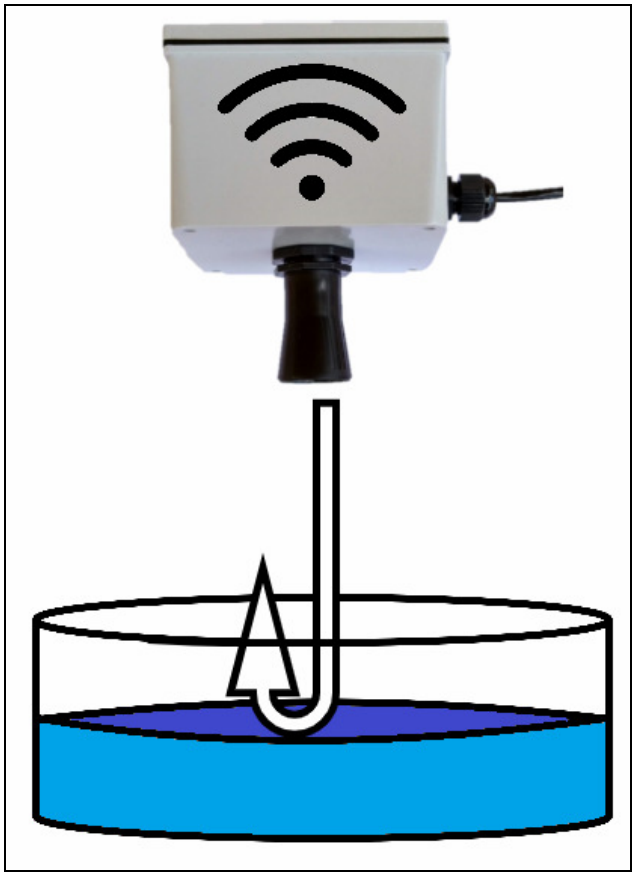
UBWH Australia

Tasmota-Plus
Smart Gauge - Range



SG-RANGE
User Guide

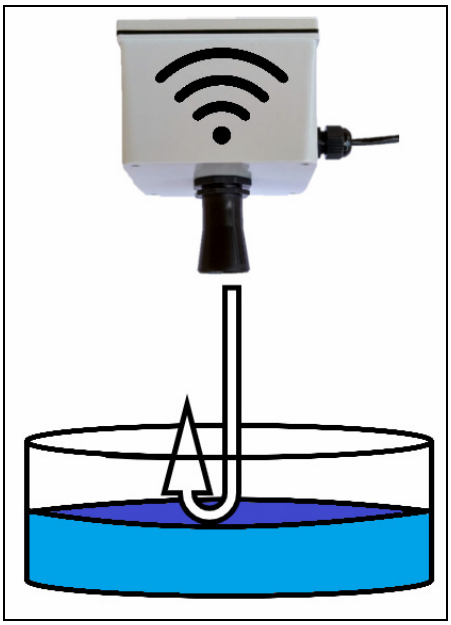
V20210420

Latest Version of this document available at:
https://github.com/UBWH/ubwh.github.io/blob/master/assets/UserGuides

Table of Contents

Introduction

The SG-RANGE is an Ultrasonic Range sensor with a smart WiFi interface.



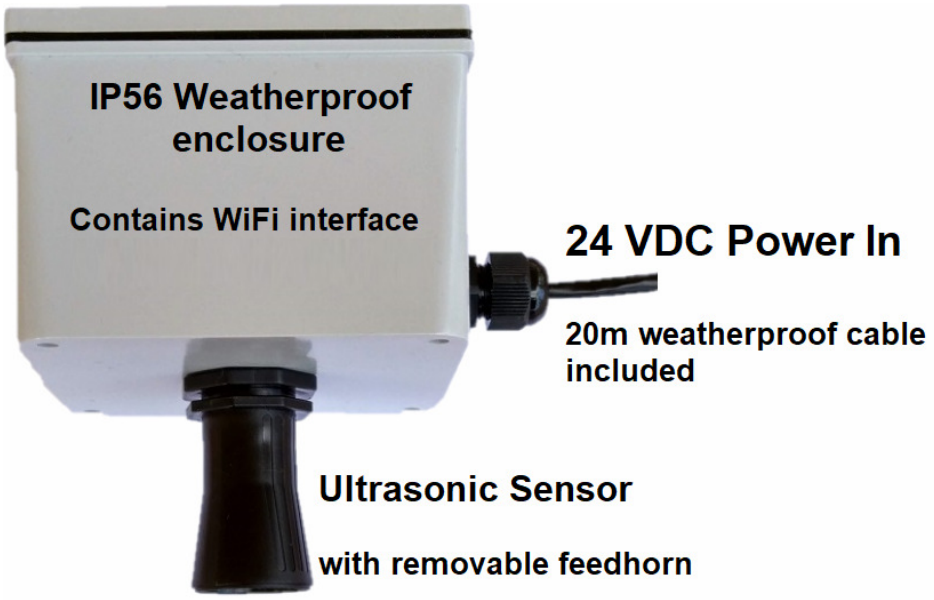
Features

Distance measuring	Distance is measured and presented in millimetres (mm). Real-time measurements can be viewed locally, or from anywhere in the world[1], accessible by any web browser. Distances can be measured in any direction to any flat surface that is perpendicular to the sensor axis.
Calculation	In many cases, the desired measurement is in some other units: for example litres of liquid in a tank. This product allows distance to be converted into some other value. Regular & irregular shaped containers are supported.
Data logging	When combined with an openHAB/MQTT[2] server, past measurements are accessible locally, or from anywhere in the world, accessible by any web browser.
Alarms/Actions	When combined with an openHAB/MQTT server, trigger points can be set to trigger events such as: • Send an alarm email • Turn a smart relay on/off • etc.
Low voltage DC power supply	This device is powered by 24 DC. (Power supply not included). No electrician required for installation.

Table 1 – Available Features

[1] Requires Internet firewall port forwarding
[2] https://openhab.org & https://mqtt.org

Hardware



The **SG-RANGE** comes pre-assembled and tested. It consists of:

- A weatherproof enclosure, housing the smart WiFi interface.
- An ultrasonic sensor. The removable feedhorn makes it easy to mount this device in the lid/cover of a tank, or on a suitable bracket.
- A 20m outdoor cable, for the 24 VDC supply.

Requirements

The SG-RANGE requires:

- **Initial Setup**
  - A device with a Web Browser & WiFi interface, located close to the SG-RANGE. A smart-phone, or tablet will usually be sufficient.
- **Operation**
  - A WiFi Access Point (AP) connected to the local LAN[3], within the WiFi Range[4] of the SG-RANGE.
  - A DHCP[5] server on the LAN.
- **Ongoing Management**
  - Any device with a Web browser and connected to the same LAN as the SG-RANGE.

