EcoKnight
Circulating type gas condensing water heater

Installation, Commissioning and Maintenance Instructions

Models:

EKW117
EKW190
EKW235
EKW295

Warning:

Read and fully understand this manual before attempting to install this Water heater. It can cause personal injury and damage to the Water heater when you do not read the manual and/or do not obey the instructions.

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DOCUMENT IDENTIFICATION

Article	Language	Version	Amended by
EcoKnight water heater ICM	English	April 2023	SJA

PREFACE

Lochinvar Ltd. reserves the right to modify specifications in this manual.

TRADEMARKS

Brand names in this manual are registered trademarks of their respective owners.

WARRANTY

Refer to the appendix Warranty (see Warranty) for the warranty provisions.

LIABILITY

User

Lochinvar accepts no liability when the water heater is not used correctly and requires the user to:

- Read this manual carefully and obey the instructions.
- Ask your installation engineer for advice about the use of the Water heater.
- Make sure that the service and maintenance activities are carried out by a qualified engineer.
- Store the manual, in good condition, near the Water heater.

Installation engineer

Lochinvar accepts no liability when the Water heater is not used correctly and requires the installation engineer to:

- Read this manual carefully and obey the instructions.
- Make sure that the entire Water heater installation complies with all applicable regulations.
- Make sure that the Water heater is tested before the installation is taken into use.
- Explain the correct use to the user.
- Notify the user when service and maintenance is required.
- Make sure that you hand over all applicable manuals.

Supplier

The EcoKnight water heater is designed in accordance with the applicable regulations. The Water heater is delivered with CE-marking and all necessary documentation in accordance with these regulations.

Lochinvar accepts no liability for claims from third parties when:

- The instructions for the correct installation of the Water heater are not followed.
- The instructions for the correct use of the Water heater are not followed.
- The Water heater has not been serviced as per the maintenance schedule.

For more information, refer to the General Terms of Sales. These are available on request, free of charge. We believe that this manual provides you with an accurate and complete description of all relevant components. If you, nonetheless, find errors or inaccuracies in this manual, please inform Lochinvar. This helps us to further improve our documentation.

COMPLIANCE

To safely produce low temperature hot water, the design and construction of the EcoKnight water heaters is in accordance with:

- UK and European Regulations 2016/426 on appliances burning gaseous fuels (GAR).
- UK and European Standard for Gas–fired central eating boilers (BS EN15502).
- UK and European Eco-Design Directive.

Refer to the appendix Declaration of conformity (See Appendix).

REGULATIONS

It is law that all gas appliances are installed by a competent person, registered with a H.S.E. approved body, in accordance with The Gas Safety (Installation and Use) Regulations 1998. Failure to install appliances correctly could lead to prosecution. It is in your own interest, and that of safety, to ensure that this law is complied with. The installation of the equipment MUST be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations, and the bylaws of the local water undertaking.

In addition, the installation should follow the relevant guidance offered in the following documents. It is not practical to list all relevant information due to continuous changes, but emphasis is placed on the following documents, as failure to comply with the guidance given will almost certainly result in an unsatisfactory installation:

Institute of Gas Engineers and Managers (IGEM) Publications

CIBSE Guides

Clean Air Act

H.S.E Guidance

Note

Manufacturer's notes must not be taken in any way as overriding statutory obligations.

Contact information!

In the event of problems with your gas, electricity, or water supply connections or when you have any comments or questions, please contact your (energy/water) supplier.

ABOUT THIS MANUAL

SCOPE

This manual gives information about safe and correct use of the Water heater and how installation, maintenance and service activities must be carried out correctly. You must obey the instructions in this manual.

Warning

Read and fully understand this manual before attempting to install this Water heater. It can cause personal injury and damage to the Water heater when you do not read the manual and/or do not obey the instructions.

The purpose of this manual is to:

- Describe the working principles and layout of the Water heater.
- Explain the safety devices.
- Highlight possible hazards.
- Describe the use of the Water heater.
- Describe the installation, service, and maintenance of the Water heater.

This manual has two parts:

A User part that describes the correct usage of the Water heater.

An Installation, Maintenance and Service part, that describes the correct installation and maintenance procedures.

TARGET GROUP

The information in this manual applies to three target groups:

- Users
- Installation engineers
- Service and maintenance engineers

The User part is intended for the (end) users. The Installation, Maintenance and Service part is intended for the installation engineers and the service and maintenance engineers.

There is a separate Service manual which covers maintenance and fault finding in greater detail.

This manual contains the following text styles/symbols for situations that may endanger users/engineers, cause damage to equipment or need special attention:

Note

A note gives more information on a topic.

Caution

Obey the caution instructions to prevent damage to the Water heater.

Warning

Obey the warning instructions to prevent danger of personal injury, and serious damage to the Water heater.

TABLE OF CONTENTS

USER PART

SAFETY

Lochinvar cannot be held responsible for damages or injuries which can lead back to:

Failure to follow the instructions provided in this manual.

Carelessness during use or maintenance of the Water heater.

Every user must study the user part of this manual and must follow the instructions in this part of the manual strictly. Do not change the sequence of the described actions. This manual must be always available for the user and service engineer.

Warning

- **If you smell gas:**
- **Shut off the mains gas supply valve!**
- **Avoid causing sparks! Do not use any electrical equipment or switch, i.e., no telephones, plugs or bells!**
- **No naked flames! No smoking!**
- **Open windows and doors!**
- **Warn occupants and leave the building!**
- **After leaving the building, alert the gas distribution company.**

Caution

Do not store or use chemical substances in the room where the Water heater is installed because of the risk of explosion and corrosion of the Water heater. Some propellants, bleaching agents and degreasing agents etc. give off explosive vapours and/or cause accelerated corrosion. If the Water heater is used in a room where such substances are stored or used, the warranty will be void.

Caution

Installation, maintenance, and service may only by carried out by a qualified engineer.

Caution

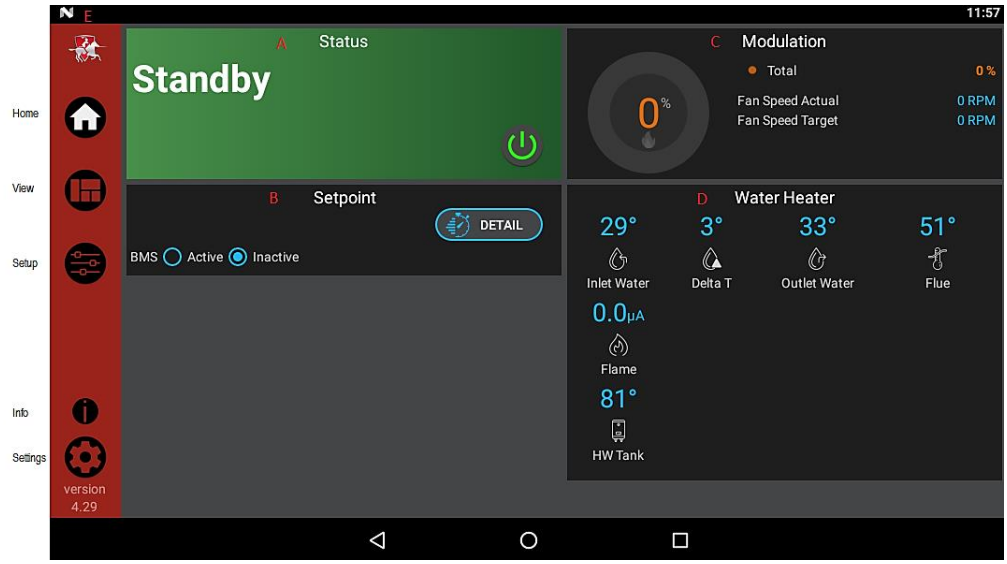
The Water heater is not intended for use by persons (incl. children under the age of 16) with reduced physical, sensory, or mental capacities, or who lack the necessary experience or knowledge. When the person responsible for their safety is supervising or has explained how the Water heater should be used, these persons can use the Water heater.

Note

Regular maintenance extends the service life of the Water heater. To determine the correct service interval, the service and maintenance engineer must do a check on both the water and gas side of the Water heater three months after installation. Based on this check, the best service interval can be determined.

CONTROL INTERFACE

Figure 1 SMARTOUCH control interface



The home screen displays basic information on how the unit is running, it is divided into the following sections:

A. Status
B. Demand
C. Modulation
D. Sensors
E. Navigation

- A-**The Status Section** is located on the top left of the screen and displays how the unit is currently running (i.e. Off, Stand-by, locking, and Lockout) including current driving demand, the next hot water setback scheduled, the reason for any blocking or lockout, and a power button.
- B-**The Demand Section** is located on the bottom left of the screen and displays information about the targets and limits of the current demand being serviced.
- C-**The Modulation Section** is located on the top right of the screen and displays the target modulation of the unit. This section also includes target and actual fan speeds.
- D-**The Sensor Section** is located on the bottom right of the screen and displays both factory installed, and field installed sensor including Inlet Water Temperature, Delta T Water Temperature, Outlet Water Temperature, Flue Temperature, and HW Tank Temperature.
- **E-The Navigation Section** is located down the left side of the screen. There are five (5) sections located below the Lochinvar icon: Home, View, Setup, Information (About), and Settings. The Home Section is the screen shown in Figure 1. The View Section provides more detailed information including subsections for: History, Cascade, Graphing, and a complete list of current Sensor Values. The Setup Section has several screens to aid in setting up the appliance.

The Setup Section includes screens for adjusting: Set Points, Pump Settings, Cascade, BMS, Ramp Delay, and Night Setback. The Information Section provides information about the hardware and software including the current software version of the interface and the version of the water heater control.

The setting section enables several interface setup features including Time Setup, Temperature Unit Select and System Update.

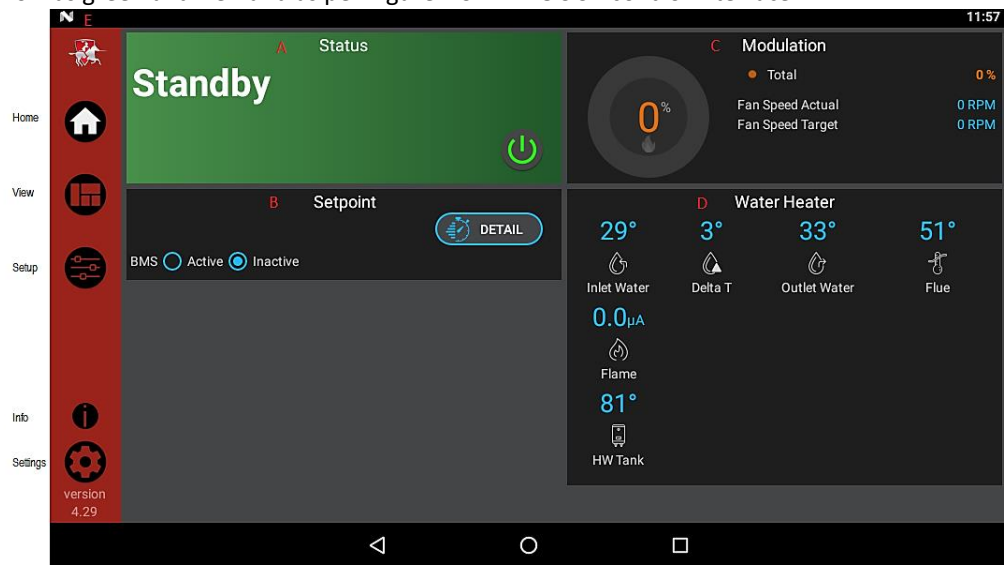
Warning

There are no user serviceable parts inside the EcoKnight water heater, only suitably qualified engineers can remove any of the panels. If the water heater is not operating correctly contact your service agent.

USE

To turn on the water heater

Ensure power supply is turned on and that there is a heat demand, the status screen should show as green and Demand as per Figure 1 SMARTOUCH control interface

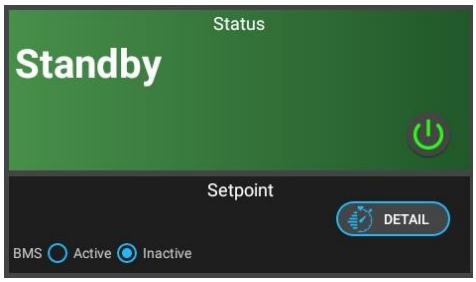


Warning

If the water heater fails to operate contact your service agent, do not attempt to investigate the fault yourself.

To set a parameter

During normal operation, set point temperatures can be adjusted from the Home Screen by pressing the DETAIL button in the demand section under Setpoint as shown below.



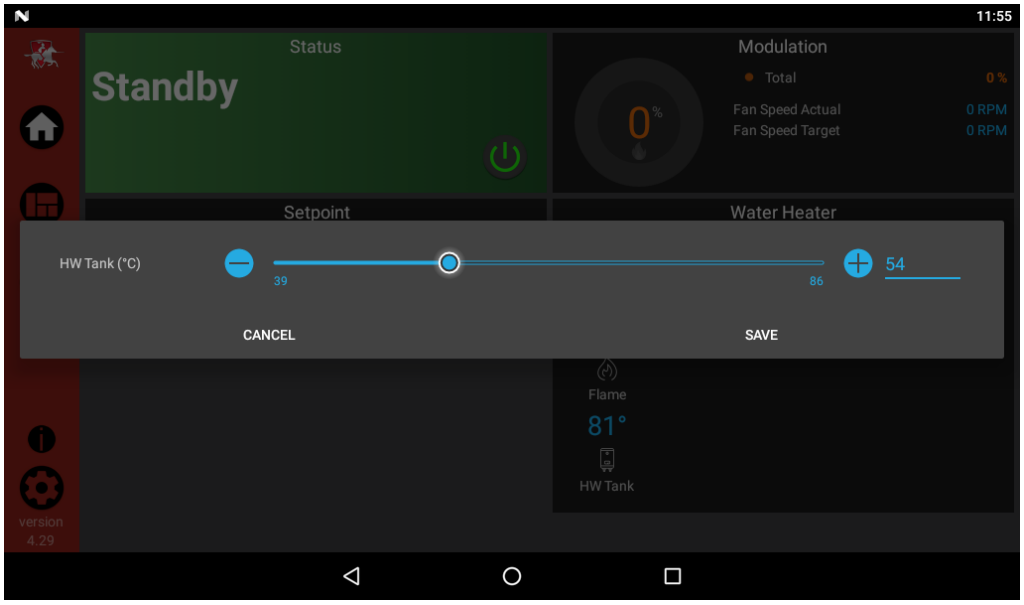
1. To change a set point, use the set point slider feature or the PLUS (+) and MINUS (-) buttons as shown below in Figure 3.

2. Once the set point has been adjusted to the desired setting, press the save button.

NOTE:

The APPLY CHANGES button must be pressed to complete programming of the controls. Failure to press the APPLY CHANGES button will result in an unprogrammed control.

Figure 3 set point adjustment



INSTALLATION PART

INTRODUCTION

ECOKNIGHT is a fully modulating condensing gas water heater; it can be used to supply hot water for domestic hot water via a direct vessel. EcoKnight features the SMARTOUCH interface which allows for simple parameter changes and shows the status of the appliance without having to scroll through multiple screens.

Safety

For safety instructions on the use of the Water heater, refer to (Safety) in the User part of this manual.

Warning

It is law that all gas appliances are installed by a competent person, registered with a H.S.E. approved body, in accordance with The Gas Safety (Installation and Use) Regulations 1998. Failure to install appliances correctly could lead to prosecution. It is in your own interest, and that of safety, to ensure that this law is complied with. The installation of the equipment MUST be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations, and the bylaws of the local water undertaking.

Leave the Water heater electrically isolated until you are ready to commission it.

READ AND UNDERSTAND THE INSTRUCTIONS

Read and fully understand all instructions before attempting to operate maintain or install the unit.

Caution

The Water heater may only be manoeuvred in an upright position. After unpacking, make sure that the Water heater is not damaged.

Make sure that the diameter of the gas supply pipe is large enough to supply sufficient capacity to the Water heater.

Make sure that the condensate drain is connected to the wastewater discharge using an open connection.

Fill the Water heater completely before use. Dry firing will damage the Water heater.

After installation, maintenance, or service, you must always check that the appliance is gas tight and make sure that the gas supply pressure, the CO2 value, and the air pressure differential are correct.

Warning

If the gas supply pressure is not correct, contact your mains gas supply company. Do not use the Water heater.

Note

Any leakage from the water heater and/or connections can cause damage to the immediate environment or floors below the level of the water heater room. Install the water heater above a wastewater drain or in a suitable metal leak tray. The leak tray must have an appropriate wastewater drain and must be at least 5 cm deep with a length and width of at least 5 cm larger than the water heater.

SAFETY DEVICES

EcoKnight water heaters have the following safety devices fitted:

1. Temperature sensors, inlet, outlet, flue gas and a high limit sensor are fitted to ensure accurate temperature control and to ensure a hazardous situation does not occur.
2. Air/gas pre-mix control, this achieves optimum efficiency and prevents gas flowing should there be a fault with the inlet fan.
3. Flame sensor to ensure the burner lights quickly, if no flame is detected the water heater will shut down.

In addition, the installer should fit a suitable sized water heater safety valve and expansion vessel as part of the unvented or boosted water kit.

Note

The packaging material is environmentally friendly, recyclable, and relatively easy to discard.
Old end-of-life appliances contain materials that need to be recycled. When you discard devices at the end of their service life, you must obey local legislation related to waste disposal.
Never discard your old device together with regular waste. Disposal of old equipment must be in accordance with the WEEE directive (waste electronic or electrical equipment)

Put the device into a municipal waste collection depot for electrical and electronic equipment. If necessary, ask your supplier or your service and maintenance engineer for advice.

PRINCIPLE PARTS

The EcoKnight water heater is a condensing, fully modulating gas water heater designed to supply domestic hot water via a direct vessel. EcoKnight water heaters feature: See exploded view

1. **Stainless steel heat exchanger-** Allows system water to flow through specially designed coils for maximum heat transfer, while providing protection against flue gas corrosion. The coils are encased in a jacket that contains the combustion process.
2. **Combustion chamber access cover**-Allows access to the combustion side of the heat exchanger coils.
3. **Fan-**The fan pulls in air and gas through the venturi. Air and gas mix inside the fan and are pushed into the burner, where they burn inside the combustion chamber.
4. **Gas valve**-The gas valve senses the negative pressure created by the fan, allowing gas to flow only if the gas valve is powered and combustion air is flowing.
5. **Venturi**-The venturi controls air and gas flow into the burner.
6. **Flue gas sensor (not shown)**-This sensor monitors the flue gas exit temperature. The control module will modulate and shut down the water heater if the flue gas temperature gets too hot. This protects the flue pipe from overheating.
7. **Water heater outlet temperature sensor (housed with the high limit sensor)**-This sensor monitors water heater outlet water temperature (system supply). If selected as the controlling sensor, the control module adjusts water heater firing rate, so the outlet temperature is correct.
8. **Water heater inlet temperature sensor**-This sensor monitors return water temperature (system return). If selected as the controlling sensor, the control module adjusts the water heater firing rate, so the inlet temperature is correct.
9. **Temperature and pressure gauge**- (Field supplied and not shown) Monitors the outlet temperature of the water heater as well as the system water pressure.
10. **Electronic Display**-Digital controls with SMART TOUCH screen technology, full colour display, and an 7" user interface screen.
11. **Flue pipe adapter**-Allows for the connection of the PP flue system to the water heater.
12. **Burner (not shown)**-Made with metal fibre and stainless-steel construction, the burner uses pre-mixed air and gas and provides a wide range of firing rates.
13. **Water outlet (system supply)**-A 2" (Models 117-235) or 2.5" (Model 295) water connection that supplies hot water to the system.
14. **Water inlet (system return)**-A 2" Models 117-235) or 2.5" (Model 295) copper water connection that returns water from the system to the heat exchanger.
15. **Gas connection pipe**-Threaded pipe connection of 1" or 1 1/4" (depending on the model). This pipe should be connected to the incoming gas supply for the purpose of delivering gas to the water heater.
16. **SMART TOUCH Control Module**-The SMART TOUCH Control responds to internal and external signals and controls the fan, gas valve, and pumps to meet the heating demand.
17. **Air intake adapter**-Allows for the connection of the PVC air intake pipe to the water heater.
18. **High voltage junction box**-The junction box contains the connection points for the line voltage power and all pumps.
19. **Water heater drain port**-Location from which the heat exchanger can be drained.
20. **Low voltage connection board**-The connection board is used to connect external low voltage devices.
21. **Low voltage wiring connections (knockouts)**-Conduit connection points for the low voltage connection board.

