User Manual R1.0
Santacary Technology Co. Ltd.
MHK-P150 Quantum PAR Light Meter

Santacary

INTRODUCTION

Congratulations on your purchase of Santacary MHK-P150 Quantum PAR Light Meter.

The light that drives photosynthesis in plants is Photosynthetically Active Radiation or PAR light and is typically defined as total radiation across a range of 400 to 700 nm. This is also referred to as Quantum light, because it is measured in units of moles striking an area over time. PAR is universally quantified as Photosynthetic Photon Flux Density (PPFD), the sum of photons in units of micromoles per square meter per second ($\mu mol \cdot m^{-2} \cdot s^{-1}$). This portable Quantum PAR Light Meter is designed to measure PAR flux.

There is a proportional relationship between the number of photons absorbed in 400 to 700 nm band and the rate of photosynthesis in plants, which is important for horticultural studies and monitoring plant physiology. Though PAR light ranges from 400 to 700nm, the region brightest to human eyes is the area of least effect on plants. Measuring quantum light can tell you if your plants are getting a sufficient amount of usable light. This meter provides a real-time PPFD reading on the LCD display, that determines the radiation incident on a planar surface. It can measure up to 9999 $\mu mol \cdot m^{-2} \cdot s^{-1}$.

This quantum light meter also measure Daily total PPFD. Daily total PPFD is typically reported in units of moles of photons per square meter per day ($mol \cdot m^{-2} \cdot d^{-1}$) and is often called Daily Light Integral (DLI).

Typical applications include measurement of incident PPFD on plant canopies in outdoor environments or in greenhouses and growth chambers, and reflected or under-canopy (transmitted) PPFD

measurement in the same environments. MHK-P150 is ideal for gardeners, agronomy application measuring PPFD.

FEATURES

- ✧ Provides accurate PAR light readings from full sun to full shade indoors or outdoors and artificial light sources (LED, High Pressure Sodium, Metal Halide, Fluorescent, and Halogen)
- ✧ PAR light measuring range from 0 to 9999 $\mu mol \cdot m^{-2} \cdot s^{-1}$
- ✧ Support three modes of operation:
  - ➢ Instant spot-check measurement mode for PAR light readings PPFD;
  - ➢ Scan mode for quickly averaging PAR over an area;
  - ➢ DLI mode shows Daily Light Integral
- ✧ Accurate and instant response
- ✧ Three AA alkaline batteries

APPLICATION:

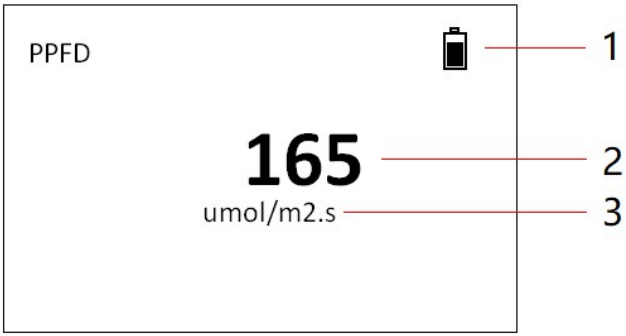
- ✧ Measurement of incident PPFD on plant canopies in outdoor environments or in greenhouses and growth chambers, and reflected or under-canopy (transmitted) PPFD measurement in the same environments
- ✧ For gardeners, agronomy application measuring PPFD

DEVICE

1. PAR light sensor
2. TFT LCD display
3. Power button
4. Select button
5. Enter button

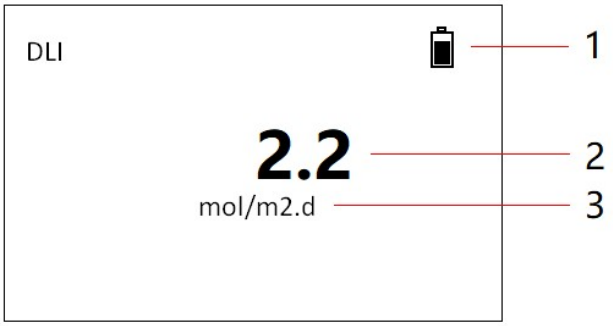
DISPLAYS

PPFD Display



1. Battery gauge
2. PPFD value
3. PPFD unit ($\mu mol \cdot m^{-2} \cdot s^{-1}$)

DLI Display



1. Battery gauge
2. DLI value
3. DLI unit ($mol \cdot m^{-2} \cdot d^{-1}$)

DAILY LIGHT INTEGRAL (DLI)

DLI is displayed in moles per square meter per day. The typical range

for DLI is 3 to 26 $mol \cdot m^{-2} \cdot d^{-1}$. This is useful for understanding the average amount of light your crop sees in a day. One mole is equal to one million micromoles.

Each type of plant has a different DLI range for optimal growth. DLI is directly correlated with plant quality, and a minimum amount of light is required for marketable plants. Measuring DLI can guide in decisions regarding shade cloths and supplemental light.

MHK-P150 Quantum PAR Light Meter is designed for spot-check measurements, and calculation of DLI through the built-in logging feature.

OPERATING INSTRUCTIONS

1. **Turn on the meter**

While the meter is turned off, press Power button shortly to turn on the meter. When the meter is first turned on, it performs 2 second countdown for meter warm up, then enters PPFD Display. The meter starts taking measurements when power on and updates PPFD readings every 1 second. The unit of PPFD is $\mu mol \cdot m^{-2} \cdot s^{-1}$, which is displayed at the same time.

