

INSTALLATION MANUAL

AIR CONDITIONER

Please read this installation manual completely before installing the product.
Installation work must be performed in accordance with the national wiring standards
by authorized personnel only.
Please retain this installation manual for future reference after reading it thoroughly.

Air-to-Water Heat Pump

THERMAV[™]

Original instruction

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For more information, Refer to the CD or LG Web site (www.lg.com).



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POLSKI

LIMBA ROMÂNĂ

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Preface

This installation manual is to present information and guide about understanding, installing, and checking **THERMAV**.

Your careful reading before installation is highly appreciated to make no mistake and to prevent potential risks.

The manual is divided into nine chapters. These chapters are classified according to installation procedure.

See the table below to get summarized information.

| Chapters | Contents |
|------------|--|
| Chapter 1 | <ul style="list-style-type: none"> • Warning and Caution concerned with safety. • This chapter is directly related with human safety. We strongly recommend reading this chapter carefully. |
| Chapter 2 | <ul style="list-style-type: none"> • Items Inside product Box • Before starting installation, please make it sure that all parts are found inside the product box. |
| Chapter 3 | <ul style="list-style-type: none"> • Fundamental knowledge about THERMAV. • Model identification, accessories information, refrigerant and water cycle diagram, parts and dimensions, electrical wiring diagrams, etc. • This chapter is important to understand THERMAV. |
| Chapter 4 | <ul style="list-style-type: none"> • Installation about the outdoor unit. • Installation location, constraints on installation site, etc |
| Chapter 5 | <ul style="list-style-type: none"> • Installation about the indoor unit. • Installation location, constraints on installation site, etc • Constrains when accessories are installed |
| Chapter 6 | <ul style="list-style-type: none"> • How to perform piping (for refrigerant) and wiring at the outdoor unit. • Refrigerant pipe connection between the indoor unit and the outdoor unit. • Electrical wiring at the outdoor unit. |
| Chapter 7 | <ul style="list-style-type: none"> • How to perform piping (for water) and wiring at the indoor unit. • Water pipe connection between the indoor unit and pre-built under floor water loop pipe. • Electrical wiring at the indoor unit. • System set-up and configuration. • As many control parameters of THERMAV is adjustable by control panel, deep understanding about this chapter is required to secure the operation flexibility of THERMAV. • For more detailed information, please read the separate operation manual to use control panel and adjust control parameters. |
| Chapter 8 | <ul style="list-style-type: none"> • Information about supported accessories • Specification, Constraints, and wiring are described. • Before purchasing accessories, please find supported specification to buy proper one. |
| Chapter 9 | <ul style="list-style-type: none"> • Test operation and check point while test running. |
| Chapter 10 | <ul style="list-style-type: none"> • Check points before starting operation are explained. • Troubleshooting, maintenance, and error code list are presented to correct problems. |


REMARK : ALL CONTENTS OF THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. TO GET THE LATEST INFORMATION, PLEASE VISIT LG ELECTRONICS WEB SITE www.lgservice.com

1. Safety Precautions



To prevent injury to the user or other people and property damage, the following instructions must be followed.

- Be sure to read before installing the unit.
- Be sure to observe the cautions specified here as they include important items related to safety.
- Incorrect operation due to ignoring instruction will cause harm or damage. The seriousness is classified by the following indications.

 **WARNING** This symbol indicates the possibility of death or serious injury.

 **CAUTION** This symbol indicates the possibility of injury or damage to properties only.

- Meanings of symbols used in this manual are as shown below.

| | |
|---|---|
|  | Be sure not to do. |
|  | Be sure to follow the instruction. |

WARNING

■ Installation

Do not use a defective or underrated circuit breaker. Use this appliance on a dedicated circuit.

- There is risk of fire or electric shock.

For electrical work, contact the dealer, seller, a qualified electrician, or an Authorized Service Center.

- There is risk of fire or electric shock.

Always ground the unit.

- There is risk of fire or electric shock.

Install the panel and the cover of control box securely.

- There is risk of fire or electric shock.

Always install a dedicated circuit and breaker.

- Improper wiring or installation may cause fire or electric shock

Use the correctly rated breaker or fuse.

- There is risk of fire or electric

Do not modify or extend the power cable.

- There is risk of fire or electric shock.

Do not install, remove, or reinstall the unit by yourself (customer).

- There is risk of fire, electric shock, explosion, or injury

For antifreeze, always contact the dealer or an authorized service center.

- Almost the antifreeze is a toxic product.

For installation, always contact the dealer or an Authorized Service Center.

- There is risk of fire, electric shock, explosion, or injury.

Do not install the unit on a defective installation stand.

- It may cause injury, accident, or damage to the unit.

Be sure the installation area does not deteriorate with age.

- If the base collapses, the unit could fall with it, causing property damage, unit failure, and personal injury.

Do not install the water pipe system as Open loop type.

- It may cause failure of unit.

Use a vacuum pump or inert (nitrogen) gas when doing leakage test or purging air. Do not compress air or oxygen and do not use flammable gases.

- There is the risk of death, injury, fire or explosion.

Make sure the connected condition of connector in product after maintenance.

- Otherwise, it may cause product damage.

Do not touch leaked refrigerant directly.

- There is risk of frostbite.

■ Operation

Take care to ensure that power cable could not be pulled out or damaged during operation.

- There is risk of fire or electric shock.

Do not place anything on the power cable.

- There is risk of fire or electric shock.

Do not plug or unplug the power supply plug during operation.

- There is risk of fire or electric shock.

Do not touch (operate) the unit with wet hands.

- There is risk of fire or electric shock.

Do not place a heater or other appliances near the power cable.

- There is risk of fire or electric shock.

Do not allow water to run into electric parts.

- There is risk of fire, failure of the unit, or electric shock.

Do not store or use flammable gas or combustibles near the unit.

- There is risk of fire or failure of unit.

Do not use the unit in a tightly closed space for a long time.

- It may cause damage to the unit.

When flammable gas leaks, turn off the gas and open a window for ventilation before turning the unit on.

- There is risk of explosion or fire.

If strange sounds, or small or smoke comes from unit, turn the breaker off or disconnect the power supply cable.

- There is risk of electric shock or fire.

Stop operation and close the window in storm or hurricane. If possible, remove the unit from the window before the hurricane arrives.

- There is risk of property damage, failure of unit, or electric shock.

Do not open the front cover of the unit while operation. (Do not touch the electrostatic filter, if the unit is so equipped.)

- There is risk of physical injury, electric shock, or unit failure.

Do not touch any electric part with wet hands. you should be power off before touching electric part.

- There is risk of electric shock or fire.

Do not touch refrigerant pipe and water pipe or any internal parts while the unit is operating or immediately after operation.

- There is risk of burns or frostbite, personal injury.

If you touch the pipe or internal parts, you should be wear protection or wait time to return to normal temperature.

- Otherwise , it may cause burns or frostbite, personal injury.

Turn the main power on 6 hours ago before the product starting operation.

- Otherwise, it may cause compressor damage.

Do not touch electric parts for 10 minutes after main power off.

- There is risk of physical injury, electric shock.

The inside heater of product may operate during stop mode. It is intended to protect the product.

Be careful that some part of the control box are hot.

- There is risk of physical injury or burns.

When the unit is soaked (flooded or submerged), contact an Authorized Service Center.

- There is risk of fire or electric shock.

Be cautious that water could not be poured to the unit directly.

- There is risk of fire, electric shock, or unit damage.

Ventilate the unit from time to time when operating it together with a stove, etc.

- There is risk of fire or electric shock.

Turn the main power off when cleaning or maintaining the unit.

- There is risk of electric shock.

Take care to ensure that nobody could step on or fall onto the unit.

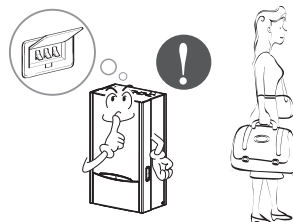
- This could result in personal injury and unit damage.

For installation, always contact the dealer or an Authorized Service Center.

- There is risk of fire, electric shock, explosion, or injury.

If the unit is not used for long time, we strongly recommend not to switch off the power supply to the unit.

- There is risk of water freezing.



⚠ CAUTION**■ Installation**

Always check for gas (refrigerant) leakage after installation or repair of unit.

- Low refrigerant levels may cause failure of unit.

Keep level even when installing the unit.

- To avoid vibration or water leakage.

Use two or more people to lift and transport the unit.

- Avoid personal injury.

■ Operation

Do not use the unit for special purposes, such as preserving foods, works of art, etc.

- There is risk of damage or loss of property.

Use a soft cloth to clean. Do not use harsh detergents, solvents, etc.

- There is risk of fire, electric shock, or damage to the plastic parts of the unit.

Do not step on or put anything on the unit.

- There is risk of personal injury and failure of unit.

Use a firm stool or ladder when cleaning or maintaining the unit.

- Be careful and avoid personal injury.




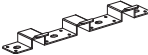


Do not turn on the breaker or power under condition that front panel cabinet, top cover, control box cover are removed or opened.

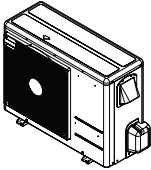
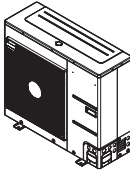
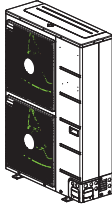
- Otherwise it may cause fire, electric shock, explosion or death

2. Installation Part

Thank you for choosing LG Electronics Air-to-Water Heat Pump **THERMAV**.

Before starting installation, please make it sure that all parts are found inside the product box.

| INDOOR UNIT BOX | | | | | |
|---------------------|---|----------|--------------------|---|----------|
| Item | Image | Quantity | Item | Image | Quantity |
| Indoor unit |  | 1 | Shut-off valve |  | 2 |
| Installation Manual |  | 1 | Installation plate |  | 1 |
| Owner's Manual |  | 1 | Installation Sheet |  | 1 |

| OUTDOOR UNIT BOX | | |
|--|---|----------|
| Item | Image | Quantity |
| Outdoor Unit UE Chassis (Product heating capacity : 3kW) |  | 1 |
| Outdoor Unit U4 Chassis (Product heating capacity : 5kW, 7kW, 9kW) |  | 1 |
| Outdoor Unit U3 Chassis (Product heating capacity : 12kW, 14kW, 16kW) |  | 1 |

3. General Information

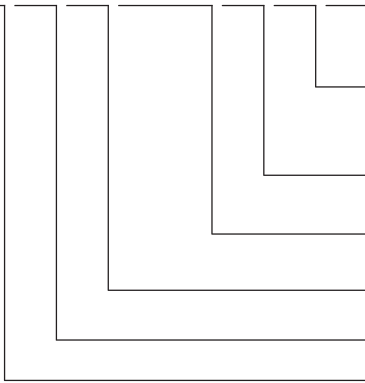
With advanced inverter technology, **THERMAV**™ is suitable for applications like under floor heating, under floor cooling, and hot water generation. By Interfacing to various accessories user can customize the range of the application.

In this chapter, general information of **THERMAV**™ is presented to identify the installation procedure. Before beginning installation, read this chapter carefully and find helpful information on installation.

Model Information

Model number nomenclature

A H - W 0 9 6 A 2



Series Number 1. Temperature control
2. Pressure control

Function
A : General heating heat pump
H : Domestic Hot heating only
T : High temperature heating heat pump

Electrical ratings
6 : 1 phase 220-240V AC 50Hz 8 : 3 phase 380-415V AC 50Hz

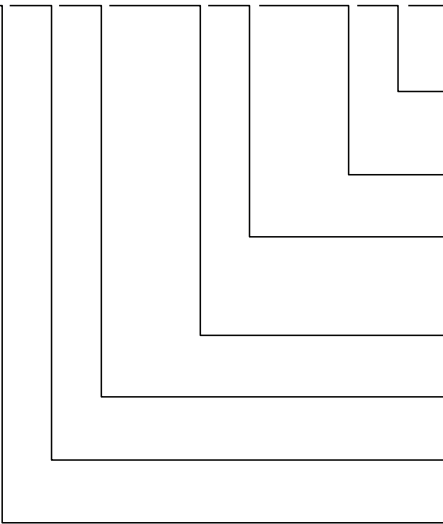
Heating Capacity (kW)
03 : 3kW 05 : 5kW 07 : 7kW 09 : 9kW 12 : 12kW
14 : 14kW 16 : 16kW

Model Type
W : Inverter Heat Pump H : Heat Pump

Classification
N : Indoor Unit U : Outdoor Unit - : Set

Air-to-Water Heat Pump for R410A

A H N W 0 9 A 0 6 A 2



Series Number 1. Temperature control
2. Pressure control

Function
A : General heating heat pump
H : Domestic Hot heating only
T : High temperature heating heat pump

Heater Capacity (kW)
04 : 4kW 06 : 6kW 09 : 9kW

Heater Electrical ratings
6 : 1 phase 220-240V AC 50Hz
8 : 3 phase 380-415V AC 50Hz
A : 3 phase 220V AC 50Hz

Heating Capacity (kW)
03 : 3kW 09 : 9kW 16 : 16kW

Model Type
W : Inverter Heat Pump H : Heat Pump

Classification
N : Indoor Unit U : Outdoor Unit - : Set

Air-to-Water Heat Pump for R410A

Model name and related information

| Model Name | | Built-In Electric Heater(kW) | Power Source (Electric Heater) | Capacity | | Power Source (Unit) |
|--------------|--------------|------------------------------|--------------------------------|---------------------------|---------------------------|---------------------|
| Outdoor Unit | Indoor Unit | | | Heating(kW) ^{*1} | Cooling(kW) ^{*1} | |
| AH UW036A2 | AH NW03604A2 | 4(2+2) | 220-240 V ~50Hz | 3 | 3 | 220-240 V ~50Hz |
| AH UW056A2 | AH NW09604A2 | 4(2+2) | 220-240V ~50Hz | 5 | 5 | |
| AH UW076A2 | AH NW09604A2 | 4(2+2) | 220-240V ~50Hz | 7 | 7 | |
| AH UW096A2 | AH NW09604A2 | 4(2+2) | 220-240V ~50Hz | 9 | 9 | |
| AH UW126A2 | AH NW16606A2 | 6(3+3) | 220-240V ~50Hz | 12 | 12 | |
| AH UW146A2 | AH NW16606A2 | 6(3+3) | 220-240V ~50Hz | 14 | 14 | |
| AH UW166A2 | AH NW16606A2 | 6(3+3) | 220-240V ~50Hz | 16 | 16 | 380-415V ~50Hz |
| AH UW128A2 | AH NW16806A2 | 6(2+2+2) | 380-415V ~50Hz | 12 | 12 | |
| AH UW148A2 | AH NW16806A2 | 6(2+2+2) | 380-415V ~50Hz | 14 | 14 | |
| AH UW168A2 | AH NW16806A2 | 6(2+2+2) | 380-415V ~50Hz | 16 | 16 | |

*1 : tested under Eurovent Heating condition
(water temperature 30°C → 35°C at outdoor ambient temperature 7°C / 6°C)

*2 : tested under Eurovent Cooling condition
(water temperature 23°C → 18°C at outdoor ambient temperature 35°C / 24°C)

*3 : All appliances were tested at atmospheric pressure.

Typical Installation Example

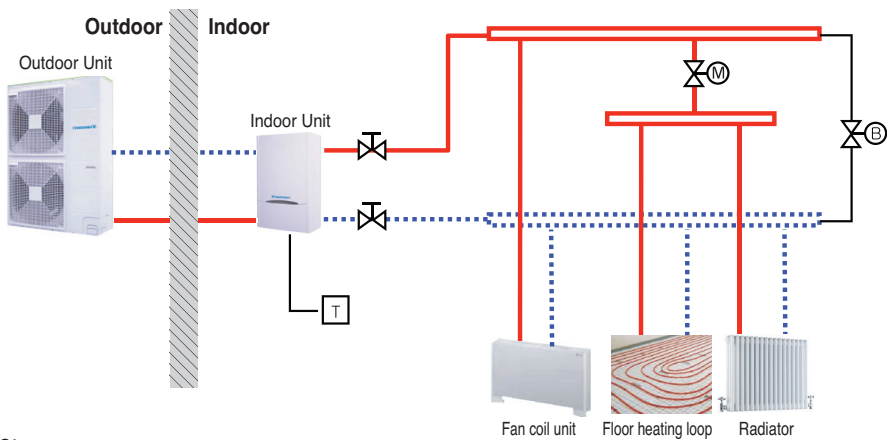
⚠ CAUTION

If **THERMAV** is installed with pre-existing boiler, the boiler and THERMA V should not be operated together. If entering water temperature of **THERMAV** is above 55°C, the system will stop operation to prevent mechanical damage of the product. For detailed electric wiring and water piping, please contact authorized installer.

Some installation scenes are presented for example. As these scenes are conceptual figures, installer should optimize the installation scene according to the installation conditions.

CASE 1: Connecting Heat Emitters for Heating and Cooling

(Under floor loop, Fan Coil Unit, and Radiator)



Note:

- Room thermostat
 - Type of thermostat and specification should be complied with chapter 4 and chapter 7 of **THERMAV** installation manual.
- 2way valve
 - It is important to install 2way valve to prevent dew condensation on the floor and radiator while cooling mode.
 - Type of 2way control valve and specification should be complied with chapter 4 and chapter 7 of **THERMAV** installation manual.
 - 2way valve should be installed at the supply side of the collector.
- By-pass valve
 - To secure enough water flow rate, by-pass valve should be installed at the collector.
 - By-pass valve should guarantee minimum water flow rate in any case. Minimum water flow rate is described in water pump characteristics curve.

— High Temperature

..... Low Temperature



Room Thermostat(Field supply)



2way valve
(Field supply)

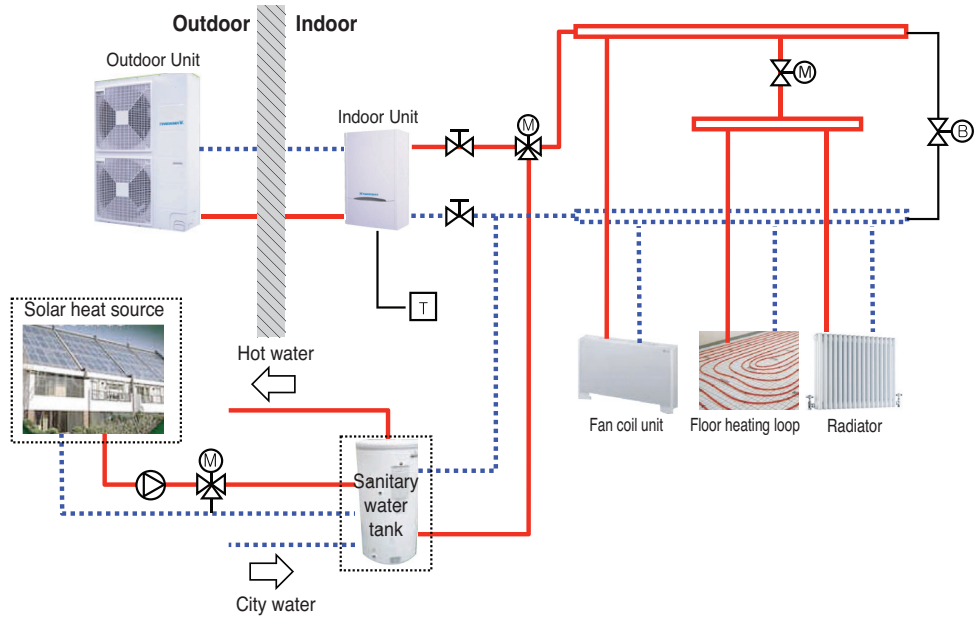


Shut-off valve



By-pass valve(Field supply)

CASE 3: Connecting Solar thermal system

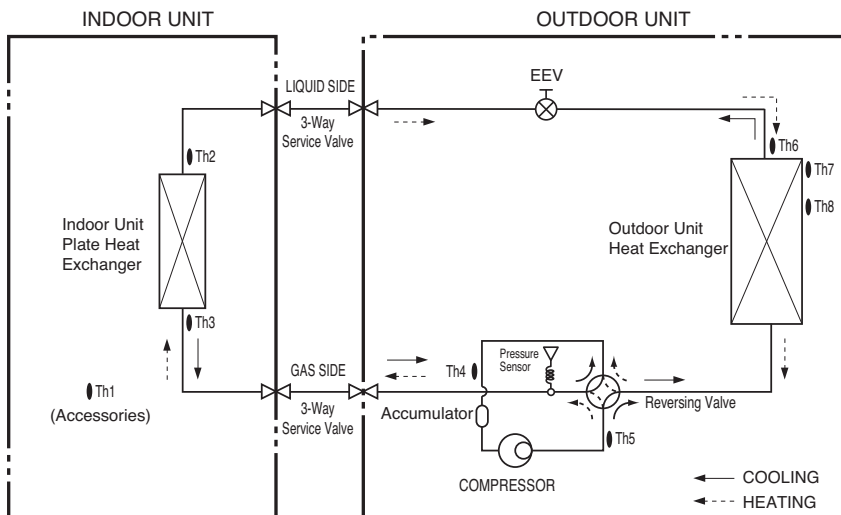


Note:

- Sanitary water tank
 - It should have additional indirect heat exchanger to utilize heat energy by solar thermal system.
- Pump
 - Maximum power consumption of pump should be less than 0.25kW.

| | | | | | | | |
|--|------------------|--|-------------------------------|--|---------------------------|--|---------------------------|
| | High Temperature | | Room Thermostat(Field supply) | | 2way valve (Field supply) | | 3way valve (Field supply) |
| | Low Temperature | | 2way valve (Field supply) | | 3way valve (Field supply) | | Pump(Field supply) |
| | Shut-off valve | | By-pass valve(Field supply) | | | | |

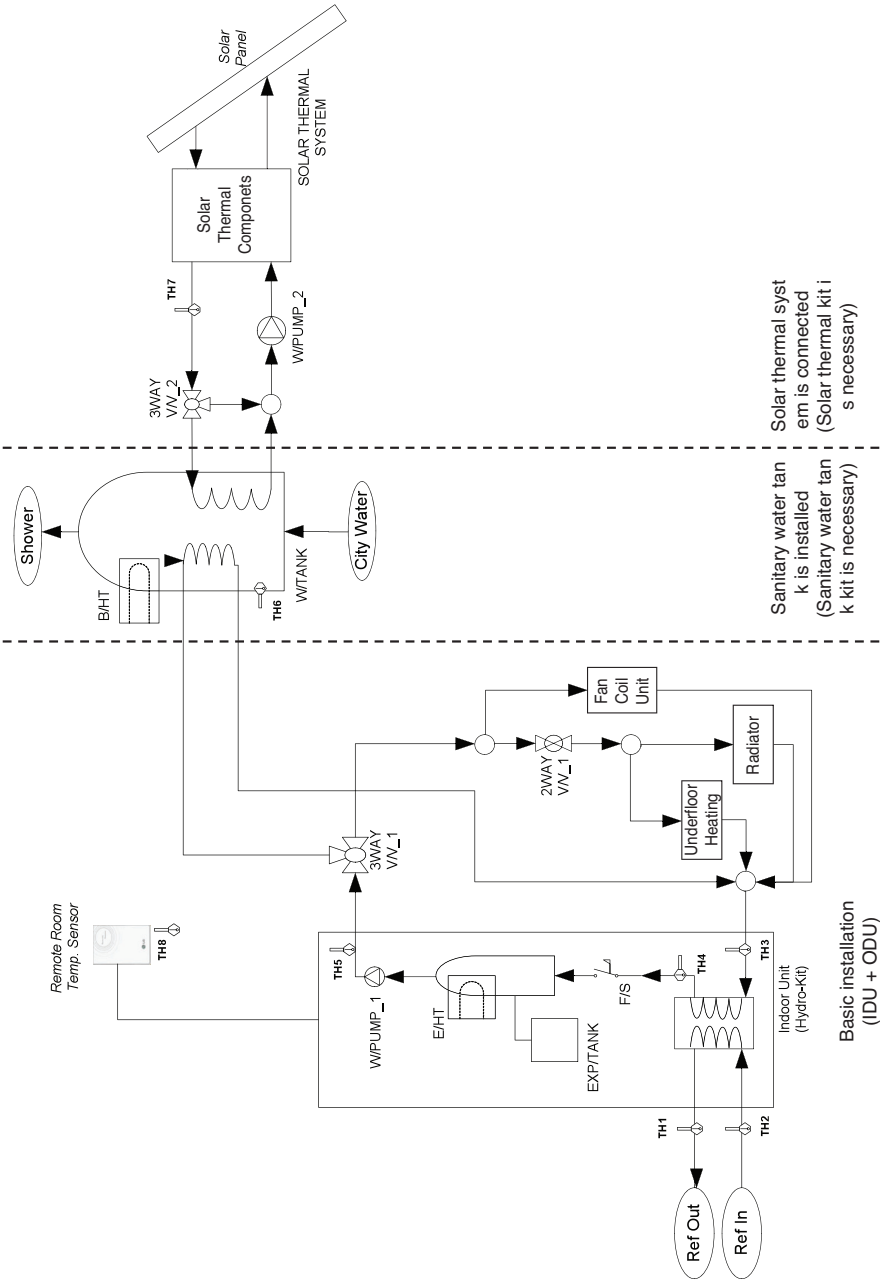
Cycle Diagram



Description

| Category | Symbol | Meaning | PCB Connector | Remarks |
|--------------|--------|--|---------------|--|
| Indoor Unit | Th1 | Remote air temperature sensor | CN_ROOM | - Optional accessory (being sold separately) - Not shown in diagram |
| | Th2 | Inlet evaporator temperature sensor | CN_PIPE | - Meaning is expressed based on Cooling mode. |
| | Th3 | Outlet evaporator temperature sensor | CN_PIPE/O | |
| Outdoor Unit | Th4 | Compressor-suction pipe temperature sensor | CN_TH3 | - Th4 and Th5 are connected at 4 pin type connector CN_TH3. |
| | Th5 | Compressor-discharge pipe temperature sensor | CN_TH3 | |
| | Th6 | Condenser temperature sensor | CN_TH2 | - Description is expressed based on Cooling mode |
| | Th7 | Outdoor air temperature sensor | CN_TH2 | - Th6 and Th7 are connected at 4 pin type connector CN_TH2 |
| | Th8' | Condenser middle temperature sensor | CN_TH3 | - Th8 is connected at 4 pin type connector CN_TH3 |
| | EEV | Electronic Expansion Valve | CN_LEV1 | |

