CLADE

Acer (Integral Pumps)

Standard & Low Noise

65/50kW

95/75kW

130/100kW

Planner Manual

PD-ACER-03

Version: 1.3

Contents

Revision	**Change Notes**	**Date**
1.2	Change from CAT 5e to CAT 6 connections between units and general updates	06/06/25
1.3	Updated for up to 50 °C return temperatures.	17/06/25

1 General Specifications

1.1 Features and benefits

1.1.1 Energy Efficiency

The unit has been evaluated for performance and reliability against stringent industry standards, ensuring consistent, verified results.

SCOP - Achieves a high Seasonal Coefficient of Performance of 3.0*

Energy Label A++: Designed to exceed typical regulatory requirements for energy labeling, reducing overall operational costs and environmental impact.

1.1.2 Functionality

Wide Operating Range: Suitable for a broad range of outdoor temperatures, from extremely low ambient conditions to warmer climates. This flexibility ensures year-round heating reliability.

Minimum/Maximum Outdoor Temperatures: -15°C to +40°C

Minimum/Maximum Flow Water Temps: From 55°C up to 70 °C

Higher return temperature: Accommodates return temperatures up to 50 °C, maintaining efficiency in high-delta-T hydronic networks and facilitating straightforward retrofits to existing systems.

1.1.3 Modular design

Cascade Operation: Multiple units can be linked together to increase total capacity or provide redundancy. The system’s modular architecture allows for phased installations or expansions.

Load-Sharing Logic: When multiple heat pumps operate in cascade mode, run-hours and capacity demands are automatically balanced, optimizing efficiency and extending equipment life.

1.1.4 Technology

DC inverter technology on compressors and fans: Ensures precise load matching, smoother ramp-ups, and more stable temperatures. Reduces energy consumption and noise by adjusting speed according to actual demand.

Electronic expansion valve: Maintains optimal refrigerant flow for higher efficiency and better control of discharge/evaporating temperatures, enhancing reliability and performance.

Hydrophilic coil: Allows moisture to drain off smoothly, reducing potential ice build-up and improving heat transfer.

* Average Climate, Flow 65°C, inlet 15°C

2 Technical Specification

2.1.1 Standard Unit Technical Specifications

2.1.2 Minimum and Maximum kW output:

Model	Min Compressor kW (-10°C)	Max Compressor kW (+7°C)
Acer 50/65kW	43	62
Acer 75/95kW	65	94
Acer 100/130kW	84	123

Structure: Built on a heavy-duty FeZn 15/10 galvanized steel frame, the Acer unit offers rigidity and longevity. The core chassis is designed for quick installation and stable placement, featuring integrated lifting eyes and forklift slots that streamline transport while ensuring reliable, vibration-resistant operation once sited.

Paneling: Durable yet service-friendly paneling encases all sides of the heat pump. Each panel is insulated to help maintain internal operating temperatures, reduce sound transmission, and enable easy access for routine checks and component replacements.

Internal exchanger: Internally a stainless plate heat exchanger maximises heat transfer and resists corrosion.

External exchanger: Designed for high thermal efficiency, the advanced fin-and-tube coil system maximises heat transfer while maintaining compact dimensions. Key features include Copper tubing for superior conductivity, Aluminium fins for enhanced airflow.

Fans: The Acer Heat Pump incorporates powered axial fans, featuring ECblue motor technology for maximum efficiency and precision airflow control, IE5 efficiency-class motor for energy savings, ultra-quiet operation for reduced noise pollution, Smart speed modulation to adapt to varying load demands.

Refrigeration circuit: The state-of-the-art refrigeration system is engineered for high-pressure CO_2 (R744) operation, ensuring superior thermal performance and ultra-low GWP (Global Warming Potential).

Electrical Panel: The intelligent control system integrates advanced monitoring, diagnostics, and remote connectivity, ensuring seamless operation and effortless management.

2.2 Refrigerant Information

2.2.1 Characteristics of R744 refrigerant

The heat pumps manufactured by Clade Engineering Systems are equipped with carbon dioxide (CO_2). Carbon dioxide is also known as R744 in the refrigeration industry. Carbon dioxide is classified as low toxicity and non-flammable therefore belongs to the A1/L1 safety category.

CO_2 is toxic at high concentrations, being an odorless gas and heavier than air it displaces oxygen and can cause serious harm to the body if the concentration of CO_2 is high. In addition, due to the high-pressure environment it has hazards which other refrigerants do not and must be handled appropriately.

All personnel involved with the specification, installation, operation, and maintenance of the unit must be fully qualified, competent and hold any certifications required to conduct the work involved.

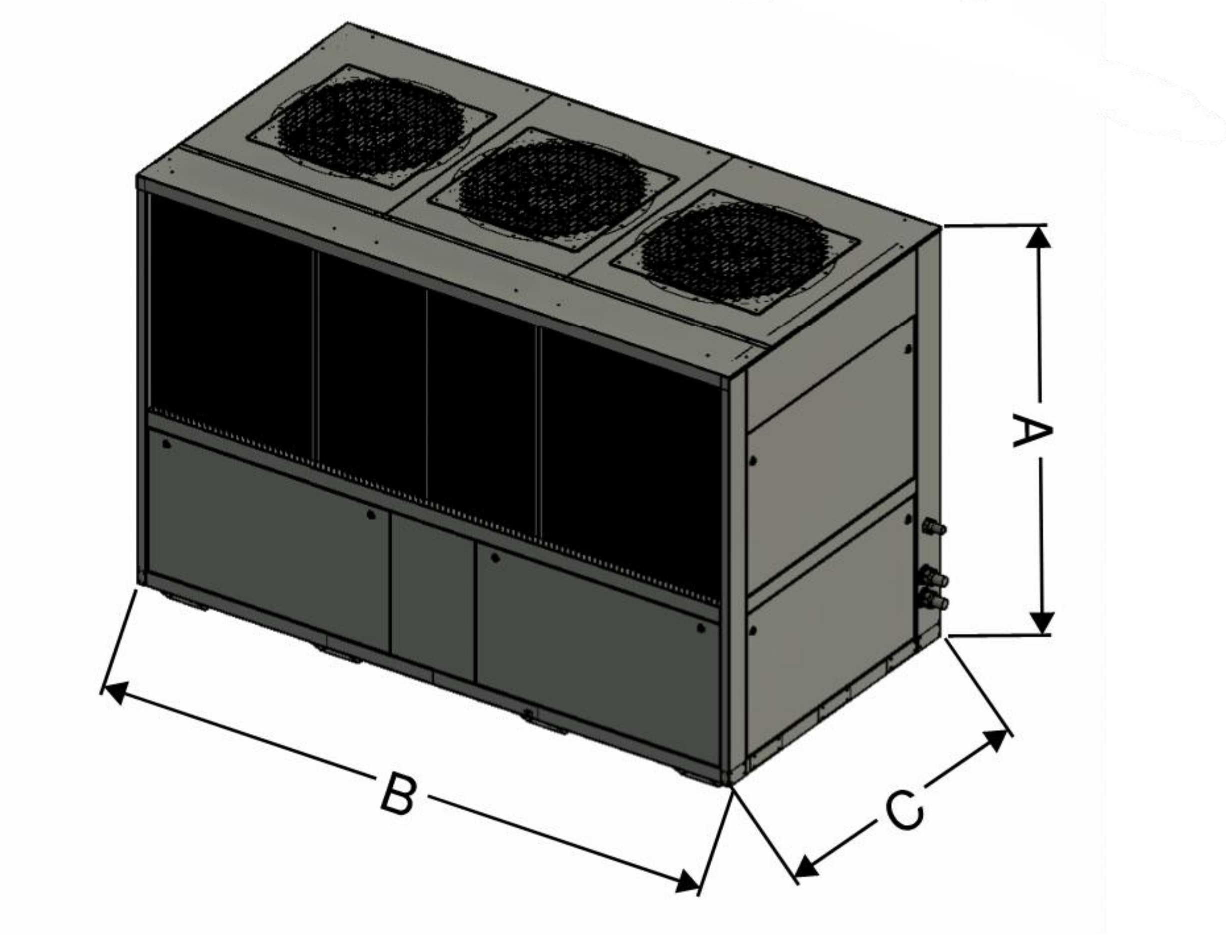
The unit has been evacuated and pre-charged in the factory with the correct amount of refrigerant, no addition charge is required. The refrigerant charge can be found on the PED label.

If due to component failure or in the event of a leak, it is recommended that the system is stopped, and the charge or remaining charge is vented to atmosphere in a controlled manner. See system maintenance manual for access points and isolation procedures. Once the issue has been rectified the system would need to evacuated and re-charged with the correct amount of refrigerant as recorded on the PED label.

Model	Refrigerant (Kg)	Equivalent CO_2 tonnes (tCO_2e)
Acer 50/65kW	5	0.005
Acer 75/95kW	7	0.007
Acer 100/130kW	10	0.010

Physical characteristics of the R744 refrigerant	
Safety class (ISO)	A1 (Non-toxic, Non-flammable)
GWP ($kg.CO_2e$)	1
Low flammability limit (LFL) (Kg/m^3 @ 60°C)	Non-Flammable
Burning velocity (BV) (cm/s)	0 cm/s (Non-flammable)
Boiling point (°C)	-78.5 (Sublimation point at atmospheric pressure)
GWP (100 yr ITH)	1
GWP (ARS 100 yr ITH)	1
Self-ignition temperature (°C)	Non-Flammable

2.4 Dimensions



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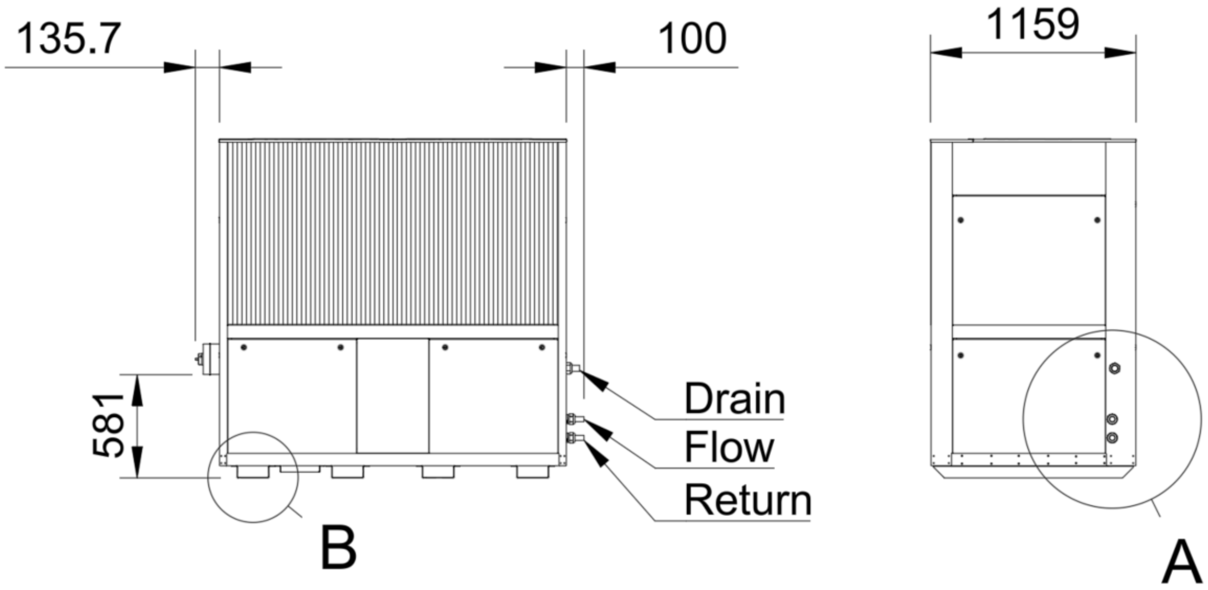
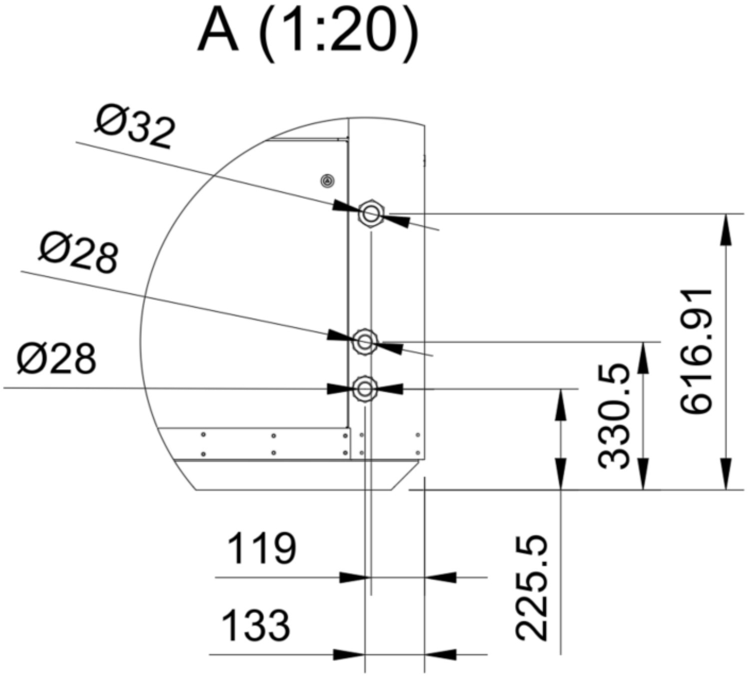
Unit	Height ‘A’ (mm)	Width ‘B’ (mm)	Depth ‘C’ (mm)	Operating Weight (kg)	Shipping Weight (kg)
Acer 65/50kW LN	2395	1959	1159	1008	1003
Acer 65/50kW SN	1907	1959	1159	943	938
Acer 95/75kW LN	2395	2815	1156	1375	1368
Acer 95/75kW SN	1907	2815	1156	1270	1263
Acer 130/100kW LN	2396	2815	1451	1605	1596
Acer 130/100kW SN	1907	2815	1450	1302	1311

2.5 Service Connections

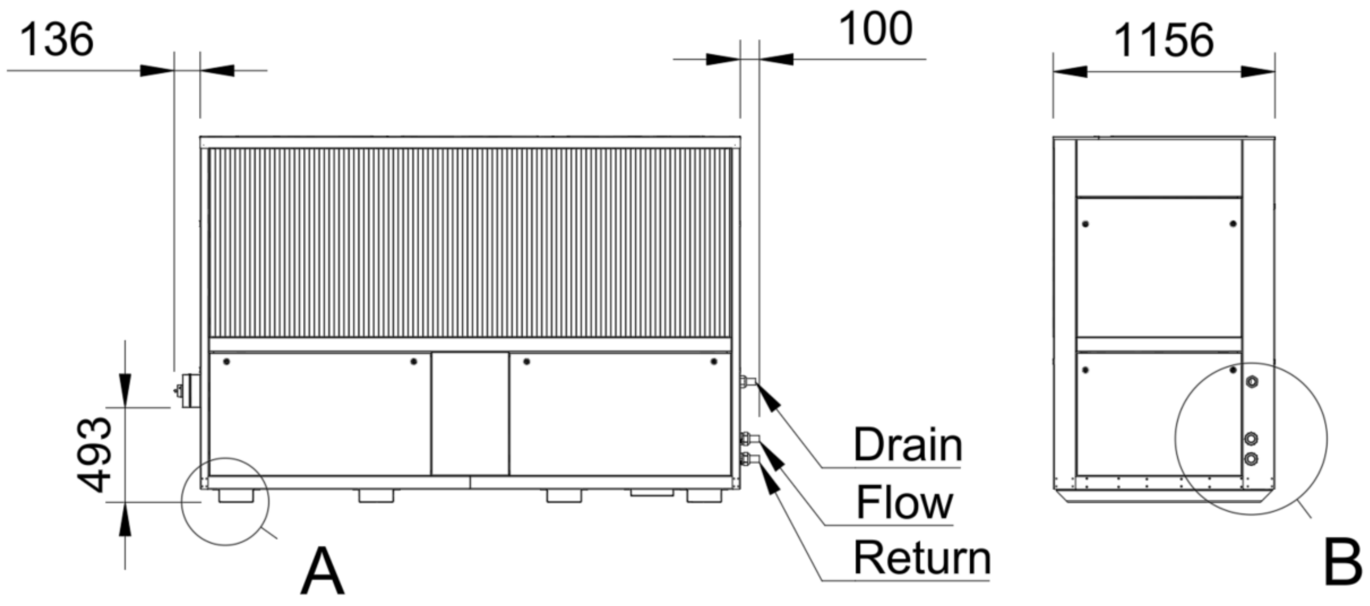
When selecting a location for the unit(s) consideration of the service connection positions is required. All water service connections are located on the right hand side panel of the heat pump and electrical on the left hand side panel of the heat pump.

