EN

SERVICE MANUAL

01 | 29-07-2022

S-THERM 4 ALL-IN-ONE SERIES

AIR TO WATER HEAT PUMPS

GSH-XXXTRB + GSH-XXXERB
GSH-XXXTRB2 + GSH-XXXERB
GSH-XXXTRB2 + GSH-XXXERB2
GSH-XXXTRB2-3 + GSH-XXXERB-3

S-THERM | sinclair HEAT PUMPS

IMPORTANT NOTE:

Read this manual carefully before installing or operating your new heat pump.
Make sure to save this manual for future reference.

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Specifications

1 Product Data

1.1 Models

1.1.1 Outdoor Unit

Series	Model	Cooling capacity (kW)	Heating capacity (kW)	Power supply	Refrigerant	Appearance
S-Therm (4th generation)	GSH-40ERB	3.8	4	230 VAC, 50 Hz	R32	
	GSH-60ERB	5.8	6			
	GSH-40ERB2	3.9	4			
	GSH-60ERB2	5.8	6			
	GSH-80ERB	7	8	230 VAC, 50 Hz		
	GSH-100ERB	8.5	9.5			
	GSH-80ERB2	7.7	8			
	GSH-100ERB2	9.35	10			
	GSH-80ERB-3	8.5	8	400 VAC, 50 Hz		
	GSH-100ERB-3	10	10			
	GSH-120ERB	11	12	230 VAC, 50 Hz		
	GSH-140ERB	12.6	14			
	GSH-160ERB	13	15.5			
	GSH-120ERB-3	11	12	400 VAC, 50 Hz		
	GSH-140ERB-3	12.6	14			
	GSH-160ERB-3	13	15.5			

CAUTION! For some units, the “COMMISSIONING” menu is under the password 000048.

1.1.2 Indoor Unit

Series	Model	Power supply	Appearance
S-therm 4th generation All-in-one IDU	GSH-40TRB	230 VAC	
	GSH-60TRB		
	GSH-80TRB		
	GSH-100TRB		
	GSH-40TRB2		
	GSH-60TRB2		
	GSH-80TRB2		
	GSH-100TRB2		
	GSH-120TRB2		
	GSH-140TRB2		
	GSH-160TRB2		
	GSH-80TRB2-3	400 VAC	
	GSH-100TRB2-3		
	GSH-120TRB2-3		
	GSH-140TRB2-3		
	GSH-160TRB2-3		

1.1.3 Possible Combinations of the Outdoor and Indoor Units

Combination of outdoor and indoor units		Bivalence	Heating spiral for DHW heating
Outdoor Unit (ODU)	Indoor unit (IDU)	[kW]	[kW]
GSH-40ERB	GSH-40TRB	1.5+1.5	3
GSH-60ERB	GSH-60TRB		
GSH-80ERB	GSH-80TRB	3+3	
GSH-100ERB	GSH-100TRB		
GSH-40ERB2	GSH-40TRB2	1.5+1.5	
GSH-60ERB2	GSH-60TRB2		
GSH-80ERB2	GSH-80TRB2	3+3	
GSH-100ERB2	GSH-100TRB2		
GSH-120ERB	GSH-120TRB2		
GSH-140ERB	GSH-140TRB2		
GSH-160ERB	GSH-160TRB2		
GSH-80ERB-3	GSH-80TRB2-3		
GSH-100ERB-3	GSH-100TRB2-3		
GSH-120ERB-3	GSH-120TRB2-3		
GSH-140ERB-3	GSH-140TRB2-3		
GSH-160ERB-3	GSH-160TRB2-3		

1.2 Product Features

1.2.1 General

This product is an integrated DC inverter unit that provides cooling, heating and water heating functions and has an energy efficiency of up to 5.0. It uses R32 refrigerant and a two-stage compressor. When heating and an outdoor temperature is between −25 and 35 °C, the leaving water temperature can be between 20 and 60 °C.

The 4th generation S-Therm unit is designed specifically for the European market where hot water is in demand. Thanks to the two-stage compression and increasing the enthalpy of the refrigerant by gas injection, the energy efficiency of heating at low temperature is significantly increased and the leaving water temperature can reach up to 60 °C. This product range strictly complies with EN14511, EUROVENT standards for Class A energy efficiency, and EN14825 for Class A+++ SCOP (35 °C) and Class A++ SCOP (55 °C). Their COP (Coefficient of performance) can reach up to 5.0. This unit can provide space heating through terminal units such as fan coil units, underfloor heating and radiators as well as domestic hot water (DHW) supply. The unit uses an environmentally friendly R32 refrigerant – it has an ODP (Ozone Depletion Potential) = 0 and a relatively low GWP (Global Warming Potential) = 675. In addition, the applied heat pump technologies reduce the consumption of coal and other energy resources and significantly reduce CO_2 emissions. Models with capacities ranging from 4.0 to 9.5 kW find wide application in small and medium-sized apartments, large family houses, etc.

1.2.2 Features

- Wide operating range

  Heating: −25–35 °C; Cooling: 10-48 °C; Water heating: -25–45 °C

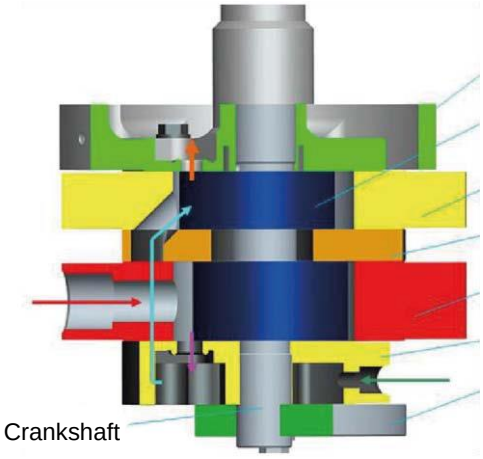
- Unique low-temperature/high-temperature two-stage compressor

  (1) At low temperatures, a two-stage low-temperature/high-temperature compressor will have lower heat capacity loss and higher energy efficiency compared to a conventional compressor.

  (2) Compressor flooding, high discharge temperature and other problems at low temperatures can also be completely prevented, resulting in a significant increase in compressor reliability.

  (3) Two-stage compression, two-stage throttling and increasing the refrigerant enthalpy by gas injection will increase the leaving water temperature and improve control accuracy.

  (4) Compressor motor resistance values:
  4/6 kW – UV/VW/UW: 1.67±7% Ω
  8/10kW – UV/VW/UW: 0.99±7% Ω



- High-efficient components (inverter pump, inverter fan, plate heat exchanger)

  (1) Class A high-efficient inverter water pump, which complies with the European ErP directive, can regulate the flow according to the actual load. This helps to improve operating efficiency and regulate water temperature more precisely.

  (2) The DC inverter fan can accurately regulate the airflow and ensure that the system runs more stably and saves more energy.

(3) The high-efficient plate heat exchanger greatly improves the performance of the unit.

(4) The high-efficient water pump also greatly improves the performance of the unit.

- All-in-one design

  (1) The unit can be integrated with terminal units such as the radiator, underfloor heating, fan coil (FCU), water heater, solar water heater, gas boiler, etc. The versatile functions allow to meet various types of requirements of different users and increase the usability of this product.

  (2) Combining all components into one device allows to save installation costs, reduces the risk of refrigerant leakage and improves system safety and reliability.

- Brand new wall-mounted wired controller

  (1) A controller with an attractive design and white cover, and adapted for wall mounting.

  (2) Touch screen LCD

  (3) Connector for separate 12V power supply to the controller and extended communication distance.

  (4) A remote monitoring interface allows the unit to be monitored via Modbus and can be integrated into a Building Management System (BMS).

(Home page)

(Menu page)

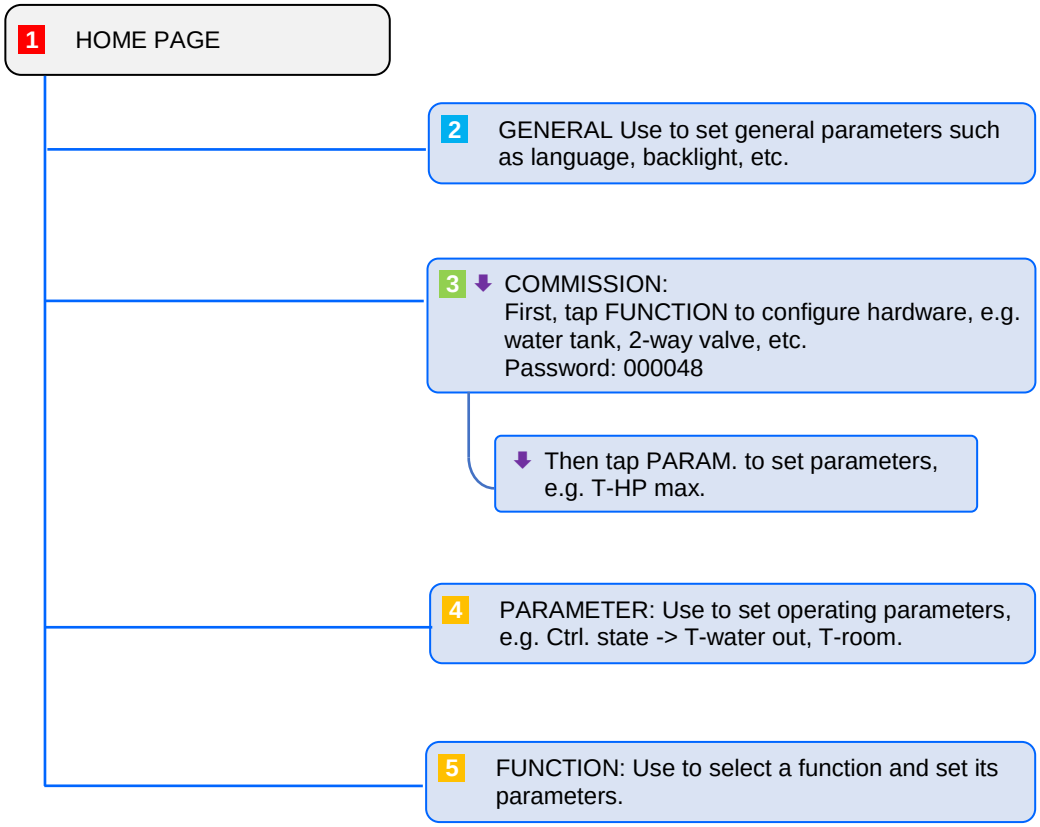
- Smart control, powerful functions

  (1) The operating mode can be switched freely. In addition, holiday mode, weather-dependent mode, quiet operation timer, temperature setting timer and floor preheating can be activated based on different requirements.

  (2) Multiple safety features ensure much safer operation of the equipment. An additional electric heater prevents the plate heat exchanger from freezing due to a too low temperature of the water, which helps to extend the product service life and increases its safety and reliability.

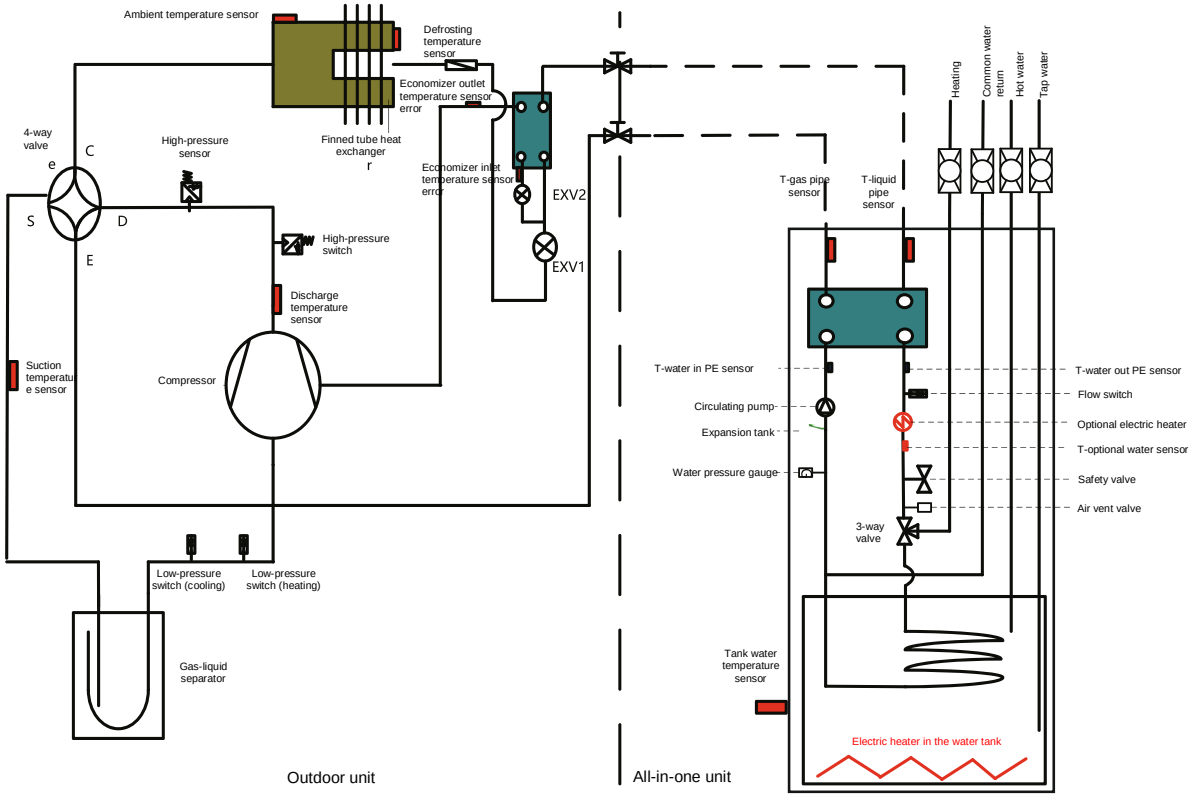
  (3) The newly developed smart defrost control programme, which operates according to the principles of “defrost when needed; do not defrost when not needed; defrost more when severe freezing; defrost less when moderate freezing”, can bring more convenience to users and ensure an adequate and sustainable heat supply.

Overview of the set parameters

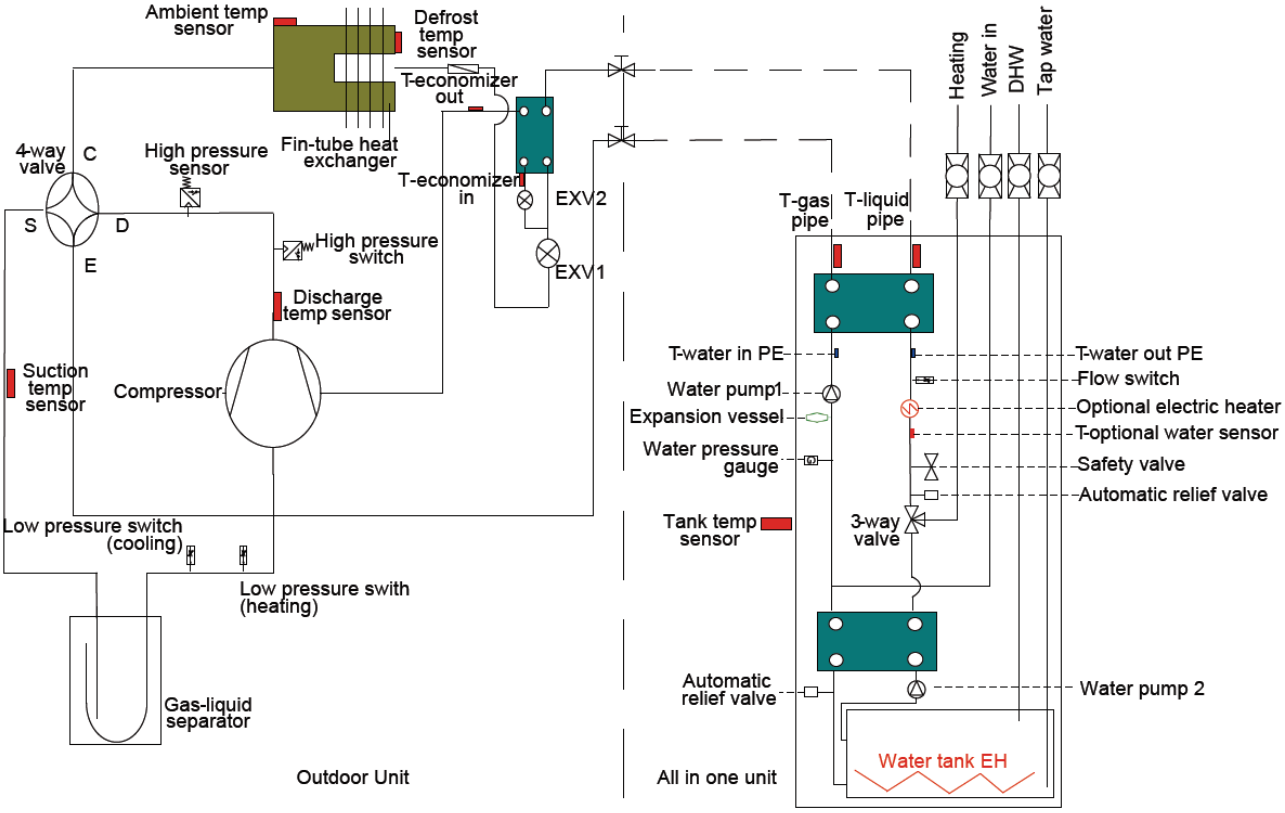


1.3 Operating Principle

1.3.1 Schematic Diagram of Units Without „2“



1.3.2 Schematic Diagram of Units With „2“



1.4 Specifications

1.4.1 Parameter List

- Whole units

Model			GSH-40TRB	GSH-60TRB	GSH-80TRB	GSH-100TRB
Capacity[*1]	Cooling (floor cooling)	kW	3.8	5.8	7.0	8.5
	Heating (floor heating)	kW	4.0	6.0	8.0	9.5
Power input[*1]	Cooling (floor cooling)	kW	0.82	1.32	1.75	2.24
	Heating (floor heating)	kW	0.78	1.20	1.70	2.07
EER[*1] (floor cooling)		-	4.6	4.4	4.0	3.8
COP[*1] (floor heating)		-	5.1	5.0	4.7	4.6
Capacity[*1]	Cooling (fan coil)	kW	3.15	4.09	5.3	6.5
	Heating (fan coil or radiator)	kW	4	5.9	8	9.5
Power input[*1]	Cooling (fan coil)	kW	0.92	1.28	1.73	2.27
	Heating (fan coil or radiator)	kW	1.02	1.51	2.14	2.64
EER[*1] (fan coil)		-	3.4	3.2	3.1	2.9
COP[*1] (fan coil or radiator)		-	3.9	3.9	3.7	3.6
Refrigerant charge		kg	1.0	1.0	1.6	1.6
Domestic hot water (DHW) temperature		°C	40–80 °C			

Model			GSH-40TRB2	GSH-60TRB2	GSH-80TRB2	GSH-100TRB2
Capacity[*1]	Cooling (floor cooling)	kW	3.9	5.8	7.7	9.35
	Heating (floor heating)	kW	4.0	6.0	8.0	10
Power input[*1]	Cooling (floor cooling)	kW	0.68	1.13	1.72	2.36
	Heating (floor heating)	kW	0.77	1.2	1.61	2.1
EER[*1] (floor cooling)		-	5.7	5.1	4.5	4.0
COP[*1] (floor heating)		-	5.2	5.0	5.0	4.8
Capacity[*2]	Cooling (fan coil)	kW	3.40	4.00	7.15	7.60
	Heating (fan coil or radiator)	kW	4.10	5.80	8.00	9.85
Power input[*2]	Cooling (fan coil)	kW	0.92	1.16	2.49	2.77
	Heating (fan coil or radiator)	kW	1.04	1.52	2.07	2.69
EER[*2] (fan coil)		-	3.69	3.45	2.87	2.74
COP[*2] (fan coil or radiator)		-	3.94	3.82	3.86	3.67
Refrigerant charge		kg	1.1	1.1	1.84	1.84
Domestic hot water (DHW) temperature		°C	40–80 °C			

Model			GSH-120TRB2	GSH-140TRB2	GSH-160TRB2
Capacity[*1]	Cooling (floor cooling)	kW	11	12.6	13
	Heating (floor heating)	kW	12	14	15.5
Power input[*1]	Cooling (floor cooling)	kW	2.5	3.41	3.60
	Heating (floor heating)	kW	2.4	2.98	3.44
EER[*1] (floor cooling)		-	4.4	3.7	3.6
COP[*1] (floor heating)		-	5	4.7	4.5
Capacity[*2]	Cooling (fan coil)	kW	10.59	11.07	11.51
	Heating (fan coil or radiator)	kW	12.4	14.48	16.09
Power input[*2]	Cooling (fan coil)	kW	3.79	4.18	4.49
	Heating (fan coil or radiator)	kW	3.29	3.93	4.44
EER[*2] (fan coil)		-	2.79	2.65	2.57
COP[*2] (fan coil or radiator)		-	3.77	3.68	3.62
Refrigerant charge		kg	1.84	1.84	1.84
Domestic hot water (DHW) temperature		°C	40–80 °C		

Model			GSH-80TRB2-3	GSH-100TRB2-3	GSH-120TRB2-3	GSH-140TRB2-3	GSH-160TRB2-3
Capacity*1	Cooling (floor cooling)	kW	8.5	10	11	12.6	13
	Heating (floor heating)	kW	8	10	12	14	15.5
Power input*1	Cooling (floor cooling)	kW	1.74	2.33	2.5	3.41	3.6
	Heating (floor heating)	kW	1.55	2.06	2.4	2.98	3.44
EER*1 (floor cooling)		-	4.4	3.7	4.4	3.7	3.6
COP*1 (floor heating)		-	5	4.7	5	4.7	4.51
Capacity*2	Cooling (fan coil)	kW	7.6	8.2	10.65	11.24	11.52
	Heating (fan coil or radiator)	kW	8.0	10.2	12.29	14.44	16.13
Power input*2	Cooling (fan coil)	kW	1.52	1.91	3.74	4.13	4.38
	Heating (fan coil or radiator)	kW	1.92	2.55	3.09	3.63	4.16
EER*2 (fan coil)		-	5.0	4.3	2.85	2.72	2.63
COP*2 (fan coil or radiator)		-	4.16	4	3.98	3.98	3.88
Refrigerant charge		kg	1.84	1.84	1.84	1.84	1.84
Domestic hot water (DHW) temperature		°C	40–80 °C				

- Outdoor units

Model			GSH-40ERB	GSH-60ERB	GSH-80ERB	GSH-100ERB
Sound pressure level	Cooling	dB(A)	52	52	55	55
	Heating	dB(A)	52	52	55	55
Dimensions (W× D× H)	Outline	mm	975×396×702	975×396×702	982×427×787	982×427×787
	Package	mm	1028×458×830	1028×458×830	1097×478×937	1094×478×937
Net/gross weight		kg	55/65	55/65	82/92	82/92

Model			GSH-40ERB2	GSH-60ERB2	GSH-80ERB2	GSH-100ERB2
Sound pressure level	Cooling	dB(A)	52	52	55	55
	Heating	dB(A)	52	52	55	55
Dimensions (W× D× H)	Outline	mm	975×396×702	975×396×702	982×427×787	982×427×787
	Package	mm	458×1029×830	458×1029×830	478×1097×937	478×1097×937
Net/gross weight		kg	55/65	55/65	88/98	88/98

Model			GSH-120ERB	GSH-140ERB	GSH-160ERB
Sound pressure level	Cooling	dB(A)	58	59	60
	Heating	dB(A)	60	61	61
Dimensions (W× D× H)	Outline	mm	940×460×820	940×460×820	940×460×820
	Package	mm	1073×563×868	1073×563×868	1073×563×868
Net/gross weight		kg	104/114	104/114	104/114

Model			GSH-120ERB-3	GSH-140ERB-3	GSH-160ERB-3
Sound pressure level	Cooling	dB(A)	58	59	60
	Heating	dB(A)	60	61	61
Dimensions (W× D× H)	Outline	mm	940×460×820	940×460×820	940×460×820
	Package	mm	1073×563×868	1073×563×868	1073×563×868
Net/gross weight		kg	110/121	110/121	110/121

Model			GSH-80ERB-3	GSH-100ERB-3
Sound pressure level	Cooling	dB(A)	55	55
	Heating	dB(A)	55	55
Dimensions (W× D× H)	Outline	mm	982×395×787	982×395×787
	Package	mm	478×1097×937	478×1094×937
Net/gross weight		kg	88/98	88/98

- Indoor units

Model			GSH-40TRB	GSH-60TRB	GSH-80TRB	GSH-100TRB
Sound pressure level	Cooling	dB(A)	29	29	29	29
	Heating	dB(A)	29	29	29	29
Dimensions (W× D× H)	Outline	mm	600×600×1756	600×600×1756	600×600×1756	600×600×1756
	Package	mm	803×683×2000	803×683×2000	803×683×2000	803×683×2000
Net/gross weight		kg	210/233	210/233	210/233	210/233

Model			GSH-40TRB2	GSH-60TRB2	GSH-80TRB2	GSH-100TRB2
Sound pressure level	Cooling	dB(A)	29	29	29	29
	Heating	dB(A)	29	29	29	29
Dimensions (W× D× H)	Outline	mm	600×650×1800	600×650×1800	600×650×1800	600×650×1800
	Package	mm	703×803×2035	703×803×2035	703×803×2035	703×803×2035
Net/gross weight		kg	195/219	195/219	195/219	195/219

Model			GSH-120TRB	GSH-140TRB	GSH-160TRB
Sound pressure level	Cooling	dB(A)	29	29	29
	Heating	dB(A)	29	29	29
Dimensions (W× D× H)	Outline	mm	600×650×1800	600×650×1800	600×650×1800
	Package	mm	703×803×2035	703×803×2035	703×803×2035
Net/gross weight		kg	195/219	195/219	195/219

Model			GSH-80TRB2-3	GSH-100TRB2-3	GSH-120TRB2-3	GSH-140TRB2-3	GSH-160TRB2-3
Sound pressure level	Cooling	dB(A)	29	29	29	29	29
	Heating	dB(A)	29	29	29	29	29
Dimensions (W× D× H)	Outline	mm	600×650×1800	600×650×1800	600×650×1800	600×650×1800	600×650×1800
	Package	mm	703×803×2035	703×803×2035	703×803×2035	703×803×2035	703×803×2035
Net/gross weight		kg	195/219	195/219	195/219	195/219	195/219

Notes:

(a) "*1" indicates that the capacity and power input are tested under the following conditions:

Cooling:
Indoor water temperature: 23 °C/18 °C; Outdoor temperature: 35 °C DB/24 °C WB

Heating:
Indoor water temperature: 30 °C/35 °C; Outdoor temperature: 7 °C DB/6 °C WB.

(b) "*2" indicates that the capacity and power input are tested under the following conditions:

Cooling:
Indoor water temperature: 12 °C/7 °C; Outdoor temperature: 35 °C DB/24 °C WB

Heating:
Indoor water temperature: 40 °C/45 °C; Outdoor temperature: 7 °C DB/6 °C WB

1.4.2 Rated Operating Conditions

Item	Water side		Heat source/user side	
	Entering water temperature (°C)	Leaving water temperature (°C)	Dry bulb temperature (DB) (°C)	Wet bulb temperature (WB) (°C)
FCU cooling	12	7	35	—
FCU heating	40	45	7	6
Floor cooling	23	18	35	—
Floor heating	30	35	7	6
Water heating	53	–	7	6

1.4.3 Operating Range

Item	Water side	Heat source/user side
	Leaving water temperature (°C)	Environment dry bulb temperature (DB) (°C)
Cooling	7–25	10–48
Heating	20–60	-25-35
Water heating	40–80 (water tank temperature)	-25-45

Note: If operating conditions are outside the above range, contact Sinclair.

1.4.4 Temperature Sensor Parameters

Displayed name	Measuring range (° C)	Rated operating data			Note
		Cooling	Heating	Hot water	
T-outdoor	-30-150	8–50	-27-37	-27-45	Temperature sensor resistance 15K
T-suction	-30-150	5–30	-25-20	-25-30	Temperature sensor resistance 20K
T-discharge	-30-150	30–102	35–102	35–102	Temperature sensor resistance 50K
T-defrost	-30-150	20–57	-25-30	-25-40	Temperature sensor resistance 20K
T-water in PE	-30-150	10–30	20–55	20–55	Temperature sensor resistance 20K
T-water out PE	-30-150	5–25	25–60	25–60	Temperature sensor resistance 20K
T-optional water Sen.	-30-150	5–25	25–60	25–60	Temperature sensor resistance 50K
T-tank ctrl.	-30-150	/	/	10–80	Temperature sensor resistance 50K
T-floor debug	-30-150	/	25–45	/	/
Debug time	-30-150	/	12–72	/	/
T-liquid pipe	-30-150	5–25	20–57	20–57	Temperature sensor resistance 20K
T-gas pipe	-30-150	30–102	35–102	35–102	Temperature sensor resistance 20K
T-economizer in	-30-150	no EVI under cooling	-20-55	-20-55	Temperature sensor resistance 20K
T-economizer out	-30-150	no EVI under cooling	-20-55	-20-55	Temperature sensor resistance 20K
T-remote room	-30-150	18–30	18–30	18–30	/
Dis. Pressure	-40-70	25–60	25–62	25–62	/
T-weather depend	-30-150	7–25	25–60	/	Based on calculation

1.4.5 Electrical Parameters

Model	**Power supply**	**Circuit breaker**	**Minimum cross-section of the earth wire**	**Minimum cross-section of the power supply wire**	**Inrush current**	**Rated current**	**Maximum current**
	V, phase, Hz	**(A)**	**(mm^2)**	**(mm^2)**	**(A)**	**(A)**	**(A)**
GSH-40ERB	230 VAC, 1 Ph, 50 Hz	16	2.5	2.5	1	3.4	10
GSH-60ERB		16	2.5	2.5	1	5.4	10
GSH-40TRB		32	10.0	10.0	-	-	27
GSH-60TRB		32	10.0	10.0	-	-	27
GSH-40ERB2		16	2.5	2.5	1	3.4	10
GSH-60ERB2		16	2.5	2.5	1	5.4	10
GSH-40TRB2		32	10.0	10.0	-	-	27
GSH-60TRB2		32	10.0	10.0	-	-	27
GSH-80ERB	230 VAC, 1 Ph, 50 Hz	25	6.0	6.0	1	7.4	19
GSH-100ERB		25	6.0	6.0	1	9	22
GSH-80TRB		40	10.0	10.0	-	-	39.5
GSH-100TRB		40	10.0	10.0	-	-	39.5
GSH-80ERB2		25	6.0	6.0	1	7.4	19
GSH-100ERB2		25	6.0	6.0	1	9	22
GSH-80TRB2		40	10.0	10.0	-	-	39.5
GSH-100TRB2		40	10.0	10.0	-	-	39.5

Model	Power supply	Circuit breaker	Minimum cross-section of the earth wire	Minimum cross-section of the power supply wire	Inrush current	Rated current	Maximum current
	V, phase, Hz	(A)	(mm^2)	(mm^2)	(A)	(A)	(A)
GSH-80ERB-3	400 V, 3N~, 50 Hz	16	2.5	2.5	1	2.35	7.5
GSH-100ERB-3		16	2.5	2.5	1	3.1	8
GSH-80TRB2-3		16	2.5	2.5	-	-	13
GSH-100TRB2-3		16	2.5	2.5	-	-	13
GSH-120ERB-3		16	2.5	2.5	1	2.02	9.2
GSH-140ERB-3		16	2.5	2.5	1	4.3	11.5
GSH-160ERB-3		16	2.5	2.5	1	4.97	11.5
GSH-120TRB2-3		16	2.5	2.5	-	-	13
GSH-140TRB2-3		16	2.5	2.5	-	-	13
GSH-160TRB2-3		16	2.5	2.5	-	-	13
GSH-120ERB	230 VAC, 1 Ph, 50 Hz	32	10.0	10.0	1	10.4	26
GSH-140ERB		40	10.0	10.0	1	13	29
GSH-160ERB		40	10.0	10.0	1	15	31
GSH-120TRB2		40	10.0	10.0	-	-	39.5
GSH-140TRB2		40	10.0	10.0	-	-	39.5
GSH-160TRB2		40	10.0	10.0	-	-	39.5

Notes:

(a) An earth-leakage breaker (RCD) must be installed in the system. If circuit breakers with an RCD function are used, their response (tripping) time must be less than 0.1 seconds and the leakage (tripping) current must be 30 mA.

(b) The above power wire cross-sections are determined based on the assumption that the distance from the distribution cabinet to the unit is less than 75 m. If the power cables are 75 to 150 m long, the power cable cross-section must be increased by one grade.

(c) The voltage of the power supply must correspond to the rated voltage of the unit. A separate power supply must be provided for the unit.

(d) All electrical installations must be carried out by qualified electricians in accordance with the applicable local standards and regulations.

(e) Ensure safe earthing (grounding). Earth wire should be connected to the building earthing system and must be installed by qualified electricians.

(f) The circuit breaker and power cable parameters in the table above are based on the maximum input power (maximum current) of the unit.

(g) The power cable parameters in the table above apply to an insulated multicore cable with copper wires (e.g. YJV XLPE insulated power cable), used at a temperature of 40 °C and resistant to a temperature of 90 °C (see IEC 60364-5-52). If operating conditions change, the applicable local standards and regulations must be followed.

(h) The circuit breaker parameters in the table above apply to the circuit breaker at an operating temperature of 40 °C. If the operating conditions change, the values must be adjusted according to the relevant standards.

(i) A switch (disconnector) must be installed on the fixed power supply. This switch must disconnect all poles and its contacts must be at least 3 mm apart when opened.

1.4.6 Capacity Correction

(1) GSH-40ERB, GSH-60ERB, GSH-80ERB, GSH-100ERB

GSH-40ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	2.58	2.87	3.02	3.21	3.28	3.15	2.87	2.24	1.89
8	2.65	2.93	3.09	3.28	3.34	3.21	2.93	2.27	1.92
9	2.68	2.99	3.15	3.34	3.40	3.28	2.99	2.33	1.95
10	2.74	3.02	3.21	3.40	3.47	3.34	3.02	2.36	1.98
11	2.77	3.09	3.28	3.47	3.53	3.40	3.09	2.39	2.05
12	2.84	3.15	3.34	3.53	3.56	3.47	3.15	2.46	2.08
13	2.87	3.21	3.37	3.56	3.65	3.50	3.21	2.49	2.11
14	2.93	3.24	3.43	3.62	3.72	3.56	3.24	2.52	2.14
15	2.96	3.31	3.47	3.69	3.78	3.62	3.31	2.58	2.17
18	3.12	3.50	3.65	3.91	3.97	3.81	3.50	2.71	2.27
20	3.21	3.56	3.78	4.03	4.10	3.94	3.56	2.80	2.36
23	3.37	3.72	3.94	4.19	4.28	4.13	3.72	2.93	2.46
25	3.47	3.84	4.06	4.32	4.41	4.22	3.84	2.99	2.52

GSH-60ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.35	3.72	3.93	4.17	4.25	4.09	3.72	2.90	2.45
8	3.48	3.89	4.09	4.34	4.42	4.25	3.89	3.03	2.54
9	3.64	4.01	4.21	4.46	4.54	4.38	4.01	3.15	2.66
10	3.72	4.13	4.38	4.62	4.70	4.54	4.13	3.23	2.74
11	3.84	4.29	4.50	4.79	4.91	4.70	4.29	3.31	2.82
12	3.97	4.42	4.66	4.95	5.07	4.87	4.42	3.44	2.90
13	4.13	4.58	4.79	5.11	5.19	4.99	4.58	3.56	2.99
14	4.25	4.66	4.95	5.28	5.36	5.15	4.66	3.68	3.07
15	4.34	4.83	5.11	5.44	5.52	5.32	4.83	3.76	3.19
18	4.74	5.24	5.52	5.89	6.01	5.77	5.24	4.09	3.48
20	4.95	5.52	5.85	6.18	6.30	6.05	5.52	4.34	3.64
23	5.36	5.93	6.26	6.67	6.79	6.54	5.93	4.62	3.93
25	5.60	6.22	6.54	6.95	7.12	6.83	6.22	4.87	4.09

GSH-80ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	4.35	4.82	5.09	5.41	5.51	5.30	4.82	3.76	3.18
8	4.51	4.98	5.25	5.57	5.67	5.46	4.98	3.87	3.29
9	4.56	5.09	5.35	5.72	5.83	5.62	5.09	3.98	3.34
10	4.72	5.25	5.51	5.88	5.99	5.78	5.25	4.08	3.45
11	4.88	5.41	5.72	6.04	6.20	5.94	5.41	4.19	3.55
12	4.98	5.57	5.88	6.25	6.31	6.10	5.57	4.35	3.66
13	5.09	5.67	5.99	6.31	6.41	6.20	5.67	4.40	3.71
14	5.25	5.83	6.10	6.47	6.63	6.36	5.83	4.51	3.82
15	5.35	5.99	6.25	6.68	6.78	6.52	5.99	4.66	3.92

GSH-80ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
18	5.78	6.36	6.73	7.16	7.26	7.00	6.36	4.98	4.24
20	5.99	6.63	7.00	7.42	7.58	7.31	6.63	5.14	4.40
23	6.41	7.10	7.47	7.90	8.06	7.79	7.10	5.51	4.66
25	6.63	7.37	7.79	8.22	8.37	8.06	7.37	5.72	4.82

GSH-100ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	5.33	5.92	6.24	6.63	6.76	6.50	5.92	4.62	3.90
8	5.46	6.11	6.44	6.83	6.96	6.70	6.11	4.75	4.03
9	5.66	6.24	6.57	7.02	7.15	6.89	6.24	4.94	4.10
10	5.79	6.37	6.70	7.22	7.35	7.02	6.37	5.01	4.23
11	5.92	6.57	6.96	7.35	7.54	7.22	6.57	5.07	4.36
12	6.11	6.70	7.15	7.54	7.67	7.41	6.70	5.27	4.49
13	6.24	6.89	7.35	7.74	7.87	7.61	6.89	5.40	4.55
14	6.44	7.15	7.48	7.93	8.13	7.80	7.15	5.53	4.68
15	6.57	7.28	7.67	8.19	8.32	8.00	7.28	5.72	4.81
18	7.02	7.74	8.13	8.65	8.91	8.52	7.74	6.05	5.14
20	7.35	8.13	8.58	9.10	9.30	8.91	8.13	6.31	5.33
23	7.74	8.58	9.04	9.62	9.82	9.43	8.58	6.63	5.66
25	8.00	8.91	9.36	10.01	10.21	9.82	8.91	6.96	5.98

(2) GSH-40ERB2, GSH-60ERB2, GSH-80ERB2,GSH-100ERB2, GSH-120ERB, GSH-140ERB,GSH-160ERB

GSH-40ERB2 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	2.58	2.87	3.02	3.21	3.28	3.15	2.87	2.24	1.89
8	2.65	2.93	3.09	3.28	3.34	3.21	2.93	2.27	1.92
9	2.68	2.99	3.15	3.34	3.40	3.28	2.99	2.33	1.95
10	2.74	3.02	3.21	3.40	3.47	3.34	3.02	2.36	1.98
11	2.77	3.09	3.28	3.47	3.53	3.40	3.09	2.39	2.05
12	2.84	3.15	3.34	3.53	3.56	3.47	3.15	2.46	2.08
13	2.87	3.21	3.37	3.56	3.65	3.50	3.21	2.49	2.11
14	2.93	3.24	3.43	3.62	3.72	3.56	3.24	2.52	2.14
15	2.96	3.31	3.47	3.69	3.78	3.62	3.31	2.58	2.17
18	3.12	3.50	3.65	3.91	3.97	3.81	3.50	2.71	2.27
20	3.21	3.56	3.78	4.03	4.10	3.94	3.56	2.80	2.36
23	3.37	3.72	3.94	4.19	4.28	4.13	3.72	2.93	2.46
25	3.47	3.84	4.06	4.32	4.41	4.22	3.84	2.99	2.52

GSH-60ERB2 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.28	3.64	3.84	4.08	4.16	4.00	3.64	2.84	2.40
8	3.40	3.80	4.00	4.24	4.32	4.16	3.80	2.96	2.48
9	3.56	3.92	4.12	4.36	4.44	4.28	3.92	3.08	2.60
10	3.64	4.04	4.28	4.52	4.60	4.44	4.04	3.16	2.68

GSH-60ERB2 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
11	3.76	4.20	4.40	4.68	4.80	4.60	4.20	3.24	2.76
12	3.88	4.32	4.56	4.84	4.96	4.76	4.32	3.36	2.84
13	4.04	4.48	4.68	5.00	5.08	4.88	4.48	3.48	2.92
14	4.16	4.56	4.84	5.16	5.24	5.04	4.56	3.60	3.00
15	4.24	4.72	5.00	5.32	5.40	5.20	4.72	3.68	3.12
18	4.64	5.12	5.40	5.76	5.88	5.64	5.12	4.00	3.40
20	4.84	5.40	5.72	6.04	6.16	5.92	5.40	4.24	3.56
23	5.24	5.80	6.12	6.52	6.64	6.40	5.80	4.52	3.84
25	5.48	6.08	6.40	6.80	6.96	6.68	6.08	4.76	4.00

GSH-80ERB2 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	5.86	6.51	6.86	7.29	7.44	7.15	6.51	5.08	4.29
7	6.08	6.72	7.08	7.51	7.65	7.36	6.72	5.22	4.43
8	6.15	6.86	7.22	7.72	7.87	7.58	6.86	5.36	4.50
9	6.36	7.08	7.44	7.94	8.08	7.79	7.08	5.51	4.65
10	6.58	7.29	7.72	8.15	8.37	8.01	7.29	5.65	4.79
11	6.72	7.51	7.94	8.44	8.51	8.22	7.51	5.86	4.93
12	6.86	7.65	8.08	8.51	8.65	8.37	7.65	5.93	5.01
13	7.08	7.87	8.22	8.72	8.94	8.58	7.87	6.08	5.15
14	7.22	8.08	8.44	9.01	9.15	8.79	8.08	6.29	5.29
15	7.79	8.58	9.08	9.65	9.80	9.44	8.58	6.72	5.72
18	8.08	8.94	9.44	10.01	10.22	9.87	8.94	6.94	5.93
20	8.65	9.58	10.08	10.65	10.87	10.51	9.58	7.44	6.29
23	8.94	9.94	10.51	11.08	11.30	10.87	9.94	7.72	6.51
25	5.86	6.51	6.86	7.29	7.44	7.15	6.51	5.08	4.29

GSH-100ERB2 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	6.23	6.92	7.30	7.75	7.90	7.60	6.92	5.40	4.56
8	6.38	7.14	7.52	7.98	8.13	7.83	7.14	5.55	4.71
9	6.61	7.30	7.68	8.21	8.36	8.06	7.30	5.78	4.79
10	6.76	7.45	7.83	8.44	8.59	8.21	7.45	5.85	4.94
11	6.92	7.68	8.13	8.59	8.82	8.44	7.68	5.93	5.09
12	7.14	7.83	8.36	8.82	8.97	8.66	7.83	6.16	5.24
13	7.30	8.06	8.59	9.04	9.20	8.89	8.06	6.31	5.32
14	7.52	8.36	8.74	9.27	9.50	9.12	8.36	6.46	5.47
15	7.68	8.51	8.97	9.58	9.73	9.35	8.51	6.69	5.62
18	8.21	9.04	9.50	10.11	10.41	9.96	9.04	7.07	6.00
20	8.59	9.50	10.03	10.64	10.87	10.41	9.50	7.37	6.23
23	9.04	10.03	10.56	11.25	11.48	11.02	10.03	7.75	6.61
25	9.35	10.41	10.94	11.70	11.93	11.48	10.41	8.13	6.99

GSH-120ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	8.68	9.64	10.17	10.80	11.01	10.59	9.64	7.52	6.35
8	8.90	9.95	10.48	11.12	11.33	10.91	9.95	7.73	6.57
9	9.21	10.17	10.70	11.44	11.65	11.23	10.17	8.05	6.67
10	9.43	10.38	10.91	11.75	11.97	11.44	10.38	8.15	6.88
11	9.64	10.70	11.33	11.97	12.28	11.75	10.70	8.26	7.10
12	9.95	10.91	11.65	12.28	12.50	12.07	10.91	8.58	7.31
13	10.17	11.23	11.97	12.60	12.81	12.39	11.23	8.79	7.41
14	10.48	11.65	12.18	12.92	13.24	12.71	11.65	9.00	7.62
15	10.70	11.86	12.50	13.34	13.56	13.03	11.86	9.32	7.84
18	11.44	12.60	13.24	14.08	14.51	13.87	12.60	9.85	8.37
20	11.97	13.24	13.98	14.83	15.14	14.51	13.24	10.27	8.68
23	12.60	13.98	14.72	15.67	15.99	15.36	13.98	10.80	9.21
25	13.03	14.51	15.25	16.31	16.63	15.99	14.51	11.33	9.74

GSH-140ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	7.90	8.76	9.25	9.82	10.02	11.07	8.76	6.84	5.78
8	8.09	9.05	9.53	10.11	10.31	11.21	9.05	7.03	5.97
9	8.38	9.25	9.73	10.40	10.59	11.35	9.25	7.32	6.07
10	8.57	9.44	9.92	10.69	10.88	11.49	9.44	7.42	6.26
11	8.76	9.73	10.31	10.88	11.17	11.63	9.73	7.51	6.45
12	9.05	9.92	10.59	11.17	11.36	11.77	9.92	7.80	6.65
13	9.25	10.21	10.88	11.46	11.65	11.90	10.21	7.99	6.74
14	9.53	10.59	11.08	11.75	12.04	12.04	10.59	8.19	6.93
15	9.73	10.79	11.36	12.13	12.33	12.18	10.79	8.48	7.13
18	10.40	11.46	12.04	12.81	13.19	12.60	11.46	8.96	7.61
20	10.88	12.04	12.71	13.48	13.77	12.88	12.04	9.34	7.90
23	11.46	12.71	13.39	14.25	14.54	13.30	12.71	9.82	8.38
25	11.85	13.19	13.87	14.83	15.12	13.57	13.19	10.31	8.86

GSH-160ERB cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	8.13	9.02	9.52	10.11	10.31	11.51	9.02	7.04	5.95
8	8.33	9.32	9.81	10.41	10.61	11.65	9.32	7.24	6.15
9	8.62	9.52	10.01	10.71	10.90	11.78	9.52	7.53	6.25
10	8.82	9.72	10.21	11.00	11.20	11.92	9.72	7.63	6.44
11	9.02	10.01	10.61	11.20	11.50	12.05	10.01	7.73	6.64
12	9.32	10.21	10.90	11.50	11.70	12.19	10.21	8.03	6.84
13	9.52	10.51	11.20	11.80	12.00	12.32	10.51	8.23	6.94
14	9.81	10.90	11.40	12.09	12.39	12.46	10.90	8.43	7.14
15	10.01	11.10	11.70	12.49	12.69	12.59	11.10	8.72	7.34
18	10.71	11.80	12.39	13.19	13.58	13.00	11.80	9.22	7.83
20	11.20	12.39	13.09	13.88	14.18	13.27	12.39	9.62	8.13
23	11.80	13.09	13.78	14.67	14.97	13.68	13.09	10.11	8.62
25	12.19	13.58	14.28	15.27	15.56	13.95	13.58	10.61	9.12

(3) GSH-80ERB-3, GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

GSH-80ERB-3 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	6.23	6.92	7.30	7.75	7.90	7.60	6.92	5.40	4.56
8	6.46	7.14	7.52	7.98	8.13	7.83	7.14	5.55	4.71
9	6.54	7.30	7.68	8.21	8.36	8.06	7.30	5.70	4.79
10	6.76	7.52	7.90	8.44	8.59	8.28	7.52	5.85	4.94
11	6.99	7.75	8.21	8.66	8.89	8.51	7.75	6.00	5.09
12	7.14	7.98	8.44	8.97	9.04	8.74	7.98	6.23	5.24
13	7.30	8.13	8.59	9.04	9.20	8.89	8.13	6.31	5.32
14	7.52	8.36	8.74	9.27	9.50	9.12	8.36	6.46	5.47
15	7.68	8.59	8.97	9.58	9.73	9.35	8.59	6.69	5.62
18	8.28	9.12	9.65	10.26	10.41	10.03	9.12	7.14	6.08
20	8.59	9.50	10.03	10.64	10.87	10.49	9.50	7.37	6.31
23	9.20	10.18	10.72	11.32	11.55	11.17	10.18	7.90	6.69
25	9.50	10.56	11.17	11.78	12.01	11.55	10.56	8.21	6.92

GSH-100ERB-3 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	6.72	7.46	7.87	8.36	8.53	8.20	7.46	5.82	4.92
8	6.89	7.71	8.12	8.61	8.77	8.45	7.71	5.99	5.08
9	7.13	7.87	8.28	8.86	9.02	8.69	7.87	6.23	5.17
10	7.30	8.04	8.45	9.10	9.27	8.86	8.04	6.31	5.33
11	7.46	8.28	8.77	9.27	9.51	9.10	8.28	6.40	5.49
12	7.71	8.45	9.02	9.51	9.68	9.35	8.45	6.64	5.66
13	7.87	8.69	9.27	9.76	9.92	9.59	8.69	6.81	5.74
14	8.12	9.02	9.43	10.00	10.25	9.84	9.02	6.97	5.90
15	8.28	9.18	9.68	10.33	10.50	10.09	9.18	7.22	6.07
18	8.86	9.76	10.25	10.91	11.23	10.74	9.76	7.63	6.48
20	9.27	10.25	10.82	11.48	11.73	11.23	10.25	7.95	6.72
23	9.76	10.82	11.40	12.14	12.38	11.89	10.82	8.36	7.13
25	10.09	11.23	11.81	12.63	12.87	12.38	11.23	8.77	7.54

GSH-120ERB2-3 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	8.73	9.69	10.22	10.86	11.08	10.65	9.69	7.56	6.39
8	8.95	10.01	10.54	11.18	11.40	10.97	10.01	7.77	6.60
9	9.27	10.22	10.76	11.50	11.72	11.29	10.22	8.09	6.71
10	9.48	10.44	10.97	11.82	12.03	11.50	10.44	8.20	6.92
11	9.69	10.76	11.40	12.03	12.35	11.82	10.76	8.31	7.14
12	10.01	10.97	11.72	12.35	12.57	12.14	10.97	8.63	7.35
13	10.22	11.29	12.03	12.67	12.89	12.46	11.29	8.84	7.46
14	10.54	11.72	12.25	12.99	13.31	12.78	11.72	9.05	7.67
15	10.76	11.93	12.57	13.42	13.63	13.10	11.93	9.37	7.88
18	11.50	12.67	13.31	14.16	14.59	13.95	12.67	9.90	8.41
20	12.03	13.31	14.06	14.91	15.23	14.59	13.31	10.33	8.73
23	12.67	14.06	14.80	15.76	16.08	15.44	14.06	10.86	9.27
25	13.10	14.59	15.34	16.40	16.72	16.08	14.59	11.40	9.80

GSH-140ERB2-3 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	8.02	8.90	9.39	9.97	10.17	11.24	8.90	6.94	5.87
8	8.21	9.19	9.68	10.27	10.46	11.38	9.19	7.14	6.06
9	8.51	9.39	9.88	10.56	10.76	11.52	9.39	7.43	6.16
10	8.70	9.58	10.07	10.85	11.05	11.66	9.58	7.53	6.36
11	8.90	9.88	10.46	11.05	11.34	11.80	9.88	7.63	6.55
12	9.19	10.07	10.76	11.34	11.54	11.95	10.07	7.92	6.75
13	9.39	10.37	11.05	11.64	11.83	12.09	10.37	8.12	6.85
14	9.68	10.76	11.25	11.93	12.22	12.23	10.76	8.31	7.04
15	9.88	10.95	11.54	12.32	12.52	12.37	10.95	8.61	7.24
18	10.56	11.64	12.22	13.01	13.40	12.79	11.64	9.09	7.73
20	11.05	12.22	12.91	13.69	13.98	13.08	12.22	9.49	8.02
23	11.64	12.91	13.59	14.47	14.77	13.50	12.91	9.97	8.51
25	12.03	13.40	14.08	15.06	15.35	13.78	13.40	10.46	9.00

GSH-160ERB2-3 cooling capacity									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	8.14	9.03	9.53	10.12	10.32	11.52	9.03	7.04	5.95
8	8.33	9.33	9.82	10.42	10.62	11.66	9.33	7.24	6.15
9	8.63	9.53	10.02	10.72	10.91	11.79	9.53	7.54	6.25
10	8.83	9.72	10.22	11.01	11.21	11.93	9.72	7.64	6.45
11	9.03	10.02	10.62	11.21	11.51	12.06	10.02	7.74	6.65
12	9.33	10.22	10.91	11.51	11.71	12.20	10.22	8.04	6.85
13	9.53	10.52	11.21	11.81	12.01	12.33	10.52	8.24	6.95
14	9.82	10.91	11.41	12.11	12.40	12.47	10.91	8.43	7.14
15	10.02	11.11	11.71	12.50	12.70	12.60	11.11	8.73	7.34
18	10.72	11.81	12.40	13.20	13.59	13.01	11.81	9.23	7.84
20	11.21	12.40	13.10	13.89	14.19	13.28	12.40	9.62	8.14
23	11.81	13.10	13.79	14.68	14.98	13.69	13.10	10.12	8.63
25	12.20	13.59	14.29	15.28	15.58	13.96	13.59	10.62	9.13

(1) GSH-40ERB,GSH-60ERB, GSH-80ERB, GSH-100ERB

EER_GSH-40ERB									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	4.62	4.45	4.32	4.11	3.77	3.40	2.82	2.07	1.67
8	4.76	4.59	4.45	4.25	3.88	3.50	2.89	2.14	1.73
9	4.93	4.73	4.59	4.39	4.01	3.60	3.03	2.21	1.77
10	5.07	4.86	4.73	4.49	4.11	3.74	3.09	2.28	1.80
11	5.20	5.03	4.86	4.62	4.25	3.84	3.16	2.35	1.87
12	5.37	5.17	5.00	4.76	4.39	3.94	3.26	2.41	1.90
13	5.51	5.30	5.13	4.90	4.52	4.05	3.37	2.48	1.97
14	5.68	5.44	5.27	5.03	4.62	4.15	3.43	2.52	2.04
15	5.78	5.61	5.41	5.17	4.73	4.25	3.54	2.62	2.07
18	6.22	6.02	5.81	5.58	5.10	4.59	3.81	2.82	2.28
20	6.53	6.32	6.12	5.85	5.34	4.79	4.01	2.96	2.38
23	6.97	6.73	6.49	6.22	5.71	5.13	4.28	3.13	2.52
25	7.28	7.00	6.80	6.46	5.95	5.34	4.42	3.26	2.62

EER GSH-60ERB									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	4.35	4.19	4.06	3.87	3.55	3.20	2.66	1.95	1.57
8	4.48	4.32	4.19	4.00	3.65	3.30	2.75	2.02	1.63
9	4.67	4.48	4.35	4.13	3.81	3.42	2.85	2.08	1.66
10	4.80	4.61	4.48	4.26	3.90	3.52	2.91	2.18	1.73
11	4.93	4.77	4.61	4.42	4.06	3.65	3.01	2.21	1.76
12	5.09	4.93	4.77	4.54	4.16	3.74	3.10	2.30	1.86
13	5.25	5.06	4.90	4.67	4.29	3.87	3.20	2.34	1.89
14	5.41	5.22	5.06	4.80	4.42	3.97	3.30	2.43	1.95
15	5.54	5.34	5.18	4.93	4.51	4.10	3.39	2.50	1.98
18	5.98	5.76	5.60	5.34	4.90	4.42	3.65	2.69	2.18
20	6.30	6.08	5.89	5.60	5.15	4.64	3.84	2.85	2.27
23	6.75	6.50	6.34	6.02	5.50	4.96	4.13	3.01	2.43
25	7.04	6.78	6.59	6.30	5.76	5.18	4.32	3.17	2.56

EER_GSH-80ERB									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	4.22	4.06	3.94	3.75	3.44	3.10	2.57	1.89	1.52
8	4.31	4.15	4.06	3.84	3.53	3.19	2.64	1.92	1.55
9	4.46	4.28	4.15	3.97	3.63	3.29	2.73	1.98	1.58
10	4.56	4.40	4.28	4.06	3.72	3.35	2.79	2.02	1.64
11	4.68	4.53	4.40	4.19	3.84	3.44	2.88	2.11	1.71
12	4.81	4.62	4.50	4.25	3.94	3.53	2.95	2.17	1.74
13	4.93	4.77	4.62	4.40	4.03	3.63	3.04	2.20	1.77
14	5.05	4.87	4.71	4.50	4.12	3.72	3.10	2.26	1.80
15	5.21	4.99	4.84	4.59	4.22	3.81	3.16	2.33	1.86
18	5.52	5.33	5.18	4.90	4.50	4.06	3.35	2.48	1.98
20	5.77	5.55	5.39	5.15	4.71	4.25	3.50	2.57	2.08
23	6.11	5.86	5.70	5.46	4.99	4.50	3.72	2.76	2.20
25	6.36	6.14	5.92	5.64	5.18	4.68	3.88	2.85	2.29

EER_GSH-100ERB									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.94	3.80	3.68	3.51	3.22	2.90	2.41	1.77	1.42
8	4.06	3.92	3.80	3.63	3.31	2.99	2.47	1.80	1.48
9	4.21	4.06	3.92	3.74	3.42	3.07	2.55	1.89	1.54
10	4.29	4.15	4.00	3.86	3.51	3.16	2.61	1.94	1.54
11	4.41	4.26	4.12	3.92	3.63	3.25	2.70	1.97	1.60
12	4.52	4.35	4.23	4.03	3.71	3.34	2.76	2.03	1.62
13	4.67	4.50	4.35	4.15	3.83	3.42	2.87	2.12	1.68
14	4.76	4.58	4.47	4.26	3.89	3.51	2.93	2.15	1.74
15	4.90	4.70	4.55	4.35	3.97	3.60	2.99	2.18	1.77
18	5.25	5.08	4.90	4.67	4.29	3.86	3.19	2.35	1.89
20	5.51	5.28	5.16	4.90	4.50	4.03	3.36	2.47	2.00
23	5.83	5.60	5.45	5.19	4.76	4.29	3.54	2.61	2.09
25	6.06	5.86	5.66	5.39	4.96	4.47	3.71	2.73	2.20