Water cycle



Solar thermal system is connected (Solar thermal kits necessary)

Sanitary water tank is installed (Sanitary water tank kit is necessary)

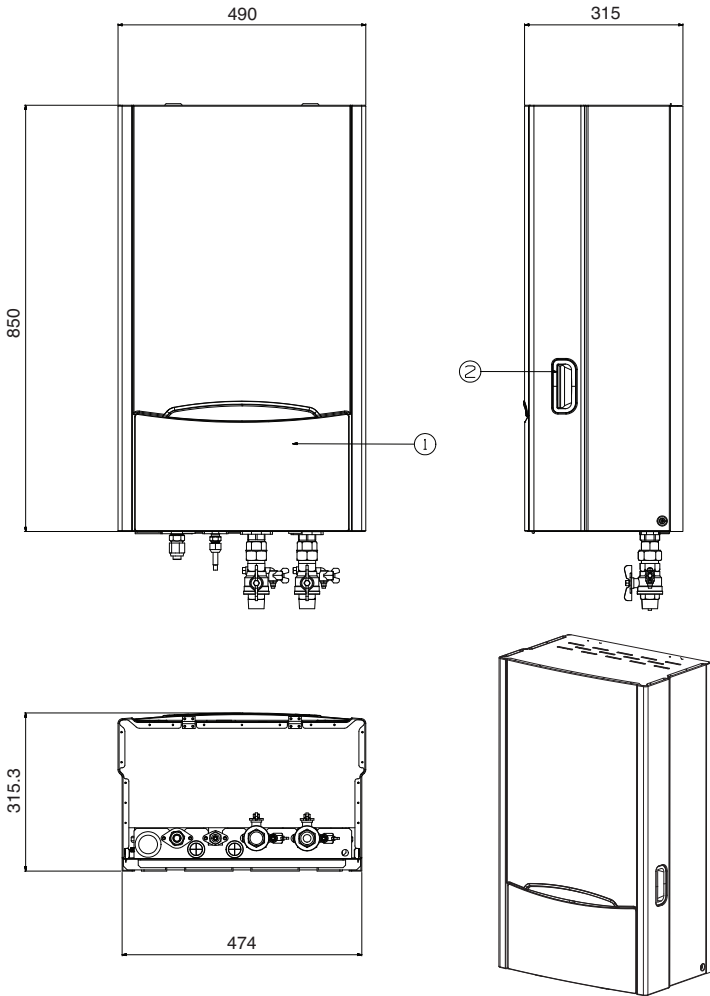
Basic installation (IDU + ODU)

Description

| Category | Symbol | Meaning | PCB Connector | Remarks |
|---------------|---|---|---|---|
| Indoor Unit | TH1 | Refrigerant temperature sensor (Gas side) | CN_PIPE/OUT | - Meaning is expressed based on Cooling mode. |
| | TH2 | Refrigerant temperature sensor (Liquid side) | CN_PIPE | |
| | TH3 | Entering Water temperature sensor | CN_TH3 | - TH3, TH4, and TH5 are connected at 6 pin type connector CN_TH3. |
| | TH4 | Interim Water temperature sensor | | |
| | TH5 | Leaving Water temperature sensor | | |
| | F/S | Flow Switch | CN_FLOW1 | |
| | E/HT | Electric Heater | CN_E/HEAT(A) CN_E/HEAT(B) | - Heating capacity is divided into two level : partial capacity by E/HEAT(A) and full capacity by E/HEAT(A) + E/HEAT(B). - Operating power(230V AC 50Hz) of E/HEAT(A) and E/HEAT(B) are supplied by external power source via relay connector and ELB. |
| | W_PUMP1 | Internal Water Pump | CN_W/PUMP(A) | - Operating power(230V AC 50Hz) of internal water pump is supplied by the connector. |
| | EXP/TANK | Expansion Tank | (no connector) | - Absorb volume change of heated water, |
| | TH8 | Remote Air temperature sensor | CN_ROOM | - Optional accessory (sold separately) - Model : PQRSTA0 |
| CTR/PNL | Control Panel (or 'Remote Controller') | CN_REMO | - Pre built-in at indoor unit | |
| 2WAY V/V_1 | To control water flow for Fan Coil Unit | CN_2WAY(A) | - 3 rd party accessory and Field installation (sold separately) - 2 wire NO or NC type 2way valve is supported. | |
| Water Heating | W/TANK | Sanitary Water Tank | (no connector) | - 3 rd party accessory and Field installation (sold separately) - Generating and storing sanitary hot water by AWHP or built-in electric heater- |
| | B/HT | Electric Heater | CN_B/HEAT(A) | - 3 rd party accessory and Field installation (usually built-in at W/TANK) - Supplying additional water heating capacity. |
| | 3WAY V/V_1 | - Flow control for water which is leaving from indoor unit. - Flow direction switching between under-floor and water tank | CN_3WAY(A) | - 3 rd party accessory and Field installation (sold separately) - SPDT type 3way valve is supported. |
| | CITY WATER | Water to be heated by Indoor unit and B/HT of W/TANK | (no connector) | - Field installation |
| | SHOWER | Water supplied to end-user | (no connector) | - Field installation |
| | TH6 | W/TANK water temperature sensor | CN_TH4 | - TH6 and TH7 are connected at 4 pin type connector CN_TH4. - TH6 is a part of sanitary water tank kit. (Model:PHLTA) - TH7 is a part of solar thermal kit (Model:PHLLA) |
| TH7 | Solar-heated water temperature sensor | | | |
| Solar Heating | 3WAY V/V_2 | - Flow control for water which is heated and circulated by SOLAR THERMAL SYSTEM. - Flow direction switching between SOLAR THERMAL SYSTEM and W/TANK | CN_3WAY(B) | - 3 rd party accessory and Field installation (sold separately) - SPDT type 3way valve is supported. |
| | W_PUMP/2 | External Water Pump | CN_W/PUMP(B) | - 3 rd party accessory and Field installation (sold separately) - If water pump of SOLAR THERMAL SYSTEM is incapable of circulation, external water pump can be used. |
| | SOLAR THERMAL SYSTEM | - This system can include following components : Solar panel, Sensors, Thermostats, Interim heat exchanger, Water pump, etc. - To utilized hot water heated by SOLAR THERMAL SYSTEM, end-user must by LG AWHP Solar-Kit. | (no connector) | - 3 rd party accessory and Field installation (sold separately) |

Parts and Dimensions

Indoor unit(External)

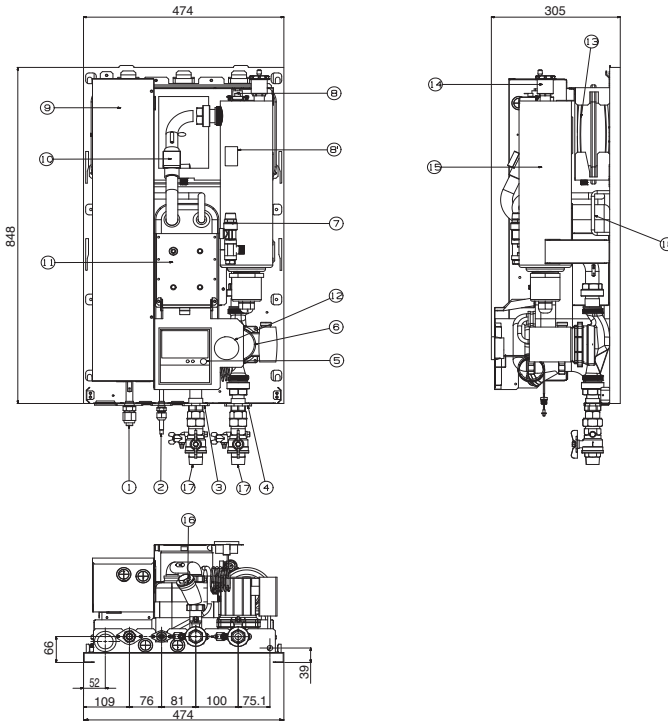


Description

(unit:mm)

| No | Name | Remarks |
|----|--------|---|
| 1 | Door | Control panel is shown after this door is opened. |
| 2 | Handle | Used to cover or uncover the front case |

Indoor unit(Internal)

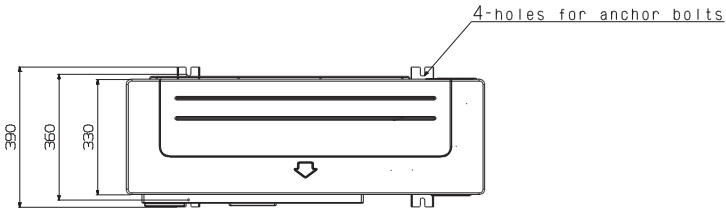


Description

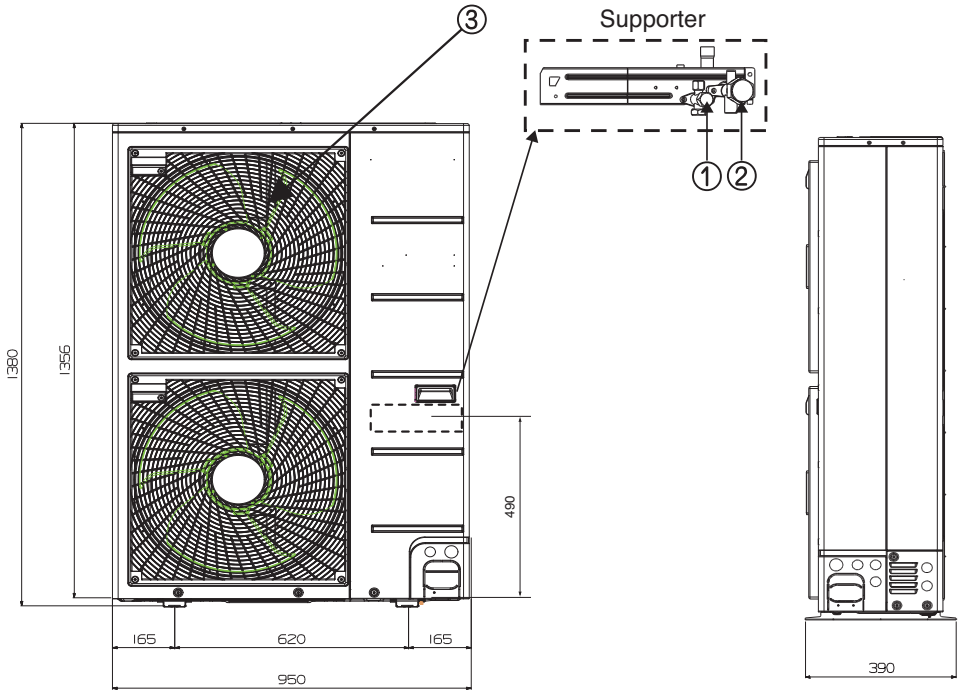
(unit:mm)

| No | Name | Remarks |
|----|----------------------|--|
| 1 | Refrigerant Pipe | Ø15.88mm(5~16kW), Ø12.7mm (3kW) |
| 2 | Refrigerant Pipe | Ø9.52mm(5~16kW), Ø6.35mm (3kW) |
| 3 | Entering Water Pipe | Male PT 1 inch |
| 4 | Leaving Water Pipe | Male PT 1 inch |
| 5 | Control Panel | Built-in Remote Controller |
| 6 | Water Pump | Max Head 7.5 / 6.5 m |
| 7 | Safety Valve | Open at water pressure 3 bar |
| 8 | Thermal switch | Cut-off power input to electric heater at 90 C (manual return at 55C) (1Ø Electric Heater is applied) |
| 8' | Thermal switch | Cut-off power input to electric heater at 90 C (manual return at 55 C) (3Ø Electric Heater is applied) |
| 9 | Control Box | PCB and terminal blocks |
| 10 | Flow Switch | Minimum operation range at 12 LPM.(5~9kW) Minimum operation range at 15 LPM.(12~16kW) ※ 3kW IDU has not a flow switch. |
| 11 | Plate Heat Exchanger | Heat exchange between refrigerant and water |
| 12 | Pressure Gage | Indicates circulating water pressure |
| 13 | Expansion Tank | Absorbing Volume change of heated water |
| 14 | Air Vent | Air purging when Charging water |
| 15 | Electric Heater | Please refer to the below Page 'Model name and related information' |
| 16 | Strainer | Filtering and stacking particles inside circulating water |
| 17 | Shut-off valve | To drain or to block water when pipe connecting |
| 18 | Carrying handle | To carry the product |

Outdoor unit(External)



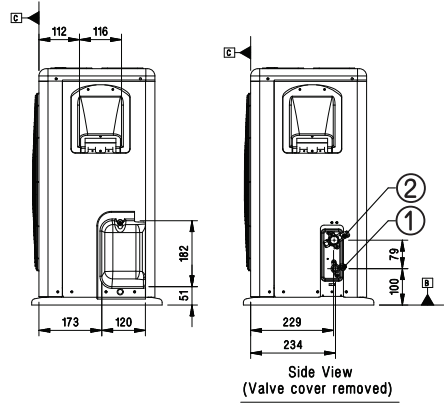
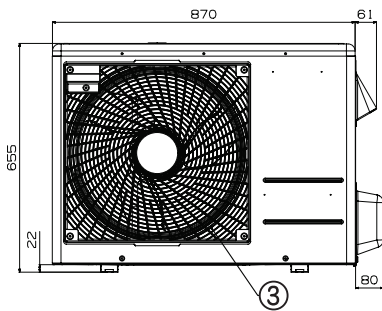
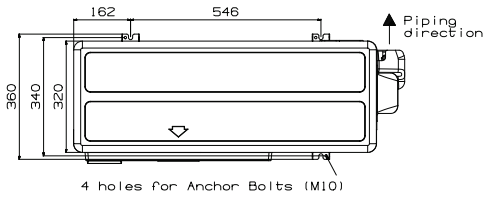
Product Heating Capacity :
12kW,14kW,16kW
U3 Chassis
(unit:mm)



Description

| No | Name |
|----|---------------------------|
| 1 | Liquid-side Service Valve |
| 2 | Gas-side Service Valve |
| 3 | Air discharge Grill |

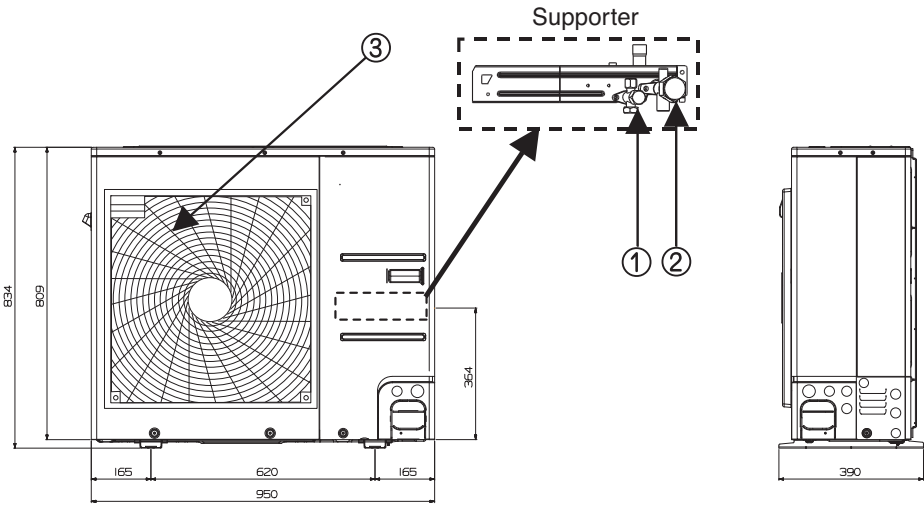
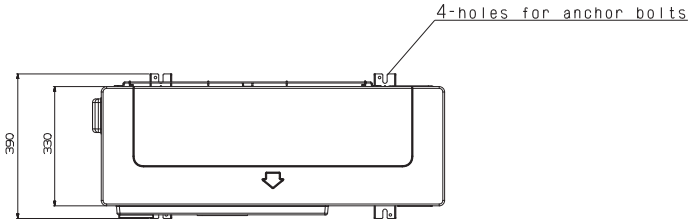
Product Heating Capacity : 3kW
UE Chasis
 (unit:mm)



Description

| No | Name |
|----|---------------------------|
| 1 | Liquid-side Service Valve |
| 2 | Gas-side Service Valve |
| 3 | Air discharge Grill |

Product Heating Capacity : 5kW,7kW,9kW
U4 Chassis
 (unit:mm)



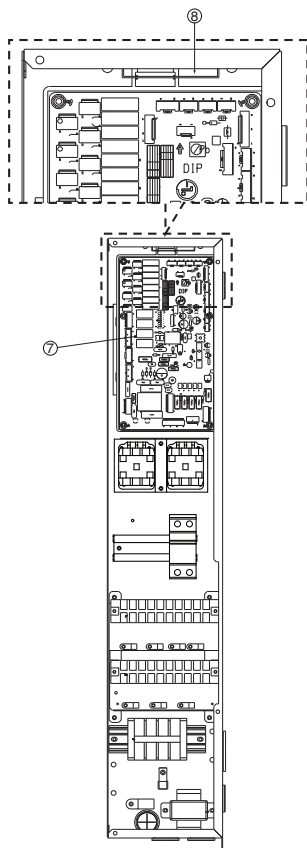
Description

| No | Name |
|----|---------------------------|
| 1 | Liquid-side Service Valve |
| 2 | Gas-side Service Valve |
| 3 | Air discharge Grill |

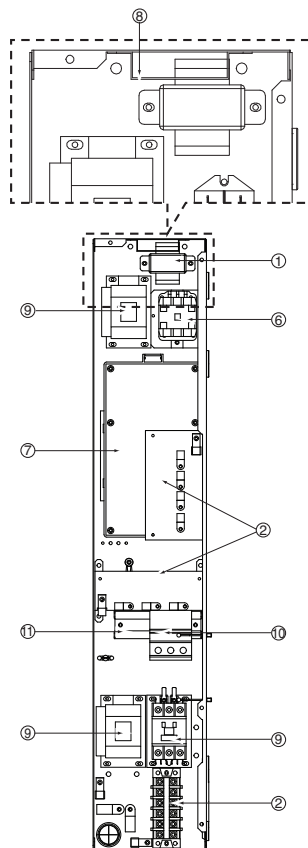
Control Parts

Control Box : Indoor Unit

1Ø Electric Heater



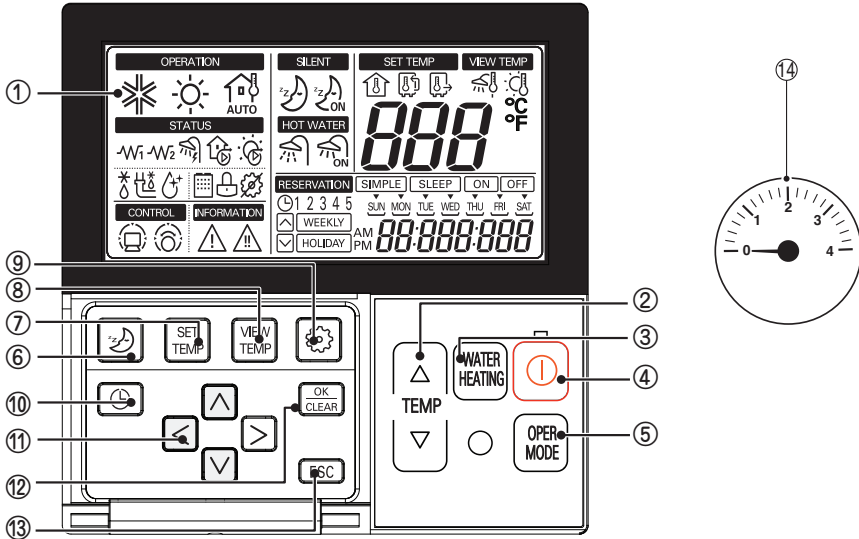
3Ø Electric Heater



Description

| No | Name | Remarks |
|----|--|---|
| 1 | Down transformer | Voltage down(230V AC) |
| 2 | Terminal blocks | The terminal blocks allow easy connection of field wiring |
| 3 | Unit ELB | The ELB protects the unit against overload or short circuit |
| 4 | Water tank heater ELB(optional) | The ELB protects the water tank heater in sanitary water tank against overload or short circuit |
| 5 | Magnetic switch | - |
| 6 | Magnetic switch (optional for water tank heater) | - |
| 7 | Main PCB | The main PCB(Printed Circuit Board) controls the functioning of the unit |
| 8 | Dry Contact□Supporter | Supporter to install Dry Contact□(sold separately) |
| 9 | Magnet Contact | |
| 10 | Unit MCCB | The MCCB protects the unit against overload |
| 11 | Water tank heater MCCB(optional) | The MCCB protects the water tank heater in sanitary water tank against overload |

Control Panel



| No | Name |
|----|--|
| 1 | Display |
| 2 | Change Temperature Button |
| 3 | Water Heating Enable / Disable Button |
| 4 | Power Button |
| 5 | Operation Mode Selection Button |
| 6 | Silent Mode On / Off Button |
| 7 | Temperature Setting Mode Button |
| 8 | Temperature View Mode Button |
| 9 | Function Setting Button |
| 10 | Programming Button |
| 11 | Direction Button (Up, Down, Left, Right) |
| 12 | Set / Clear button |
| 13 | ESC Button |
| 14 | Pressure gage |

Wiring Diagram : Indoor Unit

- Refer to the wiring diagram inside the control box.

