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# SPHERA

PORTABLE AIR CONDITIONER (LOCAL)



## OPERATING INSTRUCTIONS

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Read the instructions carefully before operating the appliance or carrying out maintenance work. Observe all the safety instructions; failure to do so may lead to accidents and/or damage. Store these instructions in a safe place for future reference.



Appliance is filled with flammable gas R290.



Before installing and using the appliance, read the owner manual.



Before installing the appliance, read the installation manual.



Any repairs you need, contact the nearest authorized Service Centre and strictly follow manufacturer's Service Manual.

## THE REFRIGERANT R290

- To realize the function of the air conditioner unit, a special refrigerant circulates in the system. The refrigerant is the fluoride R290 = 3 GWP (Global warming potential). This refrigerant is flammable and inodorous. It can lead to explosions under certain conditions, however the flammability of this refrigerant is very low and it can be ignited only by fire.
- Compared to other common refrigerants, R290 is a non-polluting refrigerant with no harm to the ozoneosphere and a no effect upon the greenhouse effect. R290 has very good thermodynamic features which lead to a really high energy efficiency. The units therefore need less filling.

### Warning:

Do not try to accelerate the defrosting process or to clean the appliance in different ways other than those recommended by the manufacturer.

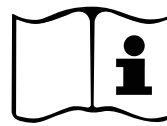
Should repair be necessary, contact your nearest authorized Service Centre.

Any repairs carried out by unqualified personnel may be dangerous.

The appliance has to be stored in a room that doesn't have any continuously operating ignition sources. (for example: open flames, an operating gas appliance or an operating electric heater.)

Do not pierce or burn.

Appliance has to be installed, used and stored in a room with a floor area larger than 12 m<sup>2</sup>.



## GENERAL OPERATING AND SAFETY INSTRUCTIONS

- This appliance is a local air conditioner designed for domestic use.
- Only use this air-conditioner as described in this manual.
- Ensure that the required voltage and frequency (220-240V~/50 Hz) match the available power source.
- Fuse style TC AC250V, the electricity passing through the fuse cannot be above 2A or 3.15A.
- This appliance can be used by children aged from 8 years and above and people 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.
- Ensure that the electricity system is able to deliver the operating current required by the air conditioner, in addition to that normally absorbed by other appliances (household appliances, lighting system, etc.). Please refer to the maximum power input data indicated on the air conditioner's data plate.
- Connection to the electricity grid must take place in accordance with current installation standards.
- Ensure that the automatic switches and system protection valves are able to withstand a start-up current of 6A (normally for less than 1 second).
- The system socket must always be fitted with an efficient earth connection.
- Make sure that the plug is fully inserted. Do not use multiple adapters. Do not touch the plug with wet hands. Make sure that the plug is clean.
- Do not use the plug as a means by which to start/stop the air conditioner: use the ON/OFF button on the remote control or on the control panel.
- Do not install the air conditioner in rooms where it may receive water splashes (e.g. laundry rooms).
- This air conditioner can be used by children of 8 years of age or older, and by persons with reduced physical, sensory and mental abilities or who lack the necessary know-how and experience to operate it, if under the supervision or instruction of a person responsible for their safety, so that they are fully aware of the attendant risks.

- Before moving or cleaning the device, ensure that it is unplugged from the socket.
- Do not move the air conditioner while it is operating; first turn the appliance off, check for any condensate build-up and empty it if necessary.
- To turn the appliance off, set the remote control to OFF and remove the plug from the socket. Pull on the plug only. Do not pull the cord.
- **Do not use the appliance if the cord or plug are damaged.** If the power supply cord is damaged, it must be replaced by the manufacturer, dealer or a similarly qualified person so as to avoid any safety risks.
- Keep the unit away from fire, possible fire sources, inflammable or explosive objects.
- Do not leave the unit unattended while it's operating, turn the unit off and unplug it.
- If drainage hose is used, the ambient temperature mustn't be lower than 0 °C. It can cause water leakage to the air conditioner.
- Do not splash or pour water on the air conditioner

#### PRECAUTION!

- **Do not insert any objects into the air conditioner: this is very dangerous as the fan turns at high speed.**
- **Ensure that air circulates freely around the unit. Do not cover the air intake and delivery grilles with drapes or any other means.**

#### WARNING!

- The air conditioner must be positioned **at least 50 cm** from the wall or any other obstacles, on a flat and stable surface so as to avoid water leaks.
- **The air conditioner is fitted with a system for protecting the compressor from overload. This means that the compressor only starts 3 minutes after its previous stoppage.**
- **Please wait at least 3 minutes before starting the unit. This helps prevent the compressor from being damaged.**

#### WARNING!

In the event of an anomaly, switch the appliance off and unplug it from the socket. Do not dismantle or attempt to repair or modify the product.

