



# **Roborock S4 Max Robot Vacuum Cleaner User Manual**

Read this user manual carefully before using this product and store it properly for future reference.

# Safety Information

## Restrictions

- This product is designed for indoor floor cleaning only, do not use it outdoors (such as on an open-ended terrace), on any surface other than the ground (such as a sofa), or in any commercial or industrial environment.
- Do not use this product on elevated surfaces without barriers such as the floor of a loft, an open-ended terrace, or on top of furniture.
- Do not use the product when the ambient temperature is higher than 104°F (40°C), lower than 39°F (4°C), or if there are liquids or tacky substances on the floor.
- Before using the product, move wires off the ground or place them to the side to prevent them being pulled on by the cleaner.
- To prevent blocking the product and to avoid damage to valuables, remove lightweight items (such as plastic bags) and fragile objects (such as vases) from the floor before cleaning.
- Children should be supervised to ensure that they do not play with the appliance.
- This product is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning

# Safety Information

- use of the product by a person responsible for their safety (CB).
- This product can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the product in a safe way and understand the hazards involved. Children shall not play with the product. Cleaning and user maintenance shall not be made by children without supervision (EU).
- Keep the main brush cleaning tools out of reach of children.
- Do not place any object (including children and pets) on the product, whether it is in operation or not.
- Keep hair, loose clothing, fingers, and all parts of the body away from openings and moving parts.
- Do not use the product on burning objects (such as cigarette butts).
- Do not use the product on high pile carpets (product effectiveness may also be reduced on dark carpets).
- Do not use the product to clean hard or sharp objects (such as decoration wastes, glass and nails).
- Do not carry the product using the laser scanner cap, main unit cover, or collision buffer.

## Safety Information

- The product must be switched off and the plug must be removed from socket outlet before cleaning or maintaining the product.
- Do not use wet cloth or liquids for cleaning the product.
- Do not use the mopping module on carpets.
- Use the product according to the manual. Any loss or damage caused from improper use will be borne by the user.
- This product contains batteries that are only replaceable by skilled persons.

## Battery and Charging

### WARNING

- Do not charge non-rechargeable batteries.
- For the purposes of recharging the battery, only use the detachable supply unit roborock CDZ11RR or CDZ12RR provided with this product.
- Do not dismantle, repair or modify the battery or charging dock.
- Keep the charging dock away from heat (such as heating vents).
- Do not wipe or clean the charging contact with wet cloth or wet hands.
- If the power cord is damaged, stop using it immediately. It must be replaced by the manufacturer, its service agent, or similarly qualified persons to avoid a hazard.

# Safety Information

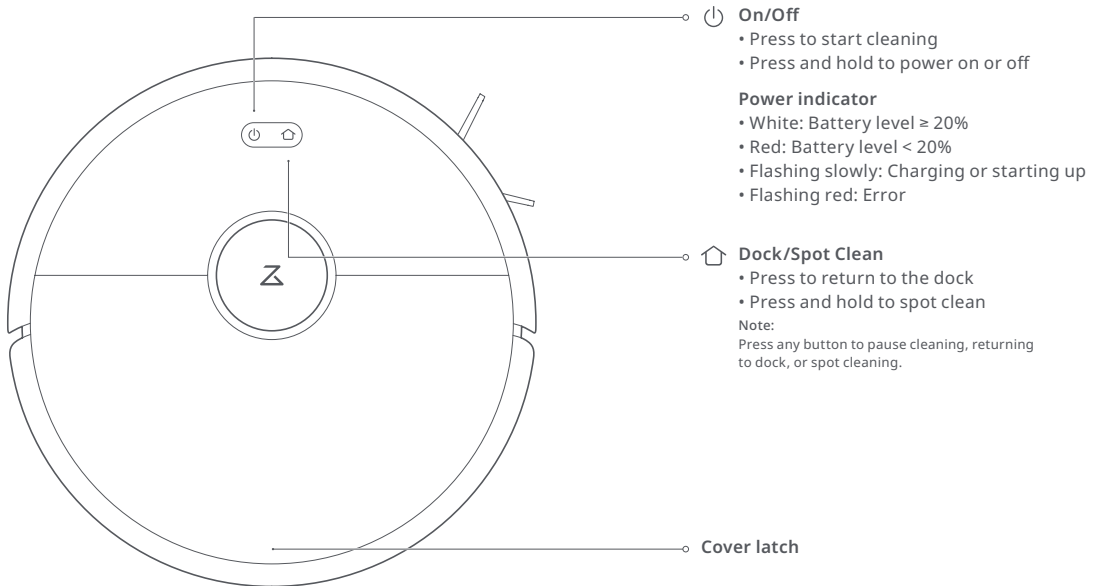
- Make sure the product is powered off before shipment.
- Use of the original packaging is advised.
- If to be left unused for a long period of time, fully charge the product and switch it off before storing it in a cool, dry place.
- Charge it at least every three months to avoid over discharging the battery.
- To satisfy RF exposure requirements, a separation distance of 20 cm or more should be maintained between this device and persons during device operation. To ensure compliance, operations at closer than this distance is not recommended.
- The antenna used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

