



# Quantum PAR Light Meter

## PRODUCT MANUAL

Item # 3415A

FOR USE UNDER ANY LIGHT SOURCE, INCLUDING LED



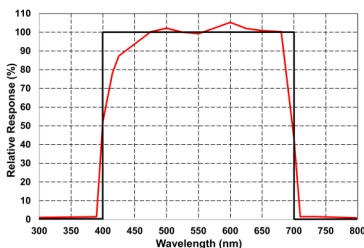
***Spectrum***<sup>®</sup>  
***Technologies, Inc.***

# FEATURES

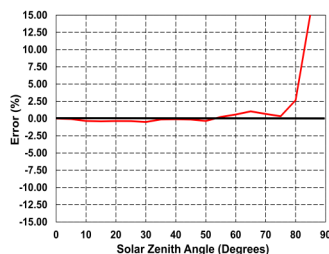
- Provides accurate PAR light readings from ANY light source:
  - Full sun to full shade indoors or outdoors.
  - Artificial light sources (LED, High Pressure Sodium, Metal Halide, Fluorescent, Halogen...).
- Three modes of operation:
  - Instant Spot Measurement mode for PAR light readings.
  - Scan mode for quickly averaging PAR over an area.
  - DLI mode shows Daily Light Integral on the LCD (no computer needed).
- Integral mounting plate for: stand, stake, lanyard & hanger hole, and magnet mounts.
- Small size allows light readings in tight spaces - no need for an external sensor.
- 1/4-20 threaded hole for mounting on camera tripods & stands.
- Includes sensor cover & soft carrying case.

# SPECIFICATIONS

|                                    |  |
|------------------------------------|--|
| <b>Range:</b>                      | PAR Light 0.0 to 6500 $\mu\text{mol m}^{-2}\text{s}^{-1}$ , 400 to 700nm<br>DLI (Daily Light Integral) 0.0 to 560.0 moles $\text{m}^{-2}\text{day}^{-1}$                       |
| <b>Display Resolution:</b>         | PAR Light 0.1 $\mu\text{mol m}^{-2}\text{s}^{-1}$ from 0.0 to 99.9,<br>1 $\mu\text{mol m}^{-2}\text{s}^{-1}$ from 100 to 6,500<br>DLI 0.1 moles $\text{m}^{-2}\text{day}^{-1}$ |
| <b>Accuracy:</b>                   | $\pm 5\%$ (each meter is calibrated to a NIST traceable light sensor on a broad-spectrum light source)   |
| <b>Azimuth Error:</b>              | $\pm 1\%$ over 360°  |
| <b>Daily Light Integral (DLI):</b> | Calculated continuously from light readings every 3 minutes  |
| <b>Water Resistant:</b>            | IP-65 rated for use in rain, irrigation, and condensing environments (do not submerge)   |
| <b>Operating Environment:</b>      | 32-130°F(0-55°C) with 0-100% RH (condensation ok)  |
| <b>Battery:</b>                    | CR2032 3v lithium coin cell included (2-year battery life)   |
| <b>Size &amp; Weight:</b>          | 5.75 x 1.75 x 0.85in (14.6 x 4.5 x 1.8cm), 0.17lb (77g)  |
| <b>Response Data:</b>              | (Red line is meter response; Black line is ideal response)   |

