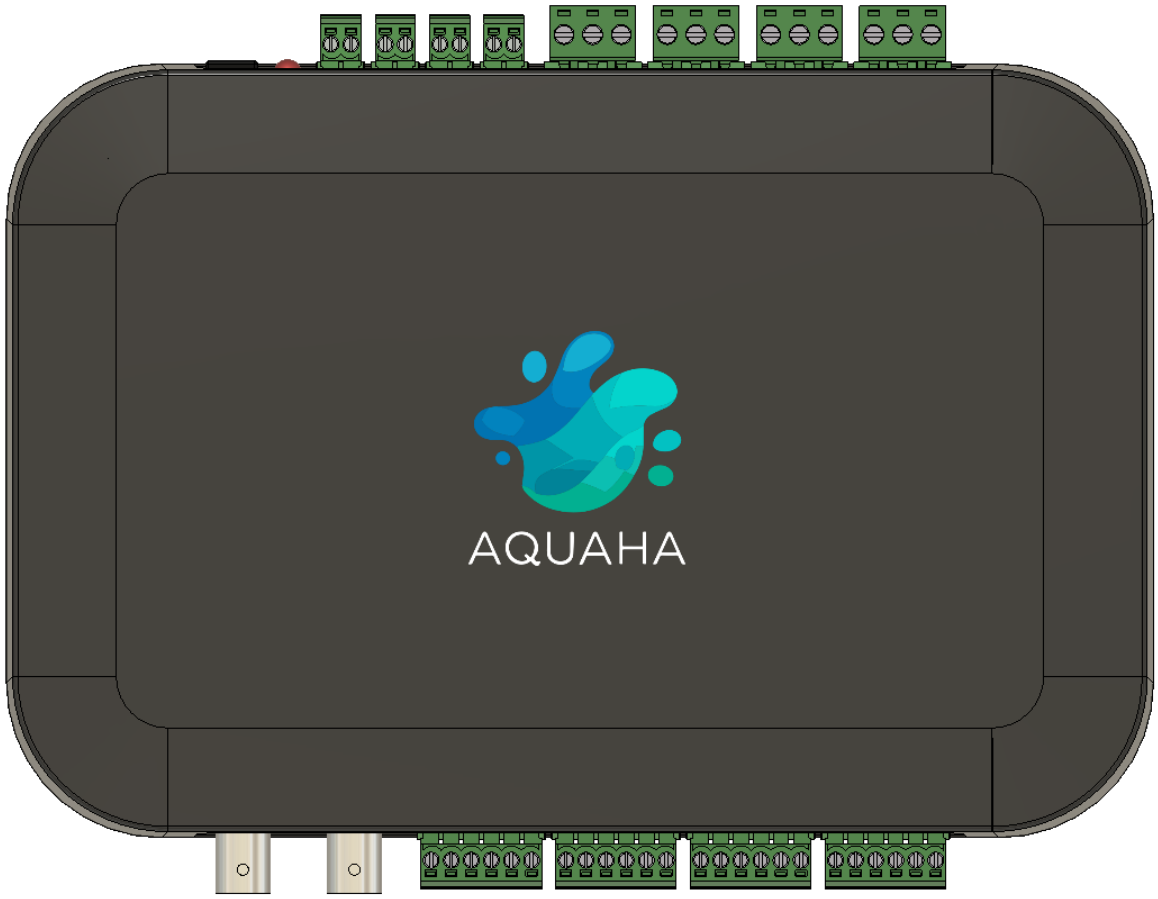
AquaHA 2.5
Technical guide

rev. 3
Last updated: 21/03/2025

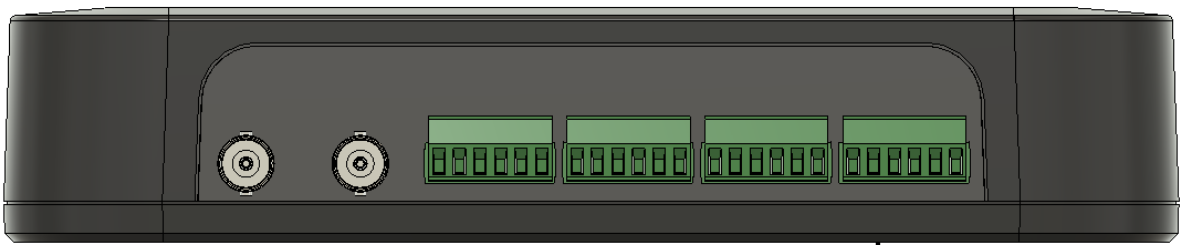
Contents

1. Overview

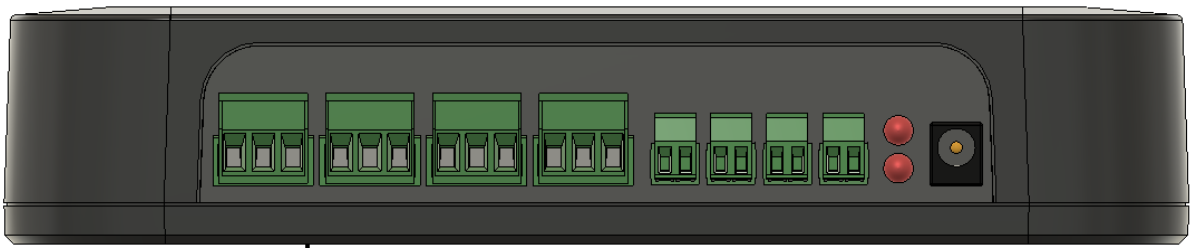
1.1. Top view



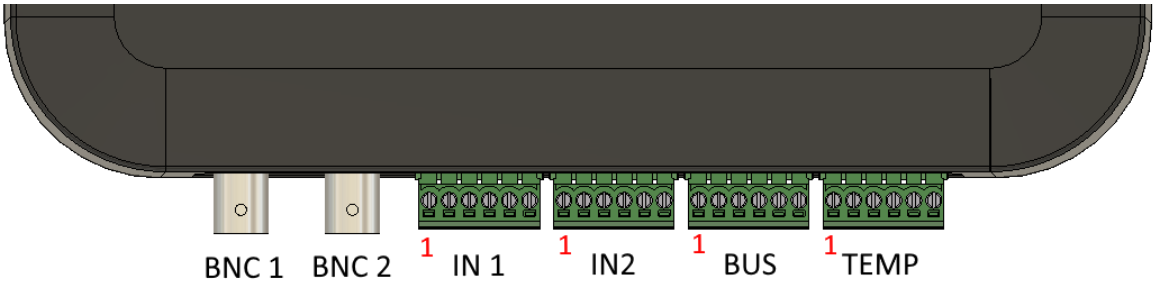
1.2. Front view



1.3. Back view



2. Front connections:



Depending on the version you buy, there will be none, one or two probe modules installed on the PCB. It is possible to swap or add modules later.

2.1. BNC connections:

BNC 1	Electrical conductivity (EC) probe, Oxidation Reduction Potential (ORP) probe, or Dissolved Oxygen (DO) probe
BNC 2	pH probe with BNC connector

2.2. IN 1 connections:

Pin	Function	Description	ESPHome	Pull-Up
1	+3V3 / **+5V** out*			
2	IN1	Input pin	GPIO34	Yes
3	GND			
4	+3V3 / **+5V** out*			
5	IN2	Input pin	GPIO35	Yes
6	GND			

* You can choose the voltage on these pins using internal jumper JP2. Default is **+5V**.

2.3. IN 2 connections:

Pin	Function	Description	ESPHome	Pull-Up
1	+3V3 / **+5V** out*			
2	IN3	Input pin	GPIO36	Yes
3	GND			
4	+3V3 / **+5V** out*			
5	IN4	Input pin	GPIO39	Yes
6	GND			

* You can choose the voltage on these pins using internal jumper JP2. Default is **+5V.**

2.4. BUS connections:

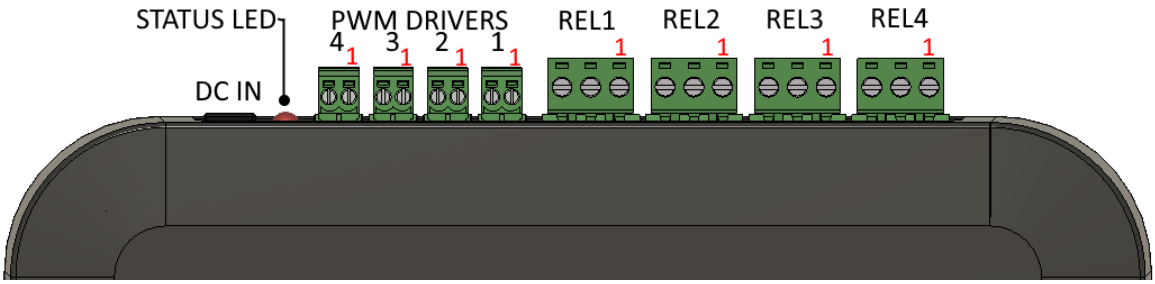
Pin	Function	Description	ESPHome	Pull-Up
1	+3V3			
2	SDA	I2C bus	GPIO21	Yes
3	SCL	I2C bus	GPIO22	Yes
4	RS485-A	RS485 / MODBUS	GPIO1/3	
5	RS485-B	RS485 / MODBUS	GPIO1/3	
6	GND			

2.5. TEMP connections:

Pin	Function	Description	ESPHome	Pull-Up
1	+3V3			
2	1W2*	One-Wire bus 2 for DS18b20 temperature sensors	GPIO5	Yes
3	GND			
4	+3V3			
5	1W1	One-Wire bus 1 for DS18b20 temperature sensors	GPIO23	Yes
6	GND			

*One-Wire bus 2 also has an internal DS18B20 temperature sensor installed on the PCB for internal temperature monitoring

3. Rear connections



3.1. DC power in:

A 5VDC 2A regulated switch-mode power supply.

