

INSTALLATION, COMMISSIONING AND SERVICING INSTRUCTIONS

Tyneham Heat Pump
65/50 95/75 130/100

CO2 R744

IMPORTANT NOTE

THESE INSTRUCTIONS MUST BE READ
AND UNDERSTOOD BEFORE INSTALLING,
COMMISSIONING, OPERATING OR
SERVICING EQUIPMENT

03/2024
V2.3






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Safety Precautions

- Thoroughly read the following safety precautions prior to use.
- Observe these precautions carefully to ensure safety.

 WARNING	Indicates a risk of death or serious injury
 CAUTION	Indicates a risk of injury or structural damage
 IMPORTANT	Indicates a risk of damage to the unit or other components in the system

General

 WARNING
Do not use refrigerant other than the type indicated in the manuals provided with the unit and on the nameplate.
Doing so may cause the unit or pipes to burst, or result in explosion or fire during use, during repair, or at the time of disposal of the unit. It may also be in violation of applicable laws.
HAMWORTHY HEATING cannot be held responsible for malfunctions or accidents resulting from the use of the wrong type of refrigerant.
Do not install the unit in a place where large amounts of oil, steam, organic solvents, or corrosive gases, such as sulfuric gas, are present or where acidic/alkaline solutions or sprays containing Sulphur are used frequently.
These substances can compromise the performance of the unit or cause certain components of the unit to corrode, which can result in refrigerant leakage, water leakage, injury, electric shock, malfunctions, smoke, or fire.
Do not try to defeat the safety features of the unit or make unauthorized setting changes.
Forcing the unit to operate the unit by defeating the safety features of the devices such as the pressure switch or the temperature switch, making unauthorized changes to the switch settings, or using accessories other than the ones recommended by HAMWORTHY HEATING may result in smoke, fire, or explosion.
To reduce the risk of fire or explosion, do not use volatile or flammable substances as a heat carrier.
To reduce the risk of burns or electric shock, do not touch exposed pipes and wires.
To reduce the risk of shorting, current leakage, electric shock, malfunctions, smoke, or fire, do not splash water on electric parts.
To reduce the risk of electric shock, malfunctions, smoke or fire, do not operate the switches/buttons or touch other electrical parts with wet hands.
To reduce the risk of electric shock and injury from the fan or other rotating parts, stop the operation and turn off the main power before cleaning, maintaining, or inspecting the unit.
Before cleaning the unit, switch off the power.
To reduce the risk of injury, keep children away while installing, inspecting, or repairing the unit.
Children should be supervised to ensure that they do not play with the appliance.
To reduce the risk of burns or frost bites, do not touch the refrigerant pipes or refrigerant circuit components with bare hands during and immediately after operation.
This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
Keep the space well ventilated. Refrigerant can displace air and cause oxygen starvation.
Always replace a fuse with one with the correct current rating.
The use of improperly rated fuses or a substitution of fuses with steel or copper wire may result in fire or explosion.
If any abnormality (e.g., burning smell) is noticed, stop the operation, turn off the power switch, and consult your dealer.
Continuing the operation may result in electric shock, malfunctions, or fire.
Properly install all required covers and panels on the terminal box and control box to keep moisture and dust out. Dust accumulation and water may result in electric shock, smoke, or fire.
Consult an authorized agency for the proper disposal of the unit.

⚠ CAUTION

Do not operate the unit without panels and safety guards properly installed.
To reduce the risk of injury, do not sit, stand, or place objects on the unit.
Do not connect the makeup water pipe directly to the potable water pipe. Connecting these pipes directly may cause the water in the unit to migrate into the potable water and cause health problems.
To reduce the risk of adverse effects on plants and animals, do not place them where they are directly exposed to discharge air from the unit.
Do not install the unit on or over things that are vulnerable to water damage.
Condensation may drip from the unit.
To prevent environmental pollution, dispose of brine in the unit and cleaning solutions according to the local regulations.
It is punishable by law not to dispose of them according to the applicable laws.
The water heated by the heat pump is not suitable for use as drinking water or for cooking it may cause health problems or degrade food.
In areas where temperature drops to freezing during the periods of non-use, blow the water out of the pipes or fill the pipes with anti-freeze solution.
Not doing so may cause the water to freeze, resulting in burst pipes and damage to the unit or the furnishings.
The model of heat pump unit described in this manual is not intended for use to preserve food, animals, plants, precision instruments, or art work.
To reduce the risk of injury, do not touch the heat exchanger fins or sharp edges of components with bare hands.
Do not place a container filled with water on the unit.
If water spills on the unit, it may result in shorting, current leakage, electric shock, malfunction, smoke, or fire.
Always wear protective clothing when touching electrical components on the unit.
Several minutes after the power is switched off, residual voltage may still cause electric shock.
To reduce the risk of injury, do not insert fingers or foreign objects into air inlet/outlet grills.
To reduce the risk of injury, wear protective gear when working on the unit.
In areas where temperature drops to freezing, use an anti-freeze circuit and leave the main power turned on to prevent the water in the water circuit from freezing and damaging the unit or causing water leakage and resultant damage to the furnishings.
Use clean tap water.
The use of acidic or alkaline water or water high in chlorine may corrode the unit or the pipes, causing water leakage and resultant damage to the furnishings.
In areas where temperature can drop low enough to cause the water in the pipes to freeze, operate the unit often enough to prevent the water from freezing.
Frozen water in the water circuit may cause the water to freeze, resulting in burst pipes and damage to the unit or the furnishings.
Periodically inspect and clean the water circuit.
Dirty water circuit may compromise the unit's performance or corrodes the unit or cause water leakage and resultant damage to the furnishings.

Transportation

⚠ WARNING

Lift the unit by using the designated lifting eyes on each side of the unit. Support the unit securely at these four points to keep it from slipping and sliding.
If the unit is not properly supported, it may fall and cause personal injury.

⚠ CAUTION

To reduce the risk of injury, products weighing 20 kg or more should be carried by two or more people.
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Installation

WARNING

Do not install the unit where there is a risk of leaking flammable gas.
If flammable gas accumulates around the unit, it may ignite and cause a fire or explosion.
Properly dispose of the packing materials.
Plastic bags pose suffocation hazard to children.
The unit should be installed only by personnel certified by Hamworthy Heating Engineering Ltd according to the instructions detailed in the Installation/Operation Manual.
Improper installation may result in refrigerant leakage, water leakage, injury, electric shock, or fire.
Any additional parts must be installed by qualified personnel.
Take appropriate safety measures against wind gusts and earthquakes to prevent the unit from toppling over and causing injury.
Periodically check the installation base for damage.
If the unit is left on a damaged base, it may fall and cause injury.
Be sure to install the unit horizontally, using a level.
If the unit is installed at an angle, it may fall and cause injury or cause water leakage.
Remove packing materials from the unit before operating the unit. Note that some accessories may be taped to the unit.
Properly install all accessories that are required.
Failing to remove the packing materials or failing to install required accessories may result in refrigerant leakage, oxygen starvation, smoke, or fire.
The unit should be installed on a surface that is strong enough to support its weight.
As an anti-freeze, use ethylene glycol or propylene glycol diluted to the specified concentration.
The use of other types of anti-freeze solution may cause corrosion and resultant water leakage. The use of flammable anti-freeze may cause fire or explosion.

Pipe Installation

WARNING

To prevent explosion, do not heat the unit with refrigerant gas in the refrigerant circuit.

CAUTION

Check that no substance other than the specified refrigerant (R744) is present in the refrigerant circuit.
Infiltration of other substances may cause the pressure to rise abnormally high and cause the pipes to explode
To prevent damage from water due to condensation, properly insulate all pipes.
Check for refrigerant leakage at the completion of installation.
Piping work should be performed by a competent person according to the instructions detailed in the Installation Manual.
Improper piping work may cause water leakage and damage.

Electrical Wiring

WARNING

To reduce the risk of wire breakage, overheating, smoke, and fire, keep undue force from being applied to the wires.
Properly secure the cables in place and provide adequate slack in the cables so as not to stress the terminals.
Improperly connected cables may break, overheat, and cause smoke or fire.
To reduce the risk of injury or electric shock, switch off the main power before performing electrical work.
To reduce the risk of current leakage, overheating, smoke, or fire, use properly rated cables with adequate current carrying capacity.
Keep the exposed part of cables inside the terminal block.
If an exposed part of the cable come in contact with each other, electric shock, smoke, or fire may result.
All electric work must be performed by a qualified electrician according to the local regulations, standards, and the instructions detailed in the Installation Manual.
Capacity shortage to the power supply circuit or improper installation may result in malfunction, electric shock, smoke, or fire.
To reduce the risk of electric shock, smoke, or fire, install an inverter circuit breaker on the power supply to each unit.
Use properly rated breakers and fuses (inverter breaker, Local Switch <Switch + Type-B fuse>, or no-fuse breaker).
The use of improperly rated breakers may result in malfunctions or fire.
Proper grounding must be provided by a licensed electrician. Do not connect the grounding wire to a gas pipe, water pipe, lightning rod, or telephone wire.
Improper grounding may result in electric shock, smoke, fire, or malfunction due to electrical noise interference.

⚠ CAUTION

To reduce the risk of current leakage, wire breakage, smoke, or fire, keep the wiring out of contact with the refrigerant pipes and other parts, especially sharp edges.

To reduce the risk of electric shock, shorting, or malfunctions, keep wire pieces and sheath shavings out of the terminal block.

Transportation and Repairs

⚠ WARNING

The unit should be moved, disassembled, or repaired only by qualified personnel. Do not alter or modify the unit.

Improper repair or unauthorized modifications may result in refrigerant leakage, water leakage, injury, electric shock, or fire.

After disassembling the unit or making repairs, replace all components as they were.

Failing to replace all components may result in injury, electric shock, or fire.

If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

⚠ CAUTION

To reduce the risk of shorting, electric shock, fire, or malfunction, do not touch the circuit board with tools or with your hands, and do not allow dust to accumulate on the circuit board.

IMPORTANT

To avoid damage to the unit, use appropriate tools to install, inspect, or repair the unit

Do not unnecessarily change the switch settings or touch other parts in the refrigerant circuit. Doing so may change the operation mode or damage the unit.

To reduce the risk of malfunctions, use the unit within its operating range.

Do not switch on or off the main power in a cycle shorter than 10 minutes.

Short-cycling the compressor may damage the compressor.

To maintain optimum performance and reduce the risk of malfunction, keep the air pathway clear

To ensure proper operation of the unit, periodically check for proper concentration of anti-freeze.

Inadequate concentration of anti-freeze may compromise the performance of the unit or cause the unit to abnormally stop.

Take appropriate measures against electrical noise interference when installing the heat pumps in hospitals or facilities with radio communication capabilities.

Inverter, high-frequency medical, or wireless communication equipment as well as power generators may cause the heat pump system to malfunction. Heat pump system may also adversely affect the operation of these types of equipment by creating electrical noise.

Check the water system, using a relevant manual as a reference.

Using the system that does not meet the standards (including water quality and water flow rate) may cause the water pipes to corrode.

To reduce the risk of power capacity shortage, always use a dedicated power supply circuit,

1 Technical Specification

1.1 Data Table

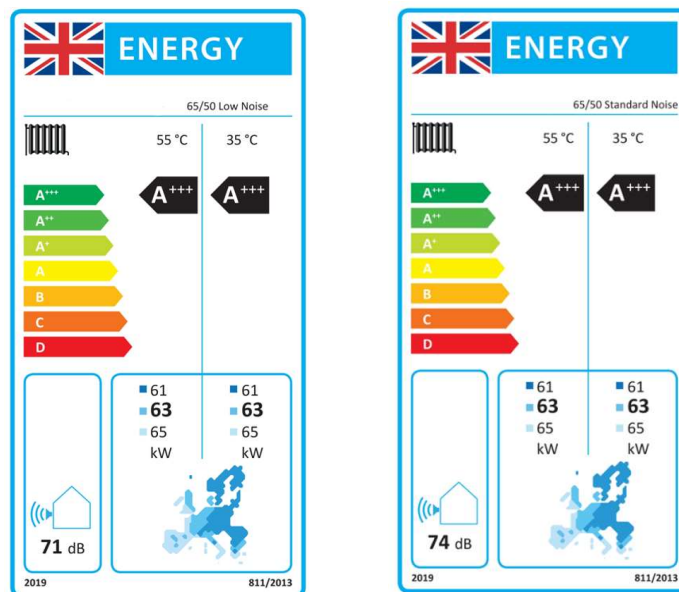
		Tyneham 65/50kW	Tyneham 95/75kW	Tyneham 130/100kW
Nominal conditions: Water side		flow 45 °C to 70 °C, return temperature <35°C		
Nominal conditions: CO ₂ side		Ambient air temperature +3°C (85% RH) and -9°C evaporation		
Compressor Manufacturer		Dorin		
Compressor Qty	Pcs.	1		
Compressor Power @ Design total	kW	20.5	33.1	43.5
Evaporator fans Power at design	kW	1.8	2.5	2.5
Total	kW	24.71	38.04	48.43
Total Amps		45.07	67.55	82.19
Variable speed drive (VSD)	Pcs.	1	1	1
Refrigerant charge (CO ₂)	kg	4.8	6.5	10
Electrical supply	-	3~ 400V 50 HZ		
Tyneham Low Noise				
Housing Weight (empty)	kg	1000	1365	1590
Housing Weight (operational)	kg	1008	1375	1605
Sound Power Level L _{W(A)} (dB)*	dB	71	72	72
Tyneham Standard Noise				
Housing Weight (empty)	kg	935	1260	1300
Housing Weight (operational)	kg	943	1270	1311
Sound Power Level L _{W(A)} (dB)*	dB	74	75	75
Connections waterside flow	DN	28mm Copper	35mm Copper	42mm Copper
Connections waterside Return	DN	28mm Copper	35mm Copper	42mm Copper
Connections waterside Pressure Rating	PN	6		
Waterside Burst Disk (supplied by installer)	PN	6		
Communication protocol	-	BACNET over IP (optional extra)		
IP-Class	-	IP54		
Evaporators Type		Flat bed		
No. evaporators	Pcs.	1		
Evaporator Air Volume	m ³ /s	6	8.9	12.9
Additional Static Pressure Available	Pa	0	0	0
Fin Material	-	AL/MG		
Defrost Type	-	Cool Gas CO ₂		
Defrost medium	-	CO ₂		
Defrost design/condition	-	> +6c ambient Off Cycle / < +6c ambient Cool Gas		
Fan regulation	-	0-10v		
Colour	-	RAL7016 Anthracite		

*Sound power established in general accordance with BS EN ISO 3740: 2019 with a survey grade accuracy (sR0) = 4 dB.