(2) GSH-40ERB2, GSH-60ERB2, GSH-80ERB2, GSH-100ERB2,
GSH-120ERB, GSH-140ERB, GSH-160ERB

EER_GSH-40ERB2									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	5.02	4.83	4.69	4.46	4.10	3.69	3.06	2.25	1.81
8	5.17	4.98	4.83	4.61	4.21	3.80	3.14	2.32	1.88
9	5.35	5.13	4.98	4.76	4.35	3.91	3.28	2.40	1.92
10	5.50	5.28	5.13	4.87	4.46	4.06	3.36	2.47	1.96
11	5.65	5.46	5.28	5.02	4.61	4.17	3.43	2.55	2.03
12	5.83	5.61	5.42	5.17	4.76	4.28	3.54	2.62	2.07
13	5.98	5.76	5.57	5.31	4.91	4.39	3.65	2.69	2.14
14	6.16	5.90	5.72	5.46	5.02	4.50	3.73	2.73	2.21
15	6.27	6.09	5.87	5.61	5.13	4.61	3.84	2.84	2.25
18	6.75	6.53	6.31	6.05	5.54	4.98	4.13	3.06	2.47
20	7.08	6.86	6.64	6.35	5.79	5.20	4.35	3.21	2.58
23	7.56	7.31	7.05	6.75	6.20	5.57	4.65	3.39	2.73
25	7.90	7.60	7.38	7.01	6.46	5.79	4.80	3.54	2.84

EER_GSH-60ERB2									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	4.69	4.52	4.38	4.17	3.83	3.45	2.86	2.10	1.69
8	4.83	4.66	4.52	4.31	3.93	3.55	2.97	2.17	1.76
9	5.04	4.83	4.69	4.45	4.11	3.69	3.07	2.24	1.79
10	5.18	4.97	4.83	4.59	4.21	3.80	3.14	2.35	1.86
11	5.31	5.14	4.97	4.76	4.38	3.93	3.24	2.38	1.90
12	5.49	5.31	5.14	4.90	4.49	4.04	3.35	2.48	2.00
13	5.66	5.45	5.28	5.04	4.62	4.17	3.45	2.52	2.04
14	5.83	5.62	5.45	5.18	4.76	4.28	3.55	2.62	2.10
15	5.97	5.76	5.59	5.31	4.86	4.42	3.66	2.69	2.14
18	6.45	6.21	6.04	5.76	5.28	4.76	3.93	2.90	2.35
20	6.80	6.56	6.35	6.04	5.55	5.00	4.14	3.07	2.45
23	7.28	7.00	6.83	6.49	5.93	5.35	4.45	3.24	2.62
25	7.59	7.31	7.11	6.80	6.21	5.59	4.66	3.42	2.76

EER_GSH-80ERB2									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.90	3.76	3.64	3.47	3.19	2.87	2.38	1.75	1.41
8	3.99	3.85	3.76	3.56	3.27	2.96	2.44	1.78	1.44
9	4.13	3.96	3.85	3.67	3.36	3.04	2.53	1.84	1.46
10	4.22	4.08	3.96	3.76	3.44	3.10	2.58	1.87	1.52
11	4.33	4.19	4.08	3.87	3.56	3.19	2.67	1.95	1.58
12	4.45	4.28	4.16	3.93	3.64	3.27	2.73	2.01	1.61
13	4.56	4.42	4.28	4.08	3.73	3.36	2.81	2.04	1.64
14	4.68	4.51	4.36	4.16	3.82	3.44	2.87	2.10	1.66
15	4.82	4.62	4.48	4.25	3.90	3.53	2.93	2.15	1.72
18	5.11	4.94	4.79	4.53	4.16	3.76	3.10	2.30	1.84
20	5.34	5.14	4.99	4.76	4.36	3.93	3.24	2.38	1.92
23	5.65	5.42	5.28	5.05	4.62	4.16	3.44	2.55	2.04
25	5.88	5.68	5.48	5.22	4.79	4.33	3.59	2.64	2.12

EER_GSH-100ERB2									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.73	3.59	3.48	3.32	3.04	2.74	2.27	1.67	1.34
8	3.84	3.70	3.59	3.43	3.12	2.82	2.33	1.70	1.40
9	3.97	3.84	3.70	3.53	3.23	2.90	2.41	1.78	1.45
10	4.06	3.92	3.78	3.64	3.32	2.99	2.47	1.84	1.45
11	4.16	4.03	3.89	3.70	3.43	3.07	2.55	1.86	1.51
12	4.27	4.11	4.00	3.81	3.51	3.15	2.60	1.92	1.53
13	4.41	4.25	4.11	3.92	3.62	3.23	2.71	2.00	1.59
14	4.49	4.33	4.22	4.03	3.67	3.32	2.77	2.03	1.64
15	4.63	4.44	4.30	4.11	3.75	3.40	2.82	2.06	1.67
18	4.96	4.80	4.63	4.41	4.06	3.64	3.01	2.22	1.78
20	5.21	4.99	4.88	4.63	4.25	3.81	3.18	2.33	1.89
23	5.51	5.29	5.15	4.90	4.49	4.06	3.34	2.47	1.97
25	5.73	5.53	5.34	5.10	4.69	4.22	3.51	2.58	2.08

EER_GSH-120ERB									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	4.50	4.34	4.21	4.01	3.68	2.79	2.75	2.02	1.62
8	4.64	4.47	4.34	4.14	3.78	2.94	2.81	2.05	1.69
9	4.80	4.64	4.47	4.27	3.91	3.08	2.91	2.15	1.76
10	4.90	4.74	4.57	4.40	4.01	3.23	2.98	2.22	1.76
11	5.03	4.87	4.70	4.47	4.14	3.38	3.08	2.25	1.82
12	5.17	4.97	4.84	4.60	4.24	3.52	3.15	2.32	1.85
13	5.33	5.13	4.97	4.74	4.37	3.67	3.28	2.42	1.92
14	5.43	5.23	5.10	4.87	4.44	3.81	3.34	2.45	1.99
15	5.60	5.37	5.20	4.97	4.54	3.96	3.41	2.48	2.02
18	5.99	5.80	5.60	5.33	4.90	4.40	3.64	2.68	2.15
20	6.29	6.03	5.89	5.60	5.13	4.69	3.84	2.81	2.29
23	6.66	6.39	6.23	5.93	5.43	5.13	4.04	2.98	2.38
25	6.92	6.69	6.46	6.16	5.66	5.42	4.24	3.11	2.52

EER_GSH-140ERB									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.79	3.65	3.54	3.37	3.09	2.65	2.31	1.70	1.37
8	3.90	3.76	3.65	3.48	3.18	2.75	2.37	1.73	1.42
9	4.04	3.90	3.76	3.60	3.29	2.85	2.45	1.81	1.48
10	4.12	3.99	3.85	3.71	3.37	2.94	2.51	1.87	1.48
11	4.24	4.10	3.96	3.76	3.48	3.04	2.59	1.90	1.53
12	4.35	4.18	4.07	3.87	3.57	3.13	2.65	1.95	1.56
13	4.49	4.32	4.18	3.99	3.68	3.23	2.76	2.03	1.62
14	4.57	4.40	4.29	4.10	3.73	3.32	2.81	2.06	1.67
15	4.71	4.51	4.38	4.18	3.82	3.42	2.87	2.09	1.70
18	5.04	4.88	4.71	4.49	4.12	3.70	3.07	2.26	1.81
20	5.30	5.07	4.96	4.71	4.32	3.89	3.23	2.37	1.92
23	5.60	5.38	5.24	4.99	4.57	4.18	3.40	2.51	2.01
25	5.82	5.63	5.43	5.18	4.77	4.37	3.57	2.62	2.12

EER_GSH-160ERB									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.68	3.54	3.43	3.27	3.00	2.57	2.24	1.65	1.32
8	3.78	3.65	3.54	3.38	3.08	2.67	2.30	1.68	1.38
9	3.92	3.78	3.65	3.49	3.19	2.76	2.38	1.76	1.43
10	4.00	3.87	3.73	3.59	3.27	2.85	2.43	1.81	1.43
11	4.11	3.97	3.84	3.65	3.38	2.94	2.51	1.84	1.49
12	4.22	4.05	3.95	3.76	3.46	3.04	2.57	1.89	1.51
13	4.35	4.19	4.05	3.87	3.57	3.13	2.68	1.97	1.57
14	4.43	4.27	4.16	3.97	3.62	3.22	2.73	2.00	1.62
15	4.57	4.38	4.24	4.05	3.70	3.31	2.78	2.03	1.65
18	4.89	4.73	4.57	4.35	4.00	3.59	2.97	2.19	1.76
20	5.14	4.92	4.81	4.57	4.19	3.77	3.14	2.30	1.86
23	5.43	5.22	5.08	4.84	4.43	4.05	3.30	2.43	1.95
25	5.65	5.46	5.27	5.03	4.62	4.23	3.46	2.54	2.05

(3) GSH-80ERB-3, GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

EER_GSH-80ERB-3									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	6.80	6.55	6.35	6.05	5.55	5.00	4.15	3.05	2.45
8	6.95	6.70	6.55	6.20	5.70	5.15	4.25	3.10	2.50
9	7.20	6.90	6.70	6.40	5.85	5.30	4.40	3.20	2.55
10	7.35	7.10	6.90	6.55	6.00	5.40	4.50	3.25	2.65
11	7.55	7.30	7.10	6.75	6.20	5.55	4.65	3.40	2.75
12	7.75	7.45	7.25	6.85	6.35	5.70	4.75	3.50	2.80
13	7.95	7.70	7.45	7.10	6.50	5.85	4.90	3.55	2.85
14	8.15	7.85	7.60	7.25	6.65	6.00	5.00	3.65	2.90
15	8.40	8.05	7.80	7.40	6.80	6.15	5.10	3.75	3.00
18	8.90	8.60	8.35	7.90	7.25	6.55	5.40	4.00	3.20
20	9.30	8.95	8.70	8.30	7.60	6.85	5.65	4.15	3.35
23	9.85	9.45	9.20	8.80	8.05	7.25	6.00	4.45	3.55
25	10.25	9.90	9.55	9.10	8.35	7.55	6.25	4.60	3.70

EER_GSH-100ERB-3									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	5.85	5.63	5.46	5.20	4.77	4.30	3.57	2.62	2.11
8	6.02	5.81	5.63	5.38	4.90	4.43	3.66	2.67	2.19
9	6.24	6.02	5.81	5.55	5.07	4.56	3.78	2.80	2.28
10	6.36	6.15	5.93	5.72	5.20	4.69	3.87	2.88	2.28
11	6.54	6.32	6.11	5.81	5.38	4.82	4.00	2.92	2.37
12	6.71	6.45	6.28	5.98	5.50	4.95	4.09	3.01	2.41
13	6.92	6.67	6.45	6.15	5.68	5.07	4.26	3.14	2.49
14	7.05	6.79	6.62	6.32	5.76	5.20	4.34	3.18	2.58
15	7.27	6.97	6.75	6.45	5.89	5.33	4.43	3.23	2.62
18	7.78	7.53	7.27	6.92	6.36	5.72	4.73	3.48	2.80
20	8.17	7.83	7.65	7.27	6.67	5.98	4.99	3.66	2.97
23	8.64	8.30	8.08	7.70	7.05	6.36	5.25	3.87	3.10
25	8.99	8.69	8.39	8.00	7.35	6.62	5.50	4.04	3.27

EER_GSH-120ERB-3									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	4.60	4.43	4.30	4.09	3.76	2.85	2.81	2.06	1.66
8	4.74	4.57	4.43	4.23	3.86	3.00	2.88	2.10	1.73
9	4.91	4.74	4.57	4.36	3.99	3.15	2.98	2.20	1.79
10	5.01	4.84	4.67	4.50	4.09	3.30	3.04	2.27	1.79
11	5.14	4.97	4.80	4.57	4.23	3.45	3.15	2.30	1.86
12	5.28	5.07	4.94	4.70	4.33	3.60	3.21	2.37	1.89
13	5.45	5.24	5.07	4.84	4.47	3.75	3.35	2.47	1.96
14	5.55	5.35	5.21	4.97	4.53	3.90	3.42	2.50	2.03
15	5.72	5.48	5.31	5.07	4.63	4.05	3.48	2.54	2.06
18	6.12	5.92	5.72	5.45	5.01	4.49	3.72	2.74	2.20
20	6.43	6.16	6.02	5.72	5.24	4.79	3.92	2.88	2.33
23	6.80	6.53	6.36	6.06	5.55	5.24	4.13	3.04	2.44
25	7.07	6.83	6.60	6.29	5.78	5.54	4.33	3.18	2.57

EER_GSH-140ERB-3									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.89	3.75	3.63	3.46	3.18	2.72	2.37	1.74	1.40
8	4.00	3.86	3.75	3.58	3.26	2.82	2.43	1.77	1.46
9	4.15	4.00	3.86	3.69	3.38	2.92	2.52	1.86	1.52
10	4.23	4.09	3.95	3.80	3.46	3.02	2.57	1.92	1.52
11	4.35	4.21	4.06	3.86	3.58	3.12	2.66	1.95	1.57
12	4.46	4.29	4.18	3.98	3.66	3.21	2.72	2.00	1.60
13	4.61	4.43	4.29	4.09	3.78	3.31	2.83	2.09	1.66
14	4.69	4.52	4.41	4.21	3.83	3.41	2.89	2.12	1.72
15	4.83	4.63	4.49	4.29	3.92	3.51	2.95	2.15	1.74
18	5.18	5.01	4.83	4.61	4.23	3.80	3.15	2.32	1.86
20	5.44	5.21	5.09	4.83	4.43	3.99	3.32	2.43	1.97
23	5.75	5.52	5.38	5.12	4.69	4.29	3.49	2.57	2.06
25	5.98	5.78	5.58	5.32	4.89	4.48	3.66	2.69	2.17

EER_GSH-160ERB-3									
Leaving water (°C)	Ambient temperature (°C)								
	10	15	20	25	30	35	40	45	48
7	3.76	3.62	3.51	3.35	3.07	2.63	2.30	1.69	1.36
8	3.87	3.73	3.62	3.46	3.15	2.73	2.35	1.71	1.41
9	4.01	3.87	3.73	3.57	3.26	2.82	2.43	1.80	1.47
10	4.09	3.96	3.82	3.68	3.35	2.92	2.49	1.85	1.47
11	4.20	4.07	3.93	3.73	3.46	3.01	2.57	1.88	1.52
12	4.31	4.15	4.04	3.84	3.54	3.11	2.63	1.94	1.55
13	4.45	4.29	4.15	3.96	3.65	3.20	2.74	2.02	1.60
14	4.54	4.37	4.26	4.07	3.71	3.29	2.79	2.05	1.66
15	4.67	4.48	4.34	4.15	3.79	3.39	2.85	2.07	1.69
18	5.01	4.84	4.67	4.45	4.09	3.67	3.04	2.24	1.80
20	5.26	5.03	4.92	4.67	4.29	3.86	3.21	2.35	1.91
23	5.56	5.34	5.20	4.95	4.54	4.14	3.37	2.49	1.99
25	5.78	5.59	5.39	5.14	4.73	4.33	3.54	2.60	2.10

- GSH heating capacity

  Calculation of actual heating capacity: Actual heating capacity = rated heating capacity × heating capacity correction factor.

(1) GSH-40ERB,GSH-60ERB, GSH-80ERB, GSH-100ERB

GSH-40ERB heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.72	2.08	2.48	2.84	3.04	3.40	3.76	3.68	3.80	4.00	3.96	3.60	3.16	2.48
30	1.68	2.04	2.40	2.76	2.96	3.28	3.64	3.88	4.00	4.24	4.20	3.80	3.32	2.60
35	1.64	1.92	2.24	2.60	2.80	3.12	3.40	4.00	4.12	4.36	4.32	3.92	3.44	2.68
40	1.64	1.92	2.24	2.60	2.80	3.12	3.40	4.00	4.12	4.36	4.32	3.92	3.44	2.68
45	\	1.92	2.24	2.60	2.80	3.12	3.40	4.00	4.12	4.36	4.32	3.92	3.44	2.68
50	\	\	2.16	2.52	2.72	3.04	3.28	3.88	4.00	4.24	4.20	3.80	3.32	2.60
55	\	\	\	2.40	2.56	2.88	3.12	3.68	3.80	4.00	3.96	3.60	3.16	2.48
60	\	\	\	\	2.44	2.72	2.96	3.48	3.60	3.80	3.76	3.40	3.00	2.32

GSH-ERB heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	2.89	3.48	4.13	4.72	5.07	5.66	6.25	6.14	6.31	6.67	6.61	6.02	5.25	4.13
30	2.66	3.19	3.78	4.31	4.66	5.13	5.72	6.08	6.25	6.61	6.55	5.96	5.25	4.07
35	2.48	2.89	3.36	3.89	4.19	4.72	5.13	6.02	6.20	6.55	6.49	5.90	5.19	4.01
40	2.42	2.83	3.36	3.89	4.19	4.66	5.07	5.96	6.14	6.49	6.43	5.84	5.13	4.01
45	\	2.83	3.30	3.84	4.13	4.60	5.02	5.90	6.08	6.43	6.37	5.78	5.07	3.95
50	\	\	3.25	3.78	4.07	4.54	4.96	5.84	6.02	6.37	6.31	5.72	5.02	3.89
55	\	\	\	3.78	4.07	4.48	4.90	5.78	5.96	6.31	6.25	5.66	4.96	3.89
60	\	\	\	\	4.01	4.48	4.84	5.72	5.90	6.25	6.20	5.61	4.90	3.84

GSH-80ERB heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	3.44	4.16	4.96	5.68	6.08	6.80	7.52	7.36	7.60	8.00	7.92	7.20	6.32	4.96
30	3.36	4.08	4.80	5.52	5.92	6.56	7.28	7.76	8.00	8.48	8.40	7.60	6.64	5.20
35	3.28	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
40	3.28	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
45	\	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
50	\	\	4.32	5.04	5.44	6.08	6.56	7.76	8.00	8.48	8.40	7.60	6.64	5.20
55	\	\	\	4.80	5.12	5.76	6.24	7.36	7.60	8.00	7.92	7.20	6.32	4.96
60	\	\	\	\	4.88	5.44	5.92	6.96	7.20	7.60	7.52	6.80	6.00	4.64

GSH-100ERB heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	4.09	4.94	5.89	6.75	7.22	8.08	8.93	8.74	9.03	9.50	9.41	8.55	7.51	5.89
30	3.99	4.85	5.70	6.56	7.03	7.79	8.65	9.22	9.50	10.07	9.98	9.03	7.89	6.18
35	3.90	4.56	5.32	6.18	6.65	7.41	8.08	9.50	9.79	10.36	10.26	9.31	8.17	6.37
40	3.90	4.56	5.32	6.18	6.65	7.41	8.08	9.50	9.79	10.36	10.26	9.31	8.17	6.37
45	\	4.56	5.32	6.18	6.65	7.41	8.08	9.50	9.79	10.36	10.26	9.31	8.17	6.37
50	\	\	5.13	5.99	6.46	7.22	7.79	9.22	9.50	10.07	9.98	9.03	7.89	6.18
55	\	\	\	5.70	6.08	6.84	7.41	8.74	9.03	9.50	9.41	8.55	7.51	5.89
60	\	\	\	\	5.80	6.46	7.03	8.27	8.55	9.03	8.93	8.08	7.13	5.51

(2) GSH-40ERB2,GSH-60ERB2, GSH-80ERB2, GSH-100ERB2, GSH-120ERB, GSH-140ERB, GSH-160ERB

GSH-40ERB2 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.76	2.13	2.54	2.91	3.12	3.49	3.85	3.77	3.90	4.10	4.06	3.69	3.24	2.54
30	1.72	2.09	2.46	2.83	3.03	3.36	3.73	3.98	4.10	4.35	4.31	3.90	3.40	2.67
35	1.68	1.97	2.30	2.67	2.87	3.20	3.49	4.10	4.22	4.47	4.43	4.02	3.53	2.75
40	1.68	1.97	2.30	2.67	2.87	3.20	3.49	4.10	4.22	4.47	4.43	4.02	3.53	2.75
45	\	1.97	2.30	2.67	2.87	3.20	3.49	4.10	4.22	4.47	4.43	4.02	3.53	2.75
50	\	\	2.21	2.58	2.79	3.12	3.36	3.98	4.10	4.35	4.31	3.90	3.40	2.67
55	\	\	\	2.46	2.62	2.95	3.20	3.77	3.90	4.10	4.06	3.69	3.24	2.54
60	\	\	\	\	2.50	2.79	3.03	3.57	3.69	3.90	3.85	3.49	3.08	2.38

GSH-60ERB2 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	2.84	3.42	4.06	4.64	4.99	5.57	6.15	6.03	6.21	6.55	6.50	5.92	5.16	4.06
30	2.61	3.13	3.71	4.23	4.58	5.05	5.63	5.97	6.15	6.50	6.44	5.86	5.16	4.00
35	2.44	2.84	3.31	3.83	4.12	4.64	5.05	5.92	6.09	6.44	6.38	5.80	5.10	3.94
40	2.38	2.78	3.31	3.83	4.12	4.58	4.99	5.86	6.03	6.38	6.32	5.74	5.05	3.94
45	\	2.78	3.25	3.77	4.06	4.52	4.93	5.80	5.97	6.32	6.26	5.68	4.99	3.89
50	\	\	3.19	3.71	4.00	4.47	4.87	5.74	5.92	6.26	6.21	5.63	4.93	3.83
55	\	\	\	3.71	4.00	4.41	4.81	5.68	5.86	6.21	6.15	5.57	4.87	3.83
60	\	\	\	\	3.94	4.41	4.76	5.63	5.80	6.15	6.09	5.51	4.81	3.77

GSH-80ERB2 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	3.44	4.16	4.96	5.68	6.08	6.80	7.52	7.36	7.60	8.00	7.92	7.20	6.32	4.96
30	3.36	4.08	4.80	5.52	5.92	6.56	7.28	7.76	8.00	8.48	8.40	7.60	6.64	5.20
35	3.28	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
40	3.28	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
45	\	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
50	\	\	4.32	5.04	5.44	6.08	6.56	7.76	8.00	8.48	8.40	7.60	6.64	5.20
55	\	\	\	4.80	5.12	5.76	6.24	7.36	7.60	8.00	7.92	7.20	6.32	4.96
60	\	\	\	\	4.88	5.44	5.92	6.96	7.20	7.60	7.52	6.80	6.00	4.64

GSH-100ERB2 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	4.24	5.12	6.11	6.99	7.49	8.37	9.26	9.06	9.36	9.85	9.75	8.87	7.78	6.11
30	4.14	5.02	5.91	6.80	7.29	8.08	8.96	9.55	9.85	10.44	10.34	9.36	8.18	6.40
35	4.04	4.73	5.52	6.40	6.90	7.68	8.37	9.85	10.15	10.74	10.64	9.65	8.47	6.60
40	4.04	4.73	5.52	6.40	6.90	7.68	8.37	9.85	10.15	10.74	10.64	9.65	8.47	6.60
45	\	4.73	5.52	6.40	6.90	7.68	8.37	9.85	10.15	10.74	10.64	9.65	8.47	6.60
50	\	\	5.32	6.21	6.70	7.49	8.08	9.55	9.85	10.44	10.34	9.36	8.18	6.40
55	\	\	\	5.91	6.30	7.09	7.68	9.06	9.36	9.85	9.75	8.87	7.78	6.11
60	\	\	\	\	6.01	6.70	7.29	8.57	8.87	9.36	9.26	8.37	7.39	5.71

GSH-120ERB heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	5.17	6.25	7.46	8.54	9.14	10.22	11.31	11.60	11.43	12.03	11.91	10.83	9.50	7.46
30	5.05	6.13	7.22	8.30	8.90	9.86	10.95	11.80	12.03	12.75	12.63	11.43	9.98	7.82
35	4.93	5.77	6.74	7.82	8.42	9.38	10.22	12.00	12.39	13.11	12.99	11.79	10.34	8.06
40	4.93	5.77	6.74	7.82	8.42	9.38	10.22	12.20	12.39	13.11	12.99	11.79	10.34	8.06
45	\	5.77	6.74	7.82	8.42	9.38	10.22	12.40	12.39	13.11	12.99	11.79	10.34	8.06
50	\	\	6.50	7.58	8.18	9.14	9.86	12.60	12.03	12.75	12.63	11.43	9.98	7.82
55	\	\	\	7.22	7.70	8.66	9.38	12.80	11.43	12.03	11.91	10.83	9.50	7.46
60	\	\	\	\	7.34	8.18	8.90	13.00	10.83	11.43	11.31	10.22	9.02	6.98

GSH-140ERB heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	6.04	7.30	8.71	9.97	10.67	11.94	13.20	13.52	13.34	14.05	13.91	12.64	11.10	8.71
30	5.90	7.16	8.43	9.69	10.39	11.52	12.78	13.76	14.05	14.89	14.75	13.34	11.66	9.13
35	5.76	6.74	7.87	9.13	9.83	10.96	11.94	14.00	14.47	15.31	15.17	13.76	12.08	9.41
40	5.76	6.74	7.87	9.13	9.83	10.96	11.94	14.24	14.47	15.31	15.17	13.76	12.08	9.41
45	\	6.74	7.87	9.13	9.83	10.96	11.94	14.48	14.47	15.31	15.17	13.76	12.08	9.41
50	\	\	7.58	8.85	9.55	10.67	11.52	14.72	14.05	14.89	14.75	13.34	11.66	9.13
55	\	\	\	8.43	8.99	10.11	10.96	14.96	13.34	14.05	13.91	12.64	11.10	8.71
60	\	\	\	\	8.57	9.55	10.39	15.20	12.64	13.34	13.20	11.94	10.53	8.15

GSH-160ERB heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	6.64	8.03	9.58	10.97	11.74	13.13	14.52	14.91	14.67	15.45	15.29	13.90	12.20	9.58
30	6.49	7.88	9.27	10.66	11.43	12.67	14.06	15.21	15.45	16.37	16.22	14.67	12.82	10.04
35	6.33	7.41	8.65	10.04	10.81	12.05	13.13	15.50	15.91	16.84	16.68	15.14	13.28	10.35
40	6.33	7.41	8.65	10.04	10.81	12.05	13.13	15.80	15.91	16.84	16.68	15.14	13.28	10.35
45	\	7.41	8.65	10.04	10.81	12.05	13.13	16.09	15.91	16.84	16.68	15.14	13.28	10.35
50	\	\	8.34	9.73	10.50	11.74	12.67	16.39	15.45	16.37	16.22	14.67	12.82	10.04
55	\	\	\	9.27	9.89	11.12	12.05	16.68	14.67	15.45	15.29	13.90	12.20	9.58
60	\	\	\	\	9.42	10.50	11.43	16.98	13.90	14.67	14.52	13.13	11.58	8.96

(3) GSH-80ERB-3, GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

GSH-80ERB-3 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	3.44	4.16	4.96	5.68	6.08	6.80	7.52	7.36	7.60	8.00	7.92	7.20	6.32	4.96
30	3.36	4.08	4.80	5.52	5.92	6.56	7.28	7.76	8.00	8.48	8.40	7.60	6.64	5.20
35	3.28	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
40	3.28	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
45	\	3.84	4.48	5.20	5.60	6.24	6.80	8.00	8.24	8.72	8.64	7.84	6.88	5.36
50	\	\	4.32	5.04	5.44	6.08	6.56	7.76	8.00	8.48	8.40	7.60	6.64	5.20
55	\	\	\	4.80	5.12	5.76	6.24	7.36	7.60	8.00	7.92	7.20	6.32	4.96
60	\	\	\	\	4.88	5.44	5.92	6.96	7.20	7.60	7.52	6.80	6.00	4.64

GSH-100ERB-3 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	4.39	5.30	6.32	7.24	7.75	8.67	9.59	9.38	9.69	10.20	10.10	9.18	8.06	6.32
30	4.28	5.20	6.12	7.04	7.55	8.36	9.28	9.89	10.20	10.81	10.71	9.69	8.47	6.63
35	4.18	4.90	5.71	6.63	7.14	7.96	8.67	10.20	10.51	11.12	11.02	10.00	8.77	6.83
40	4.18	4.90	5.71	6.63	7.14	7.96	8.67	10.20	10.51	11.12	11.02	10.00	8.77	6.83
45	\	4.90	5.71	6.63	7.14	7.96	8.67	10.20	10.51	11.12	11.02	10.00	8.77	6.83
50	\	\	5.51	6.43	6.94	7.75	8.36	9.89	10.20	10.81	10.71	9.69	8.47	6.63
55	\	\	\	6.12	6.53	7.34	7.96	9.38	9.69	10.20	10.10	9.18	8.06	6.32
60	\	\	\	\	6.22	6.94	7.55	8.87	9.18	9.69	9.59	8.67	7.65	5.92

GSH-120ERB2-3 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	5.13	6.20	7.39	8.46	9.06	10.13	11.21	11.50	11.33	11.92	11.80	10.73	9.42	7.39
30	5.01	6.08	7.15	8.23	8.82	9.78	10.85	11.70	11.92	12.64	12.52	11.33	9.89	7.75
35	4.89	5.72	6.68	7.75	8.34	9.30	10.13	11.89	12.28	12.99	12.88	11.68	10.25	7.99
40	4.89	5.72	6.68	7.75	8.34	9.30	10.13	12.09	12.28	12.99	12.88	11.68	10.25	7.99
45	\	5.72	6.68	7.75	8.34	9.30	10.13	12.29	12.28	12.99	12.88	11.68	10.25	7.99
50	\	\	6.44	7.51	8.11	9.06	9.78	12.49	11.92	12.64	12.52	11.33	9.89	7.75
55	\	\	\	7.15	7.63	8.58	9.30	12.69	11.33	11.92	11.80	10.73	9.42	7.39
60	\	\	\	\	7.27	8.11	8.82	12.88	10.73	11.33	11.21	10.13	8.94	6.91

GSH-140ERB2-3 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	6.02	7.28	8.68	9.94	10.65	11.91	13.17	13.48	13.31	14.01	13.87	12.61	11.07	8.68
30	5.88	7.14	8.40	9.66	10.37	11.49	12.75	13.72	14.01	14.85	14.71	13.31	11.63	9.10
35	5.74	6.72	7.84	9.10	9.80	10.93	11.91	13.96	14.43	15.27	15.13	13.73	12.05	9.38
40	5.74	6.72	7.84	9.10	9.80	10.93	11.91	14.20	14.43	15.27	15.13	13.73	12.05	9.38
45	\	6.72	7.84	9.10	9.80	10.93	11.91	14.44	14.43	15.27	15.13	13.73	12.05	9.38
50	\	\	7.56	8.82	9.52	10.65	11.49	14.68	14.01	14.85	14.71	13.31	11.63	9.10
55	\	\	\	8.40	8.96	10.08	10.93	14.92	13.31	14.01	13.87	12.61	11.07	8.68
60	\	\	\	\	8.54	9.52	10.37	15.16	12.61	13.31	13.17	11.91	10.51	8.12

GSH-160ERB2-3 heating capacity														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	6.66	8.05	9.60	10.99	11.77	13.16	14.56	14.95	14.71	15.48	15.33	13.94	12.23	9.60
30	6.50	7.90	9.29	10.68	11.46	12.70	14.09	15.24	15.48	16.41	16.26	14.71	12.85	10.07
35	6.35	7.43	8.67	10.07	10.84	12.08	13.16	15.54	15.95	16.88	16.72	15.18	13.32	10.37
40	6.35	7.43	8.67	10.07	10.84	12.08	13.16	15.83	15.95	16.88	16.72	15.18	13.32	10.37
45	\	7.43	8.67	10.07	10.84	12.08	13.16	16.13	15.95	16.88	16.72	15.18	13.32	10.37
50	\	\	8.36	9.76	10.53	11.77	12.70	16.43	15.48	16.41	16.26	14.71	12.85	10.07
55	\	\	\	9.29	9.91	11.15	12.08	16.72	14.71	15.48	15.33	13.94	12.23	9.60
60	\	\	\	\	9.45	10.53	11.46	17.02	13.94	14.71	14.56	13.16	11.61	8.98

- COP correction

(1) GSH-40ERB,GSH-60ERB, GSH-80ERB, GSH-100ERB

GSH-40ERB COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	2.03	2.57	3.04	3.86	4.45	5.27	6.05	6.32	6.59	7.22	7.64	7.61	8.27	8.74
30	1.64	2.11	2.50	3.24	3.74	4.41	5.19	5.73	6.08	6.51	6.94	6.94	7.49	8.03
35	1.37	1.72	2.03	2.69	3.12	3.74	4.25	5.11	5.38	5.85	6.12	6.12	6.79	7.22
40	1.17	1.56	1.87	2.42	2.77	3.39	3.94	4.52	4.76	5.19	5.42	5.38	5.97	6.36
45	\	1.33	1.60	2.15	2.42	2.93	3.43	3.90	4.10	4.45	4.68	4.91	5.15	5.46
50	\	\	1.33	1.76	2.03	2.46	2.85	3.32	3.47	3.78	3.98	4.17	4.37	4.64
55	\	\	\	1.40	1.64	1.99	2.30	2.69	2.81	3.08	3.24	3.39	3.55	3.78
60	\	\	\	\	1.29	1.52	1.76	2.11	2.18	2.30	2.46	2.57	2.69	2.89

GSH-60ERB COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.95	2.46	2.93	3.71	4.29	5.07	5.85	6.08	6.36	6.94	7.37	7.29	7.96	8.42
30	1.56	2.03	2.42	3.12	3.63	4.29	4.99	5.54	5.89	6.28	6.71	6.71	7.25	7.76
35	1.33	1.68	1.99	2.61	3.04	3.63	4.17	4.99	5.27	5.73	5.97	5.97	6.63	7.02
40	1.13	1.52	1.83	2.38	2.73	3.32	3.90	4.45	4.68	5.07	5.34	5.30	5.85	6.24
45	\	1.33	1.60	2.15	2.42	2.93	3.43	3.90	4.10	4.45	4.68	4.91	5.15	5.46
50	\	\	1.37	1.79	2.07	2.46	2.85	3.35	3.51	3.86	4.02	4.21	4.41	4.72
55	\	\	\	1.48	1.72	2.07	2.42	2.81	2.96	3.20	3.39	3.51	3.71	3.98
60	\	\	\	\	1.37	1.64	1.91	2.26	2.34	2.50	2.61	2.77	2.89	3.08

GSH-80ERB COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.81	2.29	2.70	3.44	4.00	4.70	5.40	5.66	5.88	6.44	6.81	6.77	7.36	7.81
30	1.48	1.92	2.26	2.92	3.40	4.00	4.66	5.18	5.48	5.88	6.25	6.25	6.77	7.22
35	1.22	1.55	1.85	2.44	2.85	3.40	3.89	4.66	4.92	5.33	5.55	5.55	6.18	6.55
40	1.07	1.44	1.74	2.22	2.55	3.11	3.66	4.18	4.40	4.81	5.03	5.00	5.51	5.88
45	\	1.26	1.52	2.04	2.29	2.78	3.26	3.70	3.89	4.22	4.44	4.66	4.88	5.18
50	\	\	1.30	1.74	1.96	2.37	2.74	3.22	3.37	3.70	3.89	4.07	4.26	4.55
55	\	\	\	1.44	1.67	2.04	2.37	2.74	2.89	3.15	3.29	3.44	3.63	3.89
60	\	\	\	\	1.37	1.63	1.89	2.26	2.29	2.48	2.59	2.74	2.85	3.07

GSH-100ERB COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.80	2.27	2.70	3.42	3.96	4.68	5.40	5.62	5.87	6.41	6.80	6.73	7.34	7.78
30	1.44	1.87	2.23	2.88	3.35	3.96	4.61	5.11	5.44	5.80	6.19	6.19	6.70	7.16
35	1.22	1.55	1.84	2.41	2.81	3.35	3.85	4.61	4.86	5.29	5.51	5.51	6.12	6.48
40	1.04	1.40	1.69	2.20	2.52	3.06	3.60	4.10	4.32	4.68	4.93	4.90	5.40	5.76
45	\	1.22	1.48	1.98	2.23	2.70	3.17	3.60	3.78	4.10	4.32	4.54	4.75	5.04
50	\	\	1.26	1.66	1.91	2.27	2.63	3.10	3.24	3.56	3.71	3.89	4.07	4.36
55	\	\	\	1.37	1.58	1.91	2.23	2.59	2.74	2.95	3.13	3.24	3.42	3.67
60	\	\	\	\	1.26	1.51	1.76	2.09	2.16	2.30	2.41	2.56	2.66	2.84

(2) GSH-40ERB2, GSH-60ERB2, GSH-80ERB2, GSH-100ERB2, GSH-120ERB, GSH-140ERB, GSH-160ERB

GSH-40ERB2 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	2.05	2.60	3.07	3.90	4.49	5.32	6.11	6.38	6.66	7.29	7.72	7.68	8.35	8.83
30	1.65	2.13	2.52	3.27	3.78	4.45	5.24	5.79	6.15	6.58	7.01	7.01	7.56	8.12
35	1.38	1.73	2.05	2.72	3.15	3.78	4.29	5.16	5.44	5.91	6.19	6.19	6.86	7.29
40	1.18	1.58	1.89	2.44	2.80	3.43	3.98	4.57	4.81	5.24	5.48	5.44	6.03	6.42
45	\	1.34	1.62	2.17	2.44	2.96	3.47	3.94	4.14	4.49	4.73	4.96	5.20	5.52
50	\	\	1.34	1.77	2.05	2.48	2.88	3.35	3.51	3.82	4.02	4.22	4.41	4.69
55	\	\	\	1.42	1.65	2.01	2.32	2.72	2.84	3.11	3.27	3.43	3.59	3.82
60	\	\	\	\	1.30	1.54	1.77	2.13	2.21	2.32	2.48	2.60	2.72	2.92

GSH-60ERB2 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.91	2.41	2.87	3.63	4.20	4.97	5.73	5.96	6.23	6.80	7.22	7.14	7.79	8.25
30	1.53	1.99	2.37	3.06	3.55	4.20	4.89	5.42	5.77	6.15	6.57	6.57	7.11	7.60
35	1.30	1.64	1.95	2.56	2.98	3.55	4.09	4.89	5.16	5.62	5.84	5.84	6.49	6.88
40	1.11	1.49	1.80	2.33	2.67	3.25	3.82	4.35	4.58	4.97	5.23	5.20	5.73	6.11
45	\	1.30	1.57	2.10	2.37	2.87	3.36	3.82	4.01	4.35	4.58	4.81	5.04	5.35
50	\	\	1.34	1.76	2.02	2.41	2.79	3.29	3.44	3.78	3.93	4.13	4.32	4.62
55	\	\	\	1.45	1.68	2.02	2.37	2.75	2.90	3.13	3.32	3.44	3.63	3.90
60	\	\	\	\	1.34	1.60	1.87	2.22	2.29	2.44	2.56	2.71	2.83	3.02

GSH-80ERB2 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.89	2.39	2.82	3.59	4.17	4.90	5.64	5.91	6.14	6.72	7.10	7.06	7.68	8.14
30	1.54	2.01	2.35	3.05	3.55	4.17	4.86	5.40	5.71	6.14	6.52	6.52	7.06	7.53
35	1.27	1.62	1.93	2.55	2.97	3.55	4.05	4.86	5.13	5.56	5.79	5.79	6.45	6.83
40	1.12	1.51	1.81	2.32	2.66	3.24	3.82	4.36	4.59	5.02	5.25	5.21	5.75	6.14
45	\	1.31	1.58	2.12	2.39	2.90	3.40	3.86	4.05	4.40	4.63	4.86	5.10	5.40
50	\	\	1.35	1.81	2.05	2.47	2.86	3.36	3.51	3.86	4.05	4.25	4.44	4.75
55	\	\	\	1.51	1.74	2.12	2.47	2.86	3.01	3.28	3.44	3.59	3.78	4.05
60	\	\	\	\	1.43	1.70	1.97	2.35	2.39	2.59	2.70	2.86	2.97	3.20

GSH-100ERB2 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.84	2.31	2.75	3.49	4.04	4.77	5.51	5.73	5.98	6.53	6.94	6.86	7.49	7.93
30	1.47	1.91	2.28	2.94	3.41	4.04	4.70	5.21	5.54	5.91	6.31	6.31	6.83	7.30
35	1.25	1.58	1.87	2.46	2.86	3.41	3.93	4.70	4.95	5.39	5.62	5.62	6.24	6.61
40	1.06	1.43	1.72	2.24	2.57	3.12	3.67	4.18	4.40	4.77	5.03	4.99	5.51	5.87
45	\	1.25	1.50	2.02	2.28	2.75	3.23	3.67	3.85	4.18	4.40	4.62	4.84	5.14
50	\	\	1.28	1.69	1.95	2.31	2.68	3.16	3.30	3.63	3.78	3.96	4.15	4.44
55	\	\	\	1.39	1.61	1.95	2.28	2.64	2.79	3.01	3.19	3.30	3.49	3.74
60	\	\	\	\	1.28	1.54	1.80	2.13	2.20	2.35	2.46	2.61	2.72	2.90

GSH-120ERB COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.95	2.47	2.90	3.70	4.30	5.05	5.81	6.23	6.32	6.92	7.32	7.28	7.91	8.39
30	1.59	2.07	2.43	3.14	3.66	4.30	5.01	5.62	5.89	6.32	6.72	6.72	7.28	7.76
35	1.31	1.67	1.99	2.63	3.06	3.66	4.18	5.00	5.29	5.73	5.97	5.97	6.64	7.04
40	1.15	1.55	1.87	2.39	2.74	3.34	3.94	4.39	4.73	5.17	5.41	5.37	5.93	6.32
45	\	1.35	1.63	2.19	2.47	2.98	3.50	3.77	4.18	4.53	4.77	5.01	5.25	5.57
50	\	\	1.39	1.87	2.11	2.55	2.94	3.16	3.62	3.98	4.18	4.38	4.57	4.89
55	\	\	\	1.55	1.79	2.19	2.55	2.54	3.10	3.38	3.54	3.70	3.90	4.18
60	\	\	\	\	1.47	1.75	2.03	1.93	2.47	2.66	2.78	2.94	3.06	3.30

GSH-140ERB COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.83	2.32	2.73	3.47	4.04	4.75	5.46	5.72	5.94	6.50	6.88	6.84	7.44	7.88
30	1.49	1.94	2.28	2.95	3.44	4.04	4.71	5.21	5.53	5.94	6.31	6.31	6.84	7.29
35	1.23	1.57	1.87	2.47	2.88	3.44	3.92	4.70	4.97	5.38	5.60	5.60	6.24	6.61
40	1.08	1.46	1.76	2.24	2.58	3.14	3.70	4.19	4.45	4.86	5.08	5.04	5.57	5.94
45	\	1.27	1.53	2.06	2.32	2.80	3.29	3.68	3.92	4.26	4.48	4.71	4.93	5.23
50	\	\	1.31	1.76	1.98	2.39	2.76	3.17	3.40	3.74	3.92	4.11	4.30	4.60
55	\	\	\	1.46	1.68	2.06	2.39	2.66	2.91	3.18	3.33	3.47	3.66	3.92
60	\	\	\	\	1.38	1.64	1.91	2.15	2.32	2.50	2.62	2.76	2.88	3.10

GSH-160ERB COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.74	2.21	2.60	3.31	3.85	4.52	5.20	5.38	5.66	6.20	6.55	6.52	7.09	7.51
30	1.42	1.85	2.17	2.81	3.28	3.85	4.49	4.94	5.27	5.66	6.02	6.02	6.52	6.94
35	1.18	1.50	1.78	2.35	2.74	3.28	3.74	4.50	4.74	5.13	5.34	5.34	5.95	6.30
40	1.03	1.39	1.67	2.14	2.46	2.99	3.53	4.06	4.24	4.63	4.84	4.81	5.31	5.66
45	\	1.21	1.46	1.96	2.21	2.67	3.13	3.62	3.74	4.06	4.27	4.49	4.70	4.99
50	\	\	1.25	1.67	1.89	2.28	2.64	3.18	3.24	3.56	3.74	3.92	4.09	4.38
55	\	\	\	1.39	1.60	1.96	2.28	2.74	2.78	3.03	3.17	3.31	3.49	3.74
60	\	\	\	\	1.32	1.57	1.82	2.30	2.21	2.39	2.49	2.64	2.74	2.96

(3) GSH-80ERB-3, GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

GSH-80ERB-3 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	2.04	2.58	3.04	3.87	4.49	5.28	6.07	6.36	6.61	7.24	7.65	7.61	8.28	8.78
30	1.66	2.16	2.54	3.29	3.83	4.49	5.24	5.82	6.16	6.61	7.03	7.03	7.61	8.11
35	1.37	1.75	2.08	2.75	3.20	3.83	4.37	5.24	5.53	5.99	6.24	6.24	6.95	7.36
40	1.21	1.62	1.96	2.50	2.87	3.49	4.12	4.70	4.95	5.41	5.66	5.62	6.20	6.61
45	\	1.41	1.71	2.29	2.58	3.12	3.66	4.16	4.37	4.74	4.99	5.24	5.49	5.82
50	\	\	1.46	1.96	2.20	2.66	3.08	3.62	3.79	4.16	4.37	4.58	4.78	5.12
55	\	\	\	1.62	1.87	2.29	2.66	3.08	3.24	3.54	3.70	3.87	4.08	4.37
60	\	\	\	\	1.54	1.83	2.12	2.54	2.58	2.79	2.91	3.08	3.20	3.45

GSH-100ERB-3 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	2.04	2.58	3.04	3.87	4.49	5.28	6.07	6.36	6.61	7.24	7.65	7.61	8.28	8.78
30	1.66	2.16	2.54	3.29	3.83	4.49	5.24	5.82	6.16	6.61	7.03	7.03	7.61	8.11
35	1.37	1.75	2.08	2.75	3.20	3.83	4.37	5.24	5.53	5.99	6.24	6.24	6.95	7.36
40	1.21	1.62	1.96	2.50	2.87	3.49	4.12	4.70	4.95	5.41	5.66	5.62	6.20	6.61
45	\	1.41	1.71	2.29	2.58	3.12	3.66	4.16	4.37	4.74	4.99	5.24	5.49	5.82
50	\	\	1.46	1.96	2.20	2.66	3.08	3.62	3.79	4.16	4.37	4.58	4.78	5.12
55	\	\	\	1.62	1.87	2.29	2.66	3.08	3.24	3.54	3.70	3.87	4.08	4.37
60	\	\	\	\	1.54	1.83	2.12	2.54	2.58	2.79	2.91	3.08	3.20	3.45

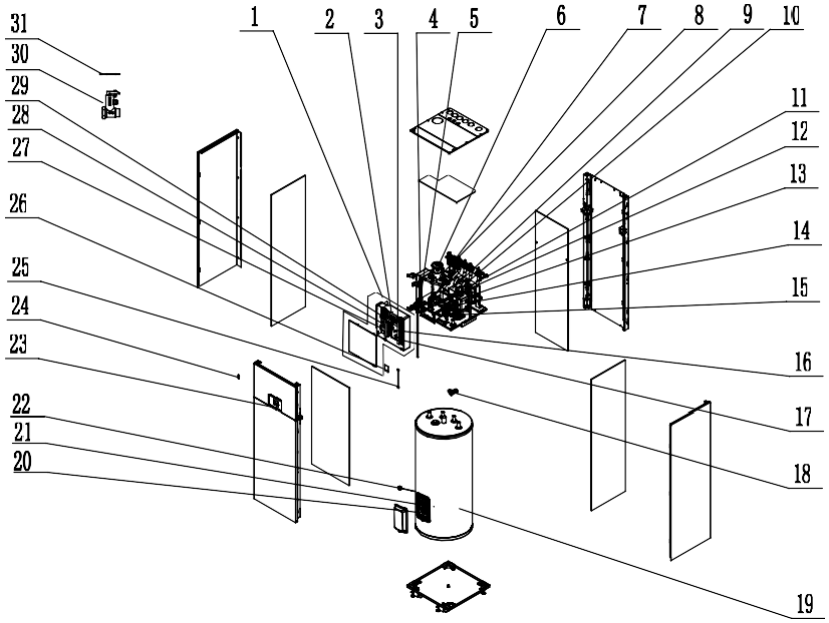
GSH-120ERB-3 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	2.06	2.60	3.07	3.90	4.53	5.33	6.13	6.58	6.68	7.31	7.73	7.68	8.36	8.86
30	1.68	2.18	2.56	3.32	3.86	4.53	5.29	5.93	6.21	6.68	7.10	7.10	7.68	8.19
35	1.39	1.76	2.10	2.77	3.23	3.86	4.41	5.28	5.58	6.05	6.30	6.30	7.01	7.43
40	1.22	1.64	1.97	2.52	2.90	3.53	4.16	4.63	5.00	5.46	5.71	5.67	6.26	6.68
45	\	1.43	1.72	2.31	2.60	3.15	3.70	3.98	4.41	4.79	5.04	5.29	5.54	5.88
50	\	\	1.47	1.97	2.23	2.69	3.11	3.33	3.82	4.20	4.41	4.62	4.83	5.16
55	\	\	\	1.64	1.89	2.31	2.69	2.68	3.28	3.57	3.74	3.90	4.11	4.41
60	\	\	\	\	1.55	1.85	2.14	2.03	2.60	2.81	2.94	3.11	3.23	3.49

GSH-140ERB-3 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.98	2.51	2.95	3.76	4.36	5.13	5.90	6.19	6.43	7.03	7.44	7.40	8.04	8.53
30	1.62	2.10	2.47	3.19	3.72	4.36	5.09	5.63	5.98	6.43	6.83	6.83	7.40	7.88
35	1.33	1.70	2.02	2.67	3.11	3.72	4.24	5.08	5.37	5.82	6.06	6.06	6.75	7.15
40	1.17	1.58	1.90	2.42	2.79	3.39	4.00	4.53	4.81	5.25	5.50	5.46	6.02	6.43
45	\	1.37	1.66	2.22	2.51	3.03	3.56	3.98	4.24	4.61	4.85	5.09	5.33	5.66
50	\	\	1.41	1.90	2.14	2.59	2.99	3.43	3.68	4.04	4.24	4.45	4.65	4.97
55	\	\	\	1.58	1.82	2.22	2.59	2.88	3.15	3.43	3.60	3.76	3.96	4.24
60	\	\	\	\	1.50	1.78	2.06	2.33	2.51	2.71	2.83	2.99	3.11	3.35

GSH-160ERB-3 COP														
Leaving heated water (°C)	Ambient temperature (°C)													
	-25	-20	-15	-10	-7	-2	2	7	10	15	20	25	30	35
25	1.87	2.37	2.79	3.55	4.12	4.85	5.57	5.77	6.07	6.64	7.02	6.98	7.59	8.05
30	1.53	1.98	2.33	3.02	3.51	4.12	4.81	5.29	5.65	6.07	6.45	6.45	6.98	7.44
35	1.26	1.60	1.91	2.52	2.94	3.51	4.01	4.82	5.08	5.50	5.72	5.72	6.37	6.76
40	1.11	1.49	1.79	2.29	2.63	3.21	3.78	4.35	4.54	4.96	5.19	5.15	5.69	6.07
45	\	1.30	1.56	2.10	2.37	2.86	3.36	3.88	4.01	4.35	4.58	4.81	5.04	5.34
50	\	\	1.34	1.79	2.02	2.44	2.82	3.41	3.47	3.82	4.01	4.20	4.39	4.69
55	\	\	\	1.49	1.72	2.10	2.44	2.94	2.98	3.24	3.40	3.55	3.74	4.01
60	\	\	\	\	1.41	1.68	1.95	2.47	2.37	2.56	2.67	2.82	2.94	3.17

2 Exploded Views and Parts List

(1) GSH-40TRB, GSH-60TRB

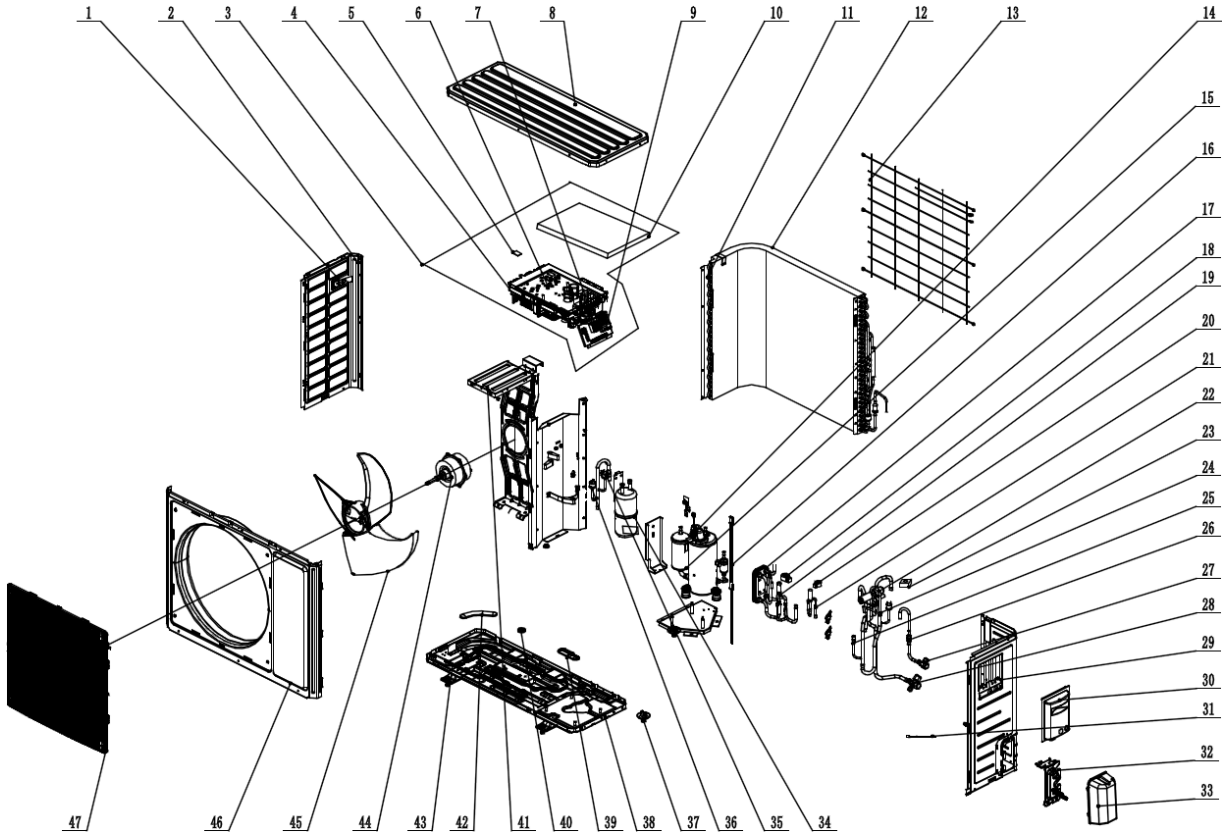


Parts list of GSH-40TRB, GSH-60TRB

No.	Part name	Part number	Quantity
1	Electric box assy	100002069963	1
2	Terminal block	422000000010	1
3	Terminal block	422000000021	1
4	Plate heat exchanger assy	030166060121	1
5	Drain pipe	0436289501	1
6	Auto air vent valve	07108208	1
7	Sealing cap (pressure warning)	26112192	1
8	Electric heater	320004060075	1
9	Electric water valve actuator	4504800101	1
10	Expansion tank	07422800004	1
11	Flow switch	43001900000602	1
12	3-way valve	072005000003	1
13	Water pump	812007060062	1
14	Safety valve	07382814	1
15	Water pressure gauge	49028009	1
16	Main board	300002060375	1

No.	Part name	Part number	Quantity
17	2-pole AC contactor	44010221	3
18	Filter	035021000010	1
19	Water tank	015005060013	1
20	Electric heater	32110008	1
21	Thermostat	45048003	1
22	Anode	015023000002	1
23	Display panel	300001060562	1
24	Magnet	70844004	2
25	Signal cable	400300412	1
26	Receiver board	30261014	1
27	Anode	04062800008	1
28	Thermostat	4504800201	1
29	Terminal block	422000000014	1
30	Safety valve	07382801	1
31	Temperature sensor	3900028312G	1

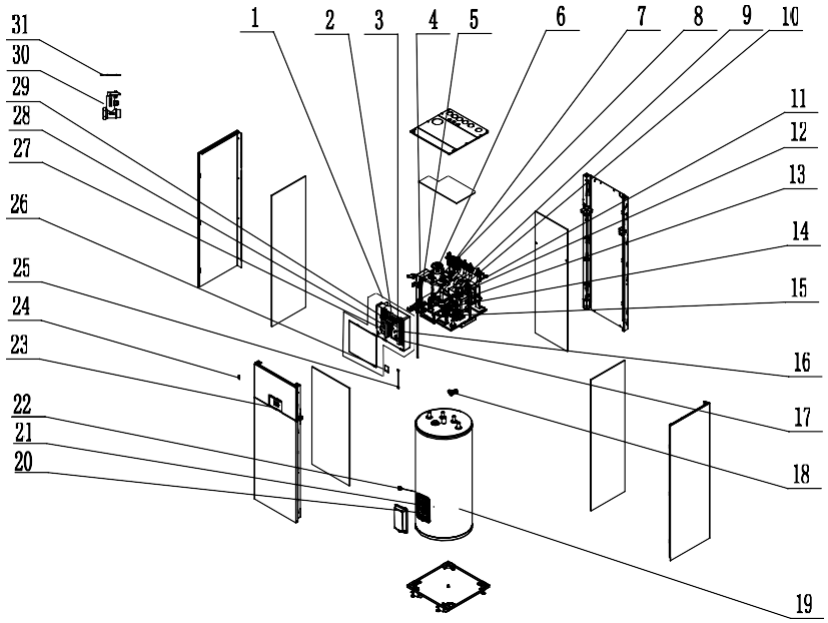
(2) GSH-40ERB, GSH-60ERB



Parts list of GSH-40ERB, GSH-60ERB

No.	Part name	Part number	Quantity
1	Handle	26233053	1
2	Left side plate	01305093P	1
3	Electric box assy	100002066812	1
4	Radiator	4901521502	1
5	Jumper	4202021905	1
6	Main board	300027060765	1
7	Terminal block	42000100000204	1
8	Top cover	000051000017	1
9	Communication interface board	300014060062	1
10	Electric box cover	20125002	1
11	Condenser support	01795010	1
12	Condenser	011002060786	1
13	Rear grille	01473043	1
14	Pressure sensor	322101038	1
15	Compressor and fittings	009001000229	1
16	Electric heater	7651300403	1
17	Plate heat exchanger	010007060010	1
18	Electronic expansion valve fittings	4304413222	1
19	Electronic expansion valve	43042800008	1
20	Electronic expansion valve fittings	07200200001209	1
21	Electronic expansion valve	072009000017	1
22	4-way valve	430004032	1
23	Magnetic coil	4300040045	1
24	Pressure protection switch	460200062	1
25	Connection for adding refrigerant	06120012	1
26	Filter	0721200102	1
27	Shut-off valve 1/4 (N)	07130239	1
28	Shut-off valve 1/2 (N)	071302392	1
29	Right side plate	0130329201	1
30	Handle	2623525404	1
31	Sensor assy	390002060101	1
32	Valve support	01705066	1
33	Valve cover	22245002	1
34	Gas-liquid separator	07225017	1
35	Pressure protection switch	460200048	1
36	Pressure protection switch	460200046	1
37	Drainage joint	06123401	1
38	Chassis	000191060066	1
39	Drainage hole cap	76713068	1
40	Drainage hole cap	06813401	1
41	Motor support	01705067	1
42	Drainage hole cap	76713033	1
43	Chassis electric heater	7651000413	1
44	Fan motor	1501506402	1
45	Axial fan	10335008	1
46	Front panel	01533058	1
47	Front grille	22415010	1

