air flow switch
## 16. Short Parts List

<table>
<thead>
<tr>
<th>Key No.</th>
<th>G.C. No.</th>
<th>Part</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>WHS Part No.</th>
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<tr>
<td>10</td>
<td>E27-572</td>
<td>Flow Switch</td>
<td>Prettl</td>
<td>1</td>
<td>8 717 002 122 0</td>
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<td>15</td>
<td>E27-578</td>
<td>Water Filter</td>
<td>Prettl</td>
<td>1</td>
<td>8 716 148 410 0</td>
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<td>17</td>
<td>E27-580</td>
<td>Pressure Relief Valve</td>
<td>Altechnic</td>
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<td>18</td>
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<td>25</td>
<td>E27-586</td>
<td>Pressure Gauge</td>
<td>Inter Albion x 32556</td>
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<td>E27-587</td>
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<td>Winkleman &amp; Panhof 15K</td>
<td>1</td>
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<td>28</td>
<td>E01-601</td>
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<td>Caleffi 502632CST</td>
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<td>30</td>
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<td>Gas Valve</td>
<td>Junkers</td>
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<td>8 747 003 381 0</td>
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<td>Burner (NG)</td>
<td>Vulcano</td>
<td>1</td>
<td>8 718 120 565 0</td>
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<td>34</td>
<td>E27-597</td>
<td>Burner (LPG) 28Si</td>
<td>Vulcano</td>
<td>1</td>
<td>8 718 120 566 0</td>
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<td>8 718 120 569 0</td>
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<td>49</td>
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<td>52</td>
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<td>55</td>
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<td>59</td>
<td>E27-623</td>
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<td>63</td>
<td>375-696</td>
<td>Primary (CH) Sensor</td>
<td>Elmwood</td>
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<td>8 716 142 302 0</td>
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<td>375-696</td>
<td>DHW Sensor</td>
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<td>8 716 142 302 0</td>
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<td>66</td>
<td>299-495</td>
<td>Overheat Thermostat</td>
<td>Elmwood</td>
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<td>8 716 142 389 0</td>
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<td>E25-322</td>
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<td>Junkers</td>
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<td>8 747 201 274 0</td>
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<td>E27-643</td>
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<td>WHS</td>
<td>1</td>
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<td>E27-644</td>
<td>O-Ring Pack</td>
<td>WHS</td>
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<td>E27-648</td>
<td>Digital Timer</td>
<td>WHS</td>
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**FLUE OPTIONS**

<table>
<thead>
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<th>FLUE OPTIONS</th>
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<tbody>
<tr>
<td>Telescopic Horizontal Flue Kit</td>
<td>425 - 725mm</td>
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<tr>
<td>E01-943 Extension Flue Kit</td>
<td>750mm</td>
</tr>
<tr>
<td>E01-944 Vertical Flue Kit</td>
<td></td>
</tr>
<tr>
<td>E01-945 Vertical Flue Adaptor</td>
<td></td>
</tr>
<tr>
<td>E01-946 Internal Fixing Kit</td>
<td>Telescopic Flue</td>
</tr>
<tr>
<td>E01-058 Flue Elbow Kit</td>
<td>90 deg.</td>
</tr>
<tr>
<td>E01-059 Flue Elbow Kit</td>
<td>45 deg.</td>
</tr>
</tbody>
</table>
17. Operational Flow Diagrams

### CENTRAL HEATING FUNCTION

**MAIN SWITCH ON**

- **Green Light On**

- **Room thermostat and/or mains programmer (or link) On** AND
- **Electronic facia programmer (if fitted) On** AND
- **ST13 link in** AND
- **CH control knob On**

**CH light On.**

**Pump On.**

**Fan ON/ignition Sequence.**

**Burner Light On.**

**Two minute minimum burner pressure then ramp up pressure over next one minute**

**Modulate gas to maintain flow temperature set by control knob**

**DEMAND END**

- **Overrun function** (see overleaf)

**Three minute wait**

- **Gas valve Off.**
- **(CH light still on. Pump still On)**

**Over temperature shut-down if flow temperature 5°C above set value**

### DOMESTIC HOT WATER FUNCTION

**MAIN SWITCH ON**

- **Green Light On**

**Flow switch On (Tap open)**

**DOMESTIC HOT WATER DEMAND (Priority over CH demand)**

- **YES**
  - Is CH interrupted?
  - NO
- **Primary 75°C**
- **DHW temp drops to user set point**

**Pump continue 4 seconds if primary temp above DHW setting. Burner to MAX for 4 seconds**

**Ignition sequence and burner to MAX for 4 seconds**

**Gas valve off. Fan on 35 seconds. Pump on until temp drops to 60°C**

**Gas valve off. Fan on. Pump on**

**Modulate gas to maintain delivered water temperature set by control knob**

**DEMAND END**

- **Overrun function** (see overleaf)

**Over temperature shut-down if water temperature above 85°C**

**Primary temperature 115°C**
**OVERRUN FUNCTION**

- **END DHW DEMAND**
  - Fan overrun function active for 3 minutes

- **END CH DEMAND**
  - Pump runs for 3 minutes

  - If primary temp over 85° pump cycles for 2 seconds every 10 seconds until temp below 85°
  - After 3 minutes the pump runs if: primary temp over 95° until below 77° hot water temp over 98° until below 63°
  - If primary temp above 80° fan runs until temp below 80°C (35 seconds minimum)
  - If primary temp below 80° run fan for 35 seconds

**AUTOFROSTAT FUNCTION**

- No demand and primary temperature below 8°C
  - Internal "Autofrost" demand
    - Run pump
      - Monitor central heating sensor
        - Below 5°C
          - Commence normal central heating mode until temperature reaches 20°C
        - 5°C to 9°C
        - Above 9°C
  - Return to normal off state
Note: This fault-finding information is for guidance only. Worcester Heat Systems cannot be held responsible for costs incurred by persons not deemed to be competent.

The electronic control system for this boiler incorporates four lights on the facia. These are used to show normal operating status. But as a secondary function, by flashing, they can also be used to help provide fault diagnostics. Therefore, with individual or groups of lights being permanently off, on or flashing, every normal fault can be identified.

To use the fault finding system, select a box below which represents the light situation during your fault. Then refer to the appropriate following section. This fault-finding system assumes that the appliance has been operating correctly until the time of failure.

PRELIMINARY CHECKS
Preliminary electrical system checks are the first electrical checks to be carried out during a fault-finding procedure. On completion of the Service/Fault-Finding task which has required the breaking and remaking of electrical connections, check (a) EARTH CONTINUITY, (b) SHORT CIRCUIT CHECK, (c) POLARITY and (d) RESISTANCE TO EARTH.

Note:
Slow flash is once per second, fast flash is five times per second.
Slow flash can only be cleared by using the facia reset button (press for at least one second).
Fast flash is cleared by removing fault and/or main switch off/on.
Is the facia on/off switch turned on? (Clockwise)
- Yes
  - Is there a 230V AC live supply across Terminal ST12 pins L and N
    - Yes
      - Has fuse F1 blown?
        - Yes
          - Replace fuse and investigate cause. Suggestions: Cable damage, connections to (or faults within) pump, fan, external 230V controls, transformer or board.
        - No
          - Replace control board (Section 15.4.10)
    - No
      - Check electrical supply to boiler.
- No
  - Turn switch on.

