

Atunci când se intră în circuitul de agent frigorific pentru reparații - sau în orice alt scop - se vor folosi proceduri convenționale. Cu toate acestea, este important ca cele mai bune practici să fie respectate, deoarece inflamabilitatea este o considerație. Trebuie respectată următoarea procedură:

îndepărtați agentul frigorific;
purjați circuitul cu gaz inert;
evacuați;

din nou purjați cu gaz inert;
deschideți circuitul prin tăiere sau sudură tare.

Încărcătura de agent frigorific trebuie recuperată în cilindrii de recuperare corespunzători. Sistemul trebuie spălat cu OFN pentru a face unitatea sigură. Repetarea acestui proces poate fi necesară de câteva ori. Aerul comprimat sau oxigenul nu se va utiliza pentru această sarcină.

Spălarea se realizează prin ruperea vaccumului în sistem cu OFN și continuarea umplerii până la atingerea presiunii de lucru, apoi aerisirea în atmosferă și, în final, tragerea la vid. Acest procedeu se va repeta până când în sistem nu mai este prezent agentul de refrigerare. Atunci când este utilizată încărcarea finală cu OFN, sistemul trebuie să fie ventilat până la presiunea atmosferică pentru a permite efectuarea lucrărilor. Această operație este absolut vitală în cazul în care trebuie să se realizeze operațiunile de sudură tare pe tubulatură. Asigurați-vă că priza pentru pompa de vid nu este aproape de sursele de aprindere și că există ventilație disponibilă.

15. Proceduri de încărcare

Suplimentar la procedurile convenționale de încărcare, este necesară respectarea următoarelor cerințe.

- Asigurați-vă că nu se produce contaminarea diferitor agenți frigorifici atunci când se utilizează echipamente de încărcare. Furtunurile sau liniile trebuie să fie cât mai scurte posibil pentru a minimiza cantitatea de agent frigorific conținut în acestea.

- Cilindrii trebuie ținutăți în poziție verticală.

- Asigurați-vă că sistemul de răcire este legat la pământ înainte de încărcarea sistemului cu agent frigorific.

- Etichetați sistemul când încărcarea este completă (dacă nu ați făcut deja acest lucru).

- Se va avea grijă deosebită ca sistemul de răcire să nu se supraîncălzească.

Înainte de reîncărcarea sistemului, acesta trebuie testat la presiune cu OFN. Sistemul trebuie să fie testat pentru scurgere la finalizarea încărcării, dar înainte de punerea în funcțiune. Trebuie să se efectueze un test de scurgere pentru urmărire înainte de a părăsi locul.

16. Dezamorsare

Înainte de a efectua această procedură, este esențial ca tehnicianul să fie complet familiarizat cu echipamentul și cu toate detaliile acestuia. Se recomandă o bună practică pentru ca toți agenții frigorifici să fie recuperați în siguranță. Înainte de efectuarea sarcinii, se prelevează un eșantion de ulei și agent frigorific în cazul în care este necesară o analiză înainte de reutilizarea agentului refrigerent regenerat. Este esențial ca energia electrică să

INSTRUCȚIUNI PENTRU SERVICIU APARATELOR CE CONȚIN R 290

fie disponibilă înainte de începerea sarcinii.

a) Familiarizați-vă cu echipamentul și cu funcționarea acestuia

b) Izolați sistemul electric

c) Înainte de încercarea procedurii, asigurați-vă că:

sunt disponibile echipamente de manipulare mecanică, dacă este necesar, pentru manipularea buteliilor cu agent frigorific;

toate echipamentele de protecție individuală sunt disponibile și utilizate corect;

procesul de recuperare este supravegheat în orice moment de o persoană competentă; echipamentul de recuperare și buteliile sunt conforme cu standardele corespunzătoare.

d) Dacă este posibil, reduceți presiunea sistemului de răcire.

