



3S-SMS-MB

Automatic Soiling Sensor

USER MANUAL

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Waste Disposal



This symbol indicates that the product is subject to European Union regulations on separate waste disposal. This applies to both the product itself and any accessories bearing the same symbol. Such products must not be disposed of as unsorted household waste.



Note: SEVEN reserves the right to make changes to this document without prior notice.

1. Introduction

Structure of the Automatic Soiling Sensor

The Automatic Soiling Sensor consists of two irradiance sensors, one designated as clean and the other as soiled, a water tank equipped with a water pump that performs the cleaning process, and an electronic panel containing the sensor's electronic components.

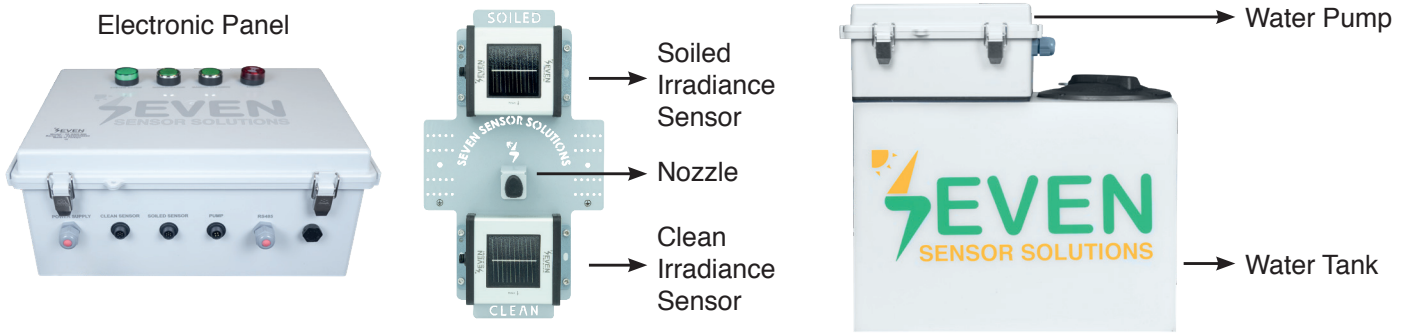


Figure 1 – Components of the Automatic Soiling Sensor

Operating Principle and Calculation of Soiling Ratio

Once the field installation of the Automatic Soiling Sensor is completed, the soiled irradiance sensor is exposed to soiling under the same environmental conditions as the solar panels in the field, while the clean irradiance sensor is cleaned daily by the cleaning system. After it starts collecting data, the sensor calculates the soiling ratio by filtering and comparing the data obtained from the soiled and clean irradiance sensors using its specialized software. The data filtering process follows a procedure in accordance with the IEC 61724-1:2021 standard. According to this standard, data within the ± 2 -hour time frame around local solar noon is considered; however, low irradiance values and unstable weather conditions are excluded from the calculation. Each data point meeting these criteria is regarded as stable data.



Note: In the factory settings, the “Minimum Stable Data” count required to calculate the soiling ratio is set to 20. This value can be changed by the user via the GUI and can be set to a minimum of 1. However, reducing this value is not recommended; as the number of stable data increases, the accuracy and reliability of the calculated soiling ratio increase.

When the required minimum number of stable data points is reached, the soiling ratio is calculated as a daily average value and presented to the user as the “Daily Average Soiling Level Percentage” after 17:00 each day. From this time on, the user can access the soiling ratio calculated for that day. However, if the minimum number of stable data points is not reached, the sensor displays the last calculated value to the user until a new soiling ratio is calculated. If no previous calculation exists, the soiling ratio is displayed as zero until suitable conditions are met.

Cleaning Process and Water Tank Capacity

By default, the Automatic Soiling Sensor cleans the clean irradiance sensor once daily for five seconds, three hours before local solar noon. As per the user's request, the cleaning frequency can be increased to a maximum of three times per day via the GUI, and the cleaning times can be adjusted according to the schedule selected by the user.



Note: The 18-liter water tank is sufficient for approximately 6 months with a cleaning frequency of once per day. However, if the cleaning frequency is increased, it should be noted that the water tank will deplete more quickly.

Data Recording and User Access

The Automatic Soiling Sensor has the capacity to store collected data for up to one year. The recorded data includes the daily calculated soiling ratio, the number of stable data points collected each day, the water level status of the tank, and the dates when the sensor was powered on or off. These records can be viewed by the user through the GUI and downloaded when needed.

2. Installation Process

It is recommended that the products be operated before installation to make sure that all system components are working properly. A general diagram of the progress of the installation steps is given below.

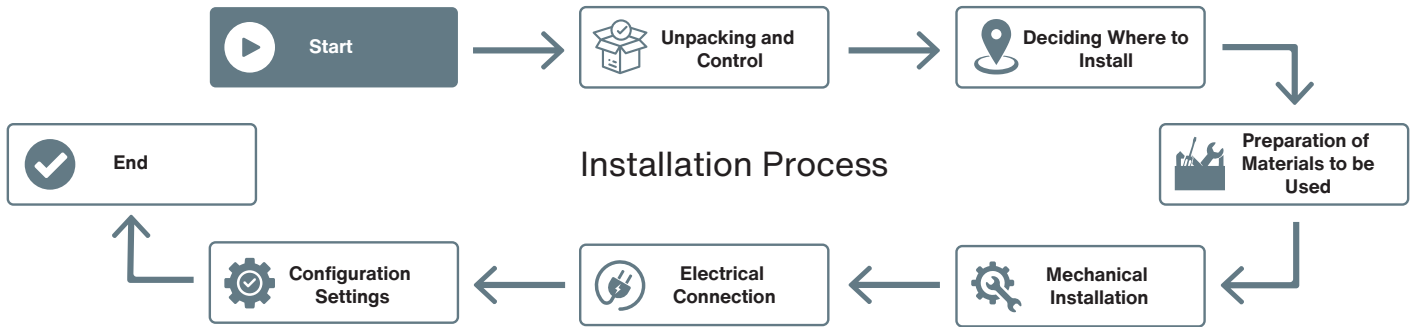


Figure 2 – Installation Process

3. Unpacking and Control

Upon receipt of the product, it must be carefully checked whether the package content is complete. SEVEN Sensor must be contacted if any of the components are missing, damaged or defective.

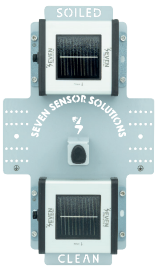
			
Qty 1	Qty 1	Qty 1	Qty 2
Irradiance Sensors	Electronic Panel	Water Tank	Irradiance Sensor Cables
			
Qty 1	Qty 1	Qty 1	Qty 1
Water Pump Cable	USB-RS485 Converter	Mounting Components	Clips

Figure 3 – 3S-SMS Packing List

Cable Lengths of the Automatic Soiling Sensor			
	Cable Type	Cable Connector	Cable Length
1	Power Cable	Cable Gland	3 m
2	Communication Cable	Cable Gland	3 m
3	Clean Irradiance Sensor Cable	7 Pin	5 m
4	Soiled Irradiance Sensor Cable	7 Pin	5 m
5	Water Pump Cable	4 Pin	3 m
6	Water Hose	-	5 m

Figure 4 – Cable Lengths



Note: The quantity and content of the received material may differ depending on the order.

