Instruction Manual

PV-Blocks

PV Evaluation system

PV-BLOCKS

EKO

Contents

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-instruments.com/ sales-eu@eko-instruments.com	Lulofsstraat 55, Unit 28, 2521 AL, Den Haag, The Netherlands	Tel: +31 [0]70 3050117 Fax: +31 [0]70 3840607

PV-Blocks system is Designed by RERA Solutions represented by EKO

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

WARRANTY AND LIABILITY

For warranty terms and conditions, please contact EKO Instruments or your distributer 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

This manual was issued: 2024/04/01
Version Number: 4.0

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 60891and 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 28 PV modules (600W) 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.
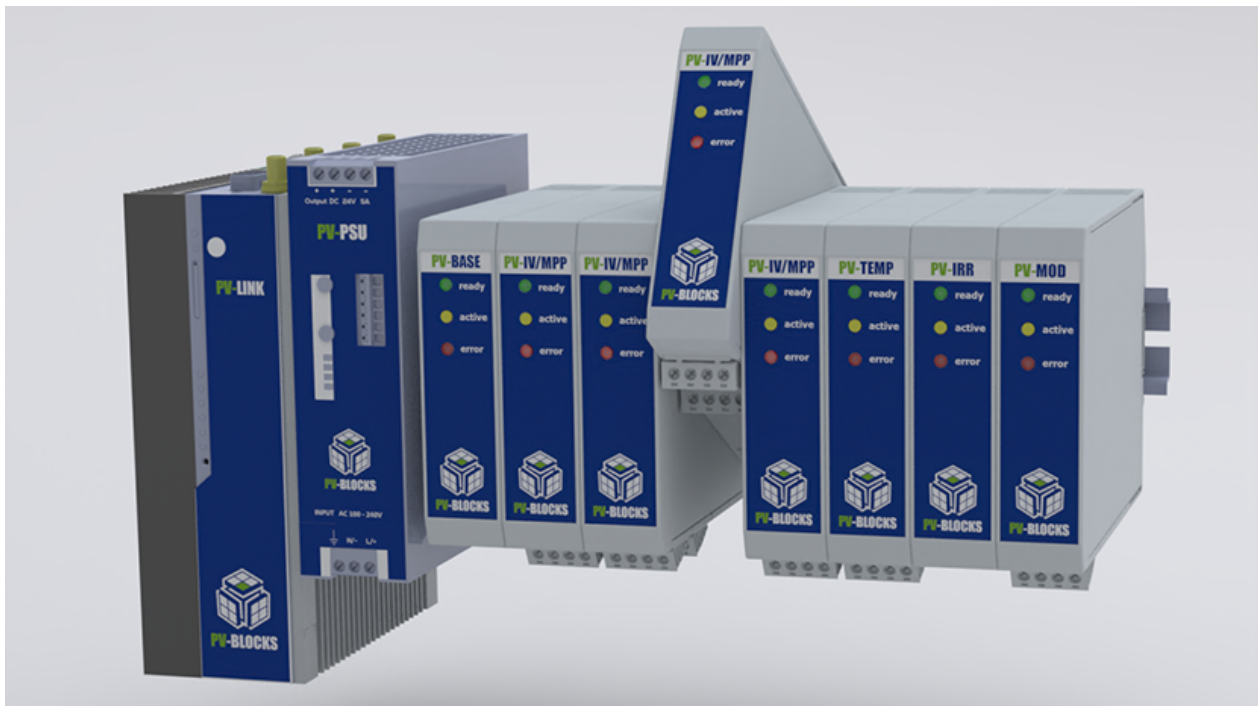
This user manual will give instructions to operate the hardware and software of the PV-Blocks system. Please read this manual carefully before using the system. The PV evaluation system is pre-configured and ready to be used. The powerful onboard computer controls the entire system and can be easily access 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-Blocks Din-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)
    - 20m ethernet cable

- PV IV/MPP Pack
    - PV-IV/MPP block
    - PV-IV/MPP Load
    - 10m power signal cable (Default)
- Fan extension cable (24V)
- **(Optional)** 1 Power supply unit for max. 8 PV HP Loads)

NoteL

LP loads don't have a fan unit and don't require

an additional power supply unit.
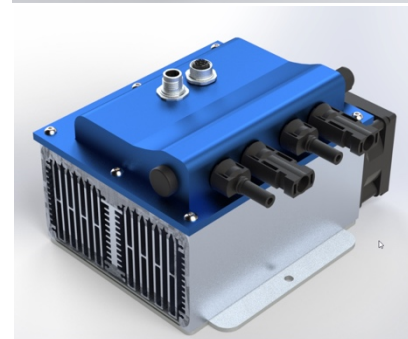
1.3. GETTING STARTED

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 PV-Blocks components are made to be used in an all-weather IP65 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 (Direct sunlight).

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-Blocks system modules outdoors. The PV-Blocks modules are compatible with any T35mm din-rail. The PV-IV/MPP load module is mounted separate from the enclosure in close distance to the PV-Modules. Based on the configuration of the system some components are pre-configured.

2. For the configuration of the system, maximum 28 units PV- Block units can be connected to one power supply. The Load fans are power through a separate power supply.

3. Attach the PV-Blocks module 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 8-pin cable to the PV-IV/MPP module.

6. PV-IV/MPP load

 The IV-Load needs to be mounted on a vertical wall. The device is suitable for outdoor usage. **However, protect it always from direct rain, sand and direct sunlight**.

