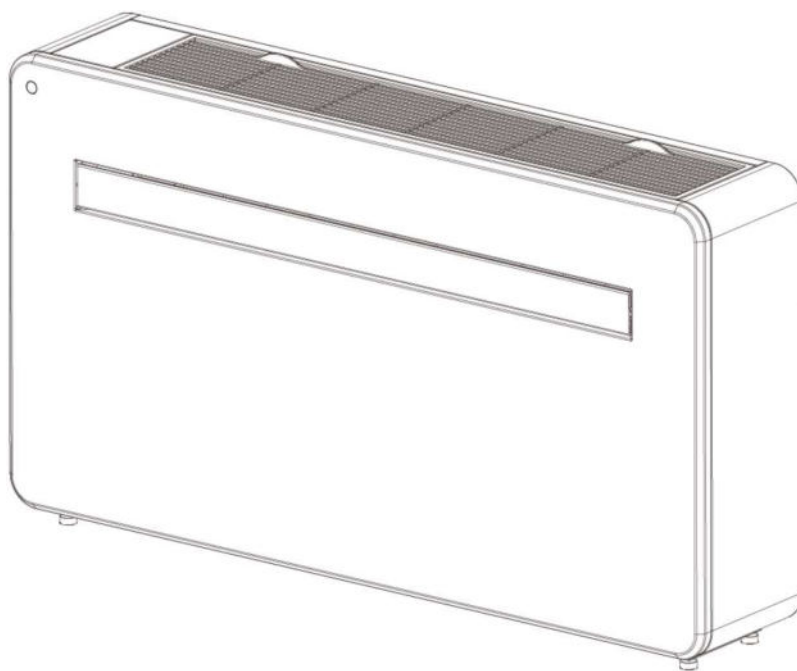


MaxiCool

USER MANUAL

TC12E-Monobloc



**WALL MOUNTED AIR CONDITIONER
WITH HEAT PUMP AND WIFI SMART APP**

SAFETY INSTRUCTIONS

IMPORTANT!

AIR CONDITIONERS MUST ALWAYS BE STORED AND TRANSPORTED UPRIGHT, OTHERWISE IRREPARABLE DAMAGE MAY BE CAUSED TO THE COMPRESSOR; IF IN DOUBT WE SUGGEST WAITING AT LEAST 24 HOURS FOLLOWING INSTALLTION BEFORE STARTING THE UNIT.



- Carefully read the instructions before installing and/or operating the unit.
- This appliance is for indoor use only.
- This unit must be only connected to a 220-240 V / 50 Hz earthed outlet.
- Installation must be in accordance with regulations of the country where the unit is used.
- If you are in any doubt about the suitability of your electrical supply have it checked and, if necessary, modified by a qualified electrician.
- This air conditioner has been tested and is safe to use. However, as with any electrical appliance - use it with care.
- Disconnect the power from the appliance before dismantling, assembling or cleaning.
- Avoid touching any moving parts of the appliance.
- Never insert fingers, pencils or any other objects though the guard.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities. It is also not intended for use by those with a lack of experience and knowledge, unless they have been given supervision or instruction concerning the use of the appliance by a person responsible for their safety.
- Do not leave children unsupervised with this appliance.
- Do not clean the unit by spraying it or immersing it in water.
- Never connect the unit to an electrical outlet using an extension cord. If an outlet is not available, one should be installed by a qualified electrician.
- Do not operate the unit unless it has been fully installed following the guidance provided within this manual.
- Never operate this appliance if the cord or plug is damaged. Ensure the power cord is not stretched or exposed to sharp objects/edges.
- A damaged supply cord should be replaced by the manufacturer or a qualified electrician in order to avoid a hazard.
- Any service other than regular cleaning or filter replacement should be performed by an authorised service representative. Failure to comply could result in a voided warranty.
- Do not use the appliance for any purpose other than its intended use.
- Avoid restarting the air conditioner unless 3 minutes have passed since being turned off. This prevents damage to the compressor.
- Never use the mains plug as a switch to start and turn off the air conditioner. Use the provided ON/OFF button located on the control panel.
- The appliance should not be installed in laundry or wet rooms.
- The appliance must be installed in a room without sources of ignition (for example: open flames, an operating gas appliance or an operating electric heater).
- The unit must be installed on a solid vertical wall by a competent person. The electricity supply must only be connected after installation is complete.

- R290 refrigerant gas complies with European environmental directives.
- R290 has a low GWP (Global Warming Potential) of 3.
- The air conditioner contains about 290g of R290 refrigerant gas.
- Do not install or store in an unventilated space with an area smaller than 15 m² per unit. The room must be such as to prevent stagnation of possible leaks of refrigerant gas as there could be a danger of fire or explosion hazard should the refrigerant come into contact with electric heaters, stoves or other sources of ignition.
- If the appliance is installed, used or stored in an unventilated room, the room must be such as to prevent stagnation of possible leaks of refrigerant gas as there could be a danger of fire or explosion should the refrigerant come into contact with electric heaters, stoves or other sources of ignition.
- Refrigerant gas may be odourless.
- Do not use the product and contact the retailer for advice, if damage has occurred to the unit which may have compromised the refrigerant system.
- Any repairs or maintenance must only be carried out on the unit by a suitably qualified engineer. Before opening and servicing the unit the authorized engineer must be in possession of a copy of the manufacturer's service manual and must follow the safety information contained within it to ensure all hazards are minimized.
- The refrigerant system should not be perforated or punctured.

Energy Saving and Unit Safety Protection Tips

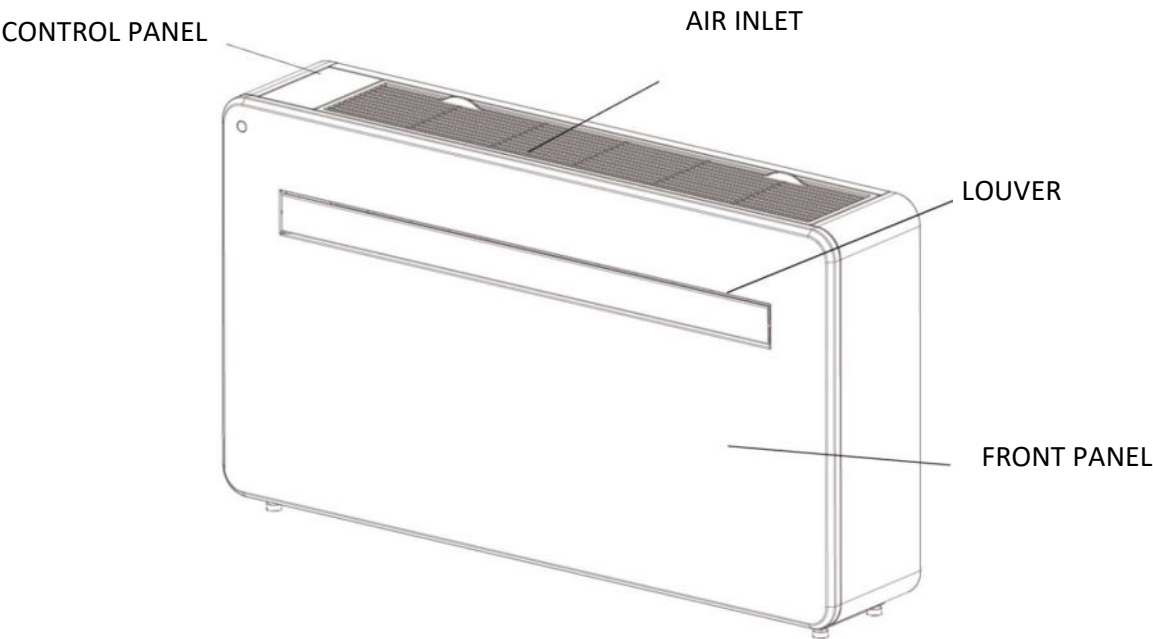
- Do not cover or restrict the airflow from the outlet or inlet grills.
- Keep the filters clean . Under normal conditions , filters should only need cleaning once every three weeks (approximately) . Since the filters remove airborne particles , more frequent cleaning maybe necessary , depending on the air quality.
- For the initial start-up set the fan speed to maximum and the thermostat to 4-5 degree lower than the current temperature . After , set the fan switch to low and set the thermostat to your desired setting.
- To protect the unit , we recommend not using the cool mode when the ambient temperature is higher than 35°C.

