

Amicus

Boost Heat Pumps

Installation, commissioning, user
and maintenance instructions

Models:

LAHP302WW LAHP1202WW
LAHP402WW LAHP1402WW
LAHP602WW LAHP1804WW
LAHP702WW LAHP2304WW
LAHP902WW LAHP2604WW



**READ AND UNDERSTAND THE
INSTRUCTIONS**

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



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1. INTRODUCTION

PRELIMINARY INFORMATION

Reproduction, storage or transmission of any part of this publication in any form, without the prior written consent of the Lochinvar Limited, is prohibited.

The unit to which these instructions refer, is designed to be used for the purposes described and to be operated in accordance with these instructions.

The Lochinvar Limited will not be liable for claims for damage caused to persons, animals, material goods or property caused by improper installation, adjustment and maintenance or improper use. Any use not specified in this manual is prohibited.

This document is intended to provide information only and does not form a contract with third parties.

The Lochinvar Limited pursues a policy of constant improvement and development of its products and therefore reserves the right to change the specifications and the documentation at any time, without notice and without obligation to update existing equipment.

Aim and content of the manual

These instructions are intended to provide the information required for the selection, installation, use and maintenance of the unit.

They have been prepared in accordance with the European Union laws and with the technical standards in force at the date of issue of the instructions.

The instructions contain all the necessary information to prevent any reasonably foreseeable misuse.

How to store this manual

The manual must be kept in a suitable place with easy access for users and operators, protected from dust and damp.

The manual must always accompany the unit during the entire life cycle of the same and therefore must be transferred to any subsequent user.

Manual Update

It is recommended that the manual is updated to the latest revision available. If updates are sent to the customer they must be added to this manual.

The latest information regarding the use of its products is available by contacting the Lochinvar Limited.

How to use this manual



The manual is an integral part of the unit.

Users or operators must consult the manual before performing any operation and especially so when transporting, handling, installation, maintaining, or dismantling the unit in order to eliminate uncertainty and reduce risk.

In these instructions symbols have been used (described in the following paragraphs) to draw the attention of operators and users to the operations that have a higher risk and which must be performed safely.

POTENTIAL RISKS

Whilst the unit has been designed to minimize any risk posed to the safety of people who will interact with it, it has not been technically possible to eliminate completely the causes of risk. It is therefore necessary to refer to the requirements and symbolism below:

LOCATION OF RISK	POTENTIAL RISK	METHOD OF INJURY	PRECAUTIONS
Thermal heat exchangers.	Small stab wounds.	Contact	Avoid any contact, use protective gloves.
Fan and fan grilles.	Cuts, eye damage, broken bones.	Insertion of sharp objects through the grid while the fans are operating.	Never put objects through the protection grilles.
Internal component: compressors and discharge pipes	Burns.	Contact	Avoid any contact, use protective gloves.
Internal component: electric cables and metallic parts	Electrocution, severe burns.	Defect in the supply cable insulation, live metallic parts.	Adequate protection of power cables, ensure correct earthing of all metal parts.
External to unit:	Poisoning, severe burns	Fire due to short circuit or Size cables and mains protection overheating of the supply cable	Size cables and mains protection system in accordance with IEE regulations
Low pressure safety valve.	Poisoning, severe burns.	High evaporating pressure causing a refrigerant discharge during maintenance.	Carefully check the evaporating pressure during the maintenance operations.
High pressure safety valve	Poisoning, severe burns.	Activation of high pressure safety valve with the refrigerant circuit open	If possible do not open the refrigerant circuit valve: carefully check condensing pressure: use all relevant PPE required by law
Entire unit	External fire	Fire due to natural disaster or combustion of elements nearby	Provide necessary firefighting equipment
Entire unit	Explosions, burns, injuries, poisoning, natural disasters	Breakages, failures due to natural disaster	Plan the necessary precautions both electrical, mechanical and structural

GENERAL DESCRIPTION OF SYMBOLS USED

Safety symbols combined in accordance with ISO 3864-2:



BANNED

A black symbol inside a red circle with a red diagonal indicates an action that should not be



WARNING

A black graphic symbol added to a yellow triangle with black edges indicates



ACTION REQUIRED

A white symbol inserted in a blue circle indicates an action that must be done to

Safety symbols combined in accordance with ISO 3864-2:



The graphic symbol “warning” is qualified with additional safety information (text or other symbols).

SAFETY SYMBOLS USED



GENERAL RISK

Observe all signs placed next to the pictogram. The failure to follow directions may create a risk situation that may be injurious to the user.



ELECTRICAL HAZARD

Observe all signs placed next to the pictogram.
The symbol indicates components of the unit and actions described in this manual that could create an electrical hazard.



MOVING PARTS

The symbol indicates those moving parts of the unit that could create risk.



HOT SURFACES

The symbol indicates those components with high surface temperature that could create risks.



SHARP SURFACES

The symbol indicates components or parts that could cause stab wounds.



EARTH CONNECTION

The symbol identifies Earthing connection points in the unit.



READ AND UNDERSTAND THE INSTRUCTIONS

Read and understand the instructions of the machine before any operations.



RECOVER OR RECYCLE MATERIAL

LIMITATIONS AND PROHIBITED USE

The machine is designed and built exclusively for the uses described in "Limitations of use" of the technical manual. Any other use is prohibited because it may pose a potential risk to the health of operators and users.



The unit is not suitable for operations in environments:




- excessively dusty or potentially explosive atmospheres;
- where there are vibrations;
- where there are electromagnetic fields;
- where there are aggressive atmospheres

UNIT IDENTIFICATION

Each unit has a rating plate that provides key information regarding the machine.

The rating plate may differ from the one shown below as the example is for a standard unit without accessories. For all electrical information not provided on the label, refer to the wiring diagram.

A facsimile of the label is shown below:

Via E. Mattei, 20 35028 Piove di Sacco PD - Italy +39 049 9731022 info@hidros.it www.hidros.eu		Manufacturer: PD022111			
1LHA.0452.SE.LS.RV.2S.X Modello Model		123456 Matricola Serial number			
2 Categoria PED PED Category		16/2018 Data di fabbricazione Manufacture date			
R410A Tipo refrigerante Refrigerant type	2 Gruppo fluido Fluid group	2088 GWP			
C1 9,5 Kg Carica refrigerante Refrigerant charge	C2 C3 C4	19,84 ton CO ₂ Equivalente CO ₂ Equivalente			
400V-3ph-50Hz Tensione-Fasi-Frequenza Voltage-Phases-Frequency		43,20 A F.L.A. (A)	20,20 kW F.L.I. (kW)		
LATO BASSA PRESSIONE LOW PRESSURE SIDE			LATO ALTA PRESSIONE HIGH PRESSURE SIDE		
29,5 bar PS			45 bar PS		
Min -30 °C Temperatura di progetto Design temperature	Max +130 °C Temperatura di progetto Design temperature	Min -30 °C Temperatura di progetto Design temperature	Max +130 °C Temperatura di progetto Design temperature		
Peso a vuoto Weight					
Contiene gas fluorurati ad effetto serra disciplinati dal protocollo di Kyoto Contains fluorinated greenhouse gasses covered by the Kyoto protocol					



The product label should never be removed from the unit.

2. SAFETY

WARNING RE POTENTIALLY HAZARDOUS TOXIC SUBSTANCES

Identification of the Type of Refrigerant Fluid Used: R134a

- Tetrafluoroethane (HFC134a) 100% by weight CAS No.: 000811-97-2

Identification of the Type of Oil Used.

- The lubricant used is polyester oil. Please refer to the information provided on the compressor data plate.



For further information regarding the characteristics of the refrigerant and oil used, refer to the safety data sheets available from the refrigerant and oil manufacturers.

Main Ecological Information Regarding the Types of refrigerants Fluids used.



ENVIRONMENTAL PROTECTION: Read the ecological information and the following instructions carefully.

PERSISTENCE AND DEGRADATION

The refrigerants used decompose in the lower atmosphere (troposphere) relatively quickly. The decomposed products are highly dispersible and therefore have a very low concentration. They do not influence the photochemical smog which is not among the VOC volatile organic compounds (as stipulated in the guidelines to the UNECE). The constituent refrigerants of R407C (R32, R125 and R134a), do not damage the ozone layer. These substances are regulated under the Montreal Protocol (revised 1992) and regulations EC no. 2037/200 of 29 June 2000.

Effects of discharges

Discharges into the atmosphere of this product does not cause a long-term contamination.

Exposure controls and personal protection

Wear protective clothing and gloves, protect your eyes and face

Professional exposure limits

R134a
HFC134a TWA 1000 ppm

REFRIGERANT HANDLING



Users and maintenance personnel must be adequately informed about the possible risks of handling potentially toxic substances. Failure to follow such instructions can cause damage to personnel or to the unit.

PREVENT INHALATION OF HIGH VAPOUR CONCENTRATION

Atmospheric concentrations of refrigerant must be minimized and kept to a level that is below the occupational exposure limit. Vapour is heavier than air and can form dangerous concentrations near the ground where the ventilation rate is lower. Always ensure adequate ventilation. Avoid contact with open flames and hot surfaces as this can cause toxic and irritating decomposition products to form. Avoid contact between liquid refrigerant and the eyes or skin.

PROCEDURES TO BE ADOPTED IN THE EVENT OF ACCIDENTAL RELEASE OF REFRIGERANT

Ensure suitable personal protection (especially respiratory protection) during cleaning operations. If deemed safe, isolate the source of the leak. If the leakage is small and if adequate ventilation is provided, allow the refrigerant to evaporate. If the loss is substantial ensure that measures are taken to adequately ventilate the area. Contain spilled material with sand, earth or other suitable absorbent material. Do not allow the refrigerant to enter drains, sewers or basements, as pockets of vapour can form.

MAIN TOXICOLOGICAL INFORMATION REGARDING THE TYPE OF REFRIGERANT USED

Inhalation

A high atmospheric concentration can cause anaesthetic effects with possible loss of consciousness. Prolonged exposure may lead to irregular heartbeat and cause sudden death. Higher concentrations may cause asphyxia due to the reduced oxygen content in the atmosphere.

Contact with skin

Splashes of nebulous liquid can produce frostbite. Probably not hazardous if absorbed through the skin. Repeated or prolonged contact may remove the skin's natural oils, with consequent dryness, cracking and dermatitis.

Contact with eyes

Splashes of liquid may cause frostbite.

Ingestion

While highly improbable, may produce frostbite.

FIRST AID MEASURES



Adhere scrupulously to the warnings and first aid procedures indicated below.

Inhalation

Move the person away from the source of exposure, keep him/her warm and let him/her rest. Administer oxygen if necessary. Attempt artificial respiration if breathing has stopped or shows signs of stopping. If the heart stops, perform external heart massage. Seek medical assistance.

Contact with skin

In case of contact with skin, wash immediately with lukewarm water. Thaw tissue using water. Remove contaminated clothing. Clothing may stick to the skin in case of frostbite. If irritation, swelling or blisters appear, seek medical assistance.

Contact with eyes

Rinse immediately using an eyewash or clean water, keeping eyelids open, for at least ten minutes. Seek medical assistance.

Ingestion

Do not induce vomiting. If the injured person is conscious, rinse his/her mouth with water and make him/her drink 200-300ml of water. Seek immediate medical assistance.

Further medical treatment

Treat symptoms and carry out support therapy as indicated. Do not administer adrenaline or similar sympathomimetic drugs following exposure, due to the risk of cardiac arrhythmia.

3. TECHNICAL CHARACTERISTICS

UNIT DESCRIPTION

Amicus boost heat pumps are particularly suitable for applications that use source energy at medium or high temperatures. These units have been designed to produce water at high or very high temperature for applications where it is necessary to have maximum efficiency in heating. The units are available in heating only mode and can produce water up to 80°C. If an external 3-way valve is used, the appliance can supply both heating and domestic hot water. A wide range of accessories allows you to choose the optimal solution.

Frame

All units are made from hot-galvanised sheet steel, painted with polyurethane powder enamel and stoved at 180°C to provide maximum protection against corrosion. The frame is self-supporting with removable panels. All screws and rivets used are made from stainless steel. The standard colour of the units is RAL 9018.

Refrigerant circuit

The refrigerant utilised is R134a. The refrigerant circuit is assembled using internationally recognised brand name components with all brazing and welding being performed in accordance with ISO 97/23. Each refrigerant circuit is totally independent from the other with the result that any fault or alarm condition on one circuit does not influence the other. The refrigerant circuit includes: sight glass, filter drier, thermal expansion valve with external equalizer, Schrader valves for maintenance and control and pressure safety device (for compliance with PED regulations).

