



# Service Manual

## Air-to-Water Heat pump



### IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are marked by ⚠ in the Schematic Diagrams, Circuit Board Diagrams, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without permission of manufacturer.



#### WARNING

- This service information is designed for experienced repair technicians only and is not designed for use by the general public.
- It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.
- Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the products dealt with in this service information by anyone else could result in serious injury or death.



#### PRECAUTION OF LOW TEMPERATURE

In order to avoid frosting, be assured of no refrigerant leakage during the installation or repairing of refrigerant circuit.



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## Safety Precautions











- Read the following “SAFETY PRECAUTIONS” carefully before installation.
- Electrical work must be installed by a licensed electrician. Be sure to use the correct rating and main circuit for the model to be installed.
- The caution items stated here must be followed because these important contents are related to safety. The meaning of each indication used is as below. Incorrect installation due to ignoring of the instruction will cause harm or damage, and the seriousness is classified by the following indications.
- Please leave this installation manual with the unit after installation.

 <b>WARNING</b>	This indication shows the possibility of causing death or serious injury.
 <b>CAUTION</b>	This indication shows the possibility of causing injury or damage to properties only.























- The items to be followed are classified by the symbols:

	Symbol with white background denotes item that is <b>PROHIBITED</b> from doing.
	Symbol with dark background denotes item that must be carried out.

- Carry out test run to confirm that no abnormality occurs after the installation.  
Then, explain to user the operation, care and maintenance as stated in instructions.  
Please remind the customer to keep the operating instructions for future reference.


 <b>WARNING</b>		
1.	Do not use unspecified cord, modified cord, joint cord or extension cord for power supply cord. Do not share the single outlet with other electrical appliances. Poor contact, poor insulation or over current will cause electrical shock or fire.	
2.	Do not tie up the power supply cord into a bundle by band. Abnormal temperature rise on power supply cord may happen.	
3.	Keep plastic bag (packaging material) away from small children, it may cause suffocation.	
4.	Do not use pipe wrench to install refrigerant piping. It might deform the piping and cause the unit to malfunction.	
5.	Do not purchase unauthorized electrical parts for installation, service, maintenance and etc. They might cause electrical shock or fire.	
6.	Do not modify the wiring of Indoor Unit for installation of other components (i.e. heater, etc). Overloaded wiring or wire connection points may cause electrical shock or fire.	
7.	Do not add or replace refrigerant other than specified type. It may cause product damage, burst and injury etc.	
8.	Do not use joint cable for Indoor / Outdoor Unit connection cable. Use specified Indoor / Outdoor Unit connection cable, refer to instruction <b>CONNECT THE CABLE TO THE INDOOR UNIT</b> and connect tightly for Indoor / Outdoor Unit connection. Clamp the cable so that no external force will be acted on the terminal. If connection or fixing is not perfect, it will cause heat up or fire at the connection.	
9.	Do not install outdoor unit near handrail of veranda. When installing outdoor unit at veranda of high rise building, child may climb up to outdoor unit and cross over the handrail and causing accident.	

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10.	Do not insert your fingers or other objects into the unit, high speed rotating fan may cause injury. 	
11.	Do not sit or step on the unit, you may fall down accidentally. 	
12.	For electrical work, follow local wiring standard, regulation and this installation instruction. An independent circuit and single outlet must be used. If electrical circuit capacity is not enough or defect found in electrical work, it will cause electrical shock or fire.	
13.	For water circuit installation work, follow to relevant European and national regulations (including EN61770) and local plumbing and building regulation codes.	
14.	Engage dealer or specialist for installation. If installation done by the user is defective, it will cause water leakage, electrical shock or fire.	
15.	<ul style="list-style-type: none"> <li>This is a R410A model, when connecting the piping, do not use any existing (R22) pipes and flare nuts. Using such same may cause abnormally high pressure in the refrigeration cycle (piping), and possibly result in explosion and injury. Use only R410A refrigerant.</li> <li>Thickness of copper pipes used with R410A must be 0.8 mm or more. Never use copper pipes thinner than 0.8 mm.</li> <li>It is desirable that the amount of residual oil is less than 40mg/10m.</li> </ul>	
16.	When install or relocate Indoor Unit / Outdoor Unit, do not let any substance other than the specified refrigerant, e.g. air etc. mix into refrigerant cycle (piping). Mixing of air etc. will cause abnormal high pressure in refrigeration cycle and result in explosion, injury etc..	
17.	Install according to this installation instruction strictly. If installation is defective, it will cause water leakage, electrical shock or fire.	
18.	Install at a strong and firm location which is able to withstand the set's weight. If the strength is not enough or installation is not properly done, the set will drop and cause injury.	
19.	This equipment is strongly recommended to be installed with Residual Current Device (RCD) on-site according to the respective national wiring rules or country-specific safety measures in terms of residual current.	
20.	During installation, install the refrigerant piping properly before run the compressor. Operation of compressor without fixing refrigeration piping and valves at opened condition will cause suck-in of air, abnormal high pressure in refrigeration cycle and result in explosion, injury etc.	
21.	During pump down operation, stop the compressor before remove the refrigeration piping. Removal of refrigerant piping while compressor is operating and valves are opened will cause suck-in of air, abnormal high pressure in refrigerant cycle and result in explosion, injury etc.	
22.	Tighten the flare nut with torque wrench according to specified method. If the flare nut is over tightened, after a long period, the flare may break and cause refrigerant gas leakage.	
23.	After completion of installation, confirm there is no leakage of refrigerant gas. It may generate toxic gas when the refrigerant contacts with fire.	
24.	Ventilate the room if there is refrigerant gas leakage during operation. Extinguish all fire sources if present. It may cause toxic gas when the refrigerant contacts with fire.	
25.	Only use the supplied or specified installation parts, else, it may cause unit vibrate loose, water leakage, electrical shock or fire.	
26.	The unit is only for use in closed water system. Utilization in an open water circuit may lead to excessive corrosion of water piping and risk of incubating bacteria colonies, particularly Legionella, in water.	
27.	If there is any doubt about the installation procedure or operation, always contact the authorized dealer for advice and information.	
28.	Select a location where in case of water leakage, the leakage will not cause damage to other properties.	
29.	When installing electrical equipment at wooden building of metal lath or wire lath, in accordance with electrical facility standard, no	

	electrical contact between equipment and building is allowed. Insulator must be installed in between.	
30.	Any work carried out on the Indoor Unit / Outdoor Unit after removing any panels which is secured by screws, must be carried out under the supervision of authorized dealer and licensed installation contractor.	!
31.	This unit must be properly earthed. The electrical earth must not be connected to a gas pipe, water pipe, the earth of lightning rod or a telephone. Otherwise there is a danger of electrical shock in the event of an insulation breakdown or electrical earth fault in the outdoor unit.	⚡
32.	Do not use joint cable for outdoor connection cable. Use specified outdoor connection cable, refer to instruction <b>CONNECT THE CABLE TO THE OUTDOOR UNIT</b> and connect tightly for outdoor connection. Clamp the cable so that no external force will be acted on the terminal. If connection or fixing is not perfect, it will cause heat up or fire at the connection.	!

### ⚠ CAUTION

1.	Do not install the Indoor Unit / Outdoor Unit at place where leakage of flammable gas may occur. In case gas leaks and accumulates at surrounding of the unit, it may cause fire.	⊘
2.	Do not release refrigerant during piping work for installation, re-installation and during repairing a refrigeration parts. Take care of the liquid refrigerant, it may cause frostbite.	⊘
3.	Do not install this appliance in a laundry room or other high humidity location. This condition will cause rust and damage to the unit.	⊘
4.	Make sure the insulation of power supply cord does not contact hot part (i.e. refrigerant piping) to prevent from insulation failure (melt).	⊘
5.	Do not apply excessive force to water pipes that may damage the pipes. If water leakage occurs, it will cause flooding and damage to other properties.	⊘
6.	Do not touch the sharp aluminum fin, sharp parts may cause injury. 	⊘
7.	Do not release refrigerant into the atmosphere. The product contains fluorinated greenhouse gases and that its functioning relies upon such gases.	⊘
8.	Select an installation location which is easy for maintenance.	!
9.	Carry out drainage piping as mentioned in installation instructions. If drainage is not perfect, water may enter the room and damage the furniture.	!
10.	<p>Power supply connection to Indoor Unit.</p> <ul style="list-style-type: none"> <li>Power supply point should be in easily accessible place for power disconnection in case of emergency.</li> <li>Must follow local national wiring standard, regulation and this installation instruction.</li> <li>Strongly recommended to make permanent connection to a circuit breaker.</li> </ul> <p>- Power supply 1: Use approved 20A 4-poles circuit breaker with a minimum contact gap of 3.0 mm.</p> <p>- Power supply 2: Use approved 15/16A 2-poles circuit breaker with a minimum contact gap of 3.0 mm. (Only applicable for S*C09*3E8)</p> <p style="text-align: center;">or</p> <p>Use approved 20A 4-poles circuit breaker with a minimum contact gap of 3.0mm. (Only applicable for S*C12*9E8/S*C16*9E8)</p>	!
11.	Ensure the correct polarity is maintained throughout all wiring. Otherwise, it will cause electrical shock or fire.	!
12.	After installation, check the water leakage condition in connection area during test run. If leakage occurs, it will cause damage to other properties.	!
13.	<p>Installation work.</p> <p>It may need two or more people to carry out the installation work. The weight of Indoor Unit / Outdoor Unit might cause injury if carried by one person.</p>	!

## 1. General Information

### 1.1 Measurements

#### 1.1.1 Outdoor units

Model	Dimension (W*H*D)	Net/Gross Weight (kg)	Power Supply
FHOF-WHS-100CE3	1032×810×445	56.3/61	220~240V/1Ph/50Hz
FHOF-WHS- -160CE3-3F	1014×1430×450	124/138	380~415V/3Ph/50Hz

#### 1.1.2 Hydronic module

Model	Dimension (W*H*D)	Net/Gross Weight (kg)	Power Supply
FHIF-WHS-120CE3	490×910×340	48/56	220~240V/1Ph/50Hz
FHIF-WHS-160CE3	490×910×340	48/56	220~240V/1Ph/50Hz

### 1.2 External outlook

#### 1.2.1 Outdoor unit

FHOF-WHS-100CE3



FHOF-WHS-160CE3-3F



### 1.2.2 Hydronic module

FHIF-WHS-120CE3

FHIF-WHS-160CE3



## 2. Specifications

Model			FHOF-WHS-100CE3	
Power supply		V/Ph/Hz	220~240/1/50	
Performance data				
Heating (A7°C/W35°C)	Capacity	kW	10.8	
	Power input	kW	2.82	
	COP	kW/kW	3.84	
Heating (A7°C/W55°C)	Capacity	kW	9.6	
	Power input	kW	3.5	
	COP	kW/kW	2.74	
Heating (A2°C/W35°C)	Capacity	kW	10.6	
	Power input	kW	3.0	
	COP	kW/kW	3.53	
Heating (A2°C/W55°C)	Capacity	kW	9.2	
	Power input	kW	3.68	
	COP	kW/kW	2.5	
Seasonal space heating energy eff. Class (average climate general)	water outlet W 35°C		A++ (ETA%: 203)	
	water outlet W 55°C		A++ (ETA%:131,1)	
SCOP	water outlet W 35°C		5.15	
	water outlet W 55°C		3.35	
Sound pressure level		dB(A)	60	
Physical data				
Dimension (W×H×D)		mm	1032x810x445	
Packing (W×H×D)		mm	1075×875×495	
Net/gross weight		kg	56.3/61	
Compressor	Brand		GMCC	
	Type		Rotary DC Inverter	
	Model		EKTF310D43UMT	
	Poles		6	
	Speed	rps	12~120	
	Oil		POE/1000mL	
Outdoor fan	Brand		Yongan	
	Motor type		Brushless DC motor	
	Model		DRN-310-90-8	
	Number of fans		1	
	Air flow	m3/h	4000	
	Number of rows		2	

Air side heat exchanger	Tube pitch(a)×row pitch(b)	mm	25×21.7
	Tube dia. and type		Φ9.52 inner grooved copper
	Fin space	mm	1.6
	Fin type (code)		Hydrophilic aluminum
	Coil length×height×width	mm	1003×750×43.3
	Number of circuits		4
<b>Piping connections</b>			
Liquid pipe	Type		Flaring
	Dia.(OD)	mm	Φ9.52
Gas pipe	Type		Flaring
	Dia.(OD)	mm	Φ15.88
Max. piping length		m	20
Max. height difference	Outdoor unit upside	m	10
	Outdoor unit downside	m	10
Refrigerant	Type		R32
	Quantity	kg	3
	Throttle type		EXV
	Additional charge	g	(Total pipe length - 5)m *30g/m
Ambient temperature range	Cooling	℃	-5~46℃
	Heating	℃	-28~43℃
	Sanitary hot water	℃	-28~43℃
Water temperature range	Cooling	℃	5~25℃
	Heating	℃	25~60℃
	Sanitary hot water	℃	40~60℃

*Note:*

*Integrated value takes into consideration the capacity drop during frosting and defrosting periods.*

*The capacity is tested in free frequency situation.*

*Water flow  $0.172\text{m}^3/(\text{h} \cdot \text{kW})$*

Model		FHOH-WHS-160CE3-3F	
Power supply		V/Ph/Hz	380~415/3/50
<b>Performance data</b>			
Heating (A7°C/W35°C)	Capacity	kW	17.28
	Power input	kW	4.75
	COP	kW/kW	3.64
Heating (A7°C/W55°C)	Capacity	kW	15.36
	Power input	kW	5.91
	COP	kW/kW	2.6
Heating (A2°C/W35°C)	Capacity	kW	16.96
	Power input	kW	5.06
	COP	kW/kW	3.35
Heating (A2°C/W55°C)	Capacity	kW	14.72
	Power input	kW	6.21
	COP	kW/kW	2.37
Seasonal space heating energy eff. Class (average climate general)	water outlet W 35°C		A++ (ETA%: 159.7)
	water outlet W 55°C		A++ (ETA%: 232.1)
SCOP	water outlet W 35°C		4.07
	water outlet W 55°C		3.38
Sound pressure level		dB(A)	70
<b>Physical data</b>			
Dimension (W×H×D)		mm	1014×1430×450
Packing (W×H×D)		mm	1095×1545×485
Net/gross weight		kg	124/138
Compressor	Brand		GMCC
	Type		Rotary DC Inverter
	Model		EKTQ420D1UMU
	Poles		6
	Speed	rps	12~120
	Oil		POE/1400mL
Outdoor fan	Brand		Yongan
	Motor type		Brushless DC motor
	Model		DR-310-100-8-2
	Number of fans		2
	Air flow	m3/h	6100
	Number of rows		2



Air side heat exchanger	Tube pitch(a)×row pitch(b)	mm	25×21.7
	Tube dia. and type		Φ9.52 inner grooved copper
	Fin space	mm	1.6
	Fin type (code)		Hydrophilic aluminum
	Coil length×height×width	mm	995×1350×43.3
	Number of circuits		7
<b>Piping connections</b>			
Liquid pipe	Type		Flaring
	Dia.(OD)	mm	Φ9.52
Gas pipe	Type		Flaring
	Dia.(OD)	mm	Φ15.88
Max. piping length		m	50
Max. height difference	Outdoor unit upside	m	20
	Outdoor unit downside	m	20
Refrigerant	Type		R32
	Quantity	kg	3.8
	Throttle type		EXV
	Additional charge	g	(Total pipe length - 5)m *30g/m
Ambient temperature range	Cooling	℃	-5~46℃
	Heating	℃	-28~43℃
	Sanitary hot water	℃	-28~43℃
Water temperature range	Cooling	℃	5~25℃
	Heating	℃	25~60℃
	Sanitary hot water	℃	40~60℃

*Note:*

*Integrated value takes into consideration the capacity drop during frosting and defrosting periods.*

*The capacity is tested in free frequency situation.*

*Water flow 0.172m<sup>3</sup>/(h · kW)*

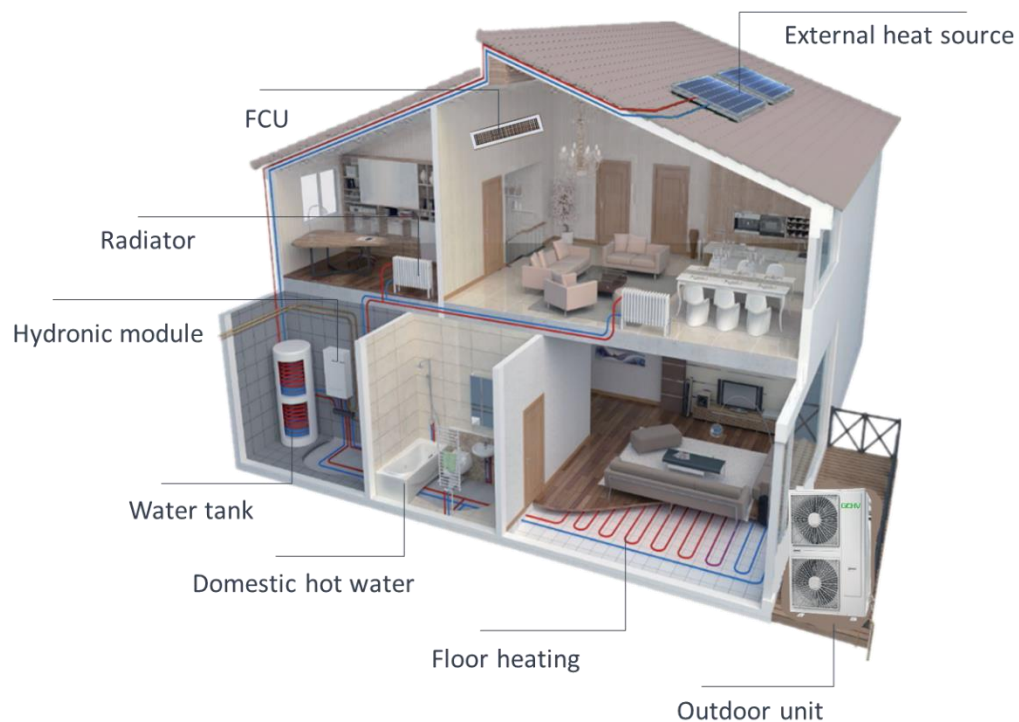
## 2.2 Hydronic module

Hydronic box				FHIF-WHS-120CE3	FHIF-WHS-160CE3
Power supply			V/Ph/ Hz	220~240/1/50	220~240/1/50
Leaving water temperatur e	Space heating		C°	25~60	25~60
	Space cooling		C°	5~25	5~25
	Domestic hot water		C°	40~60	40~60
Max. power input			kW	3.6	3.6
Max. current input			A	17	17
Sound power level			dB(A)	45	45
Dimension (W×H×D)			mm	490*910*340	490*910*340
Packing (W×H×D)			mm	620*1105*425	620*1105*425
Net/gross weight			kg	48/56	48/56
Water circuit	Piping connectio n Dia.	Outlet	mm	DN32	DN32
		Inlet	mm	DN32	DN32
	Safty valve		kPa	600	600
	Drainage pipe Dia.		mm	DN20	DN20
	Expansion tank	Volume	L	2	2
		Max. water pressure	kPa	800	800
		Pre pressure	kPa	150	150
	Water side heat exchanger	Type		Plate type	Plate type
		Volume	L	1.22	1.22
	Water pump	Brand		wilo	
		Model		Para 25/9	
		Pump head	m	9	
Refrigeran t circuit	Liquid side Dia.		mm	Φ9.52	Φ9.52
	Gas side Dia.		mm	Φ15.88	Φ15.88
Back-up E-heater	Power supply		V/Ph/ Hz	230V/1Ph/50Hz	230V/1Ph/50H z
	Capacity		kW	3kW	3kW
	Step			1	1
	Max. power input		kW	3kW	3kW
	Max. current input		A	13.6A	13.6A

### 3. Features

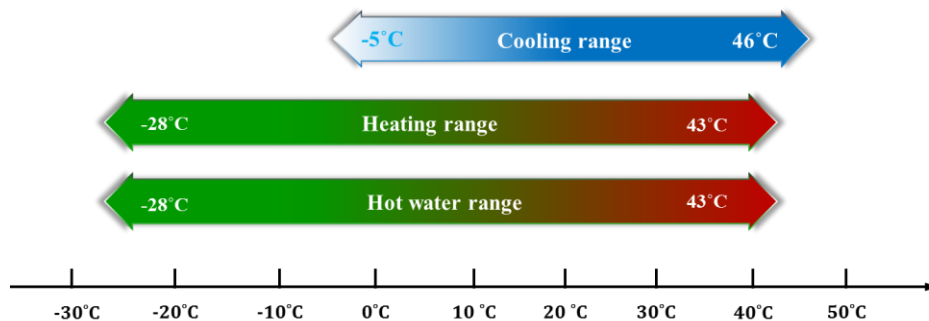
#### 3.1 Outdoor unit

- Compact structure design, flexible installation.
- Long piping up to 30 meter with height difference 20 meter, no need extra refrigerant within 5m refrigerant pipe length.
- Heating, cooling & domestic hot water mode, total heat solution.

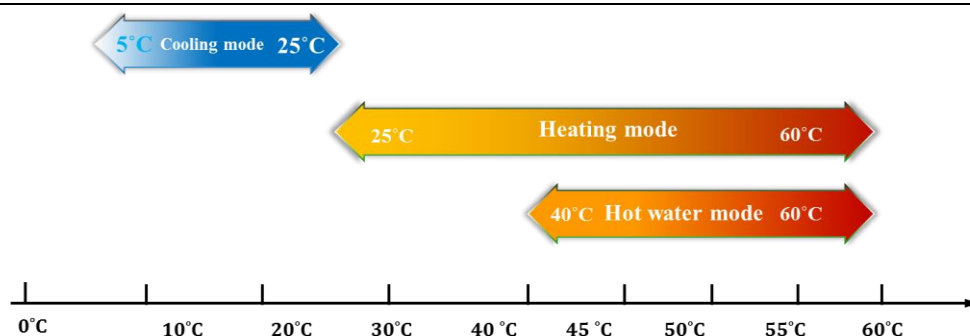


Pic.3-1 Total heat solution

- Wide operation ambient temperature range & Wide water outlet temperature range



Pic.3-2 Ambient temperature range



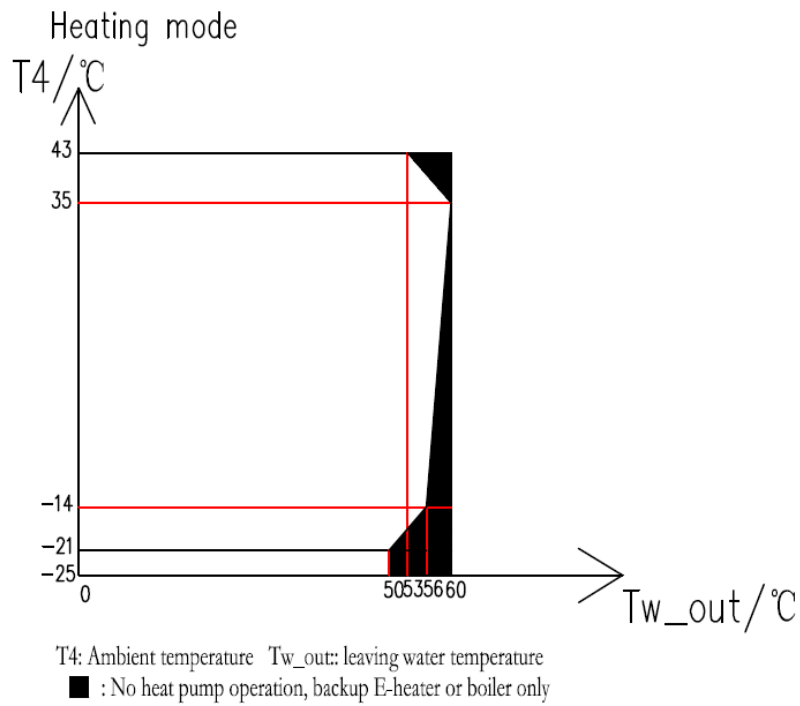
Pic.3-3 Water outlet temperature range

- DC inverter technology to guarantee optimal operational reliability and efficiency. Offers heating capacity of 85% at -15°C thanks to the large heat exchanger and large compressor.
- Seasonal space heating energy efficiency is up to A++ @35°C and @55°C.