e) Dacă nu este posibil un vid, faceți un colector astfel încât agentul frigorific să poată fi îndepărtat din diferite părți ale sistemului)

f) Asigurați-vă că butelia este situată pe cântar înainte de recuperare.

g) Porniți mașina de recuperare și utilizați în conformitate cu instrucțiunile producătorului.

h) Nu umpleți buteliile. (Nu mai mult de 80% din volumul de lichid).

i) Nu depășiți presiunea maximă de lucru a buteliei, fie și temporar.

j) Când buteliile au fost umplute corect și procesul a fost finalizat, asigurați-vă că buteliile și echipamentul sunt îndepărtate imediat de pe zonă și că toate supapele de izolare de pe echipament sunt închise.

k) Agentul frigorific recuperat nu trebuie încărcat într-un alt sistem de răcire decât dacă a fost curățat și verificat.

17. Etichetare

Echipamentul trebuie să fie etichetat cu mențiunea că a fost demontat și golit de agentul frigorific. Eticheta trebuie să fie datată și semnată. Asigurați-vă că pe echipament există etichete care să ateste că echipamentul conține agent frigorific inflamabil.

18. Recuperare

Când scoateți agentul frigorific dintr-un sistem, fie pentru service, fie pentru dezafectare, se recomandă o bună practică pentru ca toți agenții frigorifici să fie îndepărtați în siguranță.

Când transferați agentul frigorific în butelii, asigurați-vă că sunt folosite numai butelii de recuperare a agentului frigorific. Asigurați-vă că sunt disponibile numărul corect de butelii pentru menținerea încărcării totale a sistemului. Toate buteliile care urmează să fie utilizate sunt destinate agentului frigorific recuperat și etichetate pentru agentul frigorific respectiv (adică butelii speciale pentru recuperarea agentului frigorific). Buteliile trebuie să fie complet echipate cu supapa de presiune și supapele de închidere automată în stare bună de funcționare. Buteliile de recuperare goale sunt evacuate și, dacă este posibil, răcite înainte de recuperare.

Echipamentul de recuperare trebuie să fie în stare bună de funcționare, cu un set de instrucțiuni privind echipamentul la îndemână și să fie adecvat pentru recuperarea agenților frigorifici inflamabili. În plus, un set de cântare de cântărire calibrate trebuie să fie disponibile și în stare bună de funcționare. Furtunurile trebuie să fie completate

cu cuplaje de deconectare fără scurgeri și în stare bună. Înainte de a utiliza mașina de recuperare, verificați dacă aceasta este în stare de funcționare satisfăcătoare, a fost întreținută corespunzător și că toate componentele electrice asociate sunt etanșeizate pentru a preveni aprinderea în cazul eliberării agentului frigorific. Consultați producătorul dacă aveți îndoieli.

Agentul frigorific recuperat va fi returnat furnizorului de agent frigorific în butelia de recuperare corectă și vor fi aranjate note de transfer a deșeurilor relevante. Nu amestecați agenții frigorifici în unitățile de recuperare și mai ales nu în butelii.

Dacă este necesară îndepărtarea compresoarelor sau uleiurilor compresoare, asigurați-vă că acestea au fost evacuate la un nivel acceptabil pentru a vă asigura că agentul frigorific inflamabil nu rămâne în lubrifianț. Procesul de evacuare trebuie efectuat înainte de returnarea compresorului furnizorilor. Pentru accelerarea acestui proces va fi utilizată numai încălzirea electrică a corpului compresorului. Atunci când uleiul este scos dintr-un sistem, acest lucru trebuie să fie efectuat în siguranță.

19. Transportarea echipamentului care conține agenți de răcire inflamabili (Anexa CC.1)

Conformitate cu regulamentele privind transportul.

20. Aparat uzate care furnizează agenți frigorifici inflamabili

A se consulta regulamentele naționale.

21. Depozitarea echipamentelor/aparatelor

Depozitarea echipamentului trebuie să fie în conformitate cu instrucțiunile producătorului.

