2.4GHz LoRa Gateway

NEO

User Guide
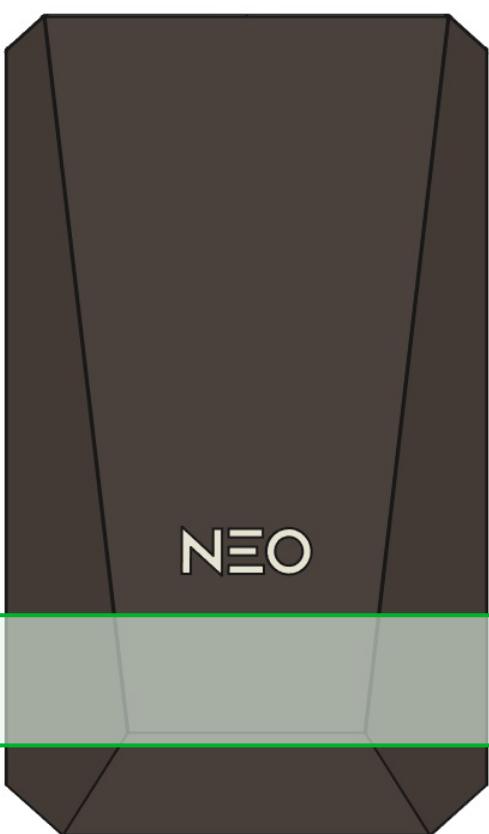
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1. Introduction

1.1 Product overview

The MX2311 is an indoor ultra-low power gateway, equipped with the SX1280 chip to provide connectivity between low-power devices and the Supernode. It operates on the 2.4GHz frequency band and utilizes LoRa modulation for long-range, low-power wireless communication, making it well-suited for indoor use. With multiple physical layers and modulations, the MX2311 is optimized for long-range communication at high data rates and has a coverage of up to 4 km. As a gateway, it is capable of data transfer, processing, and authentication, making it a versatile solution for indoor IoT networks.

1.2 Features List

- LoRa 2.4GHz.
- WiFi with full function of 802.11b/g/n over 2.4GHz.
- Two Built-in PCB Antennas for LoRa and WiFi communication.
- 10/100 Mbps Ethernet connection.
- Internal Flash memory.
- USB-C interface for power and debug.
- Internal storage 4GB eMMC Flash
- Secure element for authentication.
- Auto diagnostic functions.
- Average Low power consumption less than 1W.
- IP52 indoor enclosure.
- Temperature ranges from -10°C to 60°C.

1.2.1 WiFi

The MX2311 Gateway is equipped with built-in WiFi connectivity according to the 2.4GHz 802.11b/g/n specification. It has a built-in antenna, so no additional installation is required. The

WiFi connection can be used to provide internet access to the Gateway or to access the Web UI configuration page to manage the Gateway. If WiFi is not needed, it can be disabled to save power.

1.2.2 LoRa

It provides long range communication in the 2.4GHz band with the linearity to withstand heavy interference. The transceiver's high sensitivity and high efficiency power amplifier allows it to demodulate more data packets, reducing data collisions and allowing for more dense sensor deployment in applications such as smart farming, home automation, and asset tracking. This enables a higher degree of connectivity and control, making it possible to monitor and manage a larger number of devices or assets in a given area. Additionally, the support for different modulation schemes and programmable bit rate allows for flexibility and adaptability in different use cases and environments.