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[3] Local Area Network. See https://en.wikipedia.org/wiki/Local_area_network
[4] See Specifications, page 22
[5] Dynamic Host Configuration Protocol: See https://en.wikipedia.org/wiki/Dynamic_Host_Configuration_Protocol

Web Browser Interface

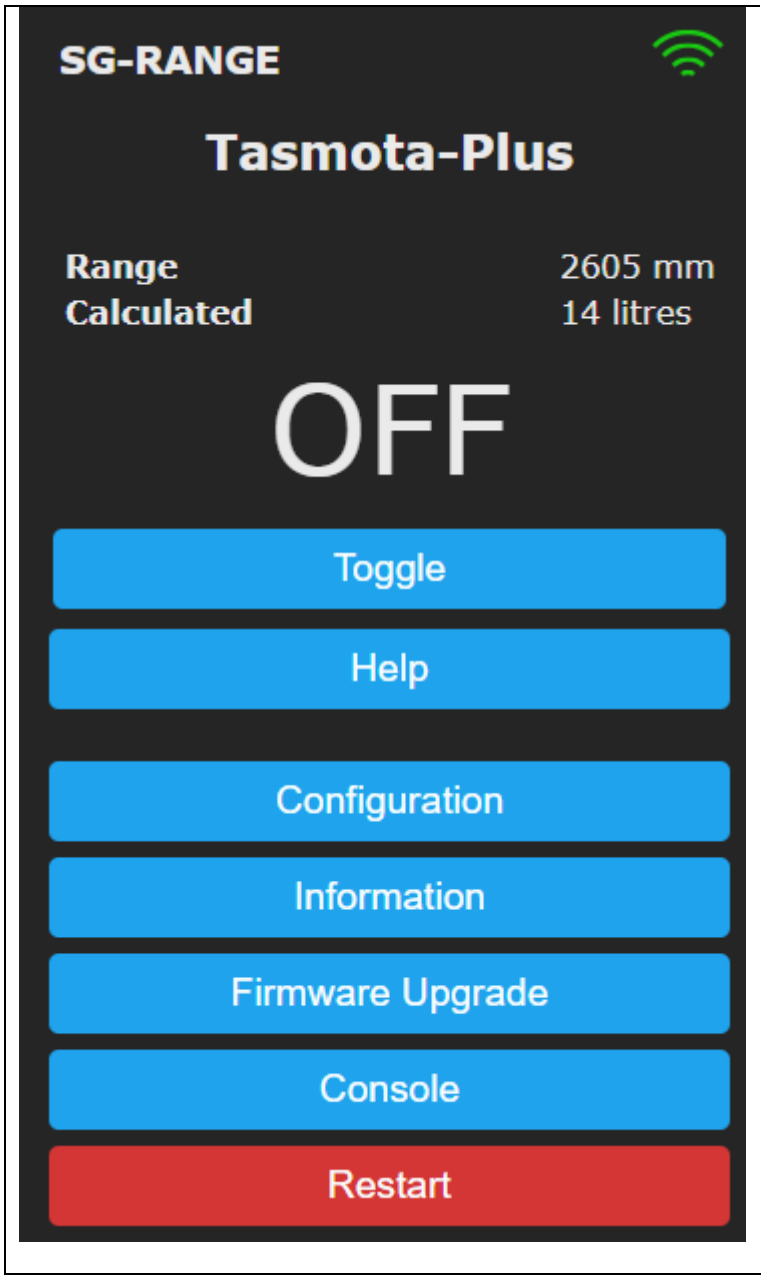


Figure 1 - The Tasmota Web Interface is available from any Web browser

Simply use any web browser to open the web page
`http://<device.ip.address>/`

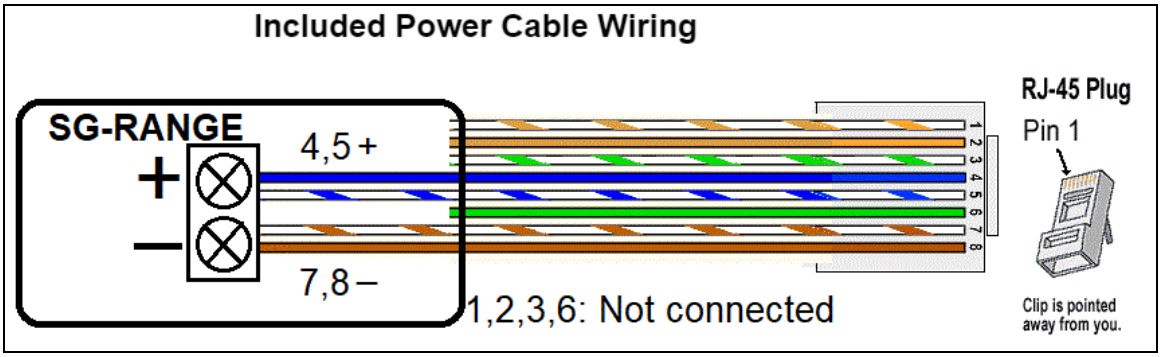
See documentation here: `https://tasmota.github.io/docs/WebUI/`

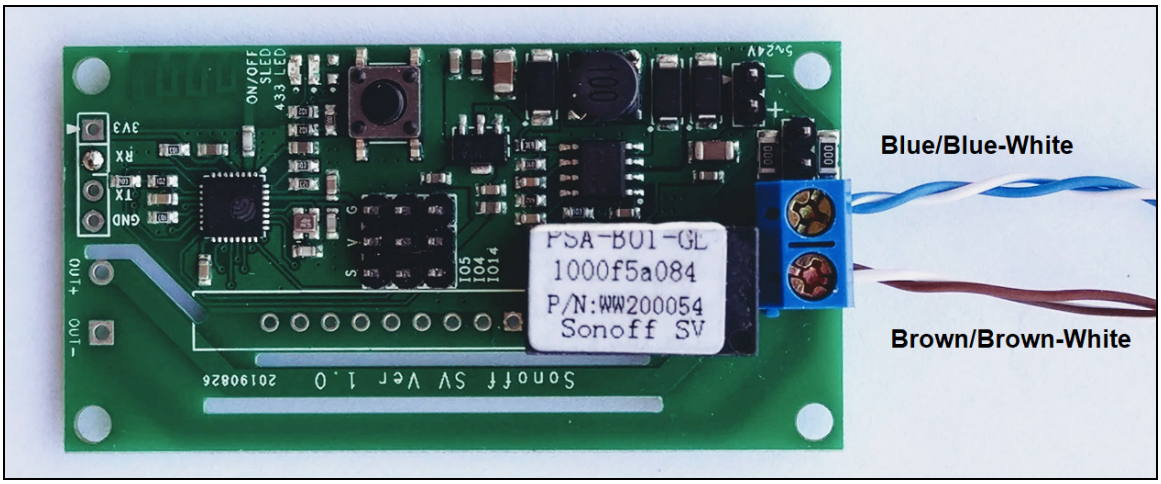
Power

The SG-RANGE is powered by 24 VDC. The power supply is not included.