22. Depozitarea echipamentelor ambalate (nevândute)

Pachetul de protecție la depozitare trebuie construit astfel încât deteriorarea mecanică a echipamentului din interiorul ambalajului să nu cauzeze o scurgere a încărcăturii cu agent frigorific.

Numărul maxim de bucăți de echipamente care pot fi depozitate împreună va fi determinat de reglementările locale.

23. Marcarea echipamentului utilizând semen

A se vedea regulamentele locale

WARNING

This product contains flammable gas R290, hermetically sealed.
Additional warnings for appliances with R290 refrigerant gas (refer to the rating plate for the type of refrigerant gas used)

**• READ THE MANUAL CAREFULLY BEFORE USING THE APPLIANCE**

- R290 refrigerant gas complies with European environmental directives.
- This appliance contains approximately 0.16 kg of R290 refrigerant gas. The maximum refrigerant charge amount is 0.3kg.
- Use only implements recommended by the manufacturer for defrosting or cleaning.
- Do not use the appliance in a room with continuously operating sources of ignition (eg. Open flames, an operating gas appliance or an operating electrical heaters).
- Do not perforate any of the components in the refrigerant circuit.
- A surface area greater than 12 m² is necessary for the installation, use and storage of the appliance.
- Stagnation of possible leaks of refrigerant gas in unventilated rooms could lead to fire or an explosion hazard should the refrigerant come in contact with electric heaters, stoves or other sources of ignition.
- Use care when storing the appliance to prevent mechanical faults.
- Only persons authorized by an accredited agency certifying their competence to handle refrigerants in compliance with sector legislation should work on refrigerant circuits.
- Maintenance and repairs requiring the assistance of other qualified

WARNING

personnel must be carried out under the supervision of specialists in the use of inflammable refrigerants.

- Information for spaces where pipes containing flammable refrigerant are allowed should include statement:
 - The installation of pipe-work shall be kept to a minimum;
 - Pipe-work shall be protected from physical damage and shall not be installed in an unventilated space;
 - Compliance with national gas regulations shall be observed;
 - Mechanical connections shall be accessible for maintenance purposes;
- The minimum rated airflow is 300 m³/h
- An unventilated area where the appliance using flammable refrigerants is installed shall be so constructed that should any refrigerant leak, it will not stagnate so as to create a fire or explosion hazard.
- The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation

ELECTRICAL CONNECTIONS

- Failure to follow these important safety instructions absolves all liability for the manufacturer .

Before plugging the appliance into the mains socket, ensure that:

- The value indicated on the rating plate must be the same as the mains power supply.
- The power socket and the electrical circuit are sufficient for the appliance.
- The main socket matches the plug. Replace the plug if necessary by a qualified person.
- Ensure the main socket is earthed.

SYMBOLS

Read the instructions



Caution



Protective Earth

GENERAL SAFETY INSTRUCTIONS

Read this instruction manual thoroughly before using the appliance and save it for future reference and if necessary pass the instruction manual on to a third party.

In any doubt consult the manufacturer's technical department for assistance

WARNING: When using electrical appliance, basic safety precautions should always be followed to reduce the risk of fire, electrical shock and personal injury.

1) General

Check if the electrical specifications of this appliance are compatible with your installation.

To protect against electrical hazard, do not immerse in water or other liquids. Do not use near water.

This appliance is for indoor use only.

Do not place objects on top of the unit.

GENERAL SAFETY INSTRUCTIONS

Do not use the unit without the filter.

Do not unplug the unit if your hands are wet, electrical shock could occur.

Do not carry the appliance while it is operating.

Place it on a secure and level area. Keep out of reach of children to prevent any accident.

Unauthorized use and technical modifications to the appliance can lead to danger to life and health.

Do not push any object into the appliance. Do not disassemble the appliance.

(For EN Standard) 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.

