



Turf-Tec Light Meter for Quantum PAR - Spot On Model - LIGHT-PAR-W Instructions



An affordable meter that provides scientifically accurate Photosynthetic Active Radiation (PAR) light readings. This 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, PPFD, PPF, and Quantum light interchangeably and is the total quantity of photons in μmoles over the light spectrum from 400 to 700 nm hitting a one-meter square area every second.



The 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.

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, Florescent, 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).
- Compact and easy to use.
- Integral mounting plate for: stand, stake, lanyard & hanger hole, and magnet mounts.
- Small size allows light readings in tight spaces without needing an external sensor
- ¼-20 threaded hole for mounting on camera tripods & stands
- Water & Impact resistant
- Includes sensor cover & soft carrying case



Specifications

Range:	PAR Light	0.0 to 6,500 $\mu\text{mol m}^{-2} \text{s}^{-1}$
	DLI (Daily Light Integral)	0.0 to 560.0 moles $\text{m}^{-2} \text{day}^{-1}$
Display Resolution:	PAR Light	0.1 $\mu\text{mol m}^{-2} \text{s}^{-1}$ from 0.0 to 99.9 1 $\mu\text{mol m}^{-2} \text{s}^{-1}$ from 100 to 6,500
	DLI	0.1 moles $\text{m}^{-2} \text{day}^{-1}$
Accuracy:	+/- 5% (Each meter is calibrated to a NIST traceable light sensor on a broad-spectrum light source.)	
Azimuth Error:	+/- 0.5% over 360°	
Daily Light Integral (DLI):	Calculated continuously from light readings every 3 minutes	
Water Resistant:	IP-65 rated for use in rain, irrigation, and condensing environments (do not submerge)	
Operating Environment:	32-130°F(0-55°C) with 0-100% RH (condensation ok)	
Battery:	CR2032 3v coin cell lithium included (2-year battery life)	
Size & Weight:	1.75in(4.5cm)W x 5.75in(14.6cm)L x .85in(1.8cm)D/ 0.17lb(77g)	
Response Data:	See Fig. 3 for Spectral Response Graph See Fig. 4 for Cosine Response Graph (Red line is meter response; Black line is ideal response)	

LIGHT-PAR-W – Turf-Tec Light Meter for Quantum PAR – Spot On



Turf-Tec Light Meter for Quantum PAR - Spot On Instructions

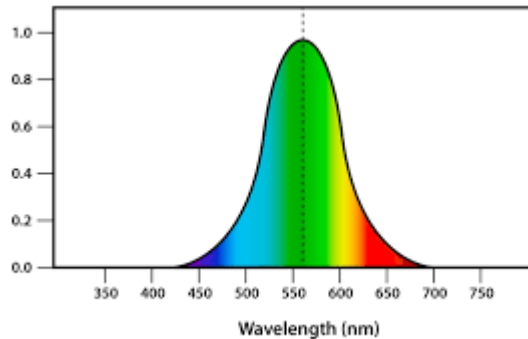
An affordable meter that provides scientifically accurate Photosynthetic Active Radiation (PAR) light readings under any light source including LEDs!

Understanding PAR Light:

This 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, PPF, and Quantum light interchangeably and is the total quantity of photons in μmoles 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 photons of light! This is not the same as foot candle or lux measurements as shown in Fig. 1.

Foot Candle/Lux meters measure: (Human Eye Response)



PAR meters measure: (Plant Response)

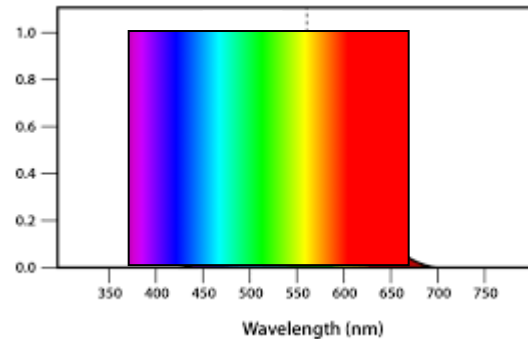


Fig. 1 – PAR vs. Human Eye Spectrum

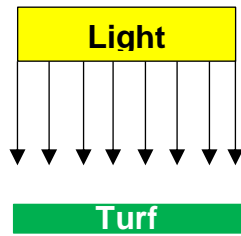
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Understanding Cosine Response (Sun Angle Effect):

This meter is designed to accurately display light intensity readings $\pm 80^\circ$ from vertical. As illustrated in Fig. 2, 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.

