

# SMART METER

**SMA EMETER-20 compatible Energy Meter**



## Manual

### LAN - WiFi

Version 1.2

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## 1. Introduction

Dear customer, thank you for purchasing this product. The SMART METER measures your consumption and feed-in values in real-time. These values can be shown anytime, anywhere on our website.

The SMART METER has the following features:

- Single or three phase measurements
- SMA Smart Meter EMETER-10 and EMETER-20 compatible
- Integrated SUNSPEC MODBUS/TCP Server
- Feed-in and consumption Real-time Measurement
- Cloud solution for analysis
- Easy to use via integrated web configuration

Specializing in products for renewable energy, Diesel generators and hybrid power solutions, the SMART METER offers the following features standard:

- Wide range power supply input from: 100 - 240 V<sub>AC</sub> (50 - 60 Hz)
- Small footprint.
- Intuitive software.
- Wide temperature range of: -25° – +60°C.
- Industrial PUR protection coating for extra rugged environment.
- Protection type IP-20.

If you have any questions or if something is unclear, you can contact us in several ways:

E-Mail : [support@elgrispower.com](mailto:support@elgrispower.com)

Phone : +49 (0) 2423 9086501

## 2. Installation

### 2.1 Safety instructions

Before installing the product in the end-installation, ensure that the device is not damaged during transport and everything looks in a normal way.

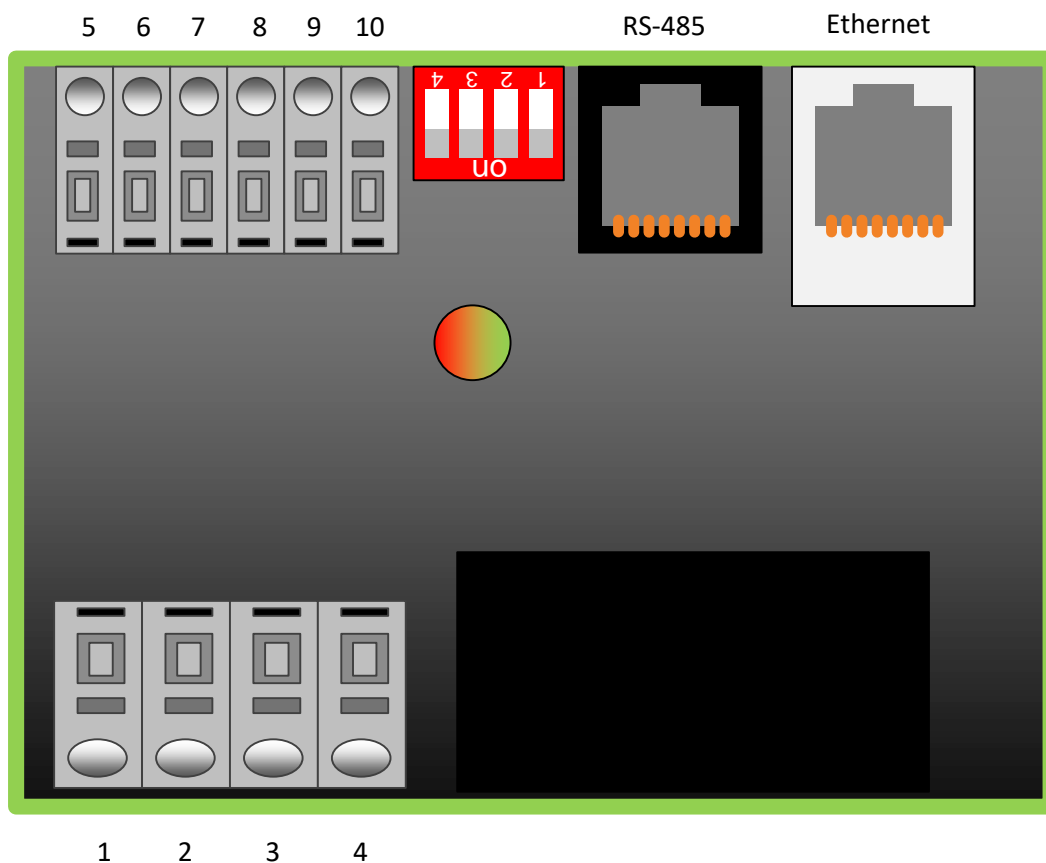
All the connecting cables must not be bent or squeezed. This can result in malfunctions, short circuits and defects in the device and/or sensor connected.

Make sure that cables are not damaged when drilling or bolting in place.

The module may only be commissioned after it has been installed contact-free in a casing. This product generates high frequency. Never operate it in the vicinity of medical devices (e.g. pacemakers) and/or medical equipment (e.g. in hospitals). Look for a suitable installation site.

