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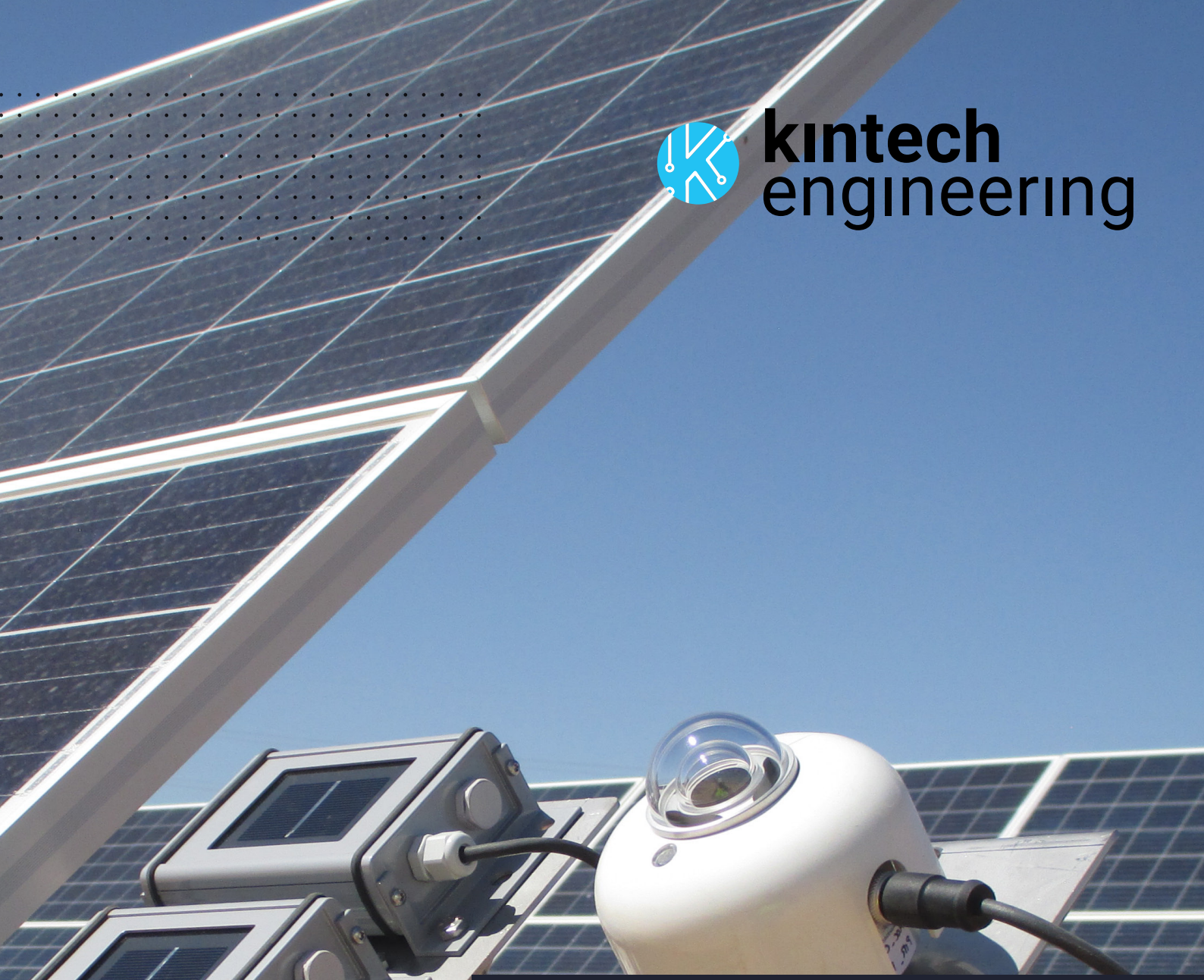

DATASHEET

Isc & Voc Monitoring

The ISC & VOC monitoring system is developed and manufactured by Kintech Engineering to accurately measure the Isc and Voc values of two solar PV panels simultaneously.

It is used for detection of fault symptoms, analysis of solar panel degradation and inclement weather conditions on the solar panels installed in the solar PV plant, including the effect from soiling.

ISC / VOC MONITORING | OTHER SOLAR

DESCRIPTION

With its small form factor, the Isc & Voc device is meant for use on solar PV panels already installed in the solar PV plant. The device can measure the Isc and Voc values from up to two solar PV panels simultaneously and when supplied as part of a complete measurement kit (including the Orbit 360 data logger) an open-source python script can be included to calculate the soiling rate.

