

Control4Energy Optimum C4E001

A standardized solution for managing overflow in PV plants in residential and commercial buildings and prioritization of consumption

Instructions for use and setting of the device

Document version: 1.1

Date of last revision: 29.1.2023

Manufacturer: Automation Solutions s.r.o.



Content

1. General information
2. Package contents
3. Safety information
4. Device installation instructions
5. Wiring diagram
6. Login to configuration
7. Device settings
- Installation parameters
- Boiler parameters
- Parameters of Wallbox EV (charging station for electric vehicles)
- License
- Program info
- Weather online
- Updates
- Equithermal curve setting
- Setting the Summer/Winter mode
- User settings
8. Access to set values, status visualization
9. CONFIGURATION OF THE WHOLE PLC
10. Technical specification – Basic documentation
11. Recycling
12. EC Declaration of Conformity

1. General information

Control4Energy is a standardized product that allows users to efficiently and automatically manage the energy produced by a domestic or commercial photovoltaic power plant installed in the user's premises.

This standardized solution is built on the platform of the Tecomat Foxtrot industrial controller with an extremely long service life and robustness, proven by tens of thousands of applications in 70 countries around the world.

The product is designed for installation by electrical installation companies, no programming is necessary, only the controller-Tecomat Foxtrot and the power supply are mounted in the house distribution board and the inverter and devices to be controlled (electrical appliances such as boiler, electric heater, heat pump, etc. are connected to the terminals of the the controller according to the attached assembly instructions.

During commissioning, the assembly company will set up the service screen with the end user - naming the circuits and the recommended order of switching on and off the power loads (appliances) according to the user's practical experience and requirements. This load naming and prioritization (order of switching on and off) can subsequently be changed by the user at any time.

The device works automatically in such a way that it ensures the consumption of the maximum energy produced from PV plant in the building in which it is installed, in such a way that according to the user-defined order of switching on and off the power loads, it switches on and off the loads, respectively modulates this load. The user sets not only the order according to his personal priorities of comfort or economy, but also the limits, when reached, the loads are connected or disconnected.

This prevents the overflow of energy produced by the PV plant into the grid (which is not economically advantageous for the owner of the PV plant), and the maximum produced energy is consumed directly in the building.

Graphs of produced energy are available to the user.

2. Package contents

The device is a separate control unit with a pre-loaded program, which is placed in a DIN rail-mounted switchboard, connected to a 230 V power supply, and other devices are connected to the inputs and outputs of the unit, according to the wiring diagram, see chap. 5.

The package contains 1 control unit Control4Energy Optimum C4E001.



3. Safety Notice

- When receiving the shipment, check that the packaging is not damaged. After unpacking, visually check the integrity of the control unit. If the control unit shows any signs of damage, do not install it.

- The installation of the control unit can only be carried out by a person with the appropriate electrical qualification valid in the country where the control unit is installed. Before installation, it is necessary to read this manual carefully and follow all safety warnings.
- The control unit must be placed in a dry room with no increased dustiness. The location must be protected from direct sunlight and the ambient temperature must not exceed the range specified in ch. 8. Technical specification – Basic documentation
- Do not place the control unit near flammable objects!
- In the case of connecting solid state relays (SSRs) to the SSR outputs, it is absolutely necessary to install these SSRs in a switchboard with sufficient heat dissipation (with a ventilation grid or ventilation holes) and to ensure their sufficient cooling in accordance with the installation manual!
- Prevent the access of unauthorized persons, especially children, to the installation area of the control unit. There is a serious risk of electric shock!
- Only connect electrical appliances and devices to the inputs and outputs of the control unit that are suitable and adapted for this mode of operation and for which the manufacturer does not explicitly prohibit connection via a switching element!
- The manufacturer is not liable for any damage caused by improper installation and operation of the device! The owner is fully responsible for the operation of the entire system.

4. Instructions for installing the device

The Control4Energy Optimum C4E001 control unit can be installed in a common electrical distribution board by mounting it on a 35 mm DIN rail.

