



AHU Valve Box



KIT AHU 7KW
KIT AHU 14KW
KIT AHU 28KW
KIT AHU 56 KW
KIT AHU 73KW

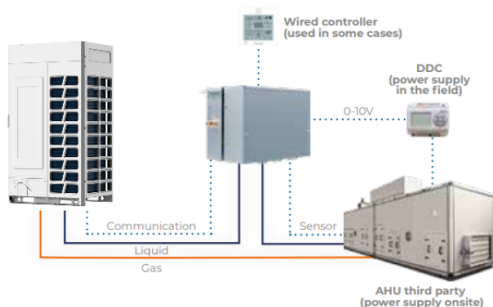
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1. General information

1.1 Function:

Thought AHU valve box, can realize the Airwell outdoor unit connect with third party air handling units. As the following figure



1.2 Feature:

(1) EXV part and control part integration, easy for translation and installation. Gas pipe is cancelled compared to the previous generation.

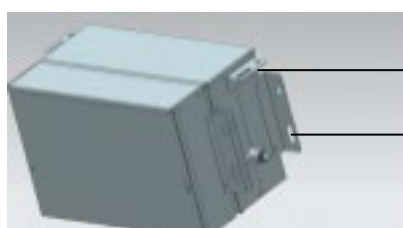


Original AHU Kit V1.0



New AHU Kit V2.0

(2) Optional insttion location: can choose filting or nailed to the wall



(3) Control box location changeable :

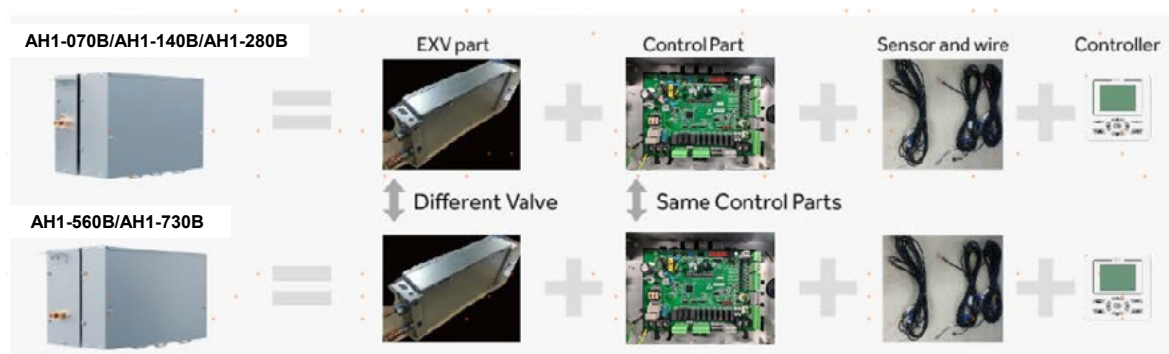
Control box can be separately with EXV box.(5 meter) Control box can be front or back of EXV box, easy installation

1.3 System lineup

Airwell AHU kit provides a wide range solution for Airwell outdoor unit connecting with the 3rd party AHU

Compatibility							
Outdoor	8-26	4	5	6	8	10	12
HP							
Power Supply	3Ph/380-415V/50/60Hz	1Ph/220-230Ph/50/60Hz 3Ph/380-400V/50/60Hz			3Ph/380-400V/50/60Hz		

1.4 Configuration



1.5 Nomenclature

Code position	1, 2		3		4	5	6	7	8	
Code meaning	Valve box series		Valve box type		Space mark	Indoor capacity which Valve box can be connected			Series number	
Code and contents	VP	3-pipe valve box	1	1 to 1	-	Cooling capacity	Cooling capacity < 99KW	Three digits*** (unit: 100W)	A	First generation
	MS	FL + SUPER MATCH valve box	2	1 to 2		Cooling capacity	Cooling capacity > 99KW	Three digits 000 (unit: HP)	B	Second generation
	AH	FL + AHU valve box	3	1 to 3		Cooling capacity	Cooling capacity is not defined	Three digits 000	C	Third generation
			4	1 to 4				
		

2. Specification

Model	KIT AHU 7KW/140KW	KIT AHU 28KW	KIT AHU 56 KW/730B
Connected AHU capacity	3 < x ≤ 7KW(070B) 7 x ≤ 14KW(140B)	14 < x ≤ 28KW(5-10HP)	8 < x ≤ 56KW(560B) 56 < x ≤ 73KW(730B)
Power supply	220-240V/50/60Hz	220-240V/50/60Hz	220-240V/50/60Hz
Dimension(W/D/H)	420/260/165	420/260/165	420/260/165
Shipping dimensions	520*340*225	520*340*225	520*340*225
Material	Galvanized steel	Galvanized steel	Galvanized steel
Color	Grey	Grey	Grey
Weight/kg	5.5	5.5	6.5
Shipping Weight/kg	8.5	8.5	10
Liquid pipe (mm)	9.52(Main) /6.35	9.52(Main) /6.35	12.7 (Main) /15.88
Pipe connection method	Flare connection and welding	Flare connection and welding	Flare connection and welding
Branch box-Indoor Max Single pipe length/m	5	5	5
Branch box- indoor max drop/m	5	5	5

3. Combination method

Capacity	Combination model
$3 \leq x \leq 7\text{KW}$	KIT AHU 7KW
$7 < x \leq 14\text{KW}$	KIT AHU 14KW
$14 < x \leq 28\text{KW}$	KIT AHU 28KW
$28 < x \leq 56\text{KW}$	KIT AHU 56 KW
$56 < x \leq 73\text{KW}$	KIT AHU 730KW
$73 < x \leq 112\text{KW}$	KIT AHU 56 KW+KIT AHU 56 KW
$112 < x \leq 146\text{KW}$	KIT AHU 730KW+KIT AHU 730KW
$146 < x \leq 168\text{KW}$	KIT AHU 56 KW+KIT AHU 56 KW+KIT AHU 56 KW
$168 < x \leq 219\text{KW}$	KIT AHU 730KW+KIT AHU 730KW+KIT AHU 730KW
$219 < x \leq 224\text{KW}$	KIT AHU 56 KW+KIT AHU 56 KW+KIT AHU 56 KW+KIT AHU 56 KW
$224 < x \leq 292\text{KW}$	KIT AHU 730KW+KIT AHU 730KW+KIT AHU 730KW+KIT AHU 730KW

Note:
The above is the combination method for single heat exchanger, when multiple heat exchangers need to be matched according to the capacity of each heat exchanger

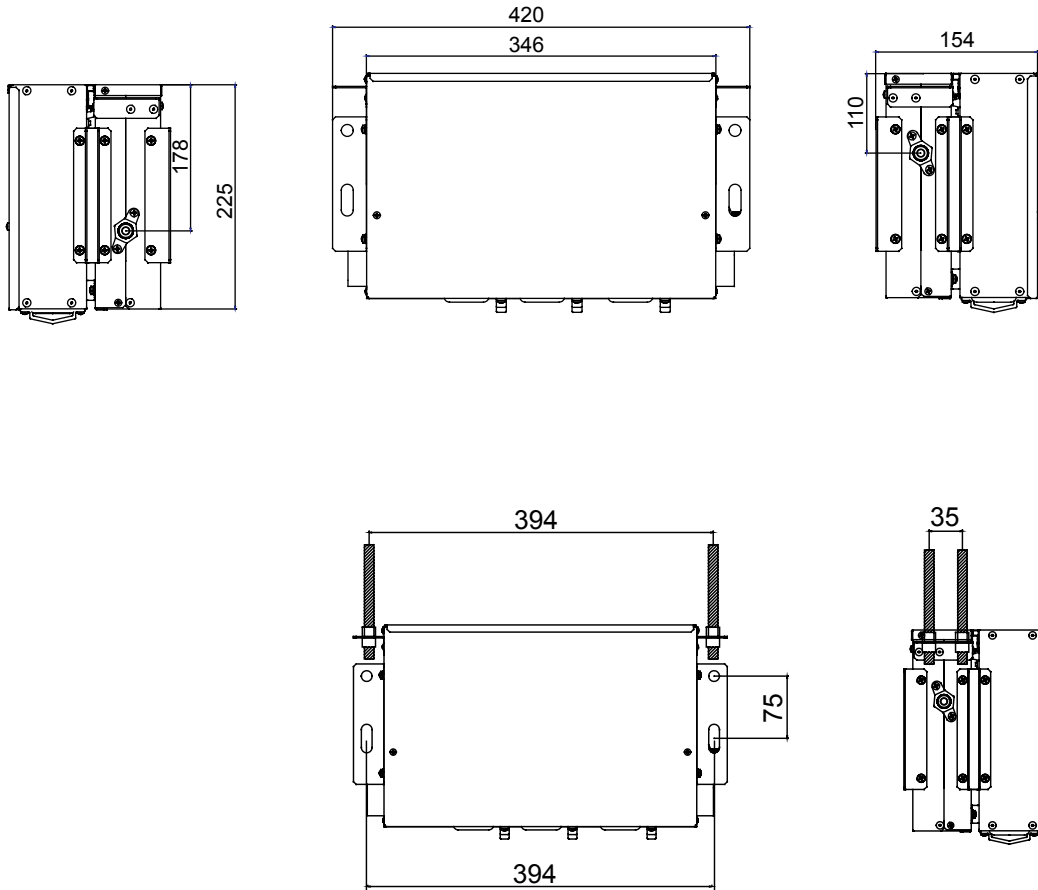
	Length
Pipe length between outdoot unit& AHU VALVE	Min5m, max.50m
Pipe length between AHU valve & AHU	Max.5m
Drop between outdoor unit & AHU valve	±30m
Drop between AHU & AHU valve	±5m

Note:
• Non-mixing connection: AHU connection rate 90 ~ 110%
• When mixing:
The total indoor unit connection rate is 50 ~ 110%, of which the air conditioner internal unit is not less than 50%

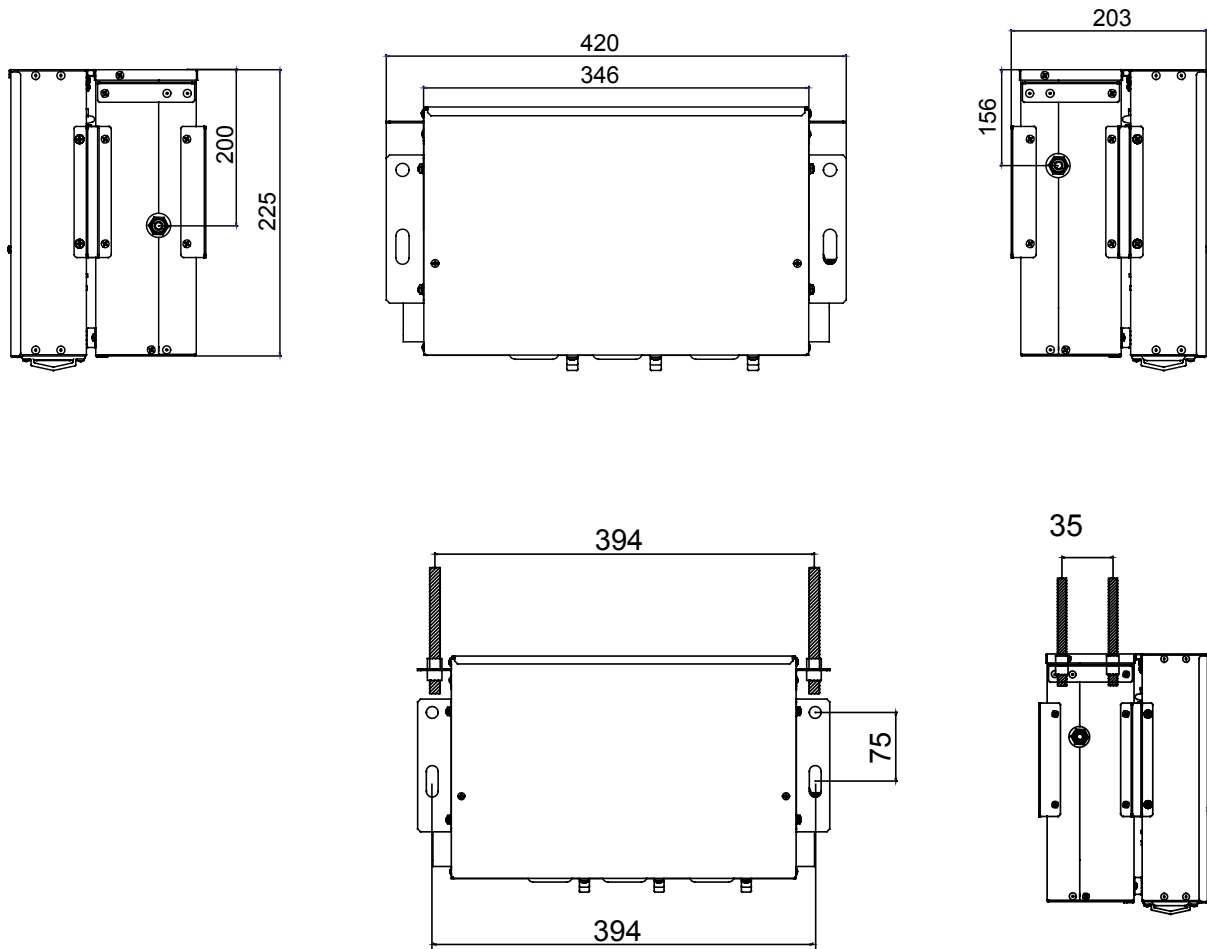
	KIT AHU 7KW	KIT AHU 14KW	KIT AHU 28KW	KIT AHU 56 KW	KIT AHU 730KW
Capacity	3.6-7.1	7.1-14	14-28	28-56	56-73.5
fan Air volumem3/h	540/1420/1775	1065/2800/3500	2100/5600/7000	4200/11200/14000	8400/14700/18375
Coil qty.	2-4	3-8	4-14	6-26	12-32
Coil volume L	0.54-1.28-1.42	1.07-2.52-2.8	2.1-5.04-5.6	4.2-10.08-11.2	8.4-13.23-14.7

