



Service Manual

GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI

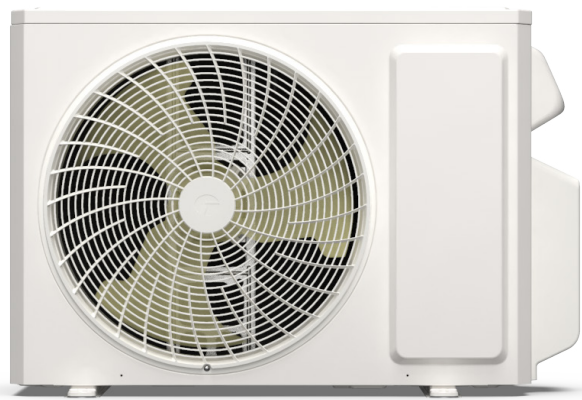
Table of Contents

Part I : Technical Information	1
1. Summary	1
2. Specifications	2
3. Outline Dimension Diagram	12
4. Refrigerant System Diagram	14
5. Electrical Part	18
5.1 Wiring Diagram	18
5.2 PCB Printed Diagram	21
6. Function and Control	24
Part II : Installation and Maintenance	26
7. Notes for Installation and Maintenance	26
8. Installation	35
8.1 Electrical Connections	36
8.2 Installation connection wires of DRED module	39
8.3 Installing the Outdoor Unit	40
8.4 Installation Dimension Diagram	41
8.5 Check after Installation	42
9. Maintenance	43
9.1 Precautions before Performing Inspection or Repair	43
9.2 Flashing LED of Indoor/Outdoor Unit and Primary Judgement	44
9.3 Malfunction Checking and Elimination	45
9.4 Troubleshooting for Normal Malfunction	57
10. Exploded View and Parts List	59
11. Removal Procedure	64
Appendix	82
Appendix 1: Reference Sheet of Celsius and Fahrenheit	82
Appendix 2: Pipe Expanding Method	83
Appendix 3: List of Resistance for Temperature Sensor	84

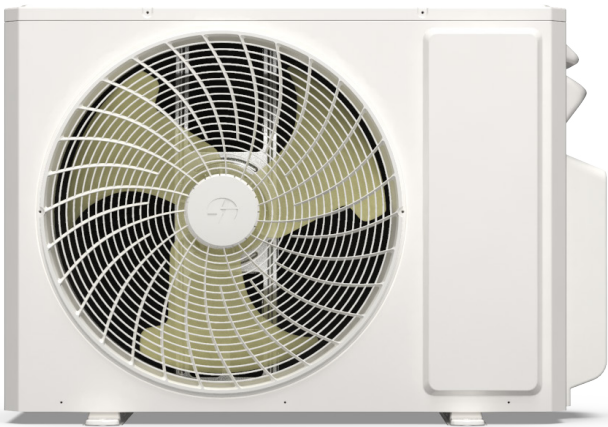
1. Summary

Outdoor Unit:

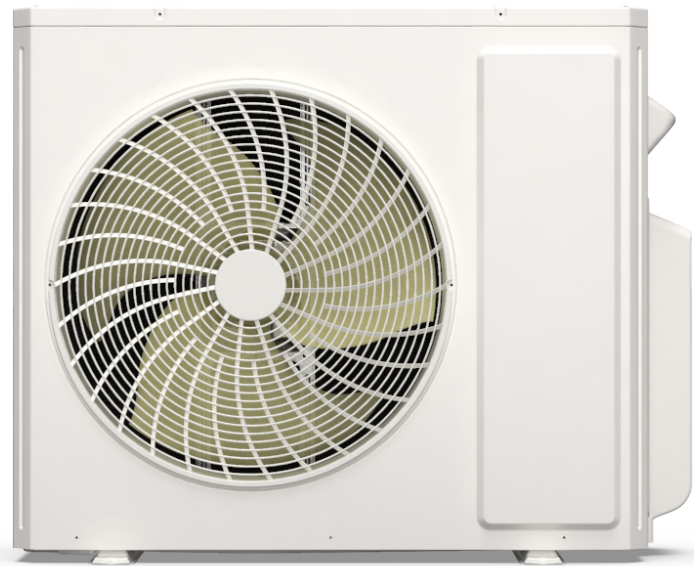
GWHD(18)NK6PO



GWHD(24)NK6PO GWHD(28)NK6PO



GWHD(36)NK6PO GWHD(42)NK6PO



Model list:

No.	Model	Product code
1	GWHD(18)NK6PO	CB228W18600
2	GWHD(24)NK6PO	CB228W18700
3		CB228W18701
4	GWHD(28)NK6PO	CB228W18300
5		CB228W18301
6	GWHD(36)NK6PO	CB228W18900
7		CB228W18901
8	GWHD(42)NK6PO	CB228W18800
9		CB228W18801

2. Specifications

Model	-	GWHD(18)NK6PO
Product Code	-	CB228W18600
Rated Voltage	V~	220-240
Rated Frequency	Hz	50
Phases	--	1
Cooling Capacity	kW	5.3
Heating Capacity	kW	5.65
Cooling Power Input	kW	1.38
Heating Power Input	kW	1.27
Cooling Current Input	A	6.12
Heating Current Input	A	5.63
Rated Power Input	kW	2.5
Rated Current	A	11
EER	W/W	3.84
COP	W/W	4.45
Compressor Manufacturer	-	ZHUHAI LANDA COMPRESSOR CO., LTD.
Compressor Model	-	QXF-A139zH170A
Compressor Refrigerant Oil Type	-	FW68DA
Compressor Type	-	Inverter Rotary
Compressor Locked Rotor Amp	A	25
Compressor Rated Load Amp	A	/
Compressor Power Input	W	1295
Compressor Thermal Protector	-	KSD115°C HPC115/95U1
Throttling Method	-	Electron expansion valve
Cooling Operation Ambient Temperature Range	°C	-15~52
Heating Operation Ambient Temperature Range	°C	-22~24
Condenser Material	-	Aluminum Fin-copper Tube
Condenser Pipe Diameter	mm	Φ7
Condenser Number of Rows-Fin Pitch	mm	2-1.4
Condenser (L×H×W)	mm	834×528×38.1
Fan Motor Speed	rpm	Cooling: 800 / Heating: 860
Fan Motor Power Output	W	30
Motor Full Load Amp	A	0.4
Fan Motor Capacitor	μF	/
Air Flow Volume	m³/h	2300
Fan Type	-	Axial-flow
Fan Diameter-Height	mm	Φ420-131.1
Defrosting Method	-	Automatic Defrosting
Climate Type	-	T1
Isolation	-	I
Moisture Protection	-	IPX4
Permissible Excessive Operating Pressure for the Discharge Side	MPa	4.3
Permissible Excessive Operating Pressure for the Suction Side	MPa	2.5
Dimension of Outline (W×H×D)	mm	822×550×352
Dimension of Carton Box (L×W×H)	mm	869×395×594
Dimension of Package (L×W×H)	mm	872×398×620
Net Weight	kg	34
Gross Weight	kg	36.5
Refrigerant	-	R32
Refrigerant Charge	kg	0.9

2. Specifications

Cross-sectional Area of Power Cable Conductor	mm ²	1.5
Recommended Power Cable	N	3
Connection Pipe Connection Method	-	Flare Connection
Not Additional Gas Connection Pipe Length	m	40
Connection Pipe Gas Additional Charge	g/m	20
Outer Diameter of Liquid Pipe1	inch	1/4
Outer Diameter of Gas Pipe1	inch	3/8
Outer Diameter of Liquid Pipe2	inch	1/4
Outer Diameter of Gas Pipe2	inch	3/8
Outer Diameter of Liquid Pipe3	inch	/
Outer Diameter of Gas Pipe3	inch	/
Outer Diameter of Liquid Pipe4	inch	/
Outer Diameter of Gas Pipe4	inch	/
Outer Diameter of Liquid Pipe5	inch	/
Outer Diameter of Gas Pipe5	inch	/
Connection Pipe Max. Height Distance (Indoor and Indoor)	m	15
Connection Pipe Max. Height Distance (Indoor and outdoor, indoor higher)	m	15
Connection Pipe Max. Height Distance (Indoor and outdoor, outdoor higher)	m	15
Max. equivalent connection pipe length	m	30
Connection Pipe Max. Length Distance (total length)	m	50

The above data is subject to change without notice; please refer to the nameplate of the unit.

2. Specifications

Model	-	GWHD(24)NK6PO	
Product Code	-	CB228W18700	CB228W18701
Rated Voltage	V~	220-240	
Rated Frequency	Hz	50	
Phases	--	1	
Cooling Capacity	kW	7.3	
Heating Capacity	kW	8.3	
Cooling Power Input	kW	1.96	
Heating Power Input	kW	2	
Cooling Current Input	A	8.7	
Heating Current Input	A	8.87	
Rated Power Input	kW	Cooling: 3.4 / Heating: 3.0	
Rated Current	A	Cooling: 15 / Heating: 14.6	
EER	W/W	3.72	
COP	W/W	4.15	
Compressor Manufacturer	-	ZHUHAI LANDA COMPRESSOR CO., LTD.	
Compressor Model	-	QXFS-M180zX170	
Compressor Refrigerant Oil Type	-	FW68DA or equivalent	
Compressor Type	-	Twin Rotary	
Compressor Locked Rotor Amp	A	24	
Compressor Rated Load Amp	A	/	
Compressor Power Input	W	1480	
Compressor Thermal Protector	-	HPC115/95/KSD115°C	
Throttling Method	-	Electron expansion valve	
Cooling Operation Ambient Temperature Range	°C	-15~52	
Heating Operation Ambient Temperature Range	°C	-22~24	
Condenser Material	-	Aluminum Fin-copper Tube	
Condenser Pipe Diameter	mm	Φ7	
Condenser Number of Rows-Fin Pitch	mm	2-1.4	
Condenser (L×H×W)	mm	851×616×38.1	
Fan Motor Speed	rpm	Cooling: 850 / Heating: 800	
Fan Motor Power Output	W	60	
Motor Full Load Amp	A	0.426	
Fan Motor Capacitor	μF	/	
Air Flow Volume	m³/h	3800	
Fan Type	-	Axial-flow	
Fan Diameter-Height	mm	Φ520-154	
Defrosting Method	-	Automatic Defrosting	
Climate Type	-	T1	
Isolation	-	I	
Moisture Protection	-	IPX4	
Permissible Excessive Operating Pressure for the Discharge Side	MPa	4.3	
Permissible Excessive Operating Pressure for the Suction Side	MPa	2.5	
Dimension of Outline (W×H×D)	mm	964×660×402	
Dimension of Carton Box (L×W×H)	mm	1029×453×715	1029×453×700
Dimension of Package (L×W×H)	mm	1032×456×737	1040×463×805
Net Weight	kg	47.5	
Gross Weight	kg	52	60
Refrigerant	-	R32	
Refrigerant Charge	kg	1.7	

2. Specifications

Cross-sectional Area of Power Cable Conductor	mm ²	2.5
Recommended Power Cable	N	3
Connection Pipe Connection Method	-	Flare Connection
Not Additional Gas Connection Pipe Length	m	40
Connection Pipe Gas Additional Charge	g/m	20
Outer Diameter of Liquid Pipe1	inch	1/4
Outer Diameter of Gas Pipe1	inch	3/8
Outer Diameter of Liquid Pipe2	inch	1/4
Outer Diameter of Gas Pipe2	inch	3/8
Outer Diameter of Liquid Pipe3	inch	1/4
Outer Diameter of Gas Pipe3	inch	3/8
Outer Diameter of Liquid Pipe4	inch	/
Outer Diameter of Gas Pipe4	inch	/
Outer Diameter of Liquid Pipe5	inch	/
Outer Diameter of Gas Pipe5	inch	/
Connection Pipe Max. Height Distance (Indoor and Indoor)	m	15
Connection Pipe Max. Height Distance (Indoor and outdoor, indoor higher)	m	15
Connection Pipe Max. Height Distance (Indoor and outdoor, outdoor higher)	m	15
Max. equivalent connection pipe length	m	30
Connection Pipe Max. Length Distance (total length)	m	60

The above data is subject to change without notice; please refer to the nameplate of the unit.