4. Field Requirements and Considerations

Since each site has its own unique challenges, the installation of the Automatic Soiling Sensor may vary from one site to another. First and foremost, the location for the sensor installation must be determined. The soiled irradiance sensor on the Automatic Soiling Sensor should be exposed to the same level of soiling as the solar panels at the site. Therefore, it is important to avoid placing the sensor near elements such as chimneys or ventilation systems that could generate additional dust sources. Furthermore, both the soiled and clean irradiance sensors should be positioned away from dark, reflective, or heat-absorbing surfaces.

For the Automatic Soiling Sensor to accurately measure the soiling ratio, the soiled irradiance sensor must be exposed to the same level of soiling as the solar panels on-site. Accordingly, it is recommended to perform site cleaning after the sensor installation is completed, if possible. If site cleaning cannot be performed immediately, measurements can still be initiated. However, in this case, it should be considered that the Automatic Soiling Sensor may be less soiled than the site, and the measurement results should be evaluated accordingly. Additionally, whenever site cleaning is performed, the irradiance sensors of the Automatic Soiling Sensor must also be cleaned. This process is essential to ensure that the soiling ratio measurements accurately represent the current site conditions.

The Automatic Soiling Sensor performs a 5-second cleaning process every day in the morning, approximately three hours before noon, in the installed region. In “Tracker” systems, the clean irradiance sensor must be positioned at the bottom, below the soiled irradiance sensor, during this cleaning process. Otherwise, if the clean irradiance sensor is positioned above the soiled irradiance sensor, the cleaning fluid may overflow onto the soiled irradiance sensor. This could lead to incorrect soiling ratio measurements, making it a critical point to consider. Therefore, it must be ensured that the irradiance sensor positions are correctly configured during system installation and maintenance procedures.

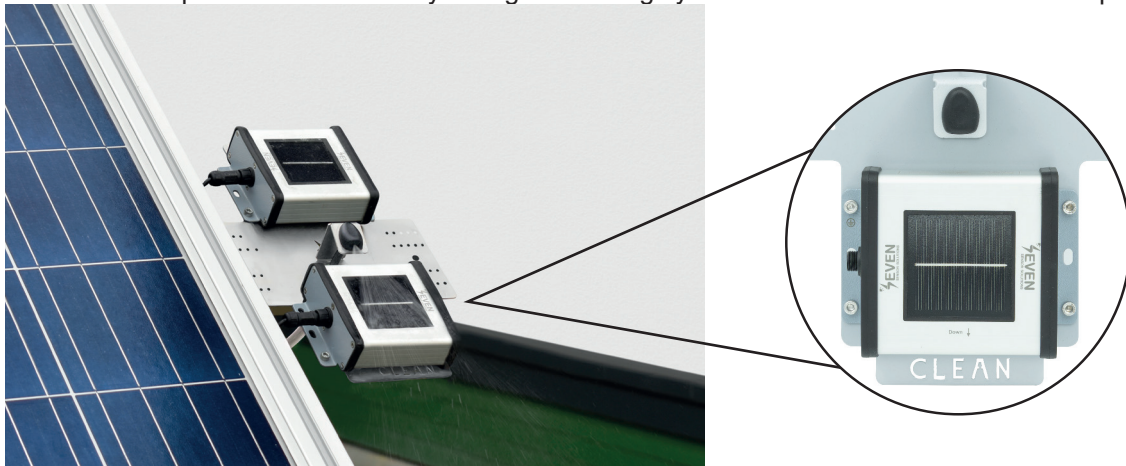


Figure 5 – Cleaning Process of the Irradiance Sensor

5. Installation and Setup

SEVEN has prepared a video for the installation and configuration procedures. During installation, you can also benefit from this video in addition to the user manual. The video link is provided below.

<https://www.youtube.com/watch?v=Tb91ACm8uvU>



Note: No operations other than those specified in the manual should be performed on the electronic panel, irradiance sensors and water tank of the Automatic Soiling Sensor. **Any modification made by the user will void the warranty of the device.**

5.1. Installation of Irradiance Sensors

Mount the installation plate holding the irradiance sensors next to the solar panels, ensuring it is aligned at the same angle and orientation as the solar panels. A 40 x 40 L bracket or 40 x 40 square profile can be used for the mounting.

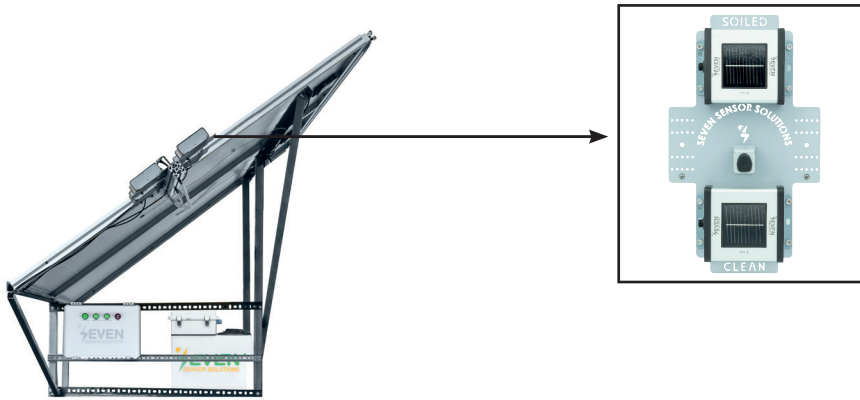


Figure 6 – Installation of Irradiance Sensors



Note: To ensure that the irradiance sensors are exposed to the same conditions as the solar panels on-site, they must be installed directly adjacent to the solar panels. Even if the sensors are mounted at the same angle and orientation as the panels, placing them away from the panels may result in soiling differences between the irradiance sensors and the solar panels.

5.2. Installation of the Water Tank

Place the water tank under the solar panel or in another suitable area to protect it from sunlight and reduce evaporation. If you have obtained a shading fixture from SEVEN Sensor, place the water tank inside this structure.