1.2.3 Processor subsystem

The MX2311 Gateway is based on the MT7688AN SoC, which is a system-on-chip developed by MediaTek. This SoC is designed for Internet of Things (IoT) applications and features a 580 MHz CPU equipped with 128MB of DDR2 and 32MB Internal flash.
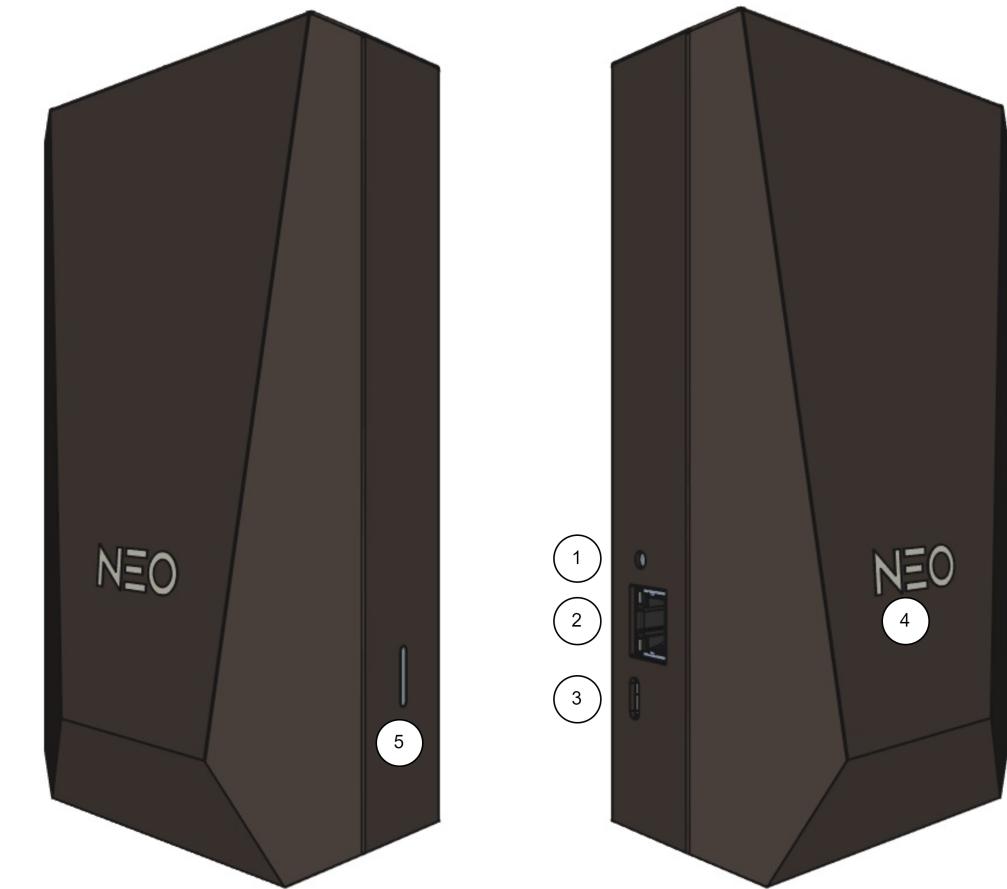

Figure 1.1: Connectors and Interfaces of the Gateway.

1.3   Connectors and Interfaces

The following interfaces are available, (see Figure 1.1):
1. User button - Is used to reset the Gateway to the factory settings.
2. Ethernet Connector.
3. USB-C Connector - The main function is to power the Gateway and can be used for accessing the console terminal.
4. NEO LED - It is an indicator for the Gateway activity.
5. Indicator RGB LED - It is used as a description of the possible status that can be found in the Table 1.1.

1.3.1   Led status

The Gateway uses an RGB LED to indicate a various status and its condition. Description of the LED status can be found in Table 1.1.

1.3.2   Console access

By default the console terminal of the Gateway can be accessed through the USB-C connector. Internally CH340C UART-USB converter is used, if the drivers for this device are not automatically installed on the PC operating system they can be downloaded from WCH Website.

The PC should detect the Gateway as a Virtual COM port. Any terminal software capable of communicating through COM ports can be used e.g. PuTTY or RealTerm. The default settings are:

- Baud rate - 57600
- Parity - none
- Stop bit - one
- Data bits - 8 bits

If the console output on USB-C port is not desirable it can be disabled in software.

