Inveo Sp. z o.o.

Nano

Instruction Manual

Overview

Warning

This manual applies only to the firmware version v0.47 onwards. Inveo does not guarantee that the information contained in this document applies to previous firmware revisions.



Purpose of the device

Nano RFID and Nano RFID PoE devices have been designed to read Unique format RIFD tags, enabling for integration with various systems via LAN.

Thanks to Modbus, HTTP client/server and SNMP support, the devices can be used in a wide range of applications. Their compact size allows for easy installation and integration with existing systems.

Nano RFID PoE can additionally be powered with PoE, making installation easy. The implemented LED's and a sound generator inform the user about the device's state and tag readout operations. Thanks to a wide array of configuration options, the device can operate both as a server and a client in a network, adapting to user's needs.

Changelog

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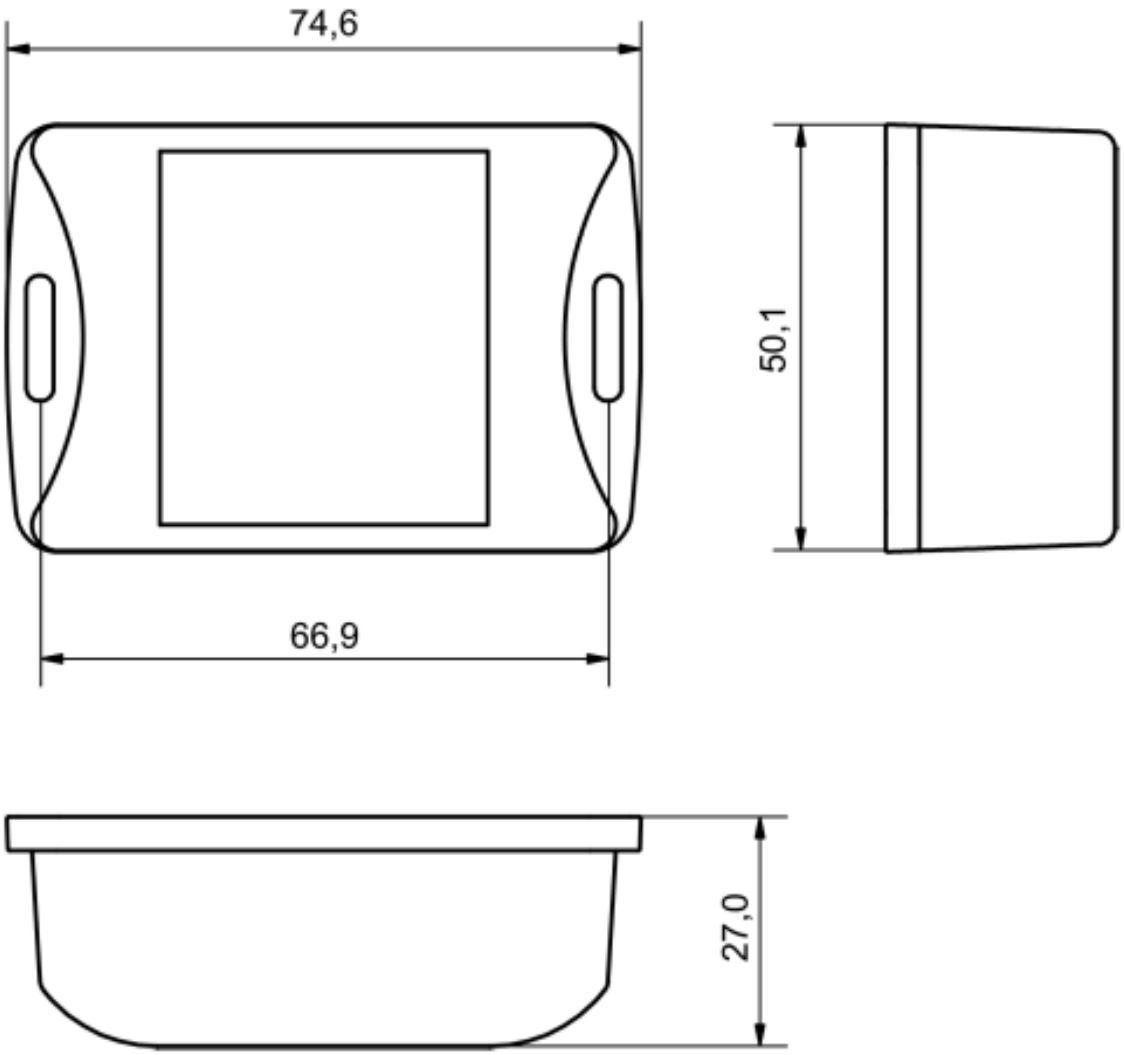
Device construction

Nano RFID PoE

Technical characteristics

Parameter	Description
Power supply	**10-24V DC:** with a 3,5mm pluggable terminal block **PoE:** 33-57V PoE IEEE 802.3af
Power consumption	1,5W
Transponders	**RFID standard:** Unique **Carrier frequency:** 125kHz **Read distance:** up to 8cm
Input	1 input **Input type:** Normally Open (NO) 3,5mm pluggable terminal block
Output	1 output **Output type:** NO, relay, **Maximum relay load:** 1A at 30V DC
Communication	Ethernet 10Mbps Half Duplex, RJ45 port
Enclosure ingress protection	IP30
Weight	ca. 70g (2,5oz)

Dimensions



Information

All dimensions are in millimeters.

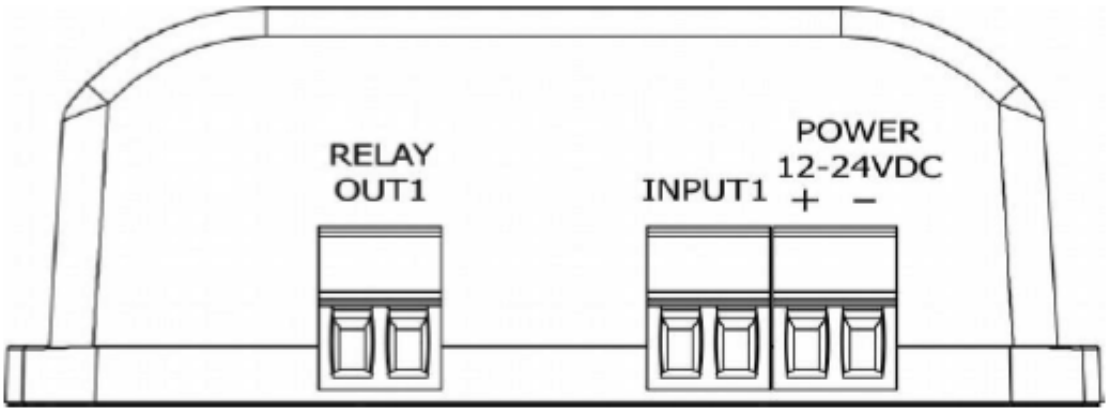
General characteristics

The module is equipped with 2 LED indicators that indicate power supply and tag application.

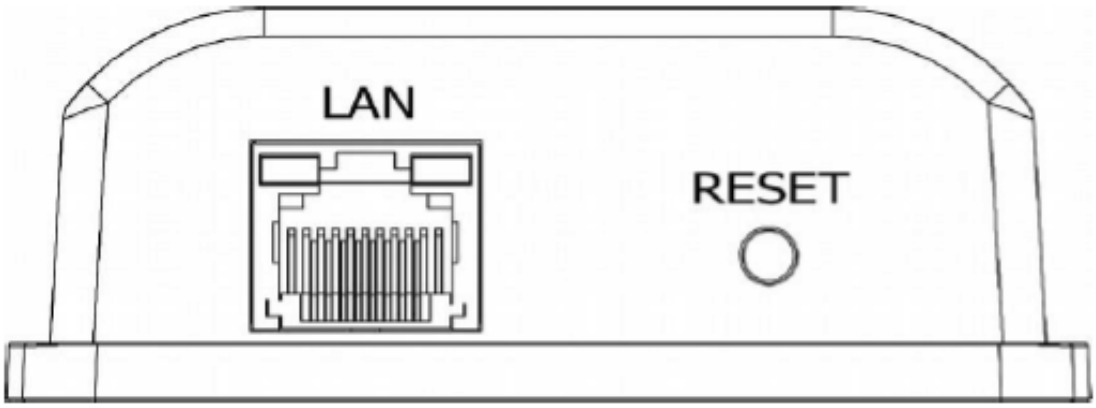
- **POWER** indicates correct power supply,
- **TAG** indicates a correct RFID tag read.



