Saving Plants - DIY Plant Watering Device

by Jaychouu

Story

Most of us like having green plants in our homes or offices because they can brighten up our living space, reduce fatigue and stress, improve our moods and productivity, and clean indoor air. However, taking care of them is no easy feat. I grew a potted plant but it ended up with yellow and dead leaves due to water shortage. To avoid following the same old disastrous road, I decided to make an auto plant watering device to save my new plants.

Thoughts

The device mainly includes a water storage container, an electric valve to control water flow, a soil humidity sensor to determine whether the valve will open to water plants, and a liquid level sensor installed outside the container to detect if the liquid level falls under the threshold, which means the container is nearly empty. And I only need to refill it when I receive the water shortage prompt.

Supplies:

1 × ESP32-E IoT Microcontroller

1 × Non-contact Capacitive Liquid Level Sensor

1 × Gravity: Analog Waterproof Soil Moisture Sensor

1 × Adjustable DC-DC Boost Converter

1 × Relay Module

1 × Solenoid Valve

1 × 3D Housing

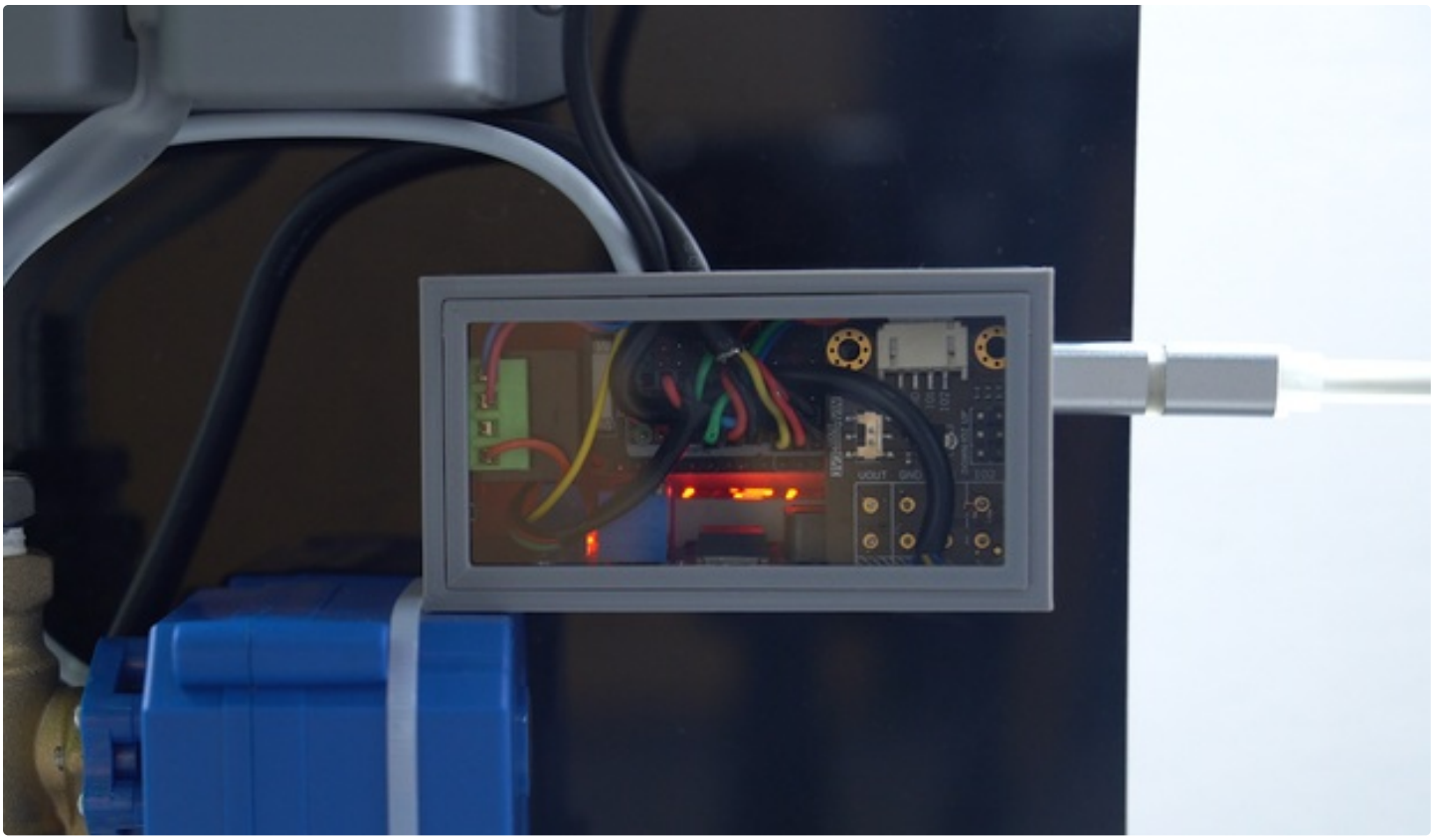
1 × Acrylic Sheet

1 × Water Container

1 × Irrigation Nozzle

Nylon Cable Ties

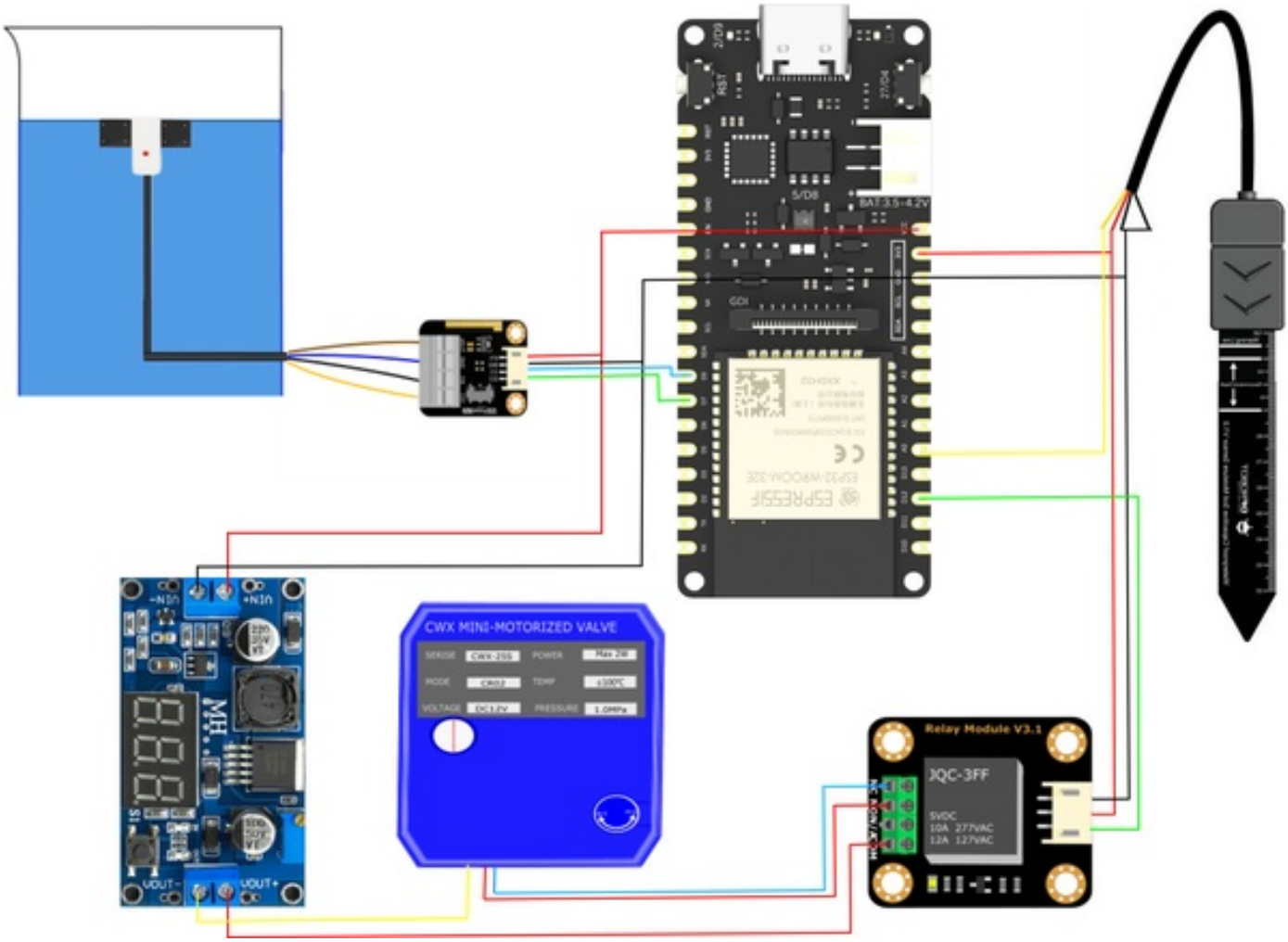
https://youtu.be/eqhAIgh_mZU



Step 1: Connection Diagram

Connect the liquid level sensor to the main controller's D7/D9 with an adapter.

The soil moisture sensor goes to the controller's A0 and the relay module to the controller's D12.



Step 2: Assembly

1.Design the 3D model of the housing and container holder on SolidWorks, and print it out.

2.Check if the ESP32 main controller, relay module, and DC-DC boost converter fit into the housing before installation.

3.Connect them together with cables according to the connection diagram.

4.Then, connect the valve, liquid level sensor, and soil moisture sensor to ESP32 according to the diagram.

5.Install the transparent acrylic cover.

6.Design a 550mm×250mm background board with holes for fixing hardware on AutoCAD.

7.Laser cut the board with a black acrylic sheet of 8mm thickness according to the drawing. A wooden board of the same size is also suitable for the project.

8.Fix the prepared holder for the container on the black board with screws.