4. Dimension

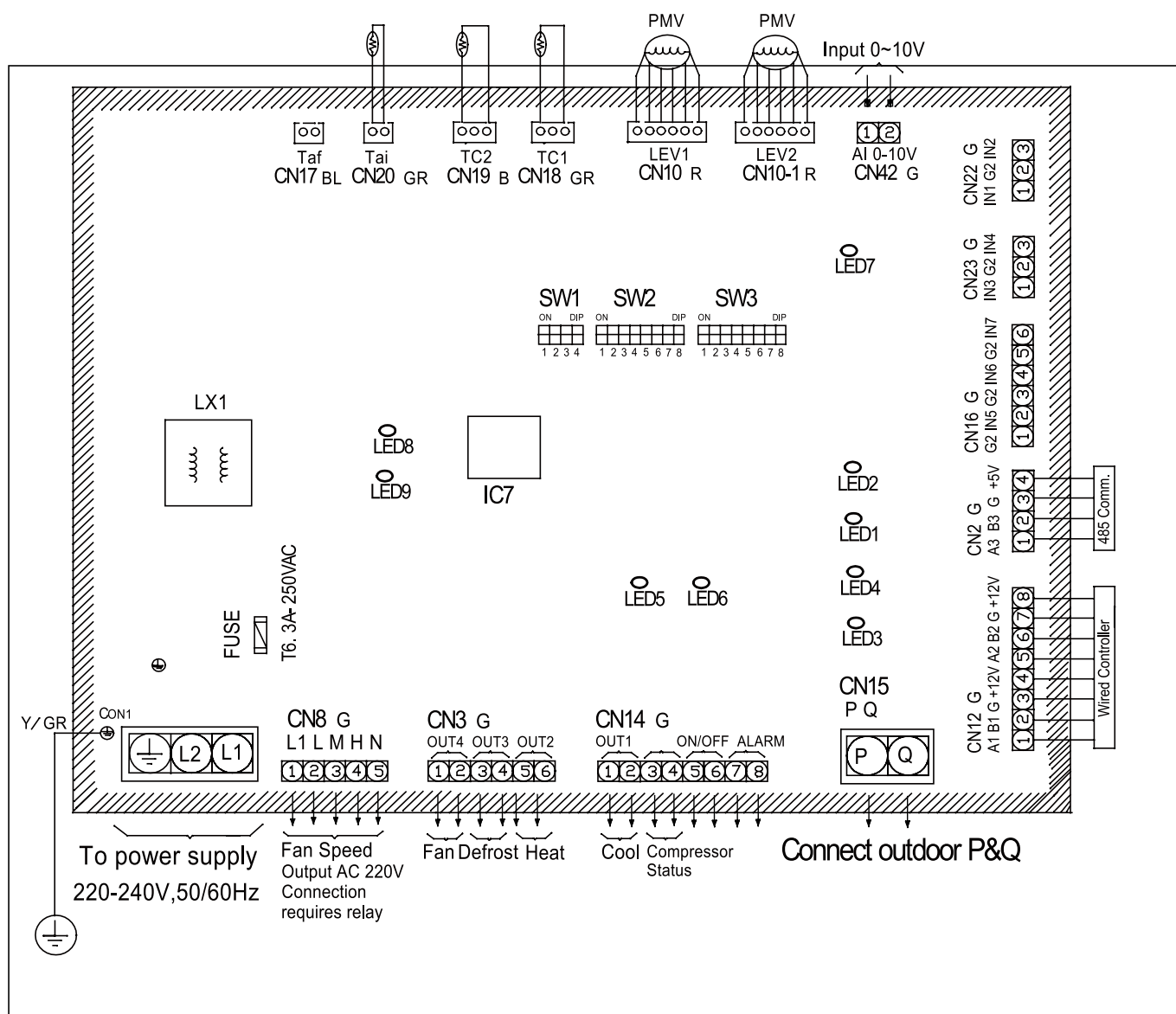
KIT AHU 7KW, KIT AHU 14KW, KIT AHU 28KW



KIT AHU 56 KW, KIT AHU 730KW



5. Wiring diagram



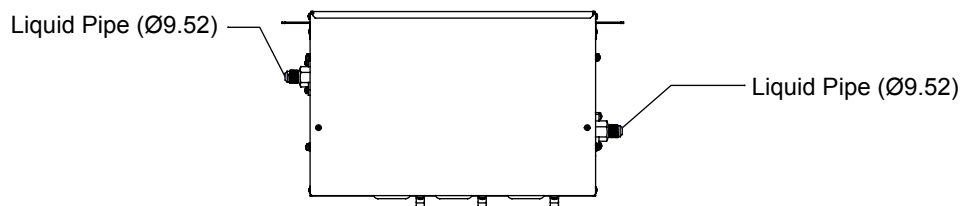
6.Installation

6.1 Parts and function

KIT AHU 7KW
KIT AHU 14KW
KIT AHU 28KW

Outdoor unit side

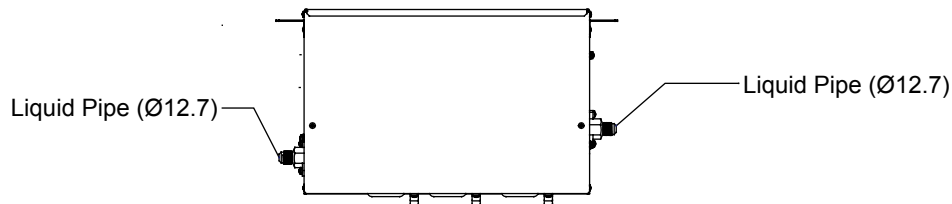
Indoor unit side



KIT AHU 56 KW
KIT AHU 730KW

Indoor unit side

Outdoor unit side



6.2 Safety

- If the connection kit is transferred to a new user, this manual shall be transferred to the user, together with the conditioner.
- Before installation, be sure to read Safety Considerations in this manual for proper installation.
- The safety considerations stated below is divided into “⚠ Warning” and “⚠ Attention”. The matters on severe accidents caused from wrong installation, which is likely to lead to death or serious injury, are listed in “⚠ Warning”. However, the matters listed in “⚠ Attention” are also likely causing the severe accidents. In general, both of them are the important items related to the security, which should be strictly abided by.
- After the installation, perform test run to make sure everything is in normal conditions, and then operate and maintain the connection kit in accordance with the user manual. The user manual should be delivered to the user for proper keeping.

⚠Warning

- Please ask the special maintenance station for installation and repair. Water leakage, electric shocks or fire accidents might be caused from improper installation if you conduct the installation by your own.
- The installation should be conducted properly according to this manual. Water leakage, electric shocks or fire accidents might be caused from improper installation.
- Please make sure to install the connection kit on the place where can bear the weight of the connection kit. The connection kit can't be installed on the grids such as the non-special metal burglar-proof net. The place with insufficient support strength might cause the dropdown of the machine, which may lead to personal injuries.
- The installation should be ensured against typhoons and earthquakes, etc. The installation unconformable to the requirements will lead to accidents due to the turnover of the machine.
- Specific cables should be used for reliable connections of the wirings. Please fix the terminal connections reliably to avoid the outside force applied on the cables from being impressed on the cables. Improper connections and fixings might lead to such accidents as heating or fire accidents.
- Correct shapes of wirings should be kept while the embossed shape is not allowed. The wirings should be reliably connected to avoid the cover and the plate of the electrical cabinet clipping the wiring. Improper installation might cause such accidents as heating or fire accidents.
- While placing or reinstalling the connection kit, except the specific refrigerant (R410A), don't let the air go into the refrigeration cycle system. The air in the refrigeration cycle system might lead to the cracking or personal injuries due to abnormal high pressure of the refrigeration cycle system.
- During installation, please use the accompanied spare parts or specific parts. If not, water leakage, electric shocks, fire accidents or refrigerant leakage might be caused.
- During installation, if refrigerant leakage occurs, ventilation measures should be taken, for the refrigerant gas might generate harmful gases upon contacting the flame.
- After installation, check if any refrigerant leakage exists. If the refrigerant gas leaks in the room, such things as air blowing heaters and stoves, etc. may generate harmful gases.
- Don't install the connection kit at the places where the flammable gases may leak. In case the gas leakage occurs around the machine, such accidents as fire disasters may be caused.
- The refrigerant gas pipe, HP gas pipe and liquid pipe should be heat insulated to preserve heat. For inappropriate heat insulation, the water caused from the condensation will drop to get the article at home wet.
- The electrical construction shall be implemented by the correspondingly qualified personnel in accordance with electrical construction standards, local electrical laws as well as specifications. Moreover, dedicated circuit must be used, rather than the wire pin. Insufficient capacity of the wire circuit and unprepared construction (if any) may cause electric shock, fires, etc.
- During the process of grounding, the ground wire cannot be connected to the gas pipe, water pipe, lightning rod and ground wire of the telephone. Incomplete grounding may cause electric shock, fires, etc.
- Install residual-current circuit breaker, or electric shock, fires, etc. will occur.
- When contacting electrical components, ensure they are powered off. Contacting the live part may result in the danger of electric shock.
- If there is leakage of the refrigerant gas flow during operation, refrigerant gas is required. If the refrigerant gas contacts any fire, poisonous gases will be produced.
- 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.

- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- The appliances are not intended to be operated by means of an external timer or separate remote-control system.
- Keep the appliance and its cord out of reach of children less than 8 years.

Attention

- The connection kit should be effectively grounded. Electric shocks may occur if the connection kit is ungrounded or inappropriately grounded. The wire for earthing shouldn't be connected to the connections on the gas pipe, water pipe, lightning rod or telephone.
- The breaker for electricity leakage should be mounted. If not, accidents such as electric shocks may happen.
- The installed connection kit should be checked for electricity leakage by being powered.
- After installation, all cassette concealed connection kits should be trial-tested. After the proper operation of the machine, other fitments can be made.
- When installing the connection kit, please fix the box and connecting pipes in an efficient way to avoid shaking when changing connection kit.
- If the ambient humidity bigger than 80%, when the water discharge hole be blocked or the filter becomes dirty, or airflow speed change, there may be leads to condensing water drop down, and at the same time there maybe some drops of water spit out.
- Keep the connection kit, power supply wiring, conductor, etc. at least 1 m away from the TV and radio to avoid image interference and noise. However, sometimes there is still noise when the distance is over 1 m due to the different states of radio waves.
- Try to install connection kit where the fluorescent lamp is far away.
- When wireless devices are being installed, the distance that the signal from the controller will reach may be shortened in a room with a fluorescent lamp that is turned on in an electric way (frequency conversion or rapid start).

Prohibitions

- Do not use components other than the fuse of proper capacity, such as metal wire and copper wire, which will cause fires and other faults if used instead of the fuse.
- When doing the cleaning and maintenance, make sure that the operation has been stopped and the manual power switch is in the off position.
- Do not use appliances such as water heater near the connection kit. Using appliances producing steam near the connection kit may lead to accidents such as water leakage, electric leakage and short circuit when the cooling system is in operation.

6.3 Installation instruction

Do not install at such places

1. A place that is filled with mineral oil, a kitchen which has oil and steam everywhere, etc., which may cause degradation, falling off and water leakage of the resinous components.
2. A place with corrosive gases such as sulphurous acid gas, which will lead to the corrosion of the copper tube, welding joint, etc., causing refrigerant leakage.
3. A place where machines give out electromagnetic waves, which will lead to abnormality and improper function of the control system.
4. A place with possible leakage of combustible gases, floating of carbon fiber and combustible dust and use of volatile combustible substances such as diluents, the accumulation of which around the machine set will lead to fires.
5. A place where small animals inhabit, whose contacting the inner electrical components may cause faults, smoking, outbreak of a fire, etc.
6. A coastal place with high salinity and a place with great variation in voltage such as a factory, which may cause faults to vehicles and ships.
7. A place where water will go into the valve box.

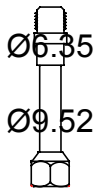
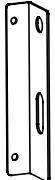
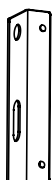




Attention item

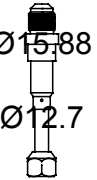
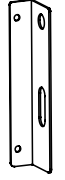
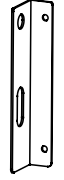




Install after making sure that the type of the refrigerant used is R410A. If any other type of refrigerant is used, the machine cannot run.

- Before and after the unpacking, if connection kit is to be moved, the hoisting handles (totally 4) shall be held firmly. Do not apply force to other parts, especially a refrigerant tube and an electrical cabinet.
- Concerning the installation of the outdoor and indoor units, refer to the installation specification of each unit.

Accessories

Confirm that the accessories below are packed together.

KIT AHU 7KW, KIT AHU 14KW, KIT AHU 28KW								
	Variable diameter	suspending		clip	screw	Thermal insulation pipe	Nut	Specification
Quantity	2	2	2	8	10	2	2	1
Shape								

KIT AHU 56 KW, KIT AHU 730KW								
	Variable diameter	suspending		clip	screw	Thermal insulation pipe	Nut	Specification
Quantity	2	2	2	8	10	2	2	1
Shape								

<Entrustment>

Before the installation is completed, do not abandon the accessories needed in installation.

Combinations

- The connection kit is special used for third party air handling units.
- The connection kit can match with FL V, FL S" system.
- 50% total outdoor capacity ≤ total indoor capacity ≤ 100% total outdoor capacity.
- Please according to the following table to select the connection kit model.

Table1: Total capacity of indoor unit:

Connection kit	The capacity of the air handling unit (kW)	The quantity of the air handling unit
KIT AHU 7KW	3≤x≤7KW (1-3HP)	1
KIT AHU 14KW	7<x≤14KW (3-5HP)	1
KIT AHU 28KW	14<x≤28KW (5-10HP)	1
KIT AHU 56 KW	28<x≤56KW (10-20HP)	1
KIT AHU 730KW	56<x≤73KW (20-26HP)	1

Inspection item

Pay much attention to the following during installation. Check them again after completion.

(1) Inspection items after installation

Inspection item	Defect	Inspection column
If the installation of connection kit is secure ?	Falling off, vibration and noise	
If gas leakage inspection is completed ?	No heating/cooling	
If complete insulation is achieved (refrigerant piping and tubing connections) ?	Water leakage	
If the voltage of the power supply is consistent with that on the nameplate ?	Out of service, burnt	
If there is improper wiring or piping ?	Out of service, burnt	
If there is construction without grounding ?	Danger in electric leakage	
If the thickness of the wire is as specified ?	Out of service, burnt	

(2) Inspection upon delivery

Inspection item	Inspection column
If the electric box cover is installed	
If the installation specification is transferred to the customer	

6.4 Installation procedure

6.4.1. Pre-installation

The installation location selected shall meet the following conditions and be approved by users.

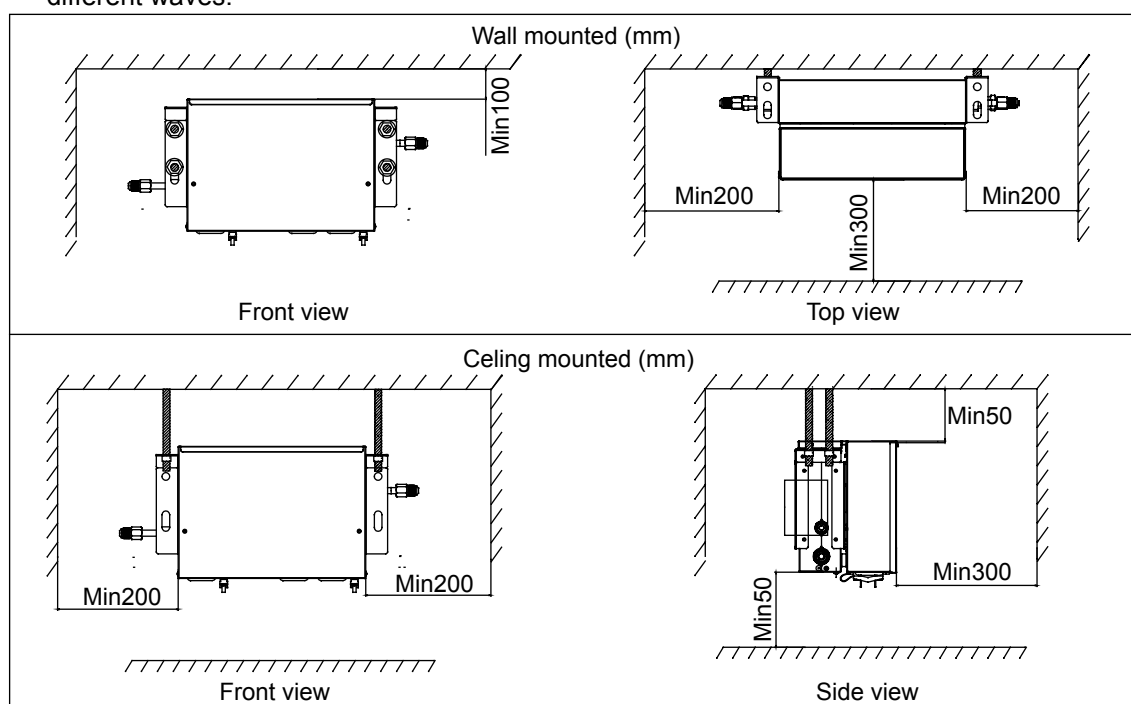
- The strength shall be sufficient to withstand the weight of the connection kit
- There is no significant tilt on the plane.
- Ensure that there is enough space for installation and maintenance.
- There is space for inspection on the side and top of the electric box
- The length of piping between the indoor and outdoor units shall be within the permissible range (referring to the specification attached to the outdoor unit).
- Please install the connection kit in places where noise will not influence the customers too much (such as washroom, passageway, warehouse, equipment room, etc.). Places with high requirement for quiet are not suggested for installation, such as bedroom, drawing room, meeting room, office, etc.

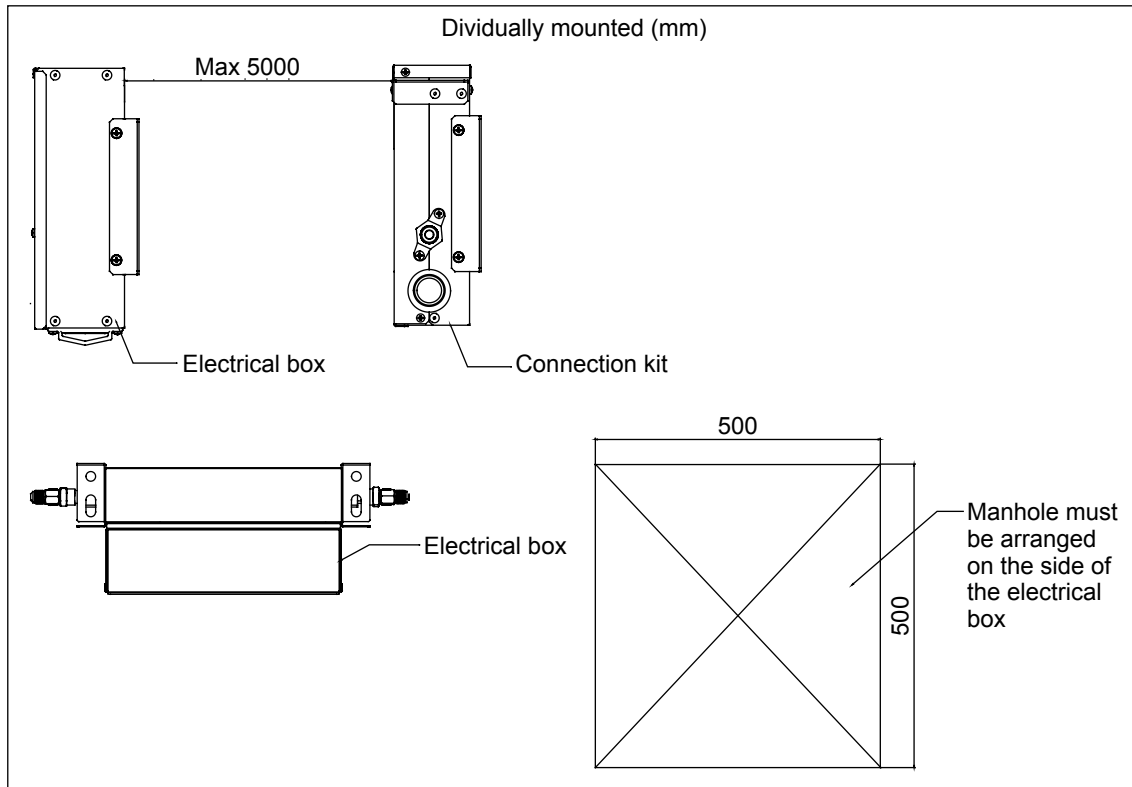
Note:

- the electrical box can be changed as show in 3 connection kit installation.
- When starting up, stop, defrosting, and oil-returning in heating mode , the 4-way valve will veer and create noise. This kind of noise is normal for the running of connection kit.
- A noise may be emitted by the connection kit as a result of control during operation or stopping of an indoor unit. If it is installed in the ceiling where it is exposed, take adequate precautions with the installation location.

