

# Hisense

## *Operation Installation & Maintenance Manual*

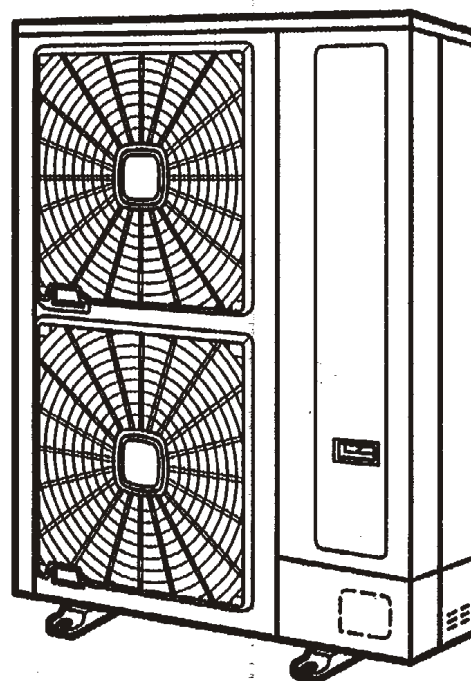
*AIR-SOURCE  
MULTI-SPLIT AIR  
CONDITIONER  
(HEAT PUMP)*

| OUTDOOR UNITS                          |
|----------------------------------------|
| AFW-38U4SC<br>AFW-48U4SC<br>AFW-54U4SC |

**IMPORTANT:**

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

Multi-functional



P00652Q

ORIGINAL INSTRUCTIONS



## 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 purposes such as drying clothes, refrigerating foods or for any other cooling or heating process.
- No part of this manual may be reproduced without written permission.
- Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

### **⚠ DANGER**

: Immediate hazards which **WILL** result in severe personal injury or death.

### **⚠ WARNING**

: Hazards or unsafe practices which **COULD** result in severe personal injury or death.

### **⚠ CAUTION**

: Hazards or unsafe practices which **COULD** result in minor personal injury or product or property damage.

### **NOTE**

: Useful information for operation and/or maintenance.

- If you have any questions, contact your distributor or dealer of Hisense.
- The unit should be installed as per the local standards.
- This heat pump air conditioner has been designed for the following temperatures. Operate the heat pump air conditioner within this range.

Temperature

(°C)

|                              |              | Max.       | Min.       |
|------------------------------|--------------|------------|------------|
| Cooling operation            | Indoor       | 32DB/23 WB | 21DB/15 WB |
|                              | Outdoor      | 43 DB      | -5 DB      |
| Heating operation            | Indoor       | 27 DB      | 15 DB      |
|                              | Outdoor      | 15 WB      | -23 WB     |
| Geothermal heating operation | Outdoor      | 15 WB      | -23 WB     |
|                              | Water supply | 55         | 20         |
| Hot water operation          | Outdoor      | 43 DB      | -23 WB     |
|                              | Water supply | 55         | 20         |
| Heat recovery                | Outdoor      | 43 DB      | 12 DB      |
|                              | Water supply | 55         | 20         |
|                              | Indoor       | 23 WB      | 15 WB      |

DB: Dry Bulb; WB: Wet Bulb

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.

## **SAFETY SUMMARY**

### **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.
- 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 touch or adjust safety devices inside the indoor or outdoor units. If these devices are touched or readjusted, it may cause a serious accident.
- Do not open the service cover or access panel for the indoor or outdoor units without turning OFF the main power supply.
- 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.
- The installer and system specialist shall secure safety against refrigerant leakage according to local regulations or standards.
- Use an ELB (Electric Leakage Breaker). In the event of a 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 a high level of oil mist, flammable gases, salty air or harmful gases such as sulphur.

### **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.
- Do not perform installation work, refrigerant piping work, 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.
- 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, lightning conductor or ground wiring for telephone.
- Connect a fuse of specified capacity.
- Do not put any foreign material on the unit or inside the unit.
- Make sure that the outdoor unit is not covered with snow or ice, before operation.
- 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.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
- Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.
- If the supply cord is damaged, it must be replaced by the manufacturer, it service agent or similarly qualified persons in order to avoid a hazard.
- The appliance shall be installed in accordance with national wiring regulations.

## **CAUTION**

- Do not install the indoor unit, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators such as medical equipment.
- Supply electrical power to the system to energize the oil heater for 12 hours before start-up after a long shutdown.
- Do not step or put any material on the product.
- 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.

### Notes:

- It is recommended that the room 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 unit is installed in a low temperature region.
- Operate the heat pump air conditioner within this rang.
  - Regarding installation altitude below 1000 meters.
  - Regarding frequency of supply power within  $\pm 1\%$  Hz of rated frequency.
  - Regarding voltage of supply power within  $\pm 6\%$  of the rated voltage.
  - Regarding transport stage temperature within  $-25\sim 55^{\circ}\text{C}$
- The A-weighted emission sound pressure level at workstations is not exceeds 70 dB(A).

## **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 method of use of the unit will be introduced within the manual.
- 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.

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# Section 1 Operation Manual

## 1. Safety Summary

### ⚠ WARNING

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

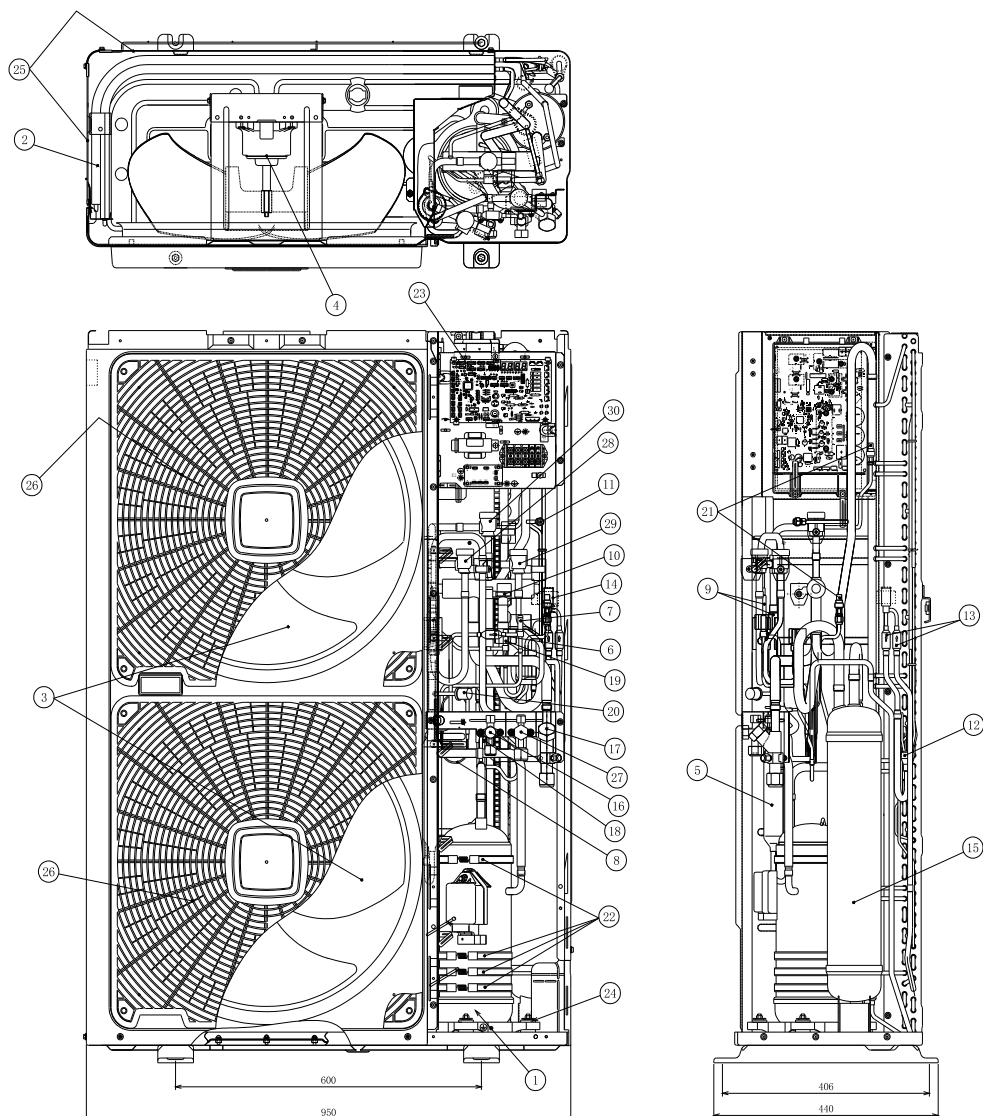
### ⚠ CAUTION

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

## 2. Structure

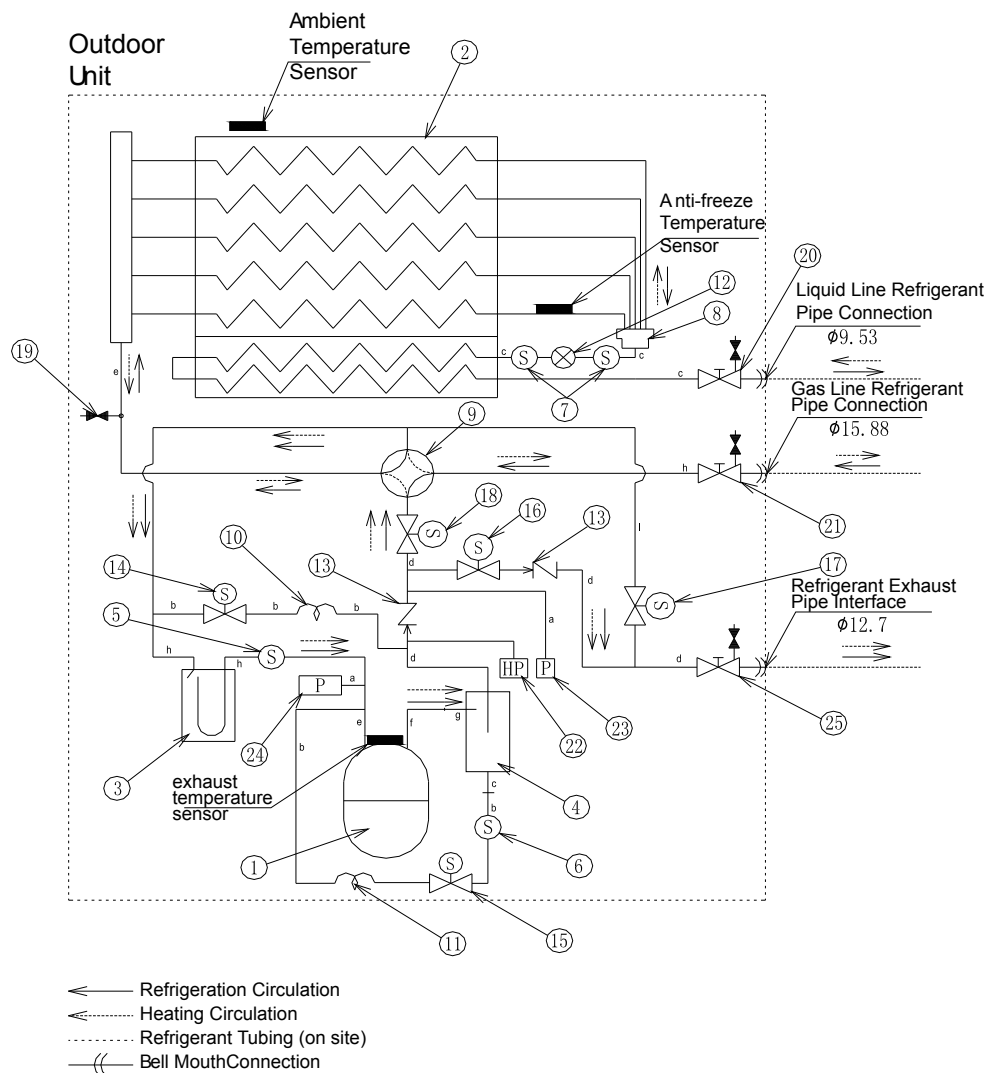
### 2.1 Outdoor Unit & Refrigerant Cycle

<Outdoor Unit>



| NO. | Part Name                 | NO. | Part Name                                                | NO. | Part Name              | NO. | Part Name           |
|-----|---------------------------|-----|----------------------------------------------------------|-----|------------------------|-----|---------------------|
| 1   | Compressor                | 9   | One-way Valve                                            | 16  | Liquid-side Stop Valve | 24  | Damper Rubber       |
| 2   | Heat Exchanger            | 10  | Four-way Solenoid Valve                                  | 17  | Gas-side Stop Valve    | 25  | Air Inlet           |
| 3   | Axial Flow Fan            | 11  | High/ Low Pressure Check Joint (refrigeration / heating) | 18  | Strainer               | 26  | Air Outlet          |
| 4   | Fan Motor                 |     |                                                          | 19  | By-pass Solenoid Valve | 27  | Exhaust Valve       |
| 5   | Oil Separator             | 12  | Flow Divider                                             | 20  | High Pressure Switch   | 28  | SV 1 Solenoid Valve |
| 6   | Strainer                  | 13  | Strainer                                                 | 21  | Pressure Sensor        | 29  | SV 2 Solenoid Valve |
| 7   | Oil Return Solenoid Valve | 14  | Electronic Expansion Valve                               | 22  | Crankcase Heater Band  | 30  | SV 2 Solenoid Valve |
| 8   | Oil Return Capillary Tube | 15  | Gas-liquid Separator                                     | 23  | Electrical Box         |     |                     |

## <Refrigerant Cycle>



| Mark | Part Name                  | Remark                       |
|------|----------------------------|------------------------------|
| 1    | Compressor                 |                              |
| 2    | Heat Exchanger             |                              |
| 3    | Gas-liquid Separator       |                              |
| 4    | Oil Separator              |                              |
| 5    | Strainer                   |                              |
| 6    | Strainer                   |                              |
| 7    | Strainer                   |                              |
| 8    | Flow Divider               |                              |
| 9    | Four-way Solenoid Valve    |                              |
| 10   | Capillary Tube             | For by-pass                  |
| 11   | Capillary Tube             | For oil return               |
| 12   | Electronic Expansion Valve |                              |
| 13   | One-way Valve              |                              |
| 14   | Solenoid Valve             | For by-pass                  |
| 15   | Solenoid Valve             | For oil return               |
| 16   | SV 1 Solenoid Valve        |                              |
| 17   | SV 2 Solenoid Valve        |                              |
| 18   | SV 3 Solenoid Valve        |                              |
| 19   | Check Joint                |                              |
| 20   | Liquid-side Stop Valve     |                              |
| 21   | Gas-side Stop Valve        |                              |
| 22   | Pressure Switch            | For high pressure protection |
| 23   | Pressure Sensor            | For high pressure protection |

| Mark | Part Name          | Remark                      |
|------|--------------------|-----------------------------|
| 24   | Pressure Sensor    | For low pressure protection |
| 25   | Exhaust Stop Valve |                             |

| Mark | O.D. × T        | Material |
|------|-----------------|----------|
| a    | Φ6.35 × 0.7 t   | C1220T-0 |
| b    | Φ6.35 × 1.07 t  |          |
| c    | Φ9.53 × 0.8 t   |          |
| d    | Φ12.7 × 1.0 t   |          |
| e    | Φ15.88 × 1.0 t  |          |
| f    | Φ15.88 × 1.2 t  |          |
| g    | Φ15.88 × 1.65 t |          |
| h    | Φ19.05 × 1.2 t  |          |
| l    | Φ9.53 × 1.2 t   |          |

