Hisense

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TCY12023016A

Hisense

VRF AIR-CONDITIONER (HEAT PUMP)

TCY12023016A

Hisense

VRF AIR-CONDITIONER
⌈ HEAT PUMP ⌋

Technical, Installation and Service Handbook

Hi - Smart H5 SERIES

BASIC MODELS

Single Phase
AVW-41HJDH2H1
AVW-48HJDH2H1
AVW-54HJDH2H1

Three Phase
AVW-41HKDH2H1
AVW-48HKDH2H1
AVW-54HKDH2H1



TCY12023016A ▶▶ 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	*52DB	-10DB
Heating Operation	Indoor	30DB	15DB
	Outdoor	*26DB	-25DB

DB: Dry Bulb, WB: Wet Bulb

*52 DB:48~52 intermittent operation

*26 DB:23~26 intermittent operation

⚠ 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 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.

CONTENT

DESIGN

1. Introduction 1
1.1 Line-Up of Outdoor Unit 1
1.2 Application Case 2
1.3 Optional Accessories 4

2. General Data 6
2.1 Key Parameter 6
2.2 Component Data 8
2.3 Safety and Control Device Setting 9
2.4 Sound Data 10
2.5 Dimensional Data 11
2.6 Structure 12
2.7 Electrical Data 13

3. Piping System 14
3.1 Connection of Refrigerant Pipes 14
3.2 Pipe Connection Design Guidance 14
3.3 Calculation of Additional Refrigerant 17
3.4 Piping Connection Branch Pipe Dimensions (optional) 19

4. Capacities and Selection Data 20
4.1 Procedure for Selection of the System 20
4.1.1 Unique features of the system 20
4.1.2 Selection parameters 21
4.1.3 Check points for system installation 21
4.1.4 Selection procedure example 23
4.2 Capacity Correction Based on Refrigerant Piping Length 25
4.3 Correction Factor According to Defrosting Operation 27

5. Control System 28
5.1 Refrigerant Cycle 28
5.2 Control Logic 29
5.3 Standard Operation Sequence 30
5.4 Electrical Wiring Diagram 40

SERVICE

1. Troubleshooting 43
1.1 Initial Troubleshooting 43
1.1.1 Checking of Electrical Wiring and Power Supply 43
1.1.2 Checking of Rotary Switch and DIP Switch Settings 44
1.2 Troubleshooting Procedure 46
1.2.1 Checking of Using 7-Segment Display 46
1.2.2 Checking of Protection Control Information 56
1.2.3 Check Mode by Remote Control Switch 58
1.2.3.1 Check mode 58
1.2.3.2 Alarm History Display 64
1.2.4 Failure of Power Supply to Indoor Unit and Remote Control Switch 65
1.2.5 Abnormal Transmission between Remote Control Switch and Indoor Unit 66
1.2.6 Abnormalities of Devices 67
1.2.7 Troubleshooting by Alarm Code 76
1.2.8 Function of RSW, DSWs and LEDs 120
1.2.8.1 Arrangement Inside Electrical Box 120
1.2.8.2 LEDS and SEGS on PCB 122
1.2.9 Checking of Inverter PCB 124
1.2.10 Checking Method of Electronic Expansion Valve 127
1.2.11 Checking of DC Fan motor 127
1.2.12 Checking of Electrical Coil Resistance for each Electrical Components 128
1.2.13 Checking of Reversing Valve 128

2. Maintenance 129

2.1 Outdoor Unit——AVW-41/48/54HJDH2H1 AVW-41/48/54HKDH2H1 129
2.1.1 Removing Service Cover 129
2.1.2 Removing Air Outlet Grille 130
2.1.3 Removing Upper Cover 130
2.1.4 Removing Lower Service Cover and Rear Cover 131
2.1.5 Removing Outdoor Fan Motor 132
2.1.6 Removing Electrical Box 134
2.1.7 Removing Compressor 135
2.1.8 Removing Pressure Switch and Pressure Sensor 138
2.1.9 Opening Electrical Box(Attaching P-Plate) 139
2.1.10 Removing Reversing Valve Coil 140
2.1.11 Removing Electronic Expansion Valve Coil 141
2.1.12 Removing Solenoid Valve Coil (SVA) 142
2.1.13 Removing Reversing Valve 143
2.1.14 Removing Electronic Expansion Valve and Solenoid Valve 144
2.1.15 Removing Printed Circuit Board (Outdoor Unit PCB) 145
2.1.16 Removing Inverter PCB 146
2.1.17 Removing Other Electrical Components 147
2.2 Main Parts 148
2.2.1 Inverter 148
2.2.2 Electronic Expansion Valve for Outdoor Units 152
2.2.3 Pressure Sensor 153
2.2.4 Pressure Switch 154
2.2.5 Noise Filter (NF1) 155
2.2.6 Reactor (DCL) 156
3. External Input/Output and Function Setting 157
3.1 DIP Switch Settings of Outdoor Unit 157
3.2 External Input / Output Setting Method 158
3.3 External Input and Output Settings 161
3.3.1 Input Fixing Heating Operation Mode (Control Function No.1)
Input Fixing Cooling Operation Mode (Control Function No.2) 162
3.3.2 Input Demand Stoppage (Control Function No.3) 162
3.3.3 Input Outdoor Fan Motor Start/Stop (Control Function No.4) 163
3.3.4 Input Forced Stoppage (Control Function No.5) 164
3.3.5 Input Demand Current Control 60%, 70%, 80%, 100% (Control Function No.6 to 9) 164
3.3.6 Output Operation Signal (Control Function No.1) 166
3.3.7 Output Alarm Signal (Control Function No.2) 166
3.3.8 Output Compressor ON Signal (Control Function No.3) 167
3.3.9 Output Defrosting Signal (Control Function No.4) 167
3.4 Function Setting 168
3.4.1 Function Setting Item 169
3.4.2 Circulator Function at Heating Thermo-OFF (Function Setting “FA”) 170
3.4.3 Night Shift (Function Setting “ni”) 170
3.4.4 Cancellation of Outdoor Ambient Temperature Limit for Heating (Function Setting “GH”) 172
3.4.5 Cancellation of Outdoor Ambient Temperature Limit for cooling (Function Setting “GC”) 172
3.4.6 Change of Defrost Condition (Function Setting “Jo”) 173
3.4.7 SLo Defrost Setting (Function Setting “bJ”) 173
3.4.8 Priority Capacity Mode for Cooling (Function Setting “cU”) 173
3.4.9 Priority Capacity Mode for Heating (Function Setting “hU”) 174
3.4.10 Low Noise Setting (Function Setting “dB”) 174
3.4.11 Demand Function Setting (Function Setting “dE”) 175
3.4.12 Wave Function Setting (Function Setting “UE”) 175
3.4.13 Low Outlet Temperature Protection In Cooling Mode1 (Function Setting “Fb”) 176
3.4.14 One key open valve (Function Setting “F8”) 176
3.4.15 One-Key Refrigerant Recovery 177
4. Field Work Instructions 180
4.1 Caution for Refrigerant Type 180
4.2 Maintenance Work 181
4.3 Service and Maintenance Record by 7-Segment Display 182
4.4 Service and Maintenance Record by Wired Controller 183

4.5 Service and Maintenance Record 185
4.6 Saturation Curve for Refrigerant 186
4.7 Mollier Chart for R32 187
5. Test Run 188
5.1 Test Run by Remote Control Switch 188
5.2 Test Run from Outdoor Unit Side 189
5.3 Checking the Test Run 191
5.4 Checklist for Refrigerant System 192

APPENDIX

INSTALLATION

DESIGN

1. Introduction

1.1 Line-Up of Outdoor Unit

Capacity	HP	4	5	6
	kBtu/h	41.5	48.0	53.0
	kW	12.1	14.0	15.5
Model	Single Phase	AVW-41HJDH2H1	AVW-48HJDH2H1	AVW-54HJDH2H1

Capacity	HP	4	5	6
	kBtu/h	41.5	48.0	53.0
	kW	12.1	14.0	15.5
Model	Three Phase	AVW-41HKDH2H1	AVW-48HKDH2H1	AVW-54HKDH2H1

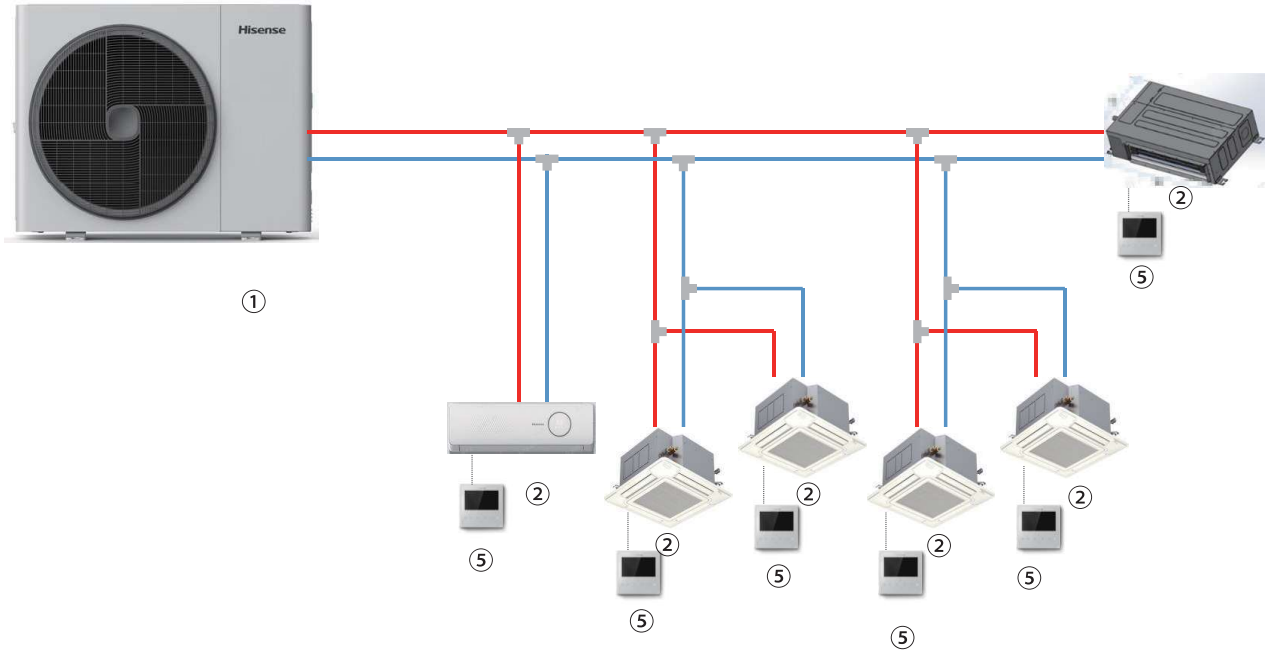


Model: AVW-41/48/54HJDH2H1
AVW-41/48/54HKDH2H1

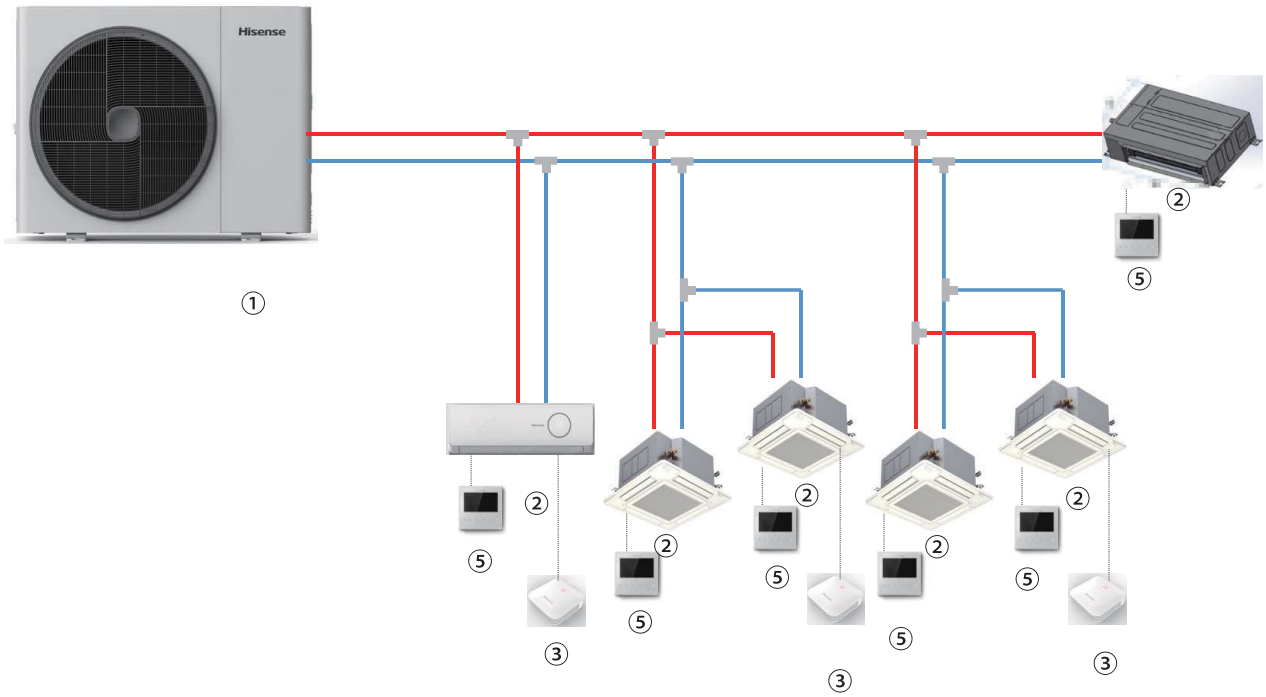
1.2 Application Case

There are 4 types of installation for the system, details refer to the Section 2.3 “SPECIAL REQUIREMENT FOR R32 UNIT” in the APPENDIX INSTALLATION part.

