



EN

PORTABLE AIR CONDITIONER (LOCAL)

LOKI PLUS WF



OPERATING INSTRUCTIONS

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



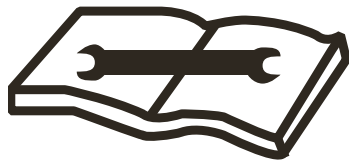
Appliance is filled with flammable gas R290.



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.

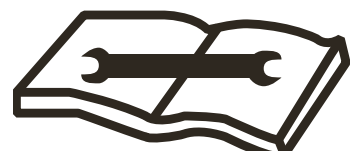
The Refrigerant R290

- 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 ozonosphere 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 m². For repairs, strictly follow manufacturer's instructions only for appliances filled with R290 flammable gas. Be aware that refrigerants do not have any odour.



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 5ET o SMT the electricity passing through the fuse cannot be above 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 POWER 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).
- 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.
- The appliance must be installed in accordance with national wiring regulations.
- 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.

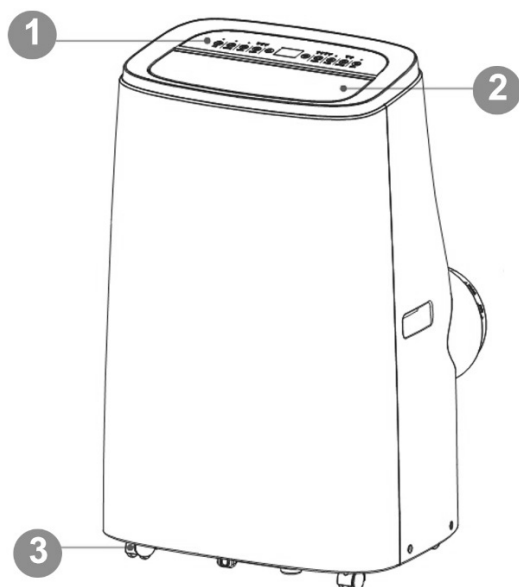
WARNING!

- 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.

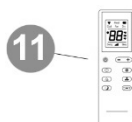
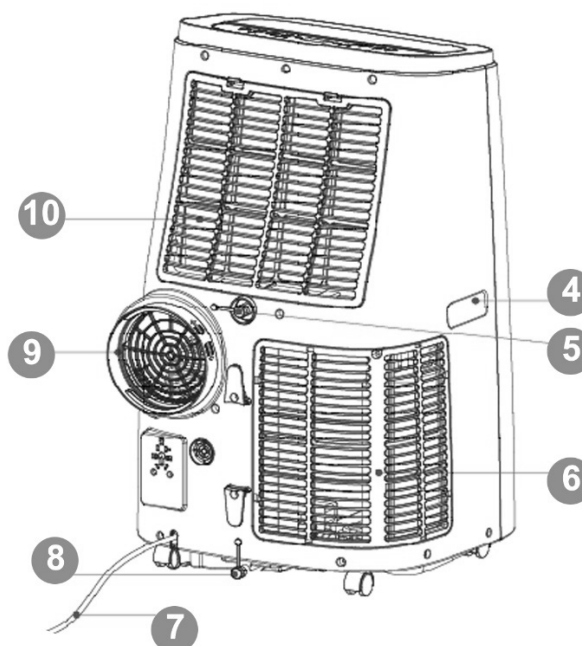
The manufacturer will not be held liable if safety and accident prevention rules are not observed.

DESCRIPTION OF THE APPLIANCE

FRONT VIEW



REAR VIEW



- 1) CONTROL PANEL AND FUNCTION BUTTONS WITHOUT REMOTE CONTROL
- 2) FIN AND AIR INTAKE
- 3) WHEELS
- 4) HANDLE
- 5) CONTINUOUS DRAINAGE DISCHARGE
- 6) AIR INLET AND FILTER

- 7) POWER CORD
- 8) AIR EXPULSION HOSE
- 9) WINDOW ACCESSORY
- 10) AIR INLET AND FILTER
- 11) REMOTE CONTROL

Min/max operating limits (internal temperature)

