NEURON

SOUNDWARE

Instructions for installation, maintenance and operation

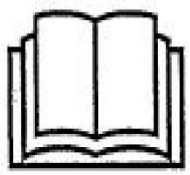
nEdge

IoT recording and specialised computing device

2022

Contents

1. Foreword



This Manual contains rules that will help you use the device safely and efficiently. Always make sure that you have read and understood this Manual before any operation and maintenance of the device.

Some activities performed in the operation and maintenance of this device may cause a serious accident if you fail to perform them in the manner described in this Manual.

Incorrect operation and maintenance of the device may be dangerous and may lead to serious injury or death. Users and maintenance personnel should receive instructions from this Manual before commencement of operation or maintenance. Keep the Manual at hand. All staff must periodically acquaint themselves with it. Do not use the device without being sure that you understand the entire contents of the Manual.

In case you lose the Manual, it gets dirty or damaged and it is no longer legible, request a new Manual from your chief. Keep this manual readily accessible to the persons operating the device at any time. In case of sale of the device or some other change in the owner, hand this Manual over together with the device.

1.1 Safety information

Most accidents are caused by non-compliance with the following basic rules of operation safety and maintenance of the device. To prevent accidents, read, understand and comply with all the provisions and warnings contained in this Manual and on the device before any operation and maintenance of the device. Do not work with or maintain the device without being sure that you understand the explanations and procedures entirely. The following warning signs are used in this Manual and on the labels on the device to identify matters related to safety:

This warning sign provides information that there is a risk of serious danger that could result in a serious injury or death!

This warning sign provides information that there is a risk of danger that could result in an injury.

This warning sign is used for risks that may result in damage to the device or other property.

NOTE
This Manual has been prepared based on the applicable regulations and technical standards.

2. Safety

Please make sure that you have fully understood this Manual and all other warnings and instructions indicated on the device. During operation of the device, always strictly follow these safety instructions.

2.1 Operating manual and safety labels

Read the instructions in this Manual and on the safety labels located on various parts of the device and make sure that you understand them and comply with them. Misunderstanding or non-compliance with the instructions leads to incorrect operation, which may result in damage or injury. Make sure that you understand the procedures for correct use of the device and performance of checks; ensure their safe application. From time to time, read this Manual and the safety labels again. If the operating Manual or the safety labels are lost or get dirty (i.e. become illegible), ask your superior to provide you with new ones; then attach the safety labels to the designated places.

2.2 Qualifications of the operator

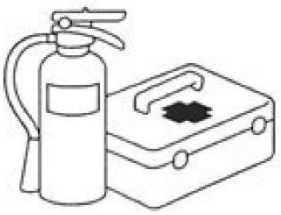
The device may only be operated by qualified workers. Before the start of operation, check that you have the necessary qualifications. Before the start of operation or maintenance, make sure that you have thoroughly read this Manual and fully understand it. If you are supposed to operate or maintain this device – although you have experience with operating or maintaining other similar devices – ask for instructions from an authorised person who has experience with operating or maintaining this device.

2.3 Unapproved modifications

Any modifications made without the consent of the manufacturer of the device or your superior may cause safety risks. Before performing any modification, consult your supplier of the device or your superior.

2.4 Fire extinguisher and first-aid kit

If any abnormality occurs during the operation of the device, stop the operation immediately and inform the authorised person. Make sure that suitable fire extinguishers are available and that you understand the instructions on the labels of these fire extinguishers. You should know what to do in case of fire. Make sure that you know how to contact persons who need to be informed in case of emergency. Make sure you know where the first-aid kit is placed.



2.5. Safety rules

Do not operate the device or perform its maintenance in case of fatigue, illness or if you have consumed alcohol, medication or other substances that cause sleepiness or fatigue. During operation, checking or maintenance of the device, always respect the rules of the workplace and safety regulations and measures. When operating the device, pay attention to safety and to the other persons present and the surrounding conditions.

2.6. Operating environment

Before disconnecting or connecting the cable, turn off the device and disconnect it from the electrical network. These operations must only be performed with dry hands. Use the device at a sufficient distance from heat and fire sources (1–2 metres), e.g. heating, candles, etc., and at a sufficient distance from electrical appliances generating strong electromagnetic fields, such as microwave ovens or refrigerators. We recommend using the device at room temperature. The maximum recommended temperature at which the device can be used is 60°C. The minimum recommended temperature at which the device can be used is 10°C Do not cover openings of the device with any objects. Keep at least 10 cm of free space around the device so that the heat released by it can be dispersed. Do not place any objects on the device. If any object or liquid enters the device, immediately turn off the device. Disconnect the power supply cable and other cables connected to the device and contact the service centre.

