



Installation, Operation, and Maintenance

Air Handlers Inverter

Model Number:

TRM-IMAHP12A1

TRM-IMAHP18A1

TRM-IMAHP24A1

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

⚠ AVERTISSEMENT DE SÉCURITÉ

Seul le personnel qualifié doit installer et procéder à l'entretien des équipements. L'installation, le démarrage et la réparation des équipements de chauffage, de ventilation et de climatisation peuvent être dangereux et nécessitent une formation et des connaissances spécifiques. Un équipement mal installé, réglé ou modifié par un individu non qualifié peut entraîner des blessures graves, voire mortelles. Lors de toute intervention sur l'équipement, respectez toutes les précautions figurant dans la documentation et sur les étiquettes et autocollants fixés à l'équipement.

Note: The following outdoor units can only be matched with one Air Handler series indoor unit within the allowable capacity ratio range, while other types of indoor units are not required.

Indoor Unit (Air Handler)	Outdoor Unit
GFH(12)UA-D6DNA1A/I	GWHD(48)ND6MO
GFH(18)UA-D6DNA1A/I	GWHD(48)ND6MO
GFH(24)UA-D6DNA1A/I	GWHD(48)ND6MO

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This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

This appliance incorporates an earth connection for functional purposes.

Note: Only for models with ground wire from PCB.

EXPLANATION OF SYMBOLS**GENERAL INFORMATION**

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.



Indicates a hazardous situation that, if not avoided, could result in death or serious injury.



Indicates a hazardous situation that, if not avoided, may result in minor or moderate injury.



Indicates important but not hazard-related information, used to indicate risk of property damage.



Indicates a hazard that would be assigned a signal word WARNING or CAUTION.

EXCEPTION CLAUSES**GENERAL INFORMATION**

Manufacturer will bear no responsibilities when personal injury or property loss is caused by the following reasons.

1. Damage the product due to improper use or misuse of the product;
2. Alter, change, maintain or use the product with other equipment without abiding by the instruction manual of manufacturer;
3. After verification, the defect of product is directly caused by corrosive gas;
4. After verification, the defects are due to improper operation during transportation of product;
5. Operate, repair, maintain the unit without abiding by instruction manual or related regulations;
6. After verification, the problem or dispute is caused by the quality specification or performance of parts and components that produced by other manufacturers;
7. The damage is caused by natural calamities, bad using environment or force majeure.

CONFORMITY AND RANGE**GENERAL INFORMATION**

Please read this owner's manual carefully before operating the unit and keep it carefully for consultation.



Only use the air conditioner as instructed in this booklet. These instructions are not intended to cover every possible condition and situation. As with any electrical household appliance, common sense and caution are therefore always recommended for installation, operation and maintenance.

The refrigerant

 Refrigerant Safety Group A2L Appliance filled with flammable gas R32.	 Before install the appliance, read the installation manual first.
 Before use the appliance, read the owner's manual first.	 Before repair the appliance, read the service manual first.

- To realize the function of the air conditioner unit, a special refrigerant circulates in the system. The used refrigerant is the fluoride R32, which is specially cleaned. The refrigerant is flammable and inodorous. Furthermore, it can lead to explosion under certain conditions. But the flammability of the refrigerant is very low. It can be ignited only by fire.
- Compared to common refrigerants, R32 is a nonpolluting refrigerant with no harm to the ozonosphere. The influence upon the greenhouse effect is also lower. R32 has got very good thermodynamic features which lead to a really high energy efficiency. The units therefore need a less filling.

WARNING

- Appliance filled with flammable gas R32.
- Appliance shall be installed, operated and stored in a room with a floor area not less than $X \text{ m}^2$.
(Please refer to table "a" in section of " Safety operation of flammable refrigerant " for space X.)
- The appliance shall be stored in a room without continuously operating ignition sources.
(for example: open flames, an operating gas appliance or an operating electric heater.)
- The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation.
- The appliance shall be stored so as to prevent mechanical damage from occurring.
- Ducts connected to an appliance shall not contain an ignition source.
- Keep any required ventilation openings clear of obstruction.
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.
- Do not use means to accelerate the defrosting

process or to clean, other than those recommended by the manufacturer.

- Servicing shall be performed only as recommended by the manufacturer.
- Should repair be necessary, contact your nearest authorized Service Centre. Any repairs carried out by unqualified personnel may be dangerous.
- Compliance with national gas regulations shall be observed.
- Read specialist's manual.



Refrigerant Safety Group
A2L



Safety operation of flammable refrigerant

Qualification of workers

Qualification of the working personnel for maintenance, service and repair operations should according to UL 60335-2 -40、CAN/C-SA-C22.2 No. 60335-2-40: 22 Annex HH.. Every working procedure that affects safety means shall only be carried out by competent persons according to Annex HH. Special training additional to usual refrigerating equipment repair procedures is required when equipment with FLAMMABLE REFRIGERANTS is affected.

Installation notes

- The air conditioner must be installed in a room that is larger than the minimum room area. The minimum room area is shown on the nameplate or following table a.
- It is not allowed to drill hole or burn the connection pipe.
- Leak test is a must after installation.

table a - Minimum room area (m²)

Based on UL 60335-2-40 requirements

The following installation height and area for customer reference

The room area is calculated according to the height of 2.2m. Minimum room height is 2.2m.

No.	Refrigerant Perfusion(kg)	Minimum Room Area(m ²)	Minimum Room Area(ft ²)
1	2.5	7.5	80.7
2	2.9	8.7	93.6
3	3.8	11.3	121.6
4	4.2	12.5	134.5
5	4.6	13.7	147.5
6	5.5	16.4	176.5

The minimum airflow Qmin is 314m³/h.

Maintenance notes

- Check whether the maintenance area or the room area meet the requirement of the nameplate.
 - It's only allowed to be operated in the rooms that meet the requirement of the nameplate.
- Check whether the maintenance area is well-ventilated.
 - The continuous ventilation status should be kept during the operation process.
- Check whether there is fire source or potential fire source in the maintenance area.
 - The naked flame is prohibited in the maintenance area; and the "no smoking" warning board should be hanged.
- Check whether the appliance mark is in good condition.
 - Replace the vague or damaged warning mark.

Welding

- If you should cut or weld the refrigerant system pipes in the process of maintaining, please follow the steps as below:
 - a. Shut down the unit and cut power supply
 - b. Eliminate the refrigerant
 - c. Vacuuming
 - d. Clean it with N₂ gas
 - e. Cutting or welding
 - f. Carry back to the service spot for welding
- The refrigerant should be recycled into the specialized storage tank.
- Make sure that there isn't any naked flame near the outlet of the vacuum pump and it's well-ventilated.

Filling the refrigerant

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

Safety instructions

for transportation and storage

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

Safety of Construction

- For appliances using FLAMMABLE REFRIGERANTS, all joints made in the installation between parts of the REFRIGERATING SYSTEM, with at least one part charged, shall be made in accordance with the following:
 - A brazed, welded, or mechanical connection shall be made before opening the valves to permit refrigerant to flow between the REFRIGERATING SYSTEM parts. A vacuum valve shall be provided to evacuate the interconnecting pipe or any uncharged REFRIGERATING SYSTEM part.
 - Mechanical connectors used indoors shall comply with ISO 14903. When mechanical connectors are reused indoors, sealing parts shall be renewed. When flared joints are reused indoors, the flare part shall be refabricated.
 - Refrigerant tubing shall be protected or enclosed to avoid damage.
 - Flexible refrigerant connectors (such as connecting lines between the indoor and outdoor unit) that may be displaced during NORMAL OPERATION shall be protected against mechanical damage.

Safety operation of flammable refrigerant

Pressure test and leak detect

- After completion of field piping for split systems, the field pipework shall be pressure tested with an inert gas and then vacuum tested prior to refrigerant charging, according to the following requirements.

The minimum test pressure for the low side of the system shall be the low side maximum allowable pressure and the minimum test pressure for the high side of the system shall be the high side maximum allowable pressure, unless the high side of the system, cannot be isolated from the low side of the system in which case the entire system shall be pressure tested to the low side maximum allowable pressure.

- Field-made refrigerant joints indoors shall be tightness tested. The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0,25 times the maximum allowable pressure. No leak shall be detected.

- Avoid oil and water splashing into the refrigerant sensor, otherwise it may cause damage to the refrigerant sensor.
- Avoid using it in the environment with electromagnetic interference, chemical substances (such as chemical plants, etc.), flammable gas, combustible and explosive gas and smog, etc.
- Avoid using items containing ethanol (such as perfume, etc.) and smog-producing items (such as cigarettes, etc.) near the refrigerant sensor, otherwise it will lead to abnormal conditions such as false alarms of the refrigerant sensor. If such phenomenon occurs, please contact the after-sales service team for maintenance.
- Only applicable to refrigerant sensor models.

