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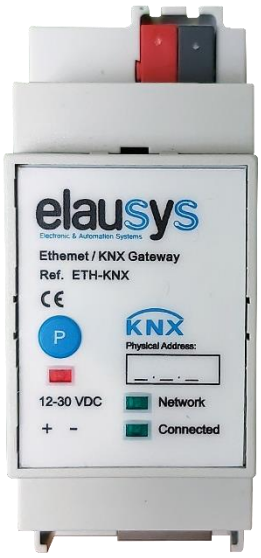
ELAUSYS
INV-KNX

KNX Gateway
for SolarEdge Inverters

User Manual



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1. INTRODUCTION

The KNX gateway for SolarEdge inverters provides a simple solution to transfer all relevant data from the inverters to KNX.

It allows integrators to take advantage of a fully integrated solar panel inverter, the data can be used to optimize energy consumption, monitoring, trending or to trigger specific action in the KNX installation.

Main features:

- KNX Interface for SolarEdge inverters serie
- Monitoring of Energy, Power, current, voltage, frequency, temperature, …
- Connected to the inverter over Ethernet
- Galvanic insulation from the KNX bus
- Configurable refresh rate of inverter data
- DIN rail mounted
- Auxiliary power supply 12-30VDC

2. OVERVIEW

2.1 USAGE & LIMITATION

This gateway is intended to be used with an SolarEdge inverter compatible with the SMA SunSpec modbus interface definition. The inverter is connected to the ethernet network on the same router as the KNX gateway.

All SolarEdge inverters with SetApp configuration are SunSpec-supported.
SolarEdge inverters with the LCD that have Firmware version 3.xxxx and above only are SunSpec-supported.

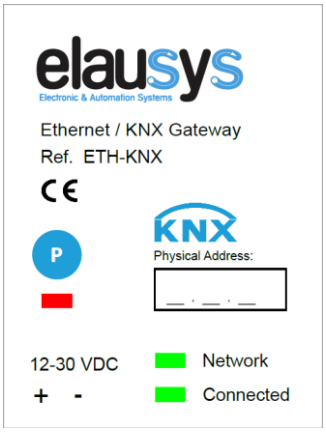
2.1 SOFTWARE

The KNX Interface is configured using the ETS tool, the free ETS Demo version can be downloaded from the website of KNX Association. The free version allows to configure up to 5 KNX modules in a project, the KNX gateway is only one module, all devices can be configured using this version.

2.2 CONNECTION DIAGRAM

The KNX bus is connected on the top side of the gateway.
An external power supply 12-30VDC is required and connected on the bottom side of the module, beside the RJ45 connector for the ethernet cable.

2.3 FRONT PANEL



The front panel is equipped with two green status LED:

Network: Physical connection to the ethernet network is established.
Connected: Communication with the inverter is established.

Button “P” : KNX Programming mode button
Red LED : KNX Programming status LED

3. PARAMETERS

The KNX interface parameters are defined in the “parameters” tab of the device, in the ETS project.

3.1 GENERAL SETTINGS

The following parameters are defined in the General section of the device parameters:

PARAMETER	VALUES	DESCRIPTION
AC Network	▪ **Single phase (default)** ▪ Tri-Phase	Type of AC network
Number of PV Circuits	▪ **1 … 4**	NOT APPLICABLE for this type of inverters
Inverter model	▪ **0…255**	2 = SolarEdge Inverters
Refresh rate (min)	▪ **0…255**	Cyclic rate of data polling from the inverter.
Battery 1	▪ **Not Used** / Used	Display group objects to monitor the status of battery 1 **(NOT USED for this inverter)**
Battery 2	▪ **Not Used** / Used	Display group objects to monitor the status of battery 2 **(NOT USED for this inverter)**

Powermeter	▪ **Not Used** / Used	Display group objects to monitor the powermeter value
Device Options	Text string	Device options are not available on this device.

4. COMMUNICATION OBJECTS

4.1 GENERAL

General communication objects of the device.

