

# MODEL SunTracker-2000

**VERY PRECISE AND LIGHTWEIGHT SOLAR TRACKER**

**FOR THE AUTOMATIC MEASUREMENT OF THE DIRECT, GLOBAL  
AND DIFFUSE SOLAR RADIATION**



- **VERY HIGH ACCURACY**
- **POSITIONING CONTROL AND REMOTE COMMUNICATIONS BY ASSOCIATED DATA LOGGER**
- **INTEGRATED GPS RECEIVER (OPTIONAL)**
- **REMOTELY CONTROLLED**
- **FULLY AUTOMATIC**
- **UNATTENDED OPERATION**
- **ACTIVE TRACKING WITH OPTIONAL SUN SENSOR**
- **OPTIMISED POWER REQUIREMENTS OF 2.12 WATTS**
- **AUTOMATIC OPERATING DIAGNOSIS**

## DESCRIPTION

Model **SunTracker-2000** is a two axis fully automatic lightweight solar tracker, to align solar radiation instruments with the normal incidence of the Sun, from any position on the earth's surface.

Includes a two axis mechanical device with two stepping motors, controlled by an electronic module combined with our Data Logger Model METEODATA. Tracking control is carried out by an astronomical algorithm calculated by the data logger, having the possibility of integrating an optional GPS receiver for ensuring a very precise clock synchronization.

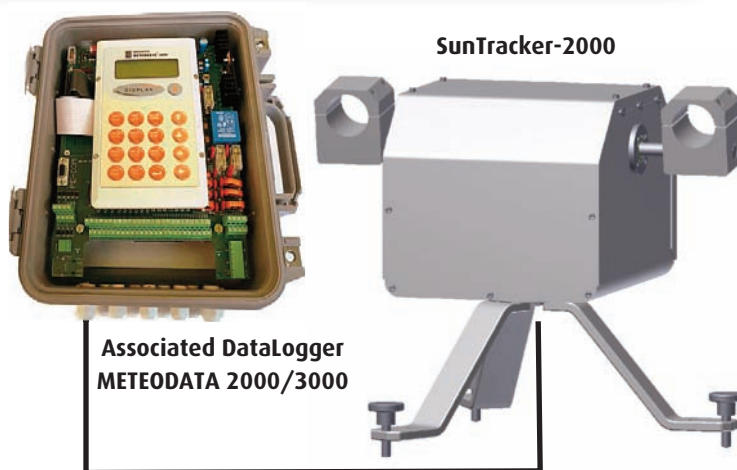
This new design has a fundamental advantage versus other solar trackers regarding the energy consumption, as it requires 2.12 watts from the battery of the data logger. So a single 50W solar panel will be enough for powering both, the solar tracker and the data logger, avoiding the need of having 115/230VAC mains line at the site.

The **SunTracker-2000** allows to mount one or two pyrheliometers for the measurement of the Direct solar radiation, as well as one pyranometer for the measurement of the Global radiation. An optional support and shading assembly can also be installed when Diffuse radiation is necessary.

The operation of the **SunTracker-2000** in association with the METEODATA logger allows to profit all the unique advantages offered by our versatile unit, as indicated below.

## MAIN FEATURES

- Unattended and automatic operation.
- Remote control of the solar tracker by means of the same communications network used with the data logger (GSM/GPRS, 3G, satellite, Wi-Fi, WiMax, etc.).
- Automatic transmission of SMS alarm messages in case of low battery or vandalism (GSM/GPRS optional modem is required for the logger).
- Clock synchronization via Internet time base or by an optional GPS receiver integrated with the data logger.
- Real-Time calculation and recording each second, of the Sun elevation and azimuth, alongside the absolute position. This allows to correlate the solar radiation measurements with the Sun position and also to carry out the Automatic Operation Diagnosis by the ADAS-3000 (Automatic Diagnosis and Alarms Software, running in the Datalogger) each second, as described at the end of this brochure.
- Automatic and continuous diagnosis of the correct operation of the two stepping motors, in such a way that, in case of accidental error, a SMS alarm message will be sent.
- Very low power consumption of 2.12 watts. This allows the logger to power also the solar tracker using a little solar panel for recharging its internal battery (mains is not necessary on the site).



## TECHNICAL SPECIFICATIONS

<b>Control module</b>	Internal, with RS485 interface
<b>Data logger communications</b>	RS232/422/485, Ethernet, etc.
<b>Clock synchronization</b>	By Internet time base or GPS receiver, via the data logger
<b>Pointing accuracy</b>	0.1° in both axis (passive tracking) better than 0.01° (active tracking) with optional Sun sensor)
<b>Mechanical transmission</b>	Precision Machined Worm and gear
<b>Torque</b>	12 Nm
<b>Payload (Balanced)</b>	Greater than 80 kg
<b>Angular velocity</b>	18.8°/second
<b>Supply voltage</b>	12 VDC
<b>Power required</b>	2.12 watts (only SunTracker-2000) 3.02 watts (entire system: METEODATA, GPS controller, Ethernet, etc.)
<b>Environmental</b>	Temperature range (no heater necessary): -30°C to +60°C (working according to Geonica's operating specifications). For applications under conditions below -30°C, contact Geonica. Rel. Humidity range 0-100%
<b>Mounting base</b>	Tripod with two spirit levels
<b>Materials</b>	Cast aluminium housing. AISI 304 Stainless steel worm and bronze gear
<b>Weight</b>	8 Kg
<b>Dimensions</b>	300x370x290 mm ( HxWxD)