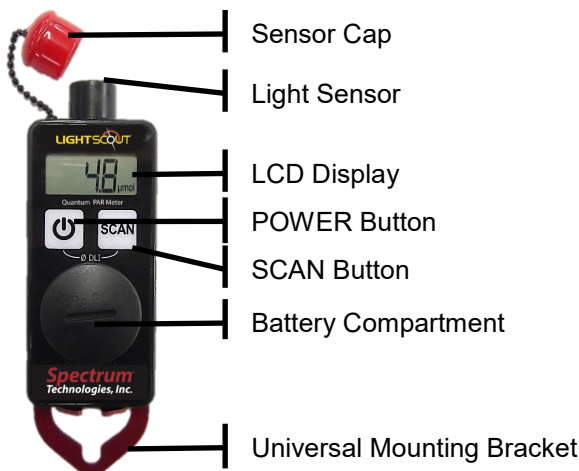


Spectral Response



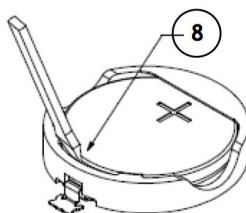
Cosine Response

# METER COMPONENTS



## CHANGING THE BATTERY

The LCD will show an empty battery icon when it is time to change the battery. Remove the screw cover of the battery compartment by rotating counter clockwise. A coin may be required to loosen the cover. Gently pry out the old battery with a small knife or tiny screwdriver as shown below, being careful not to damage the battery holder. Replace with a new CR2032 lithium coin cell battery and replace the screw cover. Tighten the cover clockwise until the o-ring seal is slightly compressed.



**WARNING:** Battery can explode or leak and cause burns if installed backwards, disassembled, charged, or exposed to water, fire or high temperature.

CR2032 Battery CALIFORNIA ONLY: Perchlorate Material – special handling may apply. See [www.dtsc.ca.gov/hazardouswaste/perchlorate](http://www.dtsc.ca.gov/hazardouswaste/perchlorate).

# METER OPERATION

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## Cleaning the Sensor

Use a damp cloth to clean the light sensor; mild soap may be used if needed. Do NOT use chemicals like alcohol, acetone, or ammonia-based cleaners. These can damage the white diffuser disk.

## Instantaneous PAR Light Readings



Remove the sensor cap and press the POWER button to turn on the meter. The DLI value is displayed for 3 seconds (see DLI section). The meter then measures and displays instantaneous PAR light readings about once per second. The meter's software automatically stabilizes readings from 50 or 60 Hz light sources.

The display automatically turns off after 5 minutes if no buttons are pressed. You can also turn it off by pressing the POWER button.

## Scanning an Area for Average PAR Light



While the meter is displaying Instantaneous readings press and hold the SCAN button, then move the light meter steadily and fluidly under the area for which you desire an average light reading. Scanning can be done for up to 35 seconds. The LCD will flash "SCAN" while the button is held, once released, the meter will display the average light reading from the duration of the scan. This average reading will be displayed for 4 seconds before the meter returns to instantaneous readings.

**Note:** To take a light measurement where the display cannot be read, press and hold the SCAN button for 1 second. The reading will then be displayed for 4 seconds.

# METER OPERATION

## Daily Light Integral (DLI) Readings

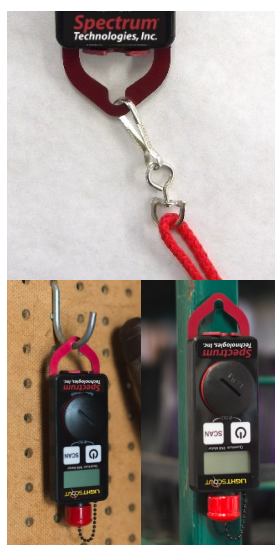


The LightScout® Quantum PAR Light Meter takes a light reading every 3 minutes to use in calculating a 24-hour Daily Light Integral (DLI). Every 15 minutes the previous 24 hours of stored readings are used to recalculate the DLI. Readings are automatically taken whether the meter is on or off, as long as there is a battery in the meter. The current DLI value will be displayed on the LCD for 3 seconds every time the meter is turned on, including after a power cycle (off and on).

The DLI calculation can be reset to zero by pressing and holding both the POWER and SCAN buttons simultaneously until you the DLI value changes to 0.0. The integration and calculation of DLI will start accumulating a new 24 hours' worth of 3-minute readings from that point forward.

## Mounting Bracket Configurations

Lanyard  
Hanger / Magnet



Stake



Vertical Stand



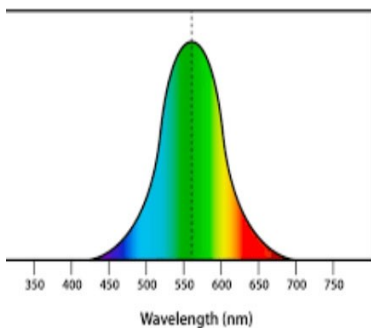
# UNDERSTANDING PAR LIGHT

The LightScout® Quantum PAR Light Meter is designed for measuring PAR light indoors and outdoors regardless of light source type. It works well for greenhouse, field, and R&D applications requiring reliable plant growth light readings.