FAIL POINT A

FAIL POINT B
- Has fuse F2 blown?
  - Yes
    - Replace fuse. This will be caused by fuse fatigue or by the board.
    - No
      - Remove control board from facia (See Section 15.4.10) and separate transformer from board. Measure resistance across the two pairs of adjacent pins on the transformer. Are any pair above 100 ohms?
        - Yes
          - Replace transformer.
        - No
          - Replace control board (Section 15.4.10).
  - No
    - Replace control board (Section 15.4.10).

FAIL POINT C
- Green diode is damaged. Replace control board. (Section 15.4.10)
Red diode is damaged. Replace control board. (Section 15.4.10)

Is there a link at terminal ST13 pins 1 and 2? No

Is there a link at terminal ST13 pins 1 and 2? Yes

With CH control knob fully clockwise, does the boiler ignite and appear to run normally in central heating mode? No

There is no heat demand. Check room thermostat or mains programmer (or link).

Yes

Red diode is damaged. Replace control board. (Section 15.4.10)

Is there a link at terminal ST13 pins 1 and 2? No

Insert a link

Yes

Is there an electronic programmer at position ST5 at right-hand end of board? No

Replace control board. (Section 15.4.10).

Yes

Remove programmer connector from board edge. Does CH lamp now light? No

Correctly set or replace electronic programmer.

Yes

With CH control knob fully clockwise, does the boiler ignite and appear to run normally in central heating mode? No

There is no heat demand. Check room thermostat or mains programmer (or link).

Yes

Red diode is damaged. Replace control board. (Section 15.4.10)
**FAIL POINT F**

Is the boiler in a very cold environment (less than 5°C)?

- **No**
  - Replace control board. (Section 15.4.10).
  - Note: A damp board could cause this fault.

- **Yes**
  - Boiler is running in "Autofrost stat" mode. See Section 17.

**FAIL POINT G “Primary Overheat”**

Is the boiler fully water pressurised and is all air vented?

- **No**
  - Rectify fault.

- **Yes**
  - Reset the controls and restart the boiler. Does the pump run?

- **No**
  - Repair or replace pump. (Section 15.4.18).

  - **Yes**
    - Remove inner casing cover and inspect the primary sensor (left of heat exchanger). Is it correctly fixed to pipe?

    - **Yes**
      - Re-fix sensor to pipe.

    - **No**
      - Remove the multiway connector from board position ST16. Is there a short circuit across contacts 5 & 6?

      - **Yes**
        - Fault caused by control board or heat exchanger

      - **No**
        - Replace overheat thermostat or check wiring to it.
Fail point: H “Burner Lockout”

1. **Is the gas supply connected and at the correct pressure?**
   - No: Rectify gas supply problem.
   - Yes: Continue with the next step.

2. **Remove front panel. Reset and restart the boiler. Can a flame be seen through the spy glass?**
   - No: Continue with the next step.
   - Yes: Continue with the next step.

3. **Turn off boiler. Remove inner cover and combustion chamber cover. Are the sense electrode and lead in good condition and is gap correct?**
   - No: Continue with the next step.
   - Yes: Continue with the next step.

4. **Turn off boiler. Remove the multiway connector from board position ST16. Test resistance across contacts 7 and 8 (brown wires) and 9 and 10 (violet wires). Are both reading below 200 ohms?**
   - No: Continue with the next step.
   - Yes: Replace control board (Section 15.4.10).

5. **Remove both brown connectors from gas valve. Is there continuity from brown and violet wires to multiway connector?**
   - No: Repair or replace harness.
   - Yes: Continue with the next step.

6. **Repair or replace flame sensor (Section 15.4.3) or wiring.**
   - No: Repair or replace gas valve (Section 15.4.1).
   - Yes: Continue with the next step.

7. **Replace control board (Section 15.4.10). Note: It is not possible to reliably check the cross-light performance of the burner. In the unlikely event of such a fault, investigate flue problems or replace burner or injector (Section 15.4.4).**
   - No: Continue with the next step.
   - Yes: Continue with the next step.

8. **Does the flashing fault signal occur at the start of a demand?**
   - No: Flashing occurs at the end of demand. Replace gas valve (Section 15.4.1).
   - Yes: Replace control board (Section 15.4.10).
Is the multiway connector at board position ST16 pushed fully home on to the board?

Yes → Check the DHW sensor. Is it correctly fitted onto the pipe with heat conductive paste between the pipe and sensor?

Yes → Remove multiway connector from board position ST16. Test resistance across contacts 17 and 18 (yellow wires). Is it between 1 kohm and 30 kohm?

Yes → Test resistance across contacts 12 and 13 (red wires). Is it between 1 kohm and 30 kohm?

Yes → Test resistance across contacts 7 and 8 (brown wires) and 9 and 10 (violet wires). Are both readings below 200 ohms?

Yes → Replace control board. (Section 15.4.10).

No → Push fully home

No → Re-fix sensor onto pipe

No → Repair or replace harness.

Is there continuity from contacts 17 and 18 to DHW sensor?

Yes → Check or replace DHW sensor. (Section 15.4.17).

No → Repair or replace harness.

Is there continuity from contacts 12 and 13 to CH sensor?

Yes → Check or replace CH sensor. (Section 15.4.15).

No → Repair or replace harness.

Is there continuity from contacts 7 and 8 (brown wires) and 9 and 10 (violet wires) to the multiway connector?

Yes → Replace gas valve. (Section 15.4.1).

No → Repair or replace harness.

Check the DHW sensor. Is it correctly fitted onto the pipe with heat conductive paste between the pipe and sensor?

Yes → Repair or replace harness.

No → Repair or replace harness.

Replace gas valve. (Section 15.4.1).

Check or replace CH sensor. (Section 15.4.15).

Is there continuity from contacts 17 and 18 to DHW sensor?

Yes → Check or replace DHW sensor. (Section 15.4.17).

No → Repair or replace harness.

Is there continuity from contacts 12 and 13 to CH sensor?

Yes → Check or replace CH sensor. (Section 15.4.15).

No → Repair or replace harness.

Is the multiway connector at board position ST16 pushed fully home on to the board?

Yes → Push fully home

No → Re-fix sensor onto pipe

No → Repair or replace harness.

Replace control board. (Section 15.4.10).
**FAIL POINT: 'Air Pressure Fault'**

1. **Does the fan run before the fault occurs?**
   - **No**
     - Turn off boiler. Is there continuity across the C and NO terminals of the air pressure switch (where green wires are fitted)?
   - **Yes**
     - Air pressure switch is shorting. Replace switch. (Section 15.4.22)
   - **No**
     - Replace control board. (Section 15.4.10)

2. **Does the burner ignite (burner light on) before fault occurs?**
   - **No**
     - Remove electrical connectors from pressure switch and restart boiler. Is there continuity between C and NO terminal (where green wires were fitted) when the fan runs?
   - **Yes**
     - Pressure switch has not closed. Are the silicon tubes in good condition and free of condensation?
   - **No**
     - Replace tubes. If condensation has occurred, also replace pressure switch and check condition of Venturi in the fan.
   - **Yes**
     - Inspect the flue. Is it free of any restrictions?
   - **No**
     - Rectify flue problem.
   - **Yes**
     - Replace air pressure switch (Section 15.4.22). Note: In the unlikely event of this not solving the problem inspect the pressure pick-up (Venturi) in the fan.

