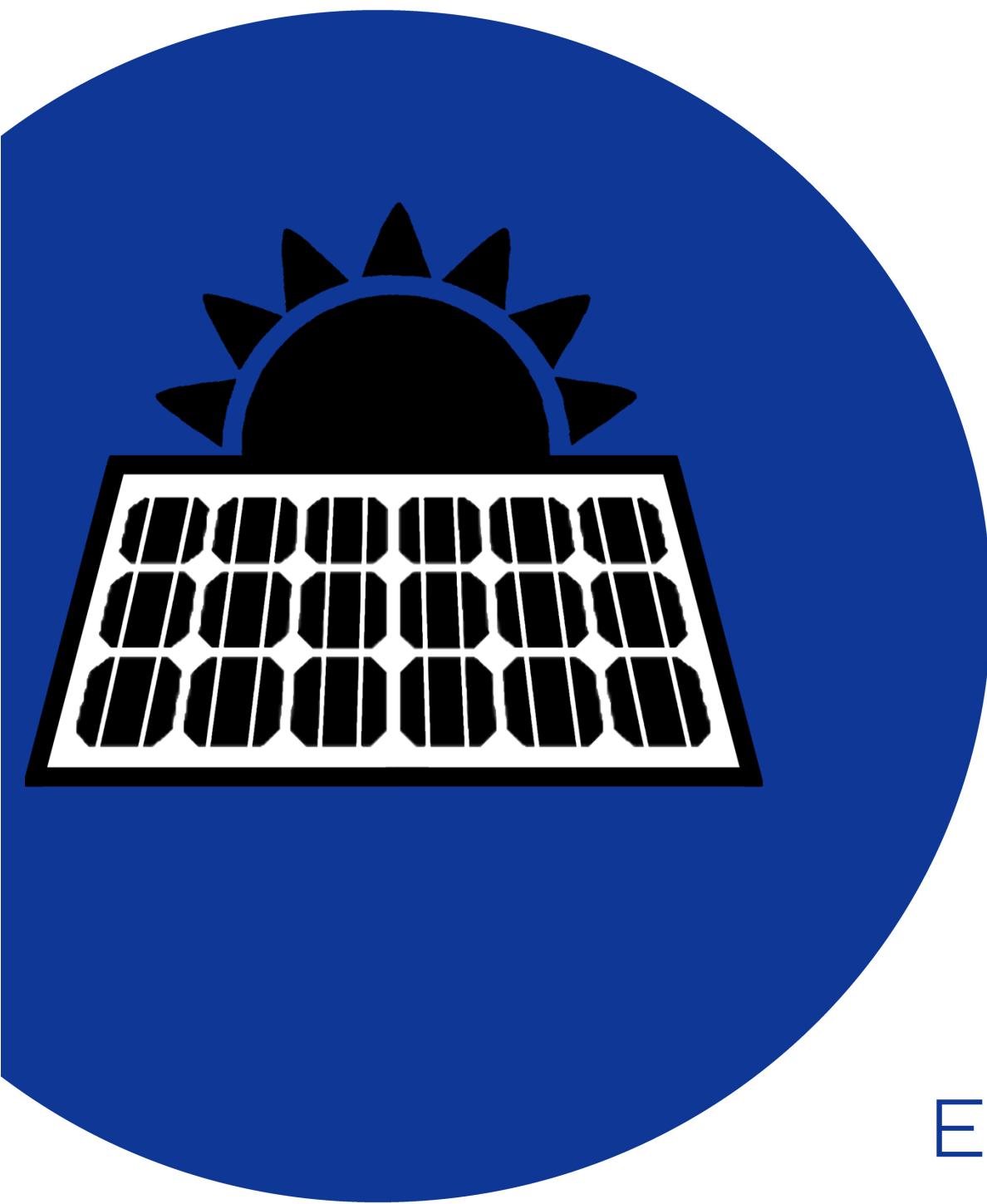


Instruction Manual
Powered by ReRa Solutions

PV-Blocks
PV Evaluation system



EKO

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Thank you for using EKO Products

Reading this manual is recommended prior to installation and operation of the product. Keep this manual in a safe and handy place for whenever it is needed.

For any questions, please contact us at below:

CONTACT INFORMATION

EKO INSTRUMENTS Europe B.V.

Europe, Middle East, Africa, South America Region

<https://eko-eu.com/>
info@eko-eu.com

Lulofsstraat 55, Unit 28,
2521 AL, Den Haag, The Netherlands
Tel: +31 [0]70 3050117
Fax: +31 [0]70 3840607

PV-Blockssystem is Designed by Rera Solutions

Mercator Building 1 / Toernooiveld 200 / 6525 EC Nijmegen / The Netherlands

WARRANTY AND LIABILITY

For warranty terms and conditions, please contact EKO Instruments or your distributor for further details.

EKO guarantees that the product delivered to customer has been tested to ensure the instrument meets its published specifications. The warranty included in the conditions of delivery is valid only if the product has been installed and used according to the instructions provided in this operating manual.

In case any manufacturing defect[s] will occur, the defected part[s] will be repaired or replaced under warranty; however, the warranty will not be applicable if:

- Any modification or repair has been done by other than EKO service personnel.
- The damage or defect is caused by disrespecting the specifications mentioned on the product brochure or instruction manual.

ABOUT INSTRUCTION MANUAL

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ENVIRONMENT

1. WEEE Directive 2002/96/EC



In August of 2005, the European Union [EU] implemented the EU WEEE Directive 2002/96/EC and later the WEEE Recast Directive 2012/19/EU requiring Producers of electronic and electrical equipment [EEE] to manage and finance the collection, reuse, recycling and to appropriately treat WEEE that the Producer places on the EU market after August 13, 2005. The goal of this directive is to minimize the volume of electrical and electronic waste disposal and to encourage reuse and recycling at the end of life.

EKO products are subject to the WEEE Directive 2002/96/EC. EKO Instruments has labeled its branded electronic products with the WEEE Symbol [figure Trash bin] to alert our customers that products bearing this label should not be disposed of in a landfill or with municipal or household waste in the EU.

If you have purchased EKO Instruments branded electrical or electronic products in the EU and are intending to discard these products at the end of their useful life, please do not dispose of them with your other household or municipal waste. Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

2. RoHS Directive 2002/95/EC

EKO Instruments has completed a comprehensive evaluation of its product range to ensure compliance with RoHS Directive 2002/95/EC regarding maximum concentration values for substances. As a result all products are manufactured using raw materials that do not contain any of the restricted substances referred to in the RoHS Directive 2002/95/EC at concentration levels in excess of those permitted under the RoHS Directive 2002/95/EC, or up to levels allowed in excess of these concentrations by the Annex to the RoHS Directive 2002/95/EC.

1. INTRODUCTION

PV-Blocks is a modular IV / MPP measurement system to measure the performance of PV modules deployed outdoors under natural sunlight conditions. The system is compliant to follow the procedures defined within IEC 60891 and requirements defined by IEC 60904-1 for I-V measurement of photovoltaic devices.

The advanced research system is fully compatible with the latest PV technologies and is scalable to test multiple modules in parallel. During long-term exposure tests, automatic measurements can be scheduled for continuous data retrieval of the measurable modules parameters. Up to 32 PV modules can be connected to the PV-Blocks base pack, to measure each individual I-V curve and characteristics under MPP load conditions. Similarly, individual temperature measurements are performed on the PV module. If modules are mounted with different tilt angles, different pyranometers or reference cells can be used to measure the total radiation in plane with the module. The system can be expanded with a meteorological station, sun-tracker (DNI, GHI, DHI) and spectroradiometer.



This user manual will give instructions to operate the hardware and software of the PV-Blocks system. Please read this manual carefully before using the system. The PV evaluation system is pre-configured and ready to be used. The powerful onboard computer controls the entire system and can be easily accessed through a local computer network. Data can be automatically collected to any local folder on your network PC.

1.1.SAFETY

All PV-Blocks are designed and manufactured with consideration for safety; however, please make sure to read and understand this instruction manual thoroughly to be able to operate the instrument safely in the correct manner.