1.2 Performance Data

Tyneham Range		65/50	95/75	130/100
Heating performance data to EN14825 (A7/W65) 50K TD				
Rated heating output	kW	65	95	130
Fan speed	rpm	1140	1140	1140
Power Consumption	kW	17	25	34
Coefficient of Performance (COP)		3.4	3.4	3.4
Seasonal Coefficient of Performance (SCOP)		3.5	3.5	3.5
Heating performance data to EN14825 (A25/W55) 50K TD				
Rated heating output	kW	65	95	130
Fan speed	rpm	1140	1140	1140
Power Consumption	kW	13	19	26
Coefficient of Performance (COP)		5	5	5
Seasonal Coefficient of Performance (SCOP)		2.8	2.8	2.8
Heating performance data to EN14825 (A7/W55) 25K TD				
Rated heating output	kW	65	95	130
Fan speed	rpm	1140	1140	1140
Power Consumption	kW	22	32	43
Coefficient of Performance (COP)		3	3	3
Seasonal Coefficient of Performance (SCOP)		2.8	2.8	2.8
Heating performance data to EN14825 (A7/W65) 35K TD				
Rated heating output	kW	65	95	130
Fan speed	rpm	1140	1140	1140
Power Consumption	kW	22	32	43
Coefficient of Performance (COP)		3	3	3
Seasonal Coefficient of Performance (SCOP)		2.8	2.8	2.8

1.2.1 Tyneham 65/50 Energy Labels



2 Site Selection

2.1 Installation Conditions

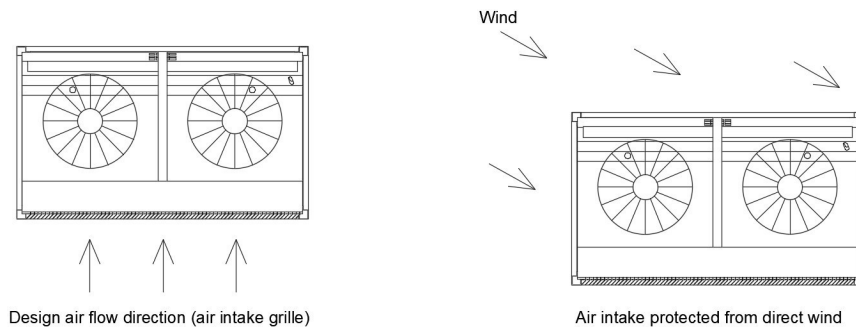
Select a site to install the outdoor unit that meets the following conditions:

- This unit is for outdoor installation only.
- The noise from the unit will not be a problem.
- The unit will not be exposed to strong winds.
- Water from the unit can be drained properly.
- The space requirements (specified in this section of the document) are met.

2.2 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:

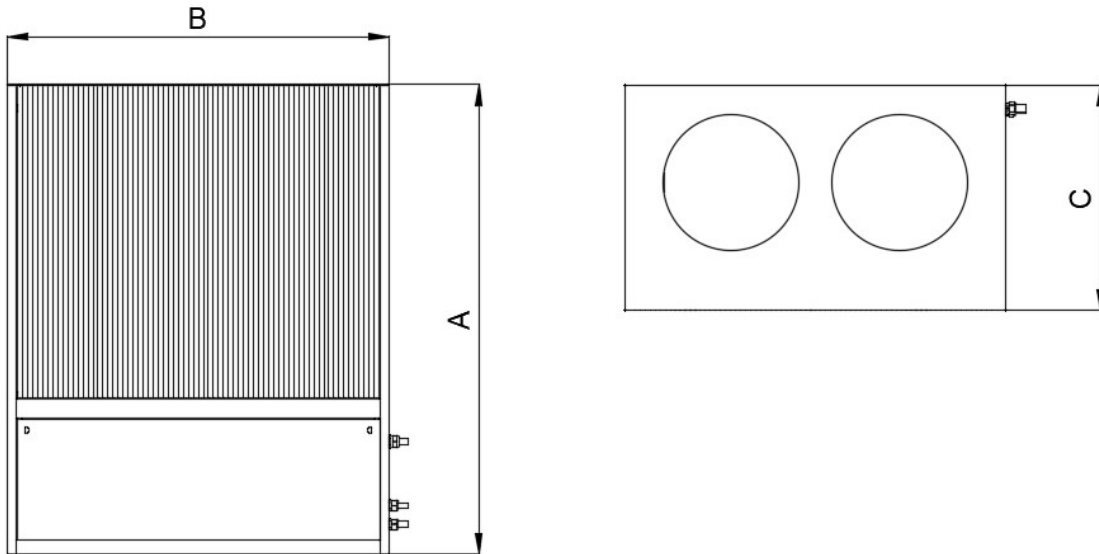


2.3 Installation Space Requirements

Hamworthy Heating recommends an allowance of 1.0m perimeter around the front and sides of the unit. There is no minimum distance requirement to the rear of the unit. The unit is designed to allow the unit to be placed up to a vertical wall.

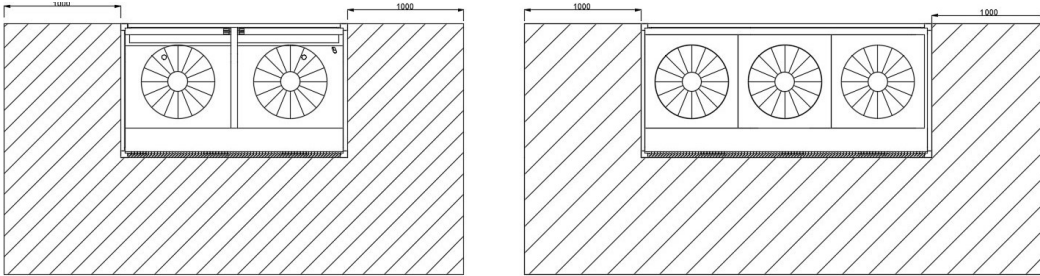
Adequate access must be available for service and maintenance of the unit with a safe defined route for engineers and care must be taken to ensure that trip hazards are eliminated.

2.3.1 Dimensions



	Dimension	Tyneham 65/50kW	Tyneham 95/75kW	Tyneham 130/100kW
A	Height (Low Noise)	2401mm	2401mm	2401mm
A	Height (Standard Noise)	1853mm	1853mm	1853mm
B	Width	1959mm	2821mm	2821mm
C	Depth	1160mm	1160mm	1457mm

2.3.2 Single Unit Installation

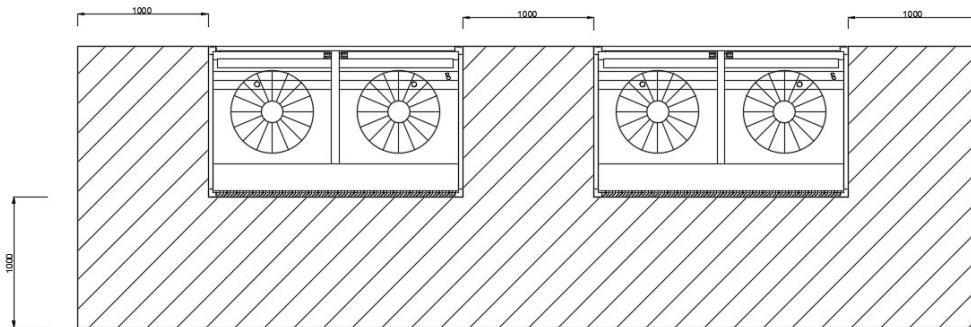


Note. 1 Meter to be kept clear to allow access to heat pump, shown in hatched region.

2.3.2 Multiple Unit Installation

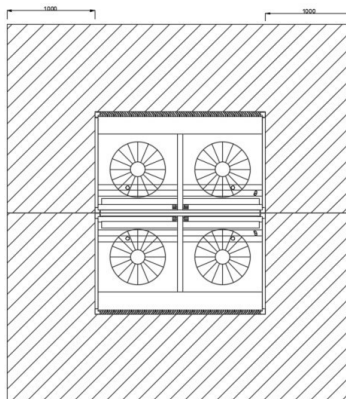
When installing multiple units, make sure to take into consideration factors such as providing enough space for people to pass through, ample space between blocks of units, and sufficient space for airflow.

Side by side installation, allow access to side of each unit for access.



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

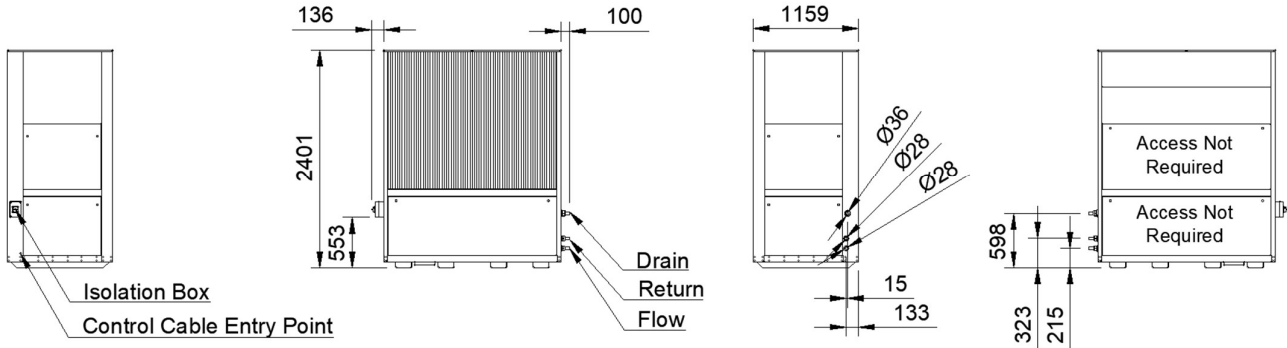
Back-to-back installation:



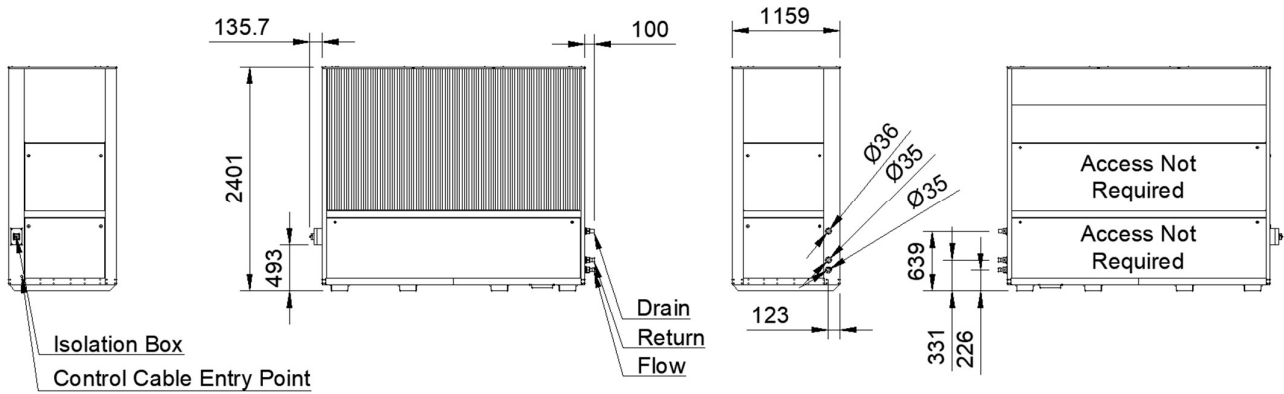
2.4 Service Connections

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

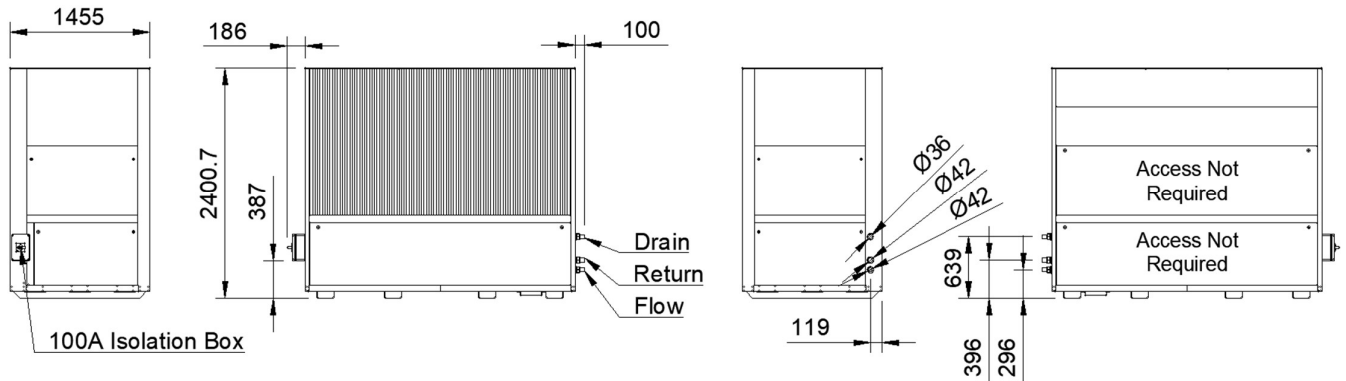
2.3.3 Tyneham 65/50



2.3.4 Tyneham 95/75



2.3.5 Tyneham 130/100



3 Unit Installation

3.1 Delivery & Unpacking

Hamworthy Heating manufactures the unit allowing for lifting access with a forklift or straps from a crane/Hiab. Lifting of the unit should only be performed by trained personnel. The design of the base mounting frames is intended to allow straps to be passed underneath the unit between the mounting frames. Mounting frames are identified in the next section of this document.

