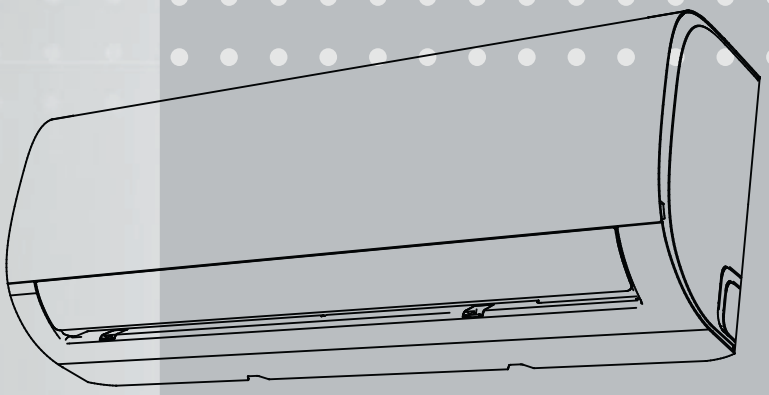
Active Series

HKEU 263 ZAL
HKEU 353 ZAL
HKEU 533 ZAL
HKEU 713 ZAL

User Manual

2019



R32

HOKKAIDO

CE

IMPORTANT NOTE:
Read this Manual carefully before installing or operating your new air conditioning unit.
Make sure to save this Manual for future reference.

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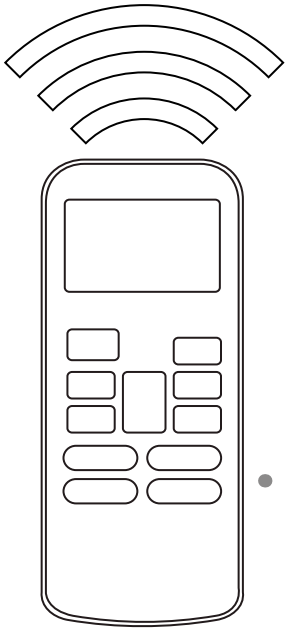

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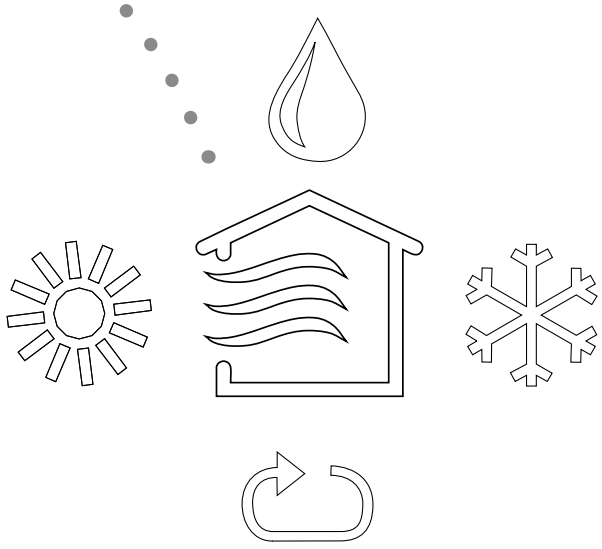

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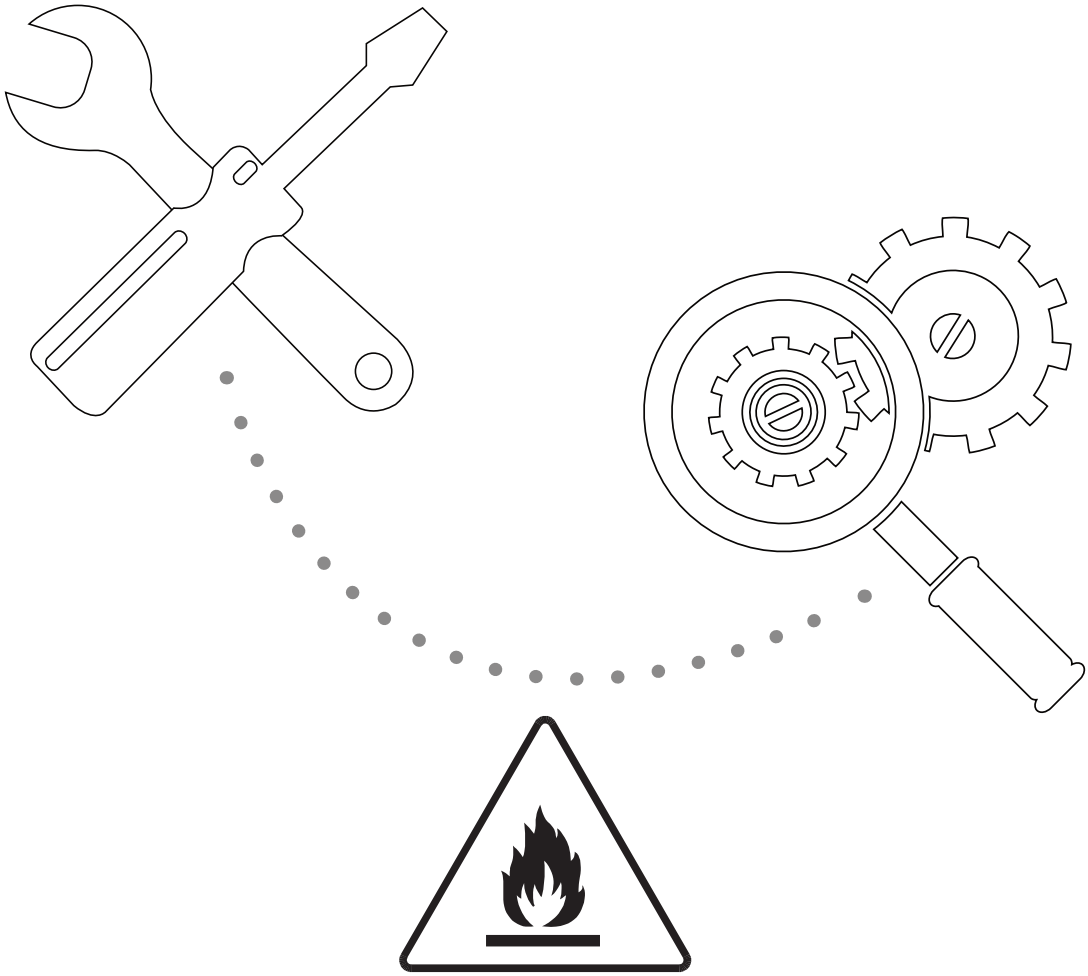