General Warnings

- Make sure the system and the cables are installed in a location where they will not get soaked with water.
- Although this product is tested to meet EMC Directive compliance requirements, it may not fully satisfy its primary specification/performance when using this product near following locations where strong electromagnetic wave is generated. Please pay attention to the installation environment.
Outdoor: High voltage power line, power receiver/distribution facility, etc.
Indoor: Large-size chiller, large rotation device, microwave, etc.
- Do not use this product in the environment where corrosive gas, such as ammonia and sulfurous acid gas, are generated. It may cause malfunction.
- Do not install in the area that cause salt damages. It may cause malfunction by paint peeling off or corrosion.

Hardware in Enclosure

- Check the system for external damage. If the device is defective, it must not be used.
- For outdoor application the PV-BlocksDin rail modules can only be used when installed in a suitable outdoor enclosure.
- To avoid any electrical damage the PV blocks should be protected from moisture, water, dust, sand.



The power supply must be switched off from outside according to EN 60950-1 (e.g., via the line protection on the primary side). Preferably mount the power supply in the normal mounting position. Ensure that the primary-side and secondary-side wiring of the power supply are the correct size and have sufficient fuse protection. The power supply is a built-in device. The IP20 degree of protection of the power supply is intended for a clean and dry environment. The power supply is mounted in a control IP54 cabinet. For the connection parameters for wiring the power supply, such as the required stripping length with and without ferrule, refer to the technical data section. As a safety measure against shock currents, always wire the protective conductor device terminal block to the control cabinet ground connection. To avoid accidental contact with live parts, always cover the termination area (e.g., installation in the control cabinet).



- Check the voltage and types of specified power supply before connecting this instrument. When improper power supply is connected, it may cause malfunction and/or accident.
- The power supply contains components that have been designed for operation at potentially lethal voltages. The accumulated level of energy can also be high. Never carry out work when mains voltage is present.
- Depending on the ambient temperature and load on the power supply, the housing can become hot.



Heatsinks

- The PV-IV/MPP loads that are connected to the PV modules will generate heat when the PV modules are in operation. Do not touch the heatsinks or wear protective gloves.
- The heatsinks that are connected to the PV modules need to be placed at a ventilated location where the heat can be easily dissipated. The heatsinks cannot be placed in direct rain or wind.
- Do not place the heatsinks directly next to PV modules. As the heatsinks will generate heat, this could influence the results of the performance measurements.



PV Modules

- High Voltage warning, wear protective gloves when connecting the PV modules to the load module.
- The loads have an MC-4 distribution connector. In case any cable need to be extended, do not touch the open leads of the PV module. Use 4 wire extension cables with MC-4 connectors.

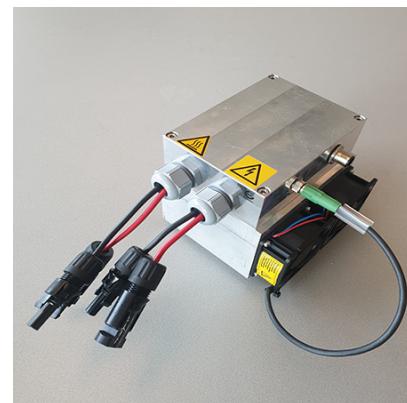
1.2.SYSTEM COMPONENTS

The PV Blocks PV Evaluation system consists of:

- PV Base:
 - Computer (PV Link)
 - 24 VDC Power supply (PSU)
 - PV Base Block (PV-BASE)
 - 10m ethernet cable



- PV IV/MPP Pack
 - PV-IV/MPP blocks
 - Load Block
 - 10m power signal cable



1.3.GETTING STARTED

In order to obtain high quality measurements several criteria with respect to set-up and mounting of the instruments have to be considered. The ideal mounting position for the system is a location which has a full hemispheric field-of-view without any obstructions [such as buildings, trees, and mountains]; however, it might be difficult to find such locations. Therefore, in practice it is ideal to install in a position which is free from obstructions at 5° above horizon.

The setup location should be easily accessible for periodic maintenance [glass dome cleaning], and avoid surrounding towers, poles, walls or billboards with bright colors that can reflect solar radiation onto the PV system.

The PB-Blocks components are made to be used in an all-weather IP54 Din-Rail enclosure which can be installed in close range to the PV modules. Hence the Load units can be directly connected to the PV module.



Install the IV/MPP load units on a metal frame not exposed to precipitation and direct sun light. The loads unit are IP54 protected, however it is strongly recommended to shelter from environmental factors.



During installation and service make sure mains power is switched off.

1.4. INSTALLATION

Follow the installation instructions:



For safety reasons always switch off-mains power before installation and service.



It is recommended to use a voltage break and fuse to protect the electronic system against over current and switch-off mains power.



To avoid electrical damage always switch off mains power before installation and service.

1. Use a proper minimum IP 65 enclosure to mount the PV-Blockssystem modules outdoors. The PV-Blocksmodules are compatible with any T35mm dinrail. The PV-IV/MPP load module is mounted separate from the enclosure in close distance to the PV-Modules
2. For the configuration of the system, maximum 8 units PV-IV/MPP can be connected to one power supply cluster. There is no limitation for the other PV-Blocks-modules connected to the same cluster.
3. Attach the PV-Blocksmodule to the din-rail. Keep the PV-Line and power supply on the left-hand side of the PV-Base communication module. All consecutive modules (PV-IV/MPP, PV Irr, PV, Temp, PV Mod) are interlinked with the base unit communication and powerline.
4. The 24 VDC voltage supply cable can be connected to the terminals (+24VDC / -V), see picture below.



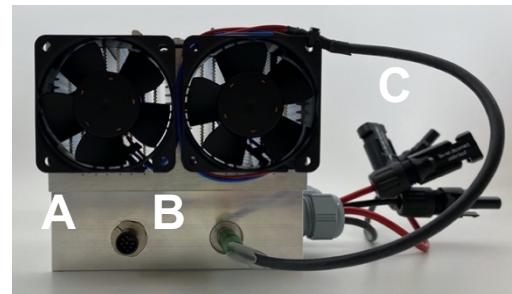
5. PV-IV/MPP Block

Connect the 2 terminal blocks which are on the cable to the PV-IV/MPP module. Check the corresponding numbers indicated on the terminal.



6. V-MPP load cables

- Connect the 8 pin load cable to the IV/MPP load
- Connect the cable of the fan to the fan connector.
- Connect the PV module to the 4 wire Module input. Y splitter is provided to connect the 2 cable of the PV modules.



In case PV module cable will be extended. Apply 4 cable in between the Y splitter and the IV/MPP module.

7. Computer

Connect the ethernet cable to COM1 for local area networks. The other port (COM2 / 3) can be used for a peer to peer connection with a PC.



2. SOFTWARE

This section will describe the PV-Blocks software functionality and the way to use it.

2.1. CONNECTING

The PV-Blocks system has to be controlled by an Ethernet network connection.

Connect the CAT-5 network cable to Port1 at the bottom of the internal computer. Connect the other end of the cable to your network. Your network should give the system a dedicated IP address.

Open a browser and type into the address bar: <http://PV-Blocks.local>



When you get a warning about connecting to an insecure site, please ignore this and continue.

▼ What if PV-Blocks.local does not work?

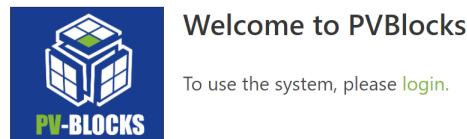
Sometimes the local network has strict security settings what prevents you to connect to the address <http://PV-Blocks.local>. If this is the case you will need to replace the name by the ip-address that was given to the PV-Blocks system. Your network administrator might be able to help you with this, but there is also another method:

- Keep the connection between your local network and the PV-Blocks system Port 1.
- Take a second network cable and connect this to port 2 of the PV Blocks computer.
- The other end of this second network cable has to be connected to your laptop or PC.
- You will have to give your laptops network adapter a static IP-address:
 - IP address 192.168.4.170
 - Subnet Mask 255.255.255.0
 - Gateway 192.168.4.1

Now open your browser and type the following address (in stead of PV-Blocks.local):
<http://192.168.4.171>

You should now be connected to the PV-Blocks system. In the main screen (after logging in) you can see the IP address that was given by your network. Write this down and use it the next time you connect (after removing the second network cable).

