SOLAR ELECTRIC

KOSTAL

Smart connections.

Technical information

KOSTAL Smart Energy Meter

KOSTAL Smart Energy Meter: suited to numerous purposes.

Flexible in use

Integrated 3-phase energy measurement of up to 63 A

Higher measurement currents possible using converter

2 LAN interfaces

2 RS485 interfaces (Modbus RTU)

Smart connected

Can be combined with PIKO 4.2-20, PIKO EPC, PIKO MP plus, PIKO IQ, PLENTICORE plus

Data display

Prepared for EEBus for integration in a Smart Home

Functions can be extended via software updates

Smart performance

High measurement accuracy

Current sensor and energy manager for connecting AC batteries

Smart control for multiple-inverter connection

Easy to install

Installation in control cabinet on top-hat rail

Simple device configuration using online interface and preset values

Software is updated via online interface

KOSTAL Smart Energy Meter: in combination with KOSTAL solar inverters

PIKO IQ / PLENTICORE plus

- 24-hour home consumption measurement
- Dynamic active power control
- Pre-configured Modbus RTU interfaces (RS485)
- Multiple-inverter connection with KOSTAL solar inverter
- Provision of measurement data when using battery functionality in combination with PLENTICORE plus
- Battery on the PLENTICORE plus is recharged from additional local generators

PIKO MP / PIKO MP plus

- 24-hour home consumption measurement
- Dynamic active power control
- Pre-configured Modbus RTU interfaces (RS485)
- Multiple-inverter connection with KOSTAL solar inverter[1]
- Battery management with optional battery functionality on the PIKO MP plus[1,2]
- Battery on the PIKO MP plus is recharged from additional local generators[1,2]

PIKO 4.2-20 / PIKO EPC

- 24-hour home consumption measurement
- Dynamic active power control[1]
- Multiple-inverter connection with KOSTAL solar inverter[1]

[1] Available later on via software update

[2] Activation code for battery for KOSTAL Smart Energy Meter can be purchased from shop.kostal-solar-electric.com

Technical data KOSTAL Smart Energy Meter

			KOSTAL Smart Energy Meter [1]
System data	Process data		ARM9 processor with 450 MHz, DDR2 RAM with 128 Mbyte eMMC Flash 4 GByte
	Operating system		Embedded Linux with integrated TCP/IP stack
	LAN interfaces for Modbus TCP		2 x (10/100 Mbit)
	RS485 interfaces for Modbus RTU		2 x (half-duplex, max. 115 200 baud)
	Rated voltage	V	max. 230/400 V~
	Operating voltage	V	110/230 V~ ± 10%
	Frequency range	Hz	50/60 ± 5 %
	Self-consumption - voltage path per phase	VA	< 0.01
	Self-consumption - current path per phase	VA	< 2
	Self-consumption - entire device	W	< 5
	Current (rated current/limiting current)	A	5 / 63 [3]
	Starting current	mA	< 25
	Product standards		EN 61010, EN 50428, EN 60950
Measurement accuracy [2]	Voltage	%	± 0.5
	Current	%	± 0.5
	Active power	%	± 1.0
	Apparent power	%	± 1.0
	Reactive power	%	± 1.0
	Power factor	%	± 1.0
	Active energy / reactive energy according to IEC 62053-22 / -23 (typical)		Class 1
Mechanical data	Housing material		Fibreglass-reinforced polyamide
	Incandescent wire test according to IEC 695-2-1		Yes
	Protective class		II
	Protection class		IP2X
	Weight	kg	0.3
	Dimensions (H/W/D)	mm	88 x 70 x 65
	Connection cross-section (mechanical, e.g. for connecting external transformers)	mm^2	10-25 (1.5-25)
	Torque for screw terminals	Nm	2
Conditions	Ambient temperature	°C	-25 ... 45
	Storage temperature	°C	-25 ... 70
	Relative humidity (non-condensing)	%	Up to 75% as an annual average Up to 95% on up to 30 days/year
	Max. height above sea level for operation	m	2000

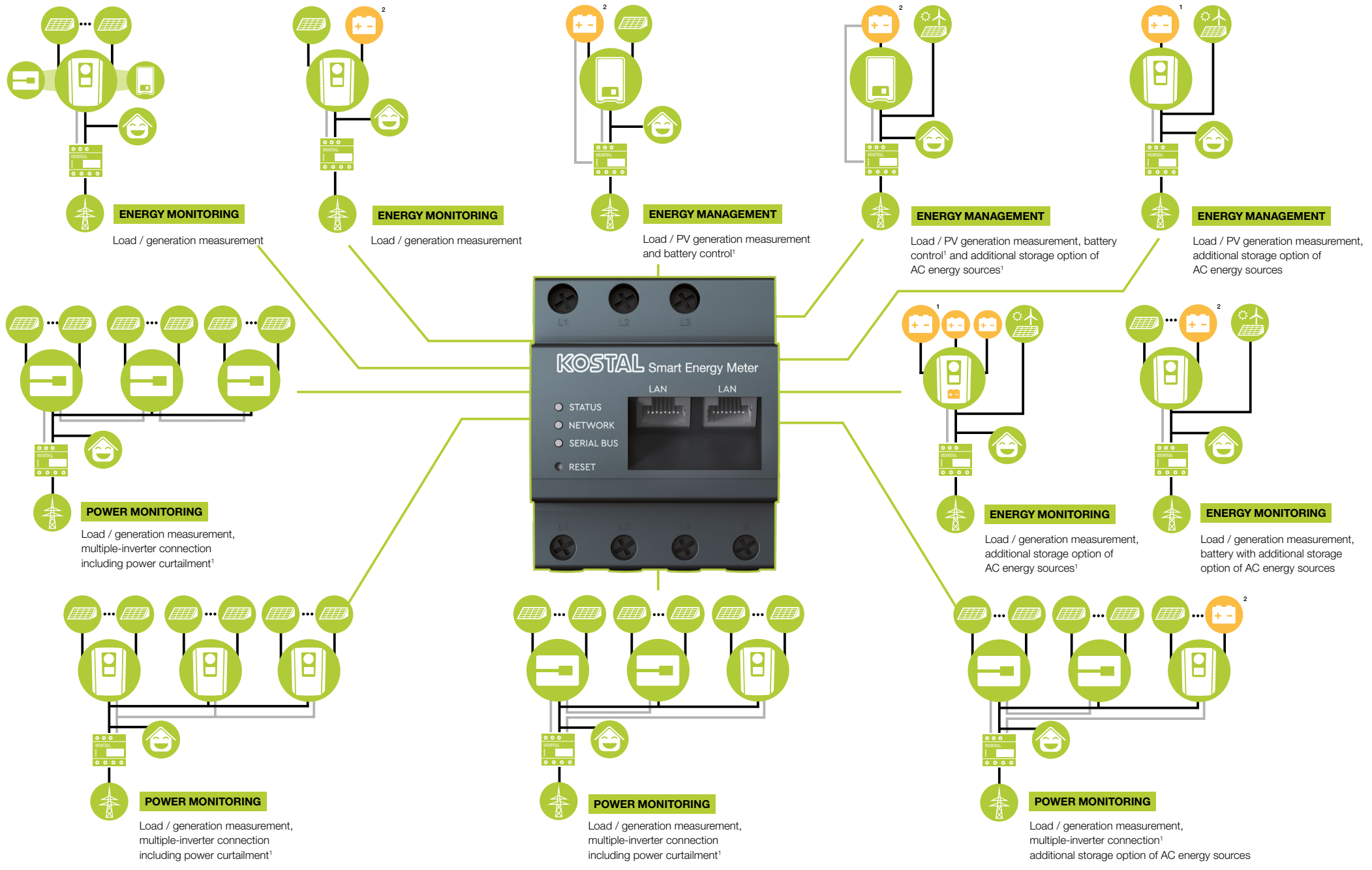
Subject to technical changes. Errors excepted. You can find current information at www.kostal-solar-electric.com. Manufacturer: KOSTAL Industrie Elektrik GmbH, Hagen, Germany

[1] 2-year warranty

[2] Accuracy class according to IEC 61557-12 with reference to measuring value of the KOSTAL Smart Energy Meter.
If using external converters, the particular measurement accuracy must be taken into account. If using current sensors via the sensor bar, subject to the power factor the accuracy of the active power is class 2.

[3] Limiting current I_N / phase 63 A. Higher currents possible via converter.

KOSTAL Smart Energy Meter: suited to numerous purposes.



[1] available at a later date
[2] requires activation code for battery

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www.kostal-solar-electric.com

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KOSTAL Smart Energy Meter (KSEM)

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2 LAN interfaces

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Functions can be extended via software updates

Easy to install

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Simple device configuration using online interface and preset values

Software is updated via online interface

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KOSTAL Smart Energy Meter: in combination with KOSTAL solar inverters

PIKO IQ / PLENTICORE plus

- 24-hour home consumption measurement
- Dynamic active power control
- Pre-configured Modbus RTU interfaces (RS485)
- Multiple-inverter connection with KOSTAL solar inverter
- Provision of measurement data when using battery functionality in combination with PLENTICORE plus
- Battery on the PLENTICORE plus is recharged from additional local generators

PIKO MP / PIKO MP plus

- 24-hour home consumption measurement
- Dynamic active power control
- Pre-configured Modbus RTU interfaces (RS485)
- Multiple-inverter connection with KOSTAL solar inverter[1]
- Battery management with optional battery functionality on the PIKO MP plus[1,2]
- Battery on the PIKO MP plus is recharged from additional local generators[1,2]

PIKO 4.2-20 / PIKO EPC

- 24-hour home consumption measurement
- Dynamic active power control[1]
- Multiple-inverter connection with KOSTAL solar inverter[1]

[1] Available later on via software update

[2] Activation code for battery for KOSTAL Smart Energy Meter can be purchased from shop.kostal-solar-electric.com

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KOSTAL Smart Energy Meter (KSME): Technical data 1

			KOSTAL Smart Energy Meter [1]
System data	Process data		ARM9 processor with 450 MHz, DDR2 RAM with 128 Mbyte eMMC Flash 4 GByte
	Operating system		Embedded Linux with integrated TCP/IP stack
	LAN interfaces for Modbus TCP		2 x (10/100 Mbit)
	RS485 interfaces for Modbus RTU		2 x (half-duplex, max. 115 200 baud)
	Rated voltage	V	max. 230/400 V~
	Operating voltage	V	110/230 V~ ± 10%
	Frequency range	Hz	50/60 ± 5 %
	Self-consumption - voltage path per phase	VA	< 0.01
	Self-consumption - current path per phase	VA	< 2
	Self-consumption - entire device	W	< 5
	Current (rated current/limiting current)	A	5 / 63 [3]
	Starting current	mA	< 25
	Product standards		EN 61010, EN 50428, EN 60950

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KOSTAL Smart Energy Meter (KSME): Technical data 2

Measurement accuracy [2]	Voltage	%	± 0.5
	Current	%	± 0.5
	Active power	%	± 1.0
	Apparent power	%	± 1.0
	Reactive power	%	± 1.0
	Power factor	%	± 1.0
	Active energy / reactive energy according to IEC 62053-22 / -23 (typical)		Class 1
Mechanical data	Housing material		Fibreglass-reinforced polyamide
	Incandescent wire test according to IEC 695-2-1		Yes
	Protective class		II
	Protection class		IP2X
	Weight	kg	0.3
	Dimensions (H/W/D)	mm	88 x 70 x 65
	Connection cross-section (mechanical, e.g. for connecting external transformers)	mm^2	10-25 (1.5-25)
	Torque for screw terminals	Nm	2

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KOSTAL Smart Energy Meter (KSME): Technical data 3

Conditions	Ambient temperature	°C	-25 ... 45
	Storage temperature	°C	-25 ... 70
	Relative humidity (non-condensing)	%	Up to 75% as an annual average Up to 95% on up to 30 days/year
	Max. height above sea level for operation	m	2000

Subject to technical changes. Errors excepted. You can find current information at www.kostal-solar-electric.com. Manufacturer: KOSTAL Industrie Elektrik GmbH, Hagen, Germany

[1] 2-year warranty

[2] Accuracy class according to IEC 61557-12 with reference to measuring value of the KOSTAL Smart Energy Meter.
If using external converters, the particular measurement accuracy must be taken into account. If using current sensors via the sensor bar, subject to the power factor the accuracy of the active power is class 2.