3.2. Power/Status LEDs:

The bottom, green LED, is always on when power is connected to the device.
The top, red status LED, can be controlled by ESPHome using **GPIO17.**

3.3. PWM Driver 1-4 connections:

Pin	Function	Description
1	PWM	Switched ground – connect to your LED light ground
2	GND	Ground – connect to your LED's power supply ground

4.2A max per channel, max. 48VDC. This means at 24VDC there is a 100W maximum. At 48VDC you can switch 200W.

ESPHome pins:

PWM Driver 1	GPIO26
PWM Driver 2	GPIO27
PWM Driver 3	GPIO32
PWM Driver 4	GPIO33

3.4. REL1-4 relay connections:

Pin	Function	Description
1	C	Common – connect to your power source
2	NO	Normally Open – Used to switch appliance **on** when relay has power
3	NC	Normally Closed – Used to switch appliance **on** when relay has **no** power

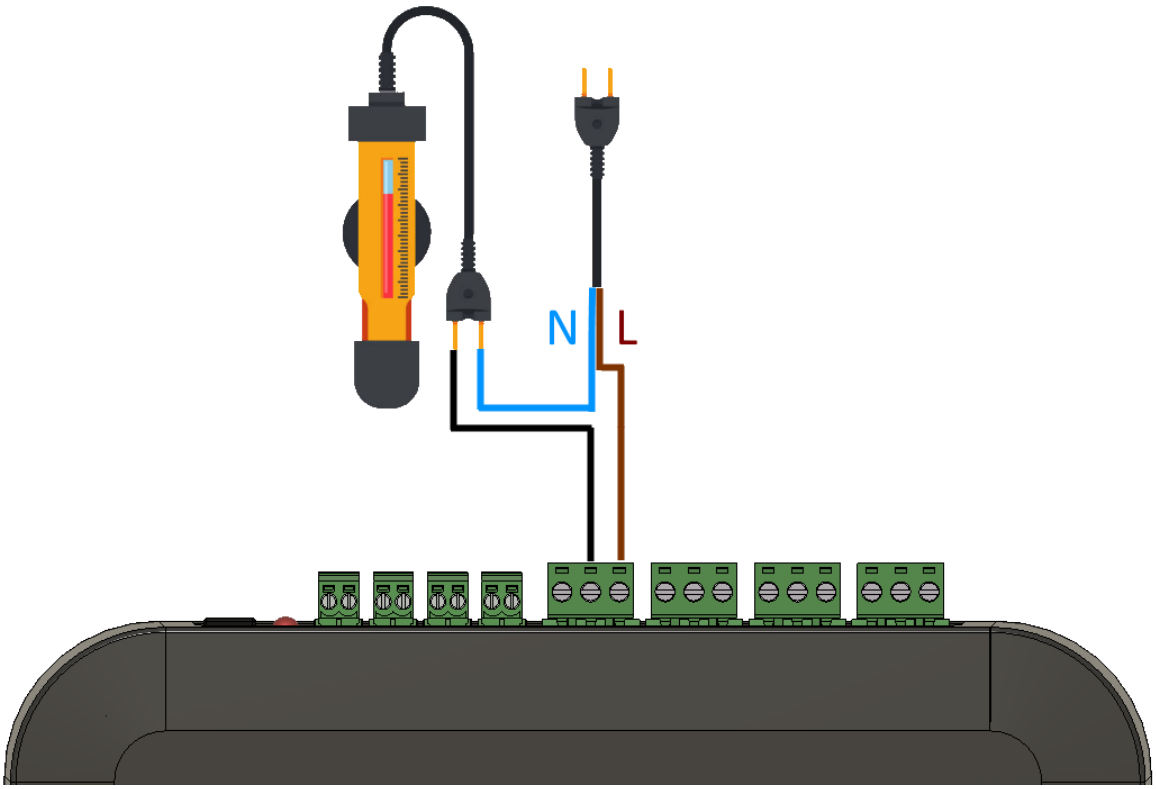
4.2A max per channel – or 1000W at 240VAC / 462W at 110VAC. Resistive loads only or a snubber circuit must be connected externally. Can switch max 250VAC or **30VDC**. There is no current monitoring on the relays. We recommend you always install fuses.

ESPHome pins:

