QUANTEC HR28CP ErP
High Efficiency Boiler

with Passive Flue
Gas Heat Recovery

INSTALLATION, COMMISSIONING & SERVICING INSTRUCTIONS

Quintec HR28CP ErP - G.C. No. 47-416-14

These instructions are to be left with the User

www.johnsonandstarley.co.uk
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**PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION.**

**LEAVE THESE INSTRUCTIONS WITH THE USER OR AT THE GAS METER AFTER INSTALLATION.**

**The Benchmark Scheme**

Benchmark places responsibilities on both manufacturers and installers. The purpose is to ensure that customers are provided with the correct equipment for their needs, that it is installed, commissioned and serviced in accordance with the manufacturer’s instructions by competent persons and that it meets the requirements of the appropriate Building Regulations. The Benchmark Checklist can be used to demonstrate compliance with Building Regulations and should be provided to the customer for future reference.

Visit www.centralheating.co.uk for more information.

Installers are required to carry out installation, commissioning and servicing work in accordance with the Benchmark Code of Practice which is available from the Heating and Hot water Industry Council who manage and promote the Scheme.

In the interest of continuous development Johnson and Starley reserve the right to change specification without prior notice. Johnson and Starley prides itself on its ability to supply spare parts quickly and efficiently.
1. FEATURES

Appliance Classification:
The QuanTec HR28CP has been tested and CE certified by B.S.I Ltd for use with LPG G31.

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2. GENERAL DESCRIPTION

2.1 The QuanTec HR28CP appliance is a high efficiency combination boiler, designed to provide both central heating and domestic hot water on demand. It’s design is room sealed, taking combustion air from outside and expelling the products of combustion back to the outside.

Standard features include full sequence automatic spark ignition, low water content stainless steel heat exchanger, automatic bypass and boiler frost protection, a daily pump and divert valve excises.

The QuanTec HR28CP incorporates an additional recuperator to preheat the DHW cold supply prior to being fully heated in the normal plate heat exchanger.

Variable CH and DHW temperature controls are fitted on the user control and the boiler features a DHW preheat facility.

- Central heating (CH) output is fully modulating with a range of: 4.8 to 21.1kW (16,500 to 82,600 Btu/h)
- Instant domestic hot water (DHW) output is also fully modulating with a maximum of: 30.28kW.

2.2 When no demand for CH, the boiler fires only when DHW is drawn off, or periodically for a few seconds without any DHW draw-off, in order to maintain the DHW calorifier in a heated condition. This only occurs if pre-heat is in the ‘ON’ period.

When there is a demand for CH, the heating system is supplied at the selected temperature of between 45°C and 80°C, until DHW is drawn off. The full output from the boiler is then directed via the diverter valve to the plate heat exchanger to supply a nominal DHW draw-off of 12.31 l/min at 35°C temperature rise.

The DHW draw off rate specified above is the nominal that the boiler flow regulator will give. Due to system variations and seasonal temperatures DHW flow rates/temperature rise will vary, requiring adjustment at the draw off tap.

At low DHW draw-off rate the maximum temperature is limited to 65°C by the modulating gas control.

The boiler features a comprehensive diagnostic system which gives detailed information on the boiler status when operating, and performance of key components to aid commissioning and fault finding.
3. BUILDING STANDARDS & REGULATIONS

STATUE LAW DEFINES THAT ALL GAS APPLIANCES MUST BE INSTALLED BY COMPETENT PERSONS, i.e. GAS SAFE REGISTERED INSTALLERS.

GAS SAFE MEMBERSHIP ENQUIRIES TEL: 0800 408 5500 IN ACCORDANCE WITH THE GAS SAFETY (INSTALLATION AND USE) REGULATIONS (CURRENT EDITION).

FAILURE TO COMPLY WITH THESE REGULATIONS MAY LEAD TO PROSECUTION.

3.1 INSTALLATION REGULATIONS

- Building Standards (Scotland) (Consolidation) Regulations
- Building Regulation Part L
- Gas Safety (Installation and Use) Regulations (as amended)
- The Water Fittings Regulations or Water by-laws in Scotland
- Building Regulation (Northern Ireland)
- Model and Local Authority Byelaws
- Health & Safety Document No. 635.
- The Electricity at Work Regulations, 1989.
- Institute of Electrical Engineers (I.E.E) Wiring Regulations
- EU Regulation No 811/2013 and No. 812/2013 supplement Directive 2013/20/EU

This appliance has been Tested and Certified in order to meet the necessary European Directives and comply with the latest Building Regulations, including the efficiency requirements of the SEDBUK scheme.

- Efficiency of Hot Water Boilers Directive 92/42/EEC
- Gas Appliance Directive 2009/142/EC
- Low Voltage Directive 2006/95/EEC

3.2 BUILDING STANDARDS AND REGULATIONS

Where no specific instructions are given, reference should be made to the relevant British Standard Code of Practice.

BS 5440:1 Flues (for gas appliances of rated input not exceeding 70 kW).
BS 5440:2 Ventilation (for gas appliances of rated input not exceeding 70 kW).
BS EN 12828 Heating Systems in buildings: Design for water based heating systems.
BS EN 12831 Heating Systems in buildings: Method for calculation of the design heat load.
BS EN 14336 Heating Systems in buildings: Installation and commissioning of water based heating systems.
BS 5546 Installation of gas hot water supplies for domestic purposes (2nd Family Gases)
BS 6798 Installation of gas fired hot water boilers of rated input not exceeding 70 kW.
BS 6891 Installation of Low Pressure Gas Pipework of up to 28 mm (R1) in domestic premises (2nd family gases).

IMPORTANT: This appliance is CE certificated for safety and performance. It is important that no modifications are made to this appliance, unless fully approved in writing by Johnson & Starley Ltd. If in doubt please ring Johnson & Starley Ltd on Telephone 01604 762881.

4. SAFETY & GAS INFORMATION

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE COMMENCING WITH THE INSTALLATION

4.1 GENERAL SAFETY INFORMATION

4.1.1 An LPG unit should not be installed in a room or internal space below ground level unless one side of the sides of the building is open to the ground.

4.1.2 Only use QuanTec original spare parts on this appliance. Failure to do so will invalidate the guarantee.

4.1.3 No artificially softened water must not be used to fill the central heating system.

4.1.4 The system can be damaged by debris entering the heat exchanger and reduce efficiency. It is recommended that the boiler is flushed, follow these guidelines as this will protect the boiler and prolong its life.

4.1.5 It is important that the system is flushed thoroughly before the appliance is left to operate (as recommended in BS 7593) in order to maintain an efficiently operating heating system. For replacement installations, the system MUST be flushed with the old boiler in situ, in order to prevent the QuanTec becoming a trap for system debris. Once the system has been flushed, an inhibitor (suitable for stainless steel heat exchangers) should be added. Appropriate inhibitors are available, for example Sentinel, Fernox and Salamander. We also recommend a Magnetic & Non Magnetic Filtration system is fitted between the last radiator and the boiler.

4.1.6 Failure to carry out the above procedure will invalidate the guarantee!
4.2 HANDLING THE UNIT

4.2.1 The weight of this appliance exceeds that recommended for a one-man lift. It will therefore be necessary to gain assistance at times during the removal from its packaging and during installation procedure. Manoeuvring the boiler may include the use of a sack truck and involve lifting, pushing and pulling.

4.2.2 It should be noted that this appliance may contain sharp edges. Care MUST be taken when handling the appliance to prevent injury. We advise the engineer to wear suitable P.P.E.

4.2.3 Once the appliance has been fired beware that certain parts will be hot to the touch.

4.2.4 Do not install flues during rain, high winds or in severe weather conditions.

4.2.5 The manufacturers instructions supplied must not be taken as overriding any statutory requirements.

4.3 OPERATING THE APPLIANCE

4.3.1 This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have supervision or been given instruction concerning use of the appliance by a person responsible for their safety.

4.3.2 Children should be supervised to ensure they do not play with the appliance.

4.4 ELECTRICAL SUPPLY

4.4.1 Ensure the mains supply voltage, frequency, number of phases and power rating comply with details on the rating label.

4.4.2 All wiring must be in accordance with the appropriate standards. The equipment must be supplied with a double pole isolator switch and for new heating systems, and where practical replacement installations, the isolator shall be situated adjacent to the appliance.

4.4.3 Ensure safety regulations and practices are adhered to when installing and using this appliance.

4.5 GAS SUPPLY

4.5.1 All equipment, gas pipework and regulator must be checked and ensuring it is in good working order and meets the gas flow and pressure requirements.

4.5.2 The Gas Supply must be connected to a regulator.

4.5.3 Installation and gas connections must follow BS 6891.
5. TECHNICAL DATA

EU Regulations No. 811/2013 and No. 812/2013 supplementing Directive 2010/30/EU.

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<thead>
<tr>
<th>TABLE 1. ErP TECHNICAL DATA</th>
<th>HR28CP</th>
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<tbody>
<tr>
<td><strong>PRODUCT DATA</strong></td>
<td>SYMBOL</td>
</tr>
<tr>
<td>Condensing boiler</td>
<td>-</td>
</tr>
<tr>
<td>Low temperature boiler</td>
<td>-</td>
</tr>
<tr>
<td>B11 Boiler</td>
<td>-</td>
</tr>
<tr>
<td>Cogeneration space heater</td>
<td>-</td>
</tr>
<tr>
<td>Combination Heater</td>
<td>-</td>
</tr>
<tr>
<td>Rated heat output</td>
<td>( P_{\text{rated}} )</td>
</tr>
<tr>
<td>Seasonal space heating energy efficiency</td>
<td>( \eta_S )</td>
</tr>
<tr>
<td>Energy efficiency class</td>
<td>-</td>
</tr>
</tbody>
</table>

**USEFUL HEAT OUTPUT**

- At rated heat output and high temperature regime: \( P_4 \) = 21.4 kW
- At 30% of rated heat output and low temperature regime: \( P_1 \) = 7.3 kW

**USEFUL EFFICIENCY**

- At rated heat output and high temperature regime: \( \eta_4 \) = 87.9 %
- At 30% of rated heat output and low temperature regime: \( \eta_1 \) = 98.8 %

**AUXILIARY ELECTRICITY CONSUMPTION**

- At full load: \( e_l_{\text{max}} \) = 0.068 kW
- At part load: \( e_l_{\text{max}} \) = 0.048 kW
- In standby mode: \( P_{\text{SB}} \) = 0.002 kW

**OTHER ITEMS**

- Standby heat loss: \( P_{\text{SB}} \) = 0.099 kW
- Ignition burner power consumption: \( P_{\text{Ign}} \) = 0 kW
- Sound power level indoors: \( L_{WA} \) = 45 dB

**ADDITIONAL DATA FOR COMBINATION HEATERS**

- Declared load profile: \( M \)
- Daily electricity consumption: \( Q_{\text{elec}} \) = 0.069 kWh
- Annual electricity consumption: \( \text{AEC} \) = 15 kWh
- Daily fuel consumption: \( Q_{\text{fuel}} \) = 6.98 kWh
- Annual fuel consumption: \( \text{AFC} \) = 427 Gj
- Water heating energy efficiency: \( \eta_{\text{w}} \) = 85 %
- Water heating energy efficiency class: - A -