(For IEC Standard) 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.

2) Electrical safety

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.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects.

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SPECIFIC SAFETY RULES

The appliance shall be installed in accordance with national wiring regulations.

Keep ventilation openings clear of obstruction.

The appliance shall be stored so as to prevent mechanical damage from occurring.

The method of connection of the appliance to the electrical supply:

- (1) Do not operate the unit with a damaged plug or loose outlet.
- (2) Use only the correct power supply-AC220-240V~50Hz.
- (3) Remove the plug from the socket if the unit is not going to be used for a long period of time.
- (4) Always turn the unit off and remove the power plug from the socket when cleaning.

WARNING: Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

Do not pierce or burn.

Be aware that refrigerant gases may not contain an odour.

ENVIRONMENTAL PROTECTION

Meaning of crossed-out wheeled dustbin:



Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get in the food chain, damaging your health and well-being

When replacing old appliances with new ones, the retailer is legally obliged to take back your old appliance for disposal at least free of charge.

ENVIRONMENTAL PROTECTION

Environment friendly disposal

You can help protect the environment!

Please remember to respect the local regulations: hand in the non-working electrical equipments to an appropriate waste disposal centre. The packaging material is recyclable. Dispose of the packaging in an environmentally friendly manner and make it available for the recyclable material collection-service.

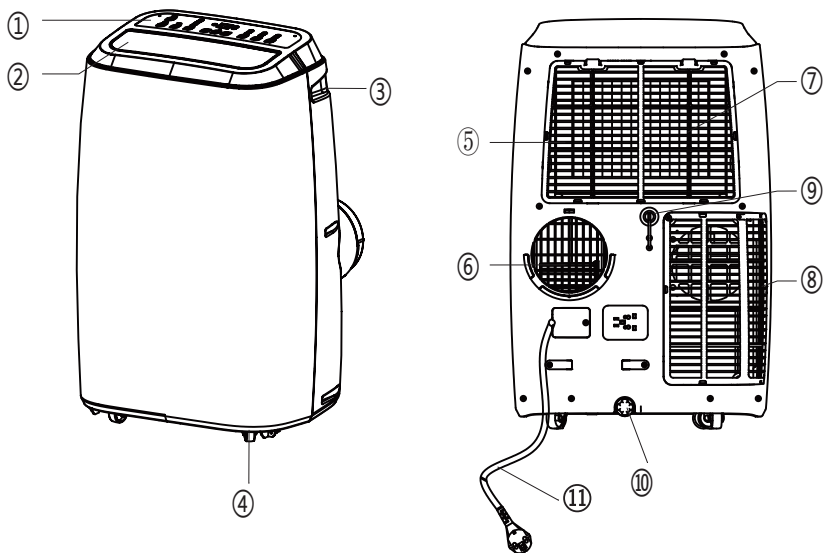
APPLIANCE SPECIFICATIONS

TECHNICAL CHARACTERISTICS	
Rated voltage	220-240V
Rated frequency	50Hz
Rated wattage (cooling)	1000W
Rated wattage (heating)	1050W
Refrigerant number	R290
Refrigerant amount	0.16 kg
Ambient operating temperature	17-35°C
Permissible excessive operating pressure	Discharge 2.6MPa
	Suction 1.0MPa
Maximum allowable pressure	Discharge 3.2MPa
	Suction 1.2MPa
Protection class	I
IP number	IP20 (no protection against ingress of water)
Fuse Type/Rating	T2AL 250V
Model	A010A-09CH/A010A-09CH CY

The data were tested with the exhaust tube < 1 meter.