Application Case 1: no need to install ③ and ④

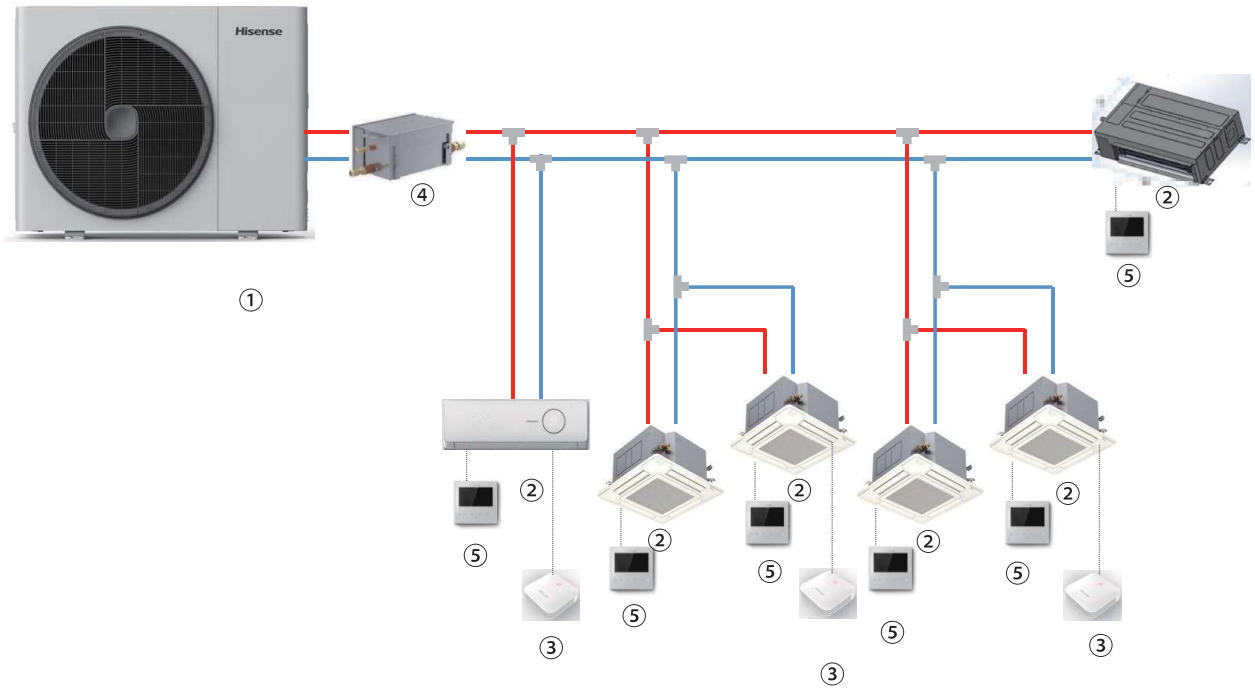


Application Case 2: need to install ③

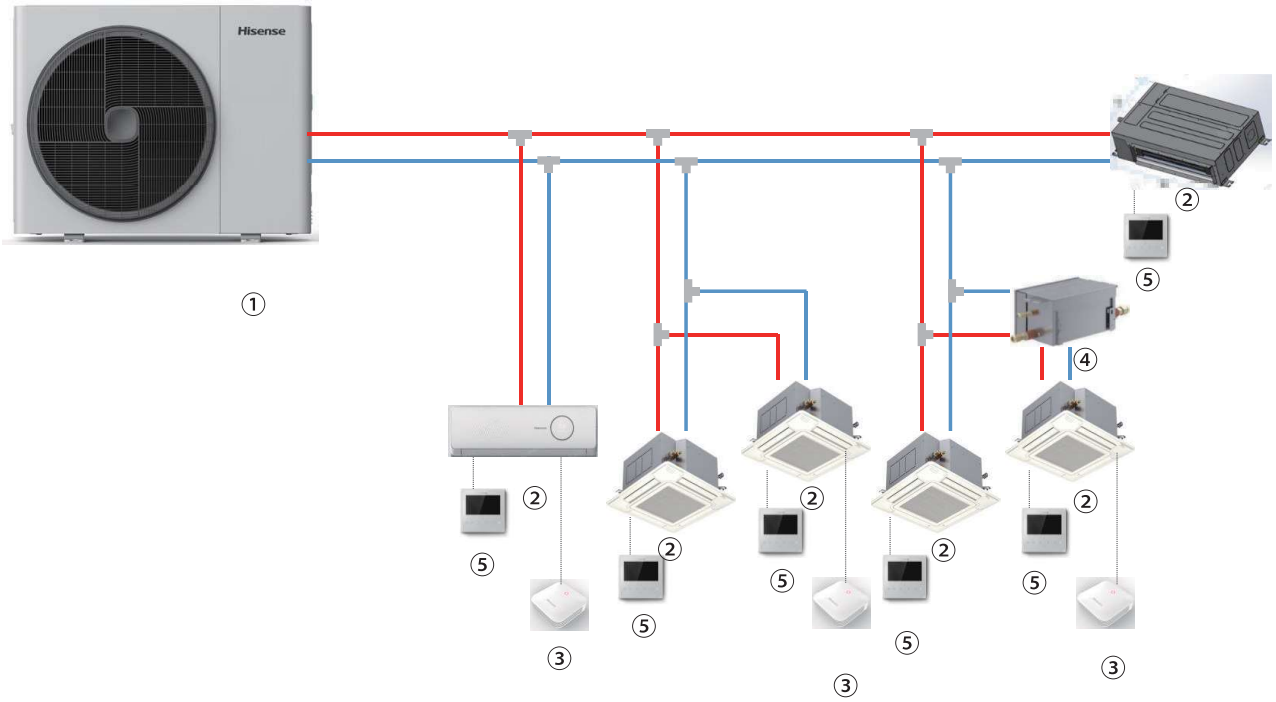


① Outdoor unit(OU)
② Indoor unit(IU)
③ Refrigerant Detector HOPT-ERD01
④ Refrigerant Shut-off Box(HESE-2V15)
⑤ Wired Controller

Application Case 3: need to install ③ and ④ , and install ④ before first branch.



Application Case 4: need to install ③ and ④ , and install ④ before after first branch.



① Outdoor unit(OU)
② Indoor unit(IU)
③ Refrigerant Detector HOPT-ERD01
④ Refrigerant Shut-off Box(HESE-2V15)
⑤ Wired Controller

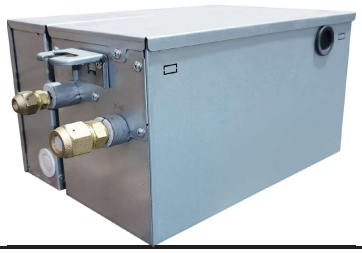
The following indoor units can be combined with the outdoor unit.

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		●	●	●	●		●	●		●										
Ceiling Ducted Type(DC Low- height)		●	●	●	●		●	●		●		●								
Wall Mounted Type		●	●	●	●		●			●		●		●						

● : Available

1.3 Optional Accessories

Type	Picture	Model
Refrigerant Detector		HOPT-ERD01
Refrigerant Shut-off Box		HESE-2V15

- 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-41HJDH2H1	6	10	50%	150%
AVW-48HJDH2H1	7	12	50%	150%
AVW-54HJDH2H1	8	13	50%	150%
AVW-41HKDH2H1	6	10	50%	150%
AVW-48HKDH2H1	7	12	50%	150%
AVW-54HKDH2H1	8	13	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-41HJDH2H1	60	120
AVW-48HJDH2H1	60	120
AVW-54HJDH2H1	60	120
AVW-41HKDH2H1	60	120
AVW-48HKDH2H1	60	120
AVW-54HKDH2H1	60	120

2. General Data

2.1 Key Parameter

Capacity				4HP	5HP	6HP
Model				AVW-41HJDH2H1	AVW-48HJDH2H1	AVW-54HJDH2H1
Power Supply				220-240V ~ 50/60Hz		
Cooling Operation※1	Nominal Capacity		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption		kW	3.30	4.24	4.70
	EER		W/W	3.67	3.30	3.30
	SEER		—	8.20	7.90	7.90
Heating Operation※1	Capacity (Max)		kW	14.2	16.0	18.0
			Btu/h	48000	54500	61500
	Power Consumption (Max)		kW	3.60	4.10	4.80
	COP (Max)		W/W	3.94	3.90	3.75
	Capacity (Nom)		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption (Nom)		kW	2.63	3.18	3.52
	COP (Nom)		W/W	4.60	4.40	4.40
	SCOP		—	5.00	4.65	4.60
Sound Pressure Level ※2	Normal mode(Cooling/Heating)		dB(A)	52/52	53/53	54/54
	Silent mode (db=3)		dB(A)	42	43	44
Cabinet Color ※3			—	Grayish White		
Outer Dimensions	Height		mm	840	840	840
	Width		mm	1100	1100	1100
	Depth		mm	390	390	390
Packing Dimensions	Height		mm	1000	1000	1000
	Width		mm	1185	1185	1185
	Depth		mm	530	530	530
Net Weight			kg	94	94	94
Gross Weight			kg	109	109	109
Refrigerating Installation	Compressor	Type	—	Rotary		
		Quantity	—	1	1	1
	Refrigeration Oil	Type	—	FW68S		
		Charge	L	1.25	1.25	1.25
	Refrigerant Charge	Type	—	R32		
		Before Shipment	kg	2.0	2.0	2.0
	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	80	80	80
Hole for Power Supply Wiring			mm	31	31	31
Hole for Control Line Wiring			mm	21	21	21
Static Pressure of Outdoor※4			Pa	35	35	35

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 performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of 4-Way Cassette Type indoor units.

※2. 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 0.92m from floor level.

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

※4. 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-41HKDH2H1	AVW-48HKDH2H1	AVW-54HKDH2H1
Power Supply				380-415V 3N~ 50/60Hz		
Cooling Operation※1	Nominal Capacity		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption		kW	3.30	4.24	4.70
	EER		W/W	3.67	3.30	3.30
	SEER		—	8.20	7.90	7.90
Heating Operation※1	Capacity (Max)		kW	14.2	16.0	18.0
			Btu/h	48000	54500	61500
	Power Consumption (Max)		kW	3.60	4.10	4.80
	COP (Max)		W/W	3.94	3.90	3.75
	Capacity (Nom)		kW	12.1	14.0	15.5
			Btu/h	41500	48000	53000
	Power Consumption (Nom)		kW	2.63	3.18	3.52
	COP (Nom)		W/W	4.60	4.40	4.40
	SCOP		—	5.00	4.65	4.60
Sound Pressure Level ※2	Normal mode(Cooling/Heating)		dB(A)	52/52	53/53	54/54
	Silent mode (db=3)		dB(A)	42	43	44
Cabinet Color ※3			—	Grayish White		
Outer Dimensions	Height		mm	840	840	840
	Width		mm	1100	1100	1100
	Depth		mm	390	390	390
Packing Dimensions	Height		mm	1000	1000	1000
	Width		mm	1185	1185	1185
	Depth		mm	530	530	530
Net Weight			kg	95	95	95
Gross Weight			kg	110	110	110
Refrigerating Installation	Compressor	Type	—	Rotary		
		Quantity	—	1	1	1
	Refrigeration Oil	Type	—	FW68S		
		Charge	L	1.25	1.25	1.25
	Refrigerant Charge	Type	—	R32		
		Before Shipment	kg	2.0	2.0	2.0
	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	80	80	80
Hole for Power Supply Wiring			mm	31	31	31
Hole for Control Line Wiring			mm	21	21	21
Static Pressure of Outdoor※4			Pa	35	35	35

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 performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of 4-Way Cassette Type indoor units.

※2. 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 0.92m from floor level.

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

※4. 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-41HJDH2H1	AVW-48HJDH2H1	AVW-54HJDH2H1
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	1.65	1.65	1.65
	Quantity		-	1	1	1
	Max. operating pressure		Mpa	4.30		
	Max.frontal area		m^2	0.93	0.93	0.93
Fan Part	Fan	Type	-	Axial-flow Fan		
		Quantity	-	1	1	1
		Outside diameter	mm	600	600	600
	Fan motor	Type	-	Waterproof brushless DC motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	140	140	140
		Quantity	-	1	1	1
		Insulation grade	-	B	B	B

Model				AVW-41HKDH2H1	AVW-48HKDH2H1	AVW-54HKDH2H1
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	1.65	1.65	1.65
	Quantity		-	1	1	1
	Max. operating pressure		Mpa	4.30		
	Max.frontal area		m^2	0.93	0.93	0.93
Fan Part	Fan	Type	-	Axial-flow Fan		
		Quantity	-	1	1	1
		Outside diameter	mm	600	600	600
	Fan motor	Type	-	Waterproof brushless DC motor		
		Start-up mode	-	Soft driving		
		Nominal output power	W	200	200	200
		Quantity	-	1	1	1
		Insulation grade	-	E	E	E

Parameters of Compressor and Fan Motor

Compressor Model			MVB40FJLMC-L	MVB-40FJMMC-L
Design Pressure	High Side	Mpa	4.30	4.30
	Low Side	Mpa	2.21	2.21
Compressor Motor	Model	-	Brushless DC motor	Brushless DC motor
	Start-up Mode	-	VFD	VFD
	Polarities	-	6	6
	Insulation Grade	-	E	E
Refrigerator Oil	Brand	-	FW68S	FW68S
	Volume	L	1.25±0.015	1.25±0.015

Outdoor Unit Models	Compressor		Fan Motor	
	Model	Quantity	Model	Degree of Protection
AVW-41HJDH2H1	MVB40FJLMC-L	1	ZWF-140B	IP44
AVW-48HJDH2H1				
AVW-54HJDH2H1				
AVW-41HKDH2H1	MVB-40FJMMC-L	1	ZWB4710L00AL	IP24
AVW-48HKDH2H1				
AVW-54HKDH2H1				

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.