The image shows the recommended configuration of lifting straps to lift the unit.

It is recommended that the unit is lifted using a spreader bar to ensure straps do not damage the aluminum grille on the front of the unit.



If the equipment is delivered damaged, the recipient is responsible to inform the supplier. The damages should be noted on the delivery sheet before signing and pictures should be taken of the damages and reported back to the supplier. If the damages were not noted until unpacking i.e. hidden underneath protective packaging, the issues must be reported within seven (7) working days of receipt for a claim to be processed. The recipient is responsible for preparing the claim and providing evidence of the damages to the supplier.

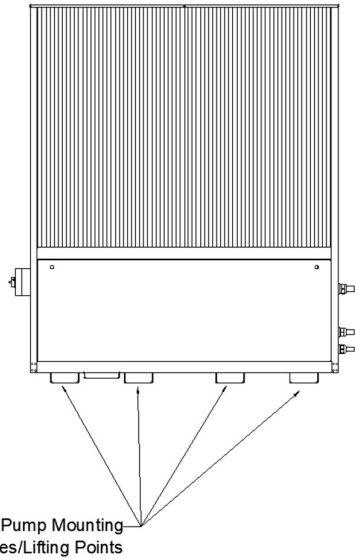
3.2 Heat Pump Installation

The unit must be installed and operated in accordance with the instructions contained in this manual and any relevant legislation and health and safety directives.

The location of the installation of the unit should be well ventilated and placed on a perfectly horizontal and stable surface and be able to carry the full weight of the system.

The unit should be securely fixed to the base using bolts to keep the unit from moving and stop noise and vibrations from being transmitted through the connected system.

Once installed, the transportation bolts must be removed from the internal base plate.



NOTE: Refer to latest product drawings for dimensions of mounting frames and lifting points.

Hamworthy Heating recommends an allowance of 1.0m perimeter around the front and sides of the unit. Adequate access must be available for service and maintenance of the unit with a safe defined route for engineers and care must be taken to ensure that trip hazards are eliminated.

The electrical supplies must comply with the requirements of the latest IEE regulations and the supply must be correctly rated for the unit.

The drainpipe connection should be installed with a downward inclination to prevent drain water from freezing in the winter. For cold climate installations it is recommended that a drain heater tape is used to prevent the drain water from freezing.

3.3 Refrigerant Charge

The heat pumps manufactured by Hamworthy Heating are equipped with carbon dioxide (CO₂). 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.

CO₂ 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 concentration of CO₂ is high. In addition, due to the high- pressure environment it has hazards which other refrigerants do not and must be handled appropriately.

All personal 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 be evacuated and re-charged with the correct amount of refrigerant as recorded on the PED label.

3.4 Noise/Attenuation

Noise attenuation is built into the Low Noise (LN) Tyneham heat pump. The LN heat pump is designed with integral inlet/outlet silencers installed to the fans. Standard Noise (SN) Tyneham units have no additional attenuation to the evaporator fans.

3.4.1 Noise Calculation

Noise details are detailed below for the Tyneham heat pump Range. Data includes units with optional silencers installed as well as a low noise housing option with silencers for comparison.

Tyneham Range	Tyneham 65 / 50		Tyneham 95 / 75		Tyneham 130 / 100	
	Standard	Low Noise	Standard	Low Noise	Standard	Low Noise
Compressor	1 x Dorin CD2500		1 x Dorin CD 3501		1 x Dorin 5001	
Fans	2 x 630H (570 rpm)		2 x 630H (570 rpm)		2 x 630H (570 rpm)	
Sound Power Level, $L_{W(A)}$ (dB) *	74	71	75	72	75	72
Sound Pressure Level at 10m (dB) **	43	40	44	40	44	40
Width (m)	1.96	1.96	2.82	2.82	2.82	2.82
Depth (m)	1.15	1.15	1.15	1.15	1.45	1.45
Height (m)	1.85	2.4	1.85	2.4	1.85	2.4
Area of 10m Parallelepiped S_d (m ²)	1486	1534	1525	1573	1539	1587

* Sound power established in general accordance with BS EN ISO 3740: 2019 with a survey grade accuracy (sR0) = 4 dB.

** Sound pressure level at 10m determined in accordance with Annex D of BS EN ISO 13487(TC): 2019.

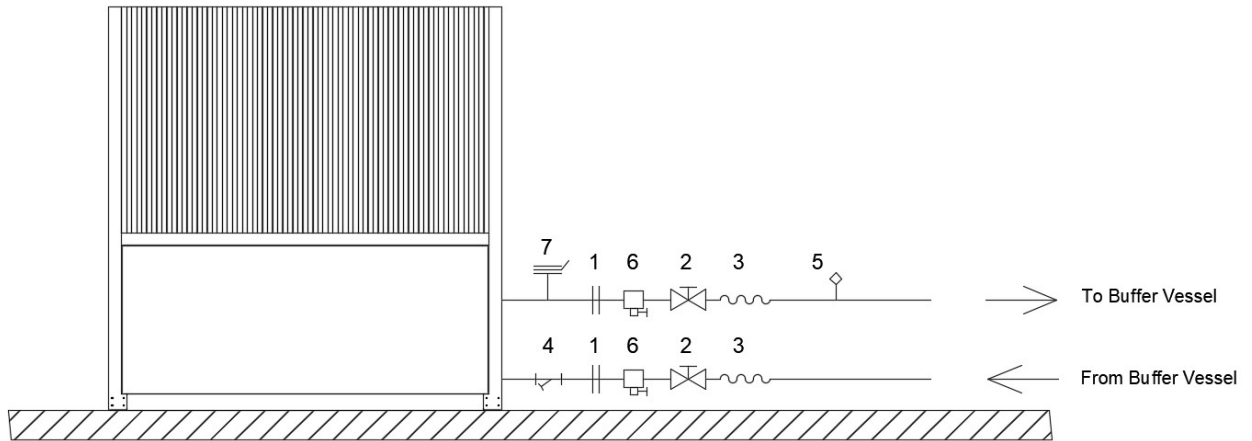
3.4.2 Fan Octave Band Data

Fan octave band levels are provided by the fan OEM as below:

Unit Type	Tyneham			
Fan Type	630-H	630-H	630-H	630-H
Silencer Pods	No	No	Yes	Yes
Fan Speed (%)	100	50	100	50
Fan Speed (RPM)	1140	570	1140	570
Frequency	Sound Power Octave Band Levels (dB)			
63Hz	75	63	75	63
125Hz	75	63	74	62
250Hz	68	53	66	51
500Hz	70	53	63	50
1000Hz	69	53	61	48
2000Hz	68	50	60	45
4000Hz	65	45	57	40
8000Hz	59	22	54	19

4 Piping

4.1 Piping Connections



1	Union/Flange joints	Allow components to be serviced/replaced
2	Valve	Allow for isolation for maintenance
3	Flexible joint	Noise/vibration reduction
4	Strainer	To remove debris out of the system.
5	Air vent valve	Required to release air accumulating within system
6	Drain valve	Allows for drainage during servicing of components
7	Burst Disc	Protects against sudden pressure changes (see section 4.5)

4.1.1 Pipe Connection Sizes

Connection Type	Tyneham 65/50kW	Tyneham 95/75kW	Tyneham 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

4.1.2 Installing a freezing prevention heater

- In cold areas (where the outside temperature drops below freezing), provide a freezing prevention heater at all local pipes to prevent spontaneous freezing.
- After the heater is installed, check outside temperature +25°C is ensured at the heat pump unit inlet/outlet pipe
- joint section (at outside temperature -25°C, joint section 0°C or higher).
- Depending on the local piping material, prevent overheating by selecting a self-temperature adjustment type heater or other method.

4.2 Part Load Considerations

The Tyneham is designed to fully modulate output duty/capacity. Control of capacity will be dependent on control type selected, see Controls Section.

Modulation/turn down ratio is 50% across the Tyneham range.

4.2.1 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.

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



4.2.2 Part Load Correction Data

Figures in the table below should be used to determine COPH at part load conditions. See Hamworthy Heating published COP tables for reference.

R744 COPH Correction Factors for Part Load								
R744 Capacity %	-10°C External	-5°C External	0°C External	5°C External	10°C External	15°C External	20°C External	25°C External
75	1.081	1.089	1.043	1.036	1.032	1.052	1.094	1.054
50	1.104	1.129	1.079	1.068	1.062	1.079	1.120	1.077
25	1.149	1.169	1.115	1.100	1.091	1.120	1.145	1.101

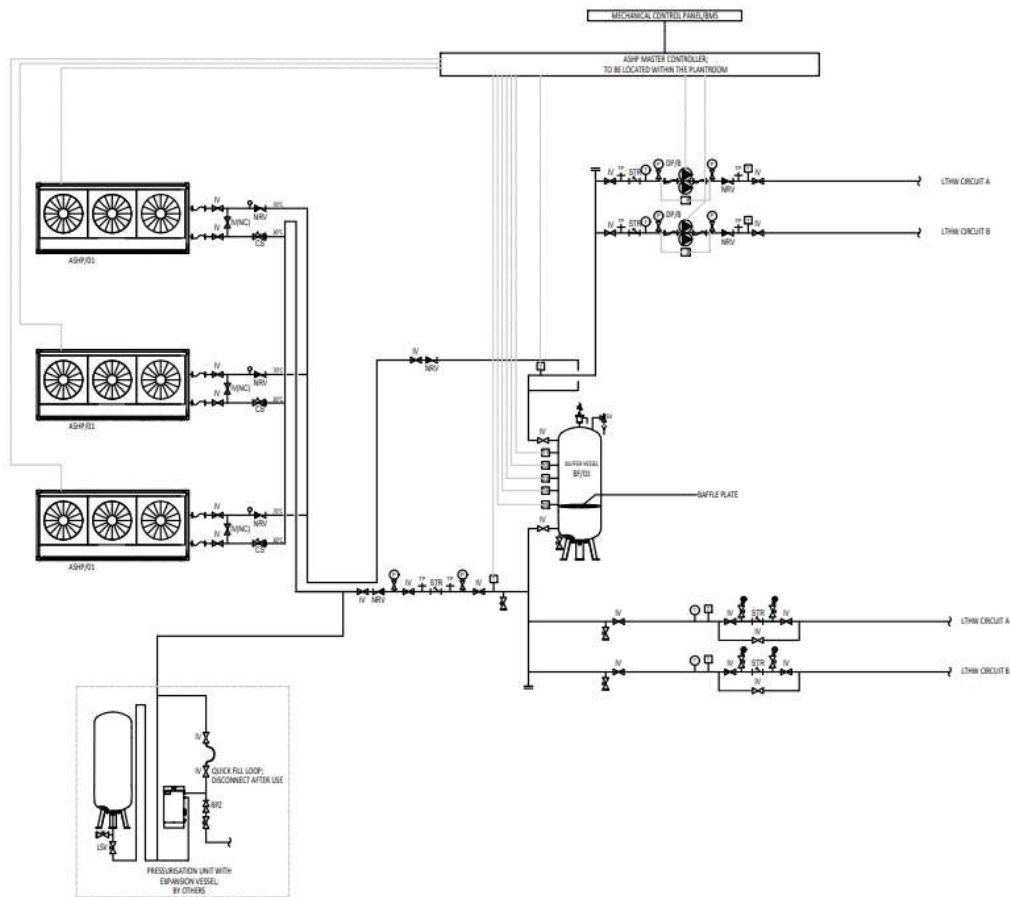
4.3 System Schematic

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.

The Tyneham can be used for heating and DHW applications and combined systems.