GO	NAME	DESCRIPTION
1	Module status	Sends 0 when the module is operating normally, sends an error code when applicable.

4.2 INVERTERS OBJECTS

GO	NAME	DESCRIPTION
3	AC Current	AC Total Current value
4	AC Current A	AC Current phase A
5	AC Current B	AC Current phase B
6	AC Current C	AC Current phase C
7	AC Voltage	AC Total Voltage
8	AC Voltage AB	AC Voltage phase AB
9	AC Voltage BC	AC Voltage phase BC
10	AC Voltage CA	AC Voltage phase CA
11	AC Voltage AN	AC Voltage phase AN
12	AC Voltage BN	AC Voltage phase BN
13	AC Voltage CN	AC Voltage phase CN
14	DC Current	DC Total Current value
15	DC Voltage	DC Total Voltage
16	PV1 Voltage	PV1 Voltage (**NOT USED**)
17	PV1 Current	PV1 Current (**NOT USED**)

18	PV2 Voltage	PV2 Voltage (**NOT USED**)
19	PV2 Current	PV2 Current (**NOT USED**)
20	PV3 Voltage	PV3 Voltage (**NOT USED**)
21	PV3 Current	PV3 Current (**NOT USED**)
22	PV4 Voltage	PV4 Voltage (**NOT USED**)
23	PV4 Current	PV4 Current (**NOT USED**)
24	AC Power	AC Power
25	DC Power	DC Power
26	AC Frequency	AC Frequency
27	AC VA	AC Apparent power
28	AC VAR	AC Reactive power
29	AC PF	Power factor
30	AC Energy	Total AC Energy
31	Efficiency	Inverter efficiency (**NOT USED**)
32	Insulation	Insulation resistance (**NOT USED**)
33	Temperature	Cabinet temperature
40	Daily Energy Yield	(**NOT USED**)
41	Battery 1 Running Status	(**NOT USED**)
42	Battery 1 power	(**NOT USED**)
43	Battery 1 SOC	(**NOT USED**)
44	Battery 1 current day charge	(**NOT USED**)
45	Battery 1 current day discharge	(**NOT USED**)
46	Battery 1 total charge	(**NOT USED**)
47	Battery 1 total discharge	(**NOT USED**)
48	Battery 2 Running Status	(**NOT USED**)
49	Battery 2 power	(**NOT USED**)
50	Battery 2 SOC	(**NOT USED**)
51	Battery 2 current day charge	(**NOT USED**)

52	Battery 2 current day discharge	(**NOT USED**)
53	Battery 2 total charge	(**NOT USED**)
54	Battery 2 total discharge	(**NOT USED**)
55	Powermeter	> 0: charging < 0: discharging

4.3 GROUP OBJECT LIST

GO	Name	Function	Size	Flags	Type ID	Type Name	Description
1	Module status	Status code	1 byte	C R - T -	20.011	DPT_ErrorClass_System	Device status
3	AC Current	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	AC Total Current value
4	AC Current A	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	AC Current phase A
5	AC Current B	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	AC Current phase B
6	AC Current C	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	AC Current phase C
7	AC Voltage	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	AC Total Voltage
8	AC Voltage AB	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	AC Voltage Phase AB value
9	AC Voltage BC	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	AC Voltage Phase BC value
10	AC Voltage CA	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	AC Voltage Phase CA value
11	AC Voltage AN	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	AC Voltage Phase AN value
12	AC Voltage BN	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	AC Voltage Phase BN value
13	AC Voltage CN	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	AC Voltage Phase CN value
14	DC Current	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	DC Total Current value
15	DC Voltage	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	DC Total Voltage
16	PV1 Voltage	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	PV1 Voltage
17	PV1 Current	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	PV1 Current
18	PV2 Voltage	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	PV2 Voltage
19	PV2 Current	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	PV2 Current
20	PV3 Voltage	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	PV3 Voltage

