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WARMCAIR DW Series II

Condensing Air & Water Heaters

High Efficiency Downflow
Condensing Air & Water Heater

C10DW, C16DW, C20DW, C25DW

INSTALLATION,
COMMISSIONING
& SERVICING
INSTRUCTIONS

WarmCair C10DW Series II - G.C. No.

WarmCair C16DW Series II - G.C. No.

WarmCair C20DW Series II - G.C. No.

WarmCair C25DW Series II - G.C. No.



These instructions are to be left with the User
For Installation in Mainland UK only.



FM 525200

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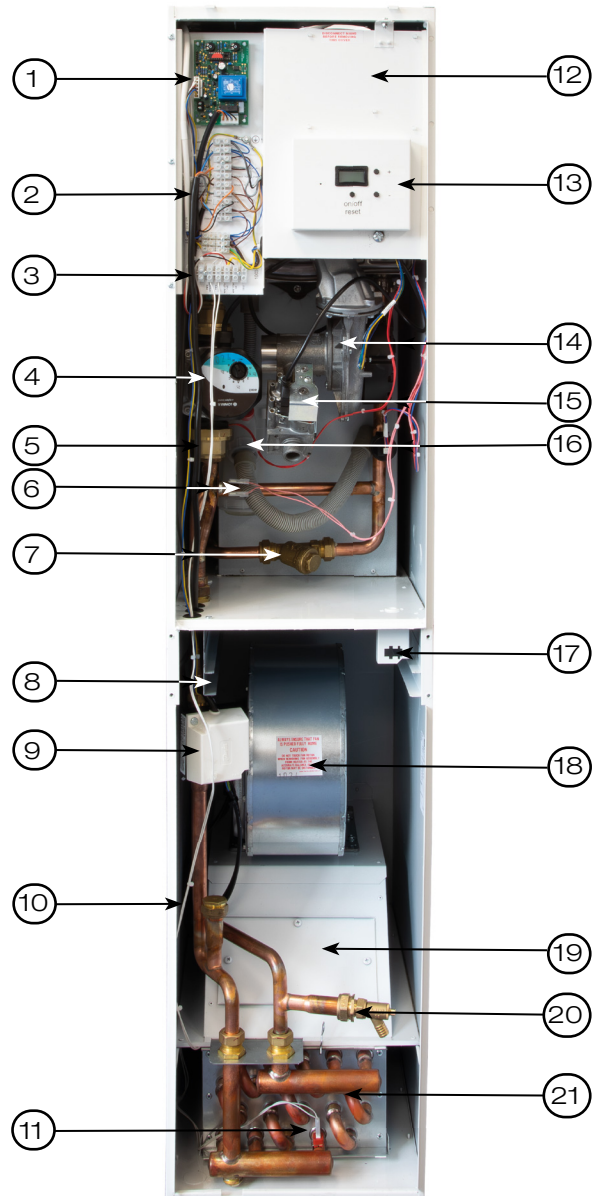
1. FEATURES

Appliance Classification:

The WarmCair Series II DW range has been tested and UKCA certified by BSI for use with Natural gas G20.

Features

1. Aquair PCB
2. 240V Wiring Centre
3. Low Voltage Wiring Centre
4. Circulation Pump
5. Flow Temperature Sensor (Behind)
6. Overheat Sensor
7. Strainer
8. Air Filter Runners
9. CH Zone Valve
10. Flow Connection for Radiators
11. CH Temperature Sensor
12. WarmCair Series II PCB (behind panel)
13. Display PCB
14. Combustion Fan
15. Gas Valve
16. Condensate Trap
17. Cleanflow Electronic Air Filter Plug
18. Air Circulation Fan
19. Warm Air Heat Exchanger Inspection Plate
20. Drain Cock
21. Warm Air Heat Exchanger



2. GENERAL DESCRIPTION

2.1 The WarmCair DW Series II range are highly efficient combined condensing gas-fired water-to-air downflow forced convection air heater and water heater. Significant reductions in Carbon and NOx emissions are achieved.

This appliance range has been designed with the bottom compartment to provide the user with Warm Air Central Heating and the top compartment to provide Domestic Hot Water. Using sophisticated controls, enabling it to provide a warm air heat output of 10-25kW (depending on the model) and hot water output of 25kW.

They are room sealed, with a stainless steel heat exchangers, using a vertical or horizontal Concentric Flue System.

The WarmCair DW Series II is a combined air heater is ideally suited for new built dwellings and the replacement of existing non-condensing air heaters. **For Indirect system applications only.**

2.2 "Summer Air Circulation" of unheated air is available by manual selection (see the user's instructions)

2.3 The air is drawn in through the air filter or air cleaner (if fitted) and the heat exchanger by a centrifugal fan, and is discharged through the base of the unit. A Summer Air Circulation switch (optional) provides the facility to supply unheated air to the air outlets during warm weather. The Modairflow control can be used to modulate the speed of the air circulation fan.

3. BUILDING STANDARDS & REGULATIONS



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

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

FAILURE TO COMPLY WITH THESE REGULATIONS MAY LEAD TO PROSECUTION.

3.1 INSTALLATION REGULATIONS

- **Building Standards (Scotland) (Consolidation) Regulations**
 - **Building Regulations Part L**
 - **Gas Safety (Installation and Use) Regulations (as amended)**
 - **The Water Fittings Regulations or Water bylaws in Scotland**
 - **Model and Local Authority Byelaws**
 - **Health & Safety Document No. 635.**
 - **The Electricity at Work Regulations, 1989.**
 - **Institute of Electrical Engineers (I.E.E) Wiring Regulations**
 - **EU Regulation No 811/2013 and No. 812/2013 supplement Directive 2013/20/EU**
- This appliance has been Tested and Certified in order to meet the necessary European Directives and comply with the latest Building Regulations.**
- **Efficiency of Hot Water Boilers Directive 92/42/EEC**
 - **Gas Appliance Directive 2009/142/EC**
 - **Low Voltage Directive 2006/95/EEC**
 - **Electromagnetic Compatibility Directive 2004/108EC**

3.2 BUILDING STANDARDS AND REGULATIONS

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

- BS 5440:1 Flues (for gas appliances of rated input not exceeding 70 kW).
- BS 5440:2 Ventilation (for gas appliances of rated input not exceeding 70 kW).
- BS EN 12828 Heating Systems in buildings: Design for water based heating systems.
- BS EN 12831 Heating Systems in buildings: Method for calculation of the design heat load.
- BS EN 14336 Heating Systems in buildings: Installation and commissioning of water based heating systems.
- BS 5546 Installation of gas hot water supplies for domestic purposes (2nd Family Gases)
- BS 6798 Installation of gas fired hot water boilers of rated input not exceeding 70 kW.
- BS 6891 Installation of Low Pressure Gas Pipework of up to 28mm (R1) in domestic premises (2nd family gases).
- BS 7671 Institute of Electrical Engineers (I.E.E) Wiring Regulations

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

4. SAFETY, ELECTRICAL, GAS & WATER INFORMATION

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE COMMENCING WITH THE INSTALLATION

4.1 GENERAL SAFETY INFORMATION

- 4.1.1 Only use WarmCair original spare parts on this appliance. Failure to do so will invalidate the guarantee.
- 4.1.2 The manufacturer's instructions supplied must not be taken as overriding any statutory requirements.
- 4.1.3 No artificially softened water should be used to fill the central heating system.

4.2 POWER FLUSHING - When a radiator system is also connected.

- 4.2.1 The system can be damaged by debris entering the heat exchanger and reduce efficiency. It is recommended that the appliance is flushed, follow these guidelines as this will protect the unit and prolong its life.
- 4.2.2 It is important that the system is flushed thoroughly before the appliance is left to operate (as recommended in BS 7593) in order to maintain an efficiently operating heating system. For replacement installations, the system MUST be flushed with the old unit in situ, in order to prevent the appliance becoming a trap for system debris. Once the system has been flushed, an inhibitor (suitable for stainless steel heat exchangers) should be added. Appropriate inhibitors are available, for example Sentinel, Fernox and Salamader.

4.3 MAGNETIC AND NON MAGNETIC FILTERS

For new and replacement installations a Magnetic & Non Magnetic filtration system must be fitted on all returns to the appliance.

- 4.3.1 Failure to carry out the above procedures will invalidate the guarantee!

4.4 ELECTRICAL INFORMATION

- 4.4.1 Ensure the mains supply voltage, frequency, number of phases and power rating comply with details on the rating label.
- 4.4.2 All wiring must be in accordance with the appropriate standards. The equipment must be supplied with a double pole isolator switch.

4.5 HANDLING THE UNIT

- 4.5.1 Ensure safety regulations and practices are adhered to when installing and using this equipment
- 4.5.2 The weight of this appliance exceeds that recommended for a one-man lift. It will therefore be necessary to gain assistance at times during the installation procedure.
- 4.5.3 It should be noted that this appliance may contain sharp edges. Care MUST be taken when handling the appliance to prevent injury.
- 4.5.4 Once the appliance has been fired beware that certain parts will be hot to the touch.
- 4.5.5 Do not install flues during rain, high winds or in severe weather conditions.



GAS LEAKS

DO NOT OPERATE ANY ELECTRICAL SWITCHES, OR USE A NAKED FLAME TURN OFF THE GAS SUPPLY. VENTILATE THE AREA BY OPENING DOORS AND WINDOWS. CALL THE NATIONAL GAS EMERGENCY SERVICE ON

0800 111999

4.6 GAS SUPPLY

- 4.6.1 It is the responsibility of the Gas Installer to size the gas installation pipework in accordance with BS 6891. Whilst the principle of the 1:1 gas valve ensures the WarmCair series II, Combined DHW range is able to deliver its full output at inlet pressures as low as 14mb, however other gas appliances in the property may not be as tolerant. When operating pressures are found to be below the minimum meter outlet of 19mb these should be checked to ensure there is adequate for correct and safe operation.
- 4.6.2 Allowing for the acceptable pressure loss of 1mb across the installation pipework, it can be assumed that a minimum permitted operating pressure of 18mb will be delivered to the inlet of the appliance. (Reference BS 6400-1 Clause 6.2 Pressure Absorption).
- 4.6.3 The external gas cock could further reduce the operating pressure when measured at its test point. The pressure drop is relative to the heat input to the boiler (kW), refer to graph below.
IMPORTANT: Installation pipes must be fitted in accordance with BS 6891. In Ireland refer to IS.813.

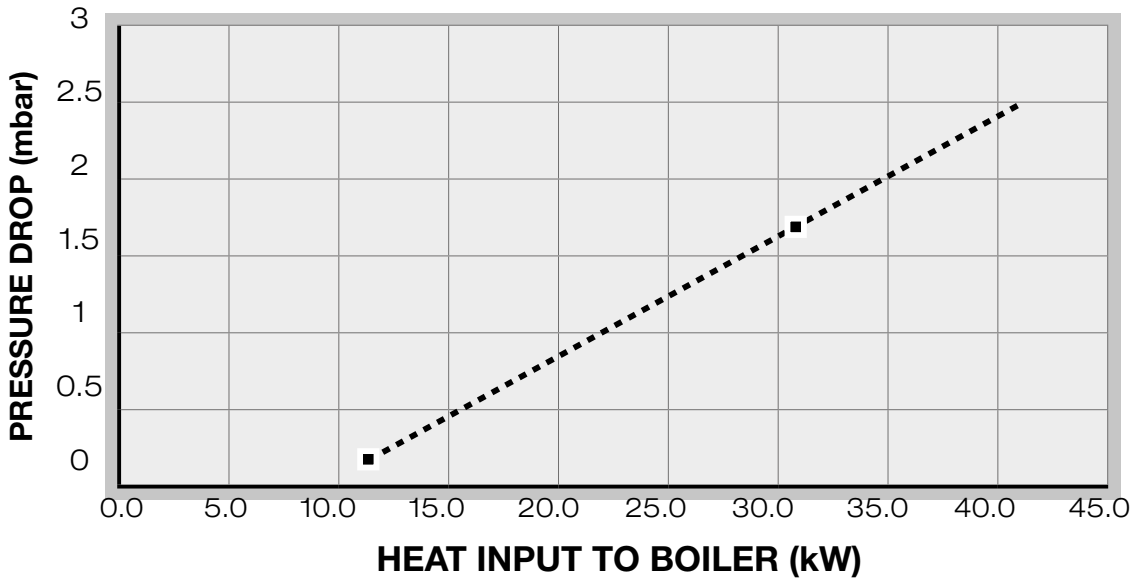


FIGURE 1. GAS COCK PRESSURE DROP

4.7 WATER SUPPLY

- 4.7.1 Water connections to the unit should be by 22mm compression fittings that are suitable for the duty.

NOTE: UNDER NO CIRCUMSTANCES SHOULD ISOLATION VALVES BE FITTED.

IMPORTANT: It is recommended that the water system be drained and flushed prior to the installation of the unit. Filtration must be fitted on all returns per paragraph 4.2

5. TECHNICAL DATA

| TABLE 1. | | C10DW | C16DW | C20DW | C25DW |
|-------------------------|--------|----------------|----------------|----------------|----------------|
| Maximum weight lift | kg | 71kg | 81kg | 90kg | 115kg |
| Gas supply | mbar | 20 | 20 | 20 | 20 |
| Gas connection | mm | 22* | 22* | 22* | 22* |
| Heating flow and return | mm | 22 | 22 | 22 | 22 |
| Flue terminal diameter | mm | 100 | 100 | 100 | 100 |
| Condense drain | mm | 21.5 | 21.5 | 21.5 | 21.5 |
| Electrical supply | V ~ Hz | 230V - 50hz | 230V - 50hz | 230V - 50hz | 230V - 50hz |
| Electrical rating | W | 150 | 150 | 150 | 150 |
| External fuse rating | A | 3 | 3 | 3 | 3 |

WARM AIR HEATING

| | | | | | |
|--------------------------|-------------------|-----|-----|------|------|
| Nominal Rated Output | kW | 10 | 16 | 20 | 25 |
| Minimum Rated Output | kW | 5 | 8 | 10 | 12.5 |
| Air on Temperature | °C | 20 | 20 | 20 | 20 |
| Air off Temperature | °C | 67 | 67 | 67 | 67 |
| Water Supply Temperature | °C | 80 | 80 | 80 | 80 |
| Water Return Temperature | °C | 73 | 72 | 71 | 55 |
| Water Flow Rate | l/s | 0.4 | 0.5 | 0.6 | 0.25 |
| Air Volume | m ³ /h | 576 | 936 | 1224 | 1584 |

TABLE 2.

Min

Max

| PERFORMANCE DATA | | | Min | Max | | |
|---------------------------------------|----------------|-------------------|---------|--------|--------|--------|
| Burner CO ² (%) | case off | | 8.0 | 9.0 | | |
| | case on | | 8.2 | 9.2 | | |
| | | | ± 0.5 | | | |
| PERFORMANCE DATA FOR WATER HEATING | | | C10DW | C16DW | C20DW | C25DW |
| Input Q | Net | kW | 25kW | 25kW | 25kW | 25kW |
| | Gross | kW | 27.7kW | 27.7kW | 27.7kW | 27.7kW |
| Gas Consumption | | m ³ /h | Min | 0.58 | | |
| | | | Max | 2.52 | | |
| Output | Non condensing | kW | 24.3kW | 24.3kW | 24.3kW | 24.3kW |
| | Condensing | kW | 27.1kW | 27.1kW | 27.1kW | 27.1kW |
| NO _x Classification | | | CLASS 5 | | | |
| Recommended Central Heating set point | | | 80 °C | | | |

ADDITIONAL DATA

| | |
|--------------------------------------|--|
| ELECTRIC POWER CONSUMPTION | 100 W (at rated heating capacity), 30 W (at minimal cap.), 10 W (standby mode) |
| USEFUL EFFICIENCY | 88.6% (at rated heating capacity), 98.9% (at minimum capacity) |
| ENVELOPE LOSS FACTOR | 0 |
| IGNITION BURNER POWER CONSUM. | 0 W |
| EMISSIONS OF NITROGEN OXIDES | 44mg / kWh |
| EMISSION EFFICIENCY | 85.33% |
| SEASONAL SPACE HEATING ENERGY EFFIC. | 82.5% |

NOTE: Gas consumption is calculated using a calorific value of 38.7 MJ/m³ gross or 34.9 MJ/m³ net. To obtain the gas consumption at a different calorific value:

- For l/s - divide the gross heat input (kW) by the gross C.V. of the gas (MJ/m³)
- For ft³/h - divide the gross heat input (Btu/h) by the gross C.V. of the gas (Btu/ft³)
- For m³/h - multiply l/s by 3.6

*Can be reduced to 15mm on entry to heater providing pressure drop across pipe work is no greater than 1mbar.

6. HEATER POSITIONING

- 6.1 This heater is not suitable for external installation unless it is protected from the elements by a suitable enclosure. The enclosure must provide the clearance for installation, servicing and maintenance as well as the correct level of ventilation. The selected position should allow for a suitable flue system to be installed.
- 6.2 When installed in a timber frame, building guidance should be taken from the Gas Industry Publication IGE/UP-7 (Guide for Gas Installations in Timber Frame Housing).
- 6.3 BS 6798 gives details of the essential features for a compartment or cupboard where a gas appliance is to be installed. An existing cupboard may require modification.
- IMPORTANT: This system can only be used in conjunction with an indirect system application with a sealed primary circuit. A filling loop, expansion vessel and pressure relief valve (not supplied) must be fitted along with the supplied bypass.**
- 6.4 If the heater is installed in a room containing a bath or shower, it is important to locate the electrical switch in a position where it cannot be touched by anyone using the bath or shower. The current IEE Wiring Regulations (BS 7671) for England and electrical provision of the Building Regulations for Scotland gives details.
- 6.5 Room ventilation for the heater is not necessary (as the heater draws its combustion air from the outside of the building, cupboard or compartment ventilation), providing that the minimum clearances are maintained. However, reference should be made to BS 5440 Pt. 2.

IMPORTANT: This appliance must be completely level. It MUST NOT lean in any direction.