Notices for using refrigerant sensor

- The refrigerant sensor can monitor whether R32 refrigerant leaks in real time. When the leakage of R32 refrigerant is detected, the sensor will trigger the alarm and emit a buzzer, and the indoor unit will display "EA" code. Meanwhile, the outdoor unit will stop running. When the sensor detects that the refrigerant concentration is below the alarm value, the unit delays for a period of time before resuming normal operation (minimum delay time is 6mins; when alarm is triggered for multiple times, it will delay for 48 hours).
- In case of refrigerant leakage, please open the window immediately for ventilation to reduce the concentration of refrigerant in the room. Meanwhile, check the room to ensure that there is no fire source. After completing the above operations, please leave the room and go to the safe place, and then contact the after-sales service team for maintenance.
- When the refrigerant sensor reaches its service life or is damaged, the indoor unit will display "FE" code. Please contact the after-sales service team to replace the refrigerant sensor.

Other

- Refrigerant sensors for replacement shall be specified by the appliance manufacturer.
- If nameplates and warning labels are visible in the installed state, installers shall ensure that labels are not covered after installation.
- Correct the minimum room area of the space Amin by multiplying by an altitude adjustment factor (AF) based on for building site ground level altitude (Halt) in meters.

Halt	0	200	400	600
AF	1	1	1	1
Halt	800	1000	1200	1400
AF	1.02	1.05	1.07	1.10
Halt	1600	1600	1800	2000
AF	1.12	1.12	1.15	1.18

FCC WARNING

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions :

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

IC STATEMENT

This device complies with Industry Canada licence exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC STATEMENT

This equipment complies with FCC's and IC's RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must be installed and operated to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. Installers must ensure that 20cm separation distance will be maintained between the device (excluding its handset) and users.

Cet appareil est conforme aux limites d'exposition au rayonnement RF stipulées par la FCC et l'IC pour une utilisation dans un environnement non contrôlé. Les antennes utilisées pour cet émetteur doivent être installées et doivent fonctionner à au moins 20 cm de distance des utilisateurs et ne doivent pas être placées près d'autres antennes ou émetteurs ou fonctionner avec ceux-ci. Les installateurs doivent s'assurer qu'une distance de 20 cm sépare l'appareil (à l'exception du combiné) des utilisateurs.



1 Operation and Maintenance

- 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.
- Do not connect air conditioner to multi-purpose socket. Otherwise, it may cause fire hazard.
- Do disconnect power supply when cleaning air conditioner. Otherwise, it may cause electric shock.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- Do not wash the air conditioner with water to avoid electric shock.
- Do not spray water on indoor unit. It may cause electric shock or malfunction.
- After removing the filter, do not touch fins to avoid injury.
- Do not use fire or hair dryer to dry the filter to avoid deformation or fire hazard.
- Maintenance must be performed by qualified professionals. Otherwise, it may cause personal injury or damage.
- Do not repair air conditioner by yourself. It may cause electric shock or damage. Please contact dealer when you need to repair air conditioner.
- Do not extend fingers or objects into air inlet or air outlet. It may cause personal injury or damage.
- Do not block air outlet or air inlet. It may cause malfunction.
- Do not spill water on the remote controller, otherwise the remote controller may be broken.
- When below phenomenon occurs, please turn off air conditioner and disconnect power immediately, and then contact the dealer or qualified professionals for service.
 - Power cord is overheating or damaged.
 - There's abnormal sound during operation.
 - Circuit break trips off frequently.
 - Air conditioner gives off burning smell.
 - Indoor unit is leaking.



- If the air conditioner operates under abnormal conditions, it may cause malfunction, electric shock or fire hazard.
- When turning on or turning off the unit by emergency operation switch, please press this switch with an insulating object other than metal.
- Do not step on top panel of outdoor unit, or put heavy objects. It may cause damage or personal injury.
- For appliances made up of more than one factory made assembly specified by the manufacturer to be used together, instructions shall be provided for completing the assembly to ensure compliance with the requirements.
- The machine must be connected to the air duct for use.

Attachment

- Installation must be performed by qualified professionals. Otherwise, it may cause personal injury or damage.
- Must follow the electric safety regulations when installing the unit.
- According to the local safety regulations, use qualified power supply circuit and circuit break.
- Do install the circuit break. If not, it may cause malfunction.
- Means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.
- Including an circuit break with suitable capacity, please note the following table. Air switch should be included magnet buckle and heating buckle function, it can protect the circuit-short and overload.
- Air Conditioner should be properly grounded. Incorrect grounding may cause electric shock.
- Don't use unqualified power cord.
- Make sure the power supply matches with the requirement of air conditioner. Unstable power supply or incorrect wiring may result in electric shock, fire hazard or malfunction. Please install proper power supply cables before using the air conditioner.
- Properly connect the live wire, neutral wire and grounding wire of power socket.
- Be sure to cut off the power supply before proceeding any work related to electricity and safety.
- Do not put through the power before finishing installation.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- The temperature of refrigerant circuit will be high, please keep the interconnection cable away from the copper tube.



- The appliance shall be installed in accordance with national wiring regulations.
- Installation must be performed in accordance with the requirement of NEC and CEC by authorized personnel only.
- The air conditioner is the first class electric appliance. It must be properly grounding with specialized grounding device by a professional. Please make sure it is always grounded effectively, otherwise it may cause electric shock.
- The yellow-green wire in air conditioner is grounding wire, which can't be used for other purposes.
- The grounding resistance should comply with national electric safety regulations.
- The appliance must be positioned so that the plug is accessible.
- All wires of indoor unit and outdoor unit should be connected by a professional.
- If the length of power connection wire is insufficient, please contact the supplier for a new one. Avoid extending the wire by yourself.
- For the air conditioner with plug, the plug should be reachable after finishing installation.
- For the air conditioner without plug, an circuit break must be installed in the line.
- If you need to relocate the air conditioner to another place, only the qualified person can perform the work. Otherwise, it may cause personal injury or damage.
- Select a location which is out of reach for children and far away from animals or plants. If it is unavoidable, please add the fence for safety purpose.
- The indoor unit should be installed close to the wall.
- Before operation, please confirm whether power specification complies with that on nameplate.
- Before cleaning or maintaining the air conditioner, please turn off air conditioner and pull out the power plug.
- Make sure the power cord hasn't been pressed by hard objects.
- Do not pull or drag the power cord to pull out the power plug or move the air conditioner.
- Do not insert or pull out the power plug with wet hands. Please use the grounded power. Make sure the grounding is reliable.
- If the SUPPLY CORD is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- If abnormal condition occurs (e. g. burned smell), please disconnect power at once and then contact local dealer.
- When nobody is taking care of the unit, please turn it off and remove the power plug or disconnect power.

**WARNING****GENERAL INFORMATION**

- Do not splash or pour water on air conditioner. Otherwise, it may cause short circuit or damage to air conditioner.
- Prohibit operating heating equipment around the air conditioner.
- Prohibit operating the unit in the bathroom or laundry room.
- Far away from fire source, inflammable and explosive objects.
- Keep children from playing or climbing on the air conditioner.
- Do not put or hang dripping objects above the air conditioner.
- Do not repair or disassemble the air conditioner by yourself.
- Do not block air outlet or air inlet.
- Prohibit inserting any objects into the air conditioner.
- Do not through sundries into the air duct. If there are sundries get into the air duct, please contact the professionals to deal with it.
- Do not use an extension cord.
- A fuse or circuit breaker should be added at the product circuit. Please refer to the MOP value on the nameplate for the detailed specification.
- The appliance shall be installed in accordance with national wiring regulations.
- If a STATIONARY APPLIANCE is not fitted with a SUPPLY CORD and a plug, an all-pole disconnection switch having a contact separation of at least 3mm in all poles should be connected in fixed wiring.