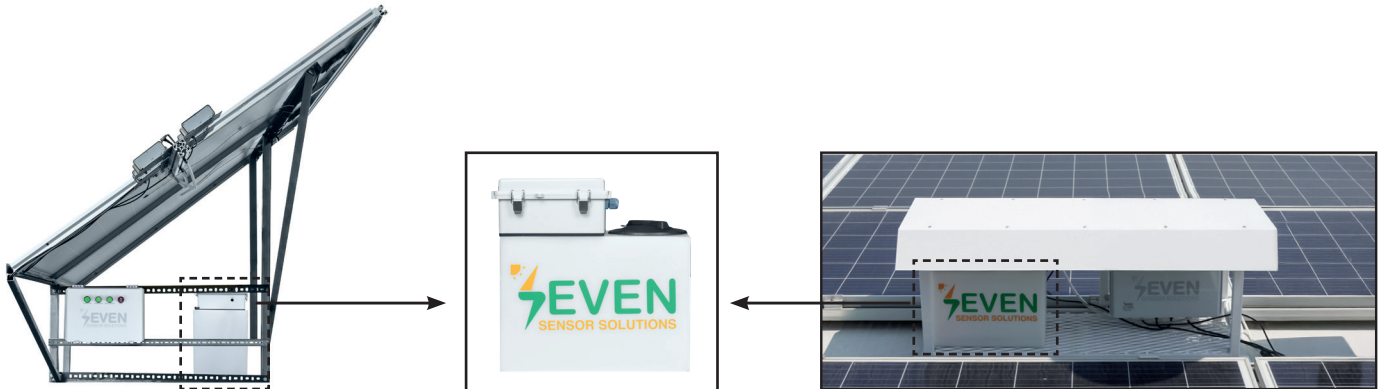


Figure 7 – Installation of the Water Tank



Note: Since the water tank contains plastic components, prolonged exposure to direct sunlight may cause discoloration.

If the ambient temperature is above 0°C, fill the water tank with 100% pure water. However, if the temperature is below 0°C, fill the tank with a mixture of 65% pure water and 35% antifreeze.



Note: Only pure water and, at low temperatures, high-quality antifreeze in the specified ratios should be used in the water tank. Otherwise, using regular water or low-quality antifreeze, or deviating from the specified ratios, may leave stains on the irradiance sensor, which can negatively affect the soiling ratio calculations.

Attach the water hose connected to the water pump box on the water tank to the nozzle on the plate where the irradiance sensors are mounted, and secure the connection point with a clip.



Figure 8 – Silicone Hose Assembly



Note: During installation, care must be taken against bending, as bending the hose between the water tank and the cleaning cell prevents the motor from generating pressure, resulting in an ineffective cleaning process.

5.3. Installation of the Electronic Panel

Mount the electronic panel under the solar panel or in another protected area using appropriate equipment and the mounting brackets on the back of the panel. If you have obtained a shading fixture from SEVEN Sensor, mount the electronic panel inside this structure.



Note: During installation, no screwing, drilling or similar operations should be performed inside the electronic panel. In addition, no power should be drawn from the power supply inside the electronic panel. Since the power supply inside the panel feeds the water pump, it draws a high current; therefore, connecting other devices to the power supply may cause the electronic components inside the sensor to malfunction or become damaged.

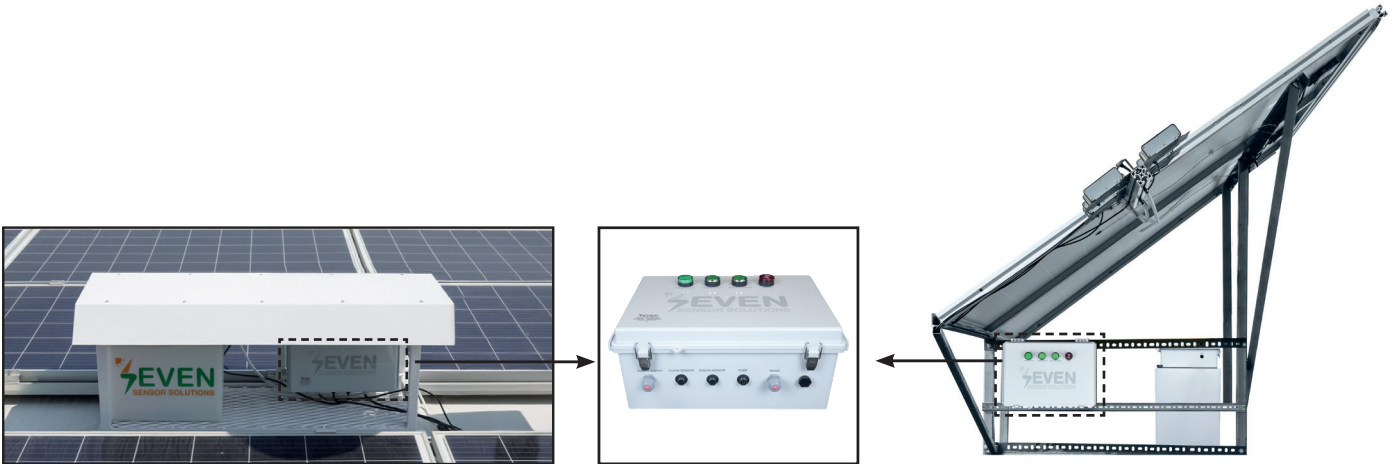


Figure 9 – Installation of the Electronic Panel



Note: The electronic panel must be installed in a protected area, as its plastic components may discolor if exposed to direct sunlight and, despite its IP54 protection rating, it could be at risk of water ingress when subjected to direct rainfall.

5.4. Connection of the Clean Irradiance Sensor Cable

Connect one end of the irradiance sensor cable, which has a 7-pin connector on both ends, to the “CLEAN SENSOR” connector on the electronic panel. Attach the other end to the connector on the irradiance sensor mounted at the point marked “CLEAN” on the irradiance sensor mounting plate.



Figure 10 – Connection of the Clean Irradiance Sensor Cable

5.5. Connection of the Soiled Irradiance Sensor Cable

Connect one end of the irradiance sensor cable, which has a 7-pin connector on both ends, to the “SOILED SENSOR” connector on the electronic panel. Attach the other end to the connector on the irradiance sensor mounted at the point marked “SOILED” on the irradiance sensor mounting plate.

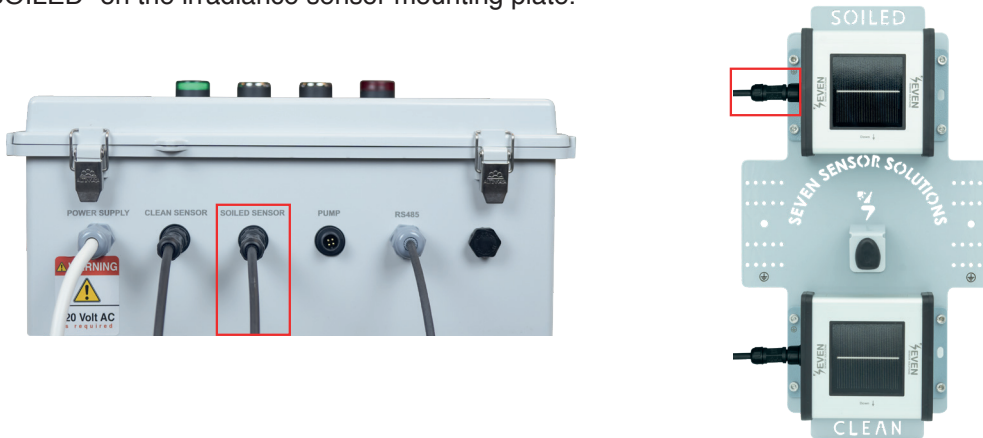


Figure 11 – Connection of the Soiled Irradiance Sensor Cable

5.6. Grounding of the Irradiance Sensors and the Mounting Plate

To protect the irradiance sensors from electrical noise, the mounting plate must be properly grounded. The aluminum housings of the soiled and clean irradiance sensors are in direct electrical contact with the mounting plate through the connection screws. The mounting plate has special connection points marked with a grounding symbol for this purpose. At least one of these points must be connected to the facility’s protective earthing system by site technical personnel using appropriate equipment and methods.

