# AgroBee-L H2O IP68 System

Very low consumption radio modules and integrated parts of the AgroBee-L system for reading VWC (Volumetric Water Content) in the soil or wet leaves (LWS: Leaf Wetness Sensor) and reading digital sensors.

The AgroBee-L H2O IP68 model offers the following:

- 3 analog inputs for ground Volumetric Water Content sensors (VWC) or Leaf Wetness sensors (LWS) of the following type
  - Decagon 10HS (VWC)
  - Watermark 200SS + 200SS-VA + 200TS (VWC)
  - Solfranc SF-S210 (VWC)
  - Decagon LWS (LWS)
  - Decagon EC-5 (VWC)
  - Decagon GS1 (VWC)
  - Meter Group TEROS-10 (VWC)
- 1 counter or digital sensor or rain gauge input

Digital sensor

AgroBee-L
H2O IP68

3 level VWC Sensor
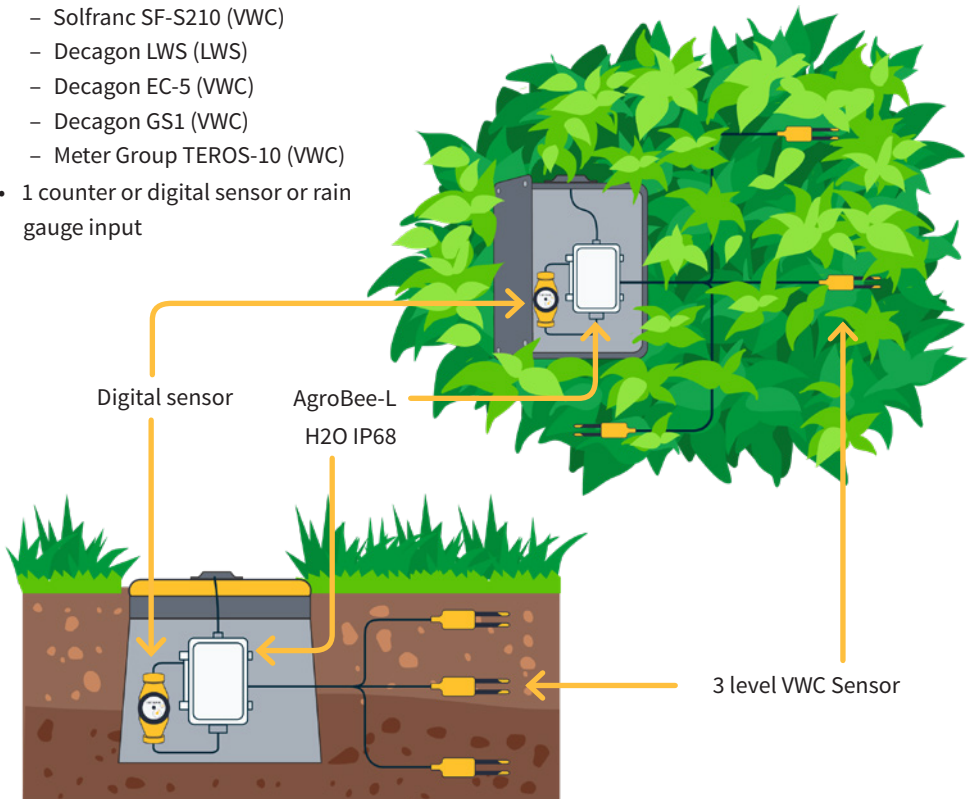
This type of module is internally resin-coated (IP68), so they are suitable for the gardening sector: modules designed to be installed at ground level, such as irrigation canals in urban areas.

This type of module, unlike the rest, offers much more limited radio coverage due to the fact that it is meant to be installed on the ground, so it should be placed much closer to the AgroBee-L Coordinator.

In terms of power, these modules are powered by an internal 19 Ah battery, which is provided with the controller. This battery is designed to provide more than 5 years of life to said module (according to working conditions).

There are 2 types of antenna for this module according to the requirements of each installation:
- An external antenna to be mounted on the box's lid.
- An internal adhesive antenna.

The number of sensors a module uses, as well as their type, can be configured using a Module Reader of the module itself, or from the controller to which said module is associated.

All sensors connected to a module should be the same type.

The module itself supplies each sensor with the necessary supply voltage according to the type of sensor configured. Likewise, the read timing of the sensors can be chosen from 3 different values: 5, 10, or 20 minutes, with the default value being 5 minutes.