You will see the welcome screen:



Press the login link.

A screenshot of the PVBlocks login page. It has a green "Login" button at the top left. The main title "Please log in" is centered above two input fields: "Email" (containing "admin@localhost") and "Password" (containing a redacted password). A "Remember me?" checkbox is below the password field. At the bottom is a blue "Log in" button. The footer of the page reads "PVBlocks by ReRa Solutions BV.".

If this is the first login then use the following credentials:

user/email: admin@localhost

password: 6vzZuP48k8OQ

If this is correct you will enter the main PV-Blocks [dashboard](#):

The screenshot displays the PV-Blocks web application interface. At the top, there's a dark blue header bar with the 'PV-BLOCKS' logo and navigation links for 'Home', 'Data', 'Setup', and 'Help'. A 'Account' button is also present in the top right corner.

The main content area is divided into several sections:

- New Site:** Shows site details: Responsible (John Doe), Phone (123456), Email (john@doe.com), Latitude (51.700), Elevation (0.0 m), Longitude (5.800), Network (Port2: not found), Port1: not found, Port3: not found.
- Tuesday, September 22, 2020:** Displays current time (7:28:28 PM), time zone (Europe/Berlin), and up-time (0 days 0 hours 4 mins).
- Meteo:** Provides environmental data: Ambient temperature (22.4 °C), Relative humidity (42 %), Barometric pressure (10156 Pa), GHI (0.0 Wm⁻²), DHI (0.0 Wm⁻²), DNI (0.0 Wm⁻²), and Wind (0.0 ms⁻¹ (270°)).
- PV Modules:** A table listing six modules with their codes, serial numbers, temperatures, irradiances, and powers. All listed modules have 0.0 values for all metrics.
- Sun-path:** A graph titled 'Sun position: (269.79, 0.55)' showing the solar elevation angle over time from 05:00 to 21:00. It features two curves: a black one representing the sun's path and a blue one representing the module's tracking path.

At the bottom center of the interface, the text 'PVBlocks by ReRa Solutions BV.' is visible.

2.2. WORKFLOW

The PV-Blocks solution is a modular system dedicated to the long term measurement of PV Modules and all its relevant parameters.

There are several PV-Blocks available:

IV-MPP

The IV-MPP Block is an autonomous measurement and control unit that directly interfaces to an outdoor load. This load is connected close to the module to be measured. The Block can measure IV Curves and perform MPP tracking while it continuously measures the voltage and current (power) of the attached module.

IV-TEMP

The IV-TEMP can be used to connect and measure 4x Pt100 elements in a 3-wire configuration.

IV-IRR

The IV-IRR is used to measure 2 analog irradiance sensors (for example reference cells).

IV-MOD

The IV-MOD connects the PV-Blocks system to an external MODBUS network. It is used to create an interface to weather-stations and digital sensors. Currently the PV-MET-500 weather station and the EKO MS-90 DNI system are supported.

Workflow

The workflow consists out of 4 steps: configuration, data collection, iv-curves and analysis

configuration:

The user defines the PV-Modules that are connected to the different loads (IV-MPP). Each module will be assigned a temperature sensor connected to an IV-TEMP and an Irradiance device connected to a PV-IRR.

data collection

As a default the system measures all values at a one minute interval. This means all temperatures, irradiances, meteo-data and the current/voltage pair of each PV-Module are stored.

Each PV-Module is kept in open voltage conditions, so no current is flowing.

IV curves

For each PV-Module it is possible to define an IV-curve measurement interval. When this interval is set to 30 minutes, the system will perform a full IV curve each 30 minutes. In between these IV-curve measurements the PV-Module can be:

- a. kept in maximum power point (MPPT) by means of the Perturbation and observation (P&O) algorithm.
- b. kept in open voltage conditions
- c. kept at a fixed voltage bias

analysis

All data can be viewed and exported in the software.



Please read the [getting started](#) to setup your system

2.3.GETTING STARTED

Step 1:

When you see the dashboard for the first time, it is advised to change your password. Go to the account menu for this by [pressing the Account button](#) in the top right corner.

Step 2:

Define your site. Go to the [Site settings](#) menu to do this.

Step 3:

Configure your Irradiance sensors. Go to the [Configure Irradiance sensors](#) menu to do this.

Step 4:

Define your hardware. Go to the [Hardware setup](#) menu to do this

Step 5:

Configure the connected PV-Modules. Go to the [Configure PV Modules](#) menu to do this

Step 6:

Setup the scheduler for IV curve measurements. Go to the [Scheduler](#) menu to do this

2.4.MENU



For the latest version of the software section, please check the software manual in the help function.

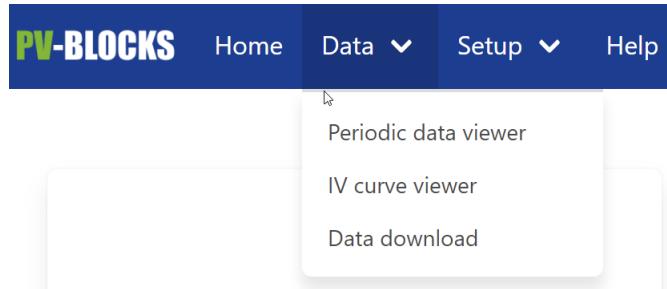
Data menu:

Data

[Periodic data viewer](#)

[IV curve viewer](#)

[Data download](#)



Setup menu:

Setup

[Configure Irradiance sensors](#)

[Configure PV modules](#)

[Site settings](#)

[Scheduler](#)

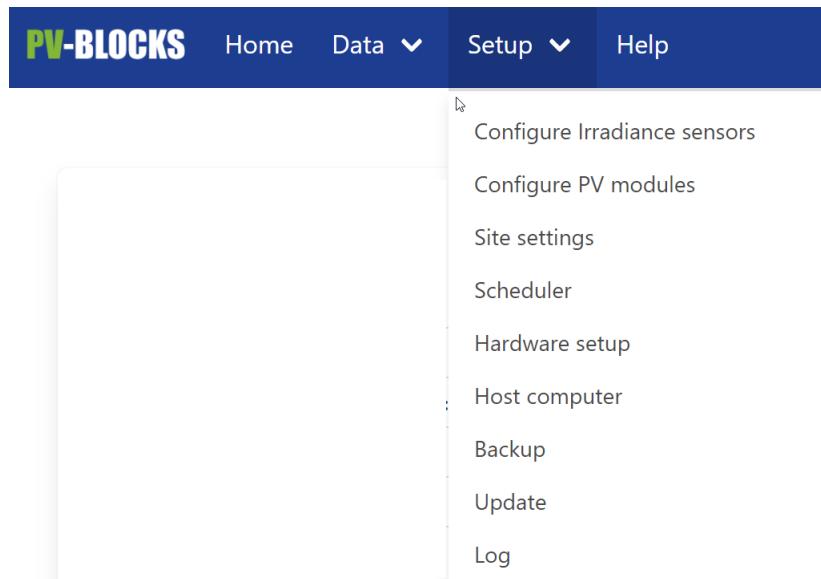
[Hardware setup](#)

[Host computer](#)

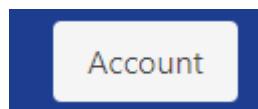
[Backup](#)

[Update](#)

[Log](#)