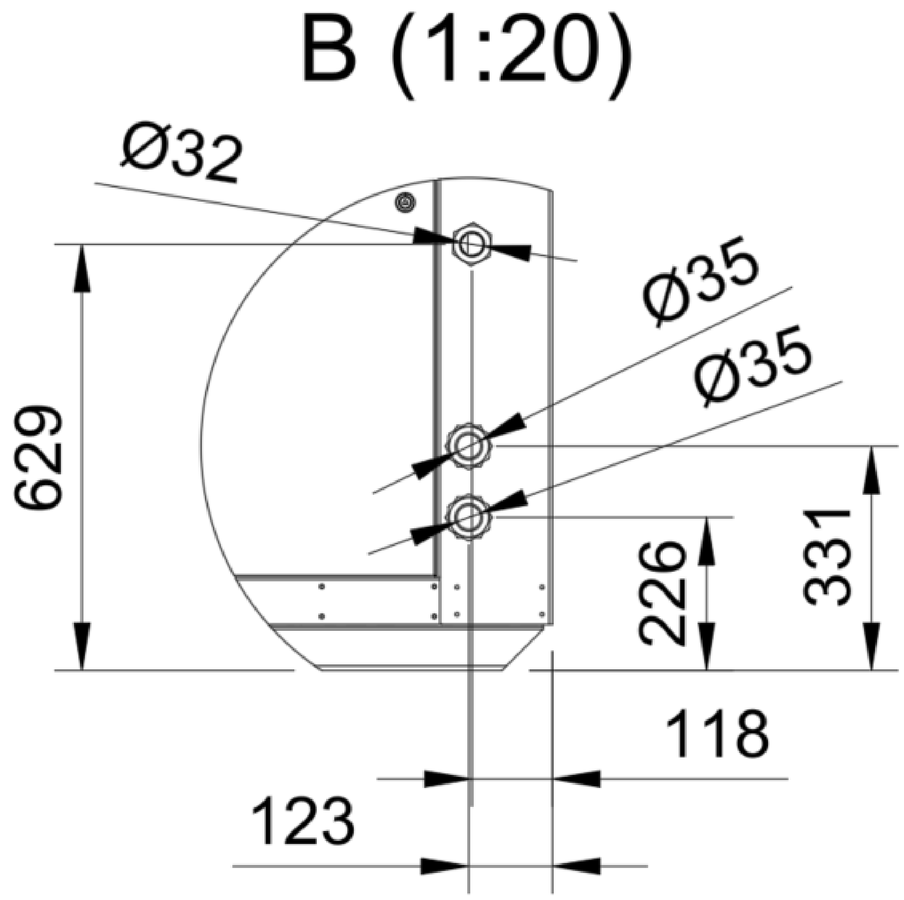
2.5.1 Acer 65/50



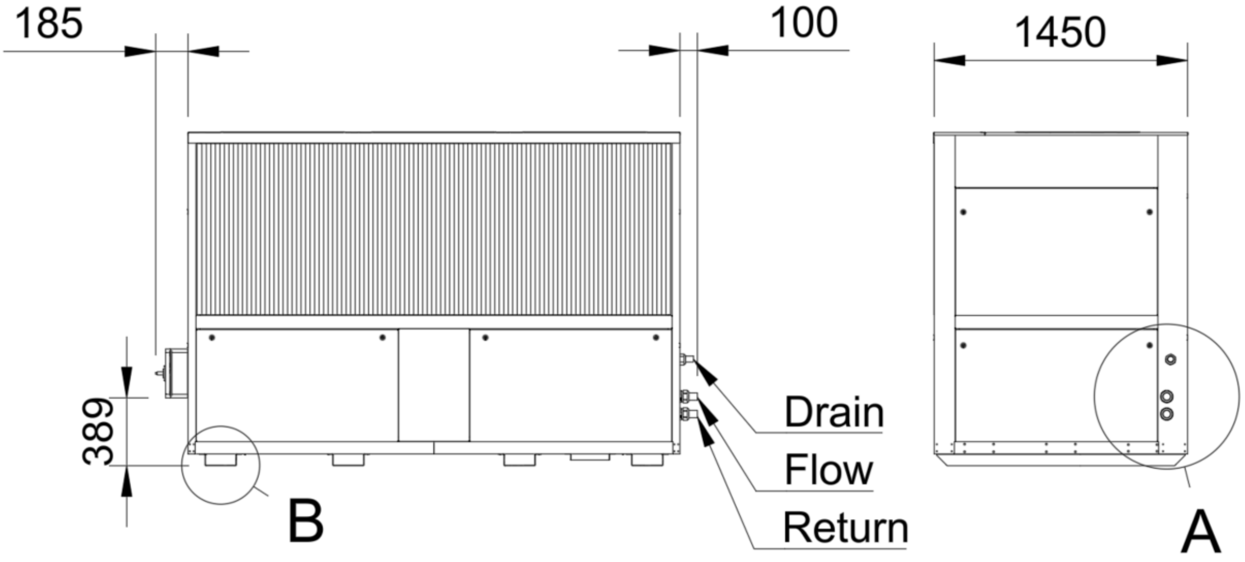


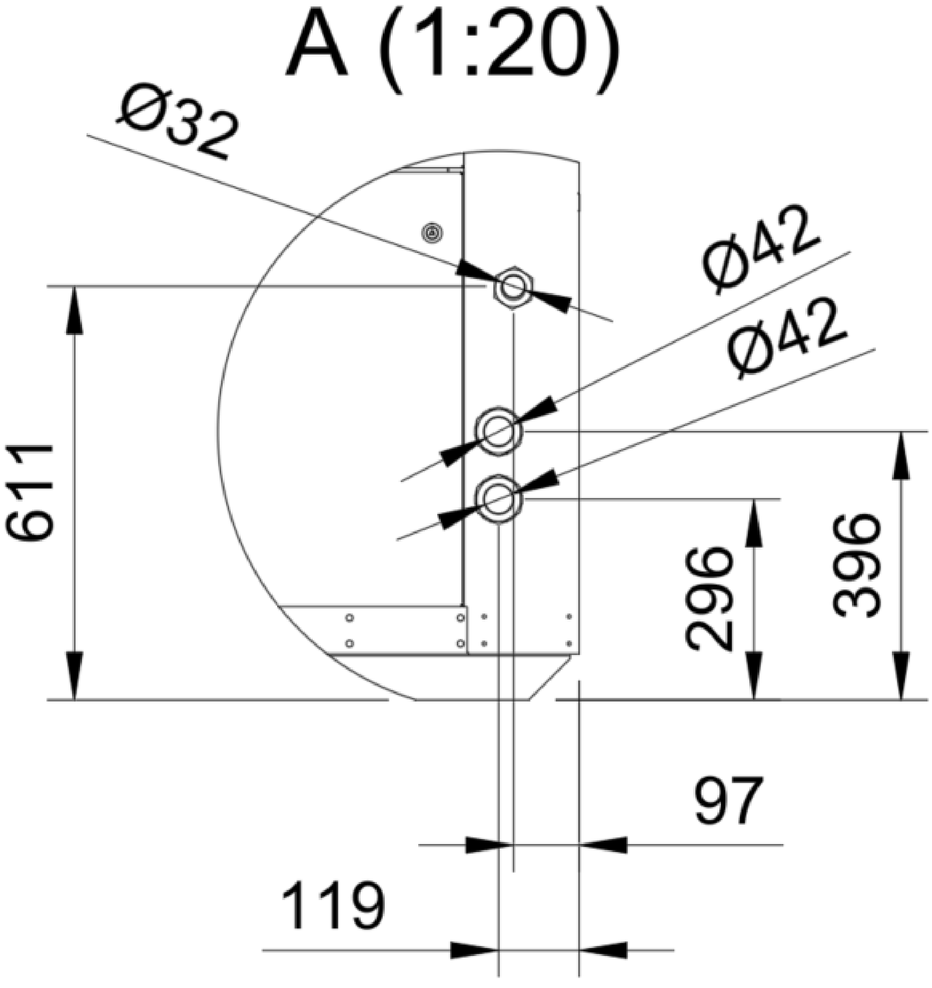
2.5.2 Acer 95/75





2.5.3 Acer 130/100

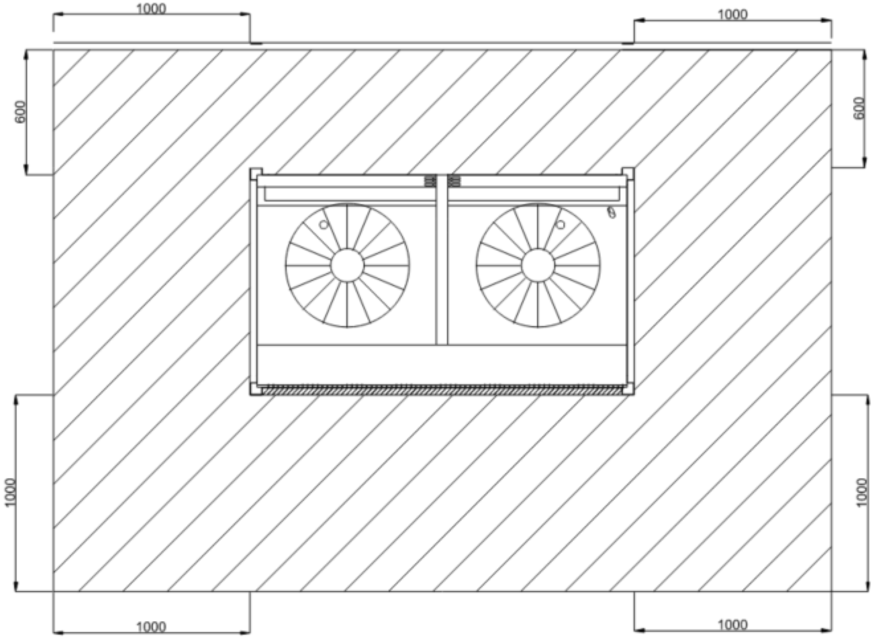




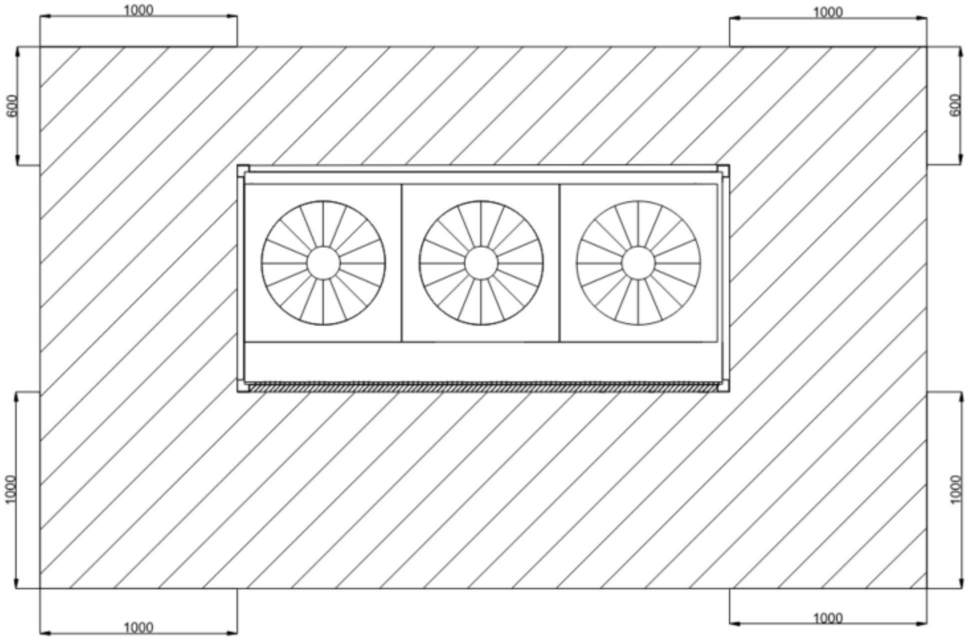
2.6 Installation Space Requirements

2.6.1 Single Unit Installation

ACER 50kW



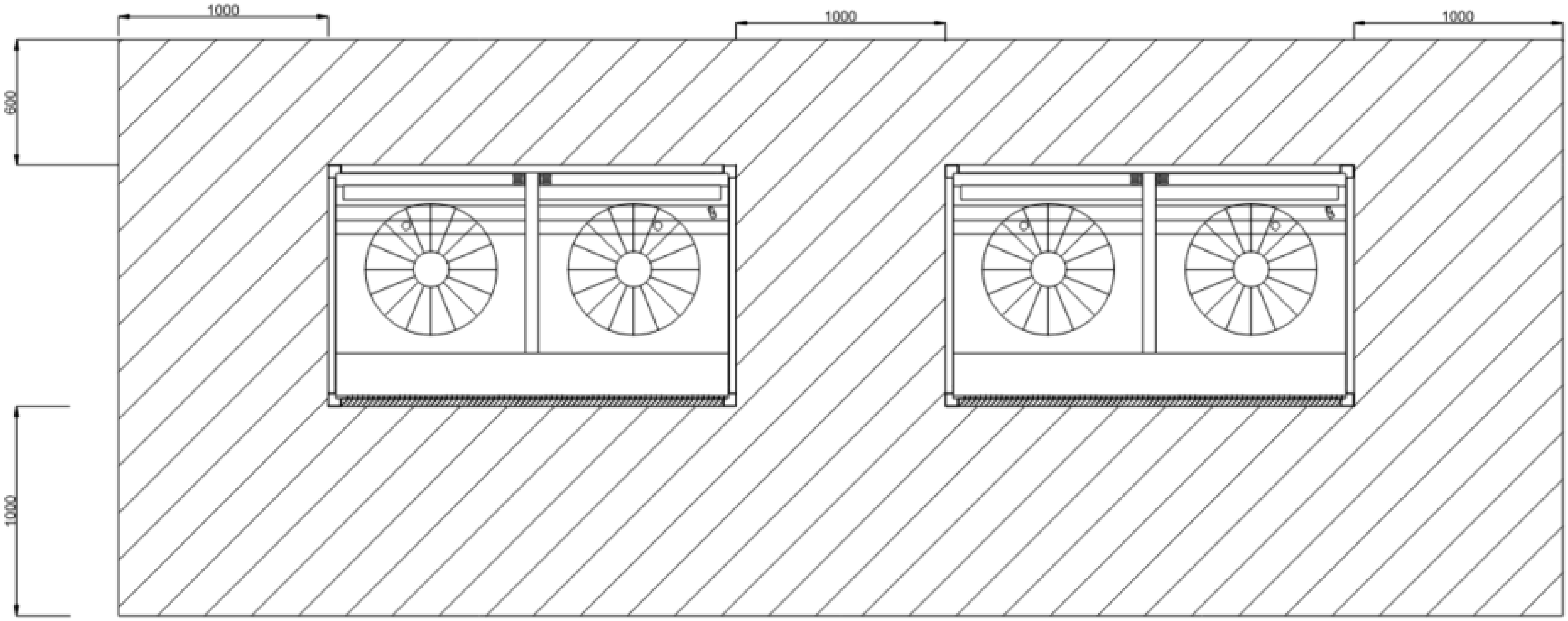
ACER 75kW



Note. 1 Meter around front and
sides to be kept clear to allow
access to heat pump, and 0.6
meters at the back of the unit
away from other units or walls,
shown in hatched region.

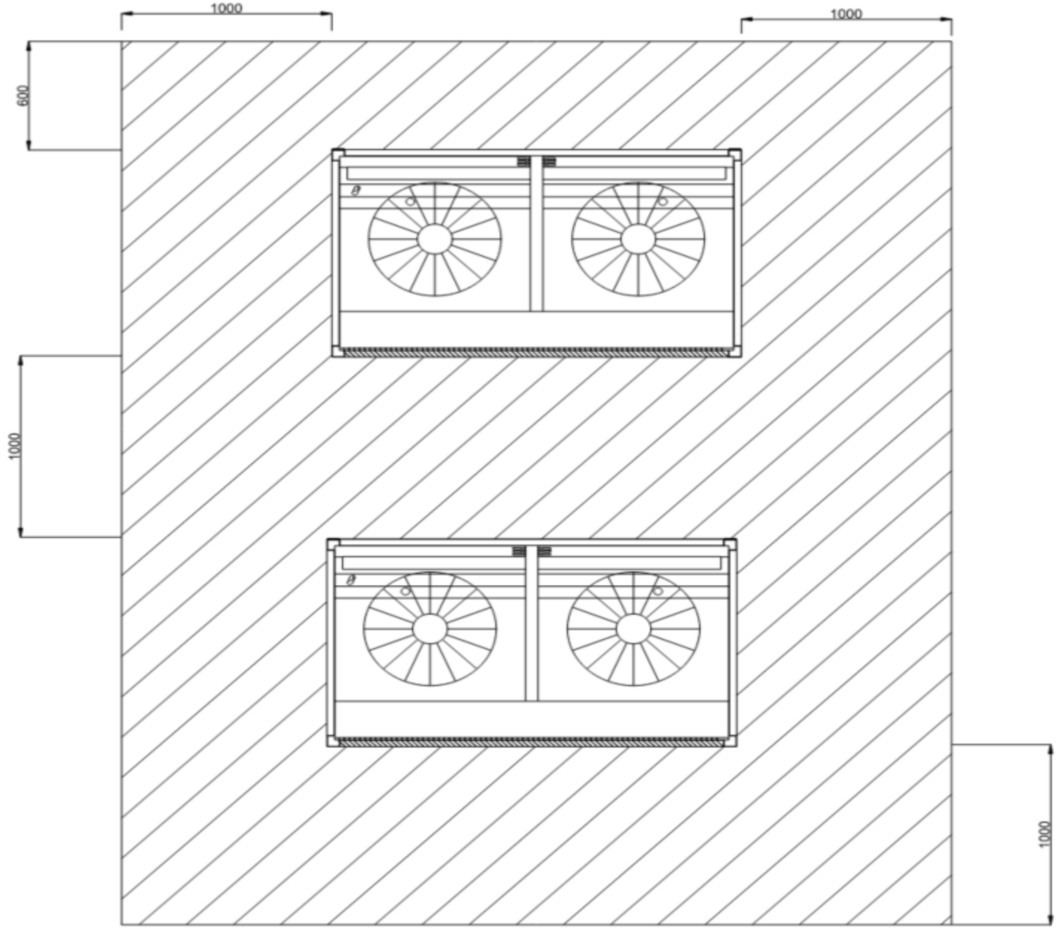
2.6.2 Multiple Unit Installation

When installing multiple units, make sure to take into consideration factors such as providing enough space for people to pass through, ample space between blocks of units, and sufficient space for airflow. Side by side installation, allow access to side of each unit for access.