LED Color	Activity
Flashing Blue	Initializing
Steady Blue	Connected to Internet, no LoRaWAN is configured
Alternative Blue and Red	Device is busy, don't unplug power
Steady Red	No Internet connection or LoRaWAN server not available
Flashing Green	Configuring Box
Steady Green	Indicates that the Gateway is connected and working normally

Table 1.1: LED activity of the Gateway

2. Quick Installation Guide

The MX2311 Gateway is a preconfigured "Plug 'n Play" device, which means that installation is extremely easy. Upon first power up, the Gateway will automatically connect to the MatchX network without the need for any additional setup. The installation guide provided will guide users through the process of configuring the Gateway and its LoRa parameters.

Each Gateway comes with a unique serial number and QR code located at the bottom of the device. These can be used for setting up the Gateway on the Cloud server. A list of available Cloud servers and links to them can be found on the MatchX website.

2.1 Software requirements

The MatchX MX2311 Gateway does not require any special software to be used, as it is preconfigured to connect to the MXC Network. To access the Cloud server, a computer or mobile device with a web browser such as Chrome or Firefox is sufficient.

To make the installation process even easier, it is possible to use a mobile device with a QR code reader to register the Gateway on the chosen Cloud Server. This allows for a streamlined setup process, as the QR code can be scanned to automatically input the Gateway's unique serial number and register it on the Cloud server.

2.2 Hardware requirements

The MX2311 was designed in a way that requires the minimum number of components to make it function.
- PC Computer or Mobile device
- Ethernet cable
- USB-C cable
- USB Power adapter
- WiFi Router or Ethernet switch
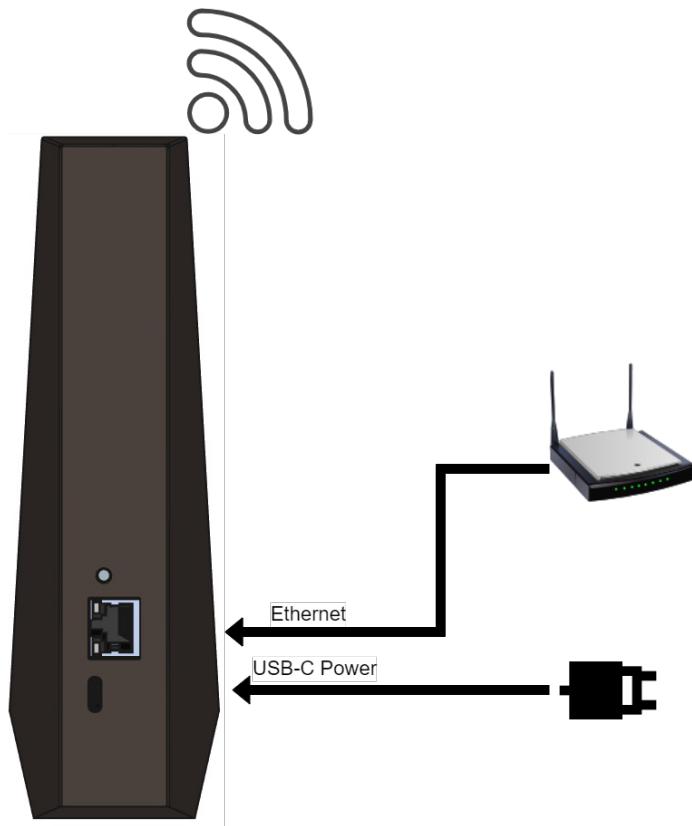
Figure 2.1: Connections of the Gateway.

2.3 Power connection

The Gateway offers only one way of supplying power through a USB-C connector. It requires a USB power adapter that is able to deliver at least 5V ⎓ 5A.