Compressors

The compressors used are a high performance scroll type that incorporates a special scroll design which enhances the efficiency of the refrigerant cycle when the source temperature is low. The compressors are all supplied with a crankcase heater and thermal overload protection by a klixon embedded in the motor winding. They are mounted in a separate enclosure thus enabling them to be maintained even if the unit is operating. Access to this enclosure is via the front panel of the unit. The crankcase heater is always powered when the compressor is in stand-by.

Source heat exchanger

Source heat exchanger are braze-welded plates and are made of stainless steel AISI 316.

The use of this type of exchangers greatly reduces the refrigerant charge of the unit compared to the conventional shell and tube evaporators, and increases the efficiency of the refrigerant loads. The heat exchangers are factory insulated with flexible close cell material and are protected by a temperature sensor used as antifreeze protection kit.

User exchangers

The user side heat exchanger is a braze welded, plate type heat exchanger, manufactured from AISI 316 stainless steel. All units are supplied with a sub-cooler to enhance the performance of the refrigerant cycle. The user heat exchangers are factory insulated with flexible close cell material.

Electric enclosure

The enclosure is manufactured in order to comply with the requirements of the electromagnetic compatibility standards CEE EN60204. Access to the enclosure is achieved by removing the front panel of the unit. The following components are supplied as standard on all units: main switch, thermal overloads (protection of pumps and fans), compressor fuses, control circuit automatic breakers, compressor contactors, fan contactors and pump contactors. The terminal board has volt free contacts for remote ON-OFF, Summer/Winter change over (reversible type only) and general alarm. For all three phase units, a sequence relay that disables the power supply in the event that the phase sequence is incorrect (scroll compressors can be damaged if they rotate in the wrong direction), is fitted as standard.

Microprocessors

All units are supplied as standard with microprocessor controls. The microprocessor controls the following functions: control of the water temperature, antifreeze protection, compressor timing, compressor automatic starting sequence, alarm reset, volt free contact for remote general alarm, alarms and operation LED's. If required (available as an option), the microprocessor can be configured in order for it to connect to a site BMS system thus enabling remote control and management. The technical department can discuss and evaluate, in conjunction with the customer, solutions using MODBUS protocols.

Control and protection devices

All units are supplied with the following control and protection devices: Return and supply user heat exchanger sensors, return and supply source heat exchanger sensors, high pressure switch with manual reset, low pressure switch with automatic reset, high pressure safety valve, compressor thermal overload protection, pump thermal overload protection (when present), source heat exchanger flow switch.

ACCESSORIES DESCRIPTION

Rubber vibration dampers (KAVG)

To be installed beneath the unit base and the ground to avoid the transmission of vibrations (and the noise) to the building.

Pressure gauges (MAML)

These enable the standing charge and the operating pressures to be monitored.

Electronic soft starter (DSSE)

It is used to reduce the peak current of the unit; the average reduction is 40% of the nominal peak current.

Remote control panel (PCRL)

It allows the remote control of all parameters of the unit.

RS485 serial interface card MODBUS protocol (INSE)

It is used to connect the unit to BMS systems using MODBUS protocol.

Source water 2 way modulating valve (4-20 mA; 0-10 V) (V2MO)

2-way modulating valve is factory installed in the hydraulic circuit at the source side, to optimize the consumption of well water as a function of the temperature of the available water. The valve is controlled by the microprocessor control unit by modulating signal 0-10V.

In the event of lack of power supply, the valve is normally closed.

Liquid line solenoid valve (VSLI)

When the unit is in stand-by mode, it avoids the translation of the liquid freon toward the compressor.

Electronic expansion valve (VTEE)

The electronic expansion valve enables the maximum possible efficiency to be achieved by maximising the evaporator heat exchange, minimising the reaction time to load variations and optimising the superheat. It is strongly recommended for use in systems that will experience large load variations.

TECHNICAL DATA

Model LAHPXXXXWW		302	402	602	702	902	1202	1402	1804	2304	2604
Heating capacity (EN14511) ⁽¹⁾	kW	37,6	43,6	64,1	75,1	97,8	121,7	150,5	195,6	243,9	301,2
Input power (EN14511) ⁽¹⁾	kW	6,7	7,5	11,1	13,7	17,6	21,7	26,2	35,0	43,1	52,2
COP (EN14511) ⁽¹⁾	W/W	5,65	5,83	5,79	5,48	5,56	5,62	5,74	5,59	5,65	5,77
Energy Class in low temperature ⁽²⁾		A++	A++	A++	A++	A++	A++	A++	A++	A++	A++
SCOP low temperature ⁽²⁾	kWh/kWh	5,71	5,83	5,91	5,81	5,85	5,94	6,09	5,95	6,01	6,20
ys,h low temperature ⁽²⁾	%	220,2	225,3	228,2	224,5	226,0	229,4	235,6	230	232,4	239,9
EnergyClassinmediumtemperature ⁽²⁾		A++	A++	A++	A++	A++	A++	A++	A++	A++	A++
SCOP medium temperature ⁽²⁾	kWh/kWh	4,62	4,73	4,78	4,76	4,67	4,74	4,85	4,73	4,79	4,91
ys,h medium temperature ⁽²⁾	%	176,9	181,1	183,2	182,2	178,7	181,5	186,1	181	183,6	188,3
Power supply	V/Ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Maximum input current	A	111,4	128,7	167,1	208,3	267,9	324,8	372,9	353,7	430,4	498,7
Peak current	A	32,8	35,4	54,2	68,6	85,8	105,6	125,8	171,6	211,2	251,6
Compressors / Circuits	n°/n°	2/1	2/1	2/1	2/1	2/1	2/1	2/1	4/2	4/2	4/2
Capacity steps	n°	2	2	2	2	2	2	2	4	4	4
Refrigerant		R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Global warming potential (GWP)		1430	1430	1430	1430	1430	1430	1430	1430	1430	1430
Refrigerant charge	Kg	4,0	4,0	5,0	6,0	8,0	10,0	10,0	21,0	26,0	33,0
Equivalent CO ₂ charge	t	5,7	5,7	7,2	8,6	11,4	14,3	14,3	30,0	37,2	47,2
Sound power LS version ⁽³⁾	dB(A)	75	75	80	83	84	86	88	88	89	91
Sound pressure LS version ⁽⁴⁾	dB(A)	59	59	64	67	68	70	72	72	73	75
Sound power XL version ⁽³⁾	dB(A)	65	65	70	73	74	76	78	78	79	81
Sound pressure XL version ⁽⁴⁾	dB(A)	49	49	54	57	58	60	62	62	63	65

Performances are referred to the following conditions:

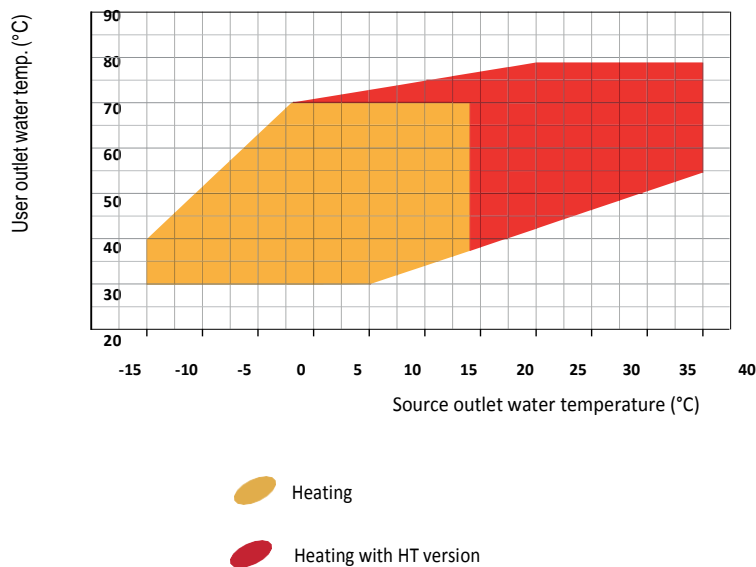
(1) Heating: user water temperature 30/35°C, source water temperature 10/7°C.

(2) Average conditions, variable - Reg EU 811/2013

(3) Sound power level in accordance with ISO 3744.

(4) Sound pressure level at 1 mt from the unit in free field conditions direction factor Q=2, calculated in accordance with ISO 3744.

OPERATION LIMITS



User heat exchanger water flow rate

The nominal water flow rate given is referred to a Dt of 5 °C. Maximum flow rate allowed is the one that presents a Dt of 3 °C: higher values may cause too high pressure drop. The minimum water flow rate allowed is the one presenting a Dt of 8 °C. Insufficient values cause too low evaporating temperatures with the action of safety devices which would stop the unit.

User hot water temperature

Once the system is on temperature, the minimum user water temperature should not be less than 30 °C: Lower values could cause incorrect working operation of the compressor and compressor failure may occur. The maximum user outlet water temperature cannot exceed 78 °C; higher values may call the action of safety devices which would stop the unit.

Source water temperature

The minimum source water outlet temperature is, in heating mode, 7 °C. To operate below this limit a glycol mixture must be used. In case of use with this glycol mixture the minimum source water outlet temperature is -5 °C. The maximum source water outlet temperature is 40 °C.



Units are designed and manufactured to European safety and technical standards. The units have been designed exclusively for heating, cooling and domestic hot water production (D.H.W.). The units must be used for this specific purpose only.

Lochinvar Limited will not be liable for claims for damage caused to persons, animals or material goods or property caused by improper installation, adjustment and maintenance or improper use. Any use not specified in this manual is prohibited.



In case of operations outside of these values, please contact the Lochinvar Limited.

DOMESTIC HOT WATER PRODUCTION

Amicus can produce domestic hot water either as a standalone system or by Pre-heating a gas fired water heater. It is important that any indirect cylinders used have been designed to work with Air source heat pumps, standard indirect cylinders will give poor performance and possible nuisance high pressure alarms with the Amicus unit. Only the solutions shown in this section should be used, further guidance can be obtained by contacting Lochinvar Ltd

SIZING INDIRECT CYLINDER COILS

Standard Indirect cylinders must not be used with Air Source Heat Pumps due to the sizing of the internal coil which are sized using typical gas boiler figures. We can calculate the kW output of an indirect coil using the formulae below:

1m^2 coil kW rating = Specific heat capacity water x flow/return temperature differential x flow rate (l/sec) or:

$Kw = 4.18 \times \text{flow/return DT} \times \text{flow rate (typical .33l/sec for gas boiler systems)}$

$4.18 \times 20 \times .33 = 27.58\text{kW}$

A typical 500 litre indirect cylinder requires 29kW to heat the contents in 1 hour, with a 1m^2 coil within it, the heat up time would be:

$29 \times 60 / 27.58 = 64.4$ minutes

With a heat pump it is not possible to achieve the supply temperature or work at the large ΔT 's associated with fossil fuel boilers hence the output of a standard indirect coil would be substantially less than that calculated above. Special, enhanced surface area coils for use with smaller heat pumps (<20kW) and plate heat exchanger/buffer tank combinations for larger units should be used.

Both options are available from Lochinvar Limited.

COMPRESSOR CAPACITY STEPS

Model	No Of Compressors			
	1	2	3	4
302	50%	50%	--	--
402	50%	50%	--	--
602	50%	50%	--	--
702	50%	50%	--	--
902	50%	50%	--	--
1202	50%	50%	--	--
1402	50%	50%	--	--
1804	25%	25%	25%	25%
2304	25%	25%	25%	25%
2604	25%	25%	25%	25%

CORRECTION TABLES

Operation with glycol

Glycol percentage	Freezingpoint(°C)	CCF	IPCF	WFCF	PDCF
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	1.09	1.22
40	-22.3	0.965	0.97	1.14	1.25
50	-33.8	0.955	0.965	1.2	1.33

CCF: Capacity correction factor

IPCF: Input power correction factor

WFCF: Water flow correction factor

PDCF: Pressure drops correction factor

1

The water flow rate and pressure drop correction factors are to be applied directly to the values given for operation without glycol. The water flow rate correction factor is calculated in order to maintain the same temperature difference as that which would be obtained without glycol. The pressure drop correction factor takes into account the different flow rate obtained from the application of the flow rate correction factor.