Technical characteristics

Power supply		
Power supply:	H2O IP68: Lithium Battery → 3.6V	Lithium Battery 19 Ah
Energy consumption: H2O IP68	Average consumption: 0,45 mW (TBC)	

Outputs	
Number	3
Type	3 Vcc ó 12 Vcc (Sensor power supply) Maximum current: 50 mA

Inputs	
Maximum distance betweeen sensor and AgroBee-L: 50m	
Number	1
Type	For potential-free contacts
Number	3
Type	Analog (12 bits)

Environment	
Temperature	-10 °C a +60 °C
Moisture	< 95 %
Altitude	2000 m
Pollution	Grade II

Box dimensions H2O IP68	
Height	130 mm
Width	100 mm
Depth	70 mm
Weight (approx.)	0,4 Kg

| Declaration of conformity		
This system conforms with the regulations and other regulatory documents in the following list:		CE
Electrical safety	UNE EN 60950-1:2007+ CORR:2007	Information technology controller. Safety. Part I: General requirements
	UNE EN 60215:1995 + A2:1995	Safety requirements for radiotransmission controller
EMC	ETSI EN 301 489-17 v1.3.2 based on ETSI EN 301 489-1 v.1.7.1:	
	UNE-EN 55016-2-3:2007	Radiated radio frequency emissions (30-1000MHz). Class B
	UNE-EN 61000-4-2:1997 + A1:1999 + A2:2001	Electrostatic discharge
	UNE-EN 61000-4-3:2007 + A1:2008	Electromagnetic field immunity
	UNE-EN 61000-4-4:2005	Transient/burst immunity
	UNE-EN 61000-4-6:2008	Current injection: 150KHz-80MHz
Radio spectrum protection	ETSI EN 300 328 v1.7.1 (Decision ERC/DEC/(01)07 and Recommendation CEPT ERC/REC 70-03)	Spurious issuer emissions Coordinator and Module H2O IP68. Effective radiated power Coordinator and Module H2O IP68. Frequency drift Coordinator and Module H2O IP68.

This symbol indicates that electrical and electronic controller must not be disposed of along with household waste at the end of its useful life. The product must be taken to the corresponding collection point for the recycling and proper treatment of electrical and electronic controller in accordance with national legislation.

AgroBee-L System Operation

The AgroBee-L radio modules are used for the activation of valves and other irrigation elements, as well as the reading of sensors and meters. It is very low consumption and follows the LoRa radio modulation, which operates in the 868MHz, 433 MHz and 915 MHz, free bands, obtaining radio coverage of up to 2500 m between two points (depending on the orography).

Currently, they can be incorporated into the Agrónic 2500, Agrónic 5500 and Agrónic Bit Con fertirrigation controllers.

The AgroBee-L system consists of a coordinator device (located in the Agrónic 2500, Agrónic 5500 or Agrónic Bit Con controllers) and by field elements with different functions, depending on the model in question. This system does not include the use of repeater elements, so all modules must connect directly with their coordinator. The field modules manage their consumption by activating the communication in the precise time of the exchange; the rest of the time, they are asleep or attending to irrigation control.
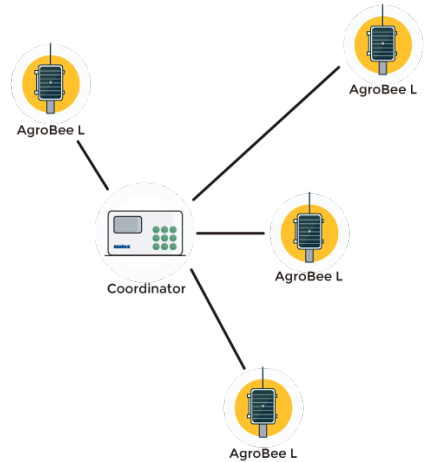
Its low consumption allows it to operate with a solar panel integrated into the module and supercapacitors or battery (depending on the model). The solar panel stores the energy in the supercapacitors/battery, offering a long operational life. It is only necessary to replace batteries in models that include batteries instead of supercapacitors.

The maximum number of modules that an Agrónic controller can manage is 20 units in standard mode, which can be configured as modules of any of the available types. There is also a priority mode, which makes it possible for the modules to communicate more often: in this case, the number of modules (10) is halved.

To use AgroBee-L modules, it is necessary to assign their outputs to the sectors or generals of the controller in question, and their inputs to the digital, analog, or counters sensors.