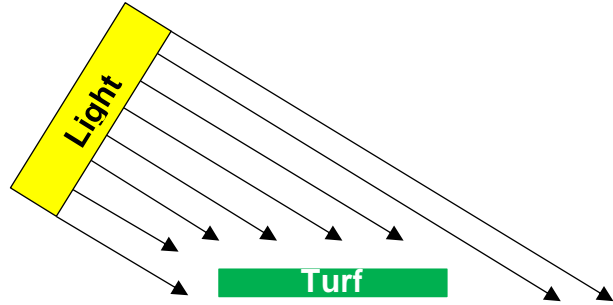
Fig. 2 - Cosine Effect

Vertical Light:



Full Light Available to Turf

Same Light at an Angle:



Only a Portion of Light Available

Response Data:

See Fig. 3 for Spectral Response Graph
See Fig. 4 for Cosine Response Graph
(Red line is meter response; Black line is ideal response)

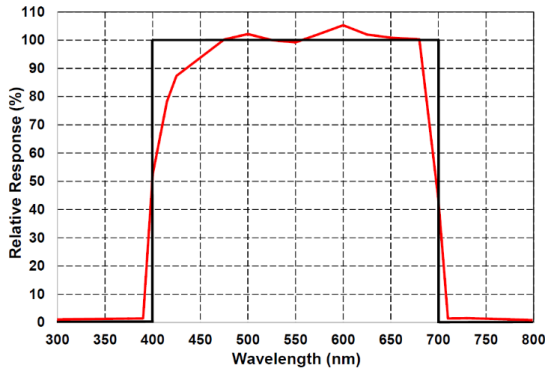


Fig. 3 – Spectral Response

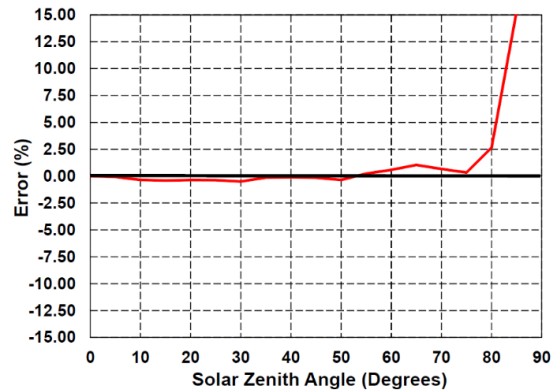


Fig. 4 – Cosine Response

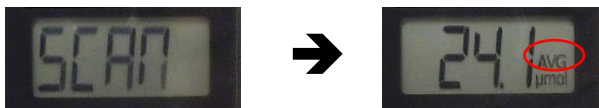
USE OF PRODUCT:

Instantaneous PAR Light Readings



Remove the sensor cap and press the POWER button to turn on the meter. Wait 3 seconds while the DLI value is displayed. 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 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: the SCAN function

can be used to hold or freeze readings on the display (for 4 seconds) when taking measurements in a location where it is not possible to view the display.

Daily Light Integral (DLI) Readings



The SpotOn® Quantum PAR Light Meter always takes a light reading every 3 minutes. The Daily Light Integral (DLI) is calculated from the past 24 hours of 3-minute readings and is updated every 15 minutes. Readings are automatically taken regardless if the meter's display is on or off. The DLI value is displayed on the LCD for 3 seconds every time the meter is turned on. The current DLI value can be viewed by turning the meter on or power cycling (off and on) as needed.