Caution: **Risk of fire / flammable materials**

(For R32/R290 units only)

WARNING: 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. For more details ,please refer to the "Information on servicing" (This is only required for the unit adopts R32/R290 Refrigerant).

Safety Precautions

Read Safety Precautions Before Installation

Incorrect installation due to ignoring instructions can cause serious damage or injury.
The seriousness of potential damage or injuries is classified as either a WARNING or CAUTION.

WARNING

Failure to observe a warning may result in death. The appliance must be installed in accordance with national regulations.

CAUTION

Failure to observe a caution may result in injury or equipment damage.

This symbol indicates that you must never perform the action indicated.

WARNING

1. Carefully read the Safety Precautions before installation.
2. In certain functional environments, such as kitchens, server rooms, etc., the use of specially designed air-conditioning units is highly recommended.
3. Only trained and certified technicians should install, repair and service this air conditioning unit.
4. Improper installation may result in electrical shock, short circuit, leaks, fire or other damage to the equipment and personal property.
   (In North America,installation must be performed in accordance with the requirement of NEC and CEC by authorized personnel only.)
5. Strictly follow the installation instructions set forth in this manual.
6. Before you install the unit, consider strong winds, typhoons and earthquakes that might affect your unit and locate it accordingly. Failure to do so could cause the equipment to fail.
7. 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.
   (EN Standard requirements)
8. Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
9. 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. (IEC Standard requirement)
10. Children should be supervised to ensure that they do not play with the appliance..
    (IEC Standard requirement)

⚠ WARNING

11. 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.
12. The appliance shall be installed in accordance with national wiring regulations.
13. An all-pole disconnection device which has at least 3mm clearances in all poles, and have a leakage current that may exceed 10mA,the residual current device (RCD) having a rated residual operating current not exceeding 30mA,and disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.
14. The appliance disconnection must be incorporated with an all-pole disconnection device in the fixed wiring in accordance with the wiring rules.
15. 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.
16. Servicing shall only be performed as recommended by the equipment manufacturer.
17. 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.
18. The appliance shall be stored so as to prevent mechanical damage from occurring.
19. Keep ventilation openings clear of obstruction.
20. Do not turn on the power until all work has been completed.
21. When moving or relocating the air conditioner, consult experienced service technicians for disconnection and reinstallation of the unit
22. In certain functional environments, such as kitchens, server rooms, etc., the use of specially designed air-conditioning units is highly recommended.
23. Removal of the plug has to be such that an operator can check from any of the points to which he has access that the plug remains removed.
24. If this is not possible, due to the construction of the appliance or its installation, a disconnection with a locking system in the isolated position shall be provided.
25. How to install the appliance to its support, please read the information for details in "indoor unit installation" and "outdoor unit installation".

⚠ CAUTION

- ⊘ For units that have an auxiliary electric heater, do not install the unit within 1 meter (3 feet) of any combustible materials.
- ⊘ Do not install the unit in a location that may be exposed to combustible gas leaks. If combustible gas accumulates around the unit, it may cause fire.
- ⊘ Do not operate your air conditioner in a wet room such as a bathroom or laundry room. Too much exposure to water can cause electrical components to short circuit.

1. The product must be properly grounded at the time of installation, or electrical shock may occur.
2. Install drainage piping according to the instructions in this manual. Improper drainage may cause water damage to your home and property.

⚠ Cautions for using R32/R290 refrigerant

1. Installation (Space)
   - That the installation of pipe-work shall be kept to a minimum.
   - That pipe-work shall be protected from physical damage.
   - That compliance with national gas regulations shall be observed.
   - That mechanical connections shall be accessible for maintenance purposes.
   - In cases that require mechanical ventilation, ventilation openings shall be kept clear of obstruction.
   - When disposing of the product is used, be based on national regulations, properly processed.
   -The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation.
   -Spaces where refrigerant pipes shall be compliance with national gas regulations.
2. Servicing
   - 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.
   - 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.
3. Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
4. 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)
5. Do not pierce or burn.
6. Be aware that refrigerants may not contain an odour.
7. Be more careful that foreign matter(oil, water,etc) does not enter the piping. Also, when storing the piping, securely seal the opening by pinching, taping, etc.
   For indoor units, use R32 flareless joint assy only when connecting the indoor unit and connecting piping(when connecting indoors). Use of pipes, flareless nut or flare nuts other than specified, may cause product malfunction, burst piping, or injury due to high internal pressure of the refrigerant cycle caused by any inflow air.
8. Appliance shall be installed, operated and stored in a room with a floor area larger than X m^2 (Please see the following form). The appliance shall not be installed in an unventilated space, if that space is smaller than X m^2 (Please see the following form).