## 2.2 Necessary Tools and Instrument List for Installation

| NO. | Tool                 | NO. | Tool               | NO. | Tool              | NO. | Tool                              |
|-----|----------------------|-----|--------------------|-----|-------------------|-----|-----------------------------------|
| 1   | Hand Saw             | 6   | Copper Pipe Bender | 11  | Spanner           | 16  | Leveller                          |
| 2   | Screw Driver         | 7   | Manual Water Pump  | 12  | Charging Cylinder | 17  | Clamper for Solder-less Terminals |
| 3   | Vacuum Pump          | 8   | Pipe Cutter        | 13  | Gauge Manifold    | 18  | Hoist (for indoor unit)           |
| 4   | Refrigerant Gas Hose | 9   | Brazing Kit        | 14  | Cutter for Wires  | 19  | Ampere Meter                      |
| 5   | Megohmmeter          | 10  | Hexagon Wrench     | 15  | GasLeak Detector  | 20  | Voltage Meter                     |

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

◇ : Interchangeability is available with current R22

● : Only for Refrigerant R410A (No Interchangeability with R22)

× : Prohibited

◆ : Only for Refrigerant R407C (No Interchangeability with R22)

| Measuring Instrument and Tool        |                                     | Interchangeability with R22 |       | Reason of Non-Interchangeability and Caution (★: Strictly Required)                                                                                                                       | Use                                                                         |
|--------------------------------------|-------------------------------------|-----------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
|                                      |                                     | R410 A                      | R407C |                                                                                                                                                                                           |                                                                             |
| Refrigerant Pipe                     | Pipe Cutter                         | ◇                           | ◇     | —                                                                                                                                                                                         | Cutting Pipe Removing Burrs                                                 |
|                                      | Chamfering Reamer                   | ◇                           | ◇     |                                                                                                                                                                                           |                                                                             |
|                                      | Flaring Tool                        | ◇ ●                         | ◇     | ★ The flaring tools for R407C are applicable to R22.                                                                                                                                      | Flaring for Tubes                                                           |
|                                      | Extrusion Adjustment Gauge          | ●                           | —     | ★ If using flaring tube, make dimension of tube larger for R410A.                                                                                                                         | Dimensional Control for Extruded Portion of Tube after Flaring              |
|                                      |                                     |                             |       | ★ In case of material 1/2H, flaring is not available.                                                                                                                                     |                                                                             |
|                                      | 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 ø12.7, ø15.88, spanner size is up 2mm.                                                                                                                                              | Connection of Flare Nut                                                     |
|                                      |                                     | ◇                           | ◇     | ★ For ø6.35, ø9 53, ø19 05, spanner size is the same.                                                                                                                                     | Connector cap connection                                                    |
|                                      | Brazing Tool                        | ◇                           | ◇     | ★ Perform correct brazing work.                                                                                                                                                           | Brazing for Tubes                                                           |
| Vacuum Drying and Refrigerant Charge | Nitrogen Gas                        | ◇                           | ◇     | ★ Strict Control against Contaminants (Blow nitrogen during brazing.)                                                                                                                     | Prevention from Oxidation during Brazing                                    |
|                                      | Lubrication Oil (for Flare Surface) | ●                           | ◆     | ★ Use synthetic oil which is equivalent to the oil used in the refrigeration cycle.                                                                                                       | Applying Oil to the Flared Surface                                          |
|                                      |                                     |                             |       | ★ Synthetic oil absorbs moisture quickly.                                                                                                                                                 |                                                                             |
|                                      | Refrigerant Cylinder                | ●                           | ◆     | ★ Check refrigerant cylinder color.                                                                                                                                                       | Refrigerant Charging                                                        |
|                                      |                                     |                             |       | ★ Liquid refrigerant charging is required regarding zeotropic refrigerant.                                                                                                                |                                                                             |
|                                      | 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.                                                                                                      | 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. Transport and Handling

#### 3.1 Arrangement of Indoor Units and Outdoor Units

- The indoor units below can be used together with the multi-functional set-free FXPNG outdoor units.

Table 3.1 Type List of Indoor Units

| Indoor Units                          | Rated Capacity kBTU/h |    |    |    |    |    |      |    |
|---------------------------------------|-----------------------|----|----|----|----|----|------|----|
|                                       | 09                    | 14 | 18 | 24 | 27 | 34 | 43 ※ | 54 |
| Ceiling in-built air-duct type        | ○                     | ○  | ○  | ○  | ○  | ○  | ○    |    |
| Ceiling in-built air-duct type (thin) | ○                     | ○  | ○  | ○  |    |    |      |    |
| Four-way air-out embedded type        | ○                     | ○  | ○  | ○  | ○  | ○  | ○    |    |
| Two-way air-out embedded type         | ○                     | ○  | ○  | ○  | ○  | ○  | ○    |    |
| Wall-mounted type                     | ○                     | ○  | ○  | ○  |    |    |      |    |
| Floor type                            | ○                     | ○  |    |    |    |    |      |    |
| Floor hidden type                     | ○                     | ○  | ○  | ○  |    |    |      |    |
| Ceiling suspended type                |                       |    | ○  | ○  | ○  | ○  | ○    |    |
| Water module                          |                       |    |    |    |    |    |      | ○  |

○: Permitted.

※: AFW-38U4SC can not be used with the 5.0 indoor unit.

- Total capacity of the indoor units (not including water module) connected with the outdoor units should be 50% ~ 130% of the rated capacity of the outdoor units.

Table 3.2 System Configuration

| Model of Outdoor Unit<br>kBTU/h | Rated Capacity kBTU/h                       |                                             |                   |                                           |
|---------------------------------|---------------------------------------------|---------------------------------------------|-------------------|-------------------------------------------|
|                                 | Min. Capacity of<br>Configuration<br>kBTU/h | Max. Capacity<br>of Configuration<br>kBTU/h | Number<br>of Sets | Min. Stand-alone<br>Operating<br>Capacity |
| 38                              | 18                                          | 49.4                                        | 2~6               | 07                                        |
| 48                              | 24                                          | 62.4                                        | 2~8               | 07                                        |
| 54                              | 27                                          | 70.2                                        | 2~9               | 07                                        |

#### 3.2 Transportation

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

### CAUTION

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

#### ● Lifting Method

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

- (1) Never remove the outer packing. Do not remove any packing materials.
- (2) Lift the unit under packing condition with two (2) ropes, as shown in Fig. 3.1.

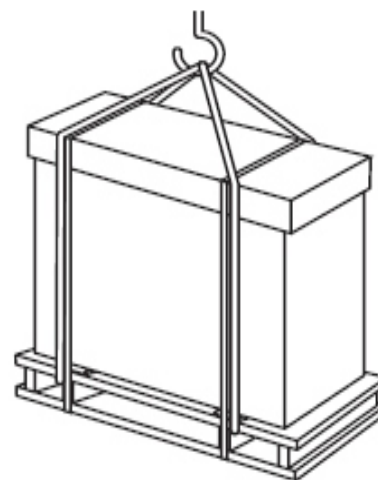


Figure 3.1 Lifting

### CAUTION

The pallet or cloth should be used for protection when the outdoor units are lifted without packing.

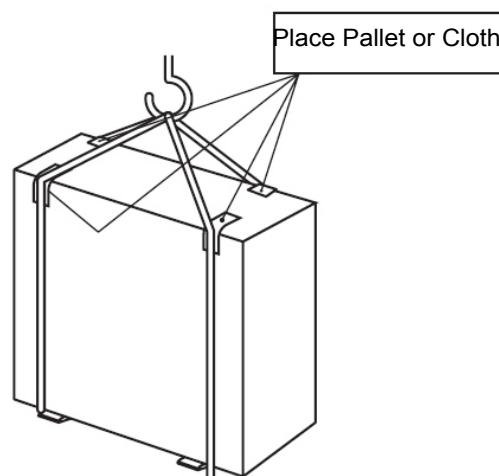


Figure 3.2 Lifting with no Wood Base

### 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.

## 4. Installation of Outdoor Unit

### 4.1 Factory-Supplied Accessories

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

Table 4.1 Accompanying Accessories

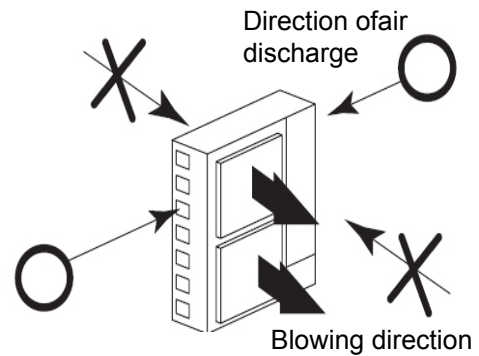
| Accessory | Quantity | Remark               |
|-----------|----------|----------------------|
| Washer    | 4        | Used for anchor bolt |

#### NOTE

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

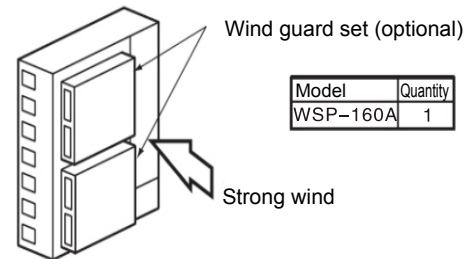
### 4.2 Initial Check

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

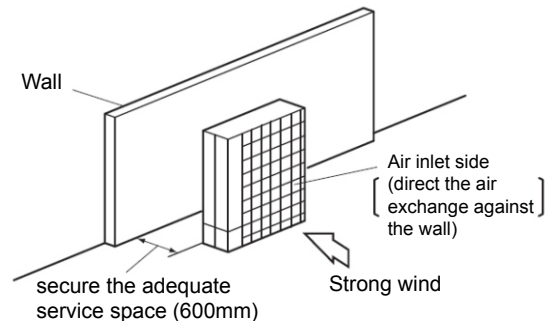


- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, adopt the wind guard set or install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.

#### (1) Use wind guard



#### (2) Installation near wall



#### NOTE:

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

### CAUTION

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

#### NOTE

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

### 4.3 Service Space

Install the outdoor unit with a sufficient space around the outdoor unit for operation and maintenance as shown in Figure 4.1.

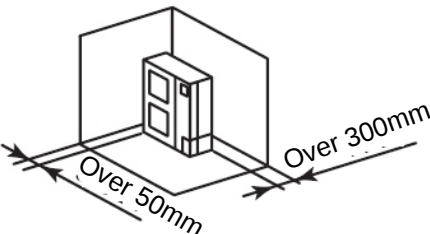
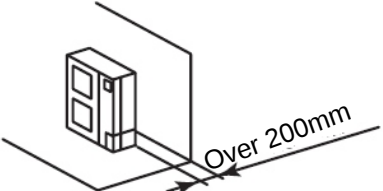
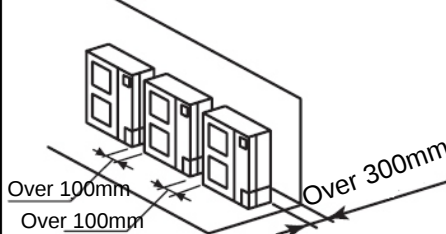
| Single Installation                                                                                                                                                                        | Single Installation                                                                                                                                | Multiple Installation                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Upper side is open</p>  <p>Over 50mm<br/>Over 300mm<br/>Keep a distance of over 100mm on the right</p> | <p>Above of two sides of the unit is open</p>  <p>Over 200mm</p> | <p>Multiple Installation</p>  <p>Over 100mm<br/>Over 100mm<br/>Over 300mm<br/>Keep a distance of over 100mm on the right</p> |

Figure 4.1 Installation Space

### 4.4 Installation Work

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

(3) Example: fasten the outdoor unit with the anchor bolt

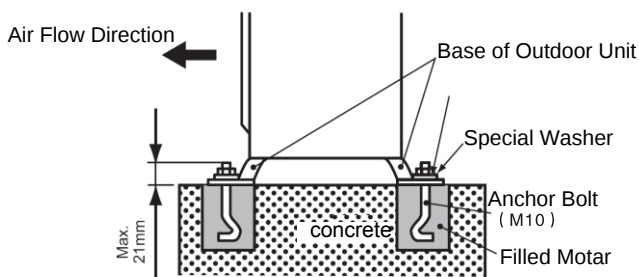
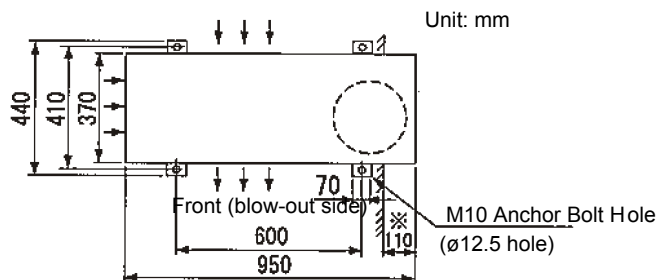


Figure 4.2 Installation of Anchor Bolts

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

(2) When installing the outdoor unit, fix the unit by anchor bolts. Refer to Figure 4.3 regarding the location of fixing holes.



**NOTE:**

If the dimension bearing "\*" can be guaranteed, it may be much easier to install the pipes from the bottom, as the foundation presents no difficulty.

Figure 4.3 Position of Anchor Bolts

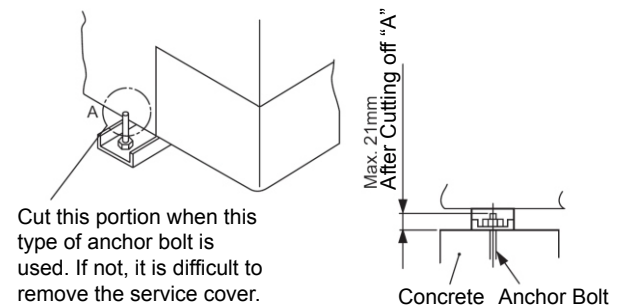


Figure 4.4 Fixing Example

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

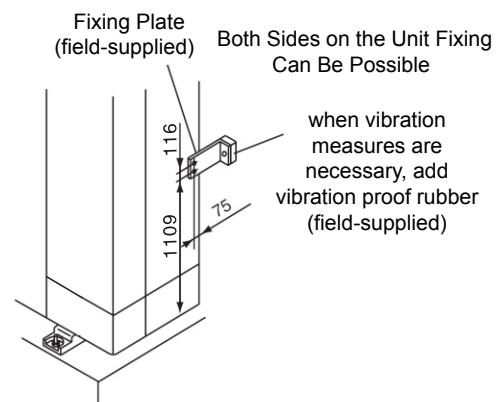
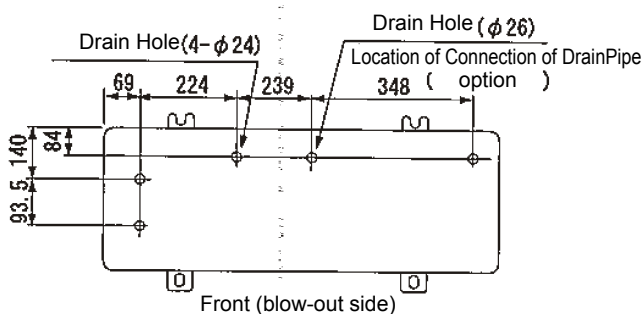


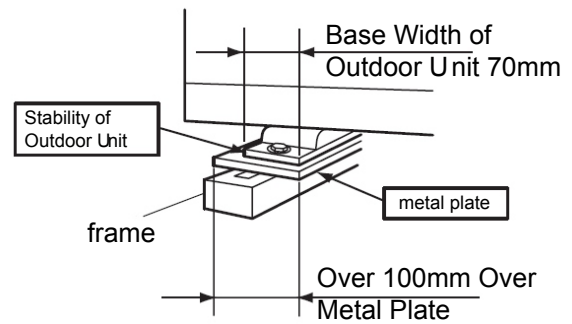
Figure 4.5 Additional Fixing Arrangement

- (5) When installing the unit on a roof or a veranda, drain water sometimes turns to ice in a cold morning. Therefore, avoid draining in an area where people often use because it is slippery.
- (6) In case of the drain piping is necessary for the outdoor unit, use the drain-kit (DBS-26 or DBS-26L:Optional Parts)



- (7) The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned the same way. When installing the outdoor unit on a field-supplied frame, use metal plates to adjust the frame width for stable installation as shown in Fig. 4.6.

