# INSTALLATION, COMMISSIONING, AND SERVICING INSTRUCTIONS

**WALL HUNG RSF GAS FIRED CONDENSING COMBINATION BOILER**

# Greenstar CDi Compact ErP

FOR SEALED CENTRAL HEATING SYSTEMS AND MAINS FED DOMESTIC HOT WATER


6720646608-00.1Wo

| These appliances are for use with: Natural Gas or L.P.G. (Cat. II 2H 3P type C13, C33 & C53) | | |
|---|---|---|
| | **Model** | **GC Number** |
| Natural Gas | 28CDi Compact ErP | 47-406-77 |
| | 32CDi Compact ErP | 47-406-79 |
| | 36CDi Compact ErP | 47-406-81 |
| LPG | 28CDi Compact ErP | 47-406-78 |
| | 32CDi Compact ErP | 47-406-80 |
| | 36CDi Compact ErP | 47-406-82 |

If you smell gas:

- Well away from the building: call the National Gas Emergency Service on 0800 111 999.
- L.P.G. boilers: Call the supplier's number on the side of the gas tank.

WORCESTER
Bosch Group

6 720 813 276 (2015/07)

## Contents

# 1 Key to symbols and safety instructions

## 1.1 Key to symbols

**Warnings**

Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **NOTICE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in severe injury or death.
- **DANGER** indicates a situation that will result in severe injury or death.

**Important information**

This symbol indicates important information where there is no risk to people or property.

**Additional symbols**

| Symbol | Meaning |
|---|---|
| 1. | a numbered step in an action sequence |
| ▸ | a step in an action sequence |
| → | a reference to a related part in the document or to other related documents |
| (1) | a reference number to identify or refer to a part or item |
| · | a list entry |
| – | a list entry (second level) |

*Table 1 Symbols*

**Examples of additional symbols used**

**A numbered step in an action sequence**

A sequence of numbered steps or actions carried out in a specific order to complete a task.

1. First action
2. Second action
3. Third action
   etc.

**A step in an action sequence**

A sequence of defined actions or steps carried out in order to complete a task.

▶ Action
▶ Next action
▶ etc

**A reference to a related part in the document or to other related documents.**

To refer the reader to a specific figure/table/section within the manual.

→ e.g. figure 1.

**A reference number to identify or refer to a part or item.**

In a related figure, items or parts identified by a sequential number.

**List entries, first and second levels**

- A single component/item
- A component/list, made up of multiple parts/items.
  - Sub component or sublist of main component/list.
  - etc.

**SYMBOLS USED IN THIS MANUAL**

| | |
|---|---|
|  | Domestic Hot Water |
|  | Central Heating |
|  | Hot Water Storage Cylinder |
|  | Domestic Cold Water Supply |
|  | Electrical Supply |
|  | Gas Supply |

*Table 2 Commonly used symbols*

**PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION.**

These instructions are applicable to the Worcester appliance model(s) stated on the front cover of this manual only and must not be used with any other make or model of appliance.

These instructions apply in the UK and Ireland only and must be followed except for any statutory obligations.

This appliance must be installed and serviced by a **GAS SAFE** registered, competent person. Failure to install correctly could lead to prosecution.

If you are in any doubt, contact the Worcester Technical helpline (0330 123 3366).

Please leave these instructions with the completed BENCHMARK CHECKLIST, (or a certificate confirming compliance with IS 813, Eire only) and the user manual with the owner or at the gas meter after installation or servicing.

Distance learning and training courses are available from Worcester.

The BENCHMARK CHECKLIST can be found in the back of this Installation manual.

| | |
|---|---|
| Ø | Diameter |
| NG | Natural Gas |
| LPG | Liquid Petroleum Gas |
| CH | Central Heating |
| DHW | Domestic Hot Water |
| DCW | Domestic Cold Water |
| DWTA | Domestic Water Treatment Association |
| PRV | Pressure Relief Valve |
| NTC | Negative Temperature Coefficient (sensor) |
| IP | Ingress Protection |
| RCD | Residual Current Device |
| TRV | Thermostatic Radiator Valve |
| ECV | Emergency Control Valve |
| WRAS | Water Regulations Advisory Scheme |
| SEDBUK | Seasonal Efficiency of Domestic Boilers in the United Kingdom |

*Table 3 Abbreviations use in this manual*

## 1.2 Safety precautions

**If you smell gas**

A gas leak could potentially cause an explosion. If you smell gas, observe the following rules.

- Prevent flames or sparks:
  - Do not smoke, use a lighter or strike matches.
  - Do not operate any electrical switches or unplug any equipment.
  - Do not use the telephone or ring doorbells.
- Turn off the gas at the meter or regulator.
- Open windows and doors.
- Warn your neighbours and leave the building.
- Prevent anyone from entering the building.
- Well away from the building: call the National Gas Emergency Service on 0800 111 999.
- L.P.G. boilers: Call the supplier's number on the side of the gas tank.

**Appliance operation:**

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge, if they have been given supervision or instruction concerning the use of the appliance, in a safe way, and understand the hazards involved.
Children shall not play with the appliance.
Cleaning and user maintenance shall not be made by children without supervision.

benchmark COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

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.

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 Hotwater Industry Council who manage and promote the scheme.
Visit **centralheating.co.uk** for more information.

**Health and safety**

The appliance contains no asbestos and no substances have been used in the construction process that contravene the COSHH Regulations (Control of Substances Hazardous to Health Regulations 1988).

**Combustion and corrosive materials**

Do not store or use any combustible materials (paper, thinners, paints etc.) inside or within the vicinity of the appliance.

Chemically aggressive substances can corrode the appliance and invalidate any warranty.

**Fittings and modifications**

Fitting the appliance and any controls to the appliance may only be carried out by a competent engineer in accordance with the current Gas Safety (Installation and Use) Regulations.

Flue systems must not be modified in any way other than as described in the fitting instructions. Any misuse or unauthorised modifications to the appliance, flue or associated components and systems could invalidate the warranty. The manufacturer accepts no liability arising from any such actions, excluding statutory rights.

**Servicing**

Advise the user to have the system serviced annually by a competent, qualified Gas Safe registered engineer. Approved spares must be used to help maintain the economy, safety and reliability of the appliance.

**Important**

The service engineer must complete the Service Record on the Benchmark Checklist after each service.

**Flue System**

Condensfit II

Only use the approved Worcester Condensfit II flue system with this appliance.

**Worcester original spare parts**

Only use Worcester original spare parts with this appliance.
Non Worcester original spare parts will invalidate the guarantee (if applicable) and any warranty.

## 2 Regulations

**Installation regulations**

Current Gas Safety (Installation & Use) Regulations:

All gas appliances must be installed by a competent person in accordance with the above regulations.
Failure to install appliances correctly could lead to prosecution.

The appliance must be installed in accordance with, and comply to, the current: Gas Safety Regulations, IET Regulations, Building Regulations, Building Standards (Scotland) (Consolidation), Building Regulations (Northern Ireland), local water by-laws, Health & Safety Document 635 (The Electricity at Work Regulations 1989), EU Regulations No. 811/2013 - Energy Labelling and any other local requirements.

**British standards**

Where no specific instruction is given, reference should be made to the relevant British Standard codes of Practice.

BS7074:1 Code of practice for domestic and hot water supply

BS6891 Installation of low pressure gas pipe work up to 28mm (R1)

BS5546 Installation of gas hot water supplies for domestic purposes

EN12828 Central heating for domestic premises

BS5440:1 Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Flues

BS5440:2 Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Air Supply

BS7593 Treatment of water in domestic hot water central heating systems

BS6798 Installation of gas fired boilers of rated input up to 70kW (net)

**L.P.G. Installations**

An appliance using L.P.G. must not be installed in a room or internal space below ground level unless one side of the building is open to the ground.

**Irish Standards**

The relevant Irish standards should be followed, including:

- ECTI National rules for electrical installations
- IS 813:2002 for Domestic Gas Installations.

**Timber Framed Buildings**

Where the boiler is to be fitted to a timber framed building the guidelines laid down in BS5440: Part 1 and IGE "Gas Installations in Timber Frame Buildings" should be adhered to.

**Potable Water**

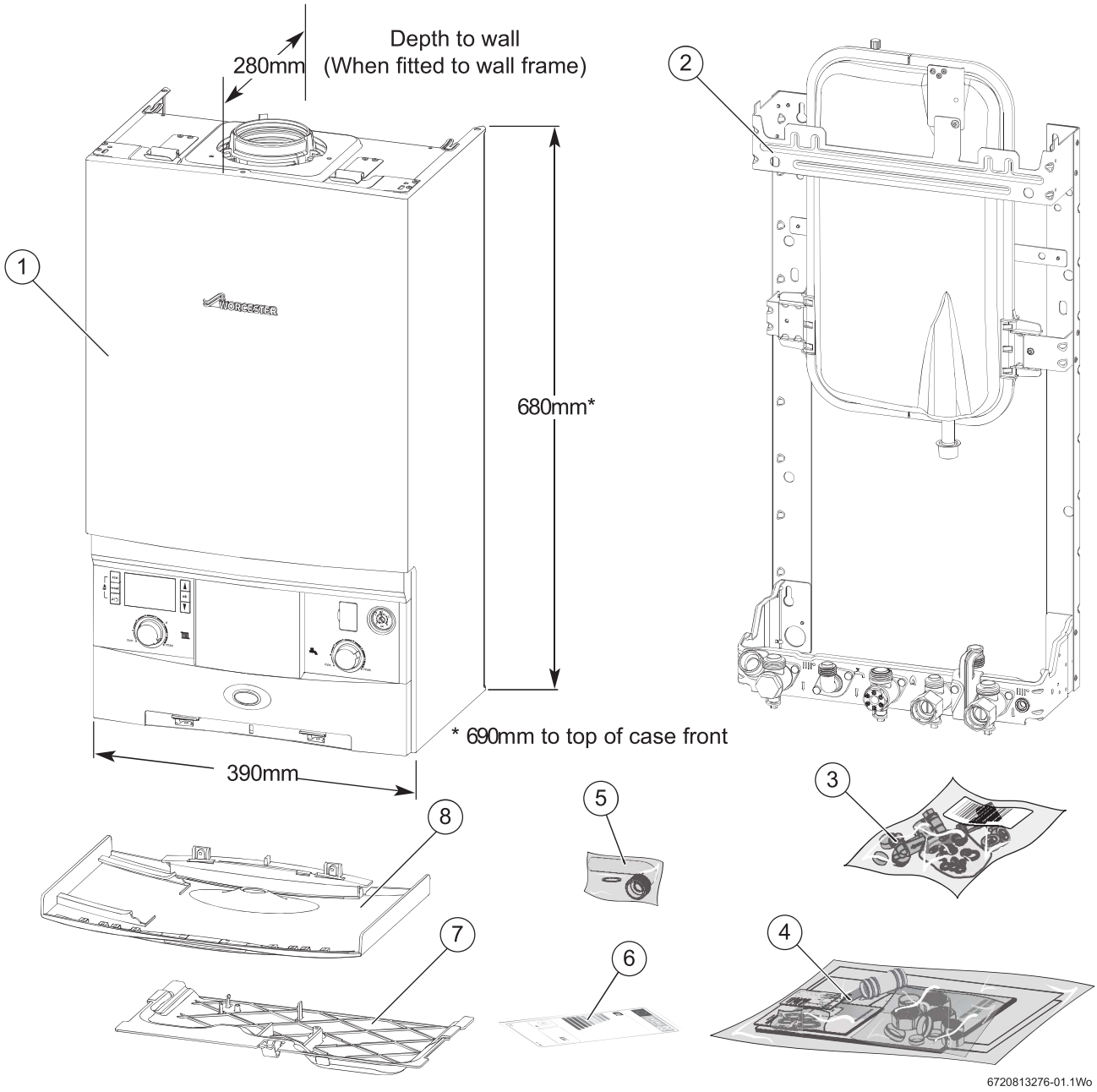
All seals, joints and compounds (including flux and solder) and components used as part of the secondary domestic water system must be approved by WRAS.

**CH Water**

Artificially softened water must not be used to fill the central heating system.

# 3 APPLIANCE INFORMATION

## 3.1 Appliance




**STANDARD PACKAGE**

1. Wall hung gas-fired condensing combi boiler for central heating and domestic hot water
2. Wall mounting frame
3. Integral Filling Loop kit
4. Hardware literature pack:
   - Greenstar CDi Compact ErP Installation, Commissioning and Servicing Instructions
   - User guide
   - Boiler fascia guide
   - Wall mounting template
   - Sealing Pack
5. PRV installer connection elbow
6. ErP label
7. Fascia panel
8. Bottom panel

## 3.2 Layout

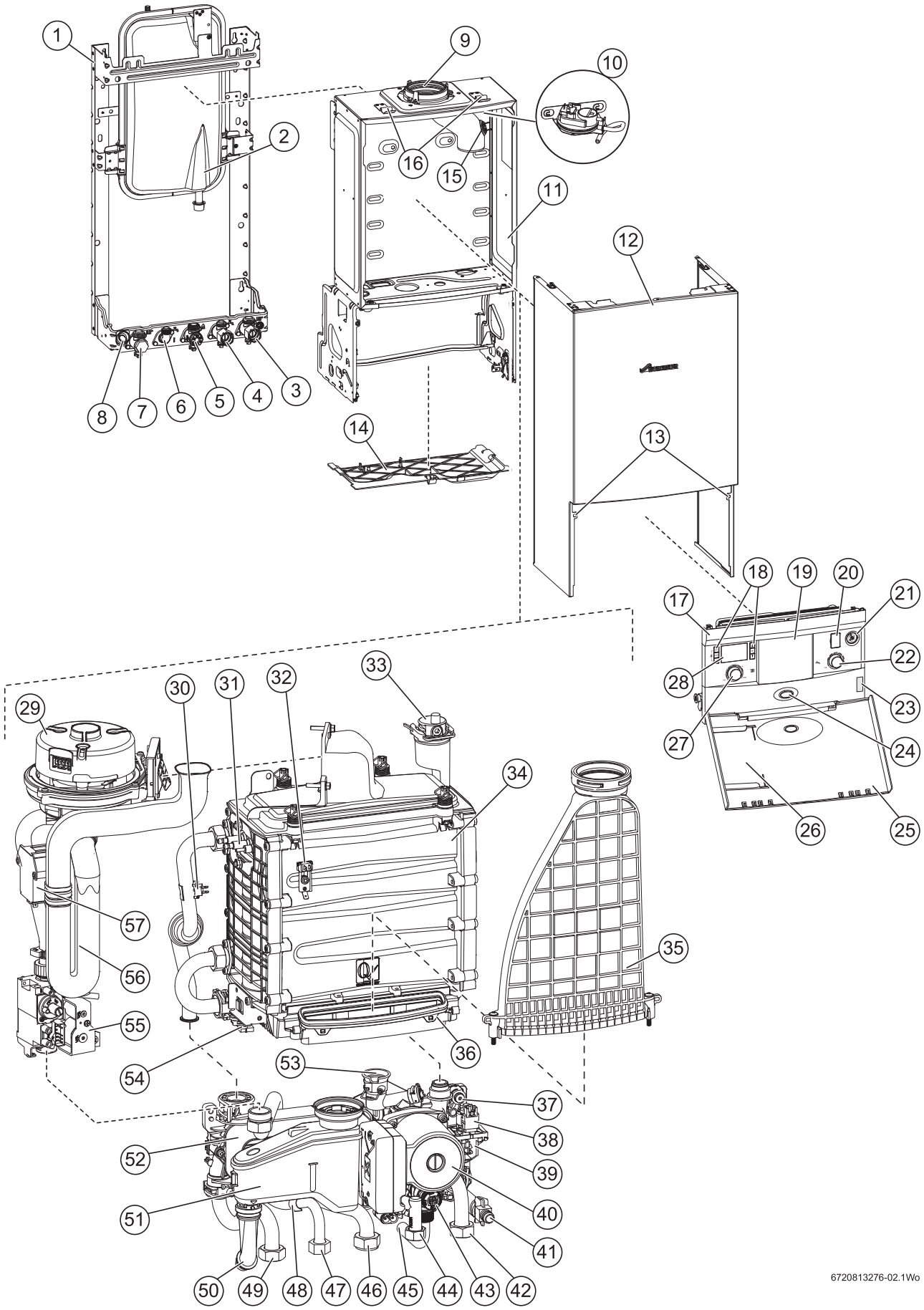



*Fig. 1 Main boiler components*

| | | | |
|---|---|---|---|
| 1 | Wall mounting frame | 30 | Flow temperature sensor (NTC) |
| 2 | Expansion vessel | 31 | Electrode assembly |
| 3 | CH return isolating valve | 32 | Maximum safety sensor (NTC) |
| 4 | DCW mains isolating valve | 33 | Auto air vent |
| 5 | Gas isolating valve | 34 | Aluminium Silicon Heat exchanger |
| 6 | DHW outlet connection | 35 | Flueway |
| 7 | CH flow isolating valve | 36 | Sump assembly |
| 8 | Condensate drain connection | 37 | Pressure gauge connection point |
| 9 | Flue connector | 38 | Diverter valve actuator (stepper motor) |
| 10 | Air Pressure Switch | 39 | Diverter valve body |
| 11 | Main superstructure | 40 | Modulating pump |
| 12 | Case | 41 | Drain point |
| 13 | Case retaining screws | 42 | CH return connection to isolating valve |
| 14 | Bottom panel | 43 | PRV |
| 15 | Flue Overheat Thermostat | 44 | DCW in connection to isolating valve |
| 16 | Case retaining clips | 45 | PRV Connection pipe |
| 17 | Control panel | 46 | Gas pipe from isolating valve |
| 18 | Control panel menu buttons | 47 | DHW outlet pipe |
| 19 | Blank for optional programmer | 48 | DHW temperature sensor (NTC) |
| 20 | Diagnostic port - Worcester service engineer | 49 | CH flow pipe to isolating valve |
| 21 | Pressure gauge | 50 | Condensate siphon drain pipe |
| 22 | DHW temperature control | 51 | Condensate siphon |
| 23 | Boiler identification label | 52 | DHW Plate heat exchanger |
| 24 | Operation/fault indicator (blue) | 53 | Expansion vessel connection |
| 25 | Control panel flap | 54 | Return temperature (NTC) |
| 26 | Boiler fascia guide location | 55 | Gas valve |
| 27 | CH temperature control | 56 | Combustion air inlet |
| 28 | Boiler display | 57 | Ignition transformer |
| 29 | Fan | | |

*Table 4 Boiler components*

**BOILER FEATURES**

- High pressure die-cast aluminium heat exchanger
- Low NOx emissions
- Fixed gas valve settings
- Direct burner ignition
- Zero pressure governor gas valve with fully modulating fan
- Display for boiler status and access to diagnostics, system and commissioning parameters
- Digital control system
- Memory retention after power interruption
- Low electrical power consumption during operation and stand-by modes
- Modulating pump
- Condensing in CH and DHW modes
- Three star Hot Water Comfort measured to EN13203 Part 1 in comfort mode with DHW pre-heat ON
- Eco mode, to use gas on demand
- Plate type DHW heat exchanger
- Ability to pre-plumb condensate drain, CH flow, DHW Outlet, Gas, DCW In, PRV and CH Return connections
- Siphonic condensate trap
- Galvanised steel wall mounting frame
- Standard wall frame provides vertical pipe route behind the boiler
- Compatible with all Worcester standard and intelligent controls
- Condensfit II flue systems 60/100 and 80/125mm allows plume re-direction as standard and ability to attach plume management kits