3. **Remove multiway connector from board position ST16. Is there continuity of the green wires?**
   - **No**
     - Repair wires or replace harness.
   - **Yes**
     - Replace control board. (Section 15.4.10)

4. **Pressure switch has opened during operation. Check flue for blockage. Also investigate sense tubes and pressure switch.**
FAIL POINT K

The gas valve mode switch (concealed by the facia side panel) is not set correctly

Turn to 'NORM' position

FAIL POINT L

Light indication during fault not covered by above details.

Control board is likely to be wet or damaged or malfunctioning. Check for wet board or connections. Dry and re-use or replace control board. (Section 15.4.10).

Hot water temperature always too hot during a demand (not regulating).

Hot water sensor could be off or poorly fixed to pipe. Repair or replace sensor. (Section 15.4.15).

Water temperature very low/low gas pressure (with all knobs set to maximum)?

Is the gas set to correct pressure?

No

Set pressure.

Yes

Remove multiway connector from board position ST16. Is the resistance across contacts 1 and 2 (blue wires) below 60 ohms.

No

Yes

Replace control board. (Section 15.4.10).

No

Remove blue (top) connector from gas valve. Is there continuity along blue wires to multiway connector?

No

Repair wires or replace harness.

Yes

Replace gas valve. (Section 15.4.1).
Gas Safety (Installation and use) Regulations 1984: All gas appliances must be installed by a competent person, in accordance with the above regulations. Failure to install the appliance correctly could lead to prosecution. The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

IMPORTANT: Read these instructions carefully in order to get the best from your appliance.

WARNING: This appliance must be earthed and protected by a 3A fuse if a 13A plug is used, or if any other type of plug is used, by a 5A fuse either in the plug or adaptor or at a distribution board.

TO FIT THE TIMESWITCH

Warning: Switch off the power supply to the appliance before starting work.

Remove boiler white case.

Remove the facia cover plate by releasing the clip at the top and withdraw it from the front.

Present the programmer to the facia and plug in the programmer connector into the four way connection on the board. See Fig. 1.

Push the programmer into position ensuring that the lead is not trapped and that the clip has been properly engaged.

Replace white case.

TO SET THE TIMESWITCH

The timeswitch is a 24V single channel unit which controls the operation of the central heating circuit (the domestic hot water is permanently available upon demand and will always take priority over central heating). The time clock is a 24 hour unit with on/off tappets available at 15 minute intervals.

Time Adjustment

See Fig. 2. Turn the dial clockwise until the correct time is at the pointer.

Switch Adjustment

To set the ON periods push the tappets towards the centre from the start of the period to the end of the period.

Using the Manual Selector:

- 1 Permanent on
- 2 Time according to the tappets
- 0 Permanent off

Fig. 1.

Fig. 2.
# 25-28Si SERIES

<table>
<thead>
<tr>
<th>APPLIANCE</th>
<th>NATURAL GAS</th>
<th>L.P.G.</th>
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<td>47 311 49</td>
<td>47 311 50</td>
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<tr>
<td>28Si</td>
<td>47 311 51</td>
<td>47 311 52</td>
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**G.C. NUMBERS**

Worcester Bosch supports the Benchmark code of practice

**USER INSTRUCTIONS & CUSTOMER CARE GUIDE**
Thank you for purchasing a Worcester Si Series gas-fired combination appliance.

Worcester Si Series appliances are made by Worcester Heat Systems and the strictest quality control standards are demanded throughout every stage of production.

Indeed, Worcester Heat Systems have led the field in innovative appliance design and performance for more than 30 years.

The result is that your new Worcester Si appliance offers you the very best of everything - quality, efficiency, economical running costs, proven reliability and value for money.

What’s more, you also have the assurance of our no-nonsense 1 year parts and labour guarantee.

And it’s backed up by Worcester Care Call - a complete maintenance scheme to keep your boiler operating at peak condition and efficiency.

No wonder that more and more people are agreeing that when it is gas, it has to be Worcester Si Series.
GENERAL INFORMATION

GAS SAFETY (INSTALLATION AND USE) REGULATIONS 1998

It is the law that all gas appliances must be installed by a competent person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution. It is in your interest and that of safety to ensure compliance with the law. The manufacturers notes must not be taken, in any way, as over-riding statutory obligations.

WARNING: This appliance must be earthed and protected by a 3 amp fuse.

ELECTRICITY SUPPLY: 230V ~ 50Hz

IMPORTANT: To get the best from your Worcester Si appliance please read these instructions carefully.

NOTE: In the event of a fault the appliance should not be used until the fault has been corrected by a competent person.

BENCHMARK

The Benchmark initiative is a code of practice to encourage the correct installation, commissioning and servicing of domestic central heating boilers and system equipment.

A 'log book' is dispatched with every appliance. This is a vital document that needs to be completed by the installer at the time of installation. It confirms that the boiler has been installed and commissioned according to the manufacturers instructions.

All CORGI Registered Installers carry a CORGI ID card and have a registration number. Both should be recorded in your central heating log book. You can check that your installer is CORGI registered by calling CORGI on 01256 372300.

Without the completion of the log book, manufacturers may refuse to respond to a call-out request. It is important that your installer has given you the fully completed log book.

GENERAL DESCRIPTION

(See Fig.1.)

The WORCESTER Si MODELS are combined domestic hot water and central heating appliances. They consist of a gas fired boiler having a varying output of between 8.5kW and 25kW (25Si) or 28kW (28Si), and all the necessary controls to provide mains fed domestic hot water and central heating.

The appliances are fitted with a manual Operating Switch.

The appliances can operate in one of two modes. Hot water only or hot water and central heating.
**Hot Water Mode:**

When a demand is made for hot water by opening a tap or shower; the flow switch will energise the boiler. The burner will light at its maximum setting and hot water will be delivered to the tap or shower.

When hot water is no longer required the appliance pump or fan may continue to operate to dissipate the excess heat within the boiler.

---

**Fig. 1. System Diagram.**

[Diagram showing system components: Automatic air vent, Primary heat exchanger, Expansion vessel, Fixed by-pass, Circulating pump, Domestic water flow switch, Relief valve, CH flow, Domestic hot water supply, Domestic cold supply, CH return, Relief valve discharge.]
CENTRAL HEATING SYSTEM

During the first few hours of operation of the central heating system, check that all radiators are being heated at an even rate. Should the upper area of a radiator be at a lower temperature than the base of the radiator, it should be vented by releasing air through the venting screw at the top of each radiator. Make sure your installer shows you how to carry out the operation. Repeated venting will reduce the quantity of water in the system and this must be replenished for safe and satisfactory operation of the appliance. Should water leaks be found in the system or excessive venting be required from any radiator, a service engineer should be contacted and the system corrected.

SEALED HEATING SYSTEM

The appliance must be fitted to a sealed heating system which is pre-pressurised. Your installer will advise you on the minimum and maximum pressure that should be indicated on the pressure gauge. See Fig. 2. Check regularly that this pressure is maintained and contact your installer or maintenance engineer if there is a permanent significant drop in pressure indicated on the gauge. If the system loses pressure it should be re-pressurised as instructed by the installer (N.B. Maximum operating pressure 2.5 bar).
CLEARANCES

Your installer will have provided adequate space around the appliance for safety and servicing. Do not restrict this space by the addition of cupboards, shelves etc. close to the appliance.

<table>
<thead>
<tr>
<th></th>
<th>RSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left-hand side</td>
<td>10</td>
</tr>
<tr>
<td>Right-hand side</td>
<td>10</td>
</tr>
<tr>
<td>In Front</td>
<td>600</td>
</tr>
<tr>
<td>Above the casing</td>
<td>180</td>
</tr>
<tr>
<td>Below</td>
<td>200</td>
</tr>
</tbody>
</table>

Minimum clearances in millimetres.