Module connectors description



- **POWER** – Additional power connector when PoE is unavailable. Power supply voltage: 12-24V DC,
- **INPUT1** – NO input. Input state is available via Modbus TCP or HTTP Get,
- **RELAY OUT1** – NO relay output. Output control and state preview are available via Modbus TCP or HTTP GET.



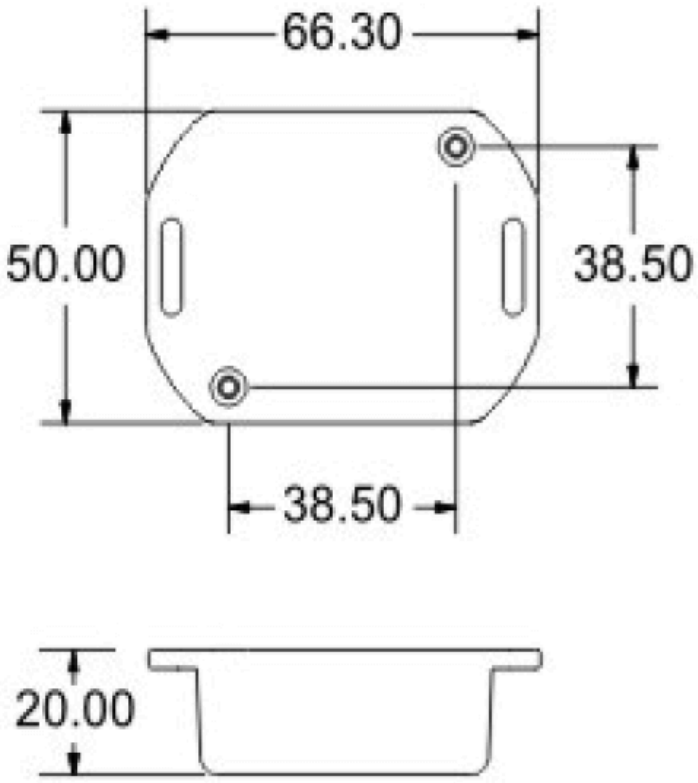
- **LAN** – LAN and PoE IEEE 802.3af,
- **RESET** – Button used to enable DHCP and restore the module to factory settings.

Nano RFID

Technical characteristics

Parameter	Description
Power supply	**Passive PoE:** 10-24V DC with a PoE adapter
Power consumption	1,5W
Transponders	**Standard of read tags:** Unique **Carrier frequency:** 125kHz **Read distance:** up to 8cm
Communication	Ethernet 10Mbps, RJ45 port
Enclosure ingress protection	IP30
Weight	ca. 40g (1,4oz)

Dimensions



General characteristics



The module is equipped with 2 LED indicators that indicate power supply and tag application.

- **POWER** indicates correct power supply,

- **OK** indicates a correct RFID tag read.

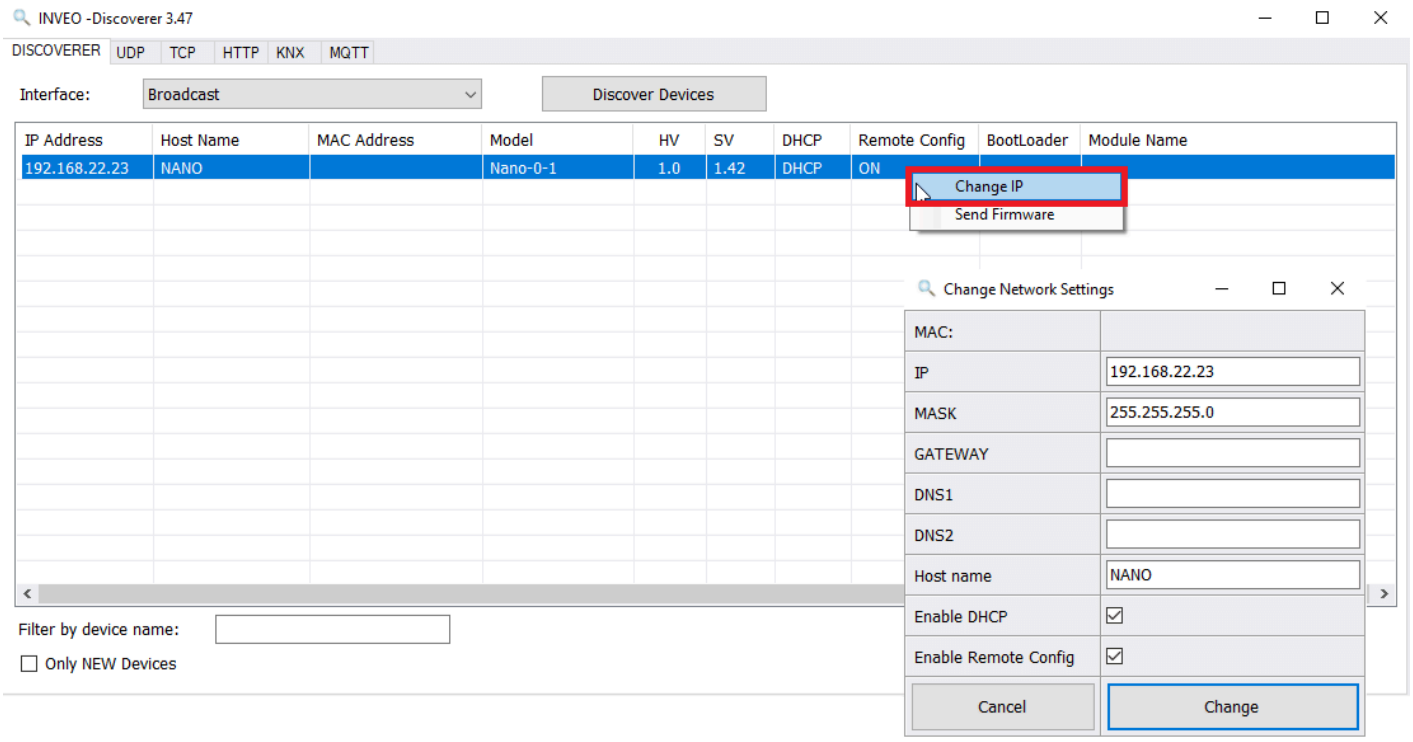
Module connectors description

- **LAN** – LAN and Passive PoE,
- **RESET** – Button used to enable DHCP and restore the module to factory settings.

Network configuration

> **Warning**
>
> **After the initial power-up, it's needed to configure the device. It can be done in two ways, the simplest method is to use the Inveo Discoverer programme.**

Changing the device's IP address - Discoverer programme



After running the **Discoverer** programme and searching for the appropriate device:

1. Right-click the device,
2. Click the **Change** button.

After the dialogue window is opened you can:

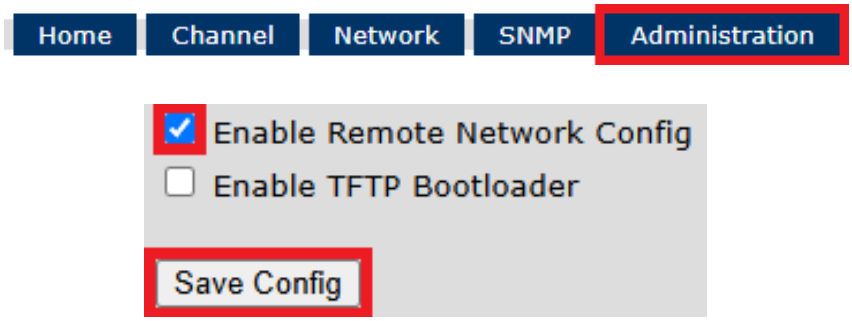
- Set the IP address, mask, gateway, DNS1/DNS2.
- Change the Host name.