# Roborock robot vacuum cleaner troubleshooting

Name	Troubleshooting
Robot	Problem listed in the User Manual
	The product cannot be powered on
	The main brush, side brush, fan, or main wheels do not work
Charging dock	The robot does not receive power
Power cable	The charging dock cannot be supplied with power

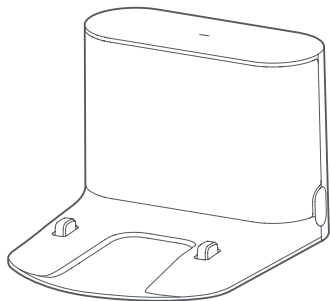
# Product Introduction

## Robot

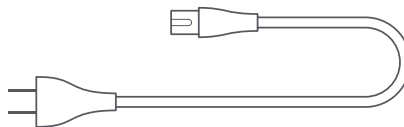


# Product Introduction

## Parts list



Charging dock

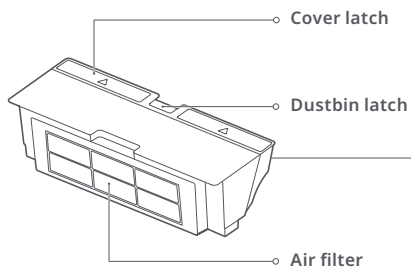


Power cable

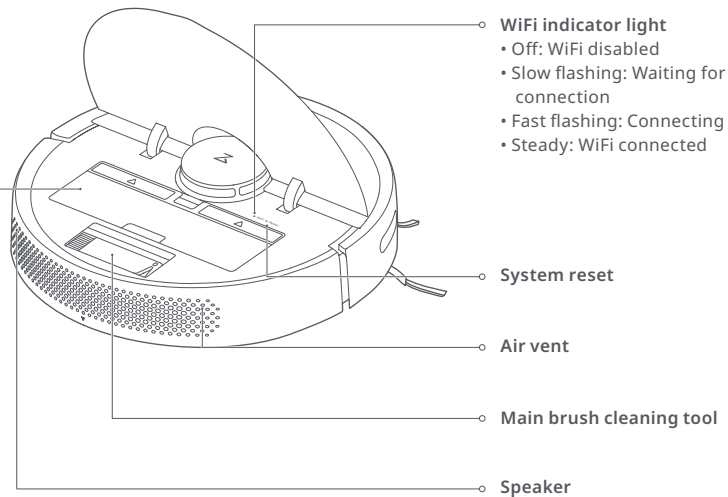


# Product Introduction

## Dustbin

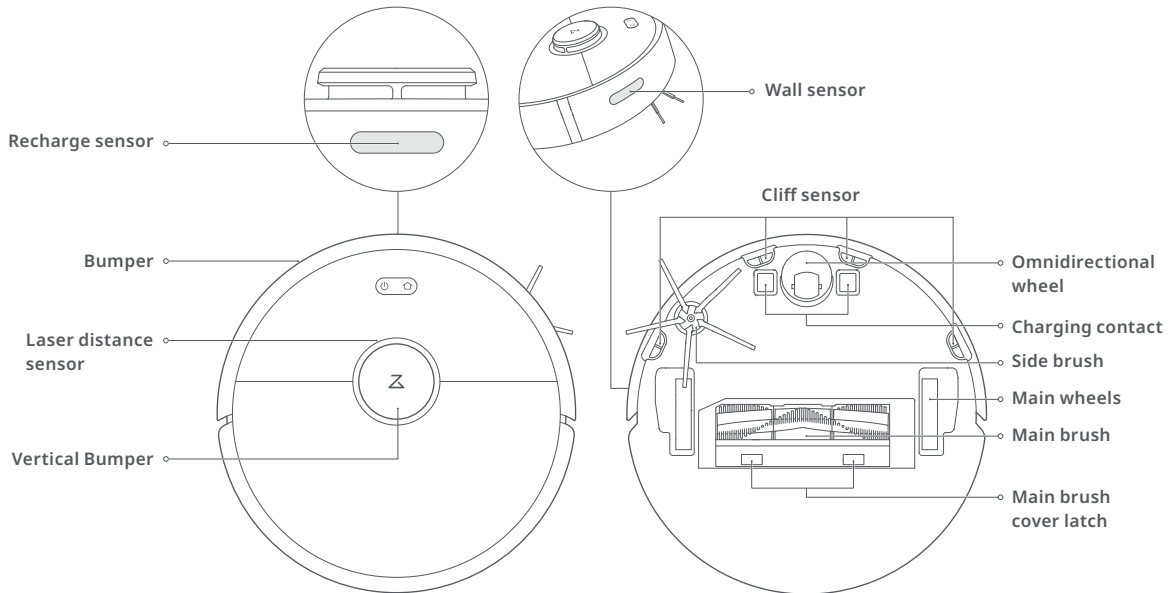


## Robot



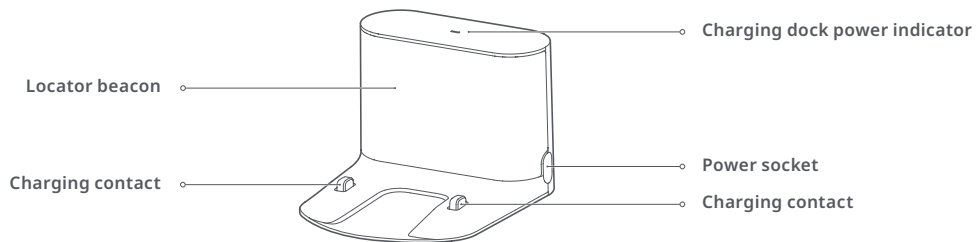
# Product Introduction

## Robot and sensors



# Product Introduction

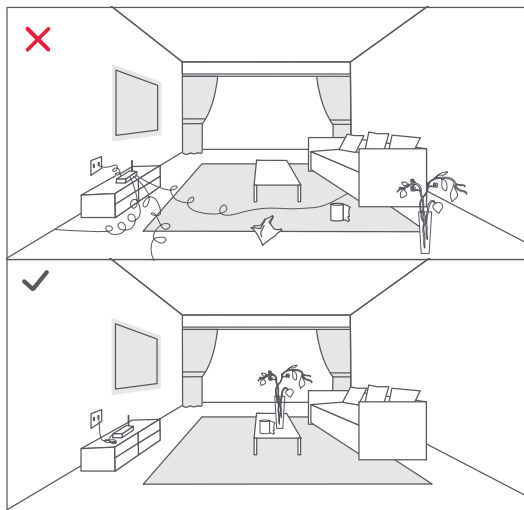
## Charging dock



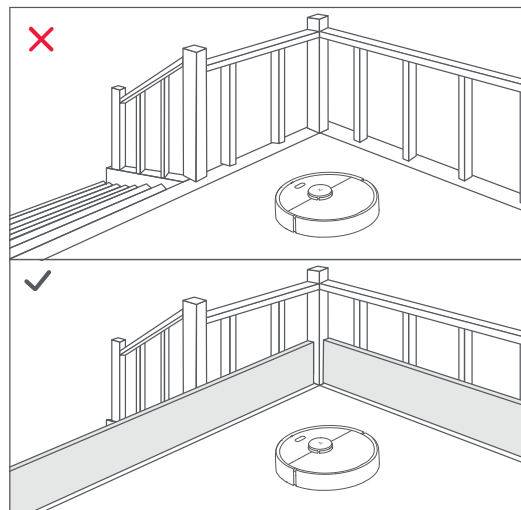
# Installation

## Important Information

1. Tidy cables and loose items from the ground and move any unstable, fragile, precious, or dangerous items to prevent personal injury or property damage due to items becoming tangled in, struck by, or knocked over by the robot.



2. If using this robot in a raised area, always use a secure physical barrier to prevent accidental falls that may result in personal injury or property damage.