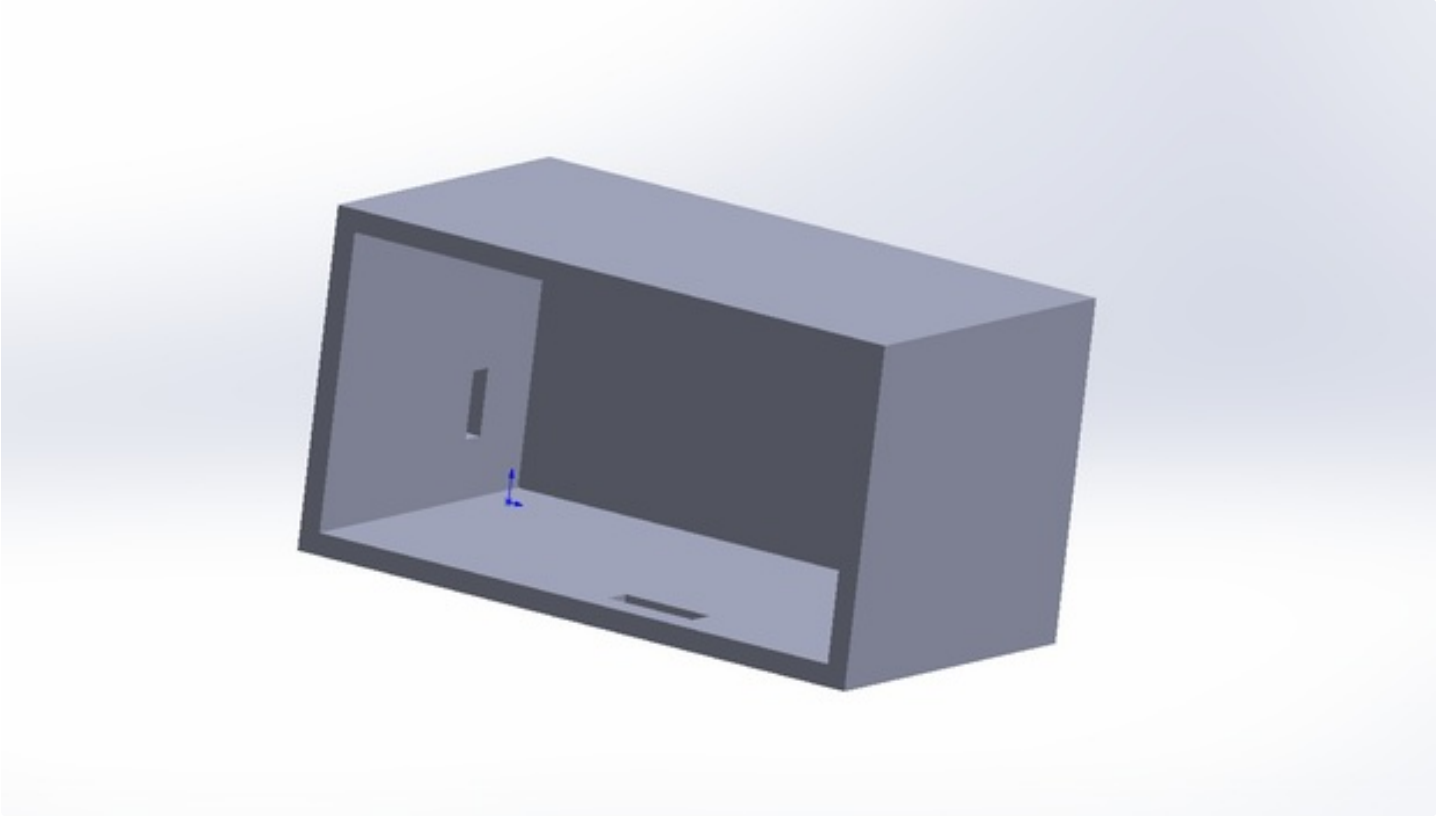
9.Fix the electric valve on the board with nylon cable ties.

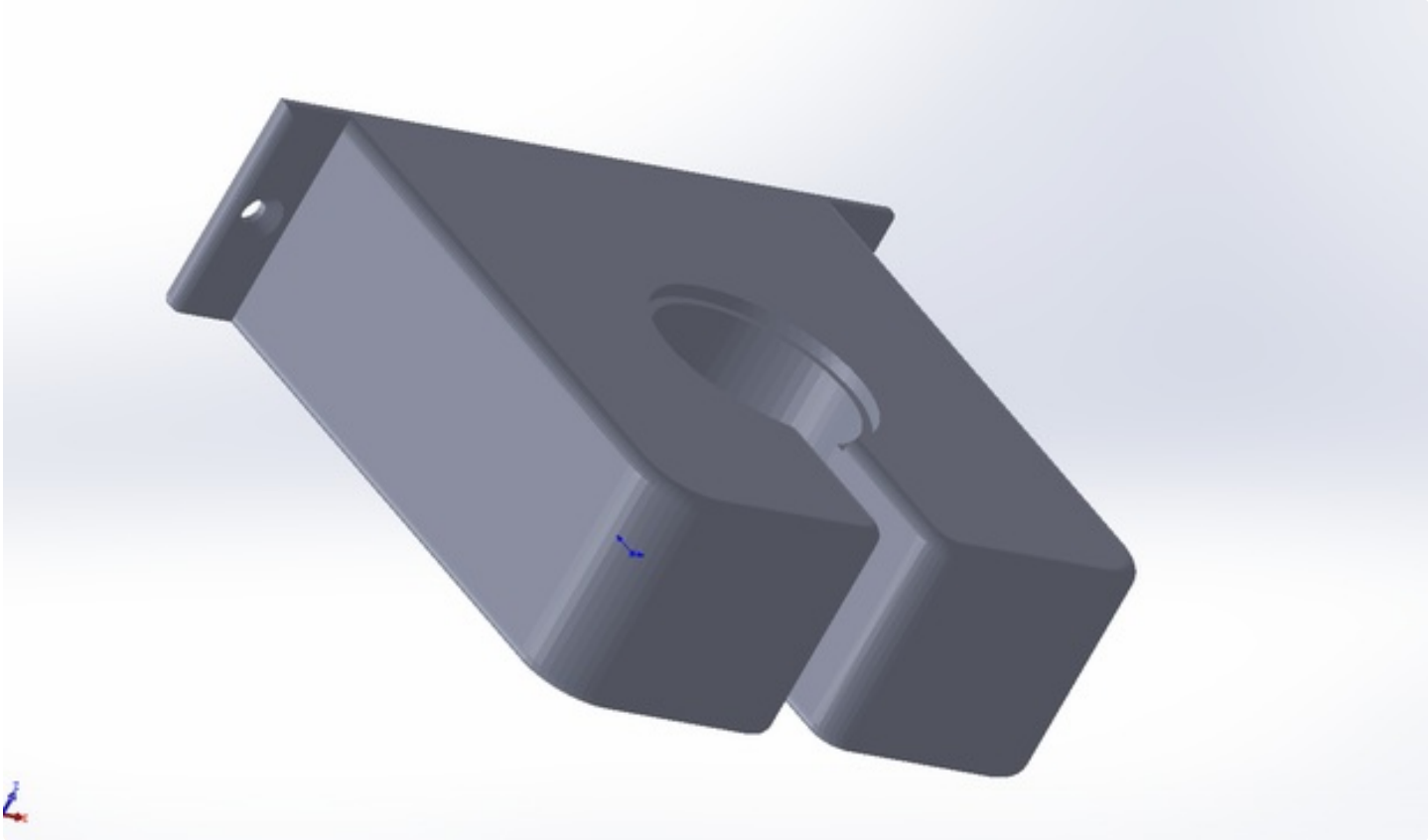
10.Attach the maincontroller box to the board with hot glue.

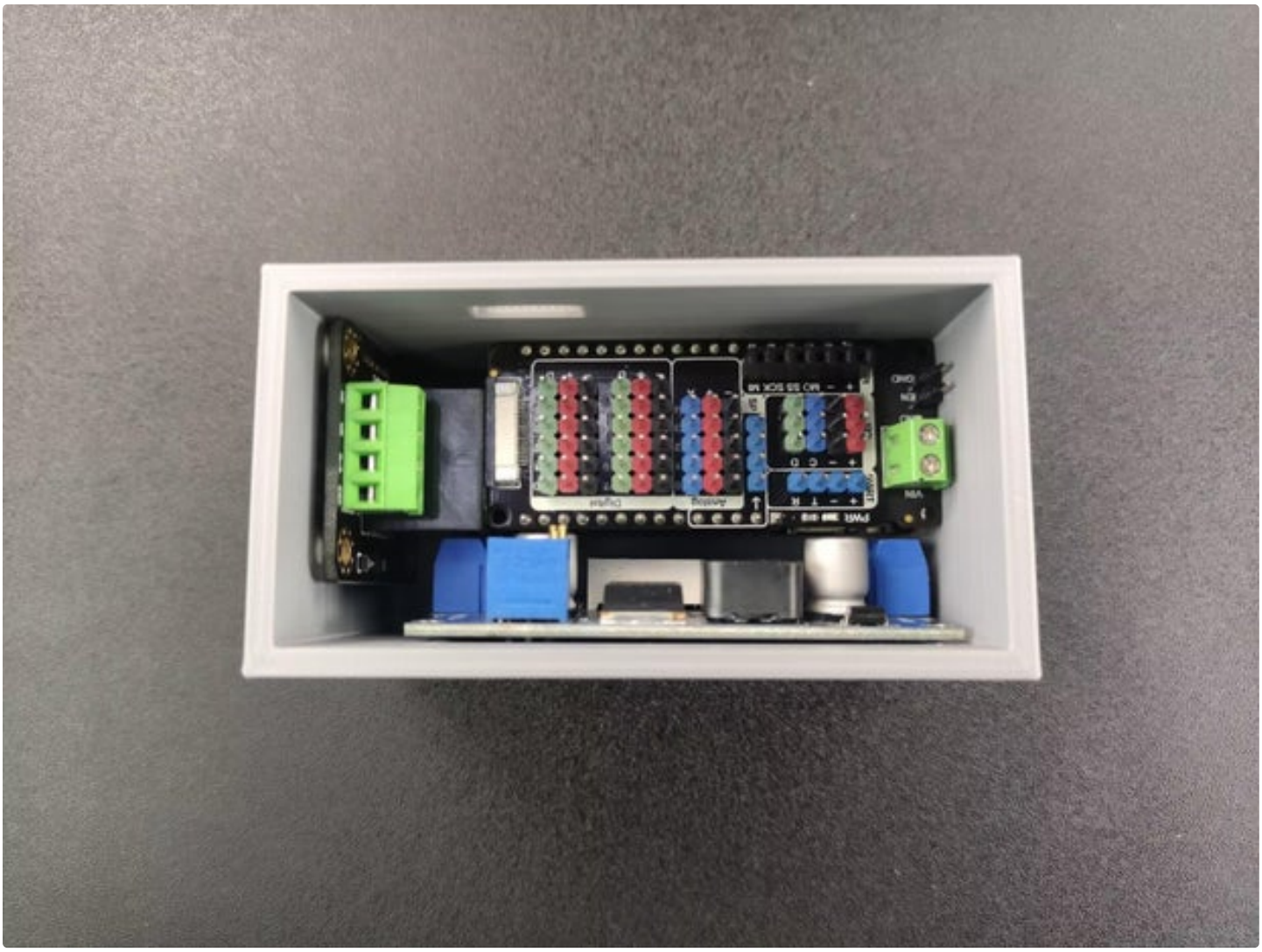
11.Attach the water container to the holder and drill a hole in its bottom for adding water and equalizing air pressure. Then fix it on the board with nylon cable ties.

