Hisense

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TCY12021008G

Hisense

VRF AIR-CONDITIONER (HEAT PUMP)

TCY12021008G

Hisense

VRF AIR-CONDITIONER
⌈ HEAT PUMP ⌋

Technical, Installation and Service Handbook

Hi - Smart E+ L+ C+ *SERIES*

BASIC MODELS

- AVW-41HJFHH1
- AVW-48HJFHH1
- AVW-54HJFHH1
- AVW-41HJFHH2
- AVW-48HJFHH2
- AVW-54HJFHH2
- AVW-41HKFHH2
- AVW-48HKFHH2
- AVW-54HKFHH2
- AVW-76HKFHH2
- AVW-96HKFHH2
- AVW-114HKFHH2



TCY12021008G ▶▶ Date: Feb. 2024

Dear users:

Thank you for choosing and using our products. For your better understanding and use of this product, be sure to read and comply with the following items before use.

IMPORTANT NOTICE

Signal words (danger, warning and caution) are used to identify severity of hazard. Definitions for identifying hazard severity are provided below with their respective signal words:

⚠DANGER : Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING : Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION : Used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTE : Useful information for operation and/or maintenance.

- This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.
- This manual gives a common description and information for this air conditioner which you operate as well for other models.
- HISENSE pursues a policy of continuing improvement in design and performance of products. The right is therefore reserved to vary specifications without notice.
- HISENSE cannot anticipate every possible circumstance that might involve a potential hazard. This air conditioner is designed for standard air conditioning only. Do not use this air conditioner for other purposes such as drying clothes, refrigerating foods or for any other cooling process.
- Do not install the unit in the following places, otherwise, it may lead to a fire, deformation, corrosion or failure.
  - * Places where oil (including machinery oil) splashes.
  - * Places where sulfide gas drifts such as in hot spring.
  - * Places where flammable gas may generate or flow.
  - * Places where strong wind with high salinity blows such as coast regions, or places with an atmosphere of acidity or alkalinity.
- Do not install the unit in the place where silicon gas drifts. If the silicon gas attaches to the surface of heat exchanger, the fin surface repels water. As a result, drain water splashes outside of the drain pan and splashed water runs inside of electrical box. In the end, water leakage or electrical devices failure may occur.
- Do not install the unit in the place where the breeze directly catches the animals and plants. It could adversely affect the animals and plants.
- Installation and service engineering must comply with local standards, laws and regulations.
- As public inaccessible appliances, the indoor units are required to be installed at a height of no lower than 2.5m.
- The installation of the air conditioner can only be carried out by the dealer or professionals. Installation by customers themselves may lead to water leakage, electric shock or a fire.
- If you have any questions, please contact your dealer or designated service center of HISENSE.
- To protect the environment, please do not discard the product at will, and HISENSE can provide recycling services in accordance with the relevant provisions of the country and provide replaceable parts in accordance with national standard requirements.
- This air conditioner has been designed for the following temperatures , please operate the air conditioner within the ranges.

Temperature (°C)

		Maximum	Minimum
Cooling Operation	Indoor	32DB/23WB	21DB/15WB
	Outdoor	48DB	-10DB*
Heating Operation	Indoor	30DB	15DB
	Outdoor	26DB/15.5WB	-20DB/-20.5WB*

DB: Dry Bulb, WB: Wet Bulb

⚠ DANGER

- Do not perform installation work, refrigerant piping work, drain pump installation, drain piping and electrical wiring without referring to installation manual. If the instructions are not followed, it may lead to water leakage, electric shock or a fire. In case of fire, cut off the power at the first time; do not touch the electrical parts by hand to avoid electric shock.
- These products are equipped with electrical parts, so do not pour water into the indoor units or outdoor units, or it will lead to a serious electrical failure.
- Do not open the service cover of the indoor or outdoor units without turning OFF the main power supply, otherwise it may lead to a serious accident. (In any cases, users are not allowed to open the service cover).
- Do not touch or adjust safety devices inside the indoor or outdoor units. Otherwise, it may lead to a serious accident.
- Refrigerant R410A for this unit is incombustible, non-toxic and odorless; however if the refrigerant leaked and contacted with fire, toxic gas will generate. Also because the R410A is heavier than air, its accumulation near floor surface could lead to difficulty with breathing. Turn OFF the main switch, extinguish any naked flames and contact your service contractor, if refrigerant leakage occurs. Do not charge oxygen, acetylene or other flammable and poisonou gases into the refrigeration cycle when performing a leakage test or an air-tightness test. These types of gases can lead to an explosion. It is recommended that nitrogen be used for these tests.
- Refrigerant safety leakage standards for construction and operation systems are determined in accordance with local regulations or standards.
- Use an ELB (Earth Leakage Breaker, with an actuation time of 0.1s or less) at or above medium induction speed, otherwise it may lead to an electric shock or a fire.
- For installation, firmly connect the refrigerant pipe before the compressor starts operating.
- For maintenance, relocation and disposal, remove the refrigerant pipe after the compressor stops.
- Do not perform a short-circuit to the protection device such as a pressure switch when operating. It may lead to a fire or explosion.

⚠ WARNING

- Do not use any sprays such as insecticide, lacquer, hair spray or other flammable gases within approximately one (1) meter from the system.
- If circuit breaker is frequently activated, stop the system and contact your or service contractor.
- Check that the earth wire is securely connected. If the unit is not properly earthed, it may lead to electric shock. Do not connect the earth wire to gas piping, water piping, lighting conductor or earth wire of a telephone.
- Before performing any brazing work, check to ensure that there is no flammable materials around. When charging refrigerant be sure to wear leather gloves to prevent from cold injuries.
- Protect the wires, electrical parts and the like from rats or other small animals. If not, rats may gnaw at unprotected parts, which may lead to a fire.
- Fix the cables securely. External forces on the terminals could lead to a fire.
- Provide a sufficiently strong foundation. If not, the unit may fall down and it may lead to injuries.
- Perform electrical work according to installation manual, relevant regulations and standards.
- If the instructions are not followed, an electrical failure and a fire may occur due to insufficient capacity and inadequate performance. Use specified cables between units, otherwise, an electrical failure or a fire may occur. Ensure that the outdoor unit is not covered with ice or snow before use.
- This appliance can be used by children aged from 8 years and above, and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and maintenance shall not be done by children without supervision.
- The A-weighted emission sound pressure level at workstations does not exceed 70 dB(A).

⚠CAUTION

- Do not step on or put any objects on the product.
- Do not put any foreign materials on or inside the unit.
- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Starting the unit after longtime idleness requires the compressor temperature to meet the starting requirements or reach a certain heating time.

NOTE:

- It is recommended that the room be ventilated every 3 to 4 hours.
  In some cases, the air conditioner may not work properly in the following cases.

* In case that the power supplied by the power transformer is less than or equal to the electric power of the air conditioner.

* In case that the large power-consuming equipment is too close to the power supply wiring of the air conditioner, large surge voltage may be inducted in the power supply wiring of the air conditioner.

- The capacity may decrease according to the outdoor air temperature. Therefore, it is recommended that auxiliary equipment be used on the job site when the unit is installed in a high temperature region.
- The repair and maintenance of this air conditioner can only be carried out by professionals.

IMPORTANT NOTICE



Correct Disposal of this product
This marking indicates that this product should not be disposed with other household wastes. To prevent possible harms to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. Please return your used device through the return and collection systems or to contact your retailers, they can take this product for environmentally safe recycling.

CHECKING UPPON DELIVERY

- Upon receiving this product, inspect it for any shipping damage.
  Claims for damage, either apparent or concealed, in a written form, should be filed immediately with the shipping company.
- Check the model number, electrical characteristics (power supply, voltage and frequency) and accessories to determine if they are correct. The standard utilization of the unit shall be explained in these instructions. Please contact your local agent, as the occasion arises.

HISENSE's liability shall not cover defects arising from the alteration performed by customers without HISENSE's consent in a written form.

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DESIGN

1. Introduction

1.1 Line-Up of Outdoor Unit

Single Fan Model

Capacity	HP	4	5	6
	kBtu/h	41.5	48.0	53.0
	kW	12.1	14.0	15.5
Model		AVW-41HJFHH1	AVW-48HJFHH1	AVW-54HJFHH1

Dual Fans Model

Capacity	HP	4	5	6
	kBtu/h	41.5	48.0	53.0
	kW	12.1	14.0	15.5
Model		AVW-41HJFHH2	AVW-48HJFHH2	AVW-54HJFHH2

Capacity	HP	4	5	6
	kBtu/h	41.5	48.0	53.0
	kW	12.1	14.0	15.5
Model		AVW-41HKFHH2	AVW-48HKFHH2	AVW-54HKFHH2

Capacity	HP	8	10	12
	kBtu/h	76.0	96.0	114.0
	kW	22.4	28.0	33.5
Model		AVW-76HKFHH2	AVW-96HKFHH2	AVW-114HKFHH2



Model: AVW-41/48/54HJFHH1



Model: AVW-41/48/54HJFHH2
AVW-41/48/54HKFHH2



Model: AVW-76/96/114HKFHH2

1.2 Application Case

The following indoor units can be combined with the outdoor unit.

Table 1.1 Indoor Unit Type List

Type	Picture	Nominal Power (kBtu/h)																	
		05	07	09	12	14	15	17	18	19	22	24	27	28	30	38	48	54	76	96
4-way Cassette Type				●	●		●			●	●	●	●		●	●	●	●		
Mini 4-way Cassette Type		●	●	●	●		●	●		●										
1-way Cassette Type			●	●	●	●			●			●								
2-way Cassette Type			●	●	●	●			●			●	●		●	●	●	●		
Console Type		●	●	●	●		●	●												
Ceiling Ducted Type(High Static Pressure)			●	●	●	●		●		●	●	●	●		●	●	●	●	●	●
Ceiling Ducted Type(Low Static Pressure)			●	●	●	●		●		●	●	●	●		●	●	●	●	●	●
Ceiling Ducted Type(DC Low- height)		●	●	●	●		●	●		●	●	●								
Ceiling Ducted Type(AC Low- height)		●	●	●	●		●	●		●	●	●								
Wall Mounted Type		●	●	●	●		●		●			●		●						
Ceiling & Floor Type								●	●		●	●	●		●	●	●			
Floor Concealed Type				●		●			●			●								

● : Available

- The number of connectable indoor units with the outdoor unit is as follows. Comply with the condition as follows when installing the unit.

Outdoor Unit Capacity (kBtu/h)	Recommended Number of Connectable I.U.	Maximum Number of Connectable I.U.	Connectable Indoor Unit Capacity Ratio	
			Minimum	Maximum
AVW-41HJFHH1	6	8	50%	150%
AVW-48HJFHH1	6	9	50%	150%
AVW-54HJFHH1	6	10	50%	150%
AVW-41HJFHH2	8	9	50%	150%
AVW-48HJFHH2	8	11	50%	150%
AVW-54HJFHH2	8	12	50%	150%
AVW-41HKFHH2	8	9	50%	150%
AVW-48HKFHH2	8	11	50%	150%
AVW-54HKFHH2	8	12	50%	150%
AVW-76HKFHH2	13	15	50%	150%
AVW-96HKFHH2	13	18	50%	150%
AVW-114HKFHH2	13	19	50%	150%

NOTES:

1. The connectable indoor unit capacity ratio can be calculated as follows:
   Connectable Indoor Unit Capacity Ratio = Total Indoor Unit Capacity / Outdoor Unit Capacity.
2. In cold areas (where the outdoor air temperature may be lower than -10ºC) or areas with extremely high temperature (where the outdoor air temperature may be higher than 43°C), the recommended number of connected units is not encouraged to be exceeded and the capacity ratio is not recommended to be greater than 100%.
   Otherwise, under certain operating limits, the temperature difference between the inlet and outlet air temperatures of the indoor unit may decrease, or the indoor unit may not reach high wind operation for a long time when it is started.
3. For the system which all the indoor units operate simultaneously, the total indoor unit capacity should be not bigger than the outdoor unit capacity. Otherwise, a decrease in operating performance and an increase in the operating limit can result in an overload.
4. When the system's farthest indoor unit pipe length or total piping length exceeds the recommended value(A), it is recommended that the number of connected indoor units should not exceed the recommended number, and the capacity ratio should not exceed 100%. Otherwise, under certain operating limits, the temperature difference between the inlet and outlet air temperatures of the indoor unit may decrease, or the indoor unit may not reach high wind operation for a long time when it is started.
5. For the system under which all the indoor units do not operate simultaneously, the total indoor unit capacity is available up to 150% or the number of connectable indoor units can be up to maximum,but the performance of each indoor unit will be reduced.
6. The maximum number of connectable indoor units differs depending on the model, capacity, environment and installation location of connected indoor units.
7. A system configuration with a combination ratio of more than 150% is unacceptable. Alarm activation and operation failure may occur.
8. For optional spare parts, please contact your local salesperson.

Outdoor Unit Capacity (kBtu/h)	Recommended value(A)	
	Maximum Piping Length	Total Piping Length
AVW-41HJFHH1	60	70
AVW-48HJFHH1	60	70
AVW-54HJFHH1	60	70
AVW-41HJFHH2	75	120
AVW-48HJFHH2	75	120
AVW-54HJFHH2	75	120
AVW-41HKFHH2	75	120
AVW-48HKFHH2	75	120
AVW-54HKFHH2	75	120
AVW-76HKFHH2	100	250
AVW-96HKFHH2	100	250
AVW-114HKFHH2	100	250

2. General Data

2.1 Key Parameter

Capacity				4HP	5HP	6HP
Model				AVW-41HJFHH1	AVW-48HJFHH1	AVW-54HJFHH1
Power Supply				220-240V ~ 50/60Hz		
Cooling Operation	Nominal Capacity		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption		kW	3.73	4.33	5.64
	EER		W/W	3.24	3.23	2.75
	SEER		—	7.72	7.66	7.17
Heating Operation	Capacity (Max)		kW	14.0	16.0	18.0
			Btu/h	48000	54500	61500
	Power Consumption (Max)		kW	3.64	4.51	5.63
	COP (Max)		W/W	3.85	3.55	3.20
	Capacity (Nominal)		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption (Nominal)		kW	2.99	3.73	4.63
	COP (Nominal)		W/W	4.05	3.75	3.35
	SCOP		—	4.41	4.36	4.26
Sound Pressure Level ※1	Normal mode(Cooling/Heating)		dB(A)	53/54	54/55	54/55
	Silent mode (db=3)		dB(A)	45	46	46
Cabinet Color ※2			—	Grayish White		
Outer Dimensions	Height		mm	990	990	990
	Width		mm	950	950	950
	Depth		mm	320	320	320
Packing Dimensions	Height		mm	1126	1126	1126
	Width		mm	1070	1070	1070
	Depth		mm	470	470	470
Net Weight			kg	88	89	90
Gross Weight			kg	103	104	105
Refrigerating Installation	Compressor	Type	—	Rotary		
		Quantity	—	1	1	1
	Refrigeration Oil	Type	—	FV50S		
		Charge	L	1.4	1.4	1.4
	Refrigerant Charge	Type	—	R410A		
		Before Shipment	kg	4.0	4.0	4.0
	Refrigerant Flow Control		—	Micro-computer Control Expansion Valve		
	Heat Exchanger Type			Multi-way Cross-flow Finned Tube Type		
	Gas Pipe		mm	Φ15.88	Φ15.88	Φ15.88
			in.	5/8	5/8	5/8
	Liquid Pipe		mm	Φ9.53	Φ9.53	Φ9.53
			in.	3/8	3/8	3/8
Fan	Condenser Fan Quantity		—	1	1	1
	Air Flow Rate		m^3/min	71	71	71
Hole for Power Supply Wiring			mm	34	34	34
Hole for Control Line Wiring			mm	27	27	27
Static Pressure of Outdoor※3			Pa	30	30	30

Notes:

The above cooling and heating capacities show the capacities when the outdoor unit is operating with the 100% rating of indoor units.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 27°C DB
19°C WB

Outdoor Air Inlet Temperature: 35°C DB

Heating Operation Conditions

Indoor Air Inlet Temperature: 20°C DB

Outdoor Air Inlet Temperature: 7°C DB
6°C WB

Piping Length: 7.5m, Piping Lift: 0m

※1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.
Measurement point: 1m from the service cover surface and 1.5m from floor level.

※2. The final appearance of outdoor units is subject to the actual products.

※3. The dip switch DSW1-4 of outdoor PCB must set ON.This value is measured from the air outlet grille of the outdoor unit.

Capacity				4HP	5HP	6HP
Model				AVW-41HJFHH2	AVW-48HJFHH2	AVW-54HJFHH2
Power Supply				220-240V ~ 50/60Hz		
Cooling Operation	Nominal Capacity		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption		kW	2.79	3.43	4.18
	EER		W/W	4.33	4.08	3.71
	SEER		—	8.20	8.10	8.00
Heating Operation	Capacity (Max)		kW	14.0	16.0	18.0
			Btu/h	48000	54500	61500
	Power Consumption (Max)		kW	3.08	3.71	4.47
	COP (Max)		W/W	4.55	4.31	4.03
	SCOP		—	4.85	4.70	4.55
Sound Pressure Level ※1	Normal mode(Cooling/Heating)		dB(A)	52/55	52/55	53/56
	Silent mode (db=3)		dB(A)	44	44	45
Cabinet Color ※2			—	Grayish White		
Outer Dimensions	Height		mm	1380	1380	1380
	Width		mm	950	950	950
	Depth		mm	370	370	370
Packing Dimensions	Height		mm	1531	1531	1531
	Width		mm	1070	1070	1070
	Depth		mm	515	515	515
Net Weight			kg	106	107	108
Gross Weight			kg	118	119	120
Refrigerating Installation	Compressor	Type	—	Rotary		
		Quantity	—	1	1	1
	Refrigeration Oil	Type	—	α 68HES-H		
		Charge	L	1.65	1.65	1.65
	Refrigerant Charge	Type	—	R410A		
		Before Shipment	kg	3.8	3.8	4.1
	Refrigerant Flow Control		—	Micro-computer Control Expansion Valve		
	Heat Exchanger Type			Multi-way Cross-flow Finned Tube Type		
	Gas Pipe		mm	Φ15.88	Φ15.88	Φ15.88
			in.	5/8	5/8	5/8
	Liquid Pipe		mm	Φ9.53	Φ9.53	Φ9.53
			in.	3/8	3/8	3/8
Fan	Condenser Fan Quantity		—	2	2	2
	Air Flow Rate		m^3/min	90	90	100
Hole for Power Supply Wiring			mm	34	34	34
Hole for Control Line Wiring			mm	27	27	27
Static Pressure of Outdoor※3			Pa	30	30	30

Notes:

The above cooling and heating capacities show the capacities when the outdoor unit is operating with the 100% rating of indoor units.

Cooling Operation Conditions

Indoor Air Inlet Temperature: 27°C DB
19°C WB

Outdoor Air Inlet Temperature: 35°C DB

Heating Operation Conditions

Indoor Air Inlet Temperature: 20°C DB

Outdoor Air Inlet Temperature: 7°C DB
6°C WB

Piping Length: 7.5m, Piping Lift: 0m

※1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.
Measurement point: 1m from the service cover surface and 1.5m from floor level.

※2. The final appearance of outdoor units is subject to the actual products.

※3. The dip switch DSW1-4 of outdoor PCB must set ON.This value is measured from the air outlet grille of the outdoor unit.

Capacity				4HP	5HP	6HP
Model				AVW-41HKFHH2	AVW-48HKFHH2	AVW-54HKFHH2
Power Supply				380-415V 3N~ 50/60Hz		
Cooling Operation	Nominal Capacity		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption		kW	2.79	3.43	4.18
	EER		W/W	4.33	4.08	3.71
	SEER		—	8.20	8.10	8.00
Heating Operation	Capacity (Max)		kW	14.0	16.0	18.0
			Btu/h	48000	54500	61500
	Power Consumption (Max)		kW	3.08	3.71	4.47
	COP (Max)		W/W	4.55	4.31	4.03
	SCOP		—	4.85	4.70	4.55
Sound Pressure Level ※1	Normal mode(Cooling/Heating)		dB(A)	52/55	52/55	53/56
	Silent mode (db=3)		dB(A)	44	44	45
Cabinet Color ※2			—	Grayish White		
Outer Dimensions	Height		mm	1380	1380	1380
	Width		mm	950	950	950
	Depth		mm	370	370	370
Packing Dimensions	Height		mm	1531	1531	1531
	Width		mm	1070	1070	1070
	Depth		mm	515	515	515
Net Weight			kg	112	113	114
Gross Weight			kg	123	124	125
Refrigerating Installation	Compressor	Type	—	Rotary		
		Quantity	—	1	1	1
	Refrigeration Oil	Type	—	FV50S		
		Charge	L	1.40	1.40	1.40
	Refrigerant Charge	Type	—	R410A		
		Before Shipment	kg	3.8	3.8	4.1
	Refrigerant Flow Control		—	Micro-computer Control Expansion Valve		
	Heat Exchanger Type			Multi-way Cross-flow Finned Tube Type		
	Gas Pipe		mm	Φ15.88	Φ15.88	Φ15.88
			in.	5/8	5/8	5/8
	Liquid Pipe		mm	Φ9.53	Φ9.53	Φ9.53
			in.	3/8	3/8	3/8
Fan	Condenser Fan Quantity		—	2	2	2
	Air Flow Rate		m^3/min	120	120	127
Hole for Power Supply Wiring			mm	34	34	34
Hole for Control Line Wiring			mm	27	27	27
Static Pressure of Outdoor※3			Pa	30	30	30

Notes:

The above cooling and heating capacities show the capacities when the outdoor unit is operating with the 100% rating of indoor units.

Cooling Operation Conditions		Heating Operation Conditions	
Indoor Air Inlet Temperature:	27°C DB 19°C WB	Indoor Air Inlet Temperature:	20°C DB
Outdoor Air Inlet Temperature:	35°C DB	Outdoor Air Inlet Temperature:	7°C DB 6°C WB

Piping Length: 7.5m, Piping Lift: 0m

※1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.
Measurement point: 1m from the service cover surface and 1.5m from floor level.

※2. The final appearance of outdoor units is subject to the actual products.

※3. The dip switch DSW1-4 of outdoor PCB must set ON.This value is measured from the air outlet grille of the outdoor unit.

Capacity				8HP	10HP	12HP
Model				AVW-76HKFHH2	AVW-96HKFHH2	AVW-114HKFHH2
Power Supply				380-415V 3N~ 50/60Hz		
Cooling Operation	Nominal Capacity		kW	22.4	28.0	33.5
			Btu/h	76400	95500	114300
	Power Consumption		kW	6.22	8.12	13.40
	EER		W/W	3.60	3.45	2.50
	SEER		—	7.00	7.80	7.55
Heating Operation	Capacity (Max)		kW	25.0	31.5	37.5
			Btu/h	85300	107500	128000
	Power Consumption (Max)		kW	5.81	7.59	10.08
	COP (Max)		W/W	4.30	4.15	3.72
	SCOP		—	4.50	4.50	4.35
Sound Pressure Level ※1	Normal mode(Cooling/Heating)		dB(A)	55/58	56/59	56/59
	Silent mode (db=3)		dB(A)	47	48	48
Cabinet Color ※2			—	Grayish White		
Outer Dimensions	Height		mm	1650	1650	1650
	Width		mm	1100	1100	1100
	Depth		mm	390	390	390
Packing Dimensions	Height		mm	1806	1806	1806
	Width		mm	1185	1185	1185
	Depth		mm	530	530	530
Net Weight			kg	145	157	158
Gross Weight			kg	161	174	175
Refrigerating Installation	Compressor	Type	—	Rotary		
		Quantity	—	1	1	1
	Refrigeration Oil	Type	—	FV50S		
		Charge	L	2.30	2.30	2.30
	Refrigerant Charge	Type	—	R410A		
		Before Shipment	kg	5.5	6.5	6.5
	Refrigerant Flow Control		—	Micro-computer Control Expansion Valve		
	Heat Exchanger Type			Multi-way Cross-flow Finned Tube Type		
	Gas Pipe		mm	Φ22.2	Φ25.4	Φ25.4
			in.	7/8	1/1	1/1
	Liquid Pipe		mm	Φ12.7	Φ12.7	Φ12.7
			in.	1/2	1/2	1/2
Fan	Condenser Fan Quantity		—	2	2	2
	Air Flow Rate		m^3/min	150	163	163
Hole for Power Supply Wiring			mm	34	34	34
Hole for Control Line Wiring			mm	27	27	27
Static Pressure of Outdoor※3			Pa	30	30	30

Notes:

The above cooling and heating capacities show the capacities when the outdoor unit is operating with the 100% rating of indoor units.

Cooling Operation Conditions		Heating Operation Conditions	
Indoor Air Inlet Temperature:	27°C DB 19°C WB	Indoor Air Inlet Temperature:	20°C DB
Outdoor Air Inlet Temperature:	35°C DB	Outdoor Air Inlet Temperature:	7°C DB 6°C WB

Piping Length: 7.5m, Piping Lift: 0m

※1. The above noise values are measured in the anechoic chamber without reflected echo, therefore the impact of the reflected echo must be taken into consideration at the scene.
Measurement point: 1m from the service cover surface and 1.5m from floor level.

※2. The final appearance of outdoor units is subject to the actual products.

※3. The dip switch DSW1-4 of outdoor PCB must set ON.This value is measured from the air outlet grille of the outdoor unit.

2.2 Component Data

Outdoor Heat Exchanger, Fan and Fan Motor

Model				AVW-41HJFHH1	AVW-48HJFHH1	AVW-54HJFHH1
Heat Exchanger	Heat exchanger type		-	Multi-way cross-flow finned tube type		
	Tube	Material	-	Copper		
		Outside diameter	mm	7		
		Rows	-	3	3	3
	Fin	Material	-	Aluminum		
		Pitch	mm	1.4	1.4	1.4
	Quantity		-	1	1	1
	Max. operating pressure		Mpa	4.15		
	Max.frontal area		m^2	0.877	0.877	0.877
Fan Part	Fan	Type	-	Axial-flow Fan		
		Quantity	-	1	1	1
		Outside diameter	mm	544	544	544
	Fan motor	Type	-	Waterproof brushless DC motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	138	138	138
		Quantity	-	1	1	1
		Insulation grade	-	E	E	E

Model				AVW-41HJFHH2	AVW-48HJFHH2	AVW-54HJFHH2
Heat Exchanger	Heat exchanger type		-	Multi-way cross-flow finned tube type		
	Tube	Material	-	Copper		
		Outside diameter	mm	7		
		Rows	-	2	2	2
	Fin	Material	-	Aluminum		
		Pitch	mm	1.4	1.4	1.4
	Quantity		-	1	1	1
	Max. operating pressure		Mpa	4.15		
	Max.frontal area		m^2	1.355	1.355	1.355
Fan Part	Fan	Type	-	Axial-flow Fan		
		Quantity	-	2	2	2
		Outside diameter	mm	544	544	544
	Fan motor	Type	-	Waterproof brushless DC motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	51	51	51
		Quantity	-	2	2	2
		Insulation grade	-	E	E	E

Model				AVW-41HKFHH2	AVW-48HKFHH2	AVW-54HKFHH2
Heat Exchanger	Heat exchanger type		-	Multi-way cross-flow finned tube type		
	Tube	Material	-	Copper		
		Outside diameter	mm	7		
		Rows	-	2	2	2
	Fin	Material	-	Aluminum		
		Pitch	mm	1.4	1.4	1.4
	Quantity		-	1	1	1
	Max. operating pressure		Mpa	4.15		
	Max.frontal area		m^2	1.355	1.355	1.355
Fan Part	Fan	Type	-	Axial-flow Fan		
		Quantity	-	2	2	2
		Outside diameter	mm	544	544	544
	Fan motor	Type	-	Waterproof brushless DC motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	138	138	138
		Quantity	-	2	2	2
		Insulation grade	-	E	E	E

Model				AVW-76HKFHH2	AVW-96HKFHH2	AVW-114HKFHH2
Heat Exchanger	Heat exchanger type		-	Multi-way cross-flow finned tube type		
	Tube	Material	-	Copper		
		Outside diameter	mm	7		
		Rows	-	2	3	3
	Fin	Material	-	Aluminum		
		Pitch	mm	1.4	1.4	1.4
	Quantity		-	1	1	1
	Max. operating pressure		Mpa	4.15		
	Max.frontal area		m^2	1.856	1.856	1.856
Fan Part	Fan	Type	-	Axial-flow Fan		
		Quantity	-	2	2	2
		Outside diameter	mm	544	544	544
	Fan motor	Type	-	Waterproof brushless DC motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	200	200	200
		Quantity	-	2	2	2
		Insulation grade	-	E	E	E

Parameters of Compressor

Compressor Model			MNB36FLAMC-L	MNB42FFDMC-L	ATH356SDPC9FQ
Design Pressure	High Side	Mpa	4.15	4.15	4.15
	Low Side	Mpa	2.21	2.21	2.21
Compressor Motor	Model	-	Brushless DC motor	Brushless DC motor	Brushless DC motor
	Start-up Mode	-	VFD	VFD	VFD
	Polarities	-	6	6	4
	Insulation Grade	-	E	E	E
Refrigerator Oil	Brand	-	FV50S	FV50S	α 6 8 HES - H
	Volume	L	1.1±0.02	1.4±0.02	1.65±0.02

Compressor Model			LNB65FEEMC
Design Pressure	High Side	Mpa	4.15
	Low Side	Mpa	2.21
Compressor Motor	Model	-	Brushless DC motor
	Start-up Mode	-	VFD
	Polarities	-	6
	Insulation Grade	-	E
Refrigerator Oil	Brand	-	FV50S
	Volume	L	2.3±0.02

Outdoor Unit Models	Compressor		Fan Motor	
	Model	Quantity	Model	Degree of Protection
AVW-41HJFHH1	MNB36FLAMC-L	1	SIC-81FW-D8138	IP43
AVW-48HJFHH1				
AVW-54HJFHH1				
AVW-41HJFHH2	ATH356SDPC9FQ	1	SIC-68FV-D851 or ZWF-50	IP23
AVW-48HJFHH2				
AVW-54HJFHH2				
AVW-41HKFHH2	MNB42FFDMC-L	1	SIC-81FW-D8138 or ZWF-138	IP43
AVW-48HKFHH2				
AVW-54HKFHH2				
AVW-76HKFHH2	LNB65FEEMC	1	SIC-81FW-D8200	IP43
AVW-96HKFHH2				
AVW-114HKFHH2				

2.3 Safety and Control Device Setting

- Compressor Protection
  The compressor is protected by the following devices and their combinations.

(1) High Pressure Switch: This switch cuts out the operation of the compressor when the discharge pressure exceeds the setting.

(2) Oil Heater: This band type heater protects against oil foaming during cold starting, as it is energized while the compressor stopped.

Model			AVW-41HJFHH1	AVW-48HJFHH1	AVW-54HJFHH1
Compressor Pressure switch			Reset automatically and non-adjustable		
High	Open	MPa	4.15	4.15	4.15
	Close	MPa	3.20	3.20	3.20
Capacity of circuit breaker		A	50	50	50
Oil heater capacity		W	56	56	56
CCP timer Time setting		min.	Non-adjustable		
			3	3	3

Model			AVW-41HJFHH2	AVW-48HJFHH2	AVW-54HJFHH2
Compressor Pressure switch			Reset automatically and non-adjustable		
High	Open	MPa	4.15	4.15	4.15
	Close	MPa	3.20	3.20	3.20
Capacity of circuit breaker		A	50	50	50
Oil heater capacity		W	88	88	88
CCP timer Time setting		min.	Non-adjustable		
			3	3	3

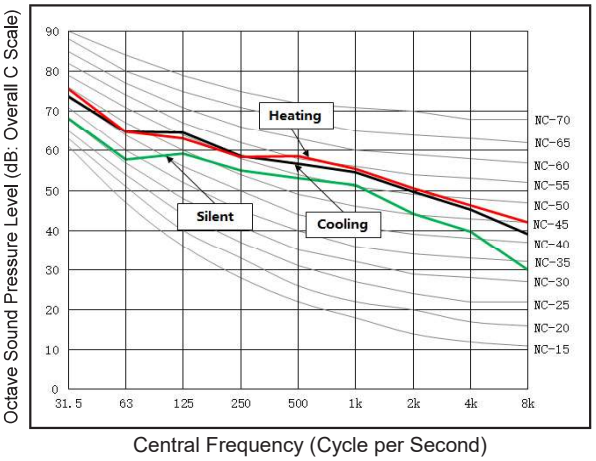
Model			AVW-48HKFHH2	AVW-48HKFHH2	AVW-54HKFHH2
Compressor Pressure switch			Reset automatically and non-adjustable		
High	Open	MPa	4.15	4.15	4.15
	Close	MPa	3.20	3.20	3.20
Capacity of circuit breaker		A	40	40	40
Oil heater capacity		W	112	112	112
CCP timer Time setting		min.	Non-adjustable		
			3	3	3

Model			AVW-76HKFHH2	AVW-96HKFHH2	AVW-114HKFHH2
Compressor Pressure switch			Reset automatically and non-adjustable		
High	Open	MPa	4.15	4.15	4.15
	Close	MPa	3.20	3.20	3.20
Capacity of circuit breaker		A	40	40	40
Oil heater capacity		W	84	84	84
CCP timer Time setting		min.	Non-adjustable		
			3	3	3

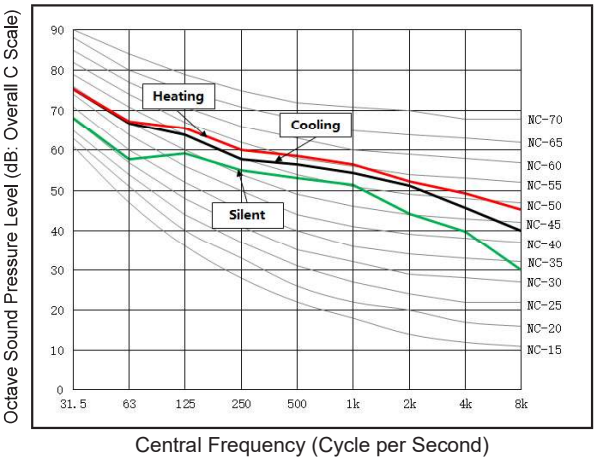
2.4 Sound Data

Measurement point: 1m from the service cover surface and 1.5m from floor level.