**Help menu:**

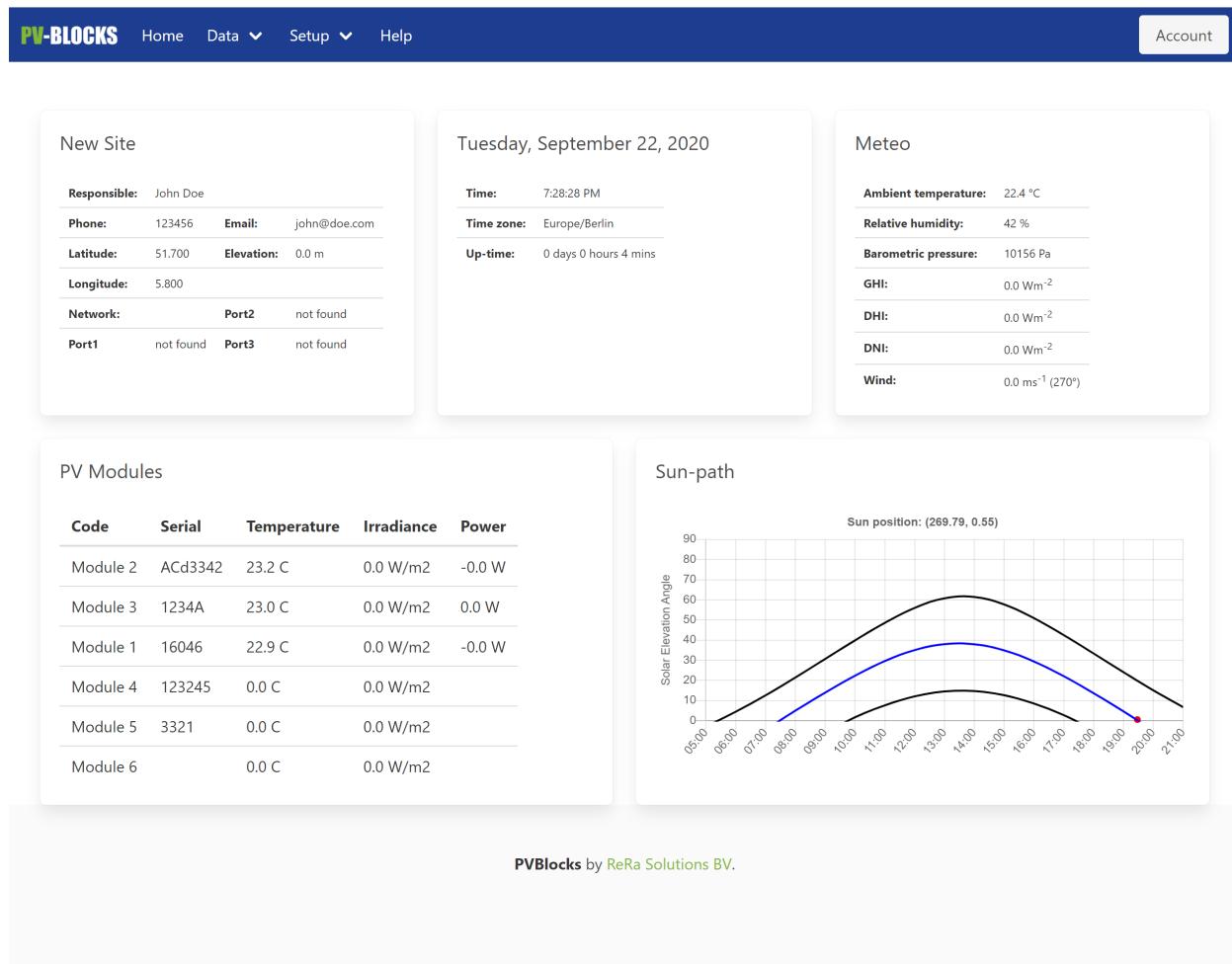
Shows this help

Account menu:

The account page can be used to change your password.

2.4.1. HOME

On the dashboard you can quickly see the status of the system.



On the dashboard you will see 5 areas and the topbar menu system.

Area: New Site

New site shows the data of the current location. This information has to be inserted by the user in the Setup/Site Settings page. Furthermore, it will show the 3 IP addresses of the Ethernet ports on the PV-Blockscomputer. The first IP address (port 1) is always the one given by your local network.

Area: Date/Time

This indicates the current date, time and timezone. It will also indicate the up-time of the system.

Area: Meteo

This region will always show the last available measurement from attached Meteo systems..

Area: PV Modules

Here an overview of the last measurements on the PV modules is shown. It shows the temperature of the temperature sensor that is attached to the specific PV-module and the irradiance that was measured for this module.

Area: Sun Path

The calculated sun elevation angle is shown, including the year max. and year min. lines.

2.4.2. DATA

Data

[Periodic data viewer](#)

[IV curve viewer](#)

[Data download](#)

2.4.2.1. PERIODIC DATA VIEWER

This page will visualize all the default measurements of a certain day. Default measurements are all values at a one minute interval. This means all temperatures, irradiances, meteo-data and the current/voltage pair of each PV-Module



In the top area you can select the day. Press the refresh icon () to update all values.

There are 4 graphs: Meteo, Irradiance, Power and Temperature. On the graphs are tools to select different data sets and enable/disable certain values.

When the Export data button is used, a single CSV file is downloaded where all data of the selected day is stored.

2.4.2.2. IV CURVE VIEWER

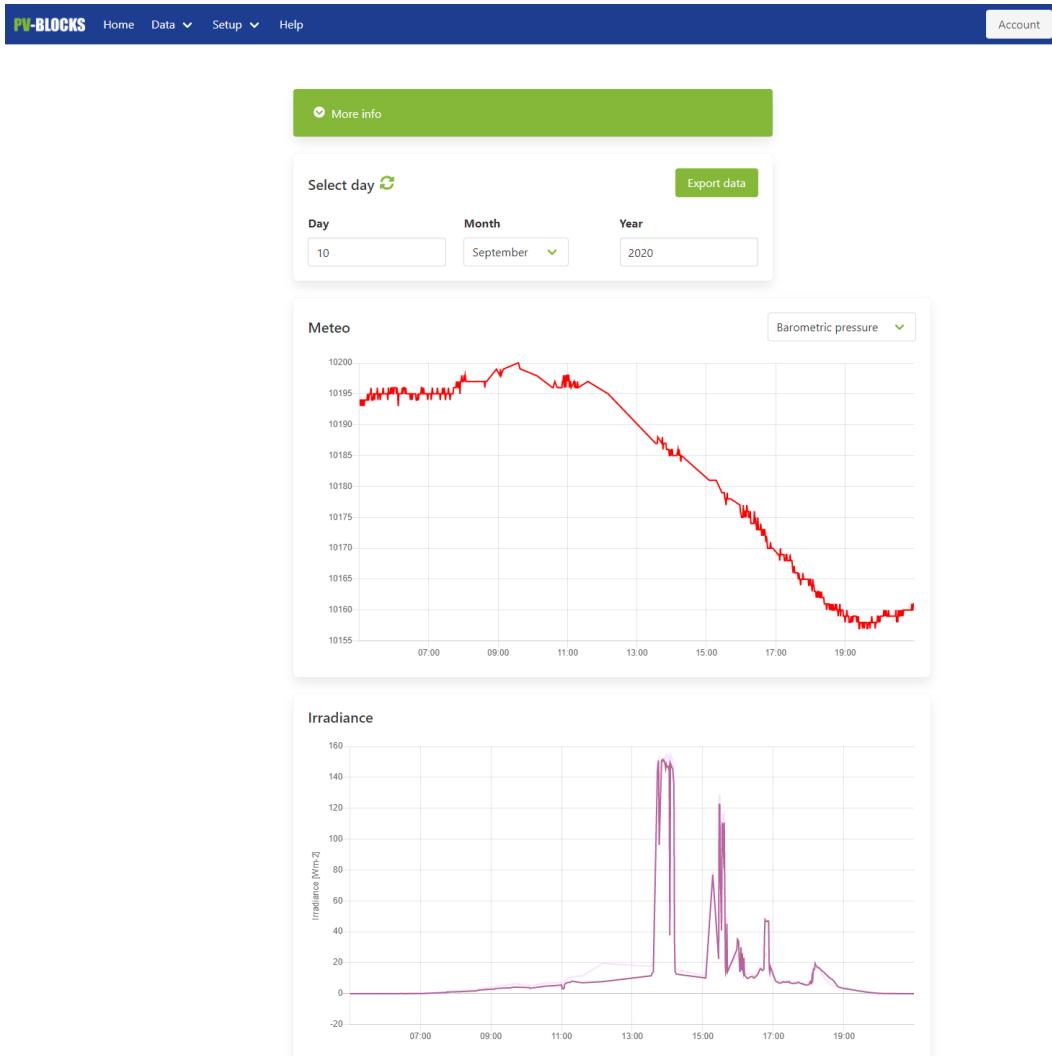
Use this page to view the measured IV curves.