2. Specifications

Model	-	GWHD(28)NK6PO	
Product Code	-	CB228W18300	CB228W18301
Rated Voltage	V~	220-240	
Rated Frequency	Hz	50	
Phases	--	1	
Cooling Capacity	kW	8.2	
Heating Capacity	kW	8.8	
Cooling Power Input	kW	1.88	
Heating Power Input	kW	2.12	
Cooling Current Input	A	8.34	
Heating Current Input	A	9.41	
Rated Power Input	kW	3.6	
Rated Current	A	15.97	
EER	W/W	4.36	
COP	W/W	4.15	
Compressor Manufacturer	-	ZHUHAI LANDA COMPRESSOR CO., LTD.	
Compressor Model	-	QXFS-B212zX070	
Compressor Refrigerant Oil Type	-	FW68DA or equivalent	
Compressor Type	-	Twin Rotary	
Compressor Locked Rotor Amp	A	35	
Compressor Rated Load Amp	A	/	
Compressor Power Input	W	1887	
Compressor Thermal Protector	-	KSD115°C HPC115/95U1	
Throttling Method	-	Electron expansion valve	
Cooling Operation Ambient Temperature Range	°C	-15~52	
Heating Operation Ambient Temperature Range	°C	-22~24	
Condenser Material	-	Aluminum Fin-copper Tube	
Condenser Pipe Diameter	mm	Φ7.94	
Condenser Number of Rows-Fin Pitch	mm	2-1.4	
Condenser (L×H×W)	mm	851×616×38.1	
Fan Motor Speed	rpm	Cooling: 850 / Heating: 800	
Fan Motor Power Output	W	60	
Motor Full Load Amp	A	0.426	
Fan Motor Capacitor	μF	/	
Air Flow Volume	m³/h	3800	
Fan Type	-	Axial-flow	
Fan Diameter-Height	mm	Φ520-154	
Defrosting Method	-	Automatic Defrosting	
Climate Type	-	T1	
Isolation	-	I	
Moisture Protection	-	IPX4	
Permissible Excessive Operating Pressure for the Discharge Side	MPa	4.3	
Permissible Excessive Operating Pressure for the Suction Side	MPa	2.5	
Dimension of Outline (W×H×D)	mm	964×660×402	
Dimension of Carton Box (L×W×H)	mm	1029×453×715	1029×453×700
Dimension of Package (L×W×H)	mm	1032×456×737	1040×463×805
Net Weight	kg	51	
Gross Weight	kg	55.5	63.5
Refrigerant	-	R32	
Refrigerant Charge	kg	1.8	

2. Specifications

Cross-sectional Area of Power Cable Conductor	mm ²	2.5
Recommended Power Cable	N	3
Connection Pipe Connection Method	-	Flare Connection
Not Additional Gas Connection Pipe Length	m	40
Connection Pipe Gas Additional Charge	g/m	20
Outer Diameter of Liquid Pipe1	inch	1/4
Outer Diameter of Gas Pipe1	inch	3/8
Outer Diameter of Liquid Pipe2	inch	1/4
Outer Diameter of Gas Pipe2	inch	3/8
Outer Diameter of Liquid Pipe3	inch	1/4
Outer Diameter of Gas Pipe3	inch	3/8
Outer Diameter of Liquid Pipe4	inch	1/4
Outer Diameter of Gas Pipe4	inch	3/8
Outer Diameter of Liquid Pipe5	inch	/
Outer Diameter of Gas Pipe5	inch	/
Connection Pipe Max. Height Distance (Indoor and Indoor)	m	15
Connection Pipe Max. Height Distance (Indoor and outdoor, indoor higher)	m	15
Connection Pipe Max. Height Distance (Indoor and outdoor, outdoor higher)	m	15
Max. equivalent connection pipe length	m	30
Connection Pipe Max. Length Distance (total length)	m	70

The above data is subject to change without notice; please refer to the nameplate of the unit.

2. Specifications

Model	-	GWHD(36)NK6PO	
Product Code	-	CB228W18900	CB228W18901
Rated Voltage	V~	220-240	
Rated Frequency	Hz	50	
Phases	--	1	
Cooling Capacity	kW	10.6	
Heating Capacity	kW	11.4	
Cooling Power Input	kW	2.65	
Heating Power Input	kW	2.85	
Cooling Current Input	A	11.76	
Heating Current Input	A	12.64	
Rated Power Input	kW	Cooling: 4.6 / Heating: 5.0	
Rated Current	A	Cooling: 20.41 / Heating: 21.74	
EER	W/W	4	
COP	W/W	4	
Compressor Manufacturer	-	ZHUHAI LANDA COMPRESSOR CO., LTD.	
Compressor Model	-	QXFS-D280zX070C	
Compressor Refrigerant Oil Type	-	FW68DA or equivalent	
Compressor Type	-	Twin Rotary	
Compressor Locked Rotor Amp	A	40	
Compressor Rated Load Amp	A	/	
Compressor Power Input	W	2294	
Compressor Thermal Protector	-	KSD115°C HPC115/95U1	
Throttling Method	-	Electron expansion valve	
Cooling Operation Ambient Temperature Range	°C	-15~52	
Heating Operation Ambient Temperature Range	°C	-22~24	
Condenser Material	-	Aluminum Fin-copper Tube	
Condenser Pipe Diameter	mm	Φ7.94	
Condenser Number of Rows-Fin Pitch	mm	2-1.4	
Condenser (L×H×W)	mm	1066×792×38.1	
Fan Motor Speed	rpm	Cooling: 860 / Heating: 860	
Fan Motor Power Output	W	130	
Motor Full Load Amp	A	/	
Fan Motor Capacitor	μF	/	
Air Flow Volume	m³/h	5800	
Fan Type	-	Axial-flow	
Fan Diameter-Height	mm	Φ550-205	
Defrosting Method	-	Automatic Defrosting	
Climate Type	-	T1	
Isolation	-	I	
Moisture Protection	-	IPX4	
Permissible Excessive Operating Pressure for the Discharge Side	MPa	4.3	
Permissible Excessive Operating Pressure for the Suction Side	MPa	2.5	
Dimension of Outline (W×H×D)	mm	1020×826×427	
Dimension of Carton Box (L×W×H)	mm	1090×494×870	1090×494×850
Dimension of Package (L×W×H)	mm	1093×497×885	1095×500×955
Net Weight	kg	72	
Gross Weight	kg	79	85
Refrigerant	-	R32	
Refrigerant Charge	kg	2.4	

2. Specifications

Cross-sectional Area of Power Cable Conductor	mm ²	4
Recommended Power Cable	N	3
Connection Pipe Connection Method	-	Flare Connection
Not Additional Gas Connection Pipe Length	m	40
Connection Pipe Gas Additional Charge	g/m	20
Outer Diameter of Liquid Pipe1	inch	1/4
Outer Diameter of Gas Pipe1	inch	3/8
Outer Diameter of Liquid Pipe2	inch	1/4
Outer Diameter of Gas Pipe2	inch	3/8
Outer Diameter of Liquid Pipe3	inch	1/4
Outer Diameter of Gas Pipe3	inch	3/8
Outer Diameter of Liquid Pipe4	inch	1/4
Outer Diameter of Gas Pipe4	inch	3/8
Outer Diameter of Liquid Pipe5	inch	/
Outer Diameter of Gas Pipe5	inch	/
Connection Pipe Max. Height Distance (Indoor and Indoor)	m	25
Connection Pipe Max. Height Distance (Indoor and outdoor, indoor higher)	m	25
Connection Pipe Max. Height Distance (Indoor and outdoor, outdoor higher)	m	25
Max. equivalent connection pipe length	m	30
Connection Pipe Max. Length Distance (total length)	m	80

The above data is subject to change without notice; please refer to the nameplate of the unit.

2. Specifications

Model	-	GWHD(42)NK6PO	
Product Code	-	CB228W18800	CB228W18801
Rated Voltage	V~	220-240	
Rated Frequency	Hz	50	
Phases	--	1	
Cooling Capacity	kW	12.3	
Heating Capacity	kW	12.6	
Cooling Power Input	kW	3.1	
Heating Power Input	kW	3.2	
Cooling Current Input	A	13.75	
Heating Current Input	A	14.2	
Rated Power Input	kW	Cooling: 4.6 / Heating: 5.0	
Rated Current	A	Cooling: 20.41 / heating: 21.74	
EER	W/W	3.97	
COP	W/W	3.94	
Compressor Manufacturer	-	ZHUHAI LANDA COMPRESSOR CO., LTD.	
Compressor Model	-	QXFS-D280zX070C	
Compressor Refrigerant Oil Type	-	FW68DA or equivalent	
Compressor Type	-	Twin Rotary	
Compressor Locked Rotor Amp	A	40	
Compressor Rated Load Amp	A	/	
Compressor Power Input	W	2294	
Compressor Thermal Protector	-	KSD115°C HPC115/95U1	
Throttling Method	-	Electron expansion valve	
Cooling Operation Ambient Temperature Range	°C	-15~52	
Heating Operation Ambient Temperature Range	°C	-22~24	
Condenser Material	-	Aluminum Fin-copper Tube	
Condenser Pipe Diameter	mm	Φ7.94	
Condenser Number of Rows-Fin Pitch	mm	2-1.4	
Condenser (L×H×W)	mm	1066×792×38.1	
Fan Motor Speed	rpm	Cooling: 860 / Heating: 860	
Fan Motor Power Output	W	130	
Motor Full Load Amp	A	/	
Fan Motor Capacitor	μF	/	
Air Flow Volume	m³/h	5800	
Fan Type	-	Axial-flow	
Fan Diameter-Height	mm	Φ550-205	
Defrosting Method	-	Automatic Defrosting	
Climate Type	-	T1	
Isolation	-	I	
Moisture Protection	-	IPX4	
Permissible Excessive Operating Pressure for the Discharge Side	MPa	4.3	
Permissible Excessive Operating Pressure for the Suction Side	MPa	2.5	
Dimension of Outline (W×H×D)	mm	1020×826×427	
Dimension of Carton Box (L×W×H)	mm	1090×494×870	1090×494×850
Dimension of Package (L×W×H)	mm	1093×497×885	1093×500×955
Net Weight	kg	73	
Gross Weight	kg	80	86
Refrigerant	-	R32	
Refrigerant Charge	kg	2.4	

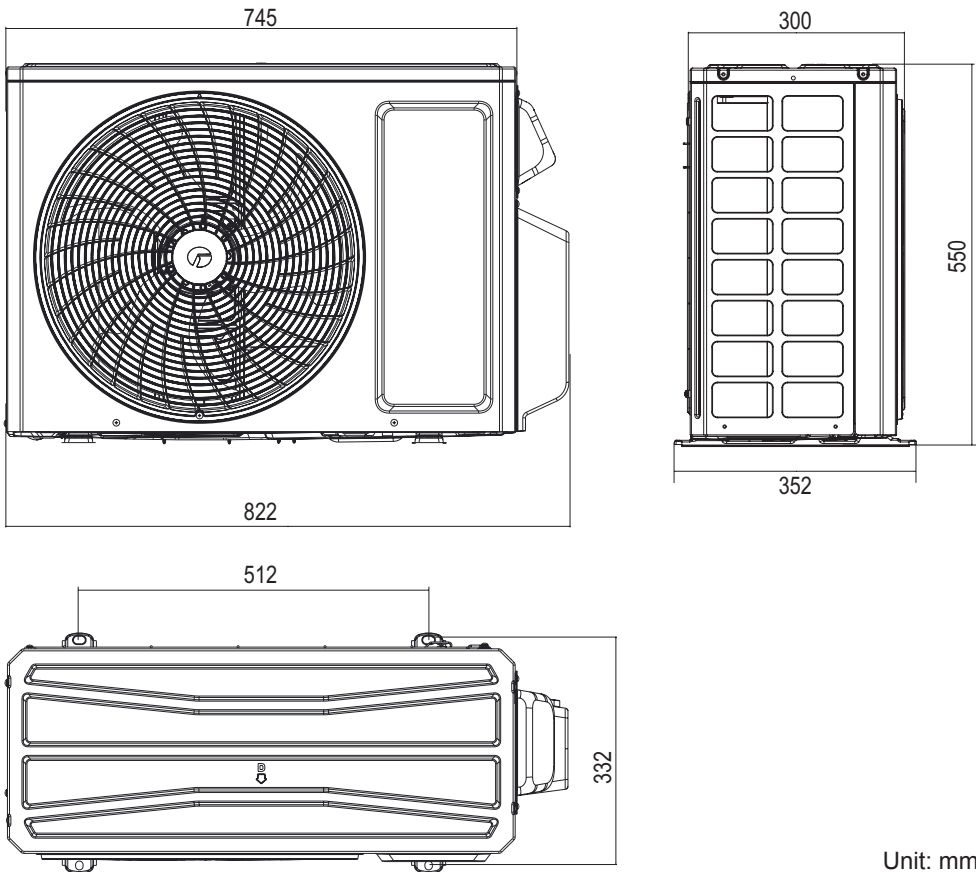
2. Specifications

Cross-sectional Area of Power Cable Conductor	mm ²	4
Recommended Power Cable	N	3
Connection Pipe Connection Method	-	Flare Connection
Not Additional Gas Connection Pipe Length	m	50
Connection Pipe Gas Additional Charge	g/m	20
Outer Diameter of Liquid Pipe1	inch	1/4
Outer Diameter of Gas Pipe1	inch	3/8
Outer Diameter of Liquid Pipe2	inch	1/4
Outer Diameter of Gas Pipe2	inch	3/8
Outer Diameter of Liquid Pipe3	inch	1/4
Outer Diameter of Gas Pipe3	inch	3/8
Outer Diameter of Liquid Pipe4	inch	1/4
Outer Diameter of Gas Pipe4	inch	3/8
Outer Diameter of Liquid Pipe5	inch	1/4
Outer Diameter of Gas Pipe5	inch	3/8
Connection Pipe Max. Height Distance (Indoor and Indoor)	m	25
Connection Pipe Max. Height Distance (Indoor and outdoor, indoor higher)	m	25
Connection Pipe Max. Height Distance (Indoor and outdoor, outdoor higher)	m	25
Max. equivalent connection pipe length	m	30
Connection Pipe Max. Length Distance (total length)	m	100

The above data is subject to change without notice; please refer to the nameplate of the unit.