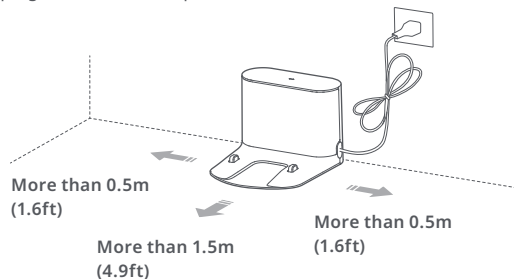
**Note:**

When using the robot for the first time, follow it throughout its whole cleaning route and watch for major obstacles. The robot will be able to clean by itself in future uses.

# Installation

## Using the robot

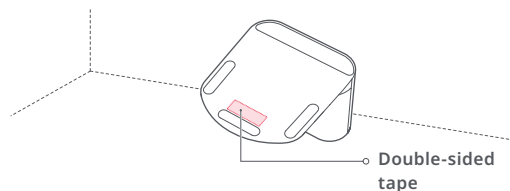
1. Place the charging dock against the wall on a flat surface and plug it into the mains power.



**Note:**

- The charging dock should have more than 0.5m (1.6ft) of clearance on each side, and more than 1.5m (4.9ft) in the front.
- If the power cable is vertical to the ground, it may be caught by the robot, causing the charging dock to be disconnected.
- The charging dock indicator is on when the charging dock is electrified, and off when the robot is charging.


2. Secure the charging dock with the adhesive tape. Wipe the floor of the area where the charging dock will be placed with a dry cloth, then stick the enclosed double-sided tape to the floor. Place the dock onto the double-sided tape to secure it in place.

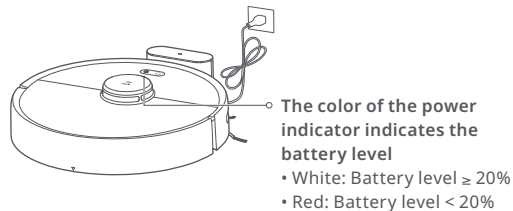


**Note:**

- Use of the double-sided tape to secure the charging dock is optional.
- When necessary, remove the double-sided tape slowly to reduce residue glue.