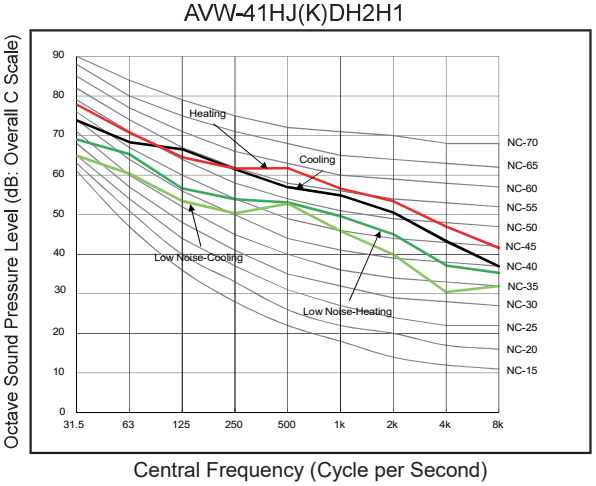
Model			AVW-41HJDH2H1	AVW-48HJDH2H1	AVW-54HJDH2H1
Compressor Pressure switch			Reset automatically and non-adjustable		
High	Open	MPa	4.30	4.30	4.30
	Close	MPa	3.80	3.80	3.80
Capacity of circuit breaker		A	50	50	50
CCP timer Time setting		min.	Non-adjustable		
			3	3	3

Model			AVW-48HKDH2H1	AVW-48HKDH2H1	AVW-54HKDH2H1
Compressor Pressure switch			Reset automatically and non-adjustable		
High	Open	MPa	4.30	4.30	4.30
	Close	MPa	3.80	3.80	3.80
Capacity of circuit breaker		A	40	40	40
Oil heater capacity		W	48	48	48
CCP timer Time setting		min.	Non-adjustable		
			3	3	3

2.4 Sound Data

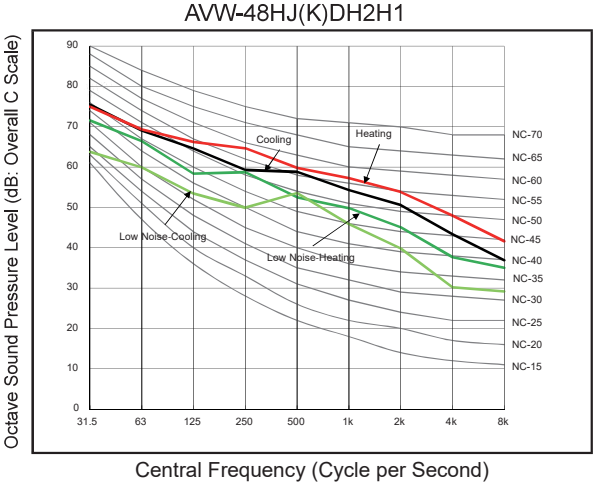
Measurement point: 1m from the service cover surface and 1.5m from floor level.

AVW-41HJ(K)DH2H1



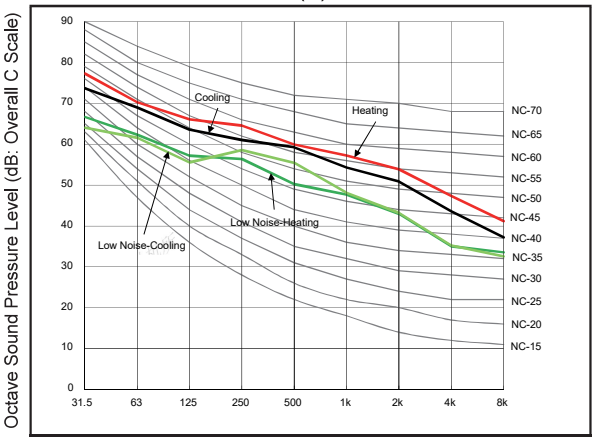
Central Frequency (Cycle per Second)

AVW-48HJ(K)DH2H1



Central Frequency (Cycle per Second)

AVW-54HJ(K)DH2H1

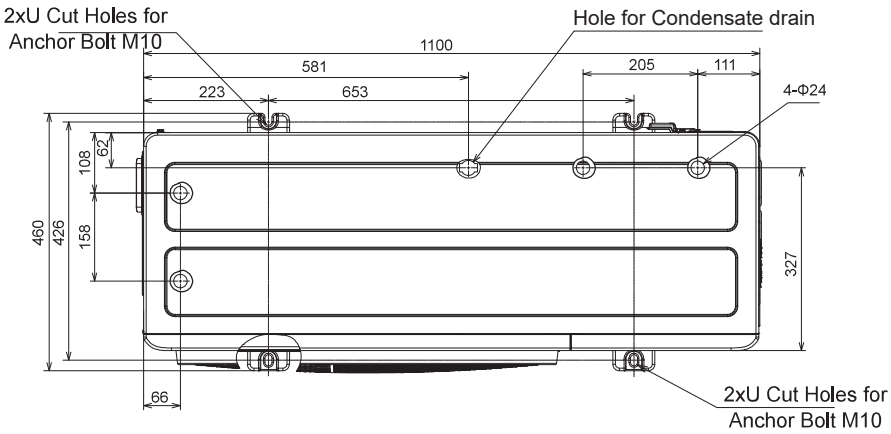


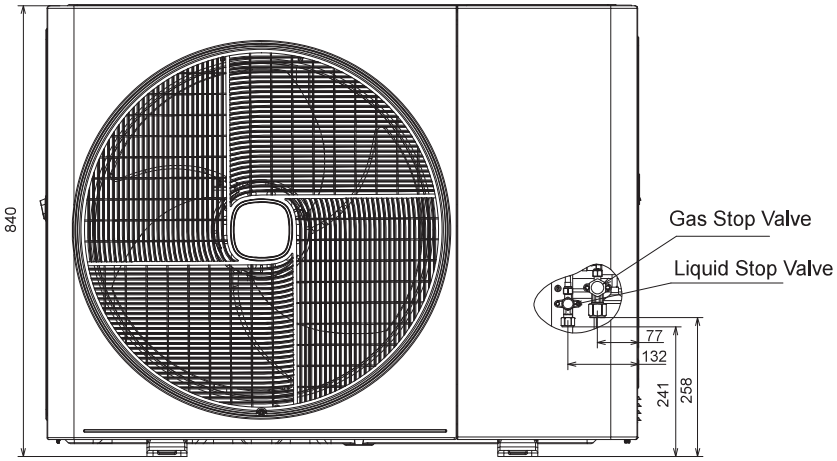
Central Frequency (Cycle per Second)

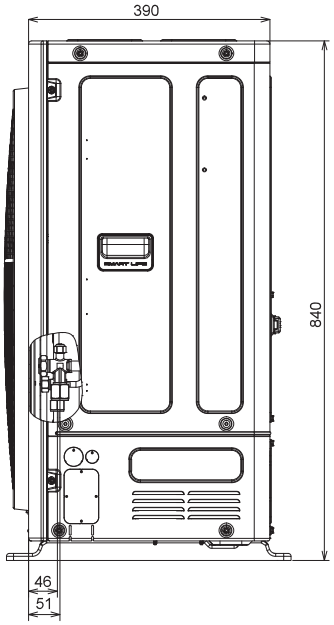
2.5 Dimensional Data

Model: Model: AVW-41/48/54HJ(K)DH2H1

unit: mm

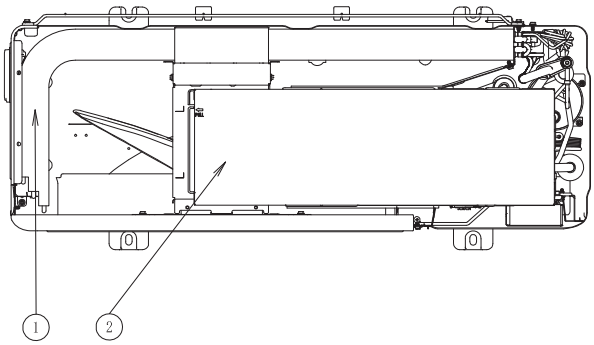


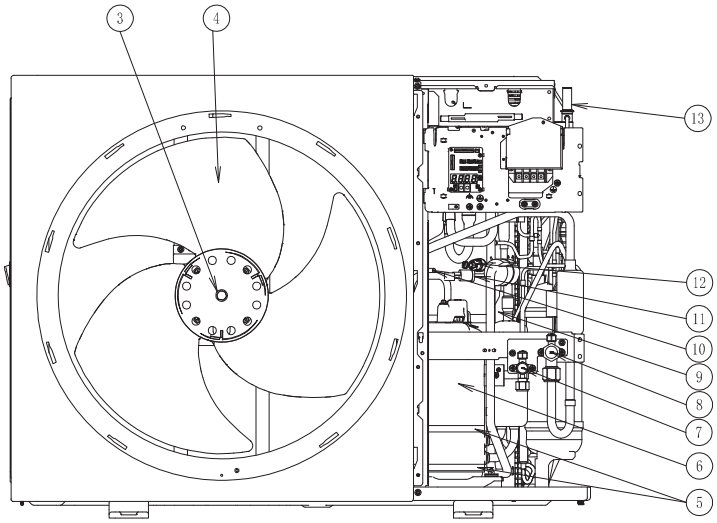


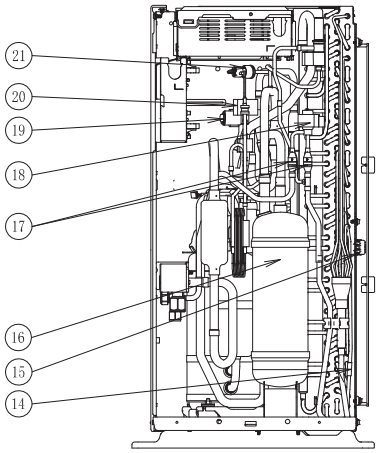


2.6 Structure

Model: AVW-41/48/54HJ(K)DH2H1







Mark	Part Name	Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Heat Exchanger	7	Stop Valve for Liquid Line	13	Pressure relief Valve	19	Reversing Valve
2	Electrical Box	8	Stop Valve for Gas Line	14	Te Temperature Sensor	20	Solenoid Valve
3	Fan Motor	9	Oil Separator	15	Ta Temperature Sensor	21	High Pressure Sensor
4	Propeller Fan	10	Td Temperature Sensor	16	Accumulator		
5	Crankcase Heater (Only three phase)	11	Pressure Switch	17	Strainer		
6	Compressor	12	Low Pressure Sensor	18	Electronic Expansion Valve		

2.7 Electrical Data

Model	Power Source	Max operating 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-41HJDH2H1	220-240V~50/60Hz	27.5	6.0	0.75	32	30	50
AVW-48HJDH2H1		29.5	6.0	0.75	32	30	50
AVW-54HJDH2H1		29.5	6.0	0.75	32	30	50
AVW-41HKDH2H1	380-415V 3N~ 50/60Hz	13.2	2.5	0.75	16	30	40
AVW-48HKDH2H1		13.2	2.5	0.75	16	30	40
AVW-54HKDH2H1		13.2	2.5	0.75	16	30	40

*Considering the actual use of end users comprehensively

*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.

(9) Equipment complying with:

EN/IEC 61000-3-12 provided that the short-circuit power Ssc is greater than or equal to the minimum Ssc value at the interface point between the user's supply and the public system.

EN/IEC 61000-3-12 = European/International Technical Standard setting the limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤75 A per phase.

(Input current of the uint AVW-41/48/54/HJDH2H1 : 27.5/29.5/29.5A

Input current of the uint AVW-41/48/54/HKDH2H1 : 16.1/16.1/16.1A).

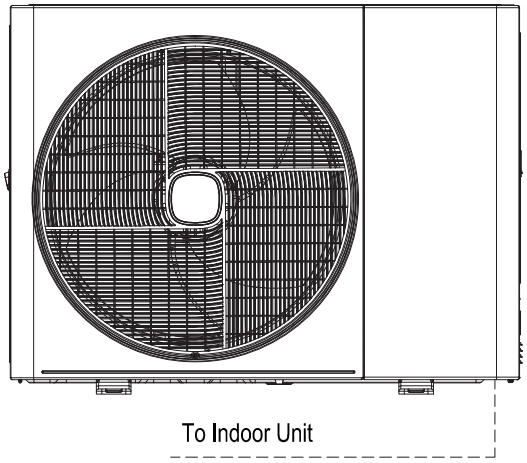
It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short-circuit power Ssc greater than or equal to the minimum Ssc value.