22. **Condensate drain connection**-Connects the condensate drain line to a 1/2" PVC connection.

23. Front access cover (not shown)-Provides access to the gas train and the heat exchanger.

24. **Ignition Electrode**-Provides direct spark for igniting the burner.

25. Flame inspection window (not shown)-The quartz glass window provides a view of the burner surface-and flame.

26. Relief Valve (Field supplied)- Protects the heat exchanger from an over pressure condition the relief valve should be set no higher than 10bar.

27. Flame Sensor (not shown)-Used by the control module to detect the presence of burner-flame

28. Line voltage wiring connections (knockouts)-Conduit connection points for the high voltage junction box.

29. Top Panel-Removable panel to gain access to the internal components.

30. Power Switch-Turns 230 VAC ON/OFF to the water heater.

31. Air box-The air box houses the combustion air filter.

32. Air pressure switch (117 and 235 models only)-The air pressure switch detects blocked flue/inlet conditions. breaking the control circuit, shutting the water heater down.

33. Pump relays-The pump relay is used to connect the water heater, system and DHW pumps.

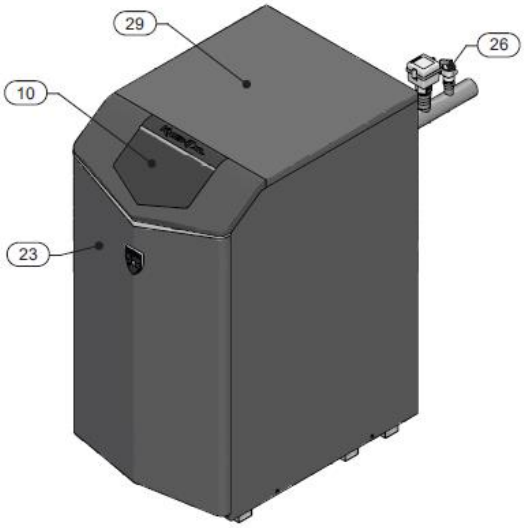
34. Transformer-The transformer provides 24V power to the integrated control.

35.High limit sensor (housed with the outlet temperature sensor)-Device that monitors the outlet water temperature. If the temperature exceeds its setting, the integrated control will break-the control circuit, shutting the water heater down.

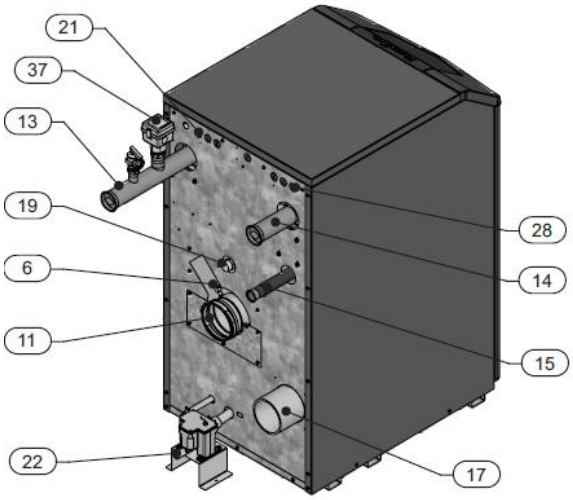
36. Air Filter (not shown)-The air filter prevents dirt and debris from entering the burner and is installed inside the air box (33).

37. Flow Switch-The flow switch is a safety device that ensures flow through the heat exchanger during operation. This appliance is low mass and should never be operated without flow. The flow switch makes contact when flow is detected and allows the unit to operate. If flow is discontinued during operation for any reason, the flow switch will break the control circuit and the unit will shut down. Lochinvar can supply a suitable flow switch on request, or the installer can use their own.

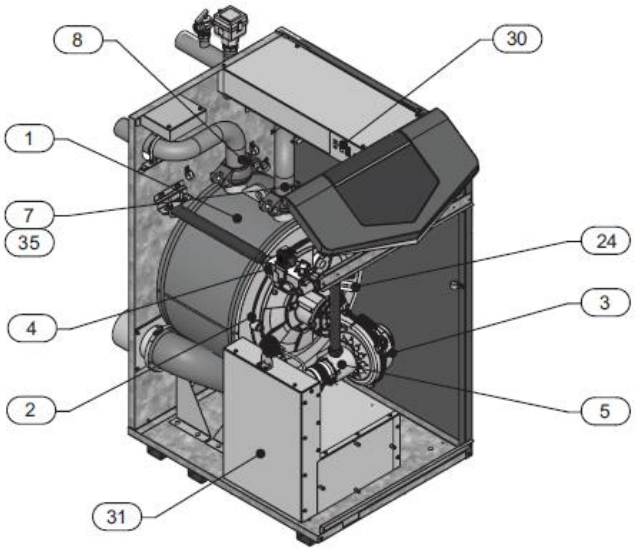
Figure 4 EcoKnight model EKW117 exploded view.



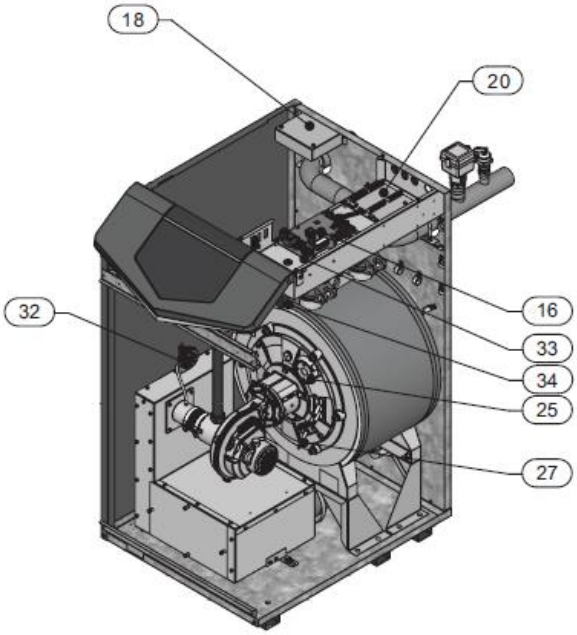
Front view



Rear view

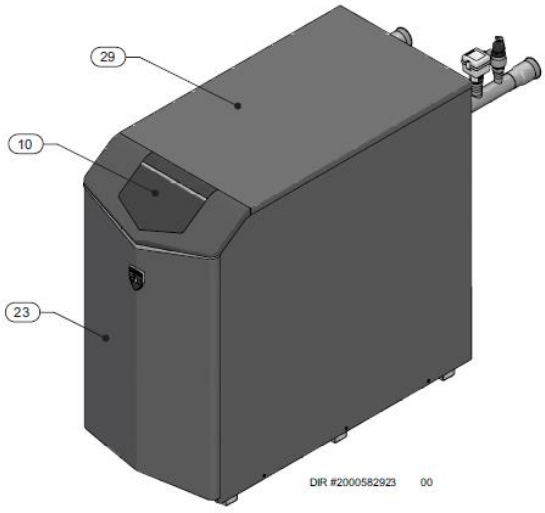


Left hand side view

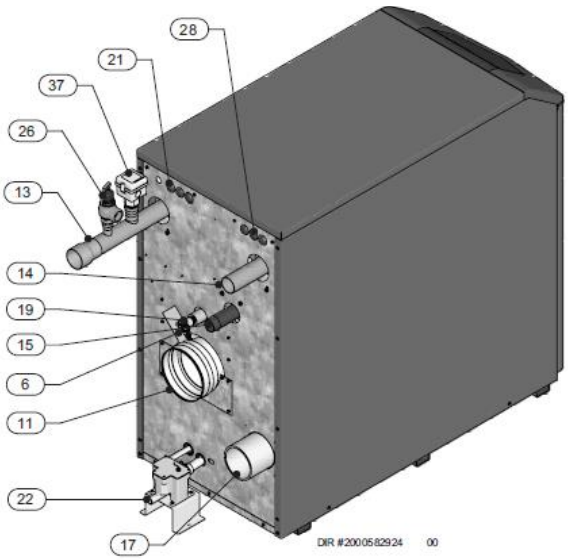


Right hand side view

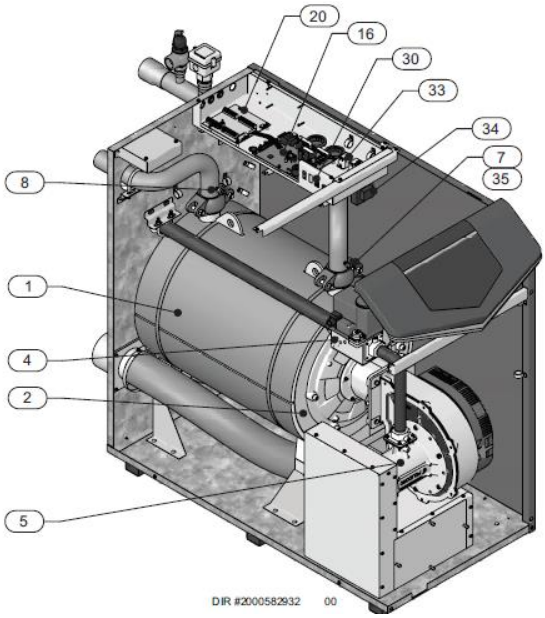
Figure 5 EcoKnight model EKW190-EKW295 exploded view.



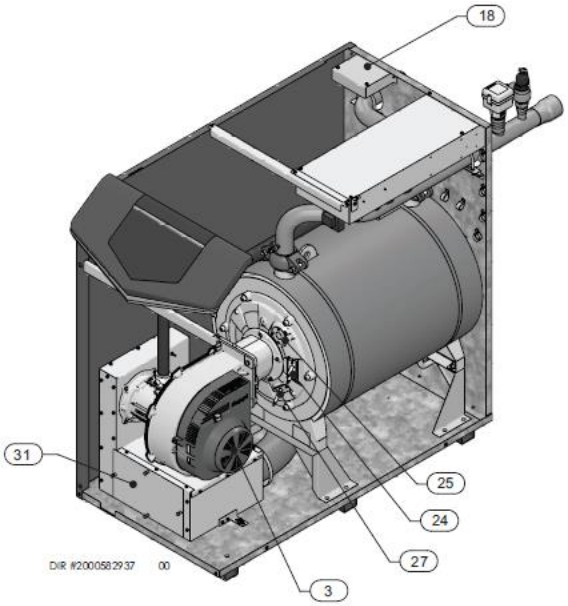
Front view



Rear view



Left hand view



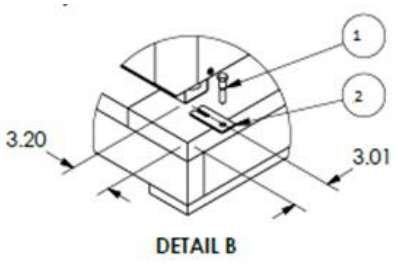
Right hand view

PACKAGING

Unpack the water heater as close as possible to the site of final installation to prevent damage to the appliance during manoeuvring. Carefully inspect the water heater for any damage and report immediately to Lochinvar customer service if any is found.

The water heater is supplied on a pallet, to remove first remove the four bolts securing the water heater to the pallet as in detail B. See Figure 6

Figure 6 detail B



Carefully remove the water heater from the pallet without dropping as this may cause damage to the water heater.

CONDITIONS

The water heater is suitable for room-sealed and for open flue combustion: For room-sealed combustion, the air inlet does not depend on the installation site. For open combustion, you must comply with the local applicable directives and ventilation regulations for open water heaters. (See section on ventilation)

Ambient conditions

The installation site must be frost-free. If necessary, adjust the installation site to keep it frost-free. Make sure that the ambient conditions are correct to prevent malfunction of the electronics in the water heater.

Air humidity and ambient temperature	
Humidity	Max 93% RH at +25°C
Temperature	<35°C as per BS6644

The equipment must be installed on a level surface that is capable of adequately supporting its weight (when filled with water) and any ancillary equipment. The operation of the equipment must not cause the temperature of any combustible material in the vicinity of the equipment and its flue to exceed 65°C. If such a situation is unavoidable, appropriate insulation should be provided.

Caution

Locate the equipment so that if the appliance or any connecting pipework should leak, water damage will not occur. When such locations cannot be avoided it is recommended that a suitable drain pan be installed under the equipment. The pan should be adequately drained but must not restrict the combustion or ventilation airflow.

Corrosion of the heat exchanger coils, and flue system may occur if air for combustion contains certain chemical vapours. Such corrosion may result in poor combustion and create a risk of asphyxiation. Aerosol propellants, cleaning solvents, refrigerator and air conditioning refrigerants, swimming pool chemicals, calcium and sodium chloride, waxes and process chemicals are corrosive. Products of this sort should not be stored near the water heater or outside by the air intake (if applicable). The fitting of this equipment in a situation where aerosols or other chemicals may be entrained into the combustion air will invalidate the warranty.

WATER COMPOSITION

The Lochinvar EcoKnight contains a stainless-steel heat exchanger; therefore, care must be exercised to ensure that the system water and any water treatment are compatible. Whenever a new water heater is connected to an existing system, the pipework must be thoroughly cleaned and flushed to remove debris, rust particles, carbonate deposits and any existing water treatment that might be incompatible with the heat exchanger. If the existing system is in poor condition and/or cannot be pressurised, then consideration should be given to using a Plate system separator. New systems must also be thoroughly flushed to remove debris and flux deposits.

Warning

EcoKnight water heaters must not be used to directly heat swimming pool water

Water Quality /Hard Water

Water supply quality may adversely affect the efficiency performance and longevity of Water Heaters and Hot Water systems. Hard water may cause the formation of limescale which will reduce operating efficiency and may cause early product failure.

Water Chemistry		
Specification	**Range**	**Requirement**
Hardness	<85ppm CaCO3	Further precautions required
	85-205ppm CaCO3	Acceptable range
	>205ppm CaCO3	Water softening required
Dissolved solids	<350ppm	Hardness level must not be above 205ppm
pH Level	6.5-8.5	Acceptable range
Chlorides	<150ppm	Acceptable range

If these values are exceeded a water treatment specialist should be consulted. Water Softeners and Water Conditioners may be considered, but whichever method is selected, it should be suitable for installation with Direct Gas-fired Water Heaters. A maintenance regime will also be required for such systems.

Caution

High hot water temperature and high demand for hot water is likely to cause quicker limescale formation, blockage of the heat exchanger by limescale or other solids will not be covered under the water heater warranty.

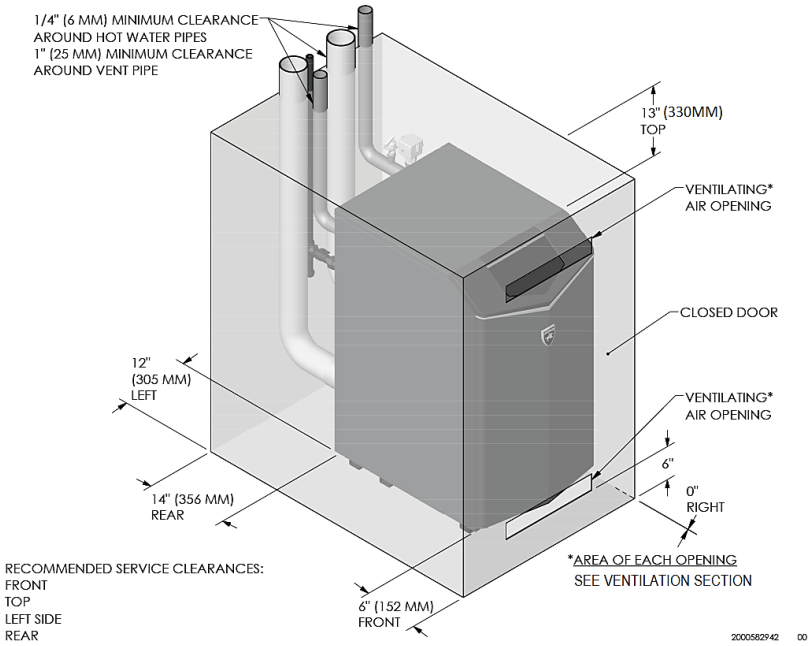
Regardless of water quality the heat exchanger should be flushed with descale at least once per year.

WORKING CLEARANCES

To maintain sufficient clearances for cooling and access for maintenance the EcoKnight should have the following clearances:

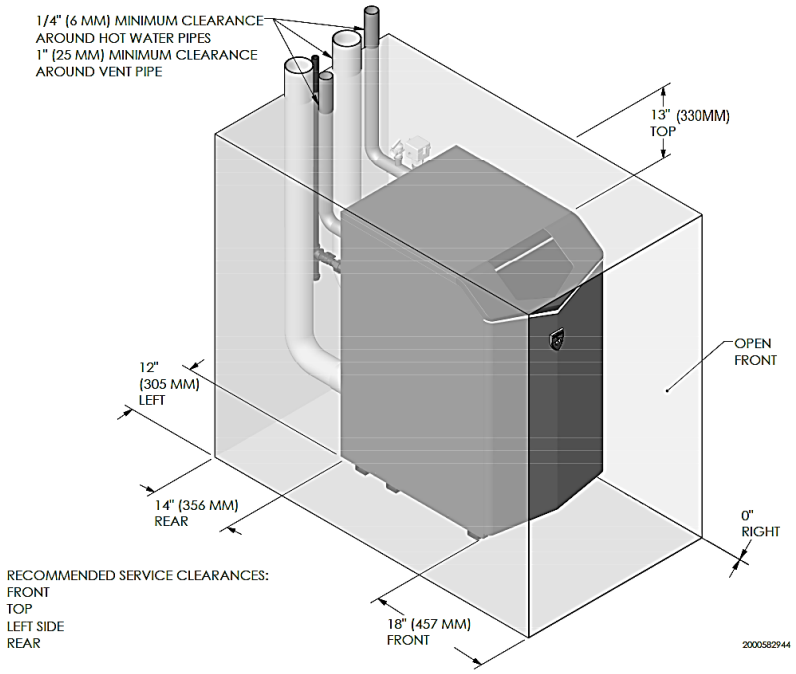
Installation in a compartment

Figure 6 compartment clearances



Installation within a plantroom

Figure 7 plantroom clearances



[See ventilation requirements]

