

FEMS App Modbus/TCP Write Access

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1. Introduction

Dear customer,

Thank you for choosing the "FEMS App Modbus/TCP Write Access". You are welcome to send us your suggestions so that we can further improve the quality of our products.

2. Installing the app

When you ordered the "FEMS App Modbus/TCP Write Access", you received a 16-digit license key. You can use this license key to redeem the app independently in the EMS App Center.

You can find instructions on how to proceed at this link: here.

3. FEMS App Modbus/TCP Write Access

These instructions describe write access to a Heckert Solar electrical energy storage system using the Modbus/TCP API. The basics of the protocol are described first. The functionality of the interface is then explained.



This app is **not** included in the standard scope of delivery. However, it can be retrofitted at any time.

3.1. Prerequisites

The device accessing the electrical energy storage system (e. g. notebook/PC) must have direct access to the IP address of the EMS - i. e. be connected to the same physical network, for example.

3.2. Basics Modbus/TCP

The Modbus protocol is a communication protocol based on a client/server architecture. It was created in 1979 by Gould-Modicon for communication with its programmable logic controllers. Modbus has become a de facto standard in the industry as it is an open protocol. The Modbus TCP version has been part of the IEC 61158 standard since 2007.

Wikipedia: Modbus/TCP

Modbus can be used to connect a client (e. g. a PC/EMS) and several servers (e. g. measurement and control systems, battery storage, PV system, EV charging station). There are two versions: One for the serial interface (EIA-232 and EIA-485) and one for Ethernet. This manual describes the version for Ethernet. TCP/IP packets are used to transmit the data.

Read and write access is possible to the following object types:

Object type	Access	Size	Function code
Single input/output "Coil"	read & write	1-bit	01 / 05 / 15
Single input "Discrete Input"	read only	1-bit	02

(Analog) inputs "Input Register"	read only	16-bits	04
(Analog) inputs/outputs "Holding Register"	read & write	16-bits	03 / 06 / 16

The Modbus interface is configured as follows:

Device address	*IP address of the EMS* (e. g. 192.168.0.20)
Port	*502
Unit ID	*1
Function codes	03 (Read Holding Registers)
	04 (Read Input Registers)
	06 (Write Single Holding Register)
	16 (Write Multiple Holding Registers)

Table 1. Parameters for write access

The interface enables access to the channels of the *_sum* and *ess0* components by default.

3.3. Modbus table

Via the Online Monitoring you can conveniently download the individual Modbus table for your system as an Excel file as follows:

In the [fig3:modbus_detail view] you can start the download via the "DOWNLOAD PROTOCOL" button.

You can also find the most important data points here in the quick overview:

Address (address)	**Name** (Name)	**Type** (Type)	**Value/Description** (Value/Description)	**Unit** (Unit)	**Access** (Access)
200	Component-ID	string16	_sum		RO
222	State	enum16	0:Ok, 1:Info, 2:Warning, 3:Fault		RO
302	EssSoc	uint16	State of charge [0 - 100]	Percent [%]	RO
303	EssActivePower	float32	AC-side active power of the electrical energy storage including excess DC generation with hybrid inverter	Watt [W]	RO
309	EssReactivePower	float32	AC-side reactive power of the electrical energy storage	Volt Ampere Reactive [var]	RO
315	GridActivePower	float32	Active power at grid connection point	Watt [W]	RO
317	GridMinActivePower	float32	Minimum active power measured per grid connection point	Watt [W]	RO