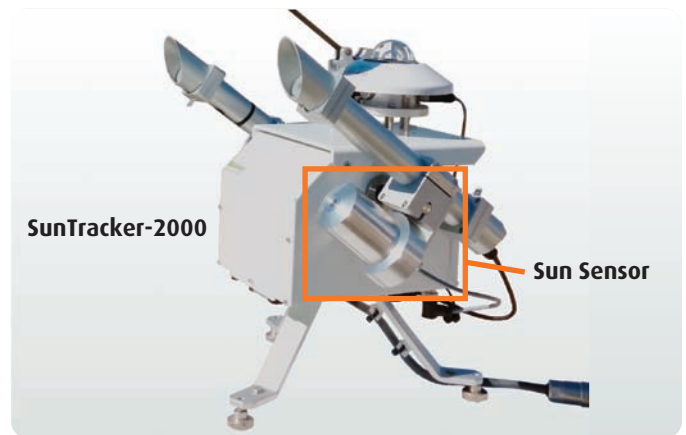
## TYPICAL SOLAR MONITORING CONFIGURATIONS

- Model **SunTracker-2000**
- METEODATA logger/controller with GPRS optional modem.
- One or two Pyrheliometers for direct radiation measurement.
- One pyranometer for either Global or Diffuse radiation with optional shading assembly.

### LOCAL AND REMOTE CONTROL FUNCTIONS

The Control Functions for the **SunTracker-2000** made locally or remotely from the GEO-DRC Data Receiving Center are indicated as follows:

1. Automatic Axis Calibration at any time.
2. Change of geographical coordinates.
3. Fine Tune of the azimuth and elevation axis alignment.
4. Activate / Deactivate solar radiation measurements during start-up and maintenance operations.
5. Date and time synchronisation.
6. Diagnostic Alarm Threshold setting



### OPTIONAL: ACTIVE TRACKING WITH SUN SENSOR

The Sun sensor for active tracking measures the incident angle of Sun rays in both orthogonal axis and the solar radiation. The high sensitivity reached is based on the geometrical dimensions of the design. Its characteristics make it a suitable tool for high accurate Sun-tracking and positioning systems, with low power consumption and high reliability. The Sun sensor has been designed with an unique and novel own technology based on MEMS fabrication processes to achieve high integrated sensing structures at low cost.

The Sun sensor allows automatic Sun pointing correction under soil, pedestal or basement displacement issues as well as for clock shifts where no GPS date and time correction is available.

#### SUN SENSOR TECHNICAL SPECIFICATIONS

<b>Sensor type:</b>	Two orthogonal axes Sun sensor
<b>Field of view (FOV):</b>	5° (± 2.5°)
<b>Accuracy:</b>	Better than 0.01°
<b>Average consumption:</b>	33mA active mode (5mA sleep mode)
<b>Temperature range:</b>	Industrial: -40 to 85°C
<b>Optical set:</b>	Diaphragm and collimator
<b>Material:</b>	Natural anodizing machined aluminum
<b>Optical window:</b>	Fused silica glass (high transmittance)
<b>Dimensions:</b>	105mm long x ø80mm
<b>Weight:</b>	700 g

### OPTIONAL: AUTOMATIC DIAGNOSIS AND ALARMS (ADAS-3000)

The marriage of the Data Logger METEODATA-3000 and the **SunTracker-2000** working together, is a unique and exclusive symbiosis solution, which allows to profit all the functionalities of the optional Automatic Diagnosis and Alarm Software (ADAS-3000 option).

The ADAS-3000 software installed at the data logger, is monitoring in real-time the measured values of the main three solar irradiance parameters (DNI, GHI and DIFF), supervising also the results of the local running algorithms that are in charge of the SunTracker operation.

The monitored solar radiation sensors and local running algorithms at the data logger are :

1. Global, Diffuse and Direct solar radiation sensors readings.
2. Accurate GPS fixes.
3. Astronomical Sun tracking algorithm.
4. Digital Signal Processing Functions.

The ADAS-3000 determines automatically the 'coherence' of the three measured parameters : DNI, GHI and Diffuse values, as a function of the Sun position at any moment, obtained by the data logger from the astronomical algorithm used for controlling the automatic tracking. If the ADAS-3000 detects any inconsistency or lack of coherence between the measured values of these three

parameters, an alarm condition is automatically generated.

This alarm can be generated by any of the following circumstances:

- Dirt deposition in the domes of the Pyranometers or in the glass filters of the Pyrhemimeters.
- Degradation of the solar sensors or incorrect calibration constant.
- Wrong leveling of the Sun tracker.
- Misalignment of the Pyrhemimeter mounted on the Sun tracker
- Incorrect operation of the Astronomical algorithm

These alarms are automatically sent by SMS (up to 5 different users) or by TCP/IP (to a Data Receiving Center) to warn the user about the low data quality being recorded at the site.

The alarm status is also recorded at the alarm channel of the data logger as the rest of historical data.

It is important to mention that minor and even large differences between the actual measurements of any of these three solar irradiance parameters and their real values (correct values), due to any of the reasons indicated before, will not be detected in any manner without our unique automatic diagnosis carried out by the ADAS-3000 software.



GALLERY

