ATLAS 2

IRRIGATION CONTROLLER WITH A SELF-SUFFICIENT SOLAR CELL

USER MANUAL

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DEVICE MANUAL

1. Description

ATLAS is an **irrigation controller** with a **self-contained solar cell** that includes two outputs for valves and two for pulse counters[1]. LTE technology enables the devices to communicate without the need for an additional connectivity deployment. From SPHERAG platform you can **control, manage and record irrigation**. The platform includes a tool that provides daily, monthly, and annual irrigation reports.

2. Specifications

Connectivity	LTE
Maximum voltage	4,2V
Minimum voltage	3,4V
Design voltage	3,7V
Rated current	5 mA
Battery capacity	5000mAh
Solar cell voltage	4V
Solar cell current	100 mA
Output voltage	14V (Solenoid latch)
Output pulse time	100 ms
Batteries technology	LiPo
Weight and dimensions	250 gr (1/2St) – 100 x 100 mm
Protection code	IP65 (Dust and water splash protection)
Infrastructure	No
Power	Self-contained power
Output control	In real time (it depends on power mode and the associated state)
Scheduling mode	Yes
Output number	1
Flux meter	1
Work temperature	ABS -20º C a 55 ºC

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[1] Based on subscription, the device can have just one output enabled for valve and counter.

3. Events

Events occurring in ATLAS trigger a recording and update of the following parameters: water meter, battery level and signal.

The events are listed below:

1. Opening/Closing both manual and automatic.
2. Solenoid synchronization.
3. Communication test
4. State transition from "Sleep" to "Awake" and vice versa
5. Power mode settings

4. Water meter

ATLAS includes two outputs for the reading of pulse counters of different manufacturers. The unit of measurement [m^3 ó L] or the value of each pulse [1, 10, 100] can be defined in the platform. The current value of your counter can also be set in the platform.

The counter registers usually update hourly[2] and after any event is triggered. These values are shown as bar charts in the platform in the "Counter" section within the selected date range. By default, data of the last three days is displayed.

Types of graphs
Total consumption

It is a bar chart that shows the total consumption [m^3] of the associated counter.

Temporary consumption

It is a bar chart that shows the volumetric consumption [m^3] produced within a couple of consecutive records. For example:

	Total consumption	Temporary consumption
Monday, April 5th, 2021 10:30 am	0 m^3	0 m^3
Monday, April 5th, 2021 10:30 am	10 m^3	10 m^3
Monday, April 5th, 2021 10:30 am	20 m^3	10 m^3
Monday, April 5th, 2021 10:30 am	25 m^3	5 m^3

Also, a .csv and .xls file can be downloaded of both types of records in the date range that you have selected.

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[2] it depends on the power mode and the associated state. See sections 5 and 6.

5. Device states

The device can be identified in 5 different states. Through the LED at the bottom, it is possible to identify its current state. While, from the platform, it can also be identified the "Awake" and "Sleep" states. The rest of the states will be displayed as "No communication".

The states are detailed below:

- ➢ **AWAKE:** LED shines 2 times every 6 seconds.
    - o <u>Receives and runs</u> **commands** (ON/OFF)**, power modes** (ECO, PSM, RT) and **programs** in real time.
    - o <u>It registers</u> information on the water meter hourly and after each event. In addition, the history of opening and closing orders executed either manually from the platform or by saved program(s) is saved in the platform's "Log".
    - o <u>It sends</u> the following numeric values hourly to the platform: water meter [m^3], battery level and signal [%]. An update of these values in real time can also be obtained by a communication test that can be performed from the platform.

- ➢ **SLEEP**: LED shines 3 times every 15 seconds.
    - o <u>It receives</u> **power modes updates** (ECO, PSM, RT) and deferred **programs**. The orders are saved in the cloud until the device switches to the "Awake" state. Then they are uploaded to the device. The transition from "Sleep" to "Awake" state depends on the power mode the device is in (see Power Modes).
    - o <u>It runs</u> **programs** that have been loaded when it was in the "Awake" state.
    - o <u>It registers</u> data from the counter in the internal memory of the device. The last saved value will be uploaded to the platform when the device switches to the "Awake" state. It does not register in the "Log" of the platform the opening and closing orders that are executed by programs stored in the device.

- ➢ **CONNECTING:** LED shines once each second. In section "No communication".

    In case of failed connection, the device restarts automatically (LED off for 15 seconds) and it flashes again once every second. In **PSM** mode it will try 5 times, and if it still does not connect, it will switch to "Sleep" state.
    - o Its <u>reception</u>, <u>execution</u> and <u>logging</u> behavior is identical to the "Sleep" state.

- **CRITICAL BATTERY:** LED shines twice each 15 seconds. In section "No communication".
  - o It occurs when the battery level is below 5 %.
  - o The behavior of the device is identical to the "Sleep" state, but the correct opening/closing operation of the solenoid is not assured because the power supply of the device is low.