Max Refrigerant Charge (kg)

Table.1-1

Refrigerant Type	LFL(kg/m^3)	Installation Height H0(m)	Floor Area (m^2)						
			4	7	10	15	20	30	50
R32	0.306	0.6	0.68	0.90	1.08	1.32	1.53	1.87	2.41
		1.0	1.14	1.51	1.80	2.20	2.54	3.12	4.02
		1.8	2.05	2.71	3.24	3.97	4.58	5.61	7.24
		2.2	2.50	3.31	3.96	4.85	5.60	6.86	8.85

Min. Room Area (m^2)

Table.1-2

Refrigerant Type	LFL(kg/m^3)	Installation Height H0(m)	Charge Amount in kg Minimum Room Area (m^2)						
			1.224	1.836	2.448	3.672	4.896	6.12	7.956
R32	0.306	0.6		29	51	116	206	321	543
		1.0		10	19	42	74	116	196
		1.8		3	6	13	23	36	60
		2.2		2	4	9	15	24	40

Note about Fluorinated Gasses

1. This air-conditioning unit contains fluorinated greenhouse gasses. For specific information on the type of gas and the amount, please refer to the relevant label on the unit itself or the "Owner's Manual - Product Fiche " in the packaging of the outdoor unit. (European Union products only).
2. Installation, service, maintenance and repair of this unit must be performed by a certified technician.
3. Product uninstallation and recycling must be performed by a certified technician.
4. For equipment that contains fluorinated greenhouse gases in quantities of 5 tonnes of CO_2 equivalent or more, but of less than 50 tonnes of CO_2 equivalent, If the system has a leak-detection system installed, it must be checked for leaks at least every 24 months.
5. When the unit is checked for leaks, proper record-keeping of all checks is strongly recommended.

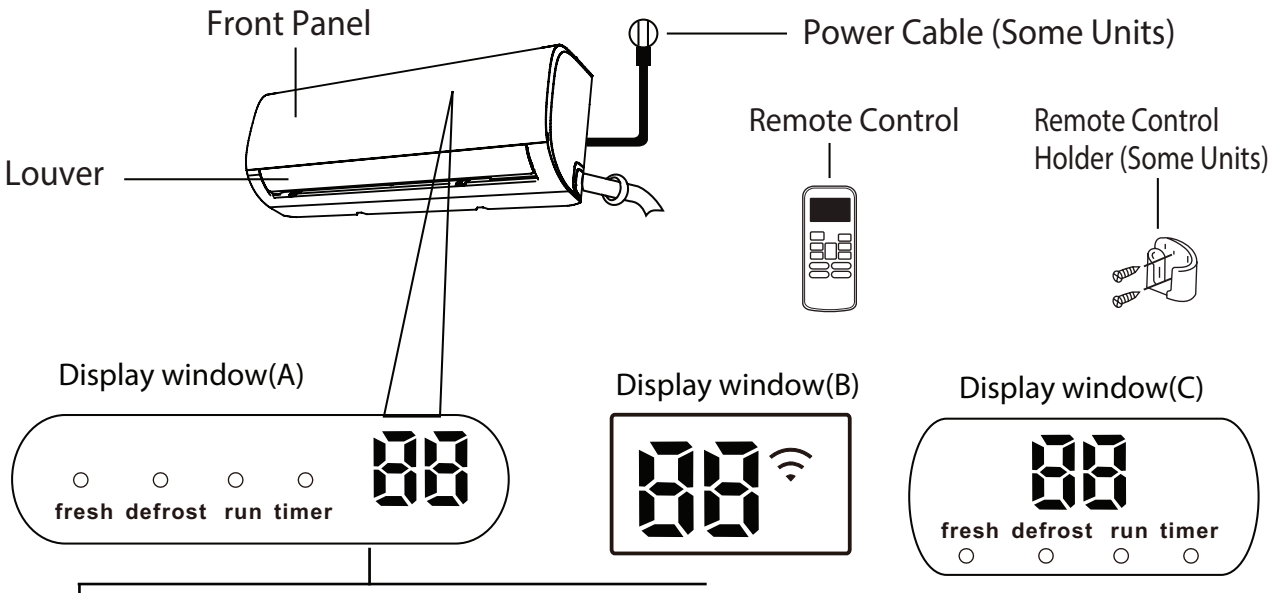
Explanation of symbols displayed on the indoor unit or outdoor unia
(applicable to the unit adopts R32/R290 Refrigerant only):

	WARNING	This symbol shows that this appliance uses a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire.
	CAUTION	This symbol shows that the operation manual should be read carefully.
	CAUTION	This symbol shows that a service personnel should be handling this equipment with reference to the installation manual.
	CAUTION	
	CAUTION	This symbol shows that information is available such as the operating manual or installation manual.

Unit Specifications and Features

1

Unit Parts



"fresh" when Fresh feature is activated (some units)

"defrost" when Defrost feature is activated

"run" when the unit is on

"timer" when TIMER is set

"88" Not available for all units.
When ECO function (some units) is activated, the "88" illuminates gradually one by one as --
-- 0--set temperature -- ..... in one second interval.
In other modes, the unit will display your temperature setting.
In Fan mode, the unit will display the room temperature.
When error occurs, it displays error code.

