



Vero Sensor

Substrate Moisture & EC · Temperature · Air RH · LoRaWAN · Bluetooth LE

USER MANUAL

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1 Safety Information

WARNING: BATTERY

Install only a correctly polarized 9 V battery. Do not short the terminals, mix damaged batteries with the device, or service the battery compartment with wet hands.

CAUTION: SENSOR PROBES

Do not force, bend, cut, or hammer the probes. Remove power before cleaning. Strong chemical cleaners may damage the housing or ceramic coating and may not be covered by warranty.

NOTE: MEASUREMENT PLACEMENT

Accurate trends need repeatable placement. Keep the exposed 3.5 in (89 mm) stainless-steel portion of the sensing needles fully in the grow medium. Return the sensor to the same position after service.

Intended use. The Vero Sensor monitors horticultural substrates and the surrounding air. Follow local battery-disposal rules and site safety procedures.

2 Product Overview & Specifications

The Vero Sensor measures substrate and air conditions in one battery-powered device. It includes high-frequency substrate sensing, protected air sensing, on-board storage, and two wireless links. Use Bluetooth LE for setup and nearby reads. Add a Growbud gateway for automatic long-range sync over LoRaWAN.

SUBSTRATE VWC + pwEC High-frequency sensing with selectable substrate profiles	ENVIRONMENT Temperature + RH Air and substrate temperature; app-calculated VPD	POWER 9 V battery Approximately 3 months under typical use
STORAGE 8 MB flash Approximately 3 months of historical data	LOCAL RADIO Bluetooth 5.0 LE Up to 300 ft (100 m), conditions permitting	LONG RANGE LoRa / LoRaWAN US915 or AS923; up to 2 mi (3 km), conditions permitting

2.1 Electrical and Environmental

PARAMETER	VALUE	NOTES
Battery	9 V alkaline or rechargeable Li-ion in 9 V format	One alkaline battery is included
Typical battery life	Approximately 3 months	Battery chemistry, temperature, radio use, and signal conditions affect life
On-board storage	8 MB flash	Persistent history; approximately 3 months at the configured logging interval
Electronics protection	Potted electronics	Built for outdoor-ready use; no formal ingress rating is claimed here
Cleaning interval	At least every 3 months	Clean sooner when residue is visible or readings become inconsistent

RANGE NOTE

Wireless ranges are maximum reference values. Walls, foliage, metal structures, antenna orientation, terrain, and radio interference can reduce practical range.

3 Installation & Placement

3.1 Unbox and Inspect

- 1. Confirm the package contains the Vero Sensor and one 9 V battery.
- 2. Inspect the housing, battery cover, and probes for transit damage.
- 3. Do not install a device with bent probes, a cracked housing, or damaged battery contacts.

3.2 Install the Battery

- 1. Remove the back cover.
- 2. Connect the 9 V battery with correct polarity and place it securely in the compartment.
- 3. Replace the cover. Touch the green center button with an ungloved finger; a blue LED blink confirms power.



3.3 Choose a Representative Location

Place the sensing needles near the wettest part of the container or block. Choose the zone where the plant continues to take up water and nutrients as surrounding media dries. Avoid isolated dry pockets, direct emitter contact, and positions where the probes can loosen. Use the same depth and orientation across comparable plants.

3.4 Insert the Sensor

Insert the full exposed 3.5 in (89 mm) sensing region and the short plastic-covered portion above it. This keeps the container edge from affecting the reading. Press straight into the media. If you install from the side of a container, confirm the sensor remains firmly supported after insertion.

DO	Keep the complete active region in uniform media.	DO	Record depth and orientation for repeat installations.
AVOID	Air gaps, container edges, large roots, and unstable placement.	SETTLE	Wait for one significant irrigation event before you judge trends.

PLACEMENT PRINCIPLE

The most useful reading is a repeatable reading from the root zone where the plant actively takes up water and nutrients.

4 Commissioning & App Setup

4.1 Get the Growbud App

Search for “growbud” in the Apple App Store or Google Play Store. You can also use the web app at www.growbud.app. Create an account to save device configuration and sensor data.



4.2 Pair the Sensor

- 1 Enable Bluetooth.** Keep the phone or tablet near the sensor.
- 2 Add the device.** In the Growbud app, choose the option to add or pair a sensor.
- 3 Enter pairing mode.** Touch the green center button with an ungloved finger. No pressure is required. The LED blinks blue while the device advertises.
- 4 Finish setup.** Select the discovered Vero Sensor, name it, and assign its grow location.