21	PV3 Current	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	PV3 Current
22	PV4 Voltage	Actual value	4 bytes	C R - T -	14.027	Electric potential (V)	PV4 Voltage
23	PV4 Current	Actual value	4 bytes	C R - T -	14.019	Electric current (A)	PV4 Current
24	AC Power	Actual value	4 bytes	C R - T -	14.056	Power (W)	AC Power
25	DC Power	Actual value	4 bytes	C R - T -	14.056	Power (W)	DC Power
26	AC Frequency	Actual value	4 bytes	C R - T -	14.033	Frequency (Hz)	AC Frequency
27	AC VA	Actual value	4 bytes	C R - T -	14.056	Power (W)	AC Apparent power
28	AC VAR	Actual value	4 bytes	C R - T -	14.056	Power (W)	AC Reactive power
29	AC PF	Actual value	4 bytes	C R - T -	14.057	Power factor (cos phi)	Power factor
30	AC Energy	Actual value	4 bytes	C R - T -	13.013	Active energy (kWh)	Total AC Energy
31	Efficiency	Actual value	2 bytes	C R - T -	8.010	Percentage (%)	Inverter efficiency
32	Insulation	Actual value	4 bytes	C R - T -	14.056	Resistance (Ohm)	Insulation resistance
33	Temperature	Actual value	2 bytes	C R - T -	9.001	Temperature (°C)	Cabinet temperature
40	Daily Energy Yield	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
41	Battery 1 Running Status	Actual value	2 bytes	C R - T -	-	-	Status code
42	Battery 1 power	Actual value	4 bytes	C R - T -	14.056	Power (W)	
43	Battery 1 SOC	Actual value	1 byte	C R - T -	5.001	Percentage (%)	State of charge (%)
44	Battery 1 current day charge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
45	Battery 1 current day discharge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
46	Battery 1 total charge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
47	Battery 1 total discharge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
48	Battery 2 Running Status	Actual value	2 bytes	C R - T -	-	-	Status code
49	Battery 2 power	Actual value	4 bytes	C R - T -	14.056	Power (W)	

50	Battery 2 SOC	Actual value	1 byte	C R - T -	5.001	Percentage (%)	State of charge (%)
51	Battery 2 current day charge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
52	Battery 2 current day discharge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
53	Battery 2 total charge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
54	Battery 2 total discharge	Actual value	4 bytes	C R - T -	13.013	Energy (kWh)	
55	Powermeter	Actual value	4 bytes	C R - T -	14.056	Power (W)	

5. CONFIGURATION

5.1 NETWORK CONFIGURATION

By default, the IP address of the KNX gateway is set to **192.168.1.51**
Using a laptop connected to the gateway, open a web browser and navigate to the IP address of the gateway.

Set a fixed IP address of your choice for the KNX gateway and configure the modbus TCP settings as below:

- Mode : Connect
- IP : IP Address of the inverter
- Server Port : 502
- Uni Id : 1