Model	Minimum Ssc value (kVA)
AVW-41HJDH2H1	208.7
AVW-48HJDH2H1	223.9
AVW-54HJDH2H1	223.9
AVW-41HKDH2H1	806.4
AVW-48HKDH2H1	806.4
AVW-54HKDH2H1	806.4

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	

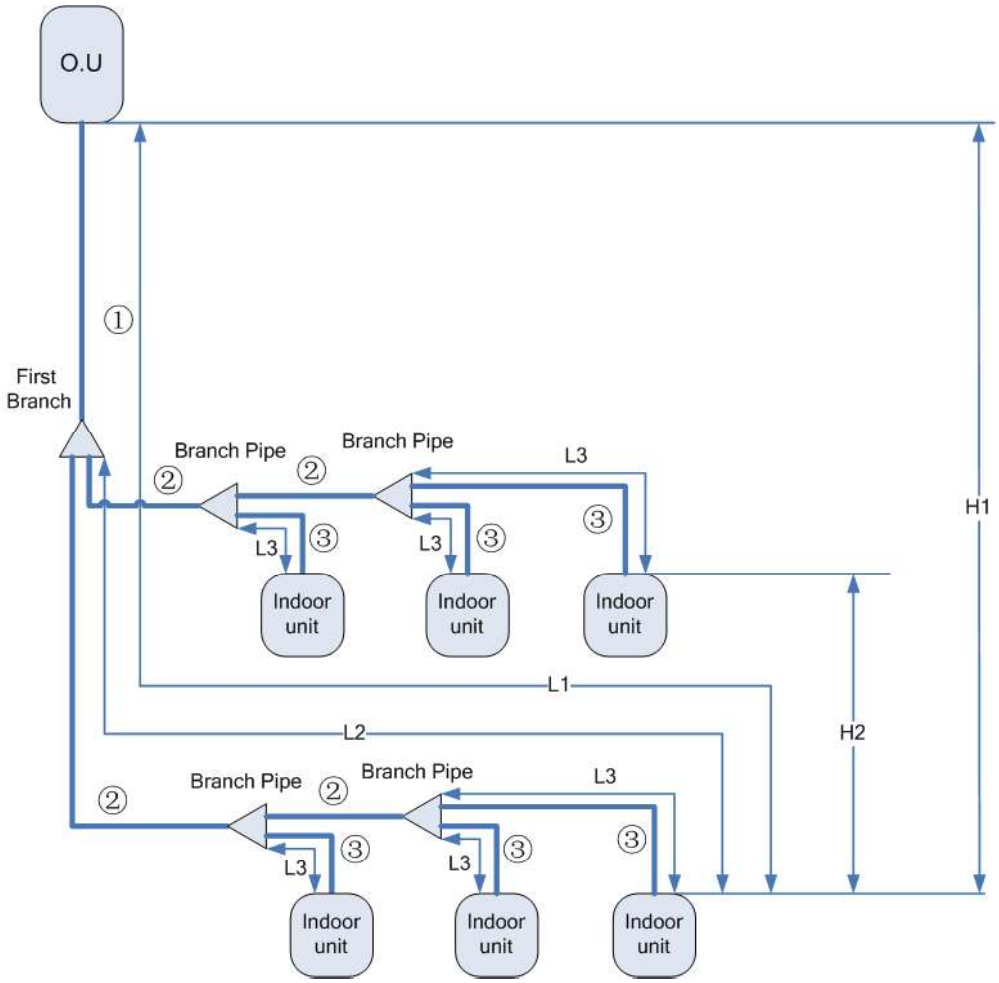
3. Piping System

3.1 Connection of Refrigerant Pipes



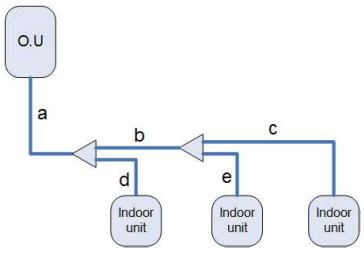
Model (HP)		41 (4HP)	48 (5HP)	54 (6HP)
Tube Size Φ (mm)	Gas	15.88	15.88	15.88
	Liquid	9.53	9.53	9.53

3.2 Pipe Connection Design Guidance



Item		Mark	Allowable Piping Length		
Total Piping Length			4HP	5HP	6HP
		-	≤180m	≤180m	≤180m
Maximum Piping Length	Actual Length	L1	≤80m	≤80m	≤80m
	Equivalent Length		≤100m	≤100m	≤100m
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	≤50m	≤50m	≤50m
	Outdoor Unit is Lower		≤40m	≤40m	≤40m
Height Difference between Indoor Units		H2	≤15m	≤15m	≤15m
Number of Main Branch Pipe		-	2 or Less※		

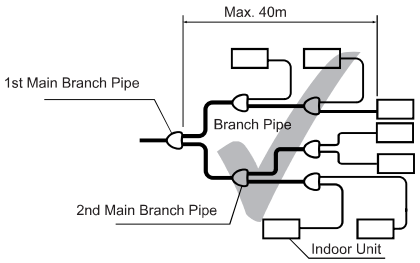
Item	Mark	Details
Total Piping Length	a+b+c+d+e	The total amount of all piping actual length.
Maximum Piping Length	a+b+c	The actual piping length between the stop valve of the outdoor unit and the terminal indoor unit.
Piping Length	-	The actual length of pipe takes no account for equivalent lengths 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) ~ 54 (6HP)	HFQ-102F

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	

NOTE:

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-41/48/54HJ(K)DH2H1

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		×0.093	
	9.53		×0.046	
	6.35		×0.019	
	Total Additional Charge For Liquid Piping (W1) kg = ∑ Total liquid piping length * refrigerant charge amount per meter			

W2: Additional refrigerant charge for indoor unit

Table of Additional refrigerant charge per each indoor unit(kg/unit)

Capacity / Type	05	07	09	12	15	17	19	22	24	27	28	30	38	48	54
4-way Cassette Type			0.25	0.25	0.25		0.25	0.33	0.33	0.48		0.48	0.60	0.60	0.60
Mini 4-way Cassette Type	0.14	0.14	0.19	0.19	0.26	0.26	0.26								
Ceiling Ducted Type	0.12	0.12	0.19	0.19	0.23		0.31		0.33						
Wall Mounted Type	0.19	0.19	0.19	0.19	0.25		0.32		0.32		0.32				

Additional refrigerant charge for indoor unit (W2) kg =
∑ number of the IU * refrigerant charge amount per corresponding IU

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-41HJDH2H1	2.0	5.5
AVW-48HJDH2H1	2.0	5.5
AVW-54HJDH2H1	2.0	5.5
AVW-41HKDH2H1	2.0	5.5
AVW-48HKDH2H1	2.0	5.5
AVW-54HKDH2H1	2.0	5.5

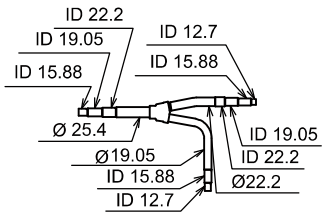
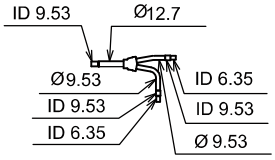
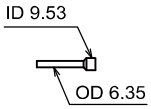
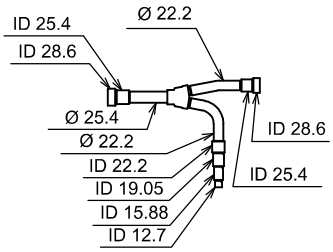
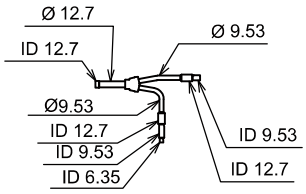
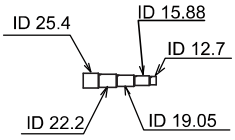
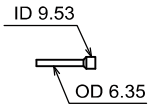
NOTES:

- W0 is outdoor unit refrigerant charge before shipment.

1. Charging Work
   Charge refrigerant (R32) 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.

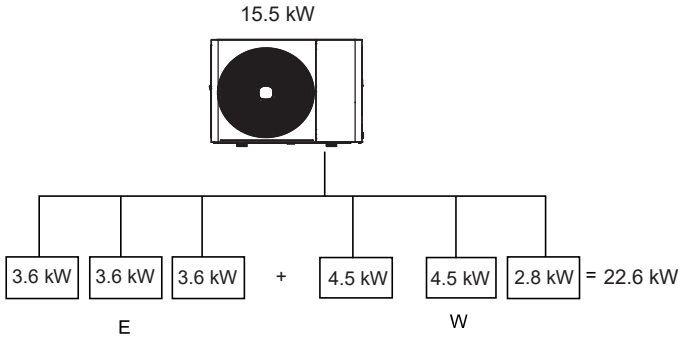
4.1.1 Unique features of the system

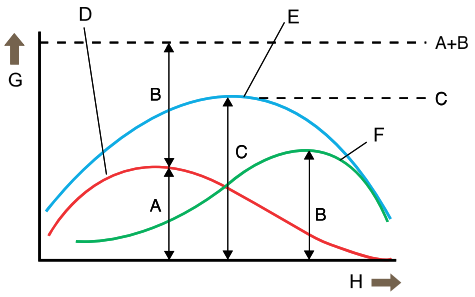
The system boasts some unique features that must be taken into account before selecting the outdoor unit.

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 Enigneering Data.

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

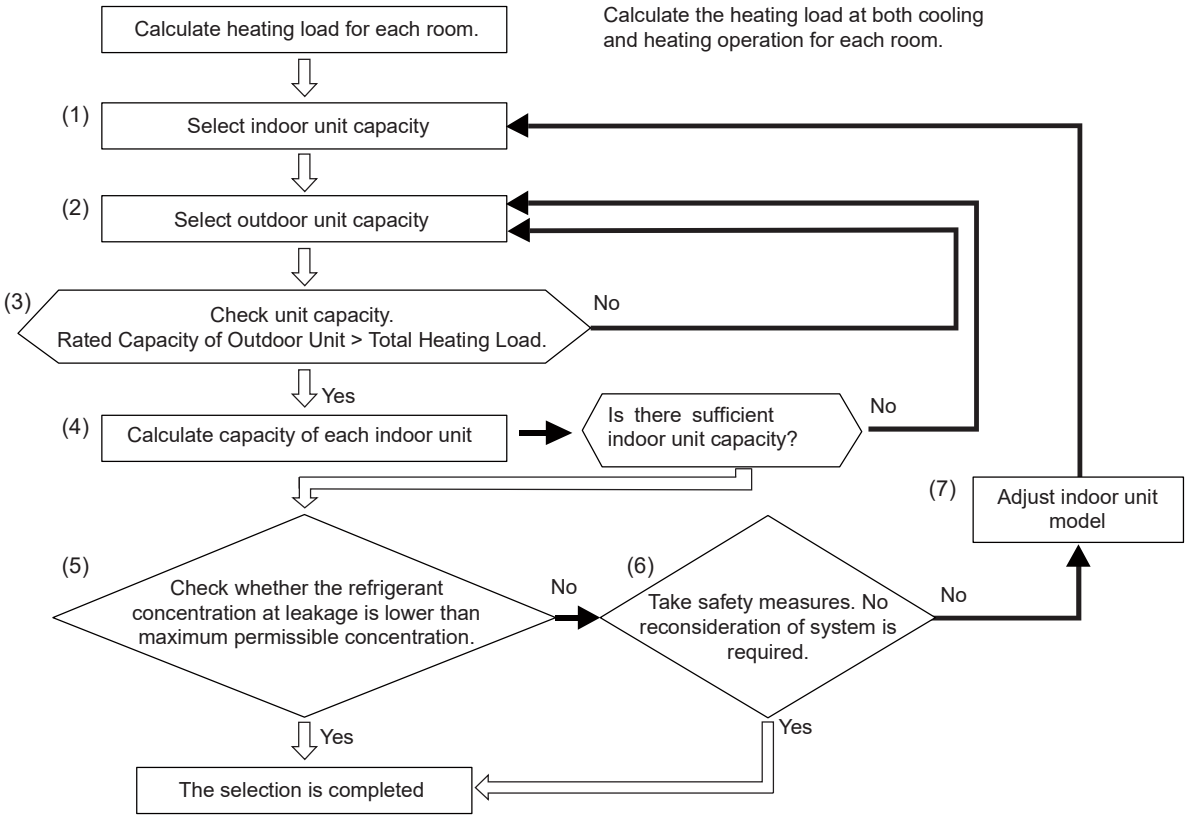
For heating correction factor depending on the piping length: 4.2 “Capacity Correction Based on Refrigerant Piping Length”.

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 = Norminal 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, Please refer to section 2.3 for details.

(6) Taking Safety Measure (Reconsideration of system is not required.), Please refer to section 2.3 for details.

(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.

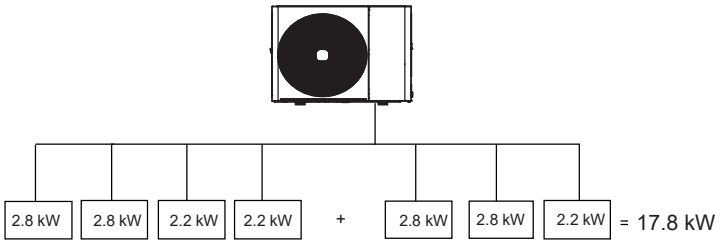
Appropriate selection of indoor units and nominal capacity

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-54HJDH2H1 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-54HJDH2H1~115%)
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-54HJDH2H1 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

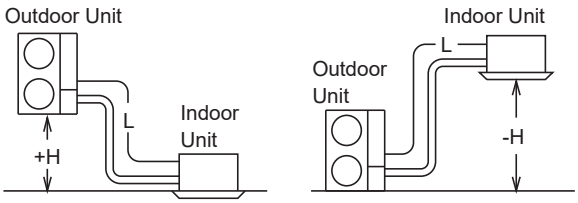
CC: Cooling capacity in the performance table

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.



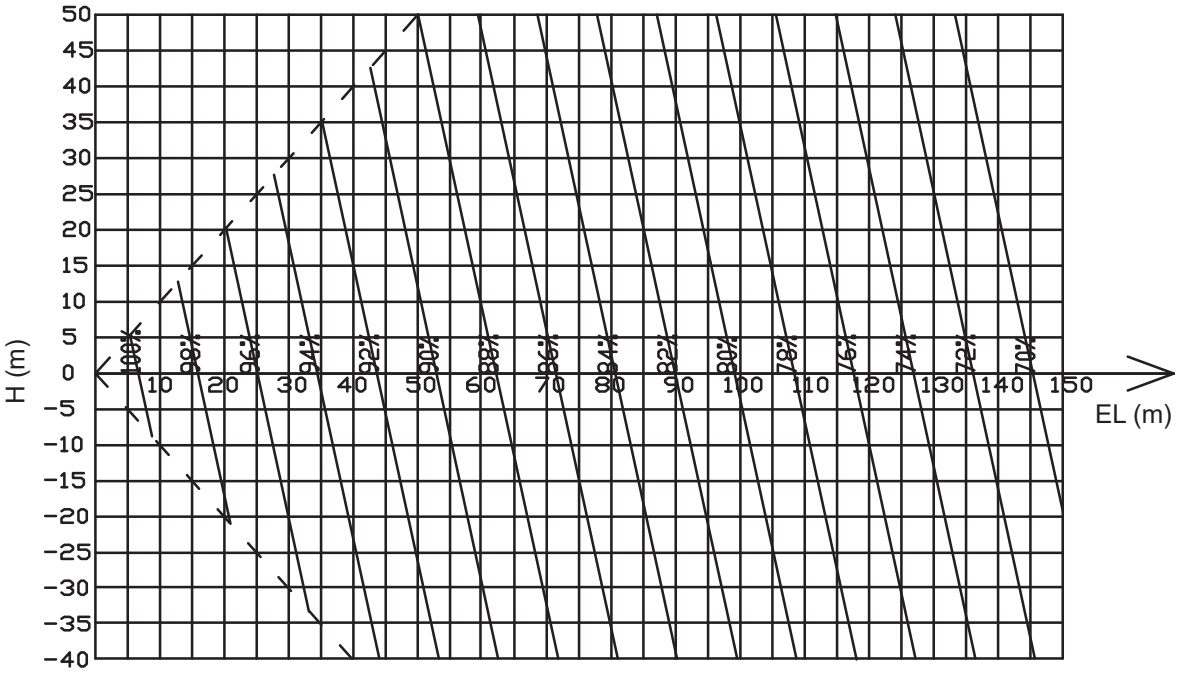
H: Vertical Distance Between Indoor Unit and Outdoor Unit

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

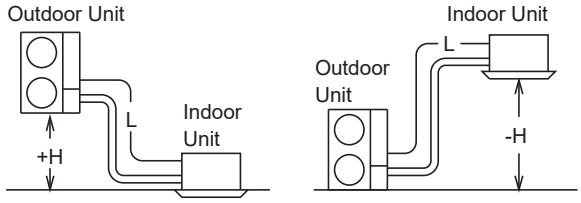
HC: cooling capacity in the performance table

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.