The AgroBee-L system has the following features, among others:

- Operation in 868 MHz, 433 MHz and 915 MHz free bands.
- Availability of 13 communication channels plus 18 transmission modes, which allow for the operation of more than one network in the same area working on the same channel.
- Availability of network code, which allows for filtering the information of several networks configured with the same parameters.
- Self-adjustable communication rate according to the chosen transmission mode and the timing mode:

- Timing in standard mode (60 –200"). Up to 20 modules.
- Timing in priority mode (30 –100"). Up to 10 modules.
- Distances of up to 2500 metres between any module and its coordinator (depending on the orography).
- Manual actions, consultations, and configuration of the network number, channel, transmission mode, and communication timing (standard/priority):
  - In-situ: Through the Module Reader
  - From a distance: Through the Agrónic
- Battery/charge level reading and solar panel (if any).
- Reading SNR level (signal-to-noise ratio) reception in the module and coordinator (in [%]).
- Reading the status of the last 16 communications and remaining time indicator until the next communication.

Installation

For the supply of radio controller, it is essential to have a coverage study. This study verifies the viability of the system according to the profile of the terrain, the location of the points to be controlled, and the distance between them. The study is delivered along with the controller offer.
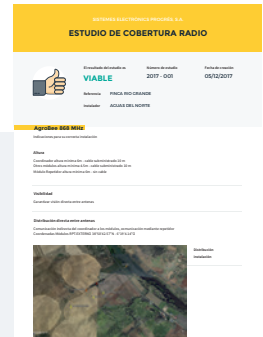
MODULES INSTALLATION

The AgroBee-L H2O IP68 module is designed to be mounted at ground level. It can be installed, for example, in irrigation boxes in urban garden areas. This means that the coverage range of this module is much lower compared to the rest of the models.

The maximum coverage range to expect with this module is about 500 metres, which is limited because it is to be installed on the ground. In addition, it is vitally important that the communicating modules are clearly visible to each other, since any obstacle can make the quality and durability of the communications difficult to some extent.

This module can be mounted with two different antennas, depending on the place and situation in which it is to be installed:

- **Internal adhesive antenna:** This antenna is not externally visible, as it is inside the module. When a module has this type of antenna and is set up in an irrigation box, the cover of said box should never be metallic, since the communication of said module will be practically impossible, given that any obstacle (especially if it is metallic) will gravely worsen the range of radio coverage. When setting up a module with this antenna, it is recommended to place the module inside the box as close as possible to the surface. In the following image, you can see the internal part of a H2O IP68 module with this antenna.

Antenna

- **External antenna for the cover:** This is the best option of the two in terms of coverage range. This antenna must be screwed onto the lid of an irrigation box so that, as it is on the exterior, it will obtain a more optimal range of coverage. When mounting this type of antenna, it is recommended that the lid of the box be metallic. When the module is supplied with this antenna, a 25 cm strip of vulcanized tape will also be delivered with the set.

Once the module is situated in the box and the antenna is screwed into the cover, you must connect the antenna to the controller: you can simply screw the antenna's cable connector into the connector located on the side of the module.

Once the antenna connector is screwed in to the controller, the tape will be used to isolate said connection: this connection is already watertight, but this additional insulation will add greater protection in case the module accidentally gets wet.

To place the tape, simply proceed as indicated in the image: place the tape on the connector and wrap it around while pulling it so that it is firmly affixed.

Inputs and Outputs

DIGITAL INPUTS

There is 1 digital input in an AgroBee-L H2O IP68 module, which can function either as a digital input or counter/rain gauge input. When the input is connected to a counter, the minimum time between pulses must be 0.1 seconds and an anti-bounce filter may be enabled in order to avoid accumulating undesired pulses. Maximum allowed distance between AgroBee-L module and a digital sensor or meter is 50m.

The digital input's wire connection is coloured Purple. The common wire input is the Grey-pink one.

ANALOG INPUTS

This model has up to 3 analog inputs for reading and managing a maximum of 3 ground Volumetric Water Content sensors, which must all be of the same type and selected among: "Decagon 10HS", "Watermark 200SS-V", "Solfranc SF-S210", Leaf Wetness sensors type "Decagon LWS", "Decagon EC-5", "Decagon GS-1" or "Meter Group TEROS-10". For said module, these inputs are the wires: A1-White, A2-Yellow, and A3-Blue, respectively. This module also has three common wires: Brown, Grey and Red. There is one for each sensor.

There are three cables for distributing power independently for each sensor: V1-Green, V2-Pink, and V3-Black.

IMPORTANT

To obtain the reading through the White-A1 wire (output of the sensor in question), the corresponding sensor must be fed through the Green-V1 wire. The same occurs with A2-V2, and A3-V3.

Said module is provided with a cable tube that allows different connections to be made more easily without the need to access the interior of the module:

• H2O IP68 - 11-wire tube

The cables of the different tubes will come identified by colours and numbers. Connect them according to the following table according to their functionality.

