MITSUBISHI HEAVY INDUSTRIES

AIR-COOLED HEAT PUMP CHILLER

Hydrolution PRO Series

Installation, Operation & Maintenance Manual

MJD012A003
202404

Table of Contents

1. Introduction

1.1 Introduction

This manual contains basic information which is to be complied with for installation, operation and maintenance. They must therefore be read and complied with by the fitter and the responsible trained staff/operators before assembly and commissioning. All procedures detailed in the manual, including tasks for installation, commissioning and maintenance must only be performed by suitable trained and qualified personnel. This manual must be permanently available at the place where the system is used.
The manufacturer will not be liable for any injury or damage caused by incorrect installation, commissioning, operation or maintenance resulting from a failure to follow the procedures and instructions detailed in the manual.

1.2 Warranty

If you may need an after-sale service, contact our distributor.

1.3 Safety

1.3.1 Symbols used in the manual

DANGER	Risk of death or injury to the operator
WARNING	Risk of damage to the unit
INFORMATION	Important information, use note
ESD CAUTION	Risk of damage to electronic components

1.3.2 Labels

Drain water

Inlet of hydraulic circuit

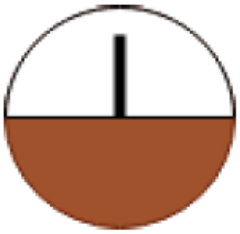
Outlet of hydraulic circuit

Direction of rotation of motors

Hot surface

Discharge of safety valves

Lifting point

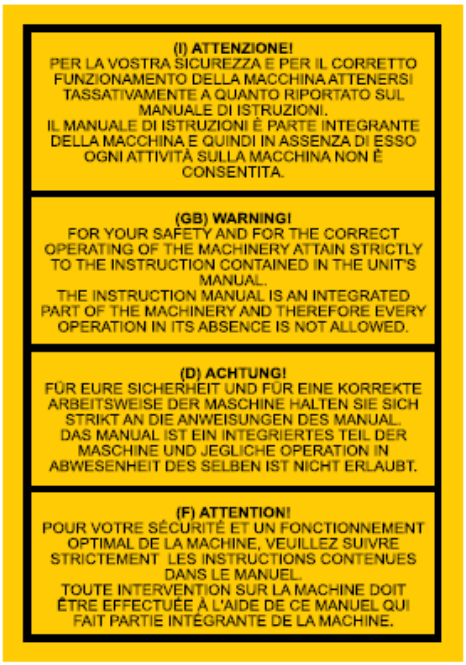


Connecting hole for external earthing

High voltage

Moving parts

A2L refrigerant UN3358



Label recalling the instruction manual.

Do not open the electrical cabinet until 5min after power is off.

MITSUBISHI HEAVY INDUSTRIES

0496 0097

HEAT PUMP

MODEL	**MCUS5001VHE-W2A**
SERVICE CODE	**MCUS5001VHE-W2A/1**
SERIAL NO.	**0001062814**
DATE	**15/11/2023**
Main power supply	**400V 3N ~ 50Hz**
F.L.A.	**32 A**
Capacity (Cooling/Heating)	**44,0/47,0 kW (W7L35/W45L7)**
Input power (Cooling/Heating)	**15,1/13,5 kW (W7L35/W45L7)**
Refrigerant type	**R32**
CO2 Eq.= 4,52 Tonn.	**6,7 kg**
Compressor Motor	**14,7 kW**
Sound power level	**86 dB(A)**
Min/Max temp. Storage	**-20,0 °C / 45,0 °C**
PS HP/PS LP	**43 bar / 30,0 bar**
TS Min/TS Max	**-30 °C / 120 °C**
CAT PED	**II**
Evaluation Module	**D1**
Unladen weight	**622 kg**
Degree of protection IP	**IP44**

Contains fluorinated greenhouse gases

MITSUBISHI HEAVY INDUSTRIES AIR CONDITIONING EUROPE,LTD. (Wholly-owned subsidiary of MITSUBISHI HEAVY INDUSTRIES THERMAL SYSTEMS,LTD) 5 The Square, Stockley Park, Uxbridge, Middlesex, UB11 1ET, United Kingdom. Manufactured under license from MITSUBISHI HEAVY INDUSTRIES THERMAL SYSTEMS, LTD

MADE IN ITALY

GWP R32=675

Nameplate

The heat pump is identified by the nameplate shown on the left.

The identification nameplate also shows the serial number of the unit. It is important to know the label as it is essential to get assistance or any information concerning the unit described in this manual.

Location: on the side of the electrical cabinet.

1.3.3 Safety Instructions

INFORMATION

This unit contains fluorinated greenhouse gas covered by the Kyoto protocol

Refrigerants are volatile or highly volatile fluorinated hydrocarbons which are liquefied under pressure. They are incombustible and not hazardous to health when used as intended.

DANGER

- Works have to be carried out by competent staff only
- Observance of the regulations for accident prevention
- Stay out of danger when lifting and setting off the unit
- Secure the unit to avoid the risk of overturning
- Safety devices may not be bypassed
- Respect the corresponding EN- and IEC standards for the electrical connection of the unit and observe the conditions of the power supply companies
- Switch off the voltage from the unit when working on it
- The unit must be earthed

WARNING

- Observe the national regulations of the country where the unit will be installed.
- The refrigerant circuit contains refrigerant and refrigeration oil, observe professional disposal for maintenance and when setting the unit out of service.
- Only water is able to be used in the hydraulic circuit.
- Observe personal protective equipment when working on the refrigerant circuit.

INFORMATION

- Respect material compatibility in the whole hydraulic circuit

1.3.4 Handling refrigerants

The unit must be installed in the environment according to the requirements specified in section 6.3. According to EN 378, refrigerants are divided in groups in respect of health and safety. The refrigerant R32 used in the heat pump belongs to the A2L fluid (mildly flammable) and is classified Group PED 1.

In order to properly manage the refrigerant is needed to respect the following:
- Adherence to the regulations by law and guidelines
- Execution only by competent staff
- Responsibility for correct disposal of refrigerant and system parts is incumbent on the operator
- Refrigerants could cause asphyxia when inhaled in high concentrations. The symptoms could include lose of mobility and consciousness.

- Do not use direct flames or electro warming devices near the chiller to increase the pressure of the refrigerant.
- A2L refrigerants are not flammable at atmospheric pressure and ambient temperature in air. In case of pressurization with air or oxygen, the mixture may get flammable. A potentially explosive atmosphere can be created at the release of refrigerants. So smoking and open fire is strictly prohibited.
- For refrigerant R32: In case of exposure to fire, hydrogen fluoride can be produced by thermal decomposition. Hydrogen fluoride has an acid effect on skin, eyes and mucous membranes.
- The refrigerant is heavier than air and accumulates near the ground.
- The room is to be evacuated immediately if high concentrations of refrigerant suddenly occur. The room may only be entered again after adequate ventilation.
- If unavoidable work is required in the presence of a high concentration of refrigerant, breathing apparatus must be worn. This does not mean simple filter masks. Comply with the refrigerant safety data sheet.
- Safety glasses and safety gloves are to be worn.
- Do not eat, drink or smoke at work.
- Liquid refrigerant must not get onto the skin (risk of freezing).
- Only use in well ventilated areas.
- Do not inhale refrigerant vapours.
- Warn against intentional misuse.
- It's absolutely essential to comply with the first aid measures if accidents occur.
- Remove refrigerant from the system before performing any welding or brazing works.
- Weld and braze heat pump systems without refrigerants only in suitably ventilated rooms.
- If the system emits a pungent smell this means that the refrigerant has decomposed due to overheating. Immediately leave the room and return only after it has been suitably ventilated or when wearing a gas mask for acid gases.
- HFC Refrigerant contributes to the global warming and with this to climate changes. It must be disposed of in accordance with the regulations, i.e. only by companies specially qualified and licensed as recognized disposal companies for refrigerant.

1.3.5 Safety and environmental requirement

The following requirements relate to the operation of refrigerating plants within the European Community.

- The used components must correspond to the pressure equipment guideline 2014/68/UE and EN 378 part 1-4.
- The staffs deal with transportation, installation, operation, maintenance and other activities including the heat pump should obey the requirement in EN 378 and national regulations.
  1) Installation: according to EN 378
  2) Operation: Determination of emergency measures (accidents, malfunctions)
     Creation of an abbreviated instruction and notification
     a. A unit protocol must be kept.
     b. To be stored in the proximity of the unit
     c. Easy to be accessed for qualified staff while repairing or routine maintenance.
  3) Repeated inspection: according to EN 378

All the activities with the unit, such as maintenance, operation, installation, etc. should be carried out by authorized and qualified specialist staff who have perfectly understanding of the unit.
Before maintenance work, the unit must be switched off by the main switch and a warning sign displayed to prevent unintentional switching-on. The safety devices must be kept in a good condition during the whole life cycle of the unit.

First aid measures

- If health problems occur during or after handling fluorinated hydrocarbons, a doctor is to be consulted immediately. The doctor is to be informed that the work involved the use of HFCs.
- In the case of acute effects, wear breath apparatus to transport the casualty is to fresh air as quickly as possible, keeping the victim warm and laying on the ground.
- The casualty must never be left unsupervised.
- In case of contact of the liquefied gas with the skin, sign of freezing, apply warm water to the concerned part. Do not rub the skin. The doctor is to be informed immediately.
- Splashes of fluorinated hydrocarbons in the eyes can be blown out or fanned out by an assistant. Then rinse with water.

Independent conversion and manufacture of replacement parts

The system may only be converted or modified after consultation with MHIAE. Original replacement parts and replacement parts/accessories authorized by MHIAE are an aid to safety.

Unacceptable operating methods

The operating safety of the system is only guaranteed when it is used as intended. The limit values stipulated in the technical data must not be exceeded under any circumstances.

2. Residual risk

DANGER

In case of fire, the pressure of the refrigerant could reach values beyond the safety valve with the consequent possible projection of the refrigerant itself or explosion of the circuit parts that remain isolated by the closure of the tap.
Do not remain in the vicinity of the safety valve and never leave the refrigerant system taps closed.

DANGER

The main switch can be used as an emergency stop when the operator is near theheat pump. The restore of the main switch will immediate restart the unit, without further action by the operator.

2.1 Transport and installation

Area	Danger	Risk	Preventative measures
Under the unit	Faulty lifting system of the unit causing its fall.	Hit, shock, dragging, trapping, crushing	Personnel trained and specialized, lifting system with adequate load capacity. Keep away from the danger area while handling the unit
Beside the unit	Collision with accidental damage to the refrigerant circuit and loss of gas	Burns, formations of acid vapors, fire, chemical effects, projection of fused particles, freezing, corrosion, sliding	Keep away from the danger area while handling the unit. Wear protective equipments (helmet, gloves, safety shoes)
Beside the unit	Support of the unit unstable or inadequate causing its tipping.	Bruises, trauma.	Make sure the unit support is adequate to its weight, is stable and level. Wear protective equipments (helmet, gloves, safety shoes)
Beside the unit	Environmental or weather conditions prevent the correct installation	Slipping, falling, crushing, impact, hit, crash, dragging, trapping, electric shock, burns, fire	Personnel trained and specialized. Keep away from the danger area while handling the unit. Wear protective equipments (helmet, gloves, safety shoes)
Beside the unit	Sharp edges, built-in parts	Cuts, contusions, burns, formation of acid vapours	Keep away from the danger area while handling the unit. Wear protective equipments (helmet, gloves, safety shoes)
Electrical box	Connection cable under voltage, sharp edge of openings for the cable introduction	Electric shock, cable damage at positioning	Check and make sure the unit is de-energized. Stand on isolated ground. Take care that sharp edges are always protected by rubber grommets. Wear protective equipments (helmet, gloves, safety shoes)

2.2 Start-up and operation

Area	Danger	Risk	Preventative measures
Beside the unit	Launch of various objects and tools (screws, nuts, washers, etc.) that can accidentally fall on the fan blades.	Bruises, trauma.	Be sure to remove tools and other installation materials. Wear protective equipments (helmet, gloves, safety shoes). Verify the correct installation of the fixed guards (metallic grids) of the fans. Keep away from the danger area.

Area	Danger	Risk	Preventative measures
Beside the unit	Moving parts (compressors, fans)	Bruises, trauma, shearing, cutting, bump, entrapment	Be sure to remove tools and other installation materials. Wear protective equipments (helmet, gloves, safety shoes). Verify the correct installation of the fixed guards (metallic grids) of the fans and compressors (if available). Keep away from the danger area.
Contact to the unit	Exposed connections, missing grounding cable	Burning, electrocution, fire, shock, fall, push, projection melted particles	Stay electrically isolated from ground. Personnel trained and specialized. Wear protective equipments (helmet, gloves, safety shoes)
Near the refrigeration pipes	Water condensation on refrigeration pipes (if not isolated)	Electrocution, slip	Isolate the tubes. Wear PPE. Install a suitable drain for the condensate
Beside the unit	Losses of refrigerant gas	Fire, burning, scalding, chemical effects, asphyxiation, loss of motility and/or consciousness, freezing.	Open the refrigerant circuit shut-off valves. Personnel trained and specialized. Wear protective equipments (helmet, gloves, safety shoes). Do not use of materials that can create environments with explosion risk.
Beside the unit	Shut-off valves closed after maintenance; fire, explosion of the refrigerant circuit even in the presence of the safety valve, refrigerant projection; high pressure switch defective with explosive consequent interruption of the refrigeration circuit.	Burns, acid vapour formation in the presence of flames	Open the refrigerant circuit shut-off valves. Do not stand in the vicinity of the safety valve (when present). Wear protective equipments (helmet, gloves, safety shoes).
Electrical alimentation	Falsely dimensioned cables or protection devices	Short-circuit, fire, acid vapours	Correctly design alimentation cables and protection elements. Wear protective mask

2.3 Maintenance

Area	Danger	Risk	Preventative measures
Beside the unit	Losses in the refrigeration circuit; high pressure switch faulty; fire, explosive interruption of the refrigeration circuit.	Burns, acid vapour formation in the presence of fire, asphyxiation, loss of motility and/or consciousness.	Open the refrigerant circuit shut-off valves. Personnel trained and specialized. Wear protective equipments (helmet, gloves, safety shoes). Do not use of materials that can create environments with explosion risk.
Contact with the unit	Contact with hot and/or cold surfaces	Burns, freezing	Avoid contact. Wear protective equipments (helmet, gloves, safety shoes).
Contact with the unit	Contact with cutting surfaces	Cuts, scrapes, bruises	Avoid contact. Wear protective equipments (helmet, gloves, safety shoes).
Electrical cabinet	Cable under voltage also with main switch OFF	Electrocution	Verify the absence of power supply. Make sure the main switch can not be turned ON during maintenance.
Fans	Contact with moving surfaces.	Cuts, scrapes, bruises	Be sure to turn off the power during maintenance. Wait the compleat stop of the moving parts. Wear PPE.
Hot components (compressor, refrigerant piping)	Contact with hot surfaces.	Burns	Wear PPE.

2.4 Dismantling

Area	Danger	Risk	Preventative measures
Beside the unit	Losses the refrigerating circuit. Faulty refrigerant recovery system. Explosive rupture of the refrigeration circuit.	Burns, acid vapour formation in the presence of flames	Open the refrigerant circuit shut-off valves. Personnel trained and specialized. Wear protective equipments (helmet, gloves, safety shoes). Do not use of materials that can create environments with explosion risk.
Beside the unit	Oil leaks	Contact with skin or eyes	Wear protective equipments (helmet, gloves, safety shoes).
Refrigerant piping	Soldering off or cutting the refrigerant pipes still under pressure	Discharge of refrigerant under high pressure, burns in case of contact to the skin	Depressurize pipes before disconnecting them. Wear safety glasses and gloves
Water piping	Unscrewing the water pipes still under pressure	Discharge of water under high pressure, contact with the skin of ethylen glycol, increased risk of electric shock in combination with electricity, risk of slipping	Drain of cooling water by drain valve. Wear rubber gloves
Electrical box	Live electrical alimentation cable	Electric shock	Check de-energized state of the alimentation before dismantling, wear safety gloves

2.5 Safety Data

Refrigerant Gas

Safety data of the refrigerant		
1. Product identification	Preparation identification	REFRIGERANT R32
	Recommended use	Refrigerant
2. Hazard identification	Most important hazards	Extremely flammable gas. Contains gas under pressure; may explode if heated. My displace oxygen and cause rapid suffocation.
3. First aid measures	Inhalation	Remove from exposure, lie down. Move to fresh air. Artificial respiration and/or oxygen may be necessary. Consult a physician.
	Contact with skin	Take off all contaminated clothing immediately if not stuck to the skin. Flush area with lukewarm water, do not use hot water. If frostbite has occurred, call a physician.
	Contact with eyes	Hold eyelids apart and flush eyes with plenty of water for at least 15minutes. Get medical attention.
	Notes for the doctor	Do not give adrenaline or similar drugs. Burns pack should be available on the premises.
4. Fire fighting measures	Extinguishing media	Use extinguishing measures that are appropriate to local and surrounding environment. Cool cylinders/tanks with water spray.
	Specific hazard	Possibility of hazardous reactions during a fire due to the presence of fluorine groups. Pressure build-up in cylinders/tanks may cause violent rupture of packages. This product can ignite when mixed with air under pressure and exposed to strong ignition sources.
	Advice for fire-fighters	Wear self-contained breathing apparatus and neoprene gloves during cleaning work after a fire.
5. Accidental release measures	Personal precautions	Evacuate personnel to safe areas. Ventilate the area especially low or enclosed places where heavy vapor might collect.
	Environmental precautions	Should not be released into the atmosphere.
6. Handling and storage	Handling requirements	Avoid breathing vapors or mist, avoid liquid contact with skin and clothing. Provide sufficient air exchange / exhaust in work rooms.
	Cylinder handling	Do not drag, slide or roll cylinders. Never attempt to lift cylinder by its valve or cap. Use a check valve or trap in the discharge line to prevent back flow into the cylinder.
	Storage conditions	Store in cool, dry well-ventilated place. Temperature not exceed 45°C. Keep valves tightly closed.
	Suitable packaging	Store in original cylinder only. Protect from contamination.

