

## 1. *What is the problem and why do you need IoT?*

I need to irrigate autonomously and remotely my plant when I am not at home.

I will provide a tank full of water near the plant.

The sensor I will use are a level sensor for measuring how much water is still in the tank , and a soil moisture sensor, to measure if the plant need water or not.

The actuator is a small water pump and a valve , in case we need to control the flux of another liquid as for example liquid fertilizer.

This is the list of sensors and actuators used in this work :

[Modulo sensore livello acqua pioggia liquido water level sensor shield \(arduino-compatibile\): Amazon.it: Elettronica](#)



[iHaospace Capacitive Soil Moisture Sensor Corrosion Resistant for Arduino Moisture Detection: Amazon.it: Elettronica](#)



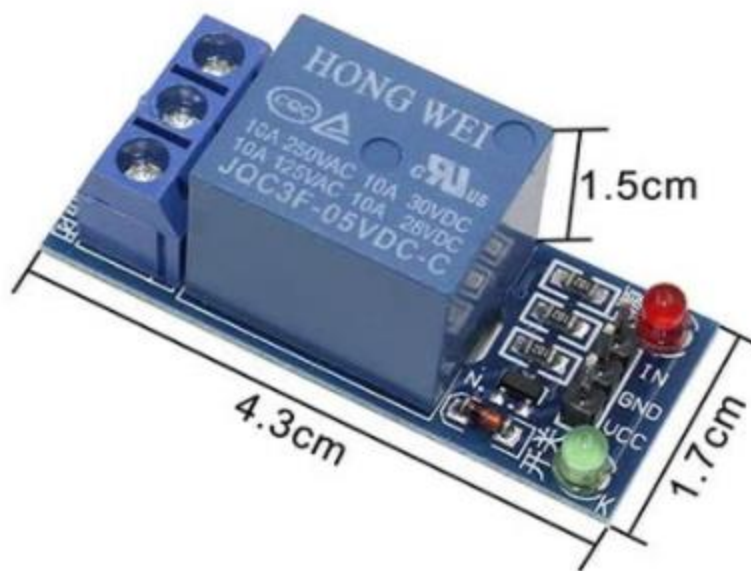
[Hanone Pompa Acqua Micro sommersibile e anfibia Pompa Acqua 3/4. Anfio Anfio Beige 5V:](#)  
[Amazon.it: Casa e cucina](#)



[ILS - Due bit tre vie Elettrovalvola valvola controllo elettronico Piccolo scarico valvola sfiato DC 5V](#)  
[DC6V: Amazon.it: Elettronica](#)



<https://www.amazon.it/sourcing-map-grilletto-Arduino-Lampone/dp/B07MMLZQJT>



1 meter of tube



For the sake of simplicity and for demonstration purposes the periodicity of the sensor measurements is 3 seconds. The pump can be activated when the soil moisture measured value is behind a given threshold.

## **2. What data are collected and by which sensors?**

For the calibration of the soil moisture sensor please read this documents <https://makersportal.com/blog/2020/5/26/capacitive-soil-moisture-calibration-with-arduino> , <https://www.electronicclinic.com/capacitive-soil-moisture-sensor-arduino-circuit-diagram-and-programming/> , <https://thecavepearlproject.org/2020/10/27/hacking-a-capacitive-soil-moisture-sensor-for-frequency-output/> , [https://media.digikey.com/pdf/Data%20Sheets/DFRobot%20PDFs/SEN0193\\_Web.pdf](https://media.digikey.com/pdf/Data%20Sheets/DFRobot%20PDFs/SEN0193_Web.pdf)

I have not found a detailed datasheet with the accuracy of the sensors. The unit of measurement is  $\text{cm}^3 \text{cm}^{-3}$  as far as concern the soil moisture sensor.

