TECHNICAL DATA SHEET HYDROBALL® (LoRaWAN / NB-IoT) (HB01L / HB01N)

Device Name and Description

Device Name: HYDROBALL® LoRaWAN (HB01L) and HYDROBALL® NB-IoT (HB01N).

Generation: 1

Description: HYDROBALL® is a standalone soil probe for irrigation management in agriculture and green areas. It has an approximately spherical shape to avoid edges that could prevent perfect contact with the soil, with a diameter of 85 mm. It measures the following soil parameters: volumetric water content, water potential, electrical conductivity, and soil temperature. The device sends data to the cloud via a LoRaWAN or NB-IoT communication protocol. The device is buried at the root level of the crop. It has a battery life of 2 to 4 years (depending on configuration) and operates with standard AA batteries. The data generated by HYDROBALL® is processed in the cloud (DENODL® API) and can be managed through easy-to-use web and mobile applications (DENODL® App), which facilitate irrigation management and decision-making in plant care, aiming to reduce water consumption and increase plant yield and quality.

Designed by DENODL® in Spain. Manufactured by DENODL® in the EU.

PRODUCT IMAGE*

* Image is subject to device version.

Applications

- The main objective of the device is to measure soil conditions, which allows for decision-making regarding plant care, in terms of resource consumption, quality, and productivity. The main applications of the product are found in the following sectors:
- Agricultural operations: cereals, vegetables, tropical trees, woody crops, fruit trees, among others.
- Green spaces and plants in urban environments: municipal public parks and gardens, trees along urban streets, flowers, planters, lawn areas.
- Private gardens: large complexes (hotels, hospitals, university campuses), large private gardens (villas and palaces, sports clubs), small private gardens (domestic users), recreational gardens.
- Sports areas: golf courses, football fields, tennis courts, any type of grass field for sports practice.
- Composting: composting plants, compost piles, and sludge processing to control moisture and temperature levels for proper maturation of compost or sludge.
- Ultimately, any application that requires soil monitoring to control water parameters and soil composition in order to promote plant growth or product transformation with maximum resource savings and maximum performance.

MAIN FEATURES

The probe is autonomous, requiring no datalogger or external power supply. It wirelessly sends data via a LoRaWAN communication protocol through an external device called HYDROPOLE (gateway), or directly to the cellular network in the case of NB-IoT models.

It is completely buried at the root level of the crop.

It operates with four AA batteries and has a battery life of 2 to 4 years, depending on the measurement period configuration and the data transmission algorithm.

The infrastructure is prepared for integrating the probe's data into digitized irrigation management systems. It allows integration with actuators from leading brands on the market.

The product is capable of collecting different types of measurements in a single device:

- Volumetric water content: measurement of the percentage of the amount of water present in the soil.
- Water potential: measurement of water availability for the plant based on soil texture, allowing the generation of the soil suction curve in real time. Measured in kPa.
- Apparent electrical conductivity: measurement that provides information about the presence of salts in the soil. Measured in dS/m.
- Temperature. Measured in °C.

Other measurements generated in the DENODL® API cloud application (in preparation).

- Soil suction curve.
- Soil texture.
- Field capacity, saturation point, and wilting point.
- Growing accumulated degrees.
- Soil evapotranspiration.

The device is robust, capable of withstanding strong mechanical forces and machinery impacts.

The device is water-and dust-resistant (IP68).

The device is easy to install and requires no maintenance beyond battery replacement.

TECHNICAL SPECIFICATIONS

Dimensions	Spherical shape, 85mm in diameter
Weight without batteries	450g
Weight with batteries	526g
Finish	Matte black White ceramic device base, finished on the bottom with a fiberglass plate featuring circular patterns. Harmonic design based on defined geometric proportions and rules.

Materials	Fiber reinforced plastics. Polyurethane resin. Ceramic. Electronic boards and components O-rings
Tolerances and quality standards	Designed and manufactured in the EU. Water- and dust -resistant (IP68). Resistant to impacts from agricultural machinery Resistant to temperatures up to 80°C.

Operating and storage conditions

The optimal operating temperature range is between -15°C and 80°C.

It is designed to operate in humid environments and saturated soils, in contact with earth and dust.

Store the device in a dry environment at a temperature between -15°C and 60°C.