7. Stability and reactivity	Conditions to avoid	The mixture may become flammable or reactive when pressurized with oxygen. Avoid heat, hot surfaces and open flames. Do not expose to temperatures exceeding 52°C. Do not store in confined space of basement, store in well ventilated place.
	Hazardous decomposition products	Thermal decomposition yields hazardous, toxic products which can be corrosive in the presence of moisture. These may include hydrogen fluoride, carbon oxides, halogenated compounds and carbonyl halides.
8. Exposure controls / personal protection	Workers exposure routes	7035 mg/m^3
	Engineering measures	Ensure adequate ventilation, especially in confined areas. Local exhaust should be used when large amounts are released.
	Respiratory protection	For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapors are heavier than air and can cause suffocation by reducing oxygen available for breathing.
	Hand protection	Leather gloves
	Eye protection	Wear safety glasses or coverall chemical splash goggles. Eye protection complying with EN166 or ANSI Z87.1. Wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
	Skin protection	Wear clothing that covers legs, arms and impervious clothing.
	Protective measures	Self-contained breathing apparatus (SCBA) is required if a large release occurs.
	Environmental	Gas escapes to be kept to the minimum by engineering processes and operating methods.
9. Toxicological information	Acute toxicity - Inhalation Irritation and sensitization	LC50/4 h rat > 520 000 ppm. No skin / eye irritation and no skin sensitization, bases on expert review of the properties of the mixture.
	Repeated dose toxicity	Inhalation rat: no toxicological significant effects were found.
	Carcinogenicity	Not classifiable as a human carcinogen.
	Toxicity to reproduction	No toxicity to reproduction.
	Mutagen assessment	Animal testing and tests on bacterial or mammalian cell cultures did not show any mutagen effects.
	Assessment teratogenicity	No teratogenic effects in animal experiments.
10. Disposal considerations	Disposal of product	Do not allow product to be released into the environment
11. Transport information	UN number	3252
	Proper shipping name	Difluoromethane
	Transport hazard class	2 (ADR) - 2.1 (IMDG) - 2.1 (IATA)
	Tunnel code	B/D
	ImS Code	F-C, S-V
12. Regulatory information	Regulation	Directive 98/24/EC on protection of the health and safety of workers from the risks related to chemical agents at work
	Chemical safety assessment	It has been carried out by the supplier of this mixture

⚠ WARNING

Please, refer to the specific "Safety Data Sheet" of refrigerant gas

Compressor oil

Safety data of the oil		
1. Identification of the substance / preparation	Identification of preparation	ENEOS MB75R
	Intended use	Synthetic refrigeration compressor oil

⚠ WARNING

Please refer to the data sheet of compressor oil

3. Transport/ Storage

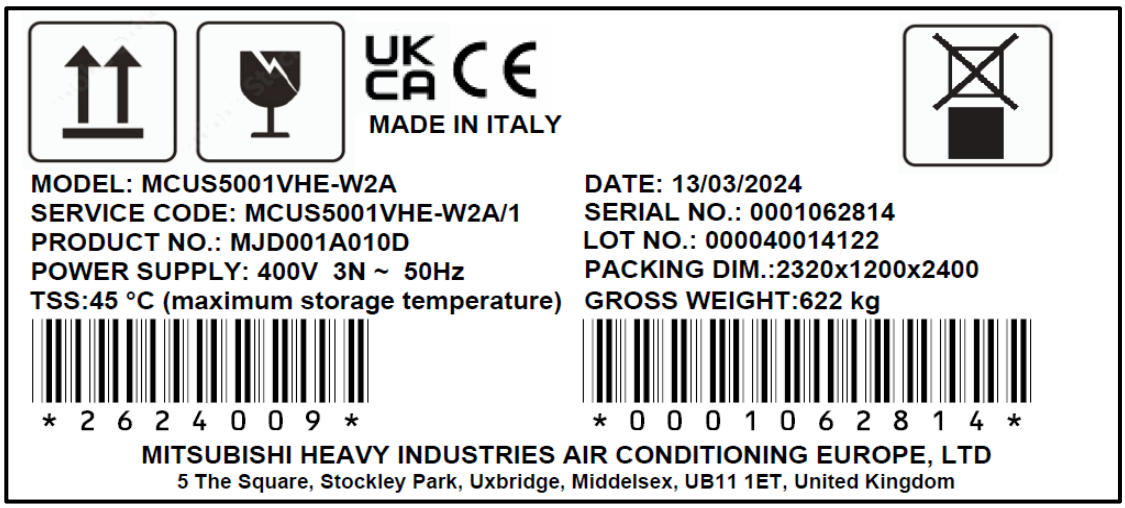
3.1 Delivery of units

To assure a persistent quality and reliability, all units are tested and inspected before leaving the factory. The heat pumps are completely assembled when shipped and contain refrigerant under pressure.
The units must always be transported upright.

INFORMATION

The refrigerant circuit is filled with R32 refrigerant ready to be used.

The unit is labelled as below.



DANGER

- The refrigerant is non-toxic and slightly flammable (A2L).

INFORMATION

- Due to the pre-filled refrigerant, the unit is marked as transport of dangerous goods.
- For special shipping indication, please contact the corresponding sales department.
- Special transport regulations must be checked country specifically.

INFORMATION

When delivery is accepted, the unit is to be checked against consignment papers for completeness and checked for external damage which is to be recorded on the consignment papers in the presence of the freight forwarder.
• You receive the consignment papers with the delivery of the heat pump.
• The shipment is made ex works, in case of shipment damages, please assert your claim directly towards the carrier.

3.2 Storage

If you put the unit into intermediate storage before the installation, the following measures have to be carried out to protect the unit from damage and corrosion:

• Make sure that the water connections are provided with protective hoods. If the intermediate storage exceeds 2 months, we recommend filling the pipes with nitrogen.

• The temperature at the storage point should not be higher than 45℃ and not lower than –5℃, and the site should not be exposed to direct sunlight. If the temperature is over 45℃, there's a risk to activate the safety valve, and have the refrigerant leak out of the unit.

• The unit should be packaged before the storage to avoid the risk of damage and corrosion especially of the heat exchanger fins.

• The unit should be stored in a location with minimum activity to reduce the risk of accidental physical damage.

• A periodic inspection is highly recommended. If your heat pump contains refrigerant gas during the storage period you also have to consider the current F-Gas regulations and EN 378.

⚠ WARNING

If the heat pump remains switched off in thermal equilibrium with the environment, unless specifically received at the time of ordering, the storage conditions listed above must be observed.

3.3 Transport

The unit can be lifted and moved by lifting devices with ropes or belts. There are lifting holes on the top of frame for this purpose.

The drawings on the following pages show the dimensions for the lifting points and the position of the centre of gravity. Make sure to keep the unit stable while lifting.

ⓘ INFORMATION

The rope forces are higher than the weight forces according to the geometry. Due to the risk of scratching the side planking we advise not to use chains.

⚠ DANGER

Make sure that the maximum capacity of the lifting equipment is greater than the total weight of the units . Check that the load is stable before proceeding with raising.

⚠ WARNING

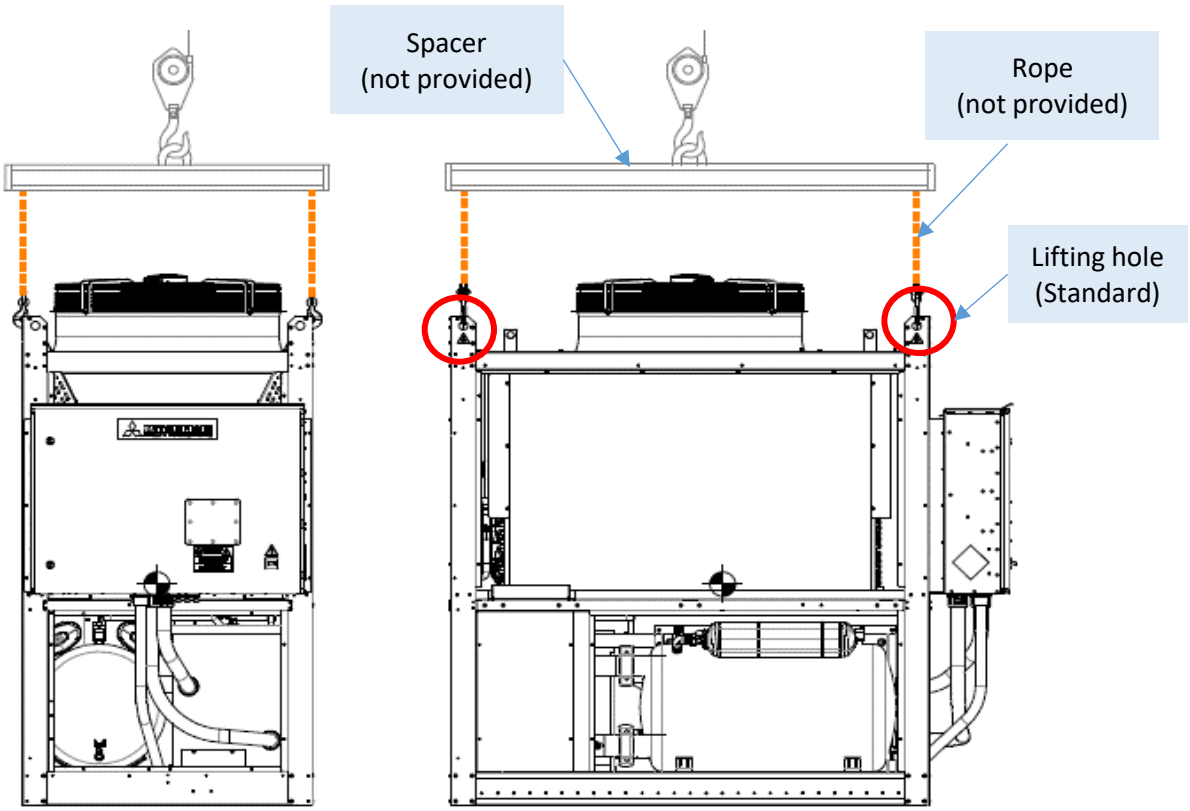
All the units are designed to be lifted and moved with empty hydraulic circuit

3.3.1 Transport protection

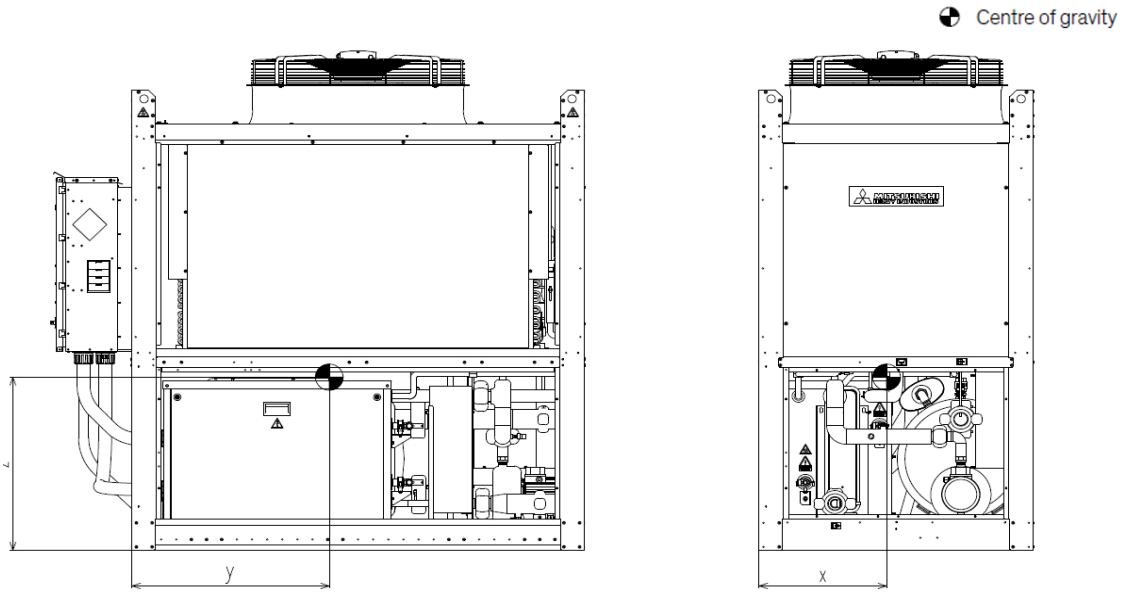
The standard packaging of the unit includ a wood pallet and bubble wrap around the heat pump and card board to protect the corner.

⚠ WARNING

Flammable refrigerant is used in this unit, which makes it unsuitable for air transportation.



3.3.2 Centre of gravity



MODEL NAME	MCU5001VHE-W	MCU5001VHE-W1 MCU5001VHE-W2	MCU5001VHE-W1A MCU5001VHE-W2A
x/mm	540	570	610
y/mm	1080	1021	1063
z/mm	1031	974	910
Weight/kg	490	556	622

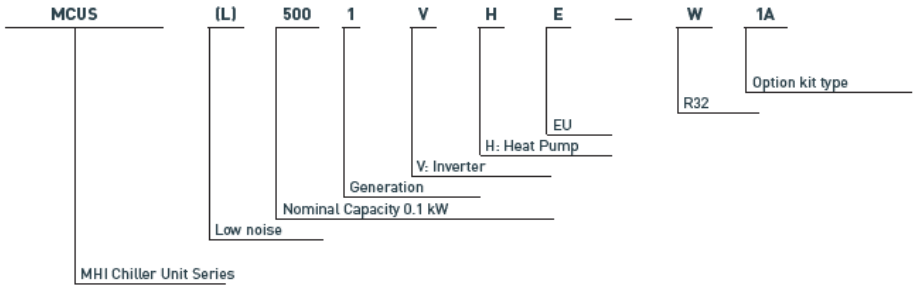
4. Description

4.1 Model list

The model name represents the variant of your heat pump unit and can be found on the nameplate located on the side of the electric cabinet. You can decode the type code by the following table.

Product Series				Model Name	Product Number
Heat Pump	Standard	50kW	Pumpless	MCUS5001VHE-W	MJD001A010
			With LP pump	MCUS5001VHE-W1	MJD001A010A
			With LP pump+buffer tank	MCUS5001VHE-W1A	MJD001A010B
			With HP pump	MCUS5001VHE-W2	MJD001A010C
			With HP pump+buffer tank	MCUS5001VHE-W2A	MJD001A010D
MHI Accessories		Wired remote controller		RC-MCU-E	PJZ502A036BB
		Group controller		MCU-C-E	MJD501A040
		Guard Grid (Top)		GG-T-MCUS	MJD131A037
		Guard Grid (Bottom)		GG-B-MCUS	MJD131A038

Unit configuration



4.2 Intended use

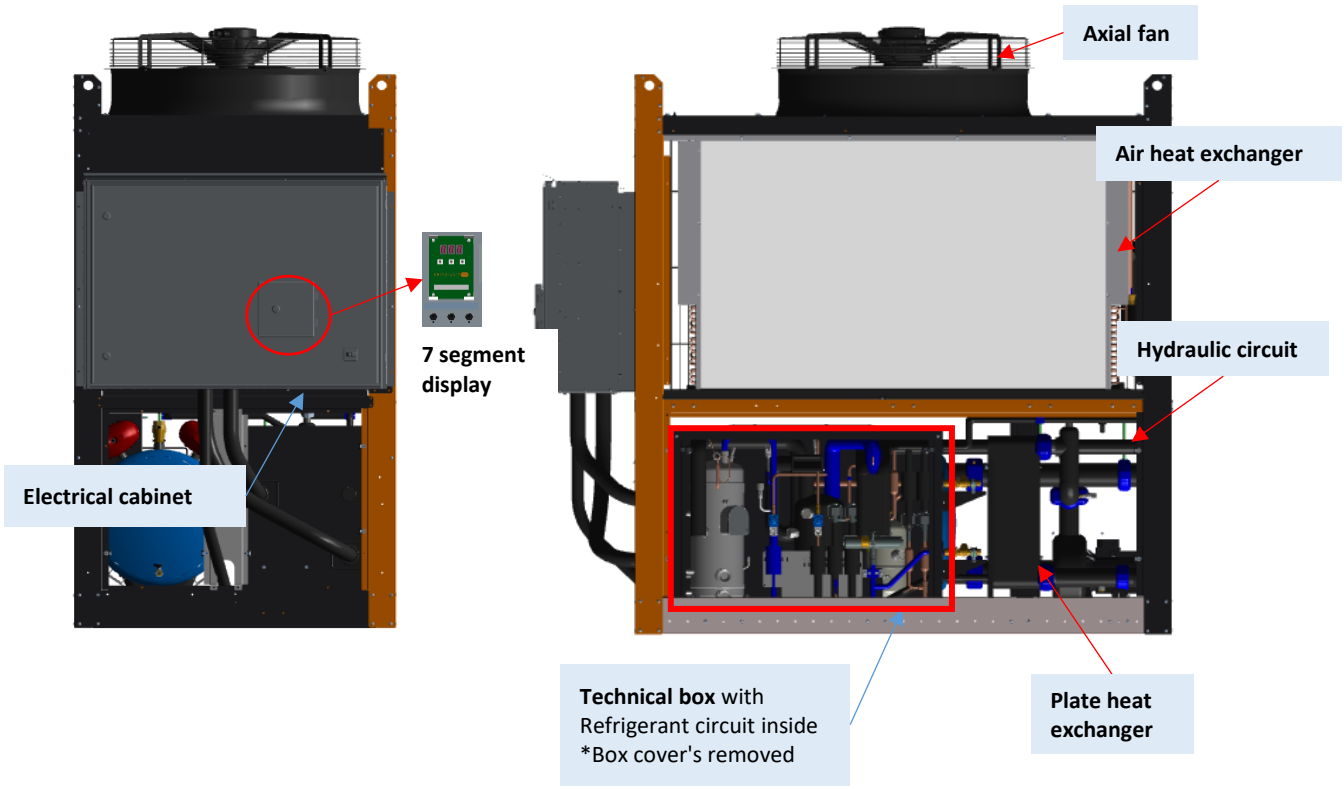
This heat pump is intended for the hot or chilled water production and for the water temperature control. The heat pump is designed for outdoor . Any use beyond this is not intended. MHIAE is not liable for any damage resulting from such misuse. The operator alone bears the risk.

4.3 Unit design

In the Hydrolution PRO series of heat pumps, they're 3 kinds of capacities: 50kW, 75kW and 100kW. The dimension of 50kW and 75kW unit is the same, which 100kW is bigger.
The 50kW heat pump consists of one refrigerant circuit with a scroll compressor, one set of tube fin air heat exchanger, a single plate heat exchanger, 4 electronic expansion valves.
After assembling, each unit is pressure tested, evacuated and fully factory charged with R32 and oil . The end of line test also includes an operational test with water flowing through the plate exchanger to ensure that the refrigerant circuit operates correctly.
Safety devices such as pressure switch and safety valves, are used in the refrigerant circuit to prevent over pressure.

Safety device	Set pressure/bar
High pressure switch	41.5
HP safety valve	43
LP safety valve	30
Hydraulic safety valve (Only the models with built-in tank)	4

Layout of 50kW standard unit



4.4 Piping diagrams

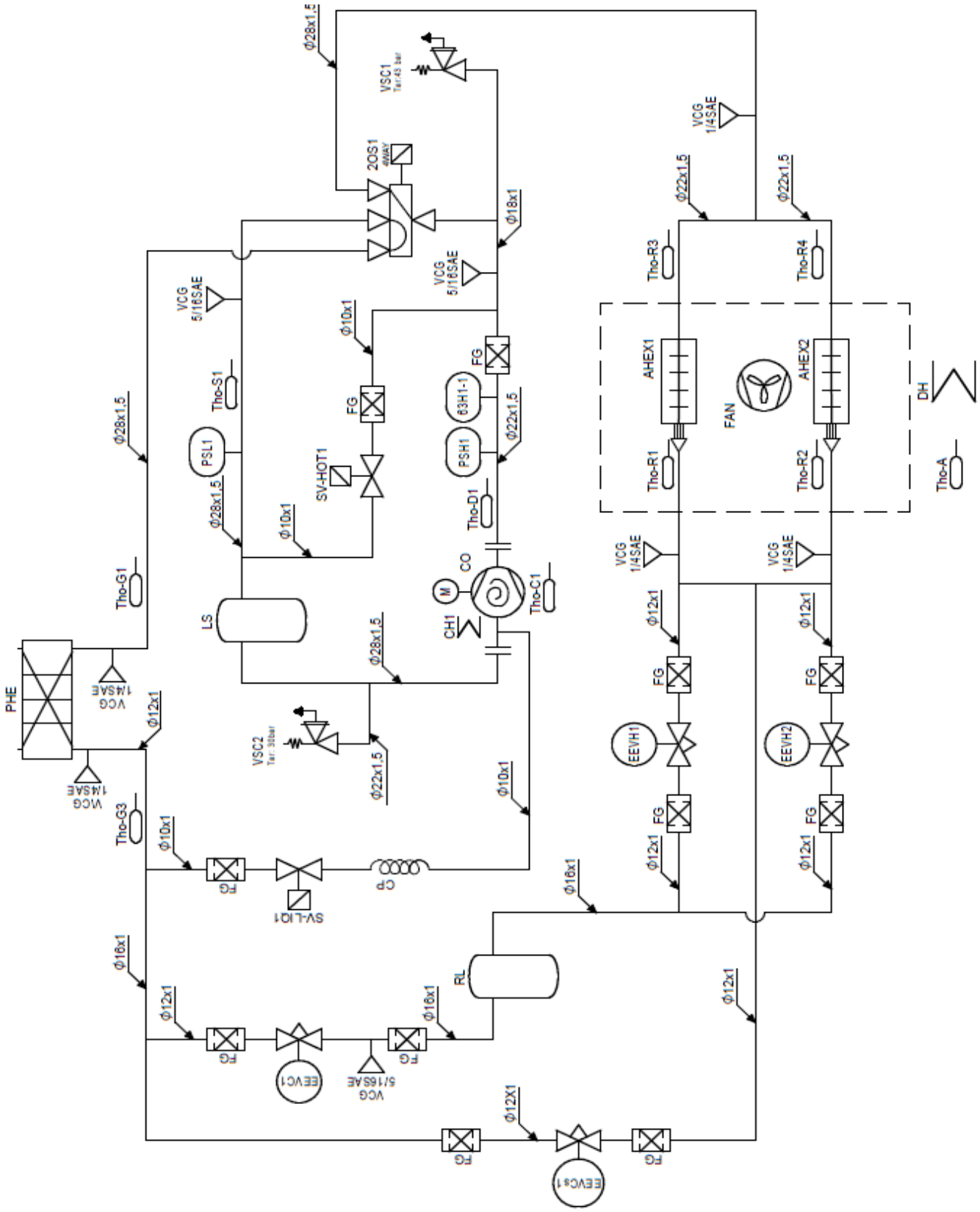
Symbol

Symbol	Meaning
	Air heat exchanger
	Fan
	Compressor
PSH1	High pressure transducer
PSL1	Low pressure transducer
PHE	Plate heat exchanger
FG	Refrigerant filter
	Temperature sensor
63H1-1	High pressure switch
DH	Drain pan heater