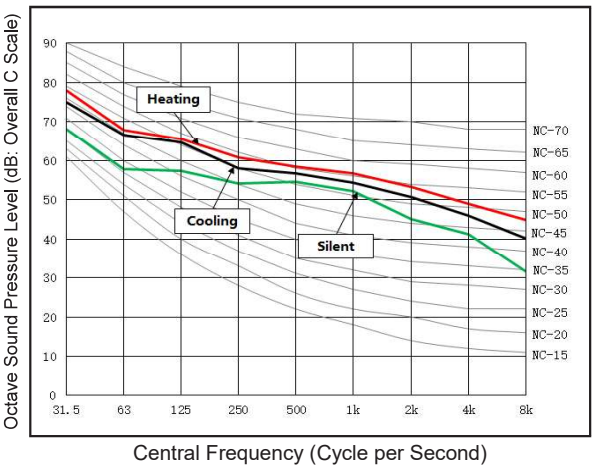
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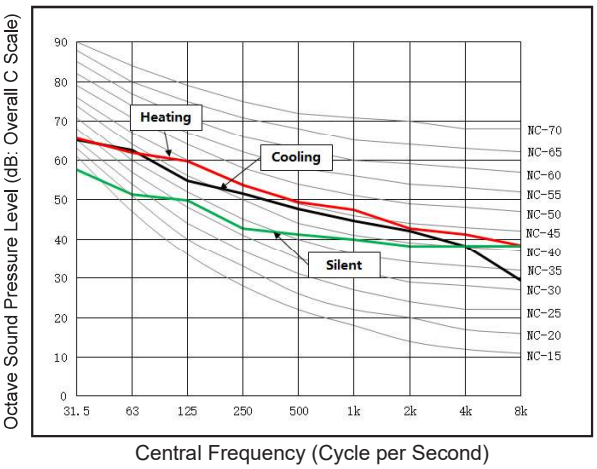
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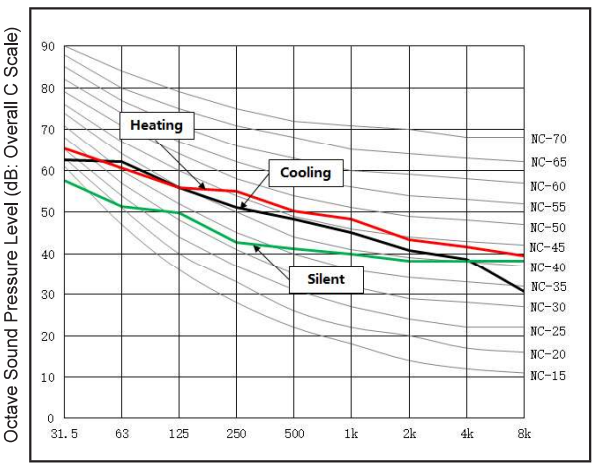
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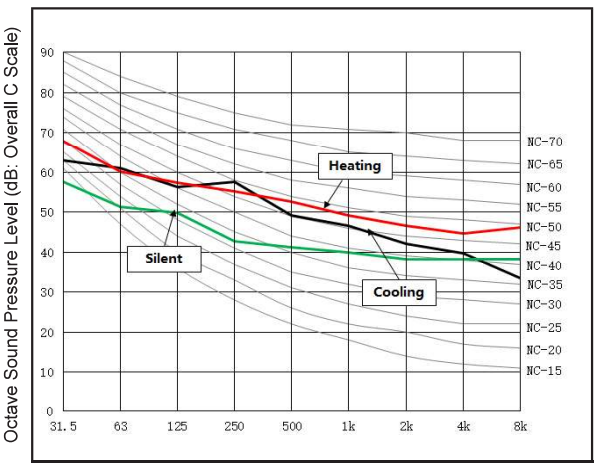
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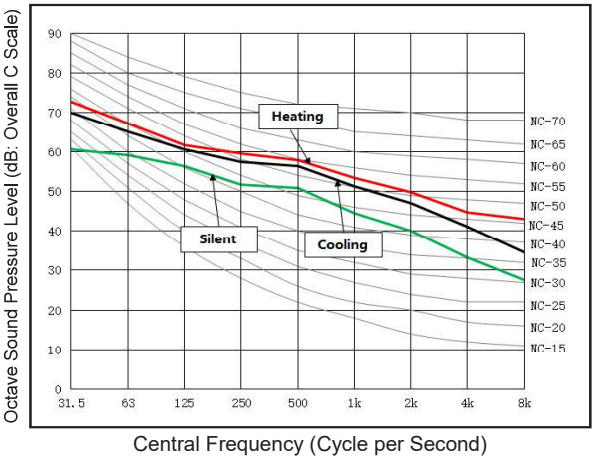
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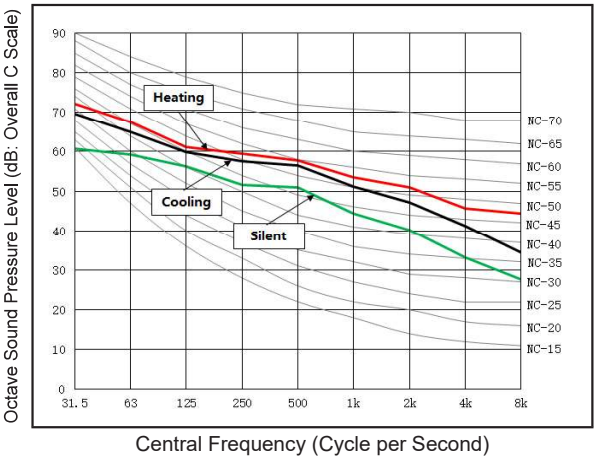
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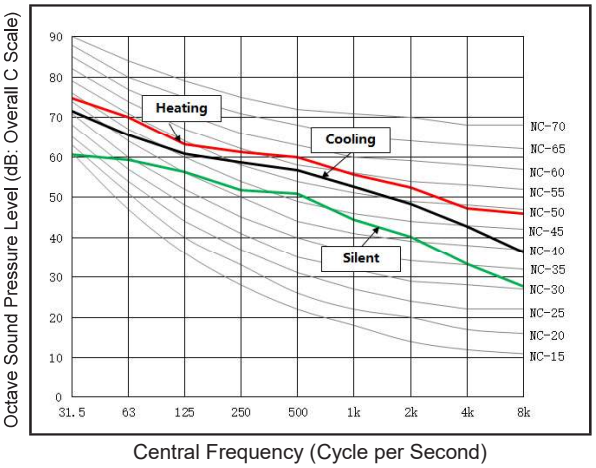
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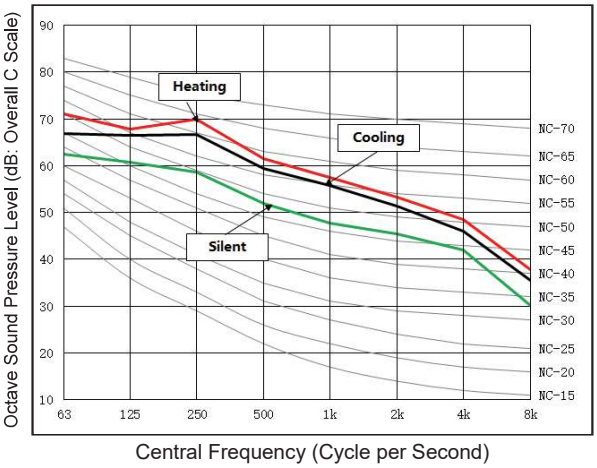
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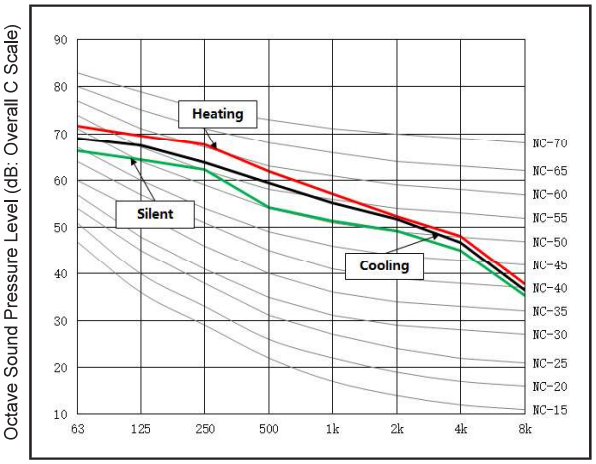
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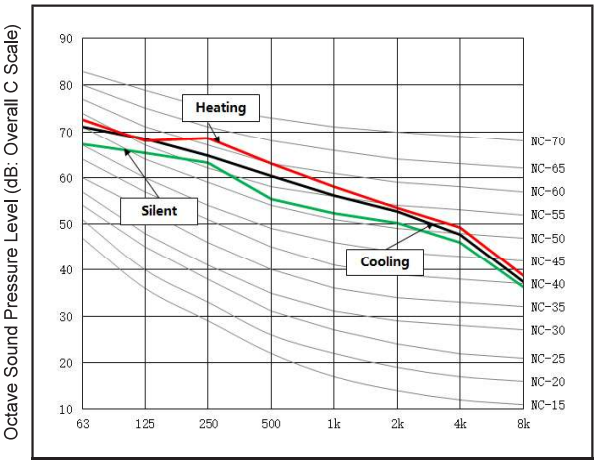
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AVW-96HKFHH2



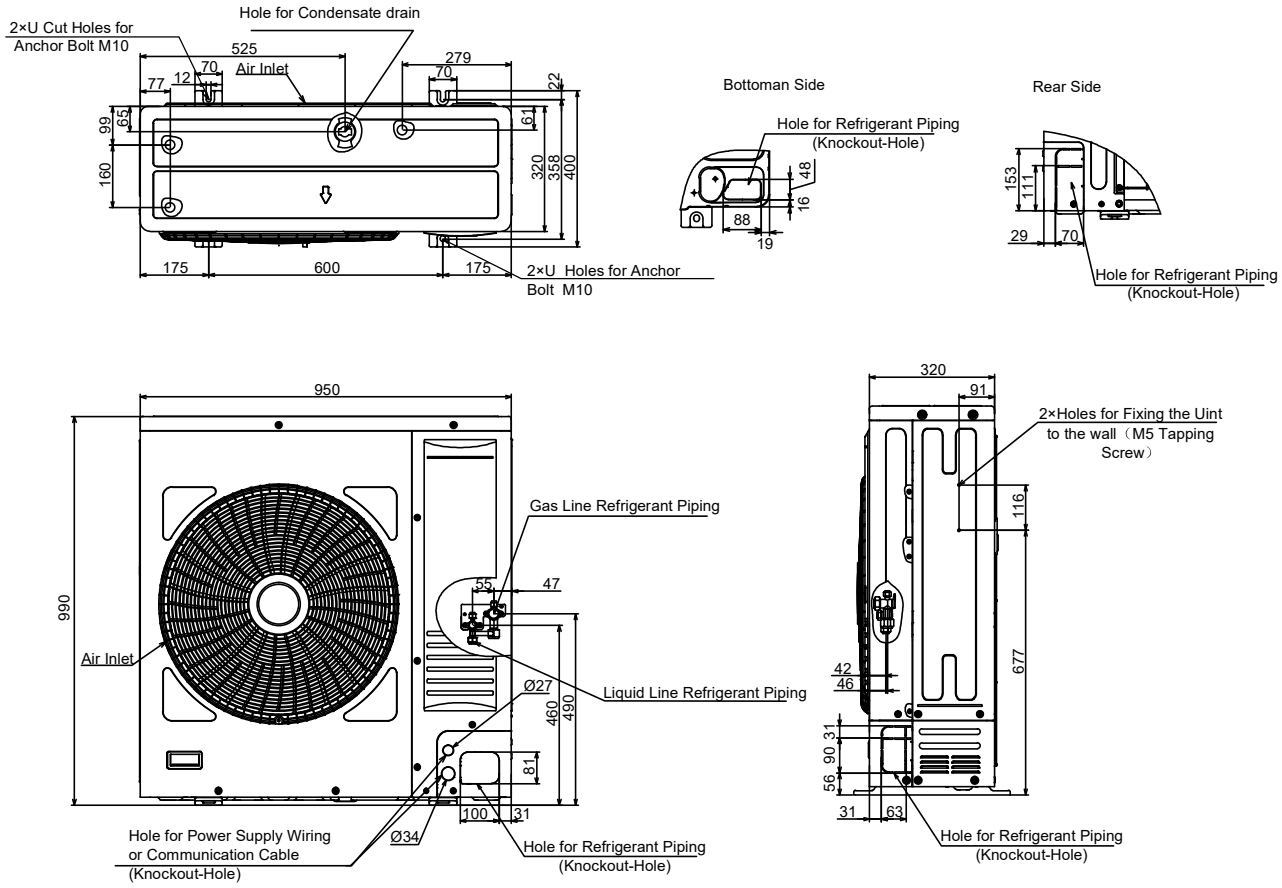
AVW-114HKFHH2



2.5 Dimensional Data

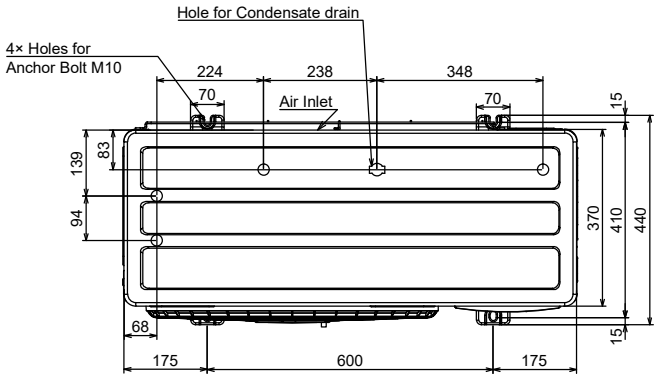
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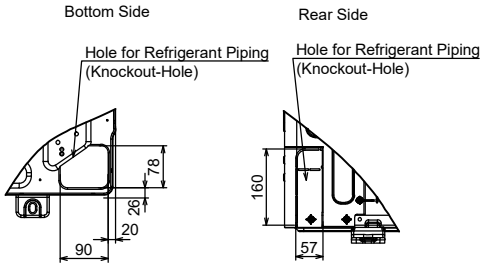
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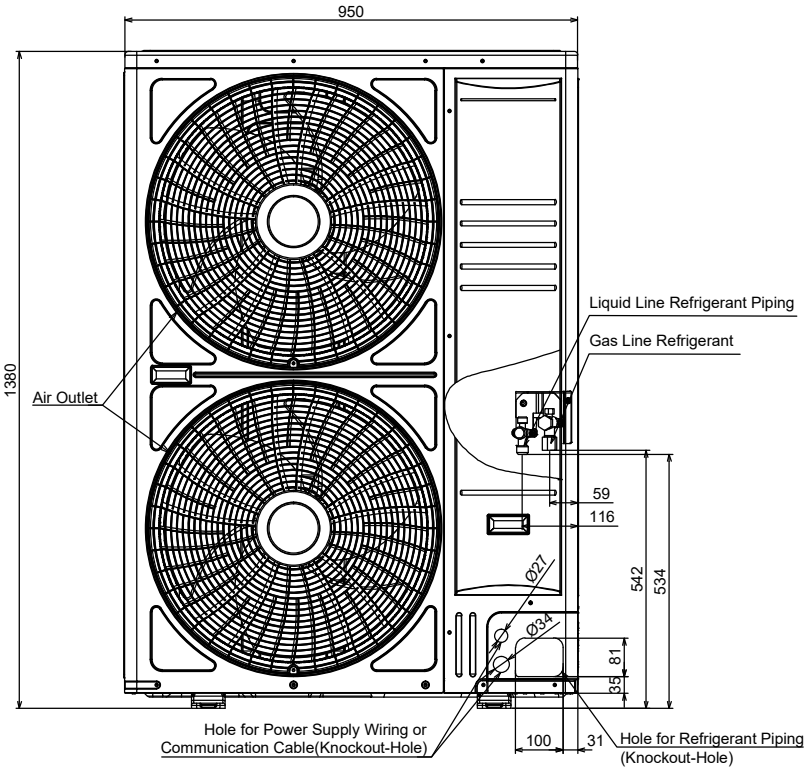


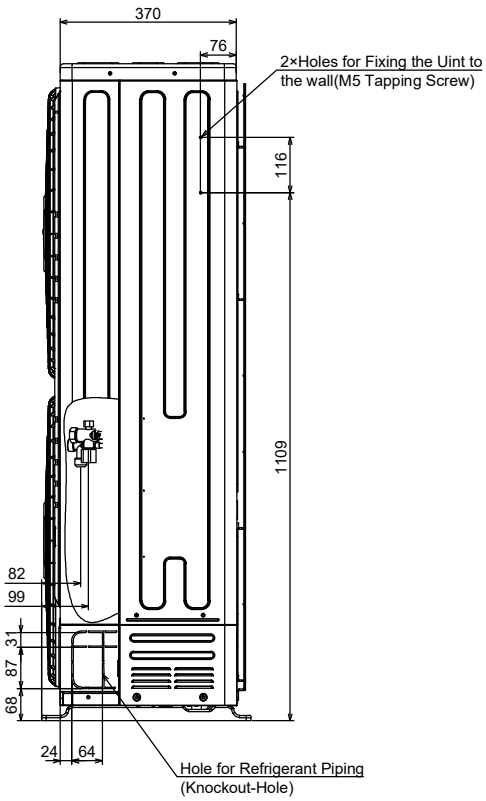
Model: AVW-41~54HJFHH2、AVW-41~54HKFHH2

unit: mm



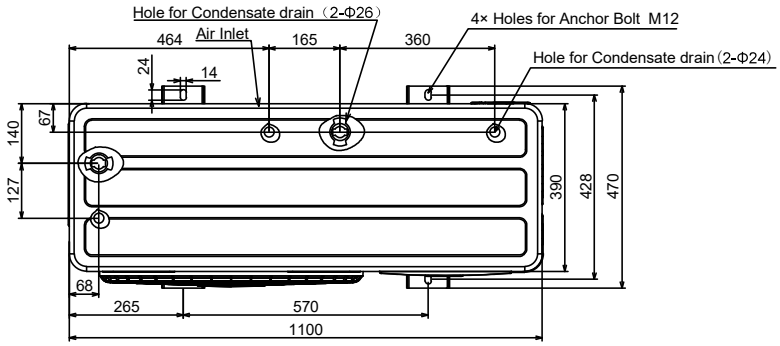


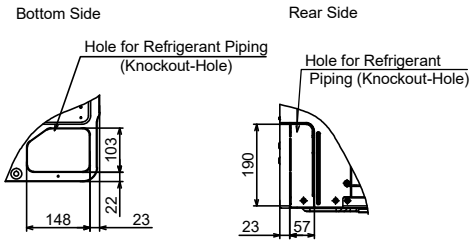


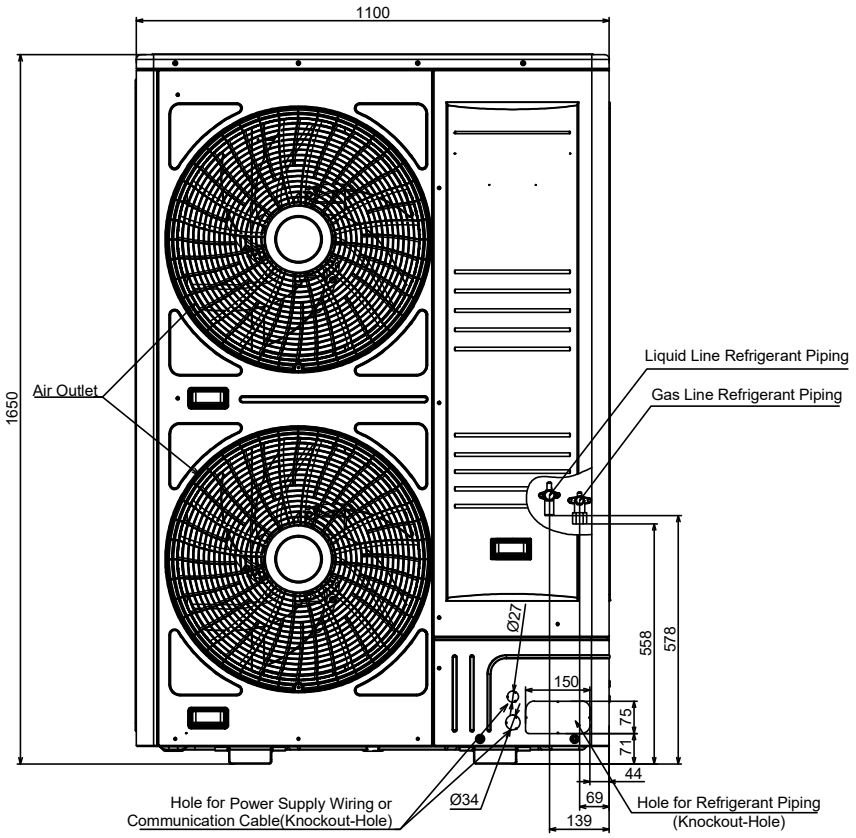


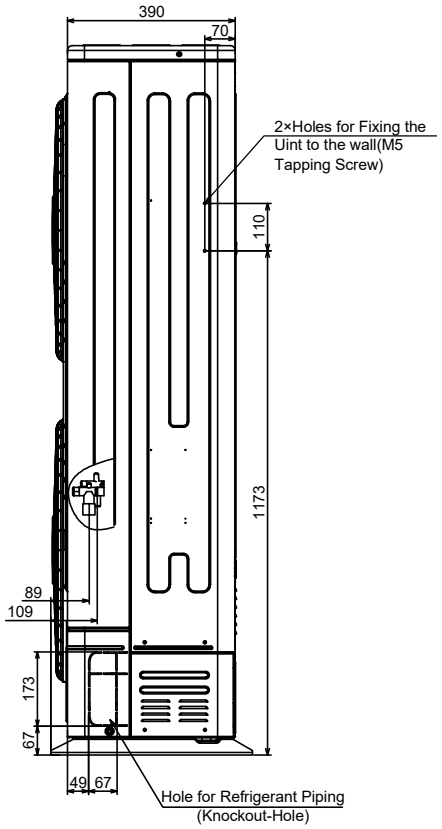
Model: AVW-76/96/114HKFHH2

unit: mm



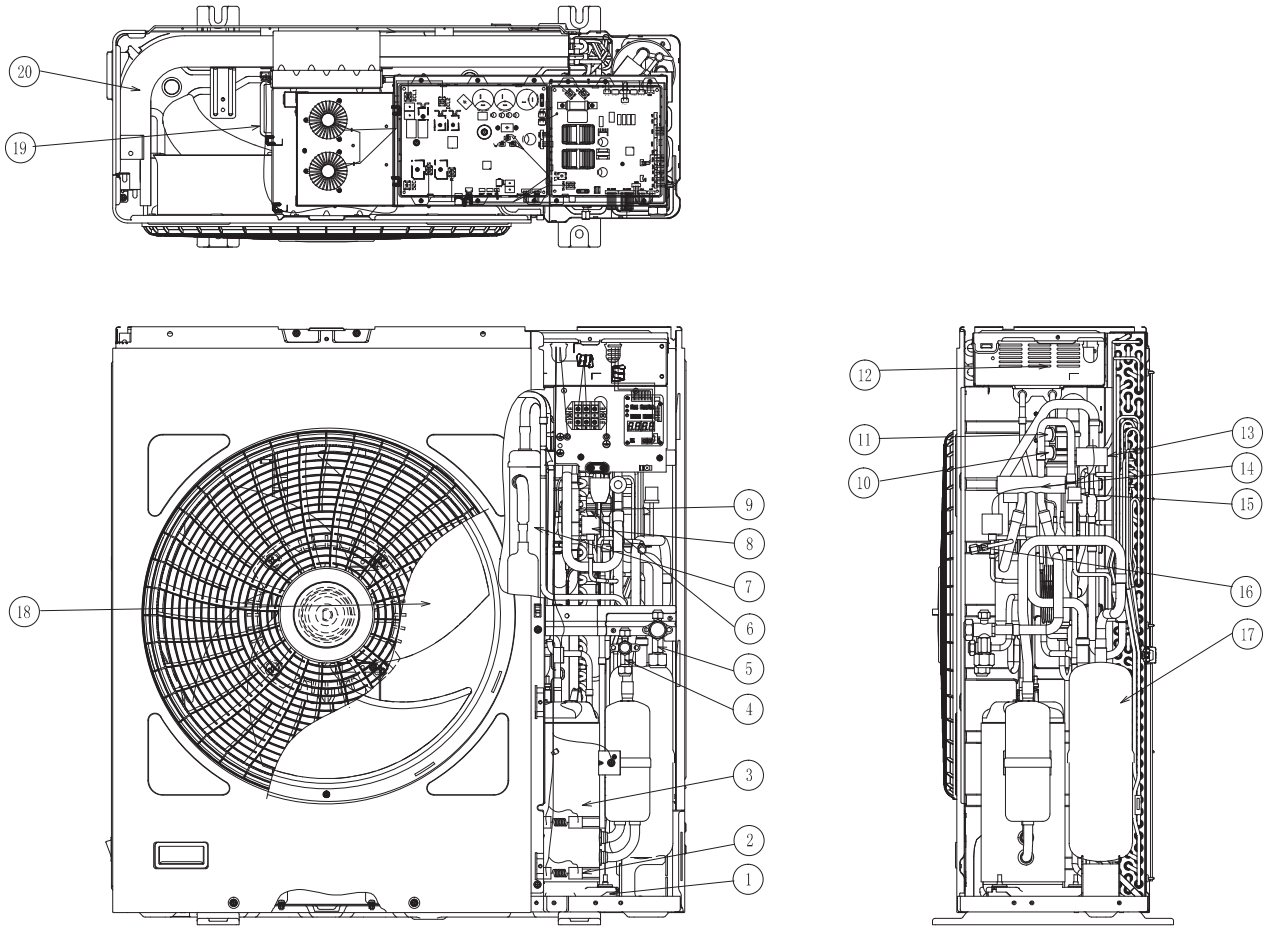






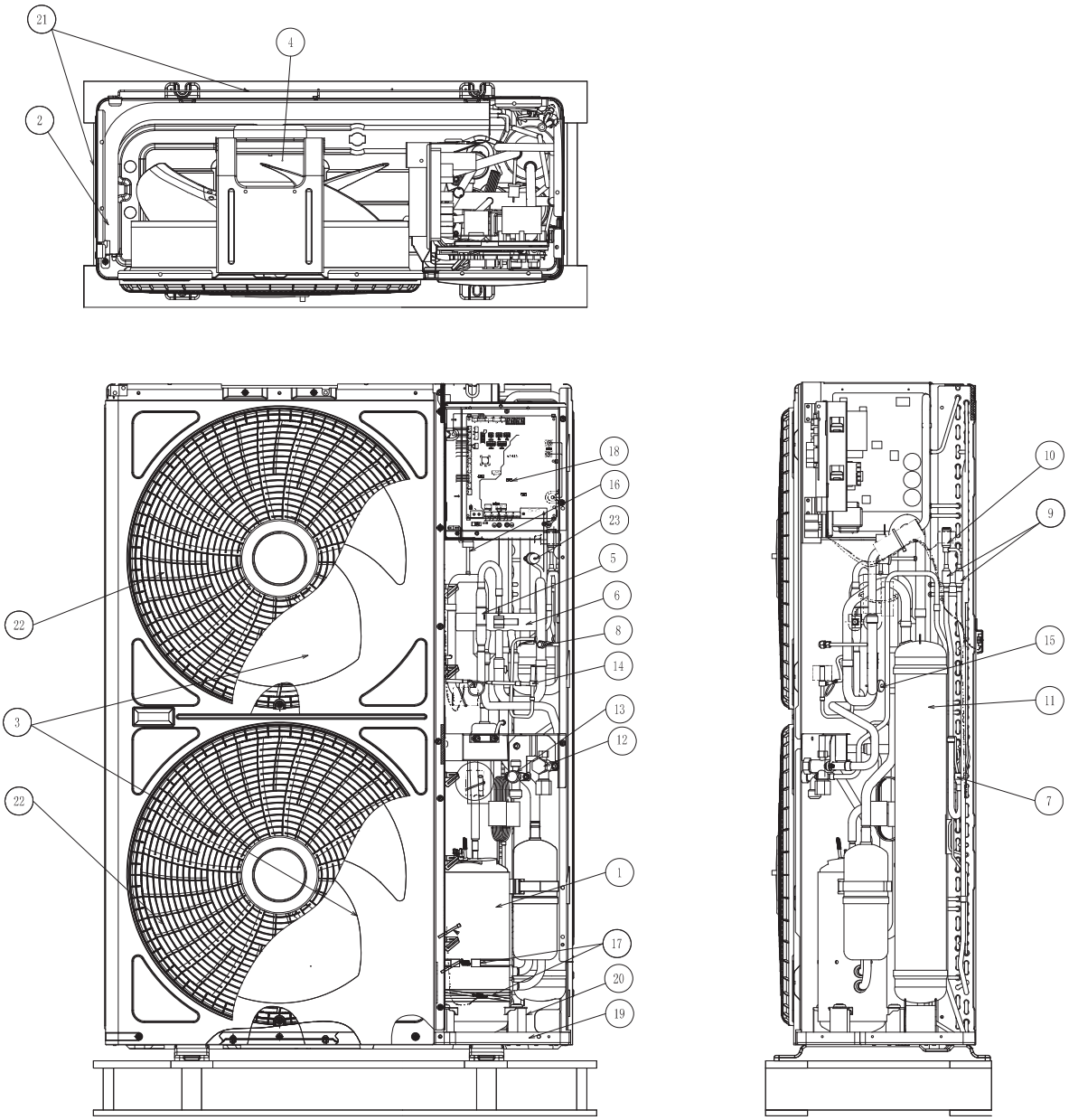
2.6 Structure

Model: AVW-41~54HJFHH1



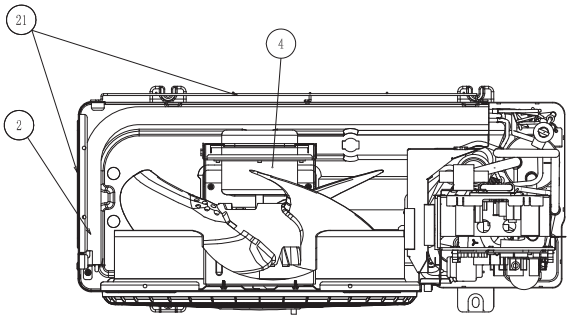
Mark	Part Name	Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Damping Rubber	7	Oil Separator	13	Electronic Expansion Valve	19	Fan Motor
2	Crankcase Heater	8	Solenoid Valve	14	Reversing Valve	20	Heat Exchanger
3	Compressor	9	Check Valve	15	Pressure Switch (L)		
4	Stop Valve for Liquid Line	10	High Pressure Sensor	16	Check Joint		
5	Stop Valve for Gas Line	11	Pressure Switch (H)	17	Accumulator		
6	Strainer	12	Electrical Box	18	Propeller Fan		