<Notice item>

- Inspect whether the installation location can sufficiently withstand the weight of connection kit and set the hoisting bolts by reinforcing the beam if necessary. Use hoisting bolts in installation (referring to 2 for the preparation before installation).
- Install the power wiring and power line of the connection kit at more than 1 m away from TV and radio to prevent the image clutter and noise. But, there may be noise even if it is more than 1 m according to the different waves.

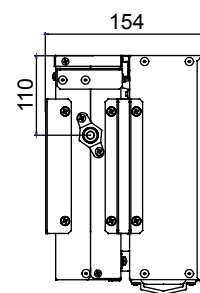
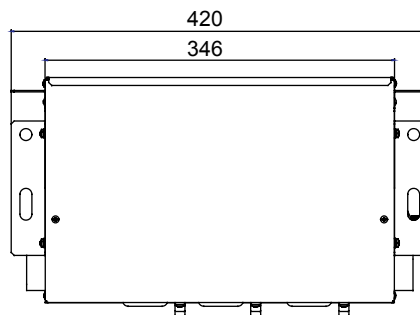
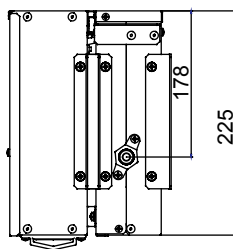


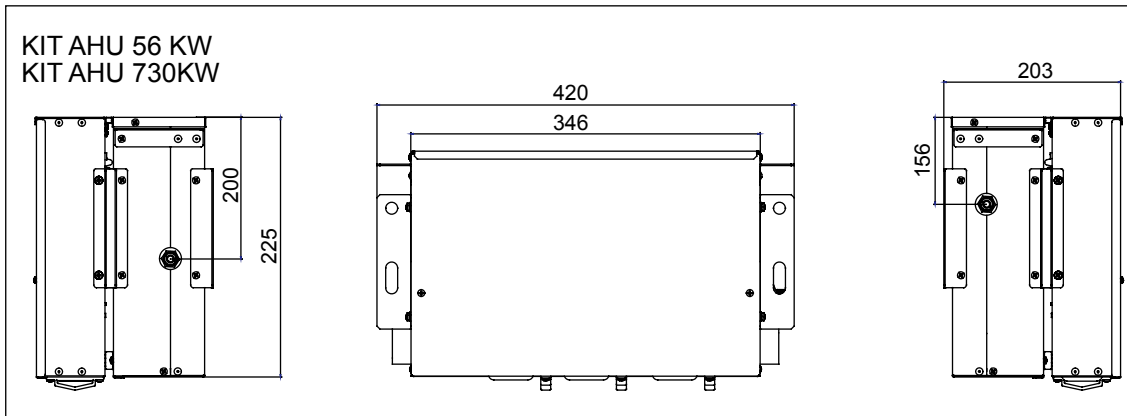


6.4.2. Preparation before installation

(1) Connection kit dimension (mm)

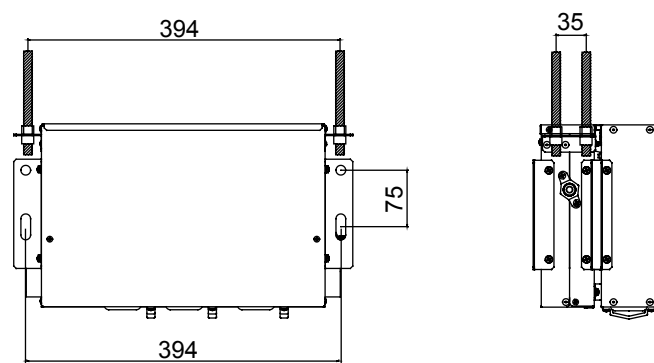
KIT AHU 7KW
KIT AHU 14KW
KIT AHU 28KW





(2) Lifting dimension of connection kit (mm)

KIT AHU 7KW
KIT AHU 14KW
KIT AHU 28KW



KIT AHU 56 KW
KIT AHU 730KW

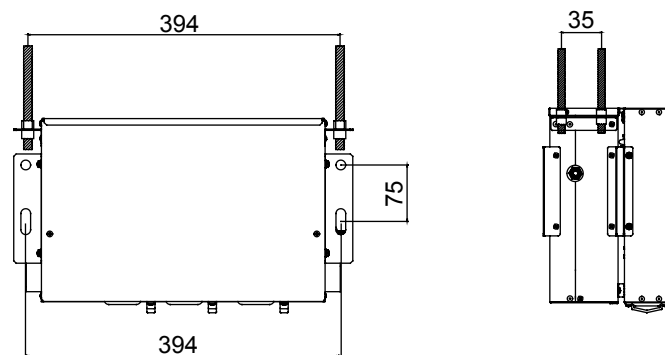


Fig.1

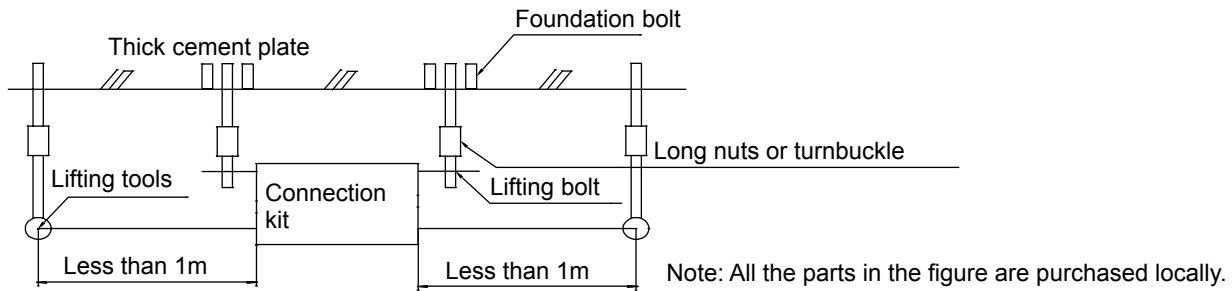


Fig.2

See the Fig.1 & Fig.2 to install the lifting bolts and hoisting tools.

- Use the lifting bolts with the size of M8~M10
- Press insert for new settings. Press hole in anchor if set. Ensure that it can sufficiently withstand the weight of the connection kit before installation.

6.5 Installation of connection kit

Use parts and components specified for installing the installation components.

(1) Change the installation direction of electric box according to requirements following the steps below; (see Fig.1)

- ① Remove the cover of the electrical appliance box; (2 screws)
- ② Remove the electrical appliance box; (2 screws)
- ③ Remove the top plate; (4 screws)
- ④ Change the outgoing direction of wiring (electric valve coil) between the equipment and the electrical appliance box;
- ⑤ Rotate 180° to install the top plate;
- ⑥ Install the electrical appliance box;
- ⑦ Install the cover of the electrical appliance box.

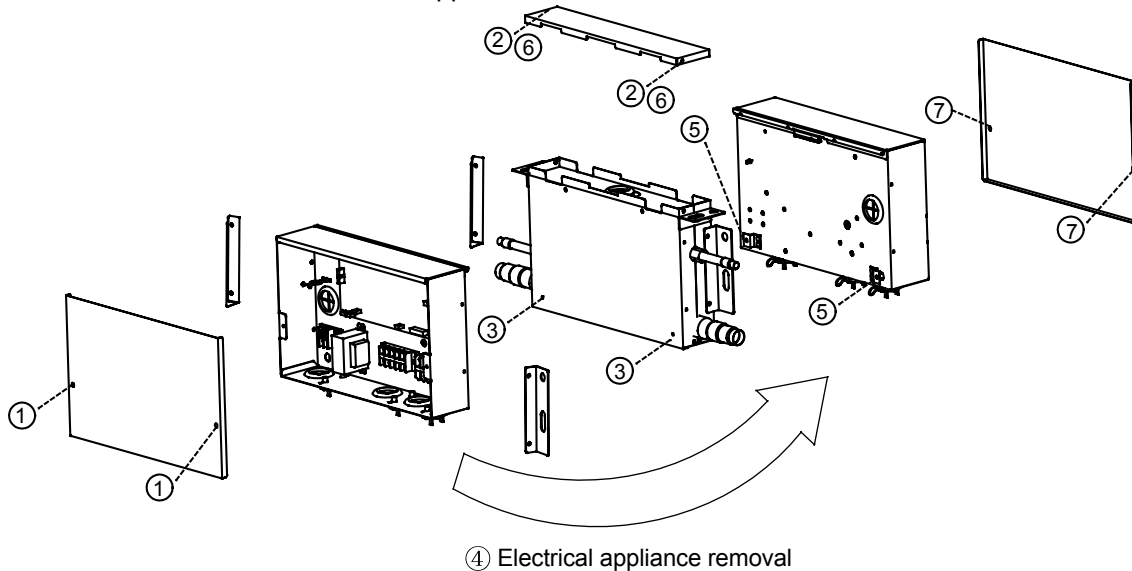


Fig.1

Install the lifting tools on the lifting bolts according to the instruction of the Fig.2

Be sure to follow the stipulations on products locally purchased to use nuts (M8 or M10 of 3 pieces for 4 positions) and gaskets (M8 with the outer diameter of 24~28 mm and M10 with that of 30~34 mm of 2 pieces for 4 positions) on the upper and lower sides of the lifting tools.

<Note>

Be sure that the product must be installed with the top surface (the oblique surface in the Fig.2) upward, or it will not work well and increase the working noise.

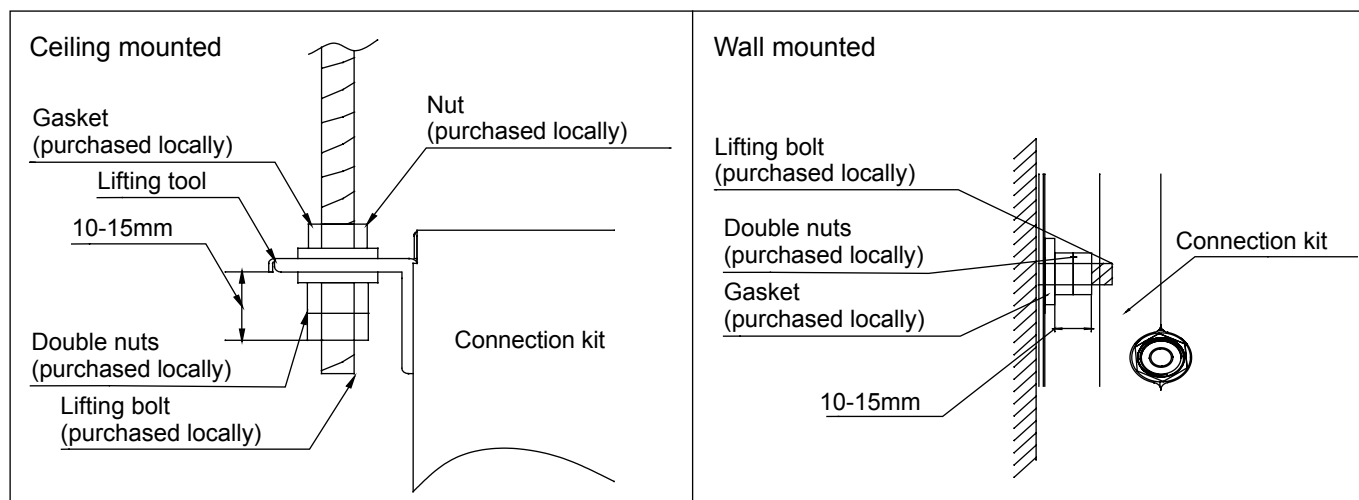


Fig.2

6.5.1. Refrigerant pipe Installation

- Pipes between the outdoor unit and connection kit, selection of refrigerant branching suite, and the Pipe between refrigerant branching suites and the indoor units, please refer to the installation instructions or equipment design data attached to the outdoor unit.
- Before Installation, make sure the type of the refrigerant to be used is R410A. (If a refrigerant other than this type is used, It cannot run properly)
- Please provide thermal insulation at the high-pressure gas pipe, suction gas pipe, liquid pipe and oil equalizing pipe (pipes for outdoor units in case of multi-split system) and the connections between these pipes. In the absence of thermal insulation, liquid leakage and scalding may happen. Particularly when the high-pressure gas pipe delivers indrawn air under full-refrigeration condition, it needs the same thermal insulation as does the suction gas pipe. Besides, high-pressure gas pipe and suction gas pipe are to deliver high-pressure gas, thus please provide thermal insulation material that can sustain temperature over 120 °C.
- Enhance the thermal insulation material based on the installation environment. The indicators are shown below.
For RH75%~80% at 30°C: over 15 mm thick.
For over 80% at 30°C: over 20 mm thick.
If not reinforced, the thermal insulation material surface is prone to condensation. Please refer to the equipment design data for further details.

The high-pressure gas pipe, suction gas pipe, liquid pipe must be provided with reliable thermal insulation. In the absence of thermal insulation, liquid leakage may happen.

The outdoor unit is already filled with refrigerant.

To connect the pipes to connection kit or remove them from connection kit, do use both spanner and torque wrench, as shown in the Fig.1.

Apply refrigerant oil to inside and outside of the flare. Screw it for 3 to 4 rounds with hands and then tighten it.

Determine the tightening torque. (Excessive tightening may damage the nuts and hence cause leakage)

Check the connecting pipes for gas leakage and then fix the thermal insulation, as shown in the in the Fig.2

Only use sealing gasket to wrap the part jointing between the gas pipe and thermal insulation.

For pipe cutter and flare tool, please use R410A special tools.

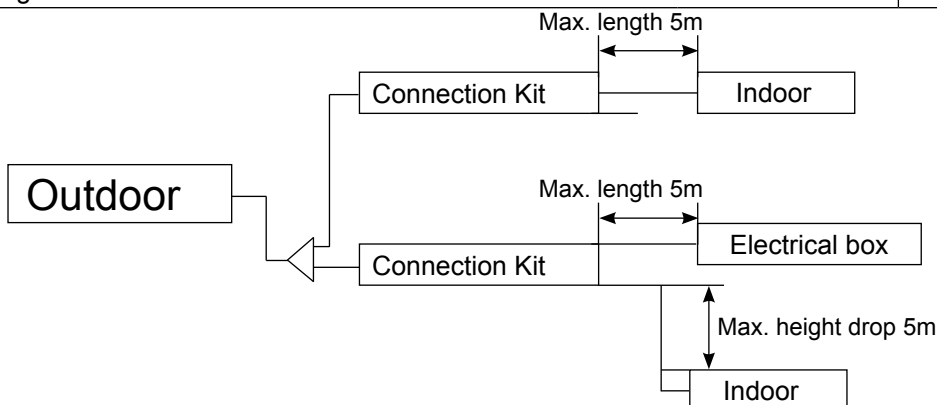
<Notes>

- Please do not let any type of gas other than the specified refrigerant go into the refrigeration system;
- In case of refrigerant leakage during operation, please replace the gas. (Fill the refrigerant at the outdoor unit)

Select piping material

- Make sure both the internal surface and external surface of the pipes are intact and are free from harmful contaminants such as sulphur, oxide, foreign matter, cutting powder, grease and water.
- Please use the following materials for refrigerant pipe.

connection kit		All Units	
Connection kit-indoor max. single pipe length /m		5	5
Connection kit- electrical box max. distance /m		5	5
Single way total pipe length		refer to outdoor	
Single way pipe length		refer to outdoor	
Main pipe between outdoor to 1st branch		refer to outdoor	
Pipe length between outdoors		refer to outdoor	
Height difference between indoor and outdoor	Outdoor is upper	refer to outdoor	
	Outdoor is lower	refer to outdoor	
Height difference between outdoors (in the same system)		refer to outdoor	
Height difference between indoors		refer to outdoor	



- The branching pipe for the pipe must have refrigerant branching suite. For selection of refrigerant branching suite and max. height drop between indoor units, please refer to the installation instructions or technical data attached to the outdoor unit.

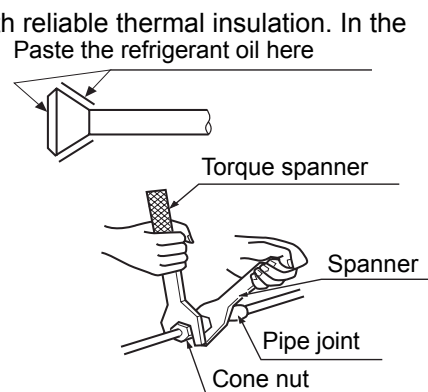


Fig.1

Piping maintenance

During installation, provide maintenance as specified in the table in order to prevent water, foreign matter and dust from entering the pipes.