> **Note**
>
> **The device will be configured after the Change button is pressed.**

If **Remote Config** is disabled (enabled by default), the device needs to be configured by changing the computer's subnet:

To enable remote configuration:

1. Go to the **Administration** tab,
2. Select **Enable Remote Config**.



> **Tip**
>
> **After making changes, apply them using the Save button**

Changing the computer's subnet address for configuration

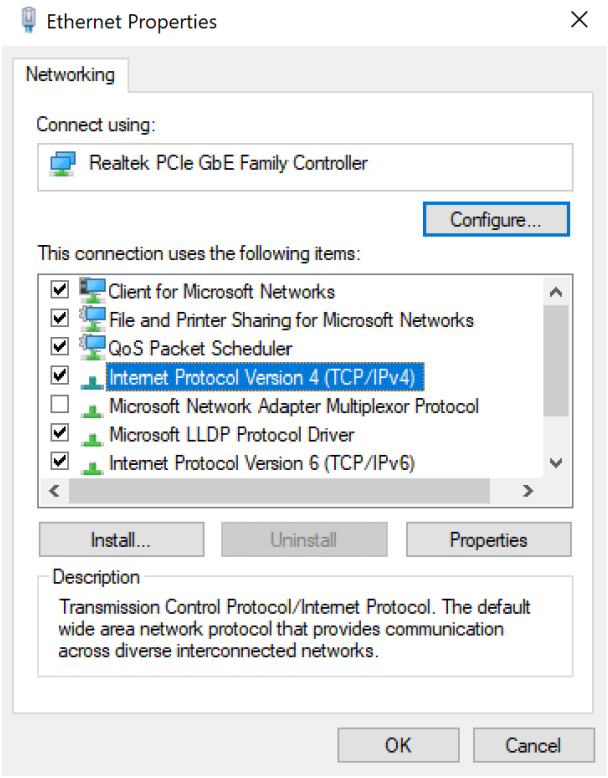
During configuration without **Discoverer** programme, it's needed to change the subnet address of the computer on the same network.

To access the computer's network configuration, do one of the following:

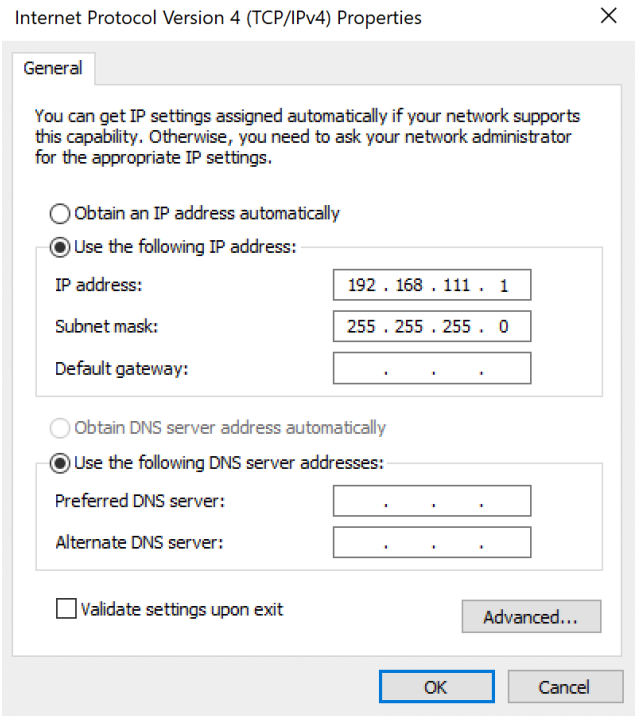
- Press **Win + R**, type in `ncpa.cpl`, and then press **Enter**.
- Alternatively, go to:
  Start → **Control Panel** → **Network and Internet** → **Network and sharing center** → **Change adapter settings**.

Then:

1. Select the network connection.
2. Right-click it and select **Properties**.
3. After selecting this option, network connection configuration screen will appear.



Select **Internet protocol version 4 (TCP/IPv4)** and type in the following parameters:

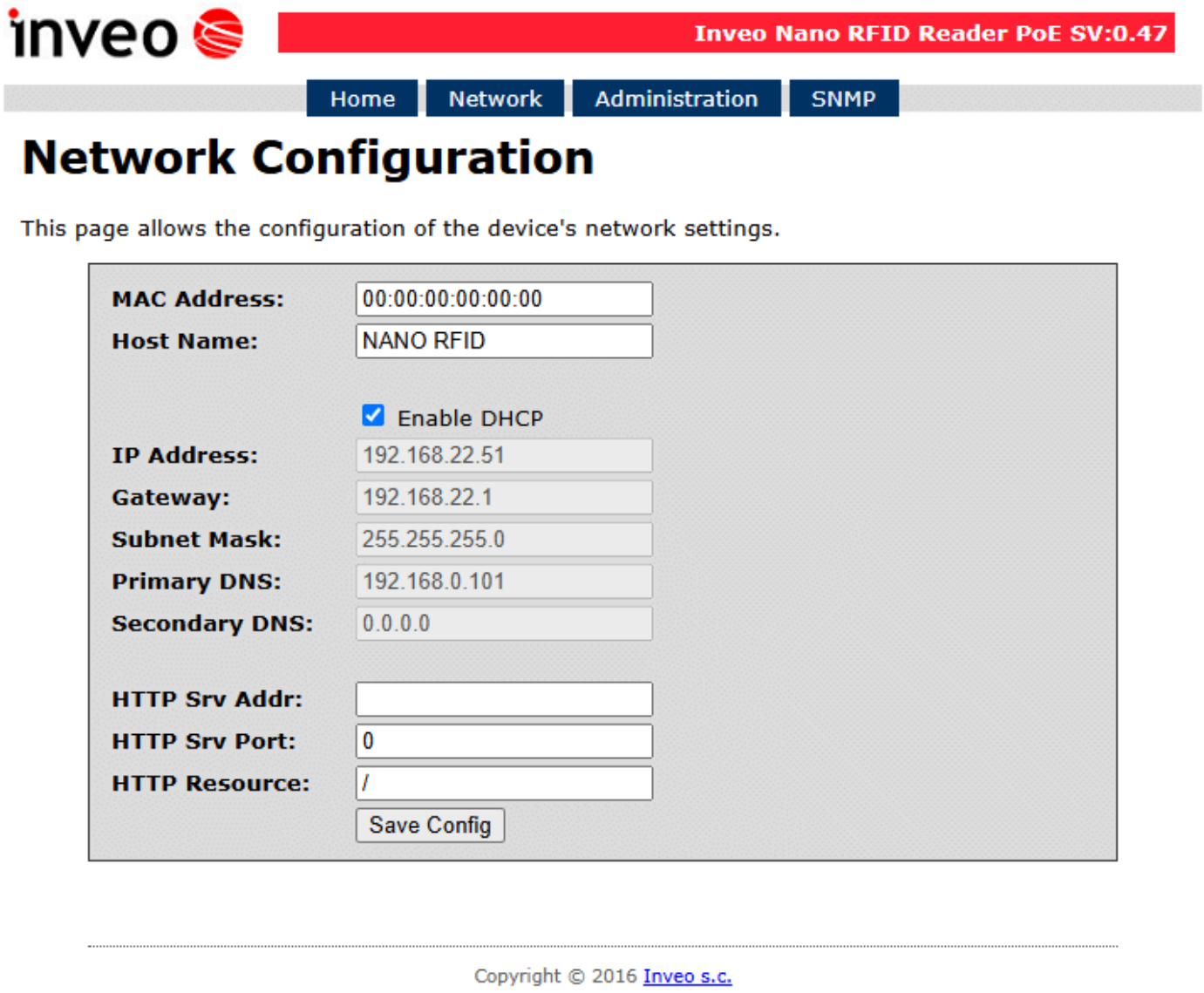


Note

After applying the configuration with OK, start a web browser and type in the following address: 192.168.111.15. (Default user and password: admin/admin00)

Network settings configuration

The network **Network** tab allows the user to change LAN settings.



