

USER MANUAL

SYNAPTIC



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1. Hints for this Manual

1.1. Range of Validity

The document describes the electrical connection of the Synaptic Unit and explain the functionalities features of the relay outputs for the energy management.


Note: Please keep these instructions in a place where they are always accessible.

1.2. Target Group

This manual is intended for qualified electricians. The tasks described in this manual can only be performed by qualified electricians.

1.3. Used Symbols

The following symbol is used in this document as described below:

	Note! "Note" provides important tips and instructions.
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2. SYNAPTIC - General Description

Synaptic is an advanced hardware solution for real-time optimization and control of energy systems, connected to the SG Connect platform. It enables the collection and analysis of data from various sources, using artificial intelligence and machine learning to accurately forecast demand and supply, as well as manage energy efficiently. Synaptic improves grid stability, reduces operational costs, and enhances supply reliability, making it a crucial component for energy system operators and renewable energy providers. You can optimize the local energy management with the Synaptic Unit to seamlessly control intelligent consumers such as (Heat pumps, Electric heaters and other SG-Ready capable devices.

3. Technical Specifications

3.1. Synaptic Specifications

Technical Specifications	
Nominal Input Voltage [Vdc]	24
Max. Input Voltage Range [Vdc]	9 - 34
Wired Connectivity	2x RS485 Modbus 2x Ethernet RJ45 (100 Mbit/s) 1x RS232 1x P1 Port
Wireless Connectivity	LTE (4G, 5G) with eSIM and external antenna
Backup Battery	>8 hours running time, LiFePo4
I/O Ports	RGB LED on chassis 3x Relays SPDT (230V) ON/OFF Push button on chassis 2x LED output (24V)
Operating Temperature Range [°C]	-20 to +60
Storage Temperature Range [°C]	30 to 90 days: -10 to +35 More than 90 days: +15 to +35
Storage Requirements	Maximum Storage Time: 1 year (After that batteries need to be checked and rebalanced)
Certification	CE, RoHS


3.2. Synaptic Relay Specifications

Relay Specifications	
Contact Arrangement	1: NC 2: COM 3: NO
Contact Resistance	< 50 milliohms initial
Maximum Switching Power	100W
Maximum Switching Voltage	60V DC
Maximum Switching Current	4A

4. Scope of delivery

Before installing the device, please first check the packaging list below to ensure all necessary material are included:

Packaging parts	Article Numbers
Synaptic	1pcs. 504942 NGEN
Connector for 24V DC power supply	1pcs. 1952267 Phoenix Contact
Modbus Connector for MBUS 1 / MBUS 2	2pcs. 1952267 Phoenix Contact
Connectors for the connection of the Relays and the LED light	4pcs. 1803581 Phoenix Contact
Antenna (LTE)	1pcs. YECT004W1A
Indicator LED + E-Stop Function	1pcs. 505428

	<p>Note! All Synaptic units prior to Generation 9 are delivered with the following antenna: Article Number: Y1RJW0HA0AA (WIFI + LTE)</p>
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4.1. Additional Antenna

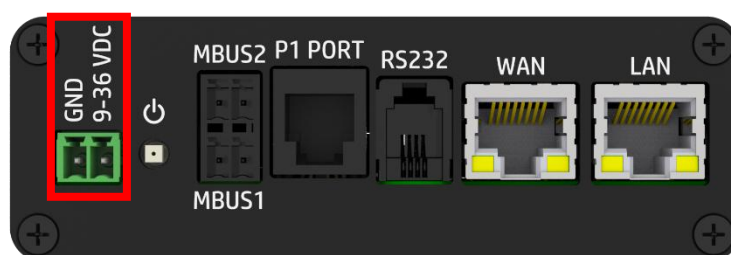
If you are unable to use the included antenna due to LTE reception issues, you have the option to order a more powerful antenna with a longer cable. This allows you to choose a location for better LTE reception more flexibly. The antenna with the matching part number can be found below:


Optional parts	Article Number
Antenna (LTE) with 2-meter Cable	1pcs. 504942 NGEN

5. Electrical Connection

5.1. 24V DC-Power Supply Connection

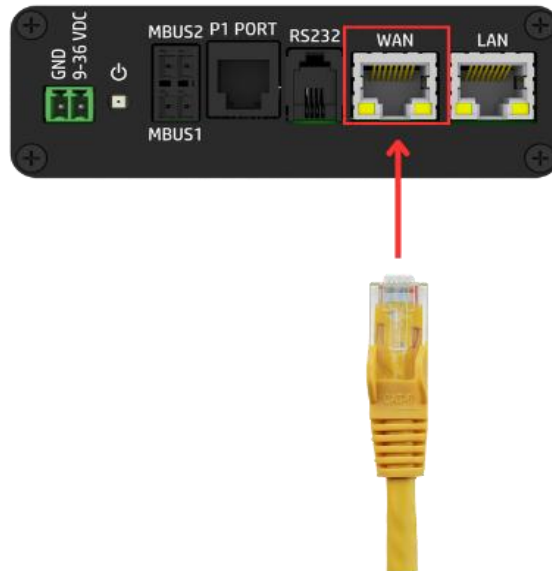
Before the Synaptic Unit can start with the operation, a 24V DC power supply is required. Please connect the 24V DC power supply using the provided connector on the connection terminal as shown below:



	<p>Note! The Synaptic-Unit is additionally equipped with a backup battery to ensure operation during a grid outage on-site. The backup battery is designed to provide up to 8 hours uninterrupted power supply.</p>
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5.2. Internet Connection with local Internet Router

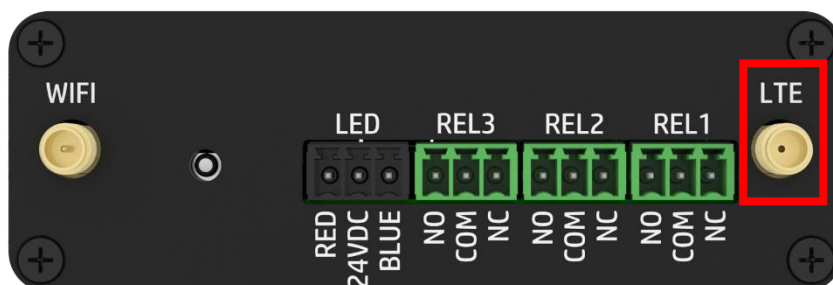
The Synaptic Unit needs to be connected to the customer's local internet router using an Ethernet cable. Connect the Ethernet cable from the internet router to the Synaptic Unit as follows:



Note!
All Ethernet cables connected to the Synaptic unit must not exceed a maximum length of 3 meters.

5.2.1. Connection of the LTE-Antenna on the Synaptic-Unit

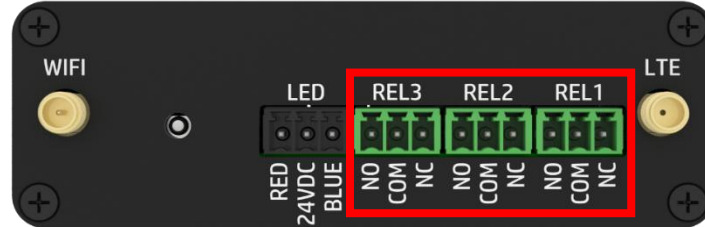
The internet connection of the Synaptic unit can be established not only through a fixed LAN connection to the local internet router but also via an LTE antenna. To do this, connect the included antenna to the corresponding port of the Synaptic unit:



Note!
The E-SIM for establishing the internet connection via the LTE antenna is already integrated and activated.

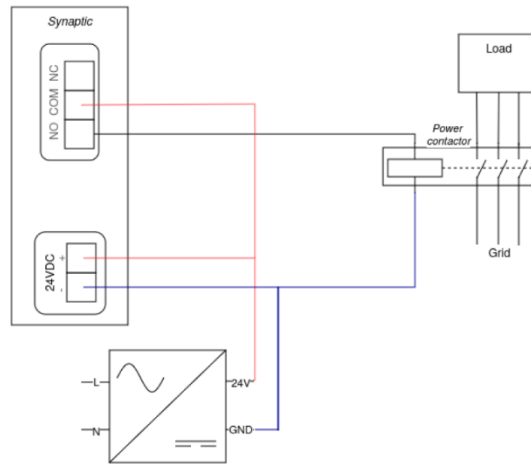
5.3. Wiring of the Relay outputs

The Synaptic unit features three relay outputs to which various production and consumption units can be connected. The wiring diagram for each relay you can find below:



5.3.1. Wiring Schematic Relay outputs

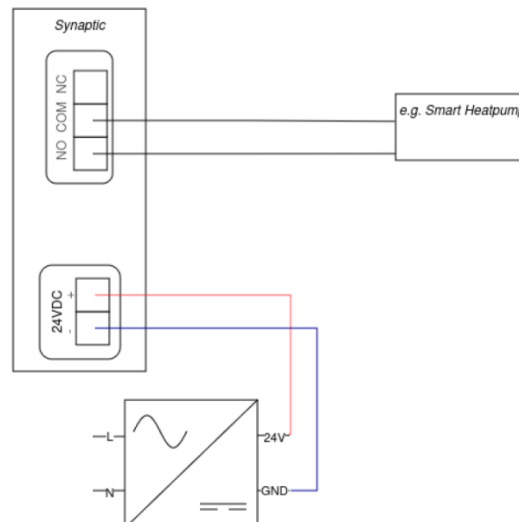
Recommended wiring for switching 230VAC loads:



Note!

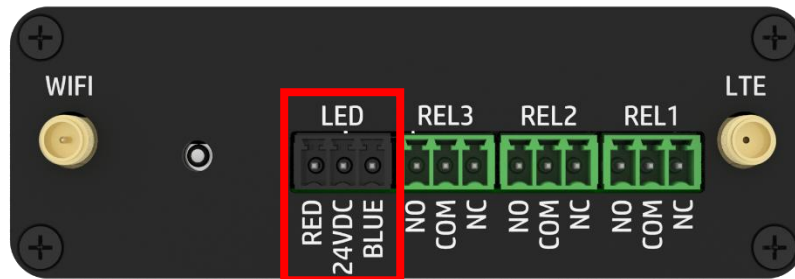
The Synaptic Unit requires a minimum power supply of 6 W at 24 VDC. If the same power supply is used to supply additional loads (e.g., a power contactor), verify that it can handle the extra demand. Otherwise, a higher rated power supply unit is required.

Recommended wiring for switching digital signals (up to 60VDC):



5.4. Connection of an External Indication LED

An external LED indicator can be connected to the Synaptic Unit to visually display its operating status at a location of your choice. Please connect the external indication LED using the provided connector on the connection terminal as shown below:



The different colours and states of the external LED have the following meanings:

- The LED light turns blue when the Synaptic unit is booting up after the power supply is switched on.



- The LED light remains solid blue when the Synaptic unit is running, and a LAN connection is established.



- The LED light flashes blue when the Synaptic unit is running via 4G, but no LAN connection is established.



- The LED light flashes red when the Synaptic unit has not internet connection via LAN or 4G.