2.7 Accessories

Use only accessories supplied or approved by the manufacturer of the device. The use of other accessories may affect the device's performance, cause it to lose its warranty or certification and it may lead to an injury.

2.8. Power adapter

If you are not using the device, disconnect the power adapter from the mains. The use of an adapter other than that supplied in the packaging with the device may result in damage to the device and cause loss of warranty for the device. Use the power adapter only in an electrical network that corresponds to the values specified for the power adapter. Otherwise, there may be a fire, damage to the power supply or the device. Do not use the adapter if it is damaged. Doing so might lead to an electric shock. The electric socket to which the power adapter is connected should be close to the device and should be easily accessible. If the power cable is damaged (it is broken or its insulating cover is damaged) or the power plug is loose, stop using the power cable immediately. The use of a damaged cable may result in an injury caused by electric current, a short circuit of the adapter or a fire.

2.9. Storage and maintenance

If you are not using the device, disconnect it from the power supply. Keep the device and its accessories clean and do not use it in a dusty environment. Keep the device away from fire and other heat sources. Protect the device and its accessories from moisture, water and keep them in a dry environment. Protect the device from shock and deformations. In case of any unusual situation, e.g. if the device begins to emit an unusual smell, sound or smoke, stop using it immediately, turn it off and disconnect it from the power supply. Then disconnect all accessories from it and contact the manufacturer. In case of any problem in terms of the device's functions, rather than its design, try to restart it by disconnecting the power cable from the power source.

2.10. Fire protection

In case of a fire caused by a short circuit, use dry powder or carbon dioxide fire extinguishers intended for extinguishing electrical devices connected to power.

2.11. To be used only for specified purposes

Use the device only for the purposes specified. Never use the device for purposes for which it is not intended.

2.12. Security risks and how to avoid them

Increased attention must be paid to movement around the device and in the area of the device. There is a risk of damage to the device, its power cable or power adapter, e.g. by being trampled on, knocked down from a table, etc.

In case of a failure of any security feature (insulation of power cables, protective cover of the device), it is necessary to stop using the device and provide for repair. A security feature of the same or higher category must be used in the repair.

3. Technical description of machinery

3.1. General information

3.1.1. Safety instructions

Warnings signs and symbols

Failure to comply with these instructions may result in **serious injuries or even death** of the personnel performing operation and maintenance of the device, as well as other persons present in the proximity of the device.

Failure to comply with these instructions may result in **damage to devices, products or other material damage**.

3.1.2. Principles of use in accordance with the purpose

See par. 3.2.

The device may only be operated if it is in a defect-free technical condition, may be used exclusively in accordance with its purpose, while being aware of all safety principles and possible threats, and exclusively with compliance with the operating instructions. Defects must be removed without delay – especially those that could affect the safety of operation of the device and endanger health when working with the device.

The use of the device in accordance with the purpose also includes compliance with the operating manual and compliance with the conditions for checks and maintenance.

3.1.3. Changes in the operating behaviour of the device

During the operation, pay increased attention to the correct course of the individual processes.

In case of any changes in the operating behaviour of the device, the device must be immediately stopped and the incorrect function and possible causes must be subsequently checked.

Malfunctions in the operating behaviour of the device must be removed, especially if they reduce the device's safety.

3.2. Purpose of the device

The device serves for monitoring and recording sounds/ vibrations, transferring the recorded sounds to digital data and sending these data or directly processing them through neural networks or through other algorithms working directly in the nEdge device.

A specific example of use is a forecast of defects of the cogeneration unit, where sensors are firmly connected with the combustion engine block and, on the basis of data from these sensors and their evaluation, nEdge points out the approaching defect, which was taught in advance to the neural network.

3.3 Description of the device

This IoT recording and specialised computing device may be installed to enable audio monitoring of any source. Thanks to the state-of-the-art computer technology, the device is able to obtain and process comprehensive data on the machine without the need to transfer data to a cloud storage.