- **DISABLED**: LED does not shine. In section "No communication".
  - o It occurs when the battery level is empty, 0 %, or if the device is damaged.
  - o The device receives deferred instructions, but it does not run programs or record data. The commands are stored in the cloud until the device switches to the "Awake" state.

6. Power modes

Then we will detail power modes in which and ATLAS can be set. When we refer to a specific time or time zone, it will apply to the time zone that you have chosen when creating the farm (e.g. Spain time zone (GMT+1)).

Transitions from "Asleep" to "Awake" state will be performed only if the device is in an area with proper LTE signal.

NOTE: If the battery level drops below 5 %, the device enters the PSM mode automatically, and it will not return to the power mode it was programmed until it reaches 15 %. A small hysteresis is programmed to prevent accelerated battery operating life drain.

1. PSM (Power Save Mode)

Normally, the device is in the "Sleep" state. It switches to the "Awake" state temporary, twice a day (see Figure 1) in order to load the new commands and then go back to the "Sleep" state. To avoid saturating the LTE cells, transitions are performed randomly within the time slots indicated in Figure 1.

In this mode, the device is able to perform up to 2 registrations (water meter, battery and signal) per day and update the schedule twice a day.
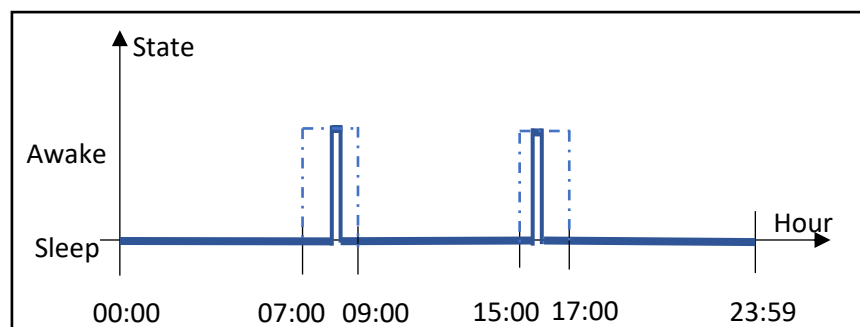
Figure 1 States switching in the PSM mode.

2. ECO

The transition to the "Awake" state is performed randomly within the time slot from 05:00 am – 07:00 am (see Figure 2) and it remains "Awake" until 10:00 pm.

When it wakes up, it will launch a first publication of data in the platform. Then it will send time information until 09:30 pm.
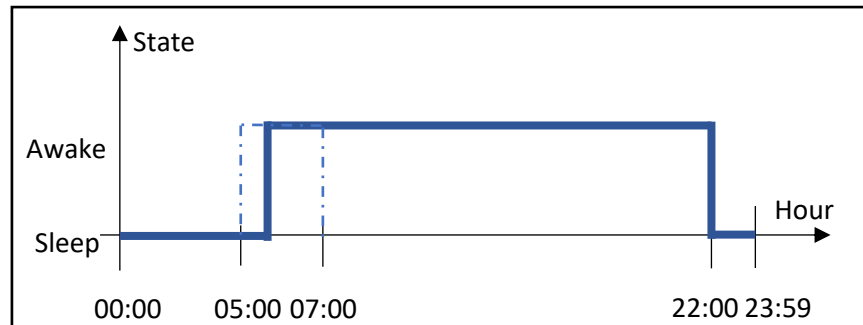

Figure 2 States switching in the ECO mode

Important: if the device is open and it enters in the "Sleep" state at 10: 00 pm, it will not close until the device enters in the "Awake" state.

3. Real Time

The device is in the "Awake" state 24 hours a day (see Figure 3).

