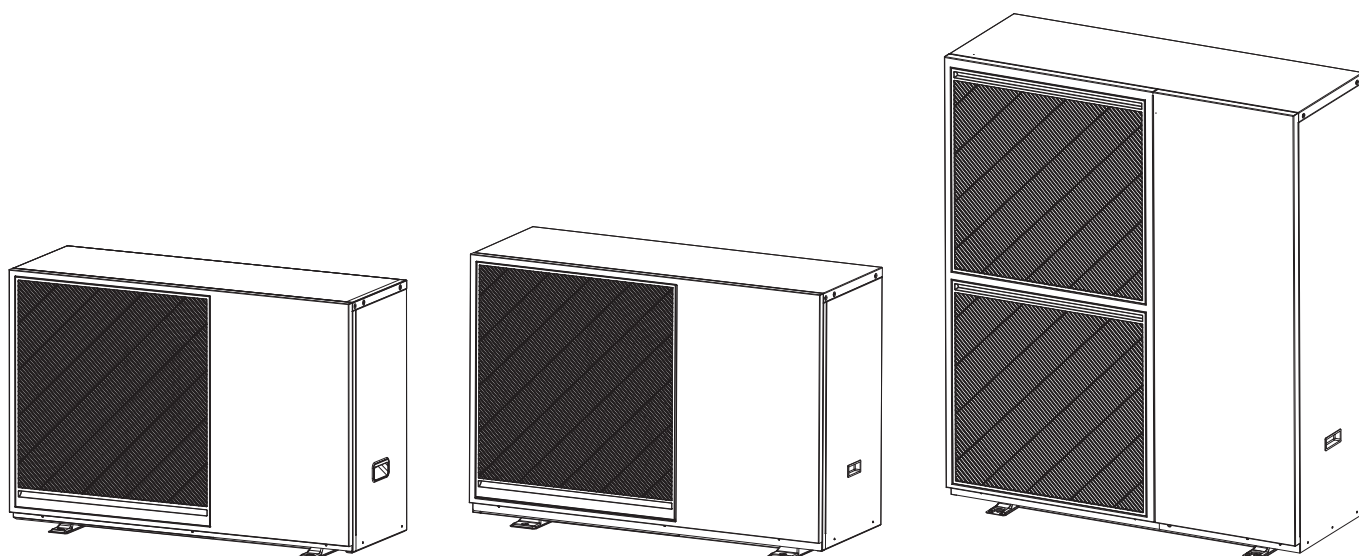


Grant Aeron 290

Air to Water Air Source Heat Pump Range

Installation & Operating Instructions



IMPORTANT NOTE FOR INSTALLERS

These instructions are intended to guide installers on the installation and commissioning of the Grant Aeron 290. After installing the unit, leave these instructions with the user.

SPECIAL TEXT FORMATS

The following special text formats are quite important and are used in these instructions for the purposes listed below:

! WARNING !

Warning of possible human injury as a consequence of not following this instruction.

! CAUTION !

Caution concerning likely damage to equipment or tools as a consequence of not following this instruction.

! NOTE !

Used for emphasis or information not directly concerned with the surrounding text but of importance to the reader.

Power Quality Information

HPR2904	Complies with the Technical requirements of BS EN/IEC 61000-3-2
HPR29065	
HPR2909	Complies with the Technical requirements of BS EN/IEC 61000-3-3
HPR29012	
HPR290155	Complies with BS EN/IEC 61000-3-11 & BS EN/IEC 61000-3-12

! WARNING !

This device is intended for external use only, and as such, these instructions outline the proper usage, safety precautions, and maintenance guidelines specifically for external application.



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This manual is accurate at the date of printing but will be superseded and should be disregarded if specifications and/or appearances are changed in the interests of continued product improvement. However, no responsibility of any kind for any injury, death, loss, damage or delay however caused resulting from the use of this manual can be accepted by Grant Engineering (UK) Limited, the author or others involved in its publication.

All goods sold are subject to our official Conditions of Sale, a copy of which may be obtained on application.

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SERVICE

The heat pump should be serviced at least every twelve months and the details entered in the Service Log in the back of the manual.

PRODUCT CODES AND SERIAL NUMBERS COVERED

The serial numbers used on the product consist of a 15 digit numerical code with the central three digits being the product identifier.

For example:



This serial number can be found on a label attached to the unit on its rear left-side panel (viewed from the rear above the flow and return connections) and should be used when registering the heat pump with Grant UK.

These instructions cover the following product codes and serial numbers:

Product code	Serial number identifier
HPR2904 - 4kW	806
HPR29065 - 6.5kW	807
HPR2909 - 9kW	808
HPR29012 - 12kW	809
HPR290155 - 15.5kW	810

The manufacturer serial is a 31 digit alpha-numeric code found on a label next to the serial number. This is used for manufacturing purposes only but should be left attached to the unit.



IMPORTANT NOTE FOR INSTALLERS

The data label gives you very important information about the installed heat pump. Do not remove this label from the heat pump under any circumstances.

Grant Aeron HPR2904	
Model	HPR2904
Power Supply	230V 1PH 50Hz
Heating Capacity*	4.0 kW
COP*	3.15
Maximum Current (Heating)	19A
Refrigerant	R290
Mass of Refrigerant	610g
GWP	3
Equivalent CO ₂	0.002t
Rated Water Flow	0.69m ³ /h / 11.5 l/min
Net Weight	101kg
Height	803mm
Length	1155mm
Depth	422mm
Max System Pressure	3 bar
Max Pressure - Suction	0.3 MPa
Max Pressure - Discharge	3.5 MPa
Waterproof Level	IPX4
* Air 7°C / Water 55°C	
Grant Engineering (UK) Ltd. Frankland Road, Swindon, Wiltshire SN5 8YG t: +44 (0)1380 736920 w: www.grantuk.com	

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1 INTRODUCTION

1.1 GENERAL

The Grant Aerona 290 Air to Water Air Source Heat Pump range consists of five models. These are all MCS approved, air-to-water, inverter driven, single-phase air source heat pumps working with R290 refrigerant.

The Grant Aerona 290 extracts heat from the outdoor air and it is transferred through the refrigerant piping to the plate heat exchanger in the hydraulic system. The heated water in the hydraulic system circulates to the heat emitters to provide space heating. This water is also used to heat the domestic hot water cylinder. The 4-way valve in the Grant Aerona 290 can reverse the refrigerant cycle to prevent ice formation in the plate heat exchanger.

The heating capacity of the unit decreases with ambient temperature. The nominal outputs e.g. 4 kW is the heating capacity at an ambient temperature of -5°C with a flow 55°C.

It is important that these instructions are followed to ensure correct installation and operation of the heat pump. Failure to do so may result in poor performance of the installed unit or system.

These instructions do not replace the installation or users manuals for any additional components used in the design of your system e.g. cylinders, motorised valves, programmers, solar thermal devices, buffers, etc.

The Grant Aerona 290 heat pump is to be used only with the Grant Aerona Smart heat pump system controller which is obtained either as a stand alone kit (purchased from Grant UK) or supplied factory-fitted and pre-wired to a Grant QR Smart Pre-Plumbed cylinder. Refer to Section 1.7 for further information.

These units are used for heating applications and domestic hot water cylinders. They can be combined with fan convactor units, underfloor heating, low temperature high efficiency radiators, domestic hot water cylinders and solar thermal systems.

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

These instructions must be left with the product for future reference.

1.2 MAIN COMPONENTS

Each model incorporates the following main components:

- **DC inverter** - This responds rapidly to changing conditions to provide the necessary output to meet heating demands by varying the speed and output of the compressor, fan and circulating pump. This reduces the on/off times of the compressor, keeping the water temperature constant during operation reducing the electricity consumption.
- **Compressor** - a high-efficiency DC twin-rotary compressor to provide smooth performance and quiet operation.
- **Plate heat exchanger (condenser)** - The high efficiency plate heat exchanger is used to transfer heat to the heating system primary circuit.
- **Fan** - a high-efficiency DC fan motor is used for smooth and quiet operation. A single fan (3 blade) is fitted to the HPR2904, HPR29065 & HPR2909, and two fans (3 blade) are fitted to the HPR29012 and HPR290155 units.
- **Circulating pump** - high-efficiency DC PWM pump speed controlled from the ASHP Hydraulic PCB.
- **Base tray heater** - factory fitted electric heater to melt any frozen condensate collected in the base of the heat pump. When the ambient temperature reaches -5°C, the base tray heater turns on and will remain on for either 60 minutes or when the ambient temperature reaches -2°C (ΔT of 3K). These temperatures are factory set and cannot be adjusted by the user.

- **Electronic expansion valve (EEV)** - Controls refrigerant flow and reduces refrigerant pressure.
- **4-way valve** - Controls refrigerant flow direction. Closed in cooling mode and open in heating mode. When closed, the air side heat exchanger functions as a condenser and water side heat exchanger functions as an evaporator, when open, the air side heat exchanger functions as an evaporator and water side heat exchanger functions as a condenser.
- **High pressure switch** - Monitors refrigerant system pressure. When refrigerant system pressure rises above the upper limit, the high pressure switches will open and then turn off heat pump.
- **High pressure sensor** - Monitors refrigerant system pressure. When refrigerant system pressure rises above the upper limit, the high pressure sensor will open and then reduce compressor operating frequency.
- **Low pressure sensor** - Monitors refrigerant system pressure. When refrigerant system pressure falls below the lower limit, low pressure sensor detects the limit value and then turns off heat pump.
- **Pressure relief valve** - A 3 bar pressure relief valve is factory fitted in the heating primary circuit of the heat pump.
- **Air purge valve (automatic air vent)** - Factory fitted to assist in the removal of air from the heating primary circuit of the heat pump.
- **Water flow switch** - Detects water flow rate to protect compressor and water pump in the event of insufficient water flow.
- **Built-in electric heater** - Provides anti-freeze protection for the plate heat exchanger and adjacent pipework in the heat pump. This will not provide antifreeze protection to the entire system.
- **Built-in Refrigerant Leakage sensor** - Detects leaks in refrigerant system for safety. The unit must be powered at all times after installation and commissioning except when servicing.

1.3 PLANNING PERMISSION

The installation of a The Grant Aerona 290 Air to Water Air Source Heat Pump Ranger on domestic premises may be considered to be permitted development, not needing an application for planning permission, provided ALL the limits and conditions listed on the Planning Portal website are met.

For further information, visit www.planningportal.gov.uk.

1.4 DNO APPLICATION

Grant UK recommend using the ENA "Connect Direct" to make sure you can connect the heat pump to the customers electrical connection. It is a simple process that requires the installer to set up an account, either as an individual or as a company.

Connect Direct is a national platform created by the seven UK Distribution Network Operators (DNOs) and the Energy Networks Association (ENA). It is used for getting approval to retrofit low-carbon technology (LCT) devices - both generation and demand - to existing residential properties. It streamlines and standardises the application process for all DNOs across GB and NI. Connect Direct is also used by LCT manufacturers, like Grant UK. They use it to register their inverters, EV charger, and Heat pumps, thereby making them available to installers to select when submitting an application.

The "Connect Direct" system has been designed to simplify the application process for installers. It uses a data-driven decision engine to assess applications. The checks made are to ensure that:

- There are no safety concerns with the cut-out fuse, or other equipment.
- There is no uncertainty over the supply capacity or the adequacy of the supply.
- The property is not on a looped supply.
- The connection does not require an upgrade
- The max demand of the property is within the supply capacity and DNO-defined thresholds for approval.
- The equipment is compliant.
- The equipment is within DNO-defined thresholds.


If all checks pass, the application will be auto-approved in real-time for you. If not, the application will be escalated to the DNO for review. Any updates will be communicated to you via Connect Direct.

Each DNO configures the threshold levels within which they are happy to auto-approve applications. These may vary geographically.

To make an application, or to set up an account, follow the procedure set out by the Energy Networks Association (ENA).


Full details on application/notification process can be found by scanning the following QR code. Refer to Table 1-1 for details.

Table 1-1: Connect direct QR code

QR Code	Link
	https://connect-direct.energynetworks.org/

In addition, you can follow the link provided below for a list of the Grant devices registered on the ENA Connect Direct website.

Table 1-2: Connect Direct QR code

QR Code	Link
	https://connect-direct.energynetworks.org/device-databases/search-demand/HP?manufacturer=Grant

1.5 CUSTOMER SUPPORT CENTRE

Grant UK provides an online support centre for Heating Professionals and Homeowners to access post-installation care, advice and maintenance support for Grant products. Follow the QR codes below to access your relevant Customer Support Centre.



Homeowner



Professional

1.6 IMPORTANT ADVICE

1. It is essential that the full layout of the system is understood before the installation of any component is undertaken. If you are in any doubt, please stop and seek advice from a qualified heating engineer or from Grant UK. Please note that Grant UK will not be able to offer specific advice about your system unless we designed it. In this case, we will always refer you to seek the advice of a qualified system designer.
2. The heat pump must be installed and commissioned in accordance with these installation and operating instructions. Deviations of any kind will invalidate the guarantee and may cause an unsafe situation to occur. Please seek advice from Grant UK if any of these user, installation and servicing instructions cannot be followed for whatever reason.
3. The heat pump contains high pressures and high temperatures during normal working conditions. Care must be taken when accessing the internal workings of the heat pump.
4. The heat pump contains an electrically driven fan which rotates at high speed. Disconnect the heat pump from the electrical supply before removing the top cover.

1.7 PRODUCT CONTENTS

The Aerona 290 comes supplied on a single pallet. The items that are included are indicated in Table 1-3.

Table 1-3: Product Contents

Output	HPR2904	HPR29065	HPR2909	HPR29012	HPR290155
4kW	1				
6.5kW		1			
9kW			1		
12kW				1	
15.5kW					1
Items					
Condensate drain elbow	3	3	3	3	3
Cable glands	3	3	3	3	3
Crimp ring Terminal fittings	6	6	6	6	6
ERP Label	1	1	1	1	1
R290 Installation & User instructions - DOC 0204	1	1	1	1	1

1.8 REMOTE CONTROLLER KITS

1.8.1 GRANT AERONA SMART CONTROLLER

The Grant Aerona 290 is designed to work exclusively with the Grant Aerona Smart heat pump system controller.

If you are using a Grant QR Smart Pre-plumbed cylinder with the Aerona 290, you will receive the installation instructions manual DOC205 with the cylinder, which will contain all the information related to Smart Controller.

If you are not using our Smart Pre-plumbed cylinder with the Aerona 290, you will receive the installation instructions manual DOC203 with the Smart Controller kit.

Table 1-4: Smart controller kits

Product code	Description
HP290SMART	Smart controller kit for Aerona 290 with a standard cylinder containing: <ul style="list-style-type: none">• Smart Controller Wiring Centre• Smart Controller Touchscreen display• Wi-Fi Hub• Outdoor Weather Sensor• 3 x Water Temperature Sensors• 2 x Flexible Hoses• 2 x Isolation Valves
HP290SMARTPP	Smart controller kit for Aerona 290 with a Grant QR Smart Pre-plumbed cylinder containing: <ul style="list-style-type: none">• Wi-Fi Hub• Outdoor Weather Sensor• 2 x Water Temperature Sensors• 2 x Flexible Hoses• 2 x Isolation Valves

1.9 INSTALLATION PACKS & ACCESSORIES

The following are available from Grant UK:

Table 1-5: Installation packs and accessories

Product code	Description
HPIDPACKP	Grant Aerona 290 Installation Pack P*
HPIDPACKQ	Grant Aerona 290 Installation Pack Q*
HPIDPACKR	Grant Aerona 290 Installation Pack R*
HPIDPACKT	Grant Aerona 290 Installation Pack T**
HPIDSYLLHKIT	Grant Combined Volumiser/Low Loss Header with 3kW backup Immersion Heater - 11.5 litre volume (available as an optional component where there is insufficient system volume).
HPIDVOL50	50 litre Internal volumiser available as an optional component where there is insufficient system volume. A factory-fitted 3kW immersion heater will provide additional assistance only during defrost cycles.

*Refer to DOC0203 - Grant Aerona Smart Heat Pump System Controller - Installation & Operation Instructions

** Refer to DOC0205 - Grant QR Smart Range - Pre-Plumbed indirect Heat Pump Cylinder - Installation, Servicing & User Instructions

1.9.1 INSTALLATION PACK P

Installation Pack P - S-Plan with non pre-plumbed cylinder.

Table 1-6: Installation Pack P

Order code: HPIDPACKP
Flexi-Foot Kit
Mag One Duo Filter
18L System Kit
32A Isolator
Immersion relay

Refer to hydraulic schematics in DOC0203 - Smart Controller.

1.9.2 INSTALLATION PACK Q

Installation Pack Q - Open Loop Direct using 3-Port diverter and mixing valve with non pre-plumbed cylinder.

Table 1-7: Installation Pack Q

Order code: HPIDPACKQ
Flexi-Foot Kit
Mag One Duo Filter
18L System Kit
32A Isolator
28mm 3-port diverter valve
22mm 3-port mixing valve
Immersion relay

Refer to hydraulic schematics in DOC0203 - Smart Controller.

1.9.3 INSTALLATION PACK R

Installation Pack R - Open Loop Direct using 3-Port diverter with non pre-plumbed cylinder.

Table 1-8: Installation Pack R

Order code: HPIDPACKR
Flexi-Foot Kit
Mag One Duo Filter
18L System Kit
32A Isolator
28mm 3-port diverter valve
Immersion relay

Refer to hydraulic schematics in DOC0203 - Smart Controller.

1.9.4 INSTALLATION PACK T

Installation Pack T - Grant QR Smart Pre-plumbed Cylinder

Table 1-9: Installation Pack T

Order code: HPIDPACKT
Flexi-Foot Kit
Mag One Duo Filter
18L System Kit
32A Isolator

Refer to hydraulic schematic in DOC0205 - Grant Smart QR Cylinder.

! NOTE !

The Grant Aerona 290 is designed exclusively for domestic or semi-domestic purposes. This means that even users without prior experience should be able to operate the Grant Aerona 290 safely.

! NOTE !

Improper installation of equipment or accessories can result in electric shock, short circuit, leakage, fire, or other damage to the equipment. It is important to use only accessories that are made by the supplier and are specifically designed for the equipment.

1.10 HEAT PUMP COMPONENTS

1.10.1 HPR2904

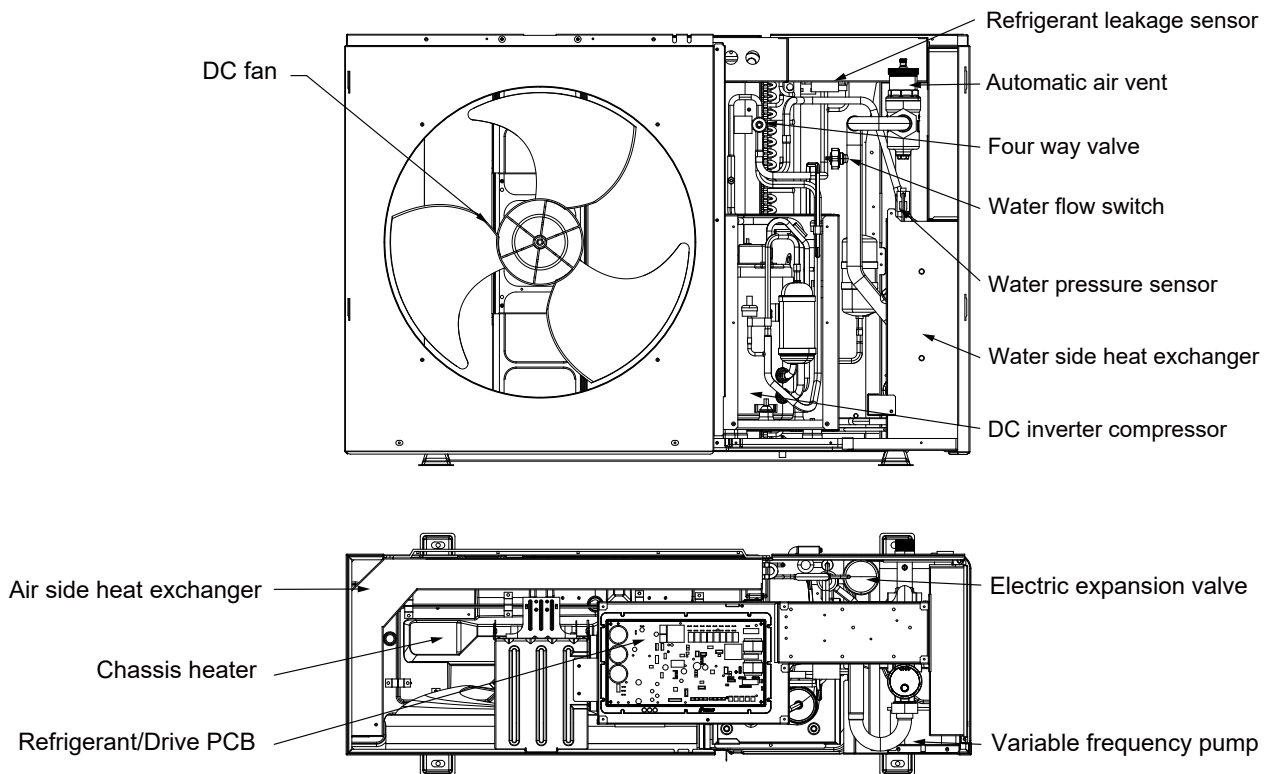


Figure 1-1: Main components - HPR2904

1.10.2 HPR29065 & HPR2909

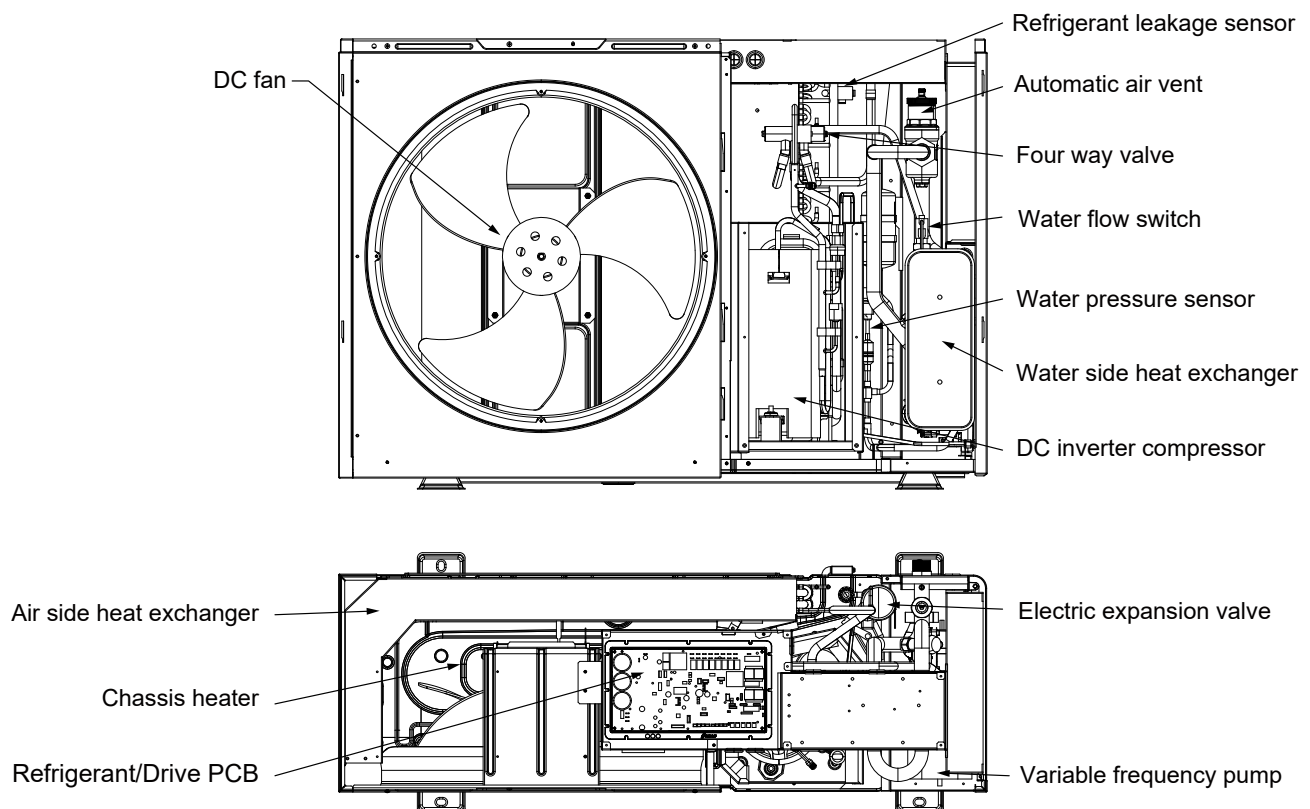


Figure 1-2: Main components - HPR29065 & HPR2909

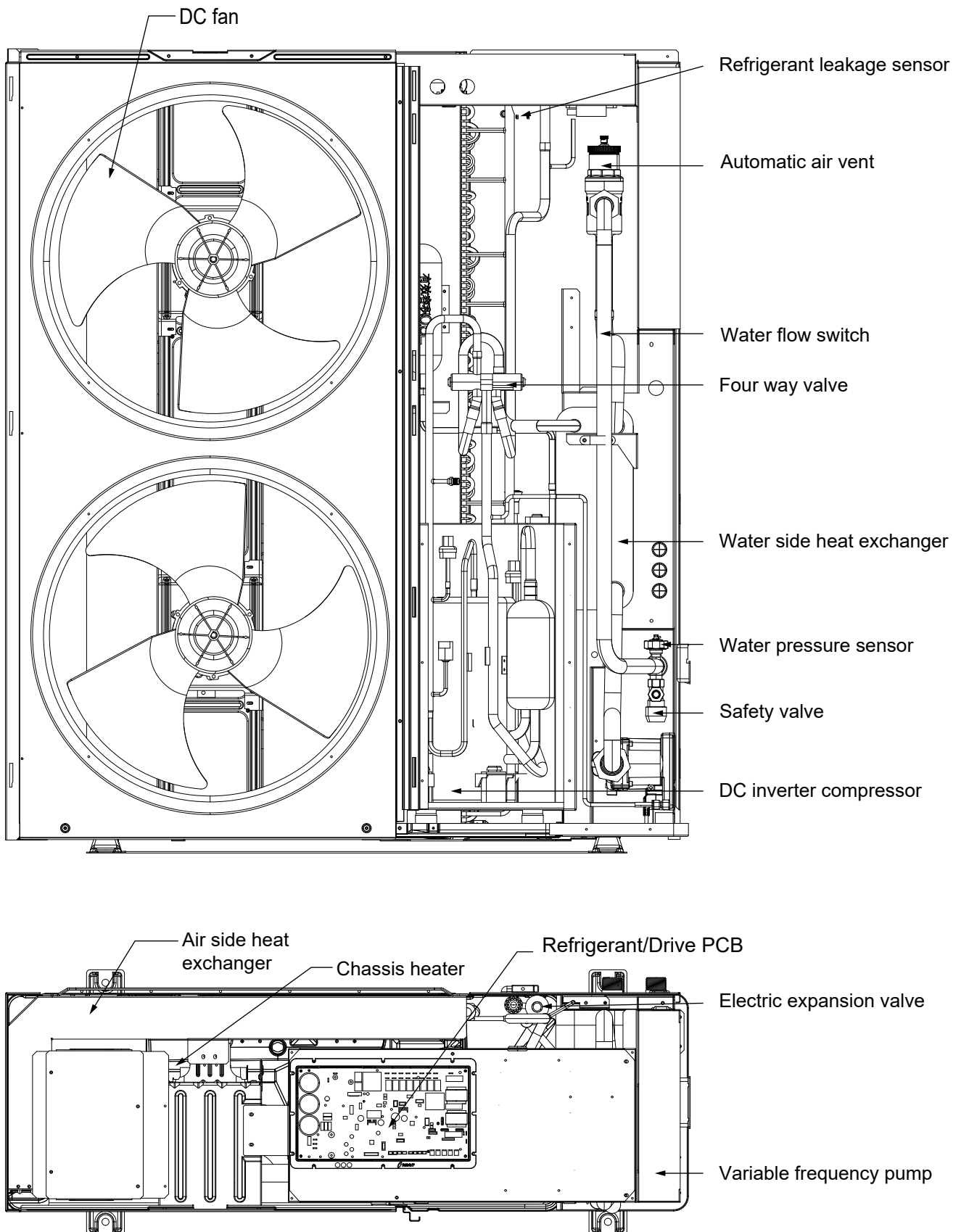


Figure 1-3: Main components - HPR29012

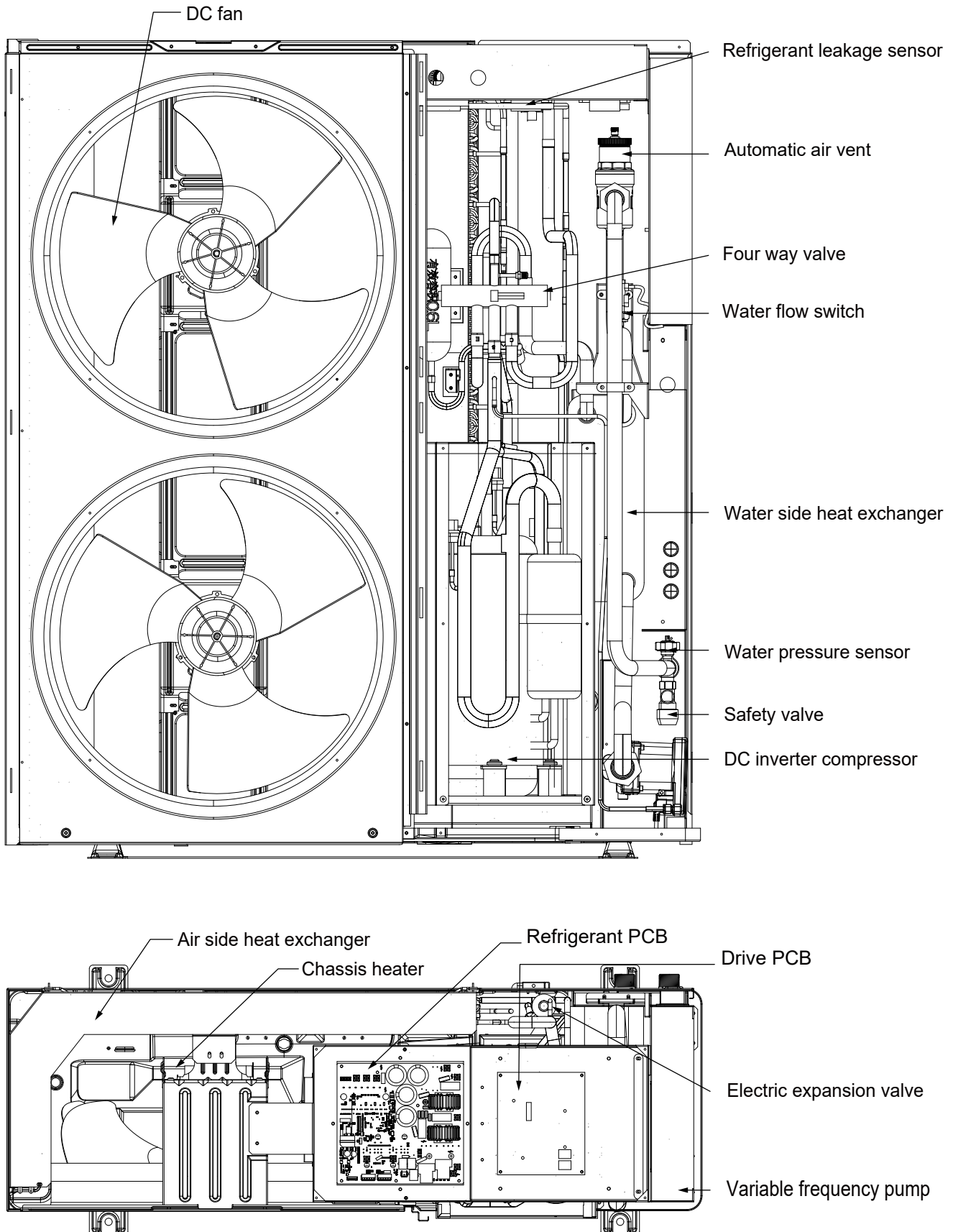


Figure 1-4: Main components - HPR290155

1.11 HYDRAULIC MODULE

Components of the hydraulic module of each unit model:

1.11.1 HPR2904

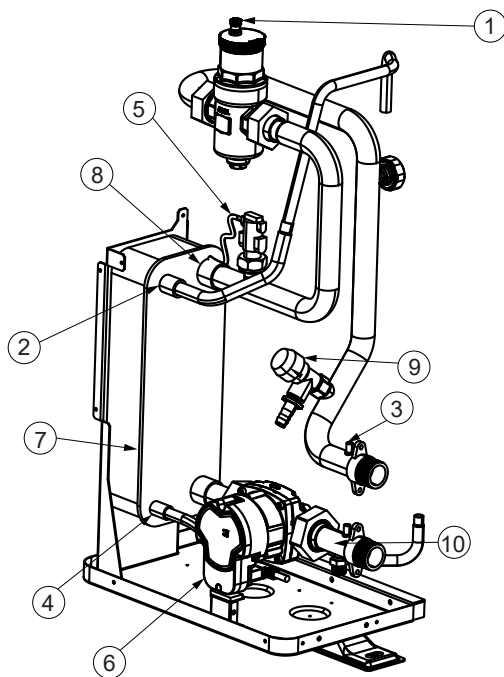


Figure 1-5: Hydraulic module - 4kW

1.11.3 HPR2909

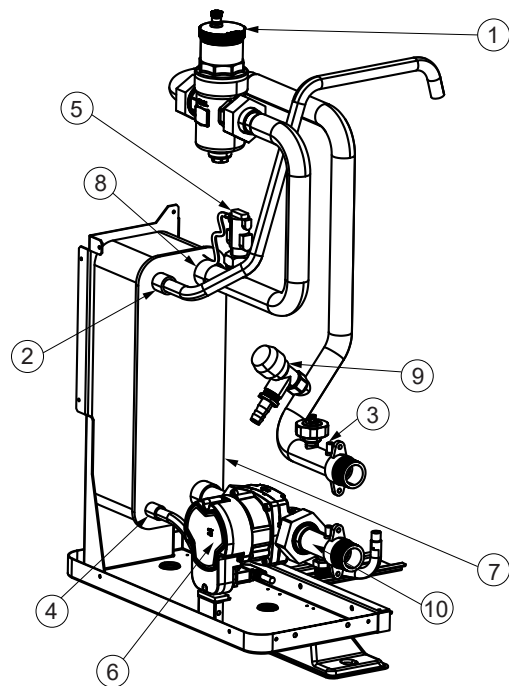


Figure 1-7: Hydraulic module - 9kW

1.11.2 HPR29065

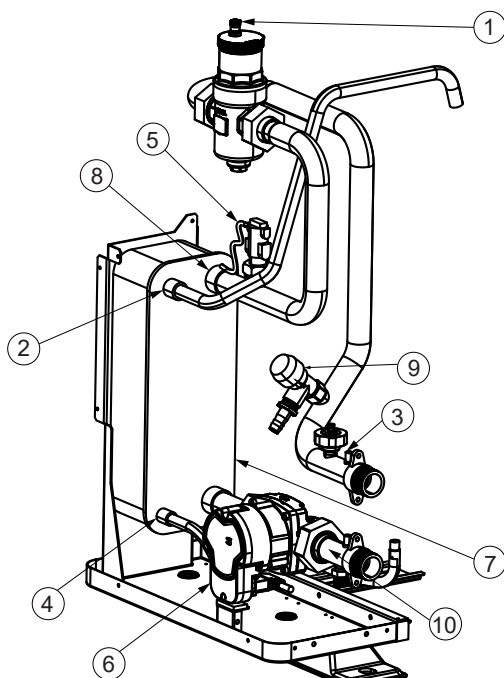


Figure 1-6: Hydraulic module - 6.5kW

1.11.4 HPR29012 & HPR290155

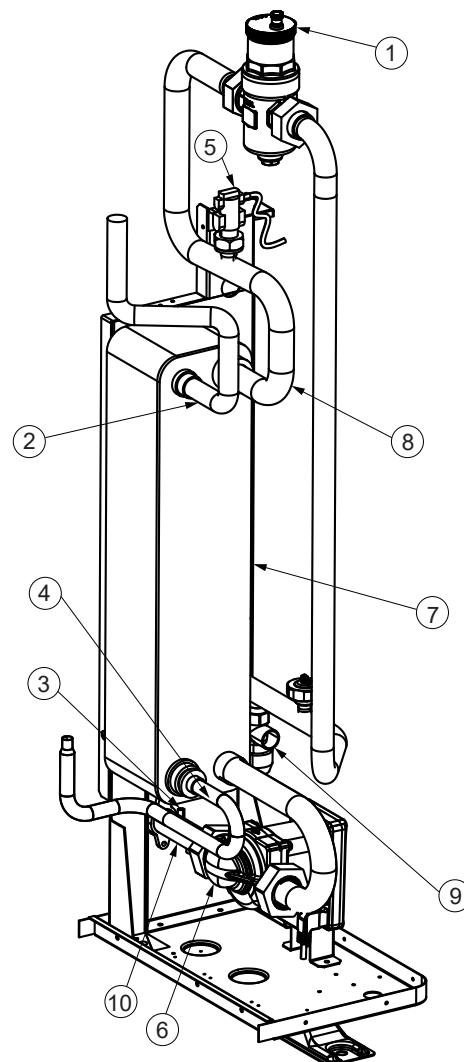


Figure 1-8: Hydraulic module - 12kW & 15.5kW

Table 1-10: Key items for Figures 1-5 to 1-8

Code	Assembly unit	Explanation
1	Automatic air purge valve	Remaining air in the water circuit will be automatically removed from the water circuit
2	Refrigerant gas pipe	Conducts refrigerant in gas state
3	Temperature sensor	Three temperature sensors determine the water and refrigerant temperature at various points in the water circuit
4	Refrigerant liquid pipe	Conducts refrigerant in liquid state
5	Flow switch	Detects water flow rate to protect compressor and water pump in the event of insufficient water flow
6	Circulating pump	Circulates water in the water circuit
7	Plate heat exchanger	Transfers heat from the refrigerant to the water
8	Flow pipe	Conducts heated water to the heating system
9	Pressure relief valve	Prevent excessive water pressure by opening at 3 bar and discharging water from the water circuit
10	Return pipe	Conducts water supply from the main supply to the heat pump

! NOTE !