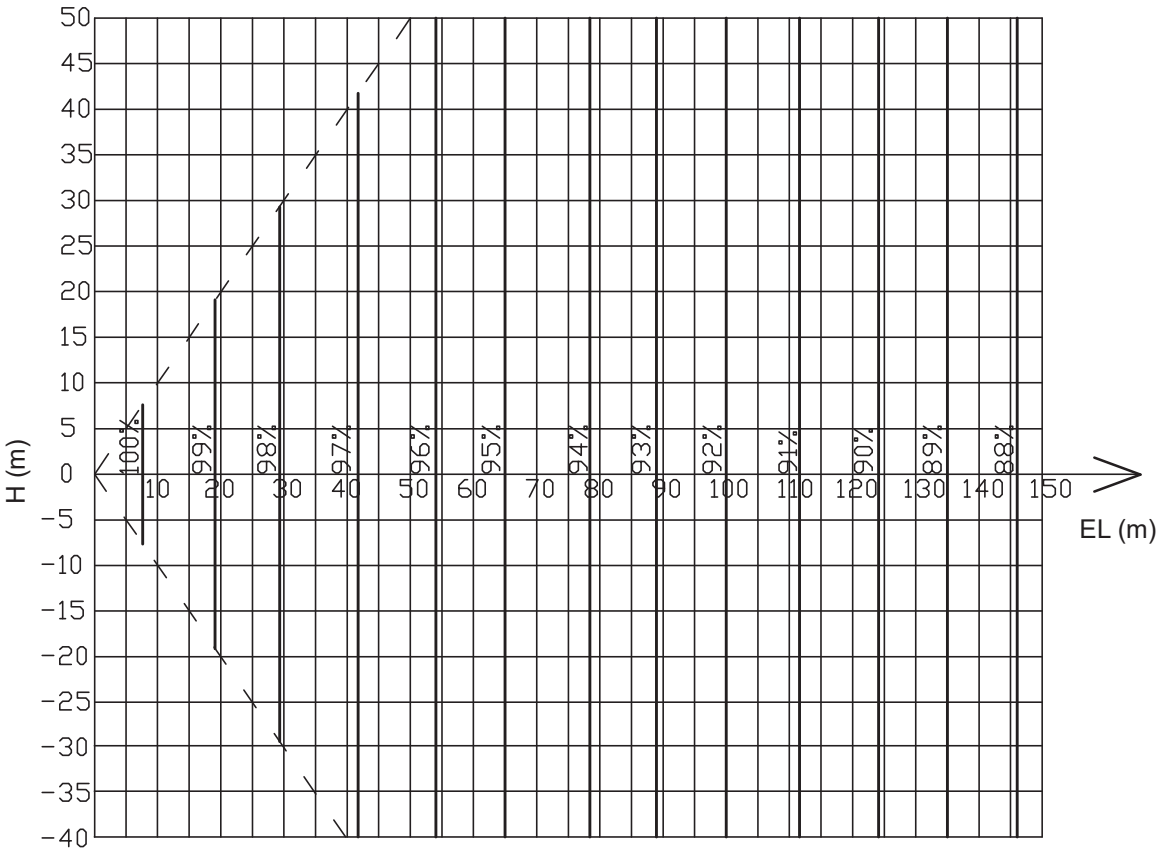
H: Vertical Distance Between Indoor Unit and Outdoor Unit

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



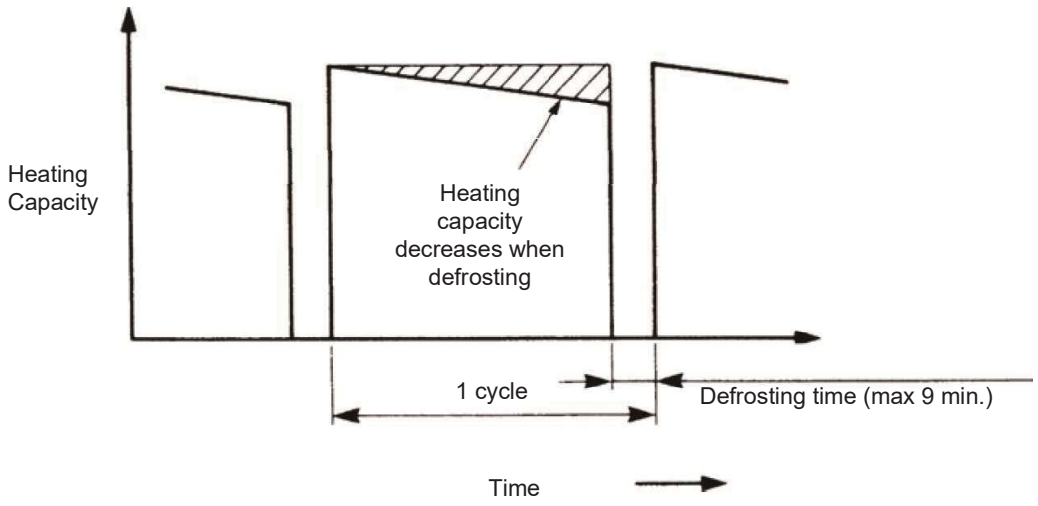
4.3 Correction Factor According to Defrosting Operation

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



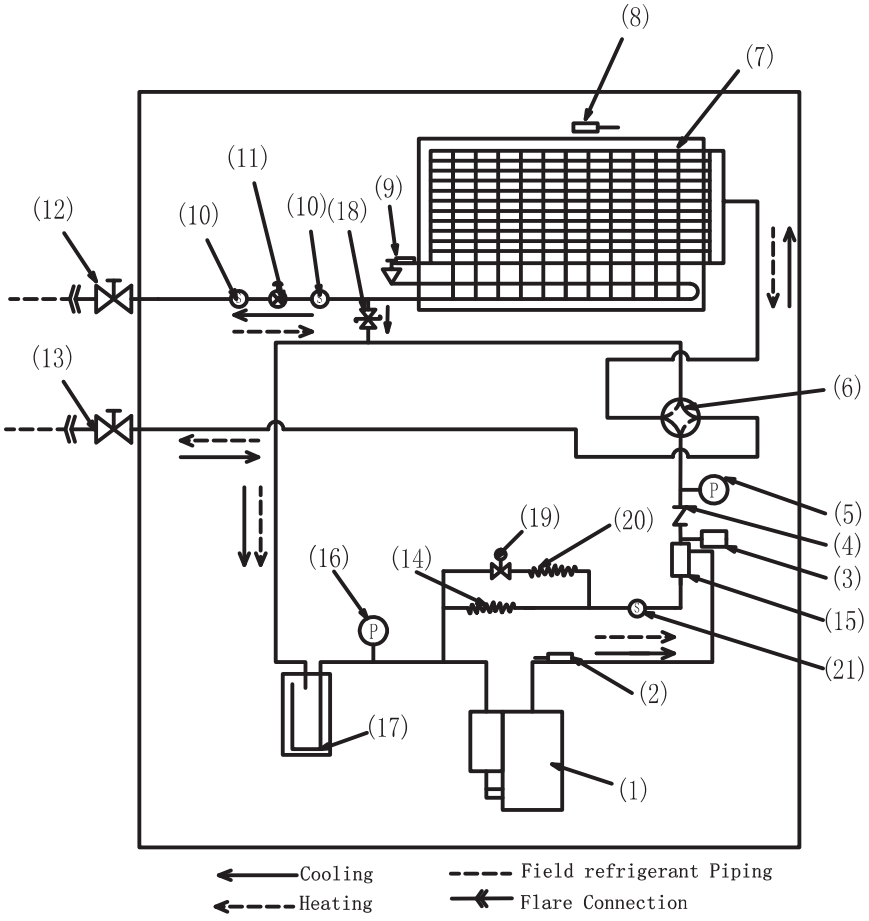
NOTES:

- 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-41/48/54HJ(K)DH2H1



Mark	Part Name	Mark	Part Name	Mark	Part Name
1	Compressor	10	Strainer	19	Solenoid Valve (SVA)
2	Temperature Sensor（Td）	11	Electronic Expansion Valve (EVO)	20	Capillary Tube(SVA)
3	Pressure Switch (H) (PSH)	12	Stop Valve for Liquid Line	21	Strainer
4	Check Valve	13	Stop Valve for Gas Line		
5	High Pressure Sensor (Pd)	14	Capillary Tube		
6	Reversing Valve (RVR)	15	Oil Separator		
7	Heat Exchanger	16	Low Pressure Sensor (Ps)		
8	Temperature Sensor（Ta）	17	Accumulator		
9	Temperature Sensor(Te)	18	Pressure relief valve		

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

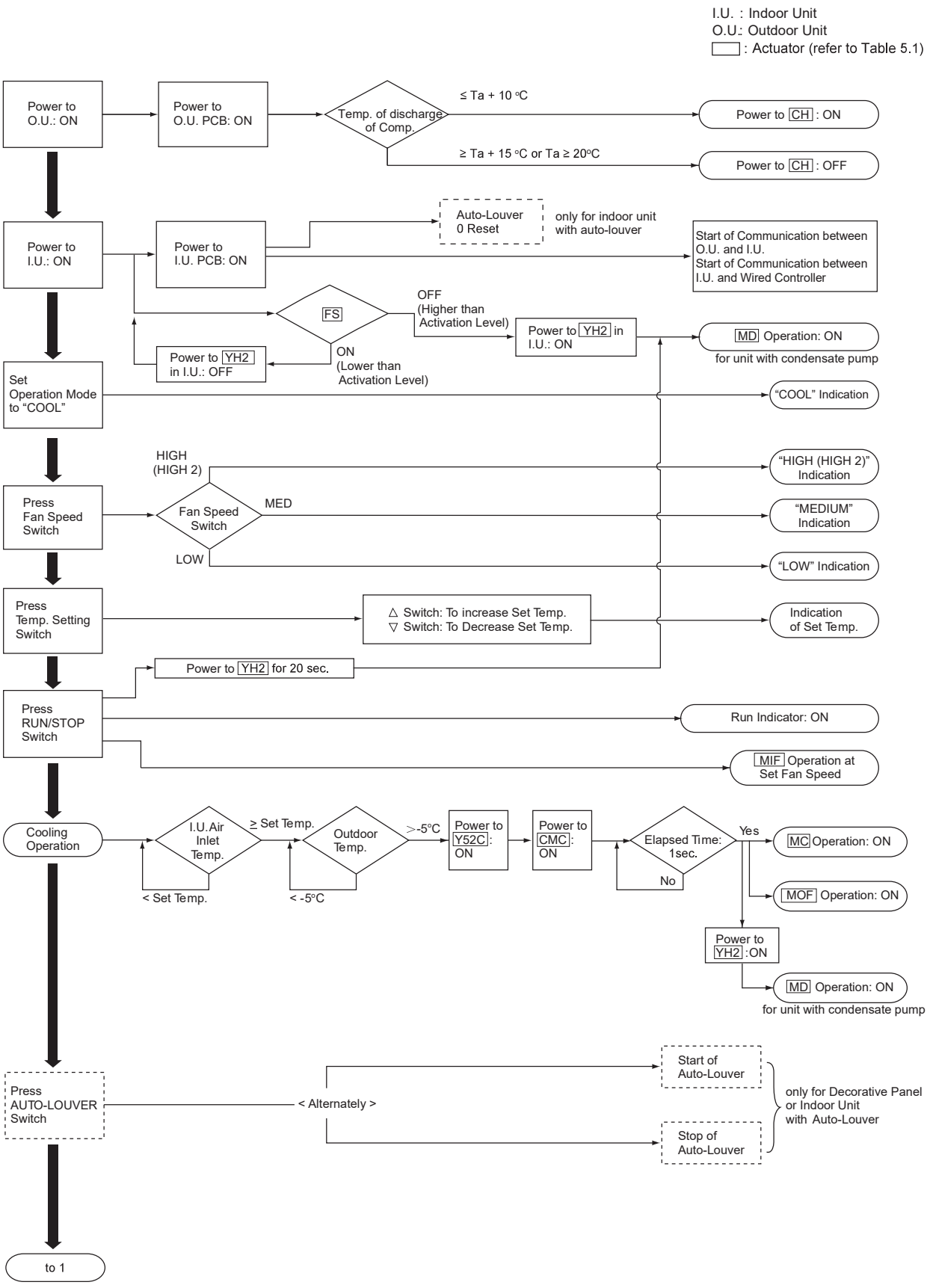
b . Amount of Temperature Difference Change