Figure 3 States switching in the Real Time mode

A flow chart is attached (see Figure 4) for a better understanding of the power modes and device states. NOTE: this flow chart is available only when the battery level is higher than 15 %.
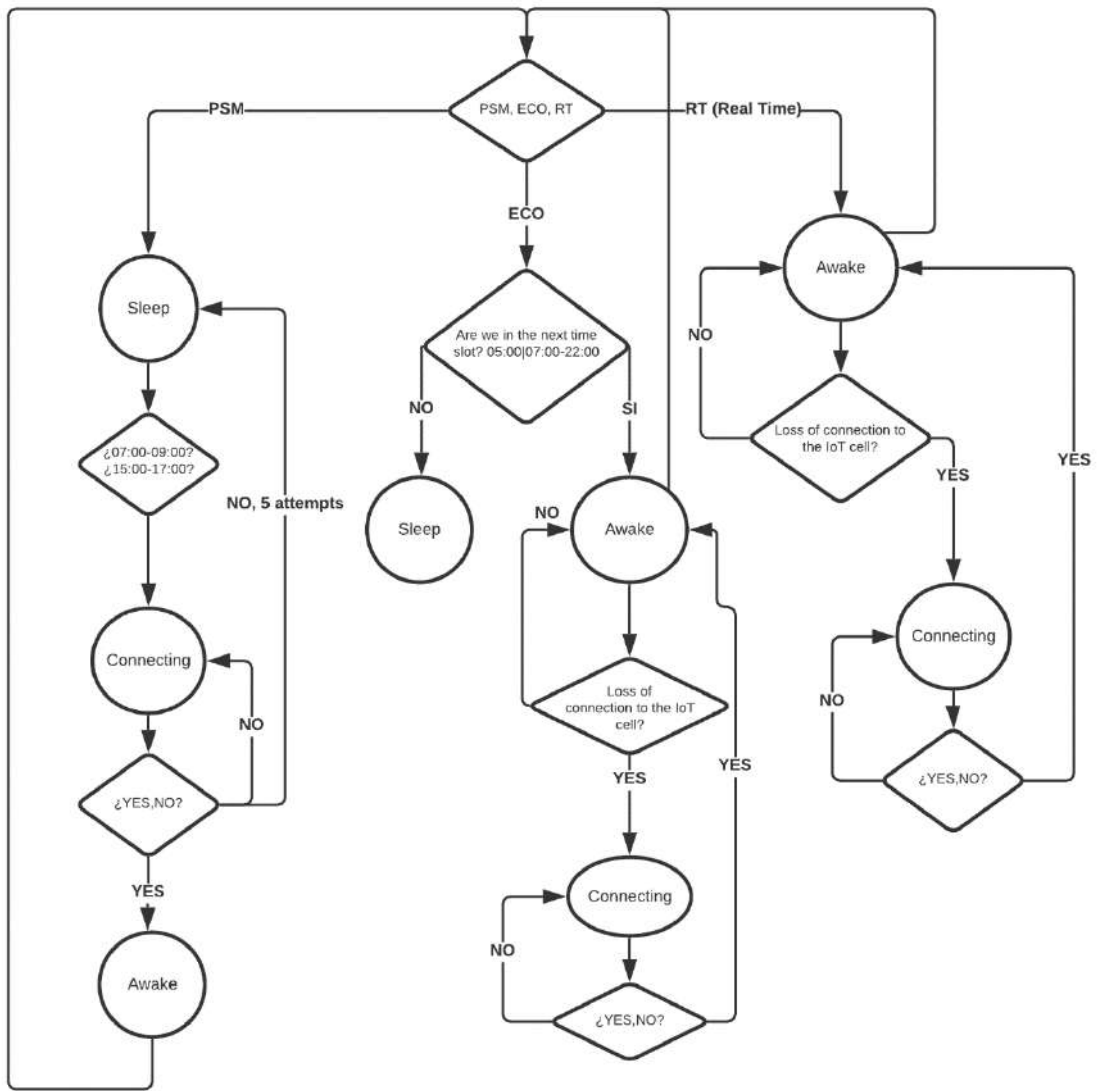
Figure 4 Switching flow chart between power modes and the states implicated.

7. Types of scheduling

The device has two types of scheduling, which in turn have different scheduling modes:

1. **BASIC**: it allows valves to be scheduled separately. The scheduling modes are:

    a. **Days of the week**: you must select the day(s) of the week on which you want to irrigate. The start time and the irrigation, time or consumption base are assigned. If you want to irrigate by time, the time duration will be assigned. And if you want to irrigate by consumption, the maximum value allowed to be used will be set. If the established consumption has not been reached by 12:00 am, the irrigation is interrupted.

    More than one start time can be assigned for the selected day(s) of the week. The device allows loading up to a maximum of 10 start times (either of the day of the week, interval or window scheduling mode).

    NOTE: The unit volume when setting up the irrigation by consumption must be the same as the one used when registering the device. This is the only mode that allows to irrigate by volume [L o m^3].

    b. **Intervals:** you must select the start time, the duration and how many days you want to irrigate from the day and time at which the scheduling is done. For example, if the scheduling is done on Monday at 11:20 am, the start time may be before or after this time. If the start time is at 10 am, then irrigation will occur on Tuesday and Thursday. But if the start time is at 12 pm, then irrigation will take place on Monday and Wednesday (see Figure 5).
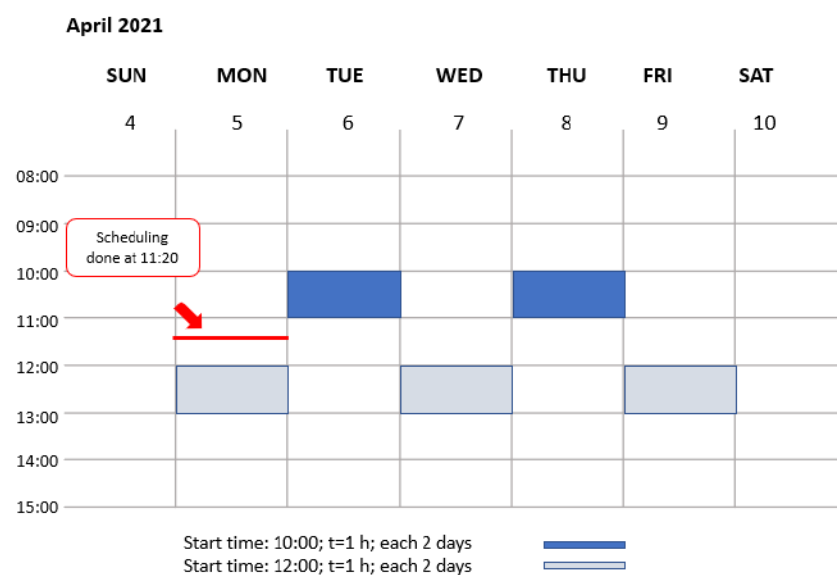

Figure 5 Basic scheduling → "Intervals" Mode

c. **Windows:** consists of an irrigation to which you assign a start time, the duration and the ON/OFF time of the valve (must be higher than 10 seconds).