This appliance is designed exclusively for domestic or semi-domestic purposes. This means that even users without prior instruction should be able to operate the appliance safely.

2 TECHNICAL DATA

2.1 HEAT PUMP TECHNICAL DATA

Table 2-1: Technical Data

	Unit	Model				
		HPR2904	HPR29065	HPR2909	HPR29012	HPR290155
Heating capacity (BS EN 14511 - air: -5°C / water: 55°C)	kW	4.10	6.76	9.21	12.00	15.57
COP (BS EN 14511 - air: -5°C / water 55°C)	-	2.48	2.27	2.31	2.25	1.90
Heating capacity (BS EN 14511 - air: 7°C / water: 35°C)	kW	4.09	7.62	9.38	12.18	16.16
COP (BS EN 14511 - air: 7°C / water 35°C)	-	4.99	4.95	4.93	4.81	4.72
SCOP average climate conditions (BS EN 14825 at 35°C)	-	5.00	5.08	4.74	4.74	4.56
Heating capacity (BS EN 14511 - air: 7°C / water: 55°C)	kW	4.36	7.23	9.30	12.21	16.33
COP (BS EN 14511 - air: 7°C / water 55°C)	-	3.19	3.00	3.11	3.22	2.87
SCOP average climate conditions (BS EN 14825 at 55°C)	-	3.66	3.62	3.69	3.74	3.33
ErP rating (low temperature: 35°C / 55°C) - heating	-	A+++ / A++				
Minimum Modulation	kW	1.25	2.40	2.61	3.20	4.63
Turn-down (from Nominal Output)	%	30.49	35.50	28.34	26.67	29.74
Maximum Flow rate required	litres/min	11.77	19.41	26.44	34.45	44.70
Rated Air Flow	m³/h	2300	2650	3350	4050	4050
Total Fan Input Power	W	100	170	170	200	200
Refrigerant system pressure (minimum/maximum)	MPa	0.3 to 3.5				
Water Pressure drop	kPa	25	39	38	38	40
Flow rate	m³/h	0.8	1.2	1.6	2.1	2.8
Refrigerant	-	R290				
GWP	-	3				
Mass of R290 Refrigerant	kg	0.61	0.83	1.00	1.20	1.65
Equivalent CO ₂	ton	0.002	0.002	0.003	0.004	0.005
Circulating pump	m head	9	9	9	9	9
Water connections	BSP	1"	1"	1"	1"	1"
Maximum inlet water pressure	bar	3				
Maximum inlet water temperature	°C	75				
Waterside heat Exchanger	-	Plate heat exchanger				
Operating ambient temperature range (space heating)	°C	-25 to 35				
Operating ambient temperature range (DHW)	°C	-25 to 43				
Water pressure (system)	bar	1 to 3				
Water drain	-	Hose nipple				
Pressure relief valve water circuit	bar	3				
Water flow rate	litres/min	10 to 20	10 to 35	10 to 35	10 to 50	10 to 50
Operating flow temperature (space heating)	°C	25 to 75				
Operating flow temperature (DHW)	°C	20 to 70				
Sound power level (BS EN12102-1)	dB	48.00	51.70	53.60	52.00	52.90
Sound Pressure level (Q=2)	1m db	40.02	43.71	45.61	44.01	44.91
Sound Pressure level (Q=2)	3m db	30.47	34.17	36.07	34.47	35.37
QuietMark	-	Yes	Yes	Yes	Yes	Yes
Height	mm	803	854	854	1365	1365
Width	mm	1155	1223	1223	1155	1155
Depth	mm	400	440	440	400	400
Weight (empty)	kg	99	115	131	153	180
Weight (full)	kg	102	117	133	157	184
Water content	litres	1.60	1.90	2.10	4.0	4.0
Heat pump casing volume	m³	0.391	0.482	0.482	0.706	0.706

2.2 HEAT PUMP DIMENSIONS

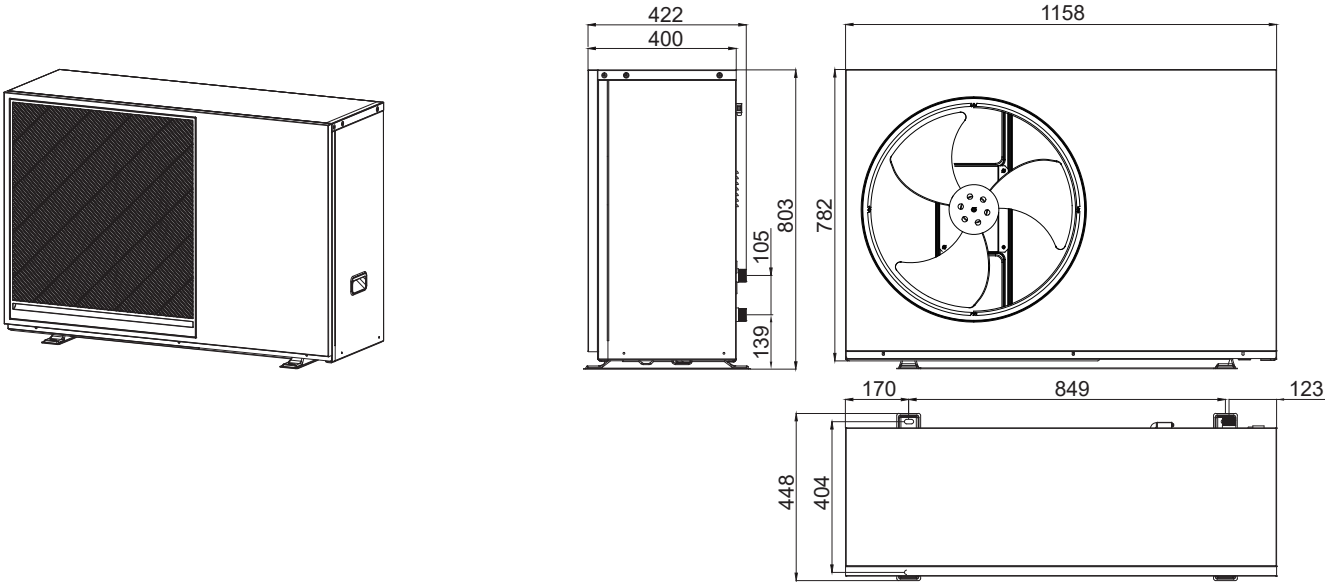


Figure 2-1: HPR2904 heat pump dimensions

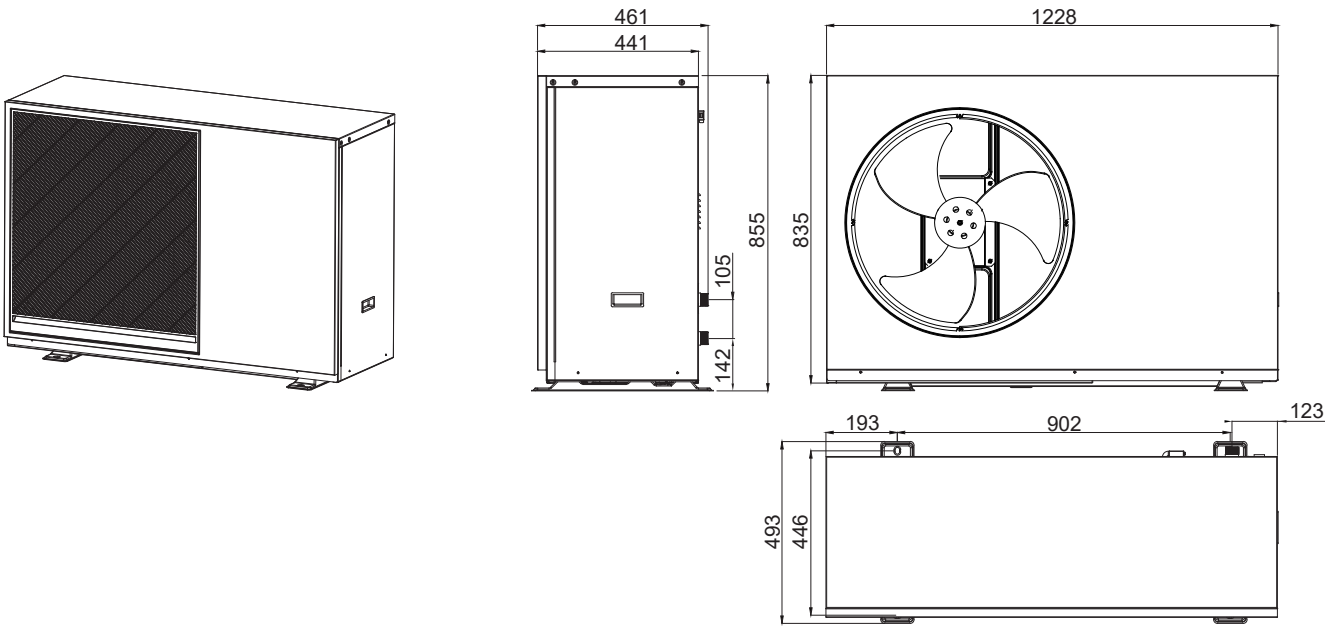


Figure 2-2: HPR29065 & HPR2909 heat pump dimensions

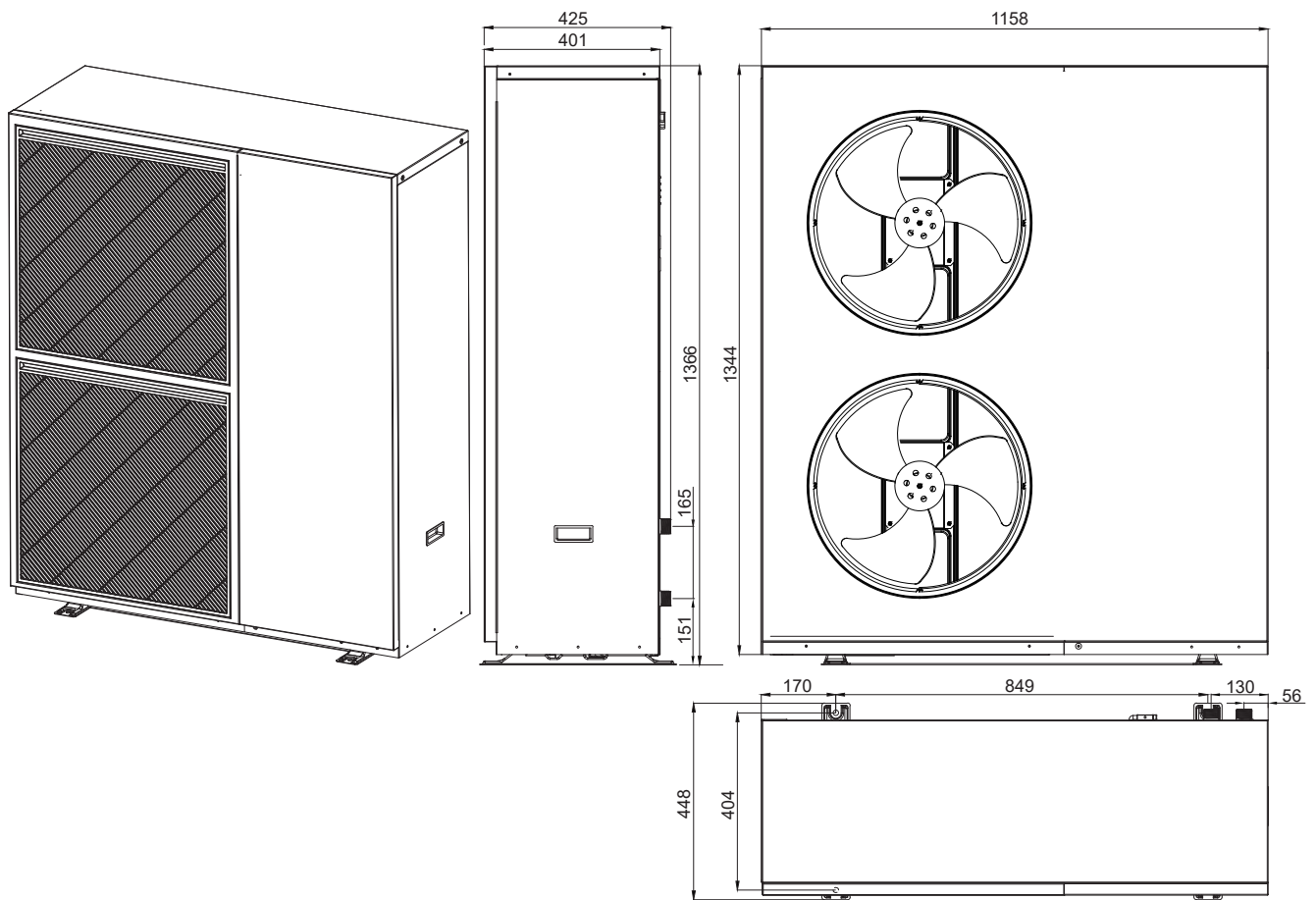


Figure 2-3: HPR29012 & HPR290155 heat pump dimensions

3 INSTALLATION REQUIREMENTS

3.1 BEFORE INSTALLATION

Before installation be sure to confirm the model name and the serial number of the unit.

When handling the unit:

Due to relatively large dimensions and heavy weight, the unit should only be handled using **lifting tools with slings**. The slings can be fitted into foreseen sleeves at the base frame that are made specifically for this purpose. Refer to Figure 3-1.

! CAUTION !

To avoid injury, do not touch the air inlet or aluminium fins of the unit.

! CAUTION !

Do not grip the unit by the fan grilles when lifting to avoid damage.

! CAUTION !

The unit is top heavy! Keep the unit upright to prevent it from falling over during handling.

! NOTE !

When units are delivered, check whether any damage occurred during shipment. If there is damage to the surface or the outside of the unit, submit a written report to the shipping company.

! NOTE !

Check that the model, specifications and quantity of units delivered as ordered.

! NOTE !

Check that all accessories ordered have been included. Retain the owner's manual for future reference.

! NOTE !

Do not remove any packaging before hoisting. If unit is not packaged or if the packaging is damaged, use suitable board or packing material to protect the unit.

! NOTE !

Hoist one unit at a time using two ropes or suitable lifting straps to ensure stability.

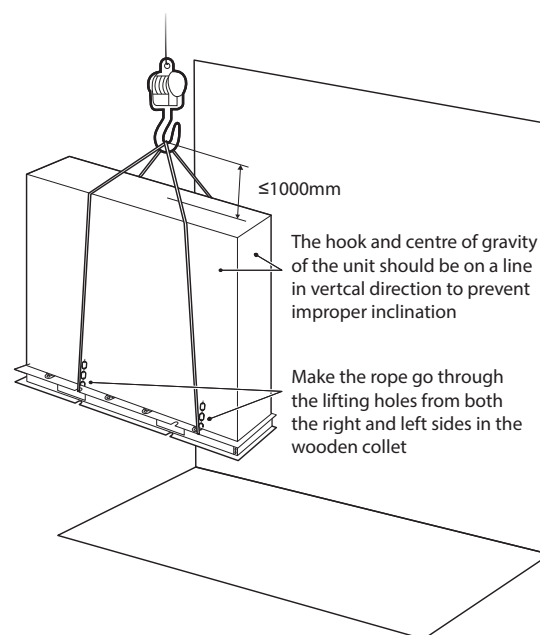


Figure 3-1: Lifting the unit

Centre of gravity of the R290

The position of the centre of gravity for different units can be seen in Table 3-1 & Figures 3-2, 3-3 & 3-4.

Table 3-1: Centre of gravity - dimensions (mm)

Model	A	B	C
Aerona 290 4 kW	450	400	190
Aerona 290 6.5 & 9 kW	500	440	200
Aerona 290 12 & 15.5 kW	700	400	230

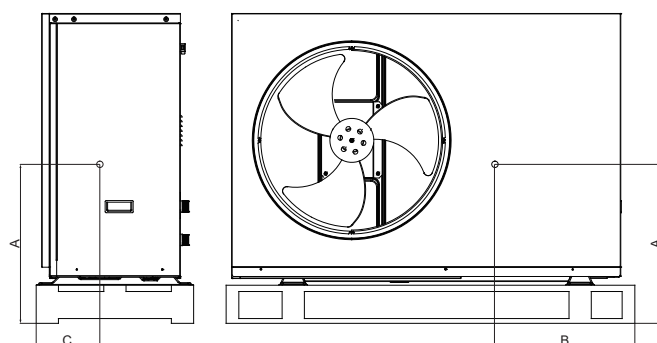


Figure 3-2: Centre of gravity for 4 kW output

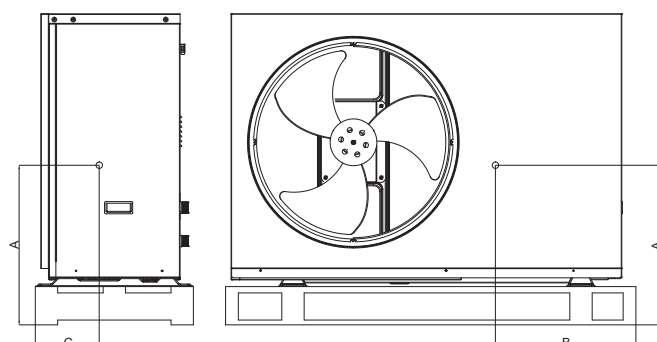


Figure 3-3: Centre of gravity for 6.5 & 9 kW output

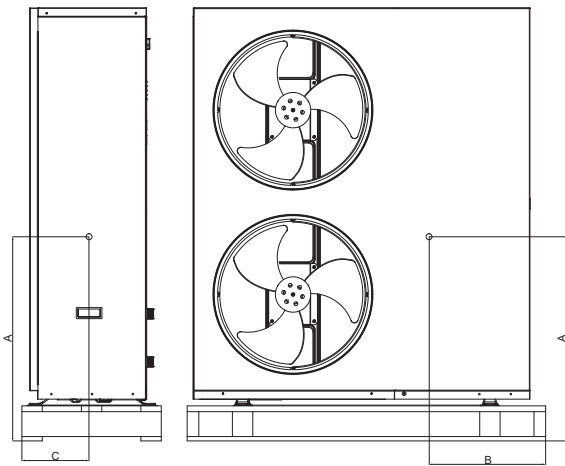


Figure 3-4: Centre of gravity for 12 & 16 kW output

3.2 INTRODUCTION

For the heat pump to operate satisfactorily, install it as outlined in this installation manual.

- The Grant R290 heat pump should only be installed by a competent person.
- Before installing the heat pump, please read the following installation information carefully and install the heat pump as instructed.
- Be sure to follow the safety notices given.
- After completing the installation, check the product operates correctly. Then, explain to the user about the operation and maintenance requirements as shown in this manual.
- Be sure to install the heat pump in a suitable location that can support the heat pump when filled. Installation in an unsuitable location may cause injury to persons and damage to the heat pump.
- Do not install in a position where there is any possibility of flammable gas leakage such as from LPG cylinder around the heat pump. Leaked flammable gas around the heat pump may cause a fire.
- After completing the installation, check for refrigerant leakage.
- Never directly touch any leaking refrigerant as it could cause severe frostbite.
- Do not touch the refrigerant pipes during and immediately after operation as the refrigerant pipes may be hot or cold, depending on the condition of the refrigerant flowing through the refrigerant piping, compressor and other refrigerant cycle parts. Burns or frostbite are possible if you touch the refrigerant pipes. To avoid injury, give the pipes time to return to normal temperature or, if you must touch them, be sure to wear protective gloves.
- Connect the heat pump with the flexible hoses and valves supplied, as described in this installation manual.
- Do not use an extension cable.
- Do not turn on the power until all installation work is complete.
- Only use correct Grant UK parts and accessories to avoid accidents such as electric shock, fire and leakage of water.
- Never touch electrical components immediately after the power supply has been turned off as electrical shock may occur. After turning off the power, always wait five or more minutes before touching electrical components.
- Be sure to connect the power supply cable correctly to the terminal block as overheating can cause a fire.
- Ensure all covers are fitted following installation to avoid the risk of electric shock from electrical terminals or components.
- Always connect the earth wire to the heat pump.
- Install a correctly rated circuit breaker.
- After installation, the heat pump and heating system must be commissioned. Hand over all documentation to the end-user and explain the operating functions and maintenance according to these instructions.

3.2.1 HEATING SYSTEM DESIGN CRITERIA

Before continuing with the installation of the R290 heat pump, please spend a few minutes confirming the suitability of the heat pump to your system. Failure to do so may result in poor performance and wasted time:

- Has a room-by-room heat loss calculation been carried out?
- Has cavity wall insulation been installed?
- Has loft insulation of 270mm been installed?
- Is this system designed for mono or bivalent?
- If monovalent, what is the total heating capacity?
- If bivalent, what is the load capacity of the heat pump?
- If bivalent, what additional heat sources are used?
- Type of system design? Open Loop, S-plan, S-plan plus
- Are the existing controls being upgraded?
- Will a volumiser be used?
- If yes, what is the capacity of the volumiser?
- Have all system pipes been lagged correctly?

3.2.2 SYSTEM DESIGN CRITERIA

A typical condensing oil or gas fired boiler operates with a flow of 70°C and a return of 50°C, i.e. with a ΔT of 20°C. The Grant Aerona 290 heat pump is designed to operate with a flow of between 24°C and 55°C (in space heating mode) or 55°C (in domestic hot water) with a ΔT of 5 to 8K.

The design of any system in the UK is typically based on the following parameters:

1. The outside design air temperature - This can fall to -3°C or lower.
2. The internal design air temperature - This can be between 18-22°C depending on the room concerned.
3. The heat pump flow temperature - This operates at lower water temperatures than an oil or gas fired appliance.

Designing a new system for use with a heat pump is straight forward, assuming the insulation properties of the dwelling meets or exceed current Building Regulations and the lower flow/return temperatures are taken into account in the selection of the type and size of the heat emitters used.

While underfloor heating is the preferred heat emitter, a combination of underfloor heating and radiators, or radiators only, works just as efficiently. It is necessary, however, to calculate the size of radiator required accurately – if this is not done, the house will fail to reach the target temperature and will be costly to rectify after the installation is complete.

When tested to BS EN 14511, the heat output for a heat pump is declared at the test conditions of 7°C outside air temperature and 35°C or 55°C water flow temperature.

The nominal output for the Aerona 290 heat pump range is based on -5°C outside air temperature and 55°C water flow temperature.

At all other values of outside air temperature and water flow temperature the actual heat pump output will vary, e.g. the heat output will:

- Decrease with lower outside air temperatures and increase with higher outside air temperatures at any given water flow temperature, and
- Decrease with higher water flow temperatures and increase with lower water flow temperatures at any given outside air temperature.

A back-up boiler can be added to the rated output of the heat pump. Provided that the heat pump is sized correctly for the system, this back-up heater will only compensate for any short fall in meeting the heat load for the property below the minimum design air temperatures.

3.2.3 HEAT EMITTER SIZING

For guidance on sizing heat emitters, e.g. radiators and/or underfloor heating, refer to the Domestic Heating Design Guide and the Underfloor Heating Design Guide.

3.3 REGULATIONS

Installation of a Grant Aeron 290 heat pump must be in accordance with the following recommendations:

- National Building Regulations, e.g. Approved Documents L & G.
- Local Bylaws (Check with the Local Authority for the area).
- Water Supply (Water Fittings) Regulations 1999.
- MCS Installers Standards (when required, e.g. for installations for the Boiler Upgrade Scheme).
- MIS 3005 - I. The Heat Pump Standard - Installation.
- MIS 3005 - D. The heat pump Standard - Design.
- MCS 020. MCS Planning Standard.

The installation should also be in accordance with the latest edition of the following standards and codes of practice:

- BS 7671 and Amendments. Requirements for Electrical Installations. IET Wiring Regulations.
- BS EN 12831. Energy performance of buildings. Method for calculation of the design heat load. Space heating load.
- BS 7593. Code of practice for the preparation, commissioning and maintenance of domestic central heating and cooling water systems.

! WARNING !

Be sure to adopt adequate measures to prevent the unit from being used as a shelter by small animals.

Small animals making contact with electrical parts can cause malfunction, smoke or fire. Please instruct the user to keep the area around the unit clean and unobstructed.

3.4 HEAT PUMP LOCATION

When assessing a location to install the Grant Aeron 290 heat pump, many factors will need to be considered. Discuss with the homeowner to choose the most suitable and practical position

- Consider a place where the noise and the air discharged will not affect neighbours.
Take opening windows and doors into account. It is not essential for the heat pump to be positioned next to a wall of the house. Behind an out-building may be more suitable so discuss the options with the homeowner. Refer to Section 2 for heat pump sound levels.
- Install the heat pump in a place where it will be free from adverse weather conditions as much as possible.
- Consider a position protected from the wind. Do not install the heat pump where strong wind blows directly onto the heat pump or where it is very dusty
- When installing the heat pump where it may be exposed to strong wind, brace it securely.
- For installation of the unit in a place where the wind direction can be foreseen, set the heat pump outlet side at a right angle to the direction of the wind. Refer to Figure 3-5.

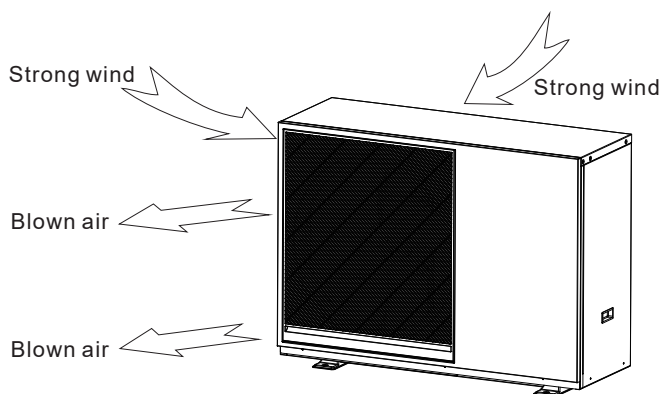


Figure 3-5: Wind installation

- Consider an area that provides the minimum space required for airflow, servicing and maintenance. Refer to section 3.6.9 for clearances.
- Ensure that sufficient precautions are taken in case of refrigerant leakage. Refer to Section 3.6 for details of protective zones.
- Do not install the heat pump where people pass frequently.
- Take preventive measures so that young children cannot reach the unit.
- Do not install the unit in places often used as a work space.
- The surfaces of the floor (or the wall for wall mounted heat pumps - refer to section 3.6.12) must be solid enough to support the weight of the heat pump and minimise the transmission of noise and vibration. Refer to section 2.1 for the weights of the units.
- Install the heat pump in a place where it will be level or not inclined more than 5°.
- Install the heat pump in a place where the flow condensate water produced during operation will not be obstructed.
- The equipment is not intended for use in a potentially explosive atmosphere.
- Places where water leaking from the unit cannot cause damage to the location, e.g. in case of a blocked drain pipe.
- Places when rain can be avoided as much as possible.
- The Grant Aeron 290 heat pumps are usually suitable for installation in coastal areas without any special treatment, but we do recommend the evaporator is sprayed with ACF50 and this must be repeated on each service.

In case of any construction work, e.g. grinding, sanding, cutting, etc, where a lot of dust is created, the unit should be switched off and covered until the work is finished.

- Do not place any object or equipment on the top of the unit.
- Do not climb, sit or stand on the top of the unit.

Do not install the unit in the following places:

- Where there is mist of mineral oil, oil spray or vapours. Plastic parts may deteriorate and cause them to come loose or water to leak.
- Where corrosive gases (such as sulphurous acid gas or chlorine gas[swimming pools]) are produced. Where corrosion of copper pipes or soldered parts may cause refrigerant to leak.
- Where there is machinery which emits electromagnetic waves. Electromagnetic waves can disturb the control system and cause equipment malfunction.
- Where flammable gases may leak, where carbon fibre or ignitable dust is suspended in the air or where volatile flammables such as paint thinner or gasoline are handled. These types of gases might cause a fire.
- In vehicles or vessels.
- Where acidic or alkaline vapours are present.

3.5 PREPARATION FOR INSTALLATION

! NOTE !

Grant R290 heat pumps should be stored and transported in an upright position. If not, then the heat pump **MUST** be positioned in an upright position for at least four hours before being operated.

3.5.1 R290 REFRIGERANT

The Grant Aerona 290 heat pump contains R290 refrigerant gas. The density of this gas is greater than that of air, so in the event of leakage it tends to disperse and stratify, accumulating in niches, depressions in the ground or underground regions.

It is mandatory to comply with the protective zones given in this manual, when installing the units. The protective zones have been designed in accordance with EN 60079-10-1, estimating an appropriate refrigerant loss in order to guarantee the safety of the units in the installation area.

The protective zone is defined as an area around the heat pump in which, in the event of a leakage of refrigerant gas, a flammable atmosphere could be formed for a short time, within which it is necessary to implement all the precautions described in the manual.

In the absence of specific standards or regulations, when using the unit in an industrial or working environment, it is advisable to carry out the classification of places with explosion hazards considering the ATEX Directive 1999/92 (Directive 89/391).

No sources of ignition shall be present in the protective zone, including:

- Flammable gases and sprays, self-igniting powders;
- Electrical equipment that is not suitable for use in potentially explosive areas (zone 2 according to Directive 89/391);
- Naked flames, heated surfaces (maximum surfaces temperature of 360°C and processing by heat; smoking is prohibited, even for electronic cigarettes).
- Sparks, electrostatic charges, direct and indirect lightning effects, eddy currents and cathodic protection.
- Ignition sources due to remote processes (ionising and non-ionising radiation).
- Permanent electrical sources (switches, lamps, etc.) or other possible triggers.

There shall also be no building openings (such as windows, doors, light shafts, flat roof windows, openings of ventilation systems), property boundaries or neighbouring properties, walkways and driveways within the protective zone.

Beyond the protective zone

In the event of a refrigerant leak, the concentration of refrigerant gas in the air is typically below the critical levels for the formation of flammable or hazardous atmospheres. You must take reasonable care to:

- prevent accumulation and stagnation in underground spaces, drains, manholes, cellars, etc.
- not place close to building vents.
- to not use naked flames and other direct heat sources.

Ensure to comply with national and local regulations for the installation of machinery (as applicable) in order to prevent the formation of fire hazards and to prevent gases from seeping underground into openings to the ground or floors below. No structural modifications may be made in the protective zone that would alter their extent or change the behaviour of the air-refrigerant mixture.

It is also strictly forbidden to tamper with, alter, remove or compromise, even partially, the functionality of the devices, guards and warnings provided for the safety of property and persons.

! WARNING !

Do not pierce the evaporator or refrigerant circuit or expose the heat pump to fire.

3.6 PROTECTIVE ZONES

3.6.1 GROUND INSTALLATIONS

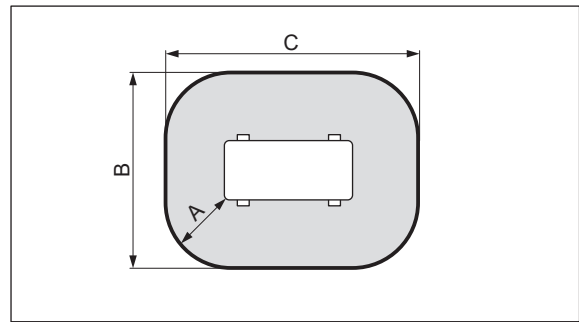


Figure 3-6: Ground installation

Table 3-2: Ground installation protective zone

Dimension	Distance (mm)
A	1000
B	2400 - for 4, 12 & 15kW units 2440 - for 6.5 & 9kW units
C	3155 - for 4, 12 & 15kW units 3223 - for 6.5 & 9kW units

3.6.2 GROUND INSTALLATIONS IN FRONT OF A BUILDING WALL

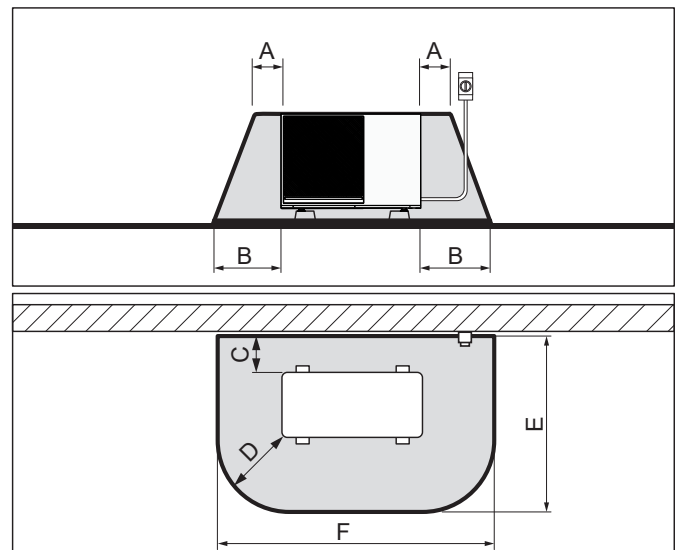


Figure 3-7: Ground installation in front of a building

Table 3-3: Ground installation in front of a building

Dimension	Distance (mm)
A	475 - for 4, 12 & 15kW units 440 - for 6.5 & 9kW units
B	1000
C	250
D	1000
E	1650 - for 4, 12 & 15kW units 1690 - for 6.5 & 9kW units
F	3155 - for 4, 12 & 15kW units 3223 - for 6.5 & 9kW units

3.6.3 GROUND INSTALLATION IN A BUILDING CORNER

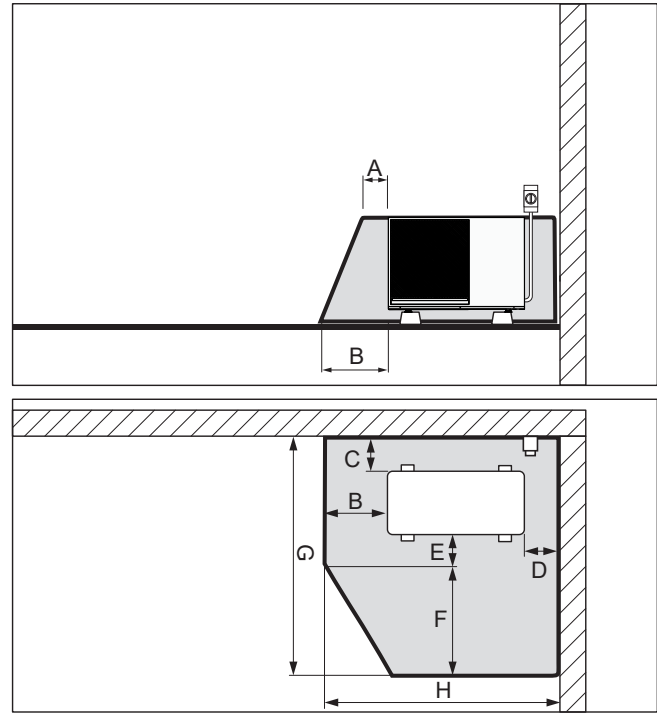


Figure 3-8: Ground installation in a corner

Table 3-4: Ground installation in a corner

Item	Distance (mm)
A	445 - for 4, 12 & 15kW units 380 - for 6.5 & 9kW units
B	1000
C	250
D	500
E	500
F	1800
G	2950 - for 4, 12 & 15kW units 2990 - for 6.5 & 9kW units
H	2655 - for 4, 12 & 15kW units 2723 - for 6.5 & 9kW units

! NOTE !