INSTALLATION SCHEMATIC S

Figure 8 Single water heater

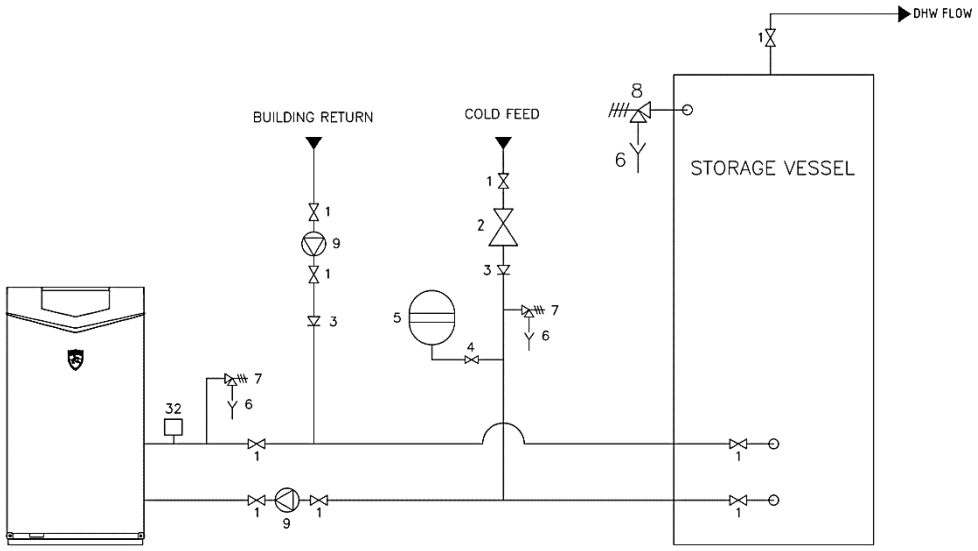
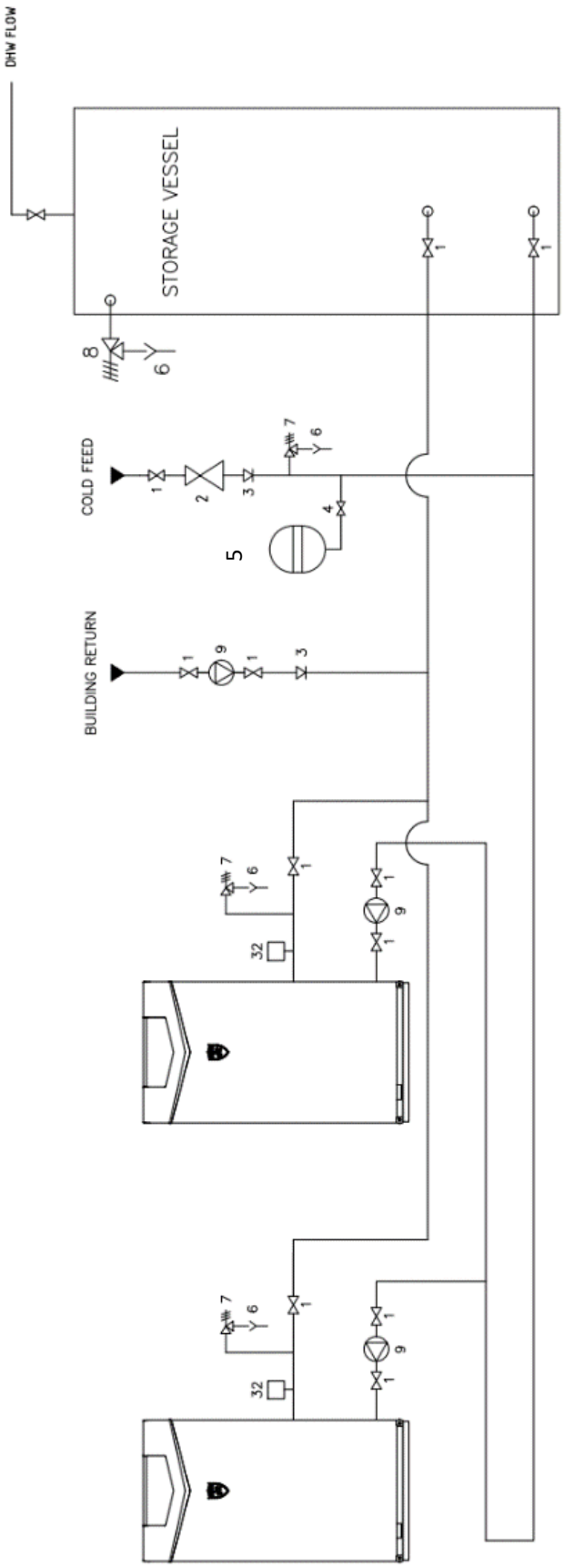


Table 1 key to drawings Figure 8 and 9

Key to drawings	
Item	**Description**
1	Isolation valve
2	Pressure reducing valve
3	Non return valve
4	Lockshield valve
5	Expansion vessel
6	Tundish
7	Expansion valve (pressure relief)
8	T&P valve
9	Circulating Pump
10	Drain valve
32	Flow switch

Figure 9 Multiple water heaters



WATER CONNECTIONS

The requirements of minimum water flow are given in Table 3. Recommendations for the water circulation system are given in BS6644 and BS CP342-2. The following notes are of particular importance.

1. Circulating pipework not forming part of the useful heating surface should be insulated. Cisterns, expansion vessels and pipework situated in areas exposed to freezing conditions should also be insulated.

2. Drain valves must be in accessible positions that will permit draining of the entire system including the water heater.

3. Tapping sizes for connection to the system are detailed in Figure 10.

4. Ideally, individual valves should be fitted to each unit to enable isolation from the system.

Open vented arrangement

The Lochinvar EcoKnight can be used in an open vented arrangement provided that a vent pipe in accordance with BS CP342-2 or BS6644 as appropriate is fitted. The minimum static head requirement for an open vented system is 1bar.

Unvented system arrangement

If the water heater is to be used in an unvented arrangement, the system should follow the guidance given in BS6700 and must comply with the Building Regulations 1992: Part G3, in England and Wales, P5 in Northern Ireland and P3 in Scotland. A kit of components that have been suitably sized for the unvented operation of the appliance is available from Lochinvar Limited. For further information, contact Lochinvar Limited.

Primary piping arrangements

1. Water heater system pipework must be sized at least as per the requirements shown in Table 5 pipework header sizing

Reducing the pipe size will restrict the flow rate through the water heater causing high limit shutdown and poor system performance.

2. A water heater shunt pump will be required to pump water between the water heater and direct storage vessel, this should be controlled via the EcoKnight water heater control. This pump should be sized on the pressure drop of the water heater and associated primary pipework run. A suitable shunt pump can be supplied as an ancillary by Lochinvar, or we can assist in ensuring your own pump is suitable.

3. A flow switch must be fitted on the water heater inlet to ensure the water heater does not operate under no flow conditions

4. Suitable water heater isolation valves should be fitted to allow the water heater to be drained without shutting the whole system, these must be full port type valves.

5. A pressure relief valve must be fitted to each water heater; this can be supplied by Lochinvar as part of the unvented system kit. There must be no valves between this valve and the water heater.

Figure 10 water heater connections

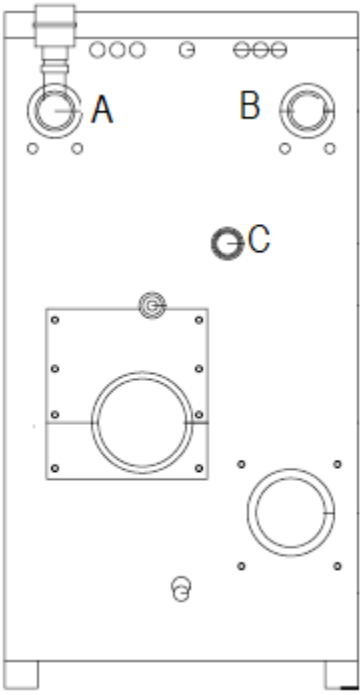


Table 2 water heater pipework connection sizes

Water heater	Water connections A and B	Gas connection C
EKW117	2"	1"
EKW190	2"	1¼"
EKW235	2"	1¼"
EKW295	2½"	1¼"

Table 3 water heater flow rates and pressure drop.

Model	Minimum pipe size	l/sec	kPa	dT
EKW117	2"	2.2	26.9	12
EKW190	2"	2.8	44.8	16
EKW235	2"	3.8	65.7	14
EKW295	2½"	5.0	44.8	14

WATER HEATER SHUNT PUMP

Lochinvar supplied water heater shunt pumps have been sized assuming the following criteria:

1. Primary pipework has been sized according to Table 5.
2. 6 Metres of pipework, 4no 90 elbows and 2no fully ported valves.

If the installation is outside these parameters the water heater shunt pump and pipework size will need to recalculated, Lochinvar can offer larger pumps for more complex systems. Contact Lochinvar technical support for assistance.

Table 4 EcoKnight shunt pumps

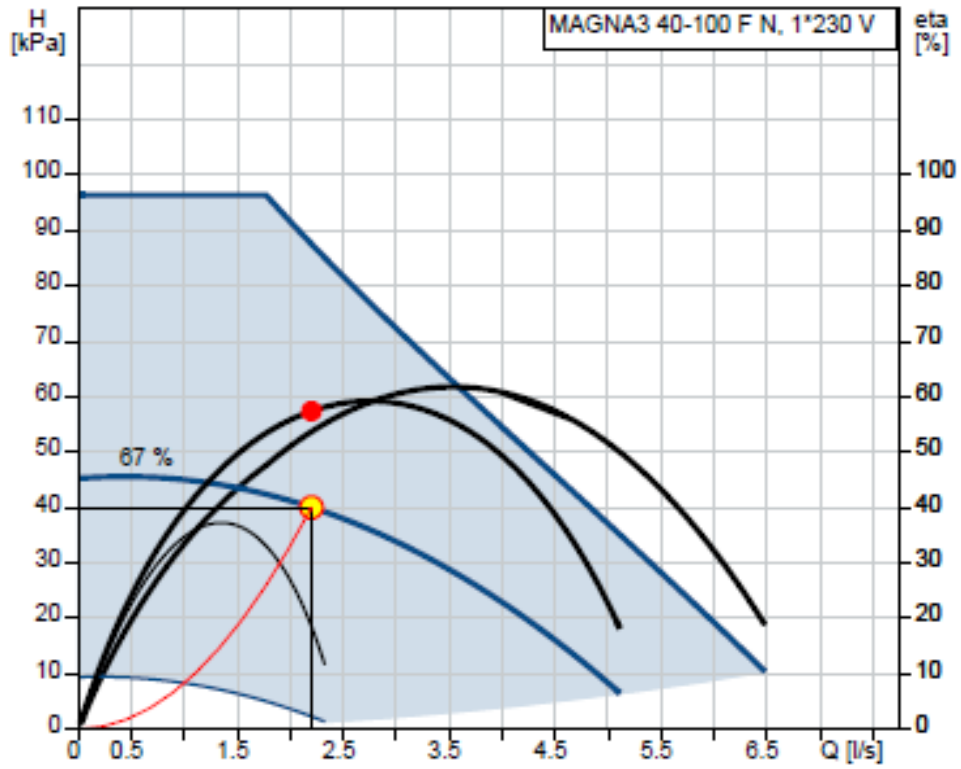
Model	Primary shunt pump	Volts	Amps
EKW117	LM900510A	230	1.66
EKW190	LM900510A	230	1.66
EKW235	LM900512A	230	2.78
EKW295	LM900512A	230	2.78

Warning

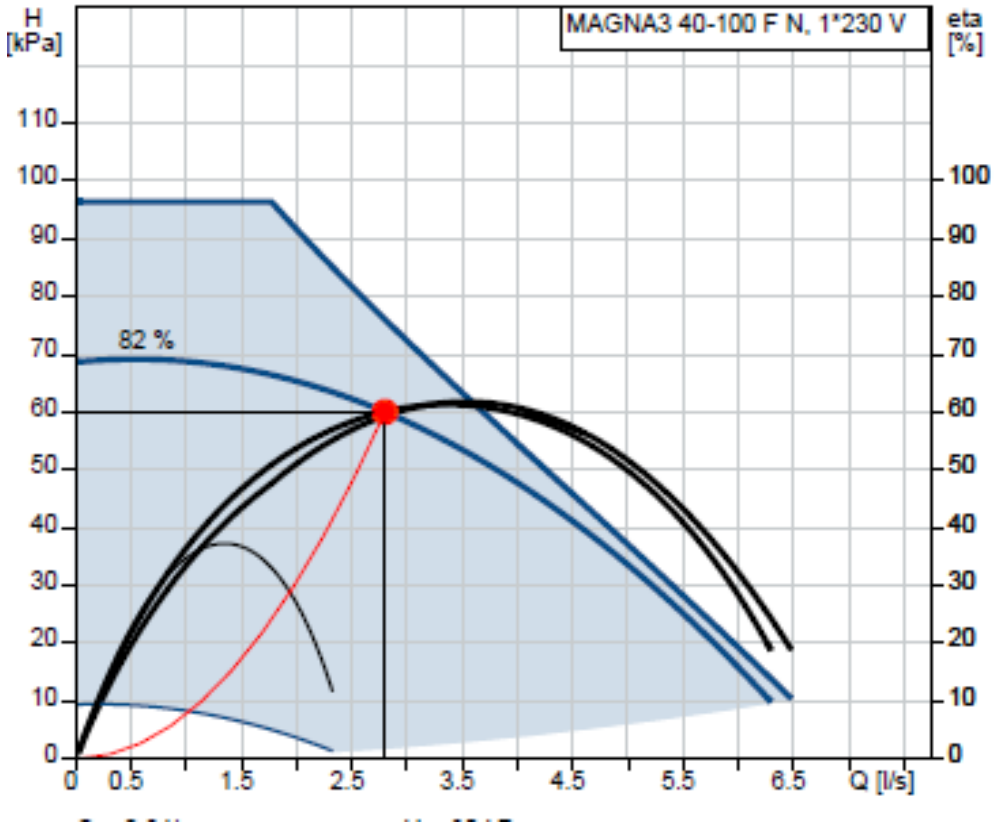
The pump must be controlled via the EcoKnight water heater to ensure the correct flow rate is always maintained. If the pump is controlled externally this can cause low flow rates across the water heater which may cause permanent damage to the heat exchanger. Any such damage caused will not be covered by the water heater warranty.

Shunt pump curves

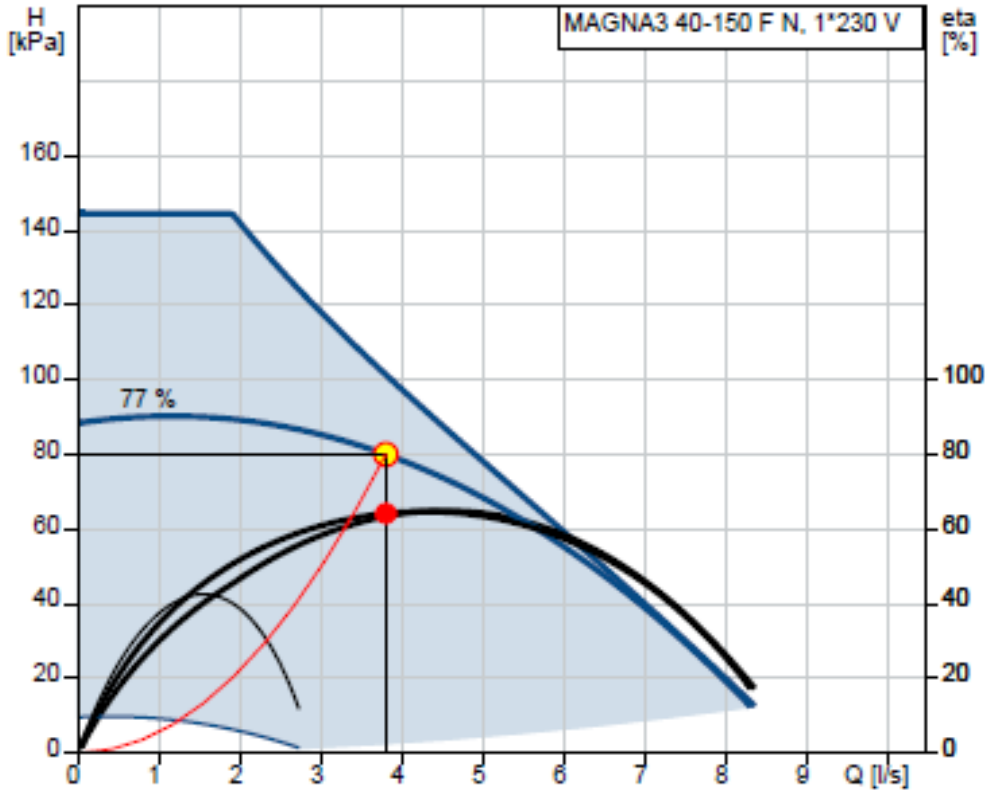
EKW117



EKW190



EKW235



EKW295

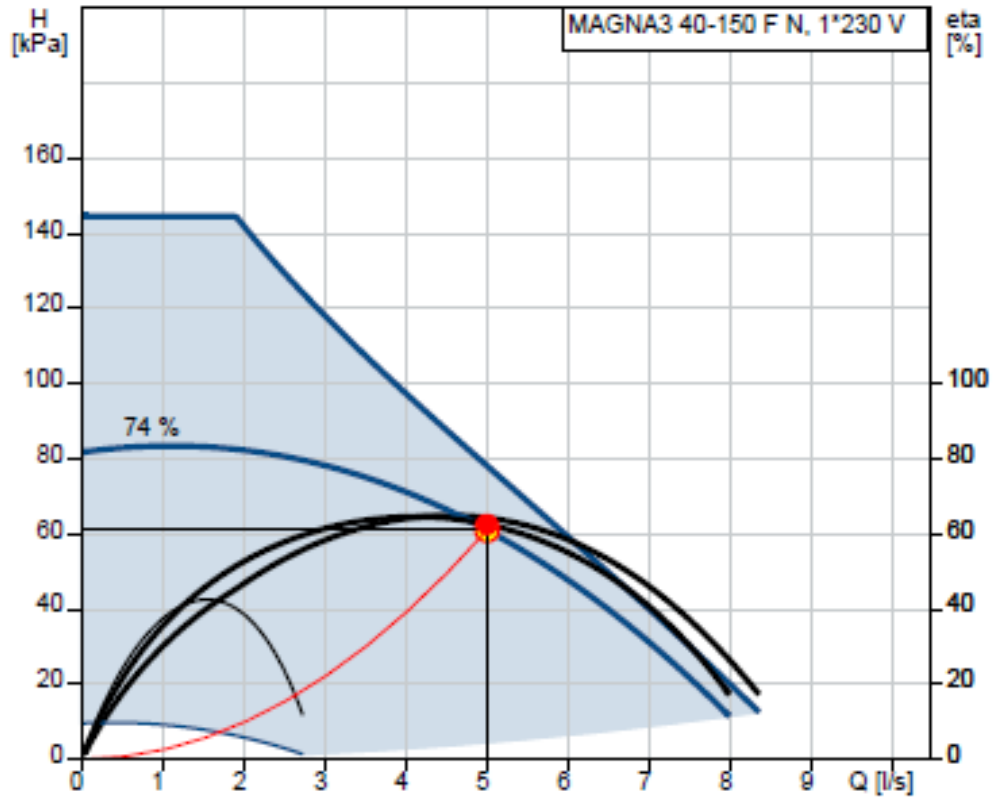


Table 5 shows the pipework header sizing required to ensure the correct flow rate is maintained between the EcoKnight water heater(s) and storage vessel(s)
Using the example schematics shown figures 11 and 12 and assuming the EcoKnight water heater is an EKW190 in both cases the header would be sized as:
Single unit = as there is only a single heater there is no common header so all the pipework should be 54mm.
Two units = the common header shown in red (B) should be sized according to the table at 67mm with the pipework between the header and each individual unit shown in blue (A) at 54mm.

