

TYNEHAM AHP60

Air/water monobloc
heat pump

INSTALLATION, COMMISSIONING AND SERVICING INSTRUCTIONS

Models: 50 and 70 kW

IMPORTANT NOTE

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



Customer After Sales Services

Telephone: 0845 450 2866 E-mail: aftersales@hamworthy-heating.com Fax: 01202 662522

Technical Enquiries

To supplement the detailed technical brochures, technical advice on the application and use of products in the Hamworthy Heating range is available from our technical team in Poole and our accredited agents.

Site Assembly

Hamworthy offer a service of site assembly for many of our products in instances where plant room area is restricted. Using our trained staff we offer a higher quality of build and assurance of a boiler built and tested by the manufacturer.

Commissioning

Commissioning of equipment by our own engineers, accredited agents or specialist sub-contractors will ensure the equipment is operating safely and efficiently.

Maintenance Agreements

Regular routine servicing of equipment by Hamworthy service engineers inspects the safety and integrity of the plant, reducing the risk of failure and improving performance and efficiency. Maintenance agreements enable our customers to plan and budget more efficiently.

Breakdown service, repair, replacement

Hamworthy provide a rapid response breakdown, repair or replacement service through head office at Poole and accredited agents throughout the UK.

Spare Parts

A comprehensive spare parts service is operated from our factory in Poole, providing replacement parts for both current and discontinued products. Delivery of parts and components is normally from stock within seven days. However, a next day delivery service is available for breakdowns and emergencies.

CONTENTS

1. REGULATIONS, RECOMMENDATIONS AND WARNINGS.....	5
1.1. Applicable regulations and standards	5
1.2. Recommendations and warnings	5
2. DESCRIPTION OF THE EQUIPMENT	15
2.1. Designations and scope	15
2.2. Packaging	15
2.3. Definitions	15
2.4. Technical data	16
2.5. Description	20
2.6. Operating principle	22
3. INSTALLATION	24
3.1. Lifting and handling	24
3.2. Installation	25
3.3. Installing the outdoor unit	25
3.4. Installing the control unit	32
3.5. Position of the centre of gravity and the vibration shock absorbers	32
3.6. Hydraulic connections	33
3.7. Electrical connections	39
4. PRE-REQUISITES BEFORE COMMISSIONING	44
4.1. Verification before switching on	44
4.2. Switching On	45
4.3. Commissioning	45
4.4. Primary loop flow rate/cascade balance adjustment	45
4.5. Operating diagram	46
4.6. TYNEHAM user interface navigation	48
5. CONTROL INTERFACE	49
5.1. User interface	49
5.2. "SET" setpoint menu (For manual operation only)	50
5.3. Sensor menu [TP]	51
5.4. Error menu [Err]	51
5.5. Operating hours menu [OHR]	51
5.6. Parameter menu [Par]	51
6. TROUBLESHOOTING	52
6.1. Troubleshooting of failures without error code	52
6.2. Error codes and diagnostic assistance	52
6.3. Inverter board errors	59
6.4. Ohmic values of the various sensors	61
7. MAINTENANCE OF THE OUTDOOR UNIT	62
7.1. Drainage of the outdoor unit on the water side	62
7.2. Filling the outdoor unit	62
7.3. Prolonged shutdown	62
7.4. Periodic checks	62

7.5. Cleaning the external surfaces.....	65
7.6. Maintenance of the outdoor unit.....	65
7.7. Residual safety risks	66
7.8. Heavy maintenance work.....	67
7.9. "Maintenance" check list	68
8. END OF PRODUCT LIFE-	74
9. ANNEX A - DATA FOR PRODUCTS ≤ 70KW	76

■ **Symbols used in this document**



INFORMATION: This symbol draws attention to comments.



CAUTION: Failure to comply with these instructions may cause damage to the installation or to other objects.



WARNING: Failure to comply with these instructions may cause electrocution.



WARNING: Failure to comply with these instructions may cause injury and serious damage to property.

1. REGULATIONS, RECOMMENDATIONS AND WARNINGS



1.1. Applicable regulations and standards



This outdoor heat pump has been designed in accordance with current regulations and must be used accordingly. See the list of standards on the back cover.

This device must be transported in compliance with the Local Laws.

This device and its refrigerant R32 must be handled in compliance with the application orders of the F Gas regulations. Specific guidelines related to the presence of Fluorine in the composition of the R32 fluid are specified in the European Union regulation n° 517/2014.

It must be installed in compliance with local or national regulations such as the RSD (Local sanitary Regulations), and in accordance with standard EN 378-3: 2016 concerning the installation of heat pumps.

The electrical connection must be made in compliance with the Current I.E.E. (BS7671) Wiring Regulations standard.

The hydraulic connection must be made in compliance with the Local Laws

Regulations covering Maintenance

The appliance must be installed and maintained by an approved professional in accordance with the prevailing regulations and code of practice, in particular:

- The legislation on the handling of refrigerants
- **Current I.E.E. (BS7671) Wiring Regulations**

CAUTION:

This device must be maintained by qualified personnel with a certificate of capacity for the handling of refrigerants.

1.2. Recommendations and warnings

1.2.1. Transport and storage

The outdoor appliance and the hydraulic station:

- must be stored in a place where the temperature is between -10°C and +50 °C with a relative humidity between 5 and 95%.
- must not be stacked,
- must be protected from humidity.

Transport and storage must comply with the national standards in force. In particular, according to the provisions of the ADR (see below), the maximum total quantity per transport unit for flammable gases is 333 kg (net mass).

Handling

The outdoor unit must not be in a horizontal position during transport.

Transport in a horizontal position may damage the appliance by moving the refrigerant and damaging the compressor's suspensions.

Damage caused by transportation in a horizontal position is not covered by the warranty.

If necessary, the outdoor unit may be tilted during manual handling (to go through a door or use a staircase). This operation must be conducted very carefully and the appliance must be immediately restored to the upright position.

1.2.2. Unpacking the appliance

Acceptance

With the carrier present, carefully check the general appearance of the packaging and the appliances. Check that the outdoor appliance has not been placed in a horizontal position. In the event of disagreement, write to the carrier within 48 hours mentioning all reserves and send a copy of this letter to the After Sales Department.

Before unpacking the appliance, check that there are no refrigerant leaks using a suitable detector. Check that there are no ignition sources near the unit.

Smoking is forbidden near to the unit.

1.2.3. Safety recommendations related to the presence of the R32 refrigerant

The handling and installation of this outdoor appliance must only be performed by personnel that are duly trained, qualified and authorised to carry out these operations, according to the laws, directives and standards applicable in each country.

The EN378:2016 standard defines the framework of requirements to be met to manage each potential risk at each stage of the machine's life cycle. This standard was also used to design this machine.

In the absence of local building codes or safety standards, the installation and maintenance of the machine may follow the elements outlined in this standard; in particular, it is the responsibility of the installer and personnel performing operations on this machine to perform a **risk analysis** prior to any installation and work on the machine.

The elements indicated below are not exhaustive given the diversity of the possible installations and interventions; they cannot be considered as an undertaking as to the responsibility of Hamworthy Heating. These elements cannot replace a risk analysis, which remains the responsibility of the installer and the personnel working on the machines.

Designation	R32.
INDICATION OF DANGERS	
Main dangers:	Asphyxia.
Specific dangers:	The rapidity of evaporation can cause burns.
EMERGENCY MEASURES	
General information	Do not give anything to persons who have fainted.
Inhalation:	Take the person to fresh air. Use oxygen or artificial respiration if required. Do not administer adrenaline or similar substances.
Contact with the eyes:	Rinse thoroughly with water for at least 15 minutes and seek medical attention.
Contact with the skin:	Rinse thoroughly with water for at least 15 minutes. Apply a sterile gauze. Remove contaminated clothing immediately.
FIRE PREVENTION MEASURES	
Extinguishers:	Water spray, dry powder.
Specific dangers:	Rupture or explosion of the recipient.
Specific methods:	Cool down the recipients by spraying with water from a safe position. If possible, stop the product from leaking. If possible, use a water spray to hose down the smoke. Move the recipients well clear of the fire zone if possible without taking risks.



MEASURES IN THE EVENT OF AN ACCIDENTAL LEAK

Individual precautions:	Use personal protection equipment. Evacuate the personnel to safe areas. Eliminate ignition sources. Ensure there is adequate ventilation.
Environmental precautions:	Try to stop the leak.
Cleaning methods:	Ventilate the area.

HANDLING AND STORAGE

Handling: Technical measures/precautions:	Ensure that the premises have adequate air renewal/extraction .
Recommendations for safe use:	Do not breathe in the vapours or use aerosols.
Storage	Close tightly and store in a cool, dry, well-ventilated place. Keep in original recipients. Incompatible products: explosives, flammable materials, organic peroxide.

CONTROLLED EXPOSURE/INDIVIDUAL PROTECTION

Control parameters:	DNEL: Derived No-Effect-Level (workers) long term, systemic effects, inhalation = 7035 mg/m ³ . PNEC: Predicted No Effect Concentration Water (fresh water) = 0.142 mg/l Aquatic, intermittent emissions = 1.42 mg/l Sediments, fresh water = 0.534 mg/kg dry weight
Respiratory protection:	Not necessary.
Protection of the eyes:	Safety glasses.
Protection of the hands:	Rubber gloves.
Hygiene measures:	Do not smoke!

PHYSICAL AND CHEMICAL PROPERTIES

Colour	Colourless.
Smell:	Ethereal. Hardly perceptible in low concentrations.
Boiling point:	-51.7 °C at atm. press.
Flash point:	648°C
Lower flammability level	13%
Upper flammability level	32%
Relative density of gas (air=1)	1.8
Relative density of liquid (water=1)	1.1
Solubility in water:	280000 mg/l.

STABILITY AND REACTIVITY

Stability:	Stable in normal conditions.
Materials to be avoided: Hazardous decomposition products Hazardous:	Air, oxidising agents, humidity. In normal conditions of storage and use, no hazardous decomposition product should be generated.

TOXICOLOGICAL INFORMATION

High toxicity:	LD/LC50/inhalation/4 hours/rat test = 1107000 mg/m ³ .
Local effects:	No known effects.
Long term toxicity:	No known effects.

ENVIRONMENTAL INFORMATION

Global warming potential GWP (R744=1):	675
Ozone damage potential ODP (R11=1): Of the ozone ODP (R11=1):	0
Disposal Considerations:	Comply with the supplier's gas collection programme. Avoid direct emission into the atmosphere.

■ Specific warnings on the R32 refrigerant

The R32 refrigerant:

- is odourless;
- is slightly inflammable (A2L), but only in the presence of flames;
- Risk of explosion at air concentrations between the lower and upper flammability levels of the fluid, see refrigerant data sheet above.

It is essential to follow the following guidelines:

- do not smoke near to the appliance ;
- put up no smoking signs near to the appliance ;
- ensure that it is installed in a well-ventilated area
- do not pierce or burn the appliance ;
- do not position the appliance near to ignition sources, such as naked flames, electric heaters, etc.;
- any special work or repairs to the appliance must be carried out by specialised technicians or qualified personnel;

■ R32 refrigerant load

The procedures described below must only be performed by specialised technicians or qualified personnel:

- ensure that other types de refrigerant do not contaminate the R32;
- keep the gas bottle in a vertical position when loading it;
- put a suitable label on the unit after loading it;
- do not load more refrigerant gas than needed;
- before loading, search for leaks before carrying out an operating test. This operation has two purposes, to control the quantity of refrigerant loaded and to check the circuit for leaks,
- after the operating test, we recommend carrying out another leak test,

■ Eliminating the R32 refrigerant

Follow the standardised procedures **for collecting refrigerants, which may only be carried out by specialised technicians or qualified personnel, and return it to the supplier.**

■ Installation precaution related to the refrigerant

If local construction codes or safety standards don't exist, the information shown below are taken from the standard EN378: 2016 may be used for information; they may be used as a guide for the safe use of machines that use R32 as a refrigerant.

This outdoor unit must not be installed in a place that can the general public or untrained, qualified or approved persons can access.

It is designed to be installed outdoors, in open air. A shelter or alcove in which at least one of the longest walls is open to the outside air by louvers having a free area of 75% and covering

at least 80% of the wall (or the equivalent if more than one wall is open to the outside air), is considered to be open to the outside air.

It must be located so that no refrigerant leaks can enter the building and/or endanger people and property. Therefore:

It must not be possible for the refrigerant to spill into a ventilation duct, under a door, hatch or similar opening in case of a leak. For this reason, the installer must ensure that there is a distance of at least 1m between the unit and any such opening. When a shelter is provided for the refrigerant appliance in the open air, this shelter must be equipped with a natural or forced ventilation device.

For refrigerant appliances which are installed outdoors at a location where a refrigerant release may stagnate, for example, below ground level, the installation must meet the requirements relative to gas detection and machine room ventilation.

1.2.4. Recommendations for hydraulic and electrical circuits

■ Hydraulic connections

The connection must comply with good engineering practices according to the regulations in force.

Reminder: Make the assembly seals according to good engineering practices in force for plumbing work:

- Use suitable seals or gaskets (fibre seals, O rings).
- Use Teflon or hemp tape.
- Use sealant (synthetic as required).

■ Characteristics of the water for the appliance

To ensure that the appliance is working correctly, the water must be filtered correctly (see the indications at the beginning of this section) and the quantity of dissolved must be minimised.

Refer to chapter 3.6.4. For further recommendations.

The maximum authorised values are as follows:

Use glycol water if the room where the primary/secondary storage tank(s) is/are installed is not frost-free; we recommend that this situation be temporary so as not to alter the system's

MAXIMUM AUTHORISED PHYSICAL-CHEMICAL CHARACTERISTICS AUTHORISED FOR THE INSTALLATION WATER	
PH	7.5 - 9
Electrical conductivity	100 - 500 μ S/cm
Total hardness	8.0 - 15.1 °f
Temperature	< 65°C
Oxygen content	< 0.1 ppm
Max. quantity of glycol	40%
Iron (Fe)	< 0.3 ppm
Chlorine ions (Cl-)	< 50 ppm

Percentage of glycol	Freezing point [°C]	Efficiency correction factor	Absorbed power correction factor	Water flow rate correction factor	Loss of head correction factor
10%	-3.2	0.985	1	1.02	1.08
20%	-7.8	0.98	0.99	1.05	1.12
30%	-14.1	0.97	0.98	1.10	1.22
40%	-22.3	0.965	0.97	1.14	1.25

performance permanently. Do not forget to flush the system once the room is frost-free. If glycol water is used, plan an annual control of the glycol quality. Use monopropylene type glycol only. The recommended concentration should not exceed 40%.

If glycol is not used, trace the pipes electrically outside.

• **In certain installations, the presence of different metals can cause corrosion problems; in this case, the formation of metal particles and sludge in the hydraulic circuit is seen.**

- Please refer to the chapter "Treatment of domestic and heating water" in our price catalogue

• **It is also necessary to ensure that the treated water does not become aggressive for the circuit.**

■ Electrical connections

Ensure that the general electrical power supply has been cut off before starting any repair work.

Characteristics of the electrical power supply

The electrical installation must be conducted in accordance with the regulations in effect and in particular to current I.E.E. (BS7671) Wiring Regulations

The electrical installation must be equipped with a differential protection.

This appliance is designed to operate under a nominal voltage of 400 V +/- 10%, 50 Hz.

For installations without neutral, a galvanic isolating transformer must be used that is earthed on the secondary side.

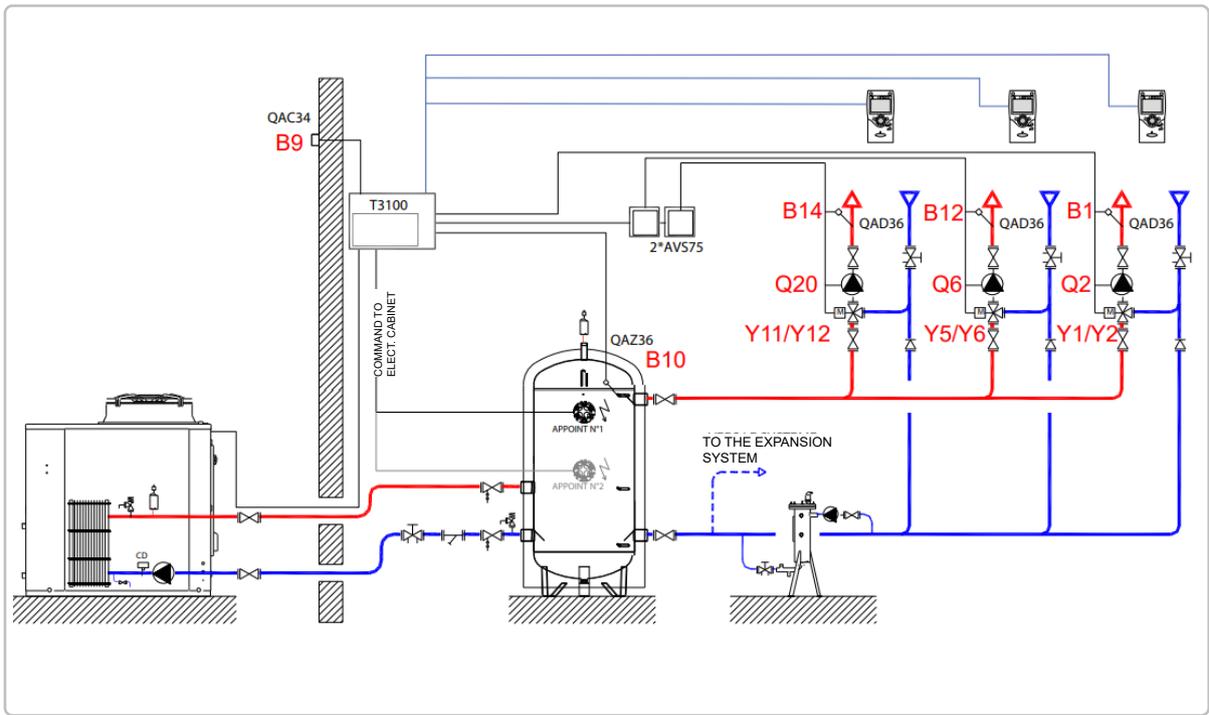
The electrical connections will only be made when all of the other assembly operations (attachment, assembly,...) have been carried out.

Never use a socket for the power supply.

CAUTION:

The contract with the energy supplier must cover the maximum electrical requirement of the installation.

The outdoor unit must be supplied directly (without external switch) by a dedicated line protected at the start by a dedicated isolator switch. (Seer "Current source" paragraph).



Example of recommended connection diagram (non exhaustive)

1.2.5. General safety rules

Before starting any operation on the units, each operator must be fully familiar with the operation of the machine and its controls and have read and understood all the information contained in this manual.

	The removal and/or handling of any safety device is strictly prohibited.
	Children and unaccompanied disabled people are not allowed to use the device.
	It is forbidden to touch the device barefoot and with wet or wet parts of the body.
	Any cleaning operation is prohibited when the main switch is in position « ON ».
	It is forbidden to pull, unplug or twist the electrical cables coming out of the device, even if it is disconnected from the power supply.
	It is forbidden to stand on the device, to sit on it and/or to put objects of any kind on it.
	It is forbidden to splash the device or project water on it.
	It is forbidden to disperse, deposit or leave within the reach of children the packaging material (cardboard, staples, plastic bags ... etc.) because it can be a potential source of danger.
	Any ordinary or extraordinary maintenance operation must be carried out at a standstill, without power supply.
	Do not put your hands or introduce screwdrivers, wrenches or other tools into moving parts.
	The machine manager and the maintenance technician must receive the appropriate training and instruction for their tasks in safe conditions.
	Operators should be familiar with personal protective equipment and accident prevention rules prescribed by national and international laws and standards.

1.2.6. Worker safety

Anywhere the unit is installed, the applicable local laws regarding worker safety and health must be accurately respected and enforced by each employer. We therefore recall that:

	It is forbidden to handle or replace parts of the machine without the express permission of the manufacturer. These interventions release the manufacturer from any civil or criminal liability..
	The use of components, consumables or spare parts other than those recommended by the manufacturer and/or mentioned in this manual may constitute a danger to operators and/or damage the machine.
	The operator's workstation must be kept clean, tidy and free of objects which may restrict his freedom of movement. The workstation must be sufficiently illuminated for the performance of the planned operations. Insufficient or excessive lighting can present risks.
	Ensure the appropriate ventilation of the work zone is always guaranteed. Ensure the air suction systems are operating correctly, in optimal conditions, and comply with the legal measures..
	During the design phase, the indications contained in UNI EN ISO 14738 were followed with regard to workstations on machines and the lifting limits imposed by UNI ISO 11228-1 were evaluated.



Be sure to maintain a posture that does not cause fatigue when installing and maintaining the unit. Also check the weight of any component before handling it.

The unit works with the refrigerant R32, included in the list of greenhouse gases (GWP 675) that meet the requirements of EU Regulation No. 517/2014 known as "F-GAS" (mandatory in the European area). One of the provisions of this Regulation requires operators working in installations using greenhouse gases to hold a certificate issued or recognised by the competent authority attesting that they have passed an examination authorising them to carry out such work. In detail :

- Up to 3 kg of total refrigerant contained in the appliance: Category 2 certificate.
- More than 3 kg of total refrigerant contained in the appliance: category 1 certificate.

Refrigerant R32 in gaseous form is heavier than air, if it is dispersed in the environment, it tends to concentrate strongly in poorly ventilated areas. Inhalation can cause dizziness and suffocation and, in case of contact with open flames or hot objects, lethal gases may be emitted (see Refrigerant Material Safety Data Sheet).

You should know that refrigerants may not develop an odor.

For any intervention on the heat pump system:



Wear appropriate PPE (especially gloves and goggles).

Ensure that the workplace is well ventilated. Do not work in closed rooms or ditches with low air recirculation.

Do not handle coolant near hot components or open flames.

Avoid any dispersion of the refrigerant in the environment and pay particular attention to accidental leaks of pipes and/or fittings, even after draining the system.

Make sure there is a fire extinguisher near the unit.

1.2.7. **Personal protective equipment**

When using and maintaining units, it is necessary to provide for the use of personal protective equipment such as:



Clothing: People who perform maintenance or work on the system must wear clothing that does not leave parts of the body uncovered, because during maintenance it is possible to come into contact with hot or sharp surfaces. Avoid clothing that can cling to or be sucked in by the airflow.



Safety shoes with non-slip soles, especially in environments where the floor is slippery.



Gloves: Protective gloves must be worn during cleaning and maintenance interventions.



Mask and goggles: Goggles and a respiratory protective mask should be used during cleaning operations.



2. DESCRIPTION OF THE EQUIPMENT

2.1. Designations and scope

TYNEHAM AHP60:

Heat pump comprising a close-coupled heat pump

Hot water production system for heating networks or thermodynamic production of domestic hot water.

