

TECHNICAL REFERENCE MANUAL

NEMOSENSE V26-2



NEMOSENSE-3xMEMS-ACC



NEMOSENSE-BMG-3xMEMS-ACC

Table of contents

Table of contents	2
1. Introduction	4
2. Operational principle	5
3. Getting started with NEMOSENSE	6
Dewesoft NEMOSENSE Config Tool	6
Dewesoft Historian software	6
Configuration mode - using the NEMOSENSE Config Tool	7
Configuration mode - Default user access level	12
Configuration mode - Admin user access level	23
Operational mode (measurement)	29
Viewing data from NEMOSENSE device	30
Downloading data files from the device to a PC	30
Synchronization	31
Meaning of LEDs and UPS mode activation button	31
5. Hardware configurations	34
Basic	34
Battery option	34
Mobile/GNSS options	35
Enclosure for explosive environments (Exd)	36
6. Specifications	37
General device specifications: NEMOSENSE	37
Battery pack (B option) extension specifications:	37
Battery pack with solar input (-BS option) specifications:	38
Mobile (M option) extension specifications:	38
GNSS (G option) extension specifications:	38
Measurement specifications: 3xMEMS-ACC-8g	39
Measurement specifications: 3xMEMS-ACC-40g	39
Measurement specifications: 3xMEMS-ACC-S	40
Measurement specifications: 3xMEMS-ACC-INC	40
Bandwidth specifications	41
Dimensional drawings	42
NEMOSENSE-3xMEMS-ACC	42
NEMOSENSE-B-3xMEMS-ACC	43
NEMOSENSE-G-3xMEMS-ACC	44
NEMOSENSE-M-3xMEMS-ACC	45
NEMOSENSE-MG-3xMEMS-ACC	46
NEMOSENSE-BMG-3xMEMS-ACC	47
NEMOSENSE 3xMEMS-ACC-EXD	49
7. Installation and Connection Instructions	50
Mounting surface	50
Mounting methods	50
Instructions for connecting and disconnecting PushPull RJ45 plug	50
Wiring	51
SIM card installation for standard 3xMEMS-ACC housing	52

SIM card installation for 3xMEMS-ACC-S variant housing	53
About this document	54
Legend	54
Online versions	54
Device Technical Reference Manual	54
DEWESoftX User Manual	54
Warranty information	55
Calibration	55
Support	55
Service/repair	55
Restricted Rights	56
Printing History	56
Copyright	56
Trademarks	56
Safety instructions	57
Safety symbols in the manual	57
Safety symbols on the device	57
General Safety Instructions	57
Environmental Considerations	57
Product End-of-Life Handling	58
System and Components Recycling	58
General safety and hazard warnings for all Dewesoft systems	58
Appendix 1 - MQTT topics and payloads	61
Valid from firmware version v4.x.x onwards	61
Legacy - MQTT payload valid for firmware older than v4.x.x	86
Appendix 2 - HTTP configuration mode API	91
Endpoint Reference	91
Examples	94
Documentation version history	97

1. Introduction

Dewesoft NEMOSENSE is a family of low power devices designed for remote monitoring. NEMOSENSE devices acquire data, store it to an internal memory and send it to the server when connection is available.

Naming convention of NEMOSENSE devices

The initial string after “NEMOSENSE” denotes the hardware options of the platform while the remaining strings denote the measurement types.

If no platform option is specified, the device only has ethernet connectivity and passive PoE power supply input.

Available platform options:

- B - battery
 - no additional option specifies standard battery module
 - WT specifies Wide Temperature battery module
- S - solar input add-on for the battery module
- M - mobile connectivity (4G / LTE)
 - no additional option to -M specifies LTE module for EU/EMEA region
 - add -NA suffix for North America region
 - add -LA suffix for Latin America region
- G - GNSS synchronization
- P - Standard IEEE 802.3af PoE power input on ENET 1 port, forward over spare pairs on ENET 2
 - Class 0 PoE device - 15 W max allocated from PSE
 - Without -P option, device supports only passive PoE power mode on both ENET ports.

Available accelerometer modules:

- 3xMEMS-ACC 8g - embedded triaxial MEMS accelerometer $\pm 2g$ to $\pm 8g$ measurement range
- 3xMEMS-ACC 40g - embedded triaxial MEMS accelerometer $\pm 10g$ to $\pm 40g$ measurement range
- 3xMEMS-ACC-S - $\pm 15g$ measurement range, $0.7 \mu g/\sqrt{Hz}$ spectral noise density.
- 3xMEMS-ACC-8g-INC - The same specs as the 3xMEMS-ACC-8g with an integrated inclinometer.
- 3xMEMS-ACC-40g-INC - The same specs as the 3xMEMS-ACC-40g with an integrated inclinometer.

The options and measurement types can be combined. Some exemplary configurations are listed below:

- NEMOSENSE-3xMEMS-ACC-8g (ethernet, triaxial MEMS accelerometer)
- NEMOSENSE-B-3xMEMS-ACC-8g (ethernet, battery, triaxial MEMS accelerometer)
- NEMOSENSE-M-3xMEMS-ACC-8g (ethernet, mobile, triaxial MEMS accelerometer)
- NEMOSENSE-G-3xMEMS-ACC-8g (ethernet, GNSS, triaxial MEMS accelerometer)
- NEMOSENSE-BM-3xMEMS-ACC-8g (ethernet, battery, mobile, triaxial MEMS accelerometer)
- NEMOSENSE-BG-3xMEMS-ACC-8g (ethernet, battery, GNSS, triaxial MEMS accelerometer)
- NEMOSENSE-MG-3xMEMS-ACC-8g (ethernet, mobile, GNSS, triaxial MEMS accelerometer)
- NEMOSENSE-BMG-3xMEMS-ACC-8g (ethernet, battery, mobile - global, GNSS, triaxial MEMS accelerometer)
- NEMOSENSE-BMG-LA-3xMEMS-ACC-8g (ethernet, battery, mobile - Latin America region, GNSS, triaxial MEMS accelerometer)
- NEMOSENSE-BSMG-3xMEMS-ACC-8g (ethernet, battery, solar input, mobile, GNSS, triaxial MEMS accelerometer)

NEMOSENSE-BSMG-3xMEMS-ACC-8g-WT (ethernet, wide temperature battery, solar input, mobile, GNSS, triaxial MEMS accelerometer)

NEMOSENSE-3xMEMS-ACC-8g-EXD (ethernet, triaxial MEMS accelerometer in EXD housing)

The NEMOSENSE platform allows additional physical interfaces and measurement interfaces to be released in future.

Refer to the following link for the latest updates: <https://dewesoft.com/products/nemosense>

2. Operational principle

NEMOSENSE is automatically powered up if the power is delivered to the device. On power-up, the following sequence occurs:

1. Initialization phase - lasts only a few seconds
2. Configuration mode - device acts as HTTP server on default IP and can be configured using the NEMOSENSE Config Tool. This mode is active for one minute and exits automatically if no attempt to connect was made using the Config Tool
3. Operational mode - after the configuration mode the operational mode starts - data is stored, evaluated and sent to the database depending on configuration of the device.

The device can be interfaced over a TCP/IP network through the ethernet ports. The NEMOSENSE-M (mobile option) devices can be interfaced over a TCP/IP either through the ethernet or over a mobile network (4G/LTE).



Note: SIM card is not included with NEMOSENSE-M devices. Users must provide their own SIM card. PIN on the SIM card must be disabled before inserting it into the device.



Note: Refer to section **7. Installation and Connection Instructions** for details on how to install the SIM card.

3. Getting started with NEMOSENSE

This chapter will help you to install the software, configure your NEMOSENSE device to send the data over ethernet or 4G/LTE (4G/LTE is only available in case of NEMOSENSE-M option) to **Dewesoft Historian** - either hosted by Dewesoft or as an on-premise solution. We will also show you how to access the data using **Grafana**.

To follow the steps, you need the following hardware:

- NEMOSENSE device,
- PC / laptop,
- an ethernet switch with internet connection (optional - NOT needed in case of NEMOSENSE with mobile connection (-M option),
- Power supply (12V-48V) and PoE injector or passive PoE switch,
- Ethernet CAT6 cable to connect your NEMOSENSE device to your computer for configuration purposes

And the following software packages:

- The Dewesoft NEMOSENSE Config Tool
- The Dewesoft Historian software (includes MQTT broker, InfluxDB database and Grafana web GUI)

Dewesoft NEMOSENSE Config Tool

Download the Dewesoft **NEMOSENSE Config Tool** from [this link](#).

Dewesoft Historian software

If you are using an on-premise solution, install the Dewesoft Historian software by following the instructions [here](#)

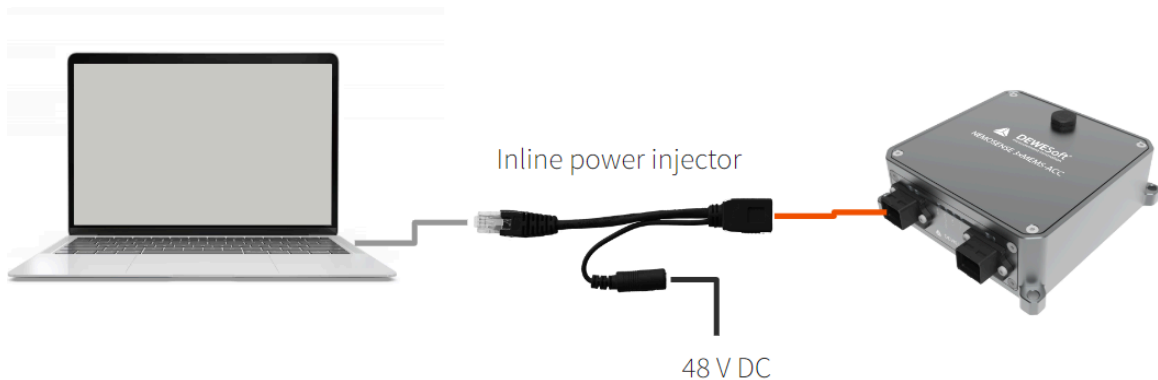


Note: the Historian client (MQTT) is already running on the NEMOSENSE device, so there is no need to install it on the device. Therefore, skip the section: DewesoftX Historian client.

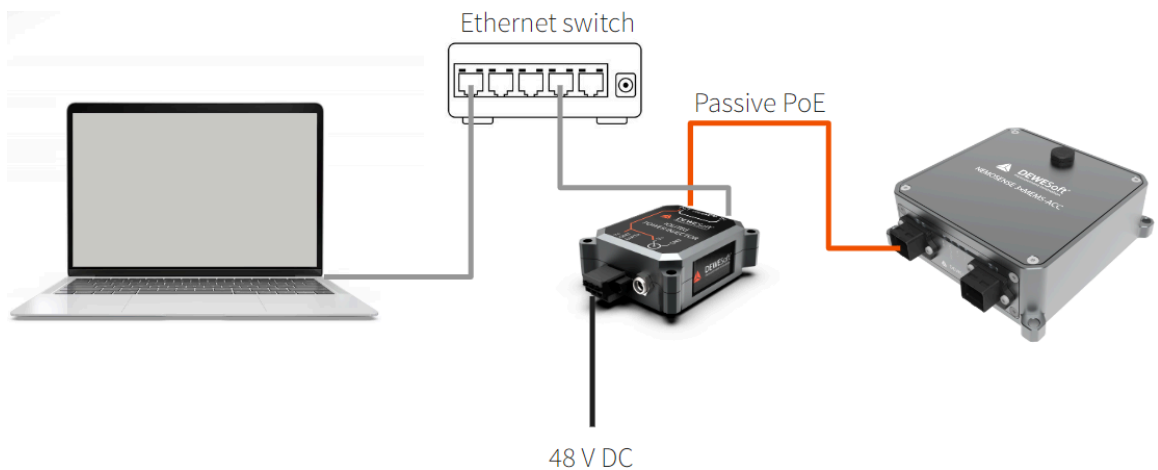
Configuration mode - using the NEMOSENSE Config Tool

Connect your NEMOSENSE to your PC directly or through a local network. The two figures below show the connection diagram for both cases.

Make sure to set the IP address of your PC to the same subnet as the NEMOSENSE default configuration address (192.168.11.95), for example you can set your PC's IP to: 192.168.11.94 (same subnet but different IP to the NEMOSENSE device). Run the **NEMOSENSE Config Tool**.



Connecting NEMOSENSE to the PC with a passive PoE injector

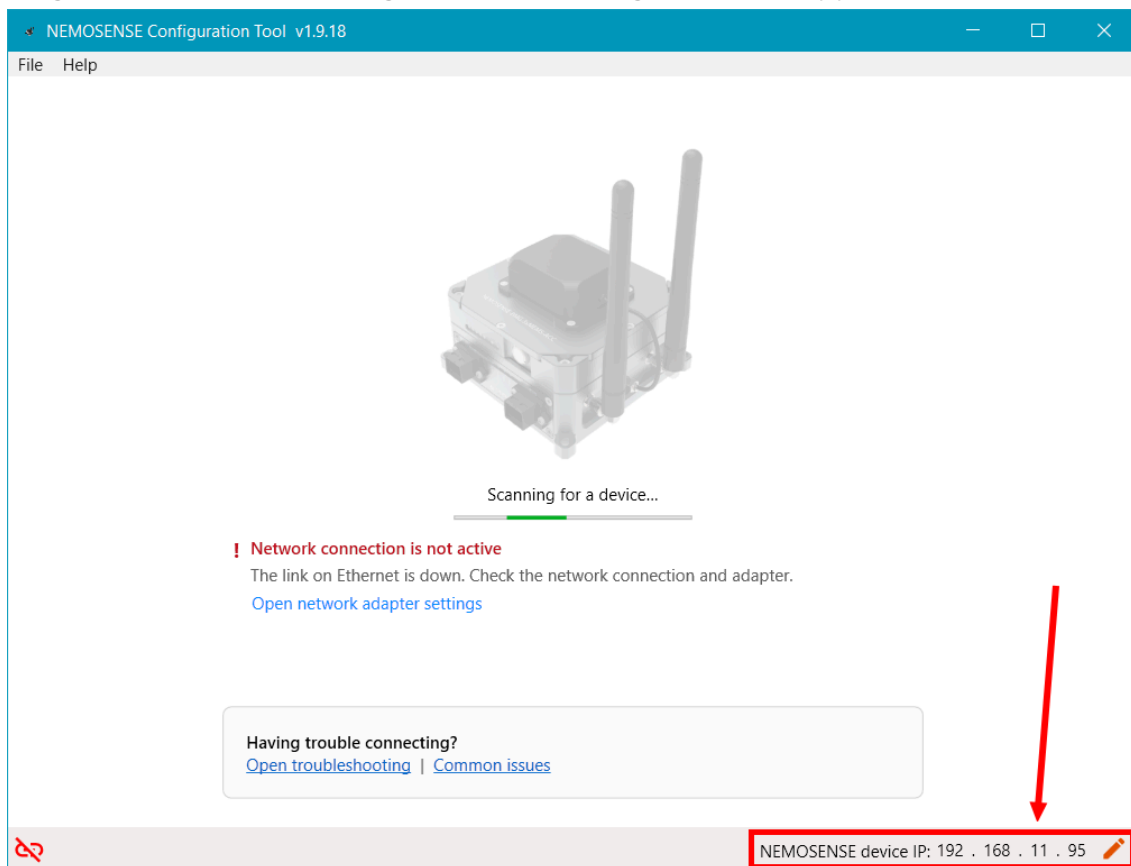


Connecting NEMOSENSE to the PC through a switch with the IOLITE-POWER-INJECTOR



Note: To ensure safe and reliable operation of the NEMOSENSE device, it is mandatory to install 1 A fast acting fuse between the power supply and the NEMOSENSE device. This fuse acts as a protective element, preventing potential damage caused by electrical faults or overcurrent situations. IOLITE-POWER-INJECTOR already includes such a fuse and satisfies this requirement. Additionally, it is important to note that the device supplying power to the NEMOSENSE must have reinforced insulation between the primary and secondary output.

After running the NEMOSENSE Config Tool, the following screen will appear:



In the bottom right corner the IP address at which the Config Tool searches for NEMOSENSE devices is displayed.