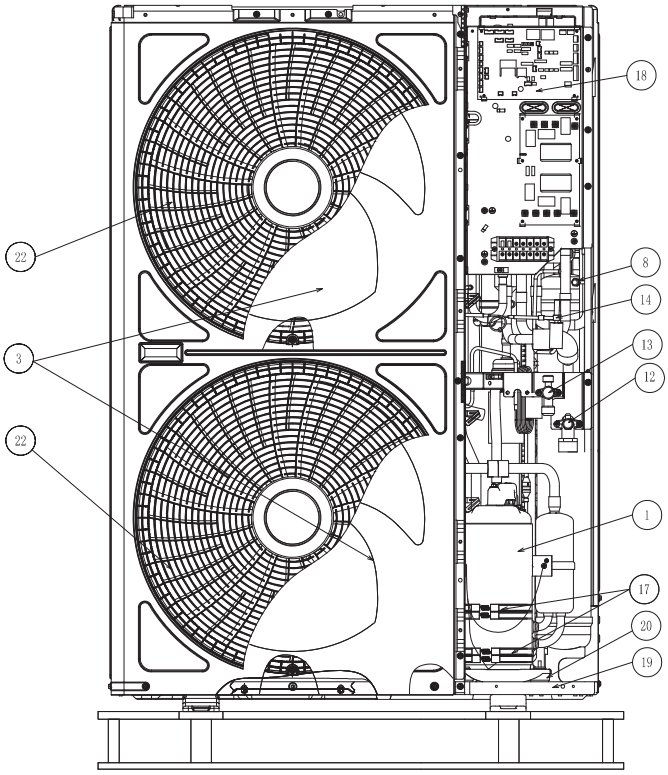
Model: AVW-41~54HJFHH2

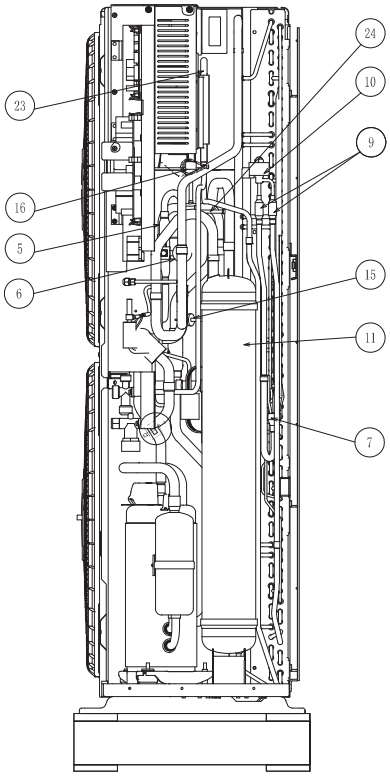


Mark	Part Name	Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	7	Distributor	13	Stop Valve for Liquid Line	19	Baseplate
2	Heat Exchanger	8	Check Joint	14	Solenoid Valve	20	Damping Rubber
3	Propeller Fan	9	Strainer	15	Pressure Switch (H)	21	Air Inlet Grille
4	Fan Motor	10	Electronic Expansion Valve	16	High Pressure Sensor	22	Air Outlet Grille
5	Check Valve	11	Accumulator	17	Crankcase Heater	23	Low Pressure Sensor
6	Reversing Valve	12	Stop Valve for Gas Line	18	Electrical Box		

Model: AVW-41~54HKFHH2

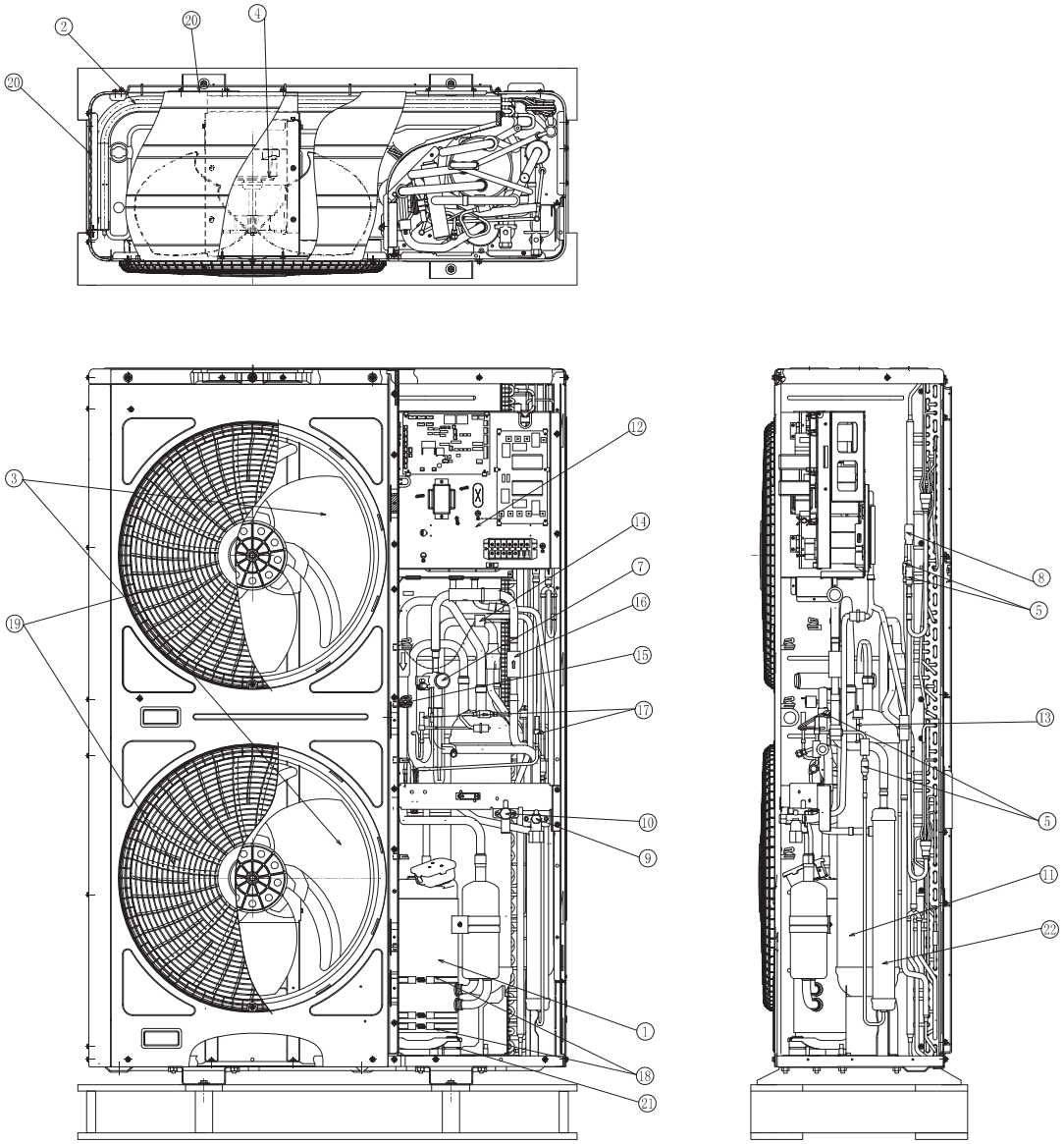






Mark	Part Name	Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	7	Distributor	13	Stop Valve for Liquid Line	19	Baseplate
2	Heat Exchanger	8	Check Joint	14	Solenoid Valve	20	Damping Rubber
3	Propeller Fan	9	Strainer	15	Pressure Switch (H)	21	Air Inlet Grille
4	Fan Motor	10	Electronic Expansion Valve	16	High Pressure Sensor	22	Air Outlet Grille
5	Check Valve	11	Accumulator	17	Crankcase Heater	23	Refrigerant cooler
6	Reversing Valve	12	Stop Valve for Gas Line	18	Electrical Box	24	Low Pressure Sensor

Model: AVW-76~114HKFHH2



Mark	Part Name	Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	7	Reversing Valve	13	Pressure Switch (H)	19	Air Outlet Grille
2	Heat Exchanger	8	Electronic Expansion Valve	14	High Pressure Sensor	20	Air Inlet Grille
3	Propeller Fan	9	Stop Valve for Gas Line	15	Low Pressure Sensor	21	Damping Rubber
4	Fan Motor	10	Stop Valve for Liquid Line	16	Check Valve	22	Oil Separator
5	Strainer	11	Accumulator	17	Solenoid Valve	23	
6	Distributor	12	Electrical Box	18	Crankcase Heater	24	

2.7 Electrical Data

Model	Power Source	Rated Current (A)	Power Source Cable Size	Transmitting Cable Size	ELB		FUSE (A)
			EN60335-1 *1 (mm^2)	EN60335-1 *1 (mm^2)	Nominal Current (A)	Nominal Sensitive Current (mA)	
AVW-41HJFHH1	220-240V~50/60Hz	27.0	6.0	0.75	32	30	32
AVW-48HJFHH1		28.5	6.0	0.75	32	30	32
AVW-54HJFHH1		30.0	6.0	0.75	32	30	32
AVW-41HJFHH2	220-240V~50/60Hz	28.0	6.0	0.75	32	30	32
AVW-48HJFHH2		28.0	6.0	0.75	32	30	32
AVW-54HJFHH2		28.0	6.0	0.75	32	30	32
AVW-41HKFHH2	380-415V 3N~ 50/60Hz	16.5	4.0	0.75	25	30	25
AVW-48HKFHH2		16.5	4.0	0.75	25	30	25
AVW-54HKFHH2		17.6	4.0	0.75	25	30	25
AVW-76HKFHH2	380-415V 3N~ 50/60Hz	22.0	4.0	0.75	25	30	25
AVW-96HKFHH2		26.0	6.0	0.75	32	30	32
AVW-114HKFHH2		26.0	6.0	0.75	32	30	32

*1 Refer to the NOTES for selection of the power source cable size.

ELB: Earth Leakage Breaker

NOTES:

(1) Field wiring shall be in conformity to local laws and regulations, and all wiring operations must be performed by qualified professionals.

(2) Refer to relevant standards for above-noted power cord size.

(3) Where power cord is connected through junction box in series, be sure to determine the total current and choose wires based on the table below.

(4) As a minimum, the chosen power cord shall be compliant with requirements on neoprene sheathed wire #57 as stated in IEC60245-1, while the power cord shall be made from copper conductor.

(5) The wiring specifications for weak-current communication circuit shall not be lower than that for RVV(S)P shielded wires or equivalent, and the shielding layer shall be grounded.

(6) A switch that can ensure all-pole disconnection shall be installed between power supply and air conditioning unit in such a manner that the contact spacing shall not be less than 3mm.

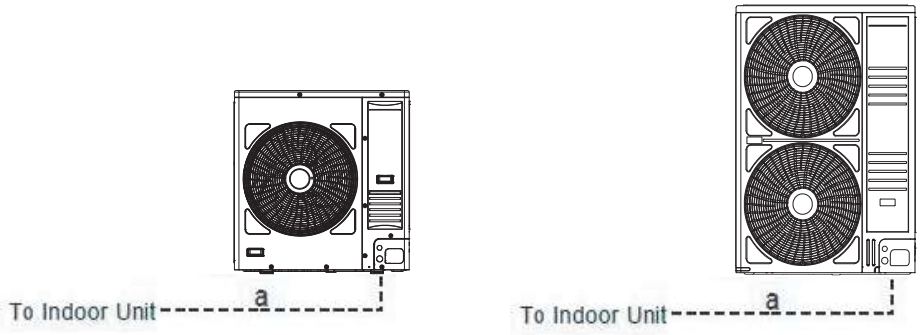
(7) Once the power cord is damaged, the dealer or the professionals from designated maintenance department must be contacted in a timely manner for repair and replacement.

(8) For the installation of power cord, the ground wire must be longer than the current-carrying conductor.

Current (A)	Wire Size (mm^2)	
i≤6	2.5	※1: DO NOT connect wires in series when the current exceeds 63A.
6<i≤10	2.5	
10<i≤16	2.5	
16<i≤25	4	
25<i≤32	6	
32<i≤40	10	
40<i≤63	16	
63<i	*1	

3. Piping System

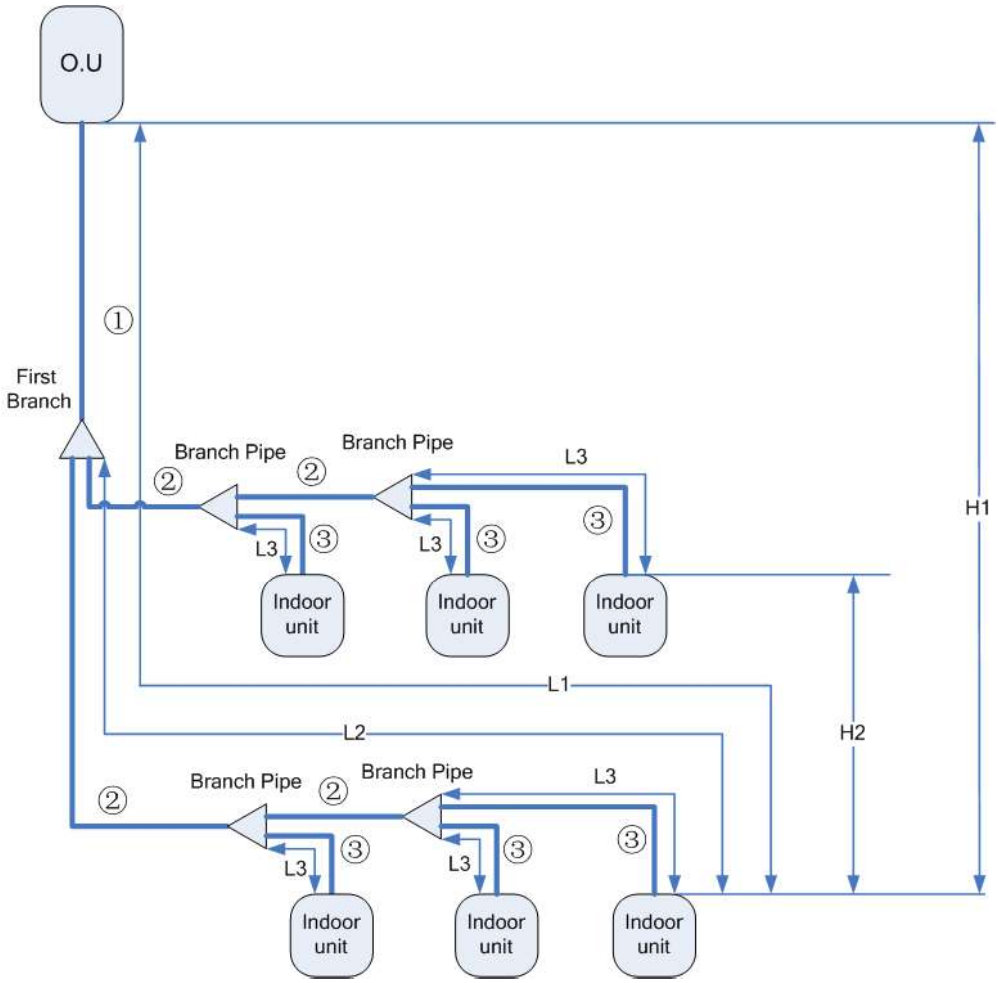
3.1 Connection of Refrigerant Pipes



Model (HP)		41 (4HP)	48 (5HP)	54 (6HP)	76 (8HP)	96 (10HP)
Tube Size Φ (mm)	Gas	15.88	15.88	15.88	22.2	25.4
	Liquid	9.53	9.53	9.53	12.7	12.7

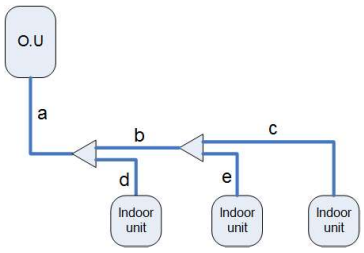
Model (HP)		114 (12HP)
Tube Size Φ (mm)	Gas	25.4
	Liquid	12.7

3.2 Pipe Connection Design Guidance



Item		Mark	Allowable Piping Length		
Total Piping Length			AVW-41/48/54 HJFHH1	AVW-41/48/54 HJ(K)FHH2	AVW-76/96/114 HKFHH2
		-	≤135m	≤150m	≤300m
Maximum Piping Length	Actual Length	L1	≤70m	≤100m	≤150m
	Equivalent Length		≤90m	≤130m	≤175m
Maximum Piping Length between Branch of 1st Branch and Each Indoor Unit		L2	≤40m	≤40m	≤40m
Maximum Piping Length between Each Branch and Each Indoor Unit		L3	≤40m	≤40m	≤40m
Height Difference between Outdoor Unit and Indoor Units	Outdoor Unit is Higher	H1	≤40m	≤50m	≤50m
	Outdoor Unit is Lower		≤30m	≤40m	≤40m
Height Difference between Indoor Units		H2	≤15m	≤15m	≤15m
Number of Main Branch Pipe		-	2 or Less※		

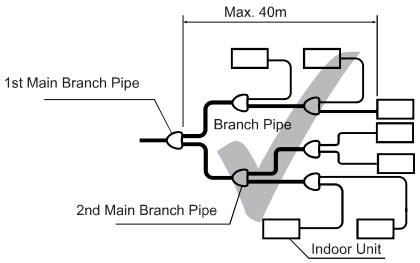
Item	Mark	Details
Total Piping Length	a+b+c+d+e	The total amount of all piping actual length.
Maximum Piping Length	a+b+c	The actual piping length between the stop valve of the outdoor unit and the terminal indoor unit.
Piping Length	-	The actual length of pipe takes no account for equivalent lengths for pressure drops of elbows.
Equivalent Piping Length	-	The combination of the straight pipe length plus the equivalent length of elbows and other pressure drop calculations.



NOTICE:

Comply with the following conditions when installing the unit.

1. Allowable total piping length may not reach maximum because of the limitation of maximum additional refrigerant amount. Make sure the additional refrigerant volume does not exceed the maximum additional refrigerant amount.
2. If the piping length (L3) between each branch and indoor unit is considerably longer than other indoor unit, refrigerant may not flow well, lessening performance compared to other models.
3. It is allowable to make one or two main branch pipes.
   The word “Main Branch Pipe” indicates the branch pipe with both branches connected to another branch pipe.



※If the number of “Main Branch Pipe” exceeds 2, please contact technical support engineer of HISENSE.

① Pipes between outdoor units refer to section 3.1.

First branch:

Outdoor Unit Capacity kBtu/h(HP)	Branch Pipe Model
41(4HP) ~ 96 (10HP)	HFQ-102F
114 (12HP)	HFQ-162F

NOTE:

When maximum length of the equivalent refrigerant pipe (L1) from the outdoor unit pipe to the indoor unit is over 100m, the pipe size of gas line from outdoor unit to first branch should be increased one size with the reducer (field-supplied).

② Pipe after first branch

Total Indoor Unit Capacity kBtu/h(HP)	Gas Φ (mm)	Liquid Φ (mm)	Branch Pipe Model
Q < 54 (6HP)	15.88	9.53	HFQ-102F
54 (6HP) ≤ Q < 86 (9HP)	19.05	9.53	
86 (9HP) ≤ Q < 114(12HP)	22.2	9.53	
114 (12HP) ≤ Q < 154 (16HP)	25.4	12.7	HFQ-162F
154 (16HP) ≤ Q < 170 (18HP)	28.6	12.7	

NOTE:

Even if the equivalent refrigerant piping length (L1) is more than 100m, no need to increase the pipe size after first branch. If the branch pipe size is larger than the first branch, adjust the branch pipe size to the first branch. In case that the selected pipe size after the first branch is larger than the pipe size before the first branch, use the same pipe size as the one before the first branch.

③ Pipe between last branch and indoor unit

(1) The pipe diameter should be the same as the indoor unit piping connection size, details refer to the technical catalog of indoor unit.

(2) When the liquid piping length is longer than 15m, use Φ9.53mm pipe and reducer (field-supplied) instead of Φ 6.35mm pipe.

3.3 Calculation of Additional Refrigerant

Although refrigerant has been charged into this unit, additional refrigerant charge is required. Determine the additional refrigerant quantity according to the following procedure, and charge it into the system. Record the additional refrigerant quantity to facilitate maintenance and servicing activities thereafter.

AVW-41/48/54HJFHH1、AVW-41/48/54HJ(K)FHH2

Calculating Method of Additional Refrigerant Charge (W kg)

W1: Additional refrigerant charge for liquid piping	Pipe Diameter (Φ mm)	Total Piping Length (m)	Refrigerant Charge (kg/m)	Additional Charge for liquid piping (kg)
	9.53		×0.04	
	6.35		×0.02	
	Total Additional Charge For Liquid Piping (W1) =			
W2: Additional refrigerant charge for connection ratio	Connection Ratio (Total Capacity of Indoor Unit /Total Outdoor Unit Capacity)		Refrigerant Charge (kg)	Additional Charge for Connection Ratio (kg)
	101%~110%		0.15	
	111%~120%		0.30	
	121%~130%		0.45	
	131%~140%		1.05	
	141%~150%		1.65	
	Additional Charge for Connection Ratio (W2) =			
Total additional refrigerant charge can be calculated as follows: W=W1+W2=				

AVW-76/96/114HKFHH2

Calculating Method of Additional Refrigerant Charge (W kg)

W1: Additional refrigerant charge for liquid piping	Pipe Diameter (Φ mm)	Total Piping Length (m)	Refrigerant Charge (kg/m)	Additional Charge for liquid piping (kg)
	12.7		×0.12	
	9.53		×0.07	
	6.35		×0.03	
	Total Additional Charge For Liquid Piping (W1) =			
W2: Additional refrigerant charge for connection ratio	Connection Ratio (Total Capacity of Indoor Unit /Total Outdoor Unit Capacity)		Refrigerant Charge (kg)	Additional Charge for Connection Ratio (kg)
	101%~110%		0.15	
	111%~120%		0.30	
	121%~130%		0.45	
	131%~140%		1.05	
	141%~150%		1.65	
	Additional Charge for Connection Ratio (W2) =			
Total additional refrigerant charge can be calculated as follows: W=W1+W2=				

Maximum Additional Refrigerant Charge

Total additional charge must not exceed the maximum additional refrigerant charge indicated in the following table. Accordingly, allowable total piping length may become shorter than maximum value due to the limitation of maximum additional refrigerant amount.

Ref. Charge of O.U.

Outdoor Unit Models	W0: Outdoor unit refrigerant charge (kg)	Maximum additional refrigerant charge (kg)
AVW-41HJFHH1	4.0	3.9
AVW-48HJFHH1	4.0	3.9
AVW-54HJFHH1	4.0	3.9
AVW-41HJ(K)FHH2	3.8	6.7
AVW-48HJ(K)FHH2	3.8	6.7
AVW-54HJ(K)FHH2	4.1	6.4
AVW-76HKFHH2	5.5	13.5
AVW-96HKFHH2	6.5	13.5
AVW-114HKFHH2	6.5	13.5

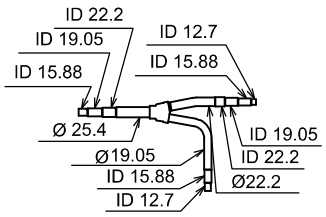
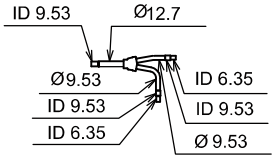
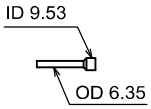
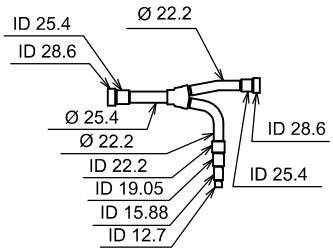
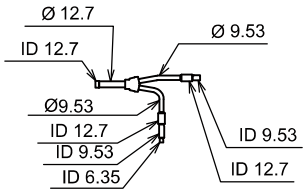
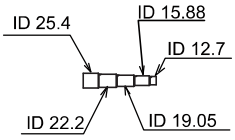
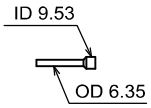
NOTES:

- W0 is outdoor unit refrigerant charge before shipment.

1. Charging Work
   Charge refrigerant (R410A) into the system according to INSTALLATION chapter.
2. Record of Additional Charge
   Total refrigerant charge of this system is calculated in the following formula.
   Total Ref. Charge = W + Wo
   This System = ☐ + ☐ = ☐ kg

Total Additional Charge(W): ☐ kg
Total Refrigerant Charge: ☐ kg
Date of Charging: ☐ / ☐ / ☐

3.4 Piping Connection Branch Pipe Dimensions (optional)

Models	Gas Line	Liquid Line	Reducer for Gas Line	Reducer for Liquid Line
HFQ-102F			—	 (2 unit)
HFQ-162F			 (1 unit)	 (1 unit)

Unit: mm, ID: Inner Diameter, OD: Outer Diameter

4. Capacities and Selection Data

4.1 Procedure for Selection of the System

This section explains the procedure to select the most suitable outdoor unit, with the values to be taken into account and the necessary steps to be carried out.

This procedure allows to select the unit with the best characteristics to provide the greatest level of efficiency and comfort considering the building layout, the specifications of the indoor units to be installed and the distribution of air and refrigerant flows.

The ease of access for installation and maintenance work must be taken into account when selecting the location for installation of the outdoor unit.

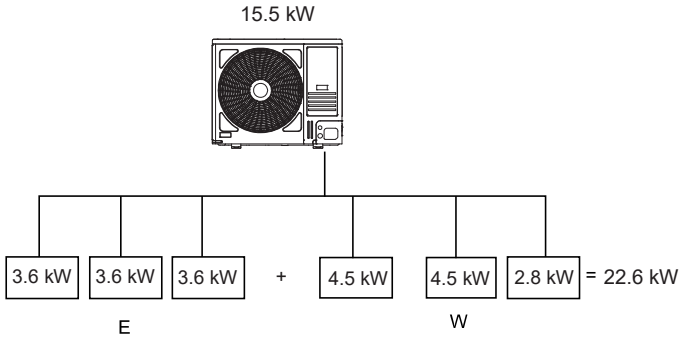
4.1.1 Unique features of the system

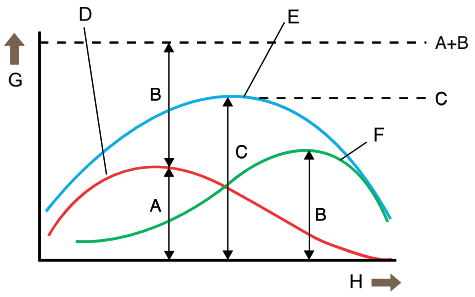
The system boasts some unique features that must be taken into account before selecting the outdoor unit.

Possibility of installing a reduced total unit capacity.

In comparison with other air conditioning systems requiring the indoor and outdoor nominal capacities to be equal, the system allows the connection of a total combined indoor capacity as low as 50% and as high as 150% of the nominal capacity of the outdoor unit. This possibility is explained in the following example:

The diagram shows a typical building with a morning peak heat load on the east zone equivalent to a 10.8 kW unit. In the afternoon, a peak equivalent to a 11.8 kW unit occurs on the west zone.





Indoor unit capacity
E: East zone (10.8 kW)
W: West zone (11.8 kW)

A: morning peak heat load in the eastern area
B: evening peak heat load in the western area
C: maximum simultaneous load for the entire building
D: eastern area load

E: total load
F: western area load G: load
H: time

In this case, a conventional system would require the installation of a 22.6 kW outdoor unit, matching the total installed indoor capacity (10.8 kW + 11.8 kW). However, the maximum simultaneous load in the whole building occurs at noon, and is equal to 15.5 kW of unit capacity. Therefore, a 15.5 kW outdoor unit could be selected, directing its capacity to either the east or the west zone as dictated by the system controls.

NOTE:

- The maximum required loads of east and west zone must not be simultaneous.
- In systems in which all the indoor units are operated simultaneously, the total indoor capacity must not exceed the nominal capacity of the outdoor unit. Otherwise, poor performance or a narrowing of the operation range in overload conditions may occur.

The ratio of total combined capacity is calculated with the following formula:

Ratio of total combined capacity = (Total capacity of the indoor units / Capacity of the outdoor unit) x 100%
= (22.6 kW / 15.5 kW) x 100% ≈146%

4.1.2 Selection parameters

To select the outdoor units, it will be necessary to consult and/or use a series of parameters shown in tables and graphics presented in the different chapters of this handbook. A summarized list is shown below:

For cooling and heating capacities: refer to Engineering Data.

For cooling correction factor depending on the piping length: 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

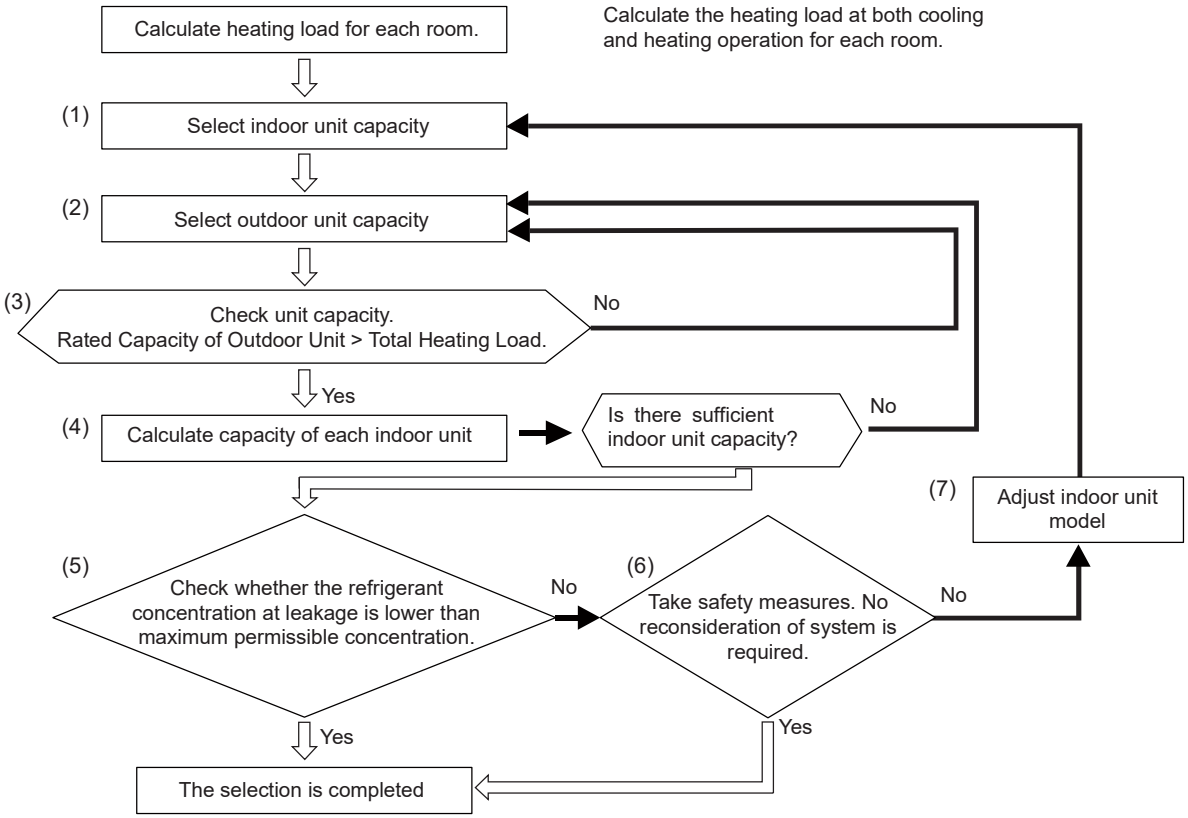
For heating correction factor depending on the piping length: 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

For sensible heat factor: VRF Indoor Units Technical Catalog.

In case of an installation with ducts (outdoor unit with AVD indoor unit) the fan performance for duct calculations should be considered. The AVD units are designed with difference static pressure ranges in order to fulfill all installation necessities.

4.1.3 Check points for system installation

For selecting the unit capacity, perform the system selection with checking the refrigerant concentration at leakage in order not to exceed the maximum permissible concentration.



(1) Selecting indoor unit capacity.

Set temporarily the indoor unit model and capacity in each room as following:

Heating Load for each room < Capacity of Indoor Unit

At this time, consider the correction factor according to room temperature.

Then, sum up each indoor unit capacity (The calculation is required for cooling and heating operation).

Capacity of Indoor Unit = Nominal capacity of Indoor Unit x correction Factor (room temperature)

Correction factor according to room temperature: When the estimated load for each room differs from the rated capacity (cooling: 27.0 ºC DB/19 ºC WB; heating: 20ºC DB), select the outdoor unit capacity at the estimated load from “Engineering Data”.

Correction Factor (room temperature) = Outdoor unit capacity at estimated load / Rated outdoor unit capacity

(2) Selecting outdoor unit capacity.

Set temporarily the outdoor unit capacity according to the total connectable indoor unit capacity at the item (1). Then, calculate maximum outdoor unit capacity with considering the correction factors according to temperature condition, piping length and lift, defrosting correction factor (for heating operation) .

The calculation is required for cooling and heating operation:

Outdoor unit capacity = Outdoor unit capacity at estimated load x Correction factors

Outdoor unit capacity at estimated load:

When calculating heating load for outdoor unit, check the ambient temperature. If the ambient temperature differs from the temperature indicated in the rated capacity (cooling: 35ºC DB; heating: 7ºC DB / 6ºC WB), select the outdoor unit capacity at the estimated load from Engineering Data.

Correction factor according to piping length:

- Select the correction factor according to 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

Correction factor according to defrosting condition (for heating operation):

- Select the correction factor according to 4.3 “Correction Factor According to Defrosting Operation”.

(3) Checking unit capacity.

Compare the outdoor unit capacity calculated in the item (2) with the total heating load.

(4) Calculating each indoor unit capacity.

Recalculate the indoor unit capacity as follows. (The calculation is required for cooling and heating operation.)

Unit capacity for each room = Outdoor Unit Capacity (value at item 2) x (indoor unit capacity in concerned room / Total indoor unit capacity)

If the outdoor unit capacity is insufficient against the necessary heating load for each room, recalculate it from the item (2) after the outdoor unit capacity is increased.