Symbol	Meaning
2051	4-way valve
	Solenoid valve
EEVH1	Electronic expansion valve
	Safety valve
CP	Capillary
	Service valve
LS	Accumulator
RL	Receiver
PSW1	Inlet pressure transducer
PSW2	Outlet pressure transducer

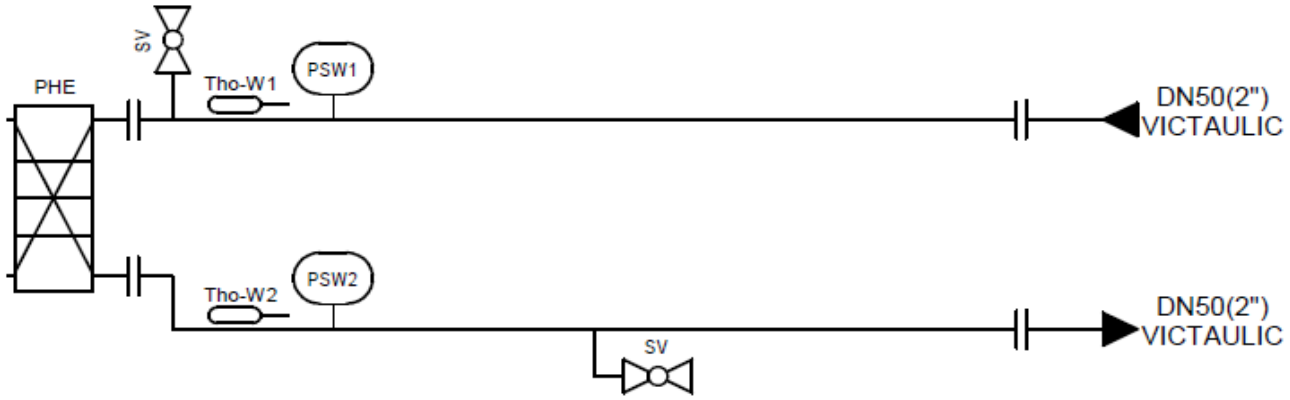
Symbol	Meaning
PW	Pump
VAP	Buffer tank
SV	Shut-off valve (Also for air vent, drain tap)
ABV	Automatic air vent valve
VBV	Vacuum breaker
VX	Expansion tank
	Disconnectable joint
	Inlet
	Outlet

MCU5001VHE-W,
MCU5001VHE-W1, MCU5001VHE-W2,
MCU5001VHE-W1A, MCU5001VHE-W2A

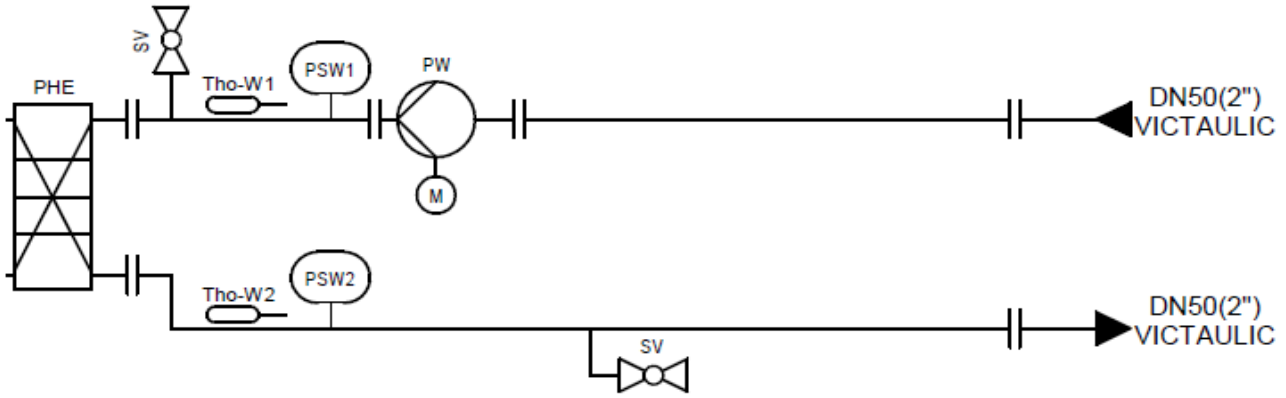


4.5 Hydraulic diagrams

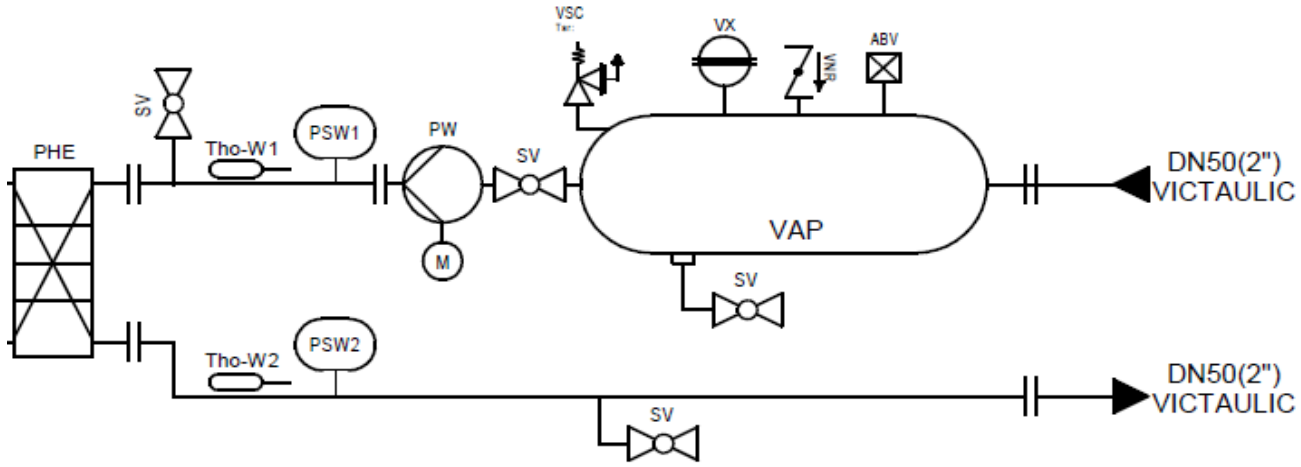
MCU5001VHE-W



MCU5001VHE-W1, MCU5001VHE-W2



MCU5001VHE-W1A, MCU5001VHE-W2A



5. Technical Data

5.1 Application limits

Item		
Power supply	Rated voltage	400V 3N ~ 50Hz
	Voltage fluctuation	Within ±10% of rated voltage
	Voltage drop at startup	Within -15% of rated voltage
	Interphase unbalance	Within 2%
Compressor ON/OFF Frequency	1 cycle time	5 min or more (OFF – OFF or Startup – Startup)
	Stop time	3 min or more (There's a restart prevention function to protect compressor.)
Cold/hot water pressure		0.7 MPa or less (1.0 MPa or less for model without pump)
Cold/hot water inlet temperature change		5°C or less/10 min (Note 1)
Flow rate change rate		10% or less of rated flow rate/min (Note 1)
Cold/hot water temperature range	Cold water inlet temp. upper limit at rated operation	35°C at I/O temp. difference 5°C, 40°C at I/O temp. difference 10°C (Note 2)
	Hot water inlet temp. lower limit at rated operation	20°C at I/O temp. difference 5°C, 15°C at I/O temp. difference 10°C (Note 3)
	In-/outlet temperature difference at rated capacity	5 - 10°C

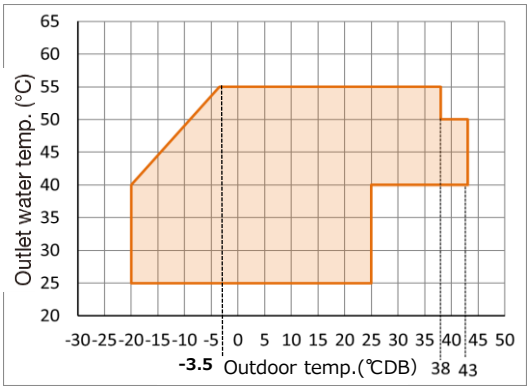
(Note 1) If the cold/hot water inlet temperature change and flow rate change occur simultaneously, suppress the changes smaller further.

(Note 2) Re-design the facility such that the inlet water temperature will become 25°C or under within 45 minutes after starting cooling operation.

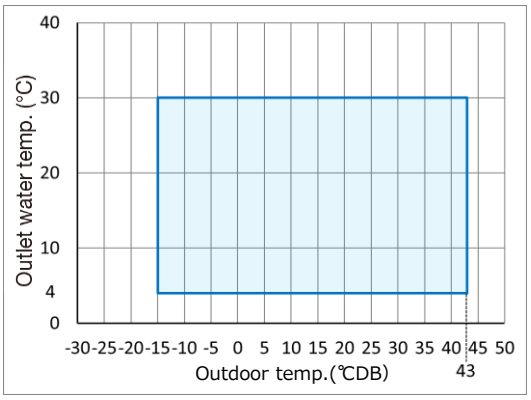
(Note 3) Re-design the facility such that the inlet water temperature will become 10°C or higher within 20 minutes, and 25°C or higher within 45 minutes, after starting heating operation.

Range of usage

Heating



Cooling



5.2 Water quality

INFORMATION

The following limits for the water circuit must not be exceeded

DANGER

Don't operate the heat pump, or stock water in the hydraulic circuit, when outlet water temperature is lower than +5℃, or the ambient temperature is lower than 15℃.

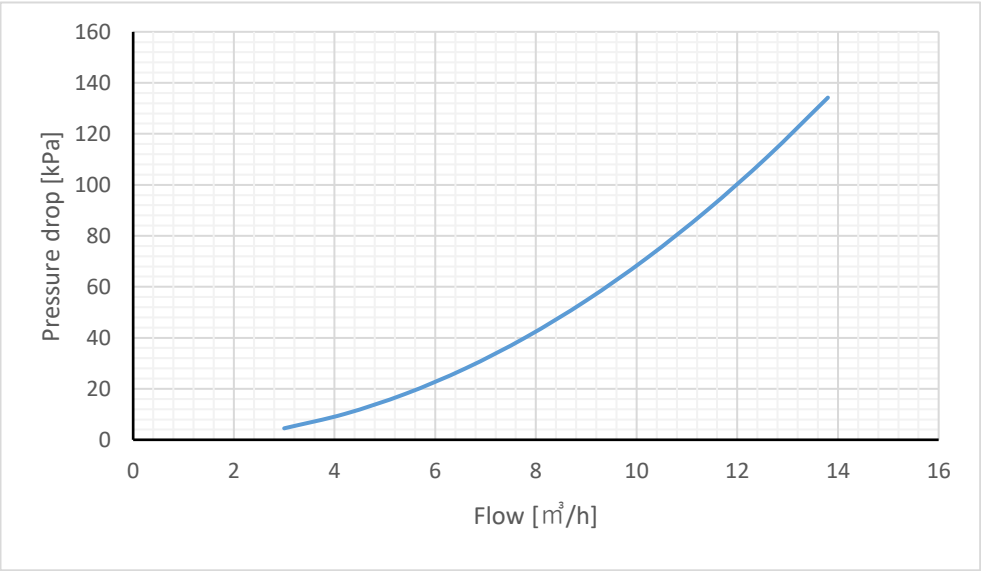
It's recommended to use water under the request as below.

No.	Feature		Value
1	pH	(25°C)	7.5 - 9.0
2	Electrical conductivity	(mS/m)(25°C)	<30
3	Chloride ion	(mgCl-/L)	<70
4	Sulfate ion	(mgSO42-/L)	<100
5	Ammonium ion	(mgNH4+/L)	<0.5
6	Total hardness	(mgCaCO3/L)	75 - 150
7	Iron	(mgFe/L)	<1.0
8	Chlorine molecular	(mg Cl2/l))	< 0.5

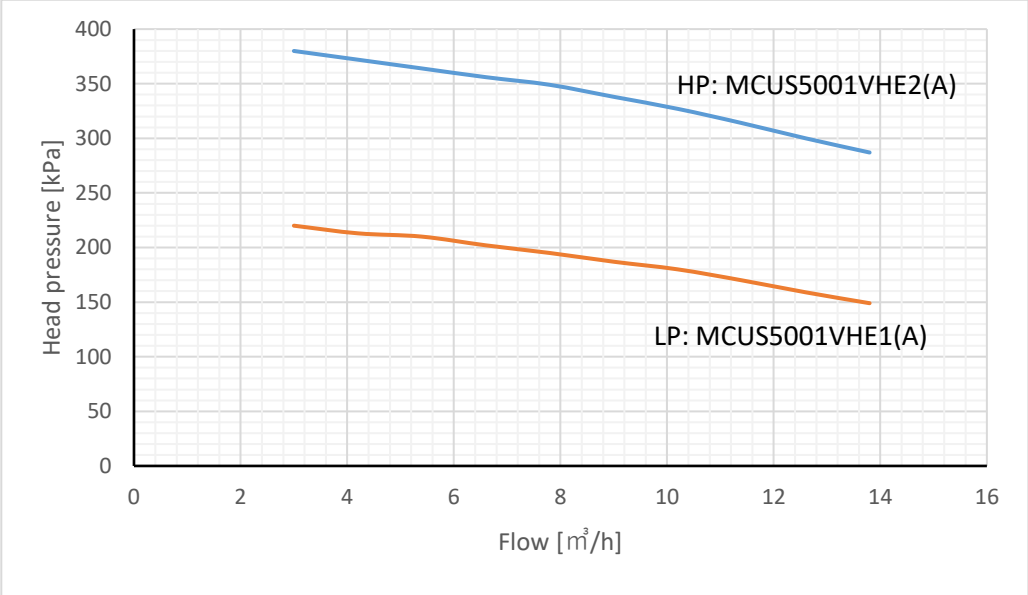
5.3 Pressure drops

With the following graphs you will find the pressure drops for different version of the heat pump.

Pressure drop of standard pumpless unit



Head pressure with optional pump



5.4 Technical data

			Model	50kW
Compressor (inverter scroll)				50kW x 1
Cooling Capacity	Nom.		kW	44.0
	Max.		kW	50.0
Heating Capacity	Nom.		kW	47.0
	Max.		kW	50.0
Power Input		Cooling	kW	15.1
		Heating	kW	13.5
Capacity Control		Method	-	Inverter Controlled
		Min	%	20
		Max	%	100
EER			-	2.91
COP			-	3.47
SEER			-	4.48
Seasonal Space Heating Class Average Climate General Water Outlet 35°C		ηs	%	180%
		SCOP	-	4.59
		Class	-	A+++
Dimensions		Height	mm	2,186
		Width	mm	1,135
		Length	mm	2,209
Water Heat Exchanger	Type			Brazed Plate
	Water Pressure Drop	Cooling	kPa	37.6
		Heating	kPa	44.5
Rated Operation		Cooling	°C	12/7
		Heating	°C	40/45
Water Flow Minimum - Maximum			m3/h	3.0～13.8
			L/min	50～230
Minimum System Water Volume			L	1276 (1) / 319 (2)
Hydraulic Connecting Type				Victaulic joint
Hydraulic Connections			mm	2B(50A)
Compressor Configuration		Type		Hermetically sealed Scroll Compressor
		Quantity	n°	1
		Minimum rps	rps	20
		Maximum rps	rps	90
Fan Type				Propeller Fan
Quantity of Fan & Motor			n°	1
Maximum Fan Speeds			rpm	720
Refrigerant		Type		R32
		Charge	kg	6.7
		Circuit Quantity	n°	1
		GWP		675
		Control		Electric Expansion Valve
Oil		Type		MB75R
		Charge	L	2.2
Acoustic Data		Sound Power	dB(A)	86dBA
		Sound Pressure	dB(A)	68.5dBA
Water pump	Rated output of the motor		kW	LP:0.9/HP:1.8
	Rated operating current		A	LP:1.2/HP:2.2
	Rated unit outside head (at 5°C Difference)		m	LP:17/HP:27
Hydraulic Specifications	Water volume of Buffer tank		L	180
	Expansion tank volume		L	8.0
	Expansion vessel pressure		bar	4.0
	Max. water-side operating pressure with hydraulic module		bar	4.0
	Safety valve setting (pump suction side)		bar	4.0

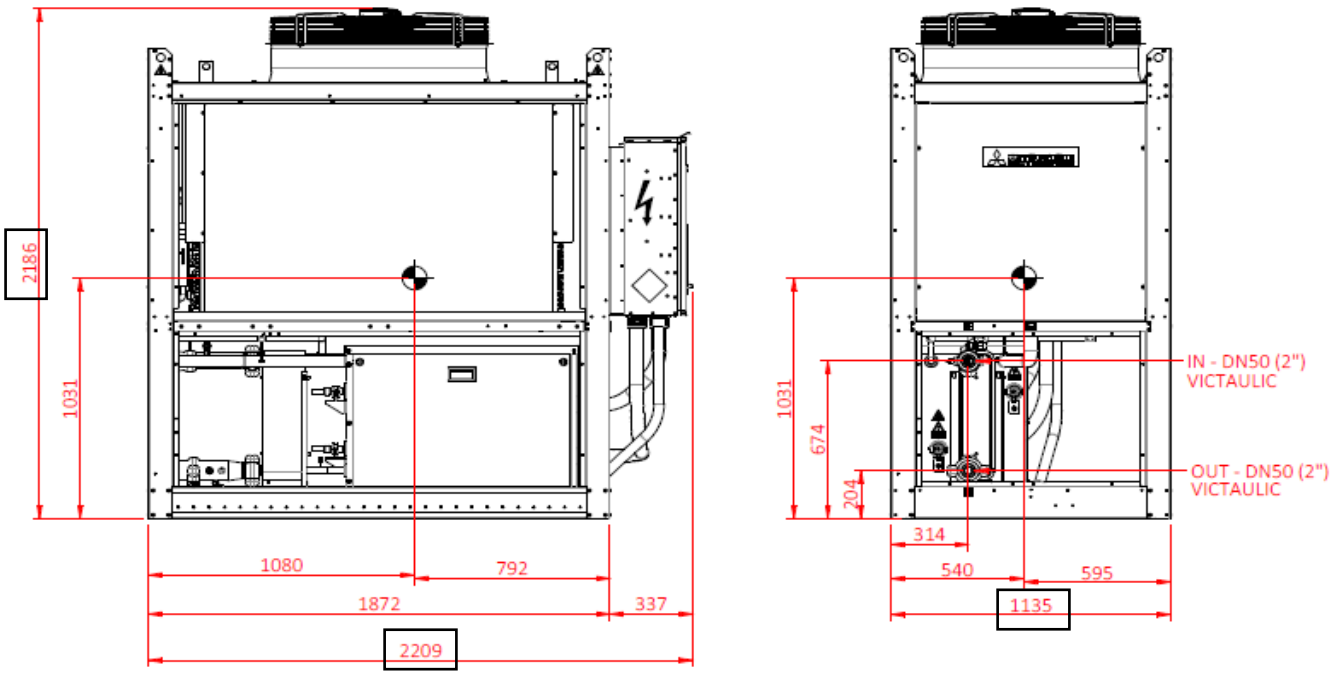
(1) Minimum allowable temperature deference 0.5 deg. (inlet water temp. and set point) for unit to start running.