- NEMOSENSE default configuration HTTP server IP: **192.168.11.95**

The HTTP Config server IP of each device may also be preconfigured to a different address in the factory on request. In such cases, you should right-click in this area and select “Change target IP” to set the IP address where the tool should search for the NEMOSENSE device. When doing so, make sure to adjust the network adapter settings accordingly.



If the device is connected but not detected, here are a few troubleshooting steps (ordered from the most to the least often problem cause based on field experience):

- make sure the NEMOSENSE device is in configuration mode - active for 1 minute after power-up, the yellow RUN LED is lit steady and the blue NETWORK LED is blinking fast. Once the Config tool detects the device, it will automatically keep it in the configuration mode,
- make sure to have correct static IP configuration on the network card that is connecting to the same network as the NEMOSENSE device (or directly to it),
- Make sure that no other app is occupying the network interface that should be connecting to the NEMOSENSE device. EtherCAT drivers can “sit” on the network interface and block other apps from accessing it - DewesoftX, TwinCAT, Acontis EtherCAT masters are the most common examples.
- when using a laptop, it may help if the charger is plugged in, since newer laptops often try to reduce power of integrated network cards and thus disrupt network traffic,

- if all of the above conditions are met and the device is still not recognized, try unplugging and plugging back the network cable of the computer network port,
- the last basic step to try is restarting the device,
- if still not successful, advanced troubleshooting steps include disabling any low-power modes on the network card being used and disabling all antivirus and firewall software. It makes sense to try on a different PC first before going into such modifications,
- however, some strict corporate IT policies may introduce tools that will prevent the Config Tool and/or NEMOSENSE device from communicating over the local network.

In the Config tool version 1.9.18 and onwards, a handy **Troubleshooting** and **Common issues** menus help with the information where the device detection process may be stuck or give a hint on incorrect network configuration.

NEMOSENSE Configuration Tool v1.9.18

File Help

Troubleshoot connection

← Back

Review the current connection checks and select the network adapter used to search for NEMOSENSE.

Network connection is not active[Common issues](#)

The link on Ethernet is down. Check the network connection and adapter.

☰ Hide diagnostic steps

✓ **Compatible network interface**
A network interface configured for the NEMOSENSE network is available.

✓ **Network interface selected**
NEMOSENSE scanning will use Ethernet.

✗ **Network connection configured correctly**
The connection on Ethernet is not active. Check the adapter connection.

— **Communicating with NEMOSENSE**
This will be checked after the network connection is ready.

— **Device ready for configuration**
This will be checked after communication with NEMOSENSE is established.

Network interfaces

Choose one or more matching network adapters to scan. The selection is remembered until the application is closed.

[Open network adapter settings](#)

Select	Interface	Description	Link	IP	Subnet
☒	Ethernet	Intel(R) Ethernet Connection (14) I219-V	Down	192.168.11.134	255.255.255.0
☐	Ethernet 2	Realtek USB GbE Family Controller	Up	10.5.164.174	255.255.255.0
☐	WiFi	Intel(R) Wi-Fi 6 AX201 160MHz	Down	169.254.11.136	255.255.0.0

Live scan

Scanning network interface (Ethernet) .

ClearOpen log folder

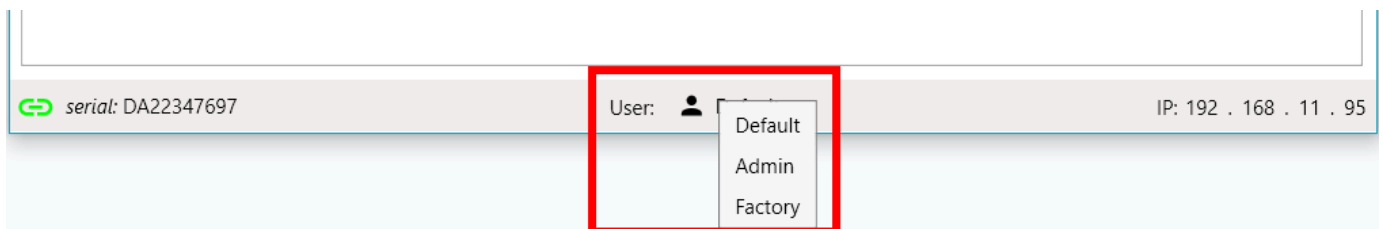
2026-08-24 09:36:59 Ping ERROR: no network connection detected on a correctly configured adapter
2026-08-24 09:37:00 Ping ERROR: no network connection detected on a correctly configured adapter
2026-08-24 09:37:01 Ping ERROR: no network connection detected on a correctly configured adapter
2026-08-24 09:37:01 Ping ERROR: no network connection detected on a correctly configured adapter
2026-08-24 09:37:02 Ping ERROR: no network connection detected on a correctly configured adapter

 NEMOSENSE device IP: 192 . 168 . 11 . 95 

The steps required to detect a device are clearly displayed. List of available network cards on the PC are listed with the link status and subnet configuration shown. Finally the device detection log is continuously written to the application log folder. Log can be shared with Dewesoft support team to simplify the diagnosis and troubleshooting process.

After the device is successfully detected the device information is displayed meaning that the device is ready to be configured. While the NEMOSENSE device is connected and the Config Tool is active it will automatically keep the device in configuration mode.

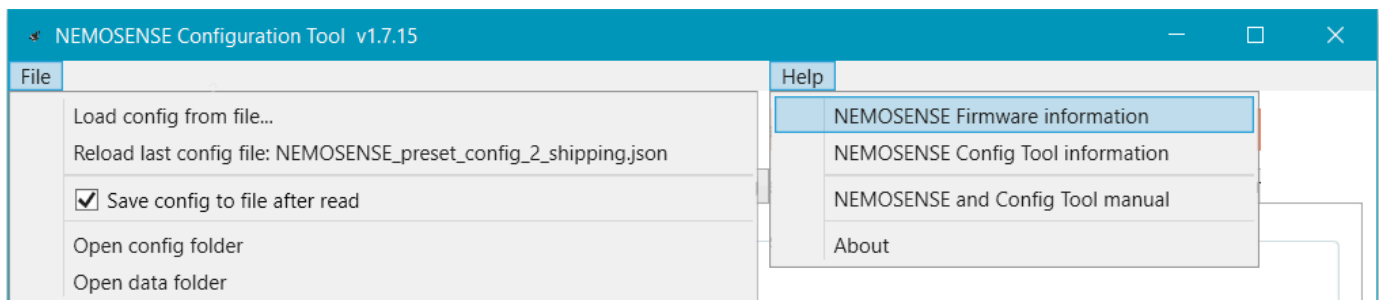
Active device parameters are automatically read from the device upon successful detection. After finishing the configuration or when there is no need to change the configuration of the device, press the **Go to measurement** button to continue to the measurement mode (described in [this section](#)).



The access to different set of device parameters is managed by means of user access levels::

- **Default** user requires no password and has access to the basic measurement, sync and data transfer settings.
- **Admin** user requires a password and has access to extended configuration options like network and server settings.
- **Factory** user requires a password and is only used during the device production or for some special adjustments.

In the menu bar, there are a few useful functions and links to simplify the use of the NEMOSENSE device and the Config Tool.



NEMOSENSE device configurations are saved in a json format and a new file is saved automatically every time the **Save to device** operation is performed. It helps keep track of device configuration over time locally, when devices are managed and configured only in the HTTP configuration mode.

- Additionally, **Save config to file after read** can be enabled, then the Config Tool will automatically save a json configuration after each Read action. Keep in mind that Read action is performed after every device detect/reconnect event, after changing the user level and after pressing the **Read from device** button.

- Those json configuration files can be saved in full or partially to keep the presets of commonly used settings for certain projects or sites. In the next step, they can be used and configuration re-deployed to other devices easily.
- Using **Load config from file** option, a browse window opens, letting you choose a valid json file for configuration upload. The tool will try to adjust the working set of parameters to match those from the loaded configuration json file. If some parameters from the loaded file are not found in the current working set in the Config Tool (meaning they were not read from the device, either not supported by the firmware version or not allowed to change by the currently logged-in access level) pop-up will show up, reporting all the failures. The rest of parameters from the file were compared/adjusted and can be saved to the device. It will be indicated by the floppy icon and the changes can be verified using the shortcut described in the next chapter.
- **Reload last config file** reuses last config file without the need to browse again and does the same procedure as described above.

Open config folder will open the location where the Config Tool is automatically saving all the configuration files after Read and Save actions.

Open Data folder will open the location where the Config Tool saves downloaded CSV files from the NEMOSENSE device - see Data tab description in next chapter

From the **Help** menu, useful information about the NEMOSENSE device, its firmware and the Config Tool can be retrieved. The release notes for both the Firmware and the Config Tool are fetched from the web and always contain the latest information plus the links to the download pages where latest updates can be downloaded.

A link to the technical reference manual you are reading right now is also there to complete the all-in-one information point about the NEMOSENSE device family.

Configuration mode - Default user access level

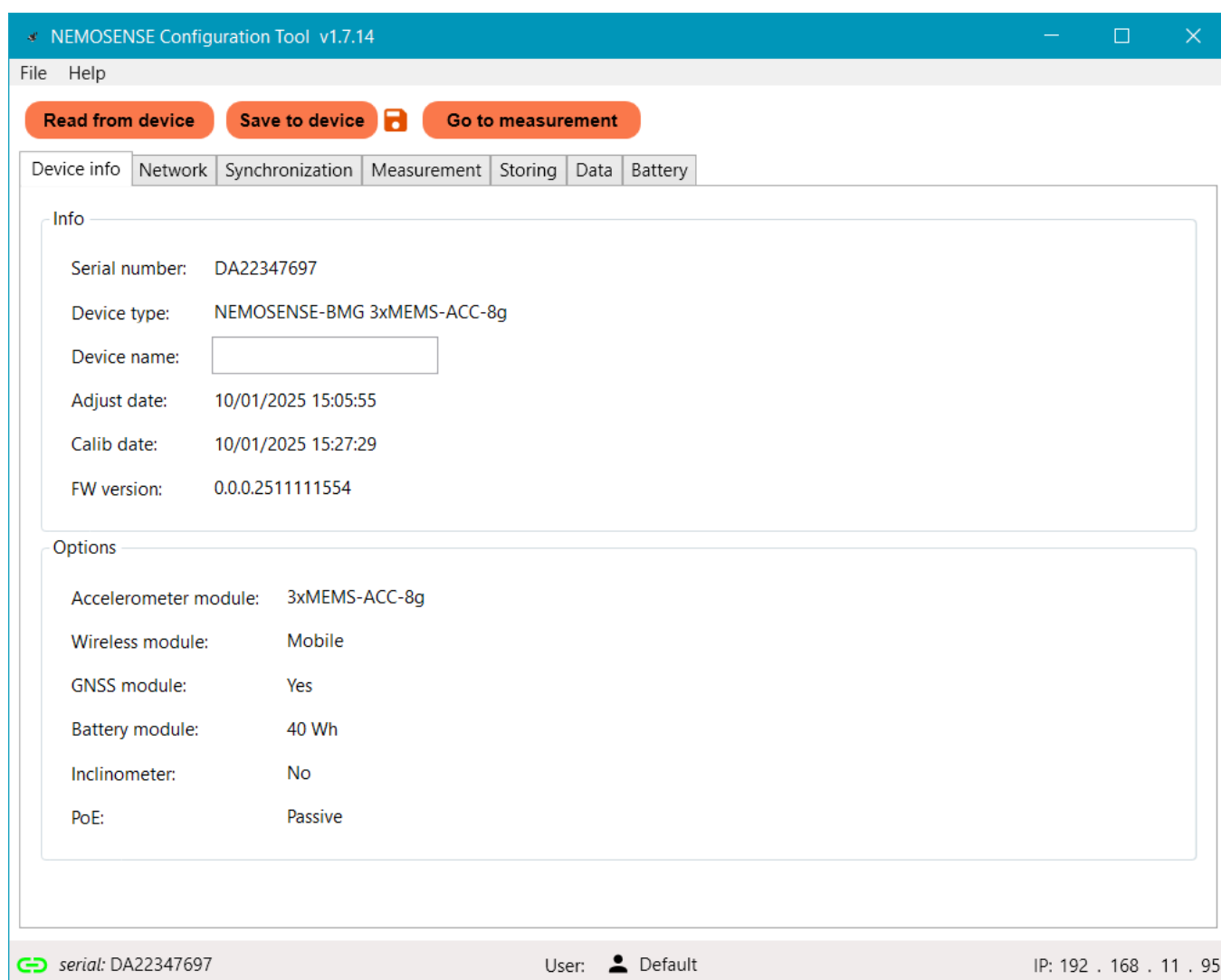
The **Device Info** tab displays basic information about the device, including the serial number, device type, calibration date, and other relevant details. In this tab, you can set or edit the **device name**.



The floppy disk icon next to the Save to the device button is indicating that there is a difference between the parameters saved on the device and those selected in the Config Tool. By executing CTRL + SHIFT+ double click onto the floppy icon, the list of differences is revealed.

For any changes to take effect, always save them to the device by pressing the **Save to device** button.

If there is an invalid value in any input fields or if the device firmware is rejecting a certain combination of parameters, the Config Tool will show a descriptive warning when trying to save configuration - please correct configuration accordingly. Available features, parameter limits and even parameter value / limit dependency on other parameters value will vary from firmware revision to revision.



NEMOSENSE Configuration Tool v1.7.14

File Help

Read from device Save to device  Go to measurement

Device info Network Synchronization Measurement Storing Data Battery

Info

Serial number: DA22347697

Device type: NEMOSENSE-BMG 3xMEMS-ACC-8g

Device name:

Adjust date: 10/01/2025 15:05:55

Calib date: 10/01/2025 15:27:29

FW version: 0.0.0.2511111554

Options

Accelerometer module: 3xMEMS-ACC-8g

Wireless module: Mobile

GNSS module: Yes

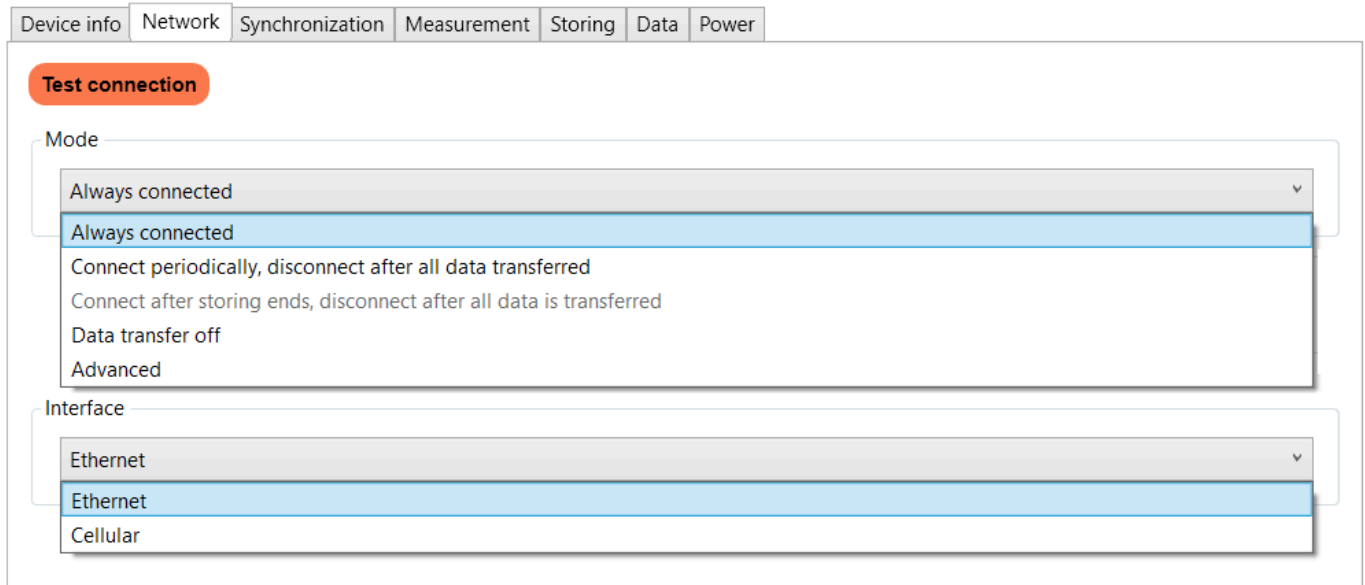
Battery module: 40 Wh

Inclinometer: No

PoE: Passive

 serial: DA22347697 User:  Default IP: 192 . 168 . 11 . 95

The **Network** tab allows you to configure how the device connects to the network and in case of -M (mobile) variant offers a choice between **Ethernet** and **Cellular** network interfaces.