APPLICATIONS

Isc & Voc monitoring of solar PV panels. The Isc output can be used for irradiance calculations whereas the Voc output can be used for cell temperature calculations. The combination of both Isc and Voc outputs can be used to estimate the solar power output.

FEATURES

General	
Supply voltage	11.5...30 V (DC)
Average current consumption	10mA @ 24V
Peak current consumption	500mA @ 24V
Operating temperature	-30...+70ºC
Storage temperature	-30...+85ºC
Dimension	72 mm x 89.7 mm x 62.2 mm
Mounting	Standard DIN Rail
IP	IP10
Compatibility	Analog output: all Kintech Engineering data loggers Digital output: Orbit 360 Premium
Manufacturer	Kintech Engineering
Inputs	
Isc range	0-20A, 0-30A
Isc accuracy	0.1%
Voc range	0-60V
Voc Accuracy	0.1%
Outputs	
Analog range	0-5V
Analog transfer function	Check “How to configure“ table
Digital*	RS485
Digital protocol	Modbus RTU

***Important**: Modbus RTU is only implemented in sensors manufactured after June of 2023.

Ordering information

Isc range	Voc range	Order code
0-20A	0-60V	SOILKIT03
0-30A	0-60V	SOILKIT04

Other options upon request.

For more information please contact **solar@kintech-engineering.com**
or visit our website **www.kintech-engineering.com**

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SENSOR WIRING TABLE

Pin Description		Orbit 360			EOL Zenith	
		Section	Terminal	Type	Section	Type
PV+	(+) PV panel 1					
PV-	(-) PV panel 1					
PV+	(+) PV panel 2					
PV-	(-) PV panel 2					
+	Power supply (+)	Power Input	+		BAT	+
GND	Power supply (-)	Power Input	(-)		BAT	-
ISC	Short-circuit Intensity 1	Analog Channels	48 52 56 60 65 69 73 77 81 84 85 86 90 91 92	Signal	Analog Inputs Extra Analog	1 2 3 4 5 1 2 3 4 5 6 7 8
VOC	Open-circuit Voltage 1	Analog Channels	48 52 56 60 65 69 73 77 81 84 85 86 90 91 92	Signal	Analog Inputs Extra Analog	1 2 3 4 5 1 2 3 4 5 6 7 8
REF	Reference	Analog Channels	47 51 55 59 64 68 72 76 80 87	(-)	Analog Inputs	- -
ISC2	Short-circuit Intensity 2	Analog Channels	48 52 56 60 65 69 73 77 81 84 85 86 90 91 92	Signal	Analog Inputs Extra Analog	1 2 3 4 5 1 2 3 4 5 6 7 8
VOC2	Open-circuit Voltage 2	Analog Channels	48 52 56 60 65 69 73 77 81 84 85 86 90 91 92	Signal	Analog Inputs Extra Analog	1 2 3 4 5 1 2 3 4 5 6 7 8
GND	GND					
A	RS485 A	RS485	33 37 41	A1, A2, A3		
B	RS485 B	RS485	34 38 42	B1, B2, B3		

Note: *Power supply must be in the range 11.5...30VDC and it has to be able to supply peaks of 500mA.*
Modbus RTU is only implemented in sensors manufactured after June of 2023.

REQUIRED DATA LOGGER VERSION

Analog output:
Minimum data logger required: **ORBIT 360 BASIC PLUS**.
Minimum **firmware** required: **any**.

Digital output:
Minimum data logger required: **ORBIT 360 PREMIUM**.
Minimum **firmware** required: **2.15**.

HOW TO CONFIGURE IN ATLAS

There are two different ouput data signal: RS485 and analog. Use and connect one of them following its wiring according to your preferences.
Important: Modbus RTU is only implemented in sensors manufactured after June of 2023.