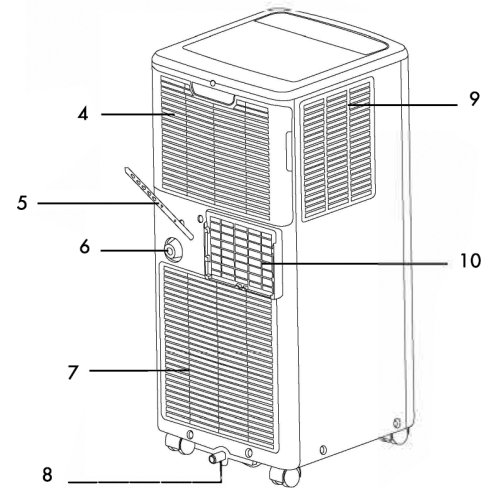
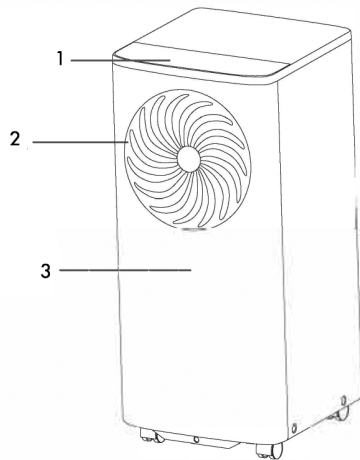
In the event of a malfunction, contact the service centre directly.

**WARNING!**

- Do not expose the air conditioner to direct sunlight, as the colour of the materials may change; moreover, the appliance may overheat causing the protection mechanism to intervene and switch the appliance off.
- Do not use insecticides, oils, detergents or spray paints near the appliance; do not use aggressive chemical detergents to clean the casing: this may damage the finish and colour.
- Close all open windows to maximise air conditioning efficiency.

The manufacturer will not be held liable if safety and accident prevention rules are not observed.

## DESCRIPTION OF THE APPLIANCE



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Control panel and function buttons without remote control</li> <li>2. Air outlet grille</li> <li>3. Front panel</li> <li>4. Upper air intake with filter</li> <li>5. Cable winder</li> </ul> | <ul style="list-style-type: none"> <li>6. Continuous condensate drain hole (dehumidification mode)</li> <li>7. Lower air intake</li> <li>8. Condensate drainage hole (cooling mode)</li> <li>9. Side air filter</li> <li>10. Air exhaust hose connection</li> </ul> |
|--|---|

**Min/max operating limits (internal temperature)**

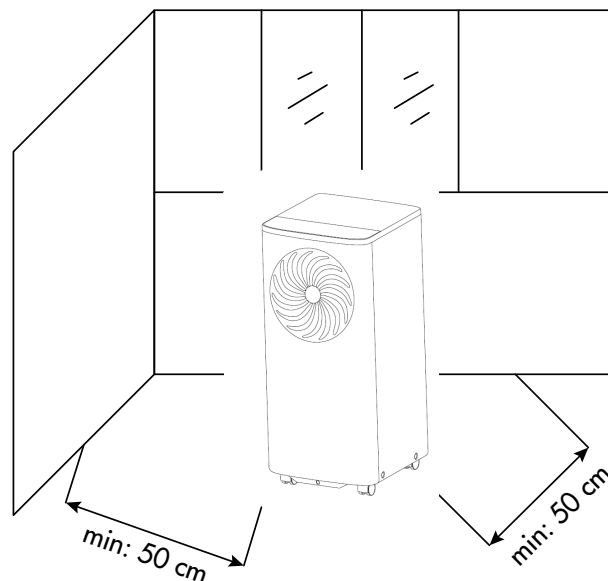
Cooling: 16 °C D.B./35 °C D.B.

Dehumidification: 16 °C D.B./35 °C D.B.

Cooling mode room temperature adjustment range: 16 °C D.B./32 °C D.B.

## PRE-OPERATING CHECKS AND OPERATIONS

The following space must be maintained to ensure the operating efficiency of the portable air conditioner.



# APPLIANCE START-UP

Open the packaging and pull out the box. Remove the product and the other elements supplied (illustrated in the box below).

LCD remote control



Round fitting for window (1) to be positioned between the end of the tube and the end fitting for the window



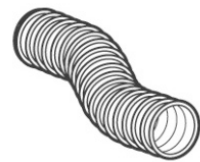
End fitting for window, supplied into 2 parts (2)



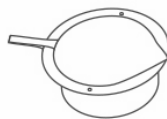
Drainage pipe



Hose



Window unit kit with plug.