Cooling: 16 °C DB / 35 °C DB

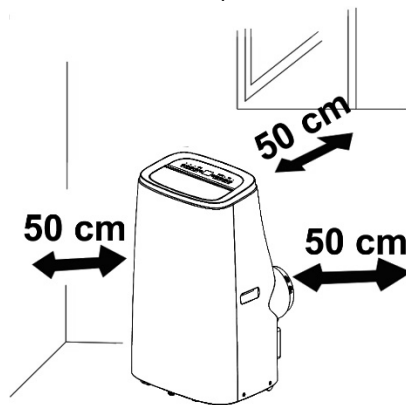
Dehumidification: 16 °C DB / 35 °C DB

Heating: 7°C DB / 35°C DB

Cooling mode room temperature adjustment range: 16 °C DB / 31 °C DB

PRE-OPERATING CHECKS AND OPERATIONS

The following space must be maintained to ensure the operating efficiency of the portable air conditioner. The unit must be placed vertically for 2 hours before the first power on.



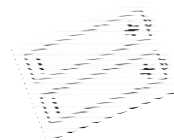
APPLIANCE START-UP

Open the packaging and remove the box from above. Remove the product and the other elements supplied (illustrated in the box below).

LCD remote control



Type AAA batteries
for the remote control
(not included)



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



Hose



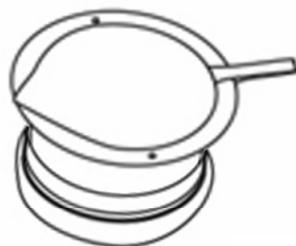
End fitting for window (2)



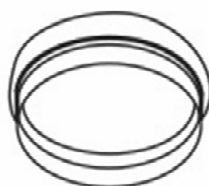
Drainage pipe.



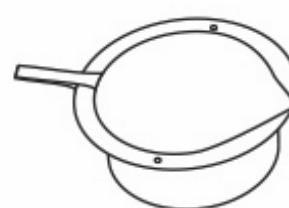
Window unit kit (A+B)



Window unit (A)



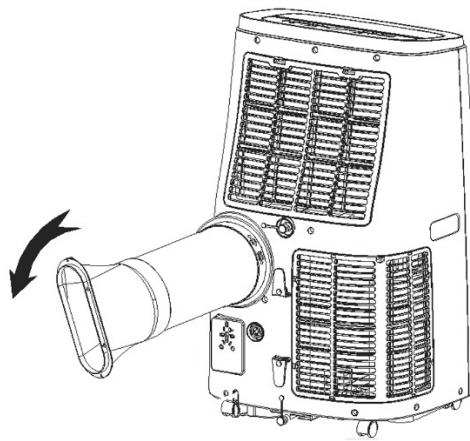
Cap (B)



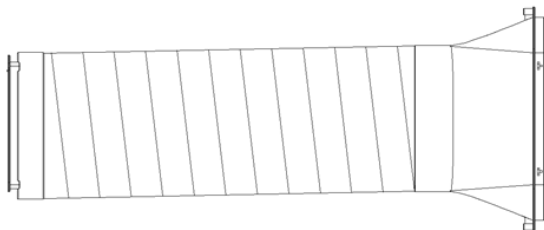
Position the product vertically on a flat and stable surface, as close as possible to a window and at least 50 cm from walls or other nearby obstacles.

USE WITH END FITTING FOR WINDOW

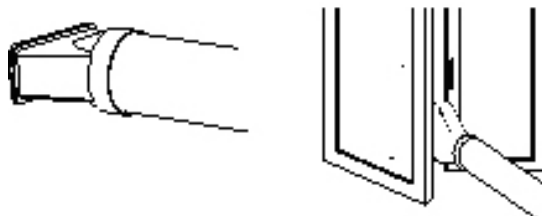
Connect the flat fitting to the hose, extend the hose as far as necessary for reaching the outside and it connect to the back of the air conditioner.



Connect the round window fitting (1) to the end of the hose then the end fitting for the window (2)

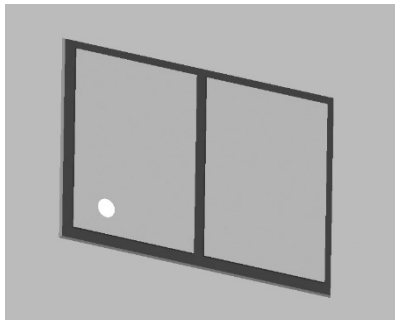


Open the windows and lock one of the two leaves with the handle.
Place the end fitting against the fixed leaf of the window, and draw the other leaf towards it.