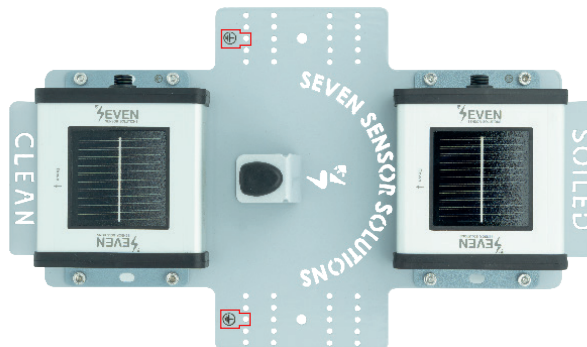


Figure 12 – Mounting Plate Grounding Connection Holes

5.7. Connection of the Water Pump Cable

Connect one end of the water pump cable, which has a 4-pin connector on both ends, to the “PUMP” connector on the electronic panel. Attach the other end to the connector located on the water pump box on the water tank.



Figure 13 – Connection of the Water Pump Cable

5.8. Connection of the Power Cable

The power cable of the Automatic Soiling Sensor is delivered pre-connected to the electronic panel, with a field-wireable connector attached at its end. To supply power to the sensor, the necessary connections must be made via this field-wireable connector. Based on the model of your Automatic Soiling Sensor, complete the sensor connections according to the instructions provided below.



Note: In the Automatic Soiling Sensor, when the water tank is empty, the buzzer on the electronic panel activates to provide an audible alert. Therefore, it is mandatory to fill the water tank before powering the sensor.

5.8.1. 3S-SMS-MB Models

Connect pin 1 of the field-wireable connector to the mains phase line (L), pin 3 to the mains neutral line (N), and pin 5 to the mains ground line. After ensuring that all connections are correct and securely completed, connect the sensor to the mains voltage to enable its operation.

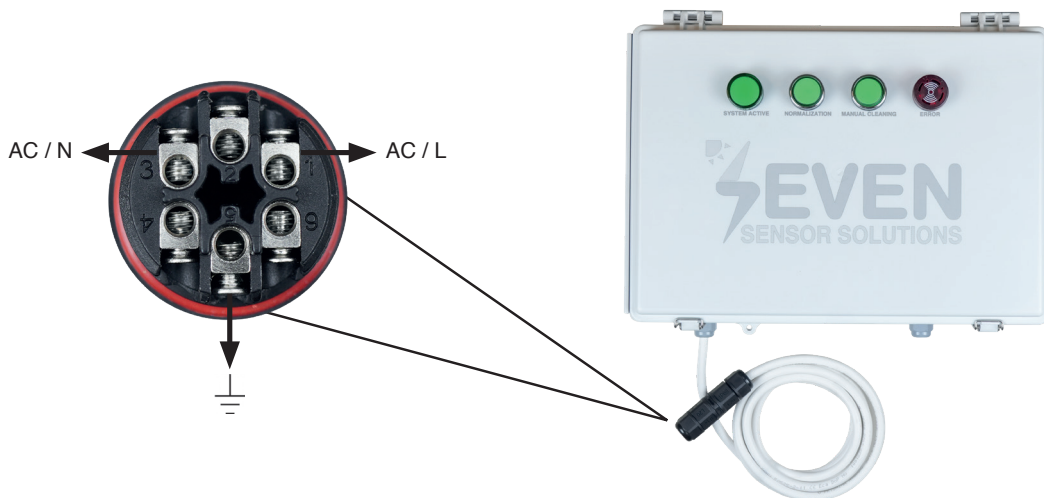


Figure 14 – Connection of the Power Cable

5.8.2. 3S-SMS-MB-24V Models

The 24-volt models of the Automatic Soiling Sensor operate with power supplies rated at 24V 5A. Before making the power connections for the 24-volt model, obtain an adapter with the required specifications.



Note: If an extension is added to the power cable, the voltage drop due to cable resistance must be considered. The sensor comes with a 3-meter-long cable with specifications of 3 x 1.5 mm². An extension of up to 50 meters with the same specifications can be added. For extensions exceeding 50 meters, the voltage drop should be calculated, and if necessary, a cable with a larger diameter should be used. Otherwise, the cleaning system may not function properly.

Connect pin 1 of the field-wireable connector to the positive (+) terminal of the 24-volt power supply, pin 3 to the negative (-) terminal of the 24-volt power supply, and pin 5 to the ground line of the 24-volt power supply. After ensuring that all connections are correct and secure, activate the 24-volt power supply to operate the sensor.

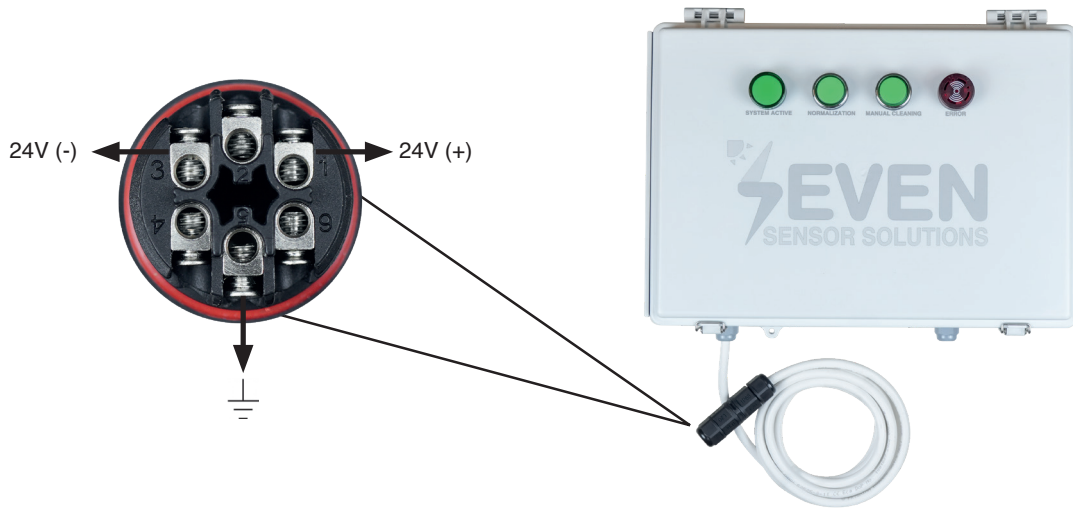


Figure 15 – 24 V Power Cable Connection



Note: If the Automatic Soiling Sensor is used within a daisy-chain set, the “Power Supply” cable is used only to feed the water pump. This applies to both the 3S-SMS-MB and 3S-SMS-MB-24V models. In this connection method, the power supply of the sensor electronics and the communication are provided over the daisy-chain cable. The supply voltage applied over the daisy-chain cable must be in the range of 12–30 VDC. Make the daisy-chain communication and power cable connections as shown below.