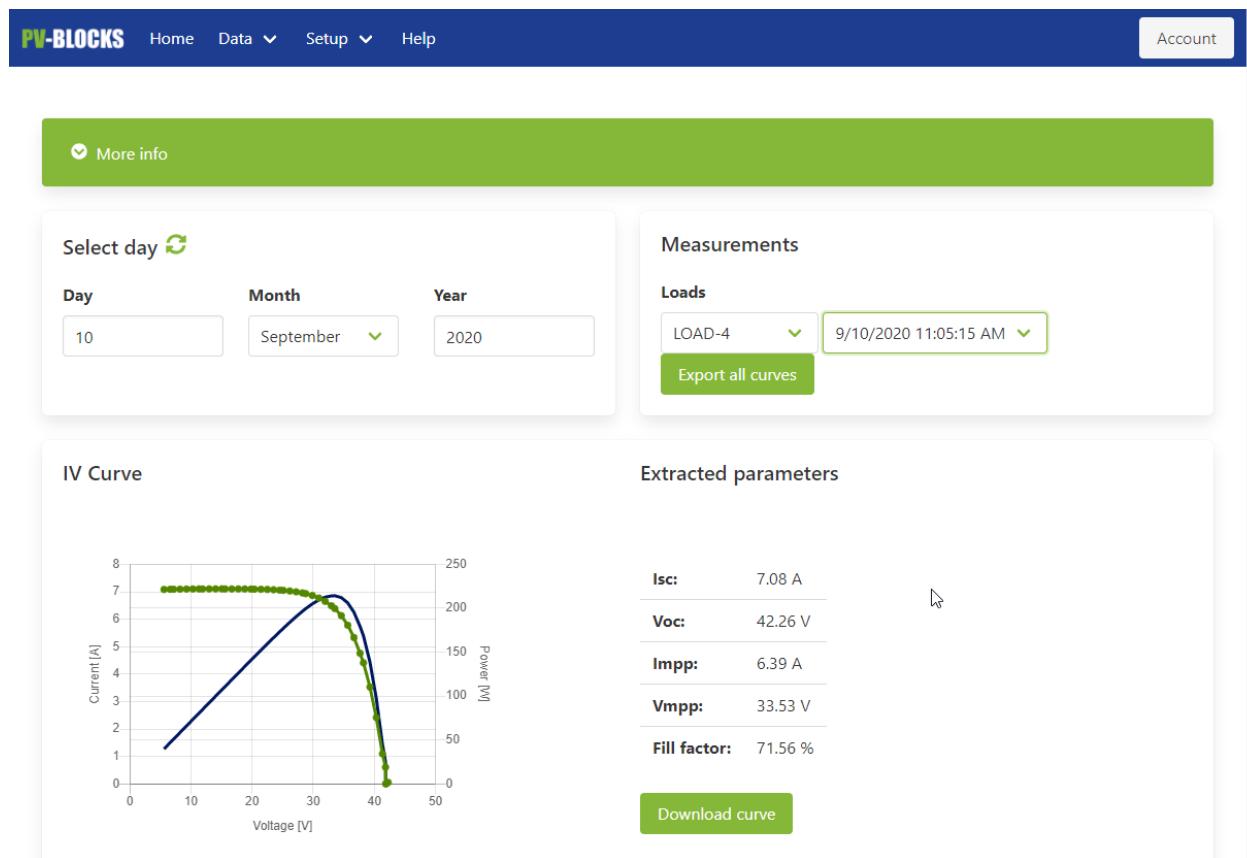


In the top area you can select the day. Press the refresh icon () to update all values.

Select the Load that you are interested in, in the Measurements area and the available curve timestamps will appear in the drop-down list next to the Loads list.

Pressing the Export all curves button will download a single file that contains all the curves measured for the selected load.





When a curve is selected by its timestamp, it is shown in the IV-curve graph together with its extracted parameters. You can download this single selected curve by pressing the Download curve button.

2.4.2.3. DATA DOWNLOAD

Use this screen to download the data collected over a longer period. Select a start day and a stop day and press the refresh icon () to update all values.

The Export button will now appear indicating the amount of measurement rows which are available.

When the Export button is used, a single CSV file is downloaded where all data of the selected period is stored.

The screenshot shows the PV-BLOCKS software interface. At the top, there is a navigation bar with links for Home, Data, Setup, Help, and Account. Below the navigation bar, there is a green header bar with a 'More info' button. The main content area has two sections for selecting export start and stop days, each with Day, Month, and Year dropdowns. The start day is set to 8 September 2020, and the stop day is set to 11 September 2020. Below these sections is an 'Export' button, which is highlighted with a green background and white text. A sub-button labeled 'Export 25032 rows' is visible underneath the main export button. At the bottom of the interface, the text 'PVBlocks by ReRa Solutions BV.' is displayed.

2.4.3. SETUP

Setup

- [Configure Irradiance sensors](#)
- [Configure PV modules](#)
- [Site settings](#)
- [Scheduler](#)
- [Hardware setup](#)
- [Host computer](#)
- [Backup](#)
- [Update](#)
- [Log](#)

2.4.3.1. CONFIGURE IRRADIANCE SENSORS

You require analog in-plane irradiance sensors to allow for the measurement of the incident power on the PV-Modules.

You can define the sensors on this page.

The screenshot shows a software interface for managing irradiance sensors. At the top, there's a dark blue header bar with the "PV-BLOCKS" logo on the left and a menu icon on the right. Below the header, the title "Irradiance sensors" is displayed in a large, bold, dark font. A green button labeled "More info" is visible. The main content area is a table with the following columns: Manufacturer, Code, Serial, Sensitivity, Irradiance, and two small icons. There are two rows of data in the table, both corresponding to "Mencke & Tegtmeyer GmbH" with "Si-mV-85" as the code. The first row has a sensitivity of 56.88 and is categorized as "InPlane". The second row has a sensitivity of 56.48 and is also categorized as "InPlane". Each row has a green "edit" icon and a green "trash" icon. At the bottom left of the table area, there is a green "New" button. In the bottom right corner of the main window, there is a watermark-like text "PVBlocks by ReRa Solutions BV." and a small cursor icon.

Manufacturer	Code	Serial	Sensitivity	Irradiance		
Mencke & Tegtmeyer GmbH	Si-mV-85	85-00003-17-20340137	56.88	InPlane		
Mencke & Tegtmeyer GmbH	Si-mV-85	85-00003-17-20340138	56.48	InPlane		

New

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Press the New button insert a new sensor. This can be a reference cell or a pyranometer. Insert the sensitivity in uV/W/m².

The screenshot shows a modal dialog box for configuring a sensor. The title bar reads "Configure sensors". Inside, there is a header with the text "Mencke & Tegtmeyer GmbH [Si-mV-85]" and a close button. Below this, the form is organized into four pairs of labels and input fields:

Manufacturer	Model
Mencke & Tegtmeyer GmbH	Si-mV-85
Serial	Sensitivity
85-00003-17-20340137	56,88
Type of irradiance	Sensor type
In-plane	Reference Cell
Tilt angle	Azimuth
15	182

At the bottom left of the dialog is a blue "Close" button.

You can also insert the tilt angle and azimuth if this is available.

2.4.3.2. CONFIGURE PV MODULES

This page is used to define the PV-Modules which are connected to the system. You can have more PV-Modules in this page then you have actively connected to the loads. Use it as a database of your PV-Modules collection.