2.2. Packaging

Outdoor unit	
Model	Code
TYNEHAM 50	AA090937
TYNEHAM 70	AA090940
TYNEHAM 50 AC*	AA090938
TYNEHAM 70 AC*	AA090941
TYNEHAM 50 D**	AA090939
TYNEHAM 70 D**	AA090942

*AC: Anti-corrosion treated

** D: Ducted version

Outdoor unit accessories	
Model	Code
Set of anti-vibration supports (pack of 4)	092040

Other accessories according to connection - see Tyneham Heat Control manual, heating application or DHW application.

The evaporator for the AC version is treated against corrosion. The heat pump's performance may be affected by this by up to 2% in relation to the values communicated in chapter 2.4.1

2.3. Definitions

Change to monobloc heat pump : to be installed outdoors only for heating and/or domestic hot water application .



CAUTION:

The minimum admissible temperature for the storage of the units is 5°C.

air/water : The outdoor air is the energysource. This energy is transmitted to the primary water circuit by the heat pump.

inverter : The fan and compressor speeds are modulated to suit the heat requirements which allows the noise level to be reduced. This technology makes it possible to save energy by avoiding high starting currents and by adjusting the power to the load.

COP (coefficient of performance) : instantaneously, this is the ratio between the energy transmitted to the heating circuit and the electrical energy consumed.

DHW : Domestic hot water

2.4. Technical data

2.4.1. Data sheet for standard units

This product is designed to be installed at a maximum altitude of 2000m

TECHNICAL CHARACTERISTICS		Measurement units	AHP 60	
			50 kW	70 kW
Heating	Heat output (1) min./nom.	kW	24.1 / 50.2	32.9 / 66.8
	Absorbed power (1)	kW	12.2	16.3
	C.O.P. (1)	W/W	4.11	4.10
	Heat output (2)	kW	48.3	62
	Absorbed power (2)	kW	18.02	23.75
	C.O.P. (2)	W/W	2.68	2.61
	SCOP (3)	W/W	4.16	3.94
	Water flow rate (1)	m ³ /h	8.6	11.5
	Useful head (1)	kPa	108	122
	Energy efficiency Water 35°C / 55°C	Class	A++/A+	A++/A+
Compressor	Type		Scroll DC Inverter	
	Oil (type)		FW68S	
	Number of compressors		2	2
	Quantity of oil	L	3.8	3.8
	Refrigerating circuits		1	1
Refrigerant	Type		R32	
	Refrigerant load (4)	kg	8.5	12
	Cooling quantity in tons of CO2 equivalent (4)	ton	5.7	8.1
	Operating pressure (upper/lower) in heat pump mode	bar	46 / 1.3	
Internal exchanger	Water capacity	L	3.54	5.12

TECHNICAL CHARACTERISTICS		Measurement units	AHP 60	
			50 kW	70 kW
Hydraulic circuit	Hydraulic circuit water capacity	L	7	9
	Max. pressure on water side	bar	6	6
	Hydraulic connections	Ø	1 1/2" (DN 40)	
	Minimum volume of water for bottle	L	389	522
	Maximum power of circulator	kW	1.04	1.35
	Max absorbed current of the circulator	A	1.86	2.45
	Energy Efficiency Index (IEE) of the circulator		≤ 0.23	≤ 0.23
Acoustic level	Noise level Lw (5)	dB (A)	82	83
	Audio power LW (6) under partial load	dB (A)	75	81
	Acoustic pressure at a distance of 1 m Lp1 (7)	dB (A)	64.4	65.4
	Acoustic pressure at a distance of 10 m Lp1 (7)	dB (A)	50.2	51.2
Electrical data	Power supply		400V/3P+N+T/50Hz	400V/3P+N+T/50Hz
	Maximum absorbed power	kW	34	43
	Maximum absorbed current	A	54	70
Dimensions and weight	A - Length	mm	1920	
	B - Width	mm	1110	
	C - Height	mm	1920 (1980 for ducted version)	
	A - Length packed	mm	2100	
	B - Width packed	mm	1110	
	C - Height packed	mm	2015 (2075 for ductable version)	
	Weight for shipping	kg	545	605
	Weight in service	kg	535	595

The above performances are given for the following operating conditions, as per the standard 14511:2018:

(1) Heating: external air temperature 7°dry C temperature (Ts) 6°C humid temperature (Th); in/out water temp.. 30/35°C.

(2) Heating: external air temperature 7°dry C temperature (Ts) 6°C humid bulb (Th).; in/out water temp. 47/55°C.

(3) Heating: average climatic conditions: T_{biv}=-7°C; in/out water temp. 30/35°C.

(4) Indicative data and subject to variation. For the correct data, always refer to the data label on the unit.

(5) Noise level: heating mode condition (1); as per EN 12102-1:2013; value calculated based on the measurements made as per UNI EN ISO 9614-1.

(6) Noise level: heating mode under partial load as per Appendix A of EN 12102:2017; value determined based on measurements made as per UNI EN ISO 9614-1, in accordance with the requirements of HP Keymark certification.

(7) Acoustic pressure: value calculated from the original acoustic pressure level as per ISO 3744:2010

N.B. : the performance date is indicative data and subject to variation. Furthermore, the outputs provided in points (1) and (2) are given in relation to the instantaneous power as per standard EN 14511. The figure provided in point (3) is determined based on the standard EN 14825.

2.4.2. Electrical data for the unit and auxiliaries

Unit power supply	V/~ /Hz	3N~400V-50Hz*	TYNEHAM Heat Pump Control command circuit	V/~ /Hz	12/01/1950
Integrated control circuit	V/~ /Hz	12/01/1950	Power supply to fans	V/~ /Hz	3N~400V-50Hz*

* Acceptable variations + /- 10%.

REMARK: The electrical data may be modified for an update. You must consequently refer to the data label on the RH side panel of the appliance.

2.4.3. Noise emissions

The acoustic pressure datas are calculated from the acoustic power level in compliance with norm ISO 3744:2010 regarding heat pumps field operation.

2.4.3.1. Full load

Noise levels refer to units at full load under standard nominal conditions (1) and under normal test conditions in heating mode, in accordance with the provisions of EU Regulation 813/2013. The tolerance on the value of the total acoustic power level is 2 dB (A). The value is determined in compliance with EN 12102-1: 2017, used together with EN ISO 9614-1 which describes the test methods with the intensimetric method.

Models in kW	Acoustic power level per octave band dB(A)							Acoustic power level [LW(A)] dB(A)	Acoustic power level at 1m dB(A)	Acoustic power level at 10m dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz			
50	59.2	66.3	69.6	73.7	76.8	78.5	69.6	82	64.4	50.2
70	61.1	67.3	70.8	74.9	78.1	79.8	70.8	83	65.4	51.2

2.4.3.2. Partial load

Sound levels refer to units at full load and in conditions guaranteeing a thermal capacity equal to that declared at a temperature of 7°C for an average climate, in accordance with standard EN 14825, in accordance with the provisions of EU regulation 813/2013(dry bulb temperature (wet bulb temperature) of the outside air = 7°C (6°C), water temperature inlet-outlet = 47-55°C). The tolerance on the value of the total sound power level is of 2dB(A). Value is determined according to EN 12102-1:2017, used in conjunction with EN ISO 9614-1 which describes the test methods with the intensimetric method

Models in kW	Acoustic power level per octave band dB(A)							Acoustic power level [LW(A)] dB(A)	Acoustic power level at 1m dB dB(A)	Acoustic power level at 10m dB dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz			
50	48.9	57.9	63.0	66.3	69.9	70.6	68.3	75	57.4	43.2
70	41.4	64.0	70.1	72.6	75.5	75.8	71.2	81	63.4	49.2

2.5. Description

2.5.1. Models AHP60 50 - 70 kW

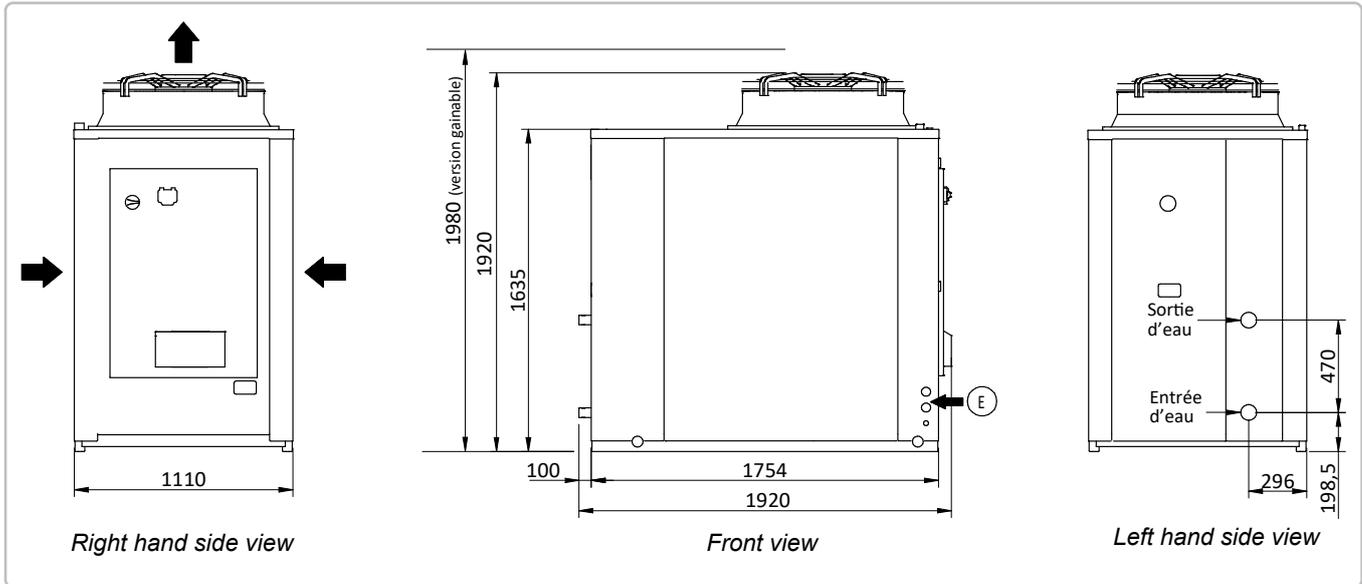


Figure 1 - Dimensions of the models AHP60 50 - 70 kW

Dimensions and weight			
Models		AHP60 50 kW	AHP60 70 kW
Length	mm	1920	
Width	mm	1110	
Height	mm	1920	
Height (ducted version)	mm	1980	
IN / OUT (water in/out)		1 1/2" grooved tube	
E		Electrical power supply input	

2.5.2. Access to internal components

2.5.2.1. Access to the refrigeration circuit

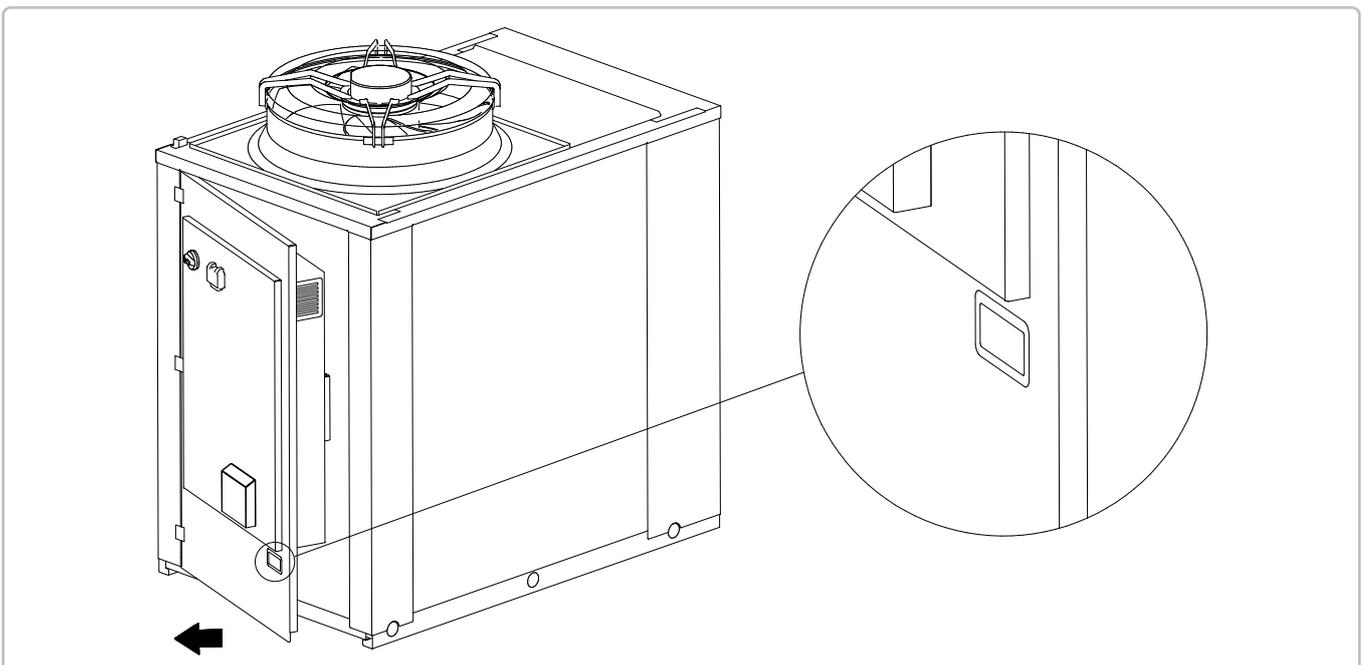


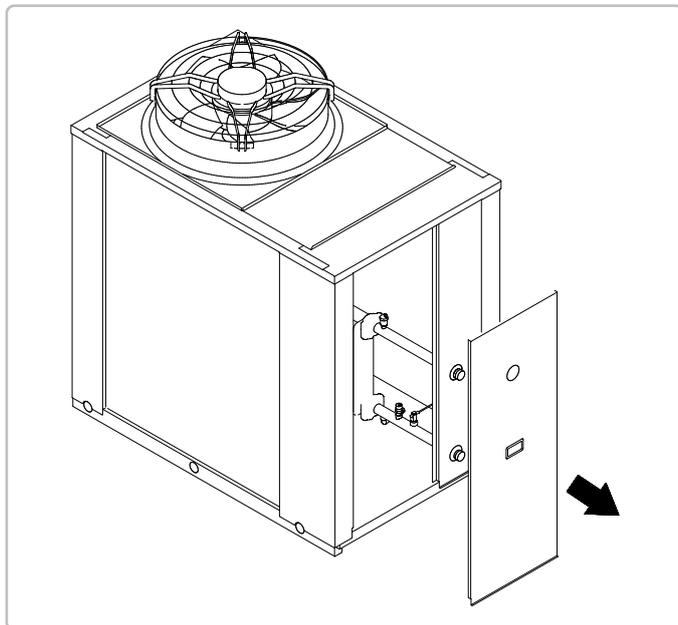
Figure 2 - Access to the refrigeration component

In case of maintenance and/or inspection of the compressors, it is necessary to access the inside of the unit by opening the door located on the front side, where the electrical panel is also located.

To unlock it, it is necessary to unscrew the fixing screws using a suitable tool and pull it towards you using the handle under the panel.

Be careful of the electrical panel that is attached to the door itself.

2.5.2.2. Access to the hydraulic component



In case of maintenance and/or checking of the hydraulic component and the refrigeration circuit, it is necessary to access the inside of the unit through the rear panel, which is close to the hydraulic connections.

Unscrew the fixing screws of the rear panel and remove it from the base.

In the case of a single-battery unit, one of the two sides can also be inspected by removing the side panels.

Figure 3 - Dismantling procedure for the hydraulic component

2.6. Operating principle

2.6.1. Production of domestic hot water or heating

When the heat pump is operating, other than in the start-up and transition phases, the inlet temperature must not fall below 25°C. A lower value may cause system anomalies, including damage to the compressor. Similarly, the outlet temperature must not exceed 58°C. With temperatures outside of this range, especially if combined with low water flow rates, there may be anomalies in the operation of the unit, or in the most critical cases, the safety devices may be tripped.

2.6.2. Ambient air temperature and summary table

This heat pump is designed to operate over an outdoor air temperature range of -20°C to +40°C. The outlet water temperature depends on the outside air temperature, within the limits provided in the diagram below

The operating limits for DHW production are shown in the graph below.

2.6.3. Operating ranges

This heat pump is designed to operate over an outdoor air temperature range of -20°C to +40°C. The outlet water temperature depends on the outside air temperature, within the limits provided in the diagram below

Range of water supply temperatures depending on the ambient temperature:

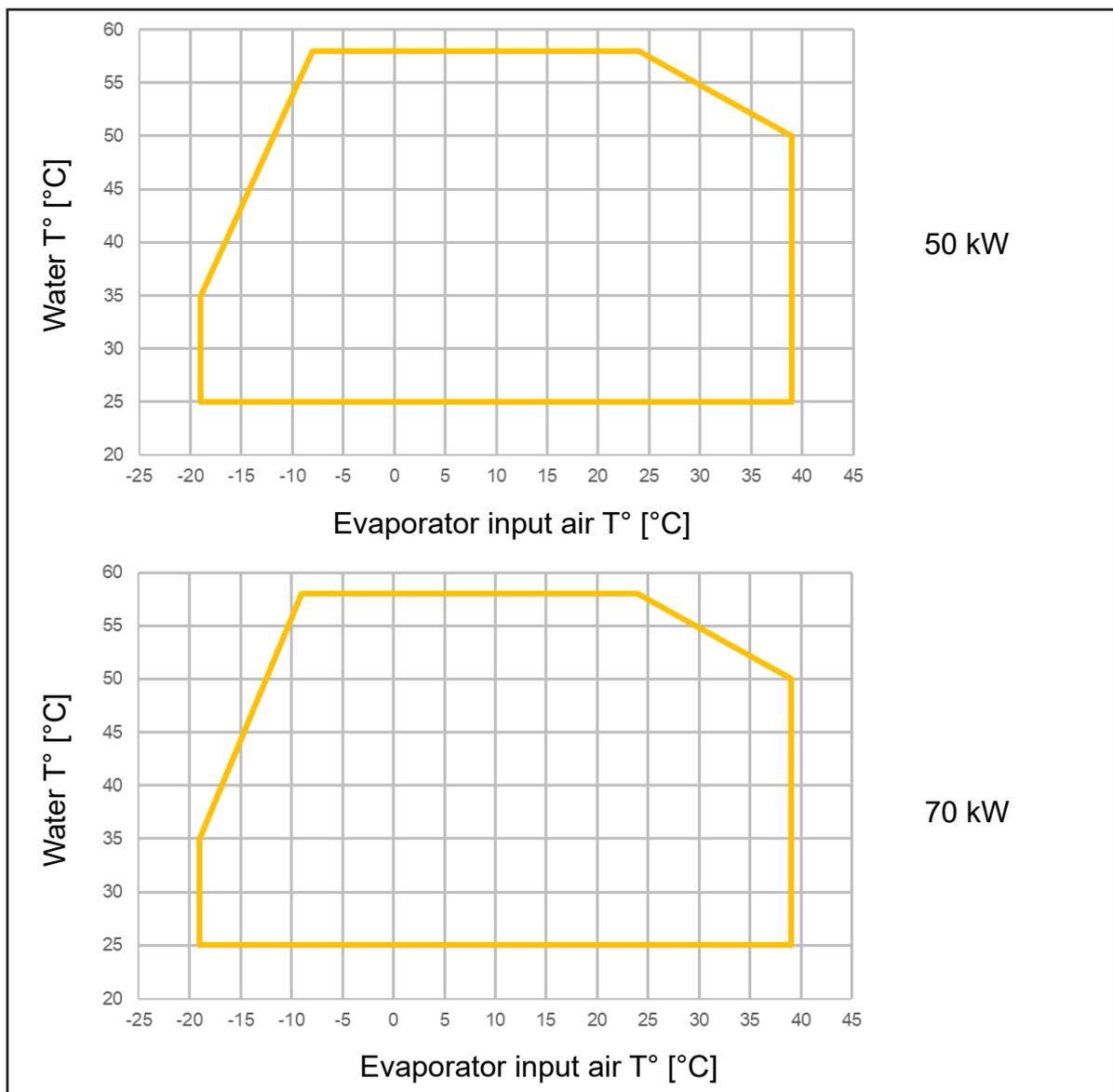


Figure 4 - Water temperature that the heat pump may provide at output according to the temperature of the air sucked in by the heat pump

Water flow rate on the condenser

The nominal water flow rate is determined for a temperature difference of 5°C between the inlet and the outlet of the condenser. The maximum authorised flow rate is that with a temperature difference of 3°C whereas the minimum is that with a temperature difference of 8°C in nominal conditions, as shown on the data sheet.

For more detailed information, we provide a table below which indicates the minimum flow rates to be guaranteed on the condenser to ensure that it operates correctly according to the model, as well as the disconnection and re-engagement flow rates for the flow rate controller.

Note: the water flow rate controller is used to avoid the failure of the anti-freeze sensor due to insufficient flow rate but does not guarantee the minimum flow rate required for correct operation of the unit.



INFORMATION:

Insufficient water flows can cause too low evaporation temperatures with the intervention of safety devices and unit shutdown and, in some extreme cases, ice formation in the evaporator and serious failures of the refrigeration circuit.

Model	AHP60	
	50 kW	70 kW
Min flow rate in m ³ /h	5.4	7.2
Max flow rate in m ³ /h	14.4	19.1
Water flow rate controller activation threshold in m ³ /h	2.77	3.31
Water flow rate controller activation threshold in m ³ /h	2.88	03:42

* When the flow rate falls below the limit indicated (flow rate controller activation threshold), the flow rate controller indicates alarm 06 which may only be reset when the flow rate controller deactivation threshold is exceeded.

3. INSTALLATION



CAUTION:

The outdoor unit and the Tyneham Heat Control control unit must be installed using the new equipment supplied.

3.1. Lifting and handling

Handling must be carried out by qualified personnel, correctly equipped with tools suited to the weight and size of the unit, in compliance with the accident prevention safety rules.

Notes:

1. Check the weight on the data label on the unit or in the technical data table;
2. Check by moving the unit that there are no ramps, steps or disconnected doors that could affect movement and damage the unit;
3. Ensure that the unit is kept vertical while it is being moved;
4. Before moving the unit, check that the equipment is suitable for lifting it and will prevent any damage occurring;
5. Check the unit's centre of gravity is aligned with the lifting point;
5. Only lift using one of the listed procedures;
6. Before any handling is started, ensure that the unit is balanced and stable.