(2) Minimum allowable temperature deference 2.0 deg. (inlet water temp. and set point) for unit to start running.

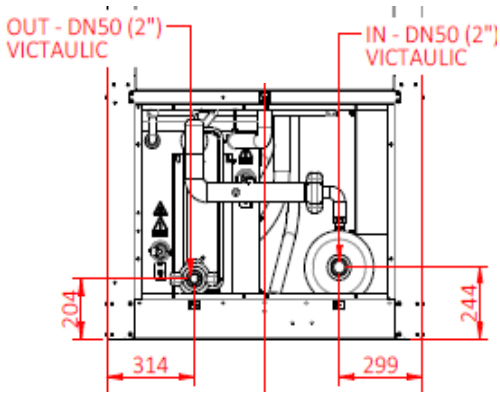
5.5 Dimensional drawings

Standard pumpless unit (MCUS5001VHE-W)

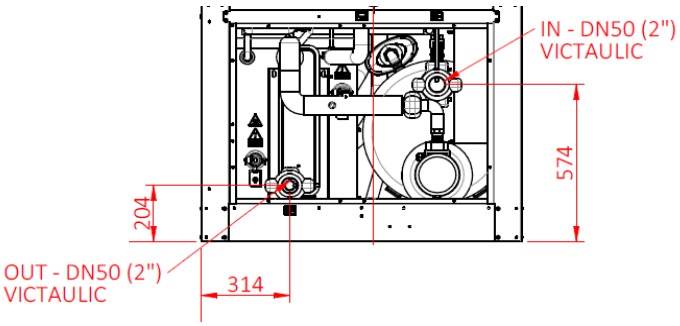
dimensions are same for all models



Standard + optional pump (MCUS5001VHE-W1, MCUS5001VHE-W2)



Standard + optional pump & tank (MCUS5001VHE-W1A, MCUS5001VHE-W2A)



6. Installation

6.1 Positioning

DANGER

Requirements with regard to A2L refrigerants
For installation in a or above a catchment area, the catchment area must be monitored for gas leaks.
In case of an increased installation on roof of buildings, it must be checked whether a lightning protection is necessary. This is also dependent of the explosion zone classification.

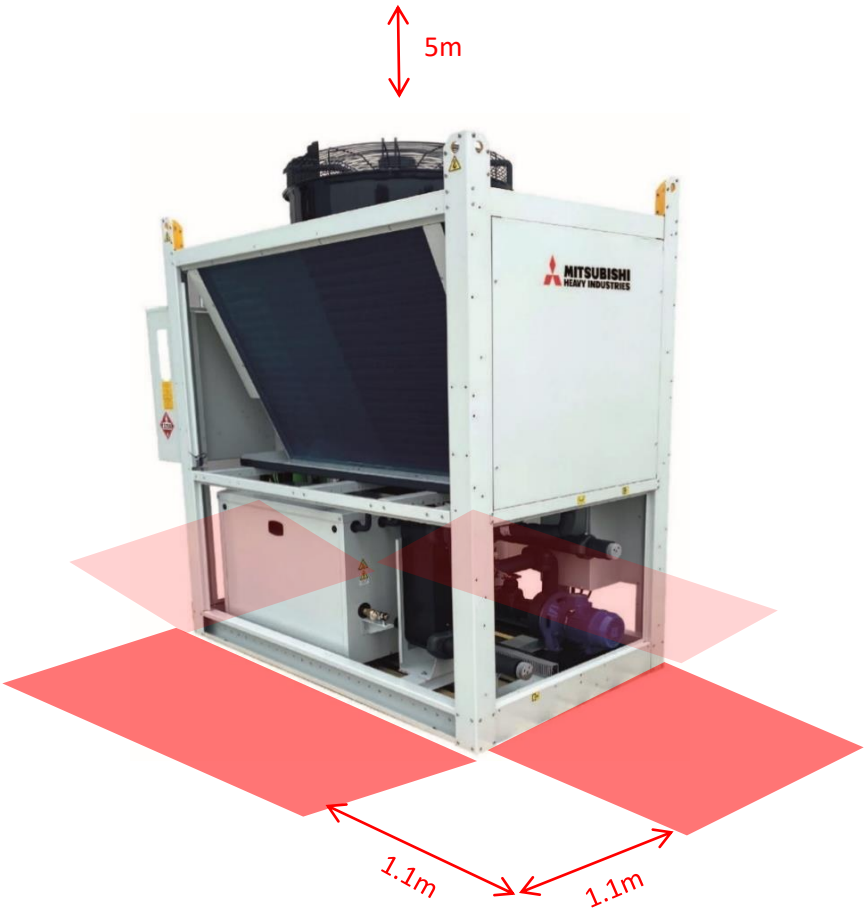
INFORMATION

Respect the relevant requirements for installation according to national regulations and EN 378.

Check that the installation site is prepared for the unit weight, which is defined in the technical data in "3.3.2 Centre of gravity " . The heat pump is designed for outside installations on a horizontal level base. For an even weight distribution, a base plate made of concrete is necessary.

- The unit should not be placed, related to the wind direction, behind heat emitting devices (e.g. chimneys) or sources of dirt and airborne chemicals (e.g. exhalation outlet hoods). Greasy and floating particles contained in the air are otherwise deposited at the condenser fins and reduce the heat transmission.
- Installation sites, which are subject to heavy snow-drifts, are unsuitable in the same way as sites where inundations can take place and a high sun exposure is present.
- For locations where outer influences might affect the airflow, an enclosure or louvre is recommended. Please consider negative impacts on the airflow by near obstacles.
- Further make sure that the site does not encourage a short-circuit of air from the air discharge to the condenser intake by aerodynamically disadvantageous conditions.
- When selecting the installation site take into account the necessary clearances for the maintenance and the air flow. Keep a clearance of 1.1 m to all sides of the unit.
- Above the fans a clearance of 5 m is required.
- If the unit is positioned in an area which is accessible to unauthorized persons, it is recommended to take steps for preventing vandalism and accidental damage.
- To avoid possible noise and vibration transmission the use of anti vibration mounts is recommended.
- Avoid following atmospheric conditions. Resulting corrosion, or other, could cause electric shock or fire.
  · Explosive atmosphere such as sulfuric gas
  · Where materials detrimental to equipment, such as ammonium, sulfuric gas, chlorine gas or alkali, may generate.
  · Where powder of carbon textile, metal or other materials is floating.
  · Where cosmetic or other special sprays are used frequently or where exposed to exhaust of such sprays.
  · Where thickly loaded with oil fume or steam (cooking room, machine factory) or where exposed to exhaust from such place.
  · Where smoke from chimney is blown over.
- Use ladders and / or scaffolding that comply with applicable laws.
  After installing the unit, check its horizontal alignment using a spirit level.

Minimum distance from obstacle or other heat pump



The free space, indicated by red areas, is required to allow correct access to the unit for maintenance and replacement of components.

INFORMATION

The minimum distance must be guaranteed from any kind of obstacles: pipes, walls, other unit, etc.

6.2 Special requirements for installation

⚠ DANGER

An unsuitable location of the unit can cause danger to persons, object and environment. Please follow the prescription of this manual before the installation of the unit.

- Access permitted only for instructed personnel doing the maintenance.
- Adequate ventilation must be ensured.
- Free flames not permitted. Only welding, brazing or similar activity are permitted if an adequate ventilation is ensured.
- It must ensured an adequate ventilation for normal operation and emergency.

Possible ignition sources on the installation site

Refer to the table below which types of ignition sources are usually relevant to evaluate for refrigeration systems.

Relevance of ignition sources from EN 1127			
Clause in EN1127–1	**Ignition sources listed in EN 1127–1**	**Usually relevant to evaluate for refrigeration systems under normal operation**	**Examples**
5.1	Hot surfaces	Yes	Electrical heaters
5.2	Flames and hot gases	Yes	Gas heaters
5.3	Mechanically generated sparks	Yes	During service
5.4	Electrical apparatus	Yes	Electrical sparks from opening circuits
5.5	Stray electric currents and cathodic corrosion protection	No	-
5.6	Static electricity	Yes	Large plastic surfaces
5.7	Lightnin	No	It is highly unlikely that lightnin will hit at the same time as a leak is occurring
5.8	Radio frequency (RF) electromagnetic waves from 104Hz to 3 × 1 011 Hz	No	-
5.9	Electromagnetic waves from 3 × 1 011 Hz to 3 × 1 015 Hz	No	-
5.10	Ionizing radiation	No	-
5.11	Ultrasonics	No	-
5.12	Adiabatic compression and shock waves	No	An air compressors takig air from the vicinity of a leak
5.13	Exothermic reactions, including self - ignition of dusts	No	-

- As protection against overpressure, the refrigerant circuit is equipped with 2 safety valves. One is on the high low pressure side, the other one is on the low pressure side.
- The outlets of the safety valves must be routed to a point reasonably far away from the unit. If necessary, it is recommended to connect them with exhaust pipelines. The pipeline dimension (diameter, length) must comply with national laws and European directives.

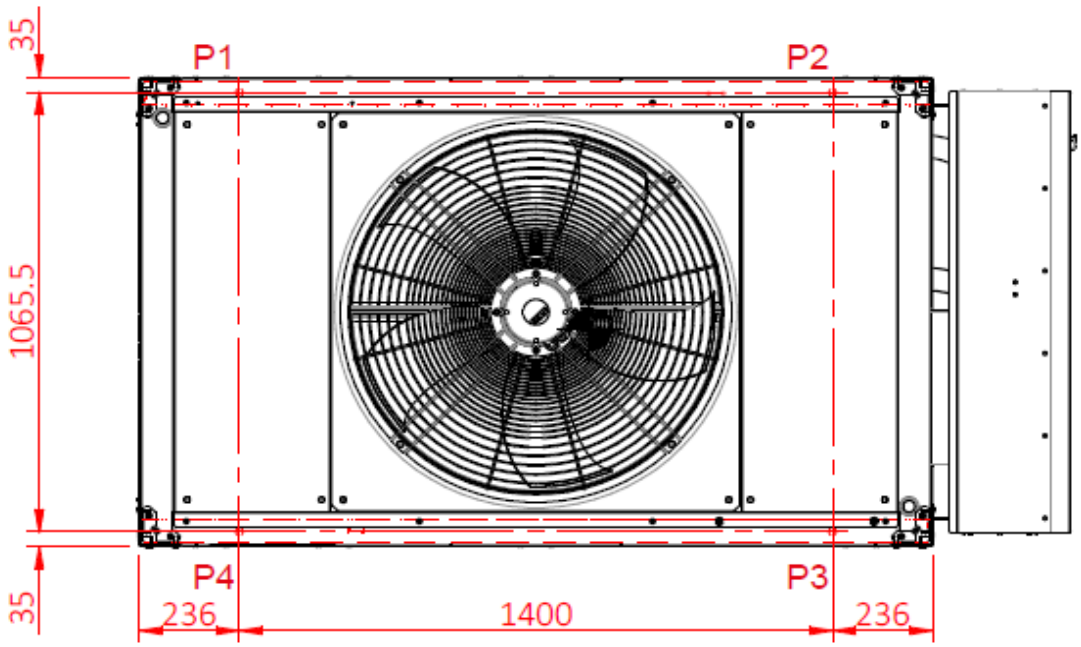
(Connection size of safety valves are both 3/4" G male.)

6.3 Installation foundation

When planning installation and constructing the foundation, take care of following items.

- Where the unit is placed, finish the floor with mortar and provide a flat, horizontal surface. The levelness should be within 3/1,000.
- Rain and condensed water are drained from the bottom of unit. Waterproof the foundation, and provide a drain ditch around the foundation.
  When the unit is installed on a mat foundation, provide a drain ditch under the unit not to block the drain outlet at the bottom of unit.
- Where the unit is raised, use a steel frame with sufficient strength, which will not sag.
- Provide a sturdy foundation that can withstand the operating weight of the product.

Weight on the supports



MODEL NAME	MCU5001VHE-W	MCU5001VHE-W1 MCU5001VHE-W2	MCU5001VHE-W1A MCU5001VHE-W2A
Weight /kg	490	530	622

※With no water inside

※There's 4 holes with the diameter of 18mm at the bottom of unit frame.

6.4 External water circuit

The basic water circuit of a standard heat pump contains an plate heat exchanger, temperature and pressure sensors in the inlet and outlet, vent valve and drain plug. For a detailed overview, please take a look at the circuit diagram in chapter "4.5 Hydraulic diagrams.

⚠ WARNING

Do not add any other fluids or additives to the hydraulic circuit except water. Please check chapter "5.2 Water quality" for detailed information about water quality requirements.

⚠ DANGER

The discharge of the safety valve must be positioned in a proposed area so that the leaving fluid will not endanger persons.

General

- Provide joints and valves on piping, which are easy to access.
- To keep the unit working stably, do not change temperatures or flow rate of supply water suddenly.
- Drain all the water from unit, if the power supply may be stopped and ambient temperatures drop below 0ºC.
- Where two or more units are installed, use the reverse return piping to equalize the flow rate to each unit.
- Avoid water hammers on the unit.

Additional components

- Suitable connection pipes according to the drawings in this chapter.
- Stop off valves upstream the unit to be able to take the unite unit out of the chilled water circuit in case of service and maintenance work without draining the entire circuit.
- Air vent valve at the highest point of the circuit. If plate heat exchanger's broken, and refrigerant might leak into water circuit. Keep where the air relief valve is well ventilated and out of possible ignition source.
- Hydraulic safety valve on the downstream of plate heat exchanger. In the model with built-in tank, the safety valve is already installed. If plate heat exchanger's broken, and refrigerant might leak into water circuit. Keep where the hydraulic safety valve is well ventilated and out of possible ignition source.
- Draining tap at the lowest point of the circuit.
- Mesh strainer in the chilled water inlet with mesh size of 800 µm
- An appropriate insulation of the pipework to prevent condensate formation.

If the heat pump is not provided with the following components, the external hydraulic circuit must be equipped with them additionally:

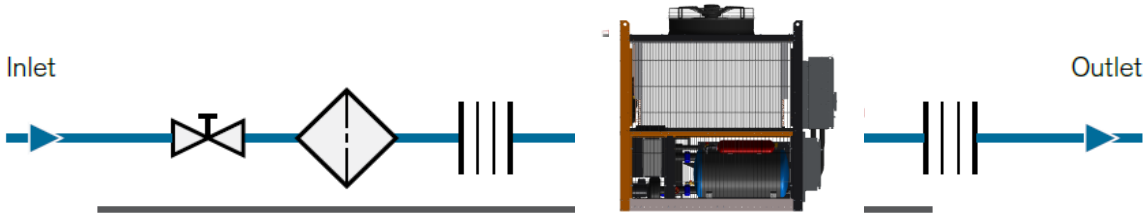
- Circulating pump with sufficient delivery height according to the minimum and maximum flow rates and corresponding pressure drop which can be found in chapter "5.4 Technical Data".
- Expansion tank with safety valve to ensure a possibility of expansion for the liquid at temperature variations. The expansion tank must be dimensioned in such a way that the water circuit volume can increase by 2% without draining off liquid through the safety valve.
- Storage tank as an accumulator for heat energy to reduce the on/off cycles of the compressor. A storage tank is recommended if the water volume of the water circuit is less than 3 L/kW . The storage tank should be lined out with thermal insulation.

⚠ WARNING

Even with a built-in storage tank the heat load should not be less than half the minimum cooling capacity of the unit.

One unit

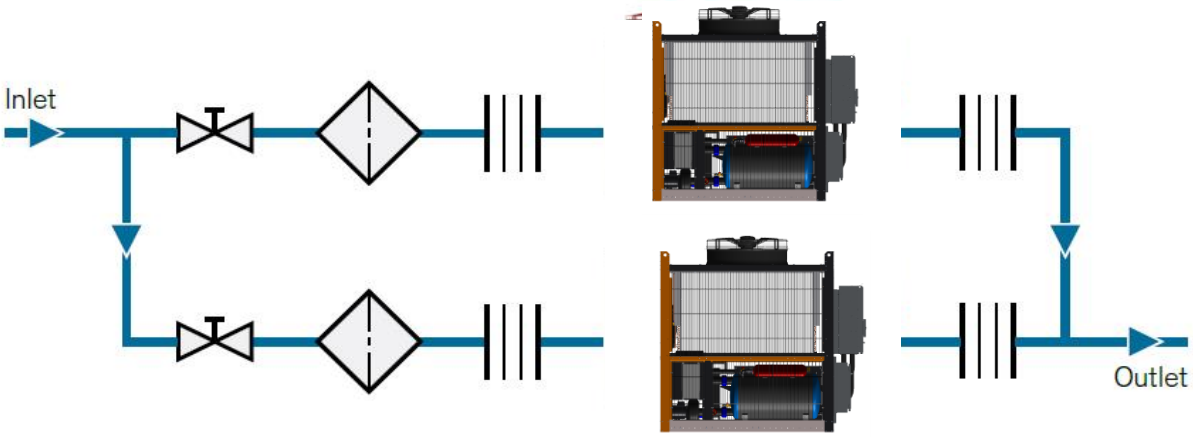
The installation of pipe compensators in the chilled water inlet and outlet are recommended, to protect them from vibration of connected devices.



Symbol	Meaning	Symbol	Meaning
	Water line		Pipe compensator
	Water shut-off valve		Mesh strainer

Muti-unit

If you connect two or more heat pumps in parallel, we recommend installing regulating valves to keep the pressure drop of each unit equally high.



To connect the units to the external system, remove the protective hoods from the water pipes.

In multi-unit system, if part of units is stopped, the water temperature will drop (in case of heating) owing to water that bypasses stopped units. If a 2-way valve is installed, this temperature drop can be prevented.

(1) Where the 2-way valve is controlled with commands from the unit

• The water pump is operated 30 seconds after “open” the 2-way valve.

• The 2-way valve is “closed” 30 seconds after stopping the pump.

(2) Where the 2-way valve is controlled from a separate panel:

• “Close” it 30 seconds before operating the pump.

• “ Close” it 30 seconds after stopping the pump (5 minutes and 30 seconds after turning “Off” the unit).

Minimum allowable water volume

If the unit is operated with water volume smaller than the minimum allowable water volume, the plate heat exchanger could freeze, resulting in freezing fractures. Always operate the unit within the allowable water volume range. Check for depletion in water volume caused by clogged strainer, air biting, failing circulation pump, or other. Pressure sensors are installed in both inlet and outlet to know if water is supplied to the unit properly.

Minimum allowable water volume

= Rated capacity x Min. capacity (10%) x Min. operation time (4 min) ÷ [(Min. operation temp. difference (0.5) + Measurement tolerance (0.2)) x Specific heat]

Anti-freezing function

When the ambient temperature or water temperature is low, the anti-freezing operation will be started automatically, to prevent any damage to the unit.

(1) When the ambient temperature is low and the pump is stopped, the anti-freezing operation could turn on the pump to protect the plate heat exchanger from . Use this function if necessary.

a. When the pump is controlled by this heat pump

- If the cold (hot) water outlet temperature drops below 3ºC, the pump operation command is turned "ON" to run the pump in a supplementary way.
- If the cold (hot) water outlet temperature rises to 5ºC, the pump operation command is turned "OFF" to stop the pump.

b. Other wise

- When the water temperature drops, control the pump in the same way as a.

(2) To protect the plate heat exchanger from freezing, the cold (hot), it's recommended to keep the water pump running for 5 minutes after turning "Off" the unit.

a. When the pump is controlled by this heat pump, the function is set by default.

b. Otherwise, control the pump in the same way as a.

6.5 Water connection

INFORMATION

The connection piping must be connected to the water lines of the heat pump free of mechanical stress.

The connection piping should consist of P235 or similar steel, as the water piping in the heat pump, to avoid the risk of corrosion at the transition to the external piping. The connection is carried out standard wise in the shape of Victaulic® connections.

