GEO-SolarSIM-D2 and SunTracker-2000/3000

THE PERFECT MARRIAGE BETWEEN A SOLAR SPECTRAL IRRADIANCE METER AND A SOLAR TRACKER

CONTROLLED BY A REMOTE VERY LOW POWER CONSUMPTION DATALOGGER

The **GEO-SolarSIM-D2** mounted on the **SunTracker-2000**, alongside one Pyrheliometer (DNI) and one shaded Pyranometer (DHI) measurement, plus **METEODATA** Datalogger/SunTracker Controller, as part of the complete **SEMS-2000 System**

The new, best way to measure the Direct Solar Spectral Irradiance automatically in near real-time and in the whole band of 280-4000 nm with 1 nm resolution

The **GEO-SolarSIM-D2** is a Solar Spectroradiometer, a Sun Photometer and a Pyrheliometer , All-in One. The **GEO-SolarSIM-D2** represents a bold new approach to solar and atmospheric measurement. It uses simple, rugged hardware and ground-breaking software to slash the cost of measuring the **Direct Solar Spectrum, Aerosol Optical Depth, Water Vapour Content and the Ozone Level,** all in one compact, low-power device.

The D2 uses silicon photodiodes, integrated with bandpass interference filters to measure the direct solar spectrum in several narrow wavelength bands.

The **GEO-SolarSIM-D2'**s proprietary software then uses these measurements to resolve the complete solar spectrum, in addition to major atmospheric variables, such as air mass, Rayleigh scattering, aerosol optical depth, ozone-layer thickness and atmospheric water vapour content.

This smart spectral sensor is designed to provide the scientific community and the Solar Industry with a versatile, low-cost, low-power tool for accurately determining the direct solar spectrum, DNI, and major atmospheric constituents as part of on-site solar resource and atmospheric characterization studies.

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So much Data

The D2 is a hugely versatile device that provides the function of a Spectroradiometer, a Pyrheliometer, a Sun Photometer and an Ozone Spectrophotometer, all in one. As a result the unit provides an unparalleled quantity and quality of data over 14,000 data points per time stamp.

Direct Spectral Irradiance

The D2 resolves the direct solar spectral irradiance over the complete spectral range **280 – 4000nm, with 1nm resolution.**

Direct Normal Irradiance

Because the D2 resolves the solar spectrum over the complete spectral range, the integral of the spectrum is used to provide an accurate measurement of the direct normal irradiance (DNI).

Aerosol Optical Depth

The D2 provides aerosol optical depth values for each wavelength over the complete 280 – 4000nm range.

Ozone content

The D2 resolves atmospheric ozone absorption values for each wavelength over the complete wavelength range, in addition to the total ozone layer thickness.

Precipitable Water Vapour

The D2 resolves atmospheric precipitable water vapour values for each wavelength over the complete wavelength range, in addition to the total column amount.

Automatic Operation and Connectivity

For automatic operation, the **GEO-SolarSIM-D2** is mounted indistinctly on the **GEONICA**'s **SunTracker-2000 or 3000** trackers , in such a way to precisely point the Sun continuously. Direct Solar Irradiance measurements at six different wavelengths, plus the temperature and the atmospheric pressure, are then measured and the individual raw data are transferred to our Datalogger **METEODATA** via a digital serial port.

The Software and Data Visualization

Therefore, the software package must be installed on the computer of the Central Receiving Station for final data processing, database generation and visualization.

The **GEO-SolarSIM-D2** software features a windows-based graphical user interface (GUI) that provides user with easy visualization of all of the **GEO-SolarSIM-D2**'s data streams. Features include:

- Visualisation of instantaneous spectral irradiance.
- Continuously updating daily plots of DNI, AOD, ozone.
- Visualisation of raw optical channel outputs.
- Internal humidity monitor.
- Customised data acquisition rates for different data streams.
- Internal heater with automatic control by the datalogger.

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Main Areas of Application

- Correction of atmospheric components (AOD, Water Vapor and Ozone) from satellite and models used in clear-sky models.
- Decrease the uncertainty in the long-term estimation of Direct Normal Irradiance (DNI).
- Precise identification of clear sky conditions analyzing spectral bands attenuated by clouds. Especially important in areas of high turbidity as the Middle East, India, etc. since in base of pyranometric data and current algorithms it is not possible to identify clear sky conditions.
- In Solar Power Tower plants, characterization of the attenuation of solar radiation in the path from the heliostats to the solar receiver.
- Precise solar radiation predictions using on-site atmospheric components to correct modeled AOD, WV, Ozone and rest of components.
- Selection of best photovoltaic technologies for specific locations based on its spectral response.
- Accurate predictions from sky imagers combined with spectral radiation and radiative transfer model (RTM).
- Modelling and predicting the output of Concentrated Photovoltaic (CPV) accurately through its spectral response.

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Connectivity

The **GEO-SolarSIM-D2** is directly connected to our Datalogger **METEODATA** via RS485 port as an integral part of our Solar Energy Measurement System (**SEMS-2000/3000**), described in a separate brochure and illustrated in the picture shown below.

Typical field installation of the **SEMS-3000** System with solar sensors mounted on the sun tracker, plus meteorological mast, datalogger and power supply for autonomous unattended operation of the whole system

Accessories

The Mounting Support

With the device is offered a standard, anodized aluminum mounting adaptor, Model SP-D2 suitable for mounting the **GEO-SolarSIM-D2** on our trackers Model **SunTracker-2000 or 3000** series, which are also part of the **SEMS-2000 or 3000** Systems.

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GEO-SolarSIM-G1

An advanced Global Spectral Irradiance Sensor

The next evolution of SolarSIM technology is the **GEO-SolarSIM-G1**, a product that enables accurate and affordable measurement of the complete, global solar spectrum and total global irradiance.
For applications where measurement of the global solar spectrum is a must, the G1 sets a new standard for accuracy, affordability and ease of use.

As the D2, the G1 uses silicon photodiodes and bandpass interference filters to make precise measurements of the solar spectrum in several narrow wavelength bands. While the D2 is configured to measure the **Direct** solar spectrum, the G1 has been developed to measure and resolve the complete global solar spectrum and total **Global** Irradiance.

Applications for the G1 include solar resource assessment, PV plant development, certification and O&M, agricultural monitoring, UV index measurement, material testing and even multi and hyper-spectral imaging.

The G1 can be used in horizontal or tilted applications, thereby making it applicable to all flat-plate solar technologies and installations.

Automatic Operation and Connectivity

For automatic operation, the **GEO-SolarSIM-G1**, as a conventional pyranometer, is mounted on a suitable support for horizontal or tilted measurements, and connected directly to our datalogger **METEODATA** via a digital serial port, as an integral part of our Solar Energy Measurement System (**SEMS-2000/3000**), described in a separate brochure.

The raw data measured by the silicon photodiodes and bandpass interference filters of the G1are recorded by the datalogger and transmitted in near real-time to the Central Receiving Station where raw data are stored in a database and processed by the software supplied with each spectral meter.

Accessories

The Mounting support

With the device is offered a suitable support Model **SP-101**, for mounting the **GEO-SolarSIM-G1** on horizontal or tilted position.

NOTE : Each **GEO-SolarSIM** Spectral Irradiance sensor is delivered with a Calibration Certificate traceable to NIST Spectral Irradiance Standard Model FEL S/N: F655, via NREL's LI-1800 Spectroradiometer S/N: PRS218. Reference units are also calibrated for aerosol measurement against the WTC Primary Standard Sun Photometer Triad, located at the World Radiation Centre in Davos, Switzerland.

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