3.1.1. Lifting method

The authorised lifting methods are:

- fork lift truck
- ropes/chains + sling bar

Lift progressively and check that the ropes/chains are in the correct position

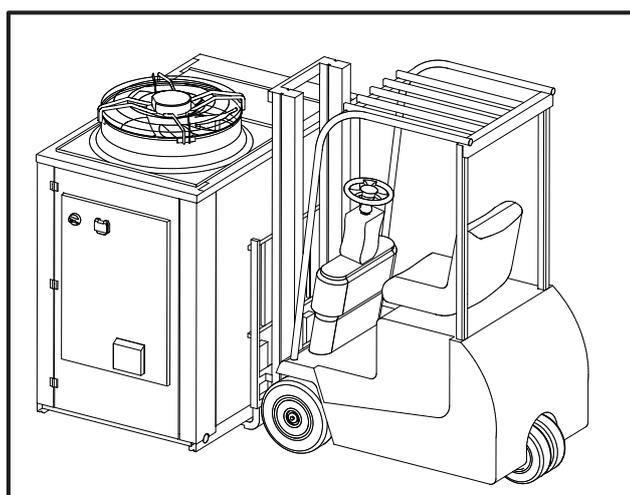


Figure 5 - Lifting with a fork lift truck

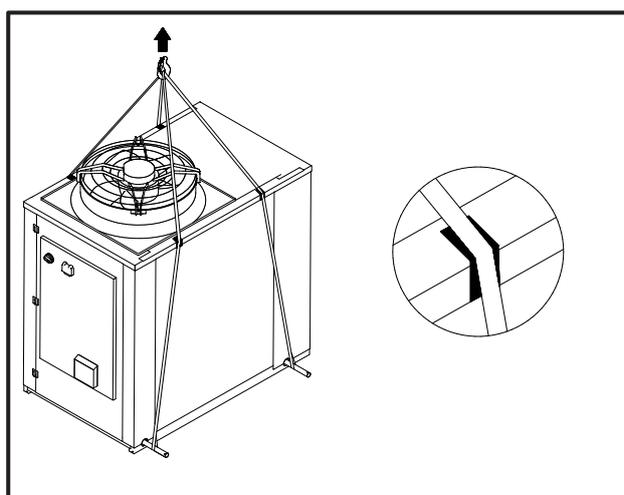


Figure 6 - Lifting with ropes/chains and sling bars

3.2. Installation

The choice of the position for installation is particularly important insofar as any later movement is a delicate operation requiring the intervention of a qualified person.

Comply with the maximum and minimum distances for the outdoor unit, the performance and service life guarantees depend on this.

3.3. Installing the outdoor unit

3.3.1. Installation precautions

The outdoor unit must only be installed outdoors. If a shelter is required, it must have broad openings and comply with the installation clearances (figure 10).. All models of the AHP60 series have been designed for outdoor installation (see paragraph 1.2.3 for further details).

- Choose a site that is sheltered from strong cold predominant winds (Mistral, Tramontane, etc.).
- The outdoor unit is made of metal elements that can be subject to corrosion when exposed to particularly aggressive environments, especially the evaporator, which is directly exposed to an external air flow forced by the fan. 3 particularly aggressive environments may be mentioned.

Marine environment: the marine environment is characterised by a high concentration of sodium chloride (salt). It is transported by the sea spray in the immediate vicinity of the coasts, by the fog, or by the sea breeze which can carry particles of salt water far from the coasts, up to several kilometres in the continent.

Industrial environment: industries use or transform chemical elements in their processes: cleaning or surface treatment agents, various combustions (hydrocarbons, coal, incinerations), salting, etc. A list of corrosive elements that can be encountered in this type of environment is provided in Table on page 27.

Rural environment: the rural environment is not free of pollution. In fact, agricultural processes include the spreading of chemical fertilisers, and emissions of potentially aggressive pollutants such as animal waste in livestock farms or gas emissions from agricultural machinery. A few elements to watch for are also shown in Table on page 27.

Determining which corrosive elements are present in the environment of an installation is a necessary preliminary step but is not sufficient to define how to protect the unit. It is also necessary to establish if it will be directly and continuously or frequently exposed to aggressive agents.

An observation of the climate and the surrounding terrain will help to define the main wind directions in the area and the distance to which the sea spray or fertilisers will be transported.

A study of the configuration of the buildings is to be carried out to highlight the zones of air recirculation, and the zones exposed to the emissions of pollutants (chimneys, nearby agricultural fields), in particular in the case of installation on a roof. Positioning the heat pump behind a building may be sufficient to protect it from aggressive agents.

Attention, installation behind a wall or under an alcove is not a guarantee of protection against corrosive elements, the shelter must allow ventilation in fresh uncontaminated air to constitute an effective protection against corrosion.

These few tips are not intended to be exhaustive when choosing a unit with or without an anti-corrosive coating (AC).. It is impossible to define this precisely because each installation is unique. However, by taking into account the above-mentioned elements, it is possible to estimate whether the appliance will be installed in exposed conditions or not. If in doubt, it is preferable to choose a unit with a protective coating in order to guarantee the longest life span for the appliance.

- For correct operation and an optimal life span of your equipment, it is necessary to have a quality of water that complies with the general conditions of sale.
- **The unit must be easily accessible for commissioning and maintenance work. If the outdoor unit is installed at a height, arrangements must be made to ensure the safety of the workers (platform with guardrail accessible via available means and in accordance with regulations).**
- Make sure that the passage of hydraulic connections is possible and easy, especially in the case of several heat pumps.

- The outdoor unit is weatherproof, but avoid installing it in a place where it may be exposed to dirt or heavy water run-off (under a leaking gutter, under a roof, etc.). Avoid installing the unit in places where water is likely to stagnate or fall, for example from gutters. Also avoid places where snow can build up (e.g. corners of buildings with sloping roofs). When installing in areas prone to snowfall, mount the unit on a 20 to 30 cm high base off the ground, to prevent snow build-up around the machine. The outdoor unit must be raised by at least 50 mm from the ground. In snowy regions, this height must be increased.
- A suspended installation is prohibited.
- During operation, water (due to the condensation of the water contained in the air) is discharged from the outdoor unit. If the unit is installed on a terrace where there is a risk of frost, a connection for the condensate drainage is required.
If the appliance is installed in a region where the temperature may fall below 0 °C for long periods, fit the drain hose with a trace heater to prevent it from icing over.
- If a water trap is installed, check the efficiency of the condensate drain.
- Nothing should obstruct the air from circulating through the evaporator and out of the fan.
- The site where the unit is installed must be free of foliage, dust, etc., which could obstruct or cover the heat exchanger.
- Ensure that the appliance does not disturb neighbours or users (noise level, draughts caused, low temperature of the blown air).
- It is advisable to create a support slab of suitable size for the unit. The appliances transmit a low level of vibration to the ground, however, it is advisable to install anti-vibration mounts between the base frame and the supporting surface.
- The installation surface of the unit must not be smooth, to avoid water/ice deposits, which can be dangerous. Provide a gutter for condensate removal to avoid ice formation.
- The presence of cavities such as pits, manholes, building entrances, or sloping roofs, in which refrigerant could accumulate in case of leakage and generate an explosive atmosphere, must be avoided.
- It is very important to avoid recirculation between suction and discharge, otherwise the performance of the unit will deteriorate or even interrupt normal operation.

		Industries / risk zones						
Type	Corrosive product	Paper / wood	Incinerators & other combustions	Cleaning	Salt extraction	Swimming pools	Treatment plants	Agriculture & fertiliser manufacturers
Oxides	Nitrogen oxides (NOX)	x	x				x	
	Sulphur oxides (SxOy)	x	x					
	Carbon oxides	x	x					
Volatile gases or liquids	Sulphurs	x					x	x
	Hydrogen fluoride		x					x
	Ozone		x					x
	Nitrous oxide							
	Methane						x	
Volatile Organic Compounds (VOC)		x	x				x	
Hydrocarbons	Terpenes	x						
Alcohols	Methanol	x						
	Other alcohols	x						
Acids	Phenols	x						
	Sulphuric acid		x					x
	Hydrochloric acid		x					
	Hydrofluoric acid							x
	Phosphoric acid							x
	Fluorosilicic acid							x
Particles	Micro-particles	x	x					
	Ash	x	x					
Other	Nitrates		x					x
	Sulphates		x			x		x
	Chlorine compounds			x	x	x	x	
	Bromides				x	x		
	Ammonia						x	x
	Phosphate					x		

Figure 7 - List (non exhaustive) of the corrosive products encountered in different environments

3.3.2. Installation precautions

We recommend that you carry out a noise nuisance risk study.

This will have to take into account the residual noise without the heat pump, the data of the machine, the installation zone, the distance to the measurement point, this list is not exhaustive.

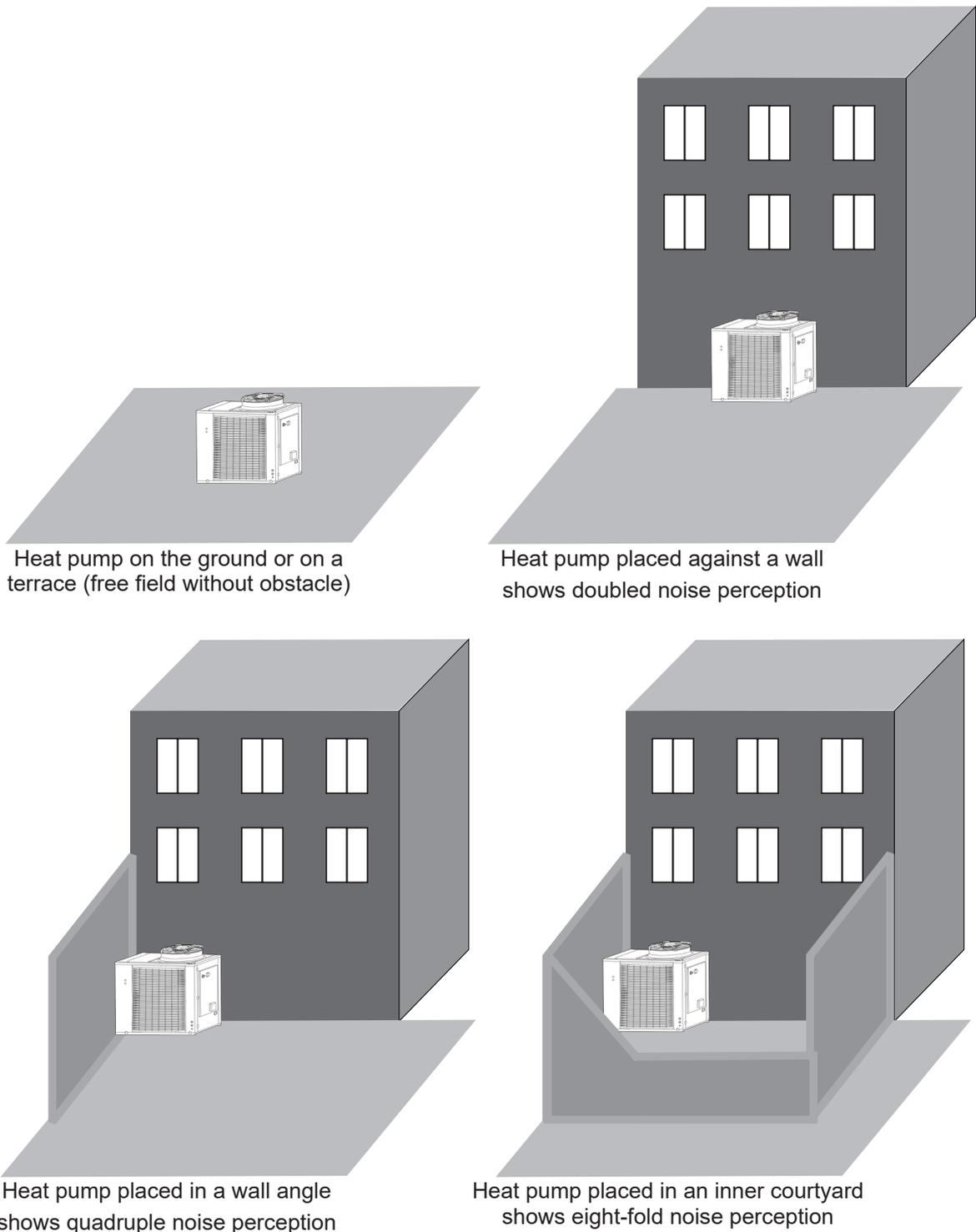
The day and night normative noise level requirements are distinct.

In order to reduce the risks, it is advisable to study the vibration transmissions from the machine to the building, as well as piping, reverberation,...

3.3.2.1. Principle of reflection of emitted noise.

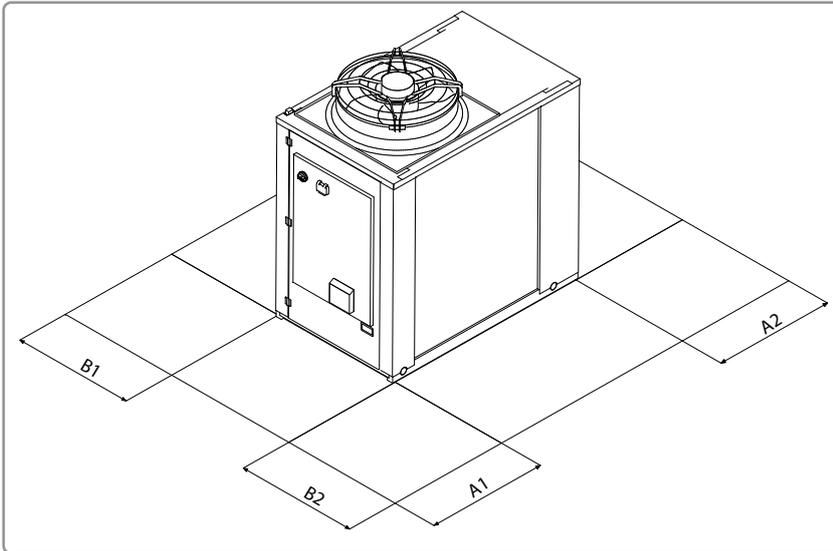
Inner courtyards and closed corners should be avoided where possible.

The volume also has an impact, for example a small inner courtyard leads to greater reflection.



3.3.3. Minimum technical clearances

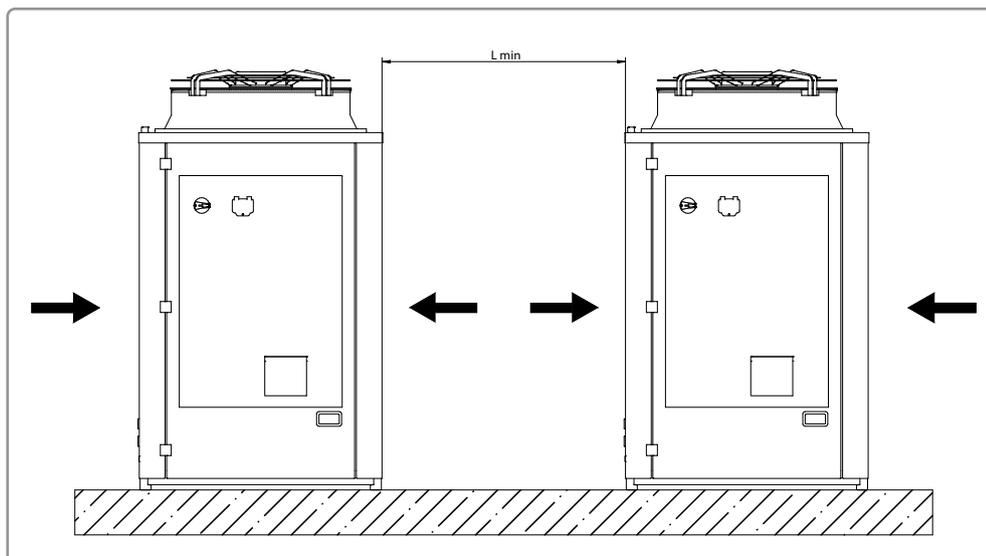
- By following the installation precautions, it is absolutely essential to ensure the following minimum service clearances are respected.
- Therefore, avoid placing the appliance under canopies or near plants or walls to avoid air recirculation.
- It is recommended that the environmental assessment should always be based on the acoustic power and pressure data reported in the "Technical data" chapter and the noise emission limits based on the unit's installation area, in accordance with standard EN-12102. This assessment is the responsibility of the installer.



MODELS AHP60 50-70 kW			
A1 (mm)	A2 (mm)	B1 (mm)	B2 (mm)
1200	1000	1500	1500



CAUTION: Do not clog or cover the ventilation openings on the top cover.



- If units are positioned side by side, the minimum distance L_{min} to be respected between them must be a minimum of 2.20m. The figure below shows the different cases.

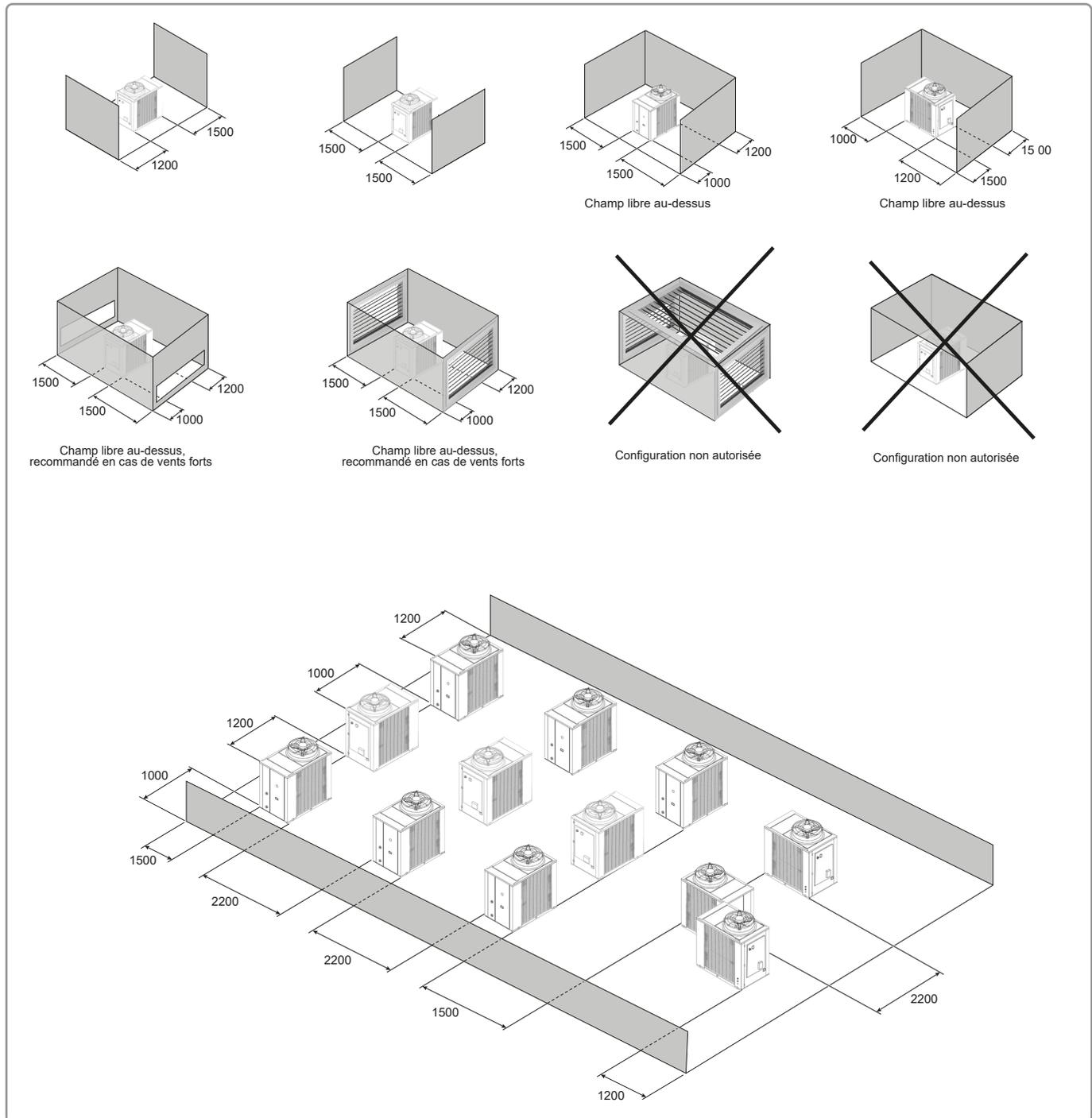
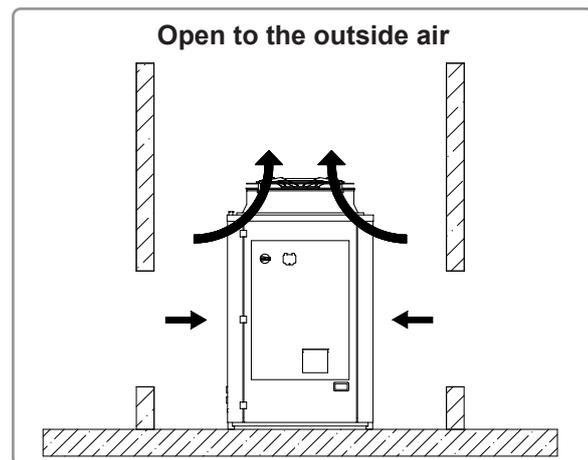
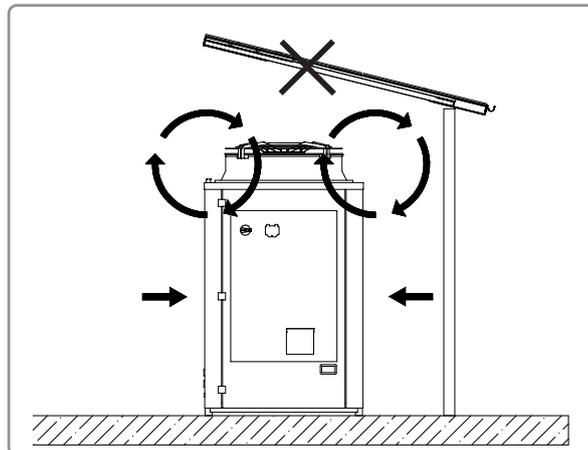


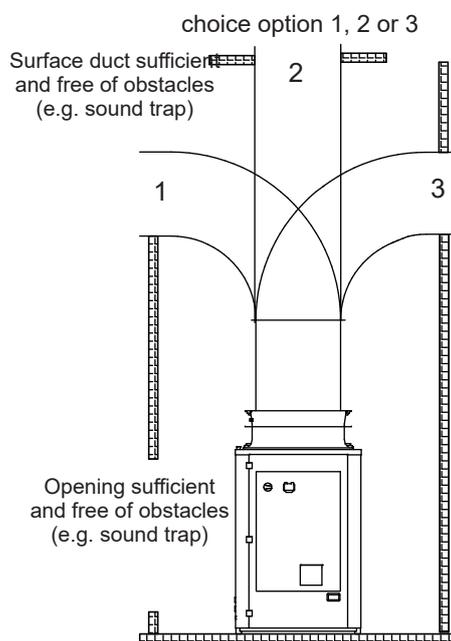
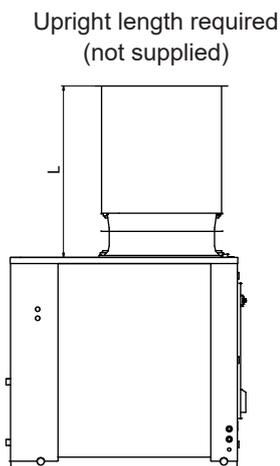
Figure 8 - Minimum clearances and types of installation

- In general, any recycling of the air should be avoided as this will have an impact on the performances of the heat pump.
- In the event of an accidental leak, it must be possible to evacuate the refrigerant.
- The unit is designed to be installed outdoors.
- Installation under a shelter is only permitted for ducted versions (see “G” references in paragraph 2.2.). If the installation has a different version for a ducted installation, contact Hamworthy Heating to exchange the heat pump.
- The ducted installation must be carried out according to the configurations shown in the diagram in the previous figure, with a maximum loss of head due to the ducts of:
- In the event of failure to comply with these precautions, the performance of the heat pump may be severely degraded and the Hamworthy Heating shall not be held liable.