We recommend the following good practice:

- Install a water bypass to be able to carry out work at the unit (without having to disconnect it from the pipework).
- Connect the pipe with adequate supports, so that it weight is not borne by the heat pump.
- Install adequate anti-vibration pipe joints to avoid the transmission of structure-borne noise.
- Insulate the pipes of the external system, if they are in contact with external air, to prevent the introduction of heat from the ambient air as well as possible.

WARNING

The connection piping must be connected to the water lines of the heat pump free of mechanical stress.

INFORMATION

For the dimensions and positions of the hydraulic connections, refer to "5.5 Dimensional drawings".

WARNING

Before doing water filling, be sure that drain valves are closed.

The position of drainages is identified with the following label: 

6.6 Electrical connection

DANGER

The main switch can be used as an emergency stop when the operator is near the heat pump. The restore of the main switch will immediate restart the unit, without further action by the operator.

WARNING

The electric cables are only to be connected by an authorized specialist.
The connection terminals are designed for copper cables.

DANGER

ATTENTION: In case of main switch, the power supply cables between the connection terminals of the customer and the main switch are always under voltage also if the main switch is open.
The supply cables are identified with the symbol below (high voltage).

- Ensure that the electric cables are de-energized and the unit is turned off.
- Ensure an appropriate isolation of all sources of supply to the unit.
- The unit must dispose of an effective earthing.
- These units are provided for 400V/3Ph/50 Hz.
- No additional controls must be installed in the control panel.
- According to EN 60204 the operator is responsible to install current protection devices between the supply conductors and the power supply connection of the unit.
- Consider local regulations for the electrical wiring.

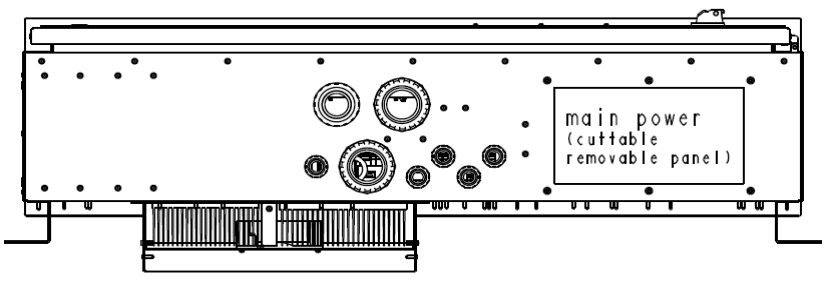
Opening the electric cabinet

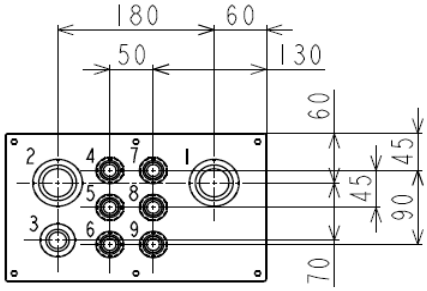
The switched ON main switch prevents opening the doors of the power section. Only if the main switch is in position "ON" you can open the door. The doors of the electrical cabinet can be opened by the key which is delivered with the unit.

Position of the electrical connections

The electrical connection lines can be introduced into the electric cabinet from the bottom. The position of the opening for the wires can be adjusted within the range of the panel shown in the bottom view as below.
Please take off the panel, and refer the recommend layout on the left side to open the holes for cable glands you need.

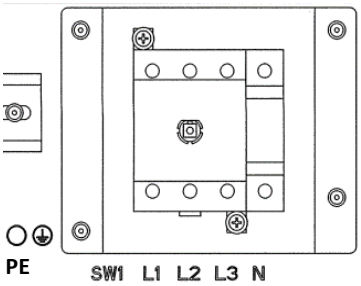
Recommend layout of removable panel
1) main power of the unit
2) low voltage side of MCU-C (optional)
3) high voltage side of MCU-C (optional)
4,7) solenoid valve between inlet/outlet of units in Cool/Heat mix mode
5,8) Signal cable between units for MCU-C (optional)
6,9) Signal cable between units for R/C (optional)
*You could connect to the ground throuh the earth bolt on the panel. It's recommended to use EMC clip, etc. for the shield cable.





The power supply system on site and the pre-fuses must be designed for the total current of the unit ("5.4 Technical Data"). Make sure that the power supply corresponds to the indications on the rating plate and that the tolerances according to the "5.1 Application limits" are not exceeded.

Route the electric cable into the electrical cabinet from below and connect the three phases to the main switch and the PE conductor next to the switch, in accordance with the wiring diagram (part of the unit documents). Use a cable gland on the bottom panel to fix the cable.



If the installation of the heat pump can introduce a different potential from the main earth collector, provide an equipotential connection with the ground PE. Use screw with a minimum diameter Φ 8 mm, located in the connection hole for external earthing that is on the base of the chiller and identified with its symbol. The cable must contain a terminal lug.

⚠ WARNING

Make sure that the phase rotation is correct, the rotating field must turn right!

You can check the phase rotation by using the controller. For this, close the electrical cabinet and turn the main switch to position I. If the phase rotation is incorrect, the controller display shows an alarm symbol.
Before fixing the phase rotation, make sure that the unit is turned OFF.
The electronic control board provides digital outputs for alarm signals and status of the unit. The assignment of outputs to different alarms and status data can be configured in the controller unit.
The default configuration is shown in the code list of the unit ("9.4 Code lists) .

6.7 Electrical connection of Remote controller (optional)

- Routing remote controller cables or other signal cables on site through cable duct, to avoid obstructing normal operations, causing extra noise, etc.
- Do not routing the power cables and signal cables together.
- Do not connect power cables to the signal wire terminal block (TB10, terminals A, B, X, Y). It could damage electronic parts.
- Since signal wires use DC 5 V, never connect 380 V wires to them. Otherwise it will trip the protective fuse on the PCB.
- Connect signal cables to terminal block (TB10, terminals A, B, X, Y, refer to the wiring diagram.
- It's recommended to use 0.3mm2 × 2-core cables as standard. If the cables are longer 100 mm , use cables as below.

Length (m)	Wire size
100 - 200	0.5mm^2 × 2-core
- 300	0.75mm^2 × 2-core
- 400	1.25mm^2 × 2-core
- 600	2.0mm^2 × 2-core

7. Operation Method

⚠ WARNING

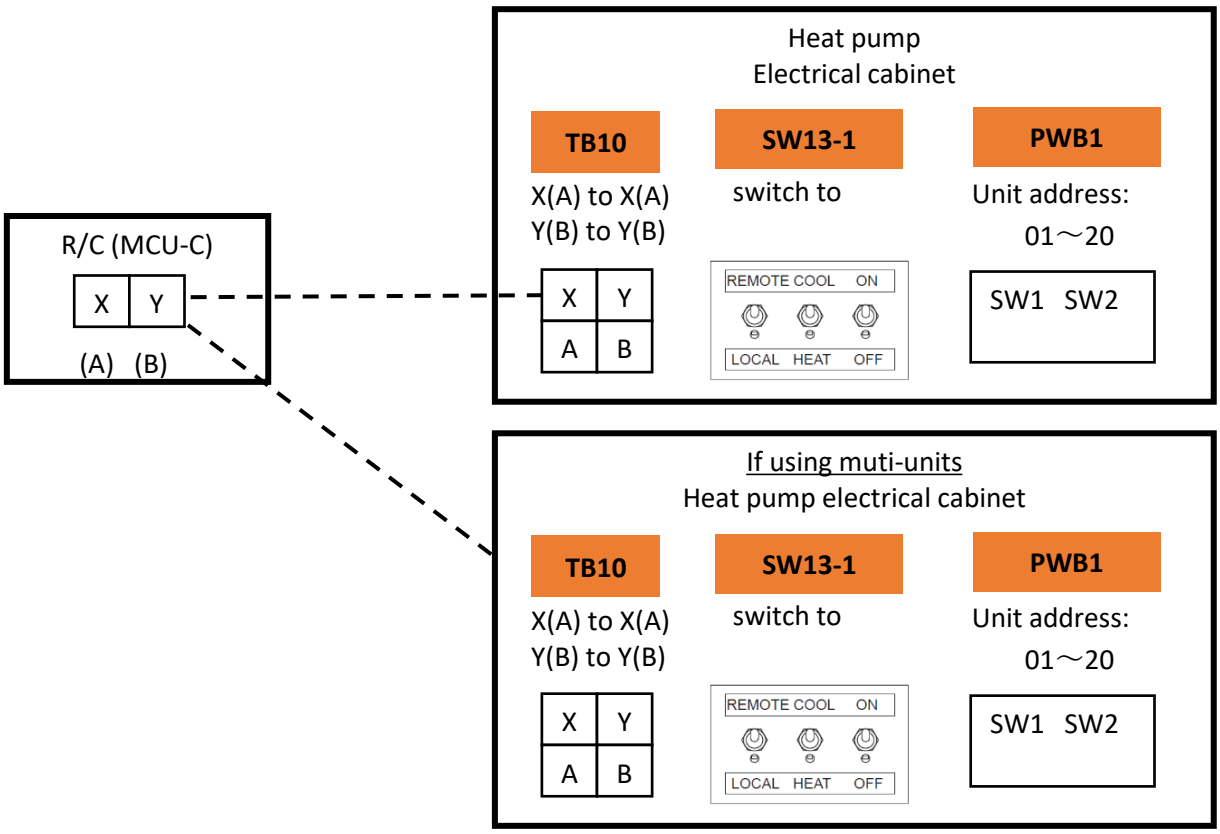
- The unit must be installed and connected in accordance to the manual, especially with the chapter "6. Installation", before the operation.
- Only authorized and certified personnel is allowed to commission the unit.

7.1 Basic setting

7.1.1 When optional remote controller(R/C) or MCU controller(MCU-C) is used

1) Connect the signal cables to X,Y (R/C), A,B (MCU-C) of TB10.
2) Switch SW13-1 to "REMOTE".
3) Set the unit address through SW1, SW2 on PWB1. The address could be set in the range of 01～20.

*Refer to the wiring diagram for the location of each parts.



7.1.2 PWB1 dipswitch setting

If you want to change the default setting of following items, change the dipswitch setting of PWB1. It is necessary to restart the unit, when changing the dipswitch setting. If it is changed while the power is ON, the setting will not be changed.

Item	Dipswitch	OFF (Default)	ON
Demand input select	SW12-1	Digital input	Analog input
Validate C/H water pump anti freeze control while local control	SW12-5	Invalid at local *1	Valid at local

*1 While it is test run with the local control, operation of water pump is prohibited for prevention of freeze. Unless the remote controller is used, change SW12-5 to ON after the test run. If it is left at OFF, the anti-freeze operation is not performed.

7.1.3 PWB1 7-segment setting

In the following cases, change 7-segment setting of according to the table.
*To change the setting, please follow the instruction in 7.2 7-segment setting method.

1) When MCU controller is connected and remote controller is not used (operation with external input), change the setting of 7-segment P10 to a higher level device. Set SW123-1 to Remote.
2) When the remote monitor system is used, change the setting of 7-segment P11.
3) When snow fan control need to be validated, change the setting of 7-segment P30.

7-segment code No.	Data display	display range	Initial value
P10	Higher device setting on PWB1	0: No higher device 1: MCU controller 4: Single remote controller	4: Single remote controller
P11	Remote monitor initial setting (No setting is necessary for FGW type remote monitor.	0: No remote monitor 1: With remote monitor	0: No remote monitor
P30	Snow fan control setting	0: Invalid 1: Valid	0: Invalid

7.1.4 Flow rate setting

1) When the pump is built in or primary pump control (external) is used
In the state of factory default, the target flow rate is calculated automatically from the unit's rated capacity and the inlet/outlet temperature difference of 5℃. If inlet/outlet temperature difference need to be changed, change it with 7-segment on PWB1. If it is necessary to change the setting flow rate, set the flow rate with 7-segment or MCU controller.

- Inlet/outlet temperature difference at flow rate calculation: Change P89 to 1.2 - 10.0℃. (Default: 5℃)
- When the flow rate is set directly:

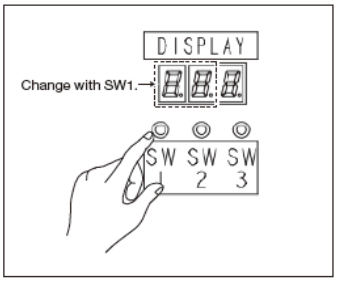
① PWB1

Target flow rate can be set for cooling and heating respectively.
Cooling target flow rate: P51
Heating target flow rate: P52
Change the target flow rate between 10.2 – 31.0 m^3/h or Aut. (Default: Aut)
*With Auto, the target flow rate is the one which is calculated from the rated capacity and the water temperature difference: P89.
Since the heating capacity varies depending on outdoor temperatures, check it on the capacity characteristics table to determine the target flow rate.

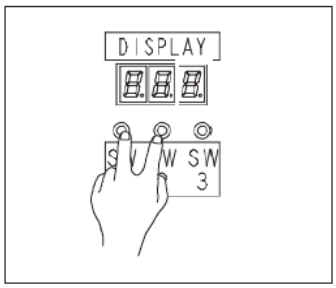
② MCU CONTROLLER (Optional)

Target flow rate: When using the primary variable flow system with MCU controller, send commands via the communication from MCU controller
* When receiving target flow rate command from MCU controller, it is necessary to change P26 of 7-segment display on PWB1 to 3.

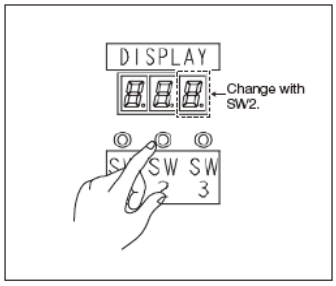
7.1.5 7-segment setting method



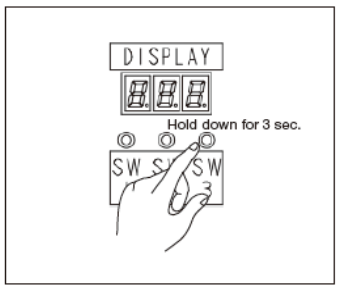
1 If SW1 is pressed, it can change the digits of hundred's place and ten's place on 7-segment display.
"C00" → "C10" → "C20" → "C30" … "C90"
→ "P00" → "P10" …
→ "P90" → "F…" → "J…" → "C…"
Setting change codes change progressively.



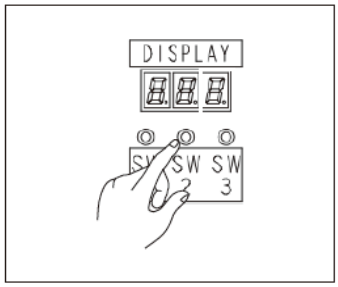
If SW1 and SW2 are pressed simultaneously, the setting code display can be switched.
"C00" → "P00" → "F00" → "J00" → "C00"



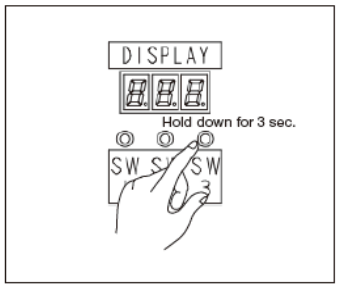
2 If SW2 is pressed, it can change the digit of one's place.
"C00" → "C01" → "C02" … "C09" → "C00"
Setting change codes change progressively.



3 If a code to change is displayed, hold down SW3 for 3 seconds.
7-segment display starts to flicker.
Setting values can be changed while it is blinking.



4 Press SW2 repeatedly till a desired value is displayed.



5 After the desired value is displayed, hold down SW3 for 3 seconds to change the display from flicker to steady lighting. When it lights steadily, the setting value change is over.

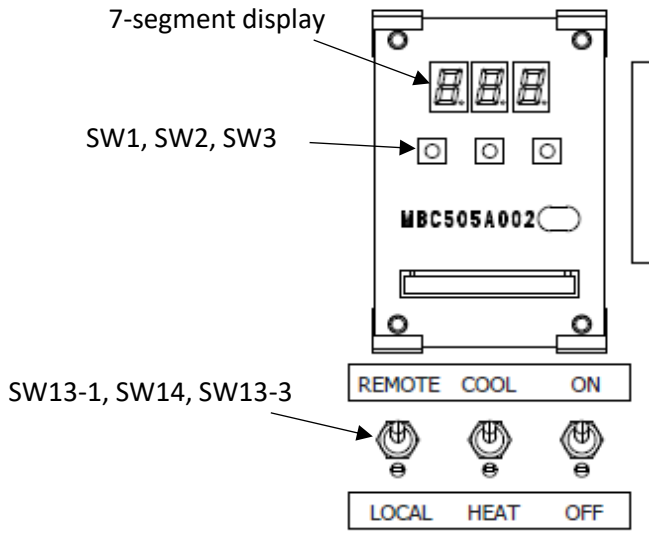
Caution

- Unless there is operation for 10 seconds, setting value returns to original one.

7.2 Unit operation

7.2.1 Local control with single unit (ON/OFF)

Without using the optional remote controller, MCU controller and external , the unit could be set and turned ON/OFF by the following operation zone. The operation zone could be accessed through the small window in the door of electrical cabinet, while the unit is powered on.
Unless the commissioning is finished, the unit can't be operated normally.



(1) Operation mode setting
Set the operation mode select switch SW13-3 at [Cool] or [Heat].

(2) Temperature setting
Change the setting temperature with 7-segment.

- Cooling setting water temperature: Change P00 in the range of 4.0 – 30.0℃. (Default: 7℃)
- Heating setting water temperature: Change P01 in the range of 25.0 – 55.0℃. (Default: 45℃)
- Unit of temperature: 0.1℃

(3) ON/OFF

- If the operation switch SW14 is turned to "ON", the unit starts operation.
- If the operation switch SW14 is turned to "OFF", the unit stops operation.

7.2.2 Remote control with external command (ON/OFF)

When operating the unit based on inputs from other device or other panel, perform the external input setting and connect signal wires. Set 7-segment P10 (the higher level device setting) at 0.

(1) External input setting

Digital/ Analog	Function	Function No.	Terminal block No. Terminal No.	OFF/ON Upper/lower limit
Digital	External operation input	1	TB3 No.1-2	OFF/ON
Digital	External operation mode input	2	TB3 No.3-4	Heating/Cooling
Analog	Temperature setting input (Cooling/heating dual use)	1	TB2 No.11-12	4.0°C/55.0°C
Analog	Temperature setting input (Cooling)	6	* 7-segment setting necessary	4.0°C/30.0°C
Analog	Temperature setting input (Heating)	7	* 7-segment setting necessary	25.0°C/55.0°C

(2) Operation mode setting

・If “External operation mode input” signal is turned ON (short-circuit), it changes to the cooling operation mode.

・If “External operation mode input” signal is turned OFF (open), it changes to the heating operation mode.

* Unless external input signals are used, change with the operation mode select switch.

(3) Temperature setting

Target water temperature can be changed with “Temperature setting input” signal.
Set the temperature setting select P05 at “1” (External input (Cooling and cooling mix mode)) with 7-segment.

* Unless external input signals are used, change P05 to “0”, and set temperatures with 7-segment P00 or P01.

* Range of use is 4 – 30℃ for cooling or 25 – 55℃ for heating, and nearest setting temperature applies to inputs out of the range of use.

* Where external input signals are input separately for cooling/heating, change the temperature setting select P05 to “2”.

(4) ON/OFF

Set the operation switch at “REMOTE”.

・If “External operation input” signal is turned ON (short-circuit), the operation starts.

・If “External operation input” signal is turned OFF (open), the operation stops.

* Unless external input signals are used, change with the operation switch.

You can refer to "7.3 External signal input and output" for the list of external signal I/O.

7.3 External signal input and output

The user could choose I/O signals by changing 7-segment setting.
It's shown below that which signals could be gotten or input into PWB1.