The screenshot shows a web-based application interface for managing PV modules. At the top, there is a dark blue header bar with the "PV-BLOCKS" logo on the left and a three-line menu icon on the right. Below the header, the main title "PV Modules" is displayed in a large, bold, dark font. Underneath the title, there is a green button labeled "More info" with a checkmark icon. The central part of the screen is a white table with a thin gray border. The table has columns for Manufacturer, Panel Code, Serial, Area, Power, and Irradiance sensor. Each row contains data for a specific module, including its manufacturer (JWA, Sunpower, JA Solar, ReRa, ReRa 2, ReRa 3), panel code (Module 2 through Module 6), serial number, area (1.3, 0, 1.6, 0, 0), power (280, 0, 265, 123, 0), and irradiance sensor status (indicated by icons). At the bottom left of the table area, there is a green button labeled "New". A cursor arrow is visible at the bottom right of the table.

Manufacturer	Panel Code	Serial	Area	Power	Irradiance sensor
JWA	Module 2	ACd3342	1.3	280	
Sunpower	Module 3	1234A	0		
JA Solar	Module 1	16046	1.6	265	
ReRa	Module 4	123245	0	123	
ReRa 2	Module 5	3321	0		
ReRa 3	Module 6		0		

Press the New button to create a new PV-Module.

JA Solar [JAM6(R)(BK)] ×

Manufacturer JA Solar	Panel Code JAM6(R)(BK)	Serial 61215/61730
Material Silicon	Area 1,3	
Isc 9.13	Voc 38.52	Power 265
TC <input type="text"/>	Alpha <input type="text"/>	Beta <input type="text"/>
Cells 72	Strings 1	Temperature sensor: RTD-2 ✓
Load: LOAD-1 ✓	In-plane irradiance detector: Si-mV-85 (85-00003-17-20340138) ✓	
<input type="checkbox"/> Bifacial module		
Save & Close		

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First fill in all data that is available for the module. Most fields are optional, however the Manufacturer, Panel code and Serial number are mandatory.

From the Load drop-down list select the Load that is connected to the PV-Module. Do the same for the temperature sensor and assign one of the connected [irradiance sensors](#) to the modules to be used as Plane of Irradiance sensor.

2.4.3.3. SITE SETTINGS

In this page you have to set the correct time zone and coordinates of the location. This is important for the calculation of sun path.

The system works in the background with UTC time values; therefore you will have to set your time zone in order to get the correct values locally.

You can also fill in some details of your measurement site, but this is optional.

The screenshot shows the 'Site settings' page of the PV-BLOCKS application. At the top, there is a blue header bar with the 'PV-BLOCKS' logo on the left and a menu icon on the right. Below the header, the title 'Site settings' is displayed. The main form has a light gray background and contains several input fields and dropdown menus. At the top of the form are two buttons: 'Save' (blue) and 'Cancel' (green). The first section, 'Site', includes a 'Site' dropdown set to 'Main Site' and a 'Description' input field containing 'Power plant'. The second section, 'Responsible', contains three input fields: 'John Doe' (name), '1234567' (phone number), and 'john@doe.nl' (e-mail). The third section, 'Coordinates', includes 'Latitude' (51.80538), 'Longitude' (5.708092), and 'Elevation' (0). A dropdown menu below these fields lists time zones: '(UTC+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna'. The fourth section, 'Time & Date', shows 'UTC Time Format: hh:mm:ss (e.g. 13:45:12)' and 'Date Format YYYY-MM-DD (e.g. 2020-09-20)', both currently set to 'current'. At the bottom of the form, the text 'PVBlocks by ReRa Solutions BV.' is visible.

2.4.3.4. SCHEDULER

The scheduler is used to control the measurements.

Scheduler

Pause scheduler

Scheduler

Before making any changes to the scheduler, you will have to temporarily pause the measurements. Use the button to pause the scheduler.

As a default the system measures the values at a one-minute interval. This means all temperatures, irradiances, meteo-data and the current/voltage pair of each PV-Module are stored.



It is not possible to change this interval.

When something changes in the PV-Blocks configuration, for example a new PV-Blocks is added, the scheduler needs to be updated.

For any change in the Scheduler (and in the hardware) it is required to pause the scheduler. Press the *Pause scheduler* button:

The scheduler is paused, no measurements are taken. Go to System Setup / Scheduler to enable it.

Scheduler

Enable scheduler

Scheduler
The scheduler is now paused, no measurements are taken. Use the button to enable the scheduler.

Reset Scheduler

Reset
To reset the scheduler, press the button. All scheduler settings will be reset and removed. Do this for example when a new PVBlock is installed.

IV-curves

PVBlock	Start	Stop	Mode	Curve Interval
LOAD-1				
LOAD-2				
LOAD-3				
LOAD-4				
LOAD-5				
LOAD-6				
LOAD-7				
LOAD-8				

PVBlocks by ReRa Solutions BV.

When the scheduler is paused, no measurements are taken anymore. This is made clear by the red warning area on top of the screen.

Pressing the Reset Scheduler button will make sure all PV-Blocks are configured correctly. Always do this when changes in hardware have been made (adding or removing physical PV-Blocks).

IV-curves

Each connected load (IV-MPP PV-Blocks) can be programmed to take IV-curves at regular intervals. After resetting the scheduler no IV-curves will be measured.

Press the green edit icon behind the load that you want to configure.

A new page opens:

The scheduler is paused, no measurements are taken. Go to System Setup / Scheduler to enable it.

Schedule

PVBlock	Start time	Stop time	IV Curve interval
LOAD-1	09:00:00	22:00:00	00:15:00

Mode

- MPP tracking
- Select mode
- MPP tracking**
- Open voltage
- Voltage bias

PVBlocks by ReRa Solutions BV.

In this page the IV-curve measurements can be configured.

Between the start and stop time the IV-curves are measured at the interval time set each day.

Between the measurement the PV-Module can be in one of the three states indicated by Mode:

- a. kept in maximum power point (MPPT) by means of the Perturbation and observation (P&O) algorithm.
- b. kept in open voltage conditions
- c. kept at a fixed voltage bias which is set in the Voltage bias input box



The default scheduler will measure current and voltage pairs of ever Load at 1 minute intervals. Depending on the mode set, this will be MPP, Voc or Vbias

2.4.3.5. HARDWARE SETUP

In this page the hardware is configured, to do this, the scheduler needs to be stopped. Press the *Pause scheduler* button to do this.



Hardware configuration

Pause scheduler

Hardware configuration

Before making any changes to the hardware, you will have to temporarily pause the measurements. Use the button to pause the scheduler.

The following screen appears:

The scheduler is paused, no measurements are taken. Go to System Setup / Scheduler to enable it.

Hardware configuration

Position	Label	PV-block	Unique ID
1	LOAD-1	IV-MPP	(3746994893856784658)Blink /Reset
2	LOAD-2	IV-MPP	(5548434744804695570)Blink /Reset
3	LOAD-3	IV-MPP	(3026418953477529618)Blink /Reset
4	LOAD-4	IV-MPP	(1376300046512852661)Blink /Reset
5	LOAD-5	IV-MPP	(9583660010928700690)Blink /Reset
6	LOAD-6	IV-MPP	(1347477008897650075)Blink /Reset
7	LOAD-7	IV-MPP	(1419534602935512168)Blink /Reset
8	LOAD-8	IV-MPP	(4323455646159970578)Blink /Reset
9	IV-MOD	PV-MOD	(4683743616348219410)Blink /Reset
10	Temperatures	PV-TEMP	(3674937299816732946)Blink /Reset
11	Temperatures	PV-TEMP	(1109686948572427547)Blink /Reset
12	Irradiances	PV-IRR	(6269010685182116882)Blink /Reset

Save

PVBlocks by ReRa Solutions BV.

On the left you find the control buttons, on the right the PV-Blocks in the system.

The controls

Enable scheduler

This will enable the scheduler and closes this page.

Reset base unit

When the system is malfunctioning, this button can be used to reset the hardware. After the pressing this button wait for one minute before enabling the scheduler.