Start Atlas and open the data logger you are working on. Now go to Site settings and scroll down to the Channels section and select the following type and model. The analog output signal from the instrument must be connected to one of the analog channels (ANL1 to ANL15) on the Orbit 360:

Magnitude	Range	Group	Sensor Type	Sensor Model	Slope	Offset
Isc	0-20A	Analog channels	Voltage	Volts	4	0
Isc	0-30A	Analog channels	Voltage	Volts	10	0
Voc	0-60A	Analog channels	Voltage	Volts	12	0

The variables from the digital output signal can be chosen (or assigned) to an analog channel according to the list here below.
Example:

Serial bus 1 baud rate: 9600bps

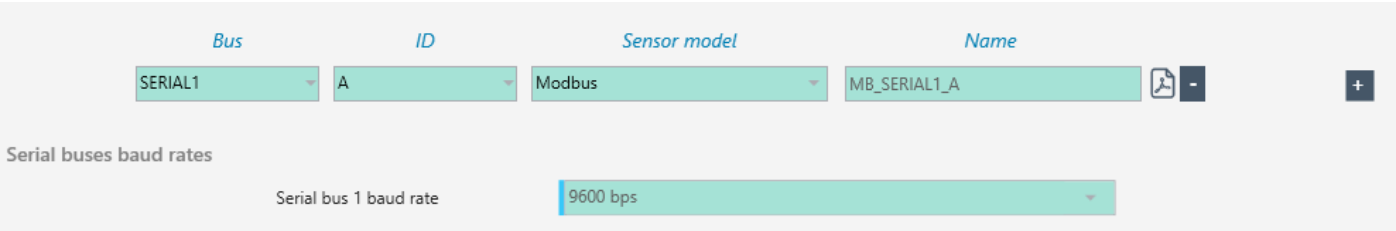
Bus: Serial 1 >>> ID: A >>> Sensor model: Modbus >>> Name: MB_SERIAL1_A

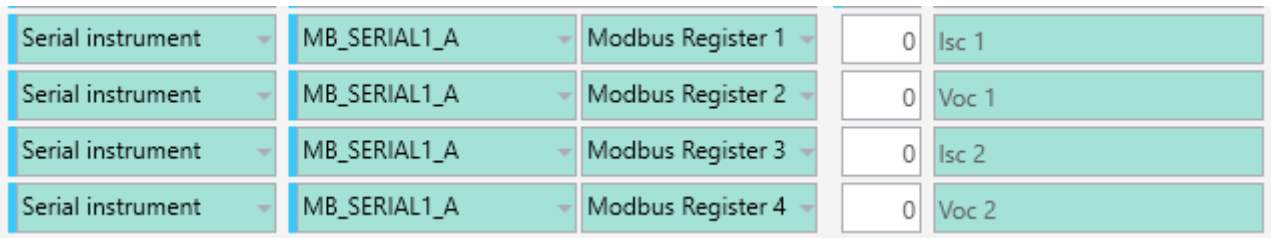
- Group: Analog channels
- Sensor Type: Serial device
- Sensor Model: **MB_SERIAL1_A**
  - Sensor Model: **Modbus Register 1**
  - Sensor Model: **Modbus Register 2**
  - Sensor Model: **Modbus Register 3**
  - Sensor Model: **Modbus Register 4**

*Refer to the section RS-485 DIGITAL OUTPUT: MODBUS RTU for more information about the digital output.