Connect the red wire to the GND terminal of the USB-RS485 converter, the green wire to the Data (+) terminal of the USB-RS485 converter, the yellow wire to the Data (-) terminal of the USB-RS485 converter, the brown wire to the V (+) terminal of the power supply, the white wire to the V (-) terminal of the power supply, and the black wire to the protective earth terminal.

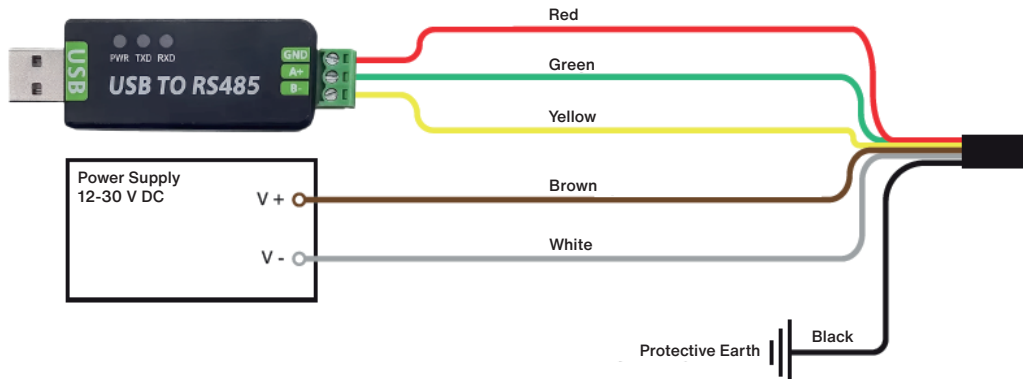


Figure 16 – Daisy-Chain Communication and Power Cable Connection

5.9. Indicators and Buttons on the Electronic Panel

After the Automatic Soiling Sensor is powered on, some checks should be performed using the buttons and LED indicators on the electronic panel cover. The functions of the buttons and LED indicators on the sensor are explained below:

1. SYSTEM ACTIVE: When the sensor is powered on, the “SYSTEM ACTIVE” LED should light up. This LED indicates that the sensor is receiving power.

2. NORMALIZATION: This button is not used during installation. It is activated when normalization is required between the soiled and clean irradiance sensors. The requirements and procedures for this process are explained in detail in the “User Interface Manual” document. The download link is provided below.

https://www.sevensensor.com/files/d/en/3S-SMS-MB_Soiling-Sensor_GUI.pdf



WARNING: This button should not be pressed except for the normalization process. When this button is pressed and held for more than 5 seconds, the soiling ratio calculation stops and does not restart until the normalization process is completed. In such a case, the issue can be resolved by turning the sensor off and on again.

3. MANUAL CLEANING: This button is used to manually operate the cleaning system. After the sensor is powered on, this button should be used to run the water pump and verify that the cleaning system is functioning correctly.

4. ERROR: A buzzer is present to provide an audible warning when the water tank is empty. No action is required regarding the buzzer during installation.



Figure 17 – Indicators and Buttons on the Electronic Panel

5.10. Communication Cable Connection

After the installation and cable connections of the Automatic Soiling Sensor are completed, the location and time parameters must be configured according to site-specific information to determine the local solar noon used in the soiling ratio calculations. To perform these settings, the Automatic Soiling Sensor must first be connected to a USB-RS485 converter. The USB-RS485 converter used for this process is included in the package provided by SEVEN Sensor.

The communication cable of the Automatic Soiling Sensor is delivered connected to the electronic panel. To connect the communication cable, connect the green wire to the Data (+) terminal of the USB-RS485 converter, the yellow wire to the Data (-) terminal of the USB-RS485 converter, and the red wire to the GND terminal of the RS485 converter.

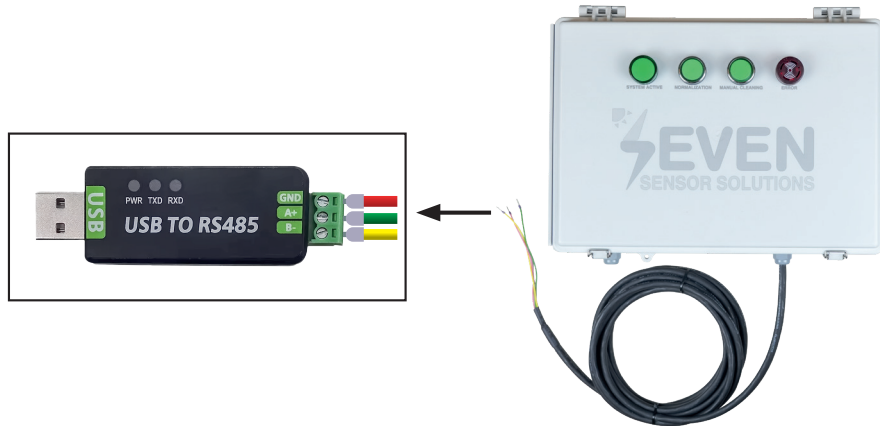


Figure 18 – Communication Cable Connection

5.11. Configuration Tool Connection

After connecting the communication cable, a Windows® computer is required to configure the time and location settings of the Automatic Soiling Sensor based on site-specific information. Once you have the computer, connect the USB-RS485 converter to the USB port of your computer.

For your computer to recognize the USB-RS485 converter, it must be identified as a serial COM port. If your computer does not have a serial COM port identified in this way, download the “User Interface Manual” document from the link below and update your driver accordingly.

https://www.sevensensor.com/files/d/en/3S-SMS-MB_Soiling-Sensor_GUI.pdf

Download and install the 3S-SMS-MB Configuration Tool software on your computer. The download link is provided below.

https://www.sevensensor.com/files/d/s/v5.0_3S-SMS-MB_Configuration_Tool.zip

When the 3S-SMS-MB Configuration Tool is launched, the following screen will appear.