The PV-IV/MPP load is connected close to the PV module.

a. Connect the M12 8 pin load cable to the IV/MPP load unit.
b. Connect the cable of the fan to the fan M8 connector.
c. Connect the PV module to the 4 wire Module input. Y splitter is provided to connect the 2 cable of the PV modules.
d. Connect the grounding wire to a grounded frame
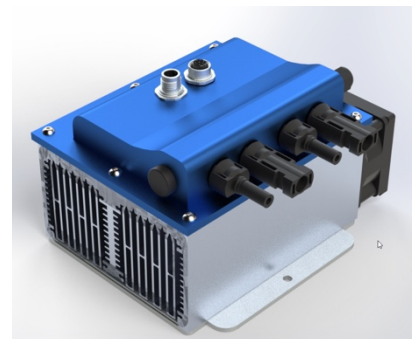
- PV-IV/MPP-Load
- Grounding cable
- M8 Fan power cable
- M8 Y-splitter
- Protection caps
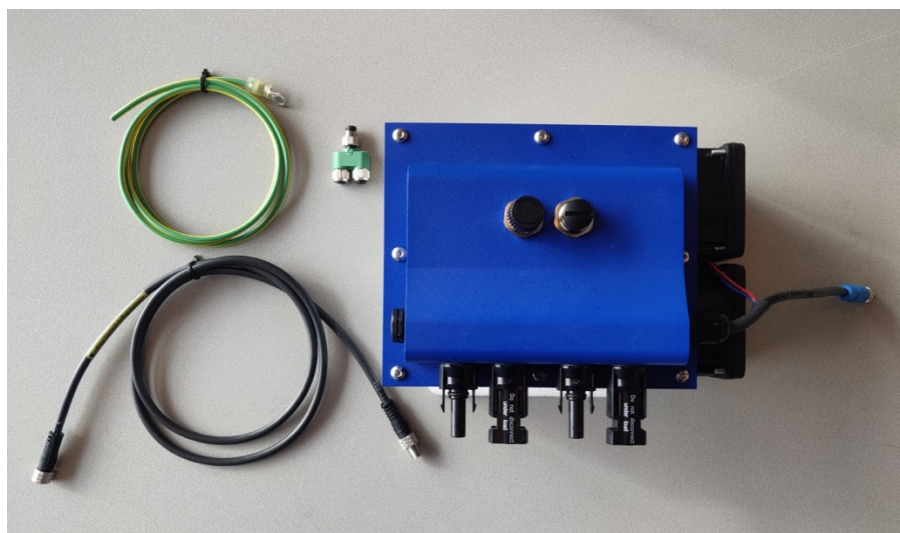
- The horizontal distance between two units should at least 200mm.
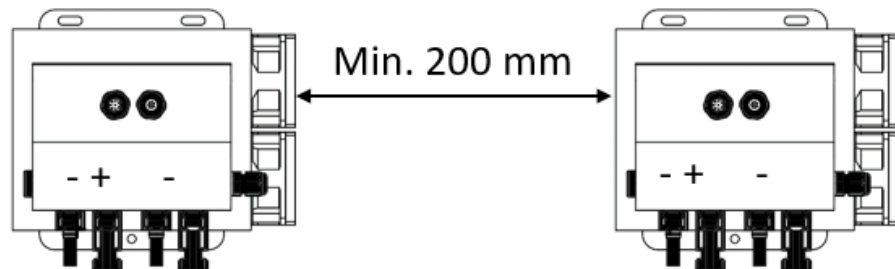
- The vertical distance between two units should be at least 150mm.
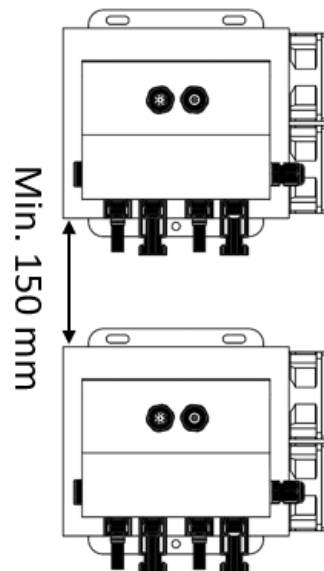
- Make sure the backplane is correctly grounded to safety earth (PE). The delivered ground cable can be used for this.

- Make sure the M12 open sockets on the front of the IV-Load are covered with the protection caps (delivered with the IV-Load) when no cable is connected.

The PV-MPP/IV-Load 600 requires an external 24V Power supply to power the fans. Each unit requires 300mA to run the fans. Please use the 4-wire M8 actuator cable that is available close to the fans.

The (24V, 5A) can connect up to 16 loads.

It is possible to use a third-party PSU. Use the following pins assignment on the M8 connector:

M8 plug pin number	Function
1	24V
4	0V

Each IV-Load is delivered with an M8 Y-splitter and M8 cable. This can be used to daisy chain the Fan power to other IV-Loads.

Please note that the fans will only run when the unit becomes warm!
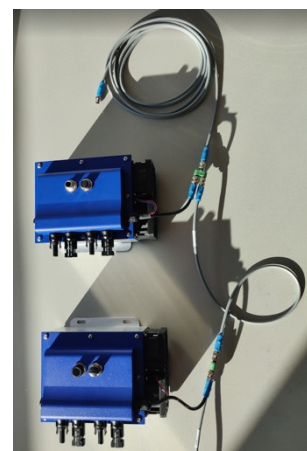
Connect PV Modules