c . Capacity Ratio between Operating Indoor Unit and Outdoor Unit

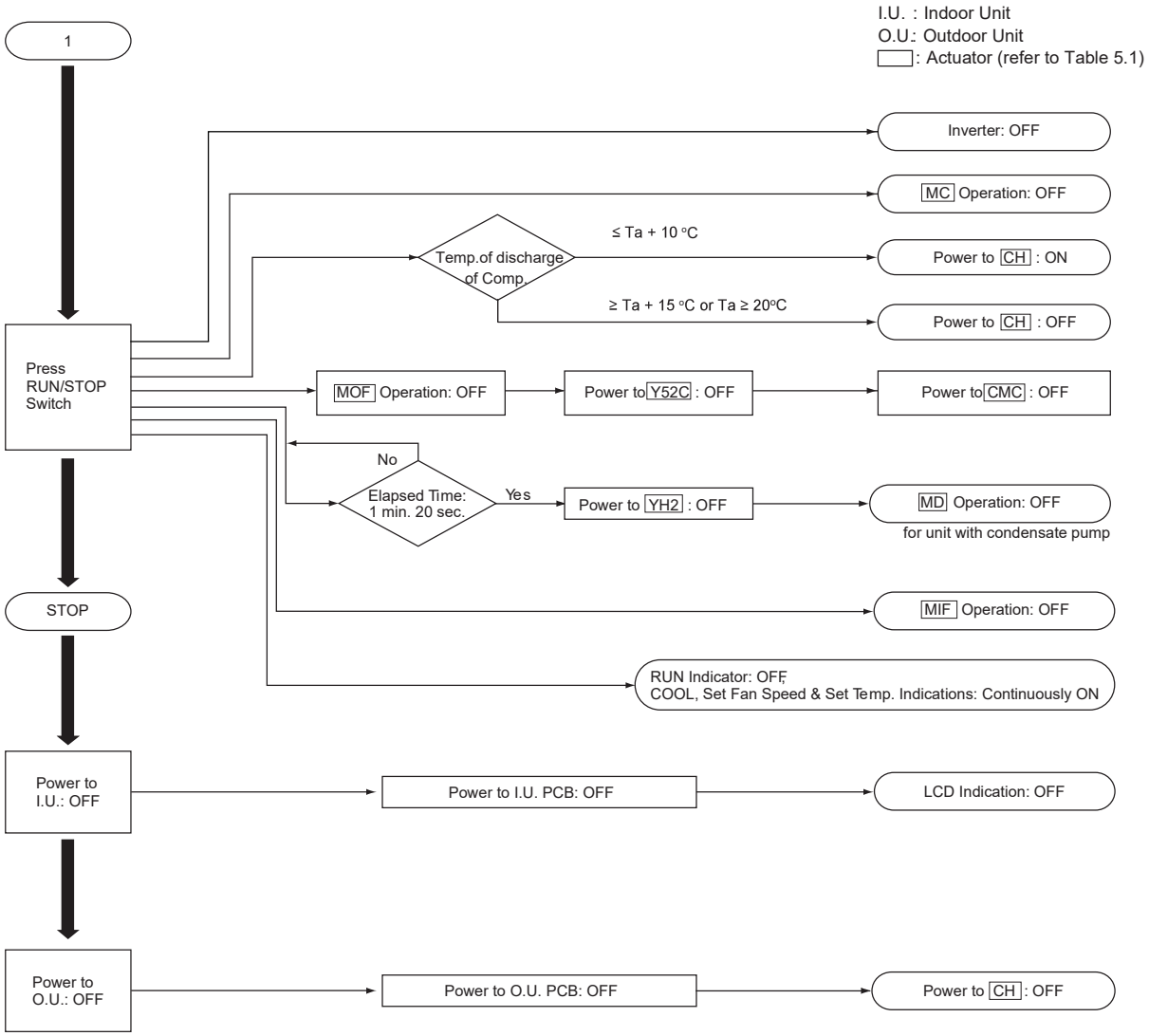
d . Temperature Difference between Indoor Gas Pipe and Indoor Liquid Pipe
(= Indoor Gas Pipe Temperature - Indoor Liquid Pipe Temperature)