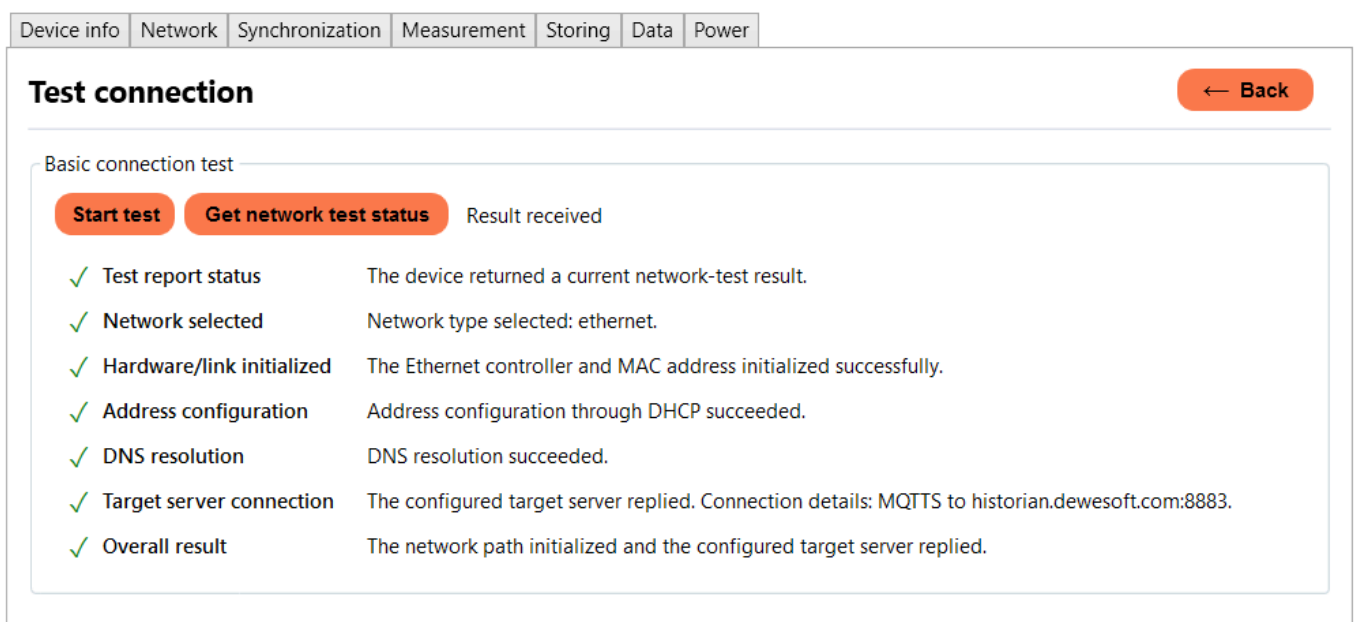


Test connection

With the firmware version 4.9.0 and Config Tool version 1.9.18, the network test functionality was added. User can run NEMOSENSE in a special mode that validates the network configuration and ping target data server. Even though some of the parameters are not changeable by the default user, the test connection command will execute using correct configuration and report status including target data server and data transfer mode.

Using the **Start test** button, the NEMOSENSE will disconnect from HTTP config mode, try to execute the required steps and return with a result, which will be displayed automatically. The process may take up to 2 minutes.

Result of the last executed test is saved on the device and can be recalled using the **Get network test status** button. The test report status will display "Result may be out of date" warning in such case.



In the admin user level mode, advanced test for cellular modem can be run in addition, which returns raw modem data that can be shared with the Dewesoft support team simplify the debugging.

Network mode Connect periodically, disconnect after all data is transferred

Define period and start time of the first period, when the network interface is activated and data transfer initiated. This allows for an efficient bulk transfer of smaller amounts of recorded data.

The network interface will be powered down after all the data from the internal memory is transferred. interface activity regardless of the data transfer period.

Terminate option allows interrupting the data transfer and powering down the network interface after configured timeout even if all the data has not been transferred to MQTT/FTP yet. It can help reduce unwanted power drain in case of network issues but at the cost of delaying data transfer to the next active period. By default the terminate timeout is set to 0 h which effectively disables this functionality.

Exception: when the NTP synchronization is enabled, the network interface will also be activated according to the configured synchronization schedule, regardless of the data transfer state.

Mode

Connect periodically, disconnect after all data is transferred

Period [hh:mm:ss]:

0
:
10
:
00

Start of period (UTC):

2025-01-01 00:00:00

Set start of period to now

Terminate connection after

0

h even if all data has not been transferred (network issues). Set to 0 to disable this function.

Network mode Connect after storing ends, disconnect after all data is transferred

In this mode, data transfer trigger is configured so that the network will be activated and stored data transfer initiated after each storing event ends. This is useful for transferring the recorded data right after the event occurs but it may consume more battery life if there are multiple events occurring in a short period of time, since the network boot and connect procedure may take longer than the actual data transfer.

This preset is not a valid selection if storing is set to Continuous or Off, since there is no expected “storing end” event in such a case.

The network interface will be powered down after all the data from the internal memory is transferred. If storing is re-activated in the meantime, network and data transfer will stay active and data will be transmitted continuously until the end of the storing event.

Terminate option allows interrupting the data transfer and powering down the network interface after configured timeout even if all the data has not been transferred to MQTT/FTP yet. It can help reducing unwanted power drain in case of network issues but at the cost of delaying data transfer to the next active period. By default the terminate timeout is set to 0 h which effectively disables this functionality.

Exception: when the NTP synchronization is enabled, the network interface will also be activated according to the configured synchronization schedule, regardless of the data transfer state.

Network mode Data transfer off

When data needs to be stored on internal memory only, battery life can be greatly reduced by disabling live data transfer. Network interface is powered down by default in this mode and no data transfer to MQTT/FTP is attempted.

Exception: when the NTP synchronization is enabled, the network interface will also be activated according to the configured synchronization schedule, regardless of the data transfer state.

Network mode Advanced

In addition to continuously enabled or disabled network mode and the two predefined modes which allow for a quick configuration of data send trigger for most commonly used and power efficient data transfer, there is also an Advanced mode.

In Advanced mode, with a similar user interface as the store trigger, you can set up a custom schedule/logic for network activation - one time and two data triggers can be combined freely.

Example of combined periodic wakeup and immediate transfer of all data after each storing event:

Mode

Advanced

Time trigger

Enable: ☒

Period [hh:mm:ss]:

2

 :

00

 :

00

▲▼

Duration [hh:mm:ss]:

0

 :

02

 :

00

▲▼

Start of period (UTC):

2025-01-01 00:00:00

▲▼

Set start of period to now

Data trigger 1

Enable: ☒

Start condition:

Simple edge negative

Stop condition:

Always when <=

Start channel:

Storing active

Stop channel:

Unsent samples count

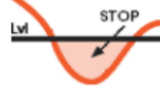
Start level:

0.5



Stop level:

0



Post-trigger [s]:

5

Timeout [s]:

?

0

The **Synchronization** tab allows you to configure the synchronization mode and the time source for the device. If the device is equipped with a GNSS module, switching between **GNSS** (Global Navigation Satellite System) and **NTP** (Network Time Protocol) as the source for time synchronization is enabled.

Device info
Network
Synchronization
Measurement
Storing
Data
Battery

Mode

Triggered
Continuous
Triggered
Off

Minimum sync period:

1

h

* Maximum expected drift during this period: 3.600 ms

Source

NTP

* Typical absolute accuracy while sync active: < 10 ms. (Ethernet)

IP:

pool.ntp.org

Port:

123

Expected time stability and the absolute accuracy are provided as a guidance and both can change depending on firmware revision. The displayed information will reflect the actual firmware capabilities.

If power saving is preferred over accurate sync, synchronization mode can be set to:

- **Off:** in case of NTP, do not start any network activity for time sync purposes. In case of GNSS sync, turn off the GNSS module.
- **Periodic:** execute time sync procedure at the beginning of measurement session and after that periodically with the set period. Besides that, in case of NTP source, the sync procedure is attempted any time the network interface is active (while transferring the data). If it was active for long enough to complete the NTP sync procedure (cca 80 s), the timer to the next planned sync is restarted.



GNSS positioning function is linked to GNSS sync functionality. If NTP sync is selected or periodic GNSS sync, the position will not be available during the time the GNSS module is powered down. Note that currently GNSS position is not stored to internal memory and is only transferred to the MQTT server while the network connection is active.

The **Measurement** tab allows you to configure the device's **sample rate** and **range** settings.

Device info
Network
Synchronization
Data transfer
Measurement
Storing
Data
Power
Firmware update

Measurement

Sample rate [Hz]: Range [g]:

Device can hold stored data up to: 231.5 days.

Alignment

Alignment Off

Live data

UTC X: **0.000000 g** Y: **0.000000 g** Z: **0.000000 g** Temp: **0.0 °C**

Duration: ms

Timestamp (UTC)	ACC X (g)	ACC Y (g)	ACC Z (g)	Temp (°C)	Roll (°)	Pitch (°)
2026-08-24 06:49:27.240	-0.045989	-0.026707	1.013251	34.94	-1.529	2.633
2026-08-24 06:49:27.280	-0.045864	-0.026645	1.013251			
2026-08-24 06:49:27.320	-0.045926	-0.026707	1.013189			
2026-08-24 06:49:27.360	-0.045989	-0.026645	1.013314			
2026-08-24 06:49:27.400	-0.045926	-0.026707	1.013189			
2026-08-24 06:49:27.440	-0.045926	-0.026645	1.013314			
2026-08-24 06:49:27.480	-0.045989	-0.026707	1.013251			

Maximum recording time is calculated according to the device storage size and the chosen sample rate. After this time, the oldest data will be overwritten. This tab also provides the **Alignment** settings for correcting the device orientation after the installation.

- **Sample Rate [Hz]:** 1000, 500, 250, 200, 125, 100, 62.5, 50, 31.25, 25
- **Range:**
 - 3xMEMS-ACC-8g module: 2 g, 4 g, 8 g
 - 3xMEMS-ACC-40g module: 10 g, 20 g, 40 g
 - 3xMEMS-ACC-S module: 15 g

- **Alignment:**
 - **Alignment Off** - device measurement axis oriented as per factory calibration
 - **Align Z to Gravity** - rotate sensor measurements so that the raw sensor Z axis aligns to the previously saved "Origin" vector,
 - **Re-Align** - acquires current device orientation as a new "Origin" vector and reorients X, Y, and Z acceleration channels as if the sensor was physically rotated to align the sensor Z axis to the current gravity vector.
- **Collect samples:** acquire some accelerometer samples to verify sensor operation. This function does not initiate data storing or does not display the data from internal storage. It returns samples from live measurement running in the background. Note that the Temp, Roll and Pitch values may need a few cycles to display correctly as they are averaged values.

The **Storing** tab allows you to configure **how data is stored** on the device. Only the stored data can be transferred to the MQTT/FTP server or downloaded from the device.

Device info
Network
Synchronization
Measurement
Storing
Data
Battery

Mode

Triggered

Time trigger

Enable: ☒

Period [hh:mm:ss]: 0 : 10 : 00
Duration [hh:mm:ss]: 0 : 01 : 00

Start of period (UTC): 2025-01-01 00:00:00
Set start of period to now

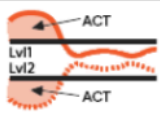
Data trigger 1

Enable: ☒

Start condition: Active while outside range
Post-trigger [s]: 10

Start channel: Roll [°]

Start level upper: 0.2
Start level lower: -0.2
Pre-trigger [s]: 1



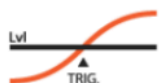
Data trigger 2

Enable: ☒

Start condition: Simple edge positive
Stop condition: Duration

Start channel: Acc Z [g]

Start level: 1.74
Pre-trigger [s]: 5
Duration [s]: 15




You can choose from the following storing modes:

- **Continuous:** All channel data is continuously stored on the device.
- **Triggered:** Data recording can be based on specific trigger events - one Time and three Data conditions can be combined freely. At least one trigger must be enabled in this mode. They are OR-ed together, whenever one or more of them are active, storing is in progress.
- **Off:** No data is stored on the device during runtime. Useful for faster upload of the rest of stored data to the MQTT/FTP server.

Storing Time trigger

Storing is repeated every period and is active for the set duration of time. Start of the first period can be set to any point in the past or the future.

Example Time trigger settings:

- Store 1 hour of data every 4 hours, starting at 00:00, 04:00, 08:00...

Time trigger

Enable: ☒

Period [hh:mm:ss]: : :

Duration [hh:mm:ss]: : :

Start of period (UTC):

- Store data every sunday at a specific time (03:00 in the morning) for 15 minutes

Time trigger

Enable: ☒

Period [hh:mm:ss]: : :

Duration [hh:mm:ss]: : :

Start of period (UTC):

Storing Data trigger

At the time of writing, acceleration, temperature and inclination channels are selectable as storing data trigger source. New channels will be supported with firmware upgrades, so refer to the displayed channel list in Config Tool for the latest trigger source channel list.

There are multiple start and stop conditions available to choose. Some start conditions (threshold - based) require additional stop condition which is set up in the same way as start condition.

There is additional timeout parameter, which forcefully deactivates the trigger in case stop condition was not met for a certain time. Set to 0 to disable this functionality.

Refer to the displayed list in the start / stop condition dropdown menu in the Config Tool. They will update based on Firmware and Config Tool version

Record while channel value is matching criteria. No stop condition required:

Data trigger start condition	Icon	Description
Active while $\geq$		Trigger active while "value $\geq$ level".
Active while $\leq$		Trigger active while "value $\leq$ level".
Active while in range		Trigger active while value is within levels (including).
Active while outside range		Trigger active while value is outside levels (excluding).

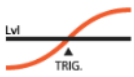
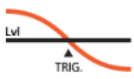
Start when channel value crosses threshold, separate stop condition required:

Simple edge positive		Trigger starts on change from "value $<$ level" to "value $\geq$ level".
Simple edge negative		Trigger starts on change from "value $>$ level" to "value $\leq$ level".
Value enters range		Trigger starts on change from value outside levels (excluding) to value within levels (including).
Value leaves range		Trigger starts on change from value within levels (including) to value outside levels (excluding).

Stop while channel value is matching criteria, regardless of the previous channel value:

Data trigger stop condition	Icon	Description
None		Trigger never stops after being started.
Duration		Trigger stops after defined time. If start condition occurs in the meantime, duration timer is restarted.
When $\geq$		Trigger stopping while "value $\geq$ level". Post-trigger starts. * If start condition occurs while stop condition is true, trigger stays off but post-trigger and timeout timers are restarted.
When $\leq$		Trigger stopping while "value $\leq$ level". Post-trigger starts. * If start condition occurs while stop condition is true, trigger stays off but post-trigger and timeout timers are restarted.
When in range		Trigger stopping while value is within levels (including). Post-trigger starts. * If start condition occurs while stop condition is true, trigger stays off but post-trigger and timeout timers are restarted.
When outside range		Trigger stopping while value is outside levels (excluding). Post-trigger starts. * If start condition occurs while stop condition is true, trigger stays off but post-trigger and timeout timers are restarted.

Stop only when channel value crosses the threshold:

Simple edge positive		Trigger stops on change from "value < level" to "value >= level". Post-trigger starts.
Simple edge negative		Trigger stops on change from "value > level" to "value <= level". Post-trigger starts.
Value enters range		Trigger stops on change from value outside levels (excluding) to value within levels (including). Post-trigger starts.
Value leaves range		Trigger stops on change from value within levels (including) to value outside levels (excluding). Post-trigger starts.

The **Data** tab provides options for downloading stored data from the device. Data is saved in a CSV format, split into 100 MB files. With a convenient **Open data folder** shortcut you can directly open the folder where CSV files are saved by default - Public documents/NEMOSENSE/Data.