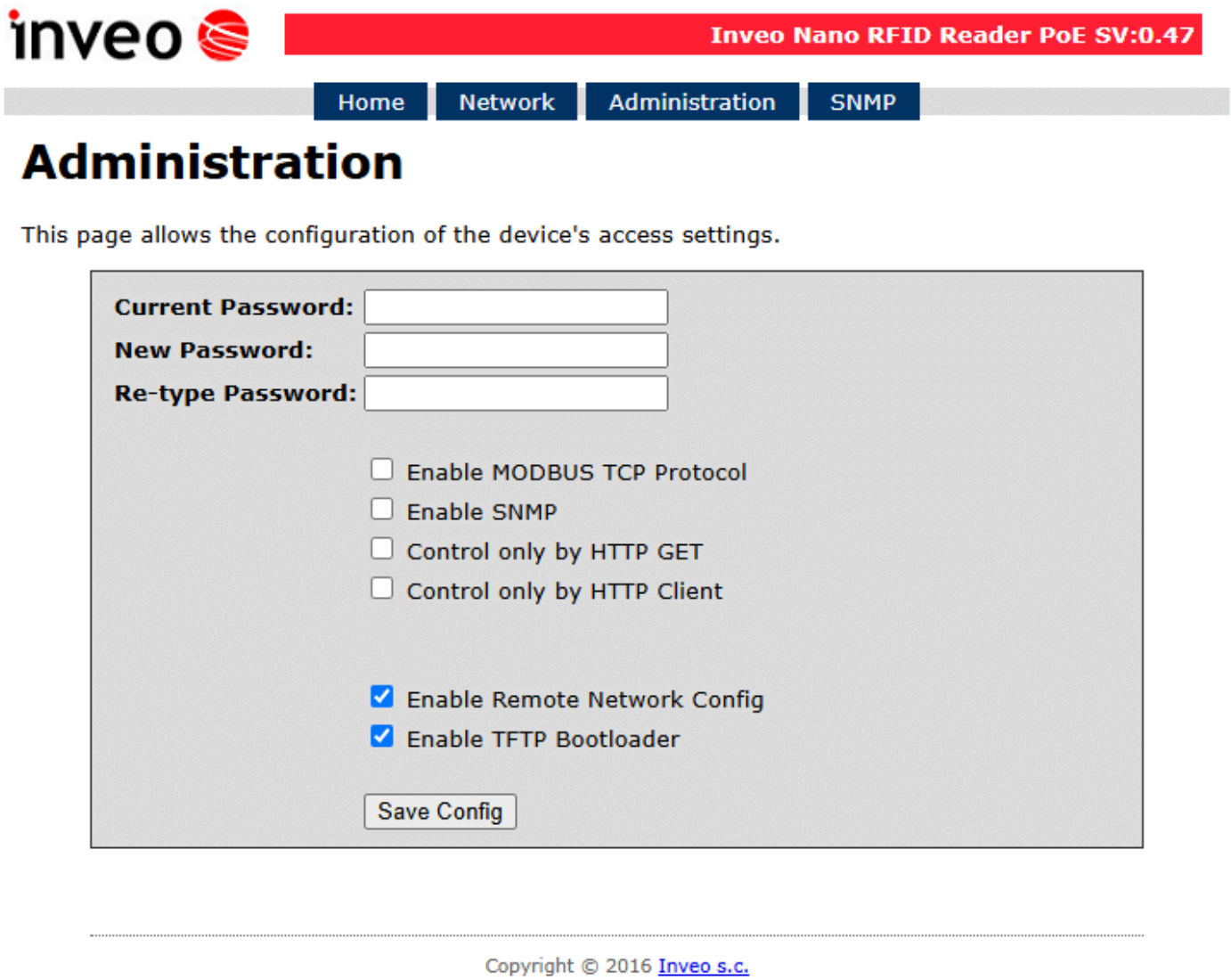
- **Host Name** – NetBios name,
- **DHCP** – Enable the DHCP client; selecting this option forces the use of DHCP assigned IP address,
- **IP Address** – Module IP address,
- **Gateway** – Network gateway,
- **Subnet Mask** – IP subnet mask,
- **DNS1, DNS2** – DNS addresses,
- **Destination IP** – IP address of the module, the input state should be routed to when using M2M communication,
- **Destination Port** – Port, on which the remote device is listening.

Tip

After making changes, apply them using the Save button

Security and services configuration

In **Administration**, active device services and access password can be selected and/or changed.



Changing the password:

To change the password, input the **Current Password**. Next, type in the new password into the **New Password** and **Re-type Password** fields. Apply the changes with **Save Config**. If you want to remove the password altogether, leave **New Password** empty.

Services settings:

The device allows selection of services that should be available. To activate the service, select the field next to its name.

- **Enable Program Access** – Enable access by external programs (Windows, Linux) and TCP/IP on port 9761,
- **Enable Modbus TCP Protocol**
- **Enable SNMP**
- **Enable Destination Client** – Forwarding of the input/output states to other modules,
- **Enable MQTT Inveo** – Activate MQTT protocol,

- **Enable Remote Network Config** – (Discoverer programme),
- **Enable TFTP Bootloader**.

> **Warning**
>
> **TFTP Bootloader and Remote Network Config should be disabled during normal operation. The settings should only be enabled before firmware update.**

Communication with a module from an external network

If the module is located in a different LAN, port forwarding is required. Depending on the communication method utilized, contact with the network administrator and forwarding of certain ports is needed.

WWW webpage and HTTP protocol:

- TCP port 80

Computer programme or own application:

- TCP port 9761

Modbus TCP:

- TCP port 502

SNMP protocol:

- UDP port 161

Checking the IP address

To check the current device IP address (Nano PoE only):

1. Press and hold the **RESET** button. The screen will display the four groups of an IP address in sequence: eg. 192 168 111 15..
2. After the full address is displayed, release the **RESET** button.

DHCP

To enable or disable DHCP support:

1. Press and hold the **RESET** button for a time between 5 ab 10 seconds.
2. The LED will start blinking about 2 times a second
3. Release the **RESET** button.

DHCP can also be enabled or disabled in the network settings. Access the **Network** tab or use the Discoverer programme.

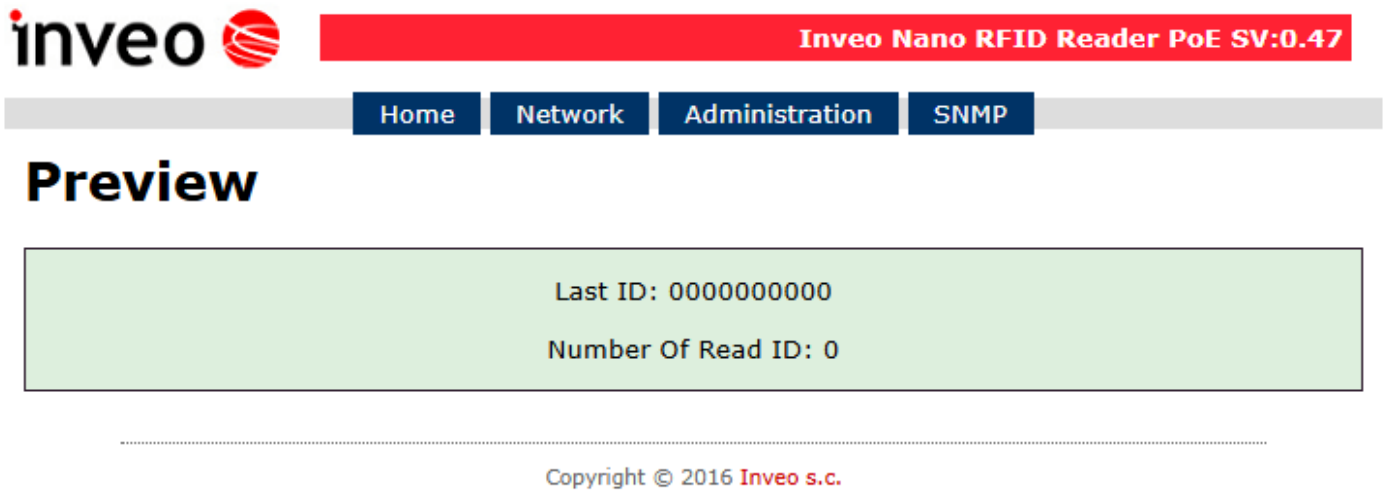
Device functions

Communication protocols

The module offers various methods of access to read RFID tags:

- **Access via the built-in webpage:** Allows browsing of read data, available from a standard Internet browser,
- **HTTP in server mode:** The module can operate as a HTTP server, allowing for direct download of RFID data by client applications that send requests to the device,
- **HTTP in client mode:** In this mode, the module automatically sends the read RFID data to an external server utilizing HTTP,
- **Modbus TCP:** Thanks to Modbus TCP support, the module can be integrated with industrial automation systems,
- **SNMP:** The module also supports the SNMP protocol, allowing for monitoring and network device management.

Built-in www page



After selecting the HOME tab, the following information is displayed:

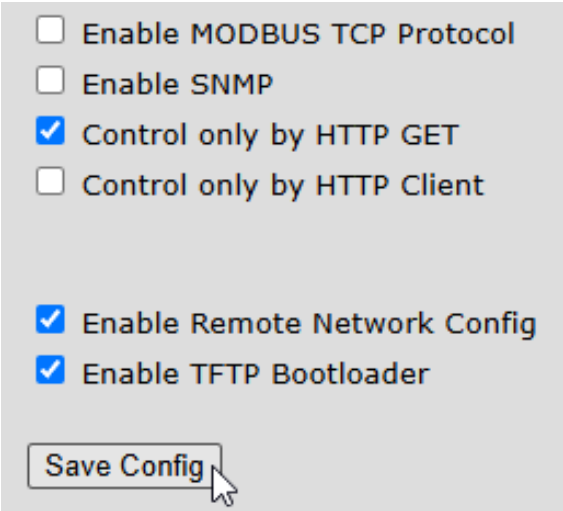
- **Last ID** – Last read RFID tag in HEX,
- **Number Of Read ID** – Number of read tags since last device reset.

> **Tip**
>
> **When the (LOCK!) flag is displayed in Last ID, this means that reading of subsequent tags will be blocked until the read flag is deleted.**

Integration with own software

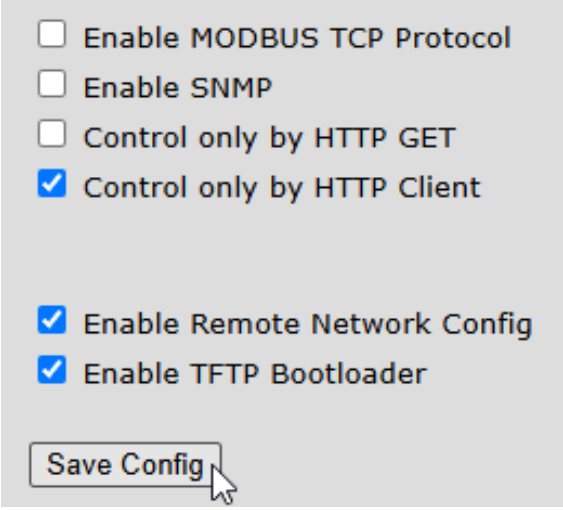
Nano RFID modules are flexible and can be integrated with proprietary software. The module can operate in one of two modes: as a server or as a client. Mode selection is available in the **Administration** tab.

HTTP Server mode



In the server mode, a remote host (client) connects with the module and manages it via HTTP GET method.
The client must regularly download the `status.xml` file from the module.
After it's read, and appropriate XML tags are decoded (described thoroughly in the **Read module status via HTTP GET**), the client can return commands to the module.
`status.xml` contains all required data, such as the module's MAC address, input/output state or ID of a card that can be saved to a database. After processing the data, the client can send instructions to the module, shuch as: generate a sound signal, flash LED's, release the door latch *(only Nano RFID PoE)*. It's important to remember that after every tag read, the module will block the subsequent readouts until the client recalls the `releaseId=1` function.

HTTP Client mode



In client mode, the module operates similarly to a web browser. It sends a request to a server and awaits a reply. After a tag is read, the module automatically connects with the server and sends data using HTTP GET. In response, the server can return an XML file with commands that define actions that the module will undertake, such as set LED state or generate a sound.

The benefit of this mode is that the module sends the RFID code to the server or control application by itself, enabling quick and automatic reaction to read data.

The client-server mode offers quick integration with various servers, such as PHP, Node.js or MySQL databases.

HTTP GET – Status

Nano RFID modules can be controlled via HTTP. To read the current module status, recall the `status.xml` resource eg. `http://192.168.111.15/status.xml`

The module will display all important information in the form of an XML file:

```
<status>
    <netbios>NANO RFID</netbios>
    <mac>000000000000</mac>
    <id>0000000000</id>
    <newId>0</newId>
    <cnt>0</cnt>
    <resetFlag>1</resetFlag>
    <enable>1</enable>
    <httpClientStatus>0</httpClientStatus>
    <out>0</out>
    <in>0</in>
    <model>RFID NANO-PoE</model>
    <fw>0.48</fw>
    <hw>1.0</hw>
</status>
```

Section	Description
`<netbios>`	Module NETBIOS name
`<mac>`	Module MAC address
`<id>`	Last read RFID tag code in HEX
`<newId>`	In Control only by HTTP GET mode: 1 – a new tag has been read 0 – no new RFID tags
`<cnt>`	Amount of RFID tags read since last device reset
`<resetFlag>`	1 – a module reset has occured
`<enable>`	1 – RFID module enabled 0 – RFID module disabled
`<httpClientStatus>`	Current TCP connection state in **Control onlyby HTTP Client** 1 – connected with a server – socket open 2 – received data from a server 3 – connection terminated 100 – no connection with server
`<out>`	1 – relay on 0 – relay off *(Nano RFID PoE only)*
`<in>`	1 – input active 0 – input inactive *(Nano RFID PoE only)*
`<model>`	Device model
`<fw>`	Firmware version
`<hw>`	Hardware revision

HTTP GET – Control

Controlling the module in Enable HTTP GET mode involves sending appropriate commands to the reader using HTTP.