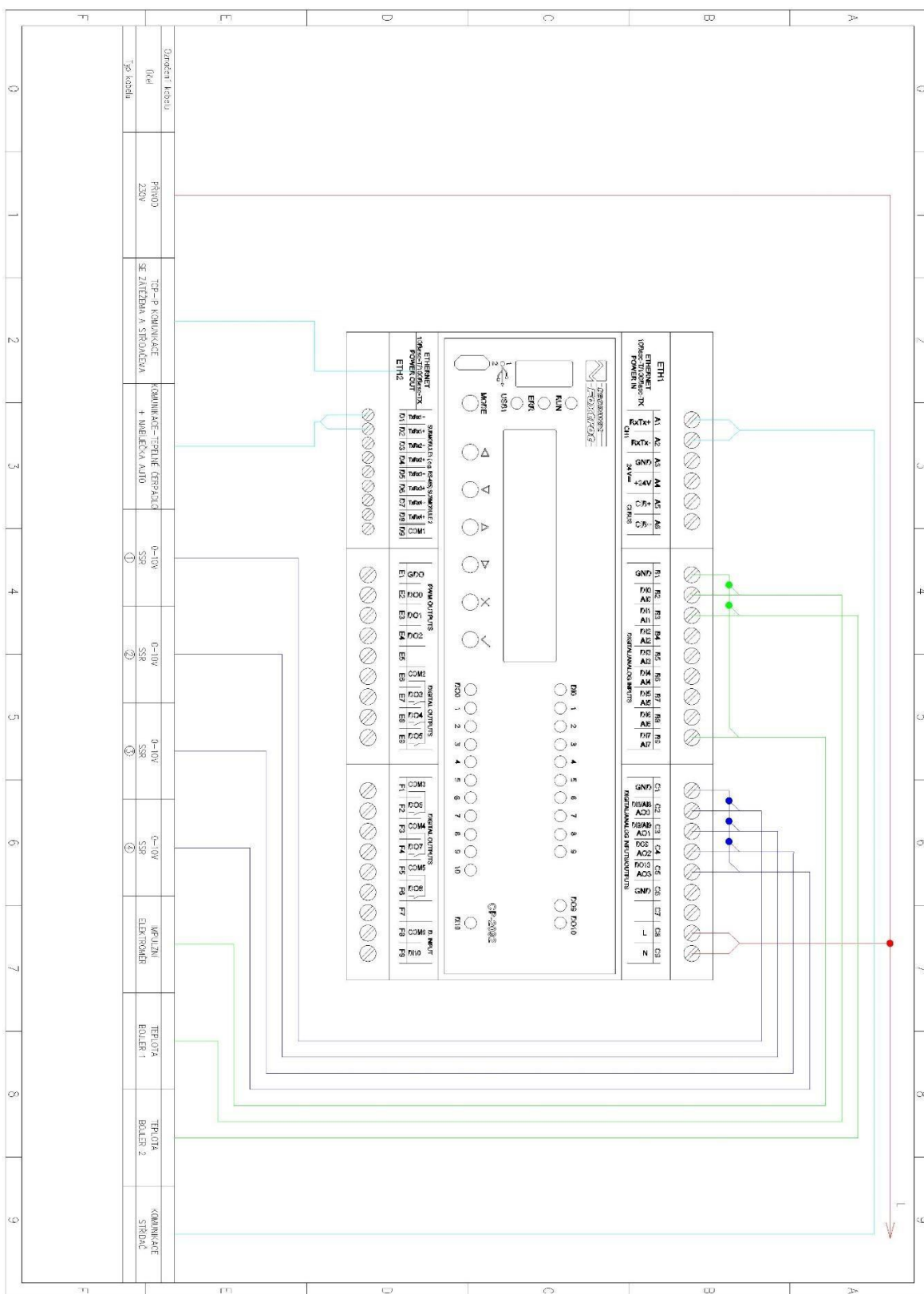
Use wires with min. cross-section of 0.5 mm², e.g. CYKY 1.5. to connect the power supply with the control unit.

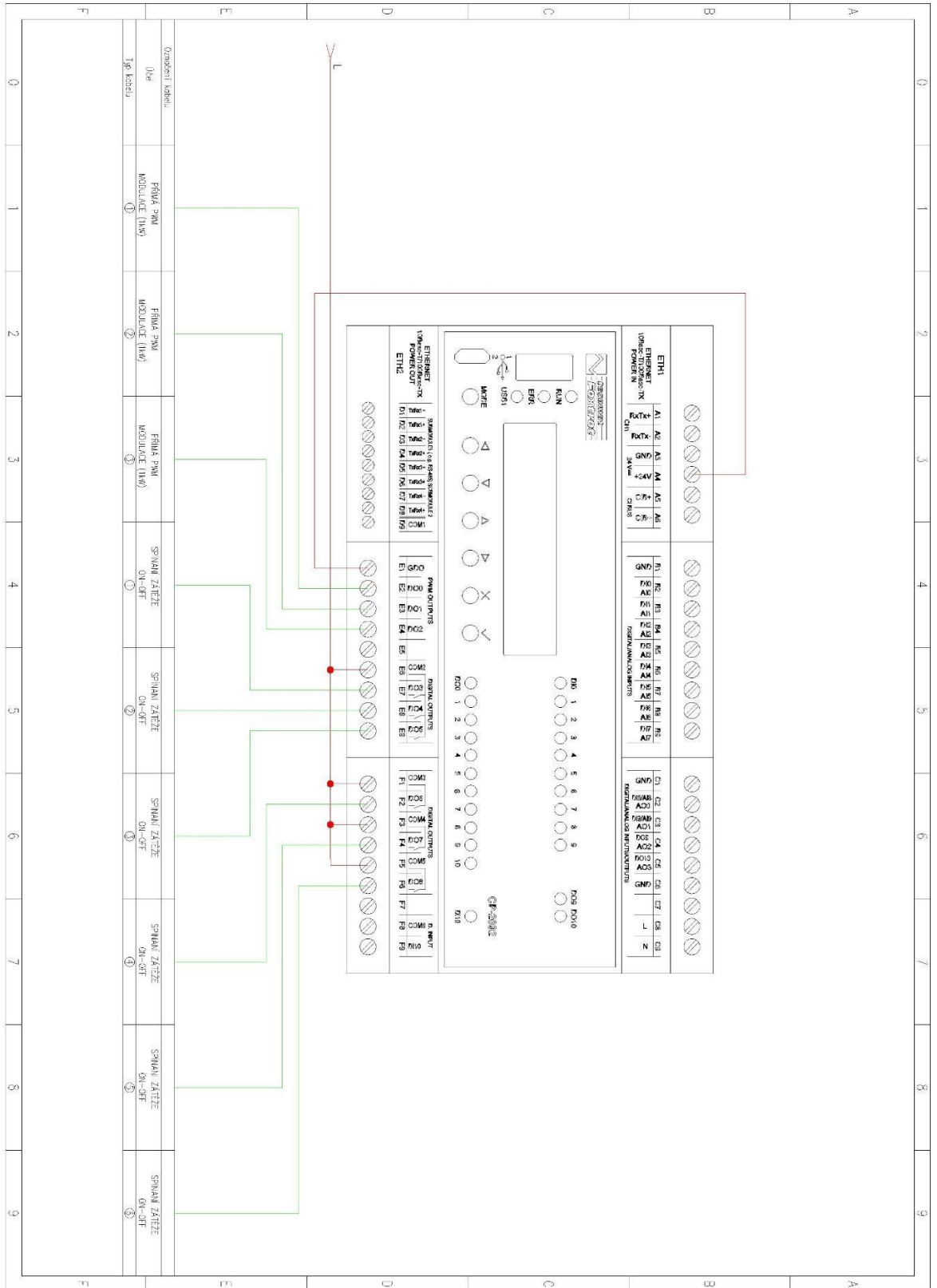
Connect the power circuits of the connected electrical appliances to the relay outputs of the control unit using wires with a cross-section corresponding to the power consumption of the connected appliances. Connect power SSR control or 0-10 V analog control to the SSR outputs using wires with a core cross-section of 0.5 to 1.5 mm². If the wires are longer than 2 m or run concurrently with other power wires, use a shielded cable if possible.

