

Data logger controller



IPex04

Installation and Connection Manual

Manual

Change log



Review	Date	Reason for the amendment
0	27/06/2022	Initial issue of the document
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Index



01 Installation
precautions

02 IPex04 controller
diagram

03 Technical
specifications

04 Connecting the various
components

- 4.1. Electrical connection
- 4.2. Connecting digital outputs
- 4.3. Connecting digital inputs or counters
- 4.4. Connecting analogue outputs
- 4.5. Connecting analogue inputs
- 4.6. Connection via communication ports

05 Status LED

06 IPex04 Controller
Configuration

07 References

Figures

01 Layout of the IPex04 connections

02 Layout of the power terminal

03 Connecting a digital output

04 Connecting a digital input or counter

05 Connecting an analogue output

06 Connecting a sensor with a voltage output

07 Wiring a two-wire current-output sensor

08 Connecting an RS-232 device

09 RS-485 bus connection

10 DIP Switch IPex08 configuration

11 IPex04 configuration web page

12 Calibration of analogue inputs

13 Firmware update

1. Installation precautions

All I/O ports are protected against incorrect wiring and misconfigurations. However, the controller card contains sensitive electronic components that may be damaged by electrostatic discharge (ESD).

Before carrying out the installation, we recommend following these steps to ensure that the IPex04 is not damaged:

- ✓ Disconnect the power supply from the equipment.
- ✓ Do not install the circuit board without its housing, as powering it up could cause a short circuit.
- ✓ Avoid touching the electronic components on the circuit board directly with your hands, as this could cause an electrostatic discharge on the components and result in damage to some of them.
- ✓ When connecting sensors to the equipment, disable the corresponding I/O reading and disconnect the power supply from the device.
- ✓ Before powering on the equipment, check that all cables are correctly connected and that none are loose, as this could cause a short circuit.
- ✓ Remember that under no circumstances should you handle the circuit board whilst it is powered on.

2. IPex04 controller diagram

The figure below shows a diagram indicating the location of each of the I/O and communication ports on the IPex04 controller.



Figure 1. Connection layout of the IPex04

3. Technical specifications

The main technical specifications of the controller card are as follows:

- 32-bit ARM microcontroller running at 120 MHz with 1 MB of Flash and 256 KB of RAM.
- 4 MB of Dataflash for data storage.
- 128 KB of EEPROM for configuration storage.
- Real-time clock (RTC).
- Watchdog timer (WDT).
- 16-bit ADC.
- 2 RS-232 ports.
- 1 RS-485 port.
- 3 status LEDs (power, 10/100 Ethernet and system operation).
- 4 software-configurable inputs/outputs, such as: digital outputs, digital inputs, analogue voltage or current inputs, 0–10 V analogue outputs and counters.
- Software-configurable analogue input ranges: 0–10 V, 0–20 mA and 4–20 mA.
- Low power consumption < 1W at 12VDC.
- Remote firmware updates.
- Basic configuration via embedded web server.
- Compatible with FIWARE and AZURE (MQTT) platforms.
- Compatible with the TLS 1.3 protocol.

4. Connecting the various components

The IPex04 has 4 inputs/outputs that can be configured via software as: digital outputs, digital inputs, analogue voltage or current inputs, 0–10 V analogue outputs or pulse counters.

The following sections describe how to connect the various components.

Output 1 (IO-01) is used in the I/O connection diagrams; the process is identical for the other outputs.

4.1. Connecting the power supply

The IPex04 can be powered by a 12 V DC or 24 V DC power supply with a minimum current of 1 A.

The following figure shows how to connect a power supply.