3. Power on and charge.

Press and hold the  button to turn on the robot. When the power indicator lights up, place the robot onto the charging dock to begin charging. The robot uses a high-performance lithium-ion rechargeable battery. To maintain peak battery performance, always keep the robot charged.



**Note:**

The robot will not turn on when the battery is low. Place the robot directly onto the charging dock to begin charging.

# Installation

## Connect to the app



4. Connect to the app. (recommended)

① Download the Roborock app

Search "Roborock" in the App Store or Google Play, or scan the QR code below, then download and install the app.



② Reset WiFi

- a. Open the top cover of the robot to reveal the WiFi indicator light.
- b. Press and hold the  button and the  button until you hear the "Resetting WiFi" voice alert. When the WiFi indicator light is flashing slowly, the robot has entered network configuration mode.

**Note:**

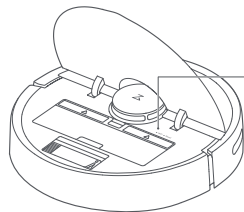
If you cannot connect your phone to the robot, reset the WiFi, and add your robot as a new device.

③ Add device

Open the app and tap "+" in the top right corner, then follow the instructions in-app. Once your robot has been added, it will be found in a list on the homepage.

**Note:**

- Due to ongoing app development, the actual process may differ slightly from the above description. Always follow the instructions given in the app.
- Only 2.4GHz WiFi is supported.




**WiFi indicator light**

- Off: WiFi disabled
- Slow flashing: Waiting for connection
- Fast flashing: Connecting
- Steady: WiFi connected



## Using the robot

5. Start cleaning.

When the battery is fully charged, the power indicator will remain lit. Press the  button or use the app to start a cleanup.

# Instructions for use


## On/off

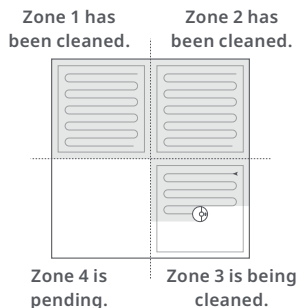
Press and hold the  button to turn on the robot. The power indicator will turn on and the robot will enter Standby mode. If the robot is in Sleep mode, press and hold the  button to turn it off and end the current cleanup.

**Note:**

The robot cannot be turned off when it is charging.

## Start cleanup



Press the  button to start cleaning. Once started, the robot will plan its cleaning route based on its scan of the area. It cleans along the edges of a zone first and then moves in a Z-shaped cleaning route to cover the internal area efficiently and thoroughly.



**Note:**

- Cleaning cannot start if the battery level is too low. Allow the robot to charge before restarting cleanup.
- Tidy away any cables on the ground (including the power cable of the charging dock) before cleaning to avoid losing power or damaging either the robot or the connected device.
- If a cleanup finishes within 10 minutes, cleaning repeats by default.
- If the battery runs low before cleanup is complete, the robot will carry out a top-up charge before resuming cleanup from where it left off.

## Pause

When the robot is cleaning, press any button to pause it. Then press the  button to continue cleaning or the  button to return it to the charging dock and stop the cleaning cycle.

**Note:**

Placing a paused robot on the charging dock manually will end the current cleanup.

## Sleep

If the robot is paused for over 10-minutes, it will go to sleep, and its power indicator will flash slowly. Press any button to wake it back up.


**Note:**

- The robot will not go to sleep when it is on the charging dock.
- The robot will automatically shut down if left in sleep mode for more than 12 hours.

# Instructions for use

## Charging

**Auto:** After cleaning, the robot will automatically return to the charging dock to recharge.

**Manual:** In Pause mode, press the  button to send the robot back to the charging dock.

The power indicator will flash slowly as the robot charges.

**Note:**

If the cleaning cycle was started away from the charging dock and the robot could not return to the dock after cleaning, it will instead return to its starting point. Place the robot directly on the dock to recharge it.

## Error

If an error occurs while the robot is cleaning, the power indicator will flash red quickly, and you will hear a voice alert. See "Troubleshooting" for resolution options.

**Note:**

- The robot will go to sleep automatically if left in an Error state for over 10-minutes.
- Placing the robot on the charging dock in an error state will stop the current cleanup.


## Reset WiFi

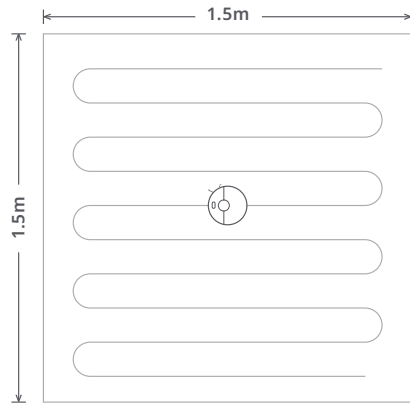
If your phone cannot connect to the robot because you have changed your router configuration, forgotten your password, or any other reason, open the top cover to see the WiFi indicator light, then press and hold the Spot Cleaning button and the Recharge button until you hear the "Resetting WiFi" voice alert. When the WiFi indicator light flashes slowly, the robot has entered network configuration mode.