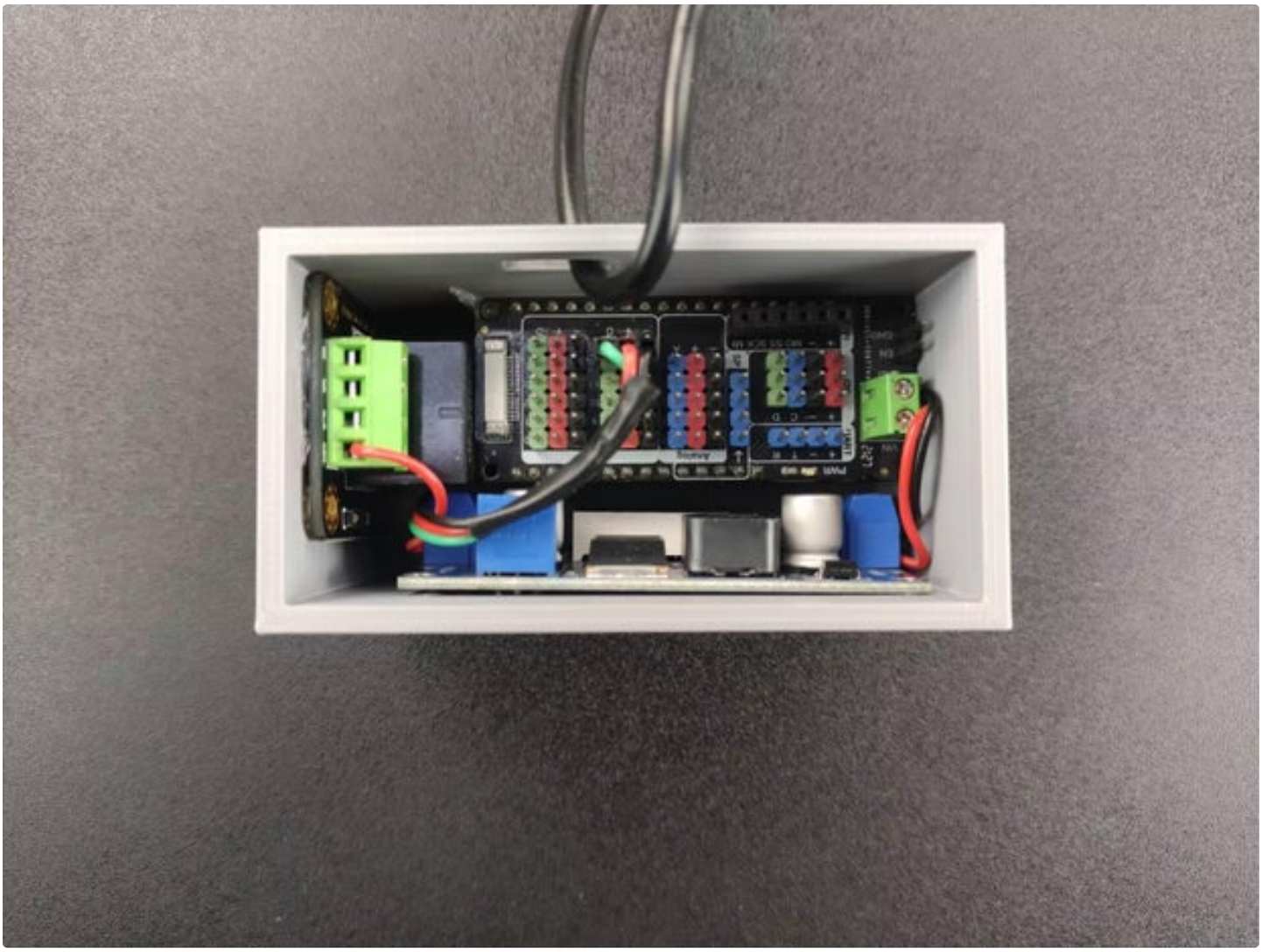
12.Install the liquid level sensor outside the container. Then the device is ready to use.

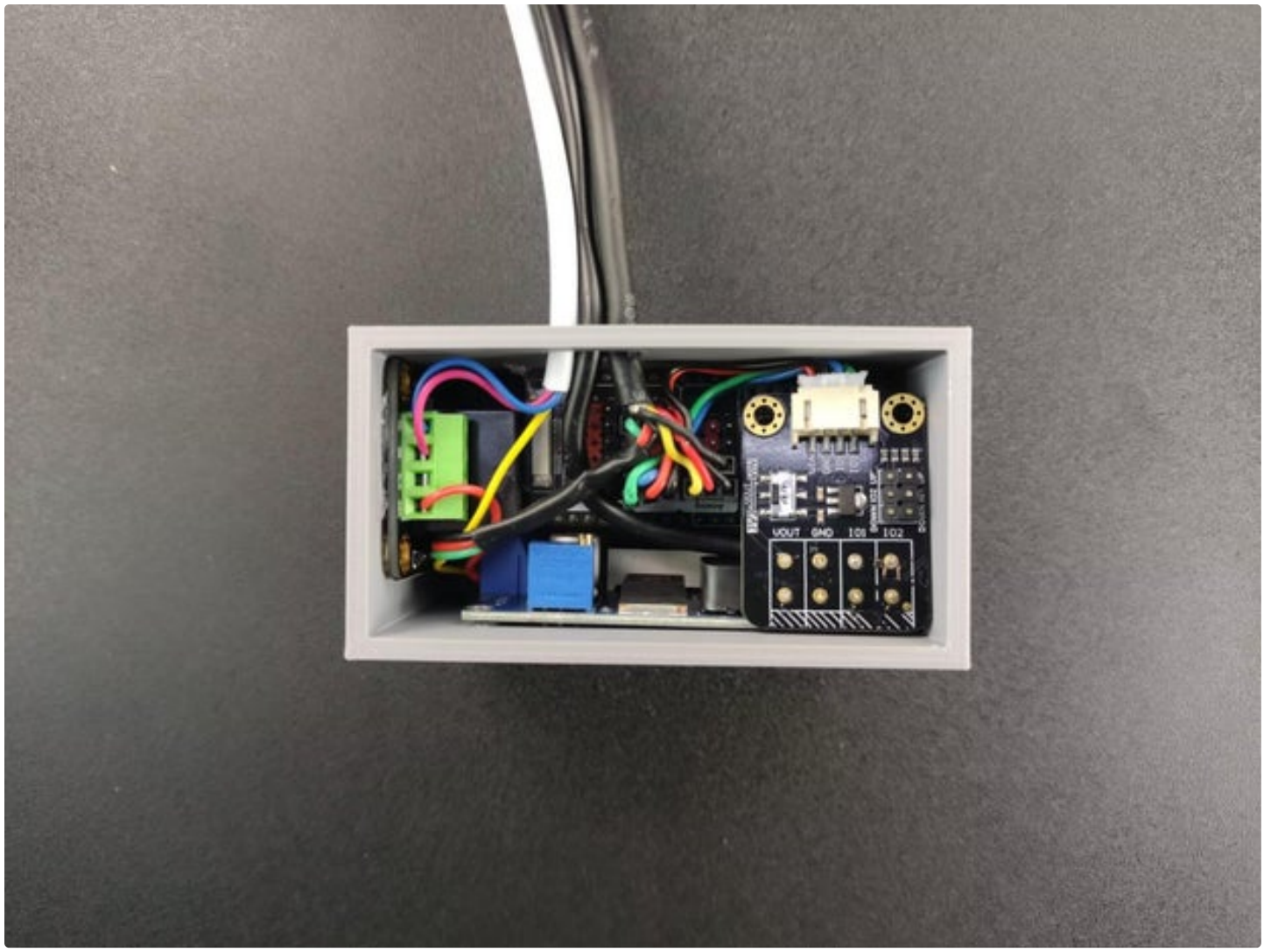
13.Fix the whole device on the wall, put the irrigation nozzles around plants evenly, and insert the soil moisture sensor into the soil. Then, all done with the hardware assembly.