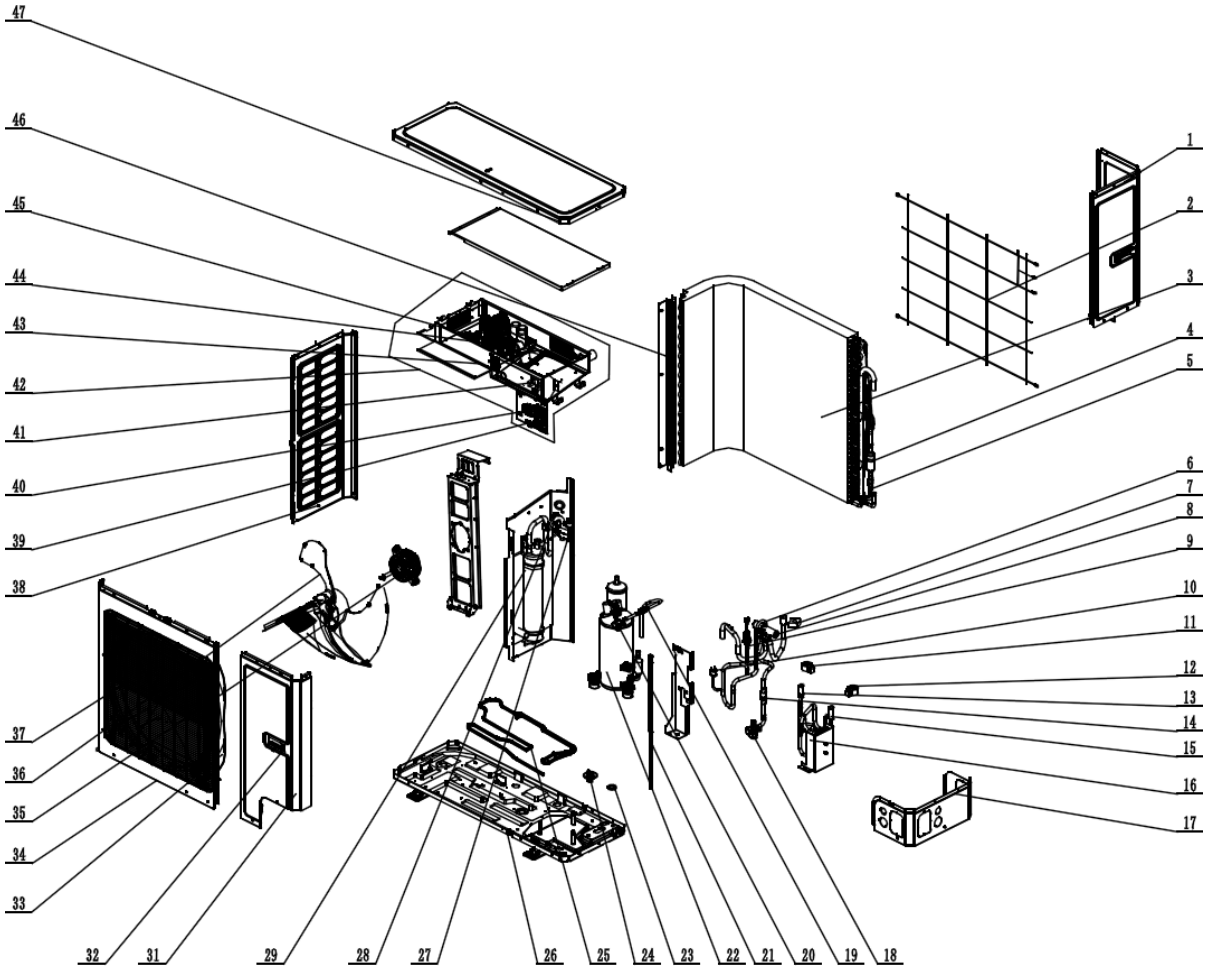
(3) GSH-80TRB, GSH-100TRB



Parts list of GSH-80TRB, GSH-100TRB

No.	Part name	Part number	Quantity
1	Electric box assy	100002069963	1
2	Terminal block	422000000010	1
3	Terminal block	422000000021	1
4	Plate heat exchanger assy	030166060121	1
5	Drain pipe	0436289501	1
6	Auto air vent valve	07108208	1
7	Sealing cap (pressure warning)	26112192	1
8	Electric heater	32000406006301	1
9	Electric water valve actuator	4504800101	1
10	Expansion tank	07422800004	1
11	Flow switch	43001900000602	1
12	3-way valve	072005000003	1
13	Water pump	812007060062	1
14	Safety valve	07382814	1
15	Water pressure gauge	49028009	1
16	Main board	300002060375	1
17	2-pole AC contactor	44010221	3
18	Filter	035021000010	1
19	Water tank	015005060013	1
20	Electric heater	32110008	1
21	Thermostat	45048003	1
22	Anode	015023000002	1
23	Display panel	300001060562	1
24	Magnet	70844004	2
25	Signal cable	400300412	1
26	Receiver board	30261014	1
27	Anode	04062800008	1
28	Thermostat	4504800201	1
29	Terminal block	422000000014	1
30	Safety valve	07382801	1
31	Temperature sensor	3900028312G	1

(4) GSH-80ERB, GSH-100ERB

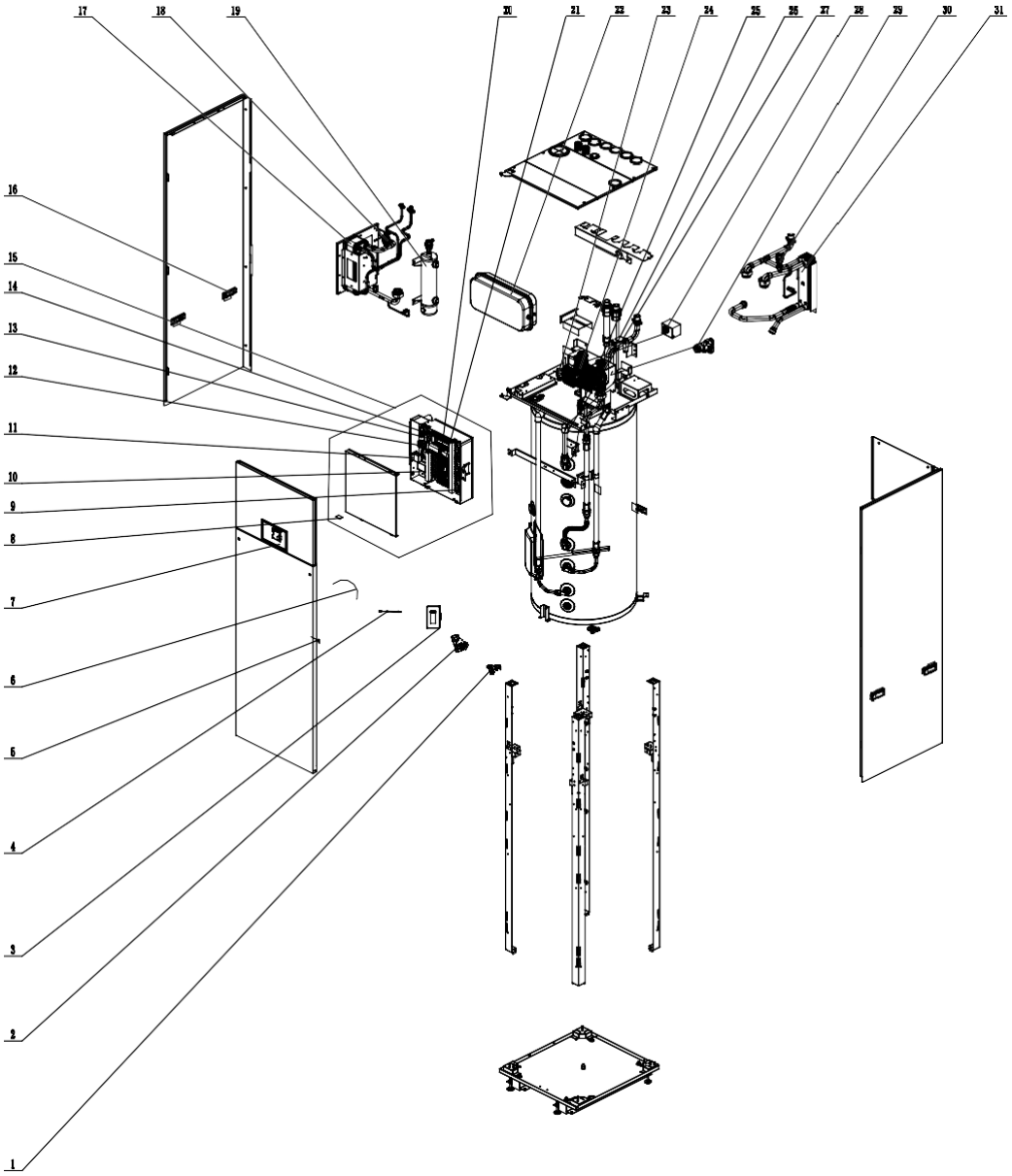


Parts list of GSH-80ERB, GSH-100ERB

No.	Part name	Part number	Quantity
1	Rear side plate	01314100045P	1
2	Rear grille	01600100004101	1
3	Condenser	01122800090	1
4	Silencer	07245012	1
5	Filter	0721212101	1
6	4-way valve assy	030152060359	1
7	Magnetic coil	4300040029	1
8	4-way valve	4300008201	1
9	Pressure sensor	322101032	1
10	Pressure protection switch	460200062	1
11	Electronic expansion valve fittings	4304413208	1
12	Electronic expansion valve fittings	4304413236	1
13	Electronic expansion valve	072009000001	1
14	Filter	0721200102	1
15	Electronic expansion valve	43042800008	1
16	Plate heat exchanger	010007060013	1
17	Right side plate	01314100109	1
18	Shut-off valve	07304100015	1
19	Filter	07224803	1
20	Shut-off valve 1/4 (N)	07130239	1
21	Compressor electric heater	7651873215	1
22	Compressor and fittings	009001000265	1
23	Drainage hole cap	06813401	3

No.	Part name	Part number	Quantity
24	Drainage joint	06123401	1
25	Electric heater	765100049	1
26	Chassis	01284100101	1
27	Pressure protection switch	460200048	1
28	Pressure protection switch	460200046	1
29	Gas-liquid separator	035027000024	1
30	Motor support	01804100309	1
31	Front side plate	01314100044P	1
32	Handle	26235253	2
33	Air distributor	10474100003	1
34	Cabinet	01514100007P	1
35	Brushless DC motor	150104060013	1
36	Axial fan	1043410000801	1
37	Front grille	01572800003	1
38	Left side plate	01314100043P	1
39	Communication board	300014060017	1
40	Terminal block	42200000001501	1
41	Filter board	300020000017	1
42	Electric box assy	100002066654	1
43	Radiator	430034000014	1
44	Main board	300027060442	1
45	Main board	300027060253	1
46	Condenser support	01894100053	1
47	Cover	01264100027P	1

(5) GSH-40TRB2, GSH-60TRB2, GSH-80TRB2, GSH-100TRB2

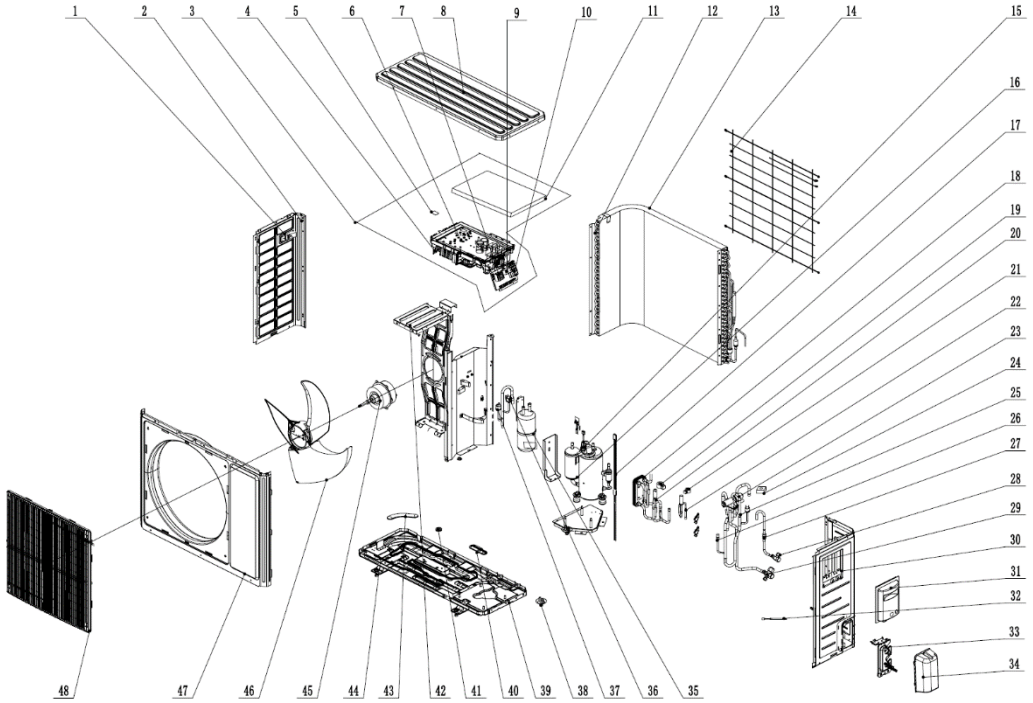


Parts list of GSH-40TRB2, GSH-60TRB2, GSH-80TRB2, GSH-100TRB2

No.	Part name	Part number	Quantity
1	Safety valve	07382801	1
2	Filter	035021000010	1
3	External room temperature sensor	30261014	1
4	Temperature sensor	3900028312G	1
5	Magnet	70844004	2
6	Signal cable	400300412	1
7	Display board	300001061020	1
8	Jumper	4202021909	1
9	2-pole AC contactor	44010221	3
10	Anode	04062800008	1
11	Thermostat	4504800201	1
12	Terminal block	422000000014	1
13	Thermostat	none	0
14	Terminal block	422000000027	1
15	Electric box assy	100002072658	1
16	Handle	26904100016	6

No.	Part name	Part number	Quantity
17	Plate heat exchanger assy	030166060226	1
18	Flow switch	43001900000603	1
19	Electric heater	32000406007502	1
20	Main board	300002062353	1
21	Mounting card (main board)	26902800034	1
22	Expansion tank	07422800004	1
23	Safety valve	07382814	1
24	Water pump	812007060062	1
25	Water pressure gauge	49028009	1
26	Water pump	81200706006201	1
27	Drain pipe	0436289504	1
28	Electric water valve actuator	4504800101	1
29	Electric 3-way ball valve	072005000003	1
30	Plate heat exchanger assy	030166060227	1
31	Auto air vent valve	07108208	2

(6) GSH-40ERB2, GSH-60ERB2

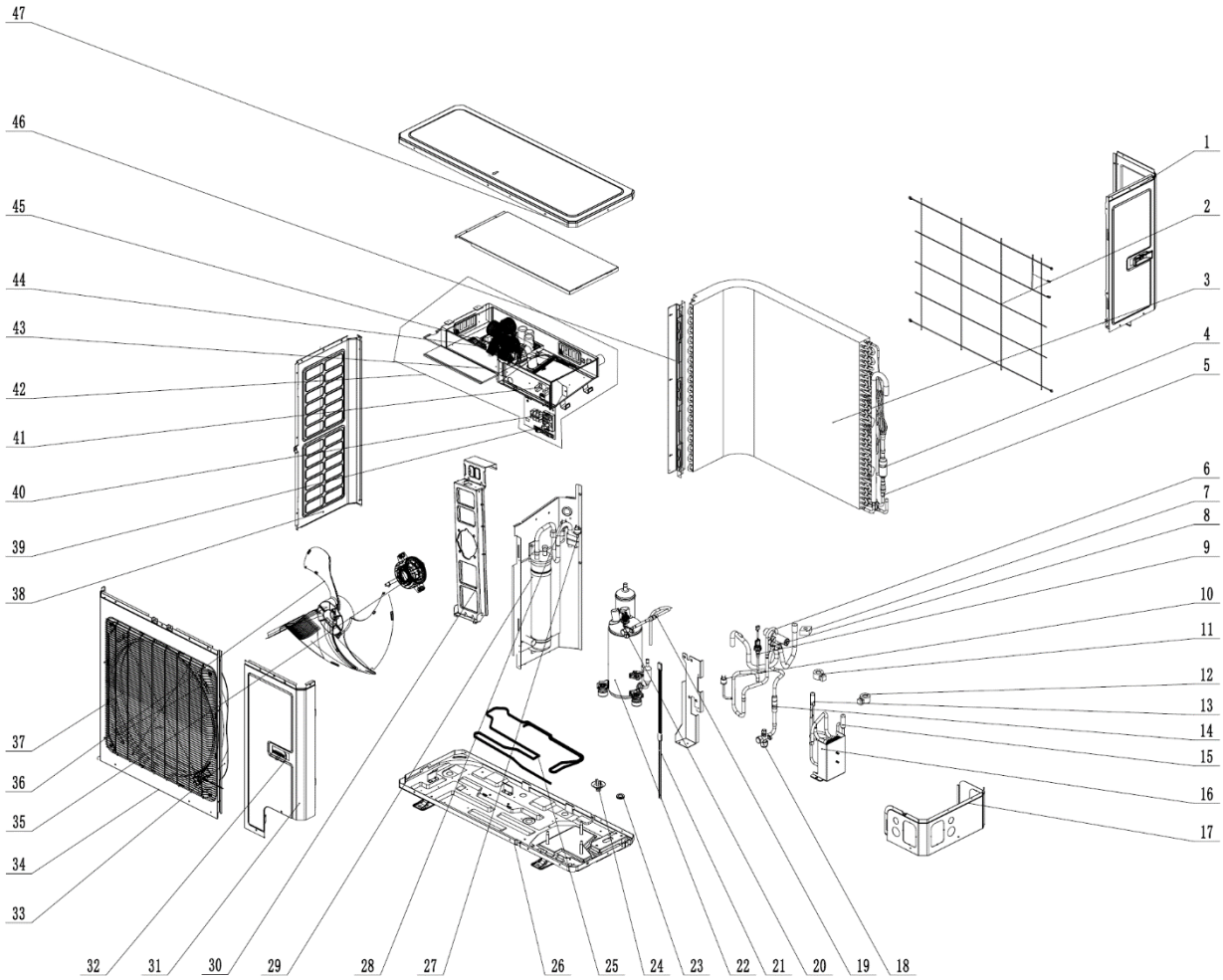


Parts list of GSH-40ERB, GSH-60ERB

No.	Part name	Part number	Quantity
1	Handle	26233053	1
2	Left side plate	01305093P	1
3	Electric box assy	100002072999	1
4	Radiator	4901521502	1
5	Jumper	4202021904	1
6	Main board	300027061922	1
7	Terminal block	42000100000204	1
8	Top cover	000051060120	1
9	Communication interface board	300014060062	1
10	Electric box cover	20125002	1
11	Condenser support	01795010	1
12	Condenser	011002060786	1
13	Rear grille	01473043	1
14	Pressure sensor	322101038	1

No.	Part name	Part number	Quantity
15	Compressor and fittings	009001000229	1
16	Electric heater	7651300403	1
17	Plate heat exchanger	010007060010	1
18	Electronic expansion valve fittings	4304413222	1
19	Electronic expansion valve	072009060039	1
20	Electronic expansion valve fittings	07200200001209	1
21	Electronic expansion valve	072009000017	1
22	4-way valve	430004032	1
23	Magnetic coil	4300040045	1
24	Pressure protection switch	460200062	1
25	Connection for adding refrigerant	06120012	1
26	Filter	0721200102	1
27	Shut-off valve 1/4 (N)	07130239	1
28	Shut-off valve 1/2 (N)	071302392	1
29	Right side plate	0130329201	1
30	Handle	2623525404	1
31	Sensor assy	390002060101	1
32	Valve support	01705066P	1
33	Valve cover	22245002	1
34	Gas-liquid separator	07225017	1
35	Pressure protection switch	460200048	1
36	Pressure protection switch	460200046	1
37	Drainage joint	06123401	1
38	Chassis	000191060066	1
39	Drainage hole cap	76713068	1
40	Drainage hole cap	06813401	1
41	Motor support	01705067	1
42	Drainage hole cap	76713033	1
43	Chassis electric heater	765100047	1
44	Fan motor	1501506402	1
45	Axial fan	10335008	1
46	Front panel	01533058	1
47	Front grille	22415010	1

(7) GSH-80ERB2, GSH-100ERB2

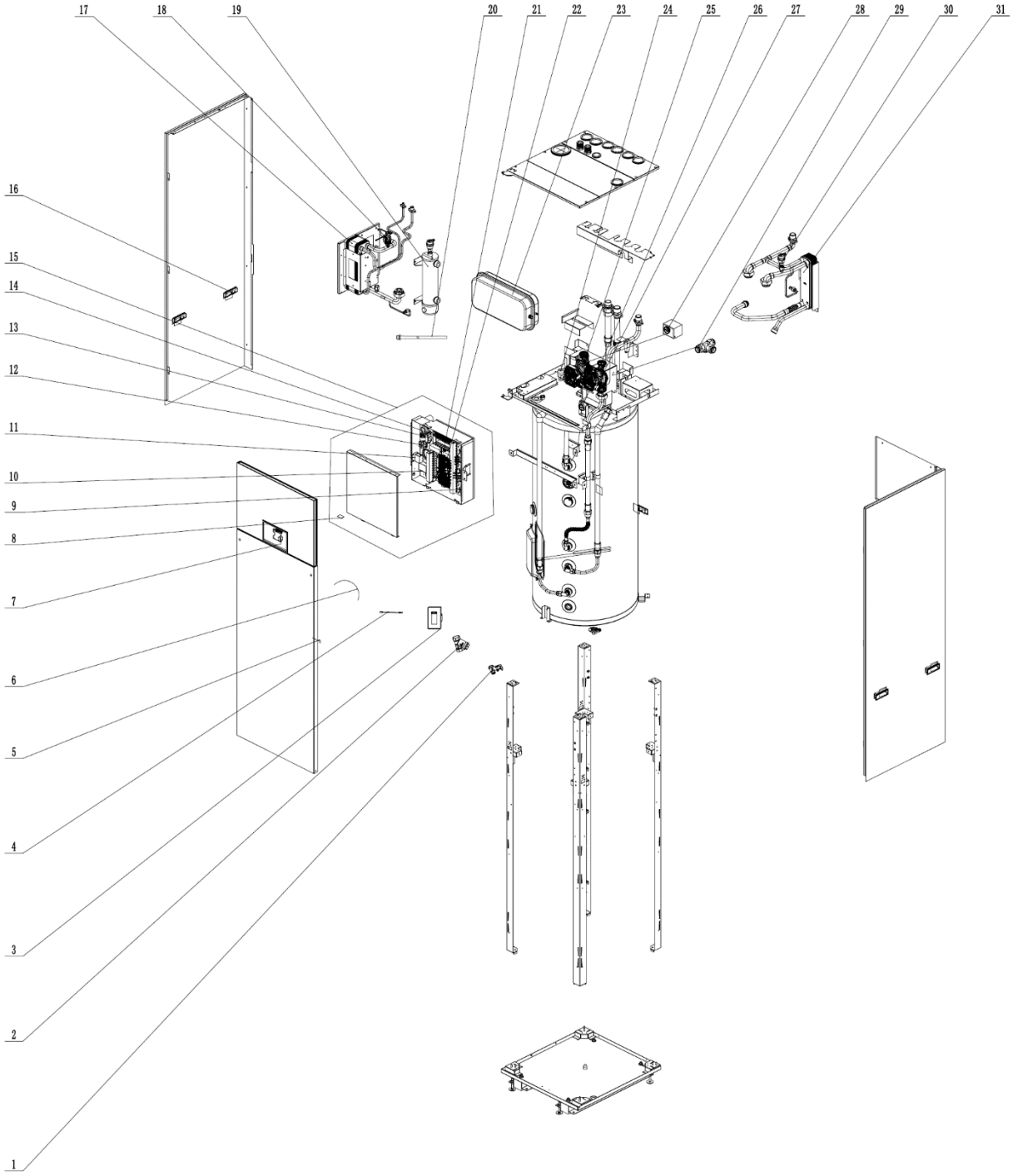


Parts list of GSH-80ERB2, GSH-100ERB2

No.	Part name	Part number	Quantity
1	Rear side plate	01314100045P	1
2	Rear grille	01600100004101	1
3	Condenser	01122800090	1
4	Silencer	07245012	1
5	Filter	0721212101	1
6	4-way valve assy	030152060359	1
7	Magnetic coil	4300040029	1
8	4-way valve	4300008201	1
9	Pressure sensor	322101032	1
10	Pressure protection switch	460200062	1
11	Electronic expansion valve fittings	4304413208	1
12	Electronic expansion valve fittings	4304413236	1
13	Electronic expansion valve	072009000001	1
14	Filter	0721200102	1
15	Electronic expansion valve	072009060039	1
16	Plate heat exchanger	010007060013	1
17	Right side plate	01314100109	1
18	Shut-off valve	07304100015	1
19	Filter	07224803	1
20	Shut-off valve 1/4 (N)	07130239	1
21	Compressor electric heater	7651873215	1
22	Compressor and fittings	009001000265	1

No.	Part name	Part number	Quantity
23	Drainage hole cap	06813401	3
24	Drainage joint	06123401	1
25	Electric heater	765100049	1
26	Chassis	0119280005801P	1
27	Pressure protection switch	460200048	1
28	Pressure protection switch	460200046	1
29	Gas-liquid separator	035027000024	1
30	Motor support	01804100309	1
31	Front side plate	01314100044P	1
32	Handle	26235253	2
33	Air distributor	10474100003	1
34	Cabinet	01514100007P	1
35	Brushless DC motor	150104060013	1
36	Axial fan	1043410000801	1
37	Front grille	01572800003	1
38	Left side plate	01314100043P	1
39	Communication board	300014060017	1
40	Terminal block	42200000001501	1
41	Filter board	300020000017	1
42	Electric box assy	100002073000	1
43	Radiator	430034060139	1
44	Main board	300027060442	1
45	Main board	300027061276	1
46	Condenser support	01894100053	1
47	Cover	01264100027P	1

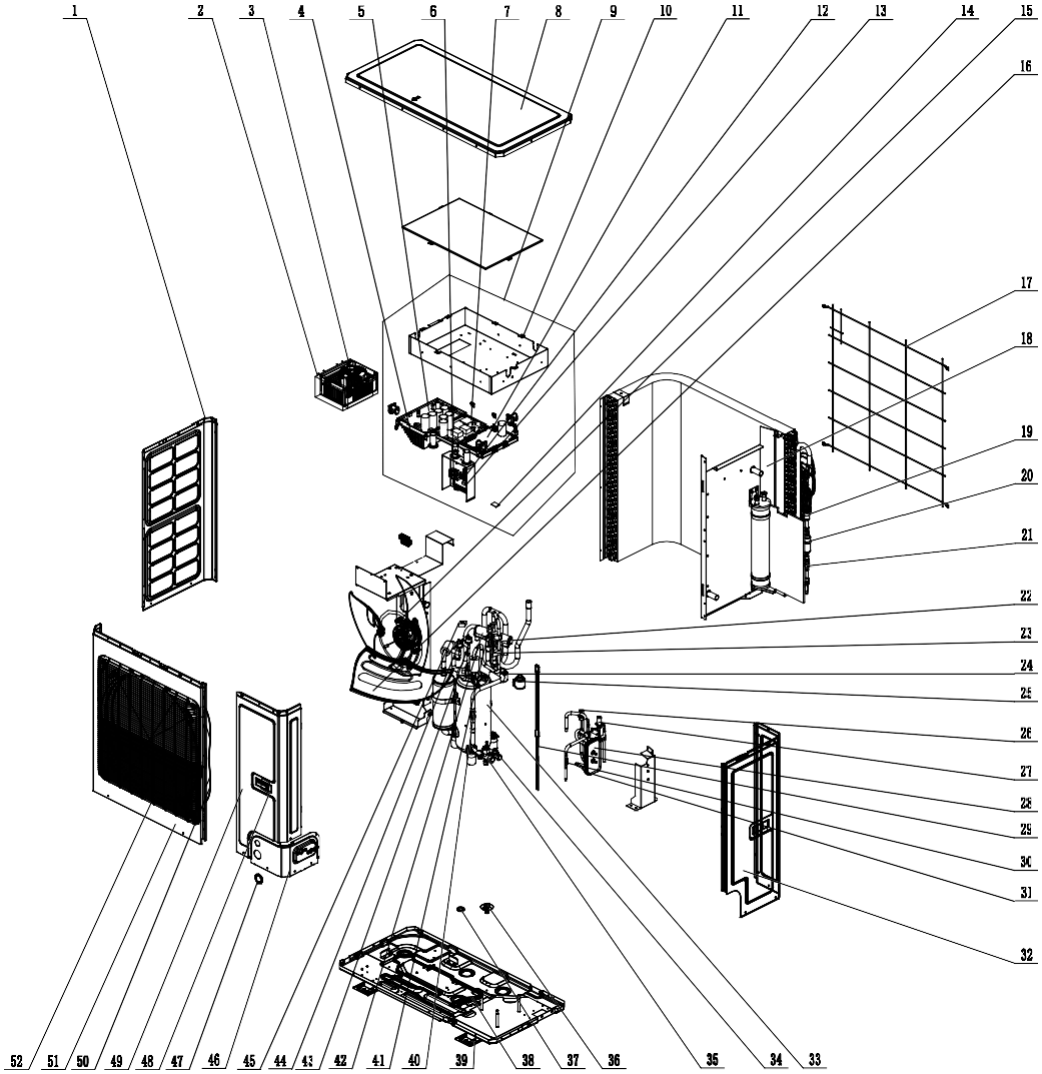
(8) GSH-120TRB2, GSH-140TRB2, GSH-160TRB2



No.	Part name	Part number	Quantity
1	Safety valve	07382801	1
2	Filter	035021000010	1
3	External room temperature sensor	30261014	1
4	Temperature sensor	3900028312G	1
5	Magnet	70844004	2
6	Signal cable	400300412	1
7	Display board	300001061020	1
8	Jumper	4202021909	1
9	2-pole AC contactor	44010221	3
10	Electronic positive electrode	04062800008	1
11	Thermostat	4504800201	1
12	Terminal block	422000000014	1

No.	Part name	Part number	Quantity
13	Thermostat	none	0
14	Terminal block	422000000027	1
15	Electric box assy	100002072658	1
16	Handle	2690410001603	6
17	Plate heat exchanger assy	030166060252	1
18	Steam current switch	43001900000603	1
19	Electric heater	32000406006302	1
20	Drain pipe	0436289504	1
21	Main board	300002062353	1
22	Mounting card (main board)	26902800034	1
23	Expansion tank	07422800004	1
24	Safety valve	07382814	1
25	Water pump	812007060064	1
26	Water pressure gauge	49028009	1
27	Water pump	81200706006201	1
28	Electric water valve actuator	4504800101	1
29	Electric 3-way ball valve	072005000003	1
30	Auto air vent valve	07108208	2
31	Plate heat exchanger assy	030166060227	1

(9) GSH-120ERB, GSH-140ERB, GSH-160ERB

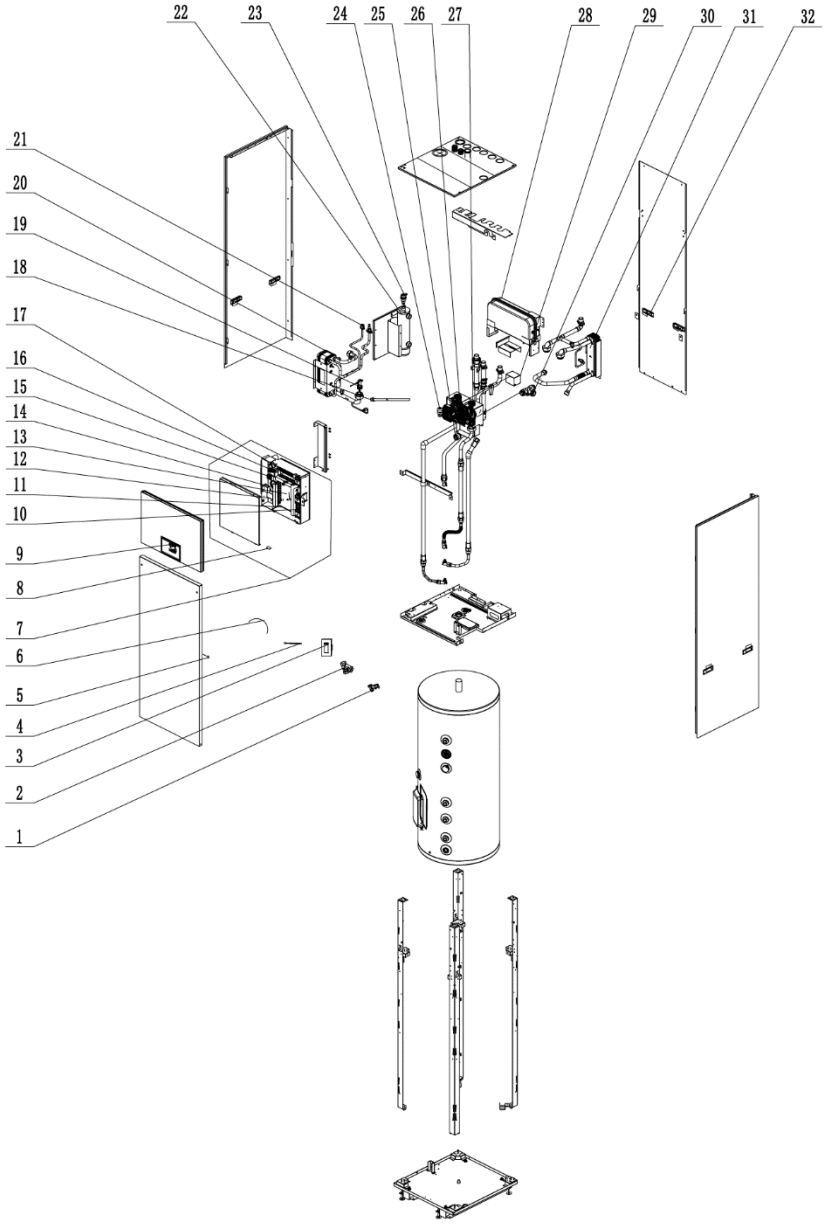


Parts list of GSH-120ERB, GSH-140ERB, GSH-160ERB

No.	Part name	Part number	Quantity
1	Left side plate	012055000007P	1
2	Choke (reactor) box	000221060024	1
3	Choke (reactor)	43128000015	1
4	Radiator	430034060143	1
5	Power board (inverter)	300078060137	1
6	Terminal block	42010004	1
7	Filter board	300020060077	1
8	Cover	01264100052P	1
9	Electric box assy	100002070839	1
10	Electric box	0142520004001	1
11	Main board	300027061276	1
12	Communication interface board	300014060017	1
13	Electric circuits cover	26905200084	1
14	Jumper	4202021908	1
15	Brushless DC motor	15010406001306	1
16	Axial fan	1043410000801	1
17	Rear grille	01600100004201	1
18	Condenser	000100060452	1
19	Current divider	07220010	1

No.	Part name	Part number	Quantity
20	Silencer	07245012	1
21	Filter	0721212101	1
22	Pressure sensor	43004406000304	1
23	Connection for adding refrigerant	06120012	1
24	Electronic expansion valve fittings	4300034419	1
25	Electronic expansion valve fittings	4300034412	1
26	Electronic expansion valve	072009060033	1
27	Electronic expansion valve	07135176	1
28	Plate heat exchanger	010007060013	1
29	Electric heater	7651521216	1
30	Filter	035021060019	1
31	Energy saver assy	000271060014	1
32	Rear side plate	012076000021P	1
33	Compressor and fittings	009001060125	1
34	Shut-off valve 1/4 (N)	07130208	1
35	Shut-off valve 5/8	07103030	1
36	Drainage joint	200038000012	1
37	Drainage hole cap	76715005	3
38	Electric heater	765100049	1
39	Foot	01894100067	2
40	Filter	07224803	1
41	Pressure protection switch	4602000603	1
42	4-way valve	43040000002	1
43	Pressure protection switch	460200046	1
44	Pressure protection switch	460200048	1
45	Magnetic coil	4300040029	1
46	Valve support	017104000021P	1
47	Gland bush	26904100134	1
48	Handle	2690410001603	2
49	Front side plate	012050000007P	1
50	Air distributor	10474100003	1
51	Cabinet	012022000003P	1
52	Front grille	01572800003	1

(10) GSH-80TRB2-3, GSH-100TRB2-3

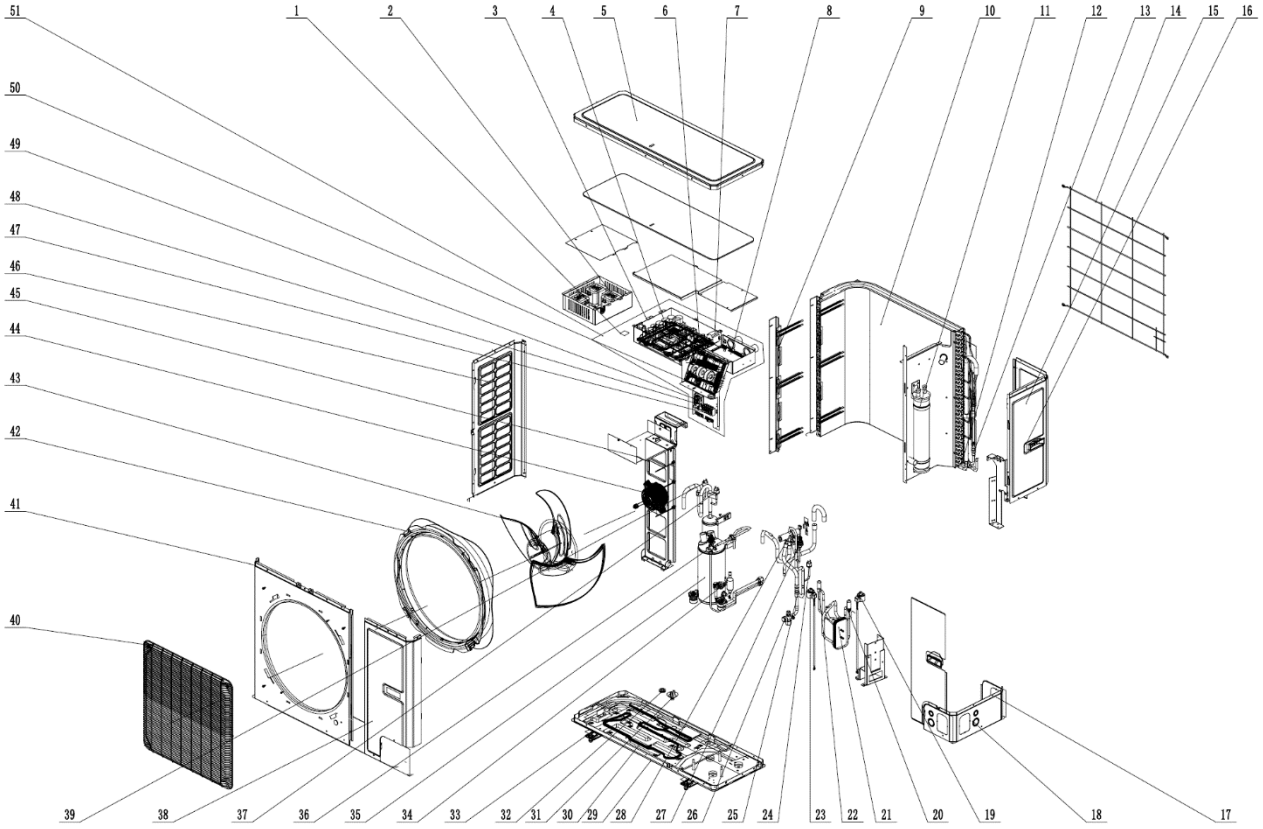


Parts list of GSH-80TRB2-3, GSH-100TRB2-3

No.	Part name	Part number	Quantity
1	Safety valve	07382801	1
2	Filter	035021000010	1
3	External room temperature sensor	30261014_X62702	1
4	Temperature sensor	3900028312G	1
5	Magnet	70844004	2
6	Signal cable	40018000125	1
7	Electric box assy	100002073980	1
8	Jumper	4202021909	1
9	Display board	300001061020	1
10	AC contactor	44010287	3
11	Mounting card (main board)	26902800034	1
12	Anode	04062800008	1
13	Main board	300002062353	1
14	Thermostat	4504800201	1
15	Terminal block	42200000002404	1

No.	Part name	Part number	Quantity
16	Terminal block	42011103	1
17	Terminal block	422000000027	1
18	Drain pipe	0436289504	1
19	Flow switch	43001900000603	1
20	Plate heat exchanger assy	030166060226	1
21	Sealing cap (pressure warning)	26112192	1
22	Electric heater	320004060064	1
23	Auto air vent valve	07108208	2
24	Safety valve	07382814	1
25	Water pressure gauge	49028009	1
26	Water pump	81200706006201	1
27	Water pump	812007060062	1
28	Expansion tank	07422800004	1
29	Electric water valve actuator	4504800101	1
30	Electric 3-way ball valve	072005000003	1
31	Plate heat exchanger assy	030166060227	1
32	Handle	2690410001603	6

(11) GSH-80ERB-3, GSH-100ERB-3

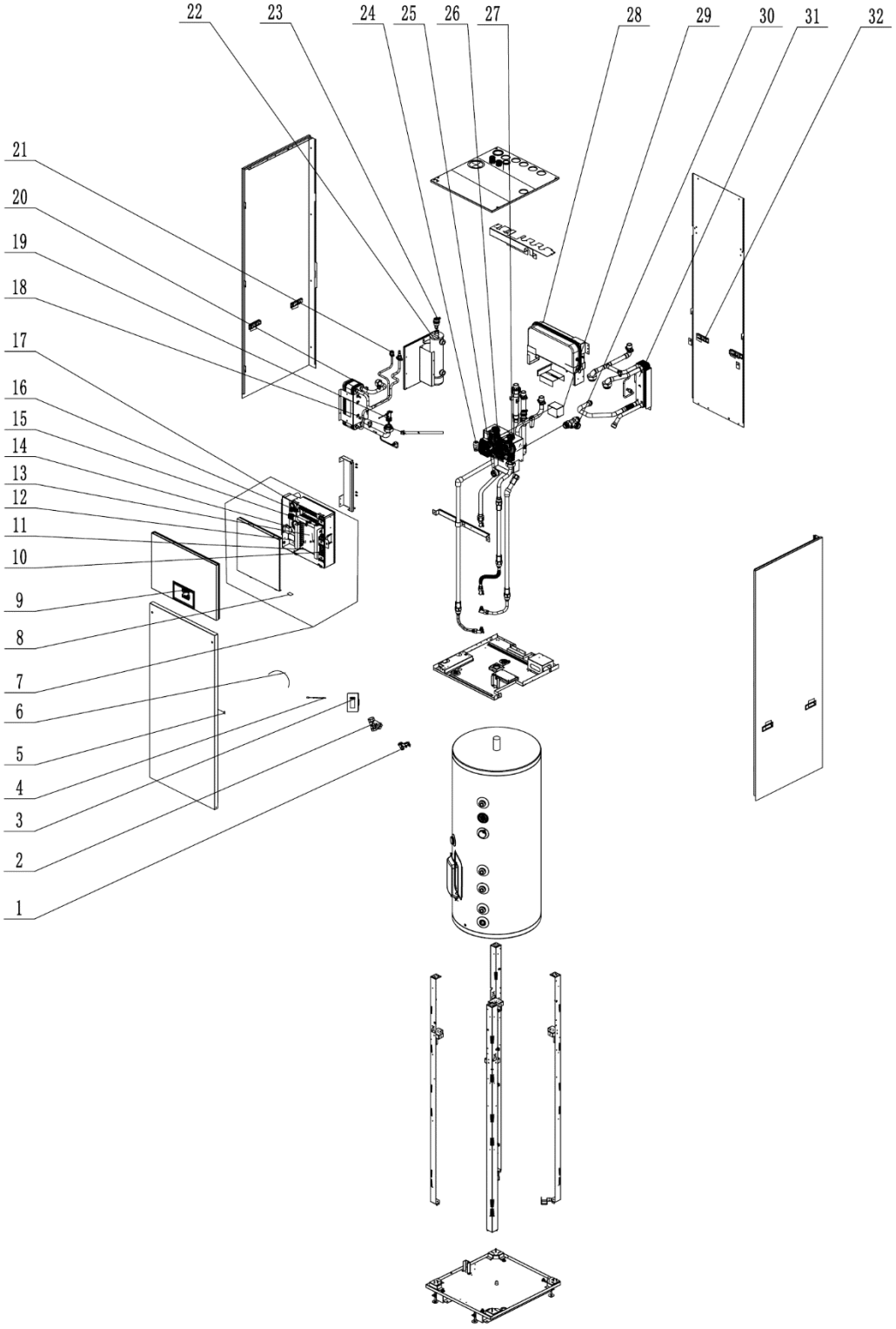


Parts list of GSH-80ERB-3, GSH-100ERB-3

No.	Part name	Part number	Quantity
1	Jumper	4202021906	1
2	Choke (reactor)	43130192	3
3	Electric box	0142520004001	1
4	Power board (inverter)	300078060146	1
5	Cover	01264100027P	1
6	Mounting plate	26904100126	1
7	Choke (reactor)	4202021906	1

No.	Part name	Part number	Quantity
8	Main board	43130192	1
9	Condenser support	0142520004001	1
10	Condenser	300078060146	1
11	Gas-liquid separator	01264100027P	1
12	Current divider	26904100126	2
13	Filter	43128000014	1
14	Rear grille	300027061276	1
15	Rear side plate	01894100053	1
16	Handle	000100060442	2
17	Right side plate	035027000024	1
18	Gland bush	03413032	2
19	Electronic expansion valve fittings	0721212101	1
20	Electronic expansion valve	01600100004101	1
21	Plate heat exchanger	01314100045P	1
22	Electronic expansion valve	26235253	1
23	Electronic expansion valve fittings	01314100109	1
24	Pressure protection switch	26904100134	1
25	Filter	4304413208	1
26	Shut-off valve	072009000001	1
27	Pressure sensor	010007060013	1
28	4-way valve assy	072009000001	1
29	Chassis	4304413222	1
30	Electric heater	460200062	1
31	Drainage joint	07224803	1
32	Drainage hole cap	07304100015	3
33	Foot	43004406000303	2
34	Filter	030072060209	1
35	Compressor and fittings	01284100101	1
36	Shut-off valve 1/4 (N)	765100049	1
37	Pressure protection switch	06123401	1
38	Front side plate	06813401	1
39	Pressure protection switch	01215004	1
40	Front grille	0721200102	1
41	Cabinet	009001000265	1
42	Air distributor	07130239	1
43	Axial fan	460200048	1
44	Brushless DC motor	01314100044P	1
45	Motor support	460200046	1
46	Left side plate	01572800003	1
47	Terminal block	000006000006	1
48	Communication interface board	10474100003	1
49	Electric circuits cover	1043410000801	1
50	Filter board	15010406001303	1
51	Electric box assy	017012060372	1

(12) GSH-120TRB2-3, GSH-140TRB2-3, GSH-160TRB2-3

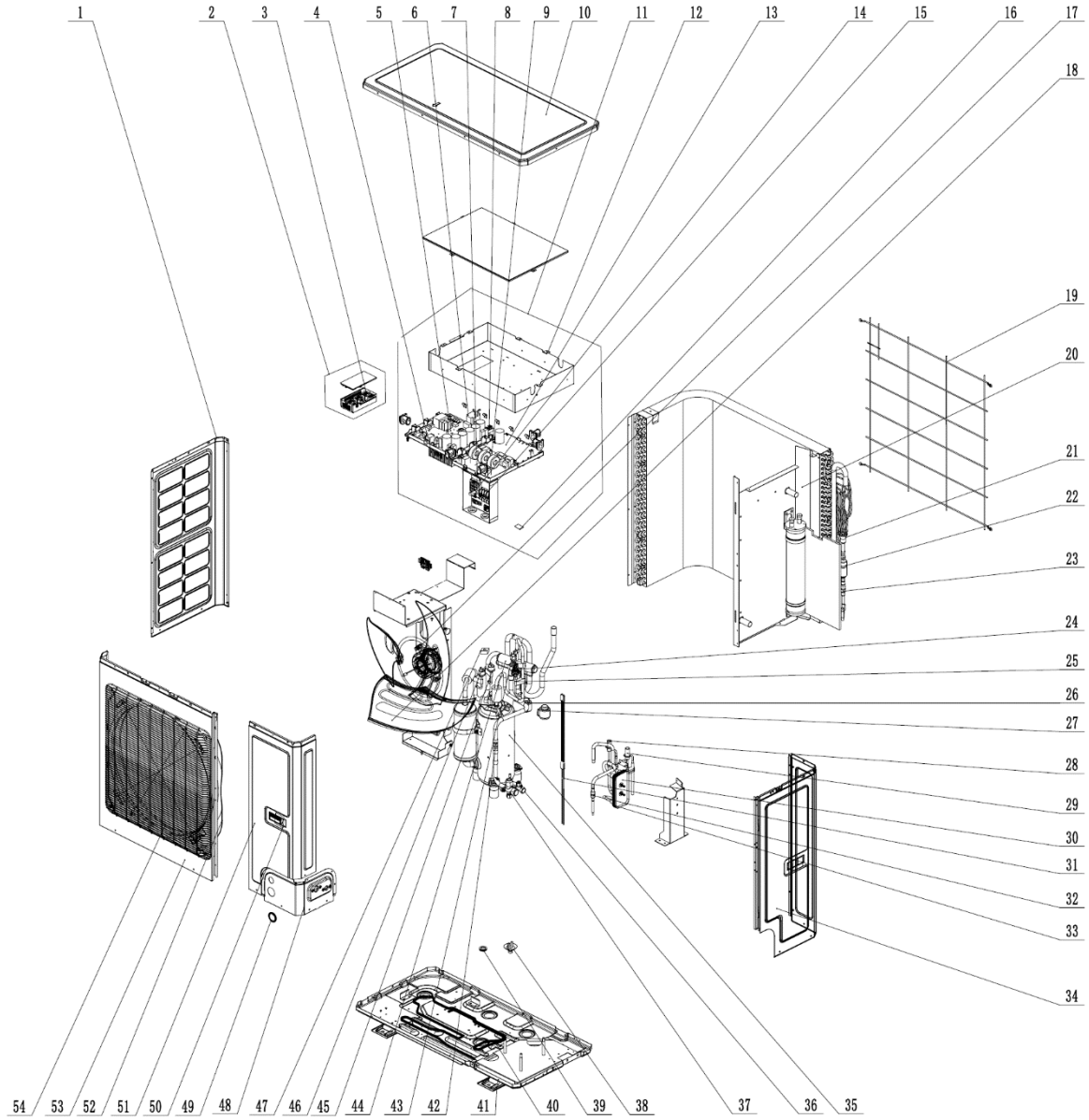


Parts list of GSH-120TRB2-3, GSH-140TRB2-3, GSH-160TRB2-3

No.	Part name	Part number	Quantity
1	Safety valve	07382801	1
2	Filter	035021000010	1
3	External room temperature sensor	30261014	1
4	Temperature sensor	3900028312G	1
5	Magnet	70844004	2
6	Signal cable	40018000125	1

No.	Part name	Part number	Quantity
7	Electric box assy	100002073980	1
8	Jumper	4202021909	1
9	Display board	300001061020	1
10	AC contactor	44010287	3
11	Mounting card (main board)	26902800034	1
12	Anode	04062800008	1
13	Main board	300002062353	1
14	Thermostat	4504800201	1
15	Terminal block	42200000002404	1
16	Terminal block	42011103	1
17	Terminal block	422000000027	1
18	Drain pipe	0436289504	1
19	Flow switch	43001900000603	1
20	Plate heat exchanger assy	030166060252	1
21	Sealing cap (pressure warning)	26112192	1
22	Electric heater	320004060064	1
23	Auto air vent valve	07108208	2
24	Safety valve	07382814	1
25	Water pressure gauge	49028009	1
26	Water pump	812007060064	1
27	Water pump	81200706006201	1
28	Expansion tank	07422800004	1
29	Electric water valve actuator	4504800101	1
30	Electric 3-way ball valve	072005000003	1
31	Plate heat exchanger assy	030166060227	1
32	Handle	2690410001603	6

(13) GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3



Parts list of GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

No.	Part name	Part number	Quantity
1	Left side plate	100002070838	1
2	Choke (reactor) box	0142520004001	1
3	Choke (reactor)	300027061276	3
4	Radiator	26905200084	1
5	Main board	42000100000401	1
6	Choke (reactor)	4202021911	1
7	Communication interface board	15010406001306	1
8	Terminal block	1043410000801	1
9	Filter board	01600100004201	1
10	Cover	011002061516	1
11	Electric box assy	07220010	1
12	Electric box	07245012	1
13	Main board	0721212101	1
14	Electric circuits cover	43004406000303	1
15	Terminal block	06120012	1
16	Jumper	4300034419	1

No.	Part name	Part number	Quantity
17	Brushless DC motor	4300034412	1
18	Axial fan	072009060033	1
19	Rear grille	07135176	1
20	Condenser	010007060013	1
21	Current divider	7651521242	1
22	Silencer	035021060019	1
23	Filter	000271060014	1
24	Pressure sensor	012076000021P	1
25	Connection for adding refrigerant	009001060125	1
26	Electronic expansion valve fittings	07130208	1
27	Electronic expansion valve fittings	07103030	1
28	Electronic expansion valve	200038000012	1
29	Electronic expansion valve	76715005	1
30	Plate heat exchanger	765100049	1
31	Electric heater	01894100067	1
32	Filter	07224803	1
33	Energy saver assy	4602000603	1
34	Rear side plate	43040000002	1
35	Compressor and fittings	460200046	1
36	Shut-off valve 1/4 (N)	460200048	1
37	Shut-off valve 5/8	4300040045	1
38	Drainage joint	017104000021P	1
39	Drainage hole cap	26904100134	3
40	Electric heater	2690410001603	1
41	Foot	012050000007P	2
42	Filter	10474100003	1
43	Pressure protection switch	012022000003P	1
44	4-way valve	01572800003	1
45	Pressure protection switch	100002070838	1
46	Pressure protection switch	0142520004001	1
47	Magnetic coil	300027061276	1
48	Valve support	26905200084	1
49	Gland bush	42000100000401	1
50	Handle	4202021911	2
51	Front side plate	15010406001306	1
52	Air distributor	1043410000801	1
53	Cabinet	01600100004201	1
54	Front grille	011002061516	1

3 Scope of Delivery

Name	Standard
User manual for the main unit	yes
User manual for the controller	yes
2-way valve	no
3-way valve	yes
External temperature sensor	yes
Wall-mounted wired controller	yes
Communication cable	yes
Water tank temperature sensor	yes
Additional heat source	no
Optional electric heater	yes

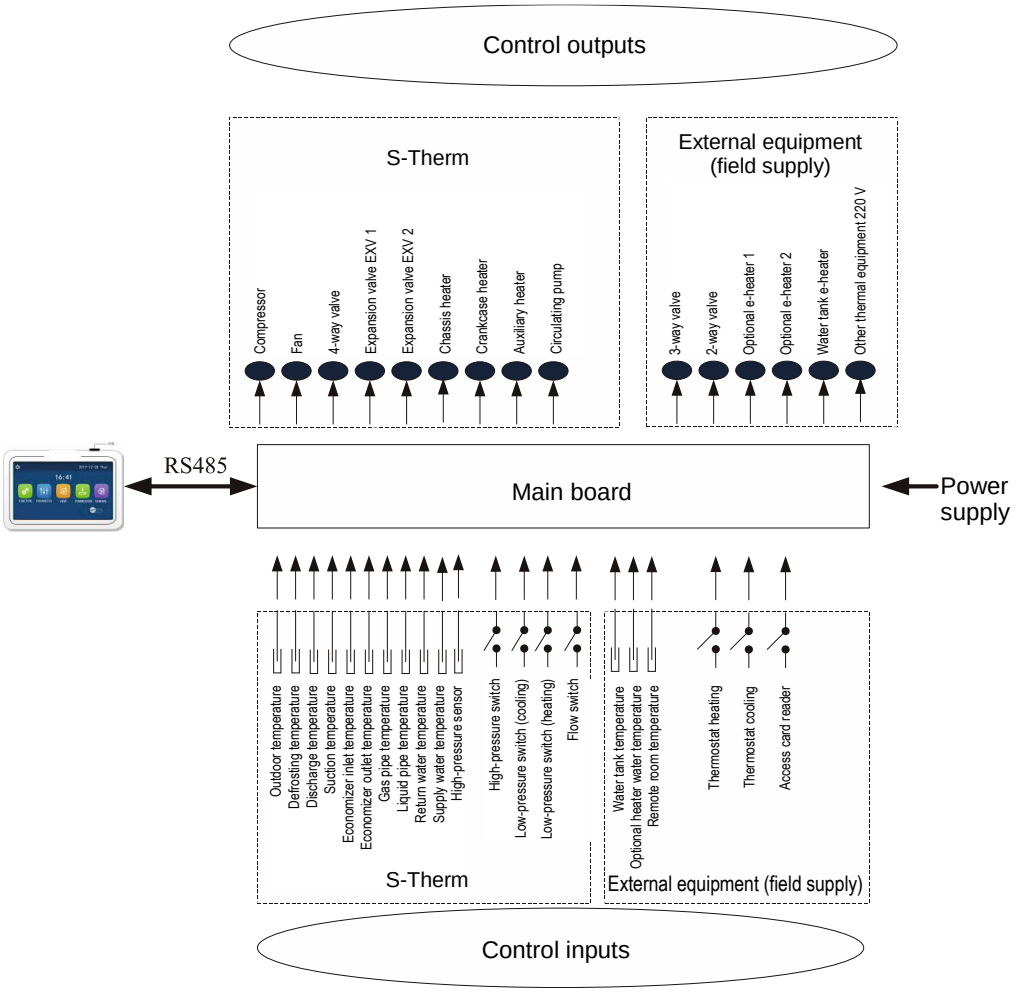
Name	Standard part code
User manual for the main unit	600005063018
User manual for the controller	600005060789
3-way valve	4504800101 072005000003
External temperature sensor	30261014
Wall-mounted wired controller	300001060562
Communication cable	4003014308 **(ODU–IDU 10 m)** 400300412 **(IDU–controller 8 m)** 40038006 **(RT. sensor cable 9,5 m)**
Expansion bolt	70110066
Optional electric heater	32000406007501: Standard models GSH-40TRB, GSH-60TRB. 32000406006301: Standard models GSH-80TRB, GSH-100TRB

Control

1 Concept of Integral Control

1.1 Control Principle Diagram

- Control principle diagram



(1) The outdoor temperature is detected by a sensor that is installed on the fins of the finned heat exchanger and is mainly used to control the initialization steps of the fan and the electric expansion valve and also to limit the maximum operating frequency of the compressor. If this sensor fails, the main board detects this fault and sends an error message to the controller. Then it will not be possible to start or stop the unit.