NOTE: If the appliance is to be enclosed after the installation then the instructions given in Section 6, Air Supply, of the Installation Book MUST be followed.

ROOM THERMOSTAT

A room thermostat may be fitted for control of the central heating temperature. It will be located in one room of the home. The method of setting a room thermostat varies with the type and manufacture. Refer to the instructions supplied with the room thermostat.

THERMOSTATIC RADIATOR VALVES

If thermostatic radiator valves are to be fitted to the system then they must conform to the requirements of BS2767:1972. It is advisable to leave one valve permanently set at maximum to prevent the boiler short cycling.

SHOWERS, BIDETS, TAPS AND MIXING VALVES

Standard hot and cold taps and mixing valves used with the appliance must be suitable for operating at mains pressure. Thermostatically controlled shower valves will guard against the flow of water at too high a temperature.

If using a pressure equalising valve, set the Domestic Hot Water temperature control knob to the ‘MAX’ position.

Hot and cold mains fed water can be supplied direct to an overrim flushing bidet subject to local water company requirements.

With all mains fed systems the flow of water from the individual taps will vary with the number of outlets operated simultaneously and the cold water mains supply pressure to the property. Flow balancing using ‘Ball-o-Fix’ type valves is recommended to avoid an excessive reduction in flow to individual outlets.

For further information contact Worcester Heat Systems Technical Helpline.

HOT AND COLD FLOW

If the flow of water demanded from both hot and cold service outlets is dependent upon mains supply, it may not be possible in some installations to operate all outlets simultaneously.

WATER MAINS FAILURE

It is important to note that in the event of a mains water supply failure, no tap water will be available until the mains supply is restored. The appliance can still be used for heating provided that the system is of the sealed system type.
USE IN HARD WATER AREAS
Normally there is no need for scale protection. However, in areas of exceptionally hard water supply it is recommended that an In-Line scale inhibitor be fitted.

Installation should be strictly in accordance with the requirements of the local Water Company. An isolating valve to facilitate servicing should be incorporated.

The water hardness may be determined using the standard test paper or by reference to the local Water Company.

Further information may be obtained from Worcester Heat Systems Technical Helpline.

VENTILATION OF ROOM SEALED FANNED FLUE (RSF) APPLIANCES
These are room sealed appliances and any ventilation openings in a wall or door must not be obstructed. Do not allow the flue terminal fitted on the outside wall to become obstructed or damaged.

NOTE: Do not place anything on top of the appliance. If the appliance is fitted in a compartment do not use the compartment for storage purposes unless it conforms to the requirements of BS 6798:1987: Section 6. It is essential that the airing space is separated from the boiler space by a perforated non-combustible partition as described in BS 6798:1987.

CIRCULATING PUMP
This may be fitted with a speed adjuster. If so it will be factory set at maximum and should not be changed.

FROST PRECAUTIONS
If the appliance is not to be used for a long period of time and there is a likelihood of freezing, then the appliance should be drained. The Worcester Heat Systems Technical Helpline will advise you on suitable frost precautions. For short periods the built-in frost protection of the appliance will be adequate.

SERVICE
Annual servicing is important in order to ensure continuing high efficiency and long life for your appliance. In the event of any difficulty in making suitable servicing arrangements, Worcester Heat Systems Limited or other competent persons will discuss regular servicing arrangements and offer a comprehensive maintenance contract.

WARNING
If a gas leak exists, or is suspected, turn off the gas supply to the appliance at the service cock and consult your local service engineer.

Do not touch any electrical switches to turn them either on or off. Open all windows and doors. Do not smoke. Extinguish all naked lights.

CLEANING
Do not use abrasive cleaners on the outer casing. Use a damp cloth and a little detergent.
OPERATION OF CONTROLS

The appliance is fitted with the following controls:

OPERATING SWITCH
In the ‘O’ position there is no mains electricity to the control board.
In the ‘I’ position mains electricity is connected to the control board.

CENTRAL HEATING TEMPERATURE CONTROL
The position of this knob will determine the temperature of the water delivered to the radiators between fully clockwise and anti-clockwise to the mark. When the knob is turned anti-clockwise past the ‘I’ position towards the ‘’ (Summer Position), then the appliance will operate in the HOT WATER mode only and no heat will be delivered to the radiators.

DOMESTIC HOT WATER TEMPERATURE CONTROL
The position of this knob will determine the temperature of the water delivered at the domestic hot water taps between fully clockwise and anti-clockwise positions.
By slightly reducing the flow of domestic water from the tap, the delivery temperature of the water will be further increased. This is of particular advantage in the winter, for example to increase bath water temperature and to remove heavy grease deposits on plates, etc. Also this will provide an added advantage of reducing the delay before hot water is obtained.

FACIA MOUNTED PROGRAMMER (if fitted)
Your installer may have mounted either a mechanical or an electronic programmer into the facia of your appliance. Operating instructions are supplied with the programmer.

RESET BUTTON
Press this button in for five seconds if any of the indicator lights are flashing slowly.

SYSTEM PRESSURE GAUGE
The grey needle will show the actual pressure in the system. When operating the pressure indicated must not be greater than 2.5bar. If it is then contact your installer.
IGNITION LOCKOUT

The appliance will enter a lockout condition in the event of the burner failing to ignite. If the burner fails to light after 5 attempts the electricity supply to the gas valve will be interrupted. If ignition lockout has occurred, the central heating demand indicator will flash slowly (approximately once per second). The appliance can be reset by pressing the reset button and holding in for 5 seconds. Check that the gas supply has not been interrupted. If this condition continues to occur, then call a service engineer.

AIR FLOW DEVICE

The appliance will enter a lockout condition in the event of an air flow fault. If the controls fail to detect the correct air flow through the appliance the electricity supply to the gas valve will be interrupted. If an air flow fault has occurred, the domestic water demand indicator will flash (approximately five times per second). The appliance will try to re-light after a waiting period of approximately 4 minutes. Check that the gas terminal has not been interrupted. If the controls fail to detect the correct air flow through the flue terminal, the fan and air pressure switch are in good order. If this condition continues to occur, then call a service engineer.
TO LIGHT AND STOP THE APPLIANCE

TO LIGHT THE APPLIANCE

Check that the water valves to the central heating circuit are open. On sealed systems check that the grey needle on the pressure gauge is not below the required pressure.

Switch on the mains electricity. The green power on indicator will light. Set the room thermostat, if fitted, to maximum. Turn the central heating temperature control knob to ‘MAX’. The red central heating demand indicator will light. The burner will light and the red flame detection indicator will light.

Set the central heating and hot water temperature control knobs and the room thermostat, if fitted, to the desired temperature.

TO STOP THE APPLIANCE

For Short Periods

Turn the central heating temperature control knob fully anti-clockwise to the ‘O’ position.

For Long Periods

Turn the operating switch to the ‘O’ position. Switch off the mains electricity.

A facia mounted electronic programmer will retain its settings for about two weeks, after which it will return to the factory set programme. The display will disappear after approximately 12 hours.

A facia mounted mechanical programmer will require resetting once the operating switch has been set to ‘O’, or the mains supply has been disconnected.

ELECTRICITY SUPPLY FAILURE

If the electricity supply fails the appliance will not operate. Once the supply is restored the appliance will return to normal operation. If a programmer is fitted, check that the settings have been maintained.

OVERHEAT CUT-OFF THERMOSTAT

The appliance will enter a lockout condition in the event of overheating.