Ensure electrical AC isolator is installed outside of the protective zone. Illustrated are typical installation locations.

3.6.4 WALL INSTALLATION IN A LOW POSITION

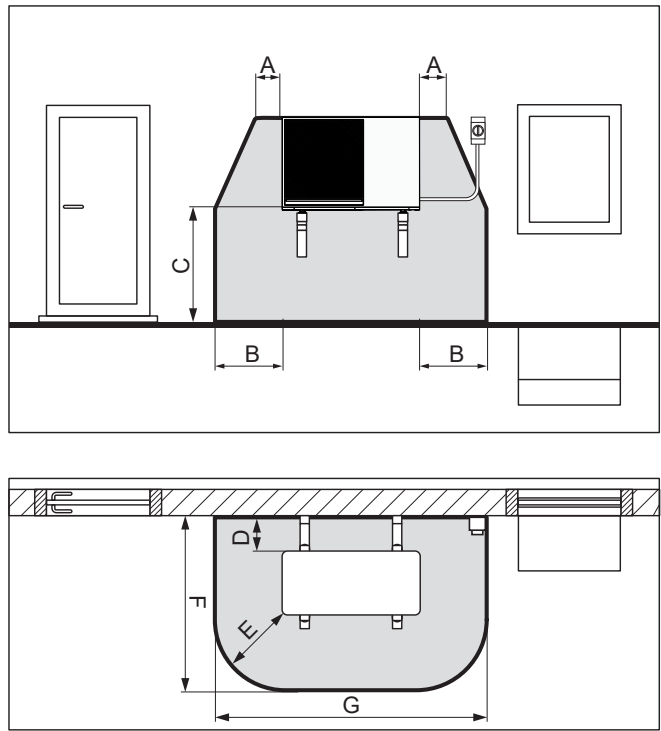


Figure 3-9: Wall installation in a low position

Table 3-5: Wall installation in a low position

Dimension	Distance (mm)
A	475 - for 4, 12 & 15kW units 440 - for 6.5 & 9kW units
B	1000
C	≤1000
D	200
E	1000
F	1600 - for 4, 12 & 15kW units 1640 - for 6.5 & 9kW units
G	3155 - for 4, 12 & 15kW units 3223 - for 6.5 & 9kW units

3.6.5 WALL INSTALLATION ABOVE OPENING

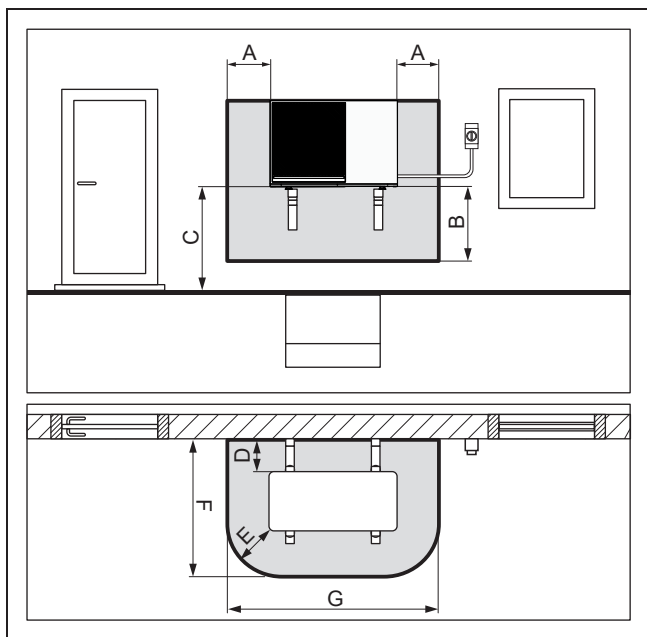


Figure 3-10: Wall installation above opening

Table 3-6: Wall installation protective zones (above opening)

Dimension	Distance (mm)
A	475 - for 4, 12 & 15kW units 440 - for 6.5 & 9kW units
B	1000
C	> 1000 (Maximum - 1100*)
D	200
E	500
F	1100 - for 4, 12 & 15kW units 1140 - for 6.5 & 9kW units
G	2105

* For 4, 6.5 & 9kW models to keep under the 2m limit as described in Section 3.6.12.

! NOTE !

Refer to Section 3.6.12 for information on maximum working heights for wall installations.

Grant UK will not be liable for the cost or provision of specialist access equipment in any instance.

! NOTE !

If installing above an opening, you must ensure there is over 1000mm clearance to allow for sufficient dissipation of refrigerant and reduce the chance of accumulation.

3.6.6 LEFT CORNER WALL INSTALLATION ABOVE OPENING

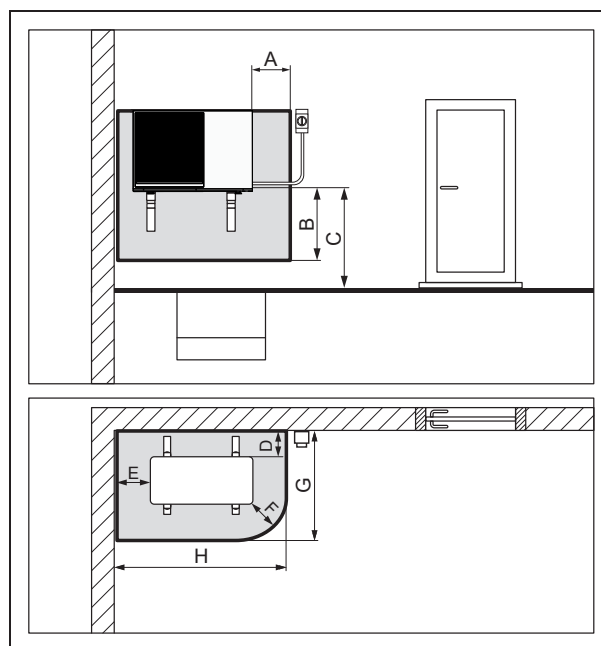


Figure 3-11: Left corner wall installation above opening

3.6.7 RIGHT CORNER WALL INSTALLATION ABOVE OPENING

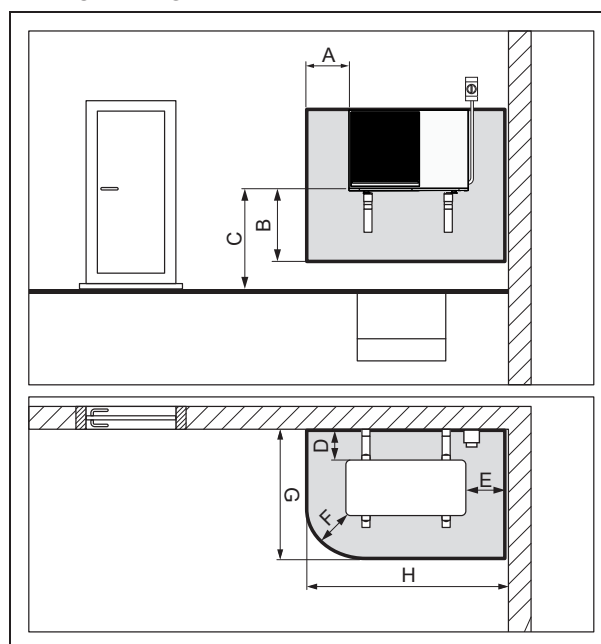


Figure 3-12: Right corner wall installation above opening

Table 3-7: Wall installation protective zones (above opening)

Dimension	Distance (mm)
A	445 - for 4, 12 & 15kW units 380 - for 6.5 & 9kW units
B	1000
C	> 1000 (Maximum - 1100*)
D	200
E	500
F	500
G	1100 - for 4, 12 & 15kW units 1140 - for 6.5 & 9kW units
H	2105

* For 4, 6.5 & 9kW models to keep under the 2m limit as described in Section 3.6.12.

3.6.8 BASE

Unless the heat pump is to be wall mounted (refer to Section 3.6.12 for further information), it should be installed on a firm flat level surface capable of supporting the weight of the heat pump and minimising the transmission of noise and vibration, for example:

- A flat trowelled concrete base approximately 150mm thick.
- Paving slabs on compacted hard core of a sufficient depth for the ground condition.
- The surface should extend at least 150mm beyond the heat pump on three sides

Alternatively, two separate smaller concrete bases can be used, each one being sized and positioned to align with the anti-vibration mounts of the heat pump model being installed.

In all the above cases a trench can be dug around the base(s) and filled with chippings or gravel to provide a means of condensate disposal. Refer to Section 3.6.10.

If the surface of the base(s) is level with or above the damp course for the building, leave a gap of approximately 150mm between the edge of the base and the wall of the house to avoid bridging the DPC.

The heat pump should NOT be installed on loose or uneven surfaces such as grass, soil, shingle or gravel.

The heat pump must be raised up from the surface of the base by approximately 100mm on suitable anti-vibration mounts.

To ensure correct drainage of water from the heat pump base tray, the heat pump must be level across both the width and depth when installed.

3.6.9 CLEARANCES

The following **minimum** clearances must be used to enable the product to be easily commissioned, serviced and maintained and allow adequate air flow in and out of the heat pump.

For ground installation clearances, refer to Table 3-8 and Figure 3-13.

For wall mounted installation clearances, refer to Table 3-9 and Figure 3-14.

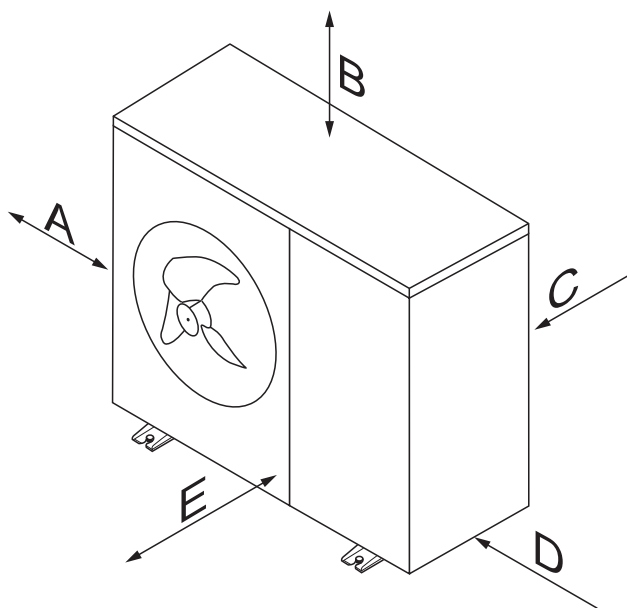


Figure 3-13: Ground installation clearances

Table 3-8: Ground installation clearances

Item	Minimum clearance required (mm)
A	100
B	1000
C	250
D	500
E	600

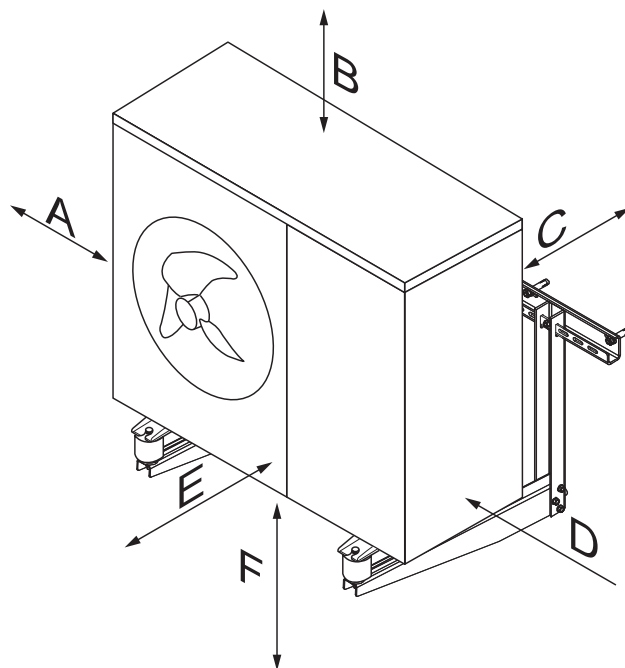


Figure 3-14: Wall mounted installation clearances

Table 3-9: Wall mounted installation clearances

Aspect	Minimum clearance required (mm)
A	100
B	1000
C	200
D	500
E	600
F	300

- Ensure there is sufficient clearance around the heat pump to carry out the installation. Ideally set the outlet side of the heat pump at a right angle to the direction of the prevailing wind.
- Prepare a water drainage channel around the foundation to drain waste water from around the unit.

3.6.10 CONDENSE DISPOSAL

The underside of the heat pump has three condensate drain holes (Refer to Figures 3-15 to 3-17). These allow any condensate to drain from the heat pump.

Provision must be made to safely dispose of this condensate.

The supplied condensate drain elbows can be inserted into the drain holes and flexible pipes fitted to direct condensate to safe drainage spots.

For example, use 40 mm waste pipe to form a condensate disposal system into which the condensate flows from the flexible pipes from the drain holes in the bottom of the heat pump casing running to a suitable gully or soakaway.

Another option would be to dig a trench filled with chippings or gravel around the base on which the heat pump is located. This will allow the condensate flowing from the drain holes in the base of the heat pump to safely disperse and not form a pool around the heat pump that will freeze in winter months.

As well as the condensate drain holes, there are also overflow holes located in the base tray of the unit. If the drain holes cannot meet the drainage requirements, when the water level reaches a certain height, it will automatically use the overflow holes to drain. Refer to Figures 3-15 to 3-17.

! WARNING !

It is essential that the condensate is able to drain away and not allowed to run onto any adjacent paths or driveways where, in winter, this will result in icing and a potential hazard for anyone walking near the heat pump. The top of the concrete base must be either level with, or above, the surrounding ground level.

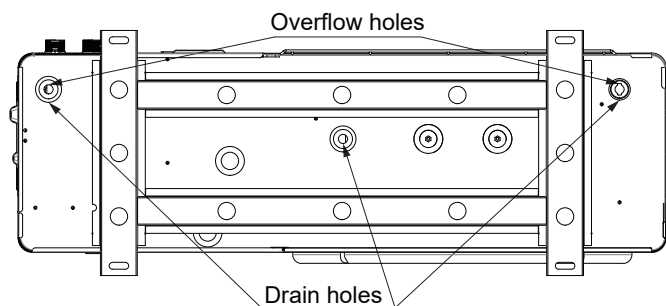


Figure 3-15: Drain and overflow holes - 4 kW

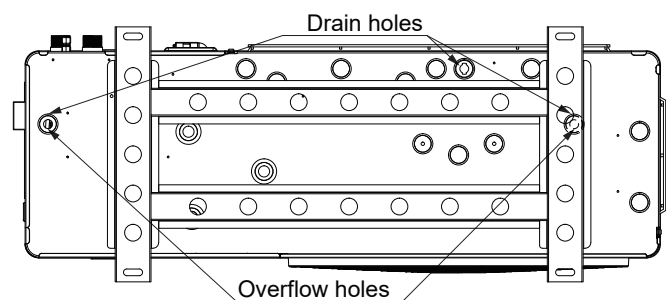


Figure 3-16: Drain and overflow holes - 6.5 kW & 9 kW

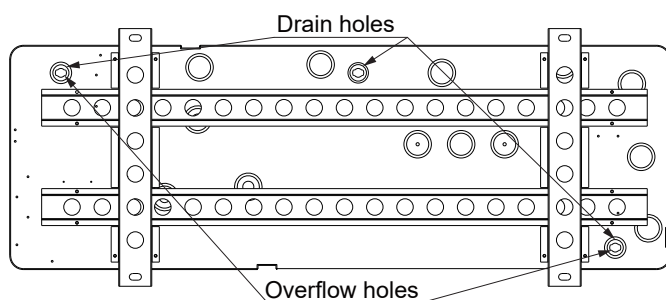


Figure 3-17: Drain and overflow holes - 12 kW & 15.5 kW

3.6.11 VIBRATION

To avoid any vibration from the heat pump causing a nuisance, install the heat pump on anti-vibration mounts, available from Grant Engineering UK (product code: HPIDFOOT/KIT2). These anti-vibration mounts are also supplied in the Installation packs. Refer to Section 1.9.

Securely fix the heat pump to these anti-vibration mounts using the mounting feet at the bottom of the heat pump.

These anti-vibration mounts are not suitable for units that are to be wall mounted.

3.6.12 WALL MOUNTED INSTALLATIONS

All five sizes of Grant Aerona 290 heat pump can be wall mounted at a safe height, with the top of the unit no more than 2m above ground level, where no specialist access equipment (such as mobile tower or scaffolding) is required to provide a safe working place to carry out servicing or repairs.

Grant UK can supply a suitable mounting bracket (product code: HPIDWALLBRKT3) for all Grant Aerona 290 models with a maximum Safe Working Load of 250kg. Refer to section 2 for details on weights.

If any other method of wall mounting is used, it is the responsibility of the installer to select a suitable mounting method (Refer to Section 2 for weights). Grant UK cannot take any responsibility for any mounting brackets other than the one supplied.

When assembling the mounting brackets, please follow the manufacturers installation instructions

In all cases, care should be taken to determine that the condition of the wall is suitable to carry the load imposed by the heat pump and ensure that the mounting bracket is firmly secured to the wall, using suitable fixings for the wall construction concerned.

If installed in a position where specialist access equipment, such as a mobile tower or scaffolding, is required to provide a safe place of work to carry out servicing or repairs, then the cost and provision of this equipment is the responsibility of the property owner/user irrespective of whether the heat pump is deemed to be at fault or not.

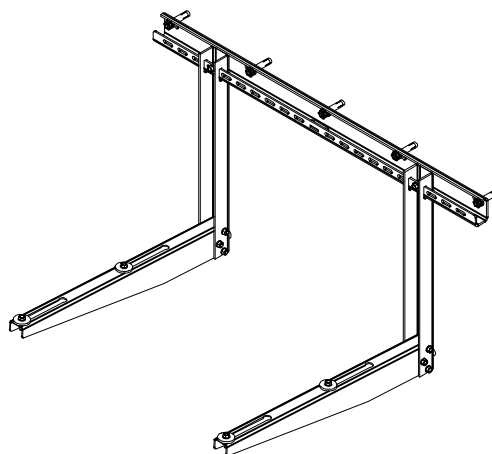


Figure 3-18: Wall mounting brackets

3.7 INSTALLING THE HEAT PUMP

3.7.1 INSULATION

It is essential that the complete water circuit, including all internal and external water pipework, valves, and pipework passing through external walls, must be insulated to reduce heat loss and a reduction in heating output and heat pump efficiency, and also to prevent freezing of external pipework during winter months.

The insulation material should have a B1 fire resistance rating and comply with all applicable legislation.

Any external insulation should be UV resistant and all joints should be sealed to prevent water ingress.

The level of insulation used should comply with the requirements of the Building Regulations Approved Document L.

The thickness of the pipe insulation will depend on the pipe diameter and the thermal conductivity of the insulation. For more details, refer to the Domestic Heat Design Guide.

Example:

For a 28mm diameter pipe, and insulation with a thermal conductivity of 0.04W/mK, the thickness of the insulation material should be at least 25mm.

! WARNING !

Safely dispose of packing materials such as nails and other metal or wood parts that could cause injuries.

3.7.2 CONNECTING THE HEATING SYSTEM TO THE HEAT PUMP

Water connections must be made in accordance with diagrams in this manual and the labels on the heat pump.

- Be careful not to deform the heat pump pipework by using excessive force when connecting.
- Pipework should be flushed before connecting the heat pump.
- Hold the pipe end downwards when removing burrs.
- Cover the pipe end when inserting it through a wall so that no dust and dirt can enter.
- **The heat pump is only to be used in a sealed heating system. It must not be used as part of an open-vented system.**

Before continuing the installation of the heat pump, check the following points:

- The maximum system water pressure is 3 bar.
- The maximum water flow temperature;
75°C for space heating
70°C for DHW

- Always use materials that are compatible with the water used in the system and with the materials used in the unit.
- Make sure the hose is connected to the pressure relief valve to avoid any water coming into contact with electrical parts.
- Air vents must be provided at all high points of the system. The vents should be located at points which are easily accessible for servicing. An automatic air purge valve is provided inside the heat pump. Check that the air purge valve can operate.
- Take care that the components installed in the pipework can withstand the water pressure and temperature.
- Always ensure that the materials used in the system are compatible with the water being used and the materials used in the unit.

! WARNING !

Never leave the unit unattended during installation or servicing when the service panel is removed.

3.7.3 SLEEVING FOR PIPES AND CABLES

All pipes passing through external walls should be individually sleeved, using either copper or plastic pipe for the sleeve.

The inside diameter of this sleeving should be large enough to accommodate the insulation on heating system pipes, usually at least 6mm larger than the outside diameter of the insulation.

It is important that the sleeve is correctly built into the wall structure using a cement mortar or suitable filler.

The annular gap between the pipe/insulation and the sleeve should be even all round with at least one end sealed with a mastic sealant, to prevent the ingress of water or vermin whilst allowing the pipe to move and maintain the fire-resistant properties of the structure.

Whilst not essential, it is also recommended as good practise to sleeve any cables passing through external walls, following the basic requirements as given above. This will make it easier to remove/replace any cables in future, should it be necessary.

! WARNING !

Be sure to use only specified accessories and parts for installation works. Failure to use specified parts may result in water leakage, electric shocks, fire, or the unit falling from its mount.

3.7.4 SYSTEM CONNECTIONS

The system connections of the heat pump must be carried out using the flexible hoses, valves and fittings supplied with the heat pump controller kit.

The hydraulic circuit must be completed following the recommendations below:

1. It is important to install the isolation valves between the heat pump and the building (supplied with the heat pump controller kit).
2. The system must have drain cocks at the lowest points.
3. Air vents must be included at the highest points of the system.
4. A system pressure gauge must be installed upstream of the heat pump.
5. All pipework must be adequately insulated and supported.
6. The presence of solid particles in the water can obstruct the heat exchanger. Therefore, protect the heat exchanger using a magnetic filter such as a Grant Mag-One Duo magnetic filter.
7. After system assembly flush and clean the whole system, paying particular attention to the state of the filter.
8. A new installation must be thoroughly flushed and cleaned before filling and adding biocide/inhibitor.

! WARNING !

Do not touch water pipes during and immediately after operation as the pipes may be hot and could burn your hands.

3.8 METERING REQUIREMENTS

Regulations came into force on the 22nd May 2018 which require that all air source heat pump installation are metered for performance to meet Ofgem requirements. This stipulates that all ASHPs must be fitted with one (or more) electricity meters to record and display the electricity used by:

- The ASHP
- Any supplementary heater for space heating controlled by the same control system as the ASHP (for example, an immersion heater in a buffer tank).
- Any immersion heater used to heat domestic hot water controlled by the same control system as the ASHP (for example, using a Grant Automatic DHW boost kit).

It must be understood that this metering is only to record the amount of electricity being used by the ASHP installation to allow users to monitor the energy consumption and performance of their system.

The electricity meter(s) used may be installed as either a separate 'stand-alone' meter for each device used (this may required up to three meters being used on a single installation) or a single 'stand-alone' meter for all devices used. Where a single meter is used for more than one device, a separate sub-consumer unit will also be required to provide separate protection and isolation for each device concerned.

The electricity meters used must be MID compliant and Class A or better, remembering that classes B and C are better than A!.

3.9 SYSTEM VOLUME REQUIREMENTS

Grant Aerona 290 heat pumps require a minimum heating system volume to ensure the system always has sufficient thermal capacity for the heat pump, allowing the heat output to be dissipated during normal operation. This varies for each model depending on the minimum modulation output of the heat pump.

This minimum system volume is 5 litres per kW output at the minimum modulation output of the heat pump. Refer to table 3-10.

To improve defrost performance, the efficiency of the heat pump in low-load situations, and to increase the durability of the heat pump, it is recommended that a larger volume than the minimum system volume is provided.

This recommended system volume is 20 litres per kW output at the minimum modulation output of the heat pump. Refer to table 3-10.

Table 3-10: System volume requirements

Model	Minimum modulation Output (kW)	Minimum system volume (l)	Recommended system volume (l)
HPR2904	1.25	6.25	25.0
HPR29065	2.40	12.0	48.0
HPR2909	2.51	12.55	50.2
HPR29012	3.20	16.0	64.0
HPR290155	4.63	23.15	92.6

Either the Minimum system volume or the Recommended system volume, can be achieved in one of several ways depending on the system design and type.

For open-loop (or partial open-loop) systems:

The available volume of the system pipework always open to the heat pump will usually exceed the required minimum system volume (as given in Table 3-10).

However, it will still be necessary to determine the actual available system volume, including all pipework and radiators, but ignoring the volume of the DHW circuit (pipework and cylinder coil), to confirm that this exceeds the required minimum volume for the size of heat pump used.

When determining the actual available system volume, should any of the radiators have a TRV fitted, then the volume of that radiator and the pipework between that radiator and the flow and return pipes should be ignored.

Also, if the any of the heating circuits include underfloor heating, and any of the loops are fitted with an actuator on the UFH flow manifold, then the volume of that UFH loop (or loops) should be ignored for the purpose of determining the minimum system volume.

If the available volume exceeds either the Minimum system volume, or Recommended system volume, whichever is to be achieved (as given in Table 3-10), then an additional volumiser will NOT be required.

However, If the available volume is less than either the minimum system volume, or recommended system volume, whichever is to be achieved (as given in Table 3-10), then an additional volumiser WILL be required.

For zoned systems:

Where controls can isolate sections of the system pipework, the available volume will be that of the **lowest volume circuit** of the system.

For example, for an S-plan system with two zoned heating circuits (upstairs and downstairs).

Determine the system volume of the upstairs circuit, including all pipework and radiators, from the heat pump flow back to the heat pump return connection – but ignoring the volume of the downstairs circuit i.e. the section after the downstairs zone valve, and the volume of the DHW circuit (pipework and cylinder coil).

Then determine the system volume of the downstairs circuit, including all pipework and radiators, from the heat pump flow back to the heat pump return connection – but ignoring the volume of the upstairs circuit i.e. the section after the upstairs zone valve, and the volume of the DHW circuit (pipework and cylinder coil).

When determining the actual system volume of either the upstairs or downstairs heating circuits, should any of the radiators have a TRV fitted, then the volume of that radiator and the pipework between that radiator and the flow and return pipes should be ignored.

Also, if either the upstairs or downstairs heating circuits include underfloor heating, and the UFH flow manifold is fitted with valve actuators, then the volume of the UFH pipework should be ignored for the purpose of determining the minimum system volume.

Then, compare the two circuit volumes and take the smaller volume as the available system volume.

If this available volume exceeds either the Minimum system volume, or Recommended system volume, whichever is to be achieved (as given in Table 3-10), then an additional volumiser will NOT be required.

However, If this available volume is less than either the Minimum system volume, or Recommended system volume, whichever is to be achieved (as given in Table 3-10), then an additional volumiser WILL be required.

Grant 50 litre Volumiser

A 'Volumiser' tank is an insulated vessel used to increase the volume of the system to meet the minimum volume requirements. It will generally only have two connections, one inlet and one outlet.

Grant UK offer an insulated 50 litre Internal volumiser. This is available in two versions – one with a factory-fitted 3kW immersion heater and the other without the immersion heater.

Table 3-11: Grant Internal 50 liter volumiser

Product Code	Product Name
HPIDVOL50	50 litre Internal Volumiser (UK) fitted with 3kW immersion heater
HPIDVOL50X	50 litre Internal Volumiser (UK)

Either version can be installed in either the flow from the heat pump or in the return to the heat pump, to suit the preference of the system designer and achieve the necessary system volume.

If the version fitted with an immersion heater is installed in the return to the heat pump, the heater can be used to assist the defrost function of the heat pump in cold ambient conditions.

Refer to the Installation Instructions supplied with the Internal Volumiser for details of the electrical connection and controller settings for this function to operate.

If the version fitted with an immersion heater is installed in the flow from the heat pump, the heater can be used to supplement the output of the heat pump to raise the flow temperature should the ambient temperature fall below the design ambient temperature.

Refer to the Installation Instructions supplied with the Internal Volumiser for details on the electrical connection and controller settings for this function to operate.

For further information on the Grant 50 litre Internal Volumisers please refer to Grant UK DOC 0207 (supplied with the volumiser).

3.10 HYDRAULIC DIAGRAMS

For information relating to the hydraulic concept drawings of the Grant Aerona Smart controller, refer to your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

! WARNING !

Do not use the heat pump to treat industrial process water, swimming pool water or domestic drinking water. Install an intermediate heat exchanger for all of the above cases.

3.11 AERONA SMART CONTROLLER

For information relating to the installation requirements of the Grant Aerona Smart controller, refer to your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

3.12 BEFORE YOU COMMISSION

3.12.1 FLUSHING AND CORROSION PROTECTION

To avoid the danger of dirt and foreign matter entering the heat pump the complete heating system should be thoroughly flushed out – both before the heat pump is operated and then again after the system has been heated and is still hot.

This is especially important where the heat pump is installed as a replacement for a boiler on an existing system. In this case the system should be first flushed hot, before the old boiler is removed and replaced by the heat pump.

For optimum performance after installation, this heat pump and the central heating system must be flushed in accordance with the guidelines given in BS 7593 'Treatment of water in domestic hot water central heating systems'.

This must involve the use of a proprietary cleaner, such as Sentinel X300 or X400, or Fernox Restorer.

After flushing, a suitable inhibitor and biocide should be used, such as Fernox F1 and F7 or alternatively Sentinel X100 and X700, specifically designed for use in air source heat pump installations. This provides long term protection against corrosion and scale and biological growth.

! NOTE !

When using water treatments additives, ensure that the volume of any volumisers, buffers and thermal stores are taken into account, in addition to the heating system pipework, when determining how much is required to correctly dose the system.

Grant Engineering (UK) Limited strongly recommends that a Grant Mag One Duo in-line magnetic filters (or equivalent*) is fitted in the heating system pipework. This should be installed and regularly serviced in accordance with the filter manufacturer's instructions.

* As measured by gauss. The Mag One Duo magnetic filter has a gauss measurement of 12000.

3.12.2 ANTI-FREEZE FUNCTION SETTING

Ice formation can cause damage to the system water circuit, should the outdoor unit and pipework be exposed to sub-zero temperatures. It is essential that the complete water circuit, including all internal and external water pipework, valves, and pipework passing through external walls, must be insulated to reduce heat loss and a reduction in heating output and heat pump efficiency, and also to prevent freezing of external pipework during winter months. Refer to section 3.7.1.

The Grant Aeron 290 software includes special functions that use the heat pump to protect the entire system against freezing.

This Frost protection is always active as long as the heat pump is powered on and cannot be de-activated or modified.

If the heat pump is installed in an area prone to electrical power supply failures, mechanical anti-freeze valves can be used to protect the system in the event of a power cut during freezing conditions. Refer to Section 3.13.

These antifreeze valves must be installed as specified in the installation instructions provided by the manufacturer or supplier.

If the outdoor air temperature (measured by the heat pump outdoor temperature sensor T4) is below 7°C and the return (TA) or flow (TB) water temperature is below 6°C for a continuous 60 seconds period, the water pump will be activated.

After the water pump has run for 5 minutes:

- If TA or TB are 6°C or above, the water pump will run for additional 5 minutes and then stop.
- If TA or TB are below 6°C the compressor will run in silent mode until TA or TB are 15°. Refer to Section 8.5.6.

Under low ambient air conditions the water pump may operate repeatedly to provide frost protection when the heat pump is not operating, e.g. possibly through the night, until the heat pump starts the following morning. The cost to protect the heat pump from freezing in this way is small due to the low water pump power consumption.

If the water flow temperature in the system drops below 4°C and the ambient air temperature is below 4°C the unit will activate the plate heat exchanger heater. Refer to Section 8.5.8.

This anti-freeze protection function will only turn off when the ambient air or water temperature reaches 6°C. Refer to table 3-11.

Table 3-12: Anti-freeze ON/OFF conditions

Plate Heat Exchanger Heater Status	Heat Pump Status	Ambient Temp (°C)	Inlet/Outlet Water Temp (°C)
ON	Stand-by/OFF	< 4	< 4
OFF	ON	> 6	> 6

All conditions must be met to turn **ON** the plate heat exchange heater. Only **one** of the conditions are required to turn **OFF** the plate heat exchanger.

3.13 ANTIFREEZE VALVES

Glycol anti-freeze cannot be used with the Aeron 290.

If the heat pump is installed in an area prone to electrical power supply failures, mechanical anti-freeze valves can be used to protect the system in the event of a power cut during freezing conditions.

If fitted, these antifreeze valves must be installed as specified in the installation instructions provided by the manufacturer of the valves or the supplier. Grant UK expect the user to take adequate precautions to protect their home and contents in the event of a power cut; this includes the heat pump and heating system components.

! WARNING !

When using antifreeze valves, it is essential that any discharge of system water can drain away and not be allowed to run onto any adjacent paths or driveways where, in winter, this will result in icing and a potential hazard for anyone walking near the heat pump.

! NOTE !

The use of antifreeze valves does not avoid the need for biocide and inhibitor.

3.14 COMPLETION

Please ensure that the heat pump commissioning form (supplied with the heat pump) is completed in full and that it is signed by the householder/user.

Leave the copy with the user and retain one copy for your own records.

Ensure that these and all other supplied installation and servicing instructions and the user instructions are handed over to the householder.

! WARNING !

Never leave the unit unattended during installation or servicing when the service panel is removed.

3.15 INSTALLATION CHECKLIST

Location and positioning

- The anti-vibration mounts are fitted (if required).
- The heat pump is fixed to the surface or mountings that it rests on.
- Maintenance clearances comply with those given in this manual.
- The position of the remote controller complies with the guidance given in the corresponding manual for the Grant Aeron Smart Controller.
- All safety requirements have been complied with.

! WARNING !

Ensure all installation work is completed with full consideration of extreme weather conditions, e.g. strong winds, heavy rain fall. For wall mounted installations, improper installation work may result in accidents due to equipment falling.

Water circuit pipework and appliances

- Water connections have been carried out as per the information in this manual.
- All water connections are tight with no leaks.
- The magnetic in-line filter is installed on the primary circuit return as close to the heat pump as possible but still within the building and in a position that is easy to access for maintenance.
- The pressure gauge with a suitable scale is installed on the sealed system pipework or expansion vessel manifold.
- The connection pipes are suitably supported so that these do not weigh on the appliance.
- The expansion vessel installed on the heating circuit is suitably sized.
- Any volumiser tank required is connected to the heat pump (refer to Section 3.9).
- The water circuit has been thoroughly flushed.
- The air vent valves are installed at the highest points on the system.
- There is no air in the system (vent if necessary).
- The isolation valves are installed on the inlet/outlet of system circuit.
- The drain valves are installed at the lowest points in the system.
- The flexible hoses are installed on the inlet/outlet of system circuit.
- The system water content complies with that specified in this manual.
- The DHW immersion heater has been installed in DHW cylinder for Legionella prevention.
- Suitable water flow rate for operation of the entire heat pump is achieved as specified in this manual.
- All pipes are insulated with suitable vapour barrier material to prevent formation of condensation and heat loss, with control and shut-off devices protruding from the insulation.

! WARNING !

Do not touch water pipes during and immediately after operation as these may be hot and could burn your hands.

Electrical connections

- All electrical connections are secure.
- Electrical connections have been carried out correctly.
- Voltage is within a tolerance of 10% of the rated voltage for the heat pump (230V).
- Electrical power supply complies with the data on the rating plate and as specified in this manual.
- The earth wires are connected securely.

! WARNING !

Make sure all wiring is secure. Use the specified wires and ensure that terminal connections or wires are protected from water and any adverse external forces. Incomplete or loose connections may cause a fire.