Location	Work period	Maintenance method
Outdoors	More than 1 month	Screw
	Less than 1 month	Screw or strap
Indoors	—	

Note

Particularly when a pipe is to penetrate through a wall or extend to outdoors, make sure foreign matter and dust etc cannot enter the pipe.

Attention item for piping connection

- To connect a pipe to or remove it from the connection kit, do use pliers for screws and torque spanner;
- When installing the connection kit, please fix the box and connecting pipes in an efficient way to avoid shaking when changing connection kit.
- For the sizes of the flares, please refer to <Table-1>.

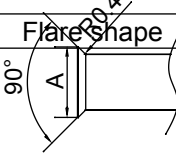
<Note>

- For connection at a flare, apply ester or ether oil to the flare (both inner surface and outer surface). Apply such oil for 3 to 4 times and insert the screw in the first use
- The tightening torque for the flare is given in <Table-1>.

If no torque wrench is available, act as the follows.

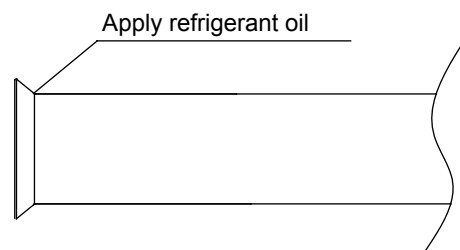
- ① Use a spanner to tighten the nut of the flare to a position where the tightening torque sharply increases.
- ② The tightening angle for the position where the tightening torque sharply increases <Table -2>.
- ③ After the work, make sure there is no air leakage.

<Table-1>

Tube size	Tightening torque (N.m)	Machined flare size A (mm)	Flare shape
Ø6.35	14.2~17.2	8.7~9.1	
Ø9.52	32.7~39.9	12.8~13.2	
Ø12.7	49.5~60.3	16.2~16.6	
Ø15.88	61.8~75.4	19.3~19.7	
Ø19.05	97.2~118.8	23.7—23.9	

<Table-2>

Pipe size	Tightening angle	Recommended tool length (mm)
Ø6.35	60°~90°	150
Ø9.52	60°~90°	200
Ø12.7	30°~60°	250
Ø15.88	30°~60°	300
Ø19.05	20°~35°	450

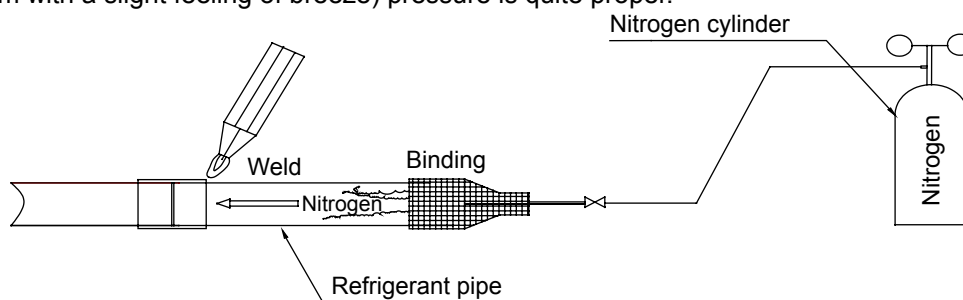


<Note>

- Excessive tightening will result in cracking at the flare and refrigerant leakage.
- To weld the refrigerant pipe, please make nitrogen replacement (*1), or send nitrogen (*2) into the refrigerant pipe while welding the pipe (refer to Fig.3). Finally use the flare or flange to connect the indoor unit and connection kit.

(*1) Nitrogen replacement method is provided in the multi-split system work manual.

(*2) If nitrogen flowing and welding proceed simultaneously, do use pressure reducing valve. Approximately 0.02 MPa (0.2 Kg/cm with a slight feeling of breeze) pressure is quite proper.



<Note>

- For pipe welding, do not use antioxidant, for its residue may cause tube blocking and component fault.
- For pipe welding, do not use flux. If the flux is chlorine product, it will corrode the tube; if it contains fluorine, it will even cause detrimental effects to the refrigerant system, such as refrigerant oil deterioration. Please do not use phosphor copper for welding material (BCup-2).

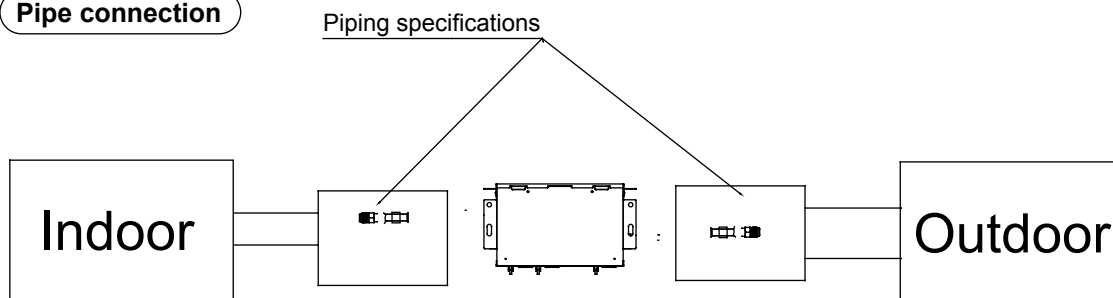
Selection of piping dimensions

Select refrigerant branching dimensions between outdoor units and connection kit, between connection kit and indoor units according to the Operation & Installation Manual of outdoor units and indoor units.

Dimensions (mm) of connection pipe of the valve box

model	Dimension (outer diameter)
	Liquid pipe / convertible dimension
KIT AHU 7KW KIT AHU 14KW KIT AHU 28KW	Ø6.35/Ø9.52
KIT AHU 56 KW KIT AHU 730KW	Ø12.7/Ø15.88

Pipe connection



When the connection kit and the piping specifications are not the same, can import and conversion by variable diameter. (the transfer pipe size selection see accessories)

Pipe insulation

Please use the auxiliary insulation cylinder and tie wire for insulation works according to Fig.1 after the gas leakage test.

Note 1:

For gas-liquid pipe of connection kit shall be wrapped with insulation materials (purchased locally) when their auxiliary insulation cylinders have been installed.

For installation of insulation materials for the flare nut connections, it shall be cautioned that:

- (1) Please connect it tightly so as to ensure no gas leakage at both ends.
- (2) The retaining clamp shall not be over tight so as to ensure the thickness of the insulation materials.
- (3) Joints of insulation materials (purchased locally) for the upper flare nut connections shall be wrapped upwards.
- (4) Ensure that joints of the insulation materials are installed upwards. (See Fig.2.)

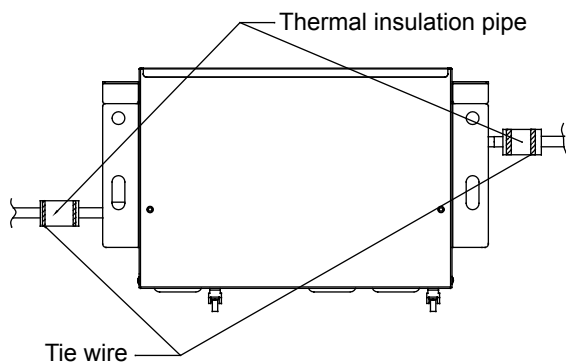


Fig.1

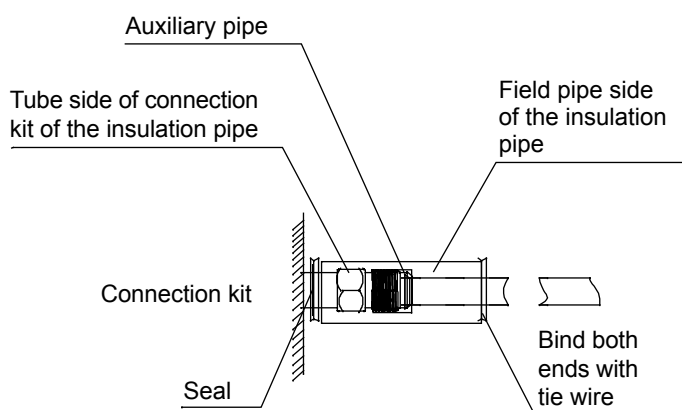


Fig.2

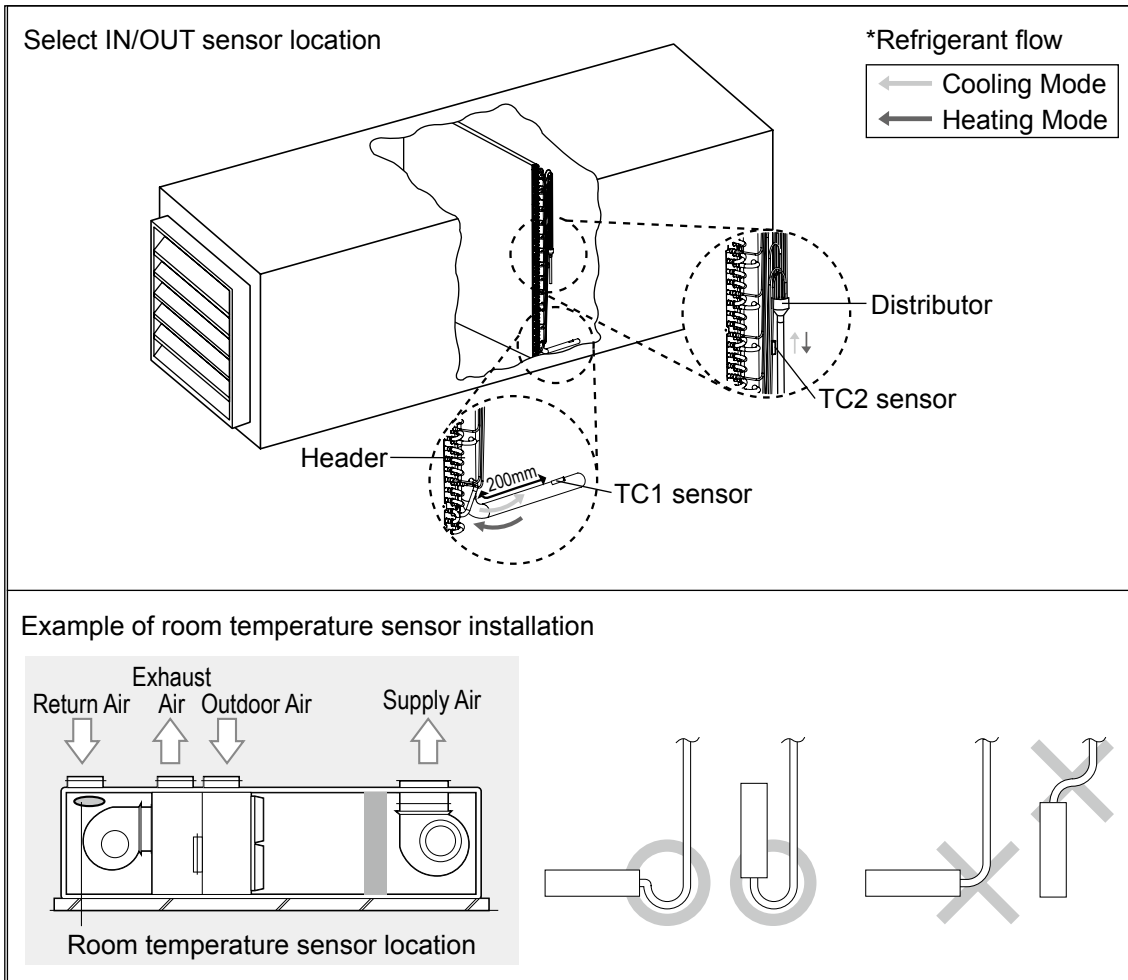
Additional refrigerant charging

Additional refrigerant charging

Charge the additional refrigerant of the liquid pipe between outdoor units and connection kits, between connection kits and indoor units according to the Operation & Installation Manual of outdoor unit.

6.6 Temperature Sensor Installation

- (1) TC2 sensor should be attached after the distributor, on the coldest part of the heat exchanger pipe.
- (2) TC1 sensor should be installed approximately 200mm behind the header of AHU heat exchanger.
- (3) TC1/2 sensor should be insulated for optimized system performance.
- (4) Room temperature sensor should be installed where room air enters.



Note

- B raise the sensor holder at location suggested above and fix the sensor with sensor clip.
- TC1/TC2 sensor should be installed where temperature of heat exchanger can be measured accurately.
- Additional backwater bend is required for horizontally mounted sensors.
- For vertically mounted sensors, the sensor sleeve needs to be inserted from the bottom up.
- When the sensor is installed, it should be fixed firmly and in full contact with the copper tube. The sensor and the copper pipe should adopt the heat preservation sheath to prevent the detection of temperature deviation.

6.7 Electrical wiring

⚠ Warning

- Electrical construction should be made with specific mains circuit by the qualified personnel according to the installation instruction. Electric shock and fire may be caused if the capacity of power supply is not sufficient.
- During arranging the wiring layout, specified cables should be used as the mains line, which accords with the local regulations on wiring. Connecting and fastening should be performed reliably to avoid the external force of cables from transmitting to the terminals. Improper connection or fastness may lead to burning or fire accidents.
- There must be the ground connection according to the criterion. Unreliable grounding may cause electrical shocks. Do not connect the grounding line to the gas pipe, water pipe, lightening rod and telephone line.

⚠ Attention

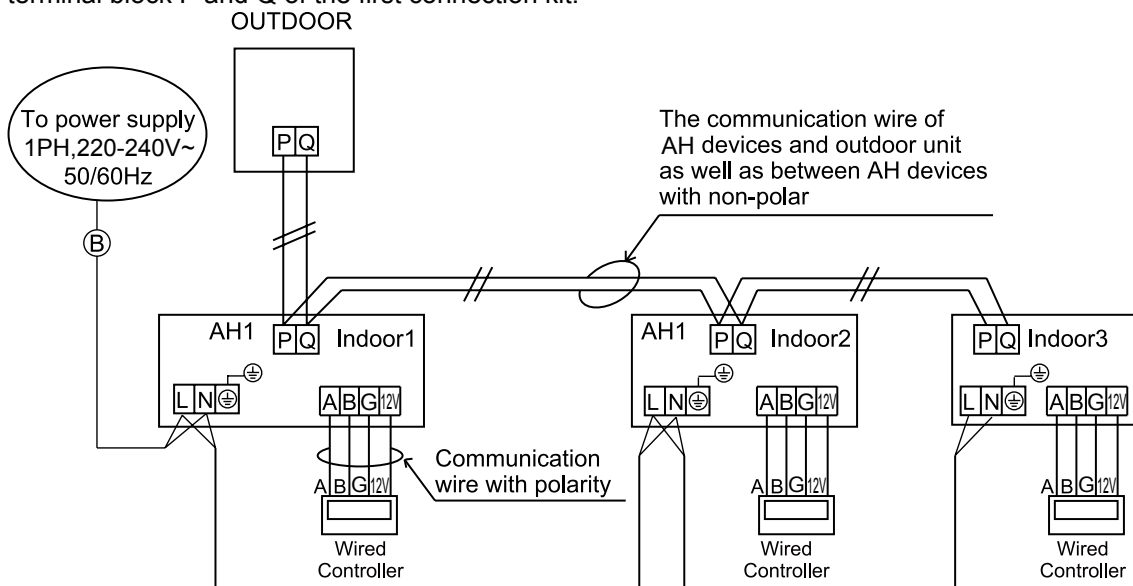
- Only copper wire can be used. Breaker for electric leakage should be provided, or electric shock may occur.
- The wiring of the mains line is of Y type. The power plug L should be connected to the live wire and plug N connected to null wire while \oplus should be connected to the ground wire. For the type with auxiliary electrically heating function, the live wire and the null wire should not be misconnected, or the surface of electrical heating body will be electrified. If the power line is damaged, replace it by the professional personnel of the manufacturer or service center.
- The power line of connection kits should be arranged according to the installation instruction of connection kits.
- The electrical wiring should be out of contact with the high-temperature sections of tubing as to avoid melting the insulating layer of cables, which may cause accidents.
- After connected to the terminal tier, the tubing should be curved into be a U-type elbow and fastened with the pressing clip.
- Controller wiring and refrigerant tubing can be arranged and fixed together.
- The machine can't be powered on before electrical operation. Maintenance should be done while the power is shut down.
- Seal the thread hole with heat insulating materials to avoid condensation.
- Signal line and power line are separately independent, which can't share one line. [Note: the power line, signal line are provided by users. Parameters for power lines are shown as below: $3 \times (1.0-1.5) \text{ mm}^2$; parameters for signal line: $2 \times (0.75-1.25) \text{ mm}^2$ (shielded line)]
- Connection kits and outdoor units should be connected to the power source separately. All connection kits must share one single electrical source, but its capacity and specifications should be calculated. Indoor & outdoor units should be equipped with the power leakage breaker and the overflow breaker.
- Connection kit can be installed in multiple, named as unit A, unit B.... Pay attention to the marks on the terminal block when connecting the outdoor unit with the indoor unit. Refer to wiring example as described in 5-2 while ensuring correct connection. In addition, the operation will be abnormal when the wiring and the tubing between indoor and outdoor machine sets are installed in different refrigerant systems.
- Energization is not to be done before it's confirmed that the connection kit have completely installed and that the outdoor and indoor installation is completed.