A 20 meter weatherproof cable is included. One end is terminated inside the enclosure. The other end has a standard RJ45 'LAN' connector, making it easy to power this product from widely available 24 V PoE[6] injectors.

The included power cable is wired as below:

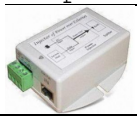




Conductor	Colour	Usage
1	Orange/White	Not used
2	Orange	Not used
3	Green/White	Not used
4	**Blue**	**+24 VDC**
5	**Blue/White**	**+24 VDC**
6	Green	Not used
7	**Brown/White**	**0 VDC**
8	**Brown**	**0 VDC**

[6] Power over Ethernet

Suitable 24 VDC Power supplies

Power Source	Product Name	Product Link
Main AC	POE-Injector, 24V, 0.5A	https://ubwh.com.au/POE-24-12W 
Unregulated DC	POE 9-36 DC to 24V DC	https://ubwh.com.au/POE-DC-24-19W 
Solar	24-48V Solar UPS PoE Switch	https://ubwh.com.au/WI-PS306GF-UPS-V2 

Mounting

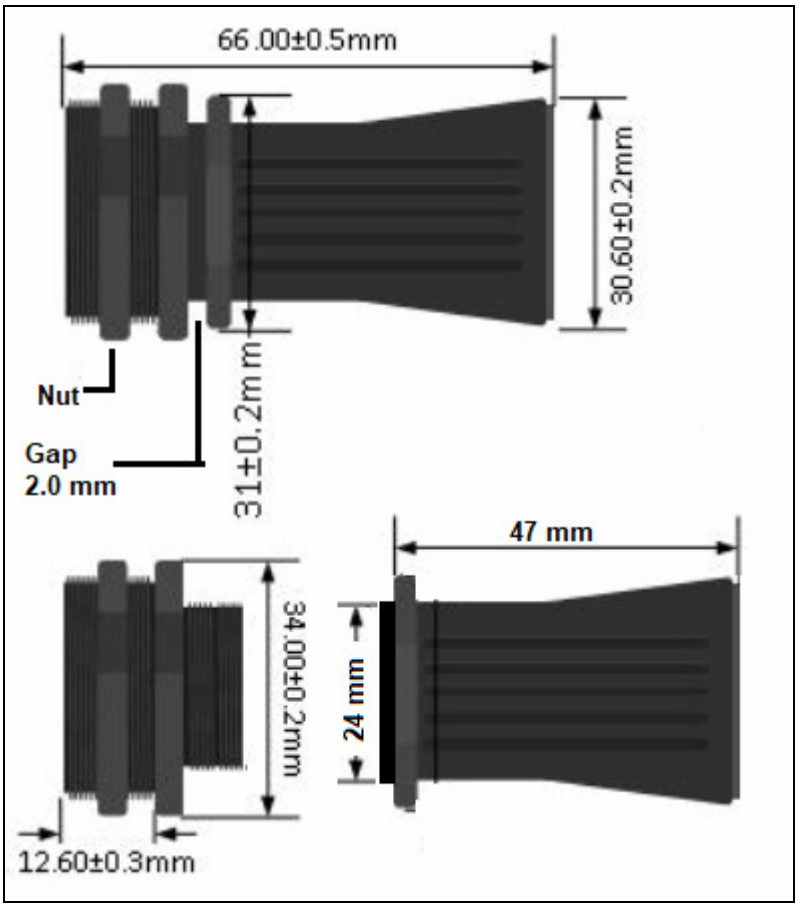


Figure 2 – Sensor Dimensions

The sensor is comprised of 2 parts:

- The sensor body, which is permanently mounted in the SG-RANGE enclosure.
- The Feed horn, which unscrews.

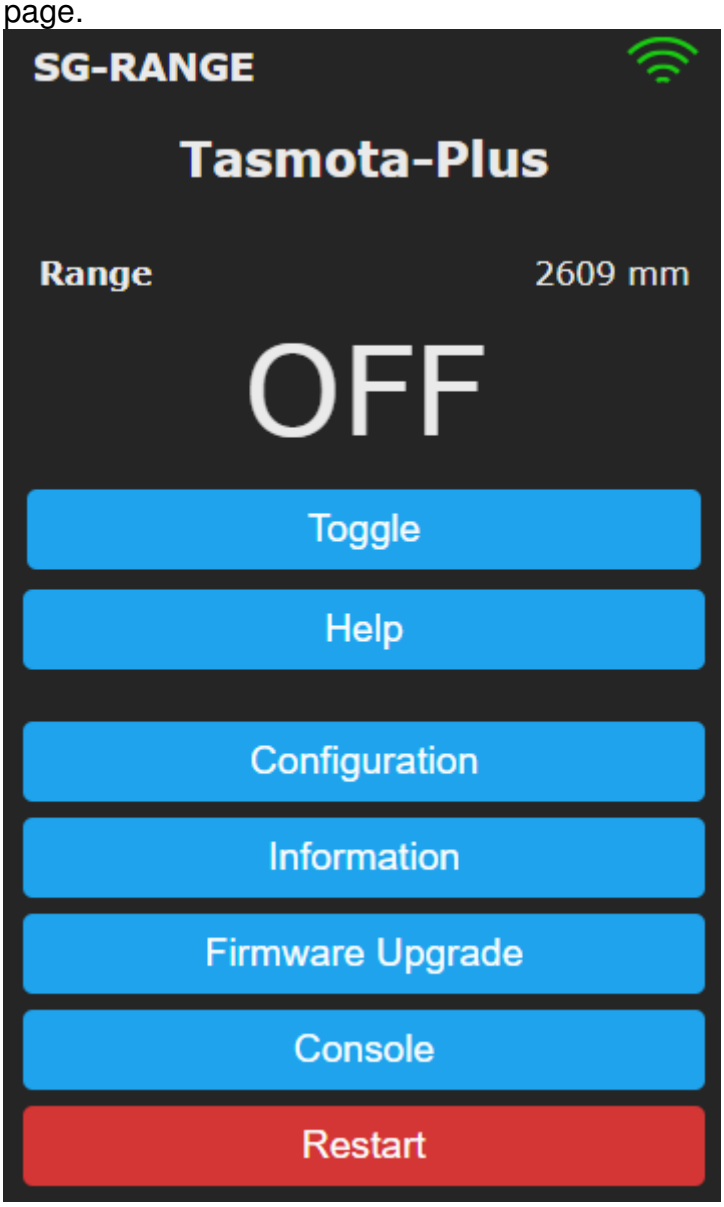
To mount the SG-RANGE

- Drill a 24 mm hole in a mounting plate (e.g. water tank lid)
- Remove Feedhorn
- Insert sensor body into hole
- Screw on feedhorn