### 2.2 Device overview LAN

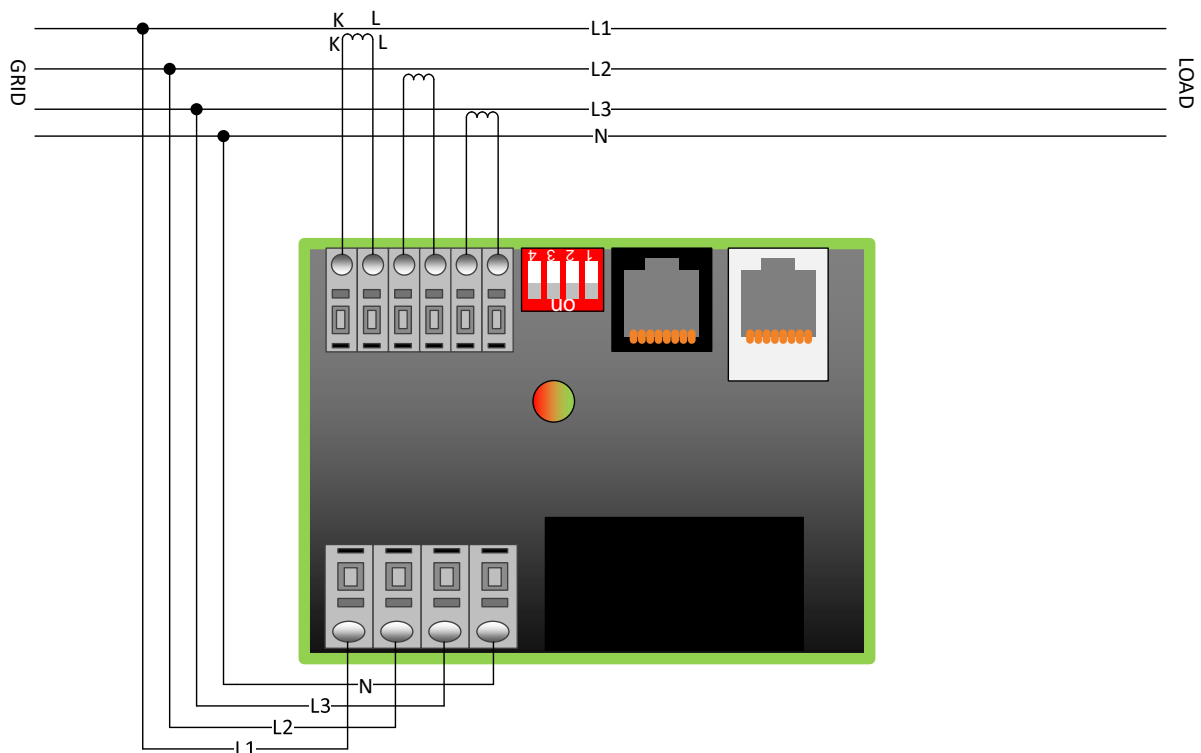
Before wiring the device, be sure that the voltage is switched off.



## 2.3 Pin description LAN

	Pin	Description	Minimum	Maximum
Voltage input	1	Phase 1 voltage input	100 Vac	240 Vac
	2	Phase 2 voltage input	100 Vac	240 Vac
	3	Phase 3 voltage input	100 Vac	240 Vac
	4	Neutral input of voltage		0 Vac
Power input	5	K input current transformer L1	0 Aac	5 Aac
	6	L input current transformer L1	0 Aac	5 Aac
	7	K input current transformer L2	0 Aac	5 Aac
	8	L input current transformer L2	0 Aac	5 Aac
	9	K input current transformer L3	0 Aac	5 Aac
	10	L input current transformer L3	0 Aac	5 Aac
Dipswitch	1	IP address selection	OFF = DHCP	ON = static
	2	System frequency	OFF = 50 Hz	ON = 60 Hz
	3	Single or Three phase	OFF = Three phase	ON = Single phase
	4	Internal use only	OFF = Default	

