AIR TO WATER HEAT PUMP

Operation, installation &maintenance manual VR3002

CE

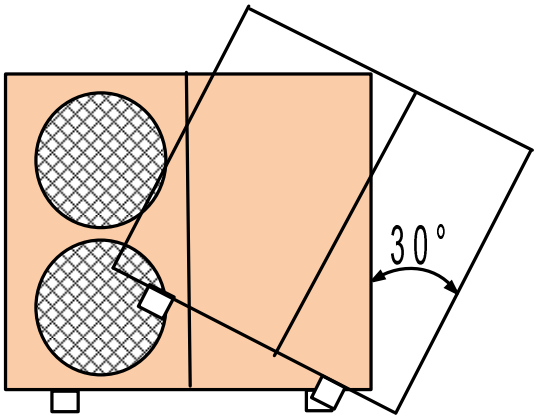
The installation of this unit is to adhere to all local
Building Codes and Standards

Index

Pre-Installation

Movement and Storage

The unit must not be transported, moved or stored at greater than a 30° angle from the upright position. Store the unit in a dry area until required.



The unit must be installed by a suitably qualified tradesperson and all electrical wiring must be completed by a licensed electrical contractor in accordance with all local Standards.

Safety

The installation must be overseen by a qualified person, in order to avoid an incorrect installation that could damage to the unit or cause injuries to people. Any faults and or leaks must be repaired immediately before the unit continues to operate. If repairs have been carried out to the unit then operation of the safety devices and parameter must be rechecked.

If a refrigerant leak occurs, remove the complete charge using a recovery unit and store the refrigerant in mobile container.

Note: care is to be taken as the refrigerant can breakdown due to high temperature, these refrigerants by-products are dangerous.

Once the leak has been repaired recharge the unit with the correct filling weight and the type found on the unit's nameplate.

Note: ensure the correct refrigerant gas is used to recharge the unit as an incorrect gas can cause damage beyond repair to the compressor.

Do not use oxygen to purge lines or to pressurize a unit for any purpose. Oxygen gas reacts violently with oil, grease and other common substances. Use only refrigerant or dry nitrogen for testing.
Never exceed the specified maximum operating pressures.

Pre-Installation

Do not un-weld or flame cut the refrigerant lines including any refrigerant circuit components until the entire refrigerant (liquid and vapour) has been removed from unit. Traces of vapour should be displaced with dry nitrogen.
Refrigerant in contact with an open flame will produces toxic gases.

Ensure that the necessary safety protection equipment is available when servicing. Have the appropriate fire extinguishers for that system.

Do not siphon refrigerant.

Avoid spilling liquid refrigerant onto the skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult medical advice.

Note: Never apply an open flame or live stream to a refrigerant container. This can dangerously overpressure and cause an explosion.

Installation Location

- The unit must be installed on a solid level surface on a concrete pad foundation not connected to the house foundation. Rubber cushions can be added to reduce vibration and noise if required.

- The unit should be place so that it is well away from bedrooms or noise sensitive areas including neighbour's section boundaries. (The unit will produce noise that is above the minimum 45 decibel rating).

- The unit should be well ventilated with no obstructions and kept level at all times.

- Ensure there is good drainage around installation area and make sure this water cannot run out onto paths as it may cause ice or slime build up which is undesirable. (The unit can produce large volumes of condensation water when running in high humidity zones. There is also a large run off when the unit melts ice during a defrost cycle).

- Avoid locations exposed to machine oil vapour, salty air, thermal springs sulphur gases or other harsh substances

- If operation in temperatures below 0°C for prolonged periods or locations where the snow may fall the unit must be raised at least 300mm off the ground. This is necessary to avoid ice build-up on the unit's chassis.

- The unit must be installed level in both axes (less than 2mm tolerance per meter)

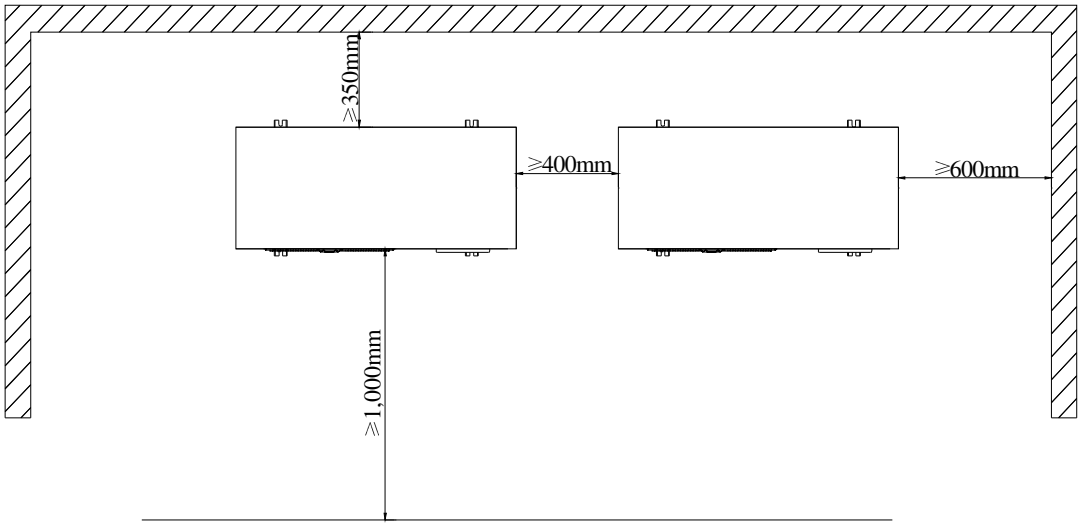
- Locations exposed to strong winds should be avoided otherwise baffles may be necessary to deflect strong winds and to prevent snow from blowing directly into the unit. They must not restrict air flow into the unit.

- Keep suitable distance between the unit and the building to ensure the normal running of the unit and enough room is available for maintenance.

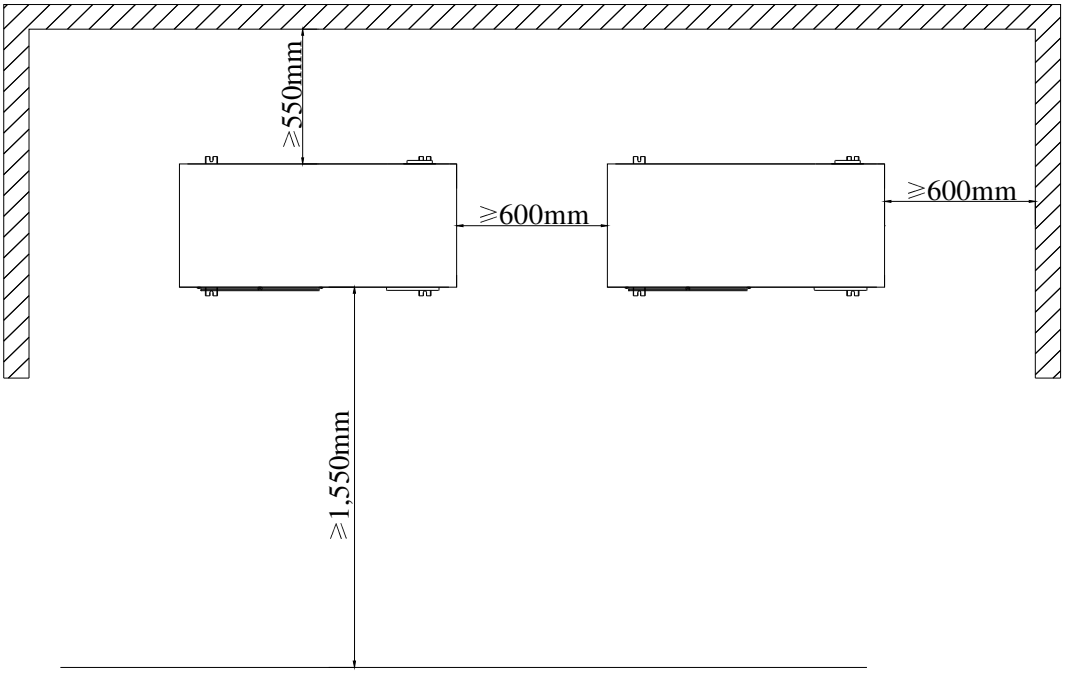
Positioning

SIDE FAN UNITS

AW09B AW10B



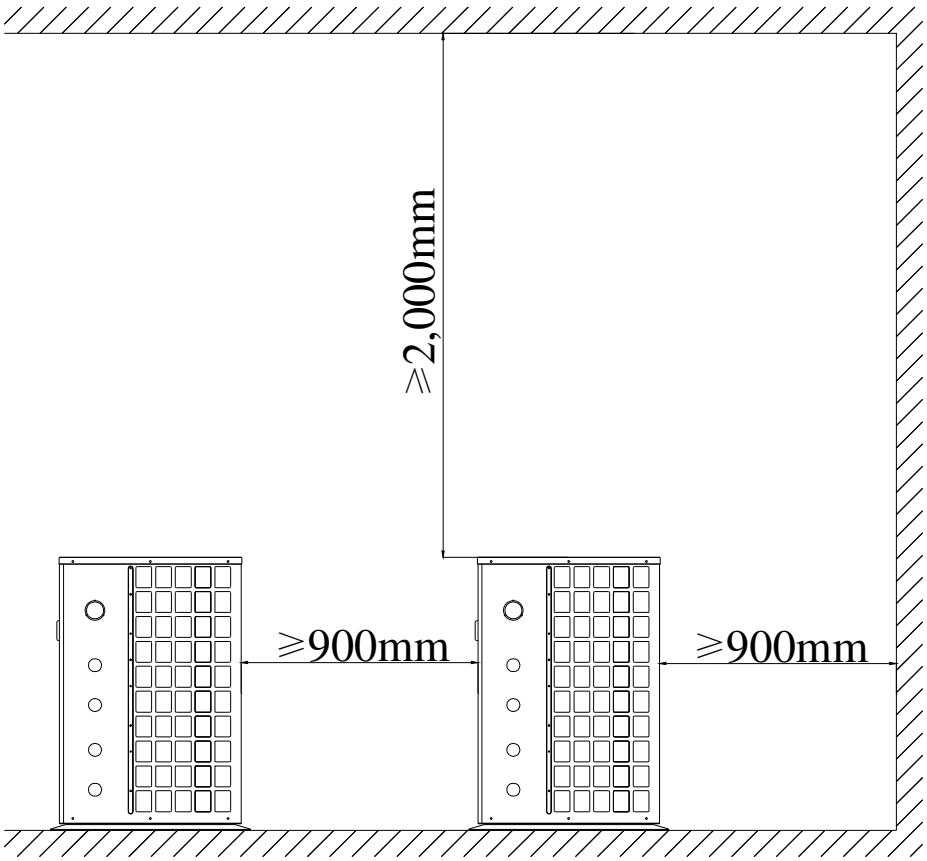
AW12B AW13B AW15B
AW12/H AW13/H



Positioning

TOP FAN UNITS

AW20B LSQ25 LSQ31



Buffer Tank

A buffer tank is recommended to ensure a trouble free heat pump operation. A suitable buffer tank can avoid excessive heat pump cycling (switching on and off).

The buffer tank provides a hydraulic separation from the volume flow in the heat pump and heating circuits. The volume flow in the heat pump circuit remains constant, even if the heating circuit volume flow is reduced by thermostatic valves.

If the total of the systems water volume is less than 12L/KW then a buffer tank should be added to reduce the compressor from ON/OFF cycling. This will prolong the compressor life span.

When a buffer tank is installed, the heating system will absorb energy from the buffer tank first. To save energy consumption ,install the indoor pump P1 that is switched on only when compressor is on. This is by changing EV01 to “1”.

RT sensor should be taken out of the unit and put into buffer tank’s sensor pocket. The RT sensor is located at lower submerged sensor pocket of the plate heat exchanger. The RT sensor in the buffer tank will control the tank temperature by starting and stopping the compressor and pump together as required.

If RT sensor has not been changed to buffer tank’s sensor pocket when EV01 has been change to “1”, when the unit reaches its set temperature ,the compressor will stop, pump P1 will also stop accordingly due to EV01 being set to “1”. When this occurs ,there is no water circulation between the heat pump and buffer tank. RT will keep its stopped temperature ,not the buffer tank water temperature. RT then can not switch on compressor and pump P1 even when buffer tank water is getting cold. Changing the RT sensor into the buffer tank will avoid this problem.

Frost Protection

The plate heat exchanger, the piping and the hydraulic pump can be damaged by frost, despite the built-in anti-freeze protection of the unit.

In frost prone areas refer to installation location instructions.

To avoid freezing-up of the water contained in the system, one of the precautions must be taken during winter:

1. Drain the water from the system, using the drains in the lower part of the unit.
2. Add the correct percentage of glycol antifreeze to the water circuit.
3. The power to the unit must be on all the time so unit can start circulation pump and auxiliary heater for anti-freeze protection.

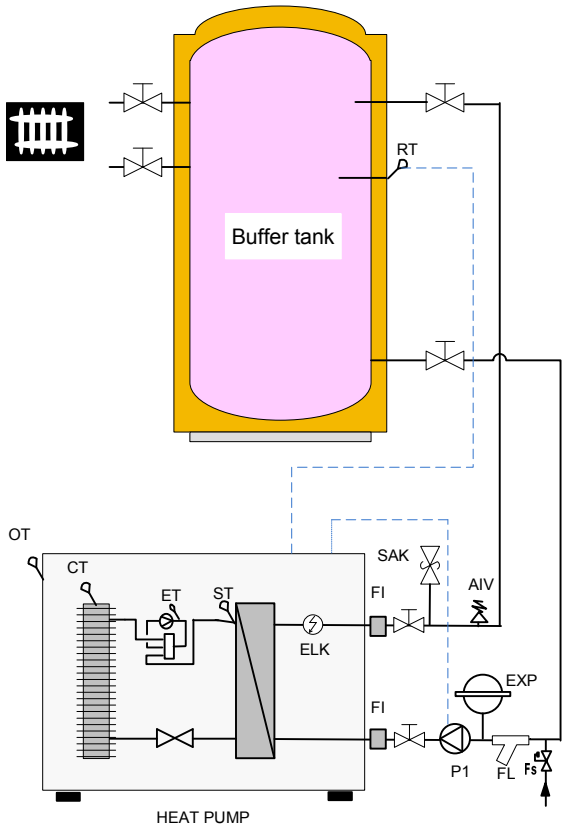
Important

The pipe work must be flushed before the heat pump is connected, so that any contaminants do not damage the components parts .

The water pressure in the evaporator can not exceed 500 kPa or 72 PSI.