## 3.3 Technical data

| DESCRIPTION CDi Compact ErP | UNIT | Natural gas | | | L.P.G. | | |
|---|---|---|---|---|---|---|---|
| | | 28kW | 32kW | 36kW | 28kW | 32kW | 36kW |
| **Domestic Hot Water** | | | | | | | |
| Minimum heat input | kW | 7.15 | 7.15 | 7.15 | 7.15 | 7.15 | 7.15 |
| Maximum rated heat output | kW | 28 | 32 | 36 | 28 | 32 | 36 |
| Maximum rated heat input | kW | 28.57 | 32.65 | 36.7 | 28.57 | 32.65 | 36.7 |
| Maximum mains inlet pressure (standing pressure) | bar | 10 | 10 | 10 | 10 | 10 | 10 |
| Minimum mains inlet pressure (working) for max. flow | bar | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| Minimum mains inlet pressure (working) for operation | bar | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Minimum required flow to fire the boiler | l/min. | 2 | 2 | 2 | 2 | 2 | 2 |
| Domestic Hot Water temperature range | °C | 40 - 60 | 40 - 60 | 40 - 60 | 40 - 60 | 40 - 60 | 40 - 60 |
| 1) Max. Domestic Hot Water flow rate - 40 °C rise ± 15% | l/min. | 10.0 | 11.0 | 13.0 | 10.0 | 11.0 | 13.0 |
| **Gas flow rate - Max. 10 minutes from lighting** | | | | | | | |
| Natural Gas G20 | $m^3/h$ | 3.0 | 3.5 | 3.9 | | | |
| Propane Gas (L.P.G.) | kg/h | | | - | 2.2 | 2.5 | 2.8 |
| **Central Heating** | | | | | | | |
| Maximum rated heat input (net) | kW | 24.34 | 24.34 | 24.34 | 24.34 | 24.34 | 24.34 |
| Maximum rated heat output 40/30 °C | kW | 25.31 | 25.31 | 25.31 | 25.31 | 25.31 | 25.31 |
| Maximum rated heat output 50/30 °C | kW | 25.17 | 25.17 | 25.17 | 25.17 | 25.17 | 25.17 |
| Maximum rated heat output 80/60 °C | kW | 24 | 24 | 24 | 24 | 24 | 24 |
| Maximum flow temperature | °C | 82 | 82 | 82 | 82 | 82 | 82 |
| Maximum flow temperature possible | °C | 86 | 86 | 86 | 86 | 86 | 86 |
| Maximum permissible operating pressure | bar | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Available pump head at 20 °C system temperature rise | m | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| **Flue** | | | | | | | |
| Flue gas temperature 80/60 °C, rated/min. load | °C | 67/64 | 72/64 | 78/64 | 69/66 | 73/66 | 79/66 |
| Flue gas temperature 40/30 °C, rated/min. load | °C | 48/36 | 51/36 | 52/36 | 50/37 | 52/37 | 54/37 |
| $CO_2$ level at max. rated heat output (after 10 minutes) | % | 9.1 | 9.1 | 9.1 | 10.6 | 10.6 | 10.6 |
| $CO_2$ level at min. rated heat output (after 10 minutes) | % | 8.5 | 8.5 | 8.5 | 9.6 | 9.6 | 9.6 |
| NOx class | | 5 | 5 | 5 | 5 | 5 | 5 |
| NOx rating | mg/kWh | 35 | 35 | 35 | 46 | 46 | 46 |
| **Condensate** | | | | | | | |
| Maximum condensate rate | l/h | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| pH value, approx. | | 4.8 | 4.8 | 4.8 | 4.8 | 4.8 | 4.8 |
| **Electrical** | | | | | | | |
| Electrical power supply voltage | a.c. V | 230 | 230 | 230 | 230 | 230 | 230 |
| Frequency | Hz | 50 | 50 | 50 | 50 | 50 | 50 |
| Maximum power consumption - running | W | 105 | 115 | 129 | 105 | 115 | 129 |
| Maximum power consumption - stand-by | W | 1 | 1 | 1 | 1 | 1 | 1 |
| **General data** | | | | | | | |
| Appliance protection rating | IP | X4D | X4D | X4D | X4D | X4D | X4D |
| Appliance protection rating with mechanical or RF mechanical timer or FW100 module fitted | IP | IP20 | IP20 | IP20 | IP20 | IP20 | IP20 |
| Appliance protection rating with Sense II control fitted | IP | IPX2D | IPX2D | IPX2D | IPX2D | IPX2D | IPX2D |
| Permissible ambient operating temperatures | °C | 0 - 50 | 0 - 50 | 0 - 50 | 0 - 50 | 0 - 50 | 0 - 50 |
| Nominal capacity of appliance | litre | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 | 2.2 |
| Total packaged weight | kg | 43.1 | 43.1 | 43.1 | 43.1 | 43.1 | 43.1 |
| Total boiler weight | | 39.5 | 39.5 | 39.5 | 39.5 | 39.5 | 39.5 |
| Lift weight | kg | 32.9 | 32.9 | 32.9 | 32.9 | 32.9 | 32.9 |
| SEDBUK 2009 | % | 89.8 | 89.8 | 89.8 | 91.9 | 91.9 | 91.9 |

*Table 5 Technical data*

1) Greenstar CDi Compact ErP boilers are fitted with a flow regulator set to achieve a 40°C temperature rise. This ensures comfortable bathing during the colder winter months.

## 3.4 Energy efficiency

**Natural gas appliances**

The following product data satisfy the requirements of the EU Regulations No. 811/2013 and No. 812/2013 supplementing Directive 2010/30/EU.

| Product data | Symbol | Unit | 7733600053 | 7733600055 | 7733600056 |
|---|---|---|---|---|---|
| Product type | – | – | 28CDi Compact ErP | 32CDi Compact ErP | 36CDi Compact ErP |
| Condensing boiler | – | – | Yes | Yes | Yes |
| Low temperature boiler | – | – | No | No | No |
| B1 boiler | – | – | No | No | No |
| Cogeneration space heater (CHP) | – | – | No | No | No |
| Combination heater | – | – | Yes | Yes | Yes |
| Rated heat output | $P_{rated}$ | kW | 24 | 24 | 24 |
| Seasonal space heating energy efficiency | $\eta_s$ | % | 94 | 94 | 94 |
| Energy efficiency class | – | – | A | A | A |
| **Useful heat output** | | | | | |
| At rated heat output and high temperature regime 1) | $P_4$ | kW | 24 | 24 | 24 |
| At 30% of rated heat output and low temperature regime 2) | $P_1$ | kW | 8.1 | 8.1 | 8.1 |
| **Useful efficiency** | | | | | |
| At rated heat output and high temperature regime 1) | $\eta_4$ | % | 88.8 | 88.8 | 88.8 |
| At 30% of rated heat output and low temperature regime 2) | $\eta_1$ | % | 99.5 | 99.5 | 99.5 |
| **Auxiliary electricity consumption** | | | | | |
| At full load | $el_{max}$ | kW | 0.029 | 0.029 | 0.029 |
| At part load | $el_{min}$ | kW | 0.014 | 0.014 | 0.014 |
| In standby mode | $P_{SB}$ | kW | 0.001 | 0.001 | 0.001 |
| **Other items** | | | | | |
| Standby heat loss | $P_{stby}$ | kW | 0.078 | 0.078 | 0.078 |
| Ignition burner power consumption | $P_{ign}$ | kW | 0 | 0 | 0 |
| Emissions of nitrogen oxides | NOx | mg/kWh | 25 | 25 | 25 |
| Annual energy consumption | $Q_{HE}$ | kWh | - | - | - |
| Sound power level, indoors | $L_{WA}$ | dB(A) | 52 | 52 | 52 |
| **Additional data for combination heaters** | | | | | |
| Declared load profile | – | – | XL | XL | XL |
| Daily electricity consumption | $Q_{elec}$ | kWh | 0.144 | 0.137 | 0.141 |
| Annual electricity consumption | AEC | kWh | 32 | 30 | 31 |
| Daily fuel consumption | $Q_{fuel}$ | kWh | 20.667 | 20.741 | 20.702 |
| Annual fuel consumption | AFC | GJ | 18 | 18 | 18 |
| Water heating energy efficiency | $\eta_{wh}$ | % | 85 | 85 | 85 |
| Water heating energy efficiency class | – | – | A | A | A |

*Table 6 Product data for energy consumption according to the EU regulations no. 811/2013 and no. 813/2013*

1) High temperature regime means 60 °C return temperature at heater inlet and 80 °C feed temperature at heater outlet.

2) Low temperature means for condensing boilers 30 °C, for low-temperature boilers 37 °C and for other heaters 50 °C return temperature (at heater inlet).

**LPG appliances**

The following product data satisfy the requirements of the EU Regulations No. 811/2013 and No. 812/2013 supplementing Directive 2010/30/EU.

| Product data | Symbol | Unit | 7733600057 | 7733600058 | 7733600059 |
|---|---|---|---|---|---|
| Product type | – | – | 28CDi Compact ErP | 32CDi Compact ErP | 36CDi Compact ErP |
| Condensing boiler | – | – | Yes | Yes | Yes |
| Low temperature boiler | – | – | No | No | No |
| B1 boiler | – | – | No | No | No |
| Cogeneration space heater (CHP) | – | – | No | No | No |
| Combination heater | – | – | Yes | Yes | Yes |
| Rated heat output | $P_{rated}$ | kW | 24 | 24 | 24 |
| Seasonal space heating energy efficiency | $\eta_s$ | % | 94 | 94 | 94 |
| Energy efficiency class | – | – | A | A | A |
| **Useful heat output** | | | | | |
| At rated heat output and high temperature regime 1) | $P_4$ | kW | 24 | 24 | 24 |
| At 30% of rated heat output and low temperature regime 2) | $P_1$ | kW | 8.1 | 8.1 | 8.1 |
| **Useful efficiency** | | | | | |
| At rated heat output and high temperature regime 1) | $\eta_4$ | % | 88.8 | 88.8 | 88.8 |
| At 30% of rated heat output and low temperature regime 2) | $\eta_1$ | % | 99.5 | 99.5 | 99.5 |
| **Auxiliary electricity consumption** | | | | | |
| At full load | $el_{max}$ | kW | 0.029 | 0.029 | 0.029 |
| At part load | $el_{min}$ | kW | 0.014 | 0.014 | 0.014 |
| In standby mode | $P_{SB}$ | kW | 0.001 | 0.001 | 0.001 |
| **Other items** | | | | | |
| Standby heat loss | $P_{stby}$ | kW | 0.078 | 0.078 | 0.078 |
| Ignition burner power consumption | $P_{ign}$ | kW | 0 | 0 | 0 |
| Emissions of nitrogen oxides | NOx | mg/kWh | 25 | 25 | 25 |
| Annual energy consumption | $Q_{HE}$ | kWh | | | |
| Sound power level, indoors | $L_{WA}$ | dB(A) | 52 | 52 | 52 |
| **Additional data for combination heaters** | | | | | |
| Declared load profile | – | – | XL | XL | XL |
| Daily electricity consumption | $Q_{elec}$ | kWh | 0.144 | 0.137 | 0.141 |
| Annual electricity consumption | AEC | kWh | 32 | 30 | 31 |
| Daily fuel consumption | $Q_{fuel}$ | kWh | 20.667 | 20.741 | 20.702 |
| Annual fuel consumption | AFC | GJ | 18 | 18 | 18 |
| Water heating energy efficiency | $\eta_{wh}$ | % | 85 | 85 | 85 |
| Water heating energy efficiency class | – | – | A | A | A |

*Table 7 Product data for energy consumption*

1) High temperature regime means 60 °C return temperature at heater inlet and 80 °C feed temperature at heater outlet.

2) Low temperature means for condensing boilers 30 °C, for low-temperature boilers 37 °C and for other heaters 50 °C return temperature (at heater inlet).

# 4 PRE-INSTALLATION

## 4.1 Cleaning primary systems

**CAUTION:**
- ISOLATE THE MAINS SUPPLIES BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

**NOTICE:** All the following pre-installation sections must be read and requirements met before starting the boiler or flue installations.

**NOTICE:**
- Debris from the system can damage the boiler and reduce efficiency. Failure to comply with the guidelines for the use of water treatment with the appliance will invalidate the appliance guarantee and contravene the Building Regulations.
- It is recommended that you fit a primary water cleanser to the system. Worcester recommends fitting a filter that will help remove both magnetite and non-magnetic debris.

**BEFORE CLEANING THE SYSTEM:**
- Ensure that the system and pipe work is in good working order.
- **Where possible keep the existing boiler/circulating pump in place when flushing the system.**

**FOLLOW THE GUIDANCE OF BS7593:**
Treatment of water in domestic hot water central heating and also the flushing guidelines below.

**NOTICE:** Artificially softened water must not be used to fill the central heating system.

**FLUSHING THE SYSTEM**
- Fill the system with cold water and check for leaks.
- Open all drain cocks and drain the system.
- Close drain cocks and add a suitable flushing agent **compatible with aluminium** at the correct strength for the system conditions in accordance with the manufacturer's instructions.
  **The pH value of the system water must be less than 8 or the appliance guarantee will be invalidated.**
- Circulate the flushing agent before the boiler is fired up.
- Run the boiler/system at normal operating temperature as directed by the manufacturer of the flushing agent.
- Drain and thoroughly flush the system to remove the flushing agent and debris.
- It may be necessary to use a power flushing machine to aid the cleansing procedure in some circumstances.
- Close the drain cocks and refill with fresh water and a suitable inhibitor.
- Vent any air from the boiler and system.

**Inhibitor**
Add a suitable inhibitor or combined inhibitor/anti-freeze, if the system is exposed to freezing conditions, to the heating system in accordance with the DWTA code of practice and manufacturer's guidelines.

**WARNING:** Sealing agents
- Normally the addition of sealing agents to the system water is not permitted as this can cause problems with deposits left in the heat exchanger.
- In cases where all attempts to find a micro leak have failed, Worcester, Bosch Group supports the use of Fernox F4 leak sealer.

**Water treatment products**
Suitable water treatment products can be obtain from the following manufacturers:

| | |
|---|---|
| FERNOX | 0870 601 5000 or www.fernox.com |
| SENTINEL | 0800 389 4670 or www.sentinel-solutions.net |

**Artificially softened water**
It is possible to have an ion exchange water softener fitted to the cold water system of the property. However, the boiler requires an untreated cold water connection taken from the mains supply, before the water softener, to the primary water filling point of the heating system.

## 4.2 MAINS SUPPLY

### 4.2.1 Electrical supply
- Supply: 230V - 50 Hz
- Cable: PVC insulated 0.75mm$^2$ (24 x 0.2mm) temperature rated to 90 °C.
- External 3A fuse to BS1362.
- The boiler must be earthed.
- This boiler must not be connected to a 3 phase supply.
- IPX4D.

**NOTICE:** IP rating change
IP rating IPX4D is reduced to IP20 if the following controls are fitted;
MT10, 7 716 192 036 or MT10RF, 7 716 192 037 or FR100 7 716 192 067.
This is reduced to IPX2D when the Sense II 7 738 111 064 is fitted.

- Wiring must comply with the latest edition of BS 7671 (IET wiring regulations).

### 4.2.2 Gas supply
To ensure that the equipment is in good working order and can meet the gas flow and pressure requirements, in addition to the demand from any other appliance being served, the following applies:
- Boilers using Natural Gas (NG) must be connected to a governed meter.
- Liquid Petroleum Gas (LPG) must be connected to a regulator.
- Installation and connection of the gas supply to the boiler must be in accordance with BS6891.
- Gas pipe sizing should be calculated to ensure no more than the permitted mbar drop between the meter/governor to the appliance inlet. (→ Commissioning section).
- The meter or regulator and pipe work to the meter must be checked, preferably by the gas supplier.

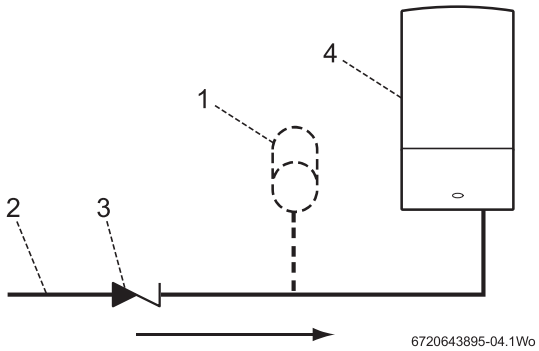
### 4.2.3 Water supply

**Water mains pressure:**

- Minimum mains water pressure for maximum performance: refer to the Technical data in section 3.3.
- Maximum mains fed water pressure 10 bar.
  If necessary fit a pressure reducing valve.

**NOTICE:** Non return, back flow prevention devices (including those associated with water meters) fitted to the mains water supply can cause a pressure build up which could damage the boiler and other household appliances.

- Where the mains water supply has a non-return, back flow prevention valve fitted, a mini expansion vessel (1) should be connected to the mains water inlet pipe (2) between the non-return valve (3) and the boiler (4) as shown below.




| | |
|---|---|
| 1 | Mini expansion vessel - part no. 7 716 192 105 |
| 2 | Mains water inlet pipe |
| 3 | Non return valve |
| 4 | Boiler |

**Use in hard water areas:**

Normally there is no need for water treatment to prevent scale formation as the maximum temperature of the DHW heat exchanger is limited by the electronic control.

In areas where temporary water hardness exceeds 200 ppm, consideration may need to be given to the fitting of a scale prevention device. In such circumstances, the advice of the local water authority should be sought.

## 4.3 Water systems and pipe work

**PLASTIC PIPE WORK:**

- Any plastic pipe work must have a polymeric barrier with 600mm (minimum) length of copper pipe before being connected to the boiler.
- Plastic pipe work used for underfloor heating must be correctly controlled with a thermostatic blending valve limiting the temperature of the circuits to approximately 50°C.

**PRIMARY SYSTEMS CONNECTIONS/VALVES:**

- All system connections, taps and mixing valves must be capable of sustaining a pressure up to 3 bar.
- Radiator valves should conform to BS2767:10.
- All other valves should conform to BS1010.
- Thermostatic radiator valves (TRV's) must be fitted to all rooms except bathrooms and the room in which the room thermostat is fitted.
- A drain cock is required at the lowest point(s) in the system.
- An air vent is required at the high point(s) in the system.

The boiler is equipped with an internal by-pass.
The internal bypass is not intended to be a substitute for an external system bypass.
An external automatic bypass should be used if the system flow can be significantly adjusted or stopped by zone valves and thermostatic radiator valves (TRV).

**SHOWERS/BIDETS:**

- If a shower head can be immersed in water or comes closer than 25mm from the top edge of a bath or shower tray spill over level then an anti-siphon device must be fitted to the shower hose.
- Bidets with direct hot and cold mains water can be used (with the approval of the local water authority) and must be the over rim flushing type with shrouded outlets to prevent the fitting of hand held sprays.

### SEALED PRIMARY SYSTEM:

**NOTICE:** Artificially softened water must not be used to fill the central heating system.

- The CH sealed system must be filled using a WRAS approved filling loop or comply with figure 2 for system fill.
- Where the system volume is more than 100 litres or exceeds 2.65 bar at maximum heating temperature, an extra expansion vessel (2) must be fitted as close as possible to the appliance in the central heating return.
- Pressurise the extra expansion vessel (2) to the same figure as the expansion vessel built into the appliance, (approximately 0.75 bar).
- **Do not use galvanised pipes or radiators**.

### SYSTEM FILL

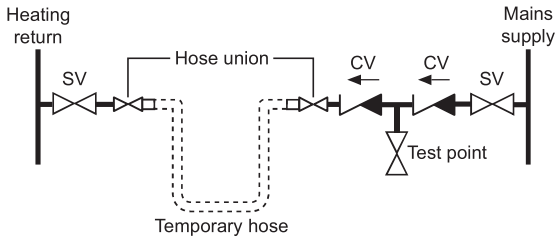



*Fig. 2 System fill*

### TYPICAL SEALED SYSTEM

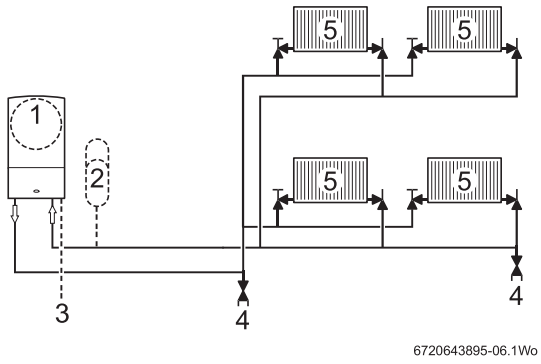



*Fig. 3 Sealed system*

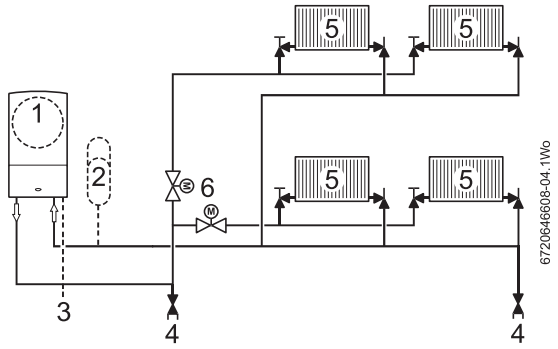



*Fig. 4 Sealed system with zone valves*

| | |
|---|---|
| 1 | Appliance expansion vessel - CH |
| 2 | Extra expansion vessel - CH return |
| 3 | Pressure relief discharge |
| 4 | Drain cock |
| 5 | Radiators |
| 6 | Zone valves |

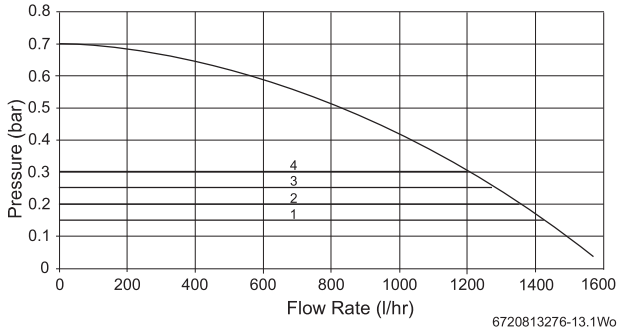
*Table 8 Key to figs. 3 and 4*

### Available pump head

In order to save as much energy as possible and the minimise the possibility of water circulation noise, a low characteristic should be chosen.