4.3.1 Recommended System Configuration - Heating



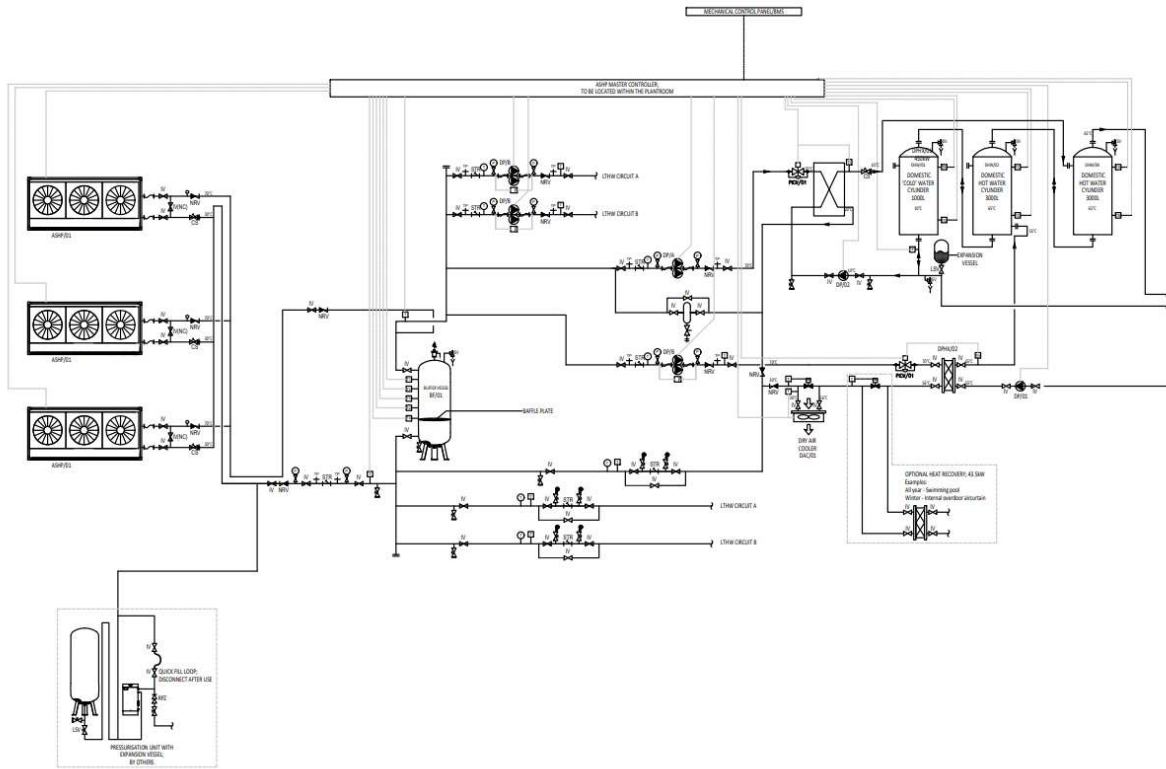
Buffer temperature sensors can be used to modulate heat pump output, see Section 6 for further details of controls.

Header connections to the buffer must be sized as a low velocity header to ensure correct pipe sizing.

NOTE: It is not recommended that low loss headers are used in a heat pump system.

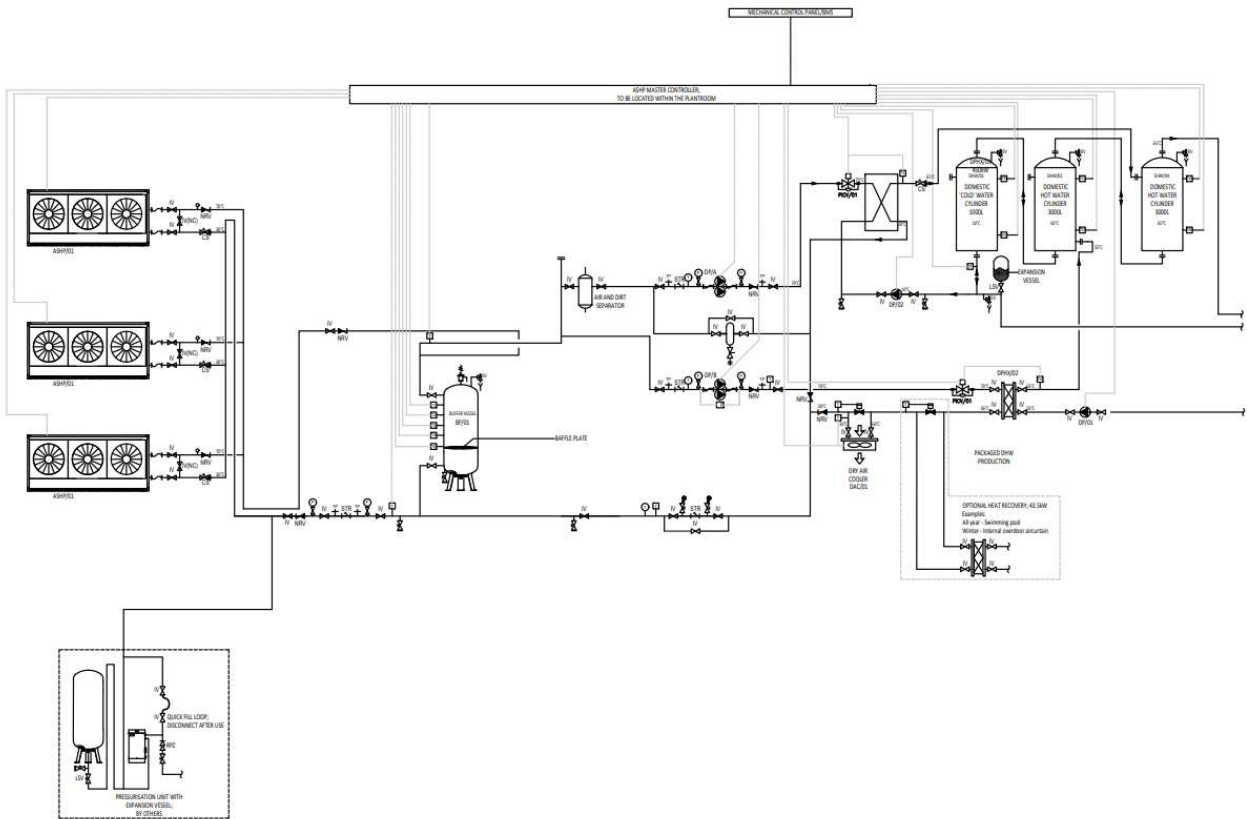
NOTE: Multiple Tyneham systems will require a Master Control unit, see Controls section of this document for further information.

4.3.2 Recommended System Configuration – Heating & DHW



NOTE: Multiple Tyneham systems will require a Master Control unit, see Controls section of this document for further information

4.3.3 Recommended System Configuration –DHW Only



NOTE: Consideration will need to be made to system volume in this configuration. Dependent on control and storage of DHW store a buffer on the primary system may be required.

NOTE: Multiple Tyneham systems will require a Master Control unit, see Controls section of this document for further information

4.4 Defrost

The unit is designed to automatically defrost. During defrost the unit will stop the distribution pump, therefore buffer sizing will need to account for defrost periods.

4.5 Recommended Buffer Size

Dependent upon system capacity and system requirements the following buffer sizes are recommended:

Storage Time (at 35°C ΔT)	50kW	75kW	100kW	150kW	200kW	300kW
30mins	600 L	900 L	1200 L	1800 L	2500 L	3700 L
45mins	900 L	1400 L	1800 L	2800 L	3700 L	5500 L
60mins	1200 L	1800 L	2500 L	3700 L	5000 L	7400 L

4.6 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.

4.6.1 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 CO₂ system should the plate heat exchanger fail.

CO₂ 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 Tyneham 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

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

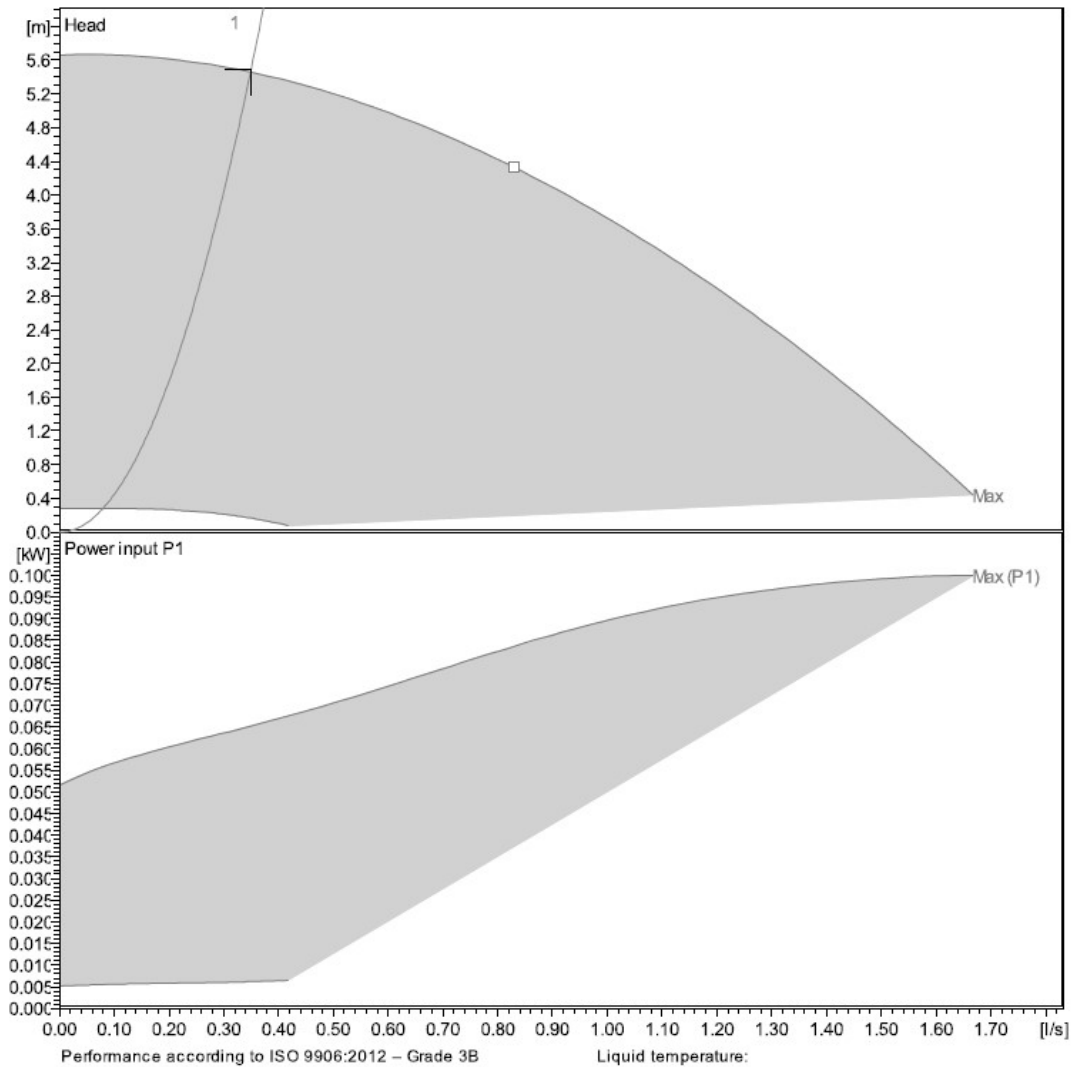
4.7 Pump Curves

4.7.1 Pump Curve 65/50kW Tyneham

LOWARA ECOCIRC XL 25-60

During commissioning the contractor is required to ensure commissioning sets are regulated as to ensure the correct head pressure at design flow conditions.

At 100% pump speed the required system head pressure is 54kPa to achieve a design full load flow rate of 0.34l/s.