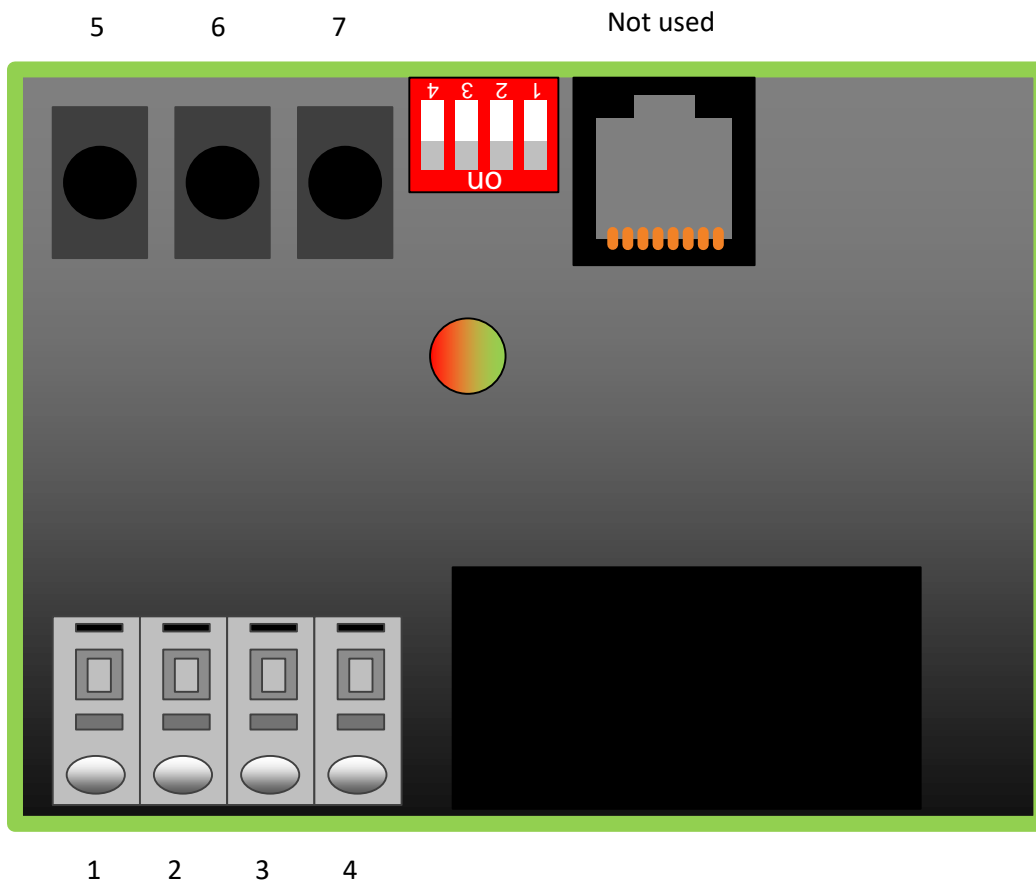
## 2.4 Wiring diagram LAN and WiFi



Please use the elgris 100 A current clamps in stead of the shown current sensors.

## 2.5 Device overview WiFi

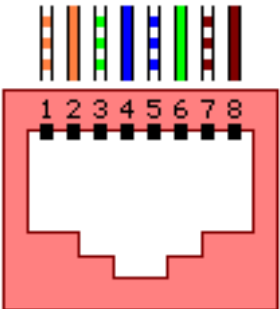
Before wiring the device, be sure that the voltage is switched off.



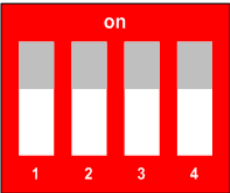
## 2.6 Pin description WiFi

	Pin	Description	Minimum	Maximum
Voltage input	1	Phase 1 voltage input	100 Vac	240 Vac
	2	Phase 2 voltage input	100 Vac	240 Vac
	3	Phase 3 voltage input	100 Vac	240 Vac
	4	Neutral input of voltage		0 Vac
Clamp input	5	Current sensor L1	elgris 100 A sensor only	
	6	Current sensor L2	elgris 100 A sensor only	
	7	Current sensor L3	elgris 100 A sensor only	
Dipswitch	1	IP address selection	OFF = DHCP	ON = static
	2	WiFi selection mode	OFF = Normal	ON = Access point
	3	Internal use only	OFF = Default	
	4	Internal use only	OFF = Default	

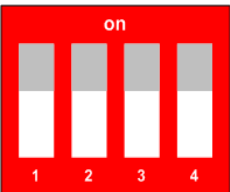
## 2.7 RS 485 pin out LAN

	Pin	Description
	1	Not connected
	2	RS-232 TX
	3	RS-232 RX
	4	RS-485 B (D-)
	5	RS-485 A (D+)
	6	GND
	7	Not connected
	8	Not connected

## 2.8 Dipswitches LAN





	Dipswitch	Description	
		OFF	ON
	1	DHCP	Static IP
	2	50 Hz	60 Hz
	3	Three phases	Single phase
4	Not used must be OFF		

## 2.9 Dipswitches WiFi

	Dipswitch	Description	
		OFF	ON
	1	DHCP	Static IP
	2	Normal mode	Access point
	3	Not used must be OFF	
4	Not used must be OFF		

## 2.10 LED status

The LED on board informs the user about the internal status.

LED colour	Meaning	Action
Off	No power or internal error	Contact support
	Internal Error	Contact support
	elgris cloud error	Check the internet connection and elgris cloud settings
	WiFi access point mode	Dipswitch 2 must be off
	normal operation	

### 3 Commissioning

Before starting with the commissioning of the SMART METER all safety precautions must be taken which apply to the rules in your country and general safety rules. Never work on a system with a connected grid before working on the power system.

Only a few settings are needed to commission the SMART METER.

Most important is the settings of the current transformer.

#### 3.1 First time power on

Follow the following steps when the system is first time being powered.

