

# Hisense

## Installation & Maintenance Manual

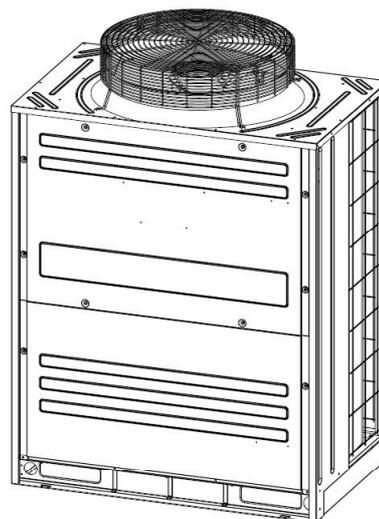
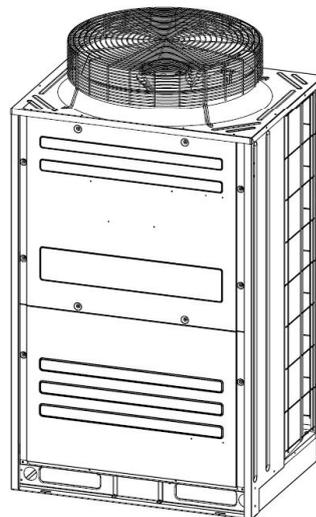
INVERTER-DRIVEN  
MULTI-SPLIT  
AIR CONDITIONER  
(HEAT PUMP)

- Outdoor Units -

AVWT-76FESRA	AVWT-96FESRA	AVWT-114FESSA
AVWT-136FESSA	AVWT-154FESSA	AVWT-170FESZA
AVWT-190FESZA	AVWT-212FESZA	AVWT-232FESZA
AVWT-250FESZA	AVWT-272FESZA	AVWT-290FESZA
AVWT-308FESZA	AVWT-324FESZA	AVWT-340FESZA
AVWT-364FESZA	AVWT-382FESZA	AVWT-398FESZA
AVWT-420FESZA	AVWT-438FESZA	AVWT-454FESZA

### **IMPORTANT:**

READ AND UNDERSTAND  
THIS MANUAL BEFORE  
USING THIS HEAT-PUMP  
AIR CONDITIONERS.  
KEEP THIS MANUAL FOR  
FUTURE REFERENCE.



P01128Q

ORIGINAL INSTRUCTIONS



## Declaration of Conformity (Manufacturer's Declaration)



Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd.

Add: 218, Qianwangang Road, Economic & Technical Development Zone, Qingdao, P.R. China

declares under its sole responsibility that the air conditioning models to which this declaration relates:

AVWT-76FESRA, AVWT-96FESRA, AVWT-114FESSA,  
AVWT-136FESSA, AVWT-154FESSA

are in conformity with the following standard(s) or other normative document(s), provided that these are used in accordance with our instructions:

EN 60335-1  
EN 60335-2-40  
EN 62233  
EN 55014-1  
EN 61000-3-2  
EN 61000-3-3  
EN 55014-2

following the provisions of:

2006/42/EC  
2014/30/EU  
2012/19/EU  
2011/65/EU  
97/23/EC \*

Directives, as amended.

\* as set out by Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. and judged positively by NB0035 as following:

Conformity Assessment Procedure: module A1

Category: II

Refrigerant: R410A

Maximum allowable pressure (high pressure sides) : 4.15MPa

Maximum allowable pressure (low pressure sides) : 2.21MPa

Manufacturing number and manufacturing year: refer to model Nameplate.

Notes:

This declaration becomes invalid, if technical or operational modifications are introduced without the manufacturers consent.

Hisense Italia S.r.l. is authorised to Compile the Technical Construction File.

Add. : Via Montefeltro 6A, 20156 Milano.

**Hisense**

Name, Surname :

*Chen Lin*

Position/ Title : Director

Date : Jan. 10,2017



## IMPORTANT NOTICE

- 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 heat pump air conditioner is designed for standard air conditioning only. Do not use this heat pump air conditioner for other purpose such as drying clothes, refrigerating foods or for any other cooling or heating process.
- Do not install the unit in the following places. It may cause a fire, deformation, corrosion or failure
  - \* Places where oil (including machinery oil).
  - \* Places where a lot of sulfide gas drifts such as in hot spring.
  - \* Places where inflammable gas may generate or flow.
  - \* Places where strong salty wind blows such as coast regions.
  - \* 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.
- Pay attention to the following points when the unit is installed in a hospital or other facilities where electromagnetic wave generates from medical equipment.
  - \* Do not install the unit in the place where the electromagnetic wave is directly radiated to the electrical box, remote control cable or remote control switch.
  - \* Install the unit at least 3 meters away from electromagnetic wave such as a radio.
- 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.
- The installer and system specialist shall secure against leakage according to local regulations or standards. The following standards may be applicable, if local regulations are not available. International Organization for Standardization, ISO5149 or European Standard, EN378 or Japan Standard, KHKS0010.
- No part of this manual may be reproduced without written permission.
- It is assumed that this heat pump air conditioner will be operated and serviced by English speaking people. If this is not the case, the customer should be add safety, caution and operating signs in the native language.
- If you have any questions, contact your distributor or dealer of HISENSE
- This manual gives a common description and information for this heat pump air conditioner which you operate as well for other models.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.
- This system can provide both Cooling/Heating Changeover and Cooling/Heating Simultaneous Operation Systems.

Temperature		(°C)	
		Maximum	Minimum
Cooling Operation	Indoor	32 DB/23 WB	21 DB/15 WB
	Outdoor	43 DB *	-5 DB *
Heating Operation	Indoor	27 DB	15 DB
	Outdoor	15 WB *	-20 WB *

DB: Dry Bulb, WB: Wet Bulb

\* The temperature may change depending on the outdoor unit.

This manual should be considered as a permanent part of the air conditioning equipment and should remain with the air conditioning equipment.

## **IMPORTANT NOTICE**



### **Correct Disposal of this product**

This marking indicates that this product should not be disposed with other household wastes. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

## **CHECKING PRODUCT RECEIVED**

- **Upon receiving this product, inspect it for any shipping damage. Claims for damage, either apparent or concealed, 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.

Therefore, the utilization of the unit other than those indicated in these instructions is not recommended.

Please contact your local agent, as the occasion arises.

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

# TABLE OF CONTENTS

1. Safety Summary .....	1
2. Structure .....	5
2.1 Outdoor Unit & Refrigerant Cycle.....	5
2.2 Necessary Tools and Instrument List for Installation .....	5
3. Before Installation .....	7
3.1 Line-Up of Outdoor Unit .....	7
3.2 Combination of Indoor Unit and Outdoor Unit .....	7
4. Transportation and Handling.....	9
4.1 Transportation .....	9
4.2 Handling of Outdoor Unit.....	10
5. Outdoor Unit Installation .....	11
5.1 Factory-Supplied Accessories .....	11
5.2 Installation .....	12
5.3 Service Space .....	13
5.4 Foundation .....	15
5.5 Drain Water Treatment .....	17
6. Refrigerant Piping Work.....	18
6.1 Piping Materials.....	18
6.2 Flaring and Joint.....	20
6.3 Caution about Outdoor Unit Installation .....	21
6.4 Piping Connection .....	23
6.4.1 Piping Size for AVWT-76FESRA to AVWT-154FESSA (Base Units).....	24
6.4.2 Piping Size for AVWT-170FESZA to AVWT-308FESZA(Two Units Combination) .....	24
6.4.3 Piping Size for AVWT-324FESZA to AVWT-454FESZA(Three Units Combination) .....	25
6.4.4 Stop Valve.....	26
6.4.5 Piping Connection.....	27
7. Electrical Wiring .....	33
7.1 General Check .....	34
7.2 Electrical Wiring Connection .....	35
7.3 Electrical Wiring for Outdoor Unit.....	38
7.4 Electrical Wiring Connection of Indoor Unit, Outdoor Unit .....	40
7.5 Dip Switch Setting of Outdoor Unit.....	42
8. Additional Refrigerant Charge.....	45
8.1 Air-Tight Test .....	45
8.2 Vacuuming.....	47
8.3 Additional Refrigerant Charge Calculation .....	48
8.4 Charging Work .....	59
8.5 Automatic Simple Judgement System for Refrigerant Amount .....	50
9. Test Run.....	52
9.1 Before Test Run.....	52
9.2 Test Run .....	54
10. Safety and Control Device Setting .....	59
11. Technical parameters.....	60

## 1. Safety Summary

< Signal Words >

- Signal words are used to identify levels of hazard seriousness.  
Definitions for identifying hazard levels are provided below with their respective signal words

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

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

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

 **NOTICE** : NOTICE is used to address practices not related to personal injury.

**NOTE** : NOTE is useful information for operation and/or maintenance.

## DANGER

- Do not perform installation work, refrigerant piping work, drain pump, drain piping and electrical wiring connection without referring to our installation manual. If the instructions are not followed, it may result in a water leakage, electric shock or a fire.
- Use the adequate refrigerant (R410A) to the outdoor unit 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-tight test.  
These types of gases or extremely dangerous can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.
- Do not pour water into the indoor or outdoor unit. These products are equipped with electrical parts. If poured, it will cause a serious electrical shock.
- Do not open the service cover or access panel for the indoor or outdoor units without turning OFF the main power supply.
- Do not touch or adjust safety devices inside the indoor unit or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Refrigerant leakage can cause difficulty with breathing due to insufficient air. Turn OFF the main switch, extinguish any naked flames and contact your service contractor, if refrigerant leakage occurs.
- Make sure that the refrigerant leakage test should be performed.  
Refrigerant (Fluorocarbon) for this unit is incombustible, non-toxic and odorless.  
However if the refrigerant is leaked and is contacted with fire, toxic gas will generate.  
Also because the fluorocarbon is heavier than air, the floor surface will be filled with it, which could cause suffocation.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
- Use an ELB (Earth Leakage Breaker).  
In the event of fault, there is danger of an electric shock or a fire if it is not used
- Do not install the outdoor unit where there is high level of oil mist, flammable gases, salty air or harmful gases such as sulfur.
- 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 of the protection device such as a pressure switch when operating.  
It may cause a fire and 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 or fuse is often activated, stop the system and contact your service contractor.
- Check that the ground wire is securely connected. If the unit is not correctly grounded, it lead electric shock. Do not connect the ground wiring to gas piping, water piping, lighting conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Before performing any brazing work, check to ensure that there is no flammable material around  
When using refrigerant be sure to wear leather gloves to prevent cold injuries.
- Protect the wires, electrical parts, etc. from rats or other small animals.  
If not protected, rats may gnaw at unprotected parts and 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.
- Do not install the unit in a place where oil, vapor, organic solvent and corrosive gas (ammonia, sulfur compound and acid) may be present in quantities.  
It may cause refrigerant leakage due to corrosion, electrical shock, deteriorated performance and breakage.
- Perform electrical work according to Installation Manual and all the relevant regulation and standards.  
If the instructions are not followed, an electrical shock and fire may occur due to insufficient capacity an inadequate performance.
- Use specified cables between units and choose the cables correctly. If not, an electrical shock or fire may occur.
- Ensure that the wiring terminals are tightened securely with the specified torques. If not, generating fire or electrical shock at the terminal connection part may occur.

## **CAUTION**

- Do not step or put any material on the product.
- Do not put any foreign material on the unit or inside the unit.
- Provide a strong and correct foundation so that;
  - a. The outdoor unit is not on an incline.
  - b. Abnormal sound does not occur.
  - c. The outdoor unit will not fall down due to a strong wind or earthquake.
- The appliance is not to be used by children or person with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised that they do not play with the appliance.

## NOTICE

- 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.
- Supply electrical power to the system to energize the oil heater for 12 hours before startup after a long shutdown.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- In some cases, the packaged air conditioner may not be operated normally under the following cases.
  - \* In case that electrical power for the packaged air conditioner is supplied from the same power transformer as the device\*.
  - \* In case that the power source wires for the device\* and the packaged air conditioner are located close to each other.

Device\*: (Ex) Lift, container crane, rectifier for electric railwa , inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch.  
It consumes a large quantity of electrical power.

Regarding the cases mentioned above, surge voltage may be inducted in the power supply wiring for the packaged air conditioner due to a rapid change in power consumption of the device and an activation of switch.

Therefore, check the field regulations and standards before performing electrical work in order to protect the power supply for the packaged air conditioner.

## NOTE

- It is recommended that the room will be ventilated every 3 to 4 hours.
- The heating capacity of the heat pump unit is decreased according to the outdoor air temperature. Therefore, it is recommended that auxiliary heating equipment be used in the field when the units is installed in a low temperature region.
- Operate the heat pump air conditioner within this range.
  - Regarding installation altitude below 1000m;
  - Regarding frequency of supply power within  $\pm 1\%$ Hz of rated frequency;
  - Regarding transport / storage temperature within  $-25\sim 55^{\circ}\text{C}$ ;
- The A-weighted emission sound pressure level at workstations, all this level does not exceed 70 dB(A) .

## 2. Structure

### 2.1 Outdoor Unit & Refrigerant Cycle

Regarding structure drawings and refrigerant cycle diagram, please refer to Technical Catalogue.

### 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	Plier	12	Charging Cylinder	17	Clamper for Solderless 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

Use tools and measuring instruments only for the new refrigerant R410A which is directly touch to 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.

Therefore, if the specified materials are not used, it may cause explosion, injur , leakage, electrical shock or fire

## NOTICE

Check the design pressure for this product is 4.15MPa.

To avoid accidental mixing of the different refrigerant or different refrigerant oil, the sizes of the charging connections have been changed.

It is necessary to prepare the following tools before performing the installation work.

◇: Interchangeability is available with current R22  
 ×: Prohibited

●: only for Refrigerant R410A (No Interchangeability with R22)  
 ✦: only for Refrigerant R407C (No Interchangeability with R22)

Measuring Instrument and Tool		Interchangeability with R22		Reason of Non-Interchangeability and Attention (★: Strictly Required)	Use
		R410A	R407C		
Refrigerant Pipe	Pipe Cutter Chamfering Reamer	◇	◇	-	Cutting Pipe Removing Burrs
	Flaring Tool	◇●	◇	* The flaring tools for R407C are applicable to R22 * If using flaring tube, make dimension of tube large for R410A.	Flaring for Tubes
	Extrusion Adjustment Gauge	●	-	* In case of material 1/2H, flaring is not available	Dimensional Control for Extruded Portion 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 socket for connecting tube.	Expanding Tubes
	Torque Wrench	●	◇	* For φ12.7, φ15.88, spanner size is up 2mm.	Connection of Flare Nut
		◇	◇	* For φ6.35, φ9.53, φ19.05, spanner size is the same.	
	Brazing Tool	◇	◇	* Perform correct brazing work.	Brazing for Tubes
	Nitrogen Gas	◇	◇	* Strict Control against Contamin (Blow nitrogen during brazing.)	Prevention from Oxidation during Brazing
Lubrication Oil (for Flare Surface)	●	✦	* Use a synthetic oil which is equivalent to the oil used in the refrigeration cycle. * Synthetic oil absorbs moisture quickly.	Applying Oil to the Flared Surface	
Vacuum Drying Refrigerant Charge	Refrigerant Cylinder	●	✦	* Check refrigerant cylinder color. ★ Liquid refrigerant charging is required regarding zeotropic refrigerant.	Refrigerant Charging
	Vacuum Pump	◇	◇	★ The current ones 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	*●	✦		
	Manifold Valve	●	✦	* No interchangeability is available due to higher pressures when compared with R22. ★ Do not use current ones to the different refrigerant. If used, mineral oil will flow into the cycle and cause sludges, resulting in clogging or compressor failure. Connection diameter is different; R410A: UNF1/2, R407C: UNF7/16.	Vacuum Pumping, Vacuum Holding, Refrigerant Charging and Check of Pressures
	Charging Hose	●	✦		
	Charging Cylinder	×	×	* Use the weight scale.	-
	Weight Scale	◇	◇	-	Measuring Instrument for Refrigerant Charging
Refrigerant Gas Leakage Detector	*●	✦	* The current gas leakage detector (R22) is not applicable due to different detecting method.	Gas Leakage Check	

\*: Interchangeability with R407C.

### 3. Before Installation

#### 3.1 Line-Up of Outdoor Unit

< Base Unit >

Capacity(kBtu/h)	76	96	114	136	154
Mode I	AVWT-76FESRA	AVWT-96FESRA	AVWT-114FESSA	AVWT-136FESSA	AVWT-154FESSA

< Combination of Base Units > \*

Capacity(kBtu/h)	170	190	212	232	250
Mode I	AVWT-170FESZA	AVWT-190FESZA	AVWT-212FESZA	AVWT-232FESZA	AVWT-250FESZA
Combination	AVWT-76FESRA	AVWT-76FESRA	AVWT-76FESRA	AVWT-114FESSA	AVWT-114FESSA
	AVWT-96FESRA	AVWT-114FESSA	AVWT-136FESSA	AVWT-114FESSA	AVWT-136FESSA
Capacity(kBtu/h)	272	290	308	324	340
Mode I	AVWT-272FESZA	AVWT-290FESZA	AVWT-308FESZA	AVWT-324FESZA	AVWT-340FESZA
Combination	AVWT-136FESSA	AVWT-136FESSA	AVWT-154FESSA	AVWT-96FESRA	AVWT-96FESRA
	AVWT-136FESSA	AVWT-154FESSA	AVWT-154FESSA	AVWT-96FESRA	AVWT-96FESRA
	-	-	-	AVWT-136FESSA	AVWT-154FESSA
Capacity(kBtu/h)	364	382	398	420	438
Mode I	AVWT-364FESZA	AVWT-382FESZA	AVWT-398FESZA	AVWT-420FESZA	AVWT-438FESZA
Combination	AVWT-96FESRA	AVWT-96FESRA	AVWT-96FESRA	AVWT-114FESSA	AVWT-136FESSA
	AVWT-114FESSA	AVWT-136FESSA	AVWT-154FESSA	AVWT-154FESSA	AVWT-154FESSA
	AVWT-154FESSA	AVWT-154FESSA	AVWT-154FESSA	AVWT-154FESSA	AVWT-154FESSA
Capacity(kBtu/h)	454				
Mode I	AVWT-454FESZA				
Combination	AVWT-154FESSA				
	AVWT-154FESSA				
	AVWT-154FESSA				

\*: Regarding the configuration of outdoor units especially for 170 ~ 454 kBtu/h, combine the specified based units (2 or 3) as shown in the table above.

#### 3.2 Combination of Indoor Unit and Outdoor Unit

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

Table 3.1 Indoor Unit Type List

Indoor Unit Type	Nominal Capacity (kBtu/h)														
	07	09	12	14	17	18	22	24	27	30	38	48	54	76	96
Ceiling Ducted Type (Low Static Pressure)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Ceiling Ducted Type (High Static Pressure)	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Low-Height Ceiling Ducted Type	○	○	○	○	○	○	○	○							
Low-Height Ceiling Ducted Type (DC)	○	○	○	○	○	○	○	○							
Slim Ceiling Ducted Type	○	○	○	○											
1-Way Cassette Type	○	○	○	○	○		○								
2-Way Cassette Type	○	○	○	○		○		○							
4-Way Cassette Type		○	○	○	○	○	○	○	○	○	○	○	○		
Compact 4-Way Cassette Type	○	○	○	○	○										
Wall-Mounted Type	○	○	○	○	○	○	○	○							
Ceiling and Floor Type					○	○	○	○	○	○	○	○			
Floor-Concealed Type		○		○		○		○							

○ : Available

- The number of connectable indoor unit with the outdoor unit is as follows.  
Comply with the condition as follows when installing the unit.
- A maximum total capacity of 140% and a minimum total capacity of 50% can be obtained by combination of the indoor units when compared with the nominal outdoor unit capacity.

Table 3.2 System Combination

Model ( kBtu/h )	Min. Capacity at Individual Operation ( kBtu/h )	Max. Number of Connectable I.U.	Recommended Number of Connectable I.U.	Range of Combination Capacity
76	07	13	8	50 to 140%
96		16	10	50 to 140%
114		19	10	50 to 140%
136		23	16	50 to 140%
154		26	16	50 to 140%
170		26	16	50 to 140%
190		33	18	50 to 140%
212		36	20	50 to 140%
232		40	26	50 to 140%
250		43	26	50 to 140%
272		47	32	50 to 140%
290		50	32	50 to 140%
308		53	32	50 to 140%
324		56	32	50 to 140%
340		59	32	50 to 140%
364		64	38	50 to 140%
382		64	38	50 to 140%
398		64	38	50 to 140%
420		64	38	50 to 140%
438		64	38	50 to 140%
454	64	38	50 to 140%	

**NOTES:**

1. For the system which all indoor units are operated simultaneously, the total indoor unit capacity should be less or equal to the outdoor unit capacity. If not, poor performance or narrow operation range at overload may occur.
2. For the system which all indoor units are not operated simultaneously, the total indoor unit capacity is available up to 140% against the outdoor unit capacity.
3. If the system is used in the cold area (ambient temperature becomes under -10°C) or under the high heating load conditions, the total indoor unit capacity should be less than 100% against the outdoor unit and total piping length is less than 300m.
4. Compared to over 9 kBtu/h of indoor units, 7 kBtu/h of indoor units are set with higher air flow. Do not install these units in the place where the cold draft may occur during heating operation. Determine the usage environment and installation location carefully.  
If the unit is installed in such places, the number of connectable I.U. should be less than the recommended number on the table above.

## 4. Transportation and Handling

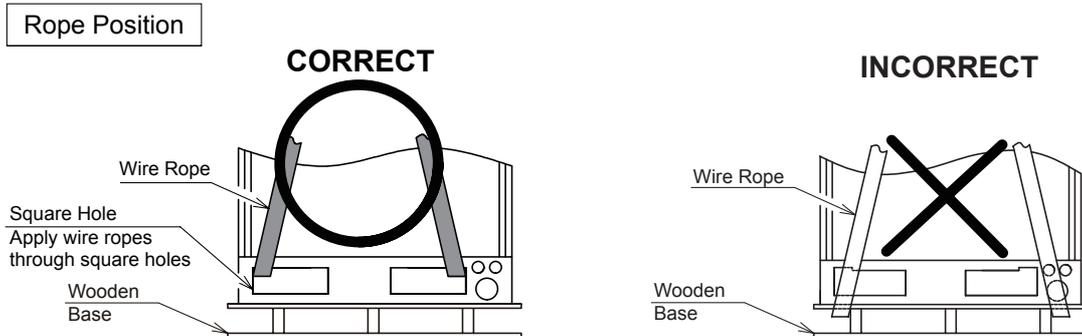
### 4.1 Transportation

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

When using a crane, hang the unit according to the description of the label attached to the outdoor unit.

## **⚠ DANGER**

Do not hang the unit by the ropes at the wooden base.



## **⚠ CAUTION**

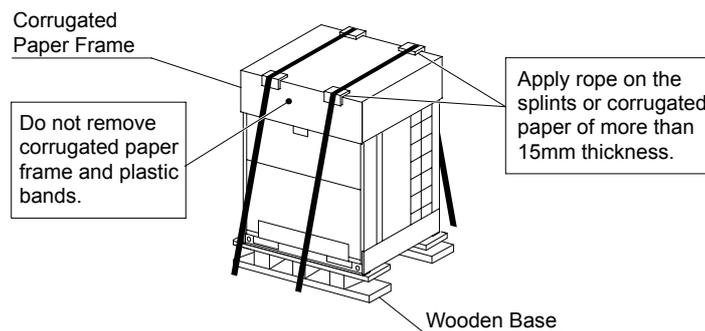
### 1. Transportation and Storage

The corrugated paper frame is not sufficiently strong, therefore pay attention to the followings in order to prevent the unit deformation.