Using the **Download Logs** function, you can select the desired **Start Date** and **End Date**, and then click **Download** to retrieve the data from the device.

The **Skip Transfer of Old Data** function skips transfer of stored data but unsent data to the server, while the data remains stored in the device memory.

Device infoNetworkSynchronizationMeasurementStoringDataBattery

Download logs

Found log entries between 2025-10-30 15:09 (UTC) and 2025-11-11 20:00 (UTC)

Start Date (UTC):

2025-10-30 20:00

End Date (UTC):

2025-11-11 20:00

Download

Open data folder

Data actions

Cancel data retrieval

Skip transfer of old stored data

Approximate download speed in HTTP config mode, exporting CSV files to local disk: for FW versions up to 4.9.0 is approximately 12h of stored data at 1000 Hz took 40 min, created 23 CSV files of 100 MB size, 2.24 GB total.

Example of downloaded CSV files:

 > This PC > Windows (C:) > Users > Public > Documents > NEMOSENSE > Data			
Name	Date modified	Type	Size
 logs_DA0F011138_selected_logs_20260605_132356_0.csv	29.06.2026 10:50	CSV File	102.401 KB
 logs_DA0F011138_selected_logs_20260624_195219_0.csv	29.06.2026 10:52	CSV File	102.401 KB
 logs_DA0F011138_selected_logs_20260625_012012_0.csv	29.06.2026 10:54	CSV File	102.401 KB
 logs_DA0F011138_selected_logs_20260625_064805_0.csv	29.06.2026 10:56	CSV File	102.401 KB
 logs_DA0F011138_selected_logs_20260625_121558_0.csv	29.06.2026 10:57	CSV File	17.217 KB

The **Battery** tab allows you to monitor and manage the battery module.

Device info
Network
Synchronization
Measurement
Storing
Data
Battery
Power

Settings



Charging power limit [W]:

Charging level limit [%]:

Reduce charge voltage when battery warm: ☒

Enable UPS (power device from battery): ☒

Status

Device power source: external
Battery is not charging.
 93.6% / 38.23 Wh
Battery serial number: DA26000330
Battery voltage: 4.12 V
Battery current: +0.000 A
Battery power: +0.00 W
Temperature: 26.6 °C

Actions

Start charging

- **Enable UPS:** Allow powering the device from the battery.
 - This parameter is also set automatically when the pushbutton on the battery module is pressed shortly (> 0.5 s), and the yellow UPS ARM LED lights up.
 - If the pushbutton is pressed for a long time (> 5 s) while the device is powered from the external supply, the yellow USP ARM LED and the parameter will be set to off.
 - If the device is powered from the battery and the pushbutton is pressed for a long time (> 5 s), the device will shut down immediately without changing the parameter and after next power up, the “Enable UPS” parameter will remain set.
- **Charging power limit:** Set maximum charging power to control the charging power during measure mode. It can be lowered to allow daisy-chaining a greater number of devices without overloading the wiring.
- **Charging level limit:** Set battery charge level at which the charging stops.
 - May be used to extend battery life in “UPS type” applications where the device runs from external power source and battery serves as a backup power source. Set to 80-90%.
 - May also be used for air shipping, lithium batteries should not be charged above 30%.
 - **Note:** If the battery is already charged above the threshold and the device is powered externally, it will not automatically drain the battery to desired charge level, it should be discharged manually below the limit and then charged up to the new level.
- **Status:** View real-time battery information, such as voltage, current, and charge level.

- **Start charging:** By default, charging is automatically activated only after entering the Measurement mode. If you want to charge the device in Configuration mode, use this button. When charging is started in Configuration mode, an additional Fast Charge (10 W) option becomes available. Fast Charge is only available in Configuration mode to prevent wiring overload in daisy chained configuration.
- **Reduce charge voltage when battery warm:**
 - to extend battery life, by default the charging voltage is reduced by 0.2 V in “warm” temperature range (for standard battery pack above 30°C, for wide temperature battery pack above 45°C). This leads to slow or no charge from cca 80% to 100% when the battery cell temperature is warm.
 - Functionality can be disabled with this parameter and the battery will charge with full voltage up to a desired charge level.
 - **Note:** Maximum temperature limit always applies according to battery pack type and if exceeded, charging stops completely until temperature falls.

The **Power** tab allows you to manage the sleep modes of a device and to save power when no measurement is required. These features are available from FW 4.8.0 and newer.

Device info
Network
Synchronization
Measurement
Storing
Data
Power

Deep sleep mode

Periodic when voltage low
Disable
Periodic
Periodic when voltage low

In deep sleep, the CPU and peripherals are disabled except the RTC. Charging remains available, but Power and Charge level limits are not monitored. The device restarts after waking from deep sleep.

Periodic settings

Period [hh:mm:ss]: 1 : 00 : 00
Duration [hh:mm:ss]: 0 : 56 : 40

Start of period (UTC): 2025-01-01 00:00:00
Set start of period to now

Low voltage deep sleep settings

Enable when bus voltage drops below [V]: 3.2

Disable when bus voltage rises above [V]: 3.3

To prevent overdischarge, a battery-powered device will completely shut down once the bus voltage drops below 3.00 V. After shutdown, the device can be started only by applying external power or by manually pressing the power button.

Deep sleep mode allows user to choose between three options:

- **Disable** - the device will operate normally, no sleep actions
- **Periodic** - fixed timing for deep sleep. The user specifies a **Period** [hh:mm:ss] and the **Duration** of sleep [hh:mm:ss]. In addition, start of the first period (UTC) can be set, which allows the user to offset the start to any point in future or to align the periodic sleep to a certain point in time/day/week. At the beginning of every Period, the device will enter deep sleep and wake after time defined by the Duration.

- **Periodic when voltage low** - the device will go into periodic sleep according to above described parameters but only when the battery voltage drops below a user specified threshold. The periodic sleep mode is cancelled at the next wake-up if the voltage has risen above the threshold in the meantime. This is useful for solar powered applications, as it prevents the battery from over-discharging in situations without sufficient sunlight.

In deep sleep mode the device does not perform any measurement function, triggers will not wake the device, CPU is stopped. Only the RTC clock keeps running according to the latest synchronization data. The power consumption drops to the very minimum.



Note: When using periodic network modes in combination with deep sleep, make sure to align the start of period and periods correctly for both, otherwise the device may never connect to the MQTT again! If the Network activity is planned during the time a device is in deep sleep, no action will happen.

Configuration mode - Admin user access level

The **Admin user** provides access to advanced device settings. The default password is **admin** and can be changed from the menu once logged into the admin user level.

On the **Network** tab, additional options for configuring ethernet or cellular interface are shown.

- Ethernet: DHCP/static IP for the measurement mode as well as the custom DNS servers can be configured. Keep in mind that HTTP configuration server address is not affected by these parameters and can be changed only by the factory.

Ethernet settings

Enable DHCP: ☒

IP:

Mask:

Gateway:

DNS settings

Set DNS 1 manually: ☐

DNS 1:

Set DNS 2 manually: ☐

DNS 2:

- Cellular: while DHCP is enabled in the background automatically to allow correct operation of LTE modem, APN needs to be configured to match the mobile provider settings for successful data connection.
Other settings usually do not require altering if not instructed to do so by the mobile provider.

LTE settings

APN:	internet
Username:	
Password:	
Authentication:	None
Timeout [s]:	100

On the **Synchronization** tab, a new setting will appear in the Admin view, allowing the user to choose the frequency of publishing the GNSS position to the MQTT. This feature applies to FW 4.8.0 and newer.

Note:

1. Since the GNSS outputs are not stored to internal memory (up to and including FW 4.9.x), but rather just sent over MQTT, there will be no position records in those cases:

- when using FTP data transfer mode,
- for the duration of network interface inactivity (in triggered data transfer modes),
- during loss of network connectivity in remote areas.

2. The synchronisation mechanism is the master source for activating the GNSS module. When using periodic synchronization mode in combination with long position reporting periods, there is a chance of missing a position sample.

From the example in the image below, periodic GNSS sync is requested every 2 hours. It means that the GNSS module is powered off for 2 hours, then activated only for as long as needed to achieve correct satellite fix and receive a few timestamps, after that module is powered down. The whole procedure may take as little as 5 seconds in good conditions.

The Position reporting period is set to 10 seconds in the example so the sampling point of GNSS position may easily fall out of the window of GNSS module activity.

To avoid this, decrease GNSS reporting period when using periodic GNSS sync.

Device info	Network	Synchronization	Data transfer	Measurement	Storing	Data	Power	Firmware update
-------------	---------	-----------------	---------------	-------------	---------	------	-------	-----------------

Mode

Minimum sync period:

* Maximum expected drift during this period: 7.2 ms

Source

* Typical absolute accuracy while sync active: < 100 us.

GNSS settings

Position reporting period [sec]:

* Position may not be acquired every period with those settings - see manual

Data transfer tab allows you to configure how the device sends data. Two transfer modes are available: **FTP** and **MQTT**.

FTP mode

In FTP mode, data is transferred to a remote server using the standard FTP protocol. Files are uploaded in the CSV file format. The length of the file is fixed to 50 000 samples and the whole file is transferred after it is completed in the internal memory. This means that at continuous storing at 1000 Hz sampling rate, the files are generated and transferred to FTP every 50 seconds, while at 25 Hz sampling rate, it will take up to 33 minutes to complete and upload one file.

FTP settings

Enable FTPS: ☐

IP:

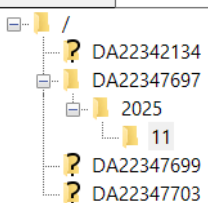
Port:

Username:

Password:

When the **Enable FTPS** box is checked the TLS authentication while connecting to the server is used - a matching root certificate will have to be saved to the device to enable connection with the FTPS server.

Uploaded files are named according to the device serial number and the timestamp of the first sample. They are sorted in device/year/month folders for easier management.

Remote site: /DA22347697/2025/11			
			
Filename	Filesize	Filetype	Last modified
DA22347697_2025_11_12_144202.csv	2.651.221	CSV File	12/11/2025 17:34:00
DA22347697_2025_11_12_162443.csv	2.651.555	CSV File	12/11/2025 17:35:00
DA22347697_2025_11_12_162533.csv	818.442	CSV File	12/11/2025 17:36:00



Note: FTP servers usually lock the file being uploaded to be writable only from the session that has started the upload. In case connection is lost during upload, a new session needs to be established and the same file cannot be overwritten until lock mechanism timeouts. Some servers (including vsftpd) default to 5 minute data connection timeout and 5 minute idle session timeouts which can result in 10 minute delay before NEMOSENSE is allowed to re-upload the same file. It is advisable to modify server settings to allow faster reupload actions.

MQTT mode

MQTT mode allows the device to send stored data plus live (non-stored) diagnostic data to an MQTT broker in the form of standard MQTT metrics, formatted by the Sparkplug B specification. At the same time, the device can also be configured and managed over MQTT protocol. This is the preferred way of connecting the NEMOSENSE device to the cloud.

All NEMOSENSE devices come with **preloaded certificates** that allow secure MQTT connection to the official Historian server at historian.dewesoft.com:8883

For other deployments, you can upload custom certificates to securely connect the MQTT server.

Device info	Network	Synchronization	Data transfer	Measurement	Storing	Data	Power	Firmware update
-------------	---------	-----------------	---------------	-------------	---------	------	-------	-----------------

Mode

MQTT

MQTT settings

Server:

Dewesoft official - MQTTS

Enable MQTTS: ☒

Address:

historian.dewesoft.com

Port:

8883

Username:

Password:

Advanced

Enable custom topic suffix: ☐ ?

Custom topic suffix:

NEMOSENSE

MQTT message delay [ms]:

0

 ?

MQTTS certificates

MQTTS root CA certificate:		Browse...	Upload
MQTTS client certificate:		Browse...	Upload
MQTTS client private key:		Browse...	Upload

The Config Tool already contains two pre-defined MQTT Server configurations, plain MQTT and MQTT over TLS for the official Historian server.

You can use the MQTTS preset if the default MQTT certificates loaded by the factory were not overwritten by the customer/user, otherwise choose plain (non-secure) MQTT when connecting to this server. Plain MQTT connection is recommended for testing purposes only.



[An example public Grafana dashboard on the official Historian server - login required.](#)

Replace the serial number in the URL or in the Device selector field with your device serial number and when your device is connected to the MQTT in **measurement mode**, you should be able to see the live diagnostic and measurement data coming.

Custom server option allows you to connect to any standard MQTT broker with or without username/password authentication. Keep in mind that for MQTT over TLS, an appropriate set of certificates need to be loaded to the device first.

Custom topic suffix feature changes the default MQTT publish and subscribe topic names used for device operation. By default the data publish topic ends with device serial number. Serial number can be replaced with a custom string to aid data identification on the broker. The subscribe topic where the device listens for MQTT commands will also use the custom suffix.:

Default for the device with serial number DA12345678:

Publish topic:

- *spBv1.0/DewesoftIoT/DBIRTH/NEMOSENSE/DA12345678*
- *spBv1.0/DewesoftIoT/DDATA/NEMOSENSE/DA12345678*

Subscribe topics:

- *STATE*
- *spBv1.0/DewesoftIoT/DCMD/NEMOSENSE/DA12345678*

Example for any device with the custom topic suffix "ID012":

Publish topic:

- *spBv1.0/DewesoftIoT/DBIRTH/NEMOSENSE/ID012*
- *spBv1.0/DewesoftIoT/DDATA/NEMOSENSE/ID012*

Subscribe topics:

- *STATE*
- *spBv1.0/DewesoftIoT/DCMD/NEMOSENSE/ID012*

MQTT message delay feature can be used to slow down the traffic from the NEMOSENSE device to the MQTT broke, for example in applications with limited speed plans to avoid unwanted disconnects by the provider. A fixed delay is applied after every MQTT message. Setting the delay value too high will make data backfill very slow. Normally this value should be set to 0 to disable the function.

The **Firmware Upgrade** tab allows you to manage and update the device firmware.

For customers not using custom deployed Historian FW upgrade FOTA server, the Config Tool offers choosing from two pre-defined official FOTA servers:

- Dewesoft official - Release: contains latest stable FW release version
- Dewesoft official - Release candidate: may contain pre-release "beta" FW versions, if available

When the **FOTA settings** are saved to the device, version check can be done - use **Check now** button. It will make device exit configuration mode, connect to FOTA server, ask for available FW version, reboot and return to the configuration mode with the available firmware version in the response. If a different firmware version is available on the server, a prompt will show up asking to execute the upgrade. If confirmed, the procedure will repeat in a similar way - device exits configuration mode, connects to FOTA server, downloads the FW upgrade file, reboots, flashes new FW image and returns to the configuration mode with the success/fail response.

By default, the **automatic firmware update option** is disabled (unchecked) in the configuration, ensuring no automatic updates are performed unless explicitly enabled.

If that option is enabled, the device will automatically connect to the selected FOTA server every time before starting measurement mode and upgrade if a different version is available.