3.16 AERONA 290 PACKAGING

Grant UK is making positive steps in achieving more sustainable business operations. As part of Grant Project Zero, our company wide carbon reduction programme, we are reviewing the way our products are packaged to ensure we reduce waste wherever possible.

Through eliminating the use of unnecessary packaging and utilising recycled, recyclable, and compostable materials, we can help lessen the environmental impact of our products.

The packaging for your Aerona 290 air source heat pump should be handled as follows:

Table 3-13: Handling packaging

Packaging	Material	Handling
Outer Carton	Cardboard	Please recycle
Packing Tape	Paper-based	Please recycle
Pallet strapping	Polyester PET	Please recycle
Pallet	Wood	Please recycle
Protective Bag	Low Density Polyethylene	Please recycle
Accessory Carton	Paper-based	Please recycle
Packaging label	Paper-based	Please recycle
Manual Bag	Cornstarch Blend	Compostable

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4 SEALED SYSTEMS

4.1 INTRODUCTION

All Grant Aerona 290 heat pumps must be used with sealed systems complying with the requirements of BS EN 12828, BS EN 12831 and BS EN 14336.

The system must be provided with the following items:

- Diaphragm expansion vessel complying with BS EN 13831
- Pressure gauge
- Pressure relief (safety) valve
- Approved method for filling the system

The minimum system water volume required is 5 litres per kW of heat pump output. Refer to section 3.9.

EXPANSION VESSEL

The expansion vessel can be fitted in either the return or flow pipework. To reduce the operating temperature of the expansion vessel, position it below the pipe to which it is connected.

For system hydraulic diagrams, refer to the online resources section of this manual for a link to the Grant UK website.

The expansion vessel may be positioned away from the system, providing the connecting pipe is not less than 13mm diameter. If the expansion vessel is connected via a flexible hose, care must be taken to ensure that the hose is not twisted.

The unit comes equipped with a Return and Flow for connection to water circuit. It is important that the circuit is installed by a qualified technician and complies with local laws and regulations. It should be noted that the unit is designed to be used in a sealed heating systems only. Any attempt to use the unit in an open vented system circuit can lead to excessive corrosion of the water piping.

! NOTE !

Ensure that the expansion vessel used is of sufficient size for the system volume.

Refer to BS 7074:1:1989 or The Domestic Heating Design Guide for sizing the required vessel.

PRESSURE GAUGE

The pressure gauge must have an operating range of 0 to 4 bar. It must be located in an accessible place next to the filling loop for the system.

SAFETY VALVE

The safety valve (provided with the heat pump) is set to operate at 3 bar. It should be fitted in the flow pipework near to the heat pump.

The pipework between the safety valve and heat pump must be unrestricted, i.e. no valves. The safety valve should be connected to a discharge pipe which will allow the discharge to be seen, but cannot cause injury to persons or damage to property.

FILLING LOOP

Provision should be made to replace water lost from the system. This can be done manually (where allowed by the local water undertaking) using an approved filling loop arrangement incorporating a double check valve assembly. The filling loop must be isolated and disconnected after filling the system.

HEATING SYSTEM

The maximum 'setpoint' temperature for the central heating water is 75°C.

An automatic air vent should be fitted to the highest point of the system.

If thermostatic radiator valves are fitted to all radiators, a system by-pass must be fitted. The by-pass must be an automatic type and correctly set when the system is commissioned.

All fittings used in the system must be able to withstand pressures up to 3 bar. Radiator valves must comply with the requirements of BS 2767:1991.

One or more drain taps (to BS 2879) must be used to allow the system to be completely drained.

4.2 FILLING THE SEALED SYSTEM

Filling of the system must be carried out in a manner approved by the local Water Undertaking.

The procedure for filling the sealed system is as follows:

1. Check the air charge pressure in the expansion vessel BEFORE filling the system.

The expansion vessel charge pressure should always be approximately 0.2 bar lower than the maximum static head of the system, at the level of the vessel (1 bar = 10.2 metres of water).

The charge pressure must not be less than the actual static head at the point of connection.

2. Check that the small cap (or screw) on all automatic air vents is open at least one turn. The cap (or screw) remains in this position until filling is completed and then it is closed.
3. The automatic air vent in the heat pump should be open with at least 2 turns from the factory. This should be checked. Remove the top panel and when necessary the right hand panel to access the automatic air vent. Refer to Figure 4-1 and section 1.10. When filling and venting is completed, close this cap.
4. Ensure that the flexible filling loop is connected and that the double check isolation valve connecting it to the water supply is closed. A valve is open when the operating lever is in line with the valve, and closed when it is at right angles to it.
5. Open the fill point valve.
6. Gradually open the double check valve from the water supply until water is heard to flow.
7. When the needle of the pressure gauge is 2.0 bar approximately, close the valve.
8. Vent each radiator in turn, starting with the lowest one in the system, to remove air.
9. Continue to fill the system until the pressure gauge indicates between 0.5 and 1.0 bar. Close the fill point valve. The system fill pressure (cold) should be 0.2 - 0.3 bar greater than the vessel charge pressure – giving typical system fill pressures of approx 0.5 bar for a bungalow and 1.0 bar for a two storey house.
Refer to the Domestic Heating Design Guide for further information if required.
10. Repeat steps 8 and 9 as required until system is full of water at the correct pressure and vented.
11. Water may be released from the system by manually operating the safety valve until the system design pressure is obtained.
12. Close the fill point and double check valves either side of the filling loop and disconnect the loop.
13. Check the system for water soundness, rectifying where necessary.

! NOTE !

The air charge pressure may be checked using a tyre pressure gauge on the expansion vessel Schraeder valve. The vessel may be re-pressurised, when necessary, using a suitable pump. When checking the air pressure, the water in the heating system must be cold and the system pressure reduced to zero.

This valve is opened from factory, when doing the installation in jobsite, this valve will automatically discharge the air in the water system during the pump operation.

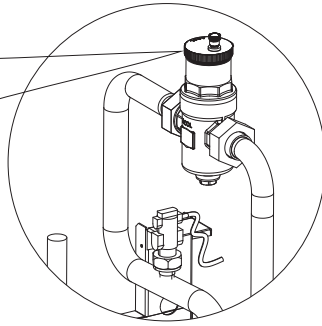


Figure 4-1: Automatic Air Vent

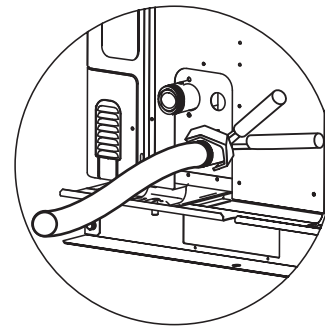


Figure 4-2: Water circuit connection

4.3 PRESSURE RELIEF (SAFETY) VALVE OPERATION

Check the operation of the pressure relief (safety) valve as follows:

1. Turning the head of the valve anticlockwise until it clicks. The click is the safety valve head lifting off its seat allowing water to escape from the system.
2. Check that the water is escaping from the system.
3. Top-up the system pressure, as necessary.

! NOTE !

The expansion vessel air pressure, system pressure and operation of the pressure relief valve must be checked on each service. Refer to Section 10

4.4 WATER CIRCUIT CONNECTION

Water connection must be made correctly in accordance with labels on the outdoor unit, with respect to the Return and Flow.

If air, moisture or dust gets in the water circuit, problems may occur. Therefore, always take the following into account when connecting the water circuit:

- Use only clean pipes
- Hold the pipe end downwards when removing burrs
- Cover the pipe end when inserting it through a wall to prevent dust and dirt from entering
- Use a good thread sealant to seal the connections. The sealant must be able to withstand the pressures and temperatures of the system
- When using non-copper metallic piping, be sure to insulate the two different materials from each other to prevent galvanic corrosion
- Copper is a soft material, so use appropriate tools for connecting the water circuit. Inappropriate tools will cause damage to the pipes

! CAUTION !

Be careful not to deform the unit's piping by using excessive force when connecting the piping. Deforming the piping can cause the unit to malfunction.

! NOTE !

Never use Zinc-plated parts in the water circuit. Excessive corrosion of these parts may occur as copper piping is used in the heat pump internal water circuit.

! NOTE !

When using a 3-port diverter valve in the water circuit, preferably chose a ball type valve to guarantee full separation between the domestic hot water and space heating water circuit. Refer to Appendix B for further information.

4.5 DRAINING THE WATER CIRCUIT

If it is necessary for any reason to drain the water from the primary circuit, ensure that there is no water remaining in the flow switch. If any water is not drained out, may freeze under winter conditions and damage the flow switch.

To avoid this, the flow switch should be removed, dried, and reinstalled in the heat pump.

To do this:

1. Turn the body of the flow switch anti clockwise to disengage and remove it from the connection on the pipework.
2. Ensure there is no water remaining in the flow switch. Refer to Figure 4-3.
3. Re-fit the flow switch into the connection on the pipework and turn the body clockwise to secure it in position.

! NOTE !

To dry the flow switch completely, remove it turning the connection anti clockwise.

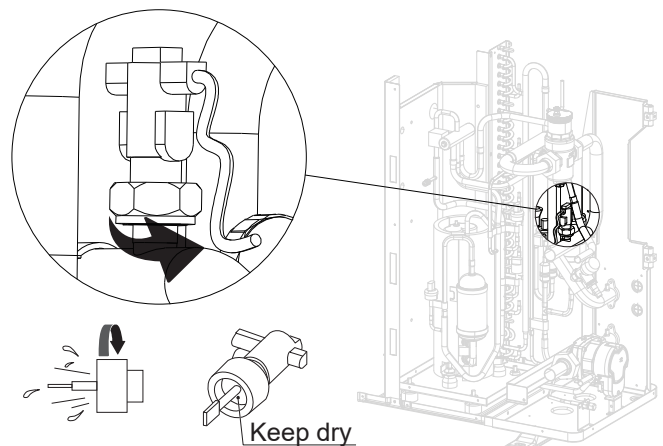


Figure 4-3: Flow switch in the heat pump

5 DOMESTIC HOT WATER

5.1 TEMPERATURE CONTROL

By default, the supplied Grant Aeron Smart Controller will prioritise any DHW demand that is made. The pump/valve terminals are de-energised as the DHW terminals are activated.

Once DHW is being provided, the flow temperature will adjust to the target temperature specified on the Aeron Smart controller for the DHW cylinder. The heat pump will stop when the cylinder temperatures reaches the desired target temperature, and should the temperature of the cylinder fall below the set level within the scheduled period the heat pump will re-engage.

A DHW demand should not exceed 60 minutes in a single period. This is to avoid excessive heat loss in the space heating circuit(s). The supplied Aeron Smart controller allows the user to configure the demand in 30 minute segments.

In addition, the end user can create a 'Boost' DHW cylinder demand via Grant Aeron Smart Controller. This 'Boost' will heat the cylinder to the preset target temperature where it will then deactivate.

We recommend up to 4 x 1 hour DHW demand periods to be scheduled in a day with at least a 1 hour gap between them.

! NOTE !

There is no limit to the number of times the Grant Aeron Smart controller can 'Boost' the DHW cylinder.

The Grant Aeron smart controller can also be configured to aid the heat pump using the immersion heater in a DHW cylinder with the use of a Grant Immersion relay. If required, the user can set temperature and time limits on when the immersion relay will trigger the immersion of the cylinder in a DHW demand.

5.2 QUICK RECOVERY CYLINDERS

As the water temperature from the heat pump is lower than from a traditional system using a boiler, a much larger coil is required inside the cylinder to transfer the heat efficiently.

The Grant range of "Quick Recovery" hot water cylinders are specifically designed for use with heat pumps.

To ensure that a 5 to 8K temperature difference is maintained between the cylinder flow and return, the correct Grant UK Quick Recovery cylinder must be selected to match the heat pump output.

Failure to use the correct cylinder can result in a reduced heat transfer in the cylinder and a lower temperature differential.

5.2.1 CYLINDER CAPACITY

To calculate the minimum cylinder capacity for a dwelling, use the following formula:

- Minimum cylinder capacity to meet Total daily DHW demand = (Number of people x 45 litres) + 40 litres
- Where the Number of people (Np) = Number of bedrooms + 1

Example:

To calculate the cylinder capacity for a 3-bedroom dwelling:

- Number of people (Np) = Number of bedrooms + 1 = 3+1 = 4

$$\text{Minimum cylinder capacity} = (Np \times 45) + 40 \text{ litres}$$

$$= (4 \times 45) + 40$$

$$= 220 \text{ litres}$$

Knowing that the minimum cylinder capacity to satisfy the total daily DHW demand is 220 litres, choose the smallest cylinder that has at least this capacity, i.e. 250 litre cylinder, product code QRSC250.

5.2.2 REHEAT TIMES

To calculate the reheat time, specific information must be available:

- The water volume of the cylinder to be heated
- The specific heat capacity of water
- The starting temperature of the water in the cylinder
- The expected final temperature of the water in the cylinder
- The nominal output of the heat pump being installed

Example:

To calculate the reheat time of a 210 litres cylinder to raise the water temperature from 30°C to 50°C (preferably within one hour or so) using an HPR29065 heat pump with an output of 6.1kW at -3°C ambient when delivering a 60°C flow temperature.

What do we know?

- Cylinder volume (V) = 210 litres
- The specific heat capacity of water (c) = 4.182 kJ/kg°C
- The starting temperature of the water = 30°C
- The expected final temperature of the water = 50°C
- Temperature rise (ΔT) = 50°C - 30°C = 20°C
- Density of water (ρ) = 1kg/litre
- Heat pump nominal output (P) = 6.1kW.

To convert kW to kJ/min, multiply by 60.

$$6.1 \times 60 = 366 \text{ kJ/min}$$

The equation used is:

$$\text{Reheat Time} = \frac{V \times \rho \times c \times \Delta T}{P}$$

$$\text{Reheat Time} = \frac{210 \times 1 \times 4.182 \times 20}{366}$$

$$= 47.99 \text{ min} \approx 48 \text{ minutes}$$

Table 5-1: Hot water cylinder approximate reheat times from 30°C to 50°C (at -3°C outdoor ambient temperature and 60°C flow temperature).

Heat pump model	Heat pump Output (kW)	HW Cylinder Volume (litres)	Approx. Reheat Time (minutes)
HPR2904	3.6	150	58
		180	70
		210	81
		250	97
		300	116
HPR29065	6.1	150	34
		180	41
		210	48
		250	57
		300	69
HPR2909	8.6	150	24
		180	29
		210	34
		250	41
		300	49
HPR29012	11.6	150	18
		180	22
		210	25
		250	30
		300	36
HPR290155	15.1	150	14
		180	17
		210	19
		250	23
		300	28

! NOTE !

Reheat times are an estimate only and should not be taken as an exact time period. We recommend that you allow 60 minutes when in domestic hot water mode.

5.3 LEGIONELLA

For protection against Legionella the temperature can be periodically to 60°C using the supplied Grant Aeron Smart Controller.

It is possible to use the Aeron 290 heat pump to raise the DHW cylinder to around 50 to 55°C during the standard operating modes.

The Grant Aeron Smart Controller also allows the cylinder immersion element to be used to raise the temperature to 60°C for one hour weekly to sterilise the cylinder against Legionella.

! NOTE !

A Grant Smart Immersion relay will be required to trigger the cylinder immersion heater.

Refer to your supplied Installation and Operating instructions for further information.

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

5.4 CYLINDER CAPACITY

Grant UK adopt the approach of recommending a cylinder based off the water demand for the property and not the capacity of the heat pump.

We recommend 45 litres per occupant plus 40 litres of additional water capacity.

Refer to Table 5-1 for guidance on reheat times for the different cylinders capacities depending of the heat pump used.

6 ELECTRICAL

6.1 POWER SUPPLY

Use a dedicated power supply with a correctly sized circuit breaker. This must be a high-speed type of 30mA (<0.1s).

The final power supply connection must be made from a weatherproof lockable isolator located outside the building.

The cable should be either armoured or run in a flexible conduit between the isolator and the heat pump. The power supply cable should be sized by a qualified electrician in accordance with current wiring regulations.

The DC residual current measured is less than 10mA on all models, therefore a Type F Residual Current Device (RCD) can be used on all Aerona 290 heat pumps.

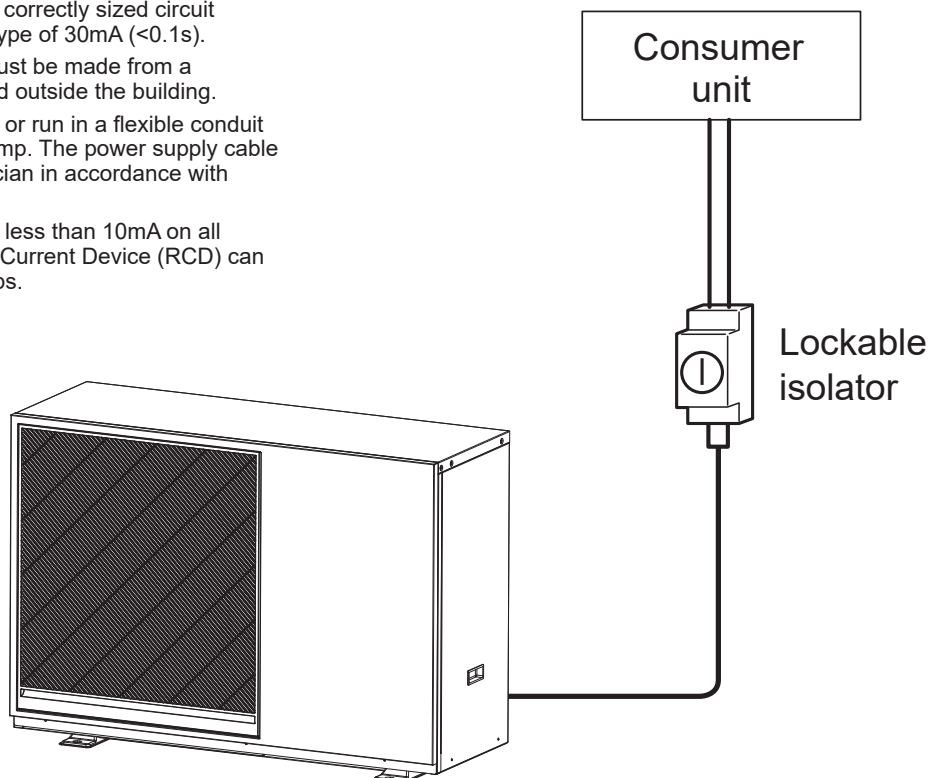


Figure 6-1: Heat pump, isolator and consumer unit

! NOTE !

A Type F Residual current device (RCD) can also be used with all Aerona 290 heat pumps as DC residual current measures under 10mA across all models.

! NOTE !

Selection of an appropriate protection device should be in conjunction with current BS 60335 & 7671 standards along with guidance from HPA & BEAMA.

Table 6-1: Electrical supply details

Model	Voltage (V)	Frequency (Hz)	Power supply cable* (mm ²)		RCD	MCB	Max Running current (A)
			Min	Max			
HPR2904	230	50	4.0	6.0	16A type B	16A type C	8.3
HPR29065	230	50	4.0	6.0	16A type B	16A type C	12.8
HPR2909	230	50	6.0	10.0	20A type B	20A type C	16.8
HPR29012	230	50	6.0	10.0	32A type B	32A type C	24.8
HPR290155	230	50	6.0	10.0	32A type B	32A type C	29.3

* Power cable should be sized by a qualified electrician in accordance with current wiring regulations.

Select circuit breaker that has a contact separation in all poles not less than 2mm providing full disconnection through a double pole isolator where:

Table 6-2: Total fan input power

Model	Total fan input power (W)	
	Single fan	Dual fan
HPR2904	100	n/a
HPR29065	170	n/a
HPR2909	170	n/a
HPR29012	n/a	200
HPR290155	n/a	200

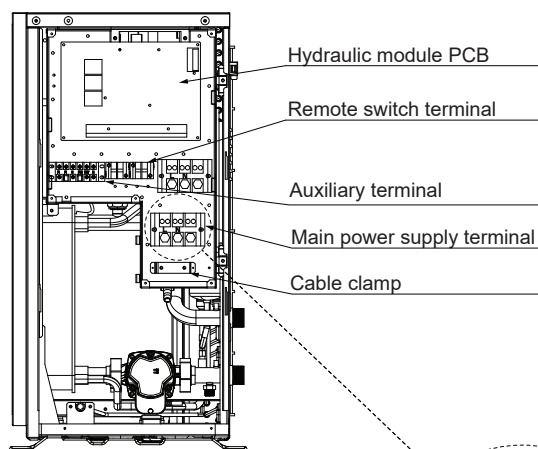
6.1.1 CONNECTING MAINS SUPPLY

1. Remove the side panel of the R290 heat pump (left side panel when viewing from the rear) and the Hydraulic PCB module panel. Refer to Figure 6-2.
2. Slot the power cable through the outer section of the supplied cable gland.
3. Remove the in situ hole cover.
4. Insert the power cable through the High voltage wire slot incorporated into the body of the heat pump (located close to the Flow and return. Refer to Figures 6-3, 6-4, 6-5 and Table 6-3).
5. Pass the power cable through the inner section of the supplied cable gland and unite with the outer section with a loose connection.
6. Guide the cable into the hydraulic PCB housing through the holes in the bottom.
7. Open the cable clamp and pass the power cable through, leaving sufficient cable length to connect to the power supply terminals.

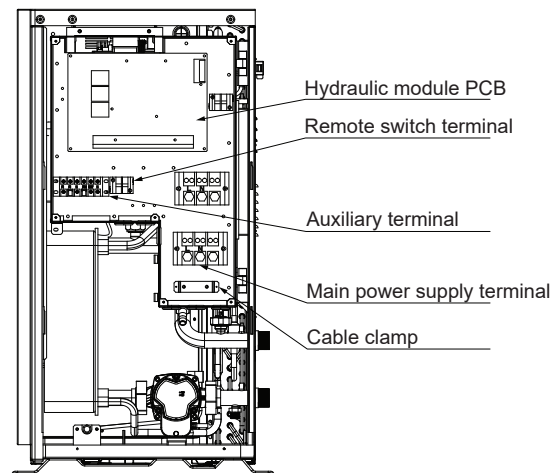
! NOTE !

In the case of long cable runs, selection of correct cable must be done in accordance with BS 7671 (IET Wiring Regulations).

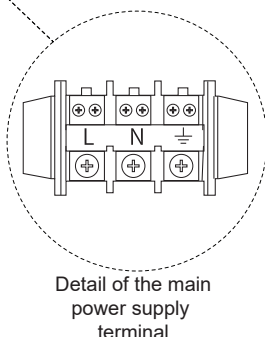
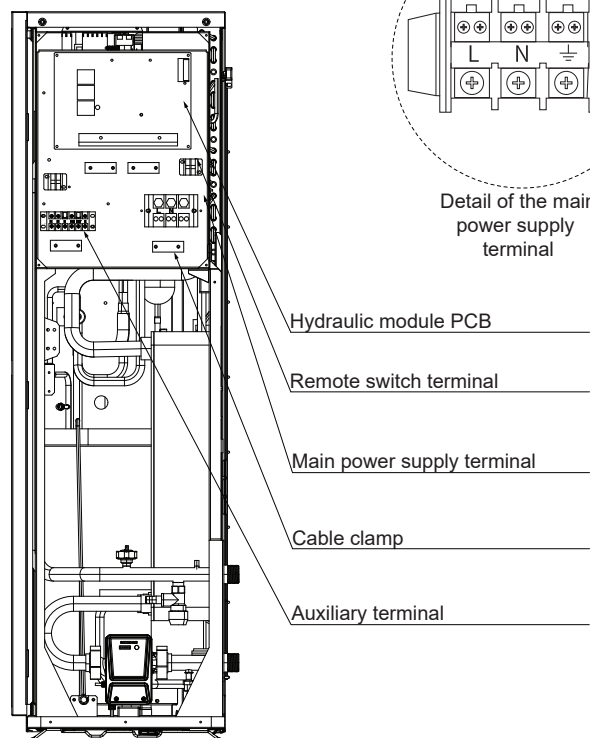
HPR2904



HPR29065 / HPR2909



HPR29012



HPR290155

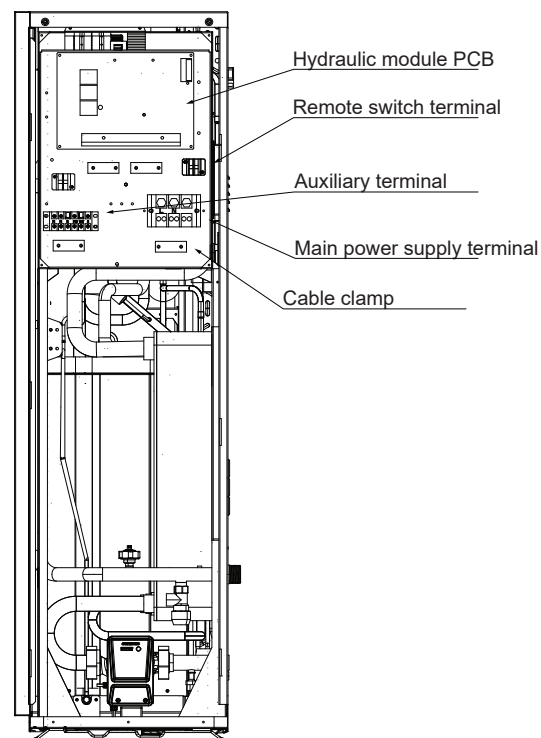


Figure 6-2: Side view for Mains and Hydraulic PCB connection

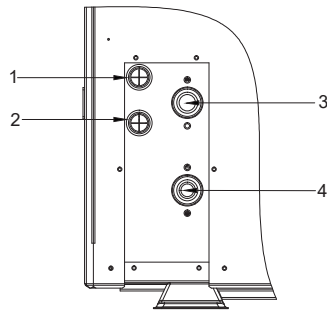


Figure 6-3: Wiring Holes for 4kW model

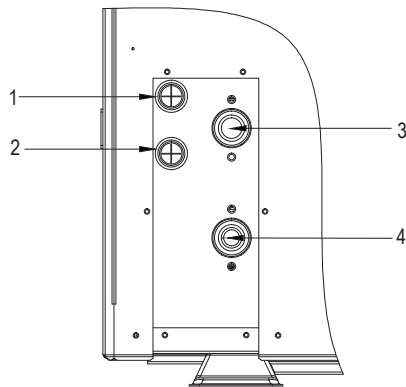


Figure 6-4: Wiring Holes for 6.5 and 9kW models

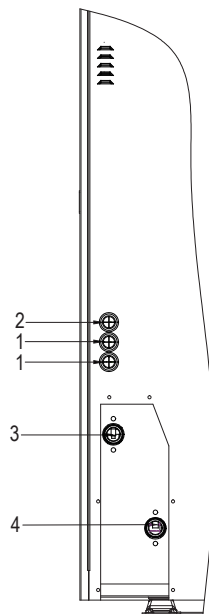


Figure 6-5: Wiring Holes for 12 and 15.5 kW models

Table 6-3: Wiring hole diagram key

Item	Description
1	High Voltage cable
2	Low voltage cable
3	Flow connection
4	Return connection

! NOTE !

Cable and circuit breakers should be to EN standards.

8. Strip the ends of connecting cables in accordance with Figure 6-6.
9. Crimp terminals with insulating sleeves can be used if required as illustrated in Figure 6-6 for connecting the wires to the terminal block. Stranded conductors shall not be soldered.
 - Use a circuit breaker with a 3 mm clearance of air gap between the contacts.
 - Be sure to FULLY insert the cable cores into the proper position of the terminal block.
 - Faulty wiring may cause not only abnormal operation but also damage to Hydraulic PCB board.
 - Fasten each terminal screw securely.
 - To check the connections are secure, pull the cable slightly.
 - Fix cables into the cable clamp.

! CAUTION !

It is important that the cable is stripped back 10mm. If shorter, it is possible to clamp down onto the insulation. If longer, a short circuit may occur.

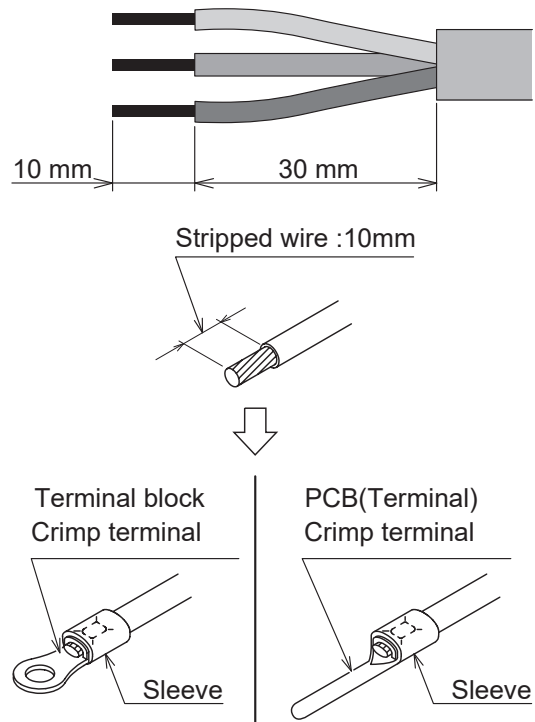


Figure 6-6: Circular wiring connection

! CAUTION !

If you do not use circular wiring terminals ensure you leave at least 30mm of exposed wire to wrap around the screw thread of the connection terminal.

10. Connect wires to the corresponding terminals on the heat pump and screw the fastenings securely into place.
11. Once this and any other connections are made to the Hydraulic PCB, refit the panel for the Hydraulic PCB enclosure with the screws previously removed.
12. Refit the side panel for the heat pump with the screws previously removed.

6.2 TIGHTENING TORQUES

When tightening fixings:

- Use the correct screwdriver. Small screwdrivers can damage the screw head and prevent appropriate tightening.
- Over-tightening the terminal screws can cause damage.

! WARNING !

When using crimp type terminals, ensure the terminal screws are sufficiently tightened, otherwise overheating may occur and possibly cause extensive damage inside the heat pump. Do not over tighten.

6.3 CONNECTION OF CONTROLLER

For information relating to the connection of the Grant Aerona Smart Controller, Refer to Section 7.

6.4 INTERNAL ELECTRIC HEATERS

The Grant Aerona 290 comes factory fitted with a number of electric heaters that aid various internal functions within the heat pump. Refer to table 6-4 for heaters and related electrical specifications.

- The base tray heater melts any frozen condensate collected in the base of the heat pump. Refer to Section 1.2.
- The compressor crankcase heater is used to prevent refrigerant from mixing with compressor oil when the compressors are stopped. Refer to Section 8.2.2 for more information.
- The plate heat exchanger heater is activated in frost protection cycles to stop ice from forming inside the plate heat exchanger. Refer to Section 8.5.8 for more information.

Table 6-4: Base tray, Compressor crankcase and Plate Heat Exchanger heater specifications

Base tray heater specification				
Specification	Unit	Base Tray	Compressor Crankcase	Plate Heat Exchanger
Voltage	V	230	230	230
Power	W	43.70	27.30	21.90
Maximum temperature	°C	180	180	180
Current	A	0.19	0.12	0.10
Resistive load				
Resistance at 20 °C	Ω	1210 ± 7%	1936 ± 7%	2420 ± 7%

7 SMART CONTROLLER

7.1 GRANT AERONA SMART CONTROLLER

The Grant AERONA Smart Controller is used to:

- Switch the heat pump on and off.
- Display selected circuit actual & target temperatures.
- Display outdoor temperature.
- Perform heat curve adjustments to flow temperatures based on ambient external air temperatures
- Manage space heating, DHW and Heat pump schedules.
- Manage Legionella protection scheduling.
- Access and check/adjust controller parameters.
- Access and check/adjust the heat pump control parameters
- Provide web based monitoring and control functionality.

The Grant AERONA Smart Controller will also display any fault error codes should there be a fault condition on both the supplied touchscreen display and any installed additional thermostats.

It can also be used to view the heat pump operating conditions at any point in time using the both the touchscreen display and the web based portal, if connected via ecoNET24 external services.

For more information refer to your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

7.2 INSTALLATION REQUIREMENTS

For information relating to the installation requirements of the Grant AERONA Smart controller, refer to Section 3 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

! NOTE !

Grant UK recommend Cat 5/6 shielded cable for the modbus connection between the wiring centre and Grant AERONA 290. Refer to your supplied controller manual for the further information.

7.3 CONNECTING THE SMART CONTROLLER TO THE HEAT PUMP

1. Isolate the mains power supply for the heat pump from the power source.
Do not connect the Smart controller modbus cable with the power on.
2. Remove the side panel and the Hydraulic PCB housing panel. Refer to Section 6.1.1
3. Feed the modbus cable through a low voltage hole in the R290 housing and Hydraulic PCB housing.
4. Strip a sufficient amount off the end of the cable to connection to the terminal on the Hydraulic PCB.
5. Connect the 2 core modbus cable to the H1(B-) and H2(A+) terminals on the Hydraulic PCB board. Refer to Figure 7-1.

! NOTE !

Make note of which wire colour is connected to which terminal. The modbus connection will need polarities matched at the heat pump and smart controller.

6. Securely fasten the modbus cable with the cable clamp fitted
 7. Refit the Hydraulic PCB housing panel & side panel to the heat pump.
 8. Connect the modbus cable to the Grant AERONA Smart controller to the G2 socket. For more information refer to Section 5 of your supplied manual:
- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
 - DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

7.4 SMART CONTROLLER OPERATION

For information relating to the operation of the Grant AERONA Smart controller, refer to Section 7 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

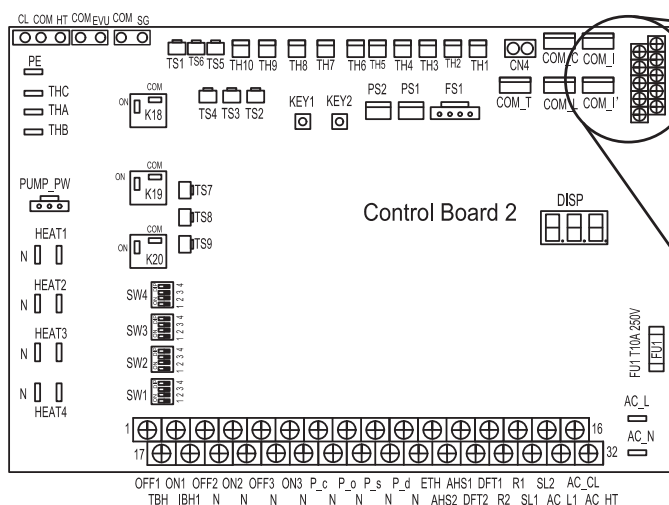


Figure 7-1: Hydraulic PCB U19 communication ports

8 OPERATION

8.1 STOP OPERATION

The stop operation occurs for one of the following reasons:

1. Normal shutdown: The heat pump will stop running when the set temperature has been reached.
2. Abnormal shutdown: In order to protect the compressor, if an abnormal state occurs, the system makes a 'turn off' operation and an error code is displayed on the unit PCB digital displays and the controller interface.

8.2 STAND BY CONTROL

8.2.1 WATER PUMP CONTROL

When the outdoor unit is in standby, the internal and external circulator pumps run continuously.

8.2.2 CRANKCASE HEATER CONTROL

The crankcase heater is used to prevent refrigerant from mixing with compressor oil when the compressor is stopped. The crankcase heater is controlled according to outdoor ambient temperature and the compressor's ON/OFF state.

When the outdoor ambient temperature is at or above 7°C or the compressor is running, the crankcase heater is OFF.

When the outdoor ambient temperature is below 5°C and the unit has just been powered ON (manually or when the power supply has been restored from a power cut), the crankcase heater will cycle on a half an hour ON half an hour OFF basis.

When the compressor has been stopped for more than 3 hours and the outdoor temperature is below 5°C, the crankcase heater will cycle on a half an hour ON half an hour OFF basis.

8.3 STARTUP CONTROL

8.3.1 COMPRESSOR STARTUP DELAY CONTROL

In initial start up or restart control (except in oil return operation and defrosting operation) or switching from on mode to another mode, the compressor startup is delayed such that a 3 minutes delay time has elapsed since the compressor last stopped. In order to prevent frequent compressor ON/OFF and to equalize the pressure with the refrigerant system.

8.3.2 COMPRESSOR START UP PROGRAM

During initial startup control and restart control, the compressor startup is controlled according to outdoor ambient temperature. The compressor startup follows the startup steps shown in Figure 8-1 until the target rotation speed is achieved.