Systems Overview

System Overview Heating Hot Water Production



Name	Description	Included	Name	Description	Included
P1	Circulation pump	External	RT	Inlet water temperature sensor	Internal
ELK	Electric heater	Internal(Optional)	ST	Outlet water temperature sensor	Internal
FI	Soft joint	External	OT	Outdoor temperature sensor	Internal
SAK	Safety valve	External	CT	Coil temperature	Internal
FL	Filter	External	ET	Exhaust gas temperature	Internal
EXP	Diaphragm expansion vessel	External	FS	Automatic water supplement valve	External
AIV	Air vent valve	External			

Systems Overview

1. Heating Mode Working Principle:

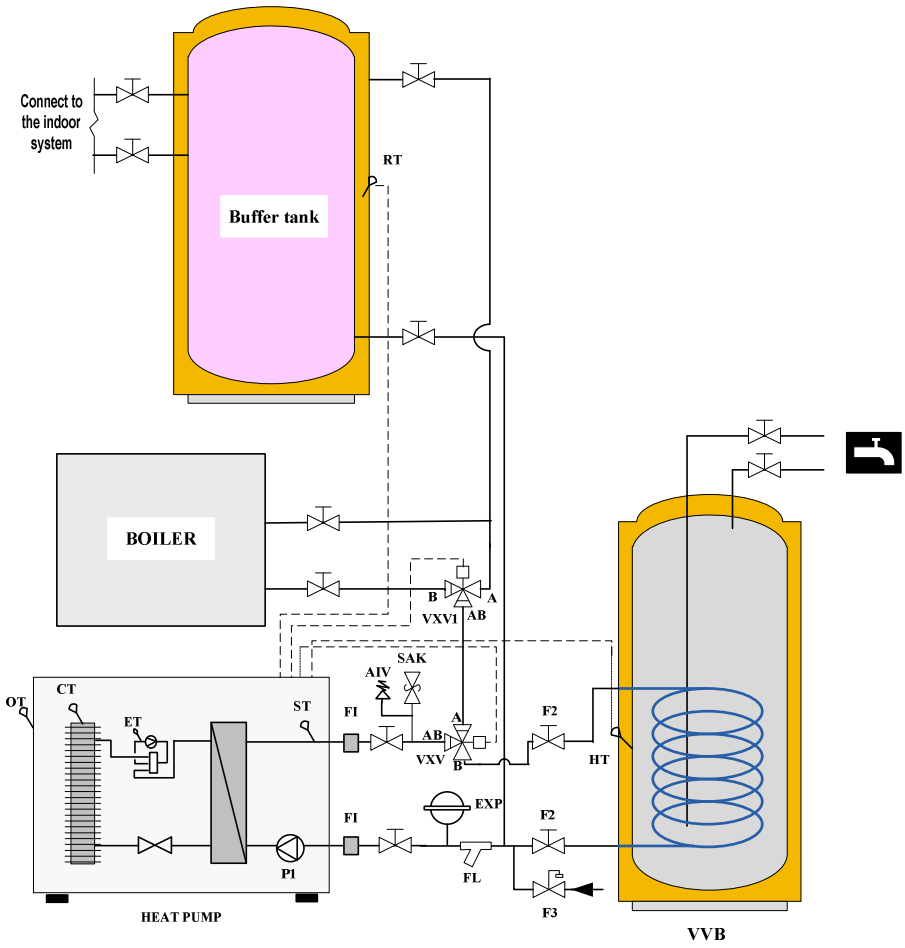
On heating mode

a. When the RT drops below ST02-ST04, the compressor and pump P1 will start to heat until RT>ST02+ST04. Then both the compressor and pump will stop. The Compressor and pump P1 will start again when RT<ST02-ST04.

b. When the outdoor temperature meets the conditions of OT<ST07 and RT< ST02 - ST04 – 1, the electric heater (ELK) will be activated to heat if fitted only. It will stop heating when OT> ST07+ST08 or RT>ST02.

Systems Overview

System Overview Heating ,Cooling with Hot Water Production with Boiler back up



Name	Description	Included	Name	Description	Included
P1	Circulation pump	Internal (optional)	RT	Inlet water temperature sensor	Internal
VXV	3 way valve	External	ST	Outlet water temperature sensor	Internal
VVB	Hot water tank	External	OT	Outdoor temperature sensor	Internal
FI	Soft joint	External	HT	Hot water temperature	Internal
F2	Shut-off valve	External	CT	Coil temperature	Internal
SAK	Safety valve	External	ET	Evaporator temperature	Internal
FL	Filter	External	EXP	Diaphragm expansion vessel	External
AIV	Air vent valve	External	FS	Automatic water supplement valve	External

Systems Overview

1. Heating Mode Working Principle:

On heating mode the three way valve (VXV) will open to the AB-A position.

a. When the RT drops below ST02-ST04, the compressor will start to heat until RT>ST02+ST04. Then compressor will stop. The Compressor will start again when RT<ST02-ST04.

b. When the outdoor temperature meets the conditions of OT<ST07 and RT< ST02 - ST04 – 1, the three way valve VXV1 opens to AB-B and boiler will be activated to heat. It will stop heating when OT> ST07+ST08 or RT>ST02

2. Cooling Mode Working Principle:

On cooling mode, Three way valve (VXV) will open AB-A.

When the RT>ST01+ST03, the compressor will start to cool until RT<ST01-ST03. Then compressor will stop. The Compressor will start again when RT>ST01+ST03.

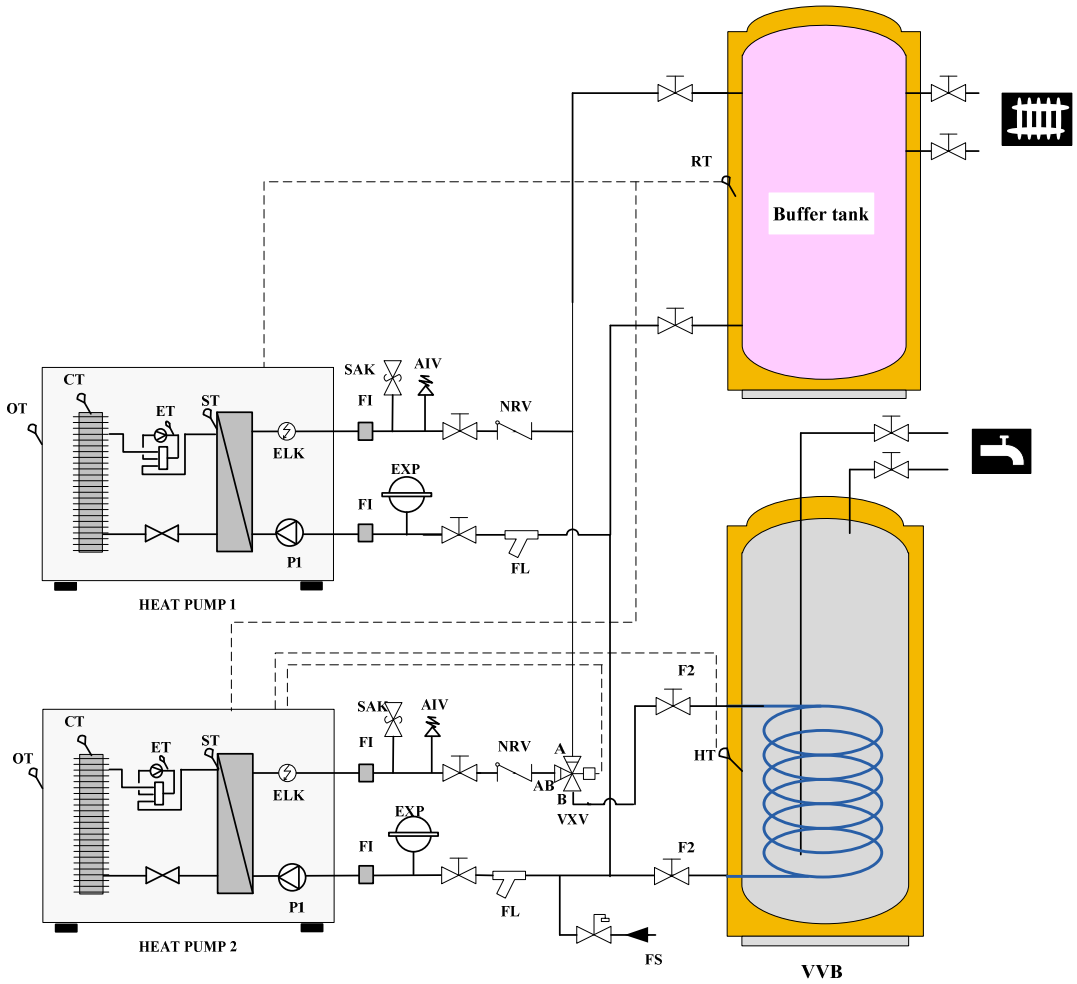
3. Hot Water Production Working Principle:

On hot water mode the three way valve (VXV) will open to the AB-B position.

When the domestic hot water requirement calls for heating, the three way valve (VXV) will have the priority to revert to the hot water tank (VVB). After the domestic hot water has reached its set temperature ST09, the three way valve (VXV) will return to the floor heating position. When HT<ST09 – ST10, the three way valve (VXV) will revert to hot water circuit again.

Systems Overview

System Overview Multiple Units in Series Cascade Connection



Name	Description	Included ?	Name	Description	Included ?
P1	Circulation pump	Internal(Option)	RT	Inlet water temperature sensor	Internal
VXV	3 way Valve	External	ST	Outlet water temperature sensor	Internal
VVB	Hot water tank	External	OT	Outdoor temperature sensor	Internal
FI	Soft joint	External	HT	Hot water temperature sensor	Internal
F2	Shut-off valve	External	CT	Coil temperature sensor	Internal
SAK	Safety valve	External	ET	Exhaust gas temperature sensor	Internal
FL	Filter	External	EXP	Diaphragm expansion vessel	External
NRV	Non return valve	External	FS	Automatic water supplement valve	External
ELK	Electric heater	Internal(Option)	AIV	Air vent valve	External

Systems Overview

Multiple Units in Series Connection

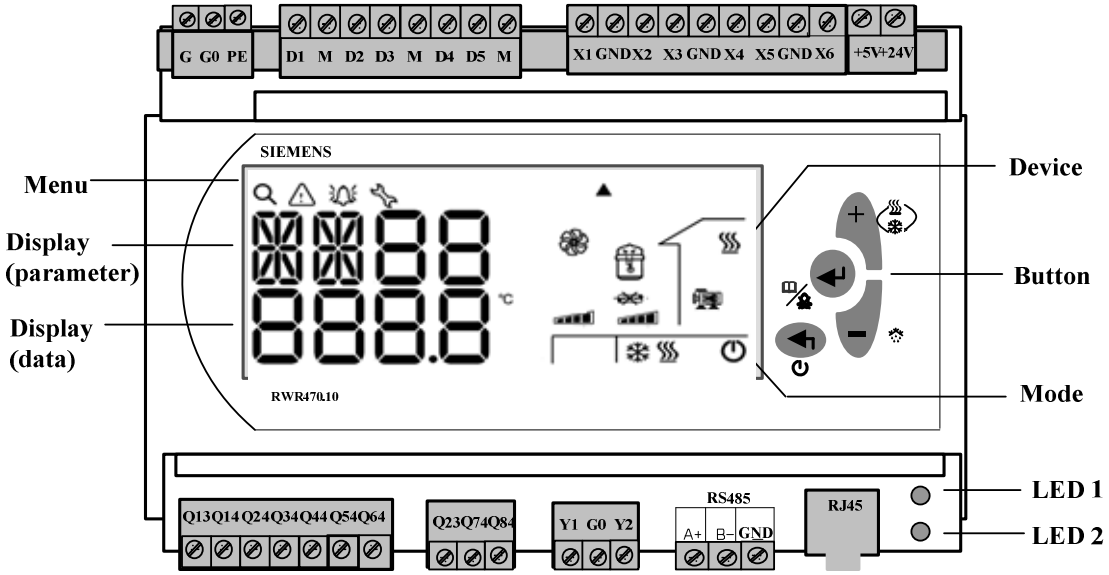
1. To set two or more units in parallel operation, set the primary unit to the required parameters, other units could have 2~5°C difference of ST01,ST02 and ST05 to allow for energy stage control.
2. Switch on all units' A/C switches , if the RT (inlet water temperature) is lower than ST02-ST04 of the unit, then the unit will start to heat. The unit with the lower ST02+ST04 will stop first, the others will stop as well if the RT continues to rise and be over its ST02+ST04.
3. RT will drop when units stop. The unit with the higher ST02-ST04 will start first again to heat . If this unit can meet the heating capacity then its RT will not drop any further, only this unit will run as required. If the heating load is bigger than the capacity of one unit then the RT will continue to drop to below the second unit ST02-ST04 , the second unit will start increasing the heating capacity.

4. When the outdoor temperature meets the conditions of OT<ST07 and RT< ST02 - ST04 – 1, the electric heater (ELK) will be activated to heat if fitted only. It will stop heating when OT> ST07+ST08 or RT>ST02.

Installation

1. The pipe installation must adhere to the local Building Code, standards and any local council requirements.
2. Ensure that the water flow and returns are correct and not reversed. Reversing the water flow will reduce the output of the unit; refer to the labels on the unit for the correct water flow direction.
3. The water pipes must not transmit any radial or axial forces to the heat exchanger. Allow some pipe flexibly between the unit and the structure to reduce any stresses and vibrations issues.
4. The water supplied to the system must be clean and not contain heavy metals that could cause harm to the unit. The water must be treated with an approved inhibitor and tested annually to prevent corrosion, fouling and deterioration of the pump fittings.
5. Protection devices are to be installed to protect the unit from operating outside of its running parameter such as control devices; shutoff valve, bleed valves, safety valves and expansion tanks.
6. The pipe installation should be designed to have the least number of elbows and joiners as they reduce flow. Install drain connections at low points to allow the system to be drain if required.
7. Flexible connections should be used where possible to reduce vibration transmission.
8. Insulate all pipe work and exposed areas to protect against both thermal heat loss and to prevent condensation on chilled pipes.
9. When filling the water system, use air vents and flushing procedure to evacuate any residual air pockets.
10. The heat pump is not fitted with shutoff valves and therefore these must be fitted outside of the heat pump to facilitate future service requirement.

Electrical Connections



	Terminal Assignments		Terminal Assignments
G	Power supply AC/DC 24 V	Q13	Supply 1 (AC 24 V …230 V)
G0	Power supply ground	Q14	Compressor 1
PE	Safety ground	Q24	Compressor 2
		Q34	A/C water pump
X1	Inlet water temperature	Q44	CN03=0, Fan motor; CN03=1 fan motor high speed
X2	Outlet water temperature	Q54	4-way valve
X3	Atmospheric temperature of outdoor	Q64	Electric heater or boiler
X4	Hot water temperature		
X5	Coil temperature	Q23	Supply 2 (AC 24 V …230 V)
X6	Exhaust gas temperature /Suction temperature	Q74	3 way valve or hot water pump
GND	Common reference point for analog input	Q84	CN03=1, fan motor low speed; CN03=0, no use.
+5 V	DC 5 V power output for active sensor	Y1	Output 10V when there is Alarm ,output 0V when there is no alarm
+24 V	DC 24 V power output for active sensor	GND	Common reference point
		Y2	EVI Output 0V or 10V
D1	Water flow switch		
D2	Low pressure switch	A+	A+ connector for RS485
D3	high pressure switch	B-	B- connector for RS485
D4	Air conditioner switch	GND	Optional for RS485 communication
D5	Hot water switch	RJ45	Service interface for parameters uploading and downloading
M	Common reference point for digital input		

Warning:

Electrical installation and service must be carried out under the supervision of a qualified electrician. Electrical installation and wiring must be carried out in accordance with local Standards.