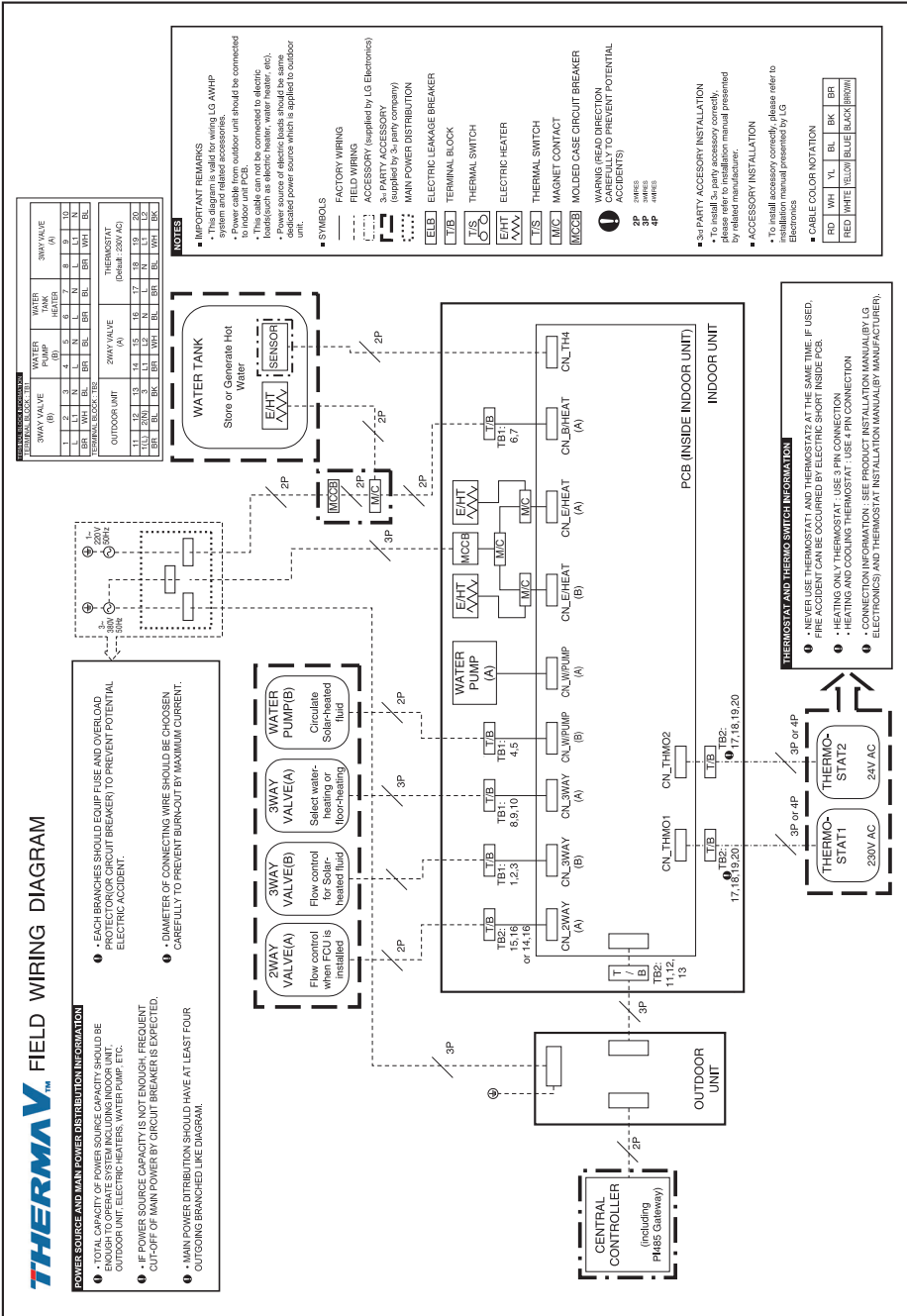
Circuit Diagram : Indoor Unit

- Refer to the circuit diagram inside the front panel.

Wiring Diagram : Outdoor Unit

- Refer to the attached wiring diagram in the outdoor unit.

Wiring Diagram : Indoor and Outdoor Unit(Including Field wiring) (Indoor : Electric Heater 3Ø 380-415V, Outdoor : 3Ø)



FIELD WIRING DIAGRAM



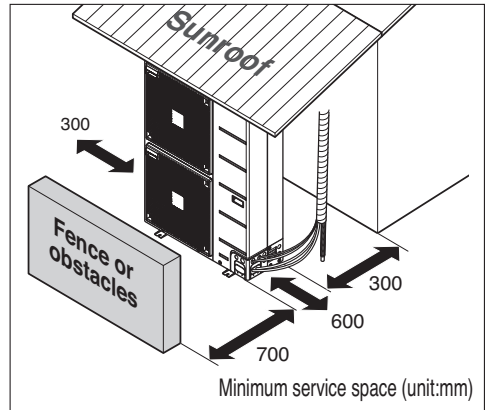
4. Installation of Outdoor Unit

The outdoor unit of **THERMAV** is installed outside to exchange heat with ambient air. Therefore, it is important to secure proper space around the outdoor unit and care for specific external conditions.

This chapter presents a guide to install the outdoor unit, make a route to connect with the indoor, and what to do when installed around seaside.

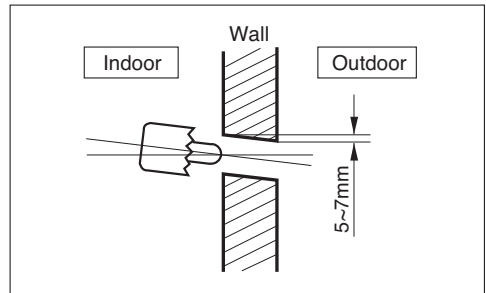
Conditions where Outdoor Unit is Installed

- If a sunroof is built over the unit to prevent direct sunlight or rain exposure, make sure that heat radiation from the heat exchanger is not restricted.
- Ensure that the spaces indicated by arrows around front, back and side of the unit.
- Do not place animals and plants in the path of the warm air.
- Take the weight of the outdoor unit into account and select a place where noise and vibration are minimum.
- Select a place so that the warm air and noise from the outdoor unit do not disturb neighbors.



Drill a Hole in the Wall

- If making a hole to the wall is required to connect pipe between the indoor unit and the outdoor unit, please follow below descriptions.
 - Drill the piping hole with a $\phi 70\text{mm}$ hole core drill.
 - Piping hole should be slightly slant to the outdoor side to prevent raindrop into indoor side.



Installation at Seaside

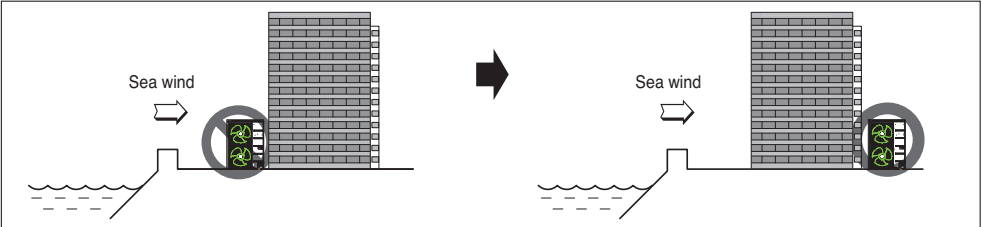


CAUTION

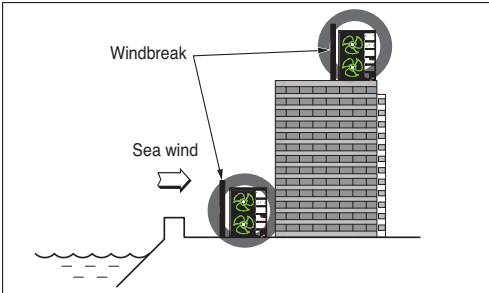
1. Air conditioners should not be installed in areas where corrosive gases, such as acid or alkaline gas, are produced.
2. Do not install the product where it could be exposed to sea wind (salty wind) directly. It can result corrosion on the product. Corrosion, particularly on the condenser and evaporator fins, could cause product malfunction or inefficient performance.
3. If outdoor unit is installed close to the seaside, it should avoid direct exposure to the sea wind. Otherwise it needs additional anticorrosion treatment on the heat exchanger.

Selecting the location(Outdoor Unit)

- 1) If the outdoor unit is to be installed close to the seaside, direct exposure to the sea wind should be avoided. Install the outdoor unit on the opposite side of the sea wind direction.



- 2) In case, to install the outdoor unit on the seaside, set up a windbreak not to be exposed to the sea wind.



- It should be strong enough like concrete to prevent the sea wind from the sea.
- The height and width should be more than 150% of the outdoor unit.
- It should be keep more than 700 mm of space between outdoor unit and the windbreak for easy air flow.

- 3) Select a well-drained place.

Periodic (more than once/year) cleaning of the dust or salt particles stuck on the heat exchanger by using water

Seasonal wind and cautions in winter

- Sufficient measures are required in a snow area or severe cold area in winter so that product can be operated well.
- Get ready for seasonal wind or snow in winter even in other areas.
- Install a suction and discharge duct not to let in snow or rain.
- Install the outdoor unit not to come in contact with snow directly. If snow piles up and freezes on the air suction hole, the system may malfunction. If it is installed at snowy area, attach the hood to the system.
- Install the outdoor unit at the higher installation console by 500 mm than the average snowfall (annual average snowfall) if it is installed at the area with much snowfall.
- Where snow accumulated on the upper part of the Outdoor Unit by more than 100 mm, always remove snow for operation.

1. The height of H frame must be more than 2 times the snowfall and its width shall not exceed the width of the product. (If width of the frame is wider than that of the product, snow may accumulate)
2. Don't install the suction hole and discharge hole of the Outdoor Unit facing the seasonal wind.

5. Installation of Indoor Unit

The indoor unit of **THERMAV** is installed inside where terminal of under floor water pipe cycle and refrigerant pipe from the outdoor unit are accessible at the same time.

In this chapter conditions for installation place is described. In addition, considerations when installing accessories or 3rd party accessories are described, too.

Conditions where Indoor Unit is Installed

Specific conditions are required for installation place such as service space, wall mounting, water pipe length and height, total volume of water, adjusting expansion vessel, and water quality.

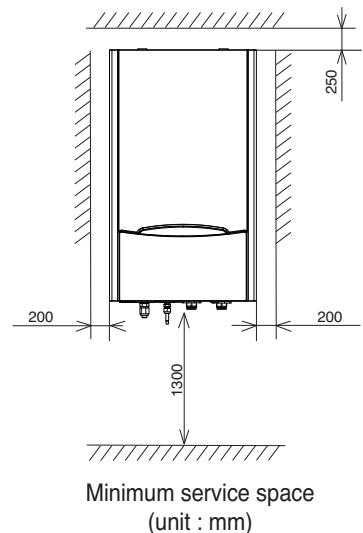
General Considerations

Followings are should be considered before the installation of the indoor unit.

- The installation place should be free from outdoor weather conditions such as rain, snow, wind, frost, etc.
- Choose the place where is water-resistant or good drainage.
- Service space should be secured.
- No flammable materials around the indoor unit.
- Mice can not be appeared to prevent entering the indoor unit or attacking wires.
- Do not place anything in front of the indoor unit to ensure air circulation around the indoor unit.
- Do not locate anything under the indoor unit to be free from unexpected water out.
- In case of water pressure increasing to 3 bar, water drainage should be treated when water is drained by safety valve.

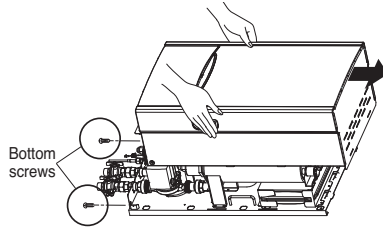
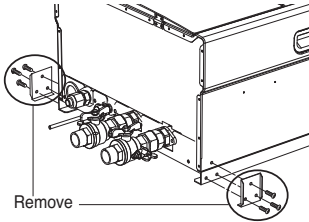
Service Space

- Ensure that the spaces indicated by arrows around bottom, side, and top side.
- Wider spaces are preferred for easy maintenance and piping.
- If minimum service space is not secured, air circulation can be troubled and internal parts of the indoor unit can be damaged by overheating.

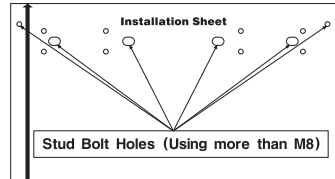


Mounting to Wall

Step 1. After releasing eight screws, detach front cover from the indoor unit. While detaching the front cover, grab the carrying handles at left and right sides of the front cover. Then pull into upward direction. When assemble the front cover, remove detached side brackets of the front cover and **ONLY** tighten two screws of bottom.



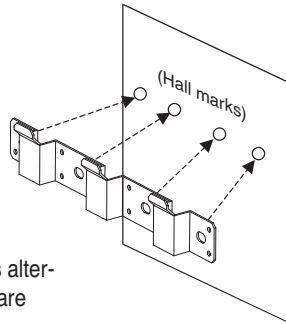
Step 2. Attach "Installation Sheet" to the wall and mark the location of bolts. This sheet helps to find correct location to the bolts.



⚠ CAUTION

The sheet should be attached level. If not, the supporting plate and the indoor unit will not be mounted correctly.

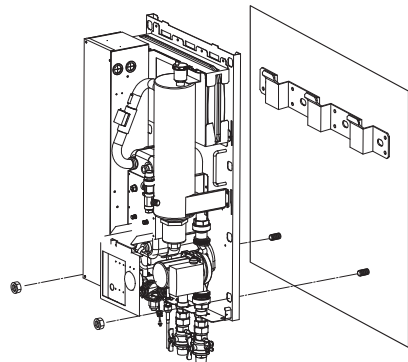
Step 3. Detach the Installation sheet. Screw bolts with supporting plate at the hole marks on the wall. When screwing bolts, use M8 ~ M11 anchor bolts to secure hanging the indoor unit.



ⓘ NOTICE

Eight small holes around four large hole marks can be used as alternatives of M8 ~ M11 anchor bolts. But M8 ~ M11 anchor bolts are more preferred.

Step 4. Hang the indoor unit at the supporting plate. Also, catch the carrying handles at left and right sides of the indoor unit.



⚠ CAUTION

While lifting the indoor unit, at least two persons should be joined. Weight of the indoor unit is almost 55kg.

Water volume and pump capacity

The water pump is three speed-adjustable (Maximum / Medium / Minimum), so it may be required to change default water pump speed in case of noise by water flow. In most case, however, it is strongly recommended to set speed as Maximum.

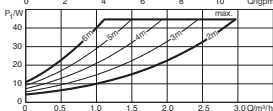
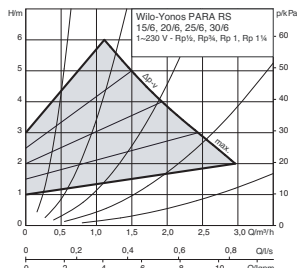
NOTICE

Water pump speed

To secure enough water flow rate, do not set water pump speed as "Min." It can lead unexpected flow rate error CH14.

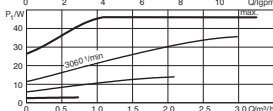
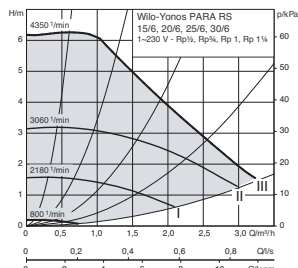
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Yonos Para 25/6

Δp -v (variable)



Tolerances of each curve according to EN 1151-1:2006

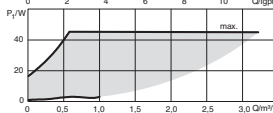
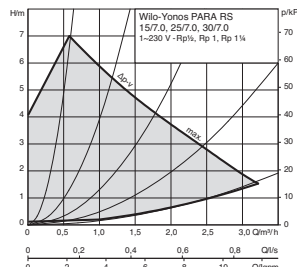
Constant speed I, II, III



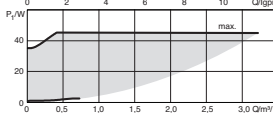
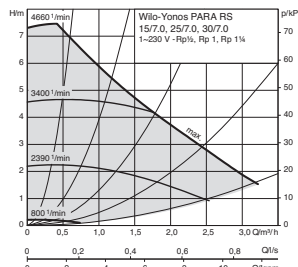
Tolerances of each curve according to EN 1151-1:2006

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Yonos Para 25/7

Δp -v (variable)



Constant speed I, II, III



■ : Operation cutoff range

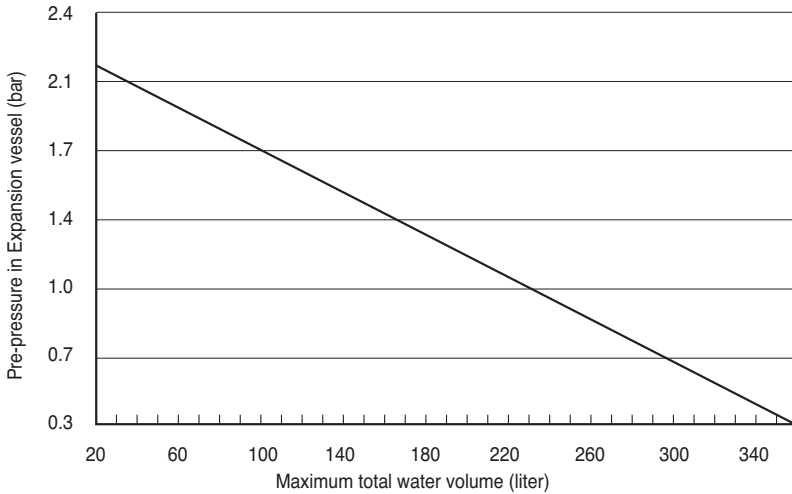
WARNING

Selecting a water flowrate outside the curves can cause damage to or malfunction of the unit.

Water Volume and Expansion Vessel Pressure

Inside **THERMAV** expansion vessel is included which is 8 liter capacity with 1 bar pre-pressure. That means, according to the volume-pressure graph, total water volume of 230 liter is supported as default. If total water volume is changed because of installation condition, the pre-pressure should be adjusted to secure proper operation.

- Minimum total water volume is 20 liter.
- Pre-pressure is adjusted by the total water volume. If the indoor unit is located at the highest position of the water circuit, adjustment is not required.
- To adjust pre-pressure, use nitrogen gas by certificated installer.



Adjusting pre-pressure of expansion vessel is as following :

Step 1. Refer "Volume-Height" table.

If installation scene is belong to Case A, go to Step 2.

Otherwise, if it is Case B, do nothing. (pre-pressure adjustment is not required.)

Other-

wise, if it is Case C, go to Step 3.

Step 2. Adjust pre-pressure by following equation.

$$\text{Pre-pressure [bar]} = (0.1 \times H + 0.3) \text{ [bar]}$$

where H : difference between indoor unit and the highest water pipe

0.3 : minimum water pressure to secure product operation

Step 3. Volume of expansion vessel is less than installation scene.

Please install additional expansion vessel at the external water circuit.

Volume-Height Table

| | V < 230 liter | V ≥ 230 liter |
|--------|---------------|---------------|
| H < 7m | Case B | Case A |
| H ≥ 7m | Case A | Case C |

H : difference between indoor unit and the highest water pipe

V : total water volume of installation scene

Water Quality

Water quality should be complied with EN 98/83 EC Directives. Requirement for resolved chemical ingredients is following table. Detailed water quality condition can be found in EN 98/83 EC Directives.

| Parameter | Value | Parameter | Value |
|--------------------|-----------------------|---------------------------------------|----------------------|
| Acrylamide | 0.10 $\mu\text{g/l}$ | Fluoride | 1.5 mg/l |
| Antimony | 5.0 $\mu\text{g/l}$ | Lead | 10 $\mu\text{g/l}$ |
| Arsenic | 10 $\mu\text{g/l}$ | Mercury | 1.0 $\mu\text{g/l}$ |
| Benzene | 1.0 $\mu\text{g/l}$ | Nickel | 20 $\mu\text{g/l}$ |
| Benzo(a)pyrene | 0.010 $\mu\text{g/l}$ | Nitrate | 50 mg/l |
| Boron | 1.0 mg/l | Nitrite | 0.50 mg/l |
| Bromate | 10 $\mu\text{g/l}$ | Pesticides | 0.10 $\mu\text{g/l}$ |
| Cadmium | 5.0 $\mu\text{g/l}$ | Pesticides — Total | 0.50 $\mu\text{g/l}$ |
| Chromium | 50 $\mu\text{g/l}$ | Polycyclic aromatic hydrocarbons | 0.10 $\mu\text{g/l}$ |
| Copper | 2.0 mg/l | Selenium | 10 $\mu\text{g/l}$ |
| Cyanide | 50 $\mu\text{g/l}$ | Tetrachloroethene and Trichloroethene | 10 $\mu\text{g/l}$ |
| 1,2-dichloroethane | 3.0 $\mu\text{g/l}$ | Trihalomethanes — Total | 100 $\mu\text{g/l}$ |
| Epichlorohydrin | 0.10 $\mu\text{g/l}$ | Vinyl chloride | 0.50 $\mu\text{g/l}$ |

CAUTION

- If the product is installed at existing hydraulic water loop, it is important to clean hydraulic pipes to remove sludge and scale.
- Installing sludge strainer in the water loop is very important to prevent performance degrade.
- Chemical treatment to prevent rust should be performed by installer.

Frost protection

In areas of the country where entering water temperatures drop below 0 °C, the water pipe must be protected by using an approved antifreeze solution. Consult your AWHP unit supplier for locally approved solutions in your area. Calculate the approximate volume of water in the system. (Except the AWHP unit.) And add six liters to this total volume to allow for the water contained in AWHP unit.

| Antifreeze type | Antifreeze mixing ratio | | | | | |
|------------------|-------------------------|------|-------|-------|-------|-------|
| | 0°C | -5°C | -10°C | -15°C | -20°C | -25°C |
| Ethylene glycol | 0% | 12% | 20% | 30% | - | - |
| Propylene glycol | 0% | 17% | 25% | 33% | - | - |
| Methanol | 0% | 6% | 12% | 16% | 24% | 30% |

CAUTION

1. Use only one of the above antifreeze.
2. If a antifreeze is used, pressure drop and capability degradation of the system can be occurred.
3. If one of antifreezes is used, corrosion can be occurred. So please add corrosion inhibitor.
4. Please check the concentration of the antifreeze periodically to keep same concentration.
5. When the antifreeze is used (for installation or operation), take care to ensure that antifreeze must not be touched.
6. Ensure to respect all laws and norms of your country about Anti-freeze usage.

6. Piping and Wiring for Outdoor Unit

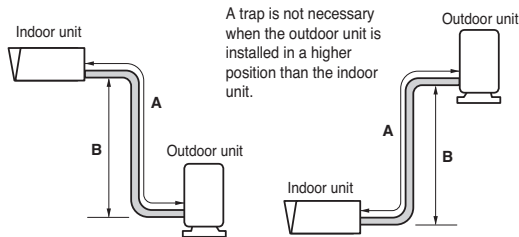
Procedures about refrigerant piping and electric wiring at the outdoor are described in this chapter. Most of procedures are similar to those of LG Air Conditioner.

Refrigerant Piping

Before starting refrigerant piping, constraints in pipe length and elevation should be examined. After resolving all constraints, some preparations are required to proceed. Then connecting pipe to the outdoor and the indoor unit is beginning.

Constraints in Pipe Length and Elevation

| Capacity | Pipe Size (mm : inch) (Diameter : Ø) | | Length A (m) | | Elevation B (m) | | *Additional Refrigerant (g/m) |
|----------|---|------------|--------------|------|-----------------|------|-------------------------------|
| | Gas | Liquid | Standard | Max. | Standard | Max. | |
| 3kW | 12.7(1/2") | 6.35(1/4") | 7.5 | 30 | 0 | 30 | 20 |
| 5kW | 15.88(5/8") | 9.52(3/8") | 7.5 | 50 | 0 | 30 | 40 |
| 7kW | | | | | | | |
| 9kW | | | | | | | |
| 12kW | 15.88(5/8") | 9.52(3/8") | 7.5 | 50 | 0 | 30 | 40 |
| 14kW | | | | | | | |
| 16kW | | | | | | | |



CAUTION

- Standard pipe length is 7.5m. If the pipe length is longer than 7.5m, additional charge of the refrigerant is required according to the table.
 - Example : If 16kW model is installed at a distance of 50m, 2,100g of refrigerant should be added according to following formula : $(50-7.5) \times 40g = 1,700g$
- Rated capacity of the product is based on standard length and maximum allowable length is based on the product reliability in the operation.
- Improper refrigerant charge may result in abnormal operation.

Note:

Fill in the f-gas Label attached on outdoor about the quantity of the fluorinated greenhouse gases (This note about f-gas label may not apply depending on your product type or market.)

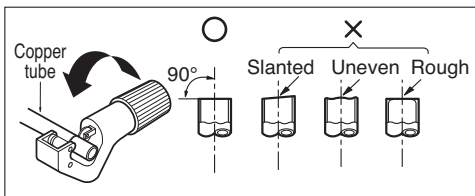
- Manufacturing site (See Model Name label)
- Installation site (If possible being placed adjacent to the service points for the addition or removal of refrigerant)
- The total Charge (① + ②)

Preparation for Piping

Preparation for piping is five steps. As main cause of refrigerant leakage is defects in flaring work, please carry out correct flaring work in the following steps.

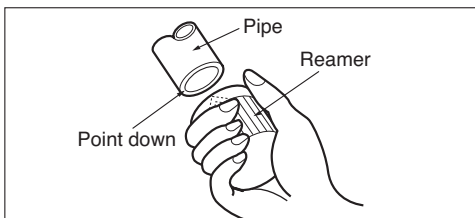
Step 1. Cut the pipes and the cable.

- Use the accessory piping kit or the pipes purchased locally.
- Measure the distance between the indoor unit and the outdoor unit.
- Cut the pipes a little longer than measured distance.