7. HEATER COMPARTMENT CLEARANCES

- 7.1 **IMPORTANT:** If the heater is to be fitted to an existing base duct (warm air plenum), always ensure that installation is carried out such that the rear of the heater is aligned with the rear of the base duct so that any overhang or blanking off will be at the front. In any event, blanking plates must be mechanically secured and all joints sealed.
- 7.2 When the heater is fitted into a compartment, a minimum clearance from the compartment walls of 3 mm ($\frac{1}{8}$ ") at the sides, rear and front must be left. Where clearances are less than 75 mm, internal surface must be lined with non-combustible material and the compartment must be of a fixed rigid structure.
- However, there is no requirement for the use of non-combustible material at the front of the unit. Consideration should also be given to the space required for the removal and replacement of the filter tray and the entry of the gas and electrical supplies. If gas connections are made from a side entry, a minimum clearance of 75 mm (3") is required at that side.
- 7.3 For service access, a minimum clearance of 450 mm (18") is required at the front of the heater. Space must also be allowed, in a compartment installation, to permit the complete removal of the heater.
- 7.4 In airing cupboard installations, the part used as the air heater compartment must comply with the relevant section of BS 5864 and must be completely separated by either a non-combustible partition or a perforated metal partition with the perforations not exceeding 13 mm ($\frac{1}{2}$ ").
- The secondary flue must be a tight fit where it passes through the partition and must be suitably protected (see BS 5440: Part 1).
- 7.5 In under stairs installations, the compartment must comply with the relevant section of BS 5864, provided that in addition all internal surfaces (including the base) are non-combustible or lined with non-combustible material. This requirement is applicable only to dwellings of more than two storeys.
- 7.6 In free-standing installations, (see instructions packed with top closure kit), only one or two walls will be in close proximity to the air heater; these must be non-combustible.
- 7.7 Where the air heater is to be installed onto a combustible surface and under-floor ducting used, a suitable base tray MUST be used in order to provide insulation.
- NOTE:** where a base plenum is used, no base tray is required!
- 7.8 Although two permanent ventilation openings are not required, consideration should be given to the amount of heat emitted by any ductwork present in the compartment, otherwise the compartment temperature could increase and will affect the safe operation of the appliance and its controls.

8. DUCT SYSTEM (See British Design Manual - Gas fired Warm Air Heating)

8.1 RETURN AIR

- 8.1.1 A room-sealed heater can be installed without positive return air ducting, provided that the path between the return air grille and the heater return air inlet is protected in such a manner that the required airflow is maintained at all times. (BS5864).
- 8.1.2 The return air grille **MUST** have a free area of not less than the values shown in the following table. It is recommended that the return air duct not be routed directly from the main living area, but from a convenient central area serving the remainder of the dwelling.
- 8.1.3 The return air system should be constructed of fire-resistant material where used. It is extremely important that the correct size of return air grilles and ducting is used.
- 8.1.4 An adequate and unobstructed return air path is essential from areas not served by a directly ducted return and to which warm air is delivered. All such rooms should be fitted with relief grilles which have a free area of 0.0088 m²/kW (1 in²/250 Btu/h) of heat supplied to the room. The only exceptions are kitchens, bathrooms and WC's.
- 8.1.5 The return air duct should allow for ease of removal for access to the flue.
- 8.1.6 All ductwork in the room or internal space in which the heater is installed shall be mechanically secured and sealed with ducting tape.
- 8.1.7 If a return air duct is not to be fitted, the top of the unit must be suitably guarded to prevent blockage.

| Minimum Ductwork and Grille Areas | | C10DW | C16DW | C20DW | C25DW |
|---|------------------------------------|-----------|------------|------------|------------|
| Minimum free area of return air grille | cm ² (in ²) | 860 (137) | 1266 (196) | 2118 (328) | 4200 (651) |
| Minimum area of return air duct | cm ² (in ²) | 500 (77) | 750 (116) | 1200 (186) | 2400 (372) |
| Minimum diameter of flexible duct (if used) | mm(“) | 300 (12) | 350 (14) | 406 (16) | 508 (20) |

9. HEATING SYSTEM

9.1 WARM DELIVERED AIR SYSTEM

9.1.1 All duct work, including riser ducts, should be fully insulated with 50 mm (2") fibre-glass or similar. If short extended duct runs are taken below floor level, these should be similarly insulated and, in addition, wrapped with a sound vapour proof barrier. They must also be protected from crushing.

9.1.2 The duct system should be carefully designed (as given in the guidelines in the British System Design Manual) to suit the needs of specific heating requirements and building layout. The type of duct system (e.g. radial/extended, plenum/stepped) should be installed using the least number of fittings to minimise airflow resistance.

The base duct, which equalises the air pressure to supply ducts, must be constructed to support the weight of the heater, which must be sealed using self-adhesive foam strip, ducting tape or sealing compound. All ducting and blanking plates must be mechanically secured and sealed.

9.2 ADDITIONAL RADIATOR SYSTEM IF FITTED

9.2.1 Any additional radiators must be connected to pipe tails provided as detailed in Figure 3.

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

NOTE:

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

9.3 PIPEWORK SIZING

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

9.4 WATER TREATMENT

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

9.4.1 For replacement installations, the system MUST be flushed with the old boiler in situ, in order to prevent the boiler becoming a trap for system debris. Once the system has been flushed, an inhibitor (suitable for stainless steel heat exchangers) should be added.

9.4.2 Appropriate inhibitors are available, for example Sentinel, Fernox and Salamander. Failure to carry out the above procedure will invalidate the guarantee!

NOTE: Water supplied from a water softener MUST NOT be used unless a specially formulated corrosion inhibitor is added (see BS 6798).

IMPORTANT: This appliance can only be used with an Indirect heating System.

9.5 HOT WATER SYSTEM FOR DHW

9.5.1 An indirect cylinder with unvented coil and a thermostat must be fitted.

9.5.2 Separate timing of DHW is required for connections: see Figure ***.

NOTE: The WarmCair Combined DHW units MUST be fitted onto a sealed primary. The pressure vessel and PVR must be fitted in the circuit before any auxiliary diverter valves.

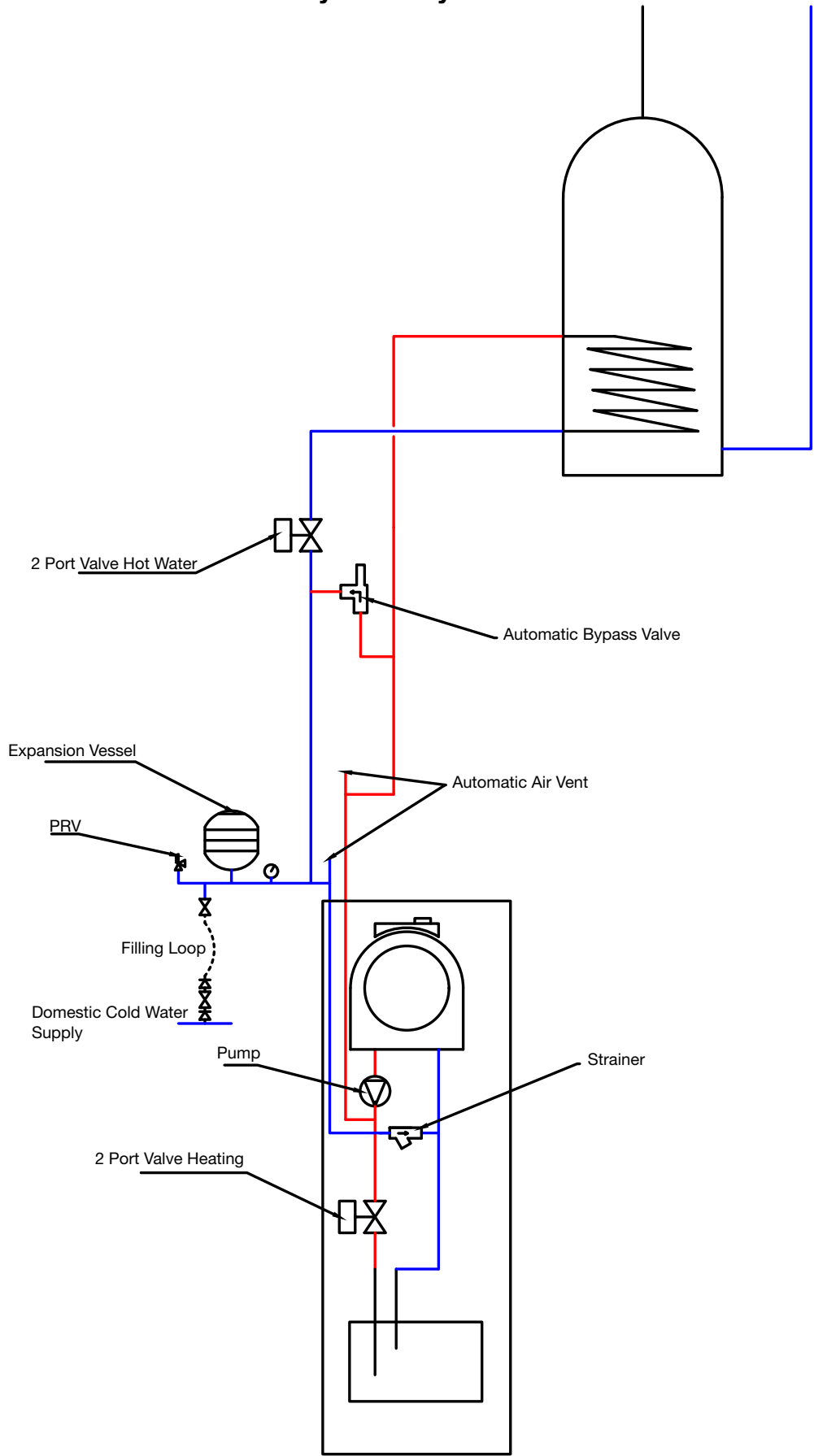


FIGURE 2. WATER FLOW SCHEMATIC

10. FLUE INSTRUCTIONS

10.1 The WarmCair DW series II, Condensing Air Heater are certified as a warm air heater with corresponding flue systems according to EU Directive 2009/142/EC on gas-fired devices. These installation instructions are covered by this certification and are referred to in the design approval test certificate.

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

THESE RELEVANT STANDARDS SHOULD BE FOLLOWED

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

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

Ensure all legislation, regulations and directives mentioned are observed.

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

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

10.5 TYPE OF FLUE SYSTEMS

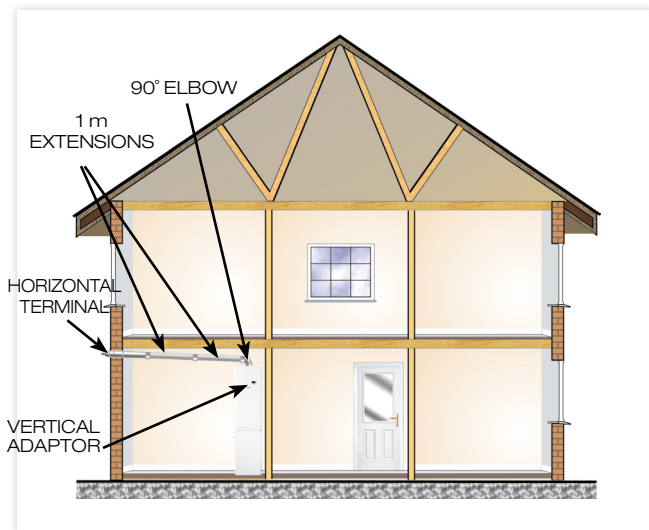


FIGURE 3. 60/100 mm HORIZONTAL CONCENTRIC FLUE EXAMPLE

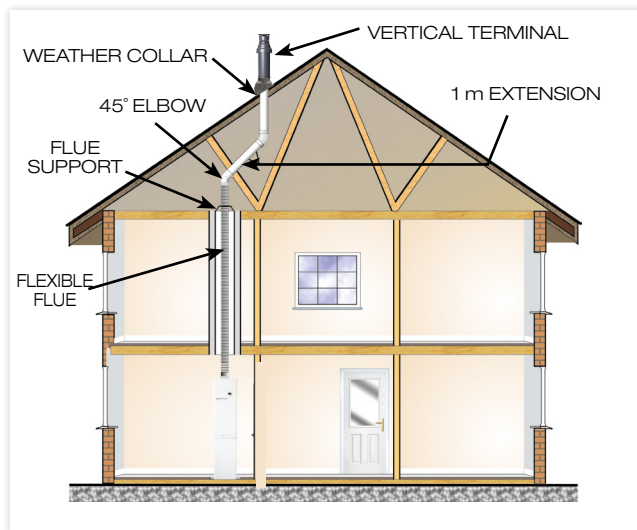


FIGURE 4. 60/100 mm FLEXIBLE FLUE EXAMPLE

10.6 FLUE TERMINAL POSITIONS

10.6.1 The following information provides the general requirements for siting flue terminals. As part of the recommendation given in **BS 5440 Part 1**. For Ireland recommendations, see the current issue of I.S. 813 "Domestic Gas Installations." Also publication a "Guide for Gas Installations in Timber Framed Housing DM2" or consult your local gas region, it **MUST** be consulted when installing the appliance into a timber-framed building.

NOTE: Due to the nature of the warm air heater, water vapour will discharge from the flue. This should be taken into account when siting the flue

10.6.2 Both the horizontal and vertical terminals must be positioned on the outside of the building and the free passage of air must be available at all times. It is not recommended to position the terminal close to projections especially under a balcony or near to a drainpipe.

10.6.3 Ensure that combustion products cannot enter the building where the heater is installed or near to any other building where doors or windows may be open.

10.6.4 Recommended terminal positions for both horizontal and vertical flues are shown and flue components and installation options are also detailed.

10.6.5 The flue **MUST NOT** be installed under a car port.



FIGURE 5. TERMINAL POSITIONS

| TABLE 3 | TERMINAL POSITION | MINIMUM DISTANCE |
|---------|--|------------------|
| A | Directly below an opening, air brick, opening window etc. | 300 mm |
| B | Above an opening, air brick, opening window, etc. | 300 mm |
| C | Horizontally to an opening, air brick, opening window etc. | 300 mm |
| D | Below gutters, soil pipes or drain pipes. | 75 mm |
| E | Below eaves. | 200 mm |
| F | Below balconies. | 200 mm |
| G | From a vertical drain pipe or soil pipe. | 150 mm |
| H | From an internal or external corner. Greater than 450 mm protrusion. | 300 mm |
| I | Above ground, roof or balcony level. | 300 mm |
| J | From a surface facing the terminal. | 600 mm |
| K | From a terminal facing the terminal. | 1,200 mm |
| M | Vertically from a terminal on the same wall. | 1,500 mm |
| N | Horizontally from a terminal on the same wall. | 300 mm |
| Q | Above intersection with roof. | 530 mm |
| P | From a vertical structure on the roof | 300 mm |
| R | From the terminal to the boundary | 300 mm |

10.7 FLUE REQUIREMENTS & GENERAL INFORMATION

10.7.1 Horizontal and vertical concentric flues (60/100 mm diameter) with balanced terminals may be installed on all the WarmCair DW series II appliance.

10.7.2 If an extended horizontal flue is being used it must have a continuous fall back towards the appliance of 3° (52 mm) per meter. This ensures that condensate runs back into the appliance from the flue system for safe discharge via a condensate waste pipe. NOT SUPPLIED.

Reference should be made to page 16 for relevant part numbers.

10.7.3 The maximum length of flue permissible is 10 meters excluding terminal.

10.7.4 The minimum vertical flue length is 1.25 m from the top of the appliance case to the top of the terminal.

10.7.5 Elbows may be fitted within the flue system with a corresponding reduction in overall flue length.

10.7.6 Guidelines for the maximum flue lengths are as follows.

NOTE: Combine EasySafe only with EasySafe components.

Store material inside

EQUIVALENT HORIZONTAL FLUE LENGTHS

Adaptor + 10 metres straight

Adaptor + 1 x 90° Elbow + 8 metres straight lengths

Adaptor + 2 x 90° Elbow + 6 metres straight lengths

Adaptor + 3 x 90° Elbow + 4 metres straight lengths

When using 90° Elbows = 1 x 90° Elbow is equivalent to 2 m Straight lengths

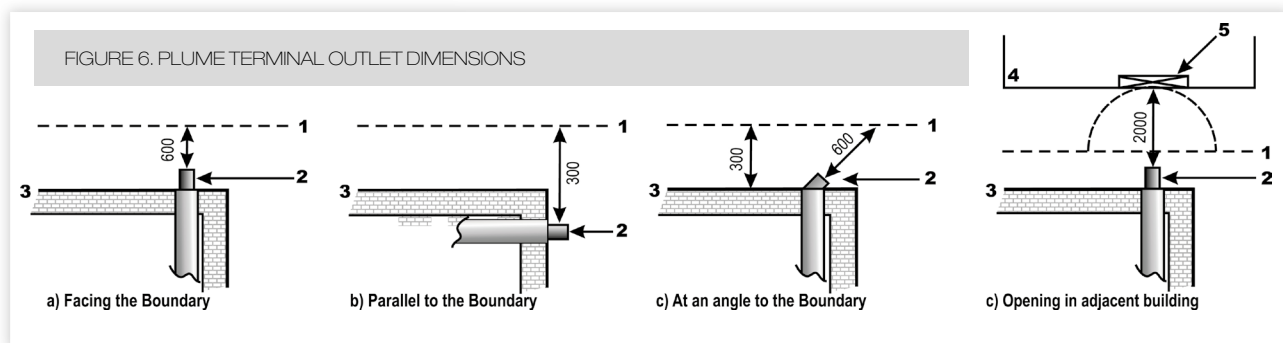
When using 45° Elbows = 2 x 45° Elbows are equivalent to 1 x 90° Elbow

10.8 PLUME TERMINAL OUTLETS

10.8.1 A flue duct outlet of an appliance should be at least 600mm from the boundary line when facing it and at least 300mm from the boundary line when running parallel to it. (See Figure 6)

NOTE: When the flow of products is at an angle to the boundary, the 600mm dimension may be measured in the direction of the flow, as long as the terminal is not less than 300mm from the boundary.

10.8.2 It is recommended the terminals are not sited within 2m of an opening in an adjacent building or within 2m of the boundary facing the terminal if the plume is likely to cause a nuisance to a neighbour, e.g discharging over a walkway or patio.