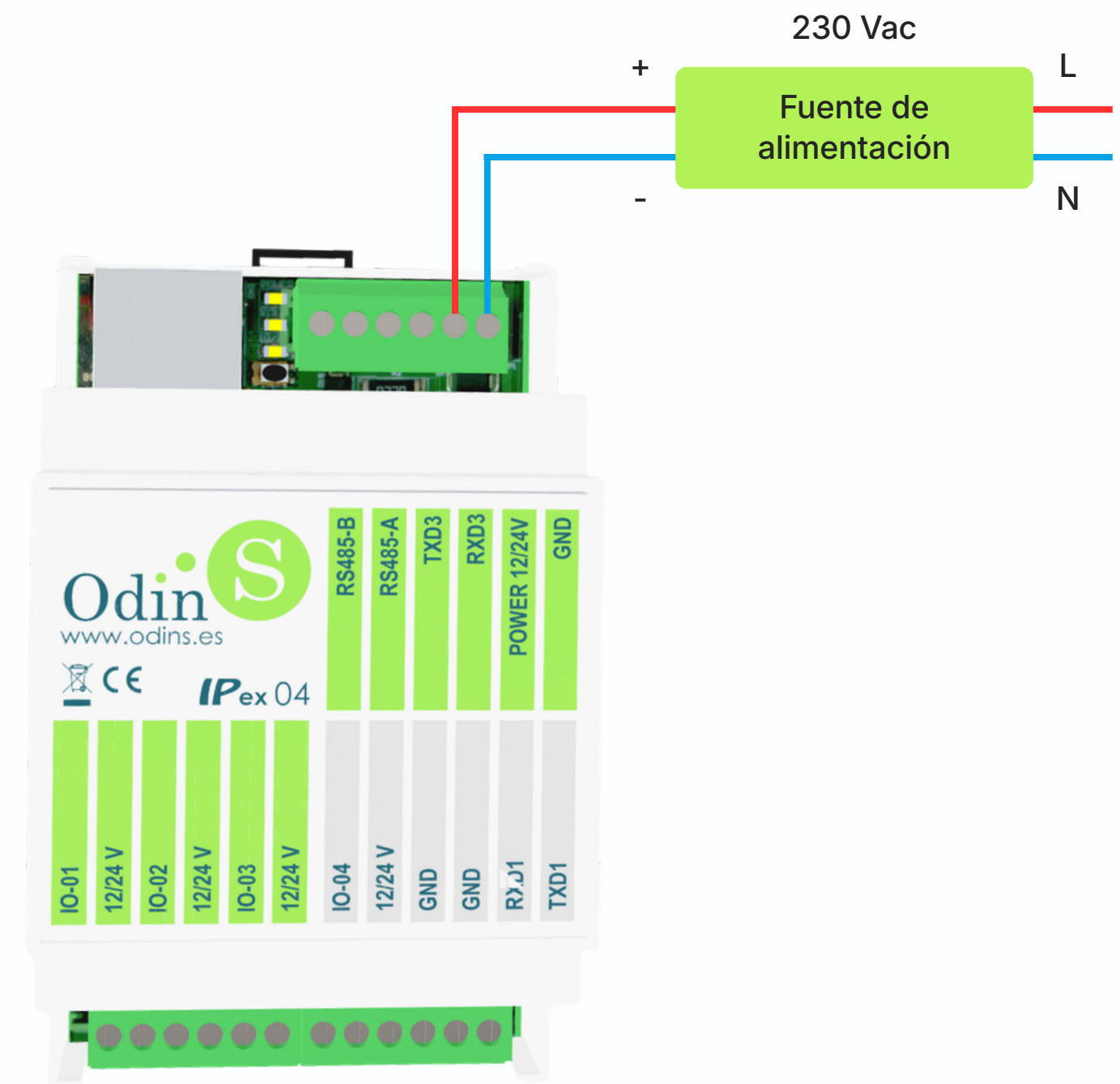


Figure 2. Power terminal layout

4.2. Connecting digital outputs

I/O ports configured as digital outputs allow devices to be driven at **12/24 V** DC, depending on the supply voltage, **with a maximum current draw of 100 mA**.

The digital outputs are open-collector (NPN) type.

The connection is made by connecting the terminal marked 12/24V to the positive terminal of the device to be controlled, and the negative terminal of the device to the terminal marked IO-0x, where 'x' is the number of the I/O to which it is connected (1–4).

The *figure 3* below shows an example of how to connect a device to a digital output.

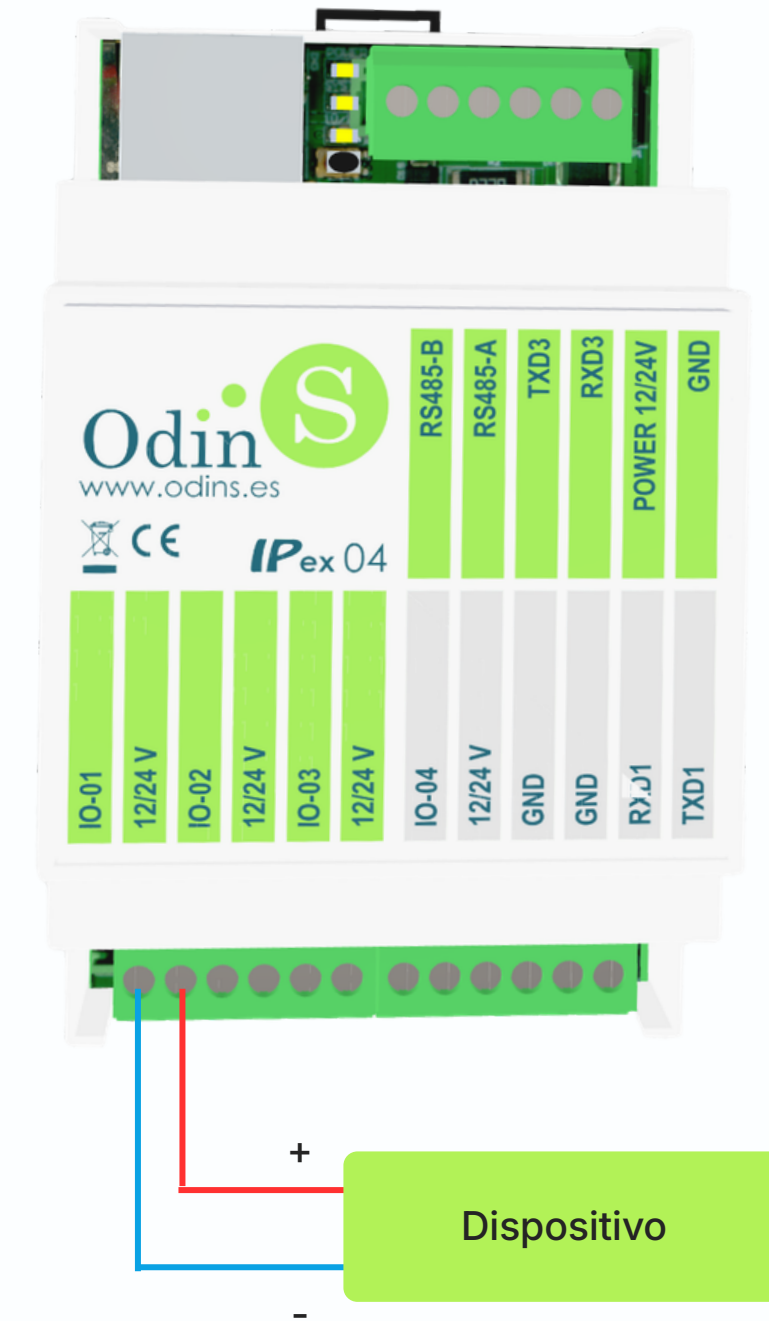


Figure 3. Wiring of a digital output

4.3. Connecting digital inputs or counters

I/O configured as digital inputs or counters are potential-free.

The connection is made by connecting a contact between the terminal marked GND and the terminal marked IO-0x, where 'x' is the number of the I/O to which it is connected (1–4).

The following *figure 4* shows the connection for a digital input or a counter.