The pump map can be selected within 2.1C in the Boiler settings menu list:

- **0** (pump variable speed setting)
- **1** (constant pressure low)
- **2** (constant pressure low/middle)
- **3** (constant pressure middle/high)
- **4** (constant pressure high)




The factory setting is:

**4** (constant pressure high)

### Constant pressure head

If the constant pressure head option (1 - 4) is chosen, the differential pressure between the CH flow and return will be kept at the corresponding value. When the CH system is cold and the radiator TRVs are fully open, the pump will be running faster to try and maintain the pressure differential. When the TRVs start to close and the resistance of the CH system increases, the pump speed reduces to maintain the pressure.

The setting (1 - 4) to be selected is dependent upon the resistance and heat load of the CH system. The higher these are, the higher the pressure constant

## 4.4 Condensate pipe work

**NOTICE:**

- ▶ Where a new or replacement boiler is being installed, access to an internal "gravity discharge" point should be one of the factors considered in determining boiler location.
- ▶ The condensate pipe must be nominally 22mm Ø plastic pipe.
- ▶ The condensate pipe work must fall at least 52mm per metre towards the outlet and should take the shortest practicable route.
- ▶ Ensure there are no blockages in the pipe run.

| Key to condensate illustrations | |
|---|---|
| 1 | Condensate discharge from boiler |
| 2 | Soil and vent stack |
| 3 | Minimum 450mm and up to three storeys |
| 4 | Visible air break at plug hole |
| 5 | Sink or basin with integrated overflow |
| 6 | 75mm sink waste trap |
| 7 | Condensate pump |
| * | Condensate trap of 75mm already incorporated into the boiler |

### 4.4.1 Internal connections

In order to minimise risk of freezing during prolonged cold spells, the following methods of installing condensate drainage pipe should be adopted, in order of priority.

Wherever possible, the condensate drainage pipe should be routed and terminated so that the condensate drains away from the boiler under gravity to a suitable internal foul water discharge point such as an internal soil and vent stack. A suitable permanent connection to the foul waste pipe should be used.

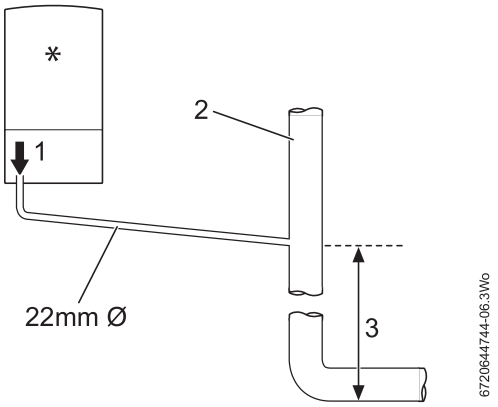



*Fig. 5 Disposal to soil vent stack*

Alternatively if the first option is not possible an internal kitchen or bathroom waste pipe, washing machine waste pipe etc. can be used. Ensure that the condensate drain pipe is connected “down stream” of the waste trap.

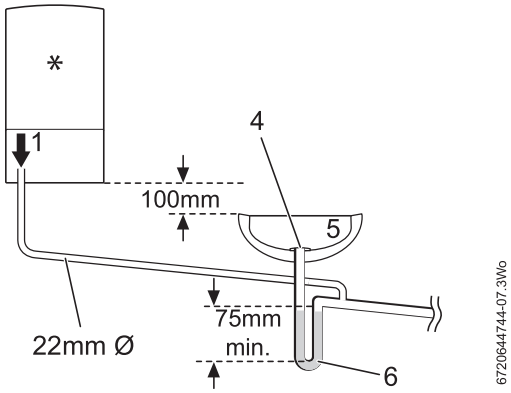



*Fig. 6 Disposal to a waste pipe*

**CONDENSATE PUMP**

Where “gravity discharge” to an internal termination is not physically possible, or where very long internal runs would be required to reach a suitable discharge point, condensate should be removed using a proprietary condensate pump, of a specification recommended by the boiler or condensate pump manufacturer.

The pump outlet pipe should discharge to a suitable internal foul water discharge point such as an internal soil and vent stack, internal kitchen or bathroom waste pipe, washing machine waste pipe etc. A suitable permanent connection to the foul waste pipe should be used.

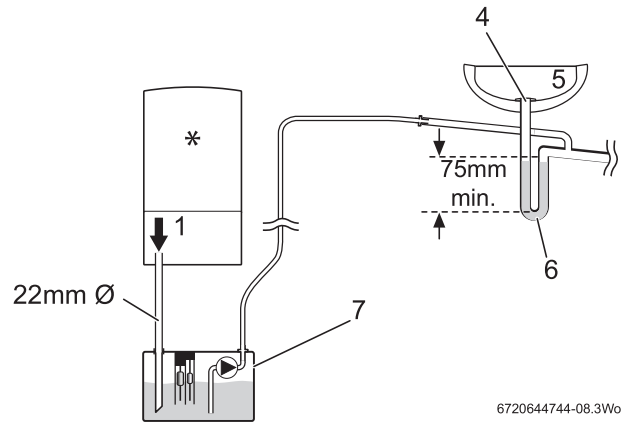



*Fig. 7 Condensate pump disposal*

### 4.4.2 External connections

**NOTICE:** Freezing conditions
- When the position of the boiler prevents internal routing, we recommend installing a CondenseSure siphon to significantly reduce the risk of freezing.
- Pipe work length should be kept to a minimum and the route as vertical as possible.
- Weather proof insulation must be used, if not using a CondenseSure siphon.

**NOTICE:** Condensate waste
- Care should be taken when siting a soak-away to avoid obstructing existing services.

| Continued - Key to condensate illustrations | |
|---|---|
| 8 | PVCu strap on fitting |
| 9 | 100mm Ø minimum plastic pipe |
| 10 | Drainage holes |
| 11 | Limestone chippings |
| 12 | Bottom of sealed tube |
| 13 | Insulate and increase pipe size |
| 14 | Pipe work transition |
| 15 | External air break |
| 16 | Air gap |
| 17 | External rain water pipe into foul water |
| 18 | 43mm 90° male/female bend |
| * | Condensate trap of 75mm already incorporated into the boiler |

If no other discharge method is possible then the use of an externally run condensate drainage pipe terminating at a suitable foul water discharge point, or purpose-designed soak away, may be considered. If this method is chosen then the following measures should be adopted:

- Use a CondenseSure siphon to help prevent the condensate freezing.
- The external run be kept as short as possible and not exceed 3 metres.
- The pipe should be run internally as far as possible before going externally and the pipe diameter should be increased to 32mm before it passes through the wall to the exterior. The pipe should be insulated using suitable waterproof and weather resistant insulation, if not using a CondenseSure siphon.
- The external pipe should take the shortest and least exposed route to the discharge point, and should "fall" as steeply as possible away from the boiler, with no horizontal runs in which condensate might stand.

- The use of fittings, elbows etc. should be kept to a minimum and any internal “burrs” on cut pipe work should be removed so that the internal pipe section is as smooth as possible.

**FITTING AN EXTERNAL AIR BREAK**

- Refer to figure 8 when a rain water down pipe is used to dispose of condensate.
- An air break must be installed in the 43mm pipe work, between the boiler condensate outlet and the drainpipe, outside the property, to avoid flooding during adverse weather conditions.

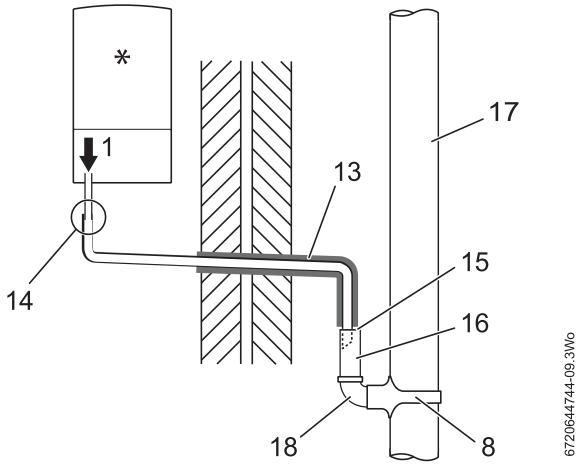



*Fig. 8 Disposal into a rainwater down pipe*

Condensate drainage pipe can be run above or below ground.

Where the pipe terminates over an open drain or gully, the pipe should terminate below the grating level, but above water level, in order to minimise “wind chill” at the open end.

The use of a drain cover (such as those used to prevent blockage by leaves) may offer further protection from wind chill.

Pipe drainage will be improved if the end is cut at 45° as opposed to a straight cut.

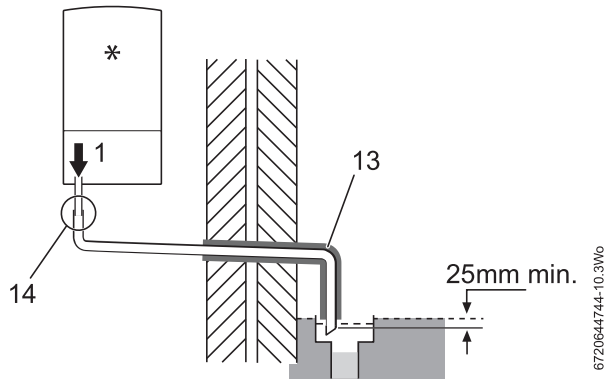



*Fig. 9 External disposal*

**CONDENSATE SOAK AWAY**

- The condensate drainage pipe may be run above or below the ground to the soak away. The examples shown on this page run above ground.
- The soak away must use a 100mm Ø plastic tube with two rows of three 12mm holes on 25mm centres and 50mm from the bottom of the tube. The holes must face away from the house.
- The tube must be surrounded by at least 100mm of limestone chippings to a depth of 400mm.

Minimum hole size for the condensate soak away must be 400mm deep by 300mmØ .

In situations where there are likely to be extremes of temperature or exposure, the use of a proprietary trace-heating system for external pipe work, incorporating an external frost thermostat, should be considered. If such a system is used, the requirement to use 32mm pipe does not apply. However, all other guidance above and the instructions for the trace heating system, should be closely followed.

**NOTICE:** Unheated internal areas.

- Internal pipe runs in unheated areas such as lofts, basements and garages should be treated as external runs and consideration should be given to using a CondenseSure siphon.

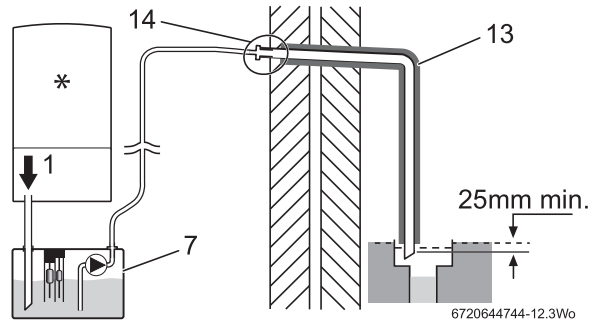



*Fig. 10 Condensate pump to external disposal*

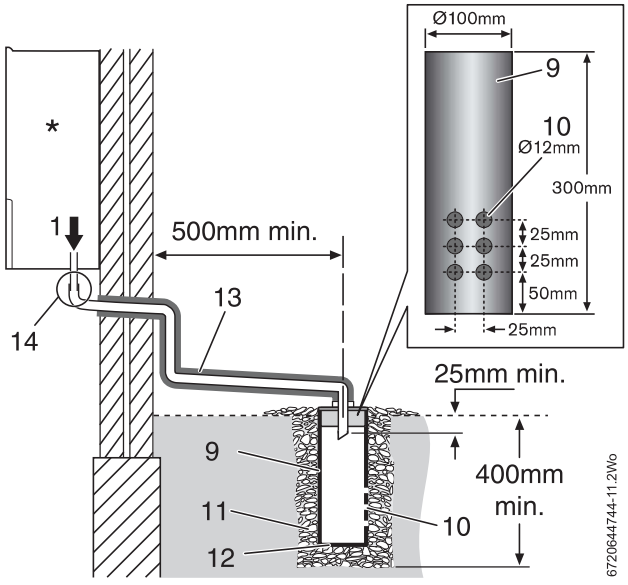



*Fig. 11 Soak away*

## 4.5 Pressure relief pipe work

**NOTICE:**

- The pressure relief valve is a safety device for the boiler and if activated may discharge boiling water or steam through the relief valve drain pipe.
- Care should be taken when siting the outlet pipe so that it does not cause an obstruction or discharge above a window, entrance or other public access where it could cause a hazard.

- The pressure relief drain pipe (1) from the boiler should be at least 15mm diameter copper pipe and run downwards, away from any electrical equipment or other hazard, preferably to an external drain or soak away.
- The pressure relief drain pipe (1) should be finished with a partial bend, near the outlet to face the external wall (as shown) to help prevent freezing.

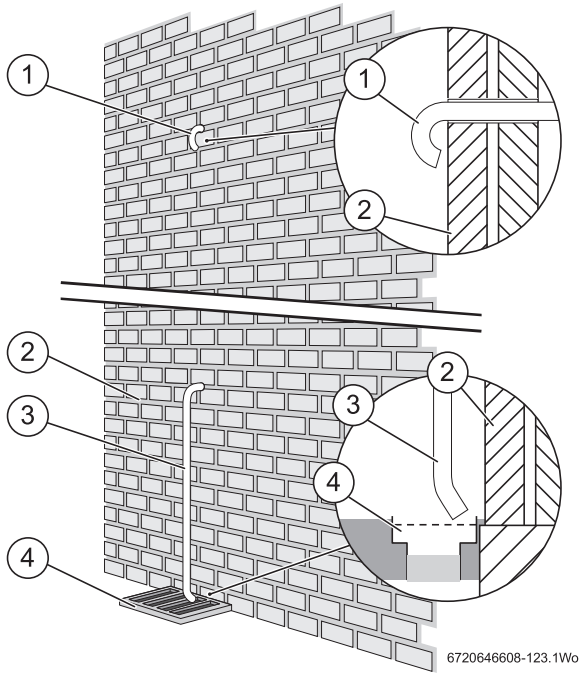



*Fig. 12 Pressure relief pipe work*

[2] Outside wall
[1, 3] PRV drain pipe
[4] External drain

## 4.6 Boiler location and clearances

### 4.6.1 Installation

This appliance is only suitable for installing internally within a property at a suitable location onto a fixed, rigid surface at least the same size as the appliance and capable of supporting the appliance weight.

No surface protection is required against heat transfer from the appliance.

The appliance must be installed where:

- An engineer can gain clear and safe access to work on the product or component, including making adequate provision for visual inspection of flues in voids.
- The homeowner can gain clear and safe access to the controls, check, top up or reset the appliance.
- Products in loft cavities must have permanent fixed lighting, a permanent fixed retractable ladder and a fixed floor area sufficient to allow access for normal use and servicing directly under and around the product and between and the access hatch.

### 4.6.2 Installation and servicing clearances

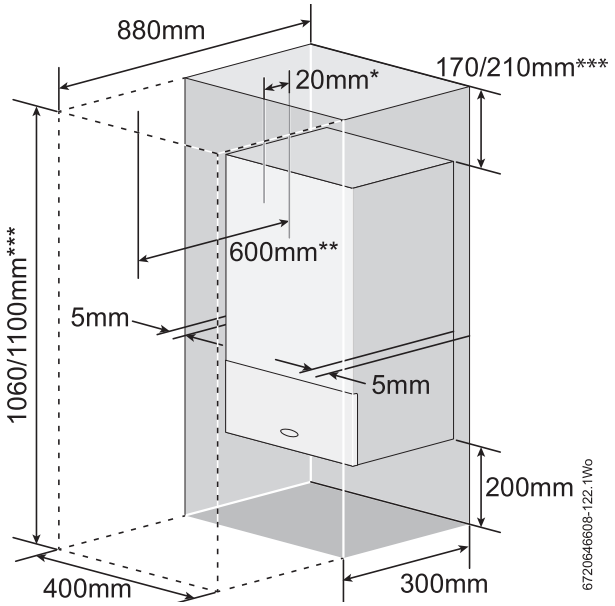



*Fig. 13 Unventilated compartment*

[*] Minimum clearance to removable door
[**] Minimum clearance required for servicing
[***] Height for either 60/100 flue or 80/125 flue

### 4.6.3 Compartments

Follow the requirements of BS6798 and BS5440 Part 2 and note:

- Minimum clearances must be maintained.
- An access door is required to install, service and maintain the boiler and any ancillary equipment.
- If fitting the boiler into an airing cupboard use a non-combustible material to separate the boiler from the airing space.
  The material can be perforated up to a maximum hole size of 13mm.

### 4.6.4 Bathrooms

Please check the IP rating of any control to be used on this appliance. Only certain controls can be fitted when the appliance is inside of the shaded area.

An appliance with blanking panel or controls that do not change the IP rating can be installed in zone 2.

Additional RCD (Residual Current Device) protection may be required.

Consult the latest version of BS7671 (IET wiring regulations).

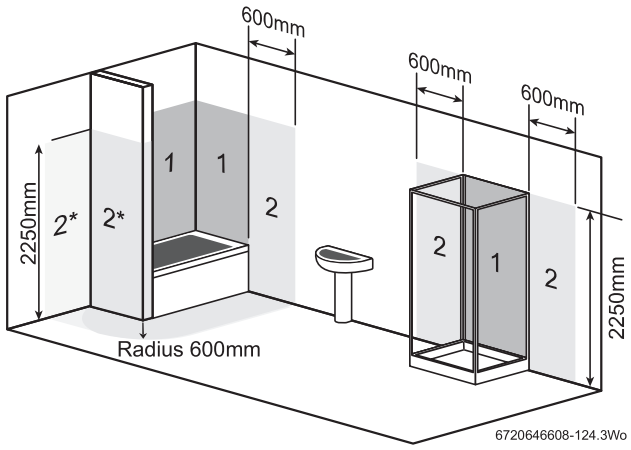



*Fig. 14 Bathroom installations*

[2*] Without the end wall, zone 2 must extend 600mm from the bath

## 4.7 Plumbing manifold

### 4.7.1 Connections

| | |
|---|---|
| Heating System | 22mm compression fittings |
| DHW | 15mm compression fittings |
| Gas | 22mm compression fittings |

Use the fittings supplied in the Hardware literature pack.

Further guidance on pipe routing can be found printed on the boiler template (supplied with the boiler).

- For further ease of fitting, an optional Vertical Pre-piping Assembly kit is available, comprising four pre-formed copper water pipes. Part number: 7 716 192 713.