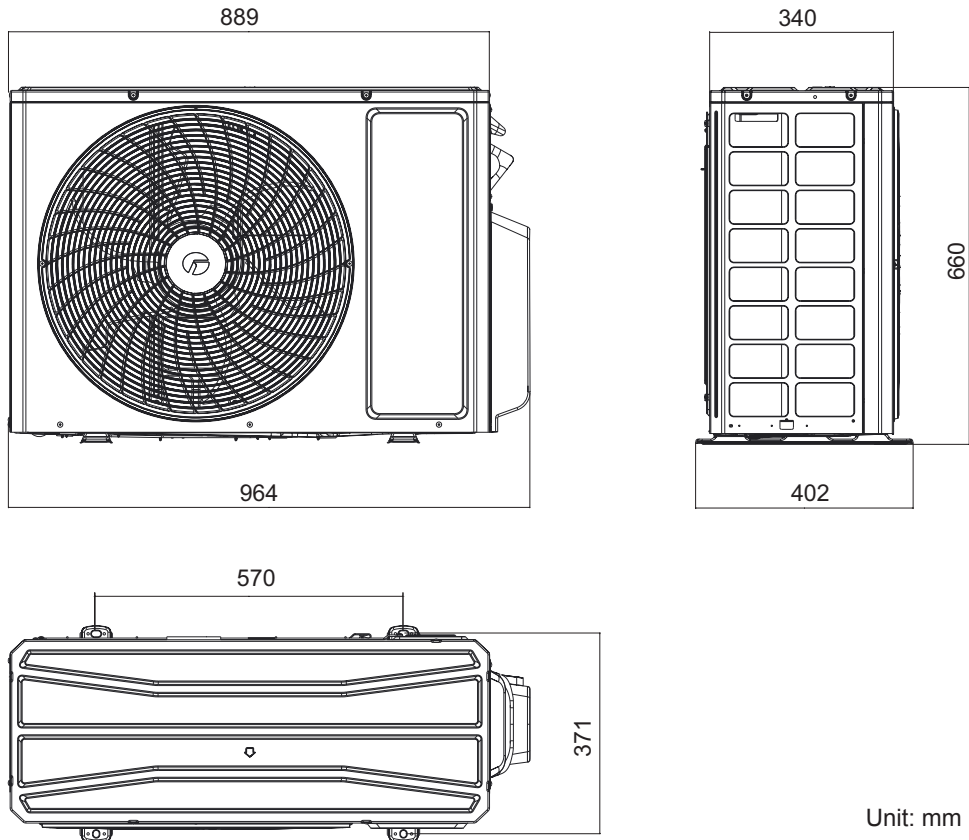
3. Outline Dimension Diagram

GWHD(18)NK6PO



Unit: mm

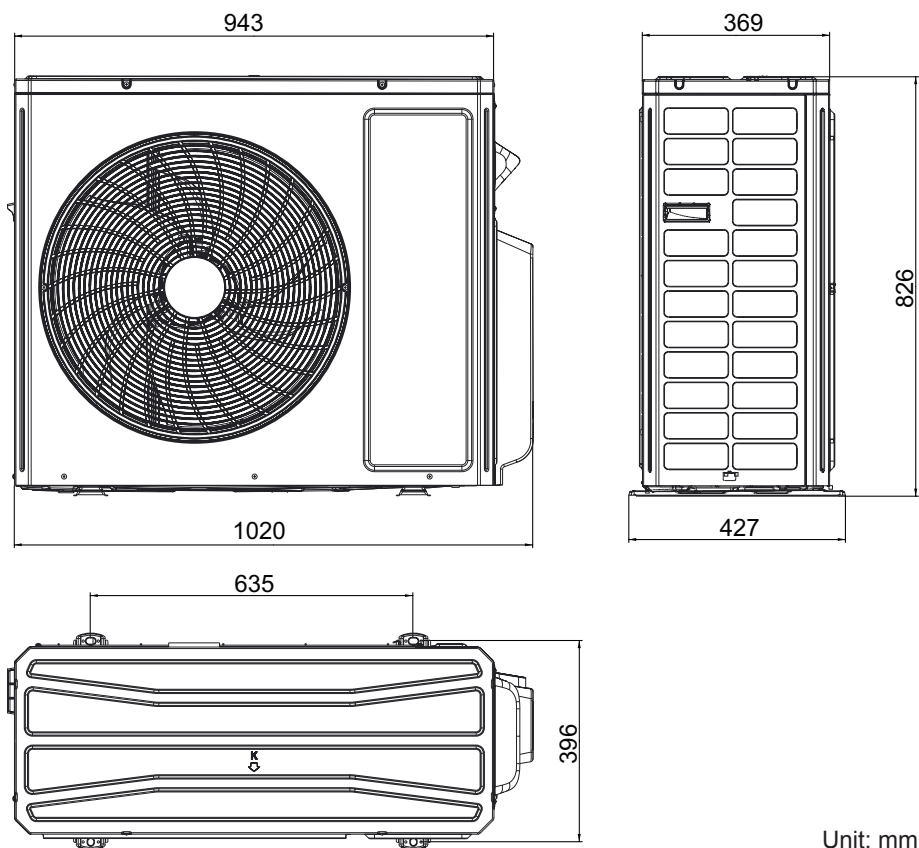
GWHD(24)NK6PO GWHD(28)NK6PO



Unit: mm

3. Outline Dimension Diagram

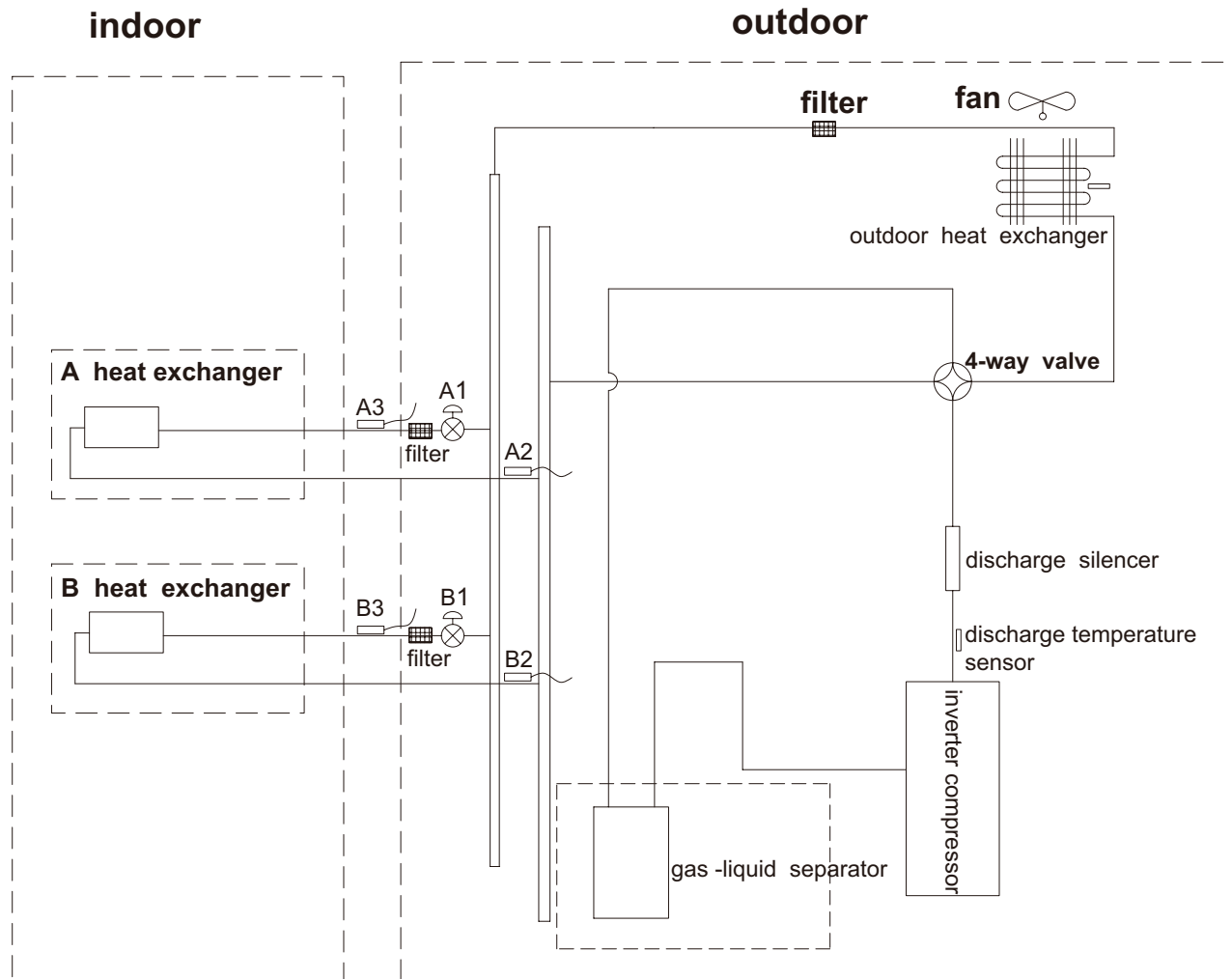
GWHD(36)NK6PO GWHD(42)NK6PO



Unit: mm

4. Refrigerant System Diagram

GWHD(18)NK6PO



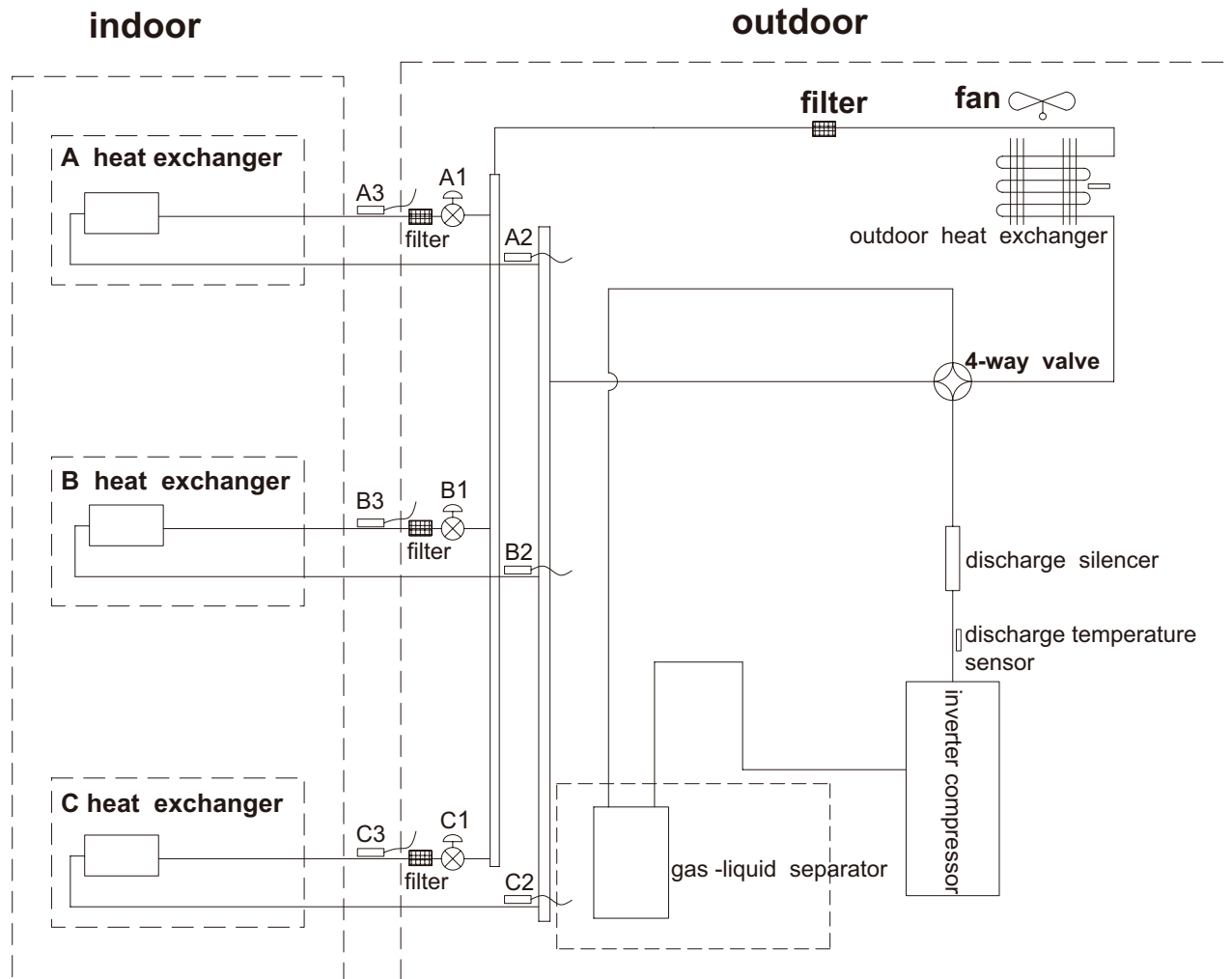
A1: A-unit electronic expansion valve
B1: B-unit electronic expansion valve