319	GridMaxActivePower	float32	Maximum active power per measured active power at the grid connection point	Watt [W]	RO
327	ProductionActivePower	float32	Active power of the PV yield and, if applicable, yield from external inverters	Watt [W]	RO
329	ProductionMaxActivePower	float32	Maximum measured active power of the PV system	Watt [W]	RO
331	ProductionAcActivePower	float32	Active power of the external AC inverters	Watt [W]	RO
339	ProductionDcActualPower	float32	Power of the DC generation of the hybrid inverter	Watt [W]	RO
343	ConsumptionActivePower	float32	Active power of the electrical consumption	Watt [W]	RO
345	ConsumptionMaxActivePower	float32	Maximum active power of electrical consumption ever measured	Watt [W]	RO
351	EssActiveChargeEnergy	float64	Cumulative electrical energy of the AC-side battery charging incl. excess PV generation at the hybrid inverter	Watt hours [Wh]	RO
355	EssActiveDischargeEnergy	float64	Cumulative electrical energy from electrical energy storage to consumption via AC output of the inverter incl. PV generation	Watt hours [Wh]	RO
359	GridBuyActiveEnergy	float64	Cumulative electrical energy from grid consumption	Watt hours [Wh]	RO
363	GridSellActiveEnergy	float64	Cumulative electrical energy of the grid feed-in	Watt hours [Wh]	RO
367	ProductionActiveEnergy	float64	Cumulative electrical energy of PV generation + external inverter generation	Watt hours [Wh]	RO
371	ProductionAcActiveEnergy	float64	Cumulative electrical energy of the external inverters	Watt hours [Wh]	RO
375	ProductionDcActiveEnergy	float64	Cumulative electrical energy of the PV generation of the inverter	Watt hours [Wh]	RO
379	ConsumptionActiveEnergy	float64	Cumulative electrical consumption	Watt hours [Wh]	RO
383	EssDcChargeEnergy	float64	Cumulative DC electrical energy of battery charging	Watt hours [Wh]	RO
387	EssDcDischargeEnergy	float64	Cumulative DC electrical energy of storage discharge	Watt hours [Wh]	RO
415	EssDischargePower	float32	Actual AC-side active power of the electrical energy storage	Watt [W]	RO

417	GridMode	enum16	1:On-Grid, 2:Off-Grid		RO

Table 2. Modbus table component Sum

Address (Address)	**Name** (Name)	**Type** (Type)	**Value/Description** (Value/Description)	**Unit** (Unit)	**Access** (Access)
500	Component-ID	string16	ess0		RO
522	State	enum16	0:Ok, 1:Info, 2:Warning, 3:Fault		RO
602	SoC	uint16	State of Charge	Percent [%]	RO
603	GridMode	enum16	1:On-Grid, 2:Off-Grid		RO
604	ActivePower	float32	Charging or discharging power[1]	Watts [W]	RO
608	MinCellVoltage	float32	Minimum cell voltage	Millivolts [mV]	RO
610	MaxCellVoltage	float32	Maximum cell voltage	Millivolts [mV]	RO
612	MinCellTemperature	float32	Minimum cell temperature	Degrees Celsius [C]	RO
614	MaxCellTemperature	float32	Maximum cell temperature	Degrees Celsius [C]	RO
616	ess0/Capacity	float32	Installed, available storage capacity	Watt-hours [Wh]	RO
618	ess0/MaxApparentPower	float32	Apparent power of the system	Volt-amperes [VA]	RO
702	Minimum Power Set-Point	float32	Minimum power set-point — Lower limit for storage power at this time. If a lower value is written to 706, that value is applied.[1,2]	Watts [W]	RO
704	Maximum Power Set-Point	float32	Maximum power set-point — Upper limit for storage power at this time. If a higher value is written to 706, that value is applied.[1,2]	Watts [W]	RO
706	SetActivePowerEquals	float32	Inverter AC active power set-point[1]	Watts [W]	WO
708	SetReactivePowerEquals	float32	Reactive power setpoint	Volt-amperes reactive [var]	WO
710	SetActivePowerLessOrEquals	float32	Maximum discharge power set-point	Watts [W]	WO
712	SetReactivePowerLessOrEquals	float32	Default maximum reactive power	Volt-amperes reactive [var]	WO
714	SetActivePowerGreaterOrEquals	float32	Default maximum charging power	Watts [W]	WO
716	SetReactivePowerGreaterOrEquals	float32	Minimum reactive power setting	Volt-amperes reactive [var]	WO
718	AvailableChargeEnergy	float32	Available charging energy	Watt-hours [Wh]	RO
720	AvailableDischargeEnergy	float32	Available discharging energy	Watt-hours [Wh]	RO

Table 3. Modbus table component electrical energy storage system

[1] Negative values correspond to battery charging — Positive values correspond to battery discharging.
[2] Factors such as D-rating and mains voltage reduce the maximum possible power, but are not yet considered in this calculation.

All power values from Modbus table component electrical energy storage system apply to the AC side of the inverter.

The registers for reactive power specifications cannot currently be used for home systems.