2.4 Accessing the Gateway and Internet connection

The gateway needs an internet connection to communicate with the LoRaWAN server such as the MatchX Supernode Server. Ethernet cable is the preferred method as it provides a more stable and reliable connection compared to WiFi. Ethernet cable also provides a faster connection, a greater signal strength and less likely to be interrupted by other wireless devices. However, WiFi can also be used as an alternative, especially if there is no Ethernet cable available or if the gateway is located in an area without a wired network. It's important to note that the performance of the WiFi connection may vary depending on the environment and the number of devices connected to the same network.

2.4.1 Ethernet connection

Ethernet cable is a preferred way of connecting because it provides more reliable and stable internet access. After the gateway is powered up, it should automatically obtain an IP address assigned by the DHCP server, which is typically running on the network. To find the assigned IP address, the user can log in to the router and see the list of assigned IP addresses or scan the entire local network

using software tools like AngryIP. The gateway will appear with its serial number as the hostname. After obtaining the IP address, it can be used directly in a web browser like Chrome or Firefox to access the gateway's web configuration interface if necessary. If the gateway's auto-configuration process is successful and internet access is available, the indicator LED should turn steady green.

2.4.2 WiFi connection

The WiFi interface of the Gateway works in Access Point mode by default. The SSID of the network generated by the device has a general format of: *MatchX_MX2311_yyyy*, where: *yyyy* - 4 last bytes of MAC address. The default password of the WiFi network is the serial number of the Gateway. After connecting to the network IP address will be automatically assigned to the PC or mobile device. The Web User Interface of the Gateway can be accessed by its IP address (192.168.0.1).

From the Web Interface it is possible to configure the Gateway to connect to other WiFi network and use it for internet connection. In this case there is no need to connect an Ethernet cable.
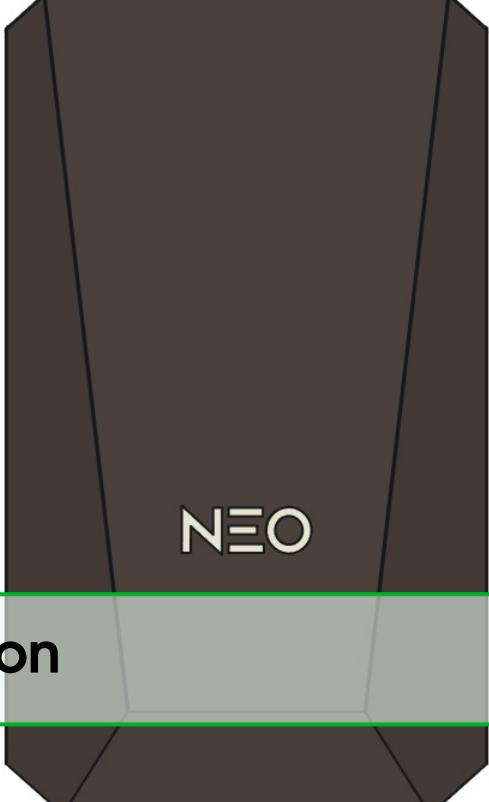
3. Product specification

3.1 Hardware Specification

Feature	Description
CPU	MT7688AN, 580MHz
Memory	128MB DDR2 RAM
Storage Memory	4GB eMMC Flash
LoRa Radio	Long Range 2.4GHz transceiver
	High sensitivity, down to -132dBm
	$\leq$10dBm, High efficiency PA
WiFi	13 Channel 2.412 GHz - 2.472 GHz, IEEE 802 Part 11b/g/n (802.11b/g/n)
Ethernet	RJ45 10/100 Mbit LAN
Console	through USB-C as virtual COM port
LEDs	Two RGB LED status indicators
Interface	USB-C for console UART and Power Reset Button
Power Supply	USB Power 5V ⎓ 0.5A
Power Consumption	Average $<$ 1W, Peak 1.65W
Operating Temperature	-10°Cto 60°C
Enclosure	Plastic
Size	190x115x63 mm
Weight	$<$ 450g
Installation method	Desktop

Table 3.1: Key hardware specifications.