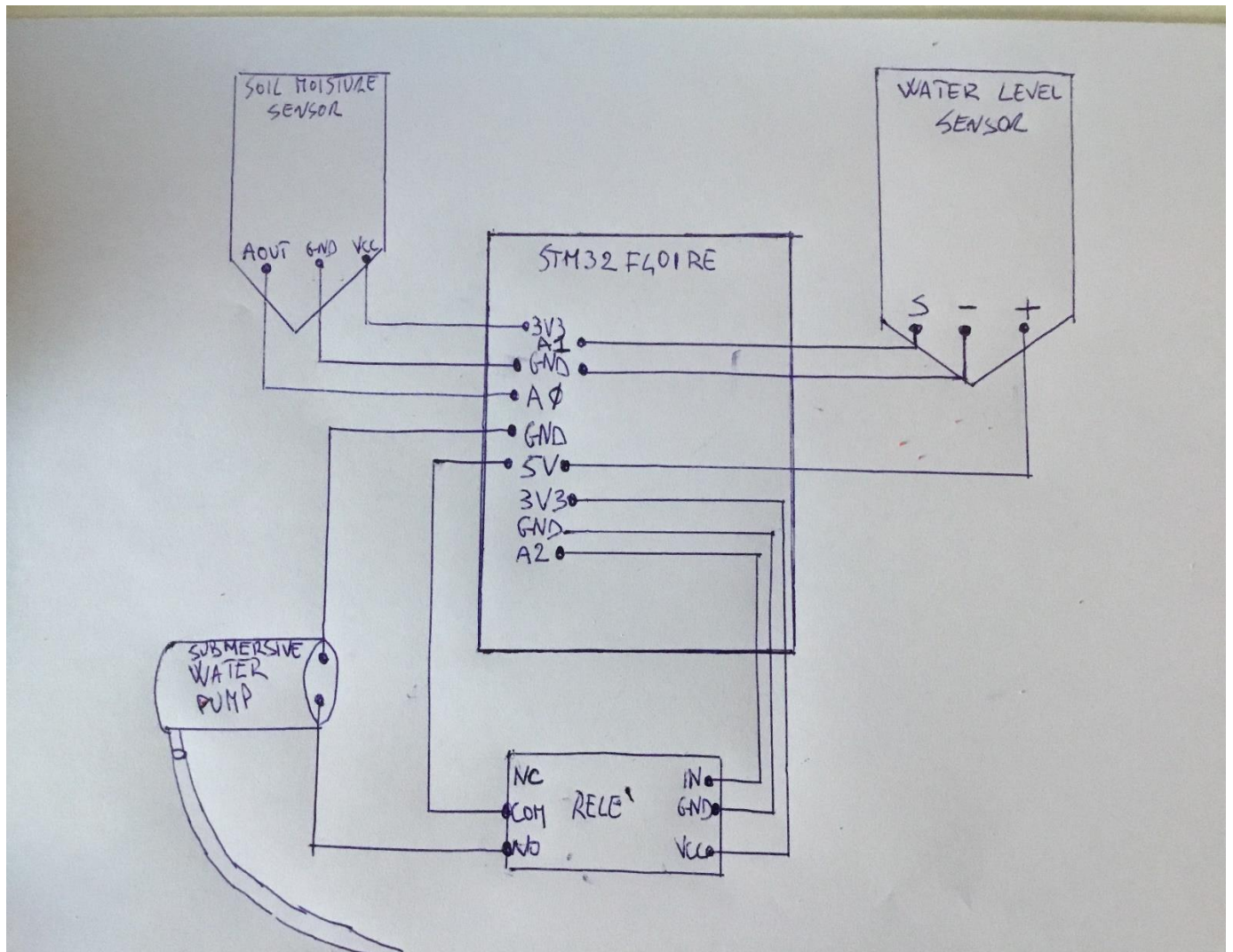
As far as concerns the water level sensor it is valid the following conversion table :

- ④ Immerse the sensor into the water deeply. The table below shows the relationship between the output voltage from the AOUT pin and the liquid level.

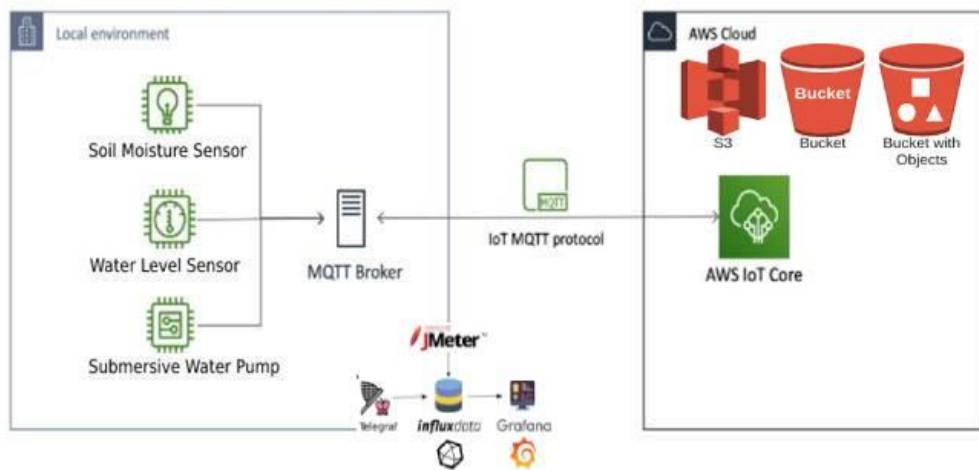
Liquid level	Output voltage
0cm	0v
0.5cm	1.3v
1cm	1.53v
1.5cm	1.62v
2cm	1.69v
2.5cm	1.74v
3cm	1.77v
3.5cm	1.81v
4cm	1.84v
4.5cm	1.86v
4.8cm	1.88v

I have not found a clear datasheet for this sensor, too.

## **3. What are the connected components, the protocols to connect them and the overall IoT architecture?**



The diagram 1 describes the overall architecture of the system.



The sensors readings from the Riot Application are delivered to the AWS IoT through the MQTT-SN, connected to MQTT broker, ending with AWS IoT endpoint. Here they are stored into S3 buckets by three rules set on the values of the reading fields.

Amazon S3

**Buckets (3)** Refresh Copy ARN Empty Delete Create bucket

Buckets are containers for data stored in S3. [Learn more](#)

Find buckets by name

	Name ▲	AWS Region ▼	Access ▼	Creation date ▼
<input type="radio"/>	<a href="#">bucketsoilmoisture</a>	US East (N. Virginia) us-east-1	<span>Public</span>	April 11, 2021, 20:10:35 (UTC+02:00)
<input type="radio"/>	<a href="#">bucketwaterlevel</a>	US East (N. Virginia) us-east-1	<span>Public</span>	April 12, 2021, 09:27:02 (UTC+02:00)
<input type="radio"/>	<a href="#">bucketwaterpump</a>	US East (N. Virginia) us-east-1	<span>Public</span>	April 12, 2021, 14:10:18 (UTC+02:00)

These buckets contains the files where the data sensors are written once the topic has been subscribed (see videos).

In order to build the required Dashboard I have chosen Grafana as a platform to visualize the data logged. This installation has required to install Influxdb as a Database , in order to store the data, and Telegraf in order to supply with an agent to collect data from the broker and serve them to the database. I have

installed these platform on the same Ubuntu machine of the broker, that is on localhost. Although it should have been installed on an external server and its domain should have been publicly available. Infact The API of S3 does not allow accessing the files in the bucket if the request comes from a local host (as in our case).

