



NODER EE12

IP CONTROLLER ACCESS CONTROL SYSTEM

Technical Documentation

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1. Protection

Read these instructions before installing this product. The manufacturer is not responsible for any malfunction or damage to the equipment resulting from failure to follow the instructions. Damage caused by incorrect installation, maintenance or operation is not covered by the warranty. Making any changes to the unit that are not authorised by the manufacturer or carrying out independent repairs will result in the loss of rights under the warranty. Installation should be carried out by a person with appropriate electrical qualifications.

2. Warning

Electric device under voltage. Before performing any activities related to the power supply (connecting wires, installing the device, etc.), make sure that **this device is not connected to the power supply**. Before connecting peripheral devices (actuators, readers, etc.), it is necessary to verify the correctness of the installation (e.g., no short circuits between wires). During the installation, before each connection, it is necessary to discharge your electrostatic charge by contact with a grounded element to avoid voltage surges, and remember to ground the **housing and door** before applying voltage to the device. In parallel with the actuators (electromagnetic lock, electric strike, relay) it is necessary to use **a semiconductor diode**, which should be installed as close as possible to the actuator. Communication buses should not be installed along 230/400V voltage lines at a distance of less than 25 cm. If the infrastructure does not allow it, it is recommended to use shielded cabling, which should be grounded on the controller side. It is necessary that the connection of wiring in the enclosure be done in an orderly manner, allowing access to the components mounted inside. Unconnected wires should be insulated.

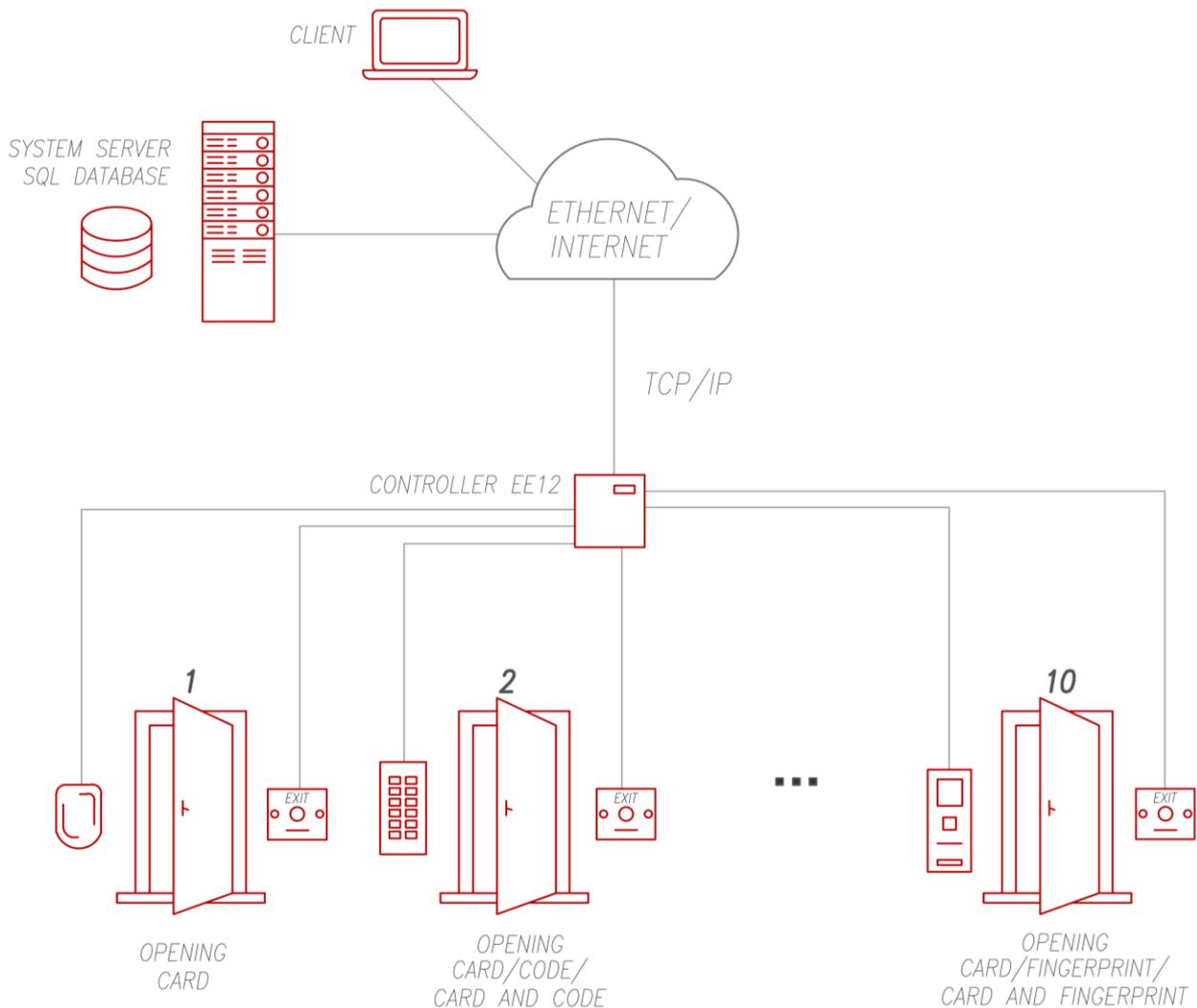
3. Device description

The IP Controller of the Access Control System is an advanced microprocessor I / O device for automated user identification. It can be used in building security systems, access control, time registration, hotel and recreational facilities, or elevators and passenger elevators. The system that overrides and manages the operation of the controller is software from AxxonSoft.

The documentation applies to the EE12 controller in PCB version V1.08 200323 or later.

4. System architecture

The EE12 controller operates in a server-client architecture, and connects to the AxxonSoft's management software via an Ethernet-based computer network. The controller has its own database, enabling autonomous operation of the device and recording of events in case of loss of network connection with the server. After reconnection, the central system of the events is automatically downloaded from the controller.



The entire connection from the card to the server is encrypted using technologies such as:

- Protected server <-> client communications → TLS 1.2 encryption;
- Protected server <-> controller communication → SSH tunnel, firewall on the controller (access to the controller only from specific IP addresses);
- Protected controller <-> reader communication → AES-256 encryption;
- Protected reader <-> card Mifare DESFire 13.56 MHz communication → AES-128 encryption.

5. Device construction

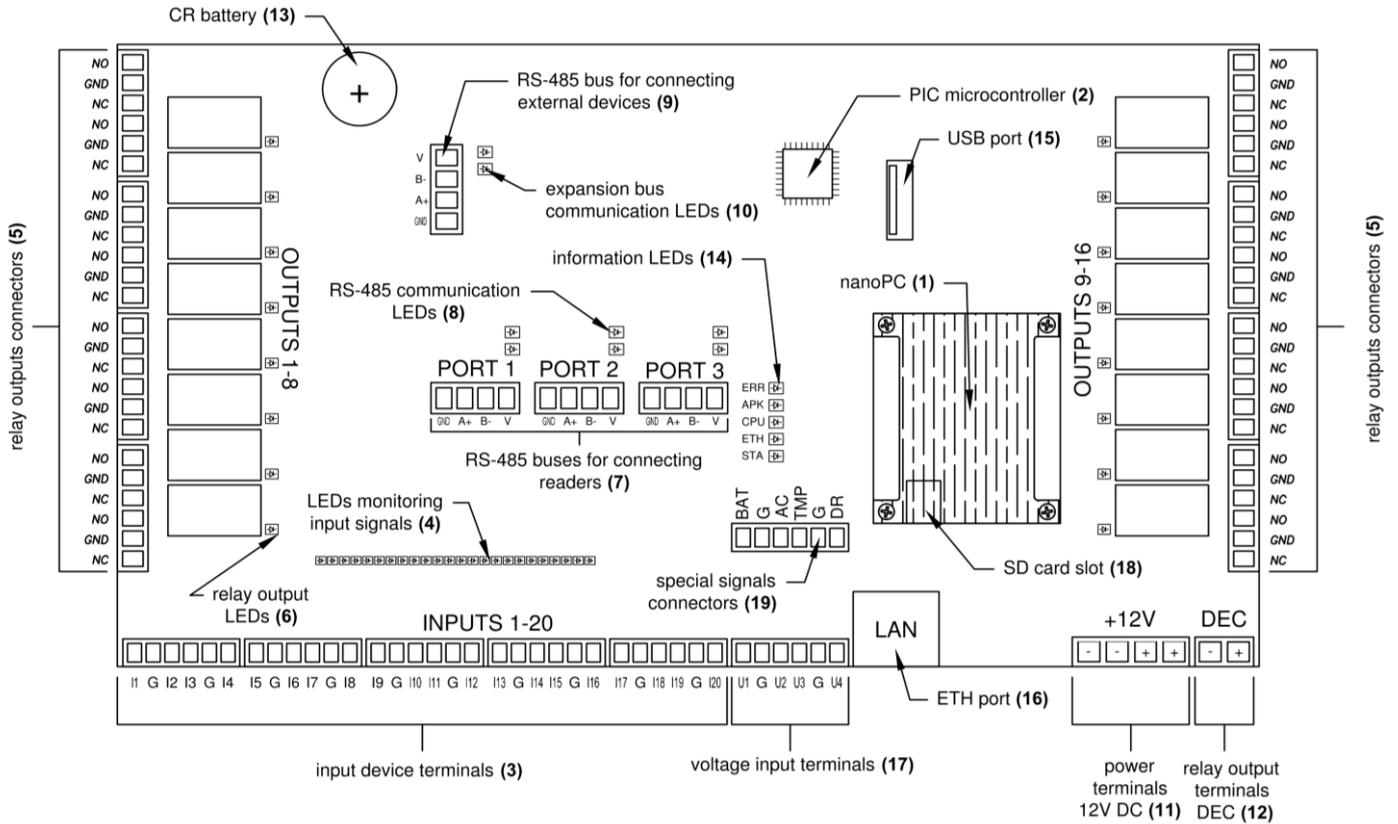
The device is built from a circuit board, where the logic is managed by a **PIC microcontroller (2)** and a **nanoPC chip (1)**.