Electrical Connections

Power Connection

Before connecting the power supply, please confirm the unit suits the power supply. The units export to Europe markets are fitted with 220-240V/1/50Hz (single phase) and 380-415V/3/50Hz (three phase) components.

- Breaker protection must be installed according to the max value stated in the nameplate attached to the unit inside of the front panel.
- The equipment must be installed via an isolator switch with a minimum breaking gap of 3 mm.
- The unit may be single or three phase, the power supply must conform to the specification on the unit's nameplate. The supply voltage must be within the range specified in the electrical data table. For wiring connection, refer to the electric wiring diagram on the inside panel of the unit.
- When the building is equipped with a RCD the heat pump should be equipped with a separate one.

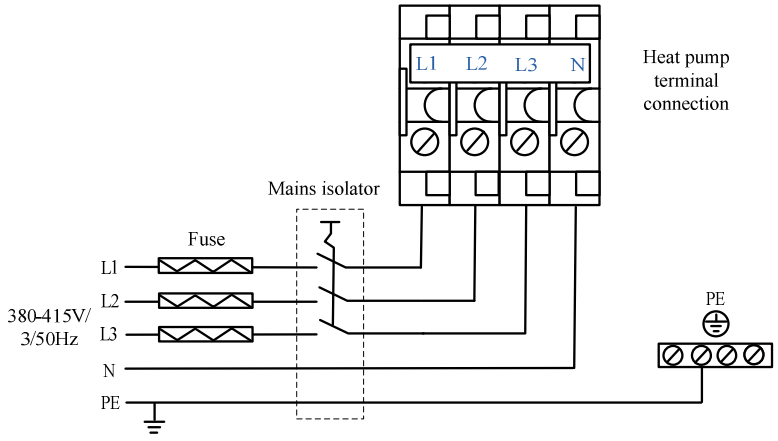
IMPORTANT:

During the installation of the unit, first make the water connections and then electrical connections. If the unit is to be removed first disconnect the electrical connections, then the water connections to reduce the chance of an electrical shock.

WARNING:

Disconnect the main power supply switch before servicing the system or handling any internal parts of the unit.
In case of any major malfunction turn the unit off, disconnect the mains power supply and contact a qualified service engineer.

Mains Connection Diagram



Electrical Connections

Outdoor Ambient Temperature Sensor:

The outdoor temperature sensor (OT) is a standard component and is prewired and positioned in the unit. The probe is located at the back of the unit in a protective casing. The outdoor sensor is terminated on the PC board X3 and GND.

Temperature sensor for hot water:

The hot water sensor (HT) is connected to terminal positions X4 and GND on the main board, the other terminal must be put into hot water cylinder temperature sensor probe inlet pocket if required.

If the hot water sensor cable runs close to power cables, then a shielded cable should be used. If a conduit is used then it should be sealed to avoid condensation forming in the temperature sensor probe.

Inlet water temperature sensor:

The return water sensor (RT) from the factory is placed in the submerged pocket of the plate heat exchanger or on the water inlet pipe.

If a buffer tank is adopted, the RT sensor can be moved to the buffer tank temperature sensor inlet pocket and EV01 parameter value can be set to “1”. This stops the pump running when the compressor is OFF (refer to Buffer Tank section).

If the RT sensor can not be moved to the buffer tank temperature sensor inlet, the EV01 parameter value must be set to “0” (factory default setting). This allows the pump to continue to run so RT measures the same as the buffer tank water temperature.

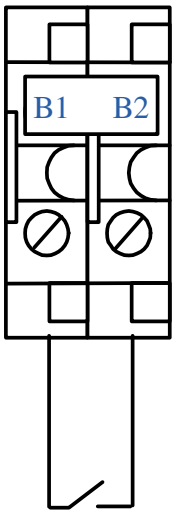
IMPORTANT:

All temperature sensors must be separated (min 200 mm) from high voltage power cables to avoid interference which will cause measured temperature fluctuating and the heat pump may operate incorrectly.

Electrical Connections

A/C switch

If the parameter SF14=0 (factory default setting), the unit's A/C ON/OFF is done by bridging the switch B1-B2, the unit's heating /cooling function is activated. An external signal like a timer or thermostat, etc could be connected to B1-B2 to activate or deactivate the unit for heating/ cooling functions. This external signal must be voltage free. If the remote control is adopted to control the unit then SF14 should be set to "1". Then the A/C switch could not control the unit any more.



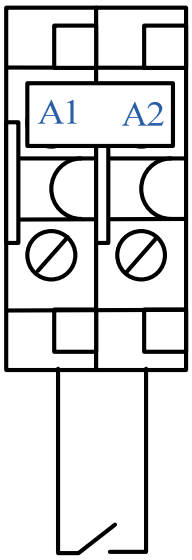
A/C switch

Note

This is a potential free input contact only. DO NOT PUT 230VAC INTO THIS CONTACT

Hot Water Switch

The unit's hot water production for ON/OFF control can only be done by the hot water switch.
When the hot water switch A1-A2 is bridged, the unit's hot water function is activated. An external signal like a timer or thermostat, etc could be connected to the A1-A2 to activate or deactivate the unit's hot water function as required. This external signal must be voltage free.



Hot water switch

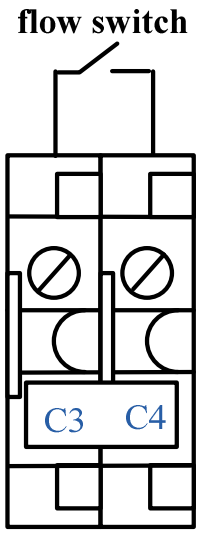
Note

This is a potential free input contact only. DO NOT PUT 230VAC INTO THIS CONTACT

Electrical Connections

Water flow switch

The unit can have a water flow switch safety fitted if not pre fitted at the factory. It is connected across C3-C4. It is used to check if the water is flowing or not in the system. If the water flow switch operates correctly when there is flow, the compressor will operate as normal. If the switch closes due to poor or no flow then the compressor with stop in a safety alarm (AL17 alarm code). The unit will not start until this fault has been cleared.

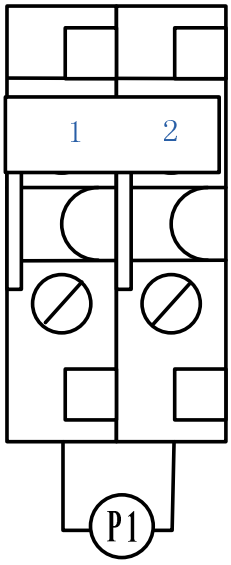


Note

This is a potential free input contact only. DO NOT PUT 230VAC INTO THIS CONTACT

External Water Pump Connection (Q34)

The unit can come from the factory with a water pump pre installed or a terminal connection for a water pump. If the pump has not been installed in the factory, there will be a connection port (1-2) at the terminal connections for smaller than 20KW unit. If water pump current is over 2A, a relay contactor must be used to activate the water pump.

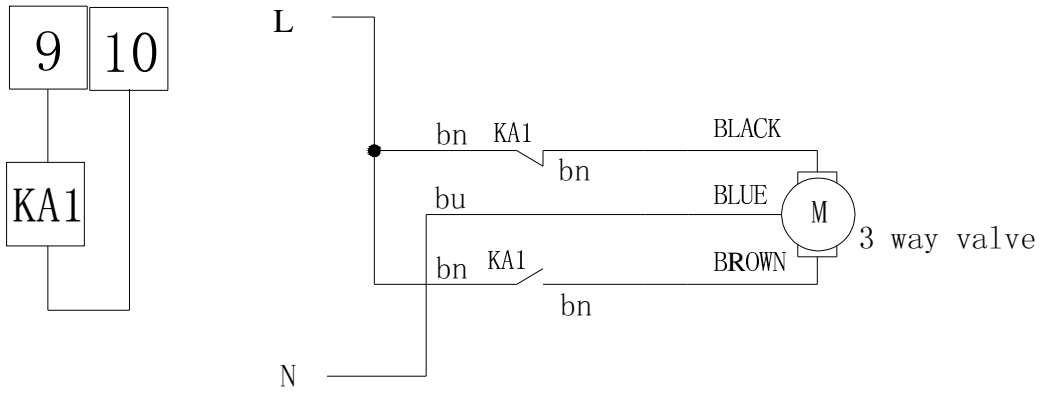


For 20KW and greater than 20KW unit, a relay contactor has been fitted in the factory . Water pump should be connected to the relay contactor according to wiring diagram pasted inside the front panel.

Electrical Connections

External Three Way Valve Connection (Q74)

If the water pump is for both heating and domestic hot water circulation, set SF10=0. Connect a 3 way valve without spring return to relay (KA1) (not supplied). KA1 is connected to Q74 - port (9-10).

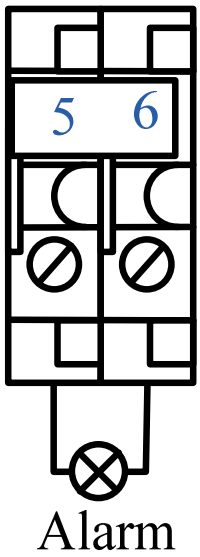


If a 3 way valve with a spring return is used then connect to the terminal (9-10) directly. There is no need for the relay KA1.

If a hot water pump is used for domestic hot water circuit, set SF10=1, connect the hot water pump to terminal (9-10). If the current is over 2A, use a relay contactor to activate the water pump.

Alarm Output (Y1)

If an alarm is activated with the unit, there is a signal output if required. The user can connect an alarm unit such as indication light or an alarm bell. This is connected to the terminal port (5-6), Y1 output is 10VDC.



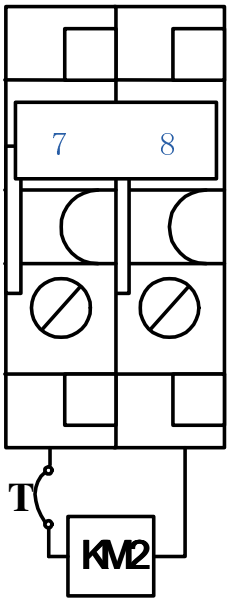
Note

This is a 10VDC output. DO NOT PUT A 230VAC INTO THIS CONTACT.

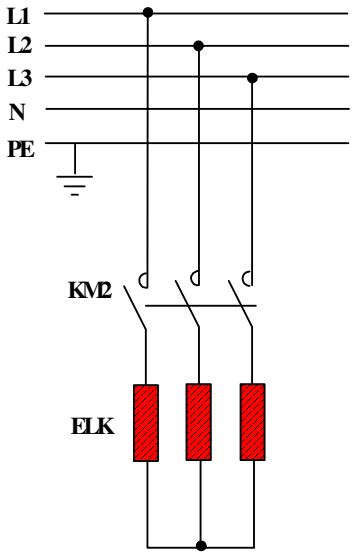
Electrical Connections

Auxiliary Electric Heater or Boiler (Q64)

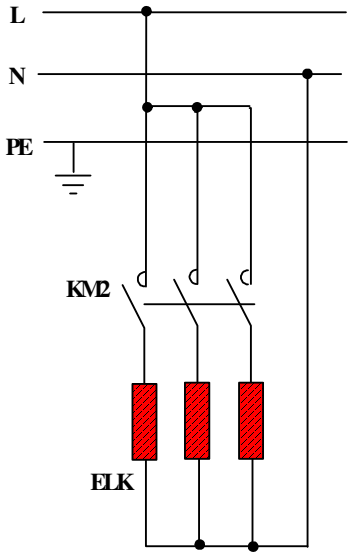
An auxiliary electric heater is optional from the factory that can be installed internally. If it is not installed in the factory there is a connection port (7-8) which can be used to activate and de-activate an auxiliary electric heater or a boiler. The max current for Q64 is 2 Amps therefore a contactor must be applied to control auxiliary electric heater or boiler.



(Three phase)



(Single phase)

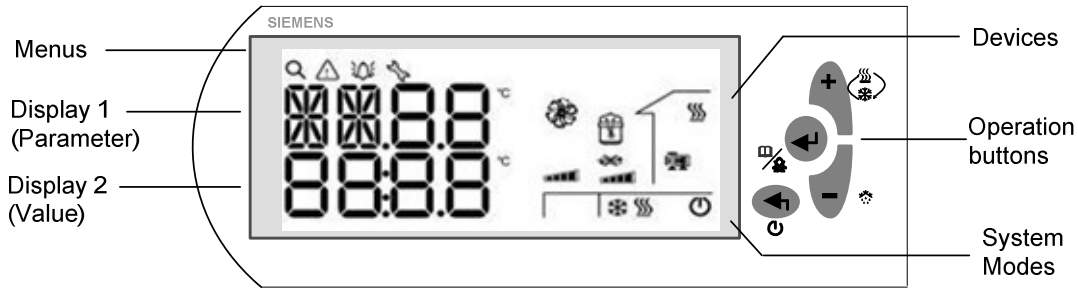


Controller

Controller display (display window & button area)

Display area：

- At normal working mode, display 1 shows temperature code, display 2 shows this code temperature value。
- At menu mode, display 1 shows menu code, display 2 shows this code value。



Menus area：

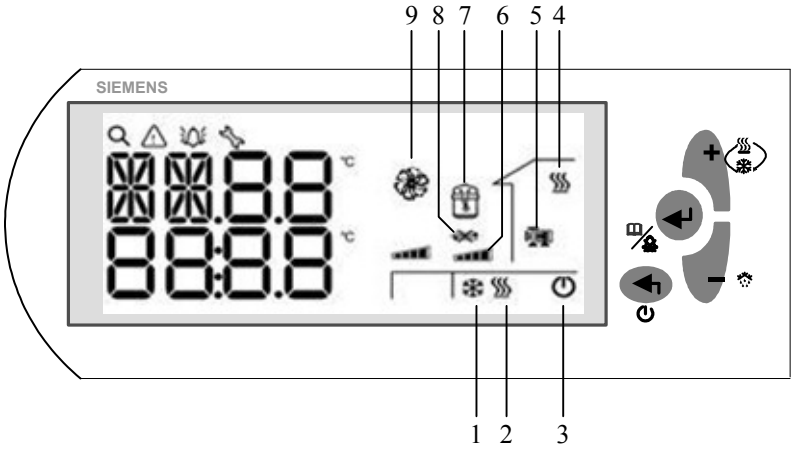
Icon	*Meaning*	*Function*
	Query/view	Actual values of all temperature
	Warning	Existence of warning, and the latest 10 warnings
	Alarm	Existence of alarm and the latest 20 alarms
	Parameters	Set parameters and values (see also Menu Tree)

Operating buttons

Button	*Name*	*Use*
	<Esc>	In Menu /parameter setting mode, press it to return to the previous menu level, or to reject the value entered
	<Enter>	Press down it for more than 2 seconds and release it to enter the Menu mode
		In Menu/parameter setting mode, press it to confirm the selected menu level, or the value entered
		Press it to acknowledge/reset warnings and alarms
	<Plus>	Press it for 2 seconds to activate the System Mode in stop mode
		Or, press it to select the menu level, or to increase the value in Menu/parameter setting mode
	<Minus>	Press it to select the menu level, or to decrease the value in Menu/parameter setting mode

Controller

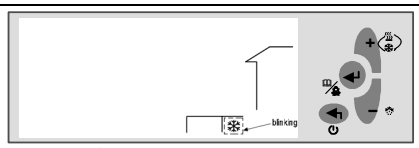
Symbol explanation



1. Cooling mode
2. Heating mode
3. ON/OFF
4. Hot water mode
5. Water pump
6. Compressor energy grade
7. Compressor
8. Water flow switch (light on represents the water flow switch alarm)
9. Fan motor

Controller

Selection of System Modes

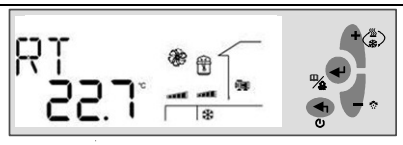
Display	*Procedures*
	In stop mode (A/C switch and hot water switch are both open circuit), press the <Plus> button for 2 seconds, and release it to activate the selection of system mode. The current system mode will start flashing. Press <Plus> or <Minus> to select the desired system mode, and then press<Enter > to confirm.