A2: A-unit gas pipe temperature sensor
B2: B-unit gas pipe temperature sensor

A3: A-unit liquid pipe temperature sensor
B3: B-unit liquid pipe temperature sensor

4. Refrigerant System Diagram

GWHD(24)NK6PO



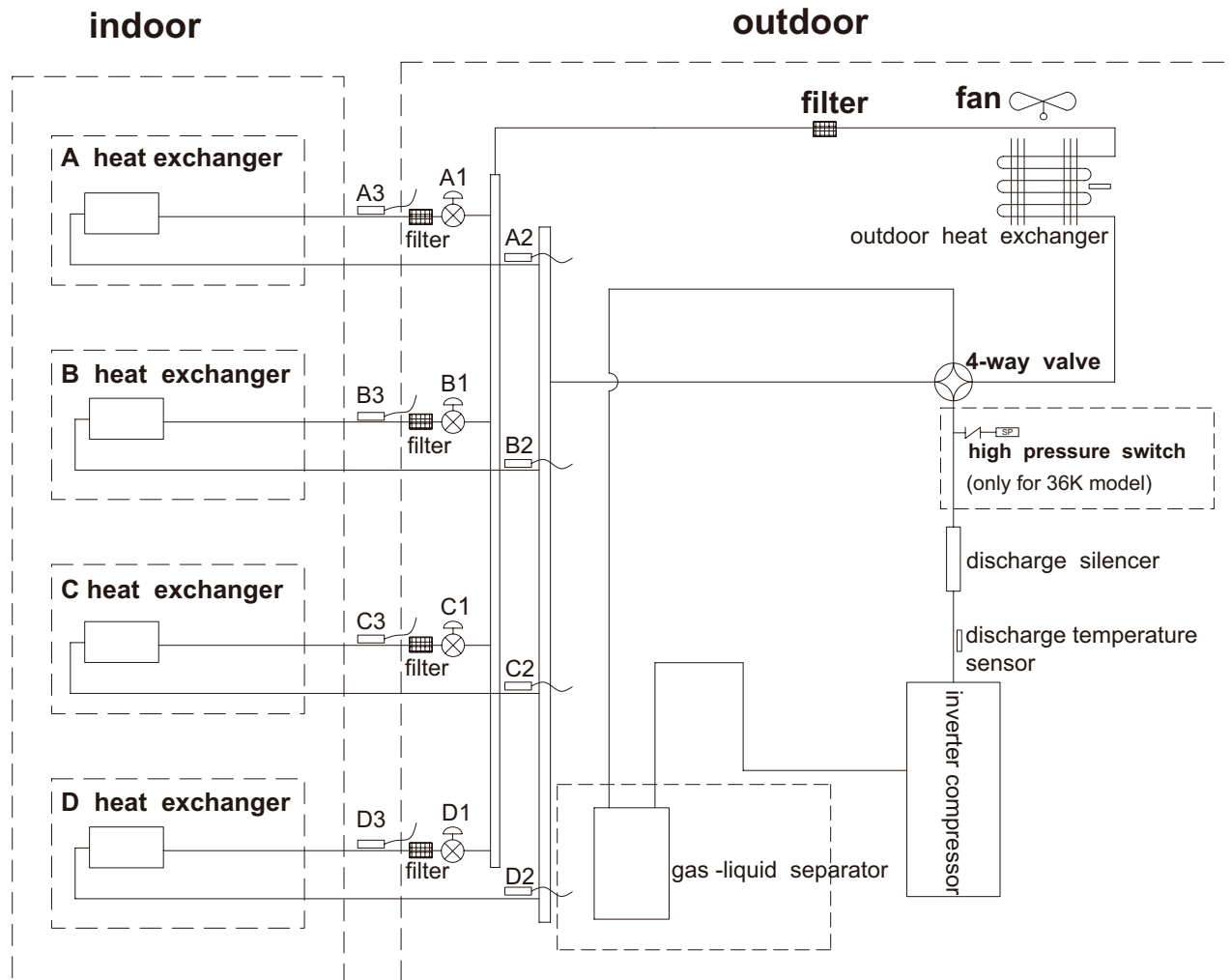
A1: A-unit electronic expansion valve
 B1: B-unit electronic expansion valve
 C1: C-unit electronic expansion valve

A2: A-unit gas pipe temperature sensor
 B2: B-unit gas pipe temperature sensor
 C2: C-unit gas pipe temperature sensor

A3: A-unit liquid pipe temperature sensor
 B3: B-unit liquid pipe temperature sensor
 C3: C-unit liquid pipe temperature sensor

4. Refrigerant System Diagram

GWHD(28)NK6PO GWHD(36)NK6PO



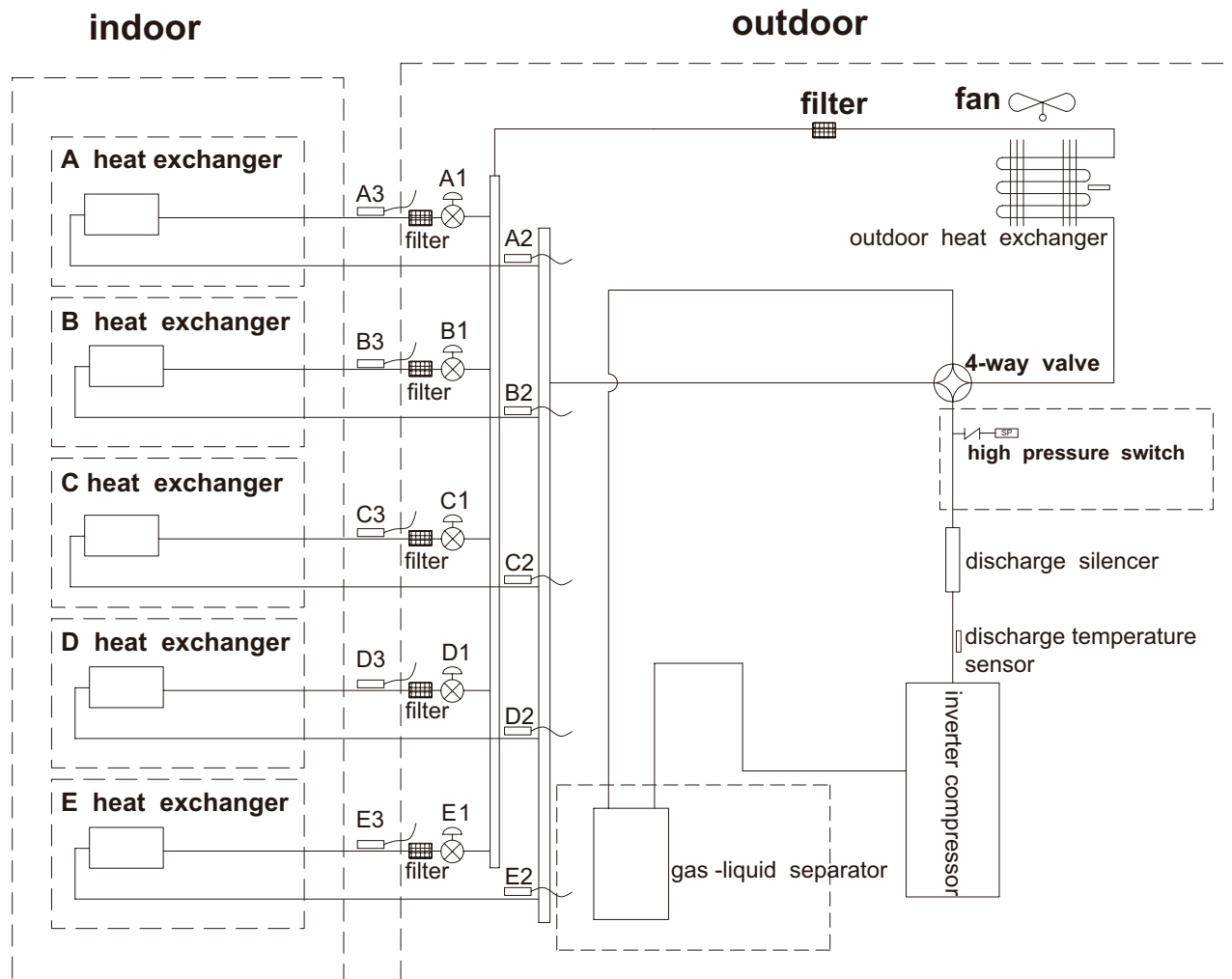
A1: A-unit electronic expansion valve
 B1: B-unit electronic expansion valve
 C1: C-unit electronic expansion valve
 D1: D-unit electronic expansion valve

A2: A-unit gas pipe temperature sensor
 B2: B-unit gas pipe temperature sensor
 C2: C-unit gas pipe temperature sensor
 D2: D-unit gas pipe temperature sensor

A3: A-unit liquid pipe temperature sensor
 B3: B-unit liquid pipe temperature sensor
 C3: C-unit liquid pipe temperature sensor
 D3: D-unit liquid pipe temperature sensor

4. Refrigerant System Diagram

GWHD(42)NK6PO



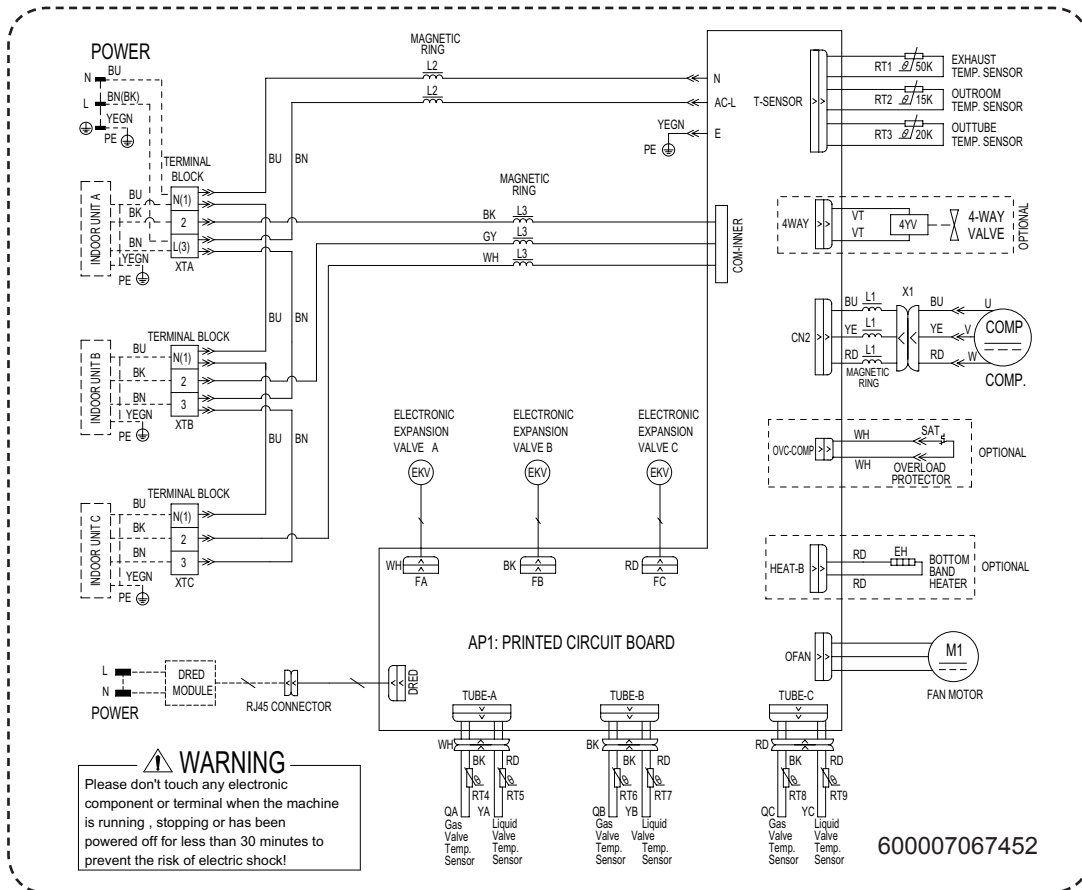
A1: A-unit electronic expansion valve
 B1: B-unit electronic expansion valve
 C1: C-unit electronic expansion valve
 D1: D-unit electronic expansion valve
 E1: E-unit electronic expansion valve

