

Comparison of the PTM-48A Photosynthesis Monitor with the LI-6400 and other similar portable or hand-held instruments

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In fact, it is difficult to compare PTM-48A and LI-6400 as they are of fairly different function and purpose. As the result of this, the PTM-48M has many capabilities, which are omitted in LI-6400, and visa versa. The table below includes a list of main functional capabilities of PTM-48A with reference to similar characteristics of LI-6400.

PERFORMANCE SPECIFICATION	PTM-48M	LI-6400
Main purpose of application	Continuous round-the-clock automatic measurement and recording of actual photosynthesis and transpiration of several leaves <i>in situ</i> .	Instant measurement of leaf photosynthesis and transpiration in controlled variable environment that allows generating light and CO ₂ response curves.
Mode of operation	Automatic sampling with preset user-defined time interval.	Manual start of every measurement session.
Leaf chamber design	Normally open leaf chamber with the pneumatic drive for automatic closing during measurement cycle.	Manual operation
Requirement for sealing the chamber on a leaf	Minor, insubstantial	Tight sealing is essential
Number of leaf chambers (measurement channels)	4	1
Ability to measure several species simultaneously in comparative study.	From 2 to 4 species	None
Approach for providing minimal disturbance of the natural conditions of a leaf.	Automatic open/close leaf chamber with short-term closed position: 30 s only.	Automatic control of temperature, CO ₂ concentration, air humidity, and light inside the chamber.
Partitioning of the measured photosynthesis rate	Auxiliary dark leaf chamber enables automatic measurement of photorespiration and dark respiration in every measurement cycle by using PIB technique.	Not available (?)
Optional sensors:	The following optional sensors may be easily and trouble-free connected to and configured in the PTM-48A: <ul style="list-style-type: none"> ▪ Quantum sensor and/or Pyranometer ▪ Air temperature and humidity ▪ Leaf wetness ▪ Leaf temperature (touch probe) ▪ Leaf temperature (infrared) ▪ Sap flow rate ▪ Dendrometer (3 models) ▪ Fruit growth (4 models) ▪ Soil temperature ▪ Soil moisture ▪ Soil EC ▪ Auxanometer Most of third-party sensors may be also connected and configured.	Has inputs and configuration procedure for third-party sensors.
Data storage memory	One record includes 33 measured and 10 computed variables. Memory capacity is 1000 records (i.e. 500 hours at 30-min sampling interval)	64 MB flash memory for data storage. 55 measured and 13 computed variables.
Interface (data transfer options)	RS232, RS485, RF modem, GPRS	RS232
Power consumption and work time.	Over 16 days with the normal car battery (12 VDC, 60 Ah).	12 VDC, 4A (10 A peak), 4-8 hours with the built-in batteries.

To be impartial, we have to say that LI-6400 is an excellent movable micro laboratory that enables measurement and computation of many essential characteristics of the leaf in vivo. At designing PTM-48A, we were quite far from the idea to make the automatic version of LI-6400 or other similar instrument. The multi-channel PTM-48A is focused on continuous monitoring of natural photosynthesis and transpiration of several undisturbed leaves. This allows calculating the net daily CO₂ balance, and evaluating plant response to natural variations of environmental factors. This approach seems to be especially useful when investigating response of plant productivity to factors others than those affecting the leaf photosynthesis directly. Irrigation scheduling and rate, diurnal temperature regime, fertilization, root zone factors, fruit load and picking, canopy treatments, supplemental lighting, and application of bioregulators are among them. The transient process of plant response (or adaptation) may continue hours and days. In that case, the PTM-48A provides a unique capability of recording the whole process in terms of leaf gas exchange, plant water status and growth against all measurable environmental factors. In addition to that, the PTM-48A makes gas exchange measurements in four replications that may improve statistics or, alternatively, allows carrying out comparative study of two to four species or treatments.

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