> **Note**
>
> **The `/status.xml` resource enables control over basic reader functions, such as LED indicators, sound signal. Additionally, the read flags can be deleted via this resource.**

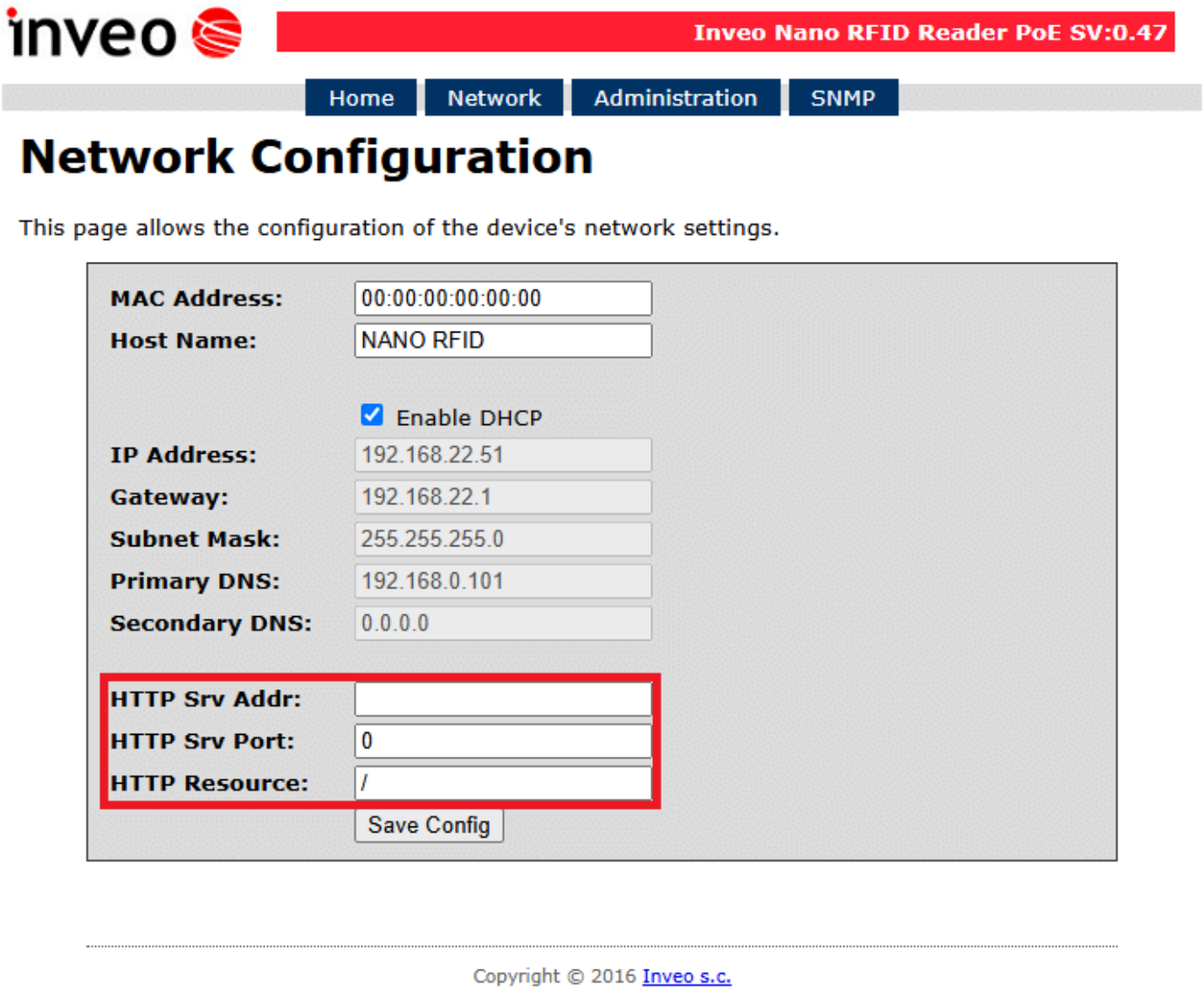
`http://<IP_address>/status.xml?`

Command	Value	Description
`enable`	1 - enabled 0 - disabled	Enable/disable the RFID antenna
`resetFlag`	0 - delete	Flag set to 1 after module restart
`releaseId`	1 - delete	Delete the read flag and await RFID tag application
`led`	on off int,int,int - TimeOn*0,1s,TimeOff*0,1s,CNT	Activate the LED. eg. `"led":5,5,5` will activate the LED for 0,5s, deactivate for 0,5s and repeat the whole sequence five times
`buzz`	TimeOn,TimeOff,Cnt a - accept r - reject	Sound generator activation. eg. `"buzz":5,3,4` will activate the buzzer for 0,5s, deactivate for 0,3s and repeat the whole sequence four times
`out*`	1 - enable 0 - disable Tx - enable for x*0,1s	Relay activation

* Only Nano RFID PoE

HTTP Client

Module control in HTTP Client mode is possible after selecting **Enable HTTP Client** in **Administration**. If the reader has **Enable HTTP Client mode activated**, configure the address the data will be sent to. To do that, use the **Network → HTTP Client Configuration** table.



1. **HTTP Srv Addr** – IP address the reader will send data to,
2. **HTTP Srv Port** – Port, the server is listening on,
3. **HTTP Resource** – Resource the reader recalls, eg. /somefile.php.

Module operation

After an RFID tag is read, the module automatically sends data to the configured server. The data has the following format: `http://<server_address/<resource>?mac=<mac_address>&id=<card_id>`

Example:
`http://192.168.111.15/rfid.php?mac=123456789012&id=1314151617`

Additionally, after the input state changes, the module sends appropriate data to the server: `mac=123456789012&in=0` or `mac=123456789012&in=1`, depending on the input state.

The data can be saved to a server, eg. to a MySQL database or a file to track RFID tag readuts, reader MAC addresses and read times.

Server response

The server can respond with an XML file containing instructions for the module. Available commands:

Command	Description
`<led>`	LED control. Example: `led=TimeOn,TimeOff,Cnt` Where TimeOn and TimeOff are in 0,1 second units. `"led":5,5,5` will activate the LED for 0,5s, deactivate for 0,5s and repeat the whole sequence five times.
`<buzz>`	Sound generator control. Example: `buzz=TimeOn,TimeOff,Cnt` `"buzz":5,3,4` will activate the buzzer for 0,5s, deactivate for 0,3s and repeat the whole sequence four times Buzzer control: a – accept sound r – reject sound
`<out>`	(Only Nano RFID PoE): Output control. 1 - enable 0 - disable Tx - enable for x*0,1s

Example XML file that sounds the accept sound and activates the LED:

```
<buzz>10,0,1</buzz>
<led>10,0,1</led>
```

The XML file syntax is not checked. Only information between the known tags is browsed.

Php server support example:

```
<?php
if($_GET["id"])
{ // module send id and MAC - $_GET["mac"]
    $user_allowed = 1; // it could be returned from DB
    if($user_allowed==1) {
        echo "<buzz>10,0,1</buzz>";
        echo "<led>10,0,1</led>";
        echo "<out>T40</out>";
    }
else {
        echo "<buzz>5,5,4</buzz>"; // different signal
        echo "<led>5,5,4</led>";
    }
}
?>
```

This code responds to the module based on the data about the RFID tag, generating various light and sound signals depending on user permissions.