[3] Limiting current I_N / phase 63 A. Higher currents possible via converter.

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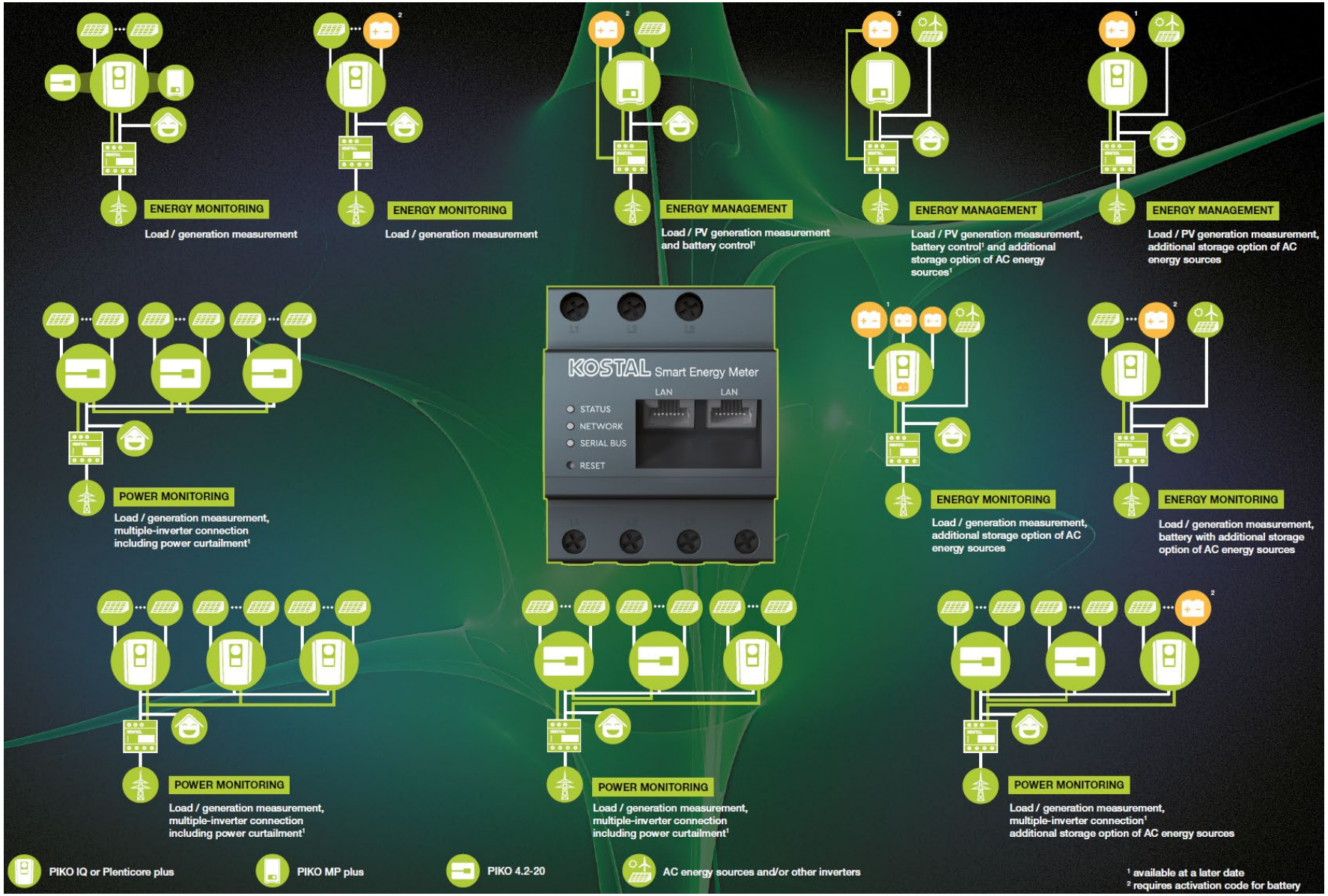
KOSTAL Smart Energy Meter: suited to numerous purposes.



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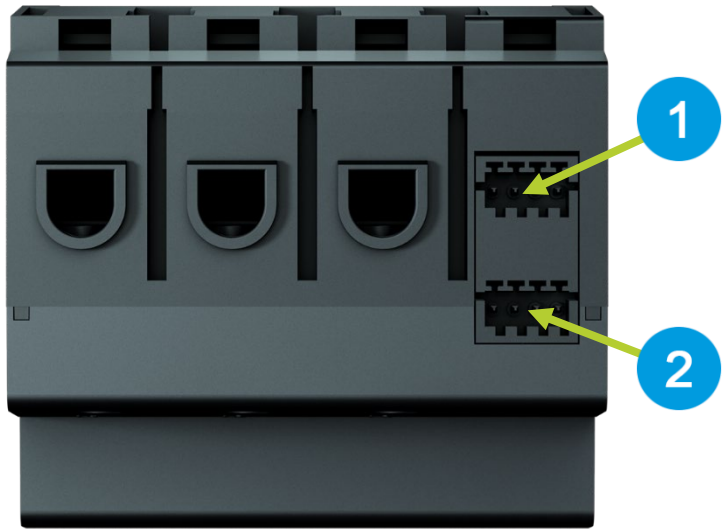
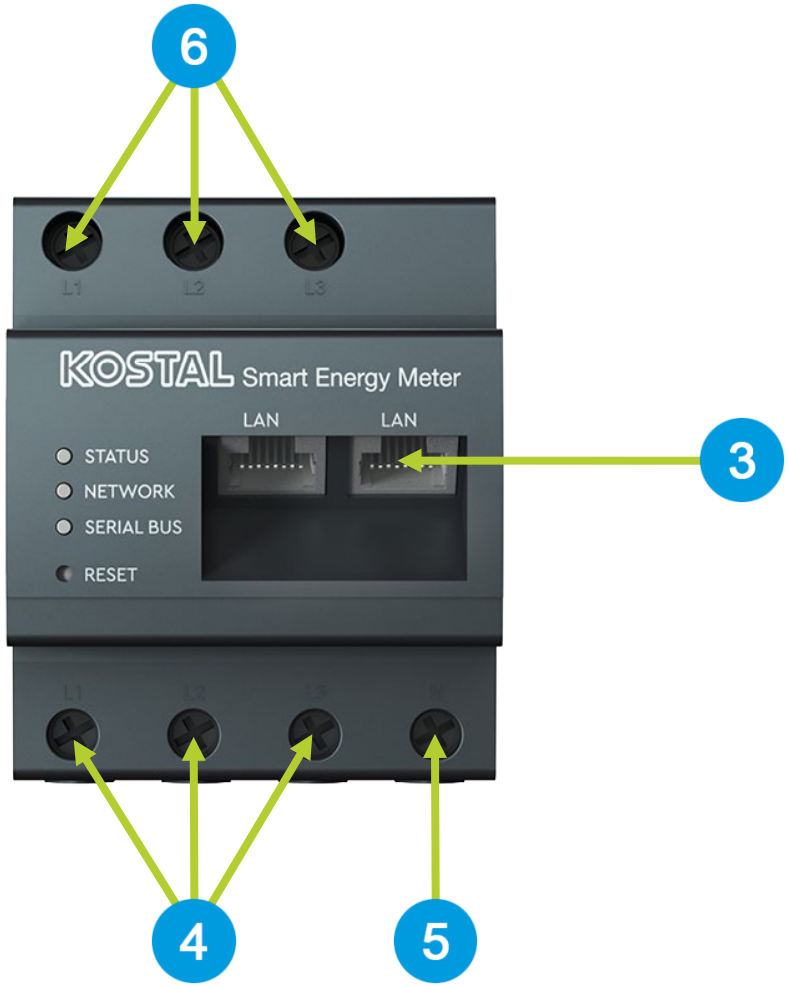
KOSTAL Smart Energy Meter: Overview of connections

View from above at the KOSTAL Smart Energy Meter





1. Modbus RTU RS485 interface (A) preconfigured for PIKO IQ/PLENTICORE plus
2. Modbus RTU RS485 interface (B) preconfigured for PIKO MP/PIKO MP plus
3. 2 x LAN interfaces
4. Inputs external wires - L1, L2, L3
5. Inputs neutral wire - N
6. Outputs external wires - L1, L2, L3

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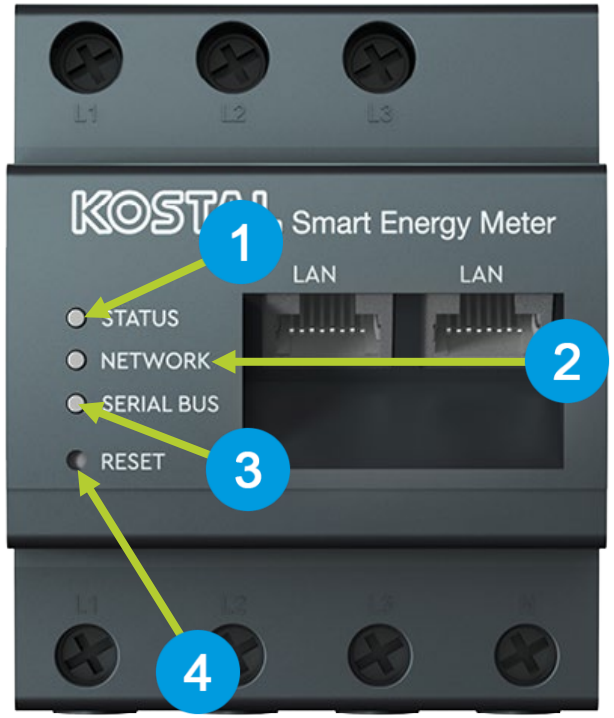
KOSTAL Smart Energy Meter: Status LED



1. **Status LED**
2. **Network LED**
3. **Serial bus LED**
4. **Reset button**

Resetting the KOSTAL Smart energy Meter network settings

Use a pointed object to press the Reset button as follows:
1x brief press (0.5 s) – then within 1 s, 1x long press (between 3 and 5 s).

Restarting KOSTAL Smart Energy Meter

Use a pointed object to press the Reset button for at least 6 s.