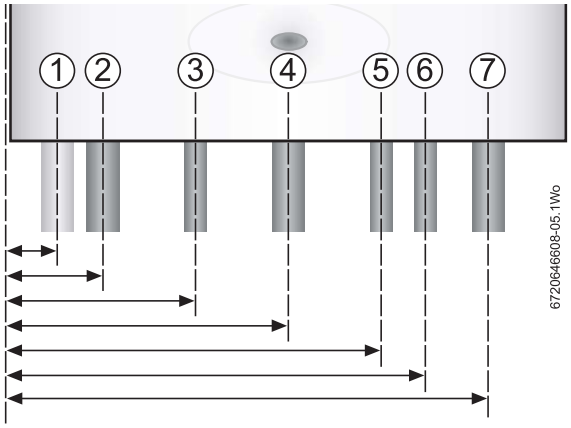



*Fig. 15 Pipe dimensions*

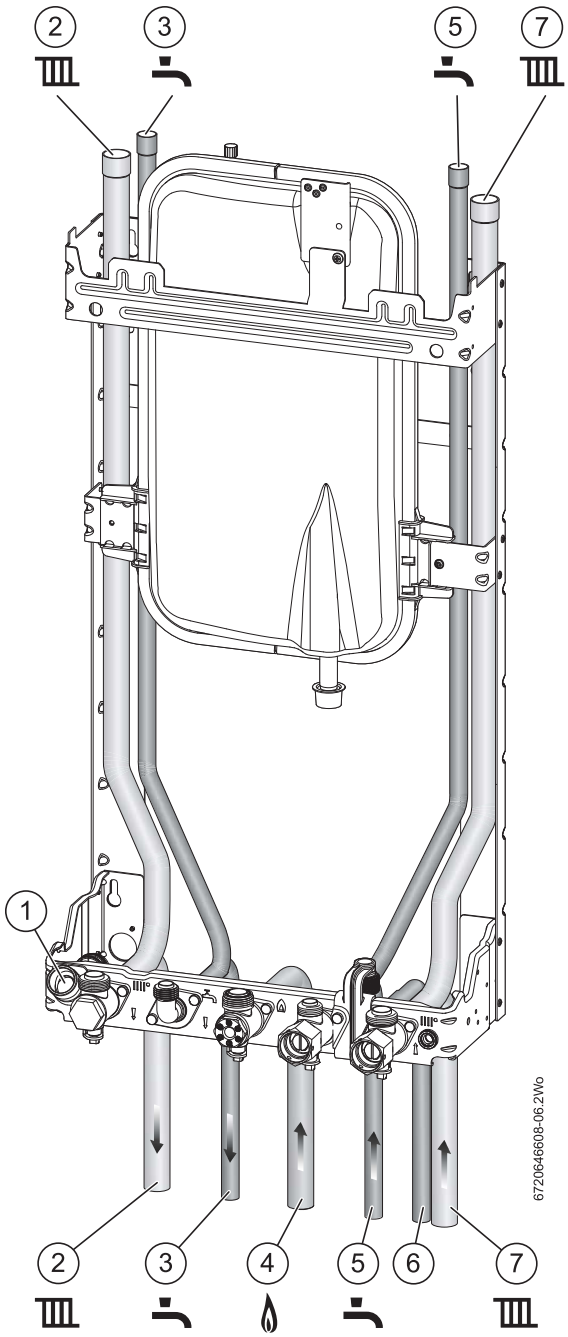



*Fig. 16 Plumbing manifold*

| No. | Function | From left case edge | Diameter of pipe |
|---|---|---|---|
| 1 | Condensate drain | 33mm | 22mm |
| 2 | CH Flow | 65mm | 22mm |
| 3 | DHW Outlet | 130mm | 15mm |
| 4 | Gas | 195mm | 22mm |
| 5 | DCW Mains In | 260mm | 15mm |
| 6 | PRV drain | 291mm | 15mm |
| 7 | CH Return | 325mm | 22mm |

*Table 9 Key to figures 15 & 16*

## 4.8 Flue options

**WARNING:** Flue systems
- Only use Worcester, Bosch approved flue systems, no other manufacturer's flue systems have been approved for use with Worcester appliances.

**CAUTION:** Non accessible flue systems:
- Where a flue system is not going to be accessible, provision must be made for service and inspection.
- Voids containing concealed flues must have at least one inspection hatch no less than 300mm square.
- Flue joints within the void must not be more than 1.5 metres from the edge of the inspection hatch.
- Inspection hatches should be located at changes of direction.
- If this is not possible, bends should be viewable from both directions.

**NOTICE:** Effective flue lengths:
- each 90° bend is equivalent to 2 metres of straight flue
- each 45° bend is equivalent to 1 metre of straight flue

Plume management kits are available for the 60/100 horizontal flue system,
Part number 7 716 191 086.
Refer to the manual supplied with the Plume Management kits for complete installation instructions

| Part number | Flue | Description |
|---|---|---|
| 7 716 191 082 | 60/100 | Telescopic horizontal flue assembly |
| 7 716 191 171 | 60/100 | Longer telescopic horizontal flue assembly |
| 7 733 600 048 | 60/100 | Horizontal high level telescopic flue kit |
| 7 719 003 702 | 80/125 | Telescopic horizontal flue assembly |
| 7 719 002 430 | 60/100 | Vertical flue assembly |
| 7 719 002 431 | 80/125 | Vertical flue assembly |

*Table 10 Flue kit part numbers*

### 4.8.1 Flue lengths

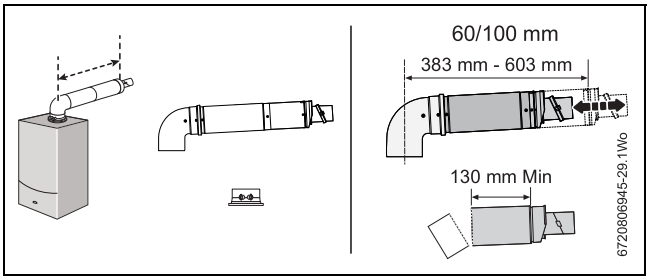
The flue systems have different maximum flue lengths

The Greenstar series has the option of two horizontal 60/100 RSF (telescopic and longer telescopic) and one horizontal 80/125 RSF (telescopic) flue system and two vertical RSF (60/100 or 80/125) flue systems:

Refer to the following example Flue options for the maximum flue lengths.

Condensfit II

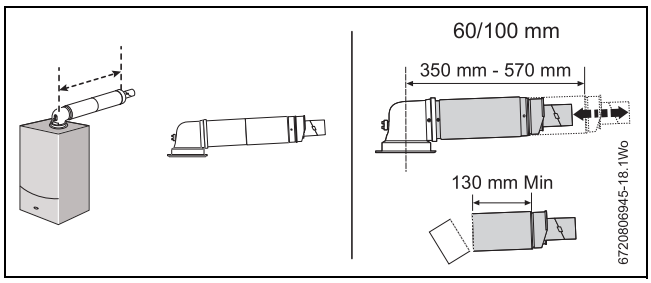
**Horizontal high level flue assembly**




| | Flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Horizontal high level telescopic flue assembly | 202 - 603 | N/A |

*Table 11*

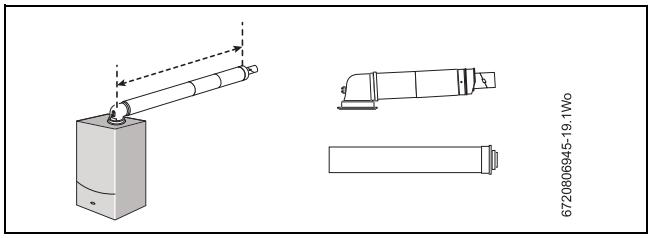
**Telescopic horizontal flue assembly**




| | Flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Telescopic horizontal flue assembly | 180 - 570 | 405 - 600 |
| Longer telescopic horizontal flue assembly | 570 - 790 | N/A |

*Table 12*

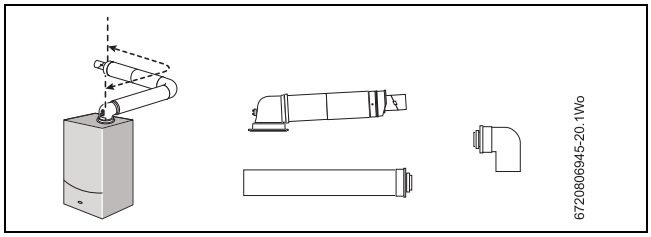
**Extended horizontal flue**




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Extended horizontal flue | 6,000 | 15,000 |

*Table 13*

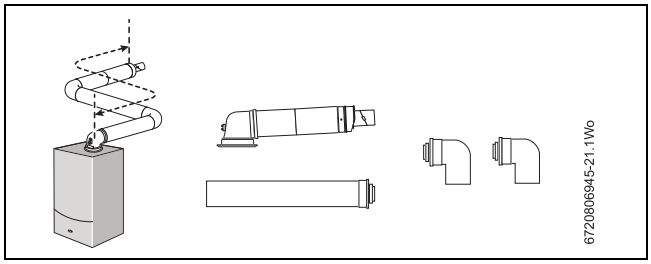
**Horizontal flue with additional elbow (1 x 90 ° bend)**




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Horizontal flue with 1 x 90° bend | 4,000 | 13,000 |

*Table 14*

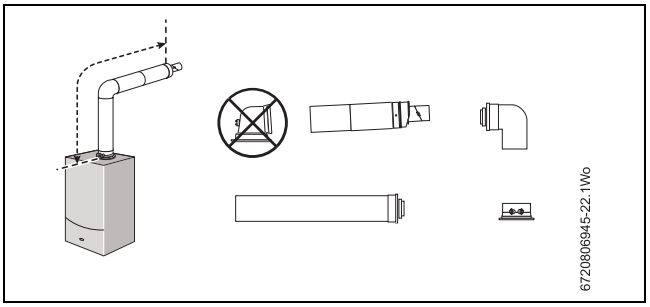
**Horizontal flue with additional elbows (2 x 90 ° bends)**




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Horizontal flue with 2 x 90° bends | 2,000 | 11,000 |

*Table 15*

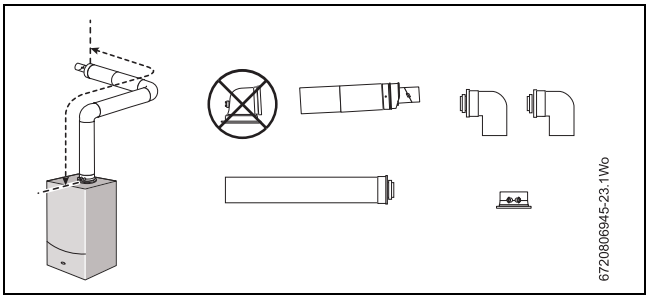
### High level horizontal flue




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| High level horizontal flue | 6,000 | 15,000 |

*Table 16*

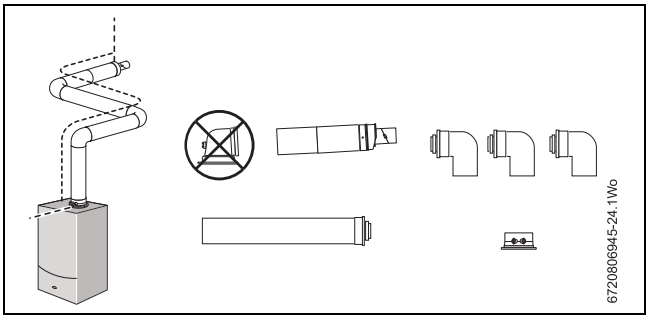
### High level horizontal flue with additional elbows




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| High level horizontal flue with 2 x 90° bends | 4,000 | 13,000 |

*Table 17*

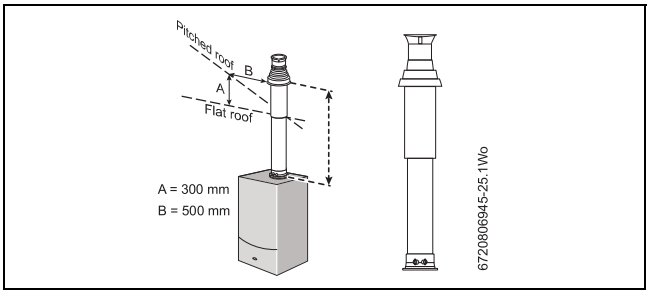
### High level horizontal flue with additional elbows




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| High level horizontal flue with 3 x 90° bends | 2,000 | 11,000 |

*Table 18*

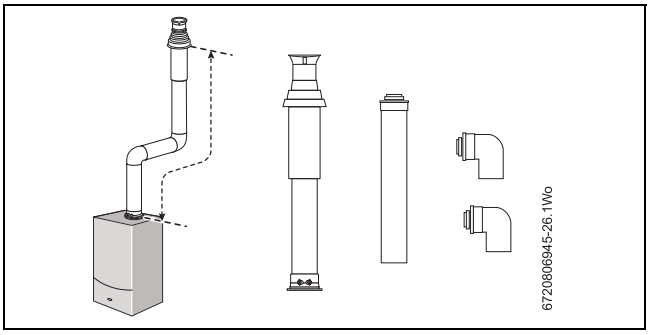
### Vertical balanced flue assembly




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Vertical balanced flue assembly | 6,000 | 15,000 |

*Table 19*

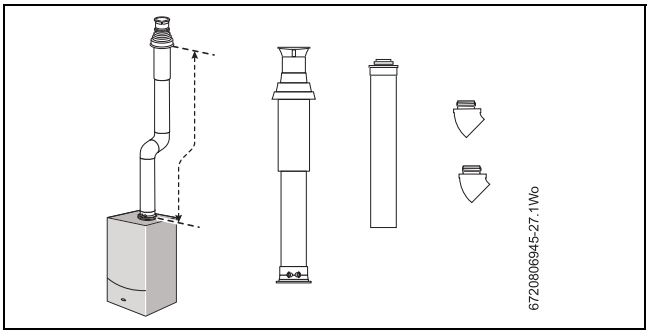
### Vertical balanced flue with elbow offset (2 x 90 ° bends)




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Vertical balanced flue with 2 x 90° bends | 2,000 | 11,000 |

*Table 20*

### Vertical balanced flue with elbow offset (2 x 45 ° bends)




| | Maximum flue length (mm) | |
|---|---|---|
| | 60/100 | 80/125 |
| Vertical balanced flue with 2 x 45° bends | 4,000 | 13,000 |

*Table 21*

## 4.9 Flue terminal positions

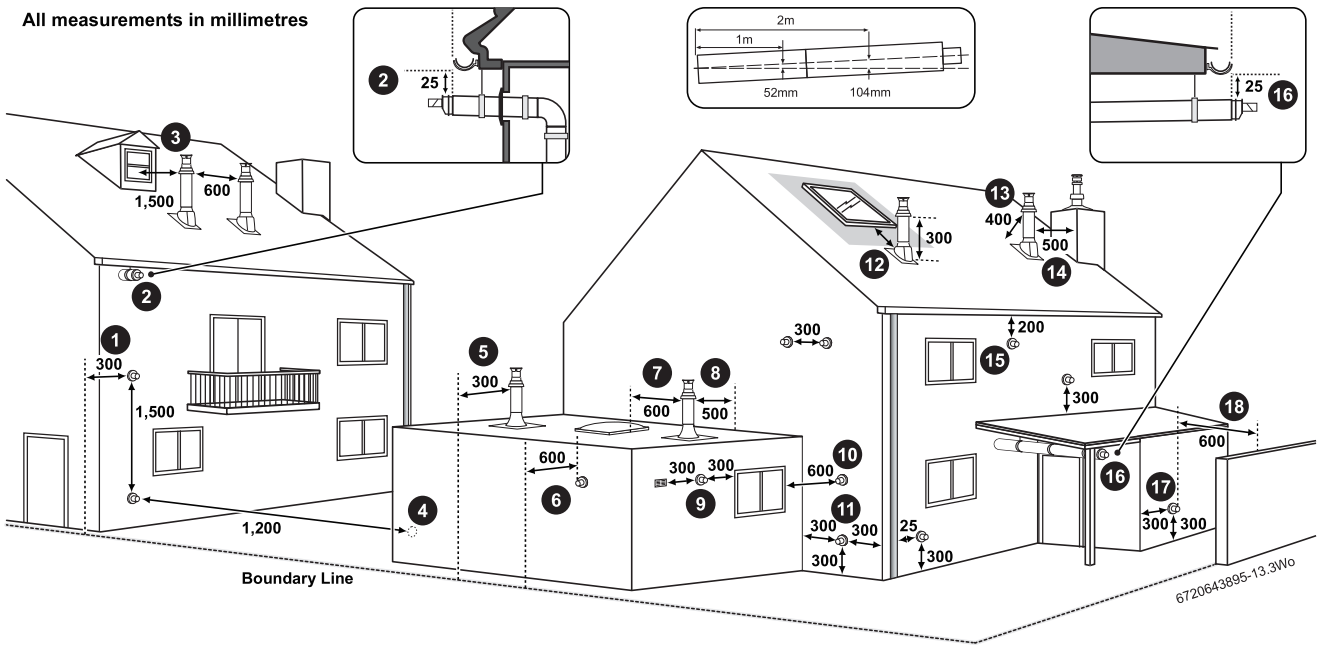



*Fig. 17 Flue terminal positions*

**NOTICE:**

- All measurements are the minimum clearances required.
- Terminals must be positioned so to avoid combustion products entering the building.
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings.
  (flue bracket 100mm part number: 7 716 191 177,
  flue brackets 100mm x 6 part number: 7 716 191 178,
  flue bracket 125mm part number: 7 716 191 179).

**Key to illustration**

1. 300mm adjacent to a boundary line.
2. The dimension below eaves, gutters, pipes and drains can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. External flue joints must be sealed with suitable silicon sealant.
3. 1,500mm between a vertical flue terminal and a window or dormer window.
4. 1,200mm between terminals facing each other.
5. Vertical flue clearance, 300mm adjacent to a boundary line unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines
6. 600m distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
7. 600mm minimum clearance from a skylight to a vertical flue.
8. Vertical flue clearance, 500mm to non-combustible building material, and 1,500mm clearance to combustible building material.
9. 300mm above, below and either side of an opening door, air vent or opening window.
10. 600mm diagonally to an opening door, air vent or opening window.
11. 300mm to an internal or external corner. This does not apply to building protrusions less than 450mm.
12. 2,000mm below a Velux window, 600mm above or to either side of the Velux window.
13. 400mm from a pitched roof or 500mm in regions with heavy snow fall.
14. 500mm clearance to any vertical structure on a roof, 600mm to room sealed flue or 1,500 to an open flue.
15. 200mm below eaves and 75mm below gutters, pipe and drains.
16. The dimension below eaves, balconies and car ports can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. External flue joints must be sealed with suitable silicon sealant.
17. Flue clearance must be at least 300mm from the ground. Terminal guards must be fitted if the flue is less than 2 metres from the ground or if a person could come into contact with the flue terminal.
18. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.

**Note:**

- Installations in car ports are not recommended.
- The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products.
- Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.
- A flue terminal guard should be fitted over a terminal, if persons could come into contact with the terminal, or it could be subject to damage and where the terminal is less than 2,000mm from the finished floor level.

## 4.10 Plume management terminal positions

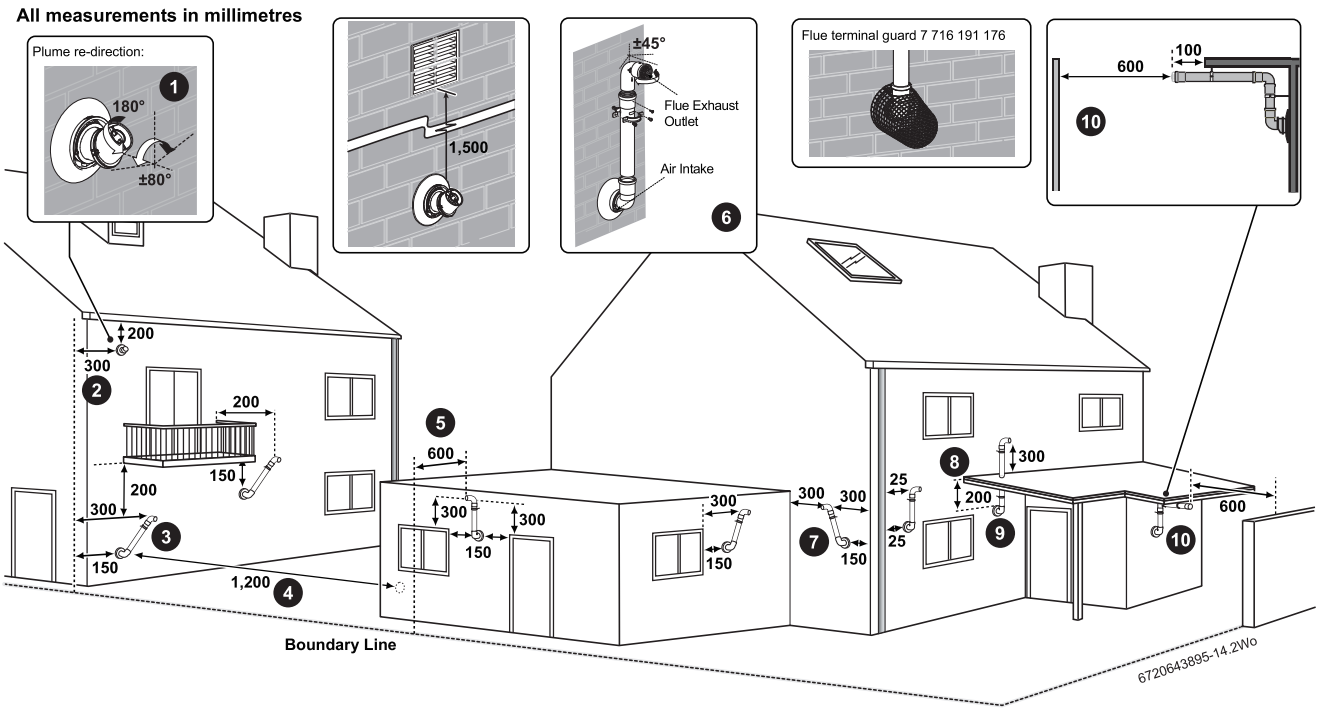



*Fig. 18 Plume terminal positions*

Maximum and minimum plume management lengths:

- A minimum distance of 500mm must be maintained between the plume management outlet and the flue air intake.
- The maximum plume management length is 4.5 metres for the appliances detailed on the front of this manual.
- The 45° bend is equivalent to 0.75 metres of straight plume management and the 90° bend is equivalent to 1.5 metres.