Connect the analog temperature sensors to the AI/DI inputs with a shielded 2-core wire with a core cross-section of 0.5 to 1 mm² between the GND clip and the corresponding AIDI input (analog/digital inputs).

Connect PT1000 analog temperature sensors with a shielded 2-core cable with a core cross-section of 0.5 to 1 mm² to the GND (ground) and AI terminals.

5. Wiring diagram





6. Login to the configuration

After entering the IP address of the control unit into the web browser provided by the DHCP server on ETH2 (to obtain it, see chapter 7 Device settings), the login screen will appear:

Welcome and login, please.

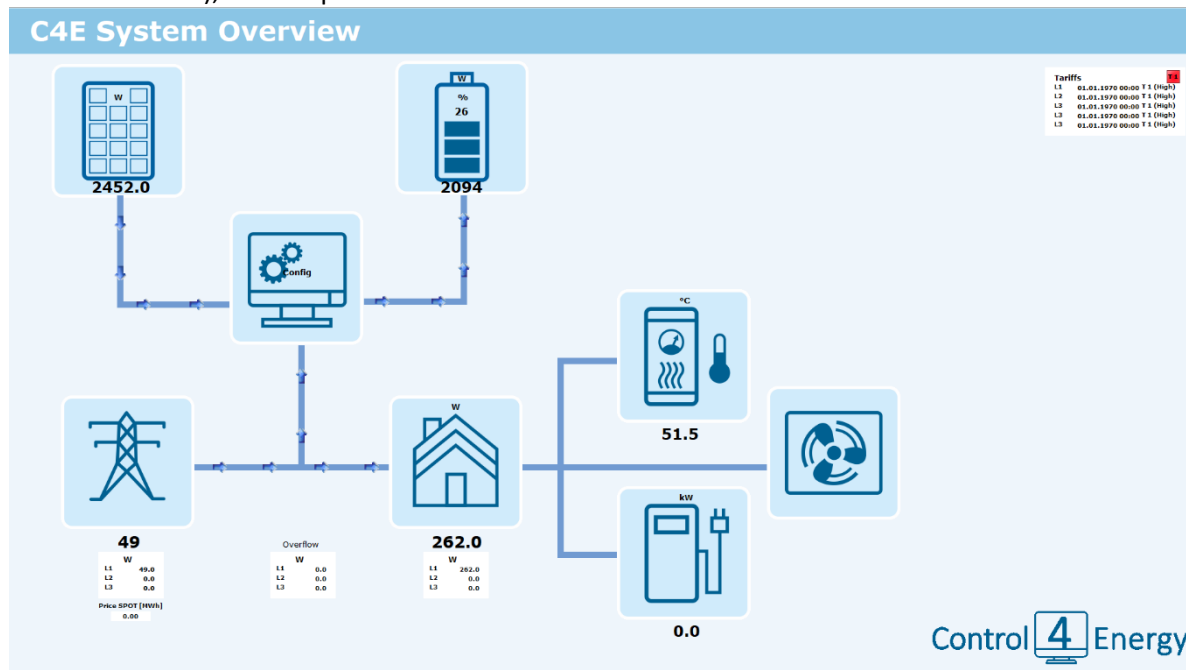
A login form with two input fields: "User name" and "Password". Below the fields is a "Login" button.

The default login name is "c4e" and the password is "c4e", you can change this information in the settings under "User Settings". Use the Login button to log in to the system.