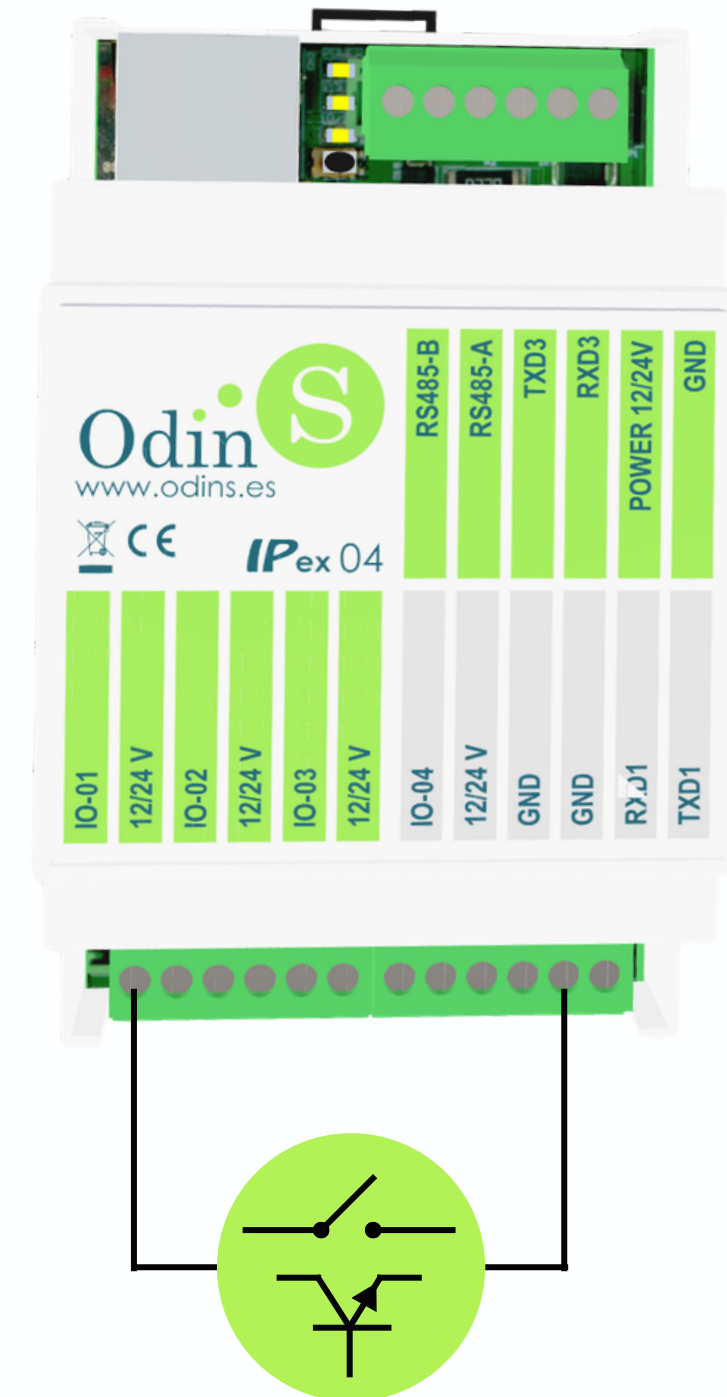


Figure 4. Wiring for a digital input or a counter

4.4. Connecting analogue outputs

I/O ports configured as analogue outputs operate at 0–10 V, allowing a maximum load of 100 mA.

The output is connected between the terminal marked IO-0x, where 'x' is the number of the I/O to which it is connected (1–4), and the terminal marked GND.

The *figure 5* below shows an example of how to connect a driver for controlling an LED lamp to an analogue output.

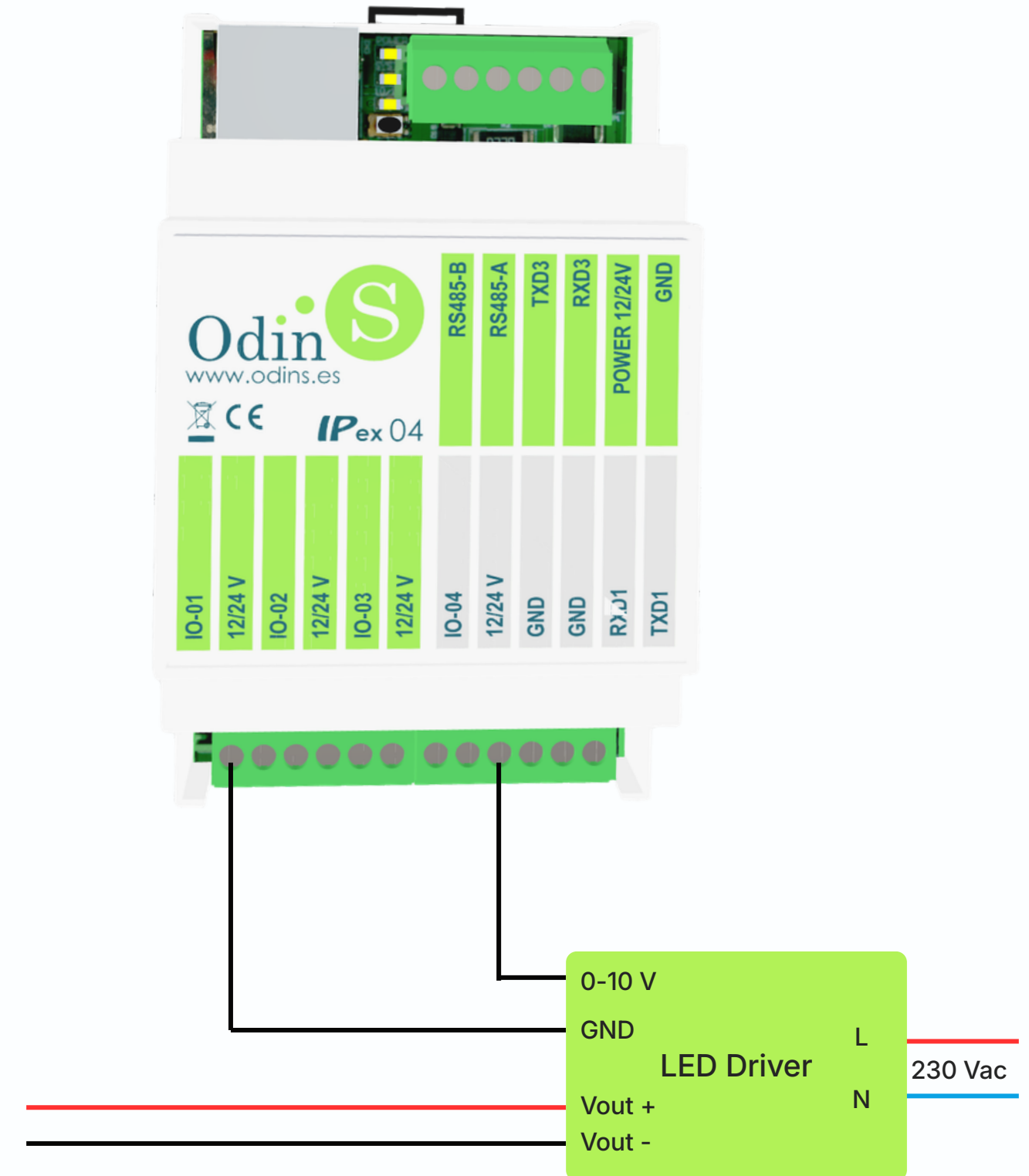


Figure 5. Wiring of an analogue output

4.5. Connecting analogue inputs

I/O ports configured as analogue inputs allow the connection of two- or three-wire analogue sensors with voltage or current outputs.

The maximum current draw of three-wire sensors shall be 500 mA.

4.5.1. Three-wire analogue voltage sensors

A sensor with an analogue voltage output normally has three wires (power supply, GND and analogue output).

The sensor's power supply is connected to the terminals marked 12/24V and GND. If an external power supply is used, the earth line must be connected to the GND terminal.

In both cases, the sensor's analogue output must be connected to the terminal marked IO-0x, where 'x' is the I/O number to which it is connected (1–4).