H2O IP68		
Wire colour	ID	Function (3 sensors + digital input)
White	A1	Analog input sensor 1
Brown	0V	Common Power Sensors
Green	V1	Power supply sensor 1
Yellow	A2	Analog input sensor 2
Grey	0V	Common Power Sensors
Pink	V2	Power supply sensor 2
Blue	A3	Analog input sensor 3
Red	0V	Common Power Sensors
Black	V3	Power supply sensor 3
Purple	D1	Digital Input 1
Grey-pink	CD	Common input

Consult the H2O IP68 sensor manual for information about its installation.

Module AgroBee-L H2O IP68

Watertight connection terminals

Sensor
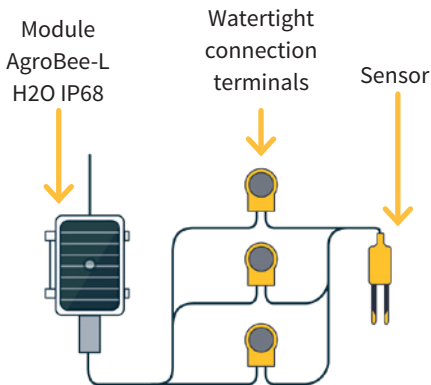
To ensure the seal of the module's cable connections, it is recommended to use watertight terminals. The connection through these terminals must be made without stripping the cable's wires.

The 3M Scotchlok series (www.3m.com), ES Caps from TYCO Electronics (www.tycoelectronics.com), or Cellpack resin splicing and junction kits (www.cellpackiberica.com) can be used as connecting elements.

Settings

For any AgroBee-L module to enter the correct operating mode, you must have an Agrónic controller (Agrónic 2500, Agrónic 5500 and Agrónic Bit Con) with the AgroBee-L option installed, which includes the internal coordinator and an antenna with 10 metres of cable. This can be verified by doing the following in the controller:

Consult ⟶ Communication ⟶ AgroBee-L ⟶ Status: Correct

In the same way, a module must be configured to communicate with the Agrónic with which you want to associate it. To do this (if the module is not already configured at the factory) you must use the Module Reader (or Agronic Radio Reader, LAR) consisting of a screen and four keys, that is connected to the AgroBee-L module through the only connector visible on the inside.

A wireless module reader is also available that allows you to perform functions without the need for a cable. Consult the wireless AgroBee Reader manual to learn about the steps to link it to the controller.

Press the ⟳ key to enter the main menu. Use the − and + keys to change the options within the menu. Use the ⟳ key to enter the selected menu option. Use the C/C key to return to the previous hierarchy's menu.

You will see the following options in the main menu:
- Consult controller
- Consult communications
- Consult digital and analog inputs
- Communication parameters
- Input-Output parameters
- Various parameters

NOTE Once the AgroBee-L module is linked with an Agrónic, all the consultations and parameters are accessible through the Agrónic.

General query menu of the module, where the following parameters are displayed:
- Module and serial number:
  – Module: It refers to the module number (1 to 20) according to the established communication parameters. There can only be one same module number for each Agrónic device.
  – Serial number: Information regarding the controller. It comes from the factory.
- Battery voltage and solar panel:
  – Vbat: Battery voltage:
    · Lithium battery: Maximum value 3.6 V; Minimum value 2.2 V

These same data can be viewed in the Agrónic by accessing "Consult - Communications - AgroBee," as you will see in the next section.

Communication consultation menu of the module, where the following parameters are displayed:
- Transceiver: Type of emitter installed in the module. It tells you if the module works at 868MHz/433MHz or 915MHz
  – RN2483 (868MHz/433MHz)
  – RN2903 (915MHz)
- Band and transmission mode:
  – Band: 868MHz, 433MHz, 915MHz
  – Transmission Mode: 1 to 18 (mode 5 will be set by default)
- Consult parameters of the communication type:
  – Channel: 1 to 13
  – Network code: It is usually the associated Agrónic serial number
  – BW: Bandwidth of the radio modulation (125KHz, 250KHz, 500KHz). It is set according to the transmission mode chosen in the communication parameters.
  – Radio modulation factor: SF7, SF8,…, SF12. It is set according to the transmission mode chosen in the communication parameters.
  – Communication status:
    · Status message:
      - Correct Communication
      - Network error
      - Communication error
      - Model error
      - Does not communicate

· Signal-Noise ratio of the last received message: Reliable communication if >40%.
– Time until next radio emission: time in [s]
– Status of the last 16 communications (the previous communications appear on the right side of the screen):
  · 1: It indicates that the emission has been made and the correct information received in the last communication
  · 0: Indicates that the radio emission has been made, but the correct data has not been received or no data has been received

Part of this information is available through the Agrónic by accessing "Consultation | Communications | AgroBee", where you can also see the query regarding the controller and the parameters of the communication.