5.3 Standard Operation Sequence

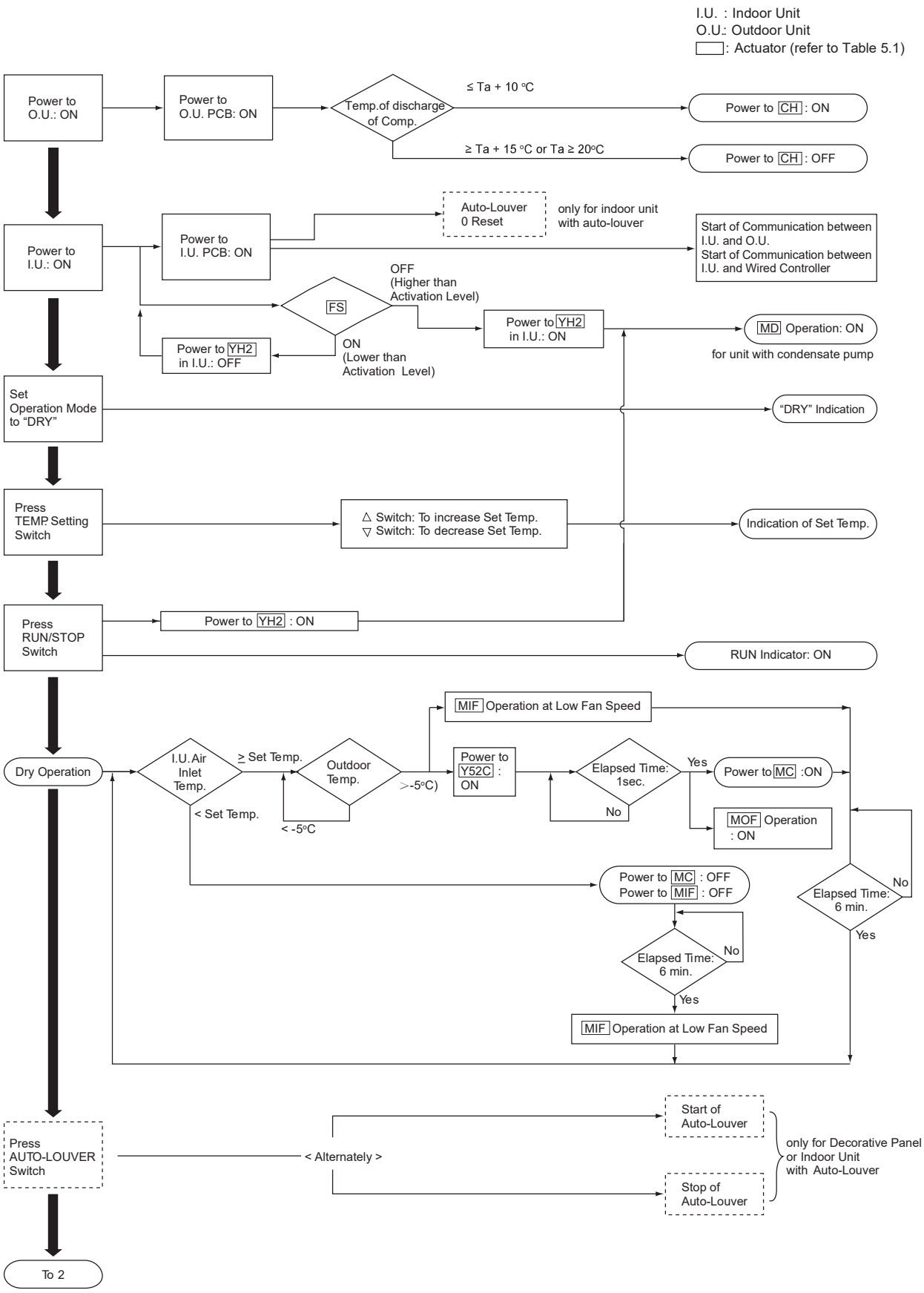
Cooling Operation



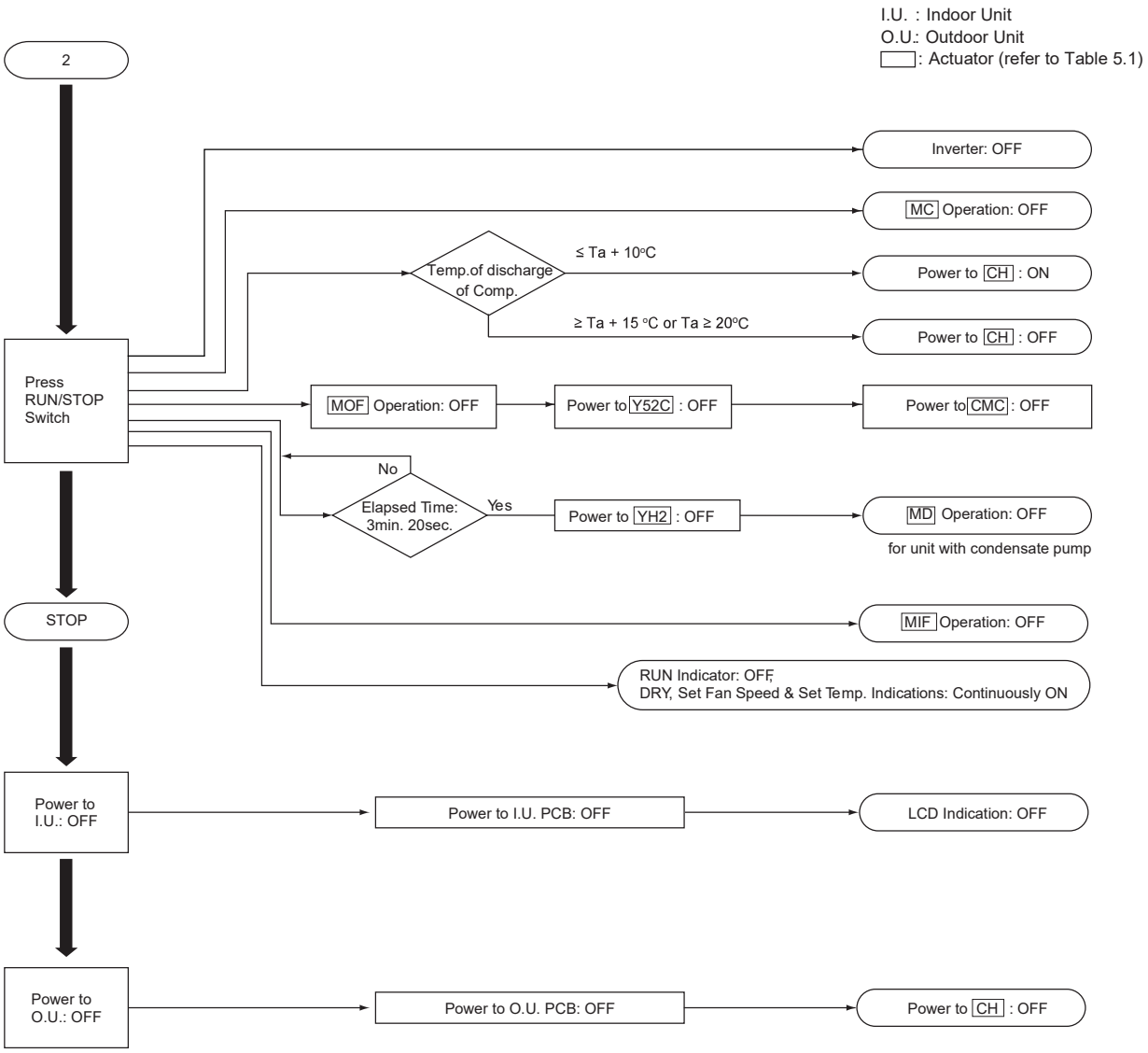
Cooling Operation



Dry Operation

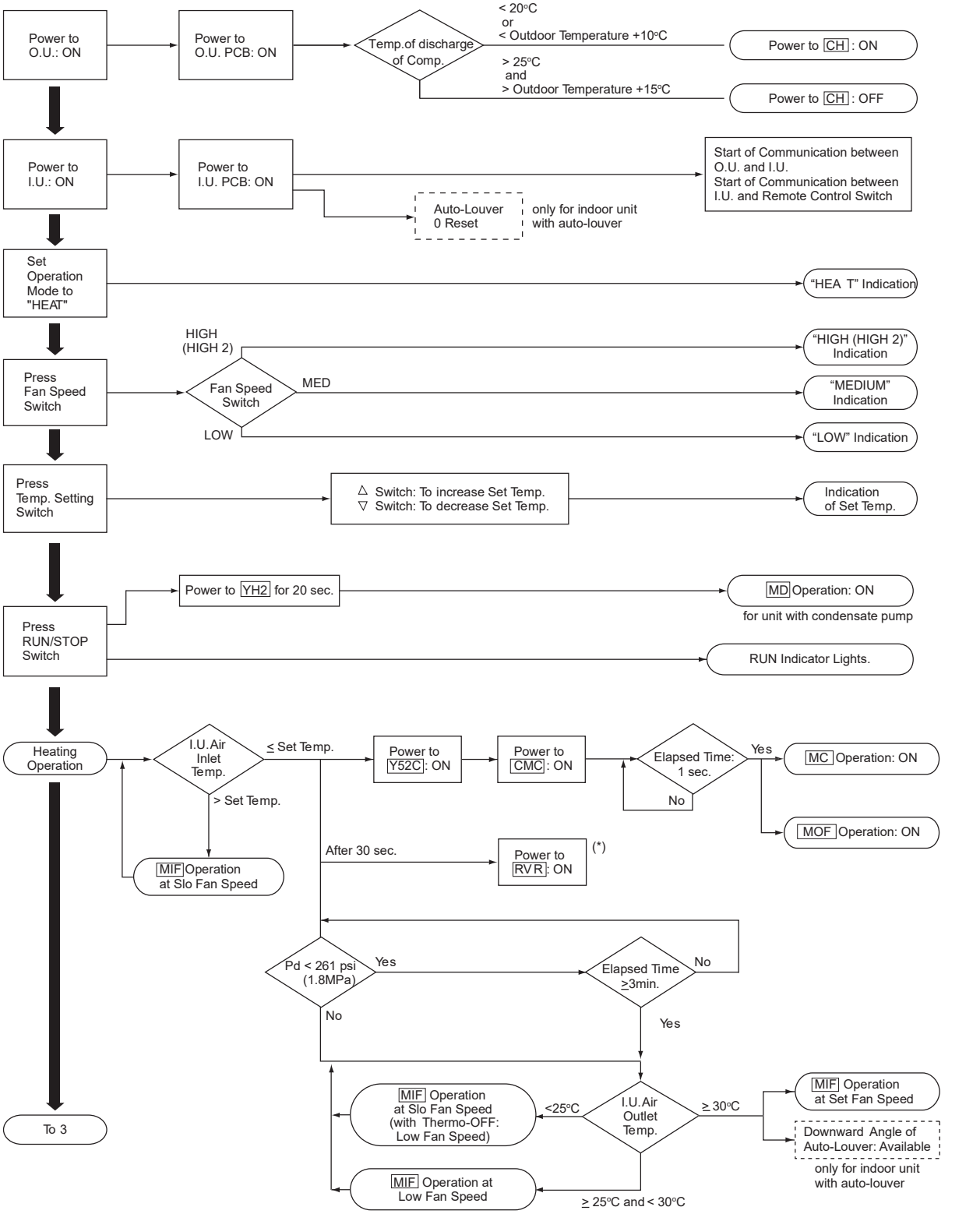


Dry Operation



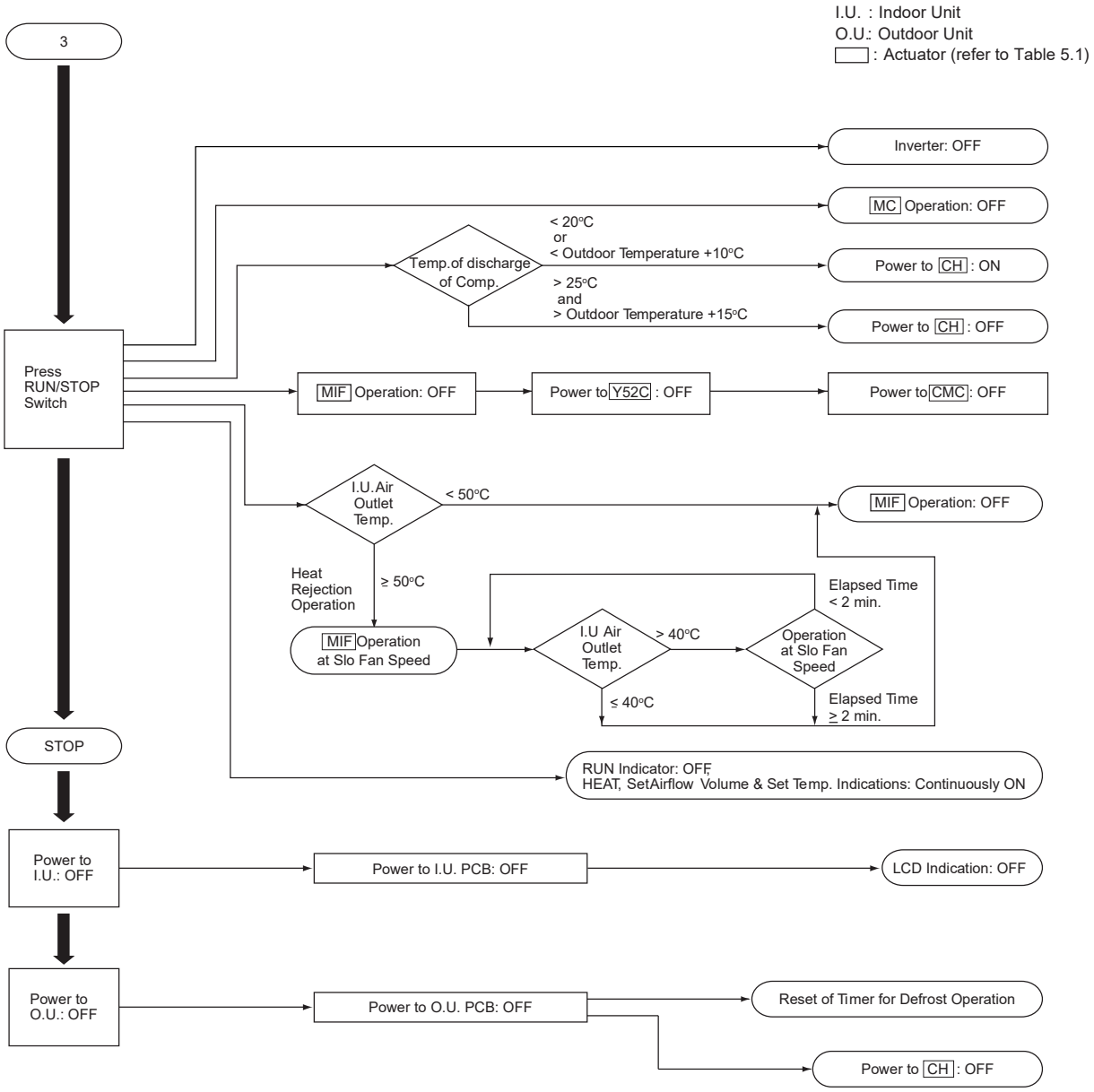
Heating Operation

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

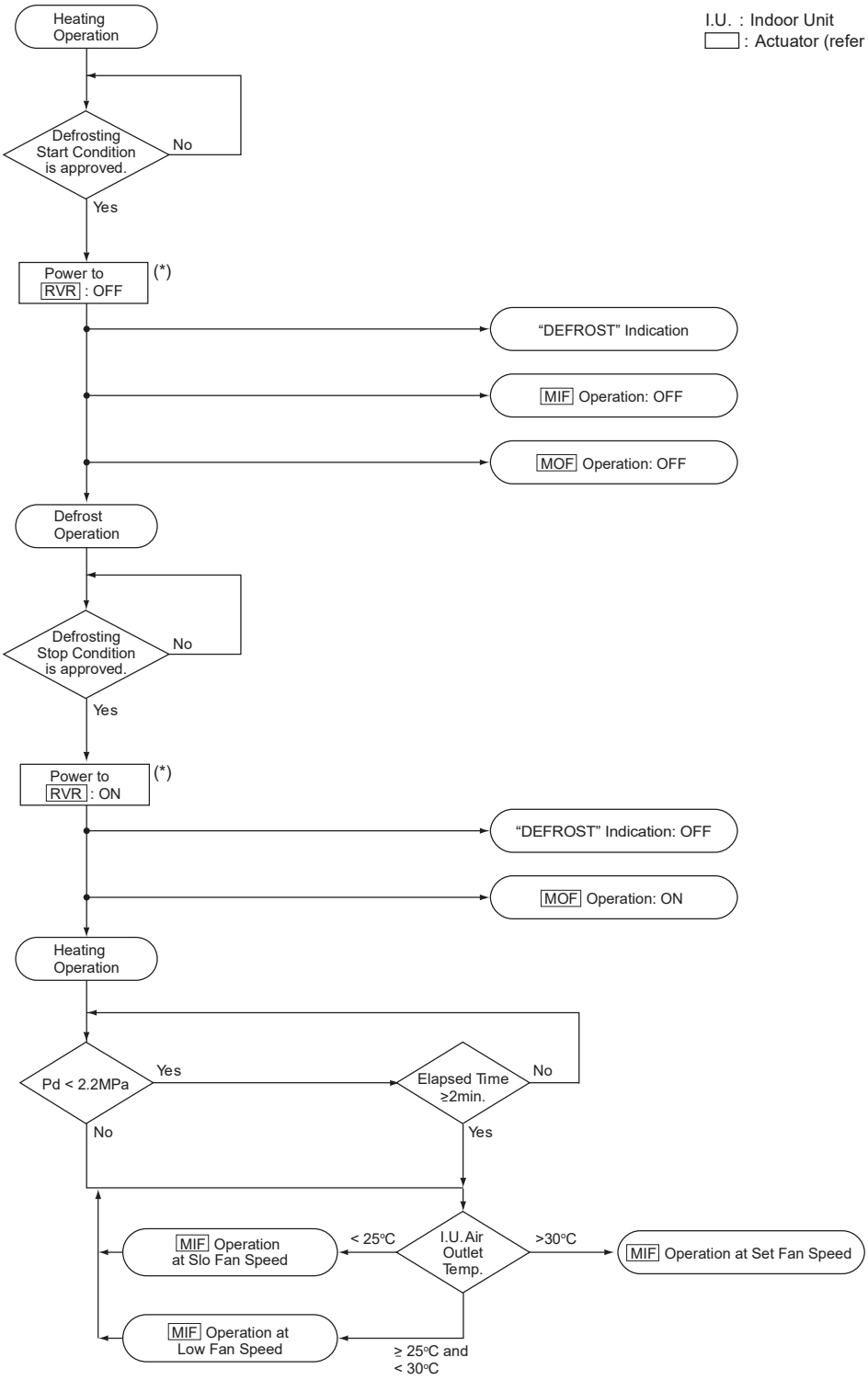


(*) Refer to Service Manual for the timing diagram of the reversing valve.

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	PCN401 (63H1)	Prevent the system pressure from exceeding 4.3MPa
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
Crankcase Heater of Outdoor Unit	CH	PCN5 (CH)	Heat the oil at the bottom of the compressor (Only for three phase)
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

< 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.

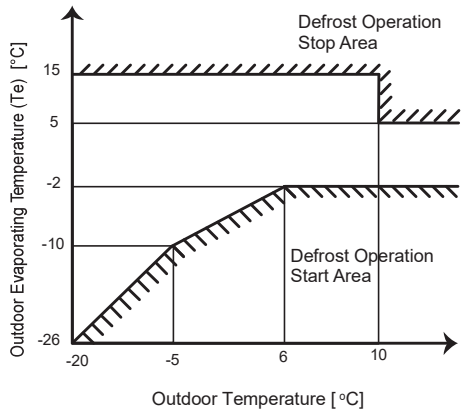
* Thermo-ON: The outdoor unit and some indoor units are running.
Thermo-OFF: The outdoor unit and some indoor units stay on, but don’t run.

< 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.

Refrigerant leakage protection control

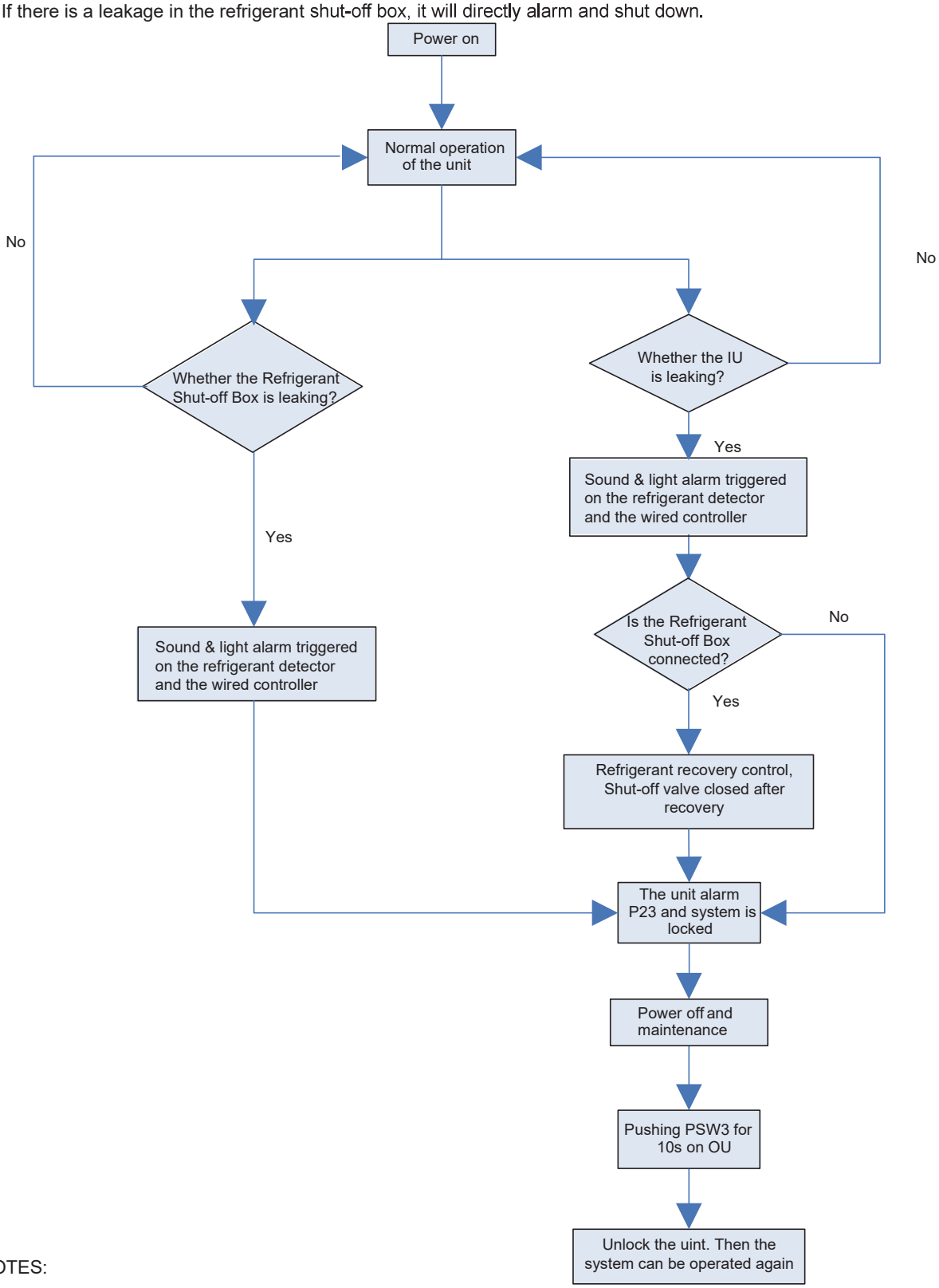
The unit has complete functions for refrigerant leakage detection, alarm, recovery, and linkage, further enhancing safety.

The specific control process is shown in the following figure:

① If a refrigerant shut-off box is installed in the system, the unit will perform refrigerant recovery. After the recovery is completed, it will be shut off and an alarm will be triggered to shut down.