Relay 1	GPIO13
Relay 2	GPIO14
Relay 3	GPIO25
Relay 4	GPIO16

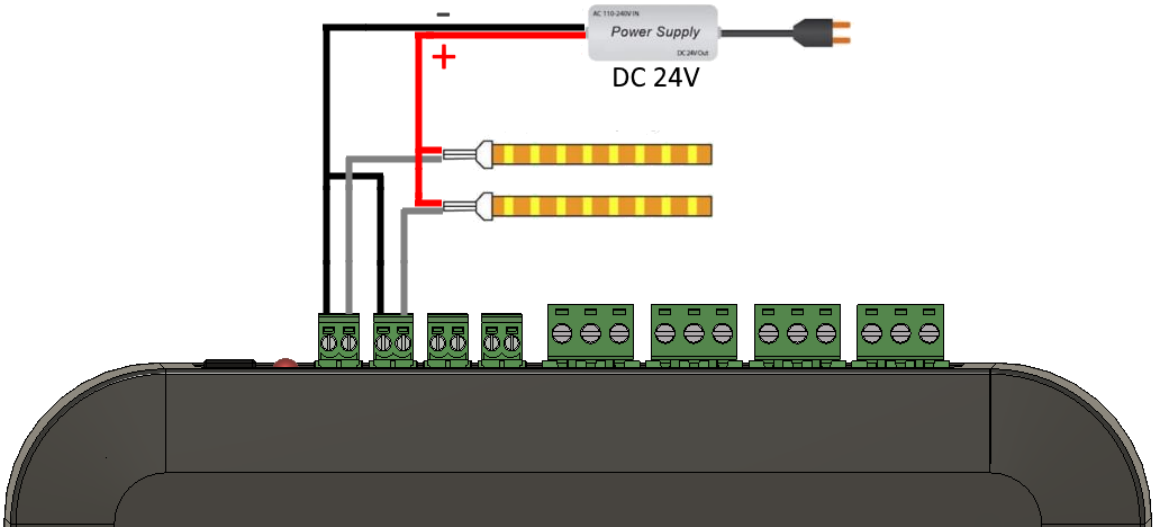
4. Wiring examples

4.1. Switching on a heater using the relay



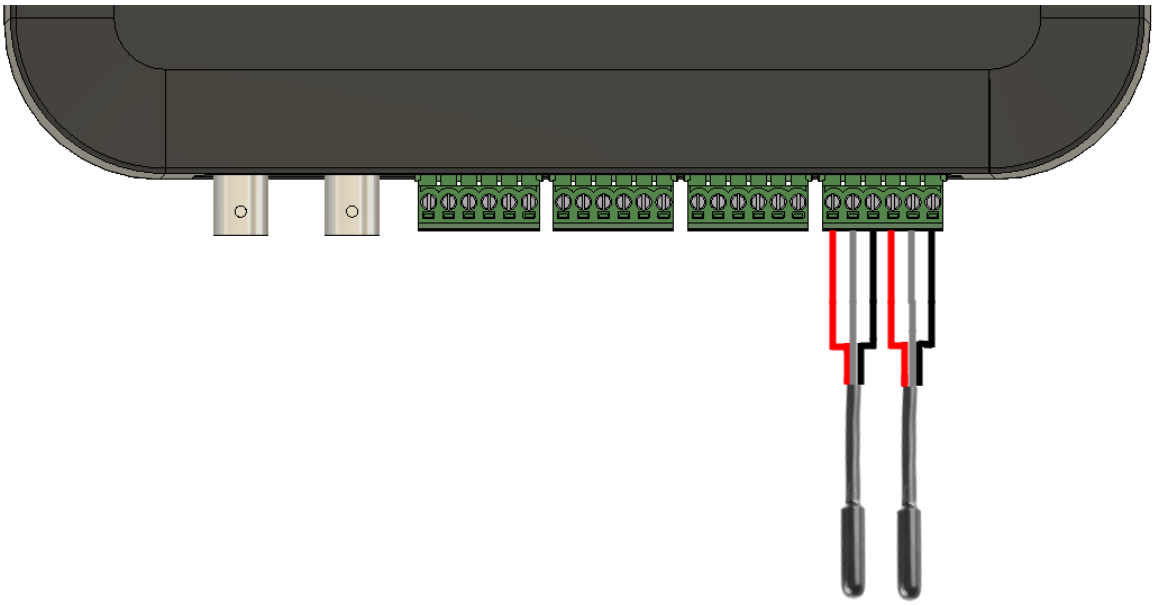
This image is for demonstration purposes only. Use correct and safe wire connection methods, like Wagos.

4.2. Dimming and controlling 2 Power LED bars



Use correct and safe wire connection methods, like Wagos.