3.2 WiFi specification

Feature	Description
WiFi standard	IEEE 802.11b/g/n
Antenna type	PCB Antenna
Frequency Band	2.412-2.472GHz(EU), 2.412-2.462GHz(USA and Canada)
Number of channels	13(EU), 11(USA and Canada)
Modulation	OFDM, DSSS
Supported rates	1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48, 54 Mbps

Table 3.2: Key WiFi specification.

3.3 LoRa Radio specification

| Feature	Description
Chipset	Semtech SX1280
Operating Frequency	2.403 GHz - 2.479 GHz
Number of Channels	Configurable single channel

Table 3.3: LoRa Radio specification.
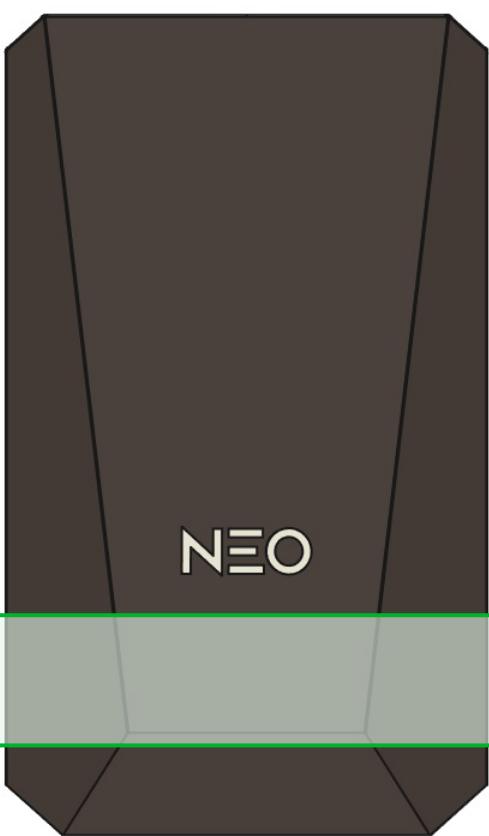
4. Package content