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

### 2. Transportation and Wire Rope

- To protect the unit, do not remove any packing.
- Do not stack or put any material on the product.
- Apply wire ropes on the both side of the unit as shown in the figure



- Hanging 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) wire ropes, as shown in Fig. 4.1.

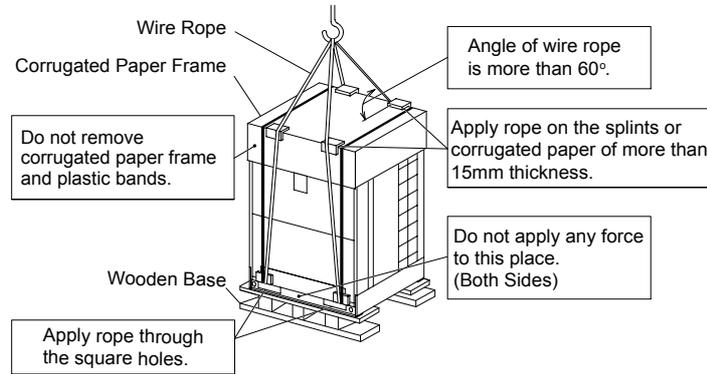


Fig. 4.1 Hanging Work for Transportation

- (3) Hang the unit without wooden base with two (2) wire ropes, as shown in Fig. 4.2.

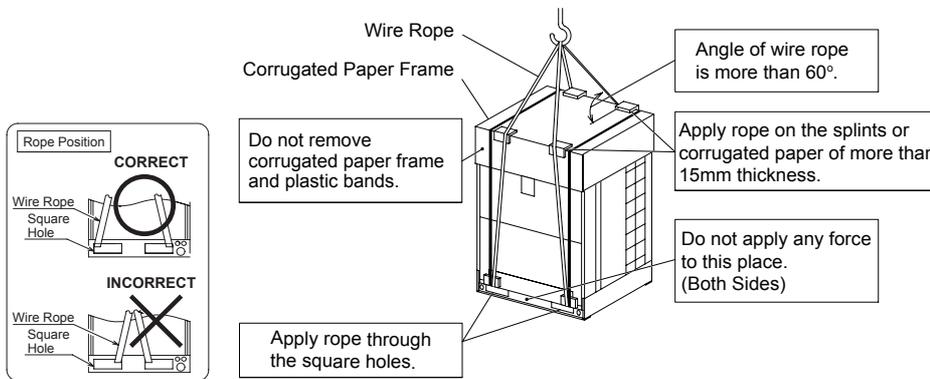
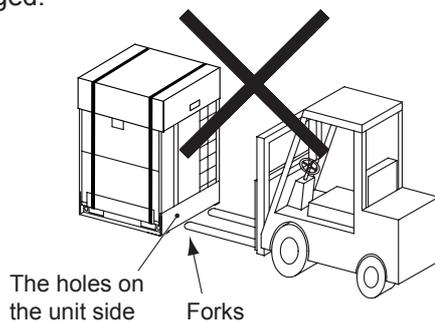


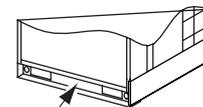
Fig. 4.2 Hanging Work without Wooden Base

When using forklift, do not insert forks into the holes on the unit side. The unit may be damaged.



Do not apply excessive force to the square holes with forks or other materials. The bottom of the unit may be deformed.

- \* Do not push the bottom base by fork.
- \* Do not use roller.



Do not apply excessive force. (Both Sides)

**NOTE**

In case of transportation after unpacking, protect the unit with the splints or cloth.

## 4.2 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.

## 5. Outdoor Unit Installation

### 5.1 Factory-Supplied Accessories

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

Table 5.1 Factory-Supplied Accessories

Accessory		76	96	114	136	154
Accessory Pipe	(A) Connection for Refrigerant Gas (Low) Pipe	 φ22.2→φ15.88	 φ22.2→φ19.05	 25.4→ 22.2	 φ25.4→ 22.2	 φ25.4→φ22.2
	(B) Connection for Refrigerant Gas (High/Low) Pipe	 φ22.2→φ19.05	-	-	-	 φ25.4→φ28.6
	(C) Connection for Refrigerant Liquid Pipe			-		-
Rubber Bush	For Connection Hole of Power Supply Wire		 ×1		 ×1	 ×1
Screw (Spare)		 ×3	 ×3	 ×3	 ×3	 ×3

---

### NOTE

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

---

## 5.2 Installation

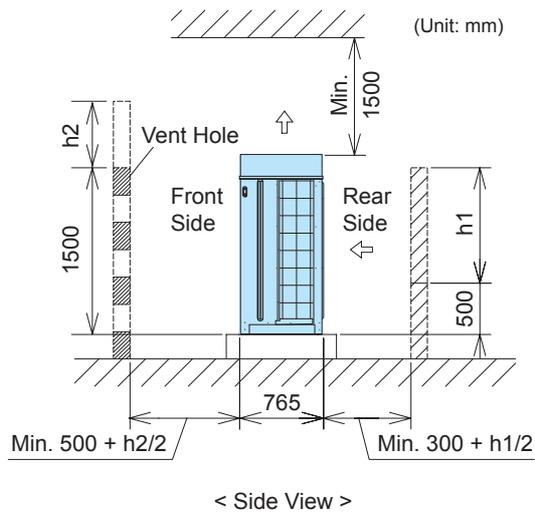
- (1) Install the outdoor unit in a dry well ventilated environment.
- (2) Install the outdoor unit where it is in the shade or it will not be exposed to direct sunshine or direct radiation from high temperature heat source.
- (3) Install the outdoor unit where the sound or the discharge air from the outdoor unit does not affect neighbors or surrounding ventilation. The operating sound at the rear or right/left sides is 3 to 6dB(A) higher than the value in the catalog at the front side.
- (4) Install the outdoor unit in a space with limited access to general public.
- (5) Check to ensure that the foundation is flat, level and sufficiently strong.
- (6) Do not install the outdoor unit where dust or other contamination could block the outdoor heat exchanger.
- (7) When installing the outdoor unit in snow-covered areas, mount the field-supplied hoods on the top of the outdoor unit and the inlet side of the heat exchanger.
- (8) While heating or defrosting operation, drain water is discharged. Provide adequate drainage around the foundation. If installing the unit on a roof or a veranda, avoid draining in or over walkways to prevent water dripping on people or the formation of ice in winter. In case of installing such a place, provide the additional drainage around the foundation.
- (9) 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.

### NOTES:

1. Do not install the outdoor unit where there is a high level of oil mist, flammable gases, salty air or harmful gases such as sulphur and an acid or alkaline environment.
2. Do not install the outdoor unit where the electromagnetic wave is directly radiated to the electrical control box.
3. Install the outdoor unit as far as possible, being at least 3 meters from the electromagnetic wave radiator.

### 5.3 Service Space

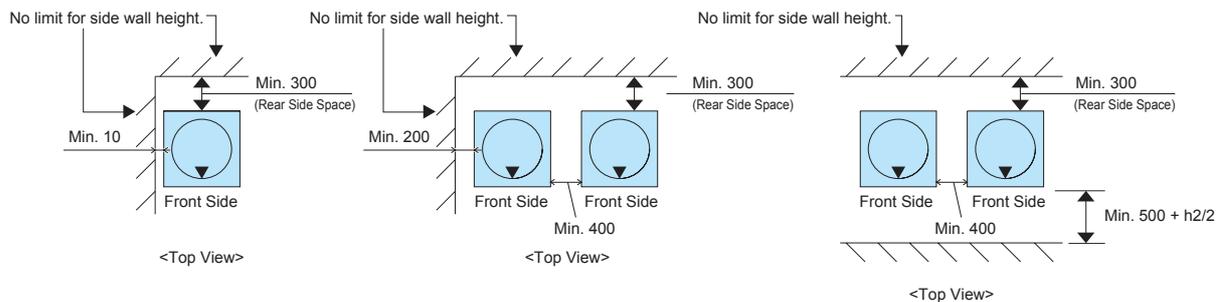
Make the service space when outdoor unit is installed as follows.



- In case of no walls at the front and the rear side of the unit, the space of 500mm for the front side and 300mm for the rear side is required.
- When the wall of front side is higher than 1,500mm, the space of  $(500 + h2/2)$  mm for the front side is required.
- When the wall of rear side is higher than 500mm, the space of  $(300 + h1/2)$  mm for the rear side is required.
- When install the wall in front of the unit, make the vent hole on the wall.
- When the space to the obstacle above the unit is less than 1,500mm or the space above the unit is closed, set up the duct at the air outlet side in order to prevent short circuit.
- When there are obstacles above the unit, the four (front, rear, right and left) sides of the unit shall be open in principle.

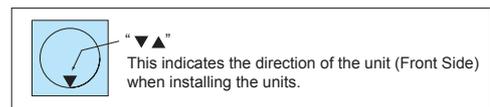
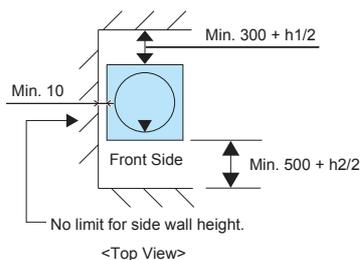
#### 1) Walls on 2 Directions

In case that the units are installed adjacent to tall buildings and there are no walls in 2 directions, the minimum rear side space is 300mm.



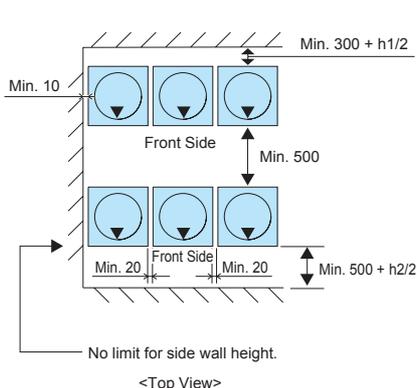
#### 2) Walls on 3 Directions

##### • Single Installation

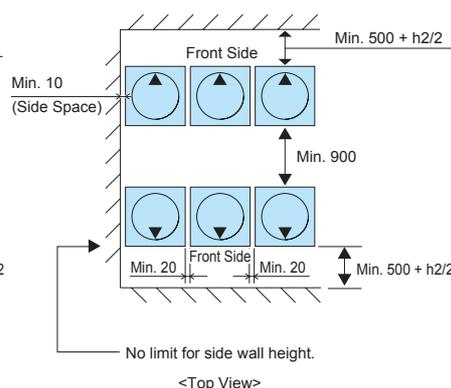


##### • Multiple / Serial Installation

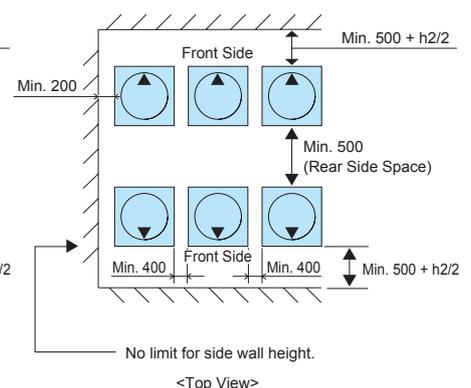
##### < Installation in the Same Direction >



##### < Rear to Rear Installation 1 >

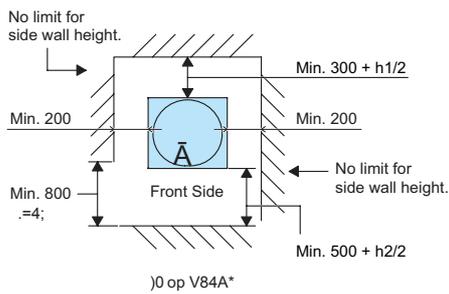


##### < Rear to Rear Installation 2 >



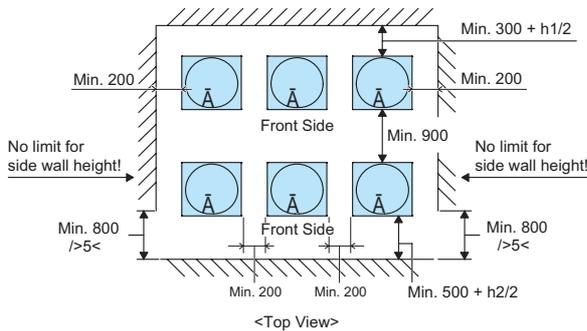
### 3) Walls on 4 Directions

#### • Single Installation

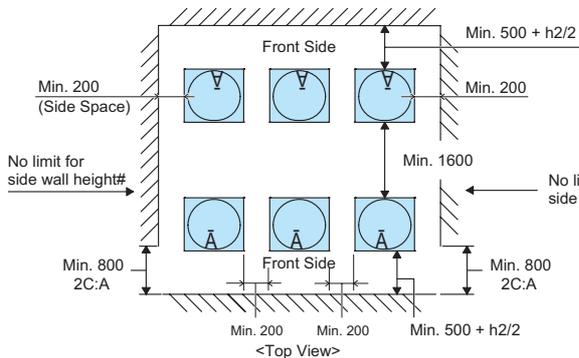


#### • Multiple / Serial Installation

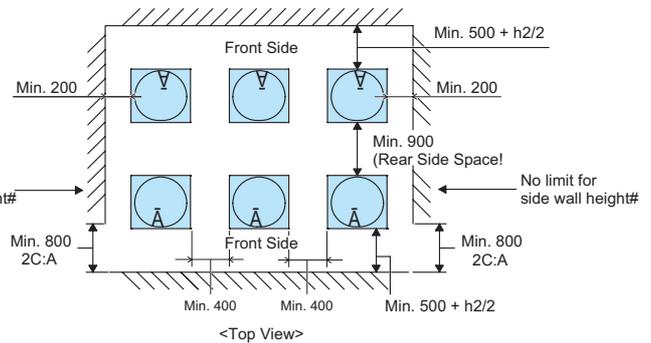
##### < Installation in the Same Direction >



##### < Rear to Rear Installation 1 >

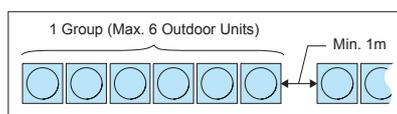


##### < Rear to Rear Installation 2 >



#### NOTE

1. Keep the upper side open to prevent mutual interference of inlet and outlet air of each outdoor unit.
2. The figure dimensions are sufficient spaces around outdoor units for operation and maintenance at typical installing conditions as follows. [ Operation Mode: Cooling Operation, Outside Temp.: 35°C ]  
In case that the outdoor unit ambient temperature is higher and also the short circuit is likely to occur compared to the installation condition, find an appropriate dimension by calculating air flow current.
3. For the multiple installation, 1 group allows 6 outdoor units (max.).  
The space of 1m between each group is required.

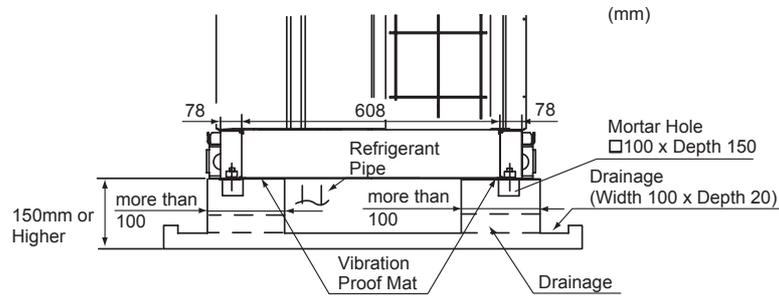


4. Partly open a wall if the unit is surrounded by walls in four directions.

## 5.4 Foundation

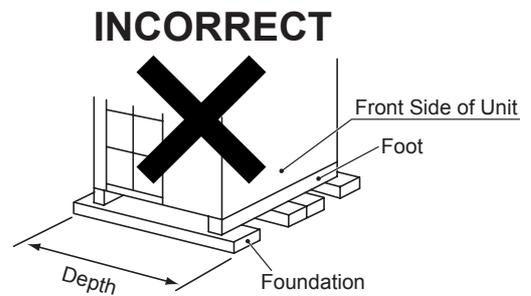
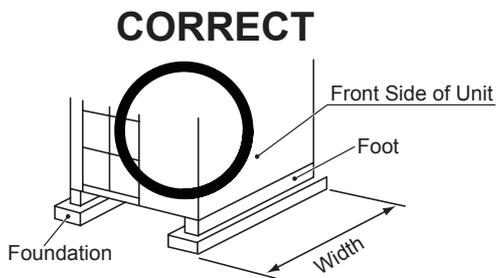
- Concrete Foundations

- (1) The height of the foundation should be 150mm higher than the ground level.
- (2) Install a drainage around foundation for smooth drain.

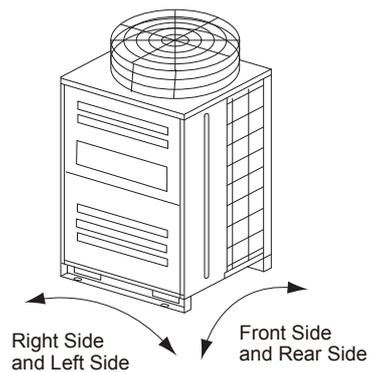


\* Provide concrete foundation as shown in the figure

\* Do not provide concrete foundation as shown below. The foot of the outdoor unit may be deformed.



- (3) Install the outdoor unit in the front-rear and right-left direction horizontally. (Use a level gauge.) Check to ensure that the gradient in four directions (front, rear, right and left) is within 10mm.



- (4) Provide a strong and correct foundation so that;
  - a. The outdoor unit is not on an incline.
  - b. Abnormal sound does not occur.
  - c. The outdoor unit will not fall down due to a strong wind or earthquake.

- (5) When installing the outdoor unit, fix the unit by anchor bolts (field-supplied)  
Refer to Fig. 5.1 regarding the location of fixing holes

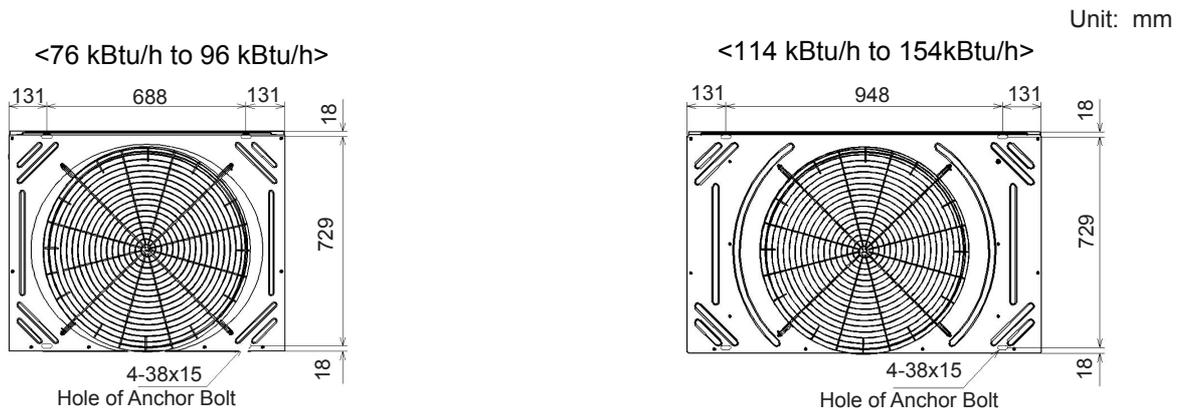
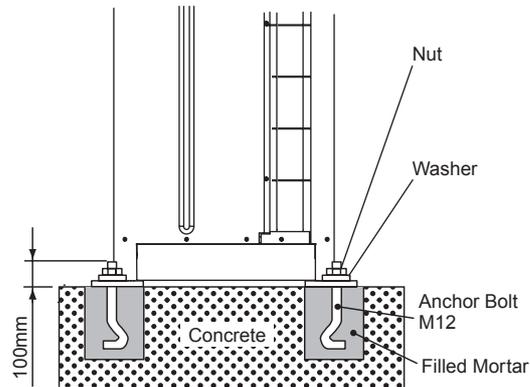


Fig. 5.1 Position of Anchor Bolts

Secure the outdoor unit with the anchor bolts.

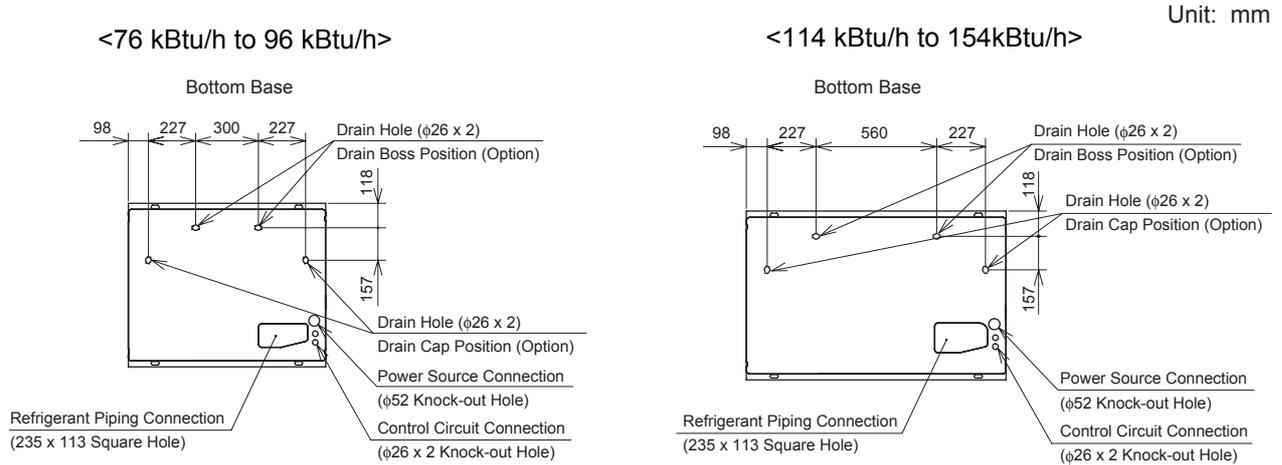


- (6) When installing the unit on a roof or a veranda, drain water sometimes turns to ice on a cold morning. Therefore, avoid draining into an area where people often use because it is slippery.
- (7) When drain piping is necessary for the outdoor unit, use the drain boss set (Optional). Do not use drain boss and drain pan kit in the cold area. The drain water in the drain pipe may be frozen and then the drain pipe may crack.

## 5.5 Drain Water Treatment

Drain water is discharged during heating and defrosting operation. (Rain water is also discharged.) Pay attention to the followings.

- (1) Choose a place where well drainage is available, or provide a drain ditch.
- (2) Do not install the unit over the walkways. Condensation water may fall on people. In case of installing the unit in such a place, provide the additional drain pan.
- (3) When drain piping is necessary for the outdoor unit, use the drain boss set (Optional). Do not use drain boss and drain pan kit in the cold area. The drain water in the drain pipe may be frozen and then the drain pipe may crack.



- Drain Boss (Optional Parts)

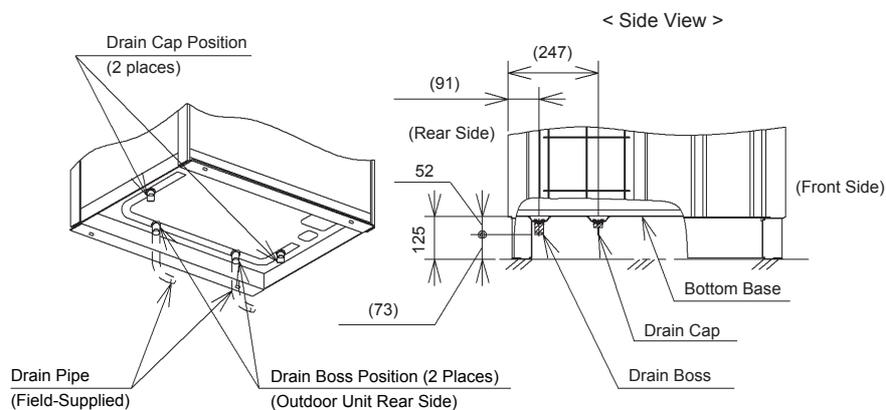
The drain boss is for the drain pipe connection in order to use outdoor unit bottom base as a drain pan.