## Correct Installation



## Recommended Metal Plate Size (field-supplied)

Material: hot rolled steel sheet (SPHC)  
Plate thickness: 4.5T

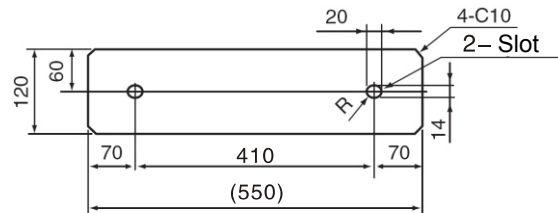
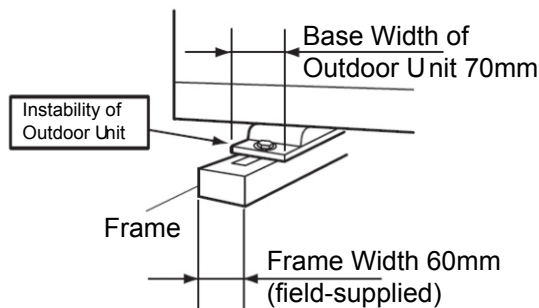


Figure 4.6 Frame and Base Installation

## Wrong Installation



## 5. Refrigerant Piping Work

### **⚠ DANGER**

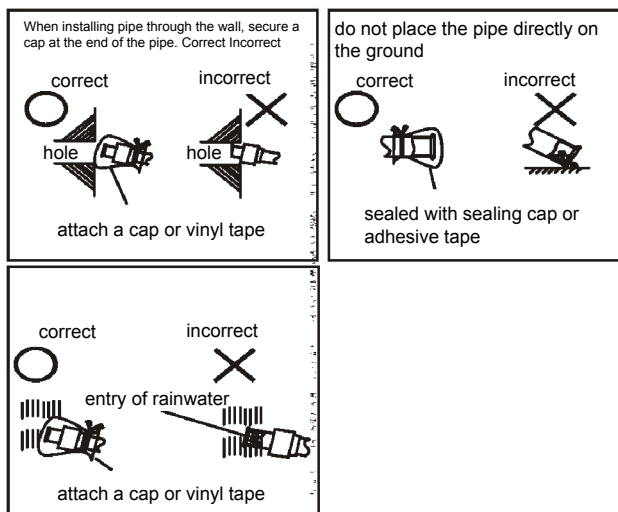
Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed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

### 5.1 Piping Materials

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

### **NOTE**

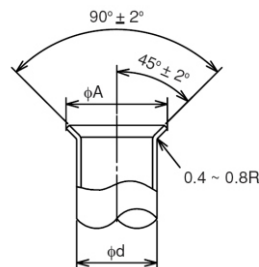
- CautionCautions for refrigerant pipe ends.



### **⚠ CAUTION**

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

Use the flare nut as below:



| Diameter<br>Φd | ( mm )<br>A <sup>+0</sup> <sub>-0.4</sub><br>R410A |
|----------------|----------------------------------------------------|
|                |                                                    |
| 6.35           | 9.1                                                |
| 9.53           | 13.2                                               |
| 12.7           | 16.6                                               |
| 15.88          | 19.7                                               |

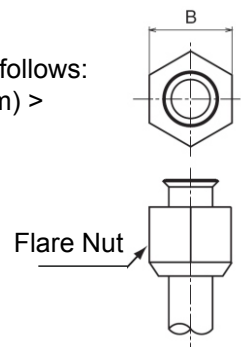
- Wall thickness and material of the tubes are shown in the table below:

| Diameter | R410A          |          |
|----------|----------------|----------|
|          | Wall Thickness | Material |
| φ 6.35   | 0.8            | 0        |
| φ 9.53   | 0.8            | 0        |
| φ 12.7   | 0.8            | 0        |
| φ 15.88  | 1.0            | 0        |

- Connector cap size

Use the connector taps as follows:  
<Connector cap size B (mm) >

| Diameter | R410A |
|----------|-------|
| φ 6.35   | 17    |
| φ 9.53   | 22    |
| φ 12.7   | 26    |
| φ 15.88  | 29    |



## 5.2 Refrigerant Piping Work

(1) Ensure that the directions for refrigerant piping work according to the tables.

Table 5.1 Specification of Pipes  
for Outdoor Unit

Unit: mm

| Diameter<br>Model kBTU/h | Outside Diameter (mm) |             |                             |                    |
|--------------------------|-----------------------|-------------|-----------------------------|--------------------|
|                          | Gas pipe              | Liquid pipe | 1st manifold of liquid pipe | Other manifolds    |
| 38~54                    | φ 15.88               | φ 9.53      | E-102TSNQ                   | E-52SN<br>E-108HSN |

※: See the accompanying accessory box of the water module for the first manifold of the liquid pipe.

Table 5.2 Specification of Pipes  
for Indoor Unit

Unit: mm (in.)

| Model of Indoor Unit kBTU/h | gas pipe         | liquid pipe     |
|-----------------------------|------------------|-----------------|
| 09~14                       | φ 12.7<br>(1/2)  | φ 6.35<br>(1/4) |
| 18~22                       | φ 15.88<br>(5/8) | φ 6.35<br>(1/4) |
| 24~30                       | φ 15.88<br>(5/8) | φ 9.53<br>(3/8) |
| 34~43                       | φ 15.88<br>(5/8) | φ 9.53<br>(3/8) |

Table 5.3 Specification of Pipes  
for Water Module

Unit: mm (in.)

| Model of Indoor Unit kBTU/h | Gas Pipe        | Liquid Pipe     |
|-----------------------------|-----------------|-----------------|
| 54                          | φ 12.7<br>(1/2) | φ 9.53<br>(3/8) |

(2) Add more refrigerant R410A

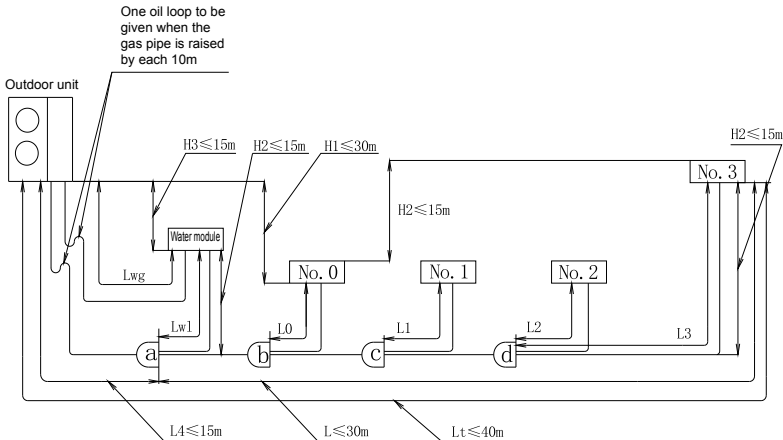
Although the unit has been filled with the refrigerant, more refrigerant should be added according to the diameter and length of the pipes connected.

Table 5.4 Refrigerant Quantity of  
Outdoor Unit Delivered W<sub>0</sub> (kg)

| Outdoor Unit kBTU/h | W <sub>0</sub> ( kg ) |
|---------------------|-----------------------|
| 38~54               | 3.6                   |

- Calculate the additional filling quantity of the refrigerant according to the length of the liquid pipe and the model of the outdoor unit, and add it to the circuit of the unit.  
 W<sub>11</sub> (kg): (total length φ 9.54 liquid pipe, m) x 0.05  
 W<sub>12</sub> (kg): (total length φ 6.35 liquid pipe, m) x 0.02  
 W<sub>13</sub> (kg): filling quantity of water module (see Table 2 of 5.8)  
 W = W<sub>11</sub> + W<sub>12</sub> + W<sub>13</sub>.
- After filling, report the additional filling quantity to the local maintenance center.

Table 5.5 Pipeline System and Additional Filling Quantity of Refrigerant

| System                                                                                                                                                                                                                                                                                                              |                                                                     | Branch System                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|----|----|----|---------------|--------|--------|--------|--------|--------|--------|--------|----|---|---|---|---|---|
| <p>System example:<br/>Take the connection of one outdoor unit, four indoor units and one water module as an example<br/>The pipes are supplied on the site.</p>                                                                                                                                                    |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                           |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Max. tubing length                                                                                                                                                                                                                                                                                                  | Max. economical tube length Lt                                      | Lt ≤ 40m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                     | Total tubing length:<br>Lt0 = Lt + Lwl + Lwg + L0 + L1 + L2 + L3    | Lto ≤ 120m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Max. height difference between outdoor unit and indoor unit                                                                                                                                                                                                                                                         | When the outdoor unit is higher than the indoor unit (water module) | H1 ≤ 30m, H3 ≤ 15m                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                     | When the indoor unit (water module) is higher than the outdoor unit | H1 ≤ 30m, H3 ≤ 15m                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Max. height difference between indoor units (including water module) or between indoor unit and manifold                                                                                                                                                                                                            |                                                                     | H2 ≤ 15m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Max. tubing length between manifold and indoor unit                                                                                                                                                                                                                                                                 | Between “a” manifold and furthest indoor unit                       | L ≤ 30m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
|                                                                                                                                                                                                                                                                                                                     | Between manifolds and indoor unit they are connected to             | Lwl, L0, L1, L2, L3 ≤ 15m                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Choose manifold                                                                                                                                                                                                                                                                                                     | AFW-38~54U4SC                                                       | Use E-102 TSNQ at “a” and E-52 SN at “b, c, d, e”                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| <p>Calculate the additional filling quantity of the refrigerant according to the formula below:</p> <p>W = W11 + W12 + W13 (kg)<br/>Wherein:<br/>W11 (kg): (total length Φ 9.54 liquid pipe, m) x 0.05<br/>W12 (kg): (total length Φ 6.35 liquid pipe, m) x 0.02<br/>W13 (kg): filling quantity of water module</p> | Liquid pipe                                                         | <p>&lt;Example&gt; (AFW-54U4SC )</p> <table border="1"><thead><tr><th>Sign</th><th>Lt-L3</th><th>Lwl</th><th>L0</th><th>L1</th><th>L2</th><th>L3</th></tr></thead><tbody><tr><td>Specification</td><td>φ 9.53</td><td>φ 9.53</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td></tr><tr><td>Length</td><td>21</td><td>5</td><td>3</td><td>5</td><td>3</td><td>5</td></tr></tbody></table> <p>W11 = 26 × 0.05 = 1.3kg<br/>W12 = (3+5+3+5) × 0.02 = 0.32kg<br/>W13 = 1.48kg</p> | Sign   | Lt-L3  | Lwl    | L0     | L1 | L2 | L3 | Specification | φ 9.53 | φ 9.53 | φ 6.35 | φ 6.35 | φ 6.35 | φ 6.35 | Length | 21 | 5 | 3 | 5 | 3 | 5 |
|                                                                                                                                                                                                                                                                                                                     | Sign                                                                | Lt-L3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Lwl    | L0     | L1     | L2     | L3 |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Specification                                                                                                                                                                                                                                                                                                       | φ 9.53                                                              | φ 9.53                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | φ 6.35 | φ 6.35 | φ 6.35 | φ 6.35 |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Length                                                                                                                                                                                                                                                                                                              | 21                                                                  | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3      | 5      | 3      | 5      |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Total                                                                                                                                                                                                                                                                                                               | W = W11+W12+W13(kg) = 3.1kg                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |        |        |        |        |    |    |    |               |        |        |        |        |        |        |        |    |   |   |   |   |   |

| Header Pipe Branch System                                                                                                                                                                                                                                                                                                       | Branch Header Pipe Branch System                                    |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------|--------|--------|--------|--------|----|--------------------|--------|--------|--------|--------|--------|--------|--------|----|---|---|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|-----|----|----|----|----|--------------------|--------|--------|--------|--------|--------|--------|--------|----|---|---|---|---|---|
|                                                                                                                                                                                                                                                                                                                                 |                                                                     |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Lt ≤ 40m                                                                                                                                                                                                                                                                                                                        | Lt ≤ 40m                                                            |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Lto=Lt+Lwg+Lwl+L0+L1+L2+L3 ≤ 120m                                                                                                                                                                                                                                                                                               | Lto=Lt+Lwg+Lwl+L0+L1+L2+L3 ≤ 120m                                   |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| H1 ≤ 30m, H3 ≤ 15m                                                                                                                                                                                                                                                                                                              | H1 ≤ 30m, H3 ≤ 15m                                                  |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| H1 ≤ 30m, H3 ≤ 15m                                                                                                                                                                                                                                                                                                              | H1 ≤ 30m, H3 ≤ 15m                                                  |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| H2 ≤ 15m                                                                                                                                                                                                                                                                                                                        | H2 ≤ 15m                                                            |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| L ≤ 30m                                                                                                                                                                                                                                                                                                                         | L ≤ 30m                                                             |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Lwl, L0, L1, L2, L3 ≤ 15m                                                                                                                                                                                                                                                                                                       | Lwl, L0, L1, L2, L3 ≤ 15m                                           |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Use E-102 TSNQ at “a” and E-108 HSN at “b”                                                                                                                                                                                                                                                                                      | Use E-102 TSNQ at “a”, E-52 SN at “b, c” and E-108 HSN at “d”       |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| <Example> ( AFW-54U4SC )                                                                                                                                                                                                                                                                                                        | <Example> ( AFW-54U4SC )                                            |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| <table><tr><td>Sign</td><td>Lt-L3</td><td>Lwl</td><td>L0</td><td>L1</td><td>L2</td><td>L3</td></tr><tr><td>Specifi-<br/>cation</td><td>φ 9.53</td><td>φ 9.53</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td></tr><tr><td>Length</td><td>21</td><td>5</td><td>3</td><td>5</td><td>3</td><td>5</td></tr></table> | Sign                                                                | Lt-L3  | Lwl    | L0     | L1     | L2     | L3 | Specifi-<br>cation | φ 9.53 | φ 9.53 | φ 6.35 | φ 6.35 | φ 6.35 | φ 6.35 | Length | 21 | 5 | 3 | 5 | 3 | 5 | <table><tr><td>Sign</td><td>Lt-L3</td><td>Lwl</td><td>L0</td><td>L1</td><td>L2</td><td>L3</td></tr><tr><td>Specifi-<br/>cation</td><td>φ 9.53</td><td>φ 9.53</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td><td>φ 6.35</td></tr><tr><td>Length</td><td>21</td><td>5</td><td>3</td><td>5</td><td>3</td><td>5</td></tr></table> | Sign | Lt-L3 | Lwl | L0 | L1 | L2 | L3 | Specifi-<br>cation | φ 9.53 | φ 9.53 | φ 6.35 | φ 6.35 | φ 6.35 | φ 6.35 | Length | 21 | 5 | 3 | 5 | 3 | 5 |
| Sign                                                                                                                                                                                                                                                                                                                            | Lt-L3                                                               | Lwl    | L0     | L1     | L2     | L3     |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Specifi-<br>cation                                                                                                                                                                                                                                                                                                              | φ 9.53                                                              | φ 9.53 | φ 6.35 | φ 6.35 | φ 6.35 | φ 6.35 |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Length                                                                                                                                                                                                                                                                                                                          | 21                                                                  | 5      | 3      | 5      | 3      | 5      |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Sign                                                                                                                                                                                                                                                                                                                            | Lt-L3                                                               | Lwl    | L0     | L1     | L2     | L3     |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Specifi-<br>cation                                                                                                                                                                                                                                                                                                              | φ 9.53                                                              | φ 9.53 | φ 6.35 | φ 6.35 | φ 6.35 | φ 6.35 |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| Length                                                                                                                                                                                                                                                                                                                          | 21                                                                  | 5      | 3      | 5      | 3      | 5      |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| W11 =26 × 0.05=1.3kg<br>W12 =(3+5+3+5) × 0.02=0.32kg<br>W13 =1.48kg                                                                                                                                                                                                                                                             | W11 =26 × 0.05=1.3kg<br>W12 =(3+5+3+5) × 0.02=0.32kg<br>W13 =1.48kg |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |
| W =W11+W12+W13(kg) =3.1kg                                                                                                                                                                                                                                                                                                       | W =W11+W12+W13(kg) =3.1kg                                           |        |        |        |        |        |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |                                                                                                                                                                                                                                                                                                                                 |      |       |     |    |    |    |    |                    |        |        |        |        |        |        |        |    |   |   |   |   |   |

### 5.3 Manifold

Table 5.6 Y Manifold

| Manifold                      | E-102TSNQ |
|-------------------------------|-----------|
| First Manifold of Liquid pipe |           |
| Manifold                      | E-52SN    |
| Gas Pipe                      |           |
| Liquid Pipe                   |           |
| Manifold                      | E-108HSN  |
| Gas Pipe                      |           |
| Liquid Pipe                   |           |

Unit: mm, ID: inside diameter, OD: outside diameter

## 5.4 Piping Connection

The pipes can be connected from 4 directions.