For example, schedule an irrigation at 10 am for 2 hours, an ON time of 5 min and an OFF time of 10 min. In this case, the scheduled valve will open from 10:00 am to 10:05 am, then it will close from 10:05 am to 10:15 am and so on until 12:00 pm. At the end of this scheduling, in this example of 2 hours, the valve will always close regardless of whether it has to be ON.

NOTE: This type of scheduling will last until the end of the day on which the schedule is set (for example, if it is scheduled to start at 08:00 pm for 8 hours, at 12:00 am the program will be interrupted).

1. **INTERMEDIATE:** it allows scheduling different valves sequentially and concurrently. To do it sequentially, you must add start times. If concurrent irrigation is desired, the valves must be selected at the same start time.

Scheduling modes included are the same as those included in the basic type. But with the exception that irrigation by volume is not allowed in any of the modes.

NOTE: When scheduling, do not carry out programs that imply an overlapping of these. This would result in the valve(s) not irrigating as intended.

8. Installation

Please read carefully the following instructions and follow them in the order described below. The effect of the guarantee cannot be assured if the instructions of this manual are not followed.

NOTE: None of the 8 wired of the device must be electrically connected. And in case you do not use the output of any of the solenoids (red and black wire) or any of the inputs of the counters (white and blue), each of them must be electrically insulated.

- STEP 1. Connect the device output wires (red and black) to the red and black wires of the LATCH 12V solenoid type (see Figure 6). In case the solenoid does not have these colors, the red wire of the ATLAS matches the positive polarity.

Note: the use of sealed connectors is recommended, see Figure 7. (these are purchased separately).
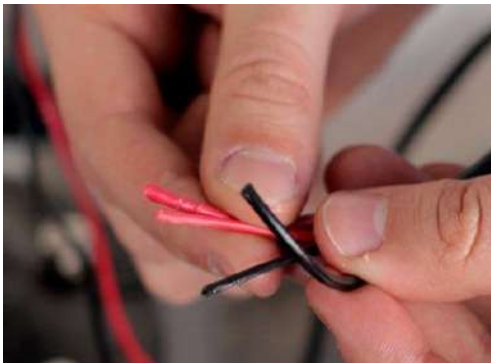
Figure 6 Connectors of a latch solenoid and of ATLAS

Figure 7 Connection of positive polarity by a sealed connector.

- STEP 2. Connect the device output wires (blue and white) to the wires of the pulse counter of our installation (brown and white), see Figure 8.
- STEP 3 (Optional). In case of having a three way valve connected to the valve of the installation, it must be set in the "AUTO" position (see Figure 9).

Figure 8 Connectors of the counter and of ATLAS
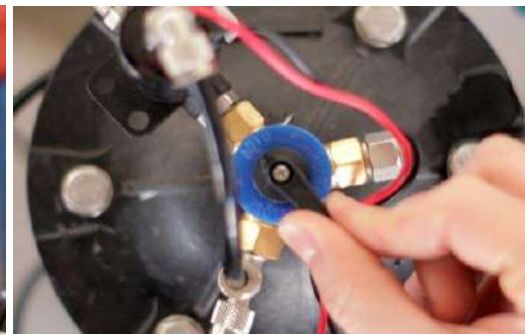
Figure 9 3 way valve, " AUTO" position

- STEP 4. Verify whether the device is in the "Awake" state. Then set the ATLAS device between 30°/45° with a south orientation, and on a fixed support.

Important considerations for the installation:

- Do not cover the solar panel with cable ties, glass or any other item and make sure regularly that the panel is not covered by dust or dirt. The radiation needs to reach directly the solar cell and over its whole surface.

- There should be no elements (houses, trees, etc.) that shade throughout the day. The solar cell needs to receive at least 6 daily hours of direct sunlight.

- The device should not be placed over concave surfaces or terrains where water could be accumulated.

9. Warranty

This Limited Warranty only applies to physical items purchased through one of SPHERAG's authorized distributors or retailers.

SPHERAG products are warranted to be free of defects in material and its production from a period of one year from the day the purchase is made. The warranty covers the repair or replacement, if necessary, of the damaged equipment in our facilities, SPHERAG TECK IoT (Zaragoza), where equipments that require assistance need to be sent. No repair or replacements are done "in situ". The warranty does not cover the shipping costs.