HTTP Client configuration testing pocedure

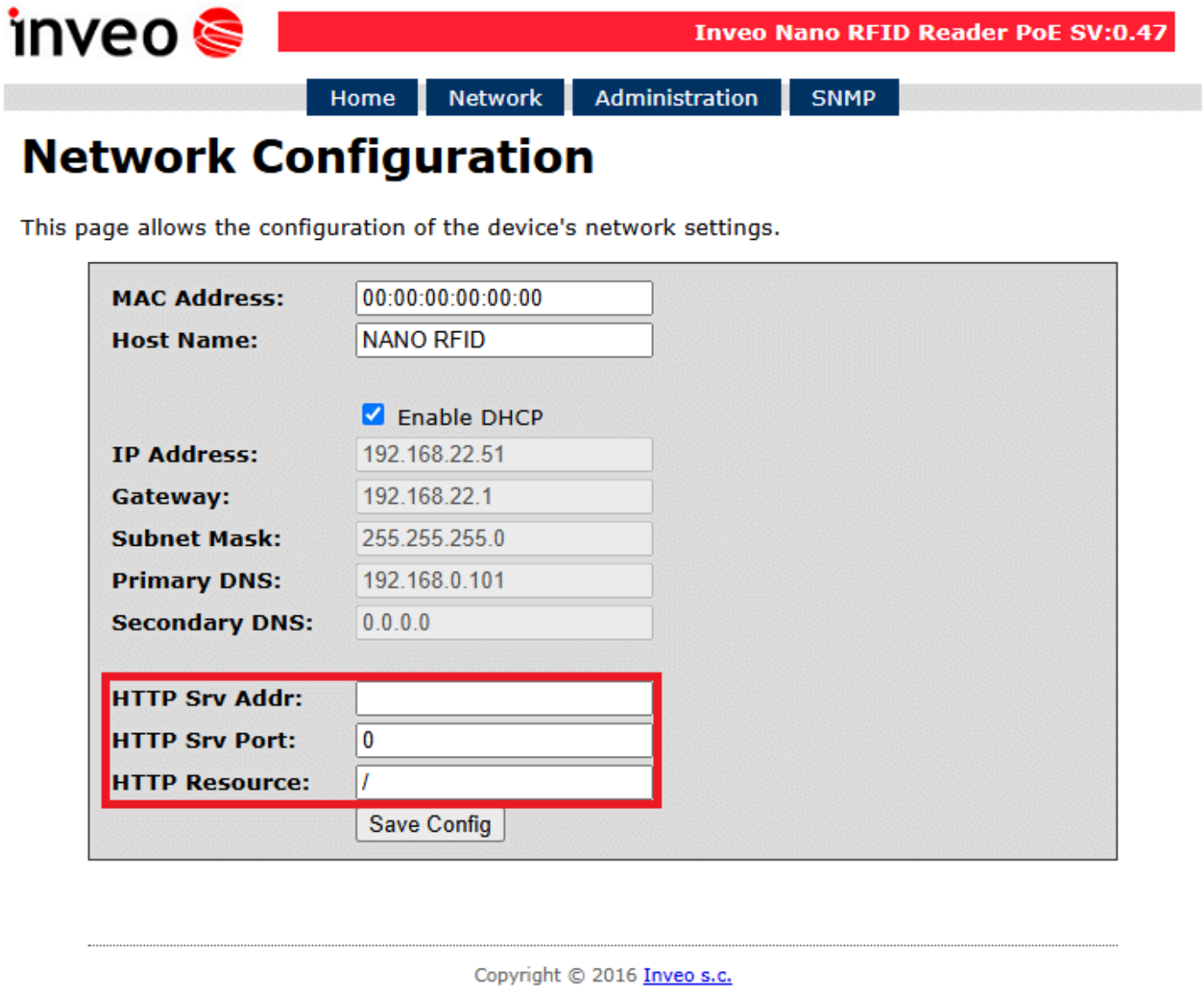
Described below is a simplified insturction manual for testing correctness of network settings for HTTP Client mode in Inveo devices, using the Discoverer programme.

Tip

Before commencing any test, make sure that the Discoverer programme has been added to the firewall exception list. This will enable smooth communication of the programme with the operating system, which is needed for correct operation.

Step 1: Network settings configuration

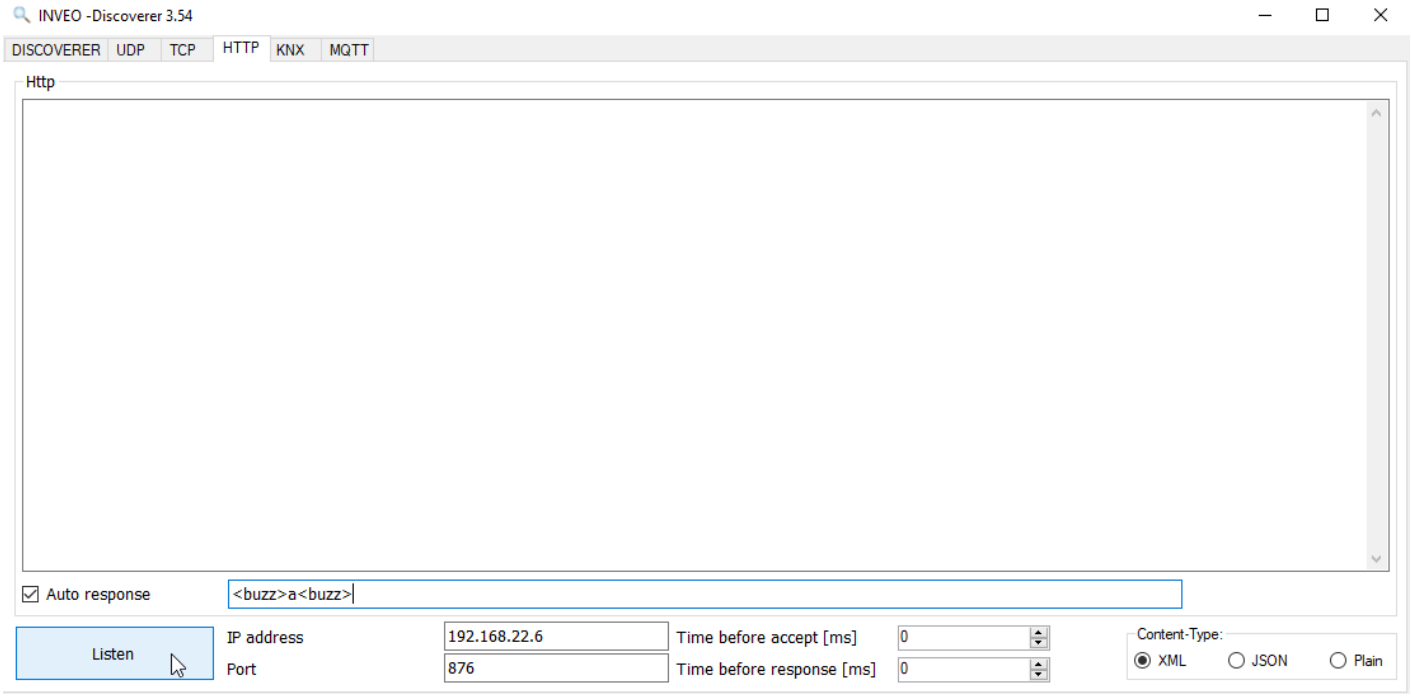
1. Open the Network tab in the device and fill the following fields:



- **HTTP Srv Addr** – IP address the reader will send data to. If testing with the Discoverer programme, input the IP address of the PC.
- **HTTP Srv Port** – Port, the server is listening on.
- **HTTP Resource** – Resource the reader recalls, eg. /somefile.php. If testing with the Discoverer programme, the value of this field can be random or empty.
- Confirm the settings by clicking **Save Config**.

Step 2: Discoverer configuration

1. In the HTTP section of the Discoverer programme, input the PC's IP address and port, corresponding to the device settings.
2. For the device to react for card application with a sound signal, click **Auto response** and enter the command: `<buzz>a</buzz>`.
3. Click the **Listen** button to begin listening for traffic.



Step 3: Testing

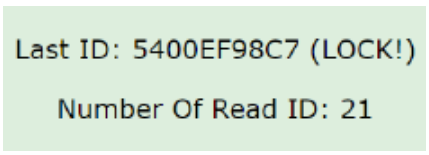
1. Apply a card to the reader. If configuration is correct, the device will emit a sound and appropriate information will appear in the **HTTP log**.

Example log may look like this:

```
-----Incoming data-----
GET /verifyCardAccess?mac=000000000000&id=5400EF98C7 HTTP/1.1
Host: 192.168.22.3

-----Response-----
HTTP/1.1 200 OK
Content-Length: 0
Content-Type: application/xml
```

If the server does not respond, Nano RFID will not read subsequent RFID tags. In this case, **LOCK!** will appear on the module's main page, informing about server connection loss.