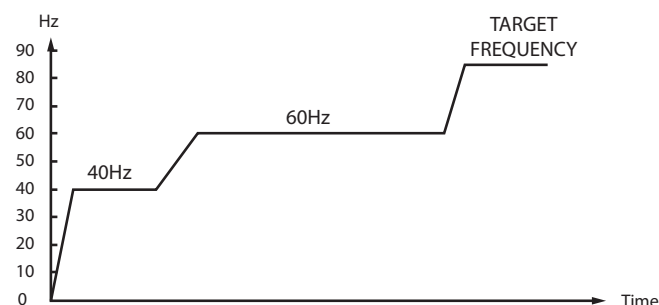


Figure 8-1: Compressor startup procedure

8.3.3 STARTUP CONTROL FOR SPACE HEATING AND DHW OPERATION

Refer to Table 8-1 for the Component control during startup in space heating and DHW modes.

Table 8-1: Component control during startup for a demand

Component	Control function and state
Inverter compressor	Compressor start up program as per Figure 8-1
DC fan motor	Start the fan 10 seconds before the compressor starts and then run half of the maximum speed and then run at maximum speed 60 seconds after the compressor startup
Electronic expansion valve	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to outdoor ambient temperature and inlet water temperature.
4-way valve	ON

8.4 NORMAL OPERATION CONTROL

8.4.1 COMPONENT CONTROL DURING NORMAL OPERATION

Refer to Table 8-2 for the Component control during space heating and DHW operations.

Table 8-2: Component control during heating demands

Component	Control function and state
Inverter compressor	Controlled according to load requirement from hydraulic module
DC fan motor	Controlled according to outdoor ambient temperature and outdoor heat exchanger pipe temperature
Electronic expansion valve	Position (steps) from 0 (fully closed) to 480 (fully open), controlled according to inlet water temperature, outlet water temperature and discharge temperature
4-way valve	ON

8.4.2 COMPRESSOR OUTPUT CONTROL

The compressor rotation speed is controlled according to the load requirement. The compressor follows a fixed starting procedure as shown in Figure 8-1. After finishing the startup, the compressor runs at the target rotation speed.

During normal operation the compressor speed is controlled according to the

- The outlet water temperature.
- The target water temperature set by the smart controller.
- The rate of change in the outlet water temperature.

8.4.3 COMPRESSOR STEP CONTROL

The running speed of the six-pole compressor (used on all models) in revolutions per second (rps) is $\frac{1}{3}$ of the frequency (Hz) of the electrical input to the compressor rotor. The frequency of the electrical input to the motor of the compressor can be altered at a rate of 1 Hz per second.

8.4.4 4-WAY VALVE CONTROL

The 4-way valve is used to change the direction of refrigerant flow through the water side heat exchanger in order to switch between heating and defrost functions.

During space heating and DHW operation, the 4-way valve is ON. During defrosting operations, the 4-way valve is OFF.

8.4.5 DC FAN CONTROL

The DC fan is activated 10 seconds prior to the start of the compressor and runs at its initial speed. After the compressor has started and run for one minute, the fan runs at a higher set speed. Refer to Table 8-1.

8.4.6 ELECTRONIC EXPANSION VALVE CONTROL

The position of the electronic expansion valve (EEV) is controlled in steps from 0 (fully closed) to 480 (fully open) as follows:

- **At power ON** - EEV first closes fully and then moves to the standby position. After a few seconds, EEV moves to an initial running position which is determined according to the operating mode, the inlet water temperature and the outdoor ambient temperature. A few minutes after, the EEV is controlled according to the inlet water temperature, the outlet water temperature, the discharge temperature and the compressor speed.
- **When the unit is on standby** - The EEV keeps current position and delay a few seconds before opening fully.
- **When the unit stops** - The EEV keeps current position first, then is delayed for a few seconds before opening fully.

8.5 PROTECTION CONTROL

8.5.1 LOW PRESSURE PROTECTION CONTROL

When the refrigerant suction pressure drops below 0.03Mpa, the system displays P03 protection and the unit stops running. When the function pressure rises above 0.03Mpa, the compressor enters re-start control. Refer to Figure 8-2.

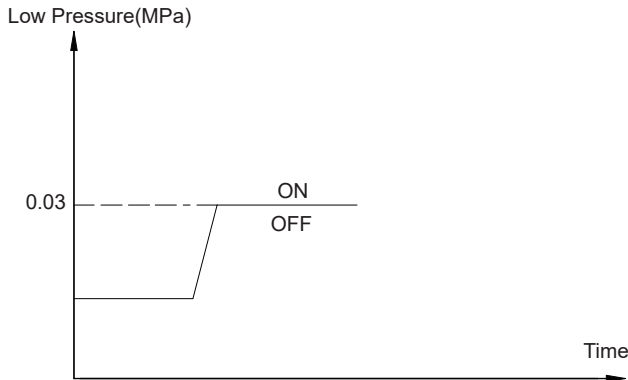


Figure 8-2: Low pressure protection control

8.5.2 HIGH PRESSURE PROTECTION CONTROL

When the refrigerant discharge pressure rises above 3.5Mpa, the system displays P02 protection and the unit stops running. When the discharge pressure drops below 2.8Mpa, the compressor enters re-start control. Refer to Figure 8-3.

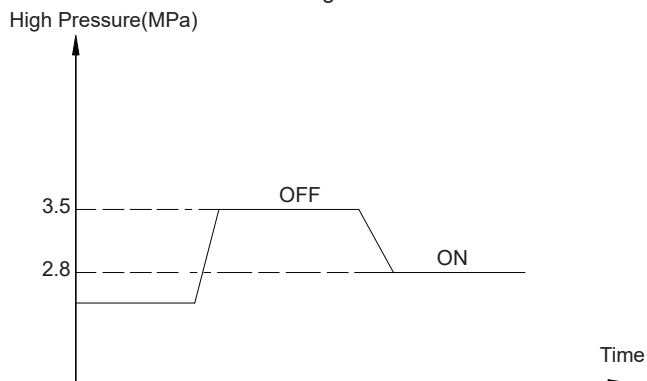


Figure 8-3: High pressure protection control

8.5.3 DISCHARGE TEMPERATURE PROTECTION CONTROL

When the compressor discharge temperature rises above 110°C, the system displays P05 protection and the unit stops running. When the discharge temperature drops below 90°C the compressor enters a re-start control. Refer to Figure 8-4.

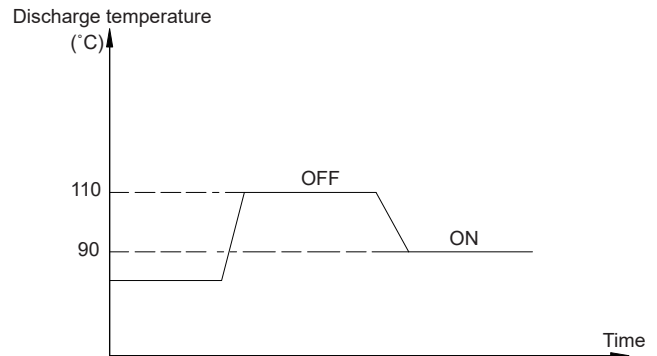


Figure 8-4: High pressure protection control

8.5.4 COMPRESSOR CURRENT PROTECTION CONTROL

When the compressor current rises above maximum current, the system displays E23 protection and the unit stops running. When the compressor current drops below maximum current, the compressor enters re-start control. Refer to Tables 8-3 & 8-4.

Table 8-3: Compressor current protection control

Model	4kW	6.5kW	9kW	12kW	16kW
Maximum current (A)	11.5	14.5	15.5	23.5	25.5

8.5.5 DC FAN MOTOR PROTECTION CONTROL

The system will check the feedback signal one minute after the fan starts. If the motor speed is lower than the default minimum speed or there is no feedback for one minute, the motor fault P11 will be displayed. If it occurs 10 times within 2 hours, the unit will shut down and be locked.

8.5.6 MODULE TEMPERATURE PROTECTION CONTROL

When the module temperature rises at or above the limit value of 96°C, the interface displays E29 protection code and the unit stops running.

8.5.7 WATER CIRCUIT ANTI-FREEZE

The Grant Aeron 290 software includes special functions that use the heat pump to protect the entire system against freezing. This Frost protection is always active as long as the heat pump is powered on and cannot be de-activated or modified.

If the heat pump is installed in an area prone to electrical power supply failures, mechanical anti-freeze valves can be used to protect the system in the event of a power cut during freezing conditions. Refer to Section 3.13.

These antifreeze valves must be installed as specified in the installation instructions provided by the manufacturer or supplier.

In the outdoor air temperature (measured by the heat pump outdoor temperature sensor T4) is below 7°C and the return (TA) or flow (TB) water temperature is below 6°C for a continuous 60 seconds period, the water pump will be activated.

After the water pump has run for 5 minutes:

- If TA or TB are 6°C or above, the water pump will run for additional 5 minutes and then stop.
- If TA or TB are below 6°C, the compressor will run in silent mode until TA or TB are 15°C

Under low ambient air conditions the water pump may operate repeatedly to provide frost protection when the heat pump is not operating, e.g. possibly through the night, until the heat pump starts the following morning. The cost to protect the heat pump from freezing in this way is small due to the low water pump power consumption.

If the water flow temperature in the system drops below 4°C and the ambient air temperature is below 4° (Refer to section 3.12.2), the unit will activate the plate heat exchanger heater.

This anti-freeze protection function will only turn off when the ambient air or water temperature reaches 6°C. Refer to table 8-4.

! WARNING !

ENSURE TO THOROUGHLY CHECK AND CORRECT ANY REFRIGERANT LEAKS PRIOR TO ATTEMPTING TO RESTART THE HEAT PUMP.

The heat pump will not function until it has been powered off completely and restarted.

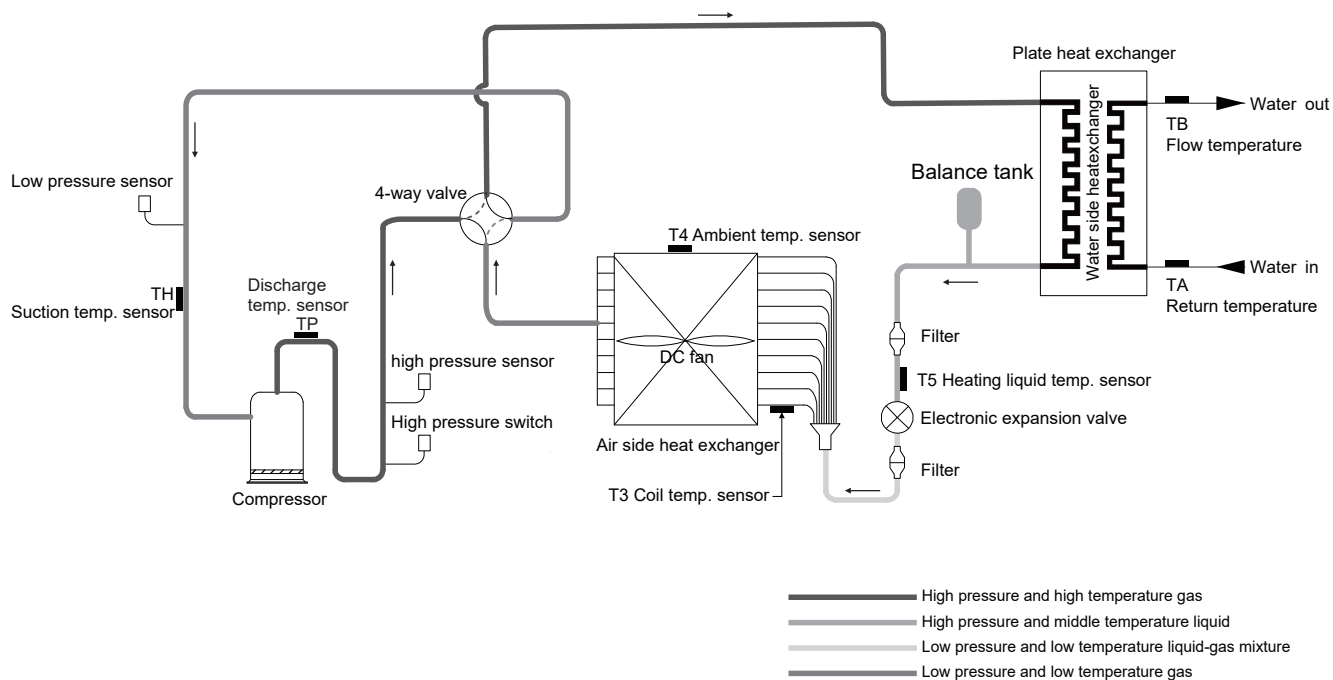


Figure 8-5: Refrigerant flow - Heating

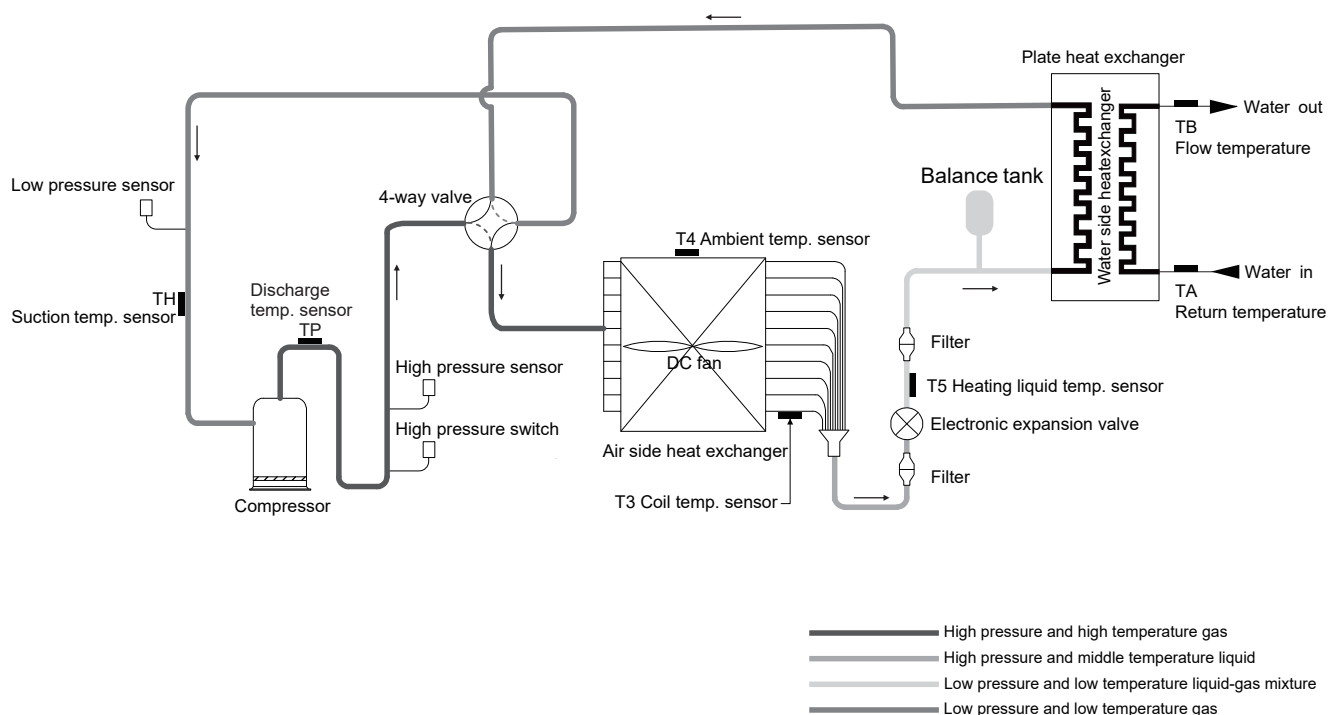


Figure 8-6: Refrigerant flow - Defrost

8.5.8 PLATE HEAT EXCHANGER FROST PROTECTION

The water side plate heat exchanger electric heater is controlled according to the outdoor ambient temperature, the inlet water temperature and the outlet water temperature to protect from the formation of ice. Refer to Table 8-4.

Table 8-4: Anti-freeze ON/OFF conditions

Plate Heat Exchanger Heater Status	Heat Pump Status	Ambient Temp (°C)	Inlet/Outlet Water Temp (°C)
ON	Stand-by/OFF	< 4	< 4
OFF	ON	> 6	> 6

All conditions must be met to turn **ON** the plate heat exchange heater. Only **one** of the conditions are required to turn **OFF** the plate heat exchanger.

When **ALL** the conditions below are met, the unit will turn on frost protection for the plate heat exchanger and starts the defrosting operation (Refer to Section 8.6.2):

- The current operation mode of the unit is shutdown or standby.
- The outdoor ambient temperature is below 4°C.
- The inlet water temperature or the outlet water temperature (the minor one) is below 4°C

When any **ONE** of the conditions below are met, the unit will turn off the frost protection for the plate heat exchanger :

- The current operation of the unit is neither shutdown nor standby.
- The outdoor ambient temperature is above 6°C
- The inlet water temperature or the outlet water temperature (the minor one) is above 6°C.

Refer to Figures 8-5 and 8-6 for refrigerant flow during heat demand and defrost functions.

8.6 SPECIAL CONTROL

8.6.1 OIL RETURN OPERATION

In order to prevent the compressor from running out of oil, this function is conducted to remove oil that has flowed out of the compressor and into the refrigerant piping.

When the compressor operates at a speed of 59Hz or less for 4 consecutive hours, the unit will start an oil-return operation.

For component control, refer to Table 8-5.

Table 8-5: Component control during oil-return operation

Component	Control function and state
Compressor	Runs at 60Hz for 4 minutes then 45Hz for 3 minutes.
Electronic expansion valve	Fully open during 60Hz operation then automatic.
DC fan motor	Controller according to outdoor heat exchanger pipe temperature.
4-way valve	OFF

8.6.2.1 DEFROST ENTER CONDITIONS

In order to recover heating capacity, the defrosting operation is conducted when the air side heat exchanger of the unit is performing as a condenser. The defrosting operation is controlled according to the following enter conditions:

1. ΔT between Outdoor Ambient temperature (T4) and the evaporator coil temperature (T3).
2. Dynamic change across the evaporator to judge the potential for frost buildup.
3. Discharge temperature.
4. Compressor run time.
5. Manual Defrost cycle.

If any of the above are fulfilled, the unit will start a defrost function.

8.6.2.2 DEFROST EXIT CONDITIONS

Refer to Table 8-6 for defrost cycle exit conditions if any are fulfilled.

Table 8-6: ΔT Defrost Exit Conditions

Component	Condition
Compressor run time	≥ 10 minutes
T3	$> 15^{\circ}\text{C}$
Flow Temperature (TB)	$< 2^{\circ}\text{C}$
Error	Check Controller for Error code

8.7 PRESSURE DROP

Pressure drop in a heat pump system describes how much pressure the circulating pump must overcome to maintain a desired flow rate through the hydraulic circuit and will include all piping, valves, fittings, and components like a plate heat exchanger, but excludes the circulating pump of the heat pump unit.

The relationship between flow rate and pressure drop is nonlinear.

As flow rate increases, the pressure drop increases roughly with the square of the flow rate, due to the nature of frictional losses in pipes and components. For example, if flow doubles, the pressure drop increases by approximately four times, assuming turbulent flow.

If the system includes narrow and/or long lengths of pipe, undersized components, or blockages in heat exchangers, pressure drops can be significantly higher, and flow may drop below the design target level unless the circulating pump can compensate for this.

The following curves (Figures 8-7 to 8-9) show the available pump performance after the pressure loss of the plate heat exchanger and primary pipe work within the heat pump have already been taken into account.

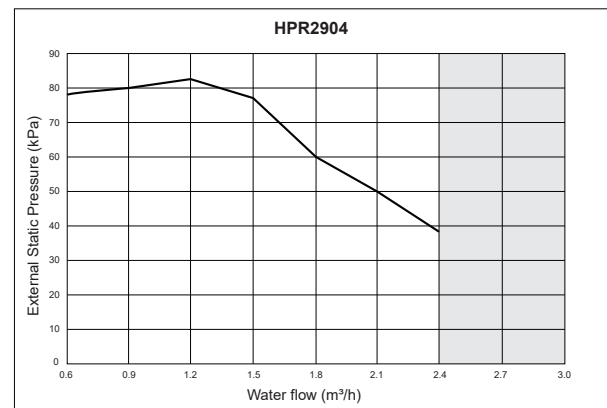


Figure 8-7: Pressure Loss Performance - HPR2904

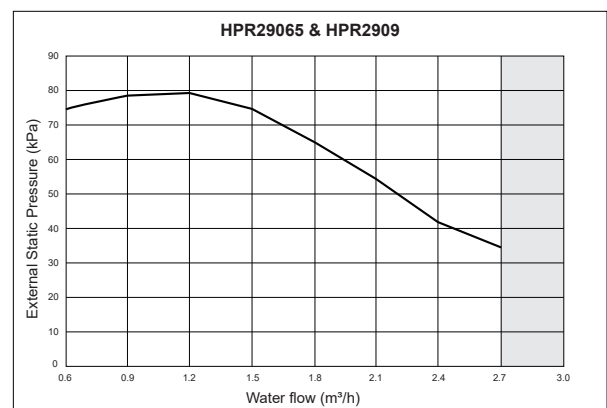


Figure 8-8: Pressure Loss Performance HPR29065 & HPR29065

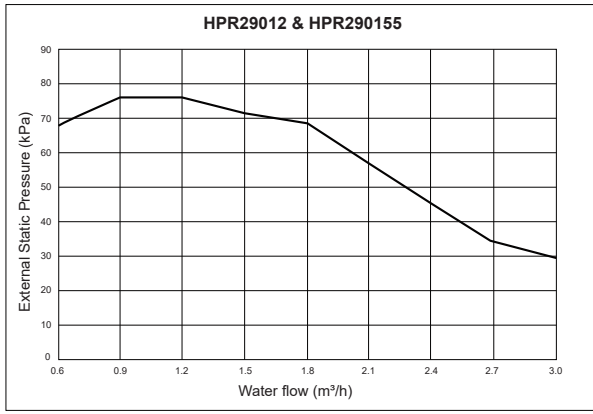


Figure 8-9: Pressure Loss Performance
HPR29012 & HPR290155

9 COMMISSIONING

9.1 SYSTEM SETUP

With the desired system installed and completed, commissioning will be required.

! CAUTION !

It is important that all information in this section is read sequentially by the installer and that the system is configured as applicable.

9.1.1 PRE-OPERATION CHECKS

Checks before initial start-up:

- Ensure the power supply is isolated before making any connections.

After the installation of the unit, check the following before switching on the circuit breaker:

- **Installation wiring:** Make sure that the installation wiring between the local consumer unit, isolator, heat pump, controls and valves (when applicable), domestic hot water cylinder, and backup immersion heater, have been connected following the instructions described in section 6 in accordance with the IET wiring regulations.
- **Fuses, circuit breakers, or protection devices:** Check that the fuses or the locally installed protection devices are of the size and type specified in section 6. Make sure that no fuses or protection devices have been bypassed.
- **Backup heater circuit breaker:** Do not forget to turn on the backup heater circuit breaker (applies only to units with optional domestic hot water cylinder installed).
- **Ground wiring:** Make sure that the earth wires have been connected properly and that the earth terminals are tightened.
- **Internal wiring:** Visually check the switch box for loose connections or damaged electrical components.
- **Mounting:** Check that the heat pump is properly mounted to avoid abnormal noises and vibrations when starting up the heat pump.
- **Damaged equipment:** Check the inside of the heat pump for damaged components or squeezed pipes.
- **Refrigerant leak:** Check the inside of the unit for refrigerant leakage. If there is a refrigerant leak, contact Grant UK.
- **Power supply voltage:** Check the power supply voltage from the local consumer unit. The voltage must correspond to the voltage on the identification label of the unit.
- **Automatic air vent:** Make sure the cap on the automatic air vent is open (at least 2 turns).
- **Isolation valves:** Make sure that both the isolation valves are fully open.

9.1.2 TURNING THE HEAT PUMP ON

The installed isolator is the primary switch and as such, the heat pump will start once the isolator has been set to 'ON'.

9.1.3 TURNING THE SMART CONTROLLER ON

The power switch for the Grant Aerona Smart controller is located on the left side of the wiring centre, when facing it from the front. For information relating to the powering ON of the Grant Aerona Smart Controller, refer to Section 5 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

9.1.4 INITIAL START-UP AT LOW OUTDOOR AMBIENT TEMPERATURE

For under floor heating systems, during initial start-up and when water temperature is low, it is important that the water is heated gradually. **Failure to do so may result in concrete floors cracking due to rapid temperature change.**

9.1.5 FAULT ON INITIAL SWITCH ON

If nothing is displayed on the touch screen display, it is necessary to check for any of the following problems:

- Wire Disconnection or wiring error (between the heat pump, wiring centre and touch screen display)
- The fuse on the hydraulic module PCB may have failed
- The fuse on the Smart Controller wiring centre PCB may have failed

If the touch screen display shows a 'P01' error code, there is a possibility that there is air in the system, or the water level in the system is less than the required minimum.

If the touch screen display shows a 'E01' error code, check the connections between the wiring centre and heat pump.

Refer to section 11 for details on error codes.

9.2 SYSTEM CONFIGURATION

The Grant Aerona Smart Controller integrated system configuration creator will aid with the setup of the space heating and DHW system within the software of the touchscreen display.

The steps in the configuration creator should reflect the system you have designed and electrically connected to the wiring centre.

For information relating to System configuration on of the Grant Aerona Smart controller, refer to Section 6 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

9.2.1 COMMISSIONING CHECKLIST

The supplied manual for the Smart controller offers an easy to follow commissioning checklist for the installer. In addition, the section includes suggested circuit settings based on concept drawings offered by Grant UK (Refer to Online resources section for QR links) and common heating circuits required.

For information relating to the commissioning on of the Grant Aerona Smart controller, refer to Appendix F of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

9.2.2 WEATHER COMPENSATION

For information relating to Weather compensation on the Grant Aerona Smart controller, refer to Section 7.13 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

9.3 SETTINGS

The parameters to control the heat pump and the installed space heating and DHW are managed via the touchscreen display. There are multiple levels of access which manage various elements:

- User settings
- System settings
- Heat pump parameters

9.3.1 USER SETTINGS

For information relating to the User settings menu on of the Grant Aeron Smart controller, refer to Section 7.9 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

9.3.2 SYSTEM SETTINGS

For information relating to the System settings menu on of the Grant Aeron Smart controller, refer to Section 8 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

9.3.3 HEAT PUMP PARAMETERS

For information relating to the Heat pump parameters menu on of the Grant Aeron Smart controller, refer to Section 9 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

9.4 TEMPERATURE CONTROL

The Grant Aeron Smart Controller will alter the flow from the heat pump based on the highest demand of the circuits active at that point.

Table 9-1: Smart controller Flow example

Circuit	Flow temperature	Setting (°C)
1 - Radiators	C1 (calculative)	48
2 - Underfloor	C2 (calculative)	31
DHW	User set target	60

Refer to Table 9-1 for example below:

- Circuit 2 is active with the Smart controller managing a target flow temperature target of 31°C.
- The installed thermostat for circuit 1 creates a demand for the circuit (target air temperature is below hysteresis value for the circuit).
- The Smart controller adjusts the heat pump target flow temperature to the 48°C temperature.
- Active temperature management for circuit 2 will be required in either the form of a 3-port actuator mixer valve or thermostatic mixing valve to keep the temperature at the required level for the underfloor circuit.
- The DHW schedule activates whilst a heat demand is active. The Smart controller will cut heating circuits and open the DHW circuit.
- The Smart controller will modify target flow temperature to 60°C until the DHW cylinder has reached target user set temperature.
- Smart controller will reactivate the heating circuits and heat pump target flow temperature is modulated down to the next highest temperature demand.
- Should the cylinder fall below hysteresis value set within its scheduled 'ON' period, the Smart controller will divert heat back to the cylinder, cutting heating circuits and adjust the target flow temperature accordingly.

9.5 FLOW

Grant Aeron 290 heat pumps are supplied with a DC PWM circulating pump. The pump output is modulated based on demand.

The flow switch within the heat pump monitors a minimum flow rate is present when the heat pump is active. If not, the flow switch will not be activated and the heat pump will shut down.

Refer to Appendix A for further information on the PWM pump.

9.6 BALANCING THE PRIMARY CIRCUIT

With the heat pump installed as described in these installation instructions, any hot water cylinders connected to the system filled with water and the primary circuit filled and vented (refer to Section 4.2); the primary circuit can be balanced.

To balance the primary circuit:

1. Access the automatic system bypass valve, if fitted, e.g. on an S-plan system using 2-port zone valves.
Ensure the automatic bypass valve is fully closed.
2. For systems fitted with one or more Thermostatic Radiator Valves (TRVs) - Fully open all TRVs fitted to radiators on the system. In warmer temperatures climates it may be necessary to slacken the TRV heads off or temporarily remove them, in order to prevent the ambient temperature closing the TRVs down.
For systems with one or more radiators without TRVs, fully open all manual radiator shut-off valves.
3. Fully open all radiator lockshield valves.
4. Turn the heat pump on, operate the system in space heating mode and allow the system to start heating up.
5. With the system flow temperature approaching its set value, check the temperature difference between the flow and return pipes connected to each heat emitter on the system, starting with the radiator emitter furthest from the heat pump.
In the case of a Grant Aeron 290 heat pump, this temperature difference should be approximately 5 to 8K (or 5 to 8°C).
6. Adjust the lockshield valve on the radiator to until the required temperature difference is achieved. In instances where this temperature difference is too low, close the appropriate radiator lockshield valve fully and open no more than half a turn at a time to until the required temperature difference is reached.

Repeat this process for the next radiator in the circuit until the required desired flow/return temperature difference has been achieved for all heat emitters on the system.

It may be necessary to repeat this cycle starting again with the radiator furthest from the heat pump until no further adjustment is required. This may require the adjustment of each radiator several times.

! NOTE !

Throughout the process of balancing the system, it is important to ensure that the heat pump is continuously operating to provide heat to the space heating circuit.

7. Turn the heat pump off and allow the system to cool.
8. While the system is cooling and with the automatic bypass valve still fully closed, re-fit or tighten any TRV heads that were removed or slackened. Then fully close all TRVs on the system.
For systems with one or more radiators without TRVs, fully close all manual radiator shut-off valves.
9. With all TRVs and/or manual shut-off valves on the system fully closed, turn the heat pump on and operate the system in space heating mode. Allow the system to reach operating temperature.
10. Open the automatic bypass valve until you detect that water is just starting to flow through it.
11. Ensure the heat pump is operating at the chosen flow temperature without modulating down.
12. If the heat pump is modulating down, open the automatic bypass valve slightly until a situation is achieved where all TRVs/manual shut-off valves on the system are fully closed and the heat pump continues to run at the chosen operating temperature.
13. Leave the automatic bypass valve in this position, open all TRVs/manual shut-off valves fully and allow the system to run according to the householder's requirements.

The primary circuit has now been balanced and the automatic bypass valve has been set.

10 SERVICING

10.1 SAFETY

Prior to performing any annual service or repair work on a Grant Aerona 290 heat pump the following guidance must be followed:

1. Create a safe working area

Set up a barrier at least 1m around the heat pump within which only those persons working on the heat pumps are permitted access. All maintenance staff and others working in this safe working area shall be instructed on the nature of work being carried out. Working in confined spaces shall be avoided.

2. Work procedure

Works shall be undertaken under a controlled procedure to minimise the risk of a flammable gas or vapour being present and to ensure that the risk of ignition is minimised within the safe working area while the work is being performed.

3. Checking for presence of refrigerant

The heat pump and the safe working area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. no sparking, adequately sealed or intrinsically safe.

4. Presence of fire extinguisher

If any hot works are to be conducted on the refrigerant circuit of the heat pump or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the refrigerant charging area.

5. No ignition sources

No person carrying out work in relation to the refrigerant circuit of the heat pump which involves exposing any pipe work that contains or has contained flammable refrigerant, shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including smoking, should be kept outside of the safe working area repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. **'NO SMOKING'** signs shall be displayed.

6. Ventilated area

Ensure that the safe working area is in the open or that it is adequately ventilated before breaking into the refrigerant circuit or conducting any hot works. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

7. Checks to the refrigerant circuit and equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. The manufacturers maintenance and service guidelines shall be followed at all times. If in doubt consult the Grant UK technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants. Checks to the refrigeration equipment.

- As an indirect refrigerating circuit is being used, the secondary (water) circuit should be checked for the presence of refrigerant.
- Marking on the equipment continues to be visible and legible. Marking and signs that are illegible should be corrected.
- The heat pump is installed such that the refrigerant circuit pipe and components are located in a position where they are unlikely to be exposed to any substance which may corrode them

8. Checks to electrical devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

- That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking.
- That there no live electrical components and wiring exposed while charging, recovering or purging the system.
- That there is continuity of earth bonding.

9. Seal electrical components

- Sealed electrical components shall not be repaired.

10. Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take account of the effects of ageing or continual vibration from sources such as compressors or fans.

11. Detection of flammable refrigerants

Under no circumstances shall potential sources of ignition be used for the detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) must not be used.

12. Leak detection methods

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants.

- Electronic leak detectors shall be used to detect flammable refrigerants, but the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant.
- Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25% maximum) is confirmed.
- Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipework.
- If a leak is suspected, all naked flames shall be removed or extinguished.
- If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.
- Oxygen Free Nitrogen (OFN) shall then be purged through the system both before and during the brazing process.

! CAUTION !

The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment.

13. Removal and evacuation

When breaking into the refrigerant circuit to make repairs or for any other purpose conventional procedures shall be used. However, it is important that best practice is followed since flammability is a vital consideration.

All equipment used must be rated for use with A3 refrigerants.

The following procedure shall be adhered to:

- Remove refrigerant
- Purge the circuit with inert gas
- Evacuate
- Purge again with inert gas
- Open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. The system shall be flushed with OFN to render the unit safe. This process may need to be repeated several times.

Compressed air or oxygen shall not be used for this task.

Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system.

When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipework are to take place.

Ensure that the outlet for the vacuum pump is not close to any ignition sources and there is ventilation available.

14. Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.

Prior to recharging the system it shall be pressure tested with OFN. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

10.2 SERVICING & MAINTENANCE PROCEDURE

Grant Aerona 290 heat pumps require only the minimum of routine maintenance. This should be carried out on an annual basis by a qualified technician and consist of the following:

10.2.1 HEAT PUMP

Check the following

- There are no refrigerant leaks. Refer to Section 10.6.
- Visual condition of the heat pump
- Any obstructions to airflow into the ASHP – remove if found
- The fan outlet grille is not obstructed - remove obstructions if found
- Condensate drain opening(s) are clear
- Pipe insulation condition
- Pressure relief valve hose discharge is clear
- Electrical power supply connections, hydraulic PCB and connections.

Inspect and clean the evaporator

- The air inlet grille and evaporator must be checked and any leaves or other debris removed from between the inlet grille and evaporator fins.

! CAUTION !

Take care not to damage or distort the Aluminium fins of the evaporator when removing any debris.

- Carefully remove any dirt or debris from the evaporator fins using either a soft brush or by gently vacuuming. Take care not to damage the fins during this manual cleaning process.
- Wash the evaporator with a neutral detergent cleaner, e.g. EnviroCoil, using a low-pressure spray.
- Do NOT use a pressure washer to clean the evaporator fins as this may damage them.
- Do NOT use any aggressive cleaning agents as these will attack and damage the aluminium fins.
- Re-apply ACF50 protection if previously used.

Inspect and clean the air outlet grille

- The air outlet grille must be checked and any leaves or any other debris removed that could otherwise obstruct the operation of the fan(s) or the free flow of air from the heat pump.
- Ensure that both the air inlet to the evaporator and the discharge from the fan outlet are unobstructed. Any foliage, plants, etc. near the heat pump must not be allowed to grow over the heat pump.
- Under no circumstances should anything be stacked on or against the heat pump.
- Refer to Section 3.6.9 for the required clearances around the heat pump.

Inspect the condensate disposal

- Check that the condensate drain holes in the bottom of the heat pump are not blocked.
- Check that any condensate hoses are not blocked.
- Check that condensate is safely disposed of and not forming a pool beneath and around the heat pump.

Inspect electrical supply connections

- Remove right hand end side panel and the cover panel from the Hydraulic PCB enclosure.
- Visually inspect the electrical power supply connections checking for obvious defects such as loose connections or defective/damaged wiring. Also check Hydraulic PCB and connections.
- Replace cover panel on hydraulic PCB housing and right-hand end side panel when finished.