**Note:**

If the robot is left connecting to the network for over an hour, its WiFi will be disabled. Reset WiFi before attempting reconnection.

## Spot Cleaning

In Standby or Pause mode, press and hold the  button to start spot cleaning. This mode is used to clean a 1.5m x 1.5m square area centered on the robot. After cleanup, the robot will return to the center of the square.



**Note:**

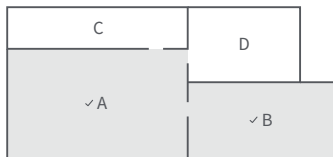
Starting spot cleaning in pause mode will stop the current cleaning cycle.



# Instructions for use

## Selective Room Cleaning

Select specific rooms for cleaning in the app. In this mode, the robot will only clean the selected rooms.



**Note:**

- A full map must be created and Map Saving mode switched on before this function can be used.
- After cleaning starts, the robot may move beyond the defined areas. Make sure there are no obstacles preventing the robot's access to the target rooms.

## Scheduled Cleaning

Use the app to set start times for scheduled cleanups.  
The robot will return to the charging dock after each cleanup.

## Zone Cleaning

Use the app to draw a specific zone for the robot to clean.

**Note:**

While cleaning the designated zone, the robot may move outside zone borders.  
Make sure that there are no cables or obstacles placed close to the cleanup zone.

## Pin n Go

Use the app to set a destination for the robot to go to.

## Cleaning mode

Use the app to choose from Quiet, Balanced, Strong, or MAX modes. The Balanced mode is the default.

## Do Not Disturb (DND) mode

In DND mode, no cleanups will start, no voice alerts will play, and the power indicator will dim. DND Mode is set from 22:00 to 08:00 by default and can be disabled or modified in the app.

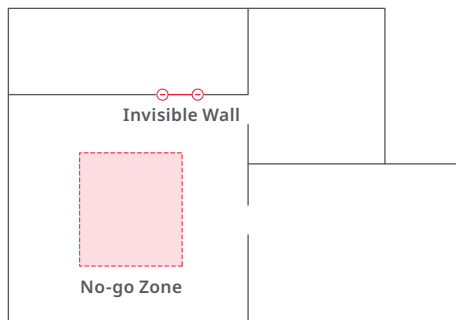
# Instructions for use

## Virtual No-go Zone and Invisible Wall

The app can be used to draw Virtual No-go Zone and Invisible Wall to keep the robot from entering the areas you define.

**Note:**

- "Map Saving Mode" must be turned on in the app to use virtual No-go Zone.
- Virtual No-go Zone and Invisible Wall should only be used to customize the cleaning area. They should not be used to isolate hazards.
- Moving the robot manually or making significant changes to the home environment may cause the loss of virtual No-go Zone and Invisible Wall.



## More app functions

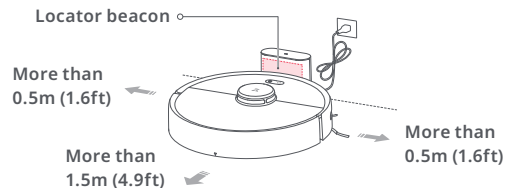
Real-time map updates	Carpet Boost	Robot location
Change cleaning mode	Part replacement schedule	Do Not Disturb (DND) mode
View cleaning history	Remote control	Firmware update
Change robot voice	View robot status	

**Note:**

Functions and details of the app may vary slightly due to continuous app development and upgrades.

## Charging Dock

The charging dock should be plugged in and placed against a wall on level ground, with more than 0.5m (1.6ft) of clearance on each side, and more than 1.5m (4.9ft) in front. For the best experience when using the mobile app, place the charging dock in an area with strong WiFi coverage.



**Note:**

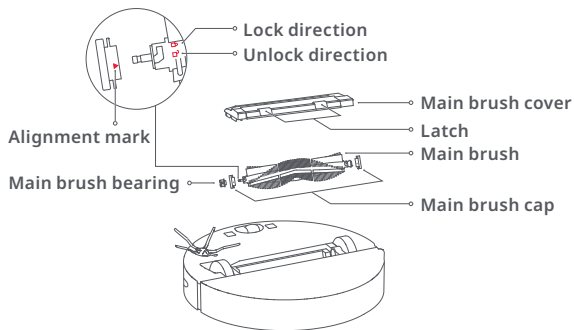
Do not place the charging dock in direct sunlight or block the locator beacon; otherwise, the robot may not be able to return to the charging dock.