CONSULT COMMUNICATIONS
AgroBee-L 868
Status: Correct
Timing: 60"
Channel: 01   TX Mode: 05
Network code: 00001

CONSULT COMMUNICATIONS
M01 (ns. 236) V1.00
Status: Correct (40")
Level: 80% / 82%
Vbat: 04.0 V   Vsol: 05.8 V
1111111111111111

CONSULT THE AGROBEE-L MODULE DIGITAL AND ANALOG INPUTS

Menu to check the status of digital inputs, counters, and H2O IP68 inputs.

The information shown on the different screens is as follows:

• Check digital inputs: For each of the digital inputs available to the module in question, its status is shown either as '0' (open contact) or '1' (closed contact).
• See accumulated counter sensors: The total number of pulses detected will be displayed for each digital input configured as a counter sensor. If this entry is not configured as a counter, the text 'N-A' (Not-Activated) will appear.
• See instant flow rate (time between pulses): The time in [ms] between the last 2 pulses detected will be displayed for each digital input that is configured as a counter sensor. If this entry is not configured as a counter, the text 'N-A' (Not-Activated) will appear.

- Consult analog sensors: For each of the available analog inputs, the value read is displayed and expressed in [%] according to the type of input in question. If the analog input in question is not configured, the text 'N-A' (Not-Activated) will appear.
- Check the supply voltage of the analog sensors: The value of the supply voltage sent to the active analog sensors is displayed in [mV].

From the Agrónic, press the '1' key in the module's consultation screen on the Agrónic to view the analog/digital inputs.

Nomenclature used in these queries:

- EA   analog input values in mV an in 4-20mA format. 4mA=800mV and 20mA=4000mV. The number next to EA indicates the sensor number.
- ED   status of digital inputs. With a '1' indicating that the contact is closed and a '0,' that it is open.
- Vsen   value of the voltage in mV supplied to the sensors.

```
AgroBee-L 02  H2O IP68
EA1: 963
EA2: 963
EA3: 963
Vsen: 12125
ED: 1
```

COMMUNICATION PARAMETERS OF AN AGROBEE-L MODULE

The following parameters are in the Communication Parameters menu of the Module Reader, which allow you to establish the communication of a certain AgroBee-L module with a controller:

- Module Module number in the network. It is used to distinguish all modules that may be associated with an Agrónic. The module number cannot be repeated in the same Agrónic:
  – 1 to 20 (timing in normal mode)
  – 1 to 10 (timing in priority mode)

- **Band** Frequency Band:
  - 868MHz or 915MHz (default value, depending on the model)
  - 433MHz (only available in models that also support 868MHz band)
- **Channel** Frequency channel number:
  - 1 to 13 (independent from the band used)
- **TX Mode** Transmission method. Set the radio's transmission and reception parameters.
  - 1 to 18 (mode 5 set by default):
    - Mode 1: The shortest coverage length permitting the lowest lag time
    - Mode 18: The greatest coverage length, but with the most lag time
- **Timing** 2 timing modes:
  - Normal mode (recommended): It is automatically set according to the chosen transmission mode, but always includes the communication of up to 20 modules. Value between 60" and 200".
  - Priority mode: It is automatically set according to the chosen transmission mode and includes the communication of up to 10 modules. Value between 30" and 100".
- **Network code** It differentiates the information from several controllers with the same communication parameters (band, channel, and transmission mode). The Agrónic serial number is assigned by default.

To modify any of the sub-menu's fields, press ↵ . The screen will display that you are in edit mode. Use the − and + keys to set the desired value. Confirm with ↵ or dismiss with C/c Press C/c to exit the menu and access the previous hierarchy's menu, which will change the parameters and let them take effect.

For an AgroBee-L module to establish communication with a certain Agrónic, you must set, through the reader, the parameters that have just been described, according to those established in the Agrónic in question. In the Agrónic, you can modify these parameters in 'Parameters | Installer | Communications | AgroBee | Coordinator':

AgroBee-L
Channel: 01
Network code: 00001
Timing: standard
Band: 868MHz
TX Mode: 05

In the Input-Output Parameters menu of the Module Reader, you can set the parameters of the AgroBee-L module's different inputs and outputs, available through the following sub-menu:

- **Digital Inputs** Configuration of digital sensors or counters.
    - Configuration of functions of each of the available digital inputs:
        - · Digital input
        - · Counter
    - Anti-bounce filter: only applicable when digital input is setup as counter. A filter time between 0.0" and 10.0" can be fixed, and it represents the minimum time that a contact must be closed to count a new pulse. Same time is considered for all the inputs of the module. This filter time can only be setup by using the Module Reader (it cannot be setup from the programmer to which this module is linked).