For more technical details, please check following web site:
www.erp-equation.com/ac

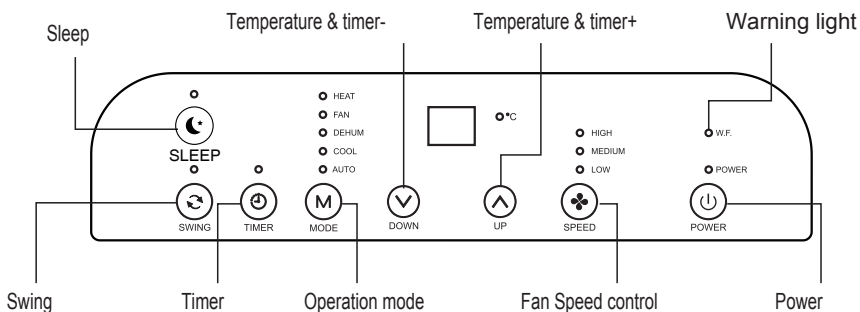
IDENTIFICATION OF PARTS



1. Control panel
2. Air outlet
3. Handle
4. Caster
5. Air Filter
6. Air outlet (Heat exchange)
7. Air intake (Evaporator)
8. Air intake (Condenser)
9. Water outlet drain for continuou drain operation (Dehumidifier mode only)
10. Water outlet drain (Note: Please ensure if the water outlet drain is well installed before use.)
11. Power supply cord

OPERATION

CONTROL PANEL



1. POWER

The power control turns the unit on and off.

2. Warning light

Condensed water may accumulate in the unit . If the internal tank becomes full, the W . F . Light will shine and the unit will not operate until the unit has been drained .

3. Mode

The Mode Control has 5 settings :

- Auto · Cool · Dehumidify · Fan · Heat

The settings are adjusted with Mode Control button . A light will indicate which setting is currently being used .

● AUTO MODE

- According to the current room temperature ,automatically select the mode: cooling, dehumidifying or heating (see table 1).

Table 1

Room Temperature (Tr)	$Tr < 23^{\circ}\text{C}$	$23^{\circ}\text{C} \leq Tr < 26^{\circ}\text{C}$	$Tr \geq 26^{\circ}\text{C}$
Mode	Heating	Dehumidify	Cooling
Set Temperature	21°C	23°C	25°C

● Cooling operation

-Press the “Mode” button till the “Cool” is on.

-Press the “ DOWN ”or“ UP ”button to select a desired room temperature from 16°C - 31°C .

-Press the “ SPEED ” button to select wind speed.

OPERATION

● Dehumidifying operation

Press the "Mode" button till the "Dehum" is on.

-Automatically set the selected temperature 2℃ less than current room temperature, temperature automatically adjustable from 16℃-31℃。

-Automatically set the fan motor to LOW wind speed.

● Fan operation

-Press the "Mode" button till the "Fan" is on.

-Press the "SPEED" button to select wind speed of high, medium, or low.

● Heating operation

-Press the "Mode" button till the "Heat" is on.

-Press the "DOWN" or "UP" button to select a desired room temperature from 16℃-31℃.

-Press the "SPEED" button to select wind speed.

4. Timer operation

Timer ON setting:

-When the air-conditioner is OFF, press the "Timer" button and press "UP" / "DOWN" to select a desired ON time.

-Preset ON Time is displayed on the operation panel.

-ON time can be set at any time in 1-24 hours.

Timer OFF setting

-When the air-conditioner ON, press "Timer" button and press "UP" / "DOWN" to select a desired OFF time.

-Preset OFF Time is displayed on the operation panel.

-OFF time can be set at any time in 1-24 hours.

5. SWING(air flow)

After machine turns on, press this key, the louver will swing continuously up and down; when press this button again the movement will stop and the louver remain in that position.

6.SLEEP

- While in cooling mode, press the SLEEP key to set the temperature.

It increases 1℃ after an hour and at most increases 2℃ after 2 hours.

- While in heating mode, press the SLEEP key to set the temperature.

It decreases 1℃ after an hour and at most decreases 2℃ after 2 hours.