The DLI calculation can be reset to zero by pressing and holding both the POWER and SCAN buttons simultaneously until you see the DLI value change 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.

Note: If there is a battery in the meter, it will take and store a light reading every 3 minutes (this function does not affect expected battery life).

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. They can damage the white diffuser disc.

METER COMPONENTS:

1. Sensor Cap
2. Light Sensor
3. LCD Display
4. POWER Button
5. SCAN Button
6. Battery Compartment
7. Universal Mounting Bracket

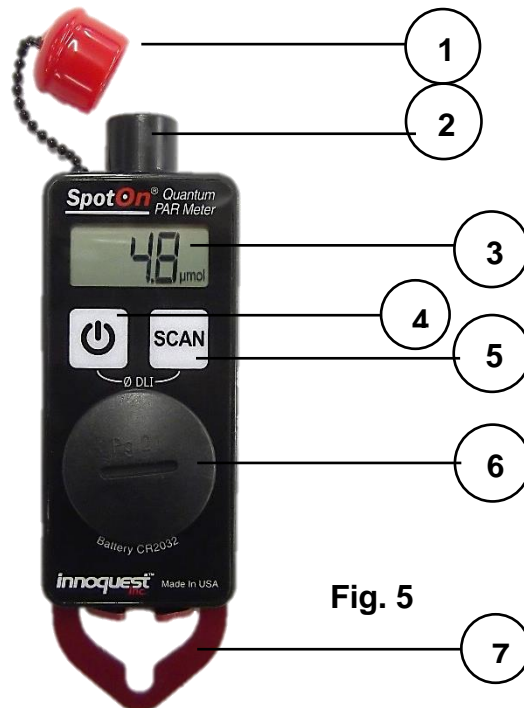
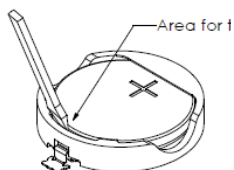


Fig. 5

Changing the Battery - Fig. 6



The LCD will show an empty battery icon when it is time to change the battery. Remove the screw cover (6) of Fig. 5 by rotating counter clockwise. A screwdriver may be required to loosen the cover. Gently pry out the old battery with a small knife or tiny screwdriver as shown in (8) of Fig. 6, 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.

Mounting Bracket

Lanyard/Hanger/Magnet Configuration:



Vertical Stand Configuration:



Stake Configuration:



LIMITED WARRANTY OF TURF-TEC INTERNATIONAL PRODUCTS

Turfgrass Products Corporation - dba - Turf-Tec International ("Seller") warrants to the final purchaser, that all Turf-Tec International tools will be free from defects in material or workmanship for a period of one year from date of purchase. SELLER'S SOLE OBLIGATION AND YOUR EXCLUSIVE REMEDY under this Limited Warranty and, to the extent permitted by law, any warranty or condition implied by law, shall be the repair or replacement of parts, without charge, which are defective in material or workmanship and which have not been misused, carelessly handled, or improperly repaired by persons other than Turf-Tec International. To make a claim under this Limited Warranty, you must return the complete tool, transportation prepaid, to Turf-Tec International after contacting Turf-Tec International and receiving a return authorization number. Please include a dated proof of purchase with your tool.

ANY IMPLIED WARRANTIES SHALL BE LIMITED IN DURATION TO ONE YEAR FROM DATE OF PURCHASE. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING BUT NOT LIMITED TO LIABILITY FOR LOSS OF PROFITS) ARISING FROM THE SALE OR USE OF THIS PRODUCT.

Hold Harmless Agreement

The seller shall protect, defend, indemnify and hold the purchaser and their respective assigns and their attorneys, accountants, employees, officers and directors harmless from and against all losses, costs, liabilities, claims, damages and expenses of every kind and character, as incurred, resulting from or relating to or arising out of the inaccuracy of results, injury of user, injury of sports participant, turfgrass loss, warranty, covenant or any agreement made by the seller in this agreement.