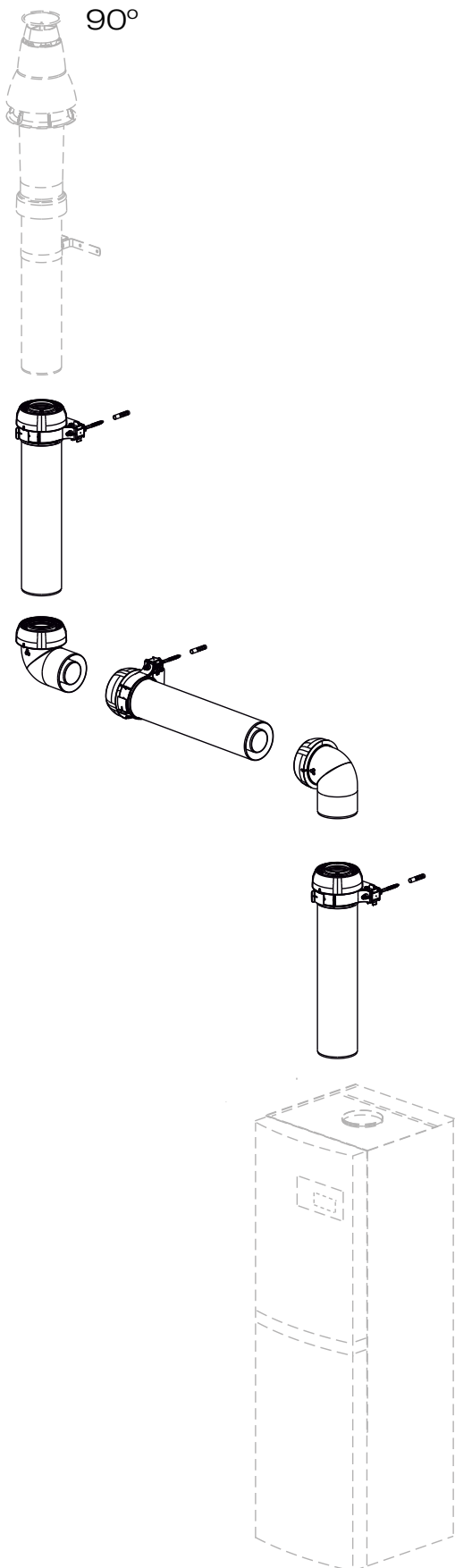


10.9 CONVENTIONAL 60/100 mm FLUE ACCESSORIES PARTS No.s

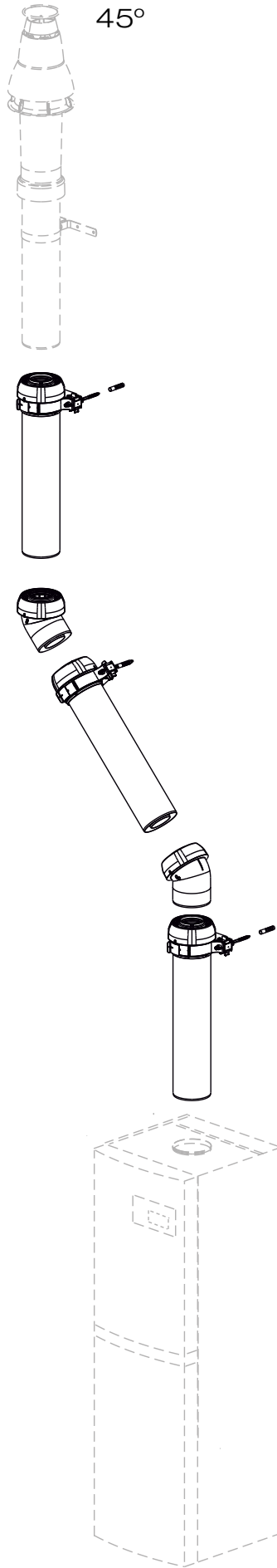
| Description | Colour | Application | Part No | |
|--|--------|-------------------------|--------------|---|
| Ridge Terminal | Grey | Vertical | 1000-0021030 |  |
| Extension 60-100 x L500mm | White | Horizontal/ Vertical | 1000-0026310 |  Extension pipes 250, 500, 1000 and 2000 mm |
| Extension 60-100 x L1000mm | | | 1000-0026320 | |
| Extension 60-100 x L2000mm | | | 1000-0026330 | |
| Elbow 60/100 x 90° | White | Horizontal | 1000-0026340 |  |
| Elbow 60/100 x 45° | | | 1000-0026350 |  |
| Wall Bracket | White | Horizontal/ Vertical | 1000-0026360 |  |
| Pitched Roof Flashing | Black | Vertical | 1000-0026370 |  |
| Flat Roof Aluminium Flashing | | Vertical | 1000-002638 | |
| Horizontal Flue Kit 60/100 Kit A | White | Horizontal | 1000-0026390 | |
| Vertical Flue Terminal | White | Vertical | 1000-0026400 | |
| Flexible Flue - 5 metre | Black | Horizontal/ Vertical | FFK-5 | |
| Adaptor: Vertical Appliance C/W Flange | White | Vertical | 1000-0022990 | |

10.10 FLUE ASSEMBLY INSTRUCTIONS

90°

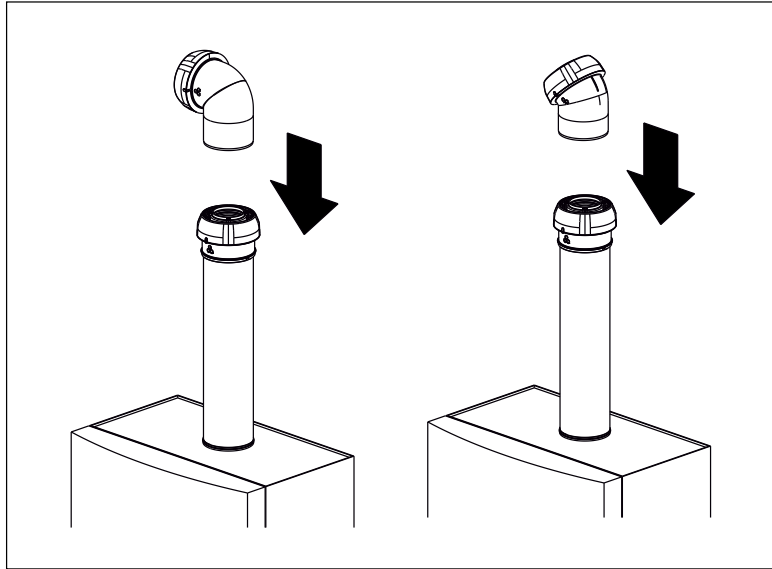
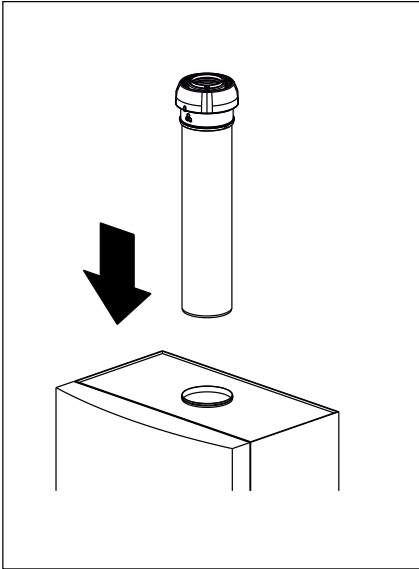


45°

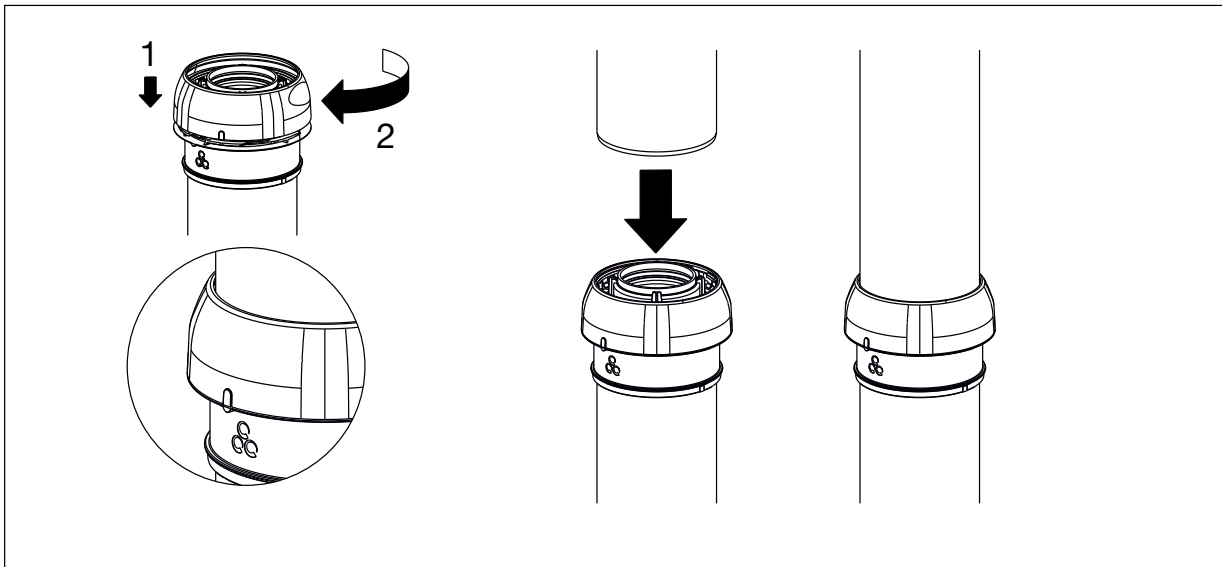


FLUE ASSEMBLY INSTRUCTIONS

1. Attaching the flue to the heater 2. Attaching bends to lengths

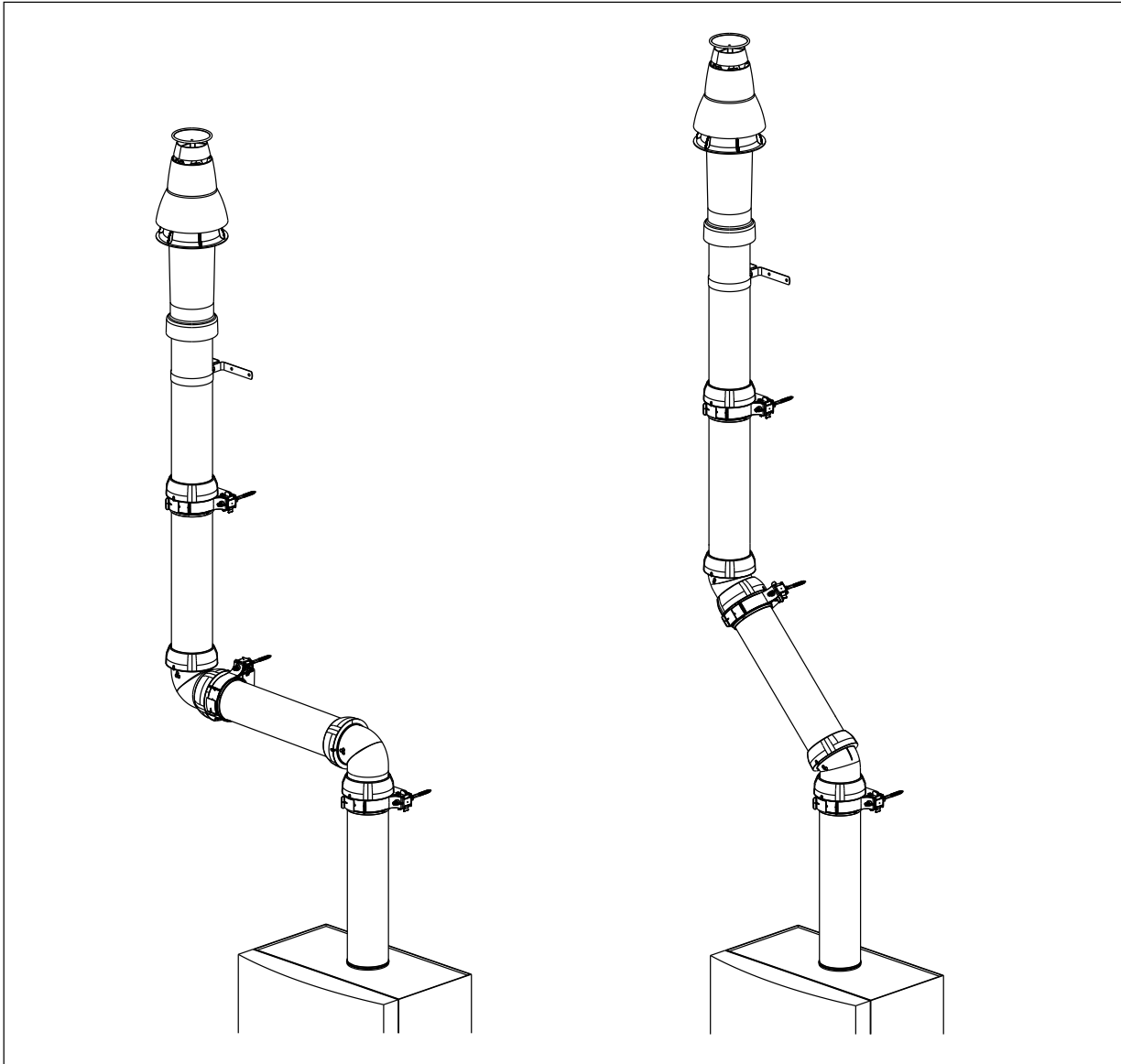


3. Attaching a flue length to another



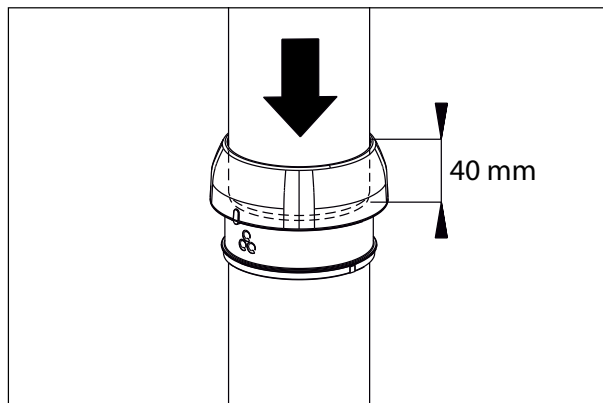
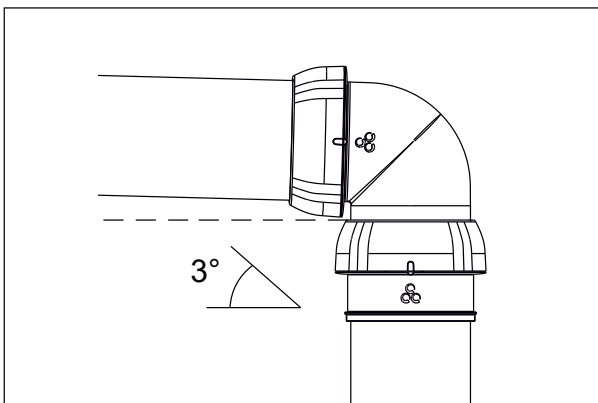
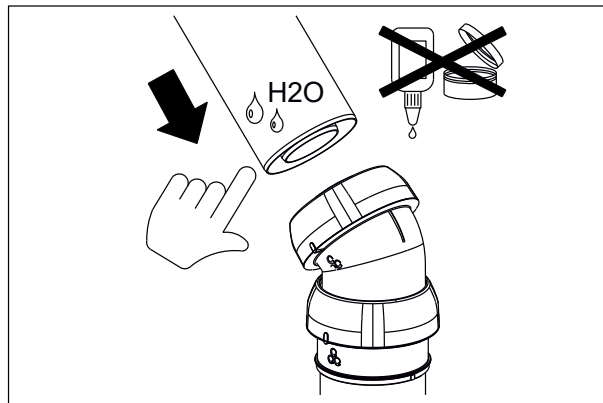
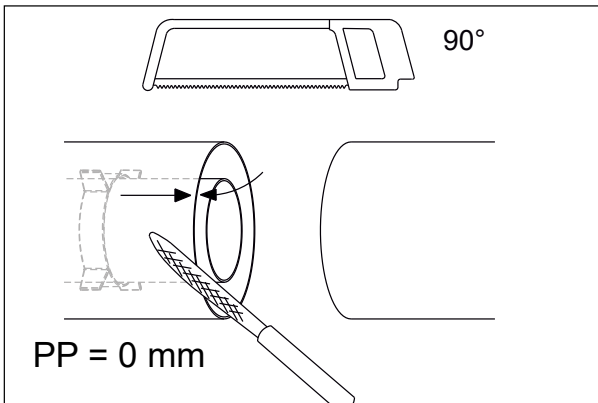
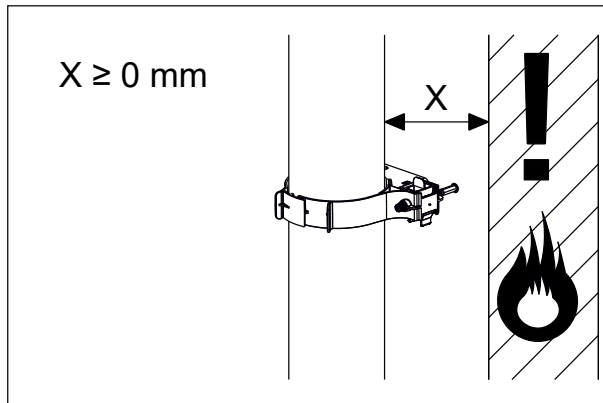
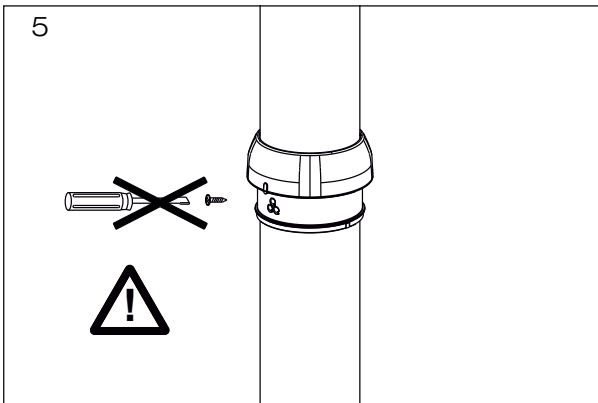
FLUE ASSEMBLY INSTRUCTIONS