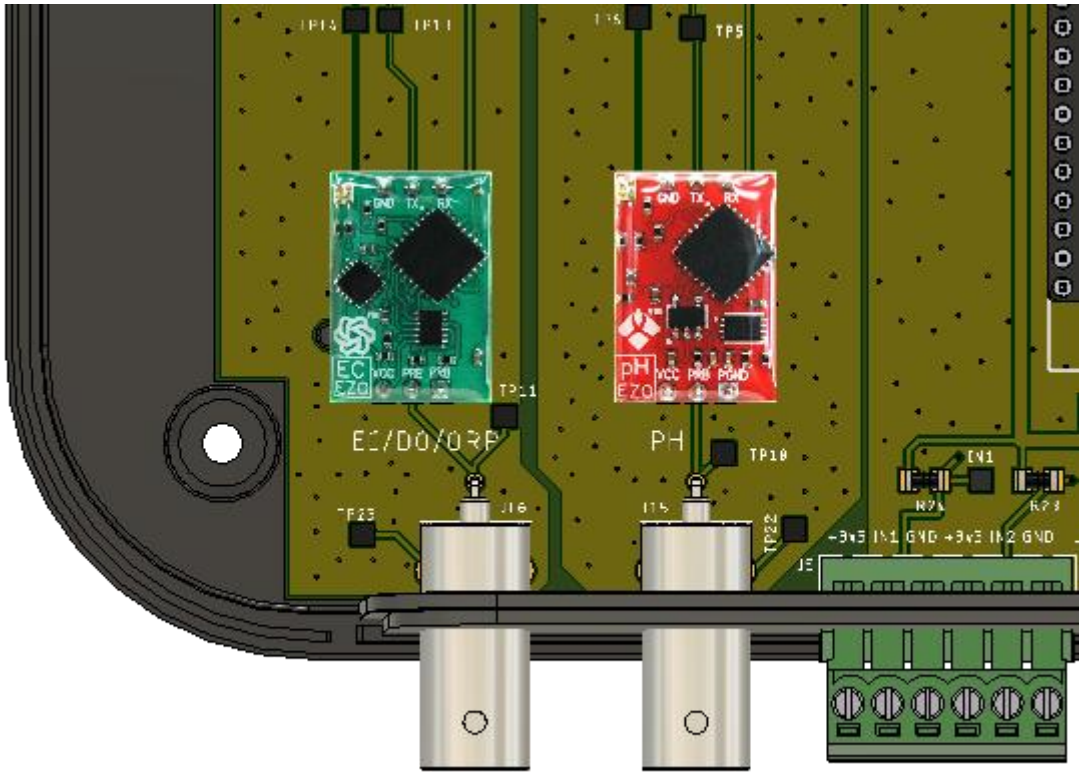
4.3. Wiring temperature sensors



You can connect over ten DS18B20 temperature sensors on a single one-wire bus.

5. Replacing EZO modules

If you ordered AquaHA with modules, then they will come pre-installed. You can always replace or add modules yourself later. If adding or using your own modules, set them to I2C mode **before** installation. Refer to the Atlas Scientific website for instructions.



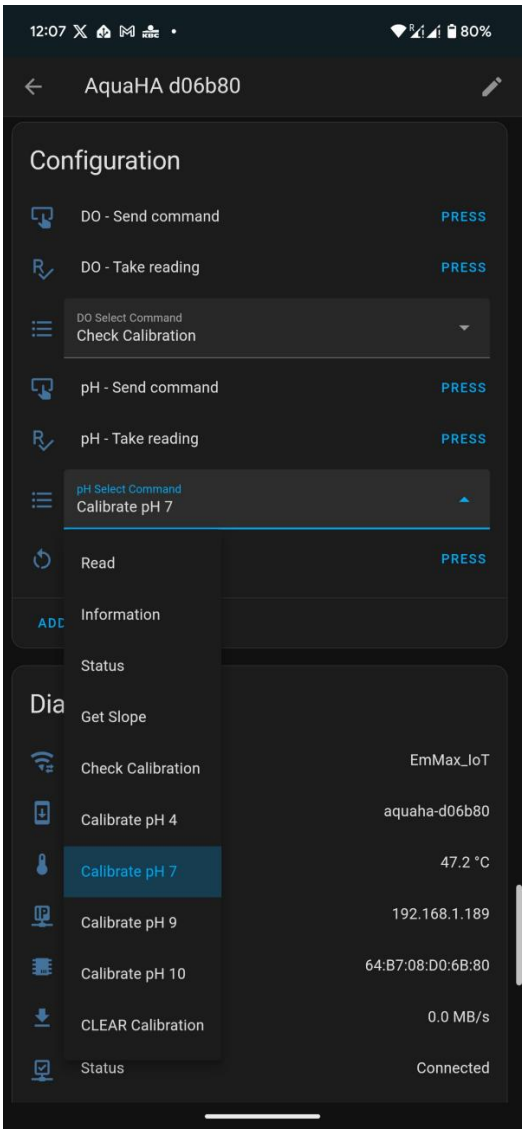
The image above shows the location of the EZO modules at the bottom left of the PCB, right above the BNC connectors. In most cases, the module on the right will be the red EZO-pH module. The module on the left can be one of EZO-EC, EZO-DO, or EZO-ORP.