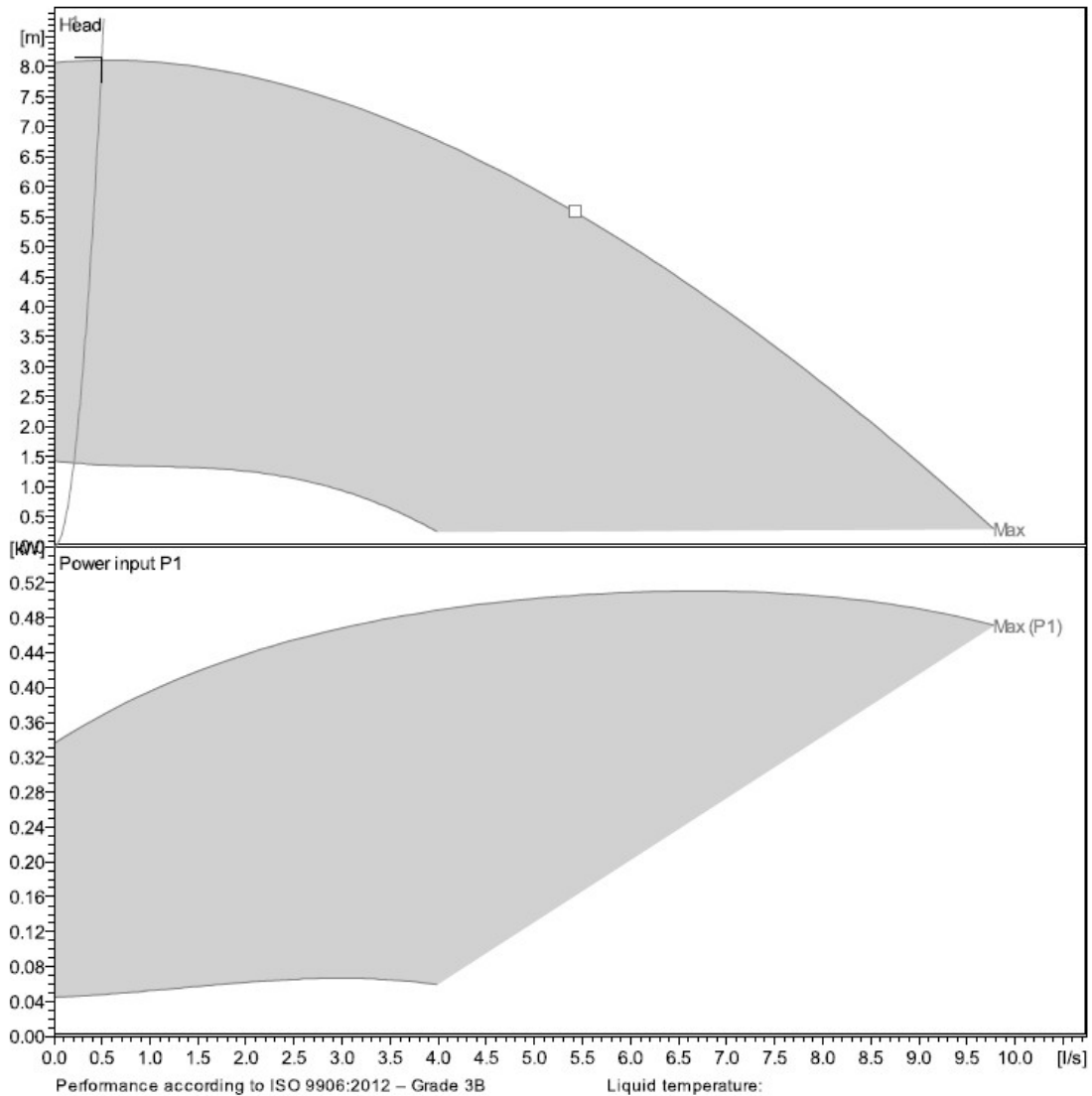


4.7.2 Pump Curve 95/75kW Tyneham

LOWARA ECOCIRC XL 65-80

During commissioning the contractor is required to ensure commissioning sets are regulated as to ensure the correct head pressure at design flow conditions.

At 100% pump speed the required system head pressure is 80kPa to achieve a design full load flow rate of 0.51/s.

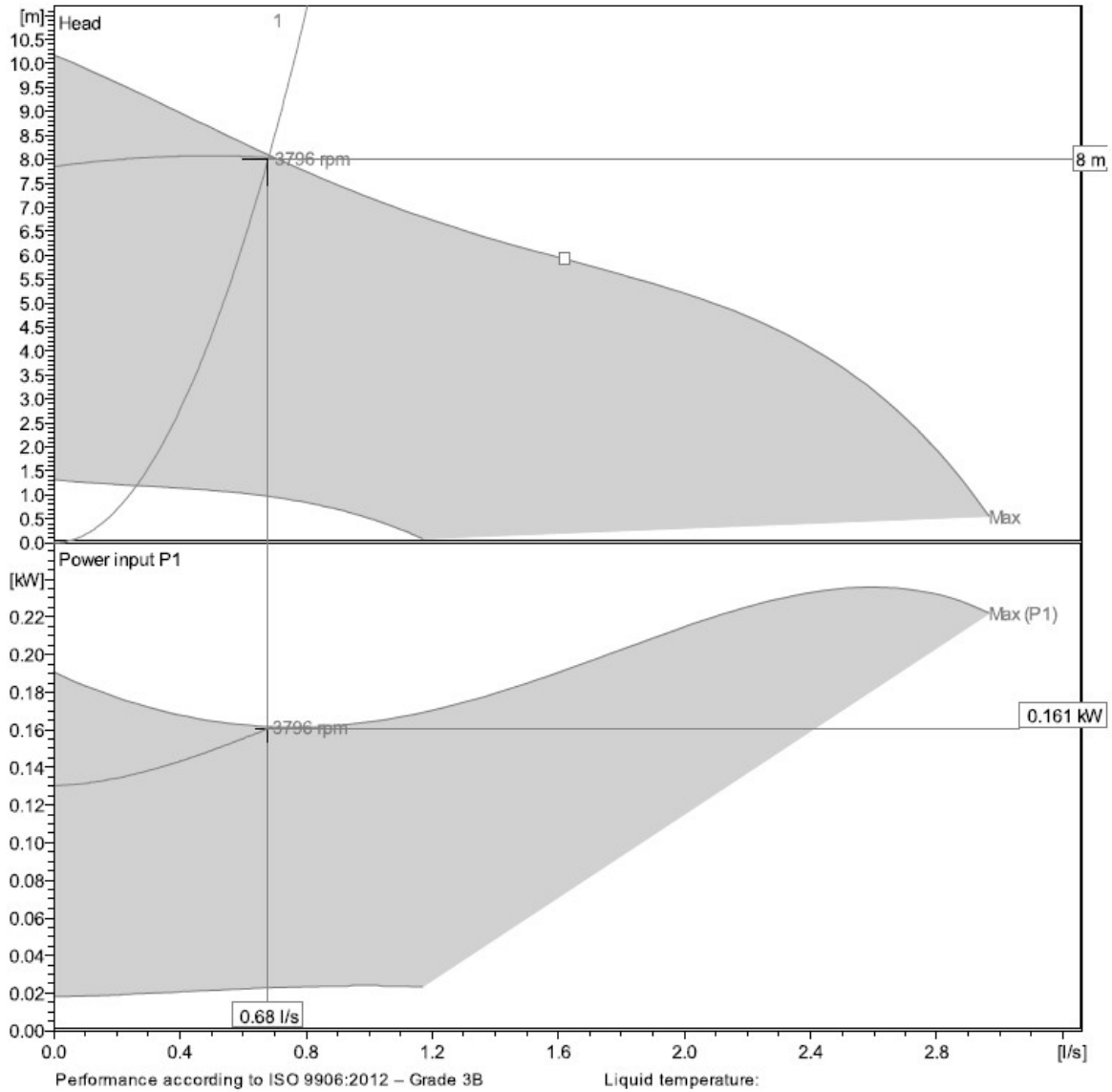


4.7.3 Pump Curve 130/100kW Tyneham

LOWARA ECOCIRC XL 32-100

During commissioning the contractor is required to ensure commissioning sets are regulated as to ensure the correct head pressure at design flow conditions.

At 100% pump speed the required system head pressure is 80kPa to achieve a design full load flow rate of 0.68l/s



5 Wiring

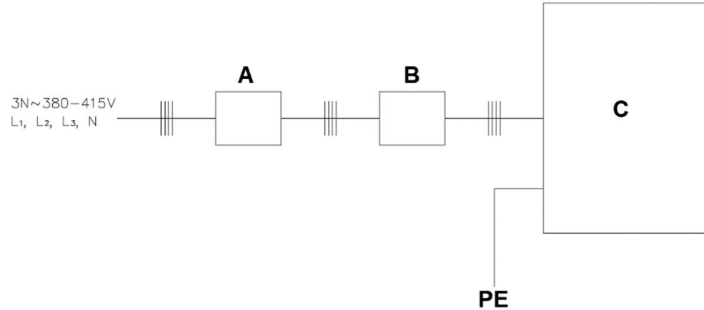
5.1 Mains Supply Installation

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	
Tyneham 50	10	10	6	63	63
Tyneham 75	16	16	10	80	80
Tyneham 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.

⚠ 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.

5.2 Cable Connections

Control cable specifications:

Remote controller cable	Size	0.3 - 1mm ²
Cable between units		Cat 5e

5.2.1 Terminal Block Arrangement

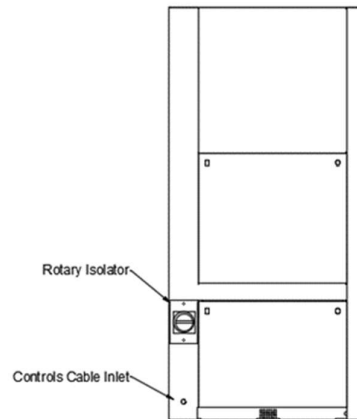
Remove front and side panels to gain access to the electrical controls and cable routes.

⚠ CAUTION

Earth tabs must be reconnected prior to refitting access panels

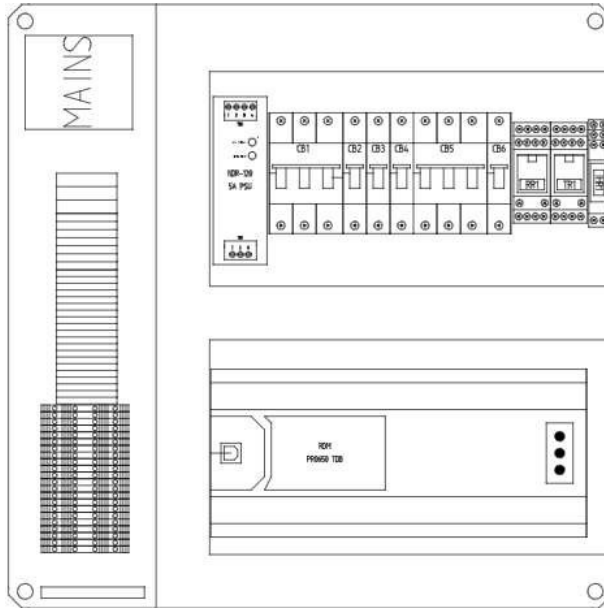
Cable glanding is located to the left-hand side of the unit where a rotary isolator is provided for electrical connections.

Stuffing glands located to the left-hand side of the unit shall be used for control cable access into the control panel.



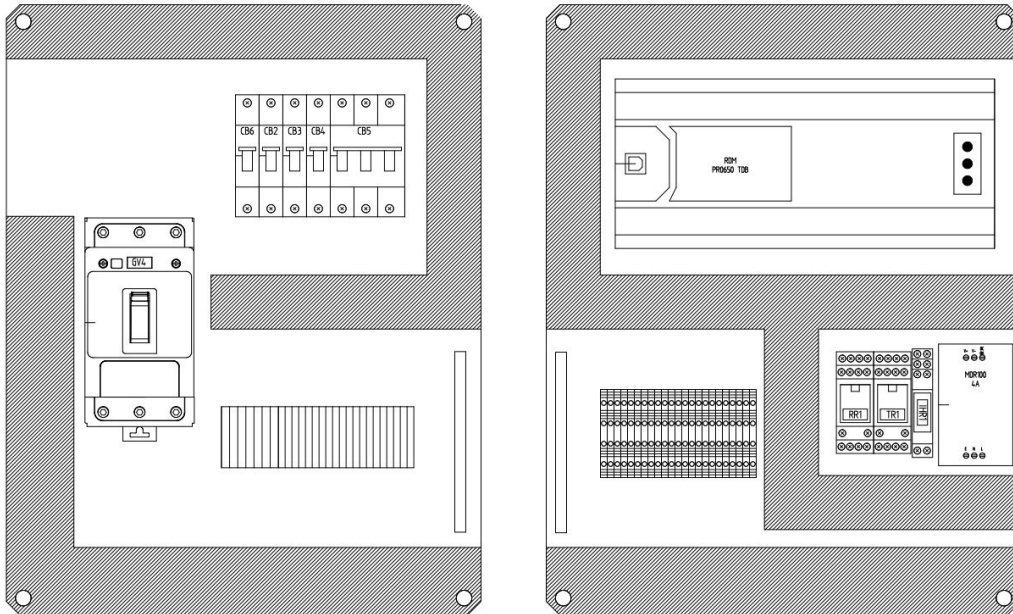
5.2.2 Tyneham 65/50kW Controls Layout

Cable glanding located to the left-hand side in line with terminal location.



5.2.3 Tyneham 95/75kW Controls Layout

Cable glanding located to the left-hand side with mains connection direct to the top side of the compressor MCCB. Control cables to be routed within trunking.



6 Controls

6.1 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.

6.1.1 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.

6.2 Control Type

There are three options for the method of control on the heat pump. Control types are detailed in this section of the document. See Section 7 of this document for details on how to select the control type on the heat pump controller.

6.2.1 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 37°C, this will initiate a high return water fault and shut down the heat pump instantly.

6.2.2 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 37°C, this will initiate a high return water fault and shut down the heat pump instantly.

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 -5°C 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 7°C 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

6.2.3 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. See section 6.3 for further details of multiplex controls.

NOTE: Should the return water temperature go above 37°C, this will initiate a high return water fault and shut down the heat pump instantly.