Correction data tables at different Δt

Water temperature diff.(°C)	3	5	8
CCCP	0.99	1	1.01
IPCF	0.99	1	1.02

CCCP = Cooling capacity correction factor IPCF = Input power correction factor

Correction tables different Fouling factors

Fouling factor	0.00005	0.00001	0.00002
CCCP	1	0.98	0.94
IPCF	1	0.98	0.95

CCCP = Cooling capacity correction factor IPCF = Input power correction factor

SOUND DATA

Amicus Boost Heat pump											
Mod.	Octave bands (Hz)								Lw		Lp
	63	125	250	500	1K	2K	4K	8K	dB	dB(A)	dB(A)
	dB	dB	dB	dB	dB	dB	dB	dB			
302	78.1	69.3	63.2	61.7	60.6	55.2	51.8	42.7	78.9	65	49
402	78.1	69.3	63.2	61.7	60.6	55.2	51.8	42.7	78.9	65	49
602	83.1	74.3	68.2	66.7	65.6	60.2	56.8	47.7	83.9	70	54
702	86.1	77.3	71.2	69.7	68.6	63.2	59.8	50.7	86.9	73	57
902	87.1	78.3	72.2	70.7	69.6	64.2	60.8	51.7	87.9	74	58
1202	89.1	80.3	74.2	72.7	71.6	66.2	62.8	53.7	89.9	76	60
1402	91.1	82.3	76.2	74.7	73.6	68.2	64.8	55.7	91.9	78	62
1804	91.1	82.3	76.2	74.7	73.6	68.2	64.8	55.7	91.9	78	62
2304	92.1	83.3	77.2	75.7	74.6	69.2	65.8	56.7	92.9	79	63
2604	94.1	85.3	79.2	77.7	76.6	71.2	67.8	58.7	94.9	81	65

Lw: Sound power level according to ISO 3744.

Lp: Sound pressure level measured at 1 mt from the unit in free field conditions direction factor Q=2 according to ISO 3744.

4. INSTALLATION

GENERAL SAFETY GUIDELINES AND USE OF SYMBOLS



Before undertaking any task the operator must be fully trained in the operation of the machines to be used and their controls. They must also have read and be fully conversant with all operating instructions.



All maintenance must be performed by TRAINED personnel and be in accordance with all national and local regulations.



The installation and maintenance of the unit must comply with the local regulations in force at the time of the installation.



Avoid contact and do not insert any objects into moving parts.

HEALTH AND SAFETY CONSIDERATIONS



The workplace must be kept clean, tidy and free from objects that may prevent free movement. Appropriate lighting of the work place shall be provided to allow the operator to perform the required operations safely. Poor or too strong lighting can cause risks.



Ensure that work places are always adequately ventilated and that respirators are working, in good condition and comply fully with the requirements of the current regulations.

PERSONAL PROTECTIVE EQUIPMENT



When operating and maintaining the unit, use the following personal protective equipment listed below, required by law.



Protective footwear.



Eye protection.



Protective gloves.



Respiratory protection.



Hearing protection.

INSPECTION

When installing or servicing the unit, it is necessary to strictly follow the rules reported on this manual, to conform to all the specifications of the labels on the unit, and to take any possible precautions of the case. Not observing the rules reported on this manual can create dangerous situations. After receiving the unit, immediately check its integrity. The unit left the factory in perfect conditions; any eventual damage must be questioned to the carrier and recorded on the Delivery Note before it is signed. The Lochinvar Limited must be informed, within 8 days, of the extent of the damage. The Customer should prepare a written statement of any severe damage.

Before accepting the unit check:

- The unit did not suffer any damage during transport;
- The delivered goods are conforming to what shown in the delivery note.

In Case of Damage

- List the damage on the delivery note
- Inform the Lochinvar Limited of the extent of the damage within 8 days of receipt of the goods. After this time any claim will not be considered.
- A full written report is required for cases of severe damage.

STORAGE

Units should be stored under cover and ideally, should remain in their packaging. The tools that are supplied for opening the electric box should be formally transferred to the person responsible for the plant.

UNPACKING



Packaging could be dangerous for the operators.

It is advisable to leave packaged units during handling and remove it before the installation. The packaging must be removed carefully to prevent any possible damage to the machine.

The materials constituting the packaging may be different in nature (wood, cardboard, nylon, etc.).



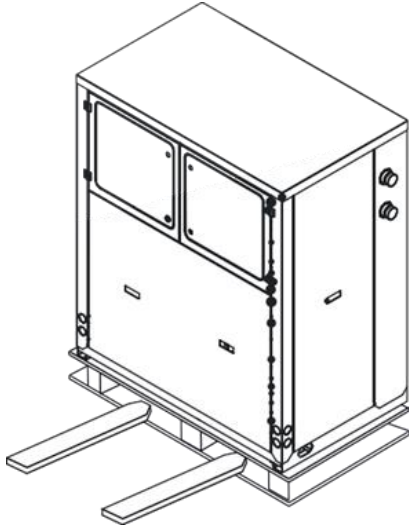
The packaging materials should be separated and sent for disposal or possible recycling to specialist waste companies.

Prior to unpacking and installing the unit, it is prudent to read this manual, note the information provided on the labels on the unit and to take all precautions required for safe working and to avoid damage. Non-compliance with the warnings can create dangerous situations.

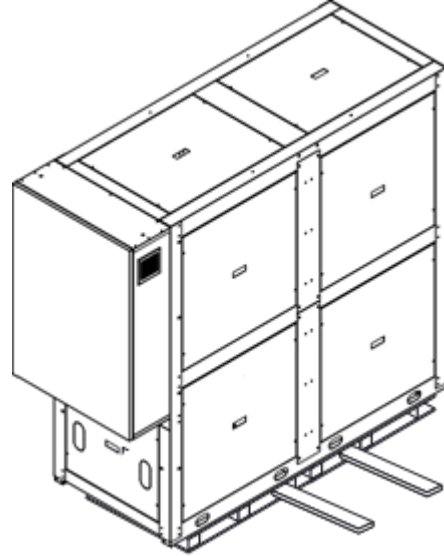
LIFTING AND HANDLING

When unloading the unit, it is highly recommended to avoid any sudden move in order to protect refrigerant circuit, copper tubes or any other unit component. Units can be lifted by using a forklift or, in alternative, using belts, being sure that the method of lifting does not damage the lateral panels and the cover. It is important to keep the unit horizontal at all time to avoid damages to the internal components.

Amicus WW 302 - 402 - 602 - 702 902-1202-1402



Amicus WW 1804-2304-2604



LOCATION AND MINIMUM TECHNICAL CLEARANCES



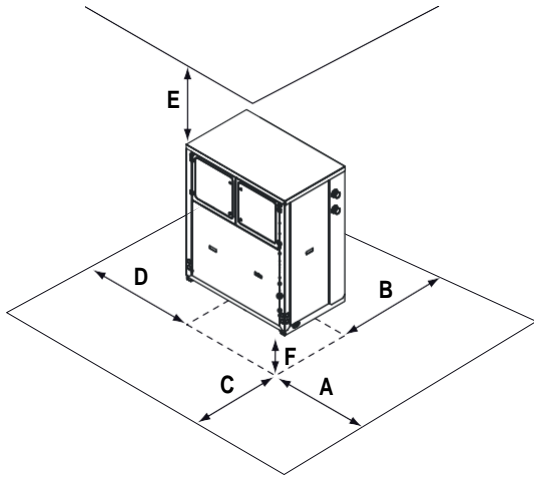
The unit has to be installed such that maintenance and repair is possible. The warranty does not cover costs for the provision of lifting apparatus, platforms or other lifting systems required to perform repairs during warranty period.



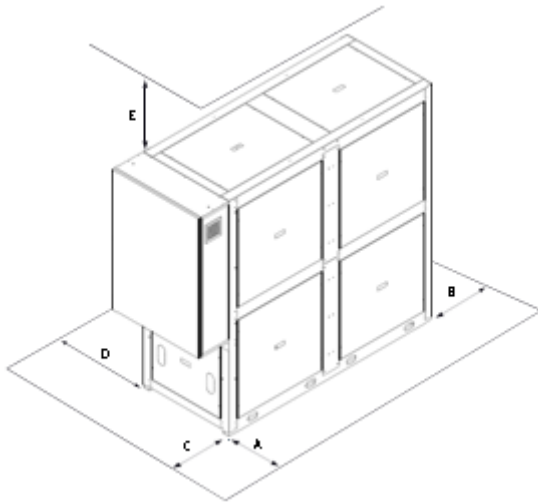
The installation site should be chosen in accordance with EN 378-1 and 378-3 standards. When choosing the installation site, all risks caused by accidental refrigerant leakages should be taken into consideration.

All models are designed and built for indoor installations, it is a good idea to create a base of support to those of the appropriate size, the units transmit to a low level of ground vibration: it is advisable to interpose between the frame base and the ground plane of vibration absorbers (spring or rubber), In this regard it is necessary to guarantee the minimum service below.

CLEARANCES



Mod.	A	B	C	D*	E
302	1000	500	600	0	500
402	1000	500	600	0	500
602	1000	500	600	0	500
702	1000	500	600	0	500
902	1000	500	600	0	500
1202	1000	500	600	0	500
1402	1000	500	600	0	500

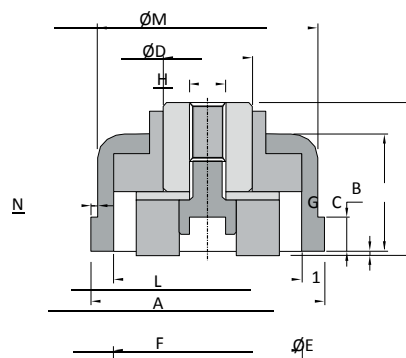


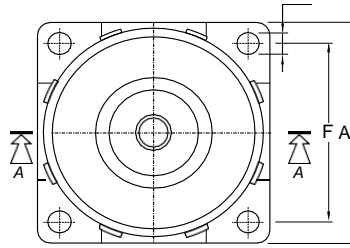
Mod.	A	B	C	D	E
1804	1000	500	800	1000	500
2304	1000	500	800	1000	500
2604	1000	500	800	1000	500

INSTALLATION OF RUBBER VIBRATION DAMPERS (KAVG)

All units should be installed on vibration dampers in order to prevent the transmission of vibration to the supporting surface and reduce the noise level. Rubber vibration dampers are available as an option in the catalogue. The vibration dampers (optional) are supplied by the factory in separate packaging.

sez A - A





Mod.	A	B	C	D	E	F	G	H	L	M	N
302÷602	88 mm	52 mm	41 mm	25 mm	11 mm	67 mm	10 mm	M12	65 mm	74,5 mm	5,5 mm
702÷1402	88 mm	52 mm	41 mm	25 mm	11 mm	67 mm	10 mm	M12	65 mm	74,5 mm	5,5 mm
1804÷2604	88 mm	52 mm	41 mm	25 mm	11 mm	67 mm	10 mm	M12	65 mm	74,5 mm	5,5 mm

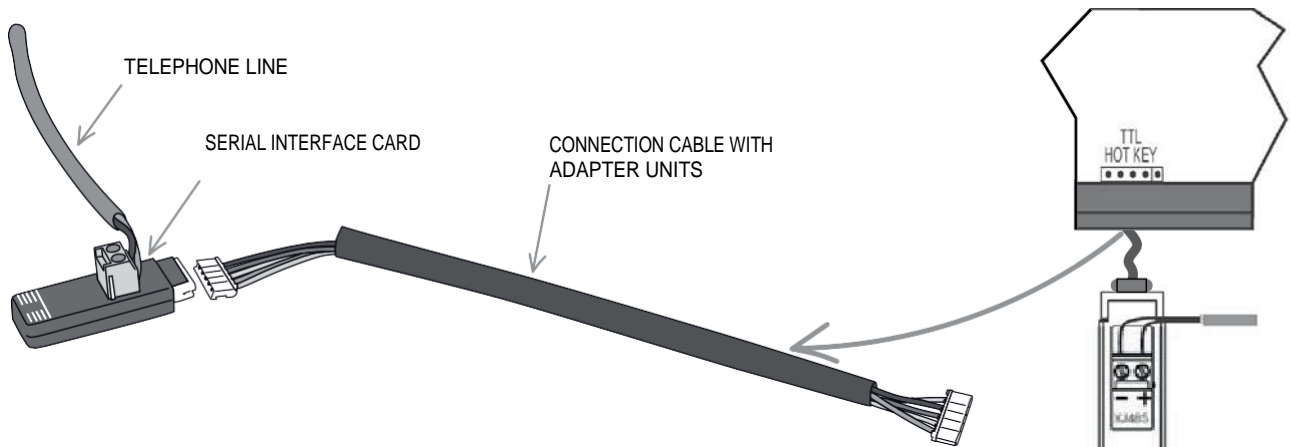
SERIAL INTERFACE CARD RS485(INSE)

Supervision system interface serial board (MODBUS RS485 available only)

The installation of the card will allow the unit to be plugged in and connected to a system with MODBUS protocol. This system allows you to remotely monitor all parameters of the unit and change their values.

The serial interface board is normally fitted at the factory, where it is provided separately is necessary to respect the polarity of the wiring as shown in the diagram. Any reversal of polarity will result in the non-functioning unit. The supervision connectivity cable must be telephone one type 2x0, 25 mm².

The unit is configured at the factory with serial address 1. In case of using the MODBUS system, you can request the list of variables by contacting the assistance.