Note that the sensor has a *Blind Zone* of 250 mm. (See Specifications). All ultrasonic sensors work on measuring the time of an echo. For that reason they can not measure very short distances. The SG-RANGE can not measure less than 250 mm. For echo distances between zero and 250 mm, the reported value will always be “250 mm”

Getting Started

1. Power the SG-RANGE.
2. Follow the instructions in the ***SS-1CHPro User Guide***[7] until you see this page.



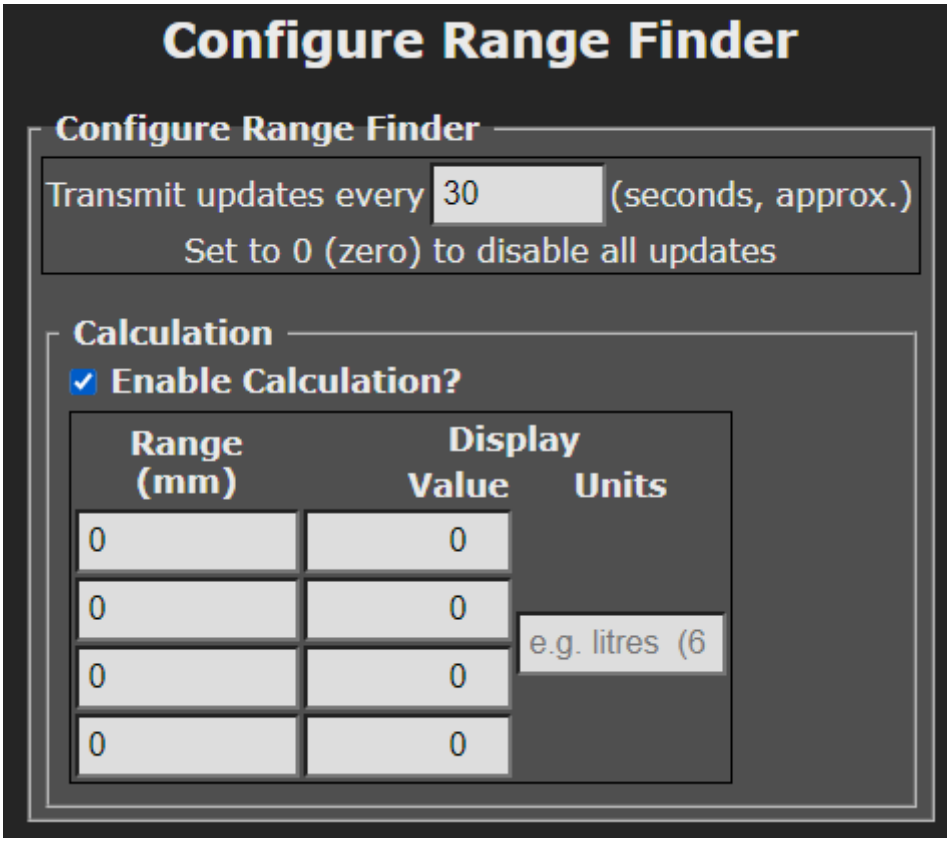
Note: The Range value will read zero for the first 30 seconds after power up.

[7] https://tinyurl.com/28nybtzx

Configuration Settings

The SG-RANGE has these special Configuration settings:

1. Update interval
2. Calculations



Update Interval

The sensor makes about 6 measurements per second, but not all measurements are used to update the display.

The update interval sets the number of seconds between updates of:

- The Dashboard page, and
- MQTT[8] telemetry messages (if enabled)

Setting the update interval to zero disables all updates. The maximum allowed interval is 255 seconds. The default interval is 30 seconds.

[8] https://mqtt.org

Calculation

Calculations are a convenient way to convert the raw distance measurements (mm) to a more meaningful value if using this device to measure (e.g.) water tank volume.

Regular Shapes

To demonstrate this feature, consider the example water tank shown below.

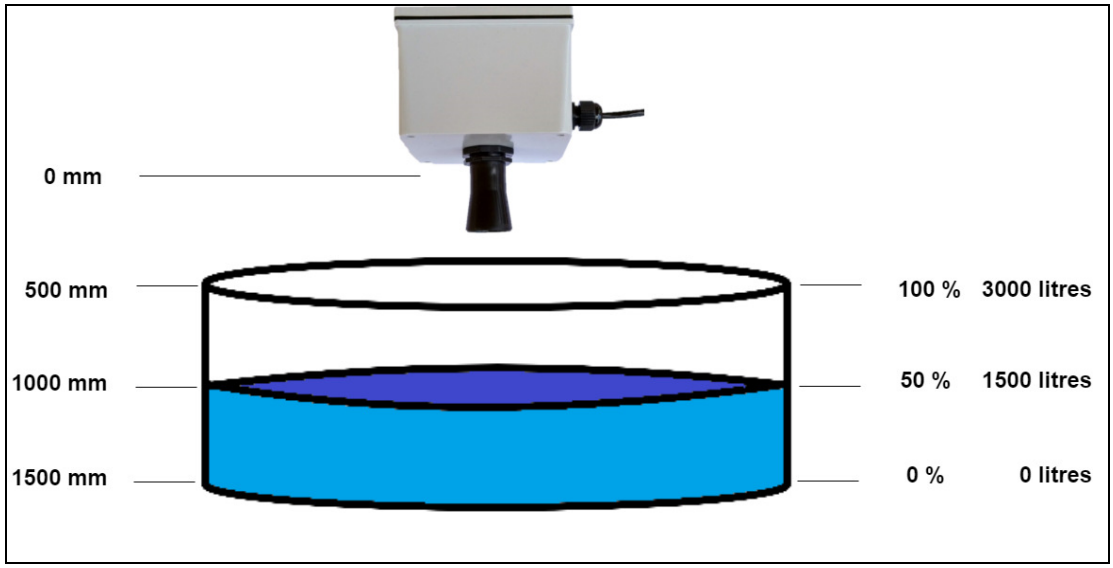
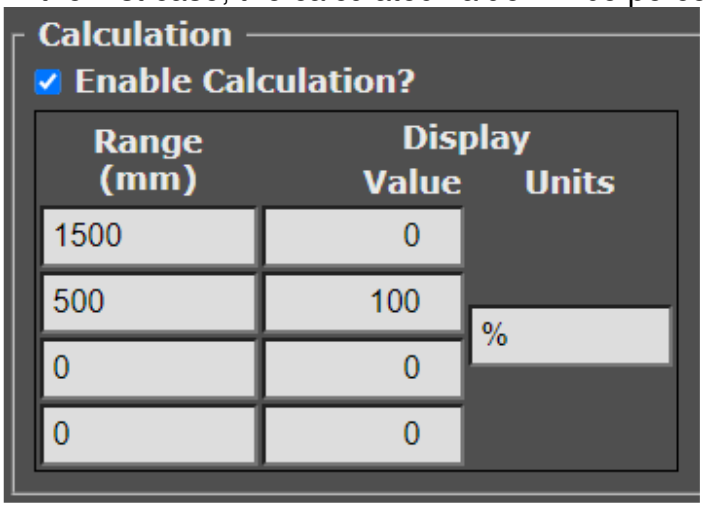
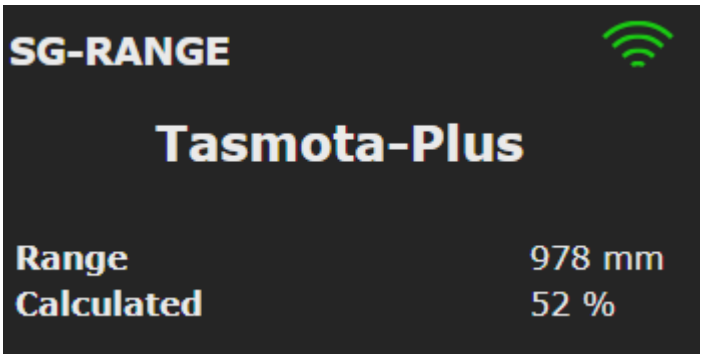