The PV-modules should always be connected using 4 wires. Two wires are used for the current, the other two wires measure the voltage. The 4-wire connection makes sure that the resistance of the long wires is not added to the resistance of the PV-module, which results in a better fill factor. If the cabling to the PV-modules is short (<2m) an MC-4 splitter cable can be used as shown in the below picture.
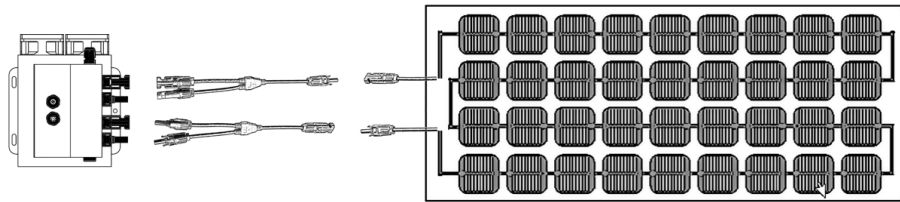
Note: On request when more power is needed (see specification Ch.3), the IV-Loads can be connected in parallel. This will double the Current but keeps the maximum Voltage the same (Function is optional).
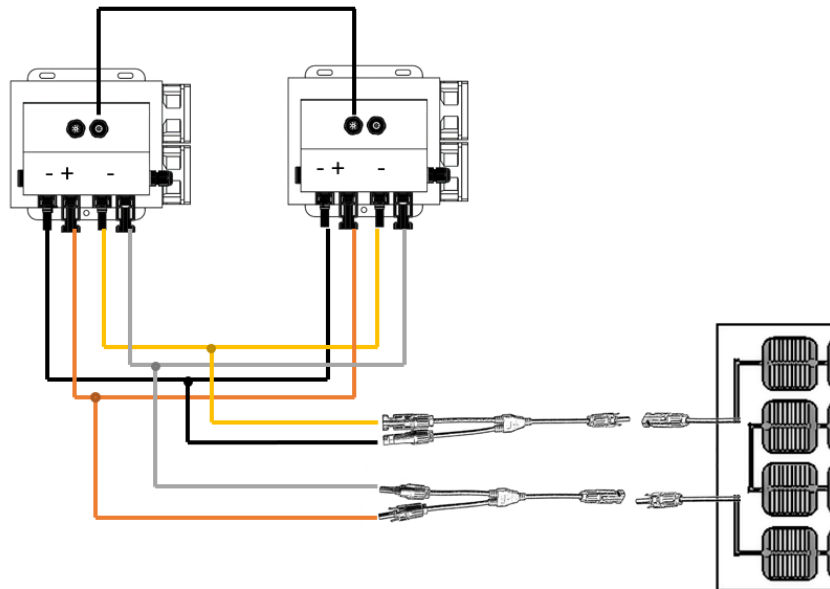
⚠️ When the load are used in MPP tracking mode. The load units will dissipate all the heat generated by the PV module. Keep the load unit free from any obstacles. Make sure forced air can flow freely. Keep the units away from the PV module to avoid heating of the PV modules to be measured. A temperature increase of the PV module can affect the PV module performance.

⚠️ The load units are protected against overheating. In case of overheating the load-unit will switch off. No MPP tracking or IV measurement can be performed till the load unit will cool down below the setting temperature. Measurements will automatically restart.

Continuous Mpp Power	Max PV-Module
$T_{ambient}$ **< 30°C**	**~450W**
$T_{ambient}$ **< 40°C**	**~400W**
$T_{ambient}$ **< 50°C**	**~350W**

⚠️ In case PV module cable will be extended. Apply 4 cable in between the Y splitter and the IV/MPP module. The Y-splitter is connected on the side of the PV-module, the 4 cable extension are connected to the MC-4 input terminal of the PV-IV/MPP load.

⚠️ The default model is named IV-Load 600 and allows for maximum 80V, 20A PV-modules. When your IV-Load is customized for different voltage and/or current ranges this is indicated on the label between brackets [Vmax/Imax]:

7.   PV-Link 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.

8.   PV-IRR Block

PV-IRR Block is a 4-channel analog input module for pyranometers and reference cells with analog output.
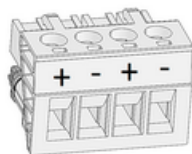
The default input rang is 0-100mV with 0.1µV resolution.

The sensor sensitivity figure which can be found on the calibration certificate or serial number label need to be configured.

Irradiance sensors   Apply
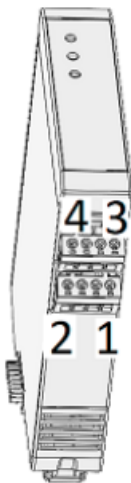
	Input 1	Irr[e0512]-1	show details...
	Input 2	Irr[e0512]-2	show details...
	Input 3	Irr[e0512]-3	show details...
	Input 4	Irr[e0512]-4	show details...

4 3

2 1

+ - + -

9. PV-TEMP Block

PV-Temp block is a 4-channel input module for 3W PT-100 temperature sensors. All 4 wires of the PT-100 can be connected to the input terminals.

Pt100 sensors

Apply
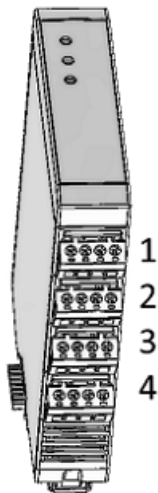
- ☑ Input 1   Pt100[dac12]-1
- ☑ Input 2   Pt100[dac12]-2
- ☑ Input 3   Pt100[dac12]-3
- ☑ Input 4   Pt100[dac12]-4
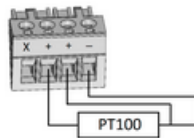
2. SOFTWARE

This section will describe the PV-Blocks software functionality and the way to use it. The software overview in this manual gives a basic description of functions and workflows. Based on the version of your software the manual definition and explanations may deviate.

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

Username: admin
Password: #pvblocks

⚠ **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:

- o Keep the connection between your local network and the PV-Blocks system Port 1.
- o Take a second network cable and connect this to port 3 of the PV Blocks computer.
- o The other end of this second network cable has to be connected to your laptop or PC.
- o 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 log-ging 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:

Welcome to PVBlocks

To use the system, please login.
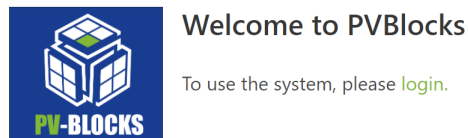
Press the login link.

Please log in

Email

admin@localhost

Password

••••••••••

☐ Remember me?

