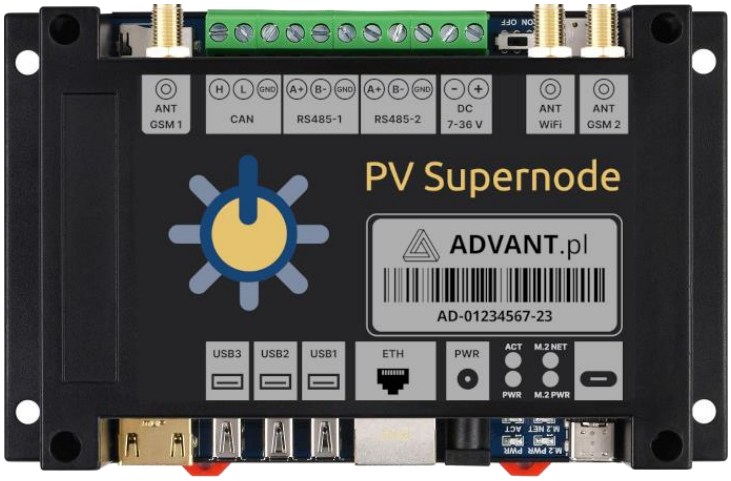
PV Supernode

Technical documentation

version 2.6



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The information contained in this documentation contains general and technical descriptions of the performance of the products covered by the documentation. Advant sp. z o.o. is not responsible for the misuse of the information contained in this document.

Observe all applicable national, regional and local safety regulations when installing and using this product. For safety reasons, repairs to the devices may only be carried out by the manufacturer.

If the devices are used in applications with technical safety requirements, the relevant instructions must be followed.

Failure to follow this information may result in personal injury or equipment damage.

1 Safety information

Before installing, operating, servicing and maintaining the PV Supernode devices, please read this documentation carefully and familiarize yourself with the construction of the device. Advant sp. z o.o. assumes no responsibility for improper use of the PV Supernode device.

2 Safety precautions

Installation, wiring, testing, and service must be performed in accordance with all local and national electrical codes. Please read the precautions listed below carefully and follow them.

To prevent the risk of electric shock, explosion, or arc flash:

- Use appropriate personal protective equipment and follow safe electrical work practices.
- Installation work must be carried out in accordance with the installation manual.
- Installation work should be carried out with the power supply disconnected or in the PPN technique with the use of appropriate instructions.
- Disconnect all electrical power sources before inspecting, testing, or maintaining the device. All circuits should be assumed to be energized until they have been completely de-energized, tested and tagged. Particular attention should be paid to the construction of the power system. All sources of electrical power should be considered, especially the possibility of reverse current.
- Do not exceed the maximum limits specified in the device ratings.

Failure to follow these instructions may result in death or serious injury.

3 Device description

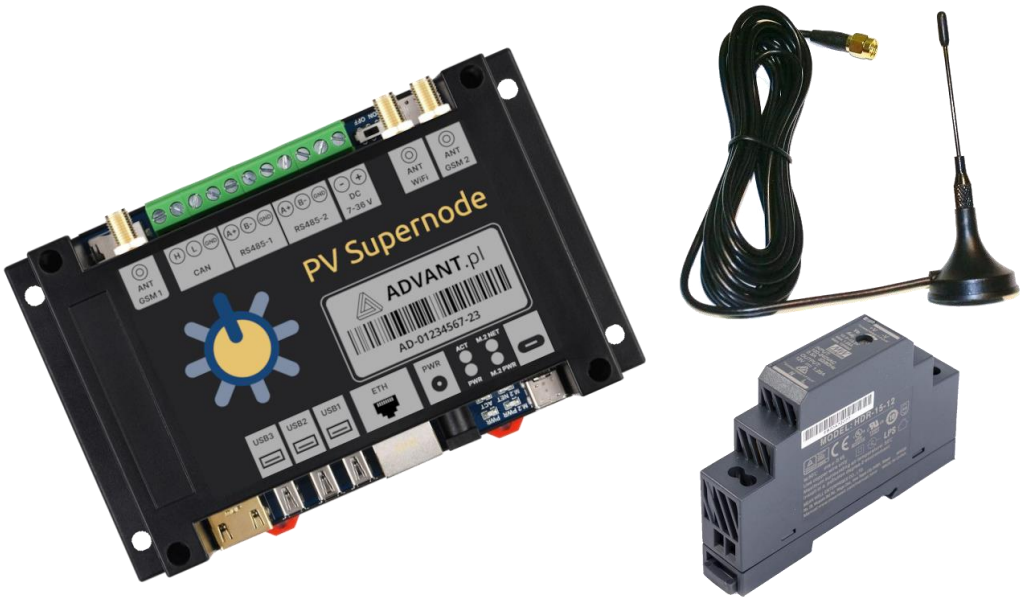
The PV Supernode controller is part of the equipment of photovoltaic installations. It performs the following functions:

- Active limitation of export of active energy to the grid - 'zero export' function or other preset threshold of the value of energy consumed or returned to the power grid
- Reactive power compensation using inverters, according to their technical capabilities
- Sitelogger - implementation of operations related to monitoring the operation of inverters and controlling their operation, in terms of active and reactive power generated

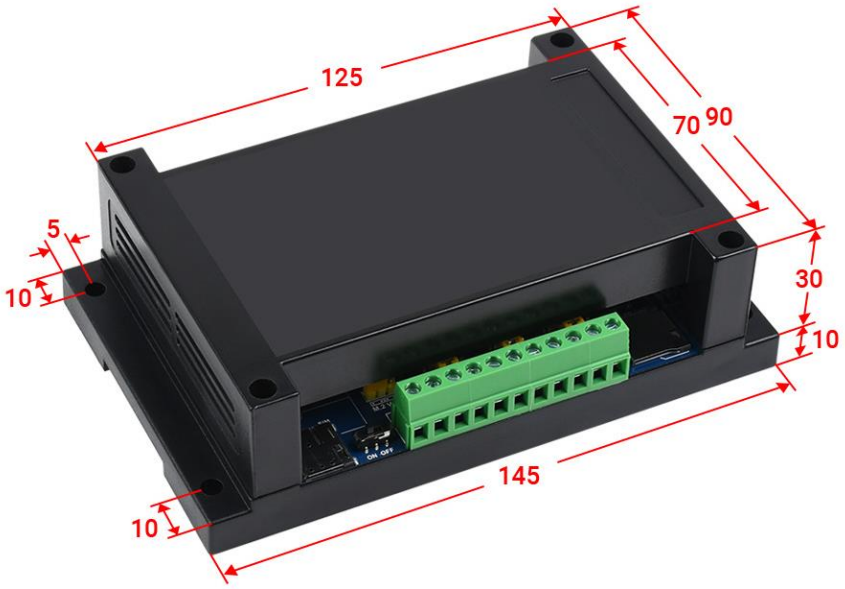
3.1 Kit contents

The PV Supernode kit includes the following items:

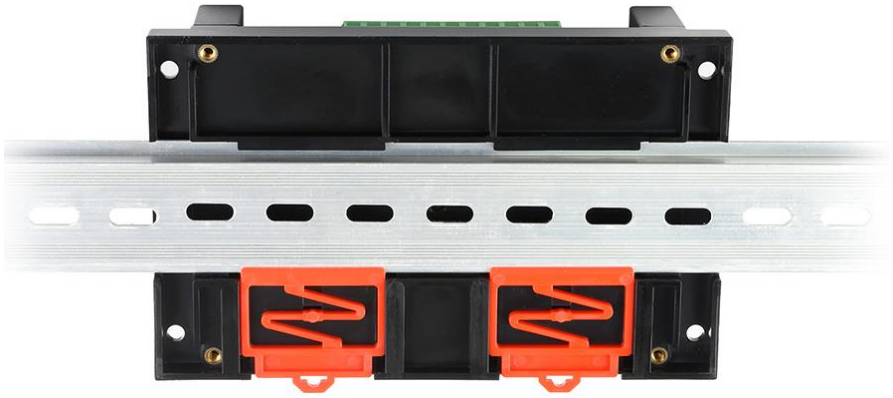
- PV Supernode device
- 12V DC power supply for DIN rail (optional)
- GSM antenna (optional)
- WiFi antenna (optional)