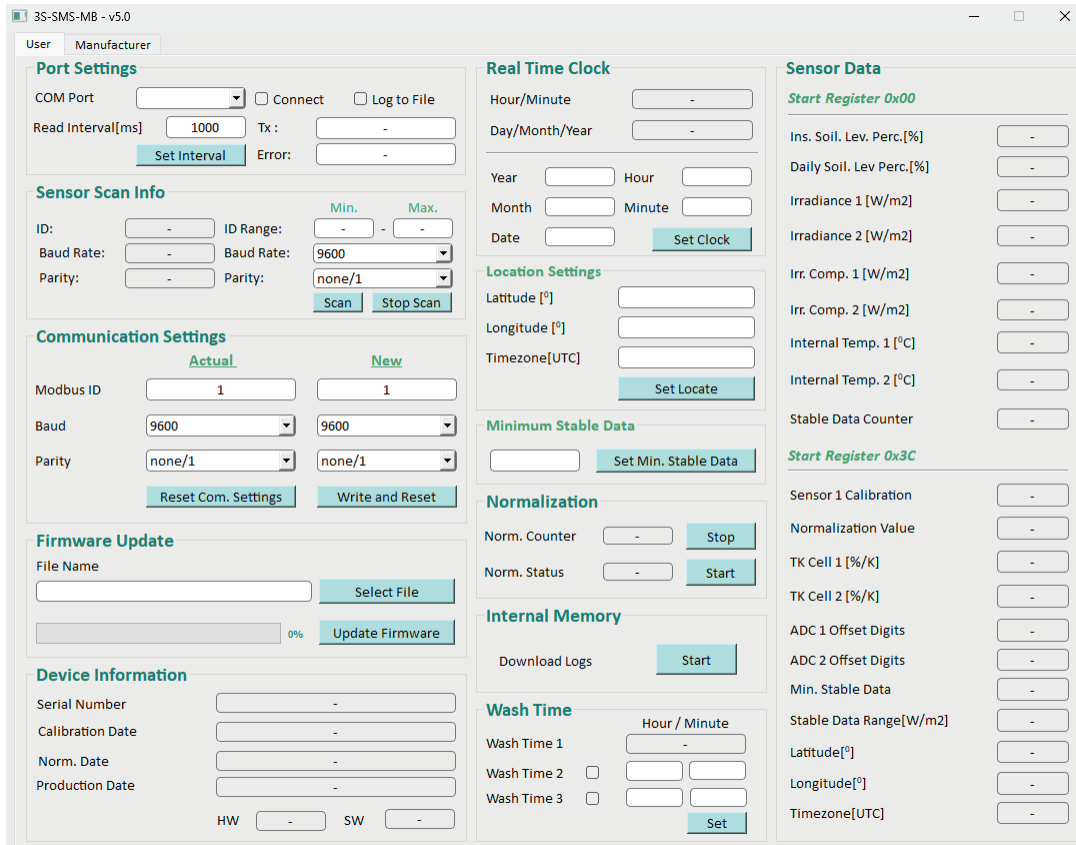


Figure 19 – 3S-SMS-MB Configuration Tool

To connect the Automatic Soiling Sensor to the 3S-SMS-MB Configuration Tool, follow the steps below:

- Select the serial COM port to which the USB-RS485 converter is connected.
- Enter the Modbus ID, Baud Rate and Parity values of the Automatic Soiling Sensor in the “**Communication Settings**” area, in the “**Actual**” section.
- Click the “**Connect**” button.



Note: The factory settings of the Automatic Soiling Sensor are as follows: Modbus ID: 1, Baud rate: 9600, Parity: None/1.

3S-SMS-MB - v5.0

User Manufacturer

Port Settings

COM Port: ☒ Connect ☐ Log to File

Read Interval[ms]: Tx: Error:

Sensor Scan Info

ID: ID Range: -

Baud Rate: Baud Rate:

Parity: Parity:

Communication Settings

Actual New

Modbus ID:

Baud:

Parity:

Figure 20–Configuration Tool Connection

When the connection is successfully completed, the details of the Automatic Soiling Sensor will be displayed in the “**Device Information**” section, and the data retrieved from the sensor in the “**Sensor Data**” section.

3S-SMS-MB - v5.0

User Manufacturer

Port Settings

COM Port: ☒ Connect ☐ Log to File

Read Interval[ms]: Tx: Error:

Sensor Scan Info

ID: ID Range: -

Baud Rate: Baud Rate:

Parity: Parity:

Communication Settings

Actual New

Modbus ID:

Baud:

Parity:

Firmware Update

File Name:

0%

Device Information

Serial Number:

Calibration Date:

Norm. Date:

Production Date:

HW: SW:

Real Time Clock

Hour/Minute:

Day/Month/Year:

Year: Hour:

Month: Minute:

Date:

Location Settings

Latitude [°]:

Longitude [°]:

Timezone[UTC]:

Minimum Stable Data

Normalization

Norm. Counter:

Norm. Status:

Internal Memory

Download Logs:

Wash Time

Hour / Minut

Wash Time 1:

Wash Time 2:

Wash Time 3:

Sensor Data

Start Register 0x00

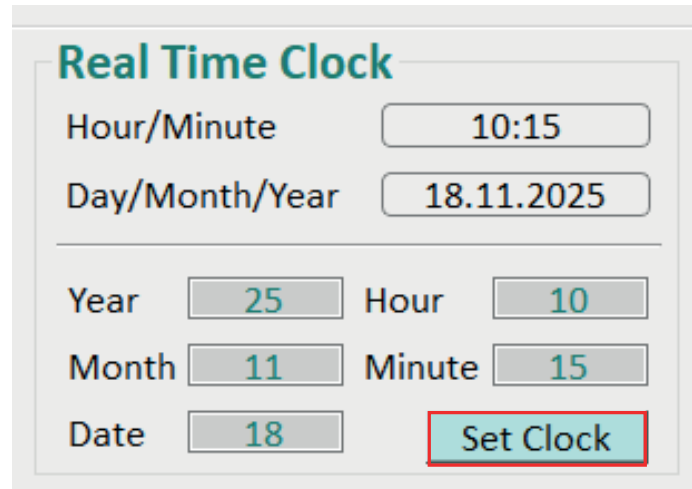
Ins. Soil. Lev. Perc. [%]	0.2
Daily Soil. Lev. Perc. [%]	0.0
Irradiance 1 [W/m2]	760.5
Irradiance 2 [W/m2]	758.4
Irr. Comp. 1 [W/m2]	760.9
Irr. Comp. 2 [W/m2]	758.7
Internal Temp. 1 [°C]	23.4
Internal Temp. 2 [°C]	24.1
Stable Data Counter	-

Start Register 0x3C

Sensor 1 Calibration	94.84
Normalization Value	94.84
TK Cell 1 [%/K]	0.04
TK Cell 2 [%/K]	0.04
ADC 1 Offset Digits	5
ADC 2 Offset Digits	5
Min. Stable Data	20
Stable Data Range[W/m2]	5
Latitude[°]	40.54
Longitude[°]	34.95
Timezone[UTC]	3.0

Figure 21 – Automatic Soiling Sensor Information

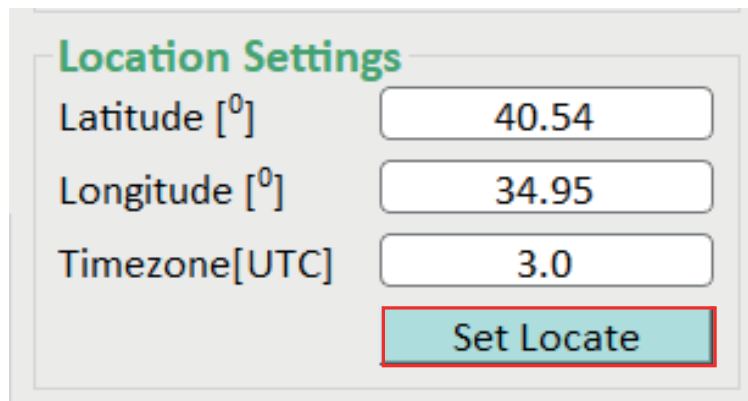
- In the “**Real Time Clock**” section, enter the values to be set as two digits in the respective fields.
- Click the “**Set Clock**” button.