Log in

The home screen occurs at login.
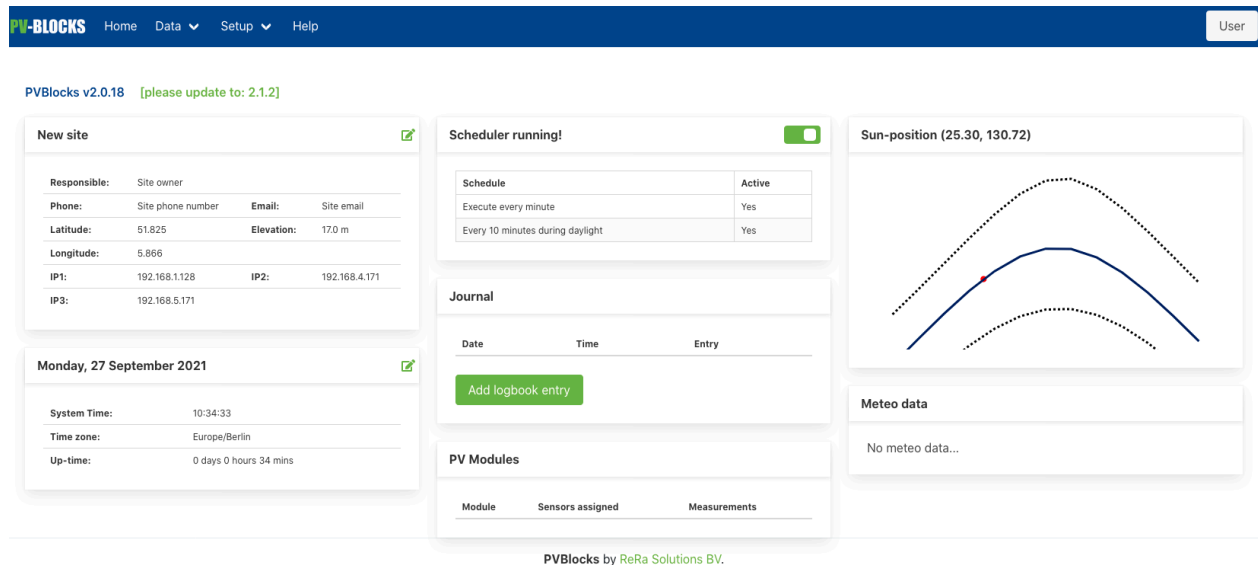
2.2. WORKFLOW

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(s) 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. An advanced programming interface is available in Phyton. This requires programming expertise to work through the API.

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 **USER** in the top right corner.

Step 2:

Define your site. Go to the **New site** menu at the home screen. Latitude and longitude information are required to calculate the solar position. A default time server is defined, another time server can be selected by the user. Select your time zone which is set to UTC.

Step 3:

PV-Blocks setup is the first step to configure the modules first time. Refresh blocks to detect all blocks in the system. Note all blocks have a unique ID but random order when displayed. Change the position by allocating the block in the system. After allocating the position the order will remain.

From the PV-Blocks setup the individual blocks can be configured. Configure the connected TEMP-Modules, IRR-Modules, PV-Modules and MOD-Modules. Labels of blocks, sensor names have default names which can be changed by the user.

Step 5:

Step 6:
Setup the scheduler for IV curve measurements. Go to the [Scheduler](#) menu to do this

2.4. MENU

Data menu:

1. PV Blocks API
2. View data
3. Download Data

Setup menu:

1. Configure PV Modules
2. Scheduler
3. PVBlocks setup
4. Assign sensors
5. Meteo
6. System
7. About

Setup menu:

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

2.4.1. HOME

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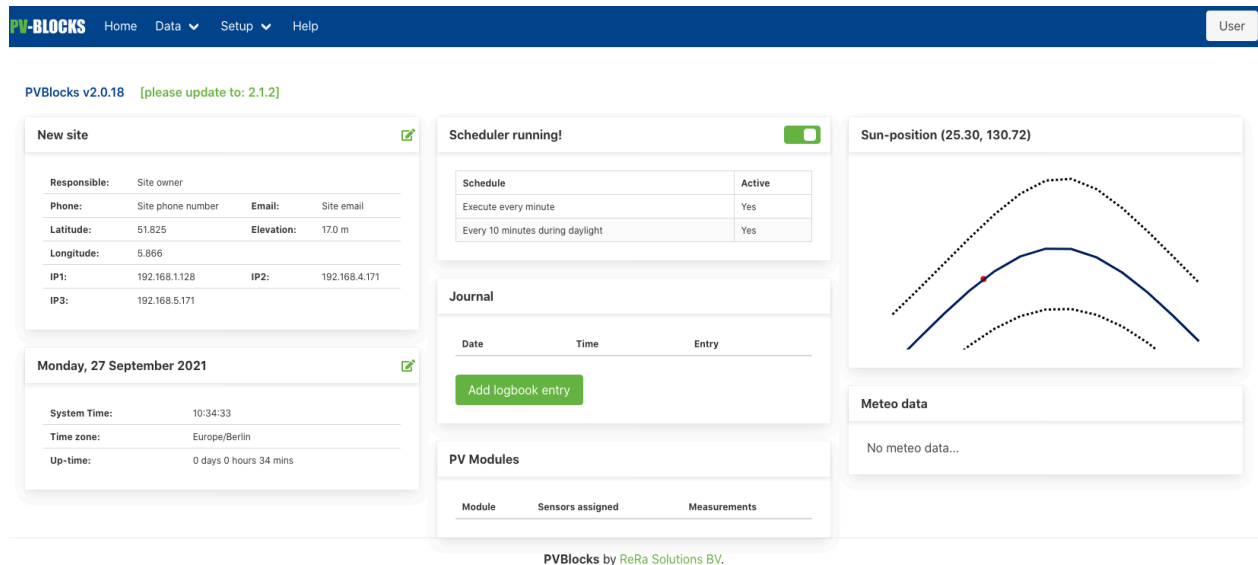
New Site

New site shows the data of the current location. This information has to be inserted by the user in the Setup/Site Settings page.

Date/Time

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

Meteo

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

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.

Sun Path

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

2.4.2. DATA

1. PV Blocks API
2. View data
3. Download Data

The PV Blocks system support to work through a Phyton API. The API is considered as an advanced user function for automatic data download.

In the view data window, the IV

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.