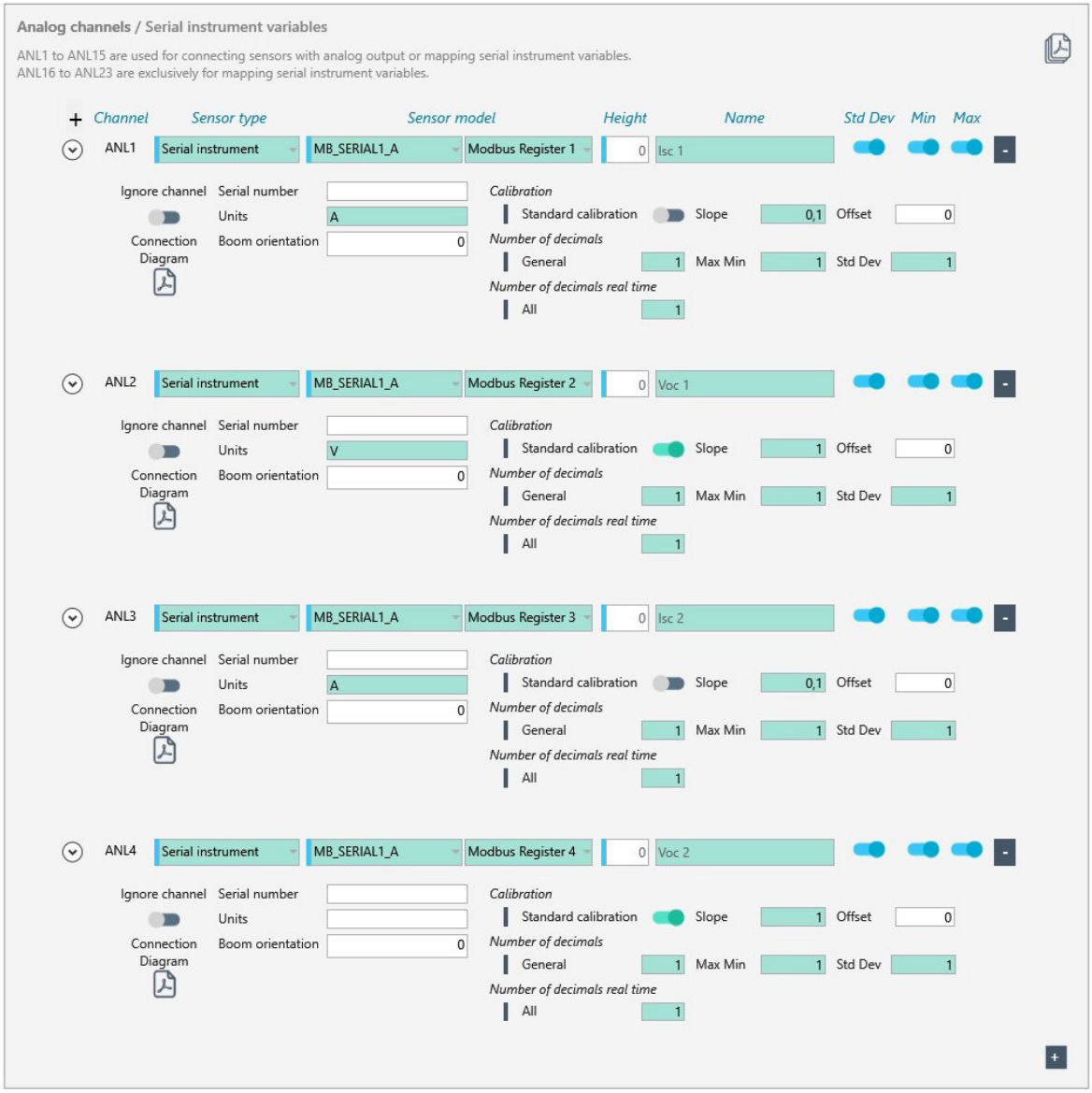
Important! Please make sure you are working with the latest version of Atlas. To check for new updates click the Check for updates button in the left-hand menu located in the main dashboard.

Sensor response time: **10ms**.
The sum of the response times of all the sensors connected to the same bus must not exceed 850ms.





Example:


Analog channels / Serial instrument variables
ANL1 to ANL15 are used for connecting sensors with analog output or mapping serial instrument variables.
ANL16 to ANL23 are exclusively for mapping serial instrument variables.
Channel
Sensor type
Sensor model
Height
Name
Std Dev
Min
Max
ANL1
Serial instrument
MB_SERIAL1_A
Modbus Register 1
0
Isc 1
Ignore channel
Serial number
Units
A
Connection Diagram
Boom orientation
0
Calibration
Standard calibration
Slope
0,1
Offset
0
Number of decimals
General
1
Max Min
1
Std Dev
1
Number of decimals real time
All
1
ANL2
Serial instrument
MB_SERIAL1_A
Modbus Register 2
0
Voc 1
Ignore channel
Serial number
Units
V
Connection Diagram
Boom orientation
0
Calibration
Standard calibration
Slope
1
Offset
0
Number of decimals
General
1
Max Min
1
Std Dev
1
Number of decimals real time
All
1
ANL3
Serial instrument
MB_SERIAL1_A
Modbus Register 3
0
Isc 2
Ignore channel
Serial number
Units
A
Connection Diagram
Boom orientation
0
Calibration
Standard calibration
Slope
0,1
Offset
0
Number of decimals
General
1
Max Min
1
Std Dev
1
Number of decimals real time
All
1
ANL4
Serial instrument
MB_SERIAL1_A
Modbus Register 4
0
Voc 2
Ignore channel
Serial number
Units
Connection Diagram
Boom orientation
0
Calibration
Standard calibration
Slope
1
Offset
0
Number of decimals
General
1
Max Min
1
Std Dev
1
Number of decimals real time
All
1

RS485 DIGITAL OUTPUT: MODBUS RTU

The sensor supports Modbus RTU protocol, over its RS-485 physical interface. The Modbus communication protocol follows a master-slave format, where the sensor is the slave and an external device is the master.
Modbus is widely used to connect the Supervisory Control and Data Acquisition (SCADA) system in the wind farm (master) with the different remote terminal units (RTU) connected to the bus (slaves).