 Working temperature range

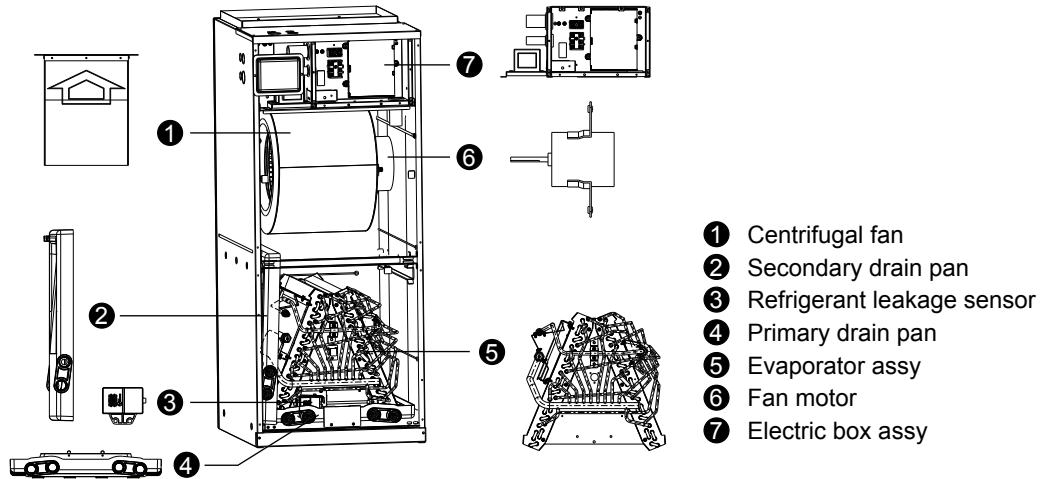
	Indoor side DB/WB(°C/°F)	Outdoor side DB/WB(°C/°F)
Maximum cooling	26.7/19.4(80/67)	see the outdoor unit Instruction manual
Maximum heating	26.7/-(80/-)	see the outdoor unit Instruction manual

- The operating temperature range (indoor temperature):
Cooling only unit: 16°C(61°F)~40°C(104°F);
Heat pump unit: for cooling mode is 16°C(61°F)~40°C(104°F);
for heating mode is 5°C(41°F)~30°C(86°F).

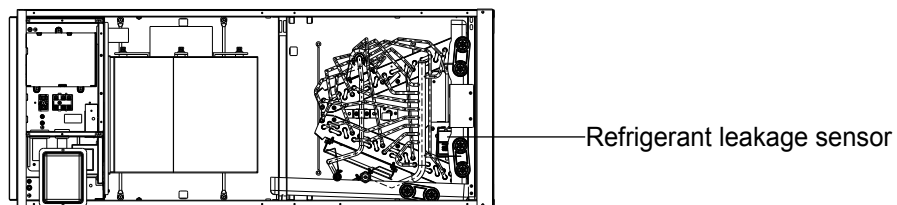
2 Product Introduction

2.1 Names of Main Parts

2.1.1 Vertical installation

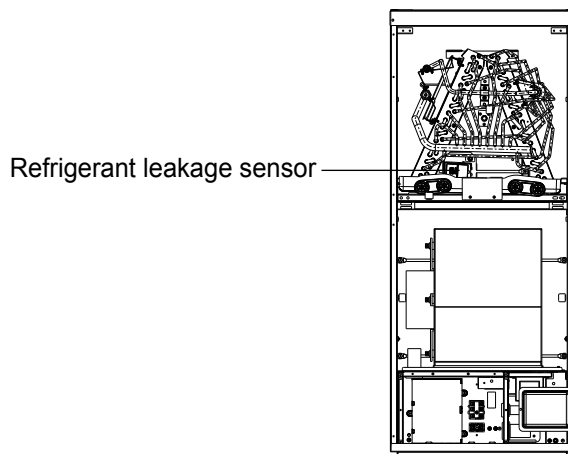


2.1.2 Horizontal installation



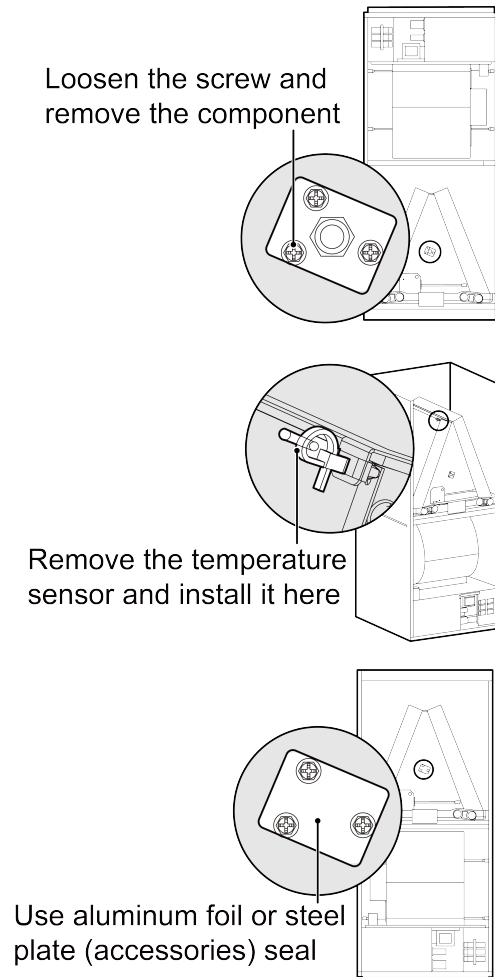
NOTE: When installing as shown in the figure, the refrigerant sensor needs to be installed in the position shown in the figure, remove the fixing screws of the Refrigerant Sensor and adjust the internal wiring to ensure that the internal wiring does not touch the sharp side, the wiring cannot exceed the drip pan and the wiring must not come into contact with water.

2.1.3 Downflow installation



NOTE: When installing as shown in the figure, adjust the internal wiring to ensure that the inner wiring will not meet the sharp side.

The inverted device also needs to adjust the position of the return air temperature package, as shown below. Firstly, loosen the screw and remove the component. Then, remove the temperature sensor and install it in the new position. Finally, use aluminum foil or steel plate (accessories) for sealing.



NOTE: If the refrigerant sensor is damaged, replace the refrigerant sensor as follows:

- (1) Remove the lower front side panel.
- (2) Remove the fixing screws of the refrigerant sensor.
- (3) Replace the refrigerant sensor with a new one.

The service life of the refrigerant sensor is fifteen years and the refrigerant sensor of the refrigerant detection system can only be replaced with the particular sensor which is specified by the manufacturer.

(4) Where a single remote refrigerant sensor is used in a room with multiple units, all units in the room which do not have a dedicated refrigerant detection system shall take the same actions. When an ITE COOLING APPLIANCE or PARTIAL UNIT'S REFRIGERANT DETECTION SYSTEMS for an appliances refrigerant circuit resets to a safe condition the unit shall not be allowed to initiate NORMAL OPERATIONS until all REFRIGERANT DETECTION SYSTEM systems in the CIRCULATION AIRFLOW have been reset.

Where a single REMOTE REFRIGERANT DETECTION system sensor is used in a room with multiple units, this requirement shall apply to all units in the room which do not have a dedicated REFRIGERANT DETECTIONSYSTEM.

3 Preparations for Installation

3.1 Pre-Installation Instruction

3.1.1 Checking Product Received

After receiving the product, please check if there is any damage caused by transportation. Shipping damage is the responsibility of the carrier. Verify the model number, specifications and accessories are correct prior to installation. The distributor or manufacturer will not accept claims from dealers for transportation damage or installation of incorrectly shipped units.

3.1.2 Before Installation

Carefully read all instructions for the installation prior to installing product. Make sure each step or procedure is understood and any special considerations are taken into account before starting installation. Assemble all tools, hardware and supplies needed to complete the installation. Some items may need to be purchased locally. Make sure everything needed to install the product is on hand before starting.

3.1.3 Codes & Regulations

This product is designed and manufactured to comply with national codes. It is installer's responsibilities to install the product in accordance with such codes and/or any prevailing local codes/regulations. The manufacturer assumes no responsibilities for equipment installed in violation of any codes or regulations.

3.1.4 Replacement Parts

When reporting shortages or damages, or ordering repair parts, give the complete product model and serial numbers as stamped on the product. Replacement parts for this product are available through your contractor or local distributor.

3.2 Important Safety Instructions

⚠ WARNING Before serving or installing this equipment. The electrical power to this unit must be in the "off" position. Caution, more than one disconnect may exist. Failure to observe this warning may result in an electrical shock that can cause personal injury or death.

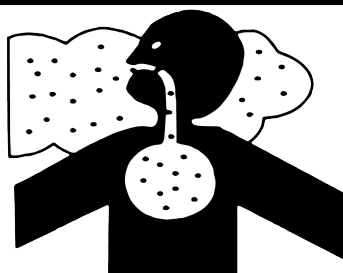
⚠ WARNING

The United States Environmental Protection Agency ("EPA") has issued various regulations regarding the introduction and disposal of refrigerants introduced into this unit. Failure to follow these regulations may harm the environment and can lead to the imposition of substantial fines. These regulations may vary due to the passage of laws. A certified technician must perform the installation and service of this product. Should questions arise, contact your local EPA office.