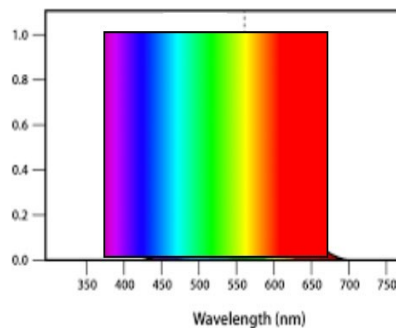
The chemical reaction of photosynthesis requires light. Unlike energy based light measurements, the quantum (quantity) of photons is measured since it can be directly tied to the number of these chemical reactions that can take place. The measure of all available light between the wavelength (color) range of 400 to 700 nanometers (nm) has been accepted as the best measure of light available for photosynthesis. This is defined as quantum Photosynthetic Active Radiation (PAR) in units of  $\mu\text{mol m}^{-2} \text{s}^{-1}$ . This is referred to as PAR light, Quantum light, PPF (photosynthetic photon flux - photons emitted by a light), and PPFD (photosynthetic photon flux density - photons hitting a surface) interchangeably, and is the total quantity of photons in  $\mu\text{moles}$  over the light spectrum from 400 to 700 nm hitting a one-meter square area every second. One micromole is equal to 602,214,085,700,000,000 ( $6.022 \times 10^{17}$ ) photons of light!

This is not the same as foot candle or lux measurements as shown in the figures below.

**Foot-Candle/Lux Meters**  
(Human Eye Response)



**PAR Meters**  
(Plant Response)



# UNDERSTANDING PAR LIGHT

## Daily Light Integral (DLI)

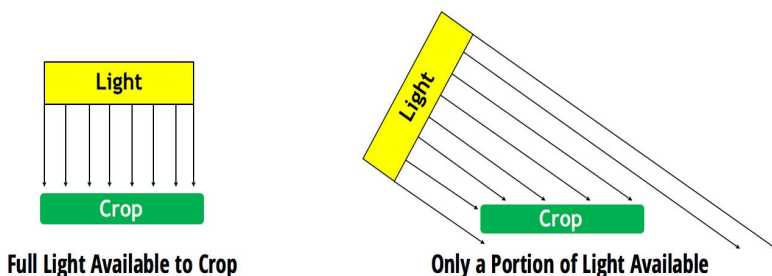
If photons were raindrops, light meters would show the intensity of a rainstorm. A five minute rainstorm may look impressive, but often provides less water than an all-day drizzle. As cumulative rainfall is measured with a rain gauge, the cumulative quantity of light is measured by recording and summing the light intensity over time, by convention, a 24 hour period.

The LightScout® Quantum PAR Light Meter can also determine the total number of photons incident on one square meter over a 24-hour period. This is defined as the Daily Light Integral (DLI) and is displayed in moles per square meter per day. The typical range for DLI is 3 to 26 moles  $\text{m}^{-2} \text{day}^{-1}$ . 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 lighting.

## Cosine Response (Sun Angle Effect)

This meter is designed to accurately display light intensity readings  $\pm 80^\circ$  from vertical. As illustrated below, less light is hitting your crop as the light source (sun) is tilted from vertical. This is called cosine effect and is accurately measured by the specially shaped diffuser on the top of the light sensor. 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.



# WARRANTY

This product is warranted to be free from defects in material or workmanship for one year from the date of purchase. During the warranty period Spectrum will, at its option, either repair or replace products that prove to be defective. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, or unauthorized modifications, or to incidental or consequential damages beyond the Spectrum product. Before returning a failed unit, you must obtain a Returned Materials Authorization (RMA) from Spectrum. Spectrum is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company.



## DECLARATION OF CONFORMITY

Spectrum Technologies, Inc.  
3600 Thayer Court  
Aurora, IL 60504 USA

Model Number: 3415A  
Description: LightScout Quantum PAR Light Meter  
Type: Electrical Equipment for Measurement, Control, and Laboratory Use  
Directive: 2014/30/EU  
RoHS Directive: 2011/65/EU  
Standards: EN 61326-1:2013  
EN 55011:2016+A1:2017

Michael Dunning, Director of Product Strategy

July 1, 2020

# ***Spectrum® Technologies, Inc.***

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