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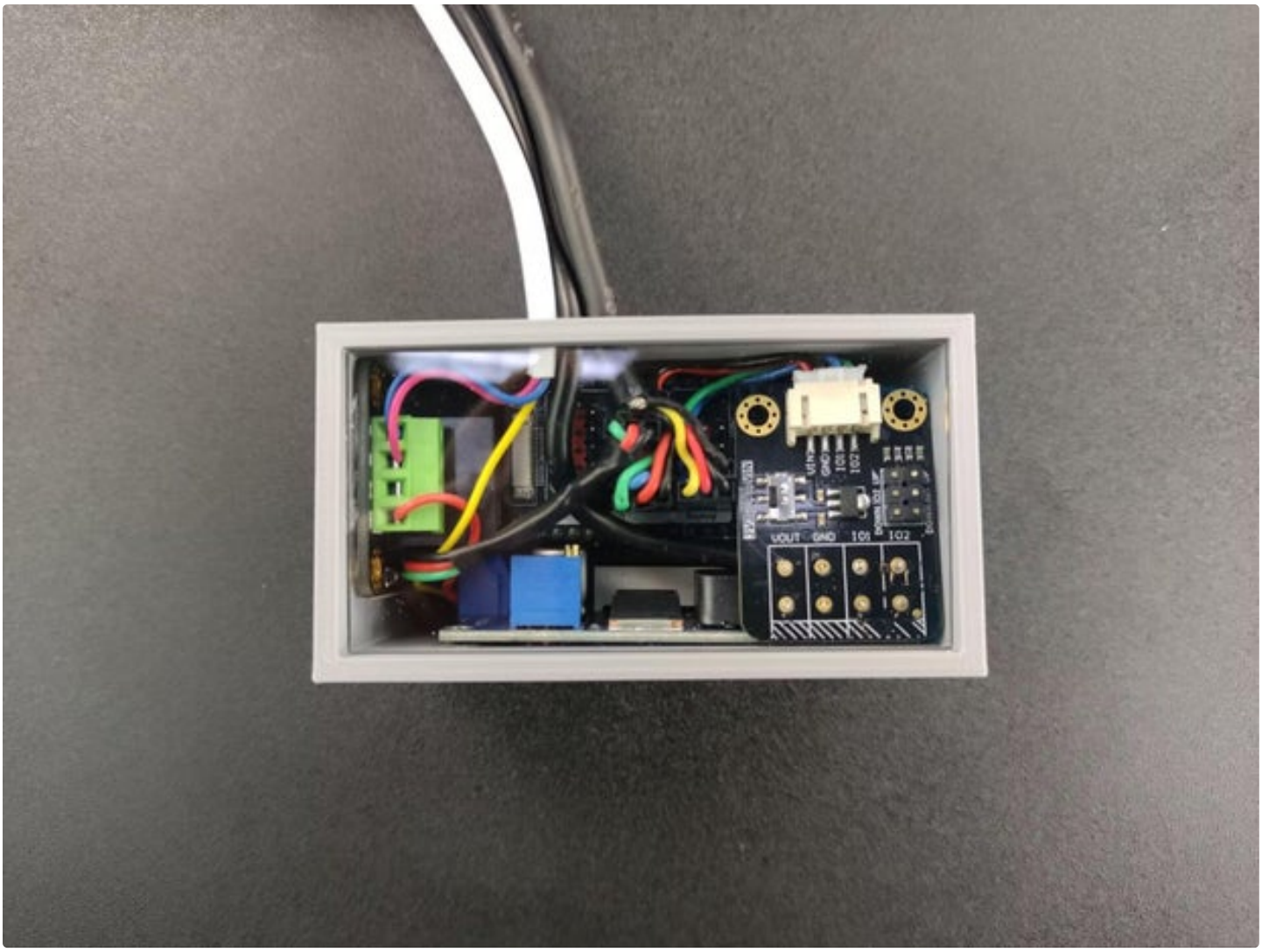
GND
IO1
IO2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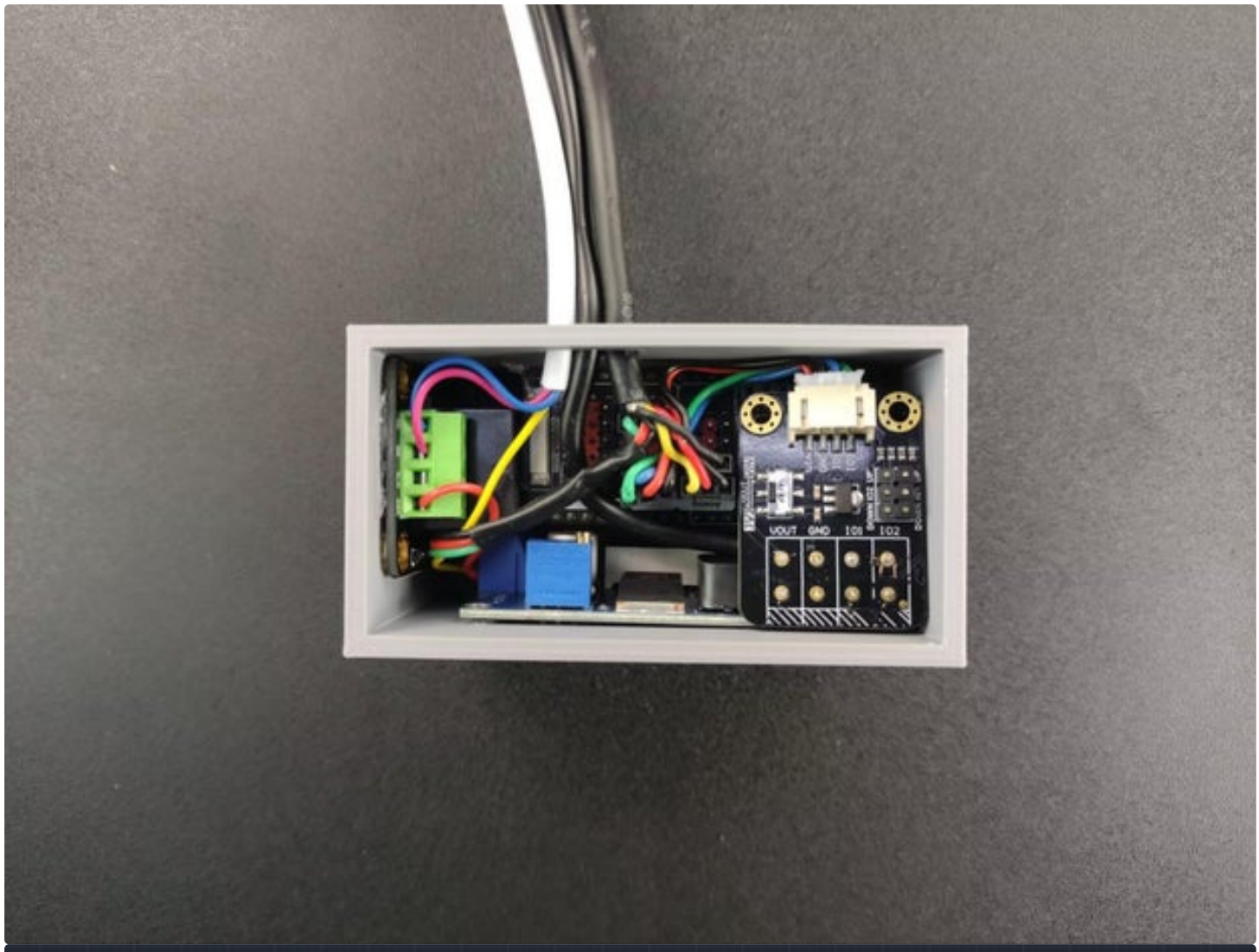