Input device connectors (3) and **special signals connectors (19)** support devices that operate in NO, NC, EOL/NO, EOL/NC, 2EOL/NO and 2EOL/NC logic. Their current status is checked by **LEDs monitoring input signals (4)**. **Relay outputs connectors (5)** support executive elements of Access Manager and SSWiN systems in NO or NC logic (depending on the selection of the connectors on the relay). The driving status of a particular relay can be checked by the relay **outputs connectors LEDs (6)**.

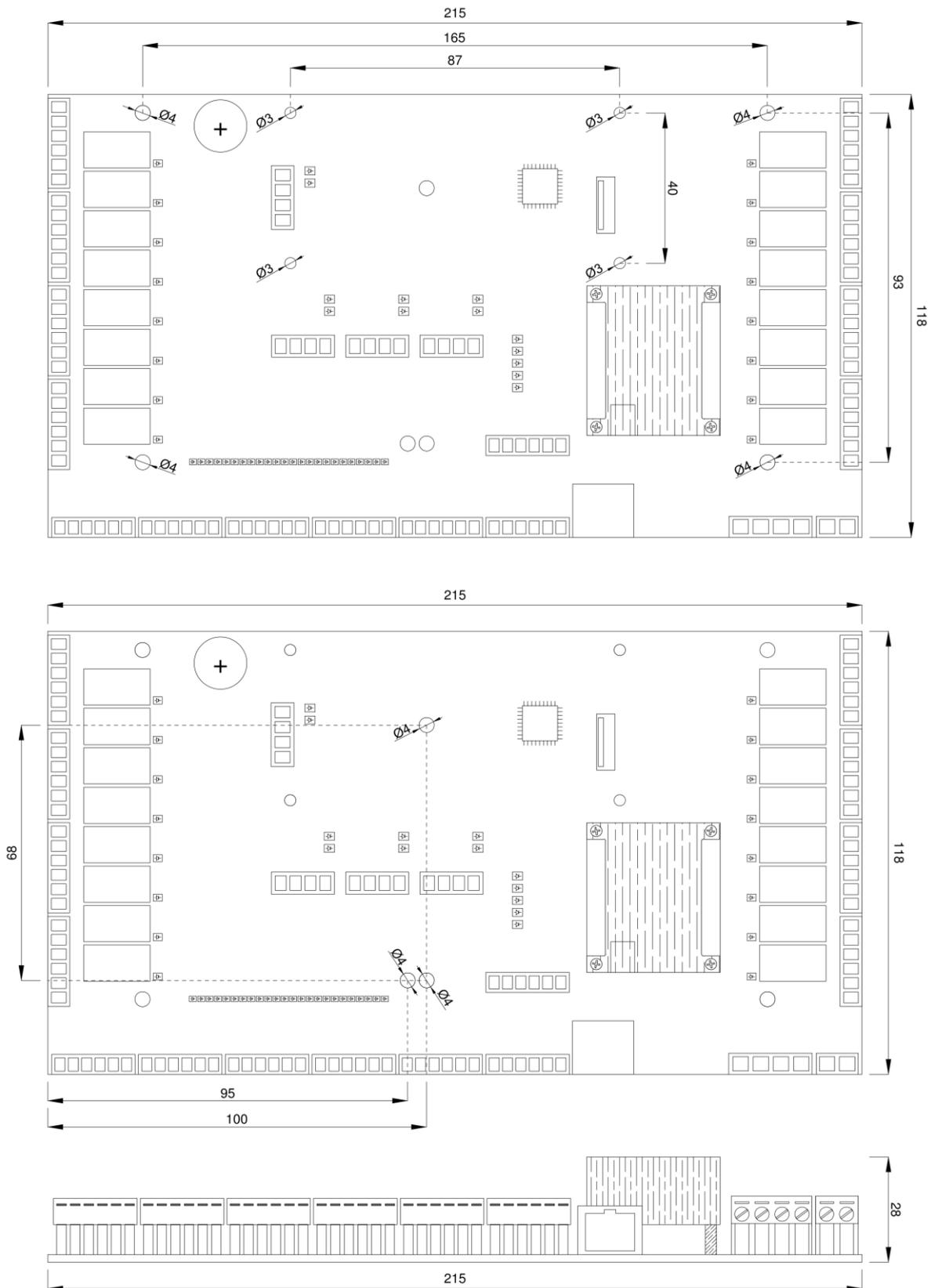
Ports 1, 2 and 3 (7) via RS-485 bus, can be used to connect Noder MD-R and MDK-R readers after native protocol or other readers, using OSDPv2 protocol and Wiegand interface (dedicated converter should be used to operate readers using Wiegand interface). The current connection status on a particular port can be checked by means of the **RS-485 communication LEDs (8)** - when the readers are properly connected, the green and red LEDs should flash with a frequency of about 15Hz (to the human eye it looks like an almost continuous light). The **RS-485 bus for connecting external devices(9)** is used for communication with other integrated devices, such as the Noder IO16RS elevator module (when properly connected, the **communication diodes (10)** should behave as in the case of ports for connecting readers), or the Suprema FaceStation 2 biometric face reader (for this device, communication with the controller takes place only when the face is read - the green **communication LEDs of the expansion bus (10)** flashes).

The **+12V power connector (11)**, are used to power the controller. The **DEC power connectors (12)** can be used to power and switch on/off other devices (note that the controller has built-in protection, which can switch on the fuse when the rated current is exceeded - see section 8.2).

The **CR battery (13)** is responsible for maintaining the date and time on the controller. The current status of the controller can be checked using the **information LEDs (14)**. The **USB port (15)** can be used for services work, such as resetting network settings to factory defaults. Use the **ETH port (16)** to connect to other devices. The **analog input device connectors (17)** and **microSD card slot (18)** are not used in the controller.



6. EE12 controller dimensions



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7. Characteristic

Characteristic	
CONTROLLER TYPE	EE12
SUPPORTED PASSING TYPES	10 passes with one-sided access control / 6 passes with two-sided access control (any combination possible)
NUMBER OF CARDS	1 024 000
NUMBER OF STORY EVENTS	2 048 000
FUNCTION PREVENTING RETRIEVE AND ZONE CONTROL	If connected to the server – global AntiPassBack In autonomic operating mode – local AntiPassBack
UPDATE OF DRIVER SOFTWARE	Remote

Technical Specification	
NUMBER OF SUPPORTED READERS	Up to 12
SUPPORTED READER INTERFACE	RS-485 Native AES 256 with encapsulation, OSPDv2
COMPATIBLE READER TYPES	Any contactless, biometric, bar, magnetic, etc.
COMMUNICATION WITH READERS	3 x RS-485
COMMUNICATION WITH SERVER	LAN/WAN
PROGRAMMABLE INPUTS	20 parameterized inputs (Detectors, buttons, reed switches, alarm, etc.)
PREDEFINED INPUTS	4 parameterized (AC, BAT, TMP, DR) (No AC [230 V power supply], low battery voltage/ lack of battery, failure of the power supply 12V DC, housing opening)
PROGRAMMABLE OUTPUTS	16 relay outputs NO/NC, 3A, 24V DC (Electric strike, tripod, signaler, etc.)
CLOCKWORKS POWER SUPPLING	CR battery
SUPPLY VOLTAGE	12V DC
ENERGY CONSUMPTION (WITHOUT READERS)	approximately ~150mA (max. ~280mA)
DIMENSIONS	215 x 118 x 28mm
WEIGHT	290g
WORKING TEMPERATURE	-10 °C - +55 °C
STORAGE TEMPERATURE	-20 °C - +70 °C
AMBIENT HUMIDITY	<80%
NORMS	CE

8. Power supply, built-in protection and special inputs of the controller

Chapter eight contains information on how to connect the controller power supply and special inputs. Recommended wiring and the controller's internal overvoltage protection are described.