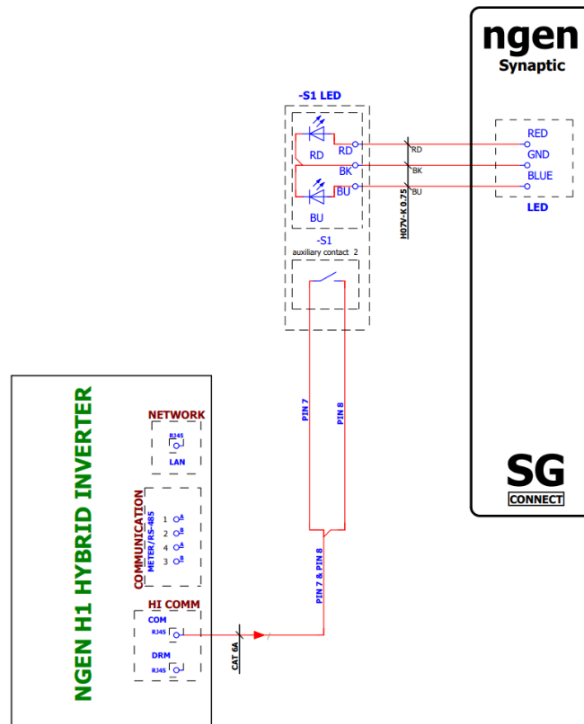


5.5. Function of the Push-Button on the External Indication LED

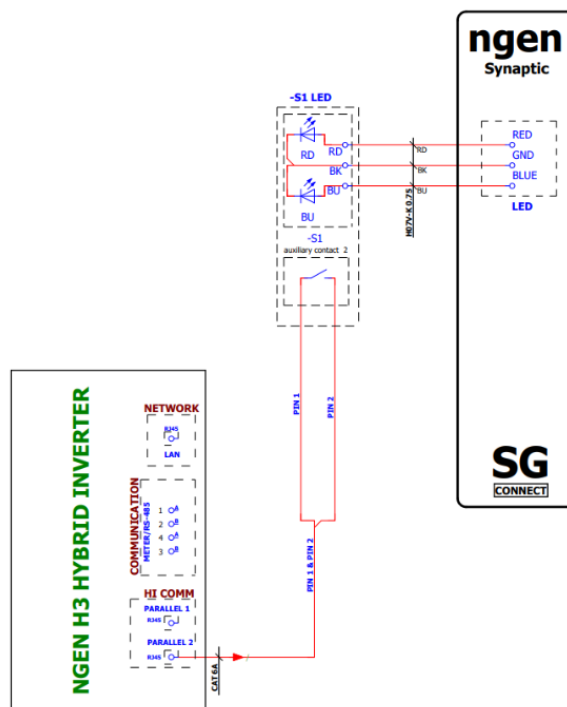
The External Indication LED features an integrated push button that activates the E-Stop function of our inverter series. When the button is pressed, the connected inverter immediately stops operation. The pressed shutdown switch minimizes the risk of electric shocks or other issues related to electrical energy sourced from the inverter.

Please refer to the following pictures for instructions on how to wire the External Indication LED with Push-Button between the Synaptic Unit and our inverter series:

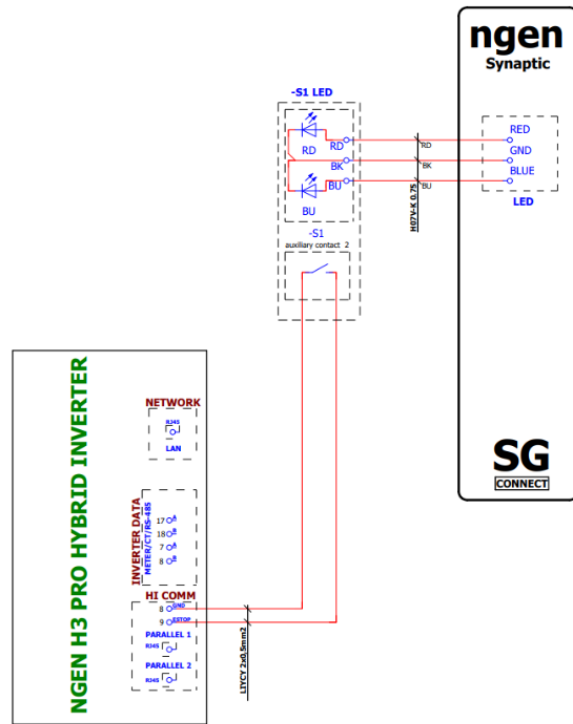
- Wiring with the NGEN-Star H1 Inverter:



- Wiring with the NGEN-Star H3 Inverter:

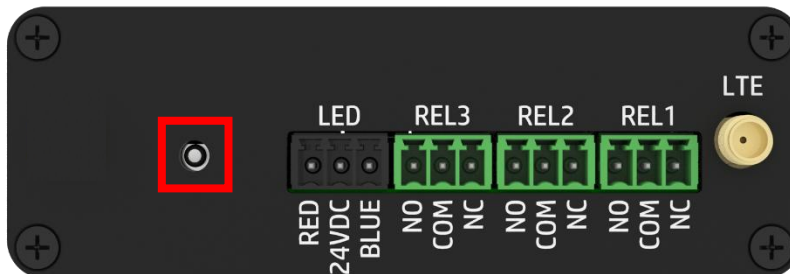


- Wiring with the NGEN-Star H3-PRO Inverter:

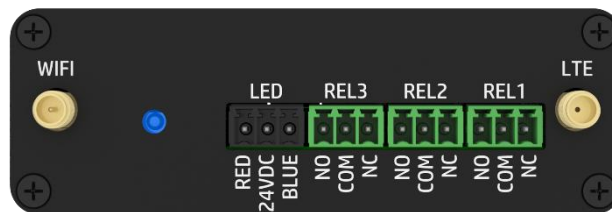


6. Internal Indication LED on the Synaptic Unit

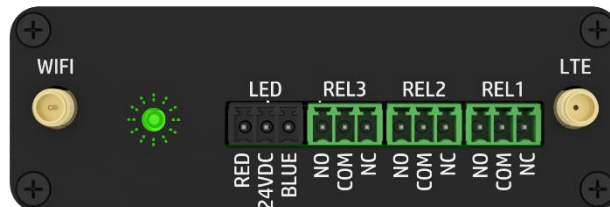
Synaptic is equipped with an LED indicator that visually displays its operating status. The different colours and states of the LED have the following meanings:



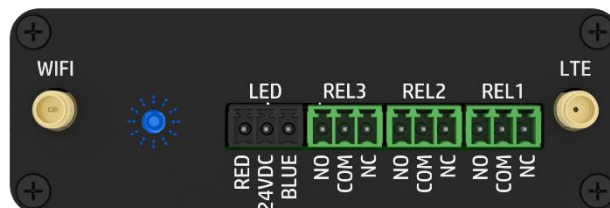
- The LED light turns blue when the Synaptic unit is booting up after the power supply is switched on.



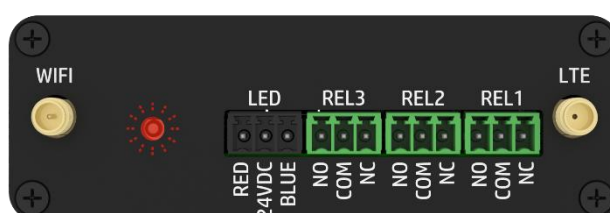
- The LED light flashes green if a LAN connection is established and the boot process is completed.



- The LED light flashes blue when the Synaptic unit is running via 4G, but no LAN connection is established.



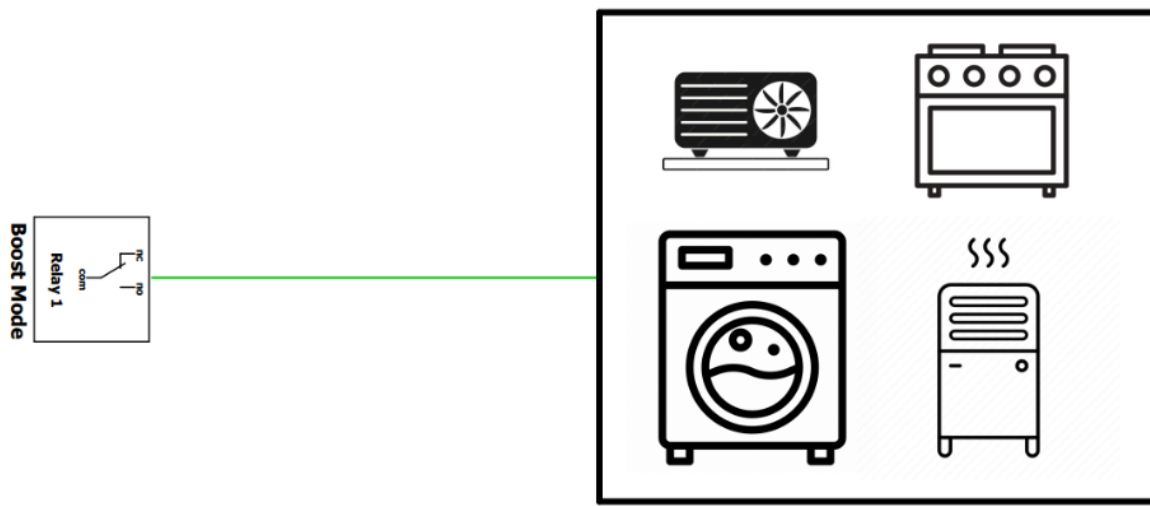
- The LED light flashes red when the Synaptic unit has not internet connection via LAN or 4G.