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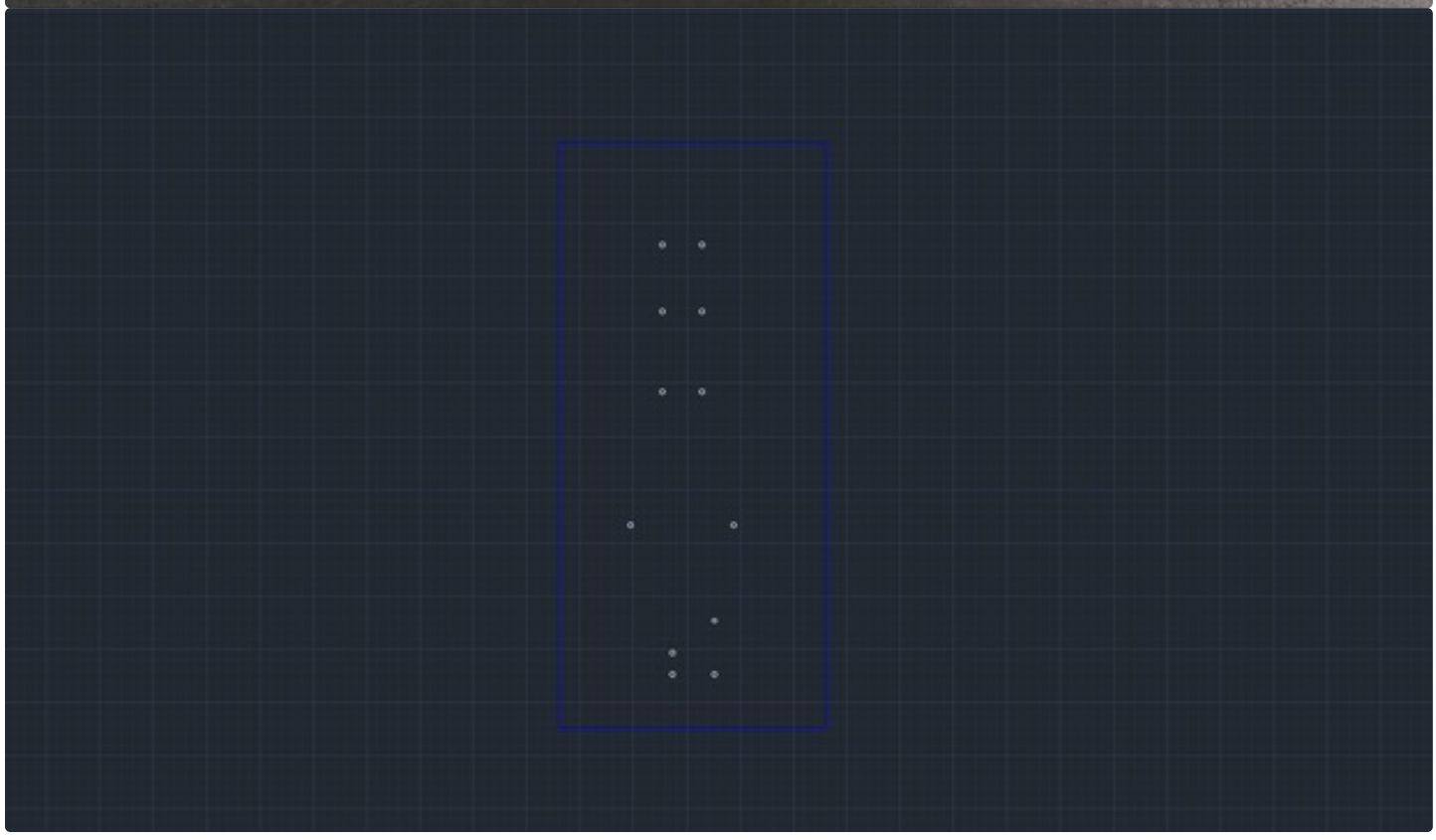
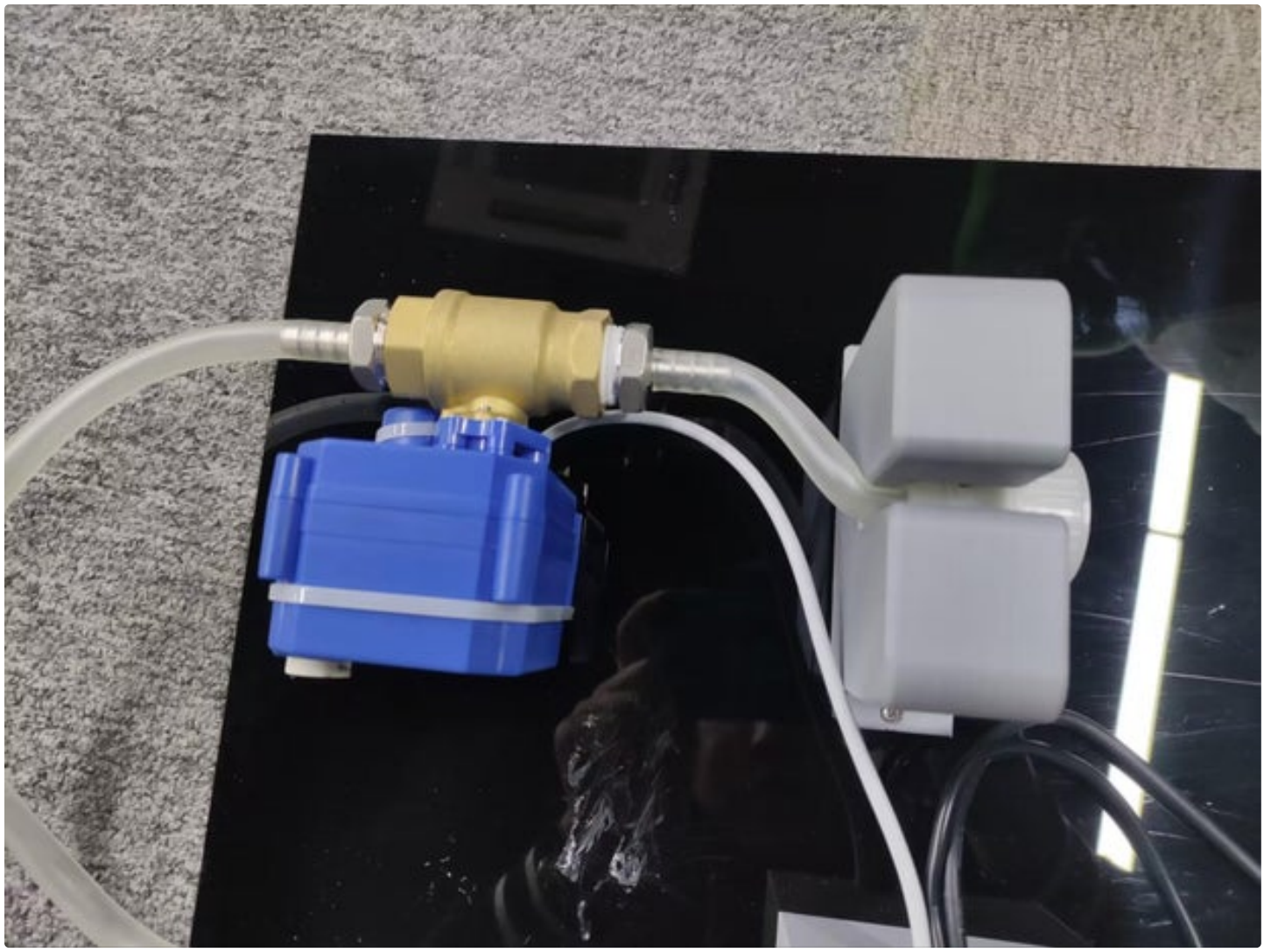
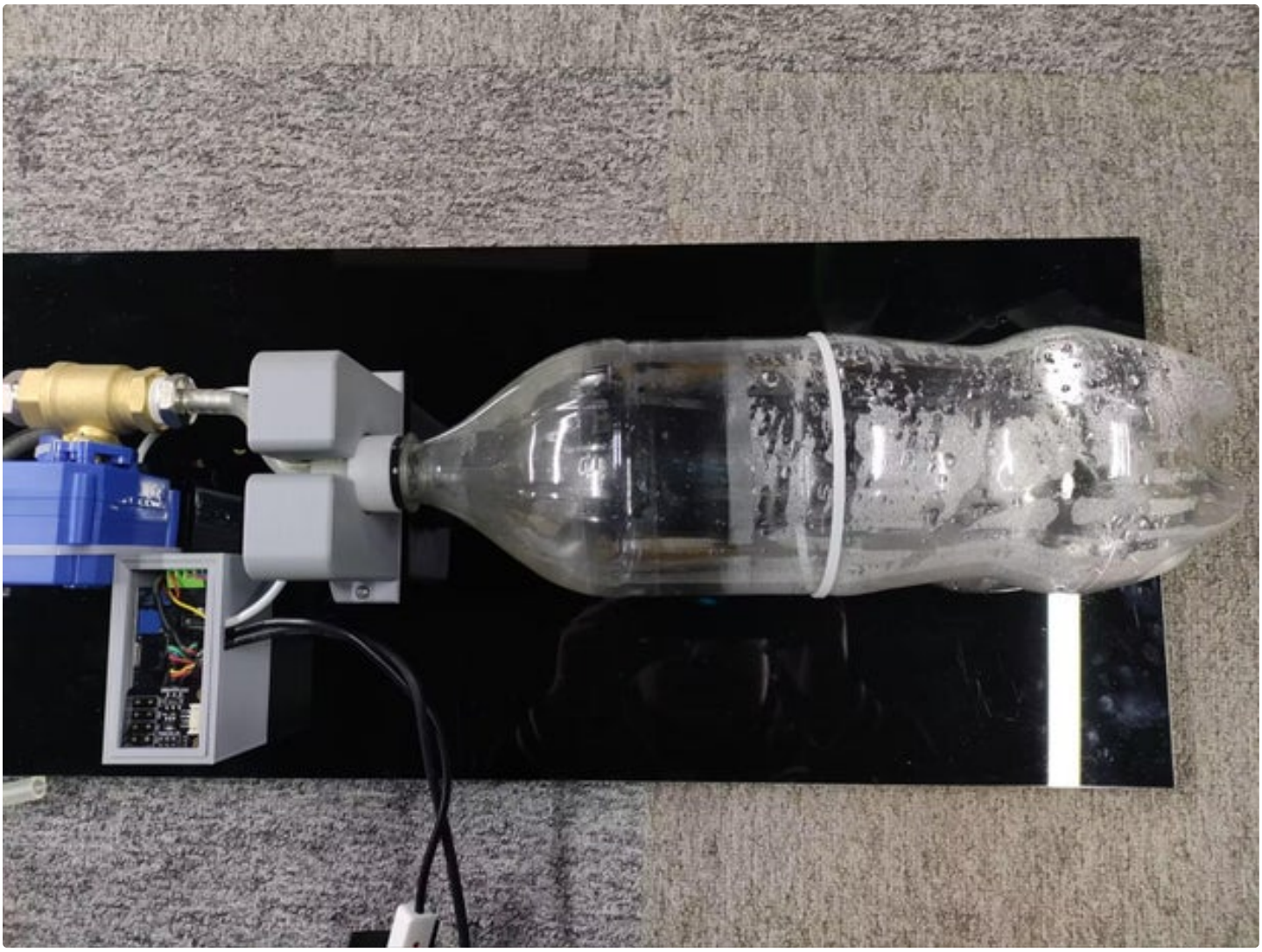
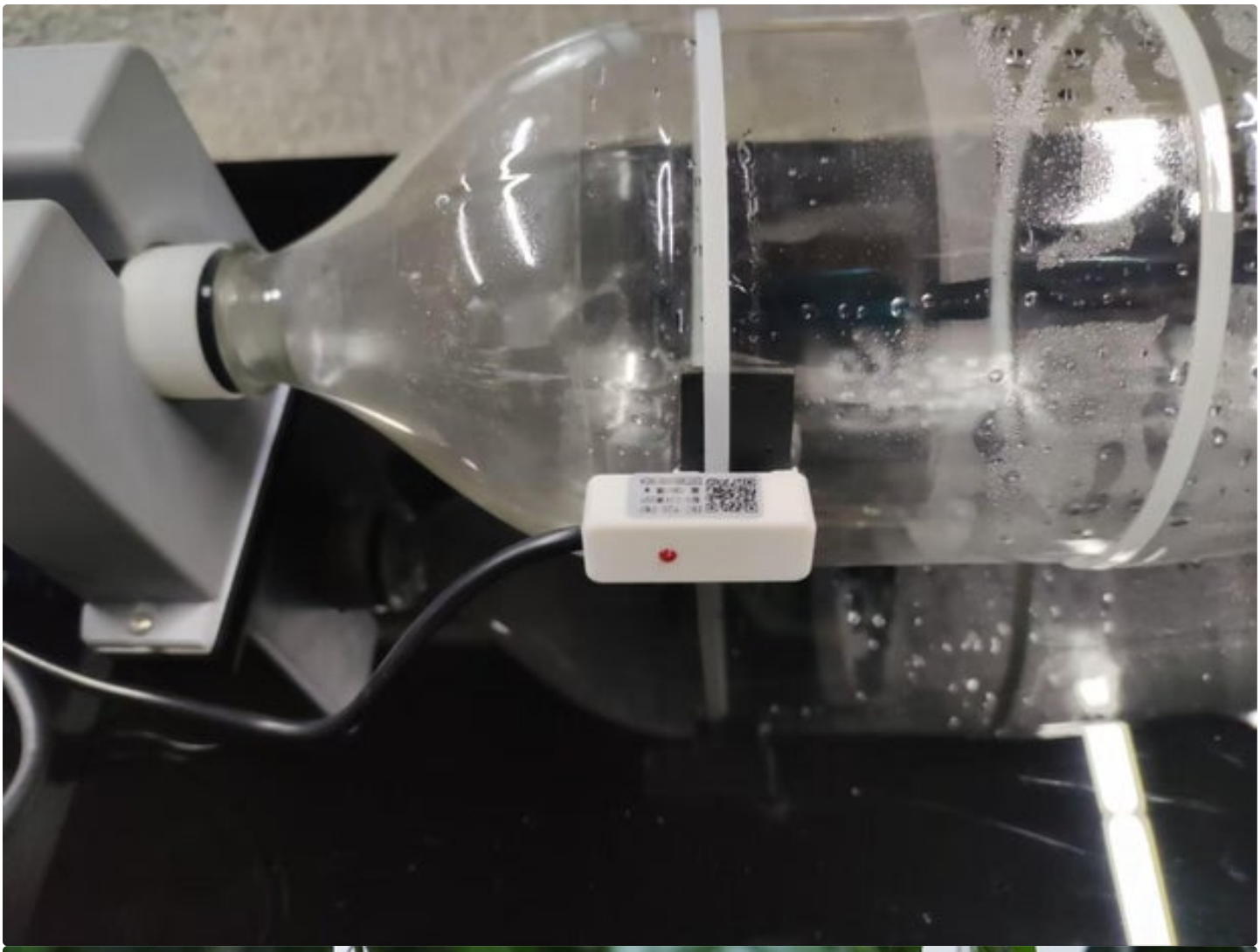