# Routine maintenance

## Main brush

\*Clean weekly

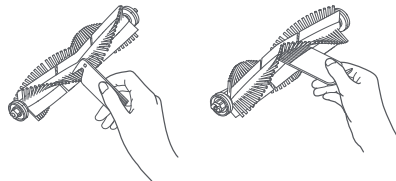
1. Turn the robot over then unlatch and remove the main brush cover.
2. Take out the main brush, remove and clean its bearings.
3. Remove the main brush cap, rotating in the unlock direction.
4. Use the supplied main brush cleaning tool to remove any entangled hair.
5. Re-install the cap and bearings following the lock direction.
6. Re-insert the main brush and secure the brush cover.



Note:  
Main brush replacement every 6-12 months is recommended.

## Using the main brush cleaning tool

Use the main brush cleaning tool to remove any hair entangled around the main brush.

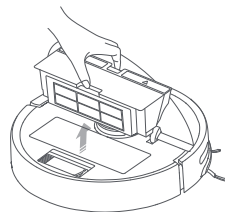


Note:  
If there is a large amount of hair, or hair is tightly entangled, remove it carefully to avoid damage to the main brush.

## Dustbin and filter

\*Weekly cleaning is recommended

1. Open the top cover of the robot, squeeze the dustbin latch, and remove the dustbin.

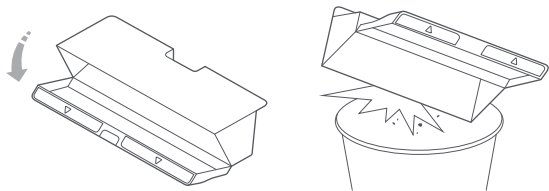


# Routine maintenance

## Dustbin and filter

\*Weekly cleaning is recommended

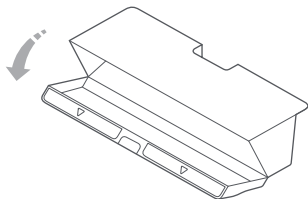
2. Open the dust bin lid as indicated by the arrow and pour out the contents.



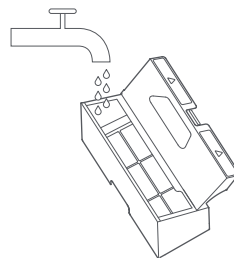
## Clean the washable filter

\*Clean every two weeks

1. Open the dust bin lid as indicated by the arrow and pour out the contents.



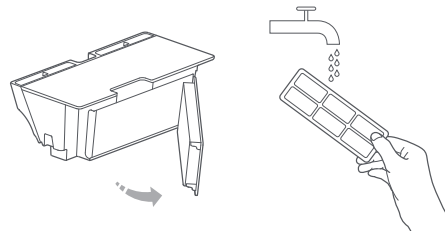
2. Fill the dust bin with clean water and close the cover. Gently shake the dust bin, then pour out the dirty water.



**Note:**

To prevent blockage, only use fresh water without cleaning liquid.

3. Remove the filter and clean it with water.



**Note:**

To avoid damage, do not touch the surface of the filter with hands, brushes, or sharp objects.

# Routine maintenance

## Clean the washable filter

\*Clean every two weeks

4. Rinse repeatedly and tap the filter frame to remove as much dirt as possible.



5. Leave the filter to dry before reinstalling it.

**Note:**

Allow the filter to dry thoroughly before use. 24-hours of drying is recommended. Alternating between two filters is recommended.

## Battery

The robot is equipped with a high-performance lithium-ion rechargeable battery pack. To maintain battery performance, keep the robot charged.

**Note:**

If the robot is to be left unused for an extended period, turn it off before storage and charge it at least once every three months to avoid battery damage resulting from over-discharging.

## Charging dock

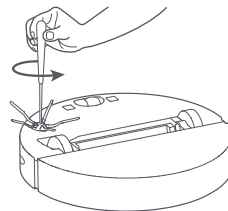
\*Monthly cleaning recommended

Use a soft dry cloth to clean the charging contacts of the charging dock.

## Side brush

\*Monthly cleaning recommended

1. Turn the robot over and remove the screw holding the side brush.
2. Remove and clean the side brush.
3. Reinstall the side brush and tighten the screw.



**Note:**

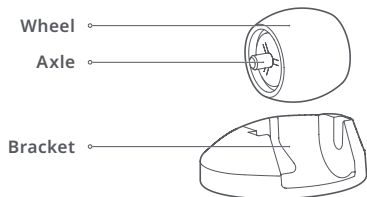
Side brush replacement every 3-6 months is recommended to maintain cleaning quality.

# Routine maintenance

## Omnidirectional wheel

\*Clean as required

1. Turn the robot over.
2. Use a small screwdriver to pry out the axle and remove the wheel.
3. Rinse the axle and the wheel with water to remove any hair and dirt.
4. Dry and reinstall the wheel, then press it back in place.



**Note:**

The omnidirectional wheel bracket cannot be removed.


## System Reset

If the robot does not respond when you press a button or the robot cannot be shut down, press the Reset button. The robot will then restart.

**Note:**

After a system reset, cleaning schedules, WiFi and other settings will be restored to factory settings.

## Restore factory settings

If the robot is not functioning after a system reset, turn it on, then press the  button, and then press and hold the Reset button until you hear the "Start restoring initial version" voice alert. The robot will then be restored to factory settings.