Device parameters

- up to 4 channels for simultaneous recording with multiple piezo sensors;
- smart recording software supporting different audio formats and recording mode of 48 kHz;
- processing of data on the device;
- LAN and possible external WiFi / LTE connectivity for data transmission;
- supports external drives;
- easy installation next to the machine or to the DIN rail.

4. Operating the device

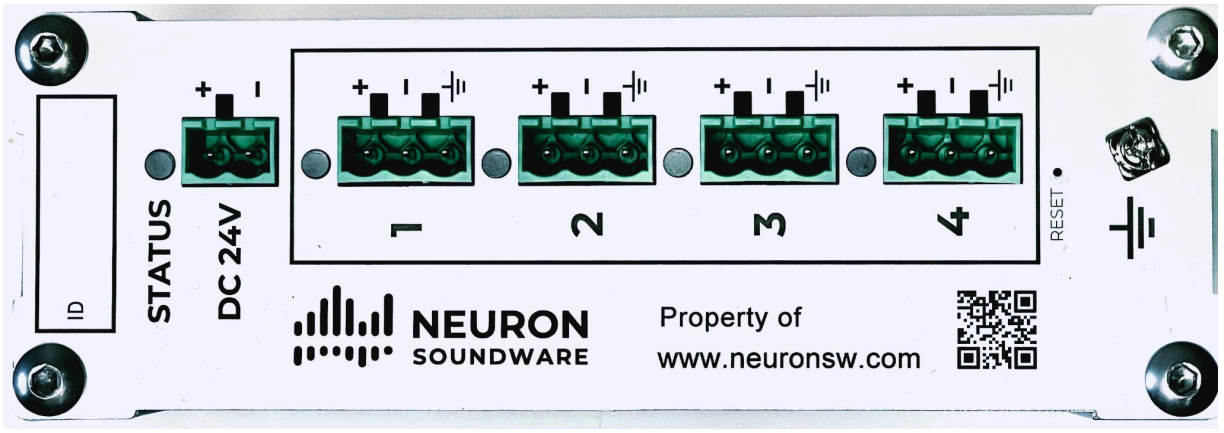
4.1 Connect the power supply and source of connection (LAN)

After you connect the sensor to the sensor port, check the color.
1,2,3,4 = sensor connectors

If it shines:

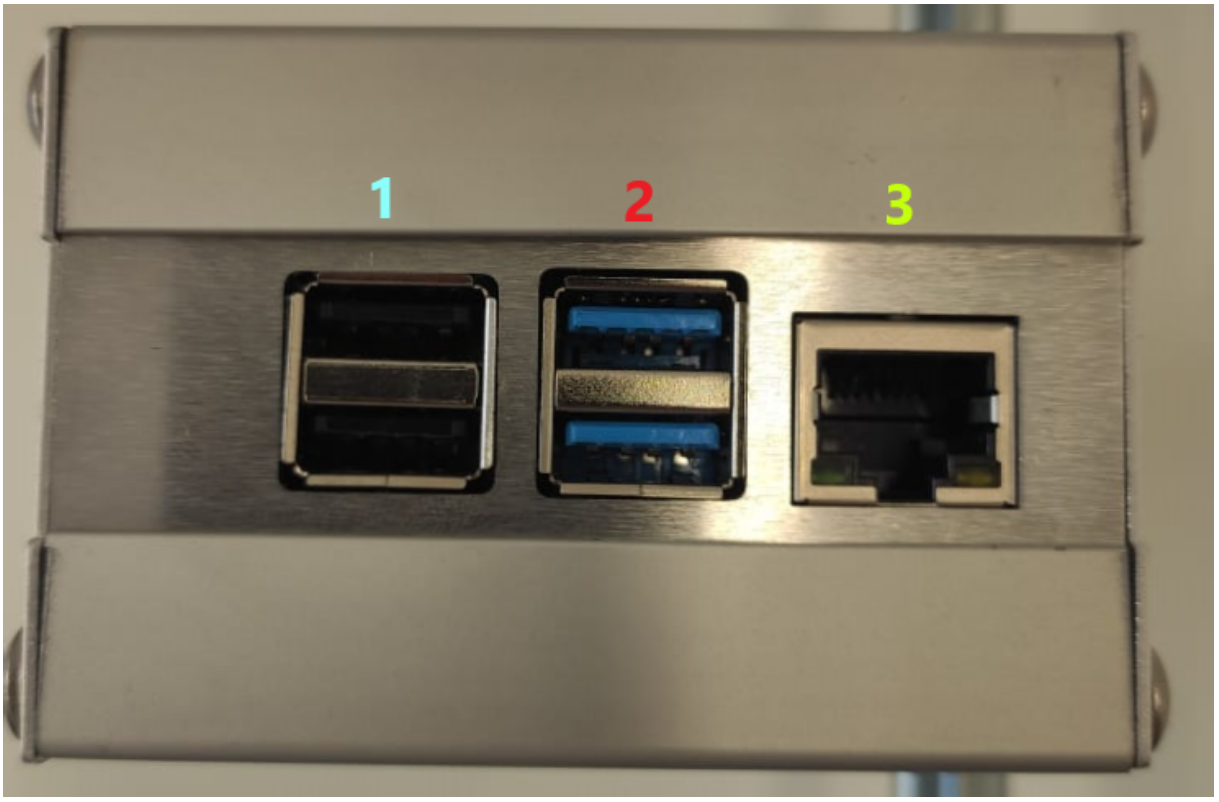
GREEN - Sensor is working fine.
BLUE - Sensor is not connected.
RED - Sensor has a power shortage, please check it is connected properly. If the issue persists, please contact Neuron SW for support.