This warranty does not apply if the equipment is not used or installed strictly in accordance with the Installation Manual. Any battery discharged caused by improper installation is not considered a manufacturing defect. It also excludes failures caused by lightning or damage due to freezing temperatures or mechanical reasons.

SPHERAG assumes no liability for any indirect, accidental, malicious or neglectful damages in relation with the use of the equipment. To be entitled to the benefits of the warranty, clients need to return the defective units along with the invoice or purchase receipt from the authorized SPHERAG distributor.

Compensation for direct and indirect damages caused by the use of equipment or accessories manufactured by us is excluded from the warranty.

SPHERAG reserves the right to alter, modify or redesign their products, prices or warranty at any time without liability for obsolescence of customers' inventory of such parts or products.

This manufacturer's warranty may apply in a different way in different countries.

10. Troubleshooting guide

Problem	Causes	Solutions
Battery does not charge	Incorrect installation.	Follow the installation guidelines.
	Lack of sunny days (especially in winter).	Turn the device in ECO mode, or in PSM mode if it is not irrigation time.
Solenoid's state (ON/OFF) does not match the one displayed on the platform.	Synchronization has not been carried on the platform.	Carry the synchronization.
	Solenoid's polarity is not well connected to the ATLAS output	Change the polarity.
False readings of flow rate	Wires (white and blue) are not electrically insulated.	Insulate them with non-conductive materials.
LED does not shine	Empty battery.	Follow the installation guidelines (Step 5).
Irrigation is not carried out	Driver failure due to bypassing the red and black wires when there is an open or close command.	Send the device to its supplier or directly to Spherag's facilities for analysis. If the failure is due to manufacturing defects, it will be repaired. If it is due to a short-circuit, the failure is irreparable and SPHERAG assumes no liability.
	Empty battery (LED does not shine).	Follow the installation guidelines (Step 5).
	Program not received on the device due to poor signal quality.	Place it in a high place, so that the signal quality improves.
Water flow does not get interrupted.	Improper installation of the valve.	Install the valve so that the arrow on the valve points in the direction of the water flow rate.
	Damaged solenoid.	Replace the solenoid.
There is no water flow.	Blocked valve by dirt or fouling.	Replace the valve.

11. Product recycling

According to the directive 2012/19/UE, the following product is framed inside the category "IT AND TELECOMMUNICATION EQUIPMENT" in accordance with Annex I. This product must not be disposed in household waste or in the street. For its adequate treatment, it must be disposed in your city's clean points or returned to your supplier.

PLATFORM

1. Platform access

- Open your browser and search https://portal.spherag.com.
- Enter your credentials (Username and Password) (See Figure 10).
- Press the "ENTER" button.

Figure 10 Username and password entry

2. Create a new farm

Login to the platform with your username and password (Section 1). You can create the farm in two ways:

1. From the left panel you can access to the "Control panel" from where you will have a general overview of all the farms. And you will find the option "New farm"

    .
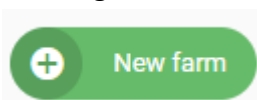
2. From the left panel, in section "Farms", press the "Add farm" button.

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Note: Both options lead you to the same window *(see* Figure 11).

Then:

(1) Write the name you want for the farm.

(2) Write the name of the location where the farm is located.

(3) Specify the time zone of the place where the farm is located.

(4) If desired, enter a description of the farm.

(5) If desired, you can press the button to change the image that the platform will use to show your farm.
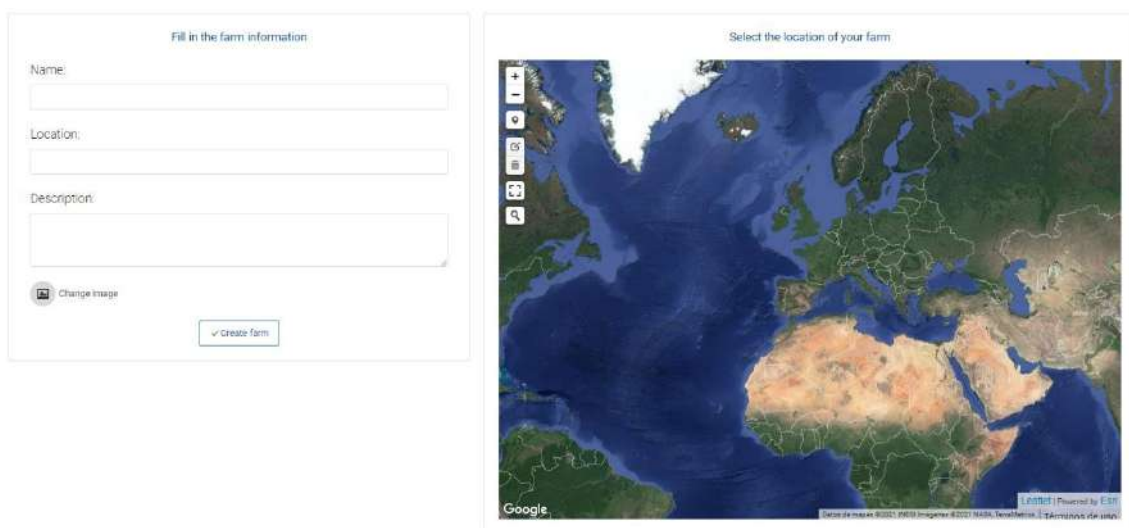
Figure 11 Farm creation

(6) Press the search button in the map and enter the place or street where the farm is located (see Figure 12).