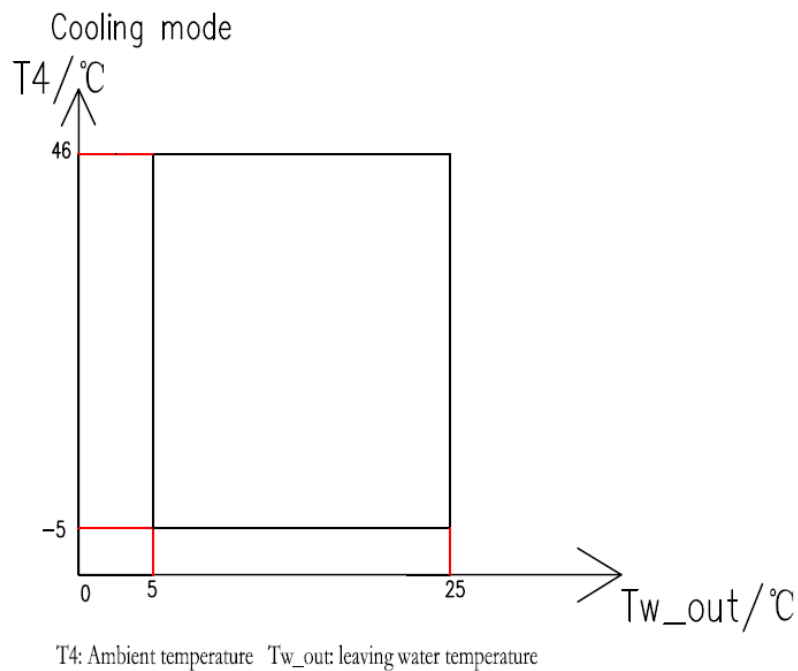
## 3.2 Hydronic module

- All hydronic components are pre-assembled, easy for installation.
- Backup E-heater for additional heating during extremely cold outdoor temperatures. The capacity of E-heater is adjustable.
- Standard drain pan in the hydronic box, no worry about condensate water.
- Plate heat exchanger enhances the efficiency.
- Standard with water flow switch, inverter water pump, pressure gauge and expansion tank.

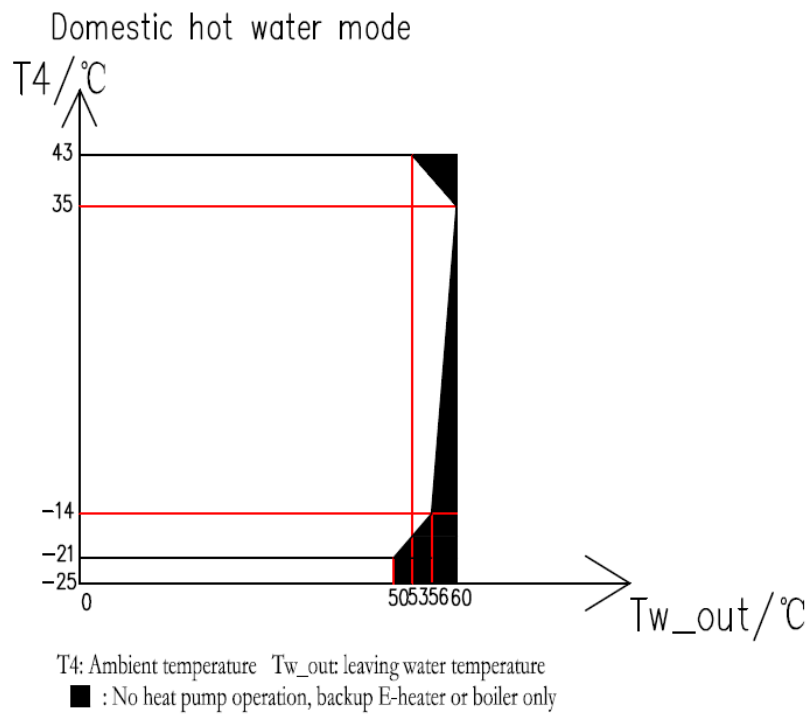
## 4. Operation range



Pic.4-1 Heating mode operation range



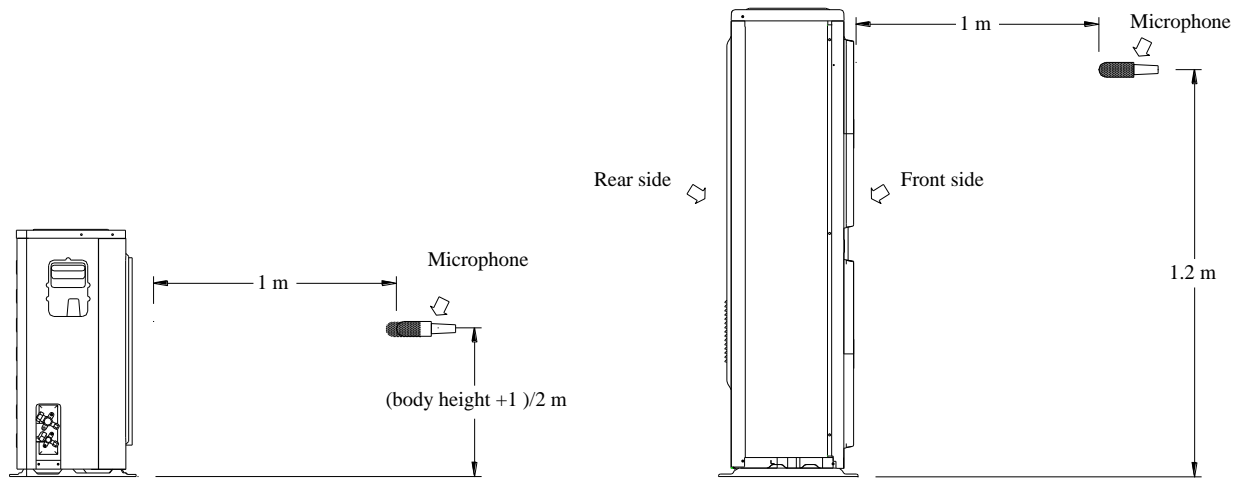
Pic.4-2 Cooling mode operation range



Pic.4-3 Domestic hot water mode operation range

## 5. Sound pressure level

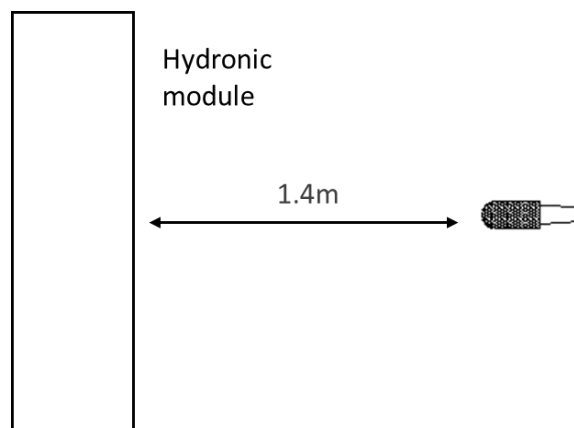
### Outdoor unit:



Pic.5-1 Outdoor unit sound test diagram

Model	Sound pressure level (dB(A))
FHOF-WHS-100CE3	57
FHOF-WHS-160CE3-3F	59

### Hydronic module:


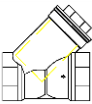








Pic.5-2 Hydronic module sound test diagram

Model	Sound pressure level (dB(A))
FHIF-WHS-120CE3	32
FHIF-WHS-160CE3	32

## 6. Accessories

### Accessories for hydronic module

Name	Pic.	QTY	Notes
Wired controller communication wire		1	25m 5-core communication wire
Y-type filter		1	Connected in water inlet pipe
Wall mounted board		1	
Temperature sensor		1	5kΩ, for DHW tank
Cable ties		3	
Wired controller cover		1	
Outdoor unit installation & owner's manual		1	
Hydronic module installation & owner's manual		1	
Wired controller installation & owner's manual		1	



## 7. Performance data

### 7.1 Heating capacity

FHIF-WHS-120CE3 / FHOFF-WHS-100CE3

LWE Tamb	30			35			40			45			50			55			60		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25/-	5.43	3.12	1.74	5.40	3.39	1.59	5.04	3.55	1.42	4.70	3.51	1.34	2.86	2.25	1.27						
-20/-	7.28	3.01	2.41	7.20	3.19	2.26	6.08	3.02	2.01	5.64	3.09	1.82	5.10	3.54	1.44	3.78	2.98	1.27			
-15/-	8.63	3.36	2.57	8.50	3.52	2.41	7.79	3.62	2.15	7.52	3.83	1.96	7.10	4.00	1.77	6.75	4.14	1.63			
-7/-8	10.40	3.39	3.07	10.20	3.54	2.88	8.65	3.64	2.37	8.27	3.99	2.07	7.55	4.00	1.89	7.11	4.12	1.73	4.95	3.26	1.52
2/1	10.80	2.89	3.73	10.60	3.00	3.53	10.19	3.04	3.36	9.60	3.14	3.06	9.31	3.27	2.84	9.20	3.68	2.50	6.00	2.78	2.16
7/6	11.00	2.71	4.06	10.80	2.82	3.84	10.49	2.91	3.61	10.19	3.04	3.35	9.79	3.17	3.08	9.60	3.50	2.74	6.80	2.83	2.40
15/12	11.50	2.35	4.89	11.30	2.37	4.76	10.78	2.41	4.48	10.48	2.78	3.77	9.98	3.16	3.16	9.80	3.46	2.83	7.00	3.38	2.07
20/15	11.70	1.74	6.74	11.60	1.97	5.88	10.98	2.08	5.29	10.67	2.43	4.39	10.17	2.82	3.60	10.00	2.94	3.40	7.30	2.62	2.78
25/18	11.90	1.66	7.15	11.80	1.82	6.48	11.27	1.88	5.98	10.86	2.20	4.94	10.36	2.47	4.19	10.20	2.70	3.77	7.50	2.56	2.94
35/24	10.80	1.35	7.98	10.50	1.52	6.92	10.00	1.54	6.50	9.22	1.69	5.45	8.74	1.96	4.45	9.00	2.27	3.97	6.80	2.02	3.37
43/28	10.60	1.30	8.15	10.30	1.35	7.63	9.80	1.53	6.42	8.92	1.51	5.91	8.36	1.63	5.13	8.60	1.99	4.31			

*Integrated value takes into consideration the capacity drop during frosting and defrosting periods. The capacity is tested in free frequency situation.*

*Remark:*

*LWE: Leaving water temperature (C°);*

*Tamb: Ambient temperature (C°);*

*HC: Heating capacity (kW);*

*PI: Power input (kW)*

## FHIF-WHS-160CE3 / FHOE-WHS-160CE3-3F

LWE Tamb	30			35			40			45			50			55			60		
	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP	HC	PI	COP
-25/-	8.96	5.26	1.70	8.64	5.71	1.51	8.48	5.98	1.42	8.00	5.93	1.35	4.84	3.87	1.25						
-20/-	12.00	5.08	2.36	11.52	5.38	2.14	10.24	5.09	2.01	9.60	5.22	1.84	8.96	5.97	1.50	6.57	4.94	1.33			
-15/-	14.24	5.67	2.51	13.60	5.94	2.29	13.12	6.10	2.15	12.80	6.46	1.98	12.48	6.75	1.85	12.00	6.98	1.72			
-7/-8	16.64	5.72	2.91	16.32	5.98	2.73	14.56	6.14	2.37	14.08	6.74	2.09	13.28	6.74	1.97	12.64	6.95	1.82	8.80	5.50	1.60
2/1	17.28	4.88	3.54	16.96	5.06	3.35	16.64	5.12	3.25	15.84	5.30	2.99	15.68	5.52	2.84	14.72	6.21	2.37	9.60	4.68	2.05
7/6	17.60	4.57	3.85	17.28	4.75	3.64	17.12	4.91	3.49	16.80	5.12	3.28	16.48	5.35	3.08	15.36	5.91	2.60	10.88	4.77	2.28
15/12	18.40	3.96	4.64	18.08	4.00	4.52	17.60	4.06	4.33	17.28	4.69	3.68	16.80	5.32	3.16	15.68	5.84	2.68	11.20	5.71	1.96
20/15	18.72	2.93	6.40	18.56	3.33	5.58	17.92	3.50	5.12	17.60	4.10	4.29	17.12	4.76	3.60	16.00	4.96	3.22	11.68	4.42	2.64
25/18	19.04	2.81	6.78	18.88	3.07	6.15	18.40	3.18	5.79	17.92	3.71	4.83	17.44	4.16	4.19	16.32	4.56	3.58	12.00	4.31	2.78
35/24	17.28	2.28	7.58	16.80	2.56	6.56	16.32	2.59	6.29	15.20	2.85	5.33	14.72	3.31	4.44	14.40	3.82	3.77	10.88	3.40	3.20
43/28	16.96	2.19	7.73	16.48	2.28	7.24	16.00	2.58	6.21	14.72	2.55	5.78	14.08	2.75	5.12	13.76	3.36	4.09			

Integrated value takes into consideration the capacity drop during frosting and defrosting periods. The capacity is tested in free frequency situation.

Remark:

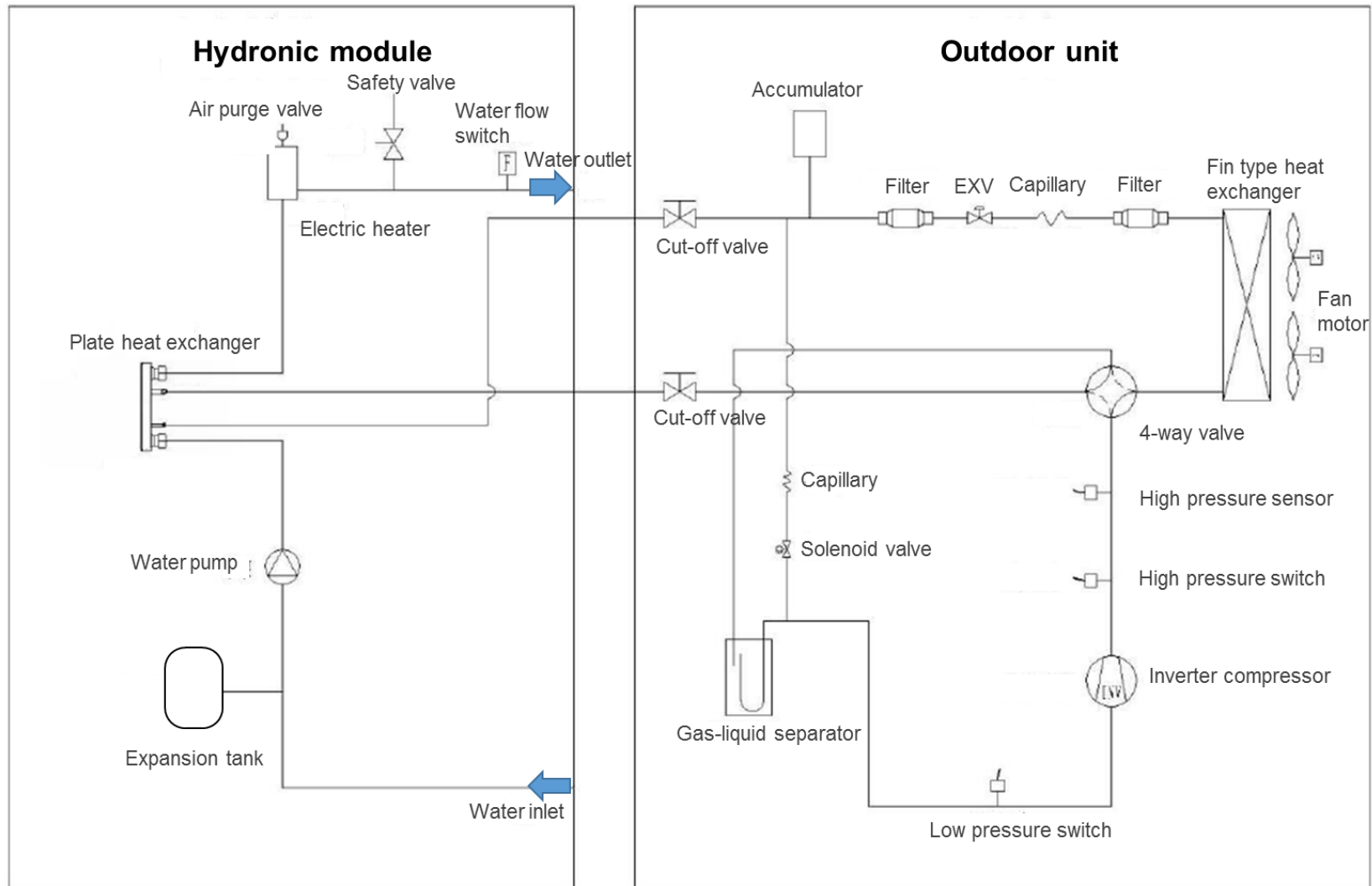
LWE: Leaving water temperature (C°);

Tamb: Ambient temperature(C°);

HC: Heating capacity (kW);

PI: Power input (kW)