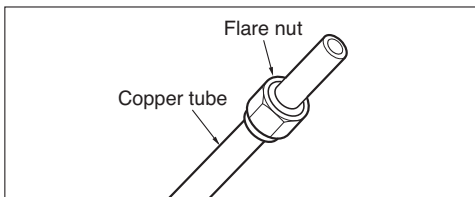
Step 2. Burrs removal.

- Remove all burrs completely from cut cross section of the pipe.
- Put the end of the pipe to downward direction in order to prevent drop of burrs into the pipe.



Step 3. Insert flare nut.

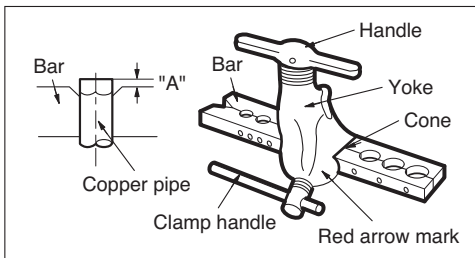
- Take out flare nuts attached at the indoor unit and the outdoor unit.
- Insert flare nuts into burr-removed pipe.
- If flaring work is finished, it is impossible to insert nuts into pipe.



Step 4. Flaring work.

- Carry out flaring work using dedicated flaring tool for R-410A refrigerant as shown below.

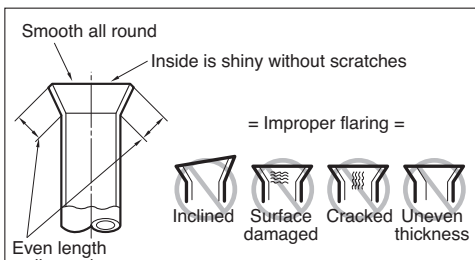
| Outside diameter | | "A" |
|------------------|------|-----------|
| mm | inch | mm |
| 6.35 | 1/4 | 1.1 ~ 1.3 |
| 9.52 | 3/8 | 1.5 ~ 1.7 |
| 12.7 | 1/2 | 1.6 ~ 1.8 |
| 15.88 | 5/8 | 1.6 ~ 1.8 |
| 19.05 | 3/4 | 1.9 ~ 2.1 |



- Firmly hold copper tube in a bar(or die) as indicated dimension in the table above.

Step 5. Check

- Compare the flared work with right figure.
- If flare is seemed to be defective, cut off the flared section and do flaring work again.



Connecting Pipe to Indoor Unit

Connecting pipe to the indoor unit is two steps. Read following directions carefully.

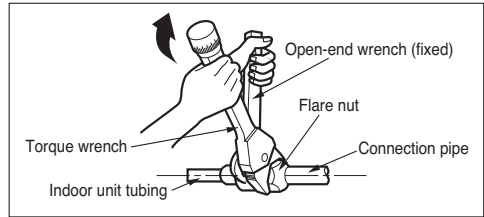
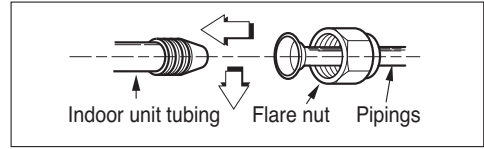
Step 1. Pre-tightening.

- Align the center of the pipes and sufficiently tighten the flare nut by hand.

Step 2. Tightening.

- Tighten the flare nut with a wrench.
- Tightening torque is as following.

| Outside diameter | | Torque |
|------------------|------|------------|
| mm | inch | kgf·m |
| 6.35 | 1/4 | 1.8 ~ 2.5 |
| 9.52 | 3/8 | 3.4 ~ 4.2 |
| 12.7 | 1/2 | 5.5 ~ 6.6 |
| 15.88 | 5/8 | 6.6 ~ 8.2 |
| 19.05 | 3/4 | 9.9 ~ 12.1 |



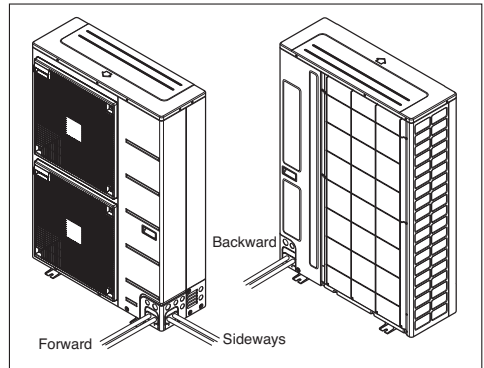
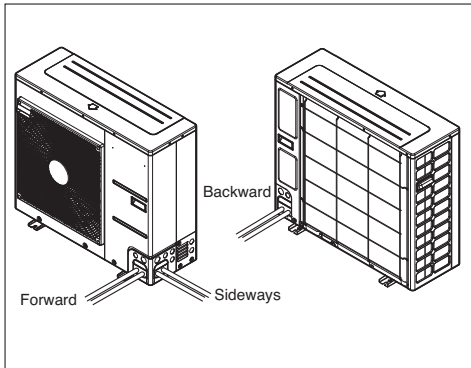
Connecting Pipe to Outdoor Unit

(Product Heating Capacity : 9kW(U4 Chassis),12kW,14kW,16kW)

Connecting pipe to the outdoor unit is five steps including PCB setting.

Step 1. Determine direction of pipes.

- The pipes can be connectable in four directions
- The directions are expressed in below figure.



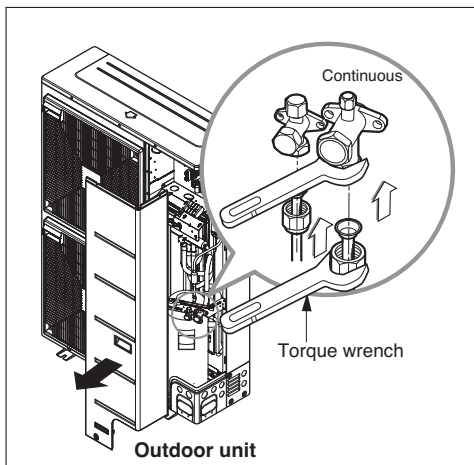
Step 2. Determine direction of pipes : in case of downward

Not Available

Step 3. Tightening

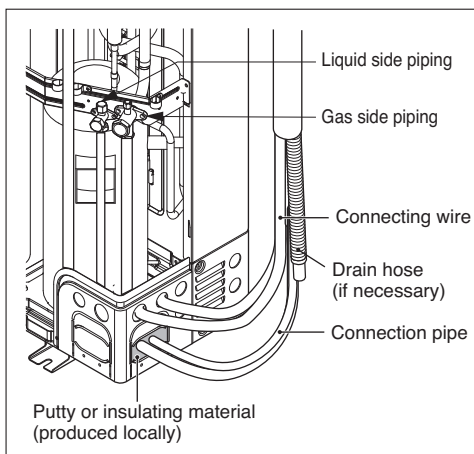
- Align the center of the pipes and sufficiently tighten the flare nut by hand.
- Tighten the flare nut with a wrench until the wrench clicks
- Tightening torque is as following.

| Outside diameter | | Torque kgf·m |
|------------------|------|-----------------|
| mm | inch | |
| 6.35 | 1/4 | 1.8 ~ 2.5 |
| 9.52 | 3/8 | 3.4 ~ 4.2 |
| 12.7 | 1/2 | 5.5 ~ 6.6 |
| 15.88 | 5/8 | 6.6 ~ 8.2 |
| 19.05 | 3/4 | 9.9 ~ 12.1 |



Step 4. Preventing entering of foreign objects

- Plug the pipe through-holes with putty or insulation material (procured locally) to fill up all gaps as shown in right figure.
- If insects or small animals enter the outdoor unit, it may cause a short circuit in the electrical box.
- Finally, form the pipes by wrapping the connecting portion of the indoor unit with insulation material and secure it with two kinds of vinyl tape. Ensuring thermal insulation is very important.

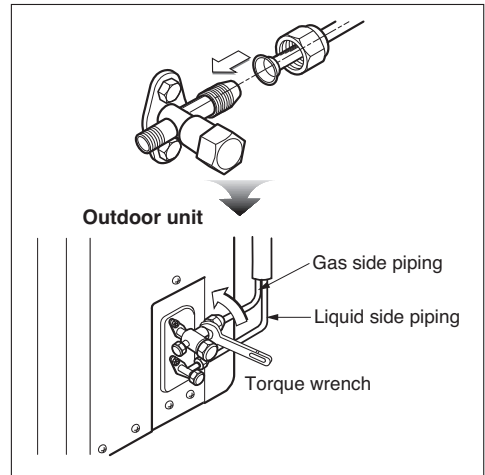


Connecting Pipe to Outdoor Unit (Product Heating Capacity : 9kW)

- Align the center of the pipings and sufficiently tighten the flare nut with fingers.
- Finally, tighten the flare nut with torque wrench until the wrench clicks.
 - When tightening the flare nut with torque wrench, ensure the direction for tightening follows the arrow on the wrench.

| Outside diameter | | Torque |
|------------------|------|----------|
| mm | inch | kgf·m |
| Ø6.35 | 1/4 | 1.8~2.5 |
| Ø9.52 | 3/8 | 3.4~4.2 |
| Ø12.7 | 1/2 | 5.5~6.6 |
| Ø15.88 | 5/8 | 6.3~8.2 |
| Ø19.05 | 3/4 | 9.9~12.1 |

Align the center of the piping and sufficiently tighten the flare nut by hand.



Electrical Wiring

Two kind of cables should be connected to the outdoor unit : One is 'Power cable', the other one is 'Connecting cable'. Power cable is a cable which is used to supply external electricity to the outdoor unit. This cable is generally connected between external power source (such as main electric power distribution panel of user's house) and the outdoor unit. Connecting cable is, on the other hand, used to connect between the outdoor unit and the indoor unit to supply electric power to the indoor unit and to establish the communication between the outdoor unit and the indoor unit.

Procedure for wiring to the outdoor unit is four steps. Before starting wiring, check if wire specification is suitable and read following directions and cautions VERY carefully.

Wire Specification

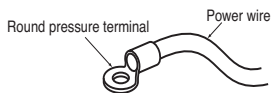
Power Cable Specification : The power cord connected to the outdoor unit should be complied with IEC 60245 or HD 22.4 S4(Rubber insulated cord, type 60245 IEC 66 or H07RN-F)



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

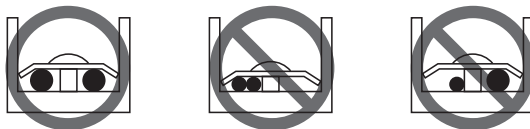
Terminal Specification of Power Cable and related Cautions :

Use round pressure terminals for connections to the power terminal block.

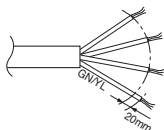


When none are available, follow the instructions below.

- Do not connect wiring of different thicknesses to the power terminal block. (Slack in the power wiring may cause abnormal heat.)
- When connecting wiring which is the same thickness, do as shown in the figure below.



Connecting Cable Specification : The connecting cable, being used to connect the indoor unit and outdoor unit, should be complied with IEC 60335-1 standard (This equipment shall be provided with a cord set complying with the national regulation).



If the supply cable is damaged, it must be replaced by a special cable or assembly available from the manufacturer or its service agent.

Circuit Breaker Specification

- Select a power source that is capable of supplying the current required by the AWHP.
- Use a recognized circuit breaker between the power source and the unit.
A disconnection device to adequately disconnect all supply lines must be fitted.
- Capacity of circuit breaker recommended.
- Separate main power supply and heater supply.

| Model | | | Core Component Electrical Spec. | | | | | | | | MCA, MOP & Circuit Breaker | | | | | | | | | |
|-------------|-----------|-------------------------|---------------------------------|---------|-----------------|--------------|----------------------|---------------|--------------|---------|----------------------------|---------|---------------------|--|---------|---------------------|-------------------------------------|---------|---------------------|----|
| | | | Compressor | | Electric Heater | | Sanitary Tank Heater | | | | For Heat Pump | | | For Electric Heater (without S/Heater) | | | For Electric Heater (with S/Heater) | | | |
| Indoor | Outdoor | Power Supply | RLA (A) | FLA (A) | Capacity (kW) | Power Supply | RLA (A) | Capacity (kW) | Power Supply | FLA (A) | MCA (A) | MOP (A) | Circuit Breaker (A) | MCA (A) | MOP (A) | Circuit Breaker (A) | MCA (A) | MOP (A) | Circuit Breaker (A) | |
| AHNW03604A2 | AHUW036A2 | 1~ 220-240V 50Hz | 8 | 10 | | | | | | | 9 | 16.6 | 20 | 15 | 27 | 30 | 25 | 45 | 40 | |
| AHNW09604A2 | AHUW056A2 | | 9.7 | 15 | 2+2 | | 8.3 | | | | | 13 | 23.9 | 20 | 15 | 27 | 30 | 25 | 45 | 40 |
| AHNW16606A2 | AHUW096A2 | | 17 | 25 | 3+3 | | 12.5 | | | | | 22 | 40.3 | 40 | 23 | 41 | 40 | 29 | 53 | 50 |
| AHNW16606A2 | AHUW126A2 | | | | | | | 3 | 10 230V | 12.5 | | 6 | 11.1 | 10 | 12 | 22 | 20 | 21 | 38 | 30 |
| AHNW16808A2 | AHUW146A2 | 3N~ 380-415V 50Hz | 5.3 | 9.9 | 2+2+2 | 3Ø 400V | 8.7 | | | | | | | | | | | | | |
| AHNW16808A2 | AHUW166A2 | | | | | | | | | | | | | | | | | | | |
| AHNW16808A2 | AHUW186A2 | | | | | | | | | | | | | | | | | | | |

Notes:

1. MCA / MOP

MCA = (1.25 x Load1) + Load2 + Load3

MOP = (2.25 x Load1) + Load2 + Load3

- Load1 : Rated running current of largest motor (compressor or other motor)

- Load2 : sum of current for all other motors

- Load3 : any other load rated 1.0A or more

2. Select wire spec. based on the MCA

3. Recommended circuit breaker is ELCB (Earth Leakage Circuit breaker)

4. RLA is measured during each individual compressor test condition.

MCA : Minimum Circuit Amperes (A)
 MOP : Maximum rating Over current Protective device
 RLA : Rated Load Amperes (A)
 FLA : Full Load Amperes (A)
 S/Heater: Sanitary Water Tan Heater

Wiring Procedure for Power Cable and Connecting Cable

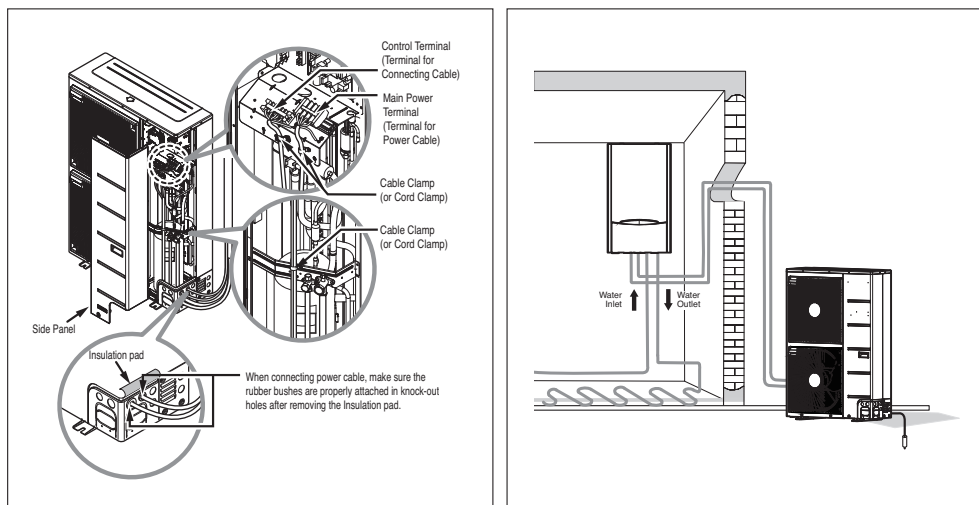
Step 1. : Disassemble the side panel from the outdoor unit by loosening screws.

Step 2. : Connect Power cable to Main Power Terminal and Connecting cable to Control Terminal, respectively.

See below figure for detailed information. When connecting earth cable, the diameter of cable should be bigger than 1.6mm² to secure safety. The earth cable is connected to the terminal block where earth symbol (⊕) is marked.

Step 3. : Use cable clamps (or cord clamps) to prevent unintended move of Power cable and Connecting cable.

Step 4. : Reassemble the side panel to the outdoor unit by fastening screws.



⚠ CAUTION

After checking and confirming following conditions, start wiring work.

1. Secure dedicated power source for the Air-to-Water heat pump. The wiring diagram (attached inside the control box of the indoor unit) is presenting related information.
2. Provide a circuit breaker switch between power source and the outdoor unit.
3. Although it is very rare case, sometimes the screws used to fasten internal wires can be loosen due to the vibration while product transportation. Check these screws and make it sure if they are all fastened tightly. If not tightened, burn-out of the wire can be occurred.
4. Check the specification of power source such as phase, voltage, frequency, etc.
5. Confirm that electrical capacity is sufficient.
6. Be sure that the starting voltage is maintained at more than 90 percent of the rated voltage marked on the name plate.
7. Confirm that the cable thickness is as specified in the power sources specification. (Particularly note the relation between cable length and thickness.)
8. Provide an ELB (electric leakage breaker) when the installation place is wet or moist.
9. The following troubles would be caused by abnormal voltage supply such as sudden voltage increasing or voltage drop-down.
 - Chattering of a magnetic switch (frequent on and off operation)
 - Physical damage of parts where magnetic switch is contacted
 - Break of fuse
 - Malfunction of overload protection parts or related control algorithms.
 - Failure of compressor start up
10. Ground wire to ground outdoor unit to prevent electrical shock.

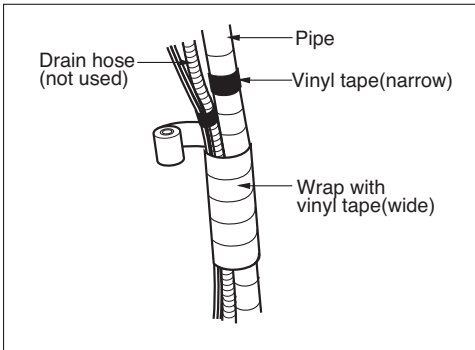
⚠ CAUTION

The Power cord connected to the unit should be selected according to the following specifications .

Finalizing

After pipes are connected and electric cables are wired, pipe forming and some tests are remained. Especially, careful attention is required while proceeding leakage test because the leakage of the refrigerant effects degrade of performance directly. Also, it is very hard to find leaked point after all installation procedures are finished.

Pipe Forming

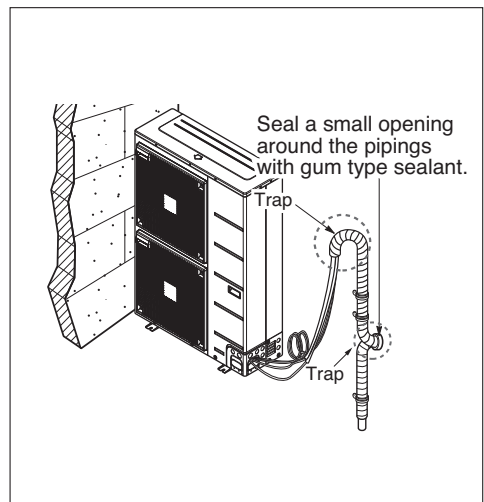
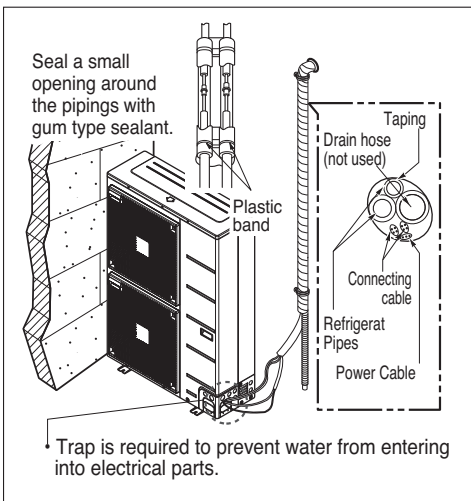


Do pipe forming by wrapping the connecting cable and refrigerant pipe (between the indoor unit and outdoor unit) with thermal insulation material and secure it with two kinds of vinyl tape.

1. Tape the refrigerant pipe, power cable and connecting cable from down to up.
2. Secure the taped pipe is along with the exterior wall. Form a trap to prevent water entering the room and electrical part.
3. Fix the taped pipe onto the wall by saddle or equivalent.

Taping Procedure

1. Tape the pipes, connecting cable and power cable from down to up. If taping direction is up to down, rain drop may be sinking into the pipes or cables.
2. Secure the taped pipe along the exterior wall using saddle or equivalent.
3. Trap is required to prevent water from entering into electrical parts.



Leakage test and Evacuation

Air and moisture remaining in the refrigerant system have undesirable effects as indicated below.

1. Pressure in the system rises.
2. Operating current rises.
3. Cooling(or heating) efficiency drops.
4. Moisture in the refrigerant circuit may freeze and block capillary tubing.
5. Water may lead to corrosion of parts in the refrigeration system.

Therefore, the indoor/outdoor unit and connecting tube must be checked for leak tight, and vacuumed to remove incondensable gas and moisture in the system.

Preparation

- Check that each tube(both liquid and gas side tubes) between the indoor and outdoor units have been properly connected and all wiring for the test run has been completed. Remove the service valve caps from both the gas and the liquid side on the outdoor unit. Check that both the liquid and the gas side service valves on the outdoor unit are kept closed at this stage.

Leakage test

- Connect the manifold valve(with pressure gauges) and dry nitrogen gas cylinder to this service port with charge hoses.

⚠ CAUTION

Be sure to use a manifold valve for leakage test.

If it is not available, use a stop valve for this purpose. The "Hi" knob of the manifold valve must always be kept close.

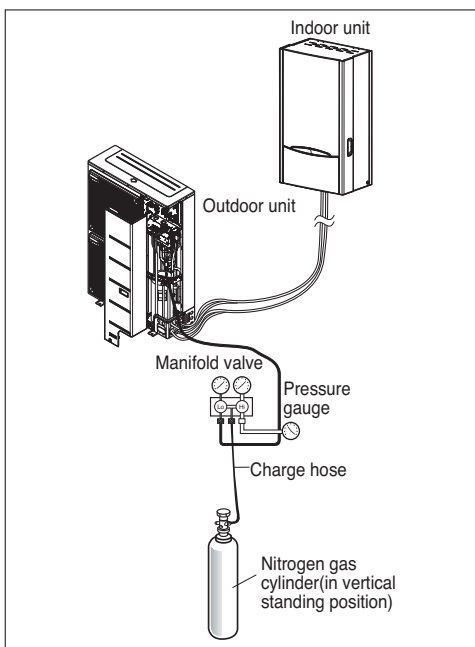
- Pressurize the system to no more than 3.0 Mpa with dry nitrogen gas and close the cylinder valve when the gauge reading reached 3.0 Mpa Next, test for leaks with liquid soap.

⚠ CAUTION

To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than its bottom when you pressurize the system. Usually, the cylinder is used in a vertical standing position.

1. Do a leakage test of all joints of the tubing(both indoor and outdoor) and both gas and liquid side service valves. Bubbles indicate a leak. Be sure to wipe off the soap with a clean cloth.

2. After the system is found to be free of leaks, relieve the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. When the system pressure is reduced to normal, disconnect the hose from the cylinder.



Evacuation

1. Connect the charge hose end described in the preceding steps to the vacuum pump to evacuate the tubing and indoor unit.

Confirm the "Lo and Hi" knob of the manifold valve is open. Then, run the vacuum pump.