- **Sensors** Configuration of analog sensors:
    - S1: Active / Not Active
    - S2: Active / Not Active
    - S3: Active / Not Active
    - Sensor type: 10HS-Decagon, 200SS-V Watermark, SF-S10 Solfranc, LWS Decagon, EC-5 Decagon, GS-1 Decagon, TEROS-10 Meter Group
    - Type of soil: The following table shows the different soil possibilities according to the type of sensor.
    - Reading rate: 5min (default), 10min, 20min.

Table on terrain selection according to sensor		
Sensor	**Terrain mineral**	**Terrain mantillo**
10HS Decagon	x	x
200SS-V Watermark	x	
SF-S10 Solfranc	x	
LWS Decagon	x	
EC-5 Decagon	x	x
GS-1 Decagon	x	x
TEROS-10 Meter Group	x	x

To modify any of the sub-menu's fields, press ↵ . The screen will display that you are in edit mode. Use the – and + keys to set the desired value. Confirm with ↵ or dismiss with C/C Press C/C to exit the menu and access the previous hierarchy's menu, which will change the parameters and let them take effect.

IMPORTANT

The detailed input/output parameters can also be entered in the Agrónic. In this case, the module will receive the parameters upon communicating with it. If not, and these parameters have been changed through the Module Reader in the same module, the Agrónic will receive and update said parameters.

To modify these parameters from the Agrónic, you must access "Parameters | Installer | Communications | AgroBee | Module." Specify the module number in the Agrónic network in question, after which you will see the following screens to modify the detailed parameters (see the Agrónic manual in question for more details).

AgroBee-L 01

Sensor: [10HS Decagon]..[GS1 Decagon]

Terrain: [Mineral][Mulch]

Timing: 5'

S1:[si/no] S2:[si/no] S3:[si/no]

AgroBee-L 01

Sensor: [10HS Decagon]..[GS1 Decagon]

Terrain: [Mineral][Mulch]

Timing: 5'

S1:[si/no] S2:[si/no] S3:[si/no]

ANALOG H2O IP68 SENSOR FORMAT

The possibility of selecting one or another type of terrain is determined by the manufacturer of each one of the standardized sensors. Being able to make this selection allows the H2O IP68 module to perform one process or the other with the sensor readings, as recommended by the manufacturer:

- **10HS Decagon** The sensor gives us the voltage x [mV] that the H2O IP68 module turns into VWC [%] (Volumetric Water Content or Ground Water Content) by the following expression: VWC [%] = $fx^5+ex^4+dx^3+cx^2+bx+a$, and according to the type of terrain:

- Mineral:
  - $a = -1.92$
  - $b = +6.69E\text{-}3$
  - $c = -7.37E\text{-}6$
  - $d = +2.97E\text{-}9$
  - $e = 0$
  - $f = 0$

- Mulch:
  - $a = -0.03$
  - $b = -1.23E\text{-}4$
  - $c = +7.05E\text{-}7$
  - $d = 0$
  - $e = 0$
  - $f = 0$

10HS sensor format	
Parameter	**Default value**
No. of integers	2
No. of decimals	1
Sign	no
Units	%
Calibration Point 1	
Value real	800 mV
Logical value	00.0 %
Calibration Point 2	
Value real	4000 mV
Logical value	50.0 %

The value in [%] is converted, by the module itself, to the standard 4-20 mA (800-4000 mV) format, so you must select the suitable data format in the controller in question according to the type of sensor and type of terrain selected. Regarding the Agrónic, the controller itself already selects the most suitable format when registering a sensor corresponding to an H2O IP68 module. It is the user's responsibility to change the data that characterize this format.

- **200SS-V Watermark** It is composed of 3 elements:

    - 200SS, Watermark sensor
    - 200SS-VA, output adaptor
    - 200TS, temperature sensor, it is advisable to compensate the temperature reading

  The sensor gives you a voltage x[mV] between 0 and 2800 mV. The value 0 mV corresponds to 0 cb and 2800 mV corresponds to 239 cb, following a linear relationship. This value in cbar is converted by the module to 4-20 mA format, so it will deliver a voltage between 800 and 4000 mV to the Agrónic. In this case, the default format selected by the Agrónic, and, according to the manufacturer, suitable for any type of mineral soil, is shown in the following table.