8.1 Connecting power and special inputs

The controller should be powered from a 12 V DC buffer power supply. Do not connect inductive devices to the controller's power connector, as they may cause power interference. These devices should be connected directly to the power supply connectors. To connect the power supply to the controller, select the appropriate cable cross-section according to the requirements of the system.

The default power supplies used in Noder control systems have built-in relay-type technical outputs. After connecting them according to the **"Standard Wiring Diagram for Power Supply and Special Inputs in Noder Housing"**, the operator can check the current status of the devices. Batteries should be connected to dedicated inputs in the power supply. If 230V AC is lost, there will be an automatic switchover to battery power and switching of the EPS relay. By default, the controller will send an event to the system about the absence of 230V. When the voltage on the power supply drops to 11.5V, the second APS relay will switch over and a low battery/no battery event will be displayed. The same event will be sent when the battery is not connected. The battery charging current is configurable via a jumper located on the power supply. The EE12 controller has a built-in voltmeter to send the voltage level applied to the controller. When the voltage drops to <10.5V, and an under-supply voltage event is generated automatically. For power supplies, a battery test is performed every 5 minutes. If the batteries are not connected during the test, then the voltage value at the output of the PSU drops momentarily below 10.5V, and an under-supply voltage event is automatically generated (value of the supply voltage given in the event may already indicate the correct value of the voltage, because its drop was instantaneous, i.e., the event is generated with a delay relative to the voltage drop).

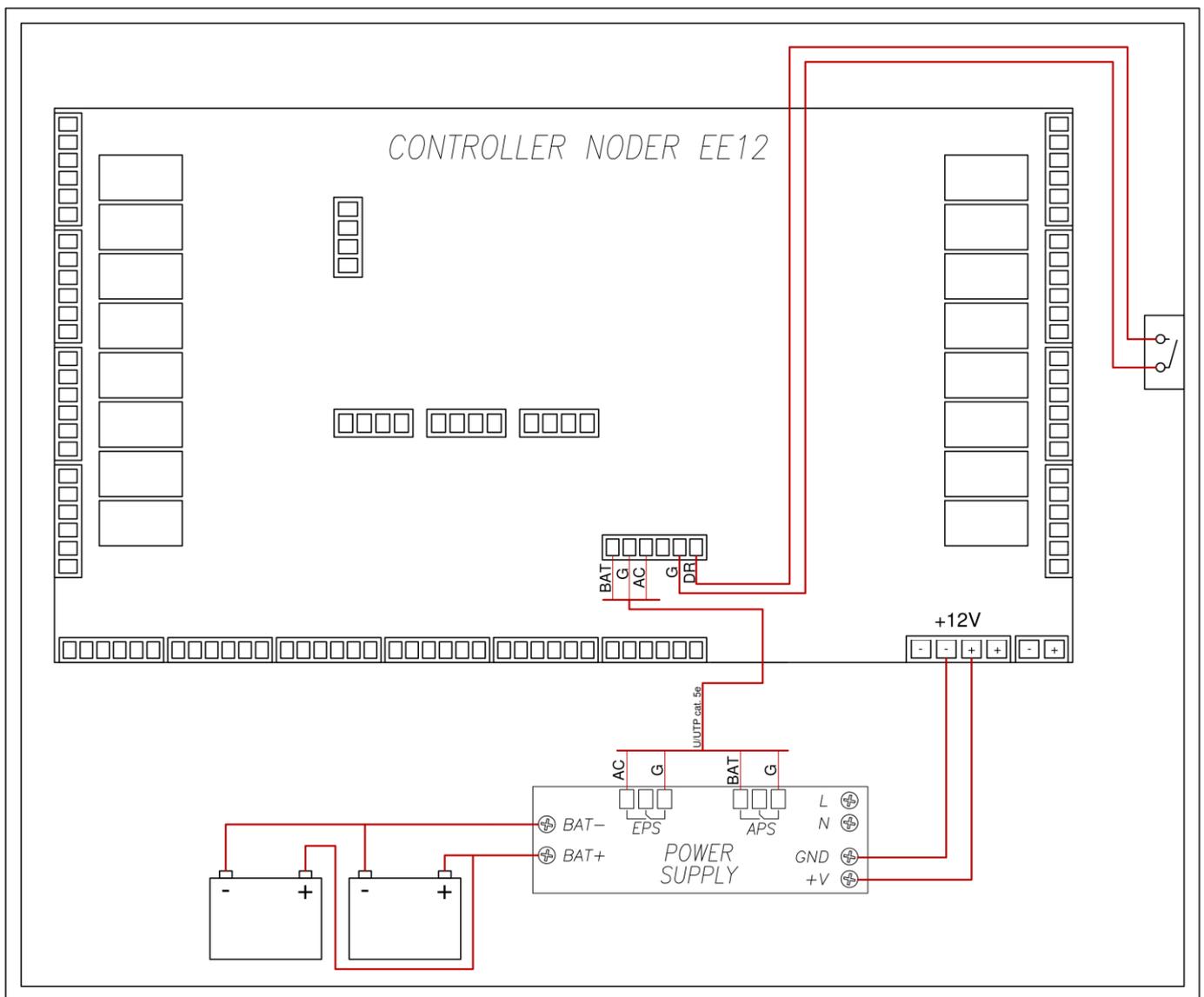
The controller has the possibility to monitor the opening of the housing door. The **"Standard Wiring Diagram for Power Supply and Special Inputs in Noder Housing"** shows an example of connecting the door tamper to the controller's special input. When they are opened, a corresponding event is generated in the system. When monitoring more than one door (e.g., the door of an enclosure that houses batteries), the tampers should be connected in series.

The controller's special signal connectors are configured as follows:

- **BAT** - low voltage on the battery/ lack of battery;
- **AC** - 230V power supply is not available;
- **TMP** - damage to the 12V DC power supply;
- **DR** - serial connection of all tamper cabinet doors and wall mounting.

For default power supplies, the TMP input is not used, but can be used when connecting another power supply. Special inputs can also be used as standard controller inputs (representing, for example, a reed switch).

Standard wiring diagram for power supply and special inputs in Noder housings:

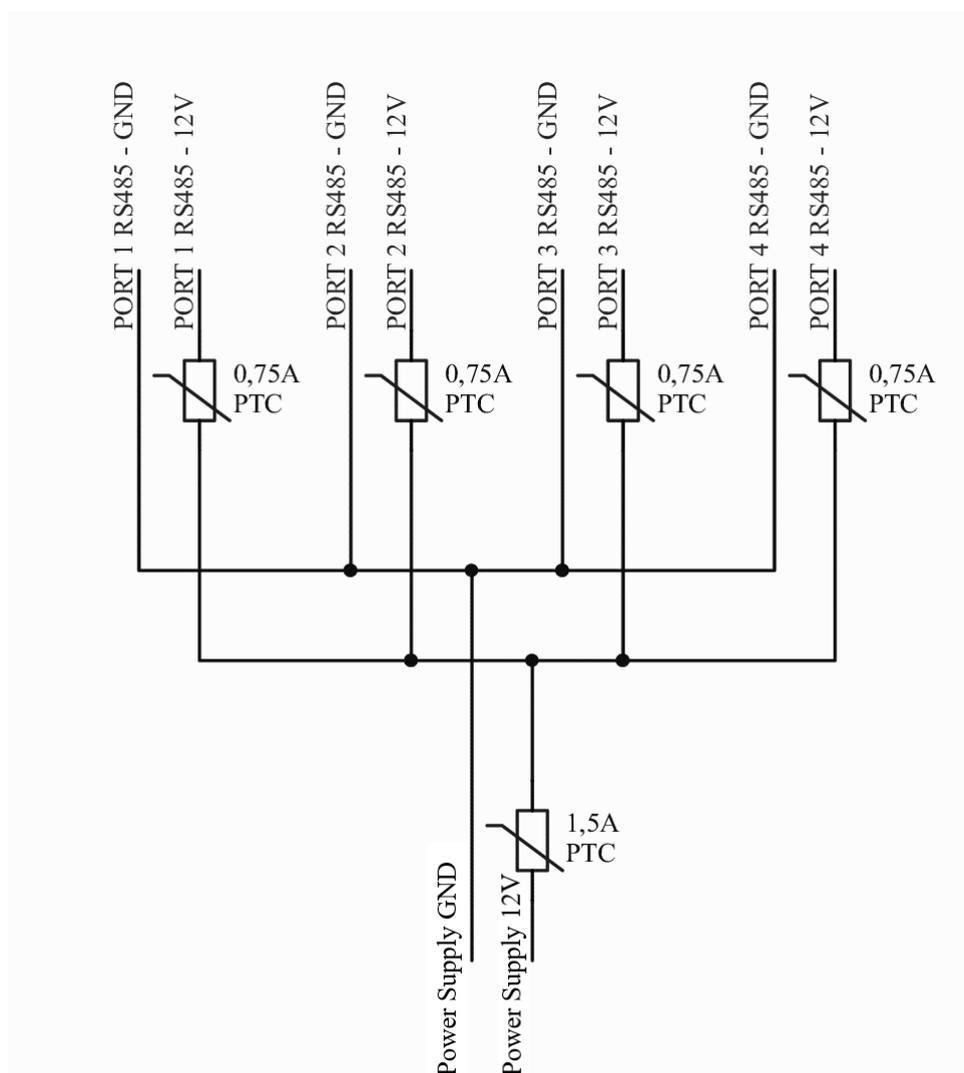


8.2 Built-in electrical protection of the controller

The controller is equipped with overcurrent protection by means of PTC polymer fuses with the following loads:

- Power input: 1,5A;
- Power outputs of the RS-485 bus (PORT1, PORT2, PORT3 and PORT4): 0,75A.

The controller is also equipped with overvoltage protection using Zener diodes on the RS485 bus, digital/analogue inputs and Wiegand bus. The diagram below shows a detailed drawing of the built-in protections:



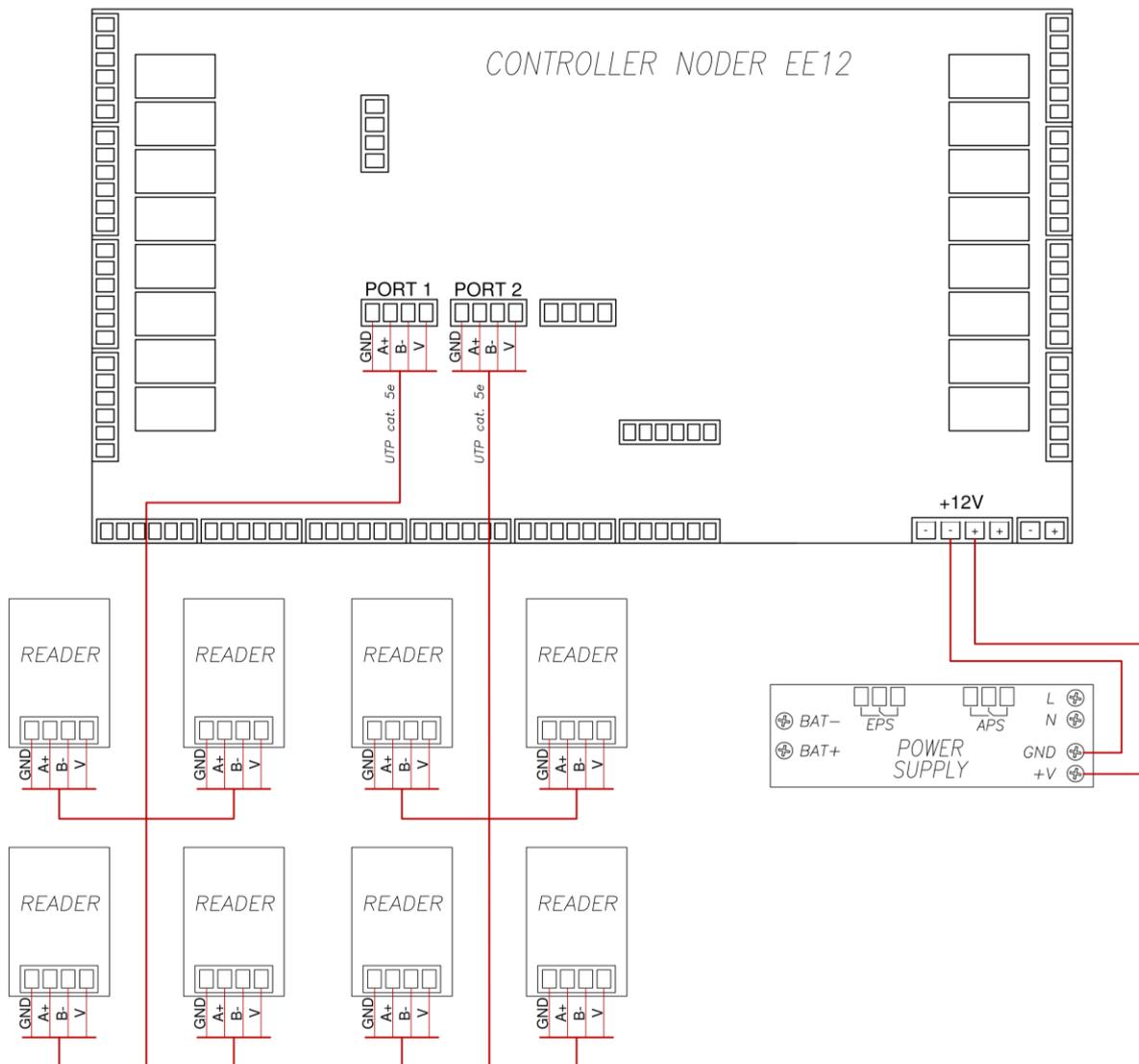
Note that the DEC relay output is located behind the 1.5A PTC fuse and it is necessary to calculate the total current consumption of the devices before connecting additional external devices to it. Exceeding the rating may lead to tripping of the fuse.

9. Connection diagrams of devices to the controller

This chapter contains information on connecting devices to the controller.

9.1 Readers connection

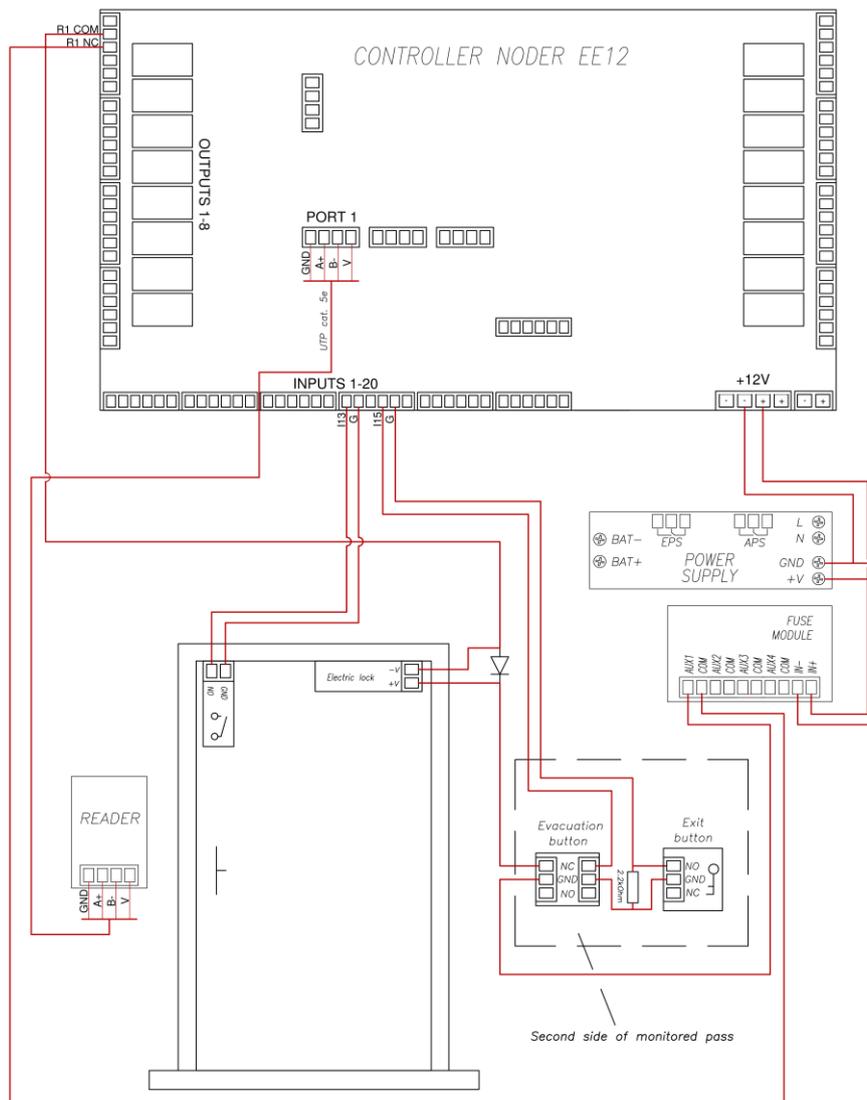
Ports 1-3 are used to connect readers. These are RS-485 bus ports and allow connecting up to 4 readers to a single port. Readers should be connected in parallel. It is recommended to connect readers in so called "Star" - each reader plugged directly into a port of the controller. The maximum length of the bus must not exceed 1200m. In the case of a several hundred-meter bus, appropriate measurements and line adjustment should be performed with terminating resistors. For connecting the readers, UTP cat. 5e cables can be used, for longer distances it is recommended to use shielded cables. The cross-section of the wires should be adjusted to the distance so as not to exceed the permissible voltage drops for the readers used.