NOTE : Some pictures and information may vary from the final product . This is due to continual product improvement.

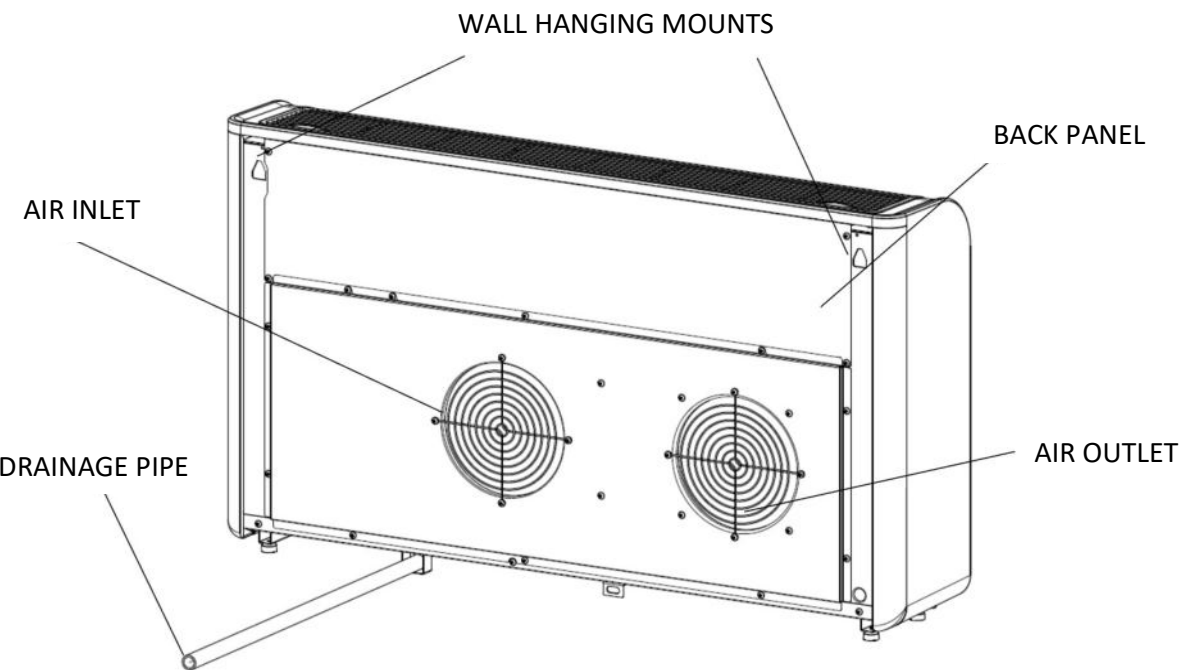
PRODUCT OVERVIEW

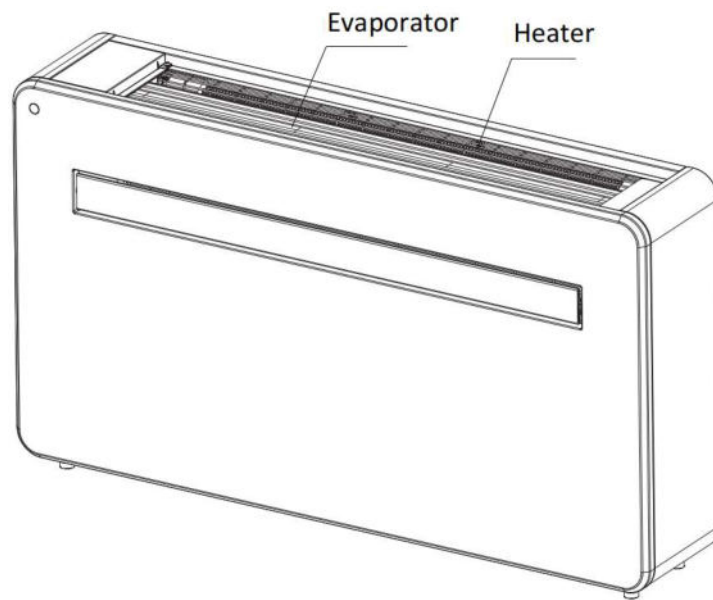
PRODUCT DIAGRAM

FRONT



BACK





After the filter opened, it's PTC heater and evaporator assembly, please don't touch the PTC heater and evaporator assembly in case been cut or scalded.

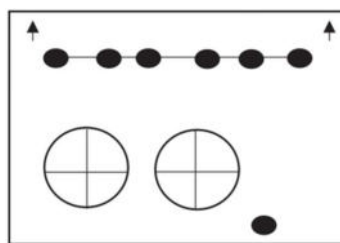
FEATURES

- ◆ Simple operation.
- ◆ Self-evaporative function with energy saving technology.
- ◆ Sleek design that seamlessly fits into any style home.
- ◆ Bright LED screen-indicates temperature and current mode.
- ◆ On / off timer function-allows you to choose when the unit operates.
- ◆ WIFI App control providing additional functionality.
- ◆ Three fan speeds.
- ◆ Four modes to suit your every need including : Cooling / Heating / Fan / Dry
- ◆ Silent running option , perfect for a restful night sleep.

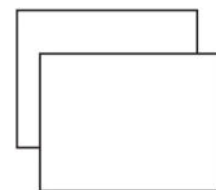
WHATS INCLUDED



AIR CONDITIONER



WALL TEMPLATE



**PLASTIC DUCTING
SHEET (X2)**



WALL BRACKET



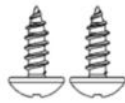
REMOTE CONTROL



VENT COVER ASSEMBLY (X2)
(CHAIN, INDOOR RING AND
OUTDOOR COVER)



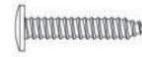
FIXED PLATE



2PCS TAPPING SCRE
(4x10mm)



7PCS WALL PLUGS
(8x40mm)



7PCS SCREWS (5x60mm)



*** DIAGRAMS FOR ILLUSTRATIVE PURPOSES ONLY**

INSTALLATION

TOOLS REQUIRED



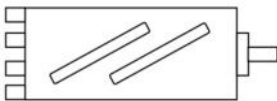
SPIRIT LEVEL



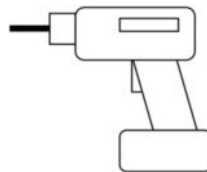
TAPE MEASURE



PENCIL



180mm CORE



DRILL



SHARP KNIFE



8mm MASONRY DRILL BIT



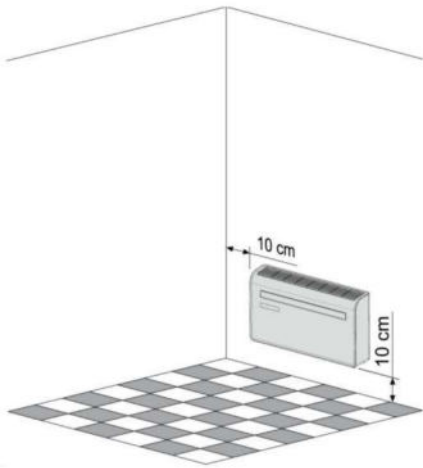
25mm MASONRY DRILL BIT

BEFORE STARTING INSTALLATION, PLEASE ENSURE YOU HAVE ALL SUITABLE EQUIPMENT AVAILABLE AND UNDERSTAND THE STEPS INVOLVED IN INSTALLATION. IF IN ANY DOUBT, PROFESSIONAL ADVICE SHOULD BE SOUGHT.