Display Code Meanings

"ON" for 3 seconds when:
- TIMER ON is set
- FRESH, SWING, TURBO, or SILENCE features are turned on

"OF" for 3 seconds when:
- TIMER OFF is set
- FRESH, SWING, TURBO, or SILENCE features are turned off

"cF" when anti-cold air feature is turned on

"dF" when defrosting

"SC" when unit is self-cleaning

"FP" when freeze protection is turned on

"" when Wireless Control feature is activated(some units)

NOTE: A guide on using the infrared remote is not included in this literature package.

Achieving Optimal Performance

Optimal performance for the COOL, HEAT, and DRY modes can be achieved in the following temperature ranges. When your air conditioner is used outside of these ranges, certain safety protection features will activate and cause the unit to perform less than optimally.

Inverter Split Type

	COOL mode	HEAT mode	DRY mode
Room Temperature	17°C - 32°C (63°F - 90°F)	0°C - 30°C (32°F - 86°F)	10°C - 32°C (50°F - 90°F)
Outdoor Temperature	0°C - 50°C (32°F - 122°F)	-15°C - 30°C (5°F - 86°F)	0°C - 50°C (32°F - 122°F)
	-15°C - 50°C (5°F - 122°F) (For models with low temp. cooling systems.)		
	0°C - 60°C (32°F - 140°F) (For special tropical models)		0°C - 60°C (32°F - 140°F) (For special tropical models)

FOR OUTDOOR UNITS WITH AUXILIARY ELECTRIC HEATER

When outside temperature is below 0°C (32°F), we strongly recommend keeping the unit plugged in at all time to ensure smooth ongoing performance.

To further optimize the performance of your unit, do the following:

- Keep doors and windows closed.
- Limit energy usage by using TIMER ON and TIMER OFF functions.
- Do not block air inlets or outlets.
- Regularly inspect and clean air filters.

For a detailed explanation of each function, refer to the Remote Control Manual.

Other Features

- Silence Function & FP (Anti-freeze) Function (some units)

  - When "Silence" function is activated, the compressor will operate at low frequency and the Indoor Unit will bring faint breeze, which will reduce the noise to the lowest level and create a quiet and comfortable room for you.

  - When "FP" function (Antifreeze) is activated in Heating mode, the Unit will operate at a setting temperature of 8°C: this is useful to keep a constant temperature in your home while you are out - for example on vacation - for a certain period of time. This function prevents the system from freezing.

- Selfclean Function

  - Thanks to this function, bacteria grown in the moisture that condenses around the heat exchanger are automatically removed.

- Auto-Restart
  If the unit loses power, it will automatically restart with the prior settings once power has been restored.

- Anti-mildew (some units)
  When turning off the unit from COOL, AUTO (COOL), or DRY modes, the air conditioner will continue operate at very low power to dry up condensed water and prevent mildew growth.

- Louver Angle Memory (some units)
  When turning on your unit, the louver will automatically resume its former angle.

- Refrigerant Leakage Detection (some units)
  The indoor unit will automatically display "EC" when it detects refrigerant leakage.

For a detailed explanation of your unit's advanced functionality (such as TURBO mode and its self-cleaning functions), refer to the Remote Control Manual.

NOTE ON ILLUSTRATIONS

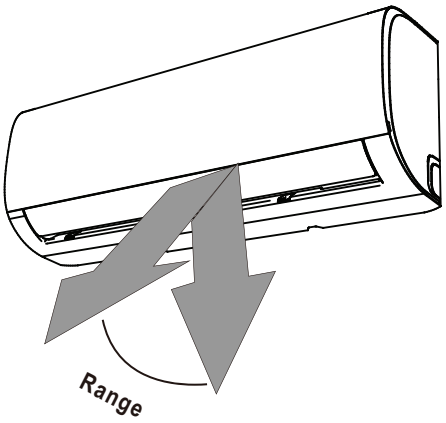
Illustrations in this manual are for explanatory purposes. The actual shape of your indoor unit may be slightly different. The actual shape shall prevail.

Setting Angle of Air Flow

Setting vertical angle of air flow

While the unit is on, use the SWING/DIRECT button to set the direction (vertical angle) of airflow.

1. Press the SWING/DIRECT button once to activate the louver. Each time you press the button, it will adjust the louver by 6°. Press the button until the direction you prefer is reached.
2. To make the louver swing up and down continuously, press and hold the SWING/ DIRECT button for 3 seconds. Press it again to stop the automatic function.



Caution: Do not keep louver at too vertical an angle for long periods of time. This can cause water condensation to drip on your furnishings.

Fig. A

Setting horizontal angle of air flow

The horizontal angle of the airflow must be set manually. Grip the deflector rod (See Fig.B) and manually adjust it to your preferred direction. For some units, the horizontal angle of the airflow can be set by remote control. please refer to the Remote Control Manual.

NOTE ON LOUVER ANGLES

When using COOL or DRY mode, do not set louver at too vertical an angle for long periods of time. This can cause water to condense on the louver blade, which will drop on your floor or furnishings. (See Fig.A)

When using COOL or HEAT mode, setting the louver at too vertical an angle can reduce the performance of the unit due to restricted air flow.

Do not move louver by hand. This will cause the louver to become out of sync. If this occurs, turn off the unit and unplug it for a few seconds, then restart the unit. This will reset the louver.

CAUTION

Do not put your fingers in or near the blower and suction side of the unit. The high-speed fan inside the unit may cause injury.