10.2.2 HEATING SYSTEM

Check the following:

- Expansion vessel pressure
- Operation of pressure relief valve
- Heating system pressure – top up if necessary
- Correct concentration of corrosion inhibitor/biocide protection
- Heating and hot water controls settings
- Any leaks on system
- Magnetic filter is cleaned

The following checks must be performed at least once a year by a qualified person:

Inspect system expansion vessel

- Check expansion vessel charge and re-pressurise as required.

Inspect system pressure relief valve

- Check for correct operation of the pressure relief valve by turning the black knob on the valve anticlockwise.

Inspect pressure relief valve discharge pipe

- Check that the outlet of the pressure relief valve discharge pipe is positioned correctly, is unobstructed and water is seen to flow out when the pressure relief valve is tested, as above.

Check heating system water pressure

- If it is below 1 bar, top-up the water in the system.

Inspect the Magnetic filter

- Check and clean the water filter following the manufacturer's instructions.

10.3 CONDENSATE DISPOSAL

Check that the condensate drain holes in the bottom of the heat pump are not blocked.

10.4 HEATING SYSTEM CONNECTIONS

Check the condition of the flexible hoses. Replace if damaged or leaking. Check the presence and condition of the pipe insulation.

10.5 HEAT PUMP CONTROLS

Check that settings on the Grant AERONA Smart Controller are as set when commissioned.

Reset to commissioned settings if necessary.

For information relating to the commissioning requirements of the Grant AERONA Smart controller, refer to Appendix G of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

10.6 REFRIGERANT

R290 is a propane gas with a purity of at least 99.5%. The gas is odourless so a leak would not be noticed by the sense of smell.

! WARNING !

R290 is classed as a hazardous substance and all technicians must ensure to have an appropriate level of safety awareness regardless of whether they handle the refrigerant or not.

Under no circumstances should the refrigerant be vented from the charging points on the refrigerant circuit of the heat pump.

If any work is required to be carried out on the refrigerant circuit, it **MUST** be undertaken by an F-gas registered refrigeration engineer.

On no account should any such work be carried out by unqualified personnel.

10.7 HEAT PUMP MONITORING

The heat pump operating conditions can be displayed via the touchscreen display of the Grant AERONA Smart Controller.

For information relating to the Heat pump accessibility on the Grant AERONA Smart controller, refer to Section 9 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

10.8 MAINTENANCE AND SERVICE

In order to ensure optimal availability of the unit, a number of checks and inspections on the unit and the field wiring have to be carried out at regular intervals.

This maintenance needs to be carried out by your local technician.

! WARNING !

ELECTRIC SHOCK

- **Before carrying out any maintenance or repair activities, switch off the power supply on the supply panel.**
- **DO not touch any live components or connections for at least 10 minutes after the power supply is turned off.**
- **Note that the crankcase heater of the compressor may operate even in standby mode.**
- **Some sections of the electric component box may be hot.**
- **Avoid touching any conductive parts.**

Do not rinse the unit with water as it may cause electric shock or fire.

Do not leave the unit unattended when the service panel is removed

10.9 HYDRAULIC PCB DIP SWITCHES

The hydraulic PCB has 4 dip switch blocks present which allow for the modification of some of the working parameters of the Grant Aerona 290. Some of these may need to be amended from new depending on the system that is being installed

If a hydraulic PCB is being replaced within a Grant Aerona 290 it will need to be checked prior to powering on the heat pump to ensure it is configured correctly.

In both cases refer to Tables 10-1 to 10-4 for dip switch configurations. Refer to Figure 10-1 for location of dip switches.

! CAUTION !

When checking or resetting the dip switches, the dip switch blocks on the hydraulic PCB are numbered 1 to 4 from the bottom upwards.

The dip switches themselves on each switch block are also numbered 1 to 4 from the bottom up.

Refer to Figure 10-1.

Table 10-1: Dip switch Block 1 (SW1)

Switch	On	Off	Description
1	Hybrid	Non-Hybrid	Additional heat source (Boiler) is connected and managed via 290 heat pump.
2	No DHW	with DHW	DHW cylinder is connected and managed via 290 heat pump.
3 & 4*	OFF / OFF		Heat / Cool mode
	OFF / ON		Heat mode only
	ON / OFF		Cool mode only
	ON / ON		Disable Heat and Cool modes

*where multiple switches used ON/OFF displayed in ascending numerical order.

Table 10-2: Dip switch Block 2 (SW2)

Switch	On	Off	Description
1	Split	Monobloc	Setting for Split or Monobloc configuration (Aerona 290 is a Monobloc system)
2, 3 & 4*	OFF / OFF / OFF		4kW output mode
	OFF / ON / OFF		6.5kW output mode
	OFF / ON / ON		9kW output mode
	ON / OFF / OFF		12kW output mode
	ON / ON / OFF		15.5kW output mode

*where multiple switches used ON/OFF displayed in ascending numerical order.

Table 10-3: Dip switch Block 3 (SW3)

Switch	On	Off	Description
1 & 2*	OFF / OFF		Enable 3kW Internal Electric pipe heater. (not available on UK Aerona 290 models)
	ON / ON		Disable 3kW Internal Electric pipe heater. (not available on UK Aerona 290 models)
3 & 4*	OFF / OFF		Shinhoo 9m Head DC PWM Water pump (Factory fitted)

*where multiple switches used ON/OFF displayed in ascending numerical order.

Table 10-4: Dip switch Block 4 (SW4)

Switch	On	Off	Description
1	Cascade	Single Unit	Configure the system for Single unit operation.

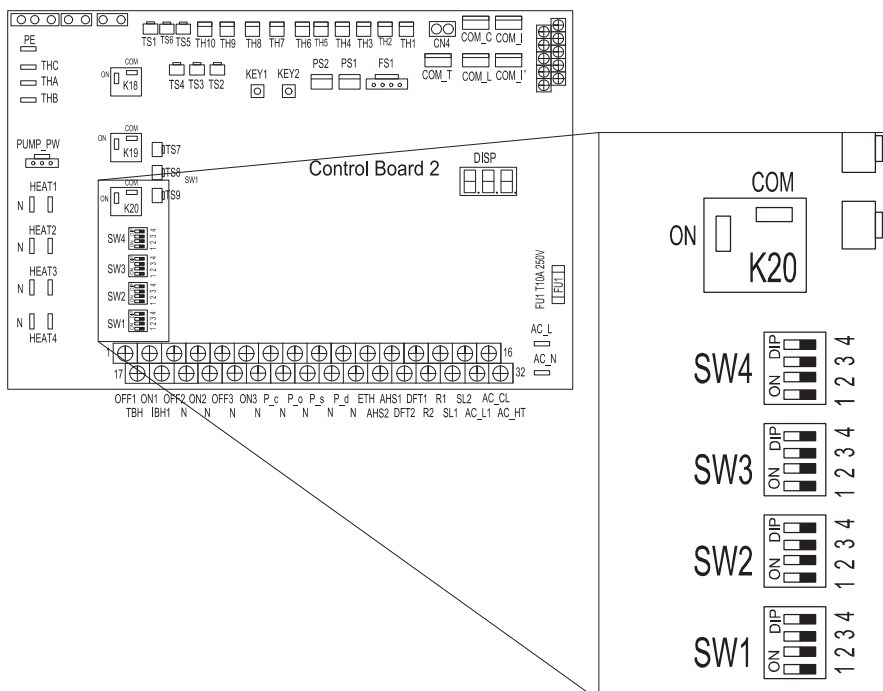


Figure 10-1: Hydraulic PCB Dip switches

11 FAULT FINDING

11.1 ERROR CODE DISPLAY

When there is a fault with the heat pump, an error code will be displayed on the touch screen display.

A list of all error codes and corrective actions can be found in Table 11-1.

Reset the fault when resolved by turning the unit OFF and back ON.

! NOTE !

Error codes displayed may be due to incorrect dip switch settings on the heat pump PCB.

Refer to Section 10-10 for dip switch settings and check these are correctly set for the heat pump model and installed system.

Fault number	Fault name	Failure analysis	Diagnosis method	Solution
P01	Water flow protection	<ol style="list-style-type: none"> 1. Lack of water in water system 2. Water flow switch is faulty 3. Water system is blocked 	<ol style="list-style-type: none"> 1. Check system water pressure 2. Check whether the water flow switch is damaged/faulty 3. Check if filter is blocked 	<ol style="list-style-type: none"> 1. Fill system to correct pressure 2. Change the water flow switch 3. Clean or change the filter
P02	High pressure protection	<ol style="list-style-type: none"> 1. Water flow is low 2. High pressure switch is faulty 3. Refrigerant system is blocked 4. Electric expansion valve is locked (HP1, Occurring during operation) 	<ol style="list-style-type: none"> 1. Check system water pressure and pump is operational 2. Check high pressure switch connection/operation 3. Check whether the refrigerant system is blocked 4. Check whether there is electric expansion valve reset sound when the unit is in standby, and power is ON or OFF 	<ol style="list-style-type: none"> 1. Fill system to correct pressure and check pump operation 2. Change high pressure switch 3. Change the filter of the refrigerant system 4. Change the Electric expansion valve
P03	Low pressure protection	<ol style="list-style-type: none"> 1. Lack of refrigerant 2. Refrigerant system is blocked 3. The heat pump is not running in regular operating conditions 	<ol style="list-style-type: none"> 1. Check for leak in refrigerant circuit 2. Check whether the filter in refrigerant circuit is blocked 3. Check whether the outdoor ambient and inlet water temperature is normal 	<ol style="list-style-type: none"> 1. Repair the leak 2. Change the filter of refrigerant circuit 3. If the ambient temperature and water temperature is too high or low, the unit will stop
P04	Condenser temperature overheat protection	<ol style="list-style-type: none"> 1. Airflow of outdoor fan is insufficient 2. Condenser is too dirty 3. The temperature sensor (T3) is faulty 	<ol style="list-style-type: none"> 1. Check whether there is any obstacle which is preventing the airflow 2. Condenser is too dirty 3. Check whether the condenser pipe temperature sensor (T3) seems in normal condition 	<ol style="list-style-type: none"> 1. Clean the grille and evaporator 2. Clean the condenser 3. Replace the temperature sensor
P05	Discharge temperature protection	<ol style="list-style-type: none"> 1. Lack of refrigerant 2. Discharge temperature sensor is faulty 	<ol style="list-style-type: none"> 1. Check for leak in refrigerant circuit 2. Check whether the discharge temperature sensor (TP) seems in normal condition 	<ol style="list-style-type: none"> 1. Repair the leak 2. Replace the temperature sensor
P08	Middle pressure protection	<ol style="list-style-type: none"> 1. Middle pressure switch not connected correctly 2. The refrigerant PCB is faulty 	<ol style="list-style-type: none"> 1. Check connections on sensor and refrigerant PCB 2. Check refrigerant PCB 	<ol style="list-style-type: none"> 1. Replace the middle pressure switch 2. Replace refrigerant PCB
P11	DC fan 1 failure	<ol style="list-style-type: none"> 1. The fan is faulty or stuck 2. The refrigerant PCB is faulty (or drive PCB on 15.5 kW models) 	<ol style="list-style-type: none"> 1. Check whether the fan is stuck or obstructed 2. Check refrigerant PCB (or drive PCB on 15.5 kW models) 	<ol style="list-style-type: none"> 1. Remove any obstructions or replace fan if faulty 2. Replace the refrigerant PCB (or drive PCB on 15.5 kW models)
P12	DC fan 2 failure			
P13	4-way valve fault	<ol style="list-style-type: none"> 1. Flow and return water temperature sensors are connected in reverse 2. 4-way valve is faulty 3. Hydraulic PCB is faulty 	<ol style="list-style-type: none"> 1. Check whether the flow and return temperature sensors are connected in reverse 2. Check whether action of 4-way valve is correct 3. Check flow and return temperatures indicated the hydraulic PCB 	<ol style="list-style-type: none"> 1. Connect sensors correctly, replace sensors if fault remains 2. Switch repeatedly to check operation is correct. If not, replace 3. If flow and return temperature are still incorrect, replace hydraulic PCB

Fault number	Fault name	Failure analysis	Diagnosis method	Solution
P14	Refrigerant leakage fault	<ol style="list-style-type: none"> 1. Leak in refrigerant circuit 2. Refrigerant leakage sensor failure 3. Hydraulic PCB is faulty 	<ol style="list-style-type: none"> 1. Check whether there is leakage in refrigerant circuit 2. Check whether refrigerant leakage sensor is normal 3. Check whether Hydraulic PCB is faulty 	<ol style="list-style-type: none"> 1. Repair leak in refrigerant circuit 2. Replace refrigerant leakage sensor 3. Replace Hydraulic PCB
P21	Abnormal operation of DC pump	<ol style="list-style-type: none"> 1. The water pump is faulty or stuck 2. The system lacks water or is blocked 3. Faulty connection between water pump and hydraulic PCB 4. The hydraulic PCB is faulty 	<ol style="list-style-type: none"> 1. Check operation of water pump 2. Check system water pressure, whether system is blocked (check filter) or valve(s) are closed 3. Check connections between water pump and hydraulic PCB 4. Check the hydraulic PCB 	<ol style="list-style-type: none"> 1. Replace water pump if faulty 2. Refill with water, remove blockage (clean filter) and open any closed valves 3. Correctly make connections on water pump and hydraulic PCB 4. Replace the hydraulic PCB if faulty
P25	Outlet pressure sensor failure	<ol style="list-style-type: none"> 1. Pressure sensor incorrectly connected 2. Sensor failure 3. The hydraulic PCB is faulty 	<ol style="list-style-type: none"> 1. Check correct connection of sensor 2. Use a multimeter to check if sensor has short circuit or is faulty 3. Check the hydraulic PCB 	<ol style="list-style-type: none"> 1. Connect sensor correctly 2. Replace sensor if faulty 3. Replace the hydraulic PCB if faulty
E02	Discharge temperature sensor failure (TP)	<ol style="list-style-type: none"> 1. Sensor incorrectly connected 2. Sensor failure 3. The hydraulic PCB is faulty 	<ol style="list-style-type: none"> 1. Check correct connection of sensor 2. Use a multimeter to check sensor 3. Check the hydraulic PCB 	<ol style="list-style-type: none"> 1. Connect sensor correctly 2. Replace sensor if faulty 3. Replace the hydraulic PCB if faulty
E03	Coil temperature sensor failure (T3)			
E04	Ambient temperature sensor failure (T4)			
E05	Liquid pipe temperature sensor failure (T5)			
E06	Return air temperature sensor failure (TH)			
E07	Water tank temperature sensor failure (TW)			
E08	Outlet water temperature sensor failure (TA)			
E09	Outlet water temperature sensor failure (TB)			
E10	Communication failure between hydraulic PCB and refrigerant PCB	<ol style="list-style-type: none"> 1. Communication cable incorrectly connected 2. The main hydraulic PCB is faulty 3. The refrigerant PCB is faulty 	<ol style="list-style-type: none"> 1. Check correct connection of communication cable 2. Check the hydraulic PCB 3. Check the refrigerant PCB 	<ol style="list-style-type: none"> 1. Replace or repair the communication cable 2. Replace the hydraulic PCB if faulty 3. Replace the refrigerant PCB if faulty
E13	Discharge pressure sensor fault	<ol style="list-style-type: none"> 1. Sensor connection incorrectly connected 2. Sensor failure 3. The refrigerant PCB is faulty 	<ol style="list-style-type: none"> 1. Check correct connection of sensor 2. Use a multimeter to check if sensor has short circuit or is faulty 3. Check the refrigerant PCB 	<ol style="list-style-type: none"> 1. Connect sensor correctly 2. Replace sensor if faulty 3. Replace the refrigerant PCB if faulty
E14	Low pressure sensor LPS failure			

Fault number	Fault name	Failure analysis	Diagnosis method	Solution
E15	DC bus voltage is too low	<ol style="list-style-type: none"> 1. Cables incorrectly connected 2. Refrigerant & Drive PCB is faulty 	<ol style="list-style-type: none"> 1. Check all connections from the Refrigerant PCB (or Refrigerant & Drive PCB for the 15.5kW model) 2. Check the Refrigerant PCB (or Refrigerant & Drive PCB for the 15.5kW model) 	<ol style="list-style-type: none"> 1. Ensure all connections are made correctly. 2. Replace the Refrigerant PCB (and Drive PCB for the 15.5kW model) if faults remain
E16	DC bus voltage is too high			
E17	AC current protection (input current)			
E18	IPM module is abnormal			
E19	PFC abnormal			
E20	Compressor failed to start			
E21	Compressor phase loss			
E22*	Inverter Module reset			
E23	Compressor over-current			
E24	PFC module temperature is too high			
E25	Current detection circuit failure			
E26	Out of step			
E27	PFC module temperature sensor is abnormal			
E28	Communication fail			
E29	IPM module temperature is too high			
E30	IPM module temperature sensor failure			
E31	Reserved			
E32*	Reserved			
E33*	Reserved			

* These error codes indicate internal diagnostics active. Heat pump will not shut down.

Fault number	Fault name	Failure analysis	Diagnosis method	Solution
E34	AC input voltage is abnormal	1. Cables incorrectly connected 2. Refrigerant & Drive PCB is faulty	1. Check all connections from the Refrigerant PCB (or Refrigerant & Drive PCB for the 15.5kW model) 2. Check the Refrigerant PCB (or Refrigerant & Drive PCB for the 15.5kW model)	1. Ensure all connections are made correctly. 2. Replace the Refrigerant PCB (and Drive PCB for the 15.5kW model) if faults remain
E35*	Drive EEPROM error			
E36	Power off reset			
E37*	Reserved			
E38*	Reserved			
E57	GAS SENSOR OFFLINE			
E58	GAS SENSOR			

* These error codes indicate internal diagnostics active. Heat pump will not shut down.

11.2 THERMISTORS

The Grant Aerona 290 contains a number of thermistors that monitor various temperatures that are factors for the efficient operation of the heat pump.

- TA - Incoming (Return) Water temperature
- TB - Outgoing (Flow) Water temperature
- T3 - Refrigerant temperature - Evaporator Coil
- T4 - Ambient (Air Temperature)
- T5 - Refrigerant Liquid Temperature
- TH - Refrigerant Suction Gas Temperature
- TP - Refrigerant Discharge Gas Temperature

Refer to Table 11-1 & 11-2 for resistance values of sensors at a defined temperature and Sections 11.2.1 to 11.2.4 for the location of the thermistor connections to the heat pump and the location of thermistors on their respective refrigerant and water circuits, where applicable.

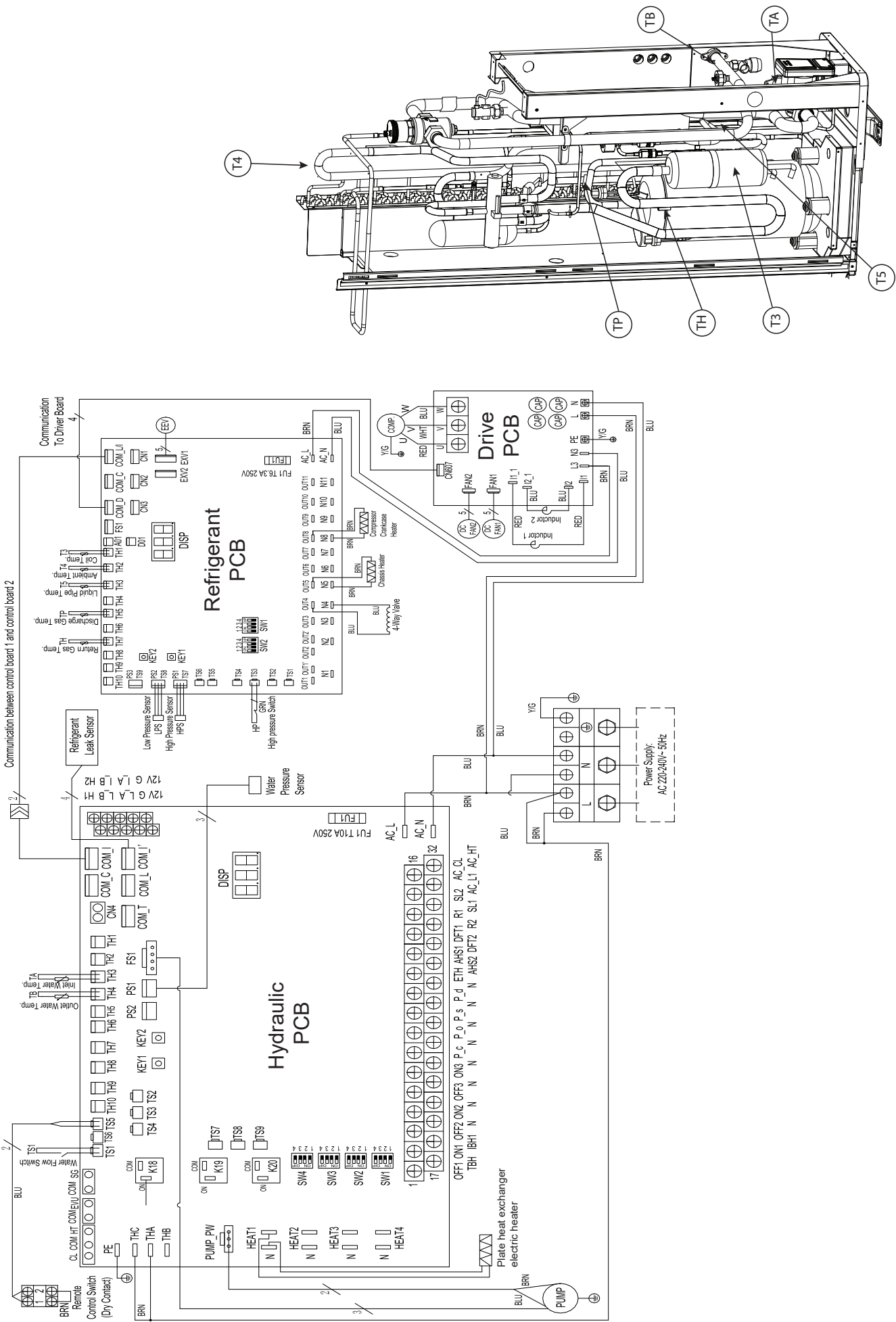
Table 11-1: Sensor resistances: TA, TB, T3, T4, T5 & TH

Temperature (°C)	Resistance (kΩ)
-20	106.732
-15	79.521
-10	59.784
-5	45.308
0	34.596
5	26.608
10	20.610
15	16.079
20	12.635
25	10.000

Table 11-2: Sensor resistances: TP

Temperature (°C)	Resistance (kΩ)
-20	527.817
-15	399.475
-10	304.948
-5	234.545
0	181.647
5	141.613
10	111.12
15	87.758
20	69.756
25	55.803
30	44.926
40	29.659
50	20.036
60	13.815
70	9.697
80	6.914
90	5
100	3.666





12 SPARE PARTS

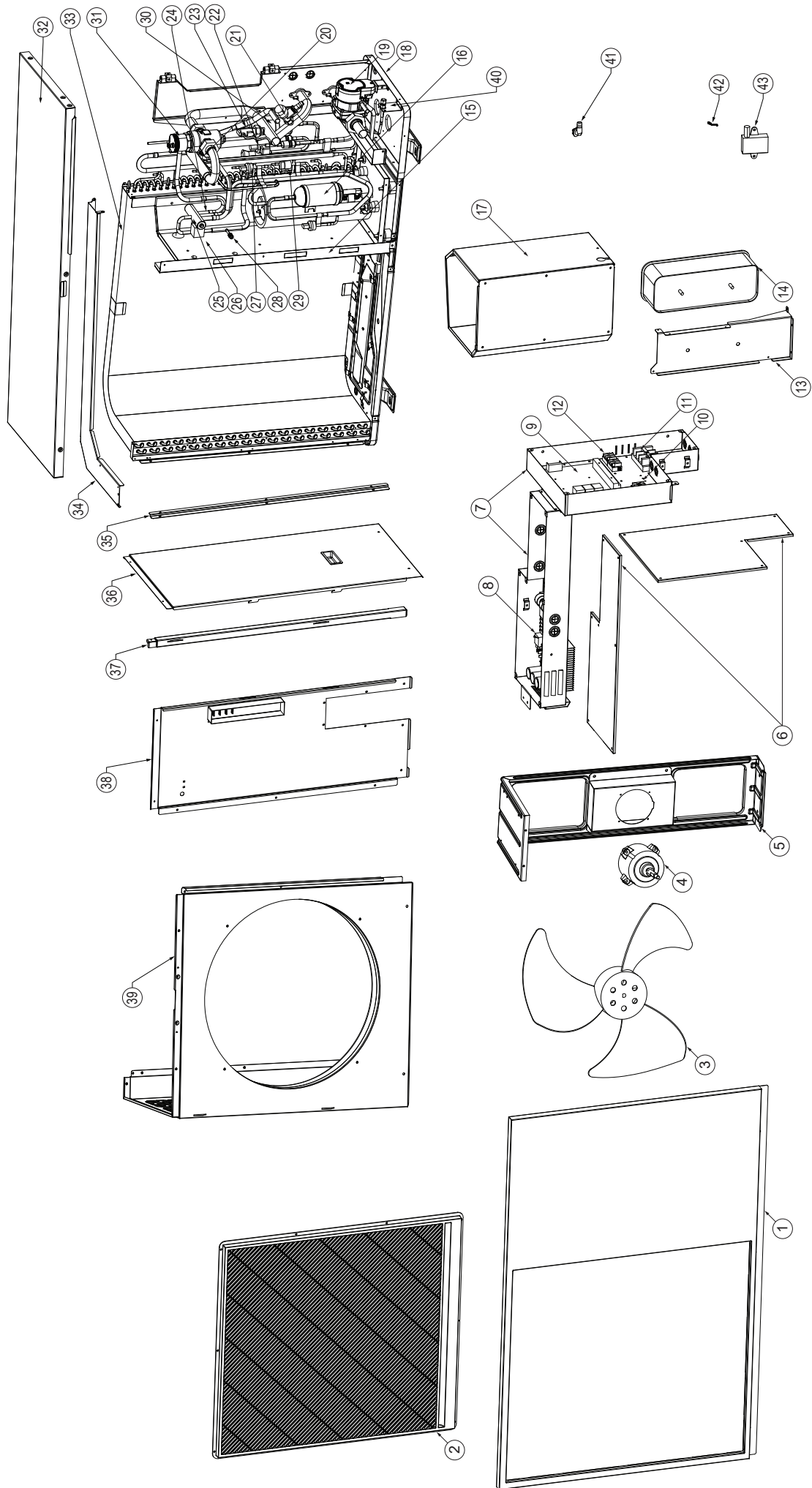
12.1 HPR2904 - 4KW

Item	Description	Product code
1	Front panel	HPR481
2	Grill	HPR380
3	Fan	HPR360
4	Fan Motor	HPR460
5	Fan Motor bracket	HPR140
6	Electric box cover	HPR322
7	Electrical control box	HPR240
8	Refrigerant/Drive PCB	HPR501
9	Hydraulic PCB - 4kW, 6.5kW & 9kW	HPR500
10	Wire Holder- 6 Position - (All models)	HPR702
11	Wire Holder- 3 Position - (All models)	HPR701
12	Wire Holder- 2 Position - (All models)	HPR700
13	PHE cover	HPR400
14	PHE	HPR402
15	Partition board assembly	HPR120
16	Compressor	HPR260
17	Compressor cover plate assembly	HPR520
18	Base assembly	HPR100
19	Circulating Pump - (All models)	HPR560
20	Water Pressure sensor - (All models)	HPR608
21	Relief Valve - (All models)	HPR669
22	Electric expansion valve	HPR665
23	Water flow switch - (All models)	HPR621
24	4-way valve assembly	HPR660
25	4-way valve body	HPR663
26	4-way valve coil - 4kW, 6.5kW, 9kW & 12kW	HPR200
27	Refrigerant Pressure Sensors - High and Low - 4kW, 6.5kW & 9kW	HPR605
28	Pin Valve - (All models)	HPR668
29	Refrigerant High Pressure switch - 4kW, 6.5kW, 9kW & 15.5kW	HPR620
30	Refrigerant storage tank assembly - 4kW, 6.5kW & 9kW	HPR640
31	Exhaust valve - (All models)	HPR667
32	Top cover	HPR320
33	Condenser assembly	HPR280
34	Condenser cover plate	HPR525
35	Condenser connecting plate	HPR523
36	Right panel	HPR482
37	Right front column	HPR220
38	Rear-right side plate assembly	HPR527
39	Wind deflector panel	HPR480
40	Meter connector - (All models)	HPR300
41	Drain hose - 4kW, 6.5kW & 9kW	HPR440
42	Sensor clamp - 4kW, 6.5kW & 9kW	HPR180
43	Refrigerant leakage sensor - (All models)	HPR606
44*	Outdoor air temperature sensor T4 - 4kW, 6.5kW, 9kW & 15.5kW	HPR604
45*	Refrigerant discharge temperature sensor (TP) - 4kW, 6.5kW & 9kW	HPR601

Item	Description	Product code
46*	Evaporator coil temperature sensor (T3) - 4kW, 6.5kW & 9kW	HPR600
47*	Refrigerant suction temperature sensor (TH/TA) - 4kW, 6.5kW & 9kW	HPR602
48*	Liquid Tube temperature sensor (T5/TB)- 4kW, 6.5kW & 9kW	HPR603
51*	Compressor electric heater - 4kW & 6.5kW	HPR263
52*	Chassis Heating Belt - 4kW, 6.5kW & 9kW	HPR420
53*	Carton	HPR160

*Not shown in exploded diagram

12.1.1 EXPLODED DIAGRAM - HPR2904 - 4KW



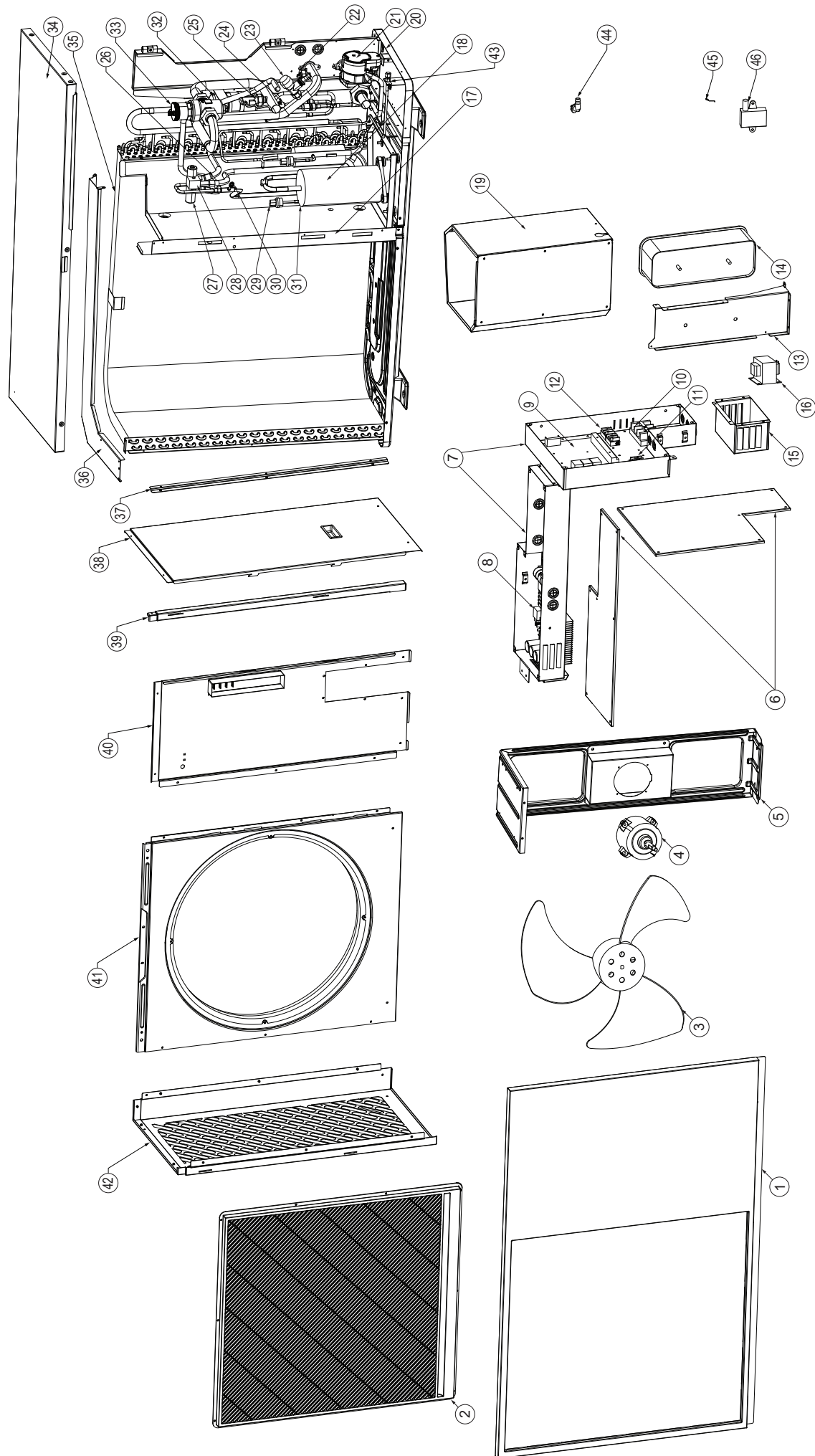
12.2 HPR29065 - 6.5KW

Item	Description	Product code
1	Front panel - 6.5kW & 9kW	HPR483
2	Grill - 6.5kW & 9kW	HPR381
3	Fan - 6.5kW & 9kW	HPR361
4	Fan Motor - 6.5kW & 9kW	HPR461
5	Fan motor bracket - 6.5kW & 9kW	HPR141
6	Electric box cover - 6.5kW & 9kW	HPR323
7	Electrical control box	HPR241
8	Refrigerant/Drive PCB	HPR502
9	Hydraulic PCB - 4kW, 6.5kW & 9kW	HPR500
10	Wire Holder- 6 Position - (All models)	HPR702
11	Wire Holder- 3 Position - (All models)	HPR701
12	Wire Holder- 2 Position - (All models)	HPR700
13	PHE cover - 6.5kW & 9kW	HPR401
14	PHE	HPR403
15	Reactor cover - 6.5kW	HPR324
16	Reactor	HPR580
17	Partition board assembly - 6.5kW & 9kW	HPR121
18	Compressor	HPR261
19	Compressor cover plate assembly	HPR521
20	Base assembly - 6.5kW & 9kW	HPR101
21	Circulating Pump - (All models)	HPR560
22	Water Pressure sensor - (All models)	HPR608
23	Relief Valve - (All models)	HPR669
24	Electronic expansion valve - 6.5kW & 9kW	HPR666
25	Water flow switch - (All models)	HPR621
26	4-way valve assembly	HPR661
27	4-way valve body - 6.5kW & 9kW	HPR664
28	4-way valve coil - 4kW, 6.5kW, 9kW & 12kW	HPR200
29	Refrigerant Pressure Sensors - High and Low - 4kW, 6.5kW & 9kW	HPR605
30	Pin Valve - (All models)	HPR668
31	Refrigerant High Pressure switch - 4kW, 6.5kW, 9kW & 15.5kW	HPR620
32	Refrigerant storage tank assembly - 4kW, 6.5kW & 9kW	HPR640
33	Exhaust valve - (All models)	HPR667
34	Top cover - 6.5kW & 9kW	HPR321
35	Condenser	HPR281
36	Condenser cover plate - 6.5kW & 9kW	HPR526
37	Condenser connecting plate - 6.5kW & 9kW	HPR524
38	Right panel - 6.5kW & 9kW	HPR484
39	Right front column - 6.5kW & 9kW	HPR221
40	Rear-right side plate assembly - 6.5kW & 9kW	HPR528
41	Wind deflector panel - 6.5kW & 9kW	HPR486
42	Left panel - 6.5kW & 9kW	HPR485
43	Meter connector - (All models)	HPR300
44	Drain hose - 4kW, 6.5kW & 9kW	HPR440
45	Sensor clamp - 4kW, 6.5kW & 9kW	HPR180
46	Refrigerant leakage sensor - (All models)	HPR606
47*	Outdoor air temperature sensor T4 - 4kW, 6.5kW, 9kW & 15.5kW	HPR604
48*	Refrigerant discharge temperature sensor (TP) - 4kW, 6.5kW & 9kW	HPR601
49*	Evaporator coil temperature sensor (T3) - 4kW, 6.5kW & 9kW	HPR600