Analog I/O signals

	Signal name	Description	Applicable range
Output from PWB1	C/H water pump inverter output	Water pump frequency value is commanded.	Used when a water pump and an inverter are installed externally on a unit without water pump. This setting is already done to CnTA-out 1 for a unit with built-in pump.
	C/H water differential pressure valve aperture output	C/H water differential pressure valve aperture value is commanded.	This is indispensable when the bypass valve control is used. When the system consists of two or more units, send the command from MCU controller (optional).
	C/H water flow rate output	C/H water flow rate value	Unlimited. Flow rate value used for control is output.
	Simplified capacity	Cooling (Heating) capacity calculated from in-/outlet temperatures, flow rate and specific heat	Unlimited. Simplified capacity value used for control is output.
	Outlet C/H water temperature output	Outlet C/H water temperature value	Unlimited. Water temperature value used for control is output.
	Inlet C/H water temperature output	Inlet C/H water temperature value	Unlimited. Water temperature value used for control is output.
Input to PWB1	C/H water flow rate input	C/H water flow rate value	Unit has the flow detection function as standard. This is used when installing an external flow meter.
	C/H water differential pressure input	C/H water differential pressure valve (Bypass valve)	Used when the bypass valve control is employed. When two or more units are used, command this from controller.
	Demand input	External (by user) setting of demand value to suppress power consumption	Unlimited.
	Temperature setting input (For both cooling, heating)	External (by user) setting of unit outlet temperature	Used when temperatures are commanded externally on a unit without remote controller.
	Target flow rate input	External (by user) setting of target flow rate value	Used when temperatures are commanded externally.

1) Since signals are not isolated at PWB1 side, it's recommended to isolate analog I/O signals.

Digital I/O signals

	Signal name	Description	Applicable range
Output from PWB1 ※ (Max. 2 points can be used from list at right. For a unit without pump, Max. 4 points can be used.)	Operation status output (OFF/ON)	ON when unit's turned on	Unlimited
	Error status output (Normal/high level error)	ON when high level error occurs	Unlimited
	Error status output (Normal/low level error)	ON when low level error occurs	Unlimited
	Stop at light load output (Normal/light load)	ON when unit is stopped at light load	Unlimited
	Operation mode output (Heating/cooling)	ON at cooling operation mode	Unlimited
	C/H water pump operation output	ON at C/H water pump operation command	Used when a water pump and an inverter are installed externally on a unit without water pump. This setting is already done to CnTA-out 9 for a unit with built-in pump.
	C/H water inverter reset output	Pump inverter reset signal	Used when a water pump and an inverter are installed externally on an unit without water pump. This setting is already done to CnTA-out 5 for a unit with built-in pump.
	C/H water solenoid valve output	External solenoid valve ON Interlocked with water pump operation.	Used when a solenoid valve is installed to stop water while units are stopped on a system consisting of two or more units.
	C/H mixture water solenoid valve output	Solenoid valves set in inlet/outlet of each units ON	Used when a C/H mixture mode is operated on a system consisting of two or more units.
	Output linked with other heat source (OFF/ON)	ON at boiler used in combination	Used when a unite is operated in combination with an external heat source.
	Freezing protection operation output (C/H water pump)	ON at freezing protection mode	Used when a unit is controlled at fan coil unit during Freezing protection operation.
Input to PWB1 ※	External operation input (OFF/ON)	External (by user) OFF/ON command	This is necessary to turn ON/OFF with external input. This is not necessary when the remote controller is connected.
	External stop input (Pulse)	External stop is made in pulse.	When the type of input signal is pulse, this is indispensable if Ene-conductor is installed.
	External operation mode input (Heating/cooling)	External (by user) heating/cooling command	Used when it is necessary to change the operation mode with an external operation input. This is not necessary when the remote controller is connected.
	Emergency stop signal (Stop/operable)	External (by user) error stop command	Used when the emergency stop signal is needed.
	C/H water pump interlock	C/H water pump operates normally, and unit operation command is permitted.	Used when an external water pump is connected to a unit without water pump. This setting is not necessary on a unit with built-in water pump.
	C/H water pump INV error input	Pump inverter error command	Used when an external water pump inverter is connected to a unit without water pump. This setting is not necessary on a unit with built-in water pump.
	Demand input (Ordinary/demand)	Validates set demand limiting value.	Used when the demand input is necessary.
	Snow control external input (Ordinary/ON)	Prevents snowfall on the fan with external command.	Used when the snow control is commanded externally in addition to the unit control.
	Heat storage mode input (invalid/valid)	Heat storage mode command from external.	Used when switching ordinary/ heat storage mode by external input.
	Emergency switching command	In an emergency, changes the system from MCU controller system to remote controller system by an external system.	Used when MCU controller and remote controller are used together.

1) Do not allocate same signal to two or more terminals.
2) Where the remote stop input command is made in pulse, use the pulse width of 1,500 msec or larger.
3)Signals are not isolated at PWB1 side. Please isolate digital I/O signals.
※It is possible to use analog input and output signal together by using the attached connector.
However, in case of output signal, please expand relay (Omron LY relay etc...) by yourself.

Procedure to change allocations

External I/O to and from PWB1
Allocations on the microcomputer of external I/O to and from PWB1 can be changed.
7-segment display: check function allocation number, then do the setting.

(1) Allocation of digital I/O functions

	7-segment setting	Data display	Display range	Minimum unit	Function allocation No.	Function (Default)	PCB connector No.
Digital input function allocation	F00	CnTD-in1	0~22	1	1	External operation status input	CN19
	F01	CnTD-in2			2	External operation mode input	CN20
	F02	CnTD-in3			3	Demand input	CN21
	F03	CnTD-in4			0	Not used	CN22
	F04	CnTD-in5			5	C/H water inverter error	CN23
	F05	CnTD-in6			0	Not used	CN24
	F06	CnTD-in7			0	Not used	CN25
	F07	CnTD-in8			0	Not used	CN26
	F08 *1	CnTD-in9			9	Local/Remote select	CN27
	F09 *1	CnTD-in10			10	For local OFF/ON	CN28
	F10 *1	CnTD-in11			11	For local Heating/Cooling	CN29
	F11	CnTD-in12			0	Not used	CN30
	F12	CnTD-in13			0	Not used	CN31
	F13	CnTD-in14			0	Not used	CN32
	F14	CnTD-in15			7	External error reset	CN33
Digital output function allocation	F15	CnTD-out1	0~18	1	1	Operation status output	CN51
	F16	CnTD-out2			2	Error status output (high level error)	CN52
	F17	CnTD-out3			3	Error status output (low level error)	CN53
	F18	CnTD-out4			7	Water solenoid valve	CN54
	F19 *2	CnTD-out5			11	C/N water inverter reset	CN55
	F20	CnTD-out6			0	Not used	CN56
	F21	CnTD-out7			0	Not used	CN57
	F22	CnTD-out8			0	Not used	CN58
	F23 *2	CnTD-out9			9	C/H water pump operation	CN59
	F24	CnTD-out10			0	Not used	CN17
	F25	CnTD-out11			16	C/H mixture water solenoid valve output	CN18
	F26	CnTD-out12			0	Not used	CN60

Allocation on microcomputer　　Default setting

- If you want to change the function of each 7-segment code, find the function number in the next page. Then change the values of F00 to F26 to the function number you want. Since there is no terminal block, please connect it directly to the connector in PWB1.
- It is prohibited to change the allocations marked with *1.
- On models with the built-in pump, it is prohibited to change the allocations marked with *2.

Allocated functions of which digital I/O can be set

	Function allocation No.	Function	OFF/Open	ON/Shorted	Note (If the function isn't allocated, refer the default setting)
Digital input function allocation	1	External operation input	OFF	ON	Default: OFF
	2	External operation mode input	Heating	Cooling	Default: OFF
	3	Demand input	-	Demand	Default: OFF
	4	C/H water pump interlock input	Error	-	Default: ON
	5	C/H water inverter error input	-	Error	Default: OFF
	7	Error reset by external input	-	Reset	Adapted to the errors which're possible to be reset by 7-segment.
	8	Error reset by external input	-	Reset	Only allowed to be set once/hour Adapted to the errors which're possible to be reset by 7-segment.
	9	Local/remote selection	Local	Remote	Default: OFF
	10	For local OFF/ON (Unit)	Stop	Operating	Default: OFF
	11	For local heating/cooling	Heating	Cooling	Default: local switch is valid
	12	7-seg water temperature setting priority input	-	ON	Default: OFF
	13	Emergency stop signal	Stop	Operating	Default: ON
	14	C/H water flow switch input	OFF	ON	Default: ON
	15	External stop input method	Step	Pulse	Default: OFF
	20	Snow fan control external input	-	On	Default: OFF
	21	Heat storage mode input	Invalid	Valid	Default: OFF
	22	Emergency switch command	MCU controller system	Remote controller system	Default: OFF
Digital output function allocation	1	Operation status output	OFF	ON	Operation signal is sent to module. Current or expected status
	2	Error status output (High level error)	-	High	Stay ON from high level error occurs until reset.
	3	Error status output (Low level error)	-	Low	Stay ON from low level error occurs until reset.
	4	Local/remote selection	Local	Remote	Outputs input status of the digital input function allocation 9.
	5	Operation mode	Heating	Cooling	Based on the valid command out of the local switch, digital input or other control device.
	7	Water solenoid valve	OFF	ON	OFF: Closed, ON: Open
	8	Defrost status	OFF	ON	Defrost control is on
	9	C/H water pump operation	OFF	ON	
	11	C/H water inverter reset	OFF	ON	
	12	Stop at light load output	Light load	-	
	13	External heat source combination output	OFF	ON	
	14	Error status output (high or low level)	-	High or low	
	15	oPE output	-	oPE	OFF if the oPE** extinguishes. Otherwise, ON
	16	C/H mixture solenoid valve output	OFF	ON	
	17	C/H water pump freezing control	Stop	Operating	
	18	Unit operation prohibition	-	oPE	

(2) Function allocation of analog I/O

	Code No.	Data display	Display rang	Min. unit	Initial value	Function (Factory default)	PCB connector No.	Terminal block No.	Terminal No.
Analog input function allocation	F27	CnTA—In1	0~14	1	1	Temperature setting input (For both cooling, heating))	CN11	A—TB2	11,12
	F28	CnTA—In2			2	C/H water differential pressure gauge input	CN12	A—TB2	13,14
	F29	CnTA—In3			3	Demand input	CN40	A—TB2	15,16
	F30	CnTA—In4			0	Not used	CN41	A—TB2	17,18
	F31	CnTA—In5			0	Not used	CN42	A—TB2	19,20
	F32	CnTA—In6			0	Not used	CN43	—	—
	F33	CnTA—In7			0	Not used	CN44	—	—
Analog output function allocation	F34	CnTA—out1	0~9	1	1	C/H water INV pump output	CN34	A—TB2	1,2
	F35	CnTA—out2			2	C/H water differential pressure valve aperture output	CN35	A—TB2	3,4
	F36	CnTA—out3			3	Simplified capacity output	CN36	A—TB2	5,6
	F37	CnTA—out4			4	Power output	CN37	A—TB2	7,8
	F38	CnTA—out5			5	C/H water flow rate output	CN38	A—TB2	9,10
	F39	CnTA—out6			0	Not used	CN39	—	—

- If it is necessary to change a function, check the function allocation numbers on next page, and change the value of F27 to F39 on the 7-segment display to the function allocation No. If there is no terminal block, it may be picked up directly from the PCB connector as well.
- On models of the built-in water pump specifications, it is prohibited to change the allocation marked with *1.

Allocated function of which analog I/O can be set

	No.	Function	Lower limit value (7-segment)	Upper limit value (7-segment)	Remark	Example of recommended additional setting		
						Terminal block No.	Terminal No.	7-segment
Analog input function	1	Temperature setting input (For both heating, cooling)	4.0°C (F41)	60.0°C (F51)	Lower and upper limit values are proportional			
	2	C/H water differential pressure gauge input	0kPa (F42)	500kPa (F52)	Lower and upper limit values are proportional			
	3	Demand input	50% (F43)	100% (F53)	Lower and upper limit values are proportional			
	4	Watt meter input	0kW (F44)	500kW (F54)	Lower and upper limit values are proportional. Where the watt meter input (PMr) is set, divide current load during operation (Qdrc, Qdrh) by the power (COPrc = Qdrc/PMr (or Qdrh/PMr)).			
	5	C/H water flow meter input	0.0m³/h (F46)	50.0m³/h (F56)	Lower and upper limit values are proportional	A-TB2	19,20	F31:5
	6	Temperature setting input (Cooling)	4.0°C (F47)	30.0°C (F57)	Lower and upper limit values are proportional			
	7	Temperature setting input (Heating)	25.0°C (F48)	60.0°C (F58)	Lower and upper limit values are proportional			
	10	External air temperature input (For both cooling, heating)	0°C (F40)	50.0°C (F50)	Lower and upper limit values are proportional			
	11	Inlet pressure	0kPa (F85)	150kPa (F92)	Lower and upper limit values are proportional			
	12	Outlet temperature	0kPa (F86)	150kPa (F93)	Lower and upper limit values are proportional			
	13	Target flow rate input	10m³/h (F87)	50m³/h (F94)	Lower and upper limit values are proportional	A-TB2	17,18	F30:13
	14	Flow detection differential pressure gauge input	0kPa (F88)	150kPa (F95)	Lower and upper limit values are proportional			
	1	C/H water INV pump output	30.0Hz (F60)	60.0Hz (F70)	Lower and upper limit values are proportional			
	2	C/H water differential pressure valve aperture output	20% (F61)	100% (F71)	Lower and upper limit values are proportional			
Analog output function	3	Simplified capacity output	0kW (F62)	200kW (F72)	Lower and upper limit values are proportional			
	4	Power output	0kW (F63)	100kW (F73)	Lower and upper limit values are proportional			
	5	C/H water flow rate output	10.0m³/h (F64)	40.0m³/h (F74)	Lower and upper limit values are proportional. (Outputs the analog input function allocation 5 as it is.)			
	6	Outlet water temperature	0°C (F65)	45.0°C (F75)	Lower and upper limit values are proportional. (Outputs the value of outlet temperature sensor Pt100.)			
	7	Inlet water temperature	0°C (F66)	45.0°C (F76)	Lower and upper limit values are proportional. (Outputs the value of inlet temperature sensor Pt100.)			
	8	Cooling water INV pump output	30.0Hz (F67)	60.0Hz (F77)	Lower and upper limit values are proportional			
	9	Simplified COP output	0.0 (F68)	15.0 (F78)	Lower and upper limit values are proportional. (Outputs COPrc at analog input function allocation 4.)			

Upper and lower limit values of analog input 4-20 mA can be changed.

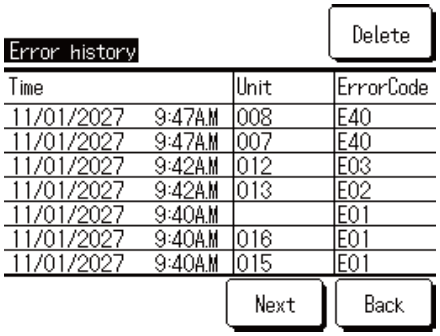
Examples of additional setting

7.4 Error resetting

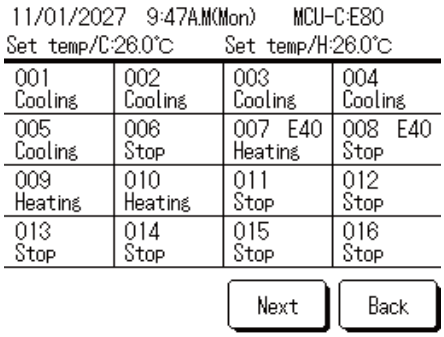
If any error occurs, report or consult your dealer or service shop. Error contents (Error code) must be confirmed before resetting the error. After removing cause of error, reset as described below. Unless it is reset, the unit cannot restart.

7.4.1 Check and reset of error code with remote controller

If any error occurs, the red operation LED lamp flickers.



1)Tap [Menu], [Error history] on the TOP screen, check the units in error and their error codes. You could find which error it is, referring to 9.7 Error code list.



2)Press F2 bottom on the TOP screen. You can also find the unit status at this moment.
IF [MCU-C] is displayed on the top right corner, it means there's some problem with the optional MCU controller.

3)Tap [Menu], [Next], [Show a contact list], the information of contact is displayed.
Report the error code and the unit in error.

Resetting procedures

1) Press “ON/OFF” switch on the main unit of remote controller.
2) Operation LED lamp goes off.
3) Tor re-start, press “ON/OFF” switch.

⚠ WARNING

Do not reset without removing the cause of error. If any error occurs, report to Company immediately.

7.4.2 Local resetting(Without remote controller or higher level device or external input)
Error code is displayed on 7-segment display of PWB1 in electrical cabinet.
Confirm the error code, and report to your dealer or service shop.
Procedures
1) Turn the operation switch SW14 to “STOP”.
2) Set 7-segment C00 at “1”.
3) Turn the operation switch SW14 to “ON”.

7.4.3 Resetting with MCU controller
Error code is displayed at 7-segment display of MCU controller.
Confirm the error code, and report to your dealer or service shop.
Procedures
1) Turn the operation switch SW14 to “STOP”.
2) Set 7-segment C00 at “1”.
3) Turn the operation switch SW14 to “ON”.

7.4.4 Resetting with external input
Error code is displayed at 7-segment display of electrical cabinet or MCU controller.
Confirm the error code, and report to your dealer or service shop.
Procedures
1) Turn OFF “External operation input” signal (open), and select “OFF”.
2) Turn ON “Error reset by external input” signal (short-circuit), and reset the error.
3) Turn ON “External operation input” signal (short-circuit), and select “ON”.
* Using the digital input function allocation (F00 – F14), set at the function No. “7” (it can reset once in 8 hours) or “8” (it can reset once per hour).

7.5 Special functions

7.5.1 Defrost control
If the evaporation temperature drops below the freezing point, condensed water generated on the air heat exchanger frosts. If operation continues in such condition, it drops the flow rate and heat transfer rate owing to clogging, resulting in a drop in capacity.
In order to avoid the drop in capacity, the defrost control by reverse cycle takes place automatically to defrost at regular intervals.

7.5.2 Demand control
Demand can be controlled in order to suppress the power consumption compulsively. The demand is input in three ways.
1) It operates based on schedule by setting the demand rate (limiting rate) with the peak-cut setting of remote controller.
2) It operates by inputting analog input signals (4 – 20 mA) PWB1.
3) It operates with pre-set demand rate by inputting digital input signals to PWB1.
This control suppresses the power consumption by restricting the maximum speed of compressor. The demand rate is the rate to limit the speed, and not the rate to limit the consumption.

7.5.3 Snow fan control

In order to prevent snowfall on the fan section while the operation is stopped in winter, the fan is operated at regular intervals to blow off snow.

Valid or invalid can be selected with 7-segment setting (P30 of PWB1: Valid, 2: Invalid), and the fan operates for 30 seconds at intervals of 10 minutes, if the set outdoor temperatures are lower than the valid conditions. This operation repeats till outdoor temperatures become higher than the invalid condition.

It can be controlled by external digital input signals as well.

7.5.4 C/H water 2-way valve control

In order to control the C/H water supply depending on the ON and OFF of unit, the 2-way valve installed at the C/H water outlet on the unit is controlled in line with ON and OFF of unit.

The 2-way valve opens just before the unit operation to operate the built-in pump or the pump which is controlled with external outputs.