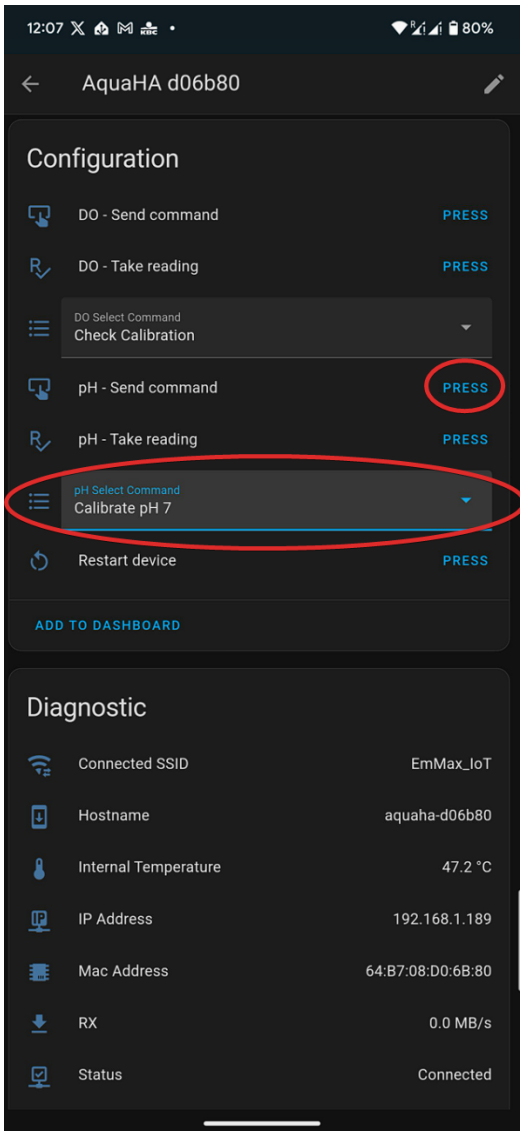
6. Calibration

For accurate results, each probe must be calibrated before use. Some probes need to be recalibrated every week, month or year. It all depends on the quality of the probe and the accuracy of the measurements that you require. Calibrating is very important and differs for each probe type. For most probes, calibration solutions can be used that are of a known value, like pH 4, 7, 9 for pH probes or 35ppt and 0ppt for salinity.

Calibration is done through Home Assistant, but you must follow the instructions that come with the Atlas Scientific modules and the specific probes you are using.

As an example, to calibrate your pH probe to a known pH7 solution, you would select “Calibrate pH 7” from the “pH Select Command” dropdown and then send the calibration command by pressing the “Press” button behind the “pH – Send command” line.



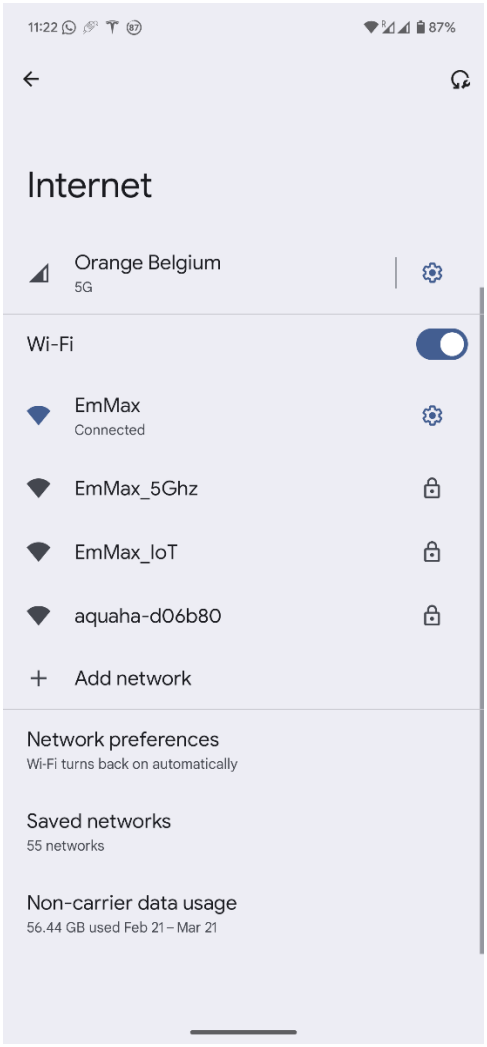


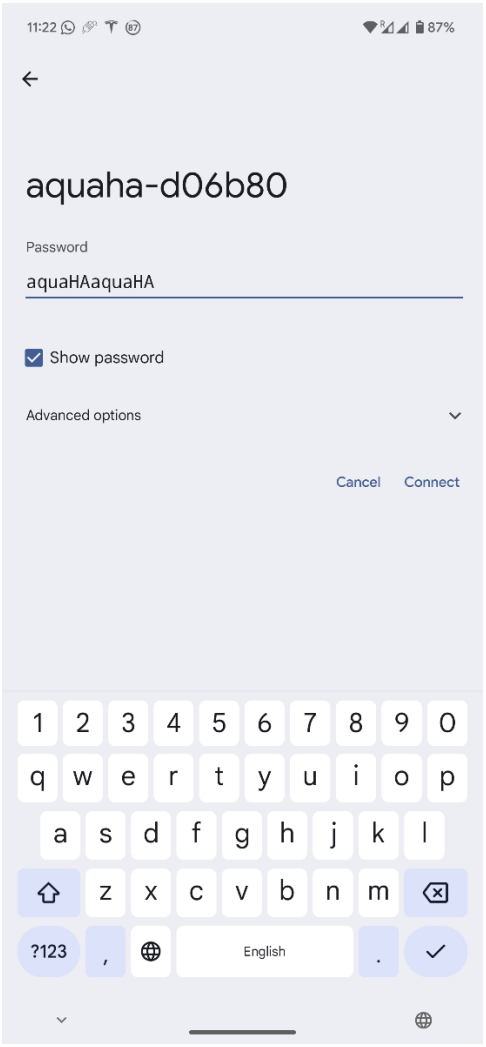
DO module:
Don’t forget to write ‘Output units (All)’ or you won’t get Oxygen Saturation readings

