



USER'S MANUAL

IO.XEC

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# 1 Before starting

## 1.1 Inside the box

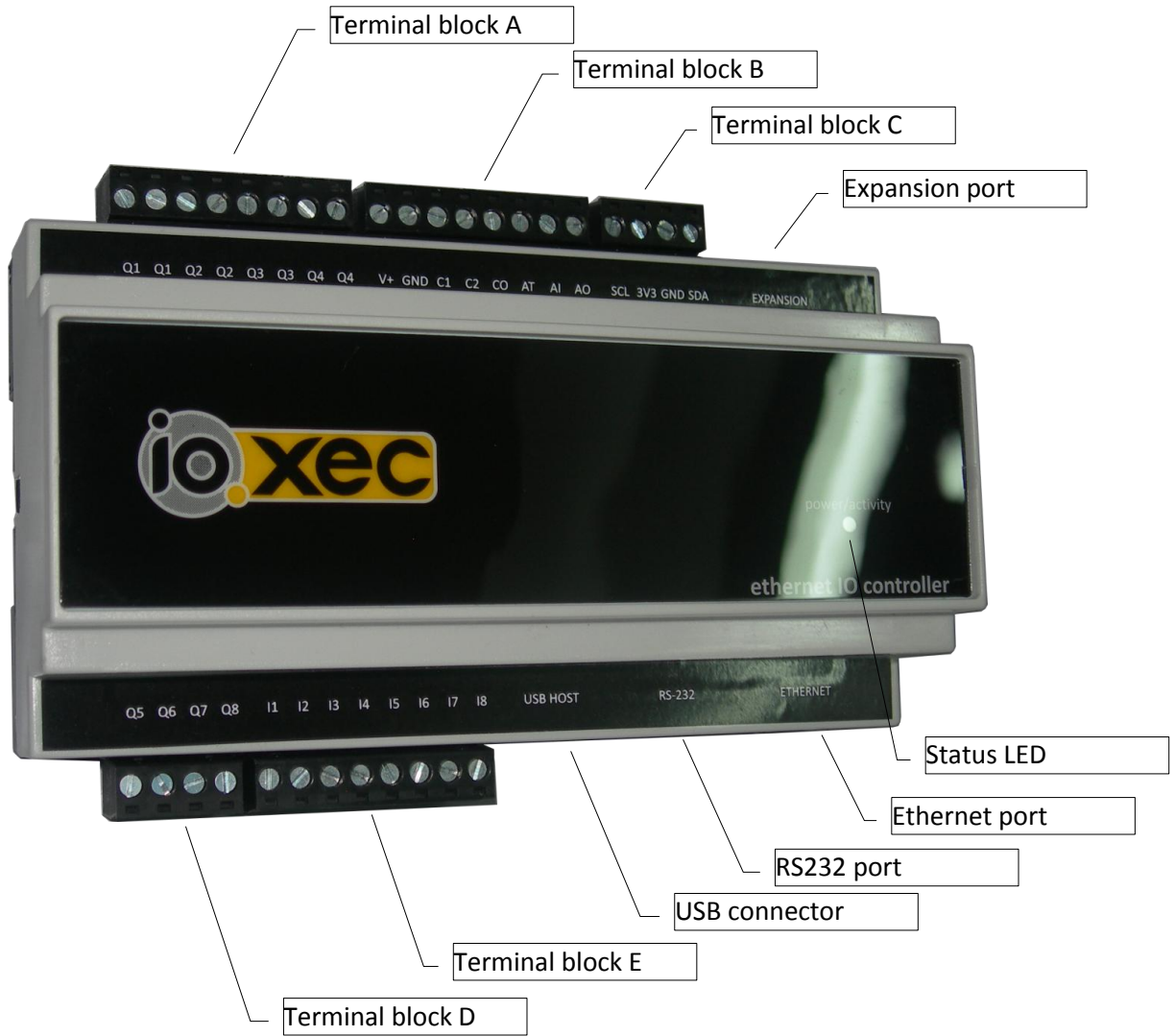
Inside the box, you must find IO.XEC and 5 wire connectors.

## 1.2 General specifications

The main electrical specifications are:

- 8 digital opto-coupled inputs, organized in 2 groups. The activation voltage is between 8V and 24V
- 4 relay digital outputs
- 4 open-collector digital outputs
- 1 analog input (0-10V)
- 1 analog input for temperature sensor
- 1 analog output (0-10V)
- 1 RS232 port
- 1 USB interface
- expansion port

### 1.3 Identifying the components of IO.XEC



**Terminal block A**

Q1	Output 1 (relay)
Q2	Output 1 (relay)
Q3	Output 1 (relay)
Q4	Output 1 (relay)

**Terminal block B**

V+	Power supply (12V)
GND	Power supply (0V)
C1	Common of inputs 1-2
C2	Common of inputs 3-8
CO	Common of outputs 5-8
AT	Analog temp. sensor
AI	Analog input
AO	Analog output

**Terminal block C**

SCL	Digital T+RH clock
3V3	Digital T+RH power
GND	Digital T+RH GND
SDA	Digital T+RH data

Terminal block D

Q5	Output 5
Q6	Output 6
Q7	Output 7
Q8	Output 8

Terminal block E

I1	Input 1
I2	Input 2
I3	Input 3
I4	Input 4
I5	Input 5
I6	Input 6
I7	Input 7
I8	Input 8

## 1.4 What is needed?

To start, you'll need:

- A power supply. The minimum rating is 12Vdc/1A.
- A working Ethernet network and an Ethernet cable, or alternatively, a cross-over Ethernet cable.
- A personal computer or any kind of device that can run a web browser.