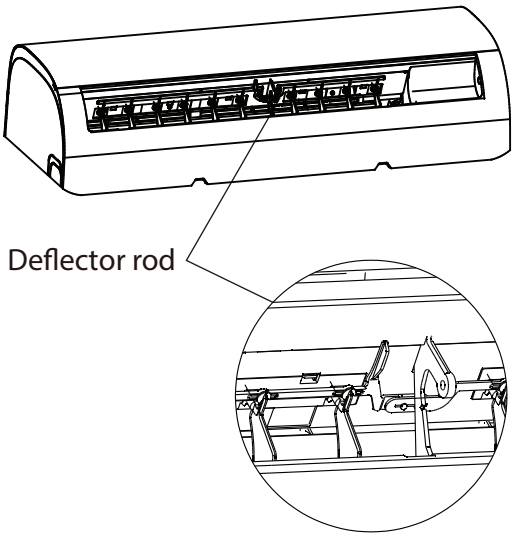


Fig. B

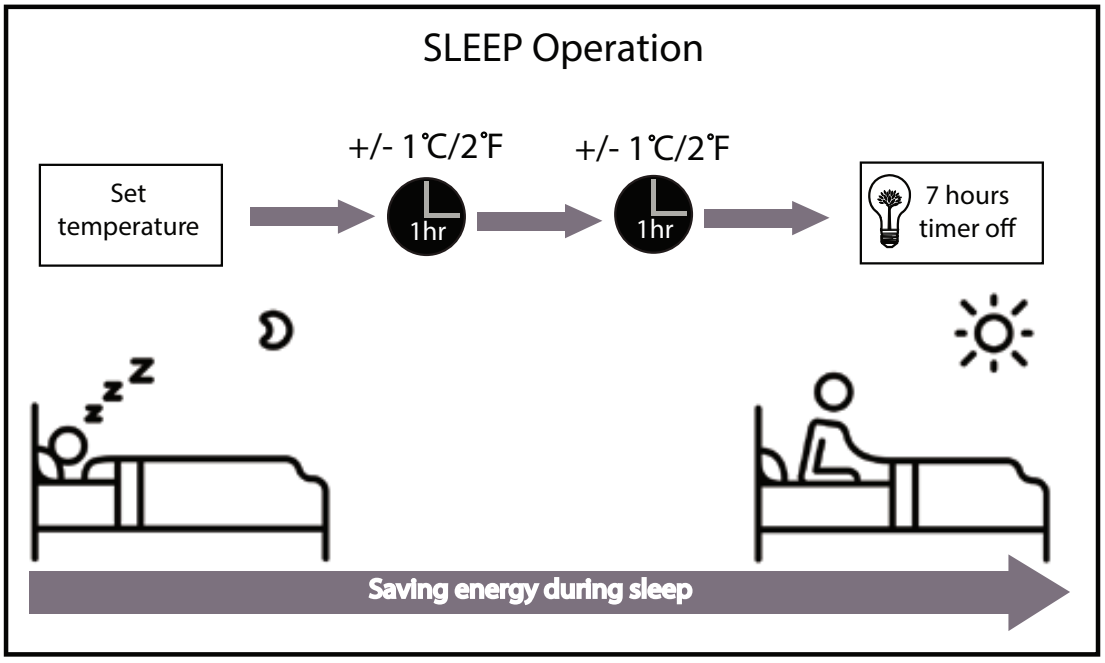
- Sleep Operation

The SLEEP function is used to decrease energy use while you sleep (and don't need the same temperature settings to stay comfortable). This function can only be activated via remote control.

Press the SLEEP button when you are ready to go to sleep. When in COOL mode, the unit will increase the temperature by 1°C (2°F) after 1 hour, and will increase an additional 1°C (2°F) after another hour. When in HEAT mode, the unit will decrease the temperature by 1°C (2°F) after 1 hour, and will decrease an additional 1°C (2°F) after another hour.

It will hold the new temperature for 5 hours, then the unit will turn off automatically.

Note: The SLEEP function is not available in FAN or DRY mode.



Manual Operation (Without Remote) 2

How to operate your unit without the remote control

In the event that your remote control fails to work, your unit can be operated manually with the MANUAL CONTROL button located on the indoor unit. Note that manual operation is not a long-term solution, and that operating the unit with your remote control is strongly recommended.

BEFORE MANUAL OPERATION

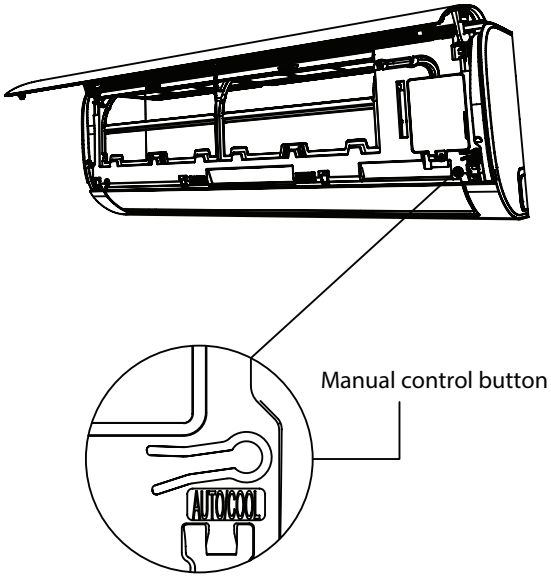
Unit must be turned off before manual operation.

To operate your unit manually:

1. Open the front panel of the indoor unit.
2. Locate the MANUAL CONTROL button on the right-hand side of the unit.
3. Press the MANUAL CONTROL button one time to activate FORCED AUTO mode.
4. Press the MANUAL CONTROL button again to activate FORCED COOLING mode.
5. Press the MANUAL CONTROL button a third time to turn the unit off.
6. Close the front panel.