(5) Checking Refrigerant Concentration at Refrigerant Leakage < Permissible Refrigerant Concentration.

(6) Taking Safety Measure (Reconsideration of system is not required.)

(7) Correction of outdoor unit model if the condition of both (5) and (6) are negative.

NOTE

- When select the temperature, consider that the ambient temperature increases by short circuit. Especially, if multiple outdoor units are installed or there is obstacle around the outdoor unit, pay attention to increase the ambient temperature.
- For selecting temperature at the heating operation in the ducted and cassette indoor unit type, consider the temperature irregularity between the floor and the ceiling surface. The temperature around the ceiling surface normally becomes 2ºC higher than the floor surface during the heating operation.
- For selecting indoor unit capacity, if the sensible heating load is considered, consider the sensible heat factor together.
- In the case that the total indoor unit capacity exceeds the outdoor unit capacity, the temperature is low or the piping length is long, if the indoor units operate simultaneously, the air outlet temperature decreases so that may be felt uncomfortably. Therefore, the facility should be designed that the cooling/heating capacity for indoor unit calculated from the cooling/heating capacity for system is more than the heating load.

4.1.4 Selection procedure example

Given conditions

Once considered the system possibilities, it's the moment to start with the selection procedure. In order to do this, it has been assumed an installation consisting of several rooms with different required cooling loads and temperature conditions.

Total load required for each room

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Estimated cooling load (kW)	1.8	1.8	1.5	1.5	1.8	1.8	1.5
Estimated heating load (kW)	2.0	2.0	1.7	1.7	2.0	2.0	1.7

Temperature conditions:

Operating conditions		Cooling	Heating
Indoor air inlet temperature	DB(°C)	27.0	20
	WB(°C)	19.0	—
Outdoor air inlet temperature	DB(°C)	30.0	1.0
	WB(°C)	—	0.0

- DB: dry bulb; WB: wet bulb.

Piping connection conditions:

Equivalent pipe length between outdoor unit and indoor units: 60 m.

Pipe height: 25 m.

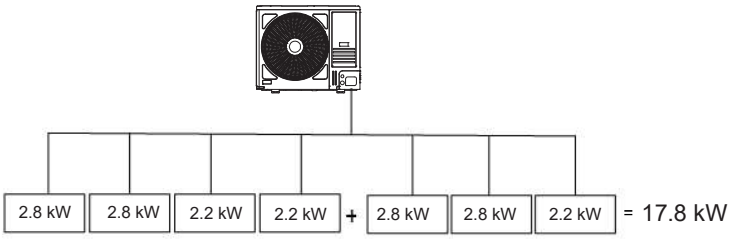
Appropriate selection of indoor units and nominal capacity

Example: selection of AVD ducted indoor units.

The pre-selected capacity of the different indoor units has not been the immediately higher in all the units, in order to apply safety factor considering the different correction factors existing, which will reduce the capacity.

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Model selected	AVD-09*	AVD-09*	AVD-07*	AVD-07*	AVD-09*	AVD-09*	AVD-07*
Nominal cooling load (kW)	2.8	2.8	2.2	2.2	2.8	2.8	2.2
Nominal heating load (kW)	3.2	3.2	2.5	2.5	3.2	3.2	2.5

Then, it's shown a diagram of the installation resulting: 15.5 kW



The resulting total indoor unit capacity is 17.8 kW.The outdoor unit with the exact capacity is the 17.8 kW model, but the possibility "Reduced total outdoor unit capacity" allows the AVW-54HJFHH1 model (nominal capacity: 15.5 kW) to be selected. Thus, it's allowed at the outdoor unit to be up to 15% smaller capacity when compared with other air conditioning systems.

Total combination horsepower = (Total indoor unit capacity / Outdoor unit capacity) x 100%
= (17.8 kW / 15.5 kW) x100% ≈ 115%

NOTE:

The maximum simultaneous load on the installation must not be higher than 15.5 kW for this example. To determine the outdoor unit pre-selected nominal cooling and heating capacity, it's necessary refer to Engineering Data, in which the total capacity combination (115%) and the temperature condition have been taken into consideration.

Concept	Room 1+2+3+4+5+6+7	Outdoor unit pre-selected capacity(AVW-54HJFHH1~115%)
Total cooling load (kW)	17.8	16.1
Total heating load (kW)	20.3	18.5

NOTES:

- If the air inlet temperature for the indoor unit or outdoor unit is not contained in the capacity tables, an interpolation should be carried out using the values above and below the air inlet temperature.
- If the total combination capacity is not shown in the capacity tables (for example, 115%), an interpolation should be carried out using the values above and below (110% and 120%) the total combination.

Next step will be the capacity correction using the different correction factors shown in this chapter.

Correction factor according to piping length:

According to 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

- Cooling capacity correction factor depending on the pipe length =0.870.
- Heating capacity correction factor depending on the pipe length =0.954.

Correction factor according to defrosting condition (for heating operation):

According to 4.3 “Correction Factor According to Defrosting Operation”.

- Outdoor inlet air temp.(ºC DB)=1, then Defrost correction factor = 0.857.

Actual capacity of the outdoor unit

Actual maximum capacity of the outdoor unit = (Outdoor unit pre-selected capacity) x (Correction factor according to pipe length and height) x (Correction factor according to defrosting operation) x (Correction factor according to altitude)

Cooling: (16.1 kW) x (0.870) x (1.0) = 14.0 kW.

Heating: (18.5 kW) x (0.954) x (0.857) = 15.1 kW.

Actual capacity of each indoor unit.

Actual capacity of each indoor unit = (Actual maximum capacity of the outdoor unit) x (Nominal capacity of each indoor units / Total nominal capacity of each indoor unit)

AVD-07*

Cooling: 14.0 × (2.2 / (2.8 + 2.8 + 2.2 + 2.2 + 2.8 + 2.8 + 2.2)) = 1.8 kW.

Heating: 15.1 × (2.5 / (3.2 + 3.2 + 2.5 + 2.5 + 3.2 + 3.2 + 2.5)) = 1.8 kW.

AVD-09*

Cooling: 13.5 × (2.8 / (2.8 + 2.8 + 2.2 + 2.2 + 2.8 + 2.8 + 2.2)) = 2.2 kW.

Heating: 15.1 × (3.2 / (3.2 + 3.2 + 2.5 + 2.5 + 3.2 + 3.2 + 2.5)) = 2.4 kW.

Results:

Concept	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7
Model selected	AVD-09*	AVD-09*	AVD-07*	AVD-07*	AVD-09*	AVD-09*	AVD-07*
Actual cooling capacity (kW)	2.2	2.2	1.8	1.8	2.2	2.2	1.8
Actual heating capacity (kW)	2.4	2.4	1.8	1.8	2.4	2.4	1.8
Estimated cooling load (kW)	1.8	1.8	1.5	1.5	1.8	1.8	1.5
Estimated heating load (kW)	2.0	2.0	1.7	1.7	2.0	2.0	1.7

Concept	Room 1+2+3+4+5+6+7
Actual total cooling capacity (kW)	14.0
Actual total heating capacity (kW)	15.1
Estimated total cooling load (kW)	11.8
Estimated total heating load (kW)	13.1

As can be seen, the actual total cooling and heating capacity are higher than the estimated total cooling and heating load. Therefore, it can be said that the AVW-54HJFHH1 unit meets the minimum cooling and heating requirements set for the system.

NOTE:
If the actual total cooling / heating capacity calculated is lower than the estimated total cooling / heating load, the calculation must be done again with the unit immediately.

4.2 Capacity Correction Based on Refrigerant Piping Length

< Cooling Capacity >

Correction factor for cooling capacity according to piping length.

The cooling capacity should be corrected according to the following formula:

CCA=CC×F

CCA: Actual corrected cooling capacity

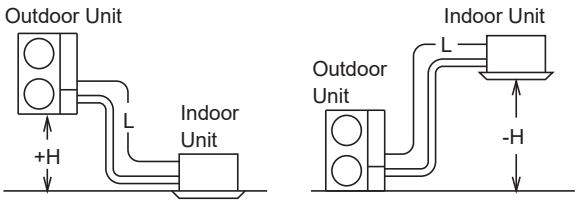
CC: Cooling capacity in the performance table

F: Correction factor based on the equivalent piping length

The correction factors are shown in the following figure.

Equivalent piping length for

- one 90° elbow is 0.5m.
- one 180° bend is 1.5m.
- one branch pipe is 0.5m.



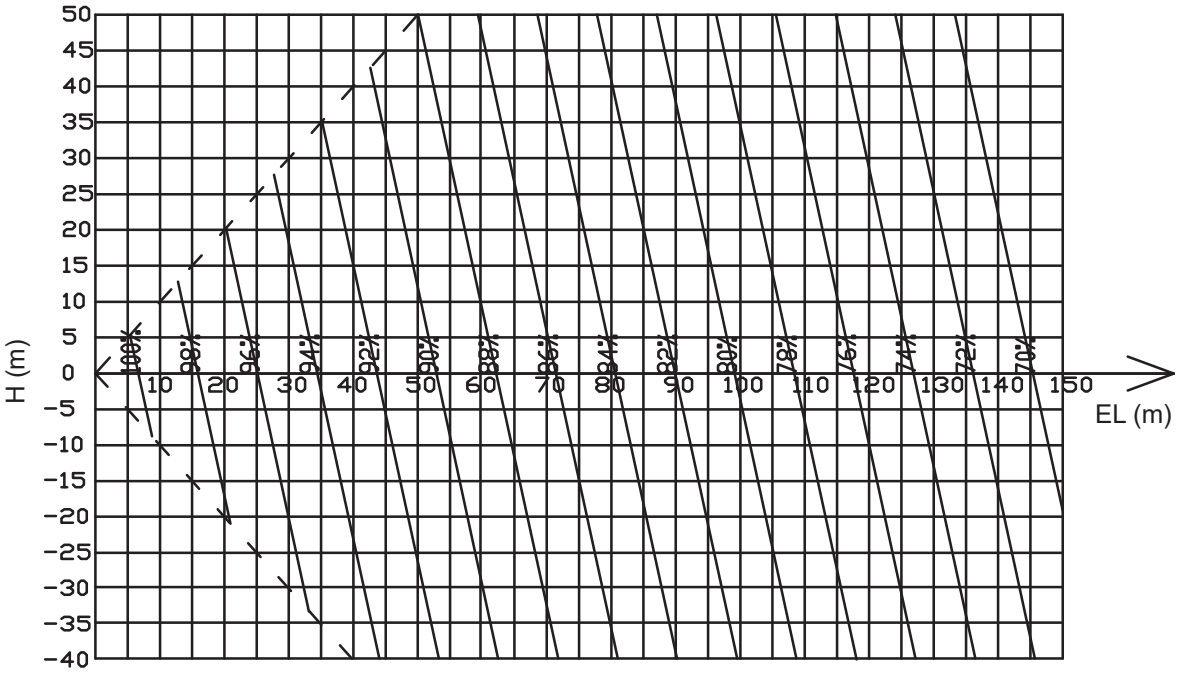
H: Vertical Distance Between Indoor Unit and Outdoor Unit

EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)

H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

* H and EL please refer to Refrigerant Piping Work



<Heating Capacity >

Correction factor for cooling capacity according to piping length.

The heating capacity should be corrected according to the following formula:

HCA=HC×F

HCA: actual corrected cooling capacity

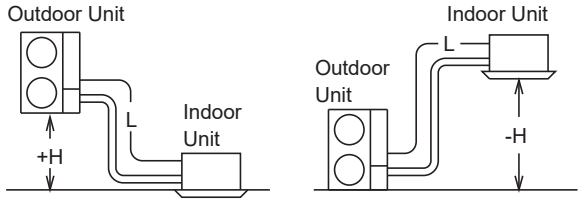
HC: cooling capacity in the performance table

F: correction factor based on the equivalent piping length

The correction factors are shown in the following figure

Equivalent piping length for

- one 90° elbow is 0.5m.
- one 180° bend is 1.5m.
- one branch pipe is 0.5m.



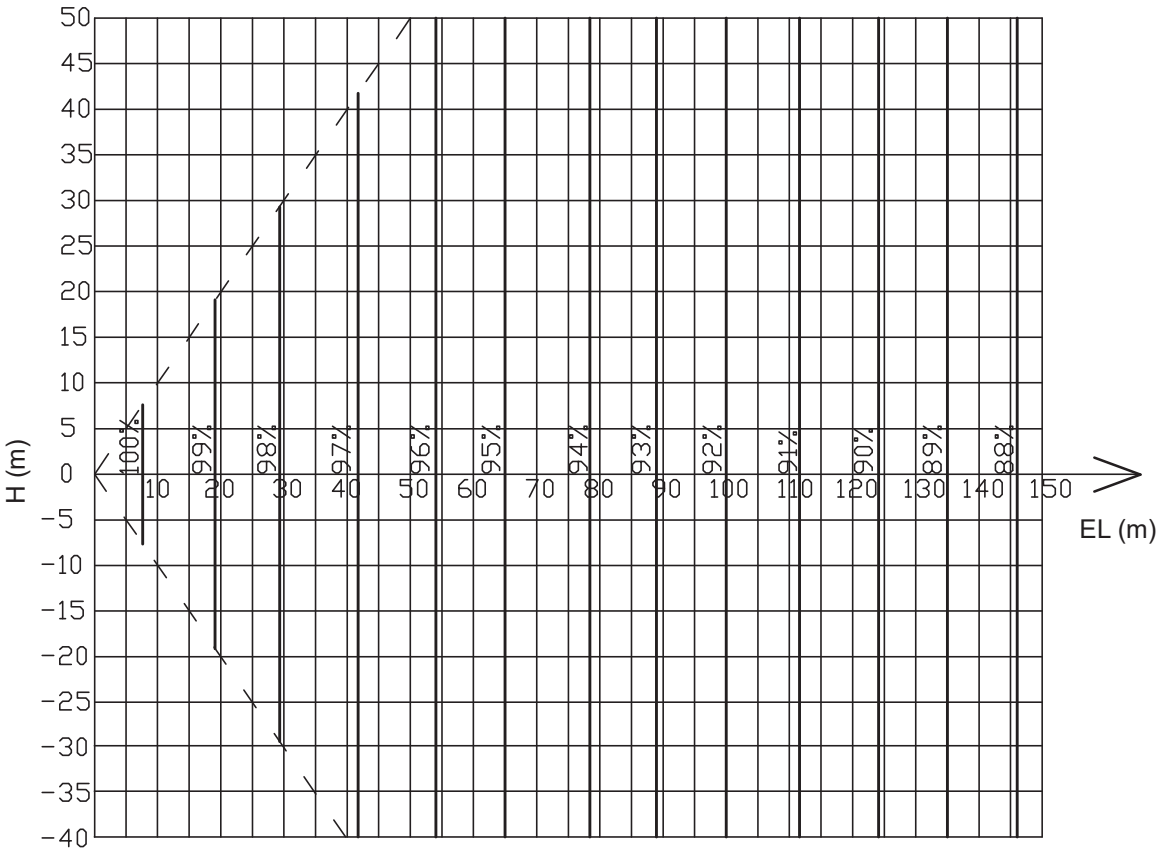
H: Vertical Distance Between Indoor Unit and Outdoor Unit

EL: Equivalent Total Distance Between Indoor Unit and Outdoor Unit (Equivalent One-Way Piping Length)

H>0: Position of Outdoor Unit Higher Than Position of Indoor Unit

L: Actual One-Way Piping Length Between Indoor Unit and Outdoor Unit

* H and EL please refer to Refrigerant Piping Work



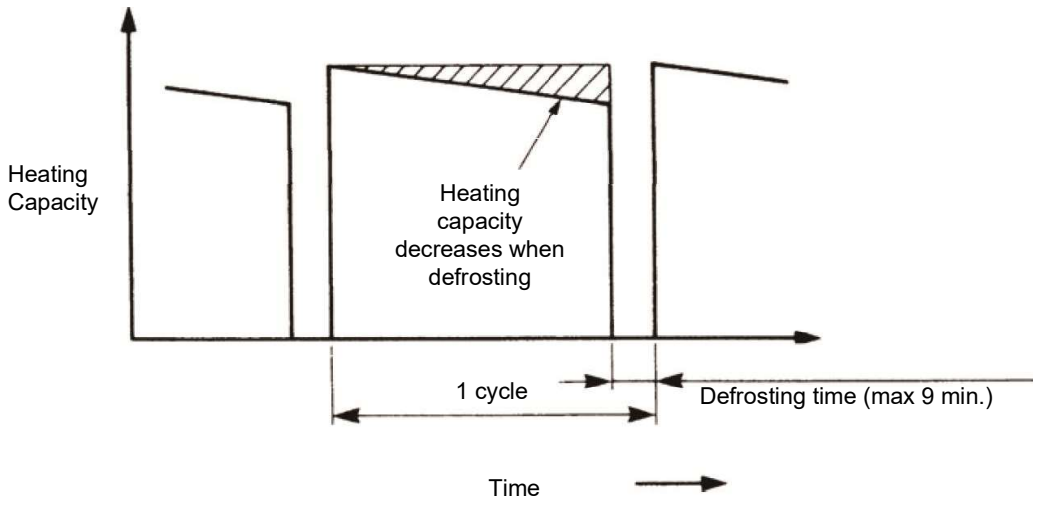
4.3 Correction Factor According to Defrosting Operation

The heating capacity in the preceding paragraph does not include defrost operation periods.

Therefore, capacity should be corrected as follows:

Corrected Heating Capacity = Correction Factor x Heating Capacity

Outdoor Inlet Air Temp. (ºC DB) (Humidity=85% RH)	-7	-5	-3	0	3	5	7
Correction Factor	0.95	0.93	0.88	0.85	0.87	0.90	1.00



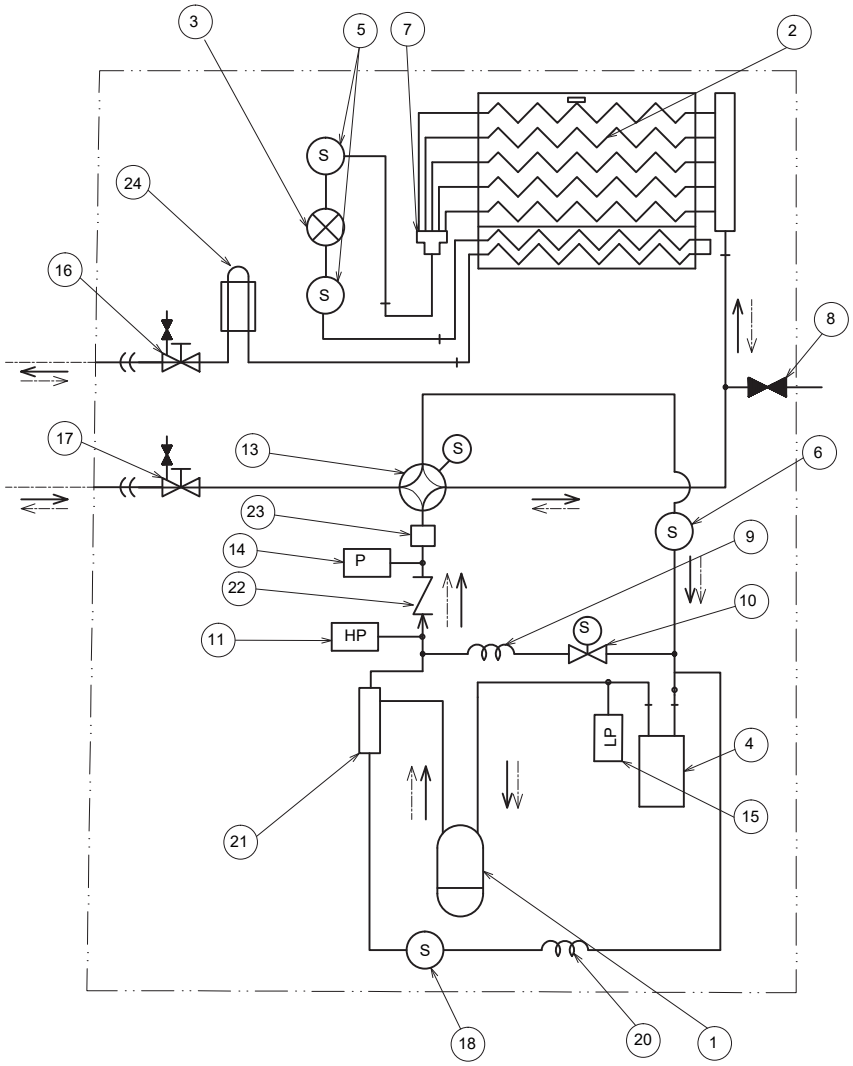
NOTES:

- The correction factor is not available for special conditions like snowfall or operation in a transitional period.
- When the outdoor inlet air temperature is higher than 7 ºC, this correction coefficient is 1.0. And when the outdoor inlet air temperature is lower than -7 ºC, this correction coefficient is 0.95.
- If the outdoor inlet air temperature is not shown in the above table (for example, 1 ºC), an interpolation should be carried out using the values before and after (0 ºC and 3 ºC) the outdoor inlet air temperature.

5. Control System

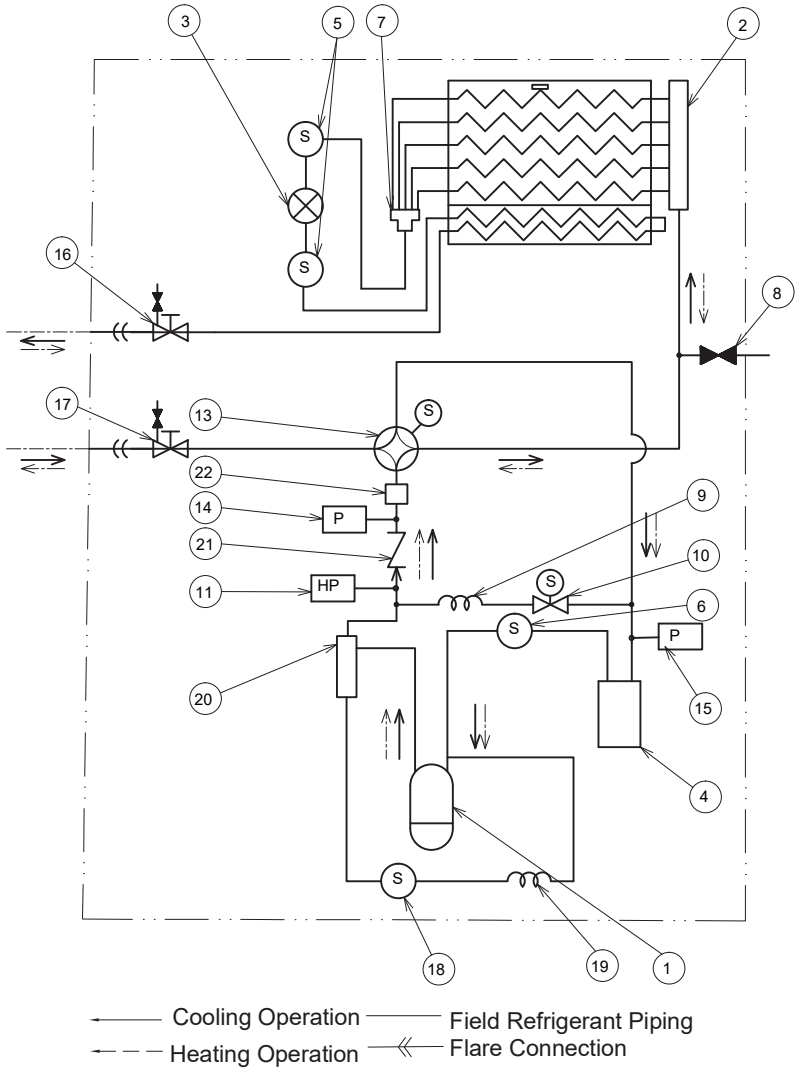
5.1 Refrigerant Cycle

Model: AVW-41/48/54HJFHH1



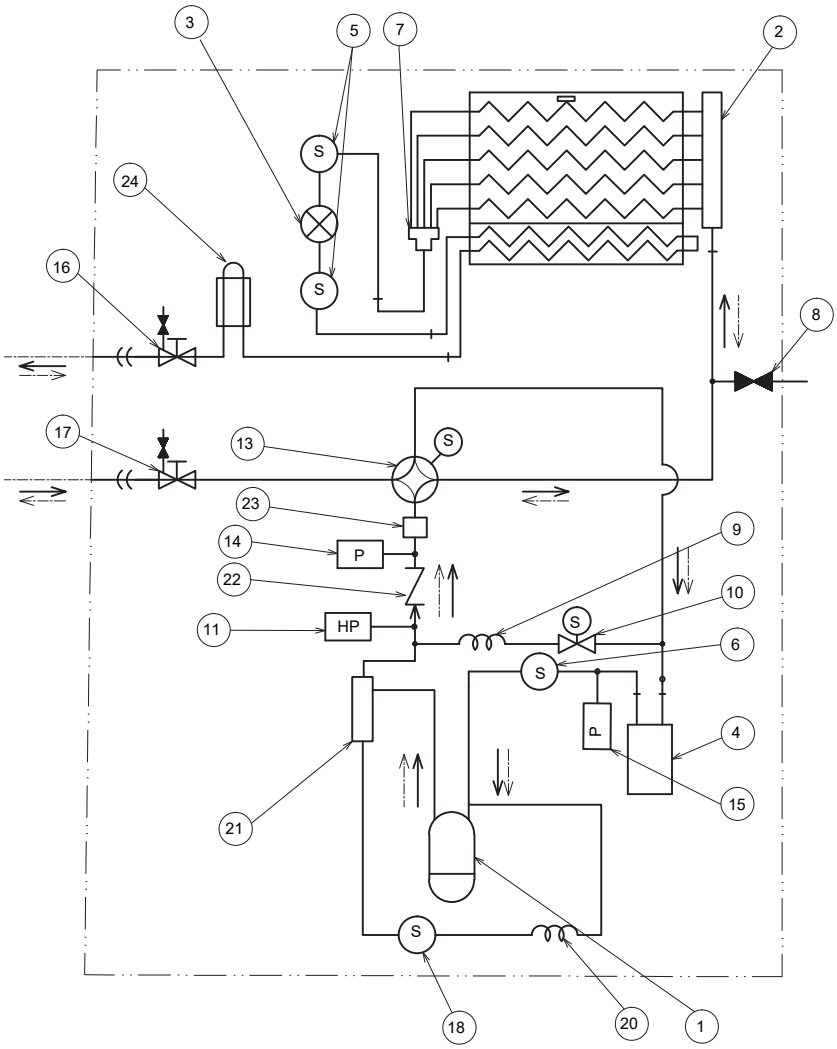
Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	10	Solenoid Valve (SVA)	21	Oil Separator
2	Heat Exchanger	11	Pressure Switch (H) (PSH)	22	Check Valve
3	Electronic Expansion Valve (EVO)	13	Reversing Valve (RVR)	24	Refrigerant cooler
4	Accumulator	14	High Pressure Sensor (Pd)		
5	Strainer	15	Pressure Switch (L) (PSL)		
6	Strainer	16	Stop Valve for Liquid Line		
7	Distributor	17	Stop Valve for Gas Line		
8	Check Joint	18	Strainer		
9	Capillary Tube	20	Capillary Tube		

Model: AVW-41/48/54HJFHH2



Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	10	Solenoid Valve (SVA)	20	Oil Separator
2	Heat Exchanger	11	Pressure Switch (PSH)	21	Check Valve
3	Electronic Expansion Valve (EVO)	13	Reversing Valve (RVR)	22	Silencer
4	Accumulator	14	High Pressure Sensor (Pd)		
5	Strainer	15	Low Pressure Sensor (Ps)		
6	Strainer	16	Stop Valve for Liquid Line		
7	Distributor	17	Stop Valve for Gas Line		
8	Check Joint	18	Strainer		
9	Capillary Tube	19	Capillary Tube		

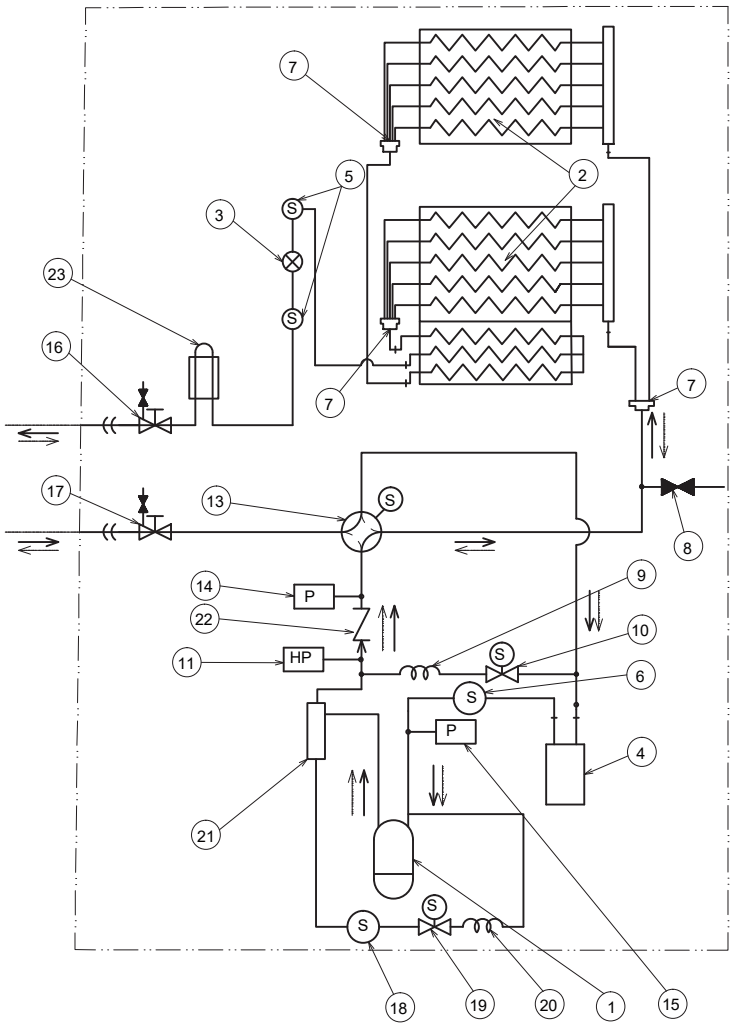
Model: AVW-41/48/54HKFHH2



Cooling Operation
Heating Operation
Field Refrigerant Piping
Flare Connection

Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	10	Solenoid Valve (SVA)	21	Oil Separator
2	Heat Exchanger	11	Pressure Switch (PSH)	22	Check Valve
3	Electronic Expansion Valve (EVO)	13	Reversing Valve (RVR)	23	Silencer
4	Accumulator	14	High Pressure Sensor (Pd)	24	Refrigerant cooler
5	Strainer	15	Low Pressure Sensor (Ps)		
6	Strainer	16	Stop Valve for Liquid Line		
7	Distributor	17	Stop Valve for Gas Line		
8	Check Joint	18	Strainer		
9	Capillary Tube	20	Capillary Tube		

Model: AVW-76/96/114HKFHH2



Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	10	Solenoid Valve (SVA)	20	Capillary Tube
2	Heat Exchanger	11	Pressure Switch (PSH)	21	Oil Separator
3	Electronic Expansion Valve (EVO)	13	Reversing Valve (RVR)	22	Check Valve
4	Accumulator	14	High Pressure Sensor (Pd)	23	Refrigerant cooler
5	Strainer	15	Low Pressure Sensor (Ps)		
6	Strainer	16	Stop Valve for Liquid Line		
7	Distributor	17	Stop Valve for Gas Line		
8	Check Joint	18	Strainer		
9	Capillary Tube	19	Solenoid Valve (SVF)		