Scan PV-Blocks

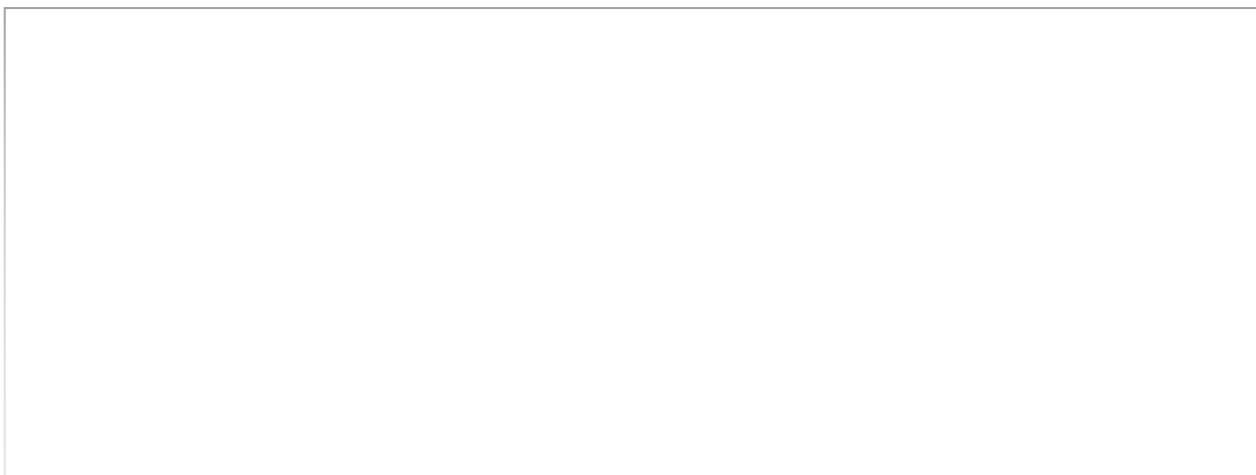
This will perform a hardware scan to get all the connected PV-Blocks. This is required when something changes in the system (adding or removing PV-Blocks).

Send trigger

This will send a measurement trigger to all PV-Blocks. Please do not use this, it is there for service only.

Direct control

This will allow for the direct control of all PV-Blocks. Please do not use this, it is there for service only.



On the right an overview of the installed PV-Blocks is shown.

There are 4 columns:

Position

This is an optional parameter that can be set to indicate the physical location of a PV-Blocks in the system.



As the system is unaware of the physical location of a PV-Blocks in the system, the user has to indicate the position manually. This is optional, but will make it easier to locate a certain PV-Blocks.



You can use the green link named Blink at the end of each row, to make the PV-Blocks blink its red led 3 times. This will tell you the position of the PV-Blocks.

Label

This can be used to give a unique name to each IV-MPP Block

PV-Block

Indication of the block type IV-MPP, IV-TEMP, IV-MOD or IV-IRR

Unique ID

This indicates the unique hardware ID of each PV-Block. Next to this you find the Blink and Reset link. Press Blink to make the PV-Block =blink its red led for three times. Press reset to reset this certain PV-Block.

The PV-IRR and PV-TEMP block can be configured by pressing the edit icon on the right:

IV-TEMP

For each of the 4 inputs of the PV-Temp Pt100 measurement block a label can be given here.

The screenshot shows the PV-BLOCKS software interface. At the top, there is a blue header bar with the logo "PV-BLOCKS" and navigation links: Home, Data, Setup, and Help. Below the header, a red message box displays the text: "The scheduler is paused, no measurements are taken. Go to System Setup / Scheduler to enable it." The main content area is titled "IV-TEMP setup". It contains a table with four rows, each representing an input and its corresponding label. The columns are labeled "Input" and "Label". The inputs are labeled "Input 1", "Input 2", "Input 3", and "Input 4". The labels are "RTD-1", "RTD-2", "RTD-3", and "RTD-4" respectively. Each label field has a small edit icon in the top right corner. At the bottom left, there is a green "Save" button. A cursor arrow is visible at the bottom right of the screen.

IV-TEMP setup

Input	Label
Input 1	RTD-1
Input 2	RTD-2
Input 3	RTD-3
Input 4	RTD-4

Save**IV-IRR**

For each of the 2 inputs of the PV-IRR it has to be indicated what Irradiance sensor is connected. These sensors are defined in [Configure Irradiance sensors](#)

The scheduler is paused, no measurements are taken. Go to System Setup / Scheduler to enable it.

IV-IRR setup

Input	Detector
Input 1	Si-mV-85 (85-00003-17-20340138)
Input 2	Si-mV-85 (85-00003-17-20340137) Select device Si-mV-85 (85-00003-17-20340138) Si-mV-85 (85-00003-17-20340137)

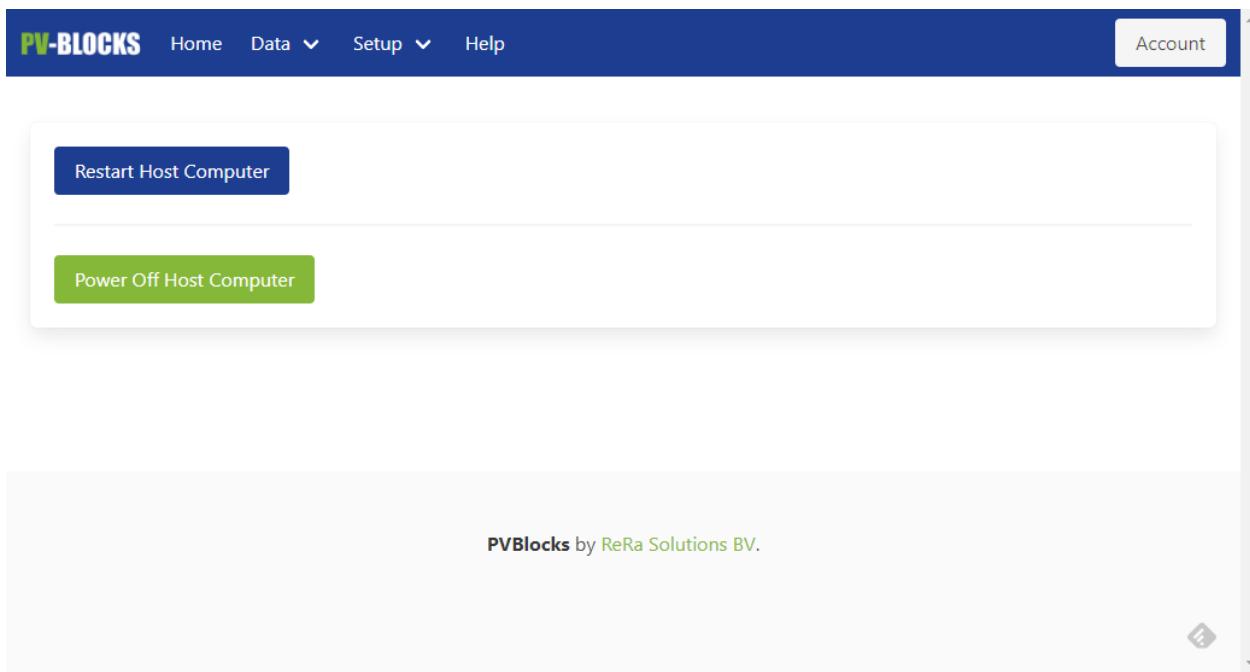
Save

2.4.3.6. HOST COMPUTER

When it is required to turn off the system, it is the best to power off the computer from this page. This ensures a long lifetime of the computer.

Try to prevent turning off the power when the computer is running.

Use this page to shutdown or restart the PC.



2.4.3.7. BACKUP

It is recommended to make a backup of the system on regular intervals. These backups contain all measurements and configuration settings.

The intended usage of these backups is the emergency restoring of the system when ever needed. Keep the backups in a safe place.

Do not use this feature to export measurement data in order to analyse. This type of export has to be done in the [data download](#) page.