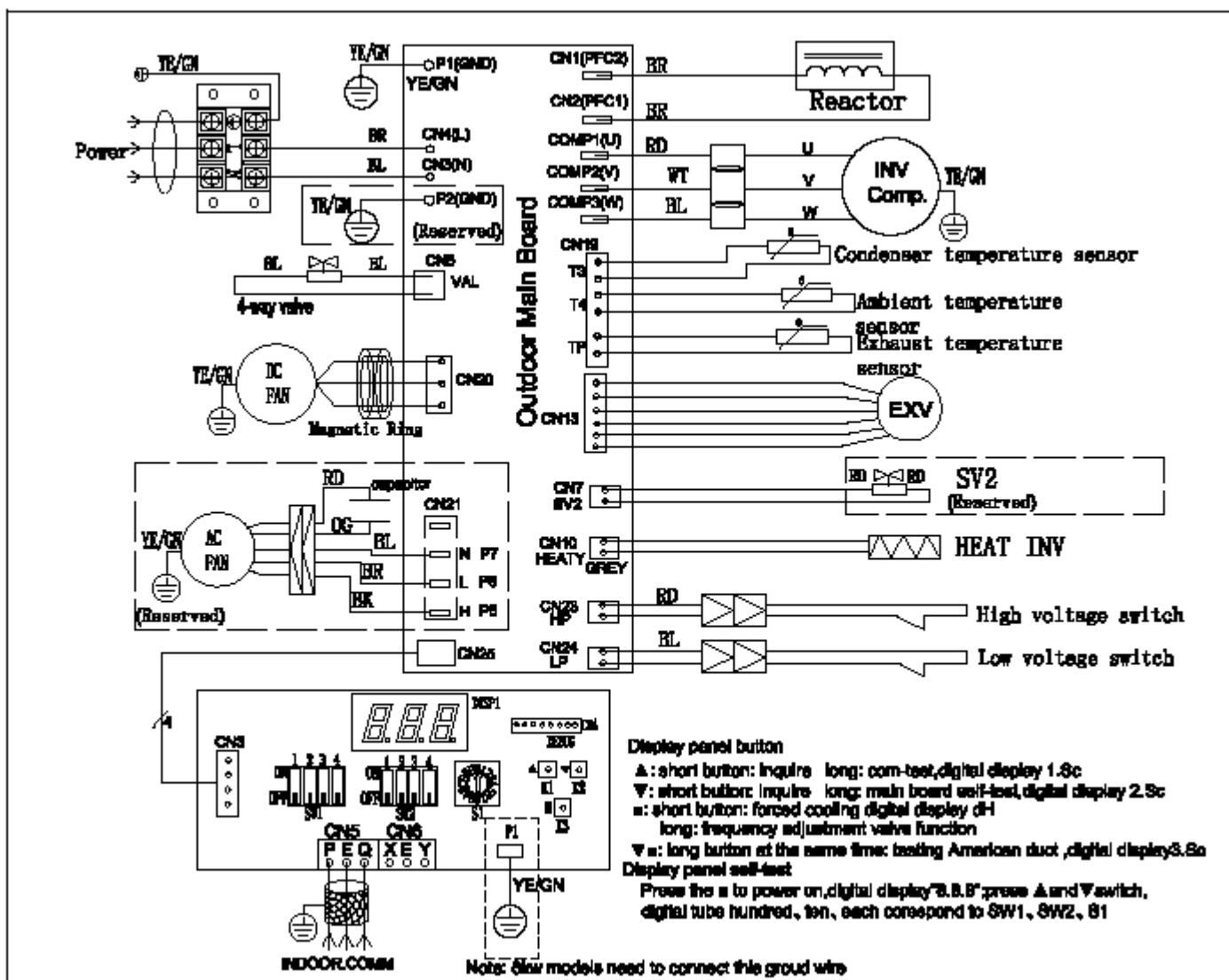
## 8. System diagram



## 9. Wiring diagram

## 9.1 Outdoor unit

### 9.1.1 FHOF-WHS-100CE3

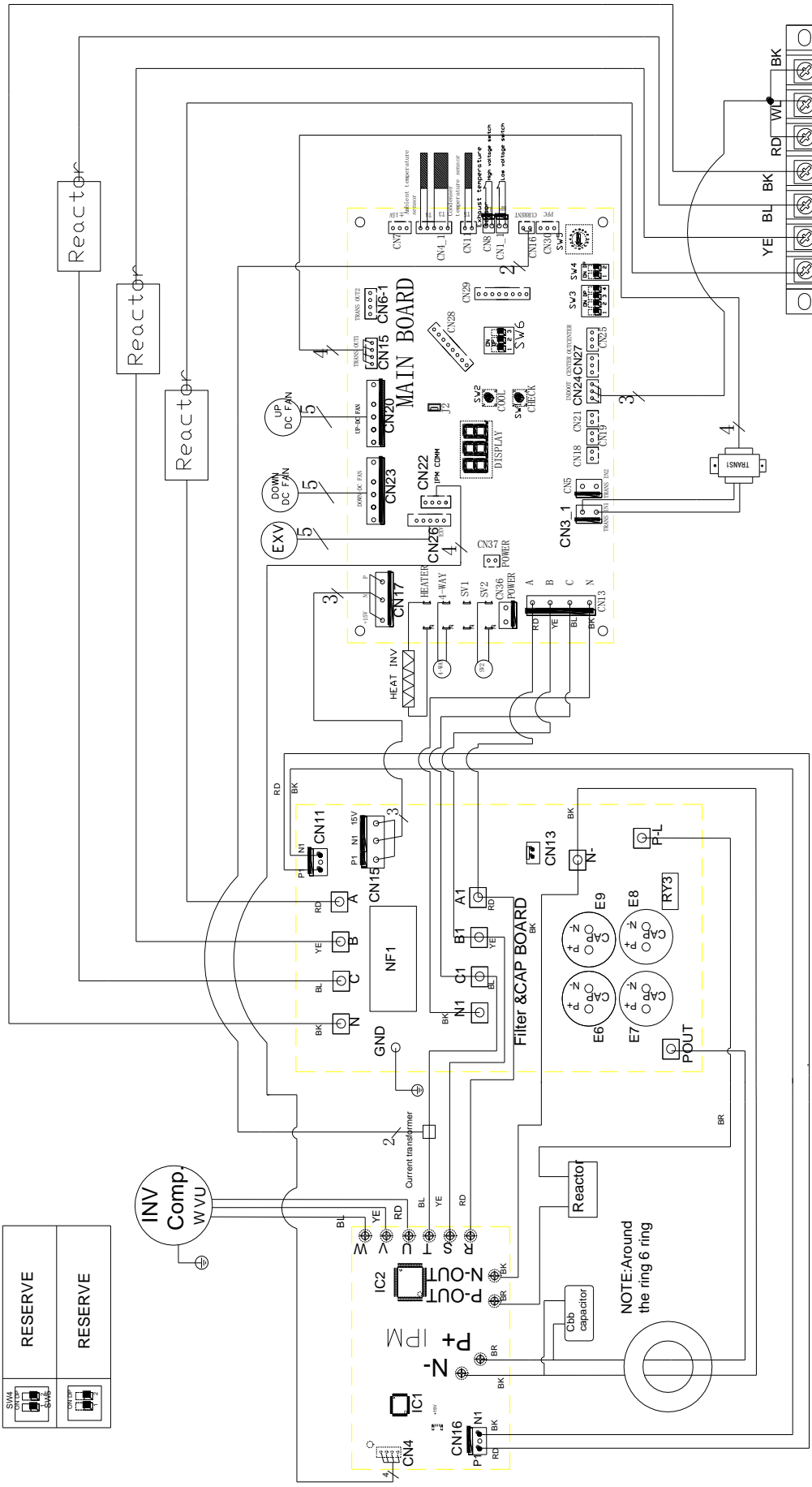


### 9.1.2 FHOF-WHS-160CE3-3F

802049390010 V.1

DEFAULT SETTING

SW1 ON/OFF	RESERVE
SW2 ON/OFF	RESERVE

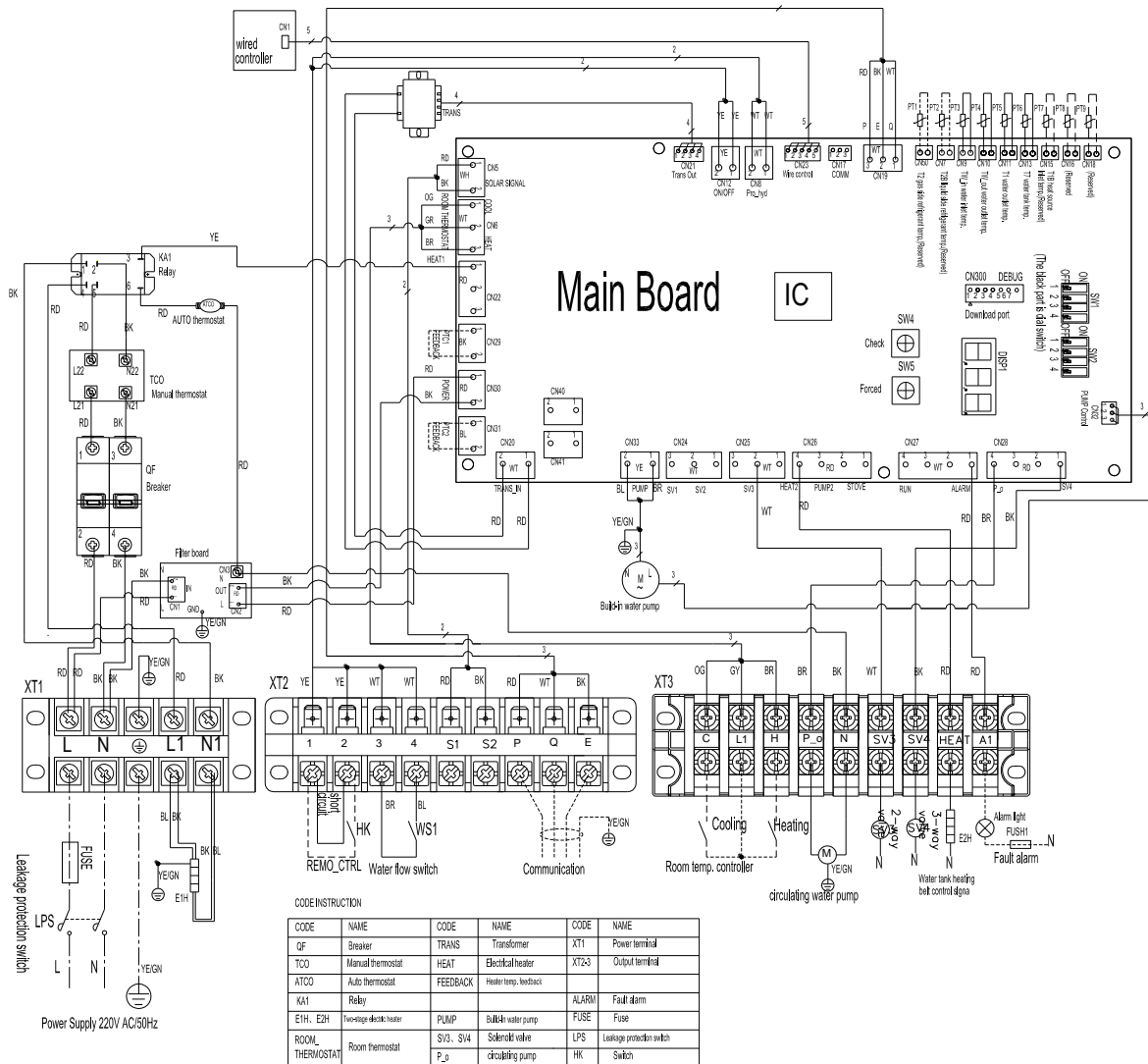


Caution1: The E1 E2 electrolytic capacitors must finish releasing electricity after outage.

Caution 2: The Mutual reactors must be through with power cord.

Start Time Setting		High-order address		Low-order address		SW6 power		Factory Default	
SW3	12min	SW4	0-15	SW5	0-15	14KW	14KW	SW3	SW6
	3min (Factory Default)		0-15		0-15	16KW	16KW	SW4	SW5
			0-15		0-15	18KW	18KW	SW5	SW6
			0-15		0-15			SW6	SW7
			0-15		0-15			SW7	SW8

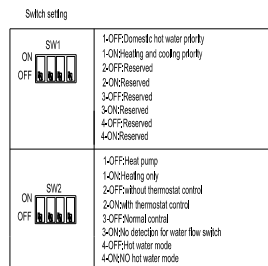
## 9.2 Hydronic module



Check table	
NUM	Display content
1	Outdoor power
2	Indoor unit setting mode
3	Outdoor unit running mode
4	Indoor unit demand
5	Setting temperature Ts1/Ts2
6	T1 water outlet temperature
7	Tw_in Heat exchange inlet water temperature sensor
8	Tw_out Heat exchange outlet water temperature sensor
9	T7 tank temperature
10	T4 ambient temperature
11	Last time error code
12	Previous two error code
13	Previous three error code
14	Software code
15	Water pump gear
16	Reserved

Note: spot check button is SW4.

Fault and protection code table	
Code	Faults and protections
E0	Water flow switch fault
E1	Comm fault between ODU and hydraulic module
E2	T1 water outlet temp. sensor fault
E3	T2 gas side temp. sensor fault(reserved)
E4	T2B liquid side temp. sensor fault(reserved)
E5	Outdoor unit fault
E6	T5 water tank temp. sensor fault (reserved)
E7	Tw_in Heat exchange inlet water temperature sensor fault
E8	Tw_out Heat exchange outlet water temperature sensor fault
E9	Comm fault between wired controller and hydraulic module
P0	EEPROM protection
P1	Excessive temp. difference between water outlet and inlet
P2	Insufficient water protection
P3	T1 and Tw_out fault protection



- The power supply is equipped with a leakage protection switch and a fuse to provide reliable protection; the power supply must be properly wired and reliable; an external load greater than 1.5A must be controlled by an AC contactor;
- Normally displayed content: 0—shutdown (standby); 2—cooling start; 3—heating start; antifreeze d0; defrosting dF; display at fault—corresponding fault code;
- The indoor system chip sets the check button, and the operation status of the outdoor system can be observed through the spot check. Convenient for engineering and technical personnel to maintain. For the specific check display sequence, please see the check code table;
- When servicing IDU and ODU, be sure to disconnect the power supply first, and check according to the corresponding classification faults. See the fault protection code table for specific protection faults;
- The REMO\_CTRL is used to remotely start and stop the units. It is short-circuited at the factory, and units use wired controller to start and stop. If it is necessary to use the REMO\_CTRL, the short line should be removed and controlled by the opening and closing switch HK. Start and stop of the unit (when HK is closed, the unit is turned on; when HK is disconnected, the unit is stopped).

## 9.3 Printed circuit board

### 1. Single phase outdoor unit



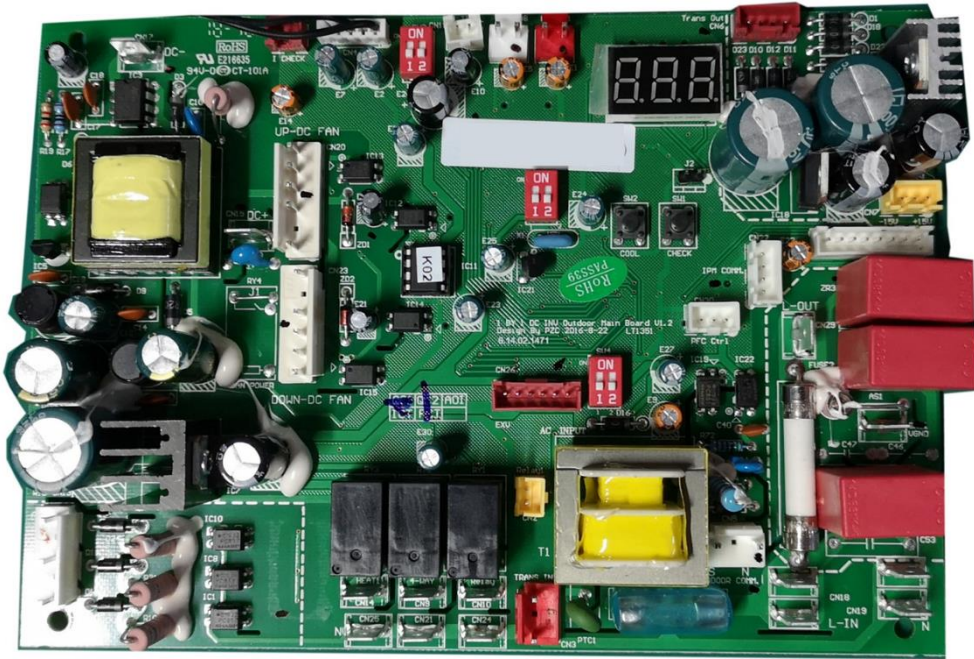
Main integrated PCB



Display board

### 2. 3-phase outdoor unit





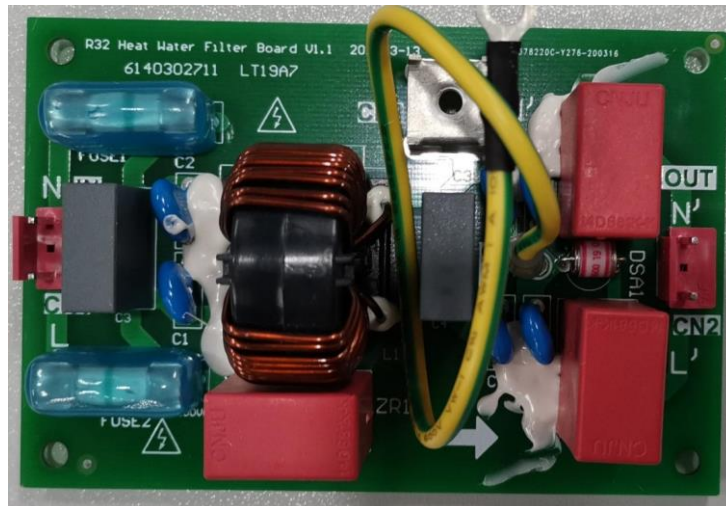
Main PCB

### 3. Hydronic module



Main PCB



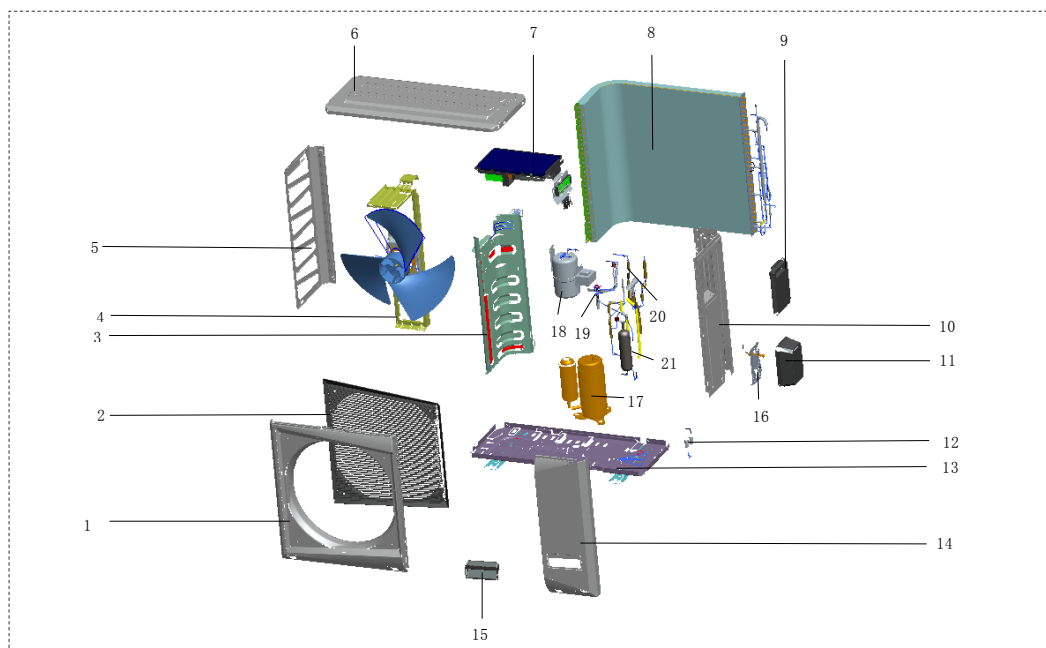


Filter board

## 10. Exploded view

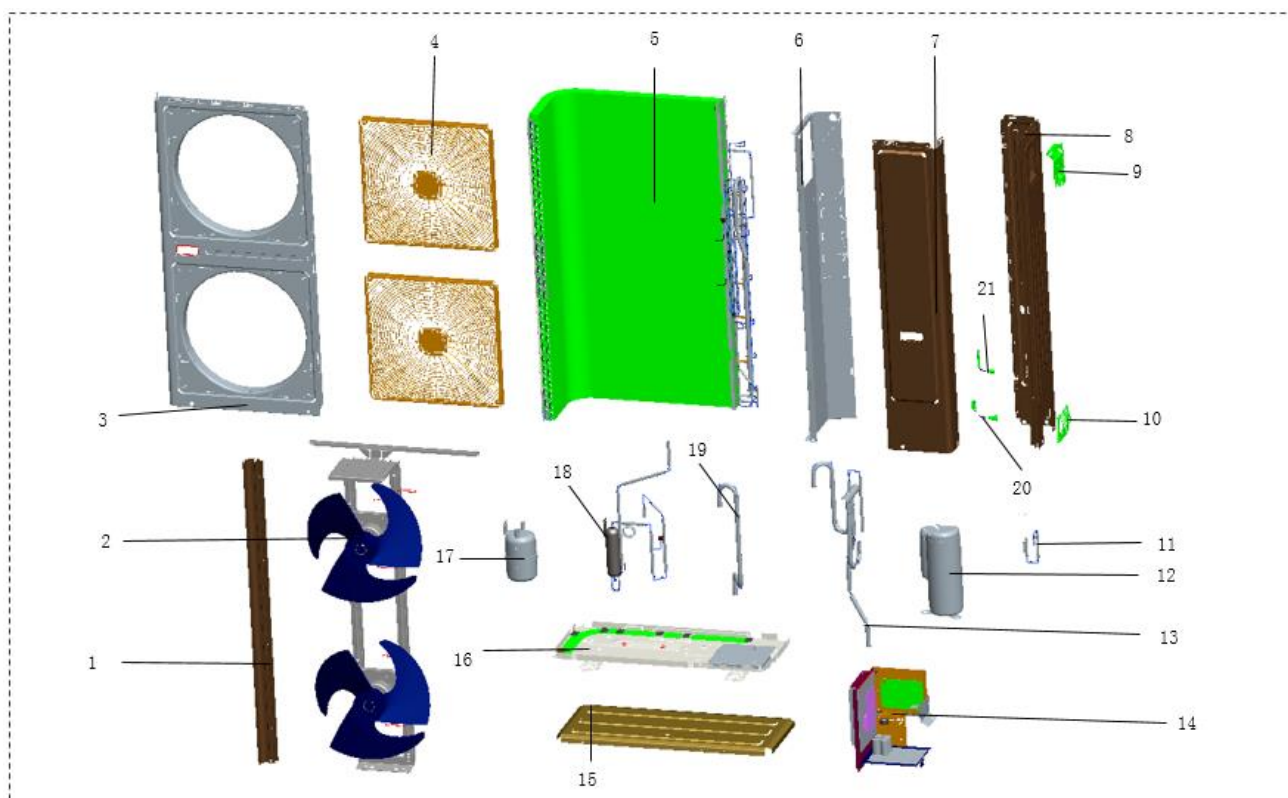
### 10.1 Outdoor unit

#### 1. FHOV-WHS-100CE3



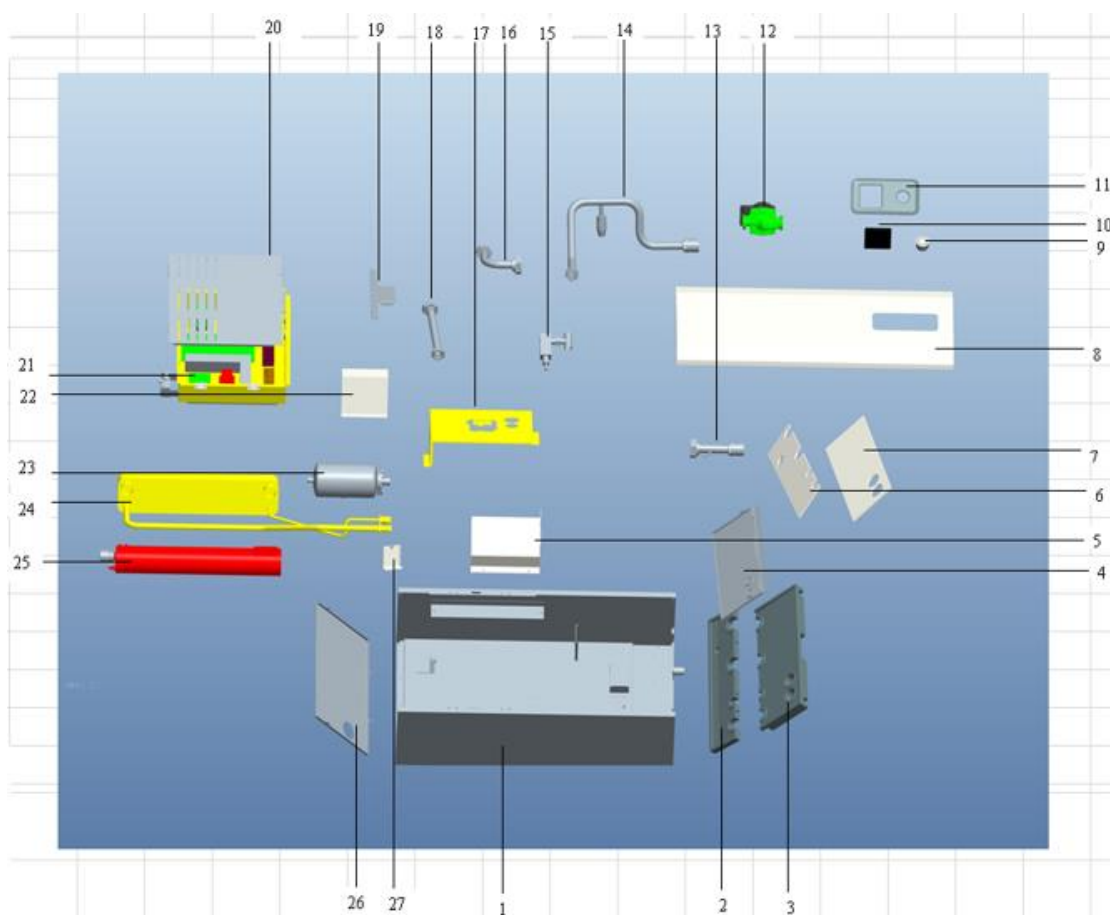
No.	Part name	No.	Part name
1	Front panel	12	EXV assy
2	Net	12.1	EXV body
3	Middle partition part	12.2	EXV coil
4	Fan motor support assy	13	Chassis assy
4.1	Fan motor	14	Right front panel
4.2	Fan blade	15	Small handler
5	Left side plate	16	Seat plate
6	Top cover plate assy	17	Inverter compressor
7	EC part	18	Gas-liquid separator
7.1	Integrated main PCB	19	Gas return pipe
7.2	Display board	20	4-way valve assy
8	Condenser part	20.1	4-way valve
9	Big handler	20.2	4-way valve coil
10	Right rear panel assy	21	Discharge pipe assy
11	Seat plate cover		

## 2. FHOH-WHS-160CE3-3F



No.	Part name	No.	Part name
1	Stand column	13.1	4-way valve
2	Fan motor support assy	13.2	4-way valve coil
2.1	DC fan motor	14	EC part
2.2	Fan blade	14.1	Current transformer
3	Front panel	14.2	Main PCB
4	Net	14.3	Transformer
5	Condenser part	14.4	Filter board
6	Middle partition part	14.5	IPM board
7	Maintenance panel	15	Top cover panel with cotton
8	Right side panel	16	Chassis
9	Big handler with cotton	17	Gas-liquid separator
10	Seat plate cover	18	Discharge pipe of compressor part
11	EXV part	18.1	High pressure switch
11.1	EXV body	18.2	Oil separator
11.2	EXV coil	19	Gas return pipe of compressor part
12	Compressor	20	Gas side stop valve
13	4-way valve assy	21	Liquid side stop valve

## 10.2 Hydronic module



No.	Part name	No.	Part name
1	Bottom plate assy	18	Heat exchanger water outlet pipe assy
2	Water pan foam 1	19	Middle beam
3	Water pan foam 2	20	EC box cover
4	Water pan assy	21	EC box
5	Expansion tank support	21.1	Transformer
6	Foam 1	21.2	Main PCB
7	Foam 2	21.3	Filter board
8	Front panel	21.4	Relay
9	Pressure gauge	21.5	Thermostat
10	Wired controller	21.6	Thermostat
11	Wired controller panel	22	Plate heat exchanger support
12	Water pump	23	Expansion tank
13	Water inlet connection pipe connection	24	Plate heat exchanger assy
14	Water outlet connection pipe connection	25	Electric heater
15	Water flow switch	26	Upper cover plate
16	Heat exchanger water inlet pipe assy	27	Electric heater support
17	Wired controller support		