4. Attaching a flue length to another

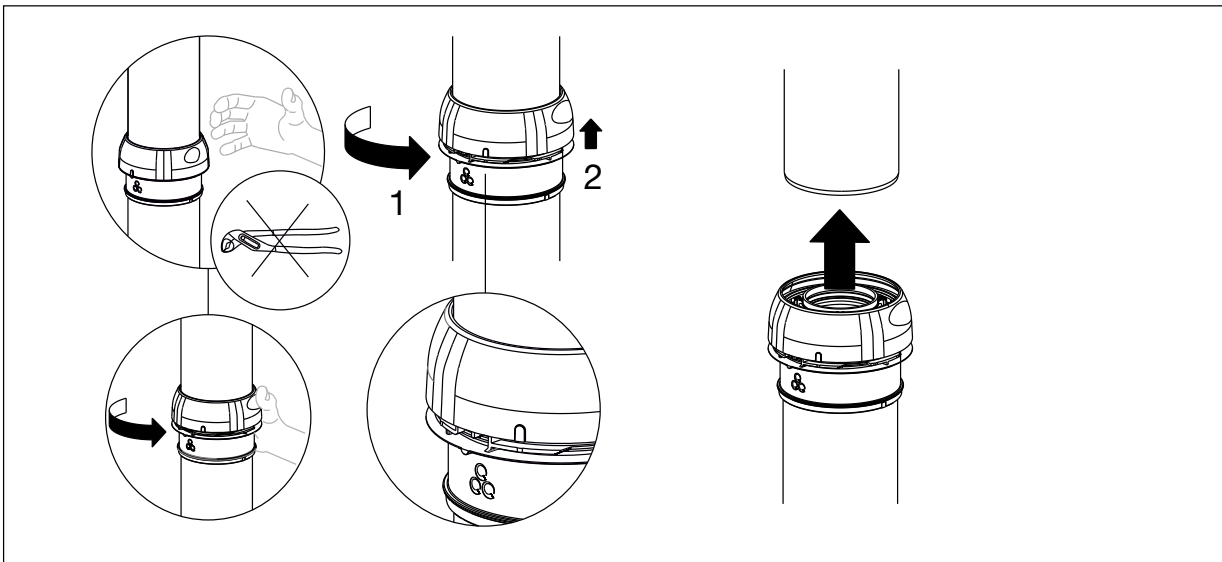


FLUE ASSEMBLY & DISASSEMBLY INSTRUCTIONS

5. Flue assembly information



6. Flue disassembly



11. EXTERNAL CONDENSATE PUMP & DRAIN TUBE

11.1 CONDENSATE PUMP

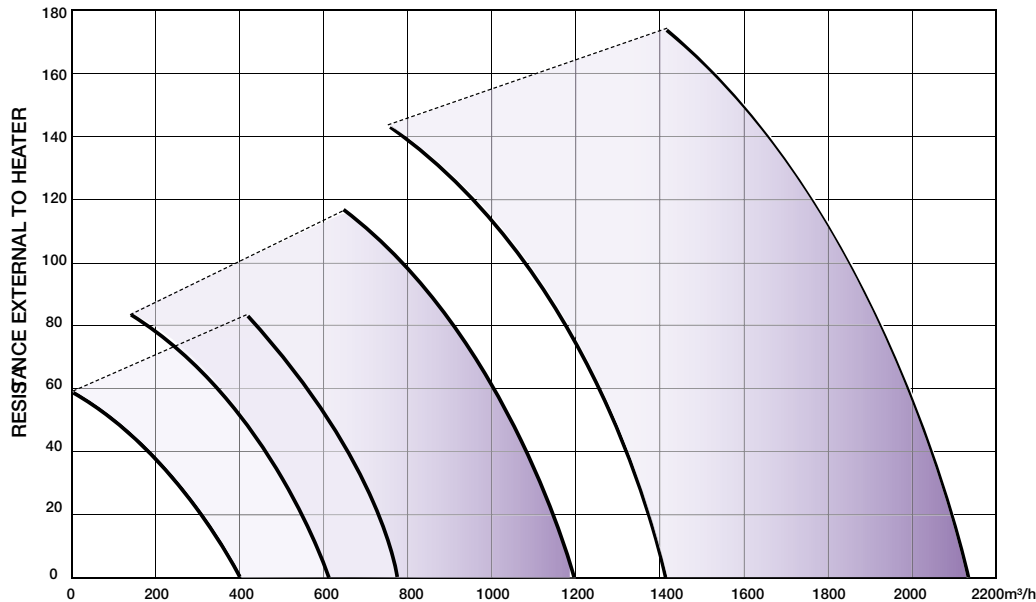
11.1.1 An external condensate pump and drain tube must be fitted to the heater.

Fit per condensate pump manufacturer's installation instructions.

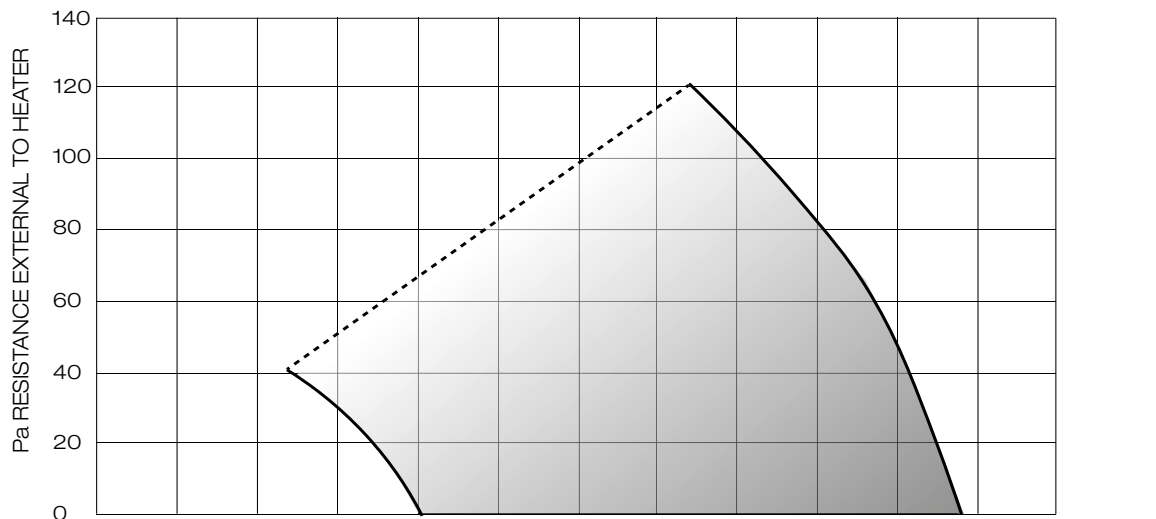
12. ELECTRICAL

- 12.1 The appliance is supplied with PVC sheathed, 3 core (Brown-Blue-Green/Yellow) 0.75 mm² CSA rated at 6 A, connected to a terminal block and exiting through the casing at the top left hand front. The cable is suitable for a 230 V - 50 Hz single phase supply.
- 12.2 The means of isolating the appliance MUST be via a double pole switch with a contact separation of at least 3 mm in both poles, and fused at 3 A. If switched live is fitted, a triple pole switch should be used.
- 12.3 A MAF Controller is supplied with the unit, which is to be connected using PVC sheathed to BS 6500, 2 core cable of 0.5 mm² CSA rated at 3 A, to low voltage terminals labelled for MAF stat on the PCB in accordance with Figure 52 and **observing correct polarity.**
- 12.4 Refer to pages 39 & 40 for the internal and external wiring diagrams.

13. WARM AIR FAN PERFORMANCE



Fan Performance graph, C10DW - C16DW - C20DW



Fan Performance graph, C25DW

14. OPERATING MODES

- 14.1 Operating modes are covered in the User Instructions, ZZ1671 packed with the appliance, for both Domestic Hot Water and Central Heating.
- 14.2 Additional radiators can be added to the system, with or without separate external zone valves (not supplied). Additional controls may be required to achieve independent operation of separated heating zones.

15. THE HEATER CONTROL PANEL

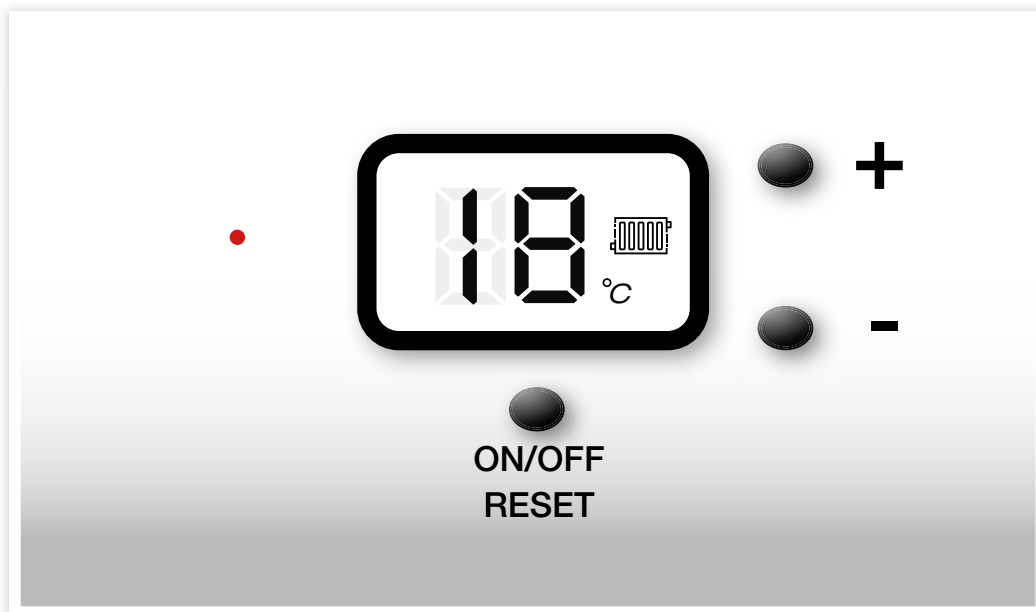


FIGURE 7. LED DISPLAY FUNCTIONS

16. TO LIGHT THE HEATER

- 16.1 Switch the mains power on and wait for the LED display to enter standby mode, showing 2 alternating dashes.
- 16.2 Press and hold the “ON/OFF/RESET” button to turn the appliance on. The display will change to show the current water temperature inside the heater.

17. COMMISSIONING

17.1 CHECK GAS INSTALLATION

- 17.1.1 The whole of the gas installation, including the meter, should be inspected and tested for tightness and purged in accordance with the recommendations of BS 6891.
- 17.1.2 Purge air from the gas installation by the approved methods only.
NOTE: The combustion for this appliance has been checked, adjusted and preset at the factory for operation on the gas type defined on the appliance data plate. Do not adjust the air/gas ratio valve.
- 17.1.3 Having checked the heater has been installed in accordance with these instructions. The integrity of the flue system and the flue seals, as described in the Flue Installation section. Proceed to put the boiler into operation as follows:

17.2 CHECK THE OPERATIONAL GAS INLET PRESSURE

- 17.2.1 Set up the heater to operate at maximum rate by opening hot tap to maximum flow.
- 17.2.2 With the heat generator operating in the maximum rate condition, check the operational gas pressure at the inlet gas pressure test point complies with the requirements.
- 17.2.3 Ensure that this inlet pressure can be obtained with all other gas appliances in the property working.

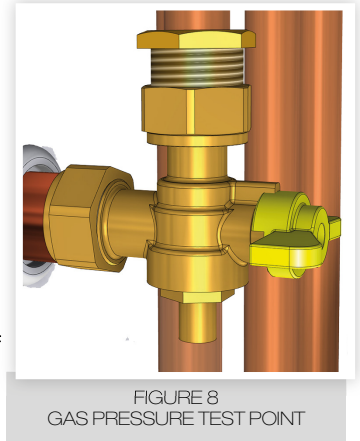


FIGURE 8
GAS PRESSURE TEST POINT

17.3 AIR PURGING IMPORTANT INFORMATION

- 17.3.1 When filling the heater with water for the first time, open the drain cock on the water-to-air heat exchanger (at bottom of the unit) to allow air release
- 17.3.2 Partially unscrew the automatic air vents (not supplied)
- 17.3.3 Set programmer and thermostat so as not to call for heating nor hot water
- 17.3.4 Remove the motor for both CH and DHW zone valves and manually turn the DHW valve so it is in the open position (parallel with pipe)
- 17.3.5 Manually activate the DHW zone valve demand via the switch at the bottom of the valve motor unit and once the unit recognises a demand has been made, return the switch to the off position. This will cause a 60 second pump overrun
- 17.3.6 Repeat step 17.3.5 until all air is cleared.
- 17.3.7 Once clear of air check system water pressure and fill back to 1.5bar as necessary.
- 17.3.8 Close the DHW zone valve and open the CH zone valve, repeating the procedure from 17.3.5 to vent the heating.
- 17.3.9 Once the CH heat exchanger has been thoroughly vented, manually open both zone valves and repeat 17.3.5 again to ensure any air is fully purged from the system.
- 17.3.10 When satisfied all air is removed, close both zone valves and refit both motor units.

NOTE: “FL” on the display is a low pressure warning. Activates between 0.3bar & 0.8bar. The number which shows after “FL” is the pressure in bar (e.g. FL 03 = 0.3 bar of pressure). “Error 04” on the display indicates critically low water pressure (<0.3bar).

18. INITIAL LIGHTING

18.1.1 Check that the system has been filled and the heat exchangers are not air-locked.

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

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

18.1.2 Refit the boiler front panel. See section 21.5 & 21.6.

18.1.3 Check that the electrical supply is OFF.

18.1.4 Check that the gas service cock is OPEN.

18.1.5 Slacken the screw in the inlet pressure test point and connect a gas pressure gauge via a flexible tube.

18.1.6 Switch the electricity supply ON and check all external controls are OFF.

18.2 WARM AIR CENTRAL HEATING

18.2.1 Set the CH temperature to maximum and switch on external control. The heat generator control should now go through its ignition sequence until the burner is established.

18.2.2 If the burner does not light, Error 01 + RESET will be displayed.

18.2.3 Reset the heater. The burner will repeat its ignition sequence. If reset occurs 5 times within 4 minutes, Error 01 + RESET will be shown.

18.2.4 When the burner is established the display will show the "flame symbol".

18.2.5 Ensure that the CH external controls are calling for heat. The burner should light.

18.2.6 Gas Rate: Check the heat generator gas rate when the heat generator is at full CH output.

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

18.2.7 Set the central heating external controls to OFF. The burner should go off and the pump continue to run for 60 seconds.

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

18.3 WATER CIRCULATION SYSTEM

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

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

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

18.3.3 Reset the system initial pressure to the design requirement.

18.4 BALANCE THE SYSTEM

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

18.4.2 Finally, set the controls to the User's requirements.

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

18.5 CENTRAL HEATING WATER TEMPERATURES

18.5.1 Temperatures can be selected using the CH thermostat between 45°C and 80°C.

18.5.2 Check fan stops when water cools to minimum temperature 40°C

18.6 COMBUSTION ANALYSIS

Sweep test (combustion test mode for minimum and maximum combustion rates).

- 18.6.1 Press & hold all 3 buttons on the control panel for 10-15 seconds to access the installer mode.
- 18.6.2 Press and hold + & - button on control panel to access sweep test mode.
- 18.6.3 "LP" will show on the display indicating minimum combustion rate. Set CH or DHW demand to activate the burner allowing combustion analysis to be taken.
- 18.6.4 Press + button to cycle through to "dP" indicating maximum combustion rate. Ensure CH or DHW demand is still set.
- 18.6.5 To exit installer mode, press and hold the "reset" button to switch off the heater.

18.7 REDUCING THE RATED NET INPUT DURING COMMISSIONING

- 18.7.1 Enter installer mode by simultaneously pressing and holding the 3 control panel buttons together until the display shows Pr00
- 18.7.2 Using the + button increase the Parameter selection to Pr12
- 18.7.3 Enter the Parameter by pressing and releasing the + and reset buttons simultaneously.
- 18.7.4 Using the + or - buttons select the required input setting from the table below.
- 18.7.5 Input the setting by pressing the reset button.
- 18.7.6 Press and hold the reset button until the display shows--
- 18.7.7 Press and hold the reset button until the display shows actual water temperature.
- 18.7.8 Using the sweep test mode check heat input and working inlet gas pressure.

| P12 Setting % | Net input kW | Gas rage m ³ /h | CO ² % |
|---------------|--------------|----------------------------|-------------------|
| 80 | 21.8 | 2.26 | 8.8 |
| 60 | 17.6 | 1.84 | 8.8 |
| 40 | 13.7 | 1.42 | 8.5 |

19. AIR HEATING COMMISSIONING

- 19.1 Ensure the heater is correctly filled with water and all air vented from the flow and return circuits.
- 19.2 Switch on electrical supply.

19.3 Setting maximum speed.

- a. Make a short across low voltage ModAirFlow terminals and adjust the fan speed as required using a small screwdriver on the warm air PCB to turn the relevant pot. Remove the short.

19.4 Setting minimum fan speed.

- a. Make a short across low voltage terminals with the white wires for pipe sensor and adjust the fan speed as required, using a small screwdriver on the warm air PCB to turn the relevant pot. Remove short.

19.5 WITH MODAIRFLOW THERMISTA-STAT FITTED

- 19.5.1 Turn up Modairflow Thermista-stat to call for heat.
- 19.5.2 With the water at the required temperature, ensure fan starts (when the display shows 62°C to 68°C).
- 19.5.3 Allow the system to warm up and check temperature rise across unit is 40°C.
- 19.5.5 Turn off Modairflow Thermista-stat and check 2 port valve closes and burner stops
- 19.5.6 Check fan stops when water cools to minimum temperature.