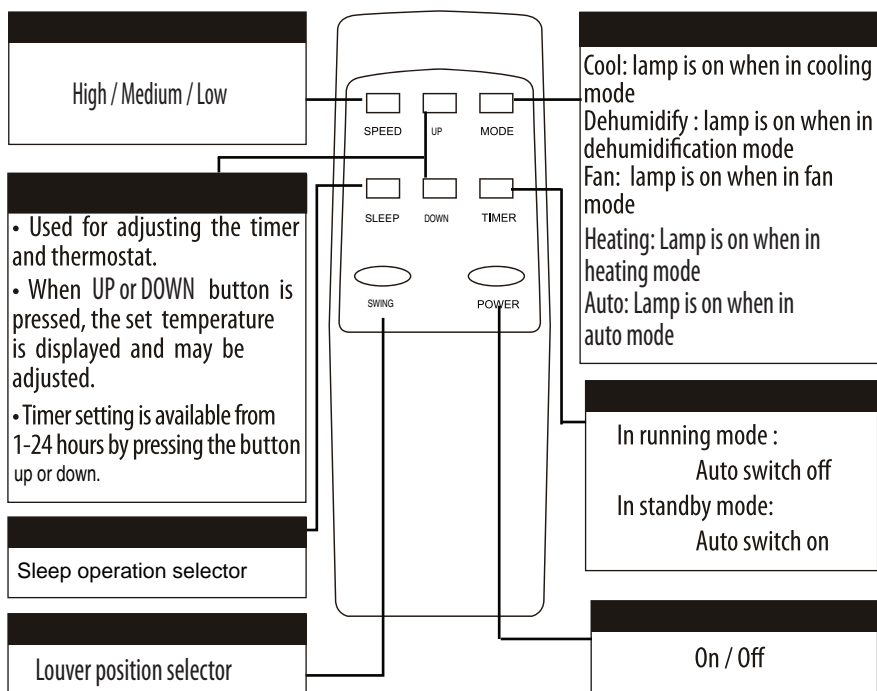
- Press the SLEEP key again can cancel the setting.

OPERATION

Air Conditioner Remote Control (batteries not included)

The functions work the same as your air conditioner's touch controls.

All key function can be accessed from the remote control.

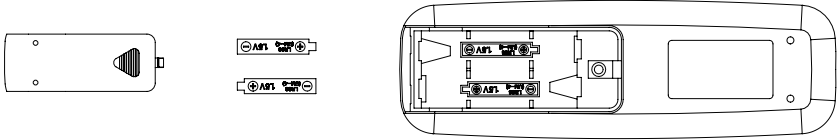


Notes:

- Do not drop the remote control.
- Do not place the remote control in a location exposed to direct sunlight.
- The remote control should be placed about 1 meter or more away from TV, or any electrical appliances.

OPERATION

Battery replacement: Remove the cover on the back of the remote control and insert the batteries with the (+) and (-) poles pointing in the proper direction.



CAUTION

Use only AAA or IEC R03 1.5V batteries.

Remove the batteries if the remote control is not used for a month or longer.

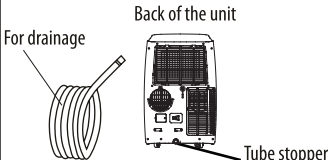
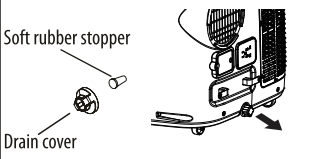
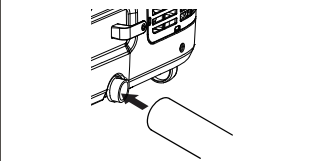
Do not attempt to recharge the supplied batteries.

All batteries should be replaced at the same time, do not mix old battery .

Do not dispose of the batteries in a fire as they may explode.

CONTINUOUS DRAINAGE

The function of continuous drainage can be started in following steps when there is a good condition of drainage near by the unit.