5.2 Control Logic

No.	Item		Details
1	Cooling Operation	Comp. Frequency Control	To determine the compressor frequency depending on (a),(b) and (c).
		I.U. Electronic Exp. Valve Control	• Quasi PI Control: To determine the I.U. electronic expansion valve opening so as to keep (d) at an optimum value. To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To control the fan steps so that High Pressure is within a stable temperature range.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during Operation Stop)
2	Heating Operation	Comp. Frequency Control	• PI Control: To determine the compressor frequency so as to keep High Pressure. To determine the compressor frequency from (a) and(c) when heating operation is started or the number of operating indoor units is changed.
		I.U. Electronic Exp. Valve(EVI) Control	• To determine the I.U. electronic expansion valve opening so that the indoor liquid pipe temperature (trl) is at an optimum level. To change the I.U. electronic expansion valve opening when the number of operating indoor units is changed.
		O.U. Electronic Exp. Valve(EVO) Control	• Quasi PI Control: To determine the O.U. electronic expansion valve opening so as to keep the temperature at the top of the compressor at an optimum level. When Operating Indoor Unit Number Changed: To determine the O.U. electronic expansion valve opening from the compressor frequency ratio before/after the change and Quasi PI Control.
		Outdoor Fan Control	The fan steps are dependent on Ta in the beginning. After that to control the fan steps so that Pd is within a stable pressure range.
		Reversing Valve Control	Reversing Valve: ON
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	At Start-up and when High Pressure Increase Protection activated: ON
		High/Low Pressure Control	SVA: ON (during operation stop)
3	Defrost Operation	Comp. Frequency Control	Fixed Compressor Frequency
		I.U. Electronic Exp. Valve Control	To determine the I.U. electronic expansion valve opening depending on the discharge temperature of the compressor (Td).
		O.U. Electronic Exp. Valve Control	EVO: 480pls (Fully Opened)
		Outdoor Fan Control	To stop the outdoor fan.
		Reversing Valve Control	Reversing Valve: OFF
		Control of Solenoid Valve for High/ Low Pressure Bypass (SVA)	at Start-up: ON
4	Comp. Preheating Control		Crankcase Heater Control

a . Difference between Indoor Inlet Air Temperature and Setting Temperature

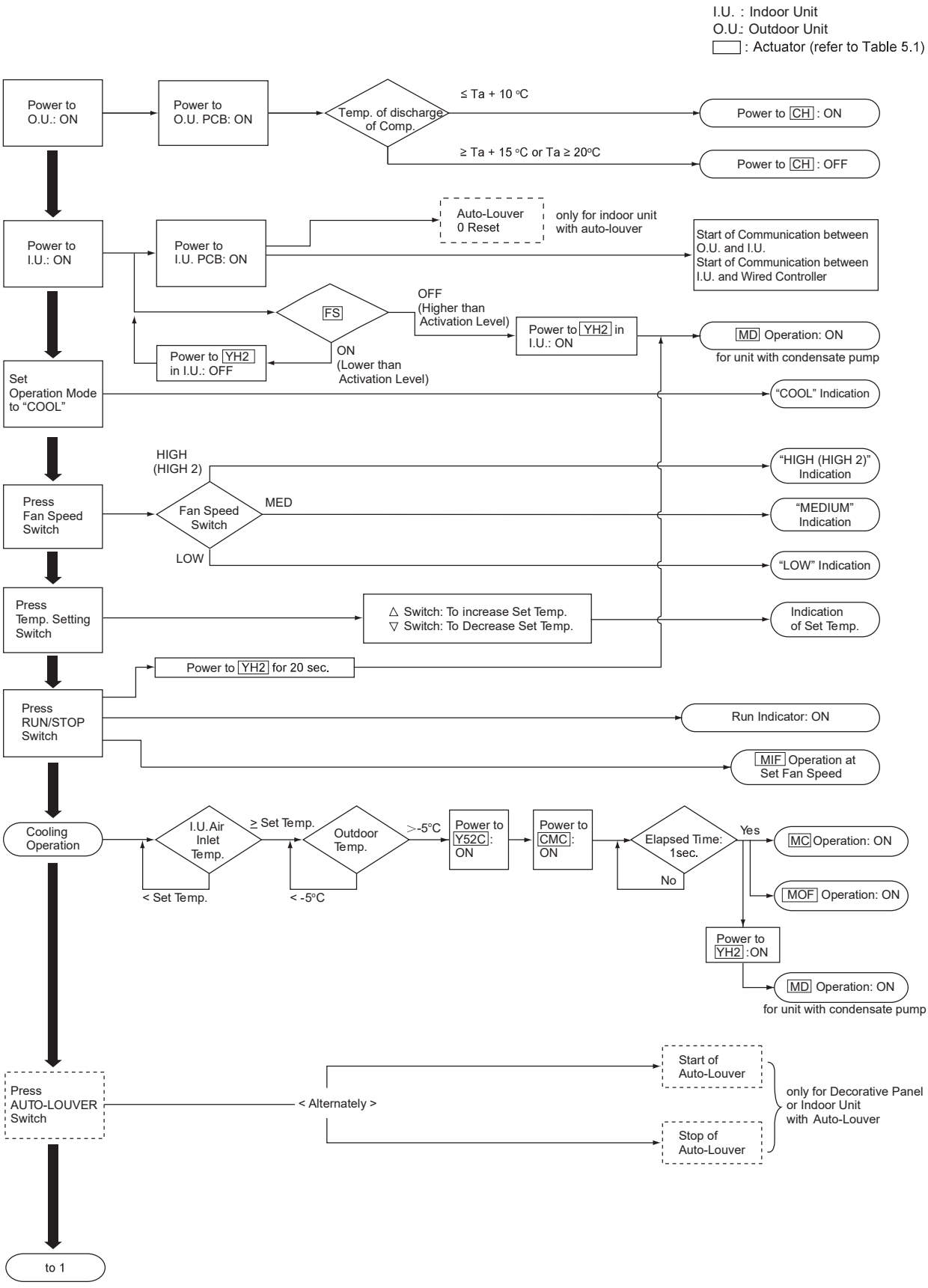
b . Amount of Temperature Difference Change

c . Capacity Ratio between Operating Indoor Unit and Outdoor Unit

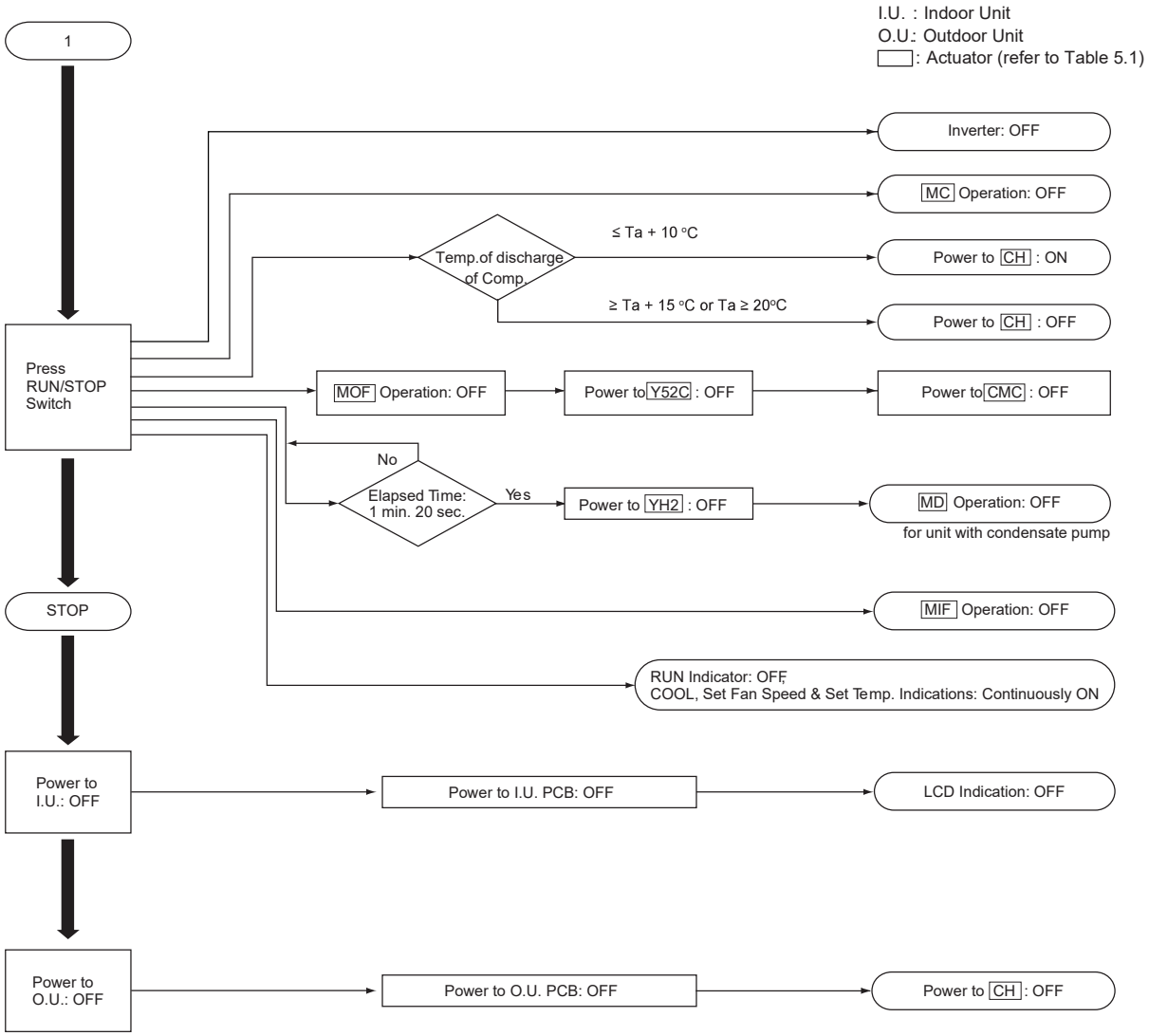
d . Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe
(= Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature)

5.3 Standard Operation Sequence

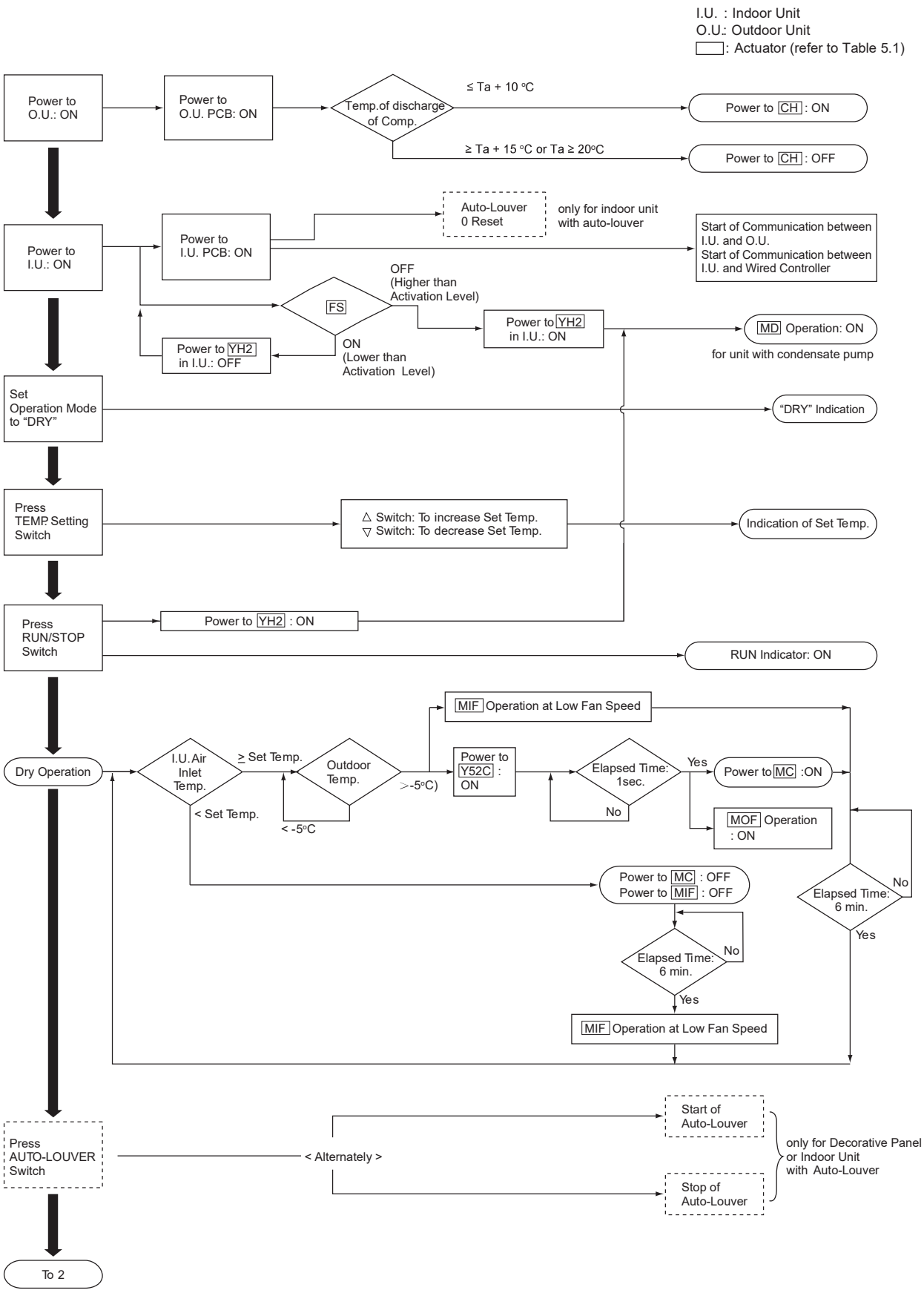
Cooling Operation



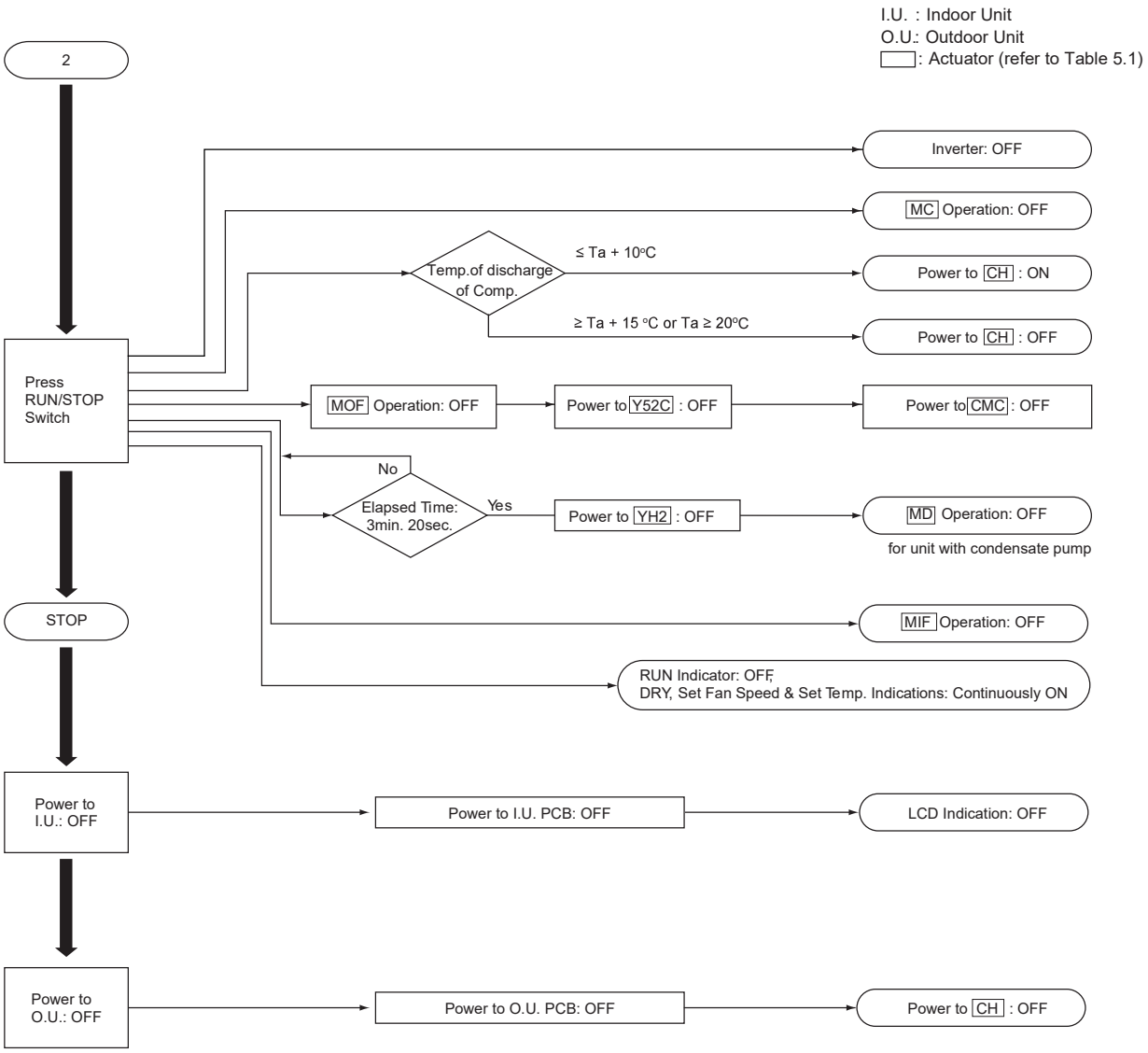
Cooling Operation



Dry Operation

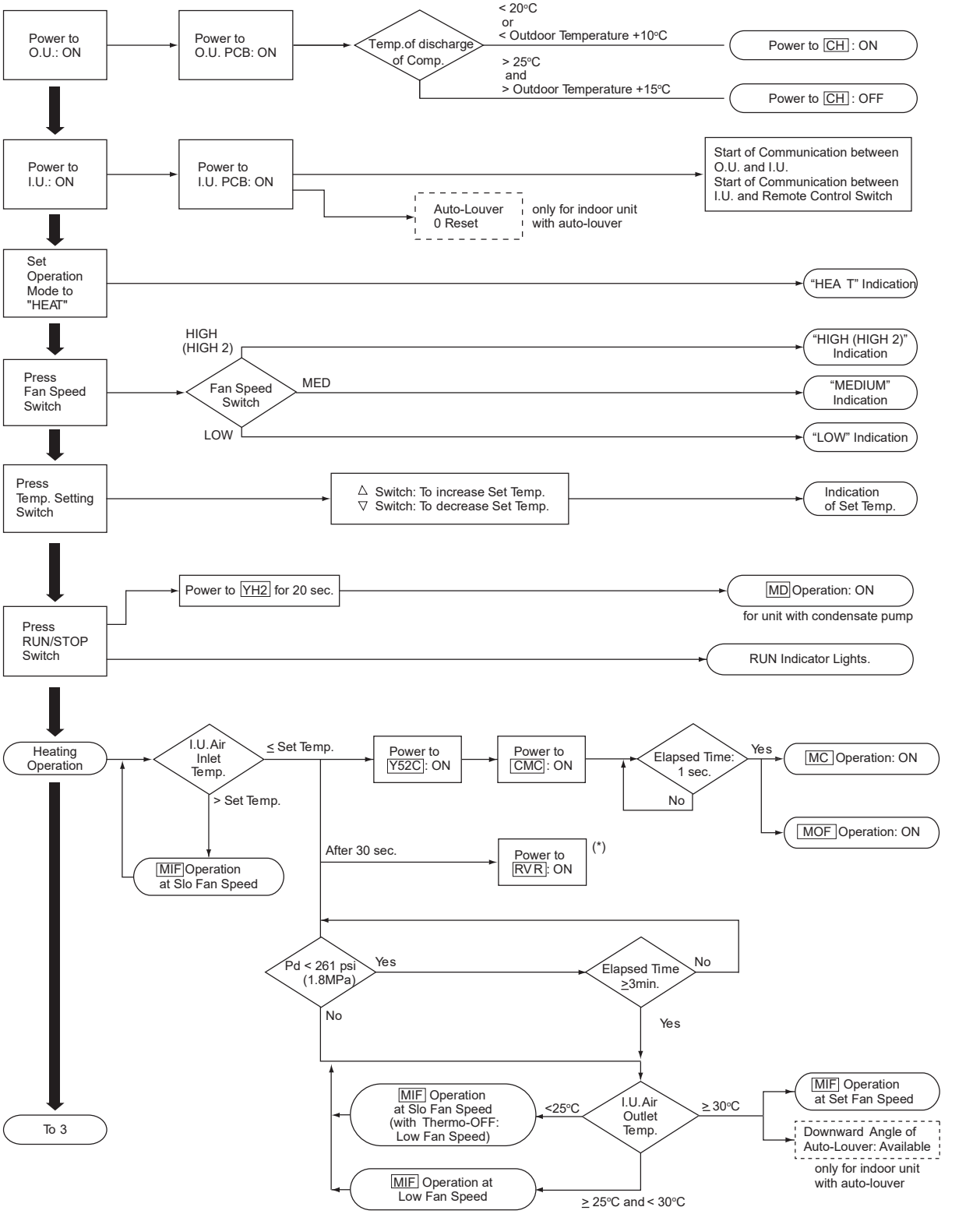


Dry Operation



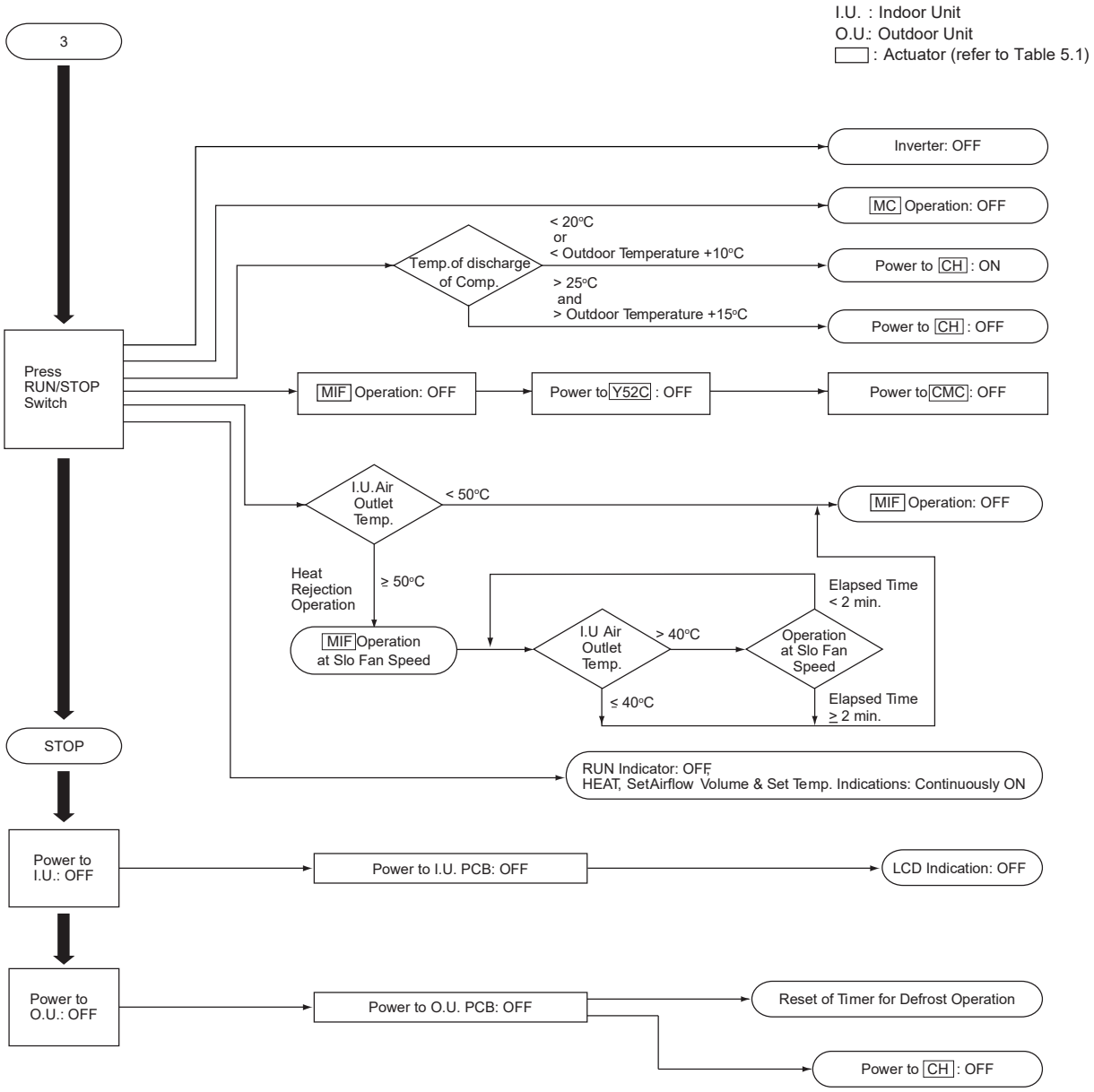
Heating Operation

I.U. : Indoor Unit
O.U.: Outdoor Unit
□: Actuator (refer to Table 5.1)

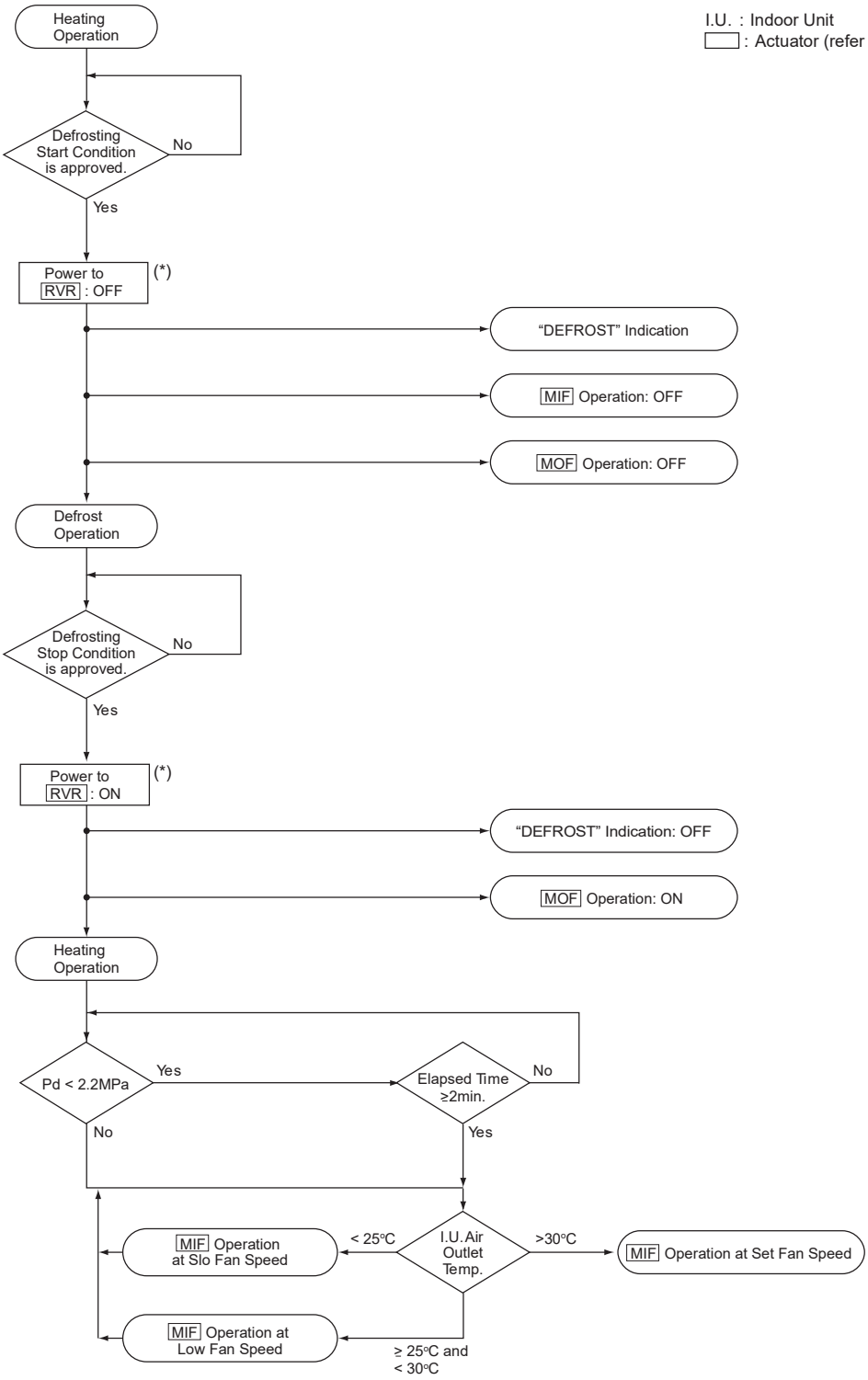


(*) Refer to Service Manual for the timing diagram of the reversing valve.

Heating Operation



Defrost Operation



(*) Refer to Service Manual for the timing diagram of the reversing valve.

Table.5.1

CH	Crankcase Heater	in O.U.
FS	Float Switch	in I.U.
YH2	Relay for Condensate Pump Motor	in I.U.
MD	Condensate Pump Motor	in I.U.
MIF	Indoor Fan Motor	in I.U.
Y52C	Relay for Magnet Switch	in O.U.
CMC	Magnet Switch	in O.U.
MC	Compressor Motor	in O.U.
MOF	Outdoor Fan Motor	in O.U.
RVR	Reversing Valve	in O.U.

Part name	Mark	Port	Purpose
Electronic expansion valve of outdoor unit	EVO	CN5A (MV1)	During heating, throttle the liquid refrigerant.
High Pressure Sensor of Outdoor Unit	Pd	CN4 (Pd)	Measure the discharge pressure of the compressor
Low Pressure Sensor of Outdoor Unit	Ps	CN9 (Ps)	Measure the suction pressure of the compressor
High Pressure Switch of Outdoor Unit	PSH	PCN8 or PCN401 (63H1) *1)	Prevent the system pressure from exceeding 4.15MPa
Low Pressure Switch of Outdoor Unit	PSL	PCN60 (63H2)	Prevent the system pressure from being lower than 0.05MPa
Thermistor for Discharge Gas Temperature	Td	THM9 (Td)	Measure the compressor discharge temperature
Thermistor for Heat Exchanger Liquid Pipe Temperature	Te	THM8 (Te)	Measure the evaporation temperature of the system during heating operation
Thermistor for Outdoor Unit Ambient	Ta	THM7 (To1)	Measure the outdoor ambient temperature
Thermistor for Refrigerant Cooler	Tsc	THM19 (Tsc)	Measure the temperature of refrigerant cooler
Crankcase Heater of Outdoor Unit	CH	PCN5 (CH)	Heat the oil at the bottom of the compressor
Reversing Valve of Outdoor Unit	RVR	PCN6 (21)	Change the status of outdoor heat exchanger (evaporator or condenser)
Solenoid Valve for Hot Gas Bypass	SVA	PCN7 (20A)	When the system pressure is too high or too low, balance the system pressure
Oil return solenoid valve	SVF	PCN12 (20B)	Ensure the oil return

*1) The “PCN8” is only for AVW-41/48/54HJFHH2.

< Defrost Operation >

The following defrost operations, “Standard Defrost”, “Forced Defrost” and “Manual Defrost” are available.

(1) Standard Defrost
This operation starts according to the outdoor temperature, the outdoor evaporating temperature and the operating time.

(2) Forced Defrost
This operation starts when the indoor unit repeats Thermo-ON/OFF* operation and therefore cannot start the “Standard Defrost.”

(3) Manual Defrost
This operation starts when the push switch “PSW1” on the outdoor unit PCB is pressed for more than 3 seconds during maintenance, etc. (This function cannot be used when the pressure and the outdoor evaporating temperature is high or at the beginning of the operation.)

NOTE:
Do not repeatedly use “Manual Defrost” frequently.

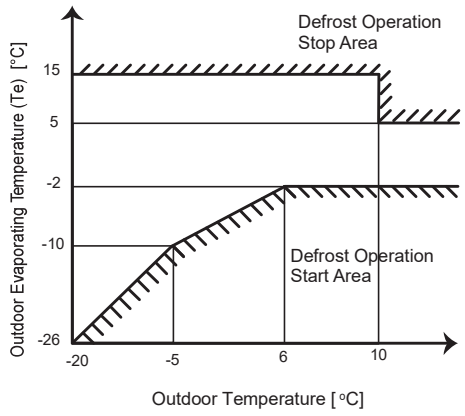
* Thermo-ON: The outdoor unit and some indoor units are running.
Thermo-OFF: The outdoor unit and some indoor units stay on, but don’t run.

< Condition for Starting Defrost Operation >

(1) Standard Defrost

(a) Temperature Condition

Temperature Conditions under Defrost Operation



(b) Condition of Operating Time for Defrost Operation Start

The defrost operation starts when the temperature condition shown in "(a) Temperature Condition" is met after a heating operation of 30 to 120 minutes. The heating operation time is determined by estimating the amount of frost on the heat exchanger.

(2) Forced Defrost

The "Forced Defrost" starts when all the following conditions are met.

(a) The reversing valve is "ON" for more than 120 minutes.

(b) The outdoor temperature is 10 °C or lower.

(c) The accumulated heating operation time is more than 60 minutes.
(The accumulated time is reset when the operation is stopped or the defrost operation is performed.)

(d) The compressor is operated continuously for more than 90 seconds.

(e) The outdoor evaporating temperature is lower than 5°C right before the operation starts.

(f) The pressure switch for control is "OFF".

< Condition for Completing Defrost Operation >

The defrost operation stops when any of the following conditions is met.

(1) The outdoor evaporating temperature reaches 25°C within 2 minutes after the defrost operation starts.

(2) The outdoor evaporating temperature reaches 15°C (the outdoor temperature < 10°C) and high pressure reaches 1.5MPa after a lapse of 2 minutes or more from the defrost operation start.

(3) The outdoor evaporating temperature reaches 5°C (the outdoor temperature > 10°C) after a lapse of 2 minutes or more from the defrost operation start.

(4) The temperature at the top of the compressor reaches 132°C.

(5) The pressure switch for control is "ON".

(6) The high pressure reaches 3.3MPa within 20 seconds after the defrost operation starts.

(7) The high pressure reaches 3.1MPa after a lapse of 2 minutes or more from the defrost operation start.

(8) More than 9 minutes have passed from the defrost operation start.