## 2 Installation

### 2.1 Connection blocks

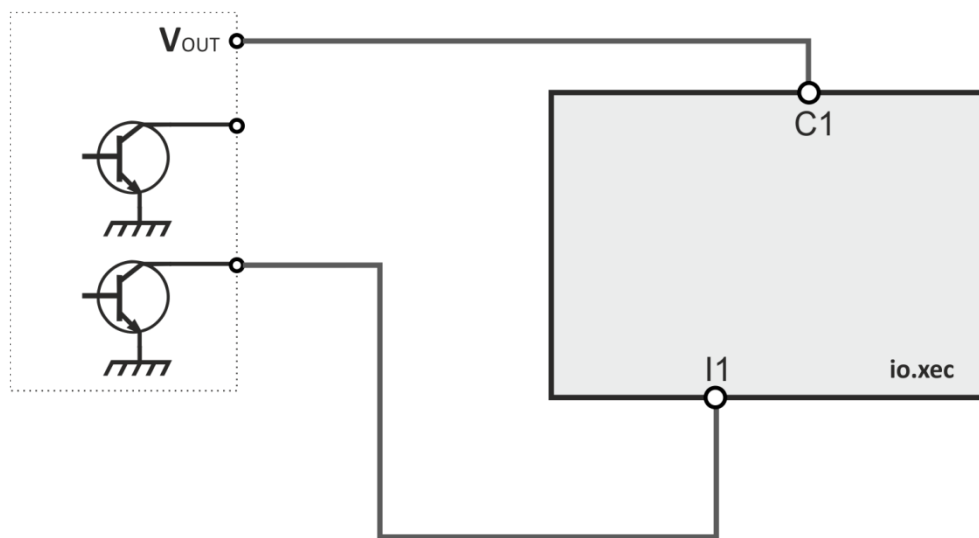
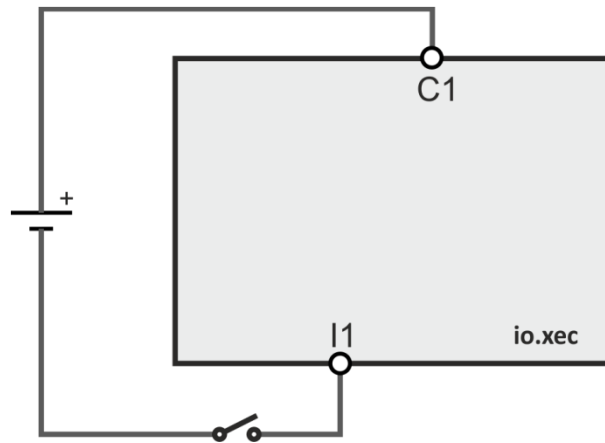
### 2.2 Connecting

#### 2.2.1 Power

Power should be connected in the V+ and GND terminals.

#### 2.2.2 Digital inputs

The inputs are photocoupled, organized in 2 groups. The activation voltage, applied between the terminal C1 (or C2) and the input terminal, is between 8V(RMS) and 24V(RMS). Here are some examples of connection diagrams:

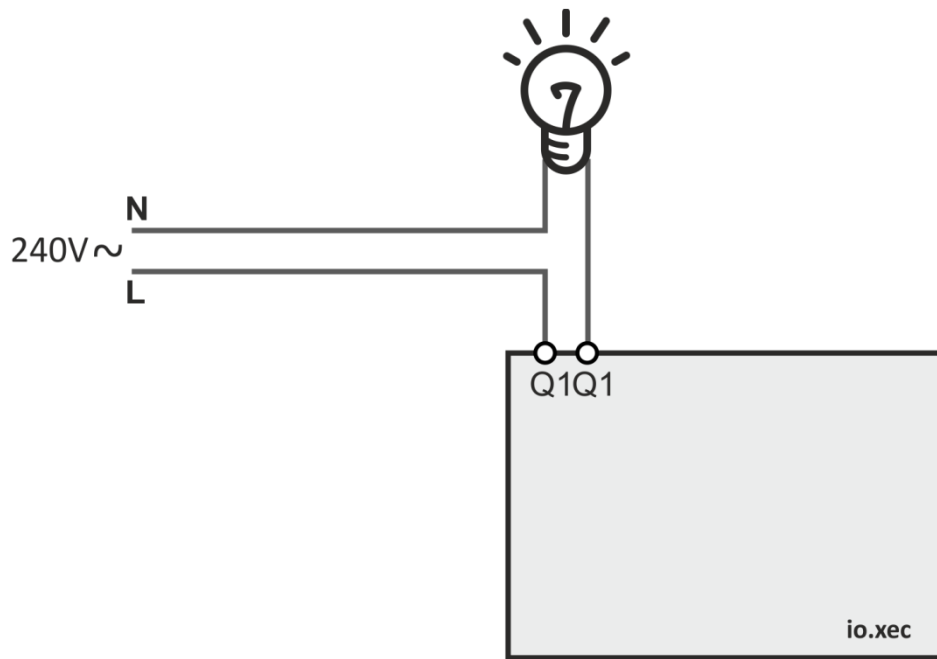


Please note that the activation voltage has no fixed polarization, therefore the terminal C1 can be connected to a positive or negative voltage.