## 11. Installation

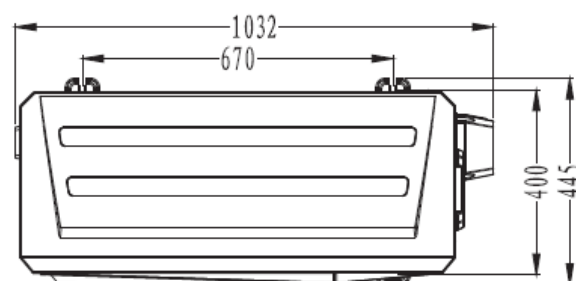
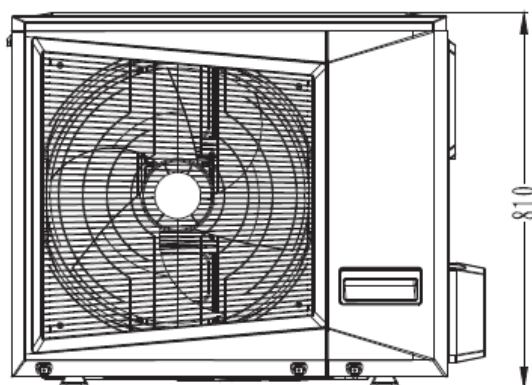
### 11.1 Installation for outdoor unit

#### 11.1.1 Select the best location

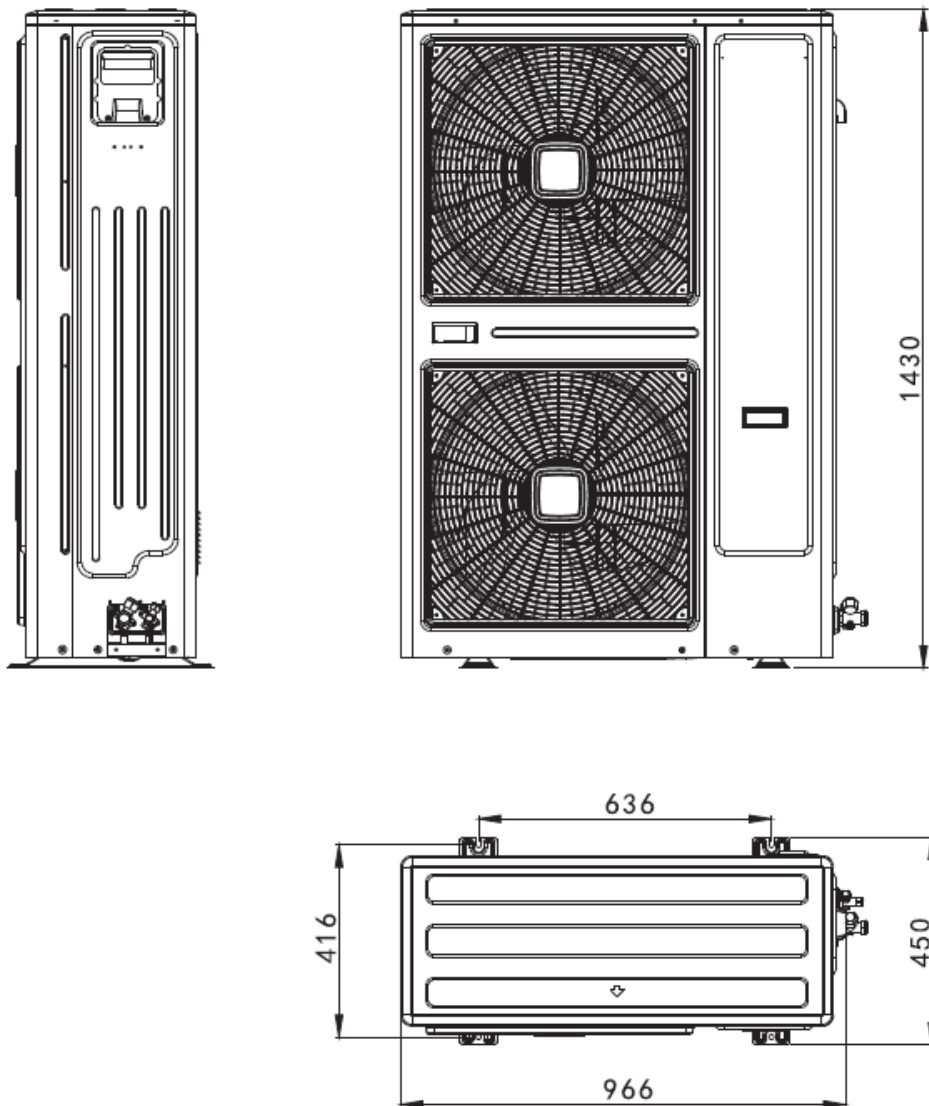
- Provide sufficient space for installation and maintenance.
- The place shall ensure that the air inlet and outlet are unobstructed and not influenced by the strong wind.
- Dry and ventilated place.
- The supporting surface shall be flat and withstand the weight of the outdoor unit, and can be installed horizontally without bringing more noise and vibration.
- Operation noise and exhaust air shall not affect neighbors.
- No flammable gas leaks.
- Easy to install the connecting pipe and electrical connection.
- Avoid installations in areas where the ambient temperature may drop below  $-28^{\circ}\text{C}$  for outdoor unit.
- If an awning is built over the unit to prevent direct sunlight or rain, be careful that heat radiation from the condenser is not obstructed.
- If outdoor unit installed near sea, region with high content of sulphur or oily location (e.g. machinery oil, etc.), its lifespan may be shortened.
- Keep indoor unit, outdoor unit, power supply wiring and transmission wiring at least 1 meter away from televisions and radios. This is to prevent image interference and noise in those electrical appliances. (Noise may be generated depending on the conditions under which the electric wave is generated, even if 1 meter is kept.)

#### 11.1.2 Installation dimension for outdoor unit

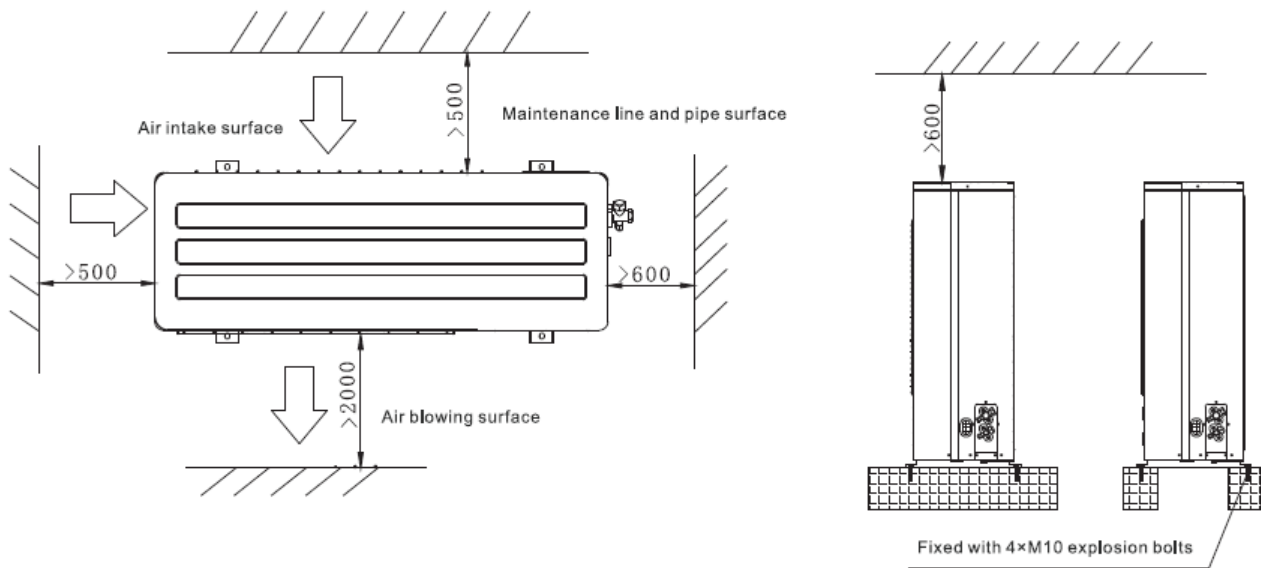
**Model** FHOH-WHS-100CE3



**Model** FHOH-WHS-160CE3-3F

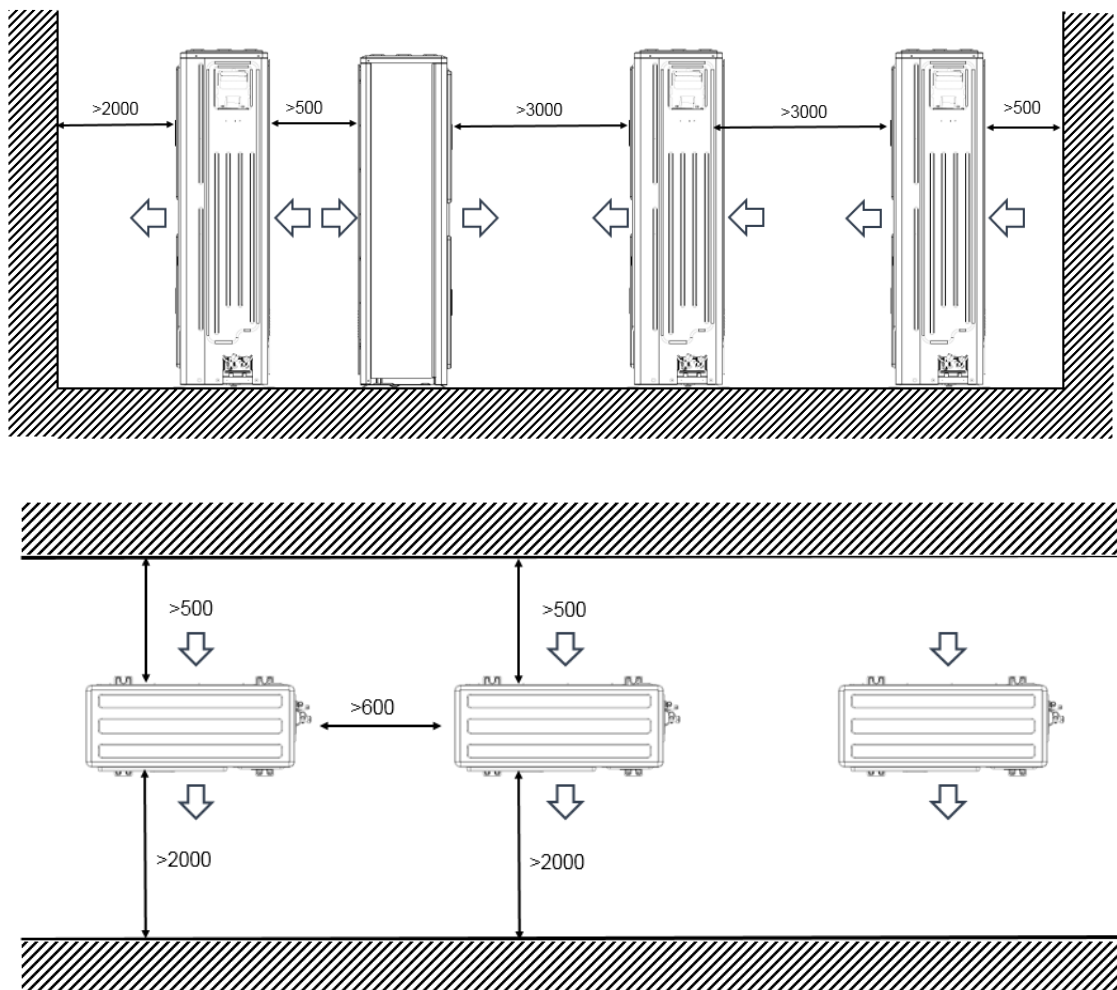


## Single unit installation



## More than one unit installation

Unit: mm



## 11.2 Installation for hydronic module

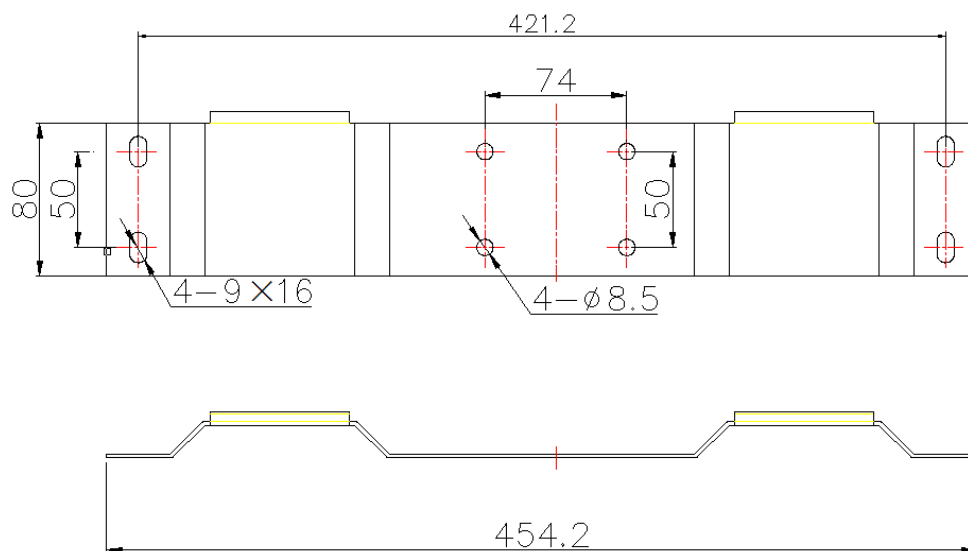
### 11.2.1 Select the best location

- There should not be any heat source or steam near the unit.
- A place where air circulation in the room is good.
- A place where drainage can be easily done.
- A place where noise prevention is taken into consideration.
- Do not install the unit near the door way.
- Ensure the spaces indicated by arrows from the wall, ceiling, fence or other obstacles.
- Recommended installation height for indoor unit shall be at least 800 mm.
- Must install on a vertical wall.
- When install electrical equipment at wooden building of metal lath or wire lath, according to electrical facility technical standard, no electrical contact between equipment and building is allowed. Insulator must be installed in between.
- Do not install the unit at outdoor. This is designed for indoor installation only.

### 11.2.2 Installation dimensions

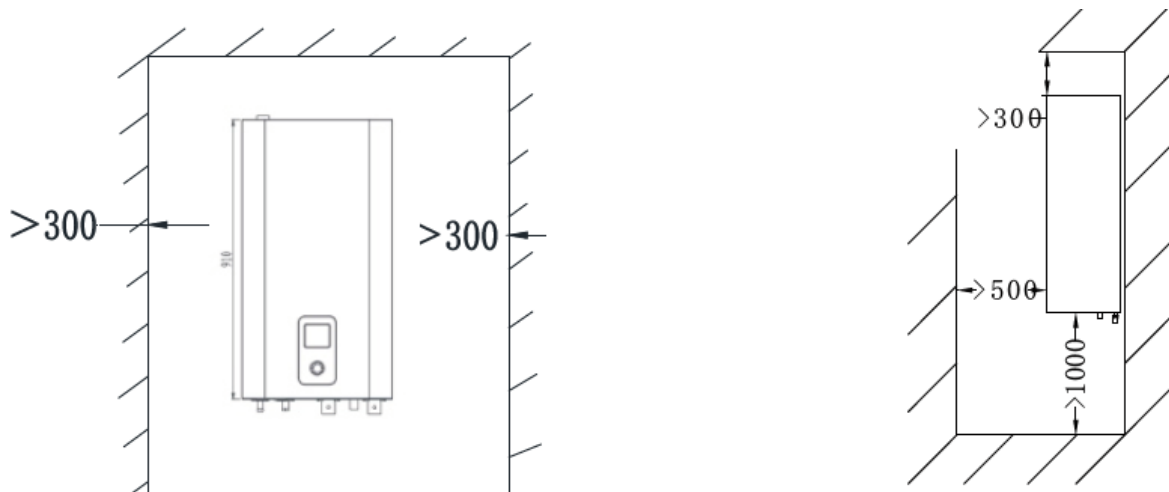
#### (1) Wall mounted panel size. (mm)

- The mounting wall is strong and solid enough to prevent it from vibration.
- Always mount the installation plate horizontally plate by aligning the marking thread and using a level gauge.
- Mount the installation plate on the wall with 8 sets of plug, bolt and washer (all non-supply) with different size.

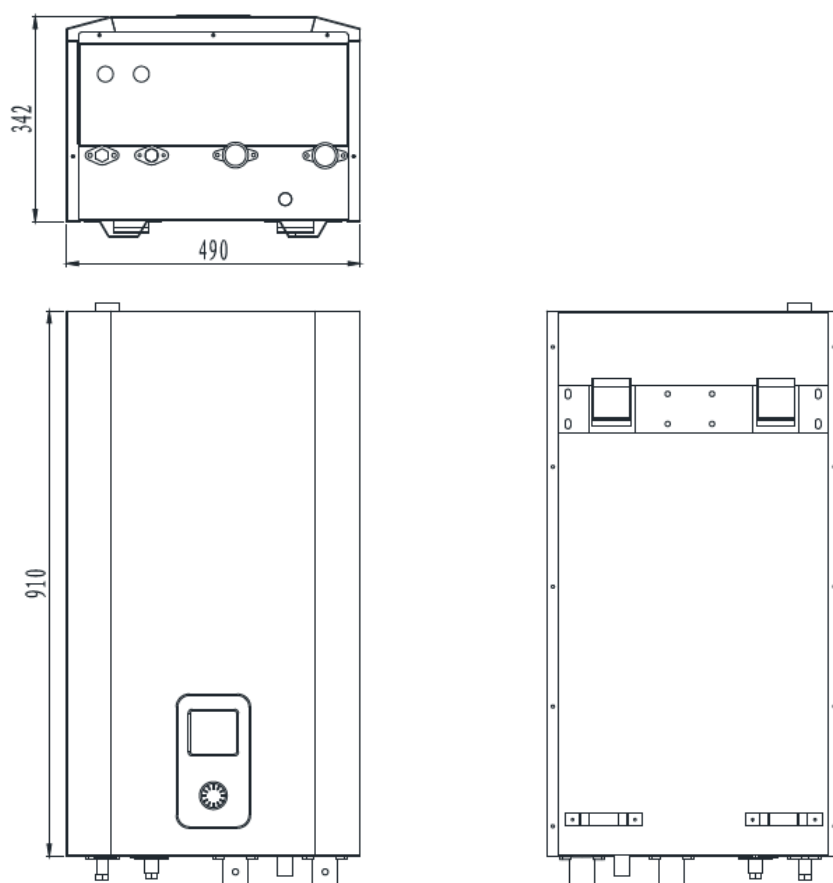


#### (2) Space required for installation and maintenance. (mm)





(3) Outline dimensions and installation dimension. (mm)



### 11.2.3 Install the hydronic module

#### (1) Fix wall mounted panel

- Choose a wall or support that is fully reliable and safe to withstand twice the weight of the unit.
- The mounting wall panel is strong and solid enough to prevent it from vibration.
- Always mount the installation plate horizontally plate by aligning the marking thread and using a level gauge.
- Mount the installation plate on the wall with 8 expansion bolts. (all non-supply) (the minimum

mounting hole diameter is 8.5 mm)

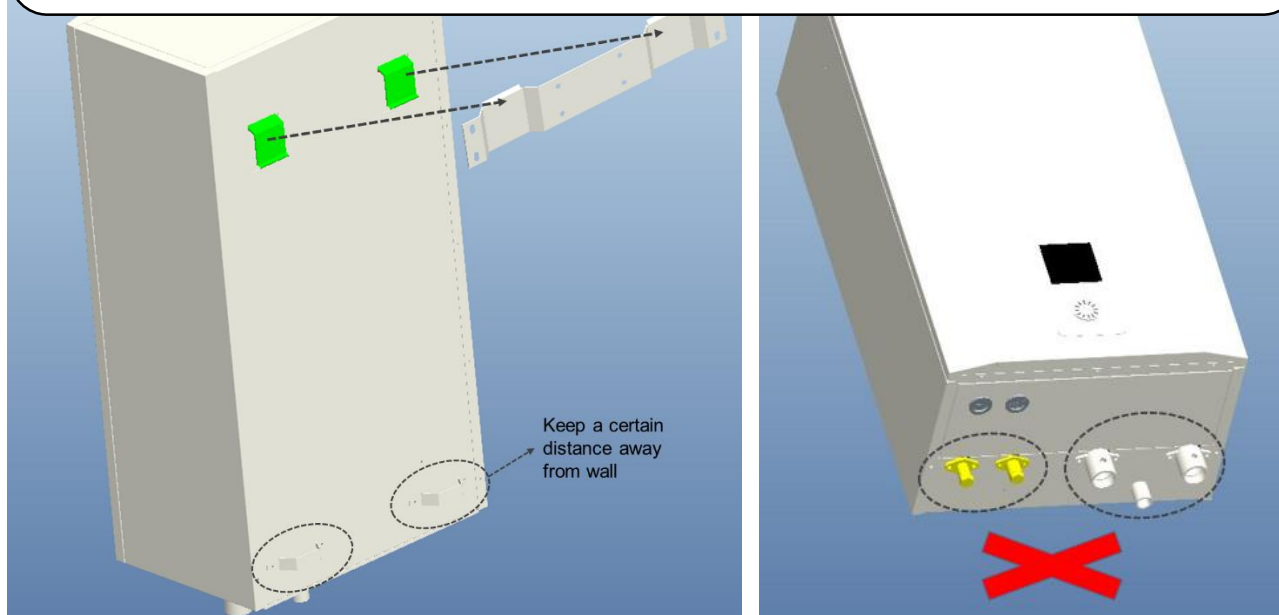
- In order to ensure the reliability of the load-bearing, the wall drilling hole needs to reach a depth of 45~50 mm.

(2) Engage the hooks on the indoor unit to the slots of installation plate. Ensure the hooks are properly seated on the installation plate by moving it left and right.

(3) Keep the unit is vertical and keep a certain away from the wall. Otherwise, the air in the water circulation system will not be easily discharged, causing the unit malfunction.

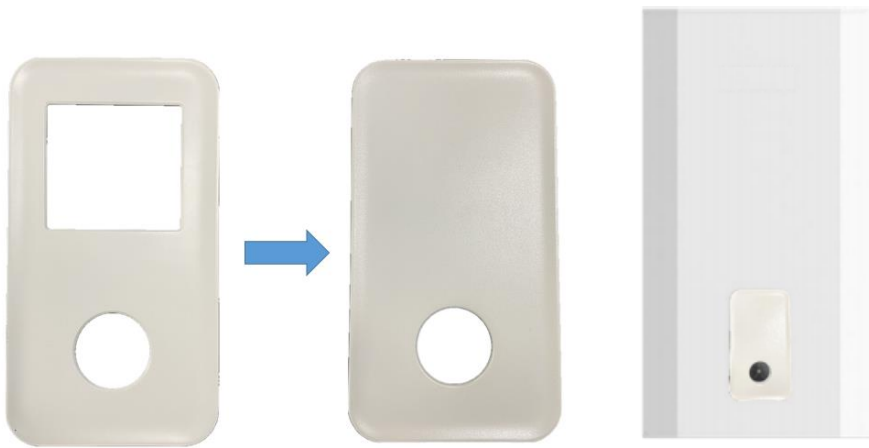
**⚠ Attention**

- As the hydraulic module is heavy, it needs at least two people for installation.
- Do not lift the indoor unit by holding the refrigerant and water pipes to prevent damage of the pipes.