(2) The defrost activation temperature is detected by a sensor that is installed on the defrost tubes of the finned heat exchanger and is mainly used to control the defrosting operation. If this sensor fails in Heating or Water heating mode, the compressor will stop and this error will be displayed on the controller. If it fails in Cooling mode, the compressor continues to run, but this error is displayed on the controller.

(3) The compressor discharge temperature is detected by a sensor that is installed on the compressor discharge pipe and is mainly used to protect against high discharge temperatures. If this sensor fails, this error is displayed on the controller and all parts except the water pump of the solar water heater and the water tank e-heater are switched off. After eliminating this fault, the main unit will resume normal operation.

(4) The suction temperature of the compressor is detected by a sensor that is installed on the compressor suction pipe and is mainly used to control the degree of overheating. If this sensor fails, this error is displayed on the controller and all parts except the water pump of the solar water heater and the water tank e-heater are switched off. After eliminating this fault, the main unit will resume normal operation.

(5) The economizer inlet temperature sensor is used to detect the temperature at the economizer inlet after throttling the refrigerant by the electric expansion valve 2. In Heating or Water heating mode, this sensor, together with the sensor at the economizer outlet, is used to control the opening angle of the electric expansion valve 2. In Cooling mode, the electric expansion valve 2 is completely closed.

(6) The economizer outlet temperature sensor is used to detect the temperature at the economizer outlet. In Heating or Water heating mode, this sensor, together with the sensor at the economizer inlet, is used to control the opening angle of the electric expansion valve 2. In Cooling mode, the electric expansion valve 2 is completely closed.

(7) The high pressure is detected by a sensor installed on the compressor discharge pipe, the low pressure is detected by a sensor installed on the compressor suction pipe, and the enhanced vapour injection (EVI) pressure is detected by a sensor installed in the refrigerant enthalpy boost section. The first sensor is mainly used for high-pressure protection, the second sensor is mainly used for defrost control, frost protection and superheat control and all three sensors are used together to control the intermediate pressure ratio of the compressor. If any of these sensors fail, it will be displayed on the controller and all parts except the water pump of the solar water heater water and the water tank e-heater are switched off. The water pump is switched off 120 seconds later than the compressor. After eliminating this fault, the main unit will resume normal operation.

Part	Range
High-pressure sensor	4.5 / 3.8 MPa (standard)
Low-pressure switch (cooling)	0.45 / 0.55 MPa (standard)
Low-pressure switch (heating)	0.1 / 0.2 MPa (standard)

(8) The return water temperature at the plate heat exchanger is detected by a sensor that is installed on the inlet pipe of the plate heat exchanger and is mainly used for the freeze protection. If this sensor fails, this error will be displayed on the controller, but the unit will continue to operate normally.

(9) The supply water temperature at the plate heat exchanger is detected by a sensor that is installed on the outlet pipe of the plate heat exchanger and is mainly used for the freeze protection on the supply water side. If this sensor fails, this error will be displayed on the controller and the unit will continue to operate.

(10) The temperature of the water heated by the auxiliary heater is detected by a sensor that is installed on the outlet pipe of the auxiliary electric heater and is mainly used to regulate the temperature of the supplied water. If this sensor fails, this error will be displayed on the controller and all parts except the electric water tank heater will be switched off (the 2-way and 3-way electric valves will be closed).

(11) The temperature sensor for the refrigerant gas pipe is used to detect the temperature of the refrigerant gas pipe. In Cooling mode, it is used together with the temperature sensor of the refrigerant liquid pipe to control the opening angle of the electric expansion valve 1.

(12) The temperature sensor for the refrigerant liquid pipe is used to detect the temperature of the refrigerant liquid pipe. In Cooling mode, it is used together with the temperature sensor of the refrigerant gas pipe to control the opening angle of the electric expansion valve 1.

(13) The high-pressure switch is used to evaluate the pressure in the system. If the pressure is too high, this switch will open and the unit will be turned off.

(14) The flow switch of the main unit is mainly used to detect the water flow. If the flow is too low, this switch opens and all parts except the water tank heater and the water pump of the solar water heater are switched off. This error will be displayed on the controller and the unit will not resume operation. The unit can only restart if the power supply to the unit is disconnected and reconnected and this error does not reappear.

Items 1 to 14 above are control parameters (signals) that come from the main unit.

(15) The water temperature in the water tank is detected by sensors immersed in the water in the tank. These sensors can be divided into two groups. Group 1 is used to control the water temperature in the tank and group 2 is used to display the water temperature in the tank. If group 1 fails in Water heating mode, this error will be displayed on the controller and all parts except the water pump of the main unit will be switched off. If group 2 fails, this error is also displayed on the controller, but the unit continues to operate normally.

(16) The solar collector outlet and inlet water temperature as well as the solar collector temperature are detected by sensors installed on the inlet pipe, outlet pipe and solar collector of the solar water heater. These sensors are mainly used to control the hot water pump of the solar water heater. If the inlet water temperature sensor fails, this error will be displayed on the controller and the unit will resume normal operation. If the other two sensors fail, this error is also displayed on the controller and the water pump of the solar water heater is switched off.

(17) The room temperature is detected by an external sensor, which is installed in the monitored room and is mainly used to control the compressor performance according to the desired room temperature setting. If the main unit is controlled according to the room temperature and this sensor fails, all parts except the solar water pump and the water tank e-heater will be turned off. However, if the main unit is controlled by the leaving water temperature and this sensor fails, this error will be displayed on the controller, but the main unit will continue to operate normally.

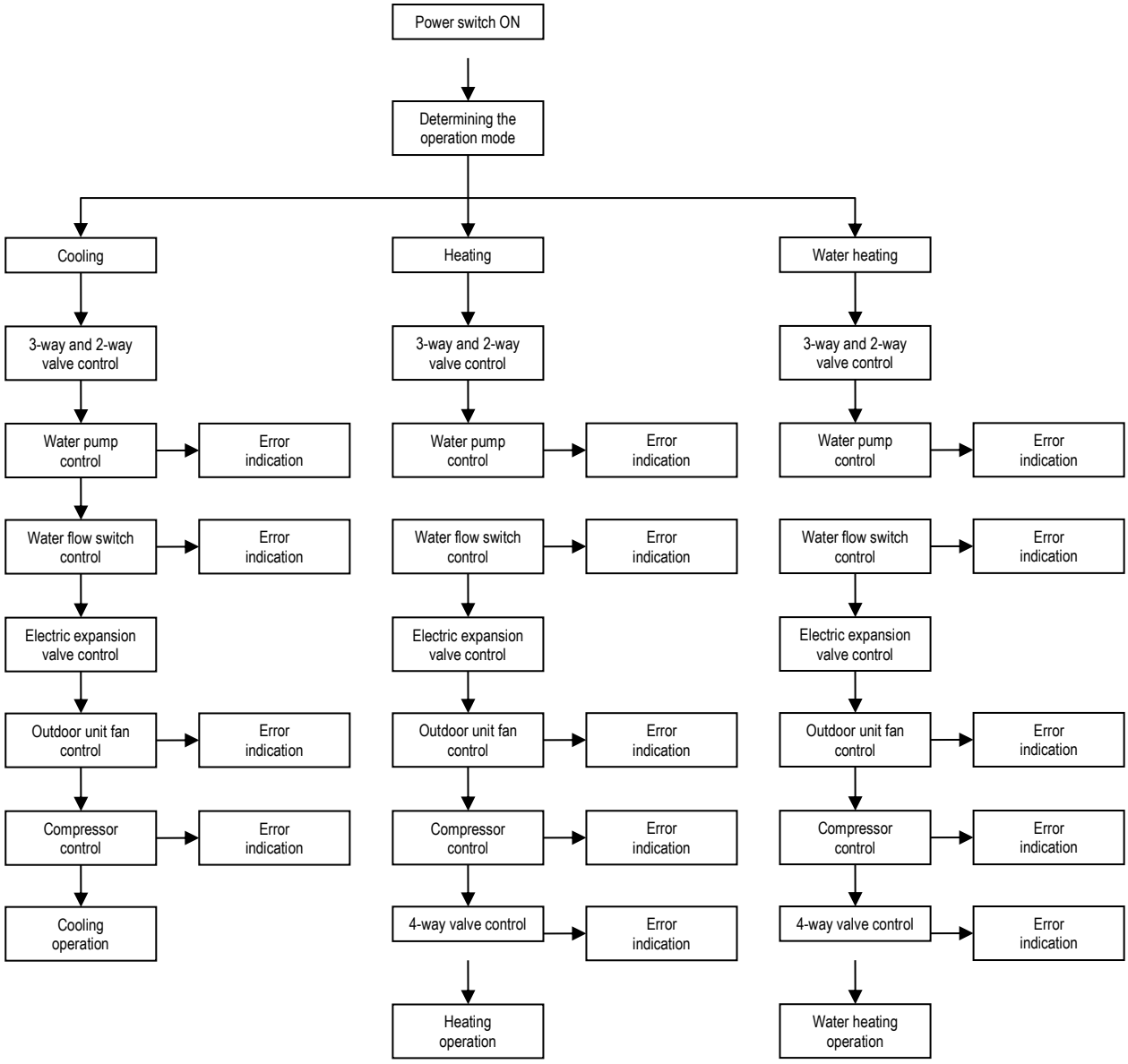
(18) The unit will operate normally according to the operating mode set by the wall-mounted wired controller. Only when the thermostat control function has been activated on the controller, the switching of operating modes between cooling, heating and shutdown can be controlled by the thermostat.

(19) On the function setting page on the controller, it is possible to enable or disable the function for controlling the unit using the room access card. When this function is activated and it is detected that the access card has been removed from the card reader, the unit will be turned off and pressing any key on the controller will be ignored. When it is detected that the access card has been inserted into the card reader, the unit will resume normal operation.

(20) The flow switch of the solar water heater is mainly used to detect the water flow. If the flow is too low, the flow switch opens and the water pump of the solar water heater is switched off immediately. This error will be displayed on the controller and the unit will not resume operation. The unit can only be restarted after this fault has been repaired and the power to the unit has been disconnected and reconnected.

The above items 15 to 20 are control parameters (signals) that come from externally installed equipment.

1.2 Control Flowchart



2 Main Control Logic

2.1 Cooling

2.1.1 Control of the Compressor

When the unit is controlled according to the leaving water temperature, the compressor operating frequency will be regulated in direct proportion to the temperature difference. (Temperature difference = current leaving water temperature − required leaving water temperature).

2.1.2 Freeze Protection

If the leaving water temperature of the plate heat exchanger is lower than the temperature for activating the freeze protection, the operating frequency of the compressor is decreased until it reaches the minimum operating frequency. After it, if the leaving water temperature is still lower than the temperature for activating the freeze protection, the main unit will stop according to the shutdown frequency, but the water pump will remain in normal operation.

If the leaving water temperature of the plate heat exchanger is higher than or equal to the temperature for deactivating the freeze protection, the freeze protection function will be terminated. Then, as soon as 3 minutes have elapsed since the compressor has been stopped and the conditions for starting it are met, the compressor will be started again and the unit will continue to run in the Cooling mode.

2.2 Heating

2.2.1 Control of the Compressor

When the unit is controlled according to the leaving water temperature, the compressor operating frequency is regulated in direct proportion to the temperature difference (it increases with increasing temperature difference and decreases with decreasing temperature difference). When the compressor reaches the minimum frequency, but the temperature difference is still too large, the unit will shut down (Temperature difference = current leaving water temperature − desired leaving water temperature).

2.2.2 Overheat Protection

When the compressor is running and the leaving water temperature of the auxiliary electric heater is higher than the temperature for activating the overheating protection, the compressor frequency is reduced to a minimum. If the leaving water temperature of the auxiliary electric heater is then still higher than the temperature for activating the overheating protection, all parts except the water pump of the main unit and the 4-way valve will be switched off. The overheat protection will be terminated when the leaving water temperature of the auxiliary electric heater drops below the temperature for activating the overheating protection. Then the unit will resume normal operation.

2.2.3 Control of the Optional Electric Heater

When the optional electric heater has been disabled using the wall-mounted controller, it will never be switched on. When it has been enabled, it will be switched on according to the outdoor temperature.

2.3 Water Heating

The water can be heated either by the solar water heater or by the main unit (heat pump).

2.3.1 Water Heating by the Main Unit

(1) When the outdoor temperature is outside the operating range, the compressor will not start and the water will be heated by the water tank heater.

(2) When the outdoor temperature is within the operating range, water will be heated by the main unit. The output frequency of the compressor will be controlled according to the difference between the set and actual value of the water temperature in the tank.

(3) Control of the water tank e-heater

- When the set temperature of the water in the tank is lower than the maximum value of the range for water heating by the main unit, the auxiliary electric heater in the main unit will be switched on according to the temperature difference and the electric heater of the water tank will be switched off at all times.
- When the set temperature of the water in the tank is higher than the maximum value of the range for water heating by the main unit, but the actual temperature of the water in the tank is lower than the maximum value for water heating by the main unit, the auxiliary electric heater in the main unit will be switched on depending on the temperature difference. If the actual temperature of the water in the tank is higher than the maximum value of the range for water heating by the main unit, the electric heater of the water tank will be switched on. The auxiliary electric heater of the main unit and the electric heater of the water tank can never be switched on at the same time.

(4) Overheating protection for water heating

When the compressor is running and the leaving water temperature of the auxiliary electric heater of the main unit is higher than the temperature for activating the overheating protection, the compressor operating frequency will be decreased until it reaches the minimum operating frequency. If the leaving water temperature of the auxiliary electric heater is then still higher than the temperature for activating the overheating protection, all parts except the water pump of the main unit and the 4-way valve will be switched off. The overheating protection will be terminated when the leaving water temperature drops below the temperature for activating the overheating protection. Then the main unit will resume normal operation.

2.3.2 Water heating by the Solar Water Heater

When a solar water heater is installed but the temperature difference (i.e. the difference between the solar collector temperature and the actual tank water temperature) does not reach the required value for start-up, the water pump of the solar water heater will not start. When the required temperature difference occurs, the water pump starts. However, if the water temperature in the tank reaches the set value or the temperature difference between the solar collector inlet/outlet water is too llow, this water pump will stop.

2.4 Shutdown

There are three types of shutdown conditions: normal shutdown, shutdown due to a specific fault, or shutdown due to some protection activation

Shutdown sequence: At normal shutdown, the compressor frequency is first reduced to the minimum value, while at shutdown due to a fault or protection, the compressor will stop directly. Then the electronic expansion valve is set to the maximum opening angle; the fan stops after the compressor has been stopped; the water pump of the main unit stops after the compressor has been stopped; the electronic expansion valve is set from the maximum opening angle to a fixed opening angle.

When the operation is shutting down in the Heating or Water heating mode, the 4-way valve is switched off after the compressor has stopped.

If the operation is shutting down due to some fault (except a communication error) or protection, the 4-way valve will be kept switched on.

If the operation is shutting down due to a communication error between the unit and the wall-mounted wired controller, the 4-way valve will be switched off a little later.

If the operation is shutting down due to some fault or protection, the electronic expansion valve will be kept at the maximum opening angle.

2.5 Control of the Compressor

When the unit is controlled according to the leaving water temperature, the compressor operating frequency is regulated based on the difference between the current water temperature and the set leaving water temperature. When the unit is controlled according to the room temperature, the compressor operating frequency is regulated based on the difference between the current room temperature and the set room temperature.

2.6 Control of the Fan

In the Cooling mode, the fan operating frequency is regulated according to the pressure on the high-pressure side. In the Heating or Water heating mode, the fan operating frequency is regulated according to the pressure on the low-pressure side. During defrosting, the fan stops, and it starts again after defrosting is finished.

2.7 Control of the 4-Way Valve

In the Cooling mode, the 4-way valve remains switched on, and it is switched off when the compressor is started in the Heating or Water heating mode. When the unit is defrosting, the 4-way valve is turned on, and it is turned off again when the defrosting is finished. At the end of the operation in the Heating mode, the 4-way valve is closed when the compressor stops.

2.8 Control of the Water Pump

The water pump first runs at the initial speed and then its speed is regulated according to the temperature difference between the entering and leaving water. When the temperature difference is high, the pump runs at high speed. When the temperature difference is low, the pump runs at low speed.

2.9 Control of the Electronic Expansion Valve

The 2 electronic expansion valves are available for two-stage throttling control. The opening angle of the electronic expansion valve in the first stage is regulated based on the ratio of the valuesof the high-pressure sensor, the low-pressure sensor, and the pressure sensor in the enthalpy-adding section. The opening angle in the second stage is regulated based on the refrigerant superheating degree at the suction.

2.10 Control of the Protection

(1) Compressor low-pressure protection

If the pressure in the low-pressure section is permanently too low, the low-pressure protection is activated, and this error is displayed on the controller; all parts will operate as at the shutdown. The operation cannot be resumed until the power to the unit is disconnected and then reconnected.

(2) Compressor discharge high-temperature protection

If the compressor discharge temperature is permanently above the maximum allowable temperature, the electric expansion valve will be opened very quickly to the maximum angle until the discharge temperature is lower than the maximum allowable temperature. However, if this condition persists, the compressor frequency is reduced or lowered three times. Whenever the compressor discharge temperature is higher than the preset value for activating the protection for three seconds, the compressor will be stopped, and the unit enters the high discharge temperature protection state.

(3) Compressor high-pressure protection

Whenever the high-pressure switch is activated, the unit enters the high-pressure protection state after 3 seconds. The operation cannot be resumed.

(4) Flow switch protection

Whenever the flow switch of the main unit has been opened, all parts except the water pump of the solar water heater and the auxiliary electric heater of the water tank are turned off. The operation cannot be resumed. The unit can only be restarted after this fault has been eliminated and the power to the unit has been disconnected and then reconnected.

(5) Communication error

If the main board or drive board of the indoor unit does not receive any data correctly, all parts will be turned off.

3 Control Panel

3.1 General

This control panel uses a capacitive touch screen. When the display backlight is off, the functional touch area is in a black rectangle.

This control panel is very sensitive and can react to accidental touches of some foreign substances. Therefore, please keep it clean during operation.

This controller is universal, and its control functions may not be exactly the same as on the controller you purchased. Since the controller is updated, the current version may be different.

3.1.1 Home Page

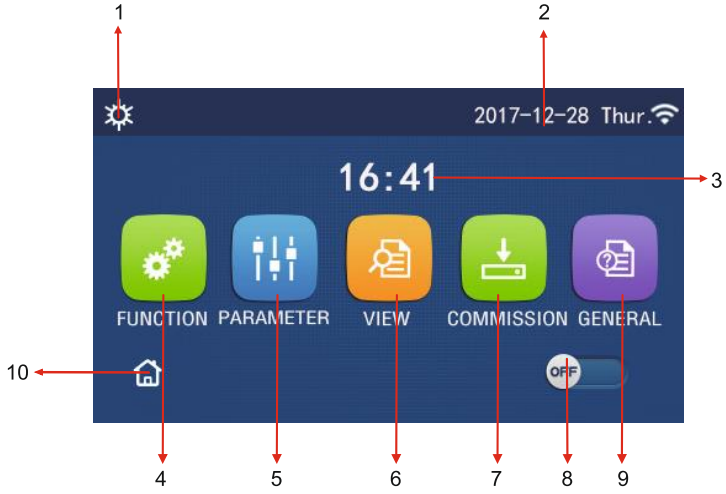
Icon	Description	Icon	Description
	Space heating		Outdoor temperature
	Space cooling		Leaving water temperature of the main unit, leaving water temperature of the auxiliary electric heater, remote room temperature

Icon	Description	Icon	Description
	Water heating		Error
	Menu		Access card removed / Disinfection failed
	Switching between cooling and heating		On/Off

Notes:

- When the controller is switched on, the "**On/Off**" icon turns green.
- When the "**Room temperature**" control mode is used, the remote room temperature is displayed in the upper right corner of the display; when the "**Leaving water temperature**" control mode is used, the leaving water temperature of the auxiliary electric heater is displayed in the Water heating mode, and the leaving water temperature of the main unit is displayed in the Cooling/Heating mode or combined modes.
- In combined modes, the set temperature is the required temperature for heating or cooling the room. Only in Water heating mode, the set temperature is the required temperature for water heating.
- If no operation is performed for 10 minutes, the home page is automatically redisplayed.

3.1.2 Menu Page



Menu page

On the menu page, the corresponding icons will be displayed according to the current mode and status of the controller.

No.	Item	Description
1	Current mode	Current mode
2	Date	Current date
3	Time	Current time
4	Function settings	Go to the user settings page.
5	Parameter settings	Go to the parameter settings page.
6	Parameter viewing	Go to the parameter viewing page.
7	Commissioning parameters	Go to the commissioning parameter settings page.
8	On/Off	It is used to turn the unit on or off. "**OFF**" indicates that the unit has been turned off, and "**ON**" indicates that the unit has been turned on. If an error occurs after which the unit automatically shuts down, this switch is set to "**OFF**".
9	General settings	Go to the general parameters settings page.
10	Home page	Return to the home page

Icon	Description	Icon	Description
	Heating		Floor preheating
	Cooling		Floor preheating error
	Water heating		Access card removed
	Heating + Hot water		Defrosting
	Hot water + Heating		Holiday
	Cooling + Hot water		Wi-Fi control
	Hot water + Cooling		Back
	Quiet operation		Menu page
	Disinfection		Save
	Emergency mode		Error

Notes:

- The “**Cooling**” mode cannot be used for heating-only units.
- The “**Hot water**” mode cannot be used for heating-only units.
- The “**Heating + Hot water**” mode cannot be for mini chillers.
- The “**Hot water + Heating**” cannot be used for mini chillers.
- The “**Cooling + Hot water**” mode cannot be used for mini chillers.
- The “**Water heating + Cooling**” mode cannot be used for mini chillers.
- The “**Disinfection**” mode cannot be used for mini chillers.

Error icon

3.1.3 Display Backlight

When “**Back light**” is set to “**Energy save**” on the General settings page, the display panel backlight will be turned off if no operation is performed within 5 minutes. However, when you touch any active area of the touch screen, it will be turned on again.

When “**Back light**” is set to “**Lighted**”, the display panel will still be lit. It is recommended to select the “**Energy save**” option to extend the service life of the display.

3.2 Operation Instructions

3.2.1 On/Off

Operation instructions:

The unit can be turned on/off by pressing the ON/OFF switch on the Menu page.

Notes:

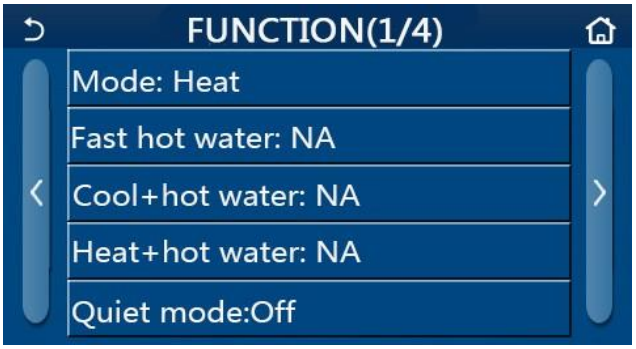
- The first time the power is connected, the unit will be turned OFF by default.
- When “**On/Off Memory**” has been set to “**On**” on the “**GENERAL**” setting page, the on/off status of the unit will be memorized. This means that in the case of a power failure, the unit will resume the set operating mode after the power supply is restored. When “**On/Off Memory**” has been set to “**Off**”, the unit will remain off when the power is restored in the case of a power failure.

Menu page in the “**ON**” state

3.2.2 Function Settings

Operation instructions:

1. When you press “**FUNCTION**” on the Menu page, you will be taken to the Function setting page, as shown in the figure below.



FUNCTION setting page

2. Press the arrow button on the Function settings page to go to the previous or next function settings page. After completing the settings, you can press the Menu page icon to return directly to the Menu page or press the Back icon to return to the previous menu level.
3. Pressing the desired function on the Function setting page will take you to the corresponding setting page of the selected function.
4. On the setting page of some functions, you can press “**OK**” to save the settings or “**CANCEL**” to cancel the settings.

Notes:

- If you change the settings of a function on the Function settings page and these settings are to be memorized during a power failure, they are automatically stored in memory and restored the next time the power is reconnected.
- If there is another submenu for the selected function, then after pressing it you will be taken directly to the setting page of the submenu.
- “NA” is displayed for functions that are not available for heating-only units and mini chillers. When you try to set them up, you will be notified that they cannot be used.

Function settings

No.	Item	Range	Default	Notes
1	Mode	Cool Heat Hot water Cool + Hot water Heat + Hot water	Heat	1. When the water tank is not available, only the "**Cool**" and "**Heat**" modes can be used. 2. For a heating-only unit, only the "**Heat**", "**Hot water**" and "**Heat + Hot water**" modes are available. 3. For heat pumps and heating-only units, the default setting will be "**Heat**", and for mini chillers, the default setting will be "**Cool**".
2	Fast hot water	On / Off	Off	When the water tank is not available, this option cannot be used.
3	Cool + Hot water	Cool / Hot water	Hot water	When the water tank is available, the default setting will be "**Hot water**"; when not available, this option cannot be used.
4	Heat + Hot water	Heat / Hot water	Hot water	When the water tank is available, the default setting will be "**Hot water**"; when not available, this option cannot be used.
5	Quiet mode	On / Off	Off	/
6	Quiet Timer	On / Off	Off	/
7	Weather depend	On / Off	Off	/
8	Weekly Timer	On / Off	Off	/
9	Holiday Release	On / Off	Off	
10	Disinfection	On / Off	Off	When the water tank is not available, this option cannot be used. The disinfection day can be set from Monday to Sunday. The default setting is Saturday. 23:00. The disinfection time can be set from 00:00 to 23:00. The default setting is 23:00.
11	Clock timer	On / Off	Off	/
12	Temp. timer	On / Off	Off	/
13	Emergen. mode	On / Off	Off	/
14	Holiday	On / Off	Off	/
15	Preset mode	On / Off	Off	/
16	Error reset	/	/	Some errors can only be terminated after a manual reset.
17	WiFi reset			To reset the Wi-Fi connection.
18	Reset	/	/	To reset all user parameter settings.

3.2.2.1 Mode

Operation instructions:
When the unit is turned off and you press "**Mode**" on the Function setting page, the mode setting page will appear, where you can select the desired mode. If you press "**OK**", this setting is saved and the Function setting page will reappear on the display.

Notes:

- The default mode when the power is first connected is "**Heat**".
- The mode setting can only be made when the unit is turned off; otherwise, a dialogue box with the warning message "**Please turn off the system first!**" is displayed.
- When the water tank is not available, only the "**Heat**" and "**Cool**" mode can be set.

- When the water tank is available, the “**Cool**”, “**Heat**”, “**Hot Water**”, “**Cool + Hot water**”, and “**Heat + Hot water**” mode can be set.
- The heat pump can be set to “**Cool**” mode; heating-only units cannot be set to “**Cool + Hot water**” and “**Cool**” mode.
- This setting can be stored in memory in case of power failure.

3.2.2.2 Fast Hot Water

Operation instructions:

When the unit is turned off and you press “**Fast hot water**” on the Function setting page, the corresponding setting page will appear, where you can select the desired option. If you press “**OK**”, this setting is saved and the Function setting page will reappear on the display.

Notes:

- This function can only be set to “**On**” when the water tank is available. When the water tank is not available, this option cannot be used.
- This setting remains stored in memory in case of power failure.
- This function is not available for mini chillers.

3.2.2.3 Cool + Hot water

Operation instructions:

When the unit is turned off and you press “**Cool + Hot water**” on the Function setting page, the corresponding setting page will appear, where you can select the desired option. If you press “**OK**”, this setting is saved and the Function setting page will reappear on the display.

Notes:

- When the water tank is not available, this option cannot be used. When available, the default priority will be set to “**Hot water**”.
- This setting remains stored in memory in case of power failure.
- This function is not available for mini chillers.

3.2.2.4 Heat + Hot Water

Operation instructions:

When the unit is turned off and you press “**Heat + Hot water**” on the Function setting page, the corresponding setting page will appear, where you can select the desired option. If you press “**OK**”, this setting is saved and the Function setting page will reappear on the display.

Notes:

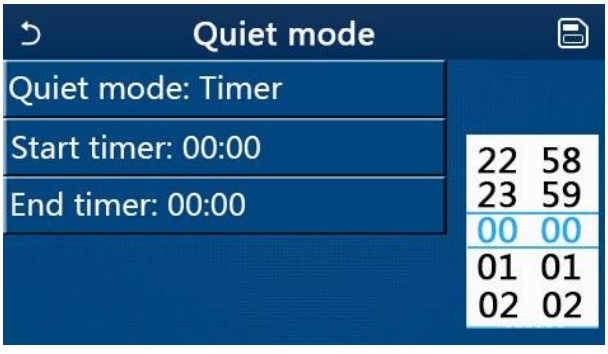
- When the water tank is not available, this option cannot be used. When available, the default priority will be set to “**Hot water**”.
- This setting remains stored in memory in case of power failure.
- This function is not available on the heating-only units and mini chillers.

3.2.2.5 Quiet Mode

Operation instructions:

When the unit is turned off and you press “**Quiet mode**” on the Function setting page, a dialogue box will appear, where you can select “**On**”, “**Off**”, or “**Timer**” options.

When the “**Timer**” option is selected, the “**Start timer**” and “**End timer**” should also be set. Otherwise, the timer settings remain the same.



Quiet mode timer

This setting will be saved by pressing the icon in the upper right corner.

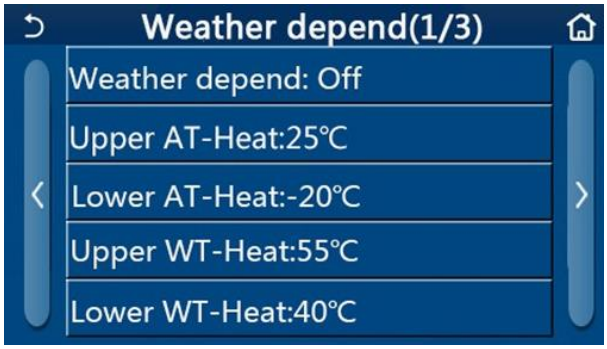
Notes:

- This function can be set in both on or off state, but will only work when the main unit is turned on.
- When this function is set to “**On**”, it will be automatically set back to “**Off**” when the main unit is turned off. However, when it is set to “**Timer**”, this setting is retained even after the main unit is turned off, and can only be cancelled manually.
- This setting remains stored in memory in case of power failure.

3.2.2.6 Weather Depend

Operation instructions:

When you press “**Weather depend**” on the Function settings page, the dialogue box will appear, where you can set this function to “**On**” or “**Off**” and also set the temperatures for the weather-dependent mode.



Page of Weather depend function

Notes:

- When the “**Weather depend**” function has been activated, it cannot be deactivated by switching the unit off/on, but only by manual setting.
- The target temperature for weather-dependent operation can be found on the parameter viewing pages.
- When the “**Weather depend**” function has been activated, it is still possible to set the desired room temperature, but this setting becomes valid only after deactivating this function.
- This function can be set to “**On**” with the unit on or off, but will only work when the unit is turned on.
- It works in the “**Cool**” or “**Heat**” mode. In the “**Cool + Hot water**” or “**Heat + Hot water**” modes, it only works when the Cooling or Heating mode is currently running. It does not work in the “Hot water” mode.
- For units that only have the Heating function, the settings for Cooling mode cannot be used.
- This setting remains stored in memory in case of power failure.
- If the “**Upper WT-Heat**”/ “**Upper WT-Cool**” is lower than “**Lower WT-Heat**”/ “**Lower WT-Cool**”, or “**Lower WT-Heat**”/ “**Lower WT-Cool**” is higher than “**Upper WT-Heat**”/ “**Upper WT-Cool**”, a message “**Enter wrong!**” is displayed and a reset is required.

3.2.2.7 Weekly Timer

Operation instructions:

1. When you press “**Weekly timer**” on the Function setting page, the setting page will appear as shown below.

2. On the “Weekly timer” setting page, you can set the weekly timer to “**On**” or “**Off**”.

3. On the “**Weekly timer**” setting page, after pressing the desired day (Mon. (Monday) to Sun. (Sunday)), the setting page of the selected day will appear.
4. On the day setting page, you can set the timer to “**Valid**” or “**Invalid**”. You can also specify 3 time periods; each of which can be set to “**Valid**” or “**Invalid**”.
5. When you press the “**Save**” icon after setting, these settings will be saved.

Notes:

- You can set 3 time periods for each day. For each time period, the start time must be earlier than the end time; otherwise, this setting will be invalid. The same applies to the order of time periods.
- When the weekly timer has been activated, the display panel will operate according to the current mode and set temperature.
- Timer settings for the day of the week
  - “**Valid**” means that this setting only works when the weekly timer has been activated, regardless of the Holiday mode.
  - “**Invalid**” means that this setting does not work even when the weekly timer has been activated.
- When both “**Weekly timer**” and “**Holiday release**” functions have been activated, the “**Weekly timer**” setting will be invalid. The “**Weekly Timer**” setting only works when the “**Holiday release**” setting has been deactivated.
- The order of priority for timer setting from highest to lowest is “**Temperature timer**”, “**Clock timer**”, “**Preset mode**”, and “**Weekly timer**”. The lower priority setting is allowed but does not work when the higher priority setting has been activated. However, it will work when the setting with higher priority has been deactivated.
- This setting remains stored in memory in case of power failure.

3.2.2.8 Holiday Release

Operation instructions:

When you press “**Holiday release**” on the Function setting page, the corresponding setting page will appear, where you can set this function to “**On**” or “**Off**”.

Notes:

- When this function has been activated, you can set some days of the week to “**Holiday release**” on the “**Weekly timer**” setting page. In this case, the “**Weekly timer**” setting for this day is invalid until it has been manually set to “**Valid**”.
- This setting remains stored in memory in case of power failure.

3.2.2.9 Disinfection

Operation instructions:

1. On the Function settings page, select the “**Disinfection**” setting page.
2. On the “**Disinfection**” setting page, you can set this function to “**On**” or “**Off**”. You can also set “**Set Clock**”, “**Set temp.**”, and “**Set day**” to perform the disinfection. The corresponding setting page will appear on the right.
3. Press the “Save” icon to save the settings.

Notes:

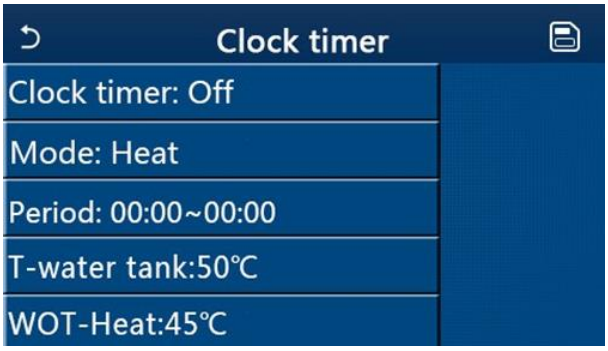
- This function is not available for mini chillers.
- This setting can only be activated when the “**Water tank**” is set to “**With**”. When “Water tank” is set to “Without”, this function will be deactivated.
- This setting can be made with the unit on or off.

- This function cannot be activated together with “**Emergen. mode**”, “**Holiday mode**”, “**Floor debug**”, “**Manual defrost**”, or “**Refri. recovery**”. When the “**Disinfection**” function has been activated, the “**Emergen. mode**”, “**Holiday mode**”, “**Floor debug**”, “**Manual defrost**”, or “**Refri. recovery**” will not be applied, and a window with the message “**Please disable the disinfect mode!**” will appear.
- The “**Disinfection**” function can be activated with the unit switched on or off. This mode will take precedence over the “Hot water” mode.
- If the disinfection cannot be performed, the message “**Disinfection fail!**” will appear on the display. This message can be deleted by pressing “**OK**”.
- When the “**Disinfection**” function has been activated and if an error in communication with the indoor unit or a water heater e-heater malfunction occurs, this function will be terminated automatically.
- This setting remains stored in memory in case of power failure.

3.2.2.10 Clock Timer

Operation instructions:

1. On the Function settings page, select the “**Clock Timer**” setting page.
2. On the “**Clock timer**” setting page, you can set the Clock timer to “**On**” or “**Off**”.



3. Parameters: “**Mode**” is used to select the desired mode for timing; “**WOT-Heat**” and “**T-water tank**” is used to set the respective water temperature; “**Period**” is used to set the time period. When you press the “**Save**” icon after setting, all settings will be saved.

Notes:

- When the “**Clock timer**” function has been set and the Mode setting includes the “**Hot water**” mode, then if the “**Water tank**” parameter is later changed to “**Without**”, the “**Hot water**” mode will be automatically switched to “**Heat**” mode, and “**Cool + Hot water**” / “**Heat + Hot water**” mode will be automatically switched to “**Cool**” / “**Heat**” mode.
- When the “**Weekly timer**” and “**Clock timer**” functions have been set at the same time, priority will be given to the former.
- When a water tank is available, it is possible to use “**Heat**”, “**Cool**”, “**Hot water**”, “**Heat + Hot water**”, and “**Cool + Hot water**” modes; however, when the water tank is not available, only “**Heat**” and “**Cool**” modes can be used.
- If the start time is after the end time, this setting is invalid.
- The temperature of the water in the tank can only be set if the set operating mode also includes the “**Hot water**” mode.
- The “**Clock timer**” setting only works once. If this setting is needed again, it must be set again.
- If the unit is turned off manually, the function will be disabled.

- When the “**Weather depend**” mode has been activated and the “**Clock timer**” mode is set to “**Hot water**”, the “**Weather depend**” mode will be disabled when the setting mode is switched.
- This function remains stored in memory in case of power failure.

3.2.2.11 Temp. Timer

On the Function settings page, select the “**Timp. Timer**” setting page.

On the “**Temp. timer**” setting page, you can set the Temp timer to “**On**” or “**Off**”.

When you select the “**Period 1**” / “**Period 2**”, a window for entering the duration will appear. Then select the “**WT-Heat/WT-Cool 1/2**”, a window for entering the temperature will appear.

Notes:

- When the “**Weekly timer**” / “**Preset mode**” / “**Clock timer**” / “**Temp. timer**” functions have been set at the same time, the latter takes priority.
- This setting only applies when the unit is turned on.
- For “**Cool**” or “**Cool+Hot water**” mode, the “**WT-Cool**” parameter is to be set, while for “**Heat**” or “**Heat+Hot water**”, the “**WT-Heat**” parameter is to be set.
- If the start time of “**Period 2**” is the same as of “**Period 1**”, the former takes priority.
- The “**Temp. timer**” is executed according to the timer.
- If the temperature is set manually during this setting, this setting takes priority.
- This function cannot be used in “**Hot water**” mode.
- This function remains stored in memory in case of power failure.

3.2.2.12 Emergen. Mode

Operation instructions:

1. On the Function setting page, set the Mode to “**Heat**” or “**Hot water**”.
2. On the Function setting page, select the “**Emergen. mode**” and set it to “**On**” or “**Off**”.
3. When the “**Emergen. mode**” has been activated, the corresponding icon will appear at the top of the menu page.
4. If the mode is not set to “**Heat**” or “**Hot water**”, the message “**Wrong running mode!**” will appear on the display.

Notes:

- Emergency mode is enabled on the condition that some fault or protection activation has occurred and the compressor has been stopped for at least 3 minutes. If the fault has been removed or the protection has been deactivated, the unit can enter emergency mode using the wall-mounted wired controller (when the unit is off).
- In emergency mode, the “**Hot water**” and “**Heat**” functions cannot be performed at the same time.

- When the operation mode is set to “**Heat**” and the parameter “**Other thermal**” or “**Optional E-Heater**” is set to “**Without**”, the unit cannot enter the emergency mode.
- When the unit is performing the “**Heat**” operation in “**Emergen. mode**” and the control unit detects an abnormal condition “**HP-Water Switch**”, “**Auxi. heater 1**”, “**Auxi. heater 2**”, or “**Temp-AHLW**”, this mode will be terminated immediately. The emergency mode also cannot be activated if the above errors occur.
- When the unit is performing the “**Hot water**” operation in “**Emergen. mode**” and the control unit detects the condition “**Auxi.-WTH**”, this mode will be terminated immediately. The emergency mode also cannot be activated if the above error occurs.
- When this function has been activated, the “**Weekly Timer**”, “**Preset mode**”, “**Clock timer**”, and “**Temp. timer**” functions will be disabled. In addition, the “**On/Off**”, “**Mode**”, “**Quiet mode**”, “**Weekly timer**”, “**Preset mode**”, “**Clock timer**”, and “**Temp. timer**” operations cannot be used.
- In the emergency mode, the thermostat does not work.
- This function can only be activated when the unit is turned off. If you try to set it up while the unit is turned on, a warning window “**Please turn off the system first!**” will appear.
- The “Floor debug”, “Disinfection”, and “Holiday mode” cannot be activated along with this function. If you try to do so, a warning window “**Please disable the emergen. mode!**” will appear.
- After a power failure, the emergency mode will be deactivated.

3.2.2.13 Holiday Mode

Operation instructions:

On the Function setting page, select “**Holiday Mode**” and set it to “**On**” or “**Off**”.

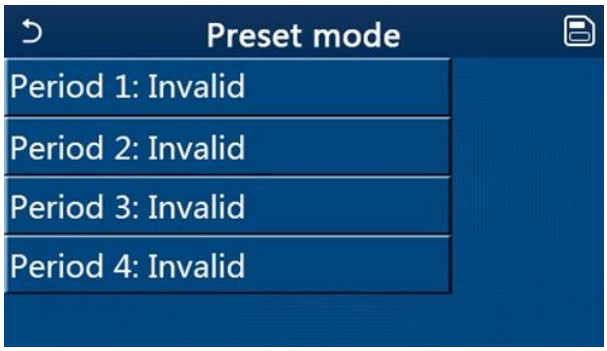
Notes:

- This function can only be activated when the unit is turned off; otherwise, a dialogue box with the warning message “**Please turn off the system first!**” will appear.
- When the “**Holiday Mode**” has been activated, the operation mode is automatically switched to “Heat”. The operating mode setting and on/off operations using the controller will not be available.
- When the “**Holiday mode**” has been activated, the controller will automatically disable the “**Weekly timer**”, “**Preset mode**”, “**Clock timer**”, and “**Temp. timer**” functions.
- When the “**Holiday mode**” is set and the unit is controlled according to room temperature, the set temperature (room temperature for heating) should be 10 °C; when the unit is controlled according to the leaving water temperature, the set temperature (leaving water temperature for heating) should be 30 °C.
- When this function has been activated, the “**Floor debug**”, “**Emergen.mode**”, “**Disinfection**”, “**Manual defrost**”, “**Preset mode**”, “**Weekly timer**”, “**Clock timer**”, and “**Temp.timer**” functions cannot be activated at the same time; otherwise, a window with the message “**Please disable the holiday mode!**” will appear.
- This function remains stored in memory in case of power failure.

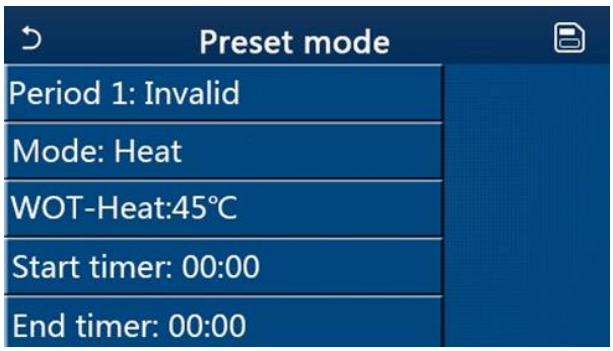
3.2.2.14 Preset Mode

Operation instructions:

On the Function setting page, select the “**Preset mode**” to enter the corresponding setting page.



On the Period settings page, you can set the respective time period to “**Valid**” or “**Invalid**”.



The “**Mode**” option is used to preset the mode; “**WOT-Heat**” is used to set the cold/hot leaving water temperature). The “**Start timer**” and “**End timer**” serve to set the respective time. When you press the “**Save**” icon after setting, all settings will be saved.

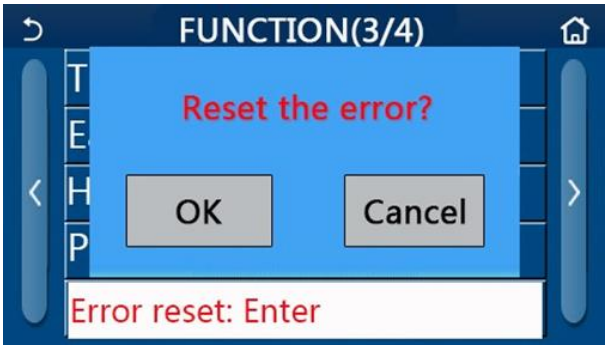
Notes:

- If the “**Preset mode**” has been set to “**Hot water**” and the “**Water tank**” is then set to “**Without**", the preset mode “**Hot water**” will be automatically switched to “**Heat**”.
- If the “**Weekly timer**” and “**Preset mode**” have been set concurrently, the latter will take priority.
- When a water tank is available, the “**Heat**”, “**Cool**”, or “**Hot water**” mode can be preset; however, when the water tank is not available, only the “**Heat**” or “**Cool**” mode can be preset.
- The time specified in “**Start timer**” must be earlier than the time specified in “**End timer**”; otherwise, the message “**Time setting wrong**” will appear.
- The “**Preset mode**” setting will work until it is manually cancelled.
- When the “**Start timer**” time is reached, the unit will start working in the preset mode. The mode and temperature can still be set in this case, but this setting will not be saved to the preset mode. When the “**End timer**” time is reached, the unit will be turned off.
- This function remains stored in memory in case of power failure.

3.2.2.15 Error Reset

Operation instructions:

When you press “**Error reset**” on the Function setting page, a dialogue box “**Reset the error**” will appear. Press “**OK**” to reset the error, or press “**Cancel**” to not reset it.



Notes:

- This operation can only be performed when the unit is turned off.

3.2.2.16 WiFi reset

Operation instructions:

When you press “**WiFi**” on the Function setting page, a dialogue box will appear. Press “**OK**” to reset the WiFi, or press “**Cancel**” to not reset it and close the dialogue box.

3.2.2.17 Reset

Operation instructions:

When you press “**Reset**” on the Function setting page, a dialogue box will appear. Press “**OK**” to reset all user parameter settings, or press “**Cancel**” to not reset them and return to the Function setting page.

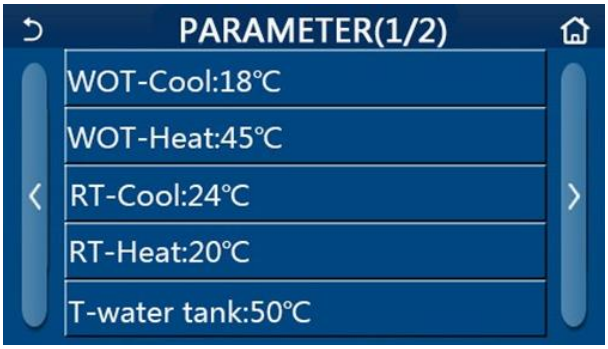
Notes:

- This function can only be performed when the unit is turned off.
- This function applies to the “**Temp. timer**”, “**Clock timer**”, “**Preset mode**”, “**Weekly timer**”, and “**Weather depend**”.

3.2.3 User Parameter Settings

Operation instructions:

1. When you press “**PARAMETER**” on the Menu page, you will enter the parameter setting page, as shown in the figure below.



Parameter setting page

2. On the parameter setting page, you can switch to the page with the desired parameter by pressing the arrow keys.
3. After setting the selected parameter, you can save it by pressing “**OK**”, and the unit will then work according to this setting. If you press “**Cancel**” instead, the setting will not be applied.

Notes:

- For parameters with different default values in different conditions, when the conditions change, the default value changes accordingly.
- All parameters will remain stored in memory in case of power failure.

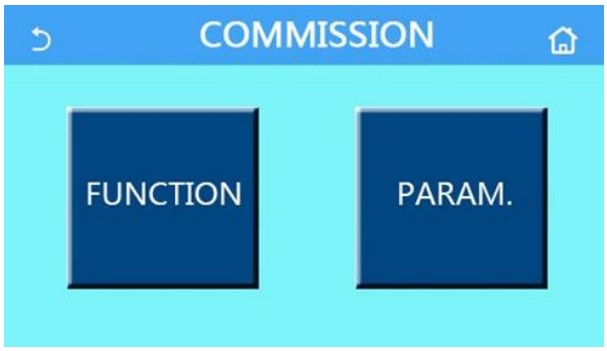
Parameter settings

No.	Full name	Displayed name	Range (°C)	Range (°F)	Default	Notes
1	Leaving water temperature for cooling (T1)	WOT-Cool	7–25 °C	45–77 °F	18 °C / 64 °F	Not available on the heating-only units.
2	Leaving water temperature for heating (T2)	WOT-Heat	20–60 °C	68–140 °F	45 °C / 113 °F	High-temperature series units
			20–55 °C	68–131 °F	45 °C / 113 °F	Normal-temperature series units
3	Room temperature for cooling (T3)	RT-Cool	18–30 °C	64–86 °F	24 °C / 75 °F	Not available on the heating-only units.
4	Room temperature for heating (T4)	RT-Heat	18–30 °C	64–86 °F	20 °C / 68 °F	/
5	Water tank temperature (T5)	T-water tank	40–80 °C	104–176 °F	50 °C / 122 °F	Not available on mini chillers
6	Leaving water temperature difference for cooling (Δt1)	ΔT-Cool	2–10 °C	36–50 °F	5 °C / 41 °F	Not available on mini chillers
7	Leaving water temperature difference for heating (Δt2)	ΔT-Heat	2–10 °C	36–50 °F	10 °C / 50 °F	/
8	Leaving water temperature difference for water heating (Δt3)	ΔT-hot water	2–8 °C	36–46 °F	5 °C / 41 °F	Not available on mini chillers
9	Room temperature control difference (Δt4)	ΔT-Room temp	1–5 °C	34–41 °F	2 °C / 36 °F	/

3.2.4 Commissioning (Configuration) Parameters Setting

Operation instructions:

When you press "**Commission**" on the Menu page, you will enter the Commission page, where the left side is for function setting and the right side is for parameter setting, as shown in the figure below.



Notes:

- When the status of a function is changed on the commissioning parameter setting page, the system will automatically save this change, and it will be retained even in the event of a power failure.
- Only an authorized qualified service staff may change the settings of the commissioning parameters; otherwise, the operation of the unit may be adversely affected.

Commissioning functions setting

No.	Item	Range	Default	Description
1	Ctrl. state	T-water out / T-room	T-water out	"**T-room**" can be set when "**Remote sensor**" is set to "**With**".
2	2-way valve	Cool 2-Way valve, On/Off	Off	Determines the status of the 2-way valve in the "**Cool**" and "**Cool + Hot water**" modes. In the "**Cool**" or "**Cool + Hot water**" mode, the status of the 2-way valve depends on this setting. This setting is not available for heating-only units.
		Heat 2-Way valve, On/Off	On	Determines the status of the 2-way valve in the "**Heat**" and "**Heat + Hot water**" modes.
5	Solar setting	With/Without	Without	When the water tank is not available, this setting cannot be used. When "**With**" is set, the solar water heating will operate according to the current conditions. When "**Without**" is set, solar water heating is not available.
6	Water tank	With/Without	Without	Not available on mini chillers
7	Thermostat	Without / Air / Air + hot water	Without	This setting cannot be switched between the options "**Air**" (Air conditioning) and "**Air + hot water**" (Air conditioning + water heating) directly, but only via the "**Without**" option.
		On /Off	Off	This setting is available for mini chillers.
8	Other thermal	With/Without	Without	/
9	Optional E-heater	Off / 1 / 2	Off	/
10	Remote sensor	With/Without	Without	When set to "**Without**", the "**Control state**" parameter will be automatically changed to "**T-water out**".
11	Air removal	On / Off	Off	/
12	Floor debug	On / Off	Off	/
13	Manual defrost	On / Off	Off	/
14	Force mode	Off / Force-cool / Force-heat	Off	"Force-Cool" is not available on the heating-only units.
15	Tank heater	Logic 1 / Logic 2	Logic 1	This setting is only possible when the water tank is available and the unit is switched off. Not available on mini chillers

No.	Item	Range	Default	Description
16	Gate-Ctrl. (Control with access card)	On / Off	Off	/
17	C/P limit	Off / Current limit / Power limit	Off	Current: limit: 0 to 50 A, default 16 A. Power limit: 0.0 to 10.0 kW, default 3.0 kW.
18	Address	[1–125] [127–253]	1	/
19	Refri. recovery	On / Off	Off	/
20	Gate-Ctrl memory	On / Off	Off	/

Commissioning (configuration) parameters setting

No.	Full name	Displayed name	Range		Default	Note
1	Max. output water temperature when using the heat pump alone	T-HP max	40–55 °C	104–131 °F	50 °C / 122 °F	
2	Run time in Cooling mode	Cool run time	1–10 min		3 min [2-way valve turned off] 5 min [2-way valve turned on]	
3	Run time in the Heating mode	Heat run time	1–10 min		3 min [2-way valve turned off] 5 min [2-way valve turned on]	

3.2.4.1 Ctrl. State

Operation instructions:

When you press "**Ctrl. state**" on the commissioning function setting page, you can select "**T-water out**" or "**T-room**".

Notes:

- When "**Remote sensor**" is set to "**With**", "**T-water out**", or "**T-room**" can be set. When "**Remote sensor**" is set to "**Without**", only "**T-water out**" can be set.
- This setting remains stored in memory in case of power failure.

3.2.4.2 2-Way Valve

Operation instructions:

When you press "**Cool 2-Way valve**" or "**Heat 2-Way valve**" on the commissioning function setting page, the corresponding setting page will appear.

Notes:

- This setting is not available for heating-only units.
- The "**Cool 2-Way valve**" determines the status of the 2-way valve in "**Cool**" or "**Cool + Hot water**" mode, while the "**Heat 2-Way valve**" determines the status of the 2-way valve in "**Heat**" or "**Heat + Hot water**" mode.
- This setting remains stored in memory in case of power failure.

3.2.4.3 Solar Setting

Operation instructions:

1. This setting is not available for mini chillers.
2. When you press "Solar setting" on the commissioning function setting page, the corresponding submenu page will appear.

3. On the submenu page, you can set the “**Solar setting**” to “**With**” or “**Without**”.
4. On the submenu page, you can set the “**Solar heater**” to “**On**” or “**Off**”.

Solar setting

Notes:

- This setting can be made with the unit on or off.
- This setting is only available when the water tank is available. When the water tank is not available, this setting cannot be used.
- This setting remains stored in memory in case of power failure.

3.2.4.4 Water Tank

Operation instructions:

When you press “**Water tank**” on the commissioning function setting page, the corresponding setting page will appear, where you can set “**Water tank**” to “**With**” or “**Without**”.

Notes:

- This setting remains stored in memory in case of power failure.
- This setting only applies when the unit is turned off.

3.2.4.5 Thermostat

Operation instructions:

1. When you press “**Thermostat**” on the commissioning function setting page, the corresponding setting page will appear.
2. On the “**Thermostat**” setting page, you can select “**Without**”, “**Air**”, or “**Air + hot water**”. When “**Air**” or “**Air + hot water**” is set, the unit will work according to the mode set by the thermostat; when “**Without**” is set, the unit will operate according to the mode set on the control panel.
3. For mini chillers, it can be set to “**On**” or “**Off**”.

Notes:

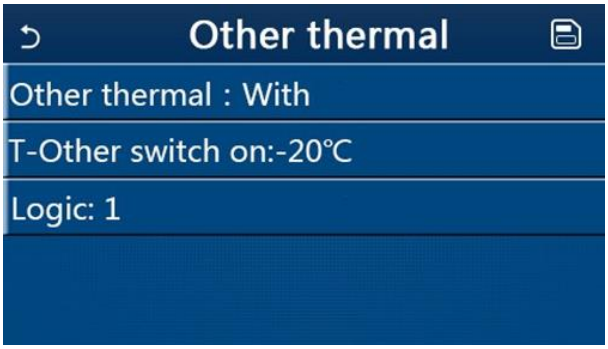
- When “**Water tank**” is set to “**Without**”, “**Air + hot water**” mode is not available.
- When the “**Floor debug**” or “**Emergen. mode**” has been activated, the thermostat function will not apply.
- When “**Thermostat**” is set to “**Air**” or “**Air + hot water**”, the “**Temp. Timer**” will be automatically deactivated and the unit will work according to the mode set by the thermostat. At the same time, the mode setting and power on/off operations on the control panel will be inactive.
- When the “**Thermostat**” is set to “**Air**”, the unit will operate according to the thermostat setting.

- When the “**Thermostat**” is set to “**Air + hot water**” and the thermostat is turned off, the unit can still work in the “**Hot water**” mode. In this case, the ON/OFF icon on the home page does not indicate the operating status of the unit. Operating parameters are available on the parameter viewing pages.
- When the “**Thermostat**” is set to “**Air + hot water**”, you can set the operation priority on the control panel (see Section 2.2.3 and 2.2.4 for details).
- The status of the “**Thermostat**” can only be changed when the unit is switched off.
- When it has been activated, the “**Floor debug**”, “**Air removal**” and “**Emergen. mode**” cannot be used.
- This setting remains stored in memory in case of power failure.

3.2.4.6 Other Thermal

Operation instructions:

1. When you press “**Other thermal**” on the commissioning function setting page, the corresponding setting page will appear.
2. On the setting page, you can set the “**Other thermal**” to “**With**” or “**Without**” and the “**T-Other switch on**” to the desired value. When the “**Other thermal**” is set to “With”, you can set operation mode for the backup heat source.



Notes:

- This setting remains stored in memory in case of power failure.
- There are 3 operating logics available for the additional heat source.

  Logic 1

  1. In the “**Heat**” and “**Heat + hot water**” modes, the set temperature for the additional heat source should be the same as the “**WOT-Heat**”; in the “**Hot water**” mode, the set temperature should be the smaller of the values “**T-Water tank**” + 5 °C and 60 °C.
  2. In the “**Heat**” mode, the water pump of the additional heat source must always be active.
  3. In the “**Heat**” mode, the 2-way valve will be controlled according to the settings on the control panel. During the heating operation, the water pump of the heat pump unit will be stopped; however, during standby, the water pump will run, but the additional heat source will be stopped.
  4. In the “**Hot water**” mode, the 3-way valve will be switched to the water tank, the water pump of the heat pump will always be stopped, but the additional heat source will start.
  5. In the “**Heat + Hot water**” mode, the additional heat source will be used only for space heating and the electric heater in the water tank will be used for water heating. In this case, the 2-way valve is controlled according to the settings on the control panel, and the 3-way valve will always be switched to the space heating system. During the heating operation, the water pump of the heat pump unit will be stopped; however, during standby, the water pump of the heat pump will run.