An overheat cut-off thermostat is fitted to the appliance which will interrupt the electricity supply to the gas valve.

If the overheat cut-off has operated, both the central heating and the hot water demand indicators will flash together.
The appliance can be reset by pressing the reset button and holding in for 5 seconds when the appliance has cooled.

IGNITION LOCKOUT
The appliance will enter a lockout condition in the event of the burner failing to ignite.
If the burner fails to light after 5 attempts the electricity supply to the gas valve will be interrupted.
If ignition lockout has occurred, the central heating demand indicator will flash slowly (approximately once per second).
The appliance can be reset by pressing the reset button and holding in for 5 seconds. Check that the gas supply has not been interrupted.
If this condition continues to occur, then call a service engineer.

AIR FLOW DEVICE
The appliance will enter a lockout condition in the event of an air flow fault.
If the controls fail to detect the correct air flow through the appliance the electricity supply to the gas valve will be interrupted.
If an air flow fault has occurred, the domestic water demand indicator will flash (approximately five times per second).
The appliance will try to re-light after a waiting period of approximately 4 minutes Check that the flue terminal has not been obstructed or damaged, and that the fan and air pressure switch are in good order.
If this condition continues to occur, then call a service engineer.
More than 30% of all calls made to Worcester Heat Systems to report appliance faults or breakdowns prove to be false alarms, as there is often a simple explanation for the apparent malfunction.

So, to help you save time and money – not to mention frustration and inconvenience – please refer to the General Information, Notes and Lighting Instructions ensuring all controls are set correctly.

If, after following the instructions the appliance still fails to operate correctly call the Worcester Heat Systems Service Centre. Arrangements will be made for an engineer to call as soon as possible.

**CALL-OUT CHARGES**

All of our field service engineers are factory trained.

If you request a visit from an engineer and your appliance has been installed within the last 12 months, no charge will be made for parts and/or labour, providing:

- The appliance was commissioned correctly on installation.
- An appliance fault is found and the appliance has been installed within the past 12 months.

A call-out charge will be made where:

- The appliance has been installed for over 12 months, or
- Our Field Service Engineer finds no fault with the appliance (see note), or
- The cause of breakdown is with other parts of your plumbing/heating system, or with equipment not supplied by Worcester.

**NOTE:** Invoices for attendance and/or repair work carried out on your appliance by any third party will not be accepted.
MAINTAINING YOUR APPLIANCE

Your new Worcester Si gas-fired appliance represents a long-term investment in a reliable, high quality product.

In order to realise its maximum working life, and to ensure it continues to operate at peak efficiency and performance, it is essential that your boiler receives regular, competent servicing and annual maintenance checks beyond the initial 12 month guarantee period.

Regular service contracts can be arranged with your installer – however if you have difficulty making a satisfactory arrangement simply contact Worcester Heat Systems on 0345 256206 for help.

If you would like to know more about Worcester’s extended warranty options please tick the appropriate box on your warranty registration card.
CONTACT NUMBERS:

UK Call Centre  Tel.  08457 256 206
UK Call Centre  Fax.  01905 757536
Scotland only  Fax.  01506 441 687

OPERATING HOURS:

Mon - Fri  8.00am to 6.00pm
Sat  8.30am to 1.00pm

Please contact our UK Call Centre number where our friendly operators will book your call with one of our team of nationwide engineers.

NOTE:
Sunday and Bank Holiday cover is not available
This appliance is guaranteed against faulty materials or workmanship for a period of twelve calendar months from the date of installation subject to the following conditions and exceptions.

1. That during the currency of this guarantee any components of the unit which are proved to be faulty or defective in manufacture will be exchanged or repaired free of material charges and free of labour charges by Worcester Heat Systems Limited.

2. That the householder may be asked to prove the date of installation, that the appliance was correctly commissioned and, where appropriate, the first 12 month service has been carried out to the satisfaction of Worcester Heat Systems Limited when requested.

3. That any product or part thereof returned for servicing under the guarantee must be accompanied by a claim stating the Model, Serial Number, Date of Installation.

4. That Worcester Heat Systems Limited will not accept responsibility for damage caused by faulty installation, neglect, misuse or accidental damage, the non-observance of the instructions contained in the installation and Operating Instructions Leaflets.

5. That the appliance has been used only for normal domestic purposes for which it was designed.

6. That this guarantee applies only to equipment purchased and used in mainland Great Britain.

This guarantee is given in addition to all your normal statutory rights.
GUARANTEE
REGISTRATION

You should complete and return the postpaid Guarantee Registration Card within 14 days of purchase.

The card will register you as the owner of your new Worcester Si appliance and, while this will not affect your statutory rights in any way, it will assist us to maintain an effective and efficient customer service by establishing a reference and permanent record for your boiler.

**IMPORTANT:** SERIAL NUMBER. Copy the number off the Guarantee Card.

<table>
<thead>
<tr>
<th>FOR YOUR OWN RECORD</th>
<th>SERIAL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL</td>
<td></td>
</tr>
<tr>
<td>TYPE/SIZE</td>
<td>DATE OF INSTALLATION</td>
</tr>
</tbody>
</table>

Do not forget to keep the Log book in a safe place.

WORCESTER
Bosch Group

EXCELLENCE COMES AS STANDARD
Telephone: (01905) 754624 Fax: (01905) 754619.
Technical Helpline (0990) 266241.
IMPORTANT: THIS BOOKLET MUST BE READ FULLY IN CONJUNCTION WITH THE
APPLIANCE INSTALLATION AND SERVICING INSTRUCTIONS

THESE INSTRUCTIONS APPLY IN THE UK ONLY
THESE INSTRUCTIONS ARE TO BE LEFT WITH THE USER OR AT THE GAS METER
The Flue System must be installed in accordance with BS 5440: Part 1 2000 where applicable.
When installed the minimum clearance between the terminal and any adjoining vertical walls or obstructions must be at least 500mm. The terminal must not be installed within 600mm of an openable window, air vent or any other ventilation opening. See Fig. 1.
If the flue needs to go through a wall next to the appliance adequate space must be allowed for the flue bend to be fitted.
When the flue is taken through the ceiling and into the roof space, or room above there must be a minimum air gap of 25mm between any part of the flue system and any combustion material.

**Note:** It is absolutely essential to ensure, that in practice, products of combustion discharging from the flue terminal cannot re-enter the building or any other adjacent building through ventilators, windows, doors, other sources of natural air infiltration, or forced ventilation/air conditioning. If this should occur, the appliance **MUST** be turned off immediately and the local Gas region called in to investigate.
The Flue System must be supported by brackets (not supplied) such that the weight of the flue system is not resting on the appliance flue connection.
The Flue System is suitable for installation in dwellings with pitched or flat roofs.
The minimum distance the Flue Terminal Assembly shall extend above the surface of the roof is 300mm. This dimension is measured from the outside surface of a flat roof or the highest point on a pitched roof to the underside of the air inlet flange on the terminal assembly. See Fig 2.

### 1. Flue Terminal Position

**Fig. 1. Terminal Position**

- **Pitched Roof**
  - 600mm
  - 500mm

- **Flat Roof**
  - 600mm
  - 500mm

### 2. Vertical Balanced Flue Options

**Important:** All the Flue items referred to in this section are supplied as optional extras and should be purchased before the installation is started. The components should be checked against the parts and part numbers shown in Table 1.