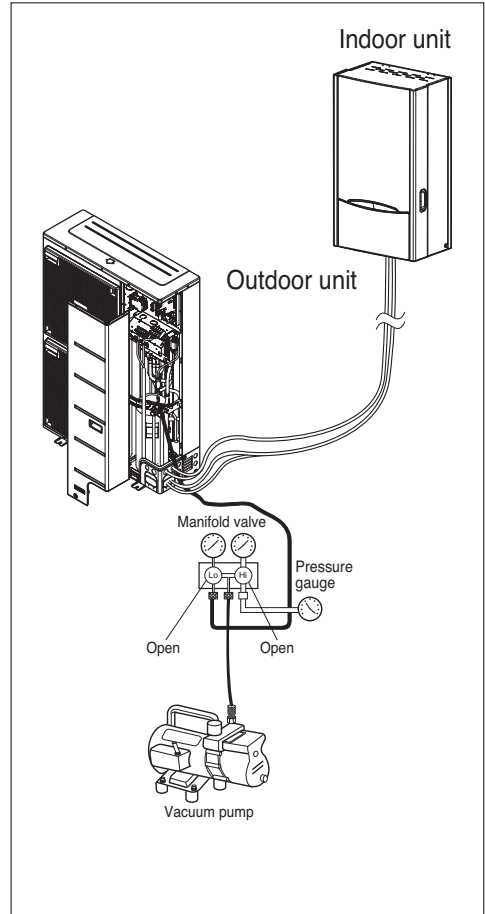
The operation time for evacuation varies with tubing length and capacity of the pump. The following table shows the time required for evacuation.

| Required time for evacuation when 30 gal/h vacuum pump is used | |
|--|---|
| If tubing length is less than 10 m(33 ft) | If tubing length is longer than 10 m(33 ft) |
| 30 min. or more | 60 min. or more |
| 0.5 torr or less | |

2. When the desired vacuum is reached, close the "Lo and Hi" knob of the manifold valve and stop the vacuum pump.

Finishing the job

1. With a service valve wrench, turn the valve stem of liquid side valve counter-clockwise to fully open the valve.
2. Turn the valve stem of gas side valve counter-clockwise to fully open the valve.
3. Loosen the charge hose connected to the gas side service port slightly to release the pressure, then remove the hose.
4. Replace the flare nut and its bonnet on the gas side service port and fasten the flare nut securely with an adjustable wrench. This process is very important to prevent leakage from the system.
5. Replace the valve caps at both gas and liquid side service valves and fasten them tight. This completes air purging with a vacuum pump. The air conditioner is now ready to test run.



7. Piping and Wiring for Indoor Unit

Procedures about water piping and electric wiring at the indoor unit are described in this chapter. Water piping and water circuit connection, water charging, pipe insulations will be shown for water piping procedures. For wiring, terminal block connection, connecting with the outdoor unit, electric heater wiring will be introduced. Accessories connection, such as sanitary water tank, thermostat, 3way or 2way valves, etc will be dealt in separated chapter.

Water Piping and Water Circuit Connection

General Considerations

Followings are should be considered before beginning water circuit connection.

- Service space should be secured.
- Water pipes and connections should be cleaned using water.
- Space for installing external water pump should be provided if internal water pump capacity is not enough for installation field.
- Never connect electric power while proceeding water charging.

Water Piping and Water Circuit Connection

Definition of terms are as follow :

- Water piping : Installing pipes where water is flowing inside the pipe.
- Water circuit connecting : Making connection between the product and water pipes or between pipes and pipes. Connecting valves or elbows are, for example, in this category.

Configuration of water circuit is shown in Chapter 2. All connections should be complied with pre-sented diagram.

While installing water pipes, followings should be considered :

- While inserting or putting water pipes, close the end of the pipe with pipe cap to avoid dust entering.
- When cutting or welding the pipe, always be careful that inner section of the pipe should not be defective. For example, no weldments or no burrs are found inside the pipe.
- Drain piping should be provided in case of water discharge by the operation of the safety valve. This situation can be happened when the internal pressure is over 3.0 bar and water inside the indoor unit will be discharged to drain hose.

While connecting water pipes, followings should be considered.

- Pipe fittings (e.g. L-shape elbow, T-shape tee, diameter reducer, etc) should be tightened strongly to be free from water leakage.
- Connected sections should be leakage-proof treatment by applying tefron tape, rubber bushing, sealant solution, etc.
- Appropriate tools and tooling methods should be applied to prevent mechanical breakage of the connections.
- Operation time of flow control valve(e.g. 3way valve or 2way valve) should be less than 90 seconds.
- Drain hose should be connected with drain piping.

WARNING

Installing shut-off valve

- While assembling two shut-off valves, that are found inside 'AWHP Installation Kit (AET69364401)', pop sound will be heard when valve is open or close by rotating handles. It is normal condition because the sound is due to leakage of charged nitrogen gas inside the valve. The nitrogen gas is applied to secure quality assurance.
- Before starting water charging, these two shut-off valves should be assembled with water inlet and outlet pipe of the indoor unit.

Water condensation on the floor

While cooling operation, it is very important to keep leaving water temperature higher than 16°C. Otherwise, dew condensation can be occurred on the floor.

If floor is in humid environment, do not set leaving water temperature below 18 °C.

Water condensation on the radiator

While cooling operation, cold water may not flow to the radiator. If cold water enters to the radiator, dew generation on the surface of the radiator can be occurred.

Drainage treatment

While cooling operation, condensed dew can drop down to the bottom of the indoor unit. In this case, prepare drainage treatment (for example, vessel to contain condensed dew) to avoid water drop.

Water Charging

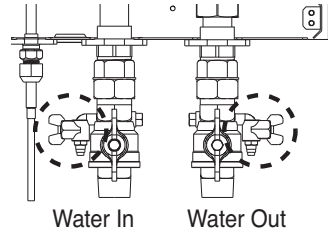
For water charging, please follow below procedures.

Step 1. Open all valves of whole water circuit. Supplied water should be charged not only inside the indoor unit, but also in the under floor water circuit, sanitary water tank circuit, FCU water circuit, and any other water circuits controlled by the product.

Step 2. Connect supply water into drain valve and fill valve located at the side of the shut-off valve.

CAUTION

No water-leakage permitted at the drain and fill valve. Leakage-proof treatment which is described in previous section should be applied.



Step 3. Start to supply water. While supplying water, following should be kept.

- Pressure of supplying water should be 2.0 bar approximately.
- For supplying water pressure, time to be taken from 0 bar to 2.0 bar should be more than 1 minute. Sudden water supply can yield water drain through safety valve.
- Fully open the cap of air vent to assure air purging. If air is exist inside the water circuit, then performance degrade, noise at the water pipe, mechanical damage at the surface of electric heater coil.

Step 4. Stop water supplying when the pressure gage located in front of the control panel indicates 2.0 bar.

Step 5. Close drain valve and fill valve. Then wait for 20~30 seconds to observe water pressure being stabilized.

Step 6. If following conditions are satisfactory, then go to step 7(pipe insulation). Otherwise, go to step 3.

- Pressure gage indicates 2.0 bar. Note that sometimes pressure in decreased after step 5 due to water charging inside expansion vessel.
- No air purging sound is heard or no water drop are popping out from air vent.

Pipe Insulation

Purpose of water pipe insulation is :

- To prevent heat loss to external environment
- To prevent dew generation on the surface of the pipe in cooling operation

Electrical Wiring

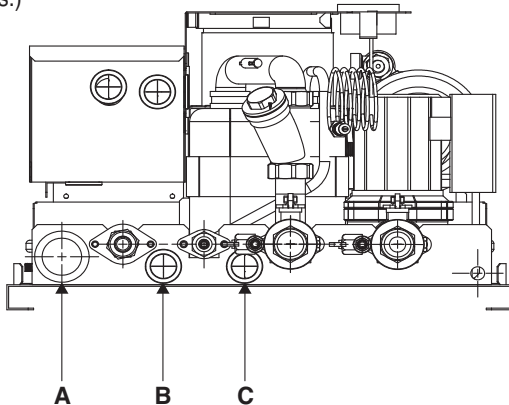
General Consideration

Followings are should be considered before beginning indoor unit wiring.

- Field-supplied electrical components such as power switches, circuit breakers, wires, terminal boxes, etc should be properly chosen with compliance with national electrical legislation or regulation.
- Make it sure that supplied electricity is enough to operate the product including outdoor unit, electric heater, water tank heater, etc. The capacity of fuse also selected according to the power consumption.
- The main electricity supply should be dedicated line. Sharing main electricity supply with other devices such as washing machine or vacuum cleaner is not permitted.

⚠ CAUTION

- Before starting wiring job, the main electricity supply should be turned off until wiring is completed.
- When adjusting or changing wiring, the main electricity supply should be turned off and ground wire should be connected securely.
- Installation place should be free from the attack of wild animal. For example, mice's wire attacking or frog's entering into the indoor unit may cause critical electrical accident.
- All power connections should be protected from dew condensation by thermal insulation.
- All electrical wiring should comply with national or local electrical legislation or regulation.
- The ground should be connected exactly. Do not earth the product to the copper pipe, steel fence at the veranda, city water outlet pipe, or any other conductivity materials.
- Fix all cable using cord clamp tightly. (When cable is not fixed with cord clamp, use additionally supplied cable ties.)



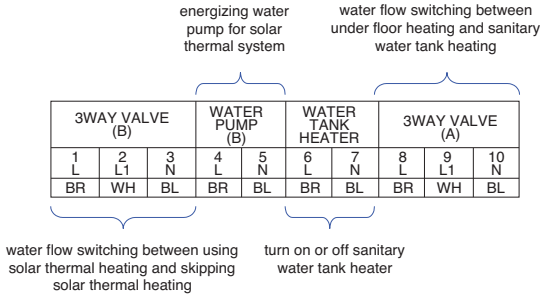
Hole A, B : for AC line (wire which is connected to the terminal block of the control box)
 Hole C : for DC line (wire which is connected to the PCB of the control box)

Terminal Block Information (1Ø Electric Heater)

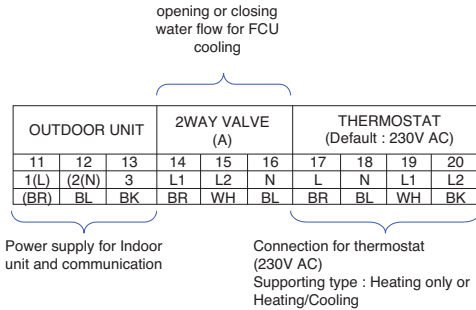
Symbols used below pictures are as follows :

- L, L1, L2 : Live (230V AC)
- N : Neutral (230V AC)
- BR : Brown , WH : White , BL : Blue , BK : Black

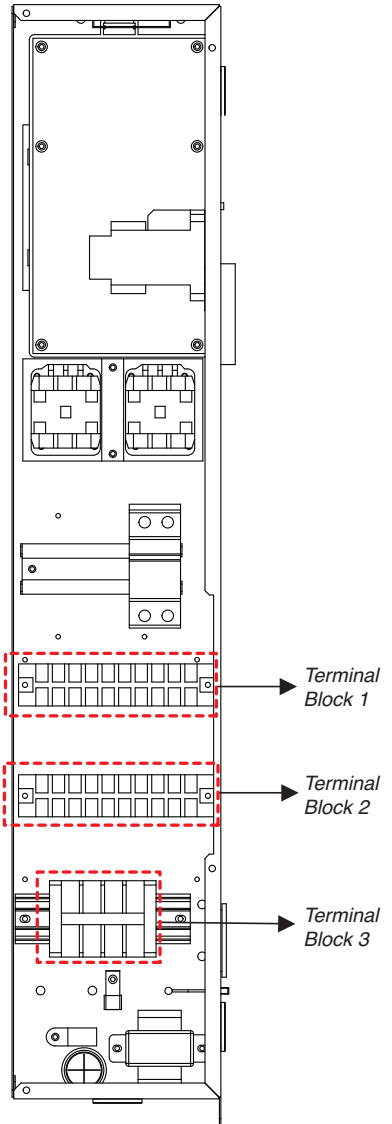
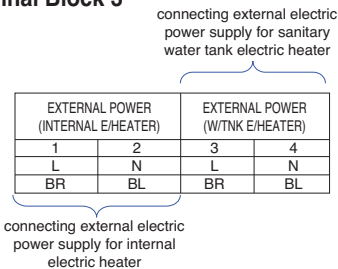
Terminal Block 1



Terminal Block 2



Terminal Block 3



Terminal Block Information (3Ø Electric Heater)

Symbols used below pictures are as follows :

- L, L1, L2 : Live (230V AC)
- N : Neutral (230V AC)
- BR : Brown , WH : White , BL : Blue , BK : Black

Terminal Block 1

energizing water pump for solar thermal system water flow switching between under floor heating and sanitary water tank heating

| 3WAY VALVE (B) | | | WATER PUMP (B) | | WATER TANK HEATER | | 3WAY VALVE (A) | | |
|----------------|---------|--------|----------------|--------|-------------------|--------|----------------|---------|---------|
| 1 L | 2 L1 | 3 N | 4 L | 5 N | 6 L | 7 N | 8 L | 9 L1 | 10 N |
| BR | WH | BL | BR | BL | BR | BL | BR | WH | BL |

water flow switching between using solar thermal heating and skipping solar thermal heating turn on or off sanitary water tank heater

Terminal Block 2

opening or closing water flow for FCU cooling

| OUTDOOR UNIT | | | 2WAY VALVE (A) | | | THERMOSTAT (Default : 230V AC) | | | |
|--------------|--------------|-----------|----------------|------------|-----------|--------------------------------|-----------|------------|------------|
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1(L) (BR) | 2(N) (BL) | 3 (BK) | L1 (BR) | L2 (WH) | N (BL) | L (BR) | N (BL) | L1 (WH) | L2 (BK) |

Power supply for Indoor unit and communication

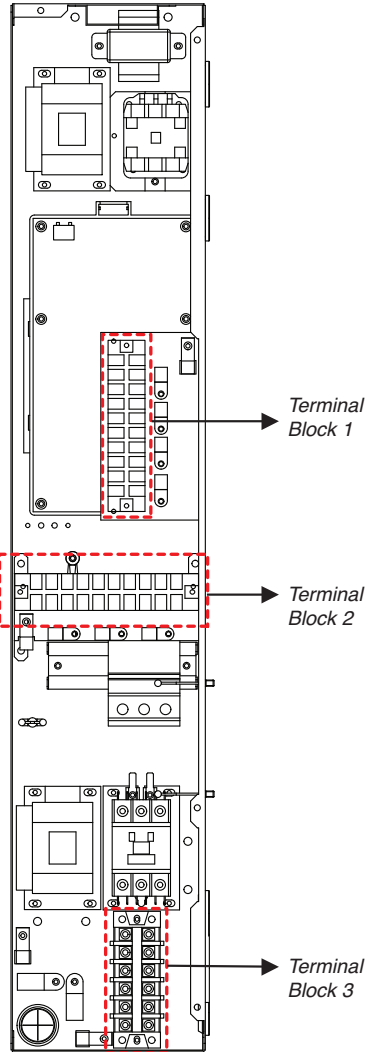
Connection for thermostat (230V AC)
Supporting type : Heating only or Heating/Cooling

Terminal Block 3

connecting external electric power supply for sanitary water tank electric heater

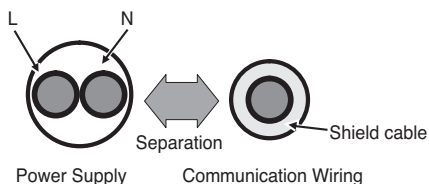
| EXTERNAL POWER (W/TNK E/HEATER) | | EXTERNAL POWER (INTERNAL E/HEATER) | | |
|---------------------------------|----|------------------------------------|----|----|
| 1 | 2 | 3 | 4 | 5 |
| L | N | R | S | T |
| BR | BL | BR | BK | GY |

connecting external electric power supply for internal electric heater

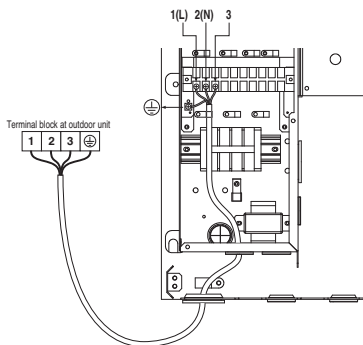


⚠ CAUTION

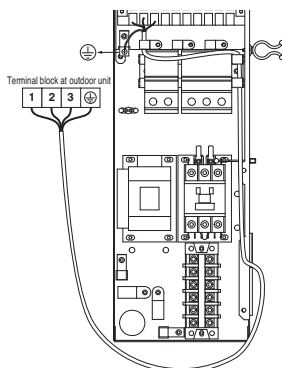
You should separate the communication wiring, in case of communication wiring length is over 40M



Connecting with Outdoor Unit



1Ø Electric Heater

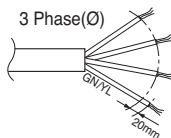
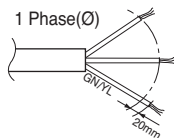


3Ø Electric Heater

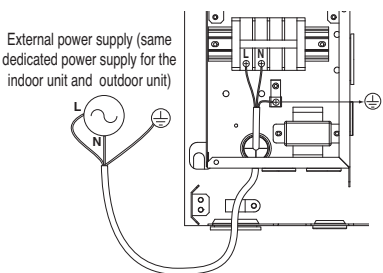
Electric Heater Wiring

⚠ CAUTION

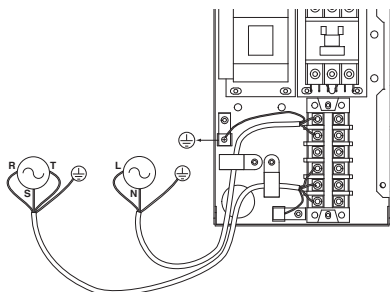
Power Cable Specification : The power cord connected to the outdoor unit should be complied with IEC 60245 or HD 22.4 S4(Rubber insulated cord, type 60245 IEC 66 or H07RN-F)



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



1Ø Electric Heater



3Ø Electric Heater

8. Accessories Installation

THERMAV can interface to various accessories to extend its functionality and to improve user convenience. In this chapter, specifications about supported 3rd party accessories and how to connect to **THERMAV** are introduced.

It is noted that this chapter only deal with 3rd party accessories. For accessories supported by LG Electronics, please refer to installation manual of each accessories.

Accessories supported by LG Electronics

| Item | Purpose | Model |
|---------------------------------|--------------------------------------|--|
| Sanitary Water Tank Install Kit | To operate with sanitary water tank | PHLTA : 1Ø Indoor PHLTC : 3Ø Indoor |
| Remote Air Sensor | To control by air temperature | PQRSTA0 |
| Dry Contact | To receive on & off external signal | PQDSA |
| Solar Heating Kit | To operate with solar heating system | PHLLA (Limit Temperature : 96°C) |
| Sanitary Water Tank | To generate and store hot water | PHS02060310 : 200 liter, Single Heating Coil, 1Ø 230V 50Hz 3kW Electric Heater PHS02060320 : 200 liter, Double Heating Coil, 1Ø 230V 50Hz 3kW Electric Heater PHS03060310 : 300 liter, Single Heating Coil, 1Ø 230V 50Hz 3kW Electric Heater PHS03060320 : 300 liter, Double Heating Coil, 1Ø 230V 50Hz 3kW Electric Heater |

Accessories supported by 3rd party Companies

| Item | Purpose | Specification |
|-------------------------|--|--|
| Solar Heating System | To generate auxiliary heating energy for water tank | |
| Thermostat | To control by air temperature | Heating-Only type (230V AC or 24V AC) Cooling/Heating type (230V AC or 24V AC with Mode selection switch) |
| 3way valve and actuator | To control water flow for hot water heating or floor heating | 3 wire, SPDT (Single Pole Double Throw) type, 230V AC |
| 2way valve and actuator | To control water flow for Fan Coil Unit | 2 wire, NO(Normal Open) or NC(Normal Closed) type, 230V AC |

Before Installation

WARNING

Followings should be kept before installation

- Main power must be turned off during installing 3rd party accessories.
- 3rd party accessories should be comply with supported specification.
- Proper tools should be chosen for installation.
- Never do installation with wet hands.

Thermostat

Thermostat is generally used to control the product by air temperature. When thermostat is connected to the product, the product operation is controlled by the thermostat.

General Information

THERMAV. supports following thermostats.

The Heat Pump supports following thermostats.

| Type | Power | Operating Mode | Supported |
|-------------------|--------|-----------------------|-----------|
| Mechanical (1) | 230 V~ | Heating Only (3) | Yes |
| | | Heating / Cooling (4) | Yes |
| Electrical (2) | 230 V~ | Heating Only (3) | Yes |
| | | Heating / Cooling (4) | Yes |

- (1) There is no electric circuit inside the thermostat and electric power supply to the thermostat is not required.
- (2) Electric circuit such as display, LED, buzzer, etc is included in the thermostat and electric power supply is required.
- (3) Thermostat generates "Heating ON or Heating OFF" signal according to user's heating target temperature.
- (4) hermostat generates both "Heating ON or Heating OFF" and "Cooling ON or Cooling OFF" signal according to user's heating and cooling target temperature.

CAUTION

Choosing heating / cooling thermostat

- Heating / cooling thermostat must have "Mode Selection" feature to distinguish operation mode.
- Heating / cooling thermostat must be able to assign heating target temperature and cooling target temperature differently.
- If above conditions are not kept, the unit can not operation properly.
- Heating / cooling thermostat must send cooling or heating signal immediately when temperature condition is satisfied. No delay time while sending cooling or heating signal is permitted.

How to wire thermostat

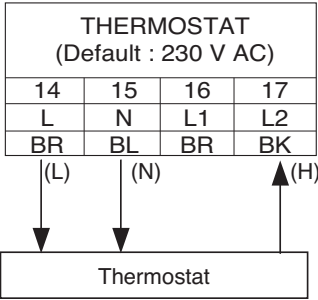
Follow below procedures Step 1 ~ Step 5.

Step 1. Uncover front cover of the unit and open the control box.

Step 2. Identify the power specification of the thermostat. If it is 220-240 V~, go to Step 3.

Step 3. If it is Heating only thermostat, go to step 4. Otherwise, if it is Heating / cooling thermostat, go to step 5.

Step 4. Find terminal block and connect wire as below. After connecting, go to step 5.



⚠ WARNING

Mechanical type thermostat

Do not connect wire (N) as mechanical type thermostat does not require electric power supply.

⚠ CAUTION

Do not connect external electric loads.

Wire (L) and (N) should be used only for operation electric type thermostat.

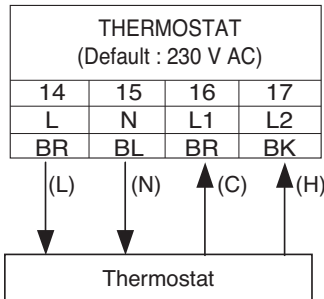
Never connect external electric loads such as valves, fan coil units, etc. If connected, Main PCB (Heater) can be seriously damaged.

(L) : Live signal from PCB to thermostat

(N) : Neutral signal from PCB to thermostat

(H) : Heating signal from thermostat to PCB

Step 5. Find terminal block and connect wire as below.



⚠ WARNING

Mechanical type thermostat

Do not connect wire (N) as mechanical type thermostat does not require electric power supply.

⚠ CAUTION

Do not connect external electric loads.

Wire (L) and (N) should be used only for operation Electric type thermostat.

Never connect external electric loads such as valves, fan coil units, etc. If connected, Main PCB (Heater) can be seriously damaged.

(L) : Live signal from PCB to thermostat

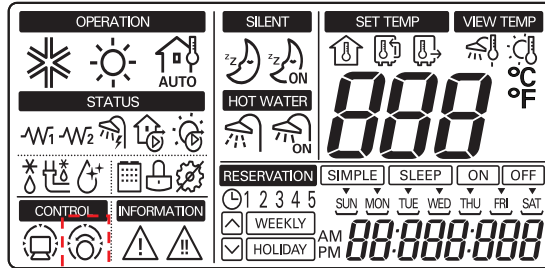
(N) : Neutral signal from PCB to thermostat

(C) : Cooling signal from thermostat to PCB

(H) : Heating signal from thermostat to PCB

Final check

- DIP switch setting :
Set DIP switch No. 8 to 'ON'. Otherwise, the unit can not recognize the thermostat.
- Remote Controller :
 - 'Thermostat' icon is displayed on the remote controller.
 - Button input is prohibited.







Thermostat Icon

NOTICE




Thermostat Operation with Remote Controller

Following features are permitted when thermostat is installed :

-  SET TEMP button
-  VIEW TEMP button
-  Temperature adjusting button(*)
-  Sanitary water heating Enable / Disable

(*) : Adjusted temperature is only used to control electric heater on / off condition.
The unit does not turn on / off according to the setting temperature at the remote controller.
It turns on / off according to the thermostat signal.

Following features are NOT permitted when thermostat is installed :

-  Operating mode (cooling / heating / weather-dependent) selection
-  Time scheduling
-  Operation On / Off

Sanitary Water Tank and Sanitary Water Tank Kit/Solar Thermal Kit

To establish sanitary water circuit, 3way valve and sanitary water tank kit is required. If solar thermal system is pre-installed at the installation field, solar thermal kit is required to interface solar thermal system – to – sanitary water tank – to – **THERMAV**.