2. **Scanning an Area for Average PAR Light**

While the meter is displaying instantaneous PPFD readings press Power button shortly, then move the light meter steadily and fluidly under the area for which you desire an average light reading. The LCD will display “SCAN” on screen up-right side while the scanning is being implemented. Scanning can be done for up to 30 seconds or press

power button ⏻ shortly to end the scanning. Once ended, the meter will display the average light reading from the duration of the scan.

3. **Daily Light Integral Readings**

The MHK-P150 Quantum PAR Light Meter takes a light reading every 3 minutes to use in calculating a 24-hour Daily Light Integral (DLI). Every 15 minutes the previous 24 hours of stored readings are used to recalculate the DLI. Readings are automatically taken whether the meter is on or off, as long as there are batteries in the meter, including after a power cycle (off and on).

While the meter is displaying instantaneous PPFD readings, press SELECT button shortly, the current DLI value will be displayed on the LCD. Press SELECT button again to switch back to instantaneous PPFD display. In this way, press SELECT button shortly to switch PPFD and DLI displays in loop.

The DLI calculation can be reset to zero in below menu operation. The integration and calculation of DLI will start accumulating a new 24 hours' worth of 3-minute readings from that point forward.

4. **Menu operations**

By pressing the Enter button ENTER shortly, the meter enters into Menu operation. There are three menu items by pressing the enter button ENTER shortly to loop. The menu items are described in table 1.

Table 1 Menu Operations

Menu Items	Functional Description
Reset DLI	The DLI calculation can be reset to zero. The integration and calculation of DLI will start accumulating a new 24 hours' worth

	of 3-minute readings from that point forward.
Zero the sensor offset	1) Keep the sensor completely dark (such as covering the sensor with a black opaque object) 2) Pressing Select button SELECT shortly to reset the sensor offset and exits the MENU operation. Return to the normal measurement state.
Exit	Exit the Menu and proceed to PPFD Display

5. **Turn off the meter**

When the measurement is completed, press power button for 2 seconds to turn off the meter.

COSINE RESPONSE (SUN ANGLE EFFECT)

Ideally a horizontally projected light source should show no available light for your crop regardless of its intensity. Conversely, a directly overhead light source will have 100% of its light available for your crop. Some of the radiation coming into a sensor at low angles is reflected, causing low readings. This is called cosine effect. The convex optical disc found on the sensor of this meter is designed to capture radiation at low angles and minimize cosine response errors.

SPECIFICATIONS

PAR Specification

Measuring Range	0 to 9999 $\mu mol \cdot m^{-2} \cdot s^{-1}$
Spectral Range	400-700 nm

Sensitivity	1 $\mu mol \cdot m^{-2} \cdot s^{-1}$
Response Time	<1s (99%)
Temperature Correlation	Max. 0.05%/°C
Cosine Correction Incident angle	Up to 80° incident angle

General

Display	2.2" TFT LCD
Operating	-10°C to 50°C (14°F to 122°F), 0~90% RH non-condensing
Storage	-10°C to 60°C (14°F to 140°F), 0~80% RH non-condensing
Power Supply	Three AA Alkaline Batteries
Meter Dimensions	74x148x26.5mm (2.91x5.83x1.04")
Weight	120 grams (4.23 oz.) without batteries

MATERIALS SUPPLIED

- ✧ Santacary MHK-P150 Quantum PAR Light Meter
- ✧ Carry case
- ✧ User Manual

MAINTENANCE

Blocking of the optical path between the target and meter can cause low readings. Occasionally, accumulated materials on the diffuser of the upward-looking sensor can block the optical path in three common ways:

1. Moisture or debris on the diffuser.
2. Dust during periods of low rainfall.
3. Salt deposit accumulation from evaporation of sea spray or sprinkler

irrigation water.

Dust or organic deposits are best removed using water, or window cleaner, and a soft cloth or cotton swab. Salt deposits should be dissolved with vinegar and removed with a cloth or cotton swab. Salt deposits cannot be removed with solvents such as alcohol or acetone. These can damage the white diffuser disk. Use only gentle pressure when cleaning the diffuser with a cotton swab or soft cloth to avoid scratching the outer surface. Mild soap may be used. The solvent should be allowed to do the cleaning, not mechanical force. Never use abrasive material or cleaner on the diffuser.

CLEANING AND STORAGE

The front panel and case can be cleaned carefully with a soft wet cloth. Allow drying completely before using. Do not use aromatic hydrocarbons or chlorinated solvents for cleaning.
Do not store the meter where temperature or humidity is excessively high.

RECOMMENDED DLI

Generalized plant responses to different light levels

Relative light level	**DLI** ($mol \cdot m^{-2} \cdot d^{-1}$)	**PPFD at Noon** ($\mu mol \cdot m^{-2} \cdot s^{-1}$)	**Generalized plant growth response**
Very Low	2 to 5	100 to 200	Poor quality
Low	5 to 10	200 to 400	Minimum acceptable
Medium	10 to 20	400 to 800	Good quality
High	20 to 30	800 to 1200	Excellent quality
Very High	30 to 60	1200 to 2000	Excellent quality

Recommended DLI for crops

Crop	Recommended DLI ($mol \cdot m^{-2} \cdot d^{-1}$)	Light hours per day
Seedlings (first 2 weeks)	6-8	16 hours - less direct light (8 inches from canopy)
Seedlings (weeks 3-4)	10-12	16 hours - less direct light (6 inches from canopy)
Greens - lettuce, kale, chard, etc	14-16	14-16 hours per day
Tomatoes, melons, vining crops	25-35	18-20 hours per day

WARRANTY

The MHK-P150 is warranted to be free from defects in material and workmanship for a period of two years from the date of purchase. This warranty covers normal operation and does not cover misuse, abuse, alteration, neglect, improper maintenance.

CONTACT US

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