(7) Press the button and place the marker where the farm is located.

Press the button to complete the creation of your farm.

Note: You can also drag or eliminate the marker .

Figure 12 Setting the location of the farm

3. Access to an existing farm

- Login to the platform with your username and password (Section 1).
- In the left menu you can access your farms from the "Control Panel" and from "My farms", as shown in the Figure 13. Press the farm you want to access to.
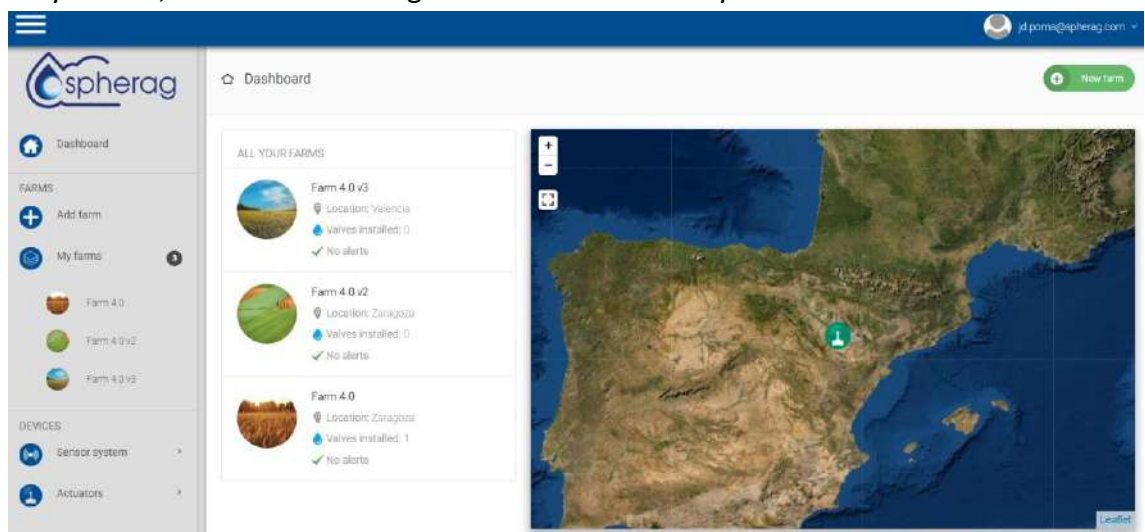
Figure 13 Display of the Control Panel

4. Add a new device - Valve

- Login to the platform with your username and password (Section 1).
- Enter in an existing farm (Section 3) or create a new farm (Section 2).
- Press the button "Add device" + Add device ∨
- Select the option ⊛ Valve

Then:

(1) Enter the IMEI of your device (see Figure 14) (unique 15-digit number – you can find it on a sticker on the side of your device).
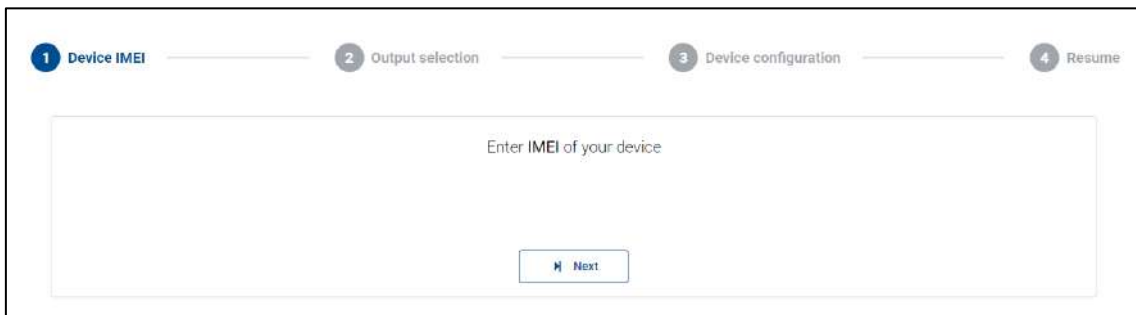
Figure 14 IMEI entry