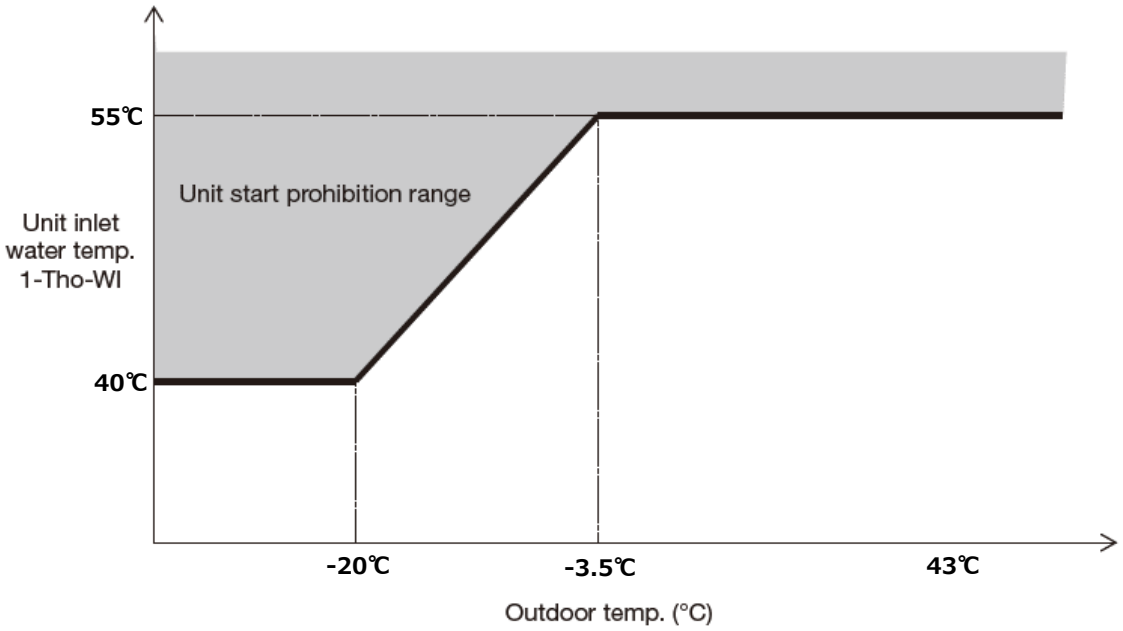
The 2-way valve closes 30 seconds after the water pump stop or 5 minutes and 30 seconds after the unit stop.

7.5.5 Anti-freeze operation

To prevent the water heat exchanger from freezing in winter while the pump is stopped in the night, the pump is operated in auxiliary manner (Anti-freeze operation). The anti-freeze operation takes place for 5 minutes and stops if the state of outdoor temperature at 3℃ or lower continues for 10 minutes or if the inlet/outlet water temperature is 3℃ or lower. However, if the outdoor temperature is -10℃ or lower or inlet/outlet water temperature is 5℃ or lower, the antifreeze operation does not stop, but continues.

7.5.6 Unit startup limit control

The range as shown below is out of the unit's operation range, and the unit does not start even if "ON" is operated with the operation switch or from the remote controller, in order to protect the unit.



8. Commissioning

⚠ WARNING

• The unit must be installed and connected in accordance to the manual, especially with the chapter "6. Installation", before the operation.
• Only authorized and certified personnel is allowed to commission the unit.

⚠ DANGER

The main switch can be used as an emergency stop when the operator is near the heat pump. The restore of the main switch will immediate restart the unit, without further action by the operator.

8.1 Preparation

⚠ WARNING

- Power supply of the customer must be switched off
- Check that the unit main-switch is in OFF position

Inspect for visible damages which can affect proper operation of the heat pump, and in particular:
• check for transport/handling/installation damages
• check the coil surfaces
• check that all components are installed in a proper way and are correctly fixed
• check if the insulations are correctly installed and without any damages
• corrosions
• verify that all documents are available (Instruction manual and electronic controller manual)
Check the refrigerant circuit: connect your own gauges and check the tightness of the refrigerant circuits according to the outside temperature of the refrigerant pressure. In case of leakage please contact the manufacturer.
Check the fans: Be sure that the fan guards are all correctly installed, and the fans are not damaged.
Check correct power connection cabling: Be sure that all the connections are correctly installed and fixed (see "6.6 Electrical connection"). Verify the earth connections (see "6.6 Electrical connection").
Check hydraulic circuit: Verify the flow direction is according the IN/OUT connections on the refrigerator (see "5.5 Dimensional drawings").
• check the hydraulic connection (no leak, no abnormal vibration)
• check if the water system is filled up with requested water quality and amount, according to the "6.4 External water circuit"
• ensure that all valves are open
• check if there is a strainer in the inlet of the unit, its size and cleanness.
Check water pump:
• After the stop of unit, the unit will keep the water pump (Supervise 7-segment P34) running for 5 minutes. Check the function of water pump with the other panel control.
• Since the unit detects flow rate even if the pump is not built in, it is not necessary to interlock with primary side.
When the interlock is used, input the short-circuit signal between the unit operation and the completion of water pump idling operation.
*After the pump is operated for a long time, even if the unit is turned “OFF“, water temperature may rise because of the heat from pump itself.

8.2 First-Startup

⚠ DANGER

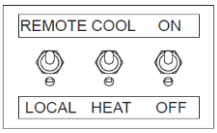
The main switch can be used as an emergency stop when the operator is near the heat pump. The restore of the main switch will immediate restart the unit, without further action by the operator.

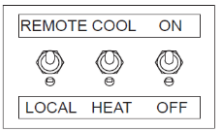
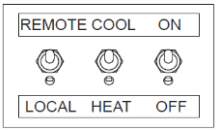
- Where the remote controller/MCU controller is connected to a system including multiple units, commissioning each unit at first.
- After completing commissioning of each unit, check the multiple unit operation with the remote controller/MCU controller.
- When checking if the outlet temperature of unit reaches the setting temperature during commissioning, please to keep the unit under a certain load.
- Please note that the unit outlet water temperature may not reach the setting temperature during the commissioning of 4 hours depending on existing loads and volume of water retained in the water circuit, because units are commissioning individually. To check stable operation in the state that the unit inlet water temperature is lower than the temperature at daily (normal) operation during cooling or higher during heating, change the setting temperature such that it will become normal setting water temperature difference. In the commissioning mode (8.2.1, Step 7), it does not stop even if the unit outlet water temperature reaches the setting water temperature. If the load is small, do the commissioning in the normal mode (refer to7.2 Unit operation).
- During single unit commissioning, there is no problem even if multiple units are operated simultaneously so far as it is possible to check operation.

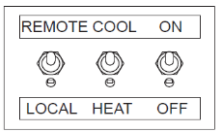
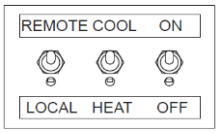
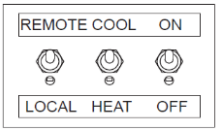
8.2.1 Single unit operation

• Commissioning each unit according to the following list. When there are valves or pumps which are controlled with other controller other than this unit, check their operations before commissioning of single unit, and prepare them such that the unit can be commissioning.
When the unit is controlled with PWB1 or the external I/O function of MCU controller, commissioning all units, after the single unit commissioning, and check operations of respective devices.

• When operate in a C/H mix mode, commissioning the Cool and Heat units separately.

Step	Item	Description	Setting	Note
1	Dipswitch setting	Set dipswitches according to the specifications at site.	**①SW11-5 (ON/OFF): Switch water temp. sensor (external /build-in sensor)** **②SW12-1 (ON/OFF): Demand control (ON/OFF)**	**① Do the setting, if external water temp. sensor is used .** **② Do the setting, if demand control (including 7-segment) is used.**
2	Address setting	Where multiple units (Remote controller/MCU control) are installed, change the address setting (SW1 & SW2) on the unit supervise PCB in the control box A of each unit.	Address setting 01-16 · SW1: Ten's place · SW2: One's place	When ommissioning unit by unit, it can be tested with the factory default: 01 as well. Set the address with care not to duplicate after commissioning.
3	**PWB1 operation switch**	Since it is commissioning unit by unit, set the operation switch in the power supply box at "OFF".  * If it is set at REMOTE in the control of built-in pump, or in the control of C/H water pump with external output, the anti-freeze operation is implemented automatically.	· Operation switch: "OFF"	Where the pump (incl. built-in) is controlled with the unit and the outdoor temperature is 3˚C or under, if power is turned on while the operation switch is set at "REMOTE", the anti-freeze operation starts.
4	Power on	Turn on the power to the unit to commissioning. Check if the display lights on 7-segment of unit supervise PWB1.	—	Confirm that the operation switch is set at "OFF", before turning power on. Where the pump (incl. built-in) is controlled with the unit and the outdoor temperature is 3℃ or under, if power is turned on while the operation switch is set at "REMOTE", the anti-freeze operation starts.

Step	Item	Description	Setting	Note
5	**7-segment setting of PWB1**	Where changing water temperatures or flow rate from factory default at commissioning, set 7-segment. [Factory default] Setting water temperature: (Cooling) 7°C (Heating) 45°C Flow rate: Rated water volume (Temp. diff. 5°C)	· P00: Setting water temp. (Cooling) · P01: Setting water temp. (Heating) · P89: Temp. diff. at flow rate Initial value 5°C <Other> · P32: Demand rate	① Set the setting water temp. lower at cooling or higher at heating than unit inlet water temp. Unless this is met, the unit may fail to start owing to low load. ② Where it is commissioning in the state of demand control valid, set the demand rate.
6	**With built-in water pump or C/H Water pump control) Water pump commissioning**	(1) Change the commissioning mode to the pump commissioning. (P02: 1) (2) If the operation switch in the power supply box is changed from "OFF" to "ON", the water pump commissioning starts.  (3) Vent air from unit inside and water piping at site. (4) It stops automatically 4 h after start. To stop commissioning manually, turn the operation switch to "OFF".  (Water temp. correction takes 5 min and 30 sec or more. Continue during correction.)	· P02: "1" commissioning mode (Pump commissioning) · Operation switch: "ON"/"OFF" · P08: Pump speed · P65: Water temp. correction complete status · P83: "1" water sensor re-correction start	① Check water leak from water pipes, abnormal noise. Positively vent air from water pipes. Water may leak temporarily, but stops soon. This is normal. ② Water pump runs at fixed frequency (Factory default 60Hz. * Pump speed can be changed by changing 7-segment P08.). ③ Commissioning the pump more than 5 min and 30 min or more. Otherwise, the water temp. correction is not completed. If 7-segment P65 is 1, it is complete. Unless it is, it cannot start commissioning. ④ To repeat the water temp. correction, start the correction by changing P83 to "1" during water pump commissioning. Water correction takes more than 30 sec, continue.
	(Water pump control with other panel) Water pump commissioning	(1) Run the water pump from other panel. (2) Do the same work (1)-(4) as the water pump commissioning with built-in water pump.		· Observe the range 25% of target flow rate - 36 m^3/h. Otherwise, E80 will occur. · After stopping the unit with the control by other panel, idle the water pump (7-segment P34) for 5 min. Otherwise, E80 will occur

Step	Item	Description	Setting	Note
7	Unit commissioning	(1) Change the commissioning mode to the unit commissioning. (P02: 2) (2) Depending on conditions at site, change the operation mode select switch in the power supply box to "Cooling"/"Heating".  (3) If the operation switch in the power supply box is turned to "ON", the unit operation starts with the target at the set temperature.  (4) It stops automatically 4 h after start. To stop operation manually, turn the operation switch to "OFF".  (5) Change the commissioning mode to normal operation. (P02: 0)	· P02: "2" Commissioning mode (Unit commissioning) · Operation mode select switch "Cooling"/"Heating" · Operation switch: "ON"/"OFF" <Other> · P06: Module to be commissioning	① Where controlling the water pump from other panel, run the water pump and feed water. ② Set the setting water temp. lower at cooling or higher at heating than the inlet water temp. Unless this is met, the unit may fail to start owing to low load. ③ Where 2 lines only out of 4 lines (2 modules) are commissioning, turn the operation switch to "ON" after changing P06 to "0" or "1". ④ It stops automatically 4 h after start. ⑤ After completing the commissioning, make sure to turn OFF the commissioning mode (P02: 0).

⚠ WARNING

When operating without remote controller, turn off the power after commissioning, then turn the dipswitch SW14 to "ON", turn off and on again the power supply and validate the antifreeze operation of water pump. Unless the power supply is reset, it cannot validate.

8.2.2 System commissioning (Without MCU controller)

• When commissioning the entire system, consult with the system administrator, owner and administrator of building. Regarding interlocks with other devices or controls of entire system such as the unit number control, etc., make adjustments corresponding to the system under the guidance of service personnel.

(1) When the remote controller is used

Check at first if 7-segment P10 (Higher level device setting on supervise PCB) is set at 4 (Default: 4), and then turn the operation switch to "Remote" to operate with the remote controller. * It is not necessary to turn off main power supply.

(2) Operation by external input

Set 7-segment P10 (Higher level device setting on supervise PCB) at 0, and the operation switch at "Remote" to receive external inputs. When the followings have already been set, it is not necessary to turn off main power supply.

Receive the operation input (Short-circuit: ON, open: OFF) at CNTD-in1 (Initially: TB3 No. 1, 2 terminals) and the operation mode input (Short-circuit: Cooling, open: Heating) at CNTDin2 (Initially: TB3 No. 3, 4 terminals).

Temperature setting relies on 7-segment (P00 at cooling, P01 at heating).

When the temperature setting is controlled with analog input, change 7-segment P05 to 1 (Cooling/heating dual use, 4 - 55° C), and receive the analog input at CNTA-in1 (Initially: TB2 No. 11, 12 terminals).

8.2.3 System commissioning (With MCU controller)

• When commissioning the entire system , consult with the system administrator, owner and administrator of building. Regarding interlocks with other devices or controls of entire system such as the unit number control, etc., make adjustments corresponding to the system under the guidance of service personnel.

(1) Confirmation before system commissioning

Is MCU controller installed according to the installation manual?

Is the resistance bulb for measurement of header temperature installed and connected?

Are measuring instruments for system controls installed and connected?

(2) Setting before MCU controller commissioning

Supply power to all units, confirm 7-segments light and do the system individual settings based on the following common settings and technical data.

Common setting unrelated to the system

With the selection of Local/Remote switch, set (A) or (B). Error will be erased if it is set properly.

(A) Where using Local/Remote switch at Remote

1) Set the number of units with P12.

2) Select the setting of MCU controller's higher level device setting P10 from:

0: External control panel (Commanded via external input)

2: Remote controller (Commanded via communication)

3) Where 2 is selected at the step 2), setting of P02 and P07 are invalid.

→ Set steps 4) on.

When 0 is selected at the step 2), select for P02 from:

0: 7-segment input

1: Cooling/heating dual use external input (4 – 55℃/TB2 No. 7, 8 terminals), and

Select the operation mode (P07) from:

0: Local

1: External input

4) In order to measure the header temperature with the resistance bulb, change P97 to 0.

Unless it is used, change P97 to 3. If 3 is selected for operation of multiple units, the header temperature will not reach the setting temperature.

5) Set all of 27, F28, F29 and F31 at 0, regardless of the system.

6) Set J01, J03, J04, J07 and J08 according to the table on the next page. It can be adjusted depending on startup conditions.

(B) When using Local/Remote switch at Local

1) Set the number of units with P12.
2) Setting of higher level device (P10) is invalid. It operates according to the Local switch.
   Mode setting P7 is also invalid. It operates according to Local switch.
   Select the setting temperature from:
   0: 7-segment input
   1: Cooling/heating dual use external input (4 – 55℃/TB2 No. 7, 8 terminals)
3) In order to measure the header temperature with the resistance bulb, change P97 to 0.
   Unless it is used, change P97 to 3. If 3 is selected for multiple units operation, it may fail to measure temperatures properly.
4) Change all of F27, F28, F29 and F31 to 0, regardless of the system.
5) Set J01, J03, J04, J07 and J08 according to the table below. It can be adjusted depending on startup conditions.

Selection of ON/OFF, operation mode and temperature setting commanding method

7-segment Code No.	Date display	Range	Initial value	Setting value
P02	Temperature setting	0, 1, 2	0: 7-segment input	0: 7-segment input 1: Cooling/heating individual use external input 2: Cooling/heating respective external input * If P10 is set at 1 or 2, setting is invalid.
P07	Operation mode setting	0, 1, 2	2: Communication (Remote controller)	0: Local 1: External input 2: Communication (Remote controller) * If P10 is set at 1 or 2, setting is invalid.
P10	Higher level device setting	0, 2	2 : Remote controller	0: External control panel (Commanded via external input) 2: Remote controller (Commanded via communication)
P12	Number of connected units	1 ~ 20	1	Setting between 1 – 16 depending on number of connected units
P97	C/H water header	0, 1, 2, 3	0: Use of return water header temp. Use of outbound water header temp.	0: Use of return water header temp. Use of outbound water header temp. 3: Return water header temp. not used Outbound water header temp. not used. * Unless header temp. sensor is used, average water temp. is used. When the header temp. and water temperature of unit are different, install Pt100Ω as the header temp. input, and set the value of P97 at 0.
F27	TB2 No. 7, 8 terminals	0 ~ 14	1: Temperature setting input	0: Not used
F28	TB2 No. 9, 10 terminals	0 ~ 14	11: C/H outbound water	0: Not used
F29	TB2 No. 5, 6 terminals	0 ~ 14	12: C/H return water header pressure input	0: Not used
F31	TB2 No. 13, 14 terminals	0 ~ 14	5: C/H water flow meter input	0: Not used
J01	Unit number increase prohibit time [min]	0 ~ 999	15	Set at 10. It can be adjusted depending on startup conditions.
J03	Initial start unit number [Unit]	1 ~ 20	1	Set taking 1/3 of number of connected units at P12 as a guide. Ex: Set 3 or 4 for 10 units. It can be adjusted depending on startup conditions.
J04	Unit number control initial standby time [min]	0 ~ 999	15	Set at 10. It can be adjusted depending on startup conditions.
J07	Increase permissible unit number [Unit]	1 ~ 20	10	Set taking 1/3 of number of connected units at P12 as a guide. Ex: Set 3 or 4 for 10 units. It can be adjusted depending on startup conditions.
J08	Reduce permissible unit number [Unit]	1 ~ 20	10	Set taking 1/3 of number of connected units at P12 as a guide. Ex: Set 3 or 4 for 10 units. It can be adjusted depending on startup conditions.

(3) Method of system commissioning

(A) When Local/Remote SW is used at Remote

Operate from the device which is set with MCU controller higher level device setting P10 (External control panel, remote controller).

(B) When Local/Remote SW is used at Local

Set the operation mode and temperatures by local switch , and turn the operation switch SW14 to “ON”.

• Connect the resistance bulb securely according to the wiring diagram. Unless it is installed, change the value of P97 to 3.

• Although the unit number control of MCU controller can be selected from 3 types, it is recommended to use the unit number control by cold/hot water load [7-segment P09: 2]. Since it is MCU controller default setting, no need to change the setting.

• Set any other setting by selecting the system in use with reference to the technical data of MCU controller.

8.2.4 Single unit commissioning check list

Commissioning check list

	Check item	Standard Guide for steady-state operation	Result	Remark
Unit	Is outlet water temp. same as setting water temp?	Within ±1°C		
	Is high/low pressure within normal range?	1.6～3.9MPa/0.18～1.3MPa		
	Is discharge temp. within normal range?	120°C or under		
	Is suction overheat within normal range?	2～20°C		
	Is compressor under-dome temp. within normal range?	25～60°C		
	Is there abnormal drop in operation range by protective function?	Check protective control operation.		
	Is it stopped by error?	Check error stop history.		
	Does the fan speed normal?	Check if it runs stably at commanded speed.		
	Is there abnormal noise, vibration?	Check by hearing, visually.		
	Does anti-freeze heater operate?	Where outdoor temp. is 3 or lower with cold region specifications.		
	Does anti-freeze operation function?	Where outdoor temp. is 3°C or lower with built-in pump.		
	Did explain to, check with the user contents of setting for remote controller, MCU CONTROLLER?	Explain.		
	Has flow rate reached setting flow rate?	Setting flow rate		
	Is built-in pump stopped by error?	Check error stop history.		
Water circuit	Is water retained more than min. retention water volume?			
	Does water leak?	No water leak		
	Is unit outlet water pressure in normal range?	Without pump: 1.0 MPa With built-in pump: 0.7 MPa or less		

Unit operation data

Item		Line 1	Line 2
Water circuit	Inlet water temp. (°C)		
	Outlet water temp. (°C)		
	Water volume (m^3/h)		
Refrigerant	High pressure (MPa)		
	Low pressure (MPa)		
	Compressor speed (rps)		
	Operating current (A)		
	Discharge pipe temp. (°C)		
	Suction pipe temp. (°C)		
	Compressor under-dome temp. (°C)		
	Suction overheat (°C)		
Air blow	Outdoor temp. (°C)		
	External fan speed (min^{-1})		

9. Maintenance

⚠ DANGER

The main switch can be used as an emergency stop when the operator is near the heat pump. The restore of the main switch will immediate restart the unit, without further action by the operator.