- ☞ Start the METER by applying power to L1 and N in case you use a single-phase system or L1, L2 and L3 with N for three phase systems. When the SMART METER unit is working properly, the LED is blinking green.
- ☞ When using the WiFi version enable the access point by switching dipswitch 2 to ON and connect with the WiFi Network "elgris AP". The password is "password"  
Select the WiFi network and insert your credentials. Press Save to store the settings and switch dipswitch 2 back to OFF. When the connection is established successfully, the led will start blinking green.  
When you put the dipswitch 2 to ON without setting a WiFi network, the previous data is lost.
- ☞ When using a LAN connection ensure that your computer is in the same network and has an IP address within the same range. In case you are using the DHCP server you need to know the IP address of the SMART METER.
- ☞ Connect to the embedded webserver by typing the default address 192.168.1.100 or DHCP address in a web browser. Please note that the used computer must be in the same address range.
- ☞ On the Menu select Settings to adjust the CT ratio. The CT ratio is defined as 1: value. For example, when you have a CT 5:200 the value is 40.  
The CT ratio for the SMART METER with 100 A elgris current clamps is 20 default.
- ☞ When the CT ratio is changed the power readings on the overview page should match the actual power. A positive value is consumption from the grid, a negative value means exporting to the grid. When this is not correct, check the wiring of K and L of the CT.  
For current clamps, swap the direction.

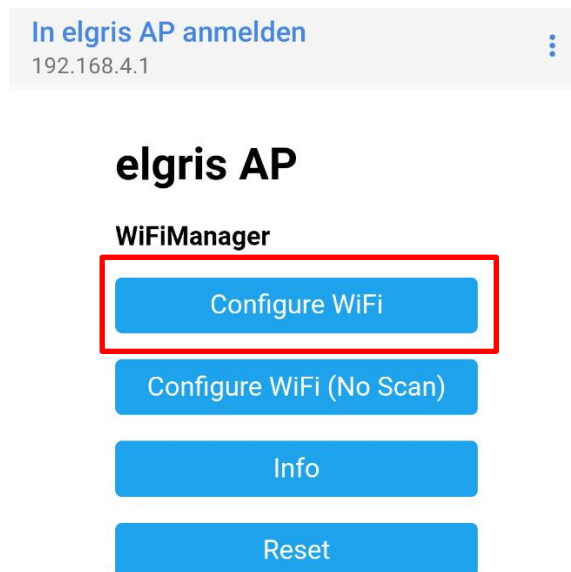


### 3.2 Connecting with a WiFi network

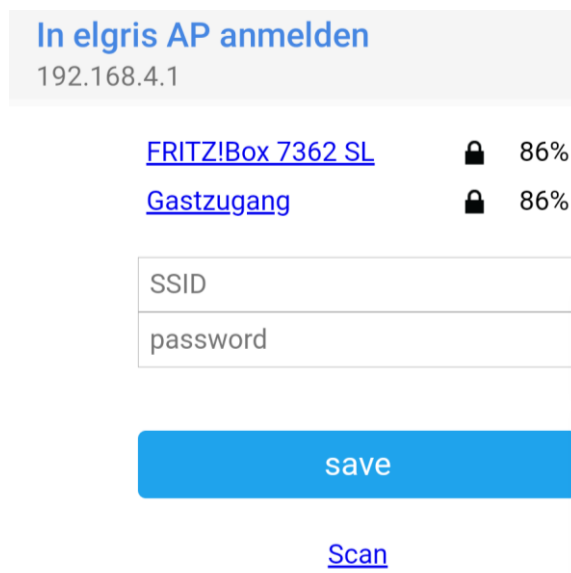
To connect with a WiFi network the dipswitch 2 must be ON. This will erase all previous settings and creates an access point where you can connect with. Use a smart phone or WiFi capable device and search for a network called “elgris AP”.

The default password for this network is “password”.

When your smart phone ask to go to the login screen accept this. In case you don't get this message, open a web browser and go to 192.168.4.1



Select “Configure WiFi”



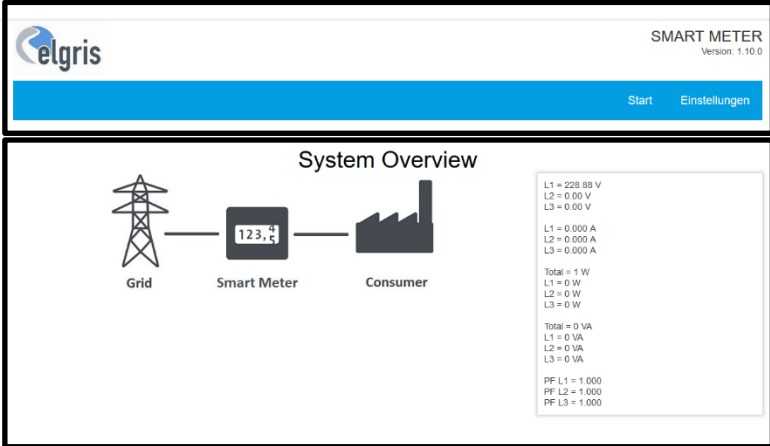
Select the WiFi network, enter the password and press “save”. Now switch back dipswitch 2 and wait till the the LED blinks green. Repeat the above steps in case the LED blinking remains red.