### Component Formation of Drain Boss

Parts Name	Material / Color	Q'ty	Application
Drain Boss	PP / Black	2	Connecting for Drain Piping
Drain Cap	PP / Black	2	Embolization for Drain Hole
Rubber Cap	CR / Black	4	Sealing for Boss and Cap

### < Installation Position >

Example: AVWT-96FESR



## 6. 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-tight 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.
- Check to ensure that no pressure exists inside the stop valve before removing the flange

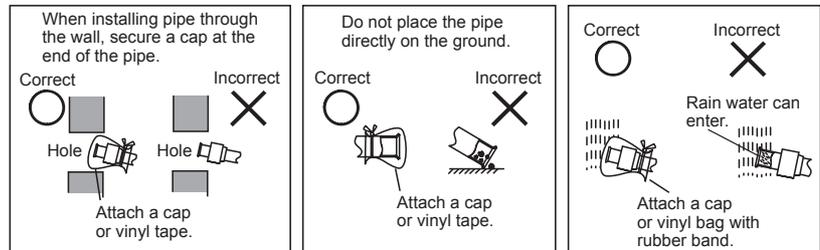
### **⚠ CAUTION**

Ensure to connect the piping among the units in the same refrigerant cycle.

#### 6.1 Piping Materials

- (1) Prepare locally-supplied copper pipes.
- (2) Select the piping size from the Table 6.1 and Table 6.2.
- (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. Do not use any tools which produce a lot of swarf such as a saw or a grinder.

#### ● Cautions for Refrigerant Pipe Ends



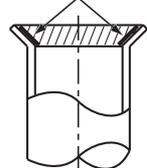
#### \$ Cautions for Piping Connection Work

- (1) Connect the indoor/outdoor units with refrigerant pipes. Fix the pipes and pay attention not to contact with weak materials such as ceiling. (Otherwise, abnormal sound may be heard due to the vibration of the piping.)
- (2) Apply refrigerant oil slightly on the sheet surface of the pipe and flare nut before the flaring work. And then tighten the flare nut with the specified tightening torque using two spanners. Perform the flaring work on the liquid piping side before the gas piping side. Check the gas leakage after the flaring work.

#### NOTE:

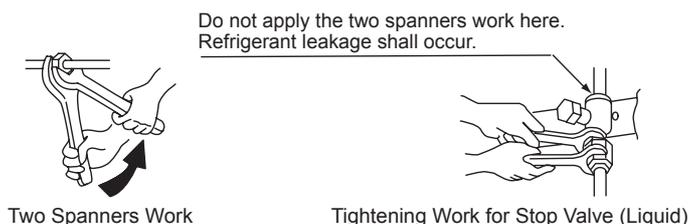
Refrigerant oil is field-supplied  
[Ethereal Oil FVC68D]

Apply Refrigerant Oil.



- (3) In case that temperature and humidity inside the ceiling exceed 27°C/RH80%, apply additional insulation (approx. 10mm thickness) to the accessory insulation. It prevents dew condensation on the surface of the insulation (refrigerant pipe only).
- (4) Perform the air-tight test (4.15MPa for the test pressure).
- (5) Perform cold insulation work by insulating and taping the flare connection and reducer connection. Also insulate all the refrigerant pipes.

#### \$ When tightening the flare nut, use two spanners



Two Spanners Work

Tightening Work for Stop Valve (Liquid)

### **⚠ CAUTION**

Do not apply excessive force to the flare nut when tightening. If applied, the flare nut may crack due to aged deterioration and refrigerant leakage may occur. Use the specified tightening torque

Table 6.1 Piping Size of Outdoor Unit

(mm)

Model	Gas		Liquid
76	φ 19.05	φ 15.88	φ 9.53
96	φ 22.2	φ 19.05	φ 9.53
114	φ 25.4	φ 22.2	φ 12.7
136			
154	φ 28.6	φ 22.2	φ 12.7
170	φ 28.6	φ 22.2	φ 15.88
190			
212	φ 28.6	φ 25.4	φ 15.88
232			
250	φ 31.75	φ 25.4	φ 19.05
272	φ 31.75	φ 28.6	φ 19.05
290			
308			
324			
340			
364	φ 38.1	φ 31.75	φ 19.05
382			
398			
420			
438			
454			

Table 6.2 Piping Size of Indoor Unit

(mm)

Indoor Unit(KBtu/h)	Gas	Liquid
07 to 14	φ12.7	φ6.35
17 to 18	φ15.88	φ6.35
22 to 54	φ15.88	φ9.53
76	φ19.05	φ9.53
96	φ22.2	φ9.53

- Piping Thickness and Material

Use the pipe as below.

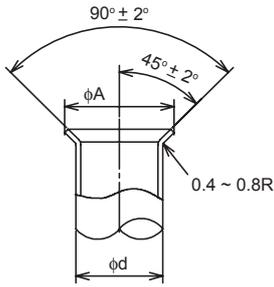
(mm)

Diameter	R410A	
	Thickness	Material
φ 6.35	0.8	O material
φ 9.53	0.8	O material
φ 12.7	0.8	O material
φ 15.88	1.0	O material
φ 19.05	1.0	1/2H material
φ 22.2	1.0	1/2H material
φ 25.4	1.0	1/2H material
φ 28.6	1.0	1/2H material
φ 31.75	1.1	1/2H material
φ 38.1	1.35	1/2H material
φ 41.3	1.45	1/2H material
φ 44.45	1.55	1/2H material

## 6.2 Flaring and Joint

- Flaring Dimension

Perform the flaring work as shown below.



Diameter ( $\phi d$ )	(mm)	
	A	R410A
6.35	+0 -0.4	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)

- Joint Selection

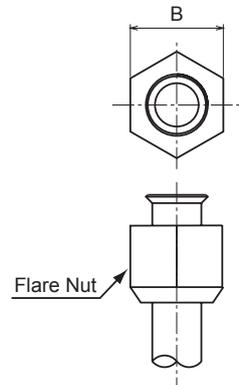
If you use 1/2H material, you can not perform the flaring work. In this case, use a joint selected from the chart below.

< Minimum Thickness of Joint (mm) >

Diameter	R410A
$\phi 6.35$	0.5
$\phi 9.53$	0.6
$\phi 12.7$	0.7
$\phi 15.88$	0.8
$\phi 19.05$	0.8
$\phi 22.2$	0.9
$\phi 25.4$	0.95
$\phi 28.6$	1.0
$\phi 31.75$	1.1
$\phi 38.1$	1.35
$\phi 41.3$	1.45
$\phi 44.5$	1.55

< Flare Nut Dimension B (mm) >

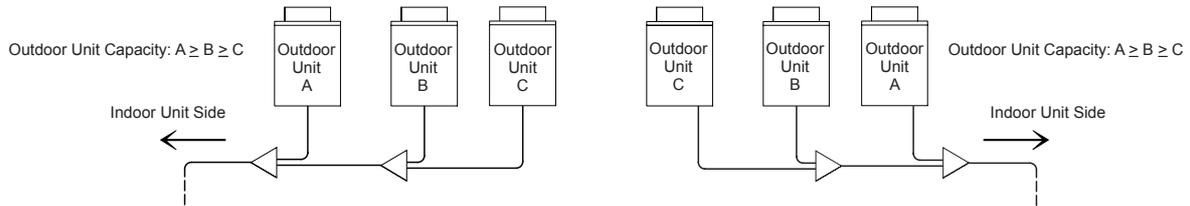
Diameter	R410A
$\phi 6.35$	17
$\phi 9.53$	22
$\phi 12.7$	26
$\phi 15.88$	29
$\phi 19.05$	36



### 6.3 Caution about Outdoor Unit Installation

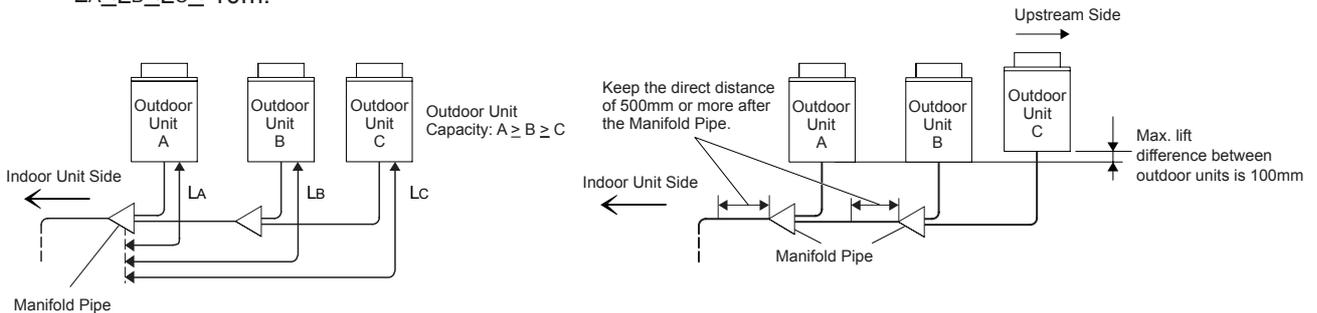
#### < Outdoor Unit Alignment >

Align the outdoor unit from large capacity as  $A \geq B \geq C$  and outdoor Unit "A" should be located at the indoor unit side.

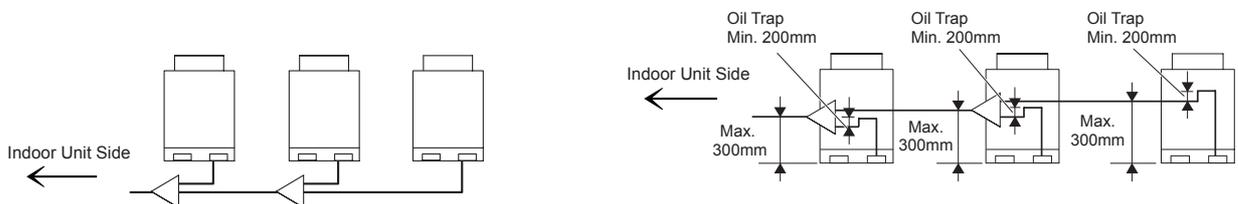


#### < Piping Work between Outdoor Units >

- (1) Piping length between Manifold Pipe (at outdoor unit side) and outdoor unit should be  $L_A \leq L_B \leq L_C \leq 10m$ .

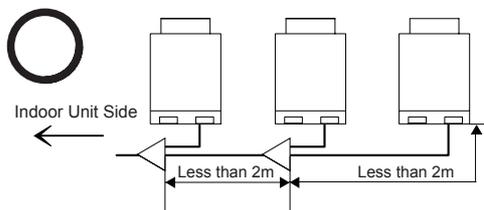


- (2) Place the Manifold Pipe lower than the outdoor unit piping connection. In case that the Manifold Pipe is placed higher than the outdoor unit piping connection, keep 300mm (max.) between the Manifold Pipe and the bottom of the outdoor unit. Also, provide the oil trap (min. 200mm) between the Manifold Pipe and the outdoor unit.

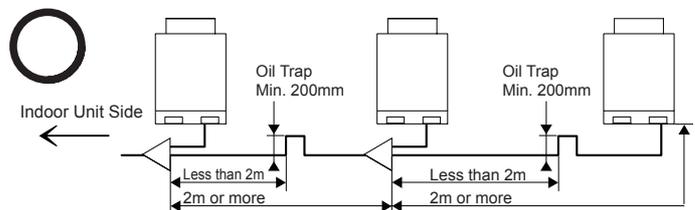


- (3) In case that the piping length between outdoor units is 2m or more, the oil trap should be provided for the gas pipe so that accumulation of refrigerant oil may not occur.

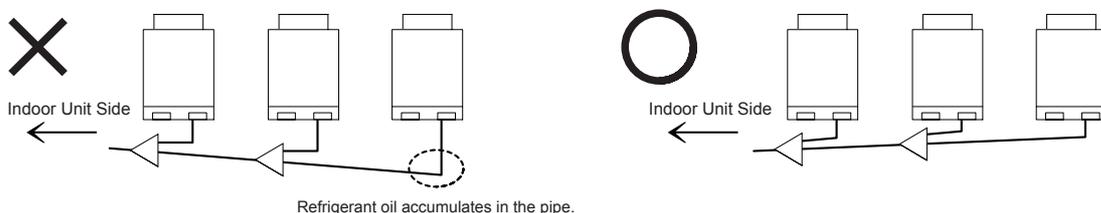
\* Less than 2m



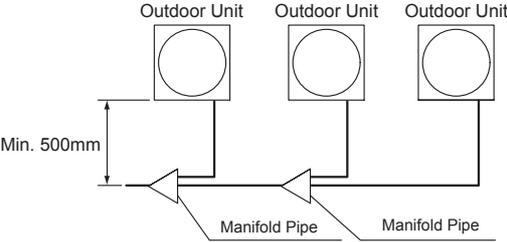
\* 2m or More



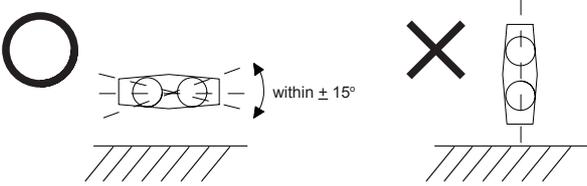
- (4) Place the outdoor unit pipe horizontally or with downward gradient towards the indoor unit side, or refrigerant oil may accumulate in the pipe.



(5) For servicing, in case that the pipe is placed forward of the outdoor unit, secure min. 500mm between the outdoor unit and Manifold Pipe. (When the compressor is replaced, a space of min. 500mm is required.)



(6) Direction of Manifold Pipe  
Place the Manifold Pipe vertically towards the ground (within  $\pm 15^\circ$ ) as shown in the figure



## 6.4 Piping Connection

Perform the piping connection work for each outdoor unit.

### NOTE:

Ensure that the refrigerant pipe should be connected to the same refrigerant cycle unit.

- Prepare the refrigerant pipe in the field for the piping work.  
Refer to Fig. 6.1 for the position of piping connection.

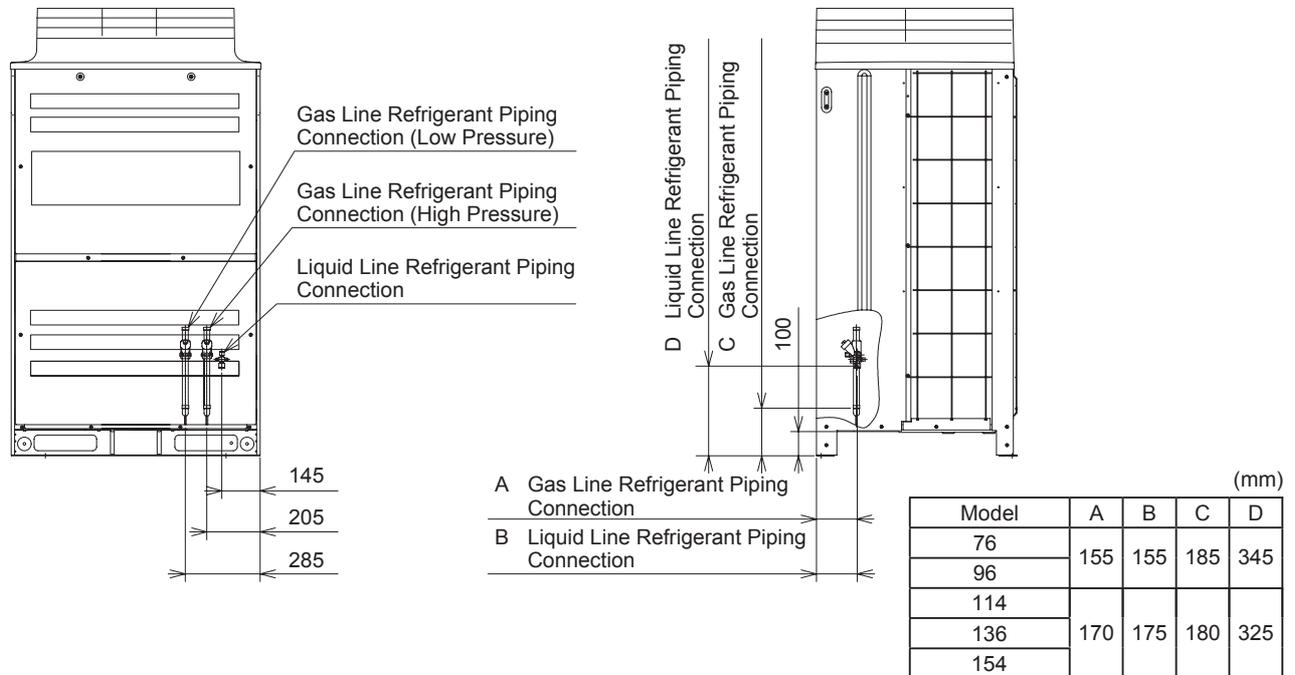
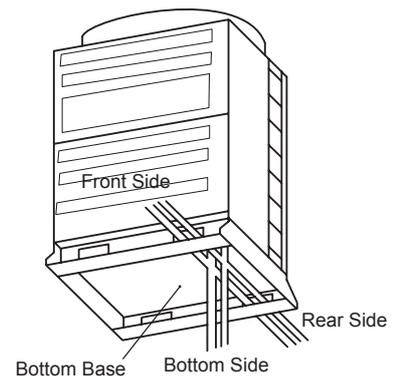


Fig. 6.1 Refrigerant Piping Connection

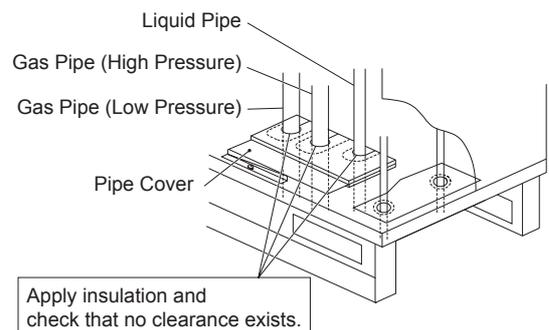
### • Piping Direction

Fix the pipes adequately in order to avoid vibration and excessive force to the valve.

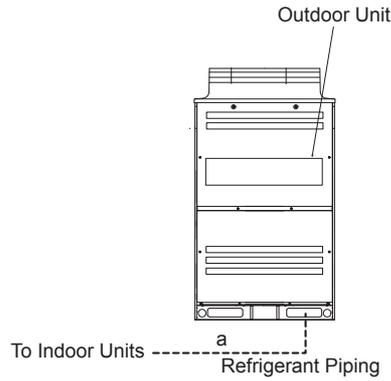
- (1) The pipes are available to connect in three directions (front, rear or bottom side) from the bottom base. For the vibration protection, properly fix the piping connection and check that no excessive force applied to the stop valve.



- (2) Operation of the stop valve should be performed according to Item 6.4.4.
- (3) Connect the pipes according to Table 5.1 and this "Installation & Maintenance Manual".
- (4) Completely seal the penetration part of the bottom pipe with insulation in order to prevent rain water entering into the conduit.



### 6.4.1 Piping Size for Base Unit



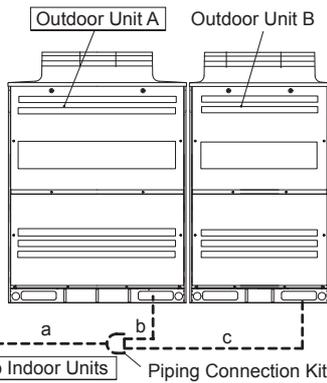
(φmm)

Model		76	96	114	136	154	
Piping Size	a	Low Pressure Gas	19.05	22.2	25.4	25.4	28.6
	High Pressure Gas	15.88	19.05	22.2	22.2	22.2	
	Liquid	9.53	9.53	12.7	12.7	12.7	

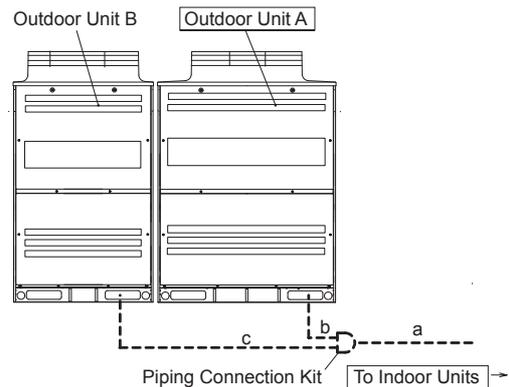
### 6.4.2 Piping Size for Two Units Combination

< Figure for AVWT-212FESZA >

(Indoor Unit on Left Side)



(Indoor Unit on Right Side)



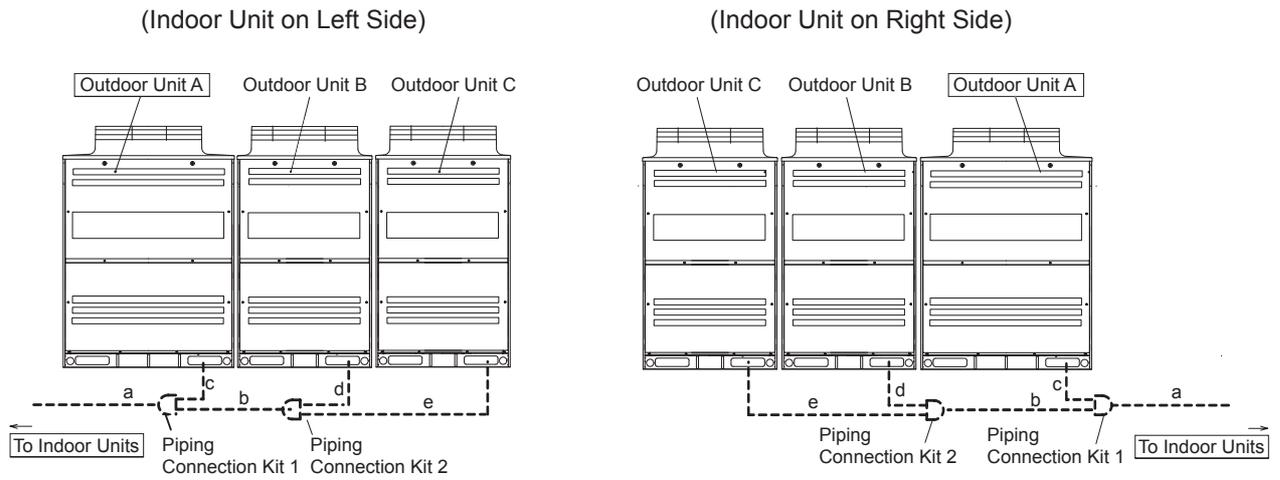
(φmm)

Model		AVWT-170FESZA	AVWT-190FESZA	AVWT-212FESZA	AVWT-232FESZA	AVWT-250FESZA	AVWT-272FESZA	AVWT-290FESZA	AVWT-308FESZA	
Combination Unit	Outdoor Unit A	AVWT-96FESRA	AVWT-114FESSA	AVWT-136FESSA	AVWT-114FESSA	AVWT-136FESSA	AVWT-136FESSA	AVWT-154FESSA	AVWT-154FESSA	
	Outdoor Unit B	AVWT-76FESRA	AVWT-76FESRA	AVWT-76FESRA	AVWT-114FESSA	AVWT-114FESSA	AVWT-136FESSA	AVWT-136FESSA	AVWT-154FESSA	
Piping Connection Kit		HFQ-M202F				HFQ-M212F				
Piping Size	a	Low Pressure Gas	28.6	28.6	28.6	28.6	31.75	31.75	31.75	31.75
		High Pressure Gas	22.2	22.2	25.4	25.4	25.4	28.6	28.6	28.6
		Liquid	15.88	15.88	15.88	15.88	19.05	19.05	19.05	19.05
	b	Low Pressure Gas	22.2	25.4	25.4	25.4	25.4	25.4	28.6	28.6
		High Pressure Gas	19.05	22.2	22.2	22.2	22.2	22.2	22.2	22.2
		Liquid	9.53	12.7	12.7	12.7	12.7	12.7	12.7	12.7
	c	Low Pressure Gas	19.05	19.05	19.05	25.4	25.4	25.4	25.4	28.6
		High Pressure Gas	15.88	15.88	15.88	22.2	22.2	22.2	22.2	22.2
		Liquid	9.53	9.53	9.53	12.7	12.7	12.7	12.7	12.7

\* Perform the installation of the outdoor unit and piping connection according to the figure. Refer to the table for the outdoor unit model, the piping connection kit model and the piping diameter.