3.2 Device dimensions (mm)



3.3 DIN rail mounting



4 How the device works

4.1 Active limitation of active energy export

The controller periodically (typically every 5 seconds) collects information from the energy analyzer or meter at the facility's connection point, and in the event of an energy outflow to the grid, it controls the inverters accordingly, adjusting their active energy production. It is possible to set the zero-export condition or the set level of active energy consumption from the network (e.g. constant consumption of 50kW for facilities with high and sudden changes in active energy consumption over time).

4.2 Reactive power compensation

Local generation of only active energy by inverters, with simultaneous consumption of reactive power from the grid, may result in exceeding the tangent phi value specified in the facility connection agreement with DSO. The controller continuously reads the value of reactive power at the main grid connection point and controls the inverters appropriately, typically in the range of cos phi -0.8 to 0.8, minimizing reactive power consumption as measured by the DSO energy meter.

4.3 Sitelogger

The controller monitors the operation and controls all inverters installed in a given location in a coordinated manner. This enables quick integration of PV Supernode with telemechanics controllers, such as - for example - Mikronika MSG701 and USP140, Apator Ex-BRG3 and SPV-RM, Regulus uREG, IEN Gdańsk STGP 3.5. This ensured comprehensive implementation of the connection conditions for PV farms as issued by the DSO. Typically, active and reactive power control by the PV farms is required by the DSO to mitigate grid congestions.

5 Technical and functional features of the device

- Compatible with inverters from Sofar Solar (all series), Solis, Goodwe, Growatt, Solaredge, SAJ, Sungrow, Huawei, Fronius, Kehua and many others
- Compatible with energy analyzers such as Eastron, Socomec, Lumel, F&F, Schneider, Lovato and others,
- No limits to the number of monitored and controlled inverters
- Possibility of mixing inverters from different manufacturers in one PV installation while maintaining the possibility of consistent control and monitoring of the installation's operation
- Uploading data on the operation of the PV installation to the PV Care

6 Device specifications

- two RS485 interfaces built-in on the main board of the device
- optional three additional RS485 interfaces using USB adapters
- power supply 7-36V DC
- 1 Gbps Ethernet connection and WiFi connectivity (optional)
- optional second Ethernet port using a USB adapter
- LTE Cat-1 modem (optional)
- real time clock (RTC) with battery backup
- three USB 2.0 connectors for extension devices
- USB type C connector - backup power supply, service connector
- size 145 x 90 x 40 mm, DIN rail mounting
- working temperature range from -10°C to 50°C

7 Communication

The PV Supernode device communicates with devices using the Modbus RTU protocol via the RS485 connector with the following parameters:

- speed - 9600 bps
- word length - 8 bits
- parity - N (none)
- number of stop bits - 1

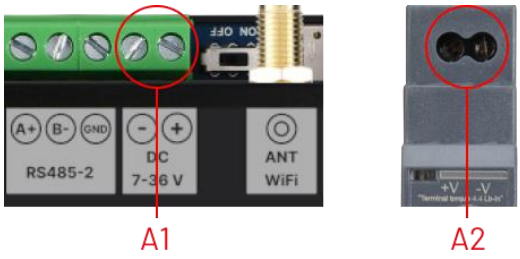
All devices such as inverter, grid analyzer, weather station, etc. connected to the PV Supernode should have the above RS485 communication parameters set. It is possible to change the above parameters of the RS485 connector.

If several devices are connected to one RS485 loop, remember that each device should have a different Modbus ID address (usually the default value is 1 on a new device) and the last device in chain should have proper termination.