## 4 Graphical User Interface

The SMART METER includes a webserver to adjust the system parameters and see the status of the system.

By default, the webserver can be reached by typing the IP address 192.168.1.100 in a web browser. Supported web browsers are Microsoft Edge, Google Chrome and Mozilla Firefox.

### 4.1 Overview

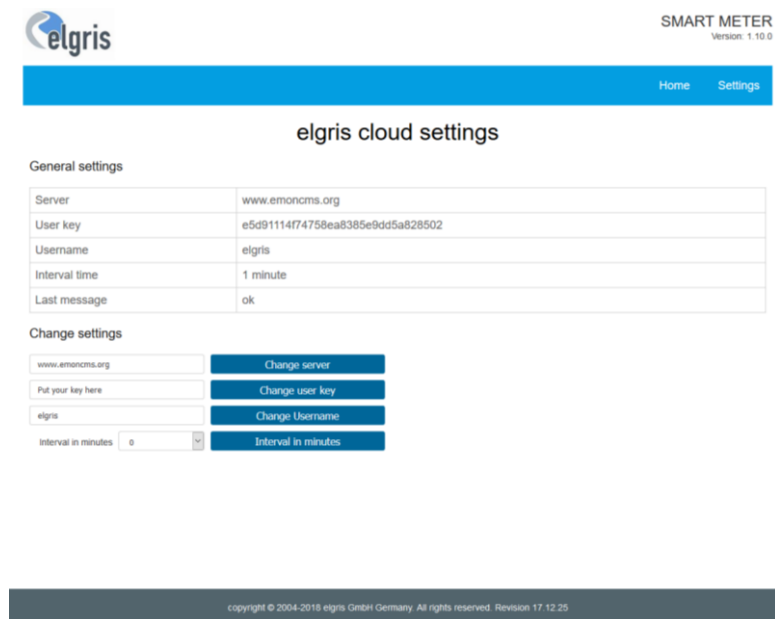


The screenshot displays the SMART METER web interface. The header includes the elgris logo and the text 'SMART METER Version: 1.10.0'. Below the header is a blue navigation bar with 'Start' and 'Einstellungen' buttons. The main content area is titled 'System Overview' and features a diagram showing the connection between the 'Grid', 'Smart Meter' (displaying '123.4'), and 'Consumer'. To the right of the diagram is a data panel with the following information:

L1 = 228.88 V
L2 = 0.00 V
L3 = 0.00 V
L1 = 0.000 A
L2 = 0.000 A
L3 = 0.000 A
Total = 1 W
L1 = 0 W
L2 = 0 W
L3 = 0 W
Total = 0 VA
L1 = 0 VA
L2 = 0 VA
L3 = 0 VA
PF L1 = 1.000
PF L2 = 1.000
PF L3 = 1.000

Annotations on the right side of the screenshot identify the header as 'Header with status information and menu' and the main area as 'Main area with system information'. A footer at the bottom of the page contains the copyright notice: 'copyright © 2004-2018 elgris GmbH Germany. All rights reserved. Revision 17.12.25'.

## 4.2 elgris Cloud



SMART METER  
Version: 1.10.0

Home Settings

### elgris cloud settings

General settings

Server	www.emoncms.org
User key	e5d91114f74758ea8385e9ddd5a828502
Username	elgris
Interval time	1 minute
Last message	ok

Change settings

<input type="text" value="www.emoncms.org"/>	<input type="button" value="Change server"/>
<input type="text" value="Put your key here"/>	<input type="button" value="Change user key"/>
<input type="text" value="elgris"/>	<input type="button" value="Change Username"/>
Interval in minutes <input type="text" value="0"/>	<input type="button" value="Interval in minutes"/>

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With the elgris cloud you can store data on the open source platform emonCMS. This enables the user to have a cloud solution where all data can be visualised and transferred on other mediums.

The emonCMS software can run on the open source server, a self-hosted server or local server like Raspberry PI.

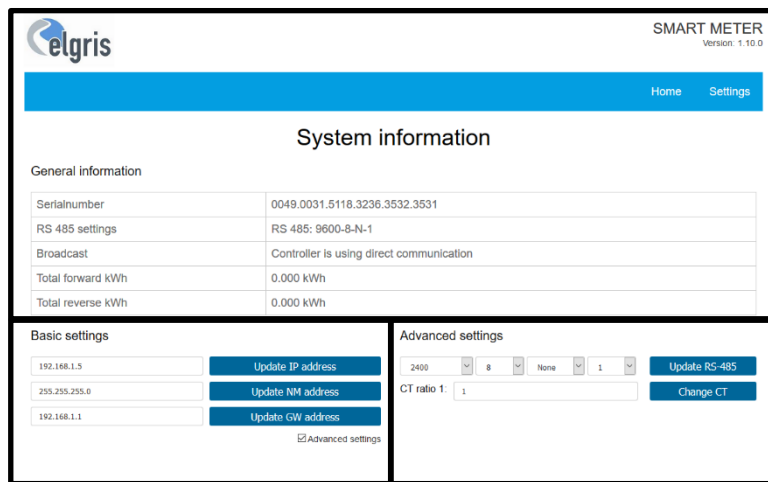
We offer the cloud hosting as a service under [ecloud.elgris.de](http://ecloud.elgris.de). Please inform about the latest conditions.