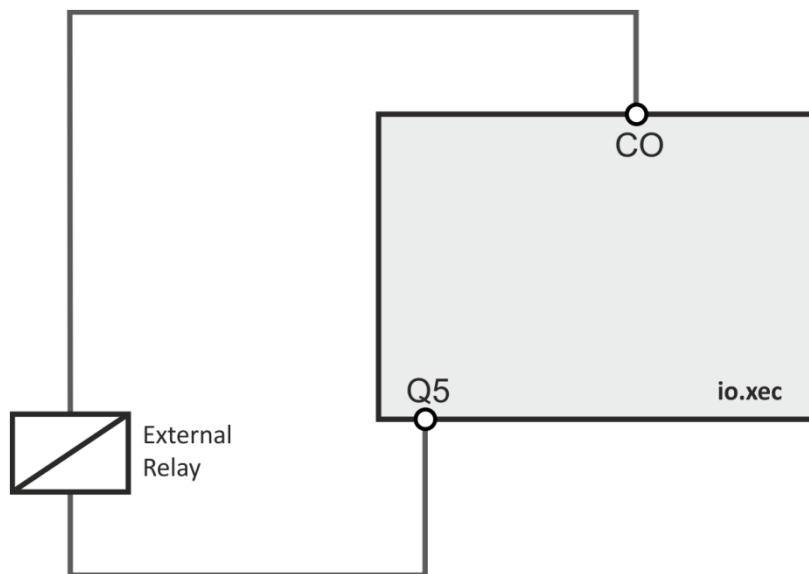
### 2.2.3 Digital outputs

There are two types of outputs: Q1 to Q4 are relay outputs, capable of switching 8A, and Q5 to Q8 are open collector outputs.

The following diagram shows how to connect a lamp using Q1.



If needed, more relays can be added. The following diagram shows how to connect an external relay to an open collector output.



## 2.2.4 Analog input

The analog input voltage must be connected to the **AI** terminal. The reference is **GND**.

When not in use, this feature should be disabled, in order to prevent erroneous behavior. Please consult section 3.3.



### 2.2.5 Analog temperature sensor

The device supports 2 different sensors: LM35DZ and MCP9701. In both of them, the output signal should be connected to the **AT** terminal. The reference is **GND**. Regarding power supply to the sensor, the LM35DZ can be powered using terminals **V+** and **GND**, while MCP9701 can be powered using terminals **3V3** and **GND**. To choose between the two, you have to access the IO configuration page. Please consult section 3.3.

When not in use, this feature should be disabled, in order to prevent erroneous behavior. Please consult section 3.3.

### 2.2.6 Analog output

The analog output is connected to **AO** terminal. The reference is **GND**.

### 2.2.7 Relative humidity and Temperature sensor

IO.XEC supports Sensirion SHT75 RH and temperature sensor. Please consult the sensor datasheet. The terminals to use are **SDA**, **SCL**, **3V3**, **GND**.

When not in use, this feature should be disabled, in order to prevent erroneous behavior. Please consult section 3.3.

## 3 Setting up IO.XEC

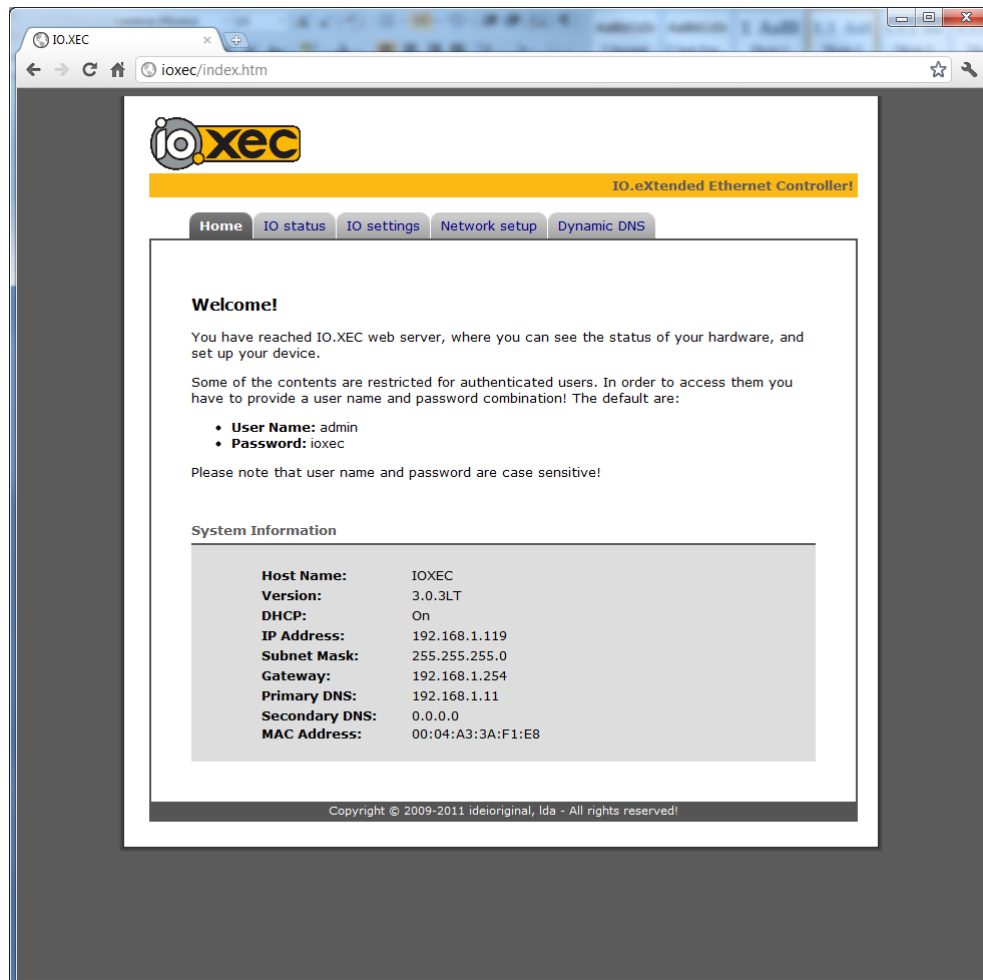
All the configuration and setup of IO.XEC is made using a browser. There are no serviceable parts inside the enclosure.