LED statuses

Status LED

Colour	State	Description
Orange	On (<10 s)	Device starts
Green	Flashes slowly	
Green	On	Device ready
Green	Flashes quickly	Firmware update active
Red	On	Error – see “Troubleshooting” section
Red	Flashes	
Orange	On (>10 s)	

Network LED

Colour	State	Description
-	Off	No connection
Green	On	Network connection is being established
Green	Flashes	Network connection is active
Orange	Flashes 2 x	Confirmation for resetting the network settings using the Reset button

Serial bus LED

Colour	State	Description
-	Off	No connection
Green	Flashes quickly	Connection active
Green	Flashes slowly	Scan process active
Red	On	Error – overload 9 V output
Orange	Flashes	Error – receiver not responding

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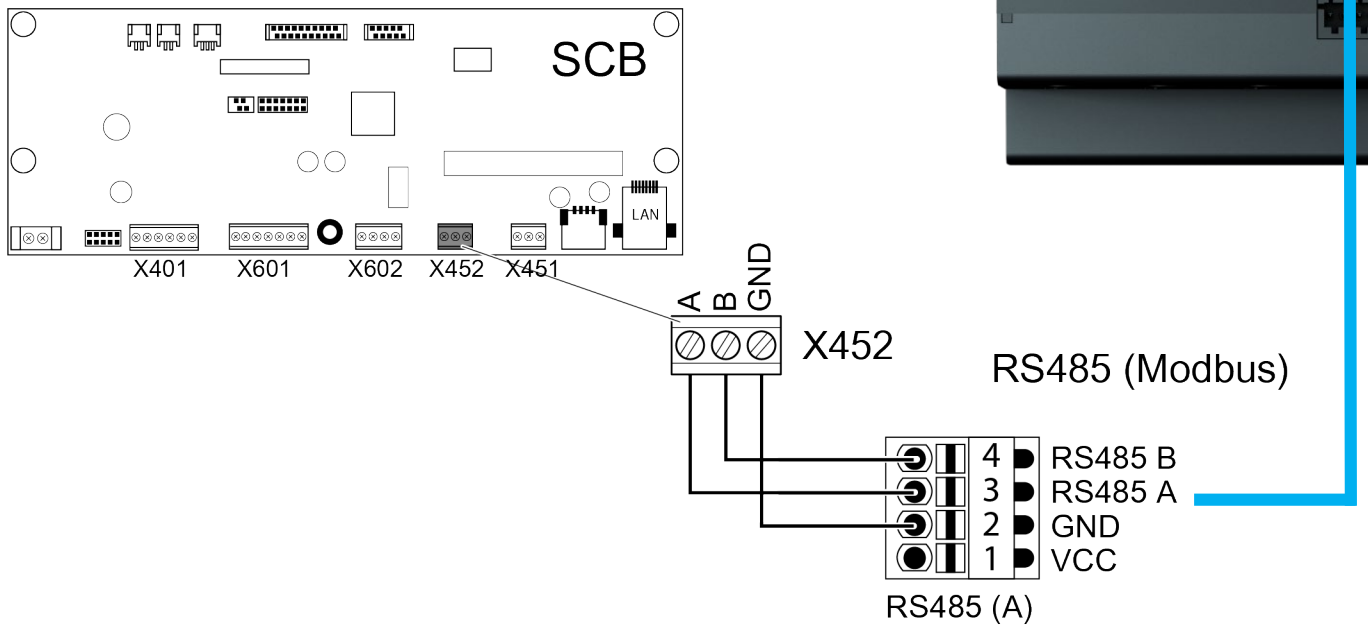
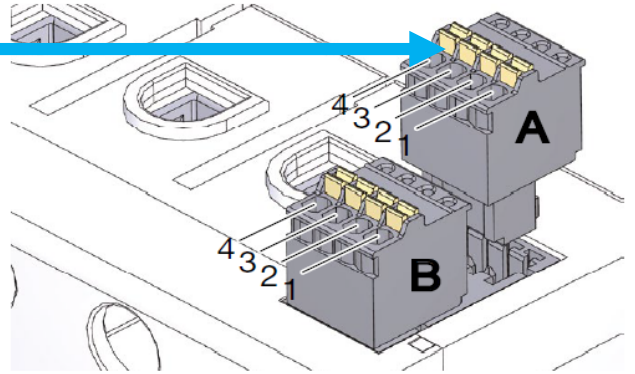
KOSTAL Smart Energy Meter: RTU Modbus (RS485 A) connection

Smart Communication Board (SCB) in the PIKO IQ or PLENTICORE plus inverter



View from above at the KOSTAL Smart Energy Meter



Connection assignment of RS485 plug:

Pin	Marking	Description
1A, 1B	VCC	Voltage output to supply ext. devices 9 V ± 10% / max. 280 mA
2A, 2B	GND	Ground
3A, 3B	A	RS485 A (preconfigured for PLENTICORE plus/PIKO IQ)
4A, 4B	B	RS485 B (preconfigured for PIKO MP plus/PIKO MP)

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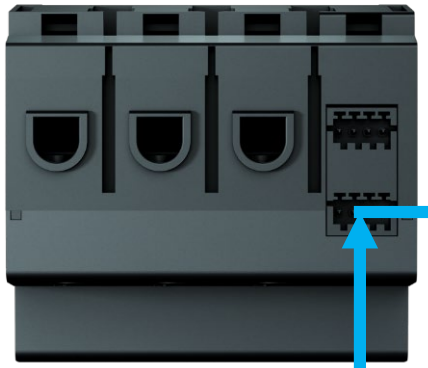
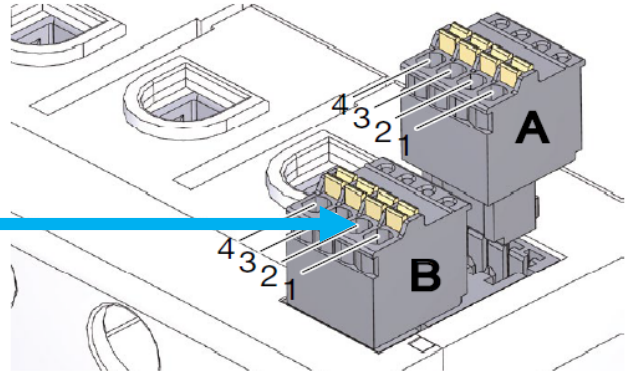
KOSTAL Smart Energy Meter: RTU Modbus (RS485 B) connection

(RJ10) for PIKO MP or COM2 (Modbus RTU)
Connection for PIKO MP plus inverter

View from above at the
KOSTAL Smart Energy Meter





Connection assignment of RS485 plug:

Pin	Marking	Description
1A, 1B	VCC	Voltage output to supply ext. devices 9 V ± 10% / max. 280 mA
2A, 2B	GND	Ground
3A, 3B	A	RS485 A (preconfigured for PLENTICORE plus/PIKO IQ)
4A, 4B	B	RS485 B (preconfigured for PIKO MP plus/PIKO MP)

Device Connection	PIKO MP (RJ10)	PIKO MP plus (RJ45) COM2	Bus-Signal	Energy Meter
Pin	1	6	Data A = A	3
	2	7	Data B = B	4
	3	8	Masse = GND	2

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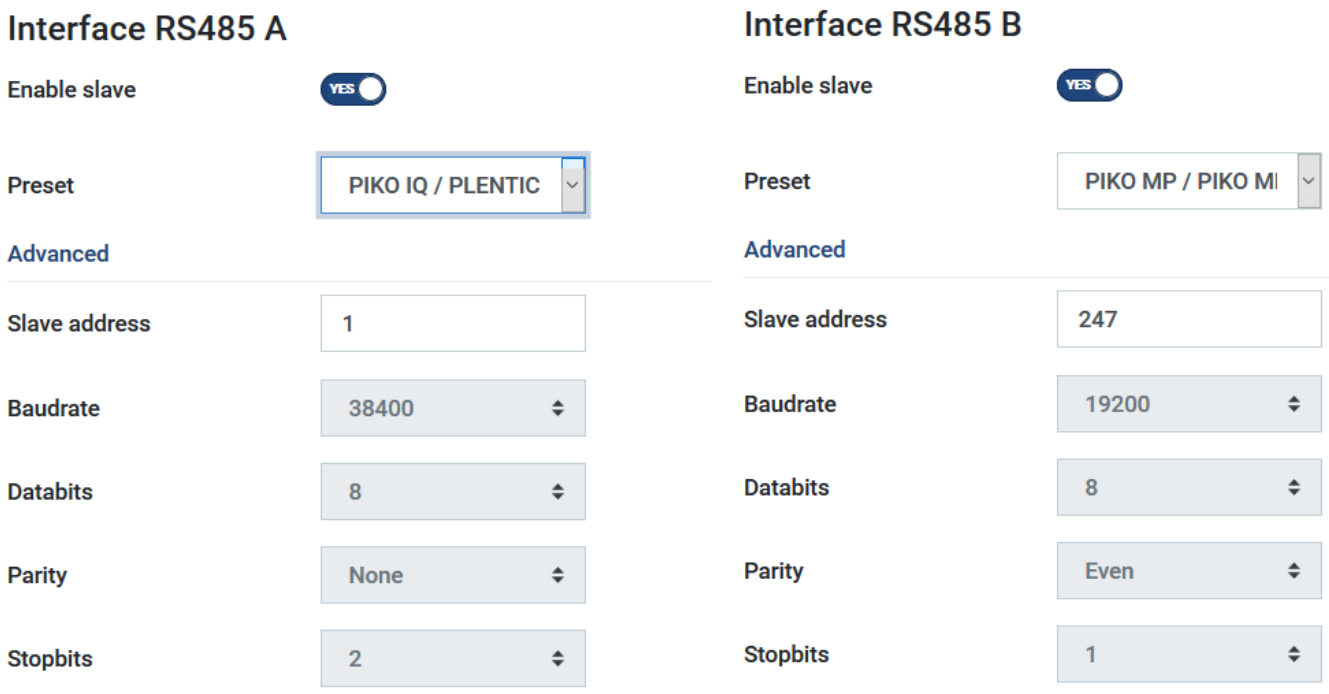
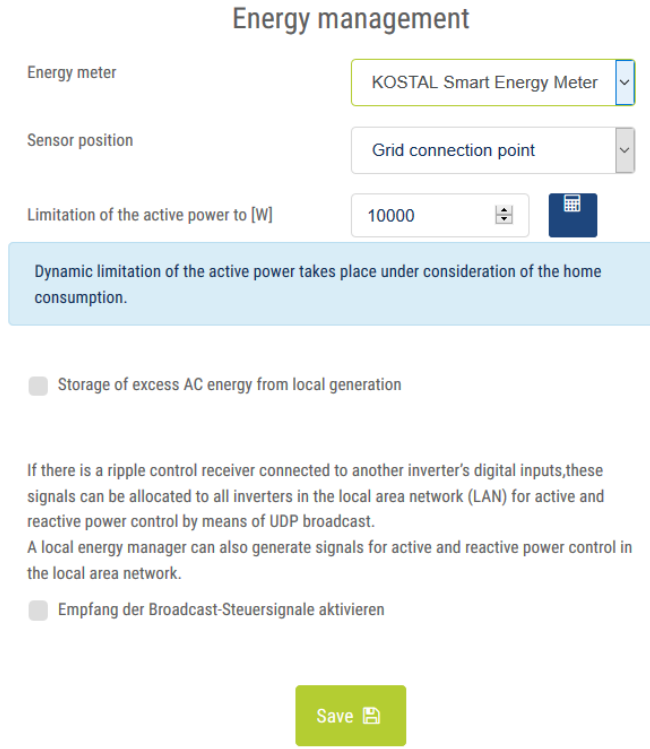
Pre-configured Modbus RTU interfaces A and B

- The Modbus RTU interfaces A and B are pre-configured as standard with the readout intervals for the PIKO IQ / PLENTICORE plus and PIKO MP / PIKO MP plus
- The KOSTAL Smart Energy Meter can be installed directly in the electrical distribution system and connected to the inverter without a PC (adjustment of parameters) and other settings.
- From firmware 1.20, the KOSTAL Smart Energy Meter is available for selection in the web server menu "Energy management". In order to make the selection, you must first have logged into the web server with the master key and the service password.