3.4. Visualization and configuration

After installing the "FEMS App Modbus/TCP Write Access", you will see the following widget in your live monitoring:

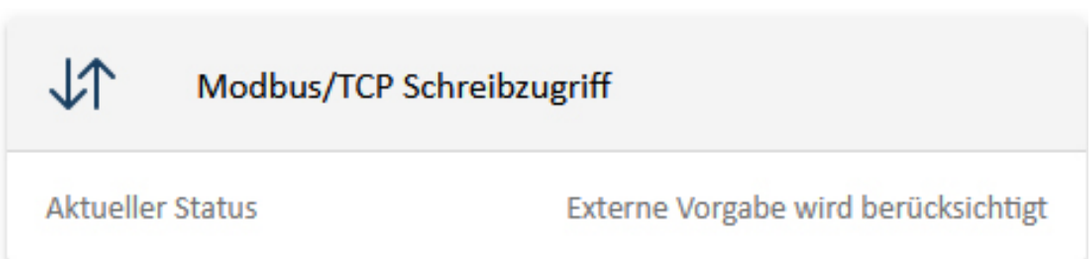


Image 1. Flat widget

The flat widget shows the current status of the external write specifications. As soon as a register is overwritten, the status changes from "No external specification available" to "External specification is taken into account".

Click on the widget to open the detailed view:

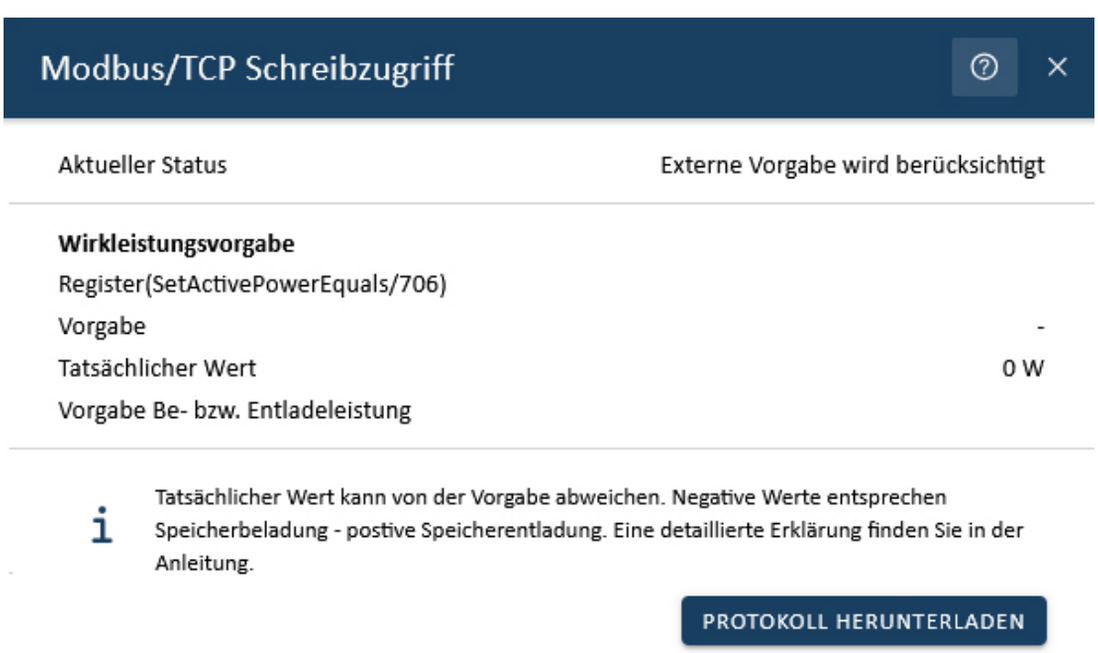


Image 2. Detail widget

In the detailed view, you will find an overview of the respective registers. This overview contains your set default value for the active power default register (SetActivePowerEquals/706) as well as the actual value that can be tech-

nically implemented. Only the default value is displayed for all other registers. As soon as other registers are overwritten, the detailed view is automatically updated.

3.5. Example 1: Write access to EssActivePower with QModMaster

In the following, the write access for setting the *EssActivePower* using the free tool *QModMaster* is shown as an example. This allows the function of the *Controller Fix Active Power Symmetric* to be simulated.