To start logging, you must fill out the server address with its hostname, the user key for security and optional a user name when you want to log more data under the same account.

With the interval time you can set the time between each update interval. By setting the time to zero, the data logging to the remote sever stops.

The response of the communication is displayed as last messages. When everything is working fine, the message "Ok" will be displayed here.

## 4.3 System settings



SMART METER  
Version: 1.10.0

Home Settings

### System information

General information

Serialnumber	0049.0031.5118.3236.3532.3531
RS 485 settings	RS 485: 9600-8-N-1
Broadcast	Controller is using direct communication
Total forward kWh	0.000 kWh
Total reverse kWh	0.000 kWh

Basic settings

192.168.1.5

255.255.255.0

192.168.1.1

Advanced settings

Advanced settings

2400 8 None 1

CT ratio 1: 1

Status information  
and settings for  
information

Basic settings:  
IP address, Netmask  
and gateway

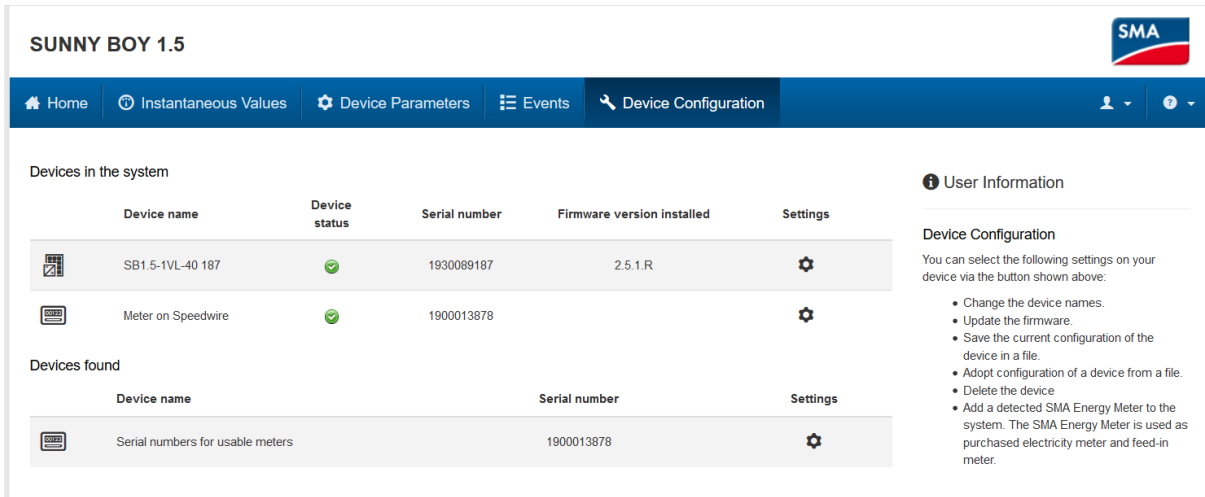
Advanced settings for  
RS 485 bus and  
control parameters

On the settings page the main settings and parameters can be changed. To enable the advanced settings, the checkbox must be selected.

## 5 SMA EMETER compatible mode

The elgris SMART METER is compatible with the SMA EMETER-10 and EMETER-20. This means that SMA inverters recognize the elgris SMART METER as being a SMA EMETER.

The following picture shows an elgris SMART METER in the SMA inverter software:



**SUNNY BOY 1.5**

Home | Instantaneous Values | Device Parameters | Events | Device Configuration

Devices in the system

Device name	Device status	Serial number	Firmware version installed	Settings
SB1.5-1VL-40 187	✓	1930089187	2.5.1.R	⚙️
Meter on Speedwire	✓	1900013878		⚙️

Devices found

Device name	Serial number	Settings
Serial numbers for usable meters	1900013878	⚙️