1. High temperature regime means 60°C return temperature at heater inlet and 80°C feed temperature at heater output.
2. Low temperature means for condensing boiler 30°C, for low temperature boilers 37°C and for other heaters 50°C return temperature (at heater).
<table>
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<th>TABLE 2. TECHNICAL DATA</th>
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<tr>
<td>Maximum weight lift</td>
<td>40kg</td>
</tr>
<tr>
<td>Gas supply</td>
<td>13P G31 37mbar</td>
</tr>
<tr>
<td>Gas connection</td>
<td>15mm copper</td>
</tr>
<tr>
<td>Injector size</td>
<td>3.65mm</td>
</tr>
<tr>
<td>Domestic hot water flow and return</td>
<td>15mm copper</td>
</tr>
<tr>
<td>Heating flow and return</td>
<td>22mm copper</td>
</tr>
<tr>
<td>Safety valve discharge</td>
<td>15mm copper</td>
</tr>
<tr>
<td>Flue terminal diameter</td>
<td>100mm (4”)</td>
</tr>
<tr>
<td>Average flue temperature-mass flow rate DHW</td>
<td>30°C 11g/s</td>
</tr>
<tr>
<td>Average flue temperature-mass flow rate CH</td>
<td>63°C 11g/s</td>
</tr>
<tr>
<td>Condense drain</td>
<td>21.5mm plastic overflow pipe</td>
</tr>
<tr>
<td>Maximum heating system water content using fitted expansion vessel</td>
<td>73lt</td>
</tr>
<tr>
<td>Electrical supply</td>
<td>230V ~ 50Hz</td>
</tr>
<tr>
<td>Electrical rating</td>
<td>100W</td>
</tr>
<tr>
<td>External fuse rating</td>
<td>3A</td>
</tr>
<tr>
<td>Expansion vessel capacity</td>
<td>8 litres</td>
</tr>
<tr>
<td>Expansion vessel initial charge pressure</td>
<td>1.0 bar</td>
</tr>
<tr>
<td>Heating system minimum pressure</td>
<td>0.5 bar</td>
</tr>
<tr>
<td>DHW maximum inlet pressure</td>
<td>6 bar</td>
</tr>
<tr>
<td>Minimum inlet pressure for appliance to operate</td>
<td>0.2 bar</td>
</tr>
<tr>
<td>Maximum flow rate at 35°C</td>
<td>12.3 l/m</td>
</tr>
<tr>
<td>Minimum domestic hot water flow rate</td>
<td>2.0 l/m</td>
</tr>
<tr>
<td>Maximum flow temperature</td>
<td>60°C</td>
</tr>
<tr>
<td>DHW specific rate</td>
<td>14.4 l/min</td>
</tr>
<tr>
<td>Water content CH</td>
<td>1.2 litres</td>
</tr>
<tr>
<td>Water content DHW</td>
<td>1.0 litres</td>
</tr>
</tbody>
</table>

- Ball valves are fitted in water and gas connections
- For larger systems use an additional expansion vessel

* Required for maximum flow rate. Boiler operates down to 2 l/min DHW delivery
** In areas of low water pressure the DHW restrictor can be removed
6. PREPARATION & POSITIONING

6.1 PREPARATION

6.1.1 ELECTRICAL CONNECTIONS: Make sure all the electrical cables are in place.

6.1.2 WATER CONNECTIONS: Important. A minimum length of 1 metre of copper pipe MUST be fitted to both flow and return connections from the boiler before connection to any plastic piping.

6.1.3 The central heating system should be in accordance with BS 6798 and for small bore and microbore systems, BS 5449.

6.1.4 It is important that the system is flushed thoroughly before the appliance is left to operate (as recommended in BS 7593) in order to maintain an efficiently operating heating system and in accordance with the Benchmark Guidance Notes on Water Treatment in Central Heating Systems. See paragraph 15.10.

6.1.5 GAS CONNECTIONS: Make sure the gas connections are in place.

6.1.6 Give consideration to the flue position. Pluming will occur at the terminal so terminal positions where this could cause a nuisance should be avoided. See Figure 11.

6.1.7 Give consideration to the overall height. See section 7.

6.1.8 CONDENSE DRAIN: This drain must be connected to a drainage point on site. All pipework and fittings in the condensate drainage system MUST be made of plastic - no other materials may be used.

IMPORTANT: Any external runs must be in accordance with BS 6798. The drain outlet on the boiler is sized for standard 21.5mm (¾”) overflow pipe.

### TABLE 3. PERFORMANCE DATA

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<thead>
<tr>
<th></th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burner CO₂ (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case off</td>
<td>10.1</td>
<td>9.2</td>
</tr>
<tr>
<td>Case on</td>
<td>9.7</td>
<td>9.5</td>
</tr>
<tr>
<td>± 0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maximum gas rate</strong></td>
<td>m³/h</td>
<td>1.17</td>
</tr>
</tbody>
</table>

**PERFORMANCE DATA FOR CENTRAL HEATING**

<table>
<thead>
<tr>
<th></th>
<th>Net</th>
<th>kW</th>
<th>Gross</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CH input Q</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Gas Consumption</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CH Output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non condensing</td>
<td></td>
<td></td>
<td>21.1</td>
<td>4.41</td>
</tr>
<tr>
<td>Condensing</td>
<td></td>
<td></td>
<td>23.07</td>
<td>4.9</td>
</tr>
<tr>
<td><strong>Seasonal Efficiency</strong></td>
<td>SEDBUK 2009</td>
<td>91.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NOx Classification</strong></td>
<td>CLASS 5 30mg/kWh</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Central Heating set point temperature range**

20 - 82°C

**PERFORMANCE DATA FOR DOMESTIC HOT WATER**

<table>
<thead>
<tr>
<th></th>
<th>NET</th>
<th>kW</th>
<th>GROSS</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DHW Input Q</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DHW output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DHW flow rate at 35°C temperature rise</strong></td>
<td></td>
<td></td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td><strong>DHW specific rate</strong></td>
<td></td>
<td></td>
<td>14.4</td>
<td></td>
</tr>
</tbody>
</table>

* The value is used in the UK Government’s Standard Assessment Procedure (SAP) for energy rating of dwellings. The test data from which it has been calculated have been certified by a notified body.

Note. Gas consumption is calculated using a calorific value of 95.6 MJ/m³ gross or 88.0 MJ/m³ nett. To obtain the gas consumption at a different calorific value:

a. For l/s - divide the gross heat input (kW) by the gross C.V. of the gas (MJ/m³)

b. For ft³/h - divide the gross heat input (Btu/h) by the gross C.V. of the gas (Btu/ft³)

c. For m³/h - multiply l/s by 3.6
6.1.9 **BOILER CONTROL INTERLOCK:** Central heating system controls should be installed to ensure the boiler is switched off when there is no demand for heating, in compliance with Building Regulations.

6.1.10 **THERMOSTATIC RADIATOR VALVES:** Central heating systems utilising thermostatic radiator valve controls in individual rooms, need one space heating temperature control over a living/dining area or hallway having a heating requirement of at least 10% of the minimum boiler heat output with a minimum 500W radiator, which should be achieved using a room thermostat. However, if the system employs thermostatic radiator valves on all radiators, or two port valves, then a bypass circuit must be fitted with an automatic bypass valve to ensure minimum flow is maintained.

6.2 **POSITIONING**

6.2.1 The boiler must be installed on a flat and vertical internal wall, capable of adequately supporting the weight of the boiler and any ancillary equipment.

6.2.2 The appliance is not suitable for external installation unless it is protected from the elements in a suitable enclosure. The enclosure must provide the required clearances for installation, servicing and maintenance as well as the correct level of ventilation. The selected position should allow for a suitable flue system to be installed.

6.2.3 The boiler may be installed in any room or internal space, although particular attention is drawn to the requirements of the current IEE (BS 7671) Wiring Regulations and the electrical provisions of the building regulations applicable in Scotland, with respect to the installation of the boiler in a room or internal space containing a bath or shower. For IE reference should be made to the current ETCI rules for electrical installations and I.S. 813.

6.2.4 **TIMBER FRAME BUILDINGS:** When installed in a timber frame building guidance should be taken from the gas industry publication IGE/UP-7 (Guide for Gas Installations in Timber Frame Housing). BS 6798 gives details of the essential features for a compartment or cupboard where a gas appliance is to be installed. An existing cupboard may require modification.

6.2.5 **BATHROOM INSTALLATIONS:** If the appliance is installed in a room containing a bath or shower it is important to locate the electrical switch in a position where it cannot be touched by anyone using the bath or shower. The current IEE Wiring Regulations (BS 7671) for England and the electrical provision of the Building Regulations for Scotland gives details. The appliance must be installed beyond Zone 2, as detailed in BS 7671. A compartment used to enclose the boiler should be designed and constructed specially for this purpose.

6.2.6 **COMPARTMENT INSTALLATIONS:** An existing cupboard or compartment may be used, provided that it is modified for the purpose. In both cases, details of essential features of cupboard / compartment design, including airing cupboard installation, are to conform to the following:

- BS 6798 (No cupboard ventilation is required - see ‘Air Supply’ for details).
- The position selected for installation MUST allow adequate space for servicing in front of the boiler.
- For the minimum clearances required for safety and subsequent service, see the wall mounting template and section 7. In addition, sufficient space may be required to allow lifting access to the wall mounting bracket.

6.2.7 **ROOM VENTILATION:** It is not necessary as the appliance draws it’s combustion air from outside of the building. Cupboard or compartment ventilation is not necessary providing that the minimum clearances are maintained. However, reference should be made to BS 5440 Pt. 2.

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**FIGURE 3. BATHROOM ZONES**
7. DIMENSIONS & CLEARANCES

7.1 DIMENSIONS

7.1.1 It is recommended that where the appliance is located in a kitchen, or next to other combustible materials, a gap of 5mm be left on either side and where the flue run is through a void in kitchen units, again a minimum gap of 5mm should be left. For the purpose of servicing, it is also recommended that the appliance be located with a minimum gap of 200mm above any surface.

Note: A minimum 450mm dimension is a desired workable clearance for servicing.

7.1.2 The boiler connections are made on the boiler connection tails.

7.1.3 The minimum clearances must be maintained for operation and servicing.

7.1.4 Additional space will be required for installation, depending upon site conditions.

7.2 CLEARANCES

7.2.1 Bottom clearance after installation can be reduced to 5mm. This must be obtained with an easily removable panel, to enable the consumer to view the system pressure gauge, and to provide the 200mm clearance required for servicing.

7.2.2 The minimum front clearance when built in to a cupboard is 5mm from the cupboard door but 450mm overall clearance is still required, with the cupboard door open, to allow for servicing.

<table>
<thead>
<tr>
<th>TABLE 3. EXPANSION VESSEL REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel charge and initial system pressure bar</td>
</tr>
<tr>
<td>Total water content of system using 8 litres (1.45 gals) capacity expansion vessel supplied with appliance</td>
</tr>
<tr>
<td>For system having a larger capacity multiply the total system capacity in litres by the factor to obtain the total minimum expansion vessel capacity required litres</td>
</tr>
</tbody>
</table>
8. HEATING SYSTEM

8.1 The installation must comply with all relevant national and local regulations. All components of the system must be suitable for a working pressure of 3 bar and temperature of 110°C. Extra care should be taken in making all connections so that the risk of leakage is minimised.

NOTE: a. The method of filling, refilling, topping up or flushing sealed primary hot water circuits from the mains via a temporary hose connection is only allowed if acceptable to the local water authority.
   b. Antifreeze fluid, corrosion and scale inhibitor fluids suitable for use with boilers having stainless steel heat exchangers may be used in the central heating system.

8.2 EXPANSION VESSEL: The integral expansion vessel is pre-charged to a pressure of between 0.5 and 1.0 bar. This should be checked before the water system is filled. Table 3 shows the water system volume that is acceptable for this vessel. If the system water volume is larger then an additional vessel must be fitted to the system. BS 5449 and BS 6798 gives further details regarding expansion vessel sizing and sealed systems. See Table 4.

8.3 PRESSURE GAUGE: The appliance has two components that monitor pressure. Firstly there is a mechanical pressure gauge on the CH flow outlet, this allows the heating system to be pre-plumbed and filled with a visual check on the pressure. The second is an electronic device used by the microprocessor control to monitor the system pressure and block the heat input, should there be a lack of pressure.

8.4 PRESSURE RELIEF VALVE: The pressure relief valve protects the system from over pressurisation. It is set to be fully open at 3 bar, however it will start to open at approximately 2.7 bar. It should not be used to flush the system. Using no less than 15mm diameter copper pipe, the discharge pipe must be extended to a safe place outside the building. The discharge position must be visible, not onto a public access area or above any window or entrance. The pipe must have a continuous fall and discharge to a safe place. It is possible that boiling water and/or steam could be discharged if the safety valve operates.