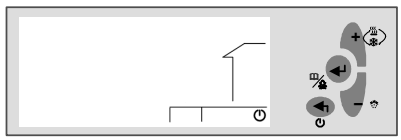
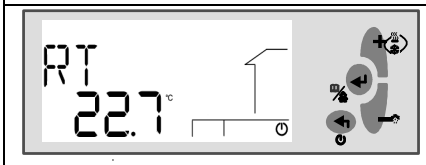
If the current system is heating only (when SF01=2) or cooling only (when SF01=0), the selection of system modes is disable.

If the current system is heating & cooling (when SF01=1), the full sequence of selecting the system modes will be as follows.

Activity	*Sequence*
Press <Plus>	❄ ⇨ ♨ ⇨ ❄ ♨ ⇨ ❄

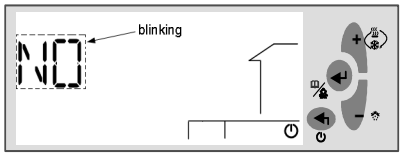
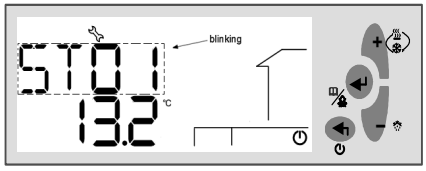
Viewing temperature

Display	*Procedures*
	In normal working mode, press <plus> or <minus>to check the temperature.

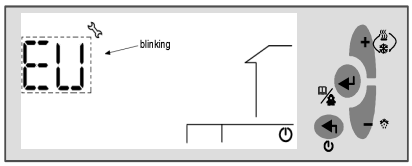
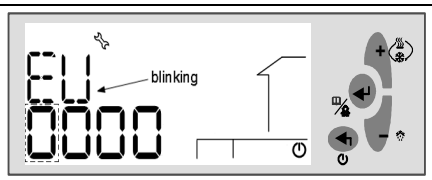
Display	*Procedures*
	In stop mode, press the <Enter> button for 2 seconds and release it to enter the Menu mode. By default, the Query 🔍 icon is blinking, waiting for further instructions.
	Press the <Enter> button to enter the query mode. Press <plus> or <minus>to check the temperature.

Code	Description
RT	Inlet water temperature (Return water temperature)
ST	Outlet water temperature (Flow water temperature)
OT	Atmospheric temperature of outdoors
HT	Hot water temperature probe
CT	Condenser temperature
ET	Exhaust gas temperature / Evaporator temperature

Changing Set points (for end users)

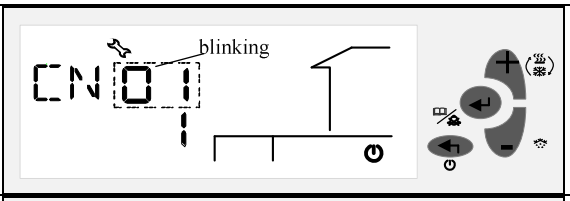
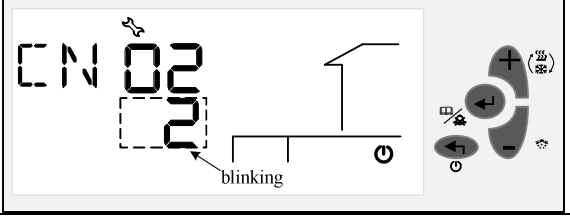
Display	*Procedures*
In stop mode, press the <Enter> for 2 seconds and release it to activate the Menu mode.	
	When the icon is blinking, press <Plus> or <Minus> to navigate to the menu, and then press <Enter> to proceed.
Contents under the Parameter Menu may vary with the privilege right of the user. • For end users, select "**NO**," and press <Enter > to proceed. • For service men and factory users, select "**EU**" or "**ID**", and press <Enter> to input the 4-digit password.	
	For end users, parameters in the "ST" group will by default be displayed. Press <Plus> and <Minus> to navigate to the parameter and press<Enter> to continue.
Or, continuously press <Esc> to exit out of the current level and back to the desired menu level.	

Accessing the Parameter Menu

Display	*Procedures*
In Stop mode, press the <Enter> for 2 seconds and release it to activate the Menu mode.	
When the icon is blinking, press <Plus> or <Minus> to navigate to the menu, and then press <Enter> to proceed.	
Contents under the menu may vary with the privilege right of the user. • For end users, select "**NO**" and press <Enter > to proceed. • For service men and factory users, select "**EU**" or "**ID**" and press <Enter>. Input the 4-digit password when the following screen is displayed	
	Press <Enter> to confirm and continue to input the password.
	Password is required for the service man (EU) and factory users(ID).
To input password, follow the instructions below: • When the digit is blinking, press <Plus>/<Minus> to select the value. Then, press <Enter> to confirm, and proceed to the next digit. • Or, press <Esc> at any time to cancel the input and return to the previous blinking digit. • Repeat steps above to input other three numbers. • After inputting the password, press <Enter> to confirm, and proceed to setting parameter values.	

Controller

Adjusting Parameter Values

Display	*Procedures*
After inputting the password and enter into the parameter setting mode.	
	Press <Plus> or <Minus> to select the parameter code, and press <Enter> to confirm.
	The default value of the parameter will start flashing, allowing you to make a change. Press <Plus> or <Minus> to increase or decrease the value, and press <Enter> to confirm.
Continuously press <Esc> to exit out of the current level and back to the desired menu level.	

User Settings

Para-meter	Descriptions	De-fault	Min.	Max.	Unit	Res	Privi-lege
ST01	Setting temperature at cooling mode (End User)	12	ST11	ST12	℃	0.1	0
ST02	Setting temperature at heating mode (End User)	40	ST13	ST14	℃	0.1	0
ST03	Setting temperature differential at Cooling mode	1	0	10	℃	0.1	0
ST04	Setting temperature differential at Heating mode	1	0	10	℃	0.1	0
ST05	Setting temperature at heating for compensation function	20	0	30	℃	0.1	0
ST06	Compensation factor for heating compensation function	6	0	30	-	0.1	0
ST07	Outdoor temperature to start the electric heater or boiler	0	-10	20	℃	0.1	0
ST08	Outdoor temperature differential to stop the electric heater or boiler	5	1	20	℃	0.1	0
ST09	Hot water temperature	50	ST15	ST16	℃	0.1	0
ST10	Hot water temperature differential	3	1	10	℃	0.1	0
ST18	No use		15	30	℃	0.1	0
ST19	No use		1	10	℃	0.1	0

Heating compensation curve setting

The control temperature for the heating mode has two methods: fixed and changeable temperatures.

1. The fixed temperature is a fixed value and is directly set by the end user from the set area.
2. The changeable temperature is determined by values of ST05, ST06 and the actual outdoor temperature measured by the OT sensor probe.

This function is selected by SF04:
When SF04=0, it is fixed temperature;
When SF04=1, it is changeable temperature.
When SF04=0, the set temperature for heating is ST02.
When SF04=1, the set temperature for heating will be controlled by ambient temperature (OT), ST05 and ST06 according to the following formula:

Set temperature at heating =ST05+ST06 /10*(ST05-OT).

- ST05 is indoor temperature
- ST06 is the heating compensation coefficient curve factor you select for the heat pump to work with. Increasing ST06 will increase compensation temperature and RT will increase relatively.
- OT is the outside temperature.
- The calculated temperature can be used for the control reference, but the maximum data will not exceed ST14.

For example:

1. Set the heating compensation coefficient ST06 to 7,
2. When outdoor temperature is 0°C, the control temperature is :

   ST05+ST06 /10*(ST05-OT)=20+7/10*(20-0)=34°C;
3. When outdoor temperature is -10°C, the control temperature is :

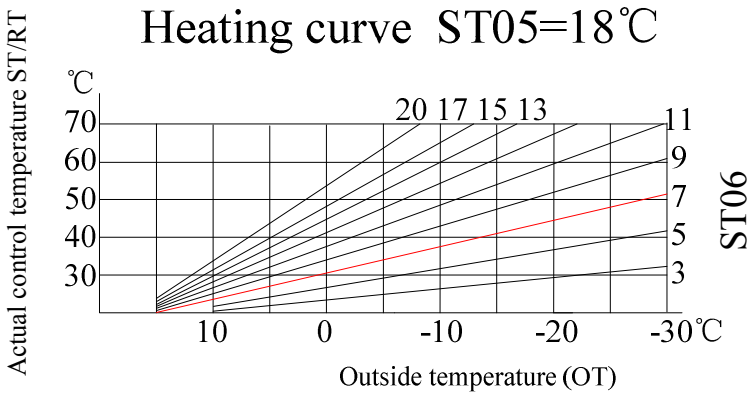
   ST05+ST06 /10*(ST05-OT)=20+7/10*(20-(-10))= 41°C;
4. When outdoor temperature is –20°C, the control temperature is :

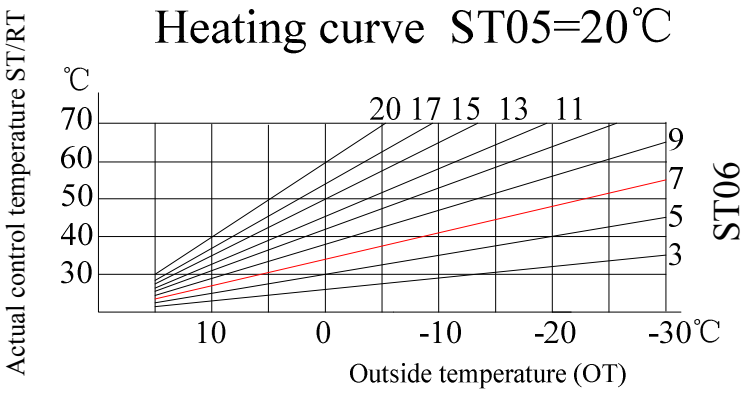
   ST05+ST06 /10*(ST05-OT)=20+7/10*(20-(-20))=48°C;
5. When there is a drop of the outdoor temperature, the control temperature will become higher to meet the larger heating requirement.
6. As the outdoor temperature increase, the control temperature will become lower, this will keep the unit under a lower pressure therefore will have low energy consumption.

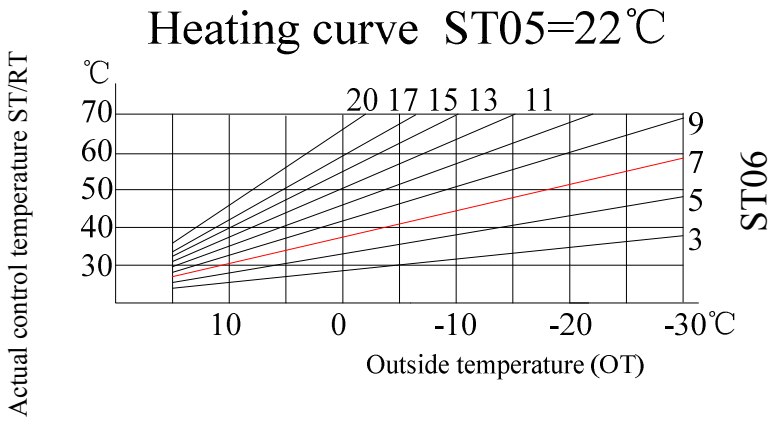
Changing ST05 or ST06 can change the heating curve.

Controller

Three example curve when ST05=18, 20 and 22.







HSHMI-01 Remote Control

Optional part for air to water units with Siemens controller

General information

- Working power: 5VDC 0.16A
- Power consumption: ≤1W
- Workable temperature: 0℃～70℃
- Standard delivered cable: 10m
- Dimension: 85(W)×20(H)×140(L)

Siemens controller setting

This remote control can switch the unit's air conditioning function ON/OFF only. The hot water ON/OFF function is activated or de-activated through terminal connection port A1-A2 .

SF14 has to set to "1" to activate the remote control switching on/off unit function.

If SF14 is "0' then the remote control cannot switch ON or OFF the unit AC function, but still can check temperature data and reset alarms.

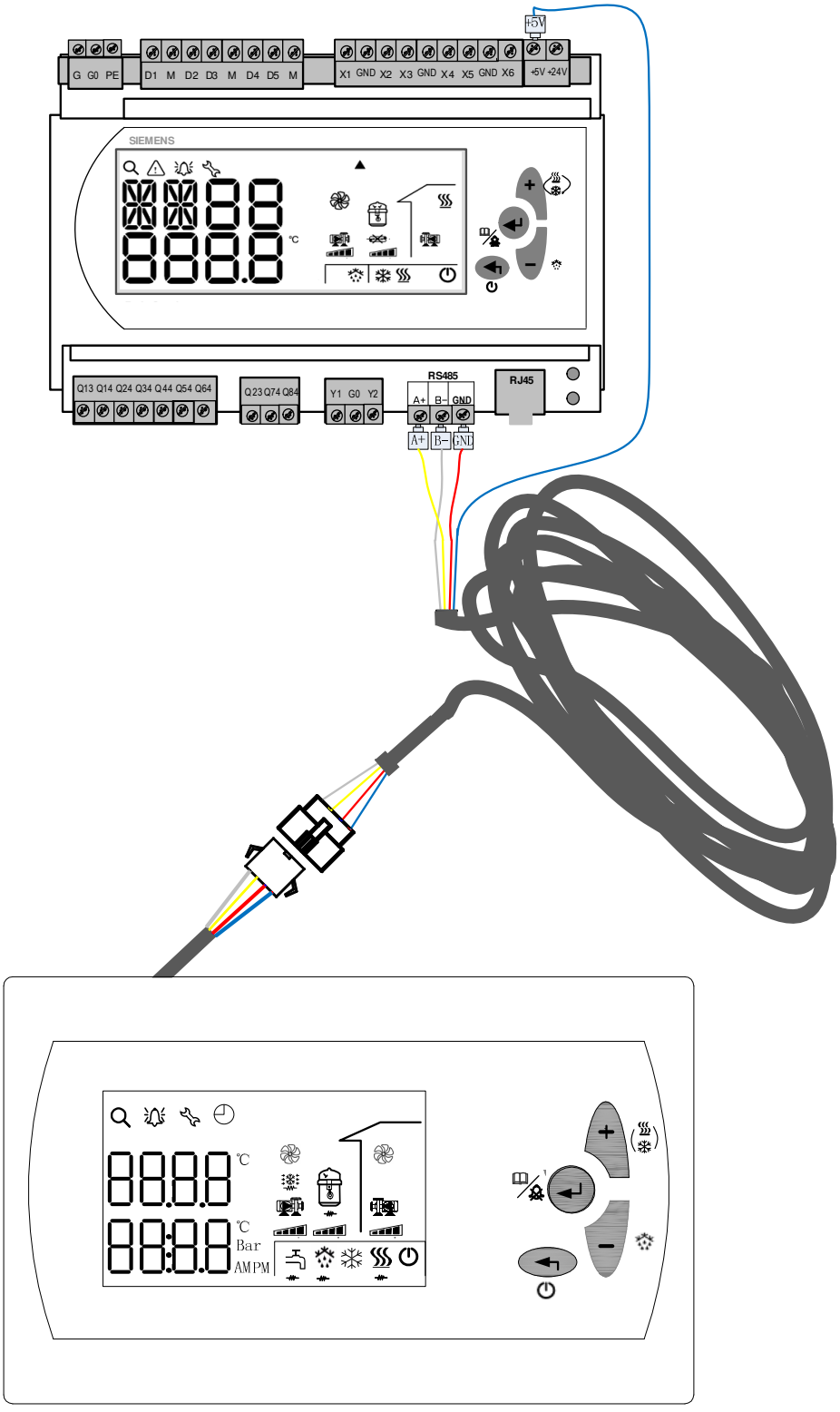
Auto reset alarm

AL00: communication trouble

The other alarms are the same as Siemens controller.