Table 5 pipework header sizing

MODEL	PIPEWORK (A) BLUE SIZE (mm)	PIPEWORK (B) RED SIZE (mm)		
	NUMBER OF ECOKNIGHT WATER HEATERS			
	1	2	3	4
EKW117	54	67	76	108
EKW190	54	76	108	108
EKW235	67	108	108	133
EKW295	67	108	133	133

Figure 11 Single water heater primary pipework sizing

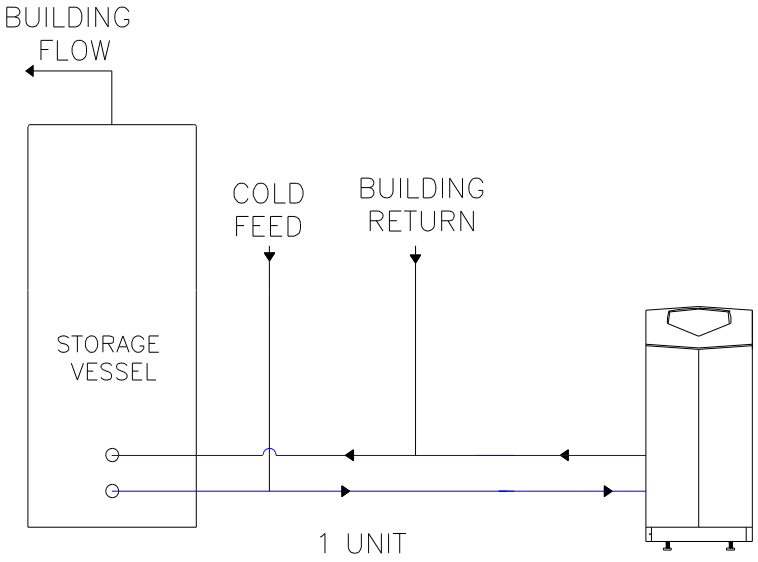
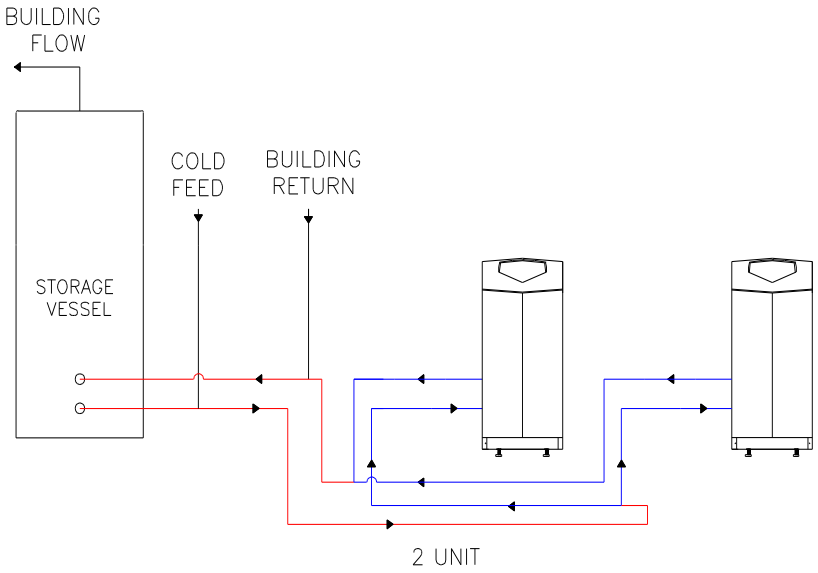


Figure 12 multiple water heater primary pipework sizing



Caution

The pipework header between the primary EcoKnight water heater circuit and the direct storage vessel must be sized as per the guidance given in this section. Failure to use the correct size of pipe header will cause operational problems and potential early failure of the water heater; this will not be covered under the water heater warranty.
If your installation is outside the scope of this guidance, please contact Lochinvar Technical support before proceeding with the installation.

Condensate drainpipe

The condensate drain is placed at the centre and at the bottom of the water heater and has a ½" 12.7mm hose discharge. Connect this hose to the condensate trap and then pipe to drain. Connect the electrical plug alongside the hose to the condensate trap.

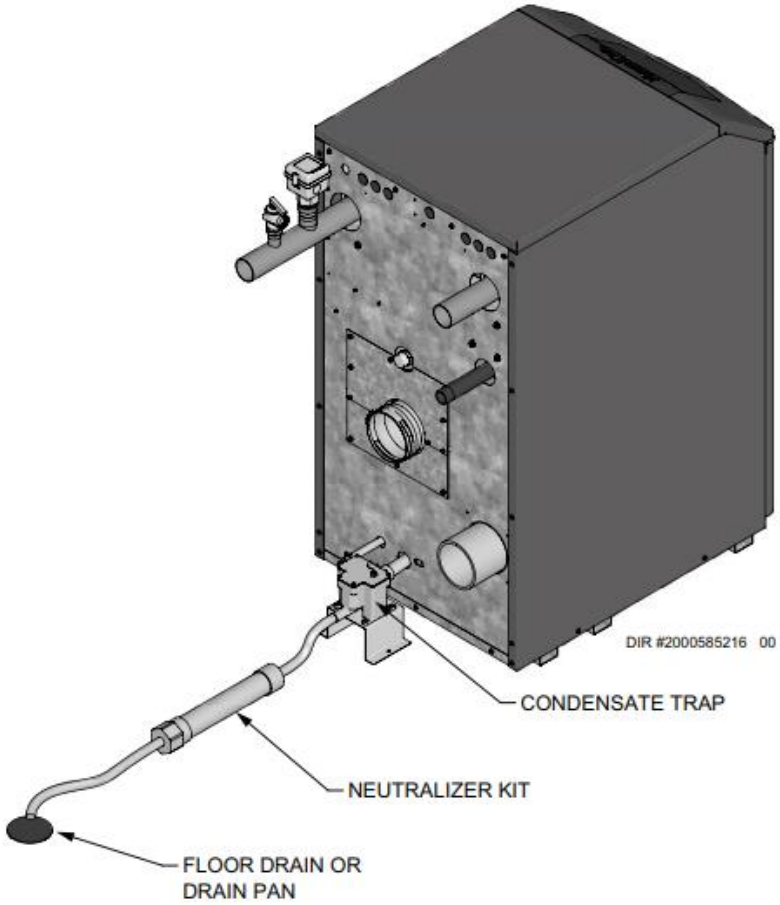
Condensate with be slightly acidic with a Ph between 3 and 5.

Use only plastic pipe for the condensate drain. The condensate line must have a continuous fall away from the water heater of 5mm per metre of pipe.

Blockage of this drain might damage the water heater. The drain connection is correct when the condensate can be seen flowing away, e.g., using a funnel. Any damage that might occur, when the drain is not installed correctly, is not covered by the warranty of the water heater.

There must be an open connection of the condensate hose into the drain. A possible vacuum in the drain must never be able to create a negative pressure on the water heater's condensate drain hose.

Figure 13 condensate drain location.



Caution

Before commissioning the water heater and/or after maintenance, the condensate trap must ALWAYS be filled with water. This is a safety measure: the water in the condensate trap keeps the flue gases from leaking out of the heat exchanger via the condensate drain.

GAS CONNECTION

Warning

Strain on the gas valve and fittings may result in vibration, premature component failure and leakage and may result in a fire, explosion, property damage or serious injury. Do not use an open flame to test for gas leaks. Failure to follow these instructions may result in fire.

The Lochinvar EcoKnight range is suitable for use on second family gasses 2H - G20 - 20mbar only. EcoKnight has also been tested for use on G20Y20 (20% Hydrogen) and has been found to operate satisfactory should this gas become available in the future in the UK.

Service pipes

The local gas distributor must be consulted at the installation planning stage to establish the availability of an adequate supply of gas. An existing service pipe must not be used without prior consultation with the local gas distributor.

Gas meter

A new gas meter will be connected to the service pipe by the local gas distributor contractor. An existing gas meter should be checked, preferably by the gas distributor, to ensure that it is adequate to deal with the rate of gas supply required.

Supply pipes

Supply pipes must be fitted in accordance with IGEM/UP/2. Pipework from the meter to the equipment must be of adequate size. The complete installation must be purged and tested as described in IGEM/UP/1.

Boosted gas supplies.

Where it is necessary to employ a gas pressure booster, the controls must include a low-pressure cut-off switch at the booster inlet. The local gas distributor must be consulted before a gas pressure booster is fitted. For details of how to connect a low-pressure cut-off switch, please refer to Page 42 Low Voltage Connections.

Plant room control valve

A manual valve for plant-room isolation must be fitted in the gas supply line. It must be clearly identified and readily accessible for operation, preferably by an exit.

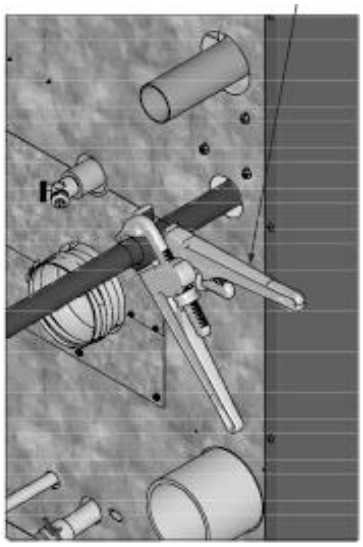
Equipment isolation valve

An approved gas-inlet appliance isolating valve and union should be installed for each unit in a convenient and safe position and be clearly marked. Ensure that the gas-inlet appliance isolating valve is in the OFF position. Although the equipment receives a gas leak check and gas train component integrity check prior to leaving the factory, transit and installation may cause disturbance to unions, fittings, and components. During commissioning a further test for tightness should be carried out on the equipment gas pipework and components. All gas pipes must be supported and must not be allowed to hang on the water heater or accessories.

Warning

The gas valve and fan will not support the weight of the gas pipe, do not attempt to support the weight of the pipe on the water heater or accessories. This could result in an unsafe situation.

When connecting /fitting any pipework to the water heater supplied gas pipe a second wrench must to be used to prevent the gas pipe within the water heater turning as per drawing below.



Caution

Before carrying out any gas pressure testing on the system pipework close the manual isolation valve on the water heater if the test pressure is to be above 30mbar. The appliance must be checked for leaks using a suitable leak detection fluid.

Warning

Take care not to allow leak detection fluid to get onto any electrical components. Or connections

LPG GAS

Warning

EcoKnight water heaters are not suitable for use on LPG gas

FLUE SYSTEM

All versions of the EcoKnight Condensing water heater (except the EKW295 which is B23 only) can be installed as either type B23 (fan assisted open flue) or C13, C33, C53 (room sealed) appliances. See the relevant section for details of each flue type and requirements. Standard flue kits are available as an ancillary item, these include the standard pieces to start the flue system, additional elbows, extensions will probably be required depending upon site installation requirements. Model HCB295 is suitable for C63 installation only, i.e., flue supplied by others.

Caution

Install the horizontal flue components with an angle of 3° back in the direction of the water heater (roughly equal to five centimetres for every linear meter). Failure to install the flue correctly will result in a build-up of condense within the flue pipework that will cause early component failure.

Note

When using a wall terminal, there is the possible risk of ice building-up on surrounding parts/structures, because the condensate will freeze. This risk should be considered during the design phase of the heating installation.

Note

EcoKnight water heaters will produce large condense clouds especially during cold weather, consideration must be taken as to whether this will cause a nuisance to neighbouring properties and if so, alternative flue arrangements used.

Note

EcoKnight water heaters can operate with very low flue temperatures; as such the flue system used must be suitable for use with condensing appliances made from either Polypropylene or stainless steel and have a temperature class of T120.

Note

Before installation of any flue system read the installation manual carefully for both the appliance and flue system to be used. Information on the flue system supplied by Lochinvar can be found within this manual.

Warning

Aluminium flue pipe must not be used on this appliance as it may lead to premature failure of the heat exchanger and will invalidate the warranty.

Detailed recommendations for the flue system are given in BS6644 for equipment above 70kW net and IGE/UP/10 for equipment of rated input above 54kW net. The following notes are intended to give general guidance only.

Flue discharge

The flue system must ensure safe and efficient operation of the equipment to which it is attached, protect the combustion process from wind effects and disperse the products of combustion to open external air.

The flue must terminate in a freely exposed position and be so situated as to prevent the products of combustion entering any opening in a building.

Clean air act

For any termination or group of terminations with a total net heat input exceeding 333 kW, the general requirements of the clean air act shall apply, and approval must be sought from the Local Authority prior to commencement of the installation.

Horizontal flue terminations (other than for fan diluted flues) are not permitted for any termination or group of terminations with a total net heat input exceeding 333 kW net heat input.

Notice:

If the total combined net input of the installation is > 333kW then approval of the height and position of any termination must be obtained from the local authority BEFORE installation to satisfy the requirements of the clean air act.

For flue gas type B23, C13, C33, C43 systems, use only flue gas and air supply parts of the approved supplier M&G group (Muelink & Grol) and only the parts mentioned in the DoP (declaration of performance): "No 001-MG-PP DoP" and No 001-MG-RVS DoP". (With exception of O4 and O5) The concerning DoP's can be found at the website of Muelink & Grol https://www.mg-flues.com/certifications

The following Manuals for parts supplied by Muelink & Grol are applicable:

- Regulations regarding flue gas systems PP(s)

- Installation instructions clamps: Checklist

- Installation instructions Skyline 3000

- Installation instruction Multiline PP (Cascade)

Aluminium flue pipe must not be used on this appliance as it may lead to premature failure of the heat exchanger and will invalidate the warranty.

Under no circumstances may this appliance exhaust gases into a masonry chimney.

For Horizontal flue terminations not exceeding 333 kW net heat input (other than for fan diluted flues) the general requirements of this Section shall apply. However, for any termination or group of terminations the risk assessment (see risk assessment) shall be completed to ensure compliance and maybe subject to approval by the local Environmental Health Officer (EHO).

Flue terminal positions

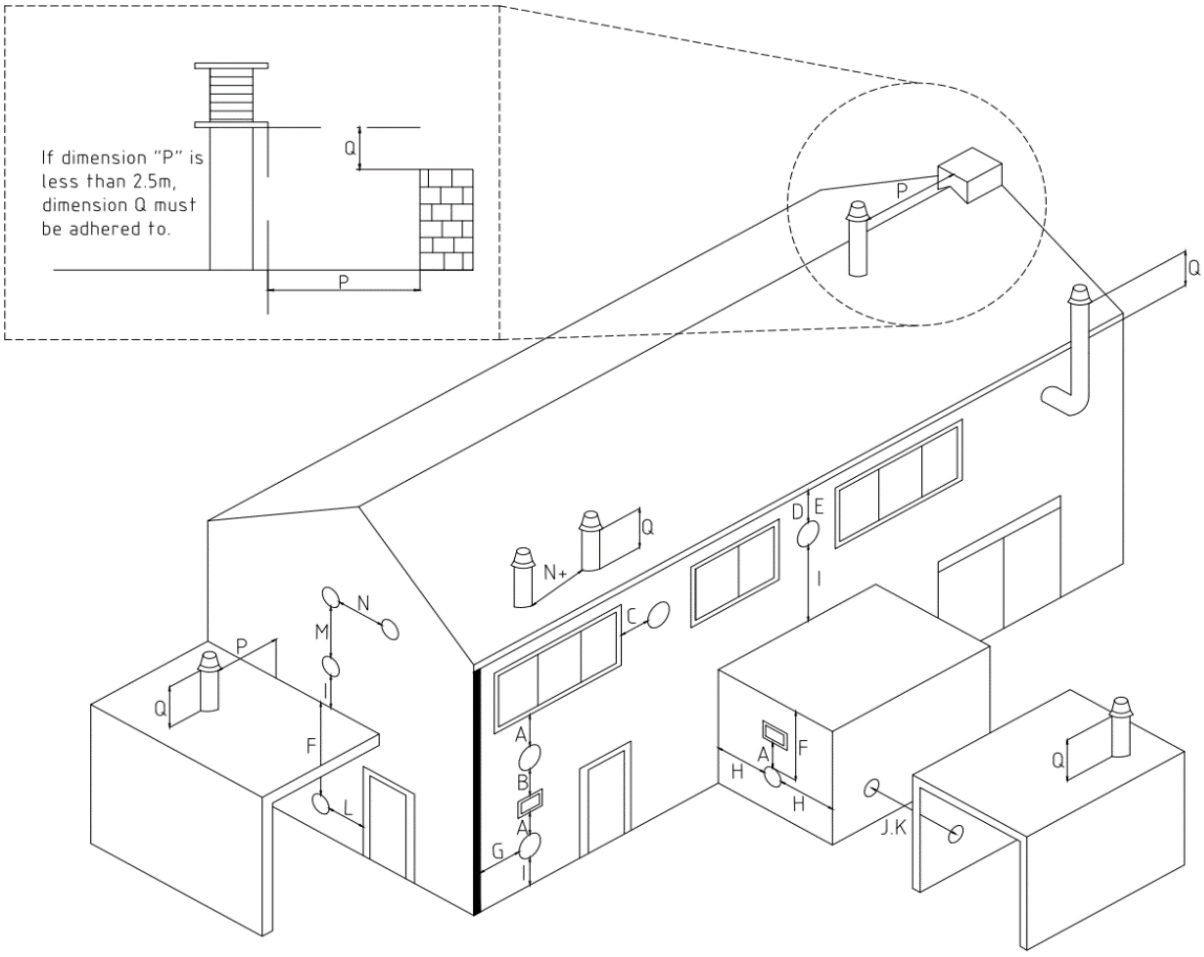


Table 7 Flue terminal positions (use in conjunction with picture above)

Location	Description	EKW117	EKW190	EKW235	EKW295
A	Directly below an opening, air brick, opening windows	2500	2500	2500	n/a
B	Above an opening, air brick, opening windows etc.	940	1468	1793	n/a
C	Horizontally to an opening, air brick, opening windows	940	1468	1793	n/a
D	Below a gutter or sanitary pipework	200	200	200	n/a
E	Below the eaves	200	200	200	n/a
F	Below a balcony or car port roof	Not recommended see UP10 risk assessment			
G	From a vertical drain or soil pipe	150	150	150	n/a
H	From an internal or external corner	2087	3775	4816	n/a
I	Above ground, roof or balcony level	300	300	300	n/a
J	From a surface facing the terminal	2087	3775	4816	n/a
K	From a terminal facing the terminal	2908	4318	5188	n/a
L	From an opening in the car port (e.g. door, window) into the dwelling	Not recommended see UP10 risk assessment			
M	Vertically from a terminal on the same wall	940	1468	1793	n/a
N	Horizontally from a terminal on the same wall	940	1468	1793	n/a
P	From a vertical structure on the roof	425	620	740	n/a
Q	Above intersection with the roof	425	620	740	n/a

Further to the requirements in IGEM/UP/10 Edition 4 +A: 2016 Section 8 under clause 8.7.3.3 and Figure 7 the following risk assessment gives guidance for the positioning of horizontal flues. This form should be completed before work commences and undertaken by a person who is competent to undertake the risk assessment.

Type C appliances with net heat input exceeding 70 kW and not exceeding 333 kW low level flue discharge risk assessment (including net heat input for groups of appliances)			
No.	**Regarding the flue position**	**No**	**Yes**
1	Is the proposed flue termination within the distance in Figure K of a road, path, track, thoroughfare, walkway, property boundary or area, which is used for public access other than for maintenance purposes?	No	Yes
2	Is the proposed flue termination within the distance in Figure K to a playground, school, yard, seating area, or area where there may be a public gathering	No	Yes
3	If the proposed flue termination enclosed on more than two sides, then does it comply with the requirements of Figure 11B?	No	Yes
4	Is the proposed flue termination within the distance in Figure K of a surface or building element that may be affected by corrosion or deterioration from plume condensate?	No	Yes
5	Is the proposed flue position in an area where vehicles could be parked within distances from Figure 12 Line G to the flue?	No	Yes
6	Are there shrubs or trees within minimum distances shown on Figure K of the proposed terminal position?	No	Yes
7	Is the proposed flue termination within a light well?	No	Yes
8	Are the products of combustion from the proposed flue position likely to build up under unfavourable atmospheric conditions, due to poor cross flow of air caused by enclosures or adjacent structures and/or likely to cause nuisance?	No	Yes
9	Is the flue termination position likely to cause a nuisance to adjoining properties?	No	Yes
Building Regulations part J			
10	Is the proposed flue termination less than 300 mm from the boundary of the property, as measured from the side of the terminal to the boundary?	No	Yes
Regarding the Clean Air Act			
11	Is the total output of the individual, or group of flue terminals (if within 5U (see A3.7)), greater than 333 kW net heat input?	No	Yes
General			
12	Are there any other considerations that are required for this risk assessment, see separate sheet.	No	Yes
13	Comments:		
If all answers are Blue, then the flue position should be suitable			
If any answer is Orange, then the flue position is unsuitable, consider revising the position or type of flue outlet or contact the local Environmental Health officer for assistance and/or approval			

Approved flue systems

The EcoKnight water heater is approved for use on the following types of flue system, however due to the high pd on the standard M&G flue system only B23 flue systems can be supplied. This manual covers the B23 and C63 flue systems only.