For a better user experience, we recommend the web browser Chrome, Firefox, Edge in the latest available version.

7. Device settings

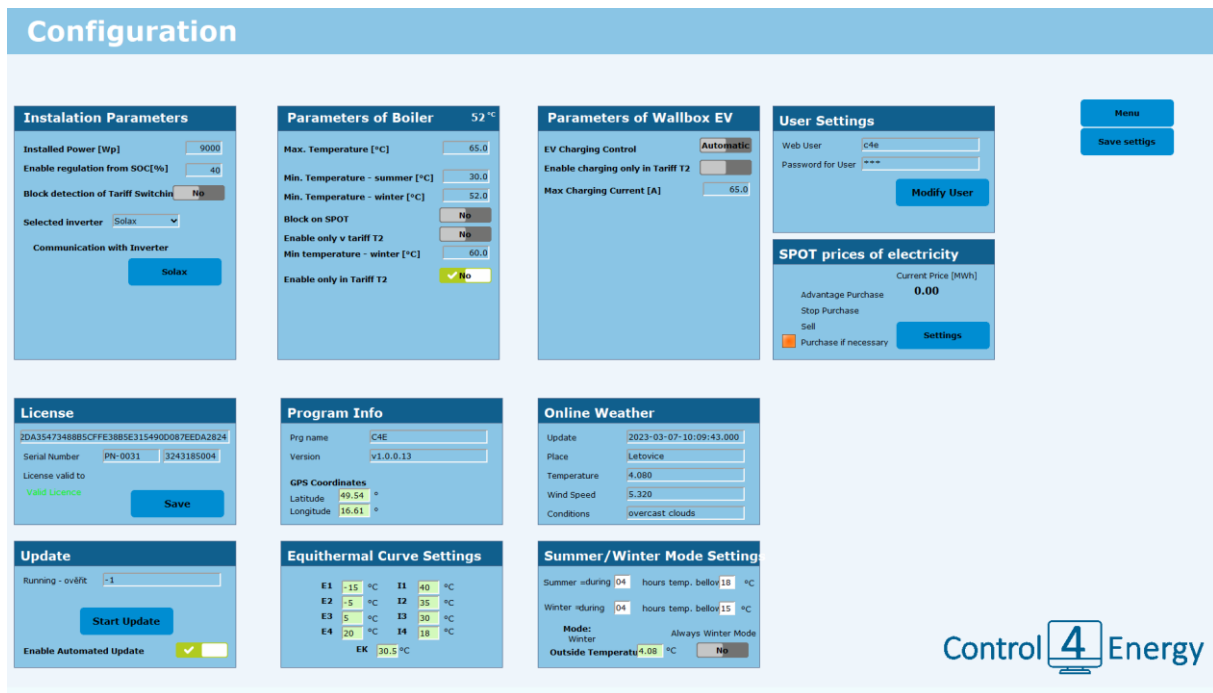
After connecting the control unit to the 230 V network and to the Internet (connect to the ETH2 port), the program will be automatically updated to the latest version. After that, it is necessary to scroll through the display of the unit (using the arrows below the display on the control unit) to display the IP address of this control unit. Write down this address and paste it into the web browser on your PC, tablet or smartphone, which will bring you to the visualization of the device (Basic overview screen), see the picture:



Screen 1 - Basic overview screen



Click the Configuration icon to go to the **Device Configuration** page.



Screen 2- Device configuration

On the Device Configuration page, you set the following parameters:

Installation parameters

- Installed power (Wp) – enter the power value of the installed and connected PV power plant in Wp, i.e. if, for example, the power of the installed PV power plant is 10 kWp, we enter the value in Wp, i.e. 10 000 Wp.
- Controller intervention from SOC (%) - State of charge - % specified value from which the control unit should regulate. We recommend using a range of 50% - 90% according to the PV plant installation settings.
- Selected inverter – from the list of inverters, we select the one connected to the Control4Energy Optimum control unit.
- Block HDO detection – HDO signal suppression
- Communication with the inverter – you click on the tag of the inverter that is connected to the control unit and make the appropriate settings of the communication channel according to the inverter.
 - o GoodWe – the inverter is connected via RS485, see the manufacturer's manual
 - ModBus address – address of the inverter
 - Speed – set communication speed (default 19200 baud)
 - Parity – set communication parity (default NO_PARITY)
 - o Growatt – the inverter is connected via RS485, see the manufacturer's manual
 - ModBus address – address of the inverter (default 1)
 - Speed – set communication speed (default 9600 baud)
 - Parity – set communication parity (default NO_PARITY)

- Solax – the inverter is connected via RS485, see the manufacturer's manual
 - ModBus address – address of the inverter (default 1)
 - Speed – set communication speed (default 9600 baud)
 - Parity – set communication parity (default NO_PARITY)
 - Inverter password – 4-digit password for the inverter settings
 - Minimum SOC – minimum battery discharge limit (10%-90%)
- Xantrex - the inverter connects via TCP/IP using InsightLocal
 - IP Address - IP Address for InsightLocal
 - Gw port 502 - Port 502 for InsightLocal
 - Gw port 503 - Port 503 for InsightLocal
 - XW address – ModBus address of the XW Pro
 - Battery monitor address – ModBus address of Battery monitor
 - MPPT1 Address – ModBus address MPPT1 Address
 - MPPT2 Address – ModBus address MPPT2 Address
 - MPPT3 Address – ModBus address MPPT3 Address
- Victron - the inverter connects using TCP/IP
 - IP Address - IP Address of modbus GW
 - HW MDB address – Modbus address of the inverter
- After saving the settings, the communication channel is set. If **Err** is on, communication with the inverter does not work.