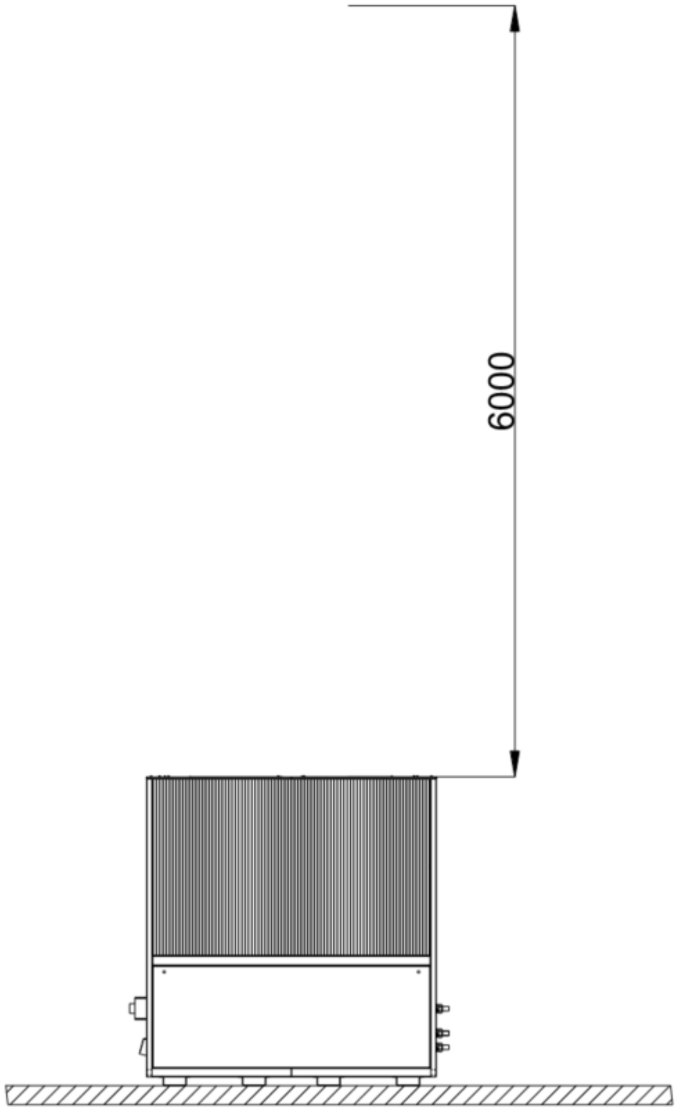
Note. 1 Meter around front and sides to be kept clear to allow access to heat pump, and 0.6 meters at the back away from other units or walls, shown in hatched region.

Units can be placed front to back, ensuring there is 1000mm between the front and back of the units. Please ensure no pipework runs over or across the equipment's access panels, as this can hinder routine inspections and servicing. Likewise, the unit should not installed beneath a dedicated shelter or roof.



Note. 1 Meter to be kept clear to allow access to heat pump, shown in hatched region.

2.6.3 Vertical Clearance

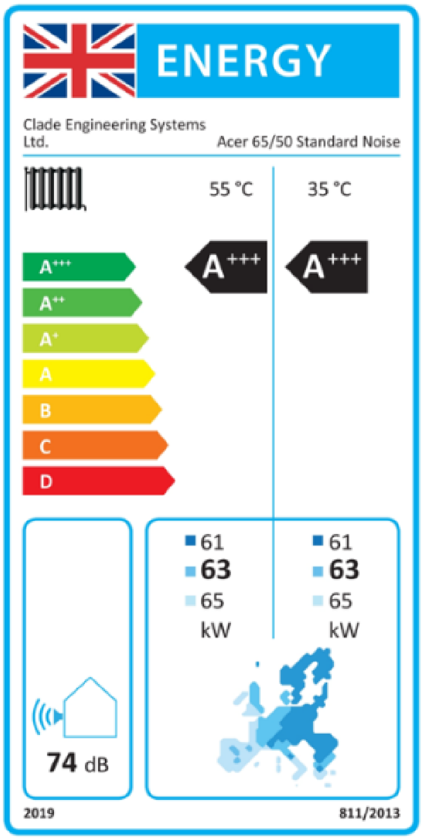


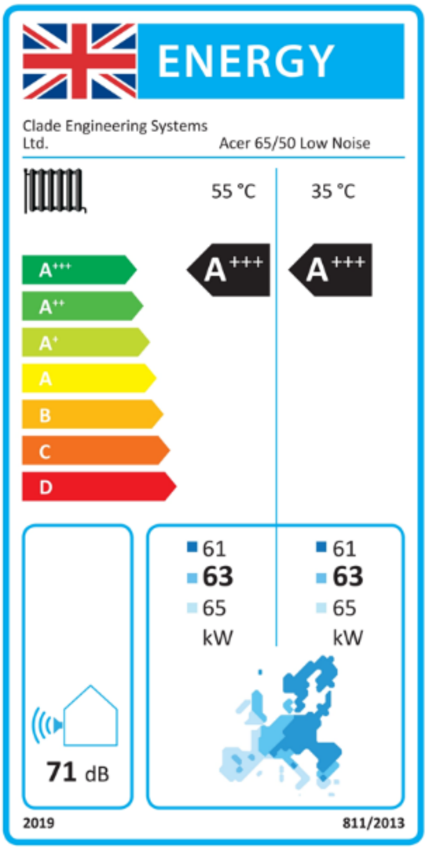
3 Technical Data

3.1 Performance Data

Acer Range		65/50	95/75	130/100
Heating performance data to EN14825 (A-5/W70) 40K TD				
Rated heating output	kW	48.2	72.4	94.8
Power Consumption	kW	24.1	36.5	47.3
Current Input	A	44.0	66.5	86.1
Coefficient of Performance (COP)		2.34	2.32	2.40
Seasonal Coefficient of Performance (SCOP)		2.65	2.63	2.63
Heating performance data to EN14825 (A7/W70) 40K TD				
Rated heating output	kW	56.0	92.2	122.9
Power Consumption	kW	25.3	32.3	51.1
Current Input	A	46.1	69.2	93.2
Coefficient of Performance (COP)		2.85	2.83	2.92
Seasonal Coefficient of Performance (SCOP)		2.65	2.63	2.63
Temperature Range	Minimum Inlet water temp	30°C		
	Maximum Outlet water temp	70°C		
	Outdoor temp range	-15°C to 40°C		

3.1.1 Energy Labels Acer 65/50





3.2 Construction Table

Acer Range		**Acer 65/50kW**	**Acer 95/75kW**	**Acer 130/100kW**
REFRIGERATION SIDE				
Compressor Type	-	Reciprocating		
Compressor Qty	Pcs.	1		
Refrigerant	-	CO_2	CO_2	CO_2
Refrigerant Circuits	Pcs	1		
Variable speed drive (VSD)	Pcs.	1	1	1
Refrigerant charge (CO_2)	kg	5	7	10
No. evaporators	Pcs.	1		
Evaporators Type	-	Flat bed		
Fin Material	-	AL/MG		
Defrost Type	-	Hot Gas CO_2		
Defrost medium	-	CO_2		
Electrical supply	-	3~ 400V 50 HZ		
DIMENSIONS & NOISE				
Acer Low Noise				
Colour	-	RAL7016 Anthracite		
Unit Weight (empty)	kg	1003	1368	1596
Unit Weight (operational)	kg	1008	1375	1605
Sound Power Level $L_{W(A)}$ (dB)*	dB	72	74	76
Acer Standard Noise				
Colour	-	RAL7016 Anthracite		
Unit Weight (empty)	kg	938	1263	1302
Unit Weight (operational)	kg	943	1270	1311
Sound Power Level $L_{W(A)}$ (dB)*	dB	82	83	85
Access				
Minimum free space side	mm	1000	1000	1000
Minimum free space front	mm	1000	1000	1000
Minimum free space back	mm	600	600	600
Minimum free space above	mm	6000	6000	6000
WATER SIDE				
Type of internal exchanger	-	Stainless steel plate heat exchanger		
Exchanger Water content	l	3.9	3.9	5.0
Connections waterside Flow/Return	DN	28mm Copper	35mm Copper	42mm Copper
Connections waterside Pressure Rating	PN	6		
Waterside Burst Disk (supplied by installer)	PN	6		
Control Methodology	-	Pump		
Water flow rates				
Nominal dT 40 K	l/s	0.37	0.55	0.73
Nominal dT 35 K	l/s	0.43	0.63	0.84
Nominal dT 30 K	l/s	0.42	0.73	0.98
Minimum Water Flow Rate	l/s	0.12	0.18	0.23
Minimum water volume in heating	l	303	443	606
Total internal water volume	l	4.3	6.3	8.4
Waterside Pressure Drops	kPa	28	40	40

FANS SECTION				
Fans type	-	Axial fans		
N° fans	Pcs.	2	3	3
Standard air-flow	m^3/h	17,640	26,280	31,320
Additional Static Pressure Available	Pa	0	0	0
Fan regulation	-	0-10V		
Fan Power Input	kW	1.4	2.0	2.7
ELECTRICAL DATA				
Total Absorbed Power (at 7°C ambient)	kW	25.3	32.3	51.1
Total Current per phase	A	46.1	69.2	93.2
Starting Method	-	Soft Start		
Starting Current (at -5°C ambient)	A	22	32.5	43.5
Total kVA	kVA	32.0	48.0	64.5
Electrical supply	-	3~ 400V 50 HZ		
Communication protocol	-	BACNET over IP (optional extra)		
IP-Class	-	IP54		

3.3 Electrical data

3.3.1 Supply voltage 400/3/50+N

ACER		65/50kW	95/75kW	130/100kW
F.L.A. - Full load current at max admissible conditions (per phase)				
F.L.A. - Total	A	46.1	69.2	93.2
F.L.I. - Full load power input at max admissible conditions				
F.L.I. - Total	kW	25.3	32.3	51.1
M.I.C. - Maximum inrush current				
M.I.C. - Total	A	67.60	101.33	127.26

Power supply 400/3/50 (+ NEUTRAL) +/- 10%. Maximum Phase Unbalance: 2%.

For non-standard voltage please contact Clade technical office

3.3.2 Wiring cross sections and fuse protection

UNIT	External power supply		
	Power supply	Switch manual	fuses
65/50kW	380-415V 3N~ 50Hz	80A (pre mounted)	80A
95/75kW	380-415V 3N~ 50Hz	80A (pre mounted)	80A
130/100kW	380-415V 3N~ 50Hz	100A (pre mounted)	100A

Deviating connection lengths and electrical fuses must be calculated according to the country-specific regulations.

3.4 Noise/Attenuation

Noise attenuation is built into the Low Noise (LN) Acer heat pump. The LN heat pump is designed with integral inlet/outlet silencers installed to the fans and upgraded housing to minimise noise. Standard Noise (SN) Acer units have no additional attenuation to the evaporator fans or housing.

To reduce the transmission of vibration and associated noise through pipework and structural elements, flexible connections must be used on all water connections to the unit. Proper isolation and support of attached pipework is also essential to minimise operational noise.

External fixings to the housings, such as pipe supports, fencing, or brackets, will adversely affect vibration and noise performance and are not recommended.

3.4.1 Noise Calculation

Noise details are detailed below for the Acer heat pump Range. Data includes units with optional silencers installed as well as a low noise housing option with silencers for comparison. Reported In accordance with BS EN ISO 4871: 2009 and Measured in Accordance with BS EN ISO 9614 - Part 1: 2009

Acer Range	Acer 65 / 50		Acer 95 / 75		Acer 130 / 100	
	Standard	Low Noise	Standard	Low Noise	Standard	Low Noise
Sound Power Level, $L_{W(A)}$ (dB)	82	72	83	74	85	76
Sound Pressure Level at 10m (dB)	50	44	51	45	53	46
Uncertainty (dB)	4	4	4	4	4	4

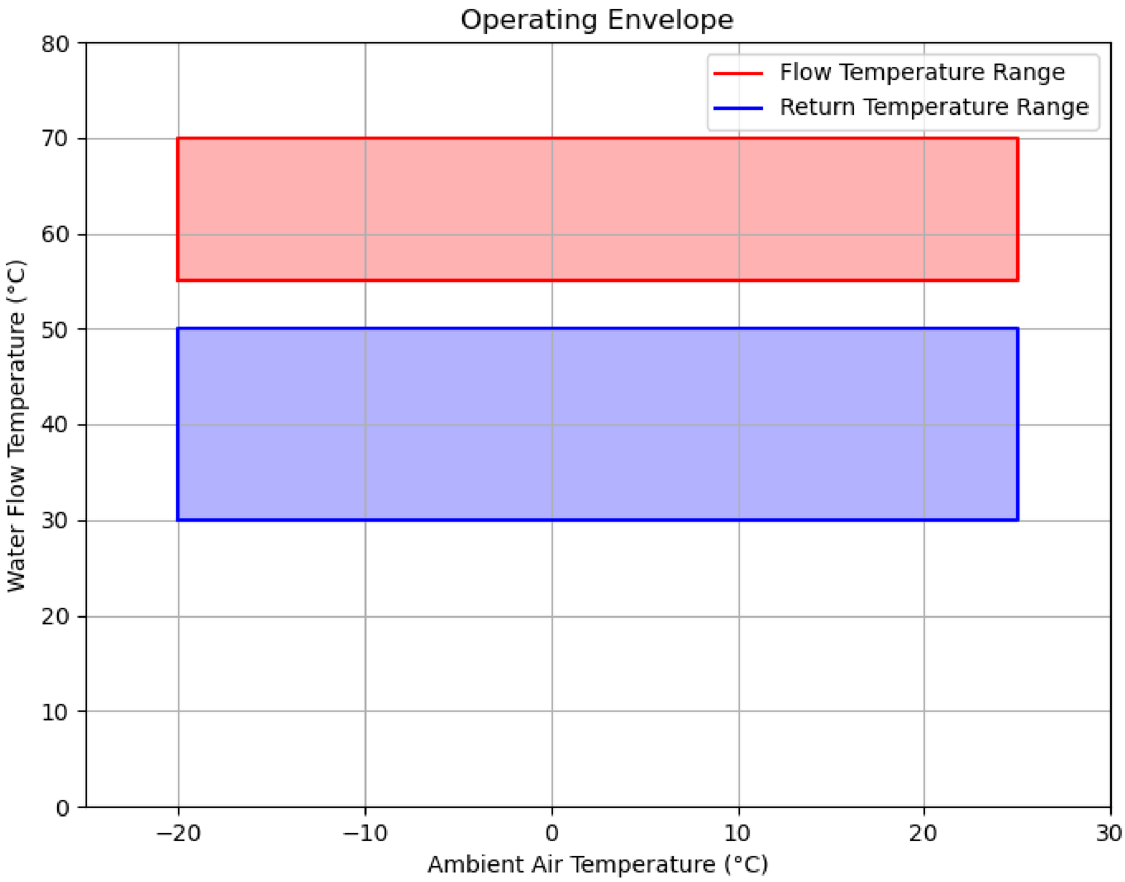
Note 1: Values determined in accordance with test standard BS EN ISO 9614 - Part 1: 2009 (survey grade).
Note 2: The sum of a measured noise emission value and its associated uncertainty represents an upper boundary of the range of values which is likely to occur in measurements

3.5 Glycol use correction factors

% propylene glycol by weight		0%	10%	20%	30%
Freezing point	°C	0	-4	-9	-16
Correction factor for flow rate	Nr	1	1.025	1.056	1.093
Correction factor for system pressure drop	Nr	1	1.053	1.118	1.200
Correction factor for unit heating capacity	Nr	1	1.005	1.011	1.019

The correction factors shown refer to water and propylene glycol mixes used to prevent the formation of frost on the exchangers in the water circuit during inactivity in winter. Glycol has no impact on kW output of the Acer units, instead the unit modulates flow rate.

3.6 Operating Ranges



3.7 Integral Pumps

Each Acer heat pump is equipped with an integral circulation pump on speed control from 20 -100%. It is important to note that pump speed is not the same as a direct mass flow rate control, rather, the heat pump's controller adjusts pump speed to balance system requirements.

Contractors must establish the final, correct mass flow rate under full-speed (100%) conditions. Ensuring this flow rate meets design specifications at maximum speed is essential for verifying that the pump can deliver the necessary head when the heat pump operates at peak load.

The internal heat exchanger, valves, and pipework in the unit create a pressure drop that increases with flow. Because the pump speed is adjustable, contractors must confirm that the required head is available at each operating condition.

Minimum Speed Check: At around 20% speed, ensure there is still adequate head to maintain flow through the heat exchanger.

Maximum Speed Check: At 100% speed, confirm the pump meets the highest expected pressure drop.