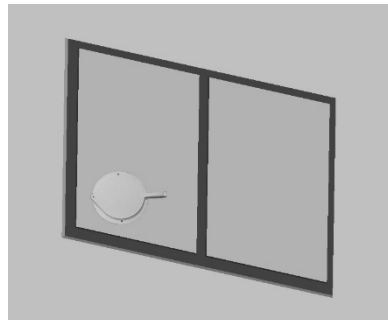


UTILIZZO CON KIT OBLÒ

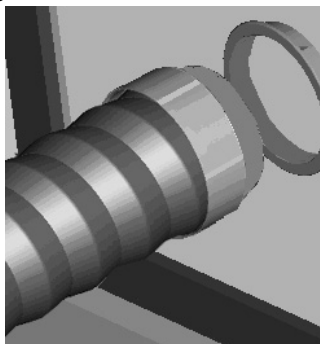
1. To make the hole in the glass it is advisable to take the porthole kit accessory to the glazier.



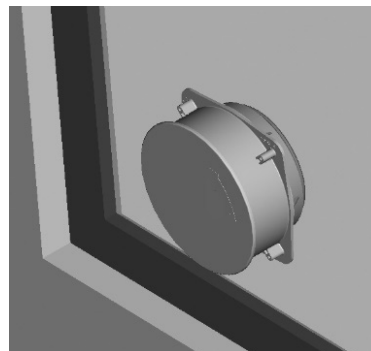
2. Insert the window unit (B) into the window.



3. Insert the round fitting (A) into the retractable flexible pipe and insert the latter with its round fitting into the window unit without the plug..



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



Connect the power cord to a suitable electric socket (220–240 V). Insert the supplied batteries into the remote control and make sure the poles match. Select the desired operating mode from the remote control.

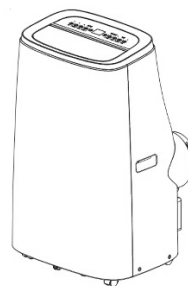
HOW TO USE THE APPLIANCE

This appliance can be used for cooling, heating, 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, Heating



Dehumidifying

THE DISCHARGE TUBE MUST ALWAYS BE CONNECTED to the appliance: the only exception is when the appliance is used solely for dehumidification, in which case it is advisable to let the appliance discharge directly into the environment for maximum efficiency (consult the "Dehumidification Mode" paragraph).

Regularly clean the air filters beneath the easily removable rear grille to keep the air conditioner working efficiently.

OPERATING MODES

1. COOLING MODE (COOL)

- The "Cool" LED on the control panel will turn on.
- The temperature can be adjusted to between 16 °C and 31 °C.
- In this mode, each time the POWER button is pressed the unit switches off, the appliance saves the temperature setting and retains this setting when it is switched on again.
- In this mode, the fan speed can be adjusted and the Timer and SLEEP functions can be set.
- For more silent operation, run the fan at low speed.

2. HEATING MODE (HEAT)

- The "Heat" LED on the control panel will turn on.
- The temperature can be adjusted to between 16 °C and 31 °C.
- In this mode, each time the POWER button is pressed the unit switches off, the appliance saves the temperature setting and retains this setting when it is switched on again.
- In this mode, the fan speed can be adjusted and the Timer and SLEEP functions can be set.
- For more silent operation, run the fan at low speed.

3. DEHUMIDIFICATION MODE (DRY)

- Press the MODE button to select the dehumidification mode.
- The temperature is controlled by the electronic board and cannot be adjusted.
- In this mode, each time the POWER button is pressed the unit switches off, the appliance saves the settings and retains them when it is switched on again.
- The fan speed is set to 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").

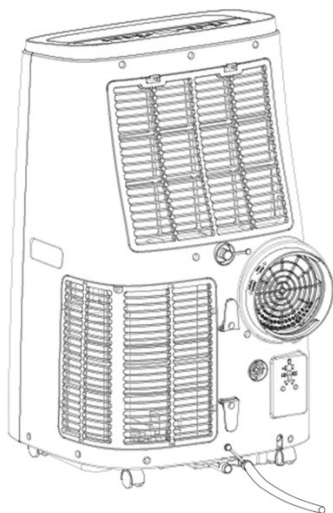
4. VENTILATION MODE (FAN ONLY)

- Press the MODE button until the Fan icon appears.
- In this mode, the fan speed can be adjusted.
- The temperature cannot be adjusted.