EC module:
Don’t forget to set ‘Output units (All)’ or you won’t get salinity readings

7. Connecting to Home Assistant

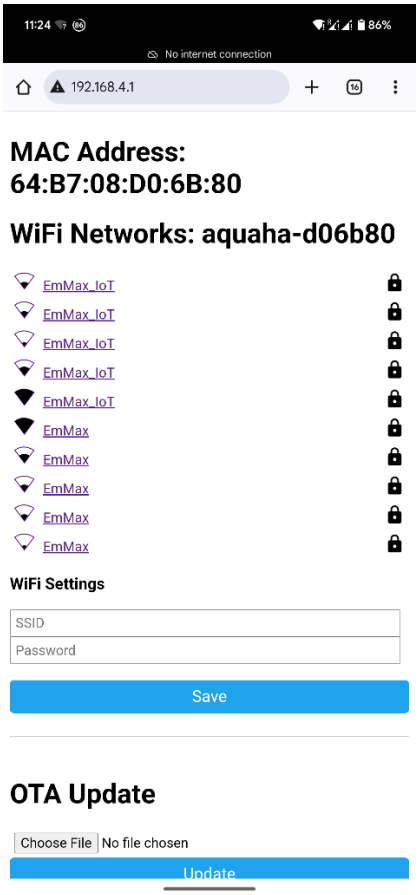
Plug in the 5VDC 2A power supply that came with the unit. After a minute you should be able to join the WiFi network it has created. It's best to use your phone for this part.

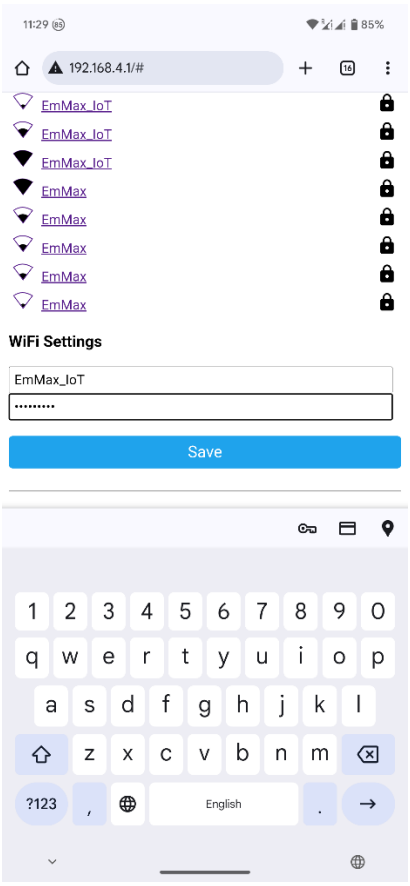




Enter the WiFi password. By default it is 'aquaHAaquaHA'.

In your browser, go to the address ‘http://192.168.4.1’. If this doesn’t work, I find it sometimes helps to switch off your 4G/5G data connection. Choose the WiFi network to connect to and enter its password. Click save to connect to it.