⚠ WARNING Due to high system pressure and electrical shock in potential, installation and service work can be dangerous. Only trained and qualified persons are permitted to install or service this equipment. Observe all warnings contained in this manual and labels/tags attached to the equipment.

⚠ WARNING This product is factory shipped for use with a 208/230V-1Ph-60Hz electrical power supply. This air handler must not be reconfigured to operate with any other power supply.

⚠ WARNING The unit must have an uninterrupted, unbroken electric grounding to minimize the possibility of personal injury if an electric fault occurs. The electric grounding circuit may consist of an appropriate sized power cord which connected with the grounding piece located in the unit control box and also connecting to the building electric service panel. Other methods of grounding are permitted if performed in accordance with the “National Electric Code” (NEC)/ “American National Standards Institute” (ANSI)/ “National Fire Protection Association” (NFPA) 70 and local/state codes. In Canada, electric grounding conforms to the Canadian electric code CSA c22.1. Failure to observe this warning can result in electrical shock that can cause personal injury.



CARBON MONOXIDE POISONING HAZARD

Special warning for installation of furnaces or air handling units in enclosed areas, such as garages, utility rooms or parking areas.

Carbon monoxide producing devices (such as an automobile, space heater, gas water heater, etc.) should not be operated in enclosed areas such as unventilated garages, utility rooms or parking areas because of the danger of carbon monoxide (CO) poisoning resulting from the exhaust emissions. If a furnace or air handler is installed in an enclosed area such as a garage, utility room or parking area and a carbon monoxide producing device is operated therein, there must be adequate ventilation directly to outside.

This ventilation is necessary to avoid the danger of CO poisoning which can occur if a carbon monoxide producing device continues to operate in the enclosed area. Carbon monoxide emission can be (re)circulated throughout the building if the furnace or air handler is operating in any mode.

CO can cause serious illness including permanent brain damage or death.

⚠ WARNING

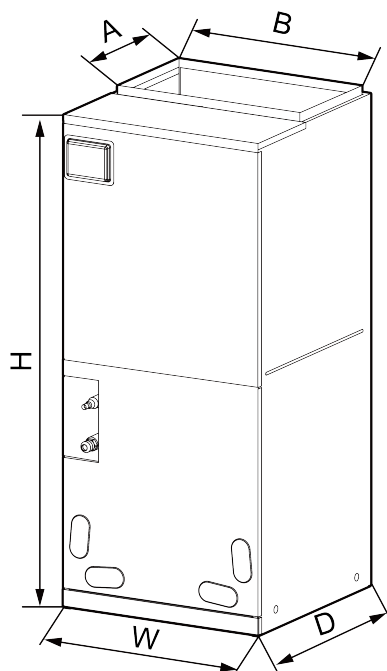
For appliances using FLAMMABLE REFRIGERANTS with safety features that depend upon the proper function of a leak detection system used for leak mitigation, the instructions and unit markings shall contain the substance of the following: “LEAK DETECTION SYSTEM installed. Unit must be powered except for service.” If any remote located REFRIGERANT SENSOR is employed to detect leaked refrigerant, such a remote located REFRIGERANT SENSOR shall also apply to this marking or be accompanied by such instructions.

3.3 Rated Working Condition

	Indoor Side Condition		Outdoor Side Condition	
	Dry Bulb Temp °C(°F)	Wet Bulb Temp °C(°F)	Dry Bulb Temp °C(°F)	Wet Bulb Temp °C(°F)
Rated Cooling	26.7(80.0)	19.4(67.0)	35(95.0)	23.9(75.0)
Rated Heating	21.1(70.0)	15.6(60.0)	8.3(47.0)	6.1(43.0)

4 Installation Instructions

4.1 Physical Dimension



Unit: inch(mm)

Model	Dimension				
	W	D	H	A	B
GFH(12)UA-D6DNA1A/I	18-1/8 (460)	21-1/4 (540)	43-1/2 (1105)	11-5/8 (295)	16-3/4 (426)
GFH(18)UA-D6DNA1A/I					
GFH(24)UA-D6DNA1A/I					

4.2 Location

⚠ WARNING	
(1)	The unit must be installed where strong enough to withstand the weight of the unit and fixed securely, otherwise the unit would topple or fall off.
(2)	The mounting bracket shall remain structurally sound throughout its service life. Any degradation must be repaired immediately; failure to do so may cause equipment detachment, resulting in personal injury or property damage.
(3)	Do not install where there is the danger of combustible gas leakage.
(4)	Do not install the unit at a place with leakage of inflammable gas.
(5)	Sealant must be applied at all penetration points where wiring, refrigerant lines, and condensate drain lines enter the cabinet.

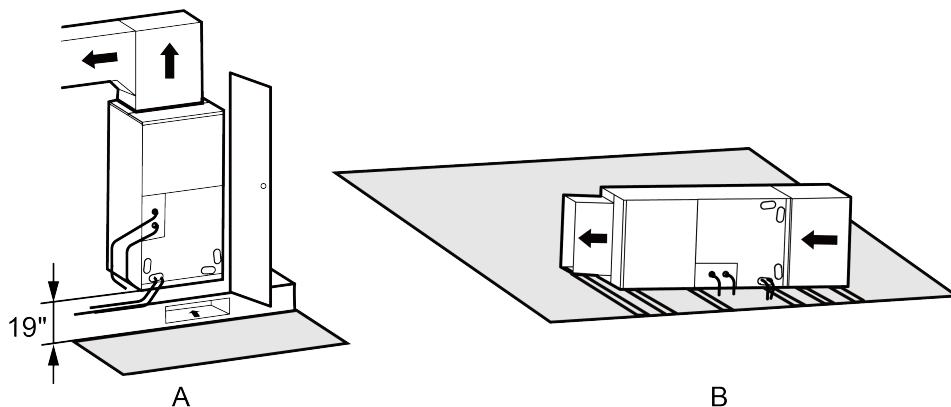
⚠ WARNING This air handler is designed for indoor installation only. Do not install it outdoors.

When installing the air handler, take consideration to minimize the length of refrigerant tubing as much as possible. Do not install the air handler in a location either above or below the condenser that violates the instructions provided with the condenser. Service clearance is to take precedence. Allow a minimum of 24" in front of the unit for service clearance. When installing the indoor unit, an external drain pan must be placed under the equipment to prevent condensate from entering the room. See local and state codes for requirements. When installing this unit in an area that may become wet, elevate the unit with a sturdy, non-porous material. In installations that may lead to physical damage (i.e. a garage) it is advised to install a protective barrier to prevent such damage. Incorrect installation of the indoor unit may result in inadequate drainage, potentially causing bacterial growth and associated health hazards. Inadequate drainage may also lead to corrosion of the unit. Vibration isolation, acoustic insulation, and noise control measures must be implemented during installation.

This air handler is designed for a complete supply and return ductwork system. Do not operate this product without all ductwork attached. The supply duct must be longer than 5 feet(1.524m).

Based upon the actual conditions, if air handler is installed as Fig. A, the air handler should be concealed in a specific room or space and make sure the air handler is not accessible to the general public. The height between the air handler and ground is above 19 in.

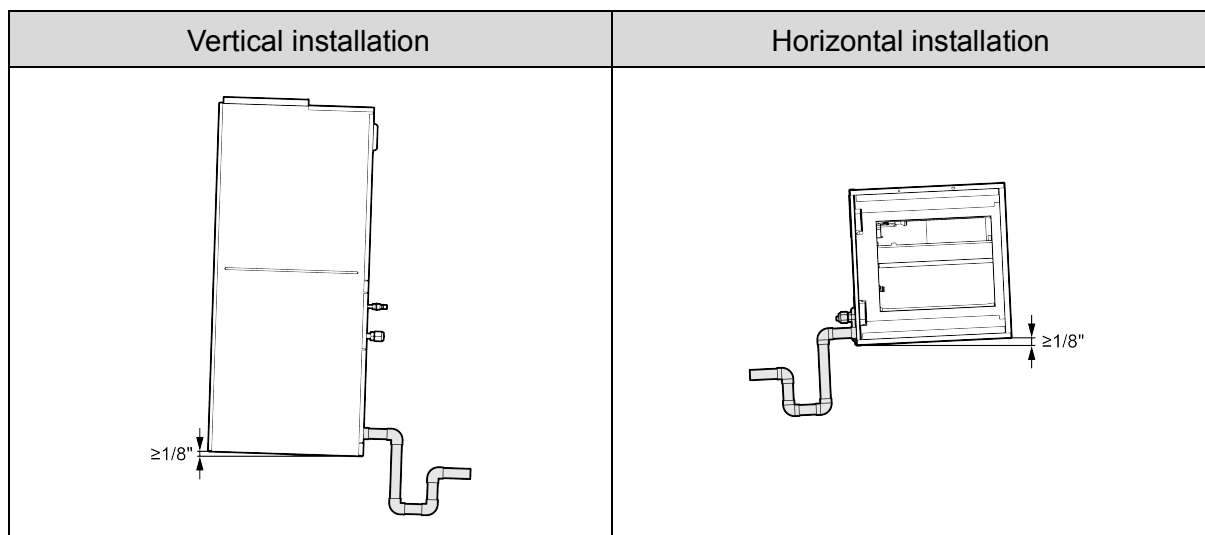
Based upon the actual conditions, if air handler is installed as Fig. B, make sure that there is enough space for care and maintenance and the height between the air handler and ground is above 2500mm. And the air handler is not accessible to the general public.