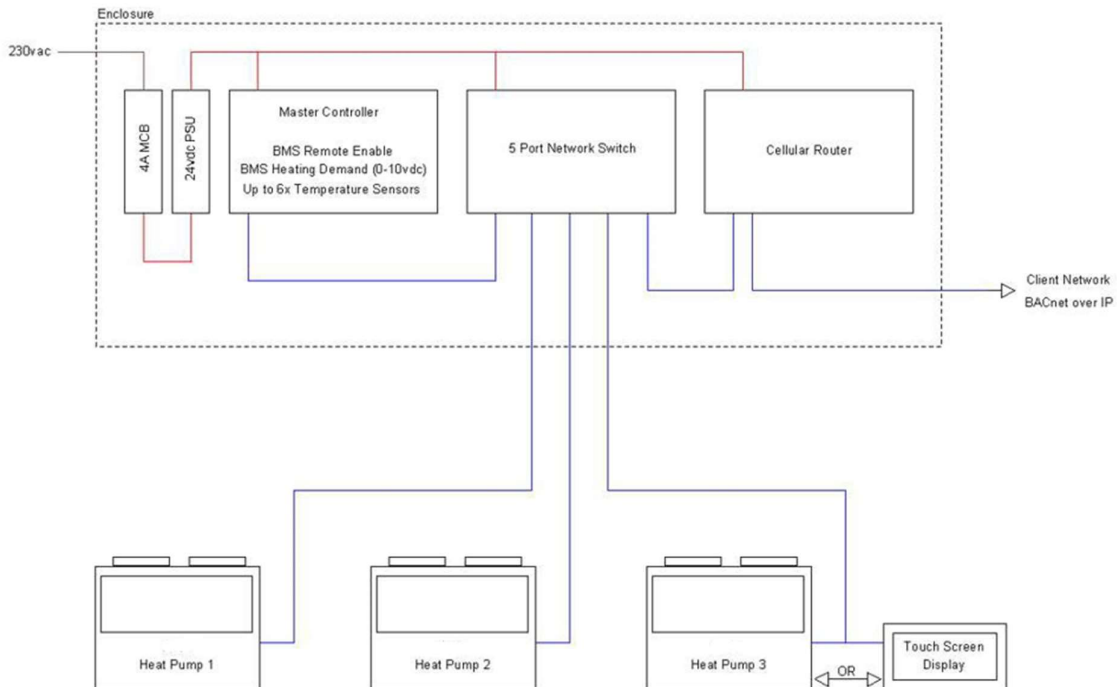
6.3 Multiplex Controls

To operate as a multiplex system, The Tyneham Master Control will be required either as a standalone unit or as part of the Tyneham Hydro Unit (packaged plant unit). The Tyneham Master Controller will enable capacity staged control of up to four Tyneham heat pumps.

- **Common Heat Pump Enable Input Signal** - This provides a common remote Stop/Start function for connection to the BEMS system for multiple heat pumps, sequence starting individual heat pumps based on the overall duty of the system and run hours.
(BMS Enable – Volt free closed contact to enable – Terminals 1 & 2)
- **0-10v Heating Capacity input Signal** - This enables the BEMS system to vary the kW output capacity of the overall heat pump system with the 0-10v signal representing the overall percentage of the system. This will increase/decrease heating capacity by increasing the compressor output capacity of each heat pump. Individual heat pumps will independently reduce its capacity based on return water temperature and discharge pressure and will enable capacity to be increased when specific conditions are met.
(BMS Heating Demand – 0-10vdc (0=0% demand / 10=100% demand) – Terminals 3 & 4)
- **System Healthy Contact** - A common System Healthy Status signal for connection to the BMS
(BMS General Fault - Volt free closed contact healthy (fail safe) - Terminals 5 & 6)

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.

6.3.1 Multiplex System Wiring Diagram



6.4 Controller IO

6.4.1 Tyneham 65/50 Controller IO

PR0652 CD NF TDB		
Status Inputs	Location	ID
Compressor Healthy	S1	
Evaporator 1 Fan Healthy	S2	
Evaporator 2 Fan Healthy	S3	
Heating Pump Healthy	S4	
System On / Off	S5	
BMS Enable	S6	
Relay Outputs	Location	ID
Compressor Enable	Relay 1	
System Healthy	Relay 3	
Universal Inputs/Outputs	Location	ID
Suction Pressure	U1	TR1
Discharge Pressure	U2	TR2
Evaporator Pressure	U3	TR3
Compressor VSD Level	U4	
Heating Pump Level	U5	
Evaporator Fan 1&2 Level	U6	
Temperature Probe Inputs	Location	ID
Ambient Temperature	P1	P1
Suction Temperature	P2	P2
Discharge Temperature	P3	P3
Gas Cooler Liquid Outlet Temperature	P4	P4
Evaporator Fin Temperature	P5	P5
Heating Flow Temperature	P6	P6
Heating Return Temperature	P7	P7
Evaporator Outlet Temperature	P8	P8
Stepper Outputs	Location	ID
High Pressure Valve	Stepper 1	STV1
Liquid Injection Valve	Stepper 2	STV2

6.4.2 Tyneham 95/75 Controller IO

PR0652 CD NF TDB		
Status Inputs	Location	ID
Compressor Healthy	S1	
Evaporator 1 Fan Healthy	S2	
Evaporator 2 Fan Healthy	S3	
Evaporator 3 Fan Healthy	S4	
Heating Pump Healthy	S5	
System On / Off	S6	
BMS Enable	S7	
Relay Outputs	Location	ID
Compressor Enable	Relay 1	
System Healthy	Relay 3	
Universal Inputs/Outputs	Location	ID
Suction Pressure	U1	TR1
Discharge Pressure	U2	TR2
Evaporator Pressure	U3	TR3
Compressor VSD Level	U4	
Heating Pump Level	U5	
Evaporator Fan 1,2 & 3 Level	U6	
Temperature Probe Inputs	Location	ID
Ambient Temperature	P1	P1
Suction Temperature	P2	P2
Discharge Temperature	P3	P3
Gas Cooler Liquid Outlet Temperature	P4	P4
Evaporator Fin Temperature	P5	P5
Heating Flow Temperature	P6	P6
Heating Return Temperature	P7	P7
Evaporator Outlet Temperature	P8	P8
Stepper Outputs	Location	ID
High Pressure Valve	Stepper 1	STV1
Liquid Injection Valve	Stepper 2	STV2

7 First Time Set Up

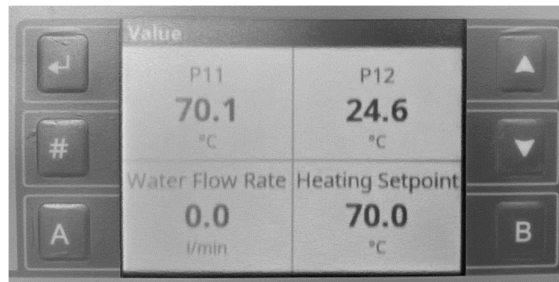
Before switching on the heat pump for the first time ensure that the LTHW circuit is filled with water and all air is removed from the system and the door switch is set to off.

The heat pump will operate according to the control type selected so on first start up it is important the desired control type is selected on the heat pump controller. See Controls section of this document for information on types of control for the heat pump.

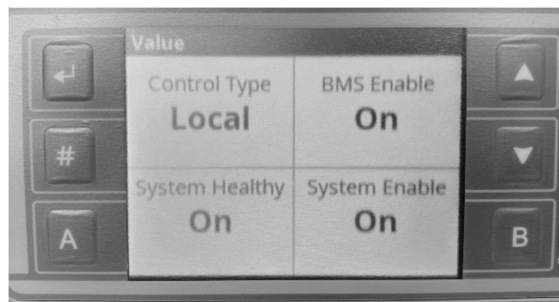
7.1 Selecting Control Type

Before the unit will operate the control type must be selected. To select the control type on the controller:

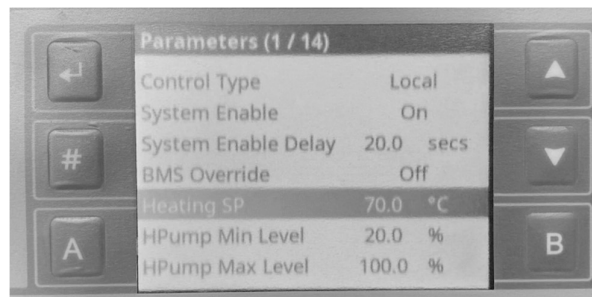
Press ENTER key to enable the RDM screen:



Press B key and check control type:

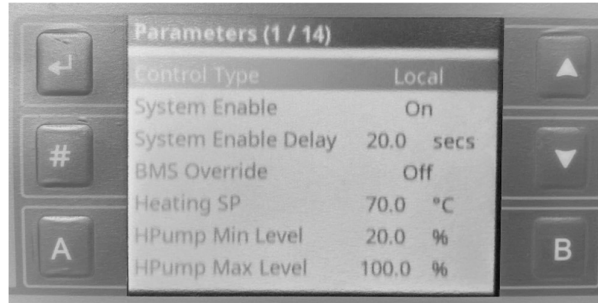


To change the control type press ENTER and DOWN key simultaneously to access the menu:



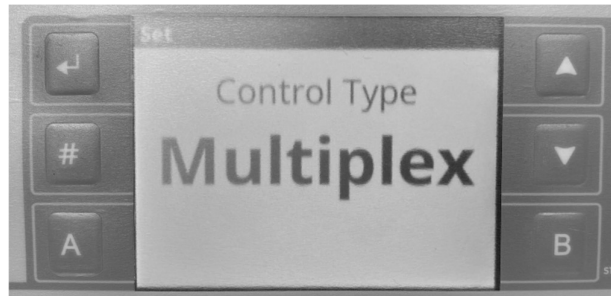
Press B key to scroll through the parameter menu:

Press DOWN key to parameter page listing Control Type parameter:



Press ENTER, then using UP/DOWN keys, scroll through to the correct control type.

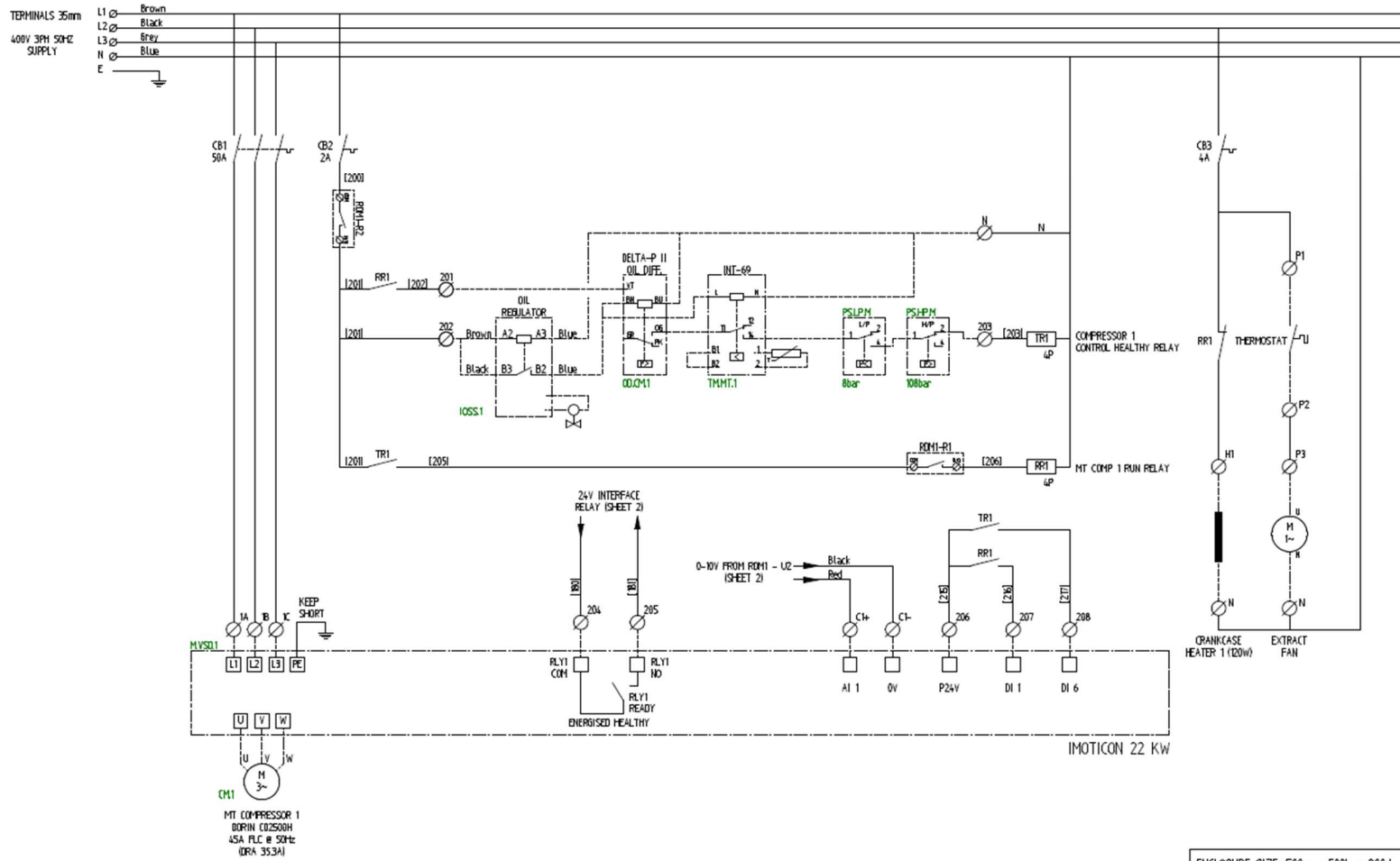
Press ENTER key to select type:

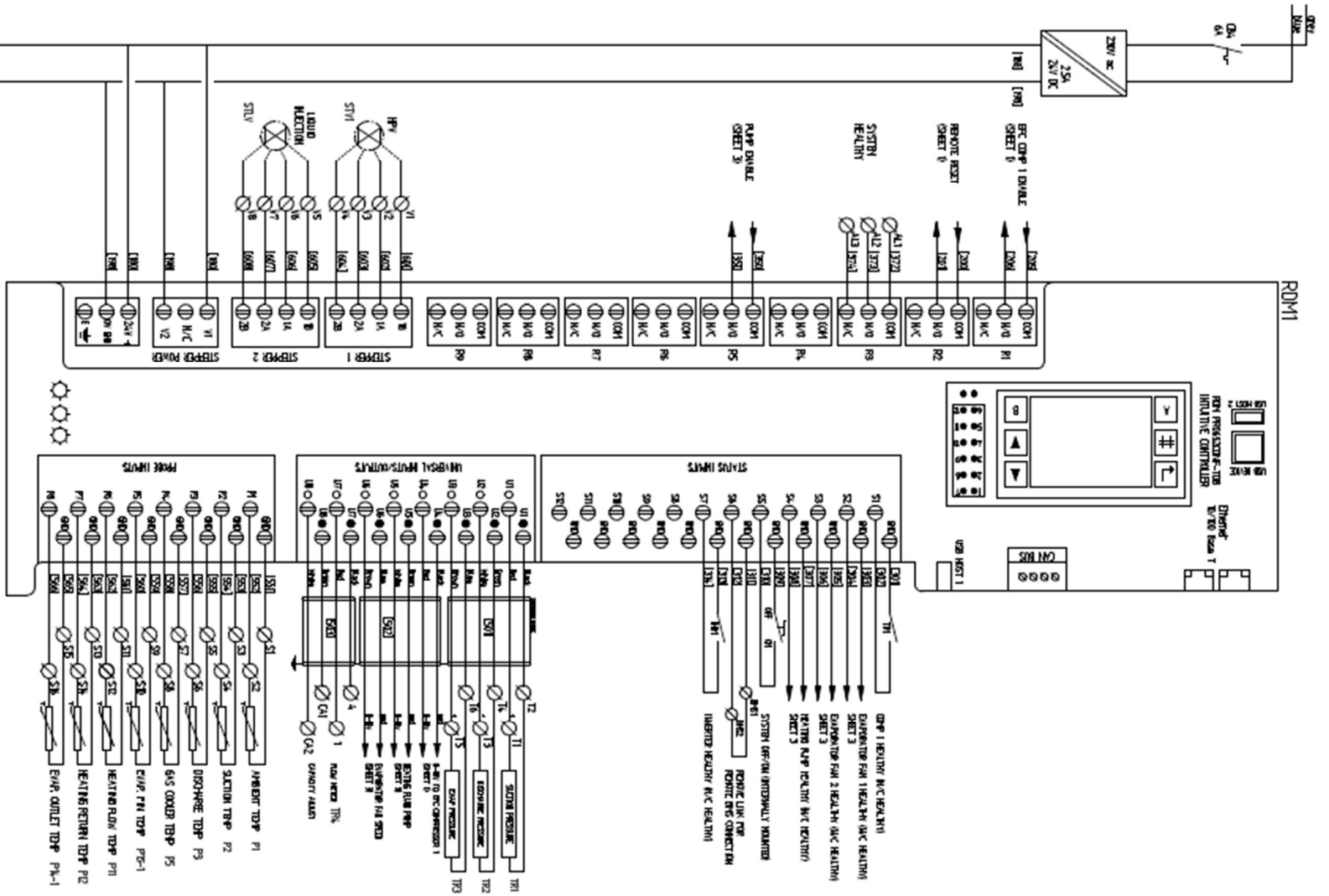


Press the # key to return to the front screen.

8 Wiring Diagrams

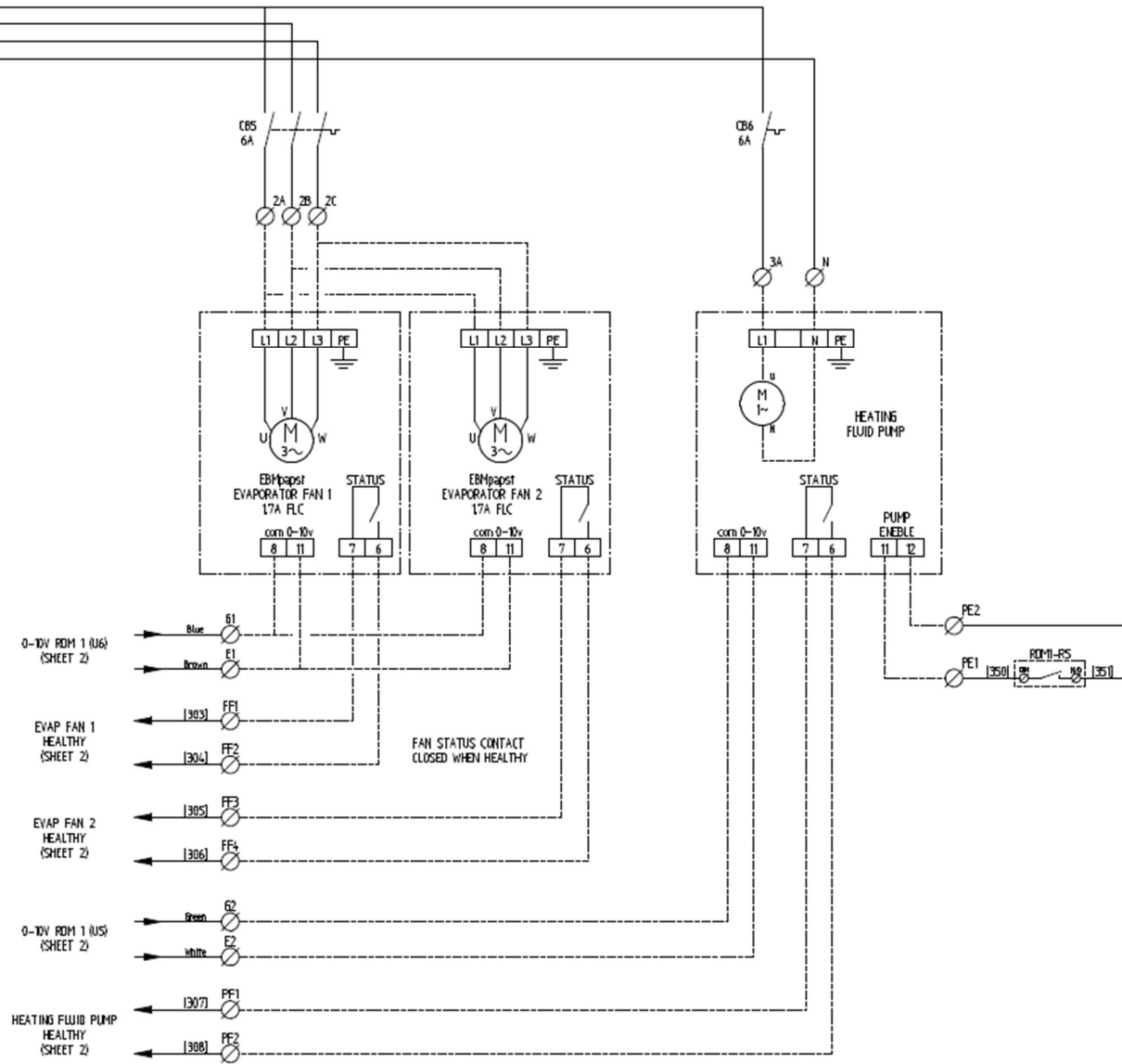
8.1 Tyneham 65/50kW Power Wiring



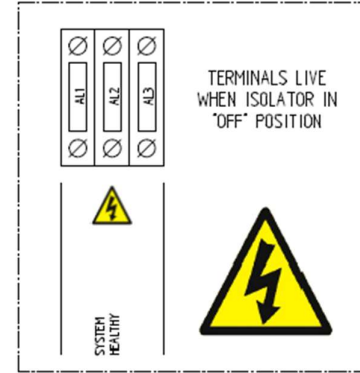
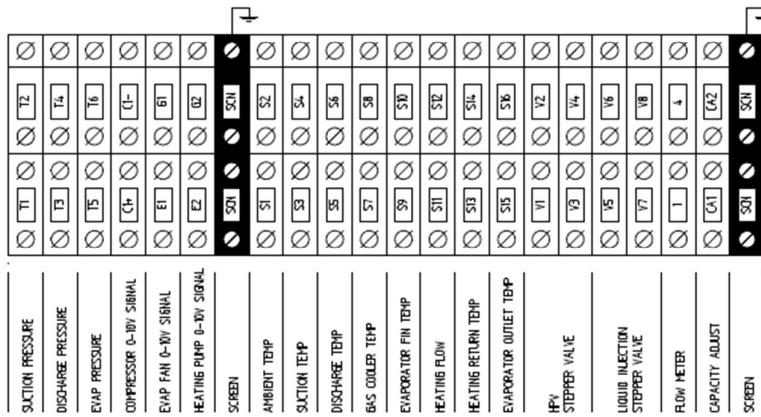
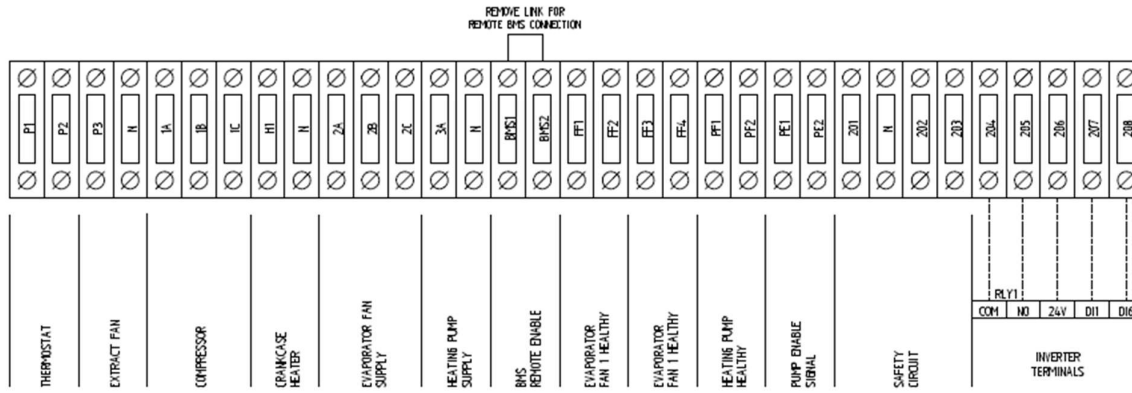


Color	Device	Device	Device	Color	Port #
B	CDI/CDH	ETS 5	ETS 6	White	SPRINK
W	White	Black	White	Black	White
Y	Yellow	Black	Yellow	Black	White
Z1	Brown	Brown	Black	Blue	Green
Z2	Brown	Brown	White	Black	Green
Z3	Brown	Brown	White	Black	Brown