<table>
<thead>
<tr>
<th>Key No.</th>
<th>The Vertical Flue Kit consists of:</th>
<th>Quantity</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flue Terminal Assembly</td>
<td>1</td>
<td>7 716 191 079</td>
</tr>
<tr>
<td>2</td>
<td>Weather Sealing Collar</td>
<td>1</td>
<td>8 716 102 321</td>
</tr>
<tr>
<td>3</td>
<td>Flue Adaptor*</td>
<td>1</td>
<td>7 716 191 016</td>
</tr>
<tr>
<td>4</td>
<td>Fire Stop Spacer</td>
<td>2</td>
<td>8 716 100 281</td>
</tr>
<tr>
<td>5</td>
<td>Silicone Sealant</td>
<td>1</td>
<td>ZJADH 019</td>
</tr>
</tbody>
</table>

The following components **MUST** be ordered separately to suit the installation requirements

<table>
<thead>
<tr>
<th>Key No.</th>
<th>Description</th>
<th>Quantity</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Extension Flue Kit (750mm) including Flue Spacer</td>
<td>As req’d</td>
<td>7 716 191 006</td>
</tr>
<tr>
<td>7</td>
<td>90° Flue Bend</td>
<td>1</td>
<td>7 716 191 013</td>
</tr>
<tr>
<td>8</td>
<td>45° Flue Bend</td>
<td>1 pair</td>
<td>7 716 191 014</td>
</tr>
</tbody>
</table>

*NOTE: A Vertical Flue Adaptor is supplied in the Vertical Flue Kit, and the separate Part No. should therefore only be ordered in the case of a vertical exit from the boiler but horizontal termination*
2.1. TERMINAL ASSEMBLY
The overall height of the terminal assembly is 1100mm.
Note. A minimum of 300mm shall extend above the surface of the roof. Refer to Fig. 2.

2.2. NOMINAL FLUE HEIGHT (NO OFFSET).
The maximum equivalent flue heights, excluding the flue terminal assembly are:

<table>
<thead>
<tr>
<th>Model</th>
<th>Equivalent Flue Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>24i, 28i, 35CDi II</td>
<td>2.3m</td>
</tr>
<tr>
<td>WR325, WH1</td>
<td>2.6m</td>
</tr>
<tr>
<td>25Si, 28Si, C1</td>
<td>3.0m</td>
</tr>
<tr>
<td>15SBi, 24SBi, 24CDi, 80ic</td>
<td>4.0m</td>
</tr>
<tr>
<td>9/14, 14/19CBi</td>
<td>3.0m</td>
</tr>
<tr>
<td>19/24CBI</td>
<td>2.25</td>
</tr>
<tr>
<td>28CDi</td>
<td>3.5m</td>
</tr>
<tr>
<td>Highflow 400 Electronic</td>
<td>4.5m</td>
</tr>
</tbody>
</table>

2.3. FLUE WITH OFFSET USING TWO FLUE BENDS.
A flue offset can be provided using 2 at 90° (except for WH1 and WR325 RSF water heaters where 90° bends cannot be used) or 2 at 45° bends.

When using an offset the overall length of the system is reduced.
A 90° bend is equivalent to 750mm of straight flue.
A 45° bend is equivalent to 375mm of straight flue.

Note: For the 24i, 28i and 35CDi II 2 x 90° bends allows a maximum straight length to not exceed 800mm or 1550mm for 2 x 45° bends.

When measuring between the centre-lines of flue ducts an allowance must be made for the relevant elbow. Refer to Fig. 3.

2.4. FLUE RESTRICTOR RINGS
The flue restrictor rings are in the appliance installation pack. Refer to the relevant Installation/service instructions for the method of fitting a restrictor ring.

<table>
<thead>
<tr>
<th>Model</th>
<th>Equivalent Flue Lengths Up to 1m</th>
<th>Equivalent Flue Lengths 1m to 4m</th>
</tr>
</thead>
<tbody>
<tr>
<td>15SBi</td>
<td>79mm</td>
<td>NONE</td>
</tr>
<tr>
<td>24SBi</td>
<td>75mm</td>
<td>NONE</td>
</tr>
<tr>
<td>C1 &amp; Si Series</td>
<td>79mm</td>
<td>NONE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Equivalent Flue Lengths Up to 725mm</th>
<th>Equivalent Flue Lengths 725mm to 3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/14CBI</td>
<td>72mm</td>
<td>NONE</td>
</tr>
<tr>
<td>14/19CBI</td>
<td>72mm</td>
<td>NONE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Equivalent Flue Lengths Up to 2600mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR325 RSF</td>
<td>NONE</td>
</tr>
<tr>
<td>WH1</td>
<td>NONE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Equivalent Flue Lengths Up to 1m</th>
<th>Equivalent Flue Lengths 1m to 2.3m</th>
</tr>
</thead>
<tbody>
<tr>
<td>35CDi II</td>
<td>85</td>
<td>NONE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Equivalent Flue Lengths Up to Max Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>24CDi</td>
<td>NONE</td>
</tr>
<tr>
<td>28CDi</td>
<td>NONE</td>
</tr>
</tbody>
</table>
3. Preparation and General Notes

3.1. FLUE HEIGHT AND OFFSETS.
Determine the height of the flue system and if offsets are needed for the system to miss ceiling/roof joists and any other obstruction. Refer to Fig. 8.

3.2. INSTALLATION OF BOILER.
Refer to the relevant Installation and Servicing Instructions for the fitting of the wall-mounting frame assembly and the boiler.
Flush the system and, where required, the cold water supply before connecting the boiler.

3.3. FLUE KITS AND EXTENSIONS.
Remove all the packing from the ducts, flue terminal assembly and flue bends.
**Important:** The air duct, flue duct, flue bends and the terminal assembly are made from aluminium and must be handled appropriately.

3.4. FLUE ADAPTOR
For some options a flue adaptor must be fitted into the spigot on the top of the appliance casing. Refer to Fig. 9, 10.
Fix the flue adaptor in position with the clamping screw ensuring that it is correctly located against the stop. Refer to Fig. 5.
If a flue bend (*WH1 and WR325 RSF may only use 45° bends*) is to be fitted directly to the top of the appliance then the flue adaptor is not required.

3.5. FLUE SUPPORT
Flue assembly lengths over 2000mm should be appropriately supported. Refer to Fig. 6 and Section 5.4.

3.6. FIRE STOP SPACER
The fire stop spacer is supplied with the flue kit. Refer to Fig. 7 and Section 5.3.

3.7. ROOF FLASHING
The roof flashing is not supplied. This is available, as a proprietary item (*Selkirk or similar*) from the building suppliers to suit a flue size of 125mm diameter and to suit pitched and flat roofs.
3.8. POSITIONING THE FLUE SYSTEM

It may be necessary to deviate from the following method of installation because of site conditions. However, joints must be sealed and fixed as described.

Align the centre of the flue spigot with the ceiling and mark the centre position. Refer to Fig. 8. Cut a hole 175mm (7in.) diameter in the ceiling.

Working within the roof space repeat the procedure and mark the centre position of the flue on the inside surface of the roof. Mark a 125mm diameter circle on the inside surface to represent the outside diameter of the flue. Refer to Fig. 8. This procedure is the same for flat and pitched roofs.

Important: The terminal assembly must extend at least 300mm above the surface or pitch of the roof. The distance may vary depending upon the type of roof and surrounding structures. In these instructions the distance is referred to as dimension ‘F’. Refer to Fig. 9.10.11.12.