### 6.4.3 Piping Size for Three Units Combination

< Figure for AVWT- 324FESZA >



Model		AVWT-324FESZA	AVWT-340FESZA	AVWT-364FESZA	AVWT-382FESZA	AVWT-398FESZA	AVWT-420FESZA	AVWT-438FESZA	AVWT-454FESZA	
Combination Unit	Outdoor Unit A	AVWT-136FESSA	AVWT-154FESSA							
	Outdoor Unit B	AVWT-96FESRA	AVWT-96FESRA	AVWT-114FESSA	AVWT-136FESSA	AVWT-154FESSA	AVWT-154FESSA	AVWT-154FESSA	AVWT-154FESSA	
	Outdoor Unit C	AVWT-96FESRA	AVWT-96FESRA	AVWT-96FESRA	AVWT-96FESRA	AVWT-96FESRA	AVWT-114FESSA	AVWT-136FESSA	AVWT-154FESSA	
Piping Connection Kit		HFQ-M212F			HFQ-M302F					
Piping Size	a	Low Pressure Gas	31.75	31.75	38.1	38.1	38.1	38.1	38.1	38.1
		High Pressure Gas	28.6	28.6	31.75	31.75	31.75	31.75	31.75	31.75
		Liquid	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05
	b	Low Pressure Gas	28.6	28.6	28.6	28.6	31.75	31.75	31.75	31.75
		High Pressure Gas	22.2	22.2	25.4	25.4	25.4	28.6	28.6	28.6
		Liquid	15.88	15.88	15.88	15.88	19.05	19.05	19.05	19.05
	c	Low Pressure Gas	25.4	28.6	28.6	28.6	28.6	28.6	28.6	28.6
		High Pressure Gas	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2
		Liquid	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7
	d	Low Pressure Gas	22.2	22.2	25.4	25.4	28.6	28.6	28.6	28.6
		High Pressure Gas	19.05	19.05	22.2	22.2	22.2	22.2	22.2	22.2
		Liquid	9.53	9.53	12.7	12.7	12.7	12.7	12.7	12.7
e	Low Pressure Gas	22.2	22.2	22.2	22.2	22.2	25.4	25.4	28.6	
	High Pressure Gas	19.05	19.05	19.05	19.05	19.05	22.2	22.2	22.2	
	Liquid	9.53	9.53	9.53	9.53	9.53	12.7	12.7	12.7	

\* Perform the installation of the outdoor unit and piping connection according to the figure  
Refer to the table for the outdoor unit model, the piping connection kit model and the piping diameter.

## 6.4.4 Stop Valve

### < Gas Valves >

- (1) Make sure that the all the spindles are closed completely.
- (2) Connect the charging hose to the service port and release gas from the high and low pressure gas pipes.
- (3) Cut the end of the closing pipes ( $\phi 6.35$ ) and check that no gas exists inside the high and low pressure gas pipes.
- (4) Remove the stop valve cover.
- (5) Remove the closing pipe from the brazing portion by using a burner. Pay attention to the flame from the burner not to burn the stop valve body.

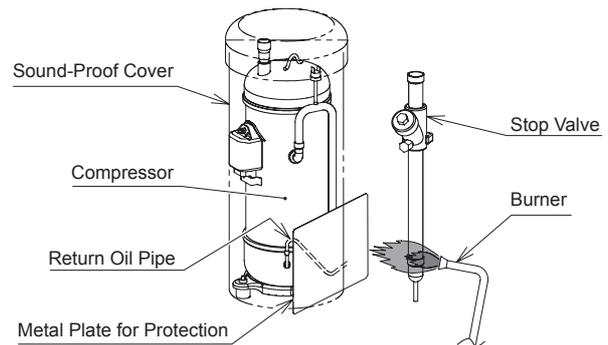
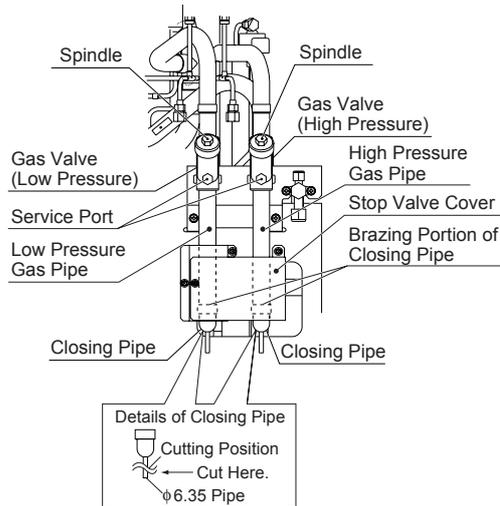


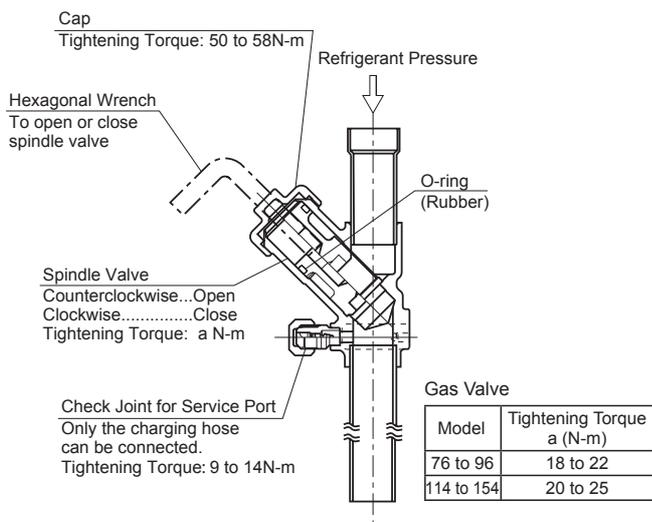
Fig. 6.2

## CAUTION

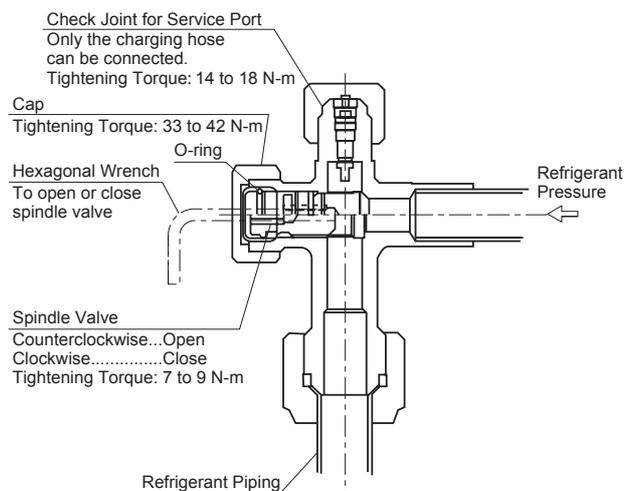
- Ensure that there is no gas inside the pipe when removing the closing pipe. Otherwise, the pipe may be blown out and it may lead to injury.
- Protect the return oil pipe and vibration proof of the compressor with the metal plate when using a burner.

- The details of stop valves are as follows.

### < Gas Valves >



### < Liquid Valve >



## CAUTION

- Do not apply an abnormal big force to the spindle valve at the end of opening. The back seat construction is not provided.
- At the test run, fully open the spindle. If not fully opened, the devices will be damaged.

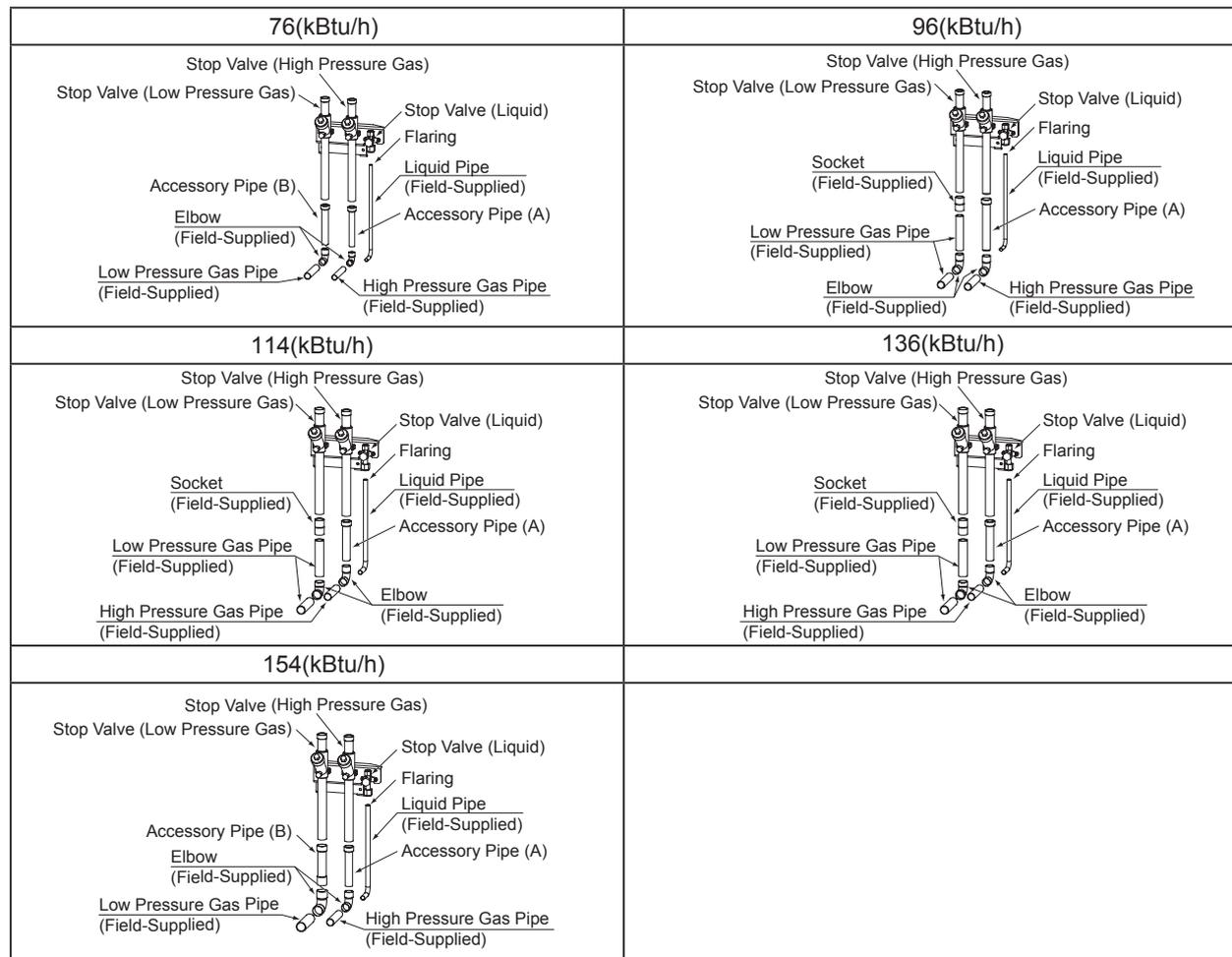
### 6.5.5 Piping Connection

- (1) Make sure that the stop valves are closed completely.
- (2) Protect the compressor and sound-proof cover with metal plate when brazing the gas pipes as shown in Fig. 6.2.  
Pay attention to the flame from the burner not to burn the stop valve body.
- (3) Connect the indoor unit and the outdoor unit with refrigerant piping.  
Prevent the refrigerant piping from touching weak parts of the building such as wall, ceiling, etc. (Abnormal sound may occur due to the vibration of the piping.)
- (4) As for the flaring work of the field pipe, use the specified tightening torque in Table 6.4.  
Put nitrogen gas into the pipe when brazing.
- (5) Insulate the gas pipe and liquid pipe completely.
- (6) Mount the piping cover equipped with the outdoor unit after the piping connection.  
If not, the unit may damaged due to snow or rain water entering.

Table. 6.3 Tightening Work of Flare Nut

Pipe Size	Tightening Torque
φ6.35 (1/4)	14 to 18 (N-m)
φ9.53 (3/8)	34 to 42 (N-m)
φ12.7 (1/2)	49 to 61 (N-m)
φ15.88 (5/8)	68 to 82 (N-m)
φ19.05 (3/4)	100 to 120 (N-m)

#### ● Details of Stop Valve Piping Connection



#### NOTES:

1. Ensure that the closing pipe of the high and low pressure gas stop valves (2 places) is removed firstly.
2. Refer to the item 6.2 for the flaring work

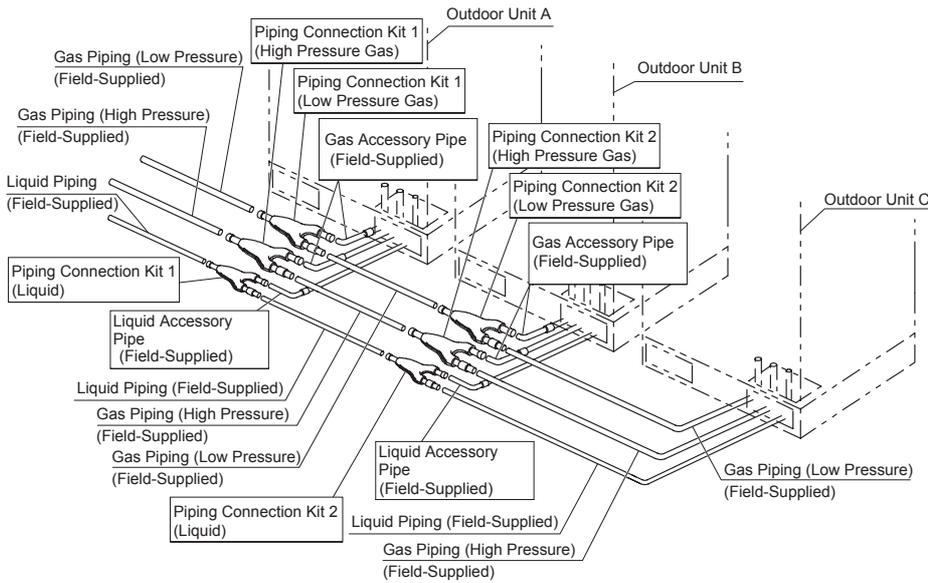
- Piping Connection Kit (Optional parts)

Item	Operation Type	Applicable Outdoor Unit		Model	Remarks
		Outdoor Unit HP	Outdoor Unit Number		
Piping Connection Kit	for Cooling/Heating Simultaneous Operation	170 to 232	2	HFQ-M202F	3 Pipes Type * for High Pressure Gas: 1 set * for Low Pressure Gas: 1 set * for Liquid: 1 set
		250 to 308	2	HFQ-M212F	
		324 to 454	3	HFQ-M302F	

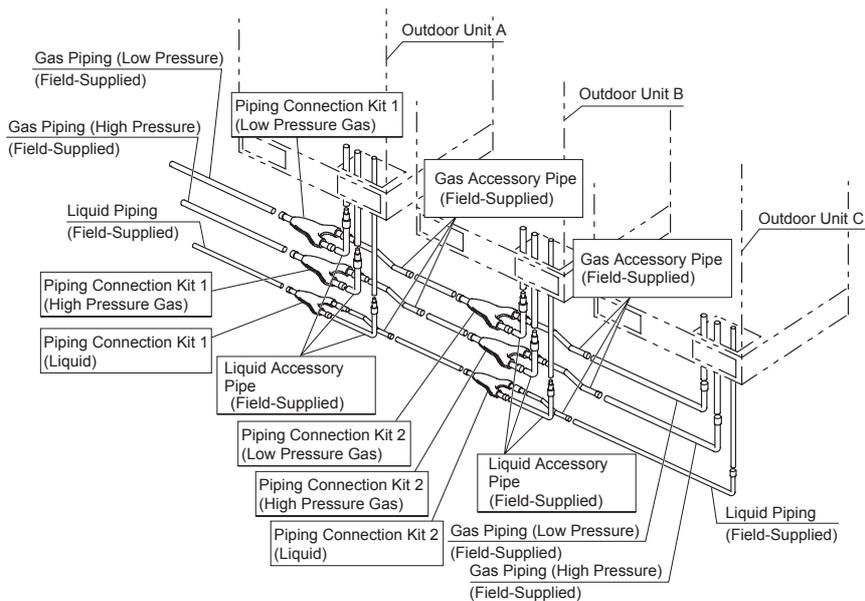
- Construction Example (In Case of 364kBtu/h: 3 Pipes Type)

Regarding the piping work for 190kBtu/h and over, refer to Installation & Maintenance Manual attached to the piping connection kit.

< Front Side or Rear Side Piping Connection >



< Downward Piping Connection >



- Branch pipe (Optional Parts)

< Line Branch >

First Branch

Outdoor Unit(kBtu/h)	Model
76 and 96	HFQ-M282F
114 to 154	HFQ-M452F
170 to 232	HFQ-M562F
250 to 340	HFQ-M692F
364 to 454	HFQ-M902F

Pipe Diameter and branch pipe after First Branch \*

Total Indoor Unit kBtu/h	Low Pressure Gas (φmm)	High Pressure Gas (φmm)	Liquid (φmm)	Model
Lower than 57	15.88	12.7	9.53	HFQ-M142F
57 to 86	19.05	15.88	9.53	HFQ-M282F
86 to 114	22.2	19.05	9.53	
114 to 154	25.4	22.2	12.7	HFQ-M452F
154 to 170	28.6	22.2	12.7	HFQ-M562F
170 to 212	28.6	22.2	15.88	
212 to 250	28.6	25.4	15.88	HFQ-M692F
250 to 340	31.75	28.6	19.05	
Over 340	38.1	31.75	19.05	HFQ-M902F

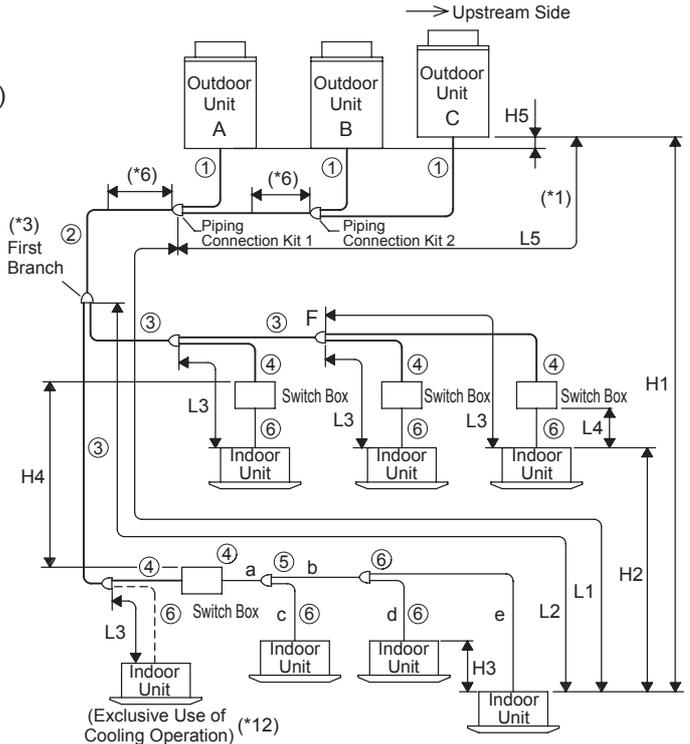
\*: If the piping branch at 2 pipes portion is necessary, use branch pipe of HFQ-102F, HFQ-162F, HFQ-242F for cooling/heating changeover operation.

● Piping Size (φmm)

① Pipe Diameter for Outdoor Unit

② Main Pipe Diameter  
(Base Unit or Piping Connection Kit 1 to First Branch)  
[Branch pipe of First Branch] (3 Pipes) (\*2)

Outdoor Unit kBTu/h	Low Pressure Gas	High Pressure Gas	Liquid
76	19.05	15.88	9.53
96	22.2	19.05	9.53
114 and 136	25.4	22.2	12.7
154	28.6	22.2	12.7
170 and 190	28.6	22.2	15.88
212 and 232	28.6	25.4	15.88
250	31.75	25.4	19.05
272 to 340	31.75	28.6	19.05
364 to 454	38.1	31.75	19.05



③ [Pipe Diameter after First Branch] (3 Pipes) (\*3)(\*7)

Total Indoor Unit kBTu/h	Low Pressure Gas	High Pressure Gas	Liquid
Lower than 57	15.88	12.7	9.53
57 to 86	19.05	15.88	9.53
86 to 114	22.2	19.05	9.53
114 to 154	25.4	22.2	12.7
154 to 170	28.6	22.2	12.7
170 to 212	28.6	22.2	15.88
212 to 250	28.6	25.4	15.88
250 to 340	31.75	28.6	19.05
Over 340	38.1	31.75	19.05

④ [Pipe Diameter between Switch Box to Branch pipe] (3 Pipes and 2 Pipes) (\*9)

Switch Box Model	Max. Combination of Indoor Unit (*8)	Available Combination of Indoor Unit Capacity (kBTu/h) (*10), (*11)	3 Pipes		2 Pipes	
			Low Pressure Gas	High Pressure Gas	Gas	Liquid
HCH-160D	7	07 to 14	15.88	12.7	12.7 (*15)	9.53
		15 to 38	15.88	12.7	15.88	9.53
		39 to 57	19.05	15.88	15.88	9.53
HCH-280D	8	58 to 76	19.05	15.88	19.05	9.53
		77 to 96	22.2	19.05	22.2	9.53

⑤ [Pipe Diameter for 2 Pipes and Branch pipe]

Total Indoor Unit kBTu/h	Gas	Liquid
Lower than 57	15.88	9.53
57 to 86	19.05	9.53
86 to 114	22.2	9.53
114 to 154	25.4	12.7
154 to 170	28.6	12.7
170 to 250	28.6	15.88

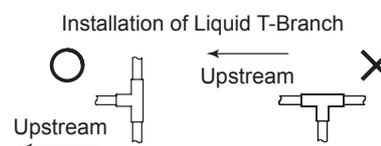
⑥ [Pipe Diameter between Branch pipe and Indoor Unit] (2 Pipes) (\*4)

Indoor Unit kBTu/h	Gas	Liquid
07 to 14	12.7	6.35 (*5)
17 to 18	15.88	6.35 (*5)
22 to 54	15.88	9.53
76	19.05	9.53
96	22.2	9.53

- Piping Work Conditions (Refer to the figure of previous page.)