Type according EN 15502-2-1: 2012	Performance	Description
B23(P)	Open Air supply from room	* Roof terminal * Without draught diverter * Water heater room air supply. * P = overpressure systems Notice: The installation room must have sufficient air supply vents. These vents must be open and may not be closed or blocked. Requirements in accordance with national and local standards, e.g., IGEM/UP/10 and BS 6644.
C13	Closed Air supply from outside	* Wall outlet. * Air supply inlet and flue gas outlet at the same air pressure zone. (a combined wall outlet e.g.).
C33	Closed Air supply from outside	* Flue terminal at the roof. * Air supply inlet and flue gas outlet located at the same air pressure zone (a combined roof terminal e.g.).
C43	Closed Air supply from outside	Type C43. A type C4 appliance incorporating a fan upstream of the combustion chamber/heat exchanger.
C53	Closed Air supply from outside	* Separate air supply duct * Separate flue gas discharge duct. * Air supply inlet and flue gas outlet at different air pressure zones. But not at opposite walls.
C63	Closed Air supply from outside	* Appliance sold without flue/air-inlet ducts * The flue gas parts are not part of the water heater. The water heater is intended to be connected to a separately approved and marketed system for the supply of combustion air and discharge of combustion products. Condensate is allowed to go to the boiler. * Air supply inlet and flue gas outlet not at opposite walls

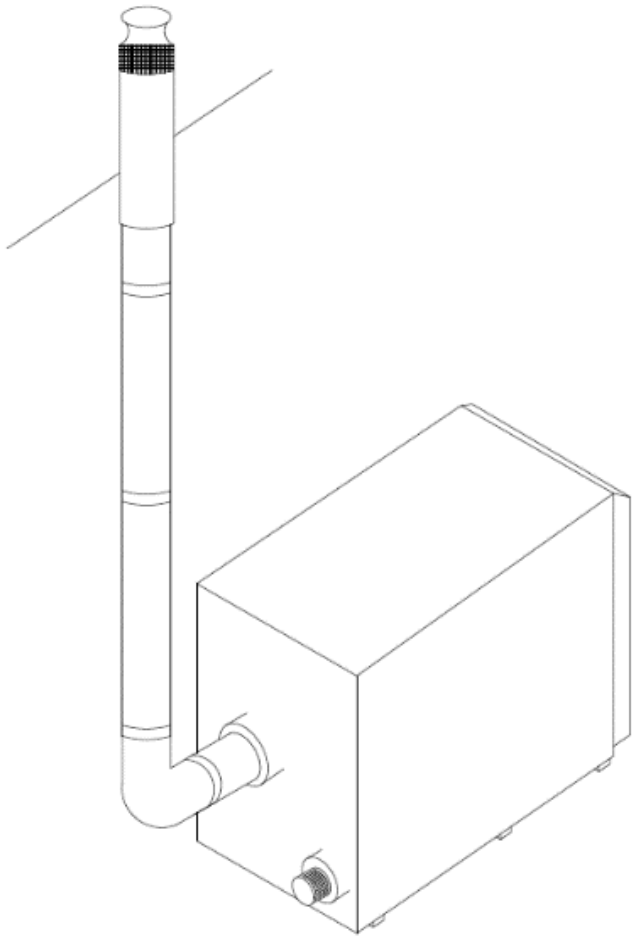
B23 Flue systems

Flue system specifications

•MANUFACTURER MUELINK AND GROL (M&G)
•TEMPERATURE CLASS T120
•FLUE GAS MATERIAL PP

Model Number		EKW-HCB117	EKW-HCB190	EKW-HCB235	EKW-HCB295
FLUE DATA TYPE All except C63					
Nominal flue diameter	mm	150*	150	150	200*
Nominal air inlet diameter	mm	100	100	100	200*
Minimum flue gas temp	°C	35			
Average flue gas temp	°C	70			
Maximum flue gas temp	°C	120			
Maximum equivalent length	m	27	27	16	24.9
Equivalent length 90° bend	mm	7.1	7.1	7.1	1.1
Equivalent length 45° bend	mm	1.8	1.8	1.8	0.7

* Flue size used is larger than the flue outlet of the appliance.



B23 Flue items available

Item no EKWCF010			
Starter kit **EKW117**			
Item	**Item No**	No	**Equivalent length mtr**
EXPANDER Ø100mm - Ø130mm PP	M85126	1	0.3
EXPANDER Ø130mm - Ø150mm	M70262	1	0.3
SAMPLING POINT Ø150mm PP	M70326	1	0.3
BEND 90° Ø150mm PP	LV310665	1	7.1
APPLIANCE AIR INLET GUARD Ø100mm	M86787	1	0
Total equivalent length mtr			8

Item no EKWCF011			
Starter kit **EKW190-235**			
Item	**Item No**	No	**Equivalent length mtr**
SAMPLING POINT Ø150mm PP	M70326	1	0.3
BEND 90° Ø150mm PP	LV310665	1	7.1
APPLIANCE AIR INLET GUARD Ø100mm	M86787	1	0
Total equivalent length mtr			7.4

Model EKW117-190-235 Additional flue items		
Item	**Item No**	**Equivalent length mtr**
EXTENSION Ø150mmPP CUT TO LENGTH (2000mm)	LV310695	2
EXTENSION Ø150mmPP CUT TO LENGTH (1000mm)	LV310694	1
BEND 45° Ø150mm PP	LV310664	1.8
BEND 90° Ø150mm PP	LV310665	7.1
ROOF TERMINAL 150MM	M70359	1
WALL CLAMP Ø150mm	M87196	n/a
FLAT ROOF FLASHING (170mm) ALU	LV302509	n/a
SLOPING ROOF FLASHING Ø100/150mm (25°-45°) LEAD	LV306017	n/a

Item no EKWCF012			
Starter kit **EKW295**			
Item	**Item No**	No	**Equivalent length mtr**
SAMPLING POINT Ø150mm PP	M70326	1	0.3
AIR INLET SCREEN (160MM)	LM900205A	1	0.3
EXPANDER PP 150-200	M70342	1	0.3

Additional flue items EKW295			
Item	**Item No**	No	**Equivalent length mtr**
VERTICAL TERMINAL Ø200mm PP	LV310683	8.8	8.8
BEND 45° Ø200mm PP	LV310667	1.1	1.1
BEND 90° Ø200mm PP	LV310668	0.7	0.7
EXTENSION Ø200MM (500MM) PP	LV310696	0.3	0.3
EXTENSION Ø200mm(1000mm) PP	LV310697	0.6	0.6
EXTENSION Ø200mm (2000mm) PP	LV310698	1.2	1.2
WALL CLAMP Ø200mm	M87198	n/a	n/a
FLAT ROOF FLASHING Ø200mm	LV302328	n/a	n/a

C63 Flue systems

In general, Water heaters are certified with their own purpose supplied Concentric or Twin Pipe flue systems, C63 certified appliances allow the installer to use other flue systems when installing the Water heaters however, they must be of a suitable minimum standard as per Table below.

Model Number	Item	EKW117	EKW190	EKW235	EKW295
Minimum flue gas temp	°C	35	35	35	35
Average flue gas temp	°C	70	70	70	70
Maximum flue gas temp	°C	120	120	120	120
Flue gas mass rate (@9.0% CO2)	g/sec	57.72	80.73	102.18	129.94
Pressure available at the flue outlet	Pa	169	183	190	196

Table 8 Flue gas material specification C63

CE string flue gas material	EU standard	Temperature class	Pressure class	Resistance to condensate	Corrosion resistance class	Metal: liner specifications
Min required PP	EN 14471	T120	P1	W	1	n/a
Min required INOX	EN 1856-1	T120	P1	W	1	L20040
CE string flue gas material	**Soot fire resistance class**	**Distance to combustible material**	**Plastics location**	**Plastics fire behaviour**	**Plastics enclosure**	
Min required PP	O	30mm	I of E	C/E	L	
Min required INOX	O	40mm	n/a	n/a	n/a	

Material	Water heater	dnom	Doutside	Linsert
PP	EKW117	100	100 +/-0.6	50 +20/ -2
PP	EKW190	150	150 +/-0.6	50 +20/ -2
PP	EKW235	150	150 +/-0.6	50 +20/ -2
PP	EKW295	150	150 +/-0.6	50 +20/ -2

Caution:

When installing the water heater as a Type C63 appliance, it should be noted that the terminals must not be installed on opposite sides of the building.

The maximum allowable recirculation rate is 10% under wind conditions.

Aluminium flue pipe must not be used on this appliance as it may lead to premature failure of the heat exchanger and will invalidate the warranty.

COMBUSTION VENTILATION

The following information is based on single water heater installations only. If more than one water heater is being used, BS6644 or IGEM UP10 (as appropriate) should be consulted to calculate the necessary requirements.

Type B installations

When used as a Type B (open flue) appliance, the combustion air requirements are as follows:

Table 9 Ventilation requirements Type B flue systems.

Model	Input nett kW	Input gross kW	Plant Room	
			High cm²	Low cm²
EKW117	105	117	211	422
EKW190	171	190	342	685
EKW235	212	235	423	847
EKW295	266	295	532	1063

When used as a type B (open flue) appliance, provision for cooling ventilation is included in the combustion ventilation allowance.

Type C flue installations

When used as a Type C (room sealed) appliance, provided sufficient clearance is provided, see Working clearances ventilation for combustion is not necessary as the combustion air is ducted directly from outside.

When used as a type C (room sealed) appliance, installed in a compartment or an enclosure, cooling ventilation should be provided as follows:

Table 10 Ventilation requirements Type C flue systems.

Model	Input nett kW	Input gross kW	Direct to outside		To an internal space	
			High cm²	Low cm²	High cm²	Low cm²
EKW117	105	117	527	527	1054	1054
EKW190	171	190	856	856	1712	1712
EKW235	212	235	1059	1059	2117	2117
EKW295	266	295	1329	1329	2658	2658

Note:

Where an installation is in a partially occupied building for example by maintenance operators and is to operate in summer months the above allowance ought to be sufficient if it does not operate for more than 50% of the time. If the water heater installation is to operate at a higher percentage of the time, increased ventilation will be required. For example, at 75%, an additional 720 m3 per hour per 1000 kW and, at 100%, an additional 1350 m3 per hour per 1000 kW total heat input will be required for inlet and extract air.

ELECTRICAL CONNECTIONS

Wiring external to the equipment must be installed in accordance with the I.E.E. Regulations and any local regulations that apply.

Warning

Leave the water heater electrically isolated until you are ready to commission it.

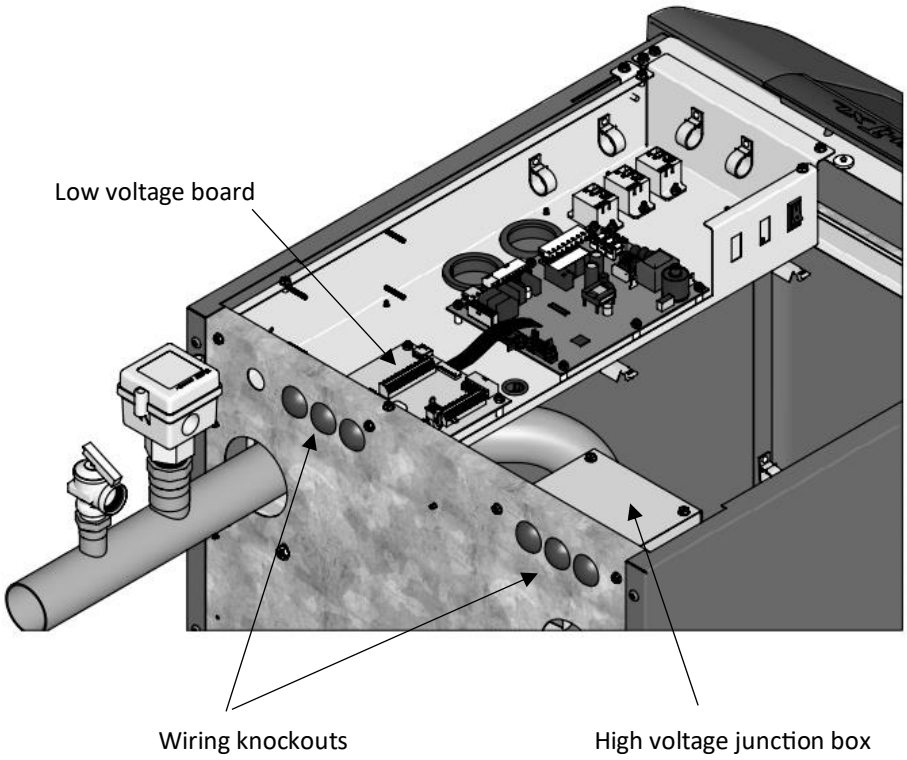
This appliance must be earthed.

A suitably competent person must check wiring. Normal supply required is 230 volts ac, single phase, 50 hz. An isolator with a contact separation of at least 3mm in all poles should be sited close to the equipment and must only serve that equipment. The double pole switch must be readily accessible under all conditions.

Preparation

Remove the top cover to gain access to the electrical connection terminals.

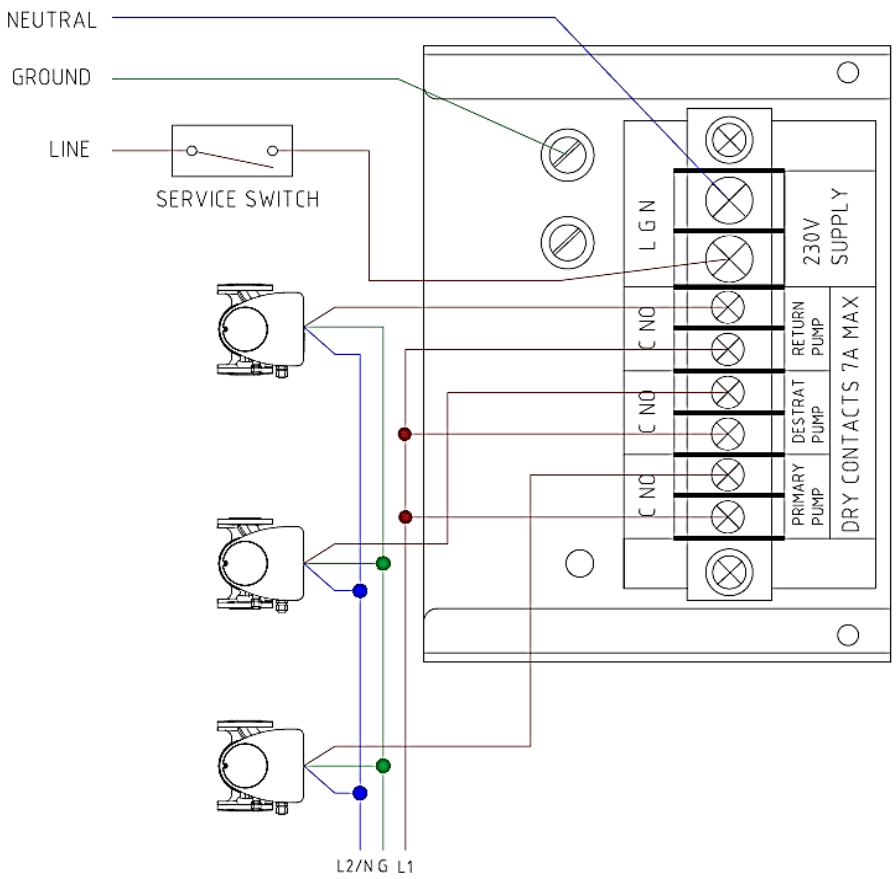
Figure 15 electrical terminal locations



High voltage connections

Route all high voltage connections through the knockouts at the rear of the water heater as shown in Figure 15

Figure 16 high voltage connections



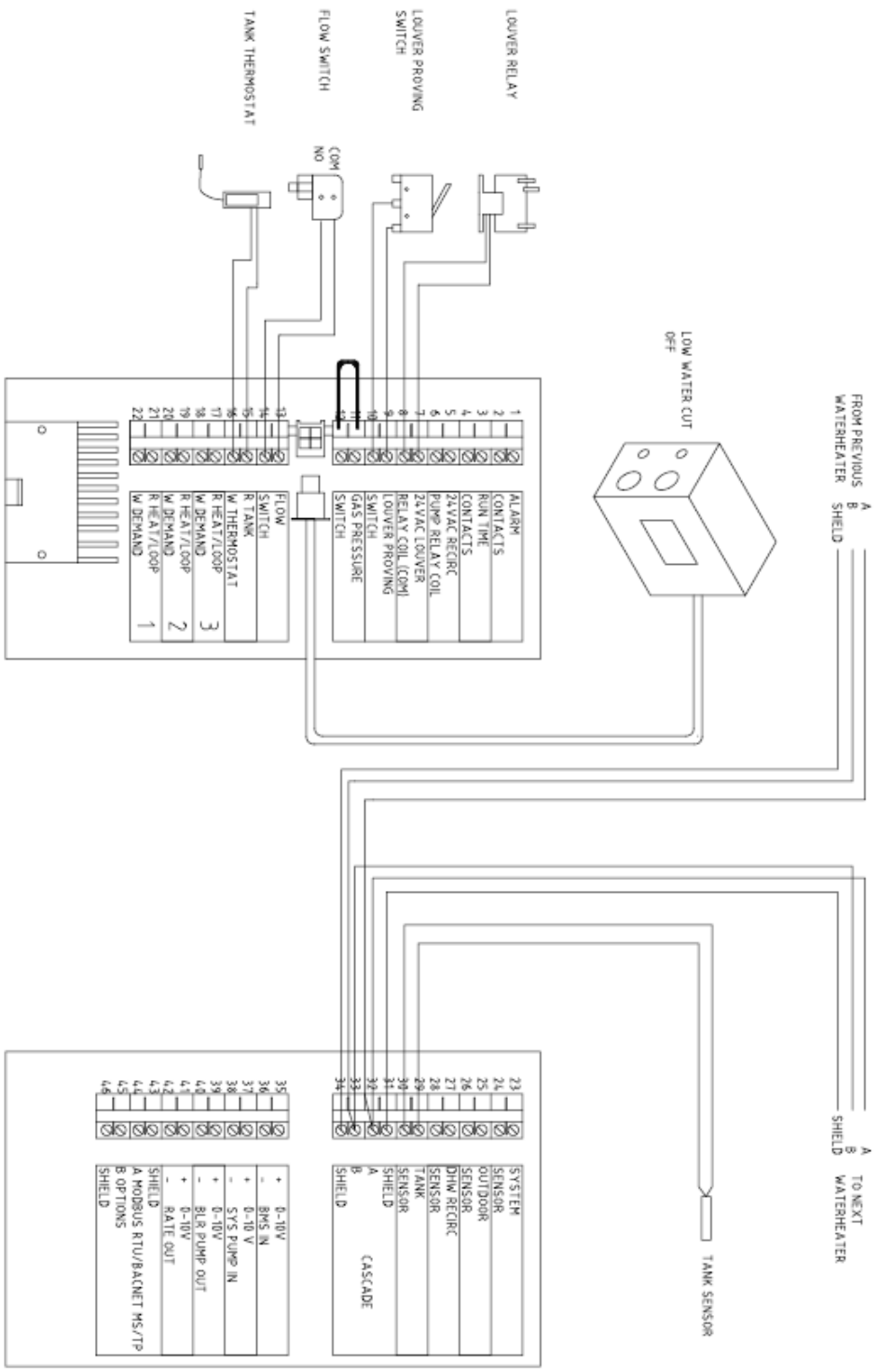
Caution

The three pump outputs are relays, each can accept up to 7amp maximum. If the pumps are larger than this, please contact Lochinvar Technical support for further assistance.

Low voltage connections

Route all low voltage connections through the knockouts in the rear of the water heater as shown in Figure 15. All connections should be secured using an appropriate cord anchorage.

Figure 17 low voltage connections, (see descriptions on next page for details)



Note

The low voltage board fitted to EcoKnight water heaters is also used on Herald heating boilers, as such some of the connections are not used. These are shown on the descriptions below

1-2 ALARM CONTACTS Volt free – Close on alarm. An internal volt free contact across pins 1 and 2 will close in the event of the heater locking out. This connection can be used by a BMS to monitor the operation of the heater.