Fig. 8. Marking out the flue assembly position.
4. Measurement of Ducts

4.1 AIR AND FLUE DUCT LENGTHS - NO OFFSET

For a flat roof, measure the distance from the appliance top panel to the outside edge of the hole diameter marked on the inside surface of the roof. This is dimension \( E_1 \). Refer to Fig. 9.

For a pitched roof, measure the distance from the appliance top panel to the highest point of the hole diameter. This is dimension \( E_2 \). Refer to Fig. 9.

Determine dimension \( F \) which must not be less than 300mm.

Duct Length = \( H - 92 \text{mm} \)

Derivation: Dimension \( G = 1100 - F \text{mm} \)

Dimension \( H = E - G \)

Refer to 2.2 for maximum duct length.

Fig. 9. Vertical flue system (No offset)
4.2 AIR AND FLUE DUCT LENGTHS - OFFSET WITH VERTICAL ADAPTER (90° or, where applicable, 45° bends)

1st Vertical Section:
Measure from the top of the flue spigot on the appliance to the centre-line of the horizontal section of the offset. Dimension 'J'.
Refer to Fig. 10.
Duct Length = J — 173mm
**Note:** The air duct must not be less than 25mm.
If the elbow fits directly onto the spigot then J = 173mm.

Offset (Horizontal) Section:
Measure from the centre of the flue spigot on the appliance to the centre-line of the 2nd vertical section. Dimension 'D'.
Refer to Fig. 10.
Duct Length = D — 162mm
**Note:** The dimension D must not be less than 210mm.

**Fig. 10. Vertical flue system offset with vertical adaptor**
(Not to be used with WH1 and WR325 Water Heaters)

2nd Vertical Section:
Measure the distance from centre-line of the horizontal offset to the outside edge of the hole diameter marked on the inside surface of the roof. Dimension 'K'. Refer to Fig. 7.
**Note:** Dimension K, for a pitched roof, must go to the highest point of the hole diameter.
Determine dimension 'F'. Refer to Fig.1 and 7 for the limiting figure.
Duct Length = L — 81mm
Derivation: Dimension G = 1100 — Fmm
Dimension L = K — G
**Note:** The air duct must not be less than 100mm.

---

**Air inlet flange**
**Weather sealing collar**
(Secure with screw provided and seal with silicone sealant)
**Roof flashing (not supplied)**

**Flat roof**
**Pitched roof**

**Ceiling**
**Fire stop spacer**

**Vertical flue adaptor**

**Appliance**
**Front**

**Note:** Straight length (D + J + L)

**Note:** For more information on bends in flue see installation and service instructions.
4.3 AIR AND FLUE DUCT LENGTHS - OFFSET WITHOUT VERTICAL ADAPTER (90° or, where applicable, 45° bends)
Measure the distance from the centre of the flue spigot on top of the appliance to the centre line of the vertical sections. Dimension D. Refer to Fig. 11,12.
Duct Length: 90° bends = D — 162mm
45° bends = (1.414 × D) — 60mm
Note: D must not be less than 210mm with 90° bends or 76mm with 45° bends.
Minimum length of air/flue duct is 48mm.
When 45° bends are used the equivalent overall height of that section is D+60mm.

Fig. 11. Vertical flue system offset without vertical adaptor
(Not to be used with WH1 Boilers and WR325 Water Heaters)

Vertical Section:
Measure the distance from the centre-line of the horizontal offset to the outside edge of the hole diameter marked on the inside surface of the roof. Dimension 'K'. Refer to Fig. 6 and 7.
Note: Dimension K For a pitched roof must go to the highest point of the hole diameter.
Determine dimension 'F' which must not be less than 300mm.
Duct Length = L — 81mm
Dimension G = 1100 — F mm
Dimension L = K — G

Note: Straight length (D + L) - 250
Note: For more information on bends in flue see installation and service instructions.
5. Installation of Flue

5.1 It may be necessary to deviate from the following method of installation because of site conditions, however, the joints must be sealed and fixed as described.

5.2 CUT DUCTS
When measurements have been made and checked, cut the air and flue ducts to length ensuring that the cuts are square and free from burrs.
All dimensions refer to straight lengths and do not include the expanded ends. Do not cut the expanded ends unless specifically instructed to do so.

5.3 POSITION OF THE FIRE STOP SPACER ASSEMBLY
Fit the fire stop spacer centrally over the hole in the ceiling. Ensure the hole aligns with the flue spigot on top of the appliance casing.

Mark the four fixing hole positions in each half for No.10 x 30mm wood screws (not supplied) and fix either into the existing joists or into reinforcement nogs. Alternatively, the plate may be fixed to the ceiling using plasterboard toggle screws. Refer to Fig. 7.

5.4 POSITION OF THE FLUE DUCT SUPPORT BRACKET
From inside the roof space fit the support centrally over the hole in the ceiling. Ensure the hole aligns with the fire stop spacer and flue spigot on top of the appliance casing.
Mark and fix in position as previously described for the fire stop spacer. Refer to Fig. 6.
Remove the fire stop spacer and support bracket until the flue is assembled.

Mark: 45° bends may be applied in any system layout as with 90° bends.

Note: For more information on bends in flue see installation and servicing instructions.
5.5 ASSEMBLY OF DUCTS

5.5.1 AIR DUCTS
Check the assembled length of the ducts. Drill two holes through the pilot holes in the expanded end of the air duct and fix the ducts together with the screws provided.

5.5.2 FLUE DUCTS
Fix the flue ducts together with screws provided ensuring that any extension ducts have the seals fitted. Refer to Fig. 8. The 750mm extension kits come complete with one flue spacer. These must be fitted at about half distance, before the ducts are finally assembled.
Assemble the flue duct into the air duct.

5.6 FITTING FLUE AND AIR DUCTS ONTO AN ELBOW AT THE APPLIANCE
Fit the flue duct to the elbow ensuring that it is fully against the stop.
Drill two holes through the duct into the elbow. Separate and apply a smear of silicone sealant and fix with screws provided. Fit the air duct over the elbow entry and repeat the above process.

5.7 PREPARE THE ROOF
Remove sufficient roof tiles, or if a flat roof, cut a hole approximately 175mm diameter for the flue terminal assembly.

5.8 FIX THE FLUE SYSTEM ASSEMBLY TO THE APPLIANCE
From inside the building, assemble the flue system starting at the appliance. Refer to Fig. 6, 8, 9 and 10.
Align the flue assembly or the first section of flue with the flue adapter fitted on top of the appliance casing. Drill two holes through the air duct and flue adapter and fix with the screws provided.
If an elbow is fitted straight onto the boiler then locate the elbow against the stop on the spigot on the boiler and fix with the clamp. Refer to Fig. 8, 9 and 10.
Note: All ducts must be truly horizontal or vertical unless the 45° elbows are being used.
Check at each stage of the system assembly that each section is properly aligned.
Each air and flue duct joint must be sealed and fixed. Each air and flue duct connection to an elbow must be sealed with silicone sealant and fixed with the screws provided.
Support any sections of the system until they are permanently fixed into place using suitable support brackets.

Fig. 13. Typical duct assembly.
Important: Do not forget to fix the fire stop spacer as the assembly of the system proceeds.

5.9 FIX THE FLUE TERMINAL ASSEMBLY
Fit the roof flashing loosely to the roof.
From outside, pass the terminal assembly through the roof flashing.
From inside the roof space align the assembly with the air and flue ducts. If required, loosely fit the support bracket ensuring that the assembly is located correctly. Refer to Fig. 6.
Drill two holes through the holes in the air duct. Separate the assembly and apply silicone sealant to the outside of the air duct.
Re-connect the assembly and fix with the screws provided.
Note: The sealant and screws are not required for the flue duct. Refer to Fig. 13.