Figure 3 - Example Water Tank - Regular shape

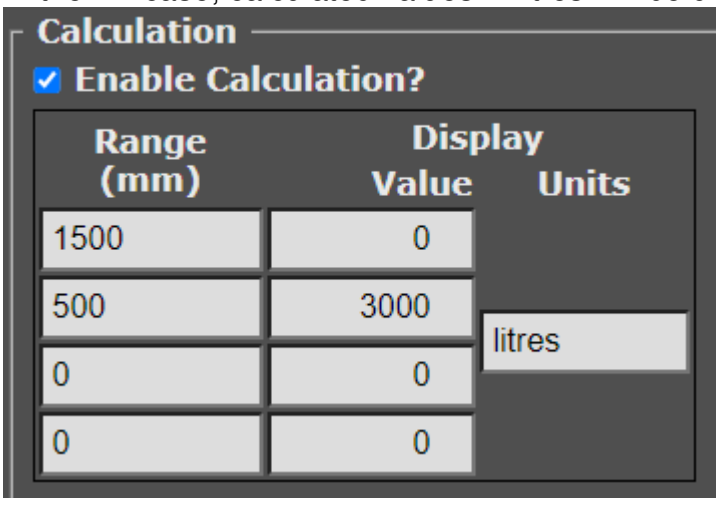
Because this is a ***Regular*** shaped tank (straight sides), only 2 calibration pairs need to be entered.

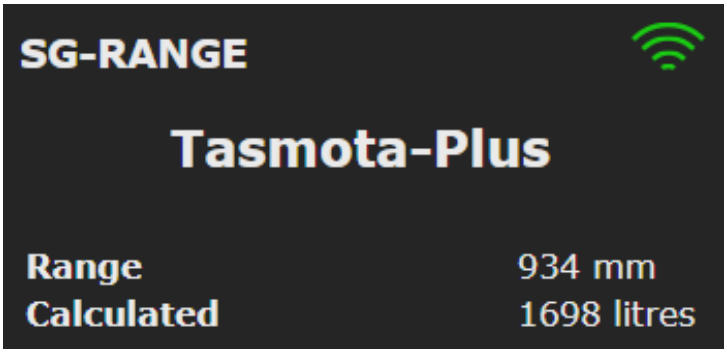
In the first case, the calculated value will be percent (%).





In the 2nd case, calculated values in litres will be displayed.





Irregular Shapes

Consider the case of an **Irregular** shaped water tank. In this case we can enter up to 4 calibration pairs to approximate the volume of water in the tank.

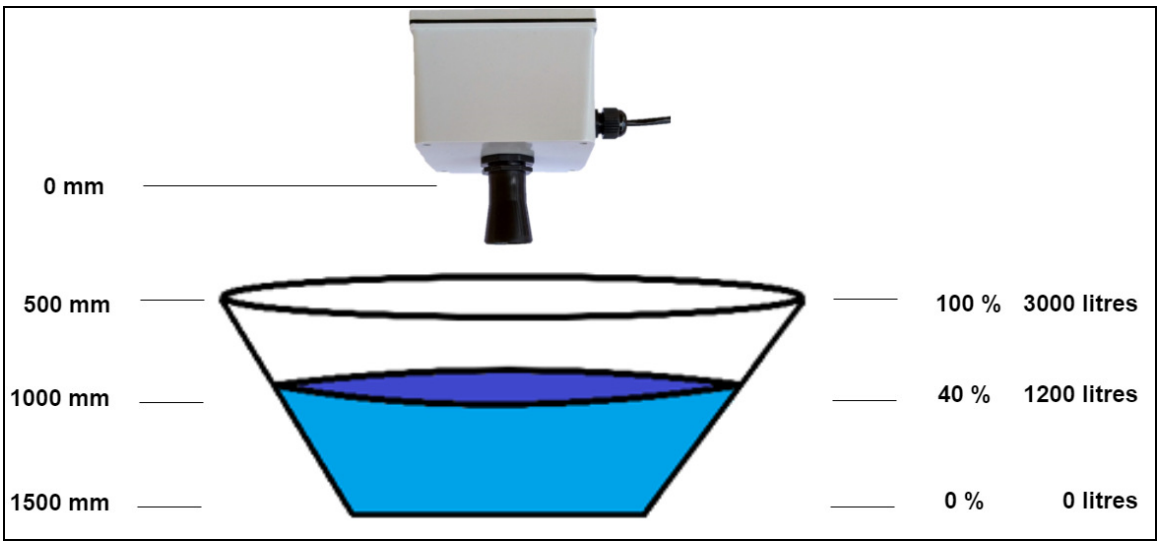
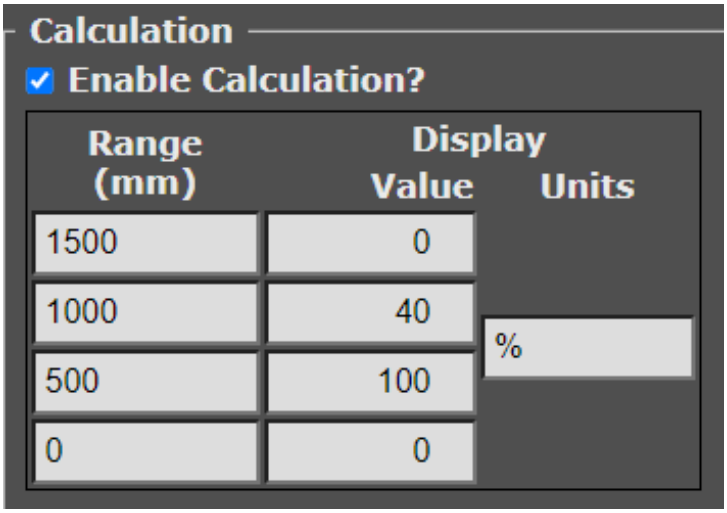
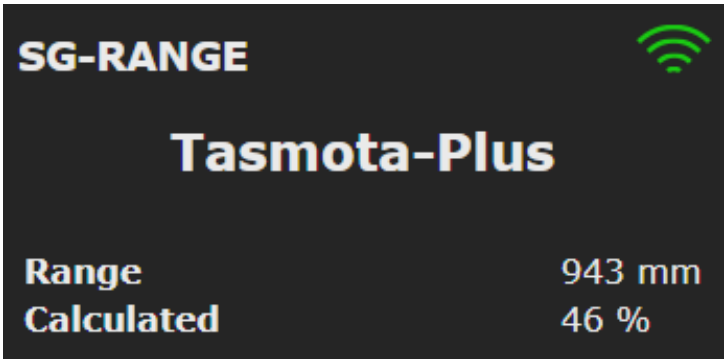