The wiring for the power line and signal line of connection kit

- Power cable and communication wire must be fixed firmly.
- Each connection kit must be earthed well.
- When power cable exceeds the range, thicken it appropriately.
- Shielded layer of communication wires must be connected together and be earthed at single point.
- Communication wire total length cannot exceed 1000m.

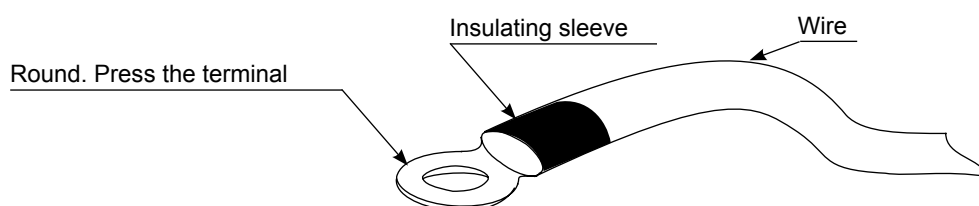
Graphical representation for wiring

Connect the communication terminal block P and Q of the main unit of the outdoor units with the communication terminal block P and Q of the first connection kit.



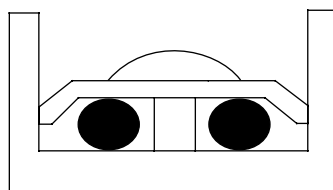
Notes:

- (1) The above wiring example is only for reference. The number of connection kits and indoor units shall be subject to the field installation.
- (2) Two-core non-polar communication line with shield shall be adopted for communication lines between the connection kit and the indoor/outdoor unit. The size for indoor unit and connection kit is H05RN-F4G 2.5mm
- (3) All connection kits within one system may share one over current breaker for power supply. But it's necessary to compute total current capacity specification.
- (4) For wiring harness connected to the power terminal block, the terminal shall be pressed with a round (refer to the following figure).

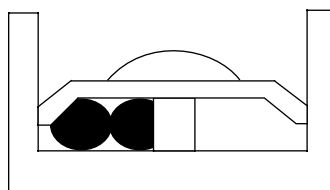


- 1) The power terminal block shall not be crimped with 2 wires of different diameters. Otherwise, poor crimp connection and looseness may lead to abnormal heating or sparking of the line.
- 2) Refer to the following figure for crimping wires with the same diameter.

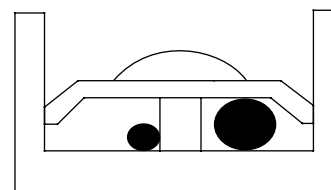
Connect wires with the same diameter on both sides



It's forbidden to connect two wires on one side



Wires with different diameters are not allowed



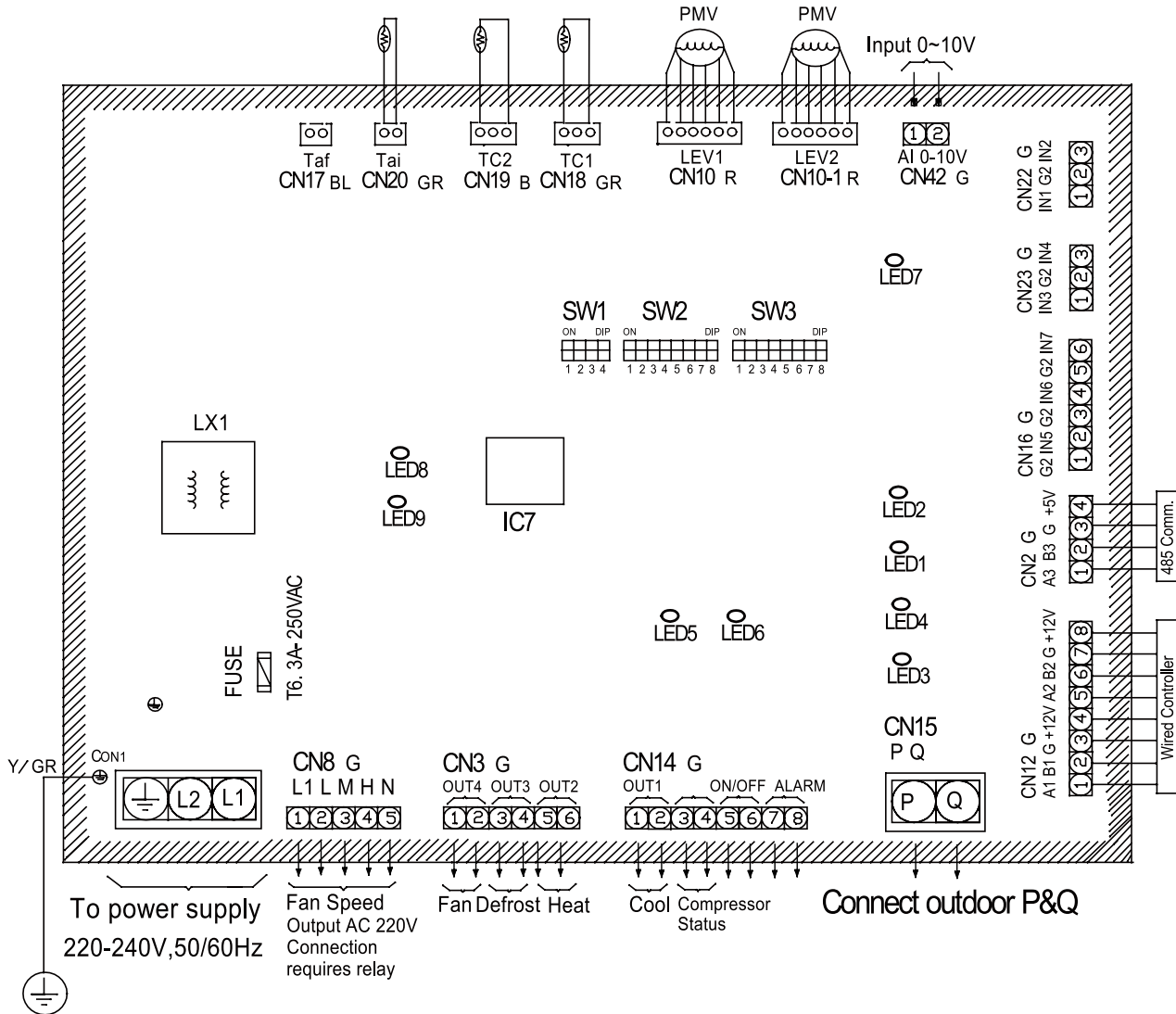
- (5) Tighten terminal screws with proper screw driver. Screw driver of small dimension will damage the screw head and fail to tighten properly.
- (6) If terminal screws are tightened excessively, they may be damaged. Refer to the following table for tightening torques of terminal screws:

Dimension of terminal screw	Tightening torque (N.m)
M3.5 (terminal block for communication line)	0.80~0.96
M4 (terminal block for power line)	1.18~1.44
M4 (terminal block for ground wire)	1.52~1.86

- (7) Power line is forbidden to the communication terminal block because it will damage the circuit control board.
- (8) Wiring of communication lines shall be within the following scope. Exceeding the limit will possibly lead to abnormal communication.
 - 1) The maximum wiring length between the outdoor unit and the valve kit, the valve kit and the indoor machine, and between valve kit is 1000 m at most. The total wiring length is 1000m at most. The maximum branch number is 16.
 - 2) The maximum wiring length between the valve kit and the wire controller for switching working modes is 500 m at most.

Wiring connection

Refer to the wiring diagram of electrical wiring of a connection kit – for wiring connection of connection kit.



(1) Connection communication line

Remove the cover of the electrical cabinet of the valve kit. Introduce communication lines for outdoor and indoor units to the through holes at the lower right of the electrical cabinet and crimp them on the communication terminal block respectively. Then fix the lead wires with crimping pliers to prevent the communication line from falling off under the effect of external force.

(2) Connection of power line and ground wire

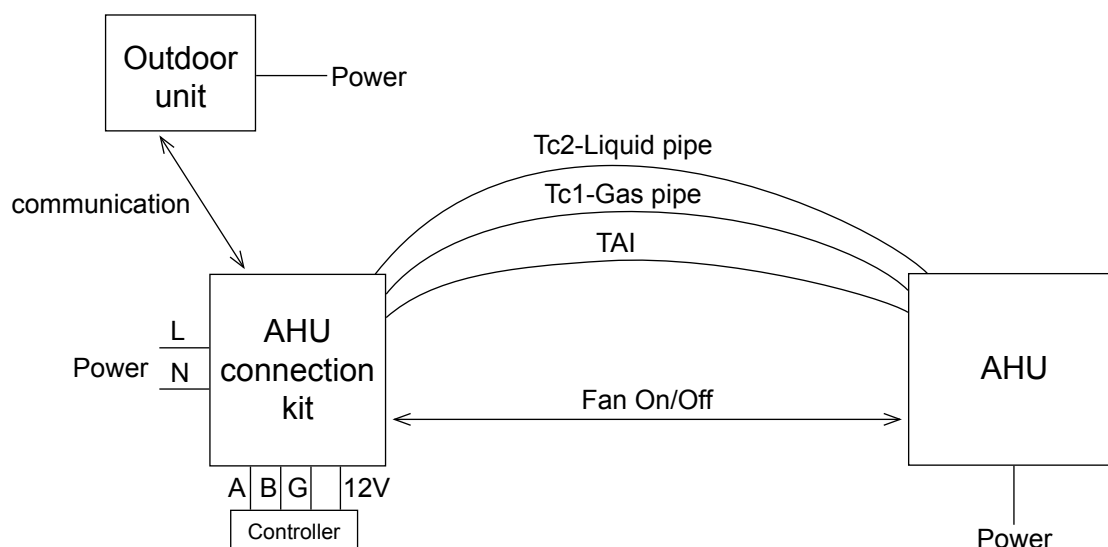
Remove the cover of the electrical cabinet of the connection kit. Introduce power lines to the through holes at the lower left of the electrical cabinet and crimp them on the communication terminal block. Then fix the power lines with crimping pliers to prevent them from falling off under the effect of external force.

1) Don't route communication lines and power lines together. Otherwise, it may cause malfunction or fault due to electrical disturbance.

2) Make sure that ground wires are properly crimped. Otherwise, grounding may be ineffective.

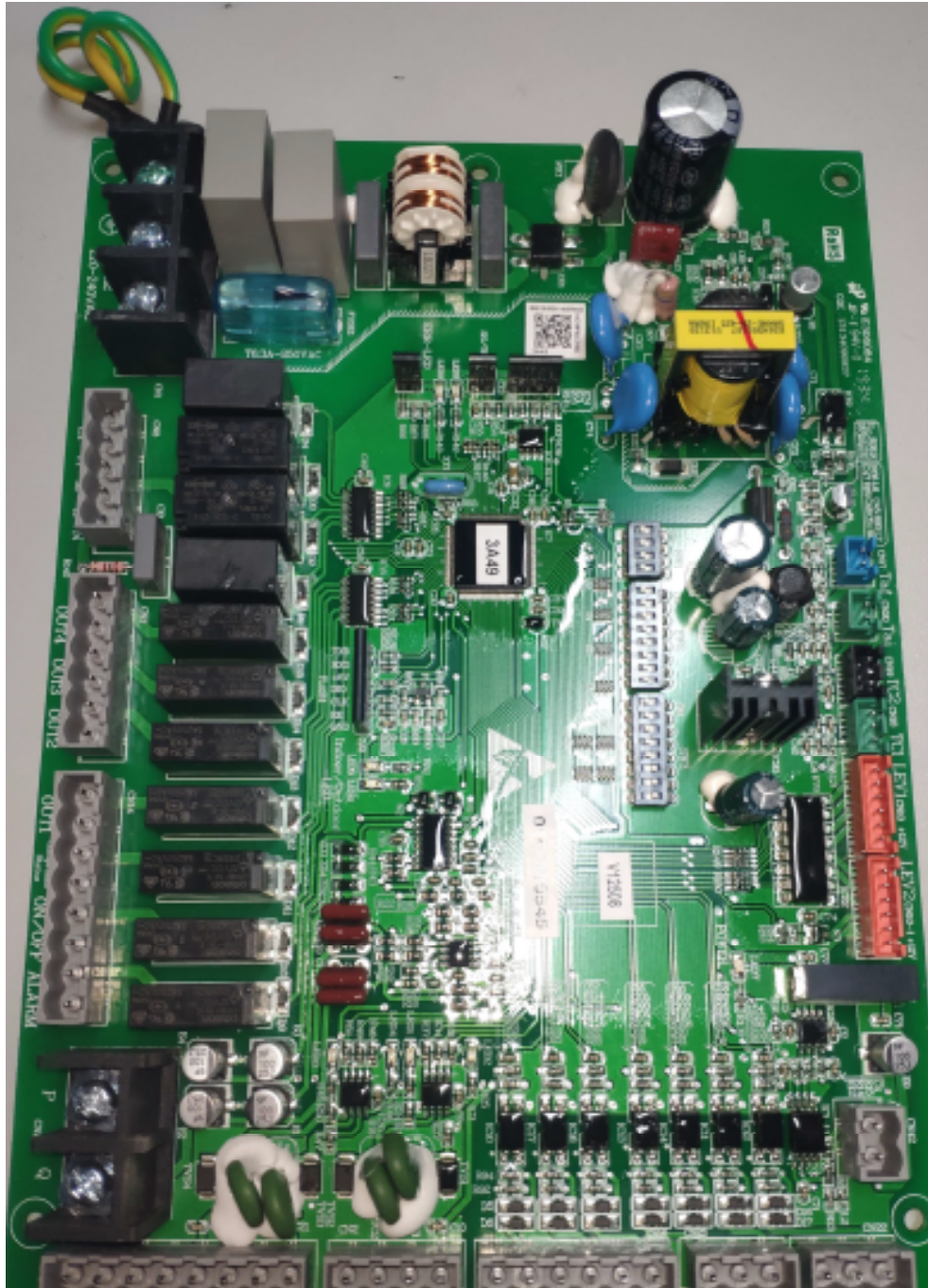
(3) Electrical specifications

Power supply	1PH,220-240V~,50/60Hz								
Power consumption	W	2.54-3.5							
Power supply current	A	0.02							
Power supply breaker	A	6.3							
Power supply cable	3x 1.5mm²								
Communication cable	2x0.75mm² shielded line								
Thermistor	TC1	Gas pipe sensor, Use the configured sensor by factory							
	TC2	Liquid pipe sensor, Use the configured sensor by factory							
	TAI	Use the configured sensor by factory							
PMV wiring	Use the configured cable by factory								
External input wiring	AWG22 cable or equivalent, 2-wired, shielded,maximum length 5m								
External output wiring	AWG18 cable or equivalent, 2-wired or 4-wired,shielded, maximum length 5m								
Input: Broken to 0; short to 1	CN22			CN23			CN16		
	IN2	IN1	Mode	IN4	IN3	Speed	IN5	0	OFF
	0	1	Cool	0	1	L		1	ON
	1	0	Heat	1	0	M			
	1	1	Fan	1	1	H			
External output	H/M/L/N	Fan signal, Output 220VAC, max.current 5A							
	CN14	ALARM				ALARM			
		ON/OFF				Outdoor Units Status			
		Compressor Status				Compressor Status			
		OUT1				Cool			
	CN13	OUT2				Heat			
		OUT3				Defrost			
		OUT4				Fan			



7.PCB photo

'0151800545



8. Dip switch setting

Operate according to the following setting as necessary after refrigerant piping construction and electrical wiring construction are finished.