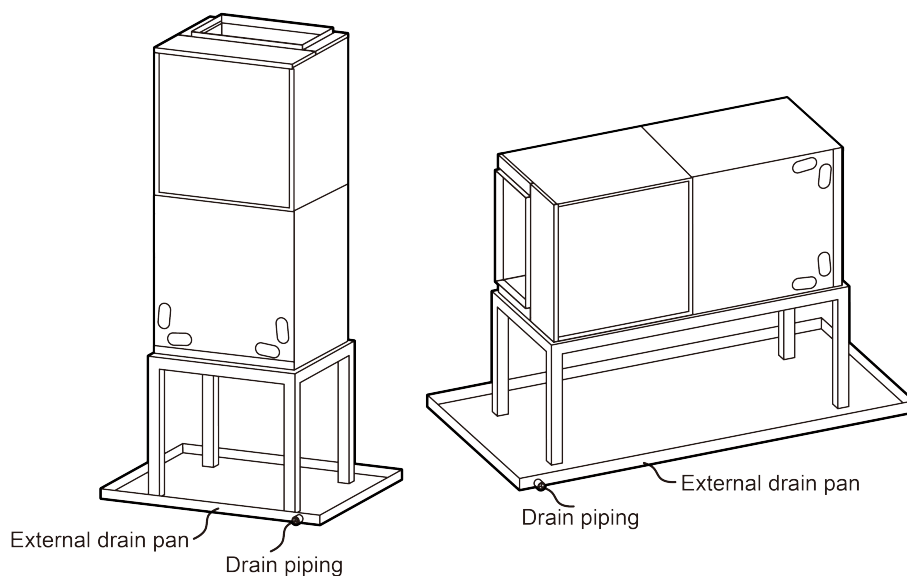
Measures should be reserved for easy disconnection and cleaning of the main drain pipe.

After installation, test the condensate pan and drain pipe. Pour sufficient water into the drain pan to fill the water seal and drain pipe. Check that the drain pan is completely emptied, there is no leakage at the drain pipe joints, and water is discharged from the end of the main drain pipe.

Make sure the unit is horizontal or slightly inclined towards the main drain so that the water in the drain pan can be completely drained. The unit shall be sloped at least 1/8 in./ft (10 mm/m) from the horizontal toward the drain outlet such that water drains freely from the pan. The following figure is for reference.



During cooling operation, condensation may form on the surface. An external drain pan must be installed, and the unit must be securely fastened to prevent falling. See the figure below.



NOTE: The use of external drain pans shall comply with local regulatory requirements.

NOTICE The product may be filled with helium or other gas. Before any operating, please ensure the gas inside the unit has been totally released. Otherwise, it may cause property loss or personal injury.

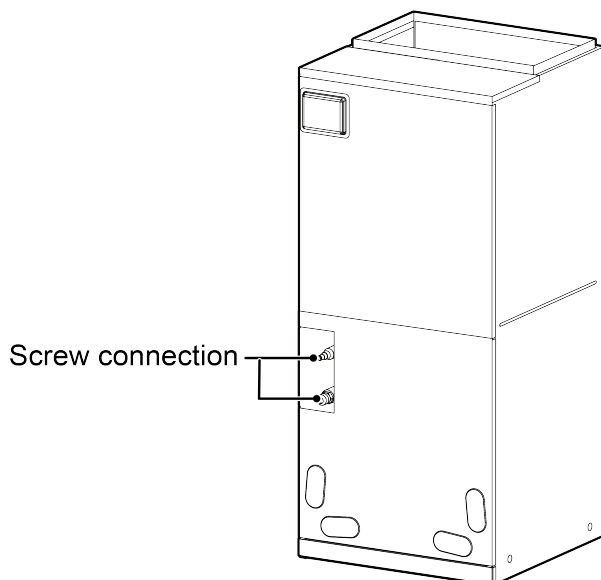
4.3 Piping Work

4.3.1 Specification of Connection Pipe

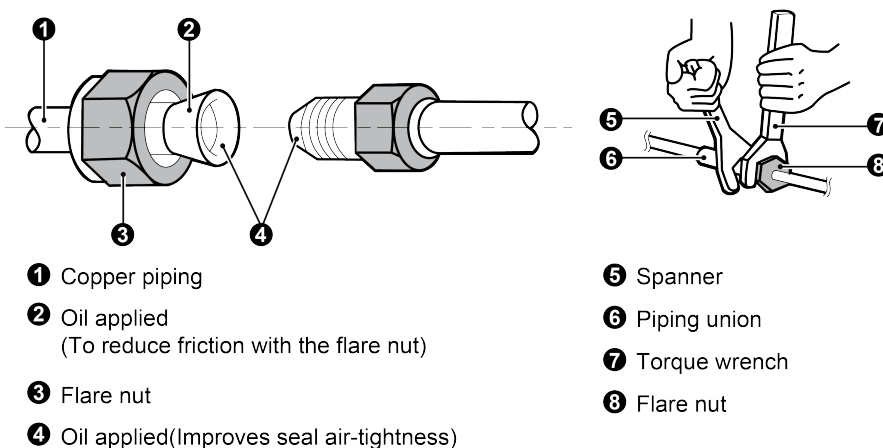
Model	External Diameter (inch)	
	Liquid Pipe	Gas Pipe
GFH(12)UA-D6DNA1A/I GFH(18)UA-D6DNA1A/I	Φ1/4	Φ1/2
GFH(24)UA-D6DNA1A/I	Φ1/4	Φ5/8

4.3.2 Piping Preparation

The connection of the gas pipe and the connection of the liquid pipe are screw connections. Prior to installation, the internal piping must be free of contaminants and protected against dust ingress. Any contamination may compromise the unit's operational integrity.



4.3.2.1 Screw Connection

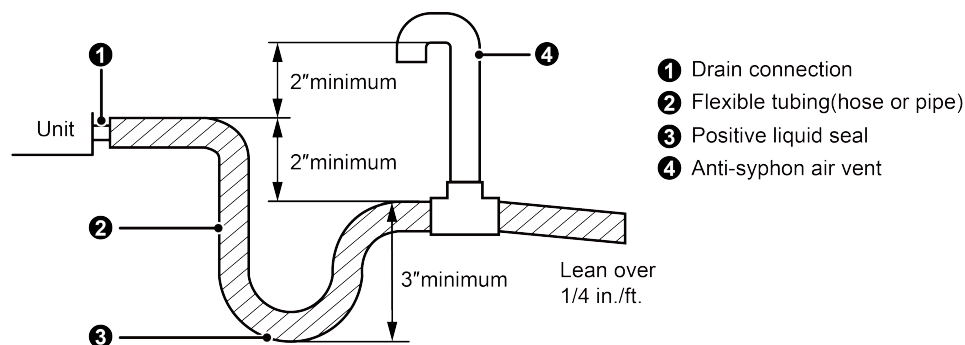


Pipe Diameter (inch)	Tightening Torque (N·m)
Φ1/4	15-30
Φ3/8	35-40
Φ1/2	45-50
Φ5/8	60-65
Φ3/4	70-75
Φ7/8	80-85

NOTE: Ensure the pipe is securely connected. Over-tightening may damage the bell mouth, while undertightening may result in refrigerant leakage.

4.4 Condensate Removal

- (1) It is not allowed to connect the condensate drain pipe into waste pipe or other pipelines which are likely to produce corrosive or peculiar smell to prevent the smell from entering indoors or corrupt the unit.
- (2) It is not allowed to connect the condensate drain pipe into rain pipe to prevent rain water from pouring in and cause property loss or personal injury.
- (3) The unit shall be sloped at least 1/8 in./ft (10 mm/m) from the horizontal toward the drain outlet such that water drains freely from the pan whether the fan is ON or OFF.
- (4) After the compressor stops, the indoor unit fan must be set with a delay of at least 3 minutes before shutting down by setting the thermostat.
- (5) Condensate drain pipe should be connected into special drain system for air conditioner.
- (6) Improper drainage may damage the house and property.
- (7) The drain pan has primary and secondary drain connection. Condensate removal is performed by attaching a 3/4" PVC pipe to the evaporator coil pan and terminated in accordance with local or state Plumbing/HVAC codes. The installation must include a trap that is located closely to the evaporator coil. Do not over-tighten the drain connection in order to prevent possible damage to the evaporator drain pan. See the following figure for details of a typical condensate line trap.