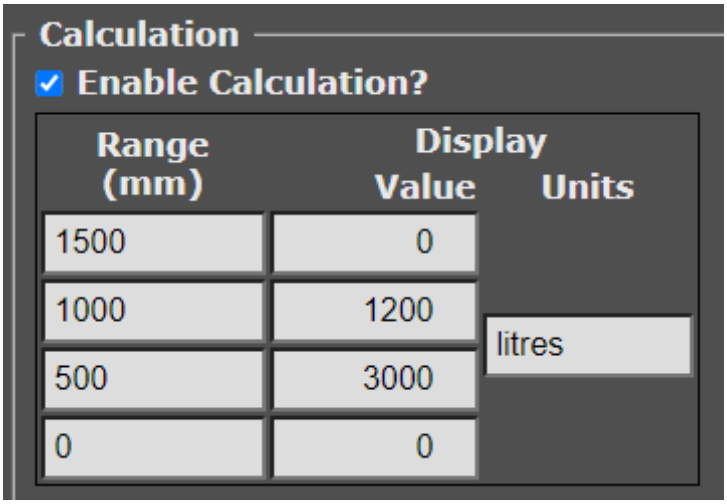
Figure 4 - Example Water Tank - Irregular shape

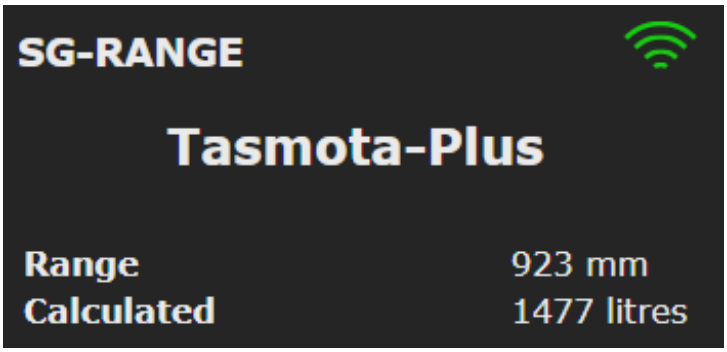
Displaying calculated Percentage.





Displaying calculated litres.



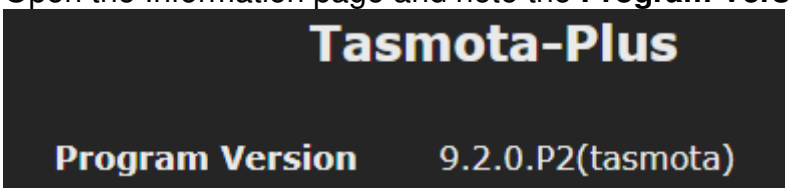


Firmware

From time to time, new Tasmota-Plus firmware may be released for your device.

Checking the installed version

Open the Information page and note the **Program Version** currently installed.

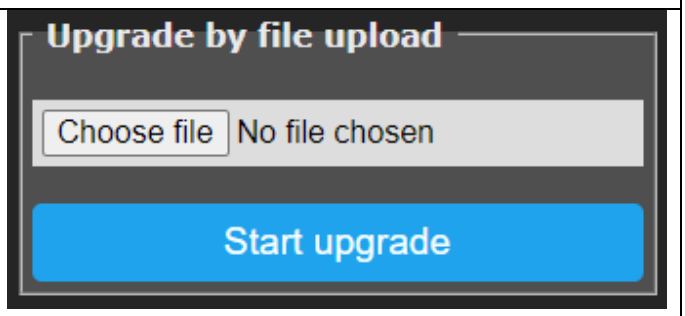


Checking the latest released version

Use your web browser to visit:
http://ubwh.com.au/tasmota/Tasmota-Plus/SG-RANGE-ReleaseNotes.php

Updating

If you choose to update the firmware to the latest version, there are two methods.

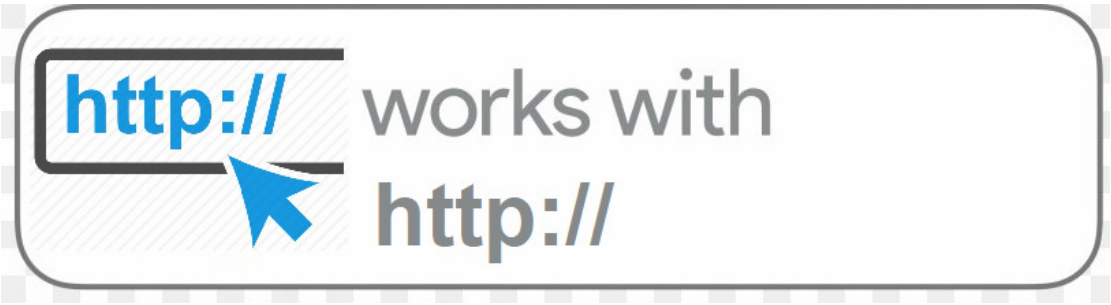
Over The Air (OTA) This is the simplest. Open the Firmware Upgrade page. Enter this OTA Url: http://ubwh.com.au/tasmota/Tasmota-Plus/tasmota-SG-RANGE.bin.gz Click **Start upgrade**	
File Upload With a web browser on your local PC, visit http://ubwh.com.au/tasmota/Tasmota-Plus/tasmota-SG-RANGE.bin.gz Save the file on your local computer. Open the Firmware Upgrade page. Choose the file just downloaded. Click **Start upgrade**	