Web interface KOSTAL Smart Energy Meter



Web interface inverter



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KOSTAL Smart Energy Meter: Commissioning

Commissioning

Note: Connect the KOSTAL Smart Energy Meter to an existing local network.

1. Connect network cable to KOSTAL Smart Energy Meter network connection.
2. Connect the other end of the network cable to a router/switch or directly to the PC/laptop.

Calling up user interface

Calling up user interface using host name

Enter the host name of the KOSTAL Smart Energy Meter in your browser's address bar. The factory host name is made up of the product name and serial number. To log in you will need the password from the KOSTAL Smart Energy Meter's type plate, which can be found on the separate instruction leaflet in the packaging.

Example: KSEM-712345678

Note: This function depends on the router settings and may not be available in larger administered networks under some circumstances.

Calling up online interface via network environment under Windows (Win7 and Win10)

1. Under Windows, in File Explorer click on "Network" or open the Start menu using the Windows button and click on "Devices and printers". An icon entitled KOSTAL Smart Energy Meter (e.g. KSEM-712345678) should be visible.
2. Click on the icon – the standard browser opens with the KOSTAL Smart Energy Meter log-on page.

Note: The target network must not be classified in the PC as "Public network" otherwise this function will be blocked by Windows.

Using HTTPS in the browser

To use the KOSTAL Smart Energy Meter with HTTPS in the browser, enter "https://" in the address line.

Note: Because the KOSTAL Smart Energy Meter's online interface is not a website registered on the Internet, the browser will display it as unsafe. To call up the online interface anyway, the browser's warning must be ignored and a one-off or permanent exception added under "Advanced settings".

Configuring settings

Set the KOSTAL Smart Energy Meter's interfaces (RS485 Modbus) to suit the connected inverter. Under Modbus settings, you only need to select one inverter to the interface to do this. The appropriate values are stored as standard. However, you can adapt the values if necessary.

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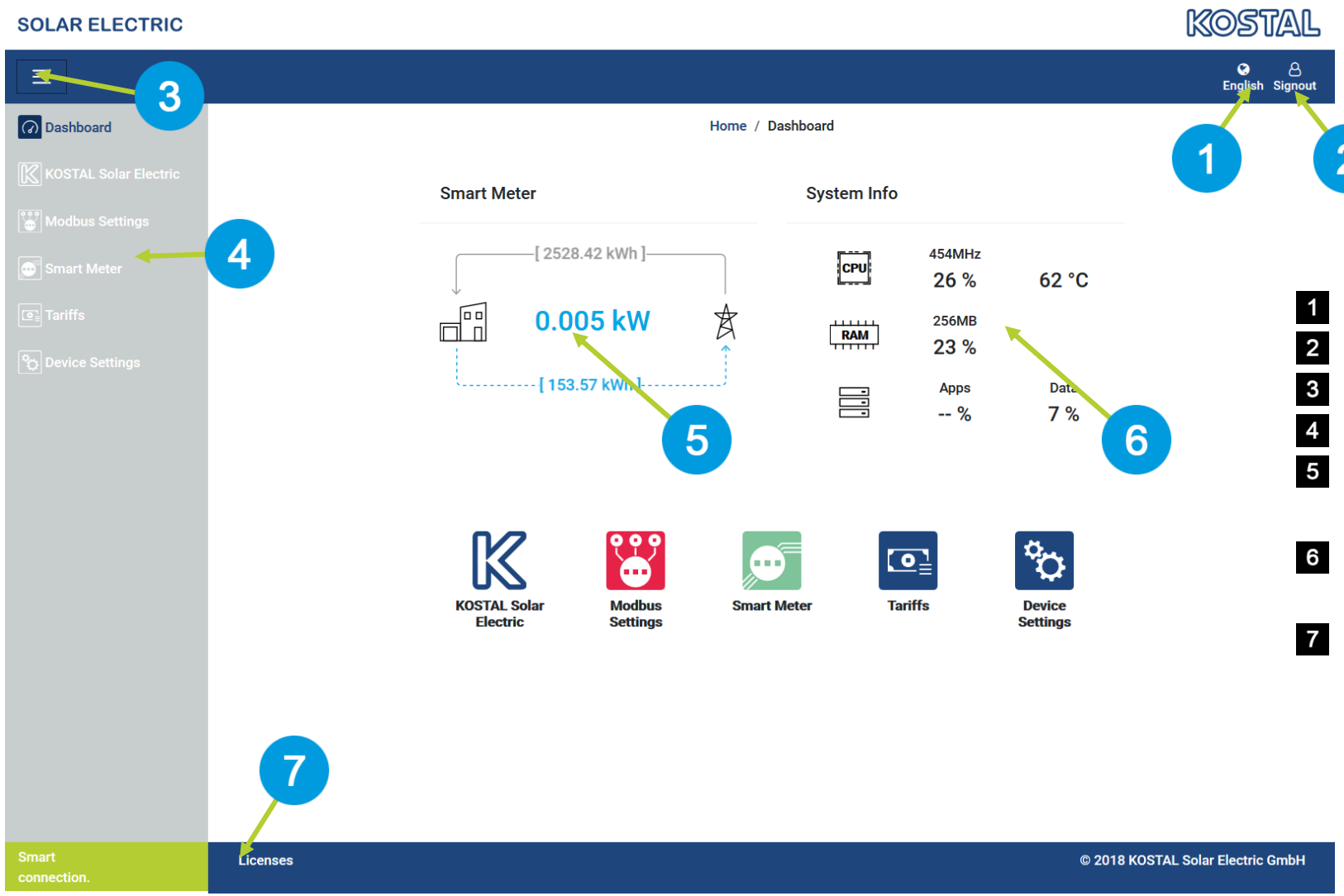
KOSTAL Smart Energy Meter user interface - Dashboard



1. Language selection
2. Web server Login/Logout
3. Show / hide web server menu
4. Web server menu
5. Display of current power values
   - Mouseclick → Display the Smart Meter menu
6. Display of current system information
   - Mouseclick → Display the device settings
7. License Note Texts

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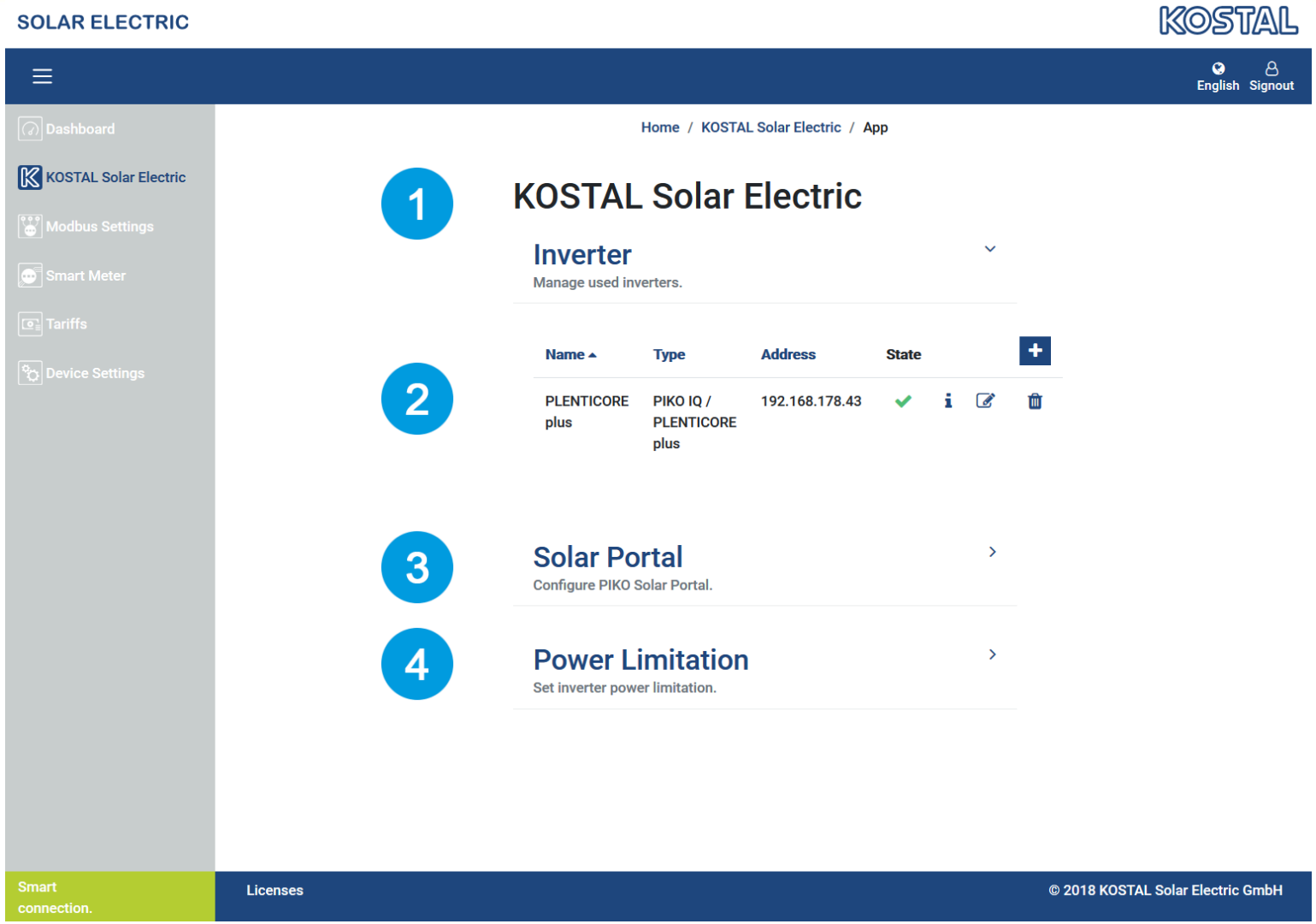
KOSTAL Smart Energy Meter user interface - KOSTAL



1. Manage used inverters for power limitation and swarm connection
2. Display the used inverters
3. KOSTAL Solar Portal activate/deactivate
4. Setting values for active power limitation

The connection of the KOSTAL Smart Energy Meter to KOSTAL solar inverters serves to reduce the feed-in power of inverters if necessary. In addition, the KOSTAL Smart Energy Meter can be connected to the KOSTAL Solar Portal to transfer data from the KOSTAL Smart Energy Meter and the inverter to the Portal.