- These minimum clearances must be respected regardless of the installation to guarantee the performances and safety of the unit.
- Generally, any possibility of air recirculation should be avoided, as this will degrade the performance of the machine.
- In the event of an accidental leak, the refrigerant must not be allowed to stagnate and it must be possible to evacuate it.
- In the case of an installation under a shelter or in an enclosed place, a ducted version is recommended. Please refer to paragraph 1.2.3
- We recommend that you check whether the noise pollution requirements related to the environment of the installation are consistent with the acoustic power and pressure data reported in the "Technical data" chapter and the noise emission limits depending on the the unit's installation area, see chapter 3.3.2, in accordance with standard EN-12102. This assessment is the responsibility of the installer.
- In the case of winds with speeds above 13.9-17.1 m/s (strong wind on the Beaufort scale) we recommend the use of wind barriers.



Ducted version



• The figure shows an example of a possible ducted installation. Before making any change to the direction of the duct, the minimum length to be observed is indicated (L = 1 m). The following is a quantitative indication of the additional static height that can be obtained with the ducted version compared to the standard version, with the same flow rate and the same absorbed power. Pressure drops that are any greater will not guarantee the declared performance.

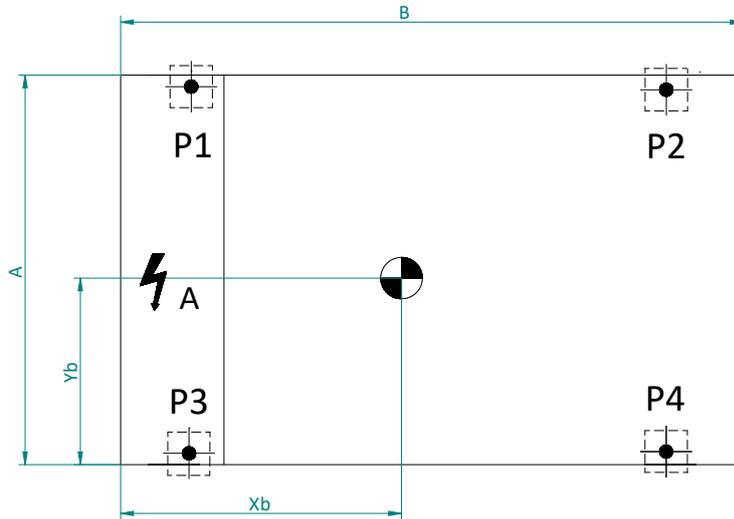
MODELS	Manometric head available to the fan for ducting		Nominal flow rate of fan m ³ /h
	in Pa	in mm H ₂ O	
TYNEHAM AHP60-50 kW	22	2	19555
TYNEHAM AHP60-70 kW	19	2	19976

3.4. Installing the control unit

The Tyneham Heat Control control unit for the heat pump is supplied separately, with a specific installation guide inside its packaging. Refer to this guide to connect this unit.

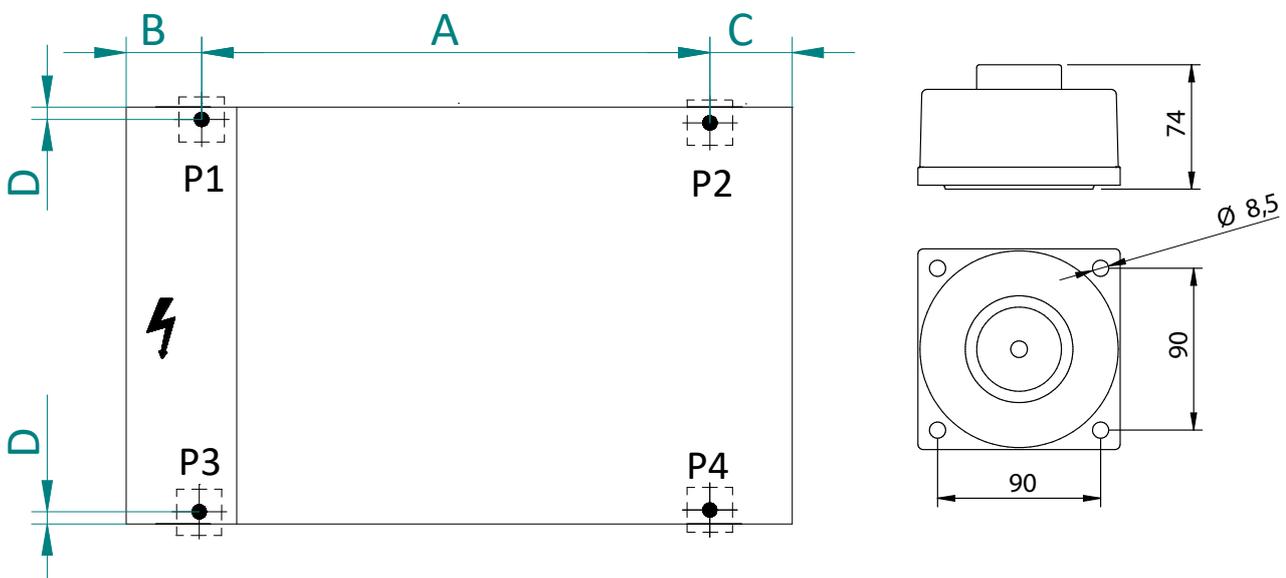
3.5. Position of the centre of gravity and the vibration shock absorbers

The position of the centre of gravity of each heat pump is indicated in the table, with reference to the dimensions indicated in the image.



Models	A [mm]	B [mm]	Xa [mm]	Yb [mm]
TYNEHAM AHP60 50 kW	1110	1754	652	517
TYNEHAM AHP60 70 kW	1110	1754	683	511

The positions laid down for the installation of the vibration shock absorbers for each type of heat pump are presented in the image below.



Models	A [mm]	B [mm]	C [mm]	D [mm]
TYNEHAM AHP60 50 kW and 70 kW	1410	105	235	32

3.6. Hydraulic connections

3.6.1. The accessories to be connected to the AHP60 hydraulic station

- The hydraulic connections must comply with good engineering practices according to the regulations in force.
- Before making the hydraulic connections, the supply pipes must be cleaned to avoid contaminating the tank with metal or other types of particles.
- The Plumbing DTU 60.1 (NFP 40-201) must be respected.
- Check when hot that the pressure does not exceed the service pressure.
- **Recommendations:** for regions where the water is hard, the use of a water softener does not imply any change in our Guarantee, provided that the softener is adjusted in line with trade standards, and is checked and maintained regularly (Decree No. 2001-1220 of 20 December 2011).
- **The hardness of the water must remain above 10°f.**

3.6.2. General

The hydraulic connections must comply with the national or local regulations; the pipes may be made of steel or galvanised steel. Flexible hoses may be used if their diameter is larger. The dimensions of the pipes must be chosen carefully to suit the nominal water flow rate of the appliance and the pressure drops in the hydraulic circuit. All of the hydraulic connections must be insulated with closed-cell insulation of adequate thickness. The refrigeration unit must be connected to the pipes using new flexible hoses that have not been re-used. We recommend fitting the following components in the hydraulic circuit:

- Thermometer with sensor for the reading the temperature in the circuit.
- Manual valves to isolate the unit from the hydraulic circuit.
- Y-shaped metal filter and filter-settler (installed on the system return pipe) with a metal mesh not larger than 1mm.
- Loading unit and discharge valve if required



CAUTION:

When choosing the size of the pipes, make sure that the maximum pressure drop of the system as stated in the technical data in paragraph 2.4.1 is not exceeded (see useful head).

Always connect the pipes to the connections using the wrench-to-wrench system.

Make a suitable drain for the safety valve.

It is the installer's responsibility to check that the expansion vessel is suitable for the actual capacity of the system.



CAUTION:

A metal filter must be fitted (with a mesh size not exceeding 1000 microns) as well as a T connector on the return pipe of the system labelled "INGRESSO ACQUA" (water inlet). If the flow rate switch is tampered with or modified, or if the metal filter and filter-settler are not fitted to the system, the warranty is immediately void. The filter and filter-decanter must be kept clean, so please always ensure they are clean after installation of the appliance and check them periodically.

All units are fitted with a flow rate controller (factory-fitted). If the flow rate controller is modified or removed, or if the water filter and filter-settler are not fitted on the unit, the warranty is immediately void. Refer to the wiring diagram supplied with the appliance for the connection of the flow rate controller. Never shunt the flow rate controller connections in the terminal block.

The heating system connected to this unit must be installed in compliance with the standard EN-12828.

3.6.3. Manometric head available

The circulation pump is built into the heat pump. The hydraulic pressure available on output from the outdoor unit is shown in the manometric head graph in paragraph 2.4.1.

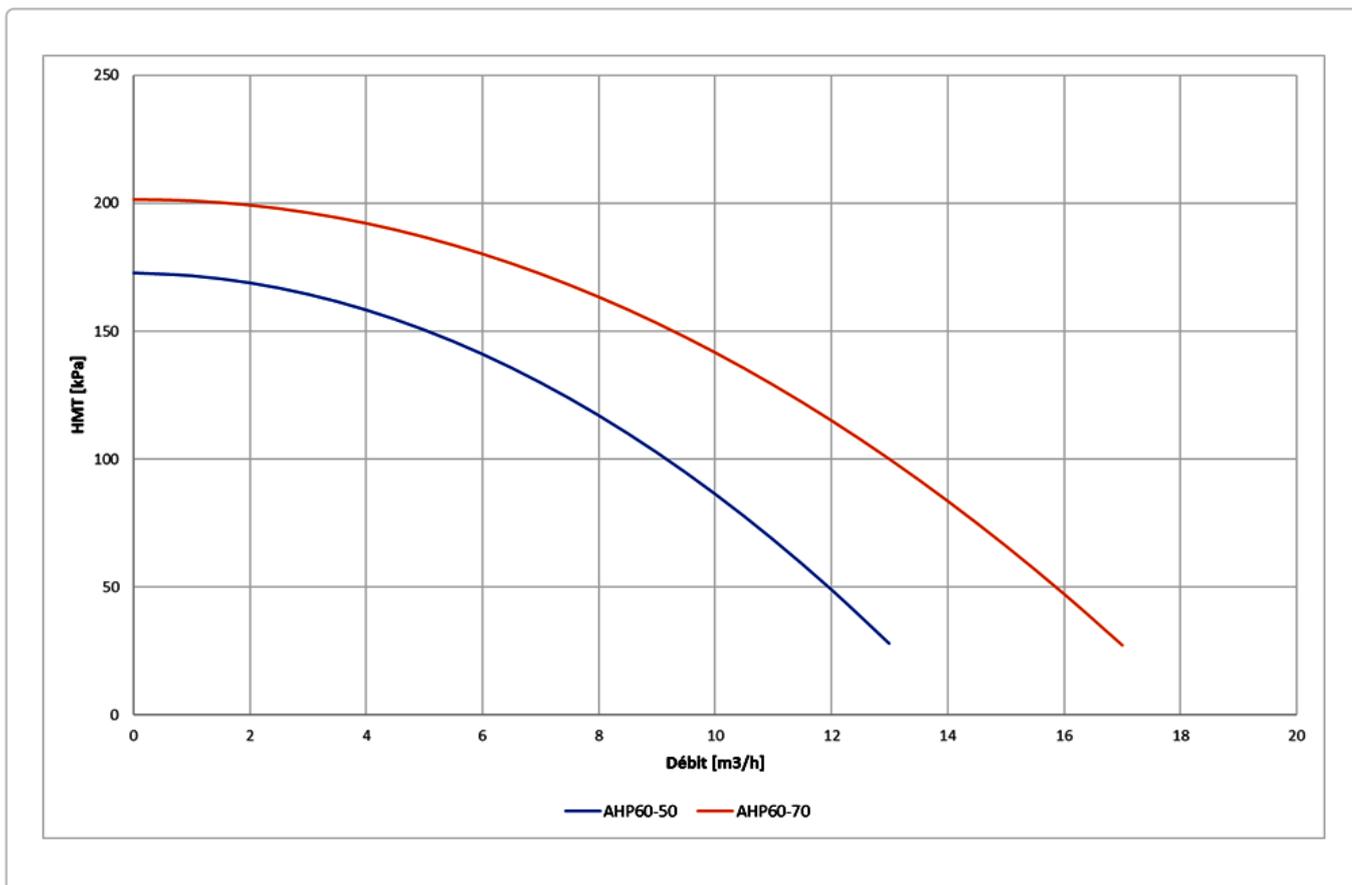


Figure 9 - Hydraulic pressures and flow rates available at the pump

3.6.4. Control of primary circuit flow rates



CAUTION:

To manage the primary circuit water flow is essential for the product performance and lifespan. The flow setting value must be adapted to the application. Refer to the Tyneham Heat Pump Control manual (unit control) and the design study.

It is imperative to install adjustment valves (not supplied), refer to the diagram library.

In the case of a cascade installation, the flow rate must be balanced between all units. It is recommended to carry out this balancing using balancing valves in order to allow the measurement unit flows over time.



CAUTION:

The adjustment and management of flow rates is the responsibility of the installer/ under installer/operator responsibility and will not be operated by Hamworthy Heating. During commissioning of the system, balancing control will be requested by Hamworthy Heating. Without control, commissioning will be refused.

3.6.5. Water quality

• Preparing the water system before putting the heat pump into service

For any installation (new or renovation), the water pipes must be thoroughly cleaned. The purpose of this initial cleaning is to eliminate germs and residue that can cause deposits to form.

In new installations in particular, residue from grease, oxidised metal, and even copper micro-deposits must be scrupulously removed.

In renovated installations, cleaning should focus on removing sludge and the products of corrosion formed when the unit was last in operation.

There are two types of methods for cleaning and removing sludge: a high intensity approach that takes a few hours, and a slower, more gradual approach that takes several weeks. In the first case, it is essential to clean before connecting the new heat pump. In the second case, fitting a filter on the heat pump return will capture any loose deposits.

The cleaning performed prior to installation improves performance, reduces energy consumption, and resists scaling and corrosion on the unit. A professional (water treatment) should carry out the cleaning.

• Protecting the unit against scaling

Water naturally contains dissolved calcium ions and carbonates that cause scaling (calcium carbonate) to form. To prevent excessive deposits, take precautions with regard to the water used to fill the unit: $8^{\circ}\text{f} < \text{TH} < 15.1^{\circ}\text{f}$.

When the installation contains softener, the equipment must be inspected frequently to check it does not discharge any chlorine-rich water into the network: the chlorine concentration must always remain below 50 ppm.

To prevent the build-up of calcium deposits (such as on exchange surfaces), the unit should be brought into service slowly, starting by operating at a low power with high primary water flow.

Water must be added during the life of the heat pump. The new water adds scaling to the water system. To avoid this, it is important to check that the hardness of the water added does not exceed $\text{TH} < 5^{\circ}\text{f}$. The amount of fill water plus the amount of make-up water added during the life of the unit should not be more than three times the water capacity of the heating system. If this guideline is not followed, complete cleaning (descaling and cleaning) is necessary.

If it has excessive scaling, the unit's settings for operation and for water treatment must be adjusted.

Adding a large amount of untreated water always contributes a significant amount of scaling. To monitor this and to detect problems, a system water meter must be installed.

When carrying out work on the installation, do not drain it completely. Only the sections of the circuit concerned need to be drained.

• Protecting the heat pumps against corrosion

Corrosion can affect the iron components used in heat pumps and heating systems, directly related to the presence of oxygen in the water heater's water. Dissolved oxygen that enters the unit when it

is being filled for the first time reacts with the equipment materials and quickly disappears. Without refreshing the oxygen through significant contributions of water, the unit might not experience any damage whatsoever. However, it is important to follow the sizing rules and installation guidelines in order to prevent oxygen from continuously flowing into the heating water. From these rules, we have:

- Preferably an expansion vessel with a membrane rather than an open expansion vessel that allows direct passage.-
- Internal pressure with the unit of more than 1 bar cold.
- Remove leaky (permeable) components that are letting out more gas than as if they were sealed. If the guidelines above are followed, the unit's system water has the proper characteristics to last a long time: $7.5 < \text{pH} < 9$ with a dissolved oxygen concentration of < 0.1 ppm

If there is a chance that oxygen could enter the unit, you must take additional precautions. Adding an oxygen scavenger (ex. sodium sulphite) is highly recommended. We recommend directing any water treatment questions to specialists, which can provide the appropriate treatment based on the characteristics of the installation, and a monitoring agreement with a guarantee as to the results.

In the case of a unit where the water is in contact with heterogeneous materials, for example, if there is any copper or aluminium, appropriate treatment is recommended to guarantee a long lifetime for the unit. In most cases, this treatment involves adding chemical solution corrosion inhibitors to the installation. We recommend contacting water treatment specialists.

- **Unit monitoring**

If the recommendations listed above (new installation or renovation) have been followed, the unit monitoring is limited to:

- Checking the amount of make-up water (fill water volume + make-up water volume < 3 times the unit volume).
- Checking the pH level (stable or slightly increasing)
- Checking the water hardness (TH stable or slightly decreasing)

We recommend monitoring these parameters two to three times a year. It should be noted that the "make up water quantity" parameter is vital for a long lifetime for the unit.

If any of these three above parameters deviates from the above recommendations, refer to a water treatment specialist to correct the problem.

- **Setting up a plate exchanger**

If the recommendations listed above cannot be met, you can set up a plate exchanger to separate the primary system from the secondary system, which protects the heat pump from undesirable effects.

- **Setting up a filtration system**

A filtration system on the back of the heat pump is obligatory in order to remove suspended particles from the unit.

3.6.6. Connecting water supply

Check that the system is stopped, with the general switch in position 0.

Add water until the pressure of the hydraulic circuit reaches 2 bar. The P drain valve is an automatic drainer, run the pump to readjust the pressure.

Check that there are no leaks.

After the "Commissioning" stage, once the machine has been started up, purge the hydraulic station again.

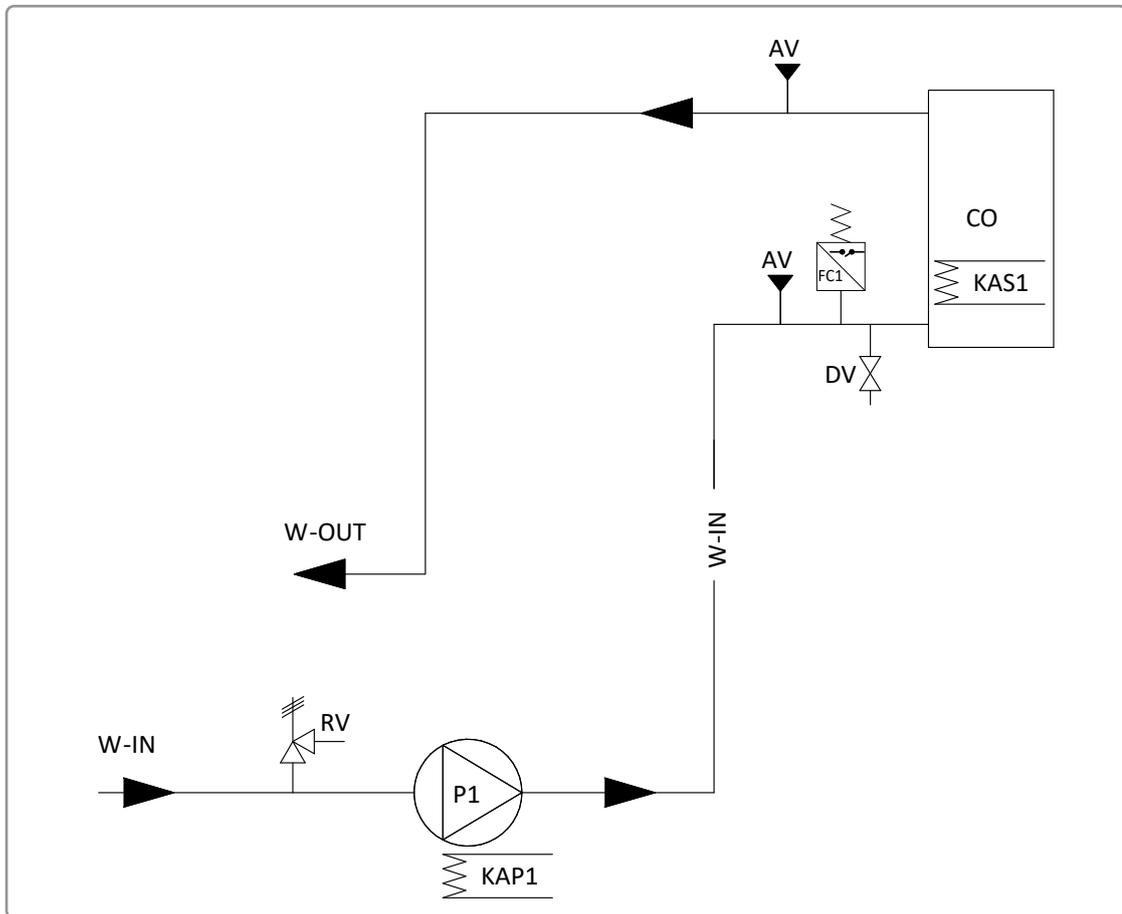


Figure 11 - Hydraulic circuit 50- 70 kW

KEY			
CO	Brazed plate heat exchanger	FC1	Flow rate controller
DV	Drain valve	W-IN	Water inlet
RV	Safety valve	W-OUT	Water outlet
KAS1	Exchanger electrical resistor	P1	Pump
KAP1	Pump electrical resistor	AV	Automatic air vent

3.6.6.1. **Precautions to take for water filling**

- Supervise all filling/refilling operations.
- Before filling/refilling the system with water, disconnect the power supply to the units.
- Filling/refilling the installation must always be carried out under controlled pressure conditions (max. 1 bar). Ensure that a pressure reducer and a safety valve have been fitted on the filling/refilling duct.
- The water in the filling/refilling duct must be filtered properly beforehand to remove all impurities and suspended particles. Ensure that a removable screen filter and filter-settler are installed.
- Periodically check and evacuate the air that accumulates in the system.
- Fit an automatic air vent at the highest point of the system.

To fill the installation, we recommend the use of an external tap installed by the installer. There is always a service valve in the unit that can be used if it is necessary to fill/drain the amount of water inside the installation or to adjust the glycol percentage.