8.5 FILLING LOOP: The group set incorporates a filling loop that temporarily connects the DHW supply to the CH system. This is used to fill the CH system on installation and whenever the water pressure has been removed for system modifications, etc. The filling loop complies with the water supply (water fittings) regulations 1999 Section G24.1 and G24.2. After filling the system the hose should be disconnected and stored in a safe place for future use.

8.6 PIPEWORK SIZING: In order to keep the noise of the system to a minimum, the velocity of water should be kept below 1.5m/s and it should be noted that the appliance is designed to operate with a temperature differential of 20˚C between flow and return. The maximum flow rates are 0.3 kg/s which, through a 22mm pipe, gives velocities of 1.00m/s. Therefore, the recommended minimum pipe size for the main carcass is 22mm.

8.7 DOMESTIC HOT WATER SYSTEM REQUIREMENTS
The DHW service must be in accordance with BS 5546 & BS 6700.

8.7.1 Domestic hot water circuits and their components, must be in accordance with the relevant standards and water supply regulations. Further guidance/recommendations can be found in building regulations G17 to 24 and R17 to 24.

8.7.2 The maximum domestic cold water supply pressure allowable for this appliance is 5 bar. If the supply pressure exceeds this, a pressure-reducing valve must be installed in the supply to the appliance.

8.7.3 If the water to the property is “hard”, more than 200ppm of salts, then a scale inhibitor should be fitted. Such products are available from Salamander.

NOTE: The system must not be filled with ‘softened’ water. The cold water filling position should be before any softening product.

8.7.4 In areas of low mains water pressures the domestic hot water regulator may be removed from the DHW flow turbine cartridge. The boiler will require the flow rate to be set to obtain a temperature rise of 35°C at the tap furthest from the boiler.

8.7.5 The boilers are suitable for connection to most types of washing machine and dishwasher appliances.

8.7.6. When connecting to suitable showers, ensure that:
   a. The cold inlet to the boiler is fitted with an approved anti-vacuum or syphon non-return valve.
   b. Hot and cold water supplies to the shower are of equal pressure.

IMPORTANT: Provision must be made to accommodate the expansion of DHW contained within the appliance. If the DHW inlet contains a back flow prevention device or non-return valve, e.g. A water meter, then a mini expansion vessel should be fitted between the device and the boiler in the cold inlet pipe.
FIGURE 6. QUANTEC HR28C WATER FLOW SCHEMATIC
9. INSTALLATION INSTRUCTIONS

**CARTON CONTENT**

<table>
<thead>
<tr>
<th></th>
<th>Item</th>
<th>Quantity</th>
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<tr>
<td>2</td>
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<td>Gas Valve Pack</td>
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<tr>
<td></td>
<td>Filling Loop pack</td>
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</tr>
<tr>
<td></td>
<td>Return Valve Pack</td>
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</tr>
<tr>
<td></td>
<td>Flow Valve Pack</td>
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<td>DHW Pack</td>
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<td>Accessory Pack</td>
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<tr>
<td></td>
<td>Copper connection pack</td>
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</tr>
<tr>
<td>3</td>
<td>Wall Mounting Plate</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Wall Mounting Template</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Installation &amp; Users Instructions</td>
<td>1</td>
</tr>
</tbody>
</table>

**FIGURE 7. CARTON CONTENTS**

### 9.1 WALL MOUNTING TEMPLATE

Use a plumb line to make sure the unit is square. Fix the template to the wall. Mark the positions of the flue and 4 fixing points.

**9.1.1** Using a 105 mm core drill make the hole through the wall. Installations that are made from within the building only will require a 125 mm diameter hole in order to fit the flue system.

**9.1.2** Using a 7mm bit, drill a minimum of 4 fixing holes for the wall plate. Insert the Rawlplugs. Remove the template.

### 9.2 FIXING THE APPLIANCE

**Caution:** This appliance exceeds the recommended weight for a one-man lift as detailed in the Manual Handling Operations, 1992 Regulations.

**9.2.1** It should be noted this appliance could contain sharp edges and care MUST be taken when handling.

**9.2.2** Screw the wall bracket to the wall using the 4 screws provided.

**9.2.3** Lift the appliance onto the fixing bracket and lower into position.

**FIGURE 8. FIXING BRACKET**
10. FLUE INSTRUCTIONS

10.1 The QuanTec HR28CP Boiler is certified as a heating boiler with corresponding flue systems according to EU Directive 90/396/EEC on gas-fired devices. These installation instructions are covered by this certification and are referred to in the design approval test certificate.

10.2 The installation of the boiler and flue system must be in accordance with the Gas Safety (Installation and Use) Regulations 1998 and the Building Regulations. If no specific instructions are given, reference should be made to the relevant codes of practice.

THESE RELEVANT STANDARDS SHOULD BE FOLLOWED

BS 5440:1 Flues and ventilation for gas appliances of rated heating input not exceeding 70kW (net): Flues
BS 5440:2 Flues and ventilation for gas appliances of rated heating input not exceeding 70kW (net): Air Supply

Ensure all legislation, regulations and directives mentioned are observed.

10.3 The air/flue duct operates at very low temperatures therefore no clearance is necessary between the air duct and the adjacent services.

10.4 Ensure while installation work is being carried out that no debris such as swarf, filings or fragments of mortar remains in the air/flue duct.

10.5 FLUE CONFIGURATIONS

<table>
<thead>
<tr>
<th>STANDARD HORIZONTAL FLUE KIT</th>
<th>OFFSET HORIZONTAL REAR FLUE</th>
<th>EXTENDED HORIZONTAL REAR FLUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be fitted to the left or the right.</td>
<td>Standard flue kit + 90° Elbow Required Extension Length</td>
<td>Can be fitted to the left or the right.</td>
</tr>
<tr>
<td>Standard flue kit comprising of: Turret Horizontal Terminal</td>
<td>Vertical Appliance Adaptor Horizontal Terminal 90° Elbow Required Extension Length</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HORIZONTAL SIDE FLUE</th>
<th>VERTICAL FLUE</th>
<th>OFFSET VERTICAL FLUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can be fitted to the left or the right. Standard Flue Kit comprising of: Turret Horizontal Terminal</td>
<td>Vertical Appliance Adaptor Required Extension Lengths Vertical Terminal</td>
<td>Can be fitted to the left or the right. Turret Vertical Terminal 90° Elbow Required Extension Lengths</td>
</tr>
</tbody>
</table>

10.6 FIGURE 9. FLUE CONFIGURATIONS
<table>
<thead>
<tr>
<th>TABLE 4</th>
<th>TERMINAL POSITION</th>
<th>MIN DISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Directly below an opening, air brick, opening window etc.</td>
<td>300mm</td>
</tr>
<tr>
<td>B</td>
<td>Above an opening, air brick, opening window, etc.</td>
<td>300mm</td>
</tr>
<tr>
<td>C</td>
<td>Horizontally to an opening, air brick, opening window etc.</td>
<td>300mm</td>
</tr>
<tr>
<td>D</td>
<td>Below gutters, soil pipes or drain pipes.</td>
<td>75mm</td>
</tr>
<tr>
<td>E</td>
<td>Below eaves.</td>
<td>200mm</td>
</tr>
<tr>
<td>F</td>
<td>Below balconies.</td>
<td>200mm</td>
</tr>
<tr>
<td>G</td>
<td>From a vertical drain pipe or soil pipe.</td>
<td>150mm</td>
</tr>
<tr>
<td>H</td>
<td>From an internal or external corner. Greater than 450mm protrusion.</td>
<td>300mm</td>
</tr>
<tr>
<td>H</td>
<td>From an internal or external corner. Greater than 450mm protrusion.</td>
<td>300mm</td>
</tr>
<tr>
<td>I</td>
<td>Above ground, roof or balcony level.</td>
<td>300mm</td>
</tr>
<tr>
<td>J</td>
<td>From a surface facing the terminal.</td>
<td>600mm</td>
</tr>
<tr>
<td>K</td>
<td>From a terminal facing the terminal.</td>
<td>1,200mm</td>
</tr>
<tr>
<td>M</td>
<td>Vertically from a terminal on the same wall.</td>
<td>1,200mm</td>
</tr>
<tr>
<td>N</td>
<td>Horizontally from a terminal on the same wall.</td>
<td>300mm</td>
</tr>
<tr>
<td>Q</td>
<td>Above intersection with roof.</td>
<td>530mm</td>
</tr>
<tr>
<td>P</td>
<td>From a vertical structure on the roof</td>
<td>300mm</td>
</tr>
<tr>
<td>R</td>
<td>From the terminal to the boundary</td>
<td>300mm</td>
</tr>
</tbody>
</table>
10.6 TYPE OF FLUE SYSTEMS
10.6.1 The standard concentric flue system 60/100mm (100mm diameter).
10.6.2 A Flexible flue kit (FFK-5) 60/100mm (100mm diameter).
   For further information contact the sales office at Johnson & Starley Ltd. Telephone 01604 762881.
10.6.3 The air/flue duct operates at very low temperatures therefore no clearance is necessary between the air duct and the adjacent services.

10.7 FLUE TERMINAL POSITIONS
10.7.1 The following information provides the general requirements for siting flue terminals. As part of the recommendation given in BS 1550 Part 1. For IE recommendations, see the current issue of I.S. 813 “Domestic Gas Installations.” Also publication a “Guide for Gas Installations in Timber Framed Housing DM2” or consult your local gas region, MUST be consulted when installing the appliance into a timber-framed building.
   **NOTE:** Due to the nature of the boiler, water vapour will discharge from the flue. This should be taken into account when siting the flue.
10.7.2 Both the horizontal and vertical terminals must be positioned on the outside of the building and the free passage of air must be available at all times. It is not recommended to position the terminal close to projections especially under a balcony or near to a drainpipe.
10.7.3 Ensure that combustion products cannot enter the building where the heater is installed or near to any other building where doors or windows may be open.
10.7.4 Recommended terminal positions for both horizontal and vertical flues are shown. See Table 4. For flue components see Table 5.
10.7.5 Where the lowest part of the flue terminal is located less than 2 metres above the ground, a balcony or above a flat roof across which there is access, the terminal MUST be fitted with a guard (Part No: 1000-0019710) which is available from Johnson & Starley. The distance between the guard and the nearest part of the terminal must not be less than 50 mm.
10.7.6 The flue MUST NOT be installed under a car port.

10.8 PLUME TERMINAL OUTLETS
10.8.1 A flue duct outlet of an appliance should be at least 600mm from the boundary line when facing it and at least 300mm from the boundary line when running parallel to it. See Figure 11.
   **NOTE:** When the flow of products is at an angle to the boundary, the 600mm dimension may be measured in the direction of the flow, as long as the terminal is not less than 300mm from the boundary.
10.8.2 It is recommended the terminals are not sited within 2m of an opening in an adjacent building or within 2m of the boundary facing the terminal if the plume is likely to cause a nuisance to a neighbour, e.g discharging over a walkway or patio.

10.9 FLUE REQUIREMENTS & GENERAL INFORMATION
10.9.1 Horizontal and vertical concentric flues (60/100mm diameter) with balanced terminals may be installed on all the QuanTec appliances.
10.9.2 If an extended horizontal flue is being used it must have a continuous fall back towards the appliance of 3° (52mm) per meter. This ensures that condensate runs back into the appliance from the flue system for safe discharge via the condensate waste pipe. Reference should be made to Table 5 for relevant part numbers.
10.9.3 The maximum length of flue permissible is 12 meters including terminal
10.9.4 The minimum vertical flue length is 1.25m from the top of the appliance case to the top of the terminal.
10.9.5 Longer flues may be fitted, however the input of the appliance will be reduced accordingly.
10.9.6 Elbows may be fitted within the flue system with a corresponding reduction in overall flue.
10.9.7 Guidelines for the maximum flue length are as follows.