  Logic 2

  1. In the “**Heat**” and “**Heat + hot water**” mode, the set temperature for the additional heat source should be the same as the “**WOT-Heat**” and both values are smaller or equal to 60 °C; in the “**Hot water**” mode, the set temperature should be the smaller of the values “**T-Water tank**” + 5 °C and 60 °C.
  2. In the “**Heat**” mode, the water pump of the additional heat source must always be active.
  3. In the “**Heat**” mode, the 2-way valve will be controlled according to the settings on the control panel. During the heating operation, the water pump of the heat pump unit will be stopped; however, during standby, the water pump will run, but the additional heat source will be stopped.

4. In the “**Hot water**” mode, the 3-way valve will be switched to the water tank, the water pump of the heat pump will always be stopped, but the additional heat source will start.
5. In the “**Heat + Hot water**” mode (“**Heat**” has priority), the additional heat source will be used only for space heating, while the electric heater in the water tank will be used for water heating. In this case, the 2-way valve is controlled according to the settings on the control panel, and the 3-way valve will always be stopped. During the heating operation, the water pump of the heat pump unit will be stopped; however, during standby, the water pump will be running.
6. In the “**Heat + Hot water**” mode (“**Hot water**” has priority), the additional heat source will be used for space heating and water heating. The additional heat source is first used for water heating, and after reaching the desired “**T-water tank**” value, the additional heat source is used for space heating.

Logic 3

The heat pump only sends a signal to the additional heat source, but all control logic must be provided “separately”.

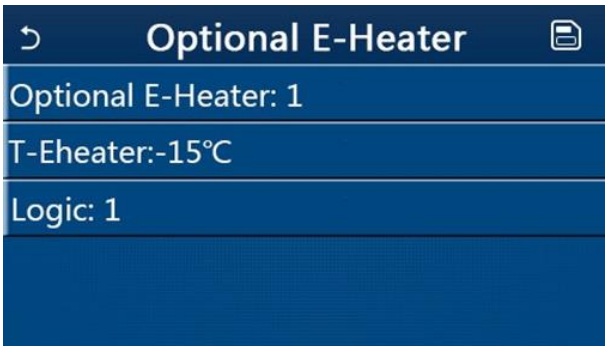
Control of the additional heat source					
No.	**Product**	**Mode**	**Note**		**Required accessories**
Logic 1	Monoblock	Heat	/	Available	RT5 temperature sensor
		Hot water	/	Available	Additional 3-way valve, water tank temperature sensor
		Heat + Hot water	/	Available	RT5 temperature sensor, water tank temperature sensor
	Split	Heat	/	Available	RT5 temperature sensor
		Hot water	/	Available	Additional 3-way valve, water tank temperature sensor
		Heat + Hot water	/	Available	RT5 temperature sensor, water tank temperature sensor
	All-in-one	Heat	/	Available	RT5 temperature sensor
		Hot water	/	Not available	/
		Heat + Hot water	/	Available	RT5 temperature sensor, water tank temperature sensor
Logic 2	Monoblock	Heat	/	Available	RT5 temperature sensor
		Hot water	/	Available	Additional 3-way valve, water tank temperature sensor
		Heat + Hot water	/	Available	Additional 3-way valve, T5 temperature sensor, water tank temperature sensor
	Split	Heat	/	Available	RT5 temperature sensor
		Hot water	/	Available	Additional 3-way valve, water tank temperature sensor
		Heat + Hot water	/	Available	Additional 3-way valve, T5 temperature sensor, water tank temperature sensor
	All-in-one	Heat	/	Available	RT5 temperature sensor
		Hot water	/	Not available	/
		Heat + Hot water	Priority = Heat	Available	RT5 temperature sensor
			Priority = Hot water	Not available	/

Control of the additional heat source					
No.	**Product**	**Mode**	**Note**		**Required accessories**
Logic 3	Monoblock	Heat	/	Available	/
		Hot water	/	Available	/
		Heat + Hot water	/	Available	/
	Split	Heat	/	Available	/
		Water heating	/	Available	/
		Heat + Hot water	/	Available	/
	All-in-one	Heat	/	Available	/
		Hot water	/	Available	/
		Heat + Hot water	/	Available	/

3.2.4.7 Optional E-heater

Operation instructions:

1. When you press "**Optional E-heater**" on the commissioning function setting page, the corresponding setting page will appear.
2. On the "**Optional E-Heater**" setting page, you can set this option to "**1**", "**2**", or "**Off**".
3. The "**T-Eheater**" setting is used for comparison with the outdoor temperature. The optional electric heater will work differently according to the comparison results.



Notes:

- This setting remains stored in memory in case of power failure.
- Only one of the "**Other thermal**" or "**Optional E-Heater**" options can be activated at the same time.
- You can select 2 operating logics for the "**Optional E-Heater**".

  Logic 1 The heat pump and the optional electric heater cannot be started simultaneously.

  Logic 2 The heat pump and optional electric heater can be started simultaneously when the outside temperature is lower than the "**T-Eheater**".
- Optional electric heater and water tank heater will not be started simultaneously.

3.2.4.8 Remote Sensor (External Temperature Sensor)

Operation instructions:

When you press the "**Remote sensor**" on the commissioning function setting page, the corresponding setting page will appear, where you can set this option to "**With**" or "**Without**".

Notes:

- This setting remains stored in memory in case of power failure.
- Only when the "**Remote sensor**" is set to "**With**", it is possible to set the "**Ctrl. State**" to "**T-room**".

3.2.4.9 Air Removal

Operation instructions:

When you press the “**Air Removal**” on the commissioning function setting page, the corresponding setting page will appear, where you can select “**Air**” (turned on in the direction of heating), “**Water tank**” (turned on in the direction of DHW) or “**Off**”.

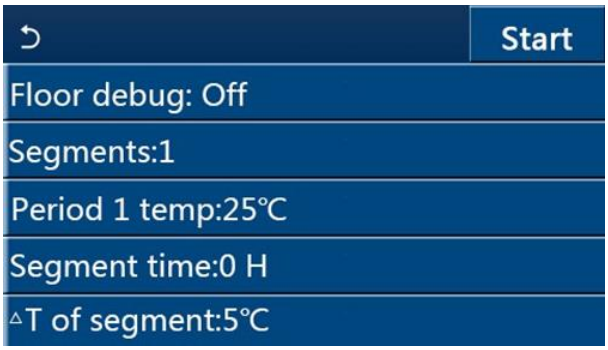
Notes:

- This setting remains stored in memory in case of power failure.
- This setting can only be activated when the unit is turned off. When this parameter is set to “**Air**” or “**Water tank**”, the unit cannot be turned on.

3.2.4.10 Floor Debug

Operation instructions:

1. When you press the “**Floor Debug**” on the commissioning function setting page, the corresponding setting page will appear.



2. On the setting page, you can set the parameters “**Floor debug**”, “**Segments**”, “**Period 1 temp**”, “**Segment time**”, and “**ΔT of segment**”.

No.	Full name	Displayed name	Range	Default	Step
1	Floor debug switch	Floor debug	On / Off	Off	/
2	Number of segments	Segments	1–10	1	1
3	The temperature of the first segment	Period 1 temp	25–35 °C 77–95 °F	25°C 77°F	1°C
4	Duration of each segment	Segment time	12–72 hours	0	12 hours
5	The temperature difference of each segment	ΔT of segment	2–10 °C 36–50 °F	5°C 41°F	1 °C

3. When this setting is finished, press “**Start**” to save the setting and the function will start; press “**Stop**” to stop the function.

Notes:

- This function can only be activated when the unit is turned off. If you try to set it up while the unit is turned on, a warning window “**Please turn off the system first!**” will appear.
- When this function has been activated, the On/Off operation will be disabled. If you press the On/Off switch, the message “**Please disable the floor debug!**” will appear.
- When the “**Floor debug**” function has been activated, the “**Weekly Timer**”, “**Clock timer**”, “**Temp. timer**”, and “Preset mode” will be deactivated.

- The “**Emergen. mode**”, “**Disinfection**”, “**Holiday mode**”, “**Manual defrost**”, “**Forced mode**”, and “**Refrigerant recovery**” cannot be activated simultaneously with the “**Floor debug**” function. If you try to do so, a warning window “**Please disable the floor debug!**” will appear.
- After a power failure, the “**Floor debug**” function will be deactivated and its running time will be reset to zero.
- When the “**Floor debug**” function has been activated, the “**T-floor debug**” and “**Debug time**” valuescan be viewed.
- When the "**Floor debug**” function has been activated and is working normally, the corresponding icon appears at the top of the menu page.
- Before activating the “**Floor debug**” function, make sure that the “**Segment time**” value is not zero. If it is zero, a warning window “**Segment time wrong!**” will appear. In this case, the “**Floor debug**” function can only be activated after changing the “**Segment time**” value.

3.2.4.11 Manual Defrost

Operation instructions:

When you press the “**Manual defrost**” on the commissioning function setting page, the corresponding setting page will appear.

Notes:

- This setting does not remain stored in memory in case of power failure.
- This setting can only be activated when the unit is turned off. When this function has been activated, the unit cannot be turned on.
- The defrosting will be terminated when the defrosting temperature reaches 20 °C or the defrosting time reaches 10 minutes.

3.2.4.12 Force Mode

Operation instructions:

1. When you press the “**Force mode**” on the commissioning function setting page, the corresponding setting page will appear.
2. On the “**Force mode**” setting page, you can select “**Force-cool**”, “**Force-heat**”, or “**Off**” option. When the “**Force-cool**” or “**Force-heat**” is set, the control panel goes directly back to the Menu page. If you press any item except the ON/OFF switch, a warning window “**The force-mode is running!**” will appear. In this case, the “**Force mode**” can be terminated by pressing the ON/OFF switch.

Notes:

- This function can only be performed if the unit has just been reconnected to the power supply and has not yet been turned on. If the unit has already been put into operation, this function is unavailable, and a warning “**Wrong operation!**” will appear.
- This setting does not remain stored in memory in case of power failure.

3.2.4.13 Gate-Ctrl. (Control With Access Card)

Operating instructions:

When you press “**Gate-Ctrl.**” on the commissioning function setting page, the corresponding setting page will appear.

Notes:

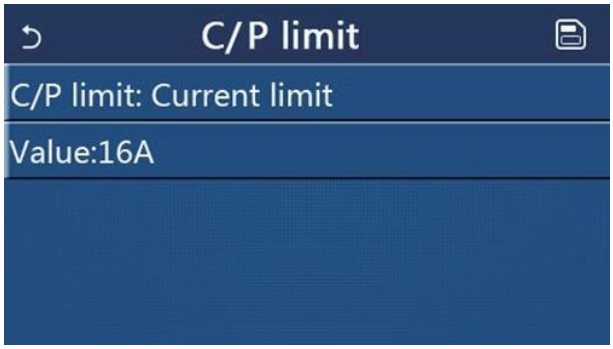
- When the “**Gate-Ctrl.**” function has been activated, the control panel will detect the status of the card reader. When the card has been inserted into the card reader, the unit will work normally. When the card is pulled out, the controller immediately turns off the unit and returns to the home page. In this case, the device cannot be controlled and only a notification is displayed when the screen is touched. The unit will resume normal operation only after the card is inserted into the card reader, and the on/off status of the control panel will be restored as it was before the card was pulled out.
- This setting remains stored in memory in case of power failure.

3.2.4.14 Current Limit/Power Limit

Operation instructions:

1. When you press the “**C/P limit**” on the commissioning function setting page, you can set it to “**Off**”, “**Current limit**”, or “**Power limit**”.
2. When the “**Off**” is set, neither the current limit nor the power limit can be set. When the “**Current Limit**” or “**Power Limit**” is set, the corresponding value can be set.

3. Press the “**Save**” icon to save the settings.



Notes:

- This setting remains stored in memory in case of power failure.

3.2.4.15 Address

Operation instructions:

When you press “Address” on the commissioning function setting page, you can set the address.

- Notes:
- It is used to set the address of the control panel so that it can be connected to the central control system.
- This setting remains stored in memory in case of power failure.
- The setting range is 1–125 and 127–253.
- The default address when the power is first connected is “1”.

3.2.4.16 Refrigerant Recovery

Operation instructions:

When you press the “**Refri. recovery**” on the commissioning function setting page, the corresponding setting page will appear.

When the parameter “**Refri. recovery**” is set to “On”, the control panel will go back to the home page. In this case, the control panel does not perform any operation except turning on/off, and a dialogue box with the warning “**The refrigerant recovery is running!**” will appear instead. Press the ON/OFF switch to quit the refrigerant recovery mode.

Notes:

- This function can only be performed if the unit has just been reconnected to the power supply and has not yet been turned on. If the unit has already been put into operation, this function is unavailable, and a warning “**Wrong operation!**” will appear.
- This function is not stored in memory in case of power failure.

3.2.4.17 Tank Heater (Control Logic of the Water Tank Heater)

Operation instructions:

When you press the “**Tank heater**” on the commissioning function setting page, the control logic setting page for the water tank heater will appear.

Notes:

- If the water tank is not available, a message “**Reserved**” will appear.
- This setting can only be activated when the unit is turned off.
- This function can be stored in memory in case of power failure.
- Logic 1 The unit compressor and the water tank heater or optional electric heater can never operate simultaneously.
- Logic 2 When “**Heating/Cooling + Hot water**” mode has been set with water heating priority and $T_{set} \geq THP_{max} + \Delta T_{hot\ water} + 2$: if the tank water temperature reaches THP_{max}, the water tank electric heater will be turned on and will start heating the water, and at the same time the compressor will be turned in heating/cooling mode; the water tank electric heater and the compressor will be turned on together.

3.2.4.18 Gate-Ctrl Memory (Gate Control Memory)

Operation instructions:

When you press “**Gate-Ctrl. Memory**” the corresponding setting page will appear.

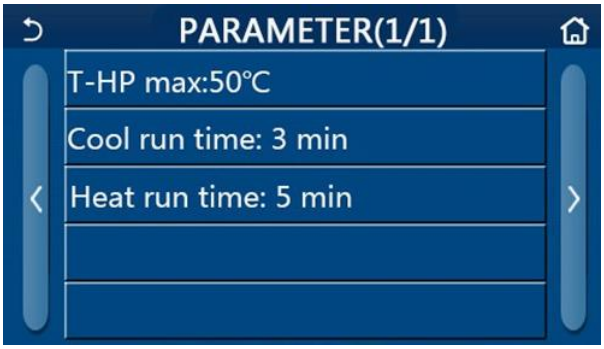
Notes:

- When this setting is enabled, the “**Gate-Ctrl**” setting is stored in memory in the case of a power failure.
- When this setting is disabled, the “**Gate-Ctrl**” setting is not stored in memory in the case of a power failure.

3.2.4.19 Parameter Setting

Operation instructions:

When you press “**PARAM**.” on the commissioning setting page, the PARAMETER setting page will appear.



Commissioning Parameter page

On this page, you can select the desired parameter and enter the corresponding setting page.

When you press “**OK**” after setting, the setting will be saved, and the unit will operate according to this setting. Otherwise, if you press “**Cancel**”, the settings will not be saved and the setting process will be terminated.

No.	Full name	Displayed name	Range		Default	Note
1	Max. HP leaving water temperature	T-HP max	40–55 °C	104–131 °F	50 °C / 122 °F	Not available on mini chillers.
2	Run time in Cooling mode	Cool run time	1–10 min		3 min [2-way valve turned off] 5 min [2-way valve turned on]	When the “**Cool run time**” elapses and the temperature difference remains in the standby zone, the unit will stop. Not available on mini chillers.
3	Run time in the Heating mode	Heat run time	1–10 min		3 min [2-way valve turned off] 5 min [2-way valve turned on]	When the “**Heat run time**” elapses and the temperature difference remains in the standby zone, the unit will stop. Not available on mini chillers.

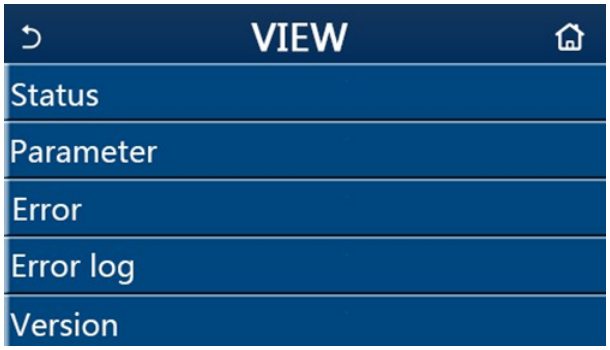
Notes:

- For parameters with different default values in different conditions, when the current conditions change, the corresponding default value changes accordingly.
- All parameters on this page remain stored in memory in case of power failure.

3.2.5 Viewing

Operation instructions:

When you press “**VIEW**” on the Menu page, you will enter the submenu page, as shown in the figure below.

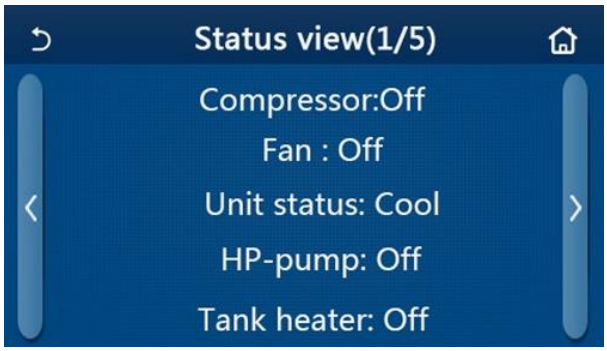


VIEW page

3.2.5.1 Status Viewing

Operation Instructions:

When you press “**Status**” on the “**VIEW**” page, you can view the status of the unit as shown in the figure below.



Status view page

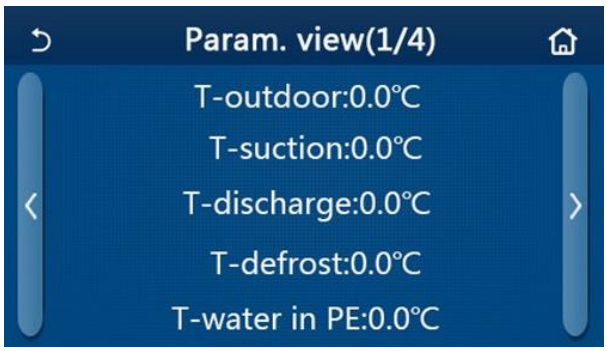
Status list

No.	Full name	Displayed name	Status	Notes
1	Status of the compressor	Compressor	On / Off	/
2	Status of the fan	Fan	On / Off	/
3	Status of the unit	Unit status	Cool / Heat / Hot water / Off	“Cool” is not available on units designed only for heating.
4	Status of the water pump	HP-pump	On / Off	/
5	Status of the water tank heater	Tank heater	On / Off	For mini chillers, “NA” is displayed
6	Status of the 3-way valve 1	3-way valve 1	–	/
7	Status of the 3-way valve 2	3-way valve 2	On / Off	For mini chillers, “NA” is displayed
8	Status of the compressor crankcase heater	Crankc. heater	On / Off	/
9	Status of the heater 1 of the main unit	HP-heater 1	On / Off	/
10	Status of the heater 2 of the main unit	HP-heater 2	On / Off	/
11	Status of the chassis heater	Chassis heater	On / Off	/
12	Status of the heat exchanger heater	Plate heater	On / Off	/
13	Status of the system defrosting	Defrost	On / Off	/
14	Status of the system oil return	Oil return	On / Off	/
15	Status of the thermostat	Thermostat	Off / Cool / Heat	“Cool” is not available on the heating-only units.
16	Status of the additional heat source	Other thermal	On / Off	/
17	Status of the 2-way valve	2-way valve	On/Off	/
18	Status of the freeze protection	HP-Antifree	On / Off	/
19	Status of the access card reader	Gate-Ctrl.	Card in / Card out	/
20	Status of the 4-way valve	4-way valve	On/Off	/
21	Status of the disinfection	Disinfection	Off / Running / Done / Fail	/
22	Status of the flow switch	Flow switch	On / Off	/

3.2.5.2 Parameter Viewing

Operation Instructions

1. On the “**VIEW**” page, if you press “**Parameter**”, you can view the individual parameters of the unit, as shown in the figure below.



Parameter view page

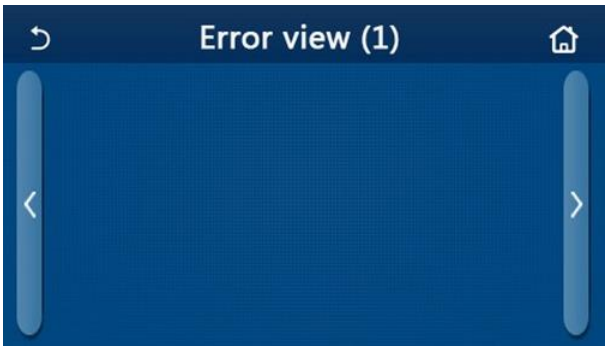
Parameter list

No.	Full name	Displayed name	Note
1	Outdoor temperature	T-outdoor	/
2	Suction temperature	T-suction	/
3	Discharge temperature	T-discharge	/
4	Defrosting temperature	T-defrost	/
5	The entering water temperature of the plate heat exchanger	T-water in PE	/
6	The leaving water temperature of the plate heat exchanger	T-water out PE	/
7	The leaving water temperature of the auxiliary heater	T-optional water Sen.	/
8	Water tank temperature	T- water ctrl.	/
9	Target floor preheating temperature	T-floor debug	/
10	Floor preheating run time	Debug time	/
11	Liquid pipe temperature	T-liquid pipe	/
12	Gas pipe temperature	T-gas pipe	/
13	Economizer inlet temperature	T-economizer in	/
14	Economizer outlet temperature	T-economizer out	/
15	Remote room temperature measured by an external sensor	T-remote room	For mini chillers, “NA” is displayed
16	Discharge pressure	Dis. pressure	/
17	Weather-dependent target temperature	T-weather depend	/

3.2.5.3 Error Viewing

Operation Instructions

On the “**VIEW**” page, if you press “**Error**”, you can view errors of the unit, as shown in the figure below.



Error view page

Notes:

- The control panel can display errors in real time. All errors will be listed on these pages.
- The maximum is 5 errors displayed per page. Others can be viewed by scrolling through these pages using the arrow keys.

Error list

No.	Full name	Displayed name
1	Ambient temperature sensor error	Ambient sensor
2	Defrosting temperature sensor error	Defrost sensor
3	Discharge temperature sensor error	Discharge sensor
4	Suction temperature sensor error	Suction sensor
5	Economizer inlet temperature sensor error	Econ. in sens.
6	Economizer outlet temperature sensor error	Econ. in sens.
7	Outdoor fan error	Outdoor fan
8	High-pressure protection	High pressure
9	Low-pressure protection	Low pressure
10	Compressor discharge high-pressure protection	Hi-discharge
11	Capacity DIP switch error	Capacity DIP
12	Communication error between the outdoor and indoor main boards	ODU-IDU Com.
13	Communication error between the outdoor main board and the drive board	Drive-main com.
14	Communication error between the display panel and indoor main board	IDU Com.
15	High-pressure sensor error	HI-pre. sens.
16	Outlet water temperature sensor error at the plate heat exchanger of the heat pump	Temp-HELW
17	Outlet water temperature sensor error at the auxiliary electric heater of the heat pump (for mini chillers, “NA” is displayed)	Temp-AHLW
18	Inlet water temperature sensor error at the plate heat exchanger of the heat pump	Temp-HEEW
19	Water tank temperature sensor error	HI-pre. sens.
20	External room temperature sensor error	T-Remote Air
21	Heat pump flow switch protection	HP-Water Switch
22	Overheating protection of the auxiliary electric heater 1 of the heat pump	Auxi. heater 1
23	Overheating protection of the auxiliary electric heater 2 of the heat pump	Auxi. heater 2
24	Overheating protection of the water tank e-heater	Auxi. -WTH
25	DC bus under-voltage or voltage drop protection	DC under-vol.
26	DC bus over-voltage protection	DC under-vol.
27	AC current protection (input side)	AC curr. pro.
28	Defective IPM	IPM defective
29	Defective PFC	PFC defective
30	Start failure	Start failure
31	Phase loss	Phase loss
32	Driver communication error	Driver Com.
33	Driver resetting	Driver reset
34	Compressor overcurrent	Com. over-cur.
35	Overspeed	Overspeed
36	Current sensing circuit error or current sensor error	Current sen.
37	Desynchronization	Desynchronize
38	Compressor stalling	Comp. stalling
39	The radiator of IPM or PFC over-temperature	Overtemp.-mod.
40	The radiator of IPM or PFC temperature sensor error	T-mod. sensor
41	Charging circuit error	Charge circuit
42	AC input voltage error	AC voltage
43	Ambient temperature sensor error at the drive board	Temp-driver
44	AC contactor protection or input over-zero error	AC contactor
45	Temperature drift protection	Temp. drift
46	Protection in case of incorrect sensor connection (current sensor is not connected to the appropriate U or V phase)	Sensor con.
47	Communication error between the display panel and outdoor unit	ODU Com.
48	Refrigerant gas pipe temperature sensor error	Temp RGL
49	Refrigerant liquid pipe temperature sensor error	Temp RLL
50	4-way valve error	4-way valve

3.2.5.4 Error Log

Operation instructions:

When you press “**Error log**” on the “**VIEW**” page, the control panel goes to the Error log page, where you can view the error logs.

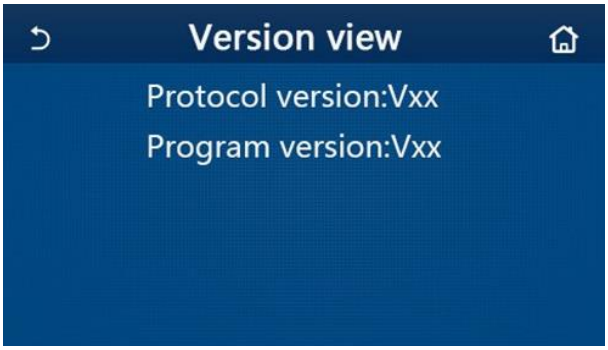
Notes:

- The error log can contain up to 20 error records. For each error, the name and time of occurrence are displayed.
- When the number of error records exceeds 20, the newest records will supersede the oldest ones.

3.2.5.5 Version Viewing

Operation instructions:

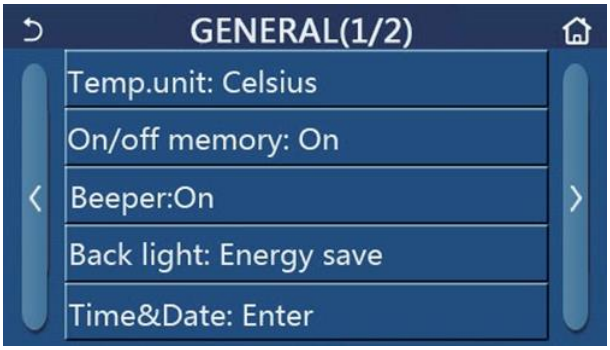
When you press “**Version**” on the “**VIEW**” page, the control panel goes to the Version view page, where you can view both the program version and the protocol version.



3.2.6 General Setting

Operation instructions:

When you press “**GENERAL**” on the Menu page, the control panel goes to the setting page, as shown in the figure below, where you can set the parameters “**Temp.unit**”, “**On/off memory**”, “**Beeper**”, “**Back light**”, “**Time & Date**”, and “**Language**”.



General setting page

General settings

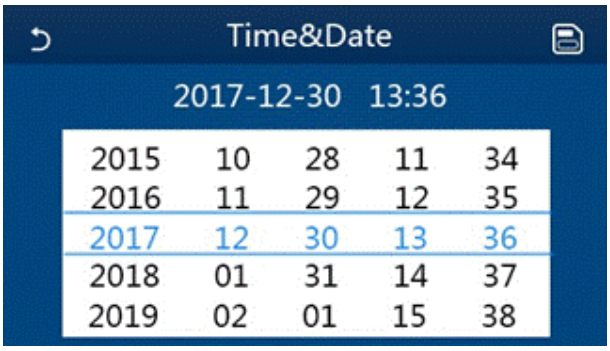
No.	Item	Range	Default	Notes
1	Temp. unit	°C/°F	°C	/
2	On/Off memory	On / Off	On	/
3	Beeper	On / Off	On	/

No.	Item	Range	Default	Notes
4	Back light	Lighted/Energy save	Energy save	**„Lighted“**: The control panel display will still be lit. **„Energy save“** When the display is not touched for 5 minutes, the back light turns off automatically but turns on again after any touch.
5	Time&Data	Enter	/	/
6	Language	Italiano/English/Español/ Nederlands/Français/ Deutsch/Български/Polski/ Türkçe/Magyar/Lietuvių/ Hrvatski/Čeština	English	/
7	WiFi	On / Off	On	/

3.2.6.1 Clock Setting

Operation instructions:

1. When you press “**Time&Data**” on the “**GENERAL**” setting page, the setting page will appear as in the figure below.



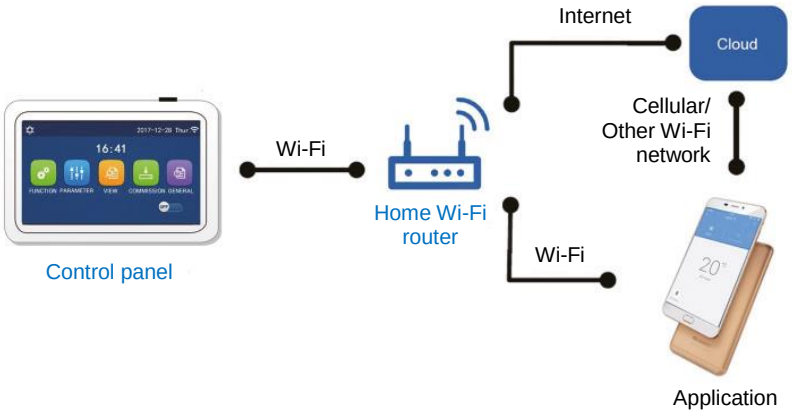
Time&Data page

2. You can scroll the columns to set the date and time values. If you press the “**Save**” icon, the setting will be saved and directly displayed, while if you press the “**Back**” icon, the setting will be cancelled, and the control panel will return directly to the “GENERAL” setting page.

Time&Data page

3.3 Smart Control

The control panel can be controlled remotely using a smartphone as shown in the image below.



Notes:

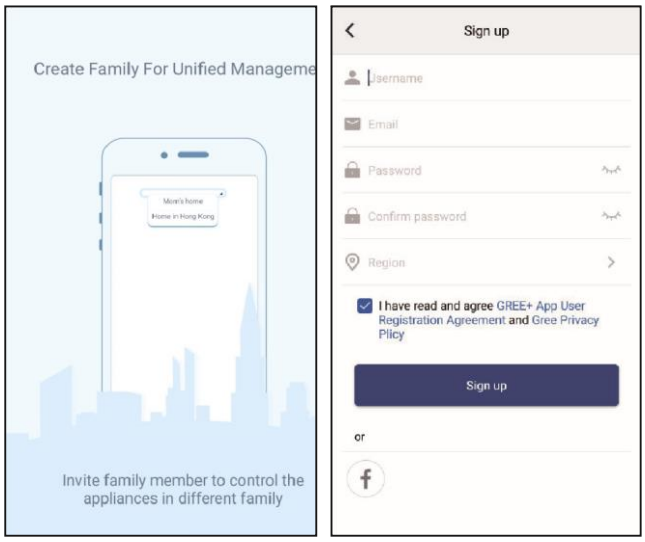
- Make sure your smartphone or tablet is running a standard Android or iOS operating system. You can find the specific version in the system settings.
- The Wi-Fi function does not support the Chinese Wi-Fi network name.
- The device can only be connected and controlled in Wi-Fi and 4G hotspot modes.
- A router with WEP encryption is not supported.
- The operating interface of the application is universal and its control functions may not completely correspond to the unit. The operating interface of the application may vary depending on the version of the application or the operating system. Refer to the current version.

3.3.1 Installing the EWPE SMART Application

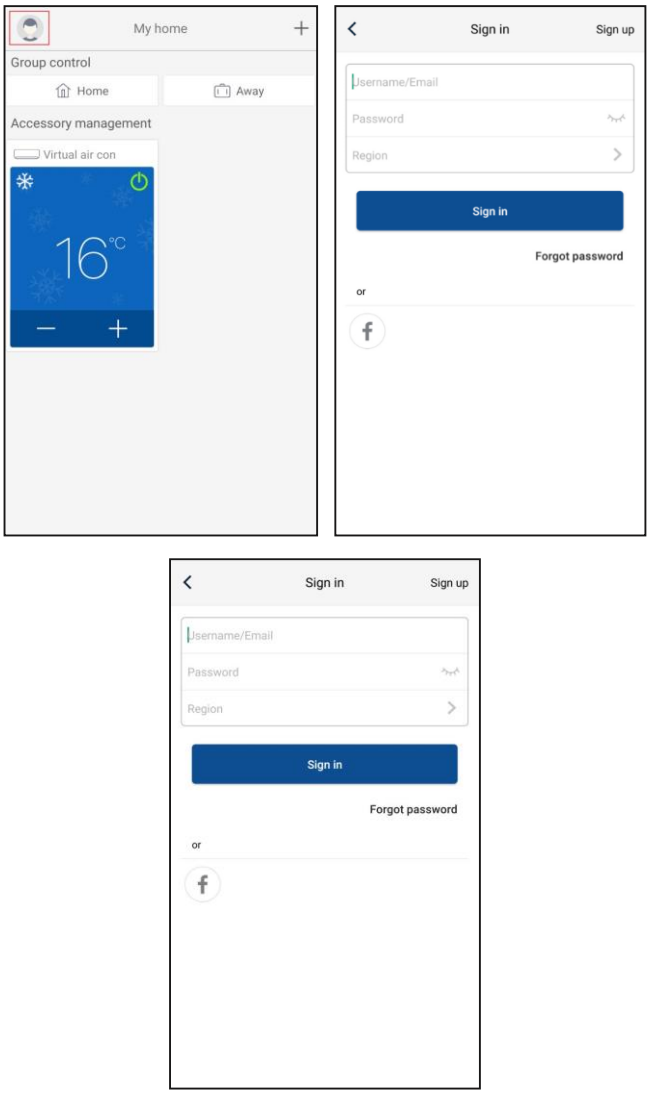
Operation instructions:

1. Use your smartphone to scan the following QR code to directly download and install the EWPE SMART app.

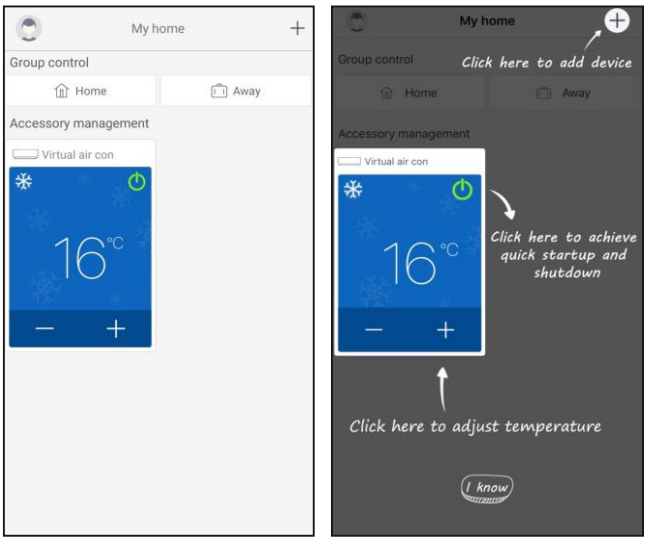
2. Open the EWPE SMART app and tap “**Sign up**” to register.

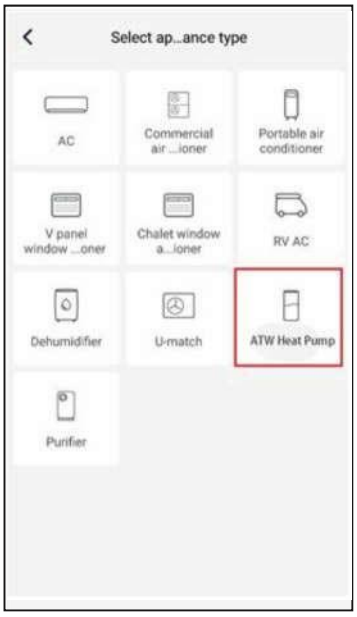


3. In addition to logging in at the inquiry interface, you can also enter the home page and log in by tapping the profile picture in the upper left corner.

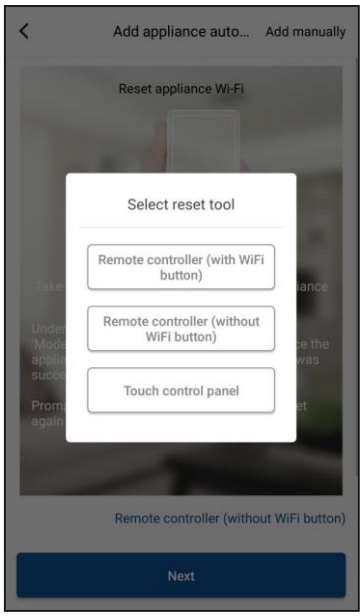


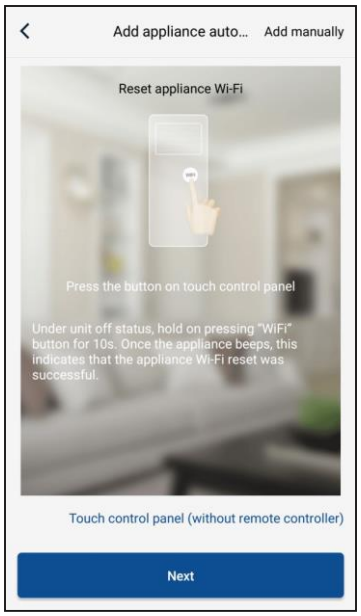
4. To add a device, tap the “+” in the upper right corner of the home page.

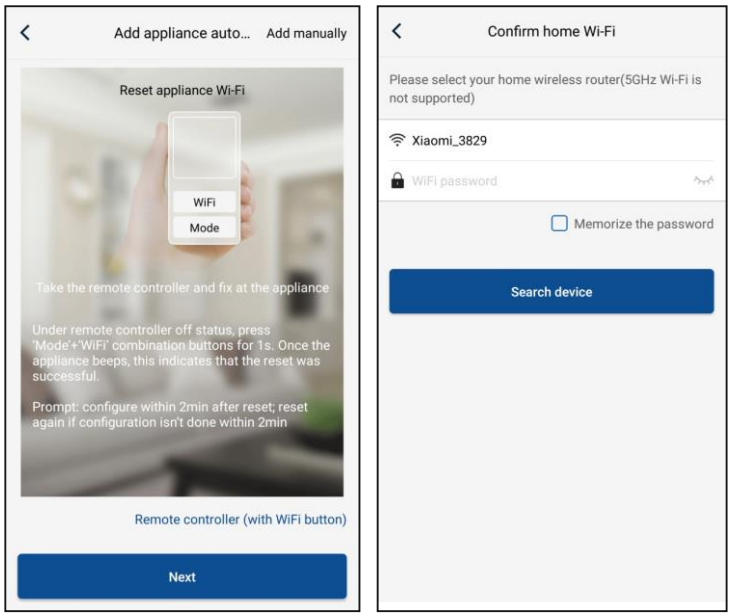




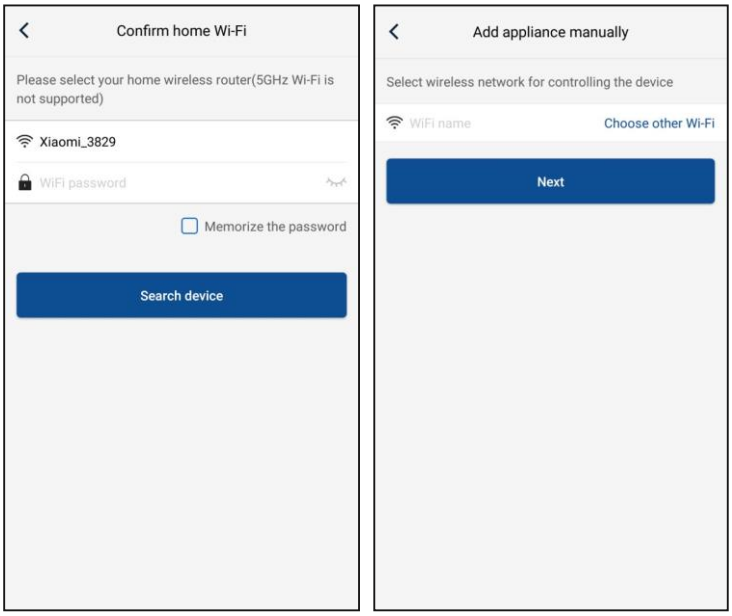
After selecting “**ATW Heat Pump**”, the application interface will display the relevant operating instructions.



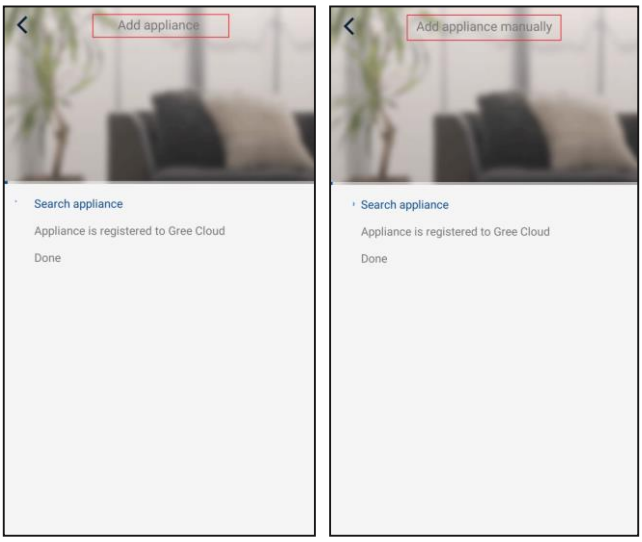




Reset the air conditioner (see operating instructions in the app interface) and tap “Next” to automatically add the home appliance (Wi-Fi password must be entered). Or, after installing and turning on the power of the air conditioner, tap “**Add appliance manually**” in the upper right corner and select the wireless network to control the appliance. Then confirm your home Wi-Fi network name and perform the configuration.

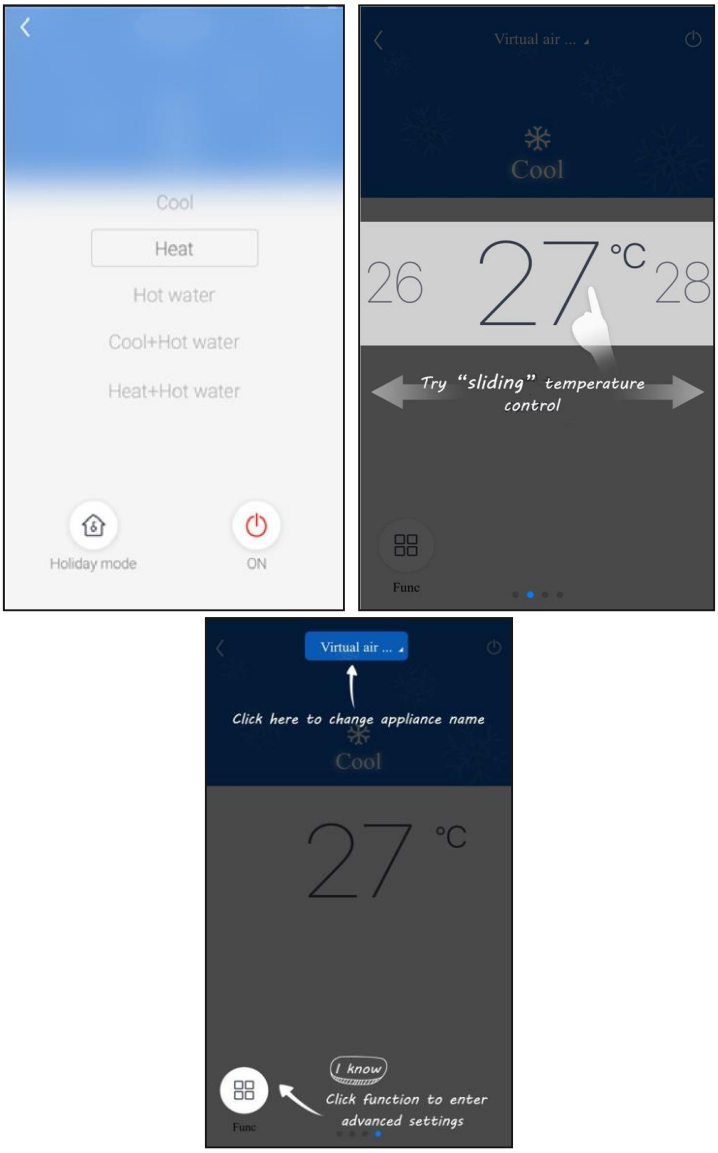


After resetting the device and entering the correct information, search the device and set up the configuration.

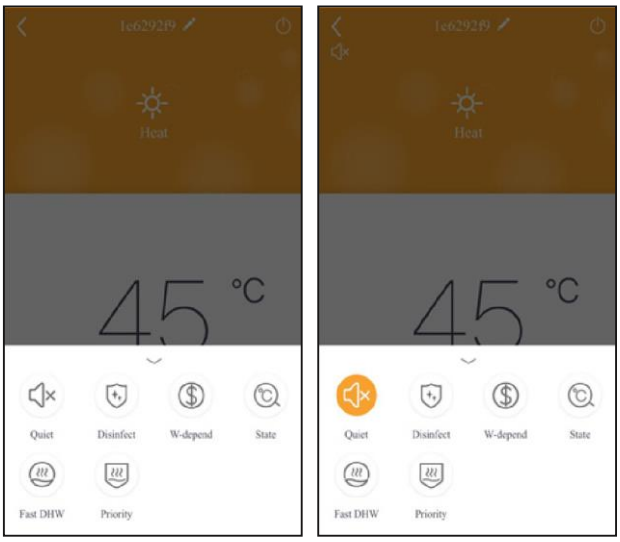


3.3.2 Setting of Main Functions

1. Set the mode and temperature.

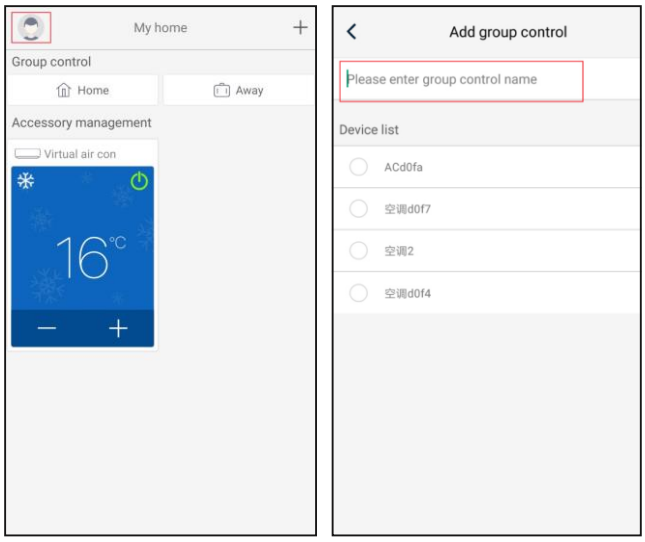


2. Tap “Func” in the bottom left corner of the device operation interface to enter the advanced settings.



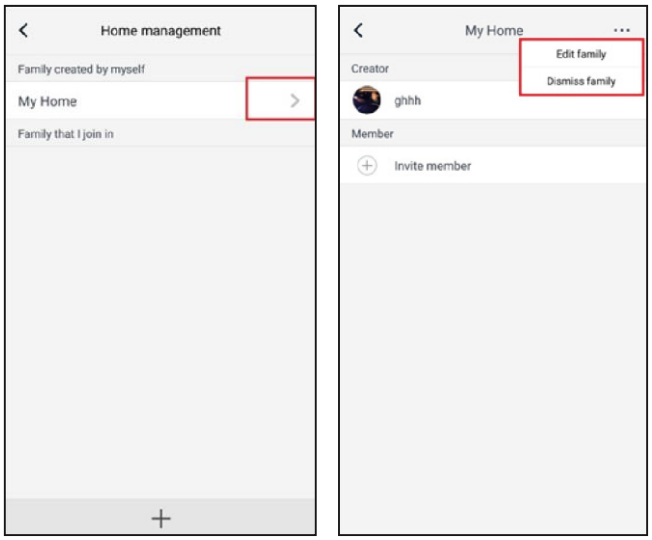
3.3.3 Setting of Other Functions

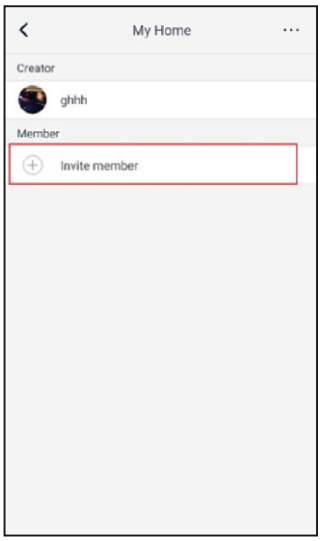
Tap the profile picture in the upper left corner of the home page and set the individual functions in the following menu.

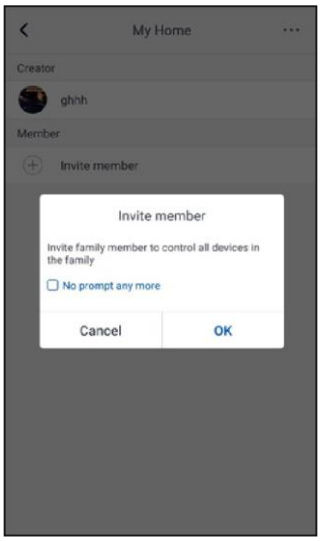


3.3.3.1 Home Management

Tap “**Home management**” to create or manage your family. You can also add family members according to the registered account.

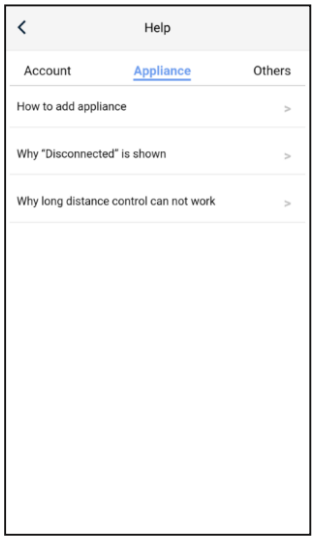


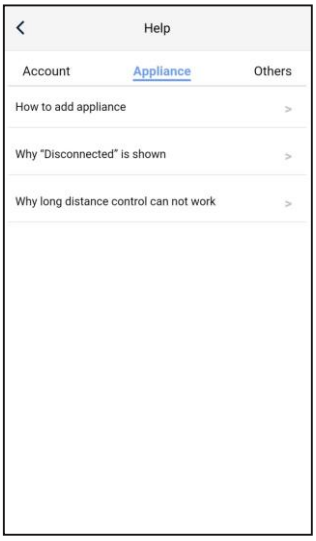


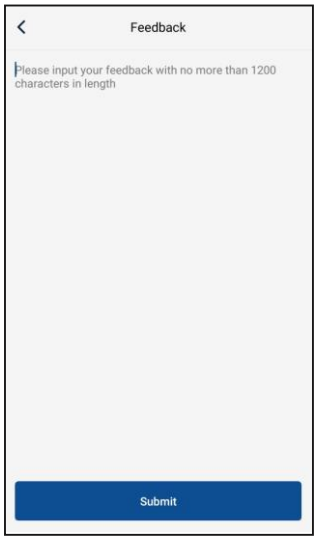


3.3.3.2 Help

Tap “Help” to view the operating instructions of the application.

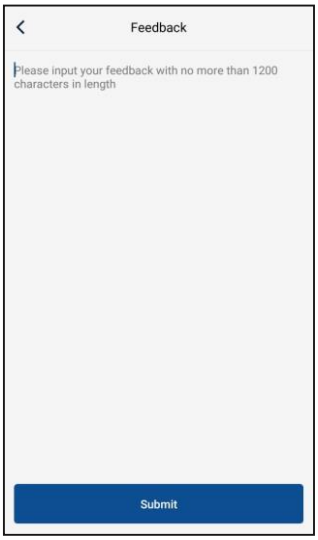






3.3.3.3 Feedback

Tap “Feedback” to submit your feedback.



UNIT INSTALLATION

1 Installation Guides

⚠ WARNING

- Installation should be performed by SINCLAIR qualified personnel, as improper installation may cause equipment malfunction, water leakage, electric shock, or fire.
- The unit should be installed on a foundation that can support it; otherwise, the unit may fall or even injure some people.
- All electrical installation should be done by a qualified electrician in accordance with local laws, standards, ordinances and regulations, as well as the User's Manual and this Service Manual. A suitable separate cable must be used to power the device, as an improper power supply could cause electric shock or fire.
- All electrical wiring should be safely and securely installed. Ensure that the terminal block and electrical wires are not subject to external forces; otherwise, they may become loose and cause a fire.
- The electrical cables should be routed properly so that the electrical box cover can be fixed well; otherwise, overheating of the terminal box, electric shock or fire may occur.
- Disconnect the power supply before touching any electrical component.

⚠ CAUTION

- The unit should be properly earthed (grounded). The earthing wire must not be connected to a gas or water pipe, a lightning rod, or a telephone line.
- A circuit breaker / RCD must be installed on the power supply; otherwise, there is a risk of electric shock.
- The drain pipe should be installed in accordance with the User's Manual and this Service Manual to ensure good water drainage and should be thermally insulated to prevent condensation. If the drain pipe is installed incorrectly, water could leak and subsequently wet the ceiling and furniture.
- Do not place the unit where there is oil mist, such as in the kitchen; otherwise, the plastics may age or crack, or the evaporator may become dirty, resulting in water leakage and poor performance.
- Do not place the unit where there is corrosive gas (such as sulfur dioxide); otherwise, the copper pipes or welded joints may be corroded and refrigerant may leak.
- Do not place the unit where there are flammable gases, carbon fibres, flammable dust or volatile flammable substances, as this may cause a fire.

⚠ SAFETY

- Always use protective clothing and other appropriate personal protective equipment (PPE) at the installation site.
- Smoking or working while intoxicated is not allowed at the installation site.
- When working with machinery and electrical equipment, do not wear gloves and tighten your cuffs. Do not perform maintenance on the device during operation.
- When using a tool with a cutting/sanding disc, stand away from the rotating disc.
- When installing the riser pipe, clean the opening and then cover it well. Do not drop any material down.
- The use of electric and gas welders must be approved in advance. When they are used, a fire extinguisher and an appropriately trained worker must always be prepared on the site. There must be no flammable or explosive substances in the welding area.
- A suitable platform must be prepared for working high above the ground.

1.1 Place for Installation

(1) Do not place the device in direct sunlight.

(2) The device must be installed on a solid base.

(3) Check that the hanging rods, ceiling and building structure are strong enough to support the weight of the air conditioner unit.

(4) Do not install the unit under windows or in the space between buildings to prevent the unit's operating noise from entering the room.

(5) The airflow at the air inlet/outlet must not be blocked by anything.

(6) Install the device in a well-ventilated area so that it can draw in and blow out enough air.

(7) Do not install the device in a place where there are flammable or explosive substances, or where there is a lot of dust, salt mist or polluted air.

(8) Select a place where a drain pipe can be easily connected to the unit.

(9) Do not install the unit in a place where there are flammables or explosives, or where flammable gas may leak.

(10) Do not install the unit in a place where there are corrosive gases, a lot of dust, salt mist, smoke, or high humidity.

1.2 Warning

(1) Installation of the unit must comply with national standards and local safety regulations.

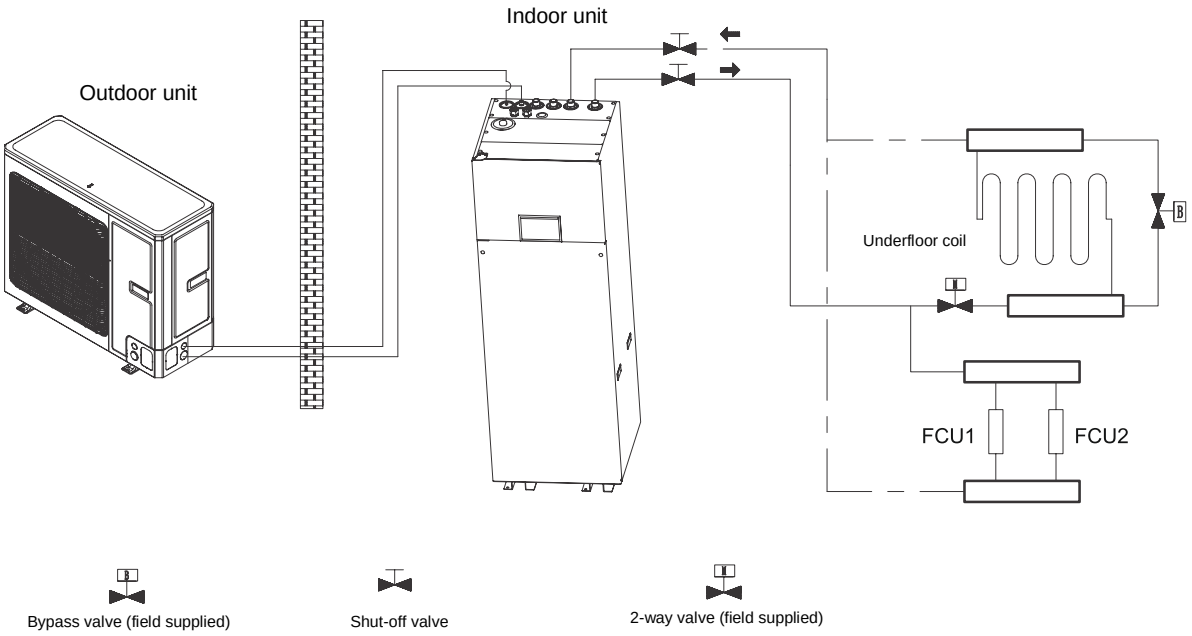
(2) The quality of the installation will directly affect the normal use of the air conditioner. The user must not perform the installation himself. After purchasing this device, contact your dealer. Professional personnel will perform installation and testing according to the Installation Manual.

(3) Do not connect power until all installation work is completed.