SOURCE WATER PUMP INSTALLATION

Recently there has been a continuous increase in installations (solution 1 at page 32) where the variable speed source water pump (inverter type) is used.

The Lochinvar Limited states that it is of fundamental importance the correct flow rate of water source in order to avoid problems of freezing of the source heat exchanger. In this regard it is noted that the source water pump should be exclusively dedicated to the heat pump and, must be working as an on/off type control.



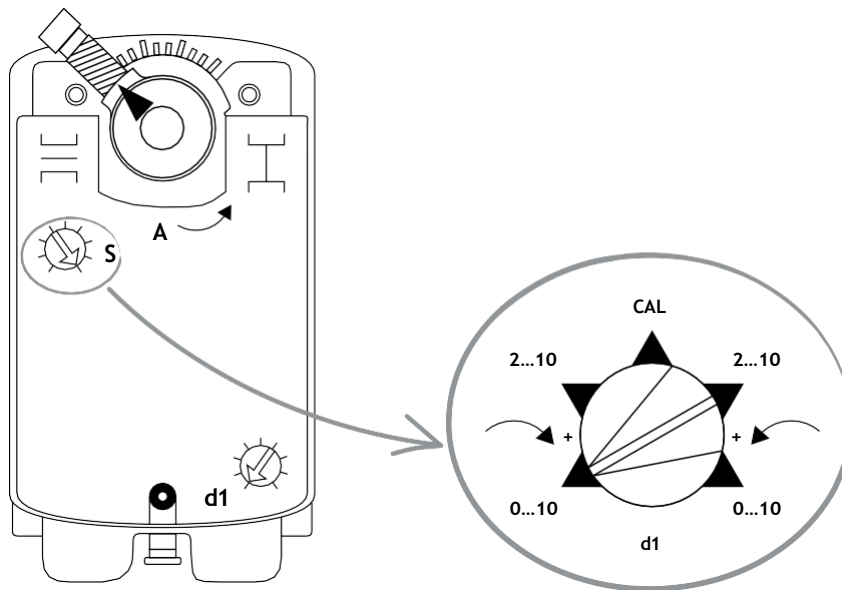
In the case of using the source water pump for other purposes (irrigation, etc.) and you need a variable speed pump (inverter type), undertakes the installation of the modulating valve V2MO. In these cases, the pump must ensure a constant pressure at the inlet of the source circuit of the heat pump of at least 3 bars, regardless of the type and number of active users.



In case of variation of the water flow to the source circuit there is a risk of freezing of the source heat exchanger. In this case the warranty expires immediately.



The activation of the modulating valve V2MO shows a selector used to vary the type of signal and the sense of rotation of the valve itself. Tampering can undermine the correct operation of the valve precluding security.



HYDRAULIC CONNECTIONS

The water pipe-work must be installed in accordance with national and local regulation and can be made from copper, steel, galvanized steel or PVC. The Pipework must be designed to cater for the nominal water flow and the hydraulic pressure drops of the system, a maximum pressure drop of 300 Pa/m run being typical. All pipes must be insulated with closed-cell material of adequate thickness. The hydraulic piping should include:

- Pockets for temperature sensor to measure the temperature in the system.
- Flexible joints, to isolate the unit from the rest of the system
- Temperature and pressure gauges for maintenance and servicing operations.
- Shut-off manual valves to isolate the unit from the hydraulic circuit.
- Metallic filters to be mounted on the inlet pipe with a mesh not larger than 1 mm.
- Vent valves, expansion tank with water filling, discharge valve.



System return water must be fitted to the connection labelled: "USER WATER IN" as incorrect connection can damage the heat exchanger by freezing.



It is compulsory to install on the USER WATER IN connection, a water strainer with a mesh not larger than 1 mm. Fitting this filter is COMPULSORY and the warranty will be invalidated if it is removed. The filter must be kept clean and checked periodically.



All units are factory supplied with a flow switch; the flow switch MUST BE FITTED in the pipework connection labelled "USER WATER OUT". If the flow switch is altered, removed, or the water filter omitted on the unit, the warranty will be invalidated.



The water flow through the heat exchangers of the unit should not be fall below dt 8°C measured at the following conditions:

Heating mode: 10/7°C Dry bulb ambient temperature	35°C water outlet temperature
Cooling mode: 30/35°C dry bulb ambient temperature	7°C water outlet temperature.

CHEMICAL CHARACTERISTICS OF THE WATER

The system is to be filled with clean water and vented after a full flushing operation has been performed; the water should have the following characteristics:

PH	6-8	Total Hardness	Lower Than 50 ppm
Electric conductivity	Lower Than 200 mV/ cm (25°C)	Sulphur ion	None
Chlorine ions	Lower Than 50 ppm	Ammonia ion	None
Sulphuric acid ions	Lower Than 50 ppm	Silicon ion	Lower Than 30 ppm
Total Iron	Lower Than 0,3 ppm		

USER CIRCUIT MINIMUM WATER CONTENT



Like any refrigerant unit also the heat pumps need a minimum water content in the user hydraulic circuit to guarantee correct operation of the unit, avoiding a high numbers of start and stop of the compressors that can reduce the working life of the unit.

Model	302	402	602	702	902	1202	1402	1804	2304	2604
Minimum water content (l)	500	600	750	850	1200	1500	1700	1200	1500	1700
Safety valve (bar)	6	6	6	6	6	6	6	6	6	6

INSTALLATION WITH SOURCE OPEN CIRCUIT (WATER TO WATER HEAT PUMP)

The source water circuit of a water to water heat pump is generally an open circuit, with sampling from a well or a water reservoir. The hydraulic source MUST include appropriate safety devices to protect the 3 major problems encountered:

- Corrosion: generated by the chemical composition of ground water;
- Clogging: caused by mud and / or suspended organic and inorganic compounds in groundwater;
- Freezing: caused by too low temperature of the fluid source.

CHEMICAL CHARACTERISTICS OF SOURCE WATER CIRCUIT

Carbonic acid dissolved	(CO ₂)	< 5 mg/Kg	Gas chloride free	(Cl ₂)	< 1 mg/Kg
Hydrogen peroxide sulfur	(H ₂ S)	< 0,05 mg/Kg	Manganese	(Mn)	< 0,1 mg/Kg*
Ammonia	(NH ₃)	< 2 mg/Kg	Nitrate	(NO ₃)	< 100 mg/Kg
Chloride	(Cl)	< 100 mg/Kg	Oxygen	(O ₂)	< 2 mg/Kg*
Chloride free	(Cl)	< 0,5 mg/Kg	Sulphate	(SO ₄)	< 50 mg/Kg
Electrical conductivity		>50µS/cm e <600µS/cm	Sulfites	(SO ₃)	< 1 mg/Kg
Iron	(Fe)	< 0,2 mg/Kg*	pH Value		6,5 – 9,0

*An excess of these limits due to a blockage of mud in the source heat exchanger and piping.



Warranty does not cover any damage caused by corrosion, clogging and freezing if attributable to lack and / or incorrect installation of described safety devices



The use of groundwater generally requires approval by the municipality and / or the province. Check with local authorities.



The limit values in the table may cause clogging by mud in the pipes and the heat exchanger.



The maintenance of the quality of ground water is borne by the user and / or maintenance Lochinvar Limited.



The temperature of source groundwater at the inlet of the source heat exchanger in heating mode, must not fall below 7.8 °C to avoid freezing problems in the source circuit. The fact is average water cooling of about 3-5 °C, resulting in temperature of the fluid outlet from the heat pump, in this case an inlet water temperature less than 7°C is dangerously close to the temperature of formation of ice.

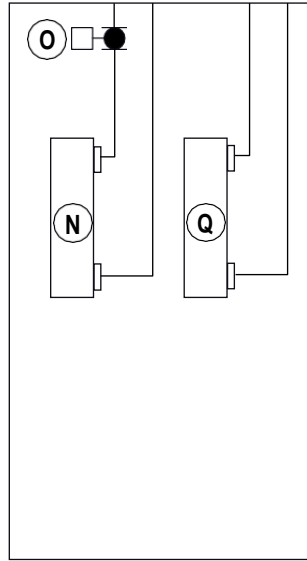


The temperature of the source groundwater at the inlet of source heat exchanger in heating mode, should never exceed 25 °C as this may activate the control devices and safety unit. For applications with temperatures above 25 °C groundwater temperature, please contact Lochinvar Limited.



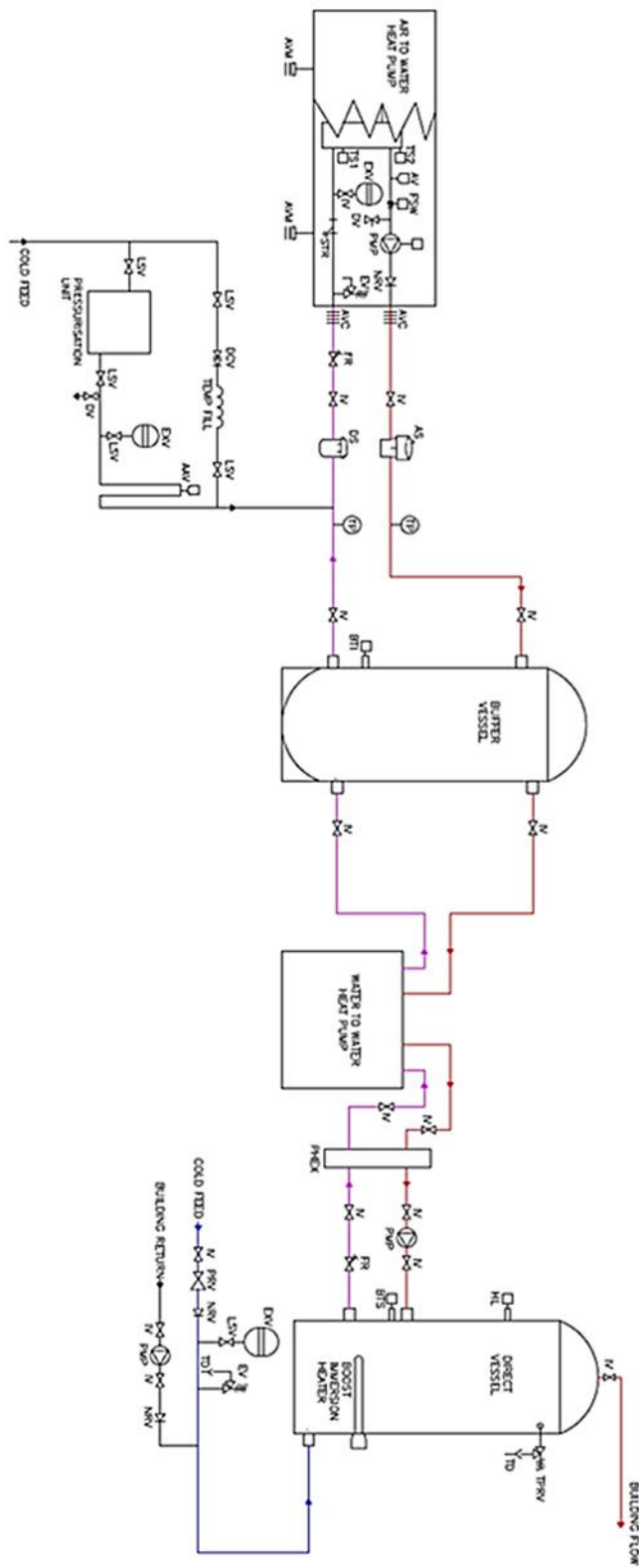
In case of installation insites with ground water temperatures close to the above it is recommended to test for water consumption for a minimum period of 36 consecutive hours (to be made, possibly, towards the end of winter season).

HYDRAULIC COMPONENTS



		O	Flow Switch
N	User heat exchanger	Q	Source heat exchanger

TYPICAL INSTALLATION



The pump must be installed with the water supply facing the water inlet connection

DOMESTIC HOT WATER (DHW) HYDRAULIC CIRCUIT



The domestic hot water (DHW) circuit also requires a minimum water content to guarantee correct operation and to avoid excessive cycling of the compressors that can reduce the working life of the unit.

The minimum domestic hot water circuit content required is:

Model	302	402	602	702	902	1202	1402	1804	2304	2604
Minimum water content (l)	500	600	750	850	1200	1500	1700	1200	1500	1700
Safety valve (bar)	6	6	6	6	6	6	6	6	6	6



The minimum water content of the domestic hot water circuit shown above in the table indicates only the minimum water content required by the system to guarantee the correct operation of the unit in terms of the correct number of start/stops of the compressors and minimum operating time allowed for each cycle. The above value does not guarantee the availability of an adequate domestic hot water flow to the user and its correct temperature over the long term; this value must be calculated according to the DHW load of the site. Please contact Lochinvar for help sizing the DHW load.