THE INSTALLER MUST ENSURE THAT THE PLANNED POSITION OF THE AIR CONDITIONER IS SUITABLE, AND THAT THERE ARE NO CABLES AND PIPES INSIDE THE WALL, AND NO OTHER

OBSTRUCTIONS FIXED ON THE WALL, WHICH WOULD PRESENT A DANGER AND/OR PREVENT COMPLETION OF INSTALLATION.

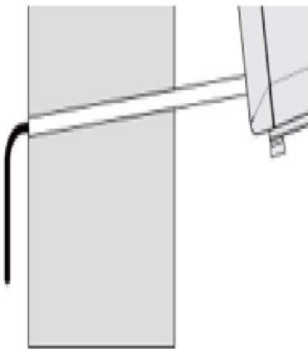
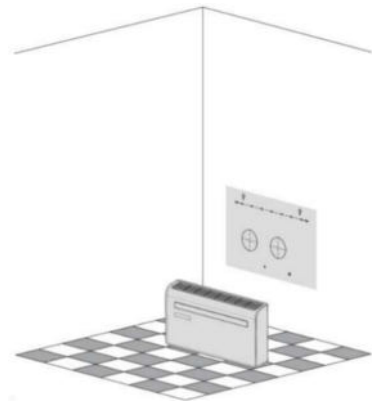
INSTALLATION



This unit must be installed on an external wall, as it vents directly out of its rear. and ensure the wall is flat, solid and reliable.

Leave at least 10 cm of space to the left, right and base of the machine. At least 20cm of space must be left above the unit to help air flow smoothly and stay away from curtains, plants, faucets, furniture and others appliances etc.

Paste the supplied installation template paper in position on the wall, ensuring that the reference line is level using a spirit level.



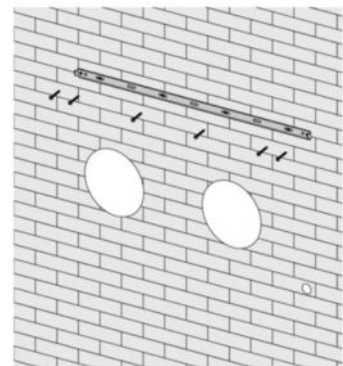
Use a 180mm core drill to drill the two holes for the units ventilation, ensuring that both the holes are aligned with the template. ensuring that the holes are at a downward angle (min 5 degrees) and aligned with the template.

The hole for the drainage pipe must be drilled using a 25mm Drill bit. Ensure the hole is at a downward angle (min 5 degrees) so that the water will drain correctly.

Use the template to mark the position of the screws for the hanging rail, using a spirit level to ensure it is straight and level.

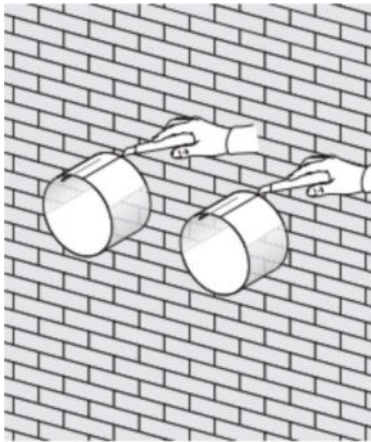
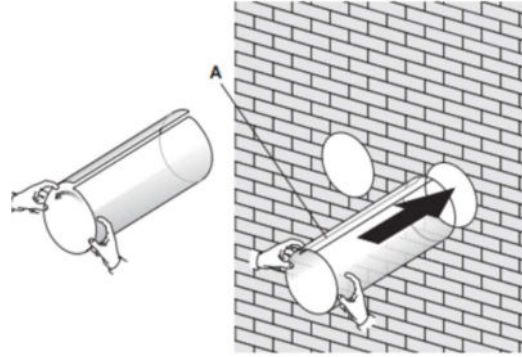
Drill the marked holes using a suitable 8mm drill bit and insert wall plugs. Line the hanging rail with the holes, and fix the rail into position using the supplied screws.

Ensure that the hanging rail is securely fastened onto the wall, and that there is no risk of the unit tipping or falling.



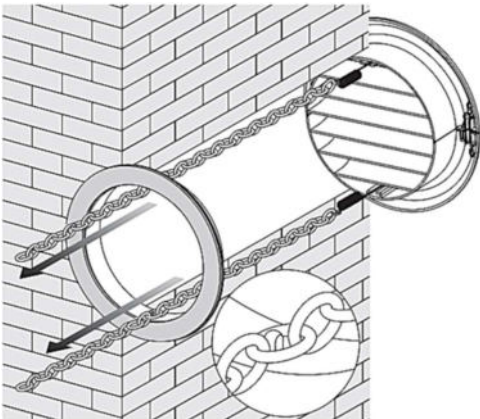
Note: The machine performs best when it is installed on a wall with a thickness not exceeding 240mm.

Roll the plastic vent sheets into a tube and feed them from the inside into the holes previously made. Ensure the tubes sit flush to the interior wall.



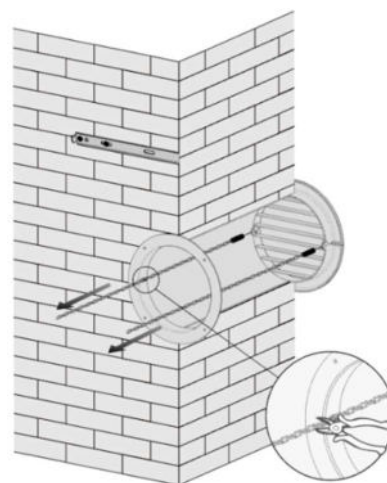
Go outside and trim off the excess vent tube using a sharp knife, keeping the edge as neat as possible.

Insert the indoor fixing ring from the vent cover onto the indoor side of the air vent. Then fold the external vent cover in half. Attach the chains to each side of the vent cover, before sliding the cover outside through the vent hole.



Expand the external cover, before tightly fixing the chains by hooking onto the indoor fixing ring. This will hold the external cover firmly in position. Repeat for the second vent.

Once the chains are fitted and secure, any excess chain should be removed by cutting the chain.



Paste the sealing strip in the accessories along the edge of the back for whole circle of the machine, cut off the excessive length if needed.

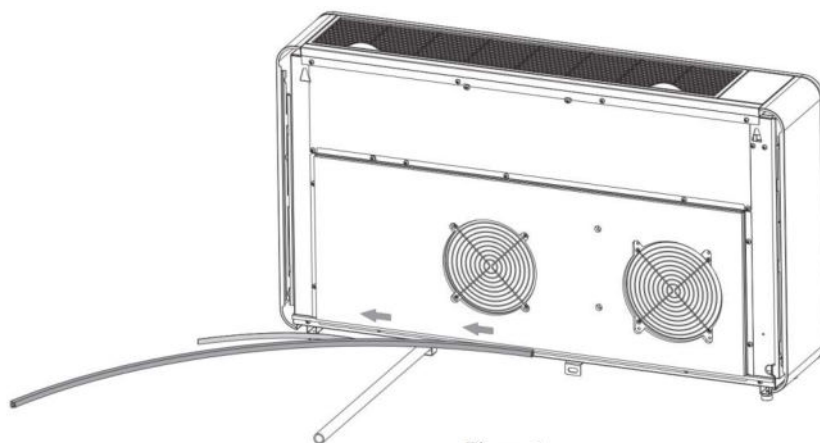


Figure 1

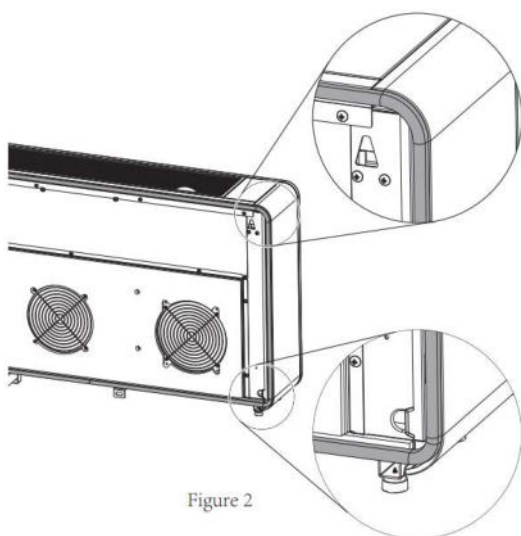
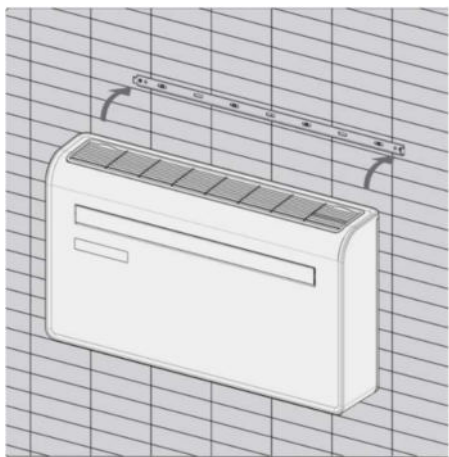