20. HANDING OVER

- 20.1 Hand the User Instructions to the householder and explain his/her responsibilities under the relevant national regulations.
- 20.2 Explain and demonstrate the lighting and shutting down procedures.
- 20.3 The operation of the heater and the use and adjustment of all system controls should be fully explained to the householder, to ensure the greatest possible fuel economy consistent with the household requirements of both heating and hot water consumption. Advise the User of the precautions necessary to prevent damage to the system and to the building, in the event of the system remaining inoperative during frosty conditions.
- 20.4 Explain the function of the heater Fault Mode. Emphasise that if a fault is indicated refer to "Fault Codes" in the User Guide.
- 20.5 Explain and demonstrate the function of time and temperature controls, radiator valves etc., for the economic use of the system.
- 20.6 Explain heater reset procedure.
- 20.7 After installation and commissioning, please complete the Commissioning Checklist before handover to the customer.

IMPORTANT:

- 20.8 A comprehensive service should be carried out ANNUALLY by a DAH1 warm air qualified Gas Safe Engineer. Stress the importance of regular servicing for safety reasons and to ensure the guarantee is valid.
- 20.9 Inform the householder of the guarantee/registration found within the folder pack and the requirement to register it to receive the full benefit of the guarantee. Once successfully registered confirmation will be sent to the householder within 28 days.

21. SERVICING & MAINTENANCE

21.1 SERVICING SCHEDULE

NOTE: It is a statutory requirement that ALL work is carried out by a DAH1 (Warm Air Heating) GAS SAFE registered engineer.

21.1.1 For the very latest copy of literature for servicing & maintenance instructions, visit our website

www.johnsonandstarley.co.uk - where the information can be downloaded.

WARNING: ALWAYS TURN OFF THE GAS SUPPLY AT THE GAS SERVICE COCK, THEN SWITCH OFF AND DISCONNECT THE ELECTRICITY SUPPLY FROM THE APPLIANCE BEFORE SERVICING.

21.1.2 Combustion testing must be carried out by a DAH1 qualified Gas Safe Engineer using a combustion analyser conforming to BS 7927.

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

21.1.4 It is the law that any service work must be carried out by a Gas Safe Registered Engineer. In Ireland, service work must be carried out by a Registered Gas Installer (RGII).

21.2 INITIAL INSPECTION

21.2.1 Light the heat generator and carry out a pre-service check, noting any operational faults.

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

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

21.3 SERVICING SEQUENCE

NOTE: In order to carry out either servicing or replacement of components, the heater front panel must be removed. Section 21.5 & 21.6

21.3.1 Remove the combustion air fan (CAF) and clean.

21.3.2 Clean and check the main burner and electrodes.

21.3.3 Visually check the combustion chamber in the heat exchanger, removing any debris.

21.3.4 Remove the Air Circulation Fan (ACF), inspect and clean.

21.3.5 Inspect and clean the Air Heat Exchanger.

21.3.6 Remove and clean the condensate trap.

21.3.7 Remove and clean the air filter.

21.3.8 After completing the servicing or exchange of components, always test for gas tightness.

21.3.9 When work is complete, the front panel **MUST** be correctly refitted, ensuring that a good seal is made.

DO NOT OPERATE THE APPLIANCE IF THE FRONT PANEL IS NOT FITTED.

21.3.10 Check the gas consumption.

21.3.11 Check combustion by connecting the flue gas analyser to the flue gas sampling point as shown in the diagram and measure CO & CO₂.

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

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



21.4 FLUE INSPECTION & CHECKS

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

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

Competence to carry out the check of combustion performance

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

- The person carrying out a combustion measurement should have been assessed as competent in the use of a flue gas analyser and the interpretation of the results.

21.4.1 After completing the servicing or exchange of components, always test for gas tightness and carry out functional checks as described above.

21.4.2 When work is complete, check the condition of the sealing foam in the inside of the front doors panels. When the door is refitted you must make ensure a good seal is made.

GAINING ACCESS TO THE HOT WATER HEATER

(Upper Section)

21.5 AIR FILTER REMOVAL

21.5.1 The air filter is removed by sliding it out from the front of the unit.

21.5.2 Check that the air filter is being regularly cleaned in accordance with the User's Instructions.

21.6 UPPER PANEL REMOVAL

21.6.1 To remove the upper panel remove the air filter.

21.6.2 Remove the two fixing screws, slacken the second two screws and pull panel forward and swing open.

21.6.3 To refit upper panel slide panel up into the two location lugs reposition and replace the two screws.

21.7 CONTROL PANEL

21.7.1 Remove the air filter, upper door and lower door (see sections 21.5 & 21.6) to access the control panel fixing screws.

21.7.2 Remove the three screws on the left of the control panel, as well as two screws on the right hand side of the panel.

21.7.3 The control panel will be loose and hung in place by the wires.

21.7.4 Refit in reverse order.

21.8 COMBUSTION AIR FAN

Refer to sections 21.5 & 21.6

21.8.1 Disconnect the electrical leads from the fan.

21.8.2 Remove 4 screws attached to the heat exchanger burner arm.

21.8.3 Remove the screws from the venturi, the combustion fan should now be released.

21.8.4 Refit in reverse order.

21.9 BURNER ASSEMBLY

Refer to sections 21.5, 21.6 and 21.7

- 21.9.1 Remove all electrical leads from the heat exchanger (ignition lead, flame sensor, earth wire and combustion gas temperature sensor).
- 21.9.2 Remove 4 screws to detach combustion fan from burner heat exchanger arm.
- 21.9.3 Remove 4 nuts on the heat exchanger.
- 21.9.4 Lift out the burner from the combustion chamber.
- 21.9.5 Brush off any deposits that may be on the burner with a soft brush. Inspect the ignition/detection electrode and check the electrode gaps.
- 21.9.6 Inspect the sealing gasket around the burner for any signs of damage. Replace if necessary.
- 21.9.7 Refit in reverse order.

21.10 WATER HEAT EXCHANGER

Refer to sections 21.5 to 21.9.

- 21.10.1 Inspect the inside of the combustion chamber, with a soft brush remove any deposits that may have occurred. Flush with clean water. DO NOT use any chemicals.
- 21.10.2 Inspect the heat exchangers insulation at the front and back of the combustion chamber for any signs of damage, then if there is damage it must be replaced.
- 21.10.3 If there are any signs of damage on the flue outlet then this must be replaced.
- 21.10.4 Refit in reverse order.

GAINING ACCESS FOR SERVICING THE HEAT GENERATOR

(Lower section)

21.11 FRONT LOWER PANEL REMOVAL

- 21.11.1 To remove the front panel remove the air filter. See section 21.5
- 21.11.2 Remove the two fixing screws and pull panel forward and up to remove.
- 21.11.3 To refit, slot panel back into position. Replace the two screws.

21.12 AIR CIRCULATION FAN

- 21.12.1 Refer to sections 21.5 & 21.11. Disconnect the 2 inline connectors on the fan assembly.
- 21.12.2 Release the screws securing the fan and withdraw.
- 21.12.3 Remove all dust from both the impeller and motor and taking care not to disturb the balance of the fan.
- 21.12.4 Refit or replacement is in reverse order.

21.13 AIR HEAT EXCHANGER

Refer to section 21.11

- 21.13.1 Remove 4 screws on the heat exchanger inspection panel, then remove panel to reveal heat exchanger.
- 21.13.2 Check the heat exchanger airways are free from obstructions. If necessary, clean with a vacuum cleaner from the heat exchanger inspection panel, taking care to not damage the airways.

CAUTION: THE ELEMENTS OF THE HEAT EXCHANGER ARE VERY FRAGILE.

- 21.13.3 Check the condition of the external strainer, cleaning as necessary.

21.15 CONDENSATE TRAP

Refer to section 21.5 & 21.6

- 21.15.1 Pull off the rubber pipe noting the position.
- 21.15.2 Remove the trap and clean by removing the top cap and clean float.
- 21.15.3 Reassembly and refit in reverse order.

22. PARTS REPLACEMENT

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

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

22.1.2 Remove any debris from within the appliance.

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

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

PART REPLACEMENTS WITHOUT DRAINING THE SYSTEM

22.2 CONTROL PANEL

Refer to section 21.5 and 21.6.

22.2.1 Remove three screws on the left of the control panel, as well as two screws on the right hand side of the panel.

22.2.2 The control panel will be loose and now hung by the wires.

22.2.3 Remove the wires, replace the PCB

22.2.4 Refit in reverse order.

22.3 COMBUSTION AIR FAN

Refer to sections 21.5 and 21.6

22.3.1 Disconnect the electrical leads from the fan.

22.3.2 Remove 4 screws attached to the heat exchanger burner arm.

22.3.3 Remove screws from Venturi

22.3.4 Remove combustion fan and refit in reverse order.

22.4 BURNER ASSEMBLY

Refer to sections 21.5, 21.6 & 21.7

22.4.1 Remove all electrical leads from the heat exchanger (ignition lead, flame sensor, earth wire and combustion gas temperature sensor).

22.4.2 Remove 4 screws to detach combustion fan from burner heat exchanger arm.

22.4.3 Remove 4 nuts on the heat exchanger.

22.4.4 Replace the sealing gasket around the burner.

22.4.5 Replace with new burner assembly.

22.4.6 Refit in reverse order.

22.5 FLOW TEMPERATURE SENSORS

Refer to sections 21.5 & 21.6

22.5.1 Unclip the flow thermistor at the front, from the flow pipe and disconnect the wire. Withdraw from the heater.

22.5.3 Reconnect the electrical leads to the new thermistor and reassemble in reverse order, ensuring that the thermistor are securely fitted to the pipes on the thermistor located tabs as shown.

22.5.4 Check the operation of the heater. See section 17.

22.6 IGNITION/DETECTION ELECTRODE

Refer to sections 21.5 & 21.6

22.6.1 Remove the HT lead.

22.6.2 Remove the 2 screws holding the ignition electrode to the combustion chamber.

22.6.3 Remove the electrode.

22.6.4 Fit the new ignition electrode with a 3.5mm gap between the prongs. Use the new gasket supplied.

22.6.5 Check the operation of the heater. See Section 17

22.7 GAS VALVE

Refer to sections 21.5 & 21.6.

22.7.1 Unplug the electrical lead.

22.7.2 Undo the union nut on the outlet of the gas control valve, rotate out of the way.

22.7.3 Undo the gas inlet pipe union at the inlet to the gas control valve.

22.7.4 Fit the new gas valve ensuring the two sealing washers are in place and reconnect gas and electrical connections.

22.8.5 Check operation of the heater. See Section 17.

22.8 WARM AIR PCB

Refer to sections 21.5, 21.6 & 21.7

22.8.1 Remove the PCB wiring

22.8.2 Release the 4 corner clips securing the PCB and withdraw it.

22.8.3 Replace and refit is in reverse order.

22.9 PCB INTERFACE

Refer to sections 21.5, 21.6 & 21.7

22.9.1 Unplug all wires from the PCB assembly.

22.9.2 Release the 4 corner clips securing the PCB and withdraw the panel.

22.9.3 Fit new PCB and reconnect all plug and wire connections.

22.9.4 Check operation of the heater. See Section 17.

22.10 AIR CIRCULATION FAN

Refer to section 21.11.

22.10.1 Disconnect the 2 inline connectors on the fan assembly.

22.10.2 Release the screws securing the fan and withdraw.

22.10.3 Replace and refit in reverse order.

22.11 CONDENSATE TRAP

Refer to sections 21.5 & 21.6.

22.11.1 Pull off the rubber pipe noting the position.

22.11.2 Unscrew the top pipe from the trap.

22.11.3 Unclip the trap and replace.

22.11.4 Refit in reverse order.

22.12 DIVERTER ACTUATOR HEAD

Refer to section 21.6

22.12.1 Unplug the electrical connections.

22.12.2 Pull out the retaining clip and lift diverter head from body of the valve.

22.12.3 Replace and refit in reverse order.

22.12.4 Check the operation of the appliance.

PART REPLACEMENTS BY DRAINING THE SYSTEM

22.13 DRAINING THE APPLIANCE

- 22.13.1 To drain the appliance, attach a length of hose to the drain point then open the drain valve.
- 22.13.2 Replace the necessary component.
- 22.13.3 After replacement close the drain valve and open all isolation valves and refill the system.
- 22.13.4 Ensure that all air locks are expelled, and check for water soundness.

22.14 PUMP HEAD

Refer to sections 19.5, 19.11 & 20.13. **(drain the appliance).**

- 22.14.1 Disconnect the electrical lead from the pump head.
- 22.14.2 Remove the 4 screws securing the pump head and remove.
- 22.14.3 Replace and refit in reverse order.
- 22.14.4 Refill and check operation of the appliance.

22.15 AIR HEAT EXCHANGER

Refer to sections 21.5, 21.11 & 21.13. **(drain the appliance).**

- 22.15.1 Disconnect the water flow temperature sensor.
- 22.15.2 Release the flow and return pipe nuts to loosen off the pipe.
- 22.15.3 Release the clip and remove the heat exchanger by sliding it forward.

NOTE: There will still be water in the heat exchanger.

- 22.15.4 Replacement and refit in reverse order.
- 22.15.5 Refill and check operation of the appliance.

23. HOT WATER FAULT FINDING- BLOCKING CODES

Should a fault arise, the display will alternate between “ER” and the fault code number. Any faults marked with N/A in the Corrective Action column should not be present on the appliance and indicate incorrect programming of the PCB - contact Johnson & Starley Ltd Technical department to assist with re-programming. If there is no fault code, potential failure causes include condensate pump high level cut-off, zone valve failure, programmer failure, Aquair PCB failure, room thermostat failure, and air circulation fan failure.

| Error Code | Type | Description |
|-----------------|---|--|
| ER 01 + RESET | Ignition failure | Check gas supply pressure, ignition electrode, spark generator and PCB |
| ER 02 + RESET | High limit stat open circuit | Check for overheat, air lock, blockage in waterways. Will take ~1 min to clear after temp reduced to normal level |
| ER 03 + RESET | Generic lockout | N/A |
| ER 04 + SPANNER | No circulation | Re-programme PCB |
| ER 05 + RESET | No tacho from combustion fan | Combustion fan or PCB fault |
| ER 06 + SPANNER | CH flow temp sensor out of range | Switch off power, measure resistance across sensor and compare to temp/resistance graph |
| ER 07 + SPANNER | DHW flow temp sensor out of range | Re-programme PCB |
| ER 08 + SPANNER | OTC (outside temperature control) out of range | Re-programme PCB |
| ER 09 + SPANNER | Flue sensor open circuit (out of range - resistance too high) | Ensure flue sensor connected. Check continuity between flue sensor and PCB. Switch off power, measure resistance across flue temp sensor and compare to temp/resistance graph |
| ER 10 + RESET | Flue sensor short circuit (out of range - resistance too low) | Switch off power, measure resistance across flue temp sensor and compare to temp/graph. Check for flue blockage. Flue too long/restrictive |
| ER 11 + RESET | False flame (detection electrode fault) | Detection electrode or PCB failure. Check if the detection electrode is touching to heat exchanger |
| ER 12 + SPANNER | CH return temp sensor out of range | Re-programme PCB |
| ER 14 + SPANNER | Over-heat (temp increase of >2°/s) | Must wait 60s after temp reduced to reset. Turn unit off/on using control panel to reset. Air purge, check for blockages, try on CH or DHW only to narrow down search |
| ER 14 + RESET | Over-heat (>105°C) | Must wait 60s after temp reduced to reset. Turn unit off/on using the control panel to reset. Air purge, check for blockages, try on CH or DHW only to narrow down search. Check continuity through over-heat sensor once within normal operation temp range |
| ER 15 + RESET | Differential over-temp across CH flow/return | Re-programme PCB |
| ER 16 + RESET | Differential over-temp across DHW flow/return | Re-programme PCB |
| ER 17 + RESET | No circulation at start up | Re-programme PCB |
| ER 18 + RESET | No water circulation fault | Re-programme PCB |
| ER 19 + SPANNER | DHW inlet probe fault | Re-programme PCB |
| ER 20 SPANNER | Return plates probe fault | Re-programme PCB |
| ER 25 + RESET | Flame failure | Check condition and distance of detection electrode. See ER 01 corrective action |
| ER 69 + SPANNER | Water pressure sensor not connected | Check and re-make connection between PCB and pressure sensor |
| ER 99 | PCB configuration fault | Re-programme PCB |

| DC VOLTAGE ACROSS PIPE SENSOR | APPROX. PIPE TEMP. °C | DC VOLTAGE ACROSS PIPE SENSOR | APPROX. PIPE TEMP. °C | DC VOLTAGE ACROSS PIPE SENSOR | APPROX. PIPE TEMP. °C | DC VOLTAGE ACROSS PIPE SENSOR | APPROX. PIPE TEMP. °C |
|-------------------------------|-----------------------|-------------------------------|-----------------------|-------------------------------|-----------------------|-------------------------------|-----------------------|
| 3.24 | 10 | 2.13 | 33 | 1.26 | 56 | 0.73 | 79 |
| 3.19 | 11 | 2.08 | 34 | 1.23 | 57 | 0.71 | 80 |
| 3.14 | 12 | 2.04 | 35 | 1.20 | 58 | 0.70 | 81 |
| 3.09 | 13 | 1.99 | 36 | 1.17 | 59 | 0.68 | 82 |
| 3.04 | 14 | 1.95 | 37 | 1.15 | 60 | 0.66 | 83 |
| 2.99 | 15 | 1.91 | 38 | 1.12 | 61 | 0.65 | 74 |
| 2.94 | 16 | 1.87 | 39 | 1.09 | 62 | 0.63 | 85 |
| 2.89 | 17 | 1.83 | 40 | 1.07 | 63 | 0.63 | 76 |
| 2.84 | 18 | 1.79 | 41 | 1.04 | 64 | 0.60 | 87 |
| 2.79 | 19 | 1.75 | 42 | 0.02 | 65 | 0.59 | 88 |
| 2.75 | 20 | 1.71 | 43 | 0.66 | 66 | 0.58 | 89 |
| 2.70 | 21 | 1.67 | 44 | 0.97 | 67 | 0.56 | 90 |
| 2.65 | 22 | 1.63 | 45 | 0.95 | 68 | 0.55 | 91 |
| 2.60 | 23 | 1.59 | 46 | 0.92 | 69 | 0.54 | 92 |
| 2.55 | 24 | 1.56 | 47 | 0.90 | 70 | 0.53 | 93 |
| 2.50 | 25 | 1.52 | 48 | 0.88 | 71 | 0.51 | 94 |
| 2.45 | 26 | 1.49 | 49 | 0.86 | 72 | 0.50 | 95 |
| 2.40 | 27 | 1.45 | 50 | 0.84 | 73 | 0.49 | 96 |
| 2.36 | 28 | 1.42 | 51 | 0.82 | 74 | 0.48 | 97 |
| 2.31 | 29 | 1.39 | 52 | 0.80 | 75 | 0.47 | 98 |
| 2.26 | 30 | 1.35 | 53 | 0.78 | 76 | 0.46 | 99 |
| 2.22 | 31 | 1.32 | 54 | 0.76 | 77 | 0.45 | 100 |
| 2.17 | 32 | 1.29 | 55 | 0.75 | 78 | TABLE 4 | |