MatchX NEO Gateway comes in a package containing:
- Gateway
- USB-C Cable
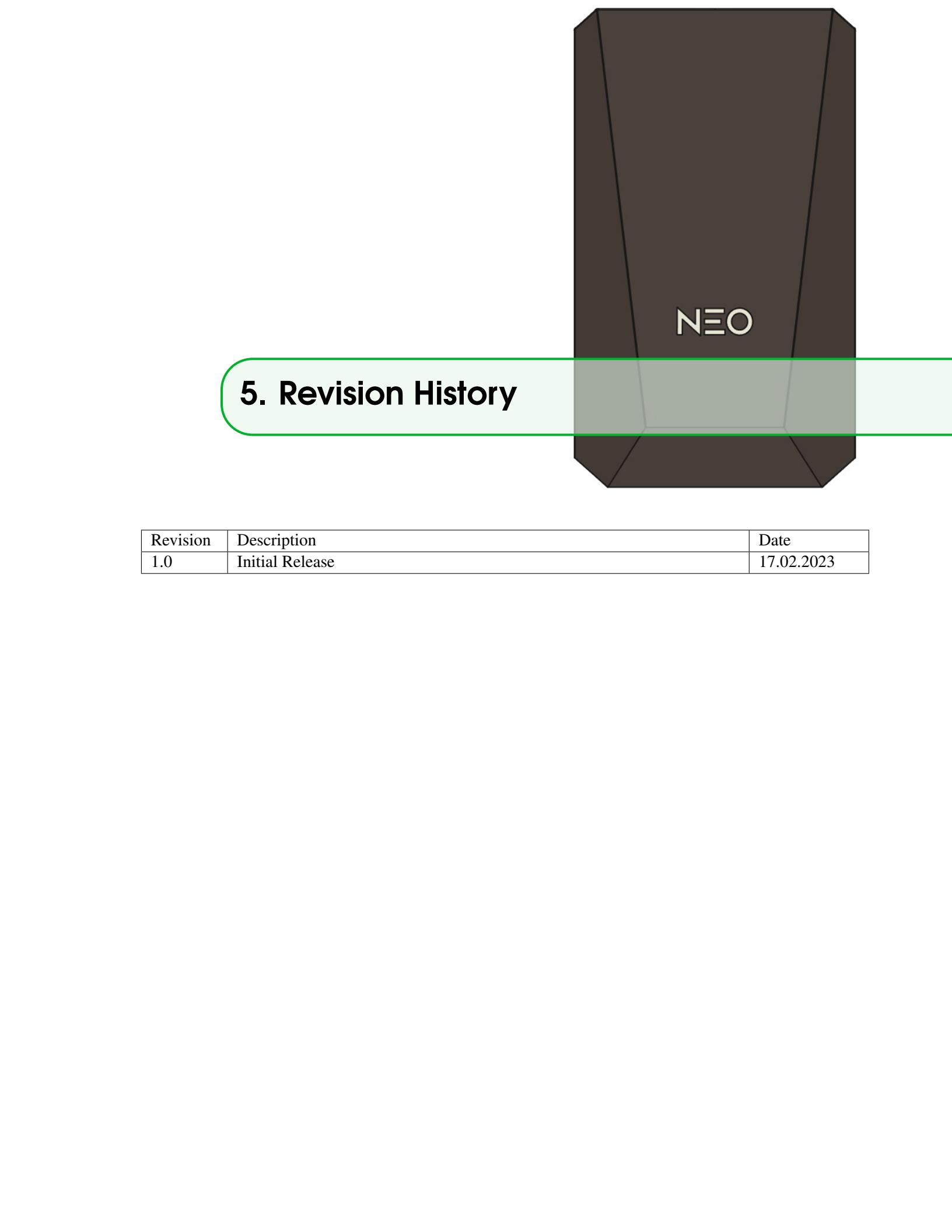
5. Revision History