Power supply and consumption

4 AA batteries of 1.5V, for optimal battery life, batteries with at least 3,000mAh should be used.

Standby power consumption: 4.6µA

Maximum power consumption during measurement and transmission: 60mA

Battery life: 2-4 years, depending on the transmission configuration.

Interface and connectivity

The device interface consists of:

- LED light.
- Button.
- USB-C port: Exclusively for technical maintenance and diagnostics.
- Battery compartment.

Measurements

Measurement range and maximum error for volumetric water content.	0% a 70%, +/- 3%
Measurement range and maximum error for water potential.	0kPa a 150 kPa, +/- 2kPa
Measurement range and maximum error for apparent electrical conductivity.	0dS/m a 6 dS/m, +/- 0,2dS/m
Measurement range and maximum error for temperature.	-40°C a +100°C, +/- 1°C

Warranty

The product is subject to the applicable warranty provisions in each county the warranty covers repair or replacement of the equipment

Technical Support Contact:

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Trade name: DENODL®

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Installation and operating instructions

Download the DENODL® App from the App Store or Play Store and log in. Then:

1. Dig a hole in the soil to reach the root depth of the crop you wish to monitor. Generally, the hole should not exceed 40cm in depth.

2. Record references for HYDROBALL®'s location. Although the probe is geolocated during the linking process, GPS accuracy is no better than 5m. Since the probe is buried, retrieving it without reference points may be difficult.

- Measure distances between points using a tape measure or any other reliable reference method.

- The HYDROBALL® menu in the DENODL® App includes a space for notes and a photo log. Write notes in references and take photos of the installation using the app. Notes and photographs will be saved in the app to facilitate HYDROBALL® retrieval.

3. Pair HYDROBALL® inside the plastic bag included in the box, without attaching the HYDROBALL® cap, so the button remains accessible. The bag protects HYDROBALL® without the cap from soil contact.

4. Perform a transmission test from within the hole:

- Place HYDROBALL® inside the plastic bag included in the box, without attaching the HYDROBALL® cap, so the button remains accessible. The bag protects HYDROBALL® without the cap from soil contact.

- Insert the bag into the hole and press the button. The LED will blink several times, indicating measurement in progress, followed by a long blink, indicating that data has been sent. Check the data transmission via the mobile app.

- After data transmission, remove the bag from the hole. Activate "field test mode" before final installation. To do this, open the battery compartment lid and close it while holding down the button. Then press the button three times consecutively. Attach the HYDROBALL® cap, taking care to prevent soil from contacting the open cap.

5. Prepare mud. This ensures proper soil contact with the HYDROBALL® surface. You'll need to bring a container of water. Pour water and soil into the container to create a dense mud. Pour the mud into the hole and place HYDROBALL® inside, slightly tilted, so that the mud fully surrounds the surface and ceramic base, leaving no air gaps between the soil and HYDROBALL®. Fill the hole with the remaining mud and soil from the field.

6. Confirm that HYDROBALL® transmits with the hole covered. For the first 4 hours, HYDROBALL® transmits every 10 minutes, allowing you to verify proper underground communication.

Data can be easily accessed and viewed through the DENODL® App, available in both web and mobile versions.

To ensure correct device operation, refer to the detailed installation instructions and video tutorials provided on the DENODL® website.

The device requires no maintenance or handling during operation.

Safety information

Do not disassemble or modify the device. Repairs should only be performed by authorized service personnel.

Do not expose the device to excessive heat sources or use it near flammable materials. Use only recommended accessories and power sources.

For operation in high-temperature environments (e.g., compost), use batteries suitable for such conditions.

Handle the device with care to avoid physical injury. Do not insert foreign objects into the device openings.

Use the device within the specified temperature range.

Transport the device in its original packaging to avoid damage. Do not drop or strike the device.

Use only the specified power source (AA batteries). Do not connect other cables to the device to avoid overloading the electrical circuits.

Do not dispose of the device in regular waste. Follow local regulations for the disposal and recycling of electronic waste. Use an authorized collection point.

Batteries must be recycled or disposed of according to local regulations.

Refer to the user manual for detailed information on installation, usage, and maintenance of the device.

For technical support, contact the manufacturer's support service.

Manufacturer Contact Information

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Revision History

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