A2: A-unit gas pipe temperature sensor
 B2: B-unit gas pipe temperature sensor
 C2: C-unit gas pipe temperature sensor
 D2: D-unit gas pipe temperature sensor
 E2: E-unit gas pipe temperature sensor

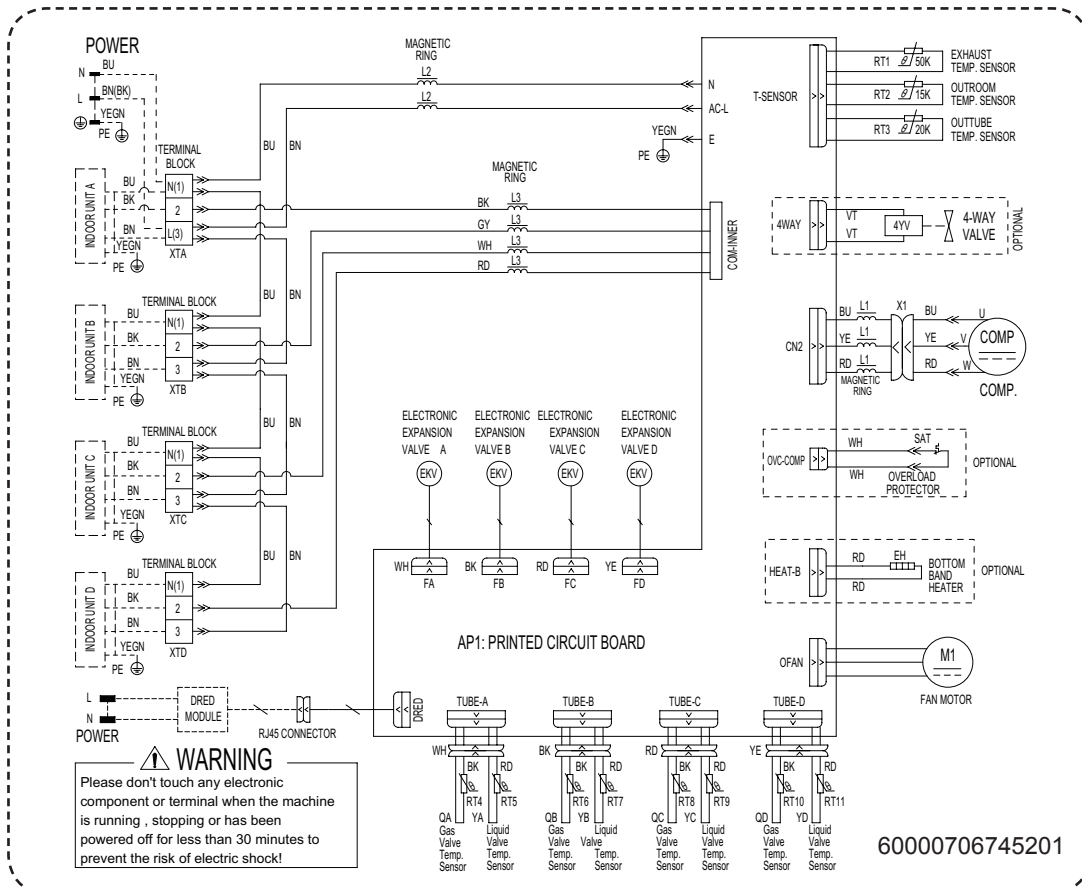
A3: A-unit liquid pipe temperature sensor
 B3: B-unit liquid pipe temperature sensor
 C3: C-unit liquid pipe temperature sensor
 D3: D-unit liquid pipe temperature sensor
 E3: E-unit liquid pipe temperature sensor