4.3 Verify Operation

ACTION	EXPECTED RESULT	IF IT DOES NOT OCCUR
Touch the center button	Blue LED blink	Check battery connection, polarity, and charge
Run Spot Check	A current sensor reading appears	Move closer, confirm Bluetooth is enabled, then retry
Review substrate values	Values appear after the read	Confirm exposed 3.5 in is fully inserted and the correct substrate profile is selected
Bluetooth sync	Stored history transfers to the app	Keep the app open and the device nearby until synchronization completes

4.4 Spot Check and Automatic Sync

After one-time pairing, you do not need to touch the button for a Spot Check. For unattended sync, pair the sensor with a Growbud gateway over LoRaWAN. Let a newly installed sensor settle through one significant irrigation event before you use its readings for irrigation decisions.

BEST PRACTICE

Name sensors by room, bench, zone, and plant position. Historical charts stay clear after you move devices.

5 Maintenance

5.1 Cleaning

1 POWER DOWN Remove the battery before cleaning.	2 WIPE Dampen a soft cloth or cotton swab with 70% or higher isopropyl alcohol.	3 DRY Gently remove soil and residue, then allow the device to dry completely.	4 REINSTALL Return the sensor to the documented depth and orientation.
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Clean the probes at least every 3 months and between crops. Clean sooner if mineral residue accumulates or readings become inconsistent.

CAUTION: STRONG CLEANERS
Bleach and other high-strength cleaners may degrade the housing and ceramic coating. If used, dilute thoroughly and rinse away all residue. Damage caused by harsh chemicals may not be covered by warranty.

5.2 Battery Replacement

1. Replace the battery approximately every 3 months or when the app shows a low-battery alert.
2. Remove the old battery and inspect the connector for contamination or damage.
3. Install a fresh 9 V battery with correct polarity, secure the cover, and confirm the blue LED blink.
4. Dispose of or recycle the old battery according to local requirements.

Rechargeable Li-ion batteries in 9 V packaging can be reused after each harvest. Keep a charged spare available where uninterrupted monitoring is important.

5.3 Routine Inspection

CHECK	INTERVAL	ACCEPTABLE CONDITION
Probe cleanliness	At least every 3 months	No heavy soil, salt, or fertilizer residue
Probe alignment	At every move	Straight, parallel, and firmly seated
Battery status	During app review	No low-battery alert; stable connection
Placement	After irrigation work or plant movement	Same documented depth, orientation, and root-zone position
Housing and cover	At battery replacement	No cracks, impact damage, or trapped debris

6 Sensing & Data

The Vero Sensor uses high-frequency sensing to measure the root-zone substrate. A protected air sensor monitors the surrounding environment. Substrate profiles in the app account for differences between common media.

6.1 Measurement Reference

MEASUREMENT	WHAT IT REPRESENTS	HOW TO USE IT
VWC	Volumetric water content: the fraction of media volume occupied by water	Track irrigation dryback, saturation, and consistency between plants
pwEC	Pore-water electrical conductivity: an estimate of salinity in water held by the substrate	Track nutrient concentration and salt movement as irrigation conditions change
Substrate temperature	Temperature at the sensing probes	Interpret root-zone conditions and compare irrigation response
Air temperature	Ambient temperature at the protected air sensor	Evaluate the crop environment around the sensor
Relative humidity	Ambient moisture in the air	Use with air temperature to understand transpiration demand
VPD	Vapor pressure deficit, calculated by the app from air temperature and humidity	Compare atmospheric drying demand across time and zones

6.2 Substrate Profiles

Select the substrate profile that most closely matches the installed media. Media properties affect the relationship between the raw response, VWC, and pwEC. Use one consistent profile when you compare devices or historical periods.

6.3 Data Storage and Retrieval

8 MB

persistent on-board flash memory

~3 months

historical storage at the configured logging interval

2 paths

Bluetooth sync nearby or automatic gateway synchronization

Stored measurements stay on the device until you retrieve and manage them. Synchronize regularly so recent history is available in the app. Long periods between visits should not leave data only on the sensor.

TREND FIRST

Freshly inserted probes may not represent settled media. Use Spot Check to verify operation. Then evaluate trends after the sensor stays in place through a significant irrigation event.

7 Communication

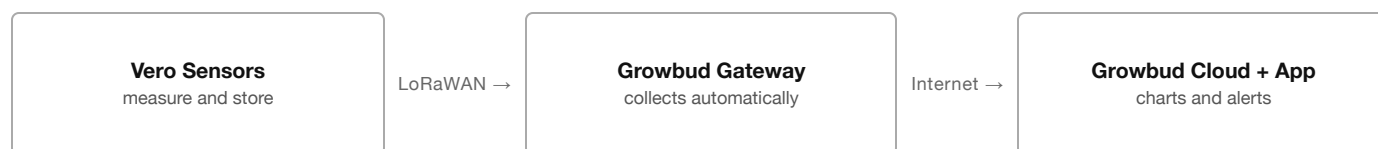
7.1 Bluetooth 5.0 Low Energy

CAPABILITY	VALUE	APPLICATION
Pairing and commissioning	Direct phone or tablet connection	One-time device setup and location assignment
Spot Check	Nearby current reading	Immediate checks without touching the button after pairing
Historical sync	Transfers on-board data to the app	Use when visiting a sensor without gateway coverage
Reference range	Up to 300 ft (100 m)	Best in open line-of-sight conditions; structures and foliage reduce range