Device info
Network
Synchronization
Data transfer
Measurement
Storing
Data
Power
Firmware update

FOTA settings

Server: Dewesoft official - Release
Address: historian.dewesoft.com
Port: 8084
☐ Always check and update FW automatically before going into measure mode
Check now

FOTA certificates

FOTA root CA certificate: Browse... Upload
FOTA client certificate: Browse... Upload
FOTA client private key: Browse... Upload

Direct firmware update

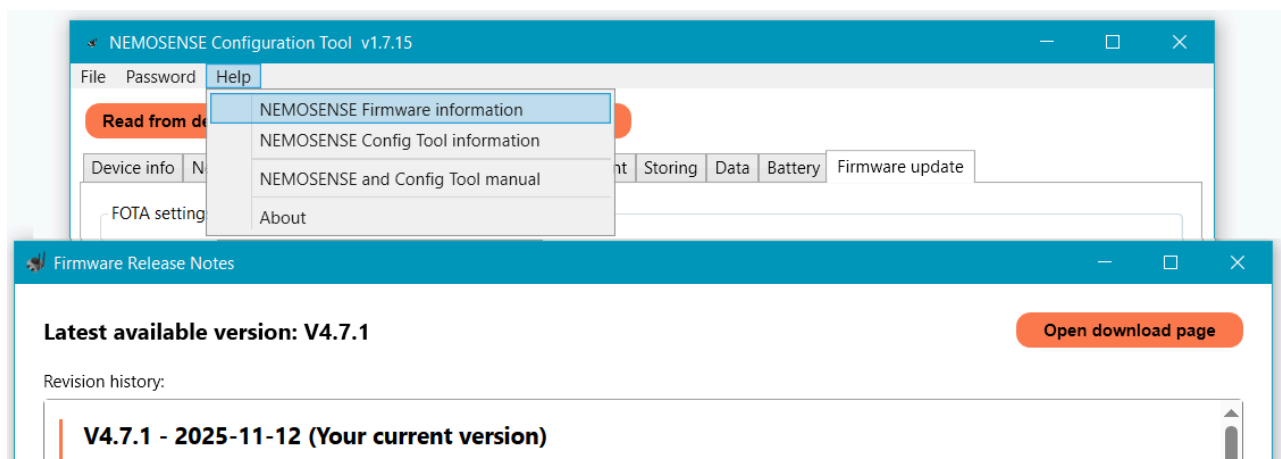
Firmware file(.bin) Browse... Upload

NEMOSENSE devices come with factory pre-configured certificates that allow TLS connection to Dewesoft official FOTA servers. When using a custom deployed Historian FOTA server, matching certificates will have to be uploaded to the devices in order to allow connection establishment. There is no way to upgrade firmware from a FOTA server whose certificates are unknown or not matching those on the device.

Direct firmware update:

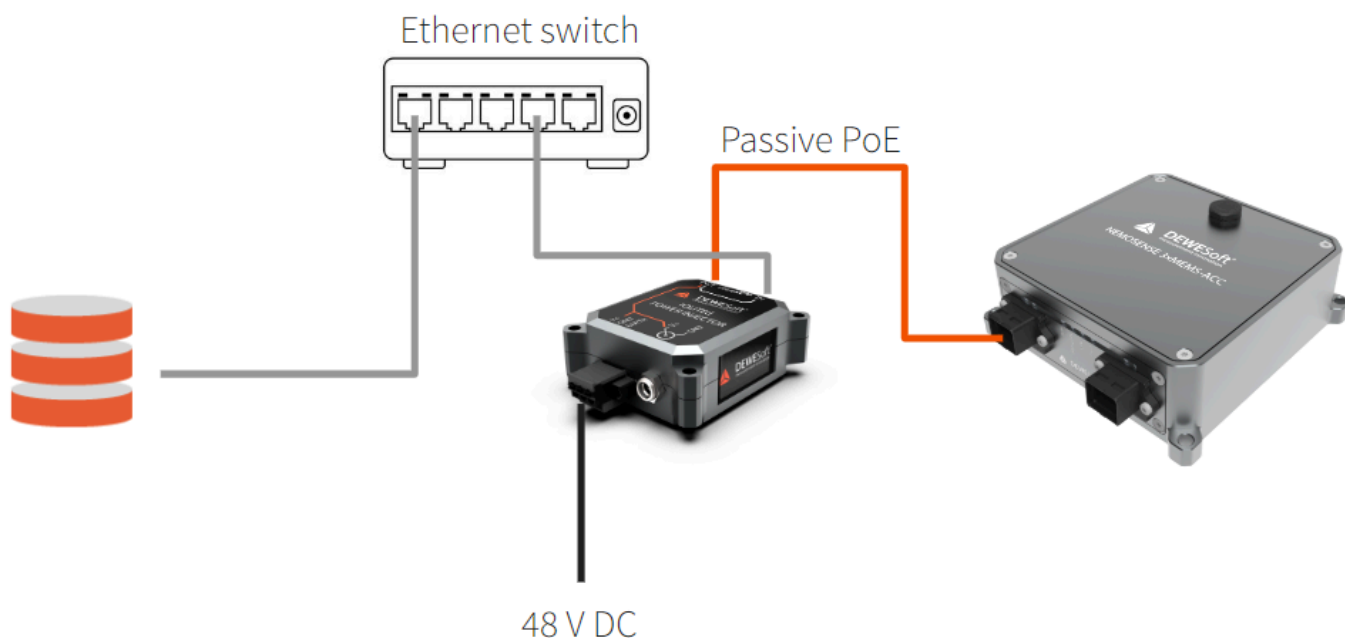
If no network connection is available, it is possible to perform a manual firmware update by uploading a digitally signed binary firmware file published on the Dewesoft website.

The firmware changelog content and the link to download page can be displayed in NEMOSENSE Config Tool from the Help menu. Same goes for the Config Tool release notes and download page and for the technical reference manual, which you are reading right now.

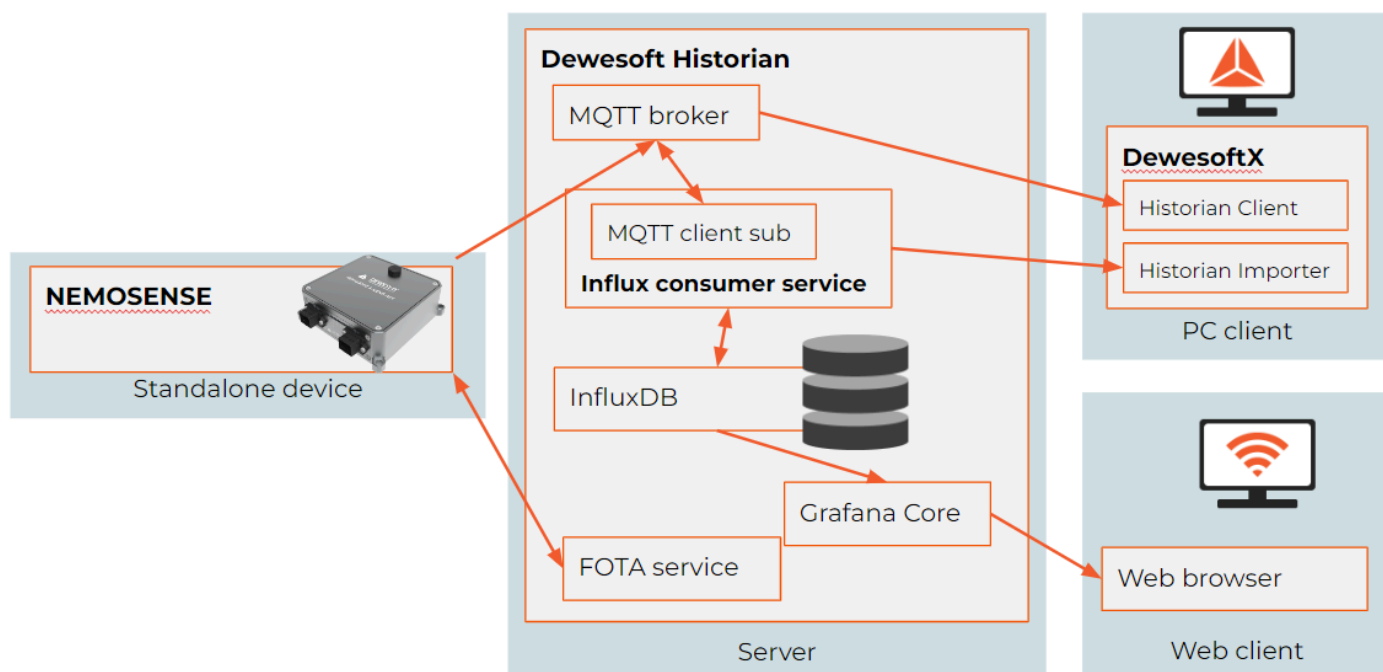


Operational mode (measurement)

When the device is in operational mode, the configuration HTTP server is not active anymore. The device operates as a TCP/IP device with the IP as defined in the Ethernet settings. If the device supports multiple interfaces (i.e. devices with “M” option support ethernet and LTE/4G), the interface to be used in operational mode is chosen by the user during configuration mode.



Connection diagram of NEMOSENSE device in operational / measurement mode



Communication block diagram of NEMOSENSE device in measurement mode connected to Dewesoft Historian

When in measurement mode, the device continuously acquires the data from the sensor at the specified sample rate. The data is saved to a data file on the internal memory. The data is also streamed

to a server over MQTT protocol (Sparkplug B payload definition) if the MQTT broker URL, port and credentials were configured in Configuration mode.

If the connection to the server is lost, the device will transmit the data when the connection is available. The oldest data is always transmitted first. The device will gradually transmit all old data and catch up to transmit the latest files. The files on the internal memory are only overwritten when the memory is full (with a standard 32 GB memory this occurs after approximately **23 days of measurement at 250 S/s**).

Viewing data from NEMOSENSE device

Web dashboard on historian.dewesoft.com

The web dashboard at historian.dewesoft.com provides an intuitive interface for accessing historical data. Users can:

- Monitor real-time trends,
- Configure custom data views,
- Efficiently generate reports.

It's also possible to install an instance of Dewesoft Historian on-site (on customer's servers). Consult the Dewesoft Historian manual for details.

Dewesoft X (local data analysis)

In addition to web clients, data can also be accessed and analyzed using **Dewesoft X** software on a local PC. Dewesoft X provides two modes for working with NEMOSENSE data:

1. **Historian Client (real-time analysis)**
 - The Historian Client plugin operates in measure mode in Dewesoft X.
 - Displays live data directly from the NEMOSENSE measurement units.
2. **Historian Importer (historical data analysis)**
 - The plugin operates in analysis mode in Dewesoft X.
 - Allows loading data from a selected time frame into a Dewesoft X data file for in-depth analysis and reporting.

Connecting to a 3rd party MQTT broker instance

NEMOSENSE can in principle be connected to any MQTT broker. See section [MQTT topics and payload](#) for further information on how to decode the data.

Note: Purchasing a NEMOSENSE device does NOT include a Dewesoft X license. NEMOSENSE is an IoT device that sends data directly to a database (Dewesoft Historian or third-party) via MQTT. Dewesoft X can still be used in free analysis mode by importing data from the Dewesoft Historian database using the Historian Importer, which is included in the free version. For live streaming the data from NEMOSENSE over an MQTT broker to Dewesoft X the Historian Client plugin is required. Historian Client can be used free of charge only when connected to historian.dewesoft.com. If another instance of Historian is used, the plugin license needs to be purchased.

Downloading data files from the device to a PC

- Open the **ConfigTool for NEMOSENSE** and navigate to the **Data** tab.

- Upon opening the tab, the time range of logs is automatically fetched (if the device is connected).
- Select the desired **UTC time frame** using the Start and End date-time pickers.
- Click **Download**. The system will begin fetching your data.
- Once the download is complete, a popup will display the path where **.csv files** are stored.



Note: CSV data is fetched slowly from the device, so downloading large datasets (e.g., a full month of data) will take a considerable amount of time.

Synchronization

The device supports the following synchronization types:

NTP synchronization

GNSS synchronization - if the GNSS (G) option is ordered

The devices are synced at production time to the factory NTP server. Even when powered off, there is a very precise RTC clock on the device that keeps track of the time. Therefore when the device is powered up again, it will have reasonably accurate absolute time. Only in case the device is not powered up for more than 1 month, the RTC battery will drain and the absolute time will not be accurate on power up, but will sync immediately when the device has access to one of the synchronization sources (NTP, GNSS).



Note: If the NTP time is available at the start of the measurement mode (i.e. the device can reach the NTP server that is configured), it will immediately jump-sync its time to the NTP time and start the measurement.

If the device cannot reach the NTP server, it will start the measurement without additional synchronization. If the NTP server is reached later on during the measurement, the device will compare its time to the NTP time and the following will occur:

- If the time difference is less than 1 second, the device will gradually steer its clock to the NTP time and the measurement will not stop
- If the time difference is more than 1 seconds, the device will restart the measurement and jump-sync its clock to the NTP time
- When using GNSS sync, if the time difference is more than 100 milliseconds, the device will restart the measurement and jump-sync its clock to the last received GNSS time.

When the NTP time is available, the device continuously steers its clock to the NTP time. The sync difference between NEMOSENSE devices on the same network with a local NTP server is typically within 10 ms. This value depends mainly on the latency of the network.

GNSS sync is supported only on devices equipped with GNSS (G option). GNSS enables several remote devices to be synchronized to a GNSS clock with 100 μ s accuracy.

Meaning of LEDs and UPS mode activation button

There are four LEDs on the front panel of the NEMOSENSE device between connectors ENET 1 and ENET 2.



1. RUN LED (yellow)
When on, it Indicates that the device is powered and running.
2. NETWORK LED (blue)
The LED is showing network and MQTT/FTP connection
 - LED steady on: network interface is active and all network functions operate correctly
 - LED flashes once: network interface active, no connection to internet
 - LED flashes twice: network interface active, no FTP / MQTT connection to the server
3. SYNC LED (red)
In normal operation the LED will flash once every three seconds. The flash is synced to the absolute clock of the device. This means that two devices should blink at the same time if they are synced and the flashing of the SYNC LED can indicate to the user if a group of devices is synced together or not.

If the red LED blinks twice at each interval, it means that the time sync procedure was not successful within the required minimum sync period.

If the SYNC led is ON permanently, this indicates an internal error. Device needs to be power-cycled and it is strongly suggested that the user contacts Dewesoft support.
4. MEASUREMENT LED (green)
When on, it indicates that the device is measuring **and storing** the data to the internal memory.

Note: In low power does, to reduce power consumption LED ON time is minimized:



- While network connection is not active, the blue NETWORK LED is OFF. Other LEDs follow the blink interval of red SYNC LED - activated only briefly every 3 seconds while the time sync procedure is active and once every 6 seconds when the time sync procedure is active. Therefore the operating status of the device can still be determined by looking at the status of LEDs while keeping the power consumption down.

There are additional LED's on the battery module of the NEMOSENSE-B:



1. **BATTERY LEVEL LED's (white):**
Indicates the remaining capacity available in a battery at a given time. Five LEDs - Each of them represents 20% (blinking indicates 10%). If all of them are on, the battery is fully charged. Status can be checked by pressing the button on the battery slot. During charging they are always on, showing the current status.
2. **CHARGING STATUS LED (blue):**
When ON, the battery is charging. Blinking indicates a charging error.
3. **UPS ARM LED (yellow):**
When ON the UPS mode is enabled. Immediately when out of power, the device switches to battery power to prevent data losses due to power loss.

There is a sole button on the battery module of the NEMOSENSE-B which has the following functions:

1. If the UPS is not armed (yellow UPS ARM LED off), a short press (0.5 s) of the button will arm the UPS and the UPS ARM LED will turn on. This also turns on the device if it is not connected to external power.
2. Any press of the button will always show the battery charge level and UPS ARM status.
3. A long press of the button (5 seconds) disarms the UPS. This also turns the device off if there is no external power connected.

5. Hardware configurations

Basic

The most basic hardware configuration of the NEMOSENSE family (NEMOSENSE-3xMEMS-ACC) does not have the battery pack or any antennas and is shown below.