NOTE:

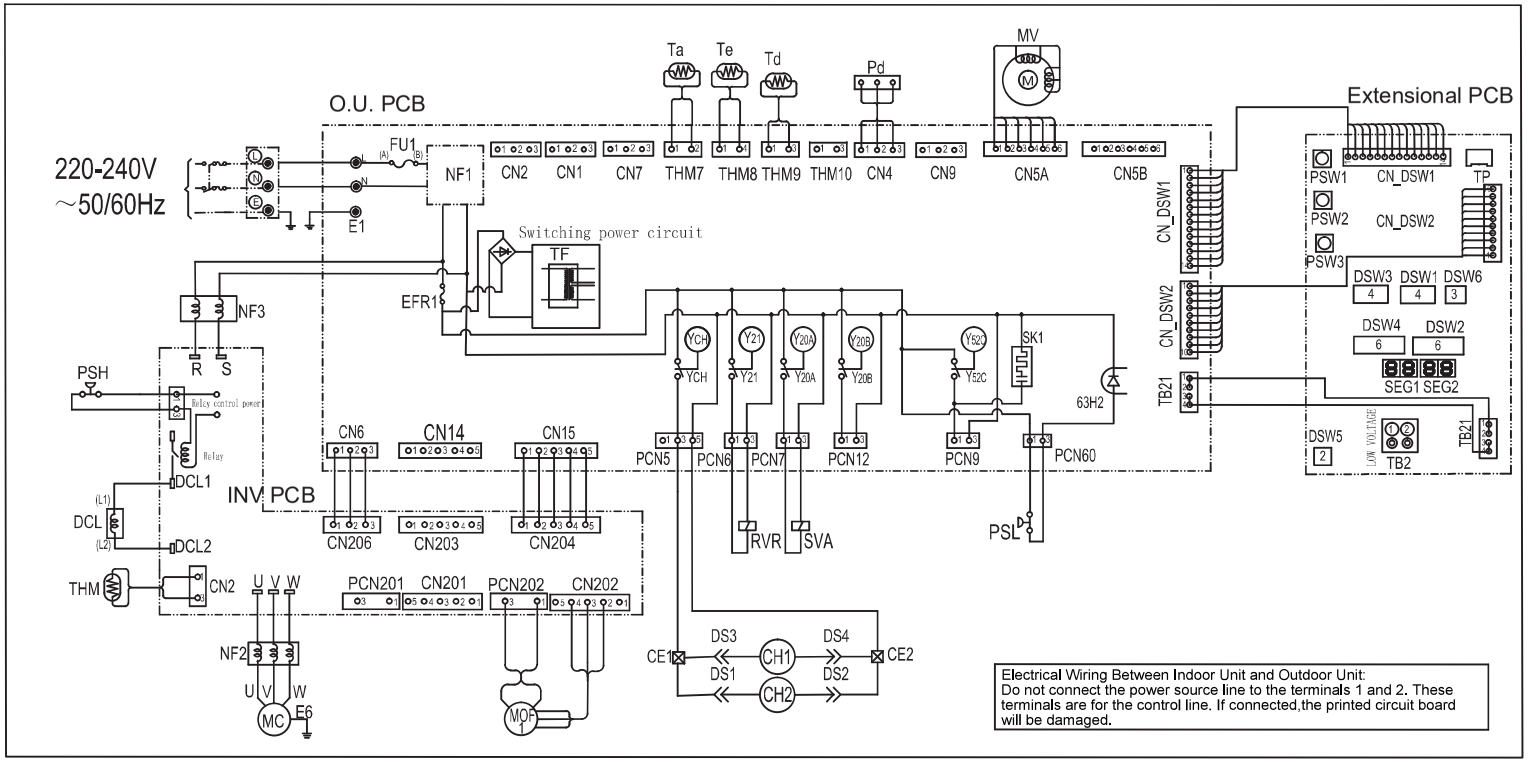
The defrost operation does not start immediately even if the above conditions are met, because these conditions may be met temporarily depending on the refrigerant system variability.

The defrost operations start when these conditions are met continuously for a certain period of time.

5.4 Electrical Wiring Diagram

AVW-41/48/54HJFHH1

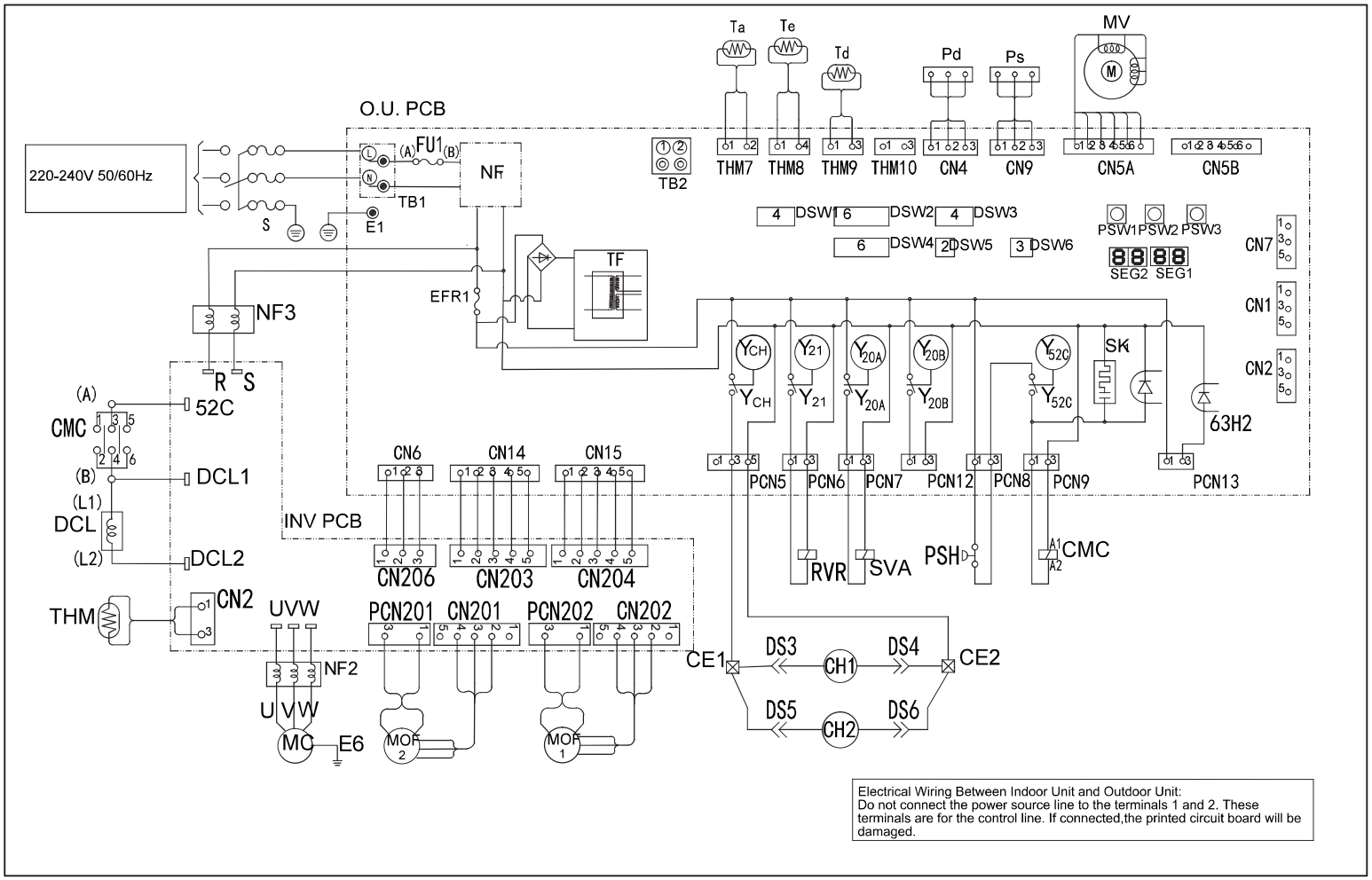
⚠ Electrical Operation or Periodic Inspection is Allowed Only After the Main Power Is Turned Off for ten Minutes



MARK	NAME
MC	Motor for Compressor
MOF_1	Motor for Out Fan
FU1	Fuse
RVR	Reversing Valve Relay
MV	Micro-Computer Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
PSH	High Pressure Switch
Pd	Refrigerant pressure sensor (vent side)
PSL	Low pressure switch
TB	Terminal Board
TF	Transformer
PCB	Printed circuit board
EFR1	Fuse
Y_{52C}	Relay(CMC)
Y_{21}	Relay(RAR)
Y_{CH}	Relay(CH)
Y_{20A}	Relay(SVA)
Y_{20B}	Relay
THM7	Thermister(air)
THM8	Thermister(pipe)
THM9	Thermister(Td)
THM81	Thermister(pipe)
DCL	Reactor
IPM	Inverter power module
$NF_{1\sim4}$	Noise Filter
PSW1	Push switch on PCB
PSW2	Push switch on PCB
PSW3	Push switch on PCB
DSW1	Dip switch on PCB
DSW2	Dip switch on PCB
DSW3	Dip switch on PCB
DSW4	Dip switch on PCB
DSW5	Dip switch on PCB
DSW6	Dip switch on PCB
$CH_{1\sim2}$	Crankcase Heater
$E_{1\sim6}$	Ground line

AVW-41/48/54HJFHH2

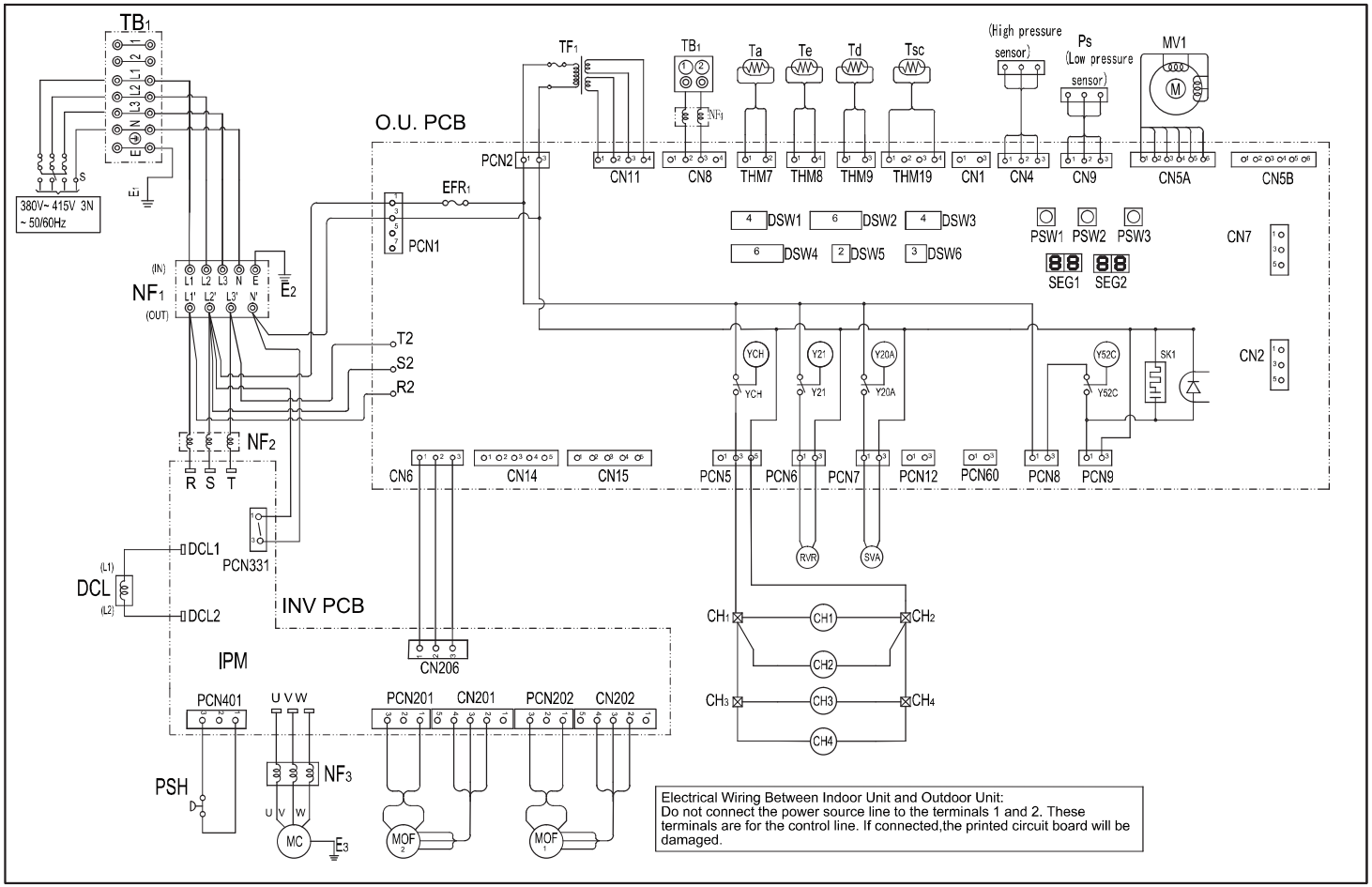
⚠ Electrical Operation or Periodic Inspection is Allowed Only After the Main Power Is Turned Off for ten Minutes



Electrical Wiring Between Indoor Unit and Outdoor Unit:
Do not connect the power source line to the terminals 1 and 2. These terminals are for the control line. If connected,the printed circuit board will be damaged.

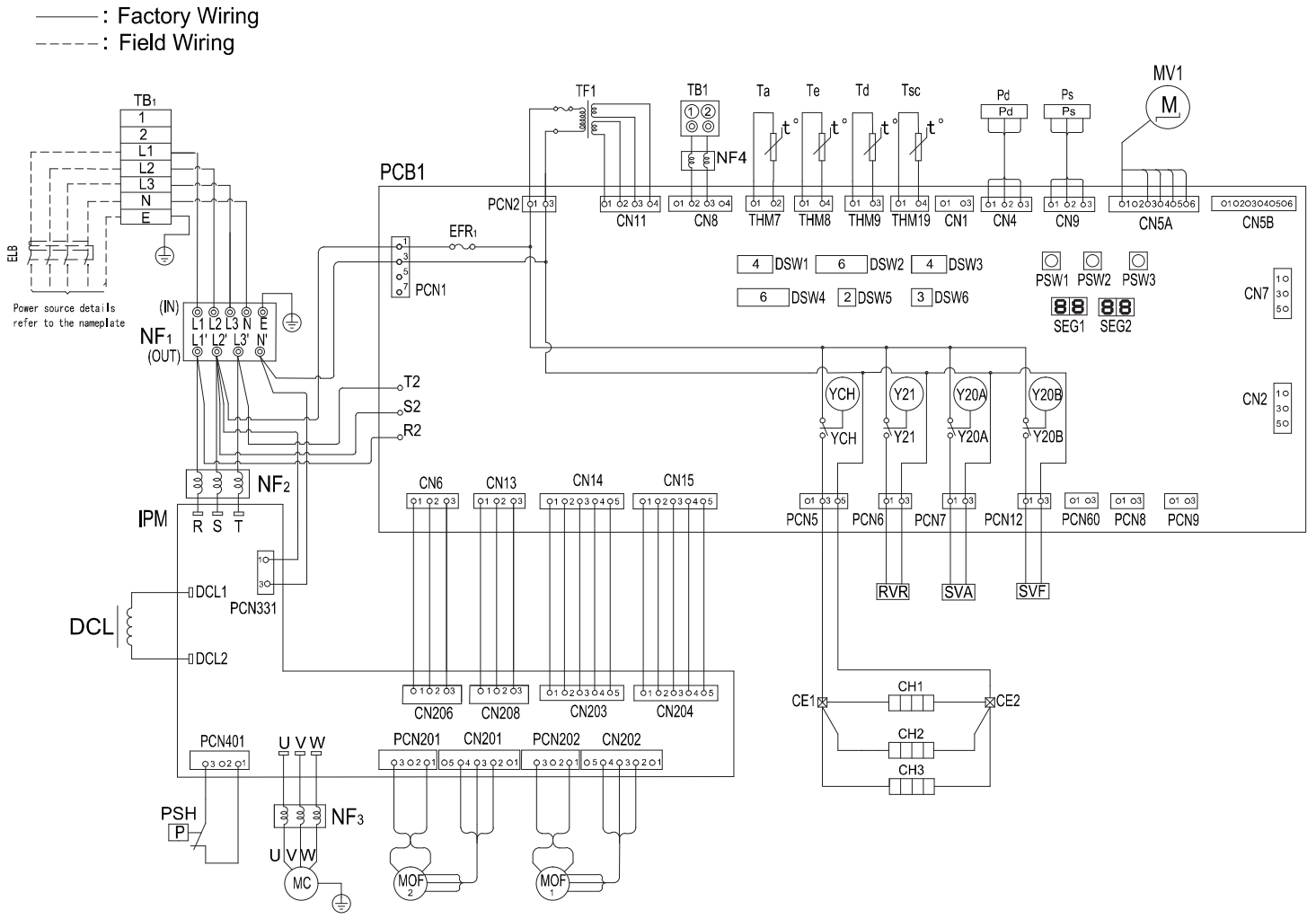
MARK	NAME
MC	Motor for Compressor
MOF_1	Motor for Out Fan
MOF_2	Motor for Out Fan
FU_1	Fuse
CMC	Contactor for Compressor Motor
RVR	Reversing Valve Relay
MV	Micro-Comupter Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
PSH	High Pressure Switch For Protection
P_d	Sensor for Refrigerant Pressure
Ps	Sensor for Refrigerant Pressure
$TB_{1,2}$	Terminal Board
TF	Transformer
PCB	Printed Circuit Board
EFR_1	Fuse
Y_{52C}	Relay(CMC)
Y_{21}	Relay(RVR)
Y_{CH}	Relay(CH)
Y_{20A}	Relay(SVA)
Y_{20B}	Relay(SVF)
THM7	Thermistor
THM8	Thermistor
THM9	Thermistor
THM81	Thermistor
DCL	Reactor
IPM	Inverter System Power Podule
$NF_{1\sim4}$	Noise Filter
PSW1	Push Switch on PCB
PSW2	Push Switch on PCB
PSW3	Push Switch on PCB
DSW1	Dip Switch on PCB
DSW2	Dip Switch on PCB
DSW3	Dip Switch on PCB
DSW4	Dip Switch on PCB
DSW5	Dip Switch on PCB
DSW6	Dip Switch on PCB
$CH_{1\sim2}$	Crankcase Heater
$E_{1\sim6}$	Ground Wire

Electrical Operation or Periodic Inspection is Allowed Only After the Main Power Is Turned Off for ten Minutes



MARK	NAME
TB1	Terminal Board
TF1	Transformer
PCB	Printed circuit board
EFR_1	Fuse
MC	Motor for Compressor
MOF1	Motor for Out Fan
MOF2	Motor for Out Fan
RVR	Reversing Valve Relay
MV	Micro-Computer Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
IPM	Inverter power module
PSH	High Pressure Switch
PSLC	Low Pressure Switch
DCL	Reactor
$NF_{1\sim4}$	Noise Filter
P_d	Refrigerant pressure sensor (vent side)
THM7	Thermister(air)
THM8	Thermister(pipe)
THM9	Thermister(Td)
THM19	Thermister(Refrigerant pipe)
$CH_{1\sim4}$	Crankcase Heater
$E_{1\sim3}$	Ground line
Y_{52C}	Relay(CMC)
Y_{21}	Relay(RAR)
Y_{CH}	Relay(CH)
Y_{20A}	Relay(SVA)
PSW1	Push switch on PCB
PSW2	Push switch on PCB
PSW3	Push switch on PCB
DSW1	Dip switch on PCB
DSW2	Dip switch on PCB
DSW3	Dip switch on PCB
DSW4	Dip switch on PCB
DSW5	Dip switch on PCB
DSW6	Dip switch on PCB
P_s	Refrigerant pressure sensor

⚠ Electrical Operation or Periodic Inspection is Allowed Only After the Main Power Is Turned Off for ten Minutes



Electrical Wiring Between Indoor Unit and Outdoor Unit
Do not connect the power source line to the terminals 1 and 2. These terminals are for the control line. If connected,the printed circuit board will be damaged.

MARK	NAME
TB	Terminal Board
TF	Transformer
PCB	Printed circuit board
EFR	Fuse
MC	Motor for Compressor
MOF	Motor for Out Fan
RVR	Reversing Valve Relay
MV1	Micro-Computer Control Expansion Valve
SVA	Solenoid Valve for Hot Gas Bypass
IPM	Inverter power module
PSH	High Pressure Switch
Pd	Sensor for Refrigerant Pressure
Ps	Sensor for Refrigerant Pressure
DCL	Reactor
NF	Noise Filter
THM7	Thermister(air)
THM8	Thermister(pipe)
THM9	Thermister(Td)
THM19	Thermister(Refrigerant pipe)
CH	Crankcase Heater
⏚	Protective earth
Y_{20B}	Relay(SVF)
Y_{21}	Relay(RAR)
Y_{CH}	Relay(CH)
Y_{20A}	Relay(SVA)
PSW	Push switch on PCB3
DSW	Dip switch on PCB3

INSTALLATION

1. Safety Summary

⚠WARNING

- **Do not perform installation work, refrigerant piping work, drain piping and electrical wiring connection without referring to the installation manual.**
- **Check that the ground wire is securely connected.**
- **Connected a fuse of specified capacity.**

⚠CAUTION

Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.

2. Structure

2.1 Outdoor Unit & Refrigerant Cycle

Regarding structure drawings and refrigerant cycle diagram, please refer to Design 2.6 “Structure” and 5.1 “Refrigerant Cycle”.

2.2 Necessary Tools and Instrument List for Installation

No.	Tool	No.	Tool	No.	Tool	No.	Tool
1	Handsaw	6	Copper Pipe Bender	11	Spanner	16	Leveller
2	Phillips Screwdriver	7	Manual Water Pump	12	Charging Cylinder	17	Clamper for Solder-less Terminals
3	Vacuum Pump	8	Pipe Cutter	13	Gauge Manifold	18	Hoist (for Indoor Unit)
4	Refrigerant Gas Hose	9	Brazing Kit	14	Cutter for Wires	19	Ammeter
5	Megohmmeter	10	Hexagon Wrench	15	Gas Leak Detector	20	Voltage Meter

Note:
Use tools and measuring instruments exclusively for the refrigerant R410A in case of direct contact with refrigerant.

⚠DANGER

The pressure of refrigerant R410A is 1.4 times higher than that of conventional refrigerant, impurities such as moisture, oxide film, and grease affect easily R410A. Be sure to remove any moisture, dust, different refrigerant or refrigerant oil from the refrigerant cycle. If materials other than specified are used, it may lead to explosion, injury, leakage, electric shock or a fire.

○: interchangeable with current R22
× : Prohibited
■: only for Refrigerant R410A (not interchangeable with R22)
●: only for Refrigerant R407C (not interchangeable with R22)

Measuring Instrument and Tool		Interchangeability with R22		Reason of Non-Interchangeability and Attention (★ : Strictly Required)	Application
		R407C	R410A		
Refrige-rant Pipe	Pipe Cutter Chamfering Reamer	○	○	——	Cutting Pipe Removing Burrs
	Flaring Tool	○	○■	* R410A requires high pressure resistance piping and larger flaring. In case of material 1/2H, flaring is not available.(The flaring tools for R410A are applicable to R407C)	Flaring for Tubes
	Extrusion — Adjustment Gauge	-	■		Dimensional Control of Tube after Flaring
	Pipe Bender	○	○	* In case of material 1/2H, bending is not available. Use elbow for bend and braze.	Bending
	Expanding Tool	○	○	* In case of material 1/2H, expanding of tube is not available. Use joint for connecting tube.	Expanding Tubes
	Torque Wrench	○	■	* For Φ1/2in., Φ5/8in. of R410A, spanner size is up to 5/64in.	Connection of Flare Nut
			○	* For Φ1/4in., Φ3/8., Φ3/4in., spanner size is the same.	
	Brazing Tool	○	○	* Perform brazing work properly	Brazing for Tubes
	Nitrogen Gas	○	○	* Strict control against contamination (Blow nitrogen during brazing.)	Prevention from Oxidation during Brazing Air-tight test
	Lubrication Oil (for Flare Surface)	●	■	* Use a synthetic oil which is equivalent to the oil used in the refrigerant cycle. * Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface
Refrige-rant Charge Vacuum Drying	Refrigerant Cylinder	●	■	* Check the cylinder for the corresponding refrigerant. ★ Liquid refrigerant charging is required regarding zeotropic refrigerant.	Refrigerant Charging
	Vacuum Pump	○	○	★ The current pumps are applicable. However, it is required to mount a vacuum pump adapter which can prevent from reverse flow when a vacuum pump stops, resulting in no reverse oil flow.	Vacuum Pumping
	Adapter for Vacuum Pump Reverse Flow prevention	●	※■		
		Interchangeable with R410A			
	Control Valve	●	■	* No interchangeability is available due to higher pressures when compared with R22. Connection diameter is different: R410A: UNFI/2, R407C: UNF7/16 ★ Do not use old ones to the different refrigerant. Otherwise, mineral oil will flow into the cycle and cause sludges, resulting in clogging or compressor failure.	Vacuum Pumping, Vacuum Holding, Refrigerant Charg-ing and Check of Pressures
	Charging Hose	●	■		
	Charging Cylinder	×	×	* Use the weight scale when charging	Refrigerant Charging
	Weight Scale	○	○	——	Measure refrigerant quantity
	Refrigerant Gas Leakage Detector	●	※■	* The current gas leakage detector (R22) is not applicable due to different detecting method.	Refrigerant Charging Gas Leakage Check
		Interchangeable with R410A			

※ interchangeable with R407C

3. Transportation and Handling

3.1 Transportation

Transport the product as close to the installation location as possible before unpacking.

⚠CAUTION

Do not put any material on the product. Apply two lifting wires onto the outdoor unit, when lifting it by crane.

- Lifting Method

When hanging the unit, ensure a balance of the unit, check safety and lift up smoothly.

(1) Do not remove any packing materials.

(2) Hang the unit under packing condition with two (2) ropes, as shown in Fig.3.1.

Do not remove the plastic band or the corrugated paper frame.

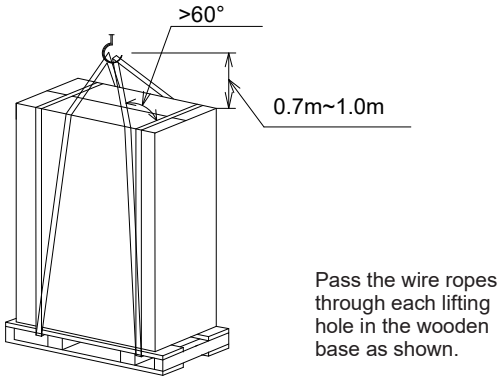


Fig.3.1 Lifting Work for Transportation

⚠CAUTION

- Lift the outdoor unit in its factory packaging with 2 wire ropes.
- For safety reasons ensure that the outdoor unit is lifted smoothly and does not lean.
- Do not attach lifting equipment to the plastic band or the corrugated paper frame.
- Ensure the exterior of the unit is adequately protected with cloth or paper.

3.2 Handling of Outdoor Unit

⚠WARNING

Do not put any foreign material into the outdoor unit and check to ensure that none exists in the outdoor unit before the installation and test run. Otherwise, a fire or failure, etc. may occur.

- **When Using Handles**
  When manually lifting the unit using the handles, pay attention to the following points.

(1) Do not remove the wooden base from outdoor unit.

(2) To prevent the unit from overturning, pay attention to the center of gravity as shown in Fig.3.2.

(3) Two or more personnel should be used to move the unit.

Example: AVW-41HJFHH1

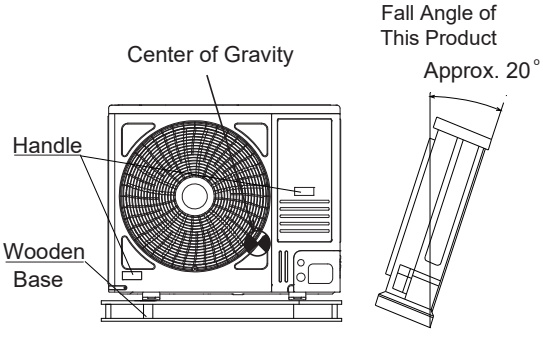


Fig.3.2 Handling of Outdoor Unit

4. Outdoor Unit Installation

4.1 Service Space

As shown in the figure below, enough operation and maintenance space should be reserved for the installation of outdoor unit.(Example: AVW-41HJFHH2)

(1) The obstacle is on the air inlet side.

(a) Upper opening

(mm)

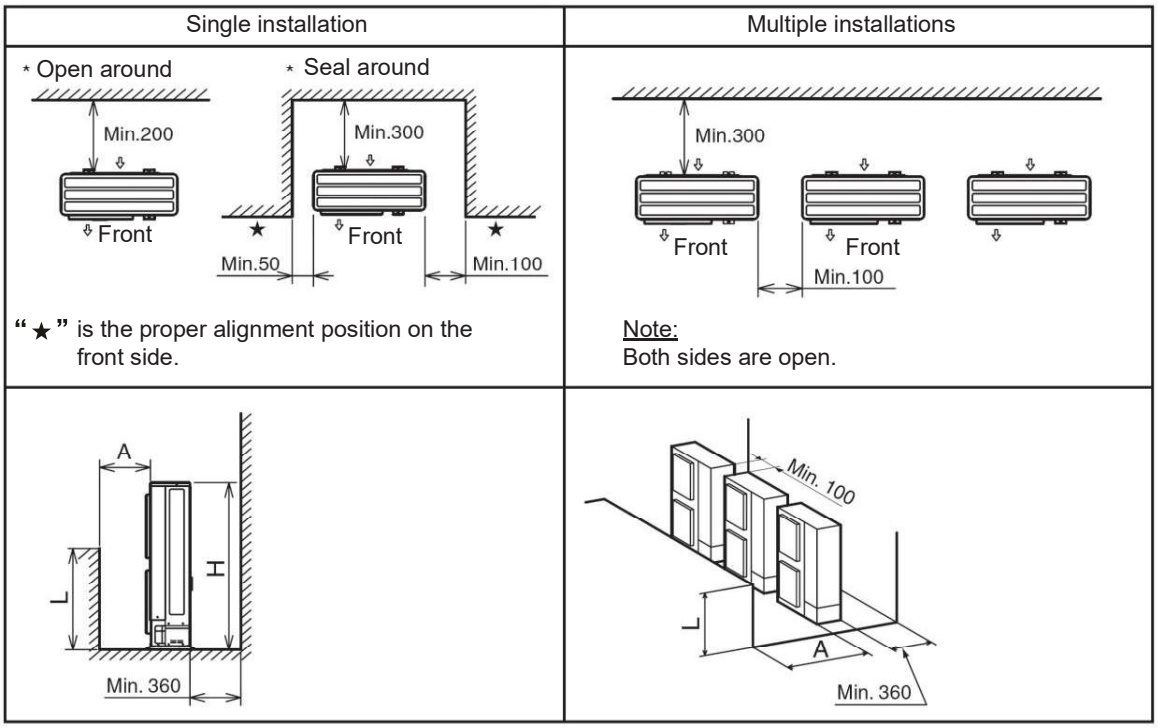


Fig. 4.1 Installation and maintenance space (Case 1)

(b) The obstacle is on the top

(mm)

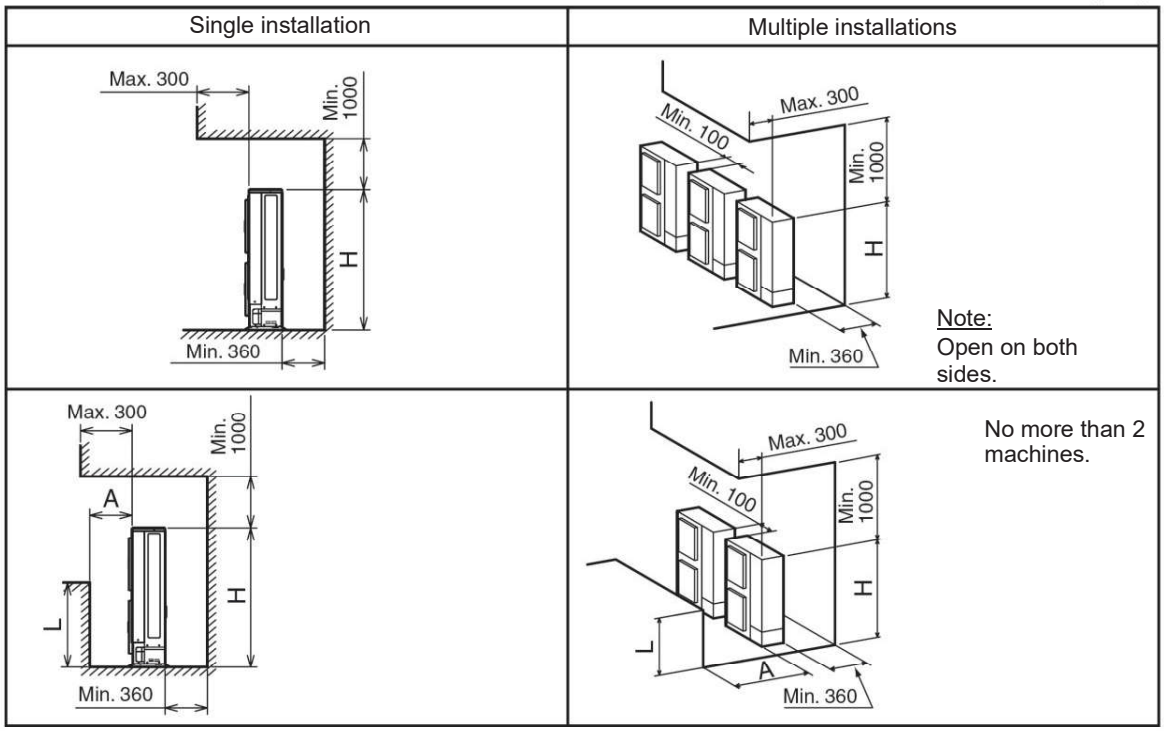


Fig. 4.2 Installation and maintenance space (Case 2)

(2) The obstacle is on the air outlet side.