Item	Mark	Allowable Piping Length (*13)	
		≤ the recommended connectable number of Indoor Unit	≥ the recommended connectable number of Indoor Unit
Total Piping Length	Total Liquid Piping Actual Length	≤ 1,000m (*14)	≤ 300m
Maximum Piping Length	Actual Length	≤ 165m	≤ 165m
	Equivalent Length	≤ 190m	≤ 190m
Maximum Piping Length between Branch pipe of 1st Branch and Each Indoor Unit	L2	≤ 90m	≤ 40m
Maximum Piping Length between Each Branch pipe and Each Indoor Unit	L3	≤ 40m	≤ 30m
Total Piping Length between Switch Box and Each Indoor Unit	* L4 * a+b+c+d+e	HCH-160D: ≤ 30m	HCH-160D: ≤ 30m
		HCH-280D: ≤ 10m	HCH-280D: ≤ 10m
Piping Length between Piping Connection Kit 1 and Each Outdoor Unit	L5	≤ 10m	≤ 10m
Height Difference between Outdoor Units and Indoor Units	O.U. is Higher	≤ 50m	≤ 50m
	O.U. is Lower	≤ 40m	≤ 40m
Height Difference between Indoor Units	H2	≤ 15m	≤ 15m
Height Difference between Indoor Units using the Same Switch Box	H3	≤ 4m	≤ 4m
Height Difference between Switch Box	H4	≤ 15m	≤ 15m
Height Difference between Outdoor Units	H5	≤ 0.1m	≤ 0.1m

- (\*1): The piping connection kit is counted from the indoor unit side (as Piping Connection Kit 1).
- (\*2): When the maximum length of the equivalent refrigerant pipe (L1) from the outdoor unit/piping connection kit 1 to the indoor unit is over 100m, the pipe size of gas/liquid line from the outdoor unit/piping connection kit 1 to first branch should be increased with the reducer (field-supplied)
- (\*3): If the refrigerant piping length 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 before the branch.
- (\*4): The pipe diameter ⑥ should be the same as the indoor unit piping connection size.
- (\*5): When the liquid piping length is longer than 15m, use φ9.53 pipe and reducer (field-supplied)
- (\*6): Keep the direct distance of 500mm or more after the piping connection kit.
- (\*7): In case of the line branch, if the length of the pipe between the terminal branch of 3 pipes (specified in the figure of mark F) and the farthest indoor unit exceeds 5m, use a T-branch to the applicable liquid pipe of 3 branches. (Corresponding to the Same Diameter as JIS B8607)



- (\*8): In case that the number of connectable indoor unit exceeds four, the high/low pressure gas pipe, gas pipe and liquid pipe (Tab. ④⑤⑥) need to increase one size respectively.
- (\*9): The liquid pipe is not required to connect to the Switch Box. Refer to Table ⑥ for the liquid pipe diameter between multi-kit and indoor unit.
- (\*10): In case that the combination of indoor unit capacity is 96kBtu/h for HCH-280D, the performance may decrease approximate 5% in cooling and 10% in heating.
- (\*11): The excess of the total capacity may cause insufficient performance and abnormal sound. Be sure to connect within the allowable total capacity.
- (\*12): For the exclusive cooling operation, connect indoor units with low pressure gas pipe and liquid pipe (without Switch Box). The total capacity of the exclusive cooling operation should be smaller than 50% of the total indoor unit capacity.
- (\*13): The condition of refrigerant piping installation is different depending on the connected indoor unit quantities.
- (\*14): Allowable total piping length may become shorter than 1,000m due to the limitation of maximum additional refrigerant amount.
- (\*15): In case that a branch is located downstream of the Switch Box and also the connected indoor unit capacity is 7~14kBtu/h use φ15.88 for the gas pipe.

#### NOTES:

1. Check the gas pipe and liquid pipe are equivalent in terms of the piping length and piping system.
2. Use a branch pipe (system components) for the branch pipe of indoor unit and Switch Box.
3. Install the outdoor unit, branch pipe and Switch Box according to each "Installation & Maintenance Manual".
4. If the piping length (L3) between each branch pipe and each indoor unit is considerably longer than other indoor unit, refrigerant may not flow well and also performance may be deteriorated compared to other models (Recommended Piping Length: within 15m)

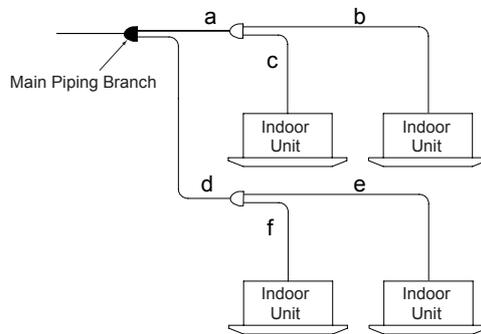
- Piping Branch Restriction

Follow the table below when performing the field-supplied piping work.

Piping Length between Branch pipe(First Branch) and Each Indoor Unit (L2)	Main Piping Branch *		Indoor Unit Capacity Ratio After Main Branch
	Piping Length After Branch	Number of Main Piping Branch	
≤ 40m	$a+b+c \leq 30m$ or $d+e+f \leq 30m$	without Limit	-
	$a+b+c > 30m$ and $d+e+f > 30m$	within 2	
within 41m to 90m	-	within 1 (Fig.1)	≥ 40% (Fig.2)

**NOTE:**

\* Main Piping Branch: Distribution from One (1) Branch pipe to Two (2) Branch pipes  
The number of main piping branch depends on the piping length after branch (a to f).



Main piping branches are 2 portions.

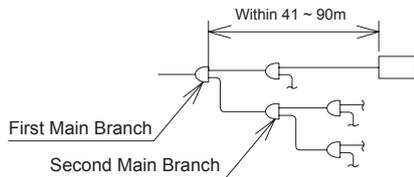


Fig. 1



Indoor unit capacity ratio is less than 40%.

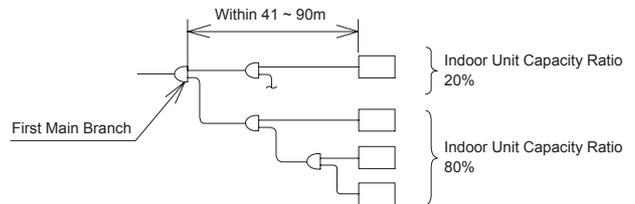


Fig. 2

## 7. Electrical Wiring

### **WARNING**

- Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 3 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 which may lead to a fire
  - 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.
  - Use a medium sensing speed type ELB (Earth Leakage Breaker, activation speed of 0.1 sec. or less). If not used, it will cause an electric shock or a fire
  - Fix the cables securely. External forces on the terminals could lead to a fire
  - Tighten screws according to the following torque.
    - M4: 1.0 to 1.3 N-m
    - M5: 2.0 to 2.4 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
-

## 7.1 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 indicated in the Technical Catalog. Make sure that the components comply with National Electrical Code (NEC).
  - Supply electrical power to each outdoor unit. An ELB, fuse and main switch should be used for each outdoor unit. If not, it will be cause of fire or electrical shock
  - The power supply for the indoor unit and outdoor unit should be provided separately. Connect a power supply wiring to each indoor unit group to be connected to the same outdoor unit. (Max. capacity of one indoor unit group is 250kbtu/h.)
  - As for the cooling/heating simultaneous operation system, the Switch Box and indoor unit in the same refrigerant cycle can be supplied with one main switch.
- (2) Check to ensure that the power supply voltage is within  $\pm 10\%$  of the rated voltage. If the power supply voltage is too low, the system cannot be started due to the voltage drop.
- (3) Check the size of the electrical wires.
- (4) In some cases, the packaged air conditioner may not be operated normally under the following cases.
  - In case that the packaged air conditioner is supplied with the same power transformer as the device with high electricity consumption\*
  - In case that the power source wires for the device\* and the packaged air conditioner are located close to each other.

\* (ex) Lift, container crane, rectifier for electric railway, inverter power device, arc furnace, electric furnace, large-sized induction motor and large-sized switch.

For the cases mentioned above, induction surge of the power supply wiring for the packaged air conditioner may occur due to a rapid change in electricity consumption of the device and an activation of switch. Therefore check the field regulations and standards before performing electrical work in order to protect the power supply wiring for the packaged air conditioner.
- (5) Check to ensure that the earth wire of the outdoor unit, indoor unit, Switch Box are connected.

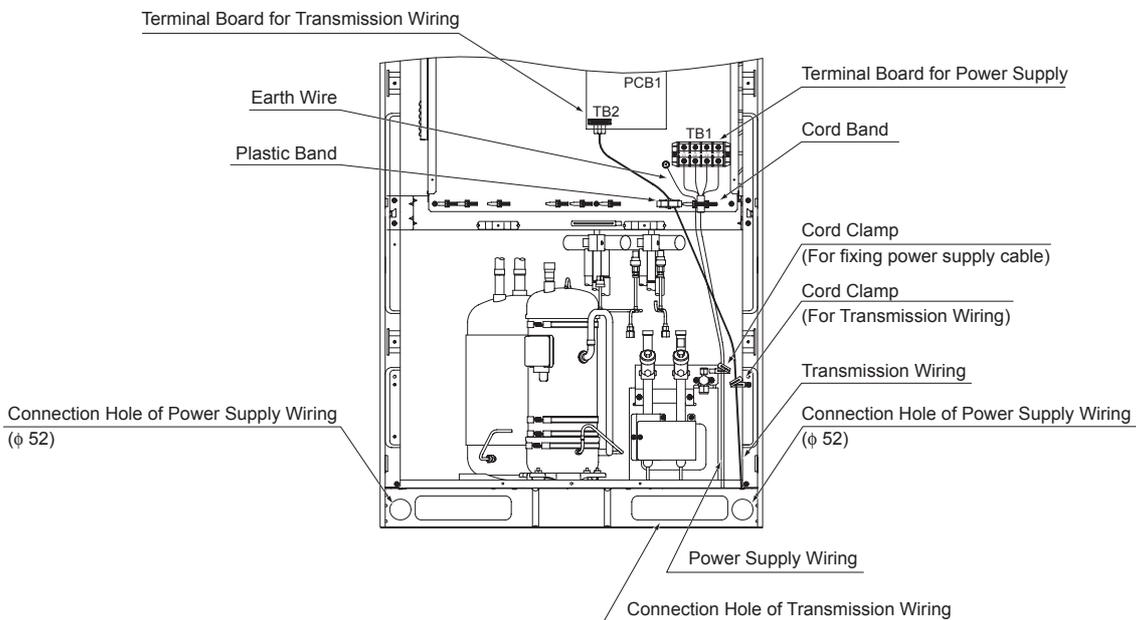


Fig. 7.1 Wiring Connection

## 7.2 Electrical Wiring Connection

### **! WARNING**

The ELB (earth leakage breaker), FUSE and S (main switch) must be installed to the each power source of outdoor unit. If not, it may cause of electrical shock or fire

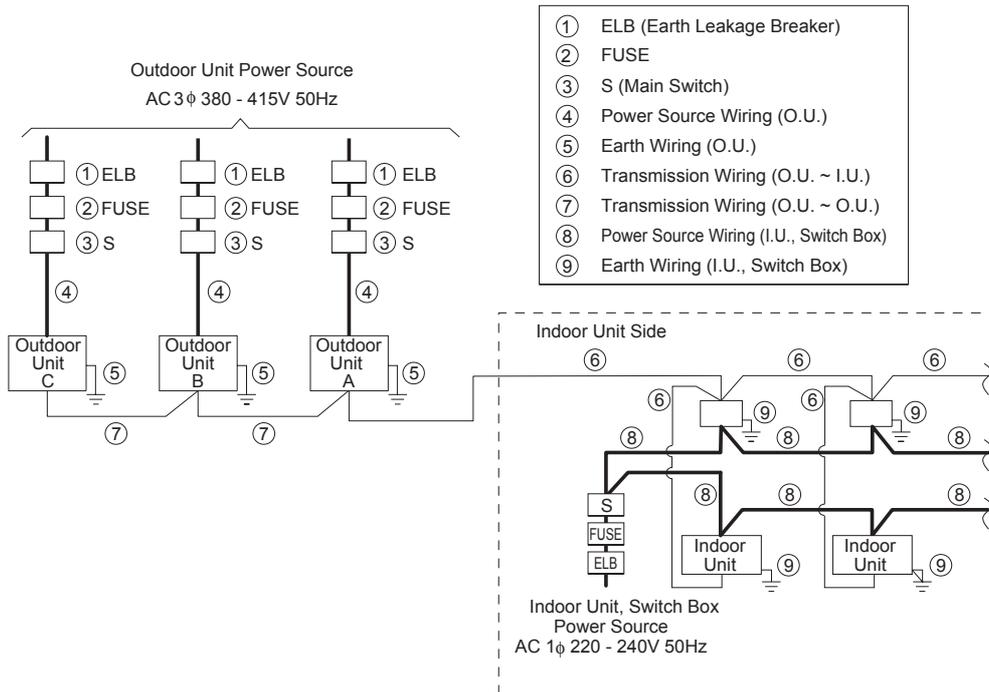
**NOTE:**

Supply the power source of outdoor units and indoor units respectively.

(1) Power Source Wiring

Supply the power sources to the each outdoor unit respectively.

Power source wiring is fundamentally according to this method.



(2) The recommended wiring, ELB, breaker size are shown as follow

■ Field Minimum Wire Sizes for Power Source

Outdoor Unit (KBtu/h)	Maximum Running Current (A)	Power Source Cable Size	Transmitting Cable Size	Earth Wire Size (mm <sup>2</sup> )	ELB		Fuse (A)
		EN60335-1 *1 (mm <sup>2</sup> )	EN60335-1 *1 (mm <sup>2</sup> )		Nominal Current (A)	Nominal Sensitive Current (mA)	
76	23	6	0.75	6	40	30	40
96	23	6	0.75	6	40	30	40
114	31	6	0.75	6	50	30	50
136	31	10	0.75	10	50	30	50
154	33	10	0.75	10	50	30	50

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

ELB: Earthleakage Breaker.

NOTES:

- 1) Follow local codes and regulations when selecting field wires
- 2) The wire sizes marked with \*1 in the above table are selected at the maximum current of the unit according to the European Standard, EN60335-1. Use the wires which are not lighter than the ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).
- 3) Use a shielded cable for the transmitting circuit and connect it to ground.
- 4) In the case that power cables are connected in series, add each unit maximum current and select wires below.

Current i (A)	Wire Size (mm <sup>2</sup> )
$i \leq 6$	2.5
$6 < i \leq 10$	2.5
$10 < i \leq 16$	2.5
$16 < i \leq 25$	4
$25 < i \leq 32$	6
$32 < i \leq 40$	10
$40 < i \leq 63$	16
$63 < i$	※1

CAUTION : In the case that current exceeds 63A, Don't series connection

## CAUTION

**Install a multi-pole main switch with a space of 3.5mm or more between each phase.**

### NOTES:

1. When the power supply wiring is longer, select the minimum wiring size which the voltage drop is within 2%.
2. Power supply voltage should be satisfied with the followings
  - Supply Voltage: Rated Voltage within  $\pm 10\%$
  - Starting Voltage: Rated Voltage within -15%
  - Operating Voltage: Rated Voltage within  $\pm 10\%$
  - Imbalance between Phases: within 3%
3. Do not connect the earth wire to the gas pipe, water pipe, lightening conductor.
  - Gas Pipe: An explosion and ignition may occur when gas leaks.
  - Water Pipe: There is no effect of earth wire when a hard vinyl pipe is used.
  - Lightening Conductor: The earth electric potential abnormally increases when a lightening conductor is used.

### 7.3 Electrical Wiring for Outdoor Unit

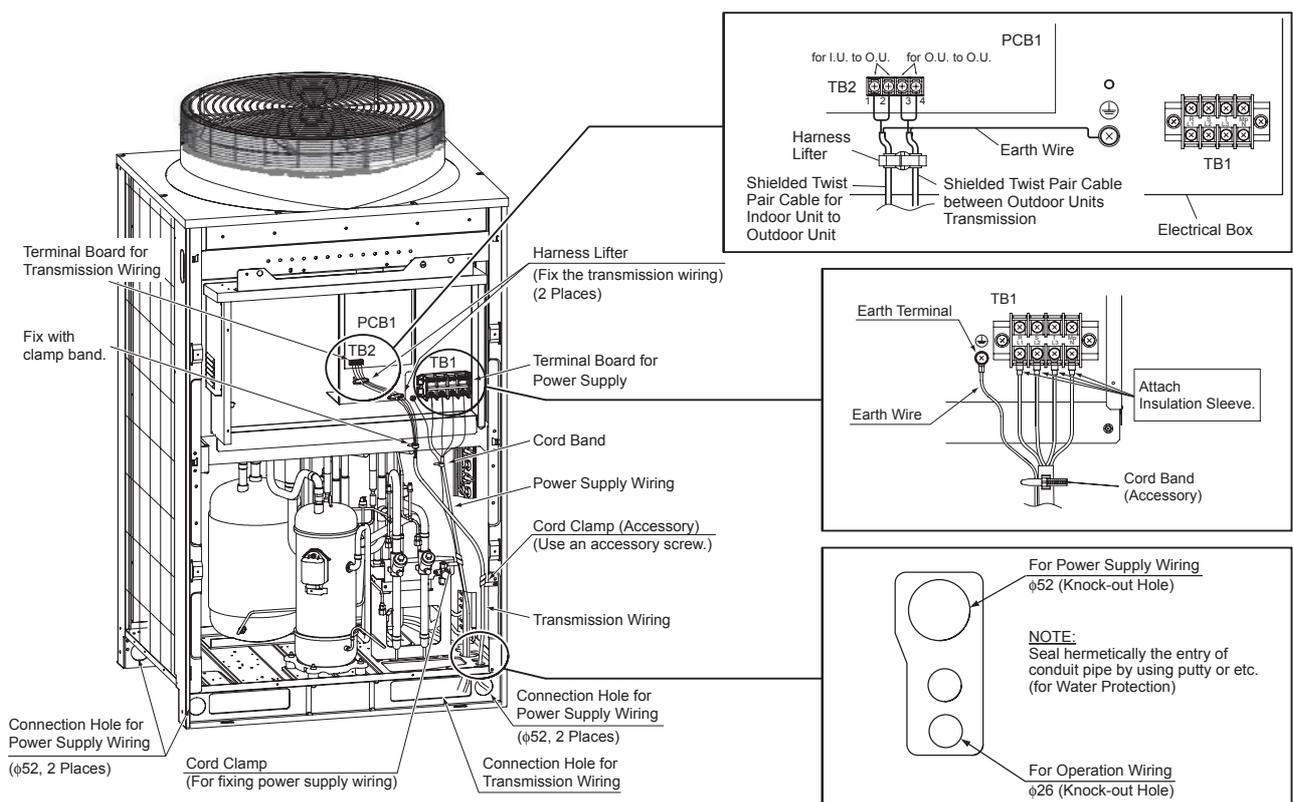
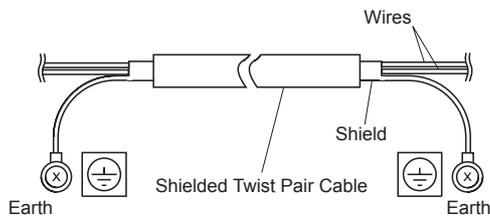
Connect the electrical wirings according to the following figure

- (1) Connect the power supply wires to L1, L2, L3, and N for for the three phase power source on the terminal board TB1 and earth wire to the terminal in the electrical control box.
- (2) Connect the transmission wires between the outdoor and indoor units to the TB2 terminals 1 and 2 on the PCB1. As for the transmission wires between outdoor units in the same refrigerant cycle, connect them to the TB2 terminals 3 and 4 on the PCB1.
- (3) Tighten screws for the terminal board according to the following table.

< Required Tightening Torque >

Size	Tightening Torque
M4	1.0 to 1.3 N-m
M5	2.0 to 2.4 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

- (4) When installing the unit in Australia, connect the both ends of shielded twist pair cable (remote control switch cable and transmission cable) to the earth as shown below.



## **CAUTION**

Pay attention to the followings to run through the cables under the unit using conduit tube.  
(The pipe cover is required to remove before performing piping and wiring works.)

### NOTES:

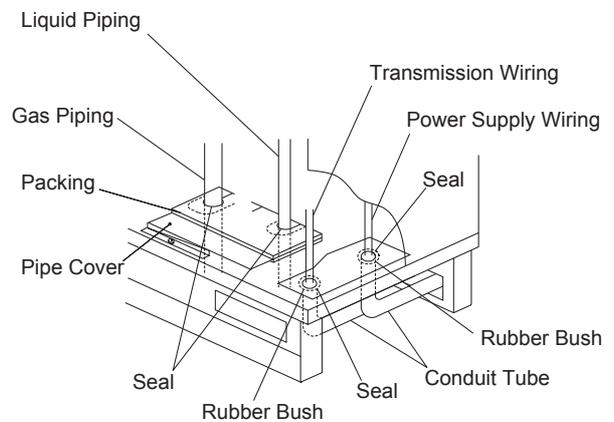
1. Do not lead the power supply wiring and transmission wiring through the same conduit tube.  
Moreover, keep at least 5cm between the power supply wiring and transmission wiring.
2. Cut cross line at rubber bush (accessory) and securely attach it to the knock-out hole for cable protecting.
3. Attach the pipe cover to avoid entering rats or other small animals into the unit.
4. Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit.
5. Completely seal the end of conduit tube with sealing materials to avoid entering rain into the conduit tube.
6. Make a drain hole at the lowest part of the conduit tube.

## **CAUTION**

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

### NOTE

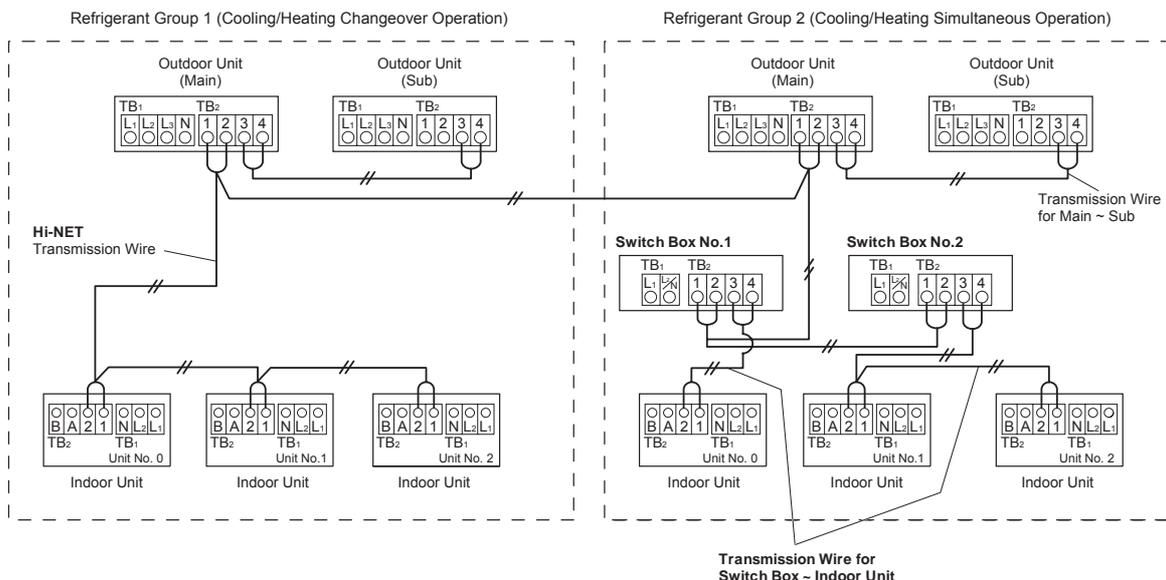
Fix the rubber bushes with adhesive when conduit tubes to the outdoor unit are not used.