#### 11.2.4 Wired controller

The hydronic module is standard with a touch screen wired controller. The wired controller can be taken away from hydronic module and installed in room, which is convenient for using and detecting room temperature. A 25m communication wire is inside the accessory bag, also with an additional wired controller cover plate which is used placed the original cover in hydronic module.



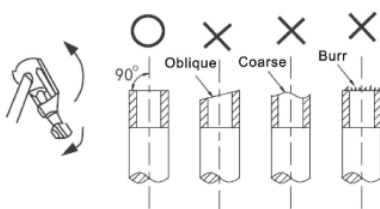
## 11.3 Refrigerant pipe work

### 11.3.1 Refrigerant piping

Decide piping length and then cut by using pipe cutter. Remove burrs from cut edge. Make flare after inserting the flare nut (locate at valve) onto the copper pipe. Align center of piping to valves and then tighten with torque wrench to the specified torque as stated in the table.

#### (1) Cutting and flaring

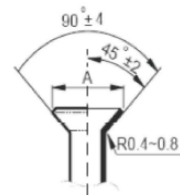
- Please cut using pipe cutter and then remove the burrs.
- Remove the burrs by using reamer. If burrs is not removed, gas leakage may be caused. Turn the piping end down to avoid the metal powder entering the pipe.
- Please make flare after inserting the flare nut onto the copper pipes.



Cutting the connection pipe

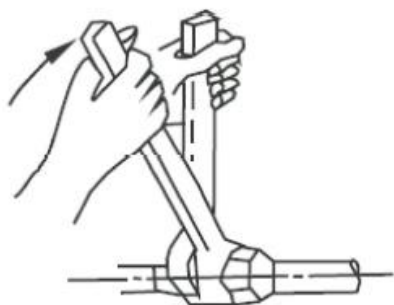
Outer diameter (mm)	A(mm)	
	MAX	MIN
Φ9.5	12.4	12.0
Φ15.9	19.0	18.6

Flaring size of connection tube



#### (2) Fastening nut

Align the connecting tube, screw the nut you're your hand and then tighten with a wrench.



Tightening

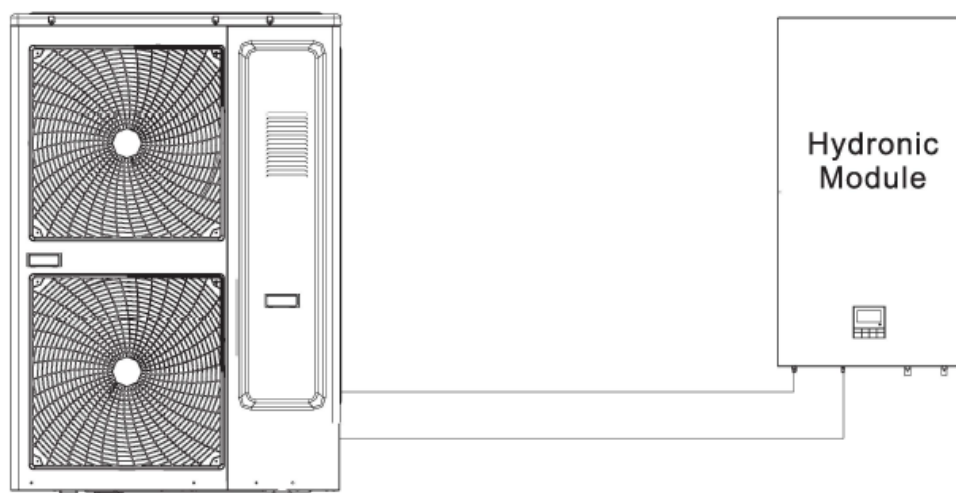
Piping size (mm)	Tightening torque (N·m)
Φ9.5	32.7~39.9(333~407 kgf·cm)
Φ15.9	61.8~75.4(630~770 kgf·cm)

Tightening torque

**⚠ Attention**

In order to prevent oxidation inside the copper tube during copper pipe welding, nitrogen filling must be taken. Otherwise the scale will block the refrigeration system!

### 11.3.2 Connection between outdoor unit and hydronic module



*Note: The refrigerant circuit of the hydraulic module contains a small amount of Nitrogen, which is used to keep the pressure and detect leakage. When installing, unscrew the nut of the refrigerant pipe joint of the hydraulic module. If there is no gas flowing out, check the refrigerant circuit of the unit for leakage. Install and operate only after confirming no leakage.*

### 11.3.3 Accessory pipe in pipeline

Because of different mounting positions of the air conditioning, the required accessory pipe can be long or short, to avoid affecting the capacity from too long cooling pipe, please select a reasonable tube length according to table below, try to select the location of the shorter lines for the installation.

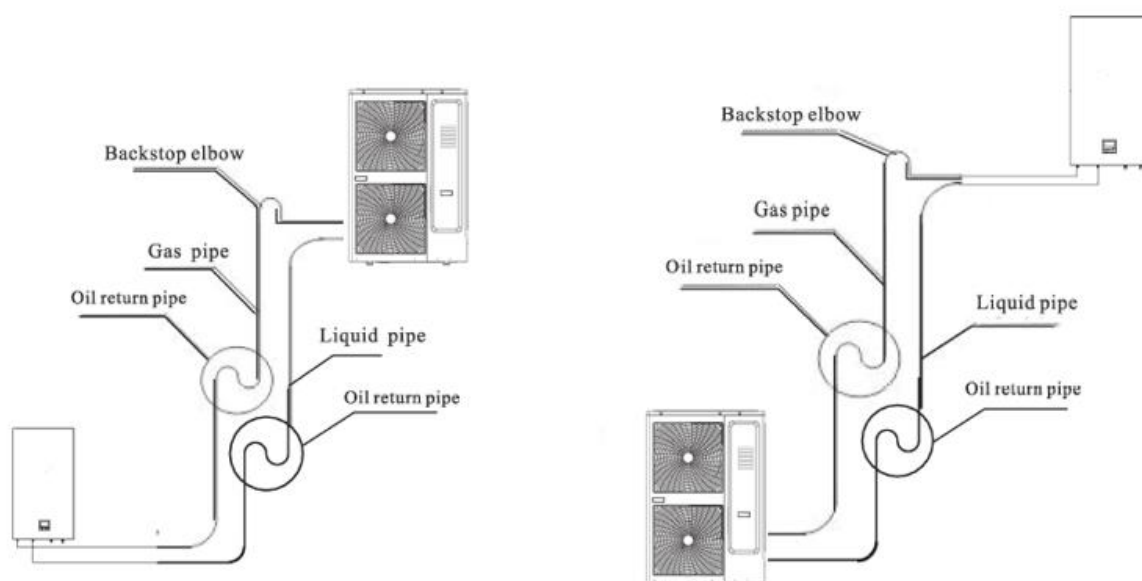
(1) The maximum allowable operating distance away from the pipe.

	<6.5kW	6.5~10.5kW	≥10.5kW
Pipe length	Max. length 15m	Max. length 20m	Max. length 50m
Height difference	Max. height 8m	Max. height 10m	Max. height 20m
Oil return bends quantity	Up to 10	Up to 10	Up to 15

*Note: On condition that 80% of the cooling capacity is guaranteed in the above parameters, the cooling capacity loss and return oil has been fully considered.*

(2) The use of oil return bend.

When the height difference between the indoor and outdoor unit is greater than 5 m, in order to facilitate oil return of the compressor, oil return bend must be used. Upon site operations, the following typical installation methods can be referred to.



*Note: Oil return elbow radius  $R \leq 100\text{mm}$ , 10 oil return elbows must be located per 5m as shown above; when the height difference between indoor and outdoor unit exceeds five meters, oil reserve elbow and backstop elbow should be set according to the relative position of outdoor unit and indoor unit.*

#### 11.3.4 Main pipe diameter

Model	Main pipe diameter			
	Pipeline length (one-way) < 30m		Pipeline length (one-way) $\geq 30\text{m}$	
	Liquid pipe	Gas pipe	Liquid pipe	Gas pipe
FHOF-WHS-100CE3	$\phi 9.52$	$\phi 15.88$	$\phi 9.52$	$\phi 15.88$
FHOF-WHS-160CE3-3F	$\phi 9.52$	$\phi 15.88$	$\phi 9.52$	$\phi 19.05$

#### 11.3.5 Remove the foreign matter inside the pipe

- When the refrigerant piping is installed, foreign matter inside the pipe must be removed with high pressure nitrogen.
- The hydronic module shall not be connected during cleaning.
- It is not possible to replace nitrogen with flammable and toxic gases such as refrigerant or oxygen.

#### 11.3.6 Air tightness test

1) After the refrigerant piping is installed and connected to the hydronic module, the nitrogen with pressure of  $40\text{kgf/cm}^2$  ( $4.00\text{ MPa}$ ) should be injected from the gas side and the liquid side, before connecting the pipe to the outdoor unit valve. Mark the pressure value and perform 8-hour air tightness test.

2) If a pressure drop is found, re-examine the leakage of all interfaces and re-pressurize for 8 hours

after completion.

3) The outdoor unit cannot be connected when holding pressure.

### 11.3.7 Vacuum pumping

1) A vacuum pump with a vacuum degree of  $-0.1\mu\text{m}$  or less and gas displacement of above 40L/min shall be used.

2) The outdoor unit does not need to be vacuumed. Do not open the shut-off valve on the gas side or liquid side of the outdoor unit.

3) Confirm that the vacuum pump can work below  $-0.1\text{MPa}$  after running for more than 1 hour. If it cannot work below  $-0.1\text{MPa}$  after running for more than 2 hours, it indicates that there is moisture or gas leakage inside and needs to be checked.

4) The vacuum pump must be equipped with a check valve.

#### Attention

- Do not mix tools and measuring instruments used for different refrigerants and in direct contact with the refrigerant.
- Never remove air with refrigerant gas.
- When the vacuum degree cannot reach  $-0.1\text{MPa}$ , please consider whether there is a possibility of leakage. Please confirm again if there is any leakage. If there is no leak, run the vacuum pump for one or two more hours.

### 11.3.8 Adding amount of refrigerant

The calculation method of the adding amount of refrigerant is shown in the following table, based on the pipe diameter and length of connection liquid side piping between outdoor unit and the hydronic module.

Liquid pipe diameter (mm)	Pipe length (m)	Adding amount of refrigerant (kg)
$\phi 9.52$	$\leq 5$	
$\phi 9.52$	$> 5$	Add 0.03kg for each additional 1m

*Note: R32 refrigerant must be charged in liquid form with fixed amount measured by electronic scale.*

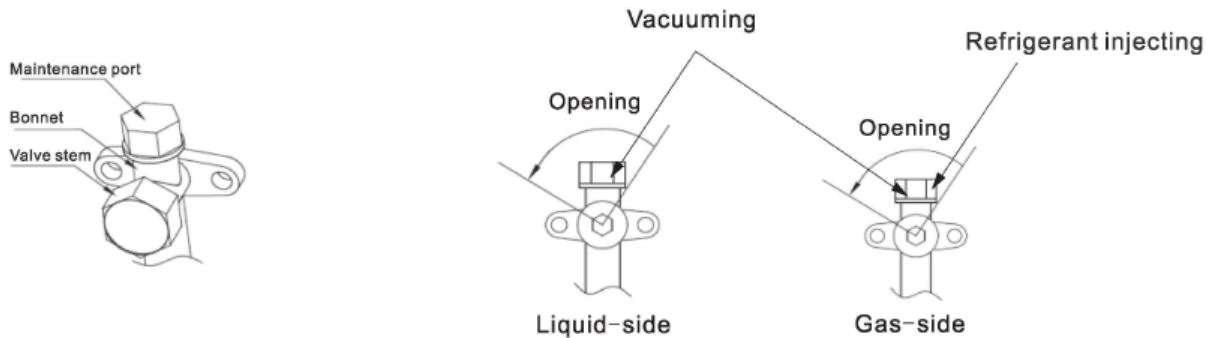
### 11.3.9 Instructions for use of the shut-off valve

1) It shall be in OFF state when delivery.

2) Open or close the valve with a 6 mm hex wrench, counterclockwise turning for opening and clockwise turning for closing.

3) The valve cover must be tightened after the operation.

4) The operation of vacuuming and refrigerant injection at the service port must be operated with the special tool R32. Inject the refrigerant at the gas side valve service port, and vacuum at the liquid side and the gas side valve service port.

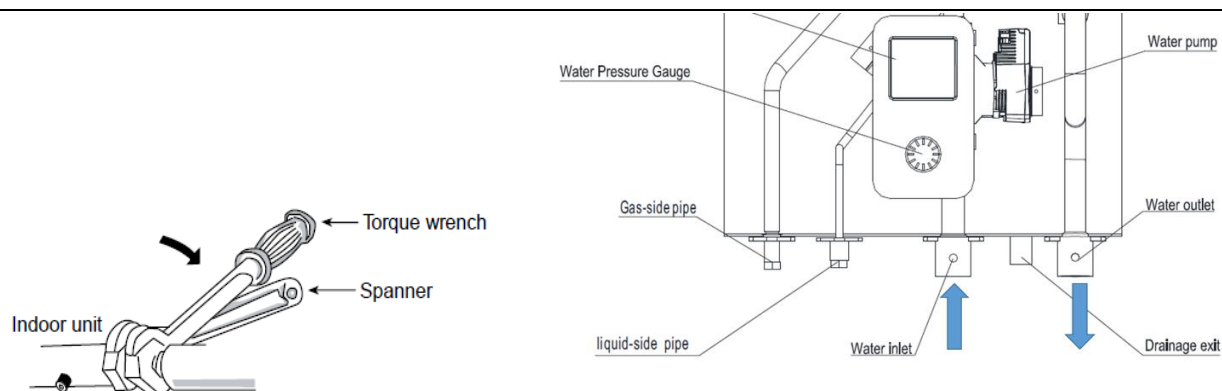


### 11.3.10 Pipe insulation treatment

- 1) Insulate the gas side and liquid side pipes separately.
- 2) Use closed-cell insulation material, with B1 flame retardant rating and 120°C high temperature resistance.
- 3) The outer diameter of the copper tube is  $\phi 9.52$ , the thickness of the insulation cotton is not less than 15 mm; the outer diameter of the copper tube is  $\phi 15.88$ , and the thickness of the insulation cotton is not less than 20 mm.
- 4) The nut joint of the hydronic module must also be insulated.

## 11.4 Water piping

- Water inlet and water outlet in indoor unit are used for connection to water circuit. Please request a licensed technician to install this water circuit.
- This water circuit must comply with all relevant European and national regulations, i.e. IEC/EN61770.
- Be careful not to deform the piping to excessive force when doing piping connection job.
- Use DN32 nut for both water inlet and outlet connection and clean all pipes with tap water before connecting to the indoor unit.
- Cover the pipe end to prevent dirt and dust when inserting it through a wall.
- Choose proper sealer which can withstand the pressures and temperatures of the system.
- If an existing tank is to be connected to this indoor unit, ensure the pipes are clean before water pipe installation is carried out.
- Be sure to use two spanners to tighten the connection. Tighten the nuts with torque wrench: 117.6N•m.
- If non-brass metallic piping is used for installation, make sure to insulate the pipes to prevent galvanic corrosion.
- Make sure to insulate the water circuit pipes to prevent reduction of heating capacity.
- After installation, check the water leakage condition in connection area during test run.
- Please check if the exhaust valve in the hydraulic module can normally release the air in the water circulation system.



	Water pipe connection
Water outlet pipe	DN32
Water inlet pipe	DN32

#### 11.4.1 Water quality

The water quality shall meet the values specified in the following table. Otherwise, the scaling will appear in the heat exchanger and the floor heating system after a period of use, which will affect the heat exchange efficiency and cause failure.

PH value	Total hardness	Conductivity	Sulfur ion	Chloride ion	Ammonia ion
6.5~8.0	200 $\mu$ V/cm	<50ppm	No	<50ppm	No
Sulfate ion	Silicon	Iron content	Sodium ion	Calcium ion	
<50ppm	<30ppm	<0.3ppm	No	<50ppm	

#### 11.4.2 Water injection and air exhaust

- 1) The exhaust valve should be installed at the highest point of the water system piping, and the drain valve should be set at the lowest point.
- 2) After the outdoor unit and hydronic module are installed, turn off the power.
- 3) Open the water inlet valve, unscrew the exhaust valve on the hydronic module, and fill the water system of the hydronic module. The air in the system can be gradually discharged through the exhaust valve and the water outlet of the water tank.
- 4) Check the water circulation system for leakage.
- 5) If there is no leakage in the system pipeline, power on and start the unit. After the pump runs, exhaust the air in the system through the exhaust valve and the water outlet of the hydronic module. After the sound of the air exhausting cannot be heard, close the exhaust valve on the hydronic module and the water outlet valve of the tank.
- 6) For the system without installing the water tank, exhaust air through the air exhaust valve on the hydronic module and water pipe system.

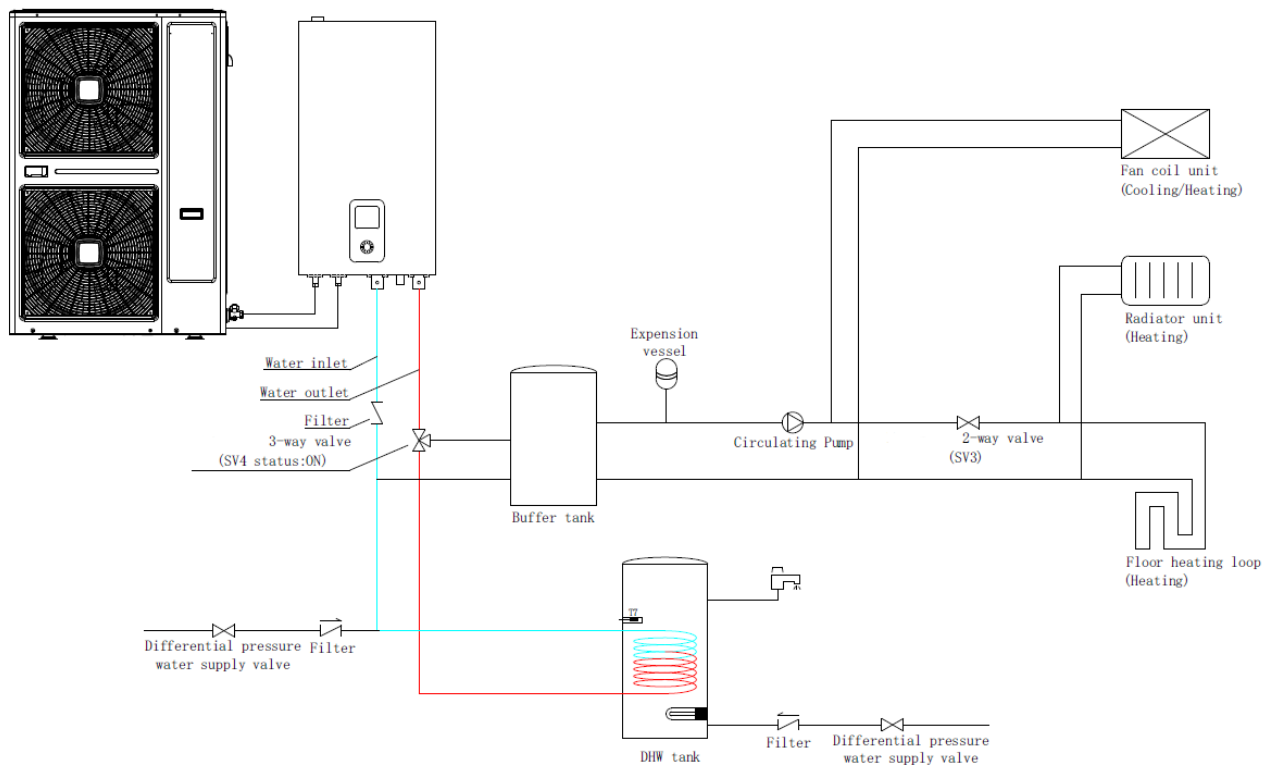
#### 11.4.3 Anti-freeze measures

- 1) When the ambient temperature is below 0 °C, be sure to keep the unit energized.
- 2) If the unit cannot be energized, drain the water in the hydronic module, buffer tank and water lines to avoid freezing the equipment and pipelines.
- 3) Follow the steps below to drain the water from the tank.

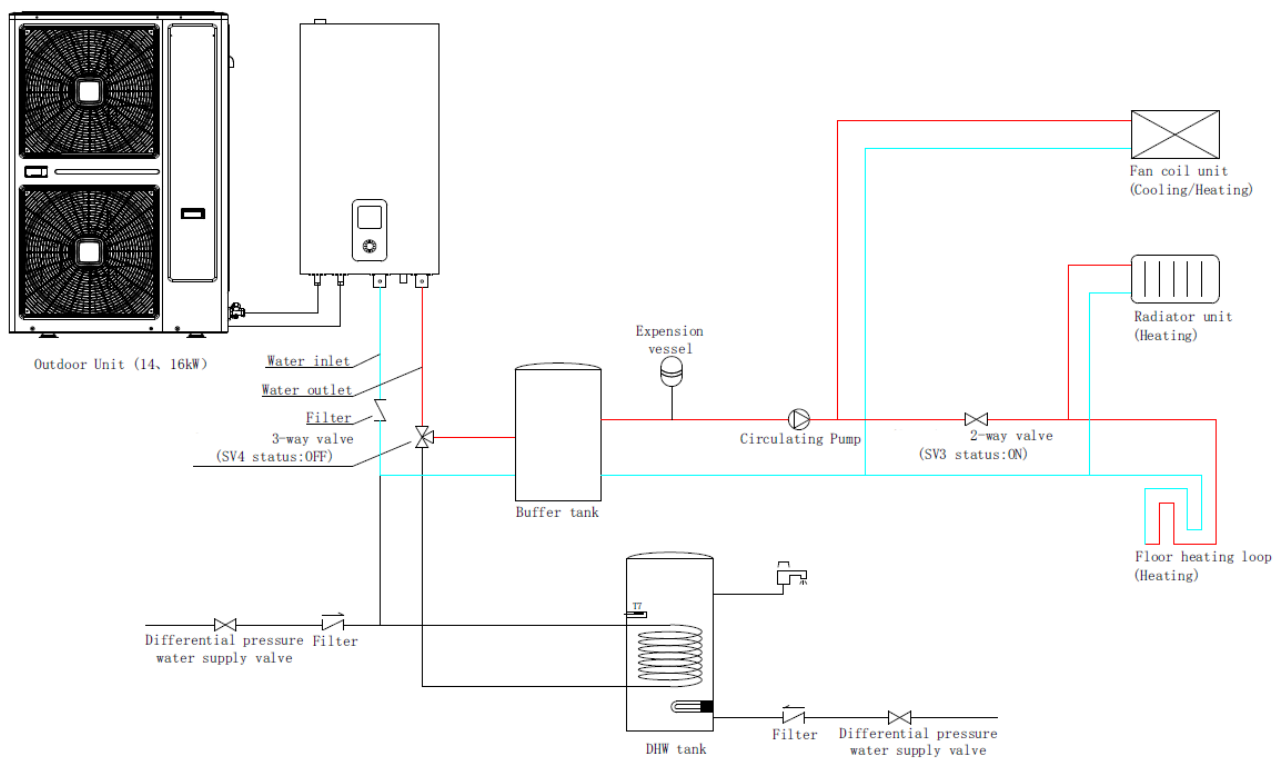


- a. Turn off the power;
  - b. Close the water inlet of the water tank;
  - c. Open the water tank outlet and drain valve;
- 4) Follow the steps below to drain the water from the hydronic module.
- a. Turn off the power;
  - b. Close the water supply valve;
  - c. Open the drain valves on the circulating water inlet and the outlet of the hydronic module.