Modbus TCP

The device supports the following Modbus RTU functions:

- 0x01 Read Coils
- 0x03 Read Holding Register
- 0x05 Write Single Coil
- 0x06 Write Single Register
- 0x0F Write Multiple Coils
- 0x10 Write Multiple Registers

Holding Registers addressing

Address	R/W	Description
1000	R	Transponder code [0]
1001	R	Transponder code [1]
1002	R	Transponder code [2]
1003	R	Transponder code [3]
1004	R	Transponder code [4]
1005	R	Device model
1006	R	Firmware version
1007	R	Hardware revision

Coils adddressing

Address	R/W	Description
1000	R	Output No. 1 state *(Nano RFID PoE only)*
1001	R	Input No. 1 state Read: 1 - input closed 0 - input open *(Nano RFID PoE only)*
1002	R	Reserve
1003	R	Reserve
1004	R/W	Read flag Read: 1 – a new transponder has been read

		Write: 0 – read flag zeroize
1005	R/W	Reset status Read: 1 – a reader restart has occured (eg. power loss) Write: 1 – force device reset 0 – zeroize restart flag
1010	R/W	Relay control* Read: 1 – relay on 0 – relay off Write: 1 – activate relay 0 – deactivate relay *(Nano RFID PoE only)*
1011	W	Buzzer control - accept
1012	W	Buzzer control - reject
1013	R/W	LED control: Read: 1 – LED activated 0 – LED deactivated Write: 1 – activate LED 0 – deactivate LED

After a tag has been read correctly, the Single Coil register 1004 will be written with 1 – a new tag has been read. Holding Registers (1000-1004) contain the subsequent digits of its code.

Tip

Reading of next transponder is possible only after the read flag has been reset (by writing Single Coil 1004 with a 0).

SNMP

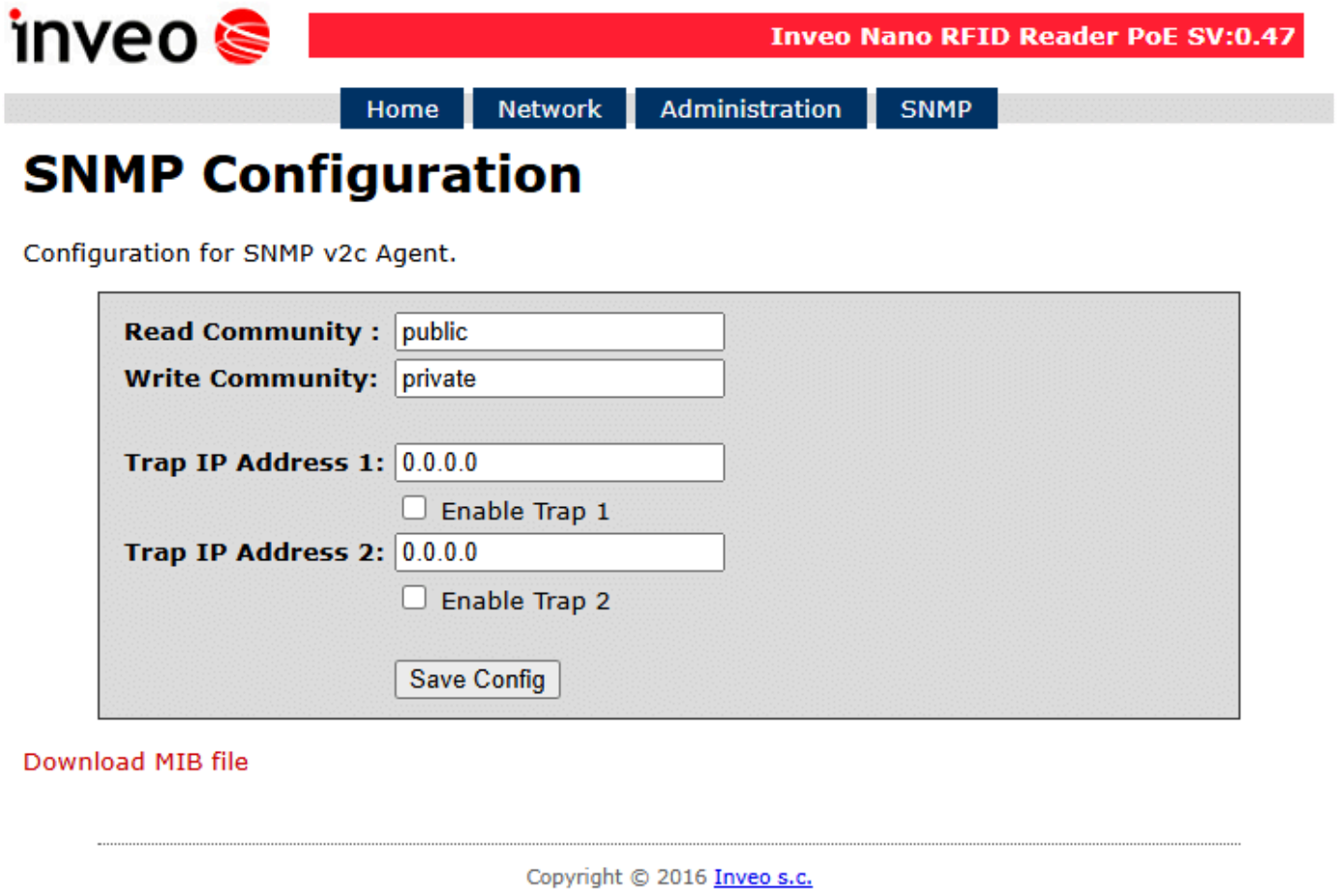
The module is equipped with an SNMP v2c server. To enable this function, go to **Administration** and **Enable SNMP**.

SNMP allows for downloading the read RFID tag's ID.

MIB file describing the SNMP structure can be downloaded from the SNMP tab by clicking **Download MIB file**.

Sending TRAP requests

The module can send a TRAP request after every successful RFID tag read. To configure their destination, type in the recipients IP address into the **Trap IP Address x** fields, where x indicates the field number (1 and 2).



Factory settings

Restoring factory settings

To restore the factory settings:

- Power up the device,
- Press the **RESET** button for a time period between 10 and 15 seconds,
- The **TAG** LED will start flashing about 4 times a second (Nano, Nano RFID PoE), `rSt` will appear on the display (Nano In/Out/Temp PoE),
- Release the **RESET** button.

Once the above steps have been completed, the device will be set to the following parameters:

- **IP address:** 192.168.111.15
- **IP mask:** 255.255.255.0
- **User:** admin
- **Password:** admin00

Warranty and manufacturer's liability

> **Warning**
>
> **The manufacturer provides a two-year warranty for the device and post-warranty service for a period of 10 years from the date of introduction of the device to the market. The warranty covers all material and production defects.**

The manufacturer undertakes to respect the warranty agreement, if the following conditions are met:

- All repairs, changes, expansions and device calibrations are carried out by the manufacturer or an authorized service center,
- The power supply system meets the applicable standards,
- The device is operated in accordance with the suggestions presented in this manual,
- The device is operated in accordance with its intended purpose.

The manufacturer assumes no responsibility for consequences resulting from improper installation, improper use of the device, failure to comply with the instruction manual, and repairs made by unauthorized personnel.

> **Warning**
>
> **The device contains no user serviceable parts inside.**

Storage, operation and transport conditions

The device should be stored in enclosed rooms, where the atmosphere is free from vapours and corrosive substances:

- Environment temperature from -30°C to +60°C (-22°F - 140°F),
- Humidity from 25% to 90% (condensation unacceptable),
- Atmospheric pressure from 700 to 1060 hPa.

The device is intended to operate in the following conditions:

- Environment temperature from -10°C do +55°C (14°F - 131°F),
- Humidity from 30% to 75%,
- Atmospheric pressure from 700 to 1060 hPa.

Recommended transport conditions:

- Environment temperature from -40°C do +85°C (-40°F - 185°F),
- Humidity from 5% to 95%,
- Atmospheric pressure from 700 to 1060 hPa.

Installation and device operation:

- The module should be operated in accordance with recommendations provided later in this manual.

Disposal and decommissioning

In an event the device needs to be decommissioned (eg. after its intended life period is surpassed), it is recommended to contact the manufacturer or his representative, who are responsible to respond appropriately, i.e., to collect the device from the user. The user can alternatively contact companies specializing in electronic device or computer equipment disposal and/or decommissioning. Under no condition should the device be placed with other waste.