HSHMI-01 Remote Control

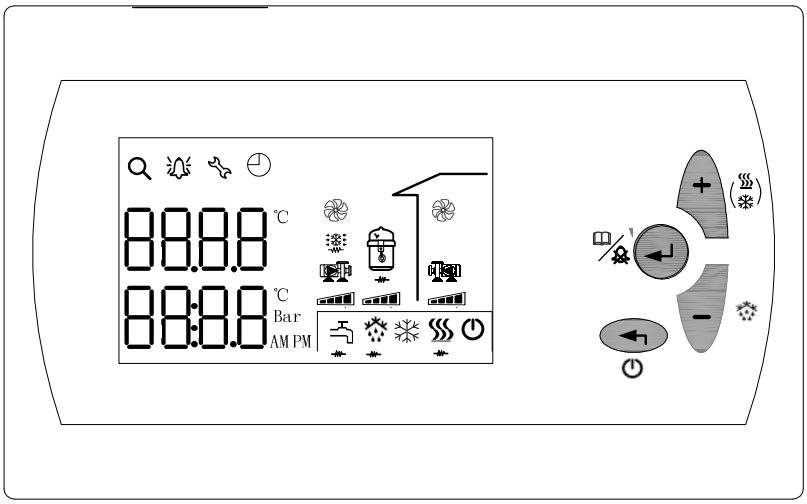
Connect to Siemens controller



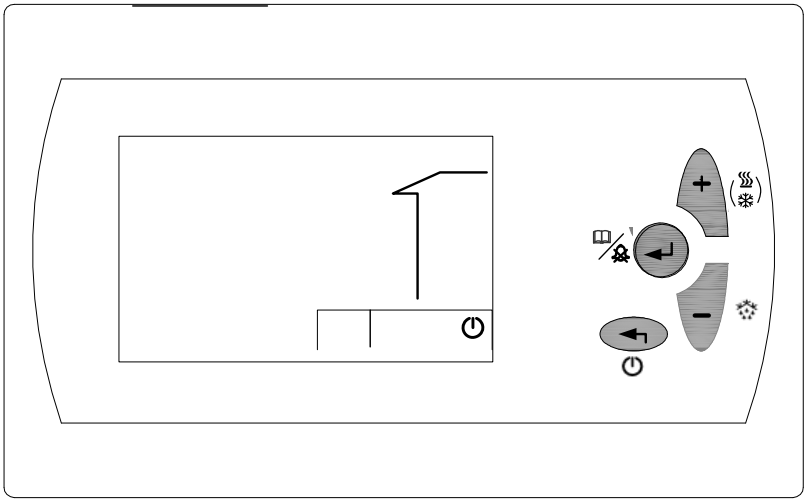
HSHMI-01 Remote Control

Operation

After power ON, remote control will display as below:



The communication between the Siemens controller and remote control will costs some time and need to wait until stop mode as below appears on remote control then further operation could be done.



When setting parameter data via remote control, buttons should be pushed in slow speed as the communication between remote control and Siemens controller costs time.
Unit A/C function could be switched on via pushing <exit> button on remote control:

The unit will switch off when the <exit> button is pushed, “OK” will display if the unit was running, press <enter> button to confirm shut down.

The other operations are same as Siemens controller on the unit.

Commissioning and Adjusting

Preparations- Filling and Flushing

1. Before commissioning, ensure the whole system has been properly flushed and filled with water.
2. Check the pipe work system for leaks.
3. The heating system is filled with water and inhibitor to the required pressure between 100-200 kPa or 15-30PSI.
4. Vent air out the system using the air venting valves.

Compressor Heater

- The unit is equipped with a compressor heater which heats the compressor before start-up when outdoor temperature is low.
- The unit must be in the standby state for 6-8 hours before the unit is switch on for the first time. This is so the compressor heater has the compressor at the correct temp before the FIRST start, this will ensure no damage is done to the compressor on start up.

Phase Sequence Protector:

There is a phase sequence protector for three phase units.

1. After powering the unit up for the first time, check the indication lights on the device.
2. Refer to Chapter on Components for location of the phase sequence protector
    - "Normal" green light on means that phase connection is correct
    - "PR" red light on means that phase connection is in reversal.
    - "PL" red light on means that there is a loss of one or more phases.
    - "O UVR-VOLT" red light on means that power supply voltage is too high/low.

Commissioning and Adjusting

Startup and Inspection

1. Turn the isolator switch on.

> ***Note:***
>
> ***Ensure that the heating control system is in the off position first.***

2. Check that all incoming phases are correct.
3. The compressor heater must have been operational for at least 6–8 hours before a compressor start can be initiated.
4. Check that water flow switch is installed correctly.
5. Start the unit by turning on the heating control system and therefore closing the A/C switch and or the hot water switch.
6. The water pump will start (the flow switch should operate), then fan motor, and finally the compressor.
7. Adjust the flow rate to make water inlet/outlet temperature difference around 5°C.
8. To work out the temperature differential between the input and output flow press PLUS (+) button to check ST and RT. The temperature difference between ST/RT can be adjusted by increasing the flow rate by either using circulation pumps or control valve.

Air in the System after Startup

- Air will initially be released from the water as its heated and further venting may be required.
- If a bubbling sound can be heard from the heat pump, the circulation pump, underfloor and or radiators then the entire system will require further venting.
- When the system is stable (correct pressure and all air eliminated) the automatic heating control system can be set as required.

Warning and Alarms

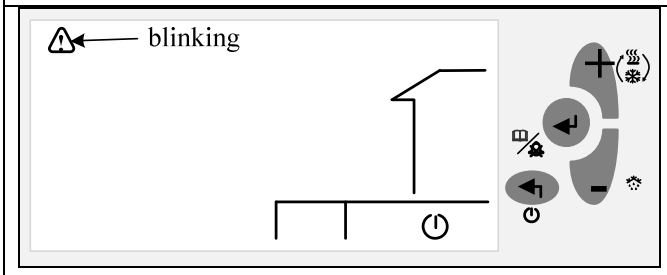
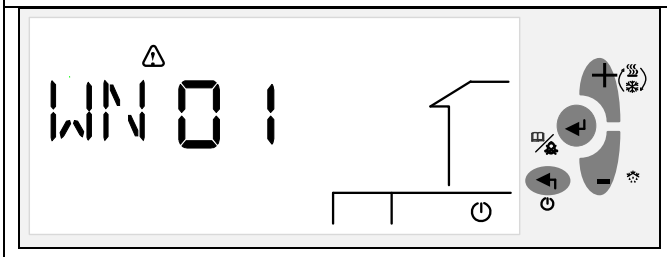
Warning Management

When a warning is detected, the corresponding warning code will be displayed on the LCD. The warning icon ⚠ will flash simultaneously.

- Only the latest 10 warnings will be kept under the ⚠menu.
- Upon power failure of the controller, the warning logs will be erased and recounted

Parameter	*Descriptions*
WN01	Anti-freeze in winter

Viewing Warning Logs

Display	*Procedures*
Press down the <Enter> for 2 seconds and release it to activate the Menu mode.	
	When the 🔍 icon is flashing, press <Plus>/ <Minus> to navigate to the ⚠ menu, and then press <Enter> to confirm.
	Two letters "WN" will be displayed on the LCD, continuously flashing. Press <Enter> again to view the last 10 warning codes generated. If no warning is generated, the word "NoNE" will be displayed.
Continuously press <Exit> to exit out of the current level, and back to the normal running mode.	

Warning and Alarms

Alarm Management

The alarms in RWR470.10 are divided into two groups: auto reset alarms and manual reset alarms.

1. Auto reset alarm, the user is not required to acknowledge and reset the unit.
2. The unit will automatically restart once the alarm status disappears.
3. Once a manual reset alarm is detected, the system will stop automatically.
4. The user needs to record and contact the installer/supplier to reset the unit.
5. To acknowledge and reset the alarm press the <Enter> button.
6. Ensure that the fault has been fixed before the alarm has been reset.

When an alarm is detected:

- The corresponding device icon (if any) and the icon will continuously flash. An alarm code will be displayed on the screen.
- If more than one alarm is detected, the alarm codes will be displayed successively on the LCD screen. These will be seen by using the <plus> or <minus> buttons, or they are manually acknowledged or reset (only for manual reset alarms).
- If the system detects warnings and alarms at the same time, the warning codes will NOT be displayed on the LCD screen.
- The last 20 auto alarms and manual reset alarms generated in total are separately logged under the auto reset alarm (AR) and manual reset alarm (MR) categories in the menu.

Note:

The alarm log is lost if the unit has a power failure or been de-powered.

Warning and Alarms

Auto Reset Alarms

The following are auto reset alarms description:

Codes	Description
AL01	Compressor low pressure (D2)
AL02	Compressor high pressure (D3)
AL03	Low outlet water temperature protection (low than AR01 at any mode)
AL05	High outlet water temperature protection (higher than AR03 at heating/hot water mode)
AL17	Flow switch alarm after the delay (AR05)

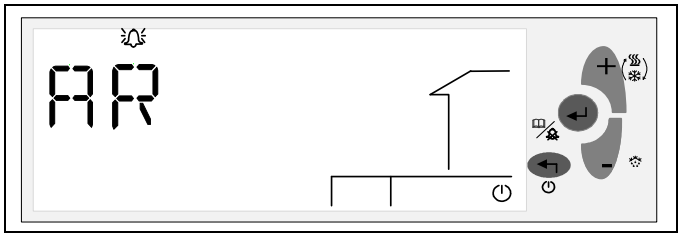
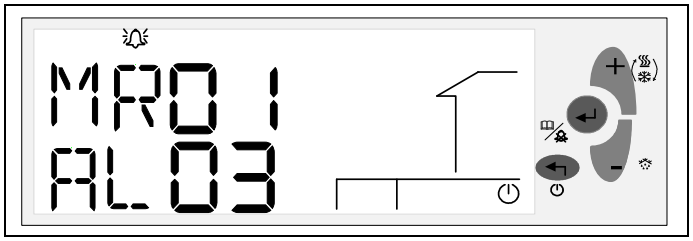
Manual Reset Alarms

The following are manual reset alarms description:

Codes	Description
AL11	RT sensor out of parameter (over 120 ºC or lower than -35 ºC) (X1)
AL12	ST sensor out of parameter (over 120 ºC or lower than -35 ºC) (X2)
AL13	OT sensor out of parameter (over 120 ºC or lower than -35 ºC) (X3)
AL14	HT sensor out of parameter (over 120 ºC or lower than -35 ºC) (X4)
AL15	CT sensor out of parameter (over 120 ºC or lower than -35 ºC) (X5)
AL16	ET sensor out of parameter (over 120 ºC or lower than -35 ºC) (X6)
AL18	Compressor low pressure alarm times within 24 hours is over the limit (AR06)
AL19	Compressor high pressure alarm times within 24 hours is over the limit (AR07)
AL20	Low Evaporator temperature protection (AR08)
AL21	High exhaust gas temperature protection (over AR10)

Viewing Alarm Logs

MR01 and AR01 are respectively the latest information of the manual reset alarm and auto reset alarm.

Display	*Procedures*
Press down the <Enter> for 2 seconds, and release it to activate the Menu mode.	
	Press <Plus> or <Minus> to navigate to the menu, and then press <Enter> to confirm. By default, auto reset alarm "AR" will be displayed on the LCD, flashing.
To view auto reset alarms generated, press <Enter> to continue when "AR" is displayed.	
To view manual reset alarms, press the <Minus> or <Plus> to navigate to the "MR" group, and then press <Enter> to continue. By default, the first manual reset alarm "MR01" will be displayed as follows. Press <Enter> to view the first manual reset alarm code. Or, press<Minus> or <Plus> to view other numbered alarms, and press<Enter> to view the specific code.	
	If no alarm is generated, the word "NoNE" will be displayed.
Continuously press <Exit> to exit out of the current level, and back to the normal running mode.	

Acknowledging and Resetting Manual Reset Alarms

Any alarm detected by the system, either an auto reset alarm or a manual reset alarm will be displayed on the LCD. However, only manual reset alarms require user's acknowledgement and reset.

- Press <Enter> to acknowledge and clear the alarm.

If the alarm status is cleared, the corresponding device icon and alarm icon that are flashing will accordingly disappear.

- Restart the system, as appropriate.

Maintenance

To ensure the optimal performance of the unit regular maintenance is essential. Failure to undertake regular maintenance can reduce the unit performance and of the system shorten the life of the unit .

Exterior Maintenance

1. Make regular checks throughout the year that the inlet grill is not blocked or clogged by leaves, snow or anything else.
2. Ensure during the colder times of the year that there isn't too much frost or ice building up on or around the unit.
3. Periodically inspected for loose, damaged or broken parts. If these faults are found and not eliminated, the unit could cause physical injury and damage to people, goods and property.
4. Regularly carry out leak checks and immediately repair any leak found. If there is a leak in the plate heat exchanger, this part must be replaced.

Unit Refrigerant Checks

1. Verify the air grills are clear and clean it at least once a year, or more often if the equipment environment is especially demanding, this ensures that the unit's performance can be maintained.
2. Check the operation of the high-pressure and low pressure switches. Replace them if there is a fault.
3. Check the fouling of the filter dryer (by checking the temperature difference in the copper piping). Replace it if necessary.