Boiler parameters

- Maximum temperature (°C) – you set the maximum boiler temperature to which the control unit can heat water in the boiler. It is recommended to choose a value in the range of 40-90 (°C)
- Minimum temperature - summer (°C) - you set the minimum temperature below which the water in the boiler should not drop during the summer mode. It is usually set lower than the minimum temperature in winter mode, e.g. in the range of 30-40 (°C).
- Minimum temperature - winter (°C)- you set the minimum temperature below which the water in the boiler should not drop during the winter mode. It is usually set higher than the minimum temperature in summer mode, e.g. in the range of 40-50 (°C).
- Block at SPOT Purchase of stops – Block heating of the minimum temperature at the "Purchase of stops" flag
- Heat SPOT Bargain purchase – Heat if the "Bargain purchase" flag is on to the temperature Temp.SPOT Bargain purchase [°C]
- Heat from the grid only during T2 Tariff – you can set with the switch button whether the Control4Energy control unit should allow the boiler to be heated from the grid only during the period of validity of the low electricity tariff or whether the boiler can be heated from the grid even in the case of a high electricity tariff.
- Connect the water temperature sensor in the boiler to input AI/DI1. The unit supports the connection of a temperature sensor PT1000 - 1000 Ω at 0 °C. A temperature of 300 °C or

more indicates a malfunction or a sensor that is not connected.

Parameters of Wallbox EV (electric vehicle charging station)

- EV charging control – you set the maximum EV charging current. We recommend entering a value corresponding to the maximum value of the charging current of the electric vehicle.
- Charge from the grid only during T2 Tariff – you choose whether the charging station controlled by the Control4Energy Optimum control unit can allow charging of the connected electric vehicle only during the validity of the low electricity tariff or whether it can charge an electric vehicle during both tariffs (low and high tariff), i.e. without restrictions.
- Maximum charging current (A) – we set the maximum charging current.

License

- License number – a window displaying the license code of the device
- Device serial number

Program info

- PRG name – program name
- Version – display of the program version
- GPS coordinates – by entering the GPS coordinates, you ensure the correct automatic switching of the Summer/Winter mode used for heating the boiler.

Weather online

- Current weather according to GPS coordinates

Update

- The "Start update" button starts the program update. If a newer version is available, the program will be updated to the latest version.
- Enable/disable automatic update. The new version is checked once a day at midnight and after the device is turned on.

Equithermal curve setting

- Setting the equithermal curve for the heat pump. Set the equithermal curve according to the supplied heat pump manual. If you want to use a local outdoor sensor, you connect it to input AI7. The unit allows the connection of a temperature sensor PT1000 - 1000 Ω at 0 °C. If you do not use an outdoor temperature sensor, the outdoor temperature is updated every 3 hours using the GPS coordinates entered in your controller.

Summer/Winter Mode setting

- Setting the transition to summer and winter mode.

User settings

- Setting the access name and password for web access of the controller. Save by clicking "Edit user"

SPOT prices

(valid for Czech market only, other markets must be customized, available as a extra paid service)

Spot prices reflect the current price of electricity on the market per MWh in CZK. The system evaluates the following values

Purchase

Stop buying

Sale

Purchase if necessary

In the SPOT electricity price settings, you can see the course of the hourly price for the current day and the upcoming day and the TOP6 prices for the current day.

Market / stock exchange - price level setting

Use the individual sliders to enable the calculation of spot commands and set the price level in CZK/MWh for individual symptoms. After setting the required price level data, the levels need to be recalculated using the "Recalculate levels" button.

If the data is read correctly, the green light is on, and if there is a data reading error, it is red.

SPOT Prices of Electricity

OTE - SPOT prices		
Hour	Today Price/MWh	Tomorrow Price/MWh
0	2833.04	0.00
1	2354.87	0.00
2	2079.08	0.00
3	1879.96	0.00
4	1668.96	0.00
5	1543.96	0.00
6	1971.85	0.00
7	3203.77	0.00
8	3282.87	0.00
9	2962.67	0.00
10	2771.48	0.00
11	2712.62	0.00
12	2453.62	0.00
13	2366.96	0.00
14	2254.74	0.00
15	2584.30	0.00
16	2812.21	0.00
17	3428.62	0.00
18	3071.84	0.00
19	3388.36	0.00
20	3491.72	0.00
21	3190.58	0.00
22	2764.18	0.00
23	2862.19	0.00

OTE - Price Level Settings	
<input checked="" type="checkbox"/> Yes	Purchasing Electricity Price lower than ... advantage purchase [MWh] 2500.00
<input checked="" type="checkbox"/> Yes	Stopped Electricity Purchasing Price higher than... stop purchase [MWh] 3500.00
<input checked="" type="checkbox"/> Yes	Selling Electricity Price higher than... advantage sell [MWh] 6000.00
Other Prices Price Level - possible purchase [MWh]	
Set Price Level	
<input type="checkbox"/>	Advantage Purchase
<input type="checkbox"/>	Purchasing Blocked
<input type="checkbox"/>	Selling
<input type="checkbox"/>	Purchasing if necessary
<input checked="" type="checkbox"/>	Data Readed
<input type="checkbox"/>	Reading Data Error
<input type="button" value="Read Data from OZS"/> <input type="button" value="Recalculate Levels"/>	

After setting all parameters on the Configuration page, click the **"Save Settings"** button to save the parameters. In the future, this page can be accessed again to change the configuration.