Factory Reset Procedure

See the ***SS-1CHPro User Guide***[9]

[9] https://tinyurl.com/28nybtzx

http:// Command Interface



Simple commands as below will return the distance, and calculated values

Note: %20 in a URL = Space character

From Web Browser

```
http://<device.ip.address>/cm?cmnd=status%208
```

From Windows or Linux command/terminal window

```
curl http://<device.ip.address>/cm?cmnd=status%208
```

From a Windows Batch file (*.bat file)

```
curl http://<device.ip.address>/cm?cmnd=status%%208
```

Note: need double **%** characters in a batch file

From a PHP script (*.php file)

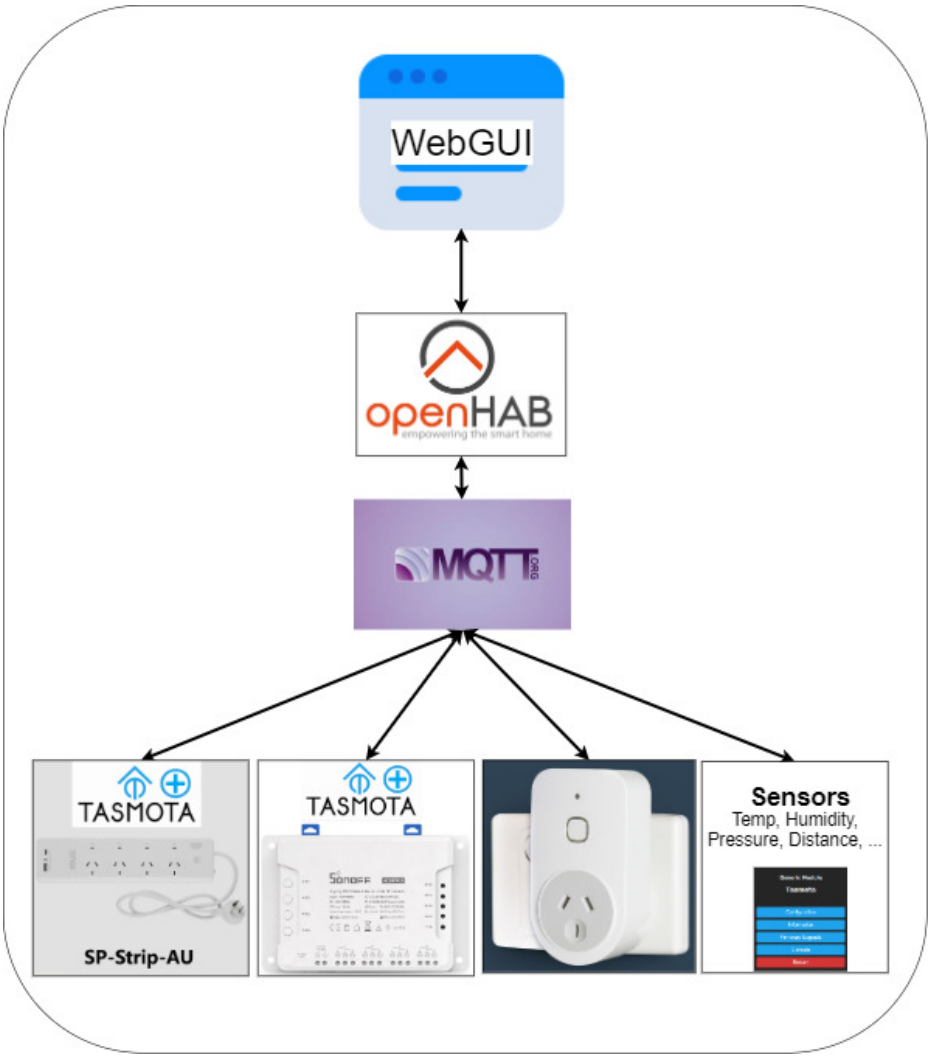
```
file_get_contents(
 'http://<device.ip.address>/cm?cmnd=status%208');
```

A typical JSON response looks like:

```
{"StatusSNS":{
    "Time":"2021-04-20T07:01:41",
    "mm":942,
    "computed":46,
    "units":"%"
  }
 }
```

More information:
https://tasmota.github.io/docs/Commands/#management

Centralised Monitoring & Control



While this device can operate 100% stand-alone, it can also be monitored and controlled, along with multiple other devices, from a single management platform.

One popular management platform is **openHAB**[10].

In simple terms:

- MQTT compatible devices (e.g. Tasmota) connect to an **MQTT** Broker[11] .
  Status information sent TO the MQTT broker.
  Commands received FROM the MQTT broker.

- **openHAB** also connects to the MQTT broker.
  Status information received FROM the MQTT broker.
  Commands sent TO the MQTT broker.

- Users interact via web pages (WebGUI)

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[10] https://www.openhab.org/ (Freeware, Open source)
[11] https://mqtt.org/ (Freeware, Open source)

WebGUI Interfaces

openHAB supports a number of User Interfaces (UIs). Each UI is highly customisable.

The images below show example visualisations.