(2) Select the number of valves that you are going to add based on the model and subscription purchased.
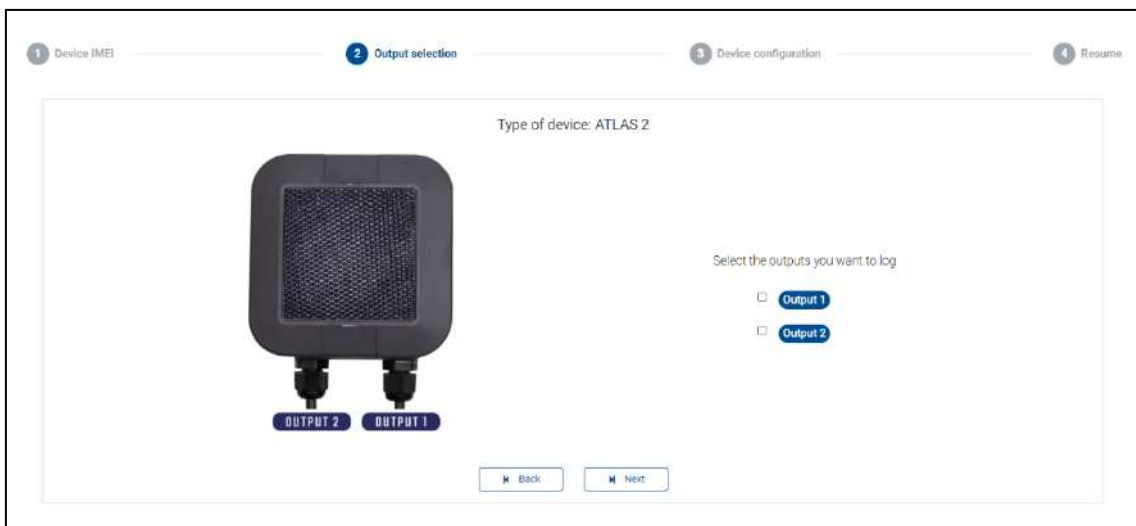
Figure 15 Selection of active valves (only ATLAS)

In the window "Device valve-settings" (see Figure 16). Depending on the model, you must repeat the process for the rest of the activated outputs.

(1) Enter the name you want for the valve.

(2) Specify the color you want for the irrigation area.

(3) Select the measuring unit (cubic meters or liters).

(4) Specify the value of the associated volume to a pulse (1, 10, 100). Your measuring unit will depend on the one you selected in point 3.

Figure 16 Device-valve settings

Press the "Next" button ![Next button]. A map will appear on the right side (see Figure 17) of the settings, where the area will be drawn.

(1) Press the button ![button] and select the valve area by clicking on the map.

Figure 17 Area settings

Note: You can also modify ![edit icon] or eliminate ![trash icon] the selected area.

(2) Press the button ![location icon] and mark in the map the location of the valve, see Figure 18.
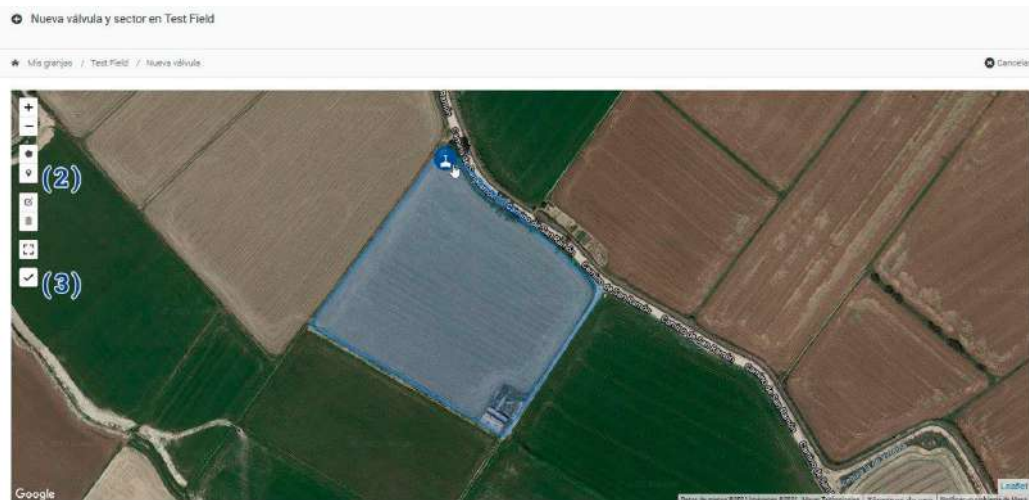
Figure 18 Valve location

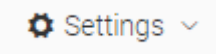Note: You can also modify ![edit icon] or eliminate ![trash icon] the valve icon.

(3) Confirm the area selection and the valve location.