**NOTICE:**

- All measurements are the minimum clearances required.
- Refer to previous page for all concentric flue terminal positions unless the flue position is specified on the figure above “Plume terminal positions”.
- Terminals must be positioned so to avoid combustion products entering the building.
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings.

**Key to illustration**

1. This feature allows some basic plume re-direction options on a standard telescopic horizontal flue terminal.
   300mm minimum clearances to a opening e.g. window.
   However the minimum clearances to an opening in the direction that the plume management is facing, must be increased to 1,500mm.
   Where the flue is less than 150mm to a drainpipe and plume re-direction is used the deflector should not be directed towards the drainpipe.
2. 300mm adjacent to a boundary line.
3. Plume Management kit air intake can be reduced to 150mm providing the flue exhaust outlet is no less than 300mm adjacent to a boundary line.
4. 1,200mm between terminals facing each other.
5. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
6. Using a Plume Management kit the air intake measurement can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance. The initial horizontal run from the terminal elbow must have a minimum 10° fall back, (stop tabs in the elbow prevent less than 10°) to the appliance for proper disposal of condensate. Any further horizontal runs can be 3°.
   – For details on specific lengths see relevant appliance Technical & Specification information.
7. Internal/external corners. The air intake clearance can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance.
8. Clearances no less than 200mm from the lowest point of the balcony or overhang.
9. 1,200mm from an opening in a car port on the same wall e.g. door or window leading into the dwelling.
10. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.

**Note:**

- Installations in car ports are not recommended.
- The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products.
- Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.

### 4.10.1 Determine the plume management system length

| Effective straight flue length for telescopic flue with plume management | |
|---|---|
| **Minimum plume length 500mm (M)** | **Maximum plume length 5,000mm (M)** |
| Maximum flue length 5,000mm (L) | Maximum flue length 2,200mm (L) |

**Note:** Measurement M plume length

- Measurement M must be a minimum of 500mm and must not exceed 4,500mm for a 60mm plume management system used with the horizontal Ø 60/100mm flue.

**Minimum plume management length**

The minimum plume length should be calculated to ensure that the air inlet and exhaust have a minimum distance of 500mm between them (→ figure 19).

The plume management can be in any configuration, within the parameters of the plume management installation instructions, as long as it does not terminate inside the shaded area.

**WARNING:** Minimum plume management length.

The minimum distance of 500mm must be maintained between air inlet and exhaust.

- Do not terminate the plume management inside the shaded area shown in figure 19

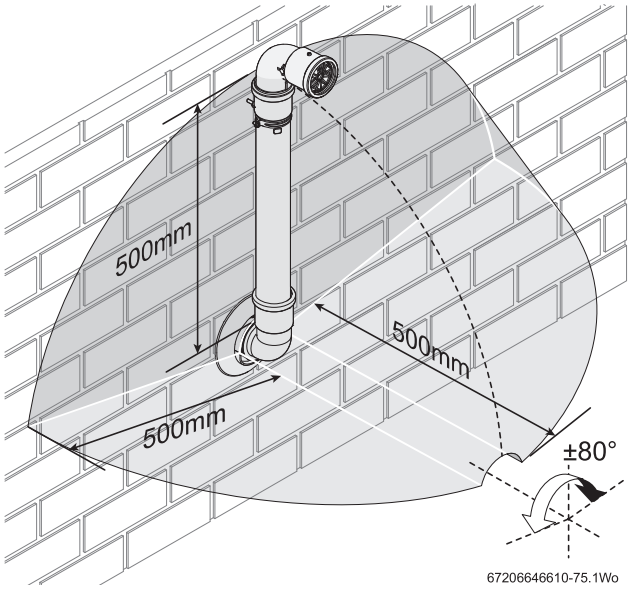



*Fig. 19 Terminal exclusion zone*

**NOTICE:** Cutting the 500mm pipe

If the 500mm plume management pipe kit is cut, an additional elbow will be required to join the pipe work.

- The Plume management extension kit contains the components required for such a configuration.

**Flue length versus plume management length**

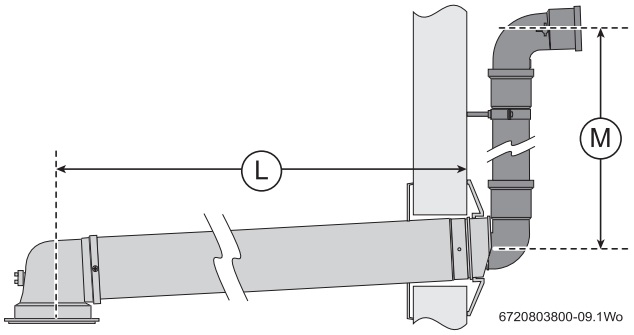



*Fig. 20 Effective lengths L and M*

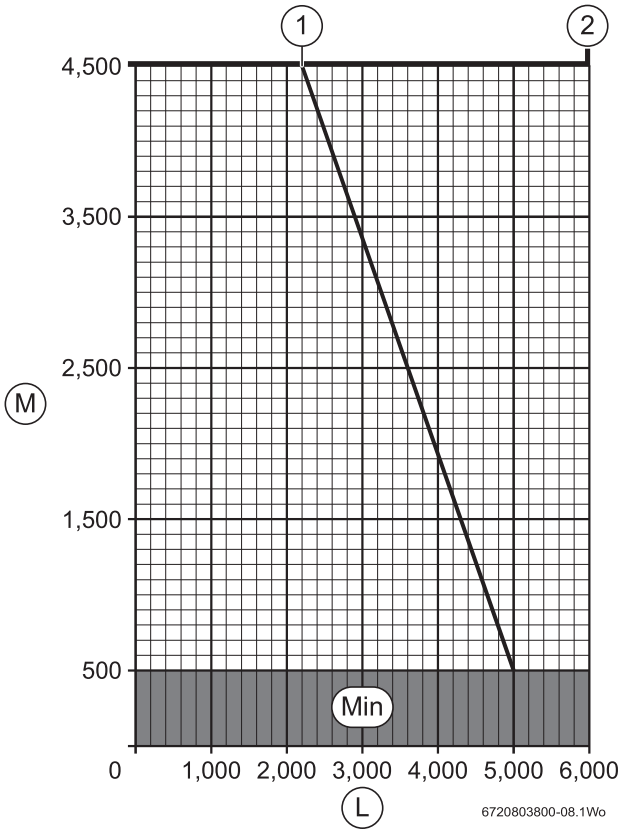



*Fig. 21 Effective flue lengths versus plume management lengths*

[Min] Minimum plume kit length 500mm
[M] Plume management length allowed (mm)
[L] Effective flue length (mm)
[1] 25 & 30Si Compact ErP data line
[2] Maximum plume length for all boilers

Refer to figure 21 to determine the appropriate plume length (M) versus the flue length (L).

The lengths for both plume and flue are the effective lengths, which includes the effective length of any bends plus the straight lengths.

The graph can be used to calculate:

- **Effective flue length** if a specific effective plume length is required.
- **Effective plume length** if a specific effective flue length is required.

# 5 INSTALLATION

**WARNING:** All the previous "Pre-Installation" sections must be read and the requirements met before starting boiler or flue installation.

## 5.1 Unpacking wall frame & ancillary items

**CAUTION:** LIFTING AND CARRYING
- ▶ Only lift a manageable weight, or ask for help.
- ▶ Bend your knees and keep your back straight with feet apart, when lifting or putting down heavy objects.
- ▶ DO NOT lift and twist at the same time.
- ▶ Lift and carry object close to the body.

▶ Remove the retaining straps from the carton.

▶ Open the four carton flaps and unpack as follows:

1. Remove items 1 to 7 from the cardboard tray.
2. Remove the wall mounting frame and cardboard tray together.

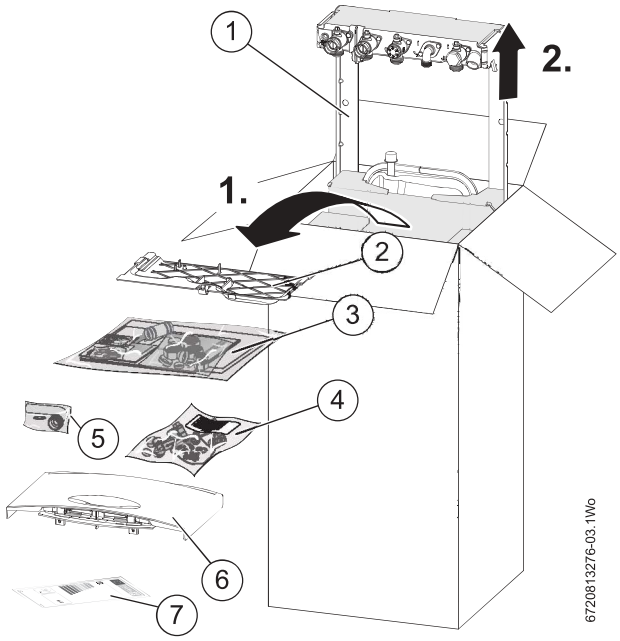



*Fig. 22 Unpacking*

[1] Wall mounting frame
[2] Bottom panel
[3] Literature pack with wall mounting template
[4] Integral Filling Loop kit
[5] PRV installer connection elbow
[6] Front fascia panel
[7] ErP label

**IMPORTANT HANDLING INSTRUCTIONS:**

- It is advised that two people are used to carry the carton from the van to the point of delivery.
- Once the carton has been delivered, the outer carton is removed first. Care should be taken when releasing the straps. If a sharp implement is used make sure the outer carton is not pierced and that the implement is used in such a way so that it may not cause personal injury.
- All sharp objects must be covered or the blade retracted after use and put away in a safe place.
  Care should be taken when lifting the boiler from the base and the proper technique for safe lifting of any heavy object should be strictly observed.

**Additional requirements for roof space installation:**

- The boiler should be first unpacked before ascending ladder to a loft space.
- Two sets of steps should be used.
- Two people should share the lifting of the boiler up to the loft hatch, where the boiler is entered into the loft space tilted and slid on its back into the loft.
- Once the appliance is removed from its packaging check the contents against the packing list.

**NOTICE:**
- ▶ **Before installing the appliance, ensure that the system has been cleaned as explained on page 12.**

## 5.2 Wall mounting template & flue opening

**WARNING: BEFORE DRILLING ENSURE THAT THERE ARE NO PIPES, ELECTRICAL CABLES, DAMP PROOF COURSES OR OTHER HAZARDS.**

**SAFETY:**

All relevant safety precautions must be undertaken. Protective clothing, footwear, gloves and safety goggles must be worn as appropriate.

**FIXING THE WALL MOUNTING FRAME:**

▶ The boiler wall mounting template shows the relative positions of the flue and the top and bottom fixing points of the wall mounting frame.

1. Fix the wall mounting template to the wall in the desired position.
2. Drill 4 holes for the wall mounting frame through the template, additional mounting holes can be utilised if required.

The wall mounting template has been sized to allow for minimum clearances of 5mm sides, 200mm base and 170mm above boiler case (which is 30mm above a 100mm diameter flue elbow).

**REAR FLUE OUTLET**

▶ The drawing opposite shows the boiler wall mounting template with the flue centre lines of both the 100mm and 125mm flue systems.

3. Mark the centre line of the flue to be used (3); the external diameter of the hole can also be marked if required.

▶ If a 100mm diameter flue is to be used, a 125mm diameter hole is required. However, if using the weather sealing collar by pushing it through from inside the property, then a 150mm diameter hole is required to accommodate this.

▶ The flue turret of the 100mm flue has an in-built 3° angle.

▶ If extensions are to be added then the complete flue must rise at an angle of 3°.

▶ Drill the hole, preferably using a core drill.

**SIDE OUTLET:**

4. Mark from the centre line of the wall mounting template to the wall that the flue will pass through (4).

▶ Allow for a rise of 52mm per metre length of flue, to give a 3° angle.

▶ Clear any debris from the site.

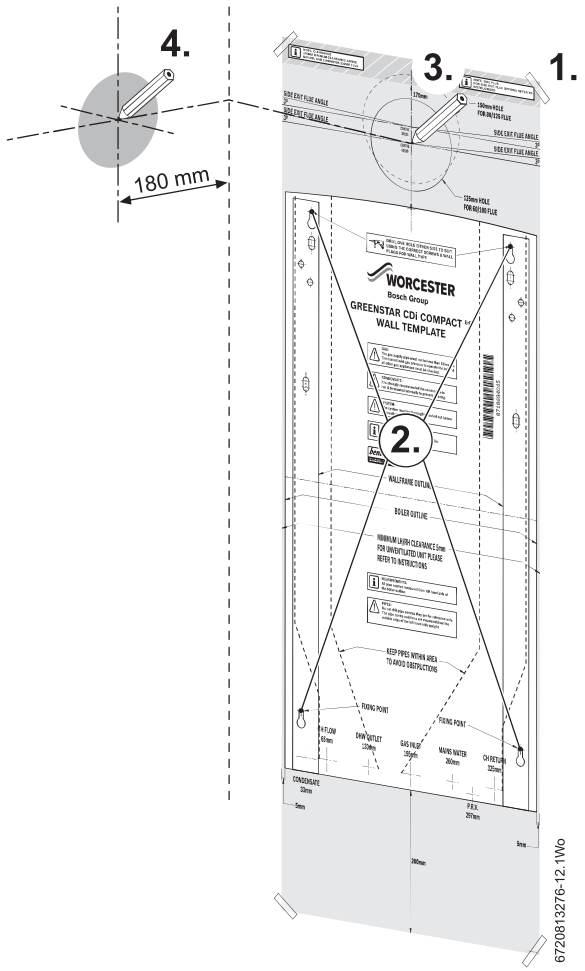



*Fig. 23 Marking the flue position*

- ▶ Remove wall mounting template.
- ▶ Secure the wall mounting frame to the wall with the appropriate fittings for the boiler weight and wall type.
- ▶ Remove and discard the red plastic dust cap from the expansion vessel pipe before hanging the boiler.

## 5.3 Unpacking the appliance

1. Remove outer carton (1) and place safely away from the working area.
2. Remove the inner sleeve (3) leaving all other cardboard inserts and base (4) in place.
3. Remove the protective wrapping (5) from the boiler.

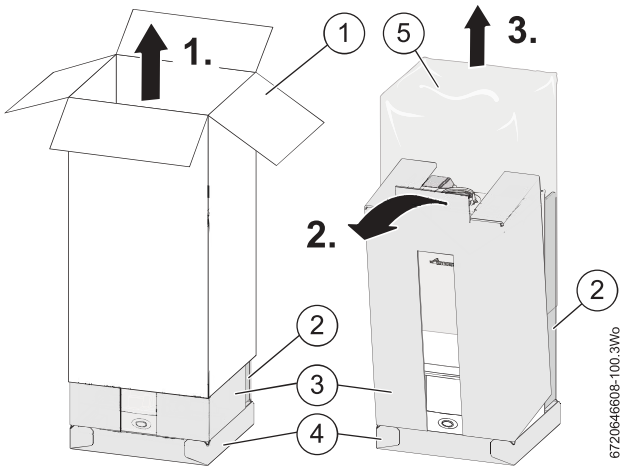



*Fig. 24 Remove the carton*

4. Remove the protective cardboard (5) from over the isolating valves.
5. Remove the protective cardboard (6) from around the expansion vessel.
6. Remove the inner packing (2) from the back of the boiler.
7. Lie the boiler on the floor ensuring that the V shaped cardboard insert (8) is in place.

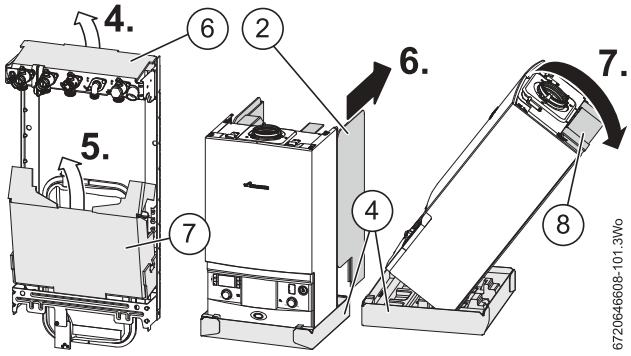



*Fig. 25 Finish unpacking*

**Removing the outer case**

- ▶ Before the case can be removed the control panel must be moved into the service position, i.e. hinged open.

1. Remove the two screws underneath the fascia securing the control panel.
2. Pull the catches forward to release.
3. Pull the bottom of the fascia forward and out to release the top of the control panel.
4. Hinge open the control panel into the service position
5. Refer to figure 26 and release the two screws securing the lower part of the case.
6. Release the spring clips at the top of the boiler.
7. Slide the case off the frame and store safely out of the way.

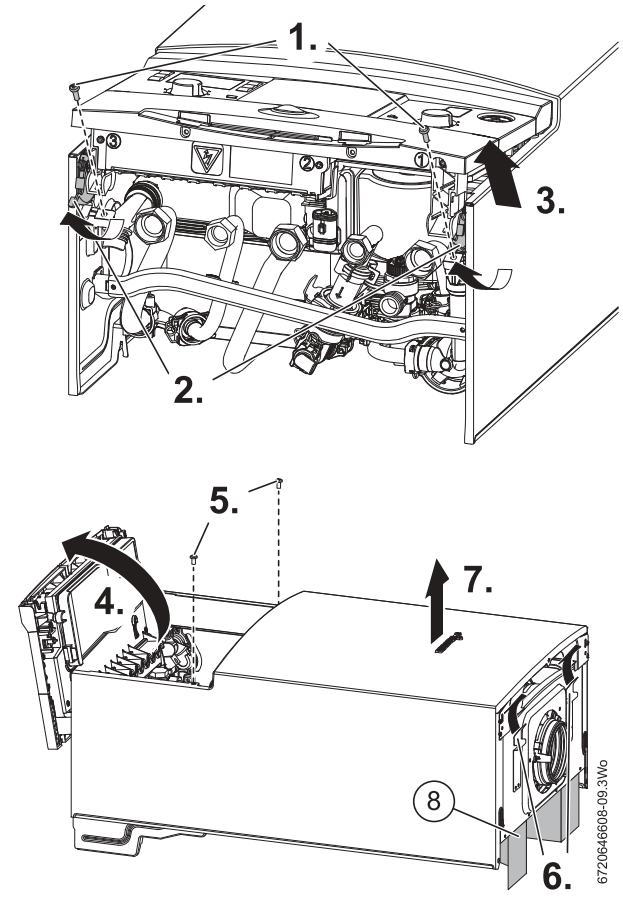



*Fig. 26 Releasing the control panel*

Refer to Figure 27. The connector (1) in the wiring harness is provided for the installation of the Domestic Hot Water Pre-Heat accessory - 7 716 192 735

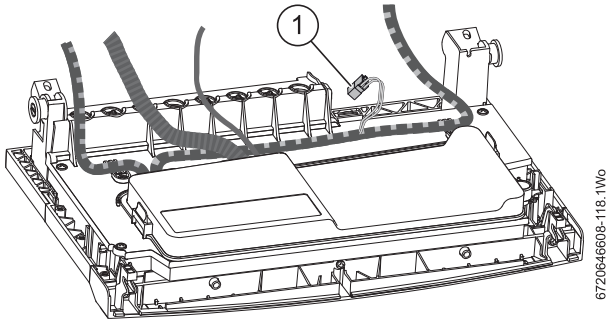



*Fig. 27 Unused connector*

- ▶ Remove any packaging within the boiler and the packaging base (3).
- ▶ Leave the V shaped support (5) in place until the boiler is ready to be hung on the wall frame, then remove.

## 5.4 Pre-plumbing boiler connections

**CAUTION:**
- ▶ Isolate the mains gas supply before starting any work and observe all relevant safety precautions.
- ▶ Be aware of plastic components when using a naked flame on pipe work.

**Plumbing the condensate drain pipe**

- ▶ Fit the condensate discharge pipe as close to the wall as possible to ensure easy fitting of the boiler bottom panel.
- ▶ Route the condensate pipe to an appropriate discharge point, refer to section 4.4.
- ▶ Plumb up to the wall frame with 22mm pipe.
- ▶ Ensure that there is enough pipe to insert 25mm into the rubber hose connector.
- ▶ Attach the connector to the condensate drain pipe.