PV-BLOCKS   Home   Data ⌄   Setup ⌄   Help   Account

✓ More info

Select day ⟳   Export data

Day   **Month**   **Year**
10   September ⌄   2020

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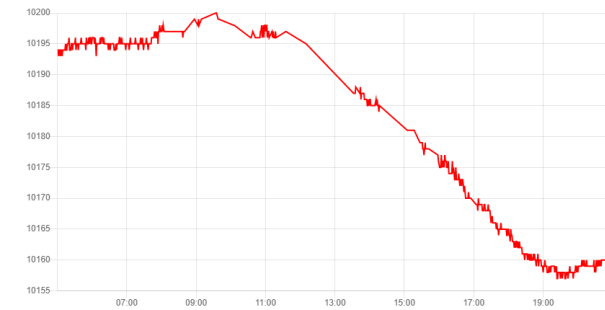
Irradiance
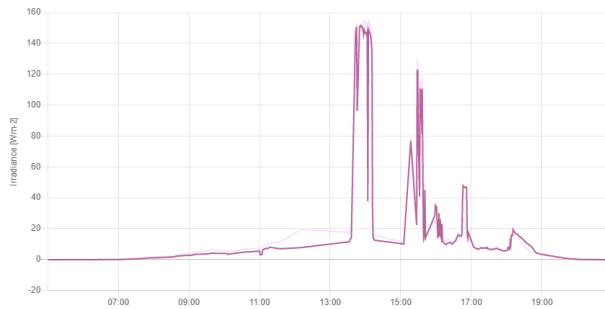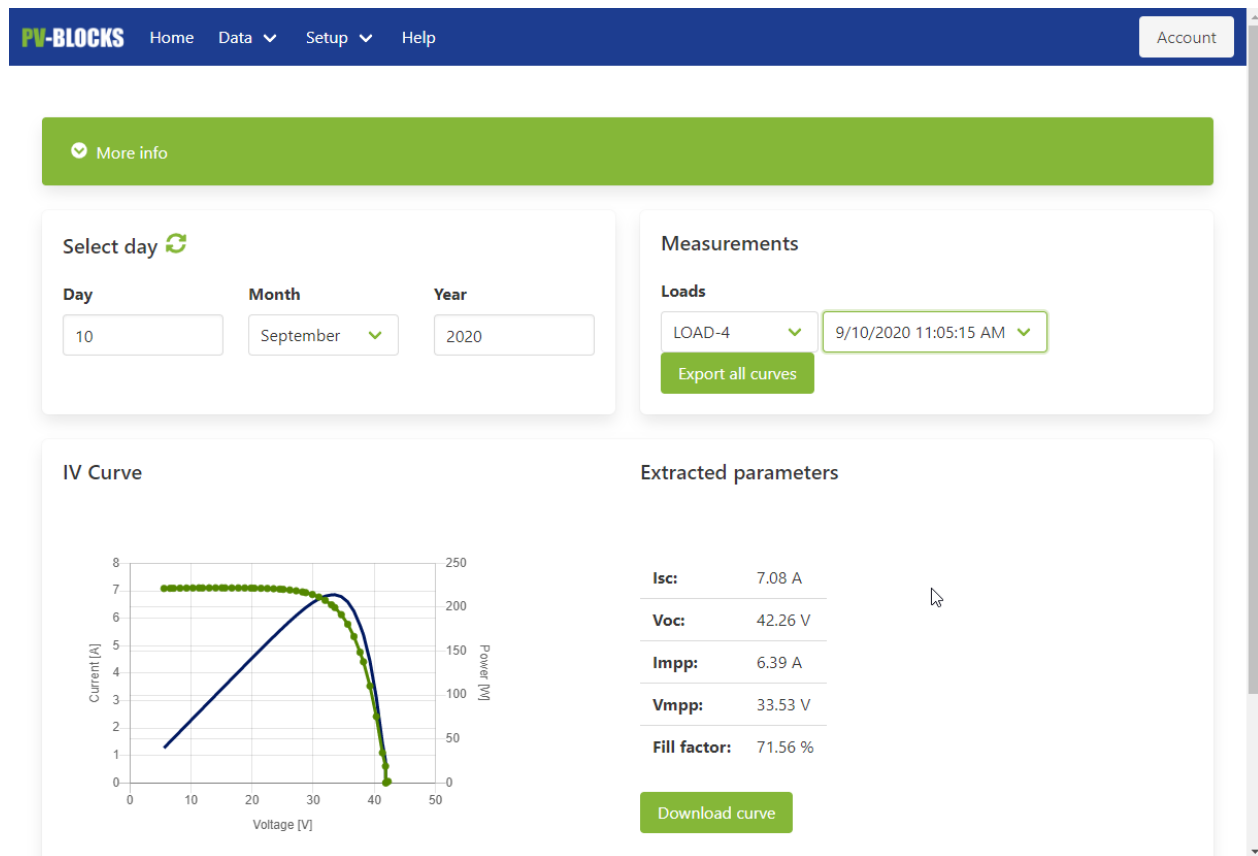
When a curve is selected by its timestamp, it is shown in the IV-curve graph together with its extracted parameters. You can download this single selected curve by pressing the Download curve button.

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.

2.4.3. SETUP

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.

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

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.