Round fitting for window unit, for positioning between the end of the tube and the window unit itself.



Position the product vertically on a flat and stable surface, as close as possible to a window and at least 50 cm from walls or other nearby obstacles.

## USE WITH END FITTING FOR WINDOW

1. Extend the hose just enough to reach the outside (max 1.5 m) and hook it to the rear part of the air conditioner (Fig. 1).
2. Open the window and lock one of the doors with the handle. Place the terminal connection on the fixed sash, bring the other sash of the window closer (Fig. 2).

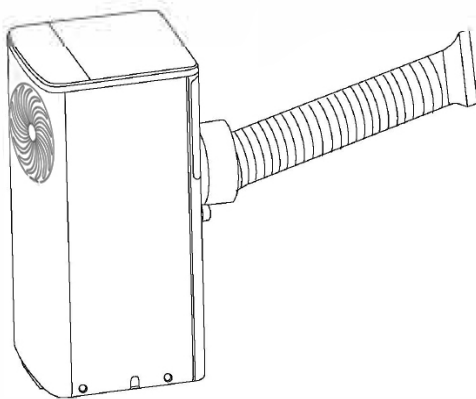


Fig. 1

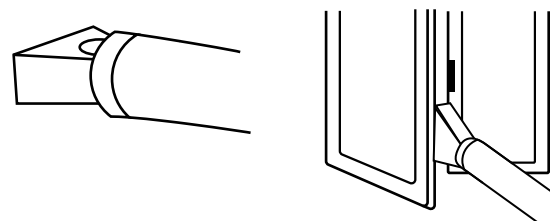
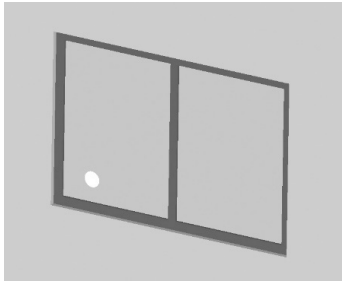


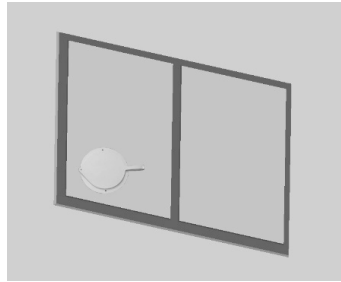
Fig. 2

## USE WITH WINDOW UNIT KIT

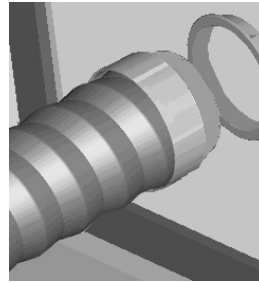
1. To make the hole in the glass, we recommend taking the porthole kit accessory to the glassmaker (Fig. 1).
2. Insert the porthole into the window (Fig. 2).
3. Insert the circular fitting for the porthole kit into the retractable flexible tube and insert the retractable flexible tube with circular fitting into the porthole without the cap (Fig. 3).
4. During periods of non-use, disconnect the hose and close the door with the cap (Fig. 4).



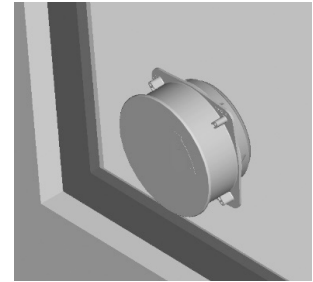
(Fig. 1)



(Fig. 2)