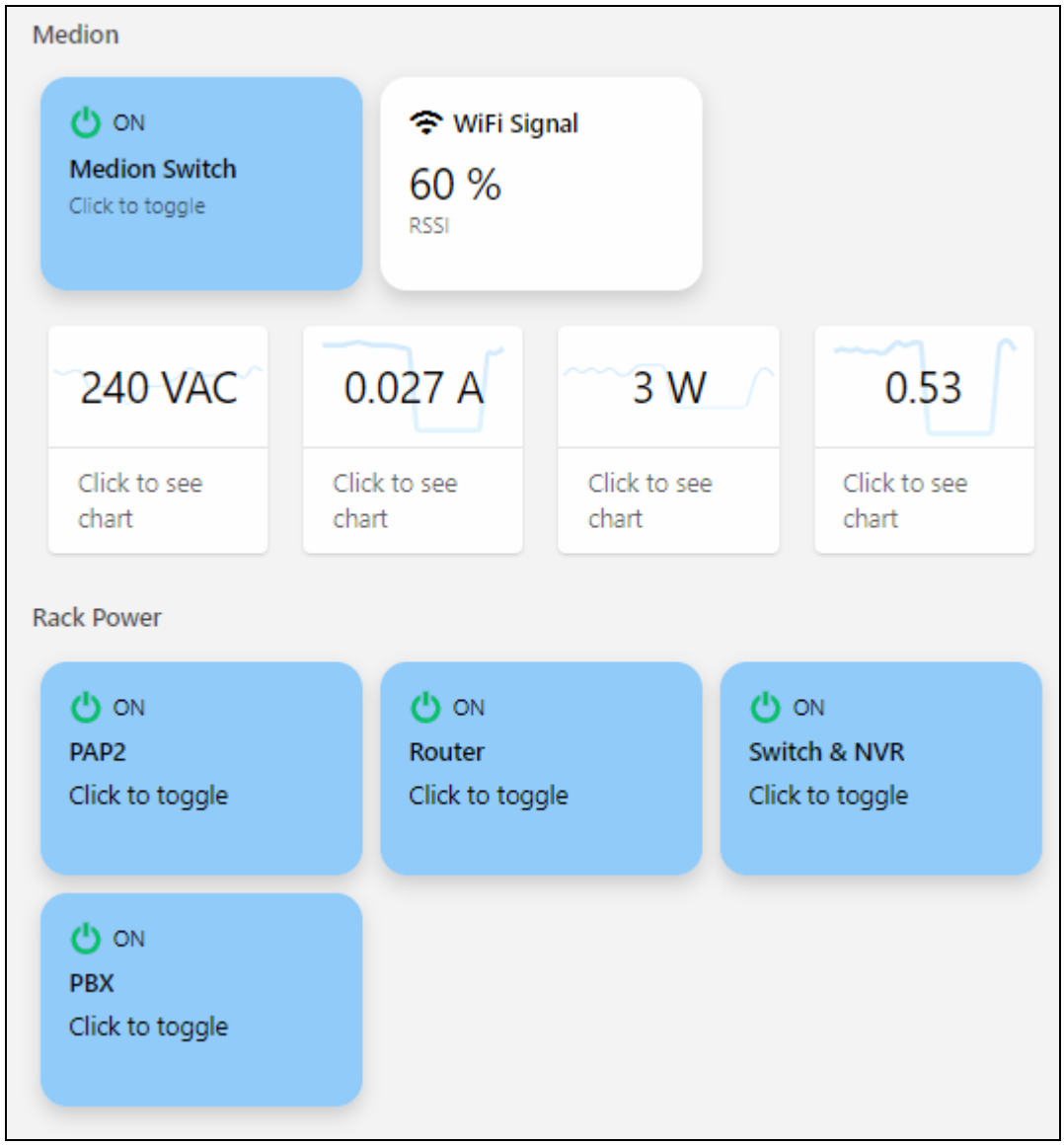

Figure 5 - Classic UI. Mobile friendly.

Figure 6 - Basic UI. Mobile friendly.

Figure 7 - Panel UI. Ideal for touch screens.

openHAB Channel Definition (Example)

Below is shown the channel definition for an SG-RANGE correctly integrated into openHAB.

Values that will be different for each installation have been replaced with XXXXXX.

```
UID: mqtt:topic:xxxxxxxx
label: SG-RANGE
thingTypeUID: mqtt:topic
configuration:
  payloadNotAvailable: Offline
  availabilityTopic: tele/tasmota_xxxxxx/LWT
  payloadAvailable: Online
bridgeUID: mqtt:broker:xxxxxxxx
channels:
  - id: Range
    channelTypeUID: mqtt:number
    label: Range
    description: ""
    configuration:
      stateTopic: tele/tasmota_xxxxxx/SENSOR
      transformationPattern: JSONPATH:$.mm
      unit: mm
  - id: Litres
    channelTypeUID: mqtt:number
    label: Litres
    description: ""
    configuration:
      stateTopic: tele/tasmota_xxxxxx/SENSOR
      transformationPattern: JSONPATH:$.computed
```

openHAB Sample History Plot

The plot below shows an example history from an SG-RANGE sensor mounted above a water tank.

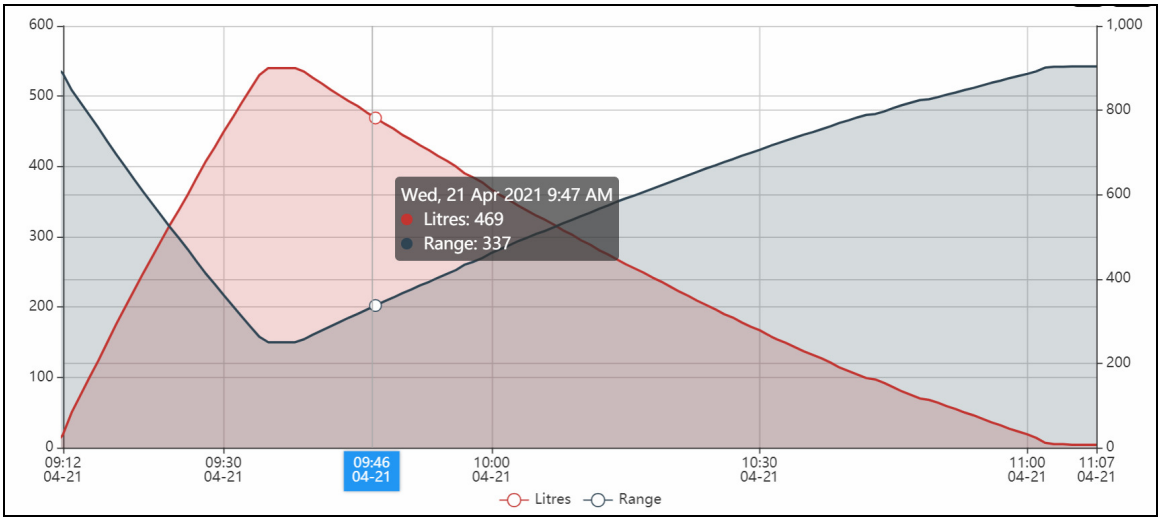

Figure 8 - Water tank: filling and emptying

Left axis: Blue line. Range (mm). Note the blind zone limits measurements to 250mm.

Right axis: Red line. Computed (litres) value.

Specifications

Sensor	Type:	A01NYUB
	Blind zone:	0 to 250 mm
	Operating range	250 to 6000 mm
	Resolution	1 mm
	Operating temperature	-15 to +60 °C
	Storage temperature	-25 to +80 °C
	IP Rating[12]	IP67 (Dust-tight, Immersion up to 1 meter)
Enclosure	Material	PVC
	Dimensions	108 x 108 x 76 mm (W x L x H)
	Weight	410 g (including sensor)
	IP rating	IP56 (Protected from: Dust & Powerful water jets)
Cable	Length	20 m
	Weatherproof	Yes
	Termination 1	Bare wires, installed in enclosure
	Termination 2	RJ45 (i.e. LAN plug)
Power supply (not included)	DC Only	24 V DC (regulated)
	Power consumption	400 mW (max.)
WiFi	Standards	802.11b/g/n 2.4 GHz
	Range	20 m (Typical, no walls) 10 m (Typical, walls)

[12] https://en.wikipedia.org/wiki/IP_Code