Full-load operating test verify the following values:

A. Compressor high-pressure side discharge pressure
B. Compressor low-pressure side suction pressure
C. Charge visible in the sight glass
D. Verify the charge status by checking the colour indicator of the sight glass
E. If the colour has turned to yellow, if so change the charge and replace the filter dryer after carrying out a leak test of the circuit
F. Temperature difference between the heat exchanger water inlet and outlet temperature
G. Actual liquid sub-cooling, overheating at the expansion device on heat pumps verify correct defrost of the air heat exchanger

Maintenance

If there is not enough refrigerant in the system, this is indicated by gas bubbles in the moisture sight glass in the cooling mode the unit will have poor performance.

If the low refrigerant charge is significant, large bubbles appear in the moisture sight glass and the suction pressure drops, then the compressor suction superheat will also be high.

Find the leak and completely drain the system with a refrigerant recovery unit. Carry out the repair, leak test and then recharge the system.

Note:

After the leak has been repaired, the circuit must be tested, without exceeding the maximum low-side operating pressure shown on the unit name plate.

The refrigerant must always be recharged in the liquid state into the liquid line.

The refrigerant cylinder must always contain at least 10% of its initial charge.

For the refrigerant quantity per unit, refer to the data on the unit name plate.

Verify the Alarm Status

1. Check the alarm menu when the unit is in the standby mode to see if any alarms or warning have occurred.

Electrical Maintenance

1. Check for correct termination tension of the electrical connections, contactors, isolation switch and transformer.
2. Check the condition of the contactors, fuses and capacitors,
3. Check the condition of the electrical cables and their insulation.
4. Carry out an operating test of the electric evaporator heaters, compressor crankcase heater, refrigerant valve and expansion device.
5. Check the phase/earth insulation of the compressors, fans and pumps.
6. Check the compressor, fan and pump winding status.

Maintenance

Mechanical Maintenance

1. Check the tension of the fan motor, fan wheel, compressor and control box fixing bolts.
2. Check that no water has penetrated into the control box.

Evaporator Coil

It is recommended that the finned coils are inspected regularly to check the degree of fouling. This depends on the environment where the unit is installed, areas by the sea can cause increase corrosion and an approved sprayed film coating is recommended.

For coil cleaning proceed as follows:

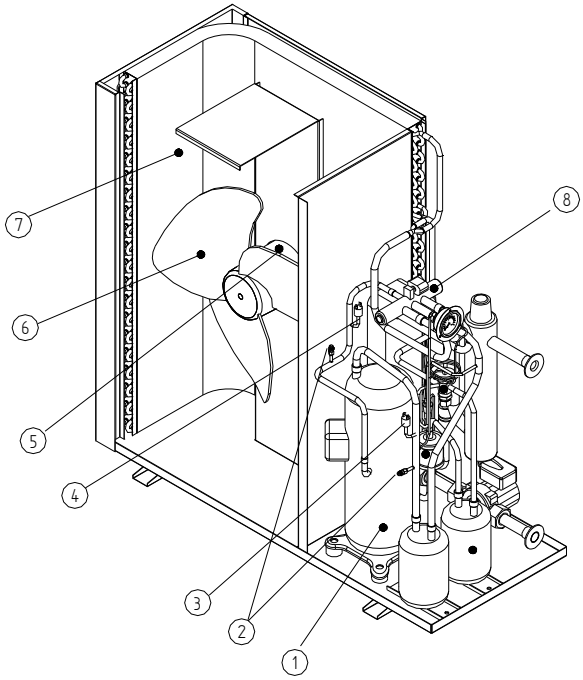
1. Remove fibers and dust collected on the evaporator face with a soft brush (or vacuum cleaner).
2. Clean the coil with the appropriate cleaning agents

Water Circuit Checks

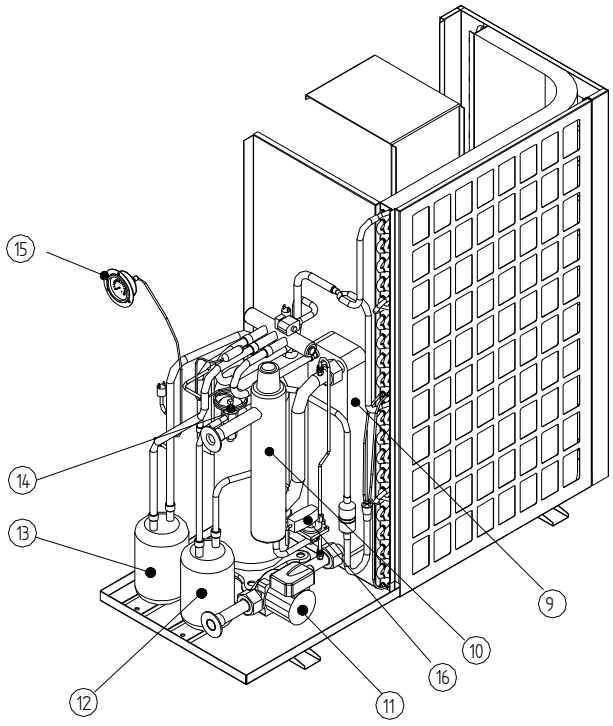
1. Clean the water filter if fitted.
2. Purge the system to remove any air.
3. Verify the correct operation of the water flow switch.
4. Check the status of the thermal piping insulation.
5. Check the water flow by checking the water inlet and outlet temperature difference.
6. Check the concentration of the anti-freeze protection solution (ethylene glycol or polyethylene glycol).
7. Check the status of the heat transfer fluid or the water quality.
8. Check the expansion tank for signs of excessive corrosion or gas pressure loss and replace it, if necessary.
9. Check that the water pressure safety valve is not leaking
10. Check that the air vent valves are not leaking system water

Components

AW10B



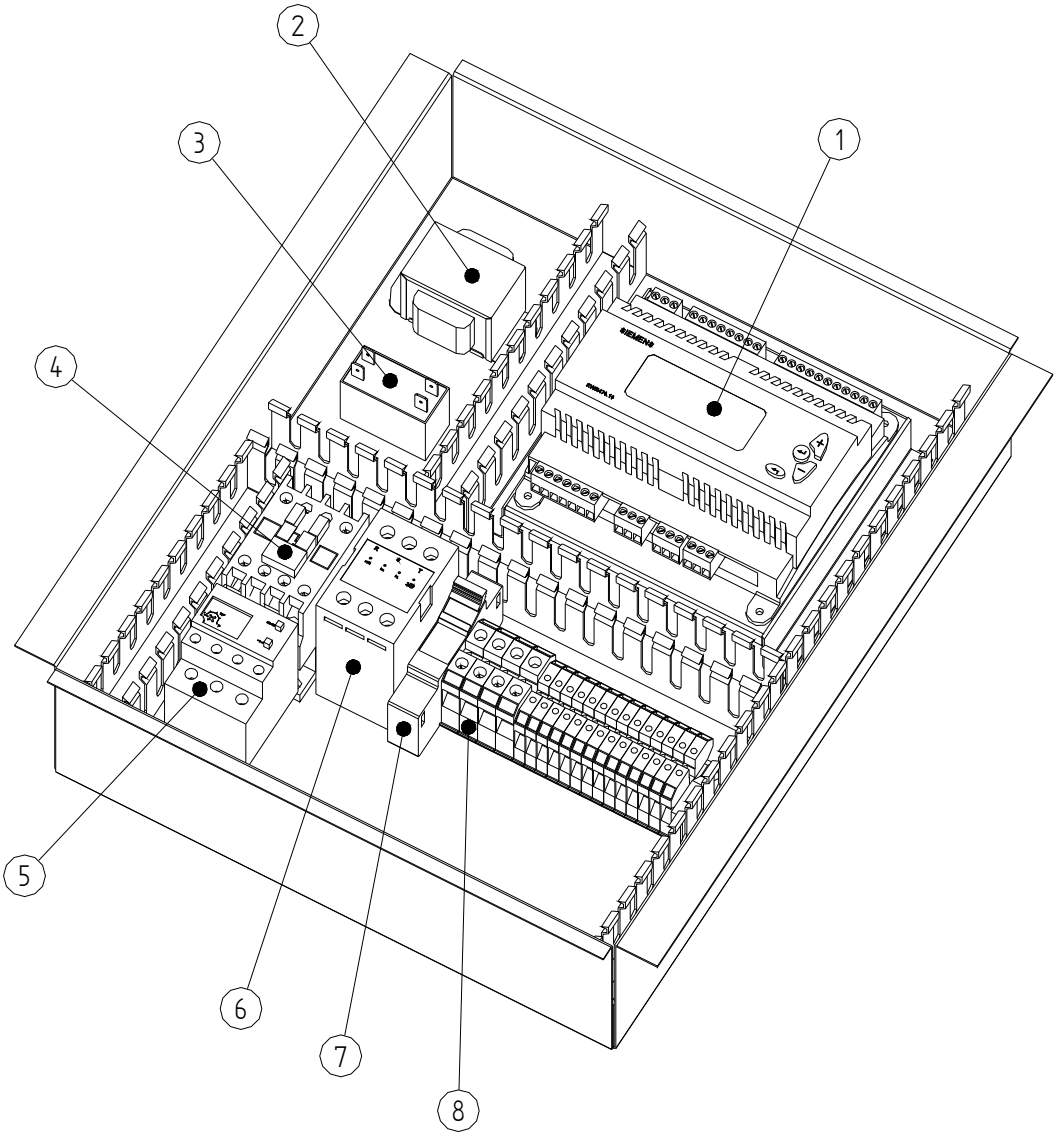
1. Compressor
2. Service connection
3. Low pressure switch
4. High pressure switch
5. Fan motor
6. Fan blade
7. Finned coil heat exchanger
8. Four way valve



9. Plate heat exchanger
10. Electric heater (optional)
11. Water pump (optional)
12. Accumulator
13. Gas-liquid separator
14. Expansion valve
15. Low pressure gauge
16. Differential pressure flow switch

Components

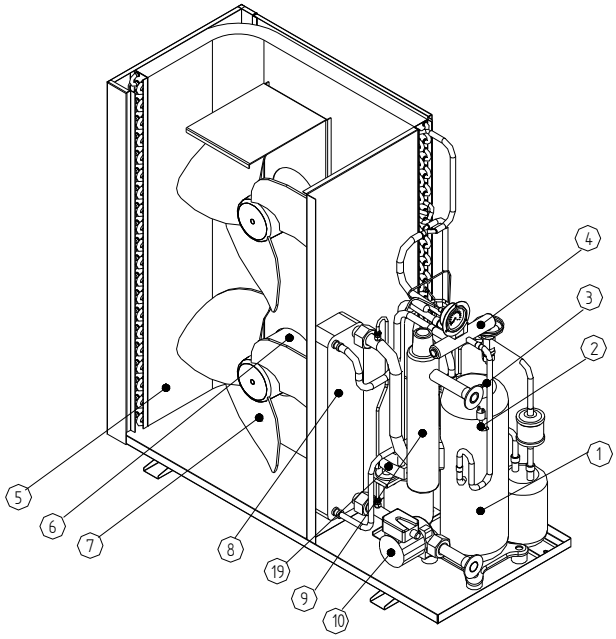
Three Phase Unit's Control Board



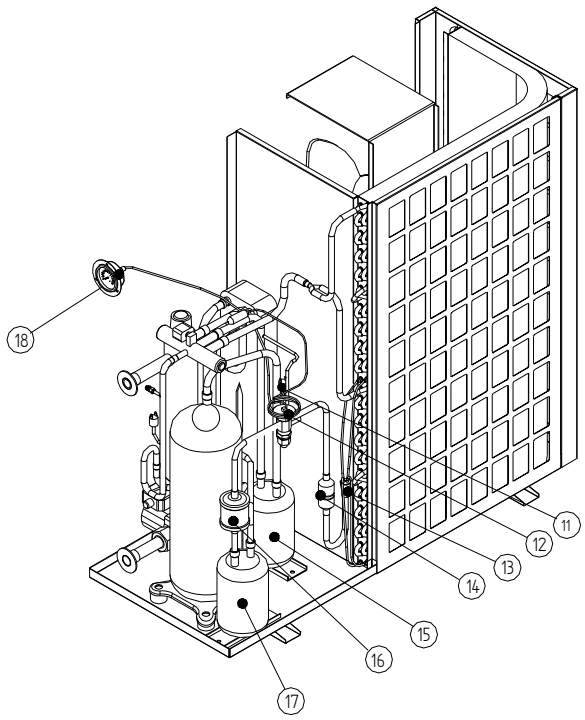
1. Siemens controller
2. Transformer
3. Fan Capacitor
4. A/C contactor
5. Thermal relay
6. Phase sequence protector
7. Controller fuse
8. Connection terminal

Components

AW15/B



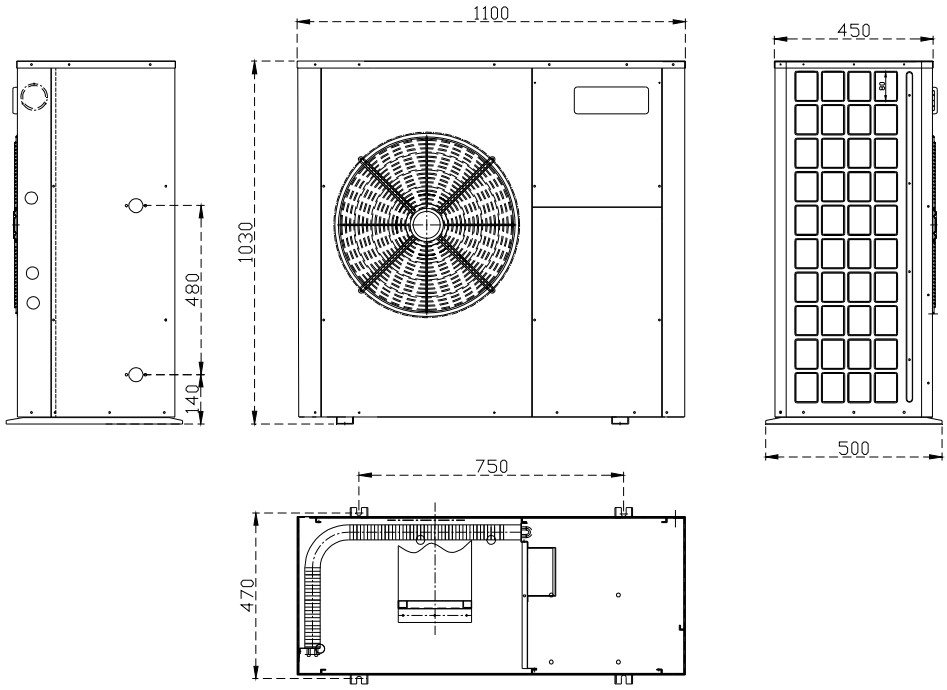
1. Compressor
2. High pressure switch
3. Service connection, high pressure
4. Four way valve
5. Finned coil heat exchanger
6. Fan motor
7. Fan blade
8. Plate heat exchanger
9. Electric heater (optional)
10. Water pump (optional)
19. Differential pressure flow switch