HOW TO ELIMINATE CONDENSATE

This appliance automatically vaporizes the condensation in cooling.

When the air conditioner operates in **Cooling**, it is not necessary to have continuous condensate drainage; only in particular climatic conditions in which the air humidity is very high, it can happen that water is deposited inside the unit. In **heating** the condensate is not vaporized automatically, it will therefore be necessary to empty the tank periodically. Alternatively, drainage can be arranged from the lower hole on the back of the unit, the condensate drain will be intermittent. **When the internal tank is full, the air conditioner will emit 8 beeps and the display will show the message "FL", signaling the filling and blocking the operation of the device.**



Cooling and Heating

When the unit operates in the cooling and heating mode, ensure that the rubber cap closing the drainage opening on the back of the appliance is properly positioned.

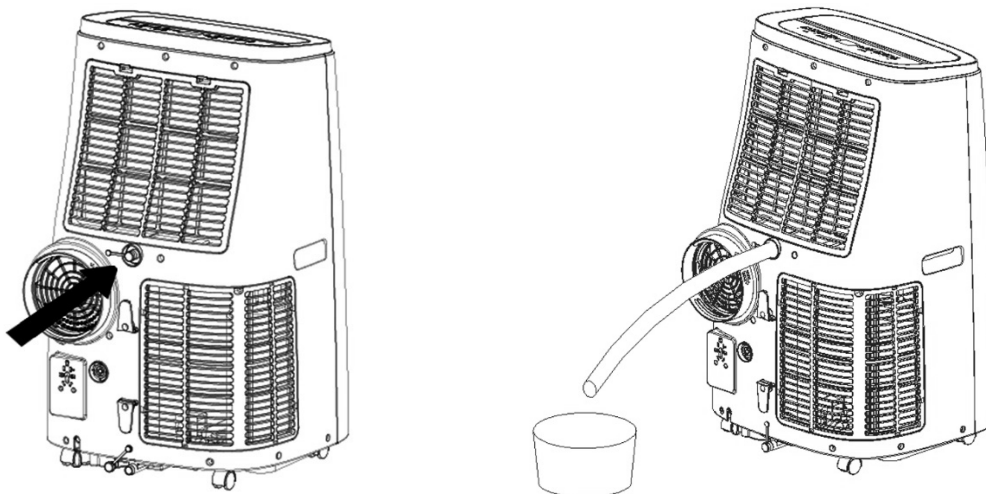
To empty the container, switch the air conditioner off and unplug the cord. Remove the cap from the rear drainage opening and place its end over a normal drain. Ensure that the tube is not twisted or bent. The tube must slope downwards. Re-close the drainage opening with the cap, insert it into the clamp and resume use of the air conditioner.

Dehumidification

WARNING!

When using the air conditioner in dehumidification mode, we recommend always ensuring continuous drainage, in order to maximise dehumidification efficiency.

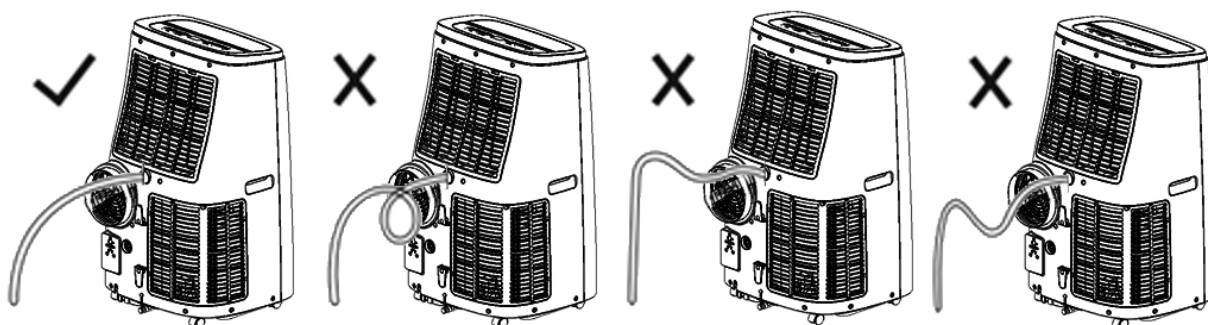
Use the drainage outlet on the appliance. The water can be drained into a drain by simply connecting the supplied drainage tube.