Step 3: Connect the Device to Blynk

1.Sign up Blynk account and log in, then create a new template (select ESP32 as hardware and WiFi as connection type).

2.Create a new device and choose "From template".

3.Select the template we just created.

4.Enter the device to see template ID, device name and AuthToken.

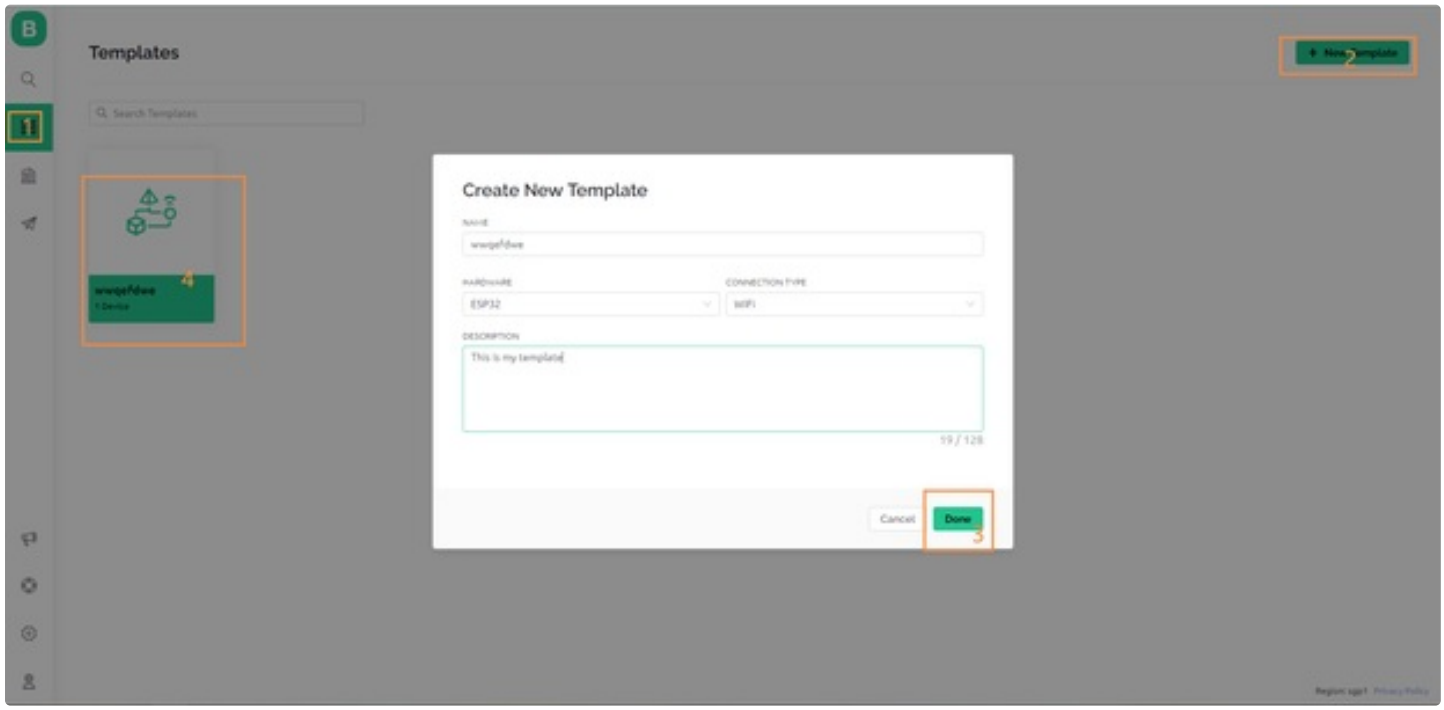
5.Edit the dashboard to configure the gauge of soil moisture.

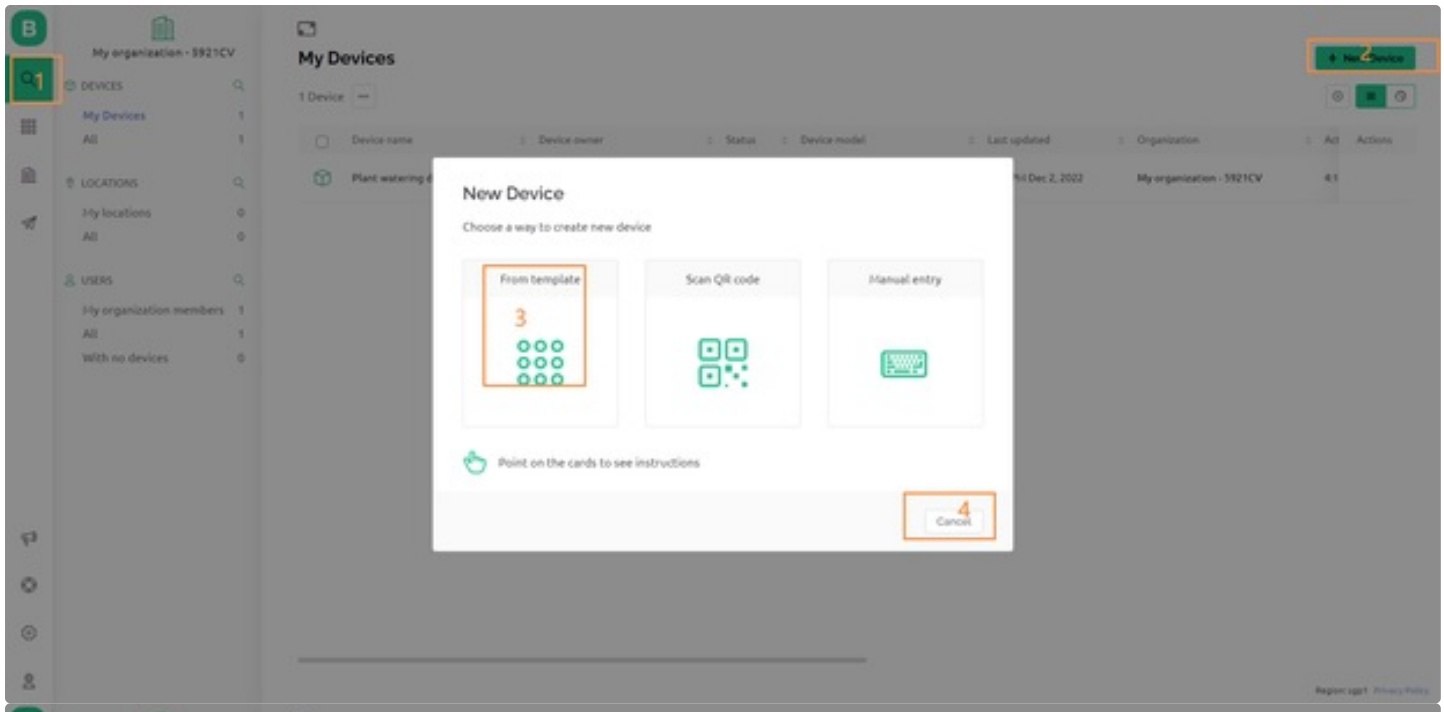
6.Drag and drop Gauge to set up.

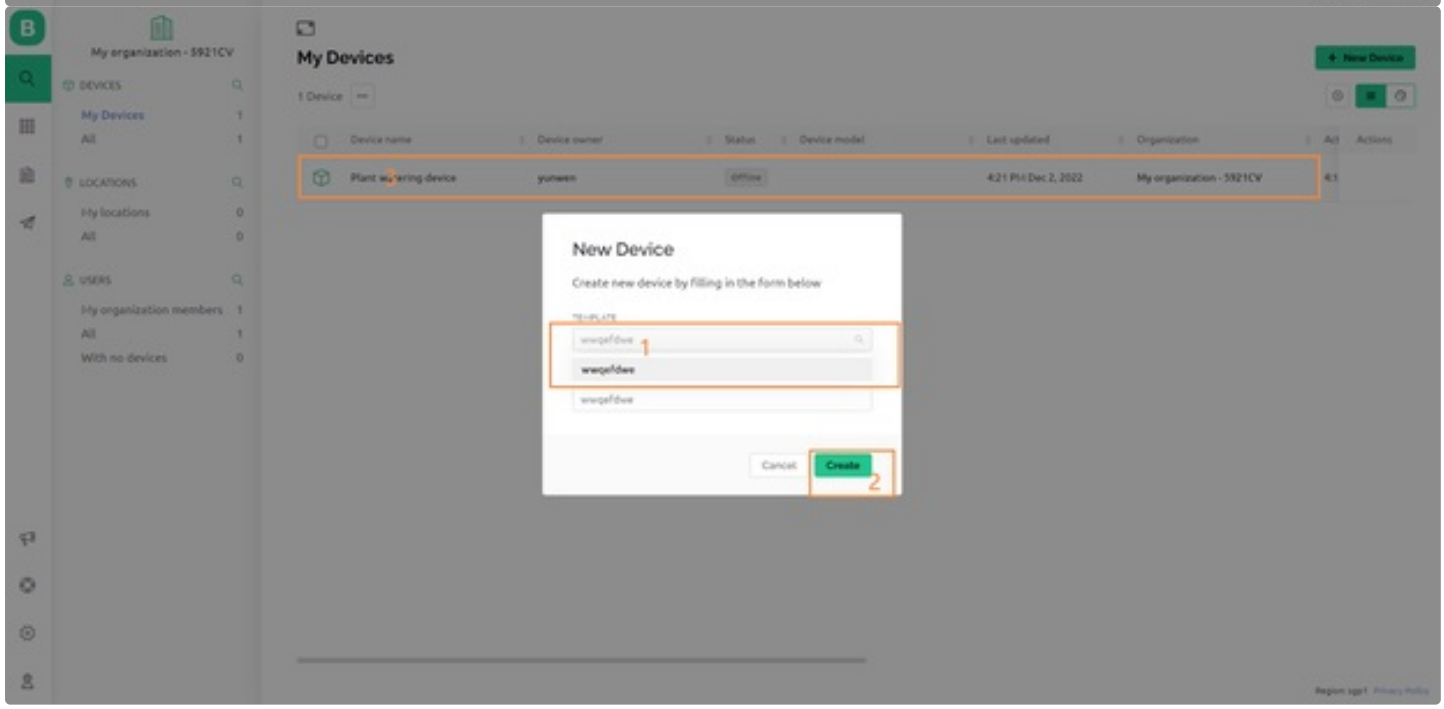
7.Create datastream and select virtual pin.