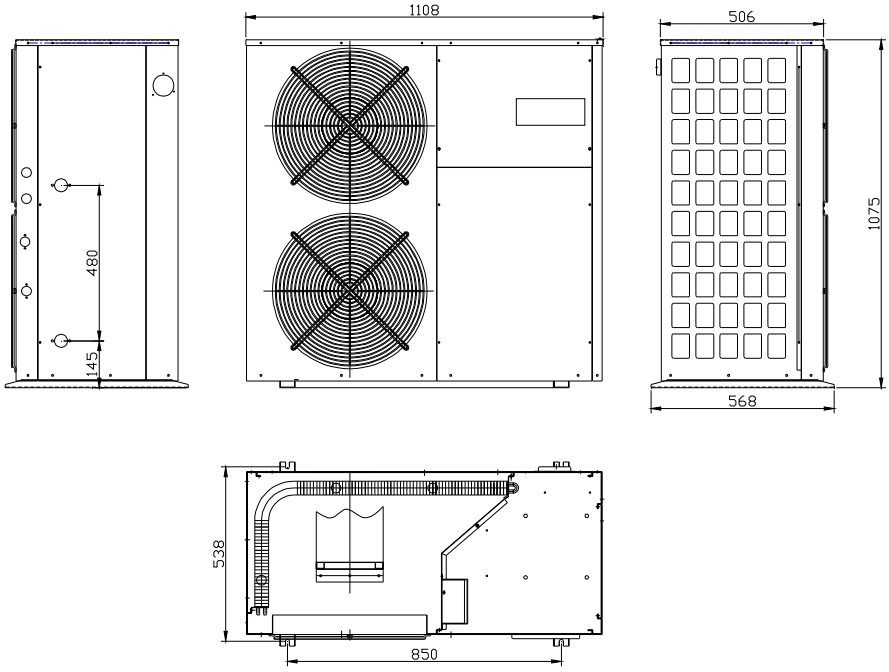
11. Low pressure switch
12. Expansion valve
13. Distributor
14. Filter
15. Gas-liquid separator
16. Filter dryer
17. Accumulator
18. Low pressure gauge

Dimensions

AW09B AW10B

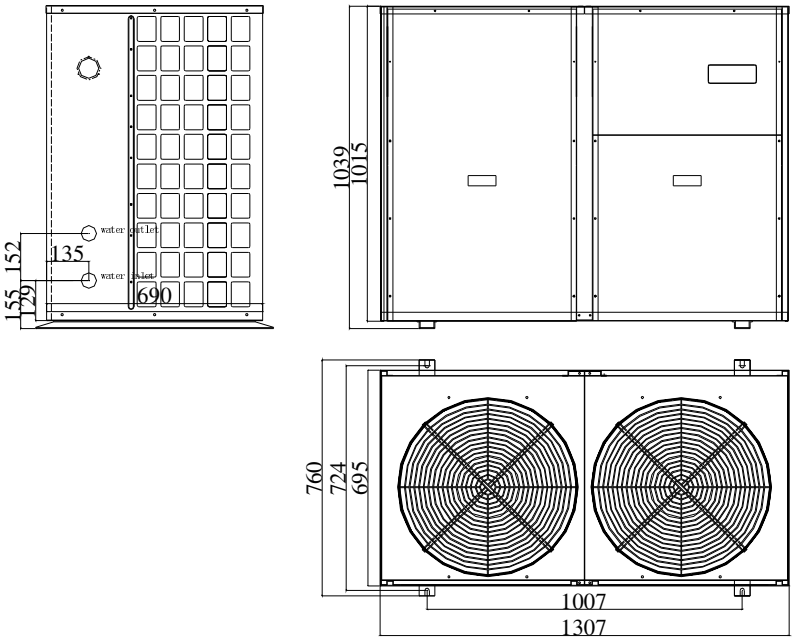


AW12B AW13B AW15B AW12/H AW13/H

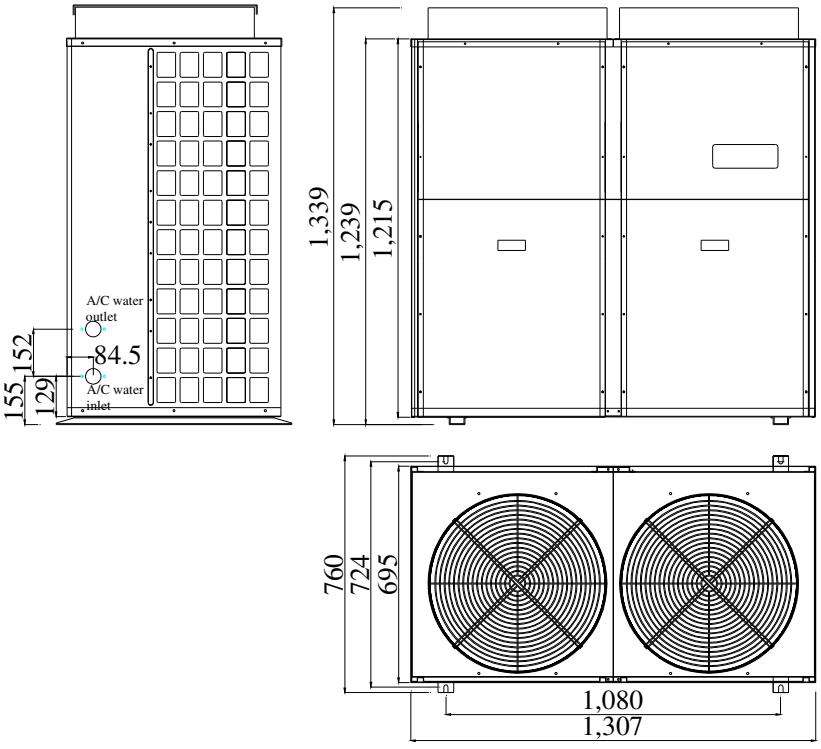


Dimensions

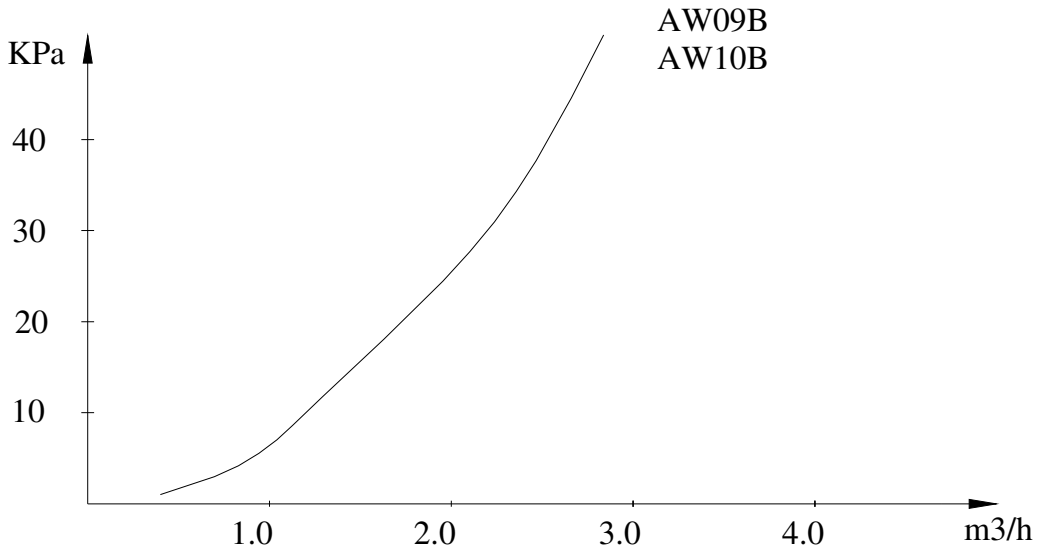
AW20 AW20/B



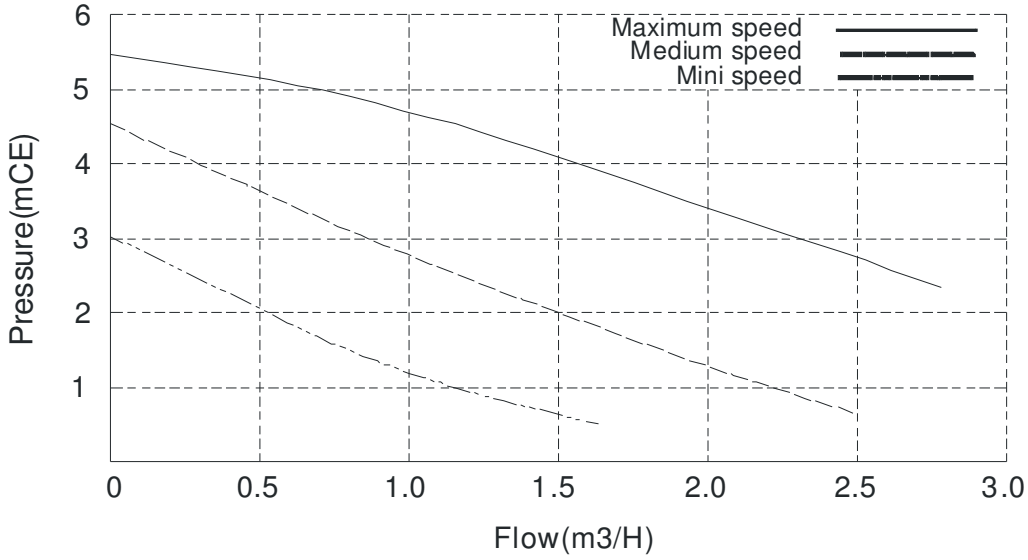
LSQ25R2 LSQ31R2



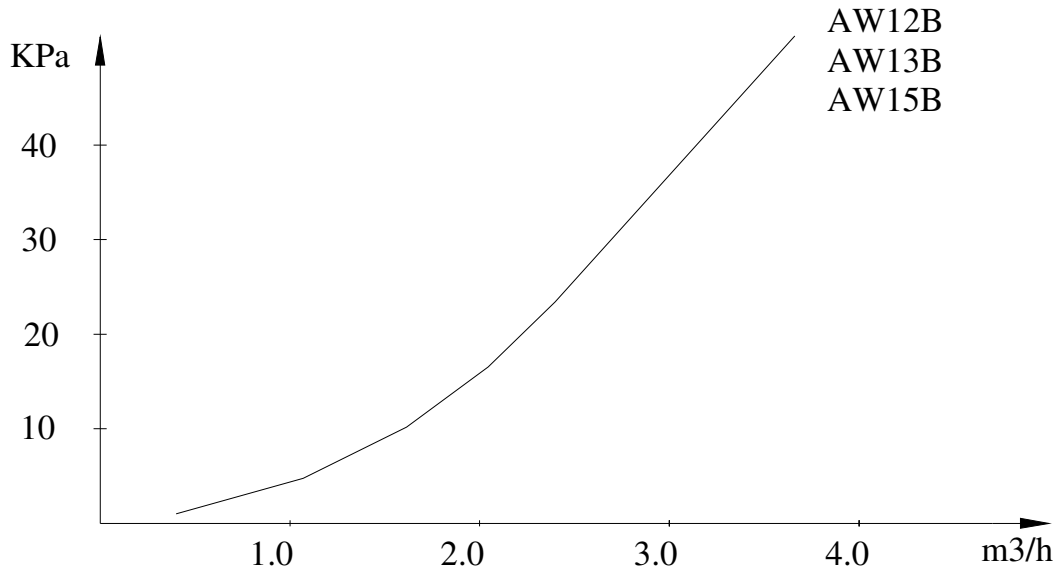
Water Pressure Plots



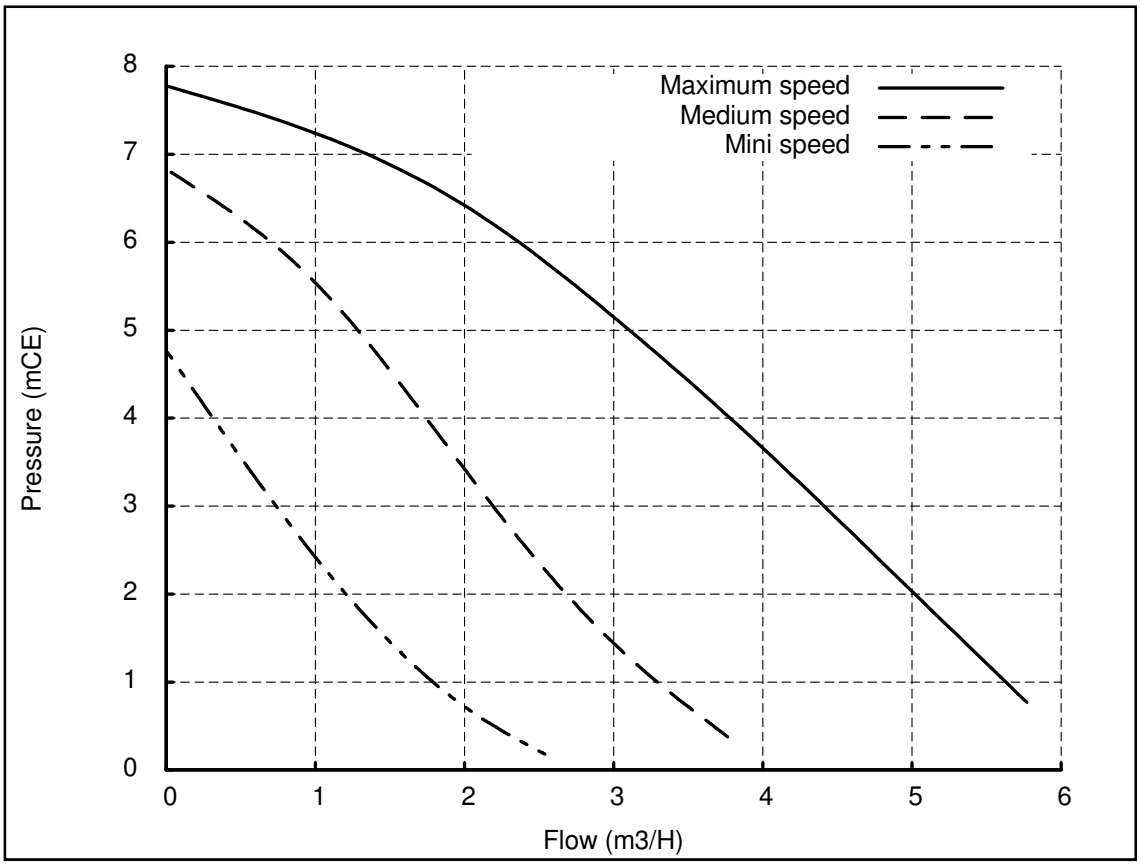
Optional water pump curve (AW09B AW10B)