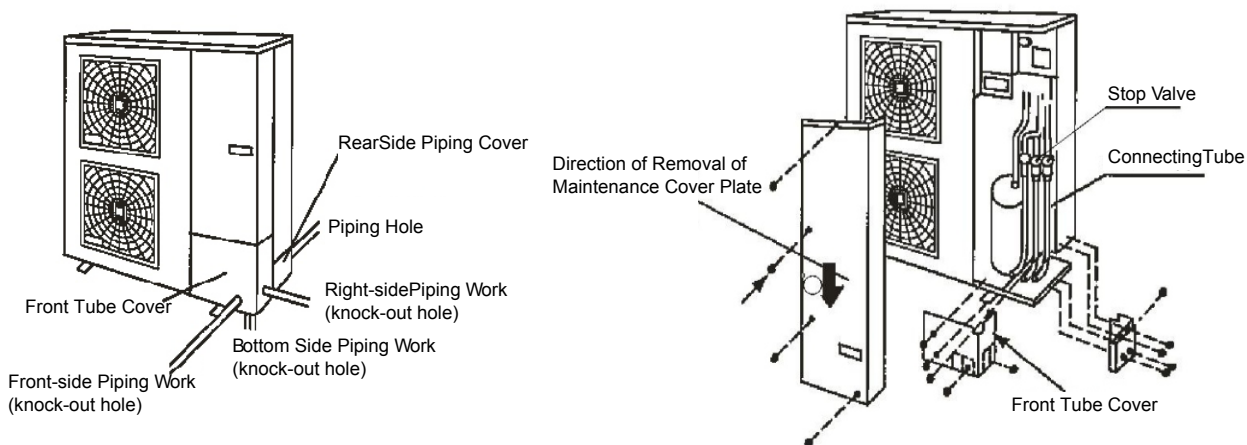


Figure 5.1 Piping Direction

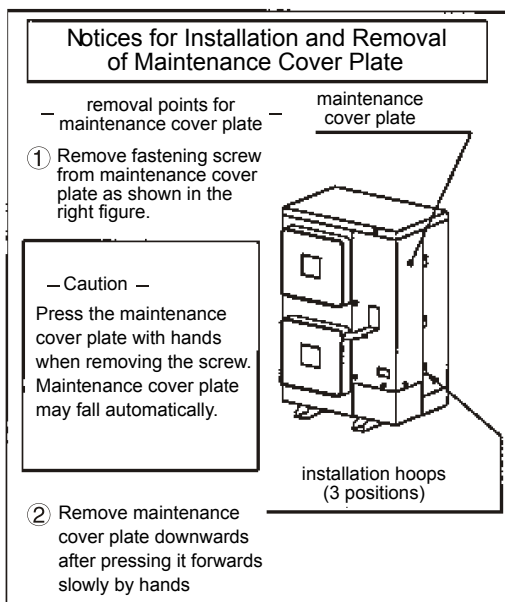


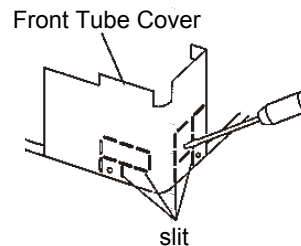
Figure 5.2 Installation & Removal of Maintenance Cover

Table 5.7 Tightening Torque of Connector Cap

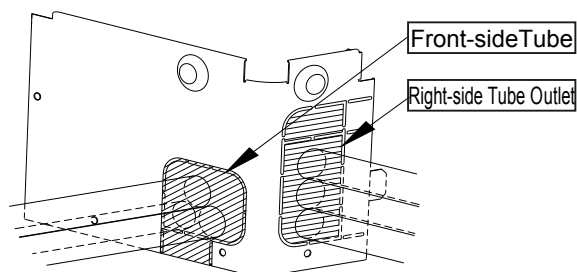
| Tubing Diameter | Tightening Torque  |
|-----------------|--------------------|
| Φ 6.35(1/4)     | 20N · m (2kgf · m) |
| Φ 9.53(3/8)     | 40N · m (4kgf · m) |
| Φ 12.7(1/2)     | 60N · m (6kgf · m) |
| Φ 15.88(5/8)    | 80N · m (8kgf · m) |

(4) Pipes can be connected from 4 directions as shown Fig. 5.1.

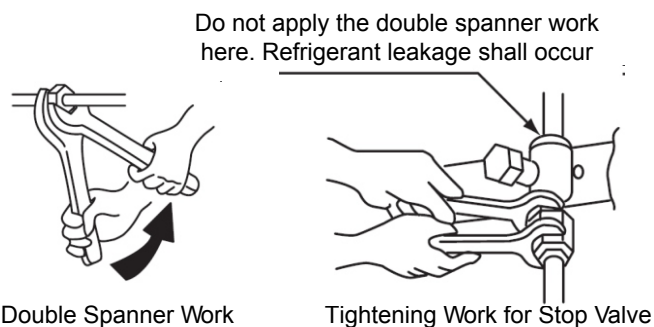
Make a knock-out hole in the front pipe cover or bottom base to pass through the hole. After removing the pipe cover from the unit, punch out the holes following the guide line with screwdriver and a hammer. Then, cut the edge of the holes and attach insulation (Field-Supplied) for cables and pipes protection.



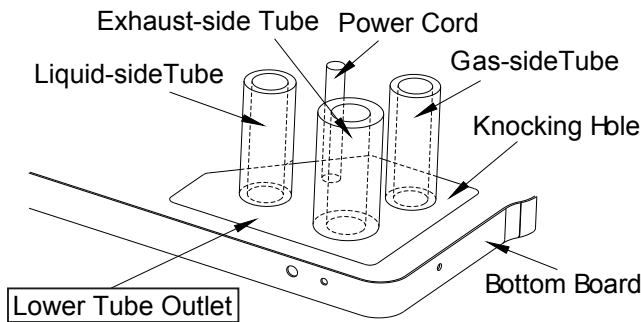
(a) Tube connection in the front and on the right



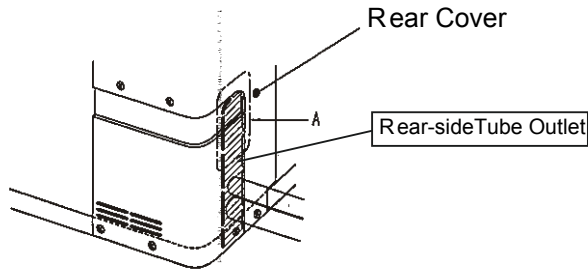
- (1) Confirm that the valve is closed.
- (2) All kinds of elbows and tubes are supplied on the site and connected by braze welding as per the operating requirements.
- (3) For the pipe connection at the stop valve, two wrenches should be used to tighten the connector cap.



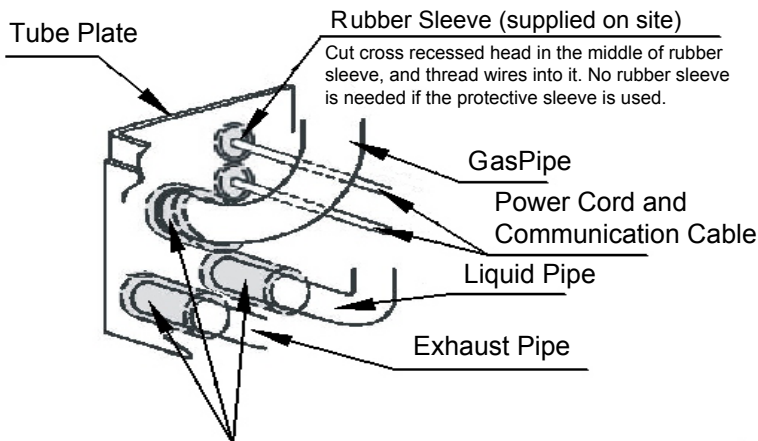
(b) Tube connection on the bottom



(c) Tube connection in the rear



(5) To avoid entry of water into the unit and damages to the electrical parts, when the tube cover is installed, the rubber bush should be given (supplied on the site) to realize full sealing (see the figure below for the tube connection in the front).



As shown in the figure, all pipes should be given independent thermal insulation, and no gap is allowed between the pipe and the hole. If installation can not be easily done, cut off the insulating pipe.

**NOTE**

When the insulation layer for the tube is thicker, both gas pipe and liquid pipe can be given thermal insulation, but the outlet should be properly sealed.

**5.5 Air Tight Test**

- (1) The stop valve has been closed before shipment, however, make sure that the stop valves are closed completely.
- (2) Connect the indoor unit and the outdoor unit with field-supplied refrigerant piping. Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching the weak part of the building such as wall, ceiling, etc.  
(If touched, abnormal sound may occur due to the vibration of the piping. Pay special Caution in case of short piping length.)

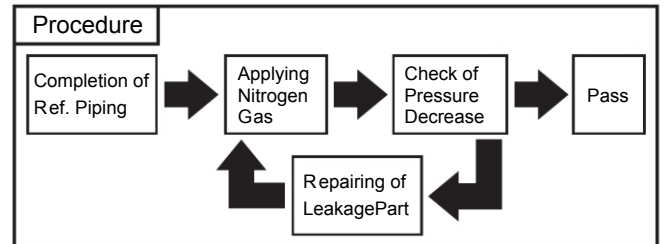
(3) Apply the oil thinly at the seat surface of the flare nut and pipe before tightening.

And when tightening the flare nut, use two spanners.

Caution Lubrication oil is filed-supplied.

Mode: FVC68D (ester based oil)

Manufacturer: IDEMITSU KOSAN Co., Ltd.



(4) Stop valve

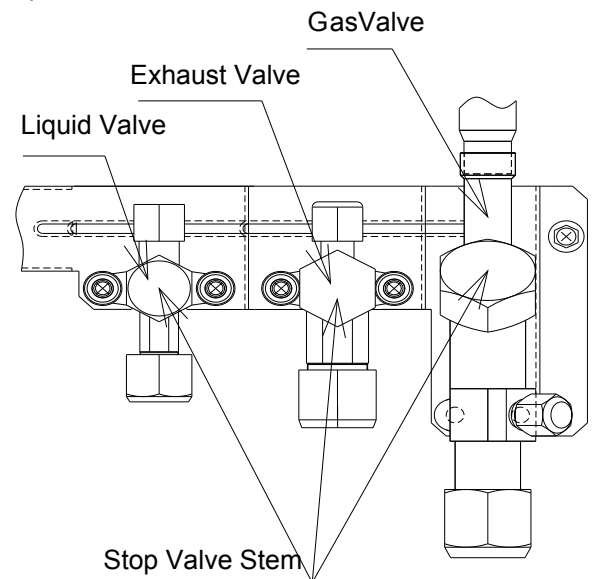
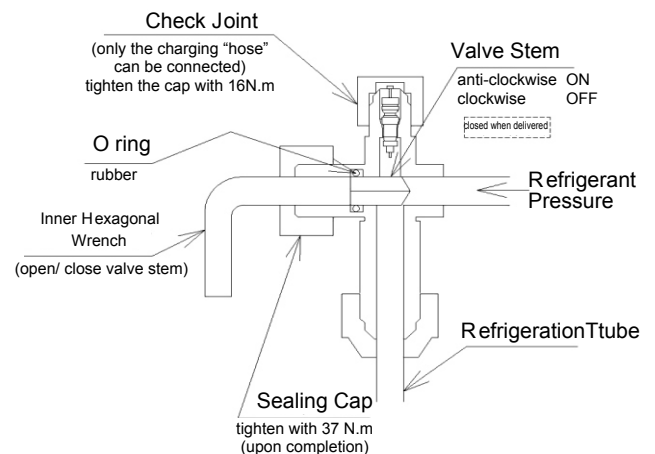


Figure 5.3 Location Chart of Stop Valve

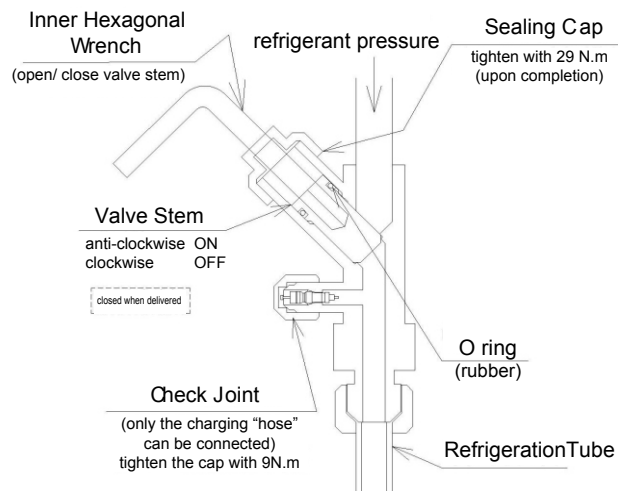
Operation of the stop valve should be performed according to the below.

<Liquid valve> <exhaust valve>



| Stop Valve Stem Tightening Moment |              |               |
|-----------------------------------|--------------|---------------|
| Gas Valve                         | Liquid Valve | Exhaust Valve |
| 11~14                             | 7~9          | 7~9           |

#### <Gas valve>



Hexagonal wrench size (mm)

| Gas Valve | Liquid Valve | Exhaust Valve |
|-----------|--------------|---------------|
| 8         | 4            | 5             |

## ⚠ DANGER

- When the valve approaches full opening, the proper force should be applied (below 5N.m). This is because the stop valve is not given the back seat structure.
- The non-return ring should not be released, or else the danger may happen, in that the valve stem may bounce out.

- Connect the gauge mani-fold using charging hoses with a nitrogen cylinder to the check joints of the liquid line and the gas line stop valves. Perform the air-tight test. Do not open the stop valves. Apply nitrogen gas pressure of 4.15MPa.
- Check for any gas leakage at the flare nut connections, or brazed parts by gas leak detector or foaming agent.
- After the air tight test, release nitrogen gas.

## ⚠ CAUTION

- After the tube is connected to the connector cap, and before the air-tightness test is carried out, open the sealing cap of the stop valve stem, and confirm that the valve has been closed (in clockwise direction).

- The connector cap should be tightened with the moment above, and the excessive moment may cause refrigerant leak at the stop valve stem.

| Tube Diameter | Tightening Moment |
|---------------|-------------------|
| 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    |

- Conduct the air-tightness test after the valve stem is properly closed.

#### NOTE:

The check joint is used for connecting the filling hose but the connector cap. It is normal that the slight leak sound comes out when the seal cap of the check joint and of the valve stem is opened, which has no effect upon the unit's function.

### 5.6 Vacuum Pumping and Refrigerant Filling

- Connect the adjusting valve at the check joint.