1. Prepare PVC hose to drain out water	
2. Take out drain cover from the drainage outlet. 3. Remove the soft rubber stopper inside the stopper.	
4. Make the drainage pipe to the stopper.	

TROUBLESHOOTING

The following cases may not always be a malfunction, please check it before asking for service.

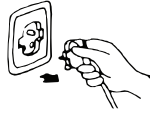
Trouble	Analysis
Does not run	<ul style="list-style-type: none">•Please wait for 3 minutes and start again, protector device may be preventing unit from working.•If batteries in the remote control are used up.•If the plug is not properly plugged.
Stops running during operation	<ul style="list-style-type: none">•If the set temperature is close to room temperature, you can lower the set temperature.•Air outlet be blocked by obstacle. Take the obstacle away.
Runs but does not cool	<ul style="list-style-type: none">•If the door or window open.•If there is other heater appliance work nearby, like heater or lamp, etc..•The air filter is dirty, please clean it.•Air outlet or intake be blocked.•Set temperature is too high.
Does not run and water full indicator is lit	<ul style="list-style-type: none">•Drain the water into a prepared container by the drainage pipe on the rear panel of the unit. If it still doesn't work, please consult a qualified technician.
E0 Code	<ul style="list-style-type: none">•Room temperature sensor failed•Replace room temperature sensor (the unit can also work without replacement.)
E1/E3 code	<ul style="list-style-type: none">• Pipe temperature sensor failed.• Replace pipe temperature sensor.
E2 /E4 Code	<ul style="list-style-type: none">•Water tank full•Please empty the water tank.

CARE AND MAINTENANCE

Appliance maintenance

1. Cut off the power supply

Turn off the appliance first before disconnecting from power supply



2. Wipe with a soft dry cloth.

If unit is quite dirty use a mild detergent and damp cloth.



3. Never use volatile substance such as gasoline or polishing powder to clean the appliance.



4. Never sprinkle water onto the main unit.

Dangerous!
Electric shock!

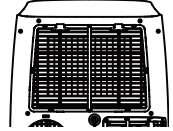


Air filter maintenance

It is necessary to clean the air filter after using it for about 100 hours. Clean it as follows:

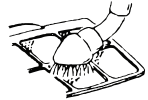
1. Stop the appliance and remove the air filter

Stop the appliance first, then pull back the air filter.



2. Clean and reinstall the air filter

If the dirt is conspicuous, wash it with a solution of detergent in lukewarm water. After cleaning, dry it in a shaded and cool place, then reinstall it...



3. Clean the air filter every two weeks. If the air conditioner operates in an extremely dusty environment.

Maintenance after using

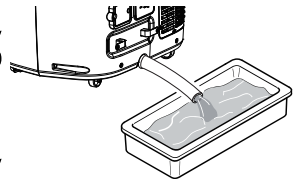
1. If the appliance will not be used for a long time, be sure to pull out the rubber plug of the drain port underside, in order to drain the water.

2. Before storing away run the unit in fan mode only for few hours to dry any moisture on the coils to prevent mold.

3. Stop the appliance and pull out the power supply plug, then take out the batteries of remote controller and keep it in a safe place.

4. Clean the air filter and reinstall it.

5. Remove the air hoses and keep them in a safe place, and cover the hole tightly.



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.

1. 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.

2. 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. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

3. 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. nonsparking, adequately sealed or intrinsically safe.

4. 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 powder or CO₂ fire extinguisher adjacent to the charging area.

5. 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.

INSTRUCTION FOR SERVICING APPLIANCES CONTAINING R 290

6. 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.

7. 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;

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

9. Repairs to sealed components

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.

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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. Intrinsically safe components do not have to be isolated prior to working on them.

10. Repair to intrinsically safe components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the 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.

11. 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.

12. 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.

13. 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

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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 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/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. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.

14. Removal and evacuation

When breaking into the refrigerant circuit to make repairs – or 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 close to any ignition sources and there is ventilation available.

15. Charging procedures

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