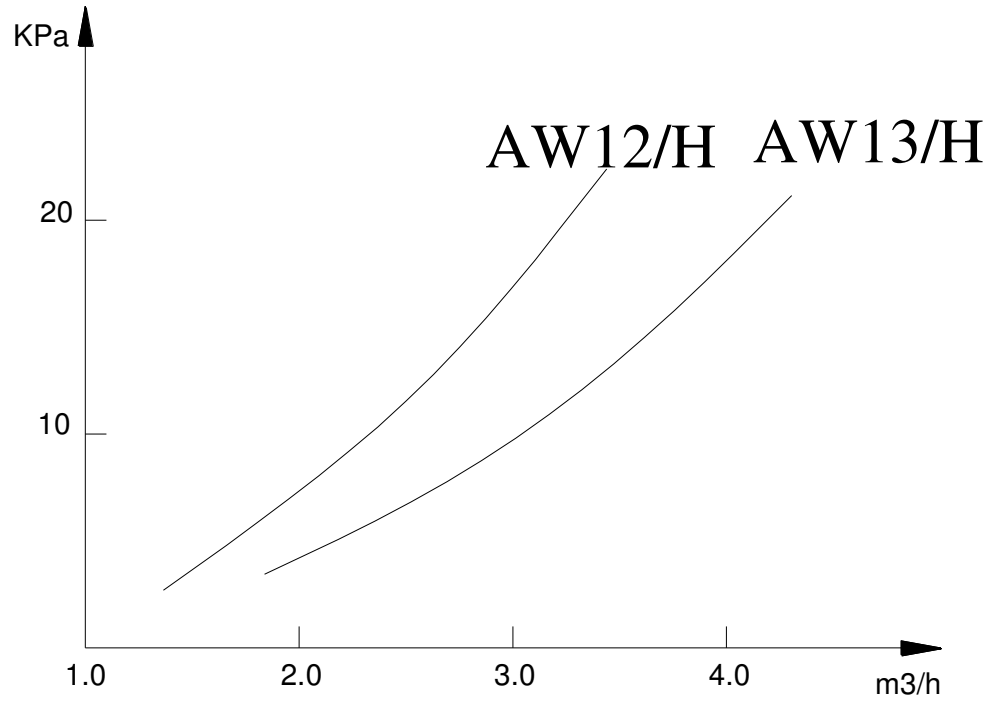
Water Pressure Plots



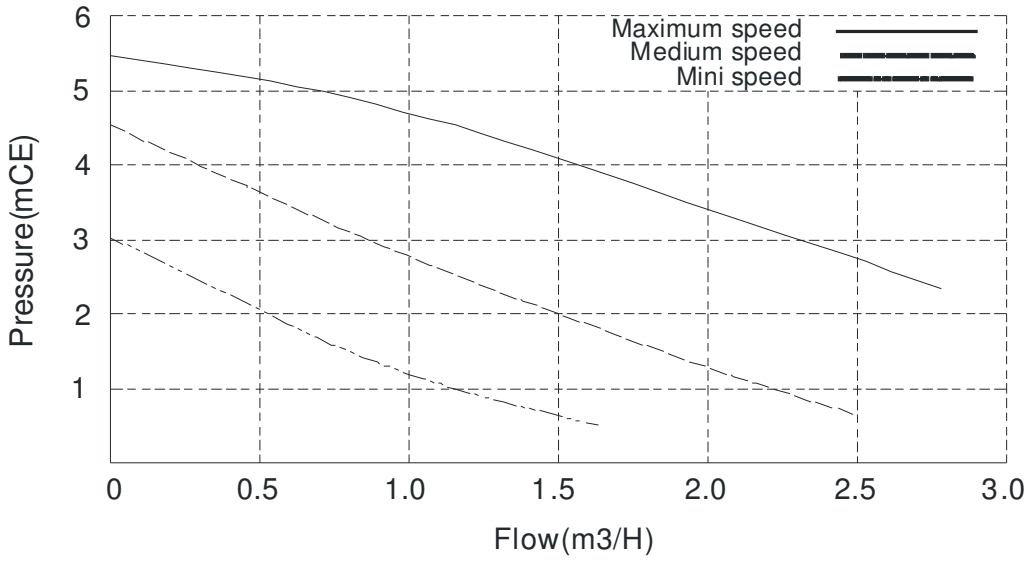
Optional water pump curve (AW12B AW13B AW15B)



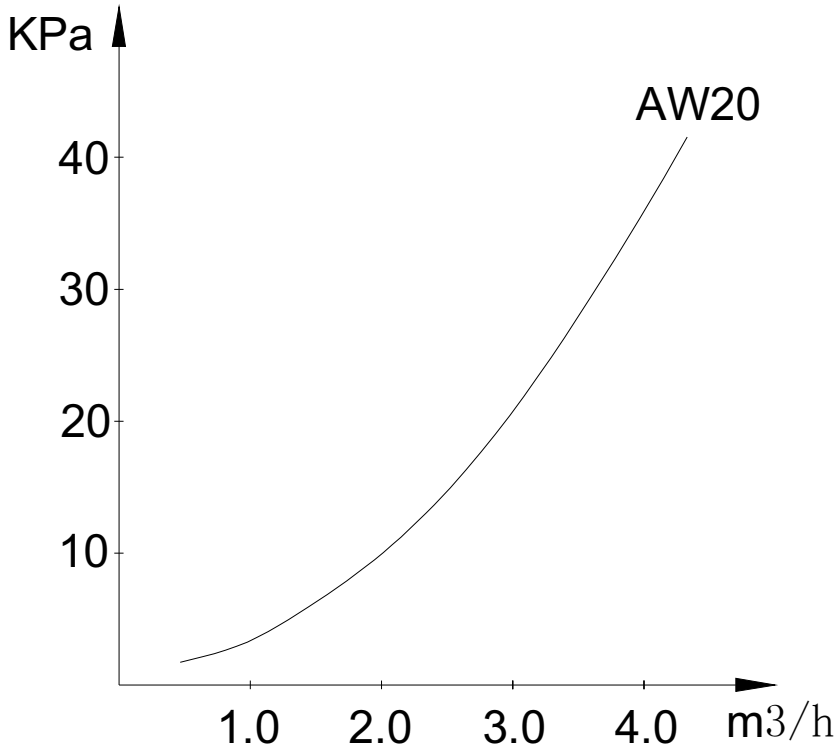
Water Pressure Plots

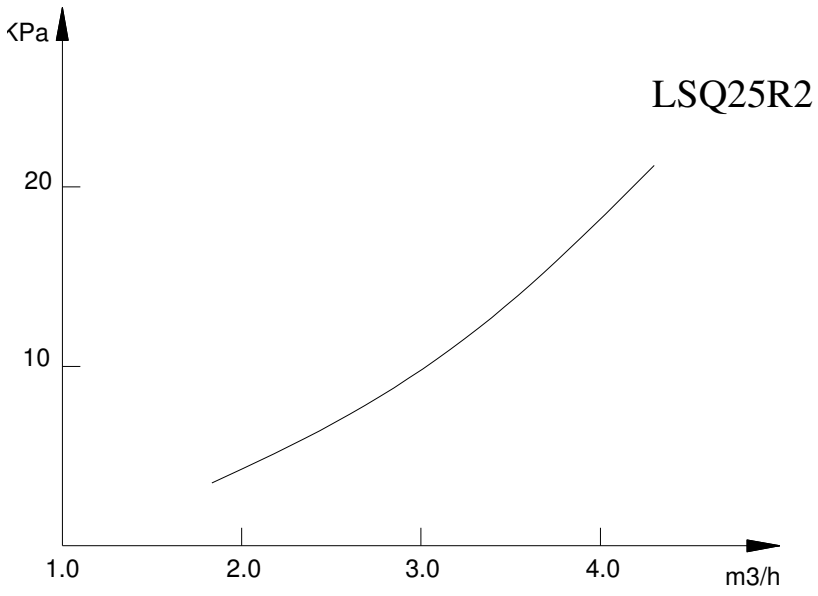


Optional water pump curve (AW12/H AW13/H)

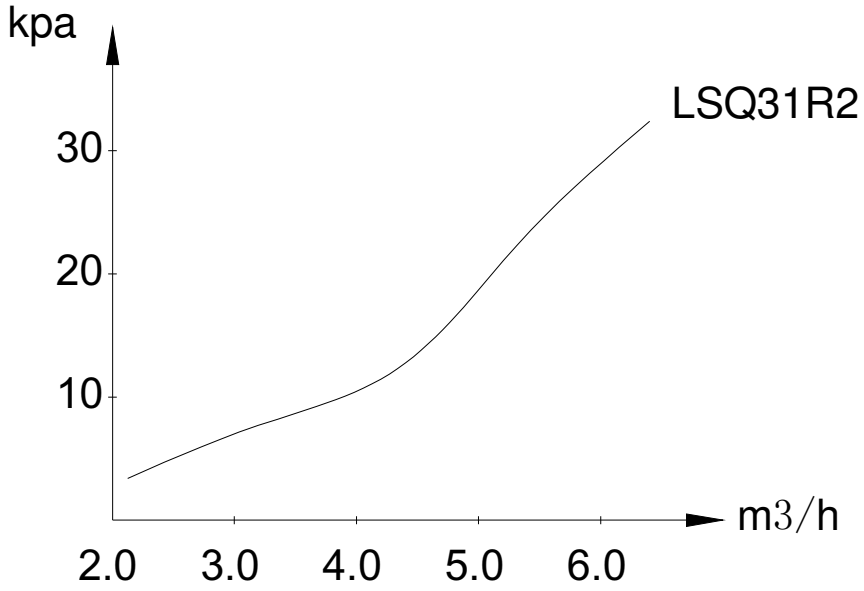


Water Pressure Plots





Water Pressure Plots



Technical Specifications

Product Description

Heating & Cooling unit

AIR TO WATER HEAT PUMP		AW09/B	AW12/B	AW10/B	AW13/B	AW15/B	AW20/B
Heat output/Power consumption at 7/35℃	kW	9.5/2.6	13.0/3.6	11.0/2.9	14.0/3.7	16.0/4.3	21.7/5.7
Heat output/Power consumption at 7/45℃	kW	9.1/3.0	12.5/4.2	10.5/3.3	13.5/4.3	15.4/5.0	21.4/6.8
Heat output/Power consumption at 7/55℃	kW	8.8/3.8	12.2/5.3	10.2/4.1	13.2/5.5	14.8/6.2	20.8/8.4
Heat output/Power consumption at 2/35℃	kW	8.2/2.5	11.1/3.5	9.5/2.8	12.0/3.6	13.8/4.3	18.9/5.7
Heat output/Power consumption at 2/45℃	kW	7.9/3.0	10.8/4.2	9.2/3.4	11.8/4.3	13.3/5.0	18.5/6.8
Heat output/Power consumption at -7/35℃	kW	6.2/2.5	8.0/3.5	7.2/2.8	9.0/3.6	10.3/4.4	14.3/5.8
Heat output/Power consumption at -7/45℃	kW	6.1/3.0	7.9/4.2	7.1/3.4	8.9/4.4	10.2/5.1	14.2/6.9
Cool output/Power consumption at 35/7℃	KW	7.8/2.9	11.5/4.3	9.5/3.3	12.2/4.3	14.5/5.2	19.6/6.8
Starting current	A	30	36	46	55	56	74
Soft-start relay		Included as standard					
Power		220-240V/1PH/50Hz		380-415V/3PH/50Hz			
Compressor		DAIKIN Scroll		HITACHI scroll			
Condenser		Brazed plate heat exchanger					
Nominal flow heating medium	l/s	0.45	0.62	0.52	0.67	0.76	1.03
Internal pressure drop at nominal flow	kPa	18	20	24	24	22	24
Air flow	m^3/h	3000	5000	3000	5000	5000	6000
Nominal output fan	W	220	300	220	300	300	440
Max outgoing heating medium temperature	℃	55℃					
Dimensions(HxWxD)	mm	1050x1050x450	1075x1105x505	1050x1050x450	1075x1105x505		1050x1300x690
Pipe connector		DN25					DN40
Weight	kg	125	175	125	175	180	270

The above data is tested by EN14511

Technical Specifications

Product Description

Heating only unit

AIR TO WATER HEAT PUMP		AW09	AW12	AW10	AW13	AW15	AW20
Heat output/Power consumption at 7/35℃	kW	9.5/2.6	13.0/3.6	11.0/2.9	14.0/3.7	16.0/4.3	21.7/5.7
Heat output/Power consumption at 7/45℃	kW	9.1/3.0	12.5/4.2	10.5/3.3	13.5/4.3	15.4/5.0	21.4/6.8
Heat output/Power consumption at 7/55℃	kW	8.8/3.8	12.2/5.3	10.2/4.1	13.2/5.5	14.8/6.2	20.8/8.4
Heat output/Power consumption at 2/35℃	kW	8.2/2.5	11.1/3.5	9.5/2.8	12.0/3.6	13.8/4.3	18.9/5.7
Heat output/Power consumption at 2/45℃	kW	7.9/3.0	10.8/4.2	9.2/3.4	11.8/4.3	13.3/5.0	18.5/6.8
Heat output/Power consumption at -7/35℃	kW	6.2/2.5	8.0/3.5	7.2/2.8	9.0/3.6	10.3/4.4	14.3/5.8
Heat output/Power consumption at -7/45℃	kW	6.1/3.0	7.9/4.2	7.1/3.4	8.9/4.4	10.2/5.1	14.2/6.9
Starting current	A	30	36	46	55	56	74
Soft-start relay		Included as standard					
Power		220-240V/1PH/50Hz		380-415V/3PH/50Hz			
Compressor		DAIKIN Scroll		HITACHI scroll			
Condenser		Brazed plate heat exchanger					
Nominal flow heating medium	l/s	0.45	0.62	0.52	0.67	0.76	1.03
Internal pressure drop at nominal flow	kPa	18	20	24	24	22	24
Air flow	m^3/h	3000	5000	3000	5000	5000	6000
Nominal output fan	W	220	300	220	300	300	440
Max outgoing heating medium temperature	℃	55℃					
Dimensions(HxWxD)	mm	1050x1050x450	1075x1105x505	1050x1050x450	1075x1105x505		1050x1300x690
Pipe connector		DN25					DN40
Weight	kg	125	175	125	175	180	270

The above data is tested by **EN14511**

Technical Specifications

Product Description

High temperature heat pump heating only unit

AIR TO WATER HEAT PUMP		AW12/H	AW13/H
Heat output/Power consumption at 7/35℃	kW	11.5/3.0	13.0/3.3
Heat output/Power consumption at 7/45℃	kW	11.2/3.6	12.5/3.9
Heat output/Power consumption at 7/65℃	kW	11.1/4.6	12.3/5.1
Heat output/Power consumption at -7/35℃	kW	8.5/3.3	9.0/3.4
Heat output/Power consumption at -7/45℃	kW	8.4/4.0	8.9/4.1
Heat output/Power consumption at -7/65℃	kW	8.3/4.6	8.8/4.8
Starting current	A	36	52
Soft-start relay		Included as standard	
Power		220-240V/1PH/50Hz	380-415V/3PH/50Hz
Compressor		HITACHI EVI Scroll	
Condenser		Brazed plate heat exchanger	
Nominal flow heating medium	l/s	0.28	0.31
Internal pressure drop at nominal flow	kPa	5	
Air flow	m^3/h	5000	
Nominal output fan	W	300	
Max outgoing heating medium temperature	℃	65	
Dimensions(HxWxD)	mm	1075x1105x505	
Pipe connector		DN25	
Weight	kg	170	175

The above data is tested by **EN14511**