The *figure 6* below shows an example of how to connect a sensor with a voltage output.

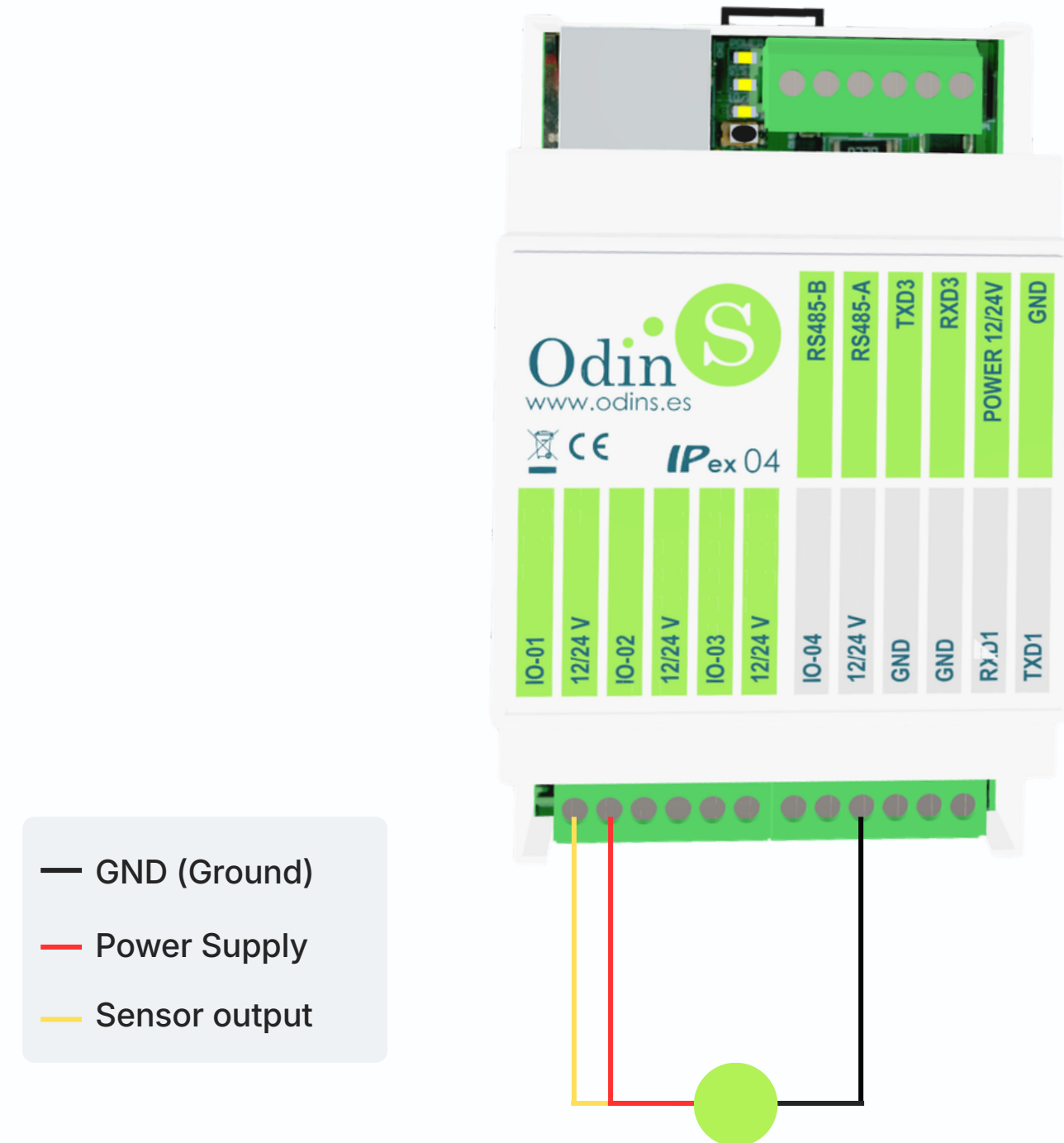


Figure 6. Wiring of a three-wire voltage output sensor.

4.5.2. Analogue current sensors

4.5.2.1. Two-wire current sensors

A sensor with a two-wire analogue current output is connected to the terminal marked 12/24V and to the terminal marked IO-0x, where 'x' is the I/O number to which it is connected (1–4).

The following figure shows an example of how to connect a sensor with a two-wire current output.