5. Electrical Part

GWHD(24)NK6PO

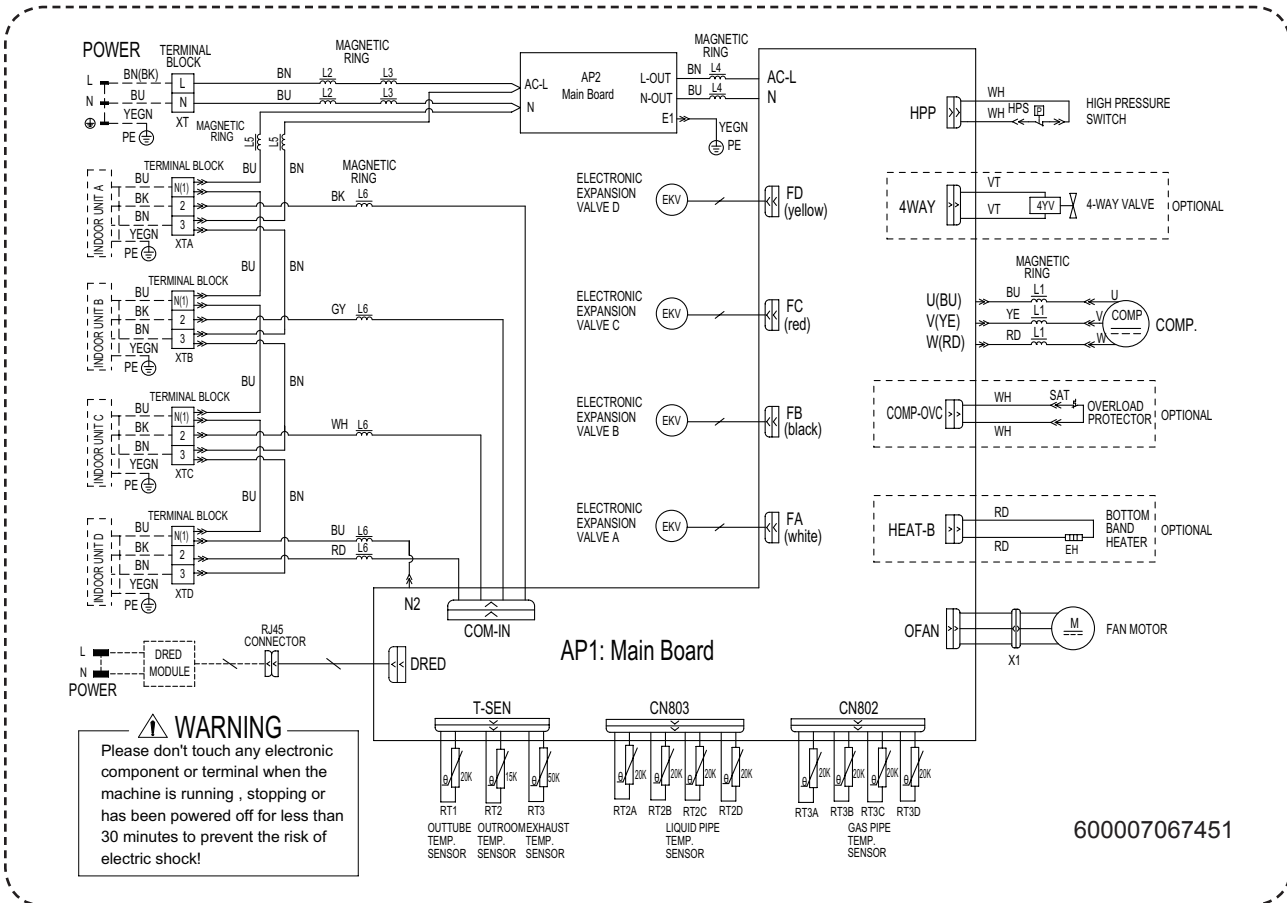


GWHD(28)NK6PO

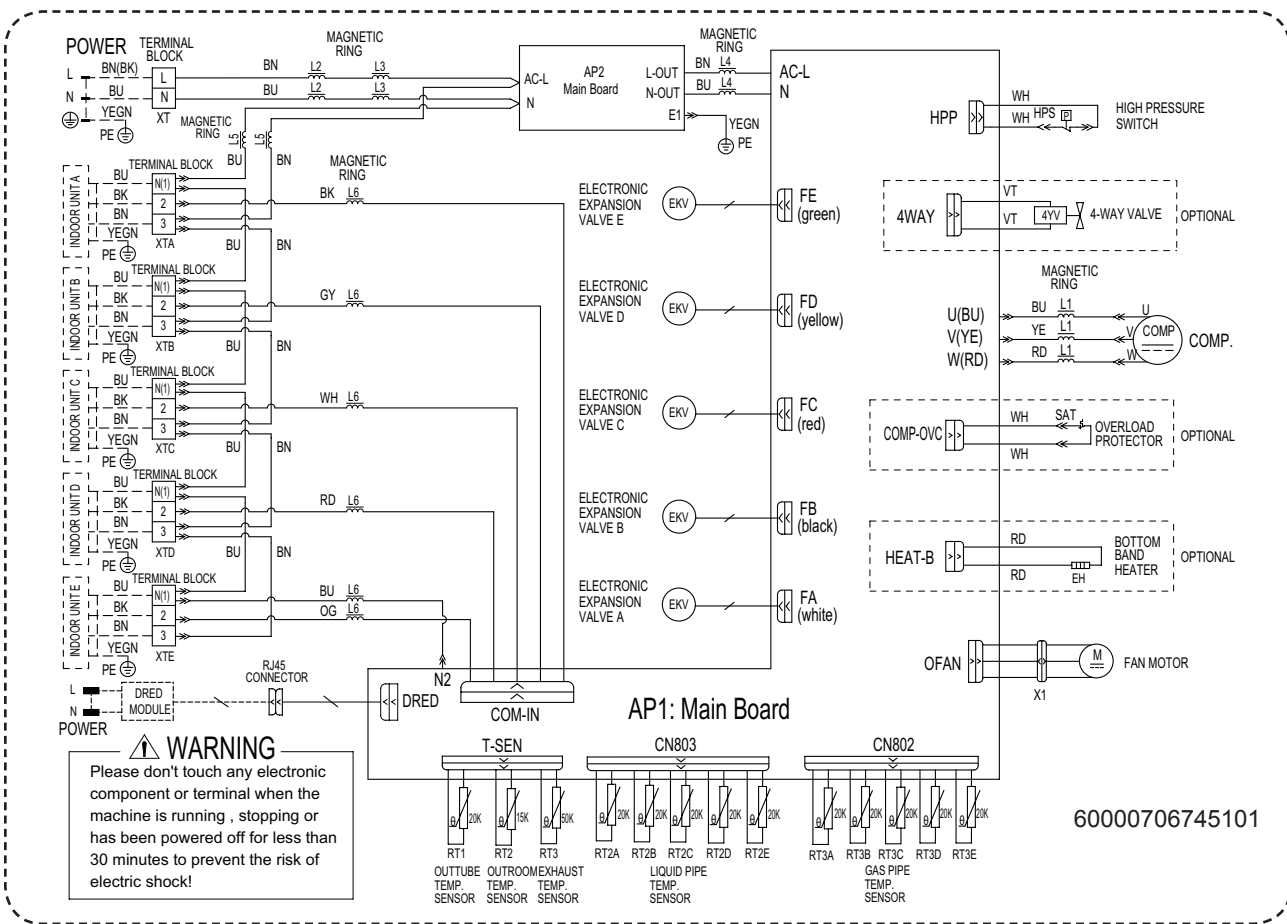


5. Electrical Part

GWHD(36)NK6PO



GWHD(42)NK6PO

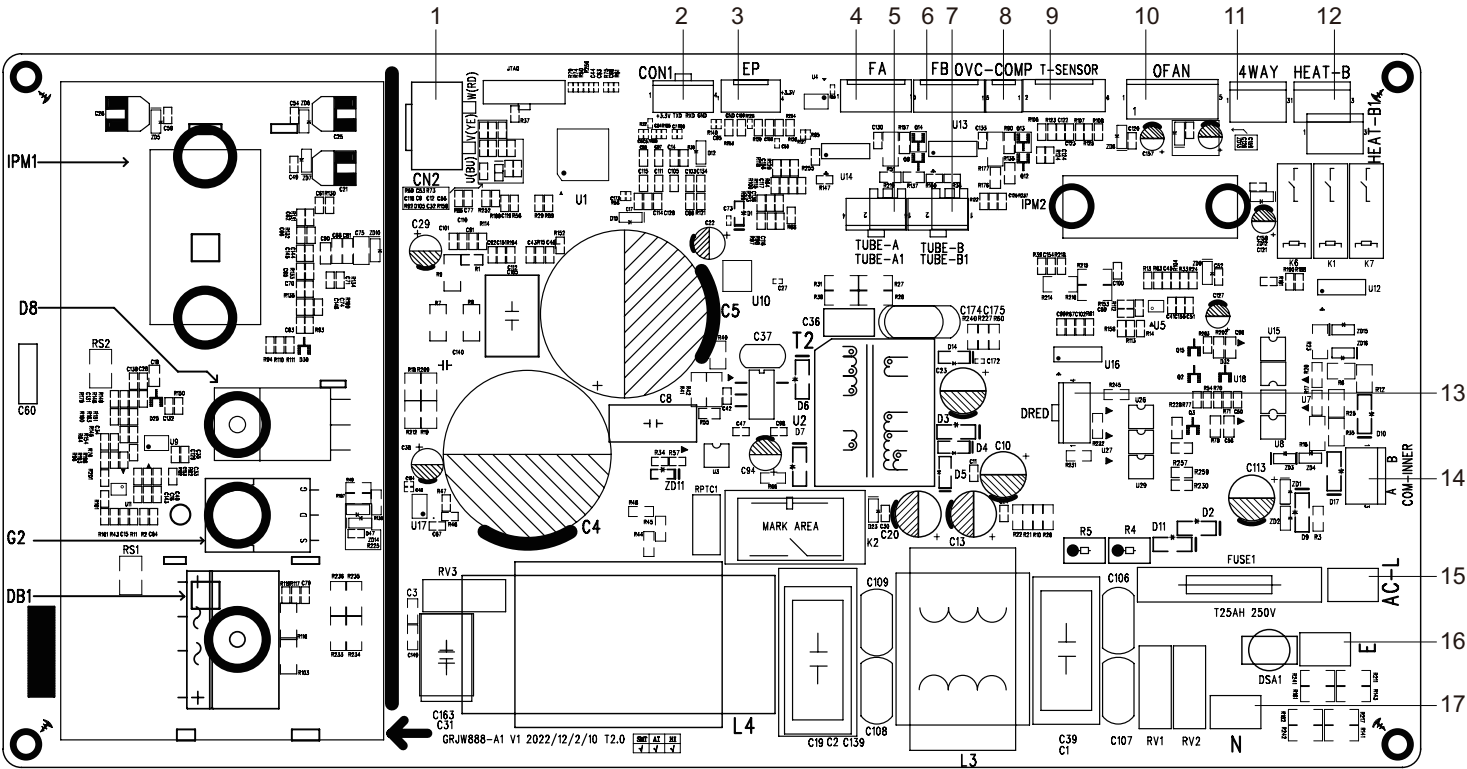


These wiring diagrams are subject to change without notice; please refer to the one supplied with the unit.

5. Electrical Part

5.2 PCB Printed Diagram

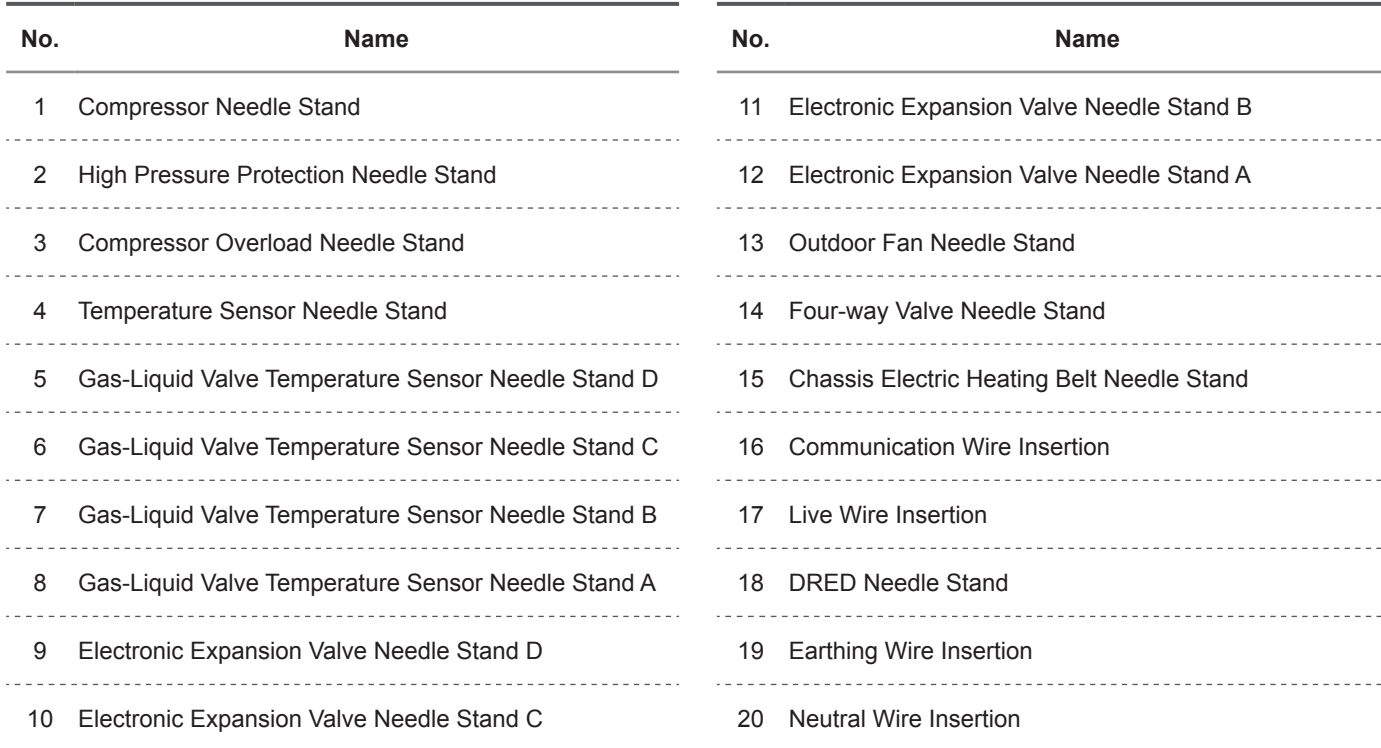
GWHD(18)NK6PO



No.	Name
1	Compressor Needle Stand
2	Computer Monitor Needle Stand
3	EEP Flash Drive Needle Stand
4	Electronic Expansion Valve Needle Stand A
5	Gas-Liquid Valve Temperature Sensor Needle Stand A
6	Electronic Expansion Valve Needle Stand B
7	Gas-Liquid Valve Temperature Sensor Needle Stand B
8	Compressor Overload Needle Stand
9	Temperature Sensor Needle Stand

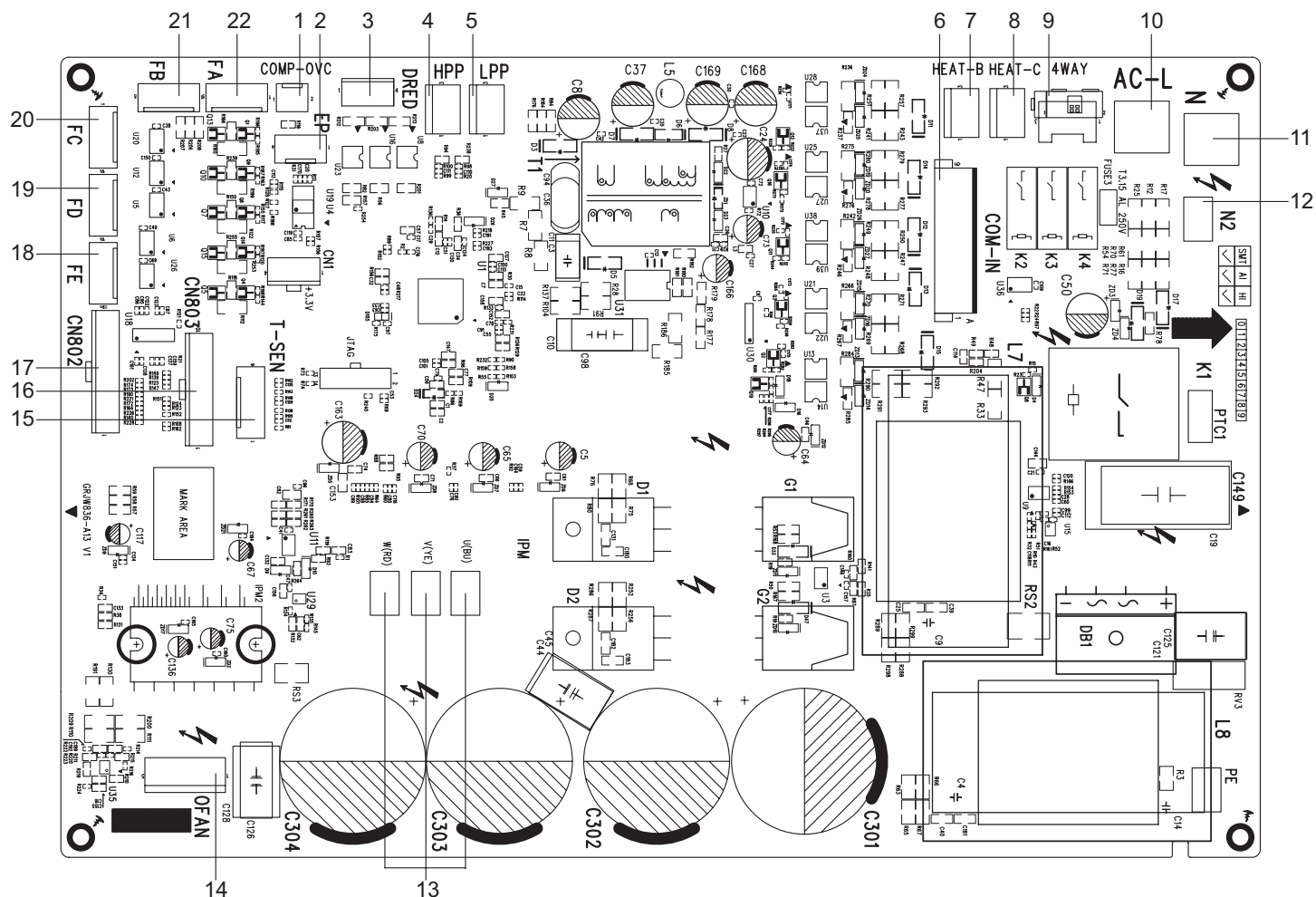
No.	Name
10	Outdoor Fan Needle Stand
11	Four-way Valve Needle Stand
12	Chassis Electric Heating Belt Needle Stand
13	DRED Needle Stand
14	Communication Wire Insertion
15	Live Wire Insertion
16	Earthing Wire Insertion
17	Neutral Wire Insertion

GWHD(24)NK6PO GWHD(28)NK6PO



5. Electrical Part

GWHD(36)NK6PO GWHD(42)NK6PO



No.	Name
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1	Compressor Overload Needle Stand
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2	EEP Flash Drive Needle Stand
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3	DRED Needle Stand
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4	High Pressure Protection Needle Stand
---	---------------------------------------

5	Low Pressure Protection Needle Stand
---	--------------------------------------

6	Communication Wire Insertion
---	------------------------------

7	Chassis Electric Heating Belt Needle Stand
---	--

8	Compressor Electric Heating Needle Stand
---	--

9	Four-way Valve Needle Stand
---	-----------------------------

10	Live Wire Insertion
----	---------------------

11	Neutral Wire Insertion
----	------------------------

No.	Name
-----	------

12	Communication Neutral Wire Insertion
----	--------------------------------------

13	Compressor Needle Stand
----	-------------------------

14	Outdoor Fan Needle Stand
----	--------------------------

15	Temperature Sensor Needle Stand
----	---------------------------------

16	Liquid Valve Temperature Sensor Needle Stand
----	--

17	Gas Valve Temperature Sensor Needle Stand
----	---

18	Electronic Expansion Valve Needle Stand E
----	---

19	Electronic Expansion Valve Needle Stand D
----	---

20	Electronic Expansion Valve Needle Stand C
----	---

21	Electronic Expansion Valve Needle Stand B
----	---

22	Electronic Expansion Valve Needle Stand A
----	---

6. Function and Control

1 Basic functions of the system

1.1 Cooling Mode

1.1.1 Cooling conditions and process:

If the compressor is in stop status and start the unit for cooling operation, when one of the indoor units reaches the cooling operation condition, the unit start cooling operation; in this case, the electronic expansion valve, the outdoor fan and the compressor start operation.