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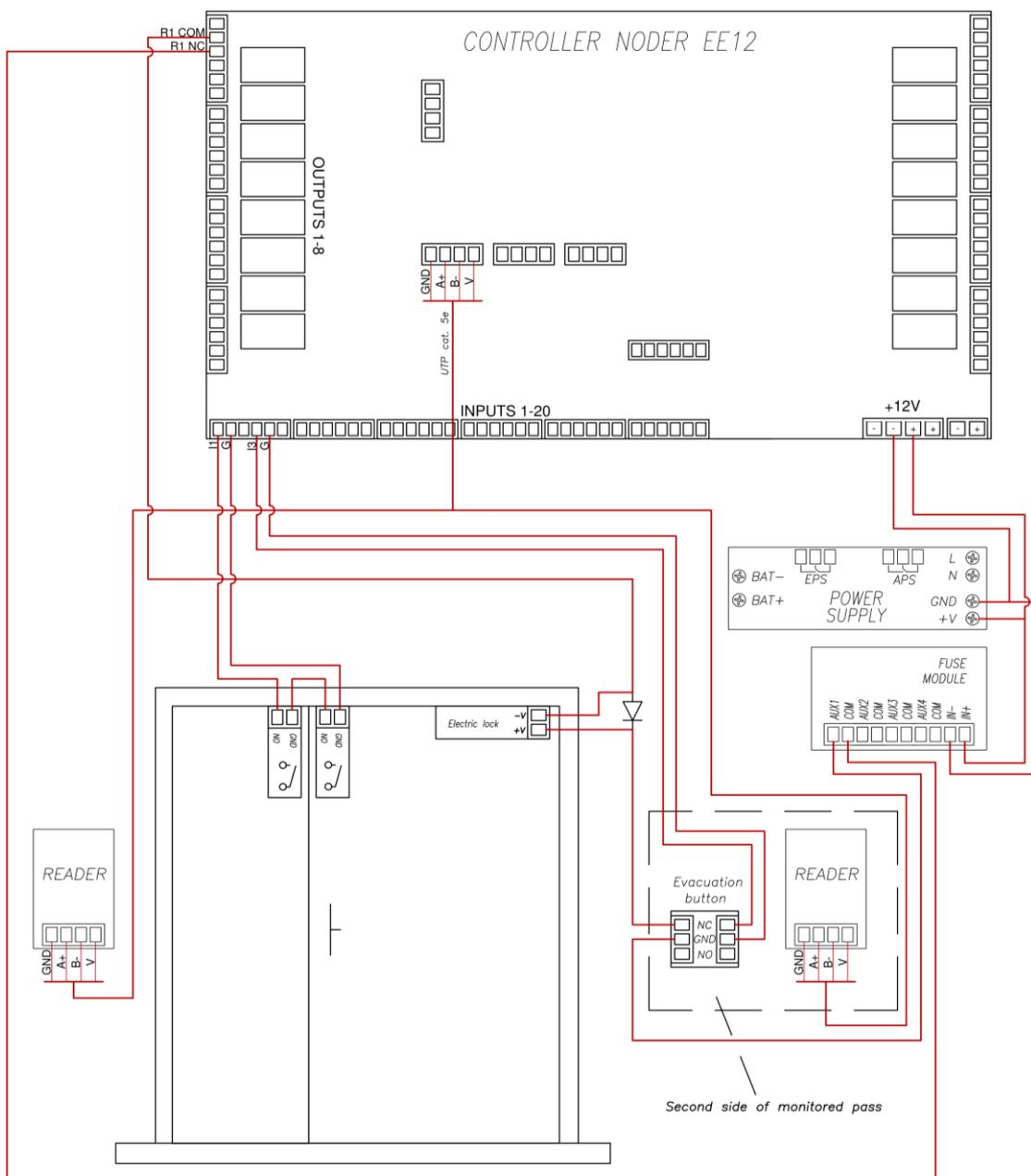
9.2 Single-left doors, one-sidedly monitored with EoL

Example of a single-sided passage with a Noder MD-R/MDK-R reader (or any other using the OSDPv2 protocol) connected to 1 port of the RS-485 bus and an exit button on the other side. The executive component is a reversing lock controlled by the controller's relay no. 1 (NC connector). It is powered from a fuse module equipped with appropriately selected fuses. In the example uses an evacuation button that, when pressed, drops voltage from the actuator. The second of the NC contacts of the evacuation button has been connected to the exit button and connected to input no. 15 (parameterised with a 2.2kOhm resistor - this solution saves one input. Using a resistor other than 2.2kOhm may cause the input status to be read incorrectly.). Another way of connection is to separately connect the exit button and escape button to different inputs of the controller and configure according to their logic. Within a single system, it is recommended to make the connection of inputs in one way, i.e., parameterized or non-parameterized. The status of opening/closing the door is checked by means of a contractron connected to the input no. 13. **A rectifying diode** should be used at the actuator (recommended model - 1N4007). Its absence may cause damage to the controller relay.



9.3 Double doors, both-sidedly monitored

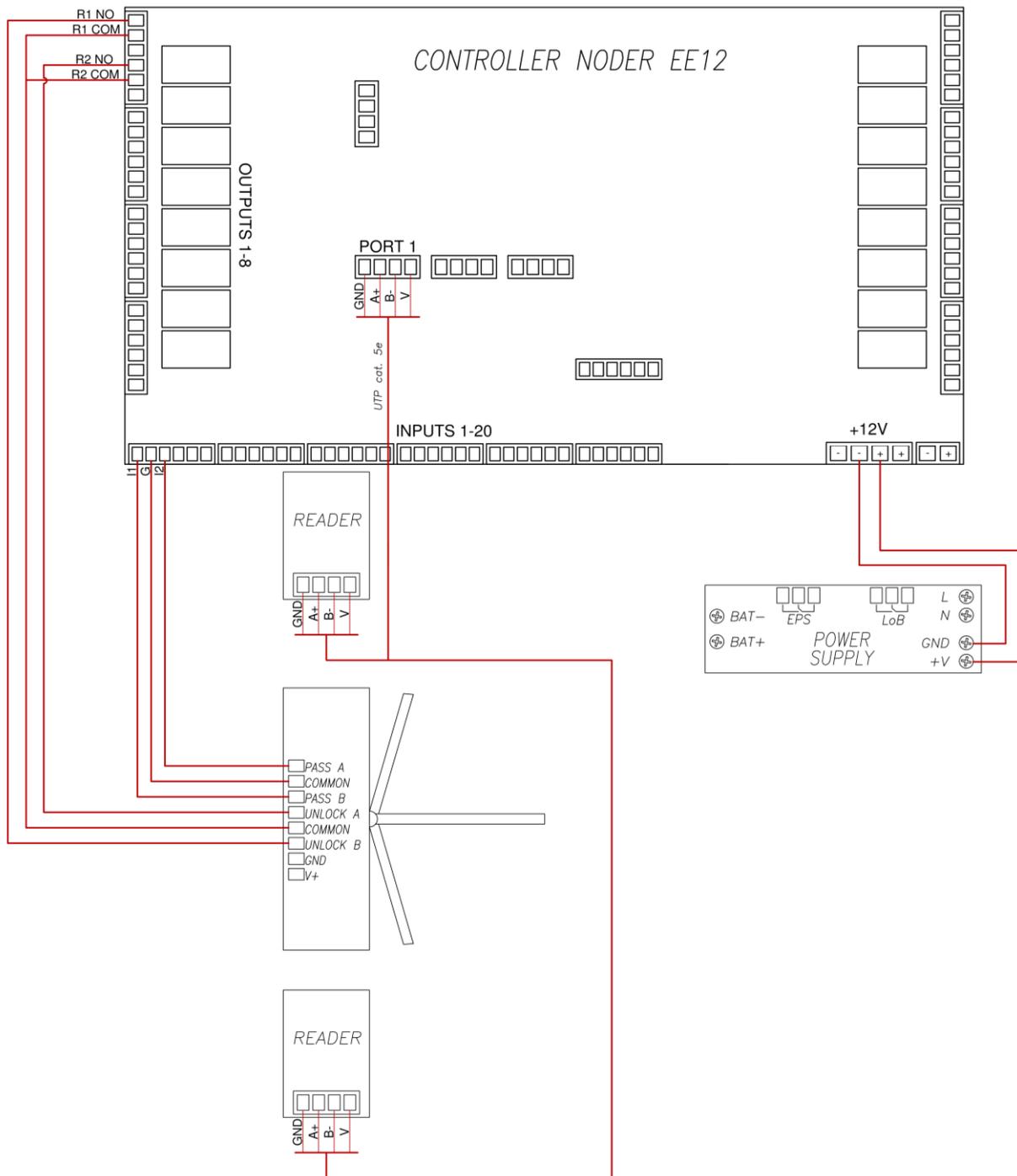
Example of a two-way passage with Noder MD-R/MDK-R readers (or others using the OSDPv2 protocol) connected to 1 port of the RS-485 bus. The actuator is a reversing lock controlled by relay no. 1 of the controller (NC connector). It is powered by a fuse module equipped with appropriately selected fuses. The example uses an evacuation button which, when pressed, drops voltage from the actuator. The second of the evacuation button's NC contacts has been connected to the controller's input no. 3 and the controller's ground. The open/closed status of the door is checked by serially connected reed switches. When one of the leaves is opened, a signal is sent to the controller by opening the ground to input no. 1. **A rectifying diode** should be used on the actuator (recommended model - 1N4007). Its absence may cause damage to the controller relay.