The 'Real Time Clock' interface features a title bar at the top. Below it, there are two input fields: 'Hour/Minute' with the value '10:15' and 'Day/Month/Year' with the value '18.11.2025'. A horizontal line separates these from the individual digit inputs. Below the line, there are six input fields: 'Year' (25), 'Hour' (10), 'Month' (11), 'Minute' (15), and 'Date' (18). A 'Set Clock' button is located at the bottom right, highlighted with a red border.

Figure 22 – Setting Date and Time Information

- In the “**Location Settings**” section, enter the latitude and longitude values of the location to be set with two decimal places after the point, and the time zone value with one decimal place after the point.
- Then click the “**Set Locate**” button.



The 'Location Settings' interface has a title bar. Below it are three input fields: 'Latitude [°]' with the value '40.54', 'Longitude [°]' with the value '34.95', and 'Timezone[UTC]' with the value '3.0'. A 'Set Locate' button is at the bottom right, highlighted with a red border.

Figure 23 – Setting Location Information



Note: The UTC time zone value is entered in dotted format. For example, 5.3 should be written for UTC+5:30. Here, the .3 represents 30 minutes; it should not be interpreted as a decimal hour. A comma should not be used and the minute value should not be converted to the decimal system.



Note: Actions such as changing the Modbus parameters, downloading the retrieved data, increasing the number of washes and performing software updates can be carried out via the device's Configuration Tool (GUI). However, these actions are not mandatory during the “Installation and Configuration” process and should only be performed based on user requirements. If you wish to perform these actions, you can download the “User Interface Manual” document, which contains detailed steps, from the link below and proceed in accordance with the instructions.

https://www.sevensensor.com/files/d/en/3S-SMS-MB_Soiling-Sensor_GUI.pdf

5.12. Monitoring Sensor Data

After all procedures are successfully completed, the Automatic Soiling Sensor is ready for use. At this stage, the USB-RS485 converter connected to the sensor's communication cable should be disconnected. The communication cable can then be connected to data loggers, SCADA systems, PLCs, or other devices that support the Modbus protocol, based on user preference.

During these connections, the green wire of the communication cable must be connected to the Data (+) terminal, the yellow wire to the Data (-) terminal, the red wire to the Data GND terminal, and the black wire to the protective earth terminal.

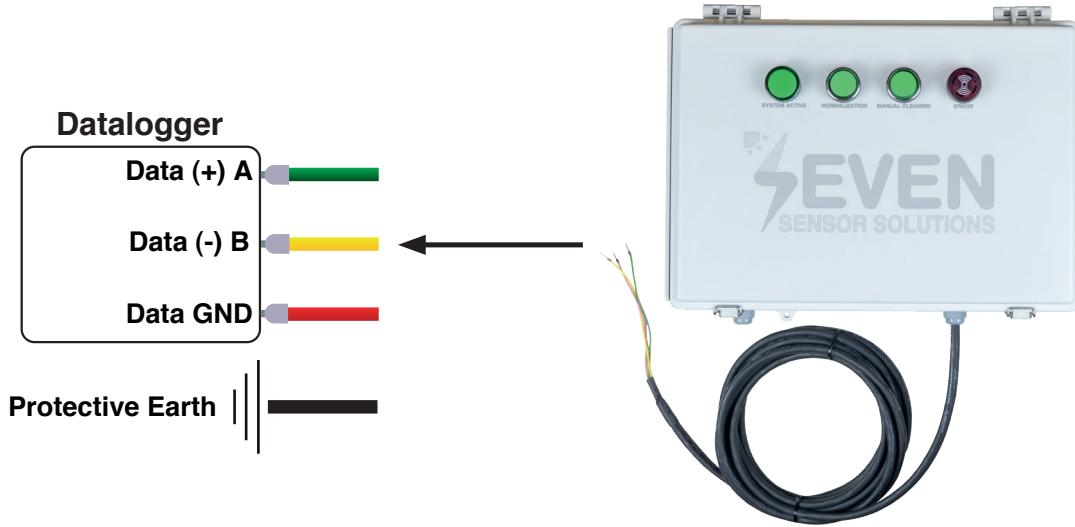


Figure 24 – Communication Cable Connection



Note: According to RS485 connection requirements, extending the communication cable is not recommended. The communication cable must be used as a single piece. The required cable length can be provided by SEVEN Sensor.

If the SEVEN Sensor Monitoring System was also purchased together with the Automatic Soiling Sensor, the Gateway device required for the monitoring system is located inside the electronic panel. To enable the Gateway device to send data to the SEVEN Sensor Monitoring System, an M2M SIM card with a capacity of 100 MB must be obtained. The obtained SIM card must be inserted into the Gateway device as shown below.

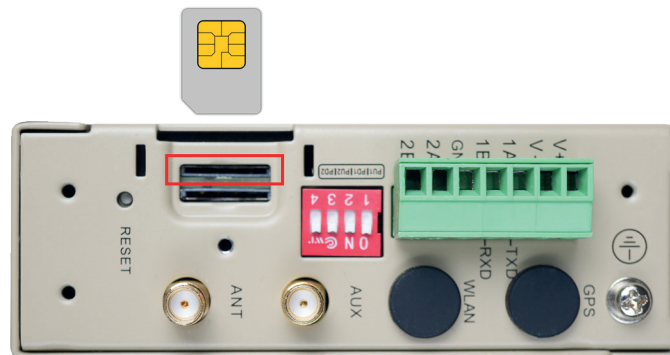


Figure 25 – SIM Card Connection to the Gateway Device

In the Gateway models of the Automatic Soiling Sensor, unlike other models, the communication cable is not connected to the electronic panel; a communication cable with a 2-pin connector is provided separately with the product. After the SIM card is inserted into the Gateway device, the communication cable connected to the electronic panel must be removed and the vacant connector must be closed with a cap (1). Then, the button that activates the communication of the Gateway device must be turned on (2). Finally, the antenna connected to the Gateway device must be placed at the highest point allowed by the cable length (3).



Figure 26 – Gateway Antenna Position

After all procedures related to the Gateway are completed, use the link below to log in to the SEVEN Sensor Monitoring System.