### 3.1 Web server

To reach IO.XEC web server, you have to use a browser like Microsoft Internet Explorer®, Mozilla Firefox® or Google Chrome®. The checks if there is a DHCP server in the network. If present, the IP address is updated with the address leased by the DHCP server. If not, IO.XEC will address itself with 169.254.1.1.

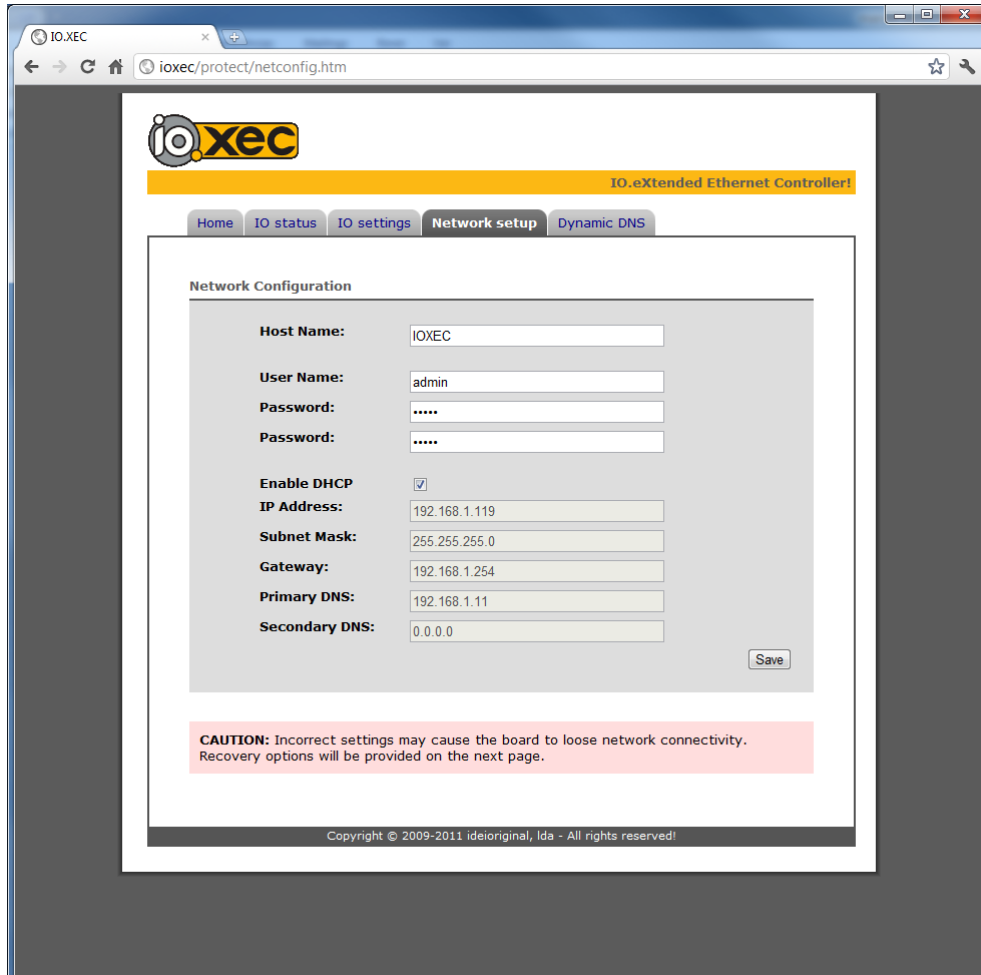
In order to connect to IO.XEC, the computer running the browser must be in the same network.

Whether the DHCP server is present, as IO.XEC has a NETBIOS name server built in, it will always respond to a network name instead of an address. The default name is IOXEC. In conclusion, you can access IO.XEC web server using this link: <http://IOXEC>



## 3.2 Network settings

In order to change the network settings, select the “Network settings” tab. After these settings are validated, IO.XEC reboots to apply the new values.