DC24V = power supply connector
STATUS LED = all OK - **solid green**
no ssh tunnel (no connection) - **blink blue**
overheating - **solid red**
doesn't record/broken - **solid red**

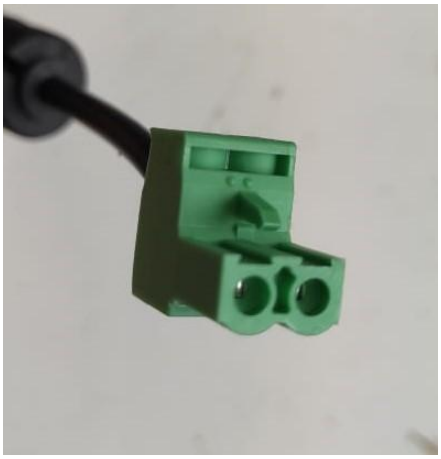


On the side you can find USB 2.0, USB 3.0 and LAN ports

1 = USB 2.0
2 = USB 3.0
3 = LAN

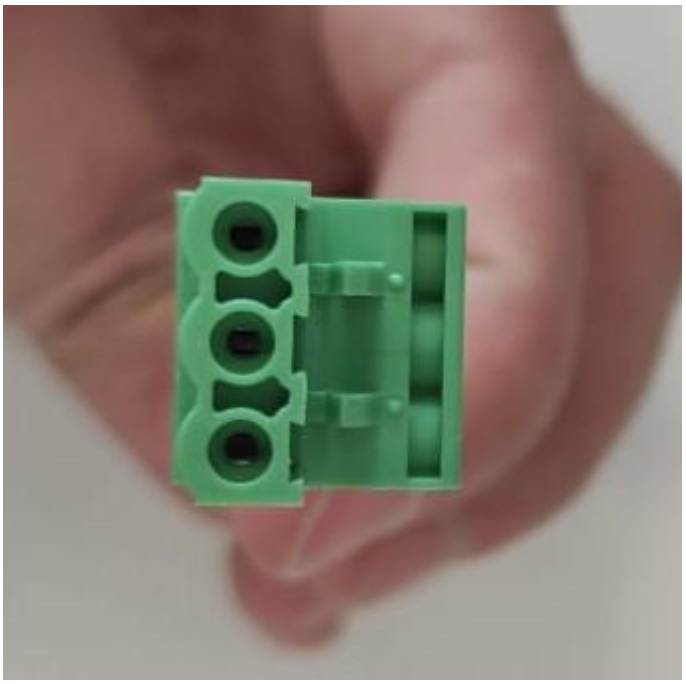


Power supply connector
Plug into power connector port (DC24V)