3**-4 RUNTIME CONTACTS** Volt free – Close when unit running. An internal volt free contact across pins 3 and 4 will close in the event of the burner operating. This connection can be used by a BMS to monitor the operation of the heater.

5**-6 24VAC RECIRC PUMP RELAY COIL** 24VAC Output – when recirc sensor calls – switches on neutral when the heater gets a call for heat from the DHW RECIRC SENSOR a 24VAC supply will be sent to a DHW recirculation pump relay (field supplied).

7-8 24VAC LOUVER RELAY COIL (COM) 24VAC Output – When the heater gets a call for heat, a 24VAC supply becomes present on pin 7. Used in conjunction with the ground pin (pin 8), these terminals can be used to send a signal to energise an auxiliary device such as a fan dilution system or mechanical ventilation system.

9-10 LOUVER PROVING SWITCH24VAC Output – When unit calls for heat.If an auxiliary device such as a fan dilution system or mechanical ventilation system is to be used, the link should be taken out of pins 9 and 10 and the auxiliary deice safety circuit wiring installed. If there is no continuity across the terminals the heater will not fire.

11-12 GAS PRESSURE SWITCH 24VAC Output – constant when unit is powered. If a gas pressure switch is to be used to ensure the incoming gas pressure is correct, the link should be taken out of pins 11 and 12 and the gas pressure switch wiring installed. If there is no continuity across the terminals the heater will not fire.

13-14 FLOW SWITCH 24VAC Output—constant when unit is powered the link should be taken out of pins 13 and 14 and the flow switch wiring installed. If there is no continuity across the terminals the heater will not fire.

15-16 TANK THERMOSTAT 24VAC Output – constant when unit is powered. An on-off type thermostat located in a direct storage vessel can be connected to terminals 15 and 16 to control the output from the water heater. This connection is not polarity sensitive. **Not to be used in conjunction with the tank sensor.**

17-18 Not used with EcoKnight water heater installations.

19-20 Not used with EcoKnight water heater installations.

21-22 Not used with EcoKnight water heater installations.

23-24 Not used with EcoKnight water heater installations.

25-26 Not used with EcoKnight water heater installations.

27-28 Not used.

29-30 TANK SENSOR 24VAC Output – To ensure close control of the DHW temperature and prevent cycling a sensor should be located in the bottom third of the direct storage vessel and connected to terminals 29 and 30 to control the output from the water heater. This connection is not polarity sensitive. **Not to be used in conjunction with the tank thermostat.**

31-34 CASCADE Communication. If the heaters are to be operated in a cascade, shielded 2-wire twisted pair communication cable should be used. The shielding should be connected to pin 31 or 34 and then all "A" terminals (pin 32) should be linked together, and all "B" terminals (pin 33) should be linked together.

35-36 BMS IN 0 – 10 V DC input. When the heater is to be controlled by a 0-10V DC analogue output from a Building Management System (BMS), the 0-10V 0V line should be connected to pin 33 and the 0V line should be connected to pin 34.

37-38 SYS PUMP IN 0 – 10 V DC input. If a variable speed pump is used in the primary loop, and a 0-10V signal is available from the speed control, this signal can be used to control the modulation of the water heater as primary flow increases or decreases. The 0-10V line should be connected to pin 35 and the 0V line to pin 36.

39-40 Not used with EcoKnight water heater installations.

41-42 RATE OUT 0 – 10 V DC output. Provides a 0-10V signal that is proportional to the firing rate of the heater. This may be used by a BMS system to monitor the actual rate of the heater.

43-46 NOT USED

Warning

If a knockout is removed by mistake, the resulting hole must be blocked with an appropriate anchor, plug or grommet to prevent accidental access to the live parts within the water heater.

Figure 18 storage vessel sensor location 7 or 13

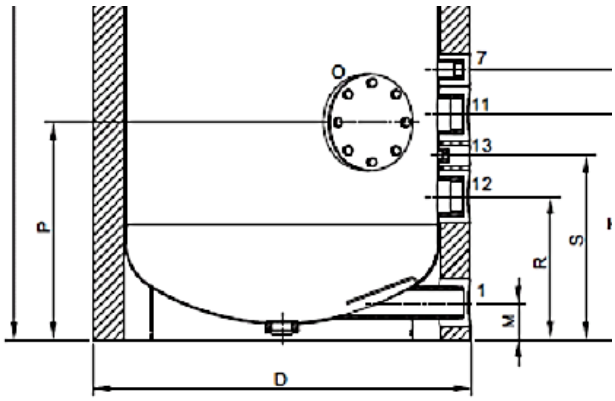
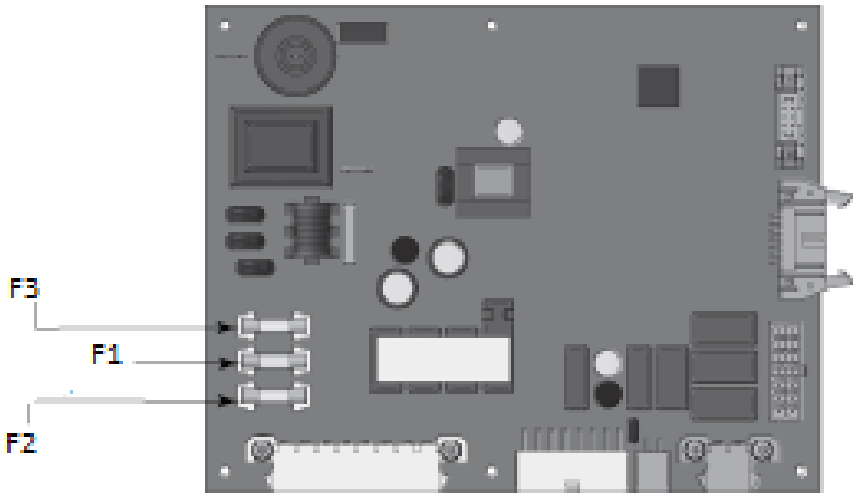


Figure 18 Fuse Location

The EcoKnight has three internal fuses. All are slow blow fuses, located and rated as follows:

- F1-5A
- F2-3.15A
- F3-80A



The water heater has three spare fuses in a plastic bag attached to the control module cover. Only replace with an equivalent rated fuse. Use of non-equivalent fuses or link wires will invalidate the warranty.

Caution

The appliance must be isolated from the mains electricity supply in the event of electric arc welding being carried out on any connecting pipework.

COMMISSIONING

Prior to start-up

Caution:

A person deemed competent must be responsible for the commissioning of this equipment. Before attempting to commission any equipment, ensure that personnel involved are aware of what action is about to be taken and begin by making the following checks:

Water side

The system should be thoroughly flushed out with cold water without any circulating pumps in position. Ensure all the valves are open.

Check the system for leaks and repair as necessary. If the water heater is fitted on an un-vented or boosted system, check there has been fitted a suitably sized un-vented system kit and check the expansion vessel cushion pressure has been set for the working pressure of the system.

Any leaks in the water heater or piping must be repaired at once, before proceeding further with the commissioning.

After flushing the water heater and the installation the system can be filled with fresh water. Fill the water heater and the system.

In hard water areas, scale formation can occur in hot water systems. The situation can intensify where higher temperatures or demands exist.

Water quality requirements

Water Chemistry		
Specification	**Range**	**Requirement**
Hardness	<85ppm CaCO3	Further precautions required
	85-205ppm CaCO3	Acceptable range
	>205ppm CaCO3	Water softening required
Dissolved solids	<350ppm	Hardness level must not be above 205ppm
pH Level	6.5-8.5	Acceptable range
Chlorides	<150ppm	Acceptable range

Note

If the above requirements cannot be satisfied, a water treatment specialist must be consulted. Failure of the heat exchanger due to deposit build up is not considered a manufacturing defect and will not be covered under warranty. Generally water conditioners will not prevent scale build up in circulating type water heaters and should not be used.

Regardless of water quality the heat exchanger should be flushed with descale liquid at least once per year.

General checks prior to lighting

1. Flueway passages are clear.
2. Adequate ventilation exists in the plant room (if necessary).
3. The system is fully charged with water, ready to receive heat. All necessary valves are open, and all allied pumps are circulating water.
4. The gas supply pipework is clear of any loose matter, tested for soundness and purged.
5. The condensate drain is installed correctly, and the condensate trap is filled with water.

Equipment checks prior to lighting.

This unit has been designed for a nominal gas inlet pressure of 20.0 mbar when used on natural gas.

1. Gas supply is connected but turned to the "off" position. Any unions or fittings are correctly tightened, test points are closed, and the flame sense electrode lead is connected correctly. Ensure the ceramic sheath around the flame sense electrode is not cracked or broken.
2. Ensure electricity supply is connected and there is a call for heat from the BMS and vessel sensor.
3. Ensure the flue system is connected correctly
4. Read User Section on the SMART TOUCH control to familiarise yourself with its operation.

Procedure for initial setup

Clock and Date

The control uses an internal clock for the night setback feature and for logging of events. For these features to work correctly, the clock must be set when the appliance is first installed or anytime the appliance has been powered off for more than four (4) hours. This parameter must be accessed to set the clock. If the unit is connected to the internet, the time will adjust based on the time zone selected.

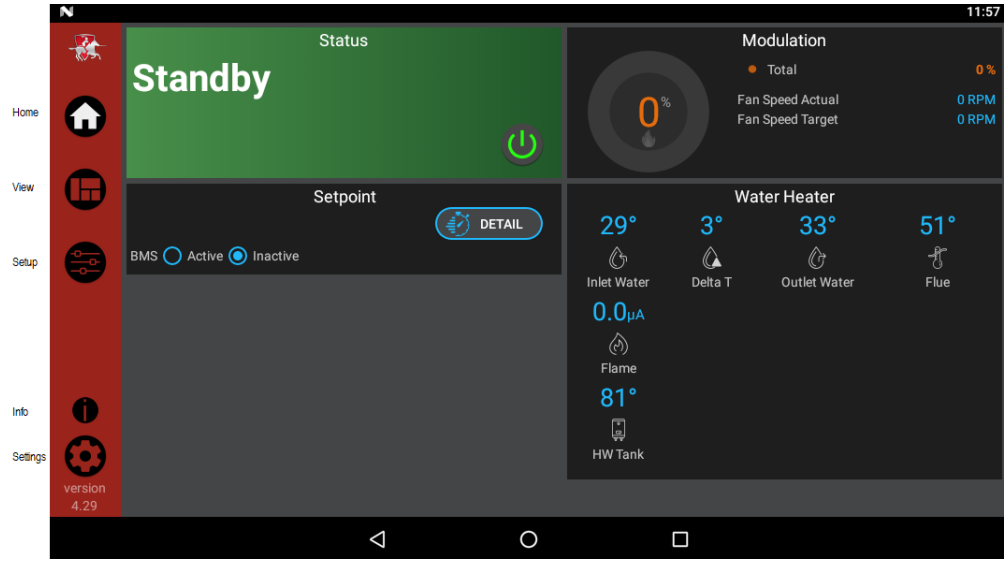
Temperature units (°C / °F)

The control can be configured to display temperature in either °C or °F.

Set clock!

The SMART TOUCH control has a built-in clock that it uses for its night setback feature and for logging events. This clock must be set when the appliance is installed and anytime the appliance has been powered off for more than four (4) hours.

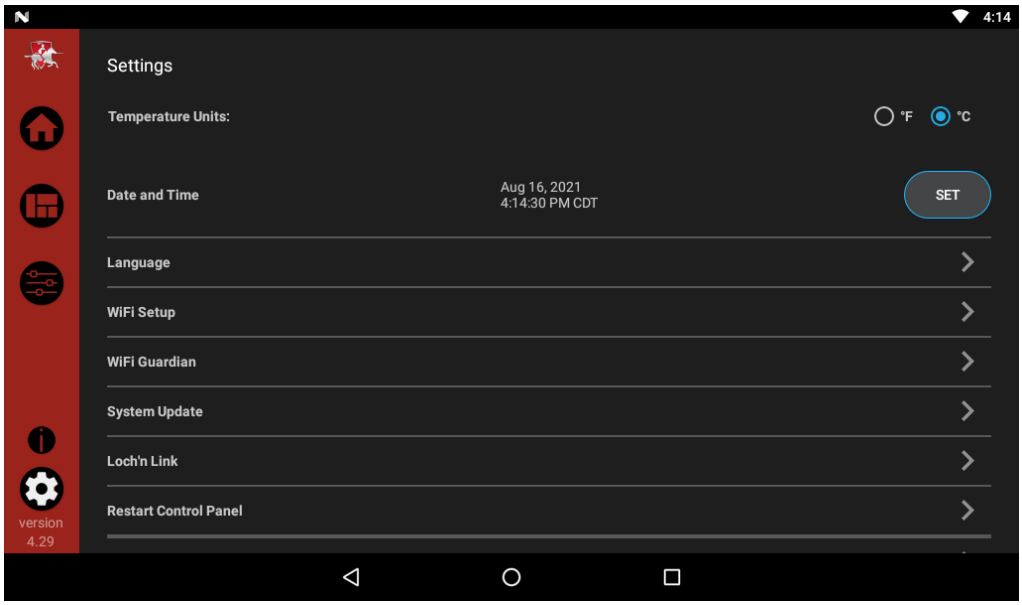
Figure 19 SMART TOUCH home screen



Use the following procedure to set the clock:

1. Press the SETTINGS button on the left-hand side See Figure 19.
2. Press the SET button across from the date and time
3. Proceed to set the date, time, and time zone. NOTE: Automatic Time Zone will not work unless the unit is connected to a Wi-Fi network.
4. Temperature units and Wi-Fi may also be set here. These items may be used to automatically sync the time.
5. Press the Home, View, or Back button to exit.

Figure 20 SMART TOUCH CONTROL settings

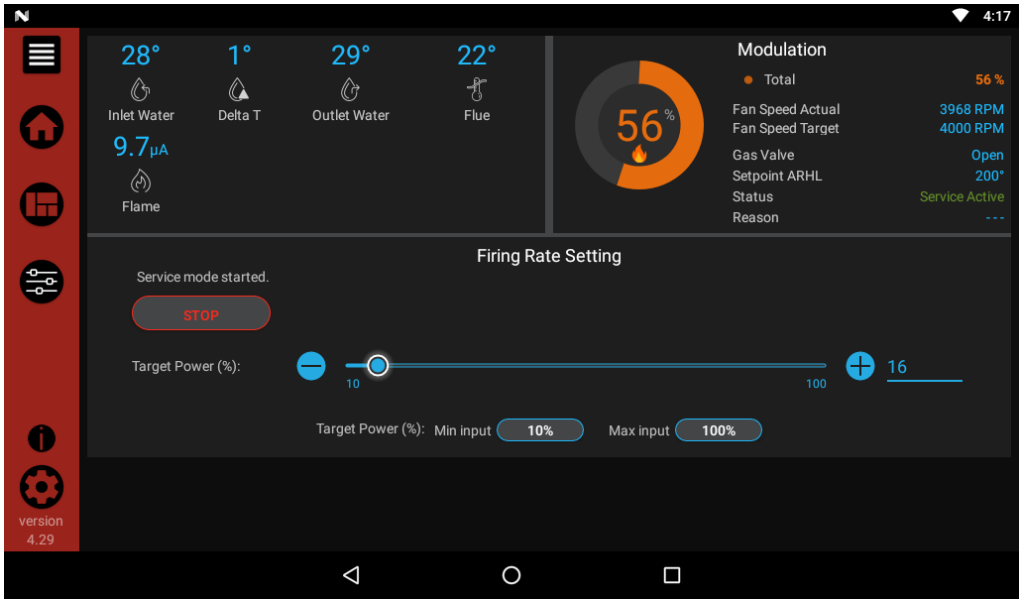


Check flame and combustion.

1. Navigate to the Setup Screen from the Home Screen by pressing the SETUP button along the left side of the screen. Enter the installer password (5309) See Figure 19

2. Select the Service Maintenance Screen. The tabs will scroll (up and down) to reveal more options.

Figure 21 service maintenance screen



3. Insert the probe from a combustion analyser into the flue gas analyser point in the flue at the rear of the water heater.

4. Once the water heater has modulated up to full fire, measure the combustion. The values should be in the range listed in the table below. The CO levels shall be less than 150 ppm for a properly installed unit.

Note

If the combustion is not within the specified range, reference the Troubleshooting Section of this Manual for possible causes and corrective actions or contact Lochinvar Technical Support.

Table 11 CO_2 levels

Natural Gas	
CO_2	O_2
8.4% - 9.4%	4.8% - 6.5%

5. Once the combustion analysis is complete, test the safety shutoff device by turning the manual shutoff valve to the OFF position and ensuring that the water heater shuts down and registers an alarm. Turn the manual shutoff switch to the ON position and reset the control.

6. Turn the main power off to the water heater and replace the flue temperature sensor into the flue pipe connection.

7. Place the water heater back into normal operation.

Adjust set point temperature(s)

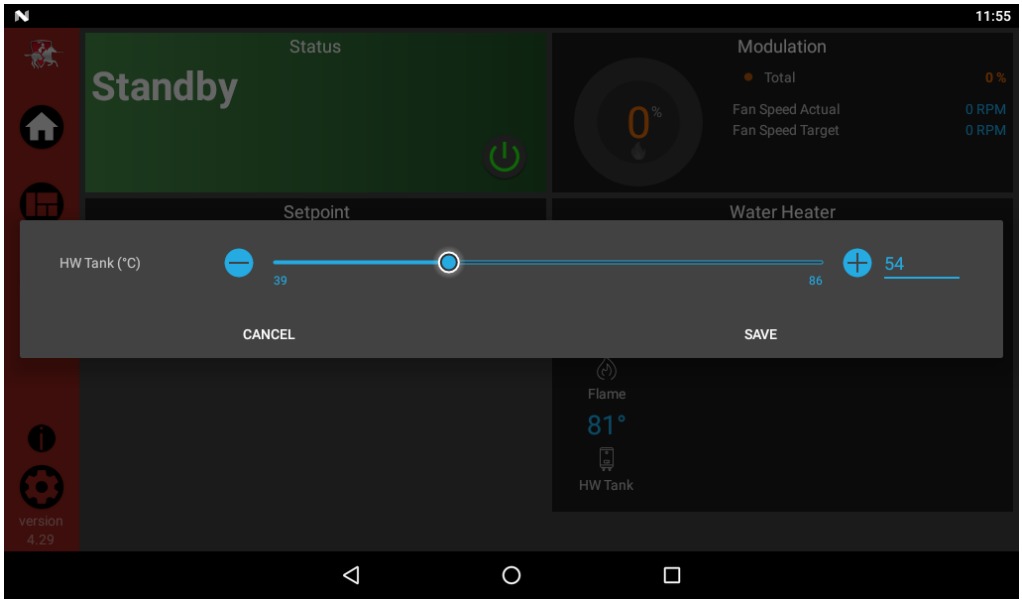
During normal operation, set point temperatures can be adjusted from the Home Screen by pressing the DETAILS button under setpoint See Figure 19.

1. To change a set point, use the set point slider feature or the PLUS (+) and MINUS (-) buttons to adjust the set points as shown in Figure 22.
2. Once the set point has been adjusted to the desired setting, press the Door Menu slider (top left) or the Setup button.
3. Press the APPLY CHANGES button on the top of the screen.

Note

The APPLY CHANGES button must be pressed to complete programming of the controls. Failure to press the APPLY CHANGES button will result in an unprogrammed control. The Door Menu button will become highlighted when there are changes that can be applied.

Figure 22 set point screen



DHW Tank Set Point

After installing the supplied tank sensor, the SMART TOUCH control will perform the tank thermostat function. The SMART TOUCH control automatically detects the presence of this sensor and generates a DHW call for heat when the tank temperature drops below the tank set point differential (Tank Set point Differential parameter) and finishes the call for heat when the tank temperature reaches tank set point + offset. This parameter can be changed by the installer by accessing the DHW Tank Set point parameter. The temperature range of this parameter tank minimum set point to tank maximum set point. The default value is 52°C.