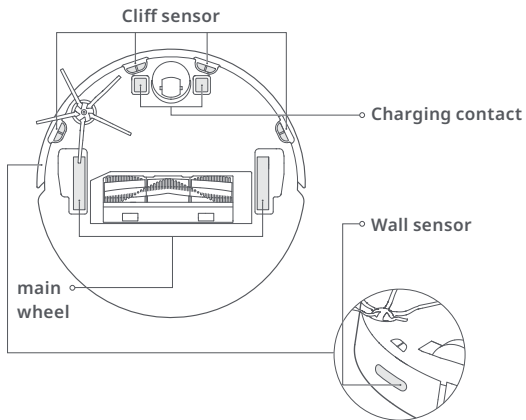
# Routine maintenance

## Robot sensors

\*Clean monthly

Use a soft dry cloth to wipe and clean all sensors, including:

1. Four cliff sensors at the bottom of the robot.
2. The wall sensor on the right of the robot.
3. The charging contact on the bottom of the robot.
4. Robot vacuum main wheel.



## Firmware update

Update the robot using the app. Place the robot on the charging dock and ensure that the battery level is higher than 20% before updating. The power indicator will flash white quickly during a firmware update.

# Basic parameters

## Robot

Name	Parameters
Model	roborock S4 Max
Dimensions	350 x 350 x 96.5mm
Battery	14.4V/5200mAh lithium battery
Weight	Approx. 3.3kg
Wireless connection	WiFi Smart Connect
Rated input	20VDC 1.2A
Charging time	<6h

**Note:**

The serial number is on a sticker on the underside of the robot.

## Charging dock

Name	Parameters
Model	CDZ11RR or CDZ12RR
Dimensions	151 x 130 x 98mm
Rated power	28W
Rated input	100-240VAC
Rated output	20VDC 1.2A
Rated frequency	50-60Hz
Charging Battery	14.4V/5200mAh lithium battery



# Troubleshooting

If an error occurs during the cleanup, the power indicator will flash red quickly, and a voice alert will play. Refer to the table below for resolution options.

Error	Solution
Error 1: Rotate the laser head to check that it turns freely.	The LDS unit is jammed. Remove any items blocking it then move the robot to a new location and restart.
Error 2: Clean and lightly tap the bumper.	The bumper is stuck. Tap the bumper repeatedly to dislodge any jammed items. If nothing falls out, move the robot to a new location and restart.
Error 3: Move the robot to a new location and restart.	A wheel is suspended. Move the robot to a new location and restart it.
Error 4: Wipe the cliff sensors, move the robot away from raised edges, and restart.	The robot is suspended. Move it to a new location and restart. If the problem persists, clean the cliff sensors. This error may also be caused by a dirty cliff sensor. Try wiping all sensors clean.
Error 5: Remove the main brush and clean the brush and bearing.	The main brush may be tangled up. Remove and clean it.
Error 6: Remove and clean the side brush.	The side brush may be tangled up. Remove and clean it.
Error 7: Look for anything stuck in the main wheels then move the robot to a new location and restart.	The main wheels may be jammed. Remove and clean them.
Error 8: Clear away any obstacles around the robot.	The robot may be stuck. Clear any obstacles around it.
Error 9: Install the dustbin and filter.	Reinstall the dustbin and filter and check that they are correctly installed. If the problem persists, try replacing the filter.
Error 10: Make sure that the filter is dry or clean the filter.	The filter is not completely dry. Dry the filter for at least 24 hours. The filter may also be blocked and require cleaning. If the problem persists, replace the filter.

# Troubleshooting

If an error occurs during the cleanup, the power indicator will flash red quickly, and a voice alert will play. Refer to the table below for resolution options.

Error	Solution
Error 11: High-intensity magnetic field detected.	The robot is too close to magnetic tape and cannot start. Move it to a new location and restart.
Error 12: Battery level is too low. Recharge before use.	Low battery. Recharge before use.
Error 13: Charging error. Clean the charging contact area.	Use a dry cloth to clean the charging contacts on the robot and on the charging dock.
Error 14: Battery error.	The battery temperature is either too high or too low. Wait until it returns to normal.
Error 16: Robot is tilted. Place it on flat ground and restart.	The robot is tilted. Move it to flat ground and restart.
Error 17: Side brush module error. Reset the system.	The side brush module is experiencing a fault. Reset the system.
Error 18: Vacuum fan error. Reset the system.	The vacuum fan is experiencing a fault. Reset the system.
Error 21: Vertical bumper pressed. Release it and retry.	The vertical bumper has been pressed. Relocate the robot and retry.
Error 22: Wipe the recharge sensor.	The recharge sensor is blocked by dust. Wipe the dust off.
Error 23: Clean the charging dock locator beacon.	The charging dock is jammed. Clear it and retry.
Error 24: Virtual no-go zone or wall detected. Move the robot to a new location and restart.	Move the robot away from the virtual no-go zone or barrier and restart.
Error 26: Wipe the wall sensor.	The wall sensor is dirty. Wipe it clean.
Internal error. Reset the system. *	Malfunction due to an internal error. Reset the system.