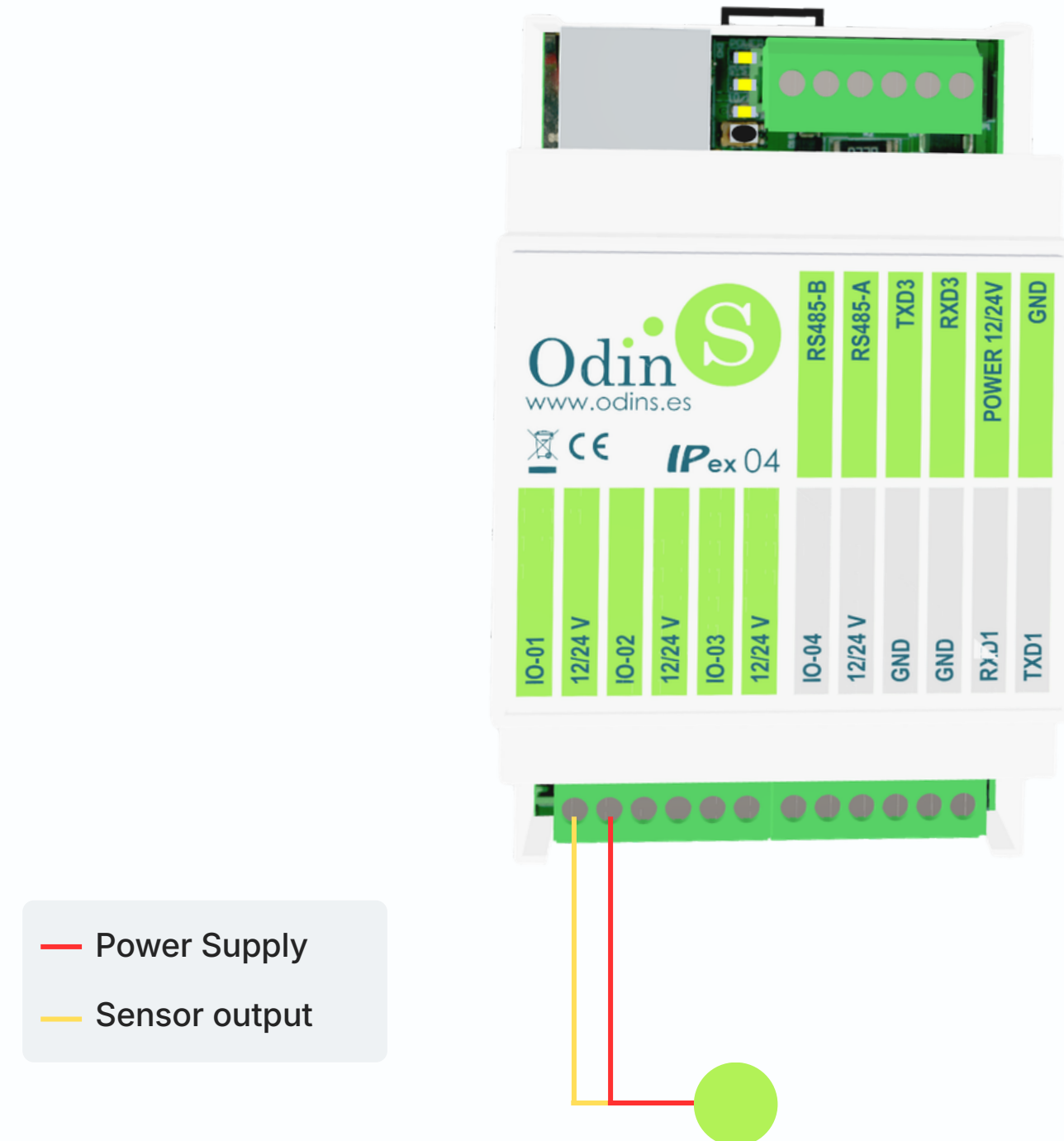


Figure 7. Wiring of a two-wire current-output sensor

4.5.2.2. Three-wire current sensors

A sensor with a three-wire analogue current output is similar to a sensor with an analogue voltage output.

The sensor's power supply is connected to the terminals marked 12/24V and GND. If an external power supply is used, the earth line must be connected to the GND terminal.

In both cases, the sensor's analogue output must be connected to the terminal marked IO-0x, where 'x' is the I/O number to which it is connected (1–4).

4.6. Connecting via the communication ports

4.6.1. Connecting an RS-232 device

The device has two RS-232 serial ports for communicating with devices that require this type of interface.

To connect to other devices, connect the TXD1, RXD1 and GND terminals on the IPex04 to the RXD, TXD and GND terminals on the other device, respectively.

The following figure shows the connection diagram.

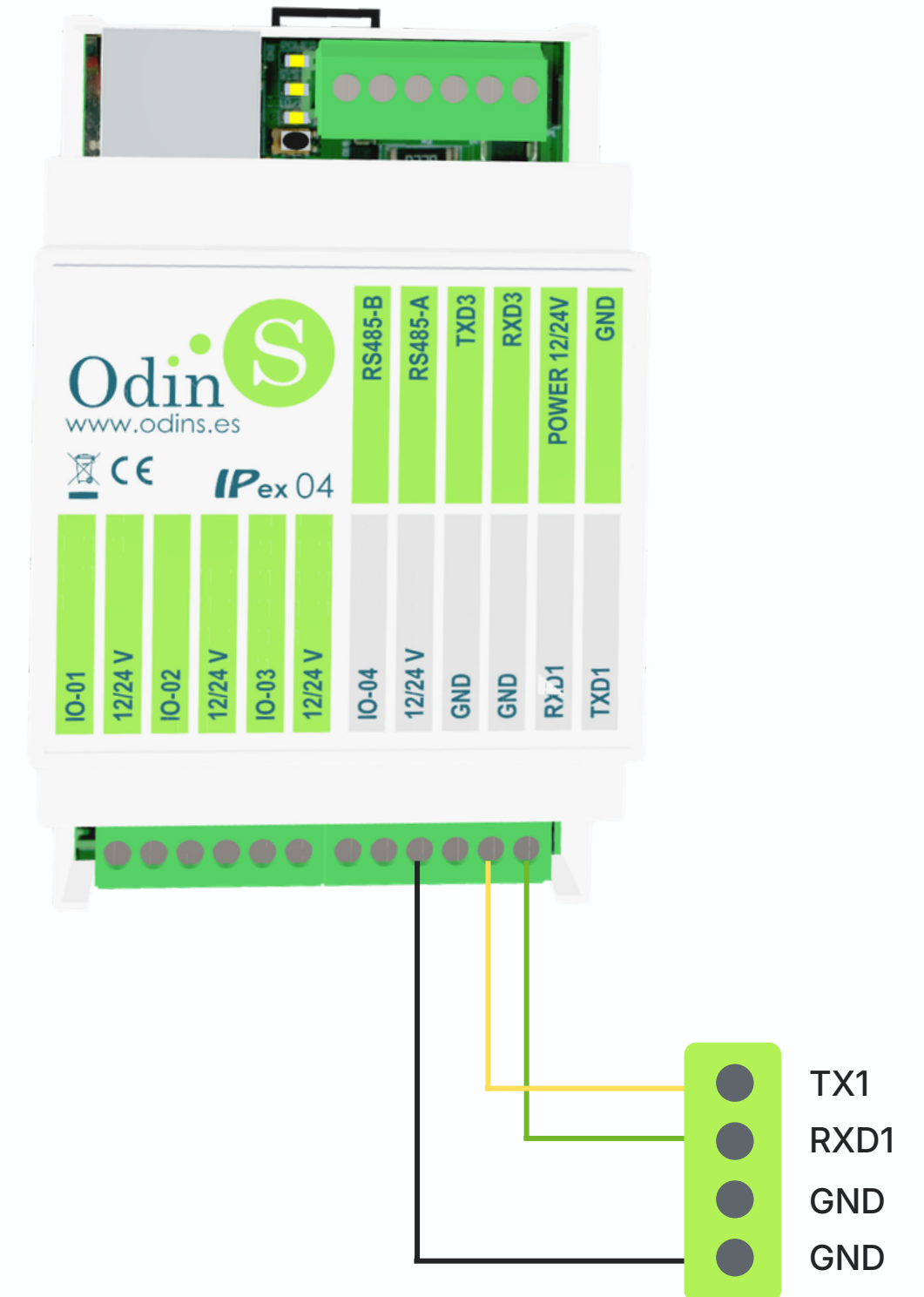


Figure 8. Wiring of an RS-232 device

4.6.2. Connecting an RS-485 device

RS-485 devices are connected to the terminals marked RS485-A and RS485-B.

A maximum of 32 nodes can be connected to an RS-485 bus. If this number is exceeded, the system may not function correctly.

On some devices, the bus lines are labelled "+" and "-" rather than "A" and "B". The equivalence is: A = "+" and B = "-".