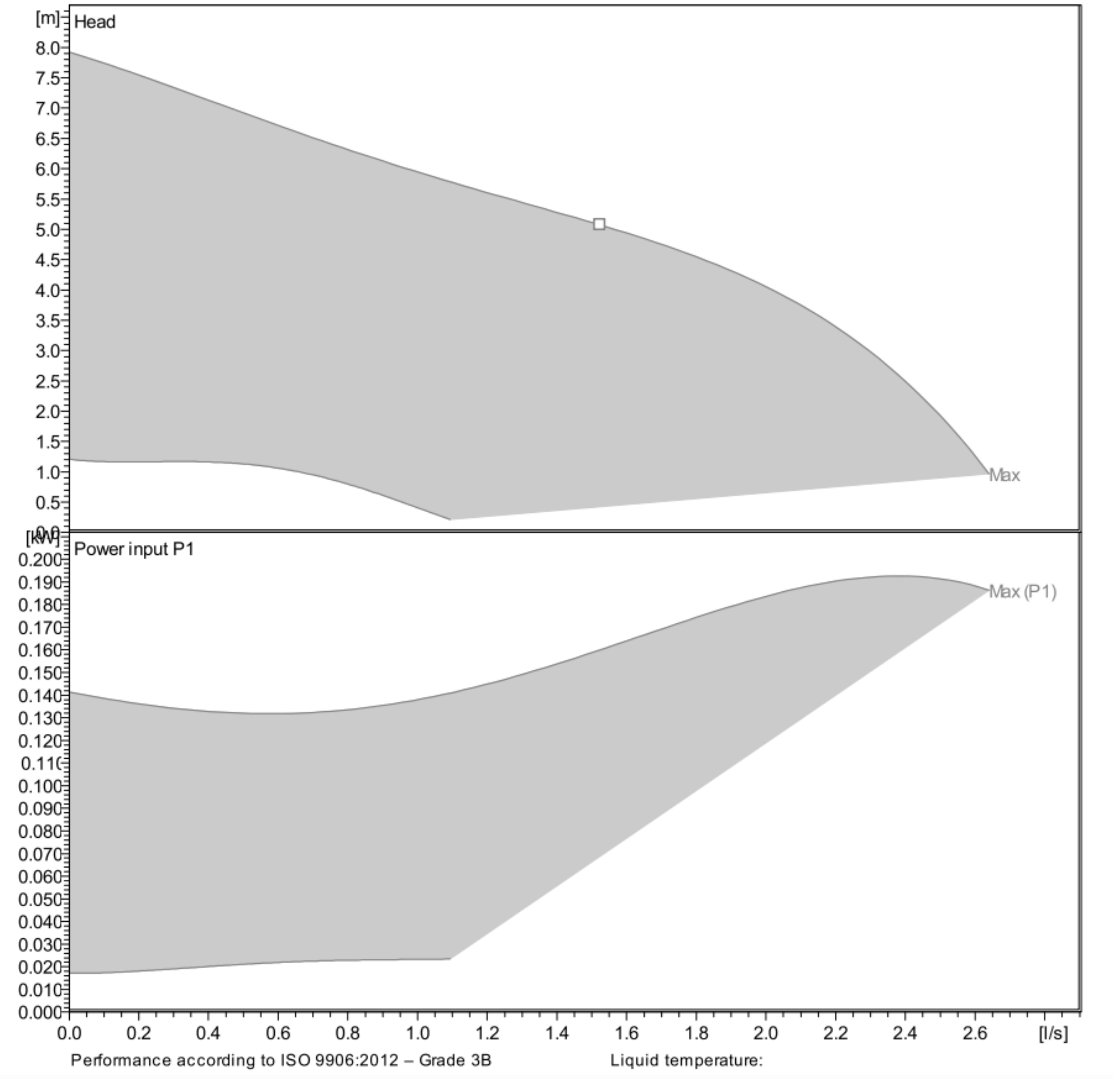
If the system's flow rate and head pressure are not set correctly, several issues can arise:

Insufficient flow: The heat pump will not achieve its intended capacity or required temperature differential, resulting in low heating performance.

Excessive flow: If the flow is too high, the water passes through the heat exchanger too quickly, reducing the temperature differential. The heat pump may then struggle to transfer enough heat to the system.

3.7.1 Pump Curve Acer

During commissioning, the contractor must adjust the commissioning sets so that the Lowara Ecocirc XL 25-80 pump delivers maximum required flow rate for the dT at 100% speed. Achieving this correct head ensures the design flow rate is met under full-load conditions, preventing underflow or overflow and ensuring the system operates efficiently.



3.8 Part Load Considerations

3.8.1 Differential Pressure Control

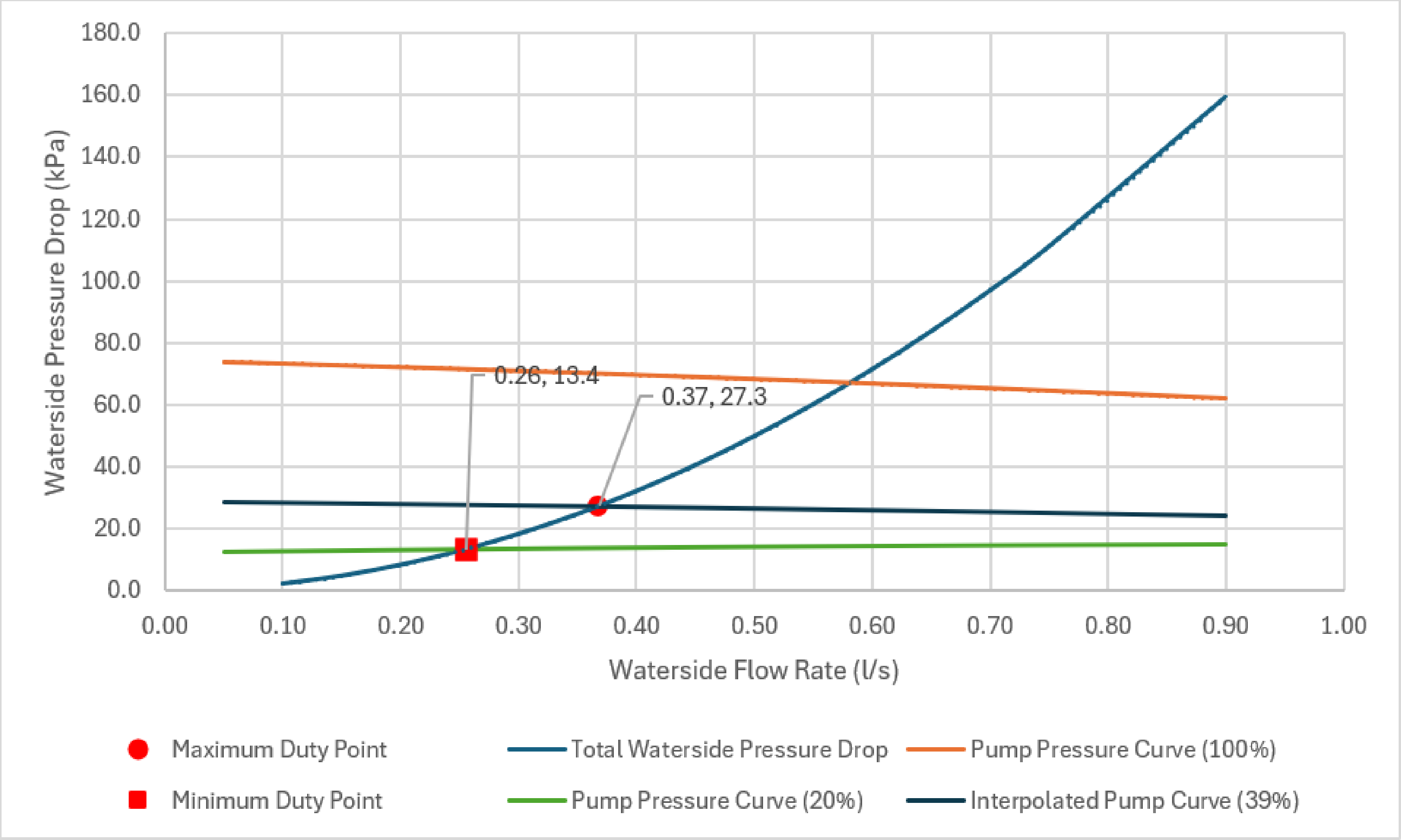
As the system modulates capacity the LTHW pump within the heat pump will also modulate to regulate flow rates to corresponding capacity and required mass flow rates.

Flow rate and pressure control on connected LTHW systems should be considered when applying variable flow equipment. It is recommended that differential pressure valves are installed on the return to the heat pumps to ensure minimum pressure drop across the heat pump flow and return pipework remain within the pump curves of the heat pump LTHW pump. See Pump Curves section to reference duty point conditions.

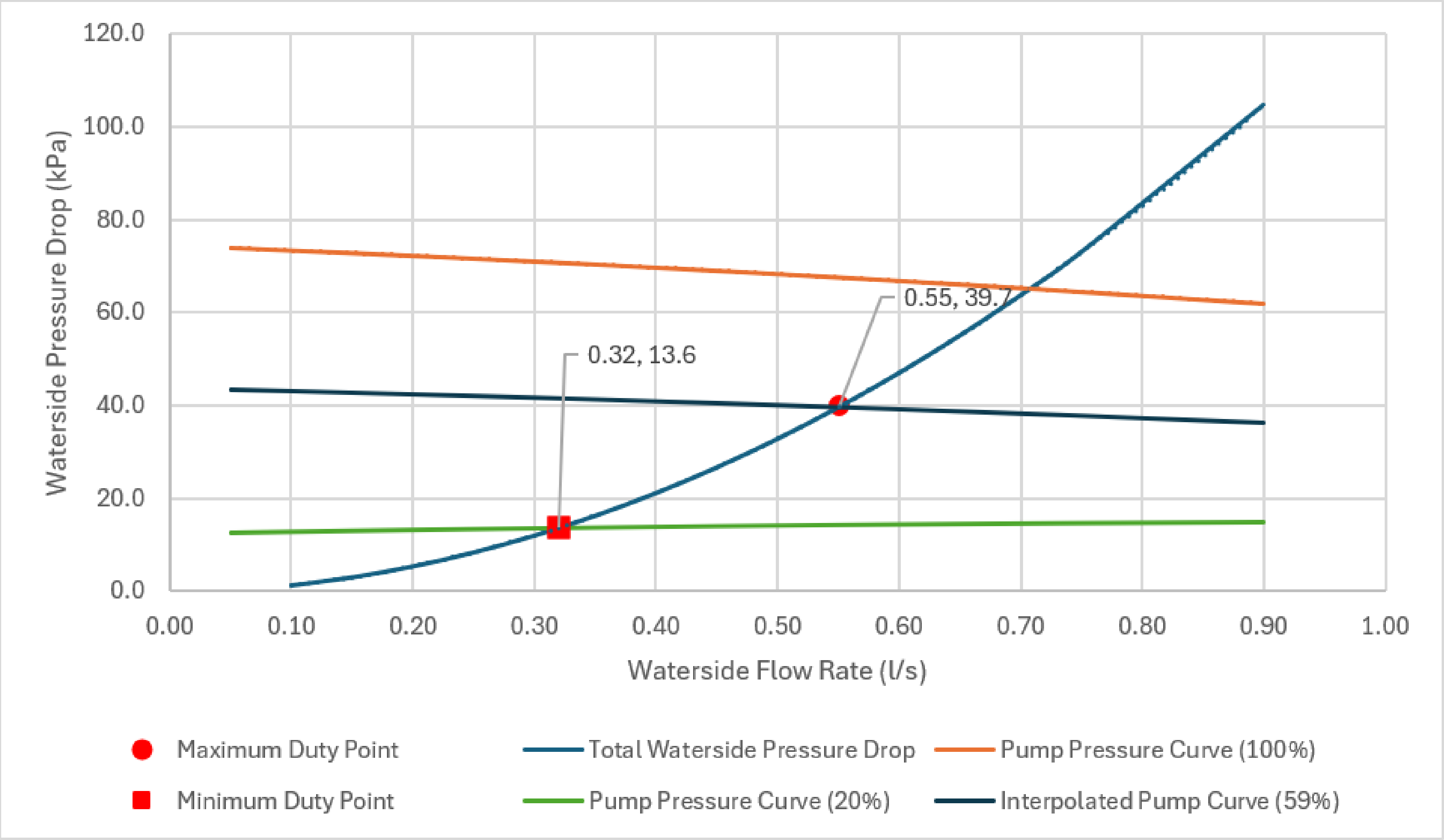
Clade recommend the use of a Danfoss Differential pressure controller with flow limitation,
AFP/VFG2 or similar. Please contact Danfoss to confirm specification and application with your LTHW system pressure drops and design flow rates.

3.9 Internal Exchanger Pressure Drops and Admissible Water Flow Rates

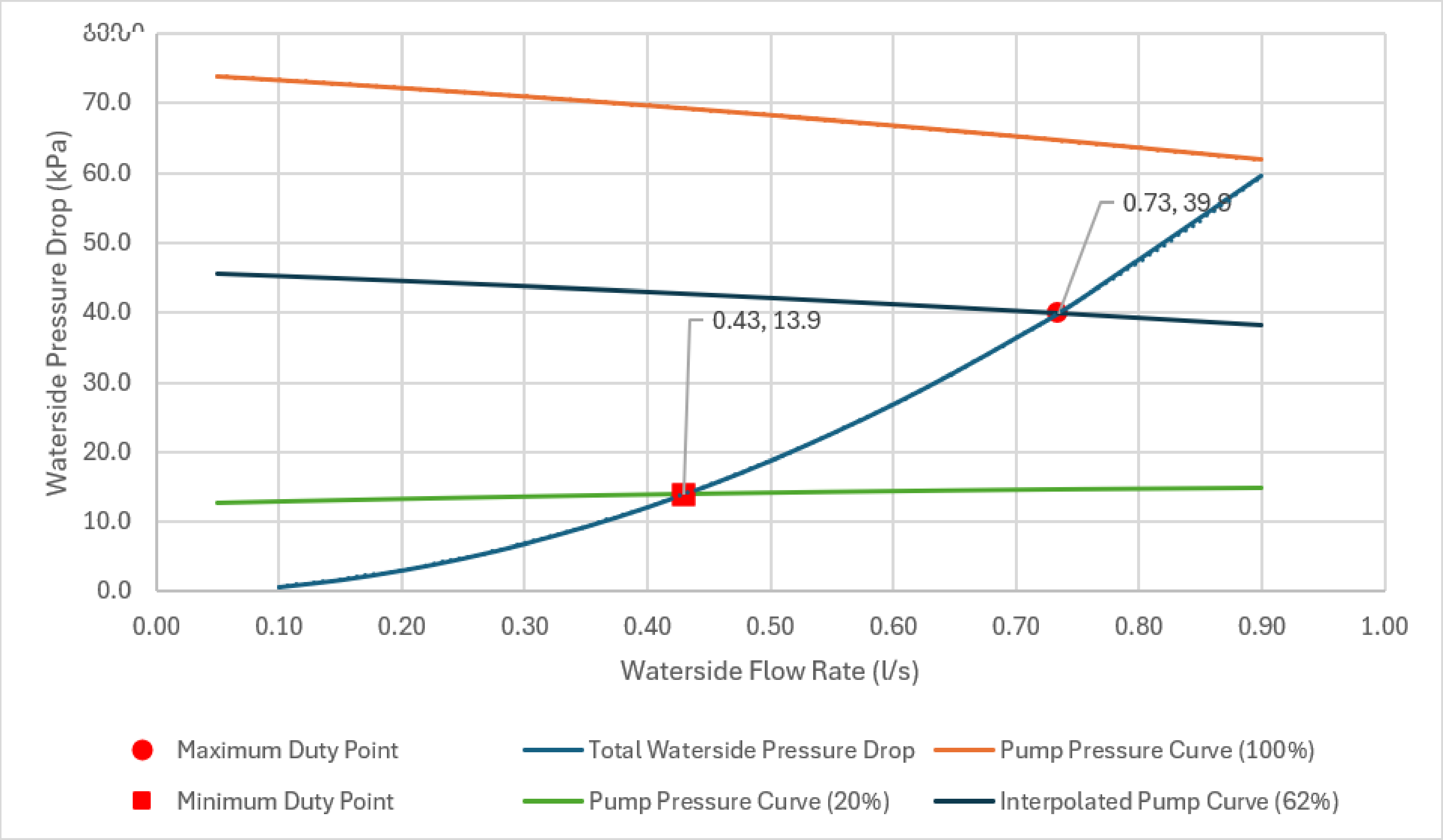
Acer Range 65/50



Acer Range 95/75



Acer Range 130/100



3.10 Heating Performances

The performance data presented here reflects testing under the controlled parameters outlined in EN 14825 and is intended for ideal conditions only. Actual performance may differ due to variables such as installation specifics, operational settings, and climatic variations. Customers should verify requirements for each individual application, recognizing that local conditions in the United Kingdom can markedly influence real-world results.

These units support two operating modes:

1. **Power Mode:** Heat output remains unrestricted up to outdoor temperatures of 7 °C, offering greater capacity in milder conditions, albeit with increased power input.

2. **Efficiency Mode:** Heat output is capped at conditions equivalent to -5 °C, allowing the electrical demand to remain at the same level as -5 °C operation. This is particularly beneficial for installations where electrical capacity is limited.