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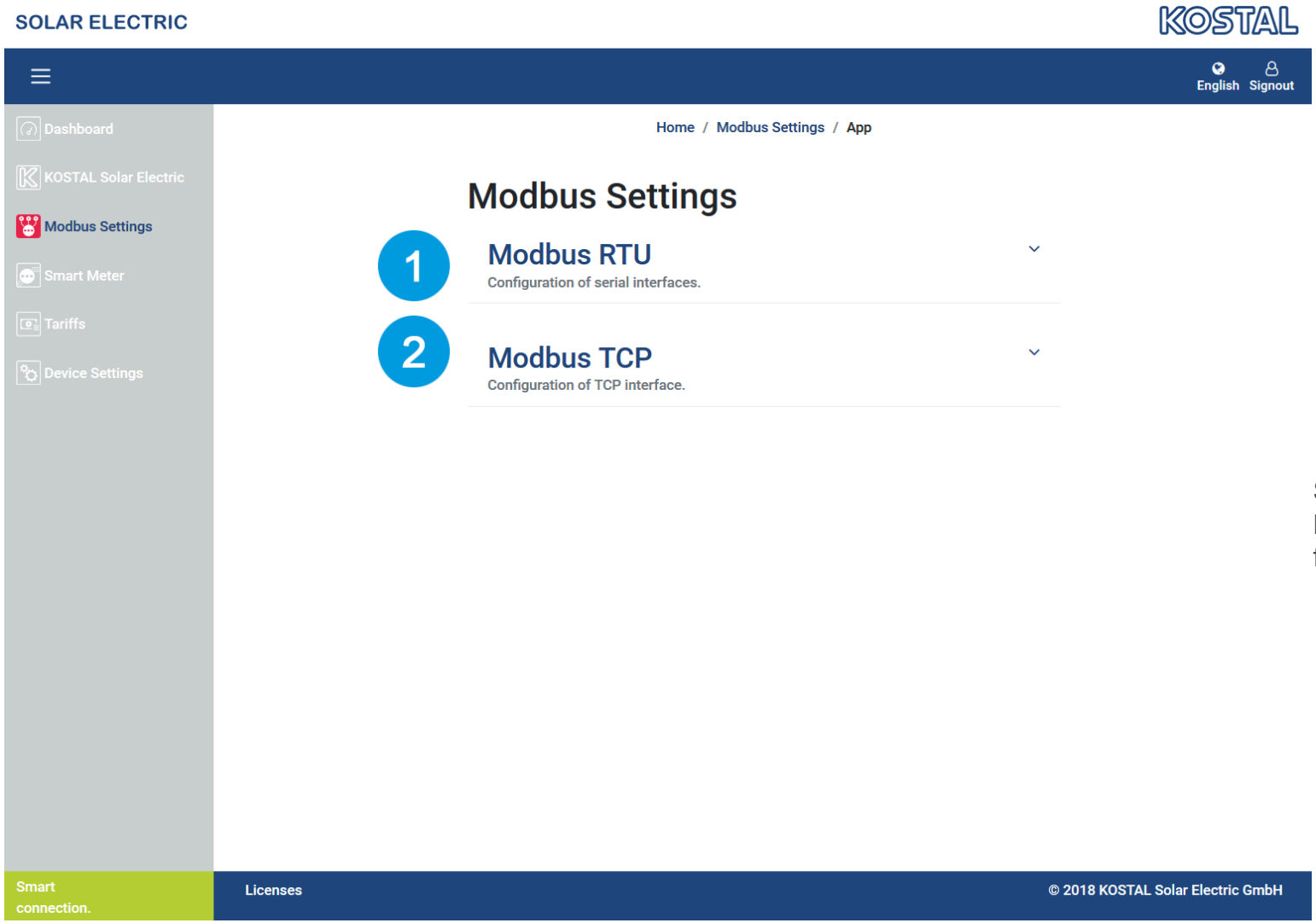
KOSTAL Smart Energy Meter: user interface - Modbus settings



1. Setup the Modbus RTU (RS485) interface
2. Setup the Modbus TCP interface

Select the devices which are connected to the RS485 Modbus RTU interfaces or activate the Modbus TCP functionality via Ethernet (LAN).

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KOSTAL Smart Energy Meter: user interface - Smart Meter

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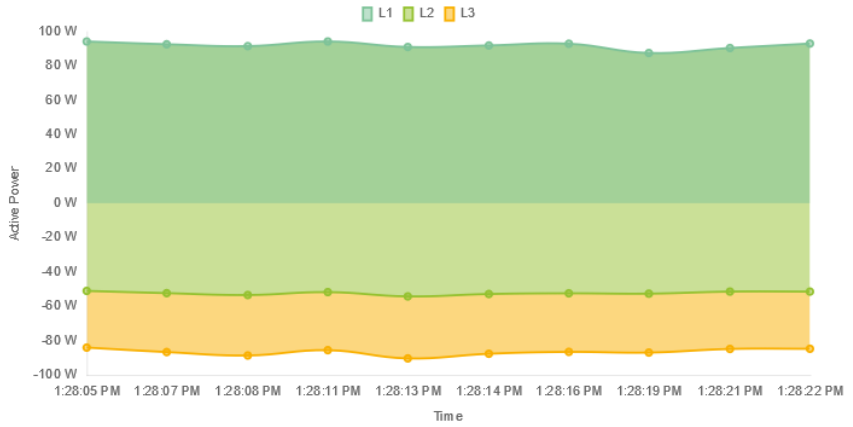
English Signout

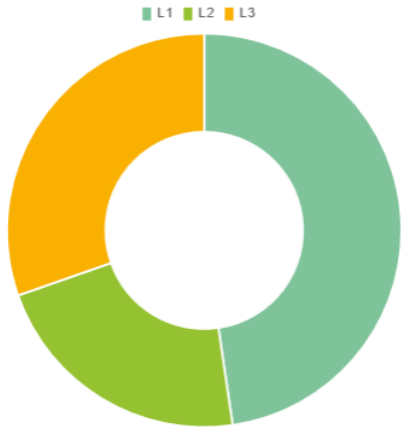
- Dashboard
- KOSTAL Solar Electric
- Modbus Settings
- Smart Meter
- Tariffs
- Device Settings

Home / Smart Meter / App

Active Power



Active Energy



consumption

L1:	1281.0 kWh
L2:	589.2 kWh
L3:	815.4 kWh
Total:	2685.6 kWh

Measured Values per Phase

enhanced	Phase L1	Phase L2	Phase L3	Total
Current	0.9 A	0.4 A	0.4 A	1.7 A
Voltage	238.1 V	234.8 V	236.3 V	
Power Factor	0.50	0.84	0.55	0.06
Active Power	**+92.9 W**	**-51.5 W**	**-33.3 W**	**+8.1 W**
Active Energy	**+1281.0 kWh**	**+589.2 kWh**	**+815.4 kWh**	**+2528.4 kWh**
	-54.8 kWh	**-145.4 kWh**	**-110.6 kWh**	**-153.6 kWh**

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KOSTAL Smart Energy Meter: user interface - Tariffs - Consumption

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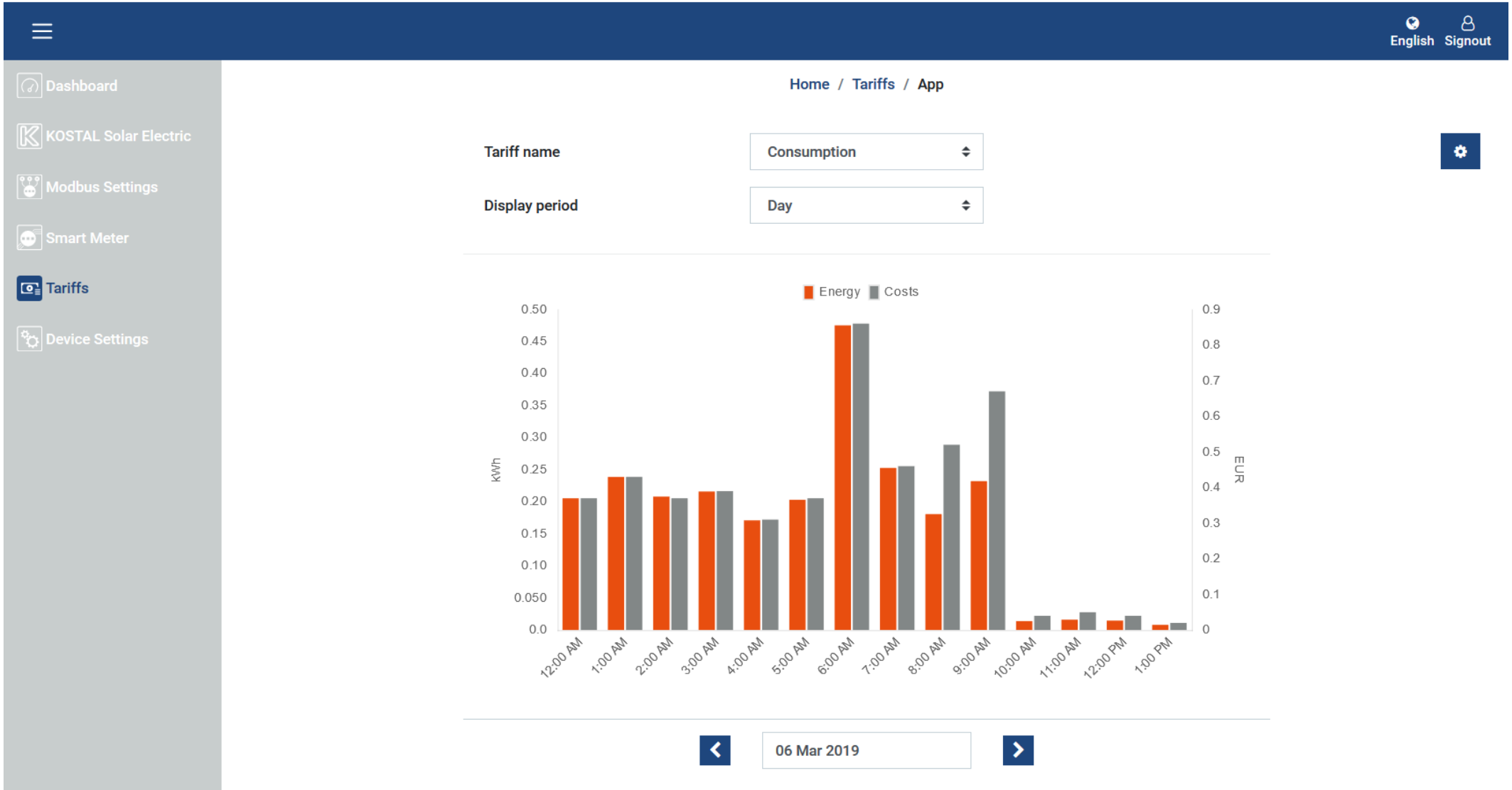