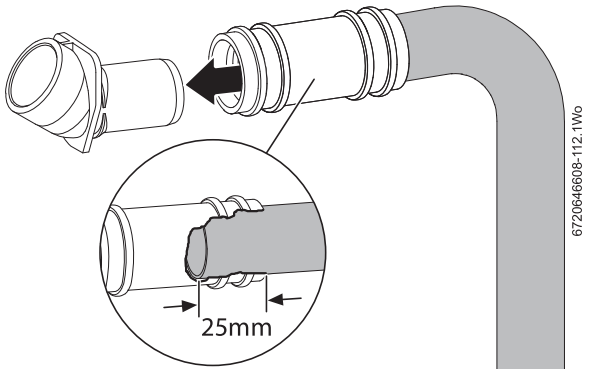



*Fig. 28 Condensate connection*

**PRV Pre-plumbing connection**

1. Fit the PRV pre-plumbing connector to the PRV locator bracket as shown in the figure below.

The elbow is supplied in the Hardware/Literature pack.

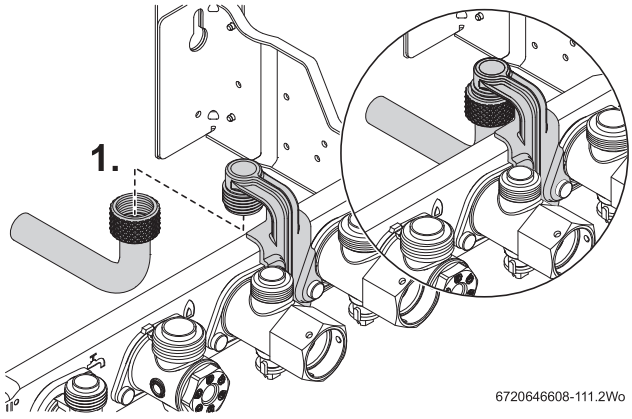



*Fig. 29 PRV pipe connection*

Once the wall frame has been mounted the PRV discharge pipe can be fitted.

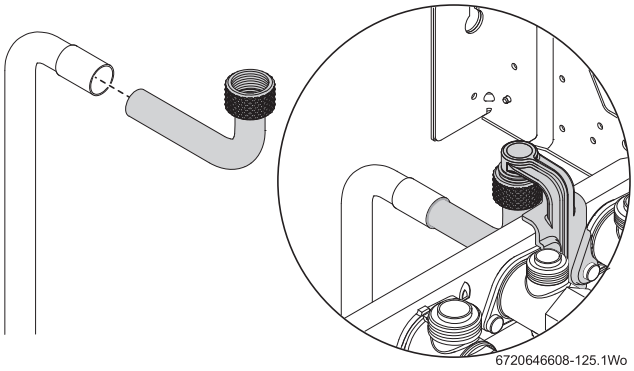



*Fig. 30 PRV elbow fitting*

- ▶ Connect the PRV discharge pipe to the pre-plumbing connector.
- ▶ The discharge pipe can be routed as required.
- ▶ The pre-plumbing connector must be removed before the boiler is hung on the wall frame.

### Integral filling link

Fit the Integral Filling Link, supplied with the boiler, before hanging the boiler on the frame.

Fitting the Filling Link assembly at this stage will be easier than when the boiler is hung on the wall frame.

- Close the isolating valves on the DHW inlet and CH return connections.

There may be mains and system water pressure behind the blanking plugs.

- Unscrew the blanking plugs from the DHW inlet and CH return connections.
- Place the filter inside the inlet of the Filling link, ensuring that the mesh is inside the Filling link assembly.
- Fit the Filling link assembly onto the DHW inlet and CH return connections, refer to figure 31

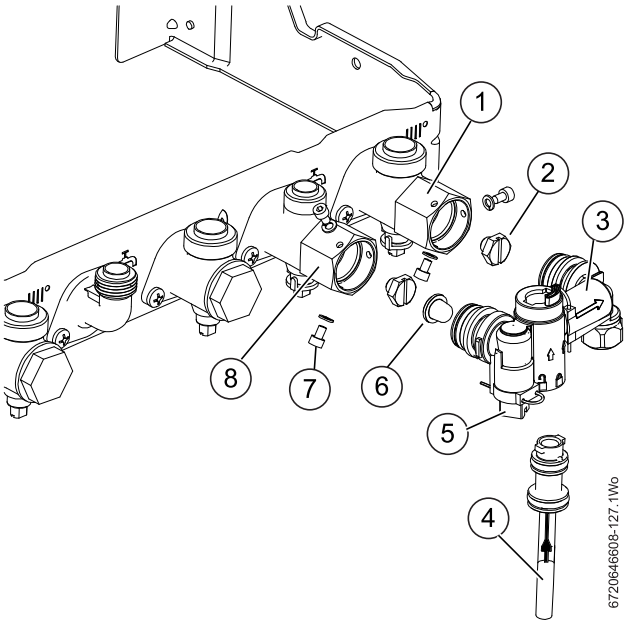



*Fig. 31 Fitting the Filling link*

[1] CH return connection
[2] Blanking plugs x 2
[3] Filling link assembly
[4] Filling key
[5] White control screw
[6] Filter
[7] M4 screws and washers x 4
[8] DHW inlet connection

- Ensure that the Filling link is pushed in fully to the locating tabs on both sides of the assembly.
- Fit an M4 screw and washer in at least two places on each connections.
- Ensure that the white plastic Control Screw [5] is turned clockwise into the fully closed position.

**Do not insert Filling key [4] at this stage.**

- Open the isolating valves on the DHW inlet and CH return connections.

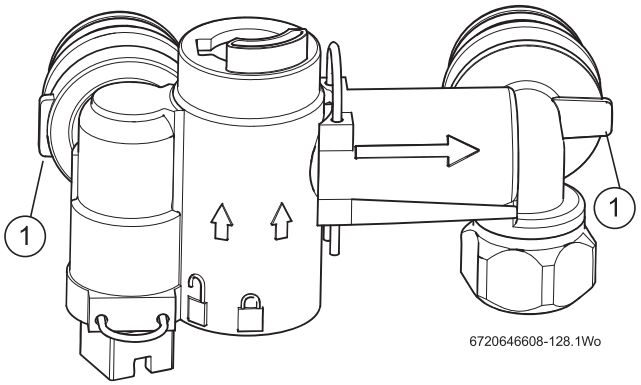



*Fig. 32 Location tabs*

[1] Locating tabs

### Gas and water connections

**WARNING:** Bonded washer for gas (3)
- The bonded washer must be used on the gas pipe isolating valve connection.

- Connect the system pipes using the compression nuts and olives supplied in the Literature/Hardware pack.

1. CH flow (22mm),
2. DHW outlet (15mm),
3. Gas inlet (22mm bonded washer),
4. Domestic Cold Water inlet (15mm),
5. CH return (22mm),

- Fit sealing washers to service valves before hanging boiler.

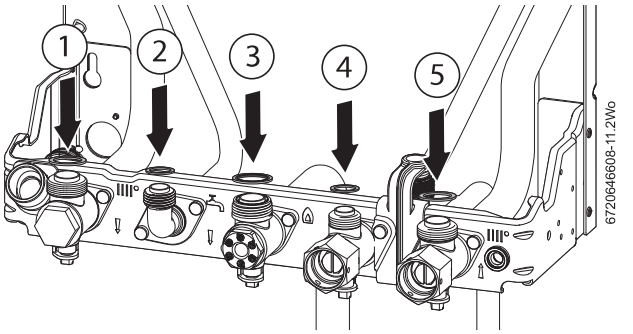



*Fig. 33 Sealing washers*

## 5.5 Hanging the boiler

**CAUTION:** Lifting the boiler
- ▶ Do not lift the boiler using the control panel as a hand hold.
- ▶ There are two handling holes incorporated into the inner casing left and right in the lower section of the appliance.

**NOTICE:** Before hanging the boiler remove:
- ▶ the plastic strip fitted to pipes.
- ▶ the red cap from the expansion vessel.
- ▶ the red plug in the expansion vessel connection in the hydraulic manifold.
  Protect the floor from residual water.

The expansion vessel is secured to a bracket on the wall frame in a “Pre-Installation” position.

Ensure that the control panel is in the closed position before hanging the boiler.
There is no requirement to re-fit the bottom screws at this time.

- ▶ Stand the boiler upright to gain access to the rear of the hydraulic manifold.
- ▶ Release the wire retaining clip securing the red plastic blanking plug.

1. Before hanging the boiler:

- ▶ Remove the blanking plug from the expansion vessel connection at the hydraulic manifold.
- ▶ Lubricate the expansion vessel “O” ring with silicone grease.
- ▶ Ensure that the wire retaining clip is still fully released so that the expansion vessel pipe connection can be made into the hydraulic manifold.

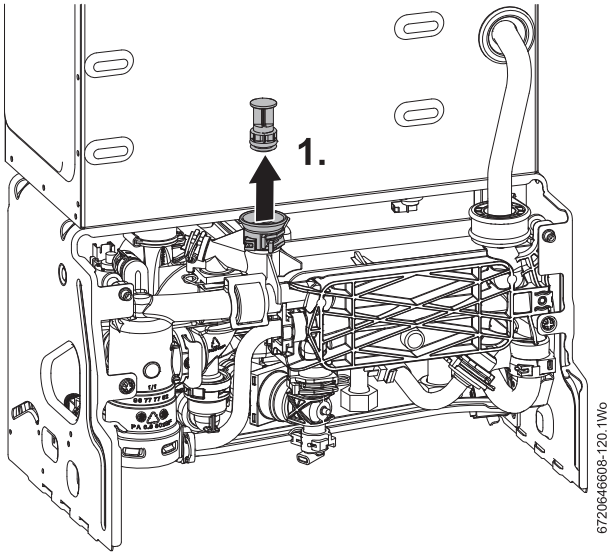



*Fig. 34 Removing the blanking plug*

1. Refer to figure 35 and ensure that the plastic protection cap is removed from the expansion vessel connection pipe.
2. Remove the pre-plumbing connector:

- ▶ Unscrew the PRV outlet pipe from the pre-plumbing connector.
- ▶ Remove the two screws (1) holding the pre-plumbing connector in place.
- ▶ Remove the temporary PRV pre-plumbing connector, and discard.
- ▶ Replace the two screws (1) removed earlier and tighten firmly.
- ▶ The boiler is mounted on the wall frame utilising the two mounting points, indicated on figure 35, left and right at the top of the wall frame.

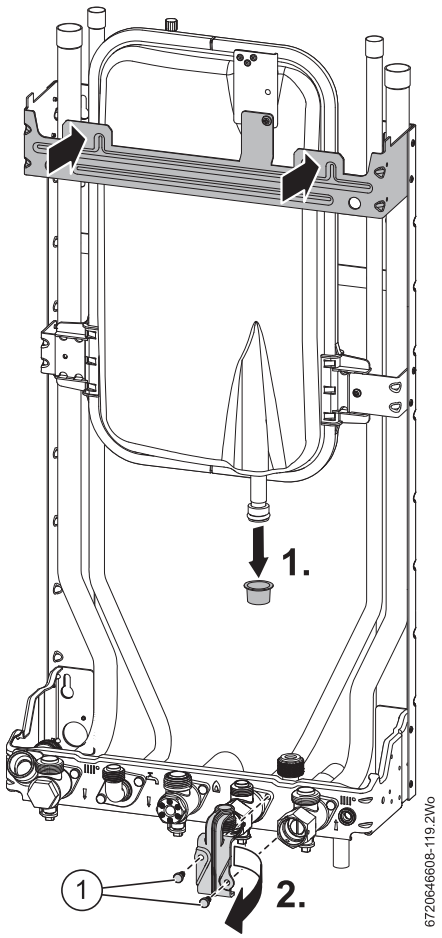



*Fig. 35 Mounting points*

- ▶ Hang the boiler on to the wall mounting frame utilising the two mounting points positioned left and right at the top rear of the appliance.
  The expansion vessel is shown removed for clarity.

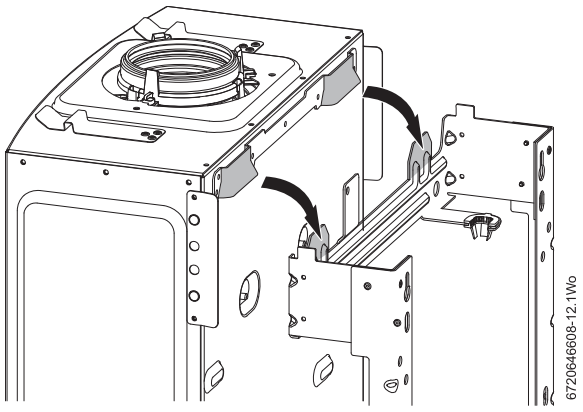



*Fig. 36 Hanging the boiler*

**WARNING:** Bonded washer (gas)
- ▶ The bonded washer must be used on the gas pipe isolating valve connection.

- ▶ Connect the PRV discharge pipe on the hydraulic unit onto the PRV outlet pipe work, and tighten firmly.
- ▶ Ensure that the gas and water connections to the isolating valves are made using the fibre washers supplied in the Literature/Hardware pack. Tighten the gas and water connections firmly.

**Connecting the expansion vessel**

To connect the expansion vessel to the hydraulic pump manifold situated to the left of the pump:

1. Release the expansion tank from the retaining bracket, see fig 37.
2. Ensure that the wire retaining clip on the pump manifold is fully withdrawn, but not removed, before inserting the expansion vessel pipe into pump manifold, see fig. 37.
3. Secure in place with the wire retaining clip.

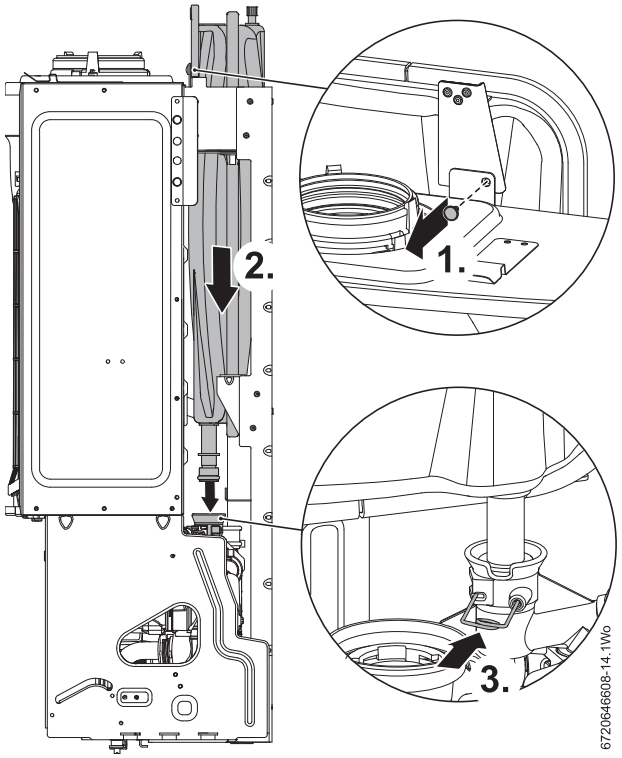



*Fig. 37 Expansion vessel connection*

**Connecting the siphon outlet**

1. Push the black rubber siphon discharge hose, onto the wall frame connector, until fully engaged.

**Filling the siphon**

2. Pour 200 to 250 millilitres of clean water through the inner flue opening to fill the siphon before running the boiler.

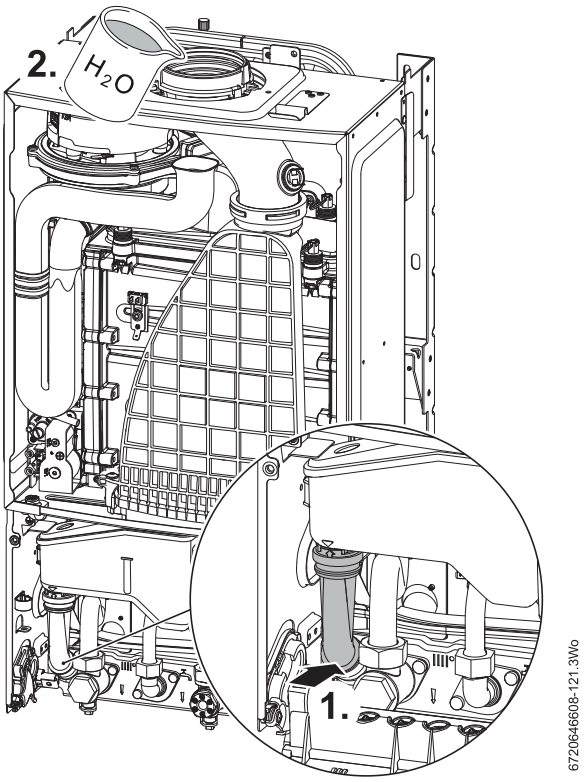



*Fig. 38 Siphon fill*

## 5.6 Flue turret/adapter installation

The flue turret/adaptor for the appliance is secured using three retaining screws (figure 39, item [1]) which come in position on the appliance.

To ease assembly of flue components, apply silicone lubricant to sealing surfaces.
Refer to the manual supplied with the flue kit for complete installation instructions.
For plume management effective lengths and the effective flue lengths, refer to details in section 4.8.

Refer to figures 39 & 40.

- ▶ Remove the three inner flue tube retaining screws [1]. The inner tube will be held in place in the appliance.
- ▶ Check the appliance flue seal [2] is correctly seated and apply silicone grease.

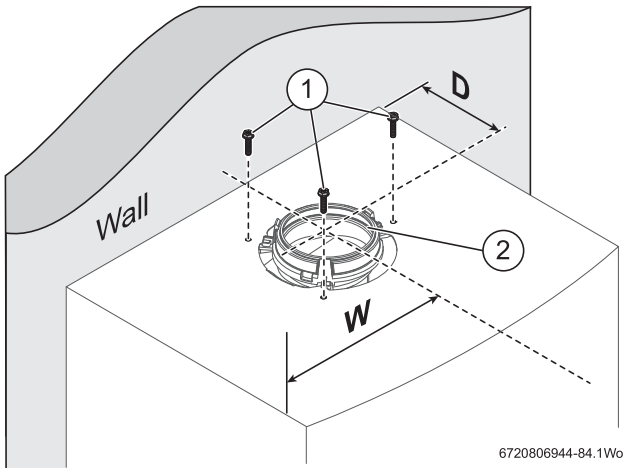



*Fig. 39 Flue turret centre*

[D] 180mm
[W] 195mm

- ▶ Align the flue turret/vertical adaptor to the appliance flue outlet with flat facing [3] to the rear of the appliance.
  The flue turret/adaptor should be pushed straight down, on to the appliance.
- ▶ The three inner flue tube retaining screws [1] are, re-used for the flue turret and replacement retaining screws [4] supplied with the adaptor kit are used to secure turret/adaptor to the appliance.

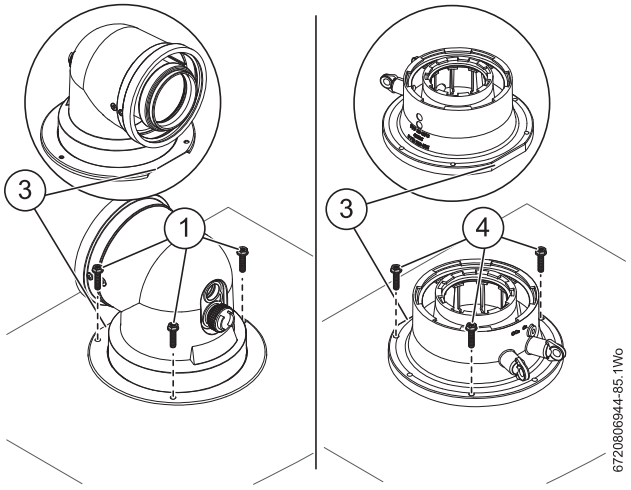



*Fig. 40 Flue turret/adaptor connection*

**Additional notes and reminders:**

- Ensure that all cut lengths are square and free from burrs.
- Ensure that the flue and seals are not damaged.
- The flue is sealed when assembled correctly, the components are pushed fully home and secured.
- The flue is set at an angle of 3° or 52mm per metre length.
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings (flue bracket 100mm part number: 7 716 191 177, flue brackets 100mm x 6 part number: 7 716 191 178, flue bracket 125mm part number: 7 716 191 179)

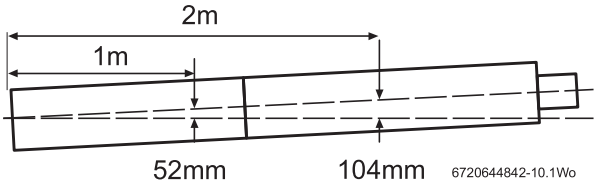



*Fig. 41 Slope for condensate disposal*

## 5.7 Electrical

**CAUTION:** Isolate the mains electrical supply before starting any work and observe all relevant safety precautions.

The boiler is pre-fitted with a mains supply cable. Route the cable through the right hand side of the wall mounting frame.