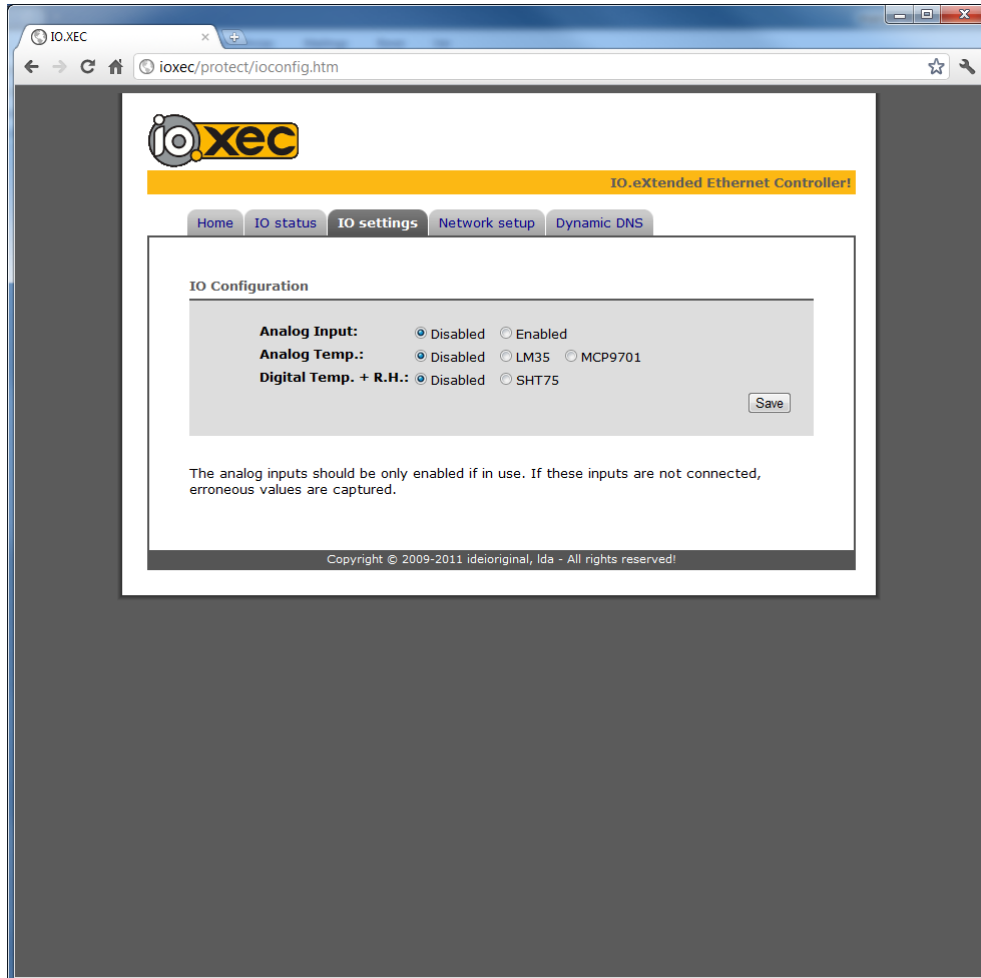
The screenshot shows a web browser window with the URL `ioxec/protect/netconfig.htm`. The page features the IO.XEC logo and a navigation bar with tabs for Home, IO status, IO settings, Network setup (selected), and Dynamic DNS. The main content area is titled "Network Configuration" and contains the following fields:

Host Name:	IOXEC
User Name:	admin
Password:	.....
Password:	.....
Enable DHCP:	<input checked="" type="checkbox"/>
IP Address:	192.168.1.119
Subnet Mask:	255.255.255.0
Gateway:	192.168.1.254
Primary DNS:	192.168.1.11
Secondary DNS:	0.0.0.0

A "Save" button is located at the bottom right of the configuration area. Below the form, a red warning box contains the text: "CAUTION: Incorrect settings may cause the board to loose network connectivity. Recovery options will be provided on the next page." The footer of the page reads "Copyright © 2009-2011 ideioriginal, lda - All rights reserved!"