8. Loads switching settings



Clicking on the icon on the main overview screen takes us to the **Load Switching Page**

Here you set the parameters for each connected input/output of the Control4Energy Optimum control unit. You set the following parameters for each input/output:

- **Bypass** – if the bypass is enabled, the technology connected to the relevant input/output will be permanently enabled. A typical example is the charger of an electric vehicle during the winter season, when you always want to charge regardless of the excess energy from the PV plant.
- **Enabled** – input/output enable setting. If it is not enabled, the control unit does not control it.
- **Description** – in writing state what device is connected to this input/output, e.g. Boiler - spiral no. 1, Heat pump, etc.
- **Priority (1-20)** - You select a number from 1 to 20 and thus determine the priority order of switching on or off the connected device to the Control4Energy control unit in the event of an excess of electricity (switching on) or a lack of electricity (switching off).

Several inputs/outputs can have the same priority, i.e. they can have the same priority number set. In that case, they are switched on/off as a group of devices at the same time.

- **Load (W)** - Enter the maximum (nominal) load of the connected device to the relevant input/output in W. i.e. e.g. in the case of connecting a heating coil of a boiler with a nominal power of 1 kW, you enter this value in W, i.e. you enter a value of 1 000.
- **Connected phase** - From the list of phases, you indicate the phase from which the device connected to this input/output is powered.
- **Switch on time (mm:ss)** - You set the switch-on delay time of the device connected to this input/output from the time when a sufficient power value is reached for switching on. By setting the appropriate delay value (e.g. n minutes and seconds), we achieve that the device does not switch on unnecessarily often in the case of short PV power peaks (e.g. the sun flashes for a short time when the sky is cloudy).
- **Switch off time (mm:ss)** - You set the delay time for switching off the connected input/output

device from the time of reaching a decrease in the available electrical energy and thus the request to switch off the connected device to this input/output. By setting the appropriate delay value, you will ensure that the device does not turn off unnecessarily often in the event of short drops in PV power values (e.g. a cloud appears for a short time when the sky is clear). Typically heat pump run-in.

- **Output type** – From the list of input/output types, select the one that corresponds to the device connected to this input/output.
 - **None** - set for unconnected inputs/outputs
 - **DO3** – digital output No. 3 – in case we connect a device that is connected to the digital output, according to the maximum current of the terminal (see. Technical specification of the Control4Energy control unit – Chap. 8. Technical specification – Basic documentation). DO4 to DO9 – analogously to DO3
 - **A00** – analog output No. 0 – serves for devices that connect to the 0-10 V analog output (e.g. SSR relay, heat pump). A01 to A03 – analogous to A00
 - **PWM 1** – modulated load, output no. 1, serves to connect PWM 24V DC loads. PWM2 to 3 – analogous to PWM1
 - **TCP IP** – set if the relevant input/output is connected to a device communicating via the TCP IP protocol, typically a charging station for electric vehicles or a heat pump.
- **Technology type** – From the list of technology types, select the one that corresponds to the type of device/technology connected to this input/output
 - **Boiler SSR** – used if the boiler's heating coil is connected to the input/output via SSR or DO. This type of technology uses the settings from the "Boiler parameters" item
 - **Heat Pump Hitachi** – used if a heat pump communicating via the Modbus protocol is connected to the input/output
 - **EV 0-10V** – used if a charging station is connected to the input/output, where the charging is controlled and connected to the 0-10V (0-100%) output. This type of technology uses the settings from "EV Wallbox Parameters"
 - **EV Schrack** – used for connection of Wallbox Schrack, communicating via the Modbus protocol is connected to the given input/output
 - **Heat Pump 0-10V** – used if a heat pump controlled by the 0-10V output is connected to the given input/output. At the output is the equithermal temperature, which is due to the setting from "Equithermal curve settings"
- **Output status** – signals output modulation according to surplus

You do this setting of load parameters and connected devices for all devices connected to the Control4Energy Optimum control unit.

Subsequently, by clicking on the "Save settings" button, all set parameters will be saved. You can return to the Load switching page at any time and change the settings, which is used in practice either in the case of connecting other switched devices to the Control4Energy control unit or in the case of changing the required switching and disconnection priorities.

9. Access to set values, status visualization

The basic overview screen of the Control4Energy control unit can be accessed at any time via a web browser on a PC, tablet or smart phone by entering the IP address of the Control4Energy Optimum

control unit in the address bar, which we saw when initially connected to the 230 V power supply on the display of the control unit and recommended copy it, or save to favorite addresses - pages in the web browser. We also recommend writing down this IP address and saving it in the switchboard to the central unit for later use in case you change your PC, phone or tablet.