1. Remove the cap by turning it anti-clockwise then remove the plug.

2. Next, insert the drainage tube into the connection tube.

3. Avoid bends in the drainage tube.



REMOTE CONTROL OPERATION

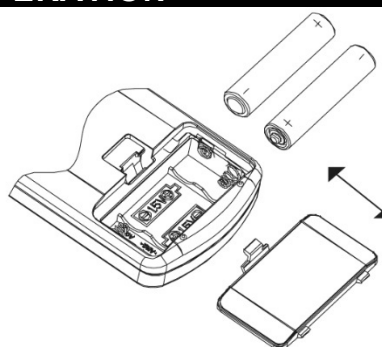
Use alkaline batteries, type AAA, LR03, 1,5V compliant with the Batteries Directive no.2006/66/CE and amendments from Directive 56/2013/UE.

Insert the batteries into the remote control, while respecting the indicated polarities.

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

Do not attempt to recharge the batteries. Replace all batteries at the same time.

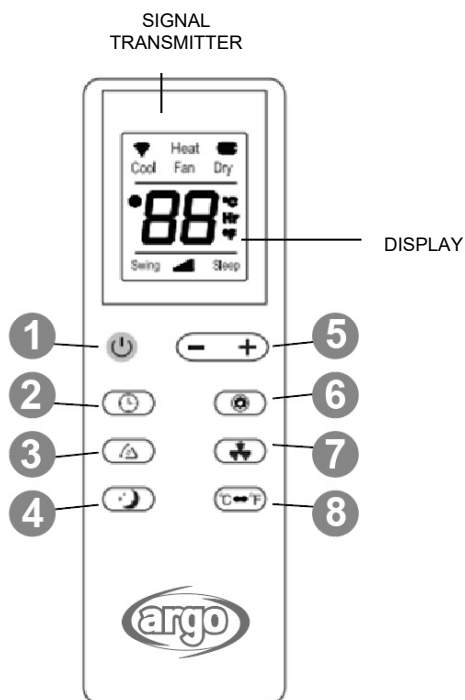
Do not throw the batteries into fire: they may explode.



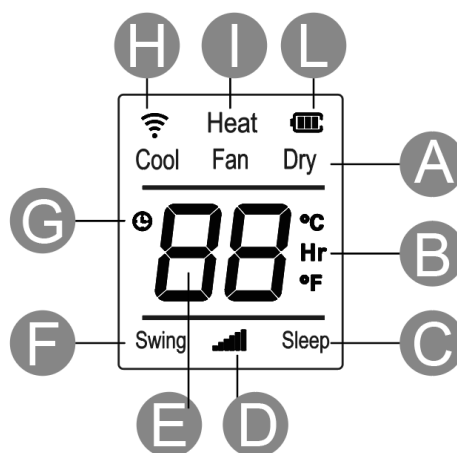
INFORMATION FOR CORRECT DISPOSAL OF THE BATTERIES PURSUANT TO EUROPEAN DIRECTIVE 2006/66/EC and changes from Directive 2013/56 / EU

Replace the batteries when depleted. At the end of their working life, batteries must be disposed of separately from unsorted waste. They must be delivered to appropriate separated waste disposal plants or to dealers that provide a similar service. Separate waste disposal of batteries prevents potential negative effects on the environment and human health resulting from inadequate disposal, and also allows the materials from which it is made to be recovered and recycled in order to achieve 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 is subject to administrative penalties as per current regulations.