Figure 2

Note:

- 1.The sealing strip should be pasted along the edge of the machine, as shown in Figure1.
2. Please peel the striping layer on the sealing strip gradually while pasting.
3. Paste from the bottom of the machine first.
4. The position of the corner should be pasted as shown in Figure 2.
5. Improper pasting may cause extra noise.



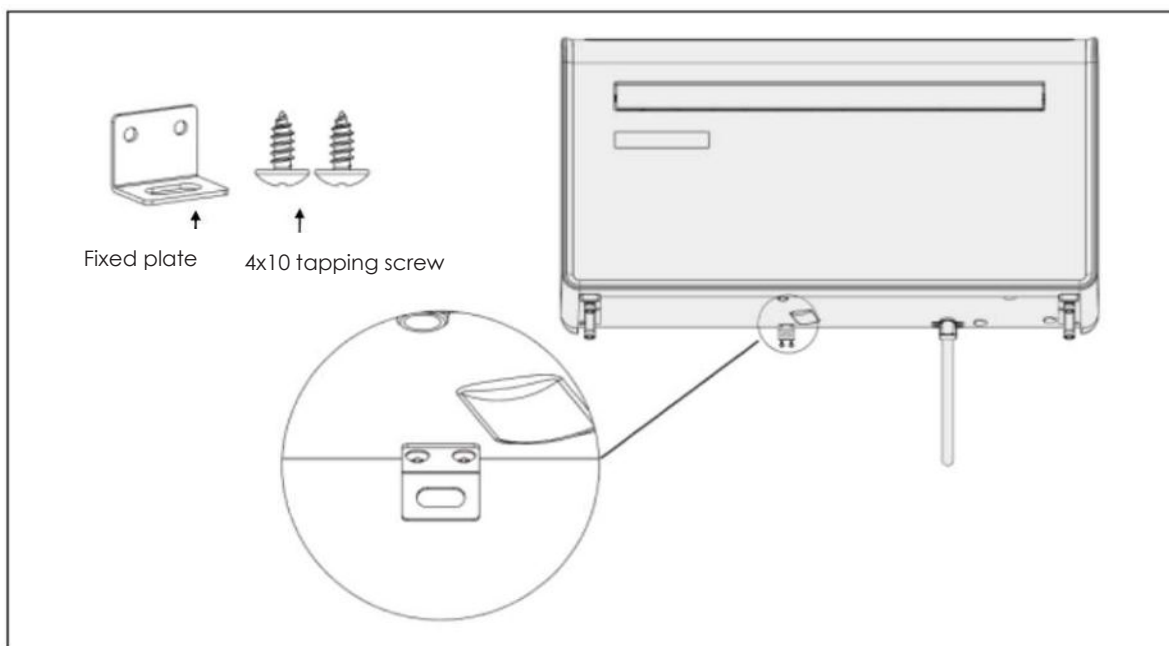
Lift the unit onto the wall, align the hanging holes with the hooks on the hanging rail and gently rest the unit into place.

At the same time, slide the drain pipe through the drainage hole.

NOTE:

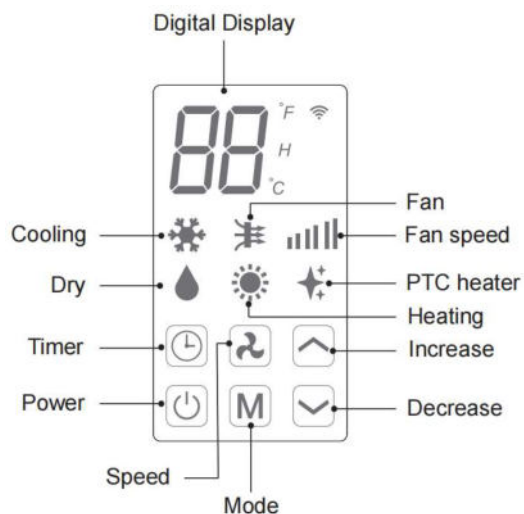
1st: please ensure that the backside of product is tightly attached on the wall to avoid additional vibration and noise.

2nd : The end of the external water pipe must be placed in an open space or drain. Avoid damage or constriction to the drainage pipe to ensure the unit drains.



OPERATION

CONTROL PANEL



REMOTE CONTROL

The air conditioner can be controlled with the remote control. Two AAA-batteries are required.

NOTE: Further details of the functions can be found on the following page.

POWER	Press the POWER button to turn the machine on or off.	
MODE	Press the MODE button to switch between cooling, heating, fan and dry modes.	
FAN	Press the FAN button to change between high, medium and low fan speeds	
LED	Press the LED button to open or close the LED background light of unit, it can be a choice for sleep condition.	
	Press the UP button to increase the desired temperature or timer duration	
	Press the DOWN button to decrease the desired temperature or timer duration	
PTC	Press the PTC button to turn the PTC electric heater on or off. (only activated in heating mode)	
SILENT	Press it for silent mode, In Silent mode, noise will be lower, fan works in low speed, frequency is low.	
SWING	Press to turn the louver swing function on and off (only activated by the remote control & APP)	
TIMER	Press the TIMER button to set the automatic switch on/off.	

FUNCTIONS

 POWER	Press "POWER" to turn the unit On or Off.	
 MODE	Press to change between the 4 different modes. The display will show the symbol for the mode currently selected.	
	 COOLING	The cooling function allows the air conditioner to cool the room and at the same time reduces air humidity. The desired temperature can be adjusted using the increase and decrease button between 16°C and 30°C. The fan speed can also be adjusted using the speed button.
	 DRY	Dry mode will extract moisture from the air, which will be drained outside using the installed drain pipe. the fan speed cannot be adjusted in dry mode.
	 FAN	In fan mode the appliance will recirculate the air within the room, and will not cool, heat or dehumidify. The fan speed can be adjusted using the Speed button, But the desired temperature can not be set.
	 HEATING	The heating function allows the air conditioner to heat the room. The desired temperature can be adjusted using the increase and decrease button between 16°C and 30°C. The fan speed can also be adjusted using the speed button.
SL SILENT		Silent mode can be activated from APP or the remote control, It can also be activated by pressing "🕒"+"⬆️" on unit control panel at the same time. It will only operate in cooling or heating modes, the fan speed will change to low and noise will be lower.
 FAN SPEED		Press to change the fan speed between Low, Medium and High. The fan speed cannot be adjusted in Dry or Silent modes.
 TIMER	The air conditioner contains a 24 hour timer, which can be used to either set a delayed start, or a set period of operation.	
	SHUTDOWN TIMER: While the unit is running press the timer button, the display will flash "0" 5 times. After the 5th flash, use the up and down buttons to adjust the duration in 1 hour increments between 1 to 24 hours. When the timer has elapsed, the unit will shutdown automatically.	
	DELAYED START TIMER: With the unit in standby, press the timer button, the display will flash "0" 5 times. After the 5th flash, use the up and down buttons to adjust the duration in 1 hour increments between 1 to 24 hours. After the timer has elapsed, the unit will start up in the same mode with the same settings as when it was turned off.	
 INCREASE AND DECREASE	Used within cooling and heating modes to adjust the desired temperature 16-30°C. Also used while setting the timer to adjust the duration.	
SWING MODE	After machine turns on, press the "SWING" button, louver will swing continuously up and down; by pressing the button again the movement will stop and the louver remain in that position. Swing mode can only be adjusted from the remote, and will initially be turned on by default. the louver will close automatic once switch OFF the product.	
COMPRESSOR PROTECTION	There is a 3 minutes delay on power on. In order to protect the life of the compressor and electronic components please do not switch on the unit for at least 5 minutes after you turned the unit off.	