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9.4 Two-sided turnstile connection

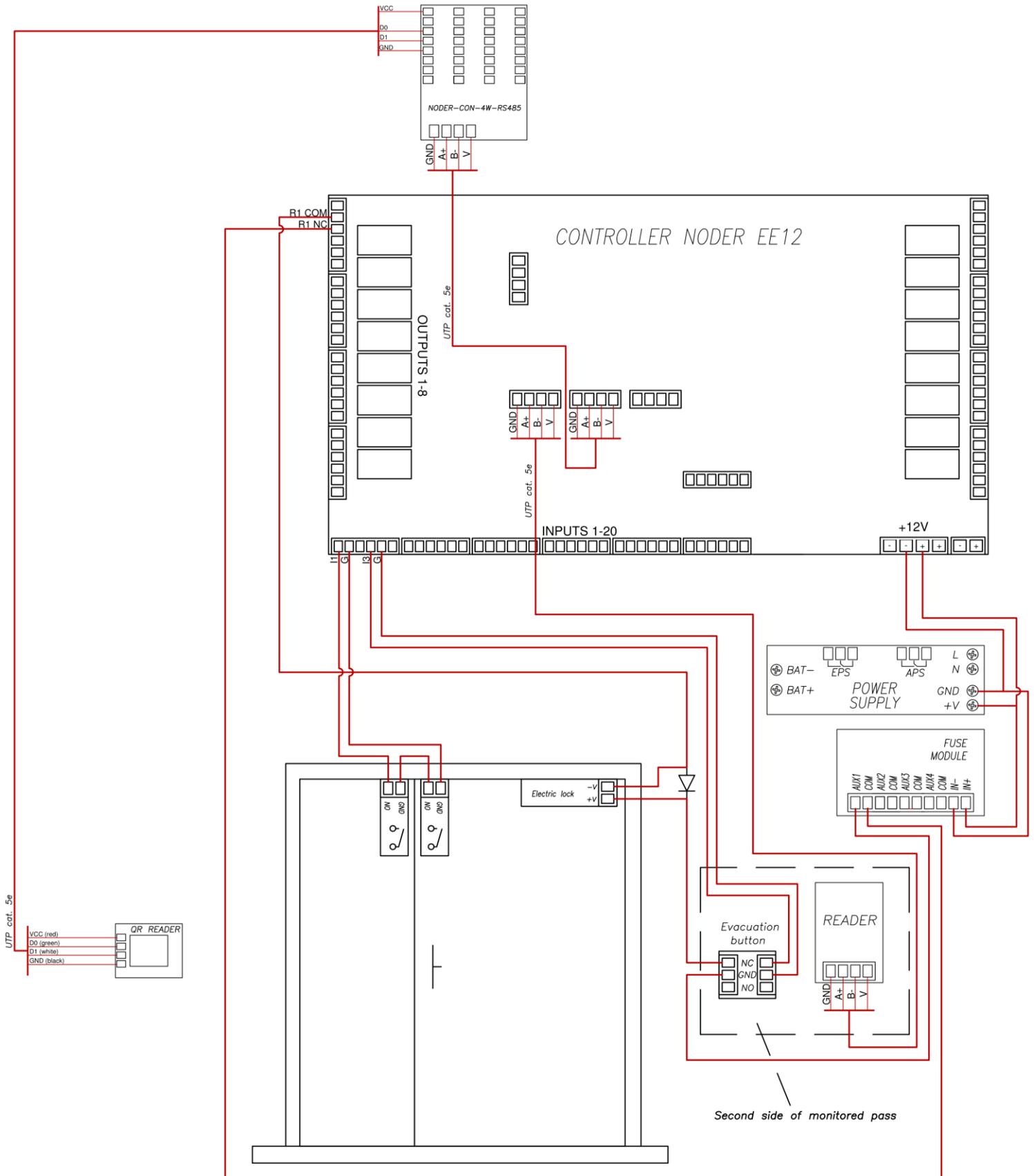
Example of a two-way gateway/tripod passage with Noder MD-R/MDK-R readers (or others using the OSDPv2 protocol) connected to 1 port of the RS-485 bus. When an authorised card is applied, the corresponding controller relay is activated (in example 1 or 2), which unlocks the passage in the specified direction. It then locks after a specified time or user transition. Feedback signals are connected to controller inputs 1 and 2 to determine whether the system user has physically crossed to the other side.



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9.5 Passage with QR reader

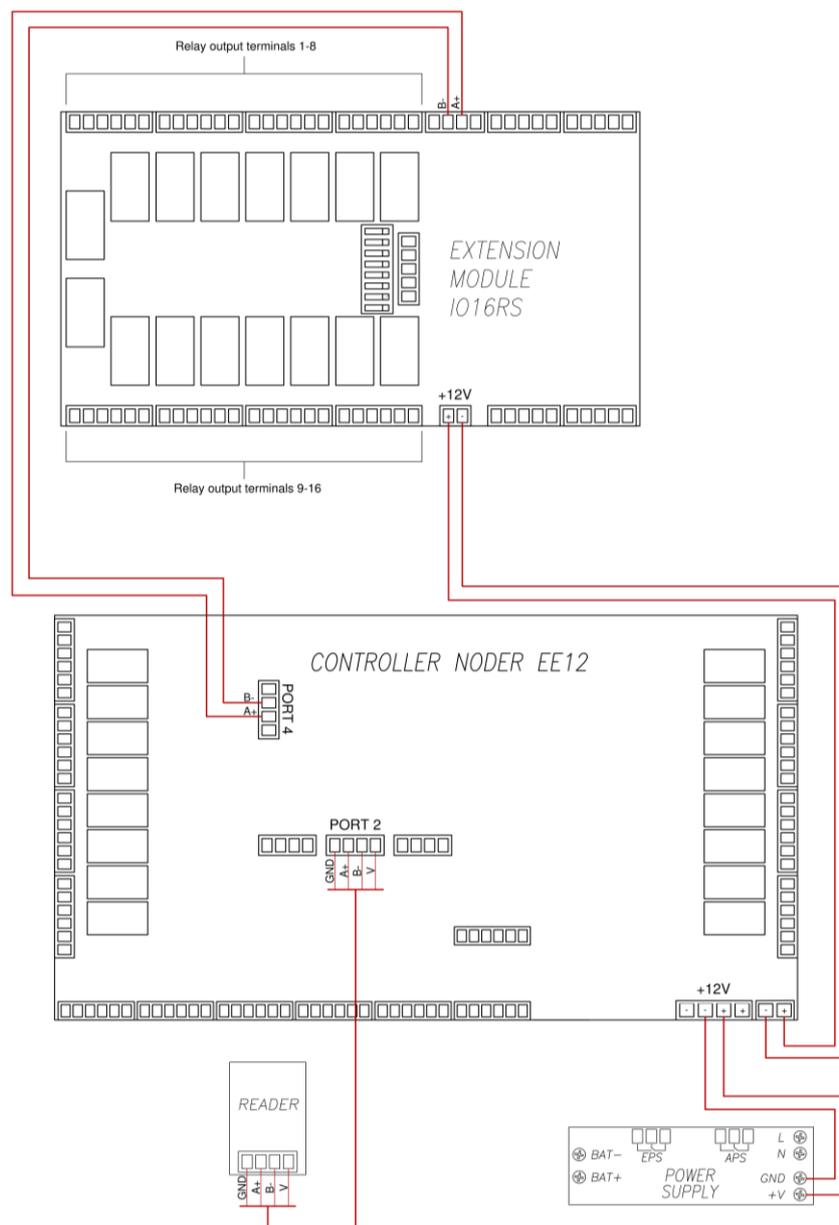
Example of two-way passage with Noder MD-R/MDK-R reader (or other according to OSDPv2 protocol) and QR reader using Wiegand interface. The connection with the reader is possible by using Noder CON-4W-RS485 converter. The actuator is a reversing lock controlled by relay no. 1 of the controller (NC connector). It is powered by a fuse module equipped with appropriately selected fuses. The example uses an evacuation button witch, when pressed, drops voltage from the lock. The second of the evacuation button's NC contacts has been connected to the controller's input no. 3 and the controller's ground. The open/closed status of the door is checked by serially connected reed switches. When one of the leaves is opened, a signal is sent to the controller by opening the ground to input no. 1. A rectifying diode should be used on the actuator (recommended model - 1N4007). Its absence may cause damage to the controller relay.