Parameter	Factory settings	Selectable values
Baudrate	9600	9600, 19200, 38400, 57600, 115200
Data bits	8	8
Parity	None	None, Even, Odd
Stop bits	1	1
Address	1	1 to 247

Among the standard functions of the Modbus protocol, the sensor implements the function 03: “Read Holding Registers”.
The sensor features 13 Modbus registers that are accessible through said function and start at address 0x0000 (PLC address: 40001).

The following table describes the Modbus map and the content of the data registers corresponding to a sensor response.

Address	PLC addres	Variable / Parameter	Read / Write	Data type	Range & scale	Example (incl. units)
0	40001	Isc channel 1	Read only	Unsigned 16	100	1545 = 15.45A
1	40002	Voc channel 1	Read only	Unsigned 16	100	4562 = 45.62V
2	40003	Isc channel 2	Read only	Unsigned 16	100	1545 = 15.45A
3	40004	Voc channel 2	Read only	Unsigned 16	100	4562 = 45.62V
4	40005	Reserved	Read only	Unsigned 16	-	-
5	40006	Reserved	Read only	Unsigned 16	-	-
6	40007	Reserved	Read only	Unsigned 16	-	-
7	40008	Reserved	Read only	Unsigned 16	-	-
8	40009	Reserved	Read only	Unsigned 16	-	-
9	40010	Reserved	Read only	Unsigned 16	-	-
10	40011	Slave address	Read/Write	Unsigned 16	1 to 247	1
11	40012	Baudrate	Read/Write	Unsigned 16	0=9600 1=19200 2=38400 3=57600 4=115200	0
12	40013	Parity	Read/Write	Unsigned 16	0=None 1=Even 2=Odd	0

The Slave Address, Baudrate and Parity can be configured writing on the registers 10 to 12. The configuration is done using the Modbus standard function 16: “Write Multiple Registers”.
Important: the registers 10, 11 and 12 must be configured at the same time using a single write (using function 16) on the three registers at once.

HOW TO CONFIGURE THIS SENSOR ON SITE (ANALOG OUTPUT ONLY)

We recommend performing the entire sensor configuration using Atlas at the office before installing sensors onsite. Once the sensor is correctly setup in Atlas, use the Upload settings tool, to upload the sensor configuration to the data logger.
In case you are already on site and need to configure the sensor directly on the data logger, follow these steps:
1. Turn on the data logger.
2. Using the keypad on the data logger, navigate the menu until you see Sensor model, then click the “right arrow” on the keypad.
3. Now scroll down to the channel you are going to connect the sensor to, and click the “right arrow” on the keypad.
4. Now click “Set” on the keypad and scroll up in the menu to set the sensor model type according to the table here below. Once you have found the correct sensor model, click the “right arrow” key twice to select it and save.
5. Click the “left arrow” several times to go back to the main menu.

Data logger model	Firmware version	Sensor model type on data logger		
		Magnitude	Number	Name
ORBIT 360	any	ISC	01	milliVolts
		VOC	01	miliVolts
EOL ZENITH	any	ISC	01	milliVolts
		VOC	01	miliVolts

Keep in mind: *if the sensor channel has been configured as milliVolts, the output values on data logger display will always be shown in milliVolts. Remember to fill in both the slope and the offset for the pyranometer sensor to see real sensor values in* V and A *in your datasets during a real-time connection with the data logger (from either Atlas or Atlas Mobile).*

HOW TO CONFIGURE IN EOL MANAGER (ANALOG OUTPUT ONLY)

Open EOL Manager and go to Settings of the data logger you are working on. Open the Inputs tab and select the following type and model:

Magnitude	Range	Group	Sensor Type	Sensor Model	Slope	Offset
Isc	0-20A	Analog Inputs	Voltmeter	Generic Voltimeter	4	0
Isc	0-30A	Analog Inputs	Voltmeter	Generic Voltimeter	10	0
Voc	0-60A	Analog Inputs	Voltmeter	Generic Voltimeter	12	0

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