General Information

THERMAV supports following 3way valve.

| Type | Power | Operating Mode | Supported |
|-----------------------|---------|---|-----------|
| SPDT 3-wire (1) | 230V AC | Selecting "Flow A" between "Flow A" and "Flow B" (2) | Yes |
| | | Selecting "Flow B" between "Flow A" and "Flow B" (3) | Yes |

(1) : SPDT = Single Pole Double Throw. Three wires consist of Live1 (for selecting Flow A), Live 2 (for selecting Flow B), and Neutral (for common).

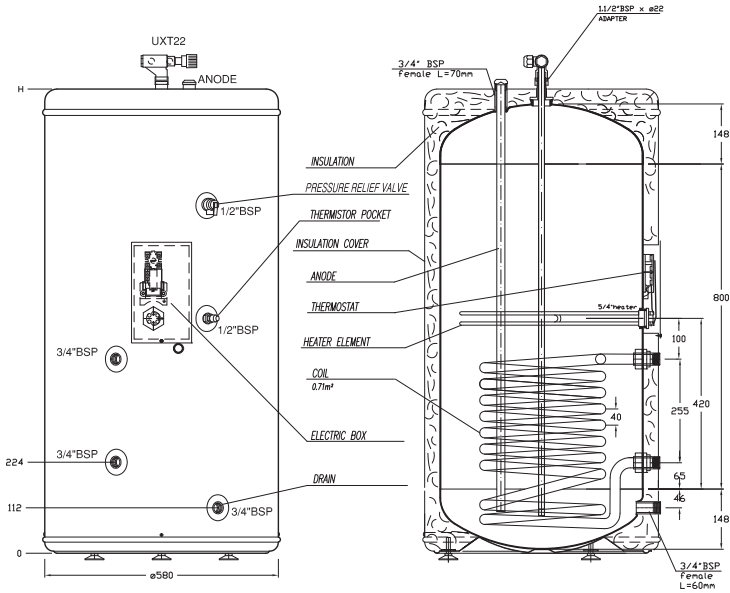
(2) : 'Flow A' means water flow from the indoor unit to under floor water circuit.

(3) : 'Flow B' means water flow from the indoor unit to sanitary water tank.

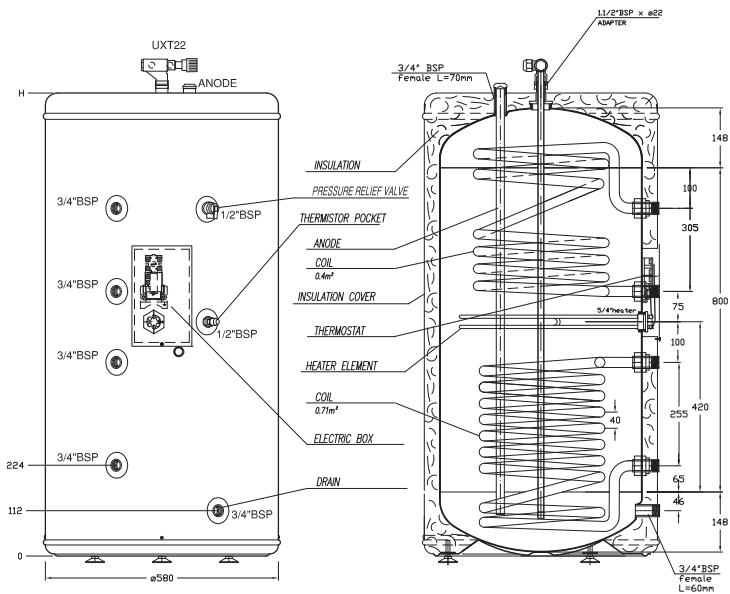
How to Install Sanitary Water Tank

For more detail information about installing sanitary water tank, please refer installation manual provided with sanitary water tank.

PHS02060310(LGRTV200E) / PHS03060310(LGRTV300E)



PHS02060320(LGRTV200VE) / PHS03060320(LGRTV300VE)



(unit : mm)

How to Install Sanitary Water Tank Kit

Follow below procedures Spet 1 ~ Step 5

- Step 1.** Find magnetic switch and ELB(MCCB) in the kit. Fit them into the indoor unit control box with enclosed a braket and screws.(symbol **A** at picture)
- Step 2.** Contact 'CN_B/HEAT(A)'(white connector)of the indoor unit PCB with magnetic switch contact using enclosed cable(symbol **B** at the picture). Connect magnetic switch contactor port no. A1 and A2.
- Step 3.** Connect magnetic switch contactor port no.L1 and L3 with RLB(MCCB) port no. 2 and 4(symbol **C** at the picture).

⚠ CAUTION

Check Poarity

- Connect magnetic switch contact port no. L1 to ELB(MCCB) port no.2
- Connect magnetic switch contact port no. L3 to ELB(MCCB) port no.4

- Step 4.** Connect magnetic switch contactor port no. T1 and T3 with terminal block 1 port 6 and 7(symbol **D** at the picture).

Check Polarity

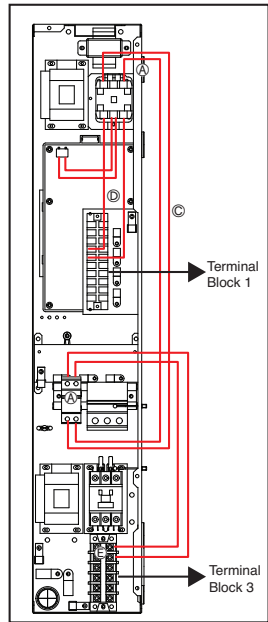
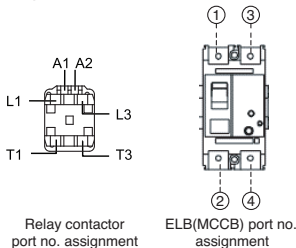
- Connect magnetic switch contact port no. T1 to terminal block 1 port 6
- Connect magnetic switch contact port no. T3 to terminal block 1 port 7

Step 5. 1Ø Electric Heater

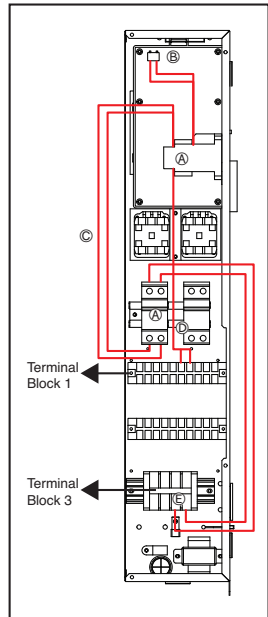
- Connect ELB(MCCB) port no.1 and 3 with block 3 port 3 and 4(symbol **E** at the picture).
- Connect ELB(MCCB) port no.1 and 3 with block 3 port 1 and 2(symbol **E** at the picture).

Check Polarity

- Connect ELB port no. 1 to terminal block 3 port 3
- Connect ELB port no. 3 to terminal block 3 port 4
- Connect MCCB port no. 1 to terminal block 3 port 1
- Connect MCCB port no. 3 to terminal block 3 port 2



3Ø Electric Heater



1Ø Electric Heater

Note:

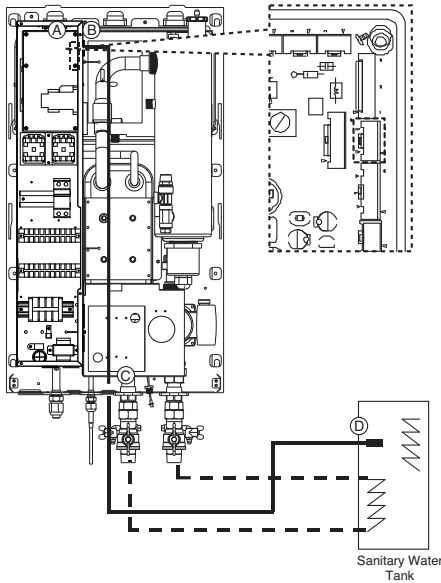
Some models are using MCCB instead of ELB

Step 6. Find sanitary water tank sensor. Connect it to 'CN_TH4' (Red Connector) of the indoor unit PCB (symbol **A** at the picture). The sensor wire should be passed through holes for sensor (symbol **B** and **C** at the picture). The sensor should be mounted correctly to the sensor hole of sanitary water tank.

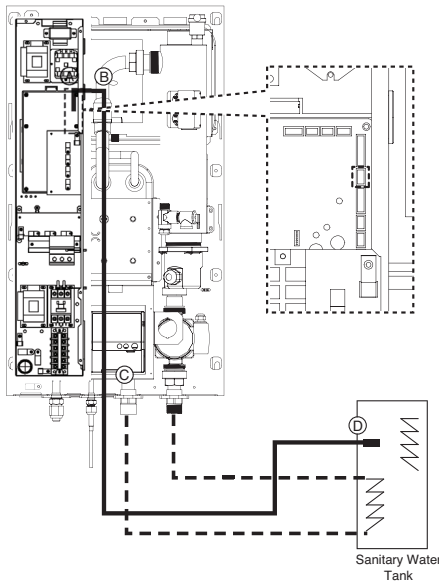
! CAUTION

Sensor mounting

Insert sensor into sensor socket and bolt it tightly.



10 Electric Heater



30 Electric Heater

How to Wire Sanitary Water Tank Heater

Step 1. Uncover heater cover of the sanitary water tank. It is located side of the tank.

Step 2. Find terminal block and connect wires as below. Wires are field-supplied item.

(L) : Live signal from PCB to Heater

(N) : Neutral signal from PCB to Heater

⚠ WARNING

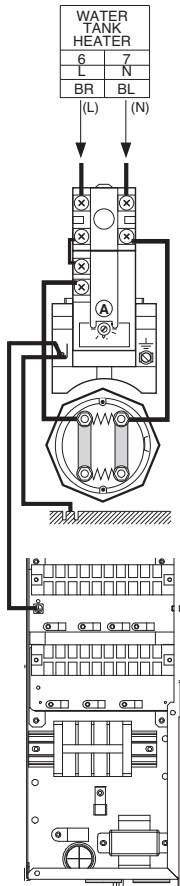
Wire specification

- Cross-sectional area of the wire should be 5mm².

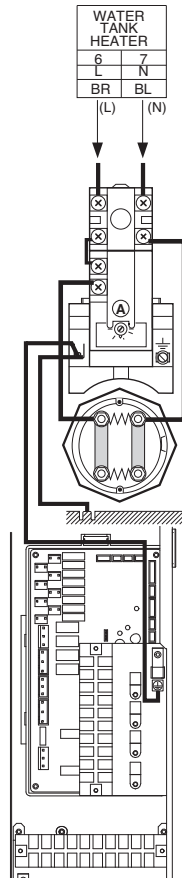
Adjusting thermostat temperature

- To guarantee proper operation, it is recommended to set temperature of thermostat to maximum temperature (symbol at the picture).

1Ø Electric Heater



3Ø Electric Heater



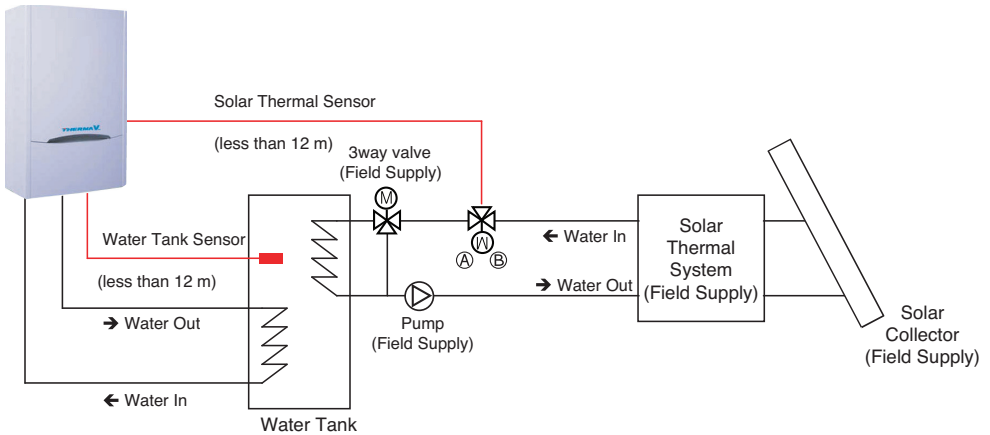
How to Install Solar Thermal Kit

Step 1. Check the diameter of pre-installed pipes. (symbol Ⓐ and Ⓑ)

Step 2. If the diameter of pre-installed pipes is different from diameter of solar thermal kit, it is necessary to reduce or extend of pipe's diameter.

Step 3. After Step 2., connect the pipe and solar thermal kit.

Step 4. Connect solar thermal sensor to 'CN_TH4'(Red connector) of the indoor unit PCB.
If the sanitary tank sensor is connected, disconnect the sensor from PCB first.



Dry Contact

LG Dry Contact is a solution for automatic control of air conditioning system at the owner's behest. In simple words, it's a switch which can be used to turn the unit On/Off after getting the signal from external sources like key-in lock, door or window switch etc specially used in Hotel rooms.

How to Install Dry Contact

- For more information about installing Dry Contact, Please refer installation manual provided with Dry Contact.
- For system set-up, please read chapter 8.(Especially function code No.6)

Remote Temperature Sensor

Remote temperature sensor can be installed any place a user wants to detect the temperature.

How to Install Remote Temperature Sensor

- For more information about installing Remote Temperature Sensor, Please refer installation manual provided with Remote Temperature Sensor.
- For system set-up, please read chapter 8.(Especially function code No.3)

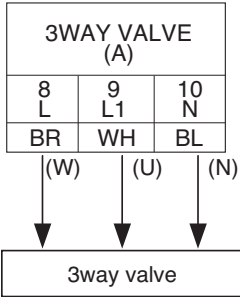
3Way Valve

How to Wire 3Way Valve

Follow below procedures Step 1 ~ Step 2.

Step 1. Uncover front cover of the indoor unit and open the control box.

Step 2. Find terminal block and connect wire as below.



⚠ WARNING

- 3way valve should select water tank loop when electric power is supplied to wire (W) and wire (N).
- 3way valve should select under floor loop when electric power is supplied to wire (U) and wire (N).

(W) : Live signal (Water tank heating) from PCB to 3way valve

(U) : Live signal (Under floor heating) from PCB to 3way valve

(N) : Neutral signal from PCB to 3way valve

Final Check

- Flow direction :
 - Water should flow from water outlet of the indoor unit to sanitary tank water inlet when sanitary tank heating is selected.
 - To verify the flow direction, check temperature at the water outlet of the indoor unit and water inlet of sanitary water tank.
 - If correctly wired, these temperatures should be almost equivalent if thermal insulation of water pipe is well performed.
- Noise or water pipe vibration while 3way valve operation
 - Due to surging effect or cavitation effect, noise or water pipe vibration can be occurred while 3way valve is operating.
 - In that case, check followings :
 - Is water circuit (both under floor water loop and sanitary water tank loop) fully charged? If not, additional water charging is required.
 - Fast valve operation yields noise and vibration. Appropriated valve operating time is 60~90 seconds.

2Way Valve

2way valve is required to control water flow while cooling operation. Role of 2way valve is to cut off water flow into under floor loop in cooling mode when fan coil unit is equipped for cooling operation.

General Information

THERMAV supports following 2way valve.

| Type | Power | Operating Mode | Supported |
|------------------|---------|--------------------|-----------|
| NO 2-wire (1) | 230V AC | Closing water flow | Yes |
| | | Opening water flow | Yes |
| NC 2-wire (2) | 230V AC | Closing water flow | Yes |
| | | Opening water flow | Yes |

(1) : Normal Open type. When electric power is NOT supplied, the valve is open. (When electric power is supplied, the valve is closed.)

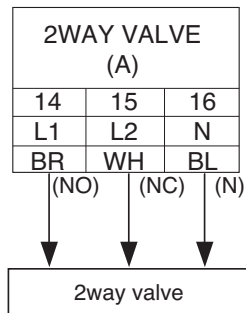
(2) : Normal Closed type. When electric power is NOT supplied, the valve is closed. (When electric power is supplied, the valve is open.)

How to Wire 2Way Valve

Follow below procedures Step 1 ~ Step 2.

Step 1. Uncover front cover of the indoor unit and open the control box.

Step 2. Find terminal block and connect wire as below.



⚠ CAUTION

Dew Condensation

- Wrong wiring can yield dew condensation on the floor. If radiator is connected at the under floor water loop, dew condensation can be occurred on the surface of the radiator.

⚠ WARNING

Wiring

- Normal Open type should be connected to wire (NO) and wire (N) for valve closing in cooling mode.
- Normal Open type should be connected to wire (NO) and wire (N) for valve closing in cooling mode.

(NO) : Live signal (for Normal Open type) from PCB to 2way valve

(NC) : Live signal (for Normal Closed type) from PCB to 2way valve

(N) : Neutral signal from PCB to 2way valve

Final Check

- Flow direction :
 - Water should not flow into under floor loop in cooling mode.
 - To verify the flow direction, check temperature at the water inlet of the under floor loop.
 - If correctly wired, this temperatures should not be approached to 6°C in cooling mode.

Conditions if Accessories are Installed

This section describes conditions about installation place where accessories are installed. Detailed installation for accessories (including supported accessory specification, wiring, PCB setting for accessory configuration, etc) will be dealt in separated chapter.

Thermostat

⚠ CAUTION

1. NEVER USE 230V AC Thermostat and 24V AC Thermostat at the same time. If used together, it causes short-circuit and yields power cut-off by circuit breaker.
2. Some electro-mechanical type thermostat has internal delay time to protect compressor. In that case, mode change can takes time more than user's expectation. Please read thermostat manual carefully if the product does not response quickly.
3. Setting temperature range by thermostat can be different with that of the product. The heating or cooling set temperature should be chosen within the setting temperature range of the product.
4. It is highly recommended that the thermostat should be installed where space heating is mainly applied.

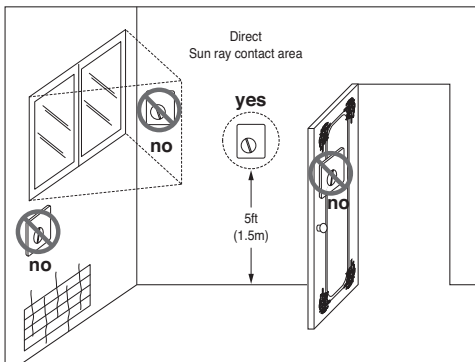
Following location should be avoid to secure proper operation :

- Height from floor is approximately 1.5 m.
- Thermostat can not be located where the area may be hidden when door is open.
- Thermostat can not be located where external thermal influence may be applied. (such as above heating radiator or open window)

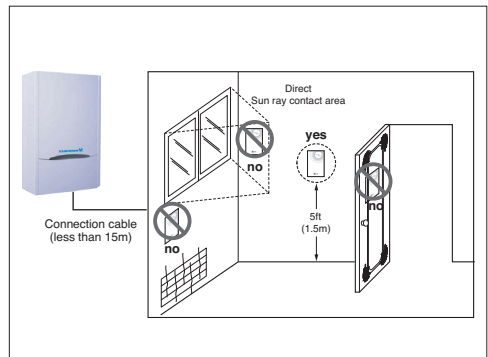
Remote Air Temperature Sensor

Role and constraint while installation of remote air temperature sensor is very similar to that of thermostat.

- Distance between the indoor unit and the remote air temperature sensor should be less than 15 m due to length of the connection cable of remote air temperature sensor.
- For other constraints, please refer to previous page where constraints about thermostat is described



Thermostat



Remote Air Temperature Sensor

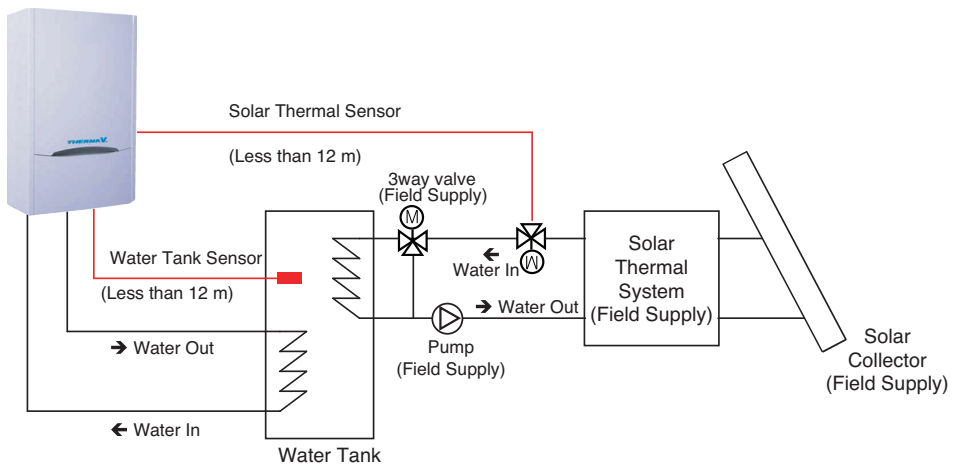
Sanitary Water Tank and Sanitary Water Tank Kit / Solar Thermal Kit

Installing sanitary water tank requires following considerations :

- Sanitary water tank should be located at the flat place.
- Water quality should be complied with EN 98/83 EC Directives.
- As this water tank is sanitary water tank (indirect heat exchange), do not use anti water-freezing treatment like ethylene glycol.
- It is highly recommend to wash out inside of the sanitary water tank after installation. It ensures generating clean hot water.
- Near the sanitary water tank there should be water supply and water drain to easy access and maintenance.
- Set the maximum value of the temperature control device of sanitary tank.

While installing sanitary water tank with sanitary water tank kit or solar thermal kit, there are some constraints like below :

- Sanitary water tank should be located under the indoor unit or same height with the indoor unit.
- Sanitary water tank should be located under the solar thermal system.
- Distance between sanitary water tank sensor or solar thermal sensor should be less than 5 m.
- If there is AC power cable near the sensor cable, the sensor cable should be away from the AC power cable at least 5 m to prevent electric noise.

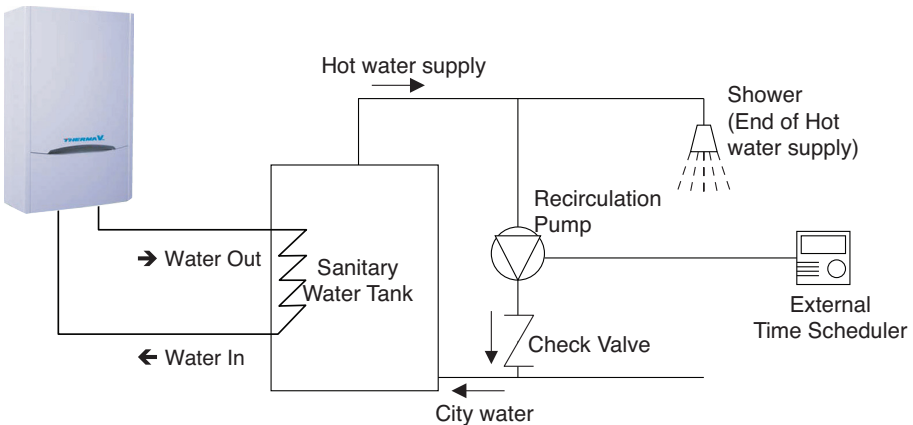


⚠ WARNING

Installing recirculation pump

When **THERMAV** is used with sanitary water tank, it is **STRONGLY** recommended to install recirculation pump to prevent flooding out cold water at the end of hot water supply and to stabilize the water temperature inside the sanitary water tank

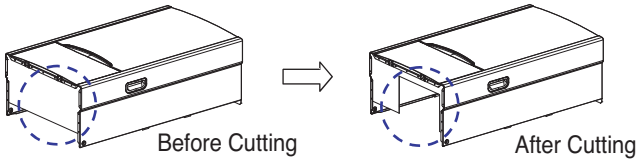
- The recirculation pump should be operated when sanitary water demand is not required. Therefore, external time scheduler to determine when the recirculation pump should turn on and turn off is required.
- The operating duration time of the recirculation pump is calculated as follow :
 Duration time [minute] = $k \times V \times R$
 k : 1.2 ~ 1.5 is recommended. (If distance between pump and tank is far, then choose high number)
 V : Volume of sanitary water tank [liter]
 R : Water flow rate of pump [liter per minute], which is determined by pump performance curve
- The pump operating start time should be prior to the sanitary water demand.



2Way(3way) Valve

2Way(3way) valve should be located between the indoor unit and the water tank.

- If enough space is not secured, the 2Way(3way) valve can be partially located inside the indoor unit by cutting out the bottom of the indoor unit.