Acer Range 65/50

Heating Capacity (Power Mode)																							
Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ACER 65/50	**70/35**	2.5	40.8	20.6	2.0	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22.0	2.6	57.8	19.6	3.0	57.8	17.9	3.2
	65/35	2.5	40.8	20.6	2.0	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22.0	2.6	57.8	19.6	3.0	57.8	17.9	3.2
	60/35	2.5	40.8	20.6	2.0	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22.0	2.6	57.8	19.6	3.0	57.8	17.9	3.2
	70/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3.0	61.6	18.7	3.3
	65/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3.0	61.6	18.7	3.3
	60/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3.0	61.6	18.7	3.3
	55/35	2.5	40.8	20.6	2.0	45.5	21.2	2.1	50.5	21.6	2.3	55.7	21.9	2.5	57.8	22.0	2.6	57.8	19.6	3.0	57.8	17.9	3.2
	55/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	53.6	21.1	2.5	59.3	21.5	2.8	61.6	21.6	2.8	61.6	20.5	3.0	61.6	18.7	3.3
	70/40	2.2	38.2	21.7	1.8	42.6	22.3	1.9	47.2	22.7	2.1	52.1	23.0	2.3	54.1	23.1	2.3	54.1	19.2	2.8	54.1	17.5	3.1
	65/40	2.2	38.2	21.7	1.8	42.6	22.3	1.9	47.2	22.7	2.1	52.1	23.0	2.3	54.1	23.1	2.3	54.1	19.2	2.8	54.1	17.5	3.1
	60/40	2.2	38.2	21.7	1.8	42.6	22.3	1.9	47.2	22.7	2.1	52.1	23.0	2.3	54.1	23.1	2.3	54.1	19.2	2.8	54.1	17.5	3.1
	70/45	1.5	27.3	23.1	1.2	30.5	23.8	1.3	33.8	24.2	1.4	37.3	24.5	1.5	38.7	24.6	1.6	38.7	23.4	1.7	38.7	21.3	1.8
	70/50	1.2	23.4	24.0	1.0	26.1	24.6	1.1	29.0	25.1	1.2	32.0	25.4	1.3	33.2	25.5	1.3	33.2	24.2	1.4	33.2	22.1	1.5

Heating Capacity (Efficiency Mode)

Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ACER 65/50	**70/35**	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
	65/35	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
	60/35	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
	70/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
	65/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
	60/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
	55/35	2.6	40.8	20.6	2.0	45.5	21.2	2.1	45.5	18.4	2.5	45.5	16.8	2.7	45.5	16.2	2.8	45.5	15.3	3.0	45.5	13.9	3.3
	55/30	2.7	43.1	19.9	2.2	48.2	20.6	2.3	48.2	18.9	2.6	48.2	17.2	2.8	48.2	16.6	2.9	48.2	15.7	3.1	48.2	14.2	3.4
	70/40	2.4	38.2	21.7	1.8	42.6	22.3	1.9	42.6	18.0	2.4	42.6	16.5	2.6	42.6	15.9	2.7	42.6	15.1	2.8	42.6	13.7	3.1
	65/40	2.4	38.2	21.7	1.8	42.6	22.3	1.9	42.6	18.0	2.4	42.6	16.5	2.6	42.6	15.9	2.7	42.6	15.1	2.8	42.6	13.7	3.1
	60/40	2.4	38.2	21.7	1.8	42.6	22.3	1.9	42.6	18.0	2.4	42.6	16.5	2.6	42.6	15.9	2.7	42.6	15.1	2.8	42.6	13.7	3.1
	70/45	1.5	27.3	23.1	1.2	30.5	23.8	1.3	30.5	21.9	1.4	30.5	20.0	1.5	30.5	19.3	1.6	30.5	18.3	1.7	30.5	16.6	1.8
	70/50	1.2	23.4	24.0	1.0	26.1	24.6	1.1	26.1	22.6	1.2	26.1	20.7	1.3	26.1	20.0	1.3	26.1	19.0	1.4	26.1	17.2	1.5

Acer Range 95/75

Heating Capacity (Power Mode)																							
Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ACER 95/75	**70/35**	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
	65/35	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
	60/35	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
	70/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
	65/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
	60/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
	55/35	2.4	61.1	30.9	2.0	68.1	31.8	2.1	75.6	32.6	2.3	83.4	33.1	2.5	86.7	33.2	2.6	86.7	29.7	2.9	86.7	27.2	3.2
	55/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	80.5	31.9	2.5	88.8	32.4	2.7	92.2	32.6	2.8	92.2	31.0	3.0	92.2	28.4	3.2
	70/40	2.2	57.2	32.4	1.8	63.7	33.4	1.9	70.8	34.2	2.1	78.1	34.8	2.2	81.1	34.9	2.3	81.1	29.2	2.8	81.1	26.7	3.0
	65/40	2.2	57.2	32.4	1.8	63.7	33.4	1.9	70.8	34.2	2.1	78.1	34.8	2.2	81.1	34.9	2.3	81.1	29.2	2.8	81.1	26.7	3.0
	60/40	2.2	57.2	32.4	1.8	63.7	33.4	1.9	70.8	34.2	2.1	78.1	34.8	2.2	81.1	34.9	2.3	81.1	29.2	2.8	81.1	26.7	3.0
	70/45	1.5	40.9	34.6	1.2	45.6	35.7	1.3	50.7	36.5	1.4	55.9	37.1	1.5	58.1	37.2	1.6	58.1	35.4	1.6	58.1	32.5	1.8
	70/50	1.2	35.1	35.8	1.0	39.1	36.9	1.1	43.4	37.8	1.1	47.9	38.4	1.2	49.8	38.6	1.3	49.8	36.7	1.4	49.8	33.7	1.5

Heating Capacity (Efficiency Mode)

Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ACER 95/75	**70/35**	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
	65/35	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
	60/35	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
	70/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
	65/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
	60/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
	55/35	2.6	61.1	30.9	2.0	68.1	31.8	2.1	68.1	27.6	2.5	68.1	25.4	2.7	68.1	24.5	2.8	68.1	23.3	2.9	68.1	21.2	3.2
	55/30	2.6	65.0	30.3	2.1	72.4	31.2	2.3	72.4	28.8	2.5	72.4	26.5	2.7	72.4	25.6	2.8	72.4	24.3	3.0	72.4	22.2	3.3
	70/40	2.4	57.2	32.4	1.8	63.7	33.4	1.9	63.7	27.2	2.3	63.7	24.9	2.6	63.7	24.1	2.6	63.7	22.8	2.8	63.7	20.8	3.1
	65/40	2.4	57.2	32.4	1.8	63.7	33.4	1.9	63.7	27.2	2.3	63.7	24.9	2.6	63.7	24.1	2.6	63.7	22.8	2.8	63.7	20.8	3.1
	60/40	2.4	57.2	32.4	1.8	63.7	33.4	1.9	63.7	27.2	2.3	63.7	24.9	2.6	63.7	24.1	2.6	63.7	22.8	2.8	63.7	20.8	3.1
	70/45	1.5	40.9	34.6	1.2	45.6	35.7	1.3	45.6	32.9	1.4	45.6	30.2	1.5	45.6	29.2	1.6	45.6	27.7	1.6	45.6	25.4	1.8
	70/50	1.2	35.1	35.8	1.0	39.1	36.9	1.1	39.1	34.1	1.1	39.1	31.3	1.2	39.1	30.3	1.3	39.1	28.7	1.4	39.1	26.3	1.5

Acer Range 130/100

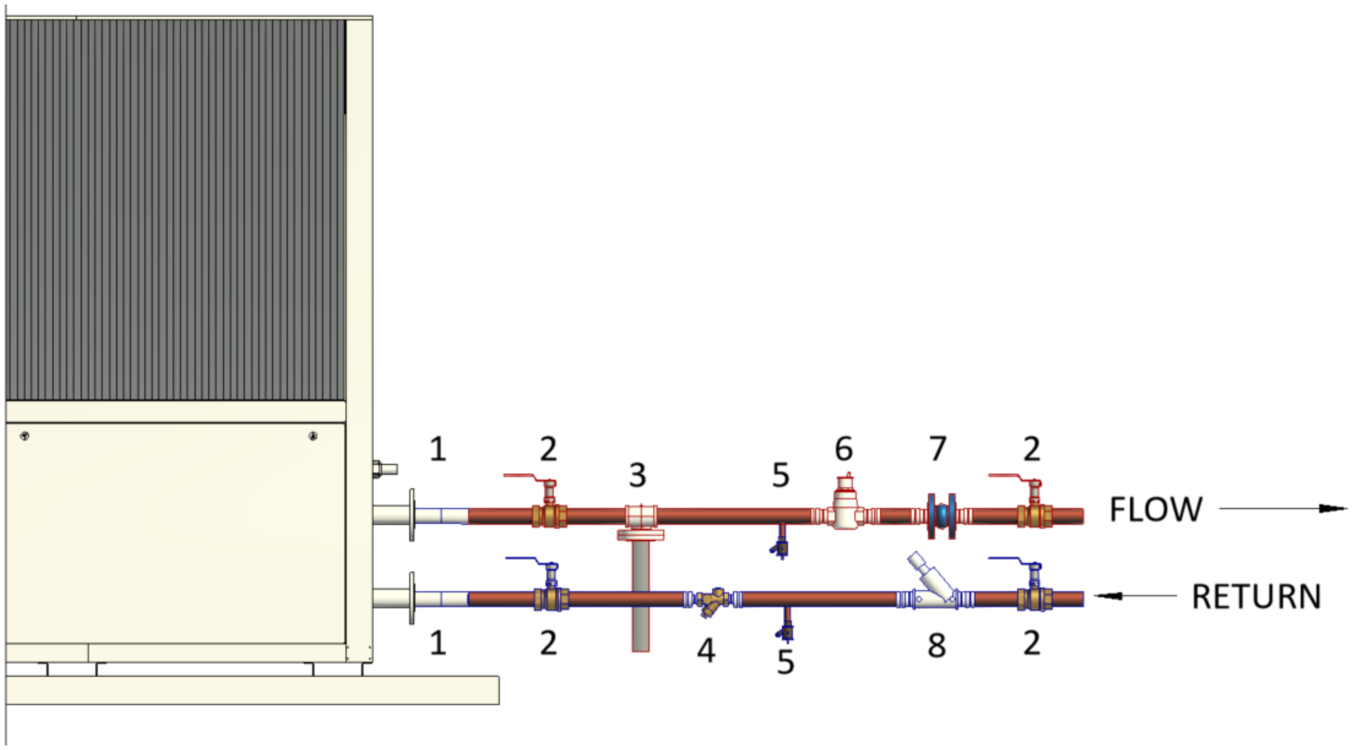
Heating Capacity (Power Mode)																							
Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ACER 130/100	**70/35**	2.4	79.1	39.4	2.0	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
	65/35	2.4	79.1	39.4	2.0	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
	60/35	2.4	79.1	39.4	2.0	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
	70/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118.0	43.3	2.7	122.9	43.8	2.8	122.9	42.0	2.9	122.9	39.2	3.1
	65/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118.0	43.3	2.7	122.9	43.8	2.8	122.9	42.0	2.9	122.9	39.2	3.1
	60/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118.0	43.3	2.7	122.9	43.8	2.8	122.9	42.0	2.9	122.9	39.2	3.1
	55/35	2.4	79.1	39.4	2.0	89.1	41.1	2.2	99.8	42.7	2.3	110.9	44.2	2.5	115.5	44.7	2.6	115.5	40.4	2.9	115.5	37.6	3.1
	55/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	106.2	41.9	2.5	118.0	43.3	2.7	122.9	43.8	2.8	122.9	42.0	2.9	122.9	39.2	3.1
	70/40	2.2	74.0	41.3	1.8	83.4	43.2	1.9	93.4	44.9	2.1	103.9	46.4	2.2	108.2	46.9	2.3	108.2	39.8	2.7	108.2	37.0	2.9
	65/40	2.2	74.0	41.3	1.8	83.4	43.2	1.9	93.4	44.9	2.1	103.9	46.4	2.2	108.2	46.9	2.3	108.2	39.8	2.7	108.2	37.0	2.9
	60/40	2.2	74.0	41.3	1.8	83.4	43.2	1.9	93.4	44.9	2.1	103.9	46.4	2.2	108.2	46.9	2.3	108.2	39.8	2.7	108.2	37.0	2.9
	70/45	1.5	53.0	44.1	1.2	59.7	46.0	1.3	66.9	47.9	1.4	74.4	49.5	1.5	77.4	50.0	1.5	77.4	48.1	1.6	77.4	44.8	1.7
	70/50	1.2	45.4	45.7	1.0	51.2	47.7	1.1	57.3	49.6	1.2	63.7	51.2	1.2	66.4	51.8	1.3	66.4	49.8	1.3	66.4	46.4	1.4

Heating Capacity (Efficiency Mode)

Model name	Water Temp (°C)	SCOP	-10°C External			-5°C External			0°C External			5°C External			7°C External			10°C External			15°C External		
			QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP	QH (kW)	PI (kW)	COP
ACER 130/100	**70/35**	2.5	79.1	39.4	2.0	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29.0	3.1
	65/35	2.5	79.1	39.4	2.0	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29.0	3.1
	60/35	2.5	79.1	39.4	2.0	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29.0	3.1
	70/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35.0	2.7	94.8	34.0	2.8	94.8	32.6	2.9	94.8	30.2	3.1
	65/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35.0	2.7	94.8	34.0	2.8	94.8	32.6	2.9	94.8	30.2	3.1
	60/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35.0	2.7	94.8	34.0	2.8	94.8	32.6	2.9	94.8	30.2	3.1
	55/35	2.5	79.1	39.4	2.0	89.1	41.1	2.2	89.1	36.1	2.5	89.1	33.7	2.6	89.1	32.7	2.7	89.1	31.3	2.8	89.1	29.0	3.1
	55/30	2.6	84.1	38.6	2.2	94.8	40.3	2.4	94.8	37.6	2.5	94.8	35.0	2.7	94.8	34.0	2.8	94.8	32.6	2.9	94.8	30.2	3.1
	70/40	2.4	74.0	41.3	1.8	83.4	43.2	1.9	83.4	35.6	2.3	83.4	33.1	2.5	83.4	32.2	2.6	83.4	30.8	2.7	83.4	28.5	2.9
	65/40	2.4	74.0	41.3	1.8	83.4	43.2	1.9	83.4	35.6	2.3	83.4	33.1	2.5	83.4	32.2	2.6	83.4	30.8	2.7	83.4	28.5	2.9
	60/40	2.4	74.0	41.3	1.8	83.4	43.2	1.9	83.4	35.6	2.3	83.4	33.1	2.5	83.4	32.2	2.6	83.4	30.8	2.7	83.4	28.5	2.9
	70/45	1.4	53.0	44.1	1.2	59.7	46.0	1.3	59.7	43.0	1.4	59.7	40.0	1.5	59.7	38.9	1.5	59.7	37.3	1.6	59.7	34.6	1.7
	70/50	1.2	45.4	45.7	1.0	51.2	47.7	1.1	51.2	44.5	1.2	51.2	41.5	1.2	51.2	40.3	1.3	51.2	38.6	1.3	51.2	35.8	1.4

4 Hydraulics

4.1 Piping Connections



1	Flexible joint	Noise/vibration reduction
2	Isolation Valve	Allows for maintenance
3	Burst Disc	Protects against sudden pressure changes (see section 4.4.3)
4	Strainer	To remove debris from the system.
5	Drain valve	Allows for drainage during servicing of components
6	Air vent valve	Required to release air accumulating within system
7	Non-return valve	Prevents backflow, ensuring fluid moves in the intended direction.
8	Commissioning set	Used for system balancing, performance testing, and setting operational parameters during commissioning.

Optional: As stated in section 3.8.1 a Danfoss Differential pressure controller with flow limitation, AFP/VFG2, is recommended.

4.1.1 Pipe Connection Sizes

Connection Type	Acer 65/50kW	Acer 95/75kW	Acer 130/100kW
Heating Flow	28mm Copper - plain end	35mm Copper - plain end	42mm Copper - plain end
Heating Return	28mm Copper - plain end	35mm Copper - plain end	42mm Copper - plain end
Condensate	40mm solvent weld waste pipe - plain end	40mm solvent weld waste pipe - plain end	40mm solvent weld waste pipe - plain end

4.2 Defrost

The ASHPs come with their own hot gas frost protection cycle. This shuts off the internal LTHW flow through the ASHPs and directs hot gas through the evaporation coils removing any ice build-up. To mitigate the loss of output while in defrost, the system buffer vessel must be sized accordingly.

4.2.1 Minimum Buffer Size

Clade's minimum buffer recommendations are given in the table. These represent the minimum storage requirements necessary to protect the heat pump and allow for a maximum of six starts per hour.

	50kW	75kW	100kW
Minimum buffer vessel capacity	303L	443 L	606L

4.2.2 Optimal Buffer Sizing

While the minimum buffer sizes ensure basic heat pump protection and operational stability, optimally sized buffers enhance system efficiency, reduce cycling frequency, and improve overall performance. Buffer vessel sizing ultimately rests with the system designer however, the following recommendations provide guidance on selecting the ideal buffer capacity to maximise energy efficiency and maintain consistent heating output.

Defrost Cycle Management: Air source heat pumps undergo periodic defrost cycles, during which the heat pump uses hot gas to clear ice from the evaporator. During this period, the buffer vessel provides stored thermal energy to maintain heating supply to the building. The vessel must be sized to cover the full heat load during defrost to prevent temperature drops. Clade recommends a minimum of 30 minutes storage to cover this.

Peak Load Consideration: The buffer volume should accommodate the total peak kWh heating demand of the building while accounting for variations in heat pump output due to defrost.

Building Load Profiles: CIBSE Guide A shows how to perform detailed analysis of building heating load profiles. Factors such as occupancy patterns, thermal mass, and intermittent heating requirements should be evaluated to determine the total time the peak load is required and the necessary storage capacity.

4.2.3 Buffer Design Considerations

To ensure optimal performance and efficiency in heat pump systems, proper buffer vessel design is crucial. A well-designed buffer enhances stratification, maximises usable volume, and provides precise control for charging and discharging cycles. Key aspects of an effective buffer design include:

- **Height-to-Width Ratio**: A buffer vessel should have a minimum height-to-width ratio of 2.5:1. This geometry promotes better thermal stratification by reducing the potential for mixing between layers, ensuring a stable temperature gradient within the vessel.

- **Sparge Pipes**: Increases the useable volume of the vessel.

- **External Combined Headers:** One in one out header based on CIBSE Cp1. Prevents mixing an and maintains stratification and sized to achieve less than 0.2 m/s velocity into the vessel. The header helps maintain stable pressure conditions across both the primary and secondary circuits. This is essential for variable flow systems and avoids issues with fluctuating demand. For the Acer units the pipework header should be sized at this velocity all the way back to heat pumps to prevent the integral pumps working against each other.

- **Perforated Baffle Plate**: Positioned inside the vessel, the baffle plate ensures an even spread of stratification and helps maintain the cold section at the bottom of the buffer critical for return temperatures.

- **Temperature sensors**
    - Five temperature sensors distributed vertically within the buffer need to be distributed properly for precise monitoring and adjustments to maintain optimal conditions. When there are multiple buffers, these need to be spread across the vessels evenly.

4.3 Frost Protection

The unit has an inbuilt frost protection mechanism, with integral pumps that continuously circulate fluid whenever outside temperatures approach freezing. This motion ensures the interconnecting pipework to the buffer is kept warm, preventing any risk of ice formation or damage.