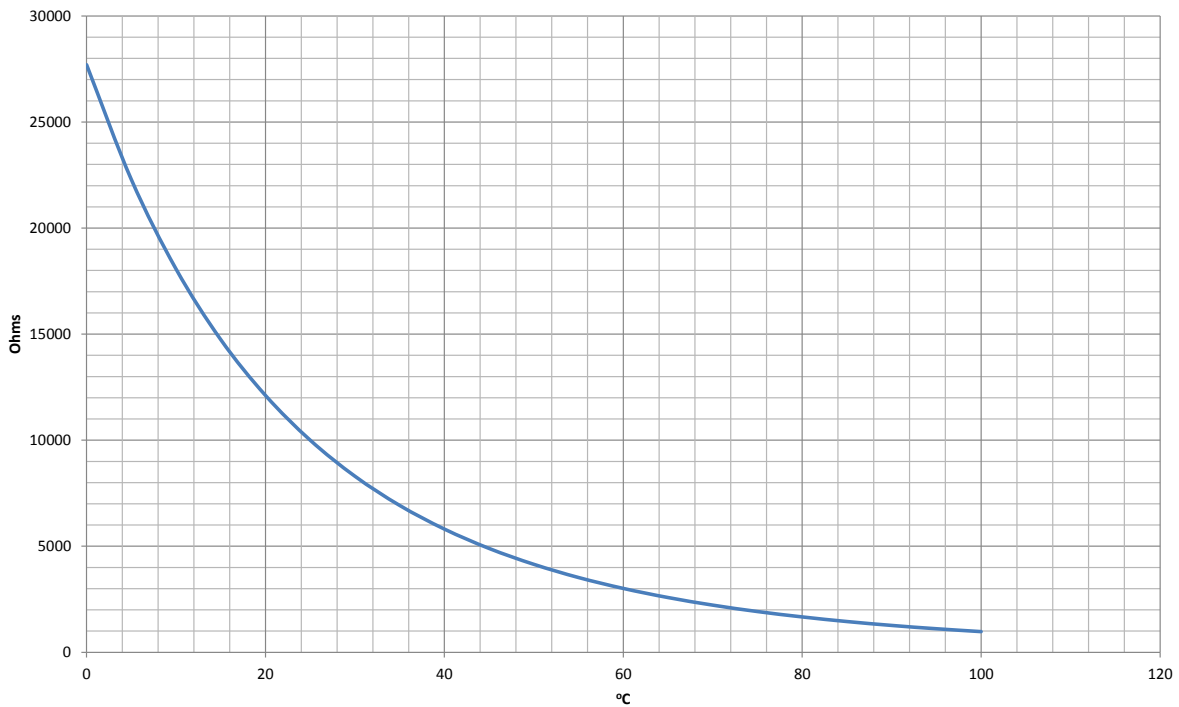
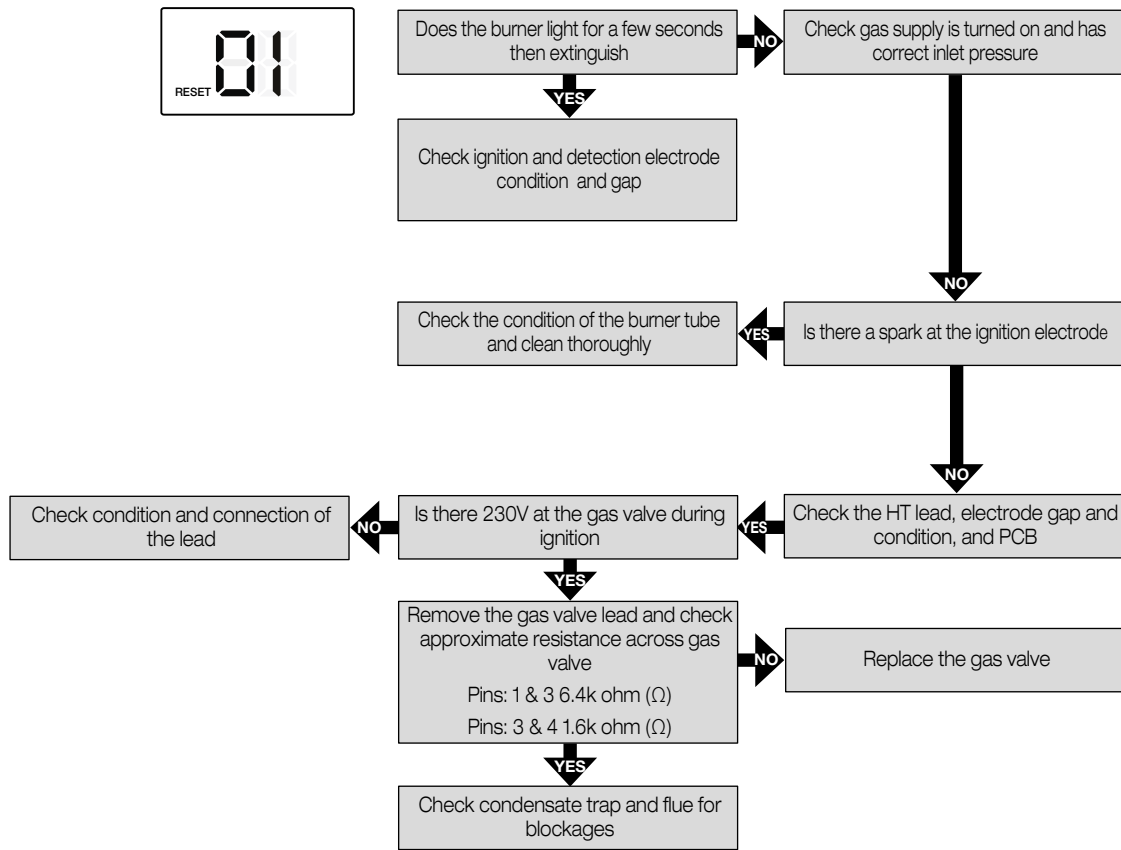


FIGURE 9. SENSOR TEMPERATURE/RESISTANCE DIAGRAM

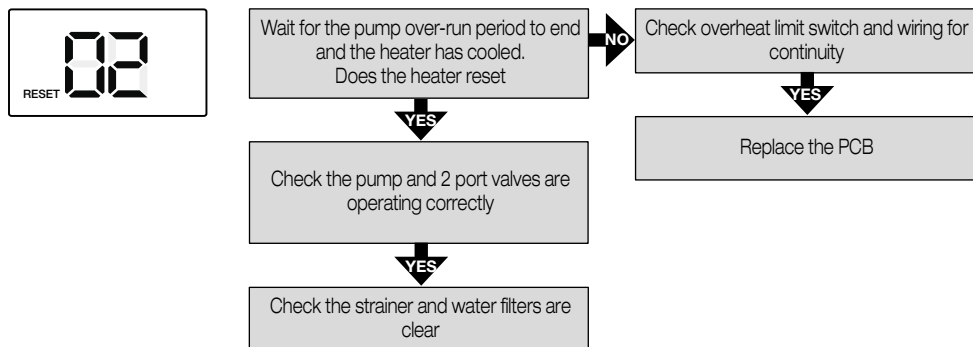
24. FAULT FINDING FLOWCHARTS & BLOCKING CODES

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

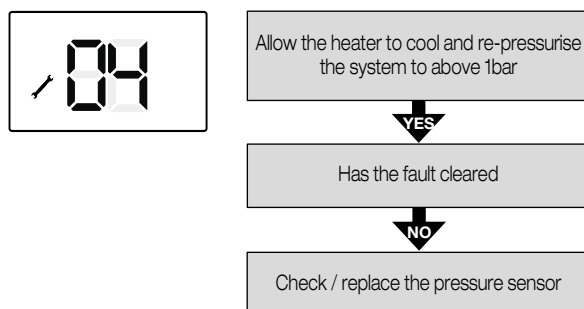
IGNITION LOCKOUT



OVERHEAT HIGH LIMIT

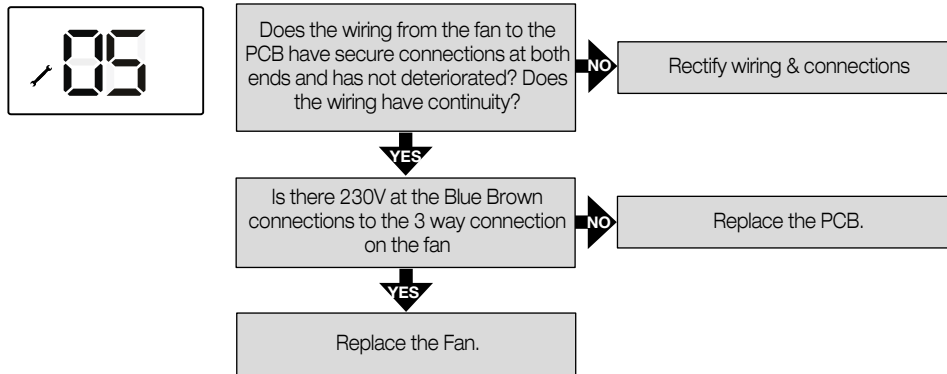


NO WATER CIRCULATION, LOW WATER PRESSURE

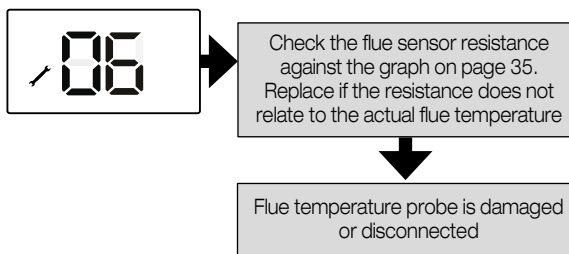


FAULT FINDING.

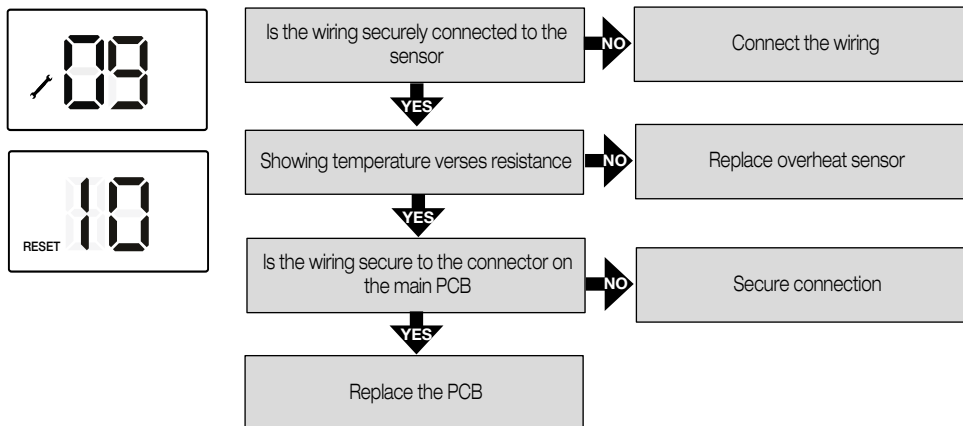
COMBUSTION FAN FAULT



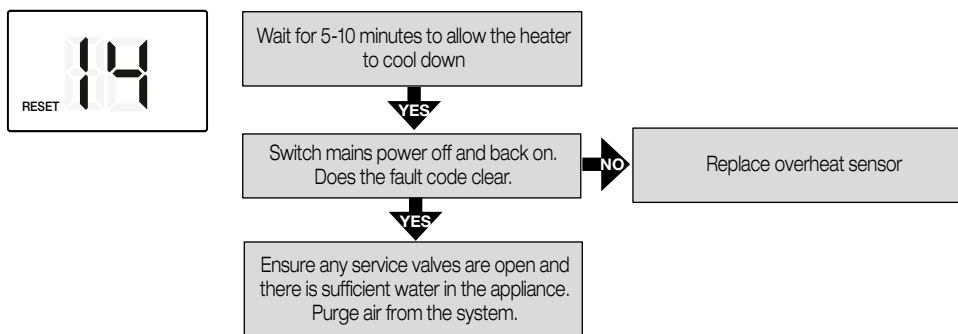
FLUE SENSOR



FLUE TEMPERATURE SENSOR LOCKOUT

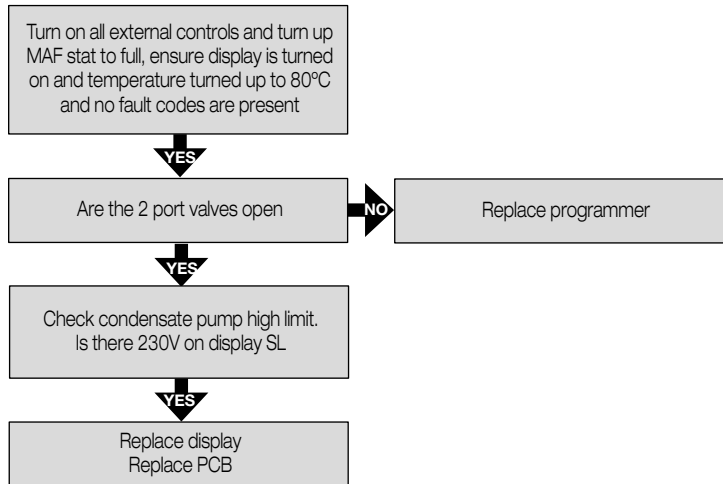


OVERHEAT

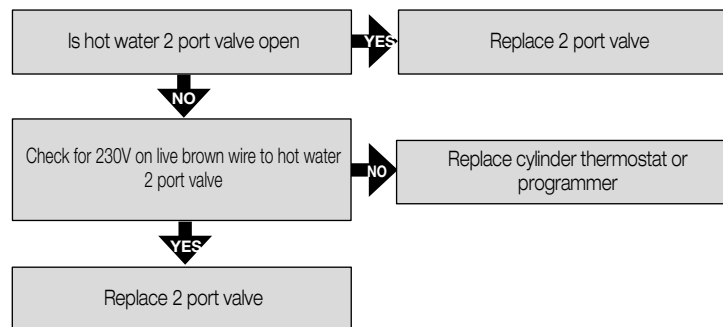


FAULT FINDING.