CAUTION

The manual button is intended for testing purposes and emergency operation only. Please do not use this function unless the remote control is lost and it is absolutely necessary. To restore regular operation, use the remote control to activate the unit.



Care and Maintenance

3

Cleaning Your Indoor Unit

BEFORE CLEANING OR MAINTENANCE

ALWAYS TURN OFF YOUR AIR CONDITIONER SYSTEM AND DISCONNECT ITS POWER SUPPLY BEFORE CLEANING OR MAINTENANCE.

CAUTION

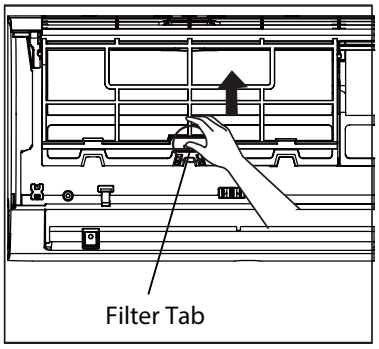
Only use a soft, dry cloth to wipe the unit clean. If the unit is especially dirty, you can use a cloth soaked in warm water to wipe it clean.

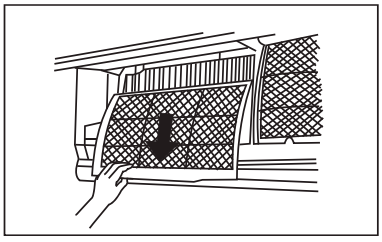
- Do not use chemicals or chemically treated cloths to clean the unit
- Do not use benzene, paint thinner, polishing powder or other solvents to clean the unit. They can cause the plastic surface to crack or deform.
- Do not use water hotter than 40°C (104°F) to clean the front panel. This can cause the panel to deform or become discolored.

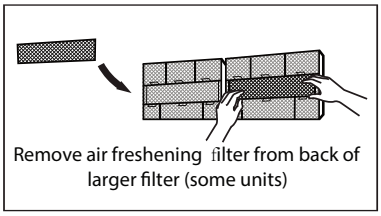
Cleaning Your Air Filter

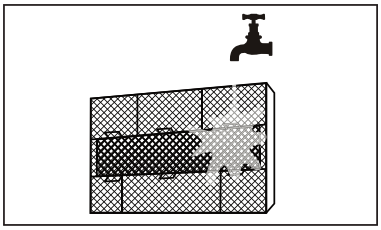
A clogged air conditioner can reduce the cooling efficiency of your unit, and can also be bad for your health. Make sure to clean the filter once every two weeks.

1. Lift the front panel of the indoor unit.
2. Grip the tab on the end of the filter, lift it up,then pull it towards yourself.
3. Now pull the filter out.
4. If your filter has a small air freshening filter, unclip it from the larger filter. Clean this air freshening filter with a hand-held vacuum.
5. Clean the large air filter with warm, soapy water. Be sure to use a mild detergent.
6. Rinse the filter with fresh water, then shake off excess water.
7. Dry it in a cool, dry place, and refrain from exposing it to direct sunlight.
8. When dry, re-clip the air freshening filter to the larger filter, then slide it back into the indoor unit.
9. Close the front panel of the indoor unit.









CAUTION

Do not touch air freshening (Plasma) filter for at least 10 minutes after turning off the unit.

CAUTION

- Before changing the filter or cleaning, turn off the unit and disconnect its power supply.
- When removing filter, do not touch metal parts in the unit. The sharp metal edges can cut you.
- Do not use water to clean the inside of the indoor unit. This can destroy insulation and cause electrical shock.
- Do not expose filter to direct sunlight when drying. This can shrink the filter.

Air Filter Reminders (Optional)

Air Filter Cleaning Reminder

After 240 hours of use, the display window on the indoor unit will flash "CL." This is a reminder to clean your filter. After 15 seconds, the unit will revert to its previous display.

To reset the reminder, press the LED button on your remote control 4 times, or press the MANUAL CONTROL button 3 times. If you don't reset the reminder, the "CL" indicator will flash again when you restart the unit.

Air Filter Replacement Reminder

After 2,880 hours of use, the display window on the indoor unit will flash "nF." This is a reminder to replace your filter. After 15 seconds, the unit will revert to its previous display.

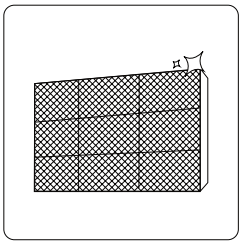
To reset the reminder, press the LED button on your remote control 4 times, or press the MANUAL CONTROL button 3 times. If you don't reset the reminder, the "nF" indicator will flash again when you restart the unit.

CAUTION

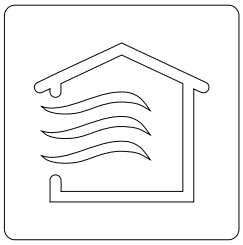
- Any maintenance and cleaning of outdoor unit should be performed by an authorized dealer or a licensed service provider.
- Any unit repairs should be performed by an authorized dealer or a licensed service provider.