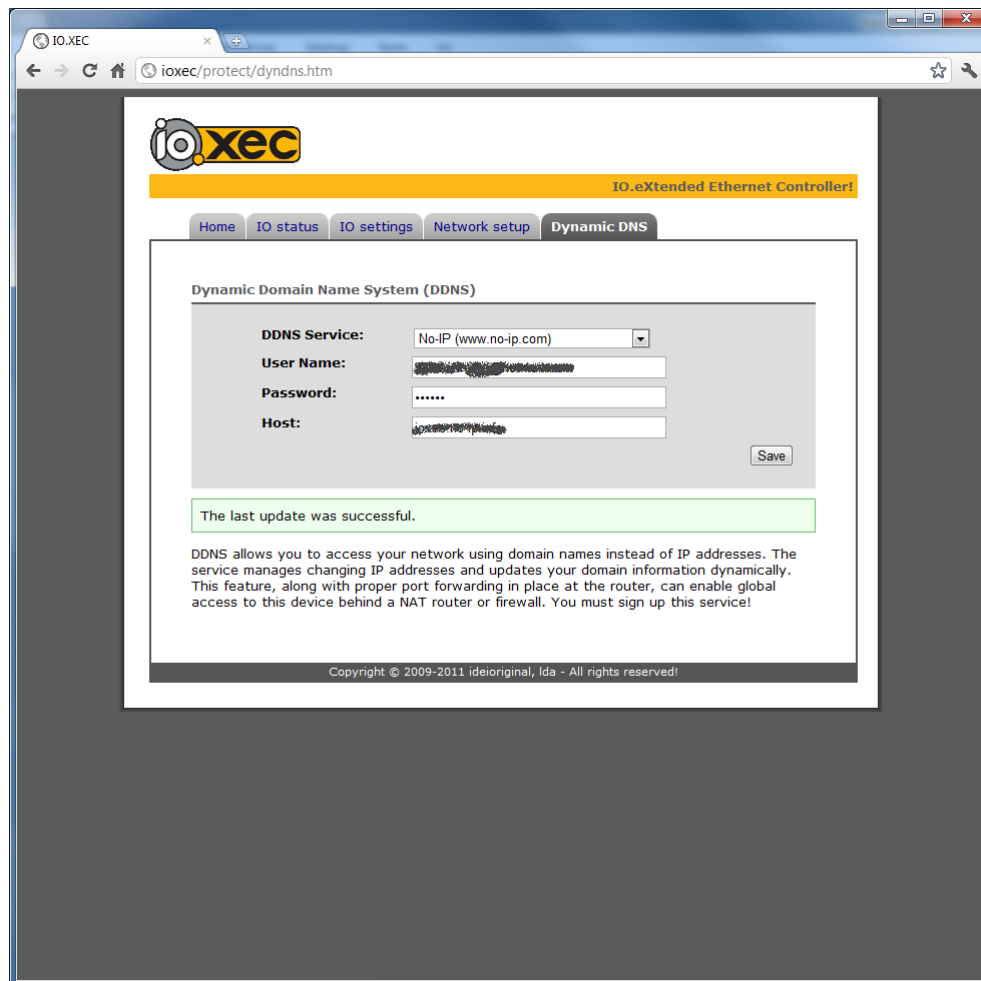
### 3.3 Hardware configuration

Select “IO settings” to reach this page, where you can enable and disable some hardware features of IO.XEC.



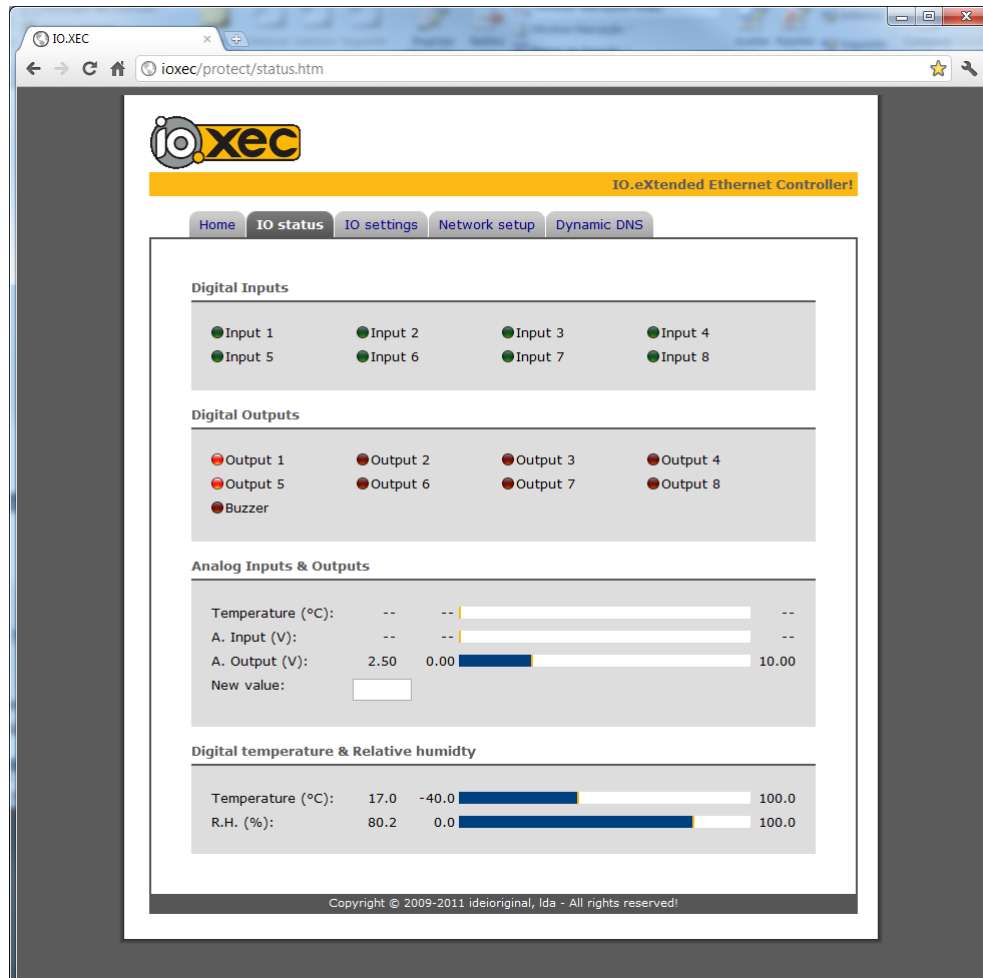
### 3.4 Dynamic DNS configuration

Dynamic DNS allows you to access your network using domain names instead of IP addresses. The service manages changing IP addresses and updates your domain information dynamically. This feature, along with proper port forwarding in place at the router, can enable global access to this device behind a NAT router or firewall. Before setting up this feature, you must sign up this service! To access this page, select the “Dynamic DNS” tab.