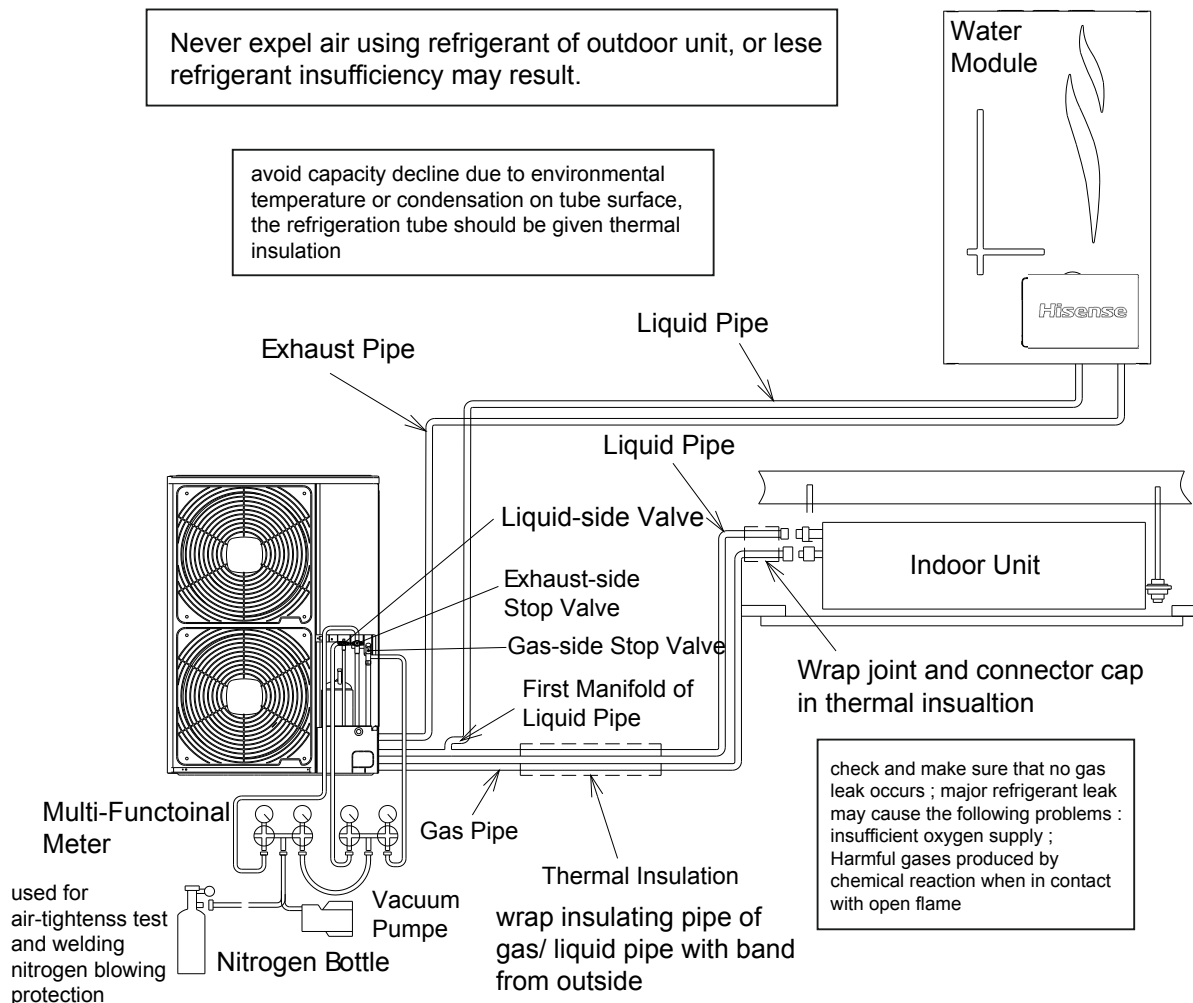
Perform vacuumizing 1 to 2 hours, until the vacuum degree reaches over 756mmHg.

After that, close the adjusting valve, stop vacuumizing, and wait for one hour. Make sure that the pressure of the adjusting valve does not rise.

#### NOTE:

- Use the dedicated tools and instruments for new refrigerant (R410A) when in direct contact with the refrigerant.
- If the vacuum degree can not reach 756mmHg, this indicates that leak may exist. Carry out the gas leak check once more. If no leak is detected, perform vacuumizing 1 to 2 hours once again.

- Use the filling tube to connect the adjusting valve and filling tank to the check joint of the liquid valve.
- Gently open the liquid valve after the gas valve and exhaust valve are fully opened.
- Open the adjusting valve to fill the refrigerant (make sure that the refrigerant is filled in liquid state).
- Start the cooling operation, and fill the specified amount of refrigerant.
- Use the weight meter to ascertain the filling quantity of refrigerant. Either excessive or insufficient refrigerant may cause serious damages to the unit.
- After the refrigeration is filled, open the liquid valve fully.



## ⚠ CAUTION

- At the test run, fully open the spindle. If nottotally opened, the devices will be damaged.
- An excess or a shortage of refrigerant is the main cause of trouble to the units. Charge the correct refrigerant quantity according to the description of label at the inside of service cover.
- Check for refrigerant leakage in detail. 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.
  1. Maximum Permissible Concentration of HFC GAS  
R410A ,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 HCFC gas, R410A in air is  $0.3\text{kg/m}^3$ , 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  $0.3\text{kg/m}^3$ , in case of leakage.
  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 volume V ( $\text{m}^3$ ) of each objective room.
    - (3) Calculate the refrigerant concentration C ( $\text{kg/m}^3$ ) of the room according to the following equation.

$$\frac{\text{R: total quantity of refrigerant (kg)}}{\text{V: room volume (m}^3\text{)}} = \text{C: refrigerant concentration} \leq 0.3 (\text{kg/ m}^3)$$

If there is any special local regulation, this should prevail.

## 5.7 Caution of the Pressure by Check Joint

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

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

|                                               | Cooling operation                                | Heating Operation |
|-----------------------------------------------|--------------------------------------------------|-------------------|
| Check joint "A" of gas stop valve             | Low pressure                                     | High pressure     |
| Check joint "B" of piping                     | High pressure                                    | Low pressure      |
| Check joint "C" of liquid stop valve          | exclusive for vacuum pump and refrigerant charge |                   |
| Check joint "D" of stop valve on exhaust side | High pressure                                    | High pressure     |

### NOTE:

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

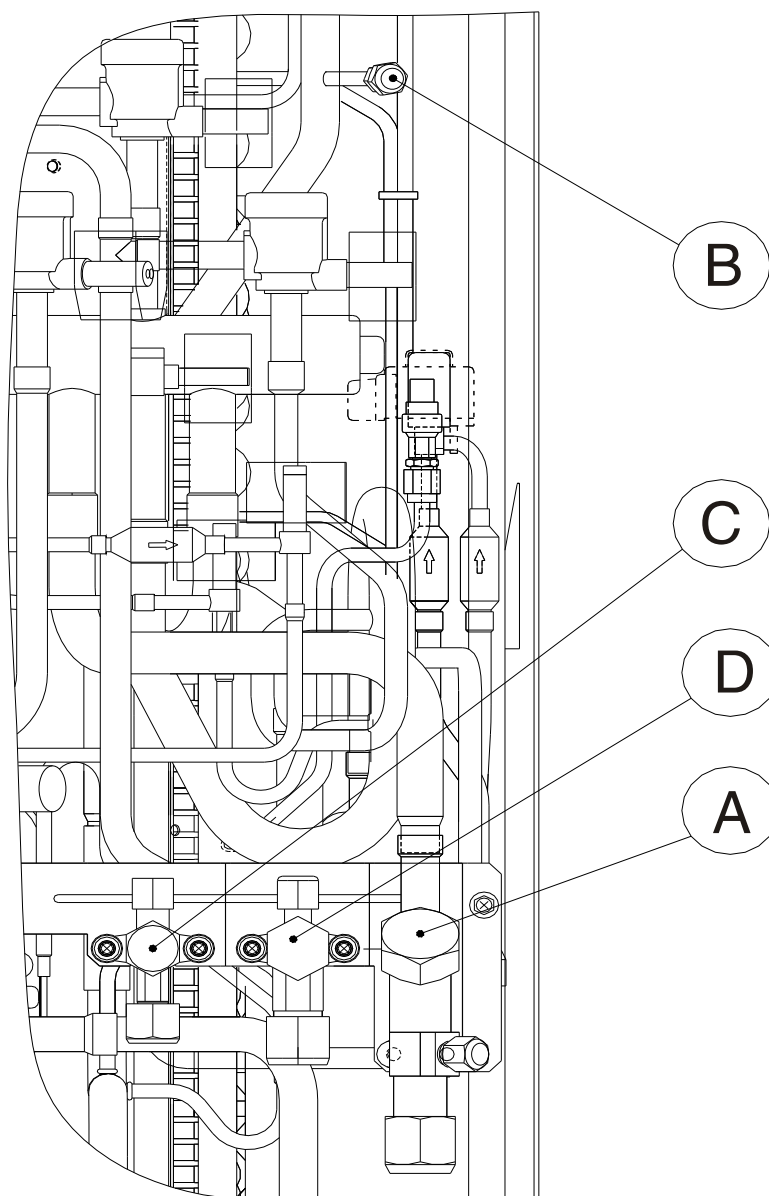


Figure 5.4 Location Chart of Check joint

## 5.8 Additional Refrigerant Charge

It is necessary additional refrigerant charge as follows:

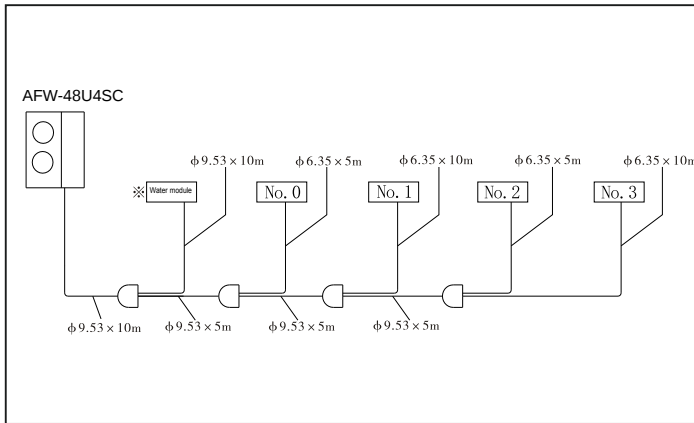
### Additional Refrigerant R410A Charge Calculation

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

A. Determine an additional refrigerant quantity according to the following procedure, and charge it into the system.

B. Record the additional refrigerant quantity to facilitate service activities thereafter.

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



※ The liquid pipe of the water module must be connected to the first manifold of the liquid pipe, and the gas pipe of the water module to the exhaust stop valve of the outdoor unit.

Take AFW-48U4SC as an example, fill in the form below:

| Tube Diameter (mm)    | Total Tube Length (m) | Additional Filling Quantity (kg) |
|-----------------------|-----------------------|----------------------------------|
| W11 = $\Phi 9.53$ ... | (10+5+5+5+10)         | $\times 0.05 = 1.75$             |
| W12 = $\Phi 6.35$ ... | (10+5+10+5)           | $\times 0.02 = 0.60$             |
| W13 =                 |                       | 1.48                             |

Total tube length: 70m Additional filling quantity  $W = W11 + W12 + W13 = 3.83$  ( kg )

| Tube Diameter (mm)    | Total Tube Length (m) | Additional Filling Quantity (kg)     |
|-----------------------|-----------------------|--------------------------------------|
| W11 = $\Phi 9.53$ ... | <input type="text"/>  | $\times 0.05 =$ <input type="text"/> |
| W12 = $\Phi 6.35$ ... | <input type="text"/>  | $\times 0.02 =$ <input type="text"/> |
| W13 =                 |                       | <input type="text"/>                 |

Total tube length:  m Additional filling quantity:  $W =$   +  +  =  ( kg )

#### 2. Filling Operation

Add the refrigerant R410A into the system as per the requirements below:

- (1) To fill the refrigerant, use the filling hose to connect the multi-functional meter and refrigerant filling tank to the check joint of the stop valve on liquid side.
- (2) Open the exhaust valve and gas valve fully, and open the stop valve on the liquid side gently. Open the multi-functional meter valve to fill the refrigerant.
- (3) Start the cooling operation, add the specified amount of refrigerant, and use the electronic scale or other weight meter to guarantee right filling quantity. Excessive or insufficient refrigerant is one of the main reasons for failure of the unit. After the refrigerant is filled, open the liquid valve fully.

#### 3. Records of Filling Quantity

With a view to easy service and maintenance, the additional filling quantity should be recorded.

Calculate the total quantity of refrigerant for the system as per the formula below:

$$\text{Total refrigerant weight} = W + W_0$$

$$\text{The system weight} = \text{ } + \text{ } = \text{ } \text{ kg}$$

#### 4. Setting of Toggle Switch of Tube Length

Set the toggle switch of the tube length as per the requirements below:

<Table 1>

( kg )

| Model kBTU/h | W0:<br>Filling Quantity<br>for Outdoor Unit |
|--------------|---------------------------------------------|
| 38~54        | 3.6                                         |

Note:

W0 denotes the filling quantity of refrigerant for the outdoor unit when delivered.

<Table 2>

( kg )

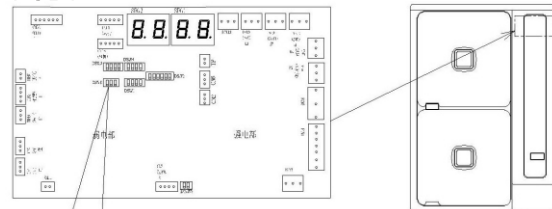
| Model kBTU/h | W13:<br>Filling Quantity<br>for Outdoor Unit |
|--------------|----------------------------------------------|
| 38           | 1.26                                         |
| 48           | 1.48                                         |
| 54           | 1.70                                         |

Total additional filling quantity of refrigerant W  kg

Total refrigerant quantity of the system  kg

M  D  Y

PCB1



| factory state                                            | height difference over 20m (indoor)                      | height difference over 25m (outdoor)                     |
|----------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| ON <input type="checkbox"/> OFF <input type="checkbox"/> | ON <input type="checkbox"/> OFF <input type="checkbox"/> | ON <input type="checkbox"/> OFF <input type="checkbox"/> |

### 5.9 Collecting Refrigerant

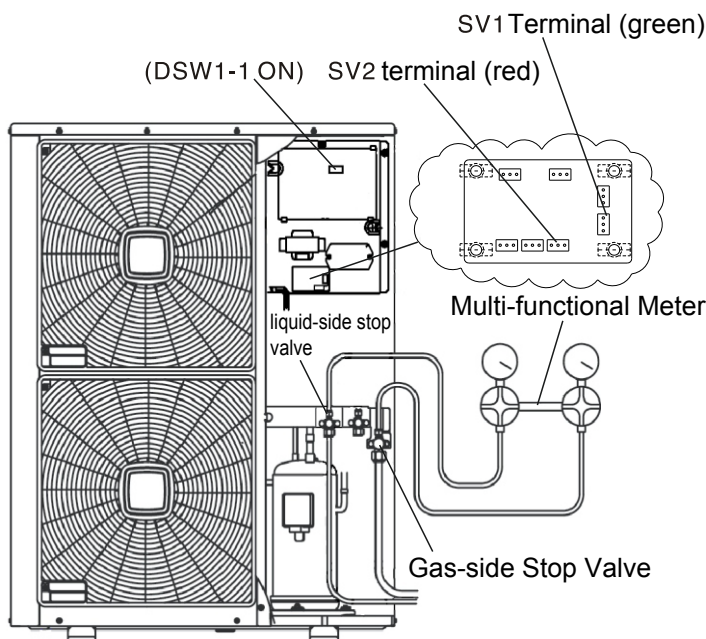
When the refrigerant should be collected into the outdoor unit due to indoor/outdoor unit relocation, collect the refrigerant as follows.