There is an opening on the side panel of the outdoor unit for draining the safety valve (the installation of which is the responsibility of the user).

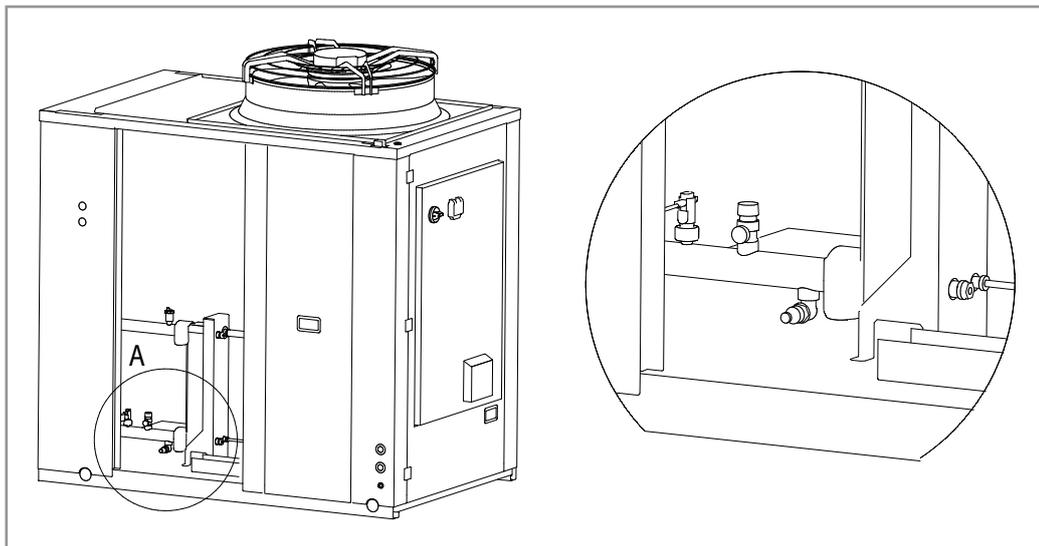


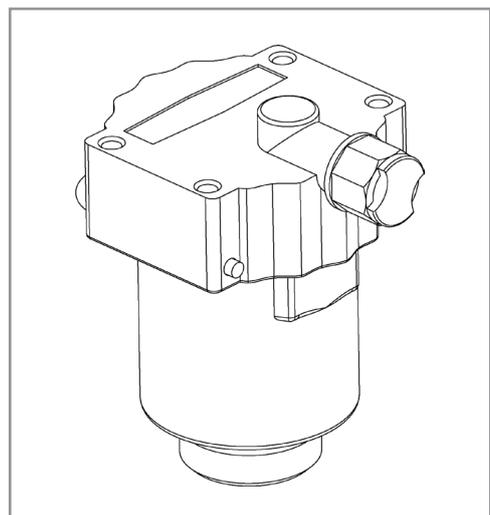
Figure 12 - Safety valve location

3.6.6.2. **Air bleed valve**

The unit is fitted with two air vent valves, which automatically evacuate the air that accumulates inside the circuit, avoiding unwanted effects such as corrosion and premature wear or lower efficiency.

They also have a safety function, so that if the condenser breaks, they allow the refrigerant gas to be evacuated into the outside air and prevent it from being transported to the internal terminals.

When the air vent remains in the open position, the air is evacuated automatically.





CAUTION: The air vent is delivered closed from the factory. It must be opened so that it can evacuate the air.



INFORMATION: If there is a water leak, the component must be changed, by unscrewing it with two wrenches, as shown in the picture below.

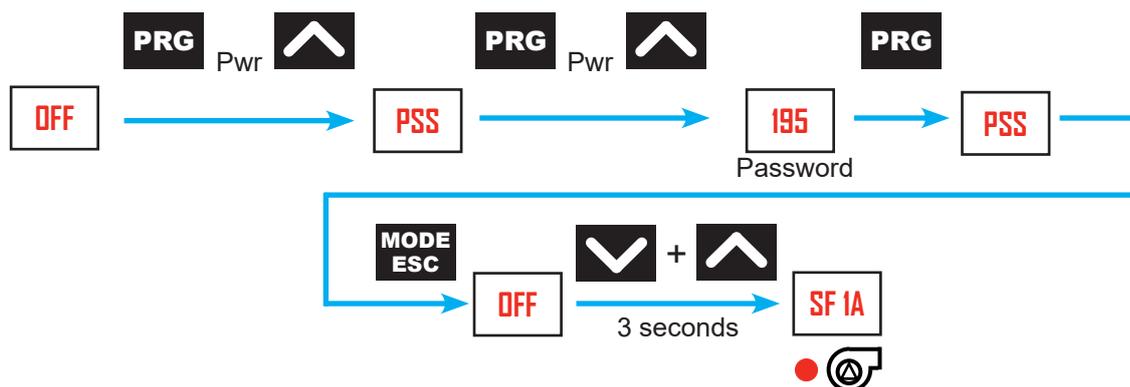


3.6.6.3. Air Evacuation Function

This function is used to drain the system, using the circulator at maximum speed.

To activate drain mode:

- TYNEHAM screen in OFF mode



The circulator is activated for 5 minutes, then switches off.

You can exit the system drain cycle manually.

To deactivate drain mode:



CAUTION: During this function, the flow rate controller's alarm is deactivated; the maintenance technician must guarantee the water content inside the installation.

3.7. Electrical connections



WARNING: Ensure that the general electrical power supply has been cut off before starting any repair work.

3.7.1. General remarks on electrical connections

Check that the electrical power supply complies with the nominal characteristics of the appliance (voltage, phases, frequency) as stated on the data plate located on the side panel of the appliance. The electrical connection must comply with the electrical wiring diagram of the appliance and local and international regulations (fit a main circuit breaker, and differential circuit breakers for each line, and earth installation adequately, etc.).



CAUTION:

The internal components are accessed by opening the door on which the electrical panel is mounted. The length of the power cables and their routing must allow the door to be opened without causing an electrical disconnection.



CAUTION:

The protective earth conductor must be longer than the phase and neutral conductors. Furthermore, the main earth conductor and the power supply conductors must have a double attachment very close to their connections.

The electrical panel is located under the cover. The minimum spaces indicated in paragraph 3.4.2 must be respected for the electrical connections.

The installer must fit a dedicated circuit breaker upstream of the electrical connections of the appliance.

The supply voltage must be definitive and must not vary, in which case contact the power supplier. The power supply must respect the mentioned limits, otherwise the warranty is immediately void.

If the power cable is damaged, it must be replaced by qualified personnel, in order to prevent any risk.

Any appliances located nearby may cause/suffer electromagnetic disturbances to/from the unit. Be aware of this risk on the installation site. We recommend powering the unit electrically with an adequate line and protections and to use independent cable ducts.

The flow rate controller (item B on the above hydraulic diagram that is factory-fitted) must ALWAYS be connected in compliance with the indications shown on the electrical wiring diagram. Never shunt the flow rate controller connections in the terminal block. The warranty will be void if the flow rate controller connections are modified or connected incorrectly.

Refer to the specific instructions for the wiring of the Tyneham Heat Control

3.7.2. Accessing the electric box

The electrical panel is accessible when the unit is closed and is positioned on the compressors' side. To open the panel door, you must turn the disconnect switch to the OFF position and use a double-bit key in both of the locks present.

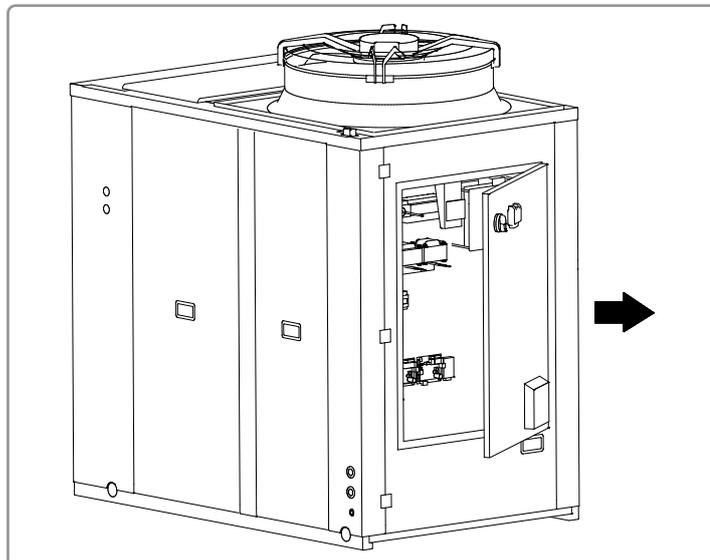


Figure 13 - Accessing the terminal block of the outdoor unit

**CAUTION:**

All of the installation operations must be carried out when the heat pump is stopped, and after disconnecting the electrical power supply.
 These operations must only be carried out by **QUALIFIED PERSONNEL**.
 Remove the cover without removing the cable duct support plate.
 When the work is complete, refit all of the covers removed with their screws and seals (if present).

3.7.3. Current source**WARNING:**

Electrical connections must only be carried out by **QUALIFIED PERSONNEL**, in compliance with the legislation in force.
 Ensure that an adequate earth connection is installed, as inadequate earthing can cause electrical shocks. The manufacturer cannot be held responsible for damage caused by ineffective or absence of earthing.

The ratings and dimensions of the power cables, electrical protections and line fuses must comply with the indications of the unit's wiring diagram and the electrical data of the technical specifications table (see paragraph 2.4.1)).

Use a dedicated power line, do not power the appliance via a line to which other users are connected. Securely fasten the power cables and make sure they do not come into contact with sharp metallic corners, which could damage them. Use double-insulated cables with copper wires.

The earth connection should be made first during the connection phase and vice versa, it should be removed last when the unit is disconnected. If the power cable comes loose, make sure that the active conductors are powered before the earth wire.

A proximity switch with adequate breaking capacity must be installed on the supply line, with contact separation for all poles.

A dedicated C-curve circuit breaker must be installed from the line start in the electrical panel.

This circuit breaker must be rated higher than the maximum current allowed by the outdoor unit, and a breaking capacity greater than the maximum cut-out current from the upstream power supply (main low voltage distribution panel or other).

An earth fault circuit breaker compatible with the inverters must be added. For this use, we recommend fitting a type B differential circuit breaker added must be, as fitting a different circuit breaker can lead to unwanted tripping.

The following table shows the recommended cable sections for a maximum length of 30 m. In all cases, depending on the type of installation, the physical location and the length of the cables (under or over 30 m), the electrical system installer must make the appropriate choice.

Electrical power supply	Models	Recommended cable section (Max. length 30 m)	Max. absorbed current (A)	Recommended tightening torque:
50Hz 400V / 3ph + N+ PE	AHP60-50 kW	*5G16 mm ²	54	L1/L2/L3: 3.4 Nm – N/PE: 1 Nm
50Hz 400V / 3ph + N+ PE	AHP60-70 kW	*5G16 mm ²	70	L1/L2/L3: 3.4 Nm – N/PE: 1 Nm

(*) FG16 cable in fixed position in the air at 30°C

The units comply with electromagnetic compatibility specifications, but the electrical installation designer must make the appropriate assessments to ensure there is no interference.

3.7.4. Connecting the control unit

See Tyneham Heat Control manual

3.7.5. User terminal

The terminal block is located inside the electrical panel. For access, see the instructions. The terminal block must be connected in accordance with the information below. The connections shown below are standard.



CAUTION: It is important to separate high voltage cables from very low voltage cables

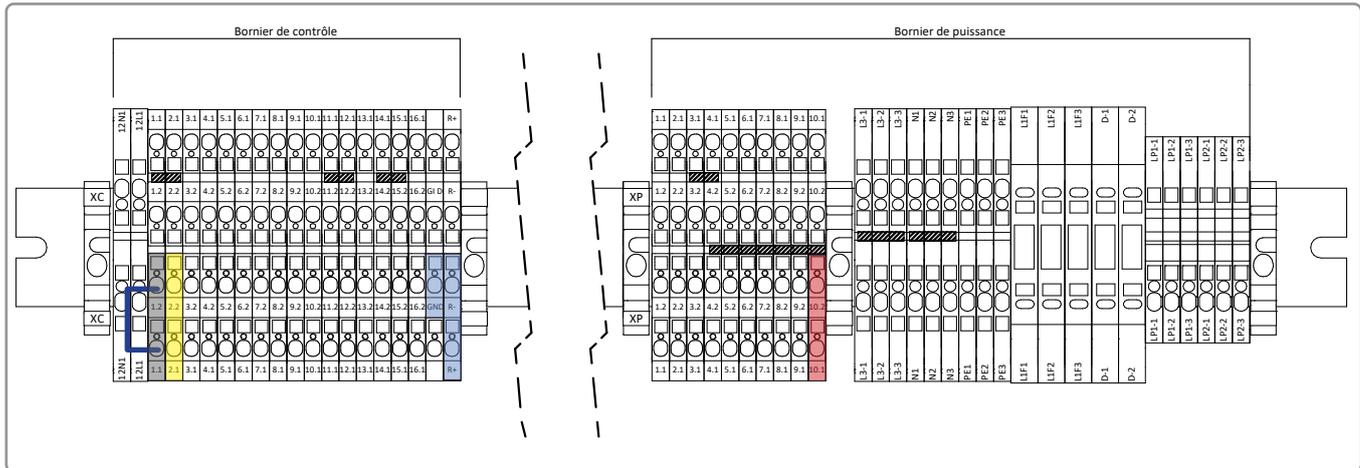


Figure 14 - Terminal block AHP60 50-70 kW

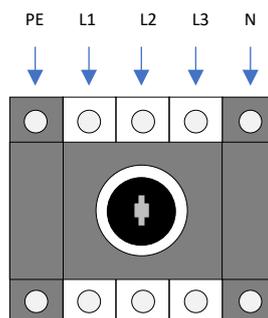
- Tyneham Heat Control Communication bus
- Programmable alarm report
- External safety
- Programmable input (e.g.: silence mode)

L1F1 to F3 terminal blocks with integrated fuses of type: 3x 8A

D1 and D2 terminal blocks with integrated fuses of type: 2x 8A(not used)

3.7.6. Power terminal

The power cables must be connected directly to the "SD1" front panel disconnecter switch. This is located inside the electrical panel. For access, see the information in chapter 2.5.2.1. The terminal block must be connected in accordance with the instructions below.



Terminal	Connection	Type
PE	Connect the earth wire	Power supply input 3-Ph/N/PE, 400 VAC, 50Hz
N	connect the neutral wire from the network	Power supply input 3-Ph/N/PE, 400 VAC, 50Hz
L1	Connect the L1 phase wire from the main power supply	Power supply input 3-Ph/N/PE, 400 VAC, 50Hz
L2	Connect the L2 phase wire from the main power supply	Power supply input 3-Ph/N/PE, 400 VAC, 50Hz
L3	Connect the L3 phase wire from the main power supply	Power supply input 3-Ph/N/PE, 400 VAC, 50Hz
GND	Tyneham Heat Control OCI 351 (REF) connection	Communication bus
R-	Tyneham Heat Control OCI 351 (B-) connection	
R+	Tyneham Heat Control OCI 351 (A+) connection	
X1.1 / 1.2	Remote on/off input Safety wiring => lack of water, dry contact "Lack of water" pressure switch	Voltage-free digital input closed=machine switched on open=machine switched off Forced stoppage
X2.1 / 2.2	Programmable input (caution, not configured in the factory, for silent ventilation function set H46=25)	Voltage-free digital input Closed = silent mode activated, Open = silent mode deactivated
X10.1 / 10.2	Output to be programmed e.g. alarm deferral H85 = 47	Voltage output 230VAC, 50Hz, 2A (AC1)

**CAUTION:**

If the heat pump is installed in cascade, each unit has its own dedicated Tyneham Heat Control regulation unit. The connection between an TYNEHAM unit and its regulation unit must be via a dedicated communication cable. Do not connect the buses of the different units and regulation units together.

4. PRE-REQUISITES BEFORE COMMISSIONING

4.1. Verification before switching on

- Check that the electrical and hydraulic diagrams of the installation the machine is connected to are available.
 - Ensure that the isolation valves of the hydraulic circuits are open.
 - Check that there are safety valves filters and expansion systems.
 - Ensure that the hydraulic circuit is filled, pressurised and bled.
 - Check that all of the hydraulic connectors are fitted correctly and that all of the instructions on the labels have been followed.
 - Check that the hydraulic installation is in accordance with the diagram included in the Tyneham Heat Control regulation instructions.
 - Ensure that arrangements have been made to evacuate the condensation.
 - Check that the terminals are connected and attached correctly.
 - Check if the electrical connections comply with the regulations in force, including the earth.
 - Check the order of the phases, the voltages between each phase and the neutral, then between each phase and the earth.
 - The voltage must be the same as that stated on the appliance's rating plate.
 - Ensure that the voltage is definitive and within the tolerance limits ($\pm 5\%$).
-
- Before switching on, check if all of the cover panels have been fitted and attached with the appropriate screws.

**CAUTION:**

- **Power up the heat pump at least 12 hours before switching it on, in order to enable the resistors to heat the compressor casing enough (the resistors are automatically supplied when the switch is closed). The heating elements are operating correctly if after a few minutes the temperature of the compressor housing resistor is 10 to 15°C hotter than the ambient temperature.**
- **Check that the weight of the pipes is not resting on the machine structure.**
- **Stop the appliance temporarily, do not switch off the power supply using the main isolator switch; this operation must only be used to switch off the electrical power supply to the appliance for prolonged stoppages (for example, seasonal holidays, etc.). Furthermore, the absence of the voltage means that the housing resistors are no longer powered and that there is a risk of compressor failure when the unit is switched back on.**
- **Do not modify the electrical connections of the appliance, otherwise this will nullify the warranty immediately.**

4.2. Switching On

- To switch on the machine, turn the outer handle of the isolator switch to the ON position (shown by "I"). The display on the machine will only be switched on if the order of the phases is correct (to be checked when switched on for the first time). After powering down, wait for at least 1 minute before powering up again.
- Check if heating cables of the compressors are powered correctly.

4.3. Commissioning

- The heat pump must only be commissioned by Hamworthy Heating commissioning personnel.
- If heating is required before the planned commissioning date, back-up generators may be used:

TYNEHAM heating system only via the tank back up resistors

TYNEHAM system via the tank, whose exchanger is connected to the gas boiler

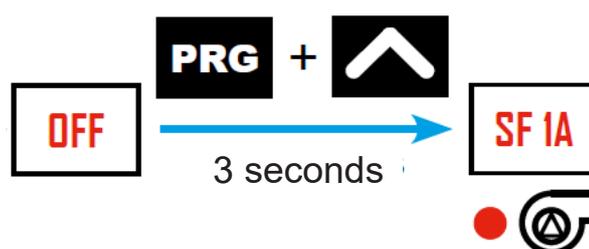
4.4. Primary loop flow rate/cascade balance adjustment

The TYNEHAM hydraulic flow adjustment service is to be carried out by you. Please refer to the Tyneham Heat Control manual adapted to your application (heating / DHW) and to the sizing study in order to know the location of the adjustment devices as well as the target flow rate value. chapter 9. HYDRAULIC DIAGRAMS AND SETTINGS.

The adjustment of the hydraulic flow is to be carried out by launching the circulator in forced operation mode.

To enable this function:

- Control in OFF mode
- Go to settings PRG => PSS => PRG => (insert password 195)
- Then perform the following operation



To quit the forced operation mode of the pump, press the same buttons again for 3s. The stoppage of the circulator is effective 2 min after leaving the mode.