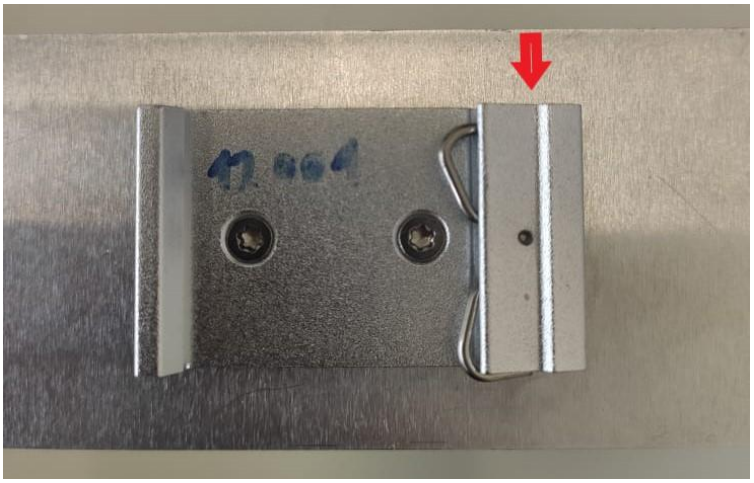
Sensors

They already come with a magnet, so just attach them to the machine and plug the green connector to the designated sensor port.



Din holder

Is located on the back of the device. Attach the red marked side first.



4.2 Network requirement sheet for nEdge device

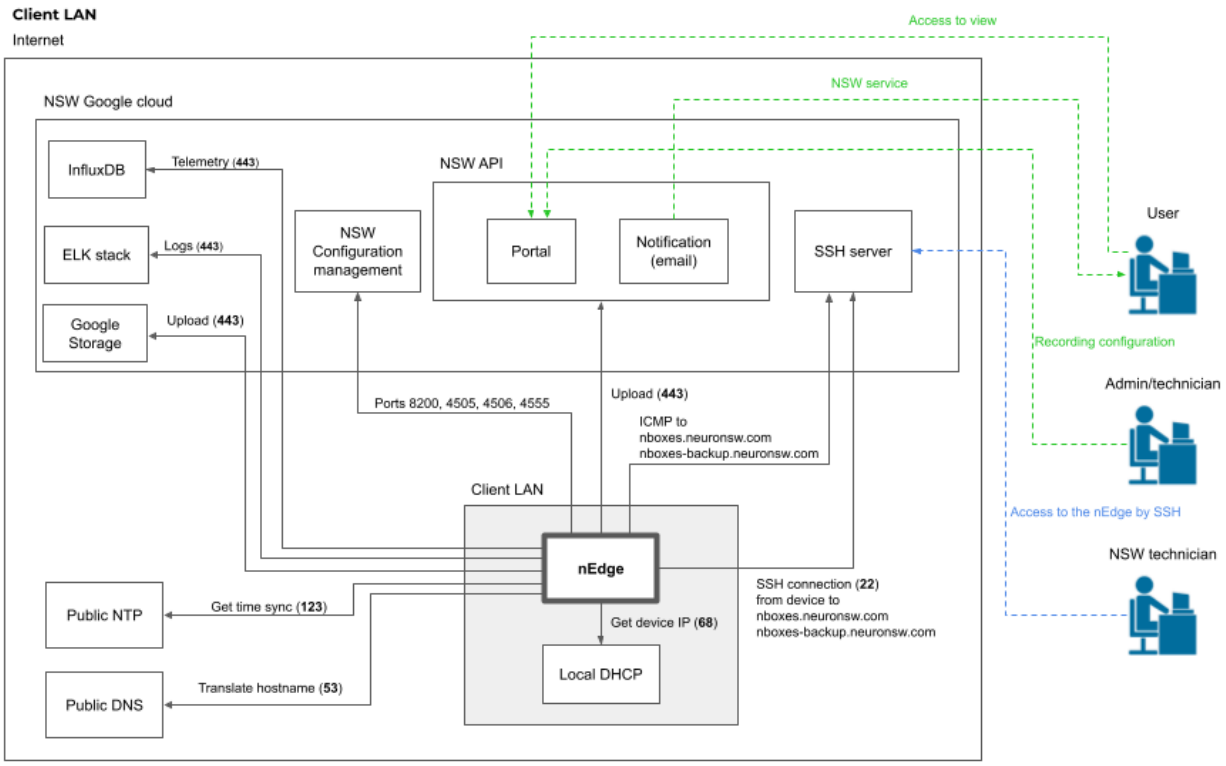
Data connectivity -	LAN using standard RJ45 connector LAN cable
System -	Customized Debian Linux.
Required opened ports **Across all IP range** **All for outgoing connection**	Port 22 (for SSH connectivity) Port 443 (for example for Uploader service) Port 53 (for DNS, default DNS server is 8.8.8.8) Port 123 (for NTP) Port 8200, 4505, 4506 and 4555 (for Configuration management) TCP+UDP) outgoing connection, encrypted

MAC address - Will be provided if requested/required, but It is highly recommended to DO NOT set up firewall rules based on MAC address to avoid issues during future replacement of the device.