<table>
<thead>
<tr>
<th>HORIZONTAL FLUE</th>
<th>VERTICAL FLUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TURRET 90° ELBOW</td>
<td>STRAIGHT 1m FLUE</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

When using 45° elbows: 2 x 45° elbow = 1 x 90° elbow
## 10.10 CONVENTIONAL 60/100mm FLUE ACCESSORY PARTS No's

<table>
<thead>
<tr>
<th>TABLE 5.</th>
<th>DESCRIPTION</th>
<th>COLOUR</th>
<th>QTY</th>
<th>APPLICATION</th>
<th>PART No.</th>
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<tbody>
<tr>
<td>1</td>
<td>60/100 Standard Horizontal Flue Kit</td>
<td>White</td>
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<td>Horizontal</td>
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<td>800mm Horizontal Terminal</td>
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<td>Vertical Appliance Adaptor</td>
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<td>5</td>
<td>45° Elbow</td>
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<td>Horizontal &amp; Vertical</td>
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<td>500mm Straight Extension</td>
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<td>Horizontal &amp; Vertical</td>
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<td>Flexible</td>
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<td>Flexible</td>
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<td>Inner Flex to Rigid Connector</td>
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<td>Flexible</td>
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<td>Outer Seal Pipe Rings</td>
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<td>Flexible</td>
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</tr>
<tr>
<td>29</td>
<td>Inner Seal Pipe Rings</td>
<td></td>
<td>2</td>
<td>Flexible</td>
<td>1000-0023480</td>
</tr>
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<td>30</td>
<td>Centralising Spacer Ring</td>
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<td>Flexible</td>
<td>1000-0023490</td>
</tr>
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<td>31</td>
<td>Flue Support Kit</td>
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<td>1000-0023500</td>
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<tr>
<td>32</td>
<td>Draw Cone &amp; Rope</td>
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<td>1</td>
<td>Flexible</td>
<td>1000-0023510</td>
</tr>
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<td>33</td>
<td>Chimney Terminal Kit 60/100mm</td>
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<td>CTK-60/100</td>
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<td>34</td>
<td>Skyline Terminal &amp; Outer Flue Cowl</td>
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<td>35</td>
<td>Locking Ring</td>
<td>Grey</td>
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<td>Vertical</td>
<td>1000-0026610</td>
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<tr>
<td>36</td>
<td>Flashing Ring</td>
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<td>1000-0026660</td>
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<tr>
<td>37</td>
<td>Chimney Cover Plate</td>
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<td>Vertical</td>
<td>1000-0026600</td>
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10.11 OPTIONAL ROOF OUTLETS

10.12 THE STANDARD HORIZONTAL FLUE SYSTEMS

The standard horizontal flue kit comprises of:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turret</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Appliance Seal</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>60/80 Adaptor</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>EPDM Outside Wall Cover Plate</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Inside Wall Cover Plate</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>100mm Diameter Clamp</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>800mm Horizontal Terminal</td>
<td>1</td>
</tr>
</tbody>
</table>

The appliance comes with a wall template.
(Label Ref: 1000-2217950-3)
10.13 INSTALLATION OF THE STANDARD FLUE SYSTEMS

IMPORTANT NOTE: Before carrying out this procedure ensure seal has not been dislodged from top of the boiler.

10.13.1 Using the template supplied with the boiler, determine the position of the flue.

10.13.2 If access is available from outside drill a 105mm diameter hole. If no access is available refer to section 2.

10.13.3 Mount the wall bracket and the boiler on the wall as detailed in paragraph 9.1.

10.13.4 Fit the appliance seal to the underside of the turret and fix the turret to the top of the boiler using the 4 screws supplied, ensuring that the heat exchanger flue seal is in place.

10.13.5 Take a measurement from the outside of the wall to the edge of the turret dimension “X” Figure 14.

10.13.6 Mark this dimension onto the horizontal terminal as shown in Figure 15.

10.13.7 Cut the flue to the desired length. Make sure the ends are square and free from burrs and the inner plastic flue pipe is chamfered.

NOTE: To ease the assembly of the flue components, apply suitable silicone lubricant to the male plastic end. (Any other type of lubricant may corrode the gasket.)

10.13.8 Place flue clamp over turret rim.

10.13.9 From the outside of the building, push the terminal through the wall and locate the male plastic end of the terminal into the female end of the turret.

10.13.10 Place clamp equally over the turret and terminal ends and tighten the 2 screws.

10.13.11 Fit the rubber-finishing ring over the outside of the flue, pushing it flush to the wall. The rib on the inside of the ring will locate in-between the locating pips on the end of the terminal.

10.14 NO OUTSIDE ACCESS

10.14.1 If no access is available from outside the building drill a 125mm diameter hole.

10.14.2 Mount the wall bracket and the boiler on the wall as detailed para 9.1.

10.14.3 a. For a rear flue measure the wall thickness and add; 40mm for a standard rear flue 90mm for a rear flue if the standoff bracket is used.
   b. For a side flue measure the distance from the outside wall to the side of the boiler and add; Length shown in Figure 16. This dimension is known as dimension “X”.

10.14.4 Mark this dimension onto the turret as in Figure 14.

10.14.5 Cut the flue to the desired length. Make sure the ends are square and free from burrs and the inner plastic flue pipe is chamfered.

NOTE: To ease the assembly of the flue components, apply suitable silicone lubricant to the male plastic end. (Any other type of lubricant may corrode the gasket.)

10.14.6 Fit the rubber-finishing ring over the outside of the flue. The rib on the inside of the ring will locate in-between the locating pips on the end of the terminal.

10.14.7 Push the terminal through the hole in the wall.

10.14.8 Fit the appliance seal to the underside of the turret and fix the turret to the top of the boiler using the 4 screws supplied, ensuring that the flue seal and 80/60 reducer is in place.

10.14.9 Place flue clamp over turret rim.

10.14.10 Pull back the terminal through the wall locating the male plastic end of the terminal into the female end of the turret.

10.14.11 Place the clamp equally over the turret and terminal and tighten the 2 screws.
11. CONDENSATE DRAIN

11.1 Where a new or replacement boiler is being installed, access to an internal “gravity discharge” termination should be one of the main factors considered when determining potential boiler locations, the condensate drainage pipe should be terminated as recommended.

11.2 Internal condensate drainage pipework must be a minimum of 19mm ID (typically 22mm OD) plastic pipe and this should “fall” at least 45mm per metre away from the boiler, taking the shortest practicable route to the termination point.

11.3 In order to minimise the risk of freezing during prolonged very cold spells, the condensate drainage pipe should be terminated at a suitable internal foul water discharge point using either:-
   a. an internal soil and vent stack
   b. an internal kitchen or bathroom waste pipe, washing machine waste pipe etc. A suitable permanent connection to the foul waste pipe should be used. Figures 18 to 20 show appropriate connection methods.

11.4 USE OF A CONDENSATE PUMP (TO AN INTERNAL TERMINATION): Condensate can be removed using a proprietary condensate pump, of a specification recommended by the boiler or pump manufacturer.

11.5 EXTERNAL TERMINATION: The use of an externally-run condensate drainage pipe, terminating at a suitable foul water discharge point or purpose-designed soakaway, may be also be considered; however if this termination method is chosen then the following measures should be adopted - The pipe should be run internally as far as possible before going externally and the pipe diameter should be increased to a minimum of 30mm ID (typically 32mm OD) before it passes through the wall. The external run should be kept as short as possible, taking the most direct and “most vertical” route possible to the discharge point, with no horizontal sections in which condensate might collect. The external pipe should be insulated using suitable waterproof and weatherproof insulation (“Class O” pipe insulation is suitable for this purpose). The use of fittings, elbows etc should be kept to a minimum and any internal “burrs” on cut pipework should be removed so that the internal pipe section is as smooth as possible.

11.6 The use of trace heating systems for external condensate drainage pipework, incorporating an external frost thermostat, should therefore be considered. If such a system is used then the installation instructions of the trace heating manufacturer and any specific recommendations regarding pipe diameter, insulation, etc. should be followed. All other relevant guidance on condensate drainage pipe installation should also be followed.

11.7 If an external soil/vent stack is used as the external termination then the connection method shown in Figure x should be used, together with the measures on insulation etc. as described above and shown in the diagram.

11.10 Where the condensate drain pipe terminates in a purpose-designed soakaway (see BS 6798 or boiler installation manual for soakaway design requirements) any above-ground section of condensate drainage pipe should be run and insulated as described above. Figure 7 shows a suitable connection method. (see Figure 20).

11.11 UNHEATED INTERNAL AREAS: Internal condensate drainage pipes run in unheated areas such as lofts, basements and garages should be treated as external pipe.
12. ELECTRICAL

WARNING: This appliance must be earthed.

12.1 DROP DOWN CONTROL PANEL: See paragraph 17.5.

12.2 ELECTRICAL CONNECTIONS

12.2.1 A mains supply of 230Vac – 50 Hz is required.

12.2.2 The fuse rating should be 3A. All external controls and wiring must be suitable for mains voltage.

12.2.3 Wiring external to the boiler MUST be in accordance with the current I.E.E. (BS 7671) Wiring Regulations and any local regulations.

12.2.4 Wiring should be 3 core PVC insulated cable, not less than 0.75mm² (24 x 0.2mm), and to BS 6500. For IE reference should be made to the current ETCI rules for electrical installations.

12.2.5 Connection must be made in a way that allows complete isolation of the electrical supply such as a double pole switch having a 3mm (1/8”) contact separation in both poles. The means of isolation must be accessible to the user after installation.

12.3 INTERNAL WIRING

12.3.1 The boiler comes pre-fitted with 1.8m of mains cable.

12.3.2 This must be connected to a permanent live supply and NOT switched by thermostats/programmers.

12.3.3 The boiler comes pre-fitted with a link wire between the room thermostat/Timer connections on the terminal strip. This creates a permanent call for heat and must be removed when adding a room thermostat/programmer.

12.4 TO ADD THERMOSTAT/PROGRAMMER

12.4.1 Isolate the mains supply to the boiler.

12.4.2 Remove the front panel. See paragraph 17.5.

12.4.3 Swing the control box down into the servicing position. See Figure 31.

12.4.4 Route incoming cables through the grommets in bottom panel (note, grommets are ‘blind’ and will require puncturing) and secure using clamps and screws provided in hardware pack.

12.4.5 Connect wires to terminal block.

12.4.6 Swing the control box back up into the operating condition and re-fit the front panel ensuring a good seal is made.

12.5 THERMOSTATS & TIMER KITS: Telephone Johnson & Starley on 01604 762881 for details.

12.5.1 MECHANICAL TIMER (24 HR) KIT: 24 hour mechanical CH timer fits into the control box of the boiler. This can be fitted in conjunction with a room thermostat.

12.5.2 ELECTRONIC TIMER (7 DAY) KIT: 7 day electronic CH timer fits into the control box of the boiler. This can be fitted in conjunction with a room thermostat. Features English language installation help messages.

12.5.3 ROOM THERMOSTAT (NO TIMER)

a. Remove link wire between room stat/timer terminals.

b. Connect room stat across terminals as shown in diagram. See Figure 22.

12.5.4 ROOM THERMOSTAT with TIMER

a. Remove link wire between room stat/timer terminals.

b. Connect room stat and programmer in series as shown in diagram. See Figure 22.

12.5.5 FROST THERMOSTAT

If parts of the system are vulnerable to freezing or the programmer is likely to be left off during cold weather, a frost stat should be fitted in conjunction with a pipe thermostat.

a. Position the frost thermostat in a suitable position, i.e. area vulnerable to freezing.

b. Connect frost stat in series with room stat as shown in diagram. See Figure 22.

12.6 OPTIONAL SYSTEM CONTROL

Open therm protocol controls are available for outside temperature compensation and room temperature sensing and can be used to improve the heating system control. They must be connected to the correct terminals as described in their own instructions. A room thermostat MUST NOT be used with these controls.