<https://monitoring.sevensensor.com>

Your login details for the SEVEN Sensor Monitoring System will be provided to you by the SEVEN Sensor sales team. Once you log in to the monitoring system with your assigned user credentials, the installation process will be complete. From this point on, you can monitor the Automatic Soiling Sensor data through the system. You can access the SEVEN Sensor Monitoring System user manual via the link below.

https://sevensensor.com/files/d/en/SEVEN-Sensor-Monitoring-System_User-Manual.pdf

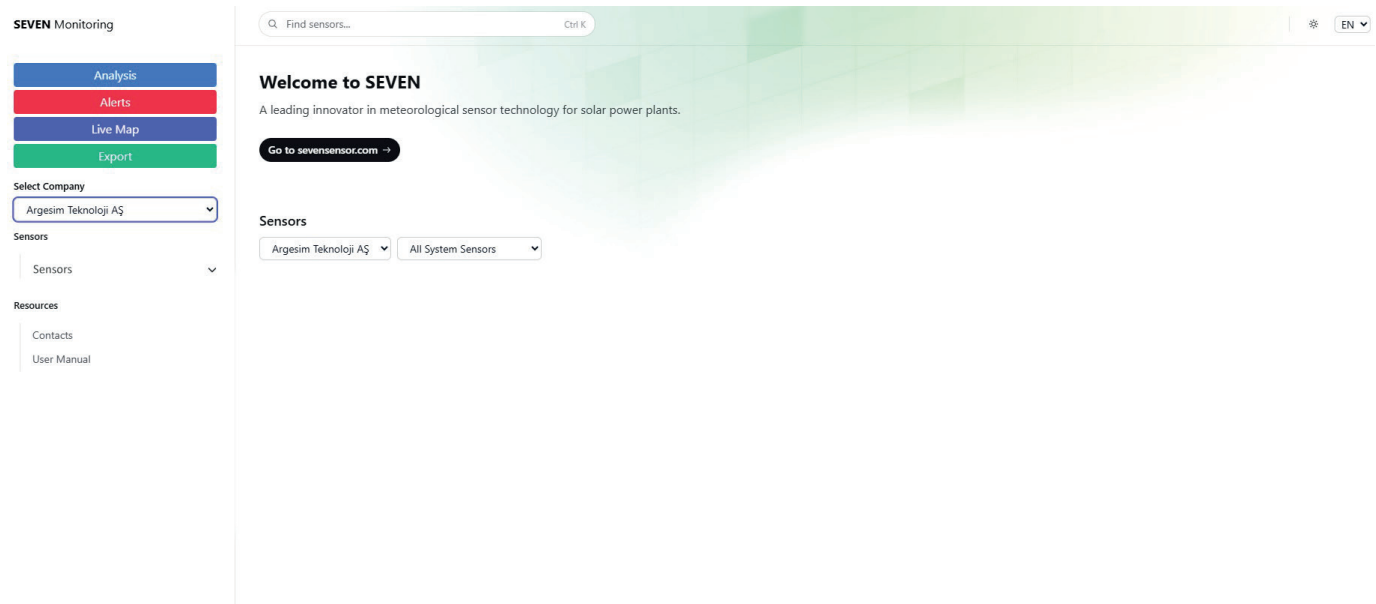


Figure 27 – SEVEN Sensor Monitoring System

6. Modbus Map

The Modbus addresses and features required to configure the Automatic Soiling Sensor with systems such as data loggers are specified in the table below.

ID-Dec	ID-Hex	Parameter Name	Range	Resolution	Description
30006	0x06	Clean Irradiance Value	0...1600 W/m ²	0,1 W/m ²	Represents the temperature-compensated and calibrated irradiance value (in W/m ²) obtained from the clean irradiance sensor of the Automatic Soiling Sensor.
30007	0x07	Soiled Irradiance Value	0...1600 W/m ²	0,1 W/m ²	Represents the temperature-compensated and calibrated irradiance value (in W/m ²) obtained from the soiled irradiance sensor of the Automatic Soiling Sensor.
30047	0x2F	Daily Average Soiling Level Percentage	0 - 100%	0,1%	Represents the daily soiling ratio calculated by the Automatic Soiling Sensor, expressed as a percentage (%).
30050	0x32	Water Tank Status	0-1	-	Represents the water tank's fill status. (1: full and 0: empty)
30335	0x14F	Stable Data Count	0-480	1	Represents the daily count of stable data recorded by the Automatic Soiling Sensor.

Figure 28 – Modbus Map

Note: The table above lists the addresses of the Automatic Soiling Sensor that need to be monitored by the user. If Modbus and SunSpec addresses other than the specified Modbus addresses, or the software features of these addresses, are required, you can download the detailed Modbus map from the link below.

<https://www.sevensensor.com/download>

7. Calibration and Normalization

The clean and soiled irradiance sensors of the Automatic Soiling Sensors are calibrated under a Class AAA sun simulator in accordance with the IEC 60904-2 and IEC 60904-4 standards, using a reference cell calibrated by the Institute for Solar Energy Research (ISFH) in Germany.

After the calibration process, small differences due to calibration uncertainty may occur between the measurements of the clean and soiled irradiance sensors. To prevent these differences from affecting the soiling ratio calculation, a normalization process is applied after calibration. Within the normalization, the calibration coefficient of the soiled irradiance sensor is updated in line with the stable measurement data obtained in accordance with the IEC 61724-1:2021 standard, and it is equalized to show the same irradiance value as the clean irradiance sensor. After the process is completed, the clean and soiled irradiance sensors show the same irradiance values under the stable weather conditions defined in IEC 61724-1:2021.

Note: Outside the stable weather conditions defined in the IEC 61724-1:2021 standard, differences may occur between the measurements of the clean and soiled irradiance sensors. This is because, under unstable weather conditions, the meteorological effects to which the sensors are exposed (e.g. cloud passages, changes in the diffuse/direct irradiance ratio, rapid irradiance fluctuations, etc.) affect the two cells to different degrees.

The Automatic Soiling Sensors do not require recalibration. The sensors can continue to be used by performing normalization again.

It is recommended to perform normalization again once a year. The requirements and application steps for re-normalization are explained in detail in the “User Interface Manual” document. The download link is provided below.

https://www.sevensensor.com/files/d/en/3S-SMS-MB_Soiling-Sensor_GUI.pdf

8. Inspection and Maintenance

To ensure the long-term and efficient operation of the Automatic Soiling Sensor, regular maintenance and inspections must be performed. It is important to check the tightness of the connection elements, the condition of the cables, and for any damage, degradation, or disconnection in the sensors and electrical enclosures. Additionally, it is necessary to observe the sensor enclosures for signs of moisture or pests, and to regularly inspect for potential issues such as loose cable connections or brittle connections.

When the water tank is depleted, approximately every six months, it is recommended to clean the inside of the tank before refilling. Otherwise, formations such as algae may occur inside the tank, which can adversely affect the cleaning performance of the clean irradiance sensor.

According to the IEC 61724-1:2021 standard, the monitoring system should be inspected at least once a year, and preferably at more frequent intervals.

9. Contact Details

Please feel free to contact us if you face any difficulties during installation or configuration.

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