FILLING THE HYDRAULIC CIRCUIT

- Before filling, check that the system drain valve is closed.
- Open all pipework, heat pump and terminal unit air vents.
- Open the shut off valves.
- Begin filling, slowly opening the water valve in the filling group outside the unit.
- When water begins to leak out of the terminal unit air vents, close them and continue filling until the pressure gauge indicates a pressure of 1.5 bar.

The installation should be filled to a pressure of between 1 and 2 bars. It is recommended that this operation be repeated after the unit has been operating for a number of hours (due to the presence of air bubbles in the system). The pressure of the installation should be checked regularly and if it drops below 1 bar, the water content should be topped-up. If frequent top-ups are required, check all connections for leaks.

EMPTYING THE INSTALLATION

- Before emptying, place the mains switch in the "Off" position.
- Make sure the filling group valve is closed.
- Open the drainage valve outside the unit and all the installation and terminal air vent valves.



If the fluid in the circuit contains anti-freeze, it MUST not be allowed to run away to drain. It must be collected for possible re-cycling or for correct disposal.

Electric connections: preliminary safety information

The electric panel is located inside the unit at the top of the technical compartment where the various components of the refrigerant circuit are also to be found. To access the electrical board, remove the front panel of the unit:



Power connections must be made in accordance to the wiring diagram enclosed with the unit and in accordance to the norms in force.



Make sure the power supply upstream of the unit is (blocked with a switch). Check that the main switch handle is padlocked and it is applied on the handle a visible sign of warning not to operate.



It must be verified that electric supply is corresponding to the unit electric nominal data (tension, phases, frequency) reported on the label in the front panel of the unit.



Power cable and line protection must be sized according to the specification reported on the form of the wiring diagram enclosed with the unit.



The cable section must be commensurate with the calibration of the system-side protection and must take into account all the factors that may influence (temperature, type of insulation, length, etc.).



Power supply must respect the reported tolerances and limits: If those tolerances should not be respected, the warranty will be invalidated.



Flow switches must be connected following the indication reported in the wiring diagram. Never bridge flow switches connections in the terminal board. Guarantee will be invalidated if connections are altered or not properly made.



Make all connections to ground provided by law and legislation.



Before any service operation on the unit, be sure that the electric supply is disconnected.



FROST PROTECTION

If opened, the main switch cuts the power off to any electric heater and antifreeze device supplied with the unit, including the compressor crankcase heaters. The main switch should only be disconnected for cleaning, maintenance or unit repairs.

ELECTRIC DATA



The electrical data reported below refer to the standard unit without accessories. In all other cases refer to the data reported in the attached electrical wiring diagrams.



The line voltage fluctuations cannot be more than $\pm 10\%$ of the nominal value, while the voltage unbalance between one phase and another cannot exceed 1%, according to EN60204. If those tolerances should not be respected, please contact our Lochinvar Limited.

Model		302	402	602	702	902
Power supply	V/~ / Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Control board	V/~ / Hz	24 V	24 V	24 V	24 V	24 V
Auxiliary circuit	V/~ / Hz	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
Line section	mm ²	--	--	--	--	--
PE section	mm ²	--	--	--	--	--

Model		1202	1402	1804	2304	2604
Power supply	V/~ / Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
Control board	V/~ / Hz	24 V	24 V	24 V	24 V	24 V
Auxiliary circuit	V/~ / Hz	230/1/50	230/1/50	230/1/50	230/1/50	230/1/50
Line section	mm ²	--	--	--	--	--
PE section	mm ²	--	--	--	--	--



Electric data may change for updating without notice. It is therefore necessary to refer always to the wiring diagram present in the units.

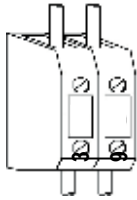
ELECTRIC CONNECTIONS

Remote wiring connections (compulsory)



The numbering of the terminals may change without notice. For their connection is mandatory to refer to the wiring diagram supplied along with the unit.

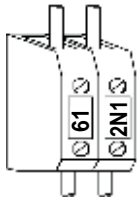
All terminals referred to in the explanations below are present on the terminal board inside the electrical box, all electric connections mentioned below and have to be made by the installer, on site.



USER CIRCUIT WATER INLET SENSOR (BTI)

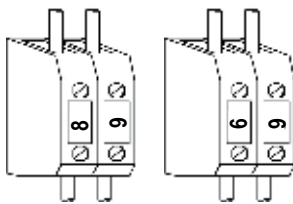
It is used to measure the return water temperature from the user circuit. The sensor is always supplied loose in a plastic bag and has to be connected to terminals 3 and 9.

As standard working mode, the user pump will be switched off during stand-by periods (Compressors in Off). The sensor must be placed in an appropriate position in order to measure the temperature of the secondary circuit (See Par. 4.23). The incorrect positioning of the user water sensor can have negative influence in the operation of the heat pump. The remote sensor is supplied loose with the unit (it is present inside the electric box) and it is available with 6 mt. cable length. In case the length of the cable is not enough it is recommended to increase the length by only using cable diameter 0.5 mm² to a maximum distance of 50 meters.



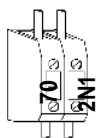
USER CIRCUIT WATER PUMP

If the pump is factory supplied and fitted (A version) it will already be connected otherwise, connect to terminals 61 and 2N1 (6 and 9 for Models 90÷162); maximum input current 3A. In standard configuration, the unit microprocessor controller switches off the user water pump when the set point is reached or if the unit is in standby. This strategy is suitable if the unit is heating a buffer store from which a secondary circuit is taken and provides a substantial reduction of energy use.



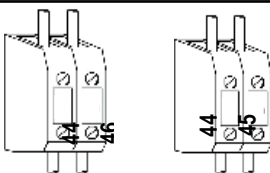
DOMESTIC HOT WATER SENSOR (BTS)

It is used to measure the return water temperature from the domestic hot water circuit. The sensor must be placed in the socket provided in the DHW (Domestic hot water) cylinder, in an appropriate position, in order to measure the correct temperature of the domestic hot water. (See Par. 4.24). The incorrect positioning of the domestic hot water sensor can have negative influence in the correct operation of the heat pump. The sensor is supplied loose with the unit (it is present inside the electric box) and it is available with 6 mt. cable length. It has to be connected to the terminal 6 and 9. In case the length of the cable is not enough it is recommended to increase the length by only using cable diameter 0.5 mm² to a maximum distance of 50 meters.



DOMESTIC HOT WATER CIRCUIT PUMP

To be connected across terminals 70 and 2N1; maximum input current 1A. In standard configuration, the microprocessor control of the unit switches off the user water pump when the set point has reached or if the unit is in standby. This strategy provides a substantial reduction of energy use.



WEATHER COMPENSATED SENSOR (BTE)

This is used to measure the ambient temperature enabling weather compensation modulation of the user set point with respect to the ambient conditions. It is connected to terminals 44 and 46 (44 and 45 for models 90 ÷ 162).

Remote wiring connections (optional)



3 WAY ON/OFF VALVE

The 3 way valve is used with 2 pipe systems to produce domestic hot water; the valve is activated by the Domestic hot water sensor (BTS) and diverts the hot water either to the domestic hot water cylinder or to the user circuit. The valve is connected across terminals 2N1/68/69.



REMOTE ON / OFF

To switch the unit on or off remotely, the cable jumper connected across terminals 1 and 2 must be replaced with a switch.

Contact closed, unit ON,

Contact open, unit OFF.



REMOTE GENERAL ALARM

For remote display of a general alarm, connect the visual or audible device between terminals 90-91-92.

Contacts 90/91 NC (Normally closed)

Contacts 91/92 NO (Normally opened)



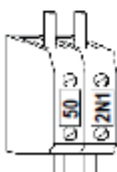
REMOTE CONTROL PANEL

The remote control panel replicates all of the functions on the main controller panel and can be connected up to a maximum distance of 50 meters from the unit. The panel has to be connected to the unit by 2 wires having diameter 0.75 mm². The power supply cables must be separated from the remote control panel wires, in order to avoid interference. The control panel has to be connected to the terminals + and -. The control panel cannot be installed in an area subject to excessive vibration, corrosive gases, is a dirty environment or has a high humidity level. The ventilation openings must not be blocked.



3 way mixing valve. It is necessary ONLY in the 2 pipes versions where the heat exchanger inside the DHW cylinder is incorrect (too small!). It is not available on the SW6 versions.

In 2 pipe versions (only) it is the 3 way mixing valve that, depending on the return water temperature from DHW cylinder, modulates the opening of the by-pass port going to the user circuit. The valve is connected to terminals 19 and 24. For more information about this option please refer to the paragraph 4.19.1.



USER CIRCUIT ELECTRIC INTEGRATION HEATERS

If user circuit integration heaters are required, the coil of the contactor that is used to switch them must be connected across terminals 2N1 and 50.



DOMESTIC HOT WATER ELECTRIC INTEGRATION HEATERS

If domestic hot water circuit integration heaters are required, the coil of the contactor that is used to switch them must be connected across terminals 2N1 and 32.



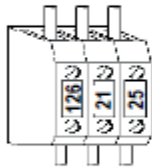
PRIORITY SELECTOR

If a priority selector switch is to be fitted, a voltage free switch has to be connected to terminals 42 and 43. The selector operates as follows:

Closed contact: Domestic hot water only;

Opened contact: Domestic hot water / Heating (and / or cooling);

The unit is supplied with noting connected to terminals 42 and 43 (Open contact).



SOURCE WATER 2 WAY MODULATING VALVE (4-20mA; 0-10V) (VM20)

126-10 ± 24 W (supply)

13 Modulation signal

2-way modulating valve is factory installed in the hydraulic circuit at the source side, to optimize the consumption of well water as a function of the temperature of the available water. The valve is controlled by the microprocessor control unit by modulating signal 0-10V.

In the event of lack of power supply, the valve is normally closed.



PUMP SOURCE

Must be connected to terminals 66 and 2N1, with maximum current of 3A. In standard configuration, the unit microprocessor control turns off the user water pump when set point is reached. This solution allows a significant reduction in electrical power consumption when the set point is reached or the unit is in standby.

Factory fitted wiring connections



USER CIRCUIT WATER OUTLET SENSOR (BTO)

This is used to measure the outlet user temperature; it is also used as antifreeze protection in cooling mode; it is connected to the terminals 5 and 9.



DOMESTIC HOT WATER OUTLET SENSOR (BTU)

This is used to measure the domestic hot water outlet temperature; it is also used as maximum temperature sensor to protect the refrigerant circuit of the unit from excessive temperatures in case of low water flow rates. The sensor is connected to terminals 8 and 9.



USER CIRCUIT FLOW SWITCH (SFW1)

This is used to protect the unit if there is a low water flow rate in the user circuit. It is factory fitted across terminals 88 and 89.

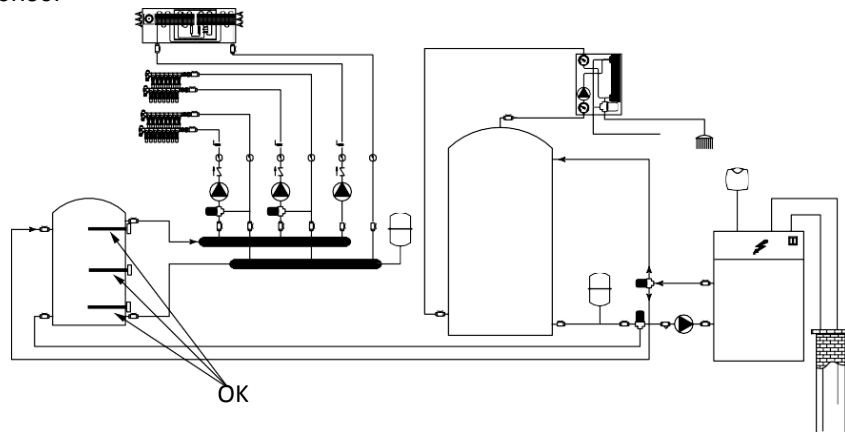
POSITIONING OF THE USER CIRCUIT WATER INLET SENSOR (BTI)

The correct positioning of the BTI sensor is extremely important to guarantee the correct operation of the heat pump. The BTI sensor is used to cycle the unit to maintain the user water temperature at set point. The BTI sensor is also used to activate the user water pump and to stop it when the user water temperature set point is reached. The BTI sensor **MUST** be positioned in order to measure the water temperature of the secondary circuit.