7. Function Explanation of the Synaptic Relay Outputs

7.1. Relay 1 – Boost Mode

The Boost Mode allows you to take advantage of periods of low-cost or free electricity for devices that can store energy in the form of heat or increase consumption at certain intervals. This feature is ideal for heat pumps, electric heaters, and electric vehicles, which you can use when electricity is cheaper or free. With the Boost Mode, you will reduce your costs and increase energy efficiency by using energy when it is most advantageous. Especially when surplus energy from a photovoltaic system is used to optimize self-consumption.

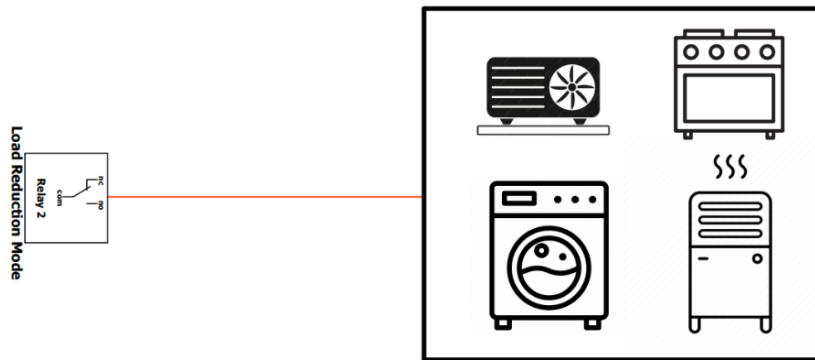


How It Works: Relay 1 is activated during intervals of reduced-price or free electricity.

Configuration: To enable this function, Relay 1 must be connected to your device so that the desired appliance turns on when the relay is activated. This allows automatic control of your device and maximizes the benefits of favourable electricity prices.

7.2. Relay 2 – Load Reduction Mode

The Load Reduction Mode is a feature that rewards you for energy-efficient behaviour. It encourages a reduction in electricity consumption by deactivating devices during times of high network load. This feature is ideal for devices such as heat pumps, electric heaters, and charging stations, which can be deactivated during periods when energy is expensive or when reducing consumption brings a reward.

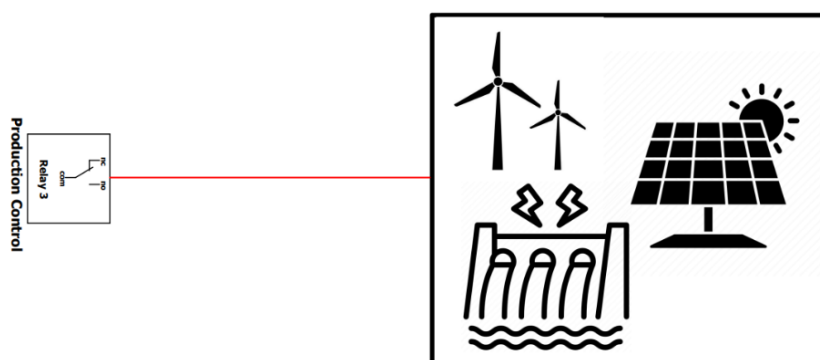


How It Works: Use devices connected to Load Reduction Mode (Relay 2) during these intervals to reduce your consumption. Receive a reward for participating in an energy-efficient program that helps stabilize the grid and reduce high network loads.

Configuration: To enable this function, Relay 2 must be connected to your device. When the relay is activated, your device will adjust to the optimal operating time, allowing you to save and earn rewards.

7.3. Relay 3 – Production Control

Production Control is a feature that helps you balance energy production and provides financial compensation for lost production. It is designed for users with solar power systems or other production units such as hydroelectric, wind or biomass plants that occasionally face disconnections or reduced production. With the Production Control, you can receive compensation for lost energy even when your system is not producing electricity for example during the activation of the negative tertiary reserves by the grid operator.



How It Works: In case of disconnections or reduced production, you receive simulated financial compensation for the lost energy.

Configuration: To enable this function, Relay 3 must be connected to your production unit, allowing monitoring and control of lost production. This way, you receive compensation and achieve a more stable return despite occasional interruptions.

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