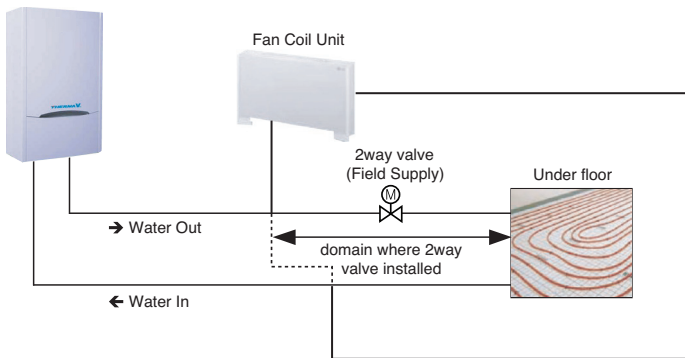
! WARNING

Mice can not be appeared to prevent entering the indoor unit or attacking wires.

! CAUTION

After cutting out the bottom of the indoor unit, remove all burrs completely. Burrs could cause personal injury.

2Way valve should be located between the indoor unit and the water entering point to the under floor. See below picture to identify clearly.



9. System Set-Up

As **THERMAV** is designed to satisfy various installation environment, it is important to set up system correctly. If not configured correctly, improper operation or degrade of performance can be expected.

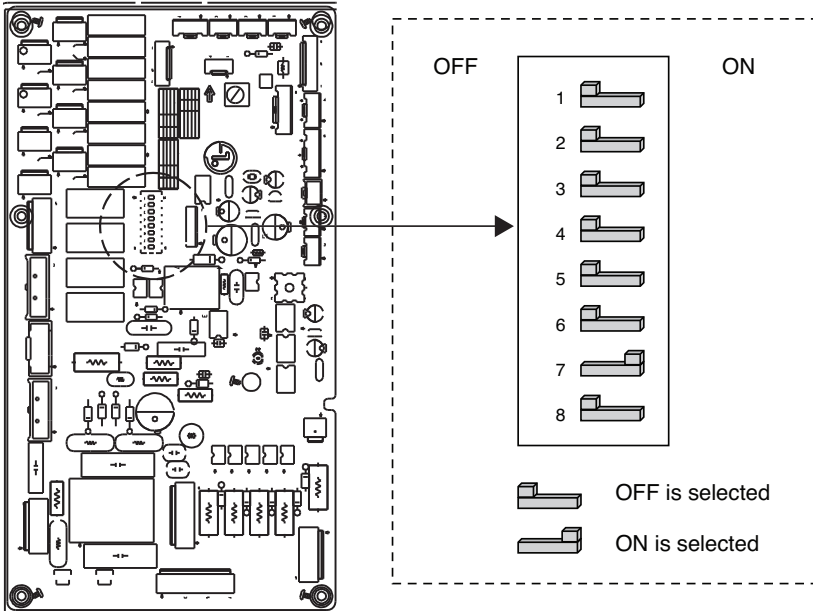
DIP Switch Setting

⚠ CAUTION





























Turn off electric power supply before setting DIP switch

- Whenever adjusting DIP switch, turn off electric power supply to avoid electric shock.

General Information



DIP Switch Information

| Description | Setting | Default |
|--|---|--|
| Role when central controller is equipped | 1  As Master 1  As Slave | 1  |
| Accessory installation information | 2  Indoor unit + Outdoor unit is installed 3  2  Indoor unit + Outdoor unit + Sanitary water tank is installed 3  2  Indoor unit + Outdoor unit + Solar thermal system is installed 3  | 2  3  |
| Emergency operation Level | 4  High temperature cycle 4  Low temperature cycle | 4  |
| External water pump installation information | 5  External water pump is NOT installed 5  External water pump is installed | 5  |
| Selecting electric heater capacity | 6  Step 2 capacity is used 7  6  Step 1 capacity is used 7  6  Electric heater is not used 7  | 6  7  |
| Thermostat installation information | 8  Thermostat is NOT installed 8  Thermostat is installed | 8  |

! NOTICE

Emergency Operation

• Definition of terms

- **Trouble** : a problem which can stop system operation, and can be resumed temporarily under limited operation without certificated professional's assist.
- **Error** : problem which can stop system operation, and can be resumed ONLY after certificated professional's check.
- **Emergency mode** : temporary heating operation while system met Trouble.

• Objective of introducing 'Trouble'

- Not like airconditioning product, Air-to-Water heat pump is generally operation in whole winter season without any system stopping.
- If system found some problem, which is not critical to system operating for yielding heating energy, the system can temporarily continue in emergency mode operation with end user's decision.

• Classified Trouble





- Trouble is classified two levels according to the seriousness of the problem : Slight Trouble and Heavy trouble
- **Slight Trouble** : a problem is found inside the indoor unit. In most case, this trouble is concerned with sensor problems. The outdoor unit is operating under emergency mode operation condition which is configured by DIP switch No. 4 of the indoor unit PCB.
- **Heavy trouble** : a problem is found inside the outdoor unit. As the outdoor unit has problem, the emergency mode operation is performed by electric heater located in the indoor unit.
- **Option Trouble** : a problem is found for option operation such as water tank heating. In this trouble, the troubled option is assumed as if it is not installed at the system.

• Emergency operation level

- When system met trouble, it stops operation and wait for user's decision : Calling service center or starting emergency operation.
- To start emergency operation, user simply push ON / OFF button once more.
- Two different levels are prepared for emergency operation : High temperature cycle and low temperature cycle.
- In emergency operation mode, user can not adjust target temperature.

| | DIP Switch | Target Leaving Water Temperature | Target Room Air Temperature | Target Sanitary Water Temperature |
|------------------------|------------|----------------------------------|-----------------------------|-----------------------------------|
| High temperature cycle | OFF | 50°C | 24°C | 70°C |
| Low temperature cycle | ON | 30°C | 19°C | 50°C |

• **Following features are permitted in emergency operation. :**




-  Operation On/Off
-  VIEW TEMP button*
-  Temperature adjust button*
-  Sanitary water heating Enable / Disable

* : Temperature measured by failed sensor is displayed as '- -'.

* : Adjusted temperature is only used to control electric heater on / off condition.

The product does not turn on / off according to the setting temperature at the control panel. It turns on / off according to the thermostat signal.

• **Following features are NOT permitted in emergency operation. :**

-  Operating mode (cooling/ heating/ weather-dependent) selection
-  Time scheduling
-  SET TEMP button

• **Duplicated trouble : Option trouble with slight or heavy trouble**

- If option trouble is occurred with slight (or heavy) trouble at the same time, the system puts higher priority to slight (or heavy) trouble and operates as if slight (or heavy) trouble is occurred.
- Therefore, sometimes sanitary water heating can be impossible in emergency operation mode. When sanitary water is not warming up while emergency operation, please check if sanitary water sensor and related wiring are all Ok.

• **Emergency operation is not automatically restarted after main electricity power is reset.**

- In normal condition, the product operating information is restored and automatically restarted after main electricity power is reset.
- But in emergency operation, automatic re-start is prohibited to protect the product.
- Therefore, user must restart the product after power reset when emergency operation has been running.

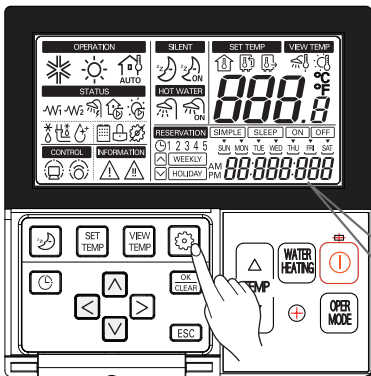
Installer Setting

How to enter installer setting mode

⚠ CAUTION

Installer setting mode is to set the detail function of the remote controller.

If the installer setting mode is not set correctly, it could cause problems to the unit, user injury or property damage. This must be set by a certificated installer, and any installation or change that is carried out by a non-certificated person should be responsible for the results. In this case, free service cannot be provided.



- 1 Press Function Setting button for 3 seconds to enter the installer setting mode.



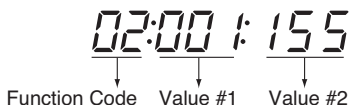
Function Code Value

(When you enter the installer setting mode initially, function code is displayed on the bottom of the LCD screen.)

Repeat pressing button, and the function code will be changed from 01 to 2B.
Please refer the code table on the next page.

Summary

Example of Fuction Code Display



| Code | Item | Detail | Remark | |
|-------|-------------|---|--------|--|
| 01 | Function | Additional refrigerant charging | | |
| | Description | Instant cooling operation for charging additional refrigerant | | |
| | Value #1 | Note | | - |
| | | Default | | 01 |
| | | Range | | - |
| | Value #2 | Note | | - |
| | | Default | | - |
| Range | | - | | |
| 02 | Function | Disable 3 minute delay | | |
| | Description | Factory use only | | |
| | Value #1 | Note | | - |
| | | Default | | 01 |
| | | Range | | - |
| | Value #2 | Note | | - |
| | | Default | | - |
| Range | | - | | |
| 03 | Function | Remote air sensor connection | | |
| | Description | Connection information about remote air sensor | | |
| | Value #1 | Note | | 01:Remote air sensor is not connected and not used. 02:Remote air sensor is connected and used. |
| | | Default | | 1 |
| | | Range | | 01 ~ 02 |
| | Value #2 | Note | | - |
| | | Default | | - |
| Range | | - | | |
| 04 | Function | Celsius / Fahrenheit switching | | |
| | Description | Display temperature in Celsius or Fahrenheit | | |
| | Value #1 | Note | | 01:Celsius 02:Fahrenheit |
| | | Default | | 1 |
| | | Range | | 01 ~ 02 |
| | Value #2 | Note | | - |
| | | Default | | - |
| Range | | - | | |

| Code | Item | Detail | Remark | |
|------|-------------|---|--|--|
| 05 | Function | Setting temperature selection | | |
| | Description | Selection for setting temperature as air temperature or leaving water temperature. | | |
| | Value #1 | Note | | 01:Air temperature 02:Leaving water temperature Air temperature as setting temperature is ONLY available when remote air sensor. Connection is enabled and Function code 03 is set as 02. |
| | | Default | | 2 |
| | | Range | | 01 ~ 02 |
| | Value #2 | Note | | - |
| | | Default | | - |
| | | Range | | - |
| 06 | Function | Auto dry contact | | |
| | Description | Setting dry contact auto start option. If thermostat is used, value should be changed from "2" to "1". | | |
| | Value #1 | Note | | 01: Auto start off 02: Auto start on |
| | | Default | | 2 |
| | | Range | | 01 ~ 02 |
| | Value #2 | Note | | - |
| | | Default | | - |
| | | Range | | - |
| 07 | Function | Address setting | | |
| | Description | Assigning address when central controller is installed If thermostat is used, value should be changed from "2" to "1". | | |
| | Value #1 | Note | | - |
| | | Default | | 00 |
| | | Range | | 00 ~ FF |
| | Value #2 | Note | | - |
| | | Default | | - |
| | | Range | | - |
| 11 | Function | Setting air temperature in cooling mode | 'Setting Air Temperature' is used when user wants to set target temperature by room air temperature. | |
| | Description | Adjusting range of 'Setting Air Temperature' in cooling mode | | |
| | Value #1 | Note | | Upper limit of setting range |
| | | Default | | 30 °C |
| | | Range | | 24 ~ 30 °C |
| | Value #2 | Note | | Lower limit of setting range |
| | | Default | | 18 °C |
| | | Range | | 18 ~ 22 °C |
| 12 | Function | Setting leaving water temperature in cooling mode | 'Setting Leaving Water Temperature' is used when user wants to set target temperature by leaving(from the unit) water temperature. | |
| | Description | Adjusting range of 'Setting Leaving Water Temperature' in cooling mode | | |
| | Value #1 | Note | | Upper limit of setting range |
| | | Default | | 24 °C |
| | | Range | | 20 ~ 25 °C |

| Code | Item | | Detail | Remark |
|-------|-------------|--------------------------|--|--|
| 12 | Value #2 | Note | Lower limit of setting range(FCU is not equipped) | |
| | | Default | 16 °C | |
| | | Range | 16 ~ 18 °C | |
| 13 | Function | | Setting air temperature in heating mode | 'Setting air temperature' is used when user wants to set target temperature by room air temperature. |
| | Description | | Adjusting range of 'Setting Air Temperature' in heating mode | |
| | Value #1 | Note | Upper Limit of setting range | |
| | | Default | 30 °C | |
| | | Range | 24 ~ 30 °C | |
| | Value #2 | Note | Lower Limit of setting range | |
| | | Default | 16 °C | |
| Range | | 16 ~ 22 °C | | |
| 14 | Function | | Setting Heating flow temperature in heating mode | 'Setting Heating flow temperature' is used when user wants to set target temperature by Heating flow (from the unit) temperature. * : Electric heater is not used |
| | Description | | Adjustin range of 'Setting Heating flow Temperature' in heating mode | |
| | Value #1 | Note | Upper Limit of setting range | |
| | | Default | 57 °C | |
| | | Range | 35 ~ 57 °C | |
| | Value #2 | Note | Lower Limit of setting range | |
| | | Default | 15 °C (*20 °C) | |
| Range | | 15 ~ 34 °C (*20 ~ 34 °C) | | |
| 15 | Function | | Setting DHW tank heating flow temperature for Sanitary water heating | 'Setting DHW tank heating flow Temperature' is used when user wants to set water temperature of Domestic hot water tank. |
| | Description | | Adjusting range of 'Setting DHW tank heating flow Temperature' in Domestic hot water tank heating mode | |
| | Value #1 | Note | Upper Limit of setting range | |
| | | Default | 50 °C | |
| | | Range | 50 ~ 80 °C | |
| | Value #2 | Note | Lower Limit of setting range | |
| | | Default | 40 °C | |
| Range | | 30 ~ 40 °C | | |
| 18 | Function | | Screed drying mode | |
| | Description | | After installing water pipes for under floor heating, user can select screed drying mode for curing the cement | |
| | Value #1 | Note | 00: Screed drying mode is not connected and not used. 01:Remote air sensor is connected and used. | |
| | | Default | 01 | |
| | | Range | 00 ~ 01 | |
| | Value #2 | Note | - | |
| | | Default | - | |
| Range | | - | | |

| Code | Item | | Detail | | Remark |
|-------------|--------------------|--|--|--|--|
| 21 | Function | | Setting electric heater on / off temperature | | DIP Switch setting is described in Chapter 6 of Installation Manual. |
| | DIP switch setting | | No.6 = Off No.7 = On | No.6 = Off No.7 = Off | |
| | Description | | Setting for using Step 1 capacity of electric heater | Setting for using Step 2 capacity of electric heater | |
| | Value #1 | Note | Outdoor air temperature where Step 1 capacity of electric heater starts operation. | Base outdoor air temperature | |
| | | Default | 0 °C | | |
| | | Range | -15 ~ 18 °C | | |
| | Value #2 | Note | Not used | Not used | |
| | | Default | - | - | |
| | | Range | - | - | |
| | 22 | Function | | Setting cut-off temperature in cooling mode (FCU setting included) | |
| Description | | Determine leaving water temperature when the unit is turned off. This function is used for preventing condensation on the floor in cooling mode. | | | |
| Value #1 | | Note | Cut-off temperature. Value #1 is valid when Value #2 is '01 (that means, FCU is not installed).' | | |
| | | Default | 16 °C | | |
| | | Range | 16 ~ 25 °C | | |
| Value #2 | | Note | Determines if FCU is installed or not. '01' means 'FCU is not installed', and '00' means 'FCU is installed.' | | |
| | | Default | 00 | | |
| | Range | 00(Equipped) ~ 01(not Equipped) | | | |
| 23 | Function | | Setting outdoor temperature range for weather-dependent operation | | |
| | Description | | Setting outdoor Max/Min temperature for weather-dependent operation | | |
| | Value #1 | Note | Upper Limit of setting range | | |
| | | Default | -10 °C | | |
| | | Range | -20 ~ 05 °C | | |
| | Value #2 | Note | Lower Limit of setting range | | |
| | | Default | 15 °C | | |
| Range | | 10 ~ 20 °C | | | |
| 24 | Function | | Setting indoor air temperature range for weather-dependent operation | | |
| | Description | | Setting indoor Max/Min temperature for weather-dependent operation | | |
| | Value #1 | Note | Upper limit of setting range | | |
| | | Default | 21 °C | | |
| | | Range | 20 ~ 30 °C | | |
| | Value #2 | Note | Lower limit of setting range | | |
| | | Default | 16 °C | | |
| Range | | 16 ~ 19 °C | | | |

| Code | Item | Detail | Remark | |
|---------|-------------|--|--|---|
| 25 | Function | Setting Heating flow temperature range for weather-dependent operation | * : Electric heater is not used. | |
| | Description | Setting Heating flow max / min temperature for weather-dependent operation | | |
| | Value #1 | Note | | Upper limit of setting range |
| | | Default | | 57 °C |
| | | Range | | 35 ~ 57 °C |
| | Value #2 | Note | | Lower limit of setting range |
| | | Default | | 15 °C (*20 °C) |
| Range | | 15 ~ 34 °C (*20 ~ 34 °C) | | |
| 26 | Function | Setting pasteurisation operation | Domestic hot water heating should be enable. • If Domestic hot water heating is disable, the disinfectionmode will not beoperated although Value #1 of Code26 is set as '01'. | |
| | Description | Setting start/maintain time for pasteurisation | | |
| | Value #1 | Note | | Enable / Disable of pasteurisation operation(00:Disable , 01:Enable) |
| | | Default | | 00 |
| | | Range | | 00 ~ 01 |
| | Value #1 | Note | | Starting date (Sunday:1,Monday:2, ...,Saturday:7) |
| | | Default | | 06 |
| | | Range | | 01 ~ 07 |
| | Value #2 | Note | | Starting time in 24 hours(00 ~ 23) |
| Default | | 23 | | |
| Range | | 00 ~ 23 | | |
| 27 | Function | Setting pasteurisation Operation | • To use disinfection mode, Domestic hot water heating should be enable. | |
| | Description | Setting pasteurisation temperature | | |
| | Value #1 | Note | | Maximum heating temperature |
| | | Default | | 70 °C |
| | | Range | | 40 ~ 80 °C |
| | Value #2 | Note | | Maximum heating duration in minute |
| | | Default | | 10 min |
| Range | | 05 ~ 60 min | | |
| 28 | Function | Setting control parameter for Domestic hot water heating operation | Only available when Domestic hot Water Tank is installed. | |
| | Description | See below notes for each values | | |
| | Value #1 | Note | | Temperature gap from Value #2 of Function Code 28 |
| | | Default | | 05 °C |
| | | Range | | 01 ~ 20 °C |
| | Value #2 | Note | | Maximum temperature generated by AWHP compressor cycle |
| | | Default | | 48 °C |
| Range | | 40 ~ 48 °C | | |
| 29 | Function | Setting control parameter for Domestic hot water heating operation | Only available when Domestic hot Water Tank is installed. | |
| | Description | See below notes for each values | | |
| | Value #1 | Note | | Temperature gap from target Domestic hotwater temperature (This value is required to frequent ON and OFF of water tank heater.) |
| | | Default | | 03 °C |
| | | Range | | 02 ~ 04 °C |
| | Value #2 | Note | | Determining heating demand priority between Domestic hot water tank heating and under floor heating |
| | | Default | | 00 : Sanitary water tank priority |
| Range | | 01 : under floor heating | | |

| Code | Item | Detail | Remark | |
|--|---|--|--|---|
| 2A | Function | Miscellaneous setting | | |
| | Description | Determine electric heater and water heater on and off | | |
| | Value #1 | Note | | 00: Operate both electric heater and Domestic hot water tank heater 01: Operate only Domestic hot water tank heater |
| | | Default | | 00 |
| | | Range | | 00 ~ 01 |
| | Value #2 | Note | | Not used |
| | | Default | | - |
| Range | | - | | |
| 2B | Function | Domestic hot water heating timers | | |
| | Description | Determine following time duration : operation time of Domestic hot water tank heating, stop time of Domestic hot water tank heating, and delay time of sanitary tank heater operating. | | |
| | Value #1 | Note | | This time duration defines how long time Domestic hot water tank heating can be continued. |
| | | Default | | 30 min |
| | | Range | | 5 ~ 95 min (step: 5 min) |
| | Value #2 | Note | | This time duration defines how long time Domestic hot water tank heating can be stopped. It is also regarded as time gap between Domestic hot water tank heating cycle. |
| | | Default | | 180 min |
| | | Range | | 0 ~ 600 min (step: 30 min) |
| | Value #3 | Note | | This time duration defines how long time Domestic hot water tank heater will not be turned on in Domestic hot water heating operation. |
| | | Default | | 20 min |
| | | Range | | 20 ~ 95 min (step: 5 min) |
| | 2E | Function | | Changing thermal on / off room air temp |
| Description | | Select Thermal on / off Temperature gap. | | |
| Value #1 | | Note | Thermal on Thermal off | |
| | | | 0 -0.5 °C 1.5 °C | |
| | | | 1 4 °C 6 °C | |
| | 2 2 °C 4 °C | | | |
| 3 -1 °C 1 °C | | | | |
| Default | | 0 | | |
| Range | | 0 ~ 3 | | |
| 2F | Function | Changing thermal on / off leaving water Ten | | |
| | Description | Select Thermal on / off Temperature gap. | | |
| | Value #1 | Note | | Thermal on Thermal off |
| | | | | 0 -2 °C 2 °C |
| | | | | 1 -6 °C 4 °C |
| 2 -2 °C 4 °C | | | | |
| 3 -1 °C 1 °C | | | | |
| Default | | 0 | | |
| Range | | 0 ~ 3 | | |

Note: Some contents may not be displayed depending on DIP switch setting in the main PCB assembly 1.

Common Setting

- **Function Code 01** : Test Run

Test run should be performed when additional refrigerant charging is required. To charge the refrigerant, the product must run in Cooling mode. Test run instantly makes the product working in Cooling mode for 18 minutes.

Note: • If you press any kind of button during this mode, Test Run mode will be finished.
• After running 18 minutes under test run mode, system will automatically turn OFF.

- **Function Code 02** : Disable 3 minute Delay

Factory use only.

- **Function Code 03** : Remote Air Sensor Connection

If user connects remote air sensor to control the product by room air temperature, the connection information should be notified to the product.

Note : If remote air sensor is connected but this function code is not set correctly, the product can not be controlled by room air temperature.

- **Function Code 04** : Celsius/Fahrenheit Switching

Temperature is displayed in Celsius or Fahrenheit.

- **Function Code 05** : Setting Temperature Selection

The product can be operated according to air temperature or leaving water temperature. The selection for setting temperature as air temperature or leaving water temperature is determined.

Note : Air temperature as setting temperature is ONLY available when Remote Air Sensor Connection is enabled and Function Code 03 is set as 02.

- **Function Code 06** : Auto Dry Contact

This function allows the Dry contact-indoor unit operate under Auto Run mode or Manual mode with remote control panel.

If thermostat is used, value should be changed from "2" to "1"

- **Function Code 07** : Address Setting

When Central Controller is installed, address assigning is set by this function.

Temperature range setting

- **Function Code 11** : Setting air temperature in cooling mode
Determine cooling setting temperature range when air temperature is selected as setting temperature.

! NOTICE

Only available when remote air temperature sensor is connected.

- Accessory PQRSTA0 should be installed.
- Also, Function Code 03 should be set properly.

- **Function Code 12** : Setting leaving water temperature in cooling mode
Determine cooling setting temperature range when leaving water temperature is selected as setting temperature.

! NOTICE

Water condensation on the floor

- While cooling operation, it is very important to keep leaving water temperature higher than 16 °C. Otherwise, dew condensation can be occurred on the floor.
- If floor is in humid environment, do not set leaving water temperature below 18 °C.

! NOTICE

Water condensation on the radiator

- While cooling operation, cold water may not flow to the radiator. If cold water enters to the radiator, dew generation on the surface of the radiator can be occurred.

- **Function Code 13** : Setting air temperature in heating mode
Determine heating setting temperature range when air temperature is selected as setting temperature.

! CAUTION

Only available when remote air temperature sensor is connected.

- Accessory PQRSTA0 should be installed.
- Also, Function Code 03 should be set properly.

- **Function Code 14** : Setting leaving water temperature in heating mode
Determine heating setting temperature range when leaving water temperature is selected as setting temperature.



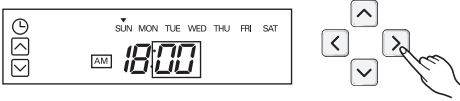



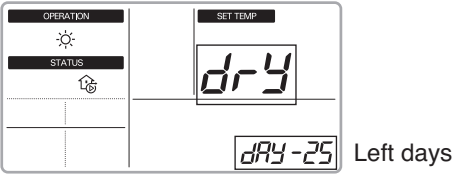
- **Function Code 15** : Setting sanitary tank leaving water temperature
Determine heating setting temperature range of water tank leaving water.