9.6 Connecting the extension module IO16RS

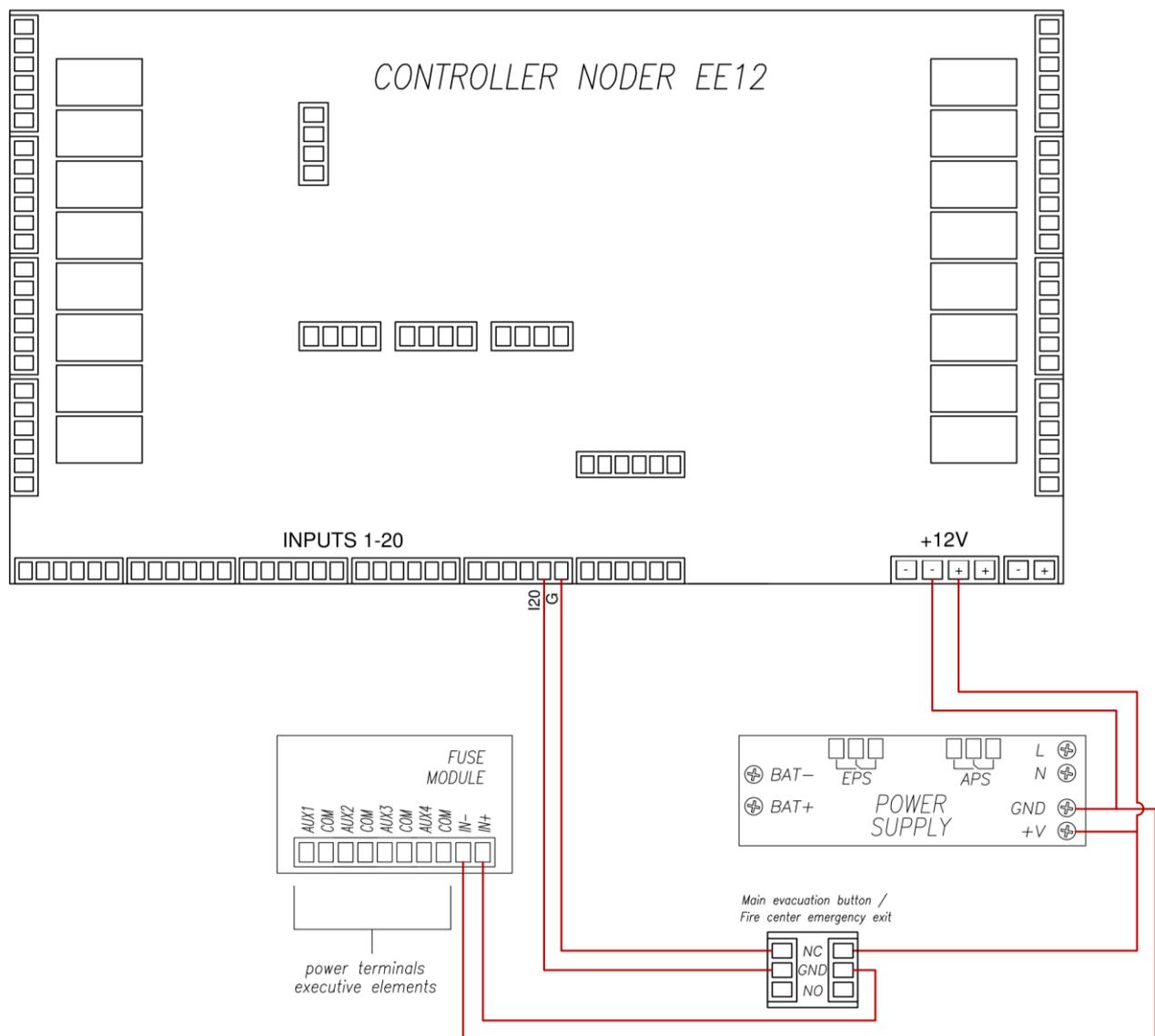
The 4th port of the controller is used to connect the RS-485 communication of the extension module. It is recommended that the IO16RS power supply be connected to the DEC relay output. This allows remote restart of the device. Information on addressing the extension module is included in its technical documentation.

The possibility of taking the elevator to given floors is indicated on the basis of the authorization of the user's card, which the user applied to the reader located inside the elevator and assigned to the extension module. Once the card has been authenticated, relays are activated representing the building floors. A single controller can serve a maximum of 64 floors (4 extension modules).



9.7 Emergency door opener connection

The main evacuation button / alarm relay from the fire panel should be connected between the power supply and the fuse module power supply. The second of the GPE contacts in the example is connected to input no. 20 of the controller to monitoring its status. In the case of the fire panel, a separate relay should be used for this purpose, since the inputs on the controller are potential-free and applying voltage to them could damage the controller.



10. First start

The first time you start the controller, you must give it a unique IP address for your network. By default, the controllers are assigned the address **192.168.117.230** in the network with the mask **255.255.255.0** and the gate **192.168.117.1**. You need to set up your computer in this network and then log in using the web browser:

- default login: **admin**
- default password: **123456**

NASAdmin

rev 2.3(210726)

After logging in, an information page about current state of the controller will be displayed:

Noder EE12 rev 2.3(211025)

MemTotal: 503188 kB
 MemFree: 118688 kB
 MemAvailable: 274636 kB
 SwapTotal: 524284 kB
 SwapFree: 524284 kB