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

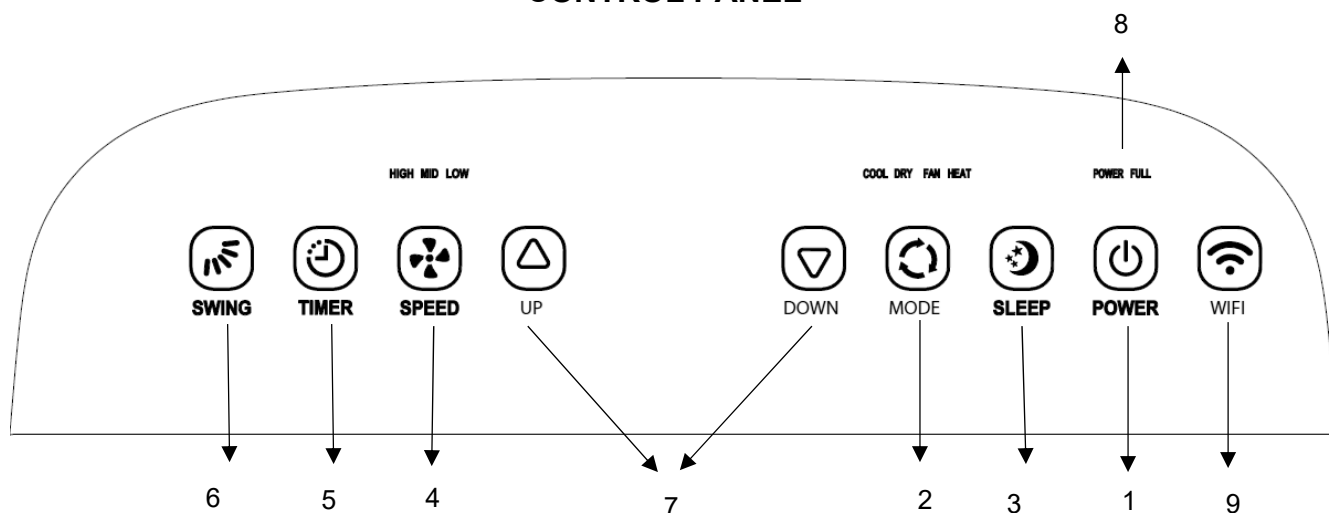


1. POWER BUTTON
2. TIMER BUTTON
3. SWING BUTTON
4. SLEEP BUTTON
5. TEMPERATURE AND TIMER ADJUSTMENT BUTTONS
6. MODE BUTTON
7. FAN BUTTON – VENTILATION SPEED
8. TASTO °C °F



- A. Mode indicator: COOL, FAN, DRY
- B. Temperature and time
- C. Sleep on/off
- D. Speed setting
- E. Display timer and temperature
- F. Swing on/off
- G. Timer set
- H. Signal transmission
- I. Heating mode
- L. Battery level

CONTROL PANEL



(1) POWER BUTTON

Press this button to switch the unit on or off.

When switched on, the appliance will start functioning based on its last settings (save function).

(2) MODE SELECTION BUTTON (MODE)

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

COOL DRY FAN HEAT

In the COOL mode the display lights up. In the DRY and FAN modes the display does not light up.

(3) SLEEP BUTTON (on both the remote control and portable unit)

Press this button to reduce to minimum the ventilation, for the most silence.

Note: The sleep mode cannot be started in ventilation mode.

(4) FAN SPEED ADJUSTMENT BUTTON

Press this button when the appliance is switched on for adjusting the ventilation speed in cooling mode, as follows: High, Medium, Low:

HIGH MID LOW

The fan speed cannot be adjusted in **DRY** mode and is fixed to low speed.

(5) TIMER BUTTON (on both the remote control and portable unit)

Press and hold this button for 1 second to set the timer.

1) **Timer-on** (automatic switch-on)

When the appliance is off, this button is used to set a delay after which the unit will switch on.

Remote control: press "TIMER" to set a time to turn on the air conditioner. Press +/- to set the time, and press "TIMER" again to confirm it. The "G" icon will remain on to indicate that the TIMER has been set.

Portable unit: Press TIMER. Press Timer again to select a number of hours from 1 to 24. Press the TIMER button to confirm.

2) **Timer-off** (automatic switch-off)

When the appliance is running in the COOL mode, set a delay after which the unit will switch off.

Remote control: press "TIMER" to set a time to turn on the air conditioner. Press +/- to set the time, and press "TIMER" again to confirm it. The "G" icon will remain lit to indicate that the switch-off TIMER is running.

Portable unit: Press TIMER. Press Timer again to select a number of hours from 1 to 24. Press the TIMER button to confirm.


Resetting the timer: If a TIMER has been set, press **TIMER** to display the delay. Press **TIMER** again to cancel the setting.

(6) "SWING" BUTTON

Press "SWING" top turn on or off the swing function.

(7) TEMPERATURE UP DOWN AND TIMER ADJUSTMENT BUTTONS

The temperature can be adjusted to between 16 °C and 30 °C.

Increase temperature (**UP** ):

1) Allows for adjusting the desired temperature in cooling (COOL) mode.

2) Whenever the (**UP** ) button is pressed, the set temperature increases by 1 °C.

Decrease temperature (**DOWN** ):

1) Allows for adjusting the desired temperature in cooling (COOL) mode.

