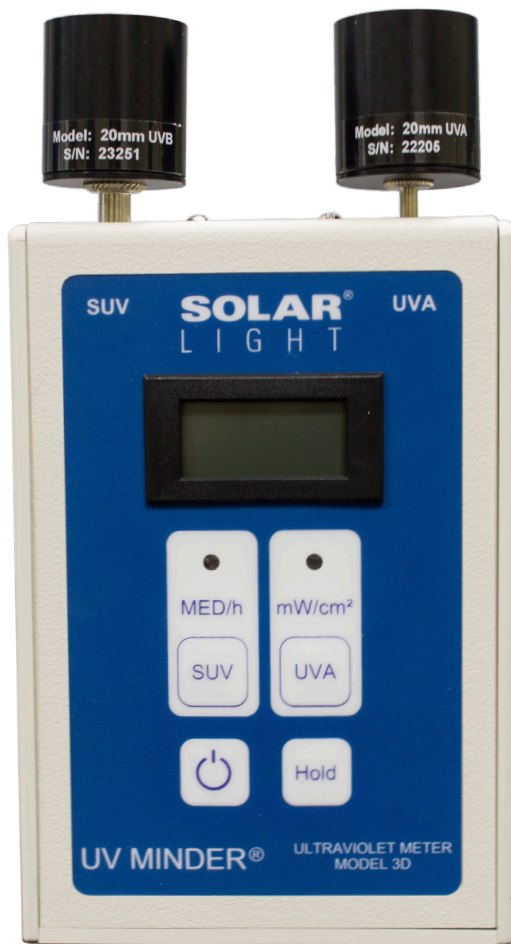


SOLAR[®] LIGHT

USER MANUAL

MODEL UV MINDER™ 3D V2.0

Erythema UV & UVA Intensity Meter



Part Number: 210114
Revision Level: A

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1

GENERAL DESCRIPTION

This digital meter measures 2 characteristics of ultraviolet radiation.

When UV radiation (UVR) is incident on the Sunburning Ultraviolet (SUV) detector an accurate intensity of the sunburning effect of radiation with wavelengths as short as 270nm is measured. This includes solar radiation, monochromatic radiation and most artificial radiation sources. The intensity of the sunburning radiation is measured in Minimal Erythema Doses (MEDs) per hour.

With UVR striking the UVA detector an intensity in milliwatts per square centimeter is measured. The meter has an analog output so SUV or UVA intensity can be recorded over a period of time. An intensity hold and automatic shut off are other functions of the 3D meter.

NOTE: The Model 3D V2.0 is provided with two dedicated detectors with which it was calibrated and tested prior to shipment. Using mismatched meter and detector will produce erroneous results.

2

INTERPRETING RESULTS

Skin sensitivity for sunburn varies widely. An erythema dose of 1.0 will produce a minimum erythema (reddening) for fair Caucasians (type II skin) on skin areas not ordinarily subjected to UVR. A dose of $21 \pm 3 \text{ mJ cm}^{-2}$ at 297nm is a minimal erythema dose*.

The sunburn ultraviolet dose required to produce skin reddening (erythema) varies between people with the fair skinned more susceptible than the tanned or darker skinned.

The relative effect of different wavelengths in producing erythema is the same for all people. This relative spectral effectiveness is shown by the Erythema Action Spectrum curve in Figure 1. What varies between people is the absolute values of the radiant energy required to produce erythema. The meter's spectral sensitivity is like that of the skin's erythema action spectrum and its absolute sensitivity corresponds to that of type II skin; a very fair person may require half as much energy to sunburn and a very dark skinned person 5 to 10 times more energy.

The integral of the cross-multiplication of irradiating flux ($\text{W cm}^{-2} \text{ nm}^{-1}$) and the Erythema Action Spectrum (McKinlay and Diffey 1987) gives

the Effective Power. It was established that:

$$1[\text{MED/HR}] = 5.83 \times 10^{-6} [\text{W cm}^{-2}] \text{ of Effective Power}$$

for an MED of 21 mJ per cm^2 effective dose.