1.1.2 Stop in cooling operation

1.1.2.1 Compressor stops

The compressor stops immediately, the outdoor fan stops after 1min.

1.1.2.2 Some of the indoor units reach the stop condition (the compressor does not stop)

The compressor operates immediately according to the required frequency. For the indoor unit with no requirement, the corresponding electronic expansion valve is closed to OP.

1.1.3 Cooling mode transfers to heating mode

When the unit transfers to heating mode, the 4-way valve is energized after the compressor stops for 2min. The other disposals are the same as stopping in cooling mode.

1.1.4 4-way valve: in this mode, the 4-way valve is closed.

1.1.5 Outdoor fan control in cooling mode

The outdoor fan starts before 5s of the starting of compressor. The outdoor fan will run in high speed for 3min after starting and then it will run in set speed. The fan shall run at every speed for at least 80s. (When the quantity of running indoor unit is changed, the unit will enter the control described in 1.3.5.1 and 1.3.5.2);

When the compressor stops, the outdoor fan runs at present speed and stops after 1min.

1.2 Dry Mode

1.2.1 The dry conditions and process are the same as those in cooling mode;

1.2.2 The status of 4-way valve: closed;

1.2.3 The temperature setting range: 16 ~ 30°C;

1.2.4 Protection function: the same as those in cooling mode;

1.2.5 In dry mode, the maximum value A of the capacity requirement percentage of single unit is 90% of that in cooling mode.

The open condition of the electronic expansion valve, outdoor fan and compressor is the same as those in cooling mode.

1.3 Heating Mode

1.3.1 Heating conditions and process:

When one of the indoor units reaches the heating operation condition, the unit starts heating operation.

1.3.2 Stop in heating operation:

1.3.2.1 When all the indoor units reach the stop condition, the compressor stops and the outdoor fan stops after 1min;

1.3.2.2 Some of the indoor units reach the stop condition

The compressor reduces the frequency immediately and operates according to the required frequency;

1.3.2.3 Heating mode transfers to cooling mode(dry mode), fan mode

a. The compressor stops; b. the power of 4-way valve is cut off after 2min; c. the outdoor fan stops after 1min; d. the status of 4-way valve: energized;

1.3.3 Outdoor fan control in heating mode

The outdoor fan starts before 5s of the starting of compressor and then it will run in high speed for 40s;

The fan shall run at every speed for at least 80s;

When the compressor stops, the outdoor fan stops after 1min.

1.3.4 Defrosting function

When the defrosting condition is met, the compressor stops; the electronic expansion valve of all indoor units open in big angle; the outdoor fan stops after 40s of the stop of compressor, meanwhile, the 4-way valve reverses the direction; after the 4-way valve reverses the direction, the compressor starts; then begin to calculate the time of defrosting, the frequency of the compressor rises to reach the defrosting frequency.

1.3.5 Oil-returned control in heating mode

1.3.5.1 Oil-returned condition

The whole unit is operating in low frequency for a long time.

1.3.5.2 Oil-returned process in heating mode

The indoor unit displays "H1".

1.3.5.3 Oil-returned finished condition in heating mode

The duration reaches 5min.

1.4 Fan Mode

The compressor, the outdoor fan and the 4-way valve are closed; temperature setting range is 16 ~ 30°C.

2 Protection Function

2.1 Mode Conflict Protection of indoor unit

When the setting mode is different of different indoor unit, the unit runs in below status:

a. The mode of the first operating indoor unit is the basic mode, then compare the mode of the other indoor units to see if there is a conflict. Cooling mode (dry mode) is in conflict with heating

6. Function and Control

mode.

b. Fan mode is in conflict with heating mode and the heating mode is the basic mode. No matter which indoor unit operates first, the unit will run in heating mode.

2.2 Overload protection function

When the tube temperature is a little low, the compressor raises the operation frequency; when the tube temperature is a little high, the compressor frequency is restricted or lows down the operation frequency; when the tube temperature is too high, the compressor protection stops running.

If the discharge temperature protection continuously appears for 6 times, the compressor can't resume running. The compressor can resume running after cutting off the power and then putting through the power. (if the running time of the compressor is longer than 7min, the protection times record will be cleared)

2.3 Discharge Protection Function

When the discharge temperature is a little low, the compressor raises the operation frequency; when the discharge temperature is a little high, the compressor frequency is restricted or lows down the operation frequency; when the discharge temperature is too high, the compressor protection stops running.

If the discharge temperature protection continuously appears for 6 times, the compressor can't resume running. The compressor can resume running after cutting off the power and then putting through the power. (if the running time of the compressor is longer than 7min, the protection times record will be cleared.)

2.4 Communication malfunction

Detection of the quantity of installed indoor units:

After 3min of energizing, if the outdoor unit does not receive the communication data of certain indoor unit, the outdoor unit will judge that indoor unit is not installed and will treat it as it is not installed. If the outdoor unit receives the communication data of that indoor unit later, the outdoor unit will treat that unit as it is installed.

2.5 Overcurrent Protection

a. Overcurrent protection of complete unit; b. phase wire current protection; c. compressor phase current protection

2.6 Compressor high-pressure protection

2.6.1 When the high-pressure switch is detected cut off for 3s continuously, the compressor will enter high-pressure protection as it stops when reaching set temperature. Meanwhile, the outdoor unit will send the signal of "high-pressure protection" to the indoor units;

2.6.2 After the appearance of high-pressure protection, when the high-pressure switch is detected closed for 6s continuously, the compressor can resume running only after cutting off the power

and then putting through the power.

2.7 Compressor overload protection

If the compressor overload switch is detected having movement, the indoor unit will display the corresponding malfunction as it stops when the indoor temperature reaching set temperature. When the compressor stops for more than 3min and the compressor overload switch is reset, the unit will resume operation status automatically. If the protection appears for more than 6 times (if the running time of the compressor is longer than 30min, the protection times record will be cleared), the unit can not resume operation status automatically, but can resume running only after cutting off the power and then putting through the power.

2.8 Compressor Phase-lacking Protection

When the compressor starts, if one of the three phases is detected open, the compressor will enter phase-lacking protection. The malfunction will be cleared after 1min, the unit will restart and then detect if there is still has phase-lacking protection. If the phase-lacking protection is detected for 6 times continuously, the compressor will not restart but can resume running only after cutting off the power and then putting through the power. If the running time of the compressor is longer than 7min, the protection times record will be cleared.

2.9 IPM Protection

2.9.1 When the IPM module protection is detected, the unit will stop as the indoor temperature reaching set temperature, PFC is closed, display IPM protection malfunction. After the compressor stops for 3min, the unit will resume operation status automatically; if the IPM protection is detected for more than 6 times continuously (If the running time of the compressor is longer than 7min, the protection times record will be cleared), the system will stop and send the signal of module protection to indoor unit. The unit can not resume operation status automatically, but can resume running only after cutting off the power and then putting through the power.

2.9.2 IPM module overheating protection

2.9.2.1 When $TIPM > 85^{\circ}\text{C}$, prohibit to raise frequency;

2.9.2.2 When $TIPM \geq 90^{\circ}\text{C}$, the operation frequency of compressor lows down by 15% every 90s according to the present capacity requirement of the complete unit. It will keep 90s after lowing down the frequency. After lowing down the frequency, if $TIPM \geq 90^{\circ}\text{C}$, the unit will circulate the above movement until reaching the minimum frequency; if $85^{\circ}\text{C} < TIPM < 90^{\circ}\text{C}$, the unit will run at this frequency; when $TIPM = 85^{\circ}\text{C}$, the unit will run at the frequency according to the capacity requirement;

2.9.2.3 When $TIPM \geq 95^{\circ}\text{C}$, the compressor stops. After the compressor stops for 3min, if $TIPM < 85^{\circ}\text{C}$, the compressor and the outdoor fan will resume operation.

7. Notes for Installation and Maintenance

Safety Precautions: Important!

Please read the safety precautions carefully before installation and maintenance.

The following contents are very important for installation and maintenance.

Please follow the instructions below.

- The installation or maintenance must accord with the instructions.
- Comply with all national electrical codes and local electrical codes.
- Pay attention to the warnings and cautions in this manual.
- All installation and maintenance shall be performed by distributor or qualified person.
- All electric work must be performed by a licensed technician according to local regulations and the instructions given in this manual.
- Be caution during installation and maintenance. Prohibit incorrect operation to prevent electric shock, casualty and other accidents.



WARNINGS

Electrical Safety Precautions:

1. Cut off the power supply of air conditioner before checking and maintenance.
2. The air condition must apply specialized circuit and prohibit share the same circuit with other appliances.
3. The air conditioner should be installed in suitable location and ensure the power plug is touchable.
4. Make sure each wiring terminal is connected firmly during installation and maintenance.
5. Have the unit adequately grounded. The grounding wire can't be used for other purposes.
6. Must apply protective accessories such as protective boards, cable-cross loop and wire clip.
7. The live wire, neutral wire and grounding wire of power supply must be corresponding to the live wire, neutral wire and grounding wire of the air conditioner.
8. The power cord and power connection wires can't be pressed by hard objects.
9. If power cord or connection wire is broken, it must be replaced by a qualified person.
10. If the power cord or connection wire is not long enough, please get the specialized power cord or connection wire from the manufacture or distributor. Prohibit prolong the wire

by yourself.

11. For the air conditioner without plug, an air switch must be installed in the circuit. The air switch should be all-pole parting and the contact parting distance should be more than 3mm.
12. Make sure all wires and pipes are connected properly and the valves are opened before energizing.
13. Check if there is electric leakage on the unit body. If yes, please eliminate the electric leakage.
14. Replace the fuse with a new one of the same specification if it is burnt down; Don't replace it with a cooper wire or conducting wire.
15. If the unit is to be installed in a humid place, the circuit breaker must be installed.

Installation Safety Precautions:

1. Select the installation location according to the requirement of this manual. (See the requirements in installation part)
2. Handle unit transportation with care; the unit should not be carried by only one person if it is more than 20kg.
3. When installing the indoor unit and outdoor unit, a sufficient fixing bolt must be installed; make sure the installation support is firm.
4. Wear safety belt if the height of working is above 2m.
5. Use equipped components or appointed components during installation.
6. Make sure no foreign objects are left in the unit after finishing installation.

Refrigerant Safety Precautions:

1. When refrigerant leaks or requires discharge during installation, maintenance, or disassembly, it should be handled by certified professionals or otherwise in compliance with local laws and regulations.
2. Avoid contact between refrigerant and fire as it generates poisonous gas; Prohibit prolong the connection pipe by welding.
3. Apply specified refrigerant only. Never have it mixed with any other refrigerant. Never have air remain in the refrigerant line as it may lead to rupture or other hazards.
4. Make sure no refrigerant gas is leaking out when installation is completed.
5. If there is refrigerant leakage, please take sufficient measure to minimize the density of refrigerant.
6. Never touch the refrigerant piping or compressor without wearing glove to avoid scald or frostbite.

Improper installation may lead to fire hazard, explosion, electric shock or injury.

7. Notes for Installation and Maintenance

Safety Precautions for Installing and Relocating the Unit:

To ensure safety, please be mindful of the following precautions.

WARNINGS

1. When installing or relocating the unit, be sure to keep the refrigerant circuit free from air or substances other than the specified refrigerant.

Any presence of air or other foreign substance in the refrigerant circuit will cause system pressure rise or compressor rupture, resulting in injury.

2. When installing or moving this unit, do not charge the refrigerant which is not comply with that on the nameplate or unqualified refrigerant.

Otherwise, it may cause abnormal operation, wrong action, mechanical malfunction or even series safety accident.