4.5 Ductwork

This air handler is designed for a complete supply and return ductwork system.

⚠ WARNING

Field ductwork must meet the National Fire Protection Association NFPA 90A, NFPA 90B and any applicable local ordinance.

Sheet metal ductwork run in unconditioned spaces must be insulated and covered with a vapor barrier. Fibrous ductwork may be used if constructed and installed in accordance with SMACNA Construction Standard on Fibrous Glass Ducts. Ductwork must comply with National Fire Protection Association as tested by U/L Standard 181 for Class I Air Ducts. Check local codes for requirements on ductwork and insulation.

Duct system must be designed within the range of external static pressure the unit is designed to operate against. It is important that the system airflow be adequate. Make sure supply and return ductwork, grills, special filters, accessories, etc. are accounted for in total resistance. See fan performance data in this manual.

Do not operate the unit without all ductwork completed.

Do not operate this product without all ductwork attached.

Inadequate ductwork that restricts airflow can result in improper performance and compressor or heater failure. Ductwork is to be constructed in a manner that limits restrictions and maintains suitable air velocity. Ductwork is to be sealed to the unit in a manner that will prevent leakage.

Return ductwork: Do not terminate the return ductwork in an area that can introduce toxic or objectionable fumes/odors into the ductwork. The return ductwork is to be introduced into the air handler bottom (up flow configuration).

Return Air Filters: Each installation must include a return air filter. This filtering may be performed at the air handler or externally such as a return air filter grille.

4.6 Electric Heater

The air handlers listed in this manual do not have factory installed electric heat. Electric heat is available as an accessory. Please refer to installation instructions provided with heater kit for the correct installation procedure.

⚠ WARNING Refer to the “Electric heater kits installation” section of this manual and the instructions provided with the heater kit for the correct installation procedure.

⚠ WARNING The electrical characteristics of the air handler, the electric heater kit, and the supply power should be identical. This air handler does not have factory installed electric heater. Electric heater is available as an accessory. If installing this option, the only heater kits that can be used are the series as indicated below. It is forbidden to use the electric heater other than those recommended.

⚠ WARNING Installation and debugging when attention to verify the switch sequence of electrical heating and fan, ensure the fan must be turned on when electric heating operation and ensure the electric heating is turned off before the fan to avoid unsafe. After turning off the electric heating, the indoor unit fan must be set with a delay of at least 3 minutes before shutdown by setting the thermostat.

⚠ WARNING Refer to the “Fan Performance Data” section of this manual, otherwise it is possible to cause an exception and dry risk of electric heating.

⚠ WARNING The supply ducts that are 5 feet away from electric heating must be at least 1 foot away from other combustibles or walls.

⚠ WARNING Installation of the electric heater must strictly adhere to the manufacturer's instructions. Unauthorized modification of the electric heating circuit is strictly prohibited, as it may cause fire hazards.

4.6.1 Electric Heater Kits Available

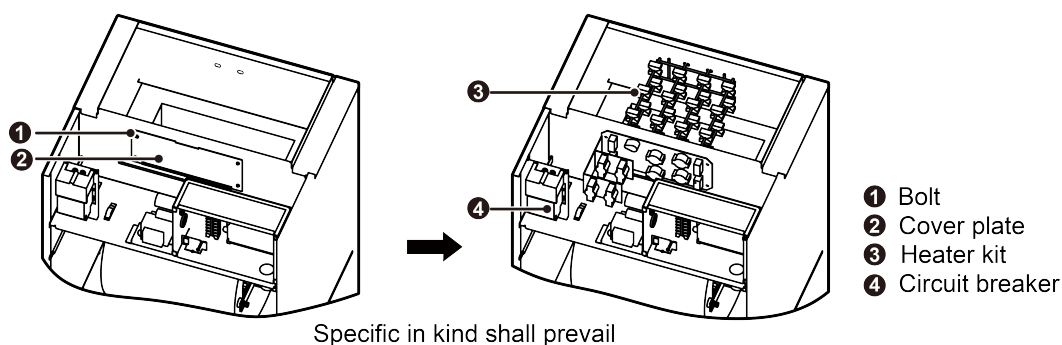
SN.	Kit1	Kit2	Description	Model
1	LYQ-08-A 5000W/240V	21-4227-01 5000W/240V	Circuit breaker, 5kW heat strip	GFH(12)UA-D6DNA1A/I GFH(18)UA-D6DNA1A/I
2	LYQ-08-C 10000W/240V	21-4216-03 10000W/240V	Circuit breaker, 10kW heat strip	GFH(24)UA-D6DNA1A/I

Maximum air outlet temperature 114.9℃.

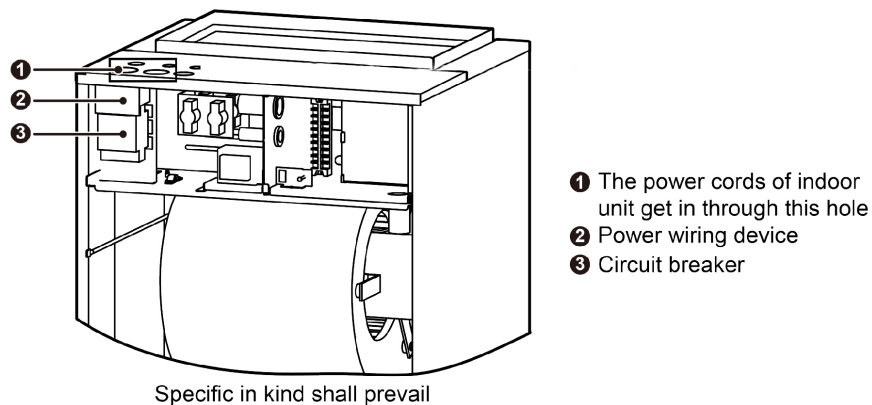
4.6.2 Electric Heater Kits Installation

⚠ CAUTION

- (1) Ensure that all power supply is disconnected prior to installing the heater kit.
- (2) A means of strain relief and conductor protection must be provided at the supply wire entrance into cabinet.
- (3) Use copper conductors only.
- (4) Installation must follow national electric code and other applicable codes.
- (5) If this appliance is installed in an enclosed area such as a garage or utility room with any carbon monoxide producing appliance, ensure the area is properly ventilated.
 - 1) Refer to the Table for appropriate heater kit.
 - 2) Check any physical damage, do not install damaged heater kit.
 - 3) Remove the upper access panel from air handler.
 - 4) Remove cover plate from air handler.
 - 5) Slide the heater kit in to the slot and secure element plate with previously removed screws.
 - 6) Before installing the electric heating, unplug the X1 terminal, and insert the plug-in terminals on the electric heating to the X1 and X2 terminals respectively.
 - 7) Insert power leads into the circuit breaker lugs and tighten.
 - 8) Connect the grounding wire to the grounding terminal; when installing the electric heater, the grounding screw must use an M6 screw or larger grounding screw.
 - 9) Knock off appropriate area of the plastic circuit breaker cover on the access panel of the air handler. Knock off the holes according to the actual installation number and positions of circuit breakers. If circuit breaker is not installed, do not knock off the holes; otherwise, electric shock may occur.
 - 10) Replace access panel and check operation.



11) Connection of power cords.



4.7 Installation of Wired Controller

Please refer to User Manual of Wired Controller for the installation details.

NOTICE! When installation is finished, the unit must be tested and debugged before operation. Please refer to Instruction Manual of ODU for auto addressing and debugging details.