 PTC electric heating function	The unit has an additional PTC electric heating element. When the weather conditions outside are bad, you can press the PTC button on the remote control to turn on the electric heating function to increase the heat. The heat power of the PTC is equal to 1000W. PTC turn on 1. Only in the heating mode, press the PTC button on the remote control to send the turn-on command to the unit. At this time, the remote control and the unit display  lights up at the same time. 2. After the unit receives the remote control command, the system will carry out self-testing, PTC will work when the following points are satisfied at the same time. Otherwise, PTC cannot work.: a. Unit is in heating mode. b. $T_w < 25^{\circ}\text{C}$ (outdoor temperature keeps lower than 25°C for 10 seconds). c. $T_s - T_r \geq 5^{\circ}\text{C}$ (The Set temperature is more than 5 degrees higher than the Room temperature). d. Room temperature $T_r \leq 18^{\circ}\text{C}$. e. Coil Temperature of evaporator $T_e \leq 48^{\circ}\text{C}$. f. Compressor is keep working for 3minutes. g. Aboved data is collected from 20S's continuous working. 3. PTC will stop working when the system self- testing detects one of the following points: a. Outdoor temperature keeps higher than 28°C for 10 seconds b. The room temperature is greater than the setpoint; c. Room temperature $T_r \geq 23^{\circ}\text{C}$. d. Compressor stop working. e. The ventilation stops or the fan is faulty. f. 4-way valve get disconnected. g. Coil Temperature of evaporator $T_e \geq 54^{\circ}\text{C}$ or sensor error. h. Unit didn't work in heating mode. i. Unit is in defrost function. PTC turn off Presses the PTC button again or change to other mode to turn off PTC function, the  lights on remote control and the unit display will be off at the same time. NOTE: ● The unit will work without PTC function as a default until the "PTC" button on remote control is pressed. ● If unit is turn off, the PTC setting will be cleared, it need to be set again.
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WIFI SETUP AND SMART FEATURES

WIFI SETUP

BEFORE YOU START

- Ensure your router provides a standard 2.4ghz connection.
- If your router is dual band ensure that both networks have different network names (SSID). The provider of your router / Internet service provider will be able to provide advice specific to your router.
- Place the air conditioner as close as possible to the router during setup.
- Once the app has been installed on your phone, turn off the data connection, and ensure your phone is connected to your router via WIFI.

DOWNLOAD THE APP TO YOUR PHONE

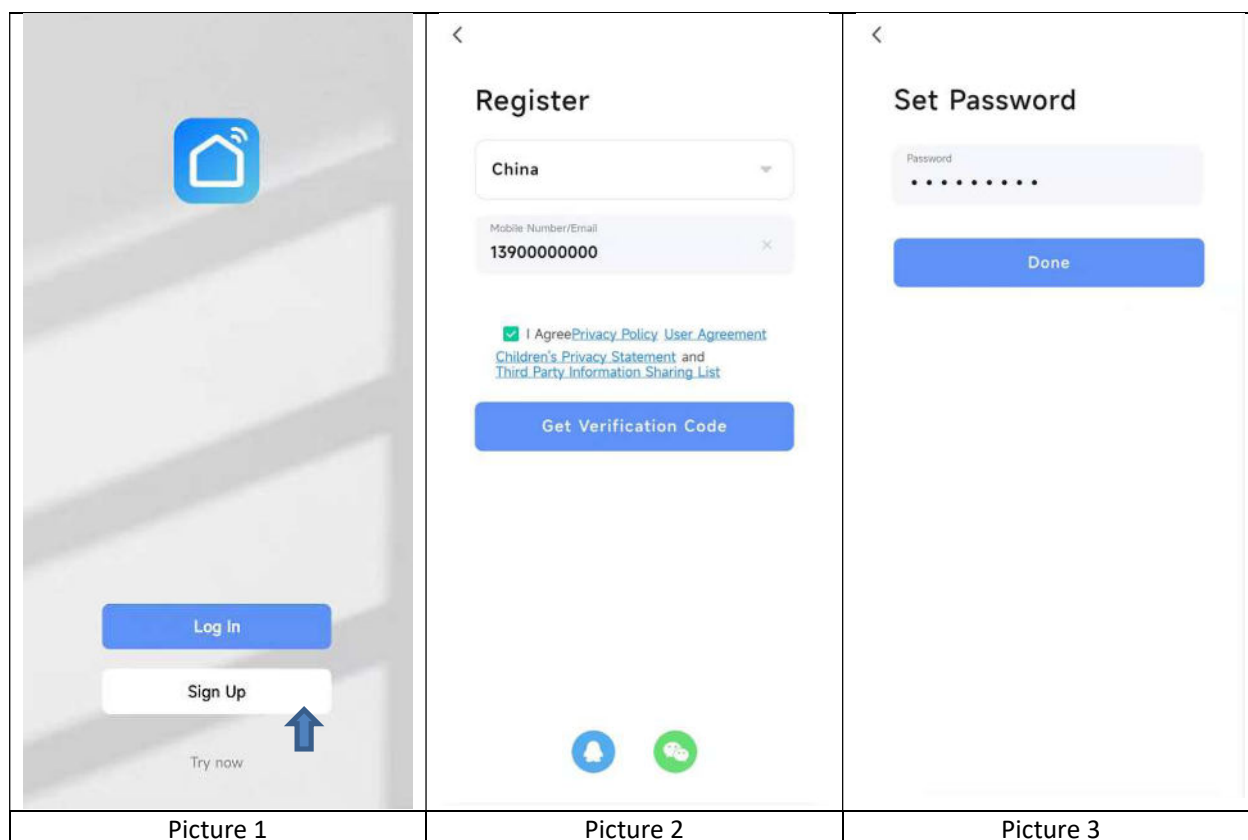
Download the "SMART LIFE" app, from your chosen app store, using the QR codes below, or by searching for the app in your chosen store.



REGISTER THE APP

If you don't have an App account , register an account or sign in with verification code by SMS. This page describes the registration process.

1. Press on the "Sign Up" button at the bottom of the screen, as shown in the picture 1.
2. The system automatically recognizes your country/ area. You can also select your country code manually. Enter your mobile phone number/ email address and tap "Get verification code", as shown in the picture 2.
3. If you choose the mobile number option, then enter the verification code in the message sent to you by SMS. Set a password as prompted and press "Done" to finish your registration. as shown in the picture 3.



WiFi CONNECTION MODE

In Standby mode press and hold the speed button for 3 seconds (until you hear a bleep) to enter the WiFi connection mode.

Please ensure your device is in the correct WiFi connection mode for the connection type you are attempting, the flashing of the WiFi light on your air conditioner will indicate this.