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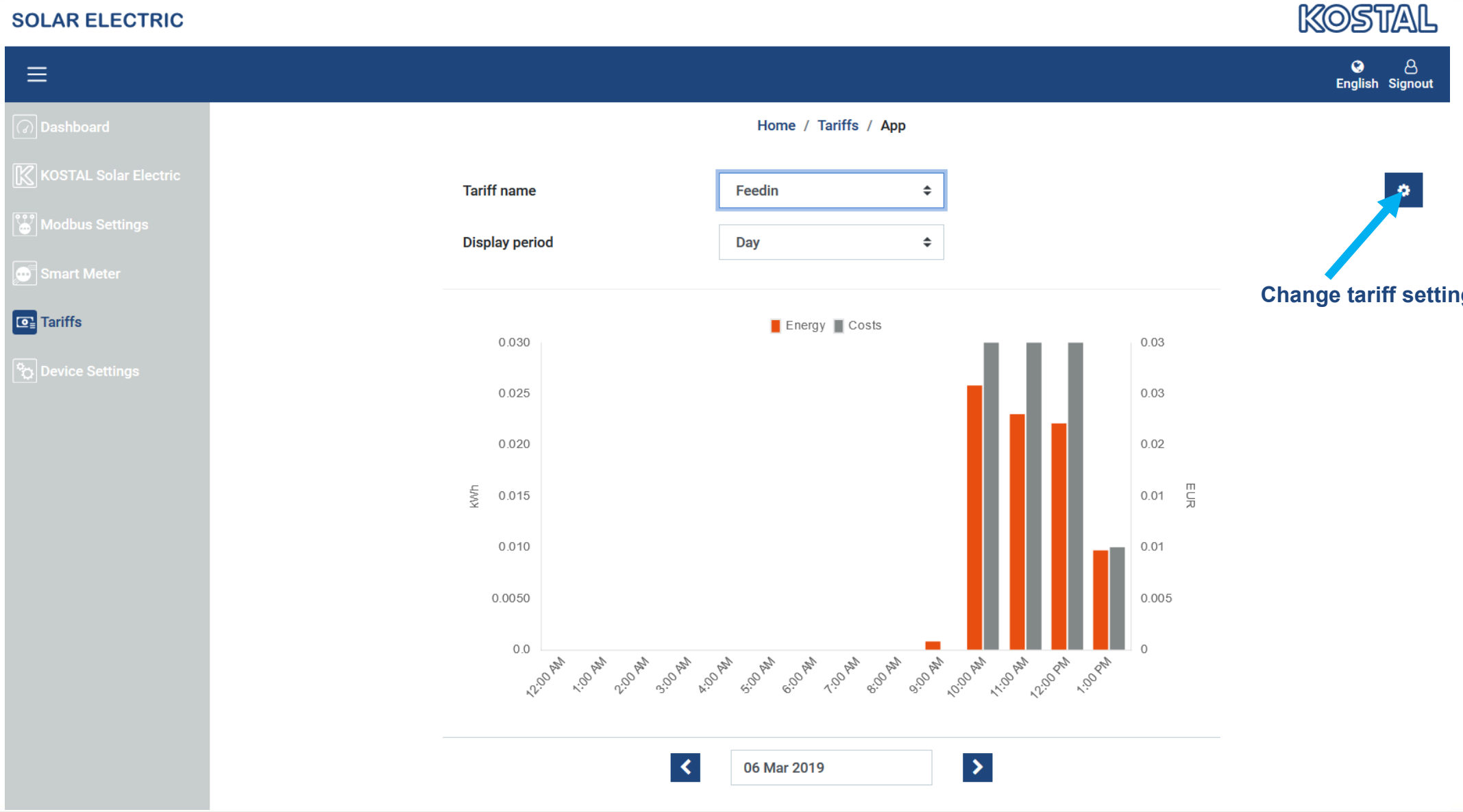
KOSTAL Smart Energy Meter: user interface - Tariffs - Feedin



Change tariff settings

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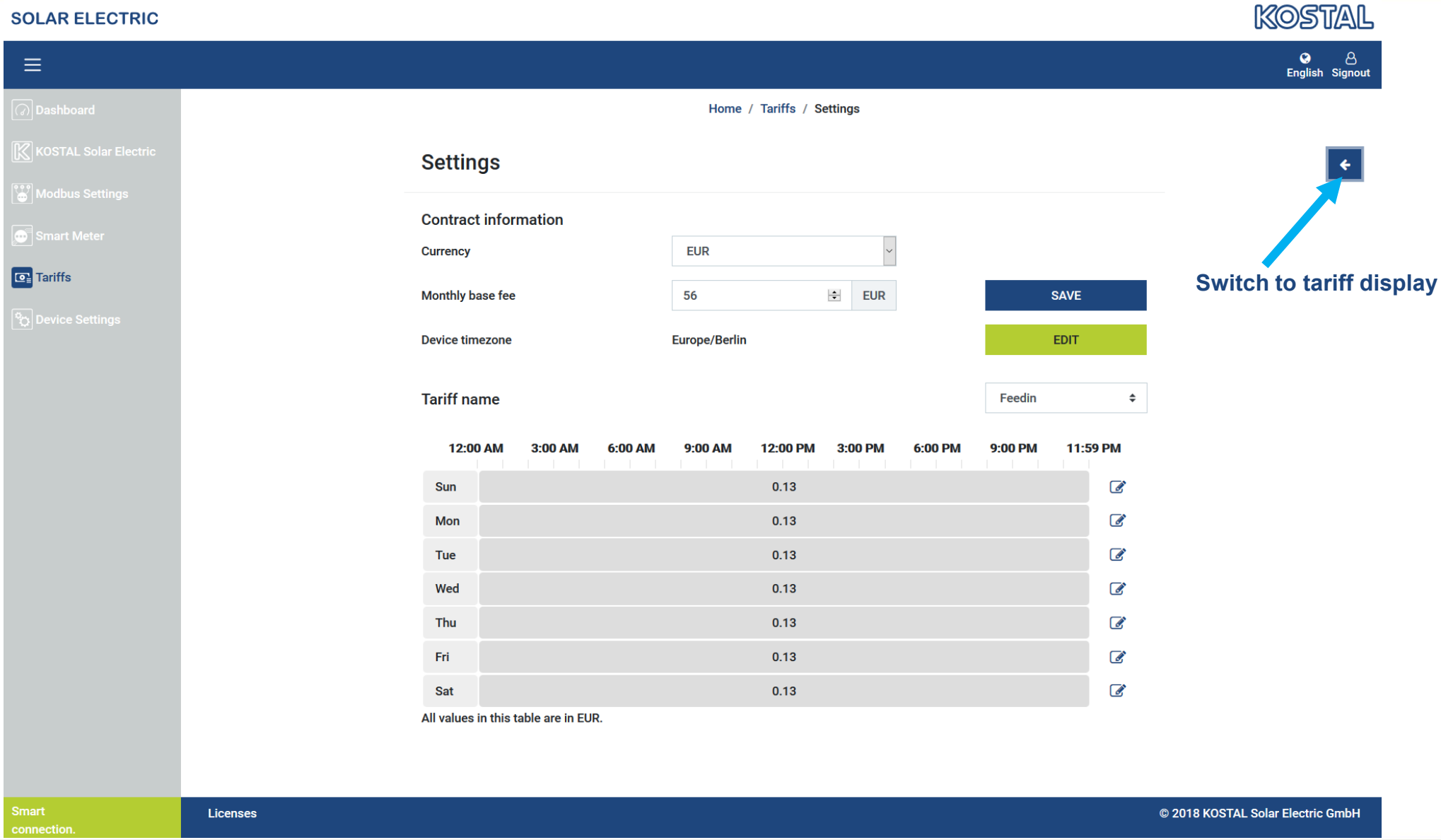
KOSTAL Smart Energy Meter: user interface - Tariff settings



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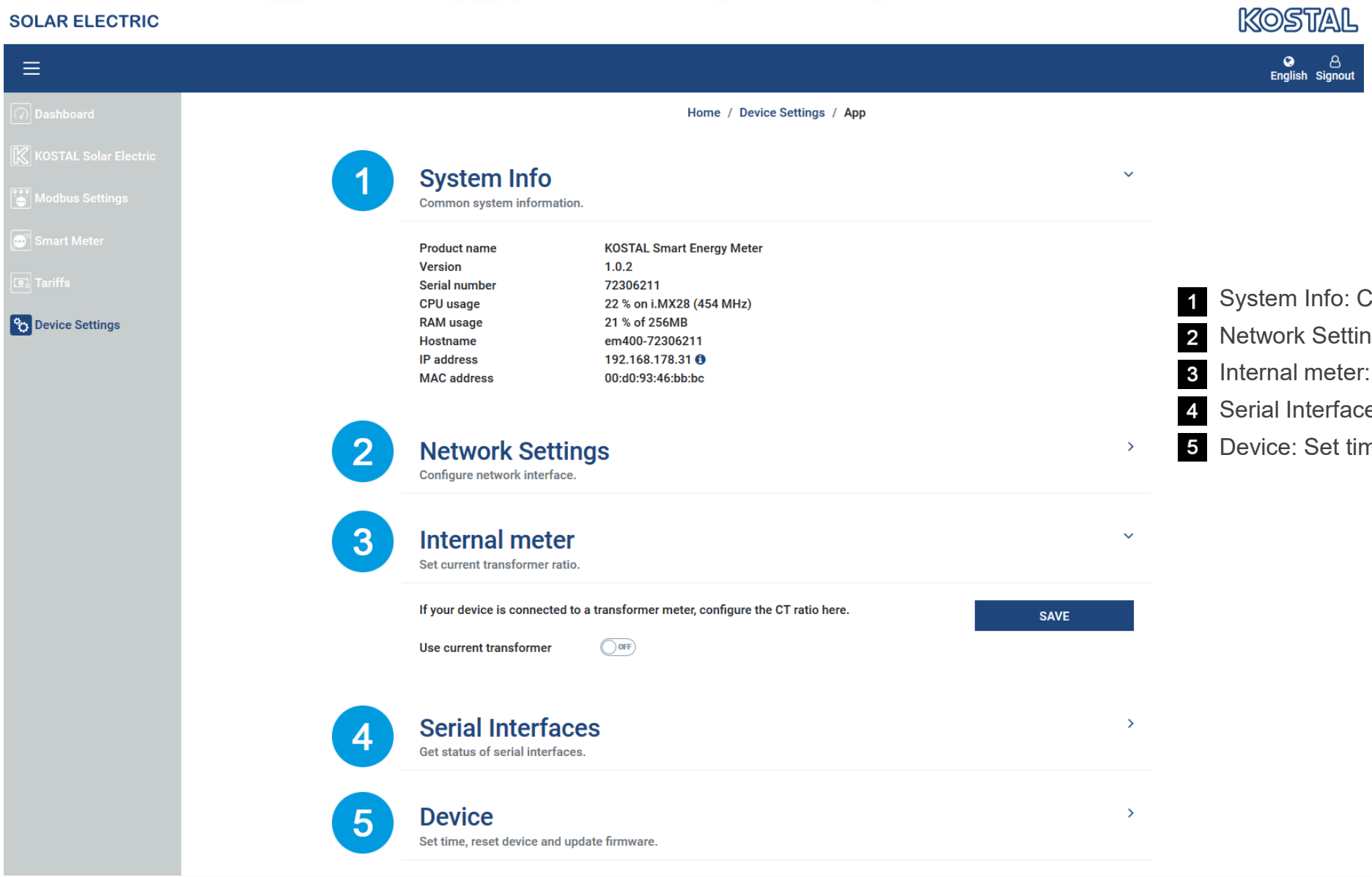
Menu Device Settings - KOSTAL Smart Energy Meter



1. System Info: Common Informationen
2. Network Settings: Configuration network
3. Internal meter: Set current transformer ratio
4. Serial Interfaces: Get status
5. Device: Set time, Reset Device, Update