8 How to connect the device

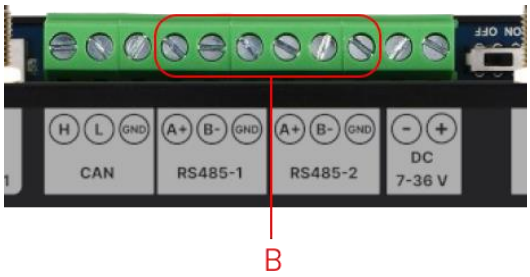
8.1 Power connection:

- Connect the cable to the power supply (A2), then to the screw connectors (A1)
- (V+ to DC+, V- to DC-)
- Connect the power supply to 230 V AC



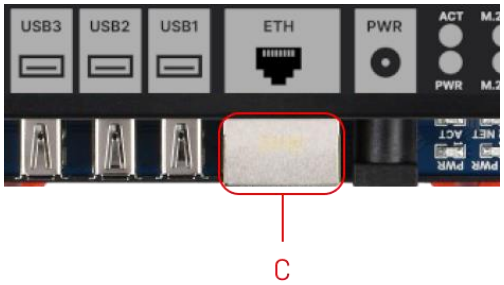
8.2 RS485 communication connection:

- Connect the RS485 cable to the screw connectors (B) and then to the inverter or network analyzer (A+ to A+, B- to B-)