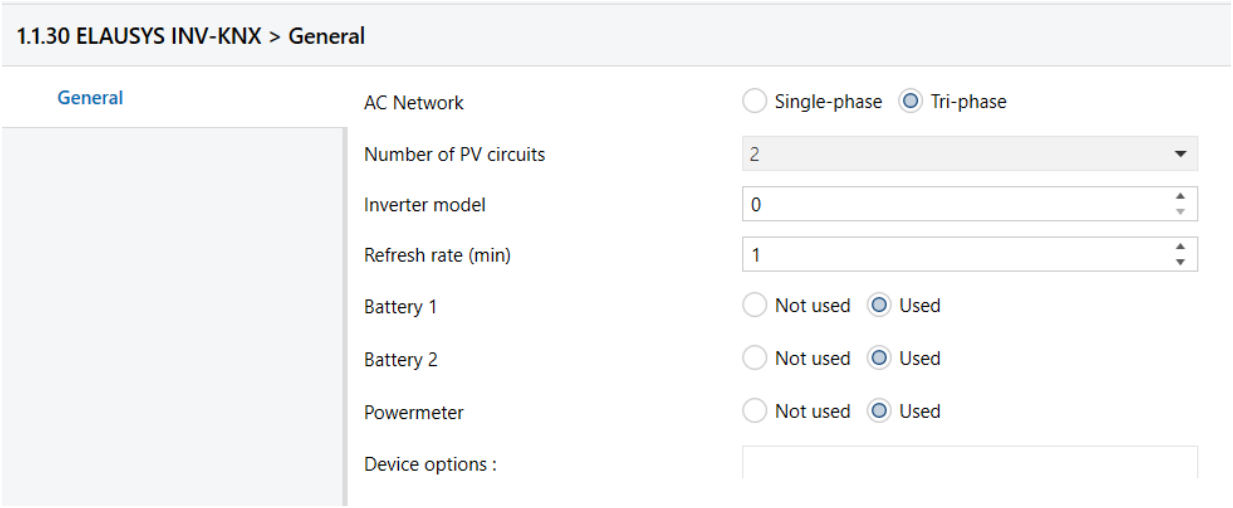
5.2 KNX PHYSICAL DEVICE

ELAUSYS devices are configured using the ETS tool. You should first download and install the free version of ETS tool before you continue.

The INV-KNX Interface must be assigned a physical address on the KNX network. Assign a free address to the module, in our example we choose 1.1.2.

5.3 ETS PARAMETERS

Once a KNX physical address is set, open the parameter tab to configure the interface.



Select the type of AC network (single phase or tri-phase).

Set the inverter model to 2 for SolarEdge inverters.

Choose the refresh rate (min) for the complete set of data.

Select if a powermeter is available on the inverter.

Device options should remain empty.

5.4 ETS GROUP OBJECTS

A group address (GA) must be assigned to each group object (GO) needed by the application.
Open the Group Objects tab of the device and assign a GA to the objects as needed.

Number	Name	Object Function	Description	Group Addres	Length	C	R	W	T	U	Data Type	Priority
1	Module status	Status code	Status	0/0/1	1 byte	C	R	-	T	-	system err...	Low
2	Firmware version	Text string	FW	0/0/2	14 bytes	C	R	-	T	-	Character...	Low
3	AC Total Current	Actual value	Value	1/0/0	4 bytes	C	R	-	T	-	electric cur...	Low
7	AC Total voltage	Actual value	Value	1/0/1	4 bytes	C	R	-	T	-	electric po...	Low
14	DC Total Current	Actual value	Value	1/0/2	4 bytes	C	R	-	T	-	electric cur...	Low
15	DC Total voltage	Actual value	Value	1/0/3	4 bytes	C	R	-	T	-	electric po...	Low
16	PV1 Voltage	Actual value	Value	1/0/4	4 bytes	C	R	-	T	-	electric po...	Low
17	PV1 Current	Actual value	Value	1/0/5	4 bytes	C	R	-	T	-	electric cur...	Low
24	AC Power	Actual value	Value	1/0/6	4 bytes	C	R	-	T	-	power (W)	Low
25	DC Power	Actual value	Value	1/0/7	4 bytes	C	R	-	T	-	power (W)	Low
26	AC Frequency	Actual value	Value	1/0/8	4 bytes	C	R	-	T	-	frequency...	Low
27	AC Apparent power	Actual value	Value	1/0/9	4 bytes	C	R	-	T	-	power (W)	Low
28	AC Reactive power	Actual value	Value	1/0/10	4 bytes	C	R	-	T	-	power (W)	Low
29	AC power factor	Actual value	Value	1/0/11	4 bytes	C	R	-	T	-	power fact...	Low
30	AC Energy	Actual value	Value	1/0/12	4 bytes	C	R	-	T	-	active ener...	Low
31	Inverter efficiency	Actual value	Value	1/0/13	2 bytes	C	R	-	T	-	percentag...	Low
32	Inverter resistance	Actual value	Value	1/0/14	4 bytes	C	R	-	T	-		Low
33	Cabinet Temperature	Actual value	Value	1/0/15	2 bytes	C	R	-	T	-	temperatu...	Low
34	Manufacturer specific status code	Status code	Value	1/0/16	2 bytes	C	R	-	T	-		Low
35	Manufacturer specific status code	Status code	Value	1/0/17	2 bytes	C	R	-	T	-		Low
36	Manufacturer specific status code	Status code	Value	1/0/18	2 bytes	C	R	-	T	-		Low
37	Manufacturer specific status code	Status code	Value	1/0/19	2 bytes	C	R	-	T	-		Low
38	Manufacturer specific status code	Status code	Value	1/0/20	2 bytes	C	R	-	T	-		Low
39	Manufacturer specific status code	Status code	Value	1/0/21	2 bytes	C	R	-	T	-		Low