12.7 ELECTRICAL TESTING

Carry out electrical checks:

- Earth continuity and short circuit of cables
- Polarity of the mains supply
- Insulation resistance to earth
13. WIRING DIAGRAM

FIGURE 22. WIRING DIAGRAM
14. CONNECTIONS & FILLING

NOTES. Ensure all boss blanking plugs are removed before connecting hardware. Each valve must be fitted to the correct boss as shown. See Figure 25.

Ensure each union is fitted with fibre seals provided. On the DHW inlet use the filter washer provided. DO NOT use a fibre seal.

Do not subject any of the isolating valves to heat as the seals may be damaged.

14.1 WATER CONNECTIONS CH
14.1.1 Connect the CH flow service valve (black handle) and copper tail provided in the hardware pack to the threaded boss connection provided at the lower rear of the boiler.
14.1.2 Connect the CH return valve (black handle) and copper tail.

14.2 GAS CONNECTION
IMPORTANT. The gas service cock is sealed with a non-metallic blue fibre washer, which must not be overheated when making capillary connections. See Figure 23 for details of the position of the gas connection.
14.2.1 For additional information of the Gas Supply see paragraph 4.3.

14.3 CONDENSATE DRAIN
14.3.1 The condensate drain tube is secured by a cable tie when packed. This cable tie needs to be cut and removed before connecting to the condensate drain hose. Remove the bung from the pipe.
14.3.2 Connect the condensate drain tube.

14.4 PRESSURE RELIEF VALVE DRAIN
14.4.1 The drain comprises of a 15mm diameter stub pipe. See Figure 23.
14.4.2 The discharge pipe should be positioned so that the discharge of water or steam cannot create a hazard to the occupants of the premises or damage the electrical components and wiring.

14.5 FILLING THE BOILER
IMPORTANT. When filling, there may be a slight water leak from the air vent therefore electrical connections must be protected.
14.5.1 Ensure Filling Loop is connected.
14.5.2 Ensure the cap on auto air vent is open. (In the up position)
14.5.3 Check all isolation handles on all water connections are in the open position.
14.5.4 Open the black handle (G) on the filling loop, then slowly open the black handle (F) until the pressure gauge reads between 1 to 1.5 bar. When reached closed the isolation valves.
14.5.5 Disconnect the left hand filling loop, retain the top hat washer and using the blanking caps, cap off the connection and the end of the filling loop.
14.5.6 Connect extended blanking cap and top hat washer to filling loop pipe.

NOTE: Fully open all DHW taps and ensure water is flowing freely.

15. COMMISSIONING

15.1 CHECK GAS INSTALLATION
15.1.1 The whole of the gas installation, including the meter, should be inspected and tested for tightness and purged in accordance with the recommendations of BS. 6891. In IE refer to IS.813.
15.1.2 Purge air from the gas installation by the approved methods only.

PLEASE NOTE: The combustion for this appliance has been checked, adjusted and preset at the factory for operation on the gas type defined on the appliance data plate. A flue Gas Analyser measurement MUST be made. Do not adjust the air/gas ratio valve.
15.1.3 Having checked the boiler has been installed in accordance with these instructions. The integrity of the flue system and the flue seals, as described in the Flue Installation section. Proceed to put the boiler into operation as follows:

15.2 AIR PURGE FUNCTION
15.2.1 During this function, heat demand is switched off and fan will run at maximum for 120 seconds.
15.2.2 Also at the same time, the supply pump will be switched on for 5 seconds and off for 5 seconds continuously.
15.2.3 Diverting 3 way valve will move to the CH position for the first 30 seconds and then to the DHW position. This will be repeated.
15.2.4 This way, air bubbles dissipate and normal operation of the supply pump is secured.
15.2.5 Function can be skipped by pressing the K4 button. This function can be activated in the following conditions:
   a. If the controller is plugged in to the Mains for the first time.
   b. After a manual reset to reset the lockout fault E03. High limit temperature protection.
   c. When the central heating water pressure is built up to the normal level after the fault F37 or fault F40.
15.2.6 If there is no heat demand afterwards, the controller will switch to standby mode.
A CH - Central heating flow. Black handle
B DHW - Domestic hot water outlet
C Gas Valve. Yellow handle
D DHW - Domestic hot water inlet. Blue handle
E CH - Central heating return. Black handle
F Fitting loop isolation valves. Black handle
G
H Gas valve test point

FIGURE 25. VALVES, TAIL PIPES & CONNECTIONS
15.5 INITIAL LIGHTING

15.5.1 Check that the system has been filled and the boiler is not air-locked. Ensure the automatic air vent cap is open.

NOTE: It is important the burner is not operated before the system is fully vented of air.

IMPORTANT: The gas input to the burner is regulated by the gas valve according to the air flow produced by the fan. It is not user-adjustable. Any interference to sealed settings on the gas valve will adversely affect operation and render our warranty void.

15.5.2 Refit the boiler front panel. See paragraph 17.5.

15.5.3 Check that the drain cock is closed and that the CH and DHW isolating valves (A, E, and D) are OPEN.

15.5.4 Check that the electrical supply is OFF.

15.5.5 Check that the gas service cock is OPEN. (C)

15.5.6 Slacken the screw in the inlet pressure test point (H) and connect a gas pressure gauge via a flexible tube.

15.5.7 Switch the electricity supply ON and check all external controls are OFF. The boiler will select ‘self purge’

15.6 CENTRAL HEATING

15.6.1 Select the winter mode.

15.6.2 Set the CH temperature to maximum and switch on thermostat. The boiler control should now go through its ignition sequence until the burner is established.

15.6.3 If the boiler does not light, after 5 attempts the error code E-01 will be displayed.

15.6.4 Reset the boiler (see paragraph 15.3). The boiler will repeat its ignition sequence. If reset occurs 5 times within 15 minutes then F-15 will be shown. If power is removed this will be reset.

15.6.5 When the burner is established the display will show the ‘flame symbol’.

15.7 DOMESTIC HOT WATER

15.7.1 With the boiler firing, set the DHW Temperature Control to maximum and fully open a DHW tap. The boiler should continue to run and the display should show the ‘flame symbol’.

15.7.2 Ensure that with the boiler operating the dynamic gas pressure is able to obtain maximum output.

15.7.3 Turn off the DHW tap.

15.8 CHECK THE OPERATIONAL GAS INLET PRESSURE

15.8.1 Set up the boiler to operate at maximum rate by opening hot tap to maximum flow.

15.8.2 With the boiler operating in the maximum rate condition check the operational gas pressure at the inlet gas pressure test point complies with the requirements.

15.8.3 Ensure that this inlet pressure can be obtained with all other gas appliances in the property working.
**IMPORTANT GENERAL CHECKS**

15.9 DOMESTIC HOT WATER (DHW) MODE

15.9.1 Fully open all DHW taps in turn and ensure that water flows freely from them.

15.9.2 Close all taps except the furthest one from the boiler and check that the boiler is firing at maximum rate. This is factory set to give a DHW temperature rise of approximately 35°C at the flow rate stated Section 5 Technical Data.

15.9.3 Reduce the DHW draw-off rate to about 3l/min and check that the boiler modulates to deliver DHW at approximately 60°C.

15.9.4 Close the DHW tap and check that the main burner extinguishes. The pump should overrun for 60 seconds.

NOTE: On systems in excess of 2 bar inlet pressure a water pressure governor may be required to prevent water noise.

15.10 CENTRAL HEATING (CH) & DOMESTIC HOT WATER (DHW) MODE

15.10.1 Ensure that the CH external controls are calling for heat. The burner should light. Display should read 58°C.

15.10.2 Fully open a DHW tap and check that hot water is delivered. Display should read 58°C.

15.10.3 Gas Rate: Check the boiler gas rate when the boiler is at full DHW output.

Check at the gas meter, with no other appliance in use. Refer to Tables 1 & 2 for gas rates.

15.10.4 Close the DHW tap. The burner should go off and the pump continue to run.

15.10.5 Set the central heating external controls to OFF. The burner should go off and the pump continue to run until the CH return temperature falls below 35°C.

15.10.6 Check the correct operation of the timer (if fitted) and all other system controls. Operate each control separately and check that the main burner responds.

15.11 FLUSHING THE SYSTEM & WATER CIRCULATION

15.11.1 With the system HOT, examine all water connections for tightness. The system pressure will increase with temperature rise but should not exceed 2.5 bar.

15.11.2 With the system still hot, turn off the gas, water and electricity supplies to the boiler and drain down to complete the flushing process.

NOTE: A flushing solution should be used during the flushing procedure. Flushing solutions: Fernox Superfloc, Sentinel X300 (new systems) or X400 (existing systems).

15.11.3 Refill and vent the system, add inhibitor, clear all air locks and again check for water tightness.

15.11.4 With the system COLD, check that the initial pressure is correct to the system design requirements. For pre-pressurised systems, this should be 1.0 bar.

15.11.5 Reset the system initial pressure to the design requirement.

15.12 BALANCE THE SYSTEM

15.12.1 The boiler does not normally need a bypass but at least some radiators on the heating circuit, off load at least 10% of the minimum boiler output, these must be provided with twin lockshield valves so that the minimum heating load is always available. See paragraph 6.1.10 regarding thermostat radiator valves.

NOTE: Systems incorporating zone valves which could completely cut off the flow through the system must also include a bypass.

15.12.2 BALANCING

   a. Set the programmer to ON.

      Close the manual or thermostatic valves on all radiators, leaving the twin lockshield valves (on the radiators referred to above) in the open position.

      Turn up the room thermostat and adjust the lockshield valve to give an uninterrupted flow through the radiator.

      These valves should now be left as set.

   b. Open all manual or thermostatic radiator valves and adjust the lockshield valves on the remaining radiators, to give around 20°C temperature drop at each radiator.

   c. Adjust the room thermostat and programmer to normal settings.

15.12.3 Check the condensate drain for leaks and check that it is discharging correctly.

15.12.4 Finally, set the controls to the User’s requirements.

NOTE: The pump will operate briefly as a self-check once every 24 hours in the absence of any system demand.

15.13 WATER TEMPERATURES

Temperatures can be selected using the CH and DHW thermostats.

<table>
<thead>
<tr>
<th>Button Setting</th>
<th>CH Flow Temperature</th>
<th>DHW Outlet Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max</td>
<td>80°C</td>
<td>60°C</td>
</tr>
<tr>
<td>Min</td>
<td>45°C</td>
<td>40°C</td>
</tr>
</tbody>
</table>
16. HANDING OVER

16.1 Hand the User Instructions to the householder and explain their responsibilities under the relevant national regulations.

16.2 This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have supervision or been given instruction concerning use of the appliance by a person responsible for their safety.

16.3 Explain and demonstrate the lighting and shutting down procedures.

16.4 The operation of the boiler and the use and adjustment of all system controls should be fully explained to the householder, to ensure the greatest possible fuel economy consistent with the household requirements of both heating and hot water consumption. Advise the User of the precautions necessary to prevent damage to the system and to the building, in the event of the system remaining inoperative during frosty conditions.

16.5 Explain the function and the use of the boiler heating and domestic hot water controls. Explain that due to system variations and seasonal temperature fluctuations DHW flow rates/temperature rise will vary. This requires adjustment at the draw off tap. It is therefore necessary to show the User the relevant section in the Users Instructions and say the following statement. “Additionally, the temperature can be controlled by the user via the draw-off tap, the lower the rate the higher the temperature, and vice versa”.

16.6 Explain the function of the boiler fault codes. Emphasise that if a fault is indicated refer to “Fault Codes” in the User Guide.

16.7 Explain and demonstrate the function of time and temperature controls, radiator valves etc., for the economic use of the system.

16.8 If a timer is fitted draw attention to the timer Users Instructions.

16.9 LOSS OF SYSTEM WATER PRESSURE - Explain that the dial underneath the boiler indicates the central heating system pressure and that if the normal COLD pressure of the system is seen to decrease over a period of time then a water leak is indicated. Explain the re-pressurising procedure and if unable to re-pressurise or if the pressure continues to drop a registered local heating installer should be consulted.