You can view the control unit's IP address again at any time by scrolling with the arrows below the control unit's display.

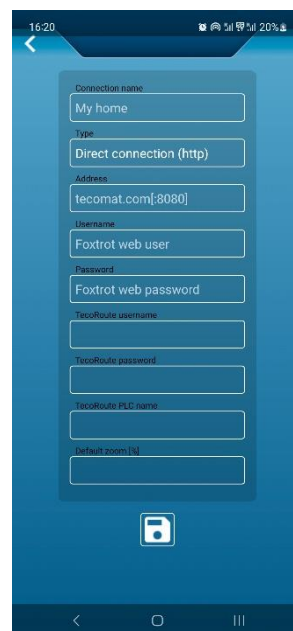
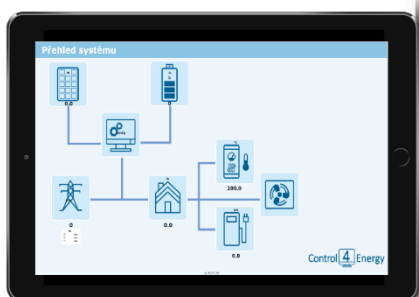


Another possible approach to visualize and set up the control unit is through the use of the **iFoxytrot application**, which can be downloaded from the App Store (for iOS) or Google Play (for Android).

After downloading the application to your mobile phone/tablet, you add a new connection in the application (the + button at the top right) and then set the following parameters:

- *Name of the connection* – name it as you wish, e.g. PVE Novák-Prague,
- *Connection type* – Direct connection (http),
- *Address* – http://VASEIP (i.e. the IP address of the control unit, the acquisition of which is described in chapter 7)
- *Name* – Your login name to the web interface
- *Password* – Your login password to the web interface (either the default data, see chapter 6 or the current one that you set in the User Settings screen)

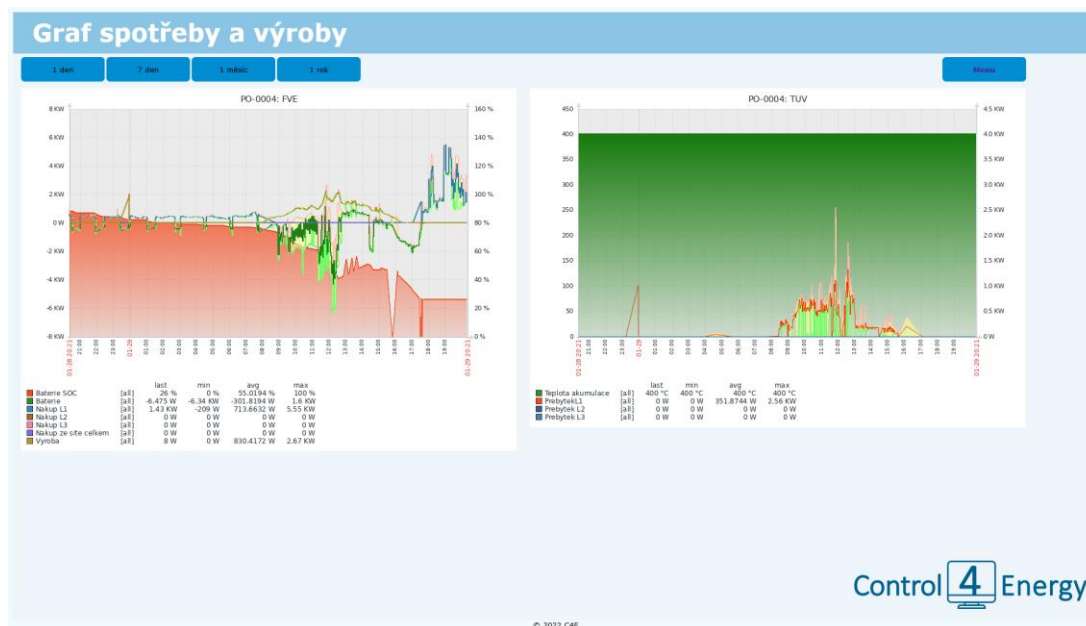
Click the "Save" icon below these parameters to save the parameters.



Subsequently, whenever you start the **iFoxytrot application**, by clicking on the name of the connected central unit, you will be connected to the visualization of the Control4Energy Optimum control unit on the main overview screen, where you can monitor the current status of the entire PV system, set Configuration and Load Switching.