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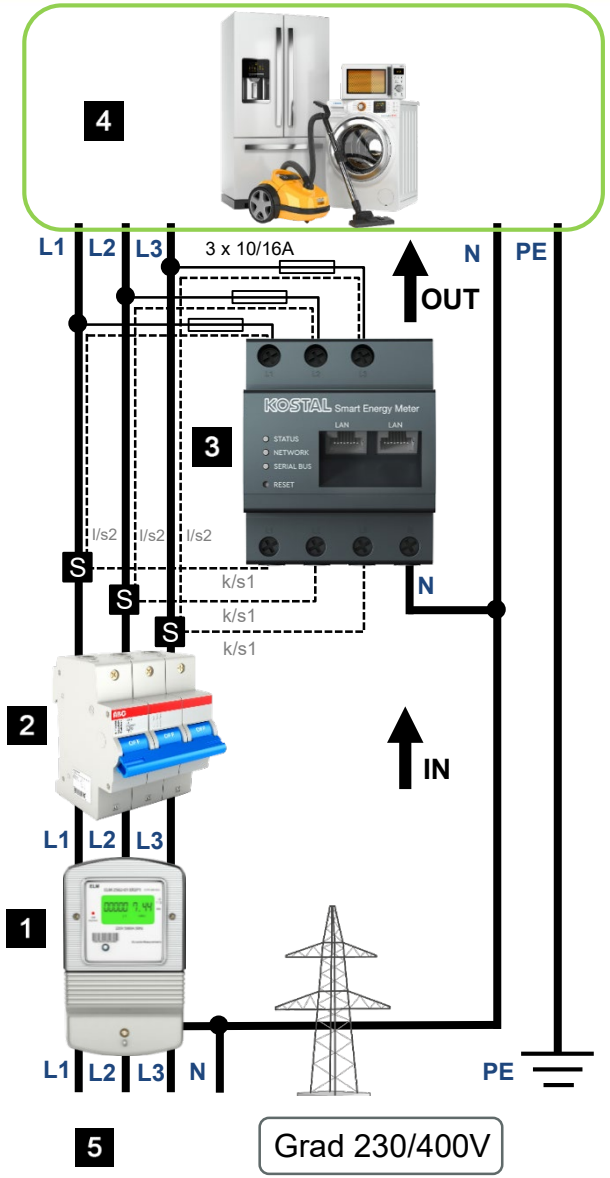
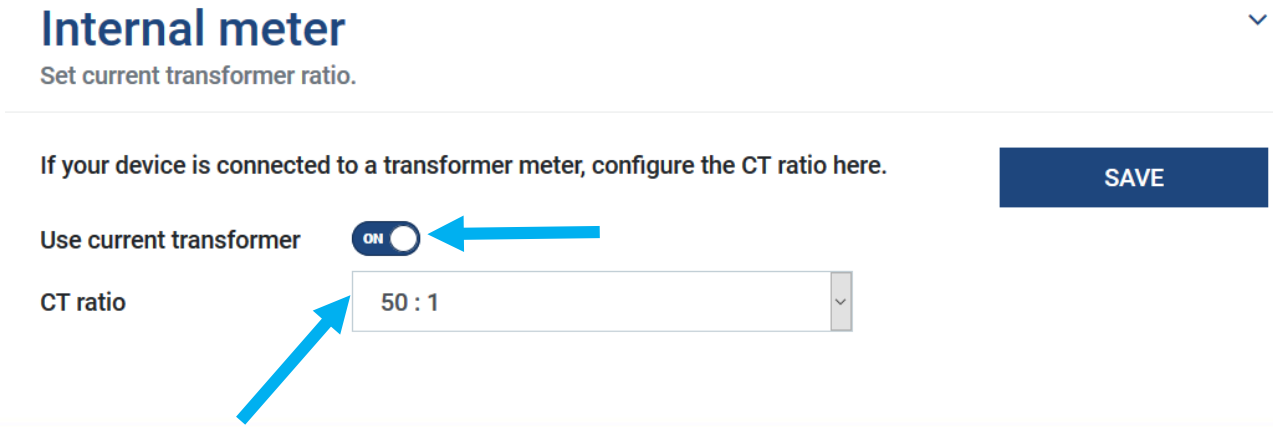
Set current transformer ratio of external transformers - KOSTAL Smart Energy Meter



1. Energy meter Grid
2. Miniature circuit breakers
3. KOSTAL Smart Energy Meter (KSEM)
4. Home consumers
5. Energy suppliers - Grid

If external transformers are used for current measurement, the use of current transformers must be activated on the web interface in the device settings and the transformer ratio must be selected in the dropdown menu.



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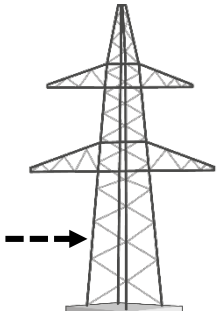
The PIKO IQ as string inverter

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

Residential house

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption



Energy supplier grid

AC

AC

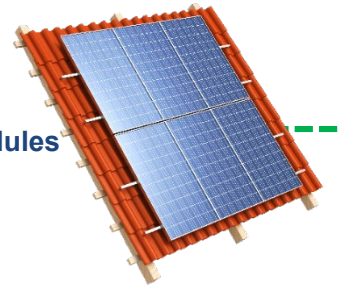
TCP – RJ45

TCP – RJ45

RS485

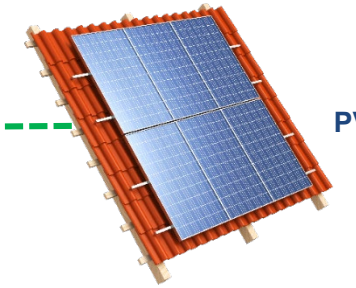
KOSTAL Solar Portal
and
KOSTAL Solar App

Router



PV modules

PIKO IQ



PV modules

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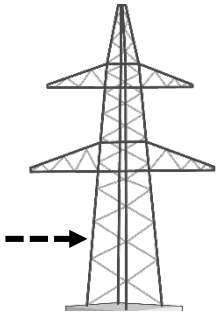
The PLENTICORE plus as string inverter

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

Residential house

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption



Energy supplier grid

AC

AC

TCP – RJ45

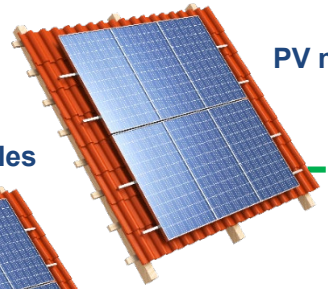
TCP – RJ45

RS485

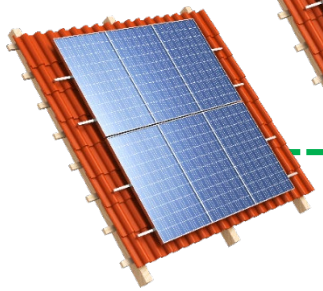
KOSTAL Solar Portal
and
KOSTAL Solar App

Router

PV modules

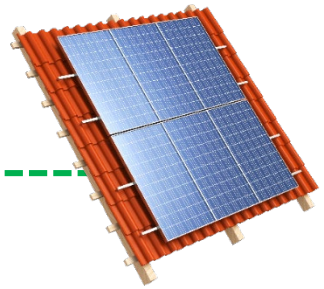


PV modules



PLENTICORE plus

PV modules



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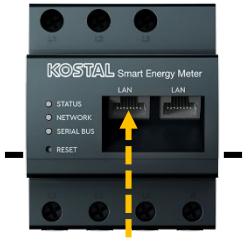
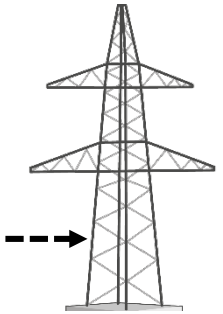
PLENTICORE plus inverter as hybrid with the BYD Battery-Box HV

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption

Residential house





Energy supplier grid

AC

AC

RS485

TCP – RJ45

TCP – RJ45

- Read out the battery values
- Max. possible charge current
- Complete energy management

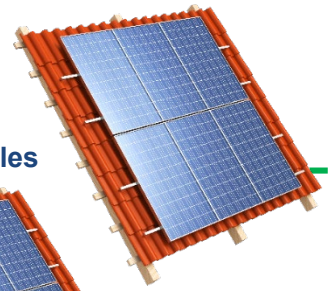
RS485

KOSTAL Solar Portal
and
KOSTAL Solar App

Router

PV modules

PV modules



PLENTICORE plus

DC

BYD Battery-Box HV

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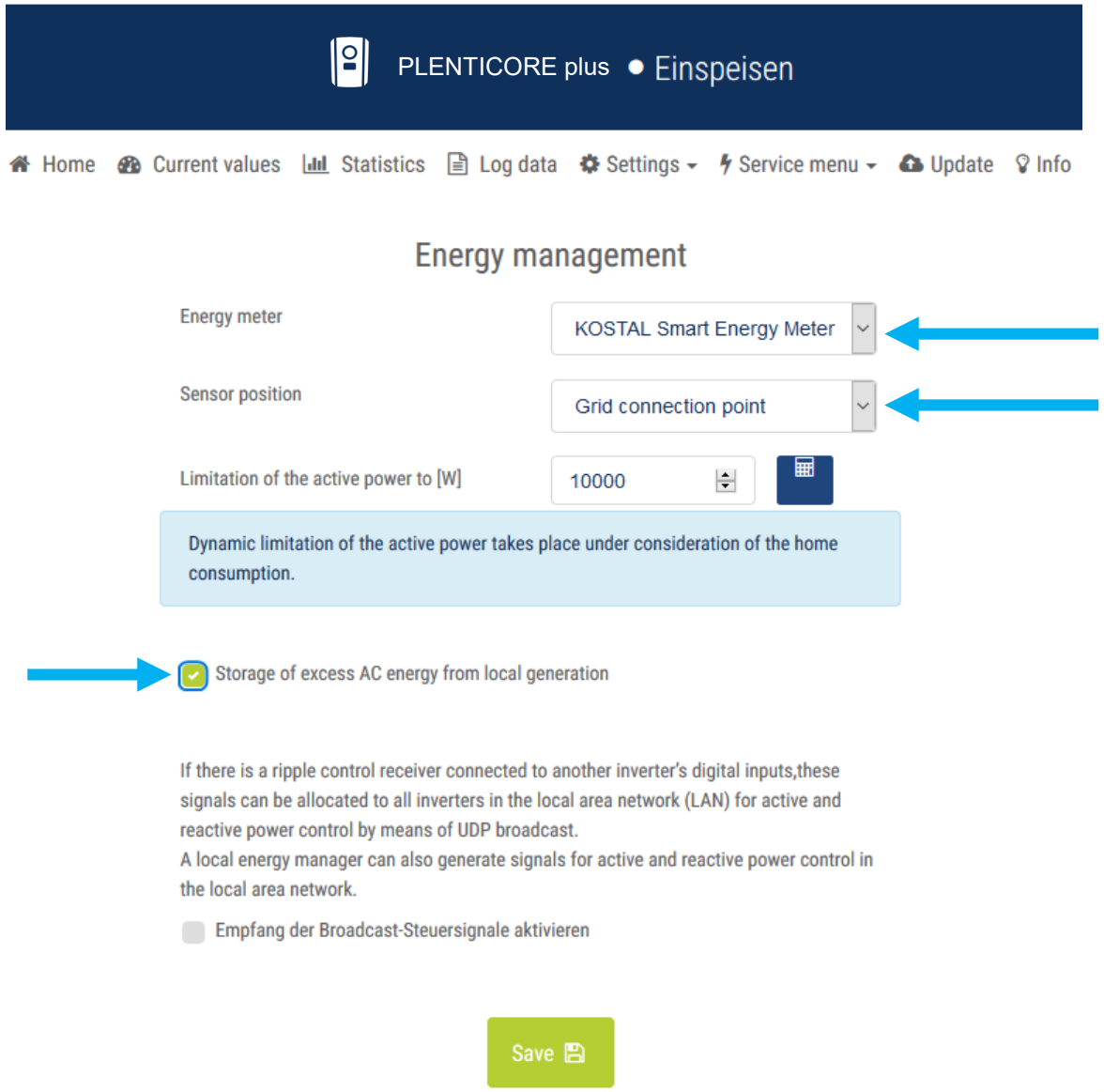
PLENTICORE plus and BYD Battery-Box HV – Activate AC-Energy function



Checkbox: „ Storage of extra AC energy from local generators“

To be able to activate this function, you must first have logged in as an installer with the master key and the service password.

This function works both with the B-control Energy Manager, the EM300 LR and the KOSTAL Smart Energy Meter (KSEM).