## 4 Retrieving status of IO.XEC

The status of IO.XEC can be retrieved using a browser (see section 3.1). The “IO status” tab should be selected. The status page refreshes itself automatically at time intervals of 500ms.



## 5 Factory defaults

The factory defaults of IO.XEC are:

NetBIOS name:	IOXEC
DHCP:	on
IP address:	169.254.1.1
Subnet mask:	255.255.0.0
Gateway:	169.254.1.1
Primary DNS:	169.254.1.1
Secondary DNS:	0.0.0.0
Username:	admin

Password: ioxec

To reset the settings to the factory defaults, do the following:

1. With IO.XEC turned on, push and hold the reset button. The with LED lights steady.
2. Hold the reset, until the LED starts flashing
3. Release the reset button, and IO.XEC will boot with the new settings.

## 6 HTTP API IO.XEC

### 6.1 Introduction

This section describes the HTTP API of IO.XEC devices. This Application Programming Interface (API) permits the integration of this device in third party services and applications.

IO.XEC allows access to all its functionality via a proprietary HTTP API. Through this API, third party applications can control, if authenticated, the outputs of the device and retrieve the status of the inputs.

The API implements a bridge between an automation application and physical inputs, outputs and sensors.

### 6.2 Communications

Data is exchanged through TCP protocol. This HTTP API is based on the HTTP protocol which goes on top of TCP data links.

#### 6.2.1 System port

The port used is the default for HTTP connections: 80.

#### 6.2.2 Authentication

Authentication uses base64 encoding, generally called Basic Authentication<sup>1</sup>. The user name is appended with a colon and concatenated with the password. The resulting string is encoded with the Base64 algorithm.

Example:

User 'admin' with Password '1234'. These are concatenated into 'admin:1234' which then gets encoded with base64. The final encoded string is "YWRtaW46MTIzNA==".

All the requests (except for the one described in section 6.3) need the authentication described above!

### 6.2.3 Protocol description

Data is passed on HTTP (GET) requests. Please note that integer variables and all other are sent as ASCII text/strings as usual on HTTP requests.

The HTTP requests described use <address> to represent IO.XEC current IP address. The network name (NetBIOS name) can also be used.

## 6.3 Device general information

The device general configuration can be obtained, retrieving the file **home.xml** from IO.XEC. The location of the file is:

<http://<address>/home.xml>

No authentication is needed for this file.

Example:

```
<response>
  <name>IOXEC</name>
  <version>3.0.3LT</version>
  <dhcp>1</dhcp>
  <ip>192.168.1.119</ip>
  <subnet>255.255.255.0</subnet>
  <gateway>192.168.1.254</gateway>
  <dns1>192.168.1.11</dns1>
  <dns2>0.0.0.0</dns2>
  <mac>00:04:A3:3A:F1:E8</mac>
  <defuser>admin</defuser>
  <defpassw>ioxec</defpassw>
</response>
```

---

<sup>1</sup> [http://en.wikipedia.org/wiki/Basic\\_access\\_authentication](http://en.wikipedia.org/wiki/Basic_access_authentication)



## 6.4 Device hardware configuration

The device configuration can be obtained, retrieving the file **ioconfig.xml** from IO.XEC. The location of the file is:

<http://<address>/protect/ioconfig.xml>

Example:

```
<response>
  <all_configs>
    <anain option="0">
      <option_name>Disabled</option_name>
      <min_val>--</min_val>
      <max_val>--</max_val>
      <precision>--</precision>
    </anain>
    <anain option="1">
      <option_name>Enabled</option_name>
      <min_val>0.00</min_val>
      <max_val>10.00</max_val>
      <precision>0.01</precision>
    </anain>
    <anatemper option="0">
      <option_name>Disabled</option_name>
      <min_val>--</min_val>
      <max_val>--</max_val>
      <precision>--</precision>
    </anatemper>
    <anatemper option="1">
      <option_name>LM35</option_name>
      <min_val>0.0</min_val>
      <max_val>150.0</max_val>
      <precision>0.1</precision>
    </anatemper>
    <anatemper option="2">
      <option_name>MCP9701</option_name>
      <min_val>-40.0</min_val>
      <max_val>125.0</max_val>
      <precision>0.1</precision>
    </anatemper>
    <digtrh option="0">
      <option_name>Disabled</option_name>
      <min_val_t>--</min_val_t>
      <max_val_t>--</max_val_t>
      <precision>--</precision>
      <min_val_rh>--</min_val_rh>
      <max_val_rh>--</max_val_rh>
      <precision>--</precision>
    </digtrh>
    <digtrh option="1">
      <option_name>SHT75</option_name>
      <min_val_t>-40.0</min_val_t>
```

```

        <max_val_t>100.0</max_val_t>
        <precision>0.1</precision>
        <min_val_rh>0.0</min_val_rh>
        <max_val_rh>100.0</max_val_rh>
        <precision>0.1</precision>
</digtrh>
<anaout>
        <min_val>0.00</min_val>
        <max_val>10.00</max_val>
        <precision>0.01</precision>
</anaout>
<din index="0">
        <label>Input 1</label>
        <group>0</group>
</din>
<din index="1">
        <label>Input 2</label>
        <group>0</group>
</din>
<din index="2">
        <label>Input 3</label>
        <group>1</group>
</din>
<din index="3">
        <label>Input 4</label>
        <group>1</group>
</din>
<din index="4">
        <label>Input 5</label>
        <group>1</group>
</din>
<din index="5">
        <label>Input 6</label>
        <group>1</group>
</din>
<din index="6">
        <label>Input 7</label>
        <group>1</group>
</din>
<din index="7">
        <label>Input 8</label>
        <group>1</group>
</din>
<dout index="0">
        <label>Output 1</label>
        <type>relay</type>
</dout>
<dout index="1">
        <label>Output 2</label>
        <type>relay</type>
</dout>
<dout index="2">
        <label>Output 3</label>
        <type>relay</type>
</dout>
<dout index="3">
        <label>Output 4</label>

```

```

        <type>relay</type>
    </dout>
    <dout index="4">
        <label>Output 5</label>
        <type>openc</type>
    </dout>
    <dout index="5">
        <label>Output 6</label>
        <type>openc</type>
    </dout>
    <dout index="6">
        <label>Output 7</label>
        <type>openc</type>
    </dout>
    <dout index="7">
        <label>Output 8</label>
        <type>openc</type>
    </dout>
    <dout index="8">
        <label>Buzzer</label>
        <type>buzz</type>
    </dout>
</all_configs>
<current_config>
    <anain>
        <option>0</option>
    </anain>
    <anatem>
        <option>0</option>
    </anatem>
    <digtrh>
        <option>1</option>
    </digtrh>
</current_config>
</response>

```

## 6.5 Current status

The device status may be obtained by getting the file **iostatus.xml** from IO.XEC. The location of the file is:

<http://<address>/protect/status.xml>

The value of each digital input is concatenated in the field “in” of the above file. The same operation is done with the outputs, in the field “out”. In this case, the status of the buzzer is also concatenated, as if it were the 9<sup>th</sup> output.

The fields marked with “-- “ are inactive.

Example:

```

<response>
    <in>00000000</in>

```

```
<out>00000000</out>
<anatem--></anatem-->
<anain--></anain-->
<anaout>0.00</anaout>
<digtemp>17.4</digtemp>
<digrh>78.8</digrh>
</response>
```

## 6.6 Change IO.XEC configuration

It is possible to change the hardware configuration of IO.XEC, as described on section 3.3. The HTTP request has the following structure:

<http://<address>/protect/ioconfig.cgi?anain=x&anatem=y&temprh=z>

The parameters x, y, z are the possible options present in the field “option” of ioconfig.xml.

Example:

To disable analogue input, enable LM35 temperature sensor and disable digital temperature and relative humidity sensor:

<http://ioxec/protect/ioconfig.cgi?anain=0&anatem=1&temprh=0>

## 6.7 Control IO.XEC outputs

### 6.7.1 Digital outputs

To change a digital output, issue the following HTTP (GET) request:

<http://<address>/protect/set.cgi?outx=val>

Where:

- x: output identifier. The following identifiers can be used:
  - 0..7: digital outputs
  - 8: internal buzzer
  
- val: resulting value. The following values can be used:
  - 0: resets output
  - 1: sets output
  - t: toggles output

Examples:

To reset output 0:

<http://ioxec/protect/set.cgi?out0=0>

To toggle output 3:

<http://ioxec/protect/set.cgi?out0=t>

To turn on the internal buzzer:

<http://ioxec/protect/set.cgi?out8=1>

## 6.7.2 Analog output

To change the analogue value of the analog output, issue the following HTTP (GET) request:

<http://<address>/protect/set.cgi?aout=val>

Where val is the desired voltage of the output.

Example:

To set the output voltage to 2.55Volt

<http://ioxec/protect/set.cgi?aout=2.55>

## 6.8 Reboot IO.XEC

To reboot IO.XEC use the following HTTP (GET) request:

<http://<address>/protect/reboot.cgi>

## 7 Firmware update

The IO.XEC firmware is updateable. With this feature, IO.XEC can run the most up to date firmware revision.

This operation is very simple and is supposed to be done by the user or installer. You need an USB flash drive in order to proceed.

The steps needed to make a firmware update are the following:

1. Download the firmware image. A file named **image.bin**
2. Copy the file to the root directory (folder) of the USB flash drive
3. Turn off IO.XEC

4. Insert the USB flash drive in USB connector
5. With a sharp object (a pencil, for example) push and hold the reset button (see section 0)
6. Turn on IO.XEC holding the reset button
7. Release the reset button
8. If the image is found, the device will start updating itself. During this process the white LED will flash
9. When finished, IO.XEC reboots

This process may reset the device with the factory defaults.