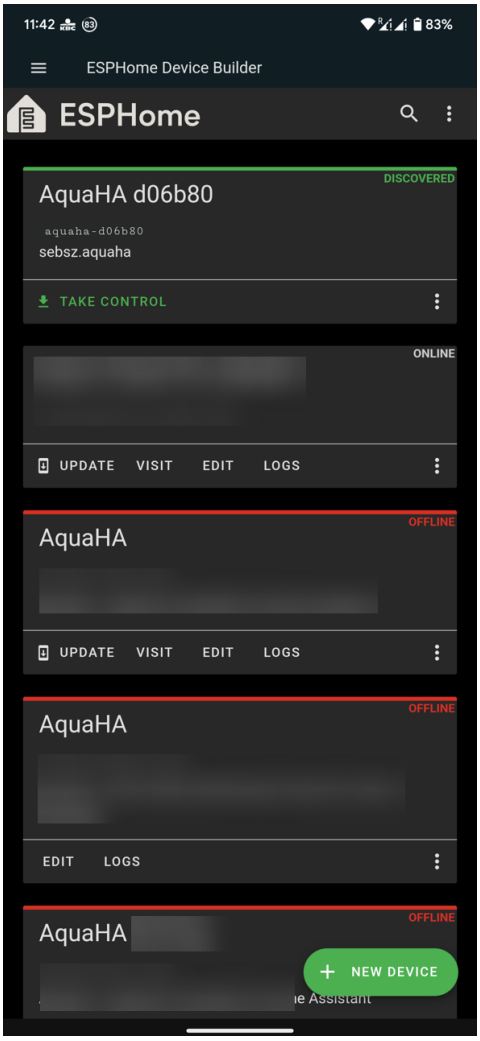


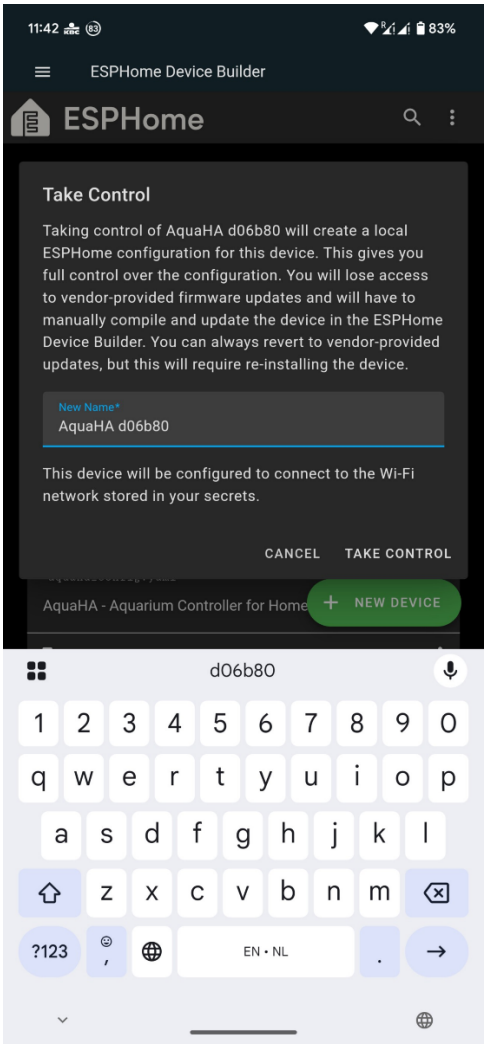


Now open the Home Assistant app on your phone or computer. Make sure you have ESPHome Device Builder installed (this is an official Add-On). Go to ESPHome Device Builder on the left-hand side of the screen.

If all has gone well, you should see a newly discovered device at the top. Click “Take Control” and feel free to give it a new name. Click “Take Control” again. Finally click “Install”. This will download our latest code from Github and compile it on your Home Assistant server. When that’s done, the compiled binary will be transmitted to your AquaHA device and installed.

When AquaHA is done and booted you should hear the start-up sound coming from the internal speaker!





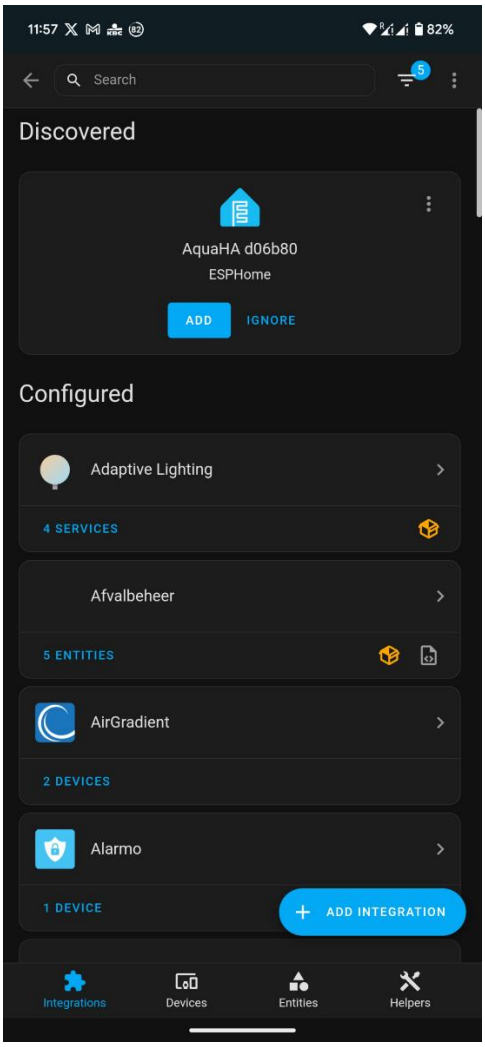
To correctly configure the device and internal temperature sensor you should modify the default yaml configuration of the device and add these lines in the substitutions block:

```
internal_temp_address: "0xFFFFFFFFFFFFFFFF"
external_temp_address: "0xFFFFFFFFFFFFFFFF"
hide_ph_module: "false"
hide_ec_module: "true"
hide_do_module: "false"
hide_orp_module: "true"
```

If you don't have any EZO modules, all four should be set to "true" (hidden). The PCB has an internal temperature sensor. The address for this sensor is written on the barcode attached to the bottom of the enclosure of your AquaHA device. It starts with "0x" as it is a hexadecimal address. By default, ESPHome does not discover this internal sensor due to a bug. That's why I have discovered the address and printed it on the barcode for you.

If you don't know the address of your external temperature sensor (attached to the terminal block) then that's okay. It will be listed in the logs and you can enter it later.
Click 'save' then 'install' then 'wirelessly' to compile and write changes to your device.

Now we're ready to add the device to Home Assistant! Go to your "Integrations" and notice in the screenshot below that Home Assistant has automatically discovered the AquaHA device. Click "Add" and then "Submit" to add the ESPHome node to Home Assistant.



Under "Devices" you should now be able to find the AquaHA device and see all the entities. Once you've calibrated your probes and gathered enough data you can start showing nice graphs in your Home Assistant dashboard!