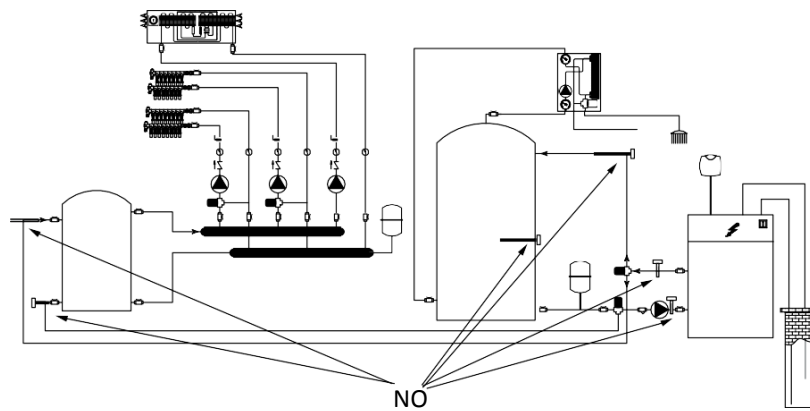


To guarantee the correct temperature measurement insert the probe into the sensor pocket of the buffer vessel

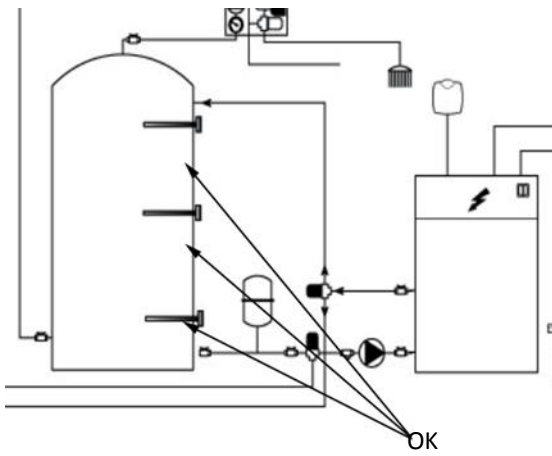
Correct positioning of the BTI sensor



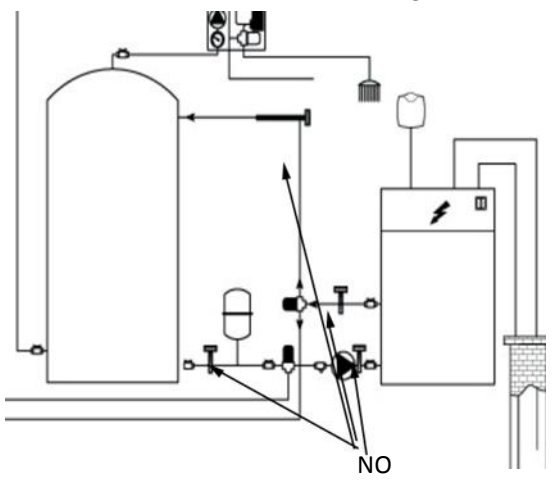
Incorrect positioning of the BTI sensor



POSITIONING OF THE DOMESTIC HOT WATER CIRCUIT SENSOR (BTS)

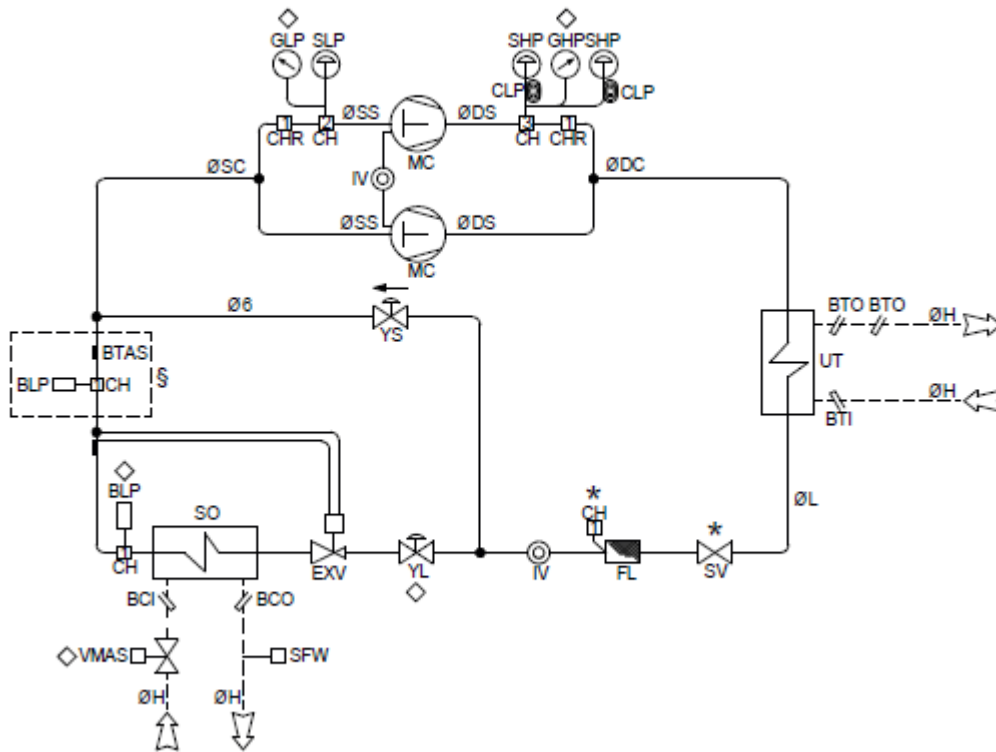


Correct positioning of the BTS sensor



Incorrect positioning of the BTS sensor

REFRIGERANT CIRCUIT LAYOUT



BCI	Source water input probe	SHP	High pressure pressostat
BCO	Source water output probe	SLP	Low-high pressure switch
BHP	High pressure transducer	SO	Source side
BLP	Low pressure transducer	SV	Shut off valve
BTFI	Free-cooling probe (inlet water plant)	SW	Sanitary side
BTI	User water input probe	UT	User side
BTO	User water output probe	V3SW5	3-Way water valve sw5
BTS	Sanitary water input probe	V3W	3-Way water valve
BTU	Sanitary water output probe	VMAS	Source water modulating valve
CH	Charging plug 1/4 sae (r407)	VR	Check valve
CLP	Expansion capillary tube	VRV	Reverse cycle valve
EXV	Thermostatic valve	YL	Liquid solenoid valve
FL	Liquid line filter	YMC	Chiller solenoid valve
GHP	High pressure gauge	YMS	Sanitary solenoid valve
GLP	Low pressure gauge	YS	Injection solenoid valve
IV	Moisture indicator sight glass	YSO	Source recovery solenoid valve
LR	Liquid receiver	YTSO	Source thermostatic valve solenoid valve
MC	Compressor	YTUT	User thermostatic valve solenoid valve
SFC	Free-cooling side	YUT	User recovery solenoid valve
SFW	Water flow switch	YW	Sanitary recovery solenoid valve

5. UNIT START UP

PRELIMINARY CHECKS

Before starting the unit the checks detailed in this manual of the electric supply and connections (par. 4.20), the hydraulic system (par. 4.11) and the refrigerant circuit (par. 5.1.4), should be performed.



Start-up operations must be performed in accordance with the instructions detailed in the previous paragraphs.



If it is required to switch the unit on and off, never do this using the main isolator: this should only be used to disconnect the unit from the power supply when the unit is to be permanently off. Isolation will result in no supply for the crankcase heater and on start up the compressor could be seriously damaged.

Before start-up



Damage can occur during shipment or installation. It is recommended that a detailed check is made, before the installation of the unit, for possible refrigerant leakages caused by breakage of capillaries, pressure switch connections, tampering of the refrigerant pipework, vibration during transport or general abuse suffered by the unit.

- Verify that the unit is installed in a workmanlike manner and in accordance with the guidelines in this manual.
- Check that all power cables are properly connected and all terminals are correctly fixed.
- The operating voltage between phases R S T is the one shown on the unit labels.
- Check that the unit is connected to the system earth.
- Check that there is no refrigerant leakage.
- Check for oil stains, sign of a possible leak.
- Check that the refrigerant circuit shows the correct standing pressure on the pressure gauges (if present) otherwise use external ones.
- Check that the Schrader port caps are the correct type and are tightly closed.
- Check that crankcase heaters are powered correctly (if present).
- Check that all water connections are properly installed and all indications on unit labels are observed.
- The system must be flushed, filled and vented in order to eliminate any air.
- Check that the water temperatures are within the operation limits reported in the manual.
- Before start-up check that all panels are replaced in the proper position and locked with fastening screws.



Do not modify internal wiring of the unit as this will immediately invalidate the warranty.



Crankcase heaters must be powered at least 12 hours before start up (pre-heating period) To do this, isolate the compressor(s), fans and pump(s) in the electrics box and then switch on the main isolator (heaters are automatically supplied when the main switch is closed). The crankcase heaters are working properly if, after several minutes, the compressor crankcase temperature is about 10÷15°C higher than ambient temperature.



During the 12 hours pre-heating period it is also important to check that the label OFF is shown on the display or that the unit is on stand-by mode. If there is an accidental start-up before the 12 hours pre-heating period has elapsed, the compressors could be seriously damaged and therefore the warranty will be immediately void.

Safety device setting

Device		Set-point	Differential	Reset
Control thermostat (Heating mode)	°C	30	2	----
Control thermostat (Domestic hot water)	°C	45	2	----
Anti-freeze thermostat	°C	4	4	MANUAL
High pressure switch	Bar	30	7	Automatic for 3 times (than manual)
Low pressure switch	Bar	0.7	1.5	
Water safety valve (Present in A versions only)	Bar	6	---	Automatic



If the unit is required for heating/cooling only (without domestic hot water production) the internal parameter of the microprocessor FS1 has to be modified from 2 to 1 in order to avoid configuration alarms. Please contact Lochinvar Limited for support.

Controls during unit operation

- Check the rotation of the fans. If the rotation is incorrect, disconnect the main switch and change over any two phases of the incoming main supply to reverse motor rotation (only for units with three-phase fan motors).
- Check that user water inlet temperature is close to the set point of the control thermostat.
- For “A” version units (units with pumps) if the pump is noisy, slowly close discharge shut-off valve until the noise is reduced to normal levels. This can occur when the system pressure drop substantially lower than the pump available pressure.

Refrigerant charge checking

- After several hours of operation, check that the sight glass has a green colour core: if the core is yellow moisture is present in the circuit. In this event it is necessary for dehydration of the circuit to take place. This must be performed by qualified people only. Check that there are no continuous vapour bubbles present at the sight glass. This would indicate a shortage of refrigerant. A few vapour bubbles are acceptable.
- Several minutes after start up and operating in cooling mode, check that condensing temperature is approximately 15°C higher than the ambient air temperature.
- On cooling mode, check that the evaporation temperature is about 5°C lower than the user water outlet temperature.
- On cooling mode check that the refrigerant superheat on the user heat exchanger is about 5-7°C
- On cooling mode check that the refrigerant sub-cooling on the source heat exchanger is about 5-7°C.

DESCRIPTION OF THE CONTROLPANEL



Display

The instrument display is divided into three zones:
 Top left zone: the display shows the inlet water temperature,
 Bottom left zone: the display shows the inlet domestic hot water temperature (the digit SAN. Will appear), Right zone: icons.

Display icons

Icon	Meaning	Icon	Meaning
°C	Celsius degrees		General Alarm
bar	Bar		Electric heaters activated
	Compressor 1		User water pump
	Compressor 2	Flow!	Water flow alarm

Key function



M makes it possible to enter the functions menu



SET makes it possible to display or modify the set points. Selects a parameter or confirms a value in programming mode.



In standard mode allows the display of the different temperatures 1 click: Bottom line displays **EIN**: User inlet water temperature
 2 clicks: Bottom line displays **EOUT**: User outlet water temperature 3 clicks: Bottom line displays **ET**: Ambient temperature
 4 clicks: Bottom line displays **DEF1**: Finned coil temperature
 5 clicks: Bottom line displays **SAN1**: Domestic hot water inlet temperature (return from the system) 6 clicks: Bottom line displays **SAN2**: Domestic hot water outlet temperature (supply to the system)
 7 clicks: Bottom line displays **CDP1**: refrigerant pressure (high pressure in cooling, low pressure in heating mode) In programming mode allows to scroll through the parameter codes or increases the values.



In standard mode allows the display of the different temperatures in opposite way of the above arrow...In programming mode allows to scroll through the parameter codes or increases the values



If pressed down for 5 seconds, it makes it possible to switch the unit on or off in chiller mode (and domestic hot water, if required). Each time this function is activated, the green led positioned just above the button will be switched **ON**.



If pressed down for 5 seconds, it makes it possible to switch the unit on or off in heating mode (and domestic hot water, if required). Each time this function is activated, the green led positioned just above the button will be switched **ON**.