The value is stored as follows (see above):

Address	Name	Type	Value/Description	Unit	Access
706	ess0/SetActivePowerEquals	float32		Watt [W]	WO

Table 4. Register address for setting the *EssActivePower* of the electrical energy storage



In addition to checking the *Base Address* for **0**, it must be ensured that the *Big* setting is selected under *Endian*.

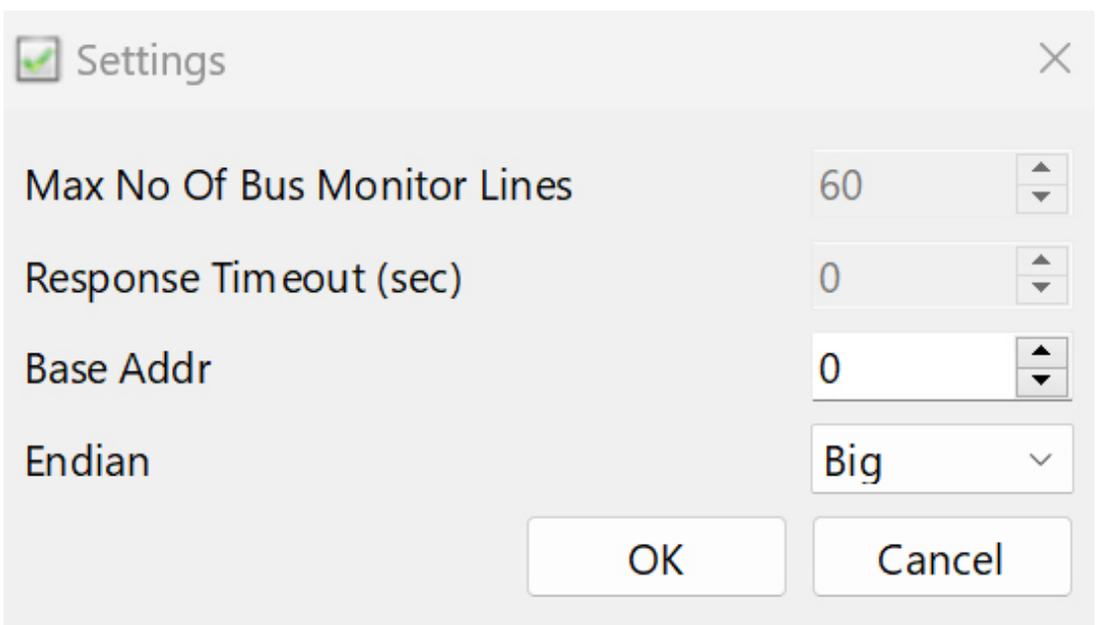


Image 3. Settings

As this is a *float32*, two 16-bit words, i. e. two registers, must be written. In this example, the electrical energy storage is to be unloaded with **4000** (4E+03) watts. The value can be entered directly as a decimal number in the register, whereby the data format *Float* must be selected. After setting the value, click on the "Read/Write" menu item to perform the write operation.