The Erythema Action Spectrum is only one of many action spectra observed in nature, with similar slope and wavelength range. Thus, the 3D meter can indicate the effectiveness of solar radiation for the induction of sunburn, phytoplankton mortality, skin elastosis and thymine dimers among other effects. Also, the 3D meter can be used for global UV monitoring, especially in conjunction with information about ozone thickness, cloud cover and air pollution.

The 3D meter is initially calibrated by the manufacturer, to show the biological effectiveness of the solar radiation, according to the McKinlay Diffey Erythema Action Spectrum and 21 mJ/cm² to induce minimal skin redness. The detector is calibrated for a clear sky, 30° solar zenith angle, 2.7mm ozone column thickness, zero albedo, sea level and 25°C room temperature.

3

OPERATING MODES

3.1 SUV

To turn the meter on and take readings using the SUV detector press the SUV button on the front panel. The displayed intensity has the units MED/HR. A maximum reading of 19.99 MED/HR can be displayed. The green flashing LED above the button indicates the SUV detector is active.

3.2 UVA

To turn on the meter and activate the UVA detector press the UVA button. The displayed intensity has the units mW/cm². A maximum

reading of 19.99 mW/cm² can be displayed. The green flashing LED above the button indicates the UVA detector is active.

Both detectors can not read simultaneously. You can switch between either detector at any time by selecting that detector.

3.3 HOLD

The HOLD function is provided to freeze the current reading. Pressing the HOLD button any time the meter is turned on will freeze the current reading. The annunciator HOLD will appear on the left hand side of the LED display. To release the reading press the HOLD button once again

* Ref.: J. Parrish et al. Photochemistry and Photobiology, vol. 36, p. 188

and the display will be updated to the current intensity. Pressing the SUV or UVA button will also reset the HOLD function.

Turning the meter off resets the HOLD status and the last reading will not be retained. The HOLD function operates the same way for both the SUV and UVA detectors.

The HOLD function is useful if the detector needs to be in a place where the display can not be read. Once the detector is in place press the HOLD button. You can now move the detector and meter to a position where you can read the display. The automatic shut off is still operative when the HOLD function is active.

3.4 OFF/AUTOMATIC SHUT OFF

Turn the meter off by pressing the OFF button.

The meter will shut itself off after eight minutes if the UV intensity is approximately below 3.2 MED/HR or 3.2 mW/cm². This will help extend the life of the battery if the meter is accidentally left on. If you want to use the meter continuously in low intensity levels the automatic shut off can be disabled by removing JP3. See Figure 3 for JP3 location.

3.5 DETECTORS

The SUV detector has a 1/4" diameter plug and the UVA detector has a smaller plug. The detectors can be used when mounted directly on the meter. Each detector has its own extension cable. The extension cable can be used if the detector is mounted in a light box or if a reading needs to be taken in a tight area where the meter will not fit.

The detectors are not waterproof and should be protected from

moisture.

NOTE: The Model 3D V2.0 is provided with two dedicated detectors with which it is calibrated and tested prior to shipment. Using mismatched meter and detector combinations will produce erroneous results. Refer to meter calibration certificate to match serial number set.

3.6 BATTERY REPLACEMENT

The meter is powered by a standard 9 volt Alkaline battery. In the event the BAT annunciator appears on the LCD it is time to replace the battery. To replace the battery remove the detectors from the meter. Using the supplied 0.050 inch allen wrench remove the two button head allen screws on the top of the case. Separate the top and bottom covers. Remove the battery from the battery cradle and replace it. Hold the bottom cover in one hand and the top cover in the other hand. Insert the groove on the bottom edge of the top case into its mating groove on the bottom case. Make certain the analog output jack aligns with its hole on the bottom cover. Press the top cover down on the bottom cover and replace the screws.

3.7 ANALOG OUTPUT

An analog output is provided at the bottom of the meter. This allows the user to continuously monitor and record the intensity irradiated on the active detector. Recording can be accomplished by a strip chart recorder or an A/D card connected to a computer. Plug the supplied 0.141 inch phone plug into the analog output jack. The red lead is] positive and the black lead is negative. The calibration factor for the analog output is 0.1 [Volt/(MED/HR)] or 0.1 [Volt/(mW/cm²)].