- (1) Attach the manifold gauge to the gas stop valve and the liquid stop valve.
- (2) Pull out SV1 plug (green) and SV2 plug (red), and insert SV2 plug into SV1 terminal.

## ⚠ DANGER

- Both SV1 and SV2 are strong current terminals. Please operate them when the unit is disconnected from the power supply, or else the danger of electric shock may take place.

- (3) Set the DSW1-1 pin of the outdoor unit PCB at the "ON" side for cooling operation. Close the liquid stop valve and collect the refrigerant.
- (4) When the pressure at lower pressure side (gas stop valve) indicates  $-0.01\text{MPa}$  (684mmHg), perform the following procedures immediately.
  - \* Close the gas stop valve.
  - \* Set the DSW1-1 pin at the "OFF" side. (To stop the unit operation.)
- (5) Turn off power source



## ⚠ CAUTION

Measure the low pressure by the pressure gauge and keep it not to decrease than  $-0.01\text{MPa}$ . If the pressure is lower than  $-0.01\text{MPa}$ , the compressor may be faulty.

### 6. Electrical Wiring

## ⚠ WARNING

- Turn OFF the main power switch to the indoor unit and the outdoor unit and wait for more than 1 minute before electrical wiring work or a periodical check is performed.
- Check to ensure that the indoor fan and the outdoor fan have stopped before electrical wiring work or a periodical check is performed.
- Protect the wires, electrical parts, etc. from rats or other small animals.
- If not protected, rats may gnaw at unprotected parts and at the worst, a fire will occur.
- Avoid the wirings from touching the refrigerant pipes, plate edges and electrical parts inside the unit. If not do, the wires will be damaged and at the worst, a fire will occur.

## ⚠ CAUTION

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

## NOTE

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

### 6.1 General Check

- (1) Make sure that the field-selected electrical components (main power switches, fuse, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data. Make sure that the components comply with National Electrical Code.
  - Connect the power cords to each outdoor unit respectively, and connect one ELB and one knife switch onto each piece of power cord.
  - Bridge the main power supply to all indoor units connected to the same outdoor unit, and connect one ELB and one knife switch onto each piece of power cord.
- (2) Check whether the power supply voltage falls within the range of  $\pm 6\%$  of the rated voltage, and whether the ground wires are included in the power cords. Or else, the electrical parts may be damaged.
- (3) Check whether the capacity of the power supply supplied meets the requirement. Or else, the compressor may fail to be started due to over low voltage in start-up.
- (4) Check whether the ground wires have been reliably connected.
- (5) By measuring the insulating resistance between the ground wires and the electrical part terminals, make sure that it is over 1 megohm.

Or else, the system should not be started, until the cause for electric leakage is found and removed.

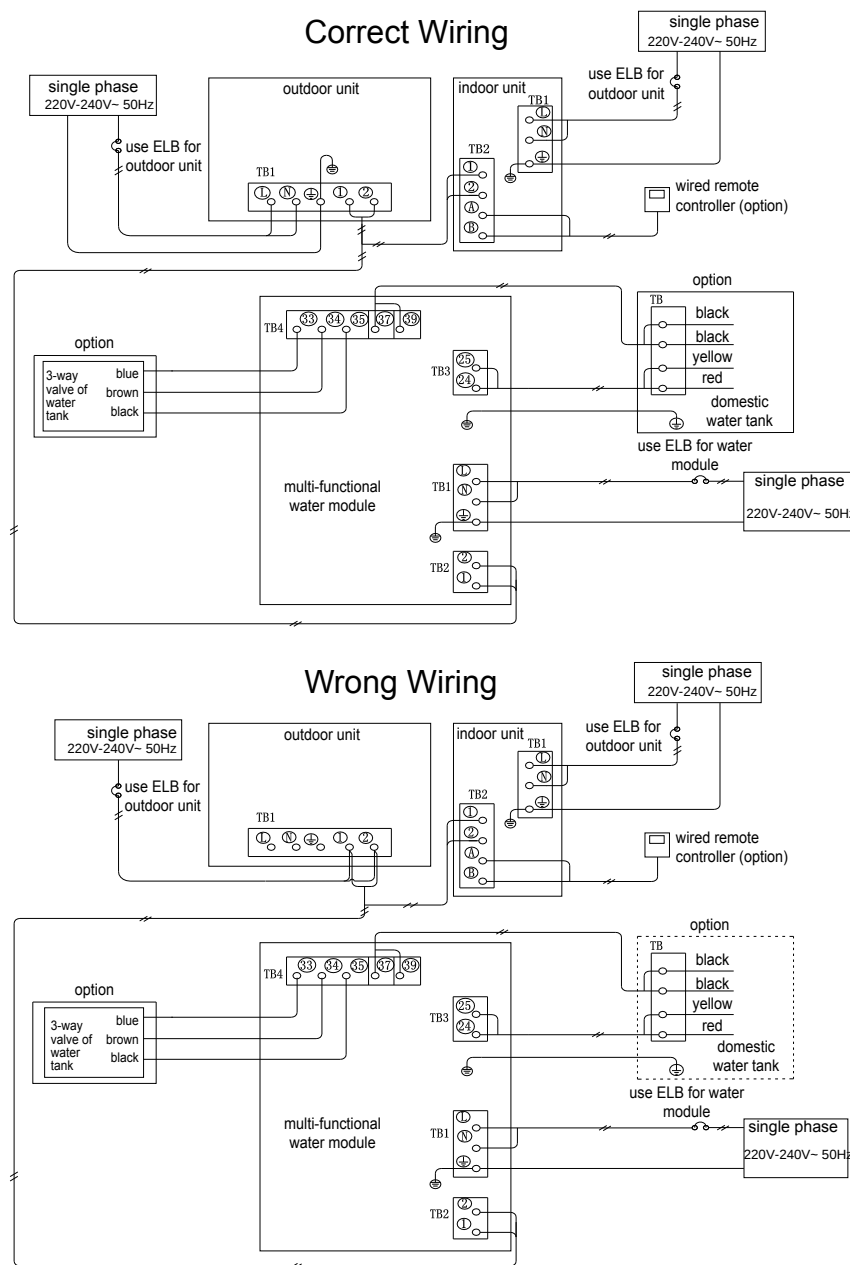
## 6.2 Electrical Wiring Connection

- (1) Connect the power supply to the terminal block in the electrical box of the indoor unit and the outdoor unit. And connect the earth wire to the electrical box of the outdoor unit. Refer to Figure 6.2 below for wiring between indoor unit and outdoor unit of AFW-38/48/54U4SC. Check the tensile force of terminal pressure wiring on each terminal block.
- (2) Connect the wires between the indoor unit and outdoor unit to terminals 1 and 2 on the terminal Board.

If the power supply are connected to 1 and 2 of terminal board, the printed circuit board will be damaged.

The wiring method for the communication cable of AFW-38/48/54U4SC is shown in Figure 6.1 below.

- (3) Do not wire in the front of the fixing screw of the service panel. otherwise, the screw can not be removed.
- (4) Use the shield twist pair (STP) for control between outdoor unit and indoor unit, connect the wires between the indoor unit and the outdoor unit to terminals 1 and 2 on the terminal board. Connect the communication cables of the wired remote controller PC-P1H1Q to A and B terminals on the terminal block.



Never connect the power supply to terminal 1 and 2 that are used for connecting the communication cables for control. Once they are wrongly connected, the printed circuit board will be burned.

Figure 6.1 Wiring of Communication Cables between Indoor Unit and Outdoor Unit

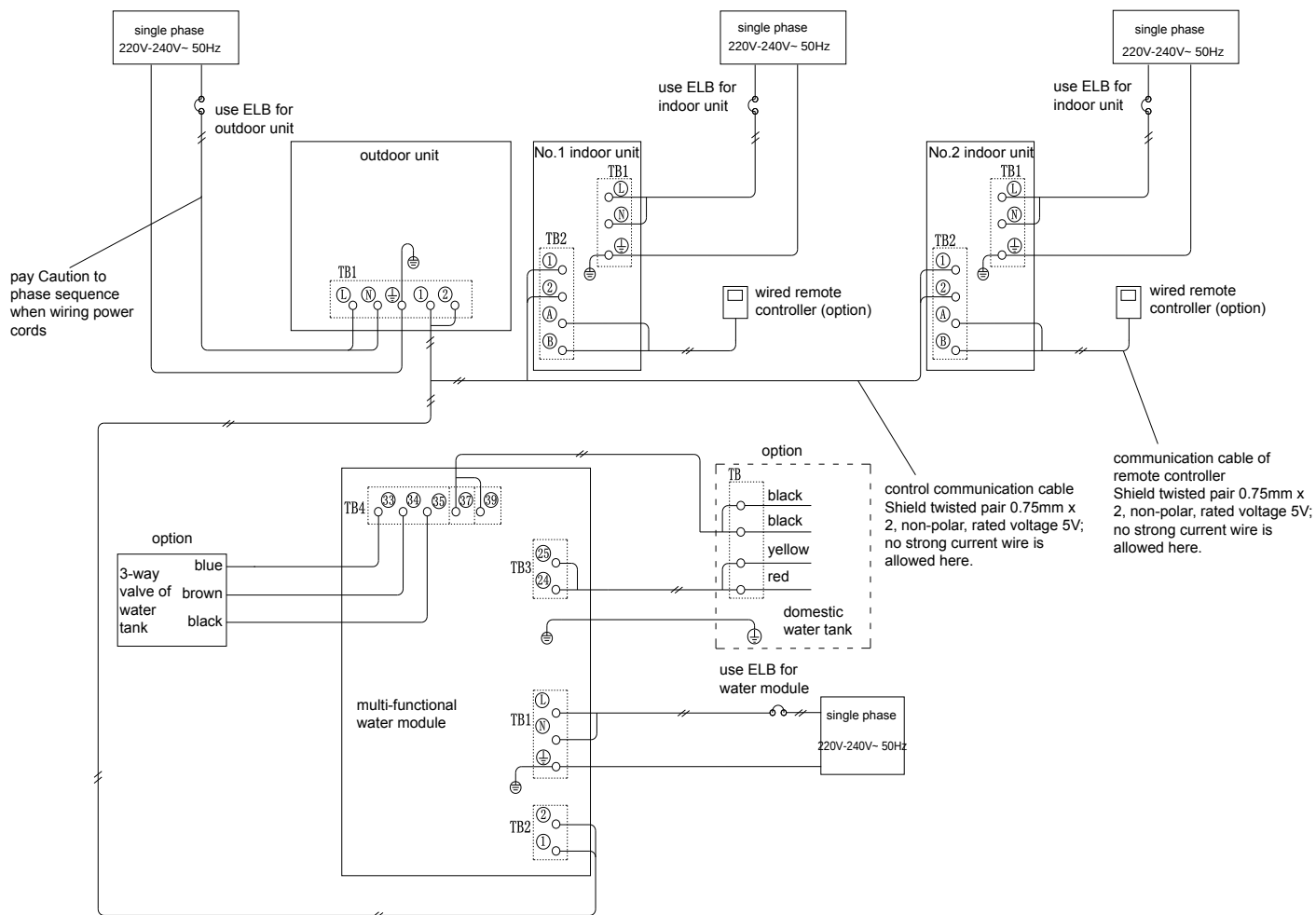


Figure 6.2 Wiring between Outdoor Unit and Indoor Unit

## CAUTION

Use the single-phase 220V-240V~ 50Hz power supply for AFW-38/48/54U4SC  
If applied Other kinds of power supply, the electrical parts to be damaged to outdoor unit and indoor unit.

## WARNING

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

M4: 1.0 to 1.3 N.m

M5: 2.0 to 2.5 N.m

M6: 4.0 to 5.0 N.m

M8: 9.0 to 11.0 N.m

M10: 18.0 to 23.0 N.m

Keep the above tightening torque when wiring work.

- (5) For the specification of the circuit breaker, please refer to the recommended model in Table 6.1 below.
- (6) If there is no protective sleeve available for power cords on the site, the rubber ring should be installed at the access hole of the power cords.

## CAUTION

- The medium-speed ELB (electric leakage breaker, whose response speed is within 0.1s) should be connected on the power cords, or else the flashover and fire may take place.
- The spacing between the communication cables and the strong current wires located between the outdoor unit and the indoor unit should be over 5 ~ 6cm, and no coaxial cable should be used.

Table 6.1 Electrical Parameters and Wire Specifications of Outdoor Door

| Model kBTU/ h | Power Supply    | Rated current (A) | Power Cord (mm <sup>2</sup> ) | Communication Cable (mm <sup>2</sup> ) | ELB               |                             | Fusing Current of Master Switch (A) |
|---------------|-----------------|-------------------|-------------------------------|----------------------------------------|-------------------|-----------------------------|-------------------------------------|
|               |                 |                   |                               |                                        | Rated Current (A) | Current Susceptibility (mA) |                                     |
| 38~54         | 220V-240V ~50Hz | 24.5              | 4.0                           | 0.75                                   | 40                | 30                          | 50                                  |

The power cord type designation is H07RN-F.

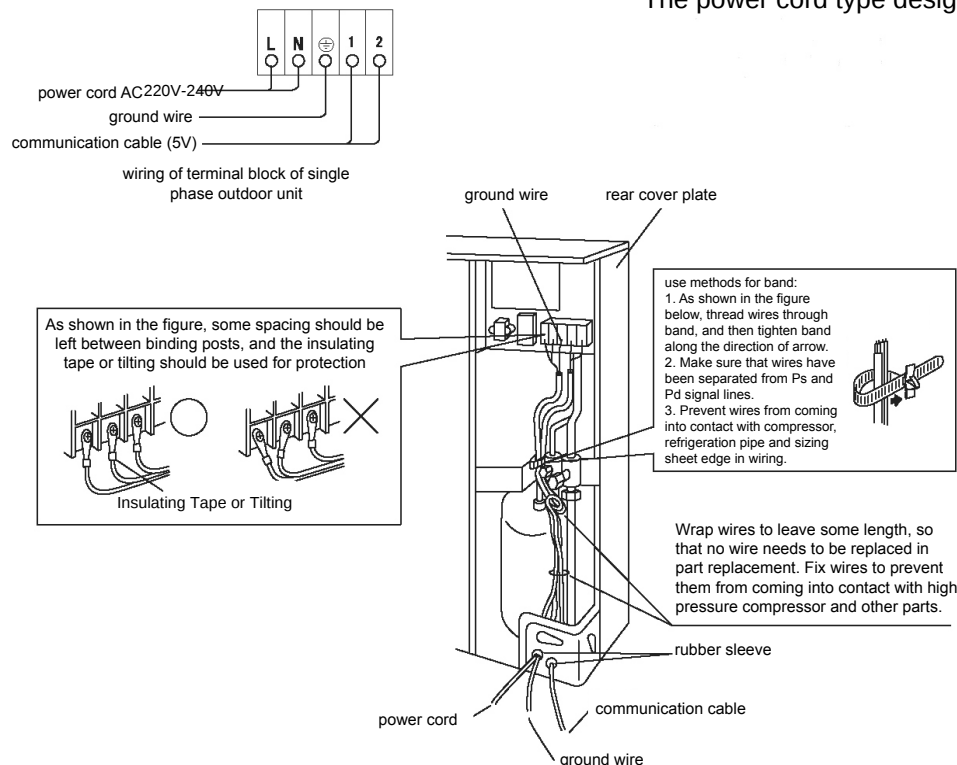


Figure 6.3 Wiring of Outdoor Unit

### NOTE:

- (1) The wiring on the site should be according to the related local regulations.
- (2) The specification of the wires in the table above should be chosen as per the requirements of the national standard IEC60335-1.
- (3) The communication cable should be shielded wire, and grounded.
- (4) If the power supply are connected in series, the wires should be chosen according to the total current value.

## CAUTION

Between the power supply and the air-conditioner unit the switch of all-pole disconnection type should be installed, and its contacts should be 3.5mm or greater apart from each other.