16.10 Explain Boiler reset procedure.

16.11 After installation and commissioning please complete the Commissioning Checklist before handover to the customer. For IE, it is necessary to complete a “Declaration of Conformity” to indicate compliance to I.S. 813.

IMPORTANT

16.12 A comprehensive service should be carried out ANNUALLY. Stress the importance of regular servicing by a Gas Safe Registered Engineer. In IE servicing work must be carried out by a Registered Gas Installer (RGI).

17. SERVICING & MAINTENANCE

17.1 SERVICING SCHEDULE

NOTE: it is a statutory requirement that ALL work is carried out by a “competent person” which in normal circumstances would be a GAS SAFE registered engineer.

17.1.1 For the very latest copy of literature for servicing & maintenance instructions, visit our website www.johnsonandstarley.co.uk, where you can download the information.

Warning. Always turn off the gas supply at the gas service cock, and switch OFF and disconnect the electricity supply to the appliance before servicing.

17.1.2 Combustion testing must be carried out by a competent person using a combustion analyser conforming to BS 7927.

17.1.3 To ensure the continued safe and efficient operation of the appliance it is recommended that it is checked at regular intervals and serviced as necessary. The frequency of servicing will depend upon the installation condition and usage but should be carried out at least annually.

17.1.4 It is the law that any service work must be carried out by a Gas Safe Registered Engineer. In IE service work must be carried out by a Registered Gas Installer (RGI).

17.2 INITIAL INSPECTION

17.2.1 Light the boiler and carry out a pre-service check, noting any operational faults.

17.2.2 Check the flue terminal (and terminal guard if fitted) is undamaged and clear of any obstruction.

17.2.3 Check all water and gas joints for signs of leakage. Remake any suspect joints ensuring a gas tightness check is carried out if applicable and the water system is correctly refilled, vented and re-pressurised.

17.3 SERVICING SEQUENCE

NOTE: In order to carry out either servicing or replacement of components the boiler front panel must be removed. paragraph 17.5.

17.3.1 Clean the main burner.
17.3.2 Clean the heat exchanger & condensate trap/siphon.
17.3.3 Check the main injector for blockage or damage.
17.3.4 Check that the flue terminal is unobstructed and that the flue system is sealed correctly.
17.3.5 After completing the servicing or exchange of components always test for gas tightness.
17.3.6 When work is complete the front panel MUST be correctly refitted, ensuring that a good seal is made.
17.3.7 Check the gas consumption.
17.3.8 Check combustion by connecting the flue gas analyser to the flue gas sampling point and measure the CO & CO². See Figure 30.

If the CO/CO² ratio is greater than 0.004 and the integrity of the complete flue system and combustion circuit seals have been verified and the inlet gas pressure (and gas rate) have been verified, then contact Johnson & Starley Ltd.

17.3.9 Once the service is complete, fill in the relevant section in the Benchmark Checklist located at the back of this book.

17.4 FLUE INSPECTION & CHECKS

PLEASE NOTE: During routine servicing, and after any maintenance or change of part of the combustion circuit, the following must be checked:

• The integrity of the flue system and the flue seals
• The integrity of the boiler combustion circuit and the relevant seals
• The operational (working) gas inlet pressure at maximum rate.
• The gas rate.
• The combustion performance.

Competence to carry out the check of combustion performance.

PLEASE NOTE: BS 6798 Specification for installation and maintenance of gas-fired boilers of rated input not exceeding 70kW net advises that:

• The person carrying out a combustion measurement should have been assessed as competent in the use of a flue gas analyser and the interpretation of the results.
• The flue gas analyser used should be one meeting the requirements of BS 7927 or BS EN 50379-3 and be calibrated in accordance with the analyser manufacturers requirements.
• Competence can be demonstrated by satisfactory completion of the CPA1 ACS assessment, which covers the use of electronic portable combustion gas analysers in accordance with BS 7967, Parts 1 to 4.

GAINING ACCESS TO THE BOILER

17.5 CONTROL PANEL & FRONT DOOR REMOVAL

17.5.1 Lower the flip door and remove the 2 screws cover plugs and unscrew the 2 screws. See figure 31. Drop down and move the control panel assembly. See figure 31.

17.5.2 To remove the door remove the 5 screws. Lift up forward and remove.
17.5.3 Refit in reverse order.

17.6 FAN REMOVAL

Refer to paragraph 17.5

17.6.1 Disconnect the front mains electrical connection.
17.6.2 Remove the red securing clip, noting its correct position. Slide the fan backwards off the venturi.
17.6.3 Remove the second electrical cable from the rear of the fan.
17.6.4 Replace with new and refit by aligning the grooves on the side of the fan and slot back into place.
17.6.5 Refit in reverse order.

17.7 BURNER ASSEMBLY REMOVAL

Refer to paragraphs 17.5 and 17.6

17.7.1 Remove the gas pipe securing clip. Undo the gas pipe.
17.7.2 Remove the ignition/detection and earth leads.
17.7.3 Remove the 4 burner fixing nuts using a 10mm spanner.
17.7.4 Lift out the burner from the combustion chamber.
17.7.5 Brush off any deposits that may be on the burner with a soft brush. Inspect the ignition/detection electrode and check the electrode gaps. See Figure 38.
17.7.6 Inspect the black rubber sealing gasket around the burner for any signs of damage. Replace if necessary. The blue rope braid seal should not be removed under any circumstances and it is not a serviceable item.
17.7.7 Refit in reverse order.
17.8 HEAT EXCHANGER
Refer to paragraphs 17.5 to 17.7
17.8.1 Inspect the inside of the combustion chamber, with a soft brush remove any deposits that may have occurred. Flush with clean water. DO NOT use any chemicals.
17.8.2 Inspect the heat exchangers insulation at the front and back of the combustion chamber for any signs of damage.
17.8.3 If there are any signs of damage on the flue outlet then this must be replaced.
17.8.4 Check the gaskets of burner door and burner, if they show signs of damage then replace.
17.8.5 Refit in reverse order.

17.9 CONDENSATE TRAP
Refer to paragraph 17.5.
17.9.1 Unscrew the 2 pipes and pull off the third pipe.
17.9.2 Remove the trap and clean by removing the cleaning plug. Flush out any deposits with clean water.
17.9.3 Refit the trap and the pipes.
17.9.4 Refit in reverse order.
18. PARTS REPLACEMENT

18.1 IMPORTANT: Before commencing with any part replacement the appliance should be isolated from the electrical supply and the gas service cock on the appliance closed.

18.1.1 All parts that are removed should be replaced and refitted in reverse order, ensuring correct seals are made and wires are connected correctly.

18.1.2 Remove any debris from within the appliance.

18.1.3 When gas-carrying components are replaced the appliance must be tested for gas tightness.

18.1.4 On completion carry out a full functional test of all appliance components and ensure system controls are operating correctly.

PART REPLACEMENTS MADE WITHOUT DRAINING THE SYSTEM

18.2 BURNER INJECTOR

18.2.1 Refer to paragraph 17.5

18.2.2 Remove the gas pipe securing clip from venturi. See Figure 36.

18.2.3 Undo the gas pipe union from the gas valve.

18.2.4 Withdraw gas pipe from venturi.

18.2.5 Remove injector from gas pipe.

18.2.6 Replace and refit in reverse order.

18.2.7 Check the operation of the boiler. See Section 15.

18.3 BURNER ASSEMBLY/VENTURI

18.3.1 Refer to paragraph 17.5

18.3.2 Remove the burner assembly. See paragraph 17.7.

18.3.3 To replace the venturi, remove the 4 screws and replace with new.

18.3.4 Inspect the ignition/detection electrode and check the electrode gaps.

18.3.5 Replace with new burner assembly.

18.3.6 Replace the sealing gasket around the burner.

18.3.7 Refit in reverse order.

18.3.8 Check the operation of the boiler. See Section 15.

18.4 FLOW & RETURN THERMISTOR SENSORS

18.4.1 Refer to paragraph 17.5

18.4.2 Unclip the thermistor sensor from the flow/return pipe and withdraw it from the boiler.

18.4.3 Disconnect the electrical leads from the thermistors.

18.4.4 Reconnect the electrical leads to the new thermistors and re-assemble in reverse order, ensuring that the thermistors are securely.

18.4.5 Check the operation of the boiler. See Section 15.

18.5 IGNITION/DETECTION ELECTRODE

18.5.1 Refer to paragraph 17.5

18.5.2 Remove the burner. See paragraph 17.7.

18.5.3 Remove the 2 torx screws holding the ignition electrode to the combustion chamber.

18.5.4 Remove the electrode.

18.5.5 Fit the new ignition electrode, using the new gasket supplied. Check dimensions as shown.

18.5.6 Refit in reverse order.

18.5.7 Check the operation of the boiler. See Section 15.

18.6 GAS VALVE

18.6.1 Refer to paragraph 17.5

18.6.2 Unplug the electrical lead connection from the gas control valve, disconnect the PDT tube.

18.6.3 Undo the union nut on the top of the gas control valve.

18.6.4 Undo the gas inlet pipe union underneath the cabinet to the gas control valve.

18.6.5 Remove the 2 screws retaining the valve to the bracket and withdraw.

18.6.6 Fit the new gas control valve ensuring the two sealing washers are in place and reconnect gas, electrical connection and PDT tube.

18.6.7 Check operation of the boiler. See Section 15.
18.7 DIVERTER VALVE ACTUATOR HEAD
18.7.1 Refer to paragraph 17.5
18.7.2 Remove the electrical connection.
18.7.3 Pull out the retaining clip and lift out the diverter head.
18.7.4 Fit new actuator head and refit in reverse order.
18.7.5 Check operation of the boiler. See Section 15.

18.8 CONDENSATE TRAP/SIPHON
18.8.1 Refer to paragraph 17.5 and 17.9
18.8.2 Replace and refit in reverse order.

18.9 PCB ASSEMBLY
18.9.1 Refer to paragraph 17.5
18.9.2 Remove the 4 screws retaining the control box cover.
18.9.3 Unplug all lead connections to the PCB assembly
18.9.4 Remove 4 PCB fixing screws, remove PCB and fit new.
18.9.5 Re-connect all plug connections.
18.9.6 Refit in reverse order.
18.9.7 Turn power back on to the boiler, after a few moments the boiler will start ‘purge cycle’ this can be cancelled by pressing reset. Refer to the fitting instructions with the spare for programming.
18.9.8 Check operation of the boiler. See Section 15.

18.10 DHW FLOW TURBINE SENSOR
18.10.1 Refer to paragraph 17.5
18.10.2 Shut of mains cold water using DHW inlet valve (D) and drain water from the system using sink and bathroom taps. See paragraph 18.12.
18.10.3 Undo the 2 unions on each side of the turbine.
18.10.4 Unplug the electrical connection and transfer to new turbine sensor.
18.10.5 Replace washer and refit in reverse order.
18.10.6 Check operation of the boiler. See Section 15.

DRAINING THE APPLIANCE
18.11 CENTRAL HEATING CIRCUIT
18.11.1 Refer to paragraph 17.5. See Figure 24.
18.11.2 Close all the CH water isolating valves (A) and (E) on the boiler inlet.
18.11.3 To drain the primary heat exchanger circuit. Attach a length of hose to the CH drain point (I) then open the drain valve.
18.11.4 After replacing any component on the boiler, close the drain valve, remove the hose and open all system isolating valves (re-pressurise as appropriate by re-connecting the filling loop) before proceeding to check operation of the boiler.
18.11.5 Disconnect filling loop.
18.11.6 Check operation of the boiler. See Section 15.

18.12 DOMESTIC HOT WATER CIRCUIT
18.12.1 Refer to paragraph 18.11
18.12.2 Close all the DHW water isolating valves on the boiler inlet.
18.12.3 To drain the DHW circuit: As there is no direct drain for the DHW circuit, depending on the location of the boiler, opening the lowest hot water tap may drain this circuit. However it must be noted that some residual water will be experienced during replacement of components.
18.12.4 After replacing any component on the boiler, close tap, open the DHW isolation valve and purge air out of the pipe work.
18.12.5 Check operation of the boiler. See Section 15.