4 SPECIFICATIONS

METER SPECIFICATIONS	
SUV Readout Range	0-19.99 [MED/HR]
UVA Readout Range	0-19.99 [mW/cm ²]
Resolution	0.01 [MED/HR] or [mW/cm ²]
Display	LCD 3½ Digit
Operating Temperature	0 to +50°C
Operating Environment	Laboratory / Industrial
Analog Output	0.1 Volt/[MED/HR] or 0.1 Volt/[mW/cm ²]
Power Consumption	<300 uA
Power Source	9V Alkaline Battery
Functions	Installed 150 Watt lamp
Accessories Included	Installed 300 Watt lamp
Size	3¾ x 5½ x 3⅝ " (9.5 x 14 x 8.6 cm)
Weight	8 oz.

SUV DETECTOR SPECIFICATIONS	
Spectral Response	Figure 1
Cosine Response	±5% at an angle of <60°, Figure 3
Connector	1/4" Plug
Operating Temperature	-10 to +60°C
Weight	1.6 oz

UVA DETECTOR SPECIFICATIONS	
Spectral Response	Figure 2
Cosine Response	±5% at an angle of <60°, Figure 3
Connector	0.141" Plug
Operating Temperature	-10 to +60°C
Weight	1.2 oz.

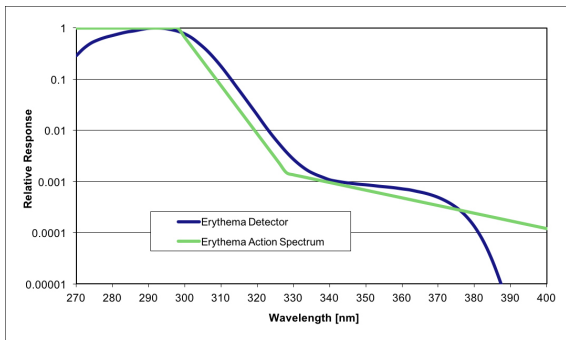


Fig. 1. SUV Linear Spectral Detector Response

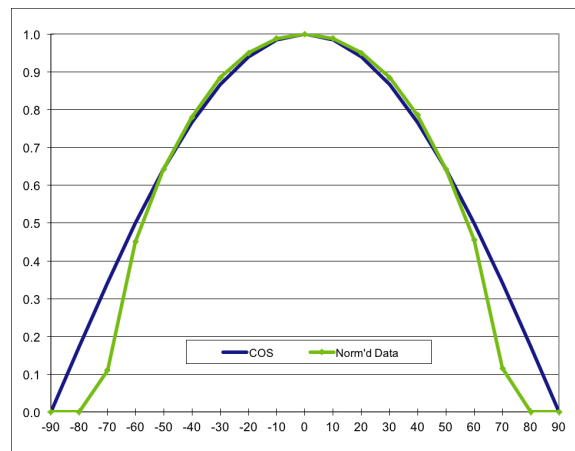


Fig. 3. SUV & UVA Detector Cosine Response

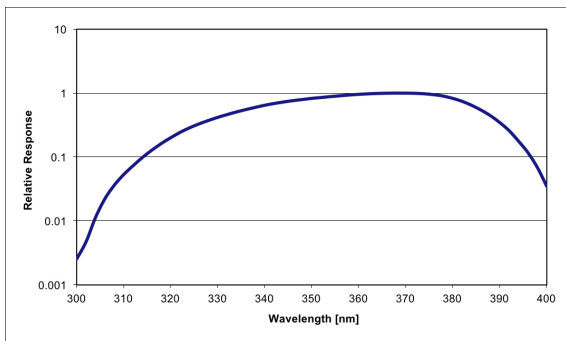
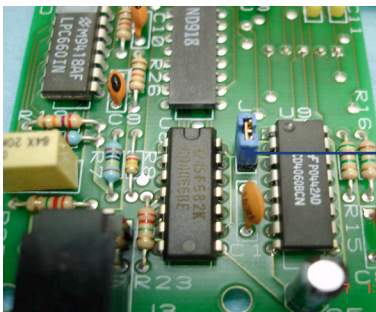


Fig. 2. UVA Log Spectral Detector Response

5 DISABLING AUTO SHUTOFF



To disable auto shutoff
remove jumper from JP3