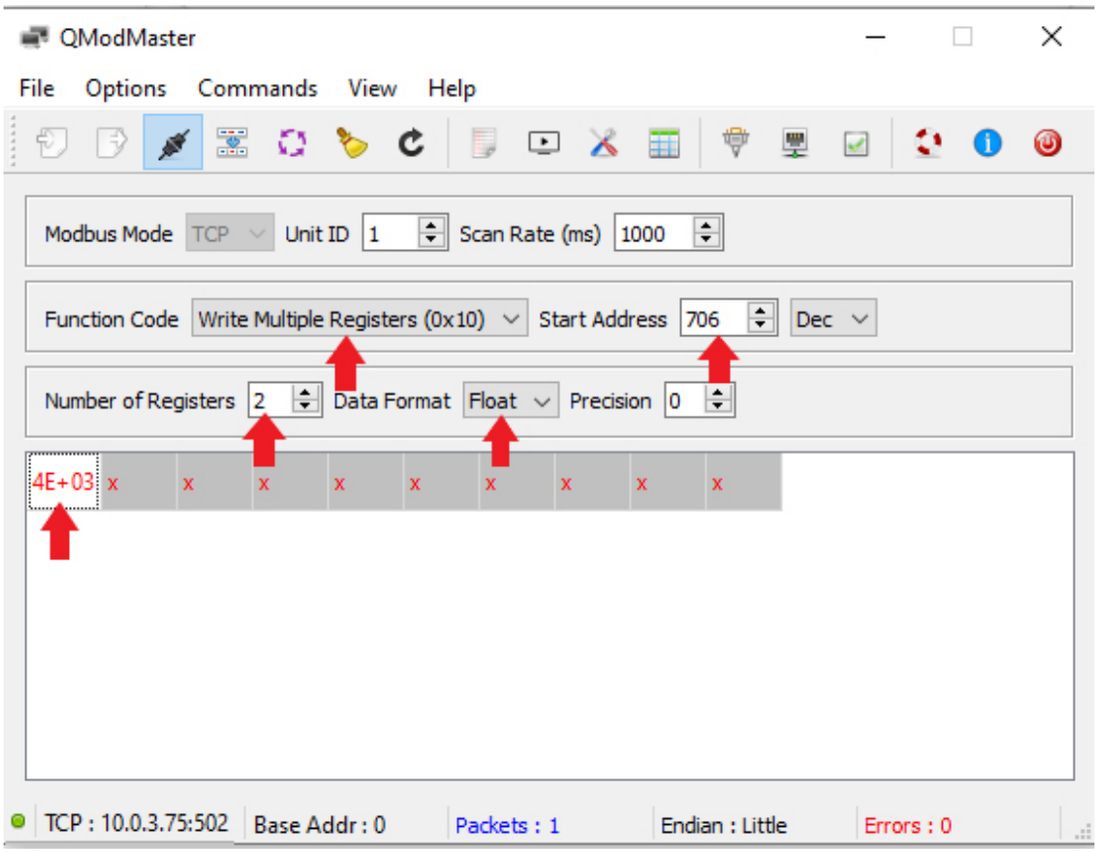


Image 4. Write value

The comparison with Online Monitoring confirms the correctness of the written value:

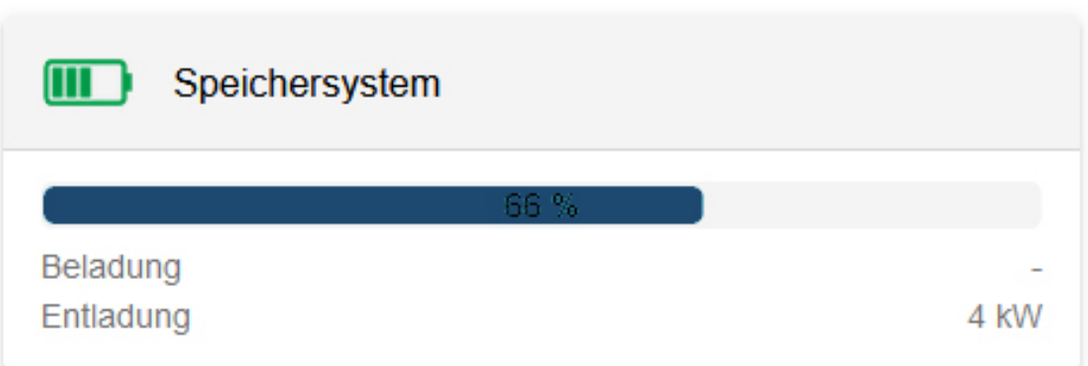


Image 5. Comparison with Online Monitoring



Image 6. Updated detailed view

Positive values correspond to battery discharge — Negative values correspond to battery charging

Other write operations are carried out in the same way.

3.6. Watchdog

The "FEMS App Modbus/TCP Write Access" has an integrated "watchdog" functionality. This ensures that a loading or unloading specification is terminated if the connection is lost (e. g. failure of the higher-level controller or the network). In the standard configuration, this "API timeout" is set to 60 seconds. A write specification is therefore implemented for 60 seconds. In order to implement continuous control, we recommend a new specification after half of the configured time, i. e. in this case after 30 seconds. If no new write specification is made within 60 seconds, charging or discharging is terminated.

The "API timeout" can be changed via the app configuration in the App Center. A value of "0 seconds" deactivates the watchdog function.