## 7. Setting of Toggle Switch of Outdoor Unit

Prior to setting all power supply switches should be turned off, or else the toggle switch will fail to work normally, and the setting done will not be valid.

Please set the toggle switch as per the requirements of the table below, in which the sign “■” denotes the location of the contacts of the toggle switch.

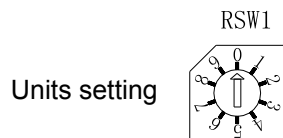
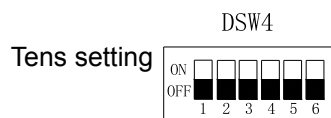
| DSW1                                                                                                                                                                                                                                                                                                                                                                                                                                                     | DSW2                                                                                                                                                                                                                                                                                         | DSW4                                                                                                                                                                                 | DSW5                                                                                                                   |    |                                                                                                          |                                                                                                          |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <p>In the test run,</p> <div><div><div><div></div><div></div><div></div><div></div></div><div>1234</div></div><div>ON<br/>OFF</div></div> <p>Full OFF: factory setting<br/>1 ON: test run (refrigeration)<br/>1, 2 ON: test run (heating)<br/>4 ON: forced shutdown of compressor</p>                                                                                                                                                                    | <p>Selection function setting</p> <div><div><div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>123456</div></div><div>ON<br/>OFF</div></div> <p>Full OFF: factory setting<br/>5 ON: function selection setting mode<br/>6 ON: external force setting mode</p> | <p>Refrigeration system number setting</p> <div><div><div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>123456</div></div><div>ON<br/>OFF</div></div> | <p>Communication setting</p> <div><div><div><div></div><div></div></div><div>12</div></div><div>ON<br/>OFF</div></div> |    |                                                                                                          |                                                                                                          |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| DSW3                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                              | DSW6                                                                                                                                                                                 |                                                                                                                        |    |                                                                                                          |                                                                                                          |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| <p>Factory setting of capacity</p> <table><tr><td>38</td><td>48</td><td>54</td></tr><tr><td><div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div></td><td><div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div></td><td><div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div></td></tr></table> |                                                                                                                                                                                                                                                                                              | 38                                                                                                                                                                                   | 48                                                                                                                     | 54 | <div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div> | <div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div> | <div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div> | <p>Pipe length setting<br/>When delivered</p> <div><div>ON</div><div><div><div></div><div></div><div></div></div><div>OFF</div></div></div> <div><div>Height difference over 20m (indoor unit)</div><div><div>ON</div><div><div><div></div><div></div><div></div></div><div>OFF</div></div></div></div> <div><div>Height difference over 25m (outdoor unit)</div><div><div>ON</div><div><div><div></div><div></div><div></div></div><div>OFF</div></div></div></div> |  |
| 38                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 48                                                                                                                                                                                                                                                                                           | 54                                                                                                                                                                                   |                                                                                                                        |    |                                                                                                          |                                                                                                          |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| <div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div>                                                                                                                                                                                                                                                                                                                                                 | <div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div>                                                                                                                                                                                     | <div><div>ON</div><div><div><div></div><div></div><div></div><div></div></div><div>OFF</div></div></div>                                                                             |                                                                                                                        |    |                                                                                                          |                                                                                                          |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |

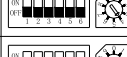
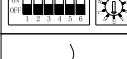
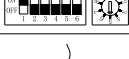
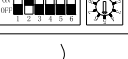
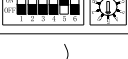
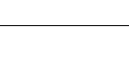
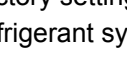
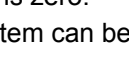
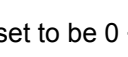
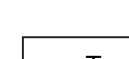
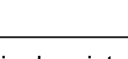
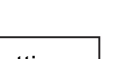
- Communication setting

All units on the H-LINK system must be given unit number and terminal resistance setting.

- Refrigeration system number setting

Use (DSW4 & RSW1) for the refrigeration system setting



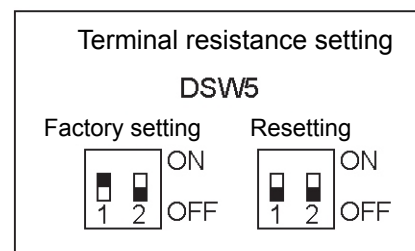
| Tens<br>Units | 0                                                                                   | 1                                                                                   | 2                                                                                    | ~ | 5                                                                                     | 6                                                                                     |
|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 0             |  |  |  | ~ |  |  |
| 1             |  |  |  | ~ |  |  |
| 2             |  |  |  | ~ |  |  |
| 3             |  |  |  | ~ |  |  |
| 4             |  |  |  | ~ |  |  |
| 5             |  |  |  | ~ |  |  |
| 6             |  |  |  | ~ |  |  |
| 7             |  |  |  | ~ |  |  |
| 8             |  |  |  | ~ |  |  |
| 9             |  |  |  | ~ |  |  |
|               |                                                                                     |                                                                                     |                                                                                      |   |                                                                                       | No Setting                                                                            |

The factory setting is zero.

The refrigerant system can be set to be 0 ~ 63.

- Terminal resistance setting

When the unit is delivered, 1# key of DSW5 is set at “ON”. When only one outdoor unit is connected on H-LINK, no re-setting is needed. When several outdoor units are connected on H-LINK, 1# key of DSW5 should be set at “OFF” from the second unit.



## 8. Test Run

Test run should be performed according to the Table 8.1 on page 25 and of Table 8.2 on page 26. And use the Table 8.2 on page 26.

### CAUTION

- If the “test run” mode is entered through the basal plate DSW1 of the outdoor unit or the wire controller of the indoor unit, only the indoor unit should undergo the refrigeration or heating test run. The test run of the water module must be conducted by the wire controller of the water module, and the detailed operating method is seen in the specifications for the water module supplied.

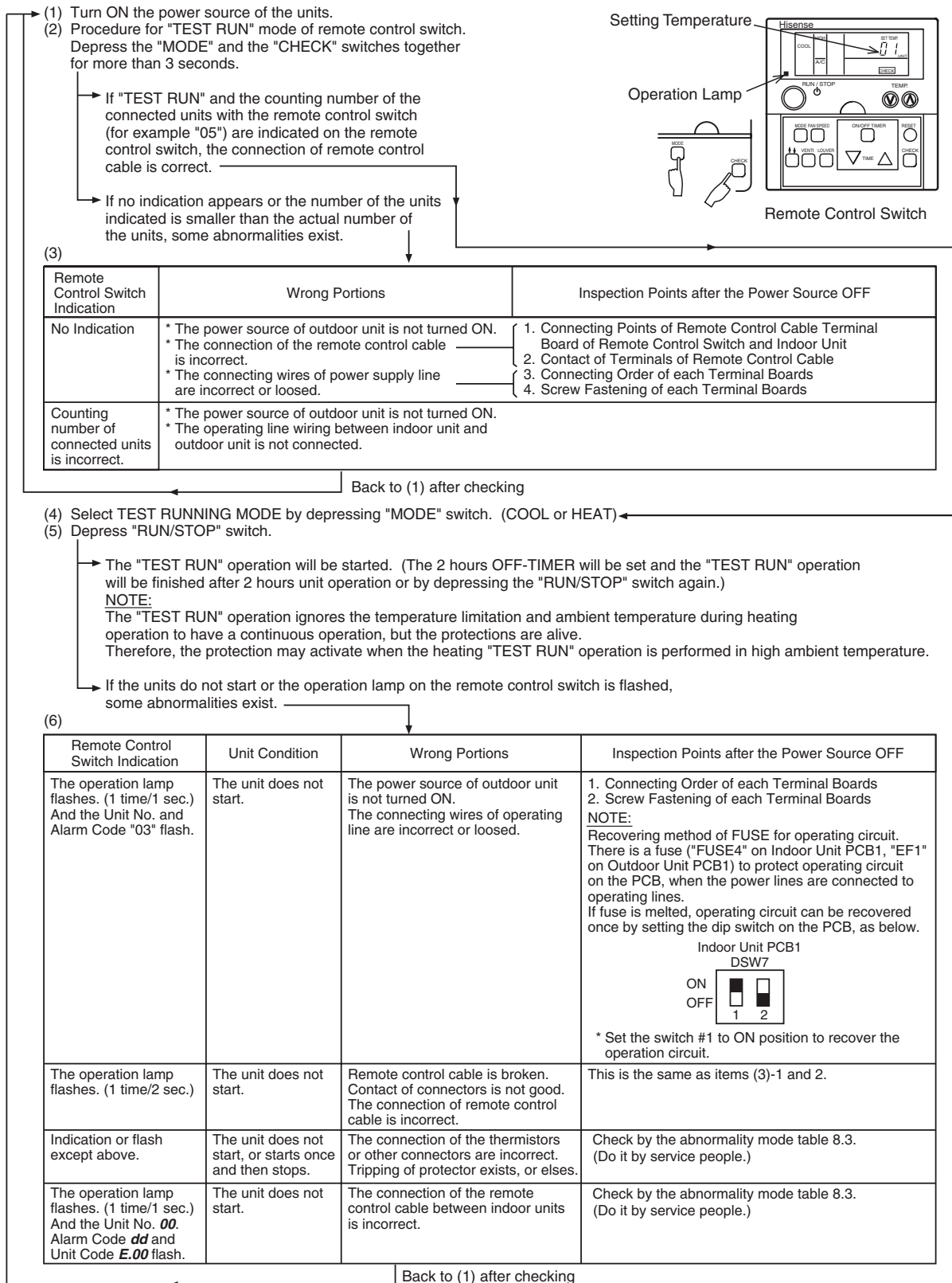
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### WARNING

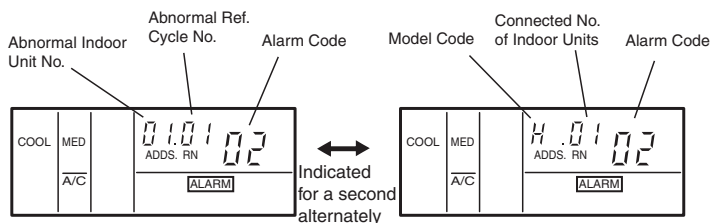
- Do not operate the system until all the check points have been cleared.
    - (A) Check and make sure that the refrigeration pipes and communication cables connected to the indoor unit, water module and outdoor unit have been connected onto the same refrigeration system. Or else the running failure may take place.
    - (B) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired.
    - (C) Check to ensure that the stop valves of the outdoor unit are fully opened, and then start the system.
    - (D) Check to ensure that the switch on the main power source has been ON for more than 12 hours, to warm the compressor oil by the oil heater.
  - Pay attention to the following items while the system is running.
    - (A) Do not touch any of the parts by hand at the discharge gas side, since the compressor chamber and the pipes at the discharge side are heated higher than 90℃.
    - (B) DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES). It will cause a serious accident.
  - Do not touch any electrical components for more than three minutes after turning OFF the main switch.
  - Run the indoor units one by one, and check and make sure that their refrigeration circuits and wires are on the same system.
-

# Table 8.1 Wiring Check by Test Run

NOTE: "TEST RUN" shall be performed with each refrigerant cycle (each outdoor unit).



## Alarm Code Indication of Remote Control Switch



## Model Code

| Indication | Model        |
|------------|--------------|
| H          | Heat-pump    |
| P          | Inverter     |
| F          | Multi        |
| C          | Cooling Only |
| E          | Others       |

Table 8.2 Records of Test Run and Maintenance

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

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

|         |          |     |     |          |     |     |         |     |     |         |     |    |
|---------|----------|-----|-----|----------|-----|-----|---------|-----|-----|---------|-----|----|
| Inlet:  | No. 1 DB | /WB | °C, | No. 2 DB | /WB | °C, | No.3 DB | /WB | °C, | No.4 DB | /WB | °C |
| Outlet: | DB       | /WB | °C, | DB       | /WB | °C, | DB      | /WB | °C, | DB      | /WB | °C |
6. Check Outdoor Ambient Temperature
 

|         |    |     |    |    |
|---------|----|-----|----|----|
| Inlet:  | DB | °C, | WB | °C |
| Outlet: | DB | °C, | WB | °C |
7. Check Refrigerant Temperature
 

|                            |    |
|----------------------------|----|
| Liquid Temperature:        | °C |
| Discharge Gas Temperature: | °C |
8. Check Pressure
 

|                     |     |
|---------------------|-----|
| Discharge Pressure: | MPa |
| Suction Pressure:   | MPa |
9. Check Voltage
 

|                    |    |
|--------------------|----|
| Rated Voltage:     | V  |
| Operating Voltage: | V, |
| Starting Voltage:  | V  |
10. Check Compressor Input Running Current
 