Connection Type	Frequency of Flashes
Quick Connection	Flashes twice per second
AP Connection (Access Point)	Flashes once per three seconds

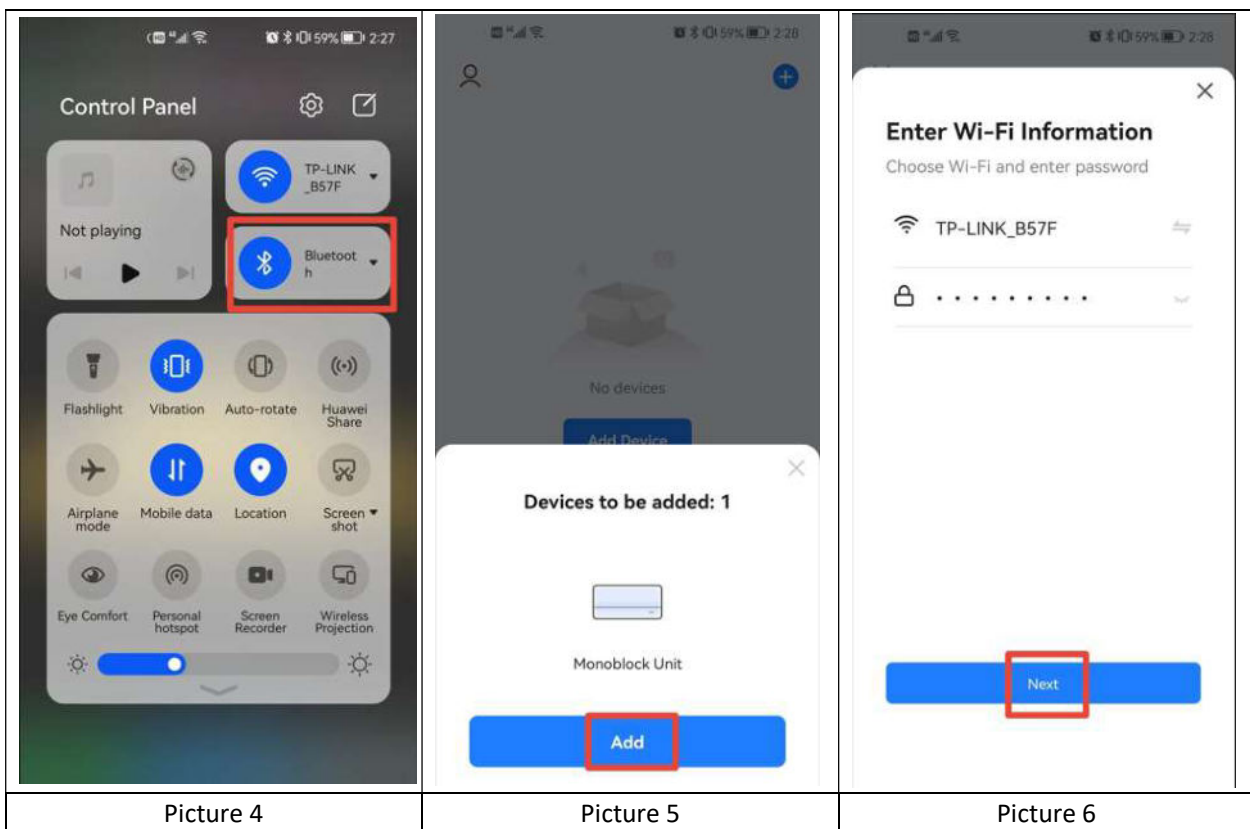
CHANGING BETWEEN CONNECTION TYPES

To change the unit between the two WiFi connection modes, hold the Speed button for 3 seconds.

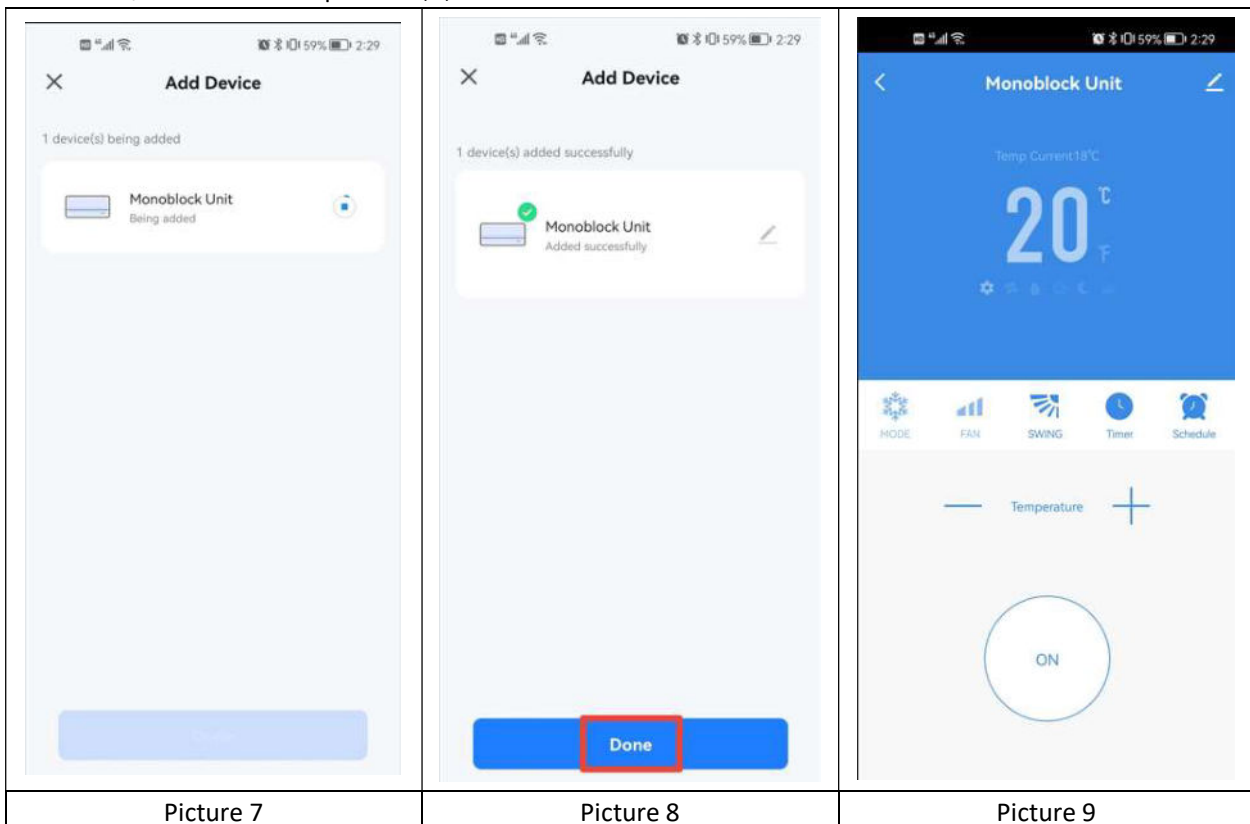
CONNECTING USING BLUETOOTH & WIFI

Before initiating the connection, make sure the unit is in standby mode and connected to the wifi network.

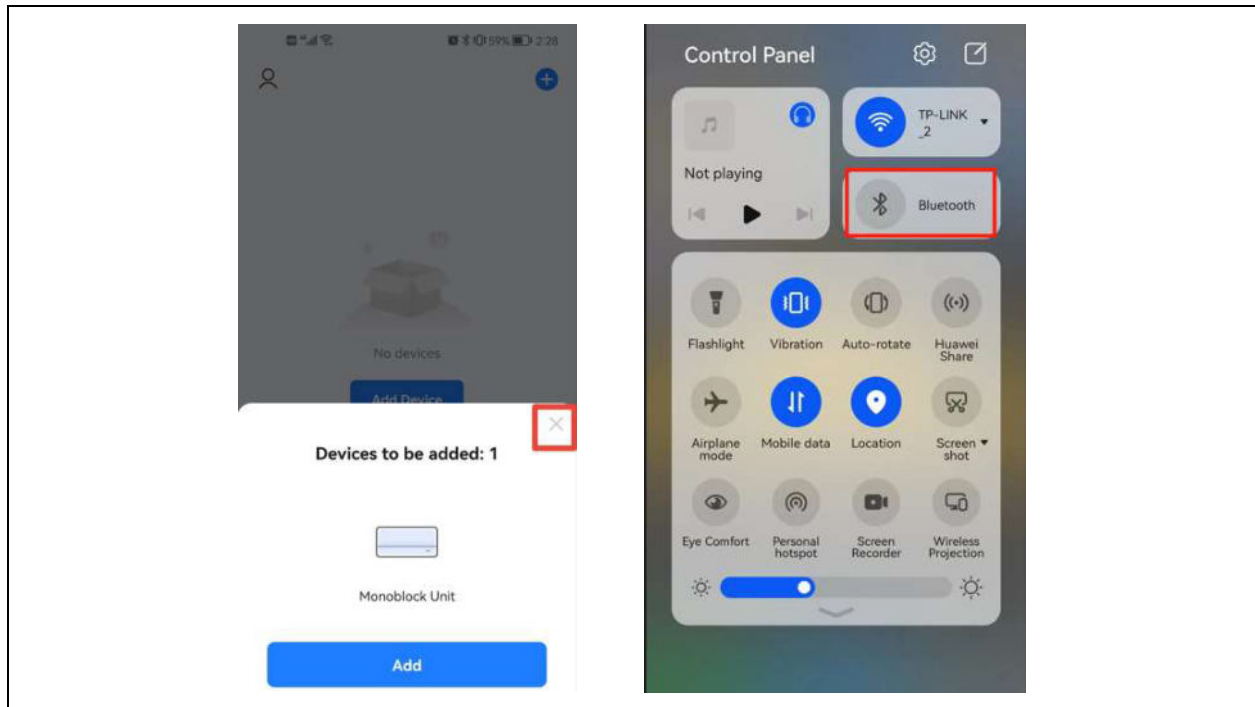
1. Open the Bluetooth of your phone, as shown in the picture 4.
2. When the device is powered on and to be connected, the connected Bluetooth device will pop up automatically after opening the App for a moment. Click "Add" button for connection, as shown in the picture 5.
3. Enter the Wi-Fi information interface, enter the password and click "Next" to continue the operation, as shown in the picture 6.