NEMOSENSE-3xMEMS-ACC (ethernet, triaxial MEMS accelerometer)

Battery option

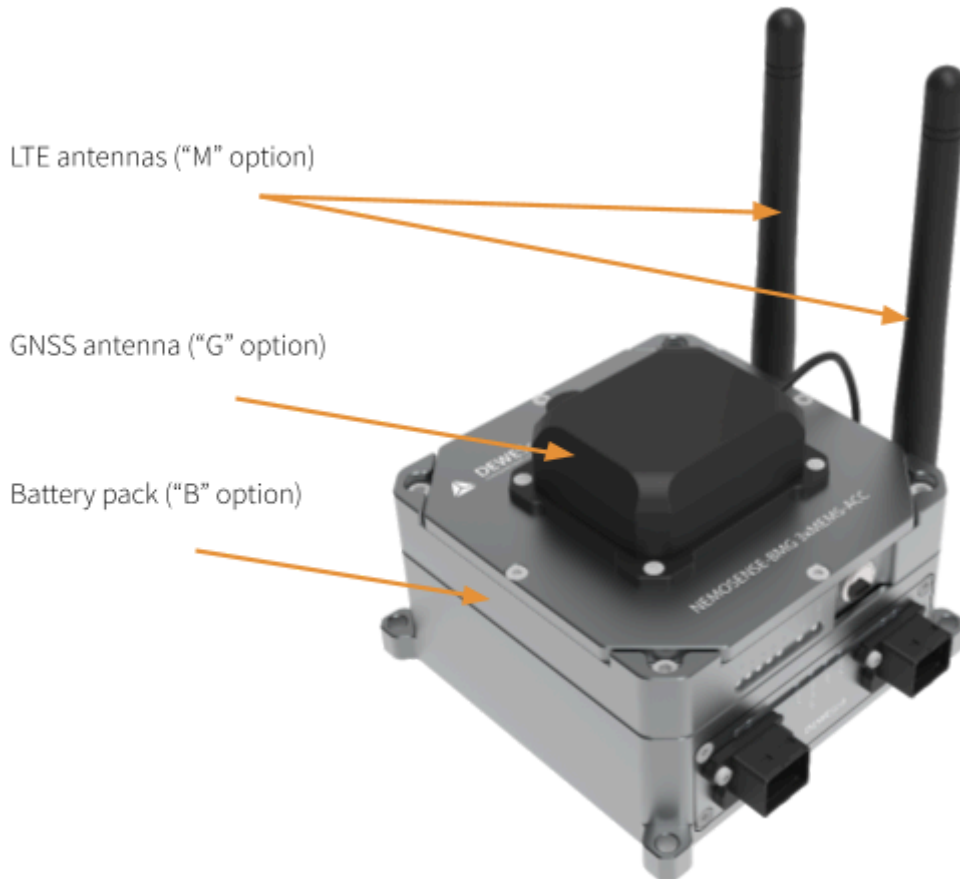
Configurations with the “B” option also contain the battery pack above the main housing. NEMOSENSE-B-3xMEMS-ACC is shown below.



NEMOSENSE-B-3xMEMS-ACC (ethernet, battery, triaxial MEMS accelerometer)

Mobile/GNSS options

Configurations with the “M” option contain two LTE/4G antennas on the side of the device. Configurations with the “G” option contain the GNSS antenna on the top of the housing. A configuration with B, M and G option is shown below.



NEMOSENSE-BMG-3xMEMS-ACC (ethernet, battery, mobile, GNSS, triaxial MEMS accelerometer)

The options and measurement types can be combined. Some additional exemplary configurations not explicitly shown are listed below:

NEMOSENSE-M-3xMEMS-ACC (ethernet, mobile, triaxial MEMS accelerometer)

NEMOSENSE-G-3xMEMS-ACC (ethernet, GNSS, triaxial MEMS accelerometer)

NEMOSENSE-BM-3xMEMS-ACC (ethernet, battery, mobile, triaxial MEMS accelerometer)

NEMOSENSE-BG-3xMEMS-ACC (ethernet, battery, GNSS, triaxial MEMS accelerometer)

NEMOSENSE-MG-3xMEMS-ACC (ethernet, mobile, GNSS, triaxial MEMS accelerometer)

Enclosure for explosive environments (Exd)

NEMOSENSE can be ordered in an Exd enclosure for explosive environments. In this case the NEMOSENSE device is installed inside a certified Exd enclosure. Only the main NEMOSENSE device (without battery or antenna-based modules) can be fitted inside the Exd enclosure. The NEMOSENSE with a low noise accelerometer (-S version) can also fit inside the Exd enclosure.

Installation of the enclosure and wiring of the cables must be done by qualified personnel according to 60079-14. Exd enclosure comes with a detailed operational manual that needs to be strictly followed.



The Exd enclosure can only be used with explosive-proof cables (order code: RJ45-EXD-Xm).



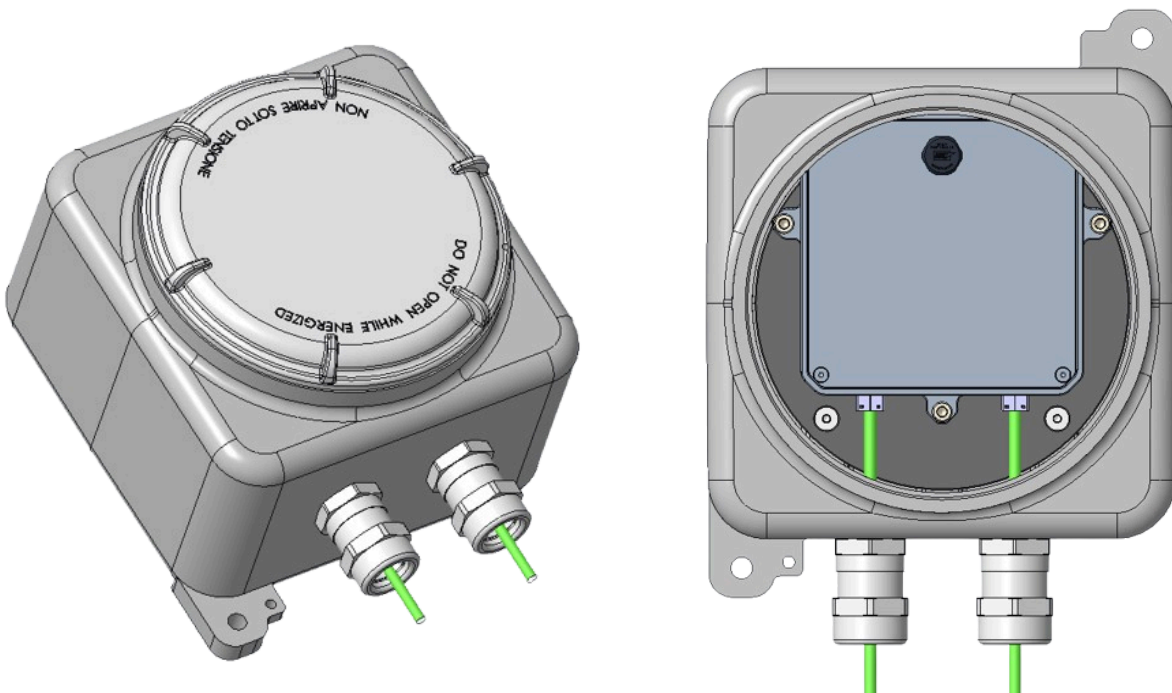
The Exd enclosure assembly containing a NEMOSENSE device has the following ATEX type of protection:



II2G Ex db IIC T5Gb

II2D Ex tb IIIC T95°C

Temperature range: -20 degC ... 40 degC



NEMOSENSE 3xMEMS-ACC-EXD (enclosure for explosive environments)

6. Specifications

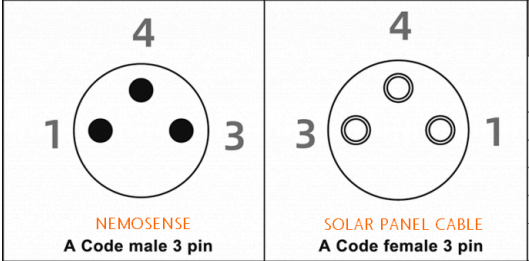
General device specifications: NEMOSENSE

NEMOSENSE-3xMEMS-ACC	
Physical interface	Ethernet
Connector	RJ45 Harting push-pull
Internal storage	32 GB memory
Data file formats - internal storage	CSV
Data transfer protocols	MQTT, FTP
Device management protocols	MQTT, HTTP
Synchronization	NTP
Synchronization accuracy	1 ms (ethernet, NTP server on LAN) 10 ms (ethernet, NTP server on internet) 100 ms (LTE, NTP server on internet)
Power supply	12 - 48 V passive PoE -P option: IEEE 802.3af, 37-57 V
Power consumption	typ. <2 W, max. 3 W
Operating temperature	-40...70 °C - see battery pack limitations
Storage temperature	-40...70 °C - see battery pack limitations
IP rating	IP67
Dimensions	130 x 130 x 50 mm
Weight	750 g

Battery pack (B option) extension specifications:

B option (battery pack)	
Battery type	Lithium-Ion batteries
Battery cell format	18650, 4 cells
Battery voltage (nominal)	3.6 V
Battery capacity	46 Wh
Charging	PoE (using 48V Power Supply): 2.5 W default, settable from 0.5 W to 2.5 W Fast charge option in configuration mode: 10 W
Operating temperature	Standard (-B option): Discharge: -20..50 °C; Charge: 0..45 °C Wide temperature (-B...-WT option): Discharge: -40..70 °C; Charge: -20..55 °C
Storage temperature	Standard (-B option): -20..50 °C Wide temperature (-B...-WT option): -40..70 °C * Max 80% charge for storage above 60 °C
IP rating	IP67
Dimensions	130 x 130 x 22 mm
Weight	300g

Battery pack with solar input (-BS option) specifications:

BS option (battery pack with solar input)	
Connector type	M8 3 pin, A-coded, male connector on battery pack
Pin assignment	1 - solar panel (+) 3 - GND 4 - reserved
Wiring	
Recommended solar panel	Standard: SOLAR-KIT-5W, SOLAR-KIT-10W, SOLAR-KIT-20W
Electrical specifications	Open circuit voltage up to 7.0 V, MPPT around 5.0 V Input overvoltage protection: 24 V Charge current drawn by the charger module: max 500 mA
IP rating	IP67

Mobile (M option) extension specifications:

M option (mobile)	
Physical interface	4G/LTE, 2 omni-directional antennas
Power Consumption	< 1 W idle, 1-3 W typically during transmission, 9 W peak
Operating temperature	-40..70 °C
IP rating	IP67
Dimensions	Two antennas are added to the main housing, see drawings for details
Weight	100g

GNSS (G option) extension specifications:

G option (GNSS)	
Supporting constellations	GPS, GLONASS, BDS, Galileo and QZSS
Antenna frequency	1164–1189MHz, 1559–1606MHz
Antenna connector	SMA
Power Consumption	< 0.5 W
Operating temperature	-40..70 °C
IP rating	IP67
Dimensions	Antenna is added to the main housing, see drawings for details
Weight	175 g

Measurement specifications: 3xMEMS-ACC-8g

MEMS Accelerometer	3xMEMS-ACC-8g		
	Min.	Typ.	Max.
Measurement ranges	+/-2 g		+/-8 g
-3 dB bandwidth		0 Hz - 0.4*fs Hz	
Sample rate	25 Hz		1000 Hz
Dynamic range		96 dB	
Noise density (lowest range)		25 µg/√Hz	
Residual noise (+/-2 g range, 50 Hz bandwidth)		100 µg RMS	
Calibrated offset error		+/-4 mg	
Calibrated gain error		+/-0.2 %	
Offset temperature drift (-20 .. 60 degC)	-0.15 mg / degC	+/-0.02 mg / degC	0.15 mg / degC
Sensitivity temperature drift (-20 .. 60 degC)		+/-0.01 % / degC	
Linearity error (smallest range)		0.1 % FS	
Crossaxis sensitivity		1 %	

Measurement specifications: 3xMEMS-ACC-40g

MEMS Accelerometer	3xMEMS-ACC-40g		
	Min.	Typ.	Max.
Measurement ranges	+/-10 g		+/-40 g
-3 dB bandwidth		0 Hz - 0.4*fs Hz	
Sample rate	25 Hz		1000 Hz
Dynamic range		96 dB	
Noise density (lowest range)		75 µg/√Hz	
Residual noise			
Calibrated offset error	-100 mg	30 mg	100 mg
Calibrated gain error		±0.5 %	
Offset temperature drift (-20 .. 60 degC)	-0.15 mg / degC	+/-0.02 mg / degC	0.15 mg / degC
Sensitivity temperature drift (-20 .. 60 degC)		±0.01 % / degC	
Linearity error (smallest range)		0.1 % FS	
Crossaxis sensitivity		1 %	

Measurement specifications: 3xMEMS-ACC-S

MEMS Accelerometer	3xMEMS-ACC-S		
	Min.	Typ.	Max.
Measurement ranges		+/-15 g	
-3 dB bandwidth		0 - 460 Hz (at 1 kS/s sample rate)	
Sample rate	25 S/s		1 kS/s
Dynamic range		137 dB	
Noise density		0.7 µg/√Hz	
Residual noise			
Calibrated offset error		±4 mg	
Calibrated gain error			
Offset temperature drift (-20 .. 60 degC)	-0.15 mg / degC	+/-0.02 mg / degC	0.15 mg / degC
Sensitivity temperature drift (-20 .. 60 degC)		+/-0.2 mg / degC	
Linearity error (smallest range)		0.05 % FS	
Crossaxis sensitivity		1 %	

Measurement specifications: 3xMEMS-ACC-INC

NEMOSENSE 3xMEMS-ACC can be used as a two-axial static inclinometer. The requirement needs to be specified at the time of order (-INC option) since additional calibration procedure is required to guarantee the calibrated accuracy of the device. NEMOSENSE-3xMEMS-ACC-INC can be used to measure the roll and pitch angles (about its X and Y axes) with the Z axis positioned vertically. Standard NEMOSENSE-3xMEMS-ACC (without -INC option) already shows roll and pitch channels in its measurement data, but the measurements are not temperature compensated and therefore do not meet the accuracy specifications listed below.

NEMOSENSE	3xMEMS-ACC-INC
	Typ.
Measurement range	+/-15 deg
Resolution	0.001 deg
Relative accuracy (23 degC)	0.01 deg
Offset temperature drift	0.0001 deg / degC typ 0.001 deg / degC max
Bandwidth	<0.1 Hz
Update rate of inclination channels	1 Hz

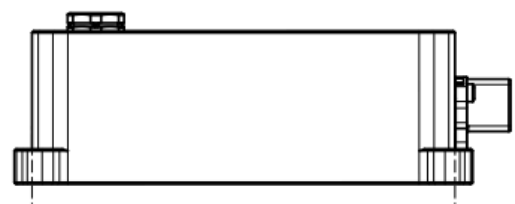
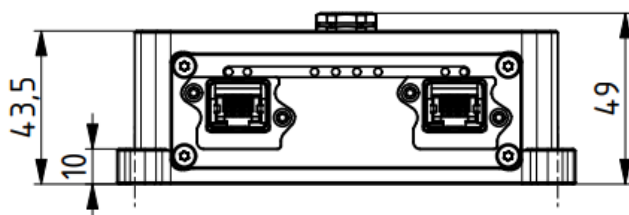
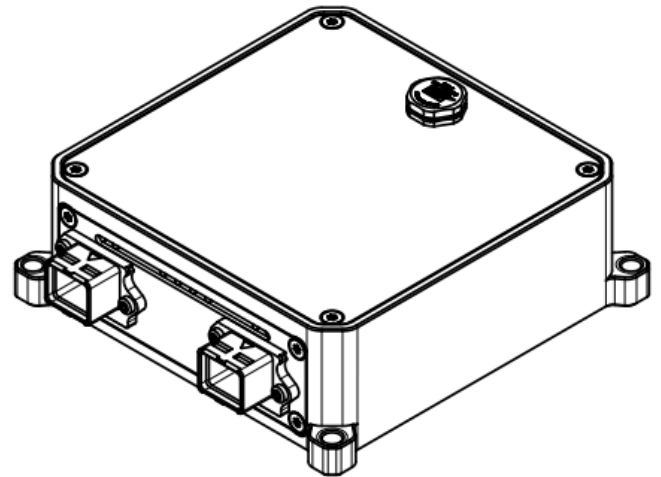
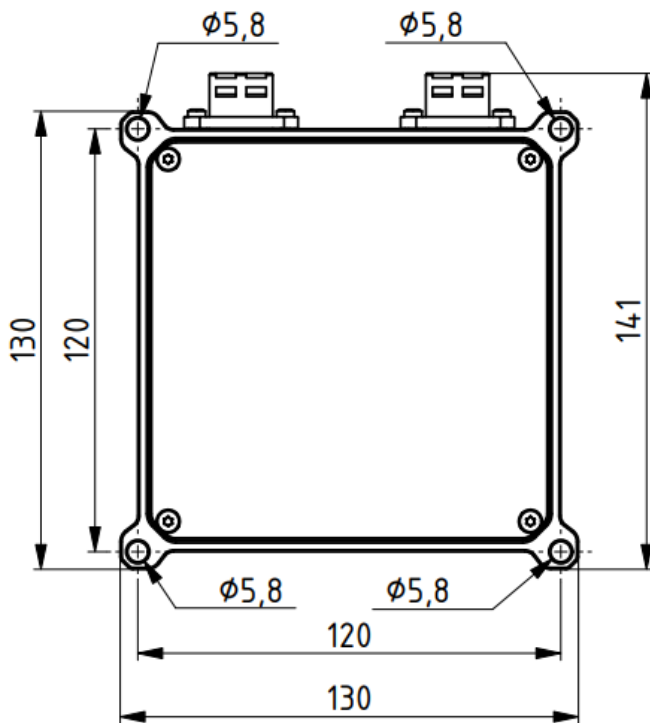
Bandwidth specifications

*Valid for firmware versions 4.7.2 and later.