200SS-V sensor format	
Parameter	**Default value**
No. of integers	3
No. of decimals	1
Sign	no
Units	cbars
Calibration Point 1	
Value real	800 mV
Logical value	000.0 cbars
Calibration Point 2	
Value real	4000 mV
Logical value	239.0 cbars

- **LWS Decagon**   This sensor for the measurement of leaf wetness (LWS) gives us a value between 10% and 50% of its supply voltage. The H2O IP68 module delivers a supply voltage of 5V, so the value that this sensor will deliver will oscillate between 500 mV (0%) and 2500 mV (100%). This value in % is converted by the module to 4-20 mA format, so it will deliver a voltage between 800 and 4000 mV to the Agrónic.

LWS sensor format	
Parameter	**Default value**
No. of integers	3
No. of decimals	0
Sign	no
Units	%
Calibration Point 1	
Value real	800 mV
Logical value	000 %
Calibration Point 2	
Value real	4000 mV
Logical value	100 %

- **SF-S10 Solfranc** The sensor gives you a voltage x[mV] between 100 mV and 2200 mV. The value 0 mV corresponds to 0% and 2200 mV corresponds to 50%, following a linear relationship. This value is converted by the module to the following format to be delivered to the controller (default format, which can be changed by the user under his or her own responsibility):

SF-S10 sensor format	
Parameter	**Default value**
No. of integers	2
No. of decimals	1
Sign	no
Units	%
Calibration Point 1	
Value real	800 mV
Logical value	00.0 %
Calibration Point 2	
Value real	2324 mV
Logical value	10.0 %
Calibration Point 3	
Value real	4000 mV
Logical value	50.0 %

- **EC-5 Decagon** The sensor gives us the voltage x [mV] that the H2O IP68 module turns into VWC [%] (Volumetric Water Content or Ground Water Content) by the following expression: VWC [%] = bx+a , and according to the type of terrain:

  – Mineral:
    · a = -0.48
    · b = +11.605E-4

  – Mulch:
    · a = -0.696
    · b = +17.749E-4

The value in [%] is converted, by the module itself, to the standard 4-20 mA (800-4000 mV) format, so you must select the suitable data format in the controller in question according to the type of sensor and type of terrain selected. In the case of the Agrónic, the controller itself already selects the most suitable format when registering a sensor corresponding to an H2O IP68 module. It is the user's responsibility to change the data that characterize this format.

EC-5 sensor format	
Parameter	**Default value**
No. of integers	2
No. of decimals	1
Sign	no
Units	%
Calibration Point 1	
Value real	800 mV
Logical value	00.0 %
Calibration Point 2	
Value real	2324 mV
Logical value	10.0 %
Calibration Point 3	
Value real	4000 mV
Logical value	50.0 %

- **GS-1 Decagon** The sensor gives you the voltage x[mV] that the H2O IP68 module turns into VWC [%] (Volumetric Water Content) through the following expression: VWC [%] = bx+a , and according to the type of terrain:

  - Mineral:
    - a = -0.554
    - b = +4.94E-4
  - Mulch:
    - a = -0.611
    - b = +5.91E-4

GS-1 sensor format	
Parameter	**Default value**
No. of integers	2
No. of decimals	1
Sign	no
Units	%
Calibration Point 1	
Value real	800 mV
Logical value	00.0 %
Calibration Point 2	
Value real	4000 mV
Logical value	57.0 %

The value in [%] is converted, by the module itself, to the standard 4-20 mA (800-4000 mV) format, so you must select the suitable data format in the controller in question according to the type of sensor and type of terrain selected. Regarding the Agrónic, the controller itself already selects the most suitable format when registering a sensor corresponding to an H2O IP68 module. It is the user's responsibility to change the data that characterize this format.

- **TEROS-10 Meter Group** The sensor gives you the voltage x[mV] that the H2O IP68 module turns into VWC [%] (Volumetric Water Content) through the following expression: VWC [%] = dx3+cx2+bx+a , and according to the type of terrain:

  - Mineral:
    - a = -2.154
    - b = +3.898E-3
    - c = -2.278E-6
    - d = +5.439E-10
  - Mulch:
    - a = -2.683
    - b = +4.868E-3
    - c = -2.731E-6
    - d = +4.824E-10

TEROS-10 sensor format	
Parameter	**Default value**
No. of integers	2
No. of decimals	1
Sign	no
Units	%
Calibration Point 1	
Value real	800 mV
Logical value	00.0 %
Calibration Point 2	
Value real	4000 mV
Logical value	70.0 %

The value in [%] is converted, by the module itself, to the standard 4-20 mA (800-4000 mV) format, so you must select the suitable data format in the controller in question according to the type of sensor and type of terrain selected. In the case of the Agrónic, the controller itself already selects the most suitable format when registering a sensor corresponding to an H2O IP68 module. It is the user's responsibility to change the data that characterize this format.

In the Various Parameters menu of the Module Reader, you can select the language among Spanish, Catalan, English, French, Italian, and Portuguese.