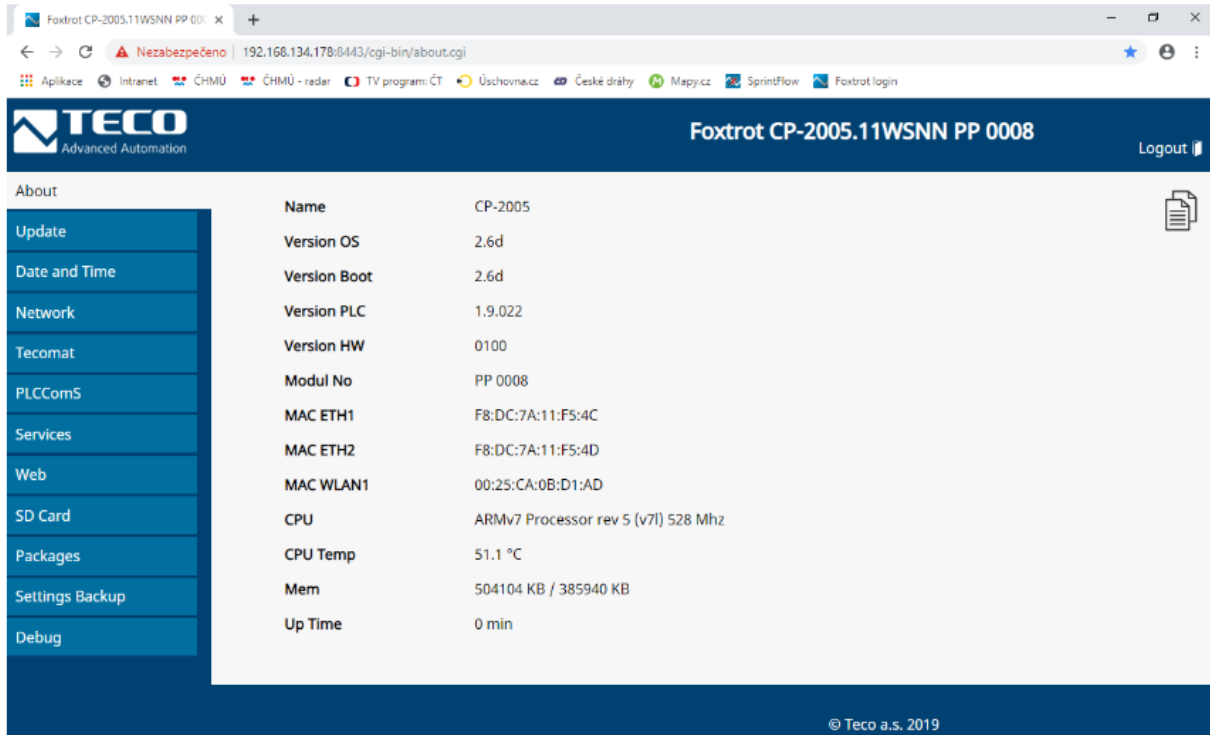
Clicking on this icon on the main overview screen will take you to the Consumption and Production Graph page. Where graphs for the last 24 hours are displayed. You can use the buttons to select the displayed time period.



CONFIGURATION OF THE ENTIRE PLC

This chapter describes setting up the PLC configuration and the TecoRoute service for remote management and is intended for trained companies managing a large number of connected Control4energy Optimum controllers.

The configuration of the entire PLC is performed from a web browser at the IP address set by the user or at the address assigned by the DHCP server on port 8080 or 8443. In the case of the default IP address of the ETH1 interface set by the manufacturer (192.168.134.176), you must enter <http://192.168.134.176> into the browser. 134.176:8080 or <https://192.168.134.176:8443>. The computer must be in the same local network as the PLC system. If the IP address of the PLC is assigned from the DHCP server, it is possible to display this address on the display of the basic module using the buttons (see chap. 6.4.). The same address must then be entered in the address bar of the browser instead of the default IP address. The PLC configuration pages can also be accessed from a browser by entering the address <https://foxtrot.local:8443>. The advantage of this procedure is that it is not necessary to know the IP address of the PLC. This option can only be used on those computers that support the so-called ZeroConf, which is a technique that allows a computer to communicate with a PLC in the local network based only on knowing the name (foxtrot.local). Only one PLC system can be connected in the local network at that time.



Screen 1 - Home page of the web server with TECOMAT FOXTROT 2 system configuration

The built-in web server enables:

- get information about installed firmware versions and used hardware
- update the entire PLC firmware
- set the date and time of the PLC including the time zone
- set automatic time synchronization with NTP server/servers
- access to system logs (system start, system boot, system update)
- setting of all network interfaces (ETH1, ETH2, WLAN1, WLAN2, LTE1)
- PLC parameter settings (EPSNET protocol communication parameters, settings for web
- PLC server, TecoRoute service settings, access to PLC log files, management of application profiles)
- PLCComS server settings
- service settings (Avahi, FTP, Samba, VPN)
- web server settings (user settings, certificate settings)

When accessing the PLC configuration website for the first time, it is necessary to enter the login data (username "admin" and password "adminc4e"). After logging in, it is then possible to add additional users, edit their login data, or remove some users (see web/Users tab). If the user loses or forgets the login data, then it is possible to delete the currently set login data in the PLC using the buttons and display on the basic module. If you then access the configuration website, you will be required to set a new name and password for access.

The appearance and functionality of the PLC configuration website may vary depending on the PLC firmware version. There is a help system that is launched by clicking the icon in the upper right of the screen.

10. Technical specification – Basic documentation

See separate attachment.

11. Recycling

The product is not subject to the obligation to take back old electrical equipment according to the Waste Act No. 185/2001 Coll., the device falls under the exception according to Annex No. 1, Decree No. 352/2005 Coll., group 5923/ENV/720/05.

At the end of its useful life, the product can be dismantled, recycled or stored in a secure landfill.

Do not dispose of the product in normal municipal waste!

12. EC Declaration of Conformity

See separate appendix issued by the control unit manufacturer Teco a.s.