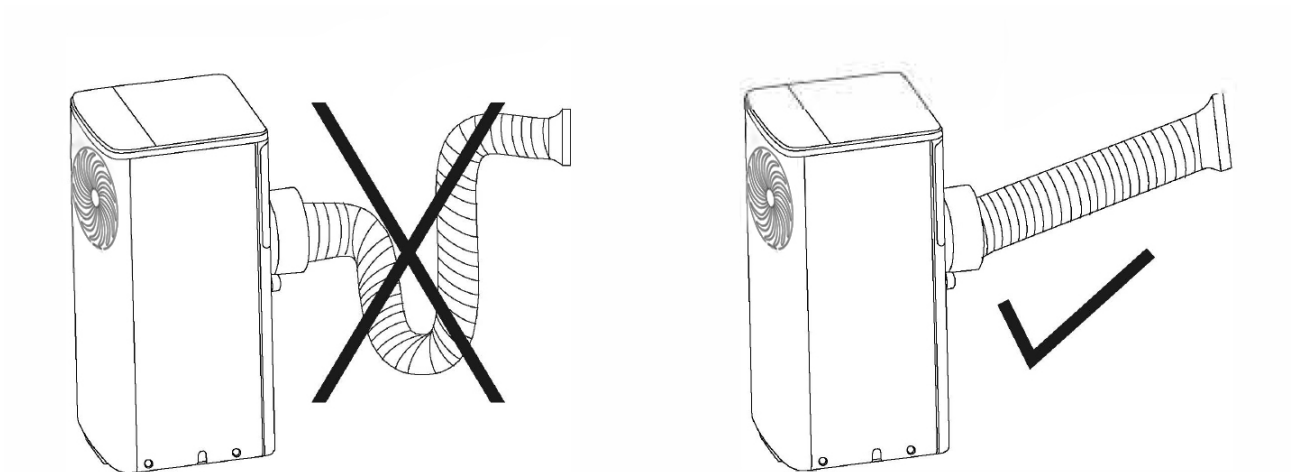
(Fig. 3)



(Fig. 4)

Avoid tight bends or folds in the hose.

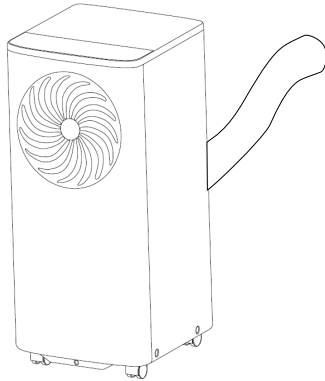
If the air conditioner is not used for prolonged periods, disconnect the pipe and plug the window unit.



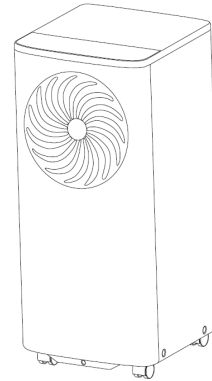


## HOW TO USE THE APPLIANCE

This appliance can be used for cooling, dehumidifying and ventilating. When switching between modes, the fan continues to rotate but the compressor stops: the compressor will start after 3 minutes. This delay protects the compressor from potential damage.



Cooling, Fan



Dehumidifying

**THE DRAINAGE TUBE MUST BE CONNECTED to the appliance AT ALL TIMES: the only exception is when the appliance is used in dehumidification mode only, in which case the appliance should be left to discharge directly into the room for maximum efficiency (see the “Dehumidification Mode” paragraph).**

Clean the air filter under the easily removable rear grille regularly to keep the air conditioner working efficiently.

## OPERATING MODES

### 1. COOLING MODE (COOL)

- Press the MODE button until the cooling mode is selected, the LED ❄️ on the control panel lights up.
- The temperature adjustment range is from 16°C to 32°C.
- In this mode, every time you press the ON/OFF button, the unit turns off, the appliance memorizes the set temperature and will maintain the setting when it is turned back on.
- In this mode it is possible to adjust the fan speed (fan Speed button), set the Timer and the SLEEP function (only from the remote control).
- For quieter operation, reduce the speed to minimum (low).

### 2. DEHUMIDIFICATION MODE (DRY)


- Press the MODE button until the dehumidification mode is selected, the LED 💧 on the control panel lights up
- The temperature is controlled by the electronic board and cannot be adjusted. In this mode, every time the unit turns off by pressing the ON/OFF button, the appliance memorizes the settings and will retain them when turned on again.
- The fan speed is fixed at low and cannot be adjusted

**NOTE:** the air conditioner does not cool the room when operating as a dehumidifier. When the appliance is used as a dehumidifier, the flexible pipe must not be connected. **For maximum dehumidification efficiency, leave the rear discharge attachment free to discharge directly into the environment.** The dehumidification mode is recommended during autumn and winter. **If used during summer, it is best to leave the flexible pipe attached so that the hot air is discharged towards the outside rather than into the room.** During dehumidification, continuous drainage should be implemented (see the next chapter, “HOW TO ELIMINATE CONDENSATE”).

### 3. FAN MODE (FAN)

- Press the MODE button to select ventilation until the corresponding icon 🌀 appears.
- In this mode, the fan speed can be adjusted.
- The temperature cannot be adjusted.

#### 4. AUTO MODE

- Press the MODE button to select Automatic mode (Auto).
- The LED  on the control panel lights up.
- This mode allows the appliance to select the operating mode (Cooling or Ventilation) based on the temperature present in the room.

## HOW TO ELIMINATE CONDENSATE

This appliance automatically vaporizes condensation in **Cooling**.