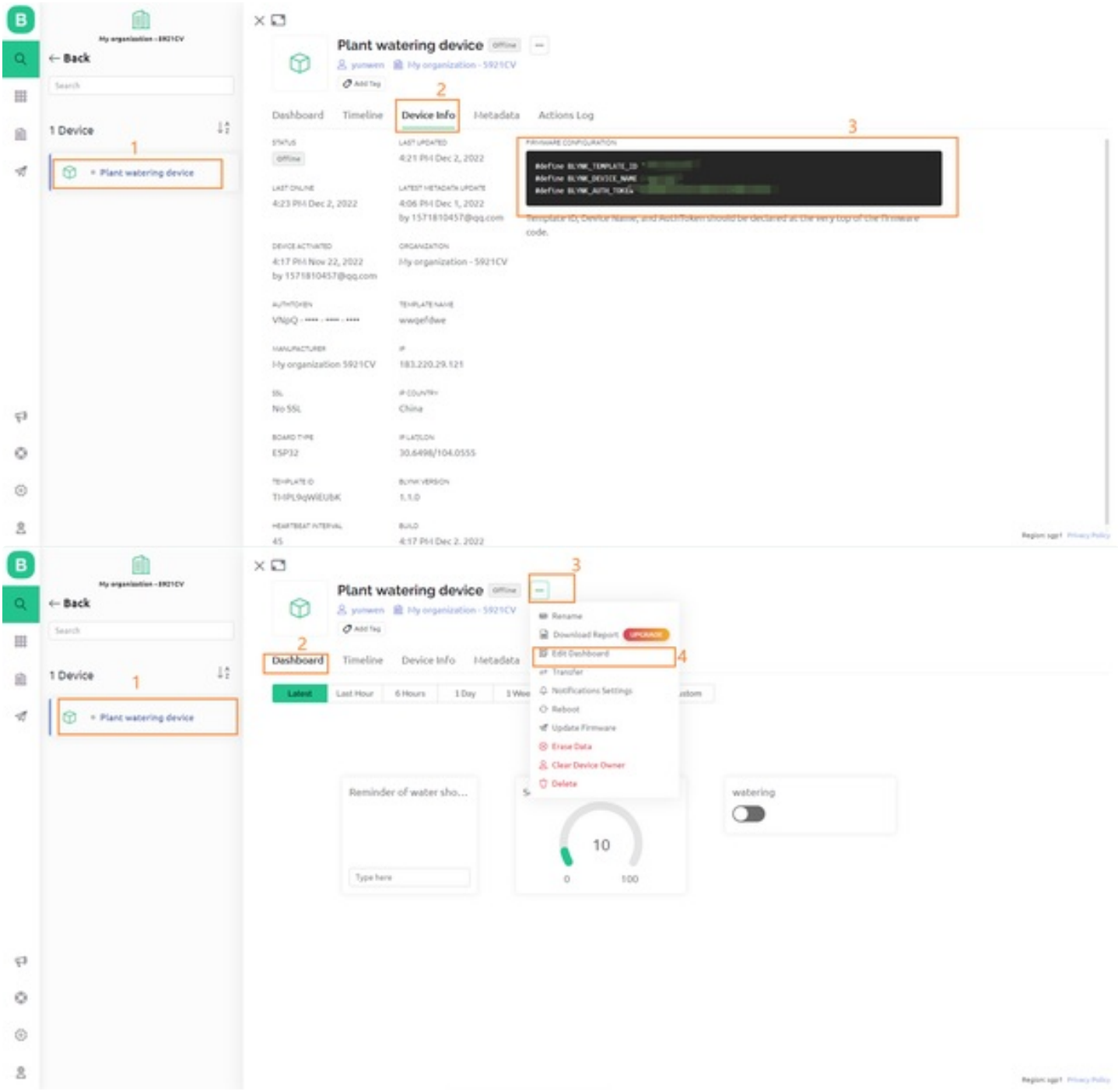
8.Set the Gauge TITLE, UNITS & MAX. For PIN, I select PIN V6 here (just keep it consistent with that in the program).

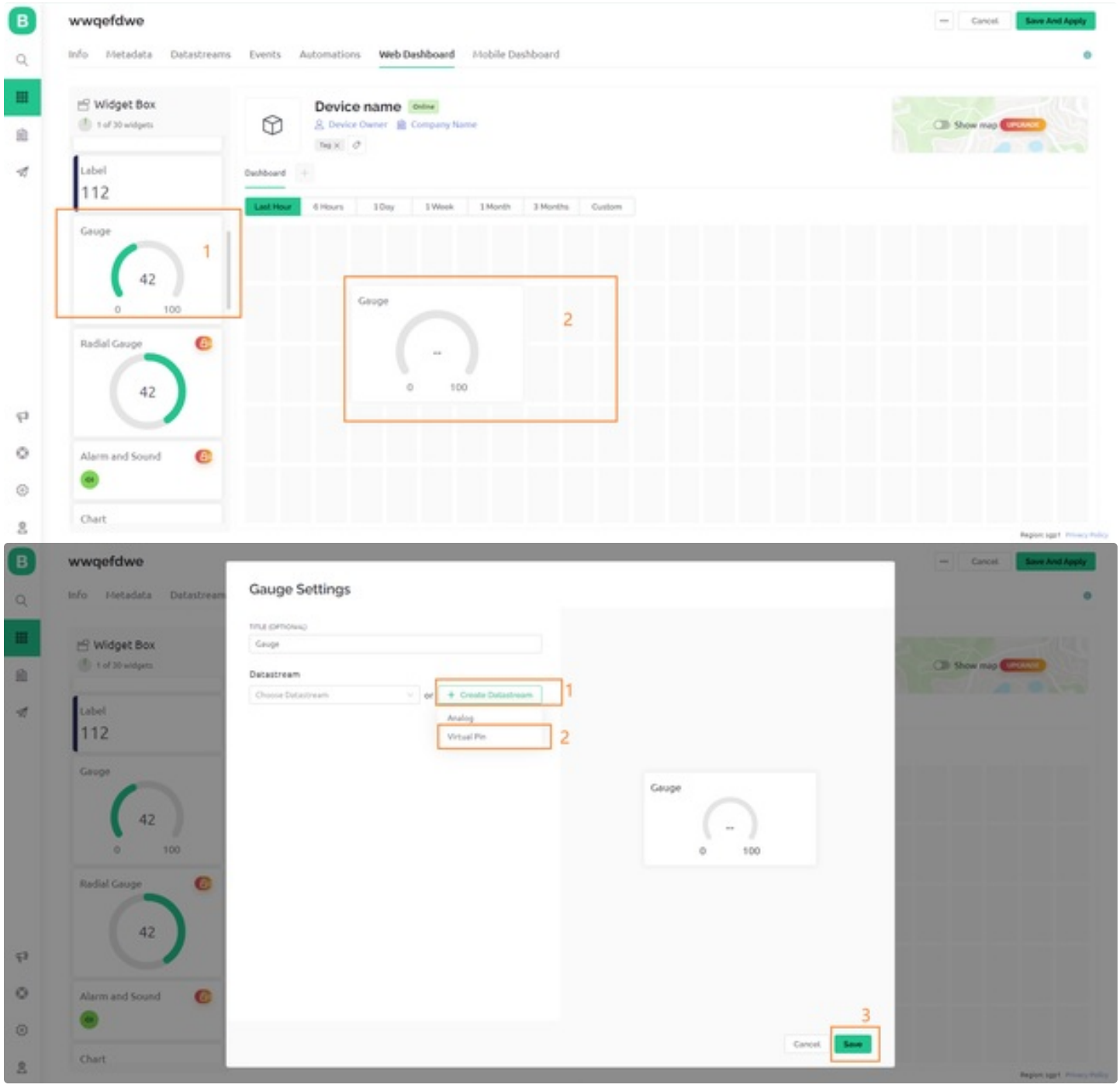
9.Now the setting of the gauge of soil moisture is done. Repeat the steps above to complete the settings of the other two.




My Devices
New Device
Choose a way to create new device
From template
Scan QR code
Manual entry
Point on the cards to see instructions
Cancel


My Devices
New Device
Create new device by filling in the form below
Cancel
Create


Back
1 Device
1
Plant watering device
Plant watering device
Offline
yunwen
My organization - 5921CV
2
Dashboard
Timeline
Device Info
Metadata
Actions Log
3
#define BLYNK_TEMPLATE_ID
#define BLYNK_DEVICE_NAME
#define BLYNK_AUTH_TOKEN
code.
STATUS
Offline
LAST UPDATED
4:21 PM Dec 2, 2022
LAST ONLINE
4:23 PM Dec 2, 2022
LATEST METADATA UPDATE
4:06 PM Dec 1, 2022
by 1571810457@qq.com
DEVICE ACTIVATED
4:17 PM Nov 22, 2022
by 1571810457@qq.com
ORGANIZATION
My organization - 5921CV
AUTHTOKEN
TEMPLATE NAME
wwqefdwe
MANUFACTURER
My organization 5921CV
IP
183.220.29.121
SSL
No SSL
IP COUNTRY
China
BOARD TYPE
ESP32
IP LATLON
30.6498/104.0555
TEMPLATE ID
TMPL9qWiEUbK
BLYNK VERSION
1.1.0
HEARTBEAT INTERVAL
45
BUILD
4:17 PM Dec 2, 2022
Back
1 Device
1
Plant watering device
Plant watering device
Offline
yunwen
My organization - 5921CV
3
2
Dashboard
Timeline
Device Info
Metadata
4
Rename
Download Report
UPGRADE
Edit Dashboard
Transfer
Notifications Settings
Reboot
Update Firmware
Erase Data
Clear Device Owner
Delete
Latest
Last Hour
6 Hours
1 Day
Reminder of water sho...
Type here
10
0
100
watering