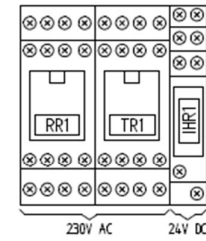
Brown
Black
Grey
Blue



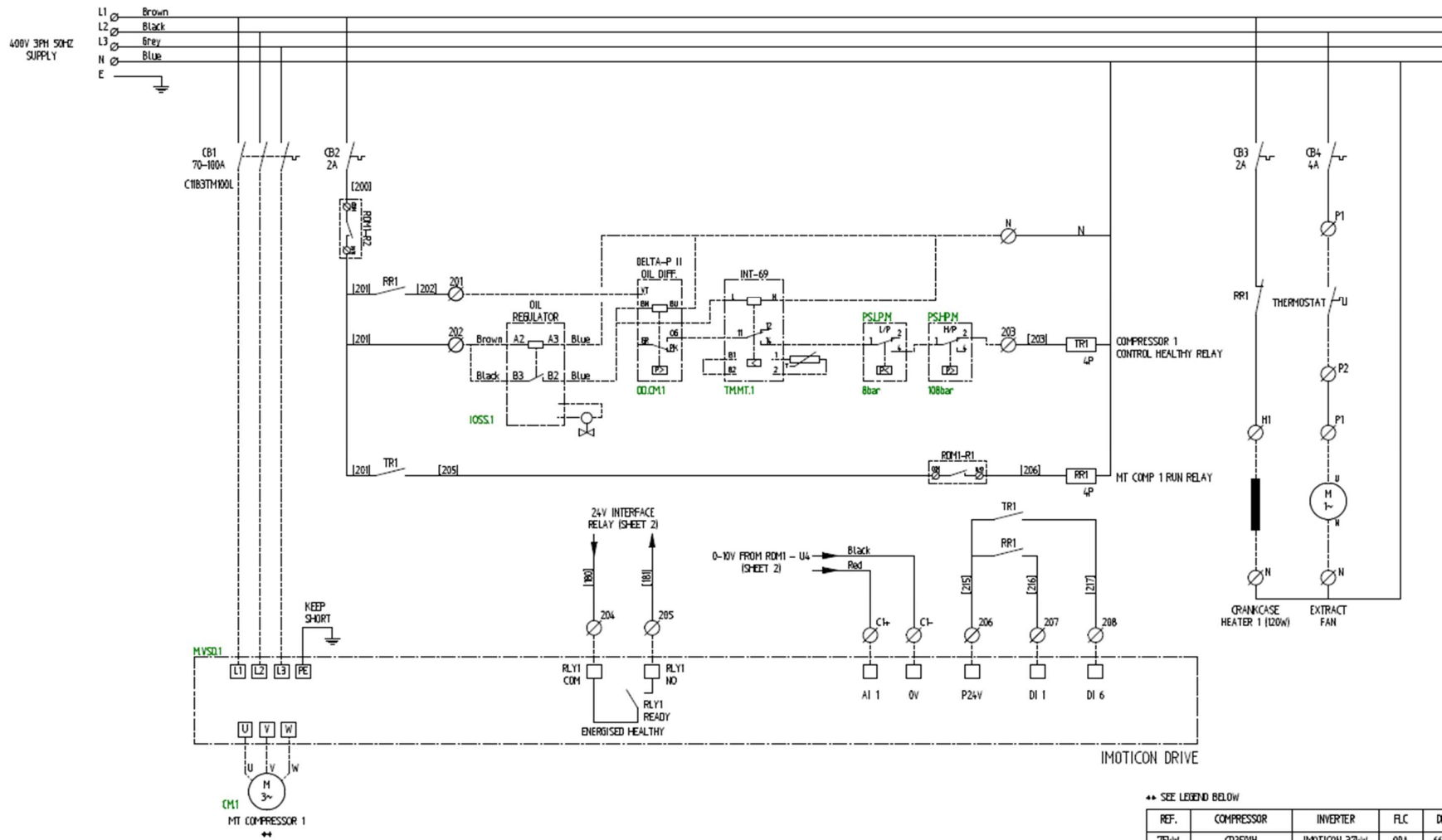
TERMINAL LAYOUT



RELAY LAYOUT



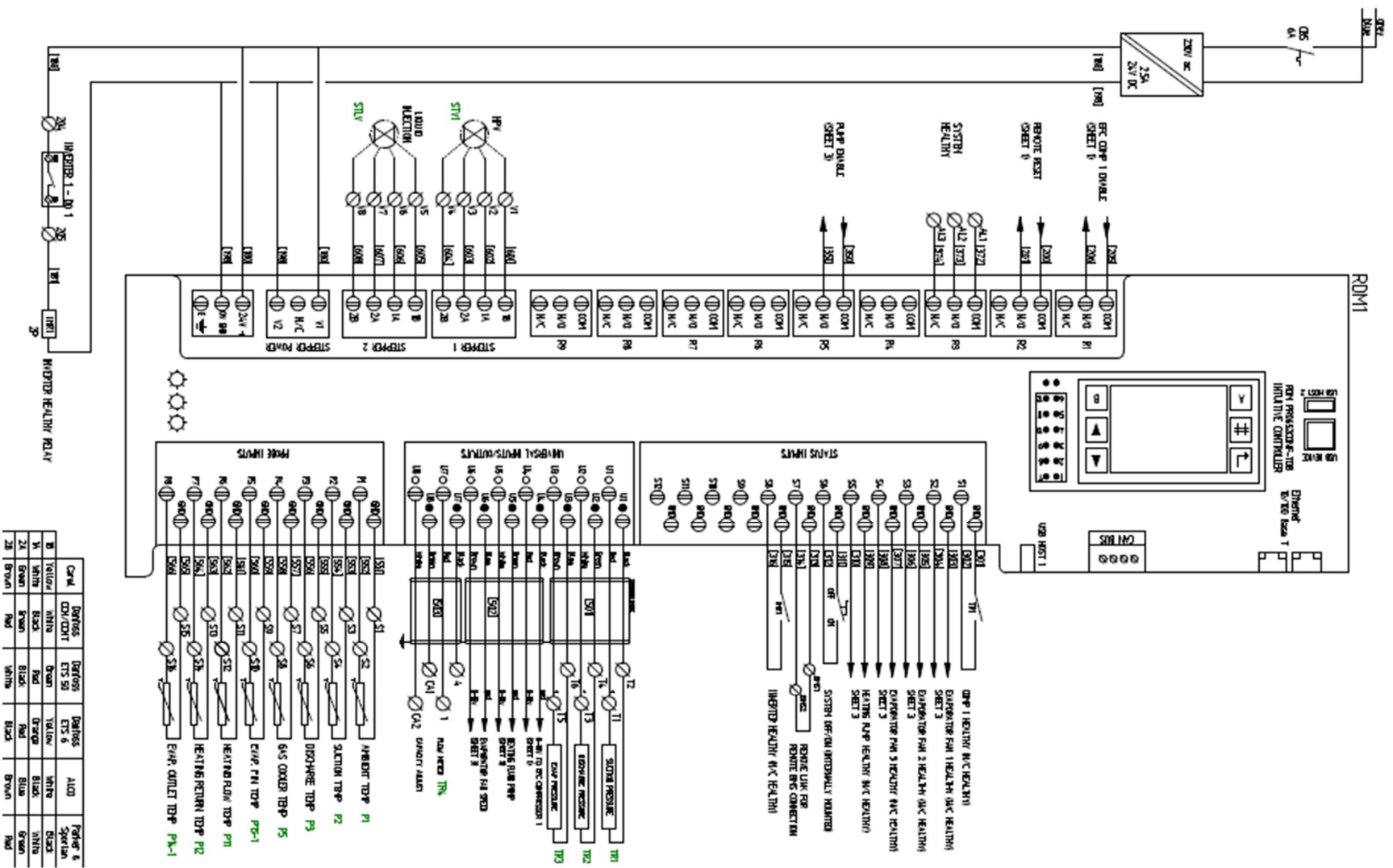
8.2 Tyneham 95/75 & 130/100kW Power Wiring



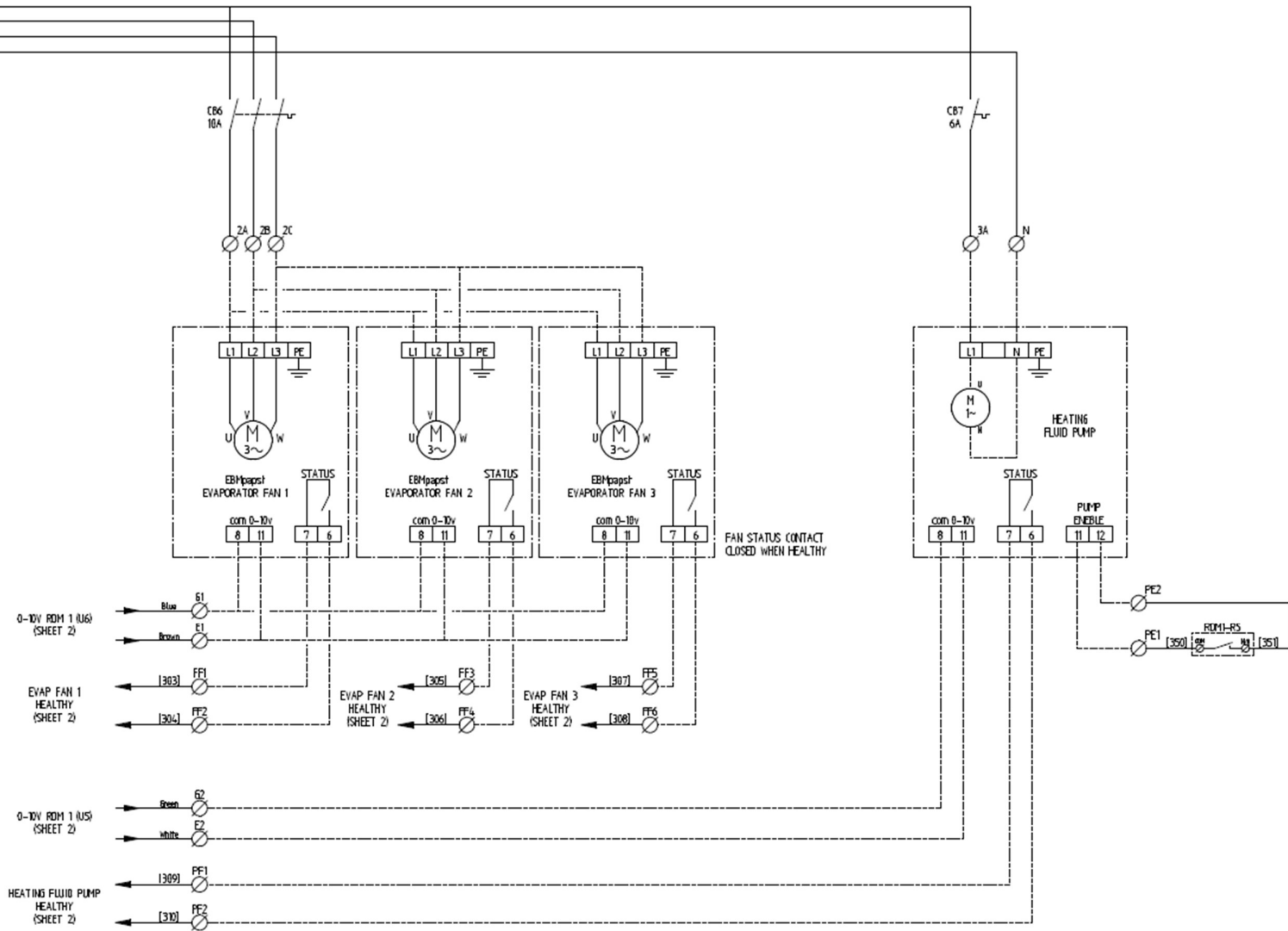
SEE LEGEND BELOW

REF.	COMPRESSOR	INVERTER	FLC	DRA
75kW	CD350IH	IMOTICON 37kW	98A	66.7A
100kW	CD500M1	IMOTICON 45kW	93A	74.2A

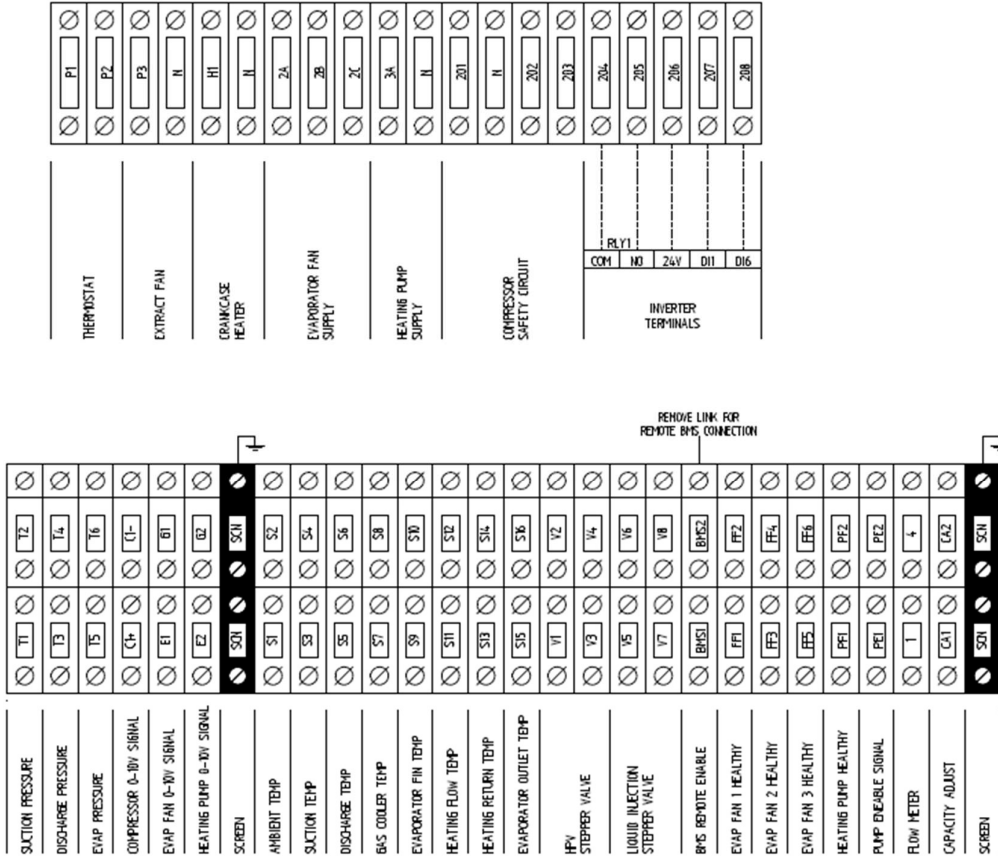
ENCLOSURE: 800w x 500h x 200d (2x 400w x 500h x 200d)



Brown
Black
Grey
Blue



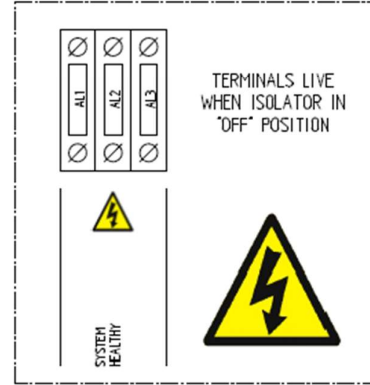
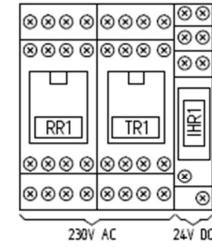
TERMINAL LAYOUT



REMOVE LINK FOR
REMOTE BMS CONNECTION

+5

RELAY LAYOUT



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