Note: this manual mode is also deactivated on one of the 3 conditions below:

- switching to another mode
- with a heat pump fault (example: flow controller on irrigation fault)
- after 1 hour of manual operation

4.5. Operating diagram

4.5.1. AHP60 50-70 kW

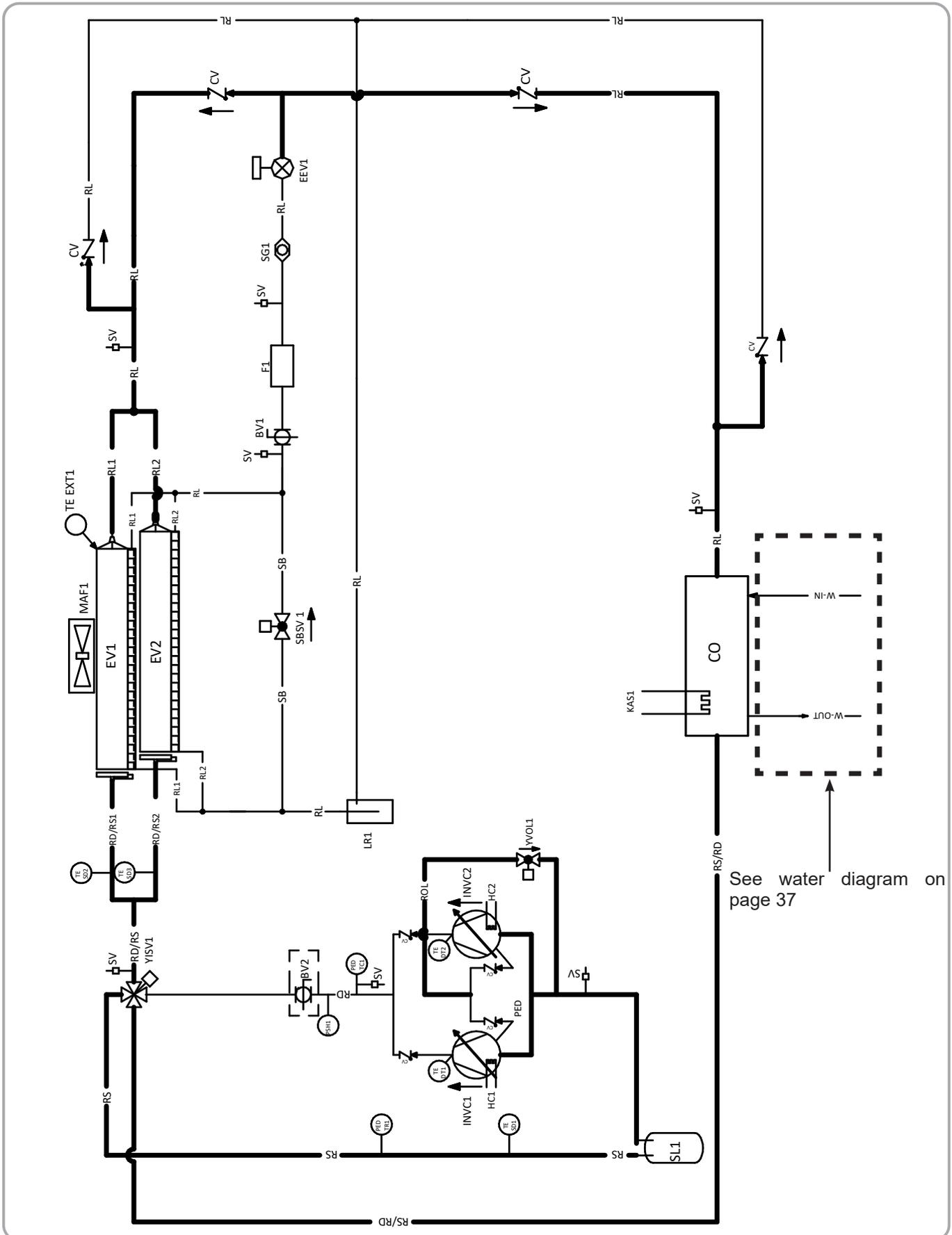
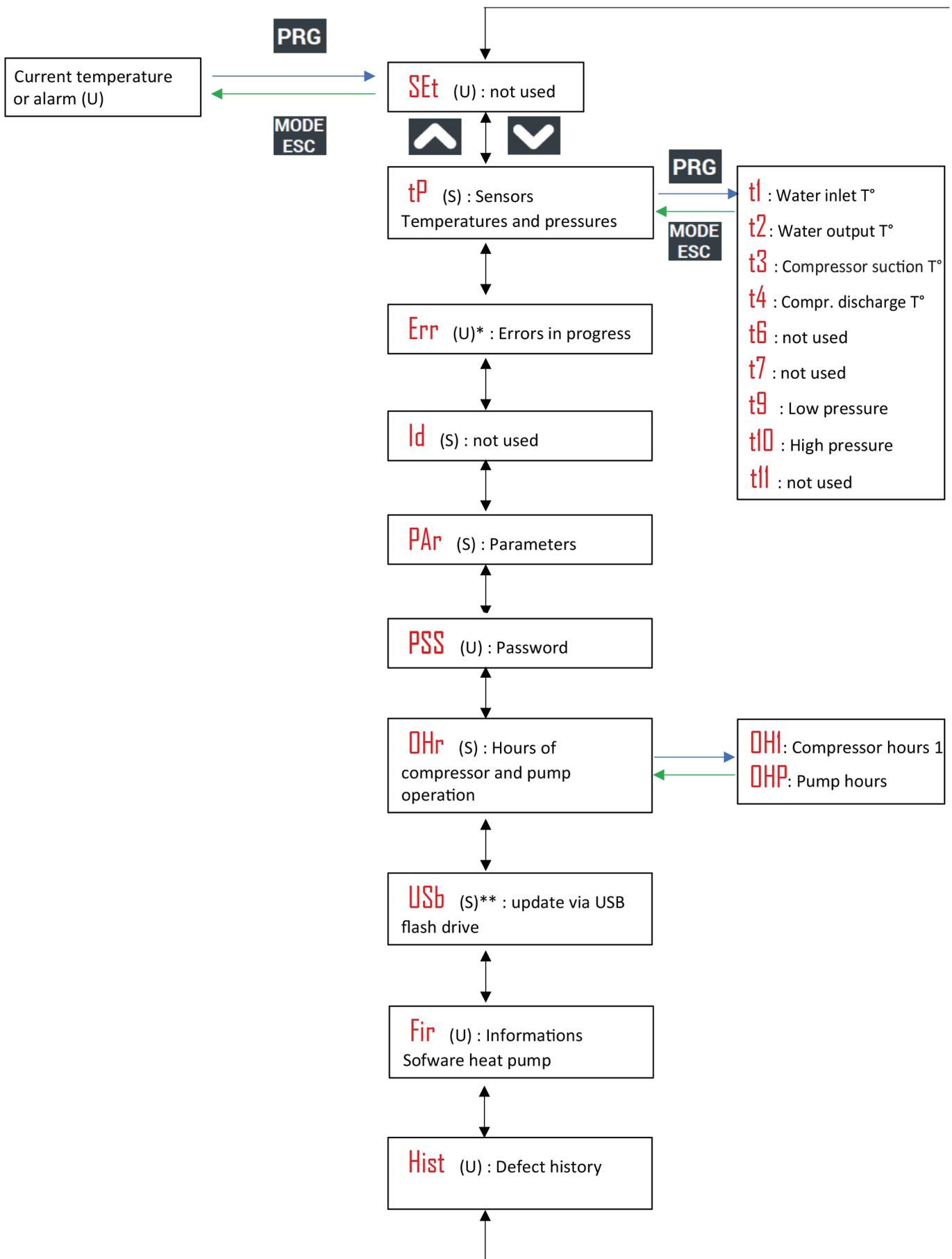


Figure 15 - Operating diagram

- Thicker lines represent insulated ducts

KEY					
INVC	1/2	COMPRESSOR	SB	1	BY-PASS LINE FOR COOLING
EV	1/2	EVAPORATOR	BV	1	MANUAL BALL VALVE
CO	1	CONDENSER	YVOL	1	OIL BALANCING SOLENOID VALVE
LR	1	FLUID BOTTLE	YISV	1	4 WAY CYCLE REVERSING VALVE
SL	1	LIQUID SEPARATOR	SBSV	1	BY-PASS LINE 2-WAY SOLENOID VALVE
EEV	1	ELECTRONIC PRESSURE REGULATOR	SG	1	LIQUID AND MOISTURE INDICATOR
SV		PRESSURE GAUGE OUTLET	CV		NON-RETURN VALVES
F	1	DEHYDRATOR FILTER	PED TC	1	HIGH PRESSURE SENSOR
HC	1/2	HOUSING RESISTOR	PED TR	1	LOW PRESSURE SENSOR
MAF	1	FAN	PSH	1	HP PRESSURE SWITCH, AUTOMATIC RESET
RD		DISCHARGE LINE	KAS	1	CONDENSER FROST-PROOF HEATING CABLE
RD/RS		DISCHARGE/SUCTION LINE	TE SD	1/2/3	SUCTION LINE TEMPERATURE SENSOR
RL		FLUID LINE	TE DT	1/2	COMPRESSOR OUTLET TEMPERATURE SENSOR
RS		SUCTION LINE	TE EXT	1	EXTERNAL AIR TEMPERATURE SENSOR
RS/RD		SUCTION/DISCHARGE LINE	W-IN		WATER IN
ROL		OIL BALANCE LINE	W-OUT		WATER OUT

4.6. TYNEHAM user interface navigation



* : Only in case of default in progress

** : Only if USB flash drive detected with the right files

5. CONTROL INTERFACE

5.1. User interface

The unit is equipped with a display underneath a transparent polycarbonate cover with an IP67 protection rating.

The interface consists of a variable text part and a series of icons identifying the operation of the appliance as shown in the table below.



	- Not used in this application -
	Heating mode LED: ON LED if the unit is in heating mode
	Pump LED: ON LED if the pump is active.
	Alarm LED: ON LED if an alarm is active.
	Defrosting LED: ON LED if the defrosting is active; OFF if the defrosting is activated or complete; FLASHING if counting the time of defrosting in progress.
	Compressor LED: ON LED if the compressor is active, OFF if the compressor is switched off, FLASHING if timer is counting down to start the compressor.
	- Not used in this application -
	Frost-free resistor LED: ON LED if the frost-free resistor is active.

The keys have specific functions as described below

	Select the operating mode and reset the alarms that need to be done so manually. Every time the key is pressed, there is the following sequence: off → cool → heat → off The heat pump only operates in Heat mode When setting the parameters, there is the BACK function to go back one level.
	Provides access to the parameter setting menu and to adjust the winter, summer and sanitary setpoints.
	UP key (arrow). In parameter setting mode, this switches to a higher menu or increases the value if a parameter.
	DOWN key (arrow). In parameter setting mode, this switches to a lower menu or decrease the value if a parameter.

It normally displays the water outlet temperature in tenths of a degree Celsius or the alarm code is displayed if there is at least one alarm in progress. If several alarms are in progress, the first one is displayed, while the second one is displayed after the first one has been reset.

Menu

Below is a description of the main navigation functions in the menus, also explaining some functions that are harder to understand. The main menu manages the following sections:

MENU	LABEL	PASSWORD LEVEL	OTHER CONDITIONS
Setpoint	Set	User	Manual operation without Tyneham Heat Control
Sensor	tP	Installer	---
Alarms	Err	User	Only if errors in progress
Digital inputs	Id	Installer	---
Parameters	Par	Installer	---
Password	PSS	User	---
Hours of operation	oHr	Installer	---
USB	USb	Installer	Only if a USB stick is present, see "software" instructions
Firmware version	Fir	Installer	---
Error history	Hist	Installer	Only if there is data in the history

Access the PSS menu to enter the maintenance technician password "195" and to activate access to a higher level. Once all of the menus have been quit, the password privileges are lost and the password needs to be entered once again.

5.2. "SET" setpoint menu (For manual operation only)

The different setpoints can be displayed and modified. This menu is not used automatically with Tyneham Heat Control.

SETPOINT	DESCRIPTION	UNIT	BY DEFAULT	RANGE
Coo	- not used -	--	--	--
Hea	Setpoint in manual operation without Tyneham Heat Control connected. (Manual mode)	°C	45.0	25 ÷ 60
Coo2	- not used -	--	--	--
Hea2	- not used -	--	--	--

Note: To operate manually without connection to the Tyneham Heat Control regulation, the pairing between the 2 must be cancelled:

Power down the Tyneham Heat Control or disconnect the communication bus between the 2, then switch off the heat pump for a few seconds via the proximity switch, then restart it

5.3. Sensor menu [TP]

Access the PSS menu to enter the maintenance technician password “195” and to activate access to a higher level. Once you have fully exited the menus, the password privileges are lost and the password needs to be entered once again.

LABEL	SENSOR
T01	Inlet water temperature
T02	Outlet water temperature
T03	Compressor suction temperature
T04	Compressor discharge temperature
T05	External air temperature
T06	- not used -
T07	- not used -
T09	Low pressure sensor
T10	High pressure sensor

5.4. Error menu [Err]

This menu is only displayed if there are errors in progress. It allows all of the ongoing errors to be viewed.

5.5. Operating hours menu [OHR]

OH1: Compressor operating hours 1

OH2: Compressor operating hours 2

OHP: Pump operating hours

Access the PSS menu to enter the maintenance technician password “195” and to activate access to a higher level. Once you have fully exited the menus, the password privileges are lost and the password needs to be entered once again.

5.6. Parameter menu [Par]

DESCRIPTION	GROUP IDENTIFICATION CODE	PARAMETER SUMMARY
Configuration	CnF	H01-
Not used	CP	C01-
Not used	ALL	A01-
Not used	rE	b01-
Not used	PUP	P01-
Not used	Fro	r01-
Not used	dFr	d01-

In CnF parameter H84, enter 21 to activate the heat pump de-icing signalling output

In CnF parameter H46, enter 25 to activate the silent ventilation function input

In CnF parameter H85, enter 47 to activate the heat pump alarm output

6. TROUBLESHOOTING

6.1. Troubleshooting of failures without error code

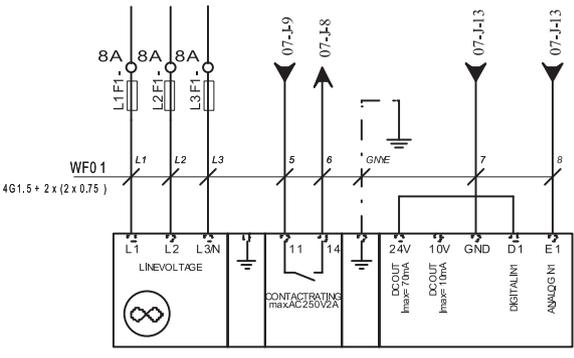
Problems encountered	Cause	Solution
HMI off with heat pump powered up	Power supply phase reversal	Reverse the cabling between 2 power supply phases
Error 495 on Tyneham Heat Control or TYNEHAM does not follow the Tyneham Heat Control instruction	No bus dialogue between heat pump and Controller regulations	Power up the heat pump. Pair Tyneham Heat Control and TYNEHAM: leave the Tyneham Heat Control powered up, switch the TYNEHAM power supply on / off for a few seconds.
HMI blocked, cannot operate the TYNEHAM in backup mode	TYNEHAM in Controller slave mode	Cancel the Tyneham Heat Control and TYNEHAM pairing: power down the Tyneham Heat Control or disconnect the communication bus between the 2 then switch the TYNEHAM on / off for a few seconds.

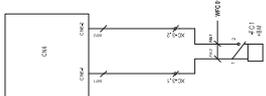
6.2. Error codes and diagnostic assistance

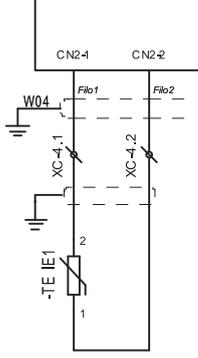
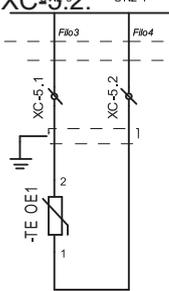
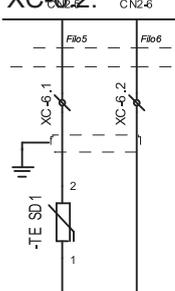
When the TYNEHAM is at fault, it displays OFF and the alarm light is on. To see the error code, you must use PRG2 twice.

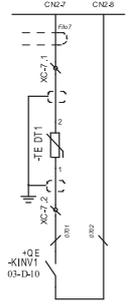
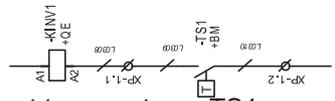
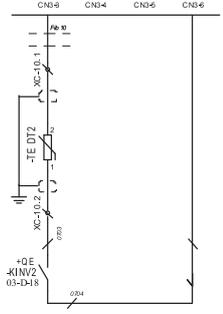
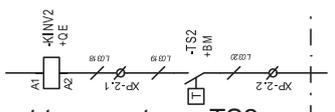
If an automatic reset fault appears, the heat pump restarts at the latest 6 minutes after the error code disappears.

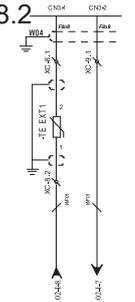
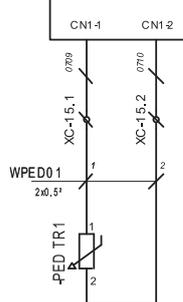
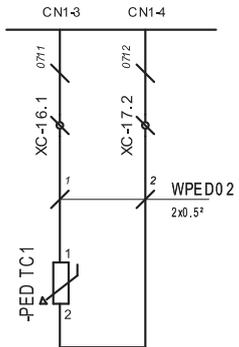
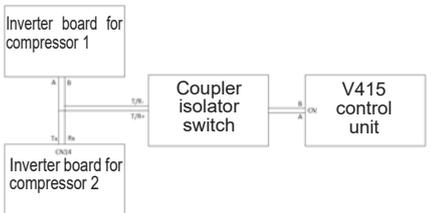
In the event of a manual reset fault, the fault is cleared by powering down the TYNEHAM.

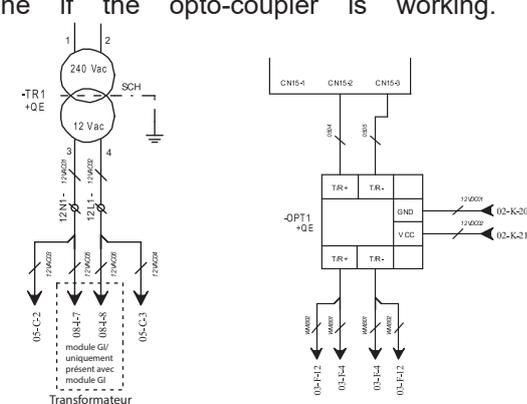
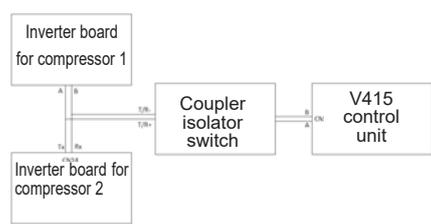
Code	Description	Cause	Solution
E000	E x t e r n a l safety element triggered	Remote activation of the ON/OFF input, input open	<ul style="list-style-type: none"> Close the digital input XC1.1/XC1.2
E001	High pressure alarm	<p>The pressure sensor detects a pressure that is higher than the "high pressure setpoint" (46 bar).</p> <p>It is reset when the pressure drops back down below 36 bar.</p> <p>If the alarm occurs more than 3 times in an hour, it needs to be reset manually.</p>	<ul style="list-style-type: none"> Check if an alarm occurs even when the mode is changed, by checking the operation of the 4 way valve. Check that the position of the unit respects the minimum distances. Check the electronic expansion valve EEV is operating and attached correctly. Check the correct operation of the fan; if it is not working, check for the presence of the three-phase supply terminals L1F1, L2F1 and L3F1 and of the fuses included in the terminal blocks. Check the correct connection and polarity between the E1-GND fan terminals and XC-13.1 / XC-13.2. Check for the presence of the D1-DCOut shunt 

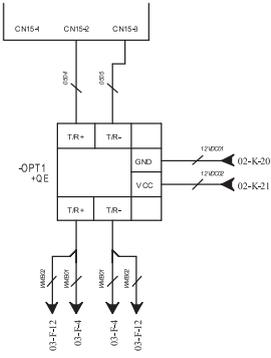
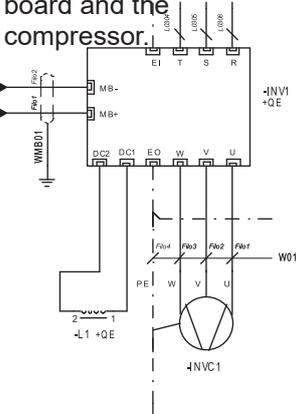
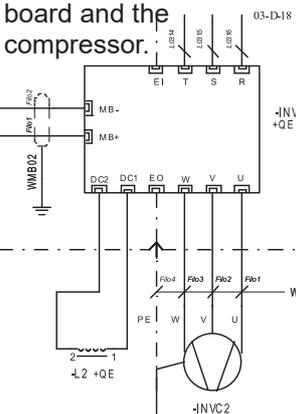
Code	Description	Cause	Solution						
E002	Low pressure alarm	<p>The pressure sensor detects a pressure that is lower than the “low pressure setpoint” .</p> <p>Low pressure setting for cooling =3.5bar. Low pressure setting for heating mode = 1.3 bar.</p> <p>If the alarm occurs more than 3 times in an hour, it needs to be reset manually.</p>	<ul style="list-style-type: none"> • Check for gas leaks in the refrigeration circuit. • Check if the alarm occurs when the operating mode is changed • Check the electronic expansion valve EEV is operating and attached correctly. 						
E005	Frost-free alarm	<p>If the water flow rate sensor (OE1) has a value of less than A08 (by default 3°C). This alarm is reset manually.</p>	<ul style="list-style-type: none"> • The temperature rises by 3°C above the intervention level 						
E006	Flow rate alarm	<p>If the flow rate controller detects an insufficient flow rate for 5 seconds consecutively. If the alarm occurs more than 3 times in an hour, it needs to be reset manually.</p>	<ul style="list-style-type: none"> • Check the operation of the flow rate controller, by checking the XC-3.1 / XC-3.2 wiring.  <ul style="list-style-type: none"> • Check that the installation instructions provided in this manual have been respected. • Check the condition of the water filters in the system 						
E008	Compressor board limit alarm	<p>If during the lubrication phase, the compressor does not exceed the minimum frequency, it is stopped and the error message E008 is displayed. This error needs to be reset manually if the compressor is stopped more than 3 times in an hour,</p>	<ul style="list-style-type: none"> • Check the fan is operating correctly • Check the continuity of the connection between U, V and W on the inverter and U, V, W on the compressor. • Check the resistor between the compressor phases: <table border="1" data-bbox="874 1227 1485 1375"> <thead> <tr> <th>Models</th> <th>Resistance of coil at 20°C</th> </tr> </thead> <tbody> <tr> <td>50 kW</td> <td>0.23 ohm</td> </tr> <tr> <td>70 kW</td> <td>0.16 ohm</td> </tr> </tbody> </table>	Models	Resistance of coil at 20°C	50 kW	0.23 ohm	70 kW	0.16 ohm
Models	Resistance of coil at 20°C								
50 kW	0.23 ohm								
70 kW	0.16 ohm								
E009	High compressor discharge temperature error	<p>If the compressor discharge temperature exceeds the value defined by the 120°C parameter, the alarm is activated and the compressor blocked.</p> <p>The alarm is automatically reset when the discharge temperature drops below the limit of 110 °C.</p>	<ul style="list-style-type: none"> • Check the correct operation of the fan; if it is not working, check for the presence of the three-phase supply terminals L1F1, L2F1 and L3F1 and of the fuses included in the terminal blocks. Check the correct connection and polarity between the E1-GND fan terminals and XC-13.1 / XC-13.2. • Check the wiring of the compressor outlet sensor, and that the bulb is inserted correctly into the well and that there is heat dissipating paste • Check the refrigerant level 						

Code	Description	Cause	Solution						
E020	<p>Inverter pressure sensor error</p>	<p>If the compressor has been operating for more than 150 seconds, if the low pressure sensor detects that the pressure is higher than the high pressure sensor, then the alarm message E020 is displayed.</p> <p>This alarm is not reset (the machine has to be powered down to clear the alarm).</p>	<ul style="list-style-type: none"> Check that the pressure sensor wiring is not inverted Check that the compressor inverter board is operating correctly. Check the compressor is operating correctly Check the continuity of the connection between U, V and W on the inverter and U, V, W on the compressor. Check the resistor between the compressor phases: <table border="1" data-bbox="805 667 1417 810"> <thead> <tr> <th>Models</th> <th>Resistance of coil at 20°C</th> </tr> </thead> <tbody> <tr> <td>50 kW</td> <td>0.23 ohm</td> </tr> <tr> <td>70 kW</td> <td>0.16 ohm</td> </tr> </tbody> </table>	Models	Resistance of coil at 20°C	50 kW	0.23 ohm	70 kW	0.16 ohm
Models	Resistance of coil at 20°C								
50 kW	0.23 ohm								
70 kW	0.16 ohm								
E611	<p>Failure of the water inlet sensor</p>	<p>The IE1 sensor is defective.</p>	<ul style="list-style-type: none"> Check that the IE1 sensor is securely attached to the terminals XC-4.1 / XC-4.2. 						
E621	<p>Failure of the water outlet sensor</p>	<p>The OE1 sensor is defective.</p>	<ul style="list-style-type: none"> Check that the OE1 sensor is securely attached to the terminals XC-5.1 / XC-5.2. 						
E631	<p>Suction sensor failure sensor failure</p>	<p>The SD1 sensor is defective.</p>	<ul style="list-style-type: none"> Check that the SD1 sensor is securely attached to the terminals XC-6.1 / XC-6.2. 						