The RS-485 bus requires a terminating resistor, which must be fitted to the first and last devices on the bus. The IPex04 controller's circuit board has a jumper, labelled JP1, which allows this terminating resistor to be enabled if required.

The following figure shows the RS-485 bus connection diagram.

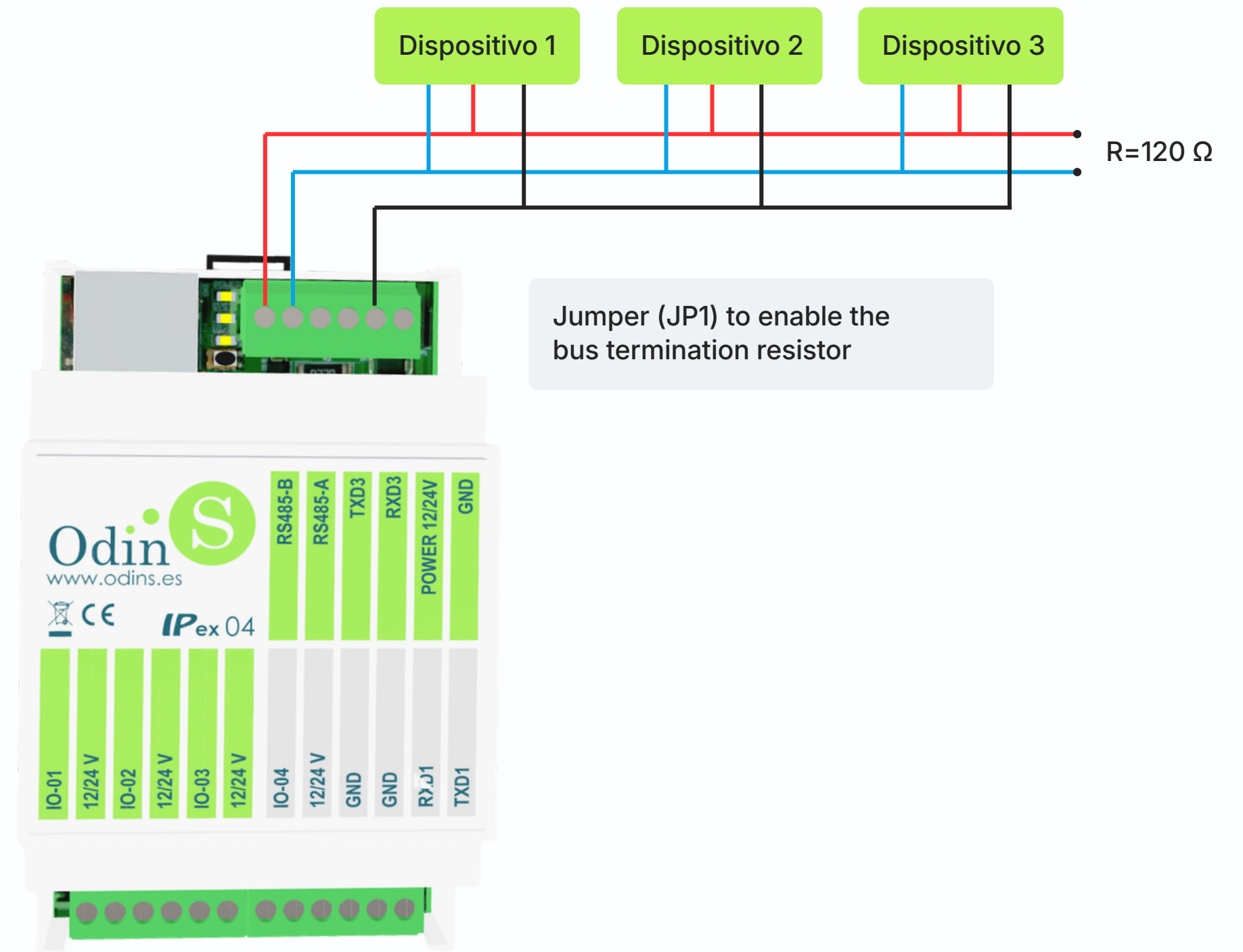


Figure 9. RS-485 bus connections.

5. Status LEDs

The controller has three status LEDs located next to the Ethernet connector: **red (D4), orange (D5) and green (D6).**

After switching on the controller, several flashing sequences are executed, enabling a series of pre-set actions, including the option to enter configuration mode in order to access the embedded web server.

Specifically, there is a window within the initial sequence where D5 remains lit and D4 is flashing; configuration mode will be activated if SW1 is pressed within that window (for further information, see the Configuration Interface Manual).

If SW1 has not been pressed, the controller will start up in normal mode, and in this mode an infinite cycle occurs, comprising four distinct parts:

1. Start of cycle: D4, D5 and D6 remain lit for five seconds.

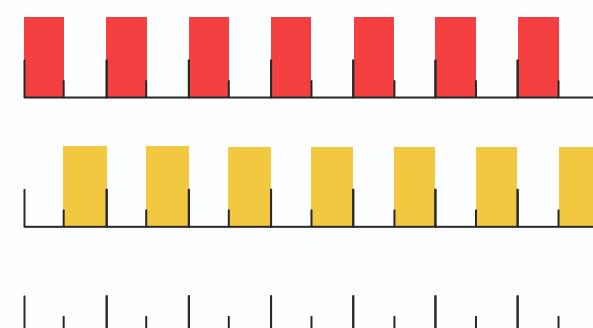
2. Connection to the GSM network: D4 and D6 remain lit whilst D5 flashes once for half a second. This phase lasts three seconds.

3. Registration on the GPRS/NB-IoT network: D4 and D6 remain lit whilst D5 flashes twice, each time for half a second. This phase lasts three seconds.

4. Connection to the MQTT broker: D4 and D6 remain lit whilst D5 flashes three times, each time for half a second. This phase lasts four seconds.