7.2 LoRa / LoRaWAN

CAPABILITY	VALUE	APPLICATION
Frequency plan	US915 or AS923 MHz	Use the regional configuration appropriate for the deployment
Gateway connection	Growbud gateway	Automatic data synchronization without visiting each sensor
Reference range	Up to 2 mi (3 km)	Site layout, terrain, foliage, and interference affect practical range
Network scale	At least 100 sensors per gateway	Multiple gateways can work together at larger sites

7.3 Network Topology



7.4 Deployment Guidance

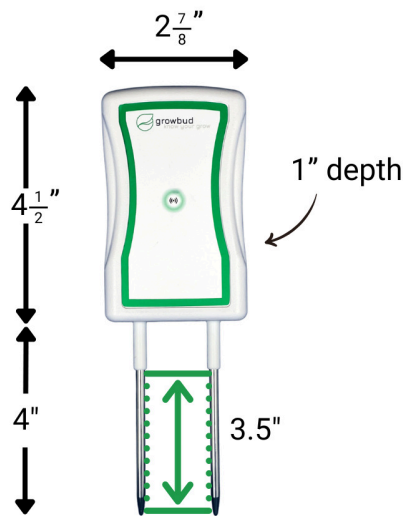
- Place gateways with as much height and clear line of sight as practical.
- Keep gateways away from large metal obstructions and dense equipment rooms.
- Verify every intended sensor position during commissioning. Do not rely only on maximum range values.
- Use multiple gateways where one location cannot provide reliable coverage across the site.

REGIONAL CONFIGURATION

LoRaWAN frequency plans are regulated by region. Use only the configuration approved for the installation location.

8 Mechanical Reference

8.1 Dimensions and Active Region



ACTIVE SENSING REGION

For the Vero, the exposed 3.5 in (89 mm) stainless-steel portion of the sensing needles is the portion used for substrate measurement. Keep it completely surrounded by uniform grow media.

8.2 Mechanical Specifications

PARAMETER	VALUE
Housing	Robust ABS plastic
Body width	2 7/8 in (73 mm)
Body height	4 1/2 in (114 mm)
Body depth	1 in (25 mm)
Probes	4 in (102 mm) exposed; 3.5 in (89 mm) active sensing region
Probe material	3/16 in stainless steel
Probe finish	Plant-safe ceramic coating for insulation and corrosion resistance
Electronics	Potted for outdoor-ready operation

8.3 Installation Constraints

- Insert the probes straight; do not use the housing as a lever.
- Support side-mounted sensors so media movement cannot loosen them.
- Keep the sensing region away from container walls and air gaps.
- Record placement before removal so the sensor can be returned consistently.

9 Troubleshooting, Warranty & Support

9.1 Troubleshooting

SYMPTOM	LIKELY CAUSE	ACTION
No blue LED blink	Battery is discharged, loose, or reversed	Remove and reconnect the battery with correct polarity; replace it if needed
Sensor not found during pairing	Not advertising, phone too far away, or Bluetooth disabled	Move closer, enable Bluetooth, and touch the center button with an ungloved finger
Spot Check does not complete	Weak local connection or low battery	Stay near the sensor, keep the app open, check battery status, and retry
Unexpected VWC or pwEC	Placement, air gaps, residue, or incorrect substrate profile	Inspect insertion depth, clean the probes, and confirm the app profile
Readings changed after service	Sensor returned to a different position	Restore the documented depth and orientation; allow one irrigation event to settle
Gateway does not receive data	Coverage, gateway connectivity, or regional configuration	Verify the gateway is online, confirm site coverage, and check the LoRaWAN region

9.2 Limited Warranty

The Vero Sensor includes a 1-year limited warranty from the date of purchase. It covers manufacturing defects and component failures under normal operating conditions.

Misuse, unauthorized repairs, impact damage, bent probes, incorrect battery installation, or damage from improper cleaning and harsh chemicals may void the warranty.

9.3 90-Day Return Policy

If you are not satisfied, return the product in original condition within 90 days, subject to Growbud return terms.

9.4 Getting Help

GROWBUD SUPPORT

support@growbud.io

www.growbud.io

Monday-Friday · 9 AM-5 PM

Include purchase details, the sensor name and location, battery type and age, screenshots of the issue, and a clear description of what happened.

BEFORE CONTACTING SUPPORT

Keep the sensor in place if possible. Note the most recent irrigation event. Do not delete the device from your account. This preserves the context needed to diagnose the issue.

Thank you for choosing Growbud. Clear root-zone data supports better cultivation decisions.