Code	Description	Cause	Solution						
E641	<p>Failure of the compressor discharge sensor 1 / intervention of the manual reset pressure switch (closed 42.8/bar open 34bar)</p>	<p>The DT1 sensor is faulty or the command chain is open</p>	<ul style="list-style-type: none"> Check that compressor discharge sensor DT1 or the NO contact of the KinV1 switch are connected to the terminals XC -7.1/XC-7.2 correctly  <ul style="list-style-type: none"> Check the KinV1 switch is working correctly: If there is no voltage at the 1-A2 switch coil, check the safety devices connected in series to it: <ul style="list-style-type: none"> - PSH1 automatic reset pressure switch - Thermostat positioned at top of *compressor TS1  <p>Intervention/reset temperatures TS1</p> <table border="1" data-bbox="833 992 1501 1104"> <thead> <tr> <th>Closing temperature</th> <th>Opening temperature</th> </tr> </thead> <tbody> <tr> <td>90 ± 5</td> <td>120 ± 4</td> </tr> <tr> <td>90 ± 5</td> <td>120 ± 4</td> </tr> </tbody> </table>	Closing temperature	Opening temperature	90 ± 5	120 ± 4	90 ± 5	120 ± 4
Closing temperature	Opening temperature								
90 ± 5	120 ± 4								
90 ± 5	120 ± 4								
E642	<p>Failure of the compressor discharge sensor 2 / intervention of the manual reset pressure switch (closed 42.8/bar open 34bar)</p>	<p>The DT2 sensor is faulty or the command chain is open</p>	<ul style="list-style-type: none"> Check that compressor discharge sensor DT2 or the NO contact of the KinV2 switch are connected to the terminals XC-10.1/XC-10.2 correctly.  <ul style="list-style-type: none"> Check the KinV2 switch is working correctly: If there is no voltage at the 1-A2 switch coil, check the safety devices connected in series to it: <ul style="list-style-type: none"> - PSH1 automatic reset pressure switch - Thermostat positioned at top of compressor TS2  <p>Intervention/reset temperatures TS2</p> <table border="1" data-bbox="833 1892 1501 2004"> <thead> <tr> <th>Closing temperature</th> <th>Opening temperature</th> </tr> </thead> <tbody> <tr> <td>90 ± 5</td> <td>120 ± 4</td> </tr> <tr> <td>90 ± 5</td> <td>120 ± 4</td> </tr> </tbody> </table>	Closing temperature	Opening temperature	90 ± 5	120 ± 4	90 ± 5	120 ± 4
Closing temperature	Opening temperature								
90 ± 5	120 ± 4								
90 ± 5	120 ± 4								

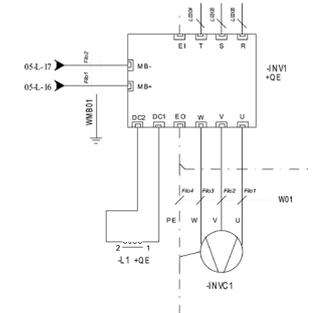
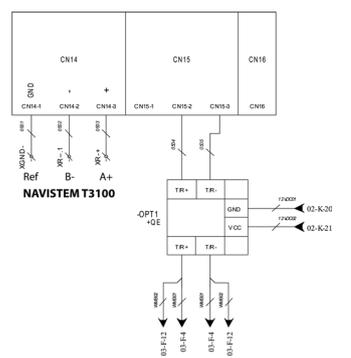
Code	Description	Cause	Solution
E651	Failure of the external air sensor	The EXT1 sensor is defective	<ul style="list-style-type: none"> Check that the sensor is securely attached to the terminals XC-8.1 / XC-8.2  <ul style="list-style-type: none"> Check the wiring of the fan fault contact terminals XC-8.2 and XC-9.1 with terminals 11 and 14. Check for the presence of a fan fault.
E691	Low pressure sensor failure	The TC1 low pressure sensor is defective.	<ul style="list-style-type: none"> Check that the TC1 sensor is attached correctly to the terminals XC-15.1 / XC-15.2. 
E701	High pressure sensor failure	The TR1 high pressure sensor is defective.	<ul style="list-style-type: none"> Check that the TR1 sensor is attached correctly to the terminals XC-16.1 / XC-16.2. 
E801	Inverter board 1 communication error	<ul style="list-style-type: none"> The communication cable between the inverter board and the fan opto-coupler is not connected or is defective. The opto-coupler OPT1 is defective or not powered. 	<ul style="list-style-type: none"> Check the communication cable between the control terminals CN15 2-3, opto-coupler OPT1 and compressor board INV1:  <ul style="list-style-type: none"> Check the 12VDC AL1 power supply board

Code	Description	Cause	Solution
<p>E801 (*) continued</p>	<p>Inverter board 1 communication error</p>	<ul style="list-style-type: none"> The communication cable between the inverter board and the opto-coupler is not connected or is defective. The opto-coupler OPT1 is defective or not powered. 	<p>If the functional diagram connections are all present, Check:</p> <ul style="list-style-type: none"> Check if opto-coupler OPT1 is powered, if there is a 12V voltage between the VCC and GND terminals. Bypass the opto-coupler separating the compressor board and the fan board to determine if the opto-coupler is working. :  <ul style="list-style-type: none"> If the LEDs of the compressor inverter board INV1 are not flashing and the board is powered, the INV1 board needs to be replaced:
<p>E802</p>	<p>Inverter board 2 communication error</p>	<ul style="list-style-type: none"> The communication cable between the inverter board and the fan opto-coupler is not connected or is defective. The opto-coupler OPT1 is defective or not powered. 	<ul style="list-style-type: none"> Check the communication cable between the control terminals CN15 2-3, opto-coupler OPT1 and compressor board INV2:  <ul style="list-style-type: none"> Check the 12VDC AL1 power supply board

Code	Description	Cause	Solution						
<p>E802 (*) continued</p>	<p>Inverter board 2 communication error</p>	<ul style="list-style-type: none"> The communication cable between the inverter board and the opto-coupler is not connected or is defective. The opto-coupler OPT1 is defective or not powered. 	<p>If the functional diagram connections are all present, Check:</p> <ul style="list-style-type: none"> Check if opto-coupler OPT1 is powered, if there is a 12V voltage between the VCC and GND terminals. Bypass the opto-coupler separating the compressor board and the fan board to determine if the opto-coupler is working. :  <ul style="list-style-type: none"> If the LEDs of the compressor inverter board INV2 are not flashing and the board is powered, the INV2 board needs to be replaced. 						
<p>E851 (*)</p>	<p>Problem on inverter board</p>	<p>Inverter board or compressor defective. Poor connection between the inverter board and the compressor.</p> 	<p>Check the continuity of the connection between U, V and W on the inverter board and U, V, W on the compressor. Change the inverter board. Check the resistor between the compressor phases:</p> <table border="1" data-bbox="805 1108 1412 1254"> <thead> <tr> <th>Models</th> <th>Resistance of coil at 20°C</th> </tr> </thead> <tbody> <tr> <td>50 kW</td> <td>0.23 ohm</td> </tr> <tr> <td>70 kW</td> <td>0.16 ohm</td> </tr> </tbody> </table> <p>If it is different from the previous values, replace the compressor:</p> <ul style="list-style-type: none"> Check the number of times the inverter board LED flashes. 	Models	Resistance of coil at 20°C	50 kW	0.23 ohm	70 kW	0.16 ohm
Models	Resistance of coil at 20°C								
50 kW	0.23 ohm								
70 kW	0.16 ohm								
<p>E852</p>	<p>Problem on inverter board</p>	<p>Inverter board or compressor defective. Poor connection between the inverter board and the compressor.</p> 	<p>Check the continuity of the connection between U, V and W on the inverter board and U, V, W on the compressor. Change the inverter board. Check the resistor between the compressor phases:</p> <table border="1" data-bbox="805 1680 1412 1825"> <thead> <tr> <th>Models</th> <th>Resistance of coil at 20°C</th> </tr> </thead> <tbody> <tr> <td>50 kW</td> <td>0.23 ohm</td> </tr> <tr> <td>70 kW</td> <td>0.16 ohm</td> </tr> </tbody> </table> <p>If it is different from the previous values, replace the compressor:</p> <ul style="list-style-type: none"> Check the number of times the inverter board LED flashes. 	Models	Resistance of coil at 20°C	50 kW	0.23 ohm	70 kW	0.16 ohm
Models	Resistance of coil at 20°C								
50 kW	0.23 ohm								
70 kW	0.16 ohm								

6.3. Inverter board errors

Error shown in the display of the main control board	Error description	Possible Causes	Solutions
E861 (Inverter card 1) - Too high motor power	IPM (Intelligent Power Module) temperature protection (100-125°C)	Too high ambient temperature	Check if dirt has accumulated in the heatsink
	- Driver H/W over current during speed acceleration - Driver H/W over current at steady state - Driver H/W over current at decel state	- Output short circuit (line to line, line to ground) - Locked compressor rotor	Disconnect compressor wiring and check line to line the short circuit on the output of the driver.
E862 (Inverter card 2)	- En phase accélération compresseur - En régime permanent compresseur - En phase décélération compresseur	- The compressor load is too heavy - Locked rotor or deteriorated magnet	Check the wiring between driver and compressor.
E871 (Inverter card 1) - Température dissipateur thermique Inverter élevée - E872 (Inverter card 2)	- Ambient over temperature protection - Heatsink over heat protection - IPM temperature protection (100-125°C) - PFC module (Power Factor Correction) over heat protection (inbox temperature > 95°C)	- The ambient temperature is too high - Faulty sensors	- Reduce ambient temperature around the driver - If the temperature is not out of range, change the driver
E881 (Inverter card 1) - Out of limits supply voltage - E882 (Inverter card 2)	DC Bus under voltage protection Serial 220V : 180 VDC Serial 380V : 310 VCC	- The voltage fluctuation of the power supply are too high - A momentary power loss occurred	- Check input voltage level - Turn off the HP, wait 2 minutes and then power on again
	DC Bus over voltage protection Serial 220V : 400 VDC Serial 380V : 800 VCC	- Power supply voltage is too high - Malfunction of PFC converter	- Check input voltage level - Change the driver
E891 (Inverter card 1) - Compressor not connected to the power supply- E 892 (Inverter card 2)	Output phase loss	One or more wires loses is not connected	- Check the voltage on the output phases - Check if the phases are correctly connected

Error shown in the display of the main control board	Error description	Possible Causes	Solutions
E901 (Inverter card 1) - Compressor driver and model mismatch - E902 (Inverter card 2)	Compressor driver and model mismatch	Main control board or inverter faulty	Change the card mismatching with the model
E911 (Inverter card 1) - Surintensité - E912 (Inverter card 2)	Output current exceed driver's overload capability	- The compressor load is too heavy - Locked rotor or deteriorated magnet	- Check the wiring between driver and compressor - If the wiring is ok, change compressor
E921 (Inverter card 1) - PFC (Power Factor Control) over current - E922 (Inverter card 2)	PFC converter over current	- Input short circuit - Faulty chocke	- Check the input phase-to-phase short - Check the L1 (if E921) or L2 (if E922) Chocke wire - Check the value of chocke is $0.85\text{mH} \pm 10\%$ - If the chocke is ok, change driver 
E931 (Inverter card 1) - Communication error with main controller - E932 (Inverter card 2)	The inverter doesn't answer to the main control board for more than 30 seconds	- Connection is broken or the master have stopped communication - Main control board or inverter is faulty - Communication wiring or opto isolator is broken	- Check communication wiring between driver and controller  - Change the main controller or the inverter - Change the wire or the opto isolator

Error shown in the display of the main control board	Error description	Possible Causes	Solutions
E941 (Inverter card 1) - PFC converter fault - E942 (Inverter card 2)	PFC converter fault	- Input phase loss	- Check the input voltage
E951 (Inverter card 1) - Temperature heatsink or ambient sensor error - E952 (Inverter card 2)	Temperature heatsink or ambient sensor error : - Inbox temperature sensor error	- Broken heatsink temperature sensor wire - Inbox temperature sensor may be damaged	- Check heatsink temperature sensor wiring - Check inbox temperature sensor - If damaged, change the driver
E961 (Inverter card 1) - Abnormal conditions - E962 (Inverter card 2)	Ferquency decelerate to stop	- Driver's output current or inbox/heatsink temperature exceed the limit o protection for a long time - Locked rotor	- Replace the driver if the fault occur continuously - Change the compressor
E971 (Inverter card 1) - EEPROM not initialized - E972 (Inverter card 2)	EEPROM not initialized	- Driver memory damaged	- Replace the driver

6.4. Ohmic values of the various sensors

T [°C]	R [Ohm]	T [°C]	R [Ohm]
-40.0	191908	110.0	755
-30.0	112877	120.0	594
-20.0	68471	130.0	473
-10.0	42739	140.0	380
0.0	27396	150.0	308
10.0	17999		
20.0	12099		
25.0	10000		
30.0	8308		
40.0	5819		
50.0	4151		
60.0	3012		
70.0	2221		
80.0	1663		
90.0	1262		
100.0	970		

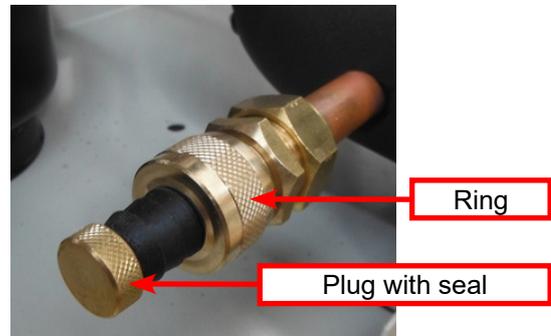
Figure 16 - Ohmic values of the sensors

7. MAINTENANCE OF THE OUTDOOR UNIT

7.1. Drainage of the outdoor unit on the water side

If the unit has to be completely drained, first close the manual inlet and outlet valves (not supplied) and then disconnect the pipes provided on the outside of the water inlet and outlet so that the liquid contained in the unit can be evacuated (to make this easier, we suggest installing two drain taps on the outside of the water inlet and outlet between the unit and the manual valves).

If it is necessary to recharge the system or to adjust the glycol content, the service valve may be used. Unscrew the plug of the service valve and connect a 14 or 12 mm hose (inner diameter - check the type of valve installed on the unit) connected to the water mains, then charge the system by unscrewing the special ring. When the operation is complete, tighten the ring and refit the plug. In all cases, we recommend filling the system using an external tap that has been fitted by the installer.



7.2. Filling the outdoor unit

Refer to paragraph 3.6.4

7.3. Prolonged shutdown

The methods for powering down depend on the application site and the shutdown period corresponding to the installation. If the appliance has a frost-free system, even when the appliance is switched off ("Off" position of the system in the appliance).



CAUTION:

The frost-free protection function remains active as long as the appliance is switched on.

system unless there is some glycol in the system

Switching off the appliance completely after draining the installation:

- Switch off the appliances using the "OFF" switch on each one.
- Close the water taps.
- Switch the differential circuit breaker to "OFF".

7.4. Periodic checks



CAUTION:

If the temperature drops below zero, there is a serious risk of freezing: use a mixture of water and glycol in the system, otherwise drain the heat pump's system and hydraulic circuits.

**CAUTION:**

Operation even for a short period of time, with a water temperature below +5°C is not covered by the warranty. Before switching the appliance back on after prolonged stoppage, ensure that the temperature of the water-glycol mix is at least +5°C or more.

	<p>All of the operations described in this chapter MUST ALWAYS BE CARRIED OUT BY QUALIFIED PERSONNEL. Before carrying out any work on the appliance or accessing internal components, make sure that the electrical power supply has been disconnected.</p>
	<p>Before starting work, safety checks must be carried out to ensure that there is the least risk of combustion possible. Work should be carried out to a controlled procedure, to minimise the risk of the presence of flammable gases or vapours during the work. The area must be checked using a suitable refrigerant gas detector before and during the work.</p>
	<p>Maintenance must only be carried out in weather conditions that are suitable for the operations envisaged.</p>
	<p>It is possible that a certain quantity of compressor oil be may be deposited in the refrigeration circuit pipes, especially in the bends. For maintenance operations that need pipes to be where it is necessary to desolder the pipes, we strongly recommend cutting the pipes and not desoldering them with a torch, as the flame may trigger the combustion of any oil present..</p>
	<p>It is forbidden to fill the refrigeration circuits with a refrigerant other than the one indicated on the rating plate. The use of another refrigerant may seriously damage the compressor.</p>
	<p>It is forbidden to use any other oils than those listed in this manual. The use of a different oil may seriously damage the compressor</p>
	<p>Compressor heads and discharge lines are generally at fairly high temperatures.</p>
	<p>Be very careful when working next to the batteries. The aluminium fins are very sharp and can cause serious injury*. Always wear the appropriate personal protective equipment.</p>
	<p>After finishing the maintenance operations, replace the panels and fasten them using the attachment screws. Pay special attention to closing the electrical component housing correctly</p>
	<p>After finishing the maintenance operations, ensure that the electrical power supply cable gland is tightened correctly</p>
	<p>We recommend carrying out checks and periodic maintenance operations by specialised personnel. EU Regulation 517/2014 stipulates that users must have regular checks carried out on the installations, Check their tightness and eliminate leaks as soon as possible. Check the mandatory nature and necessary documentation of Regulation 517/2014 and its subsequent amendments or repeals.</p>

The compulsory activities must be performed by an authorised customer service in order for the corresponding certificate to be issued. Failure to respect these activities will make the warranty void and could considerably shorten the life of your product.

OPERATIONS	1 month	4 months	6 months	12 months
Filling the water circuit.			X	
Presence of bubbles in the water circuit.			X	
Check the control and safety devices are working correctly.			X	
Check for water leaks in the hydraulic circuit.			X	
Check if the flow rate controller is operating correctly.			X	
Check if the housing resistors are powered and operating.			X	
Clean the metal filters on the hydraulic circuit.	X			
Clean the finned battery with compressed air.		X		
Check if the electrical terminals inside the electrical cabinet and on the compressor terminals are attached correctly.			X	
Tightening the hydraulic connectors.			X	
Check that the fans are attached and balanced.			X	
Correct electrical voltage.			X	
Absorption correction			X	
Verification of the refrigerant load as per the regulations in force				X
Verification of the service, overheating and under-cooling pressures.				X
If the appliance has to be switched off for a prolonged period of time, drain the water from the pipes and the heat exchanger. This operation is necessary if, during the shut-down period, the expected ambient temperatures are below the freezing point of the fluid used.			X	
Check for the presence of corrosion/oxidation.				X
Check the panel is attached				X
Check the water quality (refer to the chapter on System Water characteristics) and the concentration of glycol if present			X	
Check the hydraulic side safety valve.			X	

7.4.1. CLEANING THE EVAPORATOR

Follow the instructions below to clean correctly:

a) Remove any surface dirt. Deposits such as leaves, fibres, etc. must be removed using a vacuum cleaner (use a brush or a spray, carefully avoiding rubbing with metal or harsh parts). If compressed air is to be used, ensure that the air stream is kept pointing perpendicularly to the surface of the battery to avoid bending the aluminium fins. Take care not to bend the fins with the nozzle of the compressed air gun.

b) Rinse with water. Chemicals may be used (specific products for finned batteries). Rinse it by running water through each of the finned passages until they are completely clean. Ensure that the water stream is kept pointing perpendicularly to the surface of the battery to avoid bending the aluminium fins. Do not spray the evaporator with the stream of water. We recommend limiting the pressure to avoid damaging the fins

7.4.1.1. Cleaning the evaporator: models AHP60-50-AC and AHP60-70-AC

The anti-corrosion treatment applied to the evaporators (available as an alternative to standard evaporators) protects against aggressive atmospheres.

The frequency of cleaning depends on the environmental conditions and is left to the common sense of the maintenance personnel. When oxidising dust or particles of grease are observed on the surface of the evaporator, we recommend cleaning it. In general, in a slightly polluted atmosphere, it is recommended to carry out the cleaning treatment every three months.

Wash preferably with hot water (40-60 °C) and a pH-neutral detergent, then rinse thoroughly with cold water (50 L/m²).

If the maintenance personnel notices that the protective cover is missing on the edge of the fins, contact the nearest service centre to reapply the treatment completely restore the corrosion protection.

	<p>Do not use a high pressure cleaner to clean the evaporator, as excessive pressure can cause irreparable damage. Damage caused by cleaning with unsuitable chemicals or excessive water pressure will not be covered by the warranty.</p>
	<p>The aluminium fins are thin and sharp. Take care to use suitable PPE to avoid cuts and abrasions. Protect eyes and face properly to avoid splashing water and dirt during cleaning. Wear waterproof shoes or boots and clothing that cover all parts of the body.</p>
	<p>For units installed in an aggressive atmosphere with a high degree of soiling, cleaning the evaporator should be part of the routine maintenance programme. On this type of installation, all the dust and particles deposited on the evaporator must be removed as quickly as possible via periodic cleaning as described above.</p>

7.5. Cleaning the external surfaces

The outer panels must be properly cleaned in order to avoid the accumulation of dust/dirt that can lead to the appearance of corrosion. The paint protects against atmospheric agents, but we recommend cleaning these surfaces as frequently as possible with a neutral detergent and water, especially if the unit is installed in an aggressive atmosphere (high pollution level, salt, etc.).

7.6. Maintenance of the outdoor unit

All extraordinary maintenance operations must be carried out by an approved service centre.

7.6.1. Installation drain

Function used to drain the system, using the circulator at maximum speed.

To enable this function:

- Control in OFF mode
- Access the parameters PRG => PSS => PRG => (enter password 195)
- Hold down the UP and DOWN keys at the same time for 3 seconds.

The circulator is activated at full speed; after 5 minutes, the circulator switches off.

You can exit the system's drain cycle manually by pressing the MODE/ESC button or by holding down the UP and DOWN buttons for 3 seconds.

During this function, the flow rate controller's alarm is deactivated; the maintenance technician must guarantee the installation water filling is sufficient

7.7. Residual safety risks

This section identifies residual hazards that cannot be eliminated during the design phase by the manufacturer.

These risks are due to:	Precautions / Corrections
Handling	There are always risks of dropping the appliance or it falling when moving it. Follow the instructions in the "Handling" section and all of the required precautions in the local regulations.
Installation	Incorrect installation can cause a water leak, a gas leak, an electric shock, a fire risk, incorrect operation or damage to the appliance. The installation should only be carried out by qualified technical personnel. Place the appliance in a suitable place where there is no risk of leakage of flammable gas. Make the installation area inaccessible to third parties.
Presence of dust/water inside the electrical housing	Secure the electrical panel properly. Infiltrations may possibly cause shocks and short circuits, resulting in injury to persons, damage to property and to the equipment itself. Ensure the appliance is earthed correctly.
Maintenance	During maintenance operations, which must always be carried out by authorised personnel, ensure that the isolator switch is in the off position and lock it down.
Fan	Contact with the fan may cause injury and/or death. Do not access the appliance or remove the guards while the fan is running.
Refrigerant gas leak	Wear appropriate PPE because a gas leak can cause injury and poisoning. Read carefully the "Refrigerant Safety Data Sheet" in the manual. Do not use heat sources near the system until it is completely drained.
Water leaks	They can cause damage to property and personal injury and can lead to short circuits. We recommend connecting isolation valves.