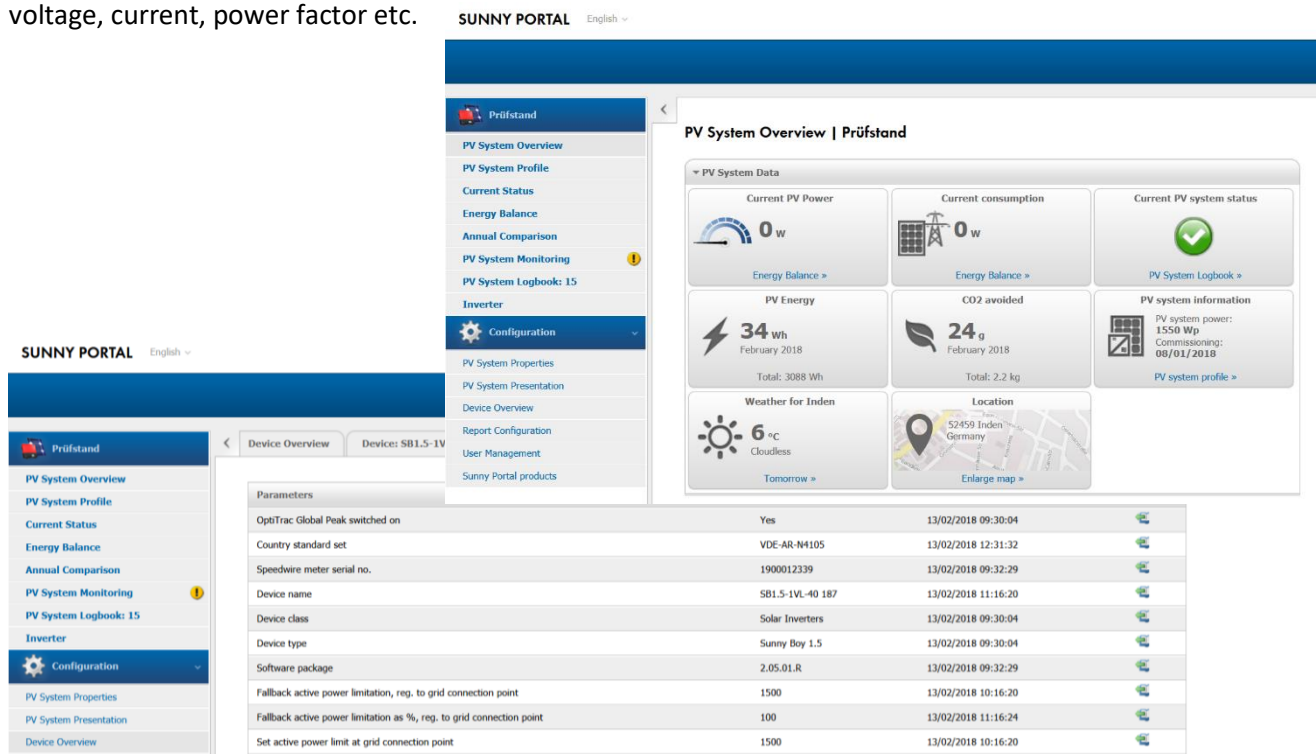
User Information

**Device Configuration**

You can select the following settings on your device via the button shown above:

- Change the device names.
- Update the firmware.
- Save the current configuration of the device in a file.
- Adopt configuration of a device from a file.
- Delete the device
- Add a detected SMA Energy Meter to the system. The SMA Energy Meter is used as purchased electricity meter and feed-in meter.

The SMA inverter transmit the metering data to the online Sunny Places portal. In addition, also the elgris cloud can be used since the SMA only shows the power and not the individual parameters like voltage, current, power factor etc.



**SUNNY PORTAL** English

**PV System Overview | Prüfstand**

Current PV Power: 0 W  
Current consumption: 0 W  
Current PV system status: ✓

PV Energy: 34 Wh (February 2018)  
CO2 avoided: 24 g (February 2018)  
Weather for Inden: 6 °C Cloudless  
Location: 52459 Inden, Germany

PV system information: PV system power: 1550 Wp, Commissioning: 08/01/2018

Parameters

Parameter	Value	Timestamp
OptiTrac Global Peak switched on	Yes	13/02/2018 09:30:04
Country standard set	VDE-AR-N4105	13/02/2018 12:31:32
Speedwire meter serial no.	1900012339	13/02/2018 09:32:29
Device name	SB1.5-1VL-40 187	13/02/2018 11:16:20
Device class	Solar Inverters	13/02/2018 09:30:04
Device type	Sunny Boy 1.5	13/02/2018 09:30:04
Software package	2.05.01.R	13/02/2018 09:32:29
Fallback active power limitation, reg. to grid connection point	1500	13/02/2018 10:16:20
Fallback active power limitation as %, reg. to grid connection point	100	13/02/2018 11:16:24
Set active power limit at grid connection point	1500	13/02/2018 10:16:20

## 6 MODBUS TCP (LAN only)

The elgris SMART METER includes a MODBUS TCP server with parameter mapping according to SunSpec parameter list 203. By offering an open protocol the implementation can be easily adopted to the user needs.

The MODBUS uses port 502 by default.

### 6.1 Register mapping Common Model

The first register address is 40000 and the registers can be read with function 0x03.