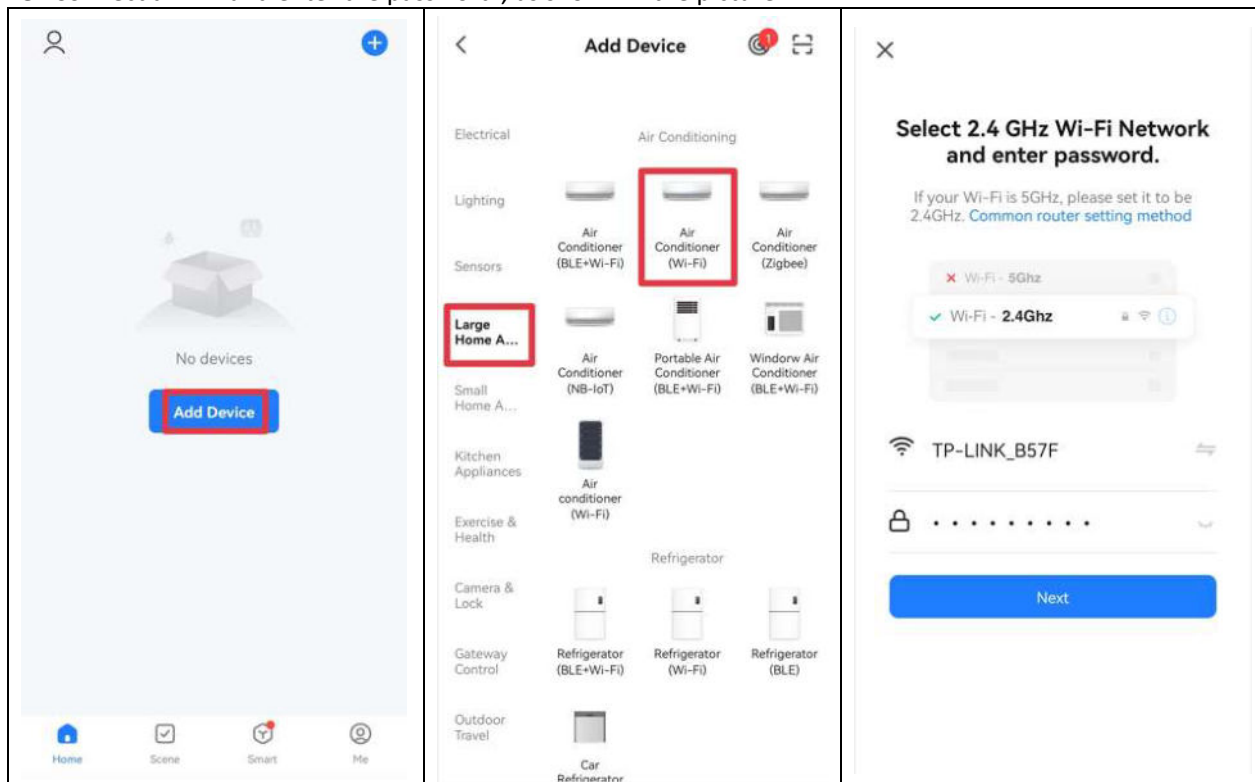
4. Enter the device connection interface after the progress bar is finished and the device is successfully connected, as shown in the picture 7,8,9.



If you don't want to use Bluetooth connection, just need to Exit the Bluetooth connection prompt or turn off Bluetooth and follow the below steps to connect the unit with Wifi connection.

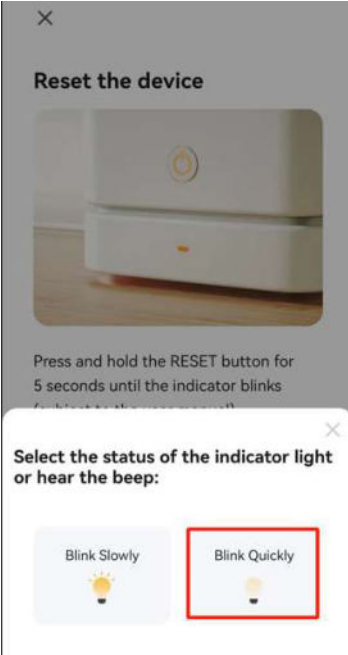
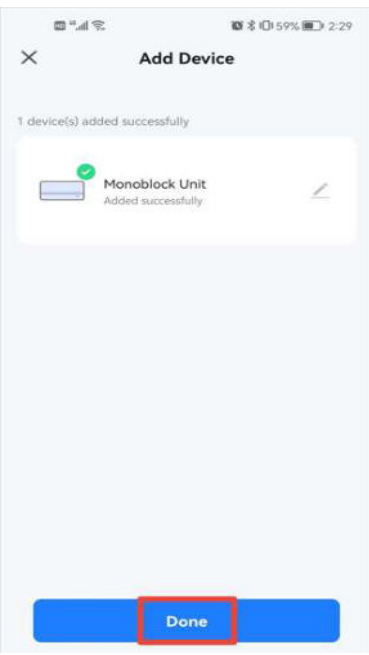
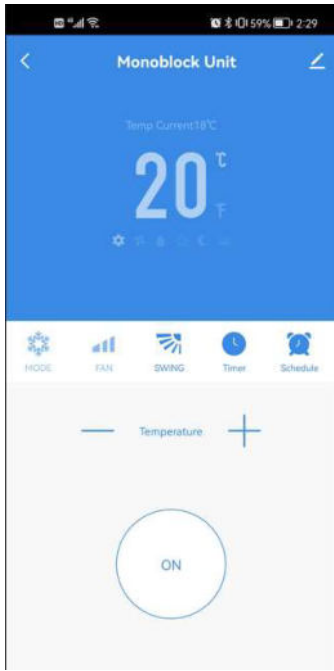


1. Click "Add Device" for operation, as shown in the picture 10.
2. Select the type of device as "Large Home Appliance", as shown in the picture 11.
3. Connect a WIFI and enter the password., as shown in the picture 12.



Picture 10	Picture 11	Picture 12
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4. Ensure the WIFI light on the air conditioner is flashing twice per second, as shown in the picture 13.
5. Enter the device connection interface after the progress bar is finished and the device is successfully connected. Click the "Done" button to enter the operation interface of the device, as shown in the picture 14,15

		
Picture 13	Picture 14	Picture 15

***Due to continuous development of the app, the layout and available features may be subject to change.**

TROUBLESHOOTING

Do not repair or disassemble the air conditioning. Unqualified repair will invalidate the warranty and may lead to failure, causing injuries and property damage. Only use it as directed in this user manual and only perform operations advised here.