When the air conditioner operates in Cooling mode, it is not necessary to have continuous condensate drainage; only in particular climatic conditions in which the air humidity rate is very high can water deposit inside the unit. When the internal tank is full the display will show the message "P1", signaling that it has been filled and blocking the operation of the appliance.

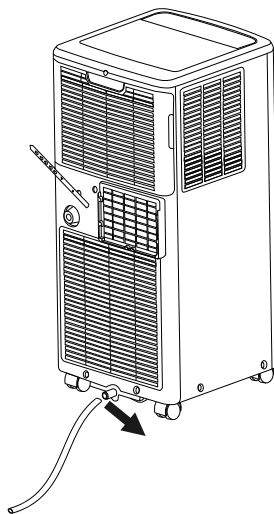
#### Cooling

This appliance automatically vaporizes condensation in Cooling. Make sure that, when the unit operates in Cooling mode, the rubber caps that close the drain holes on the back are correctly positioned. When the air conditioner operates in Cooling mode, it is not necessary to have continuous condensate drainage; only in particular climatic conditions in which the air humidity rate is very high can water deposit inside the unit. When the container is full, the display shows the message "P1" signaling that it has been filled and blocking the operation of the appliance.

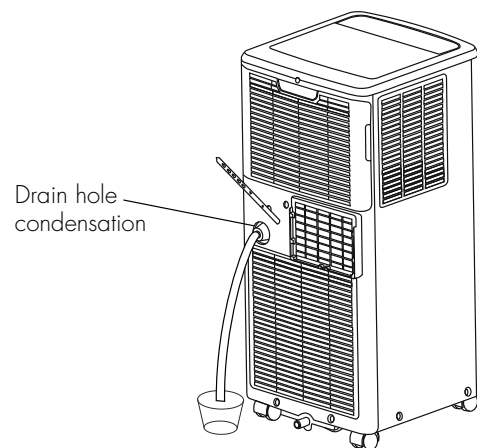
To empty the container, turn off the air conditioner and unplug it. Remove the plug from the bottom drain hole and place the end over a regular drain. Make sure the hose is free from twists and bends. The pipe must have a downward trend. Close the drain with the cap and resume using the air conditioner.

#### Dehumidification

Attention: When using the air conditioner in dehumidification, **it is advisable to always arrange continuous drainage** to ensure maximum dehumidification efficiency. Use the drainage hole in the middle. Water can be drained into a drain by simply connecting the supplied PVC pipe. Avoid bends in the drainage tube.



Manual condensate drainage  
(Cooling)



Continuous condensate drainage  
(Dehumidification)

## FUNCTION CONTROL

### BY REMOTE CONTROLLER

When using the remote control for the first time, install the batteries (not supplied) making sure to correctly position the two polarities "+" and "-". To insert the batteries, follow the instructions below:

- Open the battery compartment by sliding the door outwards (see the direction of the arrow in fig.1).
- Insert two new batteries, paying attention to the polarity (fig.2).
- Reinsert the cover into the battery compartment (see the direction of the arrow in fig.3).

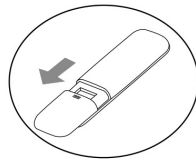


Fig.1

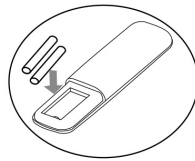


Fig.2

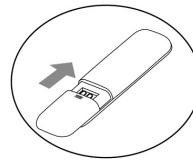


Fig.3

- Always point the remote control at the air conditioner receiver; it must be within 8 meters of the receiver and there must be no obstacle between the remote control and the unit's signal receiver.
- Do not throw or drop the remote control on the ground, avoid infiltration of water or other liquids and do not expose it to bad weather, direct contact with the sun or other heat sources.
- In the event of a malfunction, or if the display tends to disappear or reset, remove the batteries from the remote control for 30 seconds, then insert them again. If it still doesn't work, replace them.
- If you replace the batteries, do not mix new ones with old ones or with other types of batteries, this could cause the remote control to malfunction.
- In case of prolonged inactivity, remove the batteries to avoid potential leaks.
- Batteries must be correctly disposed of according to current regulations.