5. Add new device - Station

- Login to the platform with your username and password (Section 1).
- Enter in an existing farm (Section 3) or create a new farm (Section 2).
- Press the "Add device" button ![+ Add device button]
- Select the option "Station" ![Station icon]
- Enter the public key of the new device.
- Enter the private key of the new device.
- Press the button ![Save button]

6. How to edit a farm

- Login to the platform with your username and password (Section 1).
- Enter in the farm you want to edit (Section 3).
- Press ![Settings button] and select ![Edit icon]

7. How to eliminate a farm

- Login to the platform with your username and password (Section 1).
- Enter in the farm you want to edit (Section 3).
- Press ⚙ Settings ∨ and select 🗑 Remove

8. How to eliminate your device

- Login to the platform with your username and password (Section 1).
- Select the device you want to eliminate in the left panel (see Figure 19).
- Press the drop-down ☰▾ of the device you want to eliminate and press the button 🗑 Remove .
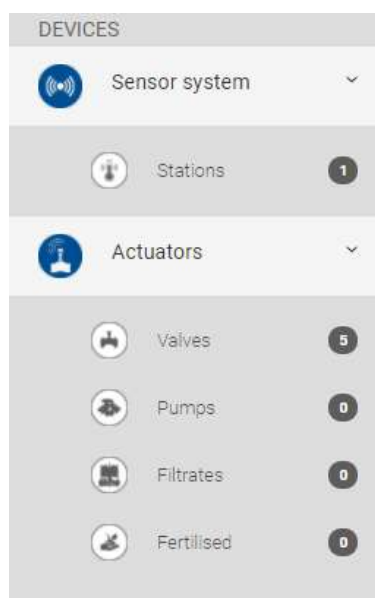

Figure 19 Select actuators/valves

9. How to open or close a valve

- Login to the platform with your username and password (Section 1).
- Enter in the farm where you want to open or close a valve (Section 3).
- In the main panel you will have the added devices (see **¡Error! No se encuentra e l origen de la referencia.**).

Figure 20 Available devices

- With the AUTOMATIC mode turned off, press the button CONTROL to open or close a valve MANUALLY.

10. How to schedule valves

- Login to the platform with your username and password (Section 1).
- Enter in the farm where you want to create a schedule (Section 3).
- Press the button ⊫ Programming .
- Select the type of schedule, see Figure 21. (For more information about schedule functionalities, see types of schedule).
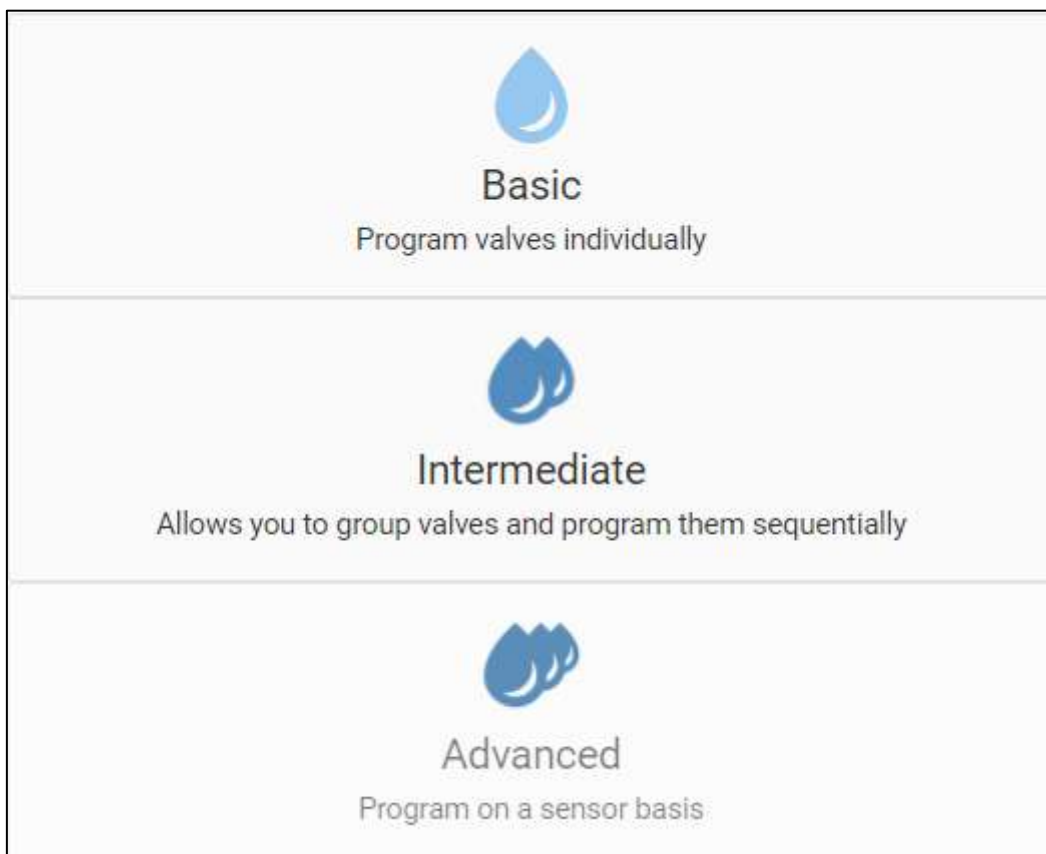

Figure 21 Types of schedule

- Fill in the date with the desired schedule. In case of a basic schedule, the parameters shown in Figure 22 will be requested.

Figure 22 Basic schedule

On the tab **Devices** press the "AUTO" button of the scheduled valve, see Figure 23.

Figure 23 Valves in Automatic

NOTES

NOTES