Item	Description	Product code
50*	Refrigerant suction temperature sensor (TH/TA) - 4kW, 6.5kW & 9kW	HPR602
51*	Liquid Tube temperature sensor (T5/TB) - 4kW, 6.5kW & 9kW	HPR603
52*	Return temperature sensor (TA/TH) - 4kW, 6.5kW & 9kW	HPR602
53*	Flow temperature sensor (TB) - 4kW, 6.5kW & 9kW	HPR603
54*	Compressor electric heater - 4kW & 6.5kW	HPR263
55*	Chassis Heating Belt - 4kW, 6.5kW & 9kW	HPR420
56*	Carton - 6.5kW & 9kW	HPR161

*Not shown in exploded diagram

12.2.1 EXPLODED DIAGRAM - HPR29065 - 6.5KW



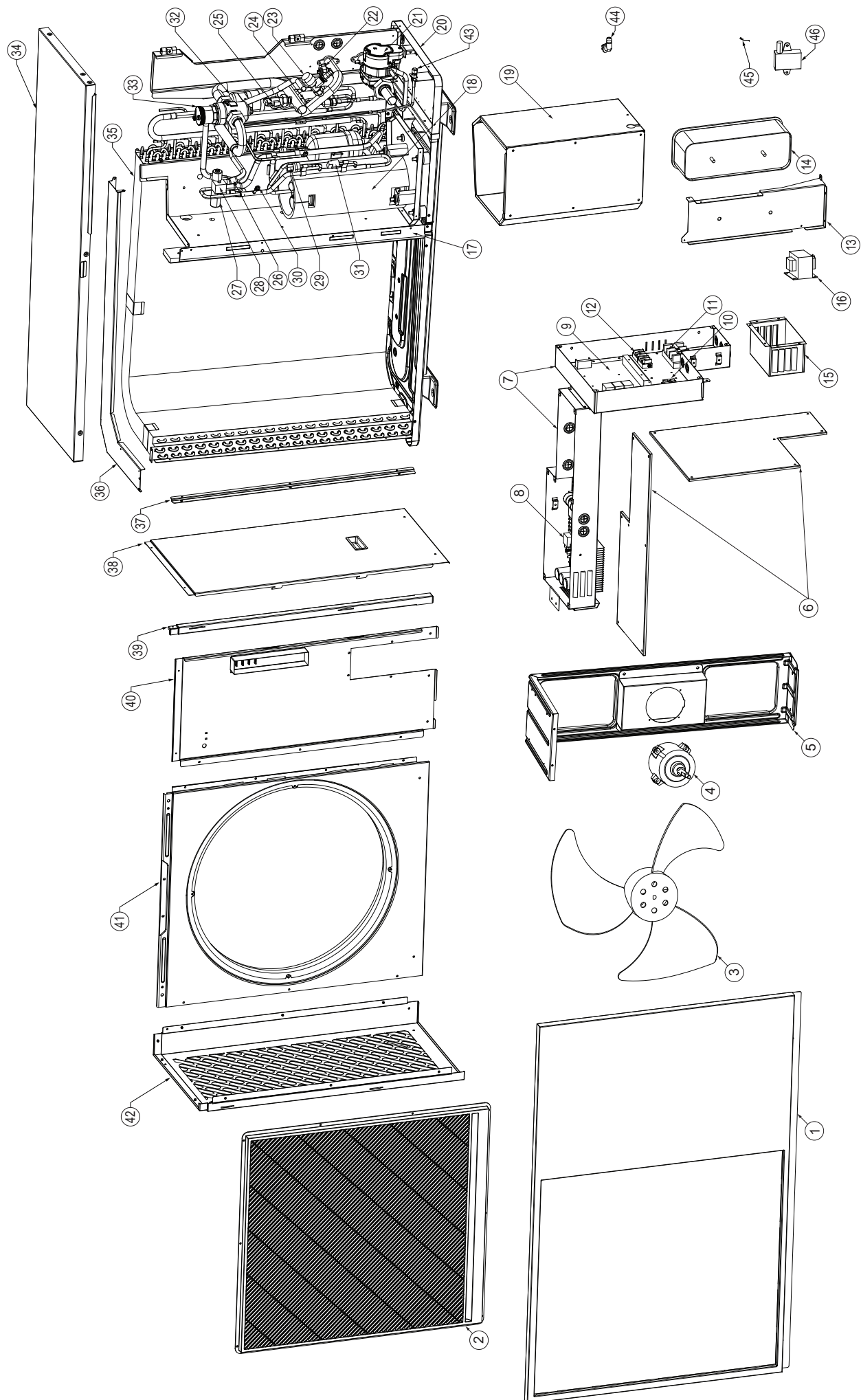
12.3 HPR2909 - 9KW

Item	Description	Product code
1	Front panel - 6.5kW & 9kW	HPR483
2	Grill - 6.5kW & 9kW	HPR381
3	Fan - 6.5kW & 9kW	HPR361
4	Fan Motor - 6.5kW & 9kW	HPR461
5	Fan motor bracket - 6.5kW & 9kW	HPR141
6	Electric box cover - 6.5kW & 9kW	HPR323
7	Electrical control box	HPR242
8	Refrigerant/Drive PCB	HPR503
9	Hydraulic PCB - 4kW, 6.5kW & 9kW	HPR500
10	Wire Holder- 6 Position - (All models)	HPR702
11	Wire Holder- 3 Position - (All models)	HPR701
12	Wire Holder- 2 Position - (All models)	HPR700
13	PHE cover - 6.5kW & 9kW	HPR401
14	PHE	HPR404
15	Reactor cover - 9kW & 12kW	HPR325
16	Reactor - 9kW & 12kW	HPR581
17	Partition board assembly - 6.5kW & 9kW	HPR121
18	Compressor	HPR262
19	Compressor cover plate assembly	HPR522
20	Base assembly - 6.5kW & 9kW	HPR101
21	Circulating Pump - (All models)	HPR560
22	Water Pressure sensor - (All models)	HPR608
23	Relief Valve - (All models)	HPR669
24	Electric expansion valve - 6.5kW & 9kW	HPR666
25	Water flow switch - (All models)	HPR621
26	4-way valve assembly	HPR662
27	4-way valve body - 6.5kW & 9kW	HPR664
28	4-way valve coil - 4kW, 6.5kW, 9kW & 12kW	HPR200
29	Refrigerant Pressure Sensors - High and Low - 4kW, 6.5kW & 9kW	HPR605
30	Pin Valve - (All models)	HPR668
31	Refrigerant High Pressure switch - 4kW, 6.5kW, 9kW & 15.5kW	HPR620
32	Refrigerant storage tank assembly - 4kW, 6.5kW & 9kW	HPR640
33	Exhaust valve - (All models)	HPR667
34	Top cover - 6.5kW & 9kW	HPR321
35	Condenser	HPR282
36	Condenser cover plate - 6.5kW & 9kW	HPR526
37	Condenser connecting plate - 6.5kW & 9kW	HPR524
38	Right panel - 6.5kW & 9kW	HPR484
39	Right front column - 6.5kW & 9kW	HPR221
40	Rear-right side plate assembly - 6.5kW & 9kW	HPR528
41	Wind deflector panel - 6.5kW & 9kW	HPR486
42	Left panel - 6.5kW & 9kW	HPR485
43	Meter connector - (All models)	HPR300
44	Drain hose - 4kW, 6.5kW & 9kW	HPR440
45	Sensor clamp - 4kW, 6.5kW & 9kW	HPR180
46	Refrigerant leakage sensor - (All models)	HPR606
47*	Outdoor air temperature sensor T4 - 4kW, 6.5kW, 9kW & 15.5kW	HPR604
48*	Refrigerant discharge temperature sensor (TP) - 4kW, 6.5kW & 9kW	HPR601
49*	Evaporator coil temperature sensor (T3) - 4kW, 6.5kW & 9kW	HPR600

Item	Description	Product code
50*	Refrigerant suction temperature sensor (TH/TA) - 4kW, 6.5kW & 9kW	HPR602
51*	Liquid Tube temperature sensor (T5/TB) - 4kW, 6.5kW & 9kW	HPR603
52*	Return temperature sensor (TA/TH) - 4kW, 6.5kW & 9kW	HPR602
53*	Flow temperature sensor (TB) - 4kW, 6.5kW & 9kW	HPR603
54*	Compressor electric heater - 9kW & 12kW	HPR264
55*	Chassis Heating Belt - 4kW, 6.5kW & 9kW	HPR420
56*	Carton - 6.5kW & 9kW	HPR161

*Not shown in exploded diagram

12.3.1 EXPLODED DIAGRAM - HPR2909 - 9KW

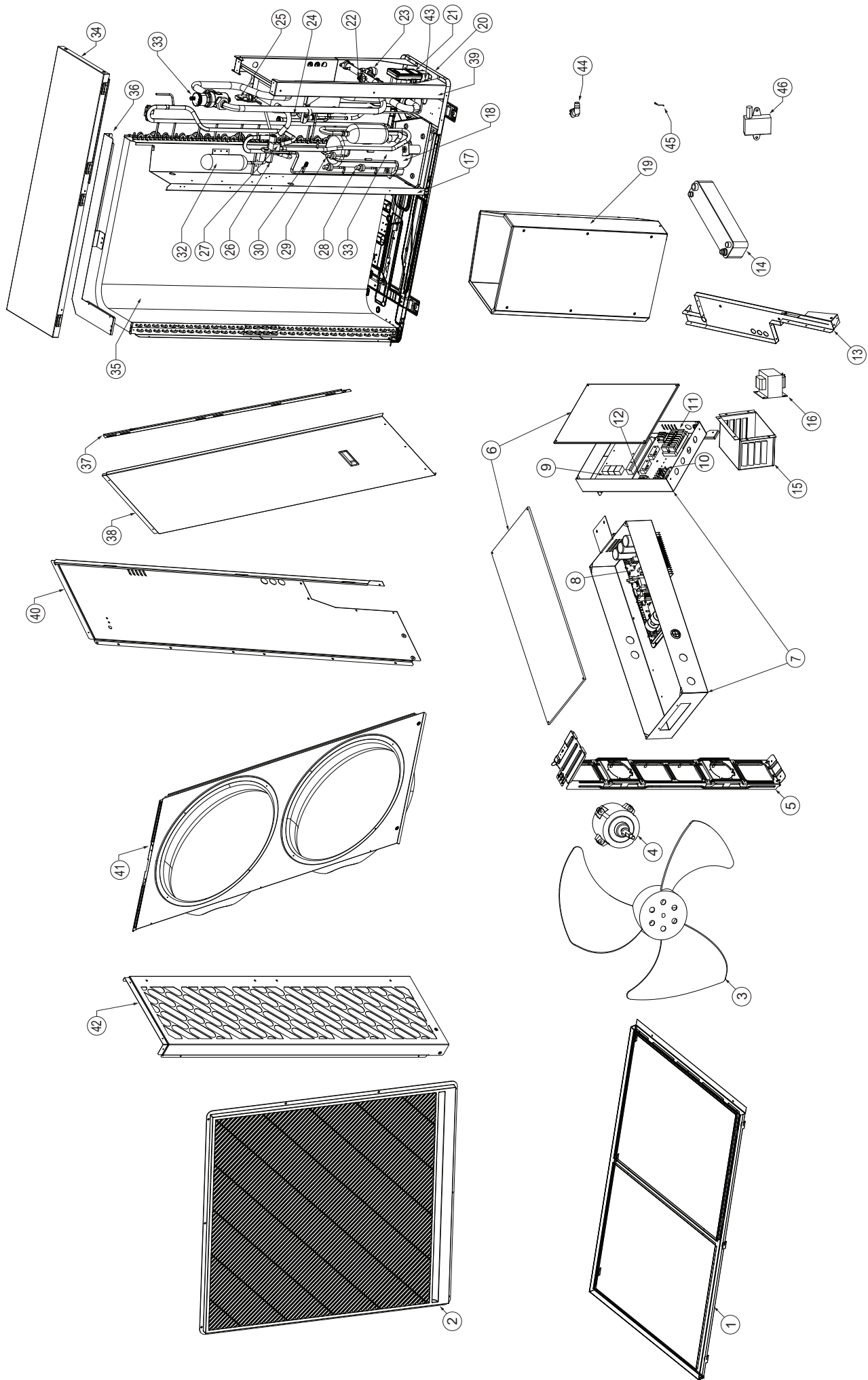


12.4 HPR29012 - 12KW

Item	Description	Product code
1	Front panel - 12kW & 15.5kW	HPR488
2	Grill - 12kW & 15.5kW	HPR382
3	Fan - 12kW & 15.5kW	HPR362
4	Fan Motor - 12kW & 15.5kW	HPR462
5	Fan Motor bracket - 12kW & 15.5kW	HPR142
6	Electric box cover - 12kW	HPR327
7	Electrical control box	HPR243
8	Refrigerant/Drive PCB	HPR505
9	Hydraulic PCB - 12kW & 15.5kW	HPR504
10	Wire Holder- 6 Position - (All models)	HPR702
11	Wire Holder- 3 Position - (All models)	HPR701
12	Wire Holder- 2 Position - (All models)	HPR700
13	PHE cover - 12kW & 15.5kW	HPR405
14	PHE - 12kW & 15.5kW	HPR406
15	Reactor cover - 9kW & 12kW	HPR325
16	Reactor - 9kW & 12kW	HPR581
17	Partition board assembly	HPR122
18	Compressor	HPR265
19	Compressor cover plate	HPR529
20	Base assembly - 12kW & 15.5kW	HPR102
21	Circulating Pump - (All models)	HPR560
22	Water Pressure sensor - (All models)	HPR608
23	Relief Valve - (All models)	HPR669
24	Electric expansion valve	HPR672
25	Water flow switch - (All models)	HPR621
26	4-way valve body	HPR670
27	4-way valve coil - 4kW, 6.5kW, 9kW & 12kW	HPR200
28	Refrigerant Low Pressure sensor - 12kW & 15.5kW	HPR614
29	Refrigerant High Pressure sensor - 12kW & 15.5kW	HPR615
30	Pin Valve - (All models)	HPR668
31	Refrigerant High Pressure switch	HPR622
32	Refrigerant storage tank assembly - 12kW & 15.5kW	HPR641
33	Exhaust valve - (All models)	HPR667
34	Top cover - 12kW & 15.5kW	HPR326
35	Condenser	HPR283
36	Condenser cover plate	HPR532
37	Condenser connecting plate - 12kW & 15.5kW	HPR531
38	Right panel - 12kW & 15.5kW	HPR489
39	Right front column - 12kW & 15.5kW	HPR222
40	Rear-right side plate assembly- 12kW & 15.5kW	HPR534
41	Wind deflector panel - 12kW & 15.5kW	HPR490
42	Left panel - 12kW & 15.5kW	HPR491
43	Meter connector - (All models)	HPR300
44	Drain hose - 12kW & 15.5kW	HPR441
45	Sensor clamp - 12kW & 15.5kW	HPR181
46	Refrigerant leakage sensor - (All models)	HPR606
47*	Outdoor air temperature sensor (T4)	HPR613
48*	Refrigerant discharge temperature sensor (TP) - 12kW & 15.5kW	HPR610
49*	Evaporator coil temperature sensor (T3) - 12kW & 15.5kW	HPR607
50*	Refrigerant suction temperature sensor (TH) - 12kW & 15.5kW	HPR616

Item	Description	Product code
51*	Liquid Tube temperature sensor (T5) - 12kW & 15.5kW	HPR611
52*	Return temperature sensor (TA) - 12kW & 15.5kW	HPR609
53*	Flow temperature sensor (TB) - 12kW & 15.5kW	HPR612
54*	Compressor electric heater - 9kW & 12kW	HPR264
55*	Chassis Heating Belt - 12kW & 15.5kW	HPR421
56*	Carton - 12kW & 15.5kW	HPR162
*Not shown in exploded diagram		

12.4.1 EXPLODED DIAGRAM - HPR29012 - 12KW



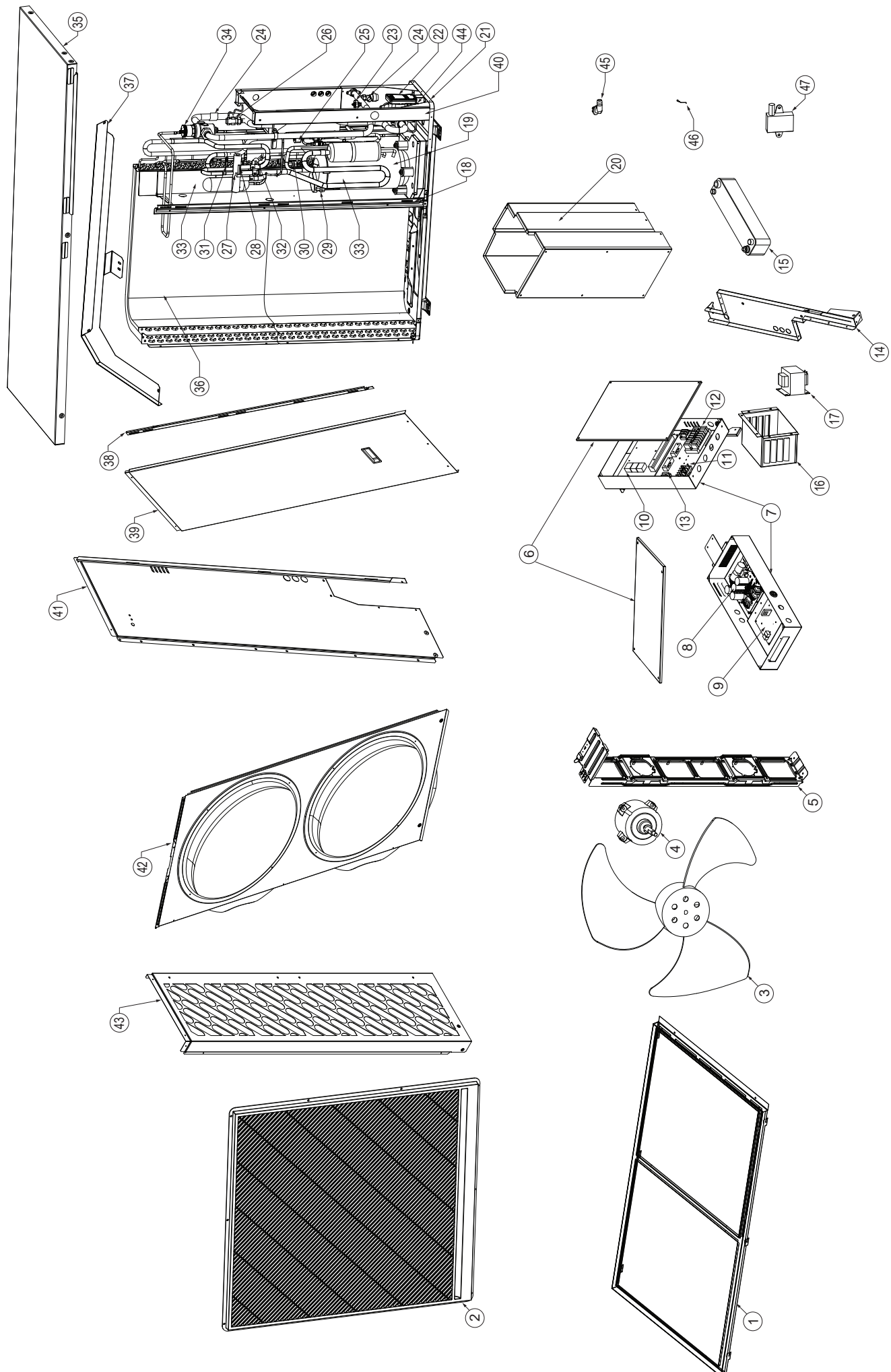
12.5 HPR290155 - 15.5KW

Item	Description	Product code
1	Front panel - 12kW & 15.5kW	HPR488
2	Grill - 12kW & 15.5kW	HPR382
3	Fan - 12kW & 15.5kW	HPR362
4	Fan Motor - 12kW & 15.5kW	HPR462
5	Fan Motor bracket - 12kW & 15.5kW	HPR142
6	Electric box cover	HPR328
7	Electrical control box	HPR244
8	Drive PCB	HPR506
9	Refrigerant PCB	HPR507
10	Hydraulic PCB - 12kW & 15.5kW	HPR504
11	Wire Holder- 6 Position - (All models)	HPR702
12	Wire Holder- 3 Position - (All models)	HPR701
13	Wire Holder- 2 Position - (All models)	HPR700
14	PHE cover - 12kW & 15.5kW	HPR405
15	PHE - 12kW & 15.5kW	HPR406
16	Reactor cover	HPR329
17	Reactor	HPR582
18	Partition board assembly	HPR123
19	Compressor	HPR266
20	Compressor cover plate	HPR530
21	Base assembly - 612kW & 15.5kW	HPR102
22	Circulating Pump - (All models)	HPR560
23	Water Pressure sensor - (All models)	HPR608
24	Relief Valve - (All models)	HPR669
25	Electric expansion valve	HPR673
26	Water flow switch - (All models)	HPR621
27	4-way valve body	HPR671
28	4-way valve coil	HPR201
29	Refrigerant Low Pressure sensor - 12kW & 15.5kW	HPR614
30	Refrigerant High Pressure sensor - 12kW & 15.5kW	HPR615
31	Pin Valve - (All models)	HPR668
32	Refrigerant High Pressure switch - 4kW, 6.5kW, 9kW & 15.5kW	HPR620
33	Refrigerant storage tank assembly - 12kW & 15.5kW	HPR641
34	Exhaust valve - (All models)	HPR667
35	Top cover - 12kW & 15.5kW	HPR326
36	Condenser	HPR284
37	Condenser cover plate	HPR533
38	Condenser connecting plate - 12kW & 15.5kW	HPR531
39	Right panel - 12kW & 15.5kW	HPR489
40	Right front column - 12kW & 15.5kW	HPR222
41	Rear-right side plate assembly- 12kW & 15.5kW	HPR534
42	Wind deflector panel - 12kW & 15.5kW	HPR490
43	Left panel - 12kW & 15.5kW	HPR491
44	Meter connector - (All models)	HPR300
45	Drain hose - 12kW & 15.5kW	HPR441
46	Sensor clamp - 12kW & 15.5kW	HPR181
47	Refrigerant leakage sensor - (All models)	HPR606
48*	Outdoor air temperature sensor T4 - 4kW, 6.5kW, 9kW & 15.5kW	HPR604
49*	Refrigerant discharge temperature sensor (TP) - 12kW & 15.5kW	HPR610

Item	Description	Product code
50*	Evaporator coil temperature sensor (T3) - 12kW & 15.5kW	HPR607
51*	Refrigerant suction temperature sensor (TH) - 12kW & 15.5kW	HPR616
52*	Liquid Tube temperature sensor (T5) - 12kW & 15.5kW	HPR611
53*	Return temperature sensor (TA) - 12kW & 15.5kW	HPR609
54*	Flow temperature sensor (TB) - 12kW & 15.5kW	HPR612
55*	Compressor electric heater	HPR267
56*	Chassis Heating Belt - 12kW & 15.5kW	HPR421
57*	Carton - 12kW & 15.5kW	HPR162

*Not shown in exploded diagram

12.5.1 EXPLODED DIAGRAM - HPR290155 - 15.5KW



13 DECLARATION OF CONFORMITY

13.1 UKCA - SAFETY DECLARATION OF CONFORMITY - HPR2904 & HPR29065



UKCA - Safety Declaration of Conformity

This declaration is made under the sole responsibility of the following Manufacturer. The Manufacturer declares that the following product conforms to the requirements of the UK Legislation and Regulations as detailed below.

The Technical Construction Files are retained at the Manufacturer's location.

Product: Air to Water Heat Pump

**Model: GRANT AERONA HPR2904
GRANT AERONA HPR29065**

In accordance with the following directive(s) or Regulation(s), provided that the products are installed and used in accordance with our instructions:

S.I. 2016/1105: Pressure Equipment (Safety) Regulations 2016 as amended

S.I. 2016/1101: Electrical Equipment (Safety) Regulations 2016

S.I. 2016/1091: Electromagnetic Compatibility Regulations 2016

S.I. 2008/1597: Supply of Machinery (Safety) Regulations 2008

S.I. 2012/3032: The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

following the provisions of:

BS EN 60335-2-40: 2003, +A11: 2004, +A12: 2005, +A1: 2006, +A2: 2009, +A13: 2012

BS BS EN 60335-1: 2012 +A16: 2023

BS EN 62233: 2008

BS EN 61000-3-2:2019 +A1:2021

BS EN 61000-3-3:2013 +A1:2019 +A2:2021

BS EN 55014-1:2021

BS EN 55014-2:2021

PED Directive 2014/68/EU

Grant Engineering (UK) Ltd

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REGISTERED IN ENGLAND No: 3196757. REGISTERED OFFICE: AS ABOVE

GUK241023 UKCA DoC HPR2901



UKCA - Safety Declaration of Conformity - continued

This declaration is made under the sole responsibility of the Manufacturer.
The Manufacturer declares that the following product conforms to the requirements of
The Pressure Equipment (Safety) Regulations 2016

Product: Air to Water Heat Pump
Model: **GRANT AERONA HPR2904**
GRANT AERONA HPR29065

Pressure equipment	Category	Conformity assessment	Notified body ID
Assembly	III	Module H	1128
Compressor	II	Module A2	1128
Plate heat exchanger	II	Module A2	1128
Pressure sensor	N.A.		

The conformity is assessed in the following standards and procedures:

Module H: Specific documentation submitted with the application
Module A2: Internal production control plus supervised pressure equipment checks at random intervals

Harmonised Standards - Technical Standards :- Specifications applied:

EN 378-2:2016 Refrigerating systems and heat pumps - Safety and environmental requirements
Part 2: Design, construction, testing, marking and documentation

Notified Body: EUROCERT S.A.
89 Chlois & Lykovriseos str
144 52
Metamorphosi
Greece
Identification No. 1128

Place of Issue
Date of issue

United Kingdom
23 October2024

Technical File Compiler and
Authorised Signatory

Neil Sawers
Commercial Technical Manager

Grant Engineering (UK) Ltd

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+44(0)1380 736920 | info@grantuk.com |www.grantuk.com

REGISTERED IN ENGLAND No: 3196757. REGISTERED OFFICE: AS ABOVE

GUK241023 UKCA DoC HPR2901



UKCA - Safety Declaration of Conformity

This declaration is made under the sole responsibility of the following Manufacturer. The Manufacturer declares that the following product conforms to the requirements of the UK Legislation and Regulations as detailed below.

The Technical Construction Files are retained at the Manufacturer's location.

Product: Air to Water Heat Pump

Model: GRANT AERONA HPR2909
GRANT AERONA HPR29012
GRANT AERONA HPR290155

In accordance with the following directive(s) or Regulation(s), provided that the products are installed and used in accordance with our instructions:

S.I. 2016/1105: Pressure Equipment (Safety) Regulations 2016 as amended

S.I. 2016/1101: Electrical Equipment (Safety) Regulations 2016

S.I. 2016/1091: Electromagnetic Compatibility Regulations 2016

S.I. 2008/1597: Supply of Machinery (Safety) Regulations 2008

S.I. 2012/3032: The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

following the provisions of:

BS EN 60335-2-40: 2003, +A11: 2004, +A12: 2005, +A1: 2006, +A2: 2009, +A13: 2012

BS BS EN 60335-1: 2012 +A16: 2023

BS EN 62233: 2008

BS EN 61000-3-11: 2019

BS EN 61000-3-12: 2011 +A1:2024

BS EN 55014-1:2021

BS EN 55014-2:2021

PED Directive 2014/68/EU

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REGISTERED IN ENGLAND No: 3196757. REGISTERED OFFICE: AS ABOVE

GUK241023A UKCA DoC HPR2902



UKCA - Safety Declaration of Conformity - continued

This declaration is made under the sole responsibility of the Manufacturer.
The Manufacturer declares that the following product conforms to the requirements of
The Pressure Equipment (Safety) Regulations 2016

Product: Air to Water Heat Pump
Model: **GRANT AERONA HPR2904**
GRANT AERONA HPR29065
GRANT AERONA HPR290155

Pressure equipment	Category	Conformity assessment	Notified body ID
Assembly	III	Module H	1128
Compressor	II	Module A2	1128
Plate heat exchanger	II	Module A2	1128
Pressure sensor	N.A.		

The conformity is assessed in the following standards and procedures:

Module H: Specific documentation submitted with the application
Module A2: Internal production control plus supervised pressure equipment checks at random intervals

Harmonised Standards - Technical Standards :- Specifications applied:

EN 378-2:2016 Refrigerating systems and heat pumps - Safety and environmental requirements
Part 2: Design, construction, testing, marking and documentation

Notified Body: EUROCERT S.A.
89 Chlois & Lykovriseos str
144 52
Metamorphosi
Greece
Identification No. 1128

Place of Issue
Date of issue

United Kingdom
23 October2024

Technical File Compiler and
Authorised Signatory

Neil Sawers
Commercial Technical Manager

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+44(0)1380 736920 | info@grantuk.com | www.grantuk.com

REGISTERED IN ENGLAND No: 3196757. REGISTERED OFFICE: AS ABOVE

GUK241023A UKCA DoC HPR2902

14 HEALTH & SAFETY INFORMATION

14.1 GENERAL

Under the Consumer Protection Act 1987 and Section 6 of the Health and Safety at Work Act 1974, we are required to provide information on substances hazardous to health (COSHH Regulations 1988).

Adhesives, sealants and paints used in the manufacture of the product are cured and present no known hazards when used in the manner for which they are intended.

! WARNING !

Isolate the heat pump from the electricity supply before removing any covers.

14.2 REFRIGERANT (R290)

The Grant AERONA 290 series units contain R290 hydrocarbon refrigerant gas with a 99.5% purity. The density of this gas is greater than that of air, so in the event of leakage it tends to disperse and stratify, accumulating in niches, depressions in the ground or underground regions.

The refrigerant circuit is hermetically sealed within the heat pump.

Work involving the refrigerant must only be performed by a qualified F-Gas Engineer or an authorised dealer with a refrigerant handling certificate.

Under no circumstances should the refrigerant be vented or otherwise released to the atmosphere. If the gas escapes suddenly from the refrigeration circuit, it will immediately cool to -45°C, causing frostbite to unprotected skin.

Whilst R290 refrigerant gas is not toxic, it is an asphyxiant.

R290 refrigerant gas is extremely flammable (Category 1) with sparks from static discharge causing ignition. A high flame velocity leaves a high potential for explosion.

! WARNING !

The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment

14.2.1 FIRST AID MEASURES

INHALATION

In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination.

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.

Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Seek urgent medical advice.

Apply artificial respiration if breathing stopped.

SKIN/EYE CONTACT

In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing.

Immediately flush eyes thoroughly with water for at least 15 minutes.

Remove contaminated clothing. Drench affected area with water for at least 15 minutes.

Obtain medical assistance

INGESTION

Ingestion is not considered a potential route of exposure.

15 DISPOSAL AND RECYCLING

GENERAL

Grant UK air source heat pumps incorporate components manufactured from a variety of different materials. However, most of these materials cannot be recycled as they are contaminated by the refrigerant and oil used in the heat pump.

DECOMMISSIONING

Before carrying out this procedure, it is essential that the technician is completely familiar with the heat pump and all its details. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken.

It is essential that electrical power is available before the task is commenced. .

- a. Become familiar with the equipment and its operation.
- b. Isolate system electrically
- c. Before attempting the procedure ensure that:
 - Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
 - All personal protective equipment is available and being used correctly.
 - The recovery process is supervised at all times by a competent person.
 - Recovery equipment and cylinders conform to the appropriate standards.
 - Pump down refrigerant system, if possible.
 - If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
 - Make sure that the recovery cylinder is situated on the scales before recovery takes place.
 - Ensure to operate recovery equipment in accordance with instructions.
 - Do not overfill recovery cylinders (Do not exceed 80% volume liquid charge).
 - Do not exceed the maximum working pressure of the recovery cylinder, even temporarily.
 - When the recovery cylinders have been filled correctly and the process completed, ensure the both recovery cylinder and equipment are removed from site promptly and all isolation valves on the recovery equipment are closed off.
 - Recovered refrigerant shall not be charged into another **refrigerant system** unless it has been cleaned and checked.

LABELLING

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing **flammable refrigerant**, ensure that there are labels on the equipment stating the equipment contains **flammable refrigerant**.

RECYCLING

In order for the heat pump to be recycled or disposed of it must be taken to a suitably licensed waste facility. You will need to contact a qualified refrigeration engineer to do this for you.

When removing refrigerant from a system, either for decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed.

- Ensure that the correct numbers of cylinders for holding the total system charge are available.
- All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e special cylinders for the recovery of refrigerant).
- Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order.
- Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of flammable refrigerants.
- In addition, a set of calibrated weighing scales shall be available and in good working order.
- Hoses shall be complete with leak-free disconnect couplings and in good condition. The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged.
- Before using recovery equipment, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release.
- Consult manufacturer if in doubt.

DISPOSAL

The refrigerant will be removed and returned to the refrigerant manufacturer for recycling or disposal.

The complete heat pump unit, including the compressor and the oil contained within it, must be disposed of at a licensed waste facility, as it still remains contaminated by the refrigerant.

- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant Waste Transfer Note arranged.
- Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant.
- The evacuation process shall be carried out prior to returning the compressor to the suppliers.
- Only electric heating to the compressor body shall be employed to accelerate this process.
- When oil is drained from a system, it shall be carried out safely.

16 PRODUCT FICHE

The product fiche for the full range of Grant Aerona³ Heat Pumps are available on the Grant website at:

<http://www.grantuk.com/professional/products/air-source-heat-pumps/r290/>

17 GUARANTEE

You are now the proud owner of an Air Source Heat Pump from Grant Engineering (UK) Limited which has been designed to give years of reliable, trouble free, operation.

Grant Engineering (UK) Limited guarantees the manufacture of the heat pump including all electrical and mechanical components for a period of twelve months from the date of installation⁴, provided that the air source heat pump has been installed in full accordance with the installation and operating instructions issued.

This will be extended to a total period of two years if the air source heat pump is registered with Grant Engineering (UK) Limited within thirty days of installation⁴ and it is serviced at twelve monthly intervals³. See main Terms and Conditions below.

Registering the product with Grant Engineering (UK) Limited

Please register your air source heat pump with Grant Engineering UK Limited within thirty days of installation. To do so visit www.grantuk.com and follow the links to the 'Homeowners Zone', where you can register your heat pump for a further twelve months guarantee (giving two years from the date of installation). This does not affect your statutory rights¹.

If a fault or defect occurs within the manufacturer's guarantee period

If your air source heat pump should fail within the guarantee period, you must contact Grant Engineering (UK) Limited, who will arrange for the repair under the terms of the guarantee, providing that the heat pump has been correctly installed, commissioned and serviced (if the appliance has been installed for more than twelve months) by a competent person and the fault is not due to tampering, system water contamination, misuse, trapped air or the failure of any external components not supplied by Grant Engineering (UK) Limited, e.g. pipework, etc.

This two year guarantee only applies if the air source heat pump is registered with Grant Engineering (UK) Limited within thirty days of installation⁴ and is serviced after twelve months³.

In the first instance

Contact your installer or commissioning engineer to ensure that the fault does not lie with the system components or any incorrect setting of the system controls that falls outside of the manufacturer's guarantee otherwise a service charge could result. Grant Engineering (UK) Limited will not be liable for any charges arising from this process.

If a fault covered by the manufacturer's guarantee is found

Ask your installer to contact Grant Engineering (UK) Limited Service Department on +44 (0)1380 736920 who will arrange for a competent service engineer to attend to the fault.

Remember - before you contact Grant Engineering (UK) Limited

- Ensure the air source heat pump has been installed, commissioned and serviced by a competent person in accordance with the installation and operating instructions.
- Ensure the problem is not being caused by the heating system or any controls not supplied by Grant Engineering (UK) Limited.

Free of charge repairs

During the two year guarantee period no charge for parts or labour will be made, provided that the air source heat pump has been installed and commissioned correctly in accordance with the manufacturer's installation and operating instructions, it was registered with Grant Engineering (UK) Limited within thirty days of installation⁴ and, for air source heat pumps over twelve months old, details of annual service is available³.