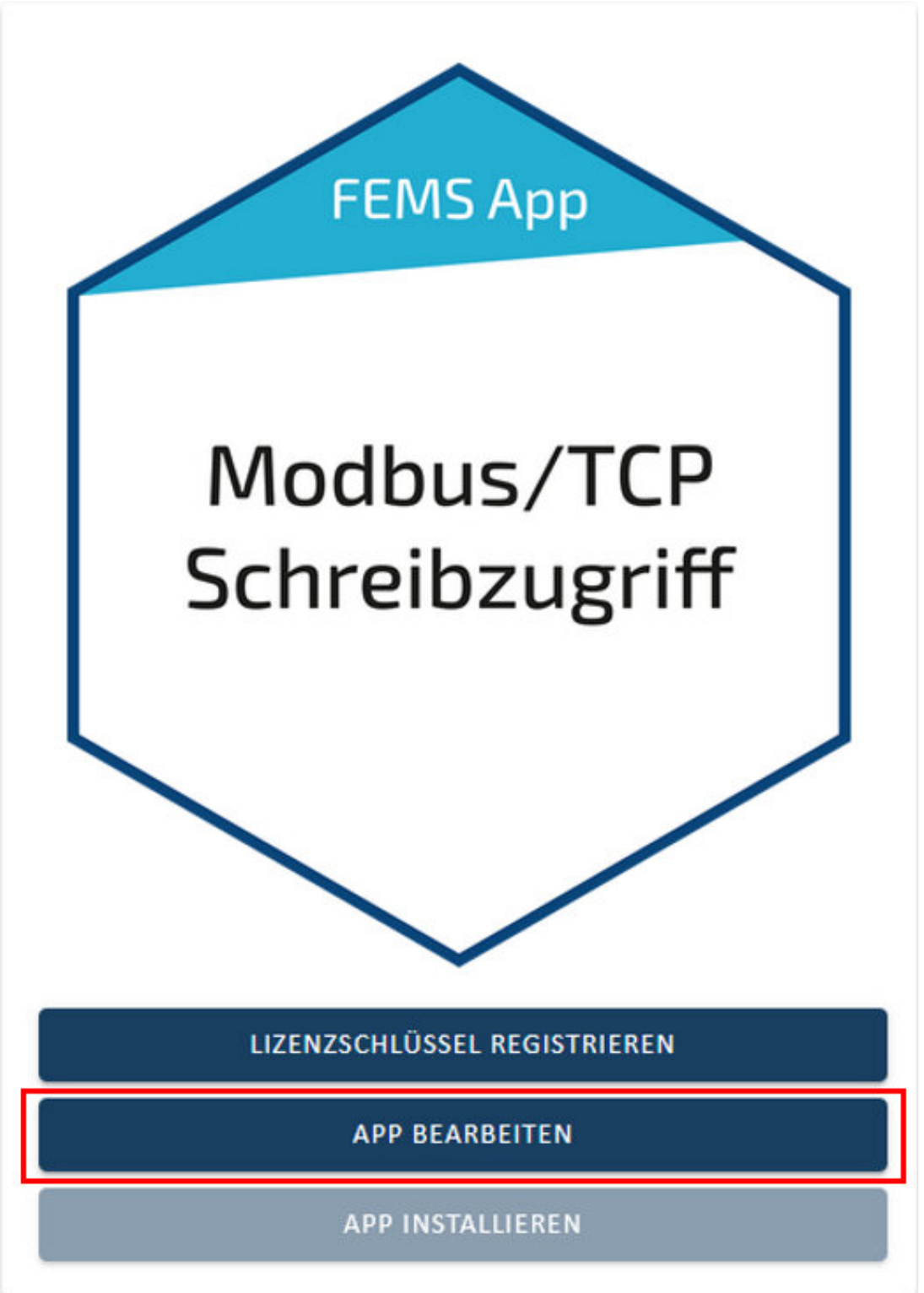


Image 7. App configuration



Image 8. Increase API timeout

3.7. Reading back the values written to EMS

If values are specified to the electrical energy storage system via write access (e.g. to 706_SetActivePowerEquals), this reflects back its actual converted values (e.g. to 604_ActivePower).

This section describes how to read back the values written to write registers 702 to 716 before they were converted by EMS.