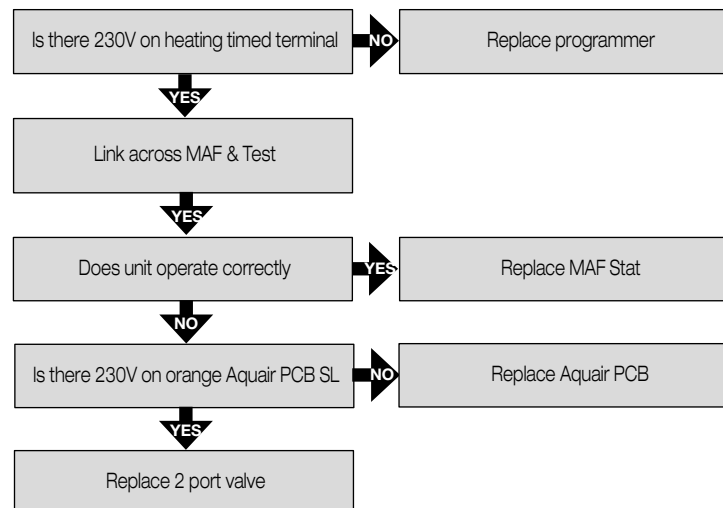
FAILURE TO LIGHT



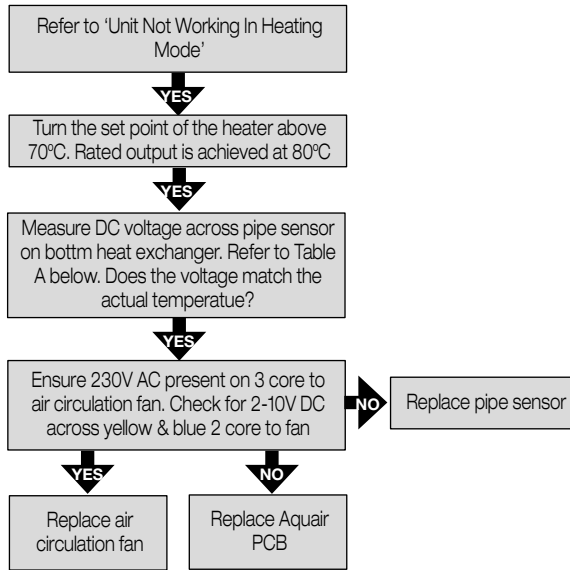
NOT OPERATING IN HOT WATER MODE



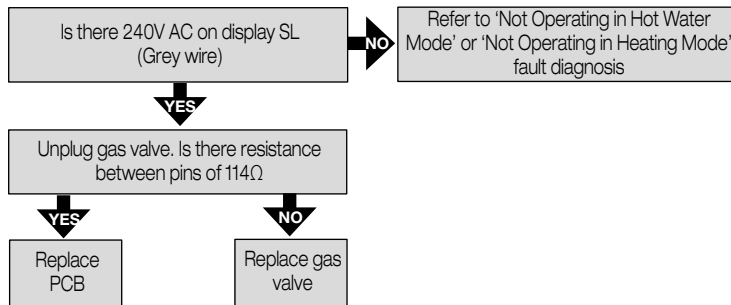
NOT OPERATING IN HEATING MODE



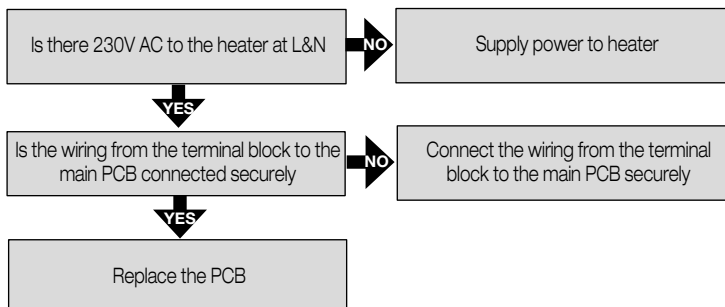
AIR CIRULATION FAN NOT OPERATING



GAS VALVE NOT OPENING



NO DISPLAY



25. WARMCAIR DW SERIES II WIRING DIAGRAMS

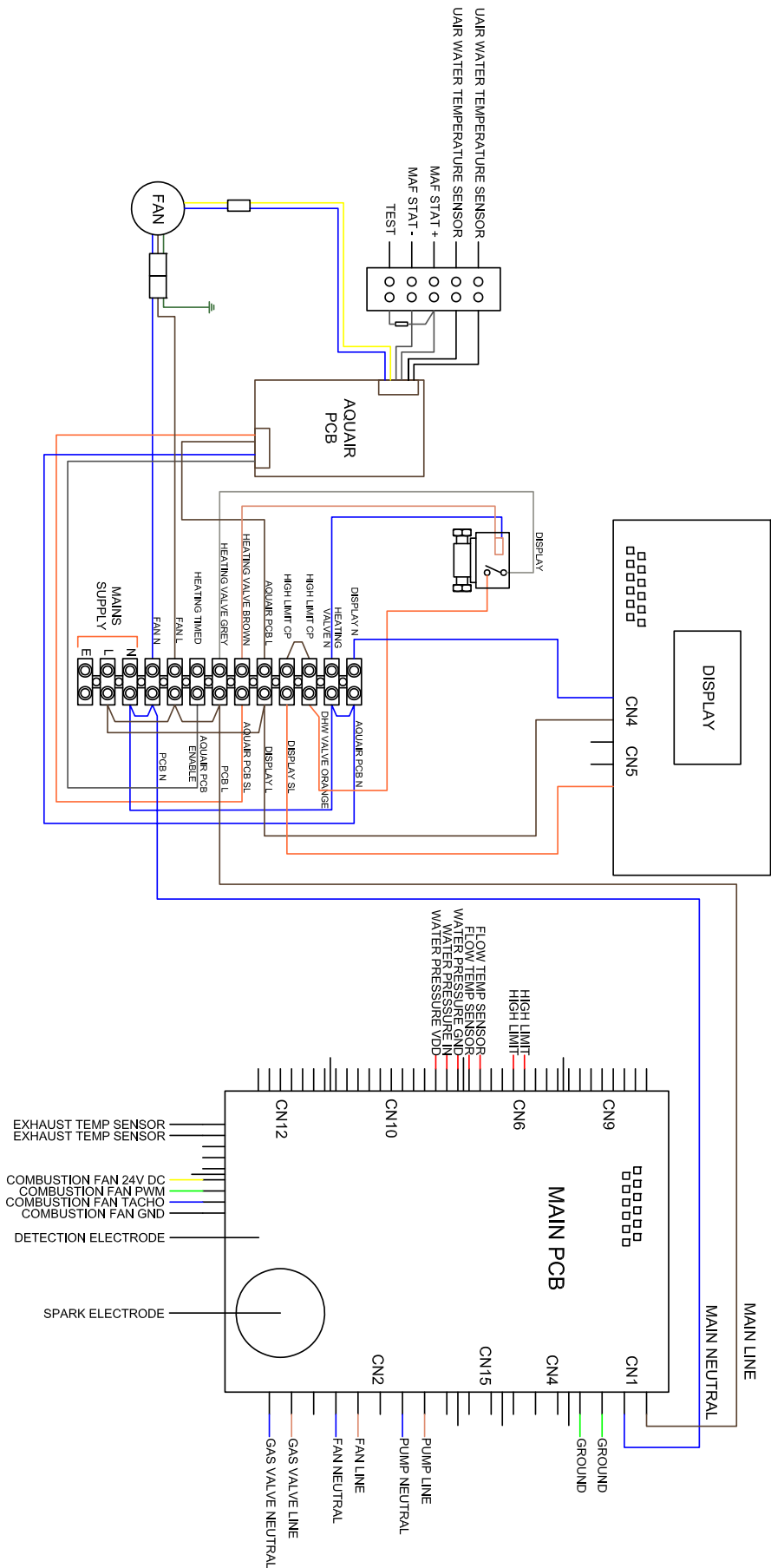


FIGURE 10. WARMCAIR DW SERIES II INTERNAL WIRING DIAGRAM

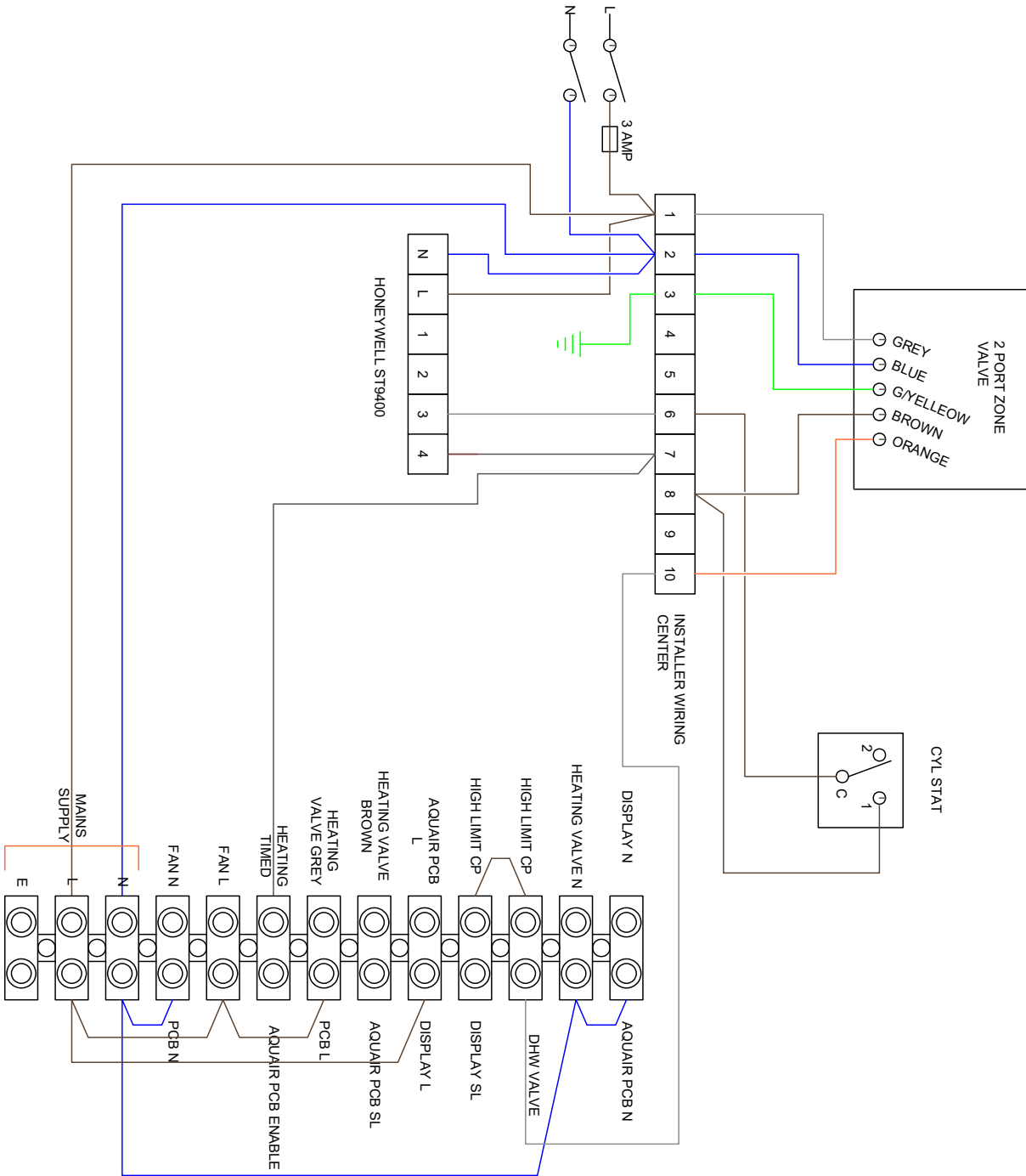
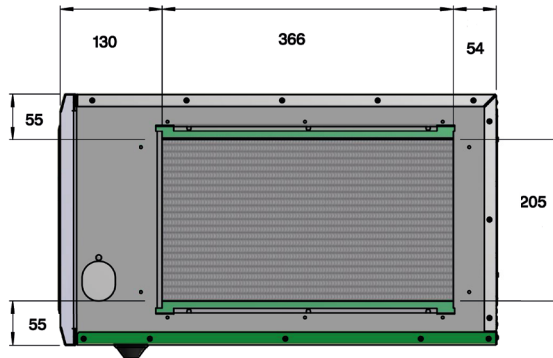
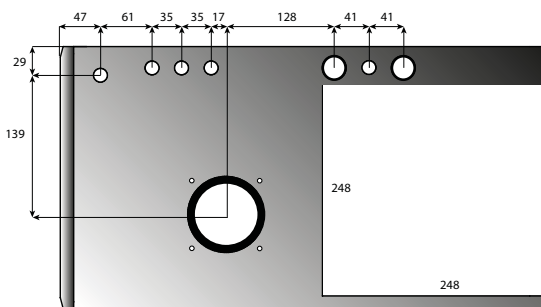
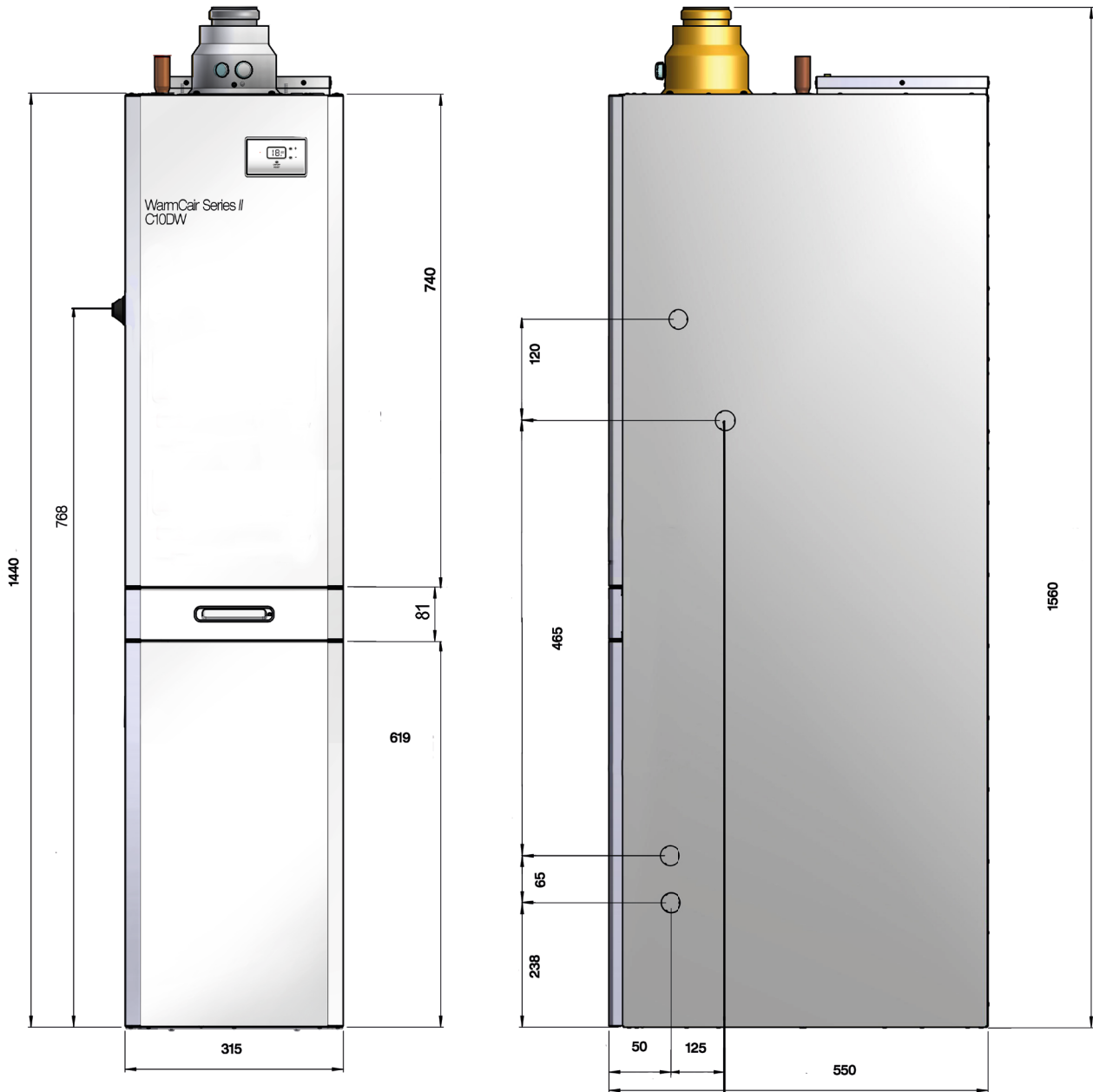


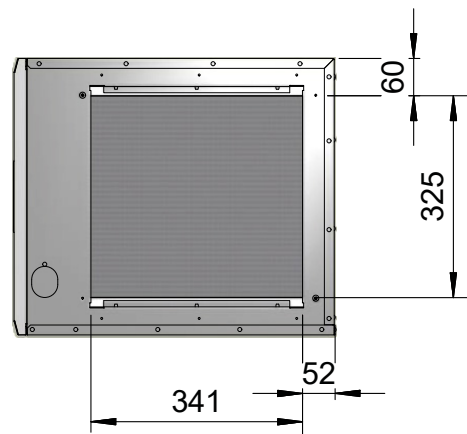
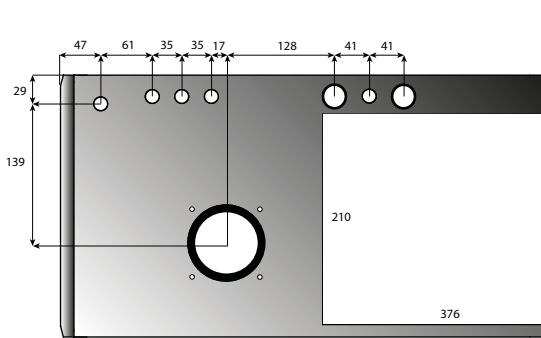
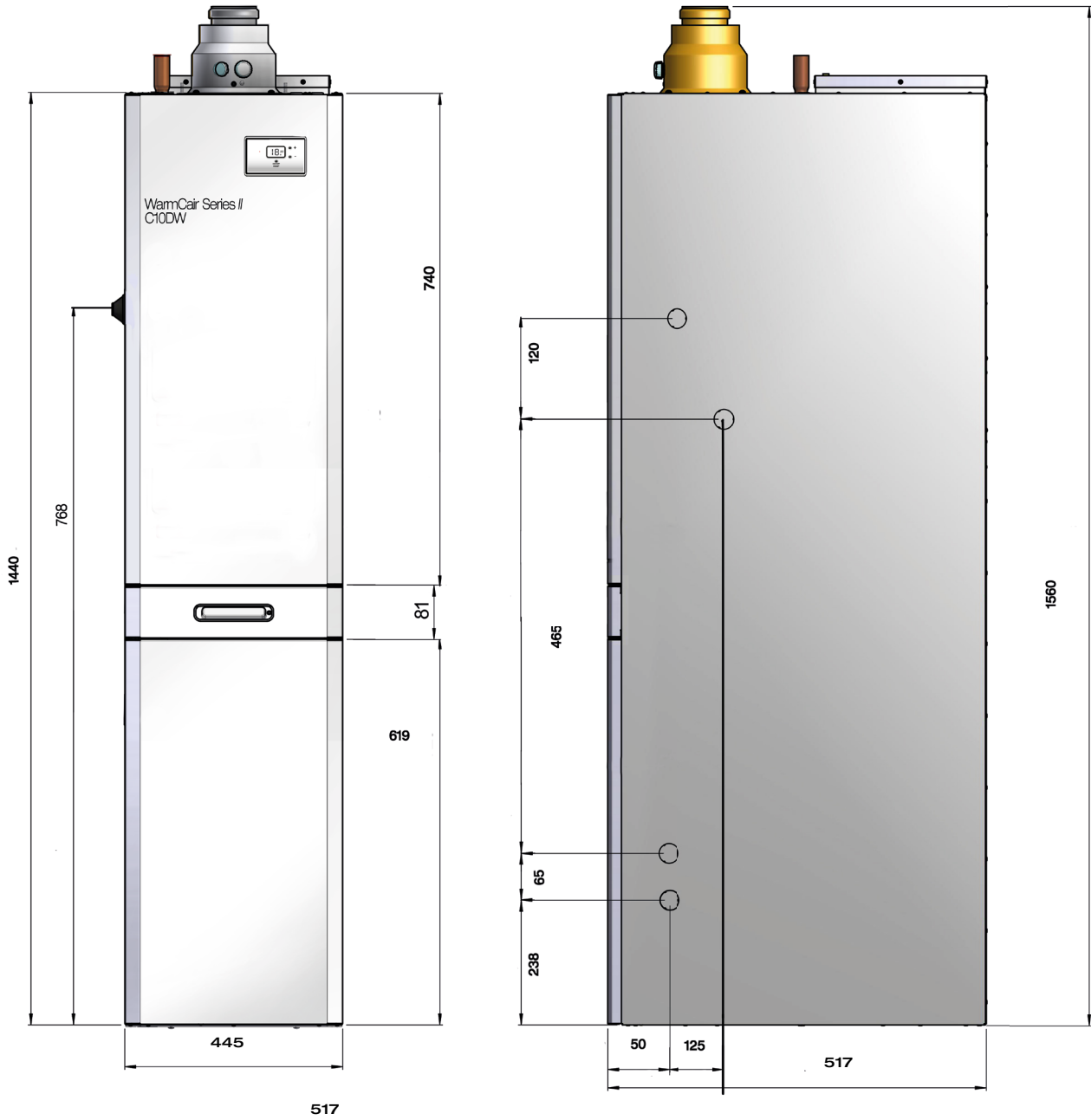
FIGURE 11. WARMCAIR DW SERIES II EXTERNAL WIRING DIAGRAM