2) Whenever the (**DOWN** ) button is pressed, the set temperature decreases by 1 °C.

The same button allows for setting the **TIMER**.

(8) TANK OVERFLOW INDICATOR

If the tank is full this led will turn on.

(9) WIFI INDICATOR

See the paragraph dedicated to the Wifi Guide.

TEMPERATURE AND ERROR DISPLAY

In the event of a malfunction, the LED display shows an error code, which facilitates the solution of the problem. With the exception of the FL message, full tank, when an error occurs do not attempt to repair the air conditioner, always take it to an Argoclima Service Center.

Problem	Cause	Solution
FL	Tank full of water.	Empty the tank. If the problem persists, contact a service centre.
E1	Room temperature sensor failure.	Contact a service centre.
E2	Failure of temperature sensor on the evaporator.	Contact a service centre.

The temperature and error display lights up only in COOL modes. It does not light up in DRY and FAN modes

SAFETY FUNCTIONS

COMPRESSOR PROTECTION

It takes 3 minutes before it starts when the unit is turned off, it can not be restarted before 3 minutes have elapsed since the previous stop.

AUTOMATIC DEFROSTING

When it works in heating, there is a risk that the ice will form on the battery: in this case the air conditioner stop working, to melt the ice and then starts again.

Wi-Fi GUIDE

Information on the App “Smart Life - Smart Living”

The App Smart Life - Smart Living  is available for Android and iOS.

Scan the corresponding QR code to get directly to the download.



Google Play



App Store

Information on How to Use the App

This appliance allows you to operate the appliance via your home net-work.


A prerequisite is a permanent Wi-Fi connection to your router and the free app “Smart Life - Smart Living”.

We recommend disconnecting the appliance from the power supply when you are away from home to prevent unintentional switching on.


System Requirement for Use of the App

- iOS 8.0 or higher
- Android 4.1 or higher

Commissioning via the App

1. Install the “Smart Life - Smart Living” app. Create a user account.
2. Activate the Wi-Fi function in the settings of your appliance.
3. Place the appliance at a distance of about 5 meters to your router.
4. Press and hold the FAN SPEED button for about 5 the LED Wifi  will flash rapidly.
5. Launch the app and select “ + ”.

6. Select the “air conditioner” menu and follow the instructions on the display.

7. Once the appliance has been successfully connected, LED Wifi  lights up. Now you can operate the appliance using the app.

NB: The unit can only be used with 2.4 GHz routers. 5 GHz routers are not supported. The appliance has only one network connection. It cannot be turned off.

CARE AND MAINTENANCE

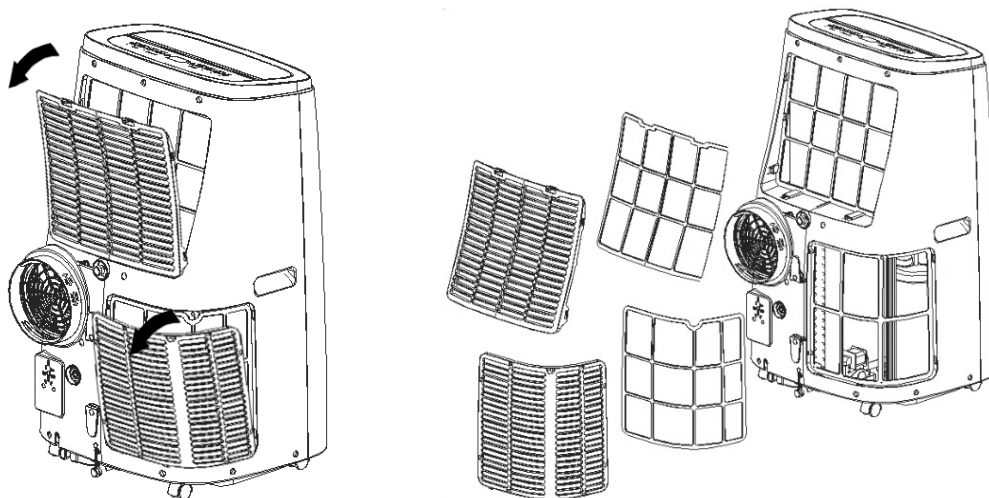
WARNING!