5 Wiring Work

5.1 Requirement and Notice on Electrical Installation

⚠ WARNING

The electrical installation for the air conditioner should observe the following requirements:

- (1) The electrical installation must be conducted by professionals in compliance with local laws and regulations and the instructions in this manual. Never extend the power cords. The electric circuit must be equipped with a circuit breaker and air switch both with sufficient capacity.
- (2) The unit's operating power must be within the nominal range stated in the instruction manual. Use a specialized power circuit for the air conditioner. Do not draw power from another power circuit.
- (3) The air conditioner circuit should be at least 1.5m away from any inflammable surface.
- (4) The external power cords, the thermostat wires and thermostat must be effectively fixed.
- (5) The external power cords, the thermostat wires and thermostat can't directly contact any hot objects. For example: they must not contact chimney pipes, warm gas pipes or other hot objects.
- (6) The external power cords, the thermostat wires and thermostat must not be squeezed. Never pull, stretch or bend the wires.
- (7) The external power cords, the thermostat wires and thermostat must not collide with any metal beam or edge on the ceiling, or touch any metal burrs or sharp metal edge around.
- (8) Connect wires correspondingly by referring to the circuit diagram labeled on the unit or electric box. Screws must be tightened up. Slipped screws must be replaced by specialized flat-head screws.
- (9) Wiring terminals should be connected firmly to the terminal board. Loose connection is forbidden. All wiring must be firmly secured. Loose terminal connections may result in terminal overheating, leading to equipment failure or fire hazards.

- (10) The wire gauge of power cord should be large enough. Damaged power cords or other wires must be replaced by specialized wires. Wiring work must be done according to national wiring rules and regulations.
- (11) Wiring must not contact or rest against refrigerant lines or any moving parts within the equipment.
- (12) Electrical wiring must not cross signal wiring. Crossing may cause signal distortion, electromagnetic interference (EMI), or circuit board damage.
- (13) Power or signal cables must be protected in metal conduit to prevent rodent and mechanical damage.
- (14) The electrical box cover must be securely closed.

5.2 Wiring Requirements

Power Cord Size and Fuse Capacity

Model	Power Supply	Fuse Capacity	Min. Power Supply Cord
	V/Ph/Hz	A	
GFH(12)UA-D6DNA1A/I	208/230V-1ph-60Hz	3.15	4xAWG18
GFH(18)UA-D6DNA1A/I			
GFH(24)UA-D6DNA1A/I			

NOTICE

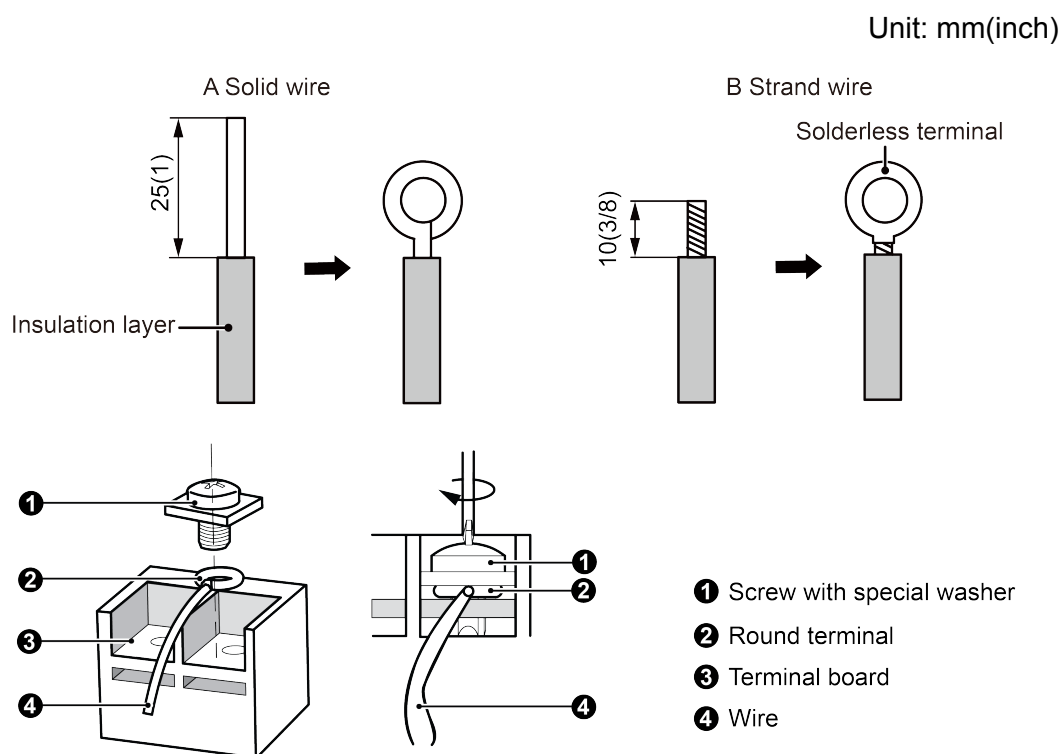
- (1) Use copper wire only as unit's power cord. Operating temperature should be within its value.
- (2) If the power cord is more than 15m (49-1/4 ft.) long, please increase properly the sectional area of power cord to avoid overload, which may cause accident.
- (3) Above selection requirements: Power cord size is based on BV single-core wire (2~4pc) at 40°C(104°F) Ambient temperature when laying across plastic pipe. Air switch is D type and used at 40°C(104°F). If actual installation condition varies, please lower the capacity appropriately according to the specifications of power cord and air switch provided by manufacturer.
- (4) Install cut-off device near the unit. The minimum distance between each stage of cut-off device should be 3mm(1/8 in.) (The same for both indoor unit and outdoor unit).

5.3 Connection of Power Cords

- (1) For solid wires (as shown below):
- 1) Use wire cutters to cut off the wire end and then peel away about 25mm of the insulation layer.
 - 2) Use a screwdriver to unscrew the terminal screw on the terminal board.
 - 3) Use nippers to bend the solid wire into a ring that fits the terminal screw.
 - 4) Form a proper ring and then put it on the terminal board. Use a screwdriver to tighten up the terminal screw.

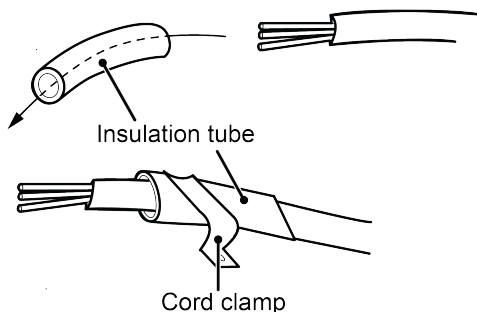
(2) For strand wires (as shown below):

- 1) Use wire cutters to cut off the wire end and then peel away about 10mm of the insulation layer.
- 2) Use a screwdriver to unscrew the terminal screw on the terminal board.
- 3) Use a round terminal fastener or clamp to fix the round terminal firmly on the peeled wire end.
- 4) Locate the round terminal conduit. Use a screwdriver to replace it and tighten up the terminal screw (as shown below).



(3) How to connect the thermostat wires and power cords.

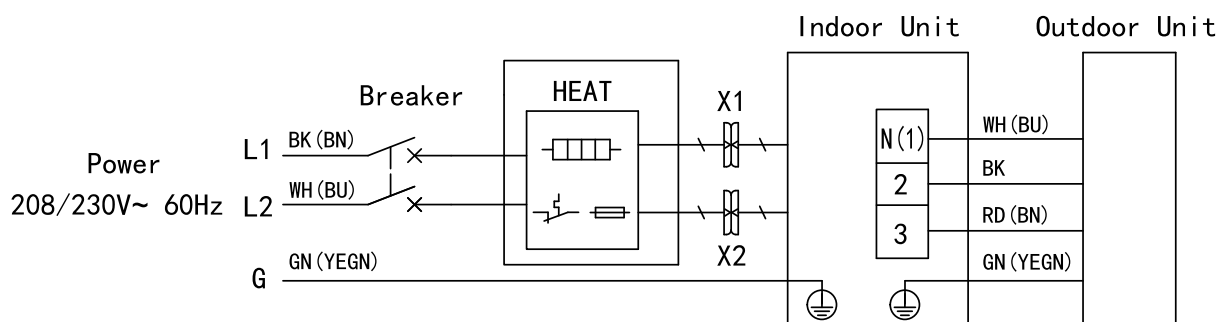
Lead the thermostat wires and power cords through the insulation tube. Then fix the wires with wire clamps (as shown in the following figure.)



⚠ WARNING

- (1) Before working, please check whether the indoor unit are powered on.
- (2) Match the terminal numbers and wire colors with the colors indicated in the indoor unit.
- (3) Wrong wire connection may burn the electrical components.
- (4) Connect the wires firmly to the wiring box. Incomplete installation may lead to fire hazard.
- (6) Ground wire should be connected.