1. Code setting for the address of wired control and the capacity of connection kit:

1 is ON, 0 is OFF

SW3_1 ~ SW3_4	Wired Indoor Address	[1]	[2]	[3]	[4]	Wired Indoor Address
		0	0	0	0	0# Slave Unit (Default)
		0	0	0	1	1# Slave Unit
		0	0	1	0	2# Slave Unit
	
SW3_5 ~ SW3_8	AHU Capacity	1	1	1	1	15# Slave Unit
		[5]	[6]	[7]	[8]	AHU Capacity
		0	0	0	0	/
		0	0	0	1	/
		0	0	1	0	/
		0	0	1	1	/
		0	1	0	0	/
		0	1	0	1	/
		0	1	1	0	/
		0	1	1	1	KIT AHU 7KW
		1	0	0	0	/
		1	0	0	1	/
		1	0	1	0	/
		1	0	1	1	KIT AHU 14KW
		1	1	0	0	/
		1	1	0	1	/
		1	1	1	0	KIT AHU 28KW
		1	1	1	1	KIT AHU 56 KW/KIT AHU 730KW

2. Code setting for the postal address of the connection kit:

SW2 is used for AH devices address setting, 1 is ON, 0 is OFF

SW2_1	Manner of set address	0				Set the address with automatism （default）				
		1				Set the address with dip switch				
SW2_2 ~ SW2_8	The communication address of first indoor unit address	[2]	[3]	[4]	[5]	[6]	[7]	[8]	Communication address	Center controller address
		0	0	0	0	0	0	0	0#（default）	0#（default）
		0	0	0	0	0	0	1	1#	1#
		0	0	0	0	0	1	0	2#	2#
		0	0	0	0	0	1	1	3#	3#
		0	0	0	0	1	0	0	4#	4#
		0	0	0	0	1	0	1	5#	5#
		0	0	0	0	1	1	0	6#	6#
		0	0	0	0	1	1	1	7#	7#

		[2]	[3]	[4]	[5]	[6]	[7]	[8]	Communication address	Center controller address
		0	0	0	1	0	0	0	8#	8#
SW2_2 ~ SW2_8	The communication address of first indoor unit address	0	0	0	1	0	0	1	9#	9#
		0	0	0	1	0	1	0	10#	10#
		0	0	0	1	0	1	1	11#	11#
		0	0	0	1	1	0	0	12#	12#
		0	0	0	1	1	0	1	13#	13#
		0	0	0	1	1	1	0	14#	14#
		0	0	0	1	1	1	1	15#	15#
		0	0	1	0	0	0	0	16#	16#
		0	0	1	0	0	0	1	17#	17#
		0	0	1	0	0	1	0	18#	18#
		0	0	1	0	0	1	1	19#	19#
		0	0	1	0	1	0	0	20#	20#
		0	0	1	0	1	0	1	21#	21#
		0	0	1	0	1	1	0	22#	22#
		0	0	1	0	1	1	1	23#	23#
		0	0	1	1	0	0	0	24#	24#
		0	0	1	1	0	0	1	25#	25#
		0	0	1	1	0	1	0	26#	26#
		0	0	1	1	0	1	1	27#	27#
		0	0	1	1	1	0	0	28#	28#
		0	0	1	1	1	0	1	29#	29#
		0	0	1	1	1	1	0	30#	30#
		0	0	1	1	1	1	1	31#	31#
		0	1	0	0	0	0	0	32#	32#
		0	1	0	0	0	0	1	33#	33#
		0	1	0	0	0	1	0	34#	34#
		0	1	0	0	0	1	1	35#	35#
		0	1	0	0	1	0	0	36#	36#
		0	1	0	0	1	0	1	37#	37#
		0	1	0	0	1	1	0	38#	38#
		0	1	0	0	1	1	1	39#	39#
		0	1	0	1	0	0	0	40#	40#
		0	1	0	1	0	0	1	41#	41#
		0	1	0	1	0	1	0	42#	42#
		0	1	0	1	0	1	1	43#	43#
		0	1	0	1	1	0	0	44#	44#
		0	1	0	1	1	0	1	45#	45#
		0	1	0	1	1	1	0	46#	46#
		0	1	0	1	1	1	1	47#	47#
		0	1	1	0	0	0	0	48#	48#
		0	1	1	0	0	0	1	49#	49#
		0	1	1	0	0	1	0	50#	50#
		0	1	1	0	0	1	1	51#	51#

SW2_2 ~ SW2_8	The communication address of first indoor unit address	[2]	[3]	[4]	[5]	[6]	[7]	[8]	Communication address	Center controller address
		0	1	1	0	1	0	0	52#	52#
		0	1	1	0	1	0	1	53#	53#
		0	1	1	0	1	1	0	54#	54#
		0	1	1	0	1	1	1	55#	55#
		0	1	1	1	0	0	0	56#	56#
		0	1	1	1	0	0	1	57#	57#
		0	1	1	1	0	1	0	58#	58#
		0	1	1	1	0	1	1	59#	59#
		0	1	1	1	1	0	0	60#	60#
		0	1	1	1	1	0	1	61#	61#
		0	1	1	1	1	1	0	62#	62#
		0	1	1	1	1	1	1	63#	63#
		1	0	0	0	0	0	0	0#	64#
		1	0	0	0	0	0	1	1#	65#
		1	0	0	0	0	1	0	2#	66#
	
		1	1	1	1	1	1	0	62#	126#
		1	1	1	1	1	1	1	63#	127#

3. Code setting for changing the control methods of connection kit: 1 is ON, 0 is OFF

SW1_1 SW1_2	Control methods	[1]	[2]	Control methods
		0	0	plan A
		0	1	plan B
		1	0	plan C
		1	1	plan D
SW1_3	Reserved	/		/
SW1_4	Anti-cold Air Function	0		Anti-cold Air Function Available
		1		Anti-cold Air Function Unavailable

Notes: **Plan A: Controlling capability by 0-10V signal.**

Simple DDC Voltage Range(V)	Output Capability
0~1.0	0% OFF
1.1~1.5	10%
1.6~2.5	20%
2.6~3.5	30%
3.6~4.5	40%
4.6~5.5	50%
5.6~6.5	60%
6.6~7.5	70%
7.6~8.5	80%
8.6~9.6	90%
9.6~10	100%

- a) If the DDC can provide 0-10V, mode and on/off signals to AHU kit, the wired controller does not need to be connected. If only 0-10V signal, the wired controller is necessary.
- b) If wired controller is connected into the system, the wired controller has the top priority. As a result, if the wired controller is set into off status, signals from DDC to AHU kit will be invalid. When the wired controller is turned on, first to adjust operation mode and then the 3rd party AHU units can be controlled by 0-10V signal from DDC to AHU kit adjusting the outdoor unit capacity.
- c) If the wired controller is connected, wired controller can directly control the 3rd party AHU fan motor. Or AHU kit PCB provides fan speed dry contact signal to DDC or to AHU unit PCB directly. If users want to use wired controller to adjust fan speeds, set the wired controller according to AHU fan motor grades and max. 3 fan speeds can be controllable.
- d) AHU kit can provide mode signal to DDC or AHU unit PCB directly to control the AHU unit, e.g. if the DDC or 3rd party AHU unit PCB receives defrost signal from AHU kit, AHU fan motor will be controlled.
- e) The maximum input range of voltage which is from DDC is 0-10v. If it exceeds 10V, input shall be 10V; if it is lower than 0V, input shall be 0V. The maximum input voltage shall not exceed 10V.

• **Plan B: Setting temperature by 0-10V signal.**

Simple DDC Voltage Range(V)	Set Temperature(°C)	
	Cool	Heat
0~1.0	16	16
1.1~1.7	17	17
1.8~2.3	18	18
2.4~2.9	19	19
3~3.5	20	20
3.6~4.1	21	21
4.2~4.7	22	22
4.8~5.3	23	23
5.4~5.9	24	24
6~6.5	25	25
6.6~7.1	26	26
7.2~7.7	27	27
7.8~8.3	28	28
8.4~8.9	29	29
9~10	30	30

- a) If the DDC can provide 0-10V, mode and on/off signals to AHU kit, the wired controller does not need to be connected. If only 0-10V signal, the wired controller is necessary.
- b) If wired controller is connected into the system, the wired controller has the top priority. As a result, if the wired controller is set into off status, signals from DDC to AHU kit will be invalid. When the wired controller is turned on, first to adjust operation mode and then the 3rd party AHU units can be controlled by 0-10V signal from DDC to AHU kit adjusting the setting temperature.
- c) If the wired controller is connected, wired controller can directly control the 3rd party AHU fan motor. Or AHU kit PCB provides fan speed dry contact signal to DDC or to AHU unit PCB directly. If users want to use wired controller to adjust fan speeds, set the wired controller according to AHU fan motor grades and max. 3 fan speeds can be controllable.
- d) AHU kit can provide mode signal to DDC or AHU unit PCB directly to control the AHU unit, e.g. if the DDC or 3rd party AHU unit PCB receives defrost signal from AHU kit, AHU fan motor will be controlled.
- e) The maximum input range of voltage which is from DDC is 0-10v. If it exceeds 10V, input shall be 10V; if it is lower than 0V, input shall be 0V. The maximum input voltage shall not exceed 10V.

- **Plan C: Third party thermostat controls ON/Off by dry contract signal.**

- a) Wired controller is necessary.
- b) The wired controller has the top priority. If the wired controller is off, the signal information from the 3rd party thermostat to AHU kit will be invalid.
- c) In this control method, it's necessary to set operation mode
- d) In this control method, AHU kit can also output dry contact signal or strong electricity to control AHU fan motors
- e) AHU kit can provide mode signal to DDC or AHU unit PCB directly to control the AHU unit, e.g. if the DDC or AHU unit PCB receives defrost signal from AHU kit, AHU fan motor will be controlled.

- **Plan D: The wired controller specially designed by Airwell is needed.**

- a) Airwell AHU kit controls 3rd party AHU units such as the on/off, temperature settings, fan speed adjustment and operation mode etc.
- b) Airwell AHU kit can provide mode signal to DDC or AHU unit PCB directly to control the 3rd party AHU fan motor. It's required to output either the dry contact or strong electricity signal.

Controlling AHU fan motor

Wired controller can be used to adjust the fan speeds.

Wired controller can realize Max. 3 fan speeds adjustment according to AHU fan motor grades.

When wired controller is set into 3 grades, High/Medium/Low fan speeds can be adjusted.

AHU kit PCB can provide two types of signals to AHU fan motor:

- a) Strong electricity type of high/medium/low fan speeds and fan motor stop signals.
- b) Dry contact type of high/medium/low fan speeds and fan motor stop signals.

When wired controller is set into 2 grades, High /Low fan speeds can be adjusted.

AHU kit PCB can provide two types of signals to AHU fan motor:

- a) Strong electricity type of high/low fan speeds and fan motor stop signal.
- b) Dry contact type of high/low fan speeds and fan motor stop signal.

When wired controller is set into 1 grade, air volume of AHU units will be uncontrollable.

AHU kit PCB can only provide two types of signals to AHU fan motor:

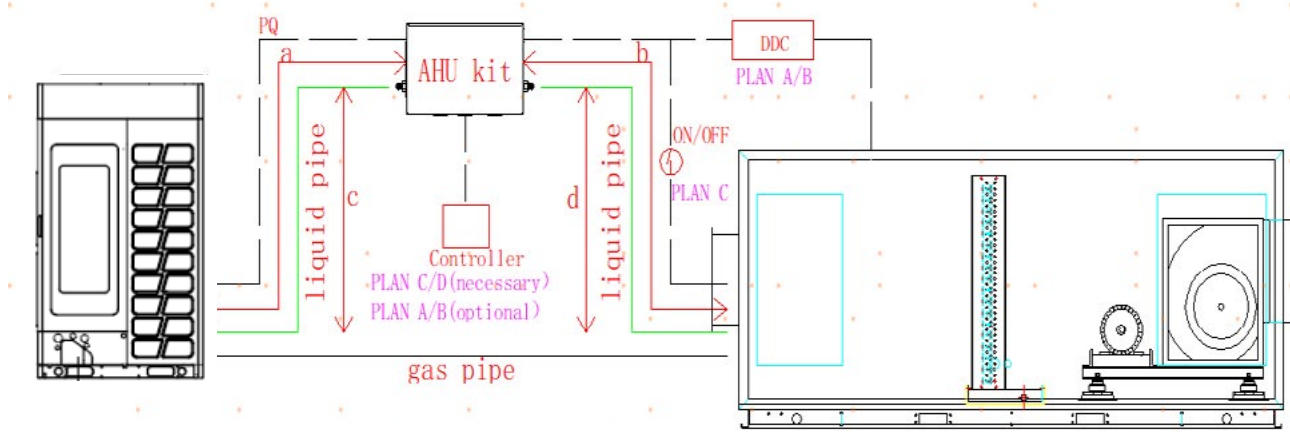
- a) Strong electricity of high fan speed and fan motor stop signals.
- b) Dry contact of high fan speed and fan motor stop signals.

Note:

In case of outputting strong electricity, it is necessary to connect the relay first before connecting to the electrical devices.

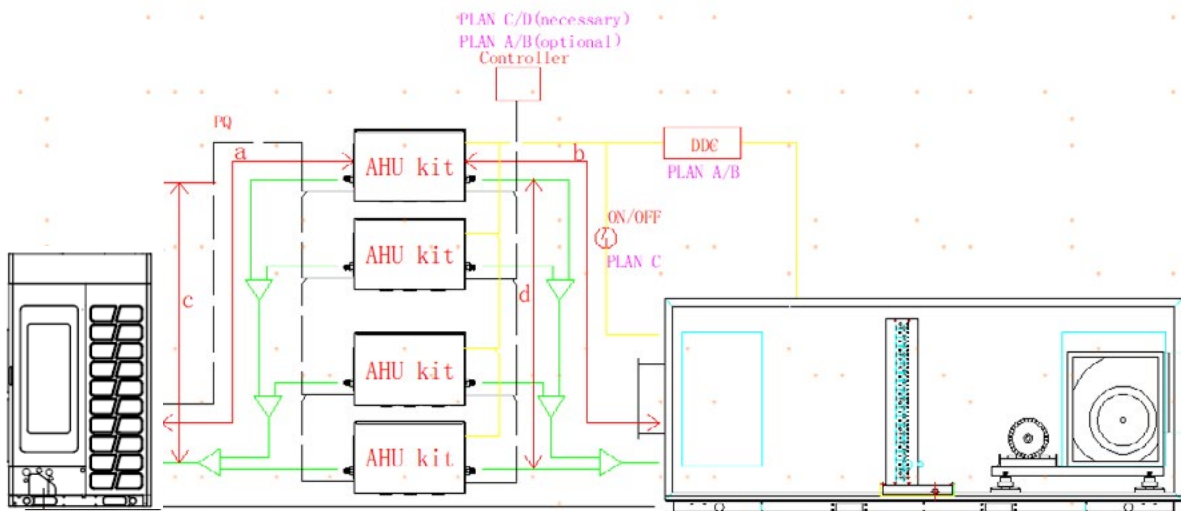
Connect method:

1. one by one: the plan A or plan B or plan C or plan D is available

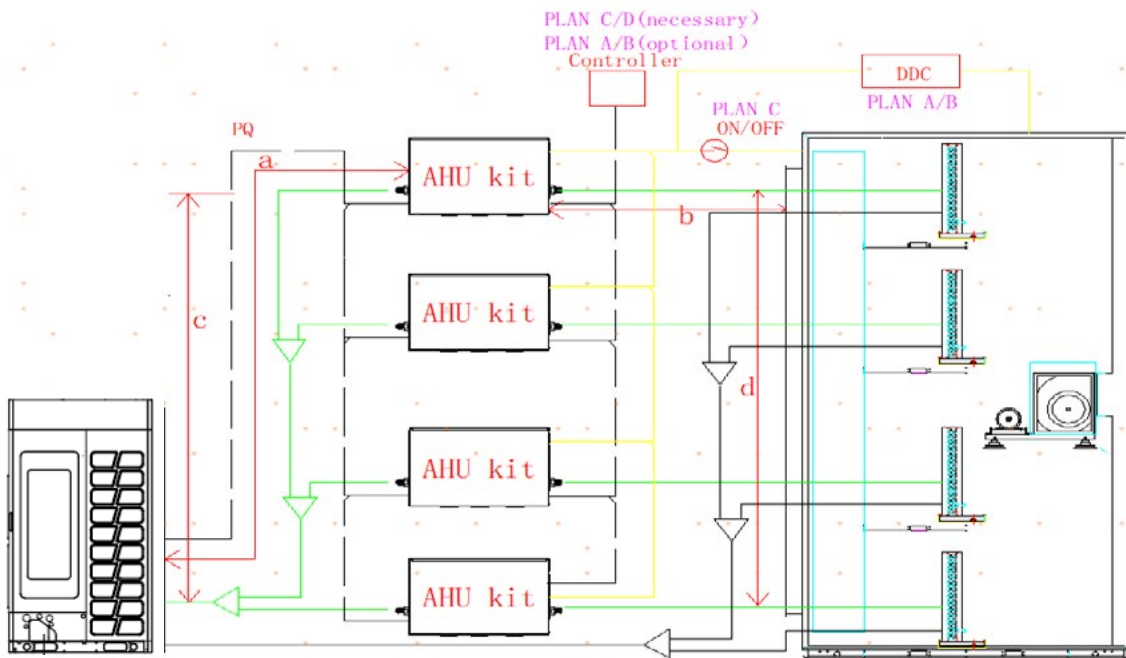


2. one outdoor with multiple AHU valves (AHU has only one coil):

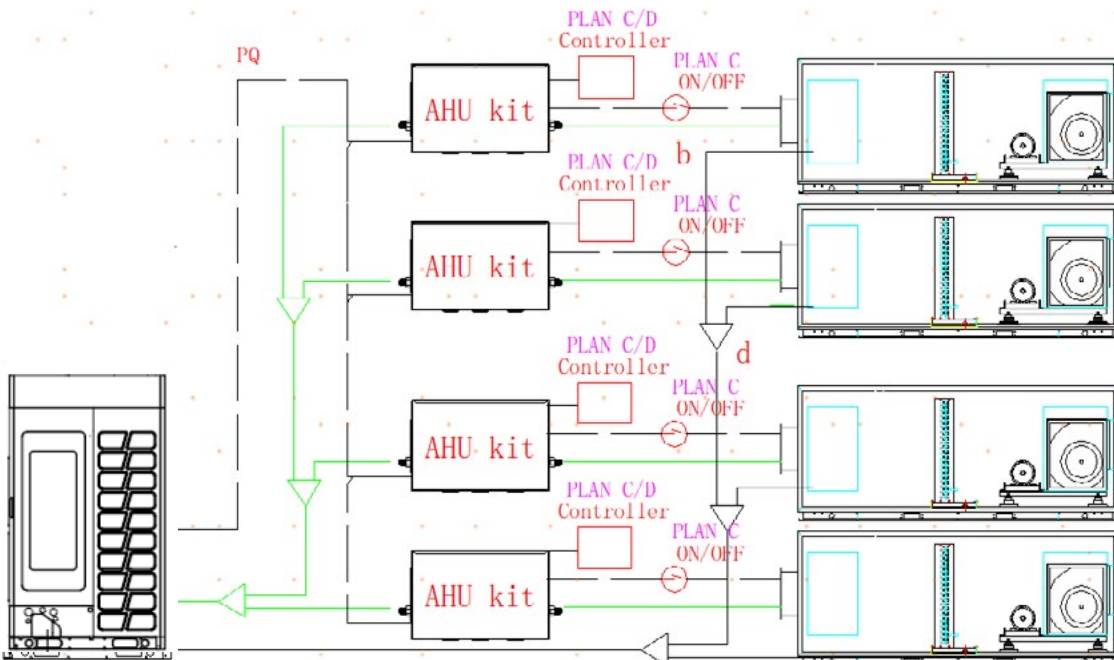
the plan A or plan B or plan C or plan D is available , and the max. qty of AHU valve boxes is 4.