Revision	Description	Date
1.0	Initial Release	17.02.2023
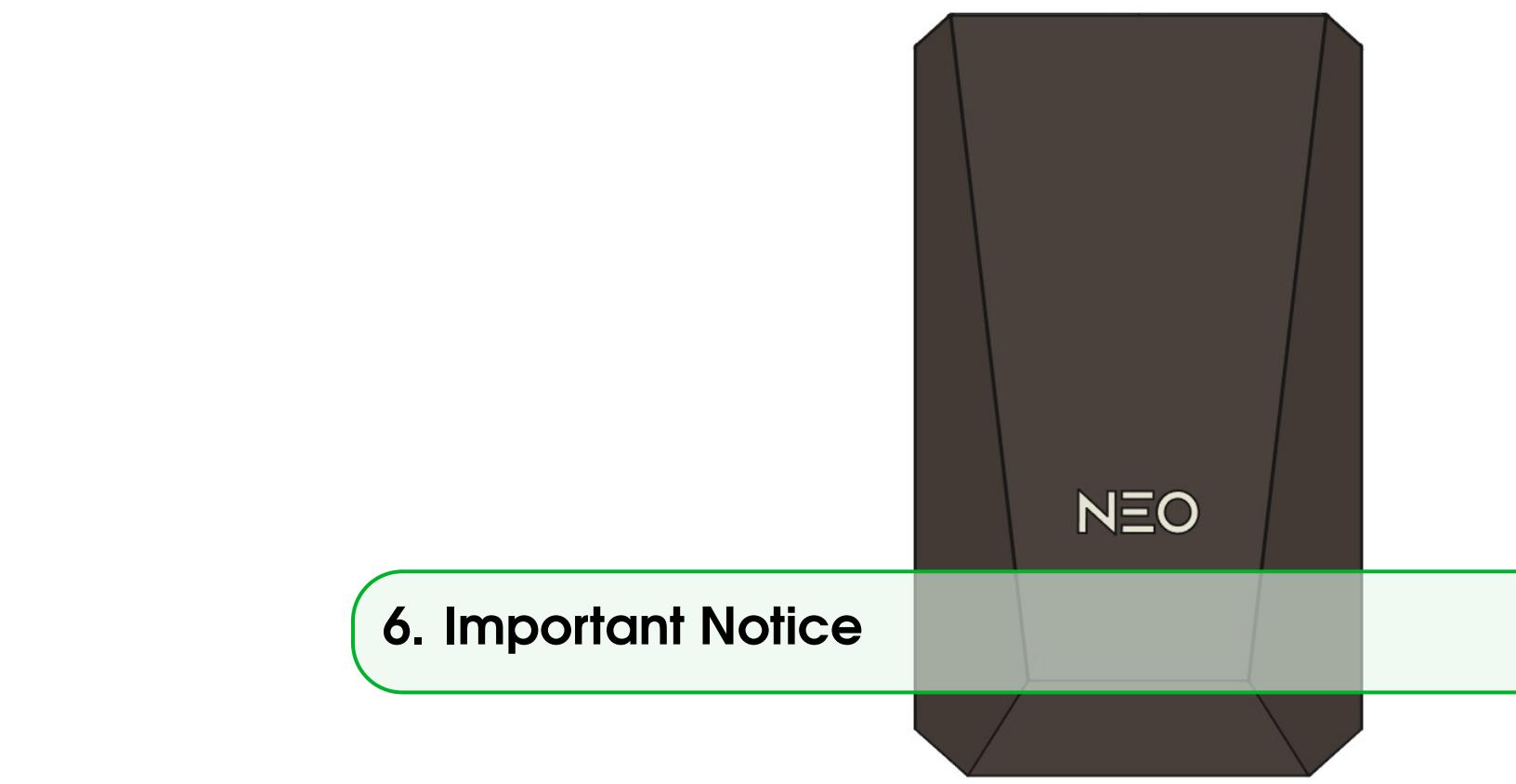
6. Important Notice

6.1 Legal notice

The information contained herein is believed to be reliable. MatchX makes no warranties regarding the information contained herein. MatchX assumes no responsibility or liability whatsoever for any of the information contained herein. MatchX assumes no responsibility or liability whatsoever for the use of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for MatchX products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information.

MatchX products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.

6.2 CE regulatory conformance - applies to MX2311

Hereby, MatchX GmbH declares that the radio equipment type MX2311 of Neo is compliance with Directive 2014/53/EU and this product is allowed to be used in all EU member states. The full text of the EU declaration of conformity is available at the following internet address: www.—.com

Manufacturer information:
Company name: MatchX GmbH
Address: Tempelhofer Ufer 17, 10963 Berlin, Germany
Operation temperature: -10°C∼ 60°C
Operation frequency (Max power)
Lora: 2403MHz-2479MHz (9.5dBm)
WiFi: 2412MHz-2472MHz (18.1dBm)

RF exposure statement RF exposure information: The Maximum Permissible Exposure (MPE) level has been calculated based on a distance of d=20 cm between the device and the human body. To maintain compliance with RF exposure requirement, use product that maintain a 20cm distance between the device and human body.

6.3 FCC regulatory conformance - applies to MX2311

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a **Class B** digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

RF Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

6.4 IC regulatory conformance - applies to MX2311

This device complies with CAN ICES-003 (B)/NMB-003(B). This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation

3. Cet appareil est conforme à la norme CAN ICES-003 (B)/NMB-003 (B).

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Exposure

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux rayonnements de la IC établies pour unenvironnement non contrôé. Cet équipement doit être installé et fonctionner à au moins 20cm de distance d'un radiateur ou de votre corps.