Figure 10 below illustrates what is explained in the previous section:

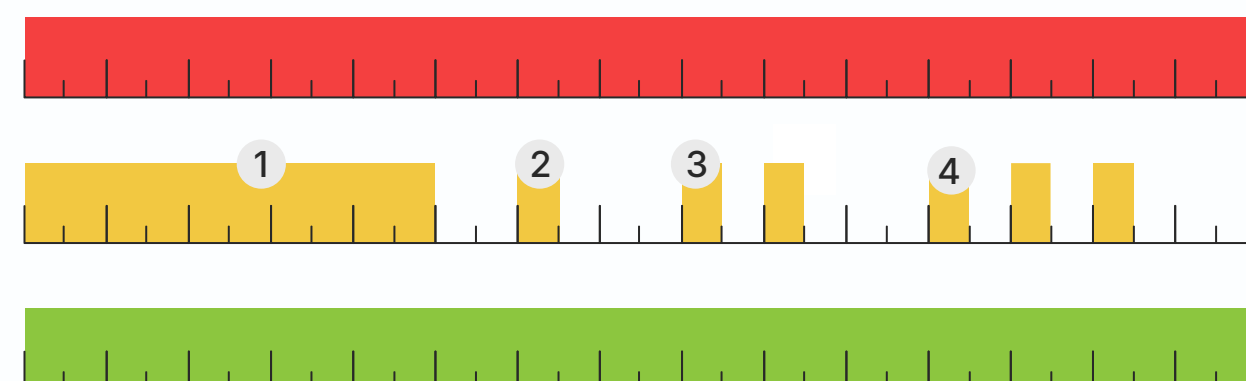
NORMAL FIRMWARE
(configuration mode)



The team is available to hear from you at:
<http://192.168.1.100>

Continuous
alternating flashes

NORMAL FIRMWARE
(configuration mode)



- 1 Start of round (always 5 seconds)
- 2 Connection to the GSM network
- 3 GPRS/NB-IoT network registration
- 4 Connection to an MQTT broker, communication with a slave device, etc.

Infinite cycle

Figure 10. Status LEDs

6. Configuring the IPex04 controller

The IPex04 controller requires minimal initial configuration, which is carried out via the web interface provided for this purpose.

The steps to follow for configuration are as follows:

1. With the controller switched off, **connect it to a computer directly or via a switch using an Ethernet cable.**
2. **Whilst holding down the button next to the Ethernet connector,** switch on the controller and continue to hold the button until the red and orange LEDs start to flash alternately.
3. If done correctly, you **can access the controller's configuration web page via a computer's web browser by entering the IP address 192.168.1.100.** The computer's network card must be configured with an IP address within the same network, **with a gateway of 192.168.1.1** and a **subnet mask of 255.255.255.0.**
4. If you have accessed the page correctly, the web page shown in the figure below will be displayed. If you cannot access it, you will need to repeat the previous steps.



Figure 11. Web page for accessing the IPex04 settings

6.1. Communications settings

In the **Communications section of the website**, you can configure the following parameters, amongst others:

- **Main interface.** Specifies the type of communications interface to be used, which can be Ethernet (by default) or GPRS/NB-IoT (requires installation of a WirelessLTE module).
- **Configuration with Ethernet interface**
- **DHCP support.** Allows you to enable automatic retrieval of network settings.
- **IP address.** Desired static IP address for the controller.
- **Subnet mask.** Subnet mask.
- **Gateway.** IP address of the gateway.

Configuration with GPRS / NB-IoT interface

- **APN.** The service provider's APN.
- **Login.** Username for the service provider to be used.
- **Password.** Password for the service provider to be used.
- **PIN.** SIM card PIN.
- **Modem RS-232 port.** Specifies the serial port to which the modem is connected.
- **Modem ON/OFF terminal.** Specifies which terminal is used to switch the modem on and off, if required.

Configuración de la plataforma destino

1. **Tipo de plataforma.** FIWARE o AZURE.
2. **Credenciales.**

Configuración del reloj

1. Servidor NTP.
2. Zona horaria.

6.2. Calibración

On the **Calibration page**, you can calibrate the analogue inputs if the readings are incorrect.

To calibrate an input, select the input and the range you wish to calibrate, connect a calibrator set to the appropriate range to that input, and press the **Read Input** button.

The minimum reading value is set by adjusting the calibrator to generate that value. The controller will return the value read by the analogue-to-digital converter. You should then press the **'Set Minimum'** button so that this value is saved and matches the value generated by the calibrator and measured by the controller.

The maximum reading value is set by adjusting the calibrator to generate that value. The controller will return the value read by the analogue-to-digital converter. Then press the **'Set Maximum'** button to save this value, ensuring that the value generated by the calibrator matches that measured by the controller.

Once calibration is complete, pressing the **'Save Calibration'** button will permanently save the changes and, if everything has gone correctly, you can press the **'Reset'** button to apply the changes made.

Should an error occur, a message will appear on screen and you will need to check the configuration settings.

Figure 12 below shows the calibration web page:

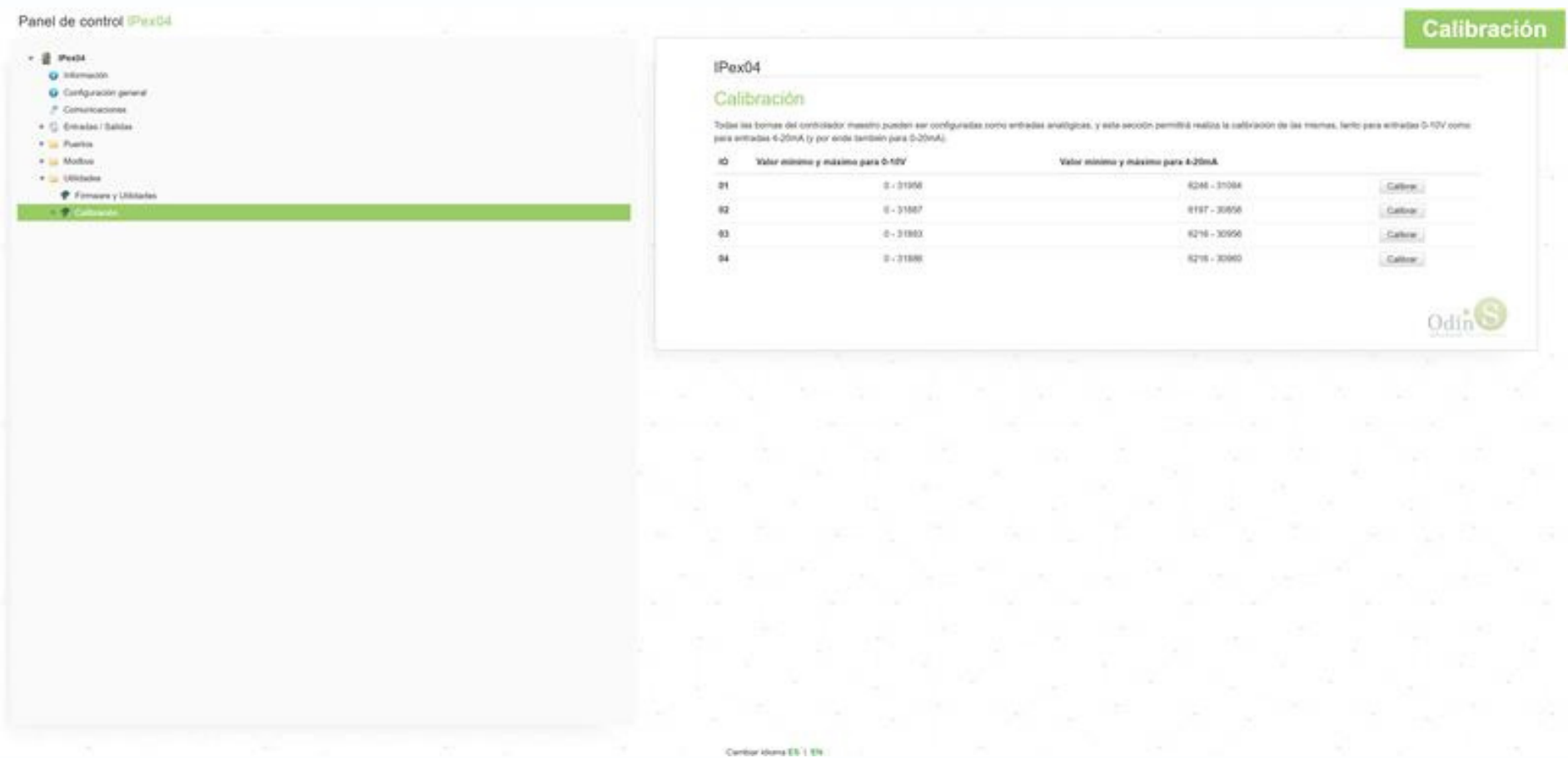


Figure 12. Calibration of analogue inputs

6.3. Advanced

On the Advanced page, you can update the device's firmware.

This option should only be used by qualified personnel with the correct files, as it may cause the controller to stop responding.

To update the firmware, click on the 'Browse...' button, select the file and click on the 'Send' button.

If everything has gone correctly, a button will appear to restart the controller and apply the new firmware.

The figure below shows the firmware update web page.

The following figure shows the 'Advanced' webpage:

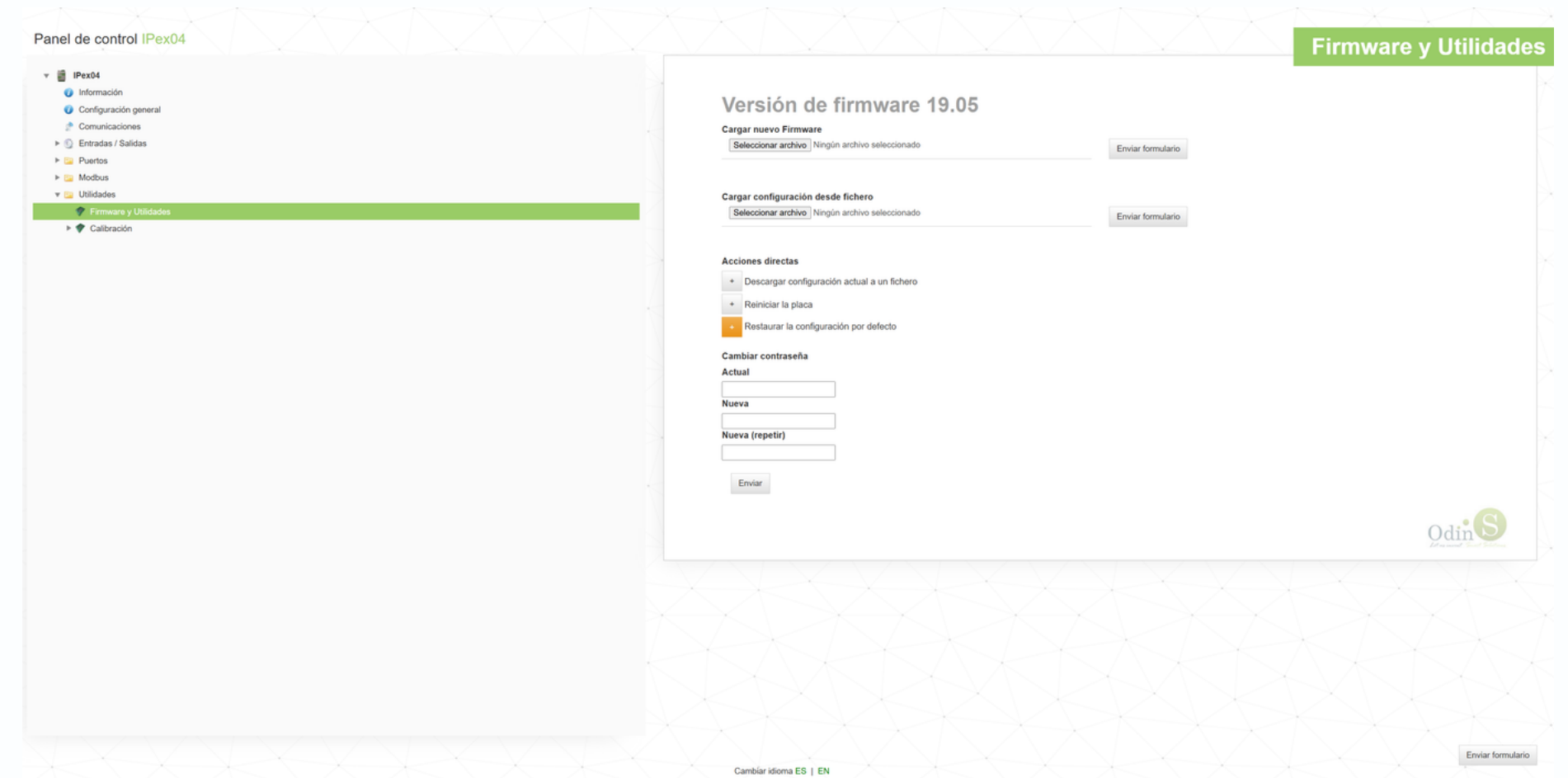
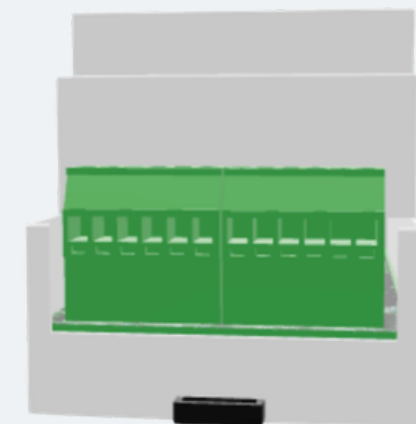


Figure 13. Firmware update

7. References

[1] Odin Solutions, IPex04 – Technical Specifications

IPex04 Visual





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