

PTM-NG26

Photosynthesis and Transpiration

Monitor

Technical Specification

1 Overview

The PTM-NG26 Photosynthesis Monitor is a modular system designed for continuous field and controlled-environment monitoring of plant gas exchange and physiological parameters. The system integrates multiple leaf gas-exchange chambers with a data logging and telemetry platform, enabling long-term autonomous operation and remote data access.

The PTM-NG26 is suitable for:

- Plant physiology research
- Controlled environment experiments
- Greenhouse and field phenotyping
- Stress and irrigation studies

2 System Architecture

The PTM-NG26 consists of the following main components:

2.1 System Controller

- Function: Central data acquisition, storage, processing, and communication unit
- Integrated cellular modem (LTE-M / NB-IoT / 4G depending on configuration)

2.2 PLS-10R Smart Phyto-Sensor™

- Function: Measurement of leaf-level gas-exchange parameters
- Quantity: 2 to 10 units

2.3 Optional Phytomonitoring Sensors

System can be extended with additional Phyto-Sensors™.

3 Measured Parameters

3.1 Primary Measurements

| Measurement | Parameter | Value |
|-------------------------------|-----------------------------------|---------------------------|
| CO ₂ Concentration | Range | 0 to 5000 ppm |
| | Resolution | 1 ppm |
| | Absolute accuracy | ±30 ppm ±3% of reading |
| | Differential Measurement Accuracy | better than ±1 ppm (typ.) |
| | Differential Measurement Interval | < 15 s |
| | | |

Notes: Differential accuracy is substantially higher than absolute accuracy, owing to the short-term stability of the sensor and the suppression of common-mode noise. When calculating gas-exchange rates (e.g., CO₂ uptake or release by a leaf), the difference between two readings taken within a short time interval is used, enabling a more precise determination of fluxes.

| | | |
|--|------------|---|
| Air Temperature | Range | 0 to 50 °C |
| | Resolution | 0.1 °C |
| Air Relative Humidity | Range | 0 to 100 %RH |
| | Resolution | 0.1 %RH |
| Leaf Temperature | Range | 0 to 50 °C |
| | Resolution | 0.1 °C |
| Photosynthetic Radiation | Range | 0 to 4000 $\mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$ |
| | Resolution | $1 \mu\text{mol} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$ |
| | | |
| Barometric Pressure | Range | 40 to 115 kPa |
| | Resolution | 0.1 kPa |
| Presence of water drops (rain, spraying) optional sensor | Range | 0 to 100 % |
| | Resolution | 1 % |

3.2 Key Derived Measurements

| Parameter | Units |
|---|---|
| Net CO ₂ Exchange (Photosynthesis / Respiration) | $\mu\text{mol CO}_2 \cdot \text{m}^{-2} \cdot \text{s}^{-1}$ |
| Transpiration Rate | $\mu\text{mol H}_2\text{O} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$ |
| Stomatal Conductance for CO ₂ | $\text{mm} \cdot \text{s}^{-1}$ |
| Stomatal Conductance for H ₂ O | $\text{mm} \cdot \text{s}^{-1}$ |
| Leaf-to-Air Temperature Difference (LATD) | °C |
| Air VPD (Air VPD) | kPa |
| Leaf VPD (Leaf VPD) | kPa |

4 Data Operation

| Parameter | Value |
|--------------------------|---------------------|
| Sampling interval | from 2.5 min |
| Internal microSD storage | 8–16 GB, expandable |
| Data transfer | USB, Cellular modem |
| Cellular modem | 2G/4G LTE-M/NB-IoT |
| Data transmission via | FTP(S) |
| Data formats | CSV, TXT |

5 Power

| Parameter | Value |
|----------------------|---|
| Power supply | External DC supply 12 V DC, 220 mA + 300 mA per PLS- 10R Smart Phyto- Sensor™ |
| Sensor power control | switching (to reduce consumption) |