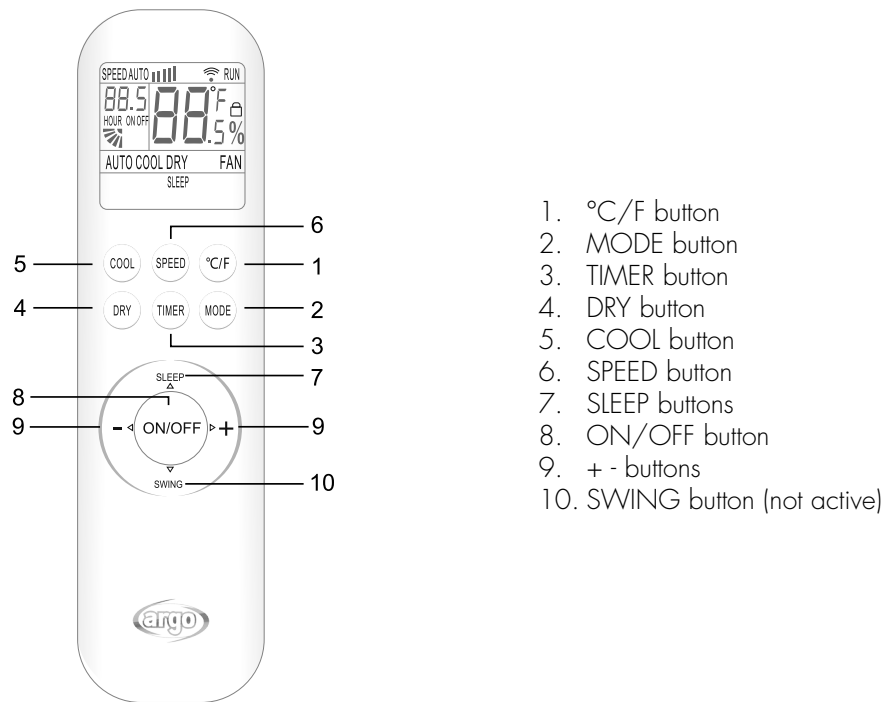


#### INFORMATION FOR THE CORRECT DISPOSAL OF BATTERIES IN ACCORDANCE WITH EUROPEAN DIRECTIVE 2006/66/EC and amendments Directive 2013/56/EU

Replace batteries when they are depleted. At the end of their life, batteries must be disposed of separately from unsorted waste. They must be taken to designated recycling centres or returned to a retailer providing this service. Separate disposal of batteries prevents potential negative effects on the environment and human health due to inadequate disposal, and also allows for recovering and recycling their constituent materials, resulting in significant savings in terms of energy and resources. The separate disposal obligation is underlined by the crossed-out dustbin symbol appearing on the battery. Illegal disposal of the product by the user implies administrative sanctions applied as per current regulations.

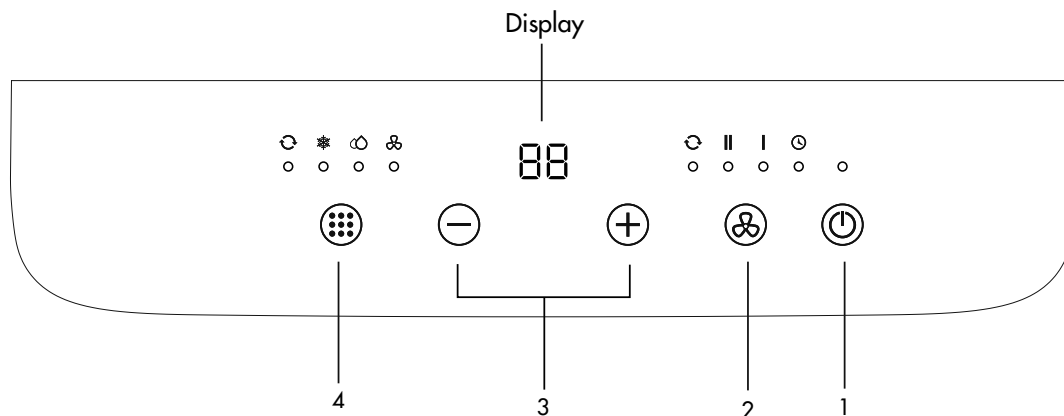
FOR OPTIMUM OPERATION OF THE REMOTE CONTROL, ADDRESS THE TRANSMITTER HEAD TOWARDS THE RECEIVER LOCATED ON THE AIR CONDITIONER.

### CONTROL BY REMOTE CONTROLLER



The supplied remote control is common to other types of air conditioners, also equipped with a heating mode. Some features may not be available for this model.

### CONTROL BY CONTROL PANEL

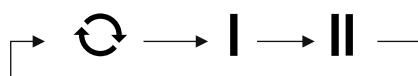


#### 1. ON/OFF BUTTON

Press this button to turn the unit on or off. By default the ventilation speed, when the unit is turned on, is low.