(a) Upper opening

(mm)

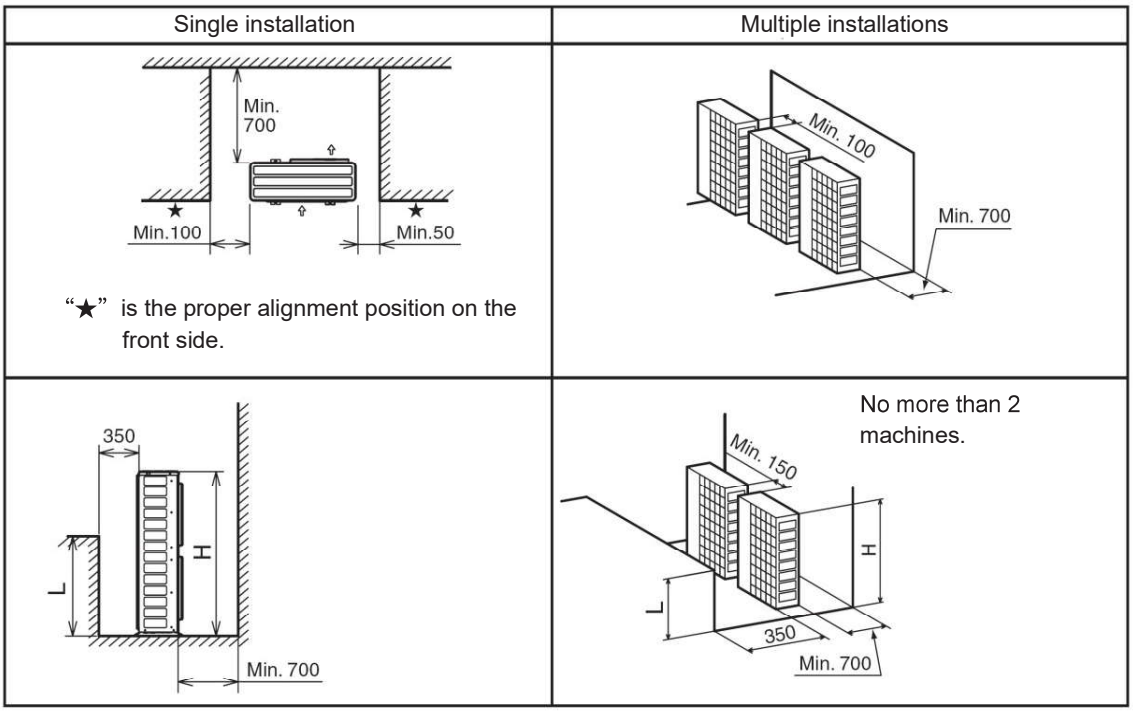
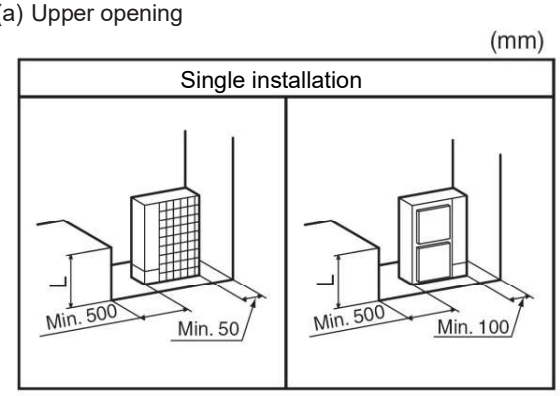


Fig. 4.3 Installation and maintenance space (Case 3)

(3) The obstacle is on both sides.

(a) Upper opening

(mm)



(b) The obstacle is on the top

(mm)

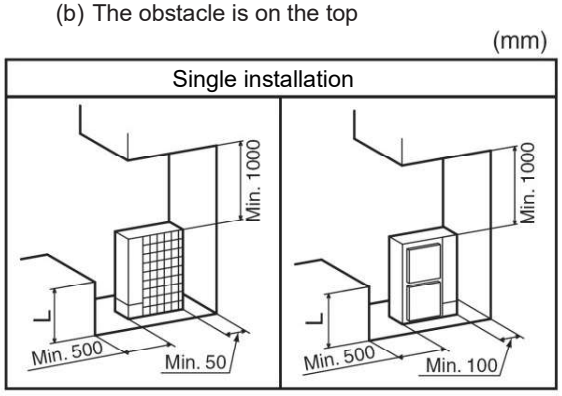


Fig. 4.4 Installation and maintenance space (Case 4)

NOTE:

If L is greater than H, install the outdoor unit on the foundation so that H is greater than or equal to L.

H: Outdoor unit height + foundation height

L	A
0<L≤1/2H	600 or more
1/2H<L≤H	1400 or more

In this case, ensure that the foundation is firm, and do not allow short circuit of air flow. In all cases, short circuit of air flow is not allowed when installing outdoor unit.

4.2 Factory-Supplied Accessories

Check to ensure that the following accessories are packed with the outdoor unit.

Table 4.1 Factory-Supplied Accessories

Accessory	AVW-41/48/54HJFHH1	AVW-41/48/54HJ(K)FHH2	AVW-76/96/114HKFHH2
Installation Manual	1	1	1
Washer	4		
Magnetic Ring	2		
Wire Clip(Big)	1		
Wire Clip(Small)	2		
Electrical Accessory Pouch		1	1
Accessory Pipe Pouch			1

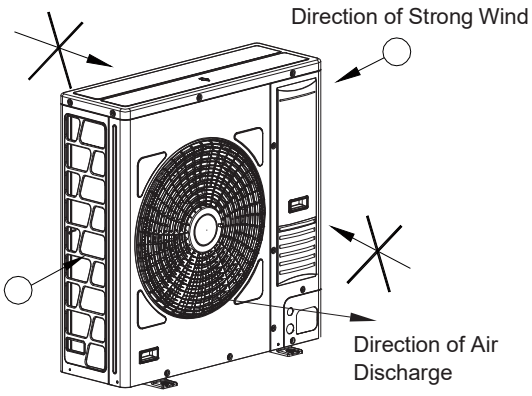
NOTE

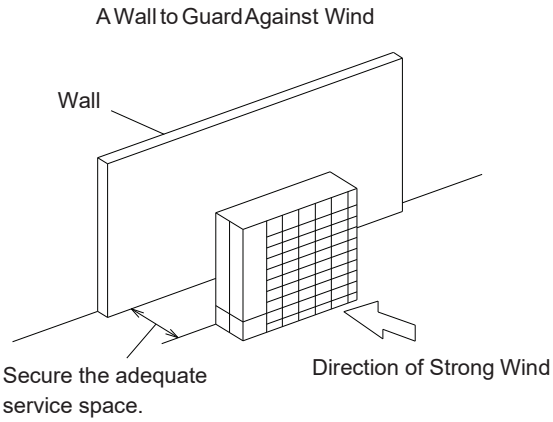
If any of these accessories are not packed with the unit, please contact your contractor.

4.3 Initial Check

- Install the outdoor unit where good ventilation is available, and where it is dry .
- Install the outdoor unit where the sound or the discharge air from the outdoor unit does not affect neighbors or surrounding vegetation. The operating sound at the rear or right/left sides is higher than the value in the catalog at the front side.
- Check to ensure that the foundation is flat, level and sufficiently strong.
- Do not install the outdoor unit where there is a high level of oil mist, salty air or harmful gases such as sulphur.
- Do not install the outdoor unit where the electromagnetic wave is directly radiated to the electrical box. Install the outdoor unit as far as possible, being at least 3 meters from the electromagnetic wave radiator. When installing the outdoor unit in snow-covered areas, mount the field-supplied hoods at the discharge side of the outdoor unit and the inlet side of the heat exchanger.
- Install the outdoor unit where it is in the shade or it will not be exposed to direct sunshine or direct radiation from high temperature heat source.
- Do not install the outdoor unit where dust or other contamination could block the outdoor heat exchanger. Install the outdoor unit in a space with limited access to general public.
- Do not install the outdoor unit in a space where a seasonal wind directly blows to the outdoor heat exchanger or a wind from a building space directly blows to the outdoor fan.

Example: AVW-41HJFHH1





- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.

NOTE:
If the extreme strong wind blows directly against the air discharge portion, the fan may rotate reversely and be damaged.

⚠CAUTION

Aluminum fins have very sharp edges. Pay attention to the fins to avoid any injury.

NOTE

Install the outdoor unit on a roof or in an area where people except service engineers can not touch the outdoor unit.

4.4 Installation Work

(1) Secure the outdoor unit with the anchor bolts.

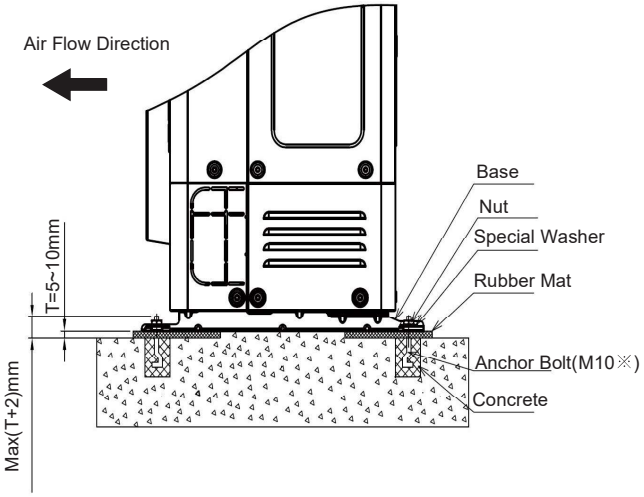


Fig. 4.5 Installation of Anchor Bolts

Fix the outdoor unit to the anchor bolts by special washer of factory-supplied accessory.

※The value is M12 for AVW-76/96/114HKFHH2.

(2) Fix the outdoor unit firmly so that declining, making noise, and falling down by strong wind or earthquake is avoided.

Example: AVW-41HJFHH1

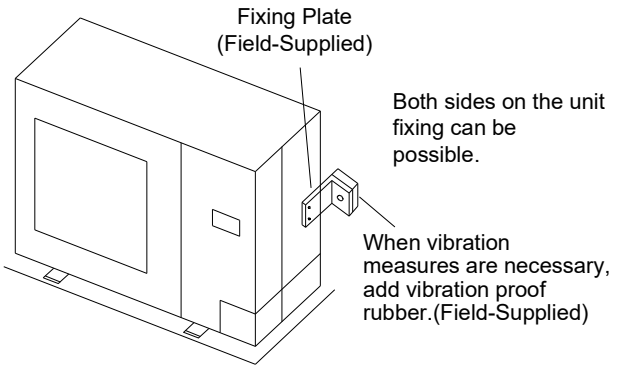
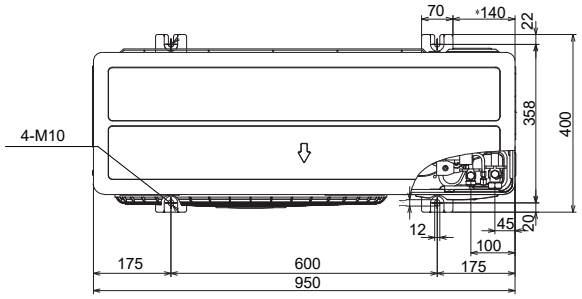


Fig. 4.6 Additional Fixing Arrangement

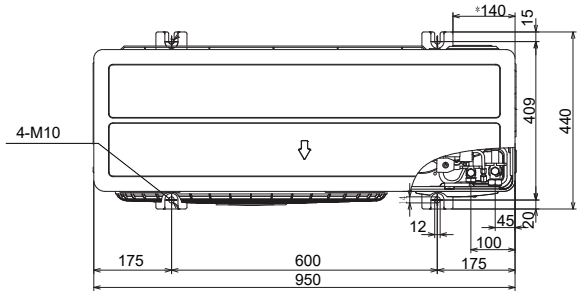
(3) When installing the outdoor unit, fix the unit by anchor bolts. Refer to Fig. 4.7.

Unit: mm

- AVW-41/48/54HJFHH1



- AVW-41/48/54HJ(K)FHH2



- AVW-76/96/114HKFHH2

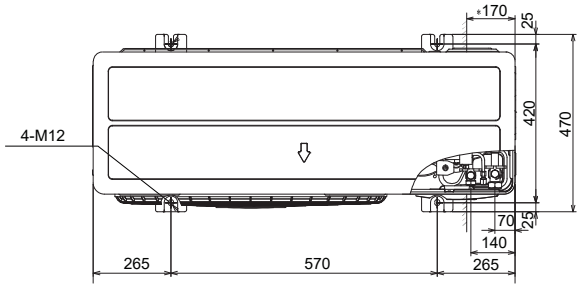


Fig. 4.7 Position of Anchor Bolts

NOTE:

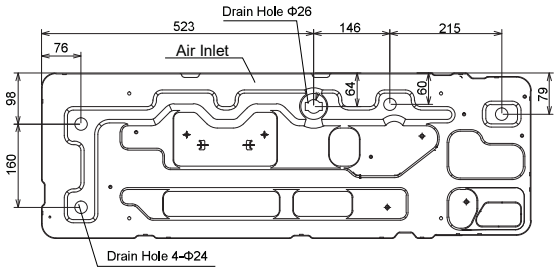
When the mark * dimension is secured, piping work from bottom side is easy without interference of foundation.

(4) When installing the unit on a roof or a veranda, drain water sometimes turns to ice in a cold morning. Therefore, avoid draining in an area where people often use because it is slippery.

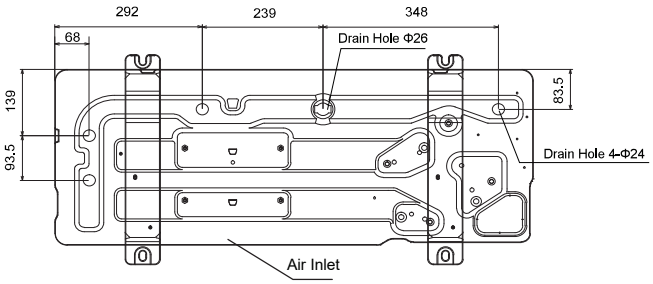
(5) In case of the drain piping is necessary for the outdoor unit, use the drain-kit (DC-01Q; DC-02Q: Optional Parts) .

Unit: mm

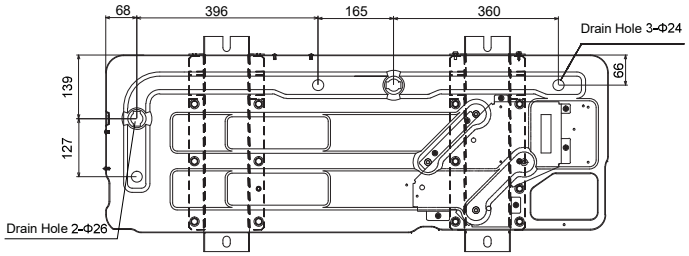
- AVW-41/48/54HJFHH1



- AVW-41/48/54HJ(K)FHH2



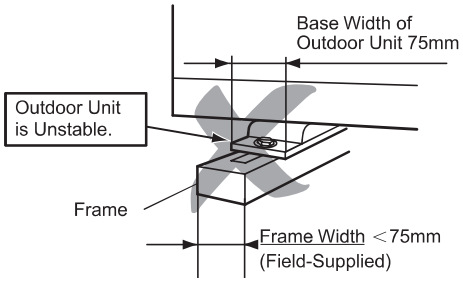
- AVW-76/96/114HKFHH2



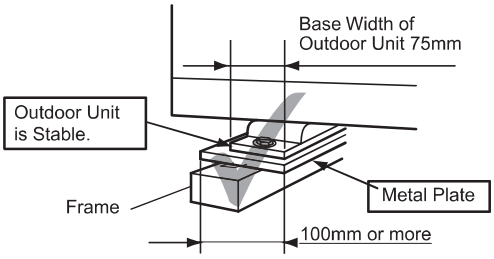
(6) The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned the same way.When installing the outdoor unit on a field-supplied frame, use metal plates to adjust the frame width for stable installation as shown in Fig. 4.8.

Unit: mm

Incorrect

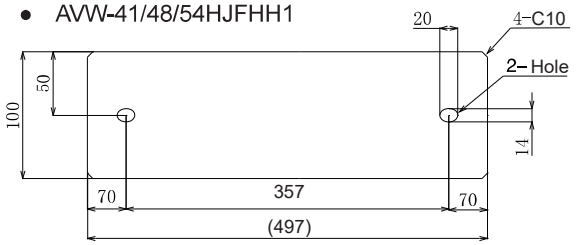


Correct



Recommended Metal Plate Size (Field-Supplied)
Material: Hot-Rolled Mild Steel Plate (SPHC) Plate
Thickness: 4.5T

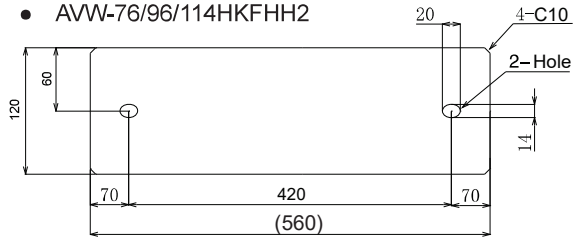
- AVW-41/48/54HJFHH1



- AVW-41/48/54HJ(K)FHH2



- AVW-76/96/114HKFHH2



5. Refrigerant Piping Work

⚠ DANGER

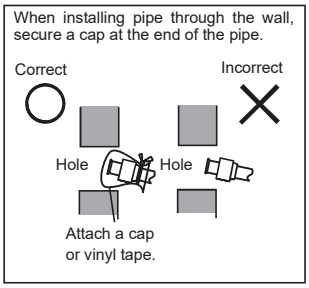
Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tightness test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.

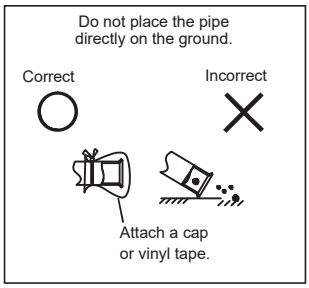
5.1 Piping Materials

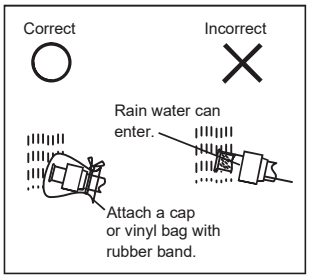
(1) Prepare locally-supplied copper pipes.
(2) Select the piping size from the Table 5.1.
(3) Select clean copper pipes. Make sure there is no dust and moisture inside of the pipes. Blow the inside of the pipes with nitrogen or dry air, to remove any dust or foreign materials before connecting pipes.

NOTE

- Cautions for Refrigerant Pipe Ends



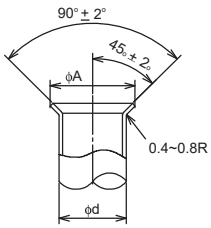




⚠ CAUTION

- Cap the end of the pipe when the pipe is to be inserted through a hole.
- Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.

- Flaring Dimension
  Perform the flaring work as shown below.



Diameter (Φd)	A $^{+0}_{-0.4}$
	R410A
6.35	9.1
9.53	13.2
12.7	16.6
15.88	19.7
19.05	(*)

(*) It is impossible to perform the flaring work with 1/2H material. In this case, use an accessory pipe (with a flare).

- Piping thickness and material use the pipe as below.

Table 5.1 Piping Size (mm)

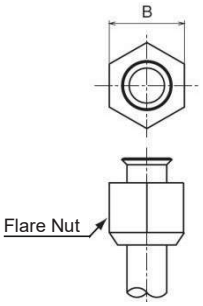
Diameter	R410A	
	Thickness	Material
Φ6.35	0.8	O material
Φ9.53	0.8	O material
Φ12.7	0.8	O material
Φ15.88	1.0	O material
Φ19.05	1.0	1/2H material
Φ22.2	1.0	1/2H material
Φ25.4	1.0	1/2H material
Φ28.6	1.0	1/2H material

Material is based on a JIS standard (JIS B8607).

- Flare nut dimension use the flare nut as below.

<Flare Nut Dimension B (mm)

Diameter	R410A
Φ6.35	17
Φ9.53	22
Φ12.7	26
Φ15.88	29
Φ19.05	36

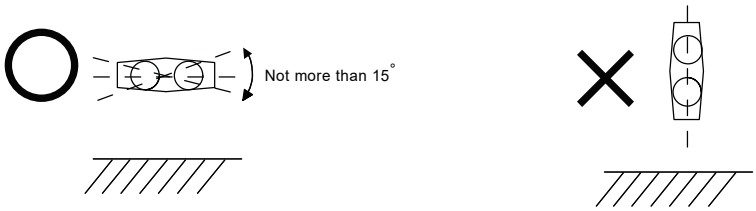


5.2 Refrigerant Piping Work

Ensure that the directions for refrigerant piping work according to " Design: 3.1 Connection of Refrigerant Pipes".

5.3 Direction of branch pipe

Place the branch pipe horizontally towards the ground (within ±15°) as shown in the figure.



5.4 Piping Connection

Pipes can be connected from 4 directions.

Example: AVW-41HJFHH1

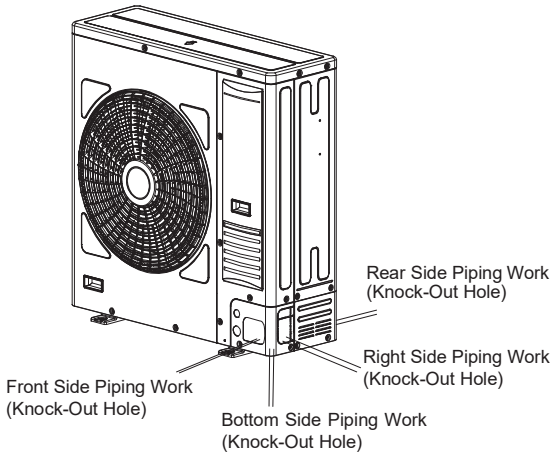


Fig. 5.1 Piping Direction

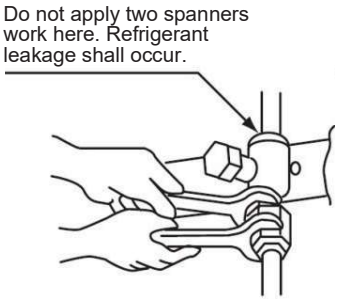
(1) Confirm that the valve is closed.

(2) Prepare a field-supplied elbows and pipes.
According to the operation requirements for connecting by braze and flare nuts.

(3) For the pipe connection at the stop valve, use two spanners to tighten the nut.



Double Spanner Work



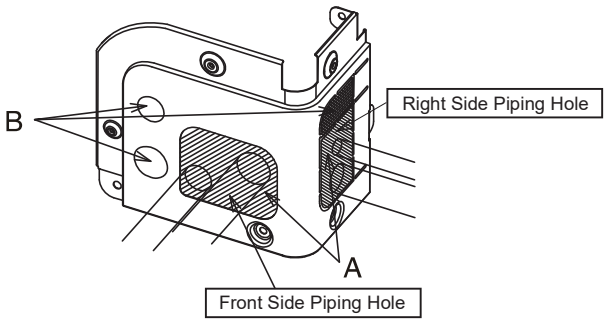
Tightening Work for Stop Valve

Tightening Torque for Flare Nut:

Pipe Size	Torque
Φ 6.35 (1/4)	14~18N·m
Φ 9.53 (3/8)	34~42N·m
Φ 12.7 (1/2)	49~61N·m
Φ 15.88 (5/8)	68~82N·m
Φ 19.05(3/4)	100~120N·m

(4) Pipes can be connected from 4 directions as shown Fig. 5.1. Make a knock-out hole in the front pipe cover or bottom base to pass through the hole. After removing the pipe cover from the unit, punch out the holes following the guide line with screwdriver and a hammer. Then, cut the edge of the holes and attach insulation (Field-Supplied) for cables and pipes protection.

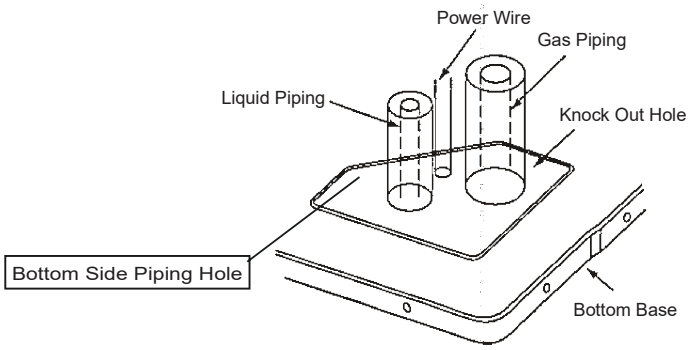
(a) Connect Front and Right Side Pipe
Select the correct knock-out size depending on whether it is for pewer wiring or transition wiring.



It is available to correct the liquid or gas piping, power wiring less than 14mm² and transition wiring form “B” part.

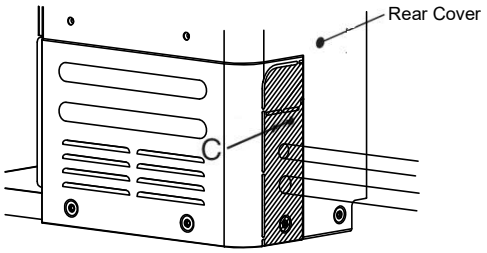
NOTE:
When using conduit, check to the tube size before removing “B” part.

(b) Bottom Side Piping Work
After removing bottom of the piping cover, perform piping and wiring works.



NOTE:
Prevent the cables from coming into direct contact with the piping.

(c) Rear Piping Work
After removing rear piping cover, punch out the “C” holes along the guide line.



NOTE:
To avoid damage protect cables and pipes with adequate insulation (Field-Supplied).

(5) To protect gaps use a rubber bush and insulation(Field-Supplied) adequately when installing the piping cover. Cut the lower side guide line of the piping cover when attaching work is difficult. If not, it will be included water in the unit and electrical parts will be damaged.

(6) Use a pipe bender or elbow(Field-Supplied) for bending work when connecting pipe.

5.5 Air-Tightness Test

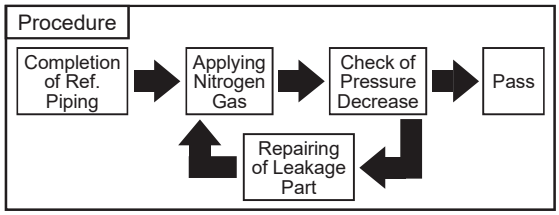
(1) The stop valve has been closed before shipment, however, make sure that the stop valves are closed completely.

(2) Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping.
Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc. (If touched, abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length.)

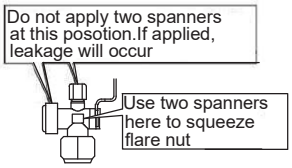
(3) Apply the oil thinly at the seat surface of the flare nut and pipe before tightening. And when tightening the flare nut, use two spanners.

Refrigerant Oil is field-supplied.

Model: α68HES-H (Ether Oil)
Manufacturer: IDEMITSU KOSAN Co., Ltd.



(4) Stop Valve
Operation of the stop valve should be performed according to the below.

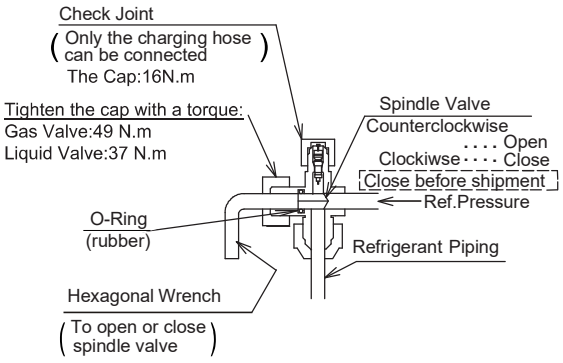


Spindle Valve Torque (N·m)

Gas	Liquid
11~14	7~9

Hexagonal Wrench Size (mm)

Gas	Liquid
5 ~ 8	4



⚠CAUTION

- Do not apply an abnormal big force to the spindle valve at the end of opening(5.0N·m or smaller). The back seat construction is not provided.
- Do not loosen the stop ring. If the stop ring is loosened, it is dangerous, since the spindle will hop out.
- At the test run, fully open the spindle. If not fully opened, the devices will be damaged.

(5) Connect the gauge manifold using charging hoses with a nitrogen cylinder to the check joints of the liquid line and the gas line stop valves.
Perform the air-tightness test.
Do not open the stop valves.
Apply nitrogen gas pressure of 4.15MPa.

(6) Check for any gas leakage at the flare nut connections, or brazed parts by gas leak detector or foaming agent.

(7) After the air tight test, release nitorogen gas.

5.6 Vacuum Pumping and charge refrigerant

(1) Connect a mani-fold gauge to the check joints at the gas valve and liquid valve sides.
Continue vacuum pumping work until the pressure reaches 756mmHg or lower for one to two hours.

(2) After vacuum pumping work, stop the mani-fold valve's valve, stop the vacuum pump and leave it for one hour.
Check to ensure that the pressure in the mani-fold gauge does not increase.

(3) Fully open the gas valve and liquid valve.

(4) Add refrigerant according to the piping diameter and piping length in the field connecting.

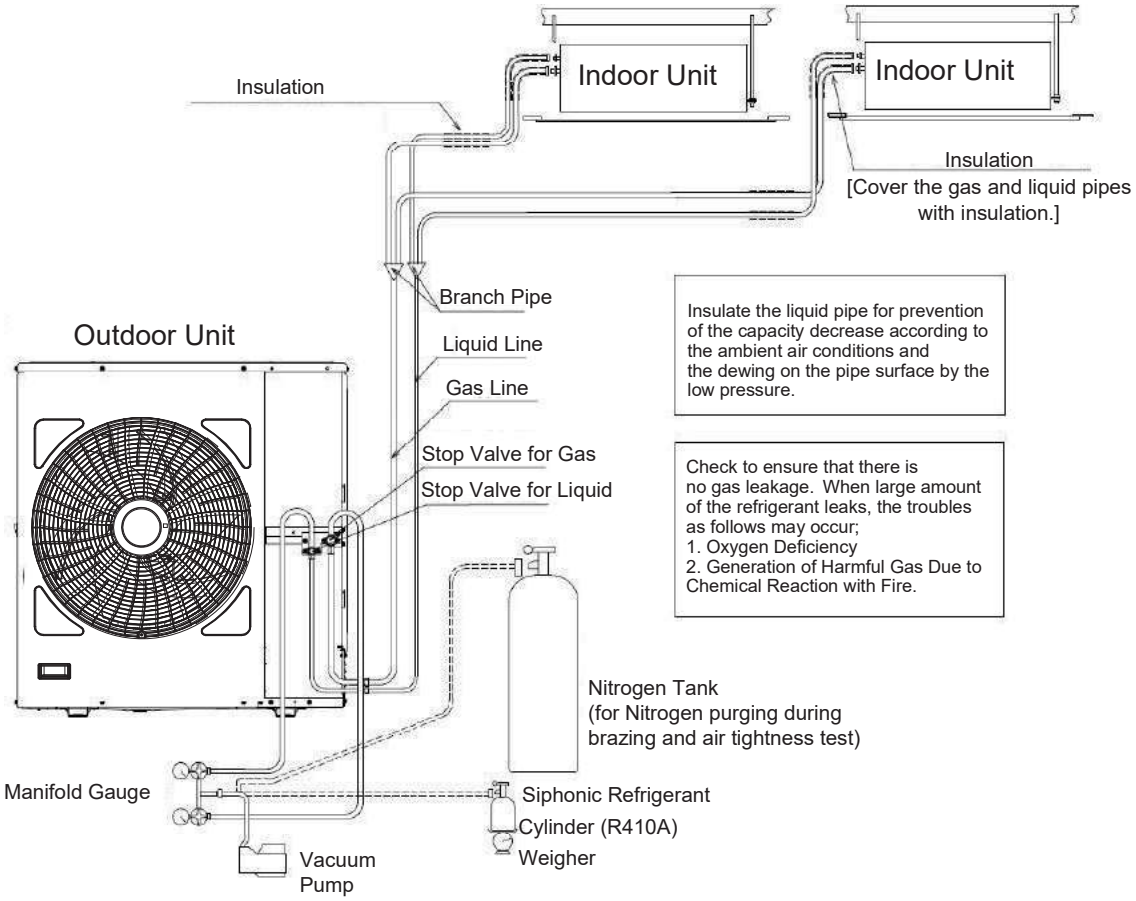
(5) Check for any gas leakage by gas leak detector or forming agent. Use the foaming agent which does not generate the ammonia (NH3) by chemical reaction. The recommended forming agent are as shown below. Do not use general household detergent for checking.