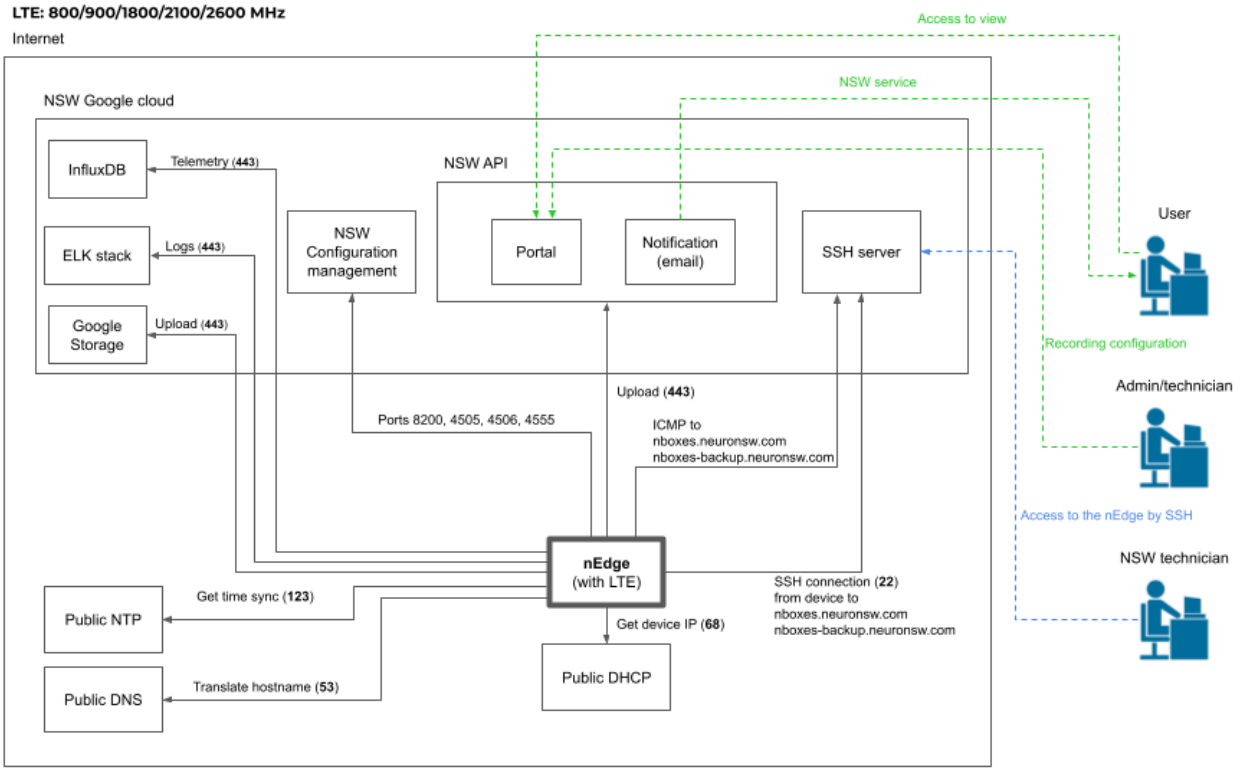
Hostnames that the device connects to (by SSH):

nboxes.neuronsw.com - **22**
nboxes-backup.neuronsw.com - **22**
new-api.neuronsw.com - **443**
salt.neuronsw.com - **8200, 4505, 4506, 4555**
Influx2.neuronsw.com - **443** - Device Telemetry
3c603d11792844fe8b69a5c775618b50.europe-west4.gcp.elastic-cloud.com - **443** -Device Logs
storage.googleapis.com - **443**

4.2.1 LAN connectivity scheme



4.2.2 LTE connectivity scheme



5. Checks and maintenance

Only qualified personnel may perform maintenance and checks.