PV-BLOCKS

PV Modules

⊙ More info

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		✎ 🗑

New

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

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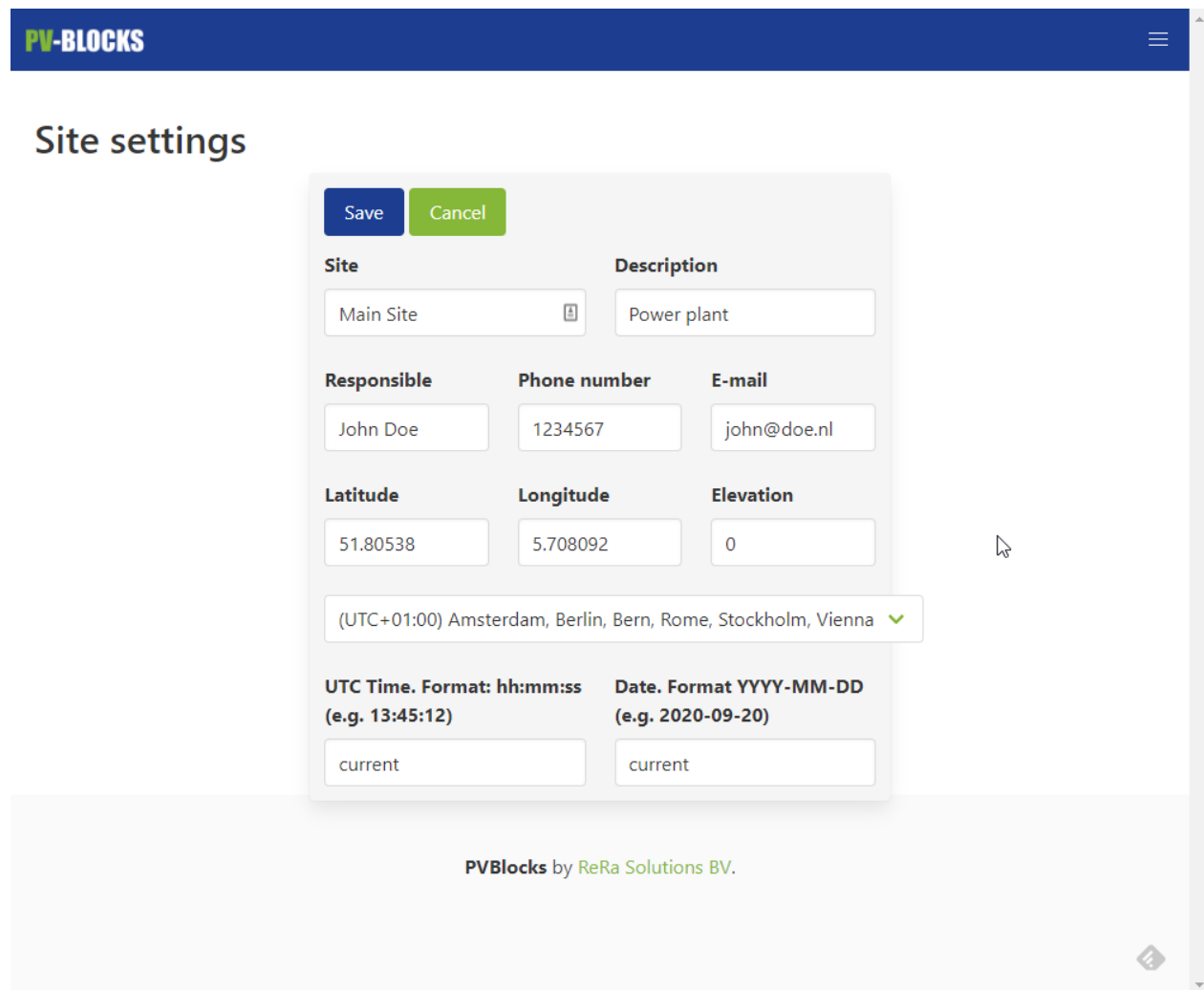
From the Load drop-down list select the Load that is connected to the PV-Module. Do the same for the temperature sensor and assign one of the connected irradiance sensors to the modules to be used as Plane of Irradiance sensor.

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.

2.4.3.4. SCHEDULER

The scheduler is used to control the measurements.

PV-BLOCKS   Home   Data ∨   Setup ∨   Help
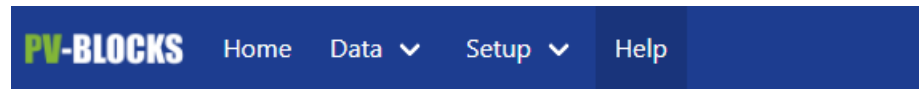
Scheduler

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 PVBlock 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:

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 PVBlock) 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:

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:

PV-BLOCKS Home Data ▾ Setup ▾ Help   Account

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

Hardware configuration

Enable scheduler **Hardware configuration**
The scheduler is now paused, no measurements are taken. Use the button to enable the scheduler.

Reset Base unit **Reset base unit**
Whenever the system is malfunctioning resetting the base unit can provide a solution.

Scan PVBlocks **Scan PVBlocks**
The hardware will scan itself to see if there are any new PVBlocks installed. Only use this when the hardware is modified or the first time the system is setup.

Send Trigger **Trigger measurements**
This will send a trigger signal to the system, resulting is a synchronous measurement among all pvblocks. This only has to be used for testing purposes.

Direct control **Direct PVBlock control**
This will allow for the direct control of the PVBlock modules.

Position	Label	PV-block	Unique ID	
1	LOAD-1	IV-MPP	(37469948938567846583	Blink /Reset
2	LOAD-2	IV-MPP	(55484347448046955705	Blink /Reset
3	LOAD-3	IV-MPP	(30264189534775296189	Blink /Reset
4	LOAD-4	IV-MPP	(13763000465128526610	Blink /Reset
5	LOAD-5	IV-MPP	(95836600109287006909	Blink /Reset
6	LOAD-6	IV-MPP	(13474770088976500754	Blink /Reset
7	LOAD-7	IV-MPP	(14195346029355121682	Blink /Reset
8	LOAD-8	IV-MPP	(43234556461599705783	Blink /Reset
9	IV-MOD	PV-MOD	(46837436163482194103	Blink /Reset
10	Temperatures	PV-TEMP	(36749372998167329463	Blink /Reset 🖉
11	Temperatures	PV-TEMP	(11096869485724275474	Blink /Reset 🖉
12	Irradiances	PV-IRR	(62690106851821116882	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.
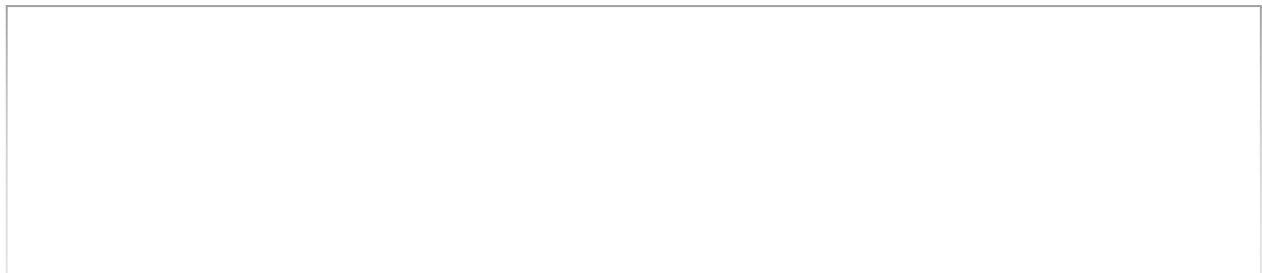
On the right an overview of the installed PV-Blocks is shown.

There are 4 columns:

Position
This is an optional parameter that can be set to indicate the physical location of a PVBlock in the system.

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

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

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 PVBlock. Next to this you find the Blink and Reset link. Press Blink to make the PVBlock =blink its red led for three times. Press reset to reset this certain PVBlock.

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.