The following documents must be made available to Grant Engineering (UK) Limited on request:

- Proof of purchase
- Commissioning Report Form
- Service documents
- System Design Criteria

Chargeable repairs

A charge may be made (if necessary following testing of parts) if the cause of the breakdown is due to any fault(s) caused by the plumbing or heating system, e.g. contamination of parts due to system contamination, sludge, scale, debris or trapped air. See 'Extent of manufacturer's guarantee' below.

Extent of manufacturer's guarantee:

The manufacturer's guarantee does NOT cover the following:

- If the air source heat pump has been installed for over two years.
- If the air source heat pump has not been installed, commissioned, or serviced by a competent person in accordance with the installation and operating instructions.
- The serial number has been removed or made illegible.
- Fault(s) due to accidental damage, tampering, unauthorised adjustment, neglect, misuse or operating the air source heat pump contrary to the manufacturer's installation and operating instructions.
- Damage due to external causes such as bad weather conditions (flood, storms, lightning), fire, explosion, accident or theft.
- Fault(s) due to incorrectly sized expansion vessel(s), incorrect vessel charge pressure or inadequate expansion on the system.
- Fault(s) caused by external electrics and external components not supplied by Grant Engineering (UK) Limited.
- Air source heat pump servicing, de-scaling or flushing.
- Checking and replenishing system pressure.
- Electrical cables and plugs, external controls not supplied by Grant Engineering (UK) Limited.
- Heating system components, such as radiators, pipes, fittings, pumps and valves not supplied by Grant Engineering (UK) Limited.
- Instances where the heat pump has been un-installed and re-installed in another location.
- Use of spare parts not authorised by Grant Engineering (UK) Limited.
- Consumable items including, but not limited to, corrosion and biocide inhibitor.
- Damage caused as a direct result of an antifreeze valve discharging.
- Faults due to incorrectly installed antifreeze valves or inadequate discharge during antifreeze valve activation.
- The cost and provision of any specialist access equipment, or any associated costs, required to inspect, repair, service or replace any units not installed in accordance with these installation instructions, irrespective of whether the heat pump is deemed to be at fault or not.

Terms of manufacturer's guarantee

- The Company shall mean Grant Engineering (UK) Limited.
- The heat pump must be installed by a competent installer and in full accordance with the relevant Codes of Practice, Regulations and Legislation in force at the time of installation.
- The heat pump is guaranteed for two years from the date of installation⁴, providing that after twelve months the annual service has been completed³ and the heat pump registered with the Company within thirty days of the installation date⁴. Any work undertaken must be authorised by the Company and carried out by a competent service engineer.
- The internal heat exchanger of the heat pump is also covered by a **two year parts and labour** guarantee from the date of installation⁴. This is subject to the following:
 - The heat pump is operated correctly, in accordance with the installation and operating instructions.
 - Proof is provided that the system has been flushed or chemically cleaned where appropriate (refer to BS 7593) and that the required quantity of a suitable corrosion inhibitor added.
 - Proof of annual servicing (including the checking of any expansion vessels and pressure relief valves) must be provided if and when requested by the Company.**IMPORTANT** Grant Engineering (UK) Limited **strongly recommends** that a Grant Mag-One Duo in-line magnetic filter/s (or equivalent⁵) is fitted in the heating system pipework. This should be installed and regularly serviced in accordance with the filter manufacturer's instructions.
- This guarantee does not cover breakdowns caused by incorrect installation, neglect, misuse, accident or failure to operate the heat pump in accordance with the manufacturer's installation and operating instructions.
- The heat pump is registered with the Company within thirty days of installation. Failure to do so does not affect your statutory rights¹.
- The balance of the guarantee is transferable providing the installation is serviced prior to the dwelling's new owners taking up residence. Grant Engineering (UK) Limited must be informed of the new owner's details.
- The Company will endeavour to provide prompt service in the unlikely event of a problem occurring, but cannot be held responsible for any consequences of delay however caused.
- This guarantee applies to Grant Engineering (UK) Limited air source heat pumps purchased and installed on the UK mainland, Isle of Wight, Channel Islands and Scottish Isles only². Provision of in-guarantee cover elsewhere in the UK is subject to agreement with the Company.
- All claims under this guarantee must be made to the Company prior to any work being undertaken. Invoices for call out/repair work by any third party will not be accepted unless previously authorised by the Company.
- Proof of purchase and date of installation, commissioning and service documents must be provided on request.
- If a replacement heat pump is supplied under the guarantee (due to a manufacturing fault) the product guarantee continues from the installation date of the original heat pump, and not from the installation date of the replacement⁴.
- The replacement of a heat pump under this guarantee does not include any consequential costs.

Foot notes

1. Your statutory rights entitle you to a one year guarantee period only.
2. The UK mainland consists of England, Scotland and Wales only. Please note that for the purposes of this definition, Northern Ireland, Isle of Man and Scilly Isles are not considered part of the UK mainland.
3. We recommend that your air source heat pump is serviced every twelve months (even when the guarantee has expired) to prolong the lifespan and ensure it is operating safely and efficiently.
4. The guarantee period will commence from the date of installation, unless the installation date is more than six months from the date of purchase, in which case the guarantee period will commence six months from the date of purchase.
5. As measured by gauss. The Mag-One Duo magnetic filter has a Gauss measurement of 12000.

18 USER INSTRUCTIONS

18.1 USER INSTRUCTIONS

These instructions are intended to assist the user with the operation of a Grant Aerona 290 air source heat pump. Full details on the Installation, Commissioning and Servicing of the heat pump are contained in these Installation and Operating Instructions.

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance.

Cleaning and user maintenance shall not be made by children without supervision.

18.2 ABOUT YOUR HEAT PUMP

Your Grant Aerona 290 air source heat pump is a highly efficient and fully automatic unit that extracts heat energy from the outside air to heat your home.

The Grant Aerona 290 is an 'air to water' heat pump. In operation, the fan (or fans) draws air through the finned coil evaporating the refrigerant in the heat pump. This refrigerant is then compressed to increase its heat energy before it passes through a heat exchanger transferring that heat energy to the water of your heating system.

Your Grant heat pump is designed to work at lower operating temperatures than traditional oil or gas fired boilers. Radiators will therefore feel cooler to the touch, but this should not cause a problem with the heating of your house. The system will have been designed to work at these lower temperatures and the heat pump will be set to ensure the correct comfort levels are maintained.

Underfloor heating systems will require a longer pre-heat period to bring the floor up to operating temperature.

The heat pump has been designed to be as efficient as possible and will operate at a 'set point' temperature depending on conditions inside and outside of your house. Due to this, your radiators will be warmer some days and cooler others. This is normal and the heat pump is working correctly.

18.3 AERONA SMART CONTROLLER

Your heat pump will be fitted with a Grant Aerona Smart Controller. This will be electrically connected to the heat pump outside, but will be located in a convenient position within your home.

The principle functions of the Grant Aerona Smart Controller are:

- To enable the heat pump operating parameters to be accessed and adjusted as required by the heat pump installer.
- To manage installed system devices where appropriate for DHW priority, Anti-Legionella protection & supplementary heating.
- To provide simple to use heating and hot water scheduling.
- To provide both the user and installer remote access to the controller for remote control & diagnostics via ecoNET24.

The heat pump is supplied with the operating parameters set to the factory default values. However, these parameter settings should have been checked by the installer when the heat pump was commissioned and adjusted where necessary to ensure they are correctly set to suit your particular installation.

These heat pump operating parameters should NOT then be altered other than by either the installer or a Grant Service Engineer if and when necessary.

The Smart Controller touchscreen will display both the outside air temperature and inside air temperature (for the area where the remote controller is located) and, if configured, will perform real time adjustments to the heat pump output temperatures

For further information on the operation and configuration of user settings, refer to Section 7 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

18.4 POWERING HEAT PUMP ON/OFF

18.4.1 POWERING HEAT PUMP ON FROM YOUR CONTROLLER

To switch the heat pump ON:

1. First, check the power supply to the heat pump is switch ON at the weatherproof isolator. This is usually located outside next to the heat pump.

2. Check the Aerona Smart is also powered ON.

For further information on the powering on the Smart controller, refer to your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

3. Tap the 'Heat pump schematic' from the touchscreen display. Refer to Figure 18-1.

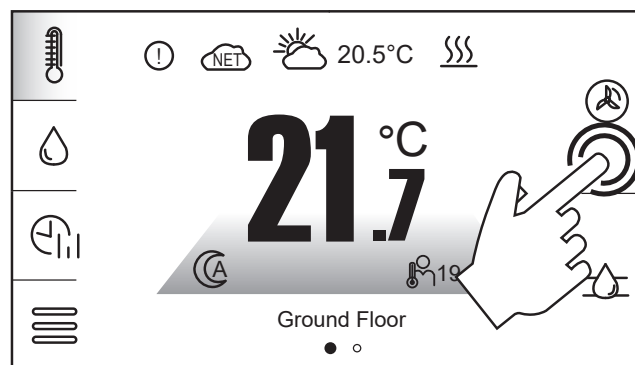


Figure 18-1: accessing HP

4. Tap the 'work mode' icon on the touchscreen display. Refer to Figure 18-2.

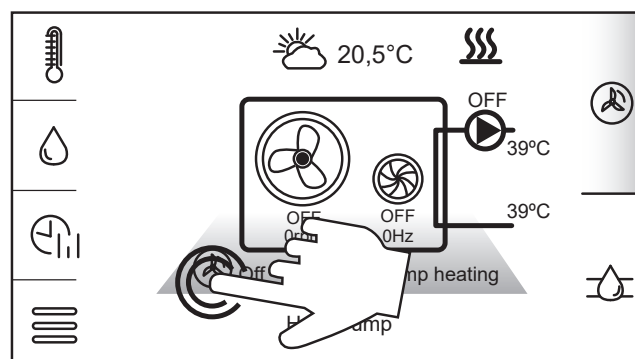





Figure 18-2: access Heat pump work mode

5. Tap 'ON'. If you tap 'SCHEDULE' the heat pump will be ON/OFF based on the schedule which can be set. Refer to Table 18-1.

Table 18-1: Heat Pump Status

 ON	The heat pump is turned on.
 OFF	The heat pump is turned off regardless of the conditions in the system.
 SCHEDULE	The heat pump is switched on and off according to the set time schedule for the heat pump.

18.4.2 POWERING HEAT PUMP OFF FROM YOUR CONTROLLER

To switch the heat pump OFF:

1. Follow the steps in 18.4.1 to step 5, and tap 'OFF'.

18.4.3 POWERING HEAT PUMP ON/OFF MANUALLY

To switch the heat pump off: Switch the external electrical isolator to OFF.

! NOTE !

This isolator is usually located on the outside wall of your house next to the heat pump.

To switch the heat pump back on: Switch the external electrical isolator back to ON.

! CAUTION !

If the electrical supply to the heat pump is switched off, e.g. at the external isolator, the frost protection function and Refrigerant leakage sensor will NOT operate.

In order for the heat pump to start (when it is switched ON) there must also be a 'demand' from the heating system controls. Refer to the Section 18.6 'Heating System Controls' section of these User Instructions.

18.5 AERONA SMART CONTROLLER DISPLAY

The operation of the Grant AERONA 290 heat pump is indicated in the top right of the touchscreen display. The red 3 wavy lines symbol indicates there is a 'demand' being communicated to the heat pump from the smart controller.

To view real time information on the status of the heat pump follow steps 1-3 in section 18.4.1 to access the 'heat pump schematic' screen. This displays active information from the heat pump such as fan, pump & compressor status and water temperatures.

18.6 HEATING SYSTEM CONTROLS

Your Grant AERONA 290 heat pump is controlled by the Grant AERONA Smart Controller and is designed to provide:

18.6.1 SPACE HEATING

The Grant AERONA Smart controller is designed to manage up to 3 space heating zones, where a user can specify set schedules for Day (occupied) or night (unoccupied) time periods.

The space heating can be managed by:

- **Thermostats** - This allows the required air temperature to be set. When the air temperature is below this setting the thermostat will 'call' for the heat pump to operate to provide heating. This is usually located in a downstairs area such as a hallway or living room, but you may have more than one room thermostat if your heating system is 'zoned'.
- **Fixed Water temperatures** - The 'zone' (circuit) is set with a fixed temperature. When the schedule comes 'ON', it will 'call' for the heat pump which delivers a set fixed output (flow) temperature for the 'circuit'.
- **Weather compensation** - The 'Zone' (circuit) is set with a climatic curve, which measures the outdoor (ambient) air temperature against a desired output (flow) temperature when the heating schedule is 'ON' and 'calling' the heat pump 'ON'.

! NOTE !

For the heat pump to operate to provide heating, the schedule must be in an ON period for heating AND the room thermostat must be 'calling'.

For further information on the operation and configuration of space heating zone settings, refer to Section 7 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

18.6.2 HOT WATER

In addition to 3 space heating zones, the Grant AERONA Smart controller is designed to manage a hot water cylinder, where a user can specify both schedules for 'ON' and 'OFF' time period for heat to be provided and desired water temperature with the aid of a cylinder water temperature sensor.

The installer should discuss and configure the desired temperature of the hot water and a level deemed too low requiring more heat (hysteresis).

When the schedule for the hot water is ON, if the cylinder temperature difference is greater than the 'hysteresis' value:

- The heat pump will be 'called' to provide heat for your hot water cylinder.
- The Smart controller will shut off any active space heating zones, and divert all heat generated to your cylinder. This is known as "Hot water priority".
- The heat pump will stay ON until your cylinder has reached it's set temperature.
- 'Hot water priority' will then be disabled, starting your space heating zones.
-

! NOTE !

If your cylinder falls below the 'hysteresis' level again within a scheduled ON time period, 'Hot water priority' will re-engage.

For further information on the operation and configuration of hot water cylinder settings, refer to Section 7 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

18.7 ANTI-LEGIONELLA PROTECTION

Your Grant Aerona Smart Controller is designed with the ability to control and schedule Anti-Legionella protection for your DHW cylinder. The Smart controller will activate the cylinder immersion heater to aid your heat pump in periodically raising the water temperature in the cylinder to 60°C to prevent Legionella bacteria on a weekly basis.

For further information on the operation and configuration of hot water cylinder settings, refer to Section 7.4 of your supplied manual:

- DOC 0203 - for systems without Grant QR pre-plumbed cylinder
- DOC 0205 - for systems with Grant QR Smart pre-plumbed cylinder

18.8 FROST PROTECTION

Your Grant Aerona 290 heat pump is fitted with automatic frost protection functions for various heat pump components that will operate when either the outside air temperature and the system water temperatures fall to a pre-set value (6°C).

This frost protection function will operate even when the heat pump is switched OFF at the Smart controller. See Section 18.4 of these User Instructions.

As the heat pump frost protection involves the operation of the circulating pump, it is perfectly normal to hear the circulating pump running (when the heat pump is off) during periods of cold weather.

Under low ambient air conditions the water pump may operate repeatedly to provide frost protection when the heat pump is not operating, e.g. possibly throughout the night, until the heat pump starts the following morning. The cost to protect the heat pump from freezing in this way is small due to the low water pump power consumption.

18.9 LOOKING AFTER YOUR HEAT PUMP

Grant Aerona 290 Heat Pumps require very little maintenance but it is important that the air inlet grilles (at the rear and left-hand side of the unit) are kept clear at all times.

Also, ensure that the fan outlet grille is unobstructed at all times.

Remove any build-up of leaves, snow or any other debris from the air inlet and outlet grilles.

! CAUTION !

Do not either

- **Stack anything (e.g. garden furniture, bicycles, etc.) either on or against your heat pump.**
- **Do not place any cover over the unit.**

In the case of any construction work, e.g. grinding, sanding, cutting, etc, where a lot of dust is created, the unit should be switched off and covered until the work is finished

- Do not place any objects or equipment on the top of the unit
- Do not climb, sit or stand on the top of the unit.

To ensure that it continues to operate efficiently your Grant Aerona 290 heat pump should be serviced annually, as detailed in Section 10 of the Installation Instructions supplied with the unit. Contact your installer or service engineer to carry out this work.

18.10 TROUBLESHOOTING

If your heat pump fails to operate:

First check:	Is the power supply is switched ON at the external isolator?
If YES:	Check that the heat pump is switched ON at the controller. Refer to the 'Section 18.3 of these User Instructions.
If YES:	Check if there is a demand from the heating system controls. Refer to the 'Heating System Controls' section of these User Instructions.
If YES:	If your heating zones are weather regulated, the outdoor temperature may be too high to 'call' the heat pump on.
If YES:	Check the display on the controller. Is an error displayed?
If YES:	What is the error code shown? Refer to Section 11 of the Installation and Operating Instructions supplied with the heat pump for a full list of the error codes. Contact your installer or service engineer for assistance.

APPENDIX A CIRCULATING PUMP

A.1 CIRCULATING PUMP

Table A-1: Circulating pump specifications

Feature	Specification
Nominal supply voltage	EU: 1 x 230V +10% / -15%, 50/60 Hz
EEL Rating	≤0.21-Part3
Motor protection	The motor is protected by the electronics in the control box and requires no external motor protection
Protection class	IPX4D (standard without drain holes)
EMC Standards	EN 61000-6-1 EN 61000-6-3
Insulation class	H (EN 60335-1)
Temperature class	TF95
Maximum Flow (m³/h)	4.5
Connection (inches)	1½ - 1 BSPM
Operational range	2 to +95°C
High voltage protection	EN 60335-1 1000V AC
Ambient temperature Range	0 to +75°C
Maximum media temperature	+125°C
Minimum media temperature	2°C (IPX4D: above dew point of ambient air).
Storage temperature	0°C to +55°C
Minimum inlet pressure <75°C	0.05 MPa (0.50 bar) @ 0.5m head
System pressure	0.3MPa (3 bar)
Maximum system pressure	1 MPa (10 bar)
Rated Condition (m @ m³/h)	6.5 @ 2.5
Relative humidity	Maximum 95%, non-condensing environment
Acoustic sound pressure level (LP)	≤ 42 dB(A)

! CAUTION !

Ensure the system is filled to required system pressure prior to the heat pump being powered on. The pump should not be run dry.

! CAUTION !

Ensure to isolate and drain down the heat pump before attempting any maintenance or repair.

A.1.1 PWM PUMP

The pump is controlled by the Grant Aeron 290 via a PWM signal that controls the speed by an ON/OFF and feedback to maintain the required flow for the circuit.

Flow management devices such as flow regulators or restrictors should not be used and all valves should be fully open. The PWM pump will automatically attempt to compensate against and restrictions to water flow which could lead to excessive wear and energy usage.

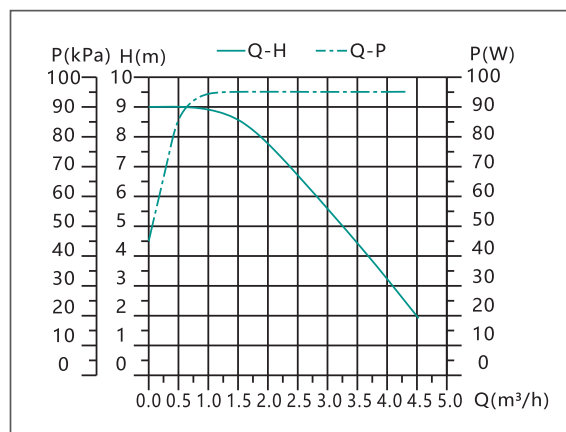


Figure A-1: Pump performance

Table A-2: Ambient vs system flow temperatures

Ambient Temperature (°C)	Water temperature	
	Minimum (°C)	Maximum (°C)
0	2	95
10	10	95
20	20	95
30	30	95
35	35	90
40	40	70

! CAUTION !

System flow temperature should always be higher than ambient temperature to avoid condensate on the pump.

A.2 PUMP INTERFACE

The pump control panel will indicate various operational states from the 2 indicator LED. Refer to Figure A-2 and Table A-3 for LED.

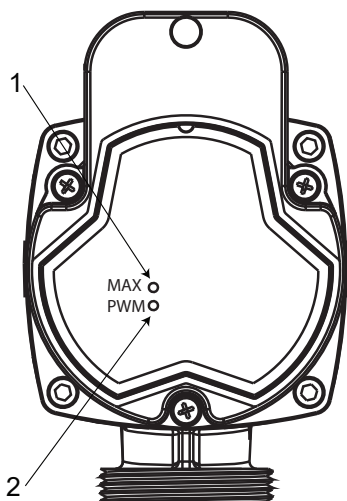


Figure A-2: Pump control panel

Table A-3: Pump control panel

Item	Description
1 (MAX)	Maximum pump RPM/PWM Feedback reached
2 (PWM)	PWM Signal active

The LED indicators will flash to indicate faults. Refer to Table A-4.

Table A-4: Pump Faults

Number of flashes	Fault description
1	When the voltage is between 265V and 275V, the pump will stop working, and the pump is at the over-voltage protection model. When the voltage is abnormal, the pump will re-start working.
2	When the voltage is between 160V and 170V, the pump will stop working, and the pump is at the under-voltage protection model. When the voltage is abnormal, the pump will re-start working.
3	Over-current protection, re-start the pump after 5s.
4	Light-load protection, re-start the pump after 5s.
5	Phase loss protection, re-start the pump after 5s.
6	Block protection, re-start the pump after 5s.
7	Over-temperature protection, re-start the pump after ambient temperature resumes to operation range.

After the fault is displayed, you will need to isolate the power supply before attempting to troubleshoot further, When complete power the Aeron 290 on to restart.

A.3 PUMP FAULT FINDING

Refer to table A-5 for fault diagnosis and correction of the circulating pump within the Grant Aeron 290.

Table A-5: Pump fault diagnosis

Fault	Cause	Action
Pump fails to start	Fuse is burnt out	Replace fuse
	Connection to PCB is loose or disconnects	Reconnect pump to Hydraulic PCB
	Pump failure	Replace the pump
	Too low voltage	Check power supply is within required range
	Pump rotors are stuck	Remove impurities
System noise	Gas in the system	Ensure automatic air purge valve is functional
	Excess flow	Reduce inlet water pressure
Noise in the pump	Gas in the pump	Ensure automatic air purge valve is functional
	Inlet pressure too low	Increase inlet water pressure
Reduced heat output of Aeron 290	Poor pump performance	Increase inlet water pressure

APPENDIX B 3-PORT DIVERTER VALVE

B.1 3-PORT DIVERTER VALVE

The 3-port diverter valve is used to divert the flow to the indirect coil of a DHW cylinder when there is a DHW demand active.

This is not a 'spring-return' type 3-port valve but a motorised ball valve.

The actuator is permanently energised via the 'permanent live' on the brown wire when the valve is in the space heating position.

When there is a DHW demand, a switched live on the black wire operates the actuator to rotate the valve anticlockwise to the DHW position.

When the DHW demand ceases, the switched live to the actuator is cut, and the permanent live operates the actuator to rotate the valve clockwise back to the space heating position.

The actuator only consumes energy when opening and closing the valve.

! NOTE !

If there is a power cut during a DHW demand period, the valve will remain in that position. It will only return to the space heating position when the power supply is resumed and the DHW demand stops.

B.2 THE VALVE BODY

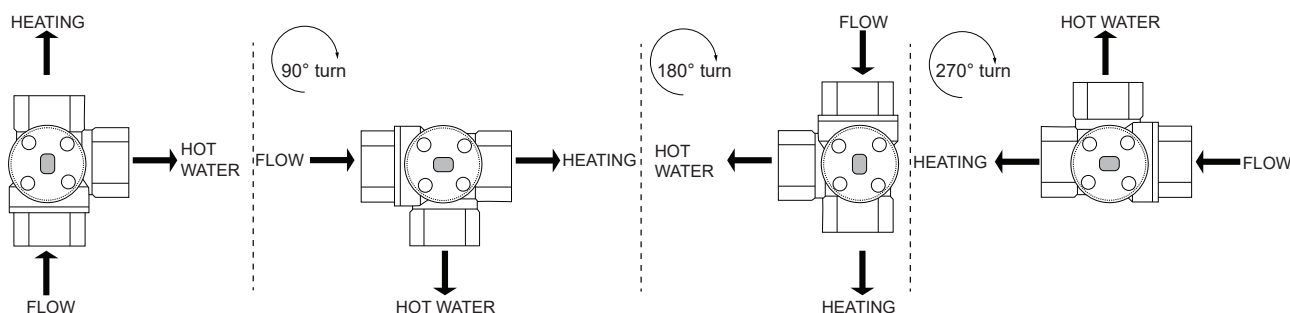
The valve body should be installed based on one of the two options shown in either B.2.1 or B.2.2, depending on how the pipework is configured on site.

OPTION 1 The flow from the heat pump passes straight through the valve for space heating and is diverted at 90° for DHW. The valve can be installed in 4 positions when turned in 90° increments as shown in B.2.1.

OPTION 2 The flow from the heat pump passes straight through the valve for DHW and is diverted at 90° for space heating. The valve can be installed in 4 positions when turned in 90° increments as shown in B.2.2.

To reduce the chance of moisture collecting in the actuator it is recommended that the valve body is installed in either a vertical or horizontal position, with the actuator facing upwards or horizontally to either side, and the cable to be positioned as shown in Figure B-2.

B.2.1 OPTION 1 - INITIAL POSITION SPACE HEATING - DIVERTS FLOW TO DHW



B.2.2 OPTION 2 - INITIAL POSITION SPACE HEATING - DIVERTS FLOW TO DHW

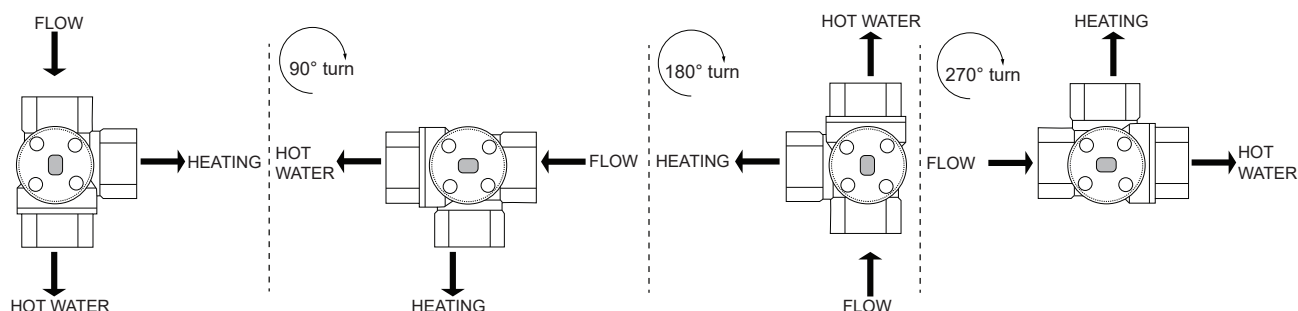


Figure B-1: Valve positions

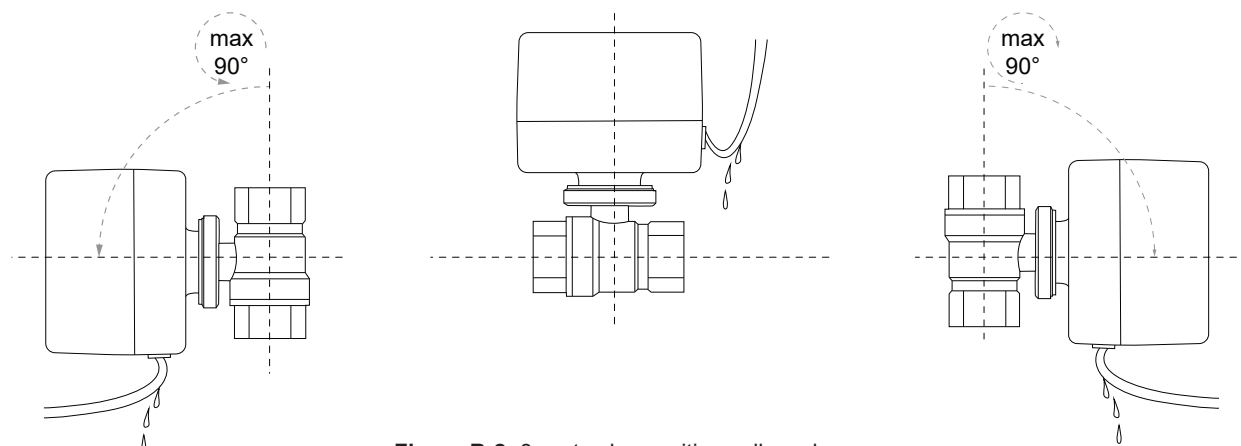


Figure B-2: 3-port valve positions allowed

B.3 FITTING THE ACTUATOR

STEP 1

Before attaching the actuator head to the valve, check the position of the spindle slot. As supplied, it should be in the position as shown in figure B-3. This is the position for a DHW demand.

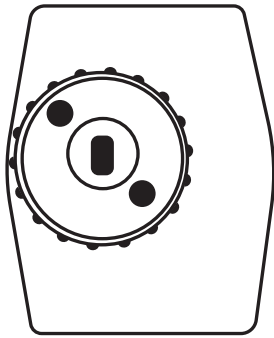


Figure B-3: Actuator spindle slot position - DHW

STEP 2

The valve drive spindle has a direction indicator (marked as a T) to indicate the 3-way valve position.

Refer to Figures B-4 and B-6 for the installation options based on valve orientation. These show the position of the drive spindle indicator required to ensure the valve is set to function correctly once the actuator is mounted.

To set the valve drive spindle to the correct position:

- For **OPTION 1** – If the actuator spindle slot is correct in Figure B-3, set the 'T' on the end of the valve drive spindle to point as shown in Figure B-4.

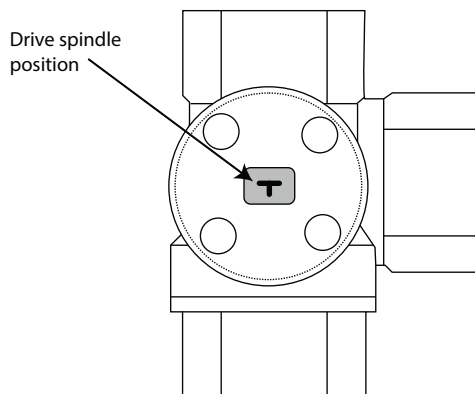


Figure B-4: Option 1 - Drive spindle position

- If the actuator is in the position shown in Figure B-5, rotate the drive spindle 90° clockwise from the position shown in Figure B-4.

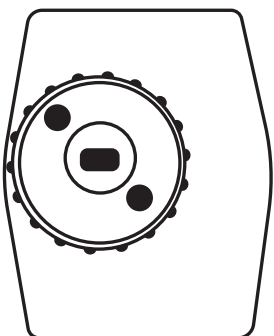


Figure B-5: Actuator spindle slot position - Heating

- For **OPTION 2** – If the actuator spindle slot position is correct as shown in Figure B-3, set the 'T' on the end of the valve drive spindle to point as shown in Figure B-6.
- If the actuator is in the position shown in Figure B-5, rotate the drive spindle 90° clockwise from the position shown in Figure B-6.

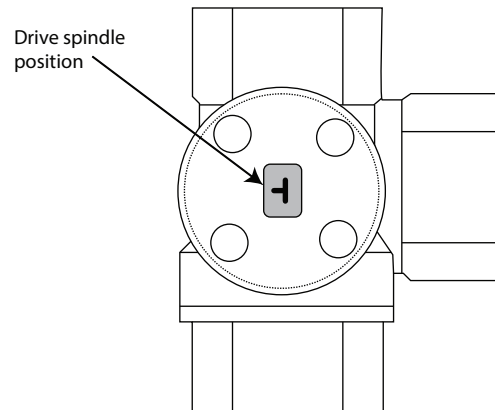


Figure B-6: Option 2 - Drive spindle position

! NOTE !

The valve spindle position **MUST** be correctly set, as described above, in order for the valve to function as intended.

STEP 3

After ensuring the spindle is in the correct position:

- Align the opening in the actuator with the valve drive spindle.
- Fit the actuator onto the valve drive spindle aligning the two drive 'pegs' with two of the recesses in the valve.
- Secure the actuator in position using the union nut.

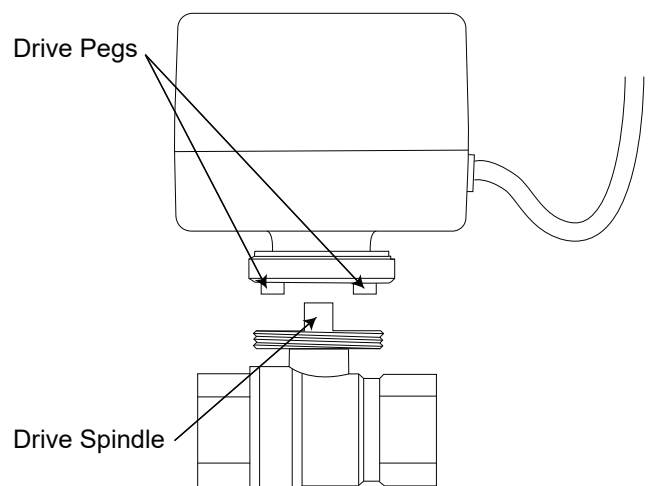


Figure B-7: Drive pegs and drive spindle

B.4 SMART CONTROLLER

The valve should be wired to the Grant Aeron Smart controller as shown in Figure B-4.

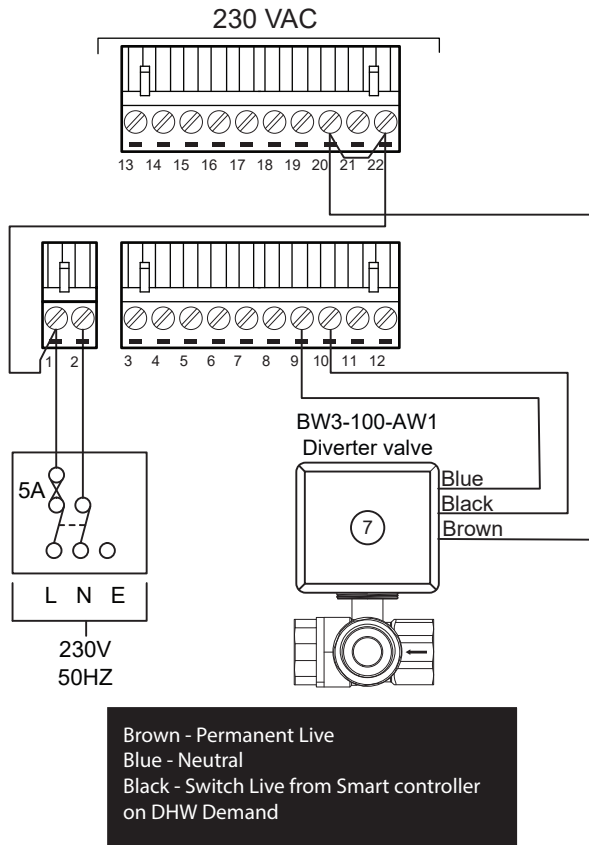


Figure B-8: Smart Controller wiring


The brown 'live' wire is permanently energised through terminal 20 and a signal is energised through terminal 10 on a DHW demand.

The smart controller will need a DHW cylinder to be configured for the DHW priority function to be active, but will manage the valve as necessary.


Refer to DOC0203 - Grant Aeron Smart controller Installation and Operating instructions manual for further information on wiring and functionality of the Grant Aeron Smart controller.

ONLINE RESOURCES

AERONA SMART CONTROLLER - HOW TO PLAYLIST

QR CODE	DESCRIPTION
	<p>How to video guides playlist for the Grant Aeron Smart Controller.</p> <p>The playlist offers a number of helpful guides on how to set individual elements of the Grant Aeron Smart controller and is monitored and updated to ensure the best possible assistance is available.</p> <p>Can't find something specific? Email info@grantuk.com or contact your local sales representative for further assistance.</p>

SCHEMATICS

QR CODE	DESCRIPTION
	<p>Grant UK online portal for approved schematic drawings.</p> <p>The schematics provided give a generalised idea on how to hydraulically and electrically design an installation using the Grant Aeron Smart controller.</p> <p>For further information or queries please contact into@grantuk.com or your local sales representative.</p>

SERVICE LOG

Service 1	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 5	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 2	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 6	Date
	Engineer
	Company name
	OFTEC Technician number
	Comments
	Signature

Service 3	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 7	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 4	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 8	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 9	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 13	Date
	Engineer
	Company name
	Telephone number
	Comments
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Service 10	Date
	Engineer
	Company name
	Telephone number
	Comments
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Service 14	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 11	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 15	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 12	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

Service 16	Date
	Engineer
	Company name
	Telephone number
	Comments
	Signature

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