② If there is no refrigerant shut-off box installed, an alarm will be triggered and the unit will be shut down directly.

③ If there is a leakage in the refrigerant shut-off box, it will directly alarm and shut down.



NOTES:

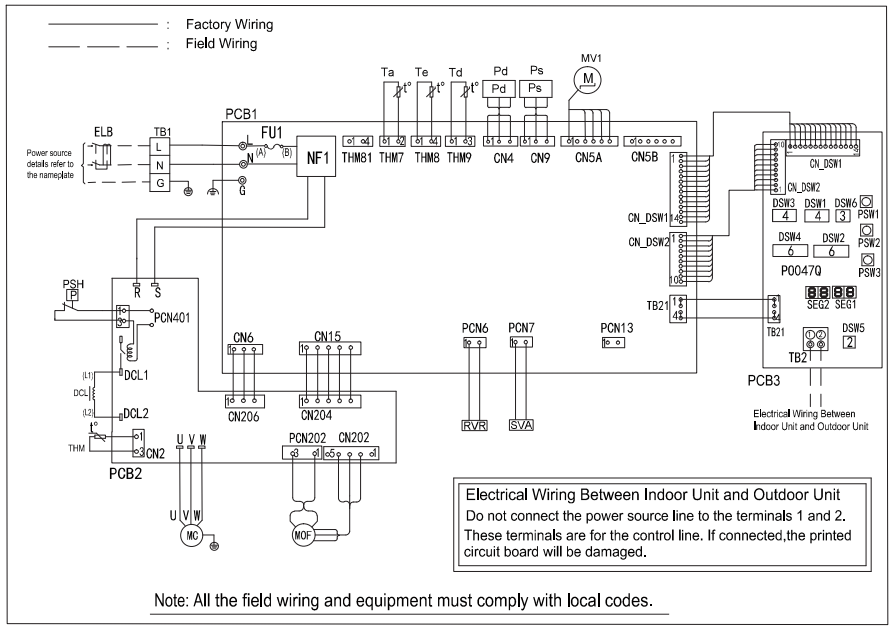
Only after professional service personnel repair it and press PSW3 for 10 seconds on OU to release the leakage alarm, can the unit operate normally.

5.4 Electrical Wiring Diagram

Model: AVW-41/48/54HJDH2H1

⚠ WARNING | ⚠ Before inspecting the electrical parts set the Operation Switch to OFF, and cut OFF the power supply.
Warning:Do not power on and carry out maintenance unless the unit has been powered off for at least 10 minutes.

[ELECTRICAL WIRING DIAGRAM]



[Refrigerant Charging Quantity]

No.	Name	Calculating Method					Additional Charge (kg)
1	W1	Additional refrigerant charge calculation for liquid piping					W1=W11+W12+W13= kg
		Pipe Diameter		Total Piping Length(m)	Additional Charge per Meter(kg/m)	Additional Charge (kg)	
		W11	12.7	m	×0.093kg/m=		
		W12	9.53	m	×0.046kg/m=		
		W13	6.35	m	×0.019kg/m=		
2	W2	Additional refrigerant charge calculation for indoor unit (W2 kg)					W2= kg
3	W	Total Additional Ref. Charge of This System = W1+W2					W= kg

Indoor Unit Type		05	07	09	12	15	17	19	22	24	27	28	30	38	48	54
Low-height Ceiling Ducted Type	AVE-**HJDDH	0.12	0.12	0.19	0.19	0.23		0.31		0.33						
4-Way Cassette Type	AVBC-**HJDBA			0.25	0.25	0.25	0.25	0.25	0.33	0.33	0.48		0.48	0.60	0.60	0.60
Mini 4-Way Cassette Type	AVC-**HJDBA	0.14	0.14	0.19	0.19	0.26	0.26	0.26								
Wall Mounted Type	AVS-**HJDDJ	0.19	0.19	0.19	0.19	0.25		0.32		0.32		0.32				
Wall Mounted Type	AVS-**HJDGA	0.19	0.19	0.19	0.19	0.25		0.32		0.32		0.32				
Wall Mounted Type	AVS-**HJDTD	0.19	0.19	0.19	0.19	0.25		0.32		0.32		0.32				

Note: Ensure that the total additional charge should not be exceeded the max.additional refrigerant charge quantity as shown in the table below.
Max. Additional Refrigerant Charge Quantity

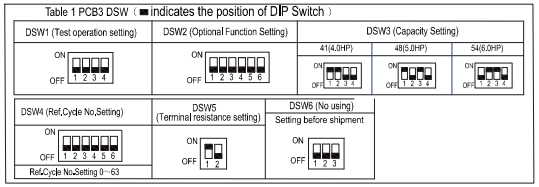
Capacity(kBtu/h)	41	48	54	W≤Wmax
Max. Additional Ref. Charge(Wmax)(kg)	5.5			

[Alarm Code Table]

CODE	CONTENT OF ABNORMALITY	LEADING CAUSE
01	Activation of Protection Device(Float Switch)	Activation of Float Switch(High Water Level in Drain Pan,Abnormality of Drain Pipe, Float Switch or Drain Pan)
02	Activation of Protection Device(High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Abnormality between Indoor and Outdoor	Incorrect Wiring,Loose Terminals,Disconnected Wire,Blowout of Fuse,Outdoor Unit Power OFF
04	Abnormality between Inverter PCB and Outdoor Unit PCB	Inverter PCB - Outdoor Unit PCB Transmission Failure(Loose Connector, Wire Breaking, Blowout of Fuse)
05	Abnormal Power Supply Phases	Incorrect Power Supply, Connection to Reversed Phase, Open-Phase
06	Abnormal Voltage	Outdoor Voltage Drop,Insufficient Power Capacity
07	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge, Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Opened Position (Disconnect Connector)
08	Increase in Discharge Gas Temperature	Insufficient Refrigerant Charge, Pipe Clogging Failure of Thermistor, Incorrect Wiring, Incorrect Piping Connection, Expansion Valve Locking at Closed Position (Disconnect Connector)
11	Inlet Air Thermistor/ Inlet Water Thermistor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
12	Outlet Air Thermistor/ Outlet Water Thermistor	
13	Freeze Protection Thermistor	
14	Gas Piping Thermistor	
16	Abnormality of Remote Control Thermistor	
17	Abnormality of Thermistor in Wire Controller	
19	Activation of Protection Device for Indoor Fan	Fan Motor Overheat,Stalling
21	Abnormality of High Pressure Sensor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
22	Abnormality of Outdoor Air Thermistor	
23	Discharge Gas Thermistor on Top of Compressor	
24	Heat Exchanger Liquid Pipe Thermistor or Tsc Thermistor	
29	Abnormality of Low Pressure Sensor	
31	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit/water module	Incorrect Capacity Code Setting of Combination Excessive or Insufficient Indoor Unit /Water Module Total Capacity Code
35	Abnormal Transmitting between Indoor Units	Duplication of Indoor Unit No. in same Ref. Gr.
36	Incorrect Setting of Indoor Unit No.	The brand or series of indoor unit and outdoor unit are inconsistent.
38	Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor Unit PCB)
43	Activation of Low Compression Ratio Protection Device	Defective Compression (Failure of Compressor of Inverter, Loose Power Supply Connection)
44	Activation of Low Pressure Increase Protection Device	Overload at Cooling, High Temperature at Heating, Expansion Valve Locking (Loose Connector)
45	Activation of Protection Device for High-Pressure Increase	Overload Operation(Heat Exchanger Clogging),Pipe Clogging,Excessive Ref.,Inert Gas Mixing
47	Activation of Low Pressure Decrease Protection Device (Vacuum Operation Protection)	Insufficient Refrigerant, Refrigerant Piping, Clogging, Expansion Valve Locking at Open Position (Loose Connector)
48	Activation of Inverter Overcurrent Protection Device	Overload Operation, Compressor Failure
51	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit)
54	Abnormality of Inverter Fin Temperature	Abnormal Inverter Fin Thermistor, Heat Exchanger Clogging, Fan Motor Failure
55	Inverter Failure	Inverter PCB Failure
57	Activation of Fan Controller Protection	Incorrect Wiring between PCB,Driver IC and Fan-motor (Broken,wrong wiring)
EE	Compressor Protection Alarm (It is can not be reset from remote controller)	This alarm code appears when the following alarms* occurs three times within 6 hours. *02, 07, 08, 43 to 45, 47
b1	Incorrect Setting of Unit and Refrigerant Cycle No.	Over 64 Number is Set for Address or Refrigerant Cycle.
b5	Incorrect Indoor Unit Connection Number Setting	More than 17 Non-Corresponding to H-Net Units are Connected to One System.

[DSW settings (before shipment)]

Table 1 PCB3 DSW (■ indicates the position of DIP Switch)



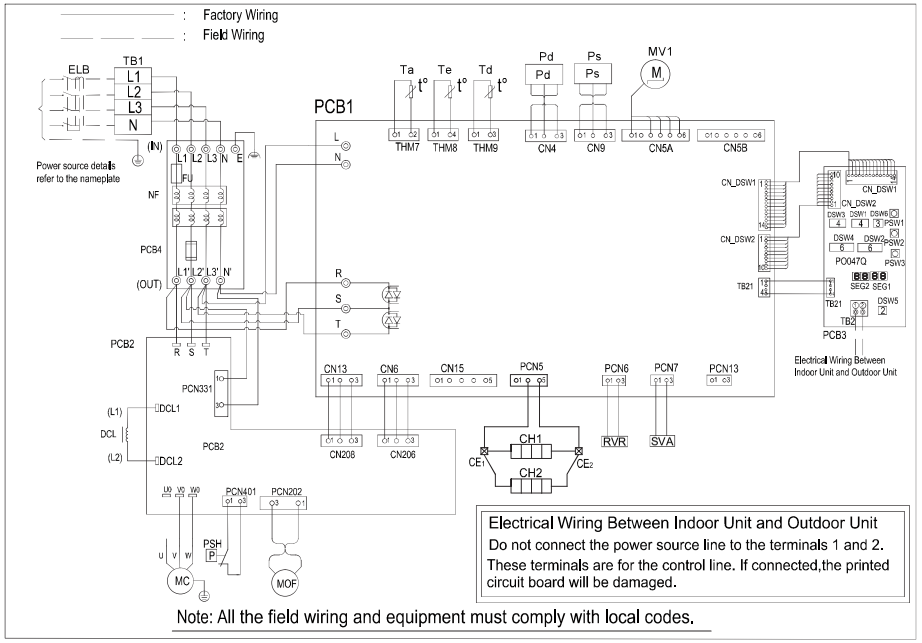
MARK	NAME
MC	Motor for Compressor
MOF	Motor for Outdoor Fan
FU	Fuse
MV	Micro-Computer Control Expansion Valve
RVR	Reversing Valve Relay
SVA	Solenoid Valve for Hot Gas Bypass
PSH	High Pressure Switch
P_d	Refrigerant pressure sensor (vent side)
P_s	Refrigerant pressure sensor
TB	Terminal Board
PCB	Printed circuit board
THM	Thermistor
DCL	Reactor
CN、PCN	Connector
NF	Noise Filter
PSW	Push switch on PCB3
DSW	Dip switch on PCB3
⏚	Functional earthing
⏚	Protective earthing

Hisense

Model: AVW-41/48/54HKDH2H1

⚠ WARNING | ⚠ Before inspecting the electrical parts set the Operation Switch to OFF, and cut OFF the power supply.
Warning:Do not power on and carry out maintenance unless the unit has been powered off for at least 10 minutes.

[ELECTRICAL WIRING DIAGRAM]



[Refrigerant Charging Quantity]

No.	Name	Calculating Method																		Additional Charge (kg)
1	W1	Additional refrigerant charge calculation for liquid piping Pipe Diameter / Total Piping Length(m) / Additional Charge per Meter(kg/m) / Additional Charge (kg) W11 12.7 m ×0.093kg/m= W12 9.53 m ×0.046kg/m= W13 6.35 m ×0.019kg/m=																		W1=W11+W12+W13= kg
2	W2	Additional refrigerant charge calculation for indoor unit (W2 kg)																		W2= kg
		Indoor Unit Type		05	07	09	12	15	17	19	22	24	27	28	30	38	48	54		
		Low-height Ceiling Ducted Type	AVE-**HJDDH	0.12	0.12	0.19	0.19	0.23		0.31		0.33								
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		Mini 4-Way Cassette Type	AVC-**HJDBA	0.14	0.14	0.19	0.19	0.26	0.26	0.26										
		Wall Mounted Type	AVS-**HJDDJ	0.19	0.19	0.19	0.19	0.25		0.32		0.32		0.32						
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		Wall Mounted Type	AVS-**HJDTD	0.19	0.19	0.19	0.19	0.25		0.32		0.32		0.32						
3	W	Total Additional Ref. Charge of This System = W1+W2																		W= kg

Note: Ensure that the total additional charge should not be exceeded the max.additional refrigerant charge quantity as shown in the table below.
Max. Additional Refrigerant Charge Quantity

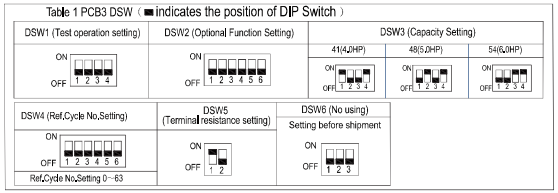
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[DSW settings (before shipment)]

Table 1 PCB3 DSW (■ indicates the position of DIP Switch)



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MOF	Motor for Outdoor Fan
FU	Fuse
MV	Micro-Computer Control Expansion Valve
RVR	Reversing Valve Relay
SVA	Solenoid Valve for Hot Gas Bypass
PSH	High Pressure Switch
P_d	Refrigerant pressure sensor (vent side)
P_s	Refrigerant pressure sensor
TB	Terminal Board
PCB	Printed circuit board
THM	Thermistor
DCL	Reactor
CN、PCN	Connector
NF	Noise Filter
PSW	Push switch on PCB3
DSW	Dip switch on PCB3
	Functional earthing
	Protective earthing