#### 2. FAN SPEED BUTTON

Press this button to adjust the fan speed in the following circular sequence: Auto, Low, High:




The fan speed cannot be adjusted in Auto mode.

By pressing this button you can set the Timer, when the Timer icon (⌚) lights up on the control panel you can adjust the desired time using the + - buttons.

### 3. "+" and "-" BUTTONS

#### Setting the Timer

Press the "+" and "-" buttons to set the Timer (the LED  lights up on the control panel after selecting the Timer function with the Fan Speed button). Each time the buttons are pressed, the adjustment step is 0.5 hours up to 10 hours, then the adjustment step changes to 1 hour with each press. The adjustment range is from 0.5 to 24 hours.

If 00 is shown on the display, the Timer function will be canceled automatically and if no setting is made within 5 seconds, the Timer function will activate automatically.

To cancel the Timer function, set the time to 00 or press the ON/OFF button.

#### Temperature setting

Press the "+" and "-" buttons to set the temperature (each press corresponds to 1 °C).

The temperature can be adjusted from 16°C to 32°C

To change the display from °C to °F, press the + and - buttons simultaneously for 3 seconds.

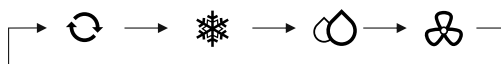
#### Activation of Timer from the remote controller

With the air conditioning on, press this button to deactivate the TIMER function, with the air conditioning off to activate it. When the button is pressed, the display will show the words "ON (OFF)" flashing. Press the "+" and "-" buttons to set the timer, with each press the selection interval will increase or decrease by 0.5 h. The range that can be set is 0.5-24 h. Press the "TIMER" button again to activate the function, the "ON (OFF)" symbol will stop flashing. If the "TIMER" button is not pressed within 10 seconds while the "ON (OFF)" symbol is flashing on the display, the TIMER function will be cancelled. If the TIMER function is active, pressing this button will deactivate it.

### 4. MODE SELECTION BUTTON

Press this button to select the different operating modes, according to this sequence:

Auto - Cooling - Dehumidification - Ventilation



The LEDs light up according to the selection made.

#### SLEEP function (can only be activated by remote controller)

Press this button on remote controller to activate or deactivate this function


After setting the Sleep mode, in the cooling function, the temperature will increase by 1 °C in one hour, then it will automatically increase by 1 °C again after another hour.

The ventilation speed will automatically switch to the lowest level available to guarantee maximum silent operation during night sleep. After 10 hours of operation in SLEEP mode the air conditioner returns to its previous functions and turns off automatically. This mode cannot be activated in ventilation and auto modes.

#### Temperature display function °C/F (can only be activated by remote controller)

Press this button on the remote control to change the temperature display from °C to °F.

#### Child Lock function (can only be activated by remote controller)

Press the DRY and MODE buttons simultaneously for 3 seconds to activate or deactivate the child lock. When this function is activated the icon  appears on the remote control display.

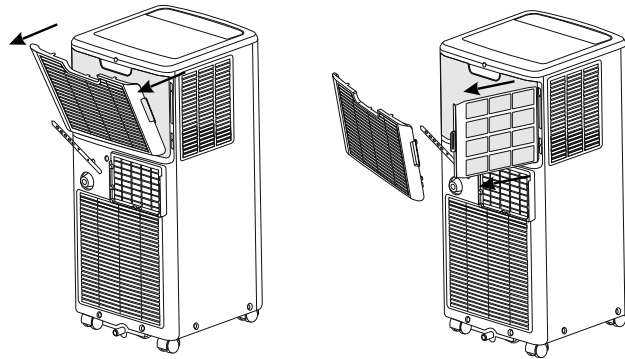
#### Memory function

In the event of a blackout, when the power supply is restored the unit will resume operating according to the last settings. The compressor resumes operation after 4 minutes.

# CARE AND MAINTENANCE

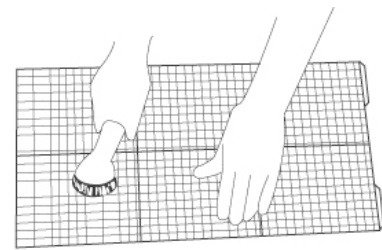
## WARNING!

Prior to carrying out any cleaning or maintenance, unplug the unit from the power socket.