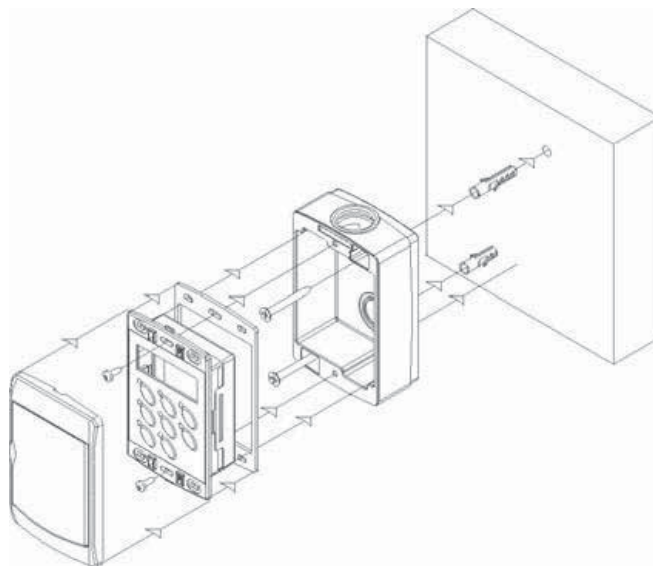
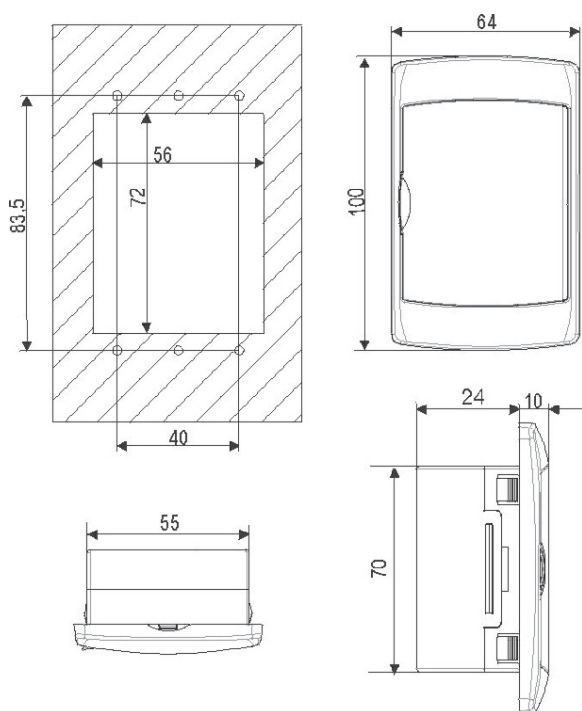
REMOTE CONTROL PANEL



Installation

The remote control panel is mounted on a panel with 72x56 mm cut-out, fixed with screw.

To obtain IP65 protection for the panel, use the rubber gasket RGW-V (optional). For wall mounting use the V-KIT plastic adapter as illustrated in the picture.








Electric data can be updated without notice. It is therefore necessary to always refer to the wiring diagram provided in the unit.



If there is damage to the remote control or there is a faulty connection, failure of communication will be indicated in the display with the message "noL" (no link).

Display icons

Icon	Meaning	Icon	Meaning
°C	Celsius degrees		General Alarm
bar	Bar		Electric heaters activated
	Compressor 1		User water pump
	Compressor 2	Flow!	Water flow alarm

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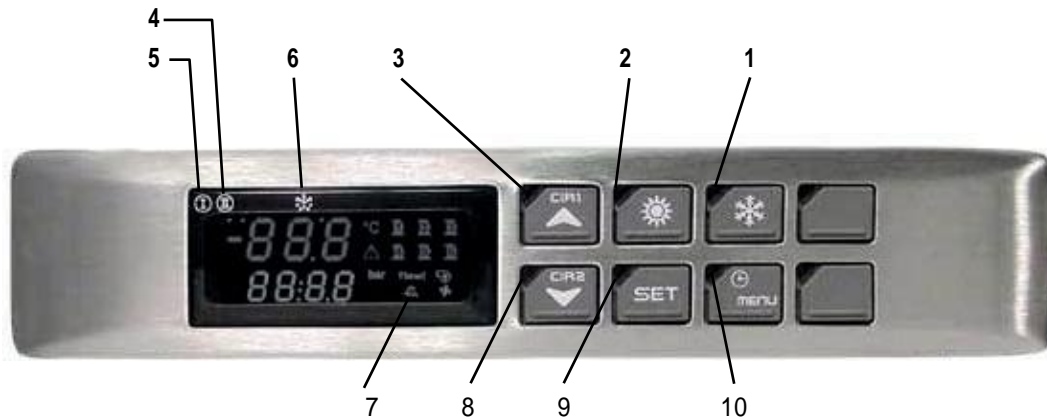


If pressed down for 5 seconds, it makes it possible to switch the unit on or off in heating mode (and domestic hot water, if required). Each time this function is activated, the green led positioned just above the button will be switched **ON**.

6. USE

SWITCH THE UNIT ON


In order to power the unit, turn the main switch in ON position. The display shows the User inlet water temperature and the Domestic hot water inlet water temperature.



Legend

1	Led ON: Unit in cooling mode. (Not used).	6	Led blinking: Defrost cycle timeout activated; Led ON: Defrost cycle activated.
2	Led ON: Unit in heating mode.	7	Led ON: Integrative user circuit heaters activated; Led blinking Domestic hot water integrative heaters activated; Led OFF: Integrative heaters not in operation.
3	Led ON: Refrigerant circuit 1 activated; When led cir1 and led cir2 are blinking at the same time it means we are entering in the programming mode.	8	Led ON: Refrigerant circuit 2 activated; When led cir1 and led cir2 are blinking at the same time it means we are entering in the programming mode.
4	Led ON: Auxiliary outputs (Not used).	9	Led blinking: Energy saving function activated.
5	Led ON: Auxiliary outputs (Not used).	10	Led ON: Menu function activated.

Heating mode

To start the unit in heating mode, press the  key. The green led is on. If requested, the compressor safety delay countdown starts and the compressor icon flashes. The water pump will be activated after few seconds and then, once the compressor countdown has finished, the compressor starts and the icon remains on. The display shows the user water inlet temperature and Domestic hot water inlet temperature.

Domestic hot water mode

At the first start up, the unit microprocessor control checks the domestic hot water inlet temperature measured by the sensor BTS (this has priority over the other parameters) and, if the measured temperature is lower than the domestic hot water set point , it will activate the domestic hot water mode automatically. If the unit is required to operate in heating and the domestic hot water temperature is higher than the set point (there is no requirement for domestic hot water) the microprocessor control will activate the unit in heating mode. If the unit is required to operate in cooling and domestic hot water mode the microprocessor control will activate both functions at the same time. If domestic hot water is not required, the microprocessor control will activate cooling mode only.

STOP

Heating mode

To stop the unit in cooling mode, press the  key. The LED switches off. The unit goes into standby mode.

STAND-BY

When the unit is switched off from the keyboard or the remote panel, it goes into standby mode. In this mode, the microprocessor control displays the sensor readings and is also able to manage alarm situations. The only visible signal on the display is the green led of circuit1 and the water temperatures. If the unit is switched off from remote ON/OFF the label OFF is displayed.



If it is required to switch the unit on or off, never do this using the main isolator: this should only be used to disconnect the unit from the power supply when the unit is to be permanently off. Isolation will result in no supply for the crankcase heater and on start up the compressor could be seriously damaged.

HOW TO CHANGE THE SETPOINTS



When modifying or varying the machine's operating parameters, make sure that you do not create situations that conflict with the other set parameters.



The complete display of the 3 set points (heating, domestic hot water, cooling) is **ONLY** available when the unit is in stand-by mode. It is suggested to put the unit in standby when modifying set points. If the unit is not in stand-by, the only editable parameters are the ones related to the operation mode of the unit (e.g. In heating mode it is only possible to change the heating and domestic hot water set points, in cooling mode it is only possible to change the cooling and domestic hot water set points.)



Select the required set point by pressing **SET** the label appears at the bottom of the display:

- **SEtH** Heating set point
- **SEtS** Domestic hot water set-point,

To set the required set points again press **SET** for 3 seconds. The current value flashes at the top and can be modified using the **CIR1** **CIR2** keys we can modify the parameter. Then press the **SET** key to memorise the parameter and exit.



All set points are intended as return temperature from the plant. For example: if hot water at 45°C is required and the Dt is 5°C, then the set point will be 40°C. If the Dt is 8°C, then the set point has to be set at 37°C.

Adjustable parameters





The adjustable set point that can be modified by the end user are:

Label	Function	Adjustment limit	Default value
SEt H	Heating set-point	20÷55°C	30°C
SEt S	Domestic hot water set-point	20÷55°C	45°C
SEt C	--	--	--
SD02	Set point compensation	0÷15°C	10°C
PAS	Password	(Contact the Lochinvar Limited)	



The units are supplied with a very sophisticated control system with many other parameters that are not adjustable by the end user; these parameters are protected by a manufacturer password.

Parameters list

By pressing the  key the user has the possibility to display the many parameters. Scroll the list of the parameters using the   keys, then press the  key to display the required one. In this menu there is just the possibility to display the parameters. It is not possible to change any value.





The parameter list is:

Display	List	Symbol	Explanation
ALrM	Alarm List	ALrM	See following paragraph
ALOG	Alarm history	ALOG	See following paragraph
UPL	Uploading parameter list from hotkey	UPL	(Not used)
CrEn	Enable to stop one refrigerant circuit	CrEn	(Not used)
COEn	Enable to stop one compressor	COEn	(Not used)
HouR	Main components working hours	CO1H CO2H EP1H SAPH	Working hours compressor 1 Working hours compressor 2 (only models with 2 compressors) Working hours user water pump Working hours domestic hot water pump
COSn	Compressors start up	CO1E CO2E	Number of start up compressor 1 Number of start up compressor 2
Cond	Modulating valve source circuit control signal	Pout1 Pout2 Pout3 Pout4	(Not used) (Not used) (Not used) (Not used)
Pout	Auxiliary proportion output 0-10V		


Acoustic signal silencing

Pressing and releasing one of the keys; the buzzer is switched off, even if the alarm condition remains in place.







Alarm reset

Press the  key (the menu AlRM appears at the bottom right of the display). Press the  key to display the alarm event. In case of multiple alarms use the   keys, to scroll through the list of the active alarms.

There are two types of alarms:

Reset alarms: RST label appears on the upper part of the display. In this case press the  key to reset.
Nonreset alarms: nO label appears on the upper part of the display. In this case the alarm is permanent; contact the Lochinvar Limited service.

Display alarm history

Press the  key, then the  ,  keys, to scroll through the menus, when AL0G label appears in the bottom part of the display, press  . To scroll the list of alarms use the   keys.

7. MAINTENANCE OF THE UNIT

GENERAL WARNINGS

Maintenance can:

- Keep the equipment operating efficiently
- Prevent failures
- Increase the equipment life



It is advisable to maintain a record book for the unit which details all operations performed on the unit as this will facilitate troubleshooting.



Maintenance must be performed in compliance with all requirements of the previous paragraphs.



Use personal protective equipment required by regulations as compressor casings and discharge pipes are at high temperatures. Coil fins are sharp and present a cutting hazard.



If the unit is not to be used during the winter period, the water contained in the pipes may freeze and cause serious damage. In this event, fully drain the water from the pipes, checking that all parts of the circuit are empty including any internal or external traps and siphons.

DRIVE ACCESS

Access to the unit once installed, should only be possible to authorized operators and technicians. The owner of the equipment is the Lochinvar Limited legal representative, entity or person owns the property where the machine is installed. They are fully responsible for all safety rules given in this manual and regulations. If it is not possible to prevent access to the machine by outsiders, a fenced area around the machine at least 1.5 meters away from external surfaces in which operators and technicians only can operate, must be provided.

PERIODICAL CHECKS



The start-up operations should be performed in compliance with all requirements of the previous paragraphs.



All of the operations described in this chapter **MUST BE PERFORMED BY TRAINED PERSONNEL ONLY**. Before commencing service work on the unit ensure that the electric supply is disconnected. The top case and discharge line of compressor are usually at high temperature. Care must be taken when working in their surroundings. Aluminium coil fins are very sharp and can cause serious wounds. Care must be taken when working in their surroundings. After servicing, replace the cover panels, fixing them with locking screws.

Every 6 months

It is advisable to perform periodic checks in order to verify the correct working of the unit.

- Check that safety and control devices work correctly as previously described.
- Check all the terminals on the electric board and on the compressor are properly fixed.
- Check and clean the sliding terminals of the contactors.
- Check for water leaks in the hydraulic system.
- Check correct operation of the flow switch and clean the strainers on the pipework.
- Check the compressor crankcase heater has the proper supply and is functioning correctly.
- Check the colour of the sight glass core (green=no moisture, yellow=moisture present): if it has a yellow colour, change the refrigerant filter.