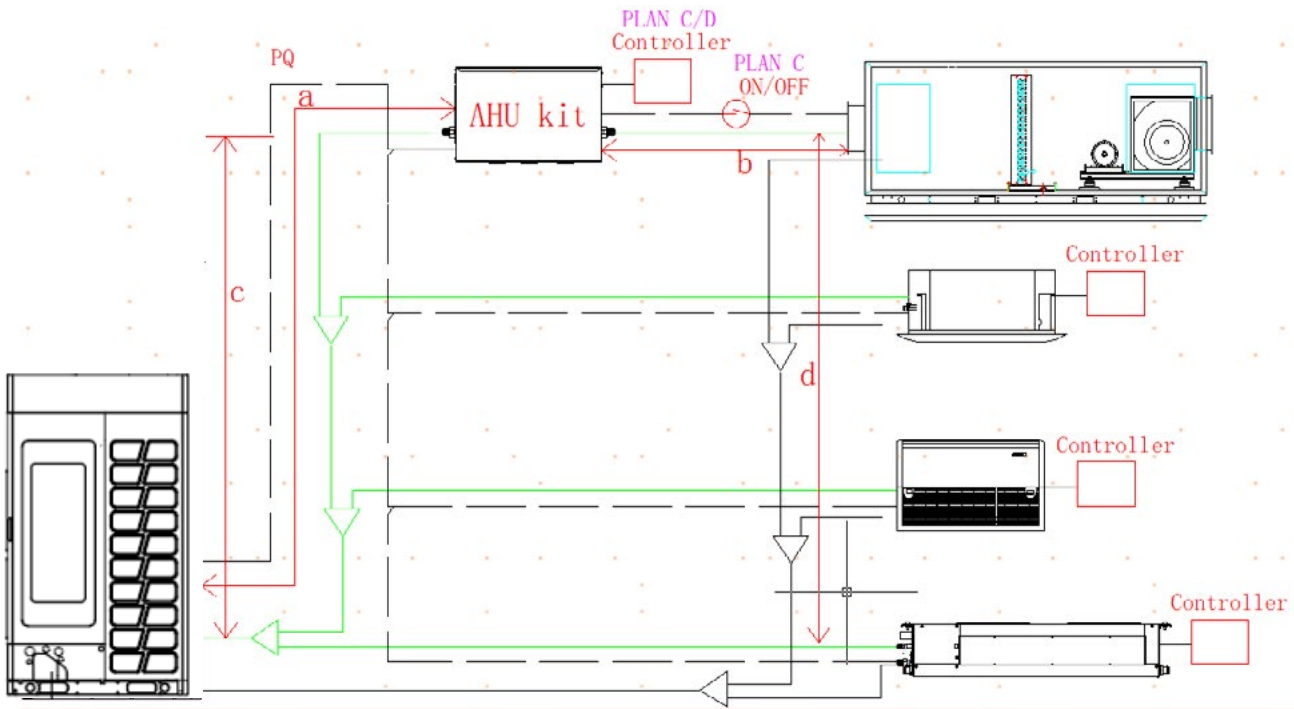
3. one outdoor with multiple AHU valves (AHU has multiple coils):
the plan A or plan B or plan C or plan D is available , and the max. qty of AHU valve boxes is 4.



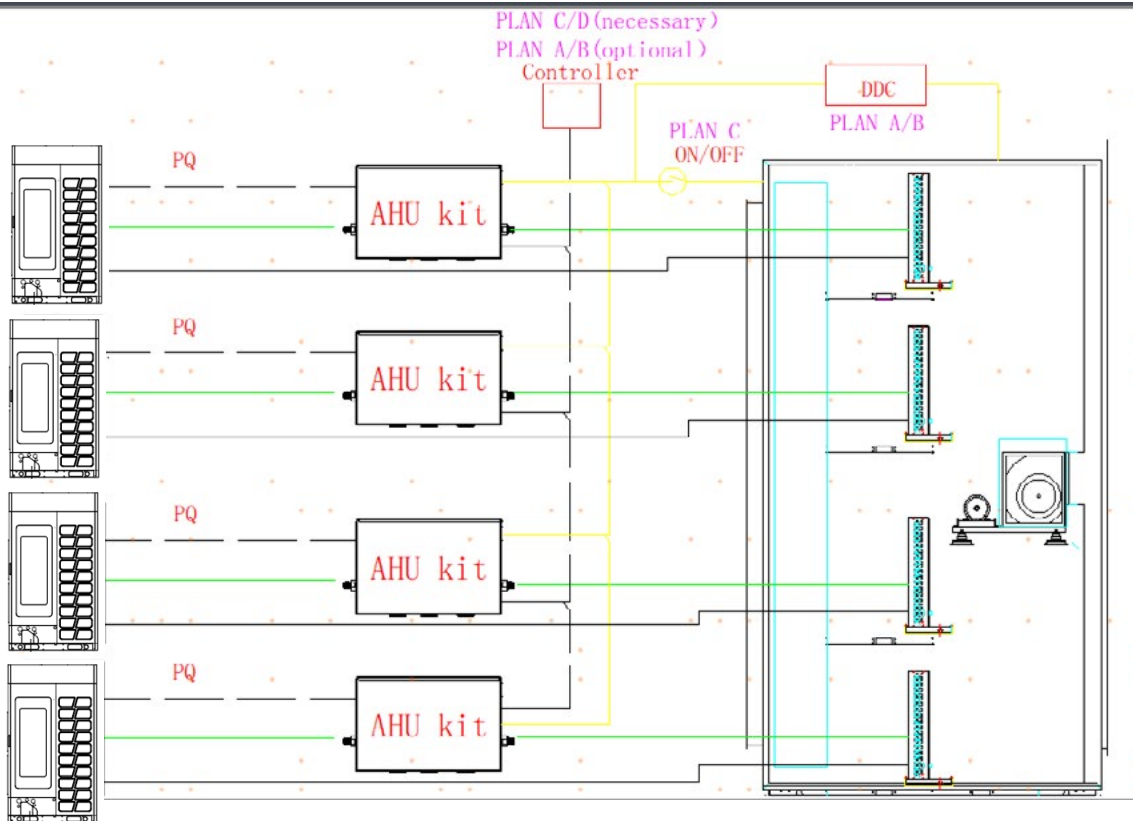
- 4 . one outdoor with multiple AHU valves (AHU has multiple coils):
the plan A or plan B or plan C is available , and the max. qty of AHU valve boxes is 4.



5. Mixed connetion: the plan C or plan D is avaiable .



5. Mixed connetion (multiple outdoor units with one AHU,AHU has multiple coils):
Note: This connection method is not recommended.



9. Failure code

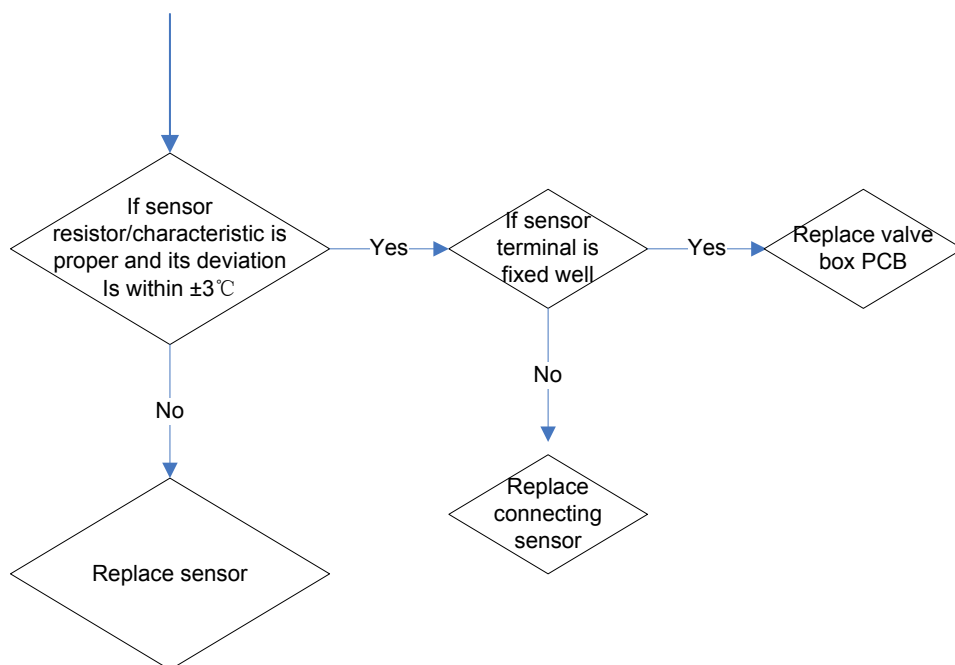
1. Confirm that the cover of the electrical cabinet of the connection kit is of good sealing.
2. Conduct commissioning in accordance with the installation and use specification attached to the outdoor unit.
At the time of energization, because electronic expansion valve will start initialization (open/ close), there may be click lasting for about 20s, which is normal.
3. When the connection kit failure, the connection kit trouble light LED5 will flicker periodically, you can according the flicker times to check the failure reason. See the below table.

Connection kit failure code list

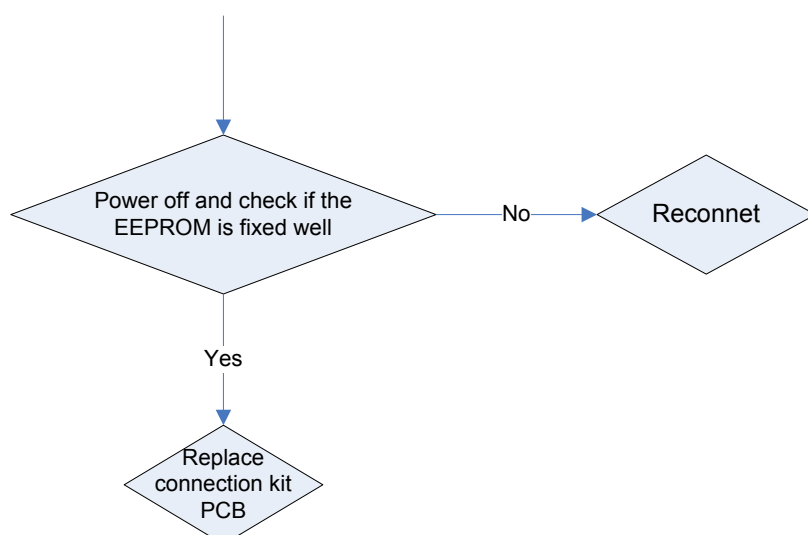
Error Code	Error Content
E1	Indoor ambient temperature Tai s ensor
E2	Indoor pipe temperature Tc1 sens or
E3	Indoor pipe temperature Tc2 sens or
E5	EEPROM Error
E6	Comm.With Outdoor
E7	Comm.With Controller
E9	Repeated address of indoor

10.Troubleshooting

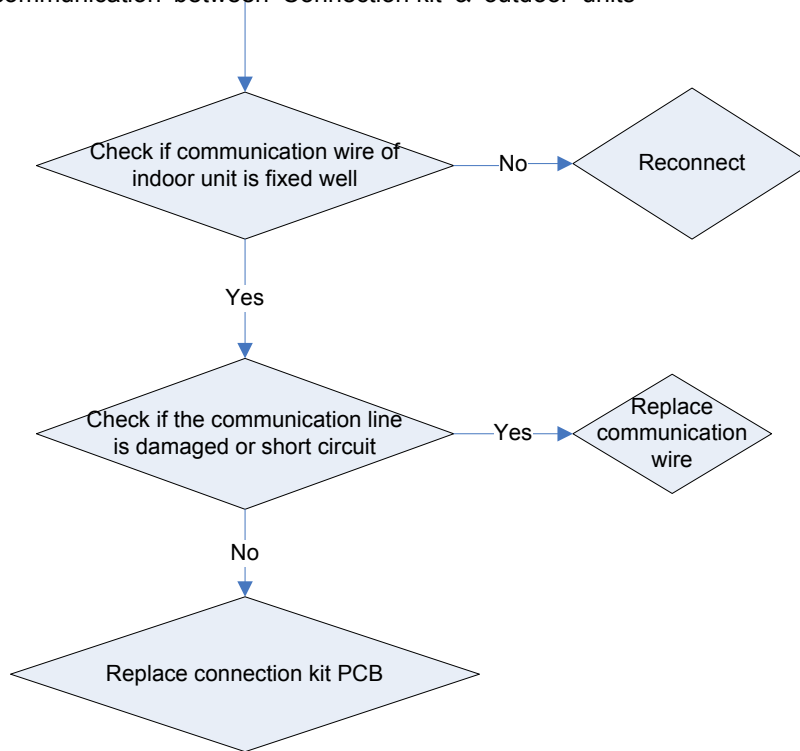
[1~3] Sensor fault



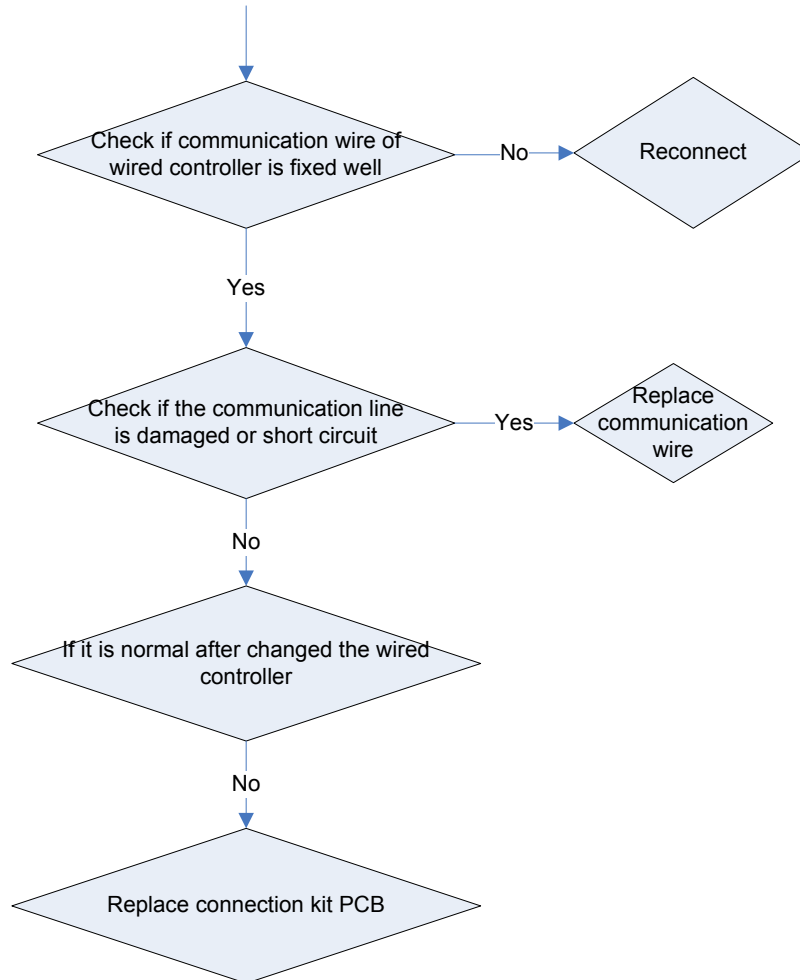
[5] Fault of connection kit EEPROM



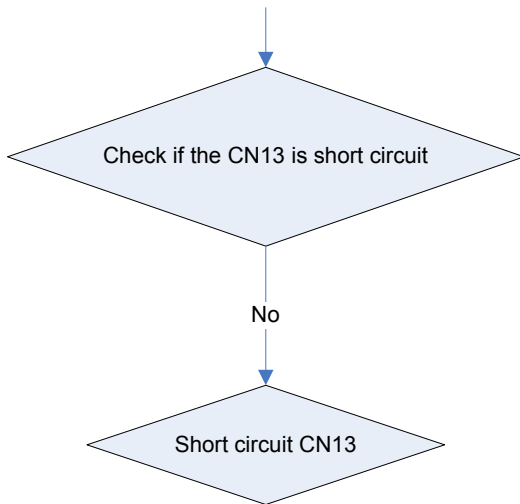
[6] Fault of communication between Connection kit & outdoor units