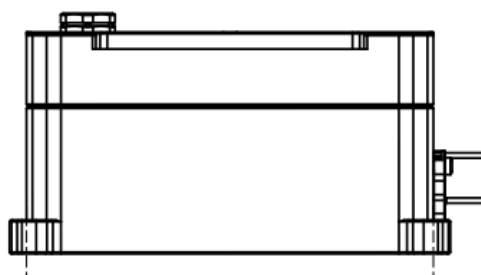
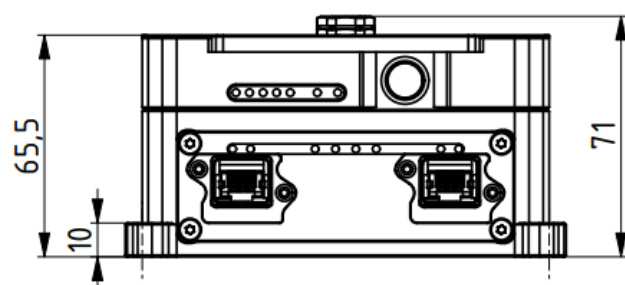
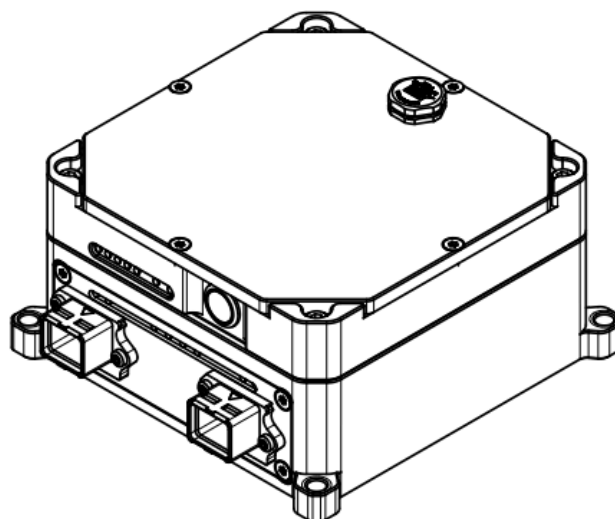
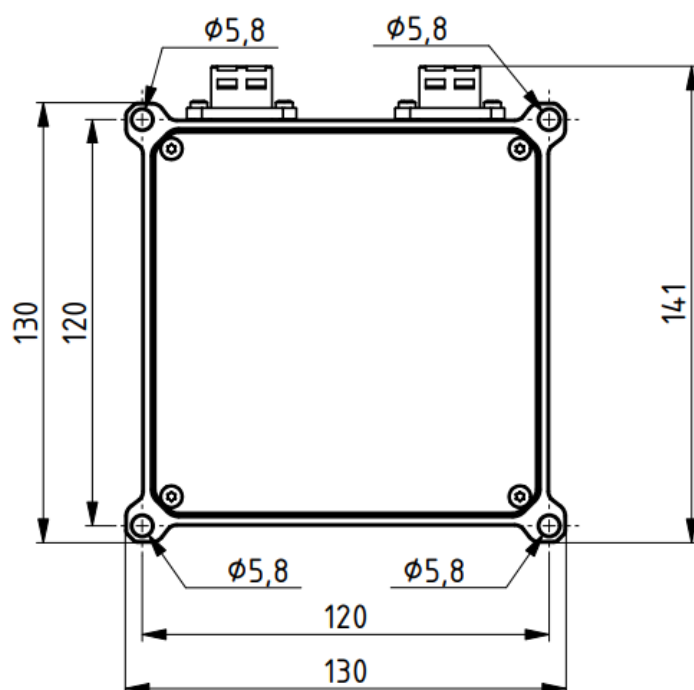
Sample rate [Hz]	Accelerometer type	
	3xMEMS-ACC (8g and 40g)	3xMEMS-ACC-S
	-3 dB [Hz]	-3 dB [Hz]
1000	335	450
500	160	204
250	80	94
200	64	60
125	39	55
100	32	26
62.5	20	15
50	16	12
31.25	10	8
25	8	6

Dimensional drawings

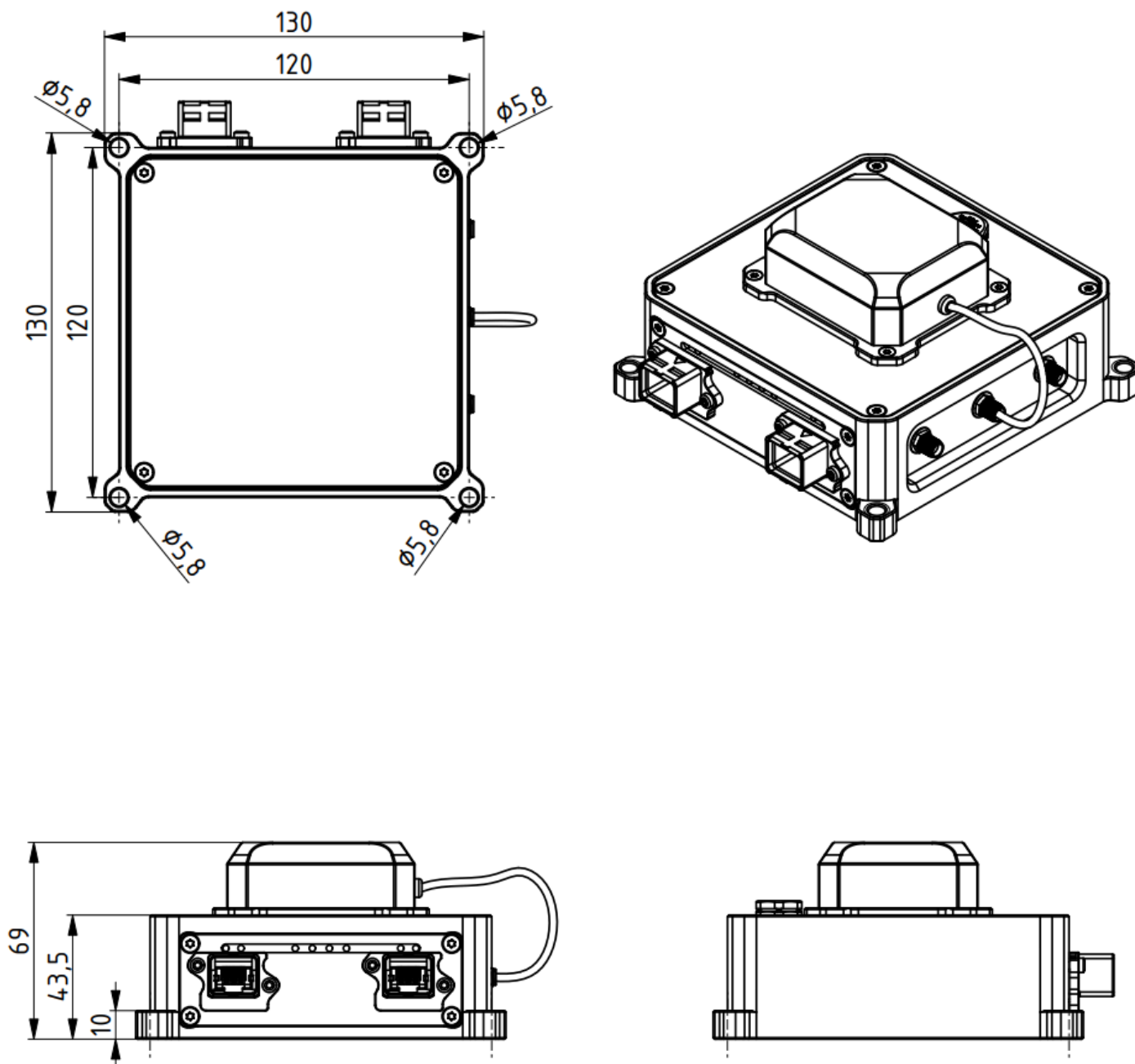
NEMOSENSE-3xMEMS-ACC



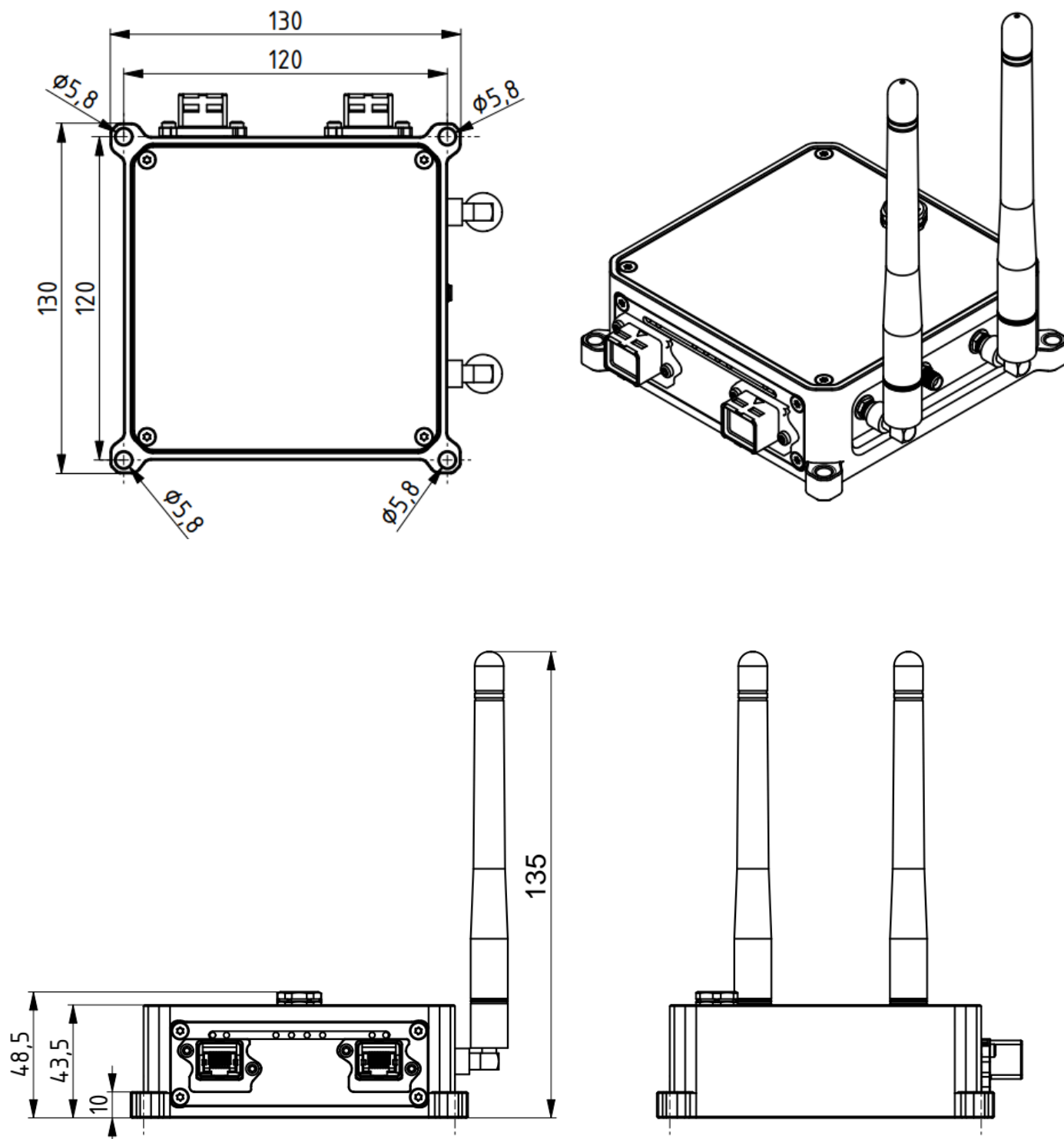
NEMOSENSE-B-3xMEMS-ACC



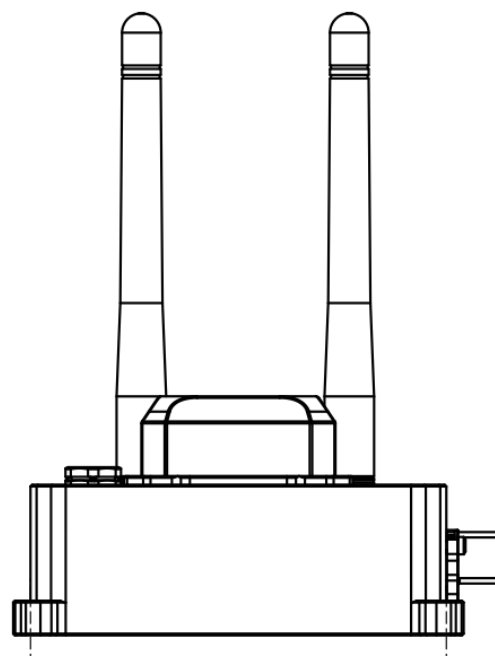
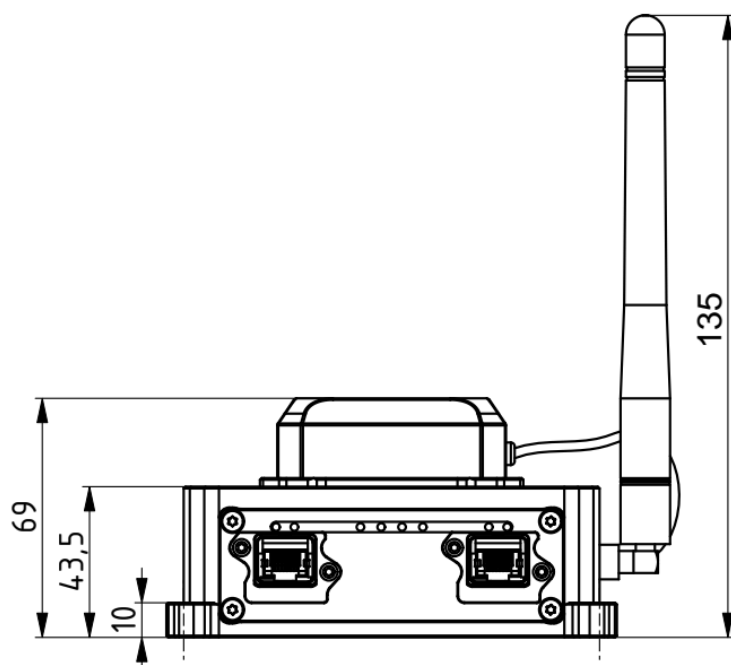
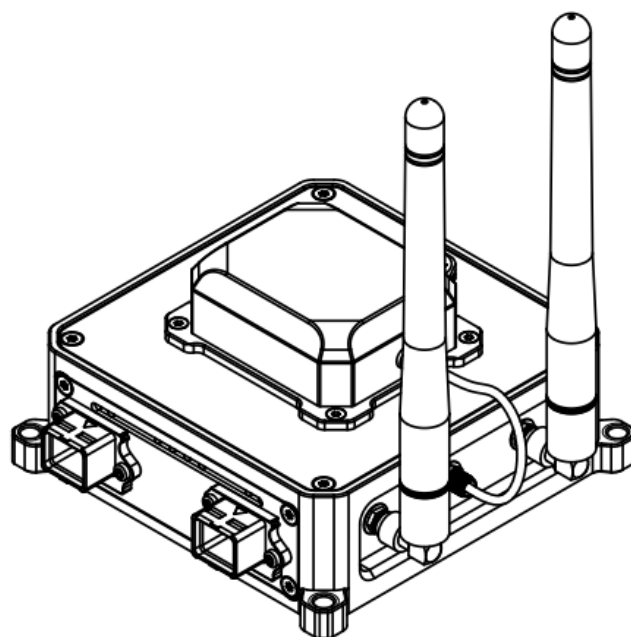
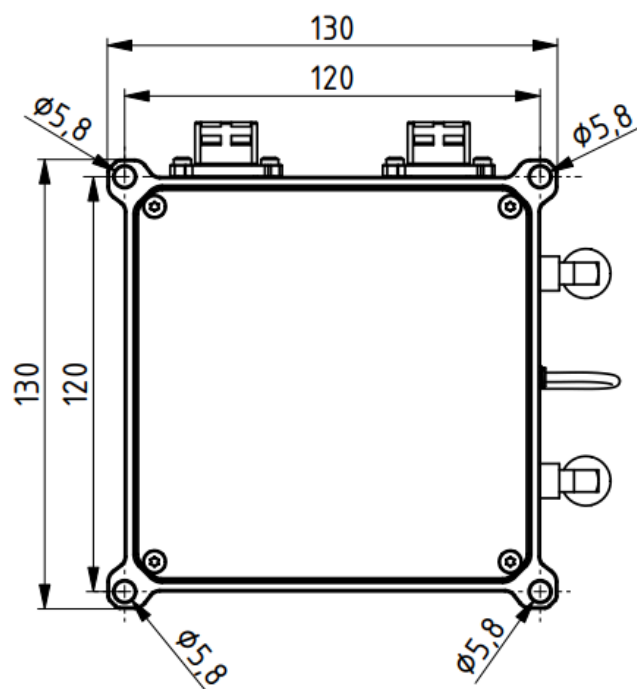
NEMOSENSE-G-3xMEMS-ACC