4.4 System Pressure

All mechanical/LTHW systems require pressure relief equipment to maintain the safe working condition of the system. This will be designed and specified by the system designer/installer.

4.4.1 Safety Valves

Safety valves on the low-temperature hot-water side are compulsory on all Acer installations. Their role is to prevent system pressure from rising above the maximum allowable working pressure, thereby protecting pipework, heat exchangers and ancillary equipment from over-pressure incidents. It is the system designer’s or installer’s responsibility to select, size and install these valves in accordance with the national standards ensuring correct set pressure, sufficient discharge capacity and proper discharge piping.

4.4.3 Bursting Disc

In addition to the required safety valves and pressurization equipment of the LTHW system it is strongly recommended that a bursting disc is installed to the system to protect the system from increase in pressure from the high- pressure CO_2 system should the plate heat exchanger fail.

CO_2 refrigerant within the heat pump operates at 100-120 bar, protection for plant and equipment on the LTHW side of the system is advised to mitigate any sudden variations in pressure.

Burst Discs consist of a thin membrane which is designed to break and open when the specific level of differential pressure rises above the resistance limit that the disc was originally calibrated for, so as to allow for the excess pressure to vent out safely.

System configuration, plant locations and servicing routes will need to be considered when locating the burst disc on the system. It is therefore the responsibility of the designer/installer to specify the type and location. On multiple Acer installations one burst disc on the common primary pipework maybe deemed sufficient.

Burst discs are designed to be installed between two flanges. Please refer to manufactures instructions for installation information.

⚠ **WARNING**

A BURSTING DISC IS NOT A SUBSTITUTE FOR A SAFETY VALVE. SAFETY VALVES MUST BE SIZED AND INSTALLED IN ACCORDANCE WITH EN 13136:2013.

⚠ **WARNING**

The designer/installer must consider adequate protection for sudden various in pressure.

5 Unit Installation

5.1 General notes

Accessibility & Space

- Select a location that is safely and easily accessible for maintenance.
- Allow sufficient technical clearance around the unit for its overall dimensions, airflow paths (intake and exhaust), and service access (as specified in this manual).
- Ensure unobstructed airflow by avoiding siting near tall walls, in corners, beneath overhangs, or below ground level where air can stagnate or recirculate.

Structural Support

- Verify that all support points can bear the unit's weight.
- Mount the unit above ground level to facilitate condensate drainage and reduce moisture ingress.
- Align and level all bearing points accurately to prevent vibration and uneven loading.

Environmental Considerations

- Avoid flood-prone areas and account for maximum potential snow levels—ensure snow drift won't block airflow or drainage.
- Protect against debris accumulation (leaves, litter, etc.) on the air coil.
- Avoid siting near strong wind corridors that could impede or exaggerate airflow, and steer clear of nearby heat or pollution sources (e.g. chimneys, flues, vehicle exhausts).
- Prevent cold-air stratification by ensuring intake air remains free-flowing and that expelled air cannot be drawn back in.
- Consult the unit's declared sound power level (dBA) in the technical specifications. Use this to model expected sound pressure levels at neighbouring facades and property boundaries.

Utilities & Drainage

- Confirm that electrical connection runs do not exceed the maximum allowable distance specified by the manufacturer.
- Provide a dedicated condensate drainage system to prevent standing water beneath the unit.
- Ensure water from the unit can be drained properly at all times.

Security & Safety

- If there is a risk of unauthorised access (children, vandalism, wildlife), install appropriate barriers or fencing.
- This unit is designed for outdoor installation only and must not be enclosed indoors.

Final Verification

- After positioning and securing the unit, verify that all space requirements (clearances for airflow, service access, and noise dissipation) outlined in this manual are met.

Adherence to these guidelines will ensure safe installation, effective airflow, and long-term reliability of the outdoor unit.

5.1.1 Structural

- Concrete bases are preferred.
- Raise the base at least 300 mm above ground level to fit hydraulic and electrical connections.
- Check that all supports are level.
- Provide adequate condensate drainage when the unit is in heating mode, ensuring water drains safely away from traffic areas where ice may form.
- Separate the foundation from the building structure to limit noise and vibration transmission.
- Use the factory-provided holes to secure the unit to its foundation.

5.1.2 Positioning

The unit is intended for outdoor use in a permanent, flat orientation, either at ground level or on a roof. In roof installations, verify that the structure supports both the unit's weight and potential maintenance loads.

Minimising vibration:
- Install anti-vibration mounts or neoprene pads under the heat pump support.
- Use flexible joints in the water circuit to reduce transmitted vibration.
- Keep the unit perfectly level.

Key considerations:
- Required service clearances.
- Electrical connection routes.
- Water/hydraulic connection access.
- Potential increases in overall height if optional vibration dampers are used.

5.1.3 Charging lines

Where heat pumps are installed at roof level, ensure that dedicated charging lines are provided. These lines must allow for safe and efficient charging of refrigerant, either during commissioning when pre-charging is not feasible, or for subsequent top-ups during maintenance. The charging lines should be easily accessible from ground or plant level, designed to minimise pressure drop, and clearly identified to avoid confusion with other services.

5.1.4 Pressure Relief Valve Refrigerant Side

PRVs are included on the refrigerant loop within the unit.

5.1.5 Condensate

Heat pumps produce significant condensate from defrost cycles. Route condensate away from areas where frozen water could pose hazards. Use a downward-sloping drainpipe to prevent ice buildup. In colder climates, consider trace heating cables to prevent freezing.

5.1.6 Freezing Prevention

In regions where ambient temperatures can fall below freezing, it is essential to protect all external pipework and equipment from ice formation. Install self-regulating trace heating cables beneath the insulation on external water lines to maintain fluid temperatures above 0 °C, even when the air temperature drops to -25 °C. After commissioning, verify under worst-case conditions that inlet and outlet pipe temperatures remain above freezing. Where trace heaters alone may not suffice, use one or more of the following measures—particularly if outdoor temperatures hover around 0 °C—to avoid permanent damage (which voids warranty):

- Mix the system water with an appropriate concentration of antifreeze glycol.
- Install electric heating cables directly under the insulation on all exposed piping.
- Drain down and isolate the system during extended shutdown periods.

Select self-regulating heaters to prevent local hot spots or overheating, and always ensure adequate control and monitoring of pipe temperatures.

5.2 Water quality

5.2.1 New Systems

Before commissioning any new installation, remove the circulator and thoroughly flush the entire system to clear out welding residue, waste, sealants, mineral oils, and other preservatives. Only then should you fill the system with clean, high-quality tap water.

5.2.2 Existing Systems

When replacing or adding a heat pump to an existing system, first drain and flush all pipework before installing the new unit. Flush each section separately, paying special attention to areas prone to debris build-up due to reduced flow, then refill with clean, high-quality tap water. If the water is still unsuitable, install an appropriate filter, such as a coarse (mesh) filter for larger debris or a finer tissue filter for smaller particles.

5.2.3 Water Filter

- Use a filter of ≥30 mesh at the water inlet, positioned for easy cleaning.
- Never remove the filter, as doing so invalidates the warranty.

5.2.4 Exclusions

Warranty coverage does not extend to damage caused by limescale, deposits, or impurities from the water supply, nor to issues stemming from improper system cleaning.

5.2.5 Risk of Frost

If outdoor temperatures near 0°C, water in pipes or the unit can freeze and cause permanent damage, which is not covered by the warranty. Prevent freezing by mixing water with a suitable antifreeze, installing heating cables under insulation, or draining the system during extended shutdowns.

5.2.7 Anti-freeze Solutions

Adding antifreeze increases system pressure drop, and only inhibited (non-corrosive) glycol compatible with the circuit should be used. Do not use different glycol mixture (i.e. ethylene with propylene). Mixing different glycol types (e.g., ethylene and propylene) is not recommended.

% PROPYLENE GLYCOL BY WEIGHT	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature (°C)	-1.6	-3.3	-5.1	-7.6	-9.6	-12.7	-16.4	-21.1	-27.9	-33.5
Safety temperature (°C)	-7.0	-8.0	-10.0	-13.0	-15.0	-18.0	-21.0	-26.0	-33.0	-39.0

5.2.8 Minimum Water Quality Requirements for Acer Units

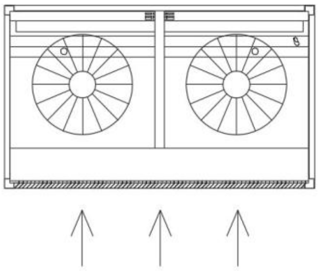
The water system should be maintained to BS 8552. Below is an extract of the figures the water sampling should achieve on a quarterly basis.

Parameter	Source Water	System Water	ALS LoR
Suspended solids	One off	Quarterly	1.0 mg/l
Conductivity	One off	Quarterly	30 µS/cm
pH	One off	Quarterly	1 pH units Dilution number
Visual appearance	One off	Quarterly	-
Odour	One off	Quarterly	-
Total Alkalinity	One off	Quarterly	2.8 mg/l
Total Hardness	One off	Quarterly	0.38 mg/l
Nitrite	-	Quarterly	0.08 mg/l
Sulphate	One off	Quarterly	4.4 mg/l
Chloride	One off	Quarterly	3.7 mg/l
Total Iron	-	Quarterly	230 µg/l
Dissolved Iron	-	Quarterly	230 µg/l
Total Copper	-	Quarterly	9 µg/l
Molybdate	-	Quarterly	0.006 mg/l
Phosphate	One off	Quarterly	0.6 mg/l
Glycol	-	Quarterly	2 mg/l
TVC 22-37°	-	Quarterly	0 cfu/ml
Pseudomonas	-	Quarterly	0 cfu/100ml
SRB	-	Quarterly	DET/ND
NRB	-	Quarterly	0 cfu/ml

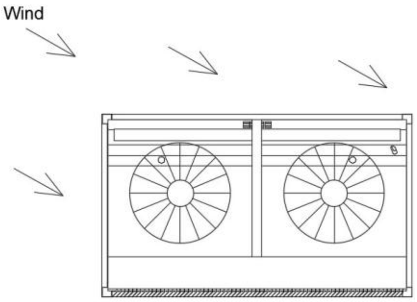
5.3 Protection Against Winds

Protection against the effects of wind should be considered when installing a unit. Whilst the design and operation of unit is designed for the effects of moderate winds, consistent and strong wind will affect the performance of the unit.

Consider the protection of the unit from direct wind across the front grille of the unit. The unit can be orientated to ensure the front on the unit faces away from direct winds as shown below:



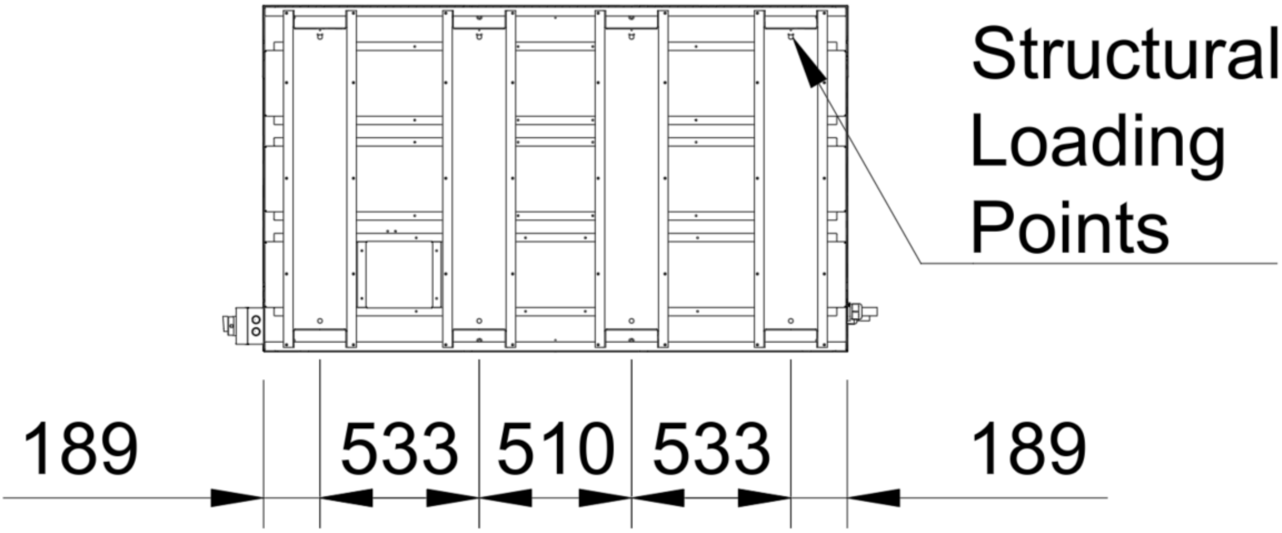
Design air flow direction (air intake grille)

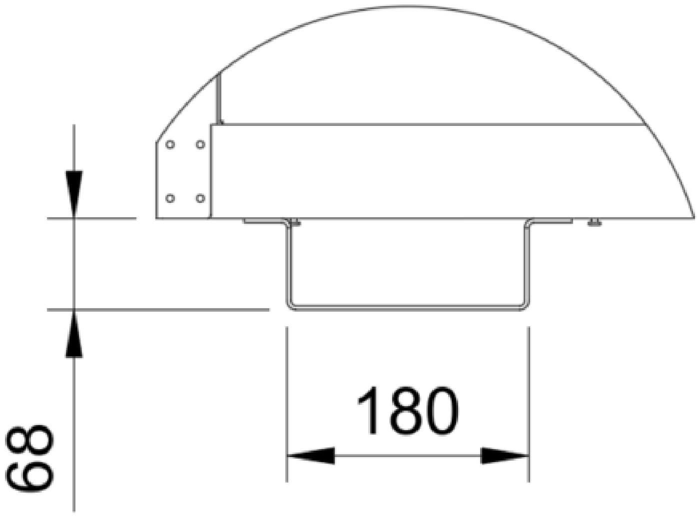


Air intake protected from direct wind

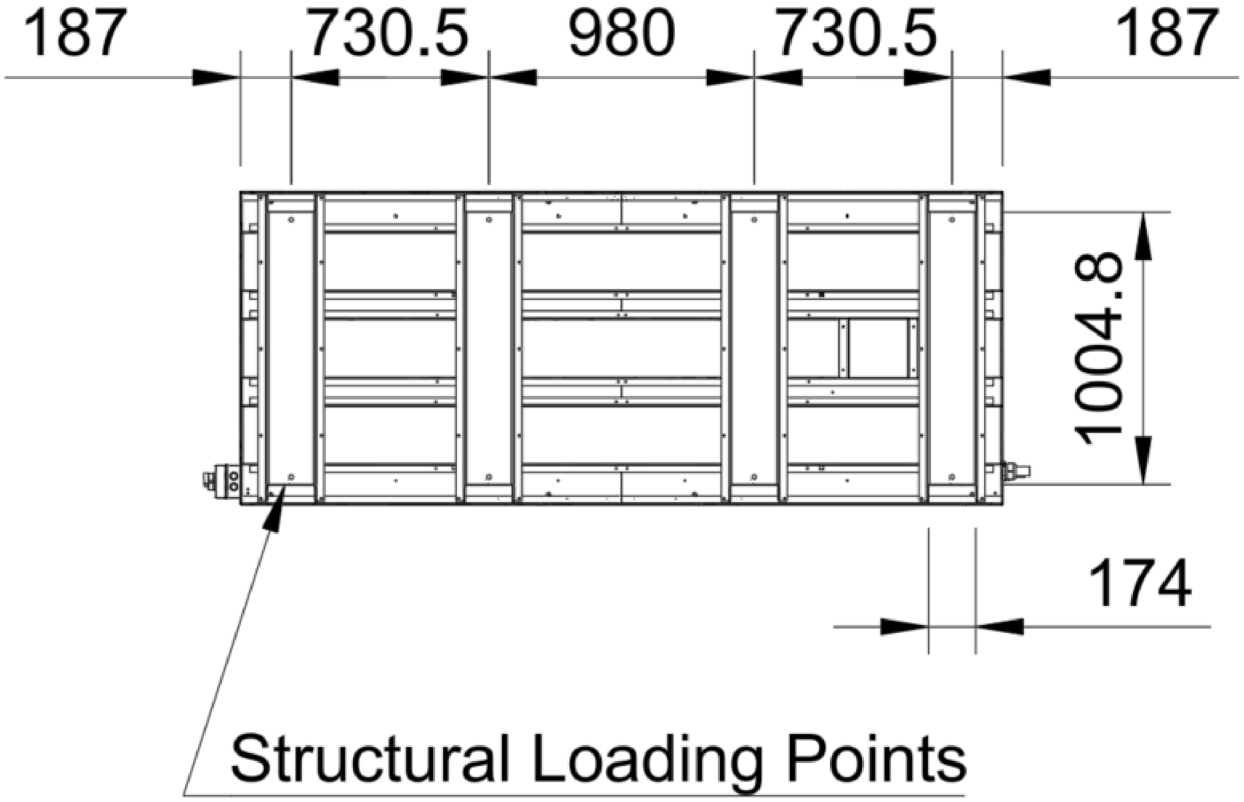
5.3.1 Lifting Centers and Structural Loading Points