wwqefdwe
Info
Metadata
Datastreams
Events
Automations
Web Dashboard
Mobile Dashboard
Widget Box
Label
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Gauge
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Radial Gauge
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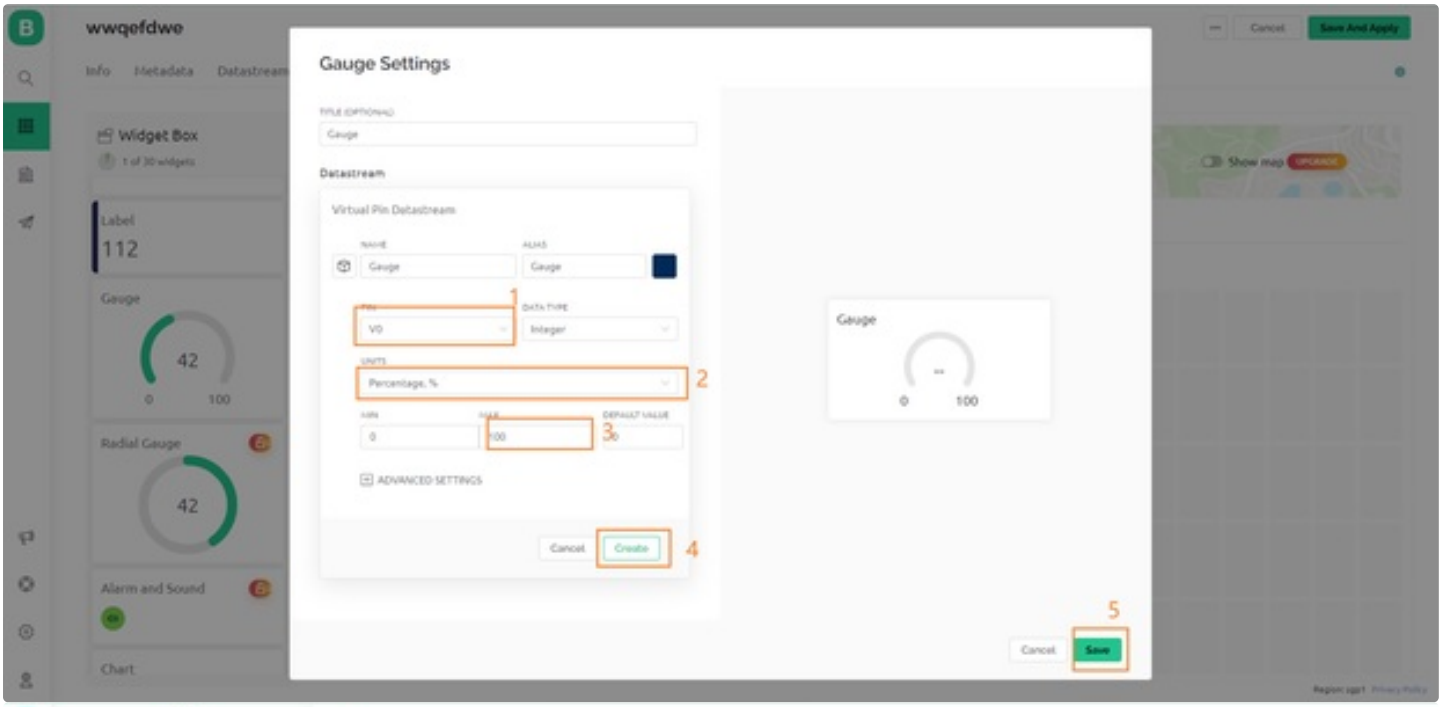
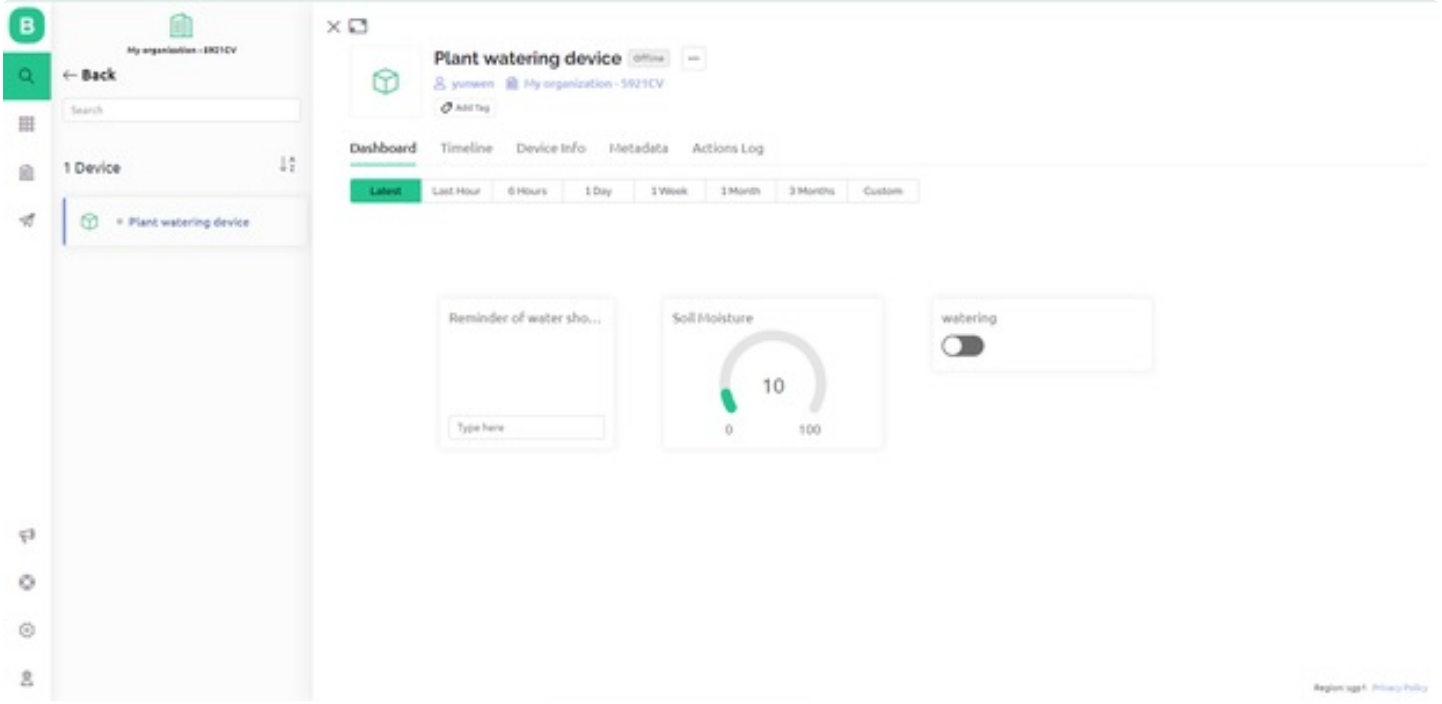
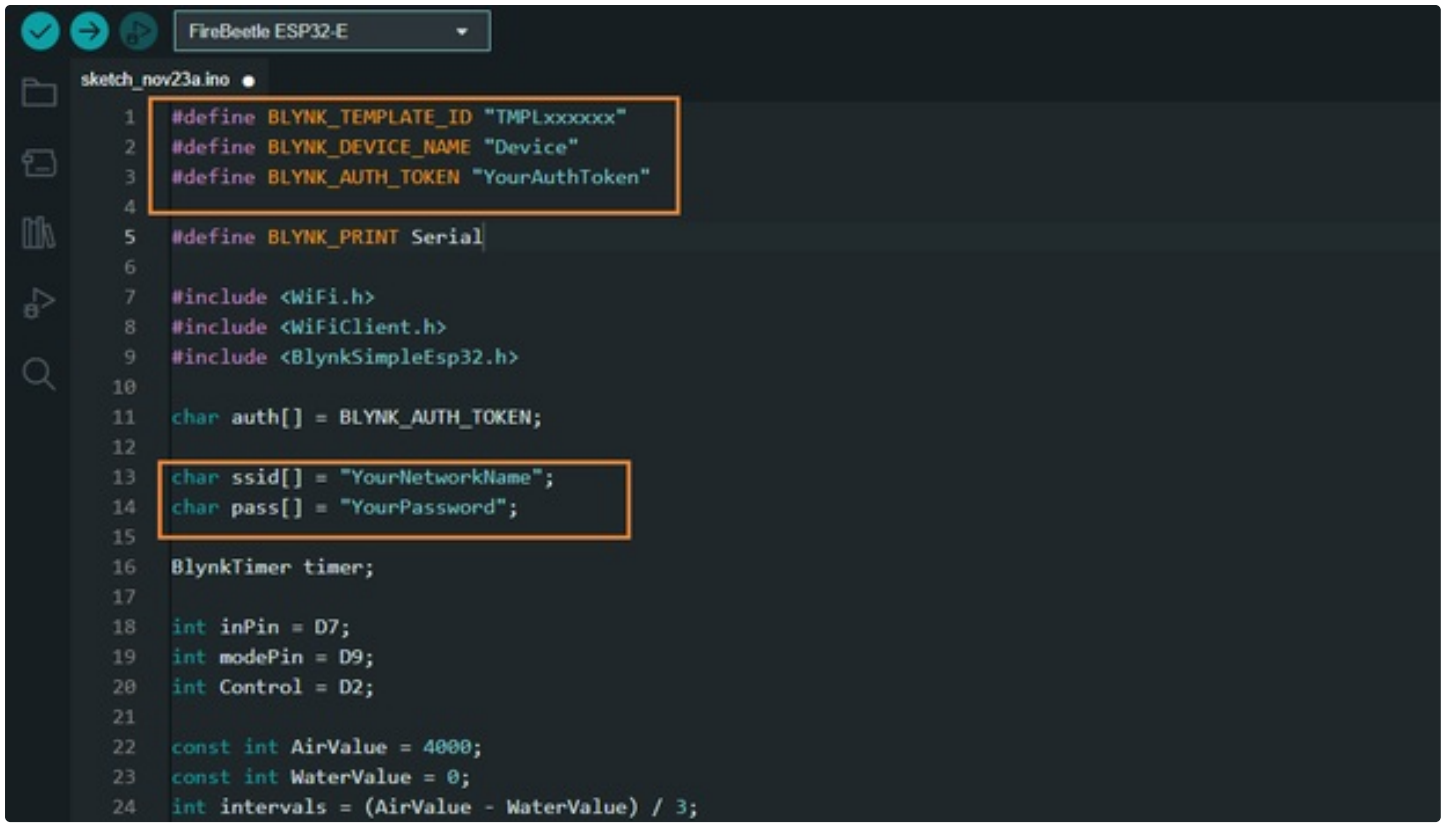
Alarm and Sound
Chart
Device name
Online
Device Owner
Company Name
Dashboard
Last Hour
6 Hours
1 Day
1 Week
1 Month
3 Months
Custom
Gauge
2
Gauge Settings
Gauge
Datastream
Choose Datastream
or
+ Create Datastream
1
Analog
Virtual Pin
2
3
Cancel
Save





Step 4: Upload Codes

Change the content in the box to yours.



Step 5: Function Test

1.Add water to the container through the top hole.

2.When the soil humidity is lower than the threshold, the valve opens to water our plants through drip irrigation(Here for the convenience of demonstration, I switch on/off the gauge to open/close the valve).

3.When the liquid level falls under the sensing point, a water shortage prompt will appear on Blynk.

The plant-watering device has been used for some time and it really helps a lot. Now I can stop worrying that my plants will die from water shortage or drowning.

Thanks for reading, feel free to leave your opinion about this project.

Codes: https://github.com/DFRobot/SmartWateringDevice