26. DIMENSIONS C10DW

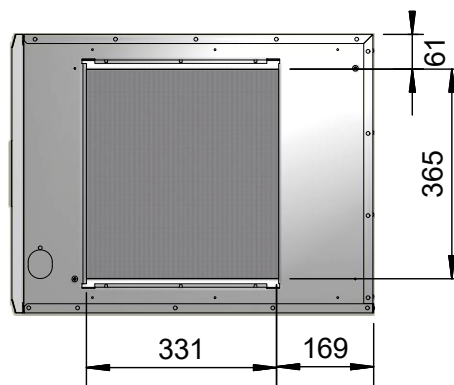
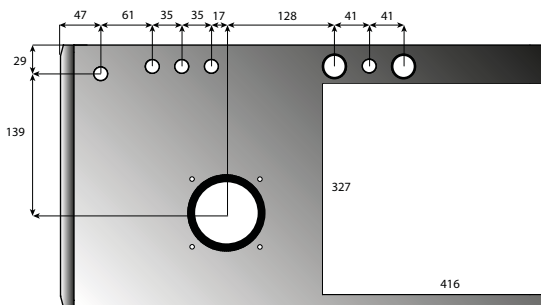
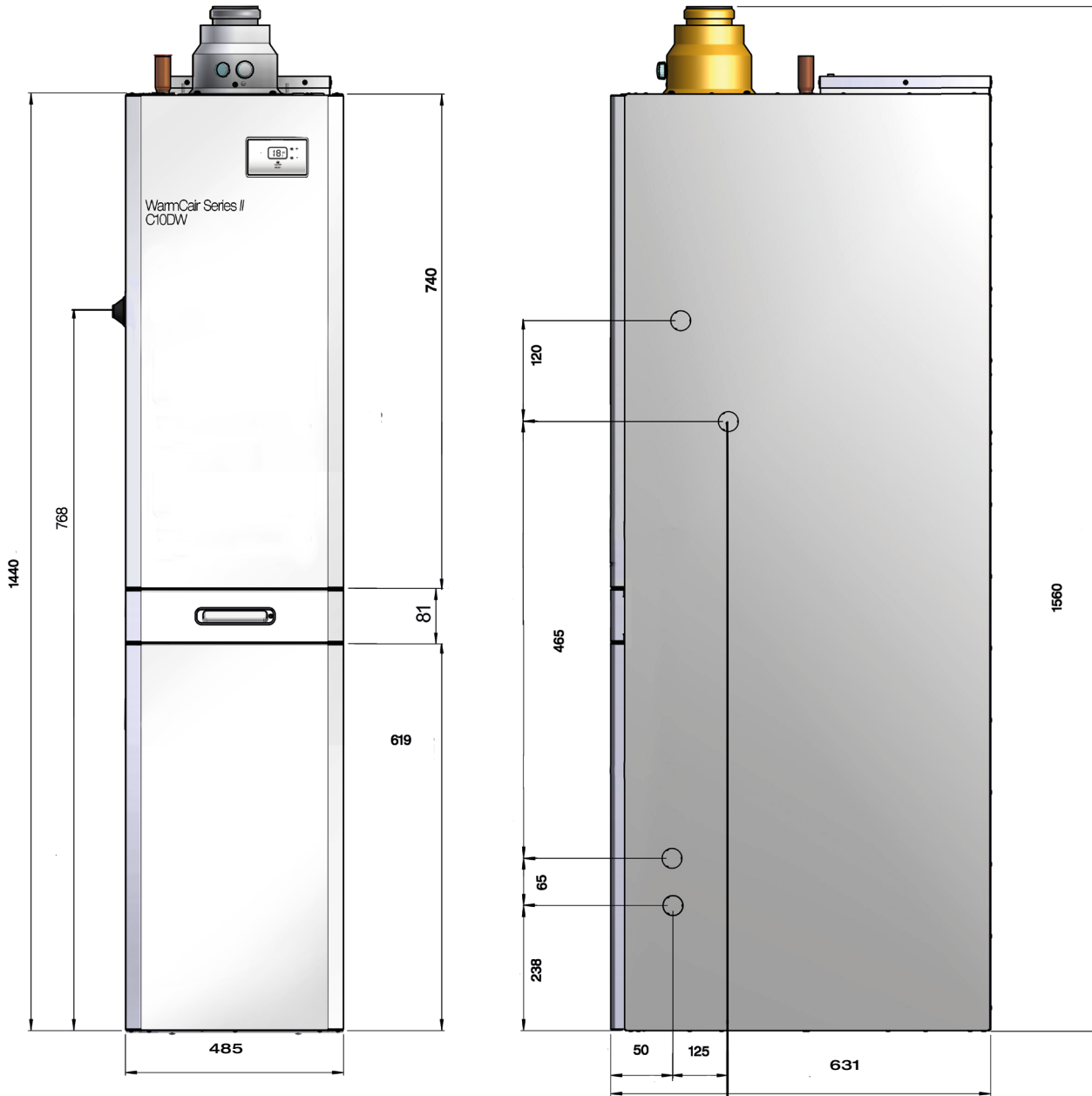


C10DW Only

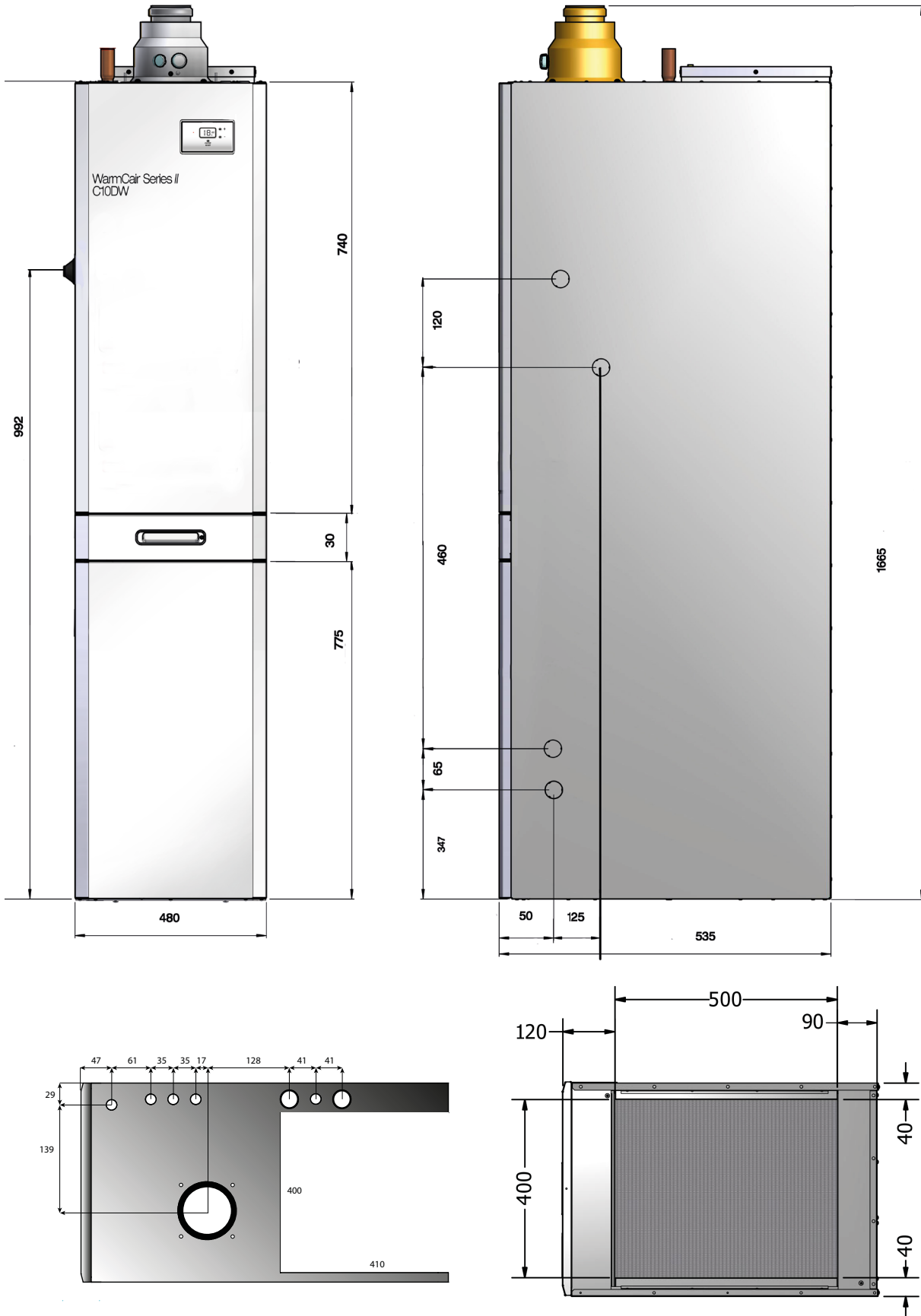
26. DIMENSIONS C16DW



26. DIMENSIONS C20DW




26. DIMENSIONS C25DW



27. LIST OF SPARES

| ITEM | DESCRIPTION | QTY | PART No. | G. C. No. | |
|------|-----------------------------------|-----|--------------|-----------|---|
| 1 | Replacement Kit - Pump CDW II | 1 | 1000-0303055 | |  |
| 2 | Replacement Kit - Gas Valve CDWII | 1 | 1000-0700755 | | |
| 3 | Combustion Fan Kit CDW II | 1 | 1000-0527895 | |  |
| 4 | Venturi 25kW Sigma | 1 | 1000-0700765 | |  |
| 5 | Kit: Temperature Sensor | 1 | 1000-0526515 | |  |
| 6 | Temperature Sensor Clip On 15mm | 1 | 1000-0526500 | | |
| 7 | Valve: Bypass 22mm Diff | 1 | 1000-0303080 | |  |
| 8 | Valve: Diverter | 1 | 1000-0303060 | |  |
| 9 | Condense Trap | 1 | 1000-0024520 | |  |
| 10 | Pressure Transducer | 2 | 1000-0020325 | |  |
| 11 | Strainer: Y Type 22mm* 22mm Comp | | 1000-0303070 | |  |

| ITEM | DESCRIPTION | QTY | PART No. | G. C. No. | |
|------|---------------------------------|-----|--------------|-----------|---|
| 12 | Heat Exchanger MHYTECH 28-32KW | 1 | 1000-0302090 | | |
| 13 | PCB: WarmCair Series II | 1 | 1000-0527900 | |  |
| 14 | PCB: Assembly: Aquair | 1 | 1000-0526270 | |  |
| 15 | Harness- Spark Lead | 1 | 1000-0534190 | |  |
| 16 | Ionisation Lead | 1 | 1000-0522690 | |  |
| 17 | PCB: Display WarmCair Series II | 1 | 1000-0528005 | |  |
| 18 | Heat Exchanger Assembly | 1 | AQ10-0138000 | |  |
| 19 | Heat Exchanger Assembly | 1 | AQ16-0138000 | |  |
| 20 | Heat Exchanger Assembly | 1 | AQ20-138000 | |  |
| 21 | Heat Exchanger Assembly | 1 | AQ25-138000 | |  |
| 22 | Fan: Air Circulation C10 | 1 | 1000-0524900 | |  |

| ITEM | DESCRIPTION | QTY | PART No. | G. C. No. | |
|------|----------------------------------|-----|--------------|-----------|---|
| 23 | <i>Fan Assembly</i> | 1 | AQ16-012600 | |  |
| 24 | <i>Fan & Flange Assembly</i> | 1 | AQ20-0126005 | | |
| 25 | <i>Fan Assembly (Nicotra)</i> | 1 | AQ36-0504000 | | |

28. LIST OF ANCILLARIES

| WARMCAIR C10DW ANCILLARY'S | | | | |
|---------------------------------------|---------|---------|--------|--------|
| Description | C10DW | C16DW | C20DW | C25DW |
| <i>Cleanflow</i> | CF10DW | CF16DW | CF20DW | N/A |
| <i>Return Air Kit</i> | TBA | TBA | TBA | TBA |
| <i>Base Duct</i> | WBX10W | WBX16W | WBX20W | WBX25W |
| <i>Slot Fix Kit</i> | TS10W | TS16W | N/A | N/A |
| <i>Slot Fix & Grille Kit</i> | TSG10W | TSG16DW | N/A | N/A |
| <i>Top Closure Kit (4 Sided)</i> | TC10W | TC16W | N/A | N/A |
| <i>Rear Riser Duct Kit</i> | ER10W | N/A | N/A | N/A |
| <i>Rear Riser Duct Kit (Extended)</i> | ER102WR | N/A | N/A | N/A |

Benchmark Commissioning & Guarantee Validation Service Record

It is a requirement that the boiler is installed and commissioned to the manufacturers' instructions and the data fields on the commissioning checklist completed in full.

To instigate the boiler guarantee the boiler needs to be registered with the manufacturer within one month of the installation. The guarantee rests with the end-user (consumer), and they should be made aware it is ultimately their responsibility to register with the manufacturer, within the allotted time period.

It is essential that the boiler is serviced in line with the manufacturers' recommendations, at least annually. This must be carried out by a competent Gas Safe registered engineer. The service details should be recorded on the Benchmark Service and Interim Boiler Work Record and left with the householder. Failure to comply with the manufacturers' servicing instructions and requirements will invalidate the guarantee.



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

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

* All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.

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CONDENSING WARM AIR COMMISSIONING CHECKLIST AND GUARANTEE VALIDATION RECORD

| | | | | | | | | | | | | | | | |
|--|--|------------------------------|--|----------|--------|--|--|-----------------|----------|---------------------|-----|--------------------|--|-------|--|
| Address: | | | | | | | | | | | | | | | |
| Warm Air Heater make and model: | | | | | | | | | | | | | | | |
| Warm Air Heater serial number: | | | | | | | | | | | | | | | |
| Commissioned by (PRINT NAME): | | | | | | Gas Safe registration number: | | | | | | | | | |
| Company name: | | | | | | Telephone number: | | | | | | | | | |
| Company email: | | | | | | Company address: | | | | | | | | | |
| | | | | | | | | | | Commissioning date: | | | | | |
| Heating and hot water systems complies with the appropriate Building Regulations? | | | | | | | | | | | Yes | | | | |
| Optional: Building Regulations Notification Number (if applicable) | | | | | | | | | | | | | | | |
| Time, temperature control and boiler interlock provided for central heating and hot water: | | | | | | | | | | | Yes | | | | |
| WATER QUALITY (DW Models) | | | | | | | | | | | | | | | |
| The system has been flushed, cleaned and a suitable inhibitor applied upon final fill, in accordance with BS7593 and the warm air heater manufacturers instructions. | | | | | | | | | | | Yes | | | | |
| What system cleaner was used? | | | | | | Brand: | | | Product: | | | | | | |
| What inhibitor was used? | | | | | | Brand: | | | Product: | | | | | | |
| Primary water system filter | | Pre-existing | | | Fitted | | | Not required | | | | | | | |
| CENTRAL HEATING MODE measure and record (as appropriate) | | | | | | | | | | | | | | | |
| Gas rate (for combination boilers complete DHW mode gas rate) | | | | | | m ³ /hr | | or | | ft ³ /hr | | | | | |
| Central heating output left at factory settings? | | | | | | Yes | | No | | | | | | | |
| If no, what is the maximum central heating output selected? | | | | | | kW | | | | | | | | | |
| Dynamic gas inlet pressure | | | | | | mbar | | | | | | | | | |
| Central heating flow temperature | | | | | | °C | | | | | | | | | |
| Central heating return temperature | | | | | | °C | | | | | | | | | |
| System correctly balanced/rebalanced? | | | | | | Yes | | | | | | | | | |
| DOMESTIC HOT WATER MODE Measure and record (DW Models) | | | | | | | | | | | | | | | |
| Gas rate | | | | | | m ³ /hr | | or | | ft ³ /hr | | | | | |
| Dynamic gas inlet pressure at maximum rate | | | | | | mbar | | | | | | | | | |
| Cold water inlet temperature | | | | | | °C | | | | | | | | | |
| Hot water has been checked at all outlets | | | | | | Yes | | Temperature | | °C | | | | | |
| CONDENSATE DISPOSAL | | | | | | | | | | | | | | | |
| The condensate drain has been installed in accordance with the manufacturers' instructions and / or BS5546/BS6798 | | | | | | | | | | | Yes | | | | |
| Point of termination | | | | Internal | | External (only where internal termination impractical) | | | | | | | | | |
| Method of disposal | | | | Gravity | | Pumped | | | | | | | | | |
| ALL INSTALLATIONS | | | | | | | | | | | | | | | |
| Record the following | | At max rate | | CO | | ppm | | CO ₂ | | % | | CO/CO ₂ | | Ratio | |
| | | At min rate (where possible) | | CO | | ppm | | CO ₂ | | % | | CO/CO ₂ | | Ratio | |
| Where possible, has the flue integrity check been undertaken in accordance with the manufacturers' instructions and/or BS5546/BS6798 and are readings correct | | | | | | | | | | | Yes | | | | |
| The operation of the heater and system controls have been demonstrated to and understood by the customer | | | | | | | | | | | Yes | | | | |
| The manufacturers' literature, including Benchmark Checklist and Service Record, has been explained and left with the customer | | | | | | | | | | | Yes | | | | |
| Commissioning Engineer's signature | | | | | | | | | | | | | | | |
| Customer's signature (To confirm satisfactory demonstration and receipt of the manufacturers' literature) | | | | | | | | | | | | | | | |

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer

Heating and Hotwater Industry Council (HHIC)



www.centralheating.co.uk

SERVICE RECORD

It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

Service Provider

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

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 01 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 02 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 03 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 04 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 05 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 06 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 07 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 08 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 09 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

| | | | |
|-----------------------|--------------------------------|--------|------------------------------|
| SERVICE 10 | | Date: | |
| Engineer name: | | | |
| Company name: | | | |
| Telephone No: | | | |
| Gas safe register No: | | | |
| Record: | At max. rate: | CO ppm | AND CO ₂ % |
| | At min. rate: (Where Possible) | CO ppm | AND CO ₂ % |
| Comments: | | | |
| Signature | | | |

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