Maintenance – Long Periods of Non-Use

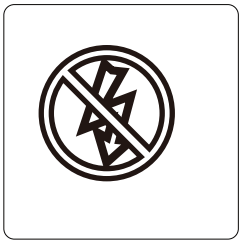
If you plan not to use your air conditioner for an extended period of time, do the following:



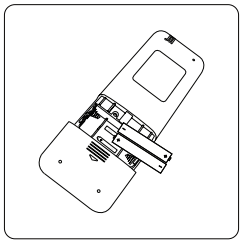
Clean all filters



Turn on FAN function until unit dries out completely



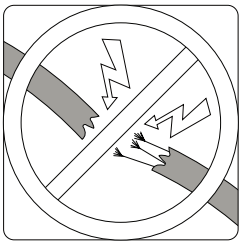
Turn off the unit and disconnect the power



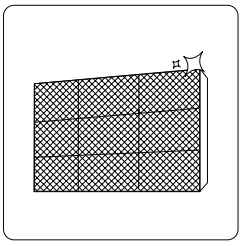
Remove batteries from remote control

Maintenance – Pre-Season Inspection

After long periods of non-use, or before periods of frequent use, do the following:

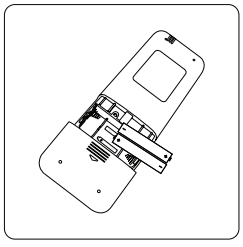


Check for damaged wires

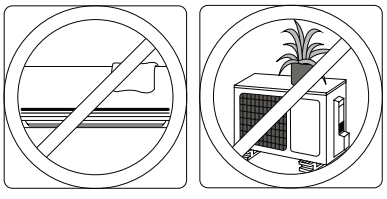


Clean all filters

Check for leaks



Replace batteries



Make sure nothing is blocking all air inlets and outlets

Troubleshooting 4

SAFETY PRECAUTIONS

If ANY of the following conditions occurs, turn off your unit immediately!

- The power cord is damaged or abnormally warm
- You smell a burning odor
- The unit emits loud or abnormal sounds
- A power fuse blows or the circuit breaker frequently trips
- Water or other objects fall into or out of the unit

DO NOT ATTEMPT TO FIX THESE YOURSELF! CONTACT AN AUTHORIZED SERVICE PROVIDER IMMEDIATELY!

Common Issues

The following problems are not a malfunction and in most situations will not require repairs.

Issue	Possible Causes
Unit does not turn on when pressing ON/OFF button	The Unit has a 3-minute protection feature that prevents the unit from overloading. The unit cannot be restarted within three minutes of being turned off.
The unit changes from COOL/HEAT mode to FAN mode	The unit may change its setting to prevent frost from forming on the unit. Once the temperature increases, the unit will start operating in the previously selected mode again.
	The set temperature has been reached, at which point the unit turns off the compressor. The unit will continue operating when the temperature fluctuates again.
The indoor unit emits white mist	In humid regions, a large temperature difference between the room's air and the conditioned air can cause white mist.
Both the indoor and outdoor units emit white mist	When the unit restarts in HEAT mode after defrosting, white mist may be emitted due to moisture generated from the defrosting process.

Issue	Possible Causes
The indoor unit makes noises	A rushing air sound may occur when the louver resets its position.
	A squeaking sound may occur after running the unit in HEAT mode due to expansion and contraction of the unit's plastic parts.
Both the indoor unit and outdoor unit make noises	Low hissing sound during operation: This is normal and is caused by refrigerant gas flowing through both indoor and outdoor units.
	Low hissing sound when the system starts, has just stopped running, or is defrosting: This noise is normal and is caused by the refrigerant gas stopping or changing direction.
	Squeaking sound: Normal expansion and contraction of plastic and metal parts caused by temperature changes during operation can cause squeaking noises.
The outdoor unit makes noises	The unit will make different sounds based on its current operating mode.
Dust is emitted from either the indoor or outdoor unit	The unit may accumulate dust during extended periods of non-use, which will be emitted when the unit is turned on. This can be mitigated by covering the unit during long periods of inactivity.
The unit emits a bad odor	The unit may absorb odors from the environment (such as furniture, cooking, cigarettes, etc.) which will be emitted during operations.
	The unit's filters have become moldy and should be cleaned.
The fan of the outdoor unit does not operate	During operation, the fan speed is controlled to optimize product operation.
Operation is erratic, unpredictable, or unit is unresponsive	Interference from cell phone towers and remote boosters may cause the unit to malfunction. In this case, try the following: • Disconnect the power, then reconnect. • Press ON/OFF button on remote control to restart operation.

NOTE: If problem persists, contact a local dealer or your nearest customer service center. Provide them with a detailed description of the unit malfunction as well as your model number.

Troubleshooting

When troubles occur, please check the following points before contacting a repair company.

Problem	Possible Causes	Solution
Poor Cooling Performance	Temperature setting may be higher than ambient room temperature	Lower the temperature setting
	The heat exchanger on the indoor or outdoor unit is dirty	Clean the affected heat exchanger
	The air filter is dirty	Remove the filter and clean it according to instructions
	The air inlet or outlet of either unit is blocked	Turn the unit off, remove the obstruction and turn it back on
	Doors and windows are open	Make sure that all doors and windows are closed while operating the unit
	Excessive heat is generated by sunlight	Close windows and curtains during periods of high heat or bright sunshine
	Too many sources of heat in the room (people, computers, electronics, etc.)	Reduce amount of heat sources
	Low refrigerant due to leak or long-term use	Check for leaks, re-seal if necessary and top off refrigerant
	SILENCE function is activated(optional function)	SILENCE function can lower product performance by reducing operating frequency. Turn off SILENCE function.