Example

An electrical energy storage system with 92 kW output, write specification to 706 = 100 kW:

→ Result on 604_ActivePower = 92 kW (maximum power of the system).
→ Result on xxx_ActualSetActivePowerEquals = 100 kW.

The following table shows the reading registers for the corresponding writing registers:

Write-only register		**Read-only register**	
Address	Name	Address	Name
702	Minimum Power Set-Point	xxx	ctrlApiModbusTcp0/Ess0ActivePowerLimit
704	Maximum Power Set-Point	xxx	ctrlApiModbusTcp0/Ess0ReactivePowerLimit
706	ess0/SetActivePowerEquals	xxx	ctrlApiModbusTcp0/ActualSetActivePowerEquals
708	ess0/SetReactivePowerEquals	xxx	ctrlApiModbusTcp0/ActualSetReactivePow-erEquals
710	ess0/SetActivePowerLessOrEquals	xxx	ctrlApiModbusTcp0/ActualSetActivePower-LessOrEquals
712	ess0/SetReactivePowerLessOrEquals	xxx	ctrlApiModbusTcp0/ActualSetReactivePower-LessOrEquals
714	ess0/SetActivePowerGreaterOrEquals	xxx	ctrlApiModbusTcp0/ActualSetActivePower-GreaterOrEquals
716	ess0/SetReactivePowerGreaterOrEquals	xxx	ctrlApiModbusTcp0/ActualSetReactivePower-GreaterOrEquals

Table 5. Table — Read and write register



"xxx" is the system-dependent register number and must always be checked!

3.7.1. Installation

First install the FEMS App write access as usual via the App Center.

After successfully installing the FEMS App write access, configure the app (see edit FEMS App):

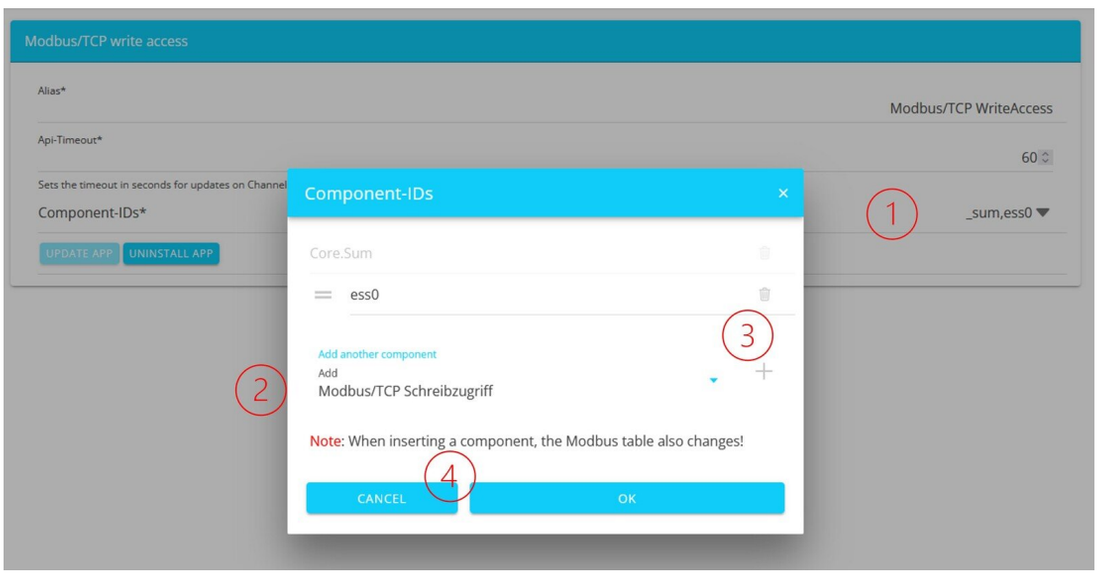


Image 9. Adding the write access component

Under "Component IDs (1)", select "Modbus/TCP Write Access" (2) and add with the plus (3). Then accept (4) and update the app.

Then download the Modbus register again. There you will find the registers marked with "xxx" above.

4. Contact us

For support, please contact:

Symphon-E Service

Service phone: +49 (0) 371 45 85 68 - 100

E-mail service: symphon-e@heckert-solar.com

5. Directories

5.1. List of illustrations

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