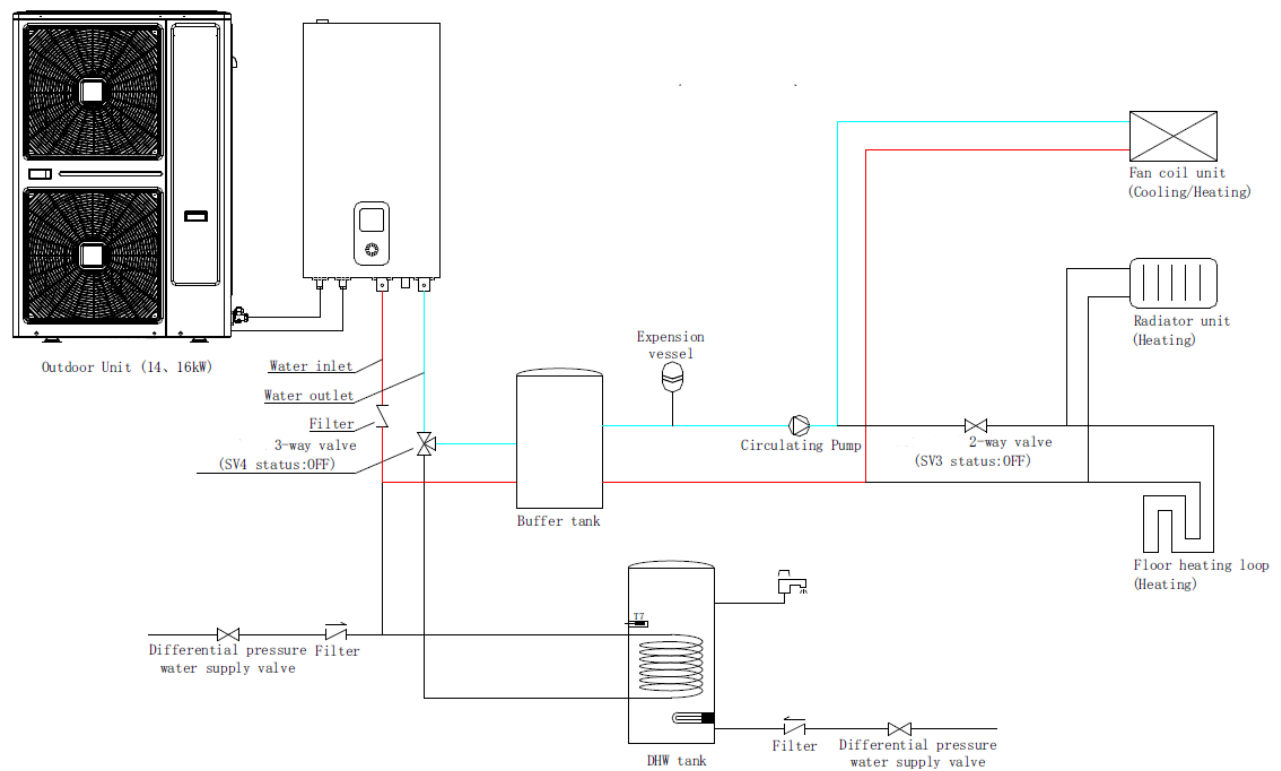
#### 11.4.4 Pipeline sketch



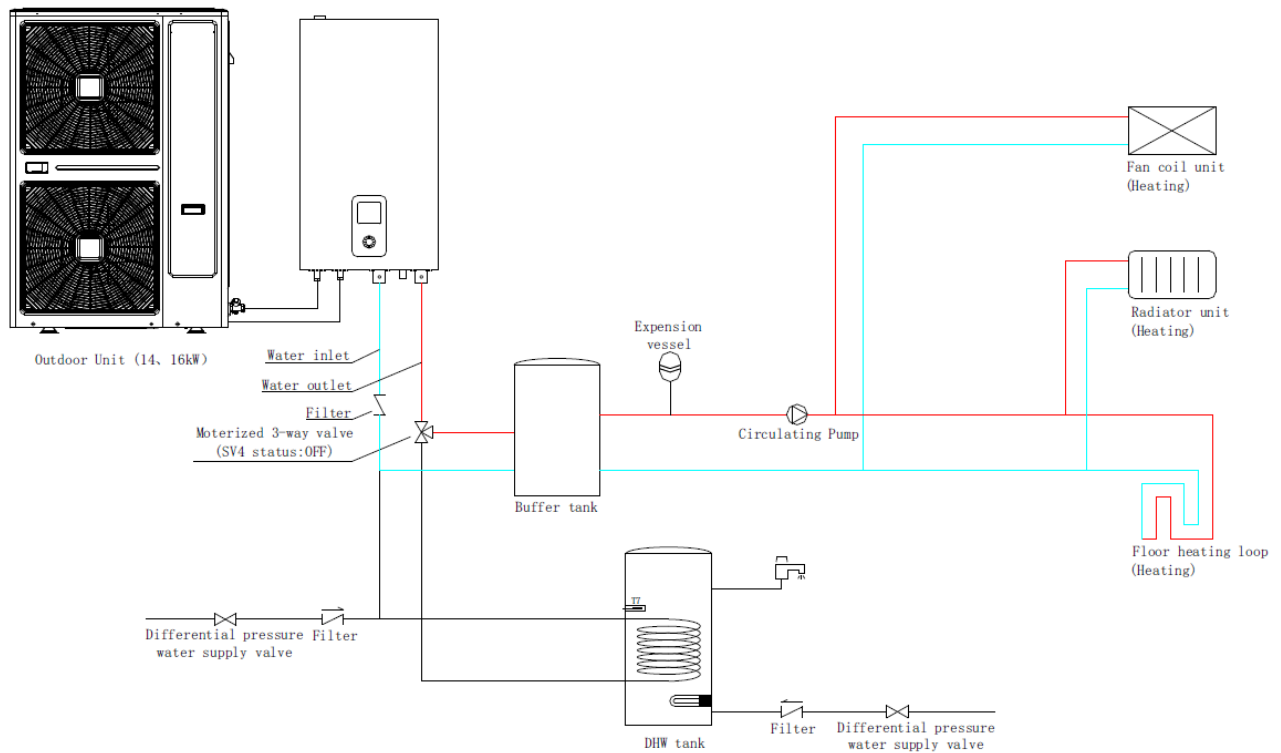
DHW MODE



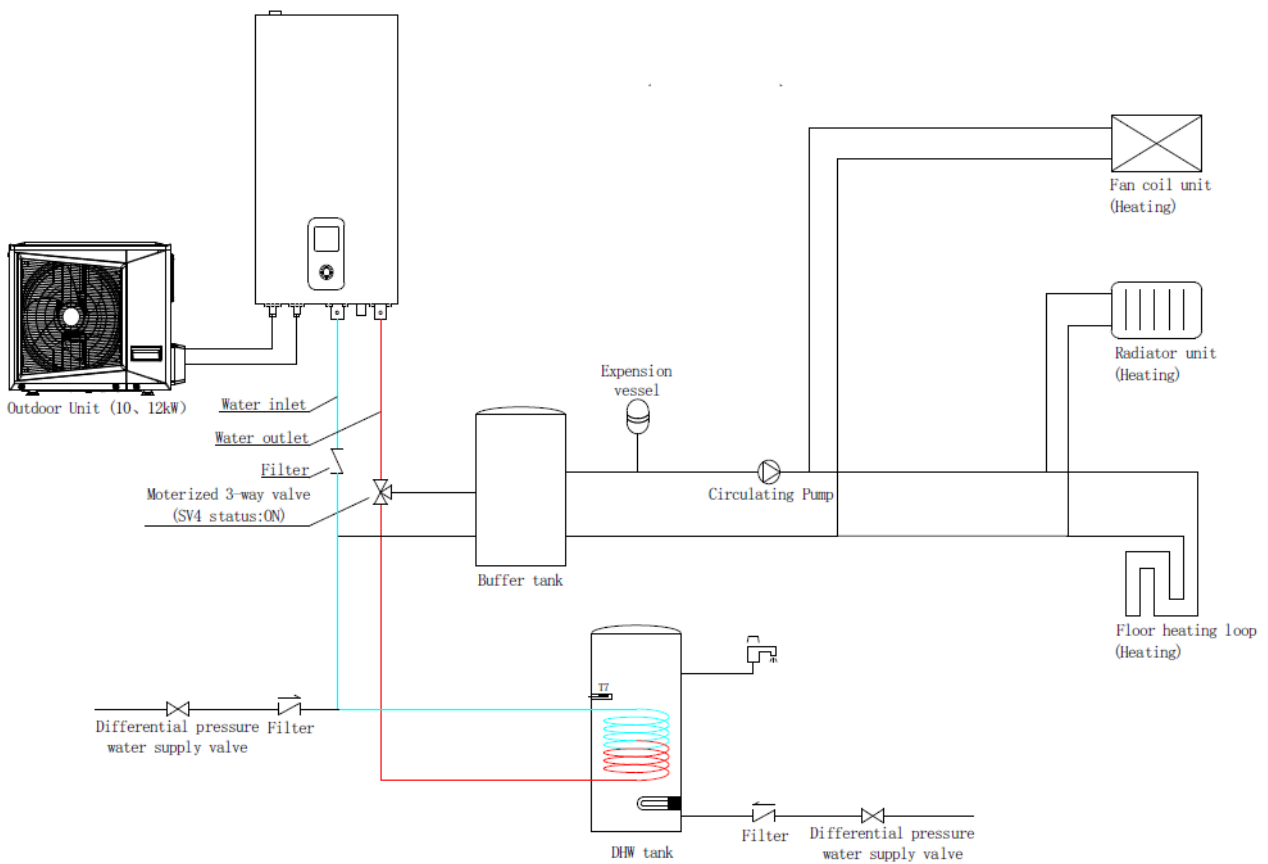
HEATING MODE



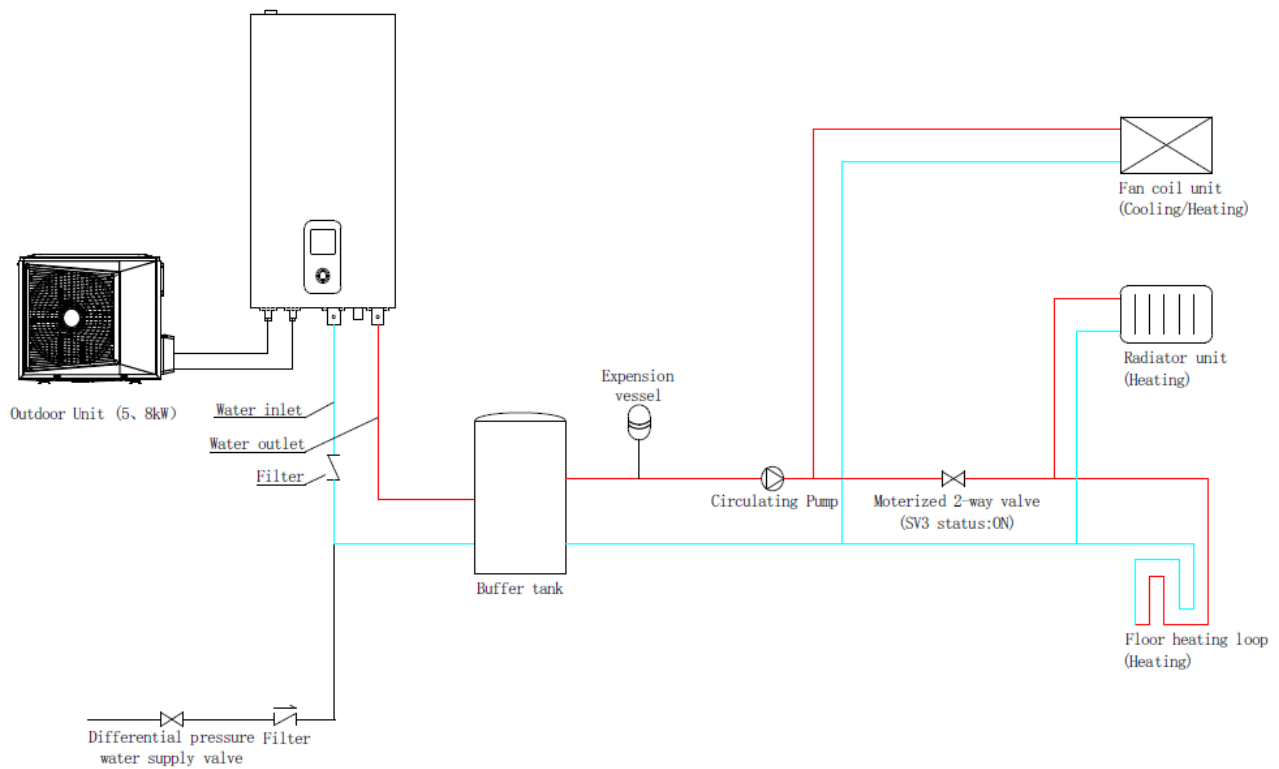
COOLING MODE



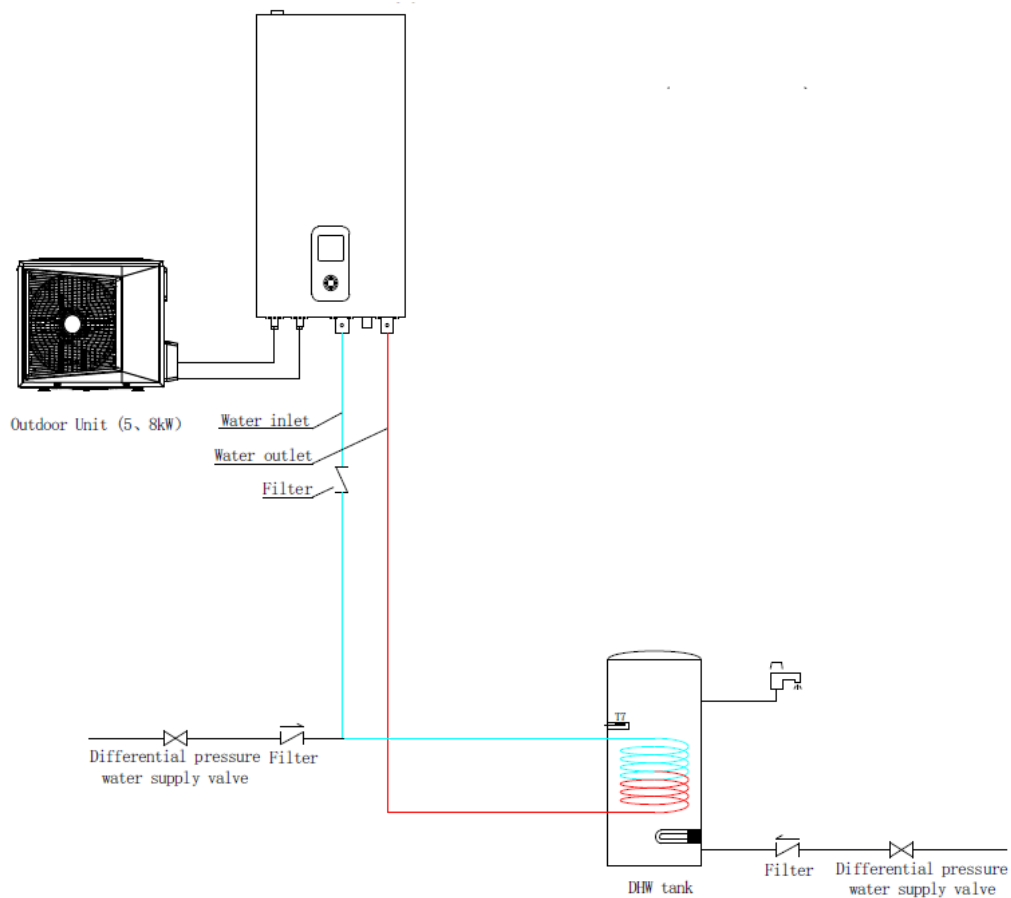
HEATING MODE WITHOUT COOLING MODE



DHW MODE WITHOUT COOLING MODE



#### HEATING MODE WITHOUT DHW MODE AND DHW TANK



#### ONLY DHW MODE

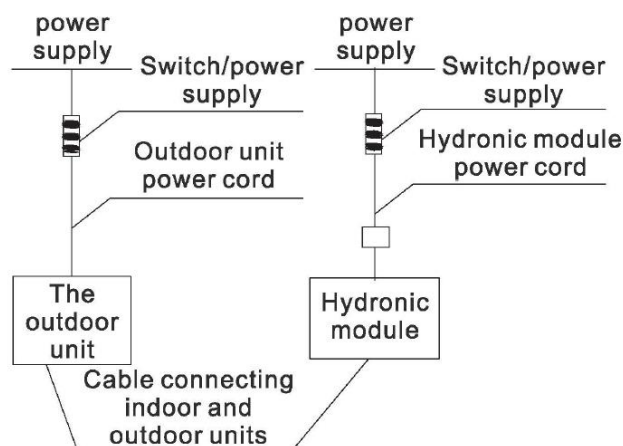
## 11.5 Electrical wiring

Please select a dedicated power supply for indoor unit and outdoor unit respectively.

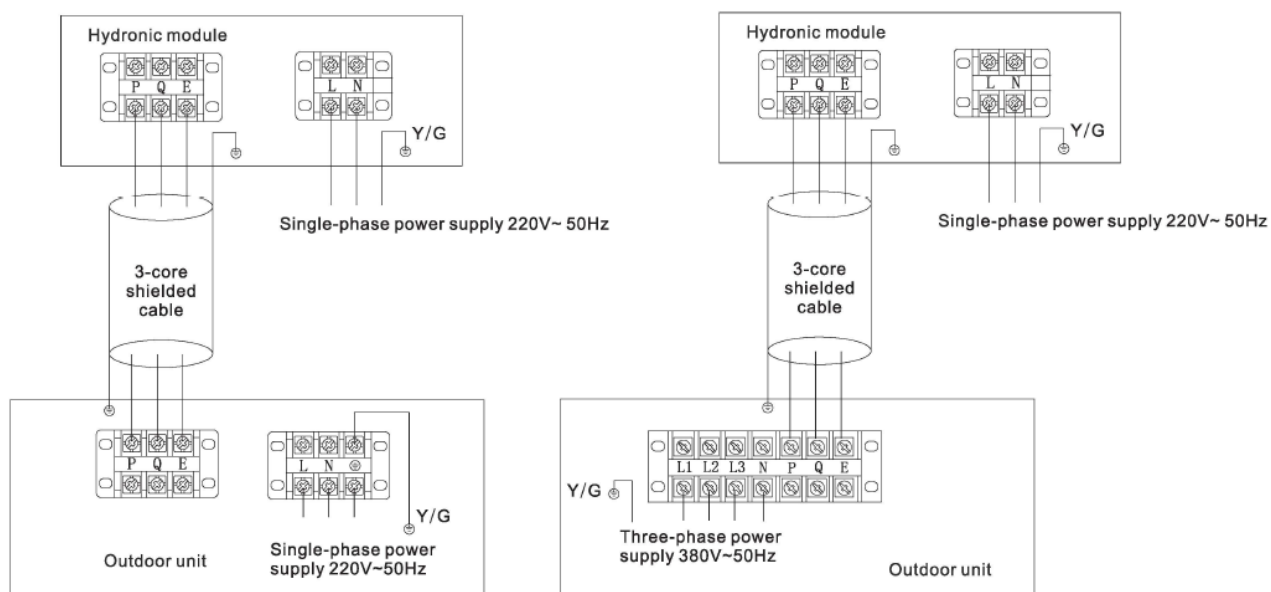
- The power supply has specified branch circuit with leakage protector and manual switch.
- Outdoor unit and indoor unit connect with required power supply which is 220-240V~ 50Hz or 380-415V 3N~ 50Hz.
- The external power supply circuit must be grounded, and the ground wire should be reliably connected to the external ground.
- Use 3-core shielded cable as indoor and outdoor signal wire.
- Switch off the power supply before making any connections.
- Use only copper wires.
- The installation should comply with relevant national electric standard.
- Power wiring should be engaged by specialized electrician.
- The field wiring must be carried out in accordance with the wiring diagram supplied with the unit.
- The power cable and signal cable should be arranged neatly and reasonably, and should not interfere with each other, and should not be in contact with the connecting pipe and the valve body.
- Be sure to install the required fuses or circuit breakers
- After the wiring is completed, the power can be turned on after careful inspection.

### 11.5.1 Outdoor unit wiring

Model		FHOF- -WHS-100CE3	FHOF -WHS-160CE3-3F	FHIF- -WHS-120CE3 -WHS-160CE3
Outdoor unit power	Phase	1	3	1
	Voltage	220~240V	380~415V	220~240V
	Frequency	50Hz	50Hz	50Hz
	Power wiring(mm)	3*4.0	5*4.0	3*4.0
Circuit breaker/fuse(A)		40/30	63/45	32
Signal wiring(mm)		3-core shielded cable 3*0.75 (2-core shielded cable 2* 0.75)		



Wiring and control

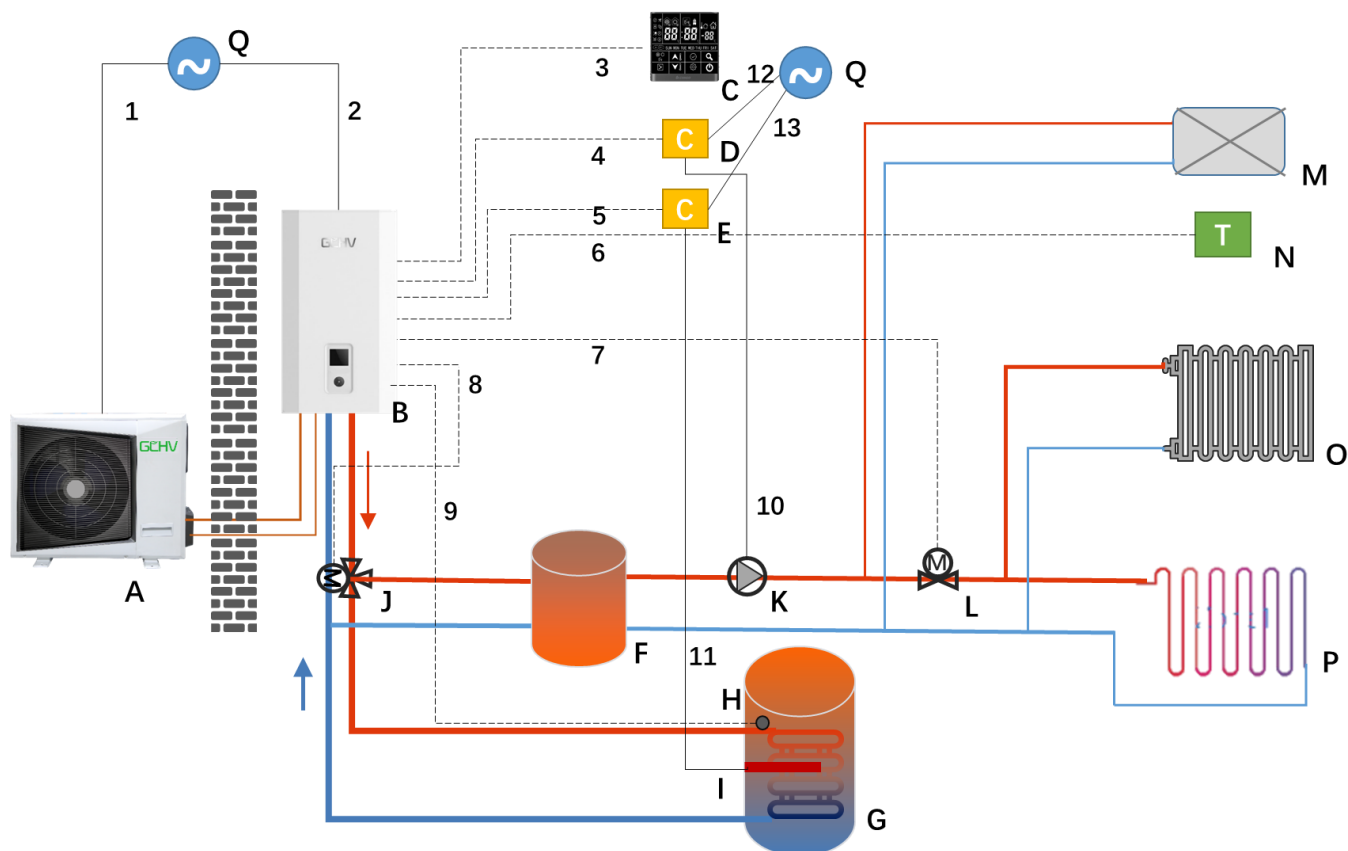


Electrical connection for single-phase and three-phase units

### ⚠ Attention

- When using the 2-core shielded cable as the signal cable, connect the shielded mesh to "E" of the terminal block. When using the 3-core shielded cable as the signal cable, the shielded mesh must be grounded.
- It is absolutely forbidden to connect the power line (strong power) to the signal line (weak power) terminal block, otherwise the electric control board will be burned out.