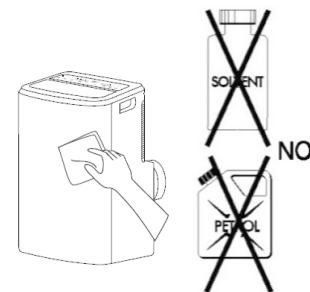
### 1. Cleaning the air filter

When the air filter needs to be cleaned, "Cl" appears on the control panel display. The air filter must be checked at least once every two weeks of operation. Operation with dirty or clogged filters always causes a decrease in the efficiency of the air conditioner and can cause serious problems. To remove the filter, unhook the rear grille and then remove the filter following the direction of the arrows, pulling it gently. Use a vacuum cleaner to remove dust. If this is not enough, wash the filter with warm water and possibly neutral detergent, rinse it with cold water and let it dry naturally before putting it back in place. Once the filter has been reinserted, close the grille and resume using the air conditioner.



### 2. Cleaning the casing

Use a soft damp cloth to clean the outer surface of the air conditioner. Do not use excessively hot water, solvents, petrol or other aggressive chemical compounds, talcum powder and brushes: they may damage the surface or colour of the casing. Remove any stains using warm water with a little neutral detergent. Do not pour water onto the air conditioner to clean it: this may damage the internal components or cause a short circuit.

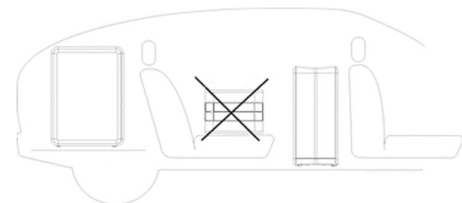


### 3. Storage

When you do not envisage using the air conditioner for a long time, clean the filters before storing it away. Keep the appliance in a vertical position at all times. Do not place any heavy objects on the top and, if possible, protect the air conditioner with a plastic sheet.

### 4. Transport

Preferably keep the air conditioner in the vertical position when transporting it. Should this not be possible, rest it on its right-hand side; when it reaches its destination, immediately put the appliance in the vertical position and wait at least 4 hours before using it in the cooling mode.



5. For complete safety, regularly check the condition of the power cord; should it be damaged through use, contact the Service Centre to replace it.

## TIPS FOR MAXIMISING COMFORT AND MINIMISING CONSUMPTION

### CHECK that:

- the unit's extraction and delivery grilles are always unobstructed;
- the air filter is always clean: a dirty filter will decrease the passage of air and thus reduce the unit performance;
- the doors and windows are closed, to avoid infiltration of unconditioned air;
- the flexible hose is correctly positioned, without folds or sharp bends;
- the room temperature is above 16 °C for the cooling mode and for dehumidification mode.

### REGULATION (EU) No. 517/2014 – F-GAS

The unit contains R290, a natural greenhouse gas with global warming potential (GWP) = 3 - Kg. 0.175 = 0.00053 Tons CO<sub>2</sub> equiv. Do not release R290 into the atmosphere.



### INFORMATION FOR CORRECT DISPOSAL OF THE PRODUCT IN ACCORDANCE WITH THE EUROPEAN DIRECTIVE 2012/19/EU

At the end of its working life this equipment must not be disposed of as an household waste. It must be taken to special local community waste collection centres or to a dealer providing this service. Disposing of electrical and electronic equipment separately avoids possible negative effects on the environment and human health deriving from an inappropriate disposal and enables its components to be recovered and recycled to obtain significant savings in energy and resources. In order to underline the duty to dispose of this equipment separately, the product is marked with a crossed-out dustbin

# SPECIALIST'S MANUAL

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

- 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.

## Safety preparation work

The maximum refrigerant charge amount is shown on the following table a  
(Note: Please refer to the nameplate for the charging quantity of R290).

|                             |        |       |       |
|-----------------------------|--------|-------|-------|
| Room area (m <sup>2</sup> ) | 4      | 11    | 15    |
| Maximum charge (kg)         | <0.152 | 0.225 | 0.304 |

Table a - Maximum charge (kg)

## Security checks

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. 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.

### • 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 refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO<sub>2</sub> fire extinguisher adjacent to the charging area.

### • No ignition sources

No person carrying out work in relation to a refrigeration 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 refrigeration equipment

Where electrical components are being changed, they shall be fit for the purpose and 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;
- 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.

- **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**

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. 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 the apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded to the point 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 can inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

- **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 bear 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.

- **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.

- **Leak detection methods**

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 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. For appliances containing flammable refrigerants, oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.

- **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 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. For appliances containing flammable refrigerants, 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 purging refrigerant systems. For appliances containing flammable refrigerants, 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 that ventilation is 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 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 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 reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. 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.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with manufacturer's instructions.
8. Do not overfill cylinders. (No more than 80% volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. 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.
11. Recovered refrigerant shall not be charged into another refrigeration 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 all appropriate refrigerants including, when applicable, 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 returning 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.



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