\* Note: A system reset may not resolve all problems.

If the problem persists after using the recommendations in the table above, please email our after-sales service team:

US/Non-Europe Support: [support@roborock.com](mailto:support@roborock.com)    Europe Support: [support@roborock-eu.com](mailto:support@roborock-eu.com)

# FAQs

Problem	Solution
Unable to power on	The battery level is low. Put the robot on the charging dock and charge it before use. The battery temperature is too low or too high. Only use the robot within the range of 4-40°C (39-104°F).
Unable to charge	If the charging dock is not receiving power, check that both ends of the power cable are properly connected. If contact is poor, clean the contact areas of the charging dock and the robot. Power is restored when the power indicator light turns on.
Slow charging	When used at high or low temperatures, the robot will automatically reduce its charging speed to extend battery life. Charging contacts may be dirty. Clean them with a dry cloth.
Unable to return to dock	There are too many obstacles near the charging dock. Move it to an open area. The robot is too far from the charging dock. Place it closer and retry.
Abnormal behavior	Restart the robot.
Noise during cleaning	The main brush, side brush, or main wheels may jammed. Turn off the robot and clean them. If the omnidirectional wheel is jammed, use a screwdriver to remove it for cleaning.
Poor cleaning performance and/or leaking dust	The Dustbin is full and needs emptying. The Filter is blocked and needs cleaning. The main brush is dirty. Clean it and retry.
Unable to connect to WiFi	WiFi is disabled. Reset the WiFi and try again. WiFi signal is poor. Make sure that the robot is in an area with good WiFi signal reception. Abnormal WiFi connection. Reset the WiFi, download the latest mobile app and retry. The current device is not supported. You can find supported models inside the app. Unable to connect to WiFi. There may be an error with your router settings. Contact Roborock customer service for help with troubleshooting.

# FAQs

Problem	Solution
Scheduled cleaning is not working	The battery level is too low. Scheduled cleaning can only begin when the battery level is above 20%.
Is power always being drawn when the robot is on the charging dock?	The robot will draw power while it is docked to maintain battery performance, but power consumption is extremely low.
Does the robot need to be charged for at least 16 hours the first three times it is used?	No. The robot can be used any time after it has been fully charged once.
Cleaning does not resume after recharging	Make sure that the robot is not in DND mode. DND mode will prevent cleanup. When cleaning a space requiring a top-up charge, if the robot was placed manually on the Charging Dock before it is recharged automatically, it will not be able to continue cleanup.
The robot cannot return to the charging dock after spot cleaning or when it has been moved manually.	After spot cleaning or a significant position change, the robot will regenerate the map. If the charging dock is too far away, it may not be able to return for recharging and must be placed on the charger manually.
The robot has begun to miss certain spots	The wall sensor or cliff sensors may be dirty. Clean them with a soft dry cloth.

# EU Declaration of Conformity

We Beijing Roborock Technology Co., Ltd., hereby, declares that this equipment is in compliance with the applicable Directives and European Norms, and amendments. The full text of the EU declaration of conformity is available at the following internet address:  
<https://global.roborock.com/pages/compliance>

## WiFi Sepcification

Service	Protocol	Frequency Range	Max. Output Power
WiFi	802.11b/g/n	2400-2483.5 MHz	≤20dBm

## Laser Safety

The laser distance sensor of this product meets the standards for Class 1 Laser Products in IEC 60825-1:2014 and will not generate hazardous laser radiation.

# WEEE Information

Correct Disposal of this product . This marking indicates that this product should not be disposed with other household wastes throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

Korrekte Entsorgung dieses Produkts Innerhalb der EU weist dieses Symbol darauf hin, dass dieses Produkt nicht über den Hausmüll entsorgt werden darf. Altgeräte enthalten wertvolle recyclingfähige Materialien, die einer Wiederverwertung zugeführt werden sollten und um der Umwelt bzw. der menschlichen Gesundheit nicht durch unkontrollierte Müllbeseitigung zu schaden. Bitte entsorgen Sie Altgeräte deshalb über geeignete Sammelsysteme oder senden Sie das Gerät zur Entsorgung an die Stelle, bei der Sie es gekauft haben. Diese wird dann das Gerät der stofflichen Verwertung zuführen.



# Warranty Information

The warranty period depends on the laws of the country in which the product is sold, and the warranty is the responsibility of the seller.

The warranty only covers defects in material or workmanship.

The repairs under warranty may only be carried out by an authorized service centre. When making a claim under the warranty, the original bill of purchase (with purchase date) must be submitted.

The warranty will not apply in cases of:

Normal wear and tear

Incorrect use, e.g. overloading of the appliance, use of non-approved accessories Use of force, damage caused by external influences Damage caused by non-observance of the user manual, e.g. connection to an unsuitable mains supply or non-compliance with the installation instructions Partially or completely dismantled appliances.