When GO and parameters are all configured, download the KNX Interface application to the device. The first download requires to press the programming button on the device to set the device in KNX programming mode then perform a full download.

5.5 INVERTER CONFIGURATION

MODBUS over TCP Support
MODBUS TCP function– is disabled by default. When enabled, it supports TCP port 502 by default. Port number can be reconfigured.

SolarEdge Device Configuration – Using the Inverter/Commercial Gateway Display (LCD)

To setup MODBUS TCP:

- Select Communication -> LAN Conf -> Modbus TCP (the default port is 502).
- To modify the TCP port, select Modbus TCP -> TCP Port, set the port number and long-press Enter.

SolarEdge Device Configuration – Using SetApp

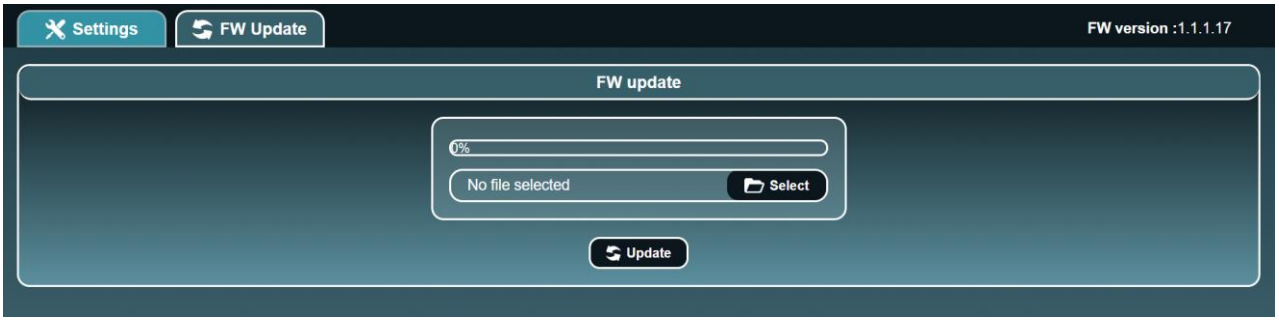
To setup MODBUS TCP:

- 1 Select Communication -> Modbus TCP -> Enable. A new Port menu is added to the screen (the default port is 1502)
- 2 To modify the TCP port, select Port, set the port number and tap Done.

The default device ID of the inverter connected to the Ethernet is 1.
The TCP server idle time is 2 minutes. In order to leave the connection open, the request should be made within 2 minutes. The connection can remain open without any MODBUS requests.

6. FIRMWARE VERSION

This user manual and related ETS application is valid for firmware versions V1.1.4.0 and above.
The firmware version can be read from the gateway webpage using a web browser.
It is displayed on the top right of the page.



In case an updated firmware would be available, the device can be updated from the FW Update page, the binary file should be selected before pressing the Update button.

7. DATASHEET

TECHNICAL DATA	VALUE
Auxiliary power supply teminal	Screw terminal 12-30VDC / GND
Power consumption KNX bus typ.	< 16 mA @ 29VDC
Operating temperature	+5°C to + 45°C
Enclosure Dimensions (Space Units)	2 SU
Mounting	DIN RAIL
KNX terminal	Pluggable micro terminal, Red/Black, 4 pole PUSH WIRE for solid conductor wire 0.6-0.8 mm²
KNX bus voltage	29 VDC