Tank Set Point Offset

The tank set point offset measures how far the actual temperature must go above the set point before the call for heat ends (the water heater will turn off). This parameter can be changed by the installer by accessing the Tank Set Point Offset parameter. The temperature range of this parameter is 0°C to 30°C. The default value is 6°C.

Tank Set Point Differential

When a tank sensor is installed, the tank temperature must drop this amount below the tank set point (DHW Tank Set point parameter) before the water heater turns back on. The installer can adjust this setting by accessing the Tank Set point Differential parameter. The minimum setting is 0°C, and the maximum is 22°C. The default setting is 3°C.

Tank Minimum Set Point

This setting controls the minimum tank set point for the tank temperature. The installer can adjust this by accessing the Tank Minimum Set point parameter. The minimum setting is 16°C and the maximum setting is the maximum tank set point (Tank Maximum Set point parameter). The default value is 16°C.

Tank Maximum Set Point

This setting controls the maximum tank set point for the tank temperature. The installer can adjust this by accessing the Tank Maximum Set point parameter. The minimum setting is the minimum tank set point (Tank Minimum Set point parameter) and the maximum setting is 85°C. The default value is 60°C.

Cascade Control

When installing a Cascade system, all units must be programmed for Cascade to operate. Access the Cascade Setup options as follows:

1. Press the SETUP button on the left side of the display screen. See Figure 19.
2. Enter the installer password.
3. Select the Cascade option as shown in Figure 23.
4. Each unit must have a unique address set between 1 and 7. The leader must be zero and has more options which are described further. The tank sensor must be connected to the cascade leader.
5. Once all the updates are complete, press the Door Menu slider (top left) or the Setup button.
6. Press the APPLY CHANGES button on the top of the screen.

Cascade types

There are two (2) options for the way a Cascade divides the load between its heaters. The first is Lead/Lag, designated as L/L in the menu. This method is used when it is desired to have the least amount of total flow through the water heaters. This method will modulate the last two (2) water heaters. This provides for smooth transitions when a water heater turns on or off. When the last water heater reaches 100% and the calculated load is still increasing, it will start the next water heater at 20% and reduce the previous water heater to 80%, thus eliminating the sudden jump in total output of the Cascade. When the calculated load is decreasing and the last water heater gets down to 20% fire, it will hold it there and start lowering the firing rate on the next-to-last water heater. When the next-to-last water heater reaches 20%, it will turn the last water heater off and raise the rate of the next-to-last water heater to 40%, thus eliminating the sudden drop in total output of the Cascade.

The other Cascade divider method is Efficiency Optimization, designated as EFF in the menu. This method is used, as the name implies, when it is desired to have the most efficient system. When the first water heater reaches a certain rate (default =90%), it lowers its rate to 45% and turns on the next water heater at 45%. The two (2) water heaters then modulate at the same rate. As the calculated load increases further and both water heaters ramp up to 90%, it lowers the rate of the first two (2) water heaters to 60% and brings the next water heater on at 60%. The three (3) water heaters then modulate together. As the calculated load decreases, the water heaters will reach a lower threshold (default = 30%), at which time the

last water heater (the third in our example) will turn off and the Cascade will increase the rates of the remaining water heaters to provide the equivalent total output as before (3 x 30%) / 2 =45% in our example). Efficiency optimization is automatically selected when water heaters of different sizes are programmed into the Leader control (see Water heater Size on this page).

Maximum Cascade Set Point

This parameter determines the set point used by the individual water heaters in a Cascade when a system sensor is connected to the Leader water heater. When a water heater is commanded to fire by the Leader water heater, it will attempt to achieve this temperature at its outlet. The Leader water heater will limit the modulation of the last water heater to fire to hold the temperature at the system supply sensor to the user set point. If any of the water heater outlet temperatures reach the maximum cascade set point, the water heater will then modulate down on its own to keep its outlet temperature within the maximum cascade set point. Therefore, this parameter can be used to limit the outlet temperatures of all the water heaters in a Cascade. This parameter is adjustable by the installer by accessing the Maximum Cascade Set Point parameter. The temperature range of this parameter is 0°C to 88°C. The default maximum cascade set point is 85°C.

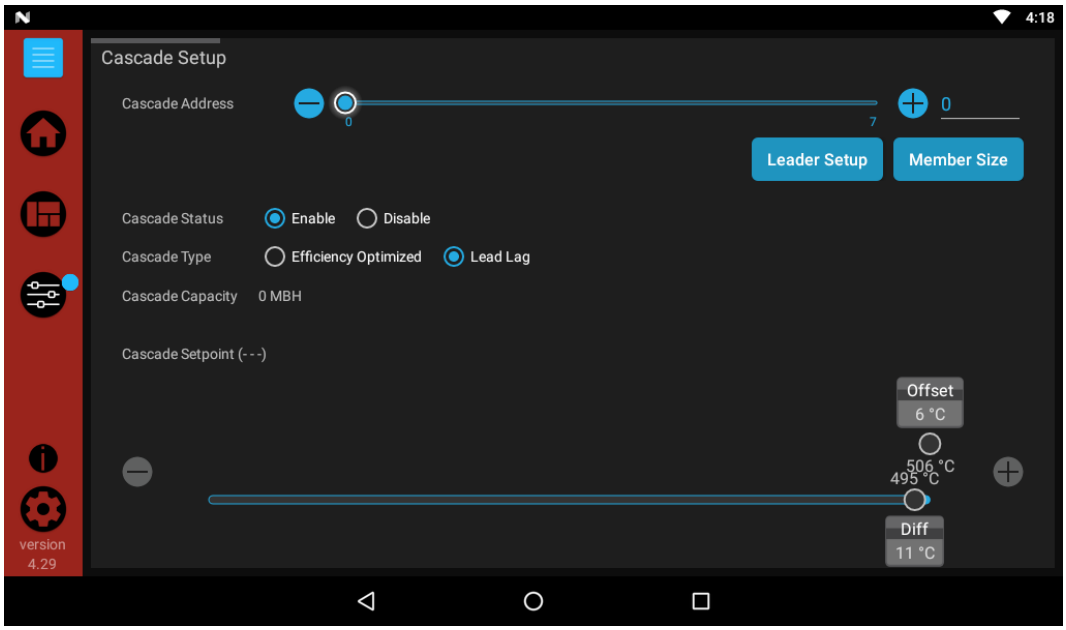
Cascade Offset

This parameter determines how much the temperature must go above set point before the lead water heater will turn off. This parameter can be adjusted by the installer by accessing the Cascade Offset parameter. The temperature range of this parameter is 0° to 11°C The default value is 6°C.

Cascade Differential

This parameter determines how much the temperature must go below the turn off temperature (Set point + Offset) before the lead water heater turns on. This parameter can be adjusted by the installer by accessing the Cascade Differential parameter. The temperature range of this parameter is 0° to 33°C The default value is 11°C.

Figure 23 cascade control setup



How the water heater operates

The EcoKnight water heater uses an advanced stainless steel heat exchanger and electronic control module that allows fully condensing operation. The fan pulls in air and pushes flue products out of the water heater through the heat exchanger and flue piping. The control module regulates fan speed to control the water heater firing rate. The gas valve senses the amount of air flowing into the water heater and allows only the right amount of gas to flow.

How the control module operates

The SMART TOUCH control module receives inputs from water heater sensors and external devices. The control module activates and controls the fan and gas valve to regulate heat input and switches the water heater, Domestic Hot Water (DHW), and system pumps on and off as needed. The user programs the module to meet system needs by adjusting control parameters. These parameters set operating temperatures and water heater operating modes. Water heater operation can be based on water heater outlet water temperature, water heater inlet water temperature, system temperature, a 0 - 10V signal, or Modbus, depending on the parameter settings.

Control inputs and outputs

Tank Sensor/Thermostat

Either of these inputs will tell the water heater to provide heat to the water tank. If a tank sensor is connected, the SMART TOUCH control will ignore the tank thermostat.

0 - 10V Input (set point or power)

The EcoKnight water heater can be controlled by a Building Management System (BMS) using a 0 - 10 VDC signal. The control can be configured by the installer to use this signal to either control set point or firing rate. The EcoKnight water heater can also be programmed to accept a call for heat from a 0 - 10V signal, See EcoKnight water heater Service Manual for details.

Anti-cycling

After the burner turns off, the control will delay the next burner cycle for a set period (time is adjustable by the installer).
The time delay will be bypassed if the inlet water temperature drops too far during the delay.

Temperature control

Modulation

The EcoKnight can modulate its firing rate from a minimum of 10% to a maximum of 100%. The firing rate is dictated by the call for heat, the heating load, ramp delay (if enabled), and various other temperature limitations.

Night setback

The controller may be programmed to reduce the DHW set points during certain times each week. Seven different start and stop times may be programmed for the DHW setback. (when using this function a legionella risk assessment must be carried out first)

Flame current support

To prevent nuisance shutdowns when the water heater is firing at minimum rates, the control will increase the firing rate when the flame signal drops too low.

Protection features

Outlet temperature, flue temperature, and temperature rise limiting. The outlet temperature is monitored by the water heater outlet temperature sensor. When the outlet temperature exceeds 85°C, the unit will reduce the fan speed. If the outlet water temperature exceeds 90°C the control will shut the unit down until it cools off. The control module monitors the flue temperature by a sensor located in the flue exhaust. If the flue temperature exceeds 102°C the control will reduce the maximum fan speed. If the flue temperature exceeds 107°C the control will shut the unit down. The unit will restart automatically once the flue temperature drops 6°C and the minimum off time has expired. The control monitors the temperature difference between the inlet and the outlet sensor. If the control determines the temperature rise is too high, it will either reduce the firing rate or shut down the unit as appropriate. The unit will restart automatically once the temperature difference has dropped below the allowable rise and the minimum off time has expired.

Freeze protection

Warning
DO NOT install the water heater in a room likely to freeze.

If this water heater may have been exposed to freezing conditions, prevent from firing. Shut off power and gas to the appliance immediately and contact the factory for further instructions.
Allowing the water heater to fire when the heat exchanger or near water heater piping is frozen could result in death or serious injury and significant property damage.

The following integral feature of the water heater control module provides some protection for the water heater only -- not for the system.
The water heater control module provides a freeze protection feature with the following attributes:
• Below an inlet temperature of 7°C, the water heater pump operates constantly.
• Below an inlet temperature of 3°C, the burner fires.
• Water heater and pumps turn off if water heater water inlet temperature rises above 7°C.
Neither this feature nor the water heater control module eliminates the possibility of freezing. The installation must still use recognized design, installation, and maintenance practice to prevent freeze potential for the water heater and system.

Note:

When system return temperatures are maintained below the dew point, condensation will form on the inside of the water heater jacket causing some internal sheet metal components to rust.

Warning:

The Freeze Protection feature will not work if the appliance does not have power, is locked out, is in shutdown mode, had a component failure, or is otherwise prevented from firing.

Monitoring external limits

Connections are provided on the connection board for external limits such as flow switch, low water cut-off, gas pressure switches, and a louver proving switch. The SMART TOUCH will shut off the burner and inhibit relighting whenever any of these external limits open.

Run-time and alarm outputs

The water heater provides dry contacts for indicating when the water heater is running, and when it is unable to operate.

Run-time and cycle counting

The control uses a timer to monitor the total hours of burner operation. The timer monitors the time the water heater is firing.

The control uses two (2) ignition counters to monitor the amount of water heater cycles. The first counter counts all ignitions of the control. The second counter counts only ignition attempts that have failed.

Service reminder

The control can be programmed for service reminder notification. This notification will become active when either a set time frame has expired, or a set amount of running hours or cycles have expired (all adjustable by the installer). The display will show a Maintenance Required screen. The installer's name and phone number can be programmed into the control. This information will appear on the Maintenance Required screen. The service reminder notification can be reset or disabled by the installer. The time dependent feature has been disabled by the manufacturer. To enable this feature, change the parameter to the desired time interval, See EcoKnight water heater Service Manual for details.

Error logging

The control will hold in memory the last 10 lockouts as well as the last 10 blockings. The date and time of the occurrence will be recorded as well. Only the 10 most current occurrences of each will be held in memory.

Water heater temperature regulation

Operating temperature (target)The SMART TOUCH control module senses water temperature and regulates water heater firing and firing rate to achieve a target temperature. The target temperature can be set between 15°C and 88°C.

High limit operations

The EcoKnight is equipped with a fixed automatic reset high limit and a manual reset high limits. The automatic reset high limit has a set point of 93°C and the manual reset high limit has a maximum set point of 98°C.When the outlet temperature exceeds 93°C, the automatic high limit action occurs. The water heater shuts down until the outlet water temperature cools below 88°C, and a 60 second timer has expired. If the outlet temperature continues to increase, the manual reset high limit action will occur at 98°C.

High limit test procedure

1. Turn ON the main power to the water heater by placing the ON/OFF switch in the ON position.
2. Navigate to the Setpoints Screen.
3. Use the slide bar to decrease the MRHL temperature below the current outlet temperature or to its minimum setting, whichever is higher.
4. Press the APPLY CHANGES button to save the setting.
5. If the current outlet temperature is above the MRHL setting then the MRHL will function, causing a water heater lockout. If the outlet temperature is below the MRHL setting, navigate to the Service Screen and place the water heater in service mode at full fire.
6. Once the outlet temperature rises above the MRHL setting, the MRHL will function causing a water heater lockout.
7. Repeat steps 2-4 to set the MRHL to the desired setting for normal operation.

Low water cut-off protection

1. The SMART TOUCH control module uses temperature sensing of both supply and return areas of the heat exchanger. If the flow rate is too low or the outlet temperature too high, the control module modulates and shuts the water heater down. This ensures water heater shutdown in the event of low water or low flow conditions.

Cascade

When multiple water heaters are installed, they can be wired together in a cascade sequence. A maximum of eight water heaters can be controlled from a single control. In this application one water heater would be designated as the Leader control and all others would be designated as Member controls. The Leader control can be programmed to use Lead/Lag or Efficiency Optimization control methods. Once the Leader water heater receives a call for heat from a sensor, BMS, or Modbus, the control will determine what the set point will be. A fixed temperature set point can be programmed into the control. See section on DHW tank set point of this manual to program the set point. If the water temperature at the tank is less than the set point -differential, then the control will initiate a call for heat on the Cascade (see the EcoKnight water heater Service Manual for an explanation of the differential). The Leader will energize the lead water heater on the Cascade. For a new start-up this will be the Leader water heater.

Sequence of the cascade

To equalize the runtime of all water heaters on the Cascade, the firing sequence will automatically be changed at set intervals.

For the first 24 hours after initializing the Cascade, the sequence will be changed every hour. After that the sequence will be changed once every 24 hours. The switching on/off sequence will be as follows:

Time	Switching on sequence
Start	L-M1-M2-M3-M4-M5-M6-M7
+1 hour	M1-M2-M3-M4-M5-M6-M7-L
+2 hours	M2-M3-M4-M5-M6-M7-L-M1

If a water heater locks out, it will automatically be given the lowest priority for the rest of that 24-hour period.

Night Setback operation with cascade

Night Setback operation of the water heaters within the Cascade is available. Programming of the Night Setback will be done through the Leader water heater. See EcoKnight water heater Service Manual for details.

Access Modes

User

The user can set the tank set point, turn the unit on/off and set up Wi-Fi.

Installer

Most parameters are only available to the installer/service engineer accessible by entering the installer password See EcoKnight water heater Service Manual for details.

Note:

The password will timeout after 60minutes from entry

Table 12 sequence of operation

	OPERATION
1	Upon a call for heat, the control turns on the Primary DHW pump.
2	The control confirms that the low water cut-off / flow switch contacts are closed and energizes the louvers (optional)
3	The control confirms that the gas pressure switch, blocked drain switch, limits, louver proving switch (optional), and contacts close. The Pre-Purge cycle begins.
4	The control confirms the fan comes up to the desired speed.
5	Once the Pre-Purge cycle is complete, the control lowers the blower speeds, initiates sparking of the ignition electrode, and opens the gas valve.
6	After a short wait, the control stops sparking and checks for the presence of flame current through the flame sense electrode.
7	If the flame is not detected aft er the sparking ends, the control will perform a post purge, then start another pre-purge cycle and try to light the burner again. On the 190 and above, the control will lock out if this second attempt also fails. On the 117 model, the control will perform a total of 4 attempts before locking out. Once the control has locked the unit out, the RESET button will need to be pressed on the touch screen LCD.
8	If the control detects flame current, the control will hold the blower speed constant for a few seconds to allow the flame to stabilize, then begin modulating the firing rate to maintain the controlling sensor to the desired set point temperature.
9	Once the DHW call for heat is satisfied, the control will turn off the gas valve and begin the post-Purge cycle. Any pumps that are running will begin their respective Pump Delay cycles.
10	At the end of the post-Purge cycle, the louver relay contacts will de-energize.
11	At the end of the Pump Delay cycle(s), the pump(s) will be turned off.

SERVICE AND MAINTENANCE PART

MAINTENANCE SCHEDULES

Service technician

	Service technician (See the following pages for instructions)
Annual Service	**General:** • Address reported problems • Inspect interior; clean and vacuum if necessary; Including air inlet filter • Clean condensate trap and fill with fresh water • Check for leaks (water, gas, flue, condensate) • Verify flue and air lines in good condition and sealed tight • Check system water pressure/system piping/expansion tank • Check fill water meter •Test water heater water. When test indicates, clean system water with approved system restorer following manufacturer's information. • Check control settings • Check ignition and flame sense electrodes (sand off any deposits; clean and reposition) • Check wiring and connections • Perform start-up checks and performance verification as per General checks prior to lighting. • Flame inspection (stable, uniform) • Flame signal (at least 10 microamps at high fire) • Clean the heat exchanger if flue temperature is more than 30°C above return water temperature. • Test low water flow conditions. **If combustion or performance indicate a need:** • Clean heat exchanger • Remove and clean burner using compressed air only • Clean the fan

Building owner

Owner maintenance	
Daily	Check water heater area Check pressure/temperature gauge
Monthly	Check vent piping Check air piping Check air and vent termination screens Check relief valve Check condensate drain system Check air vents Check strainer
Periodically	Test low water cut-off (if used) Reset button (low water cut-off)
Every six months	Check water heater piping (gas and water) for leaks Operate relief valve
End of heating season	Shut water heater down (unless water heater used for domestic hot water)

Warning:

Follow the Service and maintenance procedures given throughout this manual and in component literature shipped with the water heater. Failure to perform the service and maintenance could result in damage to the water heater or system. Failure to follow the directions in this manual and component literature could result in severe personal injury, death, or substantial property damage.

The water heater should be inspected annually only by a qualified service technician. In addition, the maintenance and care of the water heater designated in Table 13A and explained on the following pages must be performed to assure maximum water heater efficiency and reliability. Failure to service and maintain the water heater and system could result in equipment failure.

MAINTENANCE PROCEDURES

Refer to separate EcoKnight Service manual.

Dummy code until website is live

TROUBLESHOOTING

Refer to separate EcoKnight Service manual.