## 7.4 Electrical Wiring Connection of Indoor Unit, Outdoor Unit and Switch Box

- (1) Connect a power supply wiring to each outdoor unit. Connect an ELB, fuse and main switch (S) to each outdoor unit.
- (2) Connect a power supply wiring to each indoor unit group to be connected to the same outdoor unit. (Max. capacity of one indoor unit group is 250kBTu/h)  
Connect an ELB, fuse and main switch (S) to each indoor unit group.
- (3) Connect the transmission wiring between indoor units, Switch Box and outdoor units, as shown in Fig. 7.2.
- (4) Connect the transmission wiring in the same refrigerant cycle unit. (In case that the refrigerant pipe of indoor unit is connected to the outdoor unit, connect the transmission wiring to the same indoor unit.)  
Connecting the refrigerant pipe and transmission wiring to the different refrigerant cycle systems may lead to malfunction.
- (5) Use 2-Core lead wires such as shielded twist pair cable for the transmission wiring.  
(Do not use 3-Core or over.)
- (6) Use the same kind of cables for the Hi-NET system of the same refrigerant cycle.
- (7) The transmission wiring is required to be separated from the power supply wiring.  
Keep at least 5cm between the transmission wiring and the power supply wiring, and also min. 1.5m between the transmission wiring and power supply wiring for other electrical device. If the above is not secured, put the power supply wiring into the metal conduit tube to separate from other wirings.
- (8) Connect the following transmission wiring to the terminals 1 and 2 of TB2 in the outdoor unit A (main unit).
  - between outdoor unit and indoor unit
  - between outdoor unit and Switch Box
  - between outdoor unit and indoor unit in other refrigerant cycles
- (9) Do not connect the power supply wiring to the terminal board for transmission wiring (TB2).  
Printed circuit board may be damaged.
- (10) For Cooling/Heating Simultaneous Operation System, connect the transmission wiring from indoor unit (exclusively used for cooling) to the terminals 1 and 2 of TB2 in the Switch Box.
- (11) Connect the earth wire for the outdoor/indoor units and Switch Box. The earth wiring work under the condition of 100Ω (max.) ground resistance should be performed by the qualified person.

### • Transmission Wiring



### NOTES:

1. For the combination units (170~454kBTu/h), DSW settings of Main and Sub are required.
2. Alarm occurs if the transmission wires between outdoor units are connected to the terminals 1 and 2 for Hi-NET.
3. In case that alarm is indicated on the LCD of Main outdoor unit, follow the "7-segment" indication of the Main outdoor unit for checking.
4. Perform function setting from Main outdoor unit.
5. Maximum refrigerant groups with one central controller are 64.  
Maximum indoor units to be connected are 160.

380-415V 3N~ 50Hz

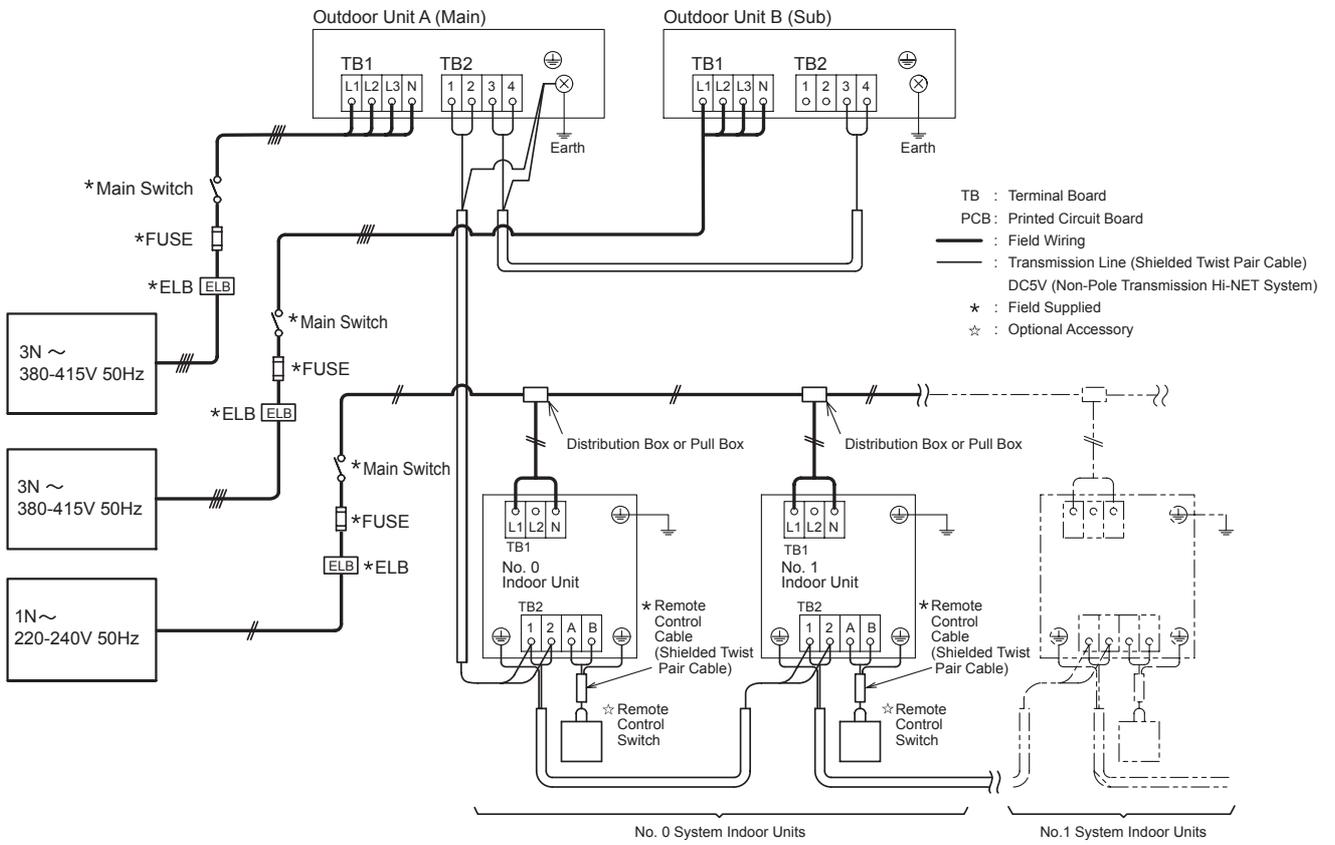


Fig. 7.2 Instruction for Electrical Wiring Connection

## 7.5 Dip Switch Setting of Outdoor Unit

TURN OFF all power sources before setting.

Without turning OFF, the switches do not work and the contents of the setting are invalid.

(However, DSW4-No.1, 2, 4 can be operated during power source is ON.)

The mark of “■” indicates the position of dip switches. Set the dip switches according to the Fig.7.3.

### NOTE

- By using switch DSW4, the unit is started or stopped after 10 to 20 seconds after the switch is operated.
- Number this outdoor unit to distinguish from other outdoor units for service and maintenance.  
And write the number in the space right.

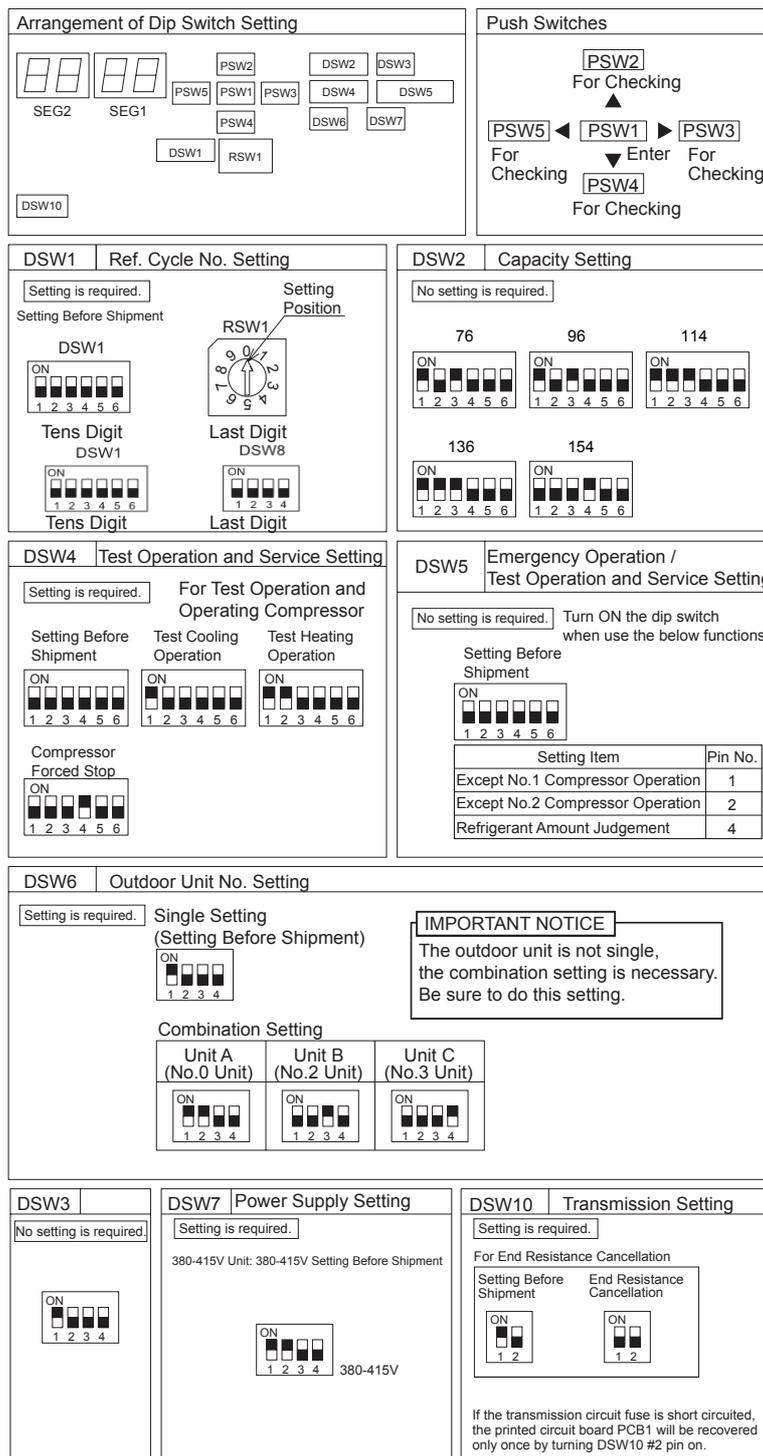


Fig. 7.3 DSW Setting

### # Setting for Transmitting

It is required to set the outdoor unit Nos., refrigerant cycle Nos. and end terminal resistance for this Hi-NET system.

### # Setting of Outdoor Unit No.

In case of the combination of base unit, set DSW6 as shown below.

Base Unit (Before Shipment)	Combination of Base Unit		
	Unit A (No.0) (Main)	Unit B (No.2)	Unit C (No.3)

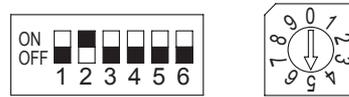
### # Setting of Refrigerant Cycle No.

In the same refrigerant cycle, set the same refrigerant cycle No. for the outdoor unit and the indoor units as shown below.

As for setting indoor unit refrigerant cycle No., set the RSW2 and DSW5 on the indoor unit PCB.

	Setting Switch	
	10 digit	1 digit
RSW1		
Outdoor Unit	DSW1	RSW1
Indoor Unit (Hi-NET)	DSW5	RSW2

Ex.: In Case of Setting Refrigerant Cycle No. 25



Turn ON No. 2 pin.

Set Dial No.5.

DSW and RSW setting before shipment is 0. Maximum in setting refrigerant cycle No. is 63.

	Setting Switch	
	10 digit	1 digit
DSW8		
Outdoor Unit	DSW1	DSW8
Indoor Unit (Hi-NET)	DSW5	RSW2

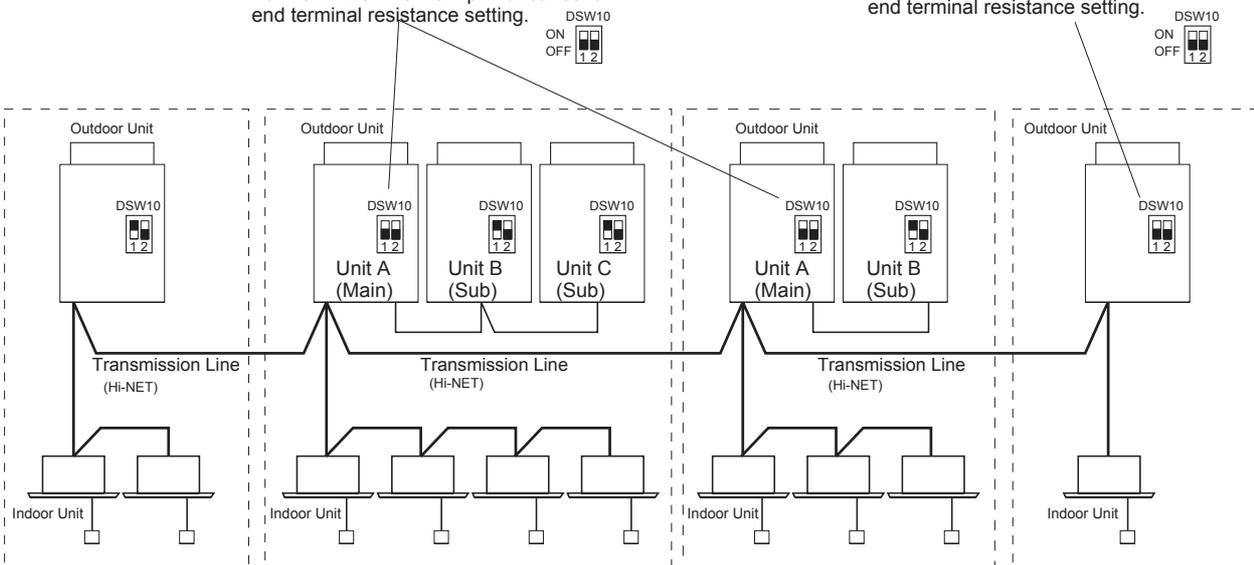
Setting of End Terminal Resistance DSW10			
Before Shipment	ON	Cancellation	ON
	OFF		OFF

### # Setting of End Terminal Resistance

Before shipment, No. 1 pin of DSW10 is set at the "ON" side. In the case that the outdoor units quantity in the same Hi-NET is 2 or more, set No. 1 pin of DSW10 at the "OFF" side from the 2nd refrigerant group outdoor unit. If only one outdoor unit is used, no setting is required.

Turn OFF DSW10 No.1 pin for cancel of end terminal resistance setting.

Turn OFF DSW10 No.1 pin for cancel of end terminal resistance setting.



• Function Setting

### External Input/Output and Function Setting

**■ Start of Setting**  
Turn ON DSW4-No.4.  
Press PSW1 for 3 seconds or more.  
"Menu Mode" will be indicated.

**■ End of Setting**  
Press PSW1 for 3 seconds or more.  
The display indication become to normal indication.  
Turn OFF DSW4-No.4.

**NOTE:**  
Release "Menu Mode" after the setting is completed.  
Otherwise, the air conditioner may not operate appropriately.

Menu Mode

Press PSW1 once.

Check Mode  
"CHEC"

↕

External Input and Output  
"i o S r"

↕

Function Setting  
"Func"

For more details, refer to "Checking of Outdoor Unit by PCB" in the Service Manual.

For the setting mode, refer to ① below.

For the function setting, refer to ② below.

#### Arrangement of Dip Switch Setting

< PCB1 >

**① [ External Input and Output Setting ]**

By pressing the push-switches PSW3 (▶) and PSW5 (◀), the function No. can be selected.  
PSW4 (▼): forward, PSW2 (▲): backward

< Example >

Fill out the selected function setting No. in the space of the table as shown.

Item	SEG2	SEG1	SET
1 Input Setting 1 CN17 [1-2 pin]	11	1	<input type="text"/>
2 Input Setting 2 CN17 [2-3 pin]	12	2	<input type="text"/>
3 Input Setting 3 CN18 [1-2 pin]	13	3	<input type="text"/>
4 Output Setting 1 CN16 [1-2 pin]	01	1	<input type="text"/>
5 Output Setting 2 CN16 [1-3 pin]	02	2	<input type="text"/>

(Setting before shipment)

Before shipping, the input/output function settings are specified to each input/output terminal according to above table. The details of function No. and external input/output settings are as shown below.

Function No.	Input	Output
1	Fixing Heating Operation Mode	Operation Signal
2	Fixing Cooling Operation Mode	Alarm Signal
3	Demand Stoppage	Compressor ON Signal
4	Outdoor Fan Motor Start/Stop	Defrost Signal
5	Forced Stoppage	-
6	Demand Current Control 40%	-
7	Demand Current Control 60%	-
8	Demand Current Control 70%	-
9	Demand Current Control 80%	-
10	Demand Current Control 100%	-
11	Low Noise Setting 1	-
12	Low Noise Setting 2	-
13	Low Noise Setting 3	-
0	No Setting	No Setting

The same input/output function setting can not be set to different input/output terminals.  
If set, a setting of larger function number is became invalid.

**② [ Function Setting ]**

By pressing the push-switches PSW3 (▶) and PSW5 (◀), the setting can be changed.  
PSW4 (▼): forward, PSW2 (▲): backward  
Refer to the Technical Catalog for more details.

< Example >

Fill out the selected function setting No. in the space of the table as shown.

Item	SEG2	SEG1	SET
1 Circulator at Heating Function Thermo-OFF	FR	0	<input type="text"/>
2 Night-Shift	ri	0	<input type="text"/>
3 Cancellation of Outdoor Ambient Temperature Limit	CS	0	<input type="text"/>
4 Defrost for Cold Area (Change of Defrost Condition)	Jo	0	<input type="text"/>
5 SLo (Fan Speed) Defrost Setting	bu	0	<input type="text"/>
6 Cancellation of Hot Start	Hr	0	<input type="text"/>
7 Priority Capacity Mode	ru	0	<input type="text"/>
8 Compressor Frequency Control Target Value for Cooling	Hc	0	<input type="text"/>
9 Compressor Frequency Control Target Value for Heating	Hh	0	<input type="text"/>
10 Indoor Expansion Valve Control Target Value for Cooling	Sc	0	<input type="text"/>
11 Indoor Expansion Valve Control Target Value for Heating	Sh	0	<input type="text"/>
12 Not Prepared	Si	0	<input type="text"/>
13 Not Prepared	So	0	<input type="text"/>
14 Not Prepared	ci	0	<input type="text"/>
15 Not Prepared	cb	0	<input type="text"/>
16 Not Prepared	ch	0	<input type="text"/>
17 Not Prepared	db	0	<input type="text"/>
18 Demand	de	0	<input type="text"/>
19 Wave Function Setting	ue	0	<input type="text"/>
20 Protection of Decrease in Outlet Temperature for Cooling	Fb	0	<input type="text"/>
21 Not Prepared	Fr	0	<input type="text"/>
22 Adjustment of Fan Rotation (for multiple installation)	fo	0	<input type="text"/>
23 Not Prepared	Lr	0	<input type="text"/>
24 Not Prepared	Fi	0	<input type="text"/>
25 Not Prepared	F2	0	<input type="text"/>
26 Not Prepared	F3	0	<input type="text"/>

44

## 8. Additional Refrigerant Charge

### 8.1 Air-Tight Test

(1) Check to ensure that the stop valves are closed completely before air-tight test.

< Tightening Check of Stop Valves >

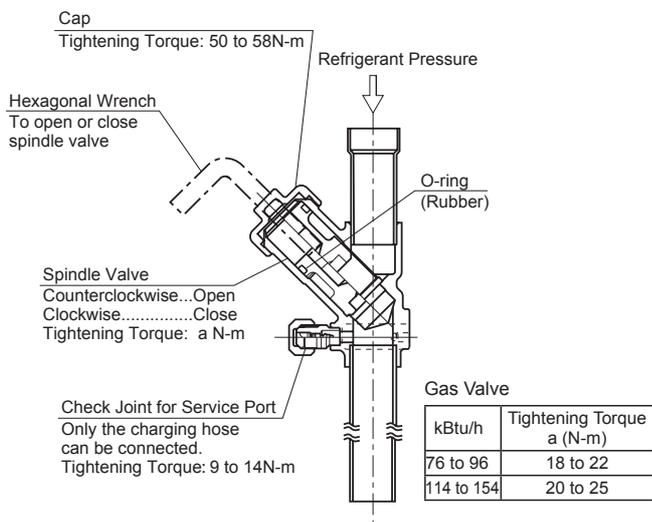
a) After connecting the pipe, remove the cap of stop valve for high pressure gas, low pressure gas and liquid gas.

Tighten the open-close spindle in the close direction with a torque \*1).

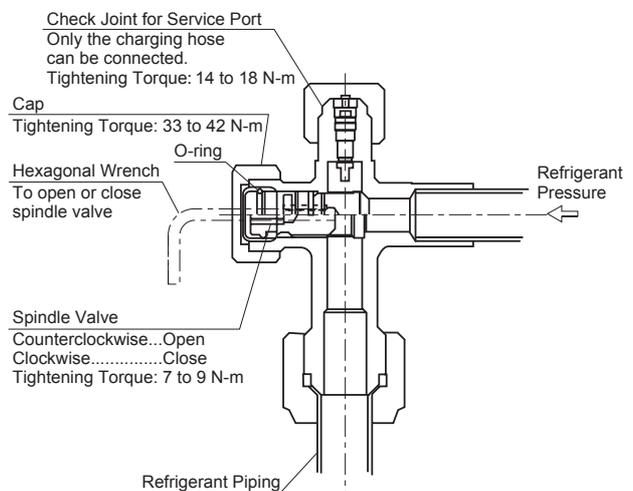
*1)	Stop Valve for High Pressure Gas and Low Pressure Gas	76 to 96	18 to 22 N-m
		114 to 154	20 to 25 N-m
	Stop Valve for Liquid Gas		7 to 9 N-m

b) Perform the air-tight test after the above check.

< Gas Valve >



< Liquid Valve >



- (2) Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping. Suspend the refrigerant piping at specified points and prevent the refrigerant piping from touching weak parts of the building such as wall, ceiling, etc. (Abnormal sound may occur due to the vibration of the piping. Pay special attention in case of short piping length.)
- (3) Connect the gauge manifold using charging hoses with a vacuum pump or a nitrogen cylinder to the check joints of the liquid line and the gas line stop valves. Perform the air-tight test. Connect a manifold gauge to the check joints of the liquid and gas stop valves in the outdoor unit. Do not open the stop valves. Apply nitrogen gas pressure of **4.15MPa**.

**⚠ DANGER**

**Be sure to use Nitrogen Gas for air-tight test. If other gases such as oxygen gas, acetylene gas or fluorocarbon gas are accidentally used, it may cause explosion or gas intoxication**

- (4) Check for any gas leakage at the flare nut connections, or brazed parts by gas leakage tester or by use of a foaming agent or gas leak detector.

Recommended Forming Agent	Manufacturer
Güprofle	Yokogawa & CO.,Ltd

- (5) Mount the piping cover equipped with the outdoor unit after connecting the pipe.