3. When refrigerant needs to be recovered during relocating or repairing the unit, be sure that the unit is running in cooling mode. Then, fully close the valve at high pressure side (liquid valve). About 30~40 seconds later, fully close the valve at low pressure side (gas valve), immediately stop the unit and disconnect power. Please note that the time for refrigerant recovery should not exceed 1 minute.

If refrigerant recovery takes too much time, air may be sucked in and cause pressure rise or compressor rupture, resulting in injury.

4. During refrigerant recovery, make sure that liquid valve and gas valve are fully closed and power is disconnected before detaching the connection pipe.

If compressor starts running when stop valve is open and connection pipe is not yet connected, air will be sucked in and cause pressure rise or compressor rupture, resulting in injury.

5. When installing the unit, make sure that connection pipe is securely connected before the compressor starts running.

If compressor starts running when stop valve is open and connection pipe is not yet connected, air will be sucked in and cause pressure rise or compressor rupture, resulting in injury.

6. Prohibit installing the unit at the place where there may be leaked corrosive gas or flammable gas.

If there leaked gas around the unit, it may cause explosion and other accidents.

7. Do not use extension cords for electrical connections. If the electric wire is not long enough, please contact a local service center authorized and ask for a proper electric wire.

Poor connections may lead to electric shock or fire.

8. Use the specified types of wires for electrical connections between the indoor and outdoor units. Firmly clamp the wires so that their terminals receive no external stresses.

Electric wires with insufficient capacity, wrong wire connections and insecure wire terminals may cause electric shock or fire.

7. Notes for Installation and Maintenance

Safety Precautions for Refrigerant

• To realize the function of the air conditioner unit, a special refrigerant circulates in the system. The used refrigerant is the fluoride R32, which is specially cleaned. The refrigerant is flammable and inodorous. Furthermore, it can lead to explosion under certain conditions. But the flammability of the refrigerant is very low. It can be ignited only by fire.

• Compared to common refrigerants, R32 is a nonpolluting refrigerant with no harm to the ozoneosphere. The influence upon the greenhouse effect is also lower. R32 has got very good thermodynamic features which lead to a really high energy efficiency. The units therefore need a less filling.

WARNING:

• Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacture.

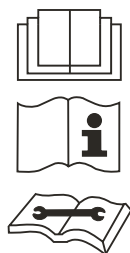
Should repair be necessary, contact your nearest authorized Service Centre. Any repairs carried out by unqualified personnel may be dangerous. The appliance shall be stored in a room without continuously operating ignition sources. (For example: open flames, an operating gas appliance or an operating electric heater.)

• Do not pierce or burn.

• Appliance shall be installed, operated and stored in a room with a floor area larger than Xm^2 .

• Appliance filled with flammable gas R32. For repairs, strictly follow manufacturers instructions only. Be aware that refrigerants not contain odour.

• Read specialists manual.



Safety Operation of Flammable Refrigerant

Qualification requirement for installation and maintenance man

• All the work men who are engaging in the refrigeration system should bear the valid certification awarded by the authoritative organization and the qualification for dealing with the refrigeration system recognized by this industry. If it needs other technician to maintain and repair the appliance, they should be supervised by the person who bears the qualification for using the flammable refrigerant.

• It can only be repaired by the method suggested by the equipments manufacturer.

Installation notes

• The air conditioner is not allowed to use in a room that has running fire (such as fire source, working coal gas ware, operating heater).

• It is not allowed to drill hole or burn the connection pipe.

• The air conditioner must be installed in a room that is larger than the minimum room area.

The minimum room area is shown on the nameplate or following table a.

• Leak test is a must after installation.

table a - Minimum room area (m^2)

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

Maintenance notes

• Check whether the maintenance area or the room area meet the requirement of the nameplate.

— Its only allowed to be operated in the rooms that meet the requirement of the nameplate.

• Check whether the maintenance area is well-ventilated.

— The continuous ventilation status should be kept during the operation process.

• Check whether there is fire source or potential fire source in the maintenance area.

— The naked flame is prohibited in the maintenance area; and the “no smoking” warning board should be hanged.

7. Notes for Installation and Maintenance

- Check whether the appliance mark is in good condition.
- Replace the vague or damaged warning mark.

Welding

• If you should cut or weld the refrigerant system pipes in the process of maintaining, please follow the steps as below:

- a. Shut down the unit and cut power supply
 - b. Eliminate the refrigerant
 - c. Vacuuming
 - d. Clean it with N₂ gas
 - e. Cutting or welding
 - f. Carry back to the service spot for welding
- Make sure that there isn't any naked flame near the outlet of the vacuum pump and its well-ventilated.
 - The refrigerant should be recycled into the specialized storage tank.

Filling the refrigerant

- Use the refrigerant filling appliances specialized for R32. Make sure that different kinds of refrigerant won't contaminate with each other.
- The refrigerant tank should be kept upright at the time of filling refrigerant.
- Stick the label on the system after filling is finished (or haven't finished).
- Don't overfilling.
- After filling is finished, please do the leakage detection before test running; another time of leak detection should be done when its removed.

Safety instructions for transportation and storage

- Please use the flammable gas detector to check before unload and open the container.
- No fire source and smoking.
- According to the local rules and laws.

Specialist's manual

• The following checks shall be applied to installations using flammable refrigerants:

- the charge size is in accordance with the room size within which the refrigerant containing parts are installed;
- the ventilation machinery and outlets are operating adequately and are not obstructed;

– if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;

– marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;

– refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

• Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

• Initial safety checks shall include:

– that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;

– that no live electrical components and wiring are exposed while charging, recovering or purging the system;

– that there is continuity of earth bonding.

• Checks to the area

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, DD.4.3 to DD.4.7 shall be completed prior to conducting work on the system.

• Work procedure

Work shall be undertaken under a controlled procedure so as to minimise the risk of a flammable gas or vapour being present while the work is being performed.

• General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

• Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure

7. Notes for Installation and Maintenance

that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

• Presence of fire extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO₂ fire extinguisher adjacent to the charging area.

• Ventilated area

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

• Checks to the refrigerating equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance. The following checks shall be applied to installations using flammable refrigerants:

- the actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;
- the ventilation machinery and outlets are operating adequately and are not obstructed;
- if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

• Checks to electrical devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the

circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

- that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- that no live electrical components and wiring are exposed while charging, recovering or purging the system;
- that there is continuity of earth bonding.

• No ignition sources

No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space.

Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

• Repairs to sealed components

During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

- Ensure that the apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

• **NOTE:** The use of silicon sealant can inhibit the

7. Notes for Installation and Maintenance

effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

• Repair to intrinsically safe components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

• Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

• Leak detection methods

Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

• Detection of flammable refrigerants

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant

and corrode the copper pipe-work.

NOTE: Examples of leak detection fluids are

- bubble method,
- fluorescent method agents.

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to clause DD.9.

• Removal and evacuation

When breaking into the refrigerant circuit to make repairs - or for any other purpose - conventional procedures shall be used. However, for flammable refrigerants it is important that best practice is followed since flammability is a consideration. The following procedure shall be adhered to:

- remove refrigerant;
- purge the circuit with inert gas (optional for A2L);
- evacuate (optional for A2L);
- purge with inert gas (optional for A2L);
- open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. For appliances containing flammable refrigerants other than A2L refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process may need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, other than A2L refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.

Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

• Charging procedures

7. Notes for Installation and Maintenance

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

• Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

- a) Become familiar with the equipment and its operation.
- b) Isolate system electrically.
- c) Before attempting the procedure, ensure that:
 - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - all personal protective equipment is available and being used correctly;
 - the recovery process is supervised at all times by a competent person;
 - recovery equipment and cylinders conform to the appropriate standards.
- d) Pump down refrigerant system, if possible.
- e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.

f) Make sure that cylinder is situated on the scales before recovery takes place.

g) Start the recovery machine and operate in accordance with manufacturer's instructions.

h) Do not overfill cylinders. (No more than 80% volume liquid charge).

i) Do not exceed the maximum working pressure of the cylinder, even temporarily.

j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

k) Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

• Labelling

Equipment shall be labelled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

• Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult

7. Notes for Installation and Maintenance

manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only

electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

• General

That the installation of pipe-work shall be kept to a minimum.

That compliance with national gas regulations shall be observed.

That mechanical connections made in accordance with 22.118 shall be accessible for maintenance purposes.

7. Notes for Installation and Maintenance

Main Tools for Installation and Maintenance



Level meter



Measuring tape



Screw driver



Impact drill



Drill head



Electric drill



Electroprobe



Universal meter



Torque wrench



Open-end wrench



Inner hexagon spanner



Electronic leakage detector



Vacuum pump



Pressure meter



Pipe pliers



Pipe pliers



Pipe cutter



Pipe expander



Pipe bender



Soldering appliance



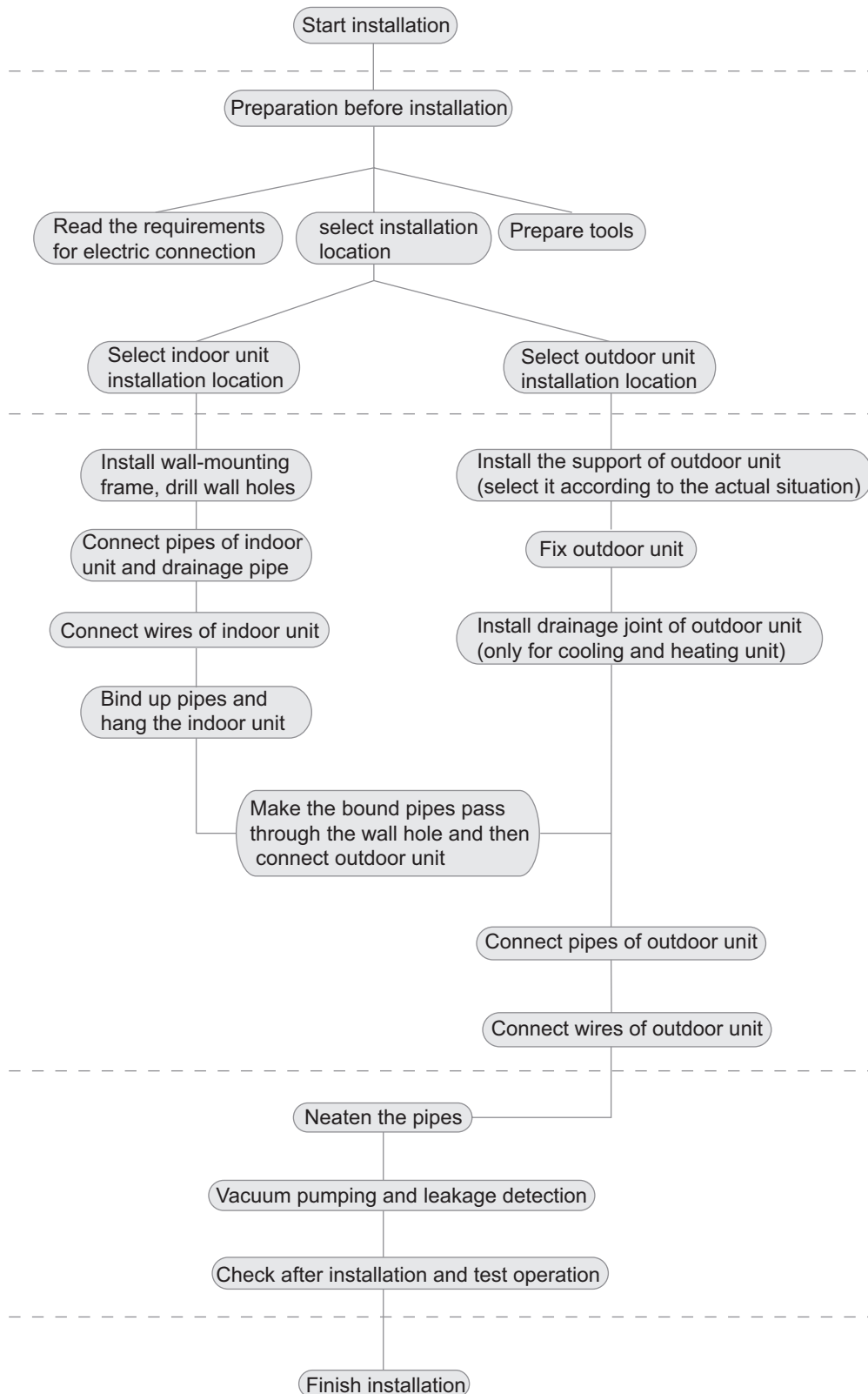
Refrigerant container



Electronic scale

8. Installation

Installation Procedures



Note: this flow is only for reference; please find the more detailed installation steps in this section.