IMPORTANT: The sensor (Energy Manager/Meter) must be mounted in the " Grid connection point " position.

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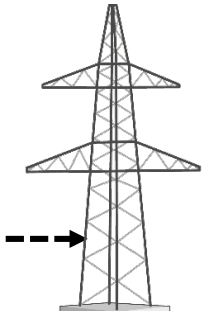
PLENTICORE plus and BYD Battery-Box HV (DC/AC-Charging)

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

RS485

Residential house

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption



Energy supplier grid

AC AC AC AC

TCP – RJ45
TCP – RJ45
TCP – RJ45
TCP – RJ45

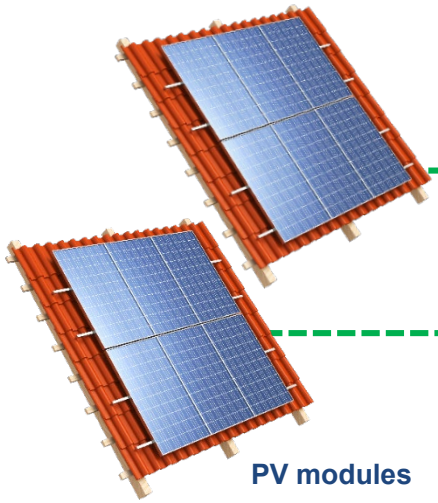
Router

KOSTAL Solar Portal
and
KOSTAL Solar App

AC AC

PIKO IQ and/or
PLENTICORE plus

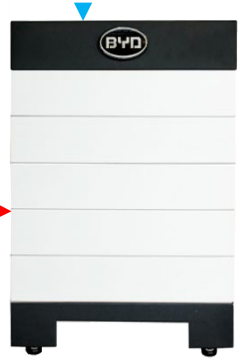
PIKO NG



PV modules

PLENTICORE plus

DC



BYD Battery-Box HV

- Read out the battery values
- Max. possible charge current
- Complete energy management

RS485

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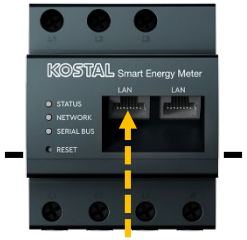
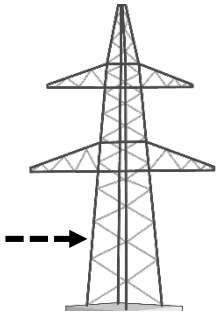
The PIKO MP plus as string inverter with 1 DC input

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

Residential house

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption





Energy supplier grid

AC

AC

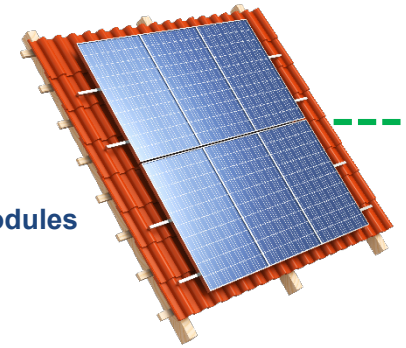
TCP – RJ45

TCP – RJ45

RS485

KOSTAL Solar Portal
and
KOSTAL Solar App

Router



PV modules

PIKO MP plus

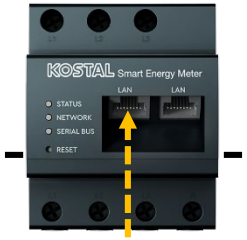
© 2019 KOSTAL Solar Electric GmbH

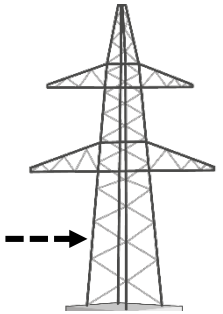
The PIKO MP plus as string inverter with 2 DC inputs

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

Residential house

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption





Energy supplier grid

AC

AC

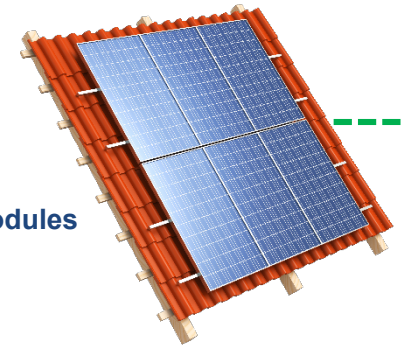
TCP – RJ45

TCP – RJ45

RS485

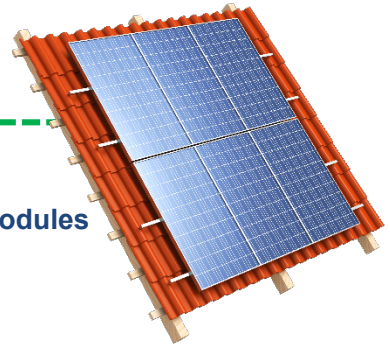
KOSTAL Solar Portal
and
KOSTAL Solar App

Router



PV modules

PIKO MP plus



PV modules

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PIKO MP plus with 1 DC-Input (AC-Charging) and BYD Battery-Box HV[1]

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

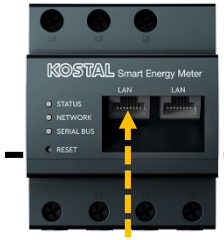
Residential house

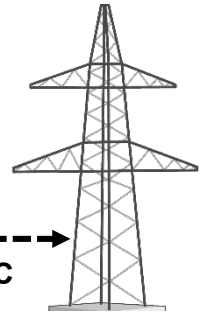
- Charging and discharging only controlled by the KSME

AC

AC

AC





Energy supplier grid

- Reading the battery values
- Max. possible charge current
- Complete energy management

TCP – RJ45

TCP – RJ45

RS485

RS485

Router

KOSTAL Solar Portal
and
KOSTAL Solar App

PIKO MP plus

- Energy flow
- Charging and discharging only controlled by the KSME

BYD Battery-Box HV

[1] will come at a later date

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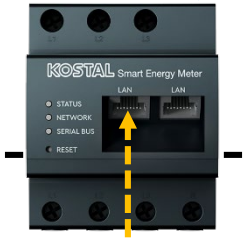
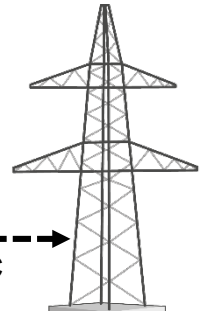
PIKO MP plus with 2 DC-Inputs (DC-Charging) and BYD Battery-Box HV[1]

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

Residential house

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption





Energy supplier grid

AC

AC

AC

TCP – RJ45

TCP – RJ45

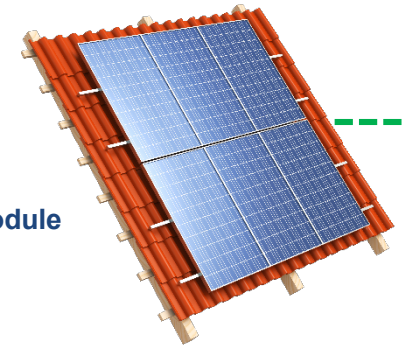
- Reading the battery values
- Max. possible charge current
- Complete energy management

RS485

RS485

KOSTAL Solar Portal
and
KOSTAL Solar App

Router



PV Module

PIKO MP plus

- Energy flow
- Charging and discharging only controlled by the KSME

BYD Battery-Box HV

[1] will come at a later date

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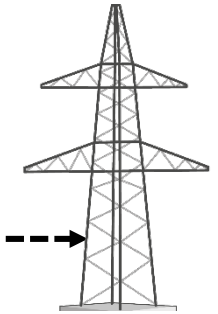
Multiple-inverter connection with PIKO IQ and/or PLENTICORE plus[1]

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.

- Read out the current PV output
- Dynamic active power reduction up to 0W
- Calculation of the current house consumption
- Send data to the KOSTAL solar portal



Energy supplier grid

AC

AC

Ext. Switch

AC

TCP – RJ45

TCP – RJ45

TCP – RJ45

TCP – RJ45

KOSTAL Solar Portal
and
KOSTAL Solar App

AC

AC

AC

PIKO IQ oder
PLENTICORE plus

PIKO IQ oder
PLENTICORE plus

PIKO IQ oder
PLENTICORE plus

[1] will come at a later date

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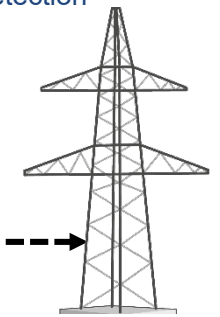
Multiple-inverter connection with PIKO Future[1]

- Control via broadcast to adjust the WR in % to max. output power up to 0W
- Reading the WR power to calculate the house consumption
- Sending consumption data to the PIKO Solar Portal

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.



Energy supplier grid

AC

AC

AC

TCP – RJ45

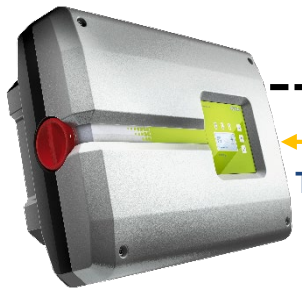
KOSTAL Solar Portal
and
KOSTAL Solar App

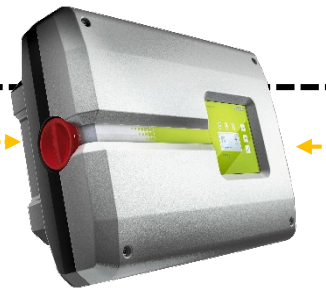
PIKO NG

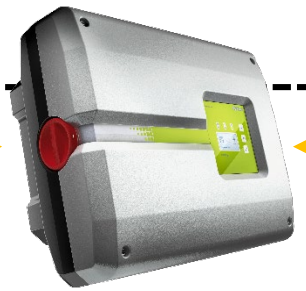
PIKO NG

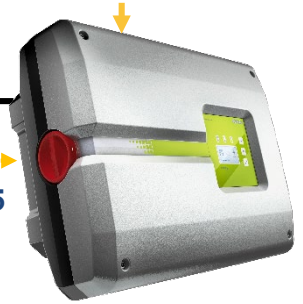
PIKO NG

PIKO NG









AC

AC

AC

TCP – RJ45

TCP – RJ45

TCP – RJ45

TCP – RJ45

[1] will come at a later date

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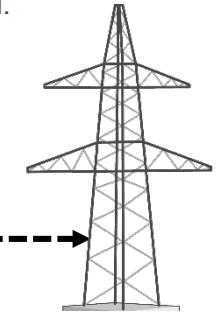
Multiple-inverter connection with PIKO Future / PIKO IQ / PLENTICORE plus[1]

Residential house

- Control via broadcast to adjust the WR in % to max. output power up to 0W
- Reading the WR power to calculate the house consumption
- Sending consumption data to the PIKO Solar Portal

KOSTAL Smart Energy Meter (KSEM)
Installation at the grid connection point. Detection of the current power values from the grid.



Energy supplier grid

AC

AC

AC

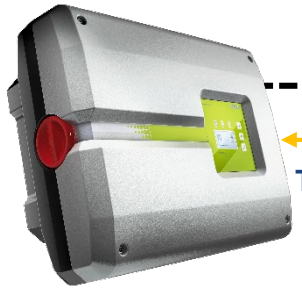
TCP – RJ45

TCP – RJ45

KOSTAL Solar Portal
and
KOSTAL Solar App

TCP – RJ45

PIKO NG



AC

PIKO NG

TCP – RJ45

AC

PIKO NG

AC

PIKO IQ and/or
PLENTICORE plus

[1] will come at a later date

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