Foaming Agent	Manufacturer
SNOOP	NUPRO (U.S.A.)
Gupoflex	YOKOGAWA & CO., LTD

NOTES:

1. When the spindle cap for stop valve is removed, the gas accumulated at O-ring or screws is released and may make sound. This phenomenon is NOT a gas leakage.
2. This unit is only for the refrigerant R410A. The manifold gauge and the charging hose should be exclusive use for R410A.
3. If vacuum degree of -0.1MPa (760mmHg) is not available, it is considered of gas leakage or entering moisture. Check for any gas leakage once again. If no leakage exists, operate the vacuum pump for more than one to two hours.

   Never use the refrigerant charged in the outdoor unit for air purging. Insufficient refrigerant will lead to failure.
   Example: AVW-41HJFHH1



⚠CAUTION

- At the test run, fully open the spindle. If not, the devices will be damaged.
- An excess or a shortage of refrigerant is the main cause of trouble to the units.
  Charge the correct refrigerant quantity according to the description of label at the inside of service cover.
- Check for refrigerant leakage carefully. If a severe refrigerant leakage occurs, it will cause difficulty with breathing, or harmful gases would generate when there is open fire in the room.

NOTE

Fill in the label attached to the unit with the amount of refrigerant charged and Tonnes of CO_2 equivalent of fluorinated greenhouse gases contained on the installation.

NOTE

- This equipment Contains fluorinated greenhouse gases.
- Refrigerant: R410A ,
  global warming potential (GWP) value : 2088.
- Weight (kg) of Refrigerant charged before shipment:
  Reference to the nameplate [_ _ _] ① kg.
- Weight (kg) of Refrigerant charged additionally on site:
  Reference to the manual [_ _ _] ② kg.
- Weight (kg) of Refrigerant charged totally:
  ③=(①+②), [_ _ _] kg.
- Tonnes of CO_2 equivalent of fluorinated greenhouse gases contained :③×2088/1000, [_ _ _] tCO_2eq.

H7D09278A

⚠WARNING

- **Only use R410A as refrigerant. Other substances may cause explosions and accidents.**
- **R410A is fluorinated greenhouse gases . Its global warming potential (GWP) value is 2088.**
  Do NOT vent these gases into the atmosphere.
- **Tonnes of CO_2 equivalent of fluorinated greenhouse gases contained is calculated by GWP value of the refrigerant × Total refrigerant charge [kg] / 1000 in the label.**

5.7 Caution of the Pressure by Check Joint

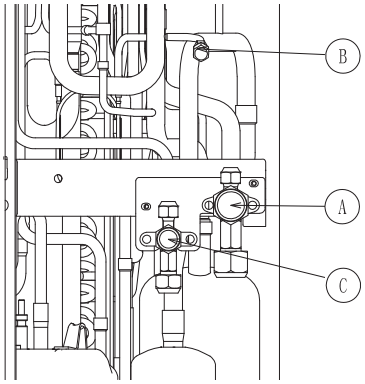
When the pressure is measured, use the check joint of gas stop valve ((A) in the figure below) and use the check joint of liquid piping ((C) in the figure below) .

At that time, connect the pressure gauge according to the following table because of high pressure side and low pressure side changes by operation mode.

	Cooling Operation	Heating Operation
Check Joint for Gas Stop Valve “A”	Low Pressure	High Pressure
Check Joint for Piping “B”	High Pressure	Low Pressure
Check Joint for Liquid Stop Valve “C”	Exclusive for Vacuum Pump and Refrigerant Charge	

NOTE:

Be careful that refrigerant and oil do not splash to the electrical parts at removing the charge hoses.



- Special Attention Regarding Refrigerant Gas Leakage

Pay attention to the critical gas concentration to avoid accidental refrigerant gas leakage before installing air conditioning systems.

$$\frac{\text{R: Total Quantity of Charged Refrigerant (kg)}}{\text{V: Room Volume (m}^3\text{)}} \leq \text{C: Critical Concentration (0.42kg/m}^3\text{)}$$

* This value should be decided according to the each country’s regulation such as ISO5149, EN378 and ASHRAE Standard 15. In the case that the calculated critical concentration is higher than this value, take the following actions:

1) Provide a gas leakage detector and exhaust fan controlled by its gas leakage detector.

2) Provide effective opening in the wall or door for ventilation to next door so that the critical gas concentration can be maintained lower than the above value. (Provide an opening with area greater than 0.15% of the floor surface at the lower part of a door.)

⚠CAUTION

1. Maximum Permissible Concentration of HFC GAS R410A
   The refrigerant R410A is an incombustible and non-toxic gas.However, if leakage occurs and gas fills a room, it may cause suffocation.Once leakage occurs, it is a must to take effective actions to make the concentration of R410A lower than 0.42 kg/m^3.
2. Calculation of Refrigerant Concentration

(1) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of target rooms.

(2) Calculate the volume of the room installing this unit V (m^3).
Calculate the refrigerant concentration C (kg/m^3) of the room according to the above equation.

(3) Please follow local codes or regulations, if any.

5.8 Collecting Refrigerant

When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows.(The following figure shows a single fan unit.)

(1) Attach the manifold gauge to the gas stop valve and the liquid stop valve.

(2) Turn ON the power source.

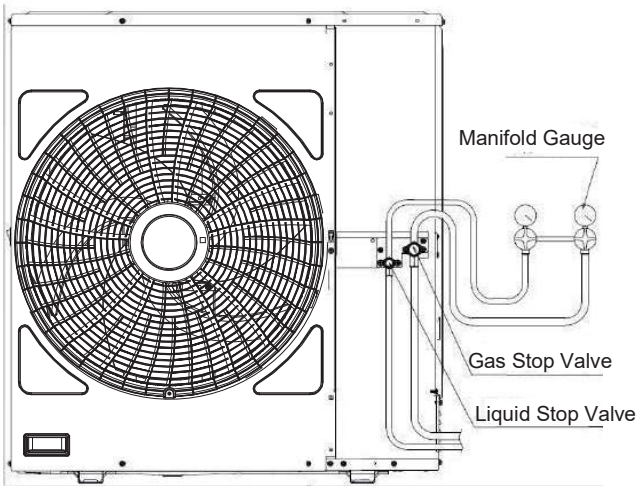
(3) Set the DSW1-1 pin of the outdoor unit PCB at the “ON” side for cooling operation. Close the liquid stop valve and collect the refrigerant.

(4) When the pressure at lower pressure side (gas stop valve) indicates 0.09MPa , perform the following procedures immediately.

* Close the gas stop valve.
* Set the DSW1-1 pin at the “OFF” side(To stop the unit operation).

(5) Turn OFF the power source.

Example: AVW-41HJFHH1



⚠CAUTION

Measure the low pressure by the pressure gauge and keep it not to decrease lower than 0.09 MPa. If the pressure is lower than 0.09 MPa, the compressor may be faulty.

6. Electrical Wiring

⚠WARNING

- **Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 10 minutes before electrical wiring work or a periodical check is performed.**
- **Check to ensure that the indoor fan and the outdoor fan have stopped before electrical wiring work or a periodical check is performed.**
- **Protect the wires, electrical parts, etc. from rats or other small animals.**
  If not protected, rats may gnaw at unprotected parts and at the worst, a fire will occur.
- **Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not do, the wires will be damaged and at the worst, a fire will occur.**

⚠CAUTION

- Tightly secure the power source wiring using the cord clamp inside the unit.

6.1 General Check

(1) Make sure that the field-selected electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data. Make sure that the components comply with National Electrical Code (NEC).

(2) Check to ensure that the voltage of power supply is within ±10% of nominal voltage and earth phase is contained in the power supply wires. If not, electrical parts will be damaged.

(3) Check to ensure that the capacity of power supply is enough. If not, the compressor will be not able to operate cause of voltage drop abnormally at starting.

(4) Check to ensure that the earth wire is connected.

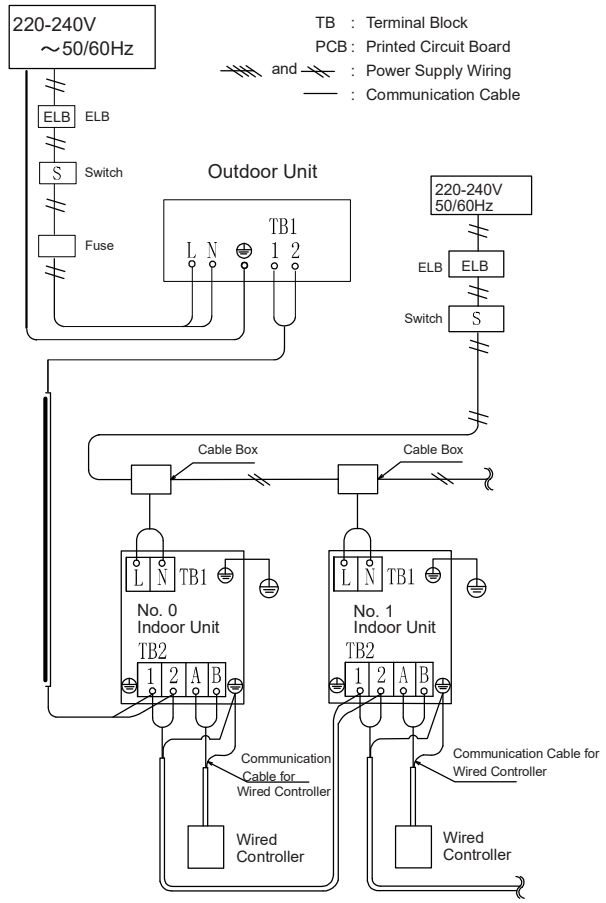
(5) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.

6.2 Electrical Wiring Connection

(1) Connect the power supply wires to the terminal board in the electrical control box of both outdoor unit and indoor unit. And connect the earth wire to the electrical control box of outdoor unit. In addition, connect the earth wire to earth screw in the electrical control box of indoor unit. Refer to Fig. 6.1.

(2) Connect the wires between the outdoor and indoor units to terminals 1 and 2 on the terminal board. If power supply wiring is connected to 1 and 2 of terminal board, printed circuit board will be damaged.

SINGLE-PHASE



THREE-PHASE

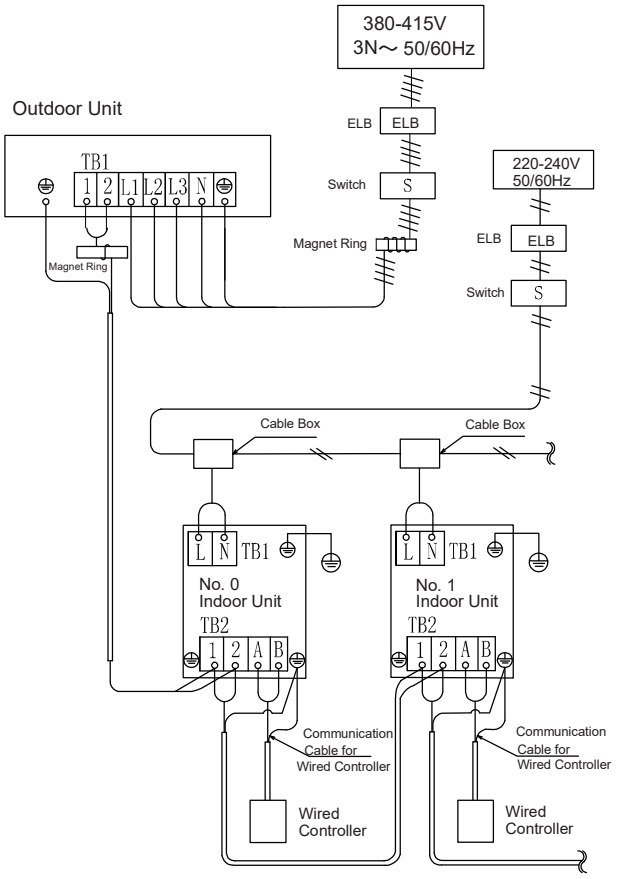


Fig. 6.1 Wiring Connection for Indoor & Outdoor

(3) Do not wire in front of the fixing screw of the service panel. If do, the screw can not be removed.

(4) Use shielded twisted pair for communication wire connecting the indoor unit and outdoor unit, respectively connected to the 1 and 2 terminals of the terminal block between the indoor and outdoor unit. Connect the communication wire of the wired controller to the A and B terminals of the indoor unit terminal block.

⚠WARNING

- **Install an ELB in the power source. If ELB is not used, it will cause electric shock or fire at the worst.**
- **The tightening torque of each screw shall be as follows.**

M4: 1.0 to 1.3 N·m
M5: 2.0 to 2.5 N·m
M6: 4.0 to 5.0 N·m
M8: 9.0 to 11.0 N·m
M10: 18.0 to 23.0 N·m

Keep the above tightening torque when wiring work.

NOTES:

1. In case of total wiring length at intermediate wiring between outdoor unit and indoor unit and between indoor units is less than 100m, it is possible to use the normal wiring (more than 0.75mm²) except shielded twist pair.
2. Total wiring length for remote control switch can be extended up to 500m.
   If total wiring length less than 30m, it is possible to use the normal wiring (0.3mm²) except shielded twist pair.
3. Power source wiring is fundamentally according to this method.

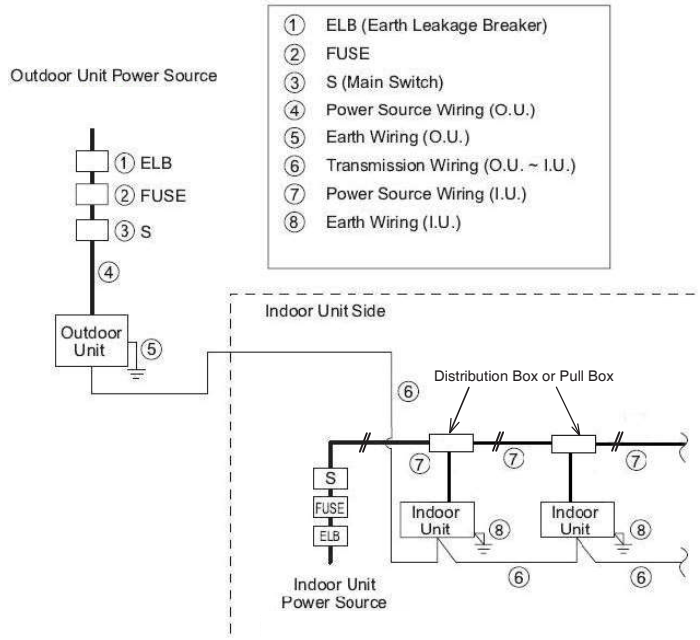
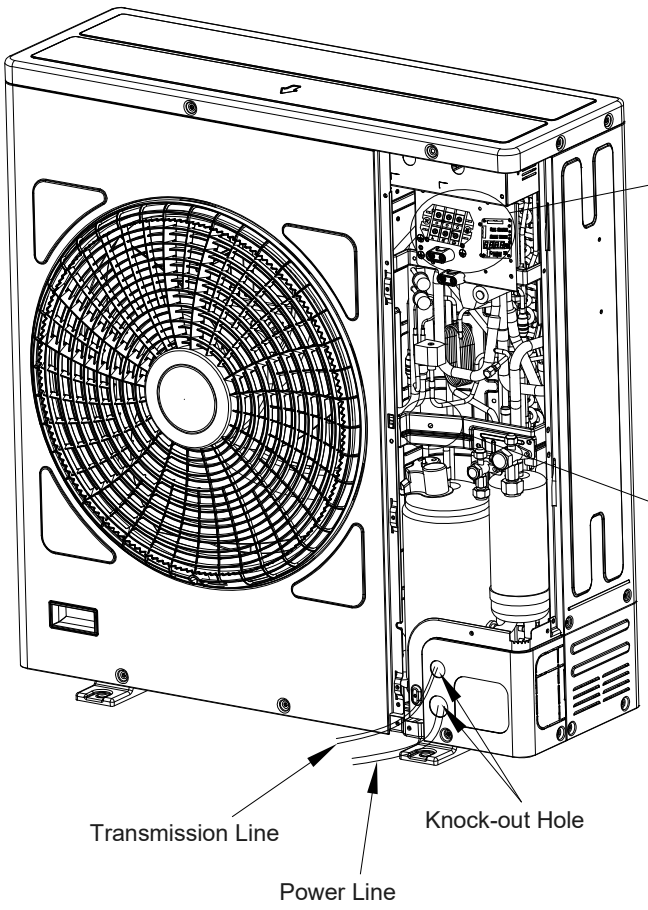


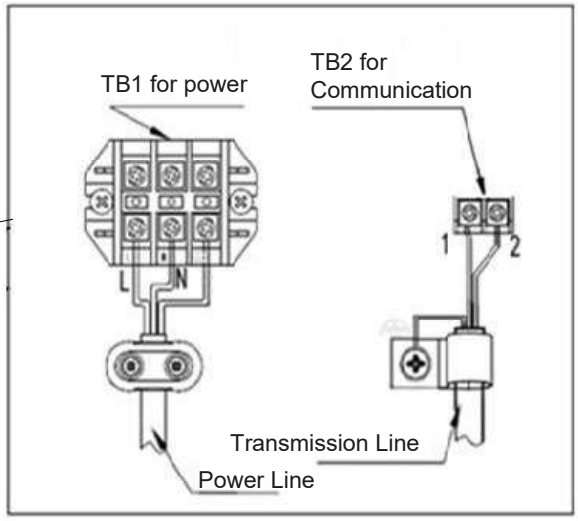
Fig. 6.2 Wiring Connection

(5) The recommended ELB、FUSE sizes etc. are shown in "Design: 2.7 Electrical Data".

(6) In the case that a conduit tube for field-wiring not used, fix rubber bushes with adhesive on the panel.

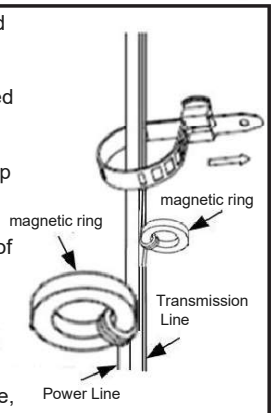
Model:AVW-41/48/54HJFHH1





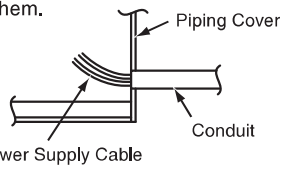
Fastening method of power line and communication line:

1. Fasten the power line and communication line through the fixed clamp (unit accessories), as shown in the right figure.
2. Install the fixing clamp on the stop valve plate to avoid contact with compressor or other high temperature parts and sharp edge of the plate.
3. Power line: 1 magnetic ring, 4 turns of wire through the core, as shown in the right figure.
4. Communication line: 1 magnetic ring, 4 turns of wire through the core, as shown in the right figure.

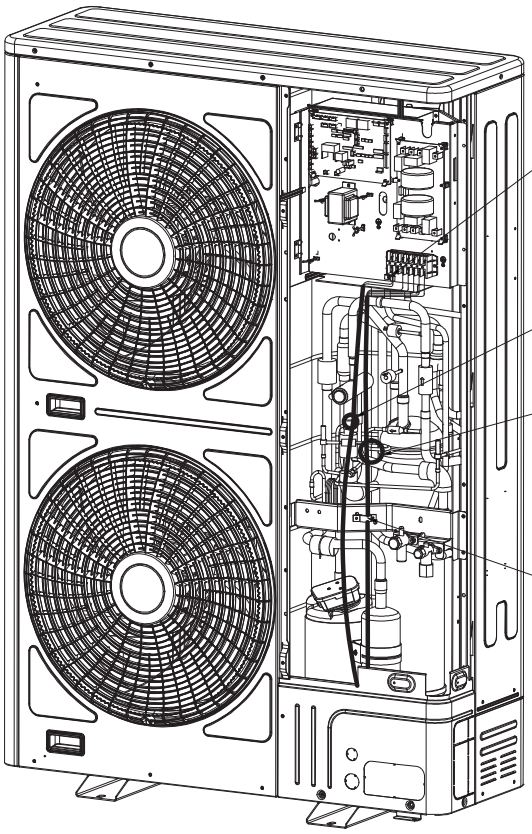


CAUTION:

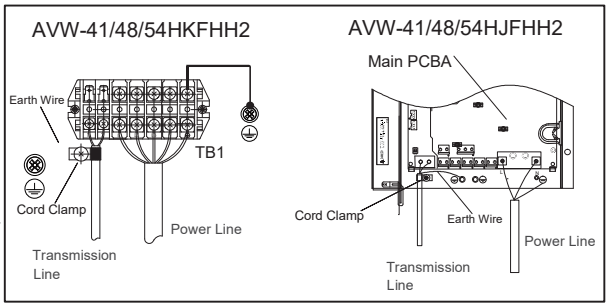
When using conduit, do NOT lead it in the outdoor unit. If the conduit wiring touches the compressor and refrigerant cycle in the outdoor unit, it may cause damage to them.



Model: AVW-41/48/54HJ(K)FHH2

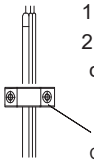


Terminal block for power source and control circuit



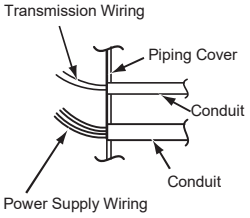
Transmission Wire(Install the small magnetic ring by winding the wire around it for 3 times. Note: The small magnetic ring is applicable only for AVW-41/48/54HKFHH2)

Power Supply Line(Install the big magnetic ring by winding the wire around it for 3 times.)

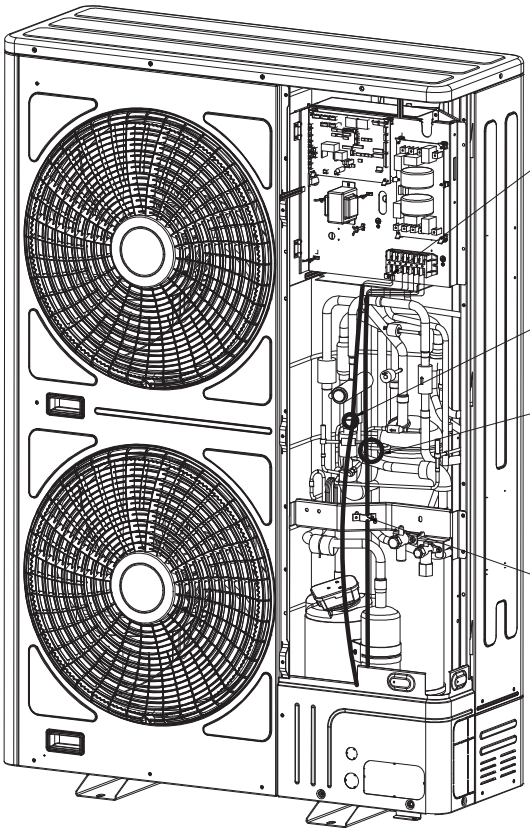


1. Fix the wire as shown in the figure on the left.
2. Tie the wires properly to avoid contact with compressor, refrigerant pipe and rear cover.

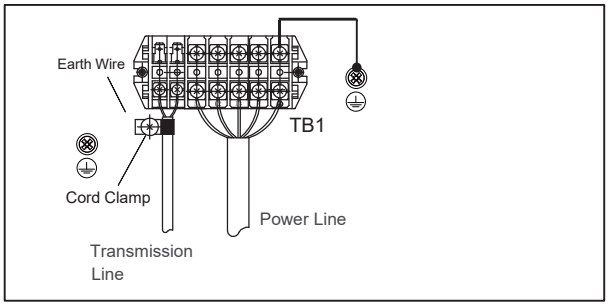
CAUTION:
When using conduit, do NOT lead it in the outdoor unit. If the conduit wiring touches the compressor and refrigerant cycle in the outdoor unit, it may cause damage to them.



Model: AVW-76/96/114HKFHH2

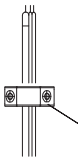


Terminal block for power source and control circuit



Transmission Wire(Install the small magnetic ring by winding the wire around it for 3 times.

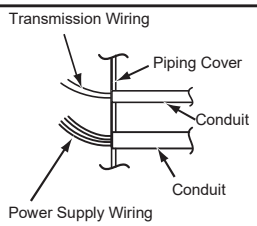
Power Supply Line(Install the big magnetic ring by winding the wire around it for 3 times.)



1. Fix the wire as shown in the figure on the left.
2. Tie the wires properly to avoid contact with compressor, refrigerant pipe and rear cover.

Cord Clamp

CAUTION:
When using conduit, do NOT lead it in the outdoor unit. If the conduit wiring touches the compressor and refrigerant cycle in the outdoor unit, it may cause damage to them.



⚠CAUTION

Pay attention to the followings to run through the cables under the unit using conduit.

1. Do not lead the power supply wiring and transmission wiring through the same conduit tube. Moreover, keep at least 50mm between the power supply wiring and transmission wiring.
2. Cut cross line at rubber bush and securely attach it to the knock-out hole for cable protection.
3. Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit.
4. Completely seal the end of conduit tube with sealing materials to avoid entrance rain into the conduit tube. Make a drain hole at the lowest part of the conduit tube.

⚠CAUTION

Tightly secure the power source wire by cord clamp inside the unit.

■ Field Minimum Wire Sizes for Power Source of Indoor Unit.

- Connect correct series indoor unit.
- Use an ELB (Earth Leakage Breaker). If not used, it will cause an electric shock or a fire.
- Do not operate the system until all the check points have been cleared.

⚠CAUTION

Install a multi-pole main switch with a space of 3.0mm or more between each phase.

7. Test Run

Test run should be performed according to the Table 7.1 . And use the Table 7.2 for recording test run.

⚠WARNING

- **Do not operate the system until all the check points have been cleared.**

(A) Check and confirm Ref. pipe system and communication wire link to same Ref. cycle system.

(B) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.

(C) Check to ensure that the stop valves of the outdoor unit are fully opened, and then start the system.

(D) Check to ensure that the switch on the main power source has been ON for more than 1 hours, to warm the compressor oil by the oil heater.

- **Pay attention to the following items while the system is running.**

(A) Do not touch any of the parts by hand at the discharge gas side, since the compressor chamber and the pipes at the discharge side are heated higher than 90°C.

(B) DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES). It will cause a serious accident.

- **Do not touch any electrical components within three minutes after turning OFF the main switch.**
- **Operate every indoor unit one by one, check and confirm their Ref. cycle and connect wire joint to same Ref. cycle system.**

Table 7.1 Checking of Wire Connection by Test Run

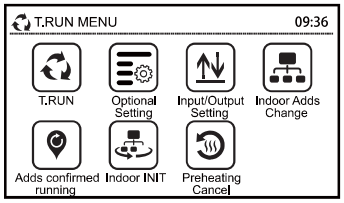
<Example: HYXE-J01H>

(1) Turn ON the power supply for all the indoor units.

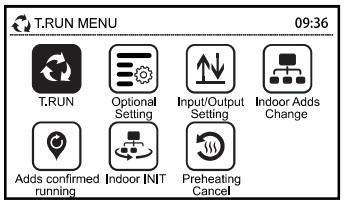
(2) For the models with the auto-address function, wait for 3 minutes approximately. The addressing is automatically performed. (There is a case that 5 minutes is required according to the setting condition.) After that, select using language from “Menu”. Refer to the operation manual for details.

(3) Press and hold “□” (menu) and “↩” (return) simultaneously for at least 3 seconds.

a. The test run menu will be displayed.

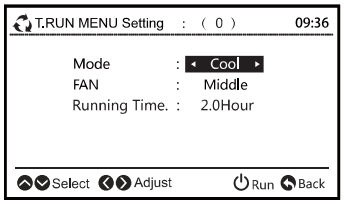


b. Select “ ” and press “ ”. The test run settings will be displayed.

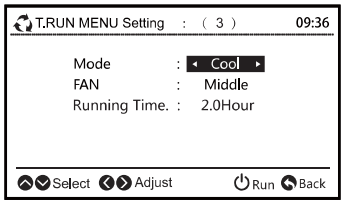


NOTE

When “ 0 ” is indicated, the auto-address function may be performing. Cancel “Test Run” mode and set it again.



(4) The total number of the indoor units connected is indicated on the LCD (liquid crystal display). The case of the twin combination (one (1) set with two (2) indoor units) is indicated " 2 " , and the triple combination (one (1) set with three (3) indoor units) is indicated " 3 ".



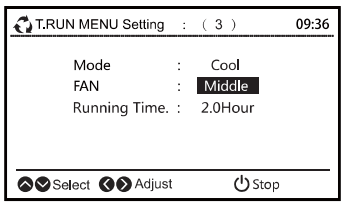
a. If the indicated number is not equal to the actual connected number of indoor unit, the auto-address function is not performed correctly due to incorrect wiring, the electric noise or etc. Turn OFF the power supply and correct the wiring after checking the following points; (Do not repeat turning ON and OFF within 10 seconds.)

- Power supply for indoor unit is not turned ON or incorrect wiring.
- Incorrect connection of connecting cable between indoor units or incorrect connection of controller cable.
- Incorrect setting of rotary switch and dip switch (the setting is overlapped) on the indoor units PCB.

b. Press "⏻" (run/stop) to start the test run.

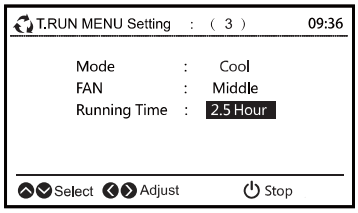
c. Press " < > ∧ ∨ " and set each item.

(5) Press "⏻" (run/stop). At this time, 2-hour OFF timer will be set automatically.



(6) The temperature detections by the thermistors are invalid though the protection devices are valid during the test run.

(7) To finish the test run, press "⏻" (run/stop) again or pass over the set test run time. When changing the test run time, press "∧" or "∨" to select "Running Time". Then, set the test run time (30 to 600 minutes) by pressing "<" or ">".



- The RUN indicator on the remote control switch flashes when some abnormalities such as protection devices activated occur during the test run as well as the RUN indicator (red) on the indoor unit flashes (0.5 second ON/ 0.5 second OFF). Additionally, the alarm code, the unit model code and connected number of indoor units will be displayed on the LCD as shown in the figure below. If the RUN indicator on HYXE-J01H flashes , it may be a failure in the transmission between the indoor unit and the remote control switch (loosening of connector, disconnecting wiring or breaking wire, etc.). Consult to authorized service engineers if abnormality can not be recovered.

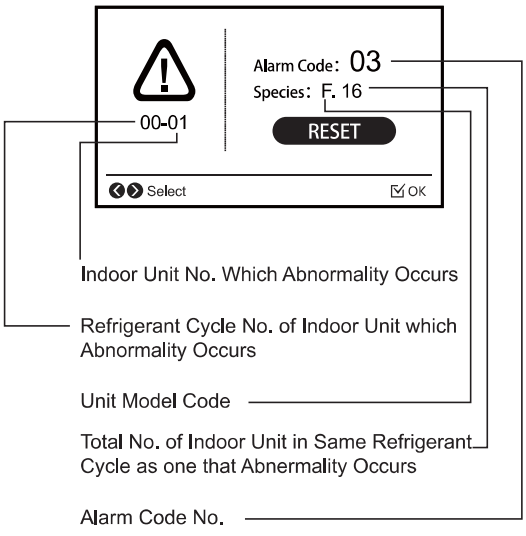


Table 7.2 Test Run and Maintenance Record

MODEL:	SERIAL. No.	COMPRESSOR MFG. No.
CUSTOMER'S NAME AND ADDRESS:		DATE:

1. Is the rotation direction of the indoor coil fan correct? ☐
2. Is the rotation direction of the outdoor coil fan correct? ☐
3. Are there any abnormal compressor sounds? ☐
4. Has the unit been operated at least twenty (20) minutes? ☐
5. Check Room Temperature

Inlet:	No. 1 DB /WB °C,	No. 2 DB /WB °C,	No.3 DB /WB °C,	No.4 DB /WB °C
Outlet:	DB /WB °C,	DB /WB °C,	DB /WB °C,	DB /WB °C

6. Check Outdoor Ambient Temperature

Inlet:	DB °C,	WB °C
Outlet:	DB °C,	WB °C

7. Check Refrigerant Temperature

Liquid Temperature:	°C
Discharge Gas Temperature:	°C

8. Check Pressure

Discharge Pressure:	MPa
Suction Pressure:	MPa

9. Check Voltage

Rated Voltage:	V
Operating Voltage:	V,
Starting Voltage:	V

10. Check Compressor Input Running Current

Input: Running	kW
Current:	A

11. Is the refrigerant charge adequate? ☐
12. Do the operation control devices operate correctly? ☐
13. Do the safety devices operate correctly? ☐
14. Has the unit been checked for refrigerant leakage? ☐
15. Is the unit clean inside and outside? ☐
16. Are all cabinet panels fixed? ☐
17. Are all cabinet panels free from rattles? ☐
18. Is the filter clean? ☐
19. Is the heat exchanger clean? ☐
20. Are the stop valves open? ☐
21. Does the drain water flow smoothly from the drain pipe? ☐