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

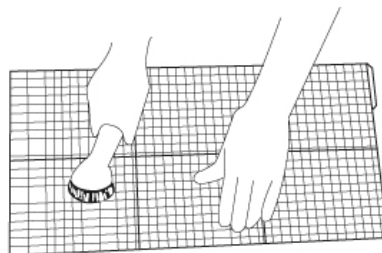
1. Cleaning the air filters

The air filter must be checked at least once every two weeks of operation. Operating with dirty or clogged filters will decrease the effectiveness of the air conditioner and can cause serious problems.

To remove the filter, release the rear grille then slide out the filter by gently pulling it.



Use a vacuum cleaner to remove any dust. Should this not be sufficient, wash the filter with lukewarm water and neutral detergent (if necessary), rinse it with cold water then leave it to dry naturally before putting it back in place. After putting the filter back in place, close the grille and resume use of the air conditioner.



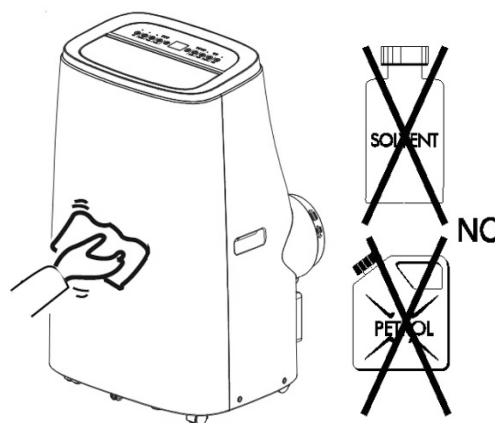
2. Cleaning the casing.

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.



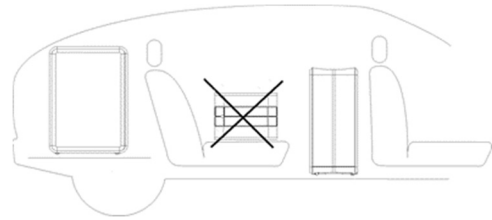
3. Storage.

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 filters are 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 18 °C for the cooling mode, and above 10 °C for dehumidification mode.

LOKI PLUS WF REGULATION (EU) No. 517/2014 – F-GAS

The unit contains R290, a natural greenhouse gas with global warming potential (GWP) = 3 - Kg. 0,24 = 0,00072 Tons CO₂ equiv.

Do not release R290 into the atmosphere.



INFORMATION FOR THE CORRECT DISPOSAL OF THE PRODUCT pursuant to art. 26 Legislative Decree 14/03/14, no. 49 "IMPLEMENTATION OF EUROPEAN DIRECTIVE 2012/19 / EU ON WASTE FROM ELECTRICAL AND ELECTRONIC EQUIPMENT"

At the end of its useful life, this appliance must not be disposed of with household waste. We recall the important role of the consumer in contributing to the reuse, recycling and other forms of recovery of such waste.

The device must be delivered separately to appropriate municipal collection centers or free of charge at retailers, upon purchase of a new equivalent type of equipment.

For products with an external dimension of less than 25 cm, this free waste collection service must be provided free of charge by large retailers (sales area of at least 400m²) even if no equivalent equipment is purchased.

Disposing of an electrical and electronic device separately allows you to avoid possible negative effects on the environment and human health resulting from inappropriate disposal and allows you to recover and recycle the materials it is made of, with important savings in energy and resources.

To emphasize the obligation to dispose of these equipment separately, the product bears the crossed out bin symbol.

Specialist's Manual

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

a) Any person who is involved with working on or breaking into a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority, which authorises their competence to handle refrigerants safely in accordance with an industry recognised assessment specification.

b) Servicing shall only be performed as recommended by the equipment manufacturer. Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of the person competent in the use of flammable refrigerants.

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 ²)	4	11	15
Maximum charge (kg)	<0.152	0.225	0.304

table a - Maximum charge (kg)

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 CO₂ 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 to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

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

---The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;

---The ventilation machinery and outlets are operating adequately and are not obstructed;

---If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;

---Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;

---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.

- a. Become familiar with the equipment and its operation.
- b. Isolate system electrically.
- c. Before attempting the procedure, ensure that:
 - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - all personal protective equipment is available and being used correctly;
 - the recovery process is supervised at all times by a competent person;
 - recovery equipment and cylinders conform to the appropriate standards.
- d. Pump down refrigerant system, if possible.
- e. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- f. Make sure that cylinder is situated on the scales before recovery takes place.
- g. Start the recovery machine and operate in accordance with 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.

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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