- The mains electrical supply to the boiler must be through either a fused double pole isolator or a fused three pin plug and unswitched socket situated, where practicable, adjacent to the boiler.
- The isolator must have a contact separation of 3mm minimum in both poles.
- Any additional equipment connected to the boiler must not have a separate electrical supply.
- External fuse rating 3A.

**Access to electrical connections:**

- ▶ Access to all wiring connections are via the Installer access cover at the bottom front of the control panel. No access is required to other parts of the control board.

1. Refer to figure 42 and release the three captive screws securing the Installer access cover.
2. Remove the Installer access cover.

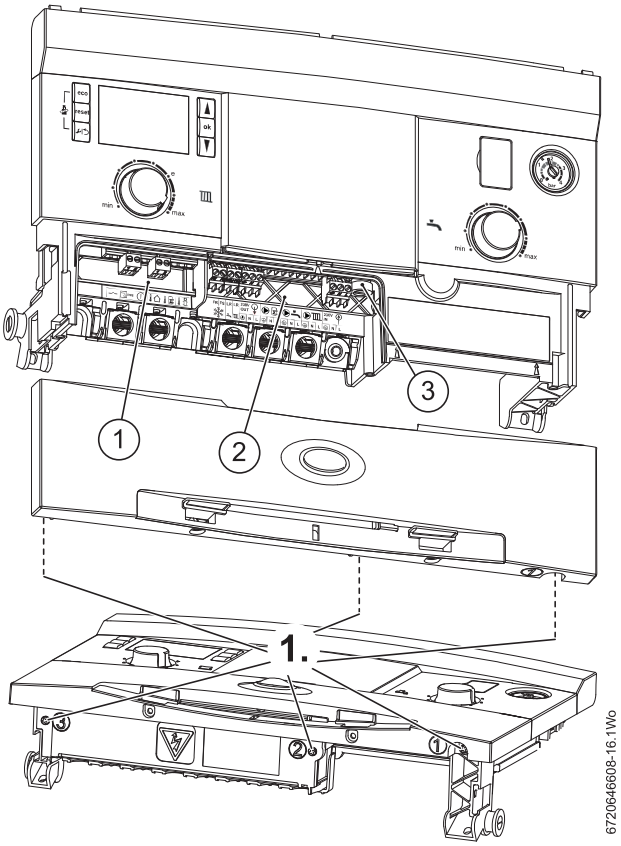



*Fig. 42 Removing the installer access cover*

[1] Low voltage connections
[2] Mains voltage connections
[3] Fuse carrier - 5A

**Low voltage connections**

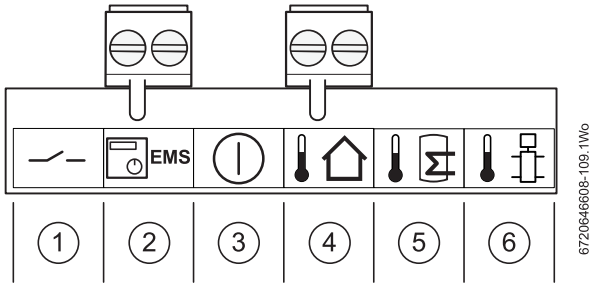



*Fig. 43 Low voltage connectors*

| Low voltage terminal strip | |
|---|---|
| 1 | Low voltage room thermostat input (NOT USED) |
| 2 | EMS bus connections |
| 3 | External cut off switch (NOT USED) |
| 4 | Outdoor compensation sensor |
| 5 | Cylinder sensor (NOT USED on Combi) |
| 6 | Low Loss Header sensor (NOT USED) |

*Table 22 Key to figure 43*

**Mains voltage connections**

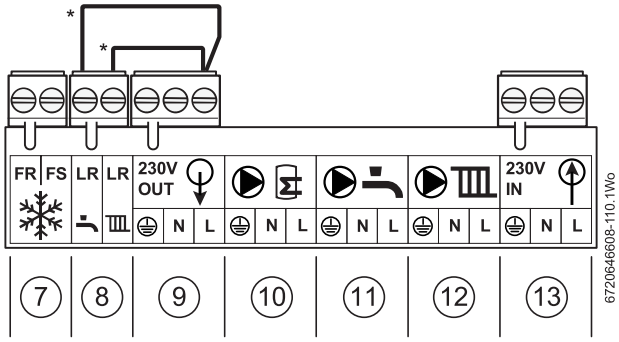



*Fig. 44 Mains voltage connectors*

| Mains voltage terminal strip | |
|---|---|
| 7 | External frost thermostat |
| 8 | 230 V A.C. switched live inputs<br>• CH - Remove link when connecting external CH control<br>• DHW - Remove link when connecting external DHW control |
| 9 | 230 V A.C. mains output to wiring centre |
| 10 | DHW charge pump (NOT USED on Combi) |
| 11 | DHW circulation pump (NOT USED on Combi) |
| 12 | CH circulation pump (NOT USED on Combi) |
| 13 | Boiler 230 V A.C. mains supply |
| * | Pre-wired links |

*Table 23 Key to figure 44*

**NOTICE:** DHW LR (Live Return) switched live
▶ This input provides connection for a proprietary external twin channel control to time the preheat function on the DHW (link must be removed).
All Worcester twin channel digital controls provide this functionality.

### 5.7.1 Mounting optional plug-in controls

**CAUTION:**
▶ Isolate the mains electrical supply before starting any work and observe all relevant safety precautions.

Refer the to Programmer/Timer manual for set up and operation of the unit.
▶ When connecting Worcester plug-in or EMS intelligent controls, the links (→ items 8 & 9 in figure 44) must be left in the connection points.

**Removing the blanking plate**

The control panel must be released and swung forward slightly to gain access to the top cover panel, refer to section 7.3 for access to the control panel.

1. Release the captive screws securing the top cover panel.
2. Remove the cover panel to enable the blanking plate to be removed.
3. Release the three captive screws enough to allow the Installer access cover to be lowered by 10mm.
4. Lower the Installer access cover to allow the blanking panel to be removed.
5. Use the tab (1) to lift and also press up on the bottom edge of the blanking plate to release the clips from the slots in the control panel.
6. Pull the blanking plate forward to remove.

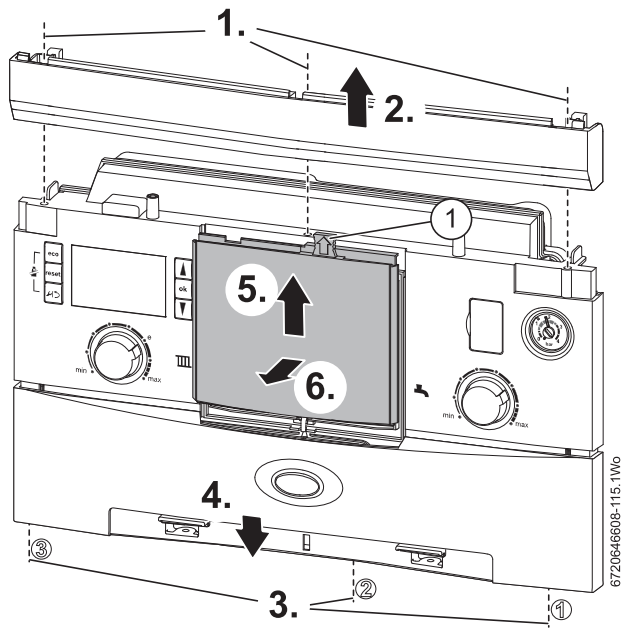



*Fig. 45 Removing the blanking plate*

**Fitting the programmer/timer**

When fitting EMS intelligent programmers, step 1 can be ignored.

1. Connect the ribbon cable to the socket (2) in the control panel, ensuring that the cable will fit into the recess (3) in the control panel.
2. Align the clips on the back of the Programmer/Timer with the slots in the control panel.

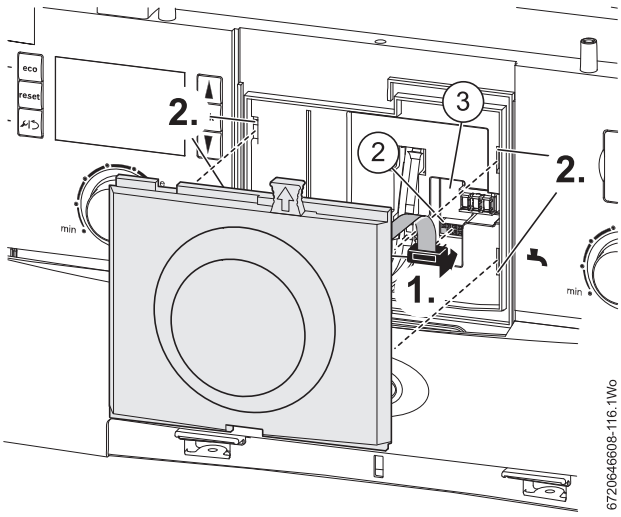



*Fig. 46 Connecting the Programmer/Timer*

3. Push the Programmer/Timer in to engage with the slots in the control panel.
4. Pull the Programmer/Timer down to secure with the clips.
5. Slide the Installer access cover up into position.
6. Secure with the three captive screws.
7. Replace the top cover panel.
8. Secure in position with the captive screws.

▶ Re-secure the control panel.

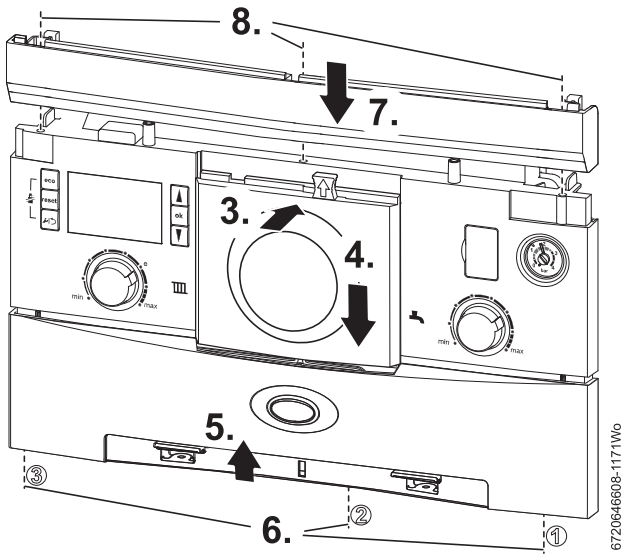



*Fig. 47 Fitting the Programmer*

| Part number | Description |
|---|---|
| 7 716 192 036 | MT10 mechanical timer |
| 7 716 192 037 | MT10RF mechanical thermostat |
| 7 716 192 038 | DT20 twin channel digital timer (preheat time control available) |
| 7 716 192 054 | DT20RF digital RF thermostat with twin channel programmer (preheat time control available) |
| 7 716 192 052 | DT10RF digistat (preheat time control available) |
| 7 716 192 053 | DT10RF optimiser (preheat time control available) |
| 7 716 192 065 | FR10 intelligent room thermostat |
| 7 716 192 066 | FR110 programmable room thermostat (preheat time control available) |
| 7 716 192 067 | FW100 weather compensation controller (preheat time control available) |
| 7 733 600 001 | Comfort I RF (RF thermostat with twin channel programmer, preheat time control available) |
| 7 733 600 002 | Comfort II RF (programmable room thermostat, preheat time control available) |
| 7 733 600 003 | Comfort (twin channel programmer) |
| 7 733 600 039 | Comfort wall plate kit |
| 7 738 110 058 | Sense I intelligent room thermostat |
| 7 738 111 064 | Sense II weather compensation controller (preheat time control available) |
| 7 716 192 072 | Worcester Wave (thermostat) |

*Table 24 Control accessories*

### 5.7.2 New complete system installations

If a new complete heating system is installed in a new build property or it is a first time installation in an existing property, the heating systems must conform to current building regulations Part L1a.

The exception to this are single storey, open plan dwellings where the living area is more than 70% of the total usable floor area. Then this type of dwelling can be controlled as one zone.

An alternative would be individual electronically controlled TRVs.

For dwellings with a floor area over 150m$^2$, separate time and temperature control for each zone is required. All radiators must have TRVs fitted in all rooms except bathrooms and rooms with thermostats.

### THIRD PARTY EXTERNAL TIMER AND TWO ZONES

Pre-wired CH & DHW links
- ▶ Remove link when connecting external CH control
- ▶ Remove link when connecting external DHW control

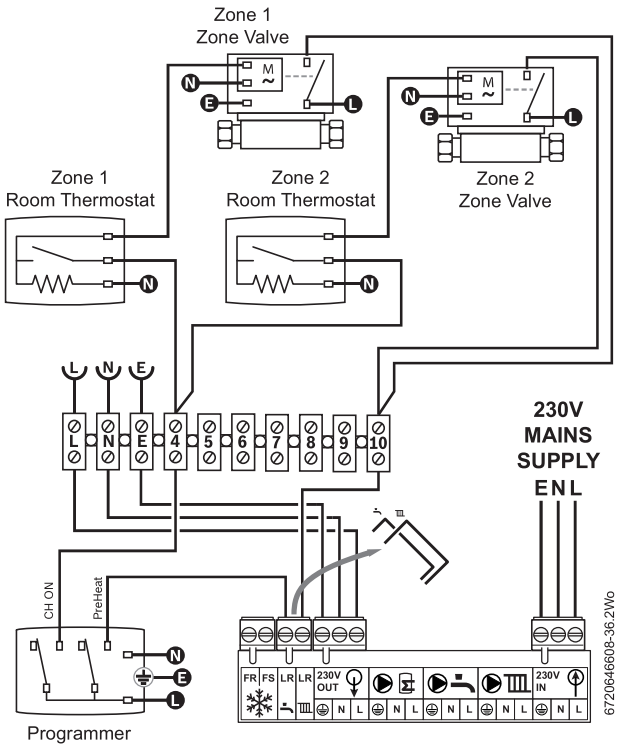



*Fig. 48 Two room thermostats, one external timer*

### INTEGRATED TIMER AND TWO ZONES

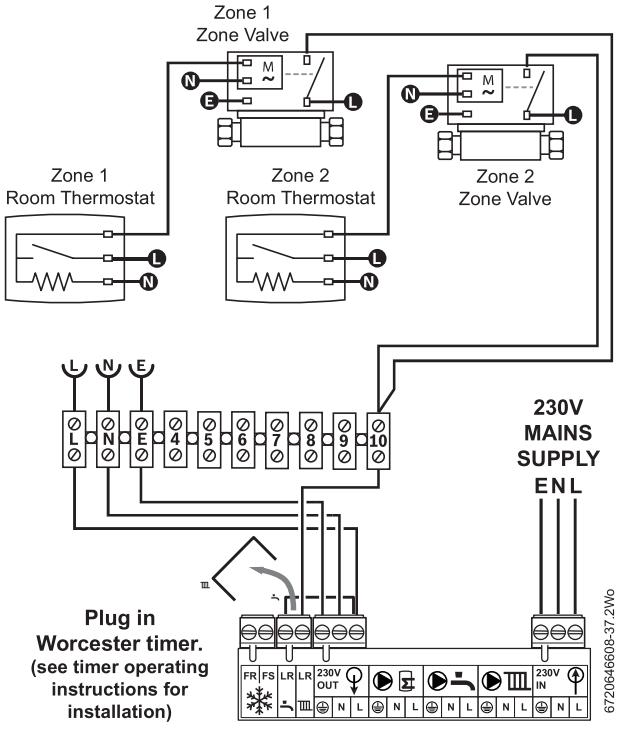



*Fig. 49 Two room thermostats, one integrated timer*

### 5.7.3 Existing installations

For boiler replacements on an existing system, it is not necessary to zone the upstairs and downstairs separately, compliance with the zone requirements can be achieved by a single room thermostat or programmable room thermostat.

While the system is drained down, TRVs must be fitted to all rooms except the bathrooms and the room with the room thermostat.

The following figures show the options of room thermostat with programmer, room thermostat only or programmable room thermostat.

**EXTERNAL 230V PROGRAMMER AND ROOM THERMOSTAT**

Pre-wired CH & DHW links
- ▶ Remove link when connecting external CH control
- ▶ Remove link when connecting external DHW control

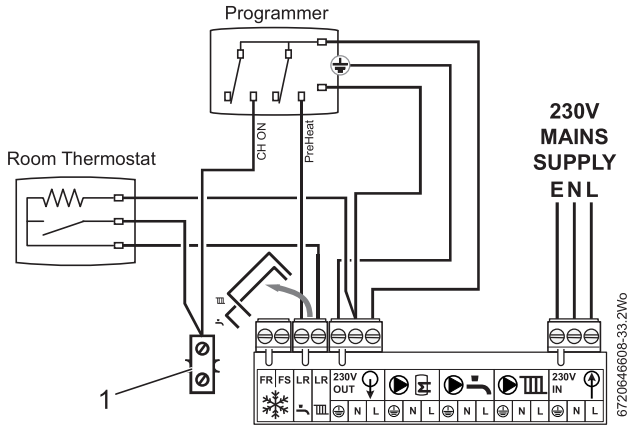



*Fig. 50 Room thermostat with programmer*

[1] Series connector, not supplied. Connector to be made safe.

**ROOM THERMOSTAT ONLY**

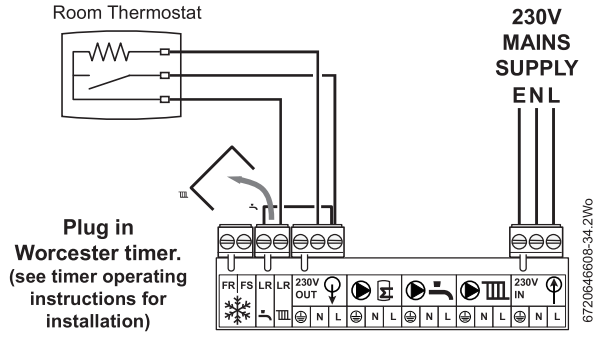



*Fig. 51 Room thermostat with plug in timer*

**PROGRAMMABLE THERMOSTAT**

The programmable room thermostat may be a hard wired or RF type.
This diagram is applicable for a hard wired unit or the receiver section of the RF pack.

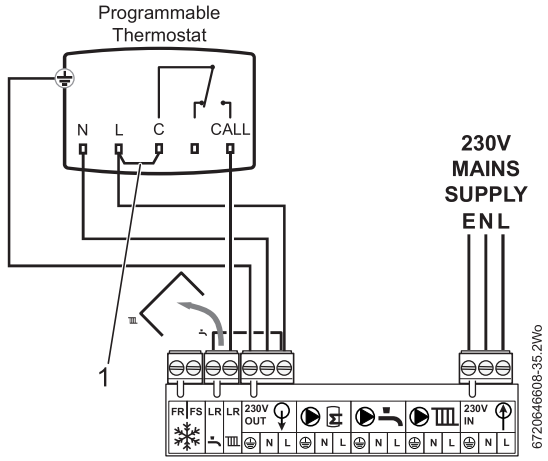



*Fig. 52 Programmable thermostat*

| | |
|---|---|
| 1 | The link between the Live (L) and Common (C) may already be fitted as part of the Programmable thermostat, if not then a link must be wired in. |

- ▶ Remove the link between $L_R$ (CH) and L at the 230V OUT terminal block connection.
- ▶ Connect external controls LIVE supply to terminal L at the 230V OUT terminal block connection.
- ▶ Connect external controls LIVE return to terminal $L_R$ (CH)

Live Return ($L_R$) is sometimes referred to as 'Call for Heat' or 'Switched Live'.

- ▶ Connect external controls NEUTRAL to terminal N at the 230V OUT terminal block connection.

Some devices do not require connection of a neutral i.e. battery powered devices.

**OPTIONAL EXTERNAL FROST STAT CONNECTION FOR PROTECTION OF SYSTEM PIPEWORK IN UNHEATED AIR SPACE**

- ▶ Connect frost thermostat cables to terminals $F_S$ & $F_R$.
- ▶ These connections are not polarity sensitive.
- ▶ The external frost thermostat only operates the pump.