End of seasons or unit switched off

If the unit is to be left out of commission for a long period, the hydraulic circuit should be drained down. This operation is compulsory if the ambient temperature is expected to drop below the freezing point of the fluid in the circuit (water or Glycol mix).

REFRIGERANT CIRCUIT REPAIR



If the refrigerant circuit is to be emptied, all the refrigerant must be recovered using the correct equipment.

For leak detection, the system should be charged with nitrogen using a gas bottle with a pressure reducing valve, until 15 bar pressure is reached. Any leakage is detected using a bubble leak finder. If bubbles appear discharge the nitrogen from the circuit before brazing using the proper alloys.



Never use oxygen instead of nitrogen: explosions may occur.

Site assembled refrigerant circuits must be assembled and maintained carefully, in order to prevent malfunctions.

Therefore:

- Avoid oil replenishment with products that are different from that specified and that are pre-loaded into the compressor.
- In the event of a gas leakage on machines using refrigerant R407C, even if it is only a partial leak, do not top up. The entire charge must be recovered, the leak repaired and a new refrigerant charge weighed in to the circuit.
- When replacing any part of the refrigerant circuit, do not leave it exposed for more than 15 minutes.
- It is important when replacing a compressor that the task be completed within the time specified above after removing the rubber sealing caps.
- When replacing the compressor following a burn out, it is advisable to wash the cooling system with appropriate products including a filter for acid.
- When under vacuum do not switch on the compressor.

8. DECOMMISSIONING

DISCONNECT THE UNIT



All decommissioning operations must be performed by authorized personnel in accordance with the national legislation in force in the country where the unit is located.

- Avoid spills or leaks into the environment.
- Before disconnecting the machine please recover:
 - the refrigerant gas;
 - Glycol mixture in the hydraulic circuit; (if applicable)
 - The compressor lubricating oil.

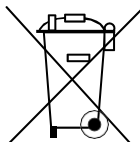
Before decommissioning the machine can be stored outdoors, providing that it has the electrical box, refrigerant circuit and hydraulic circuit intact and closed.

DISPOSAL, RECOVERY AND RECYCLING

The frame and components, if unusable, should be taken apart and sorted by type, especially copper and aluminium that are present in large quantities in the machine.

All materials must be recovered or disposed in accordance with national regulations.

RAEE Directive (EU Only)



- The RAEE Directive requires that the disposal and recycling of electrical and electronic equipment must be handled through a special collection, in appropriate centres, separate from that used for the disposal of mixed urban waste.
- The user has the obligation not to dispose of the equipment at the end of the useful life as municipal waste, but to send it to a special collection centre.
- The units covered by the RAEE Directive are marked with the symbol shown above.
- The potential effects on the environment and human health are detailed in this manual.
- Additional information can be obtained from the manufacturer.

9. DIAGNOSIS AND TROUBLESHOOTING

FAULT FINDING

All units are checked and tested at the factory before shipment, however, during operation an anomaly or failure can occur.



Be sure to reset an alarm only after you have removed the cause of the fault; repeated reset may result in irrevocable damage to the unit.

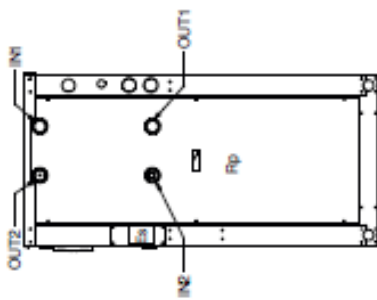
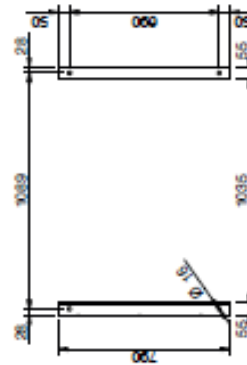
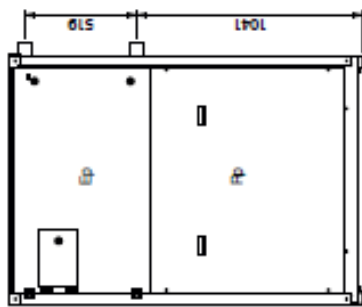
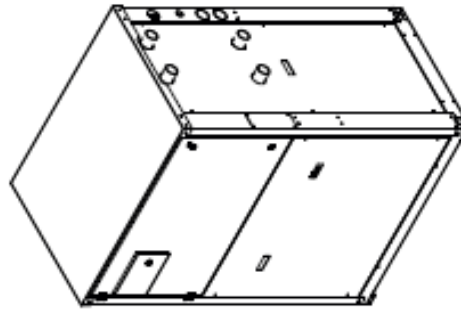
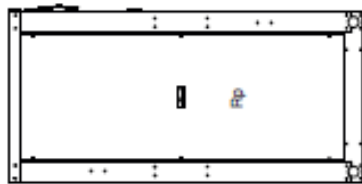
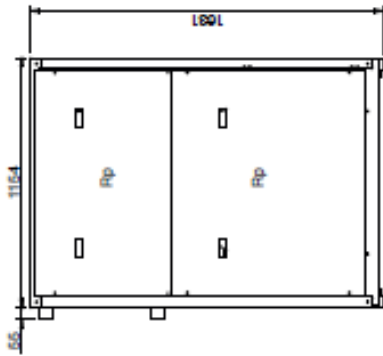
Code	Alarm Description	Cause	Solution
ACF1	Configuration alarm	Wrong configuration of microprocessor control system.	Contact the Lochinvar Limited.
ACF2	Configuration alarm		
ACF3	Configuration alarm		
ACF4	Configuration alarm		
ACF5	Configuration alarm		
ACF6	Configuration alarm		
ACF7	Configuration alarm		
ACF8	Configuration alarm		
ACF9	Configuration alarm		
AEE	Eeprom alarm	Severe hardware damage in the microprocessor control system.	Switch OFF the unit and, after few second switch ON the unit; if the alarm appears again contact the service.
AEFL	User water flow switch alarm	Presence of air or dirtiness in the user hydraulic system.	Bleed carefully the user hydraulic system or check and clean the water strainer.
AEUn	Compressor unloading alarm (only units with 2 compressors)	User water temperature is too high.	Wait until the user water temperature is lower.
AHFL	Domestic hot water flow switch alarm	Presence of air or dirtiness in the user hydraulic system.	Bleed carefully the user hydraulic system or check and clean the water strainer.
AP1	Alarm user inlet water temperature sensor	Wrong electrical connection, Sensor defect.	Check the electrical connection of the sensor to the terminal board, if correct call the service to replace the sensor.
AP10	Alarm safety domestic hot water sensor		
AP2	Alarm user outlet water temperature sensor		
AP3	Alarm pressure transducer		
AP4	Alarm finned coil sensor / defrost sensor		
AP5	Alarm domestic hot water inlet temperature sensor		
AP6	Alarm domestic hot water outlet temperature sensor		

Code	Alarm Description	Cause	Solution
AP7	Alarm ambient sensor	Wrong electrical connection, Sensor defect.	Check the electrical connection of the sensor to the terminal board, if correct call the service to replace the sensor.
AP8	Not used		
AP9	Not used		
AtE1	Not used		
AtE2	Not used		
B1 HP	High pressure switch circuit 1	In heating mode: Insufficient user circuit water flow; Insufficient domestic hot water circuit water flow.	Restore the correct user circuit water flow. Restore the correct domestic hot water circuit water flow.
b1AC	Anti-freeze alarm circuit 1 (cooling mode)	Too low water temperature	Check user temperature set point; Check user water flow.
b1AH	Anti-freeze alarm circuit 1 (heating mode)	Too low water temperature	Check user temperature set point.
b1dF	Wrong defrost circuit 1 (maximum time admitted)	Defrost time too long; Outside temperature outside the working limits; Refrigerant charge leakage.	Check defrost set point; Restore normal working conditions; Find leakage and repair.
b1hP	High pressure transducer alarm circuit 1	Transducer defect	Replace the faulty transducer.
B1LP	Low pressure switch circuit 1	Refrigerant charge leakage.	Find leakage and repair.
b1IP	Low pressure transducer alarm circuit 1	Transducer defect	Replace the faulty transducer.
b1tF	Overload source fan alarm	Fan input current outside operation limits.	Check the proper operation of the source fan and, in case replace it.
C1tr	Compressor 1 overload	Compressor 1 input current outside operation limits.	Contact the Lochinvar Limited
C2tr	Compressor 2 overload	Compressor 2 input current outside operation limits.	Contact the Lochinvar Limited
C3tr	Compressor 3 overload	Compressor 3 input current outside operation limits.	Contact the Lochinvar Limited
C4tr	Compressor 4 overload	Compressor 4 input current outside operation limits.	Contact the Lochinvar Limited

10. DIMENSIONS

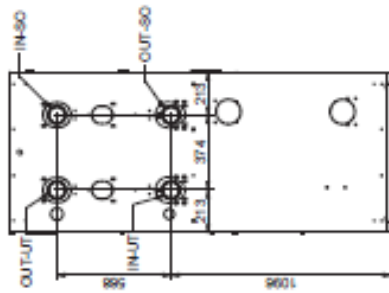
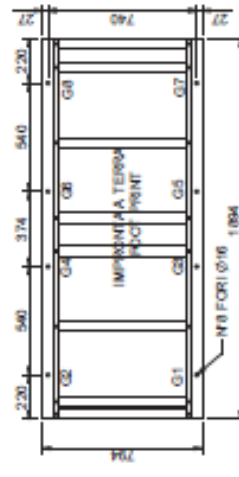
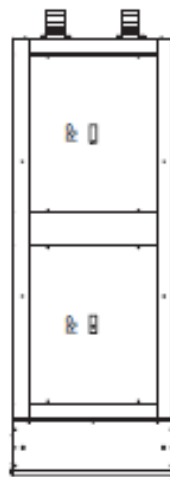
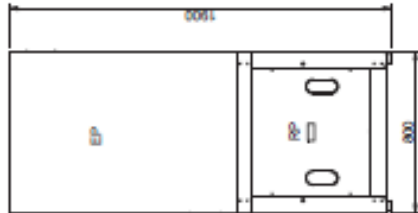
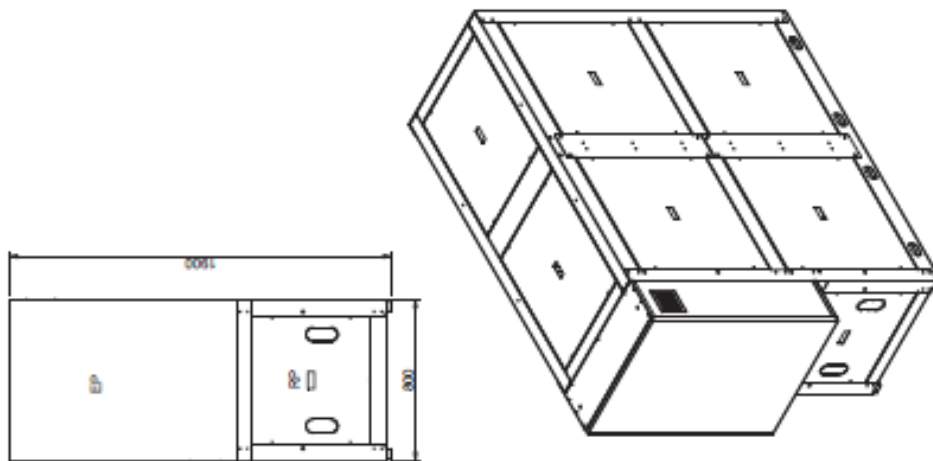
See individual drawings for further details

Dimensional Drawing Amicus LAHP WW Units 302-402-702-902-1202-1402



Rp	REMOVABLE PANEL
Ep	ELECTRICAL PANEL
Ea	INPUT POWER
IN1 Ø 2"	USER WATER INLET
OUT1 Ø 2"	USER WATER OUTLET
IN2 Ø 2"	SOURCE WATER INLET
OUT2 Ø 2"	SOURCE WATER OUTLET

Dimensional Drawing Amicus LAHP WW Units 1804-2304-2604



Rp	REMOVABLE PANEL
Ep	ELECTRICAL PANEL
Es	INPUT POWER
IN1 Ø 3"	USER WATER INLET
OUT1 Ø 3"	USER WATER OULET
IN2 Ø 3"	SOURCE WATER INLET
OUT2 Ø 3"	SOURCE WATER OULET

WEIGHT OF THE UNIT OPERATOR												
ModL	Kg	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11
1804	1170	234	234	50	50	50	50	50	204	204	234	234
2304	1270	264	264	63	63	64	64	64	264	264	264	264
2604	1320	264	264	66	66	66	66	66	264	264	264	264

NOTES

NOTES



IMPORTANT INFORMATION

These instructions must be read and understood before installing, commissioning, operating or maintaining the equipment.