2 Installation Instructions

2.1 Installation Examples

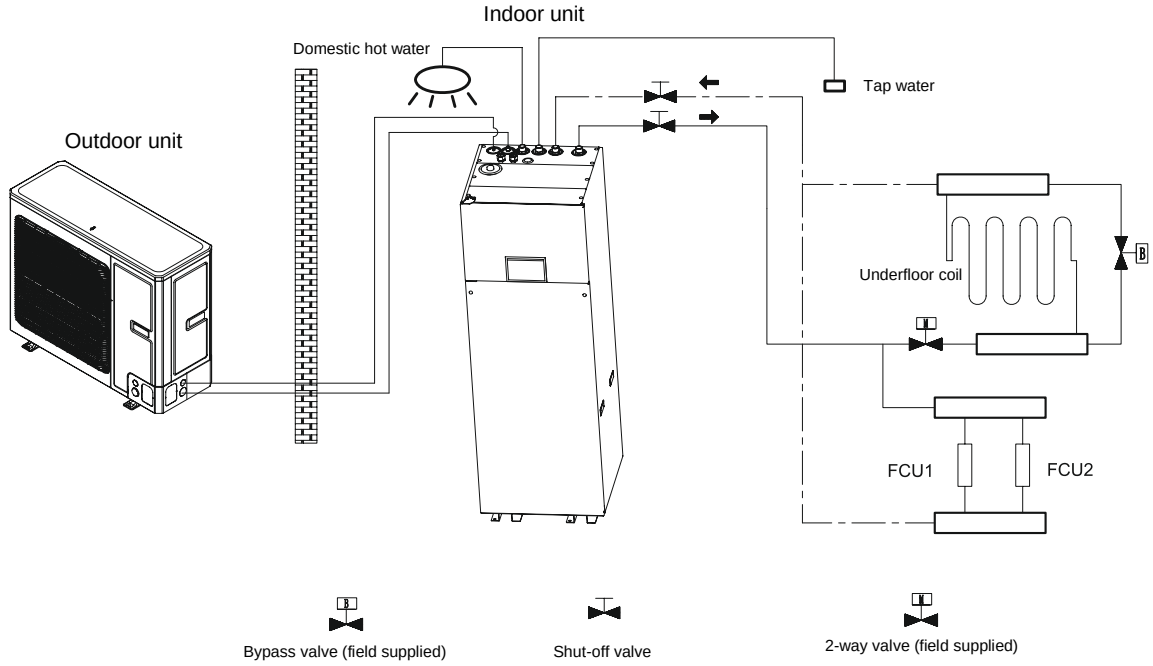
EXAMPLE 1: Connection of underfloor coil for heating and cooling



Note:

A bypass valve must be installed to ensure a sufficient water flow rate. A bypass valve should be installed at the manifold.

EXAMPLE 2: Connection of sanitary water tank and underfloor coil



Note:

The utility water tank should be equipped with an internal electric heater to ensure sufficient water heating during very cold days.

2.2 Preparing the Installation

(1) Installation of the air conditioner must comply with national standards and relevant safety regulations.

(2) The quality of the installation will directly affect the normal use of the air conditioner. The user must not perform the installation himself. After purchasing this device, contact your dealer. Professional staff will install and test the equipment according to the installation instructions.

(3) Do not connect the power supply until all installation work is completed.

2.3 Choosing a Location for Installation

(1) The outdoor unit must be installed on a solid base.

(2) Do not install the unit under windows or in the space between buildings to prevent the operating noise from entering the room.

(3) The airflow at the air intake/exhaust must not be blocked by anything.

(4) Install the device in a well-ventilated area so that it can draw in and blow out enough air.

(5) Do not install the unit in a place where there are flammable or explosive substances, or where there is a lot of dust, salt mist or polluted air.

2.4 Installation of the Outdoor Unit

2.4.1 Installation Instructions

(1) Installation of the unit must comply with national standards, directives and ordinances, and relevant safety regulations.

(2) The quality of the installation will directly affect the normal use of the air conditioner. The user must not perform the installation himself. After purchasing this device, contact your dealer. Professional personnel will perform installation and testing according to the Installation Manual.

(3) Do not connect power until all installation work is completed.

2.4.2 Installation of the Outdoor Unit

(1) The outdoor unit must be installed on a solid base.

(2) The outdoor unit should be installed close to the indoor unit to minimize the length and number of bends of the connecting pipes.

(3) Do not install the unit under windows or in the space between buildings to prevent the unit’s operating noise from entering the room.

(4) The airflow at the air inlet/outlet must not be blocked by anything.

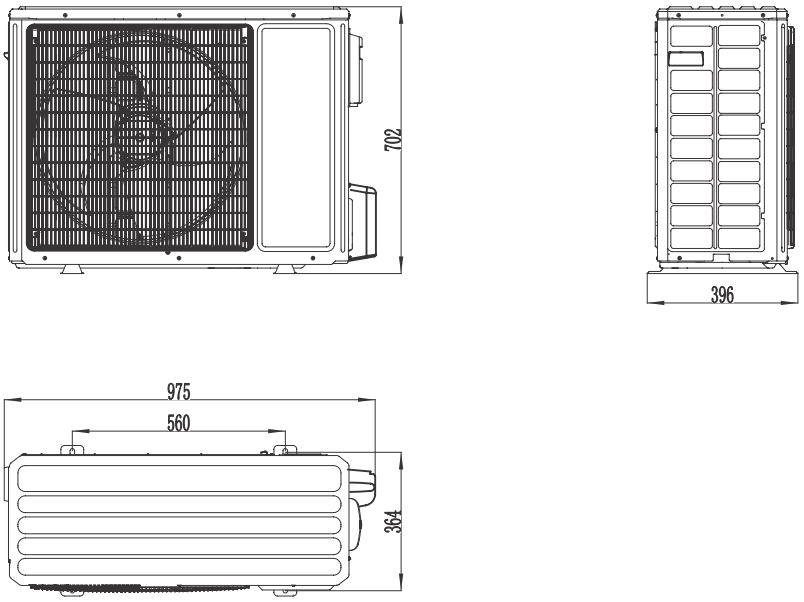
(5) Install the device in a well-ventilated area so that it can draw in and blow out enough air.

(6) Do not install the device in a place where there are flammable or explosive substances, or where there is a lot of dust, salt mist or polluted air.

2.4.3 Outline Dimensions of the Outdoor Unit

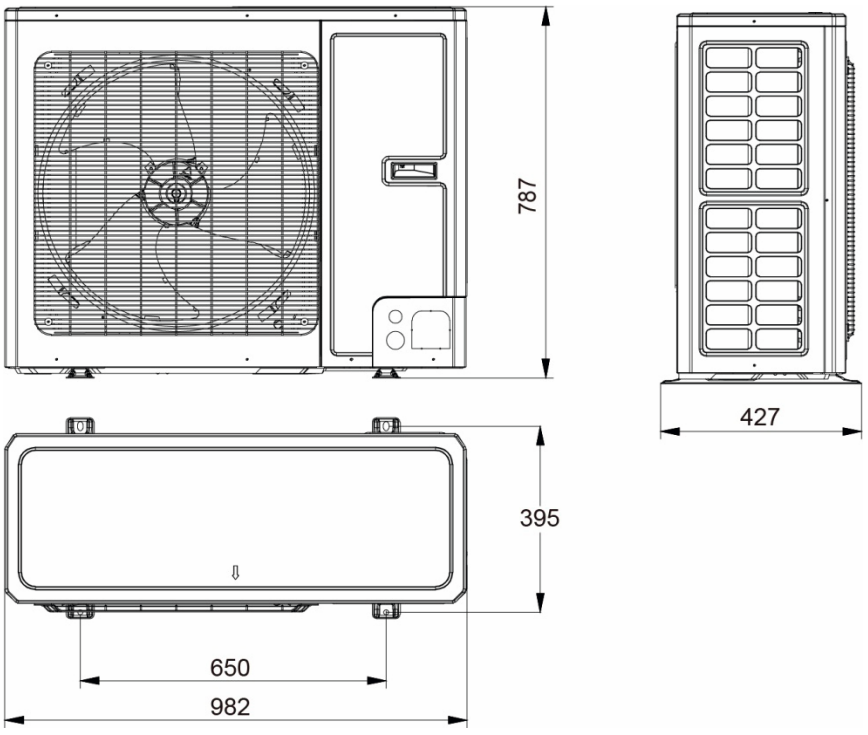
(1) GSH-40ERB, GSH-60ERB

Unit: mm



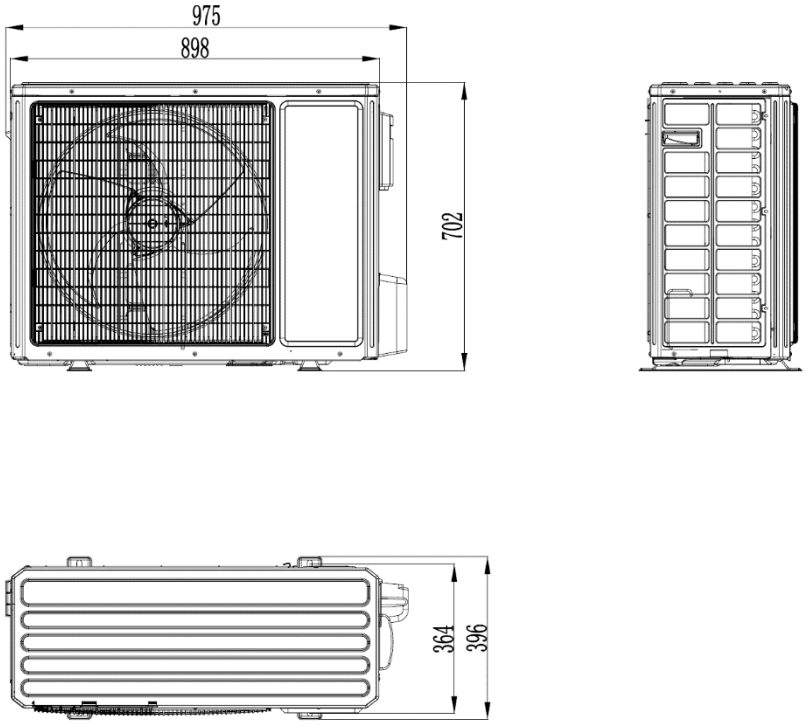
(2) GSH-80ERB, GSH-100ERB, GSH-80ERB-3, GSH-100ERB-3

Unit: mm



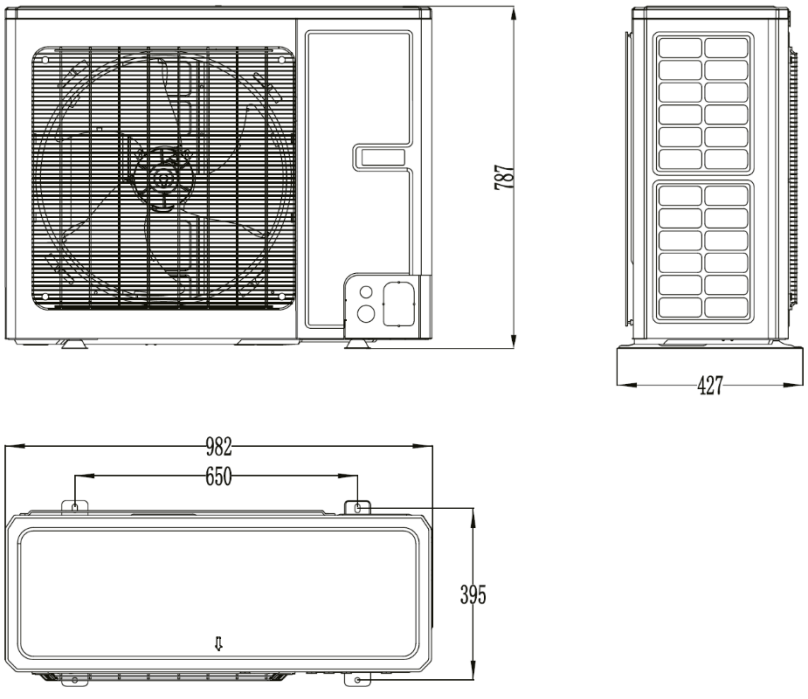
(3) GSH-40ERB2, GSH-60ERB2

Unit: mm

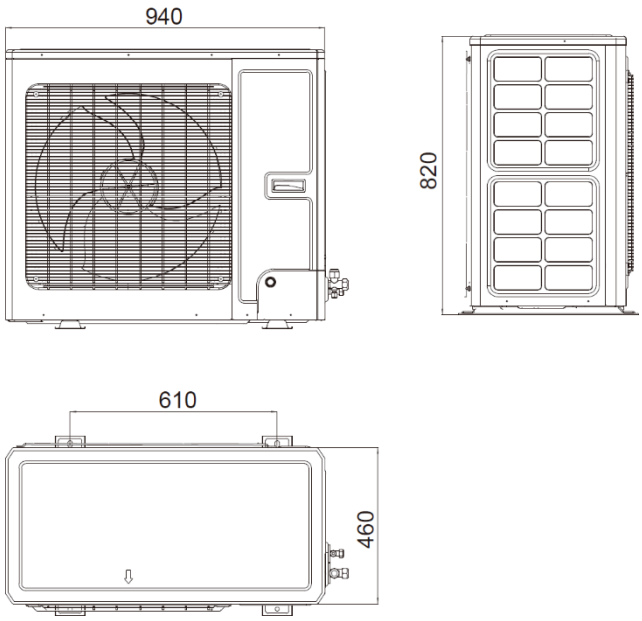


(4) GSH-80ERB2, GSH-100ERB2

Unit: mm



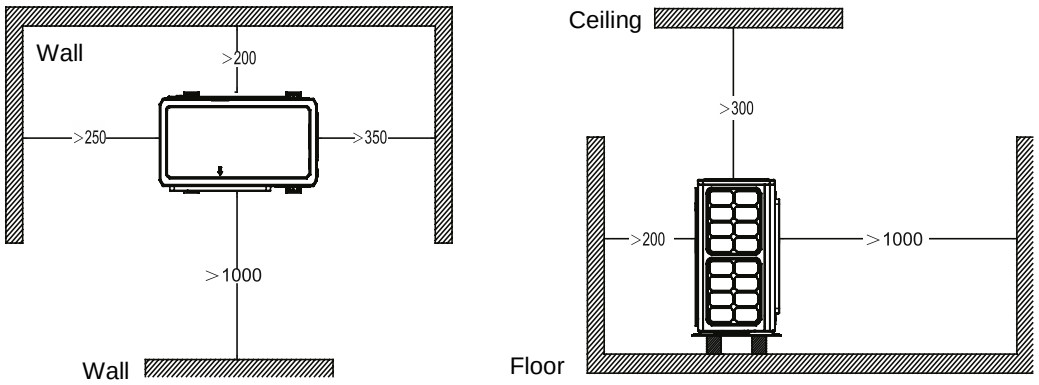
(5) GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3, GSH-120ERB, GSH-140ERB, GSH-160ERB



Description:

No.	Name	Notes	
1	Liquid-side service valve	1/4	GSH-40ERB, GSH-60ERB GSH-80ERB, GSH-100ERB GSH-40ERB2, GSH-60ERB2 GSH-80ERB2, GSH-100ERB2 GSH-120ERB, GSH-140ERB GSH-160ERB, GSH-80ERB-3 GSH-100ERB-3, GSH-120ERB-3 GSH-140ERB-3, GSH-160ERB-3
2	Gas-side service valve	1/2	Gas-side service valve GSH-80ERB,GSH-100ERB GSH-40ERB2, GSH-60ERB2 GSH-80ERB2, GSH-100ERB2 GSH-80ERB-3, GSH-100ERB-3
3	Gas-side service valve	5/8	GSH-120ERB-3, GSH-140ERB-3 GSH-160ERB-3, GSH-120ERB GSH-140ERB, GSH-160ERB

2.4.4 Space Required for Installation



2.4.5 Instructions for Installing the Outdoor Unit

(1) When moving the outdoor unit, it is necessary to use 2 ropes long enough to secure the unit from 4 sides. When transporting the unit suspended on ropes, it must not be inclined by more than 40° from the vertical; otherwise, it could tip over.

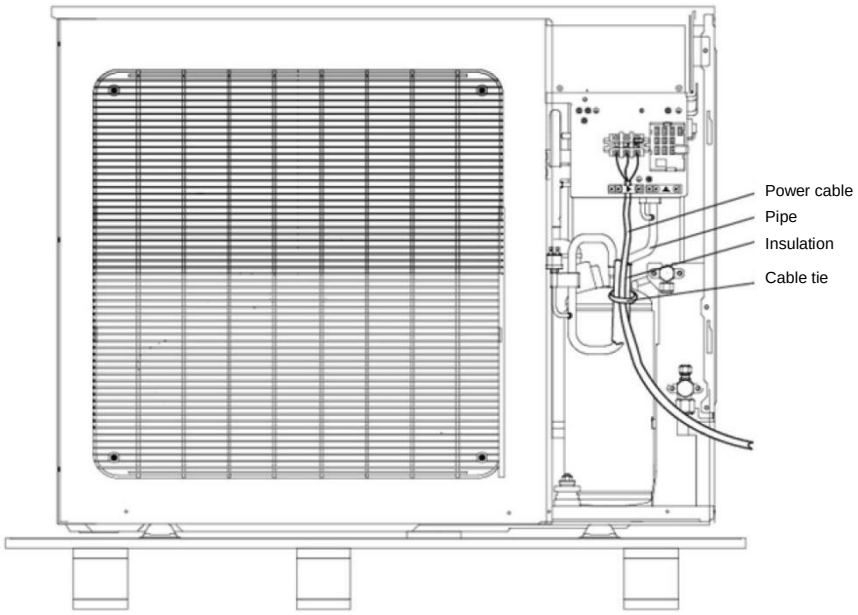
(2) Use M12 screws to mount the legs to the mounting frame.

(3) The outdoor unit should be installed on a concrete base with a height of 10 cm.

(4) The space requirements for installing the unit are shown in the following figure.

(5) The outdoor unit must only be lifted using the designated hanging holes. When lifting the unit, be careful not to damage it. Protect metal parts from impacts and scratches to prevent them from rusting.

(6) Support the panel with your hand when loosening and tightening the cable clasp screw. After connecting the power cable, fasten the cable to the pipe with the supplied cable tie as shown below.



2.4.6 Safe handling of Flammable Refrigerant

- Qualification requirements for service personnel performing installation and maintenance

  All personnel working on the air conditioning system should have a valid certificate issued by an authorized organization and a qualification for working with refrigeration systems recognized in this industry.

  If other technicians are required to maintain or repair the equipment, they should be supervised by a person qualified in the use of flammable refrigerants. Equipment should only be repaired according to the procedure recommended by the equipment manufacturer.

- Installation notes

The unit must not be used in a room where there is a source of ignition (e.g. lit fireplace, gas burner, electric heater with hot coils).

It is forbidden to drill holes in the refrigerant pipe or throw it into a fire.

The unit may only be installed in a room that has more than the minimum floor area. The minimum room area is stated on the nameplate or in the following table.

After installation, the unit must be tested for refrigerant leakage.

	Refrigerant charge (kg)	≤1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2	2.1	2.2	2.3	2.4	2.5
Minimum room area (m^2)	Floor-mounted	/	14.5	16.8	19.3	22	24.8	27.8	31	34.3	37.8	41.5	45.4	49.4	53.6
	Window-mounted	/	5.2	6.1	7	7.9	8.9	10	11.2	12.4	13.6	15	16.3	17.8	19.3
	Wall-mounted	/	1.6	1.9	2.1	2.4	2.8	3.1	3.4	3.8	4.2	4.6	5	5.5	6
	Ceiling-mounted	/	1.1	1.3	1.4	1.6	1.8	2.1	2.3	2.6	2.8	3.1	3.4	3.7	4

Maintenance instructions

(1) Check that the maintenance area and room area meet the specified requirements.
  – The device is only allowed to operate in rooms that meet the minimum space requirements.

(2) Check that the maintenance area is well ventilated.
  – Continuous ventilation must be ensured during operation.

(3) Check the maintenance area for open flames or potential sources of ignition.
  – There must be no open fire in the maintenance area and a warning sign “No smoking” must be displayed.

(4) Check that the labels and signs on the device are in good condition.
  – Replace poorly visible or damaged warning signs.

- Soldering

  If you have to cut or solder cooling system pipes during maintenance, follow these steps:

  (a) Turn off the device and disconnect it from the power supply.

  (b) Recover the refrigerant.

  (c) Perform vacuuming.

  (d) Purge the tubes with nitrogen gas (N2)

  (e) Perform cutting or soldering.

  (f) Put the device into operation.

  Refrigerant should be stored in a special container.

  Make sure there is no open fire near the exhaust of the vacuum pump and that the area is well ventilated.

- Refilling the refrigerant

  (1) When filling, use equipment that is designed exclusively for R32 refrigerant. Take care to avoid cross-contamination of different types of refrigerants.

  (2) When filling the refrigerant, the refrigerant container should be in a vertical position.

  (3) After the filling is complete, stick a label on the device with the details of the added refrigerant.

  (4) Be careful not to overfill the system with refrigerant.

  (5) After the filling and before trial run, check for refrigerant leakage. Refrigerant leakage must also be checked after removing the equipment.

- Safety instructions for transport and storage

  (1) Before unloading and opening the transport container, check it with a flammable gas detector.

  (2) There must be no source of ignition in the place. Observe the smoking ban.

  (3) Comply with local regulations and laws.

2.5 Installation of the Indoor Unit

2.5.1 Selecting a Location for Installing the Indoor Unit

(1) Do not place the device in direct sunlight.

(2) Check that the hanging rods, ceiling and building structure are strong enough to support the weight of the air conditioner unit.

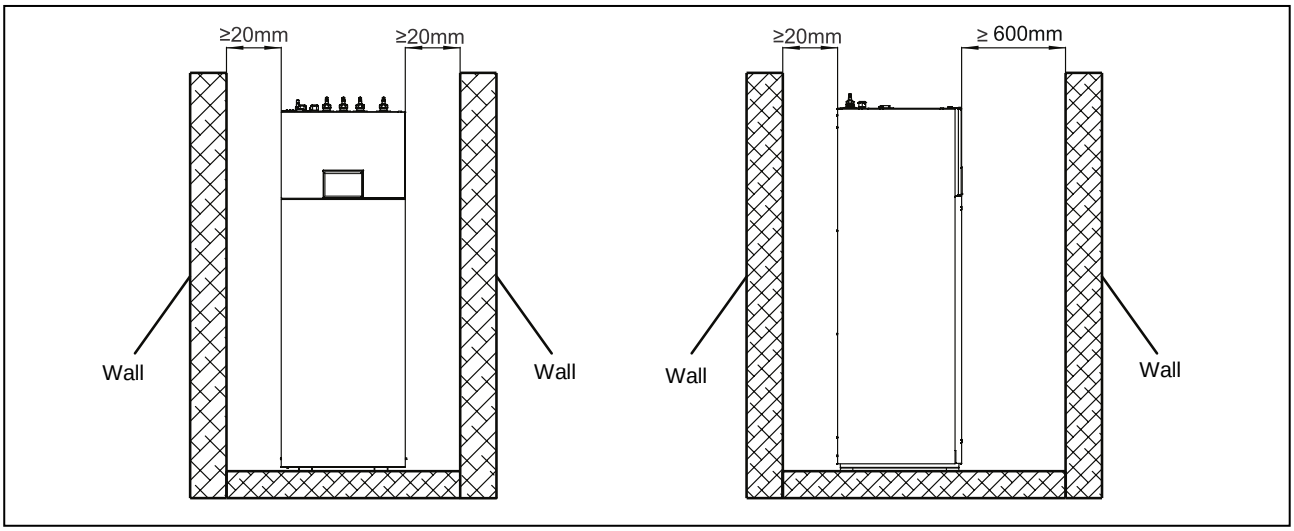
(3) Select a place where a drain pipe can be easily connected to the unit.

(4) Select a location where the connecting pipes between the indoor and outdoor units can be easily connected.

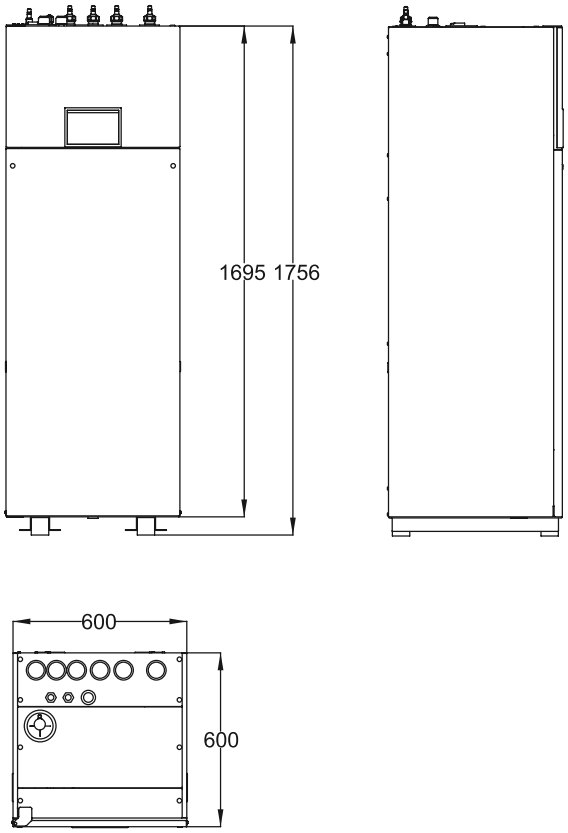
(5) Do not install the unit in a place where there are flammables or explosives, or where flammable gas may leak.

(6) Do not install the unit in a place where there are corrosive gases, a lot of dust, salt mist, smoke, or high humidity.

2.5.2 Space Required for Installation



2.5.3 Outline Dimensions of the Indoor Unit



Description:

No.	Name	Note	
1	Leaving water pipe	1″ male BSP	
2	Returning water pipe	1″ male BSP	
3	Liquid-side pipe	1/4	GSH-40TRB, GSH-60TRB GSH-80TRB, GSH-100TRB GSH-40TRB2, GSH-60TRB2 GSH-80TRB2, GSH-100TRB2 GSH-120TRB2, GSH-140TRB2 GSH-160TRB2, GSH-80TRB2-3 GSH-100TRB2-3, GSH-120TRB2-3 GSH-140TRB2-3, GSH-160TRB2-3
4	Gas-side pipe	1/2	GSH-40TRB, GSH-60TRB GSH-80TRB, GSH-100TRB GSH-80TRB2-3, GSH-100TRB2-3 GSH-40TRB2,GSH-60TRB2 GSH-80TRB2, GSH-100TRB2
5	Gas-side pipe	5/8	GSH-120TRB2-3, GSH-140TRB2-3 GSH-160TRB2-3, GSH-120TRB2 GSH-140TRB2, GSH-160TRB2

Water Tank Pressure Relief

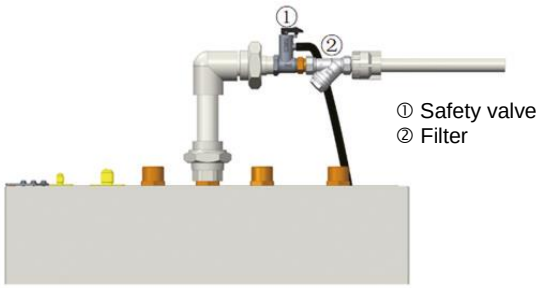
Water may drip from the drain pipe of the safety valve, so the end of this pipe must be left open to the air.

The pressure relief valve must be manually activated periodically to remove lime deposits and verify that it is not blocked.

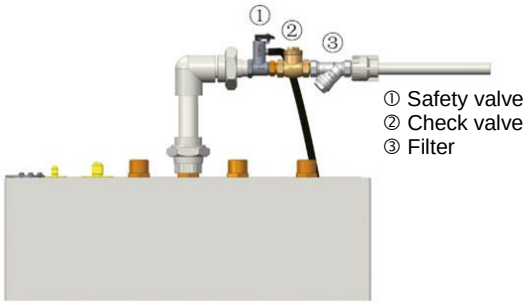
The drain pipe connected to the pressure relief valve must be installed in an environment where it cannot freeze, and so that it always points downwards.

Installation of the water tank safety valve

The pressure in the water tank will gradually increase during heating and therefore a safety valve is needed to reduce the pressure by discharging some water. If this valve is not installed or installed correctly, it could cause the water tank to become expanded, deformed, damaged, or even cause personal injury. The arrow → on the water tank safety valve must point towards the water tank. No shut-off or check valve can be placed between the safety valve and the water tank, as they could disable the function of the safety valve. A drain hose must be connected to the outlet of the safety valve. The valve and hose must be securely fastened. The drain hose should be led naturally downward into the floor drain sump and must not be bent upwards, twisted or kinked. The excess length of the drain hose in the floor drain sump should be cut off to reduce the risk of poor drainage or freezing of water in the hose at low ambient temperatures. The recommended activation pressure for the safety valve is 0.7 MPa, the same as for the water tank. Observe these requirements for the installation of the safety valve; otherwise, the normal function of the water tank may be affected.

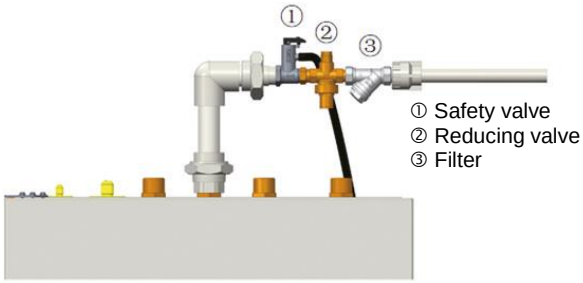


Installation mode 1: Safety valve on the water supply from the water network (inlet water pressure = 0.1–0.5 MPa)



Installation mode 2: Safety valve on the water inlet from the water network (inlet water pressure < 0.1 MPa)

In installation mode 2, a check valve is inserted before the safety valve. The check valve must be installed on the tap water pipe so that it is horizontal, its cap is at the top, and the direction of the arrow on the valve body is the same as the direction of the water flow.



Installation mode 3: Safety valve on the water inlet from the water network (inlet water pressure > 0.5 MPa)

In installation mode 3, a pressure-reducing valve is required to maintain the pressure in the water tank in the range of 0.3-0.5 MPa. The direction of the arrow on the reducing valve must be the same as the direction of the water flow.

Note: The filter, safety valve, check valve, pressure reducing valve and hose for installation are not included with the main unit and should be purchased by the user.

Thermostat of the water tank e-heater

The distance between the thermostat sensor and the water tank e-heater tube is 1 cm – much less than the distance between it and the exchanger coils. Since the maximum permissible temperature of the exchanger coils is lower than the

set value of the thermal protection of the thermostat, the temperature of the loops will not trigger any action of the thermostat.

2.5.4 Indoor Unit Installation Instructions

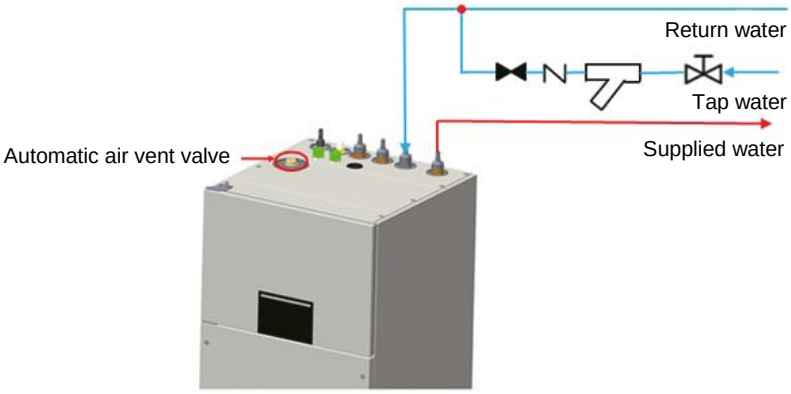
(1) Place the indoor unit as far as possible from heat sources in the room, such as radiators.

(2) Place the indoor unit as close as possible to the outdoor unit. The length of the connecting pipes in the horizontal direction should not exceed 20 m (4.0–6.0 kW) or 25 m (8.0–10 kW) and 15 m in the vertical direction.

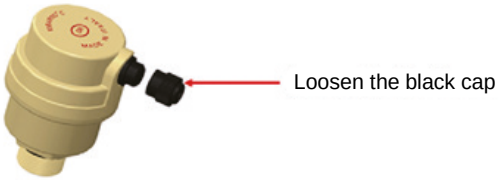
(3) Instructions for water refilling and air venting

Note: If the cap of the automatic air vent valve, which allows air to be removed from the top of the auxiliary electric heater, is not loosened before the operation, the device will operate with an insufficient amount of water.

Step 1: Connect the water pipe and loosen the cap of the automatic air vent valve.



Step 2: Open the shut-off valve on the water filling pipe and add water from the water network until the pressure gauge shows a water pressure of 2.0–2.5 bar.



Requirements for water refilling

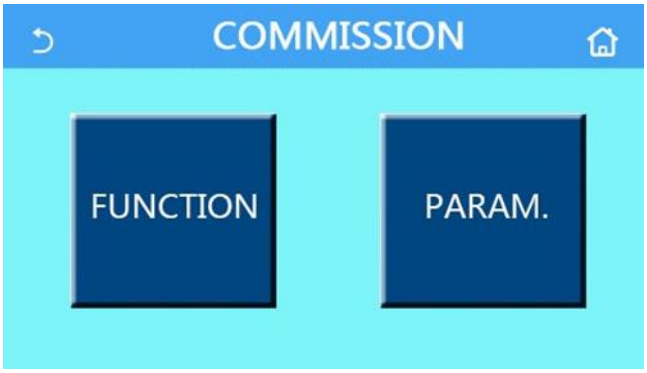
Refill makeup water from the water network to the return water pipe while keeping the automatic air vent valve open until the water system is full and free of air.

The required measured pressure for makeup water is 2.0-2.5 bar. Do not let it exceed 3 bar as this would adversely affect the pipes and their connections and lead to water leakage. However, do not leave it too low either, as a lack of water would activate the protective flow switch and the unit would then not function normally. If the water pressure is below 1 bar, pressurize it to the required pressure.

(4) Instructions for air venting using the control panel

The control panel allows to remove air from the water system as shown below.

– On the Menu page, select “COMMISSION” and go to the setting as shown below, with the option “FUNCTION” on the left and “PARAM.” on the right.

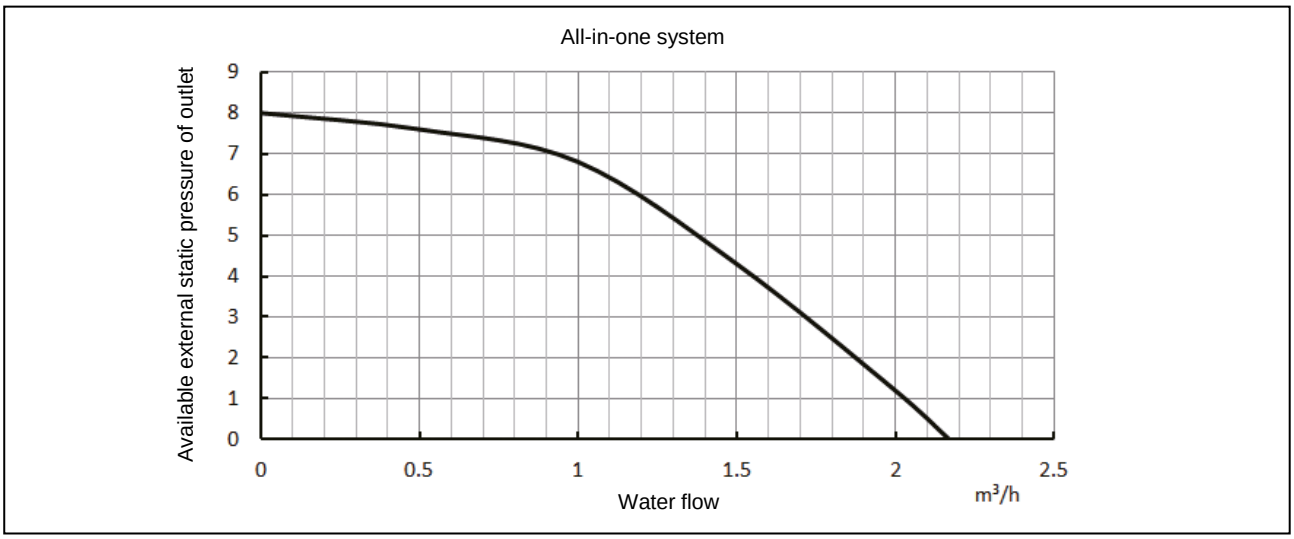


– On the “PARAM” page, select “Air removal” and go to the setting page below with “Off”, “Air” (On in heating direction) and “Water tank” (On in DHW direction).

– While refilling water, check the joints and welds of the pipes for water leaks.

– Remember that the makeup water pressure should be higher than 2 bar. If the tap water pressure is lower than required, use a pressure (booster) pump to increase it.

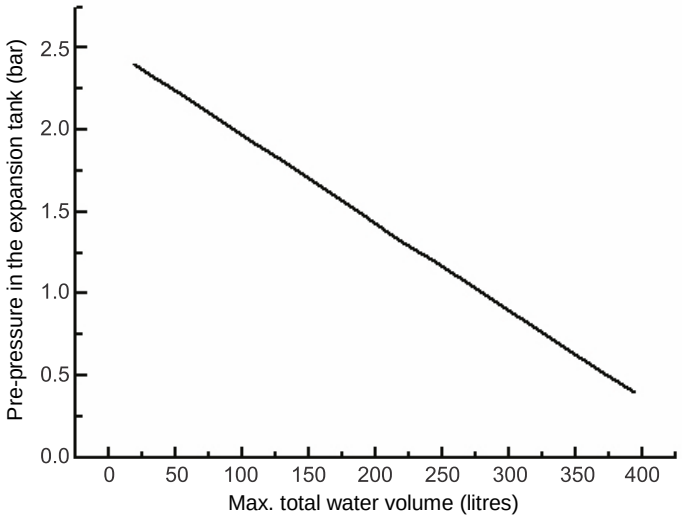
2.5.5 Available External Static Pressure of Water Outlet



Note: For maximum external static pressure, see the curve in the graph above. The circulation water pump has a variable flow rate.

During operation, the circulation water pump will adapt its performance according to the actual load.

2.5.6 Water Volume and the Expansion Tank Pressure



Notes:

(a) The expansion tank has a volume of 10 litres and a pre-pressure of 1 bar.

(b) The default total volume of water is 230 litres. If the total volume of water is changed due to the installation conditions, the pre-pressure should be adjusted to ensure the correct operation of the device. When the indoor unit is located at the highest point, no adjustment is required.

(c) The minimum total volume of water is 20 litres.

(d) Use nitrogen gas from a certified supplier for pre-pressure adjustment.

(e) For reliable system defrosting, the minimum required water volume is 13 litres/kW, i.e. a 10kW unit should have a minimum water volume of 130 litres. 15 litres/kW is recommended.

2.5.7 Method for Calculating the Required Expansion Tank Pre-Pressure

The calculation method for pre-pressure adjustment of the expansion tank is given below. If the volume of the water system has been changed during installation, check whether the pre-pressure of the expansion tank needs to be adjusted, according to the following formula:

Pg = (H / 10 + 0.3) bar

(H – the height difference between the installation location of the indoor unit and the highest point of the water system.)

Ensure that the volume of water in the system does not exceed the maximum allowed volume according to the above data. If the permitted range is exceeded, the expansion tank will not meet the requirements of the installation.

Installation height difference[1]	Water volume	
	≤ 230 l	> 230 l
< 7 m	No adjustment is required.	1. The pre-pressure must be adjusted according to the above formula. 2. Check that the water volume is less than the maximum water volume (according to the diagram above).
> 7 m	1. The pre-pressure must be adjusted according to the above formula. 2. Check that the water volume is less than the maximum water volume (according to the diagram above).	The expansion tank is too small and adjustment is not possible. Install an additional expansion tank in the external water circuit.

Note:

Installation height difference = the difference between the installation location of the indoor unit and the highest point of the water system. If the indoor unit is located at the highest point of the installation, the height difference of the installation is considered as 0 meters.

Example 1: The 10kW unit is installed 5 m below the highest point of the water system and the total volume of the water system is 230 litres.

According to the above data, there is no need to change the pre-pressure of the expansion tank.

Example 2: The unit is installed at the highest point of the water system and the total water volume is 300 litres.

(a) Since the volume of the water system is higher than 230 litres, it is necessary to reduce the pre-pressure of the expansion tank.

(b) Pressure calculation formula:

(c) Pg = (H / 10 + 0.3) = (6 / 10 + 0.3) = 0.9 bar

(d) The maximum volume of the water system is about 300 litres. Since the current volume of the water system is 300 litres, the expansion tank meets the requirements of the installation.

(e) Change the pre-pressure of the expansion tank from 1.0 bar to 0.9 bar.

2.5.8 Selection of the Expansion Tank

Formula:

$$v = \frac{c \cdot e}{1 - \frac{1 + p_1}{1 + p_2}}$$

V – Volume of the expansion tank

C – Total volume of water

P1 – Pre-pressure of the expansion tank

P2 – The highest pressure during system operation (i.e. the activation pressure of the safety valve).

e – The expansion coefficient of water (difference between the expansion coefficient at the original and the highest water temperature).

The expansion coefficient of water at different temperatures	
Temperature (°C)	The expansion coefficient e
0	0.00013
4	0
10	0.00027
20	0.00177
30	0.00435
40	0.00782
45	0.0099
50	0.0121
55	0.0145
60	0.0171
65	0.0198
70	0.0227
75	0.0258
80	0.029
85	0.0324
90	0.0359
95	0.0396
100	0.0434

2.6 Connecting the Pipeline

2.6.1 Connecting the Pipes to the Indoor and Outdoor Unit

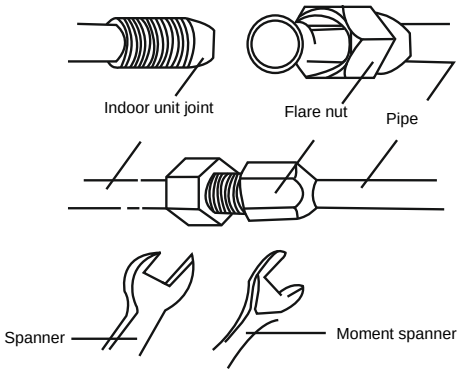
(1) Align the flared end of the copper pipe with the centre of the threaded joint. Tighten the flare nuts by hand.

(2) Tighten the flare nuts with a torque wrench until you hear a “click”.

(3) The bend radius of the pipe should not be too small; otherwise, the pipe may crack. Use a pipe bender when bending the pipe.

(4) When connecting the outdoor unit and the indoor unit, never pull the big and small joints of the indoor unit with force to prevent the indoor unit pipes from cracking and refrigerant leakage.

(5) The connecting pipe should be fixed in a bracket so that its weight is not transferred directly to the unit.



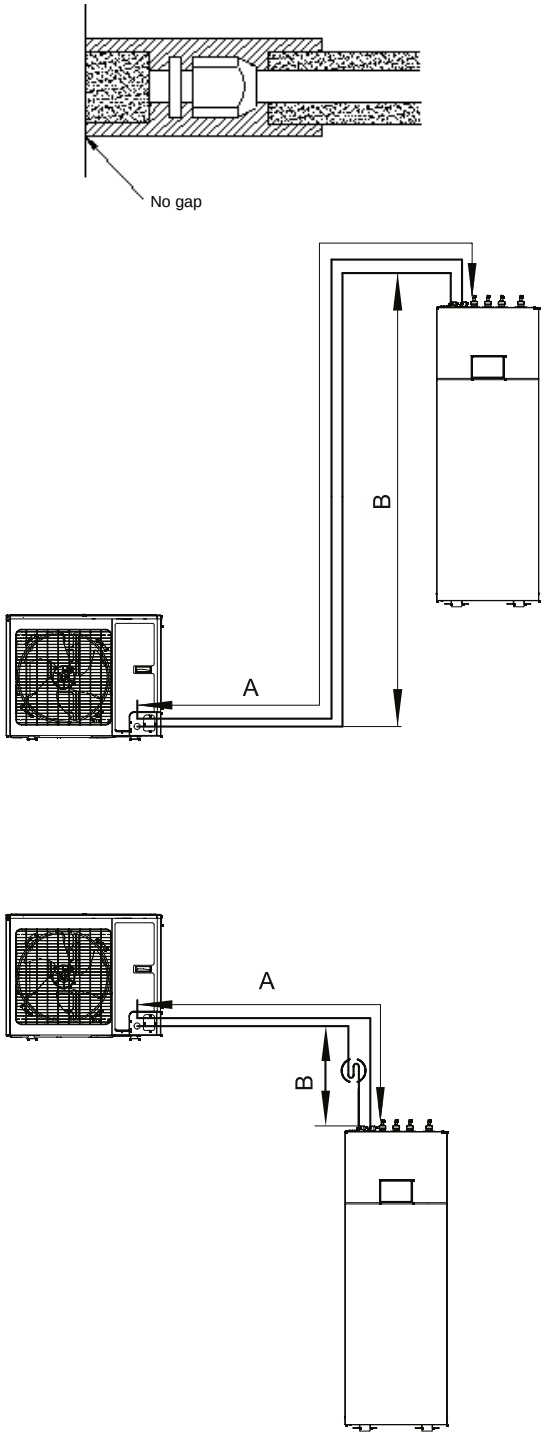
2.6.2 Insulation of Connecting Pipes

(1) To prevent moisture condensation on the connecting pipe and water dripping, the gas pipe and liquid pipe must be wrapped with thermal insulation material and adhesive tape to isolate them from the air.

(2) The connections on the indoor unit and the outdoor unit must be wrapped with thermal insulation materials so that the insulation fits tightly to the surface of the units.

(3) Wrap the pipes with tape.

- Use adhesive tape to wrap the connecting pipes and cable into one bundle. To prevent condensed water from flowing down on the drain pipe, the drain pipe should be routed separately from the connecting pipes and cable.
- Wrap the pipes with thermal insulation tape so that each turn of the tape overlaps half of the previous turn.
- Fix the wrapped pipes to the wall with brackets.
- Do not over-tighten the insulation tape, as this will reduce the effectiveness of the thermal insulation.
- After the insulation is complete and the pipes are properly wrapped, seal the holes in the wall with sealing materials.



Model	Pipe size (diameter: Ø)		Length B		Height A		Additional refrigerant	Gas pipe tightening torque	Liquid pipe tightening torque
	Gas	Liquid	Standard	Max.	Standard	Max.		N/m	N/m
GSH-40ERB	1/2"	1/4"	5 m	20 m	0 m	15 m	16 g/m	45–55	15–20
GSH-60ERB	1/2"	1/4"	5 m	20 m	0 m	15 m	16 g/m	45–55	15–20
GSH-80ERB	1/2"	1/4"	5 m	25 m	0 m	15 m	16 g/m	45–55	15–20
GSH-100ERB	1/2"	1/4"	5 m	25 m	0 m	15 m	16 g/m	45–55	15–20
GSH-40ERB2	1/2"	1/4"	5 m	20 m	0 m	15 m	16 g/m	45–55	15–20
GSH-60ERB2	1/2"	1/4"	5 m	20 m	0 m	15 m	16 g/m	45–55	15–20
GSH-80ERB2	1/2"	1/4"	5 m	25 m	0 m	15 m	0 g/m	45–55	15–20
GSH-100ERB2	1/2"	1/4"	5 m	25 m	0 m	15 m	0 g/m	45–55	15–20
GSH-80ERB-3	1/2"	1/4"	5 m	15 m	0 m	15 m	0 g/m	45–55	15–20
GSH-100ERB-3	1/2"	1/4"	5 m	15 m	0 m	15 m	0 g/m	45–55	15–20
GSH-120ERB-3	5/8"	1/4"	5 m	15 m	0 m	15 m	0 g/m	60–65	15–20
GSH-140ERB-3	5/8"	1/4"	5 m	15 m	0 m	15 m	0 g/m	60–65	15–20
GSH-160ERB-3	5/8"	1/4"	5 m	15 m	0 m	15 m	0 g/m	60–65	15–20
GSH-120ERB	5/8"	1/4"	5 m	15 m	0 m	15 m	0 g/m	60–65	15–20
GSH-140ERB	5/8"	1/4"	5 m	15 m	0 m	15 m	0 g/m	60–65	15–20
GSH-160ERB	5/8"	1/4"	5 m	15 m	0 m	15 m	0 g/m	60–65	15–20

Notes:

(a) If the pipe length is less than 10 m, no additional refrigerant is needed. If the pipe length is greater than 10 m, additional refrigerant is needed according to the table.

(b) Example: If the 10kW model is installed and the pipe length is 25 m, (25 − 10) × 16 = 240 g of refrigerant should be added. The rated capacity is based on the standard pipe length, and the maximum allowable length is based on the operational reliability of the product. If the outdoor unit is located higher than the indoor unit, an oil trap should be installed every 5–7 meters.

(c) Each 90° bend corresponds to approximately 0.5 m of pipe length.

2.7 Water Quality Requirements

Parameter	Parameter value	Unit
pH (25 °C)	6.8–8.0	
Turbidity	< 1	NTU
Chlorides	< 50	mg/l
Fluorides	< 1	mg/l
Iron	< 0.3	mg/l
Sulphates	< 50	mg/l
SiO_2	< 30	mg/l
Hardness (amount of $CaCO_3$)	< 70	mg/l
Nitrates (amount of N)	< 10	mg/l
Conductivity (25 °C)	< 300	µS/cm
Ammonia (amount of N)	< 0.5	mg/l
Alkalinity (amount of $CaCO_3$)	< 50	mg/l
Sulphides	undetectable	mg/l
Oxygen consumption	< 3	mg/l
Sodium	< 150	mg/l

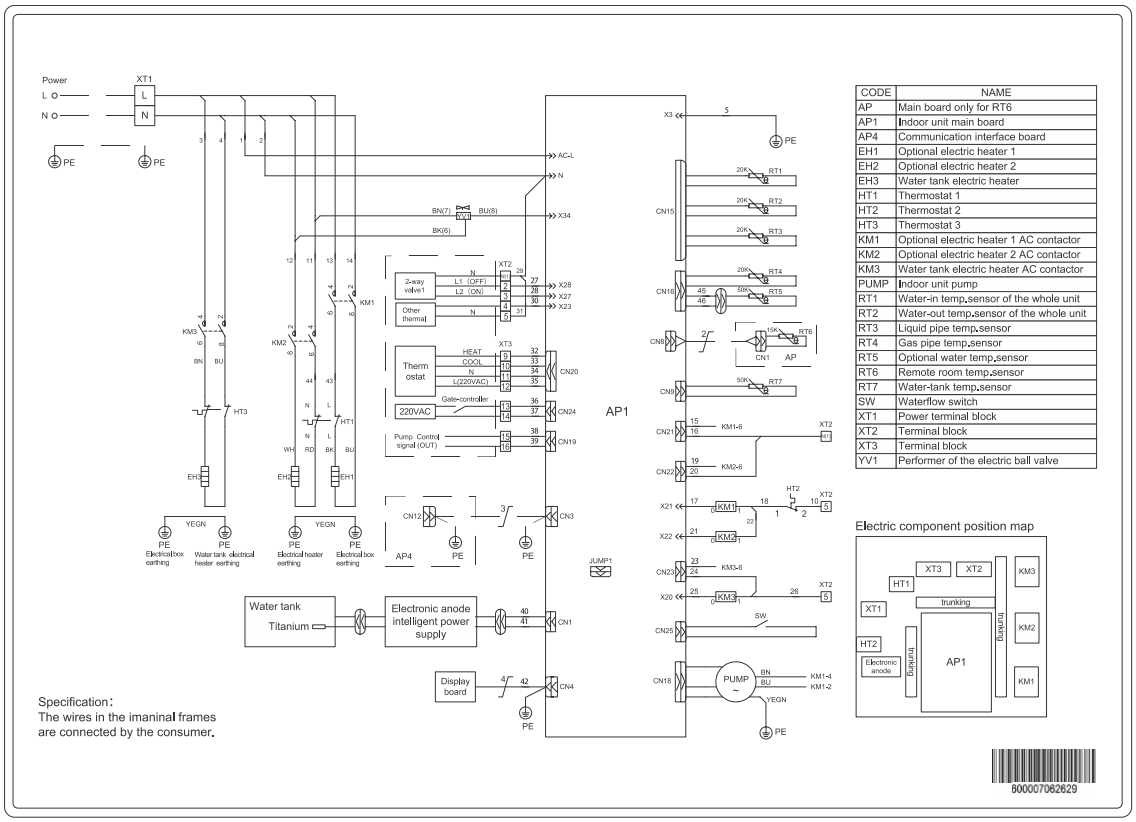
Note: If the circulating water does not meet the requirements listed in the table above, add an anti-scaling agent to the water so that the unit can always operate normally.

2.8 Electric Wiring

(1) Wiring diagrams of indoor units

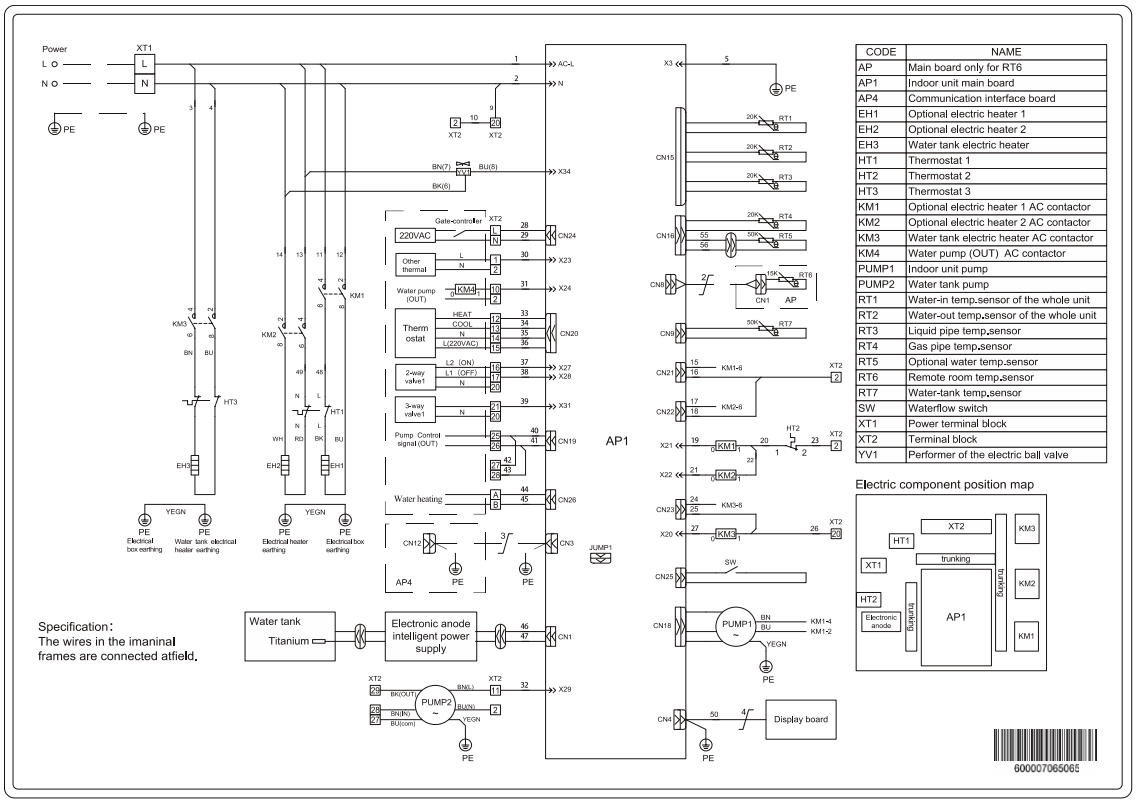
The wiring diagram may change. Always follow the diagram supplied with the unit.