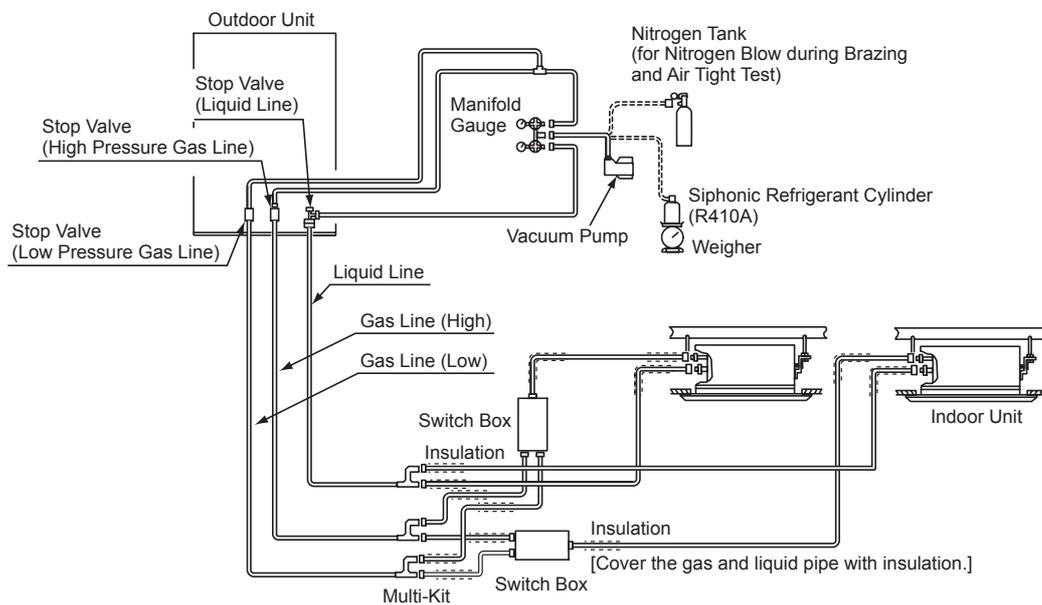
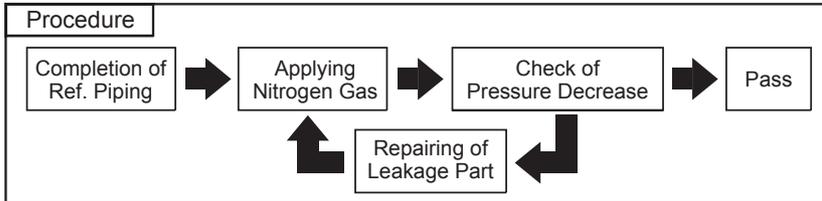


Fig. 8.1 Vacuum Pumping and Refrigerant Charge

## 8.2 Vacuuming

(1) Connect a manifold gauge and vacuum pump to the check joints.

- \* Gas Stop Valve
- Liquid Stop Valve

(2) Continue vacuum pumping work until the pressure reaches  $-0.1\text{MPa}$  ( $-756\text{mmHg}$ ) or lower for one to two hours.

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

(3) Tighten the cap of check joint ( $9$  to  $14\text{N}\cdot\text{m}$  for gas valve,  $14$  to  $18\text{N}\cdot\text{m}$  for liquid valve) after the vacuum pumping work.

### NOTES:

1. If tools or measuring instruments come into contact with the refrigerant, use the tools or the measuring instruments exclusive for R410A.
2. If vacuum degree of  $-0.1\text{MPa}$  ( $-756\text{mmHg}$ ) is not available, it is considered that there is a gas leakage. Check for any gas leakage once again. If no leakage exists, operate the vacuum pump for one to two hours.

## NOTICE

\$ Insulate the refrigerant pipes as shown in Fig. 8.2.

After connecting the refrigerant piping, seal the refrigerant pipes by using the field-supplied insulation material. Insulate the unions and flare nuts at the piping connections completely. Insulate the liquid piping and gas piping completely to avoid decreasing of performance and dewing on the surface of the pipe.

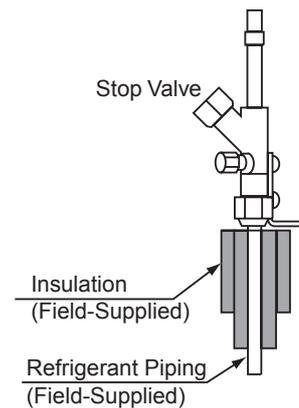


Fig. 8.2 Insulation on Pipes

### 8.3 Additional Refrigerant Charge Calculation

Table 8.1 Additional Refrigerant Charge Calculation

Although refrigerant has been charged into this unit, additional refrigerant charge is required according to piping length. 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.

#### 1. Calculating Method of Additional Refrigerant Charge (W kg)

No.	Symbol	Contents	Additional Charge (kg)																																
1	W1	Additional Refrigerant Charge Calculation for Liquid Piping (W1 kg)																																	
		<table border="1"> <thead> <tr> <th>Pipe Diameter</th> <th>Total Piping Length (m)</th> <th>Refrigerant Amount for 1m Pipe</th> <th>Additional Charge (kg)</th> </tr> </thead> <tbody> <tr> <td>φ22.2</td> <td>m</td> <td>×0.39 =</td> <td></td> </tr> <tr> <td>φ19.05</td> <td>m</td> <td>×0.28 =</td> <td></td> </tr> <tr> <td>φ15.88</td> <td>m</td> <td>×0.19=</td> <td></td> </tr> <tr> <td>φ12.7</td> <td>m</td> <td>×0.12 =</td> <td></td> </tr> <tr> <td>φ9.53</td> <td>m</td> <td>×0.06 =</td> <td></td> </tr> <tr> <td>φ6.35</td> <td>m</td> <td>×0.03 =</td> <td></td> </tr> <tr> <td colspan="3">Total Additional Charge For Liquid Piping =</td> <td></td> </tr> </tbody> </table>		Pipe Diameter	Total Piping Length (m)	Refrigerant Amount for 1m Pipe	Additional Charge (kg)	φ22.2	m	×0.39 =		φ19.05	m	×0.28 =		φ15.88	m	×0.19=		φ12.7	m	×0.12 =		φ9.53	m	×0.06 =		φ6.35	m	×0.03 =		Total Additional Charge For Liquid Piping =			
		Pipe Diameter		Total Piping Length (m)	Refrigerant Amount for 1m Pipe	Additional Charge (kg)																													
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		φ19.05		m	×0.28 =																														
		φ15.88		m	×0.19=																														
		φ12.7		m	×0.12 =																														
		φ9.53		m	×0.06 =																														
φ6.35	m	×0.03 =																																	
Total Additional Charge For Liquid Piping =																																			
		kg																																	
2	W2	Additional Refrigerant Charge Calculation for Indoor Unit (W2 kg) Additional refrigerant charge is 1kg/unit of 76KBtu/h and 96KBtu/h indoor unit. Additional refrigerant charge of less than 76KBtu/h indoor units is not needed.																																	
		76 and 96 Total Indoor Unit Numbers                      Additional Charge <div style="text-align: center;"> <input type="text"/> × 1.0kg/unit = <input type="text"/> </div>																																	
		kg																																	
3	W3	The Ratio of Indoor Unit Connection Capacity (Indoor Unit Total Capacity/ Outdoor Unit Capacity) Additional Charge Determine the ratio of indoor unit connection capacity.																																	
		<table border="0"> <thead> <tr> <th>Condition</th> <th>Refrigerant Amount</th> </tr> </thead> <tbody> <tr> <td>• I.U.Capacity Ratio is less than 100% :</td> <td>0.0kg</td> </tr> <tr> <td>• I.U.Capacity Ratio is 100~115% :</td> <td>0.5kg</td> </tr> <tr> <td>• I.U.Capacity Ratio is 116~140% :</td> <td>1.0kg</td> </tr> </tbody> </table>		Condition	Refrigerant Amount	• I.U.Capacity Ratio is less than 100% :	0.0kg	• I.U.Capacity Ratio is 100~115% :	0.5kg	• I.U.Capacity Ratio is 116~140% :	1.0kg																								
Condition	Refrigerant Amount																																		
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• I.U.Capacity Ratio is 116~140% :	1.0kg																																		
		kg																																	
4	W	Calculation of Additional Charge (W kg) = W1 + W2 +W3	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 >

Outdoor Unit (KBtu/h)	76/96	114	136	154	170~212	232~454
Max. Additional Ref. Charge Quantity (kg)	33.0	38.5	38.5	42.0	46.0	52.0

#### 2. Charging Work

Charge refrigerant (R410A) into the system according to Item 8.4.

#### 3. Record of Additional Charge

Total refrigerant charge of this system is calculated in the following formula.

Total Ref. Charge = W + Wo  
 This System =  +  =  kg

Ref. Charge Amount of O.U. Before Shipment (W0) kg

Outdoor Unit (KBtu/h)	W0 Outdoor Unit Ref. Charge (kg)
76	9.9
96	9.9
114	10.5
136	10.5
154	10.5

Total Additional Charge: W  kg  
 Total Ref. Charge:  kg  
 Date of Ref. Charge Work:  /  /

**Note:**

- W0 is outdoor unit ref. charge before shipment.
- In case of the combination of the base unit, calculate the total ref. charge before shipment of the outdoor units to be combined.

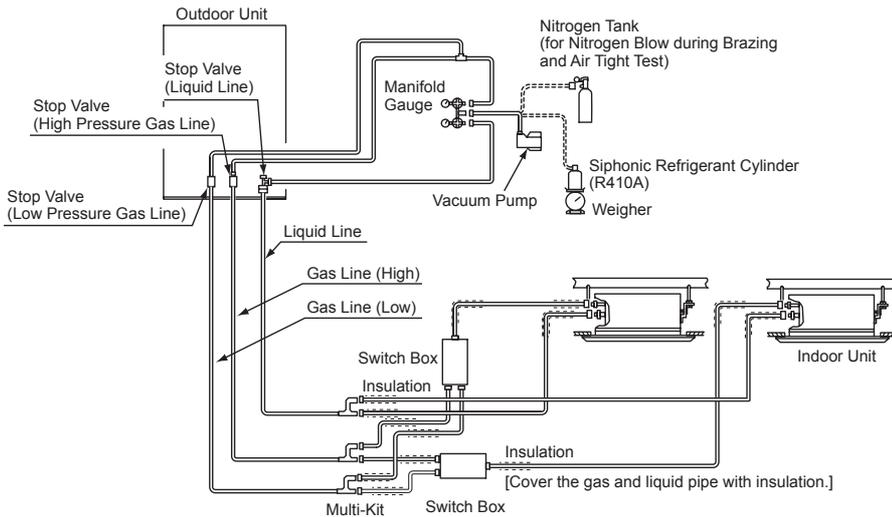
## 8.4 Charging Work

After vacuum pumping work, check that the gas stop valve, and liquid stop valve are fully closed.

Charge the additional refrigerant (refer to Table 8.1) from the check joint of liquid stop valve (Charging Refrigerant Amount Tolerance: 0.5kg).

If the specified refrigerant quantity can not be charged, follow the procedure below.

- (1) Fully open the stop valve for gas.
- (2) Operate the compressor at the cooling mode and add the refrigerant from the check joint of the liquid stop valve. At this time, the liquid stop valve is slightly opened (Charging Refrigerant Amount Tolerance: 0.5kg).



Charge the correct refrigerant quantity according to Table 8.1. If not, a compressor may be damaged due to an excess or insufficient refrigerant charge.

Refrigerant charge from check joint of gas stop valve may lead to compressor failure. Be sure to charge refrigerant from the check joint of liquid stop valve.

Insulate the liquid piping and gas piping completely to avoid decreasing of performance and dewing on the surface of the pipe.

Insulate the flare nut and union of the piping connection with insulation.

Check to ensure that there is no gas leakage. If a large refrigerant leakage occurs, it will cause difficulty with breathing or harmful gases would occur if a fire was being used in the room.

## 8.5 Automatic Simple Judgement System for Refrigerant Amount

Perform the refrigerant amount check operation according to the automatic judgement function after the refrigerant charging work.

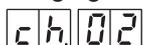
When the judgement result is excessive refrigerant, insufficient refrigerant or abnormal termination, find out the cause of abnormality and perform the refrigerant amount check operation again.

< Procedure of Refrigerant Amount Check Operation >

- (1) Reassemble all the cover except for the electrical control box cover and service cover of No.1 unit.
- (2) Turn ON the power supply of indoor unit and outdoor unit in the refrigerant cycle to be performed the refrigerant amount check operation.  
(Supply electrical power to the system 12 hours before starting this check operation to warm the compressor oil.)
- (3) Turn No.4 of DSW5 (PCB1) ON.  
7-segment Display



- (4) Check the 7-segment display and press PSW1.  
The outdoor fan and compressor will be activated and the 7-segment display will be indicated the following figure

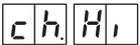


The judgement takes 30 to 40 minutes.

Refer to the table below for the result indication.

When the judgement result is excessive refrigerant, insufficient refrigerant or abnormal termination, find out the cause of abnormality and perform the refrigerant amount check operation again

### Judgement Result Indication

7-segment Indication	Result	Remarks
	Sufficient Refrigerant	The refrigerant amount is sufficient. Turn No.4 of DSW5 OFF and perform Test Run.
	Excessive Refrigerant	The refrigerant amount is excessive. Calculate the additional refrigerant amount according to the piping length. Collect the refrigerant using a collector and charge the correct refrigerant amount.
	Insufficient Refrigerant	The refrigerant amount is insufficient. Check if the additional refrigerant has been charged. Calculate the additional refrigerant amount according to the piping length and charge the refrigerant.
	Abnormal Termination	Find out the cause of abnormal termination as shown below. After resolved the cause of abnormal termination, restart the check operation. (1) Is No.4 pin of DSW5 ON before turning on the power supply? (2) Are all indoor units ready and waiting, before turned ON No.4 pin of DSW5? (3) Is the outdoor ambient temperature within the applicable range (-5 to 43°C)? (In some cases, when the connected indoor unit number exceeds the recommended number and the outdoor ambient temperature exceeds 35°C, this check operation cannot be performed.) (4) Is the total indoor units operation capacity 30% (indoor units capacity ratio) or less? (5) Is No.4 of DSW4 (compressor forced stoppage) OFF?

- (5) Turn No.4 of DSW5 OFF when the refrigerant amount is sufficient.  
Wait 3 minutes (at least) after turning No.4 of DSW5 OFF and then the outdoor unit is ready to operate.

#### NOTE:

The 7-segment indication during the check operation may be changed to the protection control code by the activation of protection control, however it is normal. As for the protection control code, refer to the sheet attached to the inside of the outdoor unit service cover.

#### NOTE:

1. Emissions of the fluorocarbons are prohibited.
2. In case of disposal and maintenance of this product, collection of fluorocarbons is required.
3. Regarding the fluorocarbon, the specification label or refrigerant label attached to the product should be followed. After the additional refrigerant charge, record the total refrigerant (= refrigerant before shipment + additional refrigerant in the field) in the refrigerant label.

\$ Special Attention Regarding Refrigerant Gas Leakage

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

$$\frac{\text{Totally Charged Refrigerant Quantity in System (kg)}}{\text{Room Space for each Indoor Unit (m}^3\text{)}} \leq \text{Critical Concentration (kg/m}^3\text{)}$$

↑  
0.3 kg/m<sup>3</sup> \*

\* In case of KHK S 0010, this value should be decided according to the each country's regulation such as ISO5149 and EN378.

In the case that the calculated critical concentration is higher than 0.3kg/m<sup>3</sup>, take the following actions.

- 1) Provide a gas leakage detector and exhaust fan(s) controlled by its gas leakage detector.
- 2) Provide each effective opening at 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 more than 0.15% of 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. The maximum permissible concentration of HFC gas, R410A in air is 0.3kg/m<sup>3</sup>, according to the refrigeration and air conditioning facility standard (KHK S 0010) by the KHK (High Pressure Gas Protection Association) Japan. Therefore, some effective measure must be taken to lower the R410A concentration in air below 0.3kg/m<sup>3</sup>, in case of leakage. As for R410A, this consideration is applied similarly.

2. Calculation of Refrigerant Concentration

- (1) Calculate the total quantity of refrigerant R (kg) charged in the system connecting all the indoor units of objective rooms.
- (2) Calculate the room space where this unit is to be installed V (m<sup>3</sup>) of each objective room.
- (3) Calculate the refrigerant concentration C (kg/m<sup>3</sup>) of the room according to the following equation.

$$\begin{aligned} & \text{R: Total Quantity of Charged Refrigerant (kg)} \\ & \text{V: Room Space Where This Unit Is to Be Installed (m}^3\text{)} \\ & = \text{C: Refrigerant Concentration X 0.3 (kg/m}^3\text{)} * \end{aligned}$$

If local codes or regulations are specified, follow them

<Example>

Japanese Standard KHK S 0010 C=0.3 (kg/m<sup>3</sup>)

## 9. Test Run

Test run should be performed according to the Item 9.2. And use the Table 9.1 for recording test run.

### **WARNING**

- **Do not operate the system until all the check points have been cleared.**  
**As for the test run of indoor unit, check “Installation & Maintenance Manual” attached to the indoor unit and Switch Box.**

#### 9.1 Before Test Run

- (1) Check to ensure that the refrigerant piping and transmission between outdoor unit and indoor units are connected to the same refrigerant cycle. If not, it will cause an abnormal operation and a serious accident.  
Check that the dip switch setting of the refrigerant cycle No. (DSW1 & RSW1 [O.U.], DSW5 & RSW2 [I.U.]) and the unit number (RSW) for the indoor units apply to the system.  
Confirm that the dip switch setting on the printed circuit board of the indoor units and the outdoor units are correct. Especially, pay attention to the setting of lift between indoor units and outdoor unit, the refrigerant No. and the end terminal resistance. Refer to the chapter “7. Electrical Wiring”.
- (2) 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 (Refer to “Caution for Insulation Resistance” for details.).  
Do not impress the voltage on the terminals for transmission (Outdoor Unit: TB2 1, 2, 3, 4 / Indoor Unit: TB2 1, 2, A, B / Switch Box: TB2 1, 2, 3, 4).
- (3) Check to ensure that each wire, L1, L2, L3 and N is correctly connected at the power source.  
If incorrectly connected, the unit will not operate and the remote control switch will indicate the alarm code “05”. In this case, check and change the phase of the power source according to the attached sheet on the reverse side of the service cover.
- (4) **Check to ensure that the switch on the main power source has been ON for more than 12 hours, to warm the compressor oil by the oil heater.**  
FSXN series outdoor units does not operate within 4 hours after power supply (Stoppage Code d1-22).  
In case of operating within 4 hours, release the protection control as follows:
  1. Supply power to the outdoor unit.
  2. Wait for 30 seconds.
  3. Push PSW5 on the outdoor PCB more than 3 seconds in order to release the d1-22.  
In case of using remote control switch for release, push “Air Flow” and “Auto Louver” switch simultaneously for 3 seconds.
- (5) Main Unit Label  
In case of the combination of base units, **attach the main unit label on a visible spot of the main unit (outdoor unit A)**, so that the outdoor unit A can be identified easily. Do not attach the main label on the sub unit (outdoor unit B and C).

## **CAUTION**

### Caution for Insulation Resistance

If total unit insulation resistance is lower than 1 megohm, the compressor insulation resistance may be low due to retained refrigerant in the compressor. This may occur if the unit has not been used for long periods.

1. Disconnect the cables to the compressor and measure the insulation resistance of the compressor itself. If the resistance value is over 1 megohm, then insulation failure has occurred of other electrical parts.
2. If the insulation resistance is less than 1 megohm, disconnect the compressor cable from the inverter PCB. Then, turn on the main power to apply current to the crankcase heater. After applying current for more than 3 hours, measure insulation resistance again. (Depending on the air conditions, pipe length or refrigerant conditions, it may be necessary to apply the current for a longer period of time.) Check the insulation resistance and reconnect the compressor.

If the leakage breaker is activated, check the recommended size.

## **NOTICE**

1. Confirm that field-supplied electrical components (main switch fuse, fuse-free breaker, earth leakage breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data given in the Technical Catalog of the unit and ensure that the components comply with national and local codes.
2. Use shielded wires ( $\geq 0.75\text{mm}^2$ ) for field wiring to protect electrically noise obstacle. (Total length of shielded wire shall be less than 1000m, and size of shielded wire shall comply with local codes.)
3. Check to ensure that the terminal for power source wiring (terminals "L1" to "L1" and "N" to "N" of each terminal board: AC 380-415V).  
If not, some component will be damaged.

## 9.2 Test Run

- (1) Check to ensure that the stop valves of the outdoor unit are fully opened and then start the system.  
(In case of the combination of base units, check that the stop valves of all the connected outdoor units are fully opened.)
- (2) Perform the test run of indoor units one by one sequentially and then check accordance of the refrigerant piping system and electrical wiring system. (If the multiple indoor units are operated simultaneously, the system can not be inspected the system accordance.)
- (3) Perform the test run according to the following procedure. Ensure that the test run is carried out without any problem.

### NOTE:

In case of 2-remote control switch (main and sub), firstly perform the test run of the main remote control switch.

- a) Set the "TEST RUN" mode by pressing the "MODE" and "CHECK" switch of controller simultaneously for at least 3 seconds.

→ "TEST RUN" is displayed on the LCD.

The total number of the indoor units connected is indicated on the LCD.

05 unit

Example when 5 indoor units are connected.

- Regarding other optional remote control switch, follow "Installation & Maintenance Manual" attached to each optional remote control switch and perform the test run.
- In case that the multiple indoor units are operated simultaneously controlled by one remote control switch, check the connected number of indoor unit is indicated on LCD.
- In case that the indicated number is not correct, 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) Set the operation mode by pressing "MODE" switch.

- c) Press "RUN/STOP" switch.

→ The operation lamp will be turned ON before the test run starts.

2-hour OFF Timer will be set automatically, and "OFF Timer" and "2HR" will be indicated on LCD. Although the air flow initial setting is "HI", the setting can be changed

- Check the following operation range.

		Cooling Operation	Heating Operation
Indoor Temperature	Minimum	21°C DB / 15°C WB	15°C DB
	Maximum	32°C DB / 23°C WB	27°C DB
Outdoor Temperature	Minimum	-5°C DB (*)	-20°C WB (**)
	Maximum	43°C DB	15°C WB

DB: Dry Bulb, WB: Wet Bulb

### NOTES:

(\*) 10°C DB ~ -5°C DB, Operation Control Range

(\*\*) -12°C WB ~ -20°C WB, Operation Control Range

- Pay attention to the following items while the system is running.
  - ' 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.
  - ' DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES).  
It will cause a serious accident.
- Do not touch any electrical components for at least 3 minutes after turning OFF the main switch.
- Check that the refrigerant piping setting and electrical wiring setting are for the same system, by operating the indoor unit one by one.

- d) Depress "AUTO LOUVER" switch and check that the louver is activated normally without abnormal sound. Depress "AUTO LOUVER" again so that the louver will stop. If abnormal sound is heard, remove the panel and adjust the fitting condition of connection parts in the panel corner cover. Ensure that the panel is mounted correctly to the unit body, otherwise the panel may be deformed.
- e) The temperature control will be invalid though the protection device will be activated during the test run. If alarm occurs, find out the cause of abnormality according to Table 9.2 "Alarm Code". And again perform the test run after solving the problems.
- f) According to the label "Checking of Outdoor Unit by 7-segment Display on PCB1" attached to the rear side of the front cover of the outdoor unit, inspect temperature, pressure, operation frequency, and connected indoor unit numbers by the 7-segment displays.
- g) To end the test run, wait for 2 hours or push "RUN/STOP" switch again.