Problem	Possible Causes	Solution
The unit is not working	Power failure	Wait for the power to be restored
	The power is turned off	Turn on the power
	The fuse is burned out	Replace the fuse
	Remote control batteries are dead	Replace batteries
	The Unit's 3-minute protection has been activated	Wait three minutes after restarting the unit
	Timer is activated	Turn timer off
The unit starts and stops frequently	There's too much or too little refrigerant in the system	Check for leaks and recharge the system with refrigerant.
	Incompressible gas or moisture has entered the system.	Evacuate and recharge the system with refrigerant
	The compressor is broken	Replace the compressor
	The voltage is too high or too low	Install a manostat to regulate the voltage
Poor heating performance	The outdoor temperature is extremely low	Use auxiliary heating device
	Cold air is entering through doors and windows	Make sure that all doors and windows are closed during use
	Low refrigerant due to leak or long-term use	Check for leaks, re-seal if necessary and top off refrigerant
Indicator lamps continue flashing	The unit may stop operation or continue to run safely. If the indicator lamps continue to flash or error codes appear, wait for about 10 minutes. The problem may resolve itself. If not, disconnect the power, then connect it again. Turn the unit on. If the problem persists, disconnect the power and contact your nearest customer service center.	
Error code appears in the window display of indoor unit: • E0, E1, E2… • P1, P2, P3… • F1, F2, F3…		

NOTE: If your problem persists after performing the checks and diagnostics above, turn off your unit immediately and contact an authorized service center.

European Disposal Guidelines

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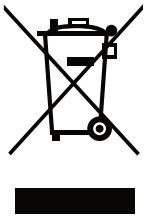
This appliance contains refrigerant and other potentially hazardous materials. When disposing of this appliance, the law requires special collection and treatment. Do not dispose of this product as household waste or unsorted municipal waste.

When disposing of this appliance, you have the following options:

- Dispose of the appliance at designated municipal electronic waste collection facility.
- When buying a new appliance, the retailer will take back the old appliance free of charge.
- The manufacturer will take back the old appliance free of charge.
- Sell the appliance to certified scrap metal dealers.

Special notice
Disposing of this appliance in the forest or other natural surroundings endangers your health and is bad for the environment. Hazardous substances may leak into the ground water and enter the food chain.



Information Servicing
(Required for the Units adopt R32/R290 Refrigerant only)

1. 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.

2. Work procedure

Works 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.

3. 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 sapces shall be avoided. The area around the work space shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

4. 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 flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. no sparking, adequately sealed or intrinsically safe.

5. Presence of fire extinguisher

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

6. No ignition sources

No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant 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 flammable 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.

7. Ventilated area

Ensure that the area is in the open or that it it 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.

8. Checks to the refrigeration 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 charge size 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 circuits shall be checked for the presence of refrigerant; marking to the equipment continues to be visible and legible.
- marking and signs that are illegible shall be corrected;
- refrigeration 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.

9. 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, and 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 there no live electrical components and wiring are exposed while charging, recovering or purging the system;
- that there is continuity of earth bonding.

10. Repairs to sealed components

10.1 During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

10.2 Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

- Ensure that apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer s specifications.

NOTE: The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment. Instrinsically safe components do not have to be isolated prior to working on them.

11. Repair to intrinsically safe components

Do not apply any permanent inductive or capacitance loads to the circuit without e that this will not exceed the permissible voltage and current permitted for the equi use. Intrinscially safe components are the only types that can be worked on while liv presence of a flammable atmosphere. The test apparatus shall be at the correct rating. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

12. 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.

13. 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.

14. Leak detection methods

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants. Electronic leak detectors shall be used to detect flammable refrigerants, but 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. 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 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.

If a leak is suspected ,all naked flames shall be removed or extinguished. If a leakage of refrigernat 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 . Oxygen free nitrogen(OFN) shall then be purged through the system both before and during the brazing process.

15. Removal and evacuation

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

- remove refrigerant;
- purge the circuit with inert gas;
- evacuate;
- purge again with inert gas;
- open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. The system shall be flushed with OFN to render the unit safe. This process may need to be repeated several times. Compressed air or oxygen shall not be used for this task.

Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system.

When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.
Ensure that the outlet for the vacuum pump is not closed to any ignition sources and there is ventilation available.

16. 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 minimize the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration 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 refrigeration system.
- Prior to recharging the system it shall be pressure tested with OFN. 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.

17. 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 reclaimed 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 protetive 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 manufacturer s 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 refrigeration system unless it has been cleaned and checked.

18. Labelling

Equipment shall be labelled stating that it has been de-commissioned and emp' refrigerant. The label shall be dated and signed. Ensure that there are labels on t equipment stating the equipment contains flammable refrigerant.

19. Recovery

- When removing refrigerant from a system, either for service or decommissioning, it is recommended good practice that all refrigerants are removed safely.
- When tranferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct numbers 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 flammable refrigerants. 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. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.
- The recovered refrigerant shall be returned to the refrigerant supplier 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 evacuation process shall be carried out prior to retruning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

20. Transportation, marking and storage for units

1. Transport of equipment containing flammable refrigerants
   Compliance with the transport regulations
2. Marking of equipment using signs
   Compliance with local regulations
3. Disposal of equipment using flammable refrigerants
   Compliance with national regulations
4. Storage of equipment/appliances
   The storage of equipment should be in accordance with the manufacturer's instructions.
5. Storage of packed (unsold) equipment
   Storage package protection should be constructed such 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.

NOTES

Due to on-going technological development of the Products by the Manufacturer, we reserve the right to vary the technical specifications at any time without notice.

A causa della continua evoluzione tecnologica dei Prodotti, ci riserviamo il diritto di variare le specifiche tecniche in qualsiasi momento e senza darne preavviso.

Avec le souci d'améliorer sa production, le Constructeur se réserve le droit de modifier les spécifications techniques des produits sans préavis.

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