## 11.6 Field wiring



A	Outdoor unit	B	Hydronic module
C	Wired controller	D	Contactor for circulation water pump (filed supply)
E	Contactor for booster heater (filed supply)	F	Buffer tank (filed supply)
G	DHW tank (filed supply)	H	T7 temperature sensor
I	Booster heater filed supply)	J	Electric 3-way valve (filed supply)
K	Circulation water pump (filed supply)	L	Electric 2-way valve (filed supply)
M	FCU	N	Room thermostat (filed supply)
O	Radiator (filed supply)	P	Floor heating (filed supply)
Q	Power supply		

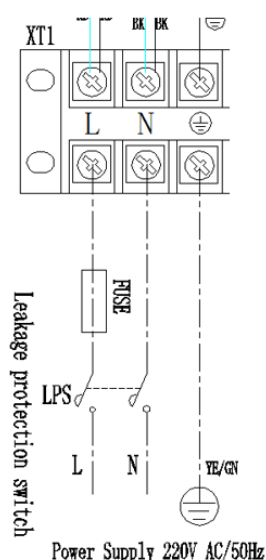
No.	Description
1	Power supply cable for outdoor unit
2	Power supply cable for hydronic module
3	Communication wire between wired controller and hydronic module
4	Circulation water pump control cable
5	Booster cable control cable

## R32 ATW Service Manual

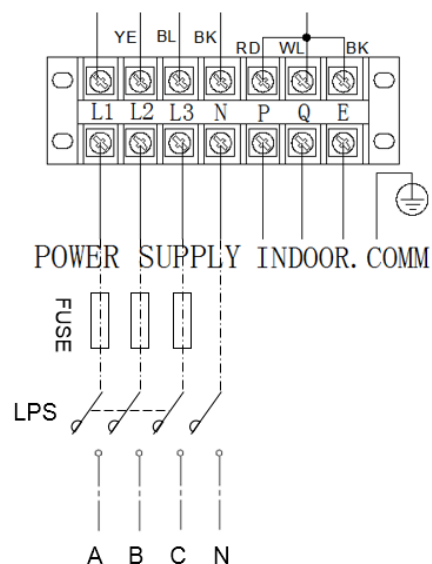
6	Room thermostat cable
7	Electric 2-way valve control cable
8	Electric 3way valve control cable
9	Temperature sensor cable
10	Power supply cable for circulation water pump
11	Power supply cable for booster heater
12	Power supply cable for circulation water pump
13	Power supply cable for booster heater
14	Communication wire between ODU and hydronic module

Equipment must be grounded. All high-voltage external loads, if it is metal or a grounded port must be grounded. All external loads current are needed less than 3A, if the loads current is greater than 3A, the load must be controlled through AC contactor.

### 1. Connection of power supply



1-phase (1-phase outdoor unit, hydronic module)

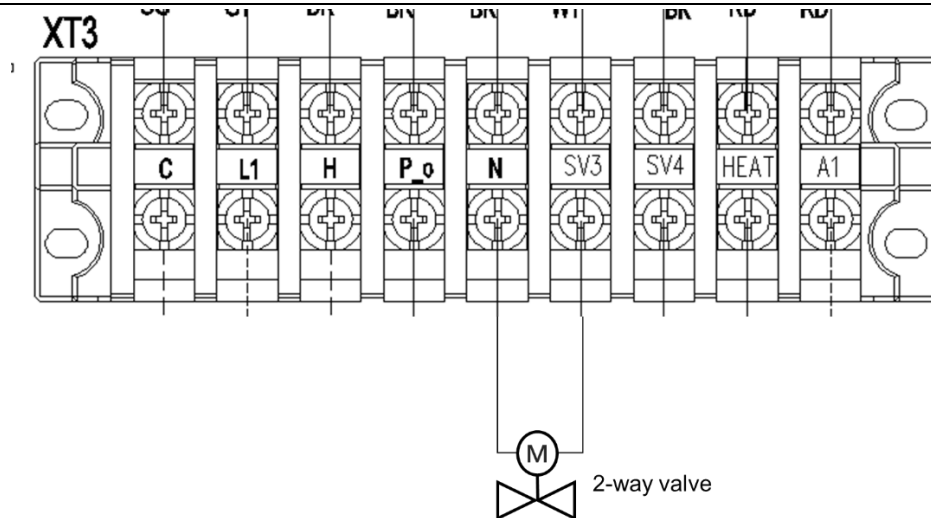


3-phase outdoor unit

Model		FHOF- -WHS-100CE3	FHOF -WHS-160CE3-3F	FHIF- -WHS-120CE3 -WHS-160CE3
Outdoor unit power	Phase	1	3	1
	Voltage	220~240V	380~415V	220~240V
	Power wiring(mm)	3*4.0	5*4.0	3*4.0
Circuit breaker/fuse(A)		40/30	63/45	32

### 2. Connection of 2-way valve

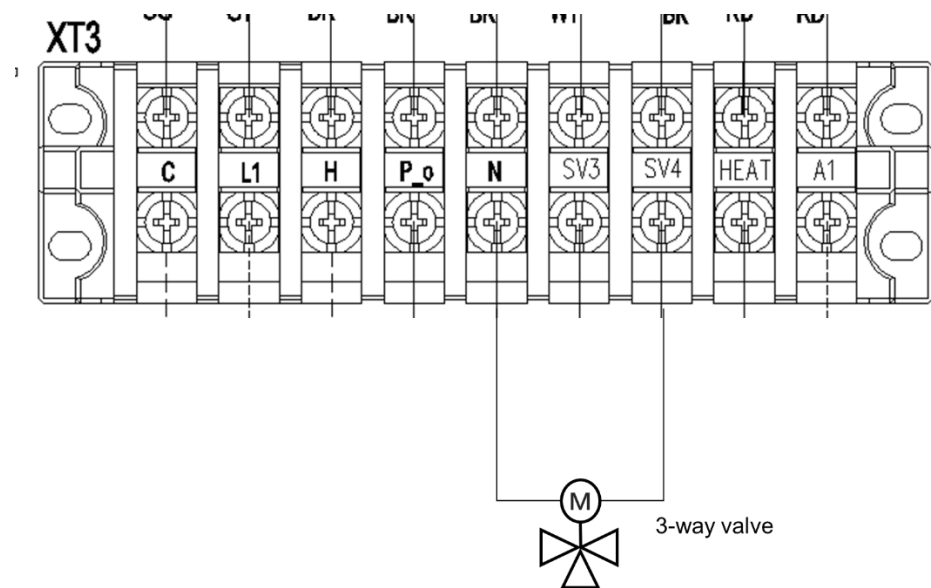




When the unit is in cooling mode, SV3 has no output. When the unit is in heating mode, defrosting mode and anti-freezing mode, SV3 has a 220V AC output.

Please use a normal closing valve for this unit.

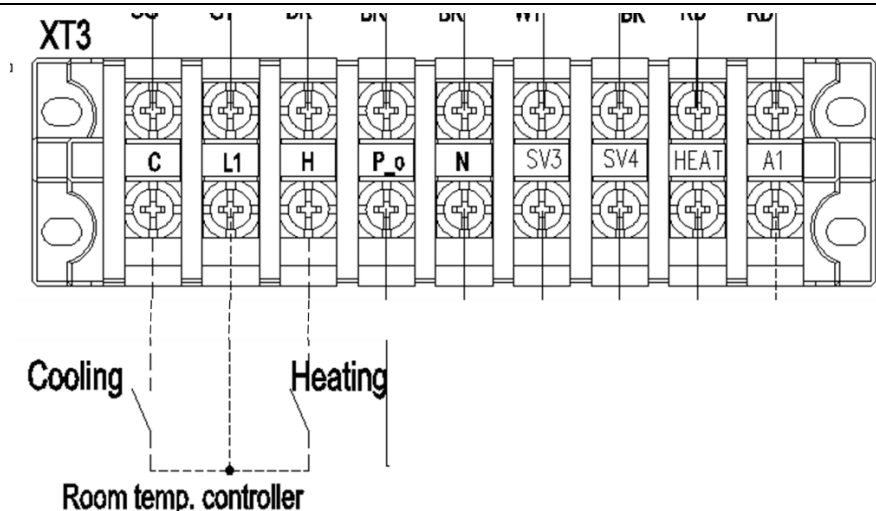
### 3. Connection of 3-way valve



When the unit is in DHW mode, SV4 has 220V output. When the unit is in cooling mode or heating mode, SV4 has no output.

Wiring of the 3-way valve is different for NC (normal close) and NO (normal open). Before wiring, read the installation manual for the 3-way valve carefully.

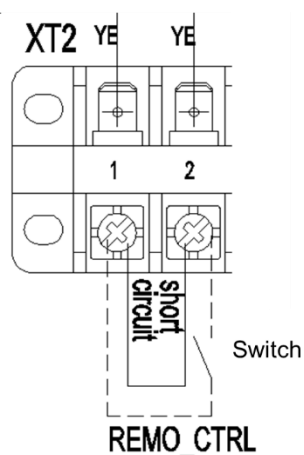
### 4. Connection of room thermostat



When hydronic module SW2-2 is in ON position, the unit is controlled by room thermostat. And the unit can't run DHW mode.

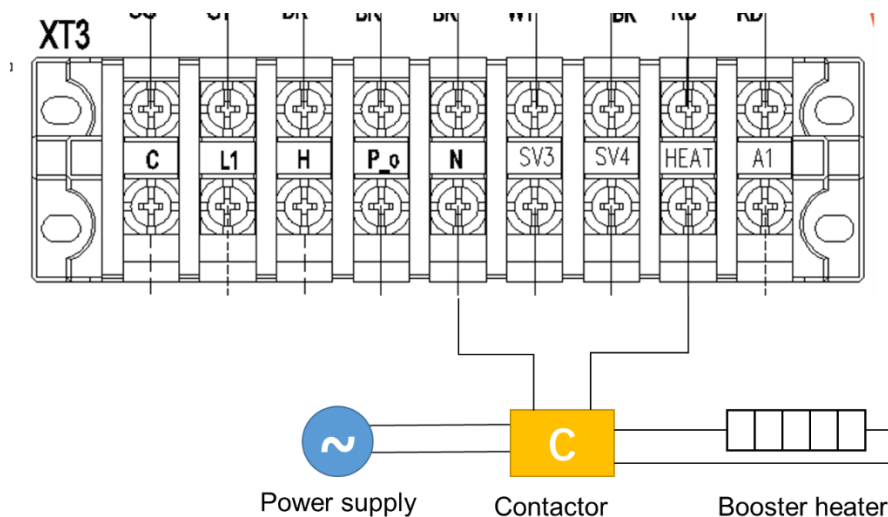
When "H" signal is connected, the unit will run heating mode, and the default setting temperature is 50°C. When "C" signal is connected, the unit will run cooling mode, and the default setting temperature is 7°C. If both signals are connected or disconnected, the unit is OFF.

#### 5. Connection of REMO\_CTRL



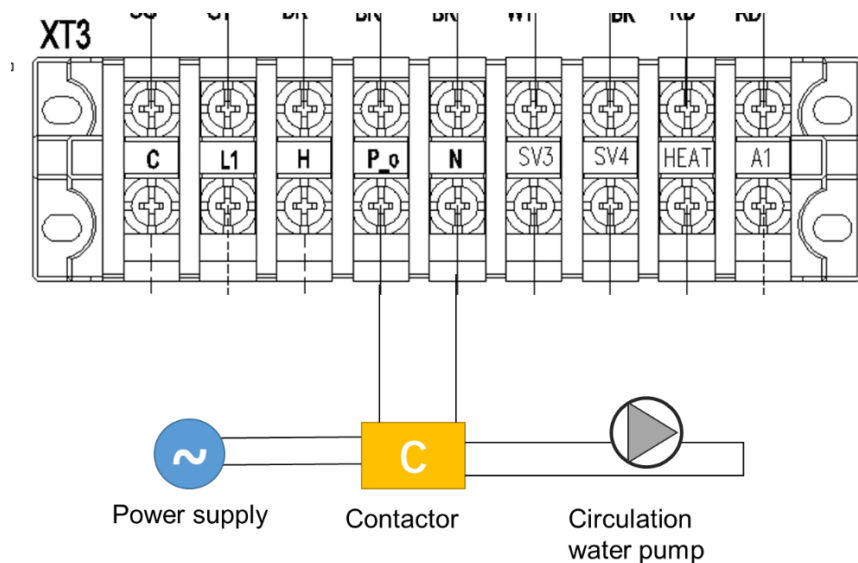
The REMO\_CTRL is used to remotely start and stop the units. It is short-circuited at the factory, and units use wired controller to start and stop. If it is necessary to use the REMO\_CTRL, the short line should be removed and controlled by the opening and closing switch. Start and stop of the unit (when switch is closed, the unit is turned on; when switch is disconnected, the unit is stopped).

#### 6. Connection of booster heater



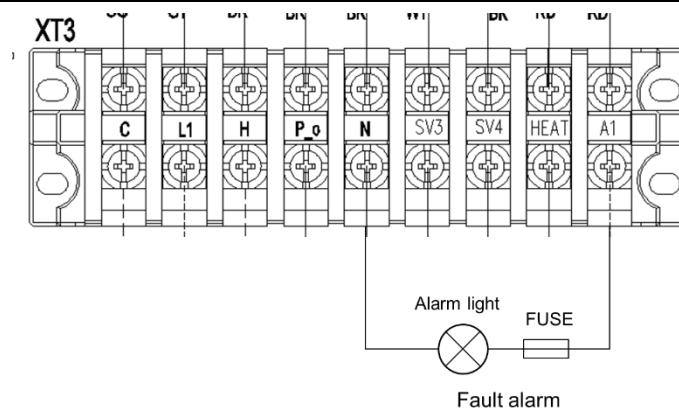
Connection of the booster heater cable depends on the application. Only when the domestic hot water tank is installed will this wiring be needed. The unit only sends ON or OFF signal to the booster heater. An additional contactor is needed and a dedicated terminal is needed to supply power to the booster heater.

#### 7. Connection of circulation water pump



Connection of the circulation depends on the length of water pipes. The unit only sends ON or OFF signal to the water pump. An additional contactor is needed and a dedicated terminal is needed to supply power to the water pump.

#### 8. Connection of alarm signal



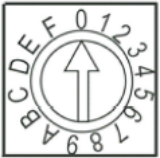
When the unit has error code, alarm port has a 220V output.

## 12. Start-up and configuration



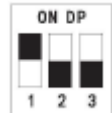
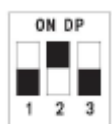
The unit should be configured by the installer to match the installation environment (outdoor climate, installed options, etc.) and user expertise.

### 12.1 DIP switch settings

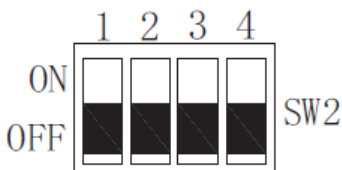
#### 1. Single phase outdoor unit

Capacity setting	 S1	0	Reserved
		1	Reserved
		2	FHOF-WHS-100CE3
		3	Reserved
		4	Reserved
		.....	.....

#### 2. 3-phase outdoor unit

Start time setting	SW3		Start time 12 min
			Start time 3 min (Factory default)
Capacity setting	SW6		Reserved
			FHOF- -WHS-160CE3-3F

#### 3. Hydronic module

 (factory default)	SW2-1	OFF	Heating and cooling
		ON	Heating only
	SW2-2	OFF	Without thermostat control
		ON	With thermostat control
	SW2-4	OFF	With DHW mode
		ON	Without DHW mode

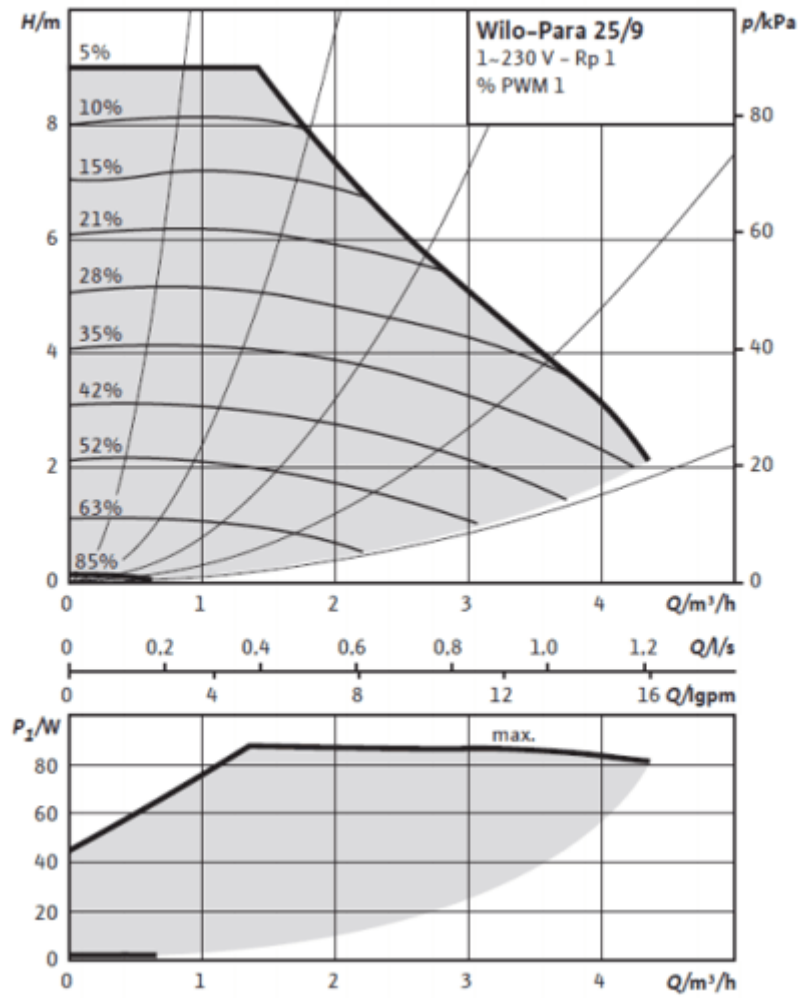
## 12.2 Pre-operation checks

After the installation of the unit, check the followings before powering on the units:

- **Field wiring:** Make sure that the field wiring between the switch box and unit and valves (when applicable), unit and room thermostat (when applicable), unit and domestic hot water tank, and unit and backup heater box have been connected according to the instructions, according to the wiring diagrams and to local laws and regulations.
- **Fuses, circuit breakers, or protection devices:** Check that the circuit breaker or the locally installed protection devices are of the size and type specified in the chapter 11 specifications. Make sure that no fuses or protection devices have been bypassed.
- **Booster heater circuit breaker:** Do not forget to turn on the booster heater circuit breaker (applies only to units with optional domestic hot water tank installed).
- **Ground wiring:** Make sure that the ground wires have been connected properly and that the ground terminals are tightened.
- **Internal wiring:** Visually check the EC box for loose connections or damaged electrical components.
- **Mounting:** Check that the unit is properly mounted, to avoid abnormal noises and vibrations when starting up the unit.
- **Damaged equipment:** Check the inside of the unit for damaged components or squeezed pipes.
- **Refrigerant leak:** Check the inside of the unit for refrigerant leakage. If there is a refrigerant leak, call your local dealer.
- **Power supply voltage:** The power supply voltage must correspond to the voltage on the identification label of the unit.
- **Air purge valve:** Make sure the air purge valve is open (at least 2 turns).
- **Shut-off valves:** Make sure that the shut-off valves are fully open

## 12.3 Water pump

The water pump in hydronic module is DC inverter type, and the water head is 9m. It will adjust running speed automatically according to the temperature difference between water inlet and outlet temperature of plate heat exchanger.



## 13. Operation and control

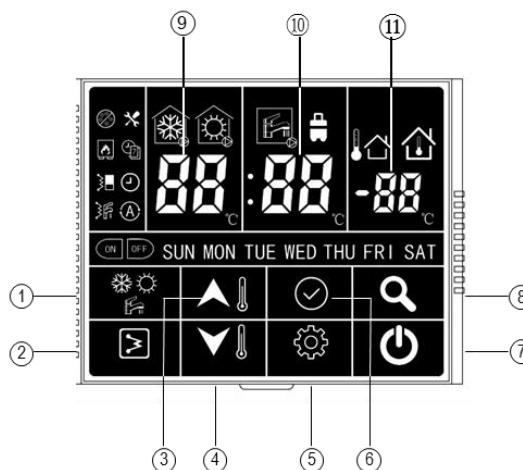
This wired controller is used for communicating with the system main board, controlling the operating status of the system through touch keys, and displaying the working status of the whole system through its LCD screen.



### 13.1 Icon introduction










#### Buttons / Indicator



- ① Mode Setting
- ② Electric auxiliary heating
- ③ Temperature +
- ④ Temperature -
- ⑤ Setting
- ⑥ OK
- ⑦ ON/OFF
- ⑧ Query
- ⑨ Left digital tube
- ⑩ Middle digital tube
- ⑪ Right digital tube









	Anti-freezing		Error		Cooling mode ON
	Reserved		Weekly timer		Heating mode ON
	Hydronic module heater		Clock		DHW mode ON
	Water tank heater		Reserved		Outdoor temp.







	Timer ON		Timer OFF		Indoor Temp.
	Cooling mode		Heating mode		DHW mode
	Day		Time / temp.		Reserved

- The wired controller and the main board will check whether the communication is successful within 1 minute after power-on. If the communication is not successful, the main control board (30 seconds) and the wired controller will alarm the communication fault. If the communication is successful later, the alarm fault is restored and normal operation control is restored.
- ON/OFF button : Press this button to turn the unit ON or OFF.
- OK button : Press this button to confirm the settings, exit all interfaces of setting or query and return to the main interface.

## 13.2 Setting the clock

- ① Short press setting button , the clock icon  flashes.
- ② Long press OK button , to enter time setting interface.
- ③ When the day icon, hour icon (left digital tube) or minute icon (middle digital tube) flash, scroll  and  to select. Press OK button  to confirm the selection each time. (24h format)

### Check the time

Short press  button, the clock icon  flashes. When the clock icon flashes, short press  button, the current time will be displayed, the clock icon becomes constantly on. And it automatically exits after 10 seconds. Press  button will also exit.