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
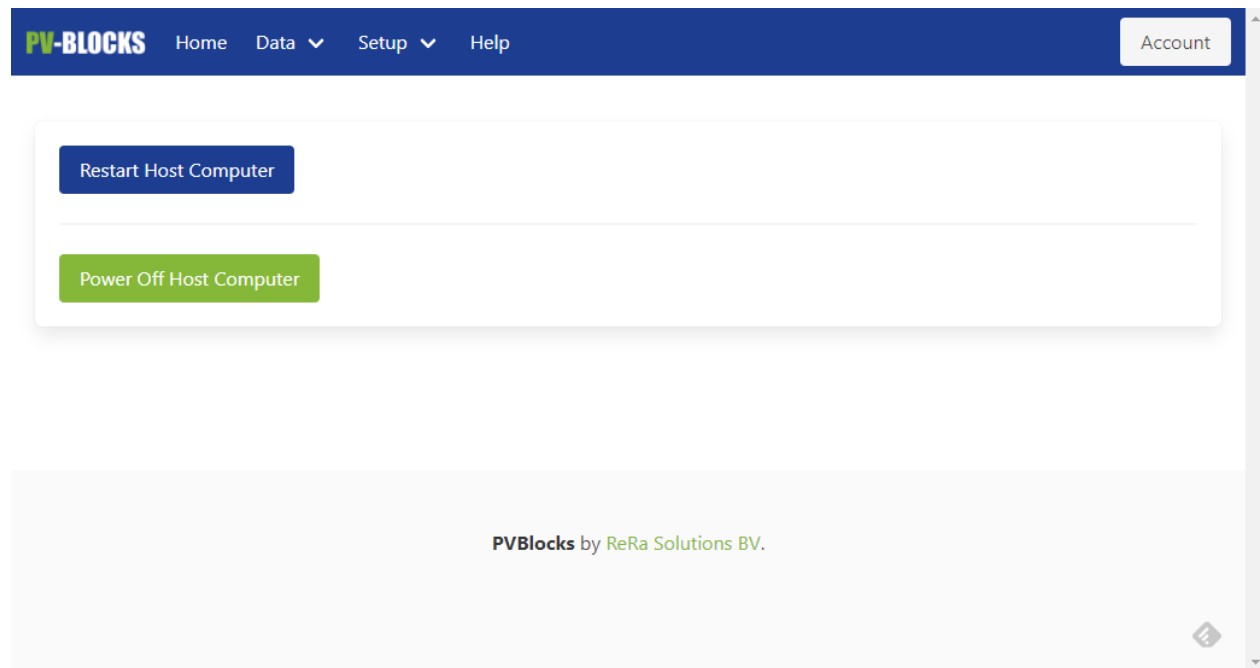
2.4.3.6. HOST COMPUTER

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.

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.

PV-BLOCKS   Home   Data ⌄   Setup ⌄   Help

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.

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	-20ºC – 50ºC
Maximum number of PV blocks	32

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	-20ºC – 50ºC

3. PV Link computer module

Supply Voltage	24 VDC
Operating temperature range	-20ºC – 50ºC
Operating system	Linux / web interface
Memory	4 GB
Data storage	32 GB SSD
Communication	WAN / Local (3 ethernet ports)

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

Operating modes	MPPT(P&O), Voltage Biasing, Open Voltage, Short circuit
Supply Voltage	24 VDC (Fan using external power supply)
Communication interface	RS 485 serial communication
Operating temperature range	-20ºC – 50ºC
IP Rating	IP54 (Load module)
Max Load IV measurement	900 W (<2s sweep speed)
Max Load MPP load	600 W (10s) 400 W < 30ºC 350 W < 40ºC 300 W < 50ºC
Max Load MPP load (in Parallel) **This configuration is only possible on request!**	1200 W (10s) 900 W < 30ºC 800 W < 40ºC 700 W < 50ºC
(V) Range / Resolution / Accuracy	<0.5 – 80 / 0.1mV / 0.1% + 0.02% (Default)
Optional range (Factory set)	<0.5 – 120 / 1 mV / 0.15% + 0.02%
Optional range (Factory set)	<0.5 – 200 / 15 mV / 0.3% + 0.02%
	Minimum voltage (Vmin) depends on resistance: Internal resistance: 11mΩ

	Cable resistance 4mm²: 5mΩ/mVmin = Current x (11mΩ + cable-length x 5mΩ)
(I) Range / Resolution / Accuracy	0-20A / 0.01mA / 0.1% +0.02%
Optional range (Factory set)	0-40A / 0.01mA / 0.1% +0.02%
Cooling	Forced ventilation
Temperature protection	Delta max T=45ºC (85 ºC board level)
ADC	Simultaneous measurement of current voltage, 24 bits
IV points	100 – 150 - 200 (More on request)
IV sweep time	200ms – 30 seconds
IV sweep	Isc – Voc or Voc - Isc
Operating modes	MPPT(P&O), Voltage Biasing, Open Voltage, Short circuit