9.1 Safety instructions

All maintenance work is to be carried out under strict compliance with the country-specific Health & Safety. In particular we refer to the accident prevention regulations for electrical installations, refrigerating machines and equipment. Noncompliance with the safety instructions can endanger people and the environment. Maintenance work has only to be carried out on the units by authorized and qualified specialist staff.

⚠ WARNING

Work on the system must always only be carried out when it is shut down. To do this, the unit must be switched off at the controller and at the master switch. A "DO NOT SWITCH ON" warning sign must be displayed.

Live electrical components are to be switched to de-energized and checked to ensure that they are in the de-energized state.
Some verifications must be effected with the unit in operation (measuring the current, pressures, temperatures). In such a case the unit must only be switched on at the master switch after all mechanical connections have been carried out.

Warning notes

• When the master switch is turned ON and the controller is stopped the power contactors are live, even if the components are not operating.
• At the fan contactors, dangerous voltages occur. Do not open the unit within the first 5 minutes after disconnection of all phases. Be sure that the unit is being isolated.
• The electronics housing of the fan motor can get hot.
• The fans have an overrun time after the unit is stopped. (Risk of injury)

9.2 Maintenance guidelines

1. It is important to maintain always the equipment in favorable condition in order to operate the unit stably over many years.
Standard inspection parts, check points and maintenance cycles are shown on next and subsequent pages. Use these as reference for maintenance.
2. Maintenance cycles are difficult to generalize because they could vary depending on conditions of use (including maintenance).
Please note that the maintenance cycles quoted here do not mean “warranty period”.
The guidelines are applicable when the following conditions of use are satisfied.
1) The equipment is used under normal conditions without frequent starts and stops.
2) Operation time is assumed to be 10 hours/day or 2,500 hours/year.
Where the following items are applicable, it should be considered to reduce the routine and preventive maintenance interval.
a. Where high temperatures, or humidity, are experienced or these change widely.
b. Where the power supply (voltage, frequency, distortion in waveform, etc.) or load fluctuate widely.

c. Where the equipment receives severe vibration or impacts.
d. Where operating atmosphere is heavily loaded with dust, salt, toxic gas like sulfuric acid gas or hydrogen sulfide, oil mist, etc.

It should be noted also that, in order to use the product without worry, it is better concluding maintenance agreements with professional contractors for regular inspections.
Contents of maintenance should be determined individually with contractors.

Unit working time: 10 hours/day of 2,500 hours/year

Parts name	Routine maintenance			Preventive maintenance	
	Check point	Criteria	Interval	Activity	Interval
Compressor	Dielectric resistance	Not less than 1 MΩ	1 year	Replace or repair	20,000 hours
	operating current	Under standard value	1 month		
Fan *1	Apparent condition	No crack or abnormal noise	1 year	Replace or repair	10 years
Air heat exchanger *2	Apparent condition	No clog between fins	1 year	Clean, replace or repair	5 years
Water heat exchanger *3	Water quality	Satisfiy requirment	1 year	Clean or replace	4 years
Expansion valve	Performance	Working properly, no deformation	1 year	Replace or repair	20,000 hours
safety valve *4	Apparent condition	No deformation or leak	6 months	Replace	-
High pressure switch	Performance	Working under the pressure of 41.5bar	1 year	Replace	25,000 hours
Solenoid valve	Dielectric resistance	Not less than 1 MΩ	1 year	Replace or repair	20,000 hours
	Performance	Working properly	1 month		
Crank case heater	Dielectric resistance	Not less than 1 MΩ	1 year	Replace or repair	8 years
	Performance	Power's supplied while compressor is stopped	1 month		
PWB board	Apparent condition	No dust's attached	1 year	Clean	25,000 hours
	Performance	Working properly, no connector is loose	1 year	Replace or repair	
Inverter	Apparent condition	No crack, deformation, color change or liquid leakage	1 year	Replace	25,000 hours
Temperature sensor	Dielectric resistance	Under standard value	1 year	Replace or repair	5 years
	Apparent condition	No deformation	1 year		
Pressure transducer	Dielectric resistance	Under standard value	1 year	Replace or repair	5 years
	Apparent condition	No deformation	1 year		
Frame	Apparent condition	No heavy rust	1 year	Clean, replace or repaint	8 years
Refrigerant circuit	Apparent condition	No leak or abnormal noise	1 year	Replace or repair	20,000 hours
Hydraulic circuit *5	Apparent condition	No clogging in parts such as strainer, etc	1 year	Clean, replace or repair	5 years

Note

1) Fan
If fan gets too dirty to work properly, make sure to clean it when the power is "OFF".
If there's any abnormal noise, please contact our distributor.

2) Air heat exchanger
If air heat exchanger gets too dirty, it'll affect the capacity of unit.Wash it with water or steam.
Make sure the power is "OFF" during washing. And start to use the unit after it gets dry.
Avoid touch the fin with bare hand, it could cause injury.

3) Water heat exchanger
Plate het exchanger is used in this unit for the heat exchange of water.
After being used for a long period, scale may grow inside plate heat exchanger. It'll lead to low performance, low flow rate, or even freeze damage.
It's recommended to clean the plate heat exchanger periodically, to get rid of scale.
Please contact our distributor for more details.

4) Safety valve

The evaluations of the safety valves must be done in accordance with the national regulations.
Where there are no criteria in national regulations, please refers to the following parts of EN 378-4:

- The safety valves are checked in accordance with EN 378-2: 2016 paragraphs 6.3.4.3.1, 6.3.4.3.4 e 6.3.4.3.5 and submitted tightness test every year.
- The safety valves are recalibrated or substituted every five years.

5) Hydraulic circuit

- Check if the strainer is clean. If it's clogged, it'll reduce the flow rate, which might lead to freeze damage of plate heat exchanger.
- Check if there's air in hydraulic circuit. If so, use air vent valve to let the air out.
- Check the water quality flow out of water tap. If it's dirty, it'll affect the unit performance and cause corrosion of plate heat exchanger and water pipes.
- Check the flow rate of hydraulic circuit, by measuring the temperature difference or pressure difference between inlet and outlet. If flow rate decreased, stop the unit immediately. Low flow rate might cause freeze damage of plate heat exchanger.
  possible reasons: strainer clog, air in hydraulic circuit, water pump trouble...
- Check the water pump periodically, according to the requirement.
  In case of water leakage or abnormal noise, please check the condition of water pump.

9.3 Guidance for drafting of the logbook

Every unit need to have logbook for the purpose of recording performed actions on the unit: maintenance, additional refrigerant charge, oil and refrigerant replacement, the history of repairs on the unit, list of replaced components, etc. Logbook should make the person responsible for maintenance. In the logbook, the following information shall be recorded:

- Details about the process of maintenance and repair
- Quantity of refrigerant which is added, reused or recuperated
- Information connected to the refrigerant which is reused and its origin
- Which components are replaced and which are new placed in the unit
- Results of periodically performed tests
- Significant periods of not using the unit

9.4 Error code lists

When error occurs, you could check PWB1 and PWB2 for further error details.
You could find the error code list in the following pages.

Note

1) When multiple error occur, the error code with higher priority will be displayed.
   The priority is as below.
   - Green, red light: high level error > low level error
   - When error level is the same: small code number > big code number
     However, in the case of red light flashing: big code number > small code number
2) 7-segment'll display error code then the address of error PWB2 repeatly.
3) When there's multiple units, firstly check PWB1. If PWB2 error occurs, you could find the address of error PWB2 in 7-segment display of PWB1. Then check the error PWB2 directly.

Error codes of PWB1

Code	PWB1			Error level	Check point
	Green light	Red light	7-segment		
E1	keep flashing	light up	E1	high	Communication error between PWB1 and PWB2
E9	keep flashing	-	E9	high	Freeze risk
E10	keep flashing	-	E10	high	Inlet/outlet temperature fault (e.g.: heating mode: inlet temp.> outlet temp.)
E13	keep flashing	light up	E13	high	Duplicate address of multi PWB1 or MCU controllers(optional)
E18	keep flashing	light up	E18	high	Setting error of address number
E29	keep flashing	light up	E29	low	Error 3 of hydraulic circuit (high temp. inlet error)
E31	keep flashing	-	E31	high	Duplicate address of multi PWB2
E32	keep flashing	-	E32	high	Open phase on power supply
E36	keep flashing	-	E36	low	Discharge temperature fault (Tho-D1)
E37	keep flashing	-	E37	low	Air heat exchanger temperature fault (Tho-R1~4)
E38	keep flashing	-	E38	low	Connection error of ambient temperature sensor (Tho-A)
E39	keep flashing	-	E39	low	Connection error of discharge temperature sensor (Tho-D1)
E40	keep flashing	-	E40	low	High pressure switch's activated (63H1-1)
E41	keep flashing	-	E41	low	Over heat power of transistor (CM1)(over 5 times/hour)
E42	keep flashing	-	E42	low	Current cut for CM1
E43	keep flashing	light up	E43	high	Address setting error of PWB2
E45	keep flashing	-	E45	low	Commutation error of inverter (PWB3-1)
E48	keep flashing	-	E48	low	Fan error
E49	keep flashing	-	E49	low	Low pressure fault
E50	keep flashing	1-time flash	E50	high	Low level of PWB1 error occurred in all the units
E51	keep flashing	-	E51	low	Over heat power of transistor (CM1)(last more than 15 minutes)
E52	keep flashing	6-time flash	E52	high	Connection error of water temperature sensor (Tho-W1, Tho-W2)
E53	keep flashing	-	E53	low	Connection error of suction temperature sensor (Tho-S1)
E54	keep flashing	-	E54	low	Connection error of high/low pressure transducer (PSH1, PSL1) or communication error of high/low pressure transducer (PSH1, PSL1)
E55	keep flashing	-	E55	low	Connection error of compressor temperature sensor (Tho-C1)
E56	keep flashing	-	E56	low	Connection error of power transistor temperature sensor (Tho-P1)
E57	keep flashing	-	E57	low	Refrigerant circuit fault
E58	keep flashing	-	E58	low	Compressor decoupling fault
E59	keep flashing	-	E59	low	Compressor start-up fault
E61	keep flashing	light up	E61	high	Commutation error between PWB1 and remote control system (Modbus)
E63	keep flashing	-	E63	low	Emergency stop by 7-segment input in PWB2
E64	keep flashing	1-time flash	E64	high	Water pump inverter fault
		4-time flash	E64	high	Connection error of inlet/outlet pressure transducer (PSW1, PSW2) or communication error of inlet/outlet pressure transducer (PSW1, PSW2)
E80	keep flashing	1-time flash	E80	high	Low water flow rate fault 1
		2-time flash	E80	high	Low water flow rate fault 2
		3-time flash	E80	high	High water flow rate fault
E84	keep flashing	light up	E84	high	Emergency stop by 7-segment input in PWB1
E87	keep flashing	light up	E87	low	Communication error between PWB2 and CPU
E88	keep flashing	1~7-time flash	E88	high	Connection error of analog input CnTD-in 1~7 (while SW12-4 is on)

Error codes of PWB2

These codes could only be checked on the 7-segment display of PWB2, it won't be displayed in the remote controller (optional).

Code	PWB1			Check point
	Green light	Red light	7-segment	
E09	keep flashing	1-time flash	E09	Freeze risk
E10	keep flashing	1-time flash	E10	Inlet/outlet temperature fault (e.g.: heating mode: inlet temp.> outlet temp.)
E31	keep flashing	1-time flash	E31	Duplicate address of multi PWB2 or address setting error
E32	keep flashing	1-time flash	E32	Open or mis-phase on power supply
E36	keep flashing	1-time flash	E36-1	Discharge temperature fault (Tho-D1)
E37	keep flashing	1-time flash	E37-1	Air heat exchanger temperature fault (Tho-R1)
		2-time flash	E37-2	Air heat exchanger temperature fault (Tho-R2)
		3-time flash	E37-3	Air heat exchanger temperature fault (Tho-R3)
		4-time flash	E37-4	Air heat exchanger temperature fault (Tho-R4)
E38	keep flashing	1-time flash	E38	Connection error of ambient temperature sensor (Tho-A)
E39	keep flashing	1-time flash	E39-1	Connection error of discharge temperature sensor (Tho-D1)
		3-time flash	E39-3	Connection error of water heat exchanger temperature sensor (Tho-G1)
		5-time flash	E39-5	Connection error of water heat exchanger temperature sensor (Tho-G3)
E40	keep flashing	1-time flash	E40	High pressure switch's activated (63H1-1)
		1-time flash	E40-1	High pressure fault (PSH1)
E41	keep flashing	1-time flash	E41-1	Over heat power of transistor (CM1)(over 5 times/hour)
E42	keep flashing	1-time flash	E42-1	Current cut for CM1
E45	keep flashing	1-time flash	E45-1	Commutation error of inverter (PWB3-1)
E48	keep flashing	1-time flash	E48100	Fan fault
E49	keep flashing	1-time flash	E49-1	Low pressure fault (PSL1)
E51	keep flashing	1-time flash	E51-1	Over heat power of transistor (CM1)(last more than 15 minutes)
E52	keep flashing	1-time flash	E52-1	Connection error of water inlet temperature sensor (Tho-W1)
		2-time flash	E52-2	Connection error of water outlet temperature sensor (Tho-W2)
E53	keep flashing	1-time flash	E53-1	Connection error of suction temperature sensor (Tho-S1)
E54	keep flashing	1-time flash	E54-1	Connection or communication error of low pressure transducer (PSL1)
		3-time flash	E54-3	Connection or communication error of high pressure transducer (PSH1)
E55	keep flashing	1-time flash	E55-1	Connection error of compressor temperature sensor (Tho-C1)
E56	keep flashing	1-time flash	E56-1	Connection error of power transistor temperature sensor (Tho-P1)
E57	keep flashing	1-time flash	E57-1	Refrigerant circuit fault
E58	keep flashing	1-time flash	E58-1	Compressor decoupling fault
E59	keep flashing	1-time flash	E59-1	Compressor start-up fault
E64	keep flashing	1-time flash	E64-1	Connection or communication error of inlet pressure transducer (PSW1)
		2-time flash	E64-2	Connection or communication error of outlet pressure transducer (PSW2)
E84	keep flashing	1-time flash	E84	Emergency stop by 7-segment input in PWB1
E87	keep flashing	1-time flash	E87	Communication error between PWB2 and CPU

10. Malfunction

Problem	Possible cause	Recommended action
Generals		
The heat pump does not start up and the electronic control doesn’t work.	No power supply	Restore power supply
	Main switch is OFF	Turn the main switch to the position of " I ON"
	No power supply to the electronic control	Check the voltage of the power cables to the control. Restore or repair the wiring
	Electric control fault	Contact our distributor
The unit works but the optional remote or MCU controller doesn't work.	Cables between unit and controller are disconnected	Reconnect the cables
	Cables between control and display are broken	Replace the cables
	Cables are connected to the wrong terminal.	Check the manual of controller, then reconnect the cables
	Electric control fault	Contact our distributor
The control works but the heat pump does not start up	Missing the turn on signal	Turn the unit on by local switch, optional controller or user's signal input.
	Errors occur to prevent the unit from working	Check the error code on the 7-segment display of PWB1 and PWB2 (9.4 Error code list). Contact the distributor
	Electric control fault	Contact our distributor

Error display (PWB1)		
E1 (Communication error between PWB1 and PWB2)	Cables between unit and controller are disconnected	Reconnect the cables
	Cables between PWB1 and PWB2 are broken	Replace the cables
	Cables are connected to the wrong terminal.	Contact our distributor
	PWB1 or PWB2 fault	Contact our distributor
E9 (Freeze risk)	Water temperature sensor error	Replace the water temperature sensor
	Low load	Change the temperature setting to increase the load
	Flow rate is low or getting low suddenly	Increase the flow rate
E10 (Inlet/outlet temperature fault)	Water temperature sensor error	Exchange the temperature sensor of inlet and outlet. Then contact our distributor
	Water temperature of inlet is too cold or changed suddenly	Control the inlet water temperature
E29 (High temperature inlet error)	Flow rate gets low suddenly	Control the flow rate
	Other heat source heat up the inlet water	Find out the heat source, and stop it.
E32 (open phase on power supply)	Power supply fault	Check if the power supply meets the requirement
	PWB1 fault	Contact our distributor
E36 (Discharge temperature sensor fault)	Discharge temperature sensor error	Replace the discharge temperature sensor
	Communication fault between sensor and PWB2	Reconnect the cables
	Refrigerant amount is low	Check if there's refrigerant leak
	Expansion valve fault	Contact our distributor
	PWB2 fault	Contact our distributor
E37 (Air heat exchanger temperature sensor fault)	Air heat exchanger temperature sensor error	Replace the air heat exchanger temperature sensor
	Communication fault between sensor and PWB2	Reconnect the connector
	PWB2 fault	Contact our distributor
E38 (Ambient temperature sensor fault)	Ambient temperature sensor error	Replace the ambient temperature sensor
	Communication fault between sensor and PWB2	Reconnect the connector
	PWB2 fault	Contact our distributor

Error display (PWB1)		
E39 (Plate heat exchanger temperature sensor fault)	Plate heat exchanger temperature sensor error	Replace the plate heat exchanger temperature sensor
	Communication fault between sensor and PWB2	Reconnect the connector
	PWB2 fault	Contact our distributor
E40 (High pressure switch is activated)	High pressure switch error	Replace the high pressure switch
	Communication fault between HP switch and PWB2	Reconnect the connector
	Outside air temperature beyond the limits permitted	Contact the distributor
	Refrigerant circuit fault (clogging, low flow rate, etc.)	Contact our distributor
E42 (Current cut)	Compressor fault	Contact our distributor
	Power transistor error	Contact our distributor
	Inverter PCB board fault	Contact our distributor
E48 (Fan error)	Fan error	Replace the fan
	Communication fault between fan and unit	Contact our distributor
E49 (Low pressure fault)	Refrigerant leak	Check if there's refrigerant leak
	Low pressure transducer error	Replace the low pressure transducer
	Communication fault between HP switch and PWB2	Reconnect the connector
	Refrigerant circuit fault (clogging, low flow rate, expansion valve, etc.)	Contact our distributor
	Partially closed tap in the hydraulic circuit	Completely open the tap

11. Dismantling and disposal

The decommissioning of the heat pumps must be carried out by experienced and qualified personnel for the operations required.

⚠ DANGER

EXPLOSION HAZARD: in carrying out any operation specified in this chapter avoid any open flames near the refrigerant pipes when the cooling system is under pressure.
Do not bring open flames near damaged or perforated pipes as the refrigerant gas vapours, mixed with the oil of the compressor, may ignite producing toxic gases.

1. Turn the unit to OFF mode.
2. Turn the main switch to OFF.
3. Disconnect the power supply from the power cables and prevent any voltage reset.
4. Open the electrical cabinet and disconnect the power cables.
5. Drain the refrigerant circuit recovering both the refrigerant and the compressor oil.

⚠ WARNING

Do not dispose of the refrigerant into the atmosphere. The refrigerant must be recovered by a qualified refrigerator technician and, if not reused, sent to an authorized disposal centre.
Even the oil of the compressor must be recovered and sent to an authorized disposal centre. Since the oil forms a mixture with the refrigerant it can not be disposed of as common lubricating oil.

6. Unplug the unit from the water circuit after closing the shut-off valves and drain the water from the hydraulic circuit of the heat pump.
7. Handle the unit as described in paragraph "3.3 Transport" .
8. Dispose of the unit according to local regulations on disposal and safety regulations in force at the installation site. It is advisable to contact a specialized recycling company. Basically, the unit contains the following raw materials: aluminum (exchangers and condensers); copper (exchangers, refrigerant pipes and electric cables), galvanized steel and iron (evaporator and condensers, panels and metal frames); rubber (water pipes).