Dummy code until website is live

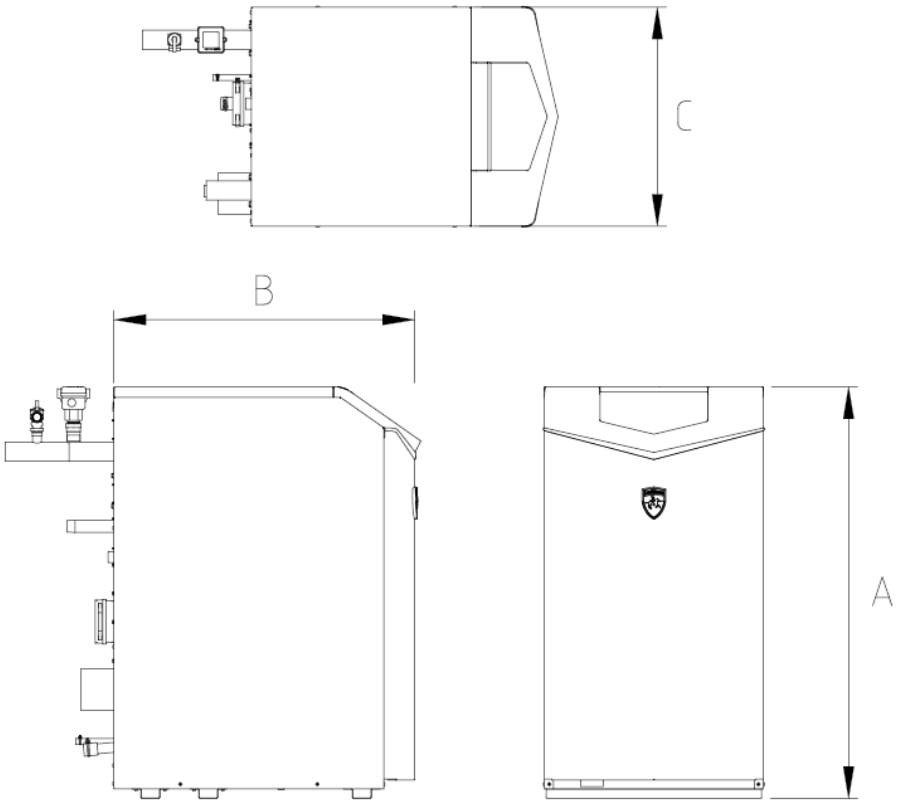
APPENDIX

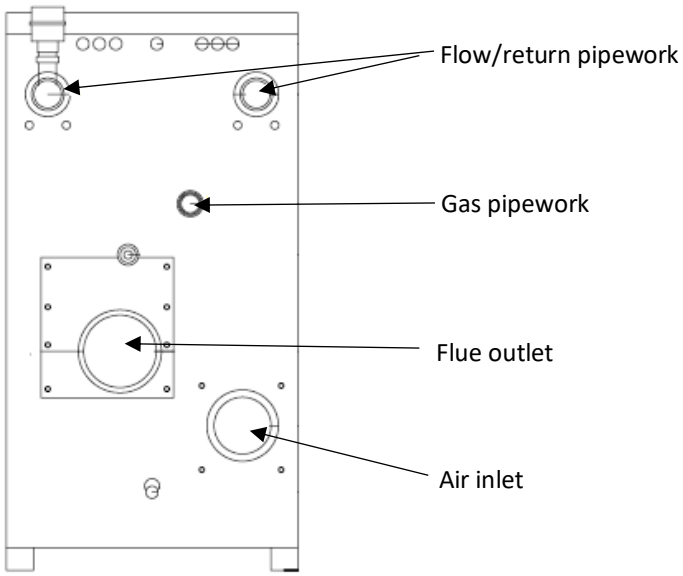
APPENDIX 1 TECHNICAL DATA TABLE

Model Number		EKW 117	EKW 190	EKW 235	EKW 295
GENERAL DATA					
Product I.D. Number		**0063DO3450**			
Classification		**I_{2H}**			
Input (gross)	kW	128.1	187.3	226.6	285.9
Input (net)	kW	115.3	168.7	204.1	257.5
Output (PmMin-PnMax)	kW	11.5-113.1	16.7-184.4	23.1-226.8	28.9-283.1
Downturn		10:1	10:1	10:1	10:1
Recovery Rate (44° ΔT)	l/hr	2187	3196	4444	4920
Recovery Rate (50° ΔT)	l/hr	1924	2812	3910	4329
Heat generator seasonal efficiency	%	96.3	96.3	95.9	95.7
Shipping Weight	kg	165.3	206.6	219.3	256.9
NOX @ 0% o2 According to EU regulation 812/2013	mg/kw	22	30	33	37
NOX Class According to EU regulation EN15502		6			
Maximum allowable temperature of the combustion air	°C	40			
GAS DATA - G20					
Nominal gas inlet pressure	mbar	21			
Maximum gas inlet pressure	mbar	25			
Minimum gas inlet pressure	mbar	17.5			
Gas flow rate	m3/hr	12.1	17.3	21.9	28.1
Flue gas mass rate (@9.0% CO2)	g/sec	57.72	80.73	102.18	129.94
Gas inlet connection size	"BSP	1	1¼	1¼	1¼
ELECTRICAL DATA					
Power consumption	W	238	767	979	1003
Power supply		Single phase 230v/50Hz			
Protection class		IP00			
WATER DATA					
Water content	litres	17	24	28	34
Water connections (F & R)	"BSP	2	2	2	2½
Max. water pressure (PMS)	bar	11			
Min. water pressure	bar	0.5			
Maximum water temperature	°C	85			

APPENDIX 2 DIMENSIONS

Model Number		EKW117	EKW190	EKW235	EKW295
A Height	mm	1143	1143	1143	1143
B Length	mm	851	1080	1080	1270
C Width	mm	609	609	609	609

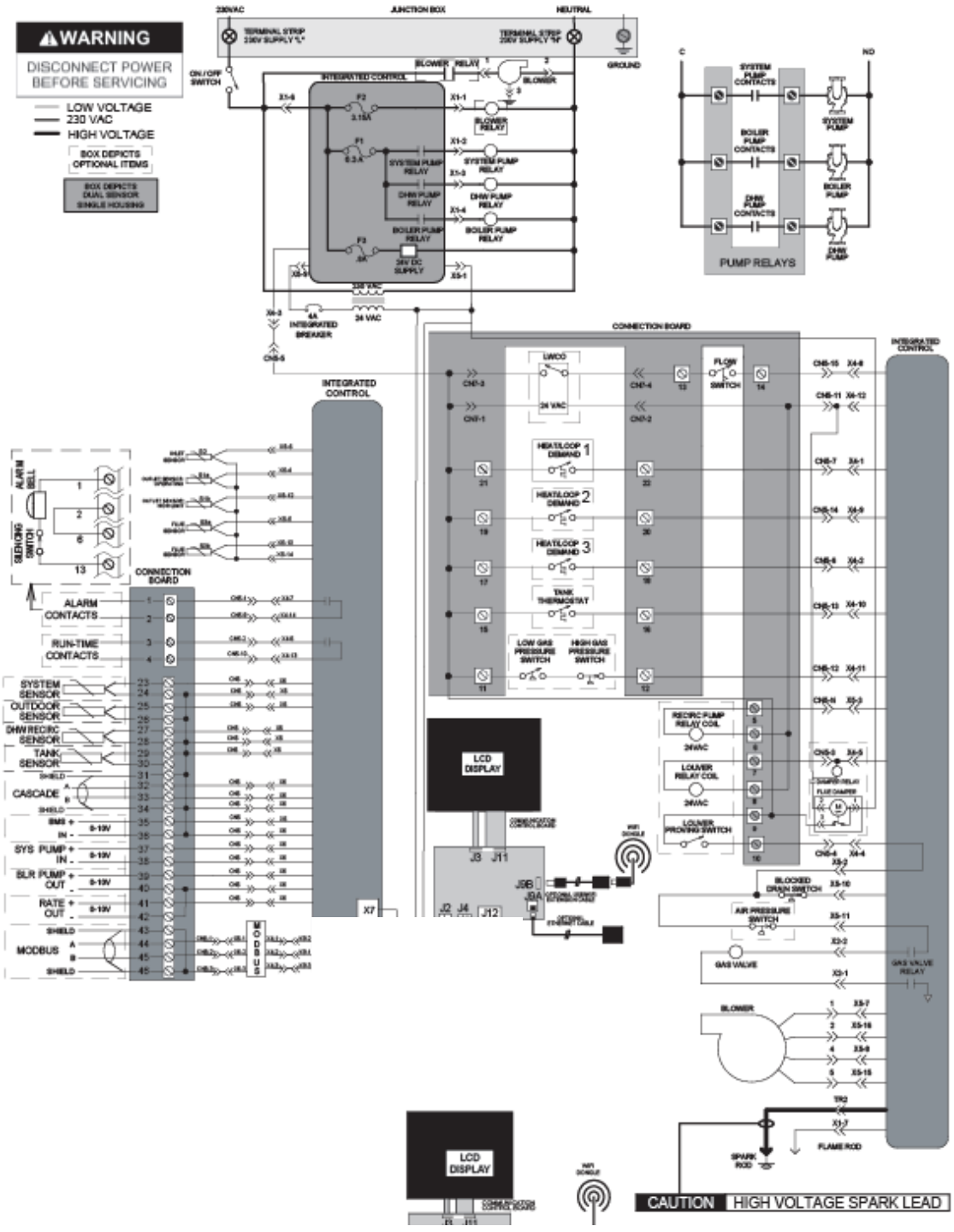




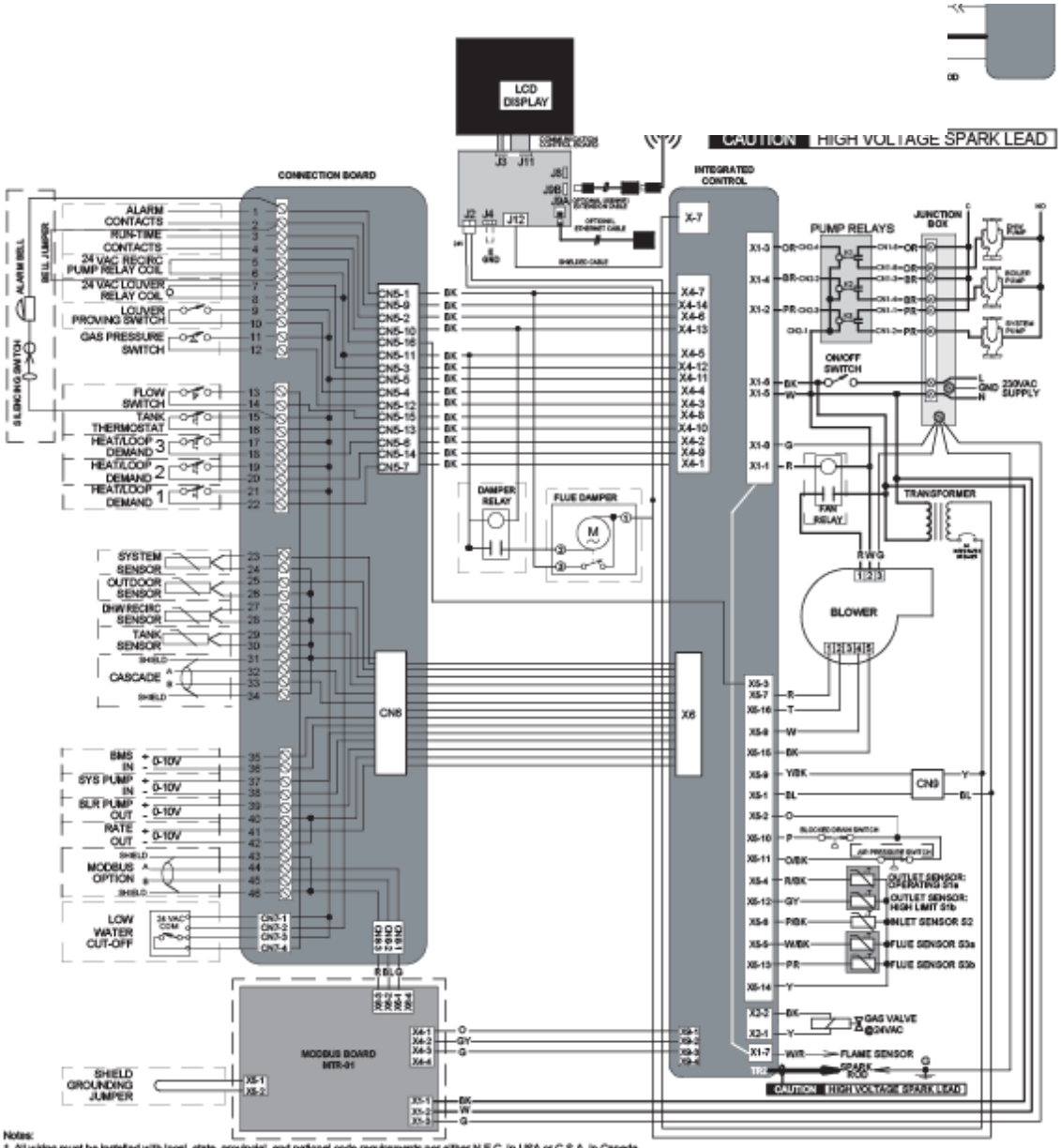
APPENDIX 3 ERP DATA TABLE

Type Circulating water heater:		**EKW117**	**EKW190**	**EKW235**	**EKW295**
Condensing boiler:		Yes	Yes	Yes	Yes
Low temperature boiler:		No	No	No	No
B11 boiler:		No	No	No	No
Cogeneration space heater:		No	No	No	No
Combination heater:		No	No	No	No
	Unit:				
Rated heat output					
P-rated (P4) at 60-80°C	kW	111.7	163.1	197.3	248.4
Heat output (p1) 30% at 30-37°C	kW	37.8	55.3	66.6	83.9
Seasonal space heating energy efficiency (ηs)					
Seasonal space heating efficiency (ηs)	**%**	92.5	92.4	87.1	86.9
Energy efficiency (η4) at 60-80°C	**%**	87.2	87.1	87.1	86.9
Energy efficiency (η1) at 30-37°C	**%**	98.4	98.4	98	97.8
Auxiliary electricity consumption					
At full load (elmax)	kW	0.238	0.767	0.979	1.003
At part load (elmin)	kW	0.193	0.283	0.821	0.353
In standby mode (Psb)	kW	0.017	0.017	0.018	0.045
Other					
Standby heat loss (Pstby)	kW	0.14348	0.14583	0.14348	0.15623
Emissions (NOx) of nitrogen oxides (EN15502)	mg/kWh	22	30	33	37
Sound power level, indoors (EN 14436 - 1:2006)	db	79.2	80.7	81.8	83.3

APPENDIX 4 WIRING DIAGRAM



APPENDIX 5 LADDER DIAGRAM



Notes:
1. All wiring must be installed with local, state, provincial, and national code requirements per either N.E.C. in USA or C.S.A. in Canada.
2. If any original equipment wire as supplied with appliance must be replaced, then it must be replaced with wire having same wire gauge (AWG) and rated for a minumum of 105°C. Exceptions: Replacement high voltage spark lead and ribbon cables must be purchased from the factory. Use of a non-approved spark lead or ribbon cables can lead to operational problems which could result in non-repairable damage to the integrated controller or other components.
3. Actual connector block locations may vary from those shown on diagrams. Refer to actual components for proper connector block locations when using diagrams to trouble shoot.
4. Where possible, switches are shown without utilities (gas, water, electricity) connected to the unit. As such, actual switch states may vary from those shown on diagrams depending upon whether utilities are connected or fault condition is present.

CERTIFICATE

Number	23GR0628/00	**Replaces**	--
Issue date	28-03-2024	**Contract number**	E4722
Due date	28-03-2034	**Module**	B (Type testing)
Report number	P000118450	**Scope**	(EU) 2016/426 (9 March 2016)
PIN	0063DO3450		

EU TYPE EXAMINATION CERTIFICATE (GAR)

Kiwa hereby declares that the **gas fired instantaneous water heaters**, model(s):

EKW 117,
EKW 190,
EKW 235,
EKW 295

Manufacturer

Lochinvar Ltd
8 Lombard Way, The MXL Centre
Oxon, OX16 4TJ Banbury
United Kingdom

meet(s) the essential requirements as described in the
Regulation (EU) 2016/426 relating to appliances burning gaseous fuels.

Reference standard: EN 15502-1:2021/AC:2022 and EN 15502-2-1:2022

This certificate is only valid in combination with the appendix to this certificate, where specific information and/or conditions are given.

Ron Scheepers
Managing director

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7300 AC APELDOORN
The Netherlands

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PRODUCTS
RvA C 002

APPENDIX 7 WARRANTY

Model	Warranty Period	
All EcoKnight EKW Range	Heat Exchanger	5 Years
	All other components#	2 Years
Conditions	Working temperature must be no greater than **85°C.** Flow switch must be fitted and connected to the water heater control. Water quality must comply with the guidance within the ICM instructions	

(1) General Warranty

If within 2(Two) years of the invoice date or commissioning date of a water heater supplied by Lochinvar Ltd., following verification, and at the sole discretion of Lochinvar Ltd., an assembly or part (with exclusion of the heat exchanger) proves to be defective or fails to function correctly due to manufacturing and/or material defects, then Lochinvar Ltd. shall repair or replace this assembly or part.

(2) Ancillary Options

Any ancillary options purchased with the water heater are covered via a standard 12-month parts only warranty. This includes items such as circulating pump, frame, and flue kits.

The warranty starts from the date of delivery, unless commissioned by Lochinvar in which case warranty starts from the date of commissioning which can be up to a maximum of 6 months after the date of delivery.

(3) Heat Exchanger Warranty

The low water content stainless steel heat exchanger has a manufacturing defect warranty of up to 5(five) years. This provides coverage to the end user via Lochinvar that if the heat exchanger becomes unserviceable due to a material or workmanship defect it will be replaced.

(4) Conditions for installation and use

The warranty set out in articles 1 and 2 will apply solely under the following conditions:

a.The water heater is installed under strict adherence to Lochinvar Ltd. installation instructions for the specific model and must be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations, and the byelaws of the local water undertaking. The installation should also be in accordance with any relevant requirements of the local gas distributor and local authority.

b.The water heater remains installed at the original site of installation.

c.The water heater is used exclusively with drinking water, which at all times can freely circulate (a separately installed heat exchanger is mandatory for heating saline water or corrosive water).

d.The heat exchanger is safeguarded against harmful scaling and lime build-up by means of periodic maintenance.

e.The water temperatures in the heater do not exceed the maximum setting of the thermostats, which form a part of the water heater.

f.The water pressure and/or heat load do not exceed the maximum values stated on the water heater rating plate.

g.The water heater is installed in a non-corrosive atmosphere or environment.

h.The water heater is connected to a protected cold supply arrangement, which is: approved by the relevant authority; with sufficient capacity for this purpose; supplying a pressure no greater than the working pressure stated on the water heater; and where applicable by a likewise approved temperature and pressure relief valve, fitted in accordance with installation instructions of Lochinvar Ltd. applying to the specific model of water heater, and further in compliance with Building Regulations, local authority installation byelaws and the Water Supply (Water Fittings) Regulations 1999.

Warranty Continued

(5) Exclusions

#Service parts and consumables are not included within the above warranty period, this includes (but is not limited to) any part identified within the Installation manual which should be changed as part of the service regime for the appliance. These parts have a 12-month warranty from the date of commissioning or from the date of delivery to site.

The warranty set out in articles 1 and 2 will not apply in the event of:

a.damage to the water heater caused by an external factor.

b.misuse, neglect (including frost damage), modification and incorrect and/or unauthorized use of the water heater.

c.contaminants or other substances having been allowed to enter the heat exchanger for example scale.

d.any attempts at repair to a defective water heater other than by an approved service engineer.

(6) Scope of the warranty

The obligations of Lochinvar Ltd. pursuant to the specified warranty are limited to free delivery from the warehouse of the replacement assemblies, parts, or water heater, respectively. Labour, installation, and any other costs associated with the replacement will not be accepted by Lochinvar Ltd.

Claims

A claim on grounds of the specified warranty must be submitted to the dealer from whom the water heater was purchased, or to another authorized dealer of Lochinvar Ltd. Inspection of the water heater as referred to in articles 1 and 2 shall take place in one of the laboratories of Lochinvar Ltd.

Obligations of Lochinvar Ltd.

Lochinvar Ltd. grants no other warranty or guarantee over its water heaters nor the (assemblies or parts of) water heaters supplied for replacement, other than the warranty expressly set out in these conditions. Under the terms of the supplied warranty, Lochinvar Ltd. is not liable for damage to persons or property caused by (assemblies or parts) of a (replacement) water heater that it has supplied.

Notes

Notes

Lochinvar®

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