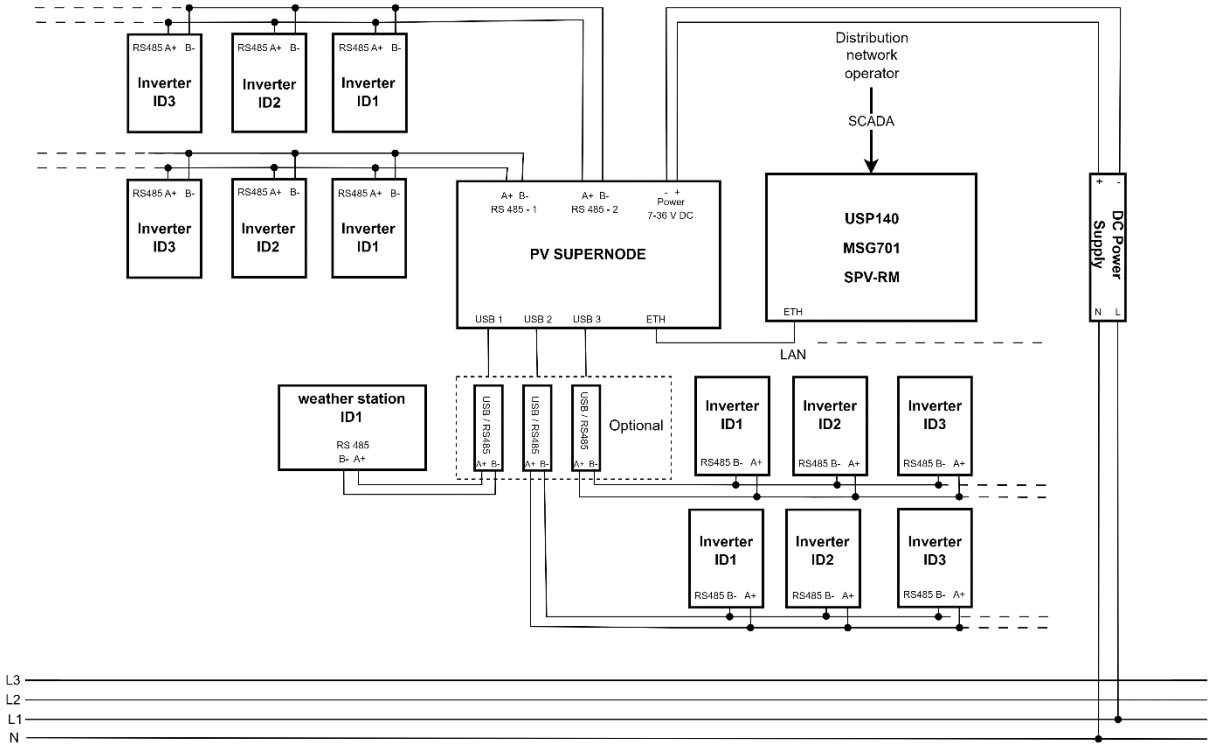


8.3 Connecting to LAN and Internet:

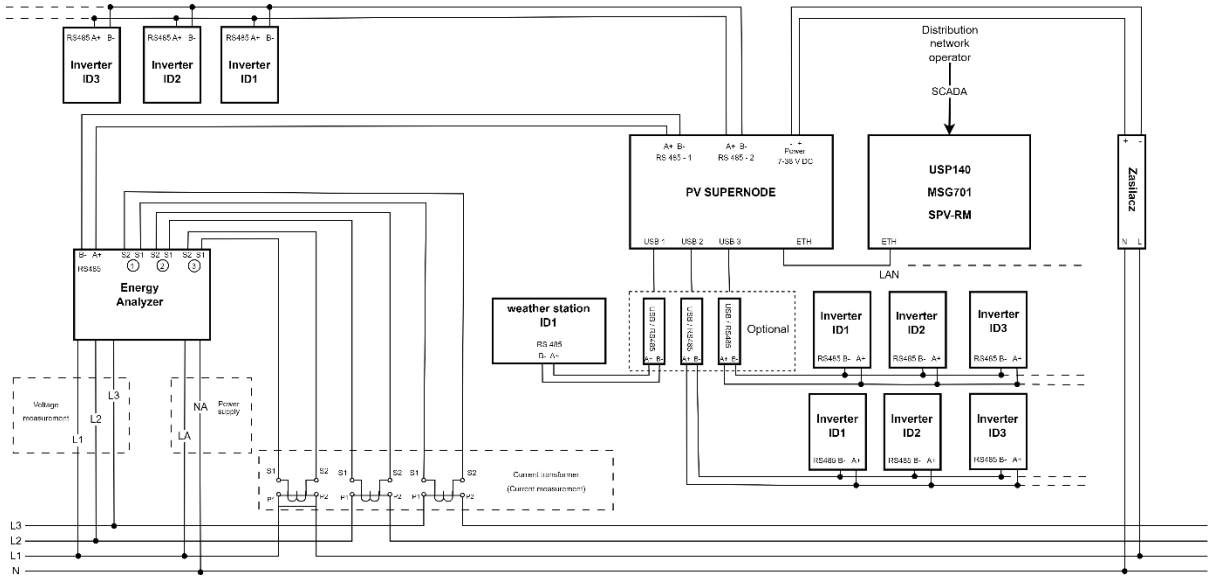
- Prepare an Ethernet cable of appropriate length (not included)
- Then connect the cable to the Ethernet socket (C) and to the switch/router of the local computer network
- In order to perform remote configuration, the device must be connected to the local network using the Ethernet connector. The device will acquire network IP settings using DHCP and then establish communication with the manufacturer's access server through an encrypted OpenVPN channel. This will enable remote access to the device without the need to forward ports on the local access router installed in the LAN.



8.4 Connection diagram – function Sitelogger



8.5 Connection diagram – functions: zero-export and reactive power compensation



9 Serial number

The serial number of the device consists of 3 sections:

- Two-character company code (AD)
- An eight-character serial number
- Two-character year of manufacture

On this basis, a sticker with a barcode is generated in the following form:



10 Environmental Protection

PV Supernode devices are designed and manufactured in accordance with the requirements of international standards for the ISO 9001 quality management system and ISO 14000 environmental management system.

Both the design and production process is carried out in accordance with the requirements of environmental protection - in particular with regard to reducing the consumption of energy, raw materials and the use of recycled materials.

The production technology ensures easy disassembly and separation of individual raw materials used in the construction of the PV Supernode device. Thanks to this, it is possible to maximize the use of materials for repeated use.

Do not dispose of your used device with normal waste/waste. Take them to a special waste collection point for disposal. In this way, you will help protect the environment.