5.10 SEAL THE TERMINAL ASSEMBLY TO THE ROOF
From outside the building make good the roof structure and ensure the roof is weather sealed by fixing the roof flashing.
Apply sealant around the air duct at the top of the flashing.
Lower the weather-sealing collar over the roof flashing and tighten the self tapping screws provided and apply sealant around the top edge of the weather sealing collar.
Refer to Fig. 9, 10, 11, 12.
DIGITAL SINGLE-CHANNEL PROGRAMMER
FITTING AND OPERATING INSTRUCTIONS

General information is given in the users instruction leaflet despatched with the appliance and/or on the lighting instruction plate fitted to the appliance.

CONFORMS TO THE ESSENTIAL REQUIREMENTS OF THE FOLLOWING DIRECTIVES:
89/336/EEC - Electromagnetic compatibility
73/23/EEC - Low voltage Directive

THESE INSTRUCTIONS APPLY IN THE UK ONLY
THESE INSTRUCTIONS ARE TO BE LEFT WITH THE USER OR AT THE APPLIANCE
Gas Safety (Installation and Use) Regulations 1984: All gas appliances must be installed by a competent person, in accordance with the above regulations. Failure to install the appliance correctly could lead to prosecution. The manufacturers notes must not be taken, in any way, as overriding statutory obligations.

**IMPORTANT:** Read these instructions carefully in order to get the best from your appliance.

**WARNING:** This appliance must be earthed and protected by a 3A fuse if a 13A plug is used, or, if any other type of plug is used, by a 5A fuse either in the plug or adaptor or at the distribution board.

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### PROGRAMMER

7 day single channel timeswitch. User maintenance is not possible.

**CONTROL**

One or Two ON and OFF periods can be chosen per day.

Programme times are set within a 23 hour 50 minute period.

**POWER UP CONDITION**

On power up, when the battery back-up has not been operational, the pre-set programme times will be in force:

<table>
<thead>
<tr>
<th></th>
<th>ON1</th>
<th>OFF1</th>
<th>ON2</th>
<th>OFF2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MON - FRI</strong></td>
<td>6.30AM</td>
<td>8.30AM</td>
<td>4.30PM</td>
<td>10.30PM</td>
</tr>
<tr>
<td><strong>SAT - SUN</strong></td>
<td>7.00AM</td>
<td>9.00AM</td>
<td>4.00PM</td>
<td>11.00PM</td>
</tr>
</tbody>
</table>

To return the programmer to the standard programme and 12.00am MON press the SET and + buttons together.

**BATTERY BACK-UP**

Lifetime Lithium battery giving:

- Display: 1 Hour min, 2 hour max every power loss.
- Timekeeping: 7 hour min, 8 hour max every power loss.
- Programme: 1.5 year min, 10 year typical.

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### TO FIT THE PROGRAMMER

**WARNING:** Switch off the power supply before starting work.

Remove the facia cover plate by releasing the clip at the top and withdraw it from the front.

Present the programmer to the facia and plug in the programmer connector into the four-way connection on the board. (Fig. 1).

Push the programmer into position ensuring that the lead is not trapped and that the clip has been properly engaged.

Switch on the power supply.
TO REPLACE THE PROGRAMMER
Follow the preceding instructions.
The programmer controls the operation of the central heating circuit. The domestic hot water is permanently available upon demand and will take priority over the supply of heat to the system during the demand.

Pressing the SET button repeatedly progresses you through the settings. To reset at any point the YES button must be pressed, followed by the + and – buttons as necessary.

NOTE: The – button is also the YES button.

Check that the gas supply to the appliance is OFF and that the room thermostat, if fitted, is at minimum to prevent the accidental operation of the appliance during the initial setting of the programmer. It is not necessary to do this when making adjustments to the programmer at a later date. Check that all taps and showers are shut.

Switch on the power supply.

TO SET THE CLOCK
Starting with the display showing the time of day press SET.
The display will ask SET CLOCK ?. If the clock display is not correct, press YES.
The display will show the current time and day with the day flashing.
Use the + and – buttons to change to the correct day. Press SET to lock in the day.
The display will show the hours flashing. Use the + and – buttons to set the hours (remember to take into account AM or PM), press SET to lock in the hours.
Repeat the actions to set the minutes.
The display will show SET PROG?.

TO SET THE PROGRAMME
If you wish to change the programme press YES otherwise press SET twice to return to the run mode with the standard programme.
If you pressed YES then the display will ask SET MON-FRI PROG?
If you want the weekday times to be the same press YES.
If you require a different time for each day press SET to access each day separately.
If you pressed YES then the display will show the first ON time for MON-FRI. Use the + and – buttons to change the time as necessary.
Press SET to access the first OFF time.
Use the SET and + and – buttons to go through the programme and change as necessary.
When you press SET after the second OFF the display will ask SET MON PROG?.
If you wish set or modify the MON times use the YES button to access the times and the SET, + and – buttons to change as necessary.
You can access each day in turn by pressing the SET button and only if you wish to change anything should you press the YES button followed by the + and – buttons.
After Friday you have the chance to set SAT and SUN the same after which they are accessed individually.
Pressing SET after the display SET SUN PROG? or the last SUN off time will show TEST? on the display.
TO TEST THE PROGRAMME

The test feature enables you to quickly run through the programme which has been set and check that all is correct with both the programme and the system.

Pressing the YES button in response to TEST? selects the test mode.

Pressing and holding down the YES button starts the clock fast running until it reaches the first switching time when the output changes and the display halts to show the time of switching and the output state.

If you continue to hold down the YES button the display will continue to fast run, after a few seconds, until the next switching time.

If you stop pressing the YES button the unit will stay in that mode until the YES button is pressed again.

In this way you can run through the days programme or, if you hold down the YES button, the whole weeks programme.

Pressing the SET button, at any time, returns the unit to the normal run mode.

OPERATIONAL NOTES

Switching:
The switching options for the central heating are

- OFF Off all the time
- TWICE On for two periods each day
- ONCE On for one period each day (ON1 to OFF2)
- ON On all the time.

Operation of the SELECT button moves the arrow to the option required.

Mixing Once or Twice Options:
To have the Central Heating twice on some days and once on others, programme the twice days as normal. For the other days set ON1 and then OFF1, ON2 and OFF2 at the desired off time. Set the SELECT button to TWICE.

One Day Off:
If you want the appliance to be off on a particular day, set the relevant ON1 and OFF1 to the same time and the ON2 and OFF2 to the same time later in the day. Set the SELECT button to ONCE or TWICE.

Central Heating Shutdown:
Set the SELECT button to OFF. This does not affect the programme.

Advance:
Advance is only operational in the ONCE or TWICE modes and is cancelled at the next programme time.

Hot Water Supply:
Hot water is available whenever a tap or shower is turned on. The supply of hot water takes priority over the delivery of heat to the central heating system for the period that the hot water is required.
Temperature Control:
The Central Heating water temperature is controlled by the centre knob on the facia. The Domestic Hot Water Temperature is controlled by the right hand knob on the facia.

Standard Programme:
To return to the standard programme press the SELECT and + buttons together.

TO LIGHT AND STOP THE APPLIANCE

Refer to the User operating instruction leaflet or the lighting instruction plate on the appliance.