18.13 PRESSURE GAUGE
18.13.1 See 18.11 to drain system.
18.13.2 Unscrew the pressure gauge and discard.
18.13.3 Fit new pressure gauge, using suitable jointing compound.
18.13.4 Refill the boiler. See paragraph 14.5.
18.13.5 Check operation of the boiler. See Section 15.
18.14 SAFETY PRESSURE RELIEF VALVE
18.14.1 Drain CH circuit. See paragraph 18.11.
18.14.2 Withdraw the clip securing the safety valve.
18.14.3 Undo the safety valve union connection.
18.14.4 Remove and refit new valve.
18.14.5 Refit in reverse order.
18.14.6 Refill boiler. See paragraph 14.5.
18.14.7 Check operation of boiler. See Section 15.

18.15 AUTOMATIC AIR VENT
18.15.1 Drain CH circuit. See paragraph 18.11.
18.15.2 The automatic air vent head is retained in the pump body with a ‘U’ clip.
18.15.3 Replace and refit in reverse order. Ensure the air vent head ‘O’ ring seal is in place when refitting and the new ‘O’ ring is fitted to the return pipe top connection.
18.15.4 Ensure the air vent cap is loose.
18.15.5 Refill the boiler. See paragraph 14.5. Check for leaks around the new air vent joint.
18.15.6 Check the operation of the boiler. See Section 15.

18.16 DIVERTER VALVE INTERNAL CARTRIDGE
18.16.1 Refer to paragraph 17.5.
18.16.2 Drain the boiler. See paragraph 18.11.
18.16.3 Remove the diverter valve head. See paragraph 18.7.
18.16.4 Unscrew the 2 screws to access the internal cartridge.
18.16.5 Lubricate the new cartridge with silicone grease and replace.
18.16.6 Refit in reverse order.
18.16.7 Refill the boiler. See paragraph 14.5.
18.16.8 Check operation of the boiler. See Section 15.

18.17 DHW PLATE HEAT EXCHANGER
18.17.1 Refer to paragraph 17.5. See Figure 47
18.17.2 Drain the boiler. See paragraph 18.11 and 18.12.
18.17.3 Remove the fan. See paragraph 17.6.
18.17.4 Remove 2 allen screws securing the plate heat exchanger to the housings enough to remove.
18.17.5 Manoeuvre the plate heat exchanger out through space left by the fan.
18.17.6 Fit the new plate heat exchanger, using the new O-rings supplied.
NOTE: The mounting pins are offset. See Figure 47.
18.17.7 Refit in reverse order.
18.17.8 Refill the boiler. See paragraph 14.5.
18.17.9 Check operation of the boiler. See Section 15.

18.18 PUMP HEAD/PWM HIGH EFFICIENCY PUMP HEAD
18.18.1 Refer to paragraph 17.5
18.18.2 Drain the boiler. See paragraph 18.11.
18.18.3 Disconnect the electrical lead from the pump.
18.18.4 Remove the 4 allen screws retaining the pump head.
18.18.5 Remove the pump head and refit new.
18.18.6 When fitting the new PMW pump head there is a loose 2 way connector.
18.18.7 Refit in reverse order.
18.18.8 Refill the boiler. Refer to paragraph 14.5
18.18.9 Check operation of the boiler. See Section 15.
18.18.10 If you have replace a standard pump with a new HE pump, as follows
   a. Press and hold the K1 & K7 buttons approx 10 second until the LCD flashes with ‘t 5’.
   b. Quickly press and release the RESET (K4) button. The LCD will display P00.
   c. Using the HOT WATER + (K7) button scroll the display to P27.
d. Using either CH+ (K1) or CH - (K2) buttons select either 0 or 1.
   ‘0’ is for the fixed speed standard efficiency pump.
   ‘1’ is for the PWM High Efficiency pump.

e. Press and release RESET (K4) button to return the display to P 27.

f. Exit installer mode by pressing and releasing RESET again for ‘t 5’ to flash followed by pressing and releasing ‘P 27’ (K5).

**NOTE:** When replacing the pump head with the new PWM High Efficiency Pump Head refer to the instructions with the kit for commissioning.

18.19 **CH WATER PRESSURE SENSOR**

18.19.1 Refer to paragraph 17.5

18.19.2 Drain the boiler. See paragraph 18.11.

18.19.3 Using a suitable tool pull out the retaining clip.

18.19.4 Pull the pressure sensor upwards to remove.

18.19.5 Unplug the electrical connection and transfer to the new pressure sensor.

18.19.6 Push the new pressure sensor onto the rear pump housing and fit retaining clip.

18.19.7 Refit in reverse order.

18.19.8 Refill the boiler. See paragraph 12.4.

18.19.9 Check operation of the boiler. See Section 15.

18.20 **DHW FILTER & FLOW REGULATOR**

18.20.1 Refer to paragraph 17.5

18.20.2 Remove the flow turbine. See paragraph 18.10.

18.20.3 Remove the clip securing the pipe to housing.

18.20.4 Withdraw the filter and flow regulator.

18.20.5 Replace and refit in reverse order.

18.20.6 Refill the boiler. See paragraph 12.4.

18.20.7 Check operation of the boiler. See Section 15.

18.21 **EXPANSION VESSEL**

**RECHARGING**

18.21.1 Refer to paragraph 17.5

18.21.2 Relieve system pressure through a CH drain point.

18.21.3 Remove the charge point cover.

18.21.4 Recharge the tank pressure to 0.75 - 1 bar.

18.21.5 Refit in reverse order.

18.21.6 Check operation of the boiler. See Section 15.

**REPLACEMENT**

18.21.7 Refer to paragraph 17.5

18.21.8 Drain the boiler CH circuit. See paragraph 18.11.

18.21.9 Remove the clip from the base of the silver hose.

18.21.10 Remove the top bracket by removing the single screw, remove the bracket.

18.21.11 Slide the expansion vessel forward with the hose attached.

**NOTE:** It is advised you take the expansion vessel outside when removing the hose. Cover the hose connection at the vessel with a cloth when removing the hose. Remember this is a pressurised container and will contain pressurised water.

18.21.12 Replace and refit in reverse order.

18.21.13 Refill the boiler. See paragraph 14.5.

18.21.14 Check operation of the boiler. See Section 5.

18.22 **FLUE SENSOR**

18.22.1 To remove the rotate the sensor so the pins are vertical. Pull out and replace with new.

18.22.2 Rotate the sensor to lock into position.
19. **FAULT FINDING FLOWCHARTS**

Should a fault occur, the boiler will shut down and these error codes will be displayed.

### IGNITION LOCKOUT

- **E01 reset**
  - If the boiler is reset does the boiler ignite for a short time and then extinguish? **YES**
  - Check the detection electrode and associated harness for continuity, visual condition and position. Check if the condensate pipe is blocked. Replace if necessary.
  - Is the gas pressure available at the boiler inlet (>18mbar)? **NO**
  - Check the gas supply
  - Is approx. 24 VDC supply available at the gas valve? **NO**
  - Check wiring connection from gas valve to PCB for continuity. If the wiring is OK then replace the PCB.
  - Unplug the gas valve. Is resistance between outside pins 114Ω? **NO**
  - Replace the gas valve
  - Check board and associated harness for continuity and visual condition. Are these functioning correctly? **NO**
  - Replace board and harness as necessary.
  - Check siphon and condensate drain pipe work for blockage and rectify if necessary. Is boiler working? **YES**
  - Replace the Gas Valve.
  - Check the pressure control pipe between fan and gas valve for continuity, visual condition, replace as necessary. Is boiler working? **YES**
  - Replace the Gas Valve.

### FALSE FLAME LOCKOUT

- **E02 reset**
  - Reset the boiler. Is the boiler working? **YES**
  - Check routing and integrity of internal boiler wiring.
  - Remove ignition lead and earth tag. Is there continuity between the terminal pins connected to the electrode? **NO**
  - Replace flame detection electrode.
  - Check routing and integrity of internal boiler wiring.

### OVERHEAT LOCKOUT

- **E03 reset**
  - Is the boiler & CH system filled with water and all isolation & radiator valves open? **YES**
  - Fill & vent the system & open all isolation valves, then reset boiler.
  - Is the Flow/Return differential across the boiler in excess of 30°C? **NO**
  - Check that the pump is rotating freely. Is the differential now below 20°C? **YES**
  - Replace the pump, the reset the boiler. **NO**
  - Reset the boiler.
  - Check the Flow & Return thermistors. Check resistance using a suitable multi-meter connection across the thermistor’s terminal pins.

### FAN FAULT

- **E04 reset**
  - Does the wiring from the fan to the PCB have secure connections at both ends and has not deteriorated? Does the wiring have continuity? **YES**
  - Rectify wiring & connections
  - Is there 230Vac at the Blue Brown connections to the 3 way connection on the fan? **NO**
  - Replace the PCB.
  - Replace the Fan.
**FLAME CIRCUIT FAILURE**
Replace the PCB.

**VALVE FEED BACK ERROR**
- Unplug the Gas Valve. Is there resistance between pins 114Ω.
  - Yes: Replace Gas Valve.
  - No: Replace Board.

**EEPROM LOCKOUT**
Replace the PCB.

**FLOW/RETURN SENSOR CALIBRATION CHECK**
- Is the boiler & CH system filled with water & all isolation valves open?
  - Yes: Fill and vent the system and open all isolation valves, check as supply, then reset boiler.
  - No: Reset the boiler. Is the boiler working?
- Does the flow pipe temperature increase by more than 1°C within 30 seconds of ignition?
  - No: Replace the Flow/Return Sensor.
  - Yes: Fit a new Thermistor.

**SENSOR STUCK LOCKOUT**
- Is the boiler filled with water and all isolation valves open?
  - No: Fill and vent the system and open all isolation valves, check as supply, then reset boiler.
  - Yes: Are the sensors secured firmly to the flow and return pipes?
  - No: Secure Sensors and reset.
  - Yes: Check resistance at 2 different temperatures. See Graph Figure 51.
  - No: Replace Sensor.
  - Yes: Does the flow pipe temperature increase by more than 1°C within 30 seconds of ignitor?
  - No: Check pump is rotating.
  - Yes: Replace the PCB.

**ADC LOCKOUT**
Replace the PCB.

**RETURN THERMISTOR FAULT**
- Remove the return thermistor from the CH return pipe and disconnect the wires. Check the resistance using a suitable multi-meter connected across the thermistor's terminal pins. Is the thermistor valve correct?
  - No: Fit a new Thermistor.
  - Yes: Is the wiring securely connected to the low voltage 9 way connector X5 on the PCB?
  - No: Check and replace wiring as necessary.
  - Yes: Replace the PCB.
FLOW THERMISTOR FAULT

Is the wiring securely connected to the Flow thermistor?

YES

Securely connect the wiring to the Flow Thermistor.

NO

Disconnect the wiring from the Flow Thermistor.

Check the resistance using a suitable multi-meter connected across the Thermistor’s terminal pins.

YES

Fit new Thermistor.

NO

Is the wiring securely connected to the low voltage 9 way connector X5 on the PCB?

YES

Check & replace as necessary.

NO

Replace the PCB.

BLOCKING CODES

Should a fault occur, the boiler will shut down and these blocking codes will be displayed.

EXHAUST SENSOR FAULT

F07

Is the boiler & CH system filled with water and all isolation & radiator valves open?

YES

Fill and vent the system and open all isolation valves, check as supply, then reset boiler.

NO

Check flue thermistor. Check resistance using a suitable multi-meter connection across the thermistor’s terminal pins. (Refer to graph on E03).

YES

Replace the flue thermistor.

NO

Check wiring & connections to 9 way connector on PCB X5.

YES

Secure to PCB.

NO

Replace PCB.

REMOTE RESET LOCKOUT

F13

Turn power on and off, reset boiler. Boiler will correct original lockout error.