Problem	Reasons	Solutions
The air conditioner does not work	There is no electricity.	Check the unit is plugged in, and the socket is working normally.
	The ambient temperature is too low or too high.	Only use to use the machine with a room temperature between -5 and 35°C.
	In cooling mode, the room temperature is lower than the desired temperature; in heating mode, the room temperature is higher than the desired temperature.	Adjust the desired room temperature.
	In dehumidification (dry) mode, the ambient temperature is low.	Ensure that the room temperature is above 17°C for dry mode.
	There is direct sunlight.	Use curtains to reduce heat from the sun.

The cooling or heating effect is poor	Doors or windows are open; there are a lot of people; or in cooling mode, there are other sources of heat (e.g. fridges)	Close doors and windows; increase air conditioning power
	The filters screen is dirty.	Clean or replace the filter screen.
	The air inlet or outlet is blocked.	Clear obstructions; make sure the unit is installed as per the instructions
The air conditioner is leaking	The unit is not straight	Use a spirit level to check the unit is horizontal, if not remove from the wall and Straighten.
	The drain pipe is blocked	Check the drain pipe to ensure it is not blocked or constricted.
Compressor does not work.	Overheat protection operational .	Wait for 3 minutes until the temperature is lowered, and then restart the machine.
The remote control does not work.	The remote control is not aligned with the direction of the remote-control receiver.	Let the remote control get close to the air conditioner, and make sure that the remote control directly faces to the direction of the remote-control receiver.
	Batteries poor.	Replace batteries.

If problems not listed in the table occur or recommended solutions do not work, please contact the service centre.

ERROR CODES

Fault Code	Fault Description	Fault Code	Fault Description
F1	Compressor IPM error	P8	Zero-crossing fault detection
F2	PFC/IPM error	PA	Return air sensor temperature abnormal protection
F3	Compressor start error	PC	Coil tube overload protection(outdoor)
F4	Compressor running out of step	PE	Abnormal refrigerant circulation
F5	Location detection loop failure	PH	Exhaust temperature protection
F6	PCB communication error	E0	Sensor on suction pipe error
F7	Coil sensor error (outdoor)	E1	Temperature sensor error
F8	Sensor on suction pipe error	E2	Sensor error on indoor coil tube
FA	Phase current over current protection	E3	DC fan Feedback failure
FE	EE error (outdoor)	E4	Communication error
FL	Water-full protection	E5	Water-splash motor error
P1	Over-heat protection on top of compressor	E6	Temperature sensor error(outdoor)
P2	Dc bus voltage Under voltage protection	E7	Fan motor error(outdoor)
P3	AC Input voltage protection	E8	Fan feedback fault
P4	AC over-current protection	EE	EE error
P5	AC under voltage protection	EA	Reversing fault of four-way valve
P6	Coil tube overload protection	Eb	Fluoride deficiency protection
P7	Defrost protection on coil tube		

Service and Operation for the Flammable Refrigerants R290

Please read this user's manual carefully to ensure proper use, maintenance and installation.

BEFORE INITIATION

To avoid damage , place the unit in an upright position for at least 24 hours before initiation.

Make sure that the air outlet and air inlet are never blocked.

Only operate the unit on a horizontal surface to ensure no water leaks out.

WARNINGS

- Any person who is involved with working on or breaking into a refrigerant a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority Which authorizes their competence to handle refrigerants safety in accordance with an industry recognized assessment specifications.
- Remember the environment when disposing of packaging around the appliance and when the appliance has reached its by date.
- The appliance shall be stored in a well-ventilated area where the size corresponds to the room area as specified for operation.
- The appliance shall be stored so as to prevent mechanical damage from occurring.
- Information for spaces where refrigerant pipes are allowed, including statements.
 - that the installation of pipe-work shall be kept to a minimum.
 - that pipe-work shall be protected from physical damage and , in the case of flammable refrigerants , shall not be installed in an unventilated space.
 - that compliance with national gas regulations shall be observed.
 - that mechanical connections shall be accessible for maintenance purposes :
 - that , for appliances containing flammable refrigerants , the minimum floor area of the room shall be mentioned in the form of a table or a single figure without reference to a formula.
- Keep any required ventilation openings clear of obstruction
- The servicing shall be performed only as recommended by the manufacturer ;
- The ducts connected to an appliance shall not contain a potential ignition source.
- When the portable air conditioner or dehumidifier is turned on , the fan can work continuously stable under normal conditions to provide the minimum air volume of 100m³/h even when the compressor is closed due to the temperature controller.
- Do not pierce or burn.
- Use only implements recommended by the manufacturer for defrosting or cleaning.
- Do not perforate any of the components in the refrigerant circuit Refrigerant gas may be odourless.
- Use care when storing the appliance to prevent mechanical faults.
- Only persons authorized by an accredited agency certifying their competence to handle refrigerants in compliance with sector legislation should work on refrigerant circuit .
- All repairs must be carried out in accordance with the manufacturers recommendations .
- Maintenance and repairs requiring the assistance of other qualified personnel must be carried out under the supervision of specialists in the use of inflammable refrigerants.
- Do not perforate any of the components in the refrigerant circuit . Refrigerant gas may be odourless.
- Refrigerant leakage contributes to climate change. Refrigerant with lower global warming potential (GWP) would contribute less to global warming than a refrigerant with higher GWP, if leaked to the atmosphere. This appliance contains a refrigerant fluid with a GWP equal to 3. This

means that if 1 kg of this refrigerant fluid would be leaked to the atmosphere, the impact on global warming would be 3 times higher than 1 kg of CO₂ , over a period of 100 years. Never try to interfere with the refrigerant circuit yourself or disassemble the product yourself and always ask a professional.

- Details of type and rating of fuses : T 3.15A, 250V AC for control PCB;
T 15A, 250V AC for driver PCB.

Additional warning for appliance with R290 refrigerant gas (refer to the rating plate for the type of refrigerant gas used)



R290 refrigerant gas complies with European environmental directives.

This appliance contains approximately 290g of R290 refrigerant gas

Appliance shall be installed, operated and stored in a room with a floor area larger than 15 m².

INSTRUCTION, REPAIRING APPLIANCES CONTAINING R290

1. Checks to the area

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

2. Work procedure

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

3. General work area

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

4. Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially 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.

5. Presence of fire extinguisher

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

extinguisher adjacent to the charging area.

6. No ignition sources

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

7. 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.

8. Checks to the refrigerating equipment

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

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

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

9. Checks to electrical devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, 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.

10. 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 may inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

11. Repair to intrinsically safe components

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

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

12. Cabling

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

13. Detection of flammable refrigerants

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

14. Leak detection methods

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants. Electronic leak detectors shall be used to detect flammable refrigerants, but the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25 % maximum) is confirmed. Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.

15. 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 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 purged with oxygen free nitrogen to render the appliance safe for flammable refrigerants. 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, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen 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 potential ignition sources and that ventilation is available.

16. Charging procedures

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

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning.

A follow up leak test shall be carried out prior to leaving the site.

17. Decommissioning

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

- a) Become familiar with the equipment and its operation.
- b) Isolate system electrically.
- c) Before attempting the procedure, ensure that:

- mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - all personal protective equipment is available and being used correctly;
 - the recovery process is supervised at all times by a competent person;
 - recovery equipment and cylinders conform to the appropriate standards.
- d) Pump down refrigerant system, if possible.
- e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- f) Make sure that cylinder is situated on the scales before recovery takes place.
- g) Start the recovery machine and operate in accordance with instructions.
- h) Do not overfill cylinders (no more than 80 % volume liquid charge).
- i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
- j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- k) Recovered refrigerant shall not be charged into another refrigerating system unless it has been cleaned and checked.

18. Labelling

Equipment shall be labelled stating that it has been decommissioned 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.

19. 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 is available. All cylinders to be used are designated for the recovered refrigerant and labeled 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.

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