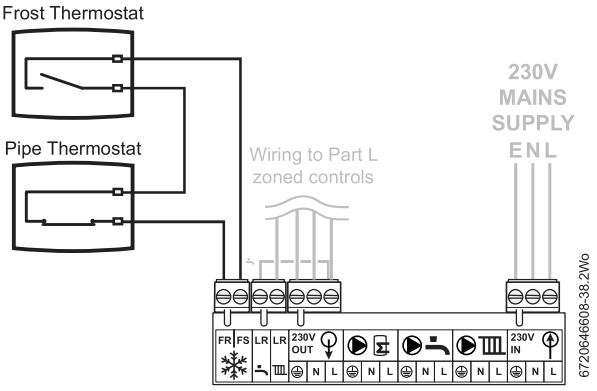



*Fig. 53 Frost Thermostat*

# 6 COMMISSIONING

## 6.1 Pre-Commissioning checks

**CAUTION:** ISOLATE THE MAINS ELECTRICITY SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

Check that the service and water pipes are connected to the correct positions on the manifold.

Ensure that the washers have been fitted to the water connections and the bonded washer to the gas connection on the manifold, refer to Fig. 33.

1. - CH Flow (22mm)
2. - DHW (15mm)
3. - Gas inlet - bonded washer (22mm)
4. - Domestic cold mains water in (15mm)
5. - CH Return (22mm)

- ▶ Check the gas type specified on the data label, on the right hand side of the combustion chamber, matches that of the gas supply.
- ▶ Turn on the main gas supply, carry out a tightness test on the gas pipe work with the boiler gas pipe isolating valve open, and connections. Rectify any leaks.
- ▶ Check that the condensate pipe has been connected and correctly fitted to the siphon.
- ▶ Check pressure relief drain pipe is correctly fitted and securely tightened.

**NOTICE:** If the boiler is not to be commissioned immediately then, after successfully completing all of the checks and any rectification work:

- ▶ Close the gas valve
- ▶ Close the water shut off valve
- ▶ Isolate the gas supply
- ▶ Isolate the electricity supply
- ▶ Label appropriately

## 6.2 Filling the system

1. Turn on the water main and open the system valves.
2. Open all radiator valves.
3. Fill the system via a WRAS approved filling loop or the optional Worcester Integral Filling Link accessory to 1 bar then close the filling loop valve(s).
4. The Automatic Air Vent will release any air trapped in the boiler.
5. Manually vent all radiators, tighten when completed and check the system and correct any leaks.

- ▶ The boiler integral expansion vessel is pre-charged to 0.75 bar (equal to a static head of 7.5m (24.6ft)). A Schraeder type valve is fitted to the expansion vessel to allow for pressure adjustment if required.
- ▶ If an extra expansion vessel is fitted to the central heating return, adjust this to the same pressure as the appliance internal expansion vessel, refer to separate instructions with the extra expansion vessel.

6. If required increase system pressure back to 1 bar.
7. Isolate and remove filling loop connection to system or if using the optional integral filling connection (not supplied with the boiler) remove the key and place in its storage position on the bottom cover of the boiler.

If the Worcester “Keyless” filling link is fitted, the link does not have to be removed.

## 6.3 Water treatment

**NOTICE:**

- ▶ Artificially softened water must not be used to fill the central heating system.

**ENSURE THAT THE SYSTEM HAS BEEN CLEANED. REFER TO SECTION 4.1 OF THESE INSTRUCTIONS.**

**FLUSHING (Central Heating):**

- ▶ Ensure the boiler is switched off.
- ▶ Open all drain cocks and drain the system while the boiler is hot.
- ▶ Close drain cocks and add a suitable flushing agent at the correct strength for the system condition in accordance with the manufacturer's instructions.
- ▶ Run the boiler/system at normal operating temperature for the time stated by the manufacturer of the flushing agent.
- ▶ Drain and thoroughly flush the system to remove the flushing agent and debris.

**INHIBITOR (Central Heating):**

- ▶ Check drain cocks are closed and all radiator valves are open before adding a suitable inhibitor compatible with aluminium (or combined inhibitor/anti-freeze if the system is exposed to freezing conditions) to the heating system water in accordance with the manufacturers instructions.

The pH value of the system water must be less than 8 or the appliance guarantee will be invalidated.

- ▶ Fill system via a WRAS approved filling loop to between 1 and 1.5 bar.
- ▶ Vent all radiators; tighten vents when complete.
- ▶ Re-pressurise if necessary to 1bar.
- ▶ Set all controls to maximum.
- ▶ Record the date when the inhibitor was added to the system on the guarantee card and Benchmark checklist.

**NOTICE:**

- ▶ The concentration of inhibitor in the system should be checked every 12 months or sooner if system content is lost.
- ▶ The addition of sealing agents to the system water is not recommended as this can cause problems with deposits left in the heat exchanger.
- ▶ In cases where all attempts to find a micro leak have failed, Worcester, Bosch Group supports the use of Fernox F4 leak sealer.

**Water treatment**

Suitable water treatment products can be obtained from the following manufacturers:

| | |
|---|---|
| FERNOX | 01799 550811 or www.fernox.com |
| SENTINEL | 0800 389 4670 or www.sentinel-solutions.net |

## 6.4 Starting the appliance

**CAUTION:** RUNNING THE APPLIANCE
- Never run the appliance when the appliance/system is empty or partially filled.

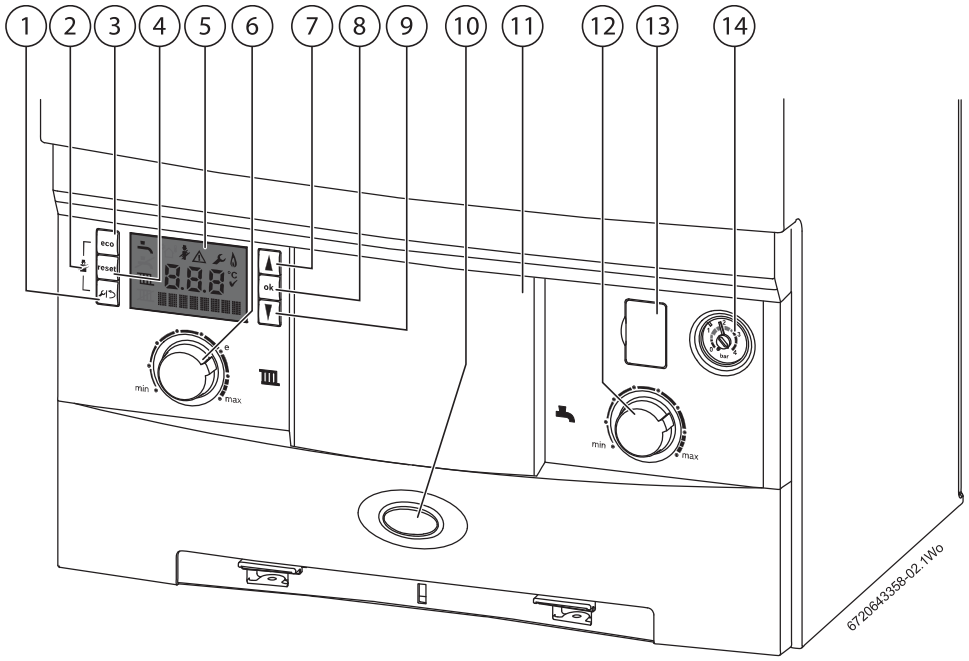



*Fig. 54 Control panel*

| | Key to figure 54 |
|---|---|
| 1 | Spanner/return button |
| 2 | Service engineer symbol |
| 3 | Eco button |
| 4 | Reset button |
| 5 | Boiler display |
| 6 | Central heating temperature control |
| 7 | Scroll up button |
| 8 | OK - Select/confirmation button |
| 9 | Scroll down button |
| 10 | Operation and fault indicator (blue) |
| 11 | Position for optional programmer |
| 12 | Hot water temperature control |
| 13 | Diagnostic port |
| 14 | System pressure gauge |

Switching the appliance on/off:
- Turn on the mains power supply, initially the “Boiler start up screens” will be displayed (refer to figure 55).
- Turn on any external controls
- Set the thermostatic radiator controls to maximum temperature
- Set the clock/programmer to continuously ON and the room thermostat to maximum temperature

The blue Operation and fault indicator light will be illuminated when there is a demand for heat or hot water.

Turn the boiler CH temperature control (6) to maximum.

The “burner on” flame symbol will be shown on the boiler display after a successful ignition sequence.

If the boiler fails to light, a flashing fault code will be displayed.

**NOTICE:** RESET
- Do not press the blue operation/fault diagnostic indicator (10) to reset the boiler.

To reset the boiler, press the reset button (4), the tick symbol will be displayed briefly for a successful reset.

### 6.4.1 Boiler start up screens

On initial start up, the following screens are displayed:

1. All the symbols are displayed for approximately two seconds.
2. The control will run an internal test for approximately 30 seconds.
3. When the internal test has been successfully performed, this screen is displayed:
   - The boiler is in stand-by.
   - The flow temperature sensor indicates the primary temperature from the heat exchanger (not the target set point).

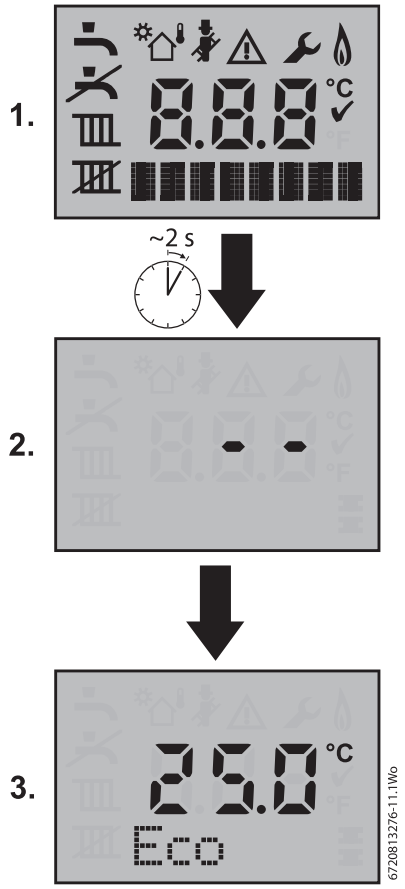



*Fig. 55 Boiler start up screen*

- If no adjustments are made for 30 seconds the back light is turned off.
- As soon as an adjustment is made, the screen will light up and the relevant information will be displayed.

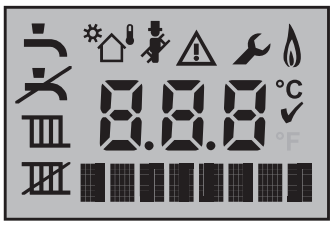
| SCREEN DISPLAY | DESCRIPTION |
|---|---|
| All possible screen symbols  | This screen is displayed briefly during boiler start up and shows all the symbols that could be displayed. |
| Alpha/Numerical display  | Displays a temperature or boiler status code. |
| Text display  | Displays PreHeat or Eco, or diagnostic code |
| Hot water  | Displays this symbol during a DHW demand. |
| Central Heating  | Displays this symbol during a CH demand. |
| Chimney sweep mode  | Displays during service when the boiler is set to maximum or minimum output. |
| Alert  | Displays with the boiler status code and diagnostic code during a fault condition. |
| Service mode  | Displays when a qualified service engineer is in the service menus. |
| Burner on  | The boiler is in operation and the flame is alight. |
| Centigrade °C | Displays next to the temperature reading. |
| Confirmation ✔ | This symbol confirms a manual change. |

*Table 25 Symbol description*

**Status codes**

Refer to section 8.5 for Status codes and Service menus.

These are not faults, but provide information concerning the current status of the boiler.

During normal boiler operation various Status codes can be displayed by pressing the button.

The first screen of the Information menu displays the current Status code, this will change as the boiler runs through the various modes and sequences.

## 6.5 Commissioning

When running in the service mode, the boiler will operate both the central heating and the domestic hot water circuits. This is to allow sufficient time for this part of the commissioning procedure. It will be necessary to run water through the domestic hot water circuit to ensure that the boiler will not cycle on low heating demands.

Having checked:

- That the boiler has been installed in accordance with the installation instructions.
- The integrity of the flue system and flue seals.

### 6.5.1 Checking the gas inlet pressure

The inlet pressure to the appliance must be checked using the following procedure:

**MEASURING THE INLET PRESSURE**

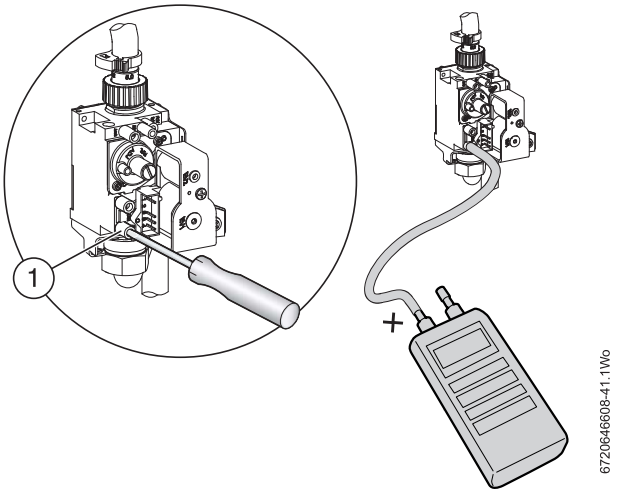



*Fig. 56 Inlet pressure test point*

- Close gas isolation valve.
- At the inlet test point (1), slacken the screw for a maximum of half a turn and connect a manometer.
  It is important to use a screwdriver of the correct size, too small a blade will damage the screw.
- Open the gas isolation valve.
- Measure the pressure with the boiler running at maximum.
  - Press the eco and button for at least 5 seconds and the boiler will ramp up to maximum output in approx. 30 to 35 seconds.
  - The display will show the chimney sweep symbol and the word MAX will flash.

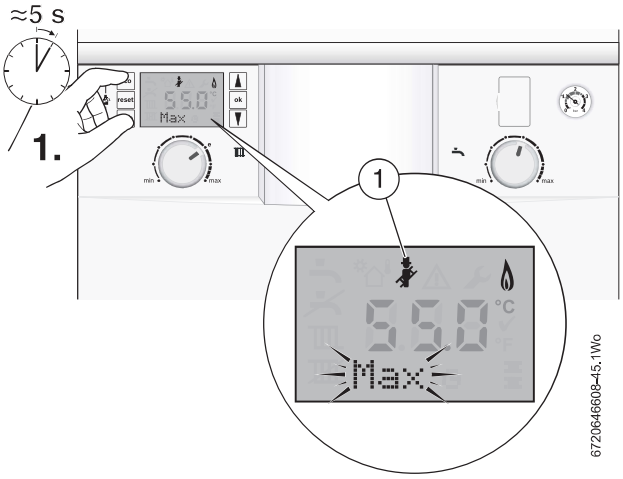



*Fig. 57 Setting boiler to maximum*

- Check the gas supply working pressure at the gas valve conforms to values shown in Fig. 58 or Fig. 59 .
- Press the ok button to return to normal operation.
- The boiler will run for 15 minutes in service mode and return to normal if no other inputs are made.

After the tests are completed:

- Disconnect the manometer.
- Retighten, but do not overtighten the inlet pressure test point screw.

**GAS PRESSURE WITHIN THE SYSTEM**

Refer to the figures below for natural gas or L.P.G gas pressures.

The working pressure at the boiler must not be less than the working pressure read at the meter minus 1mbar for natural gas or minus 2.5mbar for L.P.G.

The pressure drop from the meter to the gas valve must not be more than 2.5mbar for natural gas or 4mbar for L.P.G.

If the pressure drop is greater than shown below, then this would indicate a problem with the supply pipe work which must be rectified.

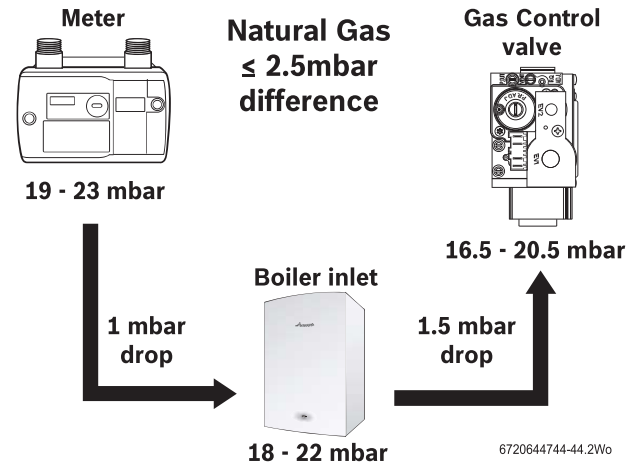



*Fig. 58 Natural gas pressures*

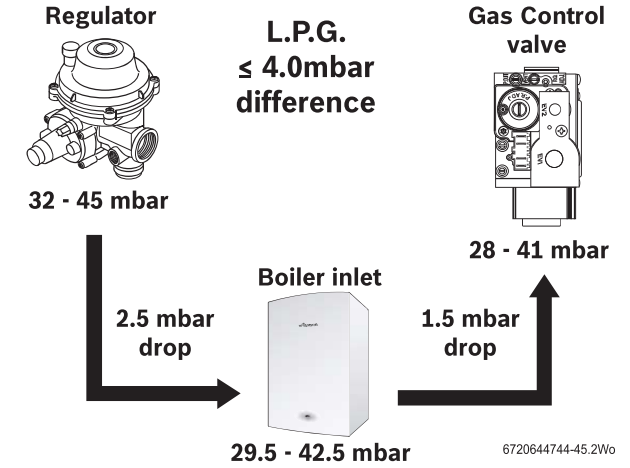



*Fig. 59 L.P.G. pressures*

**NOTICE:** Gas pressure
Do not continue commissioning until the correct gas pressure is achieved.

### 6.5.2 Checking the gas rate

- ▶ The gas rate should be measured at the gas meter after the boiler has been operating for a minimum of 10 minutes at maximum output.
- ▶ See Technical data section on page 9 of this manual for gas rates and $CO/CO_2$ ratios.
- ▶ Where a gas meter is not available (e.g. L.P.G.) the $CO/CO_2$ must be checked.

### 6.5.3 Gas rating test

- ▶ Ensure all other gas appliances are isolated.

1. Set the boiler to maximum output by pressing eco and the button together for at least 5 seconds.
   The chimney sweep symbol (1) will be displayed at the top of the screen and the word “Max” will flash at the bottom of the screen. The boiler will ramp up to maximum output in 30 to 35 seconds.

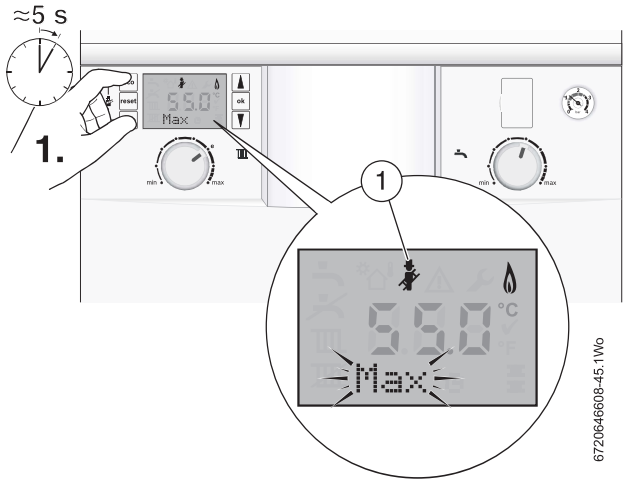



*Fig. 60 Setting boiler to maximum*

- ▶ Ensure that the boiler has stabilised at maximum output.
- ▶ Carry out Gas rating procedures as described in “Essential Gas Safety” third edition.
- ▶ If pressure and gas rate are satisfactory press the ok button and the boiler will return to normal operation.
  - – If left in the service mode the control will return to normal operation after 15 minutes.

### 6.5.4 Checking for leaks during operation

- ▶ Use an approved leak detector to check all connections for possible leaks. The product must be certified as a gas leak testing agent.
- ▶ Do not allow the product to come into contact with the electrical wiring.

## 6.6 Domestic hot water

**Controlling the hot water temperature:**

The hot water temperature can be set to between approximately 40°C and 60°C using the DHW temperature control.

### 6.6.1 Domestic hot water eco and preheat modes

- Eco mode is an energy saving feature which disables the Preheat function. Eco is enabled by default, during the initial appliance start up and Eco is displayed.
- Preheat mode, the hot water heat exchanger is kept pre-heated to reduce the time taken to deliver hot water at the tap.

In the Preheat mode, if there has been no demand for hot water for 24 hours the appliance will save energy by suspending Preheat until there is a demand for hot water. At this time Preheat mode is re-activated. It is advised to use a twin channel programmer to time the Preheat function and switch it off when it is not needed.