LOW POWER SUPPLY FROM MAINS

F34

Is mains supply to boiler between 190V - 256V @ 50 Hz?

YES

Correct electrical fault.

NO

Replace PCB.

LOW WATER PRESSURE

F37

Is the boiler & CH system filled with water and all isolation valves open. (check pressure gauge is between 1 & 1.5bar)?

YES

Fill and vent the system and open all isolation valves, check gas supply, then reset boiler.

NO

Are connections on water pressure sensor secure?

YES

Re-fit connections.

NO

Replace Water Pressure Sensor.
### OUTDOOR SENSOR ERROR

- **Is the outdoor sensor connected?**
  - Yes: Reset outside temperature compensation (P20) to 0
  - No: Replace board

- **Is the resistance of the outside temperature sensor between 5 and 30 kohms?**
  - Yes: Replace sensor
  - No: Replace board

### WATER PRESSURE TOO HIGH

- **Is the water system pressure under 2.8bar?**
  - Yes: Release water from system
  - No: Are the connections on water sensor secure?
    - Yes: Replace water pressure sensor
    - No: Correct the wiring

### WATER PRESSURE SENSOR

- **Is the water pressure sensor connected?**
  - Yes: Connect the sensor
  - No: Replace the sensor

### HE DHW OUTLET SENSOR

- **Is the boiler a system type with heat recovery?**
  - Yes: Reset boiler type 5
  - No: Is the outdoor sensor connected?

### DHW SENSOR LOCKOUT

- **Is the wiring securely connected to sensor?**
  - Yes: Correct the wiring
  - No: Is wiring secure on to X5 at PCB?
    - Yes: Correct the wiring
    - No: Does the resistance of the sensor match the graph? See Figure 52
      - Yes: Replace DHW sensor
      - No: Is there continuity in the wires between sensor and X5?
        - Yes: Correct the wiring
        - No: Replace DHW sensor

### DRIFT TEST WAITING

- **Does the resistance of the flow and return sensors correspond to a temperature value of less than 5°?**
  - Yes: Replace the faulty sensor
  - No: Replace the PCB
### FLUE TEMPERATURE SENSOR LOCKOUT

- **Is the wiring securely connected to sensor?**
  - Yes: Connect the wiring.
  - No: See graph Figure 51.

- **Is the wiring secure to 9 way connector X5 on Interface PCB?**
  - Yes: Secure connection.
  - No: Replace the PCB.

### NO DISPLAY

- **Is there 230VAC to the boiler at L & N?**
  - Yes: Supply power to boiler.
  - No: Connect the wiring from the terminal block to the Main PCB securely.

### NO CH OPERATION BUT DHW WORKS OK

- **Is the mode knob in the Winter position?**
  - Yes: Toggle to the Winter position.
  - No: Switch the timer and room thermostat on.

- **Are the radiator valves open?**
  - Yes: Open the radiator valves.
  - No: There is no voltage from the timer/room thermostat. Ensure voltage is supplied to the boiler by rectifying external wiring.

- **Is there 24V at ‘A’? (see diagram)**
  - Yes: Replace the diverter valve.
  - No: Re-engage diverter head and secure clip to group set.

### NO DHW BUT CH ON

- **Does the display show the hot water symbol?**
  - Yes: Is the turbine working?
  - No: Replace the PCB.

- **Are the flow rates correct?**
  - Yes: Adjust flow rates to achieve 35° temperature rise and check filter fitted in turbine is not blocked with debris.
  - No: Replace the PCB.

- **Is the wiring between the PCB and the diverter valve motor connected?**
  - Yes: Reconnect the wiring or replace wiring harness if no continuity.
  - No: Re-engage diverter head and secure clip to group set.

- **Check diverter head is fully engaged and clip is secured onto group set?**
  - Yes: Replace the PCB.
  - No: Replace turbine if necessary. IS DHW working?

- **Check and replace diverter valve motor head. Is boiler DHW working?**
  - Yes: Change diverter Valve cartridge - rear section.
  - No: Replace turbine sensor.
### 20. LIST OF SPARES

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<tr>
<td>34</td>
<td>Clip</td>
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<td>35</td>
<td>CH Pressure Sensor Harness</td>
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<td>1000-0526940</td>
<td>J21-278</td>
</tr>
<tr>
<td>36</td>
<td>DHW Temperature Sensor</td>
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<td>J21-267</td>
</tr>
<tr>
<td>37</td>
<td>Clip</td>
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<td>1000-3003920</td>
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<td>38</td>
<td>Flow/Return Temperature Sensor</td>
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<td>J24-700</td>
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<td>39</td>
<td>Flue Sensor</td>
<td>1</td>
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<td>J21-253</td>
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<tr>
<td>40</td>
<td>3 Way Diverter Valve Cartridge (Wilo)</td>
<td>1</td>
<td>1000-0025015</td>
<td>J21-265</td>
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<td>41</td>
<td>Diverter Head &amp; Clip</td>
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<td>42</td>
<td>Condensate Trap</td>
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<td>1000-0024525</td>
<td>J21-264</td>
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<td>43</td>
<td>Expansion Vessel</td>
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<td>44</td>
<td>Fibre Washer</td>
<td>1</td>
<td>1000-3003170</td>
<td>H39-002</td>
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<tr>
<td>45</td>
<td>Grommet</td>
<td>1</td>
<td>1000-2500150</td>
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</table>
Benchmark places responsibilities on both manufacturers and installers.* The purpose is to ensure that customers** are provided with the correct equipment for their needs, that it is installed, commissioned and serviced in accordance with the manufacturer’s instructions by competent persons and that it meets the requirements of the appropriate Building Regulations. Installers are required to carry out work in accordance with the following:

**Standards of Work**
- Be competent and qualified to undertake the work required.
- Install, commission, service and use products in accordance with the manufacturer’s instructions provided.
- Ensure that where there is responsibility for design work, the installation is correctly sized and fit for purpose.
- Meet the requirements of the appropriate Building Regulations. Where this involves notifiable work be a member of a Competent Persons Scheme or confirm that the customer has notified Local Authority Building Control (LABC), prior to work commencing.
- Complete all relevant sections of the Benchmark Checklist/Service Record when carrying out commissioning or servicing of a product or system.
- Ensure that the product or system is left in a safe condition and, whenever possible, in good working order.
- Highlight to the customer any remedial or improvement work identified during the course of commissioning or servicing work.
- Refer to the manufacturer’s helpline where assistance is needed.
- Report product faults and concerns to the manufacturer in a timely manner.

**Customer Service**
- Show the customer any identity card that is relevant to the work being carried out prior to commencement or on request.
- Give a full and clear explanation/demonstration of the product or system and its operation to the customer.
- Hand over the manufacturer’s instructions, including the Benchmark Checklist, to the customer on completion of an installation.
- Obtain the customer’s signature, on the Benchmark Checklist, to confirm satisfactory demonstration and receipt of manufacturer’s instructions.
- Advise the customer that regular product servicing is needed, in line with manufacturers’ recommendations, to ensure that safety and efficiency is maintained.
- Respond promptly to calls from a customer following completion of work, providing advice and assistance by phone and, if necessary, visiting the customer.
- Rectify any installation problems at no cost to the customer during the installer’s guarantee period.

*The use of the word “installer” is not limited to installation itself and covers those carrying out installation, commissioning and/or servicing of heating and hot water products, or the use of supporting products (such as water treatment or test equipment).

**Customer includes householders, landlords and tenants.**
**GAS BOILER SYSTEM COMMISSIONING CHECKLIST**

This Commissioning Checklist is to be completed in full by the competent person who commissioned the boiler as a means of demonstrating compliance with the appropriate Building Regulations and then handed to the customer to keep for future reference.

Failure to install and commission according to the manufacturer’s instructions and complete this Benchmark Commissioning Checklist will invalidate the warranty. This does not affect the customer’s statutory rights.

---

**Customer name:**  
**Telephone number:**

**Address:**

**Boiler make and model:**  
**Boiler serial number:**

**Commissioned by (PRINT NAME):**  
**Gas Safe register number:**

**Company name:**  
**Telephone number:**

**Company address:**  
**Commissioning date:**

**To be completed by the customer on receipt of a Building Regulations Compliance Certificate**

**Building Regulations Notification Number** (if applicable):

---

**CONTROLS**

<table>
<thead>
<tr>
<th>Room thermostat and programmer/timer</th>
<th>Programmable room thermostat</th>
<th>Optimum start control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time and temperature control to heating</td>
<td>Load/weather compensation</td>
<td></td>
</tr>
<tr>
<td>Time and temperature control to hot water</td>
<td>Combination Boiler</td>
<td></td>
</tr>
</tbody>
</table>

**Heating zone valves**  
Fitted  
Not required

**Hot water zone valves**  
Fitted  
Not required

**Thermostatic radiator valves**  
Fitted  
Not required

**Automatic bypass to system**  
Fitted  
Not required

**Boiler interlock**  
Provided

**ALL SYSTEMS**

The system has been flushed and cleaned in accordance with BS7593 and boiler manufacturer’s instructions  
Yes  
No

What system cleaner was used?  
Quantity  
litres

Has a primary water system filter been installed?  
Yes  
No

---

**CENTRAL HEATING MODE**  
**measure and record:**

<table>
<thead>
<tr>
<th>Gas rate</th>
<th>m³/hr</th>
<th>OR</th>
<th>ft³/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner operating pressure (at maximum rate)</td>
<td>mbar</td>
<td>OR</td>
<td>Gas inlet pressure mbar</td>
</tr>
<tr>
<td>Central heating flow temperature</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central heating return temperature</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COMBINATION BOILERS ONLY**

Is the installation in a hard water area (above 200ppm)?  
Yes  
No

If yes, and if required by the manufacturer, has a water scale reducer been fitted?  
Yes  
No

What type of scale reducer has been fitted?

---

**DOMESTIC HOT WATER MODE**  
**Measure and Record:**

<table>
<thead>
<tr>
<th>Gas rate</th>
<th>m³/hr</th>
<th>OR</th>
<th>ft³/hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner operating pressure (at maximum rate)</td>
<td>mbar</td>
<td>OR</td>
<td>Gas inlet pressure at maximum rate mbar</td>
</tr>
<tr>
<td>Cold water inlet temperature</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Hot water has been checked at all outlets | Yes  
Temperature °C |
| Water flow rate | l/min |

**CONDENSING BOILERS ONLY**

The condensate drain has been installed in accordance with the manufacturer’s instructions and/or BS5548/BS6798  
Yes

---

**ALL INSTALLATIONS**

Record the following:  
At max. rate:  
CO ppm  
AND  
CO/CO₂ Ratio

At min. rate: (where possible)  
CO ppm  
AND  
CO/CO₂ Ratio

The heating and hot water system complies with the appropriate Building Regulations  
Yes

The boiler and associated products have been installed and commissioned in accordance with the manufacturer’s instructions  
Yes

The operation of the boiler and system controls have been demonstrated to and understood by the customer  
Yes

The manufacturer’s literature, including Benchmark Checklist and Service Record, has been explained and left with the customer  
Yes

Commissioning Engineer’s Signature

Customer’s Signature

*(To confirm satisfactory demonstration and receipt of manufacturer’s literature)*

---

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.*
It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

Service Provider

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer’s instructions. Always use the manufacturer’s specified spare part when replacing controls.

<table>
<thead>
<tr>
<th>SERVICE 01</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer name:</td>
<td></td>
</tr>
<tr>
<td>Company name:</td>
<td></td>
</tr>
<tr>
<td>Telephone No:</td>
<td></td>
</tr>
<tr>
<td>Gas safe register No:</td>
<td></td>
</tr>
<tr>
<td>Record:</td>
<td>At max. rate: CO ppm AND CO₂ %</td>
</tr>
<tr>
<td></td>
<td>At min. rate: (Where Possible) CO ppm AND CO₂ %</td>
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<table>
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sustainable solutions
under one roof

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01604 762881

Fax
01604 767408

In the interest of continuous development Johnson & Starley reserve the right to change specifications without prior notice.