- All persons working on the refrigeration circuit must be able to present a certificate issued by an industry-approved organisation proving their refrigerant handling capability.
- These operations facilitate the recovery and recycling of substances, thus reducing the environmental impact in accordance with the provisions of British standards on waste electrical and electronic equipment (WEEE).

7.8. Heavy maintenance work

Some maintenance work may involve the replacement of broken components, which can be heavy.

Below is a list of components and the approximate weight of each part (take into account that residual oil, liquid gas or water can increase the weight).

Refer to the table before the maintenance phase (or refer to the label on the component itself) and choose the equipment/posture that is most suitable for the work to be performed taking into account the load limits imposed by the technical standards and the state of health and capacity of the person carrying out the work.

Weight [kg]	Unit model AHP60	
	50 kW	70 kW
Compressor	40.1	40.6
Brazed exchanger/condenser	25	35
Evaporator	41.8	54
Fluid tank	2.7	5
Anti-floodback fluid bottle	5.5	7.1
Pump	16.4	17.9
Standard/ducted fan	47 / 41	52 / 44
Inverter board	12	12

7.9. “Maintenance” check list

- Before starting any work on equipment containing flammable refrigerant, safety checks must be performed to minimise the risk of ignition. Take the following steps before working on the cooling system:

	Measure	Performed	Comment
1	<p>General working environment</p> <ul style="list-style-type: none"> ■ Inform all of the following persons of the type of work to be carried out: <ul style="list-style-type: none"> – All of the maintenance personnel. – All persons near to the installation. ■ Prohibit access to the heat pump. ■ Check for flammable materials and ignition sources in the immediate vicinity of the heat pump: remove all flammable materials and ignition sources. 		
2	<p>Check that the refrigerant is present</p> <ul style="list-style-type: none"> ■ To detect a flammable atmosphere in good time: check for refrigerant leaks in the environment before, during and after the work using an explosion-proof refrigerant detector suitable for R32. <p>This refrigerant detector must not generate sparks and must be properly sealed.</p>		
3	<p>Extinguisher</p> <p>A CO₂ or powder extinguisher must be available for the following situations:</p> <ul style="list-style-type: none"> ■ Topping up the refrigerant. ■ When welding or brazing. 		
4	<p>Sources of ignition</p> <ul style="list-style-type: none"> ■ When working on a refrigeration circuit containing or having contained flammable refrigerant, it is forbidden to use ignition sources that could cause the refrigerant to ignite. <p>Remove all sources of ignition from the environment where the installation, repair, disassembly or disposal work is being performed, where the risk of refrigerant leaks cannot be excluded.</p> <ul style="list-style-type: none"> ■ Check for the presence of flammable materials and ignition sources in the immediate vicinity of the heat pump before proceeding with the work: <p>Remove all flammable materials and ignition sources.</p>		
5	<p>Ventilation of the work site</p> <ul style="list-style-type: none"> ■ Perform repairs outdoors or ventilate the work area sufficiently before working on the refrigeration circuit or before welding or brazing. ■ Ventilation must be maintained throughout the work. The ventilation must dilute the refrigerant that may escape to the outside. 		

Measure	Performed	Comment
<p>6</p> <p>Checking the refrigeration installation</p> <ul style="list-style-type: none"> ■ Replacement electrical components must be suitable for the application and meet the manufacturer's specifications. Only replace defective components with original parts. ■ Replace the components according to the instructions in the manual. If necessary, call on Hamworthy Heating's technical intervention department. <p>Carry out the following checks:</p> <ul style="list-style-type: none"> ■ The refrigerant load must not exceed that allowed for the installation room. ■ Check the operation of the ventilation system. The ventilation openings must not be obstructed or blocked. ■ Check there is refrigerant present in the secondary circuit if a hydraulic decoupling system is used. ■ The inscriptions and symbols must always be clearly visible and legible. Replace illegible information. ■ Refrigerant lines or components must be installed in such a way as to avoid contact with substances that may cause corrosion. <p>Exception: refrigerant lines must be made of corrosion-resistant materials or be sufficiently protected against corrosion.</p>		
<p>7</p> <p>Checking the electrical components</p> <ul style="list-style-type: none"> ■ The following safety checks must be carried out during maintenance and repair work on the electrical components: see below. ■ In the event of a safety-related fault, the system must not be connected until the fault has been rectified. <p>If immediate rectification of the fault is not possible, a suitable temporary solution must be found to allow the system to operate. Inform the user.</p> <p>Carry out the following safety checks:</p> <ul style="list-style-type: none"> ■ When filling or evacuating refrigerant and when flushing the refrigeration circuit, do not place electrical components or live cables in the immediate vicinity of the appliance.. ■ Check the earth connection. 		
<p>8</p> <p>Repairs to sealed units</p> <ul style="list-style-type: none"> ■ When working on the sealed components, switch off the appliance completely, even before removing the sealed covers. ■ If a power supply is absolutely necessary during the work: to prevent a potentially dangerous situation, a permanently operating refrigerant detector should be installed at the most critical locations. 		

	Measure	Performed	Comment
8	<ul style="list-style-type: none"> ■ In particular, care must be taken to ensure that, when working on electrical components, the units are not modified to such an extent that the protection they offer is affected. Such modifications include damage to cables, too many connections on a single terminal block, connections that do not comply with the manufacturer's specifications, damage to seals and incorrect installation of cable glands. ■ Ensure that the device is installed correctly. ■ Check that the seals are fully inserted. This ensures that the seals provide reliable protection against the penetration of a flammable atmosphere. Change if defective. <p>Warning</p> <p>The use of silicone as a sealant may affect the operation of the leak detectors. Do not use silicone as a sealant.</p> <ul style="list-style-type: none"> ■ Replacement parts must meet the manufacturer's specifications. ■ Work on components suitable for flammable atmospheres: these components do not have to be powered down. 		
9	<p>Repair work on components suitable for use in flammable atmospheres</p> <ul style="list-style-type: none"> ■ While we cannot completely rule out exceeding the permissible voltages and currents, permanent capacitive or inductive loads must not be connected to the device. ■ Only components suitable for a flammable atmosphere may be powered up in the vicinity of such an atmosphere. ■ Use only suitable original parts or components approved by Hamworthy. Other components may cause the refrigerant to ignite if leaked. 		
10	<p>Wiring</p> <ul style="list-style-type: none"> ■ Check if the wiring is subject to wear, corrosion, traction, vibrations, sharp edges or other unfavourable surrounding influences. ■ When checking, also take into account the effects of ageing or constant vibrations at the compressor and fans. 		
11	<p>Refrigerant detectors</p> <ul style="list-style-type: none"> ■ Do not use potential ignition sources to detect refrigerant and leaks. ■ Flame detectors or detectors with naked flames are prohibited. 		
12	<p>Leak detection</p> <p>The following leak detection methods are suitable for installations with flammable refrigerants:</p> <p>Leak detection using electronic refrigerant detectors:</p> <ul style="list-style-type: none"> ■ If necessary, electronic refrigerant detectors do not have the necessary sensitivity or must be calibrated to the corresponding range. Calibrate in a refrigerant-free environment. 		

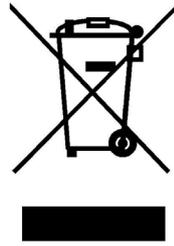
	Measure	Performed	Comment
12	<ul style="list-style-type: none"> ■ The refrigerant detector must be suitable for the R32 refrigerant to be detected. ■ The refrigerant detector must not contain any potential source of ignition. ■ Calibrate the refrigerant detector to suit the refrigerant used. Set the response threshold to < 3 g/a, suitable for propane. <p>Leak detection using leak detection liquids:</p> <ul style="list-style-type: none"> ■ Leak detector liquids associated with most refrigerants are suitable. <p>Warning</p> <p>Liquid leak detectors containing chlorine react with the refrigerant, causing corrosion.</p> <ul style="list-style-type: none"> ■ Do not use liquid leak detectors containing chlorine. <p>Measures to be taken when there is a leak in the refrigeration circuit:</p> <ul style="list-style-type: none"> ■ Immediately extinguish any open flame in the vicinity of the heat pump. ■ Always recover all refrigerant from the refrigeration circuit if brazing work is required to eliminate the leak. <p>Flush the area to be brazed with oxygen-free nitrogen before and during brazing.</p>		
13	<p>Recovering the refrigerant</p> <p>Recovery and evacuation of the refrigerant</p> <p>If any work is to be done in the refrigerant circuit for repair or other reasons, it should be done according to standard procedures. In general, special care must be taken with regard to the flammability of the refrigerant. The following procedure should be followed in all cases:</p> <ul style="list-style-type: none"> - recover the refrigerant; - purge the refrigerant circuit with dry nitrogen; evacuate; - purge again with inert gas; - open up the refrigerant circuit by cutting or brazing it. <p>The refrigerant charge must be recovered in an appropriate recycling bottle. The refrigerant circuit must be purged with nitrogen to ensure safety. This process must be repeated several times if necessary. Under no circumstances should compressed air or oxygen be used.</p> <p>The purging process must be carried out by bringing oxygen-free nitrogen into the vacuum and raising the pressure to the operating pressure level.</p>		
	<p>Then the excess pressure must be lowered and evacuated. This process must be repeated until no refrigerant remains in the system. Once the last purging process is completed, the pressure in the system must be reduced to the atmospheric pressure level. This is particularly important if brazing is to be carried out on the refrigerant circuit.</p> <p>Ensure that the outlet of the vacuum pump leads to a well ventilated area and that there are no flammable sources in the vicinity.</p>		

Measure	Performed	Comment
<p>14</p> <p>Topping up the refrigerant Filling with refrigerant</p> <p>In addition to the usual filling procedure, the following requirements must be satisfied:</p> <ul style="list-style-type: none"> - make sure that the filling valve is not used for different refrigerants. The pipes should be as short as possible to minimise the amount of refrigerant contained. - the refrigerant bottles must remain in a vertical position. - make sure the refrigerant circuit is earthed before filling it. - the appliance may be marked (if not already marked) when the filling process is complete. - take special care not to overfill the appliance. <p>Before the appliance is filled, a pressure test with nitrogen must be carried out. The leak test can be performed on the filled appliance, but it must be done before commissioning. A final leak test must be performed before leaving the facility.</p>		
<p>15</p> <p>Deactivation</p> <p>To deactivate it, it is especially important that the technician is familiar with all details of drain equipment. We recommend that first of all the refrigerant is recovered. Before draining, take samples of the oil and refrigerant if the refrigerant needs to be treated. The important factor is that there is a power supply available where the work is to be carried out.</p> <ol style="list-style-type: none"> a) Familiarise yourself with the appliance and how it operates. b) The system must not be powered. c) Before starting the draining, ensure that: <ul style="list-style-type: none"> - equipment is available (where required) to transport the bottles of refrigerant; - PPE are available and that they are used correctly; - the suction process is constantly monitored by a qualified person; - the draining station and refrigerant bottles comply with the relevant guidelines. d) Carry out a pumping cycle, if possible. e) If a vacuum cannot be created, suck with a manifold hose so that the refrigerant can be removed from all parts of the system. f) Make sure that the refrigerant bottle is on the scale before starting the suction. g) Turn on the draining appliance and follow the manufacturer's instructions. h) Make sure that the recycling bottles are not overfilled (never more than 80% of their capacity). i) Never exceed the permissible operating overpressure of the recycling bottle, even for a short period. 		

15	<p>j) If the recycling bottles are filled as required and the process is completed, ensure that the bottles and equipment are immediately removed from the facility and that all shut-off valves are closed.</p> <p>k) Recovered refrigerant must not be used to fill other systems until it has been purified and examined.</p>		
16	<p>Marking (on the heat pump)</p> <p>If the heat pump has been taken out of service, affix the following marking, along with the date and signature, prominently on the heat pump:</p> <ul style="list-style-type: none"> ■ The refrigerant is inflammable. ■ The installation is not in service. ■ The refrigerant has been removed. 		
17	<p>Recovering the refrigerant and the compressor oil Recovery</p> <p>If the refrigerant has to be recovered for repair or decommissioning, care must be taken to ensure that this is done safely.</p> <p>If the refrigerant is put into bottles, make sure that only appropriate refrigerant bottles are used for this purpose. Make sure that there are enough refrigerant bottles ready to receive the full volume in the installation. All refrigerant bottles used must be suitable for the refrigerant to be recovered and labelled accordingly (i.e., special recycling bottles for refrigerant recovery). The refrigerant bottles must contain a safety valve and shut-off valves that are firmly attached and in good condition. Empty recycling bottles are evacuated and must be cooled down before the suction process, if possible. The draining devices must be in good condition and suitable for the recovery of flammable refrigerant. Instructions for each step of the recovery procedure are to be found near to the device. In addition, calibrated scales must be available and in good condition. The hoses must be equipped with hermetic fittings and in good condition. Before using the draining device, you must check that it is in good condition, that it has been maintained correctly and that the electrical devices belonging to it have been waterproofed to avoid ignition in case of a refrigerant leak. In case of doubt, contact the manufacturer. The refrigerant recovered must be returned to the supplier in a proper recycling bottle. Do not mix refrigerants in the refrigerant bottles.</p> <p>When compressors or compressor oil are to be drained, care must be taken to ensure that they are drained at a pressure level that is sufficiently low to ensure that there is no refrigerant left in the oil. Before returning the compressor to the manufacturer, it must be evacuated. This process should only be accelerated by electrically heating the compressor housing. If the oil has to be removed from an installation, it must be done with appropriate caution.</p>		

8. END OF PRODUCT LIFE-

The regular elimination and appropriate recycling of this product will help prevent environmental damage and health risks.



This crossed-out wheeled bin symbol on the equipment indicates that the product, at the end of its useful life, should be collected separately, and not disposed of with other solid/urban waste.

The equipment is manufactured in accordance with the European Directive on Waste Electrical/Electronic Equipment and the adverse effects of improper disposal are indicated in the user/installation manual. The manufacturer or its importer/distributor is available to answer any request for further information.

Hamworthy Heating has signed up to the Eco-systems service which collects, recycles and cleans our used electrical equipment, according to the highest environmental requirements.

Eco-systems is an eco-organisation which is approved by the public authorities for the WEEE (Waste Electrical and Electronic Equipment) sector.

The appliances which have the symbol above must not be put with domestic waste and must be collected separately.

When the appliance has reached the end of its life cycle and needs to be replaced, a number of recommendations must be followed:

- the refrigerant must be recovered by specialised personnel and sent to a collection centre; as per the procedures indicated in the F-Gas Regulation 517/2014;
- any antifreeze solution that may have been added to the hydraulic circuit must be recovered and disposed of properly;;
- the lubricating oil of the compressors must also be recovered and sent to a collection centre;
- electronic components such as controllers, pilot boards and inverters must be removed and sent to a collection centre;
- if the structure and various components cannot be used, they must be dismantled and separated according to their nature, in particular copper and aluminium present in significant quantities in the device.

These operations facilitate the recovery and recycling of substances, thus reducing the environmental impact.

The user is responsible for the disposing of the product correctly in compliance with the national regulations in force in the country of destination. For further information, we recommend you to contact the installation company or the competent local authorities.

	Incorrect disposal of the appliance may cause serious environmental damage and endanger people. We therefore recommend that you contact authorised persons with appropriate technical training obtained through courses recognised by the competent authorities.
	The same precautions described in the previous paragraphs must be followed.
	Special attention must be paid to the disposal of the refrigerant gas.
	Illegal disposal of the product by the end user will result in the application of the penalties provided for by the law in the country where the disposal takes place.

9. ANNEX A - DATA FOR PRODUCTS ≤ 70KW

Product reference				
Trademark		Hamworthy		
Model		TYNEHAM AHP-60-50	TYNEHAM AHP-60-70	
Heat pump		Air-Water		
Nominal power (average / cool / hot climatic conditions)		44 / 50 / 51	49 / 60 / 63	
Rated heat output (35°C)				
Element	Symbol	Unit		
Rated heat output	P_{nominal}	kW	44	49
<i>Declared heating capacity at partial load for an indoor temperature of 20°C and an outdoor temperature T_j</i>				
$T_j = -7^\circ\text{C}$	P_{dh}	kW	39,3	43,6
$T_j = +2^\circ\text{C}$	P_{dh}	kW	24,9	28,8
$T_j = +7^\circ\text{C}$	P_{dh}	kW	24,7	33,1
$T_j = +12^\circ\text{C}$	P_{dh}	kW	28,5	36,9
$T_j = \text{bivalent temperature}$	P_{dh}	kW	39,3	43,6
$T_j = \text{operating limit temperature}$	P_{dh}	kW	34,0	41,7
For air-water heat pumps : $T_i = -15^\circ\text{C}$ (Si TOL < -20°C)	P_{dh}	kW	-	-
Bivalent temperature	T_{biv}	°C	-7	-7
Heating capacity over a cyclic interval	P_{cych}	kW	-	-
Degradation coefficient ($T_j = +7^\circ\text{C}$)	C_{dh}		1,000	1,000
Degradation coefficient ($T_j = +12^\circ\text{C}$)	C_{dh}		1,000	1,000
Electricity consumption in modes other than active mode				
Off mode	P_{off}	kW	0,022	0,022
Thermostat shutdown mode	P_{To}	kW	0,022	0,022
Standby	P_{SB}	kW	0,022	0,022
Active crankcase heater mode	P_{CK}	kW	0,076	0,076
Other Features				
Power regulation			Variable	
Sound power level, indoors/outdoors	L_{WA}	dB(A)	- / 75	- / 81
Annual energy consumption	Q_{HE}	kWh	22063	25821
Seasonal space heating energy efficiency (35°C)				
Seasonal space heating energy efficiency	η_s	%	163	155
<i>Declared coefficient of performance or declared primary energy coefficient at partial load for an indoor temperature of 20°C and an outdoor temperature T_j</i>				
$T_j = -7^\circ\text{C}$	COP_d		2,22	2,09
$T_j = +2^\circ\text{C}$	COP_d		4,25	3,89
$T_j = +7^\circ\text{C}$	COP_d		5,55	5,67
$T_j = +12^\circ\text{C}$	COP_d		7,22	7,01
$T_j = \text{bivalent temperature}$	COP_d		2,22	2,09
$T_j = \text{operating limit temperature}$	COP_d		1,91	1,79
For air-water heat pumps : $T_i = -15^\circ\text{C}$ (Si TOL < -20°C)	COP_d		-	-
For air-water heat pumps: Operating limit temperature	TOL	°C	-10	-10
Efficiency over a cyclic interval	COP_{cyc}		-	-
Maximum heating water operating temperature	WTOL	°C	58	58
Auxiliary heater				
Rated heat output	P_{sup}	kW	-	-
Type of energy used			-	-
For air-to-water heat pumps normal airflow, outdoors		m ³ /h	19555	19976
For water-brine-water heat pumps, nominal flow rate of brine or water, outdoor heat exchanger		m ³ /h	-	-

Product reference				
Trademark			Hamworthy	
Model			TYNEHAM AHP-60-50	TYNEHAM AHP-60-70
Heat pump			Air-Water	
Nominal power (average / cool / hot climatic conditions)			44 / 51/ 49	51 / 63 / 65
Rated heat output (55°C)				
Element	Symbol	Unit		
Rated heat output	P_{nominal}	kW	44	51
<i>Declared heating capacity at partial load for an indoor temperature of 20°C and an outdoor temperature T_j</i>				
$T_j = -7^\circ\text{C}$	P_{dh}	kW	39,3	45,5
$T_j = +2^\circ\text{C}$	P_{dh}	kW	24,9	28,5
$T_j = +7^\circ\text{C}$	P_{dh}	kW	24,7	35,3
$T_j = +12^\circ\text{C}$	P_{dh}	kW	28,5	39,7
$T_j = \text{bivalent temperature}$	P_{dh}	kW	39,3	45,5
$T_j = \text{operating limit temperature}$	P_{dh}	kW	34,0	42,9
For air-water heat pumps : $T_i = -15^\circ\text{C}$ (Si TOL < -20°C)	P_{dh}	kW	-	-
Bivalent temperature	T_{biv}	°C	-7	-7
Heating capacity over a cyclic interval	P_{cych}	kW	-	-
Degradation coefficient ($T_j = +7^\circ\text{C}$)	Cdh		1,000	1,000
Degradation coefficient ($T_j = +12^\circ\text{C}$)	Cdh		1,000	1,000
Electricity consumption in modes other than active mode				
Off mode	P_{off}	kW	0,022	0,022
Thermostat shutdown mode	P_{To}	kW	0,022	0,022
Standby	P_{SB}	kW	0,022	0,022
Active crankcase heater mode	P_{CK}	kW	0,076	0,076
Other Features				
Power regulation			Variable	
Sound power level, indoors/outdoors	L_{WA}	dB(A)	- / 75	- / 81
Annual energy consumption	Q_{HE}	kWh	29398	34544
Seasonal space heating energy efficiency (55°C)				
Seasonal space heating energy efficiency	η_s	%	122	120
<i>Declared coefficient of performance or declared primary energy coefficient at partial load for an indoor temperature of 20°C and an outdoor temperature T_j</i>				
$T_j = -7^\circ\text{C}$	COP_d		1,55	1,55
$T_j = +2^\circ\text{C}$	COP_d		3,06	3,02
$T_j = +7^\circ\text{C}$	COP_d		4,48	4,38
$T_j = +12^\circ\text{C}$	COP_d		7,10	6,82
$T_j = \text{bivalent temperature}$	COP_d		1,55	1,55
$T_j = \text{operating limit temperature}$	COP_d		1,25	1,41
For air-water heat pumps : $T_i = -15^\circ\text{C}$ (Si TOL < -20°C)	COP_d		-	-
For air-water heat pumps: Operating limit temperature	TOL	°C	-10	-9
Efficiency over a cyclic interval	COP_{cyc}		-	-
Maximum heating water operating temperature	WTOL	°C	58	58
Auxiliary heater				
Rated heat output	P_{sup}	kW	-	-
Type of energy used			-	-
For air-to-water heat pumps normal airflow, outdoors		m ³ /h	18863	19588
For water-brine-water heat pumps, nominal flow rate of brine or water, outdoor heat exchanger		m ³ /h	-	-

Hamworthy Heating Accredited Agents

Southern Ireland (Sales & Service)
HEVAC Limited
Naas Road, Dublin 12, Ireland
tel: 00 353 141 91919 fax: 00 353 145 84806

Scotland (Sales & Service)
McDowall Modular Services
14-46 Lomond Street, Glasgow, Scotland G22 6JD
tel: 0141 336 8795 fax: 0141 336 8954

Hamworthy Heating Customer Service Centre

Servicing
tel: 01202 662555



Customer Service Centre
Hamworthy Heating Limited,
Wessex House,
New Fields Business Park,
Stinford Road,
Poole,
Dorset BH17 0NF

Telephone: 01202 662500
Fax: 01202 662522
Email: aftersales@hamworthy-heating.com
Website: www.hamworthy-heating.com

Hamworthy reserves the right to make changes and improvements which may necessitate alteration to the specification without prior notice.