Table 9.1 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 fan correct?
2. Is the rotation direction of the outdoor 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:	<u>    </u> No. 1 DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> No. 2 DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> No. 3 DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> No. 4 DB	<u>    </u> /WB	<u>    </u> °C
Outlet:	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C
Inlet:	<u>    </u> No. 5 DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> No. 6 DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> No. 7 DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> No. 8 DB	<u>    </u> /WB	<u>    </u> °C
Outlet:	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C,	<u>    </u> DB	<u>    </u> /WB	<u>    </u> °C
6. Check Outdoor Ambient Temperature
 

Inlet:	<u>    </u> DB	<u>    </u> °C,	<u>    </u> WB	<u>    </u> °C
Outlet:	<u>    </u> DB	<u>    </u> °C,	<u>    </u> WB	<u>    </u> °C
7. Check Refrigerant Temperature
 

Liquid Temperature:	<u>                    </u> °C
Discharge Gas Temperature:	<u>                    </u> °C
8. Check Pressure
 

Discharge Pressure:	<u>                    </u> MPa
Suction Pressure:	<u>                    </u> MPa
9. Check Voltage
 

Rated Voltage:	<u>                    </u> V
Operating Voltage:	<u>    </u> L <sub>1</sub> -L <sub>2</sub> <u>    </u> V, <u>    </u> L <sub>1</sub> -L <sub>3</sub> <u>    </u> V, <u>    </u> L <sub>2</sub> -L <sub>3</sub> <u>    </u> V
Starting Voltage:	<u>                    </u> V
Phase Imbalance:	$1 - \frac{V}{V_m} =$ <u>                    </u>
10. Check Compressor Input Running Current
 

Input:	<u>                    </u> kW
Running Current:	<u>                    </u> 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?

Table 9.2 Alarm Code

Code	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	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	Outdoor Unit	Activation of Protection Device (High Pressure Cut)	Activation of PSH (Pipe Clogging, Excessive Refrigerant, Inert Gas Mixing)
03	Transmission	Abnormality between Indoor and Outdoor	Incorrect Wiring, Loose Terminals, Disconnect Wire, Blowout of Fuse, Outdoor Unit Power OFF
04		Abnormality between Inverter PCB and Outdoor PCB	Inverter PCB - Outdoor PCB Transmission Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
04.		Abnormality between Fan Controller and Outdoor PCB	Fan Controller - Outdoor PCB Transmission Failure (Loose Connector, Wire Breaking, Blowout of Fuse)
05	Supply Phase	Abnormality Power Source Phases	Incorrect Power Source, Connection to Reversed Phase, Open-Phase
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacit
06.		Abnormal Fan Controller Voltage	Outdoor Voltage Drop, Insufficient Power Capacit
07	Cycle	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)
0A	Transmission	Abnormality between Outdoor and Outdoor	Incorrect Wiring, Breaking Wire, Loose Terminals
0b	Outdoor Unit	Incorrect Outdoor Unit Address Setting	Duplication of Address Setting for Outdoor Units (Sub Units) in Same Refrigerant Cycle System
0C		Incorrect Outdoor Unit Main Unit Setting	Two (or more) Outdoor Units Set as "Main Unit" Exist in Same Refrigerant Cycle System
11	Sensor on Indoor Unit	Inlet Air Thermistor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
19	Fan Motor	Activation of Protection Device for Indoor Fan	Fan Motor Overheat, Locking
21	Sensor on Outdoor Unit	High Pressure Sensor	Incorrect Wiring, Disconnecting Wiring Breaking Wire, Short Circuit
22		Outdoor Air Thermistor	
23		Discharge Gas Thermistor on Top of Compressor	
24		Heat Exchanger Liquid Pipe Thermistor	
25		Heat Exchanger Gas Pipe Thermistor	
29		Low Pressure Sensor	

Code	Category	Content of Abnormality	Leading Cause
31	System	Incorrect Capacity Setting of Outdoor Unit and Indoor Unit	Incorrect Capacity Code Setting of Combination Excessive or Insufficient Indoor Unit Total Capacity Code
35		Incorrect Setting of Indoor Unit No.	Duplication of Indoor Unit No. in same Ref. Gr.
36		Incorrect of Indoor Unit Combination	Indoor Unit is Designed for R22
38		Abnormality of Picking up Circuit for Protection in Outdoor Unit	Failure of Protection Detecting Device (Incorrect Wiring of Outdoor PCB)
39	Compressor	Abnormality Running Current at Constant Speed Compressor	Overcurrent, Blowout Fuse, Current Sensor Failure, Instantaneous Power Failure, Voltage Drop, Abnormal Power Supply
3A	Outdoor Unit	Abnormality of Outdoor Unit Capacity	Outdoor Unit Capacity > 510kBTu/h
3b		Incorrect Setting of Outdoor Unit Models Combination or Voltage	Incorrect Setting of Main and Sub Unit(s) Combination or Voltage
3d		Abnormality Transmission between Main Unit and Sub Unit(s)	Incorrect Wiring, Disconnect Wire, Breaking Wire, PCB Failure
43	Protection Device	Activation of Low Pressure Decrease 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 High Pressure Increase Protection Device	Overload Operation (Clogging, Short-Pass), Pipe Clogging, Excessive Refrigerant, 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	Sensor	Abnormal Inverter Current Sensor	Current Sensor Failure
53	Inverter	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	Fan Controller	Activation of Fan Controller Protection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short Circuit), Instantaneous Overcurrent
5A		Abnormality of Fan Controller Fin Temperature	Fin Thermistor Failure, Heat Exchanger Clogging, Fan Motor Failure
5b		Activation of Overcurrent Protection	Fan Motor Failure
5c		Abnormality of Fan Controller Sensor	Failure of Current Sensor (Instantaneous Overcurrent, Increase of Fin Temperature, Low Voltage, Earth Fault, Step-Out)
EE	Compressor	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, 39, 43 to 45, 47
b1	Outdoor Unit No. Setting	Incorrect Outdoor Unit Address Number or Unit Number Setting	Over 64 Number is Set for Address or Refrigerant Cycle.
b5	Indoor Unit No. Setting	Incorrect Indoor Unit Connection Number Setting	More than 17 Non-Corresponding to Hi-NET Units are Connected to One System.
C1	Switch Box	Incorrect Indoor Unit Connection	2 or more Switch Boxes are connected between outdoor unit and indoor unit.
C2		Incorrect Indoor Unit Connection No. Setting	9 or More Indoor Units Connected to Switch Box
C3		Incorrect Indoor Unit Connection	The indoor units of different refrigerant cycle is connected to Switch Box.

## 10. 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 is stopped.

Model			76	96	114
For Compressor Pressure Switches			Automatic Reset, Non-Adjustable (each one for each compressor)		
High	Cut-Out	MPa	4.15 <sup>-0.05</sup> <sub>-0.20</sub>	4.15 <sup>-0.05</sup> <sub>-0.20</sub>	4.15 <sup>-0.05</sup> <sub>-0.20</sub>
	Cut-In	MPa	3.20 <sup>+0.15</sup> <sub>-0.20</sub>	3.20 <sup>+0.15</sup> <sub>-0.20</sub>	3.20 <sup>+0.15</sup> <sub>-0.20</sub>
Fuse Capacity 3φ, 380-415V, 50Hz		A	40 x 2	40 x 2	40 x 2 + 32 x 2
Oil Heater Capacity		W	40 x 2	40 x 2	40 x 2
CCP Timer Setting Time		min.	3	3	3
For DC Fan Module Fuse Capacity 3φ, 380-415V, 50Hz		A	20 x 1	20 x 1	20 x 1

Model			136	154
For Compressor Pressure Switches			Automatic Reset, Non-Adjustable (each one for each compressor)	
High	Cut-Out	MPa	4.15 <sup>-0.05</sup> <sub>-0.20</sub>	4.15 <sup>-0.05</sup> <sub>-0.20</sub>
	Cut-In	MPa	3.20 <sup>+0.15</sup> <sub>-0.20</sub>	3.20 <sup>+0.15</sup> <sub>-0.20</sub>
Fuse Capacity 3φ, 380-415V, 50Hz		A	40 x 2 + 32 x 2	40 x 2 + 32 x 2
Oil Heater Capacity		W	40 x 4	40 x 4
CCP Timer Setting Time		min.	3	3
For DC Fan Module Fuse Capacity 3φ, 380-415V, 50Hz		A	20 x 1	20 x 1

11. Technical parameters

## Technical parameters

<b>Model(s):AVWT-76FESRA</b>							
<b>Outdoor side heat exchanger of air conditioner/heat pump:air</b>							
<b>Indoor side heat exchanger of air conditioner/heat pump:air</b>							
<b>Type: compressor driven vapour compression</b>							
<b>Driver of compressor:electric motor</b>							
<b>Indication if the heater is equipped with a supplementary heater:no</b>							
<b>Parameters shall be declared for the average heating season</b>							
Item	Symbol	Value	Unit	Item	Symbol	Value	unit
<b>cooling</b>							
Rated cooling capacity	$P_{rated,c}$	22.4	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	350.2	%
<b>Declared capacity (*) for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj</b>				<b>Declared energy efficiency ratio (*), at indoor temperature 27(19) °C and outdoor temperature Tj</b>			
Tj = 35 °C	Pdc	20.8	kW	Tj = 35 °C	EERd	4.01	—
Tj = 30 °C	Pdc	15.4	kW	Tj = 30 °C	EERd	6.18	—
Tj = 25 °C	Pdc	9.8	kW	Tj = 25 °C	EERd	10.12	—
Tj = 20 °C	Pdc	5.6	kW	Tj = 20 °C	EERd	19.11	—
co-efficient for air conditioners(*)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	crankcase heater mode	$P_{CK}$	0	kW
thermostat-off mode(cooling)	$P_{TO}$	0	kW	standby mode	$P_{SB}$	0.03	kW
<b>heating</b>							
Rated heating capacity	$P_{rated,h}$	28.0	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	155.3	%
<b>Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj</b>				<b>Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj</b>			
Tj = -7 °C	Pdh	16.1	kW	Tj = -7 °C	COPd	2.39	—
Tj = 2 °C	Pdh	10.1	kW	Tj = 2 °C	COPd	3.87	—
Tj = 7 °C	Pdh	6.7	kW	Tj = 7 °C	COPd	5.03	—
Tj = 12 °C	Pdh	3.7	kW	Tj = 12 °C	COPd	8.11	—
Tj = bivalent temperature	Pdh	16.1	kW	Tj = bivalent temperature	COPd	2.39	—
Tj = operating limit	Pdh	14.9	kW	Tj = operating limit	COPd	2.30	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps(**)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	Back-up heating capacity (*)	elbu	0	kW
thermostat-off mode(heating)	$P_{TO}$	0.04	kW	Type of energy input			
crankcase heater mode	$P_{CK}$	0.01	kW	standby mode	$P_{SB}$	0.03	kW
<b>Other items</b>							
Capacity control	variable			air flow rate, outdoor measured		9300	m3/h
Sound power level , indoor/outdoor measured	LWA	-/90	dB(A)				
Global warming potential	GWP	2088	kgCO <sub>2</sub> eq.				
<b>Note</b>	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
<b>Contact details</b>	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, P.R. China						

# Technical parameters

**Model(s):**AVWT-96FESRA

**Outdoor side heat exchanger of air conditioner/heat pump:**air

**Indoor side heat exchanger of air conditioner/heat pump:**air

**Type:** compressor driven vapour compression

**Driver of compressor:**electric motor

**Indication if the heater is equipped with a supplementary heater:**no

**Parameters shall be declared for the average heating season**

Item	Symbol	Value	Unit	Item	Symbol	Value	unit
<b>cooling</b>							
Rated cooling capacity	$P_{rated,c}$	28.0	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	334.2	%
<b>Declared capacity (*) for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj</b>				<b>Declared energy efficiency ratio (*), at indoor temperature 27(19) °C and outdoor temperature Tj</b>			
Tj = 35 °C	Pdc	26.0	kW	Tj = 35 °C	EERd	3.62	—
Tj = 30 °C	Pdc	19.3	kW	Tj = 30 °C	EERd	5.89	—
Tj = 25 °C	Pdc	12.2	kW	Tj = 25 °C	EERd	9.54	—
Tj = 20 °C	Pdc	5.8	kW	Tj = 20 °C	EERd	18.20	—
co-efficient for air conditioners(*)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	crankcase heater mode	$P_{CK}$	0	kW
thermostat-off mode(cooling)	$P_{TO}$	0	kW	standby mode	$P_{SB}$	0.03	kW
<b>heating</b>							
Rated heating capacity	$P_{rated,h}$	31.5	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	147.1	%
<b>Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj</b>				<b>Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj</b>			
Tj = - 7 °C	Pdh	19.4	kW	Tj = - 7 °C	COPd	2.4849	—
Tj = 2 °C	Pdh	12.1	kW	Tj = 2 °C	COPd	3.7521	—
Tj = 7 °C	Pdh	8.1	kW	Tj = 7 °C	COPd	4.1382	—
Tj = 12 °C	Pdh	4.5	kW	Tj = 12 °C	COPd	8.019	—
Tj = bivalent temperature	Pdh	19.4	kW	Tj = bivalent temperature	COPd	2.4849	—
Tj = operating limit	Pdh	17.9	kW	Tj = operating limit	COPd	2.42	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps(**)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	Back-up heating capacity (*)	elbu	0	kW
thermostat-off mode(heating)	$P_{TO}$	0.04	kW	Type of energy input			
crankcase heater mode	$P_{CK}$	0.01	kW	standby mode	$P_{SB}$	0.03	kW
<b>Other items</b>							
Capacity control	variable			air flow rate, outdoor measured		10200	m3/h
Sound power level , indoor/outdoor measured	LWA	-/90	dB(A)				
Global warming potential	GWP	2088	kgCO <sub>2</sub> eq.				
<b>Note</b>	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
<b>Contact details</b>	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, P.R. China						

# Technical parameters

**Model(s):**AVWT-114FESSA

**Outdoor side heat exchanger of air conditioner/heat pump:**air

**Indoor side heat exchanger of air conditioner/heat pump:**air

**Type:** compressor driven vapour compression

**Driver of compressor:**electric motor

**Indication if the heater is equipped with a supplementary heater:**no

**Parameters shall be declared for the average heating season**

Item	Symbol	Value	Unit	Item	Symbol	Value	unit
<b>cooling</b>							
Rated cooling capacity	$P_{rated,c}$	33.5	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	338.5	%
<b>Declared capacity (*) for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj</b>				<b>Declared energy efficiency ratio (*), at indoor temperature 27(19) °C and outdoor temperature Tj</b>			
Tj = 35 °C	Pdc	31.5	kW	Tj = 35 °C	EERd	3.66	—
Tj = 30 °C	Pdc	23.6	kW	Tj = 30 °C	EERd	6.01	—
Tj = 25 °C	Pdc	15.3	kW	Tj = 25 °C	EERd	9.64	—
Tj = 20 °C	Pdc	7.0	kW	Tj = 20 °C	EERd	18.01	—
co-efficient for air conditioners(*)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	crankcase heater mode	$P_{CK}$	0	kW
thermostat-off mode(cooling)	$P_{TO}$	0	kW	standby mode	$P_{SB}$	0.03	kW
<b>heating</b>							
Rated heating capacity	$P_{rated,h}$	37.5	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	148.6	%
<b>Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj</b>				<b>Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj</b>			
Tj = - 7 °C	Pdh	23.9	kW	Tj = - 7 °C	COPd	2.5351	—
Tj = 2 °C	Pdh	14.9	kW	Tj = 2 °C	COPd	3.7521	—
Tj = 7 °C	Pdh	10.0	kW	Tj = 7 °C	COPd	4.2218	—
Tj = 12 °C	Pdh	5.5	kW	Tj = 12 °C	COPd	8.181	—
Tj = bivalent temperature	Pdh	23.9	kW	Tj = bivalent temperature	COPd	2.5351	—
Tj = operating limit	Pdh	22.1	kW	Tj = operating limit	COPd	2.46	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps(**)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	Back-up heating capacity (*)	elbu	0	kW
thermostat-off mode(heating)	$P_{TO}$	0.04	kW	Type of energy input			
crankcase heater mode	$P_{CK}$	0.01	kW	standby mode	$P_{SB}$	0.03	kW
<b>Other items</b>							
Capacity control	variable			air flow rate, outdoor measured		10500	m3/h
Sound power level , indoor/outdoor measured	LWA	-/91	dB(A)				
Global warming potential	GWP	2088	kgCO <sub>2</sub> eq.				
<b>Note</b>	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
<b>Contact details</b>	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, P.R. China						

# Technical parameters

**Model(s):**AVWT-136FESSA

**Outdoor side heat exchanger of air conditioner/heat pump:**air

**Indoor side heat exchanger of air conditioner/heat pump:**air

**Type:** compressor driven vapour compression

**Driver of compressor:**electric motor

**Indication if the heater is equipped with a supplementary heater:**no

**Parameters shall be declared for the average heating season**

Item	Symbol	Value	Unit	Item	Symbol	Value	unit
<b>cooling</b>							
Rated cooling capacity	$P_{rated,c}$	40.0	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	333.9	%
<b>Declared capacity (*) for cooling, at indoor temperature 27(19) °C and outdoor temperature <math>T_j</math></b>				<b>Declared energy efficiency ratio (*), at indoor temperature 27(19) °C and outdoor temperature <math>T_j</math></b>			
$T_j = 35\text{ °C}$	$P_{dc}$	37.2	kW	$T_j = 35\text{ °C}$	EERd	3.41	—
$T_j = 30\text{ °C}$	$P_{dc}$	28.8	kW	$T_j = 30\text{ °C}$	EERd	5.61	—
$T_j = 25\text{ °C}$	$P_{dc}$	17.6	kW	$T_j = 25\text{ °C}$	EERd	9.49	—
$T_j = 20\text{ °C}$	$P_{dc}$	8.2	kW	$T_j = 20\text{ °C}$	EERd	20.48	—
co-efficient for air conditioners(*)	$C_{dc}$	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	crankcase heater mode	$P_{CK}$	0	kW
thermostat-off mode(cooling)	$P_{TO}$	0	kW	standby mode	$P_{SB}$	0.03	kW
<b>heating</b>							
Rated heating capacity	$P_{rated,h}$	40.0	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	155.6	%
<b>Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature <math>T_j</math></b>				<b>Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature <math>T_j</math></b>			
$T_j = -7\text{ °C}$	$P_{dh}$	26.4	kW	$T_j = -7\text{ °C}$	COPd	2.63	—
$T_j = 2\text{ °C}$	$P_{dh}$	15.7	kW	$T_j = 2\text{ °C}$	COPd	3.88	—
$T_j = 7\text{ °C}$	$P_{dh}$	10.0	kW	$T_j = 7\text{ °C}$	COPd	5.95	—
$T_j = 12\text{ °C}$	$P_{dh}$	4.9	kW	$T_j = 12\text{ °C}$	COPd	7.92	—
$T_j =$ bivalent temperature	$P_{dh}$	26.4	kW	$T_j =$ bivalent temperature	COPd	2.63	—
$T_j =$ operating limit	$P_{dh}$	24.8	kW	$T_j =$ operating limit	COPd	2.56	—
<b>Bivalent temperature</b>				<b>Operating limit temperature</b>			
heating/Average	$T_{biv}$	-7	°C	heating/Average	$T_{ol}$	-10	°C
heating/Warmer	$T_{biv}$	—	°C	heating/Warmer	$T_{ol}$	—	°C
heating/Colder	$T_{biv}$	—	°C	heating/Colder	$T_{ol}$	—	°C
Degradation co-efficient heat pumps(**)	$C_{dc}$	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	Back-up heating capacity (*)	$e_{bu}$	0	kW
thermostat-off mode(heating)	$P_{TO}$	0.04	kW	Type of energy input			
crankcase heater mode	$P_{CK}$	0.01	kW	standby mode	$P_{SB}$	0.03	kW
<b>Other items</b>							
Capacity control	variable			air flow rate, outdoor measured		11700	m3/h
Sound power level , indoor/outdoor measured	LWA	-91	dB(A)				
Global warming potential	GWP	2088	kgCO <sub>2</sub> eq.				
<b>Note</b>	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
<b>Contact details</b>	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, P.R. China						

# Technical parameters

**Model(s):**AVWT-154FESSA

**Outdoor side heat exchanger of air conditioner/heat pump:**air

**Indoor side heat exchanger of air conditioner/heat pump:**air

**Type:** compressor driven vapour compression

**Driver of compressor:**electric motor

**Indication if the heater is equipped with a supplementary heater:**no

**Parameters shall be declared for the average heating season**

Item	Symbol	Value	Unit	Item	Symbol	Value	unit
<b>cooling</b>							
Rated cooling capacity	$P_{rated,c}$	45.0	kW	Seasonal space cooling energy efficiency	$\eta_{s,c}$	311.6	%
<b>Declared capacity (*) for cooling, at indoor temperature 27(19) °C and outdoor temperature Tj</b>				<b>Declared energy efficiency ratio (*), at indoor temperature 27(19) °C and outdoor temperature Tj</b>			
Tj = 35 °C	Pdc	41.9	kW	Tj = 35 °C	EERd	3.21	—
Tj = 30 °C	Pdc	31.3	kW	Tj = 30 °C	EERd	5.22	—
Tj = 25 °C	Pdc	20.5	kW	Tj = 25 °C	EERd	8.83	—
Tj = 20 °C	Pdc	9.4	kW	Tj = 20 °C	EERd	19.05	—
co-efficient for air conditioners(*)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	crankcase heater mode	$P_{CK}$	0	kW
thermostat-off mode(cooling)	$P_{TO}$	0	kW	standby mode	$P_{SB}$	0.03	kW
<b>heating</b>							
Rated heating capacity	$P_{rated,h}$	50.0	kW	Seasonal space heating energy efficiency	$\eta_{s,h}$	151.1	%
<b>Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj</b>				<b>Declared coefficient of performance (*)/Average season, at indoor temperature 20 °C and outdoor temperature Tj</b>			
Tj = - 7 °C	Pdh	28.5	kW	Tj = - 7 °C	COPd	2.4459	—
Tj = 2 °C	Pdh	16.9	kW	Tj = 2 °C	COPd	3.5308	—
Tj = 7 °C	Pdh	10.8	kW	Tj = 7 °C	COPd	5.4145	—
Tj = 12 °C	Pdh	5.3	kW	Tj = 12 °C	COPd	7.3656	—
Tj = bivalent temperature	Pdh	28.5	kW	Tj = bivalent temperature	COPd	2.4459	—
Tj = operating limit	Pdh	26.7	kW	Tj = operating limit	COPd	2.38	—
Bivalent temperature				Operating limit temperature			
heating/Average	Tbiv	-7	°C	heating/Average	Tol	-10	°C
heating/Warmer	Tbiv	—	°C	heating/Warmer	Tol	—	°C
heating/Colder	Tbiv	—	°C	heating/Colder	Tol	—	°C
Degradation co-efficient heat pumps(**)	Cdc	0.25					
Power consumption in modes other than 'active mode'							
off mode	$P_{OFF}$	0.03	kW	Back-up heating capacity (*)	elbu	0	kW
thermostat-off mode(heating)	$P_{TO}$	0.04	kW	Type of energy input			
crankcase heater mode	$P_{CK}$	0.01	kW	standby mode	$P_{SB}$	0.03	kW
<b>Other items</b>							
Capacity control	variable			air flow rate, outdoor measured		11900	m3/h
Sound power level , indoor/outdoor measured	LWA	-92	dB(A)				
Global warming potential	GWP	2088	kgCO <sub>2</sub> eq.				
<b>Note</b>	The above performance data is obtained on the basis of the performance of this outdoor unit, with a 100%-combination of ceiling ducted type indoor units.						
<b>Contact details</b>	Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd. 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, P.R. China						



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