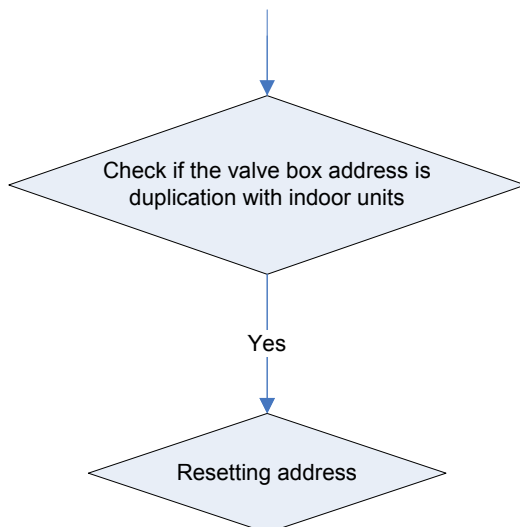
[7] Fault of communication between connection kit and wired control



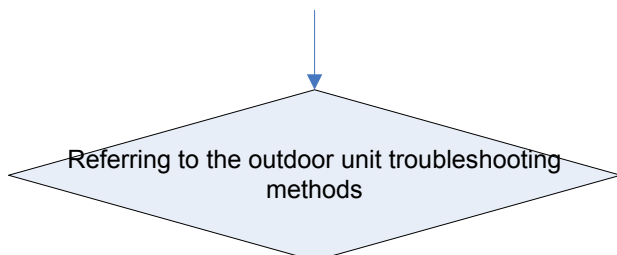
[8] Fault of connection kit water drainage



[9] Fault of duplicate connection kit address



[20] Outdoor unit fault



11.Sensor resistance table

Model	Code	Description	PCB socket	Color	Characteristic
KIT AHU 7KW	0150401850	Ambient temp. sensor	CN20	Green	R25=23K Ω ±3%, B25/50=4200K±3%
KIT AHU 14KW	0150401849	TC1 sensor	CN18	Green	R25=10K Ω ±3%, B25/50=3700K±3%
KIT AHU 28KW KIT AHU 56 KW KIT AHU 730KW	0150401848	TC2 sensor	CN19	Black	R25=10K Ω ±3%, B25/50=3700K±3%

R25=10KΩ±3% B25/50=3700K±3%					
Temp (℃)	resistance (KΩ)			% (resist.tol)	
	Rmax	R (t) Normal	Rmin	MAX(+)	MIN(-)
-30	145.819	135.018	124.217	7	7
-29	138.071	129.126	120.181	6.93	6.93
-28	131.793	123.339	114.885	6.85	6.85
-27	125.665	117.684	109.703	6.78	6.78
-26	119.706	112.18	104.654	6.71	6.71
-25	113.933	106.843	99.753	6.64	6.64
-24	108.361	101.687	95.013	6.56	6.56
-23	102.997	96.719	90.441	6.49	6.49
-22	97.847	91.946	86.045	6.42	6.42
-21	92.915	87.371	81.827	6.35	6.35
-20	88.2	82.994	77.788	6.27	6.27
-19	83.702	78.815	73.928	6.2	6.2
-18	79.417	74.832	70.247	6.13	6.13
-17	75.342	71.041	66.74	6.05	6.05
-16	71.471	67.437	63.403	5.98	5.98
-15	67.798	64.015	60.232	5.91	5.91
-14	64.316	60.769	57.222	5.84	5.84
-13	61.017	57.692	54.367	5.76	5.76
-12	57.895	54.778	51.661	5.69	5.69
-11	54.942	52.019	49.096	5.62	5.62
-10	52.149	49.409	46.669	5.55	5.55
-9	49.51	46.941	44.372	5.47	5.47
-8	47.016	44.607	42.198	5.4	5.4
-7	44.659	42.4	40.141	5.33	5.33
-6	42.433	40.315	38.197	5.25	5.25
-5	40.332	38.345	36.358	5.18	5.18
-4	38.346	36.482	34.618	5.11	5.11
-3	36.472	34.723	32.974	5.04	5.04
-2	34.7	33.059	31.418	4.96	4.96
-1	33.027	31.487	29.947	4.89	4.89
0	31.445	30	28.555	4.82	4.82
1	29.951	28.594	27.237	4.75	4.75
2	28.538	27.264	25.99	4.67	4.67
3	27.202	26.006	24.81	4.6	4.6
4	25.938	24.815	23.692	4.53	4.53
5	24.742	23.687	22.632	4.45	4.45
6	23.61	22.619	21.628	4.38	4.38
7	22.538	21.607	20.676	4.31	4.31
8	21.522	20.647	19.772	4.24	4.24
9	20.559	19.737	18.915	4.16	4.16
10	19.646	18.874	18.102	4.09	4.09
11	18.779	18.054	17.329	4.02	4.02
12	17.958	17.276	16.594	3.95	3.95
13	17.177	16.537	15.897	3.87	3.87
14	16.436	15.834	15.232	3.8	3.8
15	15.731	15.166	14.601	3.73	3.73
16	15.061	14.53	13.999	3.65	3.65
17	14.424	13.925	13.426	3.58	3.58
18	13.817	13.349	12.881	3.51	3.51

19	13.24	12.8	12.36	3.44	3.44
20	12.69	12.277	11.864	3.36	3.36
21	12.166	11.778	11.39	3.29	3.29
22	11.666	11.302	10.938	3.22	3.22
23	11.189	10.848	10.507	3.15	3.15
24	10.734	10.414	10.094	3.07	3.07
25	10.3	10	9.7	3	3
26	9.898	9.604	9.31	3.06	3.06
27	9.514	9.226	8.938	3.13	3.13
28	9.147	8.864	8.581	3.19	3.19
29	8.796	8.519	8.242	3.25	3.25
30	8.459	8.188	7.917	3.31	3.31
31	8.137	7.871	7.605	3.38	3.38
32	7.828	7.568	7.308	3.44	3.44
33	7.532	7.277	7.022	3.5	3.5
34	7.248	6.999	6.75	3.56	3.56
35	6.977	6.733	6.489	3.63	3.63
36	6.716	6.477	6.238	3.69	3.69
37	6.466	6.232	5.998	3.75	3.75
38	6.227	5.998	5.769	3.81	3.81
39	5.997	5.773	5.549	3.88	3.88
40	5.776	5.557	5.338	3.94	3.94
41	5.564	5.35	5.136	4	4
42	5.36	5.151	4.942	4.06	4.06
43	5.166	4.961	4.756	4.13	4.13
44	4.978	4.778	4.578	4.19	4.19
45	4.799	4.603	4.407	4.25	4.25
46	4.625	4.434	4.243	4.31	4.31
47	4.46	4.273	4.086	4.38	4.38
48	4.301	4.118	3.935	4.44	4.44
49	4.148	3.969	3.79	4.5	4.5
50	4.001	3.826	3.651	4.56	4.56
51	3.86	3.689	3.518	4.63	4.63
52	3.724	3.557	3.39	4.69	4.69
53	3.594	3.431	3.268	4.75	4.75
54	3.468	3.309	3.15	4.81	4.81
55	3.349	3.193	3.037	4.88	4.88
56	3.233	3.081	2.929	4.94	4.94
57	3.123	2.974	2.825	5	5
58	3.015	2.87	2.725	5.06	5.06
59	2.913	2.771	2.629	5.13	5.13
60	2.815	2.676	2.537	5.19	5.19
61	2.721	2.585	2.449	5.25	5.25
62	2.63	2.497	2.364	5.31	5.31
63	2.543	2.413	2.283	5.38	5.38
64	2.459	2.332	2.205	5.44	5.44
65	2.379	2.255	2.131	5.5	5.5
66	2.301	2.18	2.059	5.56	5.56
67	2.228	2.109	1.99	5.63	5.63
68	2.156	2.04	1.924	5.69	5.69
69	2.088	1.974	1.86	5.75	5.75

70	2.021	1.91	1.799	5.81	5.81
71	1.958	1.849	1.74	5.88	5.88
72	1.897	1.791	1.685	5.94	5.94
73	1.839	1.735	1.631	6	6
74	1.782	1.68	1.578	6.06	6.06
75	1.728	1.628	1.528	6.13	6.13
76	1.676	1.578	1.48	6.19	6.19
77	1.626	1.53	1.434	6.25	6.25
78	1.578	1.484	1.39	6.31	6.31
79	1.531	1.439	1.347	6.38	6.38
80	1.486	1.396	1.306	6.44	6.44
81	1.443	1.355	1.267	6.5	6.5
82	1.401	1.315	1.229	6.56	6.56
83	1.362	1.277	1.192	6.63	6.63
84	1.323	1.24	1.157	6.69	6.69
85	1.285	1.204	1.123	6.75	6.75
86	1.249	1.169	1.089	6.81	6.81
87	1.214	1.136	1.058	6.88	6.88
88	1.181	1.104	1.027	6.94	6.94
89	1.148	1.073	0.998	7	7
90	1.116	1.042	0.968	7.06	7.06
91	1.085	1.013	0.941	7.13	7.13
92	1.056	0.985	0.914	7.19	7.19
93	1.026	0.957	0.888	7.25	7.25
94	0.998	0.93	0.862	7.31	7.31
95	0.971	0.904	0.837	7.38	7.38
96	0.944	0.879	0.814	7.44	7.44
97	0.918	0.854	0.79	7.5	7.5
98	0.893	0.83	0.767	7.56	7.56
99	0.867	0.806	0.745	7.63	7.63
100	0.843	0.783	0.723	7.69	7.69
101	0.819	0.76	0.701	7.75	7.75
102	0.796	0.738	0.68	7.81	7.81
103	0.772	0.716	0.66	7.88	7.88
104	0.749	0.694	0.639	7.94	7.94
105	0.727	0.673	0.619	8	8

R25=23KΩ±3% B25/50=4200K±3%					
Temp (°C)	resistance (KΩ)			% (resist.tol)	
	Rmax	R (t) Normal	Rmin	MAX(+)	MIN(-)
-30	538.771	513.115	487.459	5	5
-29	502.577	478.894	455.211	4.95	4.95
-28	469.29	447.408	425.526	4.89	4.89
-27	438.613	418.379	398.145	4.84	4.84
-26	410.288	391.564	372.84	4.78	4.78
-25	384.088	366.751	349.414	4.73	4.73
-24	359.817	343.754	327.691	4.67	4.67
-23	337.296	322.407	307.518	4.62	4.62
-22	316.375	302.567	288.759	4.56	4.56
-21	296.916	284.105	271.294	4.51	4.51
-20	278.794	266.905	255.016	4.45	4.45
-19	261.904	250.866	239.828	4.4	4.4
-18	246.146	235.895	225.644	4.35	4.35
-17	231.433	221.911	212.389	4.29	4.29
-16	217.685	208.838	199.991	4.24	4.24
-15	204.831	196.609	188.387	4.18	4.18
-14	192.805	185.163	177.521	4.13	4.13
-13	181.548	174.443	167.338	4.07	4.07
-12	171.005	164.399	157.793	4.02	4.02
-11	161.126	154.983	148.84	3.96	3.96
-10	151.866	146.153	140.44	3.91	3.91
-9	143.184	137.87	132.556	3.85	3.85
-8	135.04	130.096	125.152	3.8	3.8
-7	127.398	122.799	118.2	3.75	3.75
-6	120.225	115.946	111.667	3.69	3.69
-5	113.492	109.51	105.528	3.64	3.64
-4	107.168	103.462	99.756	3.58	3.58
-3	101.228	97.779	94.33	3.53	3.53
-2	95.647	92.437	89.227	3.47	3.47
-1	90.403	87.415	84.427	3.42	3.42
0	85.472	82.691	79.91	3.36	3.36
1	80.837	78.248	75.659	3.31	3.31
2	76.478	74.067	71.656	3.25	3.25
3	72.377	70.133	67.889	3.2	3.2
4	68.52	66.43	64.34	3.15	3.15
5	64.889	62.943	60.997	3.09	3.09
6	61.47	59.659	57.848	3.04	3.04
7	58.253	56.566	54.879	2.98	2.98
8	55.222	53.651	52.08	2.93	2.93
9	52.366	50.904	49.442	2.87	2.87
10	49.676	48.314	46.952	2.82	2.82
11	47.14	45.872	44.604	2.76	2.76
12	44.749	43.569	42.389	2.71	2.71
13	42.494	41.395	40.296	2.65	2.65
14	40.366	39.343	38.32	2.6	2.6
15	38.358	37.406	36.454	2.55	2.55
16	36.463	35.577	34.691	2.49	2.49
17	34.673	33.848	33.023	2.44	2.44
18	32.982	32.215	31.448	2.38	2.38

19	31.385	30.671	29.957	2.33	2.33
20	29.874	29.21	28.546	2.27	2.27
21	28.445	27.828	27.211	2.22	2.22
22	27.095	26.521	25.947	2.16	2.16
23	25.816	25.283	24.75	2.11	2.11
24	24.606	24.111	23.616	2.05	2.05
25	23.46	23	22.54	2	2
26	22.396	21.947	21.498	2.04	2.04
27	21.386	20.949	20.512	2.09	2.09
28	20.429	20.003	19.577	2.13	2.13
29	19.52	19.104	18.688	2.18	2.18
30	18.657	18.252	17.847	2.22	2.22
31	17.837	17.442	17.047	2.26	2.26
32	17.059	16.674	16.289	2.31	2.31
33	16.318	15.943	15.568	2.35	2.35
34	15.614	15.249	14.884	2.39	2.39
35	14.944	14.588	14.232	2.44	2.44
36	14.306	13.96	13.614	2.48	2.48
37	13.699	13.362	13.025	2.53	2.53
38	13.123	12.794	12.465	2.57	2.57
39	12.572	12.252	11.932	2.61	2.61
40	12.048	11.736	11.424	2.66	2.66
41	11.548	11.244	10.94	2.7	2.7
42	11.072	10.776	10.48	2.74	2.74
43	10.617	10.329	10.041	2.79	2.79
44	10.184	9.904	9.624	2.83	2.83
45	9.77	9.497	9.224	2.88	2.88
46	9.376	9.11	8.844	2.92	2.92
47	8.999	8.74	8.481	2.96	2.96
48	8.639	8.387	8.135	3.01	3.01
49	8.296	8.05	7.804	3.05	3.05
50	7.967	7.728	7.489	3.09	3.09
51	7.654	7.421	7.188	3.14	3.14
52	7.354	7.127	6.9	3.18	3.18
53	7.067	6.846	6.625	3.23	3.23
54	6.793	6.578	6.363	3.27	3.27
55	6.531	6.322	6.113	3.31	3.31
56	6.281	6.077	5.873	3.36	3.36
57	6.041	5.842	5.643	3.4	3.4
58	5.811	5.618	5.425	3.44	3.44
59	5.592	5.404	5.216	3.49	3.49
60	5.383	5.199	5.015	3.53	3.53
61	5.182	5.003	4.824	3.58	3.58
62	4.989	4.815	4.641	3.62	3.62
63	4.806	4.636	4.466	3.66	3.66
64	4.629	4.464	4.299	3.71	3.71
65	4.461	4.3	4.139	3.75	3.75
66	4.3	4.143	3.986	3.79	3.79
67	4.145	3.992	3.839	3.84	3.84
68	3.997	3.848	3.699	3.88	3.88
69	3.856	3.71	3.564	3.93	3.93

70	3.72	3.578	3.436	3.97	3.97
71	3.591	3.452	3.313	4.01	4.01
72	3.466	3.331	3.196	4.06	4.06
73	3.347	3.215	3.083	4.1	4.1
74	3.233	3.104	2.975	4.14	4.14
75	3.122	2.997	2.872	4.19	4.19
76	3.017	2.895	2.773	4.23	4.23
77	2.918	2.798	2.678	4.28	4.28
78	2.821	2.704	2.587	4.32	4.32
79	2.728	2.614	2.5	4.36	4.36
80	2.639	2.528	2.417	4.41	4.41
81	2.555	2.446	2.337	4.45	4.45
82	2.472	2.366	2.26	4.49	4.49
83	2.394	2.29	2.186	4.54	4.54
84	2.319	2.217	2.115	4.58	4.58
85	2.246	2.147	2.048	4.63	4.63
86	2.177	2.08	1.983	4.67	4.67
87	2.11	2.015	1.92	4.71	4.71
88	2.045	1.952	1.859	4.76	4.76
89	1.983	1.892	1.801	4.8	4.8
90	1.923	1.834	1.745	4.84	4.84
91	1.865	1.778	1.691	4.89	4.89
92	1.809	1.724	1.639	4.93	4.93
93	1.755	1.672	1.589	4.98	4.98
94	1.702	1.621	1.54	5.02	5.02
95	1.652	1.572	1.492	5.06	5.06
96	1.602	1.524	1.446	5.11	5.11
97	1.554	1.478	1.402	5.15	5.15
98	1.507	1.433	1.359	5.19	5.19
99	1.462	1.389	1.316	5.24	5.24
100	1.418	1.347	1.276	5.28	5.28
101	1.374	1.305	1.236	5.33	5.33
102	1.332	1.264	1.196	5.37	5.37
103	1.289	1.223	1.157	5.41	5.41
104	1.249	1.184	1.119	5.46	5.46
105	1.208	1.145	1.082	5.5	5.5