Address	Size	Name	Label	Value	Type	R/W	Description
40000	2	ID	Common	1	uint32	R	Value = "SunS" (0x53756e53). Uniquely identifies this as a SunSpec MODBUS Map
40002	1	DID	SunSpec_DID	1	uint16	R	Value = 0x0001. Uniquely identifies this as a SunSpec Common Model Block
40003	1	L	SunSpec_Length	65	uint16	R	65 = Length of block in 16-bit register
40004	16	Mn	Manufacturer		string	R	"elgris"
40020	16	Md	Model		string	R	"SMART METER"
40036	8	Opt	Options		String	R	Not used, for future compatibility
40044	8	Vr	Version		string	R	"1.10.15"
40052	16	SN	Serial Number		string	R	19000XXXX (SMA serial compliant)

## 6.2 Register mapping WYE connect Meter Model

Address	Size	Name	Label	Value	Type	R/W	Description
40069	1	ID	WYE-connect three phase (abcn) meter	1	uint16	R	Value = 203 Uniquely identifies this as a SunSpec 203 MODBUS Map
40070	1	L	SunSpec_Length	105	uint16	R	105 = Length of block in 16-bit register
40071	1	A	Amps		int16	R	Total AC current
40072	1	AphA	Amps Phase A		int16	R	Phase A current
40073	1	AphB	Amps Phase B		int16	R	Phase B current
40074	1	AphC	Amps Phase C		int16	R	Phase C current
40075	1	A_SF			sunssf	R	Current scale factor
40076	1	PhV	Voltage LN		int16	R	Line to neutral AC voltage
40077	1	PhVphA	Voltage AN		int16	R	Phase voltage AN
40078	1	PhVphB	Voltage BN		int16	R	Phase voltage BN
40079	1	PhVphC	Voltage CN		int16	R	Phase voltage CN
40080	1	PPV	Voltage LL		int16	R	Line to Line AC voltage
40081	1	PhVphAB			int16	R	Line voltage AB
40082	1	PhVphBC			int16	R	Line voltage BC
40083	1	PhVphCA			int16	R	Line voltage CA
40084	1	V_SF			sunssf	R	Voltage scale factor
40085	1	Hz	Hz		int16	R	Frequency
40086	1	Hz_SF			sunssf	R	Frequency scale factor
40087	1	W	Watts		int16	R	Total real power
40088	1	WphA	Watts phase A		int16	R	Real power phase A
40089	1	WphB	Watts phase B		int16	R	Real power phase B
40090	1	WphC	Watts phase C		int16	R	Real power phase C
40091	1	W_SF			sunssf	R	Real power scale factor
40092	1	VA			int16		AC apparent power
40093	1	VAphA	VA phase A		int16	R	Apparent power phase A
40094	1	VAphB	VA phase B		int16	R	Apparent power phase B
40095	1	VAphC	VA phase C		int16	R	Apparent power phase C
40096	1	VA_SF			sunssf	R	Apparent power scale factor
40097	1	VAR			int16		AC apparent power
40098	1	VARphA	VA phase A		int16	R	Reactive power phase A
40099	1	VARphB	VA phase B		int16	R	Reactive power phase B
40100	1	VARphC	VA phase C		int16	R	Reactive power phase C
40101	1	VAR_SF			sunssf	R	Reactive power scale factor

Address	Size	Name	Label	Value	Type	R/W	Description
40102	1	PF	PF		int16	R	Power factor
40103	1	PFphA	PF phase A		int16	R	
40104	1	PFphB	PF phase B		int16	R	
40105	1	PFphC	PF phase C		int16	R	
40106	1	PF_SF			sunssf	R	Power factor scale factor
40107	2	TotWhExp			acc32	R	Total Wh exported
40109	2	TotWhExpPhA			acc32	R	Total Wh exported phase A
40111	2	TotWhExpPhB			acc32	R	Total Wh exported phase B
40113	2	TotWhExpPhC			acc32	R	Total Wh exported phase C
40115	2	TotWhImp			acc32	R	Total Wh imported
40117	2	TotWhImpPhA			acc32	R	Total Wh imported phase A
40119	2	TotWhImpPhB			acc32	R	Total Wh imported phase B
40121	2	TotWhImpPhC			acc32	R	Total Wh imported phase C
40123	1	TotWhSF			sunssf	R	Real energy scale factor
40125	2	TotVARhExp			acc32	R	Total VAR exported
40127	2	TotVARhExpPhA			acc32	R	Total VAR exported phase A
40129	2	TotVARhExpPhB			acc32	R	Total VAR exported phase B
40131	2	TotVARhExpPhC			acc32	R	Total VAR exported phase C
40133	2	TotVARhImp			acc32	R	Total VAR imported
40135	2	TotVARhImpPhA			acc32	R	Total VAR imported phase A
40137	2	TotVARhImpPhB			acc32	R	Total VAR imported phase B
40139	2	TotVARhImpPhC			acc32	R	Total VAR imported phase C
40140	1	TotVARh_SF			sunssf	R	Reactive energy scale factor
40141	1	Evt	Events		bitf32	R	Not supported yet