Inspections, maintenance and repairs of the device may only be performed by persons with a due certification (local or national) and authorised by a person appointed by the operator.

Cleaning and maintenance may only be performed when the device is at standstill and turned off. It is prohibited to use sharp objects for cleaning that could damage parts of the electrical system or other parts of the device.

5.1. Maintenance and cleaning

The device does not require any special maintenance. In case of any technical problem or if servicing is needed, please contact the manufacturer. Only clean the device with dry pieces of cloth from natural fibres that do not generate static electricity. Do not use any sharp objects.

6. Installation

Before reading this chapter, please read and be sure that you understand the chapter on safety.

Before commencing work, check the individual parts of the device and the cables for any signs of damage. In case of any damage to the device or its parts, immediately stop using the device and notify the responsible person of this fact. When operating the device, use personal protective equipment prescribed by the local operating regulation. During operation and maintenance of the device, do not wear any jewellery (rings, chains, watches) – there is a risk of damage to health or endangerment of life! During operation, never open or remove any covers or disconnect any safety components.

6.1. Storage of the device

If you are not using the device, clean it from impurities, place it in the original box and store in a dry environment at room temperature, covered with air-permeable fabric.

Never cover the device with plastic film or airtight fabric – this could lead to condensation of water on some parts of the device and corrosion of these parts.

6.2 Installation

Position the device and make sure that there is enough space around the device for its operation. Connect the device to the mains. It is necessary that the electrical network parameters correspond to

the technical parameters of the device; perform a test operation during which you will test all the functions of the device.

7. Start of operation and operation

During operation, never remove the protective covers of the device and do not work without these covers. In case of any abnormal noise or non-standard functioning of the device, immediately turn it off, turn off the main switch and notify the responsible person of this fact.

Only a trained maintenance employee can interfere with the set-up of the device! Users may only use the device for the purpose for which it is intended and may in no case change the settings and adjustment of the device!

7.1 Instructions for start of operation and operation

Instructions for the individual parts of the device can be found in the relevant part of these instructions for use.

8. Disposal after end of lifetime

Before commencing the disassembly, the device must be disconnected from the supply of working substances.

The device contains substances and materials that are dangerous to the environment.
For this reason, it is necessary to dispose of waste from this device pursuant to the applicable legislation after the end of the device's lifetime.

8.1 Disposal of the device after the end of lifetime

After the end of the device's lifetime, proceed according to the following instructions:
Disconnect the power supply. Disassemble the device and sort the individual parts according to their material. Clean the disassembled parts that are contaminated by operating liquids or other substances from residues of these liquids or other substances, then send it to the manufacturer.

9. Manufacturer & technical parameters:

9.1 Technical parameters

Dimensions	53 × 80 × 155 mm
Material of the cover:	Aluminium
CPU, GPU, RAM, Storage:	Quad core Cortex-A72 (ARM v8) 64-bit, 1,2 GHz, ARM Mali-T860MP4 GPU, 4 GB RAM, 32 GB eMMC
Connectivity:	Ethernet, possible external: LTE SIM7600(on request, WiFi (on request) RS232, RS485, etc
EL. source, consumption:	24 V DC, max 1A, min 120mA
Sound recording:	Up to 4 recording channels
Operating temperatures:	Min. -10°C, max. 60°C
Outputs:	1x ETH, 2xUSB2.0, 2xUSB3.0
Sensors:	IEPE 1D sensors, standardly used is CTC AC102-1A, ADS1263 (on request for current measurement)

9.2 Communication means:

Inner:
I2C / UART / SPI / I2S

Outer:
LAN 1 GbE / USB II/ USB III / HDMI | External: GSM - LTE / WIFI

9.3 Technical specification of the sensor:

Dimensions:	(W×L×H): 25 × 22 × 53 mm (sensor only)
Audio quality:	0,5 Hz - 15+ kHz
Weight:	90 g
Temperatures:	−50 °C to 121 °C
Maximum vibration:	5,000g, peak

9.4 Manufacturer and service company:
NeuronSW SE Škrétova 490/12 Prague 2, 12000

9.5 Registered office of the company:
NeuronSW SE Škrétova 490/12 Prague 2, 12000

9.6 Address of the company office:
Panorama business center, Škrétova 490, Vinohrady, 120 00 Prague 2, Czech Republic

9.7 Website:
https://www.neuronsw.com