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

Table 8.3 Alarm Code

| Code No. | Category                             | Content of Abnormality                                                                 | Leading Cause                                                                                                                                                                                     |
|----------|--------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01       | Indoor unit                          | Activating of protection device                                                        | High water level in drain pan, activated float switch                                                                                                                                             |
| 02       | Outdoor unit                         | Activating of protection device                                                        | Refrigerant tubes blocked, excessive refrigerant, entry of incondensable gas                                                                                                                      |
| 03       | Transmission                         | Abnormality between indoor unit and outdoor unit<br>Abnormality between outdoor units  | Terminal of operating circuit loosened, disconnected or wired wrongly<br>Power supply of outdoor unit OFF, fuse of outdoor unit melted                                                            |
| 04       |                                      | Abnormality between basal plate of outdoor unit and drive plate of compressor          | Communication error, disconnection, wrong wiring                                                                                                                                                  |
| 7B       |                                      | Abnormality between outdoor unit and water module                                      | Terminal of operating circuit loosened, disconnected or wired wrongly<br>Power supply of outdoor unit OFF, fuse of outdoor unit melted                                                            |
| 05       | Supply phases                        | Abnormality of power supply phases                                                     | Anti-phase or open phase in power supply wiring                                                                                                                                                   |
| 06       | Voltage drop                         | Variable frequency voltage failure                                                     | Voltage fluctuation of outdoor unit, insufficient capacity of power supply                                                                                                                        |
| 07       | Cycle                                | Decrease of Discharge Gas Superheat                                                    | Excessive refrigerant, expansion valve locked in open state (disconnected)<br>Wrong wiring of refrigerant and electrical system between indoor unit and outdoor unit                              |
| 08       |                                      | Increase of Discharge Gas Temperature (on top of compressor)                           | Insufficient refrigerant, refrigerant tube blocked, expansion valve locked in open state (disconnected)<br>Wrong wiring of refrigerant and electrical system between indoor unit and outdoor unit |
| 09       | Outdoor fan motor                    | Protective device acting                                                               | Indoor fan motor over heated, locked                                                                                                                                                              |
| 11       | Sensor on indoor unit                | Return air temperature/ inlet water temperature sensor defect                          | Indoor unit temperature sensor wired by mistake, not wired, disconnected or shorted                                                                                                               |
| 12       |                                      | Air outlet temperature/ outlet water temperature sensor defect                         |                                                                                                                                                                                                   |
| 13       |                                      | Heat exchanger liquid pipe (frozen) temperature sensor defect (including water module) |                                                                                                                                                                                                   |
| 14       |                                      | Heat exchanger gas pipe temperature sensor defect                                      |                                                                                                                                                                                                   |
| 16       |                                      | Wire controller temperature sensor defect                                              |                                                                                                                                                                                                   |
| 17       |                                      | Wire controller switch in-built temperature sensor defect                              |                                                                                                                                                                                                   |
| 21       | Sensor on outdoor unit               | High pressure sensor defect                                                            | Outdoor unit temperature sensor and pressure sensor wired by mistake, not wired, disconnected or shorted                                                                                          |
| 22       |                                      | Ambient temperature sensor defect                                                      |                                                                                                                                                                                                   |
| 23       |                                      | Exhaust temperature sensor defect                                                      |                                                                                                                                                                                                   |
| 24       |                                      | Heat exchanger liquid-side temperature sensor defect                                   |                                                                                                                                                                                                   |
| 29       |                                      | Low pressure sensor defect                                                             |                                                                                                                                                                                                   |
| 31       | System                               | Indoor / outdoor unit capacity setting, indoor/ outdoor capacity combination error     | Indoor / outdoor unit capacity code setting error<br>Total capacity of indoor unit being over big or small                                                                                        |
| 35       |                                      | Indoor unit number setting error/ water module number error                            | Different indoor units within the same refrigerant tube system set to be the same unit number                                                                                                     |
| 36       |                                      | Indoor unit combination error                                                          | Indoor unit of J type (using refrigerant 22)                                                                                                                                                      |
| 38       |                                      | Indoor unit protection & detection circuit error                                       | Outdoor unit protection circuit defect (basal plate of outdoor unit wired wrongly)                                                                                                                |
| 43       | Pressure                             | Avoid over low low pressure protection acting                                          | Compressor defect (compressor variable frequency failure, compressor power cords loosened)                                                                                                        |
| 44       |                                      | Avoid over high low pressure protection acting                                         | Over load inside refrigeration house, over high temperature outside heating house, and expansion valve locked in open state (disconnected)                                                        |
| 45       |                                      | Avoid over high high pressure protection acting                                        | Over load running (heat exchanger blocked)<br>Refrigerant tube blocked, excessive refrigerant, entry of incondensable gas                                                                         |
| 47       |                                      | Avoid over low low pressure protection acting (avoid vacuum running)                   | Insufficient refrigerant, refrigerant tube blocked, expansion valve locked in closed state (disconnected)                                                                                         |
| 48       | Inverter                             | Frequency converter over current protection acting                                     | Over load running, compressor failure                                                                                                                                                             |
| 51       |                                      | Current sensor defect                                                                  | Current sensor failure                                                                                                                                                                            |
| 53       |                                      | Frequency converter signal detection error                                             | Drive IC signal detection error (over current, low voltage, short circuit protection)                                                                                                             |
| 54       |                                      | Over high frequency converter radiator fin temperature protection acting               | Radiator fin temperature sensor failure, heat exchanger blocked, fan motor failure                                                                                                                |
| 55       |                                      | Frequency converter not acting                                                         | Variable frequency basal plate failure                                                                                                                                                            |
| 57       | Indoor unit fan                      | Fan motor protection acting                                                            | Variable frequency basal plate and fan motor disconnected or wired wrongly, fan motor failure                                                                                                     |
| EE       | Compressor                           | Compressor protection alarm (can not be reset through wire controller)                 | Alarm codes below of damages to compressor occurring three times within 6 hours:<br>02, 07, 08, 39, 43~45, 47                                                                                     |
| b1       | Indoor unit sequence setting         | Refrigerant system address setting error                                               | Refrigerant system address setting over 64                                                                                                                                                        |
| b5       | Number of connected indoor units     | Number of connected indoor units error                                                 | Over 17 indoor units connected other than via H-LINK                                                                                                                                              |
| 7A       | Water way defect                     | Over low water pressure or over low water flow                                         | Water pump failure, water leak in water system (alarm code of water module: 70)                                                                                                                   |
|          | Refrigeration system                 | Water module liquid pipe frozen                                                        | Low liquid pipe temperature of water module (alarm code of water module: 76)                                                                                                                      |
| 71       | Water tank electric heater failure   | Water tank electric heater failure                                                     | Electric heater of water tank wired wrongly, disconnected or shorted                                                                                                                              |
| 72       | Water module electric heater failure | Water module electric heater failure                                                   | Over high temperature in electric heater of water module                                                                                                                                          |
| 79       | Communication failure                | Outdoor unit type error                                                                | Water module connected to other kind of outdoor unit                                                                                                                                              |

## 9. Safety and Control Device Setting

### ● Compressor protection

The compressor uses the protective device as below:

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

| Model of Outdoor Unit kBTU/h      |         | 38~54                      |
|-----------------------------------|---------|----------------------------|
| For compressor<br>Pressure switch | CUT-OUT | Auto reset, non-adjustable |
| High pressure                     | CUT-IN  |                            |
|                                   | M Pa    | $4.15^{+0.05}_{-0.15}$     |
|                                   | M Pa    | $3.2 \pm 0.15$             |
| Control circuit fuse<br>current   | A       | 50                         |
| Oil heater band power             | W       | $28 \times 4$              |
| CCP timer<br>Setting time         | Min     | Non-adjustable<br>3        |
| For control<br>PCB fuse capacity  | A       | 5                          |

### Annex: Specification

| Model kBTU/h | Technical Indicators               |                              |                                  |
|--------------|------------------------------------|------------------------------|----------------------------------|
|              | Rated Refrigeration<br>Output (kW) | Rated Consumed<br>Power (kW) | Rated Energy<br>Efficiency Grade |
| 38           | 11.2                               | 2.99                         | Grade 1                          |
| 48           | 14.0                               | 3.92                         | Grade 1                          |
| 54           | 15.5                               | 4.44                         | Grade 1                          |
|              |                                    |                              |                                  |

## Appendix one

Technical parameters for heat pump space heaters

|                                                                                                              |                                 |          |      |                                                                                                                                            |                    |       |                   |
|--------------------------------------------------------------------------------------------------------------|---------------------------------|----------|------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-------|-------------------|
| Model(s):                                                                                                    | Outdoor unit: AFW-38U4SC        |          |      |                                                                                                                                            |                    |       |                   |
|                                                                                                              | Indoor unit: AFM-54EX4SA        |          |      |                                                                                                                                            |                    |       |                   |
| Air-to-water heat pump:                                                                                      | yes                             |          |      |                                                                                                                                            |                    |       |                   |
| Water-to-water heat pump:                                                                                    | no                              |          |      |                                                                                                                                            |                    |       |                   |
| Brine-to-water heat pump:                                                                                    | no                              |          |      |                                                                                                                                            |                    |       |                   |
| Low-temperature heat pump:                                                                                   | yes                             |          |      |                                                                                                                                            |                    |       |                   |
| Equipped with a supplementary heater:                                                                        | yes                             |          |      |                                                                                                                                            |                    |       |                   |
| Heat pump combination heater:                                                                                | no                              |          |      |                                                                                                                                            |                    |       |                   |
| Parameters shall be declared for                                                                             | medium-temperature application. |          |      |                                                                                                                                            |                    |       |                   |
| Parameters shall be declared for                                                                             | average climate conditions.     |          |      |                                                                                                                                            |                    |       |                   |
|                                                                                                              |                                 |          |      |                                                                                                                                            |                    |       |                   |
| Item                                                                                                         | Symbol                          | Value    | Unit | Item                                                                                                                                       | Symbol             | Value | Unit              |
| Rated heat output (*)                                                                                        | Prated                          | 8.9      | kW   | Seasonal space heating energy efficiency                                                                                                   | $\eta_s$           | 123   | %                 |
| Declared capacity for heating for part load at indoor temperature 20℃ and outdoor temperature T <sub>j</sub> |                                 |          |      | Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20℃ and outdoor temperature T <sub>j</sub> |                    |       |                   |
| T <sub>i</sub> = - 7℃                                                                                        | P <sub>dh</sub>                 | 7.9      | kW   | T <sub>i</sub> = - 7℃                                                                                                                      | COP <sub>d</sub>   | 1.98  | -                 |
| T <sub>i</sub> = +2℃                                                                                         | P <sub>dh</sub>                 | 4.8      | kW   | T <sub>i</sub> = +2℃                                                                                                                       | COP <sub>d</sub>   | 3.14  | -                 |
| T <sub>i</sub> = +7℃                                                                                         | P <sub>dh</sub>                 | 3.1      | kW   | T <sub>i</sub> = +7℃                                                                                                                       | COP <sub>d</sub>   | 3.54  | -                 |
| T <sub>j</sub> = +12℃                                                                                        | P <sub>dh</sub>                 | 1.4      | kW   | T <sub>j</sub> = +12℃                                                                                                                      | COP <sub>d</sub>   | 4.88  | -                 |
| T <sub>j</sub> =bivalent temperature                                                                         | P <sub>dh</sub>                 | 7.9      | kW   | T <sub>j</sub> =bivalent temperature                                                                                                       | COP <sub>d</sub>   | 1.98  | -                 |
| T <sub>j</sub> = operation limit temperature                                                                 | P <sub>dh</sub>                 | 8.9      | kW   | T <sub>j</sub> = operation limit temperature                                                                                               | COP <sub>d</sub>   | 1.95  | -                 |
| T <sub>j</sub> = - 15℃ (if TOL < - 20℃)                                                                      | P <sub>dh</sub>                 | -        | kW   | T <sub>j</sub> = - 15℃ (if TOL < - 20℃)                                                                                                    | COP <sub>d</sub>   | -     | -                 |
| Bivalent temperature                                                                                         | T <sub>biv</sub>                | -7       | ℃    | Operation limit temperature                                                                                                                | TOL                | -10   | ℃                 |
| Cycling interval capacity for heating                                                                        | P <sub>cyh</sub>                | -        | kW   | Cycling interval efficiency                                                                                                                | COP <sub>cyh</sub> | -     | -                 |
| Degradation co-efficient (**)                                                                                | C <sub>dh</sub>                 | 1        | -    | Heating water operating limit temperature                                                                                                  | WTOL               | -     | ℃                 |
|                                                                                                              |                                 |          |      |                                                                                                                                            |                    |       |                   |
| Power consumption in modes other than active mode                                                            |                                 |          |      | Supplementary heater                                                                                                                       |                    |       |                   |
| Off mode                                                                                                     | P <sub>OFF</sub>                | 0.02     | kW   | Rated heat output (*)                                                                                                                      | P <sub>sup</sub>   | 0     | kW                |
| Thermostat-off mode                                                                                          | P <sub>TO</sub>                 | 0.2      | kW   |                                                                                                                                            |                    |       |                   |
| Standby mode                                                                                                 | P <sub>SB</sub>                 | 0.02     | kW   | Type of energy input                                                                                                                       |                    |       |                   |
| Crankcase heater mode                                                                                        | P <sub>CK</sub>                 | 0.06     | kW   |                                                                                                                                            |                    |       |                   |
|                                                                                                              |                                 |          |      |                                                                                                                                            |                    |       |                   |
| Other items                                                                                                  |                                 |          |      |                                                                                                                                            |                    |       |                   |
| Capacity control                                                                                             |                                 | variable |      | Rated air flow rate, outdoors                                                                                                              |                    | 6800  | m <sup>3</sup> /h |
| Sound power level, indoors/outdoors                                                                          | L <sub>WA</sub>                 | 39/67    | dB   |                                                                                                                                            |                    |       |                   |
| Annual energy consumption                                                                                    | Q <sub>HE</sub>                 | 6013     | kWh  |                                                                                                                                            |                    |       |                   |
| Contact details                                                                                              |                                 |          |      |                                                                                                                                            |                    |       |                   |
| Qingdao Hisense Hitachi Air-conditioning Systems Co., Ltd.                                                   |                                 |          |      |                                                                                                                                            |                    |       |                   |
| 218, Qianwangang Road, Economic and Technological Development Zone, Qingdao, P.R. China                      |                                 |          |      |                                                                                                                                            |                    |       |                   |

(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(T<sub>j</sub>).  
(\*\*) If C<sub>dh</sub> is not determined by measurement then the default degradation coefficient is C<sub>dh</sub> = 0.9.

## Appendix two

### Technical parameters for heat pump space heaters

[illegible]

## Appendix three

Technical parameters for heat pump space heaters

|                                       |                                 |  |  |
|---------------------------------------|---------------------------------|--|--|
| Model(s):                             | Outdoor unit: AFW-54U4SC        |  |  |
|                                       | Indoor unit: AFM-54EX4SA        |  |  |
| Air-to-water heat pump:               | yes                             |  |  |
| Water-to-water heat pump:             | no                              |  |  |
| Brine-to-water heat pump:             | no                              |  |  |
| Low-temperature heat pump:            | yes                             |  |  |
| Equipped with a supplementary heater: | yes                             |  |  |
| Heat pump combination heater:         | no                              |  |  |
| Parameters shall be declared for      | medium-temperature application. |  |  |
| Parameters shall be declared for      | average climate conditions.     |  |  |

| Item                                                                                                 | Symbol | Value | Unit | Item                                                                                                                                | Symbol   | Value | Unit |
|------------------------------------------------------------------------------------------------------|--------|-------|------|-------------------------------------------------------------------------------------------------------------------------------------|----------|-------|------|
| Rated heat output (*)                                                                                | Prated | 12.8  | kW   | Seasonal space heating energy efficiency                                                                                            | $\eta_s$ | 118   | %    |
| Declared capacity for heating for part load at indoor temperature 20°C and outdoor temperature $T_j$ |        |       |      | Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature $T_j$ |          |       |      |
| $T_j = -7\text{ °C}$                                                                                 | Pdh    | 11.3  | kW   | $T_j = -7\text{ °C}$                                                                                                                | COPd     | 1.92  | —    |
| $T_j = +2\text{ °C}$                                                                                 | Pdh    | 6.9   | kW   | $T_j = +2\text{ °C}$                                                                                                                | COPd     | 3     | —    |
| $T_j = +7\text{ °C}$                                                                                 | Pdh    | 4.4   | kW   | $T_j = +7\text{ °C}$                                                                                                                | COPd     | 3.4   | —    |
| $T_j = +12\text{ °C}$                                                                                | Pdh    | 2     | kW   | $T_j = +12\text{ °C}$                                                                                                               | COPd     | 4.8   | —    |
| $T_j$ =bivalent temperature                                                                          | Pdh    | 11.3  | kW   | $T_j$ =bivalent temperature                                                                                                         | COPd     | 1.92  | —    |
| $T_j$ = operation limit temperature                                                                  | Pdh    | 10.8  | kW   | $T_j$ = operation limit temperature                                                                                                 | COPd     | 1.85  | —    |
| $T_j = -15\text{ °C}$ (if TOL < - 20 °C)                                                             | Pdh    | —     | kW   | $T_j = -15\text{ °C}$ (if TOL < - 20 °C)                                                                                            | COPd     | —     | —    |
| Bivalent temperature                                                                                 | Tbiv   | -7    | °C   | Operation limit temperature                                                                                                         | TOL      | -10   | °C   |
| Cycling interval capacity for heating                                                                | Pcych  | —     | kW   | Cycling interval efficiency                                                                                                         | COPcvc   | —     | —    |
| Degradation co-efficient (**)                                                                        | Cdh    | 1     | —    | Heating water operating limit temperature                                                                                           | WTOL     | —     | °C   |

|                                                   |      |      |    |                       |      |   |    |
|---------------------------------------------------|------|------|----|-----------------------|------|---|----|
| Power consumption in modes other than active mode |      |      |    | Supplementary heater  |      |   |    |
| Off mode                                          | POff | 0.02 | kW | Rated heat output (*) | Psup | 2 | kW |
| Thermostat-off mode                               | PTO  | 0.2  | kW |                       |      |   |    |
| Standby mode                                      | PSB  | 0.02 | kW | Type of energy input  |      |   |    |
| Crankcase heater mode                             | PCK  | 0.06 | kW |                       |      |   |    |

|                                     |     |          |     |                               |  |      |                   |
|-------------------------------------|-----|----------|-----|-------------------------------|--|------|-------------------|
| Other items                         |     |          |     |                               |  |      |                   |
| Capacity control                    |     | variable |     | Rated air flow rate, outdoors |  | 6800 | m <sup>3</sup> /h |
| Sound power level, indoors/outdoors | LWA | 39/69    | dB  |                               |  |      |                   |
| Annual energy consumption           | QHE | 8951     | kWh |                               |  |      |                   |

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(\*) For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).

(\*\*) If Cdh is not determined by measurement then the default degradation coefficient is Cdh = 0,9.





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