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

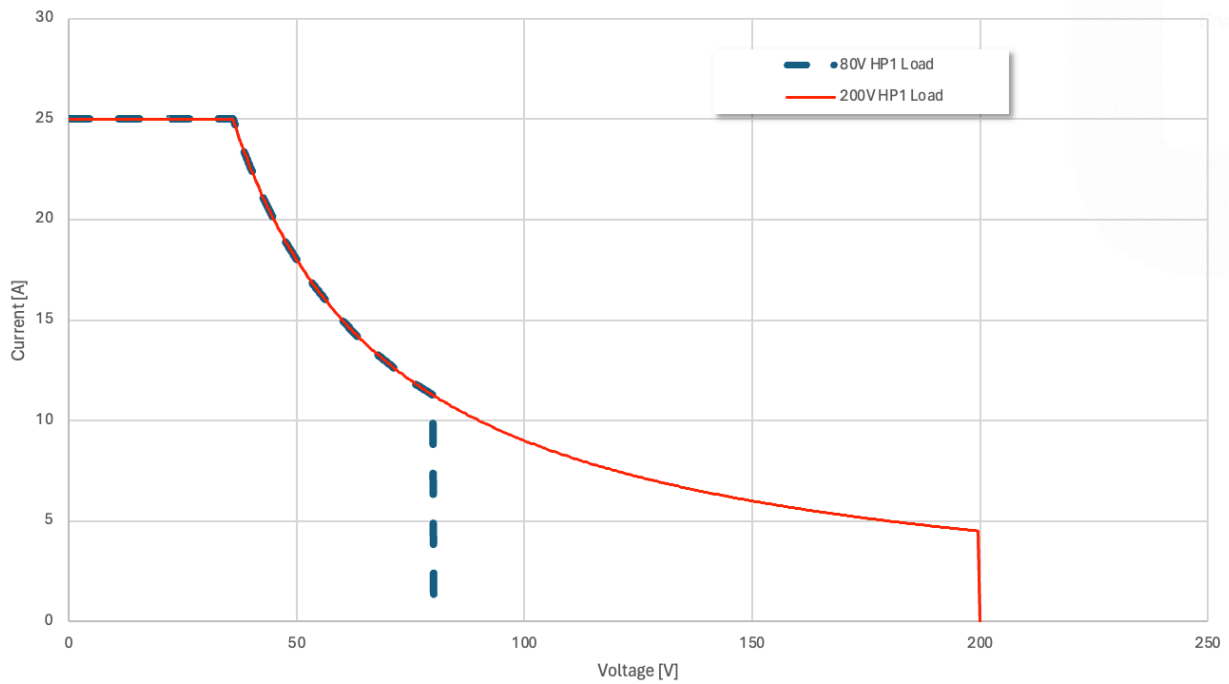|	
Operating modes	MPPT(P&O), Voltage Biasing, Open Voltage, Short circuit
Supply Voltage	24 VDC
Communication interface	RS 485 serial communication
Operating temperature range	-20ºC – 50ºC
IP Rating	IP54 (Load module)
Max Load IV measurement	100 W (depending on sweep speed)
Max Load MPP load	28 W < 30ºC 24 W < 40ºC 20 W < 50ºC
(V) Range / Resolution / Accuracy	<0.05 – 20 / 0.1mV / 0.1% + 0.02% (Default)
Optional range (Factory set)	<0.05 – 40 / 1 mV / 0.15% + 0.02%
Optional range (Factory set)	<0.05 – 200 / 15 mV / 0.3% + 0.02%
	Minimum voltage (Vmin) depends on re-sistance: Internal resistance: 11mΩ Cable resistance 4mm²: 5mΩ/mVmin = Current x (11mΩ + cable-length x 5mΩ)
(I) Range / Resolution / Accuracy	0 – 1A (Default
Optional range (Factory set)	0-20A / 0.01mA / 0.1% +0.02%
Cooling	Forced ventilation
Temperature protection	Delta max T=45ºC (85 ºC board level)
ADC	Simultaneous measurement of current voltage, 24 bits
IV points	100 – 150 - 200 (More on request)
IV sweep time	200ms – 30 seconds
IV sweep	Isc – Voc or Voc - Isc
Operating modes	MPPT(P&O), Voltage Biasing, Open Voltage, Short circuit

S.O.A IV-curves

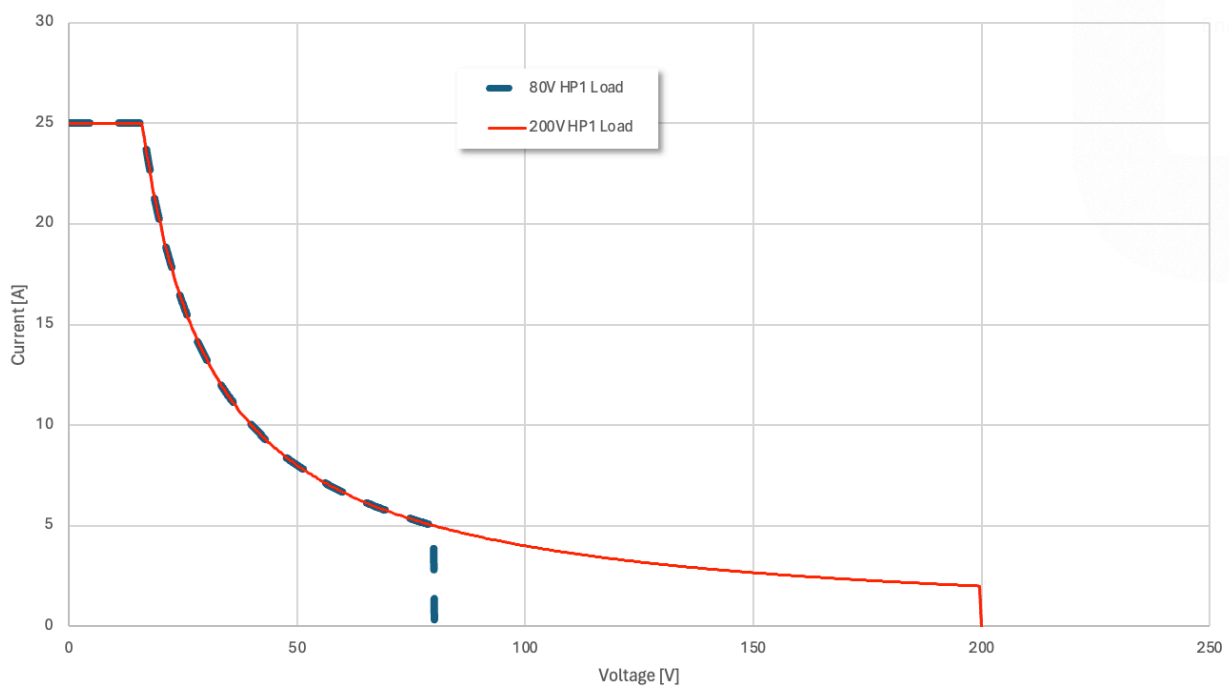Fig. 3.1 Max IV Current / Voltage characteristics (HP load)

S.O.A MPP tracking

Fig. 3.2 Max MPP Current / Voltage characteristics (HP Load)

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	-20ºC – 50ºC
Temperature sensor	PT-100 / 3W
Number of channels	4
Accuracy	+/- 0.1ºC (with PT-100 sensor +/- 0.3ºC)
Resolution	0.05ºC

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	-20ºC – 50ºC
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	-20ºC – 50ºC
Sensors	Modbus RTU
Number of channels	4

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