! NOTICE

Only available when sanitary water tank feature is installed.

- Sanitary water tank and sanitary water tank kit should be installed.
- DIP switch No. 2 and 3 should be set properly.

- **Function Code 18** : Screed drying mode.
After installing water pipes for under floor heating, user can select screed drying mode for curing the cement.

| | |
|---|---|
| <p>1 Keep pressing programming button for 3 seconds to enter setting screen drying mode.</p> |  |
| <p>2 Press programming button to select function code 18.</p> |  |
| <p>3 Press left, right button to move to screed drying setting part.</p> |  |
| <p>4 Press up, down button to adjust "01" or "00" (00: Not Used 01: Used)</p> |  |
| <p>5 If you finish the setting, press OK / CLEAR button.</p> |  |
| <p>6 Press exit button to exit or system will automatically release without any input 25 seconds.</p> |  |
| <p>7 During the screed drying mode, "dry" is displayed. Left days for completing the screed drying mode are displayed.</p> |  |

Temperature Control Parameter Setting

• **Function Code 21** : Setting Electric Heater On/Off temperature

Using Half capacity of electric heater : when DIP Switch No. 6 and 7 is set as 'OFF-ON' :

- Value #1 : outdoor air temperature where half capacity of electric heater starts operation.

- Value #2 : not used.

- Example : If Value #1 is set as '-1' and DIP Switch No 6. and 7 is set as 'OFF-ON', then half capacity of electric heater will start operation when outdoor air temperature is below -1°C and current leaving water temperature or room air temperature is much lower than target leaving water temperature or target room air temperature.

Using Full capacity of electric heater : when DIP Switch No. 6 and 7 is set as 'OFF-OFF' :

- Value #1 : base outdoor air temperature.

- Value #2 : temperature gap (it means 'how much colder than base outdoor air temperature?')

- Example : If Value #1 is set as '-1' and Value #2 is set as '3' and DIP Switch No 6. and 7 is set as 'OFF-OFF', then full capacity of electric heater will start operation when outdoor air temperature is below -4°C (-4 = Value #1 - Value #2) and current leaving water temperature or room air temperature is far much lower than target leaving water temperature or target room air temperature.

• **Function Code 22** : Setting Cut-off Temperature in Cooling Mode (FCU setting included)

Determine leaving water temperature when the product is turned off. This function is used for preventing condensation on the floor in cooling mode.

- Value #1 : cut-off temperature. Value #1 is valid when Value #2 is '01' (that means, FCU is installed)'

- Value #2 : determines if FCU is installed or not. '01' means 'FCU is NOT installed', and '00' means 'FCU is installed.'

- Example : If Value #1 is set as '10' and Value #2 is '01' and actually FCU is NOT installed in the water loop, the product stop operation in cooling mode when the leaving water temperature is below 10 °C.

- Example : If Value #1 is set as '10' and Value #2 is '00' and actually FCU is installed in the water loop, the Value #1 is not used and the product do NOT stop operation in cooling mode when the leaving water temperature is below 10 °C.

! NOTICE

FCU Installation

- If FCU is used, related 2way valve should be installed and connected to the indoor unit PCB.
- If Value #2 is set as '00' but FCU or 2way valve is NOT installed, the product can abnormal operation.

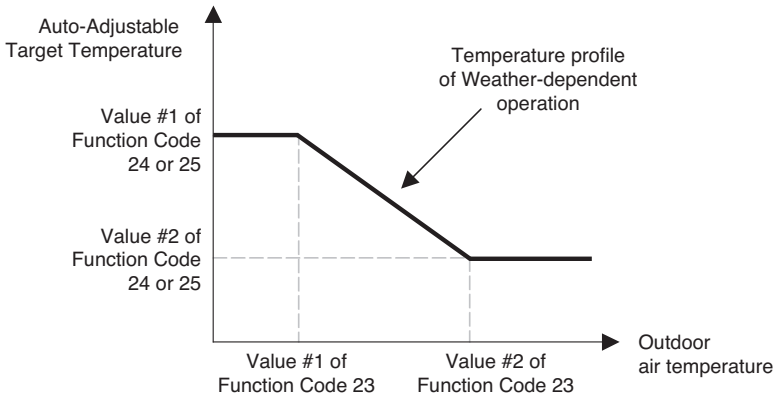
Function Code 23 and 24 : Setting Weather-dependent operation Mode

• **Function Code 23, 24, and 25** : Setting Weather-dependent operation

Weather-dependent operation is that the product automatically adjusts target temperature (leaving water or room air) according to the outdoor air temperature.

- Value #1 and Value #2 of Function Code 23 : range of outdoor air temperature
- Value #1 and Value #2 of Function Code 24 : range of auto-adjustable target room air temperature
- Value #1 and Value #2 of Function Code 25 : range of auto-adjustable target leaving water temperature

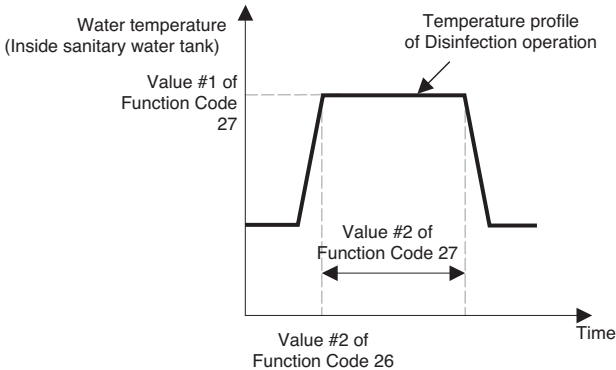
Note : Weather-dependent operation is applied for heating mode only.



• Function Code 26 and 27 : Setting Disinfection operation

Disinfection operation is special sanitary tank operation mode to kill and to prevent growth of viruses inside the tank.

- Value #1 of Function Code 26 : Selecting enable or disable of disinfection operation. '00' for disable, and '01' for enable.
- Value #2 of Function Code 26 : Determining the date when the disinfection mode is running. '01' for Sunday, '02' for Monday, ... , and '06' for Saturday.
- Value #3 of Function Code 26 : Determining the time when the disinfection mode is running. '00' for 0:00am, '01' for 01:00am, ... , '22' for 10:00pm, and '23' for 11:00pm.
- Sunday, '02' for Monday, ... , and '06' for Saturday.
- Value #1 of Function Code 27 : Target temperature of disinfection mode.
- Value #2 of Function Code 27 : Duration of disinfection mode.



! NOTICE

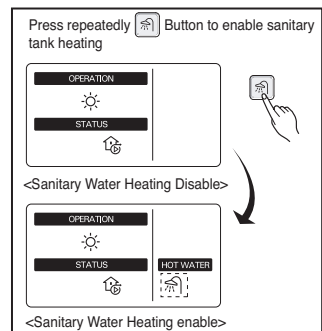
Vales of Function Code 26

- If Value #1 of Function Code 26 is set as '00', that is 'disable disinfection mode', Value #2 and Value #3 is not used.
- When Value #1 is set as '01', that is 'enable disinfection mode', Value #2 is displayed at the position of Value #1 and Value #3 is displayed at the position of Value #2. It is due to limited width of the control panel display.

! NOTICE

Sanitary water heating should be enable

- If sanitary water heating is disable, the disinfection mode will not be operated although Value #1 of Code 26 is set as '01'.
- To use disinfection mode, sanitary water heating should be enable.(by button input or scheduler programming)

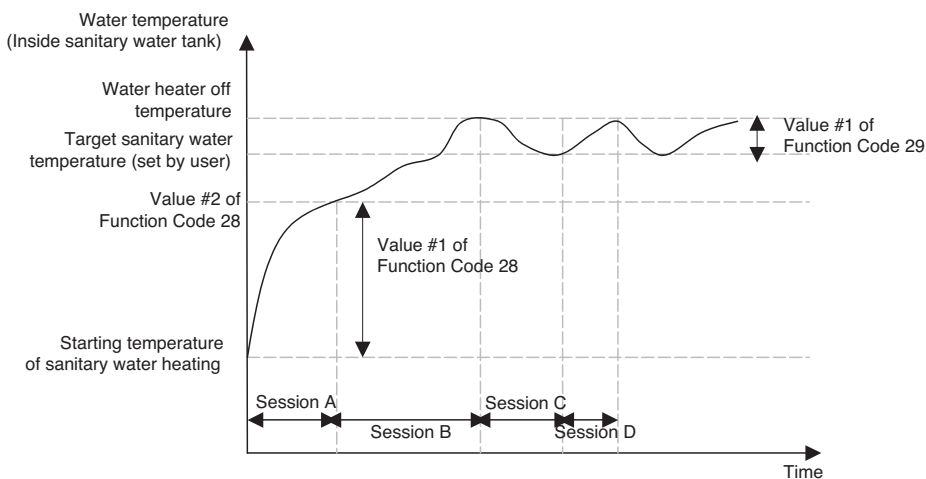


• **Function Code 28 and 29** : Setting control parameter for Sanitary water heating operation

Descriptions for each parameters are as following.

- Value #1 of Function Code 28 : temperature gap from Value #2 of Function Code 28.
- Value #2 of Function Code 28 : maximum temperature generated by AWHP compressor cycle.
- Example : If Value #1 is set as '5' and Value #2 is set as '48', then Session A (see the graph) will be started when the water tank temperature is below 45°C. If temperature is above 48 °C, then Session B will be started.

- Value #1 of Function Code 29 : temperature gap from target sanitary water temperature. This value is required to frequent On and Off of water tank heater.
- Value #2 of Function Code 29 : Determining heating demand priority between sanitary water tank heating and under floor heating.
- Example : If user's target temperature is set as '70' and Value #1 is set as '3', then the water tank heater will be turned off when the water temperature is above 73 °C. The water tank heater will be turned on when the water temperature is below 70 °C.
- Example : If Value #2 is set as '0', that means heating priority is on sanitary water heating, sanitary water is heated by AWHP compressor cycle and water heater. In this case the under floor can not be heated while sanitary water heating. On the other hand, if the Value #2 is set as '1', that means heating priority is on under floor heating, sanitary tank is ONLY heated by water heater. In this case the under floor heating is not stopped while sanitary water is heated.




Session A : Heating by AWHP compressor cycle and water heater
 Session B : Heating by water heater
 Session C : No heating (Water heater is Off)
 Session D : Heating by water heater

! NOTICE

Sanitary water heating does not operate when it is disabled.

Enabling / Disabling of sanitary water heating is determined by pushing  button.

When  icon is displayed on the control panel, sanitary water heating is enabled. (by button input or scheduler programming)

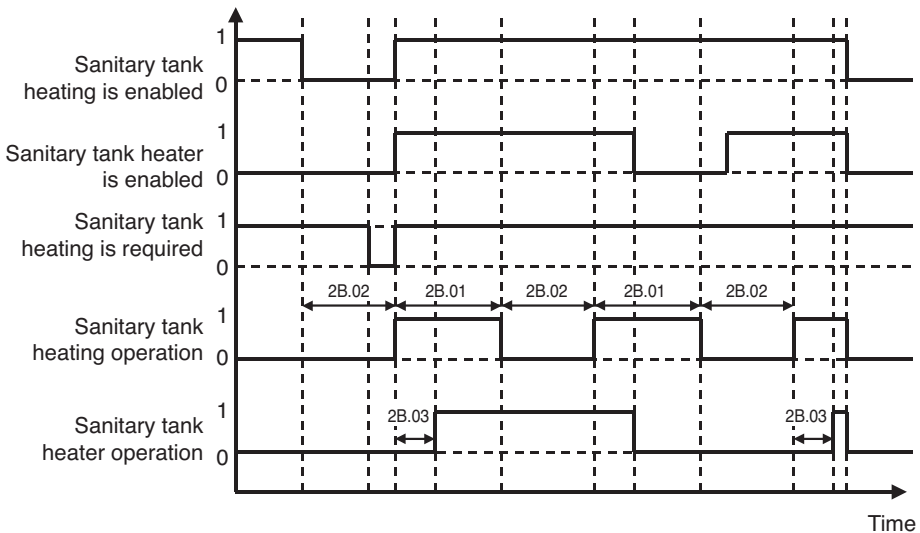
• **Function Code 2A** : Miscellaneous setting

- Value #1 of Function Code 2A : determine electric heater and sanitary tank heater on and off.
- Value #2 of Function Code 2A : not used.
- Example : If Value #1 is set as '0', then electric heater and sanitary tank heater are on and off according to control logic. If Value #1 is set as '1', then electric heater is never turned on and only water heater is on and off according to control logic.

• **Function Code 2B** : Sanitary water heating timers

Determine following time duration : operation time of sanitary tank heating, stop time of sanitary tank heating, and delay time of sanitary tank heater operating.

- Value #1 of Function Code 2B : This time duration defines how long time sanitary tank heating can be continued.
- Value #2 of Function Code 2B : This time duration defines how long time sanitary tank heating can be stopped. It is also regarded as time gap between sanitary tank heating cycle.
- Value #3 of Function Code 2B : This time duration defines how long time sanitary tank heater will not be turned on in sanitary water heating operation.
- Example of timing chart :



* 1=active / 0=not active

10. Check Points, Maintenance and Troubleshooting

If everything is going well until now, it is time to start the operation and to take advantages of **THERMAV**. Before starting operation, pre-check points are described in this chapter. Some comments about maintenance and how to do troubleshooting are presented.

Check List before Starting Operation

! CAUTION

Turn off the power before changing wiring or handling product

| No | Category | Item | Check Point |
|----|----------------------|------------------------|---|
| 1 | Electricity | Field wiring | <ul style="list-style-type: none"> All switches having contacts for different poles should be wired tightly according to regional or national legislation. Only qualified person can proceed wiring. Wiring and local-supplied electric parts should be complied with European and regional regulations. Wiring should be following the wiring diagram supplied with the product. |
| 2 | | Protective devices | <ul style="list-style-type: none"> Install ELB (earth leakage breaker) with 30mA. ELB inside the control box of the indoor unit should be turned on before starting operation. |
| 3 | | Earth wiring | <ul style="list-style-type: none"> Earth should be connected. Do not earth to gas or city water pipe, metallic section of a building, surge absorber, etc. |
| 4 | | Power supply | <ul style="list-style-type: none"> Use dedicated power line. |
| 5 | | Terminal block wiring | <ul style="list-style-type: none"> Connections on the terminal block (inside the control box of the indoor unit) should be tightened. |
| 6 | Water | Charged water pressure | <ul style="list-style-type: none"> After water charging, the pressure gage (in front of the indoor unit) should indicate 2.0~2.5 bar. Do not exceed 3.0 bar. |
| 7 | | Air purge | <ul style="list-style-type: none"> During water charging, air should be taken out through the hole of the air purge. If water does not splash out when the tip (at the top of the hole) is pressed, then air purging is not completed yet. If well purged, the water will splash out like fountain. Be careful when testing air purge. Splashed water may make your dress wet. |
| 8 | | Shut-off valve | <ul style="list-style-type: none"> Two shut-off valves (located at the end of water inlet pipe and water outlet pipe of the indoor unit) should be open. |
| 9 | | By-pass valve | <ul style="list-style-type: none"> By-pass valve should be installed and adjusted to secure enough water flow rate. If water flow rate is low, flow switch error (CH14) can be occurred. |
| 10 | Product Installation | Hang to the wall | <ul style="list-style-type: none"> As the indoor unit is hung on the wall, vibration or noise can be heard if the indoor unit is not fixed tightly. If the indoor unit is not fixed tightly, it can fall down during operation. |
| 11 | | Parts inspection | <ul style="list-style-type: none"> There should be no apparently damaged parts inside the indoor unit. |
| 12 | | Refrigerant leakage | <ul style="list-style-type: none"> Refrigerant leakage degrades the performance. If leakage found, contact qualified LG air conditioning installation person. |
| 13 | | Drainage treatment | <ul style="list-style-type: none"> While cooling operation, condensed dew can drop down to the bottom of the indoor unit. In this case, prepare drainage treatment (for example, vessel to contain condensed dew) to avoid water drop. |

Maintenance

To assure best performance of **THERMAV**, it is required to perform periodical check and maintenance. It is recommended to proceed following check list for once a year.

⚠ CAUTION

Turn off the power before proceeding maintenance

| No | Category | Item | Check Point |
|----|-------------|------------------------|---|
| 1 | Water | Water pressure | <ul style="list-style-type: none"> • In normal state, the pressure gage (in front of the indoor unit) should indicate 2.0~2.5 bar. • If the pressure is less than 0.3 bar, please recharge the water. |
| 2 | | Strainer(Water filter) | <ul style="list-style-type: none"> • Close the shut-off valves and disassemble strainer. Then wash the strainer to make it clean. • While disassembling the strainer, be careful for water flood out. |
| 3 | | Safety valve | <ul style="list-style-type: none"> • Open the switch of the safety valve and check if water is flood out through the drain hose. • After checking, close the safety valve. |
| 4 | Electricity | Terminal block wiring | <ul style="list-style-type: none"> • Look and inspect if there is loosen or defected connection on the terminal block. |

Test Run

Check before Test run

| | |
|---|---|
| 1 | Check to see whether there is any refrigerant leakage, and check whether the power or transmission cable is connected properly. |
| 2 | <p>Confirm that 500 V megger shows 2.0 MΩ or more between power supply terminal block and ground. Do not operate in the case of 2.0 MΩ or less.</p> <p>NOTE: Never carry out mega ohm check over terminal control board. Otherwise the control board may break.</p> <p>Immediately after mounting the unit or after leaving it turned off for an extended length of time, the resistance of the insulation between the power supply terminal board and the ground may decrease to approx. 2.0 MΩ as a result of refrigerant accumulation in the internal compressor.</p> <p>If the insulation resistance is less than 2.0 MΩ, turn on the main power supply.</p> |



Troubleshooting

If **THERMAV** operates not properly or it does not start operation, please check following list.

CAUTION

Turn off the power before proceeding troubleshooting

Troubleshooting for Problem while Operation

| No | Problem | Reason | Solution |
|----|---|---|---|
| 1 | Heating or cooling is not satisfactory. | <ul style="list-style-type: none"> Setting target temperature is not proper. | <ul style="list-style-type: none"> Set target temperature correctly. Check if temperature is water-based or air-based. See Function code 03 and 05 in Chapter 6. |
| | | <ul style="list-style-type: none"> Charged water is not enough. Water flow rate is low. | <ul style="list-style-type: none"> Check pressure gage and charge more water until pressure gage is indicating 200~250 kPa. Check if strainer gathers too much particles. If so, strainer should be cleaned. Check if internal water pump speed is NOT set as 'High'. It should be set as 'High.' Check if pressure gage indicates above 30 kPa. Check if water pipe is getting closed due to stacked particles or lime. |
| 2 | Although electric power supply is OK (remote controller displays information), the unit does not start working. | <ul style="list-style-type: none"> Water inlet temperature is too high. | <ul style="list-style-type: none"> If water inlet temperature is above 55 °C, the unit does not operated for the sake of system protection. |
| | | <ul style="list-style-type: none"> Water inlet temperature is too low. | <ul style="list-style-type: none"> If water inlet temperature is below 5 °C, the unit does not operated for the sake of system protection. Wait while unit warms up the water inlet temperature. |
| 3 | Water pump noise. | <ul style="list-style-type: none"> Air purging is not completely finished. | <ul style="list-style-type: none"> Open the cap of air purge and charge more water until pressure gage is indicating 200~250 kPa. If water does not splash out when the tip (at the top of the hole) is pressed, then air purging is not completed yet. If well purged, the water will splash out like fountain. |
| | | <ul style="list-style-type: none"> Water pressure is low. | <ul style="list-style-type: none"> Check if pressure gage indicates above 30 kPa. Check if the expansion tank and pressure gage operates well. |
| 4 | Water is flood out through drain hose. | <ul style="list-style-type: none"> Too much water is charged. | <ul style="list-style-type: none"> Flood out the water by opening the switch of the safety valve until pressure gage is indicating 200~250 kPa. |
| | | <ul style="list-style-type: none"> Expansion tank is damaged. | <ul style="list-style-type: none"> Replace the expansion tank. |
| 5 | Sanitary water is not hot. | <ul style="list-style-type: none"> Thermal protector of water tank heater is activated. | <ul style="list-style-type: none"> Open the side panel of the sanitary water tank and push the reset button of the thermal protector. (for more detail information, please refer to installation manual of sanitary water tank.) |
| | | <ul style="list-style-type: none"> Sanitary water heating is disabled. | <ul style="list-style-type: none"> Push  button and identify if  icon is displayed on the remote controller. |

Troubleshooting for Error Code

| Code No. | Description | Cause | Normal Condition |
|----------|--|---|--|
| 1 | Problem in remote room air sensor | <ul style="list-style-type: none"> • Incorrect connection between sensor and PCB(Heater). • PCB(Heater) fault • Sensor fault | <ul style="list-style-type: none"> • Resistance: 10 kΩ at 25 centigrade (unplugged) → for Remote room air sensor • Resistance: 5 kΩ at 25 centigrade (unplugged) → for all sensors EXCEPT remote room air sensor • Voltage: 2.5 V DC at 25 centigrade (plugged) (for all sensors) • Refer resistance-temperature table to check in different temperature |
| 2 | Problem in refrigerant (inlet side) sensor | | |
| 6 | Problem in refrigerant (outlet side) sensor | | |
| 8 | Problem in water tank sensor | | |
| 16 | Problems in sensors | | |
| 17 | Problem in water-inlet sensor | | |
| 18 | Problem in water-outlet sensor | | |
| 19 | Problem in water-interim sensor | | |
| 3 | Bad communication between remote controller and unit. | <ul style="list-style-type: none"> • Incorrect connection between sensor and PCB(Heater) • PCB(Heater) fault • Sensor fault | <ul style="list-style-type: none"> • Wire connection between remote controller and Main PCB assembly(Heater) should be tight • Output voltage of PCB should be 12 V DC |
| 5 | Bad communication between Main PCB assembly(Heater) and Main PCB assembly(Inverter) of the unit. | <ul style="list-style-type: none"> • The connector for transmission is disconnected • The connecting wires are misconnected • The communication line is broken • Main PCB assembly(Inverter) is abnormal • Main PCB assembly(Heater) is abnormal | <ul style="list-style-type: none"> • Wire connection between remote control panel and Main PCB assembly(Heater) should be tight. |
| 53 | | | |
| 9 | PCB program (EEPROM) fault | <ul style="list-style-type: none"> • Electrical or mechanical damage a the EEPROM | <ul style="list-style-type: none"> • This error can not be permitted |
| 14 | Problem in flow switch | <ul style="list-style-type: none"> • Flow switch is open while internal water pump is working • Flow switch is closed while internal water pump is not working • Flow switch is open while DIP switch No. 5 of Main PCB assembly(Heater) is set as on | <ul style="list-style-type: none"> • Flow switch should be closed while internal water pump is working or DIP switch No. 5 of Main PCB assembly(Heater) is set as on • Flow switch should be open while internal water pump is not working |
| 15 | Water pipe overheated | <ul style="list-style-type: none"> • Abnormal operation of electric heater • Leaving water temperature is above 57 °C | <ul style="list-style-type: none"> • If there is no problem in electric heater control, possible maximum leaving water temperature is 57 °C |
| 20 | Thermal fuse is damaged | <ul style="list-style-type: none"> • Thermal fuse is cut off by abnormal overheating of internal electric heater • Mechanical fault at thermal fuse • Wire is damaged | <ul style="list-style-type: none"> • This error will not be happened if temperature of electric heater tank is below 80 °C |

Airborne Noise Emission

The A-weighted sound pressure emitted by this product is below 70 dB.

** The noise level can vary depending on the site.

The figures quoted are emission level and are not necessarily safe working levels. Whilst there is a correlation between the emission and exposure levels, this cannot be used reliably to determine whether or not further precautions are required. Factors that influence the actual level of exposure of the workforce include the characteristics of the work room and the other sources of noise, i.e. the number of equipment and other adjacent processes and the length of time for which an operator is exposed to the noise. Also, the permissible exposure level can vary from country to country. This information, however, will enable the user of the equipment to make a better evaluation of the hazard and risk.

Limiting concentration

Limiting concentration is the limit of Freon gas concentration where immediate measures can be taken without hurting the human body when refrigerant leaks in the air. The limiting concentration shall be described in the unit of kg/m³ (Freon gas weight per unit air volume) for facilitating calculation

| |
|--|
| Limiting concentration: 0.44kg/m³(R410A) |
|--|

■ Calculate refrigerant concentration

$$\text{Refrigerant concentration} = \frac{\text{Total amount of replenished refrigerant in refrigerant facility (kg)}}{\text{Capacity of smallest room where indoor unit is installed (m}^3\text{)}}$$