From this menu, you can also can completely erase the module's data, restoring it to factory settings, maintaining the serial number and the model.

Battery levels and radio signal/quality

You have already seen how to consult the different parameters of an AgroBee-L module through the Module Reader. In the Agronic to which the AgroBee-L module is associated, it also shows the battery information and radio link performance of said module.

Consultation ⟶ Communications ⟶ AgroBee-L ⟶
(down and up arrow to go through the different modules)
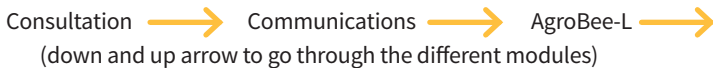
The information provided is:
- Module number, serial number, and firmware version
- Signal level received by the Agrónic and the module. It is displayed in % and indicates the level of the signal-to-noise ratio.
  Advisable/recommended value > 40%
- Vbat: Battery level in mV:
  – Module with Lithium Battery 19 Ah: VBat max = 3.6 V; VBat min = 2.2 V.
- VSol: Voltage level delivered by the solar panel.

Estimated battery life

Battery life with standard communication rate mode 5: 60 seconds	
Type	H2O IP68
Lithium Battery 19000 mAh	> 5 years

Battery life is approximate since there are several factors that can affect consumption. Frequent reading of digital sensors (when counters are configured) shortens the duration. Likewise, if a priority mode rate is set, the battery life will decrease.

Battery replacement place the battery in its location having previously turned the module OFF. Respect the polarity.

If a module does not find the Agronic with which it communicates, said module will follow its own course, and will send data every certain time, according to the established timing. However, in order to avoid possible collisions and/or interferences, the module will slightly offset the pre-established communication time. The consumption of an AgroBee-L module is practically unchanged due to the fact that it is not connected to any Agrónic.

Updating the AgroBee-L module software

Whenever there is a new software version for an AgroBee-L module, the user can update it. To do this, you must perform the following steps:

Normal ⇅ Record   Mini USB

- Have a computer with an Internet connection and a USB to miniUSB cable.
- Download the program "AgronicUpg" + "drivers" + update file (dfu) by typing this address bit.ly/actualizaragronic into the computer's browser.
- Select and download the AgroBee-L folder.
- Go to the module and turn it off using the switch.
- Place the other switch inside the module in the recording position (by default, it is in the 'Normal' position).
- Connect the USB to the computer and the miniUSB to the module.
- Start up the module using the ON/OFF switch.
- On the computer, run the program "AgronicUpg". If you do not see the "Internal Flash" line on the screen as seen in the image, you must install the drivers. If you already have the drivers installed, skip to the next step.
- To install the drivers, go to the files you have

ON ⇅ OFF

Switch
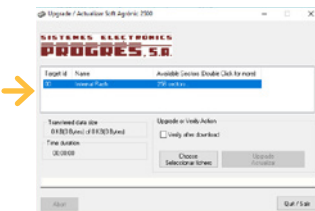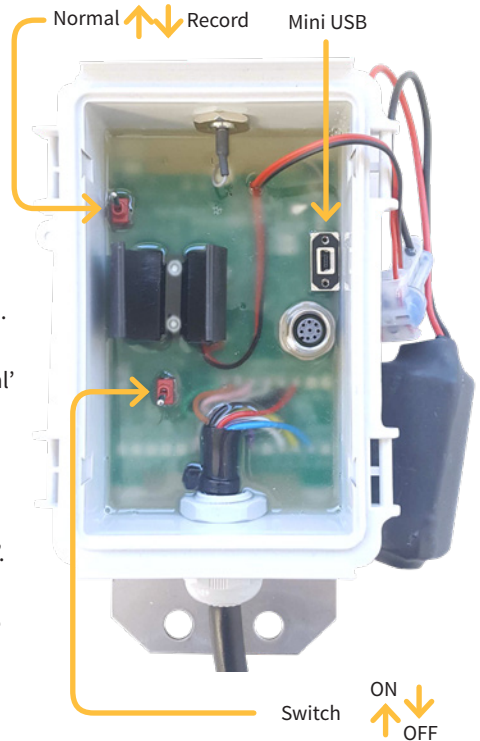
downloaded and select the folder that corresponds to your Windows version. Run the file "dpinst_" and follow the steps. If you use Windows XP, call Progrés to help you with the installation.
- Press the "Choose file" button and select the file "xxx.dfu". Once loaded, press the "Update" button and wait for the process to finish.
- Once the process is finished, the module is updated.
- To finish, turn off the module, disconnect the miniUSB cable, and place the second switch in the 'Normal' position.
- Finally, the module can be started up again.

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