

Comparison of the PTM-50 Photosynthesis Monitor with the LI-6400 and other portable or handheld instruments

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In fact, it is difficult to make unbiased comparison of PTM-50 and LI-6400 as they are of different design and purpose. The PTM-50 records continuously in natural leaf environment while the LI-6400 makes a short-term test in controlled environment inside a sealed leaf chamber. To make a right choice, customer has to analyze purpose and conditions of a study rather than to compare details of specifications.

| PERFORMANCE CHARACTERISTICS | PTM-50 | LI-6400 |
|---|---|---|
| Main purpose of application | Evaluation of real productivity of growing plants, and their short- and long-term physiological response to changing environmental conditions. | Evaluation of instant physiological characteristics of a leaf under study, and its response to controlled environmental changes inside the leaf chamber. Allows producing light and CO ₂ response curves. |
| Mode of operation | Automatic sampling | Manual start of every measurement session. |
| Leaf chamber design | Normally open leaf chamber, motorized for automatic closing during short measurement cycle. | Manually handled leaf chamber |
| Need for sealing the chamber on a leaf | Minor, inessential | Tight sealing is critical |
| Number of leaf chambers (measurement channels) | 4 | 1 |
| Ability to measure automatically several species simultaneously in comparative study. | Up to 4 species | No |
| Approach for providing minimal disturbance of the natural conditions of a leaf. | Automatic open/close leaf chamber with short-term closed position: less than 30 sec only. | Automatic control of environment inside the leaf chamber. |
| Built-in sensors: | <ul style="list-style-type: none"> ▪ Quantum (PAR) sensor ▪ Air temperature and humidity ▪ Leaf temperature (touch probe) ▪ CO₂ concentration ▪ Air flow rate ▪ Atmospheric pressure | <ul style="list-style-type: none"> ▪ Quantum (PAR) sensor ▪ Air temperature and humidity ▪ Leaf temperature (touch probe) ▪ CO₂ concentration ▪ Air flow rate ▪ Atmospheric pressure |
| Optional wireless sensors | <ul style="list-style-type: none"> ▪ Quantum (PAR) sensor ▪ Pyranometer ▪ Leaf wetness ▪ Air temperature and humidity ▪ Leaf temperature (touch probe) ▪ Leaf temperature (infrared) ▪ Sap flow rate ▪ Dendrometer (3 models) ▪ Fruit growth (4 models) ▪ Soil moisture, EC and temperature ▪ Auxanometer. | No |
| Data storage memory | Single record consists of 33 measured and 10 computed variables. Memory capacity is 1000 records (that is 500 hours at 30-minute sampling interval) | 64 MB flash memory for data storage. 55 measured and 13 computed variables. |
| Interface (data transfer) | Wireless. 2.4 GHz built-in modem coupled with a special USB wireless adapter for PC. Communication distance: up to 1 km line-of sight. | RS232 |
| Power consumption and work time. | Over 16 days with the normal car battery (12 VDC, 55-60 Ah). | 12 VDC, 4A (10 A peak), 4-8 hours with the built-in batteries. |

To be fair, we have to say that LI-6400 is excellent portable laboratory for discovering many essential characteristics of the leaf. At designing the PTM-50, we were far from the idea to make an automatic version of LI-6400. The multi-channel PTM-50 is focused on continuous monitoring of undisturbed leaves in natural conditions. The records allow calculating net daily CO₂ balance, and evaluating plant

response to natural variations of environment. This approach is especially useful when studying response of plant productivity to factors others than those affecting leaf photosynthesis immediately. Irrigation, temperature regime, fertilization, root zone factors, fruit load and picking, canopy treatments, supplemental lighting, and application of bioregulators are among them. Plant response (or adaptation) may continue hours and days. In that case, the PTM-50 provides a unique ability of recording the whole process. Besides, the PTM-50 makes gas exchange measurements in four replications that may improve statistics or, alternatively, allows carrying out comparative study with several species or treatments.

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