*Note: when first power on or repower on the controller, the default time is 18:00, Monday.*






## 13.3 Running mode and temperature setting













### 13.3.1 Running mode setting

Short press MODE button  to select running mode.

1. When the unit is without DHW mode

- Heating only model: the wired controller can only select heating mode.
- Heat pump model: it will be selected heating  → cooling  → heating .

2. When the unit is with DHW mode

- Only heating model: the wired controller can only select heating  → DHW  and heating + DHW combination mode  .
- Heat pump model: it will be selected heating  → DHW  → cooling  → cooling + DHW   → heating + DHW   → heating .

*Note: 1. Whether the unit is with DHW mode depends on SW2-4 in hydronic module PCB.*

*SW2-4 : OFF—with DHW mode*











*ON—without DHW mode*







*2. SW2-1: OFF—heating and cooling*

*ON—heating only*






### 13.3.2 Temperature setting

1. When the unit is with DHW mode

- When the unit is set in only heating mode or only cooling mode
  - a) In main interface and when the unit is ON, short press  or  , to enter heating/cooling water temperature  $T_{S1}$  setting interface, left digital tube flashes.
  - b) Press  or  button to choose the target temperature. Press button once to increase the setting temperature by 1°C. When the setting temperature reaches the highest or lowest value, press the button again that the setting temperature won't change.
  - c) Press  button or no operation for 5 seconds, it will save the setting and exit the temperature setting interface.
- When the unit is set in only DHW mode
  - a) In main interface and when the unit is ON, short press  or  , to enter DHW water temperature  $T_{S2}$  setting interface, middle digital tube flashes.
  - b) Press  or  button to choose the target temperature. Press button once to increase the setting temperature by 1°C. When the setting temperature reaches the highest or lowest value, press the button again that the setting temperature won't change.
  - c) Press  button or no operation for 5 seconds, it will save the setting and exit the temperature setting interface.

- When the unit is set combination mode and the unit is running one mode
  - a) In main interface, short press  or  , to enter current running mode temperature setting interface, one digital tube flashes. (no operation for 5 seconds to exit setting)
  - b) Press  or  button to choose the target temperature. Press button once to increase the setting temperature by 1°C. When the setting temperature reaches the highest or lowest value, press the button again that the setting temperature won't change.
  - c) Short press  button, to enter the other mode temperature setting interface.
  - d) After finishing the setting, Press  button or no operation for 5 seconds, it will save the setting and exit the temperature setting interface.

## 2. When the unit is without DHW mode

- a) In main interface, short press  or  , to enter heating/cooling water temperature T<sub>S1</sub> setting interface, middle digital tube flashes.
- b) Press  or  button to choose the target temperature. Press button once to increase the setting temperature by 1°C. When the setting temperature reaches the highest or lowest value, press the button again that the setting temperature won't change.
- c) Press  button or no operation for 5 seconds, it will save the setting and exit the temperature setting interface.

Notes: 1. The default temperature is 7 °C for cooling mode, 45 °C for heating mode, 50 °C for DHW mode.

2. The setting temperature range is 5~25 °C for cooling mode, 25~60 °C for heating mode and 40~60 °C for DHW mode.

## 13.4 Display shows

### 13.4.1 Digital display

Status	DHW mode is ON*				DHW mode is OFF*
	Standby mode	Running heating/cooling mode	Running DHW mode	Setting temperature	All modes
Left digital	T1	T1	T <sub>S1</sub>	T <sub>S1</sub>	T1
Middle digital	T7	T <sub>S2</sub>	T7	T <sub>S2</sub>	T <sub>S1</sub>

Note:

T1: water outlet temperature of hydronic module

T7: DHW water tank temperature

T<sub>S1</sub>: heating or cooling mode setting temperature



T<sub>S2</sub>: DHW mode setting temperature



\*: When SW2\_4 is in OFF position, DHW mode is ON; when SW2\_4 is in ON position, DHW mode is OFF.

### 13.4.2 Icon display


When there is a box outside the mode icon, it means the unit is running in this mode.

## 13.5 Electric auxiliary heating


1. When the unit is in heating mode or timer heating mode is ON, in the main interface, press electric auxiliary heating button , the hydronic module electric heater icon  is displayed to open electric heater.

When water outlet temperature  $T_1 \leq (\text{setting temperature } T_s - 6^\circ\text{C})$ , the electric heater will work and the icon  will still show. If not, this icon  will disappear.



When  $T_1 \geq T_s$  or T4 temperature sensor is fault, the electric heater will stop working.


When the electric heater is working, if press the button , the electric heater will not stop working until  $T_1 \geq T_s$ .

## 13.6 Forced defrosting

Long press electric auxiliary heating button , “dF” will be displayed. If the unit is in heating mode or DHW mode and T3 (outdoor unit heat exchanger temperature) is lower than  $15^\circ\text{C}$ , the unit will enter forced defrosting mode.

## 13.7 Sterilization mode

Long press mode setting button , the water tank electric heater icon  flashes 5s, and the high-temperature sterilization mode is manually activated (only available when DHW mode or cooling(heating) + DHW combination mode).




After flashing 5s, if the hydronic module is running sterilization mode, the icon  will still flash until it exit sterilization mode.

Exit condition: 1. Water tank temperature  $T_7 \geq 70^\circ\text{C}$  and last 30 minutes;  
2. Run sterilization mode more than 3 hours.












































## 13.8 Weekly timer setting

When it reaches to setting time, the unit will start to work according setting mode and temperature or shutdown the unit.

### 13.8.1 Weekly timer setting

Press setting button  twice, the weekly timer icon  flashes, long press  button to enter the

weekly timer setting interface.




1. After entering the weekly timer setting mode,  icon flashes, press  or  button to select  or , and press  button, when  icon is always on, enter the start time setting.
2. **Days setting:** Long press  or  button to switch setting items. When the  icon is always on, SUN icon starts to flash (flashing indicates that the setting is adjustable), short press  or  button to switch from SUN-SAT. After selecting a day, press  button and the day icon will be on. Press  button again to cancel the selection, the icon flashes, and you can reset it. After finishing days setting, the selected day's icon is always on (if no day is selected, the currently flashing day will be selected).
3. **"Hour" setting:** Long press  button, at this time "Hour" flashes (left digital tube, initial value is 08, if it has been set, the last set value is displayed, the temperature unit is not displayed), short press  or  button to select the time (00-23), short press  button, the number is always on. Press  button again to cancel the selection, the icon flashes, and you can reset it.
4. **"Minute" setting:** After "Hour" setting is completed, long press  button. At this time, "Minute" flashes (middle digital tube, initial value is 00, if it has been set, the last set value is displayed, temperature unit is not displayed), short press  or  to select the time (00-59). Short press  button, the number is always on. Press  button again to cancel the selection, the icon flashes, and you can reset it.
5. **Mode setting:** After finishing minutes setting, long press  to enter the timer mode setting. Short press  to choose mode. The operations are like chapter [13.3.1](#).
6. **Temperature setting:** After finishing mode setting, long press  to enter temperature setting.
  - a) When the digital tube flashes, short press  or  to set the target temperature. Press  button to select the setting temperature value, and the value is always on. Press  button again to cancel the selection, the icon flashes, and you can reset it. Press button once to increase the setting temperature by 1°C. When the setting temperature reaches the highest or lowest value, press the button again that the setting temperature won't change.
  - b) If setting mode is combination mode, after finishing first temperature setting, long press  button to switch to the other temperature setting.
7. After finishing temperature setting, long press mode setting button  to back timer setting interface. When  icon flashes, press  button to enter shutdown timer setting interface.
8. **Shutdown time setting:** When  is always on, long press  button to select timer shutdown days. Short press  or  button to switch from SUN-SAT. After selecting a day, press  button and the day icon will be on. Press  button again to cancel the selection. When the days icon flashes, and you can reset it. Long press  button to enter "Hour" and "Minutes" setting.
9. **Exit:** After finishing all setting, long press  button to exit timer setting.



*Notes: 1. After finishing every setting, please remember short press  button to save the set,*

*otherwise, the weekly timer setting will fail.*

*2. Long press  button, it will come back to last setting interface.*



### 13.8.2 Weekly timer setting query

Press setting button  twice, the weekly timer icon  flashes, short press  button to enter the weekly timer setting interface.




In weekly timer viewing interface, press  or  button to check:

1. Timer on: the digital tube displays the timer on time;
2. Timer off: the digital tube displays the timer off time.
3. Timer on: the digital tube displays the timer setting temperature, and setting mode;





### 13.8.3 Clear weekly timer setting

In main interface, press setting button  three times, and middle digital tube displays 1 or 0. At this time, long press  button, the controller will clear weekly settings.

## 13.9 Power-down memory setting

In main interface, press setting button  three times, and middle digital tube displays 1, meaning the controller with power-down memory (default). Press  or  button, when it displays 0, meaning the controller without power-down memory.


## 13.10 Spot check

Press  button to enter the query status, press  button or no operation for 5 seconds to exit the query interface and return to the main interface. Press  or  button in query interface, it will show these data in turn:

No.	Description	Notes
1	AC side setting water temperature Ts1	
2	Domestic hot water setting temperature Ts2	When hydronic module is without DHW function, it will show 0.
3	Water inlet temperature of heat exchanger Tw_in	
4	Water outlet temperature of heat exchanger Tw_out	
5	Water outlet temperature of hydronic module T1	
6	Water tank temperature T7	
7	Temperature detected by temperature probe of wired controller T6	


8	Ambient temperature T4	When hydronic module is without DHW function, it will show 0.
9	Capacity of hydronic module	Capacity (HP) = value * 0.1
10	Operating capacity demand of hydronic module	Capacity (HP) = value * 0.1
11	Water pump gear	

## 13.11 Error code display

When the unit has error, the icon  and error code will appear in the screen. Only when the error is solved, it will disappear.

Error code	Description	Error code	Description
E0	Water flow switch failure	E8	Heat exchanger water outlet temperature sensor Tw_out malfunction
E1	Communication failure between hydronic module and outdoor unit	E9	Communication failure between hydronic module and wired controller
E2	Water outlet temperature sensor T1 malfunction	EF	Mode conflict
E5	Outdoor unit failure	P0	EEPROM protection
E6	Water tank temperature Sensor T7 malfunction	P1	Excessive temperature difference between water inlet and outlet protection
E7	Heat exchanger water inlet temperature sensor Tw_in malfunction	P2	Water shortage protection

## 13.12 Anti-freezing function

When ambient temperature or water temperature is too low, in order to protect water pipe from freezing, the unit will enter anti-freezing mode. “d0” and  icon will show in wired controller.

## 14. Troubleshooting

Before starting the troubleshooting procedure, carry out a thorough visual inspection of the unit and look for obvious defects such as loose connections or defective wiring.

### 14.1 Spot check

#### 14.1.1 Spot check in outdoor unit

For single phase outdoor unit, press up button to enter spot check.



For three-phase outdoor unit,

No.	Display content	Remarks
0	Current frequency / quantity of indoor unit	
1	Capacity of outdoor unit	50/80/100/120/140/160
2	Total capacity of indoor units	
3	Total required capacity after correction of outdoor unit	
4	Operation mode	0: Standby ; 2: Cooling; 3: Heating; 4: Forced cooling
5	Actual operating capacity of outdoor unit	
6	Fan speed	0~8
7	Tw_in water inlet temperature of heat exchanger	
8	Tw_out water outlet temperature of heat exchanger	
9	T1 water outlet temperature of hydronic module	
10	T3 condenser temperature of outdoor unit	
11	T4 ambient temperature	
12	T5 exhaust temperature	
13	Opening degree of electronic expansion valve	1-phase ODU: Actual value = Check display value $\times 4$ ; 3-phase ODU: Actual value = Check display value $\times 8$
14	High pressure	



15	Primary current	
16	Secondary current	
17	Primary voltage	
18	Secondary voltage	
19	Last failure or protection code	No protection or fault display ---
20	Control parameter	For developers only
21	Control parameter	For developers only
22	---	End of check

#### 14.1.2 Spot check in hydronic module

Press SW4 check button to enter spot check.



No.	Display content	Remarks
1	Capacity of outdoor unit	
2	Set mode of indoor unit	
3	Operating mode of outdoor unit	0: Standby; 2: Cooling; 3: Heating; 4: Forced cooling
4	Operating capacity demand for indoor unit	
5	Setting temperature	
6	T1 water outlet temperature	
7	Tw_in water inlet temperature of PHE	
8	Tw_out water outlet temperature of PHE	
9	T7 DHW Tank Temperature	
10	T4 ambient temperature	
11	Previous fault	
12	Previous second fault	
13	Previous third fault	
14	Software version	
15	Pump output level	
16	---	

#### 14.1.3 Spot check in wired controller

Press query button to enter spot check. Press up and down button to turn pages.



No.	Display content	Remarks
1	AC side setting water temperature Ts1	
2	Domestic hot water setting temperature Ts2	When hydronic module is without DHW function, it will show 0.
3	Water inlet temperature of heat exchanger Tw_in	
4	Water outlet temperature of heat exchanger Tw_out	
5	Water outlet temperature of hydronic module T1	
6	Water tank temperature T7	
7	Temperature detected by temperature probe of wired controller T6	
8	Ambient temperature T4	When hydronic module is without DHW function, it will show 0.
9	Capacity of hydronic module	Capacity (HP) = value * 0.1
10	Operating capacity demand of hydronic module	Capacity (HP) = value * 0.1
11	Water pump gear	

## 14.2 Error code and troubleshooting

### 14.2.1 Outdoor unit

Code	Failure or protection	Failure cause and corrective action
E1	Three-phase supply phase-sequence fault (only for 3Ph unit)	1. Check the power supply cables to avoid phase loss 2. Check the power supply cables sequence; change any two cables sequence of the three power supply.
E2	Communication failure between indoor unit and outdoor unit	Cause: Communication interrupted for 2mins or more between ODU and IDU 1. Wire doesn't connect between IDU and ODU. Connect the wire.

		<p>2. Communication wire sequence is not right. Reconnect the wire in the right sequence.</p> <p>3. Whether there is a high magnetic field or high power interfere, such as lifts, large power transformers, etc. To add a barrier to protect the unit or to move the unit to the other place.</p>
E4	Ambient temperature sensor failure	<p>1. The T4 sensor connector is loosening. Reconnect it.</p> <p>2. The T4 sensor connector is wet or there is water in. Remove the water, make the connector dry. Add waterproof adhesive</p> <p>3. The T4 sensor failure, change a new sensor.</p>
E6	Condenser temperature sensor failure	The same with E4.
E8	T5 exhaust temperature sensor failure	The same with E4.
E9	AC over voltage/ under voltage protection	
E10	EEPROM failure	<p>1. The EEPROM parameter is error, rewrite the EEPROM data.</p> <p>2. EEPROM chip part is broken. Change a new EEPROM chip part.</p> <p>3. Main PCB is broken, change a new PCB.</p>
H0	Communication failure between the main control chip and the module board	
H4	Display P6 protection f or 3 times within 30 minutes	<p>It can only be restored by repowering on the unit.</p> <p>The same with P6.</p>
H5	Display P2 protection f or 3 times within 30 minutes	<p>It can only be restored by repowering on the unit.</p> <p>The same with P2.</p>
H6	Display P4 protection f or 3 times within 100 minutes	<p>It can only be restored by repowering on the unit.</p> <p>The same with P4.</p>
H9	Display P9 protection f or 2 times within 10 minutes	<p>It can only be restored by repowering on the unit.</p> <p>The same with P9.</p>
H8	High pressure sensor failure	Cause: Exhaust pressure $P_c < 0.3\text{MPa}$
H10	Display P3 protection f or 3 times within 60 minutes	<p>It can only be restored by repowering on the unit.</p> <p>The same with P3 and P14.</p>
P1	High pressure protection (high voltage switch)	<p>Heating mode, DHW mode:</p> <p>1. The water flow is low; water temp is high, whether there is air in the water system. Release the air.</p> <p>2. Water pressure is lower than 0.1Mpa, charge the water to let the pressure in the range of 0.15~0.2Mpa.</p> <p>3. Over charge the refrigerant volume. Recharge the refrigerant in right volume.</p> <p>4. EXV locked or coil connector is loosening. Tap-tap the valve body and plug in/ plug off the connector for several times to make sure the valve is working correctly. And</p>

		<p>install the EXV coil in the right location</p> <p>DHW mode:</p> <p>Water tank heat exchanger is smaller than the required 1.7m<sup>2</sup> (10-16kW unit) or 1.4m<sup>2</sup> (5-7kW unit)</p> <p>Cooling mode:</p> <ol style="list-style-type: none"> <li>1. Heat exchanger cover is not removed. Remove it.</li> <li>2. Heat exchanger is dirty or something is block on the surface. Clean the heat exchanger or remove the obstruction</li> </ol>
P2	Low pressure protection	<p>3 times P2 protection appears within 30 minutes and then reported H5.</p> <ol style="list-style-type: none"> <li>1. System is lack of refrigerant. Charge refrigerant in right volume.</li> <li>2. When at heating mode or DHW mode, heat exchanger is dirty or something is block on the surface. Clean the heat exchanger or remove the obstruction.</li> <li>3. The water flow is low in cooling mode.</li> <li>4. EXV locked or coil connector loose. Tap-tap the valve body and plug in/ plug off the connector for several times to make sure the valve is working correctly. And install the EXV coil in the right location</li> </ol>
P3	Primary current overcurrent protection	
P4	Exhaust temperature is too high protection	<p>3 times P4 protection appears within 100 minutes and then reported H6.</p> <ol style="list-style-type: none"> <li>1. The same reason to P1.</li> <li>2. System is lack of refrigerant. Charge the refrigerant in right volume.</li> <li>3. Tw_out temp sensor connector loosens. Reconnect it.</li> <li>4. T1 temp sensor connector loosens. Reconnect it.</li> <li>5. T5 temp sensor connector loosens. Reconnect it.</li> </ol>
P5	T3 high temperature protection	<ol style="list-style-type: none"> <li>1. Outdoor unit heat exchanger is not good.</li> <li>2. Temperature sensor is in wrong place or broken.</li> </ol>
P6	Module protection	<p>3 times P6 protection appears within 30 minutes and then reported H4.</p> <ol style="list-style-type: none"> <li>1. Power supply voltage of the unit is low, increase the power voltage to the required range.</li> <li>2. The space between the units is too narrow for heat exchange. Increase the space between the units.</li> <li>3. Heat exchanger is dirty or something is block on the surface. Clean the heat exchanger or remove the obstruction.</li> <li>4. Fan is not running. Fan motor or fan is broken. Change a new fan or fan motor.</li> </ol>

		<p>5. Over charge the refrigerant volume. Recharge the refrigerant in right volume.</p> <p>6. Water flow rate is low, there is air in system, or pump head is not enough. Release the air and reselect the pump.</p> <p>7. Water outlet temp sensor is loosening or broken, reconnect it or change a new one.</p> <p>8. Water tank heat exchanger is smaller than the required 1.7m<sup>2</sup> (10-16kW unit) or 1.4m<sup>2</sup> (5-7kW unit)</p> <p>9. Module wires or screws are loosening. Reconnect wires and screws.</p> <p>The Thermal Conductive Adhesive is dry or drop. Add some thermal conductive adhesive.</p> <p>10. The wire connection is loose or drop. Reconnect wire.</p> <p>11. IPM board is defective, replace a new one.</p> <p>12. If already confirm the control system has no problem, then compressor is defective, replace a new compressor</p>
P9	DC fan failure	2 times P9 protection appears within 10 minutes and then reported H9
L0	DC compressor module failure	
L1	DC bus low voltage protection	
L2	DC bus high voltage protection	
L4	MCE fault / synchronization / closed loop	
L5	Zero speed protection	
L7	Phase sequence error protection	
L8	Speed change > 15Hz at the previous and last moments	
L9	set speed and actual running speed difference >15 Hz	

#### 14.2.2 Hydronic module

Code	Failure or protection	Failure cause and corrective action
E0	Water flow switch fault	<p>1. The wire circuit is short connected or open. Reconnect the wire to assure effective connection.</p> <p>2. Water flow rate is too low</p> <p>3. Water flow switch failed, switch is opened or closed continuously. Change water the flow switch.</p>
E1	Communication fault between hydronic module and outdoor unit	<p>1. Wire doesn't connect between IDU and ODU. Connect the wire.</p> <p>2. Communication wire sequence is not right. Reconnect the wire in the right sequence.</p> <p>3. Whether there is a high magnetic field or high power</p>

		interfere, such as lifts, large power transformers, etc. To add a barrier to protect the unit or to move the unit to the other place.
E2	T1 fault of water outlet temperature sensor	<ol style="list-style-type: none"> <li>1. The T1 sensor connector is loosening. Reconnect it.</li> <li>2. The T1 sensor connector is wet or there is water in. Remove the water, make the connector dry. Add waterproof adhesive.</li> <li>3. The T1 sensor failure, change a new sensor.</li> </ol>
E5	Outdoor unit fault	Please see the error code in outdoor unit.
E6	T7 fault of DHW tank water temperature sensor	<ol style="list-style-type: none"> <li>1. The T7 sensor connector is loosening. Reconnect it.</li> <li>2. The T7 sensor connector is wet or there is water in. Remove the water, make the connector dry. Add waterproof adhesive.</li> <li>3. The T7 sensor failure, change a new sensor.</li> </ol>
E7	Tw_in fault of heat exchanger inlet water temperature sensor	<ol style="list-style-type: none"> <li>1. The sensor connector is loosening. Reconnect it.</li> <li>2. The sensor connector is wet or there is water in. Remove the water, make the connector dry. Add waterproof adhesive.</li> <li>3. The sensor failure, change a new sensor.</li> </ol>
E8	Tw_out fault of heat exchanger outlet water temperature	<ol style="list-style-type: none"> <li>1. The sensor connector is loosening. Reconnect it.</li> <li>2. The sensor connector is wet or there is water in. Remove the water, make the connector dry. Add waterproof adhesive.</li> <li>3. The sensor failure, change a new sensor.</li> </ol>
E9	Communication fault between hydronic module and wired controller	<ol style="list-style-type: none"> <li>1. Wire doesn't connect between controller and unit. Connect the wire.</li> <li>2. Communication wire sequence is not right. Reconnect the wire in the right sequence.</li> <li>3. Whether there is a high magnetic field or high power interfere, such as lifts, large power transformers, etc. To add a barrier to protect the unit or to move the unit to the other place.</li> </ol>
P0	EEPROM protection	<ol style="list-style-type: none"> <li>1. The EEPROM parameter is error, rewrite the EEPROM data.</li> <li>2. EEPROM chip part is broken. Change a new EEPROM chip part.</li> <li>3. Main PCB is broken, change a new PCB.</li> </ol>
P1	Protection for large temperature difference of inlet and outlet	<ol style="list-style-type: none"> <li>1. Check that all shut off valves of the water circuit are completely open.</li> <li>2. Check if the water filters need cleaning.</li> <li>3. Charging water</li> <li>4. Make sure there is no air in the system (Purge air).</li> <li>5. Check on the manometer that there is sufficient water pressure. The water pressure must be &gt;1 bar (water is cold).</li> </ol>

		6. Check that the pump speed setting is on the highest speed. 7. Make sure that the expansion tank is not broken. 8. Check that the resistance in the water circuit is not too high for the pump
P2	Protection for insufficient water flow	
P3	T1 and Tw_out simultaneous fault protection	The same to E2 and E8.