- GSH-40TRB,GSH-60TRB, GSH-80TRB,GSH-100TRB



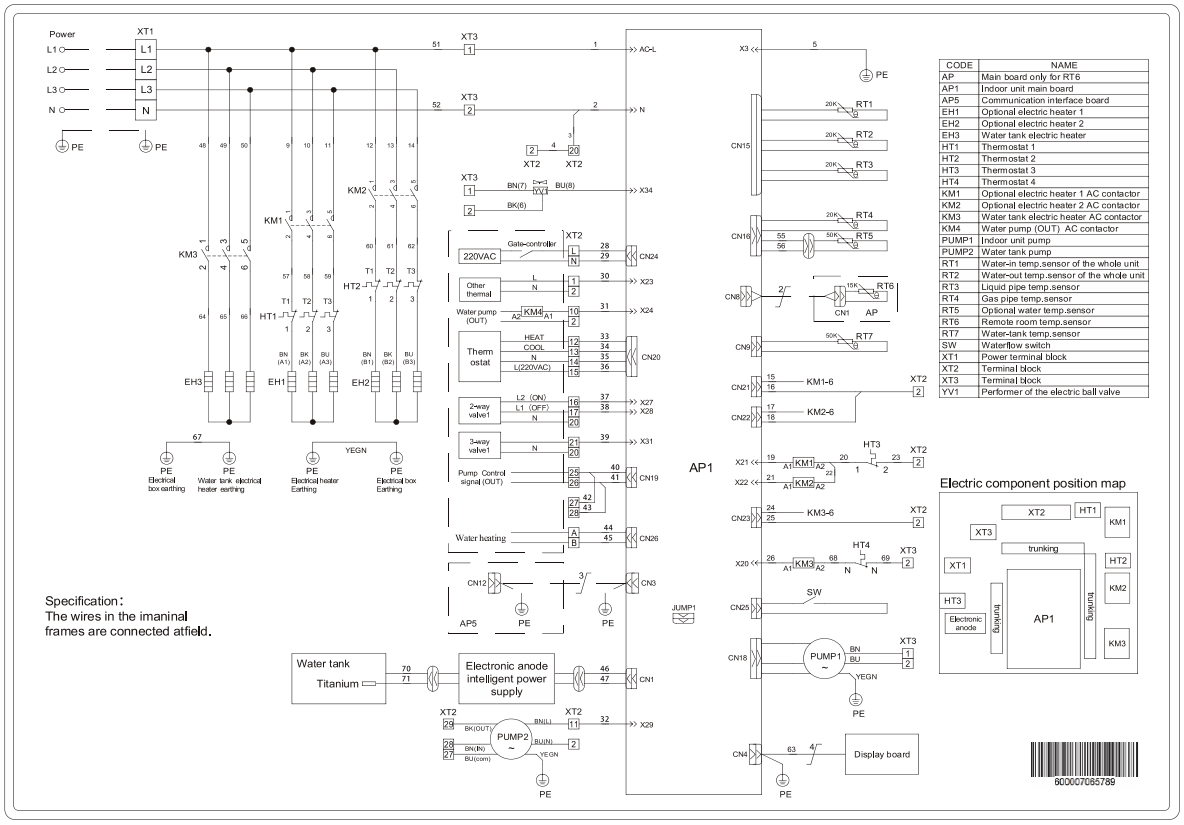
CODE	NAME
AP	Main board only for RT6
AP1	Indoor unit main board
AP4	Communication interface board
EH1	Optional electric heater 1
EH2	Optional electric heater 2
EH3	Water tank electric heater
HT1	Thermostat 1
HT2	Thermostat 2
HT3	Thermostat 3
KM1	Optional electric heater 1 AC contactor
KM2	Optional electric heater 2 AC contactor
KM3	Water tank electric heater AC contactor
PUMP	Indoor unit pump
RT1	Water-in temp.sensor of the whole unit
RT2	Water-out temp.sensor of the whole unit
RT3	Liquid pipe temp.sensor
RT4	Gas pipe temp.sensor
RT5	Optional water temp.sensor
RT6	Remote room temp.sensor
RT7	Water-tank temp.sensor
SW	Waterflow switch
XT1	Power terminal block
XT2	Terminal block
XT3	Terminal block
YV1	Performer of the electric ball valve

- GSH-40TRB2, GSH-60TRB2, GSH-80TRB2, GSH-100TRB2, GSH-120TRB2, GSH-140TRB2, GSH-160TRB2



CODE	NAME
AP	Main board only for RT6
AP1	Indoor unit main board
AP4	Communication interface board
EH1	Optional electric heater 1
EH2	Optional electric heater 2
EH3	Water tank electric heater
HT1	Thermostat 1
HT2	Thermostat 2
HT3	Thermostat 3
KM1	Optional electric heater 1 AC contactor
KM2	Optional electric heater 2 AC contactor
KM3	Water tank electric heater AC contactor
KM4	Water pump (OUT) AC contactor
PUMP1	Indoor unit pump
PUMP2	Water tank pump
RT1	Water-in temp.sensor of the whole unit
RT2	Water-out temp.sensor of the whole unit
RT3	Liquid pipe temp.sensor
RT4	Gas pipe temp.sensor
RT5	Optional water temp.sensor
RT6	Remote room temp.sensor
RT7	Water-tank temp.sensor
SW	Waterflow switch
XT1	Power terminal block
XT2	Terminal block
YV1	Performer of the electric ball valve

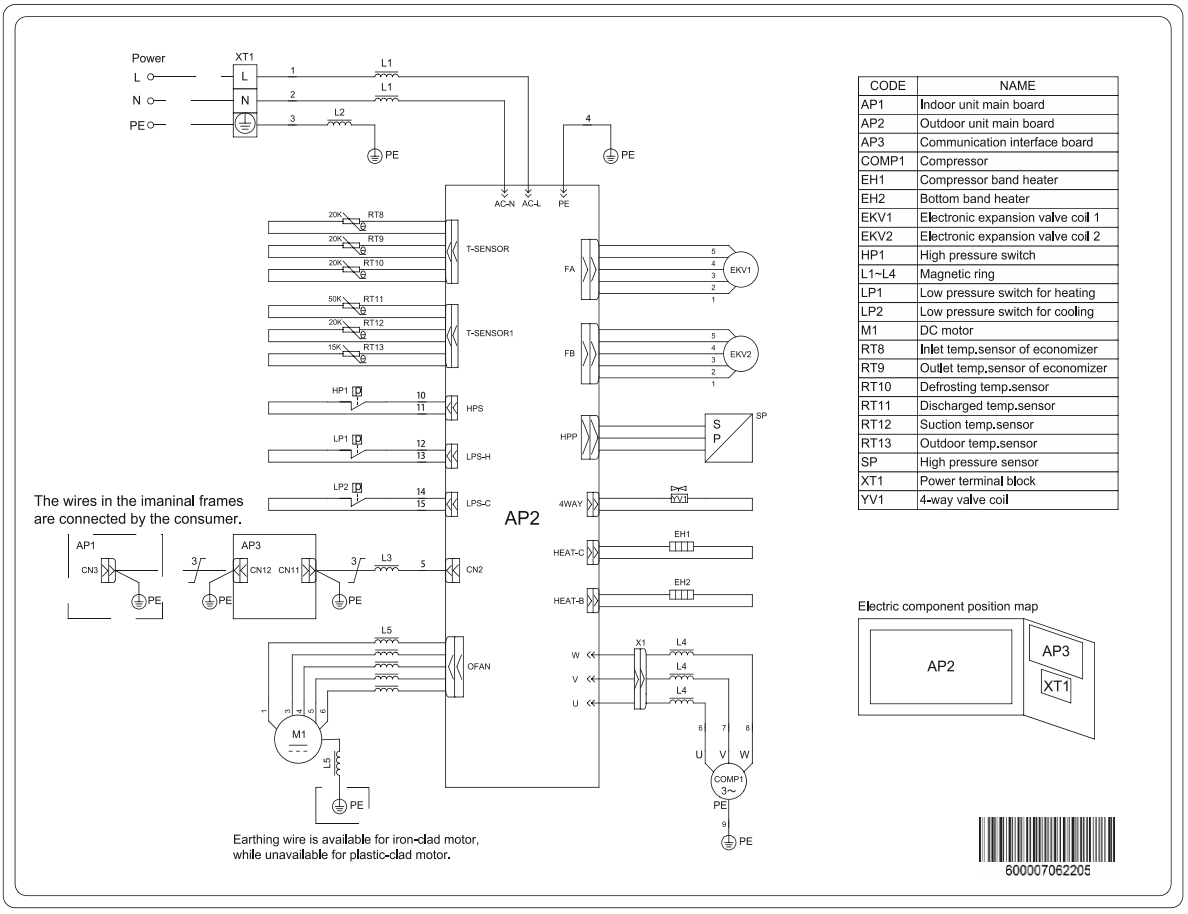
- GSH-80TRB2-3, GSH-100TRB2-3, GSH-120TRB2-3, GSH-140TRB2-3, GSH-160TRB2-3



CODE	NAME
AP	Main board only for RT6
AP1	Indoor unit main board
AP5	Communication interface board
EH1	Optional electric heater 1
EH2	Optional electric heater 2
EH3	Water tank electric heater
HT1	Thermostat 1
HT2	Thermostat 2
HT3	Thermostat 3
HT4	Thermostat 4
KM1	Optional electric heater 1 AC contactor
KM2	Optional electric heater 2 AC contactor
KM3	Water tank electric heater AC contactor
KM4	Water pump (OUT) AC contactor
PUMP1	Indoor unit pump
PUMP2	Water tank pump
RT1	Water-in temp.sensor of the whole unit
RT2	Water-out temp.sensor of the whole unit
RT3	Liquid pipe temp.sensor
RT4	Gas pipe temp.sensor
RT5	Optional water temp.sensor
RT6	Remote room temp.sensor
RT7	Water-tank temp.sensor
SW	Waterflow switch
XT1	Power terminal block
XT2	Terminal block
XT3	Terminal block
YV1	Performer of the electric ball valve

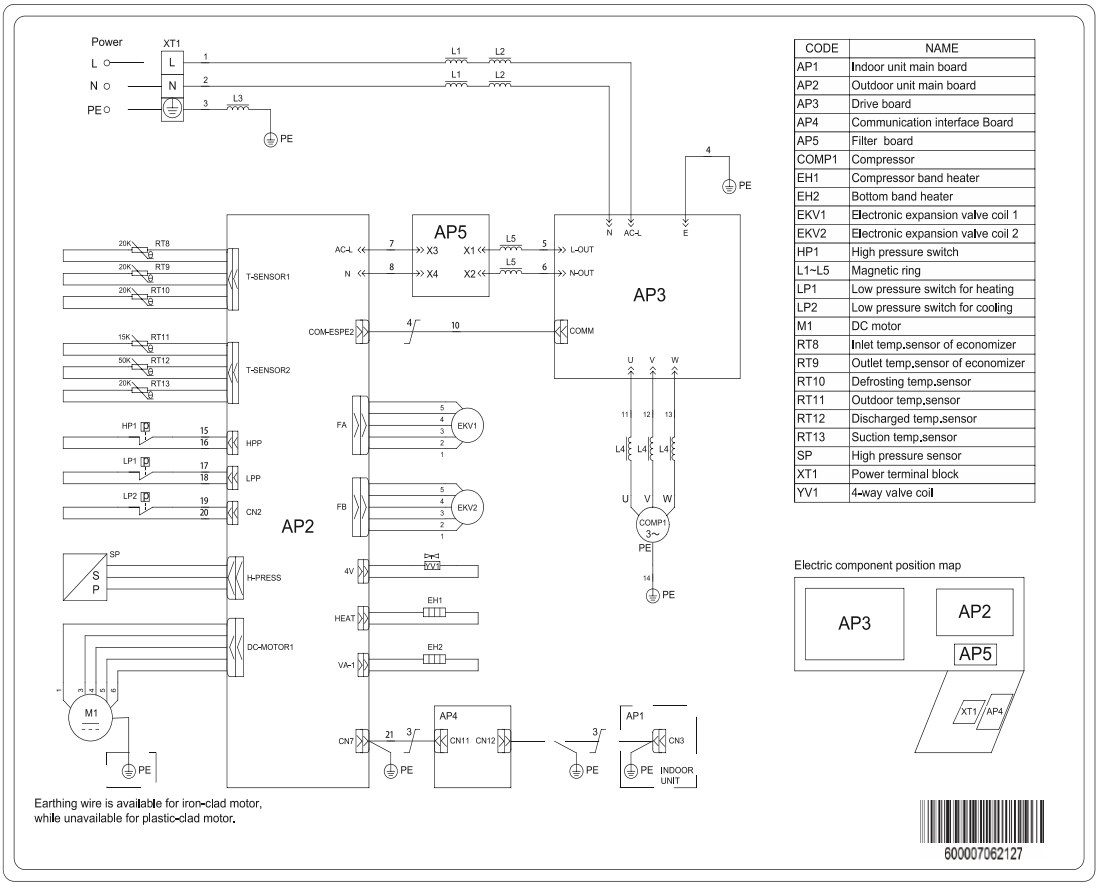
(2) Wiring diagram of outdoor units

- GSH-40ERB, GSH-60ERB



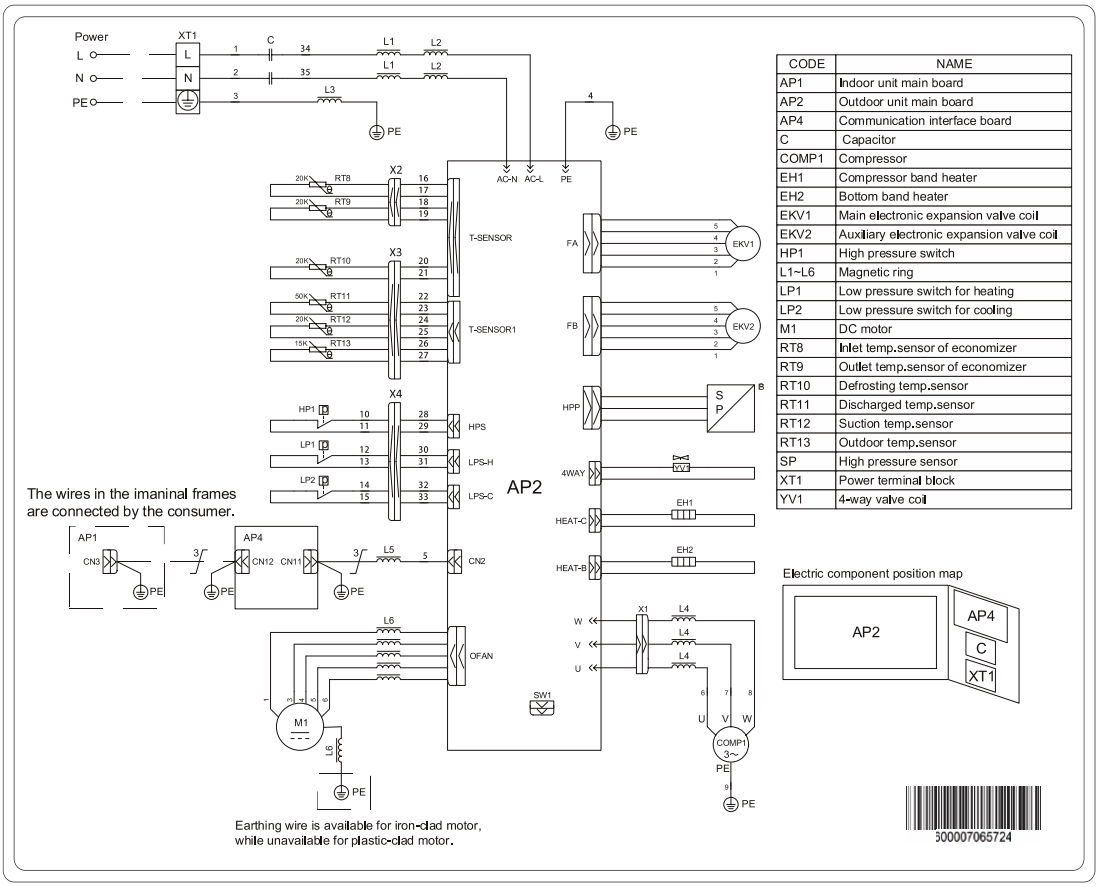
CODE	NAME
AP1	Indoor unit main board
AP2	Outdoor unit main board
AP3	Communication interface board
COMP1	Compressor
EH1	Compressor band heater
EH2	Bottom band heater
EKV1	Electronic expansion valve coil 1
EKV2	Electronic expansion valve coil 2
HP1	High pressure switch
L1~L4	Magnetic ring
LP1	Low pressure switch for heating
LP2	Low pressure switch for cooling
M1	DC motor
RT8	Inlet temp.sensor of economizer
RT9	Outlet temp.sensor of economizer
RT10	Defrosting temp.sensor
RT11	Discharged temp.sensor
RT12	Suction temp.sensor
RT13	Outdoor temp.sensor
SP	High pressure sensor
XT1	Power terminal block
YV1	4-way valve coil

- GSH-80ERB, GSH-100ERB



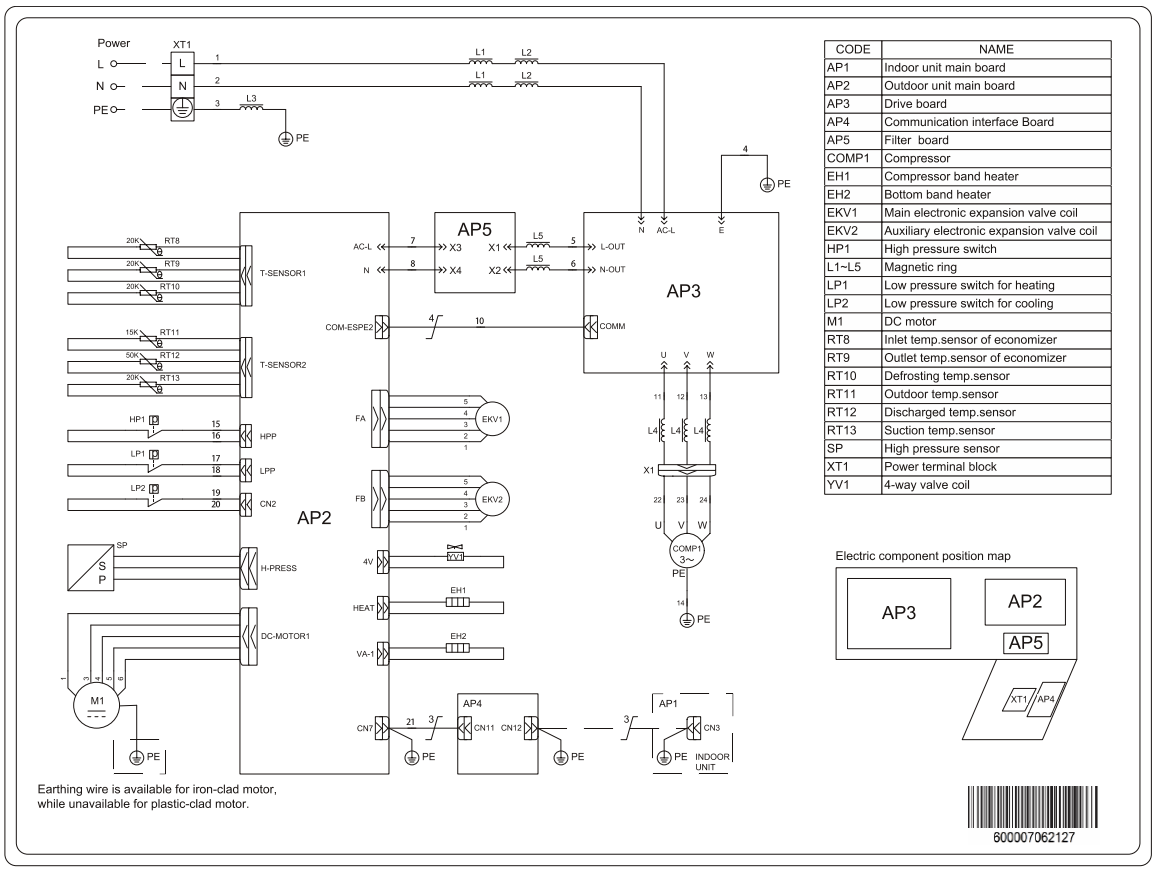
CODE	NAME
AP1	Indoor unit main board
AP2	Outdoor unit main board
AP3	Drive board
AP4	Communication interface Board
AP5	Filter board
COMP1	Compressor
EH1	Compressor band heater
EH2	Bottom band heater
EKV1	Electronic expansion valve coil 1
EKV2	Electronic expansion valve coil 2
HP1	High pressure switch
L1~L5	Magnetic ring
LP1	Low pressure switch for heating
LP2	Low pressure switch for cooling
M1	DC motor
RT8	Inlet temp.sensor of economizer
RT9	Outlet temp.sensor of economizer
RT10	Defrosting temp.sensor
RT11	Outdoor temp.sensor
RT12	Discharged temp.sensor
RT13	Suction temp.sensor
SP	High pressure sensor
XT1	Power terminal block
YV1	4-way valve coil

- GSH-40ERB2, GSH-60ERB2



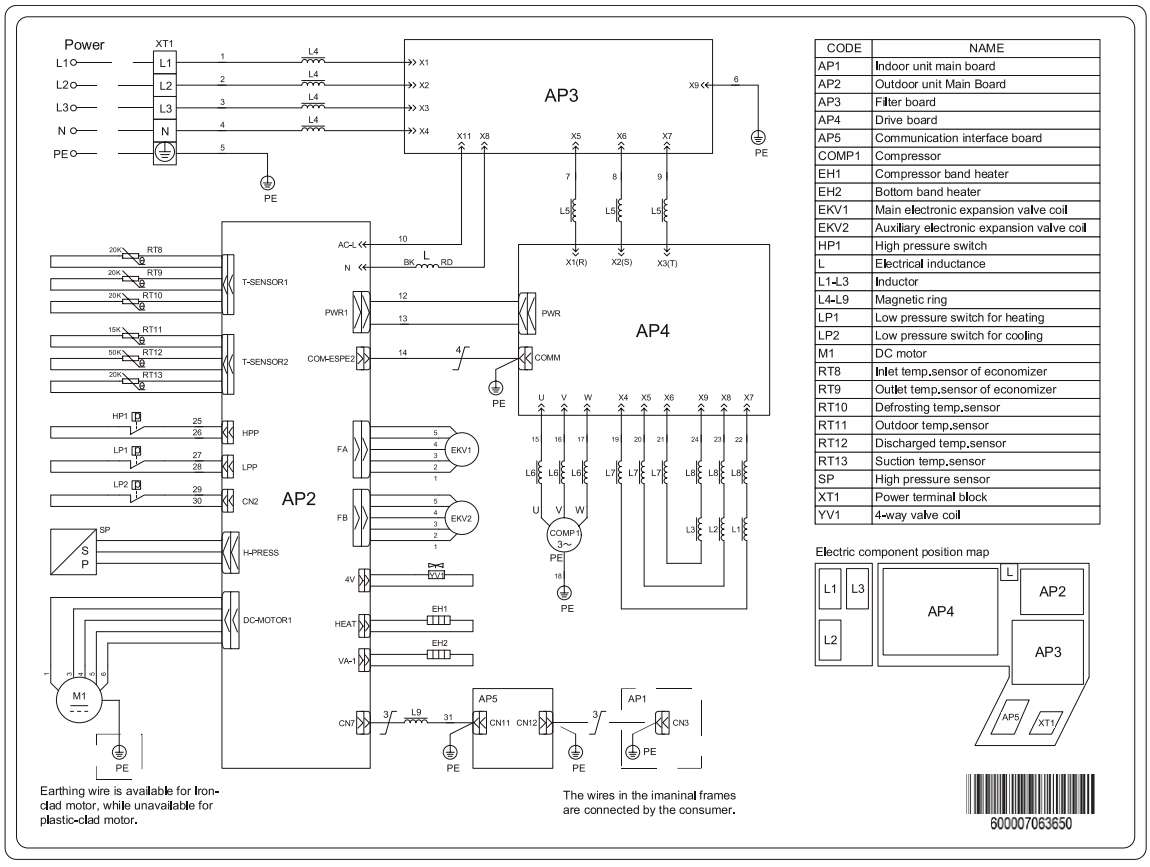
CODE	NAME
AP1	Indoor unit main board
AP2	Outdoor unit main board
AP4	Communication interface board
C	Capacitor
COMP1	Compressor
EH1	Compressor band heater
EH2	Bottom band heater
EKV1	Main electronic expansion valve coil
EKV2	Auxiliary electronic expansion valve coil
HP1	High pressure switch
L1~L6	Magnetic ring
LP1	Low pressure switch for heating
LP2	Low pressure switch for cooling
M1	DC motor
RT8	Inlet temp.sensor of economizer
RT9	Outlet temp.sensor of economizer
RT10	Defrosting temp.sensor
RT11	Discharged temp.sensor
RT12	Suction temp.sensor
RT13	Outdoor temp.sensor
SP	High pressure sensor
XT1	Power terminal block
YV1	4-way valve coil

- GSH-80ERB2, GSH-100ERB2



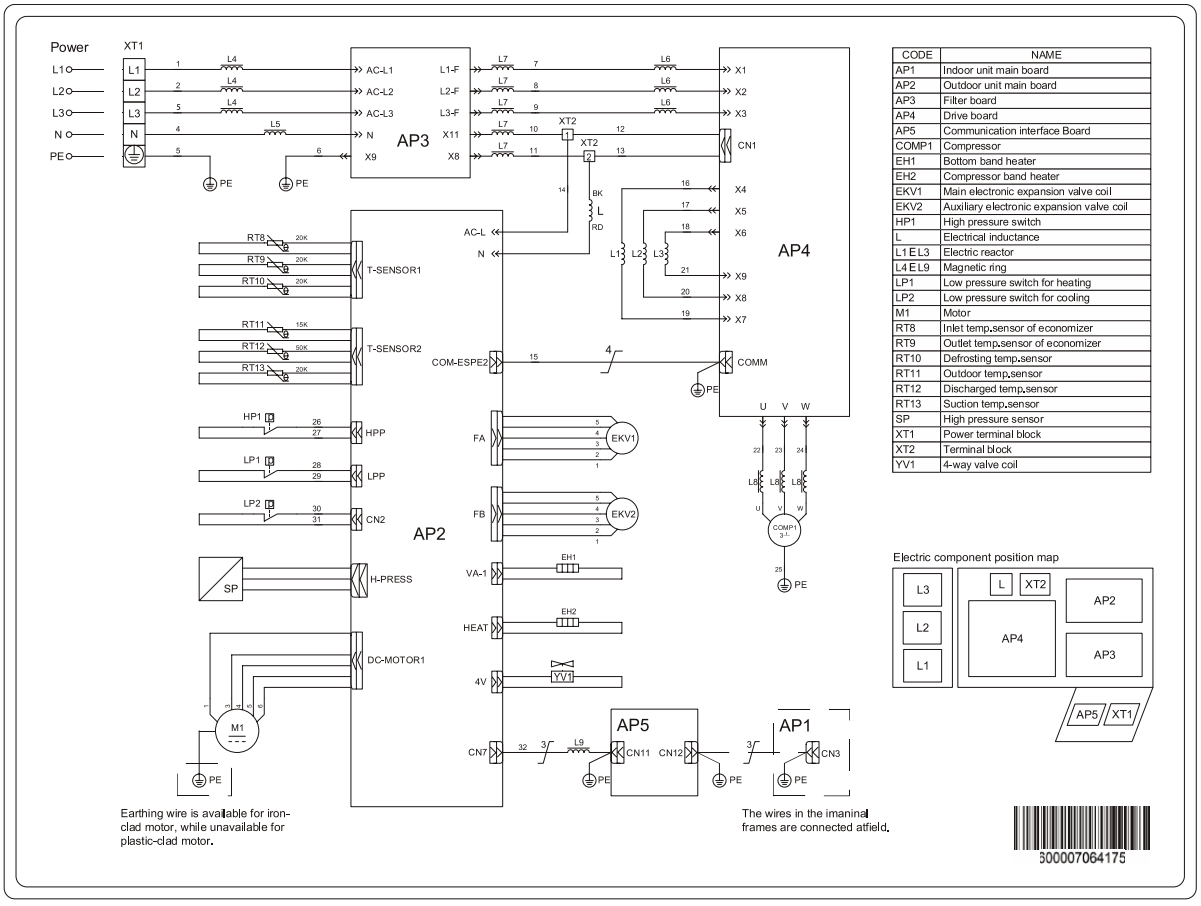
CODE	NAME
AP1	Indoor unit main board
AP2	Outdoor unit main board
AP3	Drive board
AP4	Communication interface Board
AP5	Filter board
COMP1	Compressor
EH1	Compressor band heater
EH2	Bottom band heater
EKV1	Main electronic expansion valve coil
EKV2	Auxiliary electronic expansion valve coil
HP1	High pressure switch
L1~L5	Magnetic ring
LP1	Low pressure switch for heating
LP2	Low pressure switch for cooling
M1	DC motor
RT8	Inlet temp.sensor of economizer
RT9	Outlet temp.sensor of economizer
RT10	Defrosting temp.sensor
RT11	Outdoor temp.sensor
RT12	Discharged temp.sensor
RT13	Suction temp.sensor
SP	High pressure sensor
XT1	Power terminal block
YV1	4-way valve coil

- GSH-80ERB-3, GSH-100ERB-3



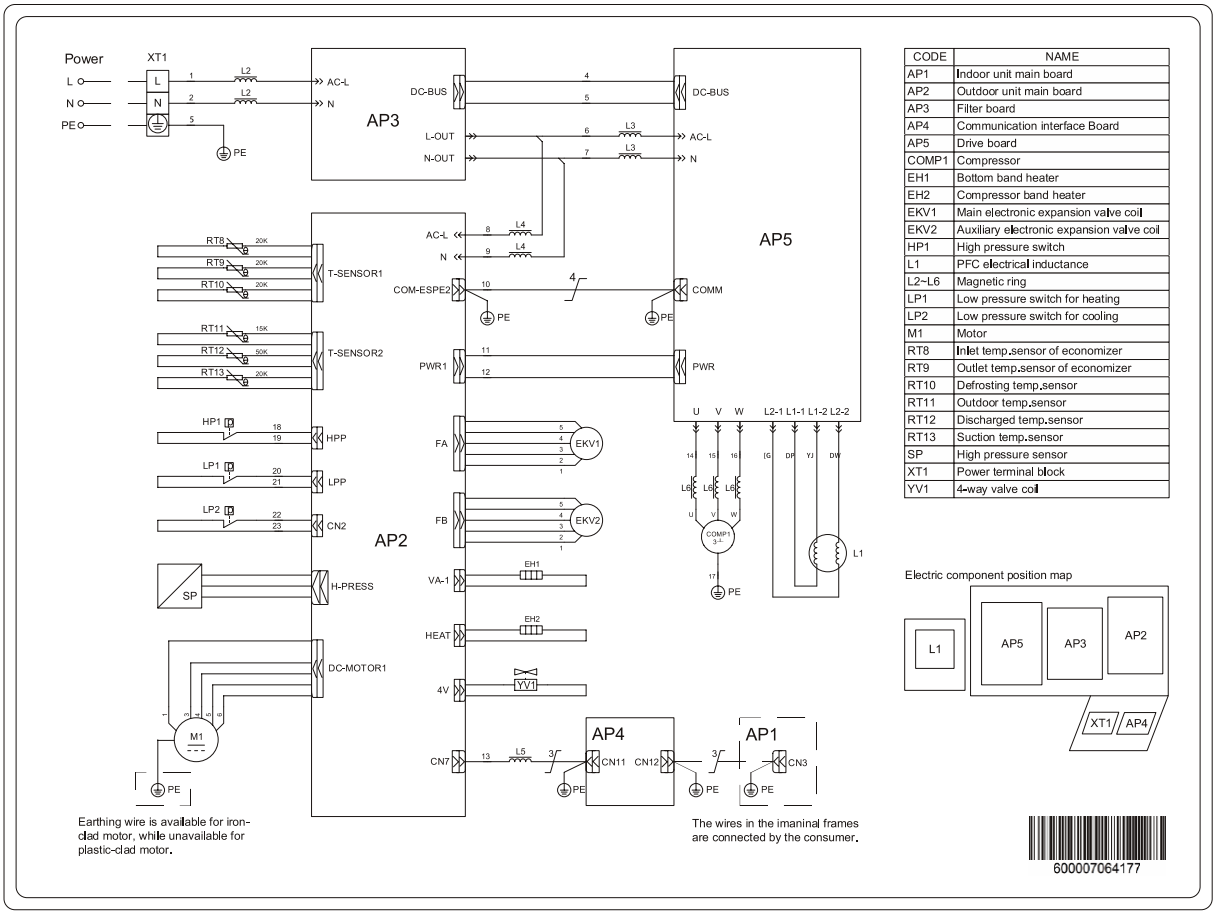
CODE	NAME
AP1	Indoor unit main board
AP2	Outdoor unit Main Board
AP3	Filter board
AP4	Drive board
AP5	Communication interface board
COMP1	Compressor
EH1	Compressor band heater
EH2	Bottom band heater
EKV1	Main electronic expansion valve coil
EKV2	Auxiliary electronic expansion valve coil
HP1	High pressure switch
L	Electrical inductance
L1-L3	Inductor
L4-L9	Magnetic ring
LP1	Low pressure switch for heating
LP2	Low pressure switch for cooling
M1	DC motor
RT8	Inlet temp.sensor of economizer
RT9	Outlet temp.sensor of economizer
RT10	Defrosting temp.sensor
RT11	Outdoor temp.sensor
RT12	Discharged temp.sensor
RT13	Suction temp.sensor
SP	High pressure sensor
XT1	Power terminal block
YV1	4-way valve coil

- GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3



CODE	NAME
AP1	Indoor unit main board
AP2	Outdoor unit main board
AP3	Filter board
AP4	Drive board
AP5	Communication interface Board
COMP1	Compressor
EH1	Bottom band heater
EH2	Compressor band heater
EKV1	Main electronic expansion valve coil
EKV2	Auxiliary electronic expansion valve coil
HP1	High pressure switch
L	Electrical inductance
L1 E L3	Electric reactor
L4 E L9	Magnetic ring
LP1	Low pressure switch for heating
LP2	Low pressure switch for cooling
M1	Motor
RT8	Inlet temp.sensor of economizer
RT9	Outlet temp.sensor of economizer
RT10	Defrosting temp.sensor
RT11	Outdoor temp.sensor
RT12	Discharged temp.sensor
RT13	Suction temp.sensor
SP	High pressure sensor
XT1	Power terminal block
XT2	Terminal block
YV1	4-way valve coil

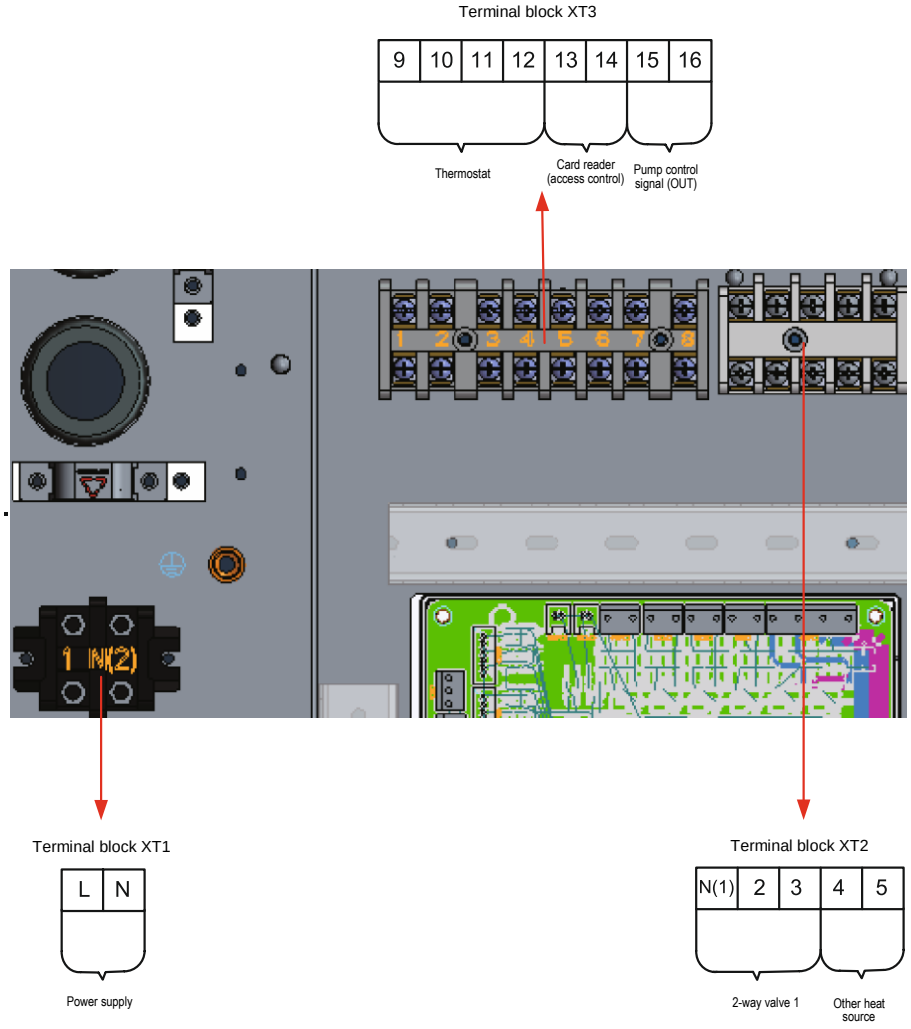
- GSH-120ERB, GSH-140ERB, GSH-160ERB



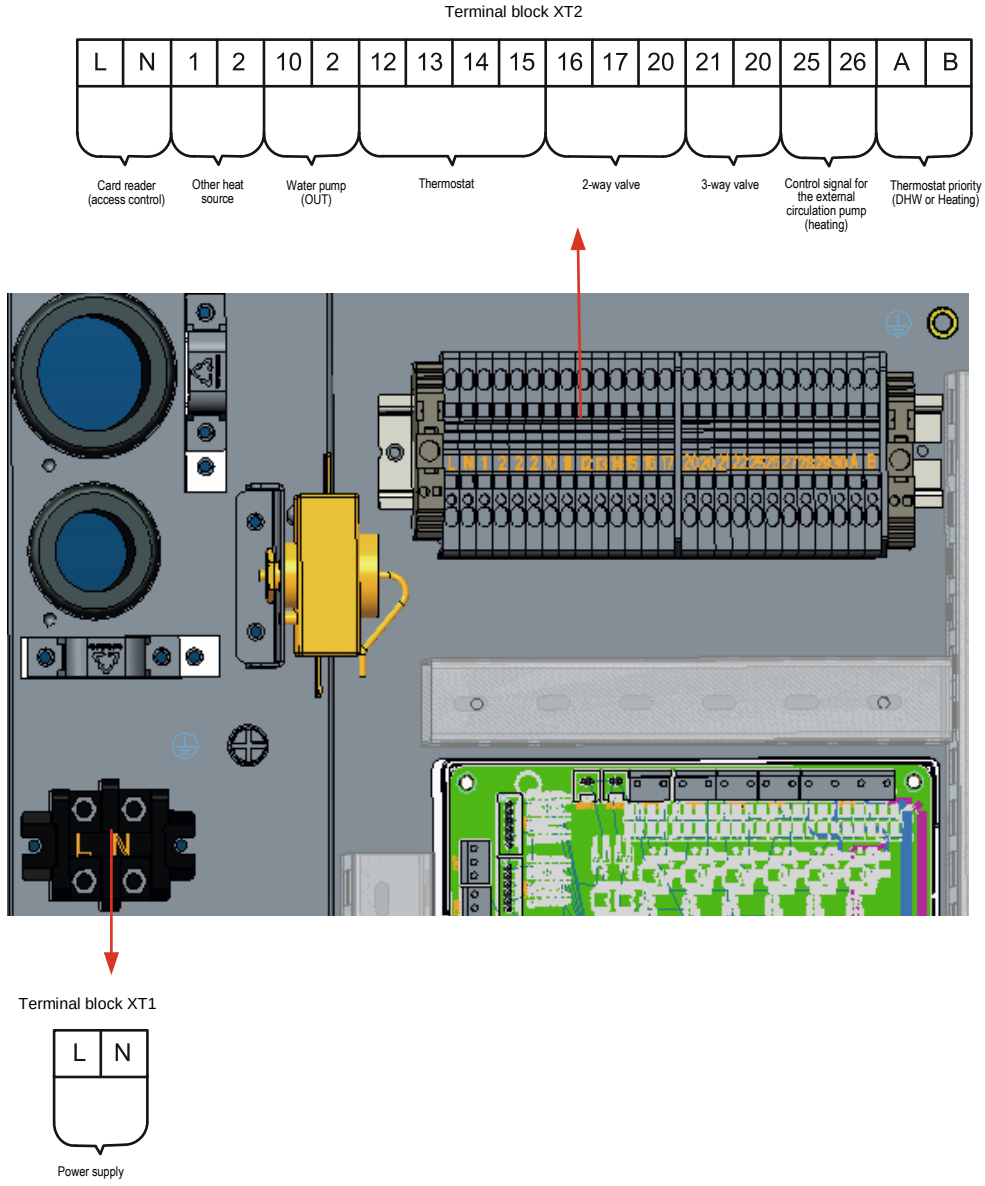
CODE	NAME
AP1	Indoor unit main board
AP2	Outdoor unit main board
AP3	Filter board
AP4	Communication interface Board
AP5	Drive board
COMP1	Compressor
EH1	Bottom band heater
EH2	Compressor band heater
EKV1	Main electronic expansion valve coil
EKV2	Auxiliary electronic expansion valve coil
HP1	High pressure switch
L1	PFC electrical inductance
L2~L6	Magnetic ring
LP1	Low pressure switch for heating
LP2	Low pressure switch for cooling
M1	Motor
RT8	Inlet temp.sensor of economizer
RT9	Outlet temp.sensor of economizer
RT10	Defrosting temp.sensor
RT11	Outdoor temp.sensor
RT12	Discharged temp.sensor
RT13	Suction temp.sensor
SP	High pressure sensor
XT1	Power terminal block
YV1	4-way valve coil

2.9 Wiring of the Terminal Block

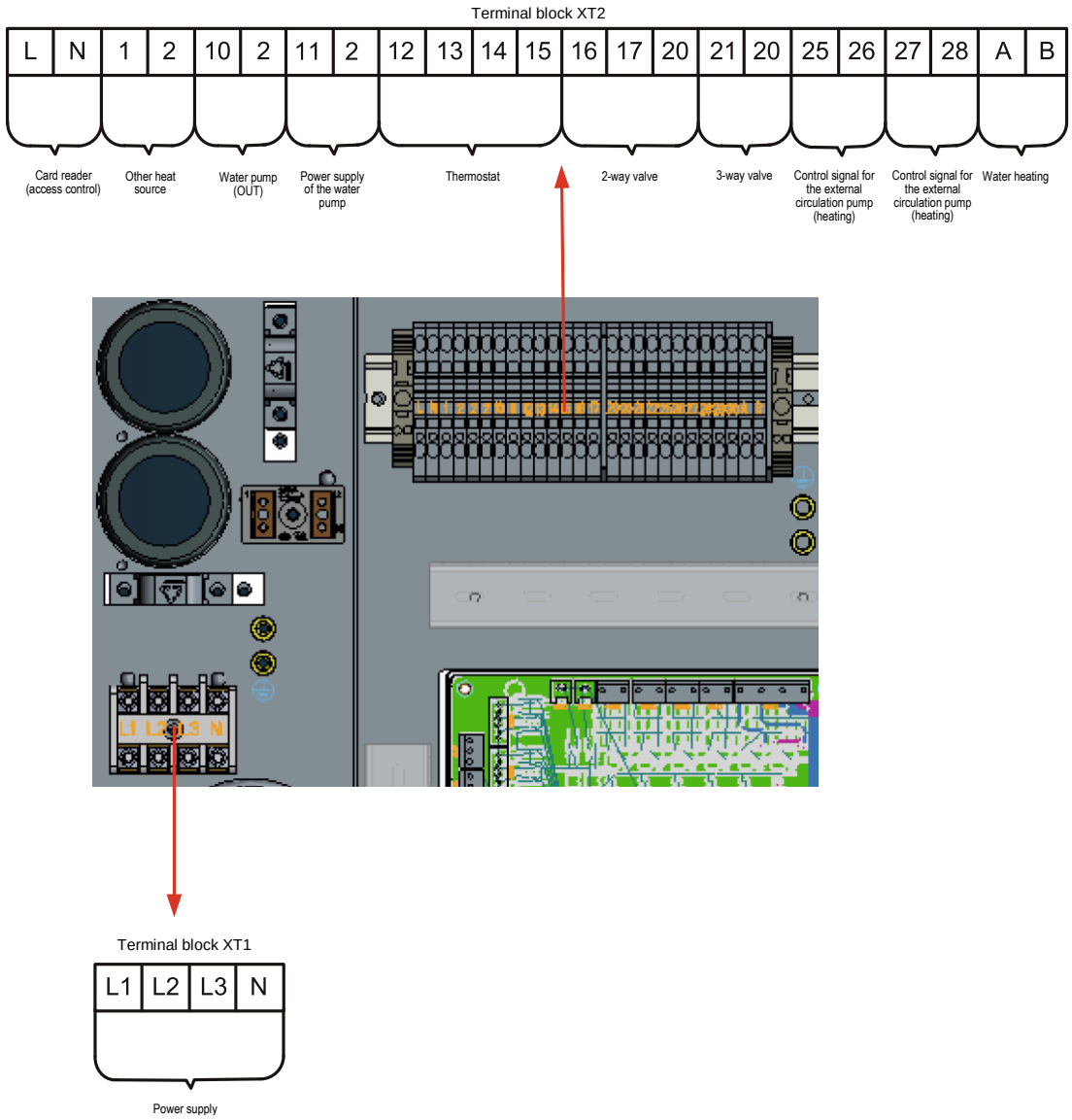
- GSH-40TRB,GSH-60TRB,GSH-80TRB, GSH-100TRB



- GSH-40TRB2, GSH-60TRB2, GSH-80TRB2, GSH-100TRB2, GSH-120TRB2, GSH-140TRB2, GSH-160TRB2



- GSH-80TRB2-3, GSH-100TRB2-3, GSH-120TRB2-3, GSH-140TRB2-3, GSH-160TRB2-3



2.10 Wiring of the 2-Way Valve

2-way valve 1 is needed to control the water flow during cooling or heating operation. The purpose of the 2-way valve 1 is to interrupt the flow of water to the underfloor loop in the Cooling mode when a fan coil unit is used for cooling.

General information

Valve type	Power supply	Operation mode	Supported
NO (normally open), 2 wires	230 VAC, 50 Hz	Closing the water flow	Yes
		Opening the water flow	Yes
NC (normally closed), 2 wires	230 VAC, 50 Hz	Closing the water flow	Yes
		Opening the water flow	Yes

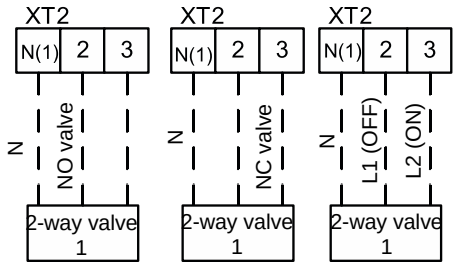
- Normally opened type: The valve is opened when NOT energized. (The valve is closed when power is applied.)
- Normally closed type: The valve is closed when NOT energized. (The valve is opened when power is applied.)

Wiring of the 2-way valve:

Follow steps 1 and 2 to connect the 2-way valve.

Step 1: Remove the front cover of the unit and open the electronics box.

Step 2: Find the terminal block and connect the wires as shown below.



⚠ WARNING

- The normally open type should be connected to the (OFF) and (N) terminals to close the valve in the Cooling mode.
- The normally closed type should be connected to the (ON) and (N) terminals to close the valve in the Cooling mode.
- (ON): Control signal from the PCB to the 2-way valve (normally open type)
- (OFF): Control signal from the PCB to the 2-way valve (normally closed type)
- (N): Common neutral wire from the PCB to the 2-way valve (both types)

2.11 Wiring of the Additional Heat Source

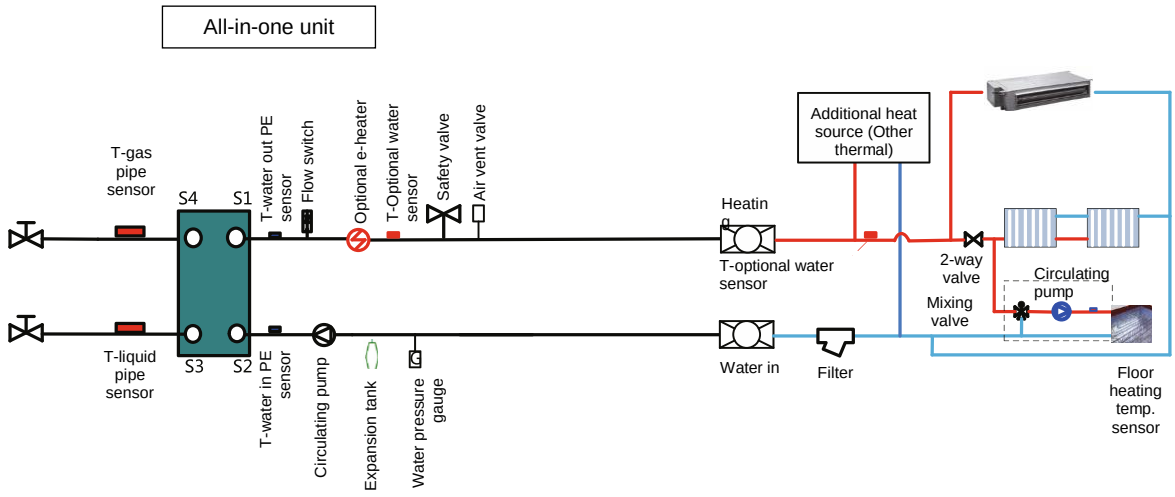
An additional heat source (Other thermal) can be connected to the device, and it is controlled so that when the outdoor temperature is lower than the set value for switching on the additional heat source, a voltage of 230 V will be applied to the appropriate terminals of the main board.

Note: The additional heat source and the optional electric heater CANNOT be installed simultaneously.

Step 1: Installation of the additional heat source

The water pipes of the additional heat source must be connected in parallel with the water pipes of the indoor unit. In addition, an additional temperature sensor (with a 5 m cable) must also be installed.

(1) GSH-40ERB,GSH-60ERB, GSH-80ERB, GSH-100ERB,
GSH-40ERB2, GSH-60ERB2, GSH-80ERB2, GSH-100ERB2, GSH-120ERB, GSH-140ERB, GSH-160ERB, GSH-80ERB-3, GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

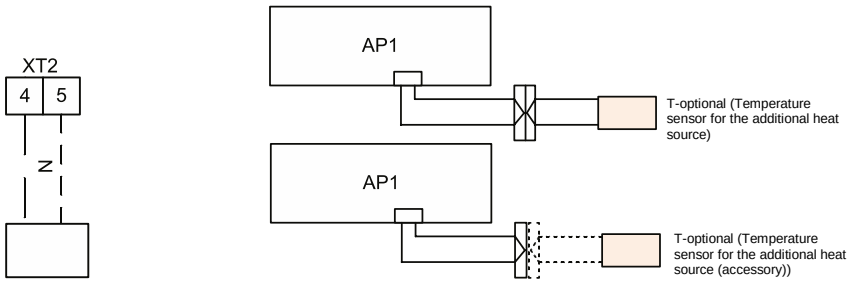


Note: In this situation, Logic 2 is not available for the additional heat source. The use of an additional heat source for the preparation of hot water is not recommended.

Step 2: Electrical wiring

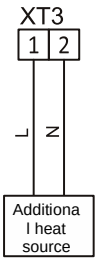
Terminals L and N of the additional heat source should be connected to XT2–4,5.

(1) GSH-40ERB,GSH-60ERB, GSH-80ERB, GSH-100ERB



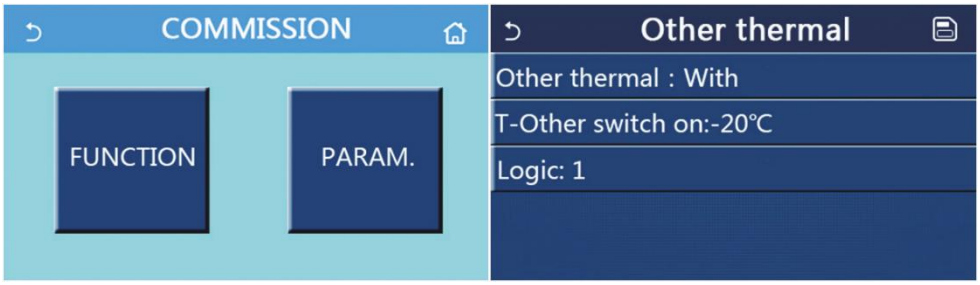
(2) GSH-40ERB2, GSH-60ERB2, GSH-80ERB2, GSH-100ERB2,
GSH-120ERB, GSH-140ERB, GSH-160ERB, GSH-80ERB-3,
GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

Terminals L and N of the additional heat source should be connected to XT3–1,2



Step 3: The setting of the wall-mounted wired controller

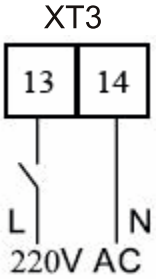
To use an additional heat source, you need to enter the “COMMISSION” → “FUNCTION” → “Other thermal” menu, set the “Other thermal” to “With”, and also set the “T-Other switch on” and “Logic” appropriately.



2.12 Wiring of the Access Card Reader (Gate-controller)

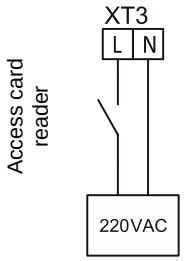
If an access card reader is available, it can be used to turn the unit on/off. Connect it as follows:

(1) GSH-40ERB,GSH-60ERB, GSH-80ERB, GSH-100ERB



(2) GSH-40ERB2, GSH-60ERB2, GSH-80ERB2, GSH-100ERB2,
GSH-120ERB, GSH-140ERB, GSH-160ERB, GSH-80ERB-3, GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

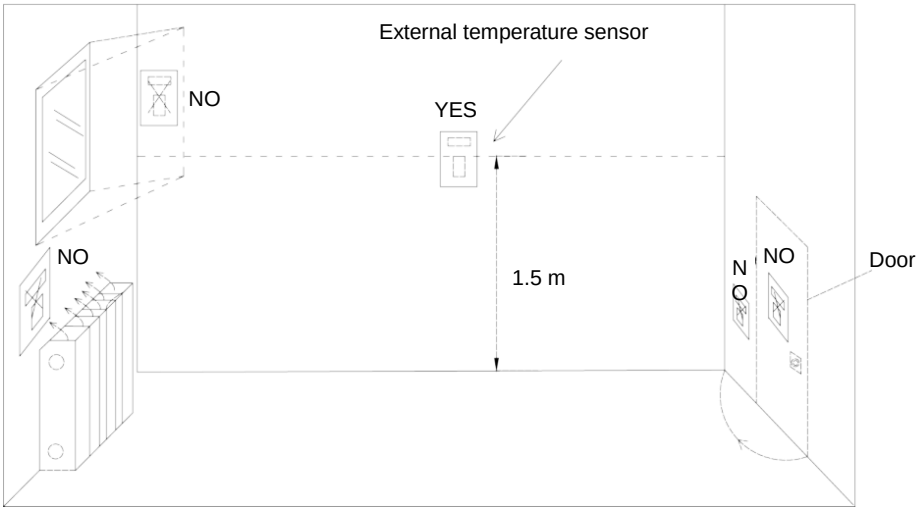
If an access card reader is available, it can be used to turn the unit on/off. Connect it as follows:

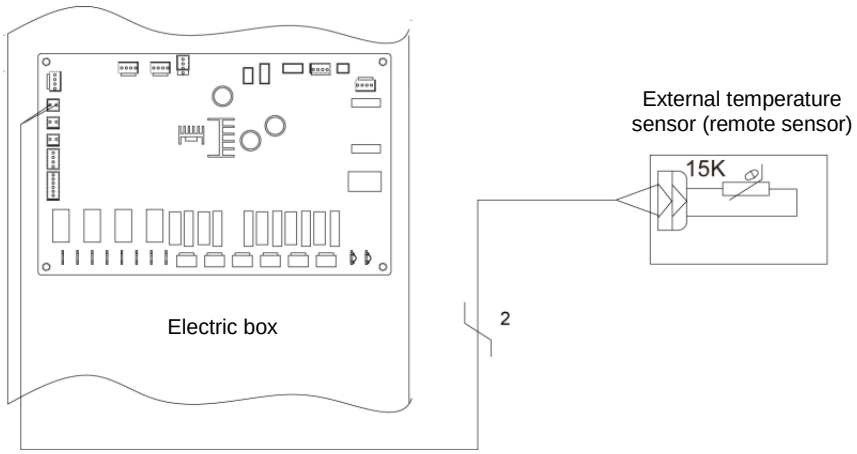


2.13 Wiring of the External Air Temperature Sensor (Remote Temperature Sensor)

Front side

Back side





Notes:

(a) The distance between the indoor unit and the external air temperature sensor should be less than 15 meters because of the length of the sensor cable.

(b) The height of the sensor above the floor should be approximately 1.5 meters.

(c) The external air temperature sensor should not be positioned so that it is covered when the door is open.

(d) The external air temperature sensor should not be positioned where it could be affected by external thermal influences.

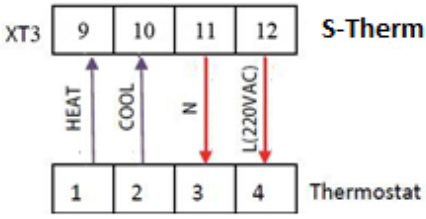
(e) The external air temperature sensor should be installed where the main air-conditioned space is to be.

(f) After installing the external temperature sensor, you should change the relevant parameter on the control panel to “With” so that the device operation is controlled according to the data from the external temperature sensor.

2.14 Wiring of the Thermostat

(1) GSH-40ERB,GSH-60ERB, GSH-80ERB, GSH-100ERB

Installing a thermostat is very similar to installing an external air temperature sensor.



Thermostat connection

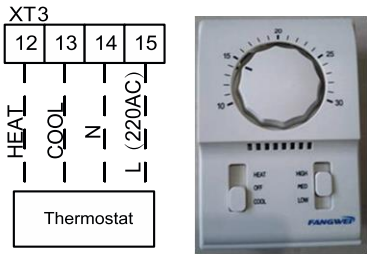
1. Remove the front cover of the indoor unit and open the electric box.
2. Identify the required power supply of the thermostat. If the thermostat is designed for 230 V, locate terminals 9–12 on the XT3 terminal block.
3. If the thermostat is intended for both heating and cooling, connect it as shown in the picture above.

⚠ CAUTION

- The 220 V supply voltage can be supplied to the thermostat from the 4th generation S-Therm heat pump.
- The required temperature (for heating or cooling) can be set by the thermostat only within the adjustable temperature range of this device.
- Other restrictions are the same as for the external temperature sensor (see previous pages).
- Do not connect any other external electrical equipment. The 220 V AC terminals can only be used for the electric thermostat.
- Never connect external electrical loads to the terminals, such as valves, fan coil units, etc. Connecting them can seriously damage the unit's electronics board.
- Installing a thermostat is very similar to installing an external air temperature sensor.

(2) GSH-40ERB2, GSH-60ERB2, GSH-80ERB2, GSH-100ERB2,
GSH-120ERB, GSH-140ERB, GSH-160ERB, GSH-80ERB-3,
GSH-100ERB-3, GSH-120ERB-3, GSH-140ERB-3, GSH-160ERB-3

Installing a thermostat is very similar to installing an external air temperature sensor.



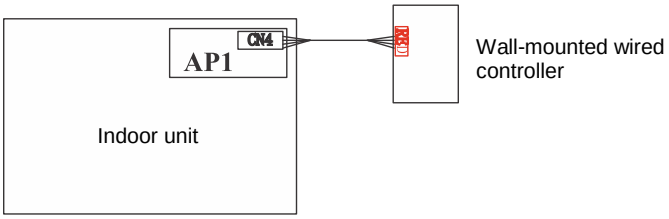
Thermostat connection

1. Remove the front cover of the indoor unit and open the electric box.
2. Identify the required power supply of the thermostat. If the thermostat is designed for 230 V, locate the terminals 12–15 on the XT3 terminal block.
3. If the thermostat is intended for both heating and cooling, connect it as shown in the picture above.

⚠ CAUTION

- The 230 V supply voltage can be supplied to the thermostat from the S-Therm heat pump.
- The required temperature (for heating or cooling) can be set by the thermostat only within the adjustable temperature range of this device.
- Other restrictions are the same as for the external temperature sensor (see previous pages).
- Do not connect any other external electrical equipment. The 220 V AC terminals can only be used for the electric thermostat.
- Never connect external electrical loads to the terminals, such as valves, fan coil units, etc. Connecting them can seriously damage the unit's electronics board.
- Installing a thermostat is very similar to installing an external air temperature sensor.

2.15 Wiring of the Controller



Note:

The wall-mounted wired controller can be connected to the CN4 connector on the AP1 board using a 4-wire communication cable.