- Dashboard
- 🌐 Network settings ▼
- ⚙️ Configuration ▼
- 🖥️ Terminals

NASAdmin

```

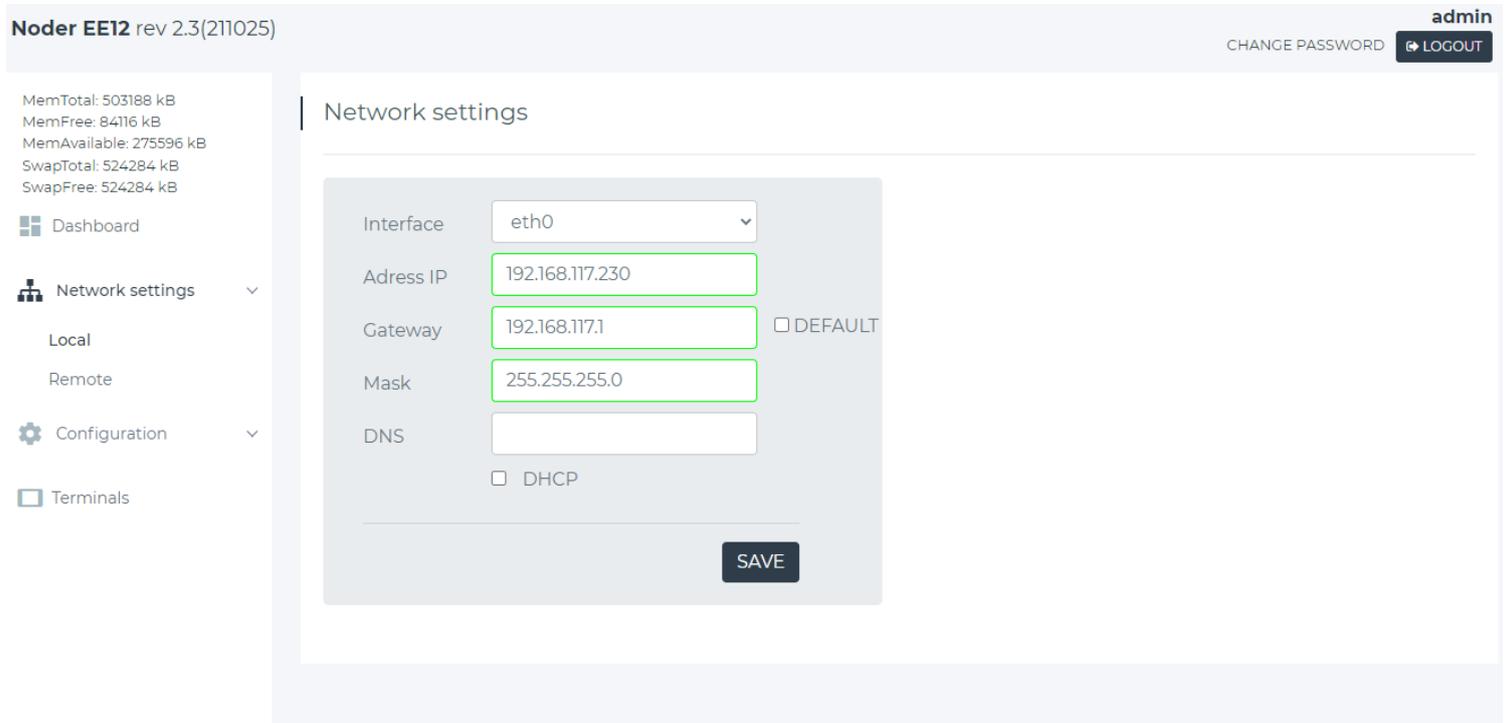
MAC eth0: 02:81:09:28:99:F7
WLAN: no adapter found
Main EMMC/SD, total: 7.3 GiB
Spare EMMC/SD: not installed
USB drive: not installed
DB/FTP storage: 3.7G(total), 763M(used), 2.8G(free)
RAM Total: 503188 kB
RAM Free: 118136 kB
RAM Available: 274116 kB
CPU Temp: 27.4°C
Linux Apk: OK!
Update Apk: OK!
SQL server: OK!
Time: Thu Feb 2 11:49:46 UTC 2023
SN: 00-D1-69-2C-15-03-4D-42
FW version: 1FW__v140
FW compilation: Mar 23 2022 14:09:47
Apk version: RC44
Apk compilation: Jan 18 2023 09:37:18
Logs: 0
System name: 4.14.111 GNU/Linux
System uptime: up 1 minute
kdApp uptime [dd-hh:mm:ss]: 00:33, PID:2333
updateDaemon uptime [dd-hh:mm:ss]: 00:49, PID:1096
          
```

On the left side there are tabs for network settings options and configuration options. In addition, other devices such as RCP readers can be configured in the **“Terminals”** tab.

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10.1 Network settings

To change the IP address, select **Network settings** -> **Local**. In the window that opens, enter the new network settings and then click **Save**.



Noder EE12 rev 2.3(211025) admin
CHANGE PASSWORD LOGOUT

MemTotal: 503188 kB
MemFree: 84116 kB
MemAvailable: 275596 kB
SwapTotal: 524284 kB
SwapFree: 524284 kB

- Dashboard
- Network settings**
 - Local
 - Remote
- Configuration
- Terminals

Network settings

Interface: eth0

Address IP: 192.168.117.230

Gateway: 192.168.117.1 DEFAULT

Mask: 255.255.255.0

DNS:

DHCP

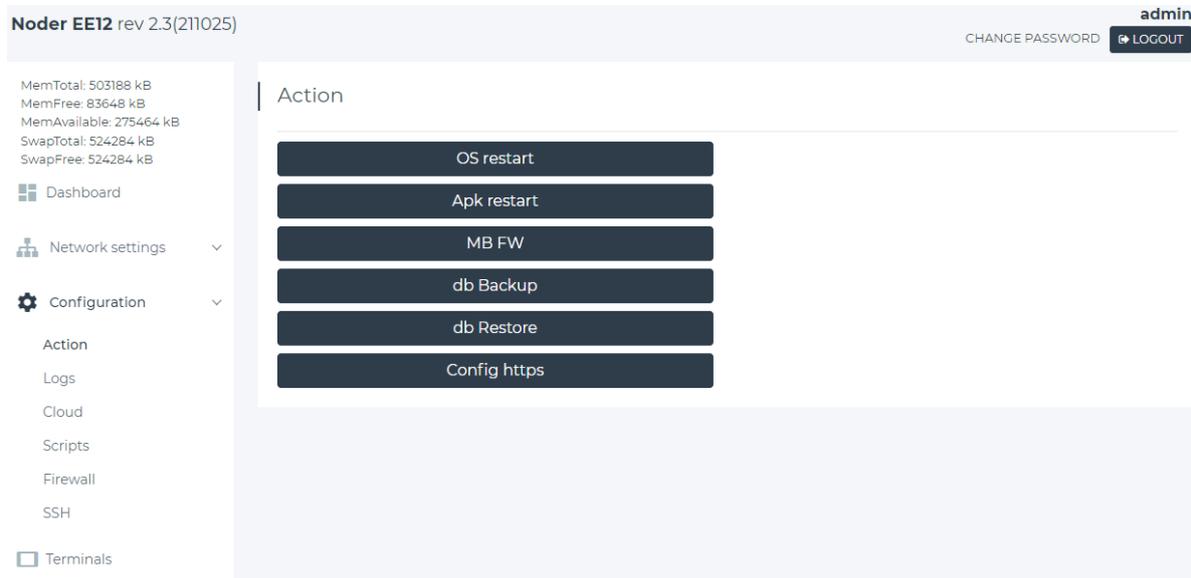
SAVE

© 2022 NASAdmin

The controller should have a static IP address. If there is no configuration on the network side to securely assign the device always the same address, then the DHCP option should be unchecked. If it is checked, the address setting options will be greyed out, and the address assignment option will be taken over by the DHCP controller. To check, after setting the destination address, change the computer's network settings and connect to the controller's newly assigned IP address.

10.2 Configuration options

In the basic configuration of the controller, only the “**Action**” tab is used.



The **Action** tab gives you the possibility to restart device elements such as:

- **OS restart** – Restart the operating system (the entire controller). Use this option when **SQL server** has a state other than OK or **Apk restart** did not solve the problem.
- **Apk restart** – restart the controller application. Use this option if the **Linux Apk** has a state other than OK.
- **MB FW** – PIC microprocessor software update from the internal memory of the controller.
- **db Backup** – creating a copy of the internal security of the controller's database.
- **db Restore** – restoring the database from a backup copy saved to the internal memory.
- **Config https** - allows you to generate a new https certificate.

11. LED information's on controller

The controller is equipped with diodes informing about the operating status of the device:

- **ERR** - red, lighting or blinking means that the hardware error of the device has been detected.
- **APK** - green, blinking means correct operation of the controller application.
- **CPU** - in the bootloader mode blinking alternately with the STA diode, indicates bootloader mode.
- **ETH** - in the bootloader mode, receive the FW frame.
- **STA** - works together with the CPU as described above, and blinks when the microcontroller is working properly.

12. Addressing readers

Readers connected to ports should be addressed. Addressing of readers is done with programming cards available from the manufacturer. The set includes cards with addresses from 1 to 4. A maximum of 4 readers can be addressed on each bus port. The addresses are as follows:

Reader address	Port	Logical address in the controller
1	1	1
2	1	2
3	1	3
4	1	4
1	2	5
2	2	6
3	2	7
4	2	8
1	3	9
2	3	10
3	3	11
4	3	12

The reader is in addressable mode for 10 seconds after being connected to the power supply. When the programming card is applied, the reader reprograms itself (reads the card and starts flashing the green LED at a frequency of about 1Hz), then reboots and signals with a green LED blink and a beep. The number of flashes and beeps corresponds to the assigned address of the reader. A reader with an already assigned address will always signal its address with a sound and a green diode flash after being connected to the power supply.

13. Further configuration

After connecting all devices: readers, buttons, reed switches, power supplies and others, and addressing the readers with special address cards, you should collect information about the devices and ports to which they are connected and go to Device Configuration in the AxxonSoft management platform. Device configuration is described in the **Start-up and Configuration Guide**, available at <https://noder.pl/en/downloads/>.