Electrical wiring



⚠ WARNING

- (1) High and low voltage wires should be led through different rubber rings of the electric box cover.
- (2) Do not bundle up the thermostat wires or lay them side by side, otherwise errors will occur.
- (3) High and low voltage wires should be secured separately. Secure the former ones with big clamps and the latter ones with small clamps.
- (4) Use screws to tighten up the thermostat wires and power cords of unit on the terminal board.
Wrong connection may lead to fire hazard.
- (5) If the thermostat wires of unit and power cords are not correctly connected, the air conditioner may get damaged
- (6) Ground the unit through connecting the ground wire.
- (7) The units should comply with applicable local and national rules and regulations on power consumption.
- (8) When connecting the power cords, make sure the phase sequence of the power supply matches with the corresponding terminals, otherwise the compressor will get reversed and operate abnormally.

6 Setting of External Static Pressure

Working range for external static pressure of this series of duct type unit is 0 Pa~250 Pa. For corresponding external static pressure to the respective static pressure notch please see as below. The setting of static pressure for indoor fan can be done via wired controller and our debugging software. For specific setting method please see the Wired Controller Instruction Manual or Our Debugging Software Instruction Manual.

Applicable to:12K/18K/24K							
Static pressure notch for indoor fan	3	4	5	6	7	8	9
External static pressure (Pa)	0	20	50	100	150	200	250

External static pressure should stay within the minimum and maximum limits shown in the table below in order to ensure proper operation of both cooling and heating operation.

Model	GFH(12)UA-D6DNA1A/I, GFH(18)UA-D6DNA1A/I							GFH(24)UA-D6DNA1A/I						
Level	Static pressur: inwg(Pa)							Static pressur: inwg(Pa)						
	3 (0)	4 (20)	5 (50)	6 (100)	7 (150)	8 (200)	9 (250)	3 (0)	4 (20)	5 (50)	6 (100)	7 (150)	8 (200)	9 (250)
Speed 1(CFM)	765	590	340					1000	880	735	335	290	305	255
Speed 2(CFM)	825	705	500	285				1030	940	795	535	430	415	410
Speed 3(CFM)	1000	885	735	365	285	300	255	1120	1030	910	675	550	495	415
Speed 4(CFM)	1115	1030	910	725	575	520	470	1235	1175	1060	975	790	670	635

7 Maintenance

7.1 Maintenance before the Seasonal Use

- (1)Check if the air inlet and air outlet of indoor and outdoor unit are blocked.
- (2)Check if securely grounded.
- (3)Check if all the power cord and communication cable are securely connected.
- (4)Check if any error code displayed after energized.

7.2 Maintenance after the Seasonal Use

- (1)Set the unit in fan mode for half a day in a sunny day to dry the inner part of unit;
- (2)When the unit won't be used for a long time, please cut off power supply for energy saving;
the characters on the wired controller screen will disappear after cutting off the power supply.

8 Table of Error Codes for Indoor Unit

Number	Error code	Error
1	E1	Compressor high pressure protection
2	E2	Indoor anti-freeze protection
3	E3	Compressor low pressure protection, refrigerant lack protection and refrigerant colleting mode
4	E4	Compressor high discharge temperature protection
5	E5	AC over-current protection
6	E6	Communication error
7	E7	Mode conflict
8	E8	Anti-high temperature protection
9	E9	Full water protection
10	F1	Indoor ambient temperature sensor is open/short circuited
11	F2	Indoor evaporator temperature sensor is open/short circuited
12	F3	Outdoor ambient temperature sensor is open/short circuited
13	F4	Outdoor condenser temperature sensor is open/short circuited
14	F5	Outdoor discharge temperature sensor is open/short circuited
15	H6	No feedback of indoor fan motor
16	A2	Electric auxiliary heater relay sticking
17	C5	Jumper cap malfunction protection
18	EE	Loading EEPROM malfunction
19	EA	Refrigerant leakage alarm
20	FL	Outlet temperature sensor is open/short circuited
21	FE	Refrigerant sensor communication error

Note: If there're other error codes, please contact qualified professionals for service.

9 Troubleshooting

The air conditioner is not expected to be serviced by users. Incorrect repair may cause electric shock or fire, so please contact an authorized service center for professional service. The following checks prior to contact may save your time and money.

Phenomenon	Troubleshooting
The unit can't start	① Power supply is not connected. ② Circuit breaker tripping caused by leakage of electricity. ③ Input voltage is too low. ④ Defect of main PC-board.
The unit stops after running for a while.	① The inlet or outlet of ODU or IDU are blocked by obstacle.
Poor cooling effect	① The filter is dirty. ② Too heavy heat load of room(e.g. too many people) ③ Door or windows is open. ④ Inlet and outlet of IDU are blocked. ⑤ Setting temperature is too high. ⑥ Refrigerant is insufficient (e.g. refrigerant leakage)
Poor heating effect	① The filter is dirty. ② Door or window is open. ③ Setting temperature is too low. ④ Refrigerant is insufficient (e.g. refrigerant leakage)
Indoor fan doesn't start up during heating	① At starting, the IDU fan could not operate till the heat exchange become hot, for preventing delivering the cool air. ② At defrosting, the IDU fan stopped due to system switch to cooling mode. for preventing delivering the cool air, and resume operating after defrosting.

NOTICE!

If air conditioner still fails to work normally after checking and handling as described above, please stop using it immediately and contact local service center for assistance.

10 SPECIALIST'S MANUAL

Aptitude requirement for maintenance man(repairs should be done only by specialists).

- a. Any person who is involved with working on or breaking into a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority, which authorises their competence to handle refrigerants safely in accordance with an industry recognised assessment specification.
- b. Servicing shall only be performed as recommended by the equipment manufacturer. Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of the person competent in the use of flammable refrigerants.

That pipe-work including piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

- **Checks to the area**

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, the following precautions shall be complied with prior to conducting work on the system.

- **Work procedure**

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

- **General work area**

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

- **Checking for presence of refrigerant**

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking adequately sealed or intrinsically safe.

- **Presence of fire extinguisher**

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

- **No ignition sources**

No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

- **Ventilated area**

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

- **Checks to the refrigerating equipment**

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

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

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

resistant to being corroded or are suitably protected against being so corroded.

- **Checks to electrical devices**

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

Initial safety checks shall include:

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

- **Repairs to sealed components**

Sealed electrical components shall be replaced.

- **Repair to intrinsically safe components**

Intrinsically safe components must be replaced.

- **Cabling**

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

- **Detection of flammable refrigerants**

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

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

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

Leak detection fluids are also suitable for use with

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

NOTE: Examples of leak detection fluids are

- bubble method,
- fluorescent method agents.

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

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

- **Removal and evacuation**

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

- safely remove refrigerant following local and national regulations;
- evacuate;
- purge the circuit with inert gas (optional for A2L);
- evacuate (optional for A2L);
- continuously flush or purge with inert gas when using flame to open circuit; and
- open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

- **Charging procedures**

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

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.

- Cylinders shall be kept in an appropriate position according to the instructions.

- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.

- Label the system when charging is complete (if not already).

- Extreme care shall be taken not to overfill the refrigerating system.

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

- **Decommissioning**

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

- a) Become familiar with the equipment and its operation.

- b) Isolate system electrically.

- c) Before attempting the procedure, ensure that:

- mechanical handling equipment is available, if required, for handling refrigerant cylinders;
- all personal protective equipment is available and being used correctly;
- the recovery process is supervised at all times by a competent person;
- recovery equipment and cylinders conform to the appropriate standards.

- d) Pump down refrigerant system, if possible.

- e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.

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

- g) Start the recovery machine and operate in accordance with instructions.

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

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

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

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

- **Labelling**

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

- **Recovery**

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

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

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

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

If compressors or compressor oils are to be removed, ensure that they have been evacuated

to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Transportation, marking and storage for units

Transport of equipment containing flammable refrigerants.

Attention is drawn to the fact that additional transportation regulations may exist with respect to equipment containing flammable gas. The maximum number of pieces of equipment or the configuration of the equipment permitted to be transported together will be determined by the applicable transport regulations.

Marking of equipment using signs

Signs for similar appliances used in a work area are generally addressed by local regulations and give the minimum requirements for the provision of safety and/or health signs for a work location.

All required signs are to be maintained and employers should ensure that employees receive suitable and sufficient instruction and training on the meaning of appropriate safety signs and the actions that need to be taken in connection with these signs.

The effectiveness of signs should not be diminished by too many signs being placed together.

Any pictograms used should be as simple as possible and contain only essential details.

Disposal of equipment using flammable refrigerants

See national regulations.

Storage of equipment/appliances

The storage of the appliance should be in accordance with the applicable regulations or instructions, whichever is more stringent.

Avoid other heat sources or direct sun light.

Avoid a place where is possible for inflammable gas to leak out.

Storage of packed (unsold) equipment

Storage package protection should be constructed such a way that mechanical damage to the equipment inside the package will not cause a leak of the REFRIGERANT CHARGE.

The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

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