The screenshot shows the PV-BLOCKS Backup interface. At the top, there is a navigation bar with links for Home, Data, Setup, Help, and Account. The main section is titled "Backup" and displays "Available backups". A table lists one backup entry:

Name	Date	Download	Restore
psql-data-20200921-113355-d3b71249-bec4-4b3d-b71e-df68a01c5160.tar.gz	21-Sep-2020 11:33:58	Download Backup (5Mb)	

Below the table is a button labeled "New backup". Further down, there is a section for uploading a backup from a device, with the instruction "Upload backup from your device." and the sub-instruction "Upload a backup from your computer so you can restore it." At the bottom of the page, there is a footer with the text "PVBlocks by ReRa Solutions BV." and a small logo.

When it is required the supplier will explain how to restore a backup, this is currently disabled.

2.4.3.8. UPDATE

When the supplier informs you about an available update you can use this page. When you press the Update System button it will ask you for a confirmation. When you agree it will go online to get the latest version of the software. It will start the system and after 3-5 minutes it is back online again. Please press the browser refresh button after this time to see if the system is running again.



Update system software

Update System**Update software**

To update the software, press the button.
The system will restart and after a few
minutes you can reload this page.

Update Key**Update Configuration Key**

The system uses a configuration key to update
the software. When this key has changed it
needs to be renewed. Insert the key below and
press the button. Only do this when advised so
by the distributor of the system.

 Paste the configuration key here

There is an *Update Key* button. Please do only use this when asked for by the supplier.
You might damage the update system when this is not used correctly.

2.4.3.9. LOG

In this screen the software logs are shown. Please only use this when asked to by supplier for support issues.



Logs

Blazor Log

```
2020-09-22 00:00:00.597 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:00.5978874+00:00"
2020-09-22 00:00:00.695 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:01.605 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:01.6057210+00:00"
2020-09-22 00:00:01.695 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:02.606 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:02.6067375+00:00"
2020-09-22 00:00:02.699 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:03.611 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:03.6110489+00:00"
2020-09-22 00:00:03.699 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:04.614 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:04.6140472+00:00"
2020-09-22 00:00:04.703 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:05.617 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:05.6175949+00:00"
2020-09-22 00:00:05.706 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:06.617 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:06.6178950+00:00"
2020-09-22 00:00:06.706 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:07.618 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:07.6186448+00:00"
2020-09-22 00:00:07.705 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:08.621 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:08.6218082+00:00"
2020-09-22 00:00:08.706 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:09.630 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:09.6300013+00:00"
2020-09-22 00:00:09.706 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:10.631 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:10.6312131+00:00"
2020-09-22 00:00:10.708 +00:00 [INF] Waiting for SQL dump to be done
2020-09-22 00:00:11.634 +00:00 [INF] Link <TimeWorker> running at: "2020-09-22T00:00:11.6345998+00:00"
```

2.4.4. HELP

This will open the current help pages.

2.4.5. ACCOUNT

Use this page to change your password. The default password is "*password123*"

[Logout](#)

Email
Password
Change password

Current password

New password

Confirm new password

Update password

PVBlocks by ReRa Solutions BV.



3. SPECIFICATIONS

PV Base pack (items 1-3)

1. PV Base communication module

Supply Voltage	24 VDC
Communication interface	RS 485 serial communication
Operating temperature range	-25°C – 70°C
Maximum number of PV blocks	32
Maximum number of IV/MPP blocks	8

2. Power supply module

Supply Voltage	24 VDC
Power	5 A /120 W
Input voltage range	100 VAC – 240 VAC / 50-60 Hz
Operating temperature range	-25°C – 70°C

3. PV Link computer module

Supply Voltage	24 VDC
Operating temperature range	-25°C – 70°C
Operating system	Linux / web interface
Memory	4 GB
Data storage	32 GB SSD
Communication	WAN / Local (3 ethernet ports)

IV / MPP pack 600 (IV/MPP module + Load module)

Operating modes	MPPT(P&O), Voltage Biasing, Open Voltage, Short circuit
Supply Voltage	24 VDC
Communication interface	RS 485 serial communication
Operating temperature range	-25°C – 40°C
Max Load IV measurement	600 W
Max Load MPP load	600 W
(V) Range / Resolution / Accuracy	<1 – 5 / 50µV / 0.05% + 0.02%
	<1 – 50 / 500µV / 0.05% + 0.02%
	<1 – 100 / 1 mV / 0.1% + 0.02%
	<1 – 200 / 15 mV / 0.1% + 0.02%
(I) Range / Resolution / Accuracy	0-20A / 200µA / 0.1% +0.02%
Cooling	Forced ventilation
Temperature protection	Delta max T=45°C (85 °C board level)
ADC	Simultaneous measurement of current voltage, 24 bits
Voltage range / Resolution	1 – 200V / 1mV (No true zero)
Voltage Accuracy	+/- 10mV
Current range / Resolution	0 – 20A / 1mA

Current accuracy	+/- 10mA
IV points	100
IV sweep time	200ms – 30 seconds
IV sweep	Isc – Voc or Voc - Isc
Operating modes	MPPT(P&O), Volatge Biasing, Open Voltage, Short circuit

IV / MPP pack 350 (IV/MPP module + Load module)

Operating modes	MPPT(P&O), Voltage Biasing, Open Voltage, Short circuit
Supply Voltage	24 VDC
Communication interface	RS 485 serial communication
Operating temperature range	-25°C – 40°C
Max Load IV measurement	350 W
Max Load MPP load	350 W
(V) Range / Resolution / Accuracy	<1 – 5 / 50µV / 0.05% + 0.02%
	<1 – 50 / 500µV / 0.05% + 0.02%
	<1 – 100 / 1 mV / 0.1% + 0.02%
	<1 – 200 / 15 mV / 0.1% + 0.02%
(I) Range / Resolution / Accuracy	0-20A / 200µA / 0.1% +0.02%
Cooling	Forced ventilation
Temperature protection	Delta max T=25°C (85 °C board level)
ADC	Simultaneous measurement of current voltage, 24 bits
Voltage range / Resolution	1 – 200V / 1mV (No true zero)
Voltage Accuracy	+/- 10mV
Current range / Resolution	0 – 20A / 1mA
Current accuracy	+/- 10mA
IV points	100
IV sweep time	200ms – 30 seconds
IV sweep	Isc – Voc or Voc - Isc
Operating modes	MPPT(P&O), Volatge Biasing, Open Voltage, Short circuit

PV Temp module

Temperature sensor (Optional)	Temperature sensor PT-100 / 3W / Class A
Supply Voltage	24 VDC
Communication interface	RS 485 serial communication
Operating temperature range	-25°C – 70°C
Temperature sensor	PT-100 / 3W
Number of channels	4
Accuracy	+/- 0.1°C (with PT-100 sensor +/- 0.3°C)
Resolution	0.01°C

PV Irradiance module

Solar sensors	MS-80 / Silicon Reference cell + shunt resistor
Supply Voltage	24 VDC
Communication interface	RS 485 serial communication
Operating temperature range	-25°C – 70°C
Irradiance sensor	Analog (mV output)
Number of channels	4
Input range (mV)	0-100 mV
Accuracy	+/- 1µV
Resolution	0.15 µV

PV Modbus module

Sensors	MS-80S / MS-90 plus+ / PVmet 500
Supply Voltage	24 VDC
Communication interface	RS 485 serial communication
Operating temperature range	-25°C – 70°C
Sensors	Modbus RTU
Number of channels	4



EKO Asia, Oceania

1-21-8 Hatagaya,
Shibuya-ku, Tokyo
151-0072 Japan
P. +81.3.3469.6711
F. +81.3.3469.6719
info@eko-asia.com
www.eko.co.jp

EKO North America

95 South Market Street,
Suite 300, San Jose,
CA 95113, USA
P. +1-408-977-7751
F. +1-408-977-7741
info@eko-usa.com
www.eko-usa.com

**EKO Europe,
Middle East, Africa,
South America**

Lulofsstraat 55, Unit 28,
2521 AL, Den Haag,
The Netherlands
P. +31 (0)70 3050117
F. +31 (0)70 3840607
info@eko-eu.com
www.eko-eu.com