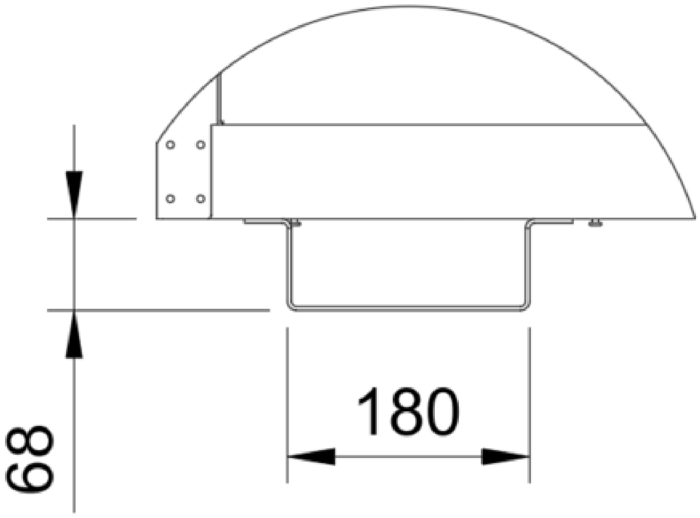
Acer 65/50



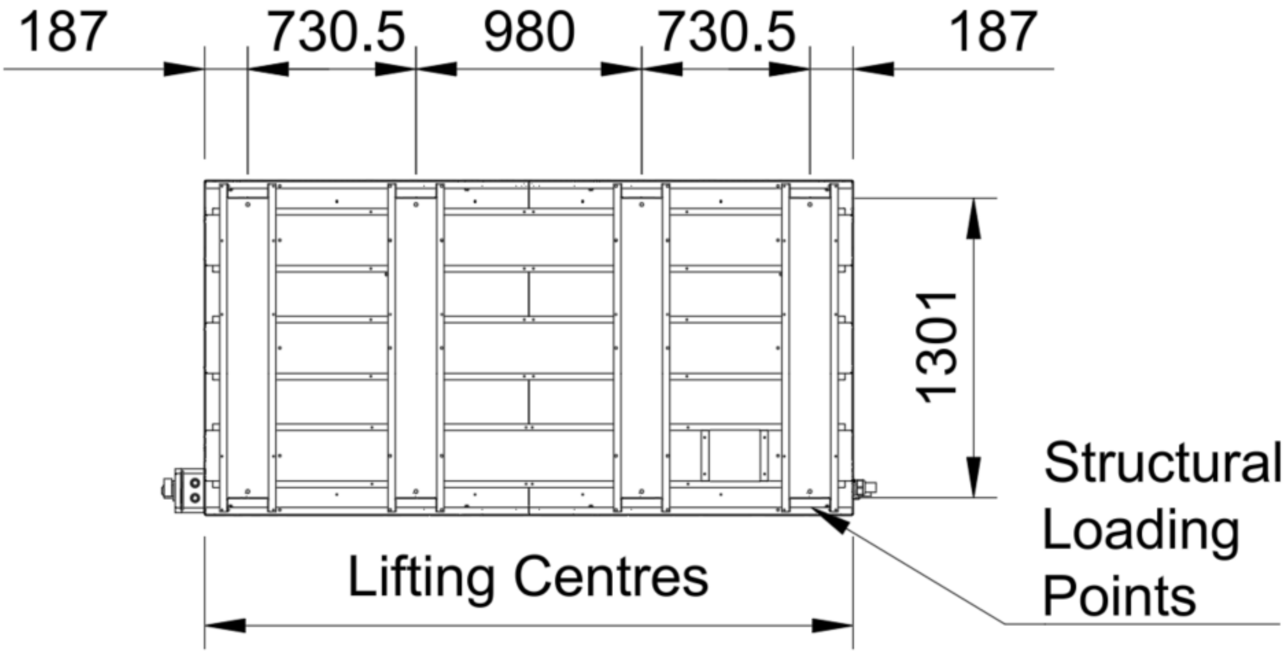


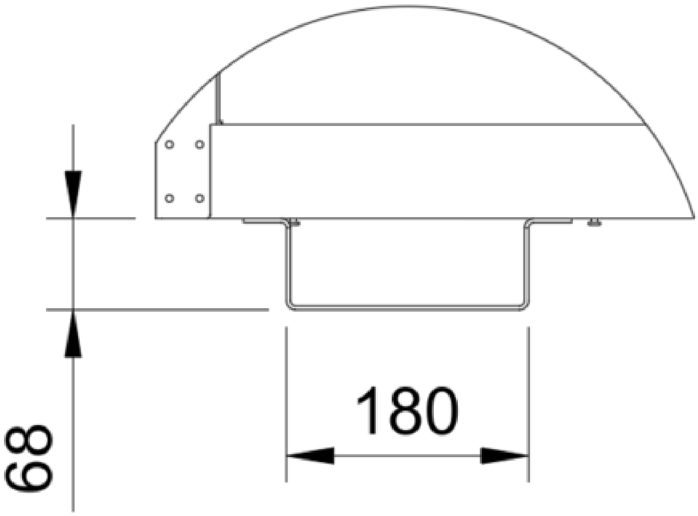
Acer 95/75


187
730.5
980
730.5
187
1004.8
174
Structural Loading Points


68
180

Acer 130/100


187
730.5
980
730.5
187
1301
Structural Loading Points
Lifting Centres


68
180

6 System Configuration

6.1 System Schematics

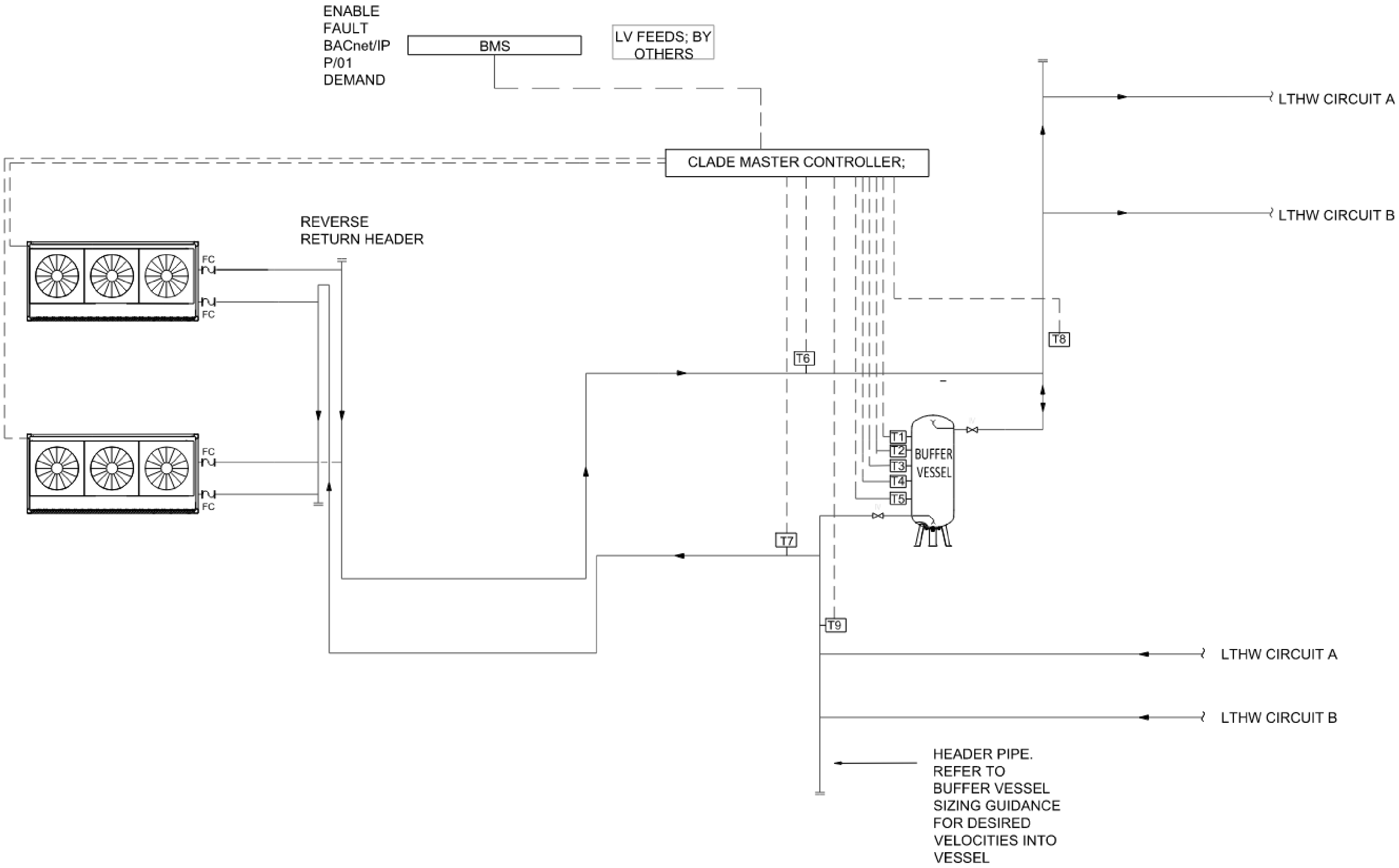
The unit must be installed in a configuration that allows correct hydraulic balance between primary and secondary systems. It is recommended that a buffer vessel is installed in the following configuration, allowing each system to operate independently at different flow conditions.
It is important that the secondary system is designed to operate at the correct flow and return temperatures. For detailed schematics please refer to Clade's Schematic Pack document.

The Acer can be used for heating and DHW applications and combined systems.
Buffer temperature sensors can be used to modulate heat pump output, see Section 8 for further details of controls.

To prevent the integral pumps from working against each other, each ASHP should be connected to a dedicated flow and return header leading to the buffer vessel. The pipework should be sized to maintain a flow velocity of less 0.2 m/s. This configuration reduces pressure drop within the pipework and ensures efficient pump operation.

Multiple ASHP units are to be connected in a reverse return configuration to ensure equal flow distribution across all units. Even flow distribution across ASHPs enhances system efficiency and prolongs equipment lifespan.

6.1.1 General Arrangement

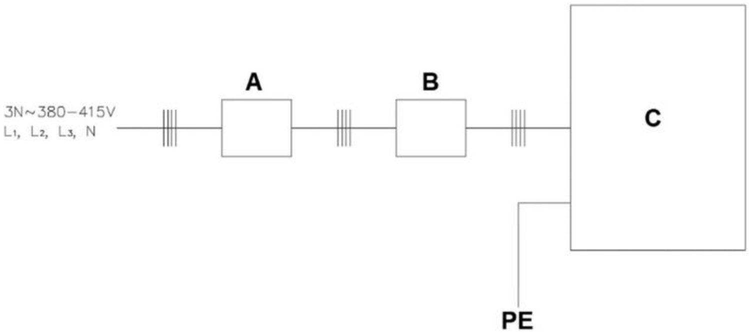


7 Wiring

7.1 Mains Supply Installation

Schematic Drawing

A: Protection Device
B: Local Isolation
C: Heat Pump unit



Main power supply cable size and switch capacities:

Model	Cable size (mm^2)			Local Isolation (A)	Protection (A)
	L1,L2,L3	Neutral	Earth	AC22/AC23	
Acer 50	16	16	10	80	80
Acer 75	16	16	10	80	80
Acer 100	25	25	16	100	100

A dedicated power supply is required for each unit with its own protection device and local isolation.

Local climate conditions and cable service routes should be taken into account as part of the cable selection and installation of the electrical supply.

The cable size in the above table is selected using Table 4E4A as part of BS7671 2018 IET wiring regulations. The cable selection should only be used between the local isolation and outdoor unit.

The electrical installation should be designed and installed to meet BS7671 2018 IET wiring regulations or adhere to the wiring regulations of the region of install.

7.1.1 Maximum Cable Sizes

The maximum cable sizes into the isolators of the unit can be seen below.

Model	**Single or multiple strand wire (mm^2)**	**Fine strand with sleeve (mm^2)**
Acer 50	25	10
Acer 75	25	10
Acer 100	50	50

⚠ **WARNING**

Be sure to use specified wires and ensure no external force is imparted to terminal connections. Loose connections may cause overheating and fire.

⚠ **CAUTION**

Only use properly rated breakers and fuses. Using a protection device of the wrong size may cause the unit to malfunction or set fire.

7.2 Cable Connections

Control cable specifications:

Remote controller cable size	0.3 - 1mm²
Cable between units	Cat 6

8 Controls

8.1 Individual Heat Pump Controls

Each heat pump has its own integrated and independent controls on board the heat pump designed to maintain a fixed flow temperature. This is an adjustable parameter and, in this instance, has been set to maintain 65°C.

8.1.1 Off/On Switch

The Off/On switch selects the operation of the heat pump. Selecting the on position will start the heat pump. Selecting the Off position will instigate a stop sequence and stop the heat pump from running. The heat pump will continue to run for a short period until it has completed the stop sequence.

⚠ **CAUTION**

The Off/On switch should not be used in an emergency. Any emergency isolation should be carried out at the local isolator.
The inverter should be fully discharged, prior to removal of the compressor terminal box cover.

8.2 Control Type

There are three options for the method of control on the heat pump:

- Multiplex
- BMS
- Local control

These will be described in the following sections.

8.3 Multiplex Controls

8.3.1 Multiplex Control

Multiplex control should be used when the heat pump is to be controlled by a Master Controller. This enables the control of the heat pump by the Master Controller which can operate multiple heat pumps.

NOTE: Should the return water temperature go above 50°C, this will initiate a high return water fault and cause the heat pump to eventually shut off.

The controller has two modes of control based on the temperatures of the flow and return on both the primary and secondary side of the system. This manages the heat pump(s) and buffer vessel to maintain efficient heating, switching between two modes depending on how much the heat the building is calling for.

Mode 1 – Buffer-Filling

If the building's outlet water (Secondary Flow) is significantly cooler (≥3 °C difference) than the heat pump's outlet (Primary Flow). Gradually heats the buffer from the bottom up, in multiple stages. Each stage refers to a different sensor (T4, T3, T2, T1) that activates only once the lower region is mostly heated. Ensures a reserve of hot water in the vessel without sending overly hot water back to the heat pump.

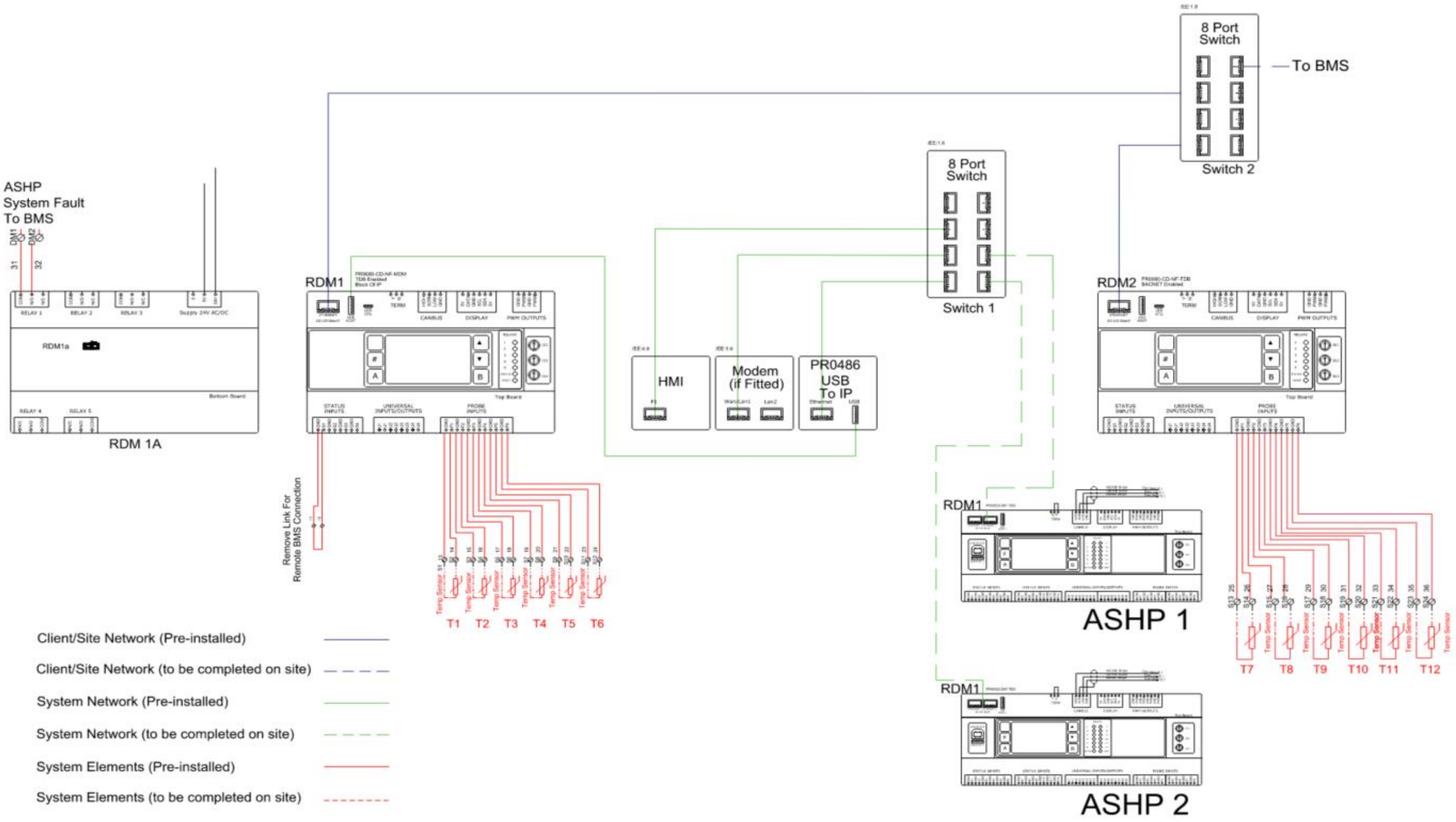
Mode 2 – Site-Load matching

If the Secondary Flow rises closer (within ~2 °C of that 3 °C gap) to the Primary Flow, meaning the building is drawing most of the heat directly. Uses a faster-acting PI control to match the building's demand in real time. It focuses on keeping the buffer topped up near its target while preventing excessive return temperatures. This maximizes direct supply to the site under higher loads, adjusting capacity so the return from the buffer stays within safe limits.