3 Commissioning and Trial Run

3.1 Check Before Startup

For safety reasons, the unit must be checked before commissioning. The procedure is as follows:

The following steps must be performed by qualified service personnel.		
Check with the technical support person, dealer, installation contractor, and customer that the following points have been met.		
No.	**Confirmation of installation**	√
1	The content of the request for the installation of this unit corresponds to reality. If not, commissioning will be refused.	□
2	Is there a written record indicating additional or changed items due to unsuitable installation conditions?	□
3	Is the Application for installation and Commissioning list filled?	□
No.	**Preliminary check**	√
1	Is the appearance of the unit and internal piping system in order during shipping, relocation or installation?	□
2	Check the quality, quantity, etc. of the supplied accessories.	□
3	Check that documentation and drawings are available for electrical wiring, controls, piping, etc.	□
4	Check that the installation of the unit is stable enough and that there is enough space for operation and service.	□
5	Check all units for refrigerant pressure and system piping for leaks.	□
6	Is the water tank installation stable and securely fixed after filling with water?	□
7	Is the thermal insulation of the water tank, outlet/inlet pipes and water refill pipe correct?	□
8	Are the tank water level indicator, water temperature indicator, control unit, pressure gauge, safety valve, automatic air discharge valve, etc. installed and working properly?	□
9	Does the power supply agree with the information on the nameplate? Does the power cord meet the installation requirements?	□
10	Are the power and control cables connected correctly according to the wiring diagram? Is the equipment properly earthed (grounded)? Are all cables securely connected to terminals and connectors?	□
11	Are connecting pipes, water pump, pressure gauge, thermometer, valves, etc. installed correctly?	□
12	Is each valve in the system open or closed according to operational requirements?	□
13	Confirm that customers and inspection personnel are present on site as specified in Section A.	□
14	Is the installation check table properly completed and signed by the installation contractor?	□
Warning: If any item is marked as non-compliant (×), inform the contractor. The above items are only for reference.		
Confirmed items after the preliminary check	**General evaluation: Commissioning** □ **Service** □	
	Assess the following items (if nothing is written, everything is assumed to be OK).	
	a: Power supply and electrical control system b: Refrigerant amount calculation	
	c: Heating problems of unit d: Noise problem	
	e: Pipeline problems f: Others	
	Normal commissioning cannot be performed until all installation conditions are met. If there is any problem, it must be solved first. The installer will bear all costs caused by delay or re-commissioning due to problems not immediately solved.	
	Provide the installer with a list of change and service requests.	
	Was the installer given a written list of the requirements, which he confirmed with his signature after approval?	
	Yes ( ) No ( )	

3.2 Trial Run

During the trial run, it is tested whether the unit can operate normally. If the unit does not operate normally, find and solve problems until the trial run is satisfactory. All conditions for commissioning must be met before the trial run. The trial run should be carried out according to the following steps:

The following procedure should be performed by experienced and qualified service personnel.	
No.	**Initiation of the preliminary testing procedure**
Note: Before testing, make sure that all power supplies including the main switch on the power supply are disconnected; otherwise, an accident may occur.	
1	Make sure that the unit's compressor has been preheated for 8 hours.
⚠ Caution: Warm the lubricating oil for at least 8 hours before start-up to prevent the refrigerant from mixing with the lubricating oil, which could cause damage to the compressor when the unit is started.	
2	Check that the phase sequence on the power supply is correct. If not, correct the phase wiring sequence first.
⚠ Before start-up, double-check the phase sequence to prevent the compressor from running in reverse, which could damage the unit.	
3	Use a multimeter to measure the insulation resistance between individual phases and ground, as well as the resistance between phases.
⚠ Caution: Improper earthing can cause electric shock.	
No.	**Preparing for start-up**
1	Disconnect all temporary power supplies, restore all protections and check the wiring one last time.
	Check the power supply and voltage of the control circuit. The voltage _____ V must be within ±10% of the rated operating supply.
No.	**Start-up of the unit**
1	Check all conditions required to start the unit: oil temperature, operating mode, refrigerant charge, load, etc.
2	Start the unit and observe the operation of the compressor, electric expansion valve, fan motor, circulation pump, etc.
	Note: Under the abnormal operating condition, the unit will be damaged. Do not operate the unit at high pressure or high current.
Other:	

Items for approval after commissioning	Assess overall operating condition: good, adjustments needed etc.
	Identify potential problems (if nothing is written, installation and commissioning are assumed to be in accordance with requirements).
	a) Problem with power supply or electrical control system: b) Problem with refrigerant charge calculation:
	c) Outdoor refrigerant system: d) Noise problem:
	e) Problem with the indoor unit and piping system: f) Other problems:
	During operation, a fee is charged for maintenance that was necessary due to problems not related to the quality of the equipment, such as improper installation or maintenance.
	Approval of status and acceptance
	Is the user trained as required? Please mark and sign. Yes ( ) No ( )

TEST OPERATION, TROUBLESHOOTING, AND MAINTENANCE

1 Trial Run

1.1 Checking the Wiring

⚠ NOTE

- Do not test the power supply unless suitable test equipment is available and precautions have been taken; otherwise, serious injury may result.

(1) Are the parameters of the connection cables and the circuit breaker correct?

(2) Does the wiring comply with the relevant electrotechnical standards (electric code), ordinances and regulations?

(3) Are all wires connected correctly?

(4) Are all contacts functional?

(5) Are the power supply and insulation correct?

(6) Are the initial set values of control parameters and protective elements correct?

1.2 Checking the Water System

(1) Are the water flow directions at the inlets and outlets correct?

(2) Are the water pipes clean? Are there any foreign substances on the pipe joints? Is the water quality satisfactory?

(3) Is the pipe insulation in good condition?

(4) Is the water system air vent valve working properly?

(5) Instructions for adding water and venting

1.3 Checking the Communication System

When the unit is powered on, check the communication system, including communication between AP1 and AP2, between the wall-mounted wired controller and the main board. If an abnormal communication condition occurs, this fault will be displayed on the wired controller. In this case, find the cause according to the error code displayed. For wiring of the communication system see the relevant diagram.

1.4 Trial Run

When there are no problems with the wiring and piping, start the unit. After starting, check that the electric expansion valve, water pump, fan and compressor are working normally. If a malfunction occurs, solve it according to the troubleshooting flowchart in this manual. If you cannot solve the problem, contact your dealer.

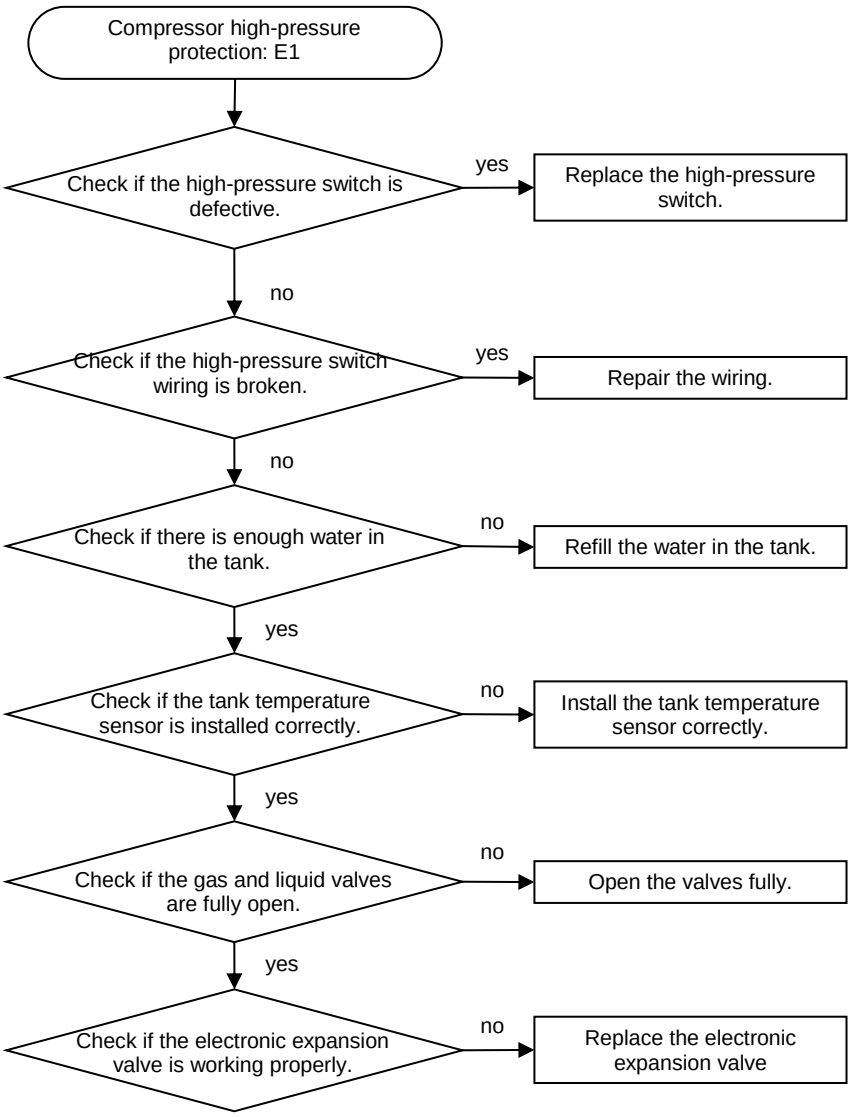
2 Error Code List

No.	Full name	Displayed name	Error code
1	Ambient temperature sensor error	Ambient sensor	F4
2	Defrosting temperature sensor error	Defrost sensor	d6
3	Discharge temperature sensor error	Discharge sensor	F7
4	Suction temperature sensor error	Suction sensor	F5
5	Economizer inlet temperature sensor error	Econ. in sens.	F2
6	Economizer outlet temperature sensor error	Econ. in sens.	F6
7	Outdoor fan error	Outdoor fan	EF
8	High-pressure protection	High pressure	E1
9	Low-pressure protection	Low pressure	E3
10	Compressor discharge high-pressure protection	Hi-discharge	E4
11	Capacity DIP switch error	Capacity DIP	C5
12	Communication error between the outdoor and indoor main boards	ODU-IDU Com.	E6
13	Communication error between the outdoor main board and the drive board	Drive-main com.	P6
14	Communication error between the display panel and indoor main board	IDU Com.	E6

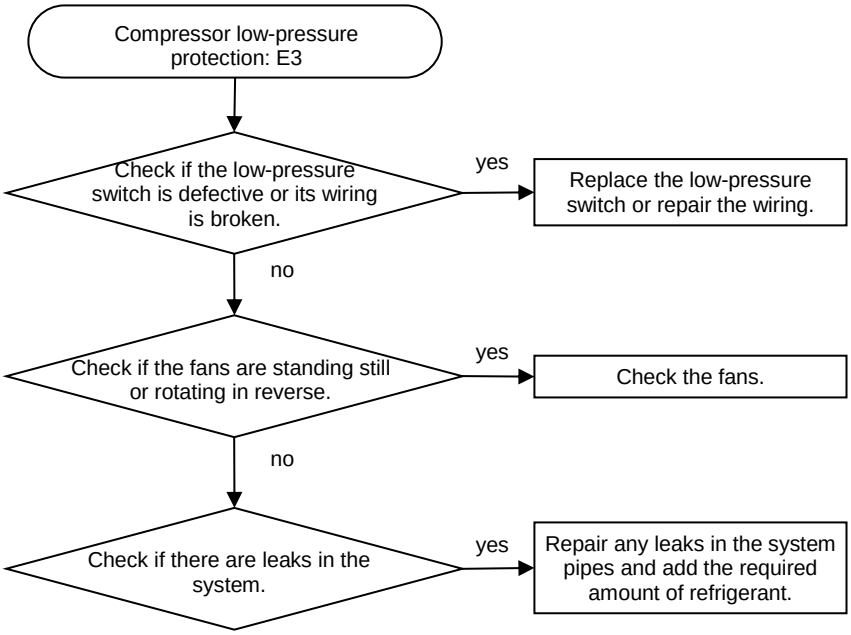
No.	Full name	Displayed name	Error code
15	High-pressure sensor error	HI-pre. sens.	Fc
16	Outlet water temperature sensor error at the plate heat exchanger of the heat pump	Temp-HELW	F9
17	Leaving water temperature sensor error at auxiliary electric heater of the heat pump	Temp-AHLW	dH
18	Inlet water temperature sensor error at the plate heat exchanger of the heat pump	Temp-HEEW	It does not have an error code but is displayed on the control panel
19	Water tank temperature sensor error (“NA” for mini chillers)	Tank sens.	FE
20	External room temperature sensor error	T-Remote Air	F3
21	Heat pump flow switch protection	HP-Water Switch	Ec
22	Overheating protection of the auxiliary electric heater 1 of the heat pump	Auxi. heater 1	EH
23	Overheating protection of the auxiliary electric heater 2 of the heat pump	Auxi. heater 2	EH
24	Overheating protection of the water tank e-heater	Auxi. -WTH	EH
25	DC bus under-voltage or voltage drop protection	DC under-vol.	PL
26	DC bus over-voltage protection	DC under-vol.	PH
27	AC current protection (input side)	AC curr. pro.	PA
28	Defective IPM	IPM defective	H5
29	Defective PFC	PFC defective	Hc
30	Start failure	Start failure	Lc
31	Phase loss	Phase loss	Ld
32	Jumper cup error	Jumper cap error	C5
33	Driver resetting	Driver reset	P0
34	Compressor overcurrent	Com. over-cur.	P5
35	Overspeed	Overspeed	LF
36	Current sensing circuit error or current sensor error	Current sen.	Pc
37	Desynchronization	Desynchronize	H7
38	Compressor stalling	Comp. stalling	LE
39	Radiator of IPM or PFC over-temperature	Overtemp.-mod.	P8
40	Radiator of IPM or PFC temperature sensor error	T-mod. sensor	P7
41	Charging circuit error	Charge circuit	Pu
42	AC input voltage error	AC voltage	PP
43	Ambient temperature sensor error at the drive board	Temp-driver	PF
44	AC contactor protection or input over-zero error	AC contactor	P9
45	Temperature drift protection	Temp. drift	PE
46	Protection in case of incorrect sensor connection (current sensor is not connected to the appropriate U or V phase)	Sensor con.	Pd
47	Communication error between the display panel and outdoor unit	ODU Com.	E6
48	Refrigerant gas pipe temperature sensor error	Temp RGL	F0
49	Refrigerant liquid pipe temperature sensor error	Temp RLL	F1
50	4-way valve error	4-way valve	U7

3 Troubleshooting Flowcharts

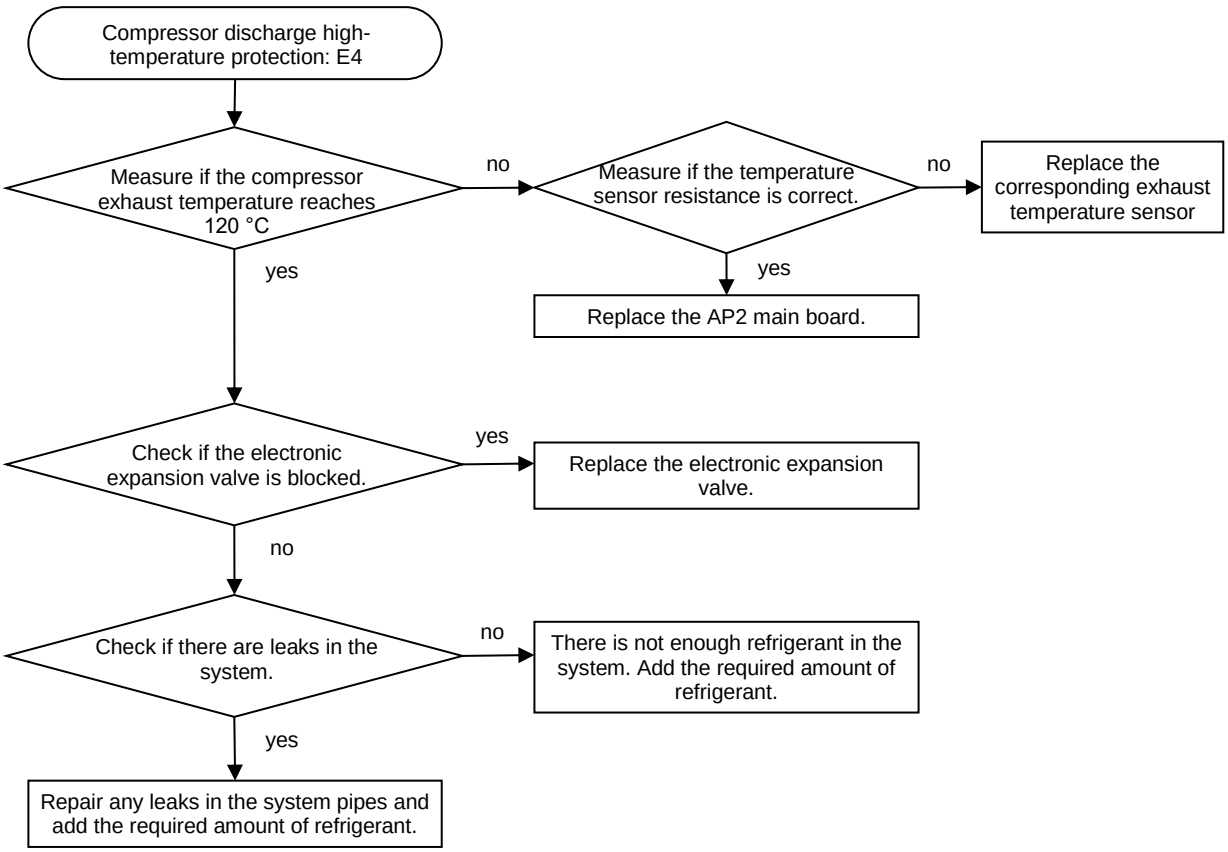
3.1 Compressor High-Pressure Protection (E1)



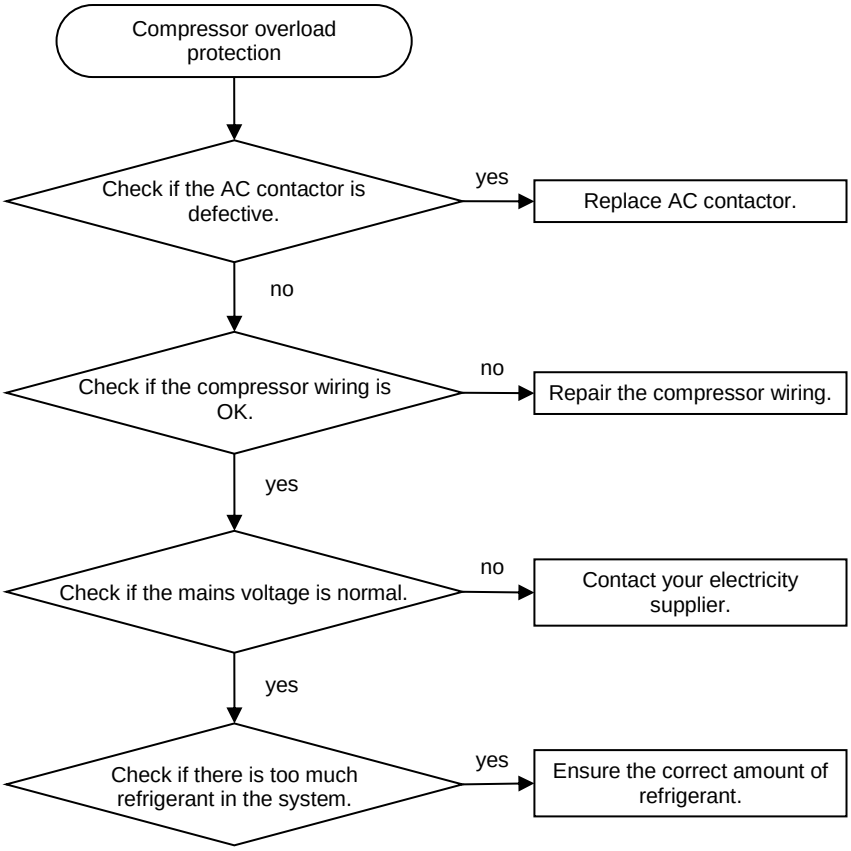
3.2 Compressor Low-Pressure Protection (E3)



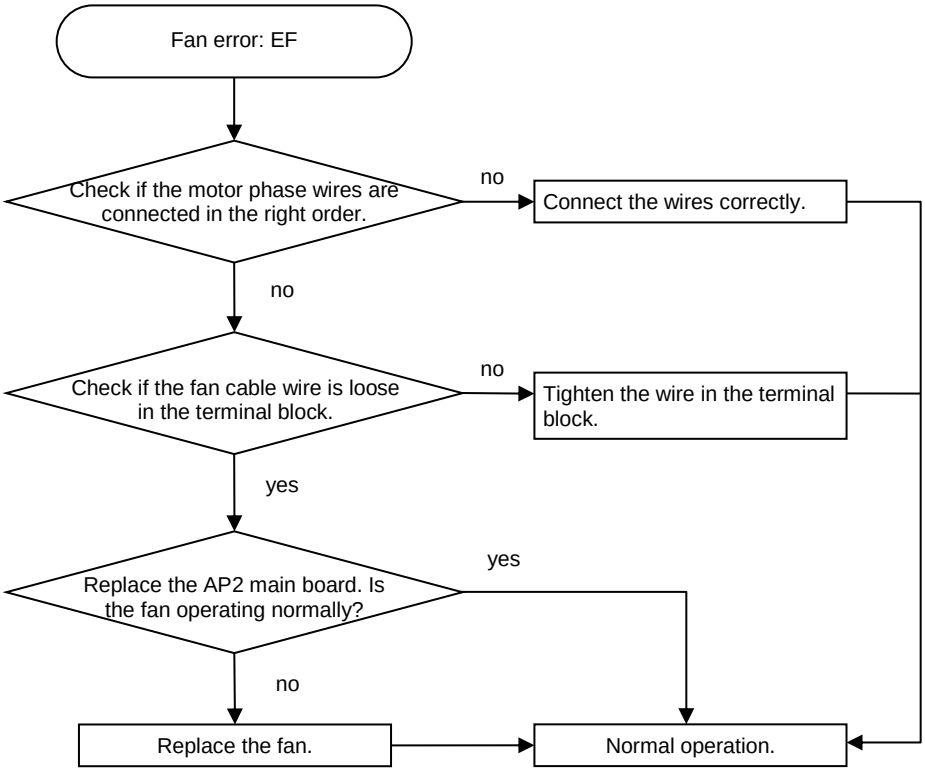
3.3 Compressor Discharge High-Temperature Protection (E4)



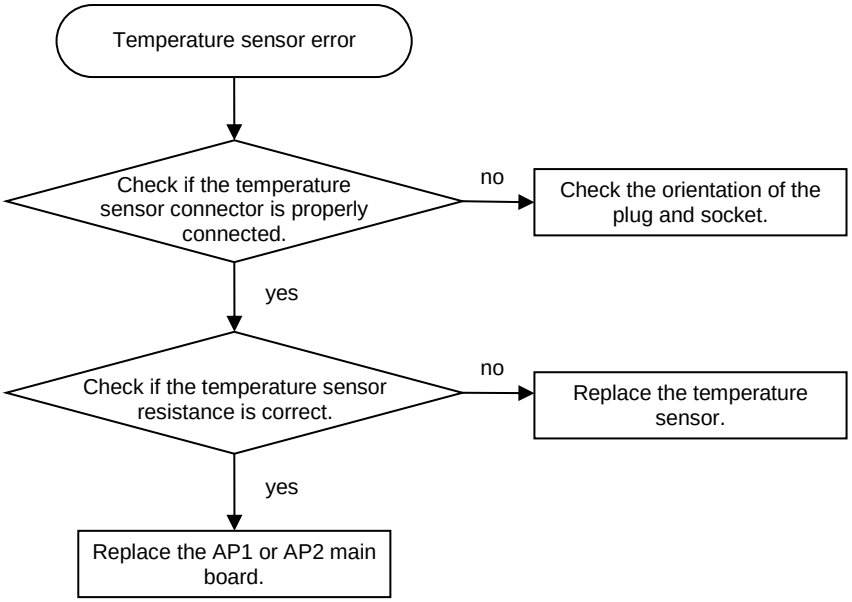
3.4 Compressor Overload Protection or Driver Error



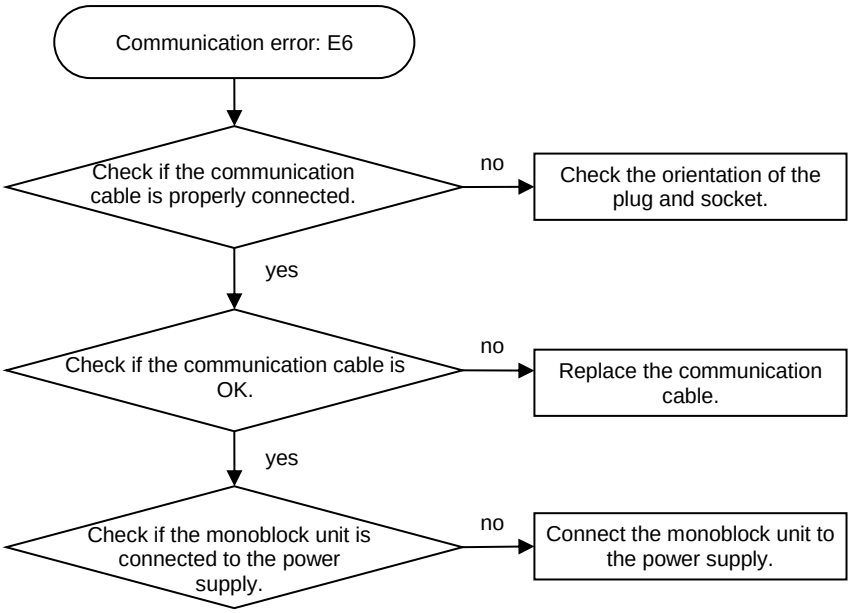
3.5 Fan DC Motor Malfunction (EF)



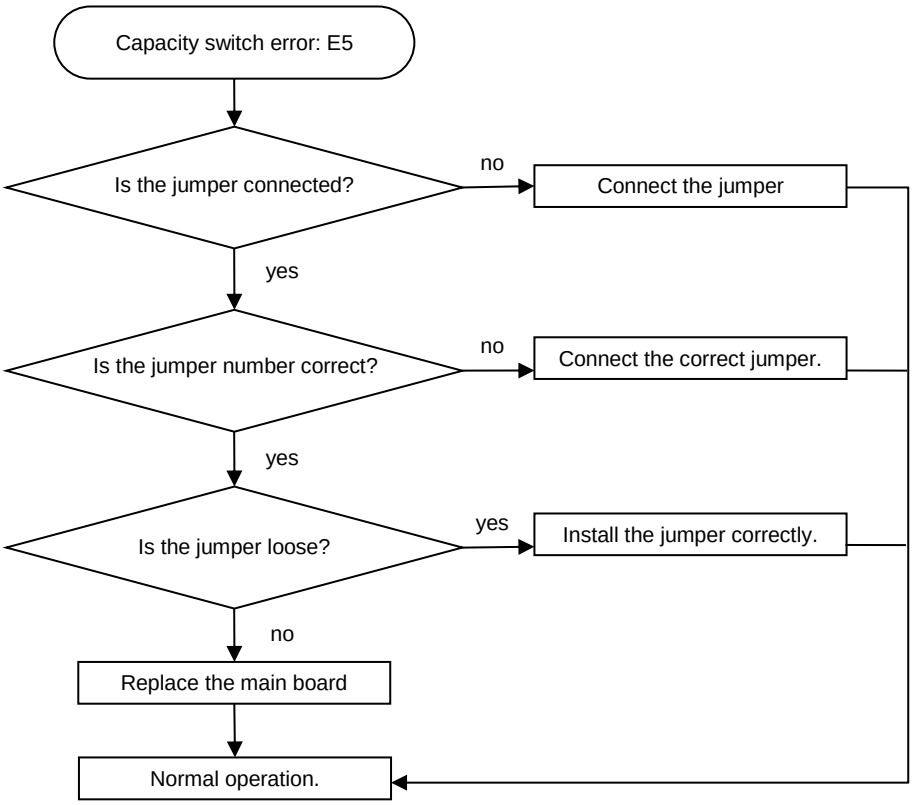
3.6 Temperature Sensor Error



3.7 Communication Error (E6)



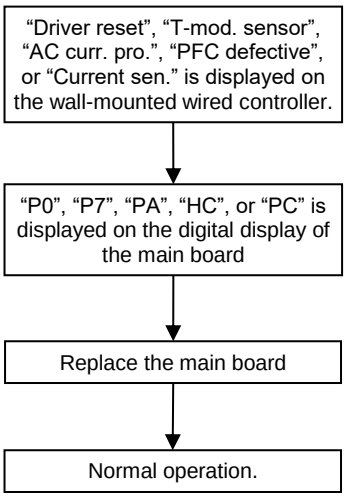
3.8 Capacity Switch Error (C5)



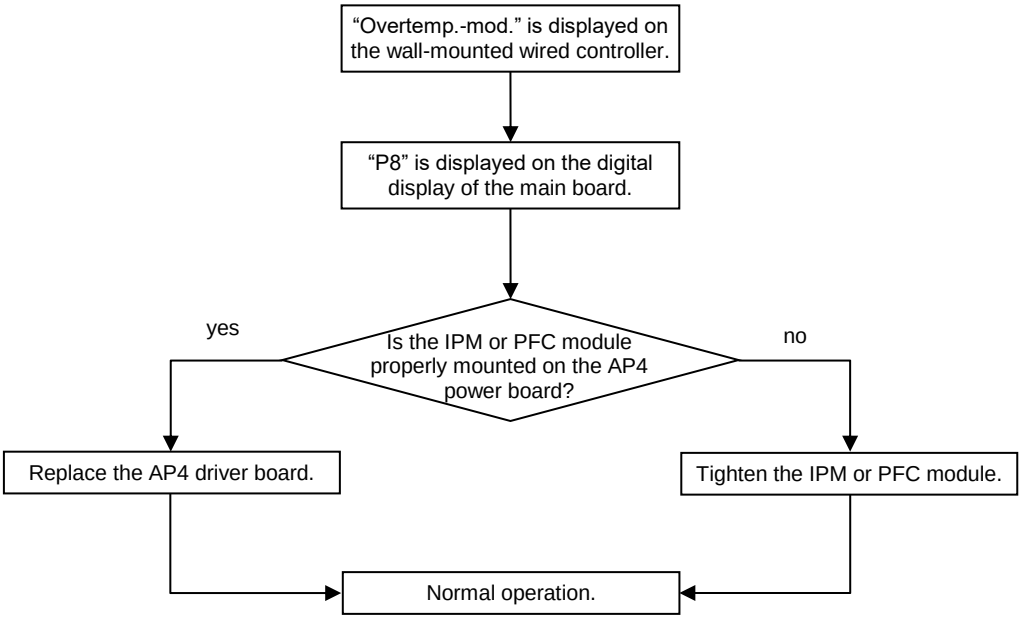
4 Diagnosis of the Drive Module

4.1 Driver Diagnosis Flowchart for Single-Phase Unit and Three-Phase Unit

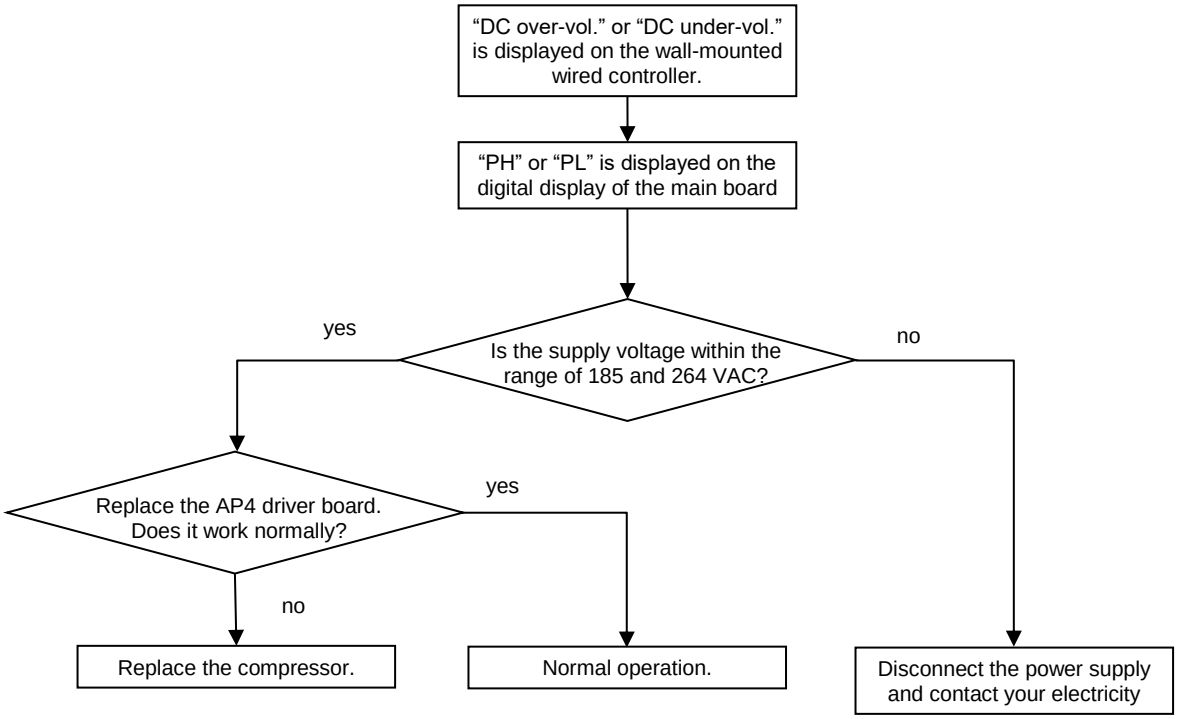
- Drive module reset “P0”); IPM or PFC temperature sensor error (code: “P7”); AC overcurrent protection (input side) (code: “PA”); Current measurement circuit error (code: “PC”); PFC protection (code: “HC”)



- IPM or PFC over-temperature protection (P8)

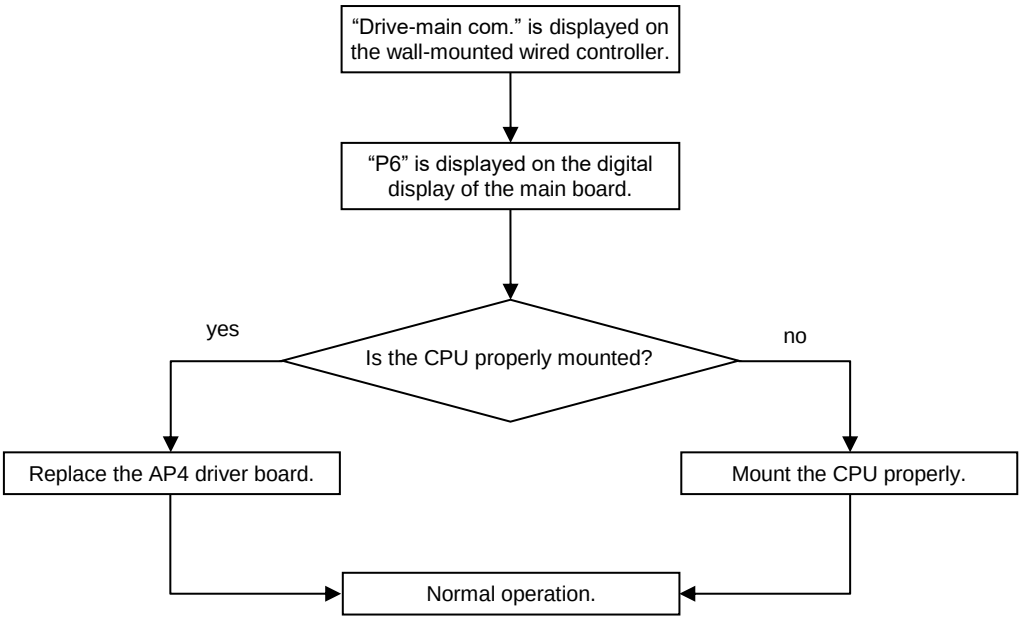


- DC bus over-voltage protection (PH); DC bus under-voltage protection (PL)

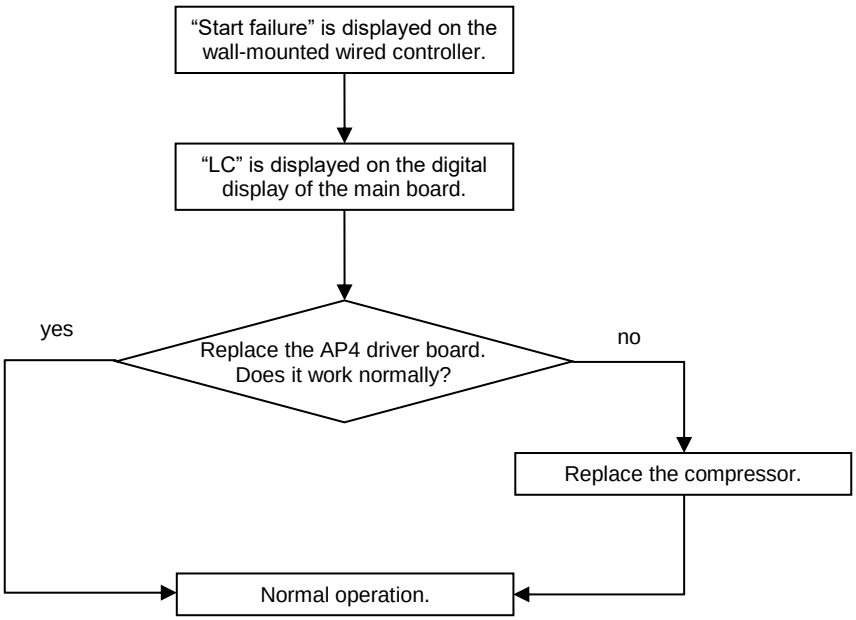


Note: The 3-phase input voltage is in the range of 320 to 475 VAC.

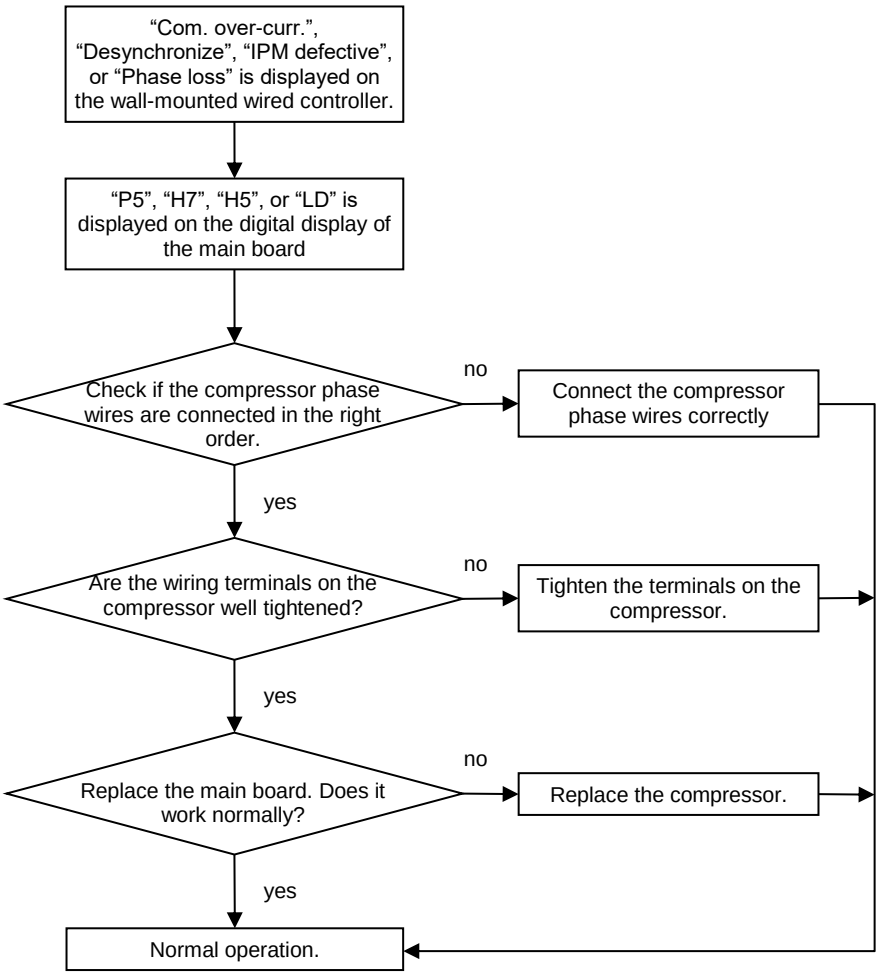
- Communication error between driver board and main control board (P6)



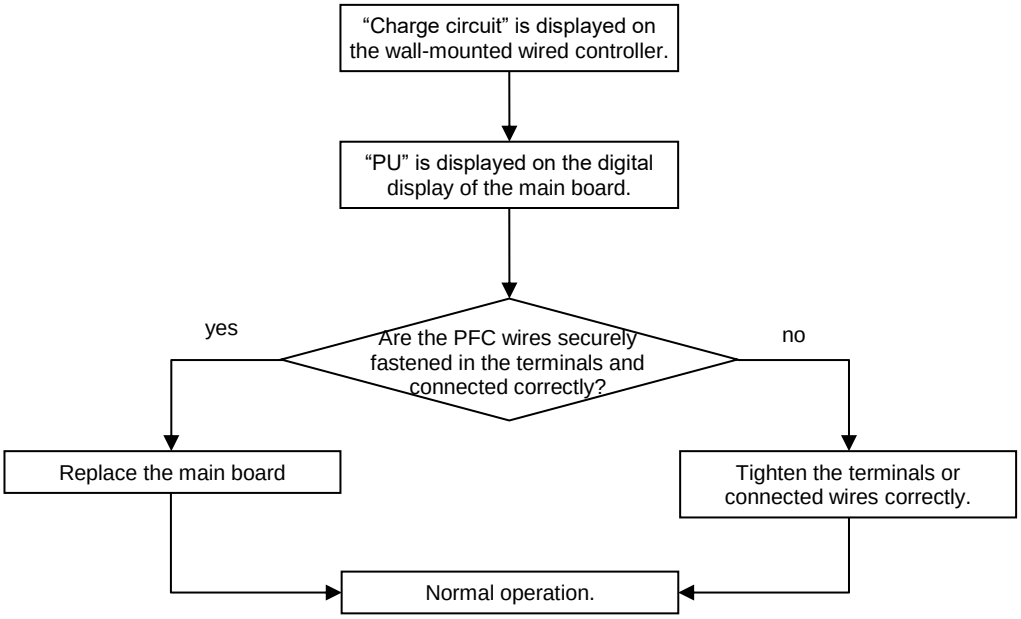
- Compressor start failure (LC)



- Compressor overcurrent protection (P5); Compressor motor desynchronizing (H7); IPM protection (H5); Phase loss (LD)



- Charging circuit error (PU)



5 Daily Maintenance and Repair

5.1 Daily Maintenance

To prevent damage to the unit, all protective elements must be mounted on it so that the user cannot tamper with the device.

Before starting for the first time, and before starting after a long shut down (more than 1 day), when the device is disconnected from the power supply, first connect the power supply and let the unit preheat for at least 8 hours.

Never place any items on the unit and accessories. Keep the space around the unit dry, clean and well ventilated.

Remove dust accumulated on the condenser fins as necessary to ensure proper operation of the unit and to prevent the unit from shutting down due to protection activation.

To prevent activation of the protection or damage to the unit caused by a blocked water system, clean the water system filter regularly and check frequently for water replenishment.

To ensure frost protection, never disconnect the power supply if the ambient temperature drops below 0 °C in winter.

To prevent frost damage to the unit, water must be drained from the unit and piping system during extended downtime. In addition, open the water tank drain plug and drain the water from the tank.

During normal operation, do not turn the unit off and on too often and do not close the manual valve of the water system.

Check the operating condition of all parts frequently and make sure that there are no oil stains at the pipe joints or on the filling valve to prevent refrigerant leakage.

In the event of a malfunction that cannot be resolved by the user, contact an authorized service centre immediately.

⚠ NOTE

A pressure gauge is installed on the return water pipe in the indoor unit. Maintain system hydraulic pressure according to the following points:

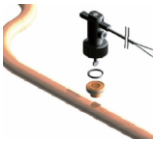
- If the pressure is less than 0.5 bar, add water immediately.
- When refilling the water, the system hydraulic pressure should not exceed 2.5 bar.

5.2 Troubleshooting

Malfunction	Cause	Solution
The compressor does not start	1. 1. Power supply problem. 2. Loose wire. 3. Main board fault. 4. Compressor malfunction.	1. Reverse phase order. 2. Check and retighten. 3. Find the cause and repair. 4. Replace the compressor.
Heavy fan noise	1. The fan mounting bolt is loose. 2. The fan blade touches the cover or grille. 3. The fan does not work reliably.	1. Tighten the fan mounting bolt. 2. Find the cause and repair. Replace the fan.
Heavy compressor noise	1. Liquid refrigerant enters the compressor (flooding) 2. The internal parts of the compressor are damaged.	1. Check that the expansion valve is OK and that the temperature sensor is not loose. If you find a fault, repair it. 2. Replace the compressor.
The circulation pump does not work or does not work properly.	1. Power supply or terminal block problem. 2. Relay malfunction. 3. Air in the water pipe.	1. Find the cause and repair. 2. Replace the relay. 3. Bleed the piping.
The compressor often starts or stops.	1. Too little or too much refrigerant. 2. Poor water circulation in the water system. 3. Low load.	1. Add or discharge a part of the refrigerant. 2. The water system is blocked or there is air in it. Check water pump, valve and piping. Clean the water filter or bleed the pipes 3. Adjust the load or add an accumulating device.
The unit does not heat even when the compressor is running.	1. Refrigerant leak. 2. Compressor malfunction.	1. Detect and repair leaks, and add refrigerant. 2. Replace the compressor.
Low efficiency of water heating.	1. Poor thermal insulation of the water system. 2. Poor heat exchange of the evaporator. 3. Not enough refrigerant in the unit. 4. Blockage of the heat exchanger on the water side.	1. Improve the thermal insulation of the system. 2. Check that the air supply and exhaust of the unit are OK and clean the evaporator of the unit. 3. Check for refrigerant leakage from the unit. 4. Clean or replace the heat exchanger.

5.3 Repair

5.3.1 Main Parts

Picture	Name	Function
	Compressor	It is the core of the refrigeration system, which is mainly used to convert low-temperature, low-pressure refrigerant vapour to high-temperature high-pressure vapour and then discharge it into the evaporator. Here, a two-stage compressor is used to increase the enthalpy of the refrigerant, which can greatly improve the heating performance of the unit.
	Electronic expansion valve	It is one of the four main components and is used to convert high-pressure liquid refrigerant to a low-temperature, low-pressure vapour-liquid mixture and to regulate the flow of refrigerant entering the evaporator.
	Gas-liquid separator	It is installed on the suction line side, and its purpose is to prevent liquid refrigerant from entering the compressor, which could otherwise lead to the compressor being flooded with liquid refrigerant and consequently damage the compressor.
	4-way valve	It is used to switch the direction of refrigerant flow when switching between cooling and heating. It can also be used for defrosting by a counterflow of the refrigerant.
	Plate heat exchanger	It is a water-refrigerant plate-type heat exchanger used to liquefy high-temperature high-pressure vapour refrigerant or to evaporate low-temperature low-pressure liquid refrigerant. The condensation heat is removed by circulating water, and the heat for evaporation is also supplied by circulating water.
	Water pump	It is a motor-driven pump for water circulation.
	Expansion tank	It is used to maintain a stable water system pressure. The tank is filled with a certain volume of nitrogen, which is separated from the water by a gas bag. If the water pressure exceeds the nitrogen pressure, the gas bag expands and water enters the tank to reduce the pressure of the water system. Conversely, if the water pressure drops, the nitrogen in the tank expels the water out to the water system.
	Flow switch	It prevents the heat exchanger from freezing due to reduced water flow. When the flow rate drops to the limit at which the flow switch is activated, the switch opens, and the unit reports an error and shuts down.

Picture	Name	Function
	Economizer	It is used in the Heating mode and Water Heating mode, but NOT used in the Cooling mode. On the one side, it can increase the subcooling before the expansion valve, and, on the other side, it can heat the refrigerant in the heating circuit.
	Safety valve	It prevents an unusual increase in the circulating water pressure. If the pressure is greater than the set value (0.3 MPa), this valve opens to release the water pressure.
	Air vent valve	It is used to remove air trapped inside the water system to ensure normal system operation. It is usually installed at the highest point of the system.

5.3.2 Charging and Discharging of Refrigerant

The unit has been charged with refrigerant before shipment from the manufacturer. Too much or too little refrigerant will cause malfunction or damage to the compressor. If refrigerant charging or discharging is needed for installation, maintenance, or other reasons, follow the steps below and the nominal amount of refrigerant on the nameplate.

Discharging: Remove the metal panels on the unit casing, connect a hose to the charging valve, and then discharge the refrigerant.

⚠ NOTE

- Discharging is only permitted when the unit has been stopped. (Turn off the power and reconnect it after 1 minute.)
- Protective equipment should be used during discharging to prevent possible frostbite.
- When refrigerant discharging is completed but vacuuming cannot be performed immediately, disconnect the hose to prevent air or dirt from entering the unit.
- When discharging is complete, use hoses connected to the charging valve, manometer, and vacuum pump to vacuum the unit.
- When vacuuming is complete, the pressure in the unit should remain below 80 Pa for at least 30 minutes to ensure that there are no leaks in the system. Either charging valve 1 or 2 can be used for vacuuming.
- When the vacuuming is complete and you are sure that there are no leaks in the system, you can charge the system with refrigerant.

Leak detection methods:

The following refrigerant leak detection methods are suitable for systems containing flammable refrigerant.

Electronic leak detectors can be used to detect flammable refrigerant leaks, but their sensitivity may not be adequate and recalibration may be required. (The detection equipment must be calibrated in a place where there is no refrigerant.)

Make sure that the detector is suitable for the refrigerant used and cannot cause it to ignite.

The refrigerant leak detection equipment must be set to the LFL (lower flammability limit) percentage of the refrigerant, must be calibrated for the refrigerant used, and must be able to determine the appropriate gas concentration (max. 25%).

Leak detection fluids can be used for most refrigerants, but the use of chlorine-containing cleaners should be avoided as chlorine can react with the refrigerant and cause corrosion of copper piping.

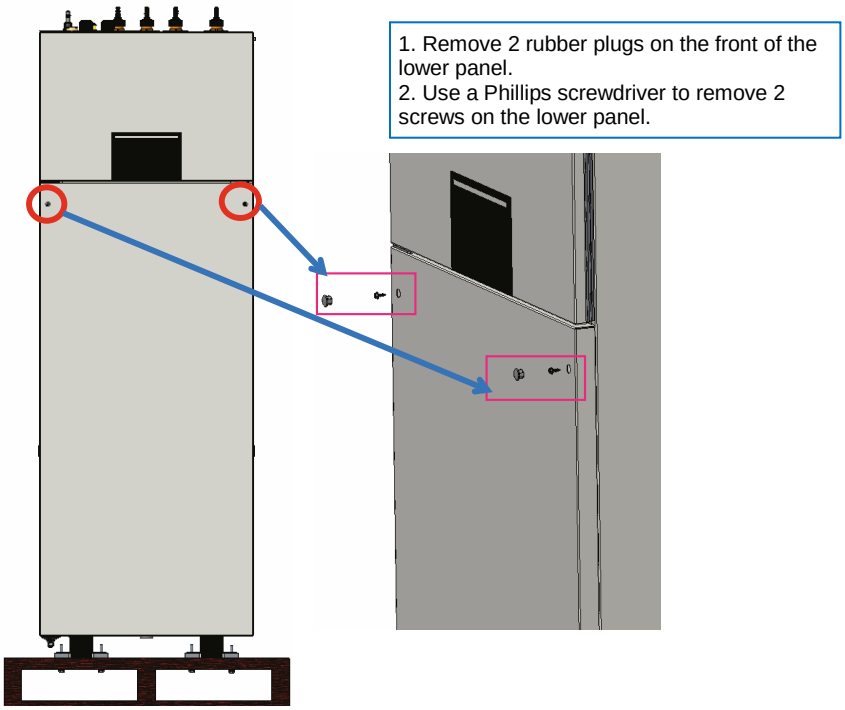
If there is a suspicion of refrigerant leakage, all open flames must be removed/extinguished. If a refrigerant leak is detected that requires brazing to repair, all refrigerant must be discharged from the system or isolated (using shut-off valves) in the part of the system that is not repaired. Before and during brazing, the piping system must be flushed with oxygen-free nitrogen (OFN).

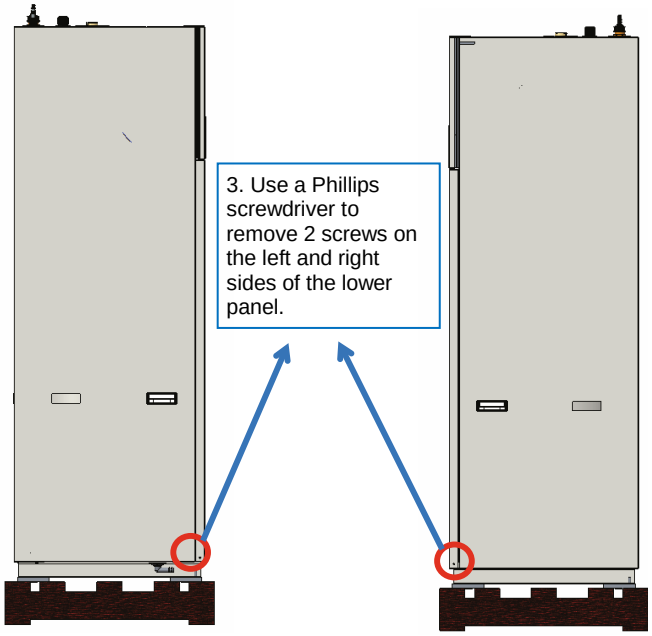
Note:

Before and during the operation, use a suitable refrigerant leak detector to monitor the work area and ensure that technicians are fully aware of the potential and actual danger of a flammable refrigerant leak. Make sure that the leak detection equipment is suitable for the flammable refrigerant. It should not produce sparks, it should be completely enclosed and inherently safe.

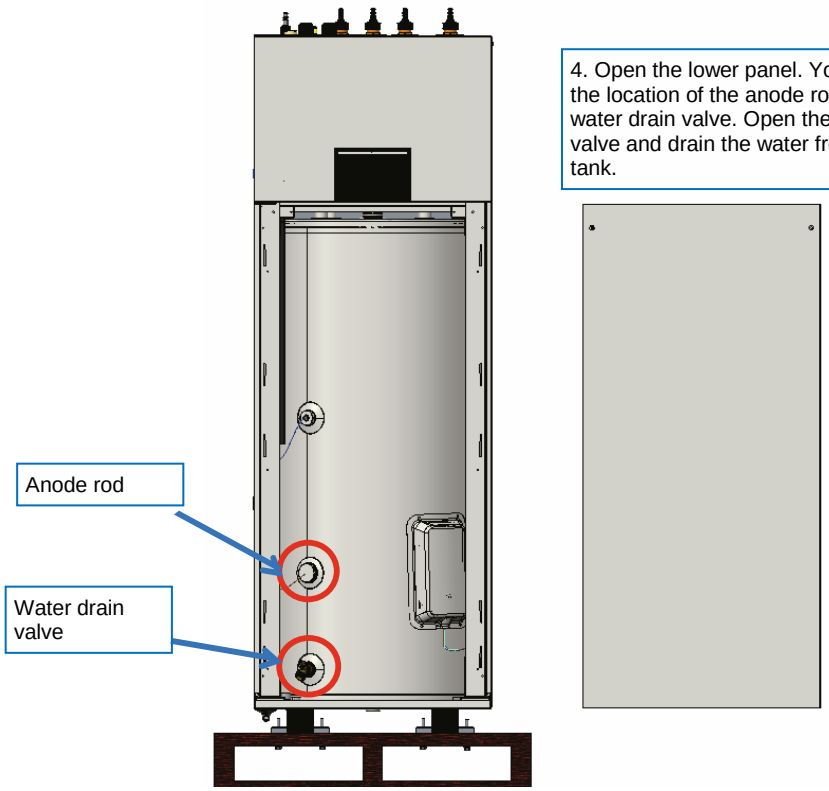
5.3.3 Replacement of the Anode Rod

Note: Before any installation or replacement, make sure that the power supply is disconnected!

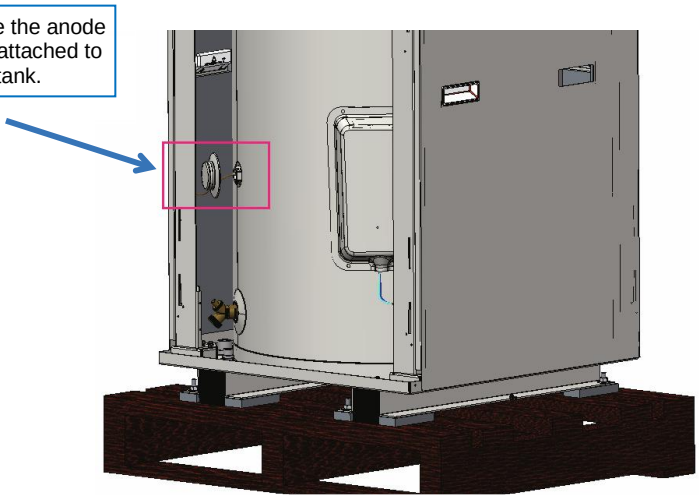




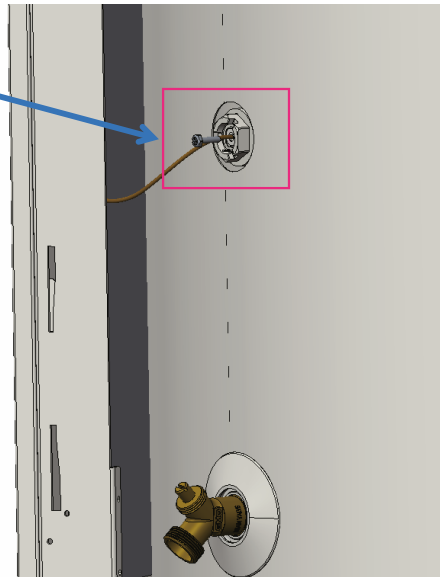
4. Open the lower panel. You will see the location of the anode rod and the water drain valve. Open the water drain valve and drain the water from the tank.



5. Remove the anode rod cover attached to the water tank.



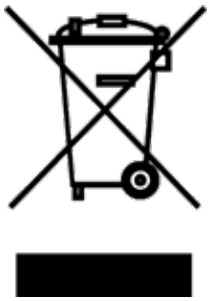
6. Use a Phillips screwdriver to remove 1 screw that secures the power cord.



7. Use a wrench to unscrew the old anode rod counterclockwise and remove it.

8. Install a new anode rod by performing steps 1–7 in reverse order.

NOTE CONCERNING PROTECTION OF ENVIRONMENT



This product must not be disposed of via normal household waste after its service life, but must be taken to a collection station for the recycling of electrical and electronic devices. The symbol on the product, the operating instructions or the packaging indicate such disposal procedures. The materials are recyclable in accordance with their respective symbols. By means of re-use, material recycling or any other form of recycling old appliances you are making an important contribution to the protection of our environment. Please ask your local council where your nearest disposal station is located.

INFORMATION CONCERNING USED REFRIGERANT MEDIUM

This unit is containing fluorinated gases included in the Kyoto protocol.
The maintenance and the liquidation must be carried out by qualified personnel.

Type of refrigerant: R32
The quantity of the refrigerant: Please see the unit label.
The value GWP: 675 (1 kg R32 = 0,675 t CO_2 eq)
GWP = Global Warming Potential

 Appliance filled with flammable gas R32.

In case of quality problem or other please contact your local supplier or authorized service center.
Emergency number: 112

PRODUCER

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This product was manufactured in China (Made in China).

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