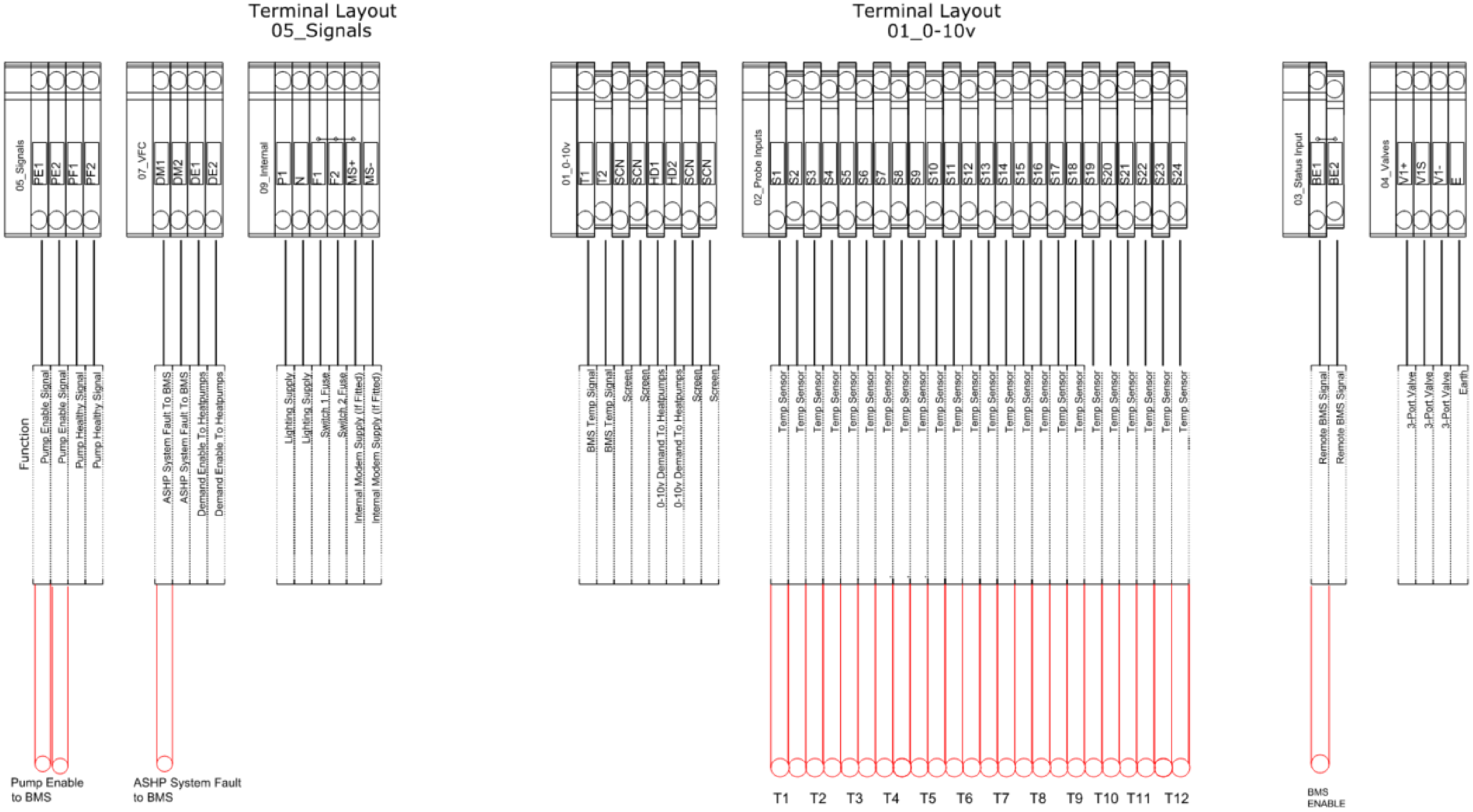
Master controller will be installed as a standalone unit. The heat pumps will connect to the master controller by CAT5 cable between the two units, installed by the contractor as below.

8.3.2 Multiplex System Network Diagram

Master Control Panel



Terminal Layout



8.3.3 Heat Pump Data

A single connection to the master controller is all that is required to access all connected heat pump data. If the client wishes to monitor or log this data via their Building Management System, the master controller can be integrated through its BACnet interface. The table below details the data points available via the BACnet connection from the master controller:

Master Controller (large)				
Device Name		**BACnet**		
Inst.-No.		**280028**		
Obj. Type	**Object Name**	**Description**	**Unit**	**Read/Write**
BO	obj_1	System Healthy	On=Healthy / Off=Fault	Read
AO	obj_2	Ambient Temp	ºC	Read
AO	obj_3	ASHP Target Temp	ºC	Read
AO	obj_4	Heating Demand	%	Read
AO	obj_5	T1 Temp	ºC	Read
AO	obj_6	T2 Temp	ºC	Read
AO	obj_7	T3 Temp	ºC	Read
AO	obj_8	T4 Temp	ºC	Read
AO	obj_9	T5 Temp	ºC	Read
AO	obj_10	T6 Temp	ºC	Read
AO	obj_11	T7 Temp	ºC	Read
AO	obj_12	T8 Temp	ºC	Read
AO	obj_13	T9 Temp	ºC	Read
AO	obj_14	T10 Temp	ºC	Read
AO	obj_15	T11 Temp	ºC	Read
AO	obj_16	T12 Temp	ºC	Read
AO	obj_17	HP1 Status	*See Status Table	Read
AO	obj_18	HP1 P11 Flow Temp	ºC	Read
AO	obj_19	HP1 P12 Return Temp	ºC	Read
AO	obj_20	HP2 Status	*See Status Table	Read
AO	obj_21	HP2 P11 Flow Temp	ºC	Read
AO	obj_22	HP2 P12 Return Temp	ºC	Read
AO	obj_23	HP3 Status	*See Status Table	Read
AO	obj_24	HP3 P11 Flow Temp	ºC	Read
AO	obj_25	HP3 P12 Return Temp	ºC	Read
AO	obj_26	HP4 Status	*See Status Table	Read
AO	obj_27	HP4 P11 Flow Temp	ºC	Read
AO	obj_28	HP4 P12 Return Temp	ºC	Read
AO	obj_29	HP5 Status	*See Status Table	Read
AO	obj_30	HP5 P11 Flow Temp	ºC	Read
AO	obj_31	HP5 P12 Return Temp	ºC	Read
AO	obj_32	HP6 Status	*See Status Table	Read
AO	obj_33	HP6 P11 Flow Temp	ºC	Read
AO	obj_34	HP6 P12 Return Temp	ºC	Read
AO	obj_35	HP7 Status	*See Status Table	Read
AO	obj_36	HP7 P11 Flow Temp	ºC	Read
AO	obj_37	HP7 P12 Return Temp	ºC	Read
AO	obj_38	HP8 Status	*See Status Table	Read
AO	obj_39	HP8 P11 Flow Temp	ºC	Read
AO	obj_40	HP8 P12 Return Temp	ºC	Read

***Status Table**
0=Off
1=Heating
2=Defrost
3=Satisfied
4=Initialising
5=Fault
6=Not Present
7=Offline

8.4 BMS Control

This control type must be selected when it is intended to control the heat pump from an independent BMS.

Selecting BMS will allow the heat pump to operate on a 0-10V input signal from the BMS, overriding the local return temperature control.

NOTE: Should the return water temperature go above 50°C, this will initiate a high return water fault and cause the heat pump to eventually shut off.

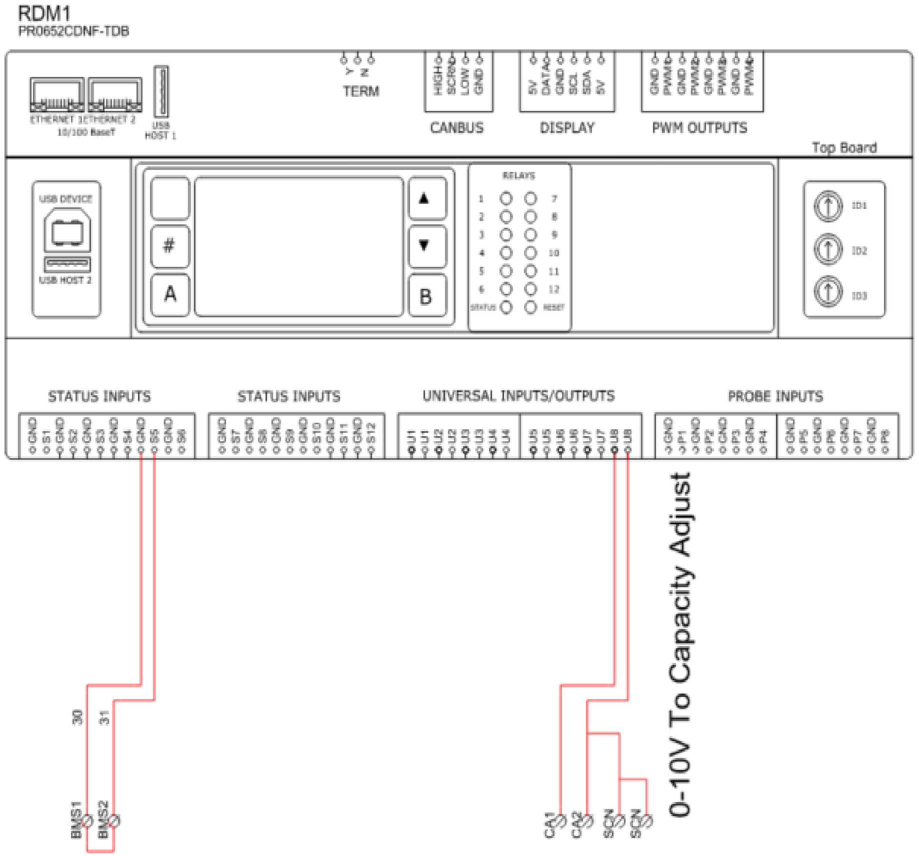
A 0-10V signal allows the heat pump to be controlled to a desired capacity (QH) based on a percentage of maximum capacity.

NOTE: Maximum capacity will alter dependent on ambient temperatures. Therefore, the minimum QH at 2V (50%) at -5ºC will be less than the minimum capacity during times of warmer ambient conditions. When sizing and selecting buffer vessels the low demands of the building need to be considered in conjunction with minimum turn capacity of the heat pump. Published capacities at 7ºC ambient temperatures are deemed as maximum capacities.

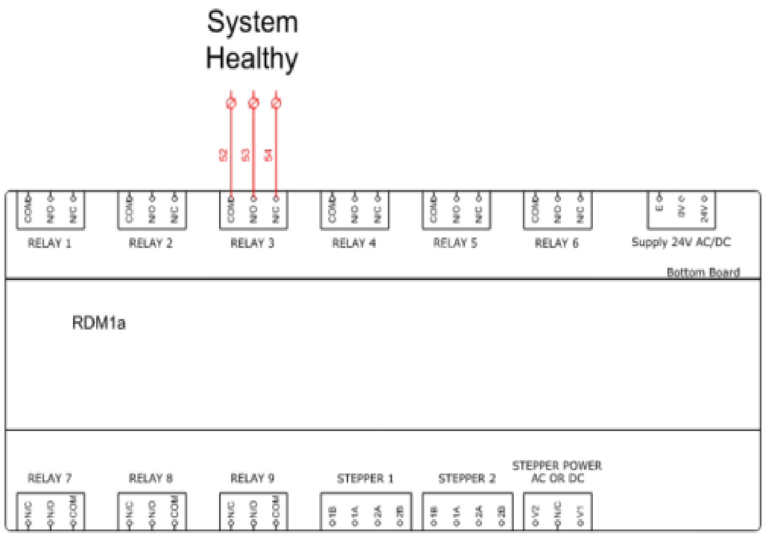
The table below denotes the controls associated with a 0-10V signal:

Voltage Signal	Status
0-0.9	Fault
1-1.9	Off
2	Capacity Control (50-100%)
3	
4	
5	
6	
7	
8	
9	
10	

NOTE: The function will not be available when operating as a multiplex installation using the master controller

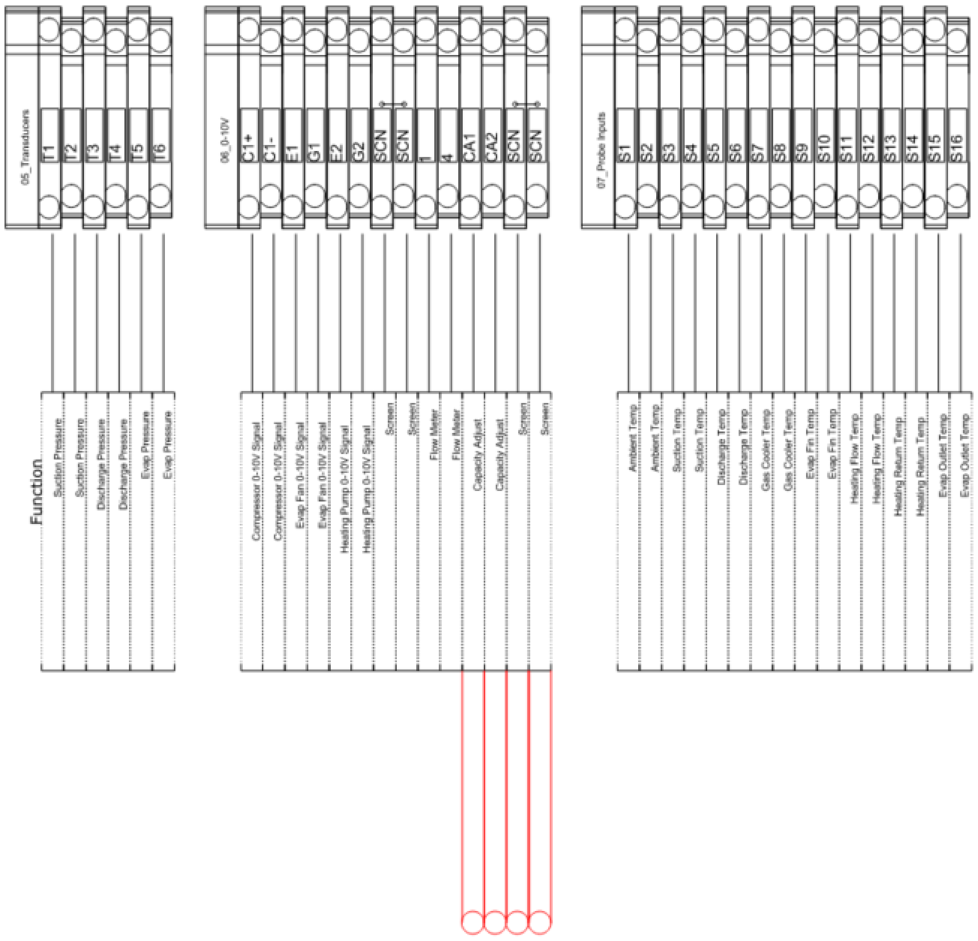


Remove Link
For Remote
BMS Connection



Terminal Layout

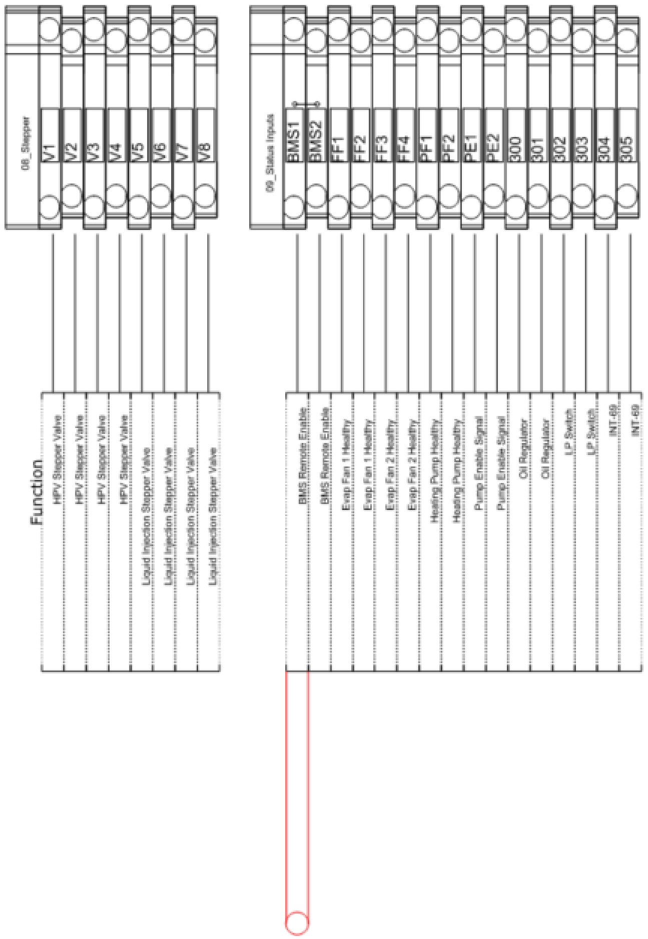
05_Transducers



0-10v Capacity
Control

Terminal Layout

08_Stepper



BMS
Enabling signal

Terminal Layout

01_Mains Incommer

8.5 Local control

Selecting LOCAL control means the heat pump will control without any external control signals. This should be selected when there is no BMS 0-10V capacity control input or Master Controller input. Selecting this control type means the unit will operate on return temperature control.

The delivered heating capacity is adjusted by the return temperature which is set to 30°C for optimum efficiency. Should the return temperature rise above this, the heat pump will reduce its heat output and in turn reduce the flow rate of the pump whilst maintaining flow temperature. A reduction in return water temperature will see increase the heating capacity of the heat pump and thus increase flow to maintain a constant flow temperature.

NOTE: Should the return water temperature go above 50°C, this will initiate a high return water fault and cause the heat pump to eventually shut off.

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