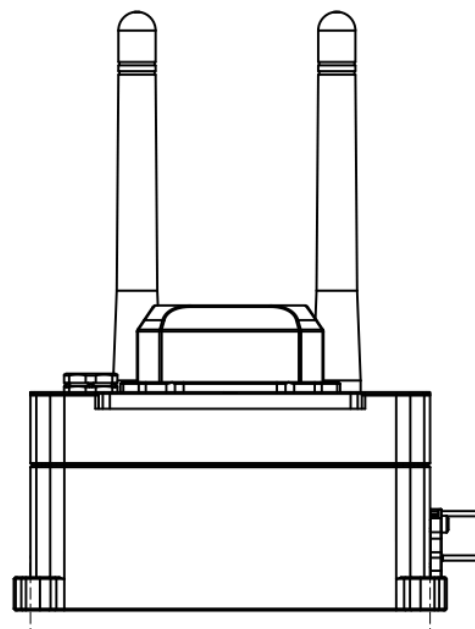
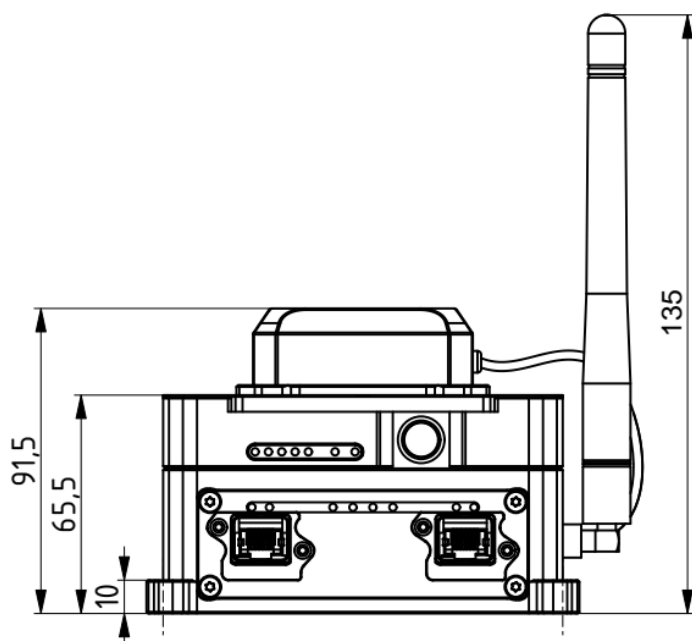
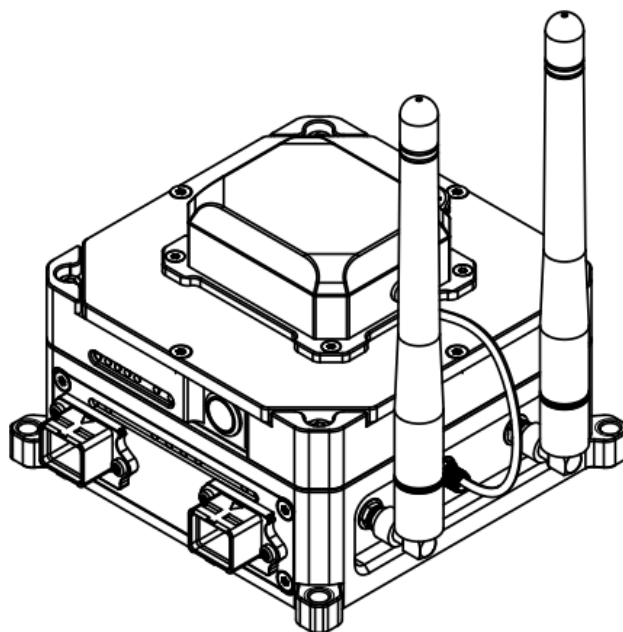
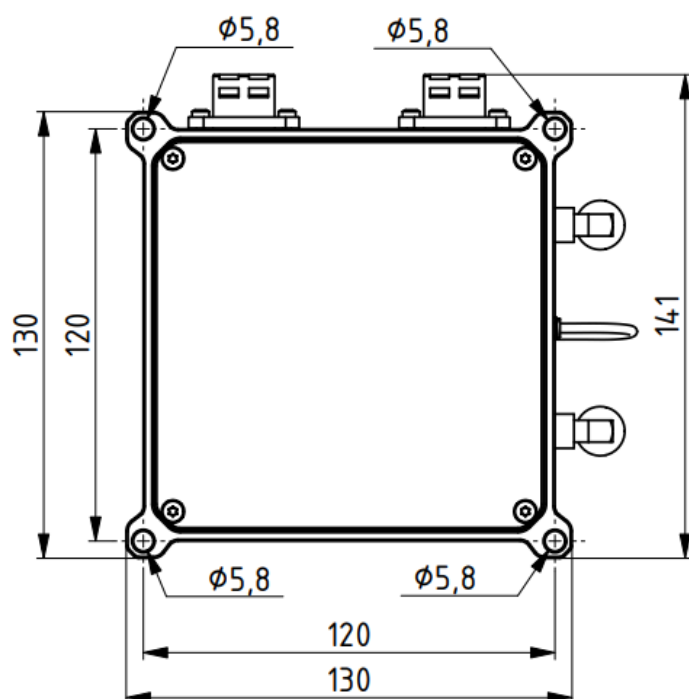
NEMOSENSE-M-3xMEMS-ACC



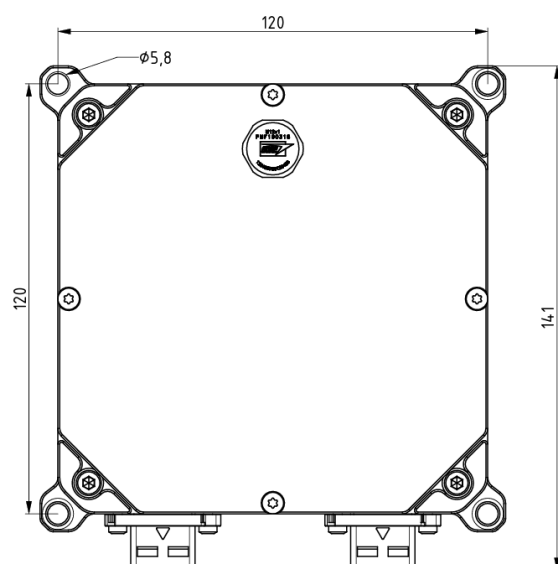
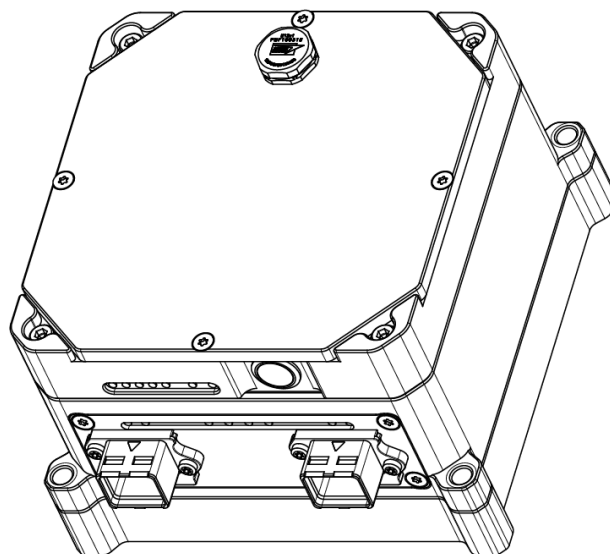
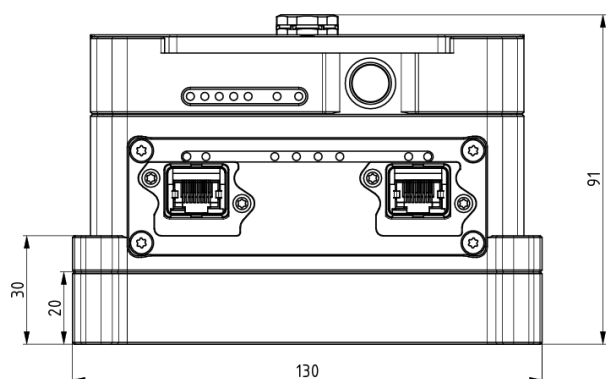
NEMOSENSE-MG-3xMEMS-ACC



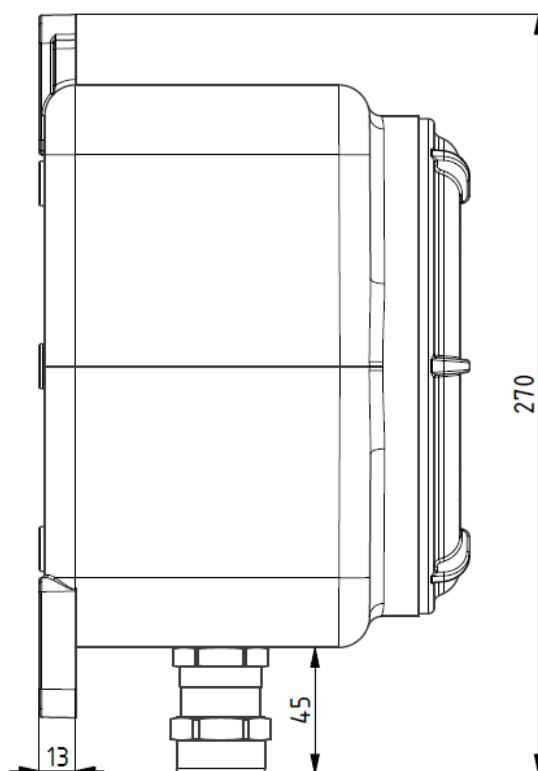
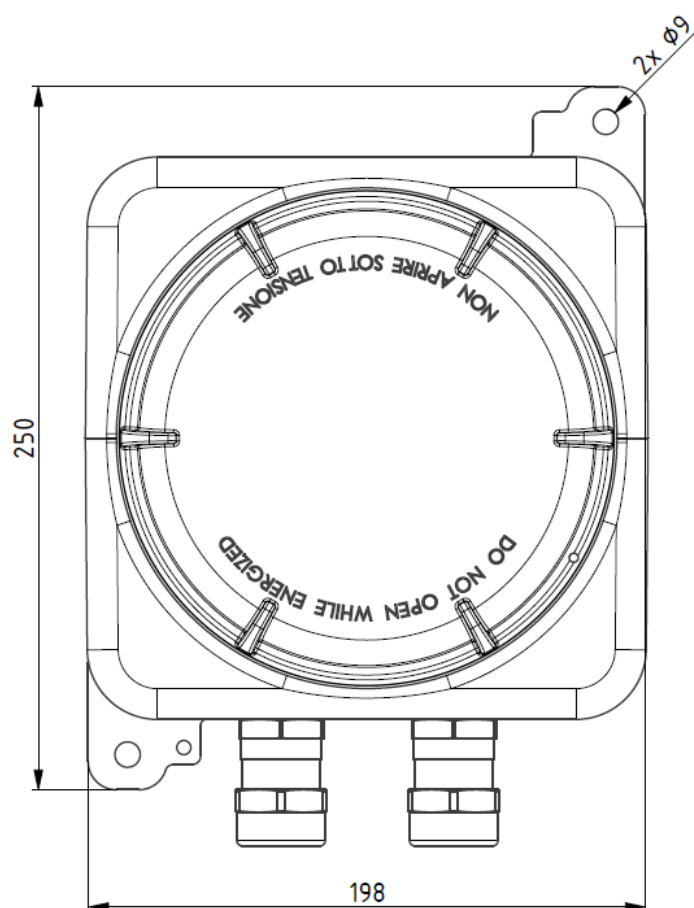
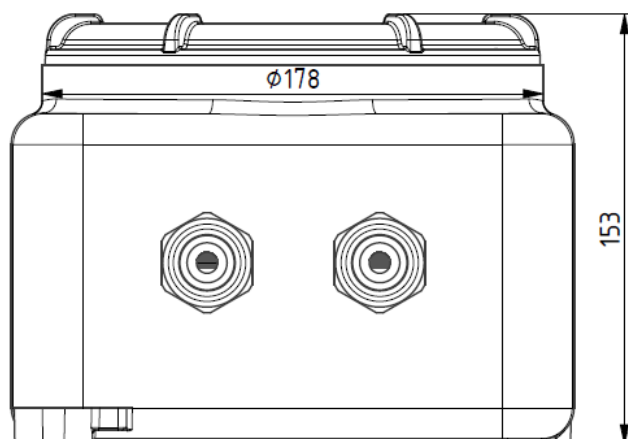
NEMOSENSE-BMG-3xMEMS-ACC



NEMOSENSE-3xMEMS-ACC-S



NEMOSENSE 3xMEMS-ACC-EXD



7. Installation and Connection Instructions

Mounting surface

The NEMOSENSE device should be mounted on stable and solid surfaces that allow optimal data collection. Suitable materials for mounting include metal surfaces such as steel or aluminum, which provide a rigid and secure base. Concrete or other solid materials can also be used, ensuring that the surface is flat and solid.

Mounting methods

The device can be installed using different methods depending on the specific setup requirements:

Direct Mounting with bolts: The device comes with four holes that allow direct mounting using bolts. Ensure that bolts are compatible with the material of the mounting surface. Secure all screws tightly to avoid displacement or vibration. For technical advice, please contact the support team.

Mounting Brackets: If direct installation is not feasible, specialized mounting brackets available from Dewesoft can be used. Everything is available in the [Dewesoft Configurator](#).



Hint

The device is **IP67-rated**, meaning it is completely protected against the ingress of dust and protected against temporary immersion in water up to 1 meter depth for 30 minutes. All connectors used must maintain this level of protection when installed.

Instructions for connecting and disconnecting PushPull RJ45 plug

Connecting the PushPull RJ45 connector

1. Ensure that the PushPull RJ45 plug is properly aligned with the device port.
2. Gently push the connector towards the port until slight resistance is felt.
3. Once aligned, continue pushing until a "click" sound is heard, indicating the connector is securely attached to the device.
4. Always install the security mechanism after connecting to prevent unauthorized disconnection.

Disconnecting the PushPull RJ45 connector:

1. Before disconnecting, the security mechanism must be removed. Only authorized personnel are permitted to perform this action.
2. Once the security mechanism is removed, grasp the PushPull RJ45 connector by its body (do not pull on the cable).
3. Gently pull the connector straight back until it detaches from the port.
4. Ensure the connector is completely disconnected from the device before handling further.
5. After disconnection, it is mandatory to install the provided protective cap. This cap prevents dust and debris from entering the port and is installed and removed in the same manner as the PushPull RJ45 connector.
6. Once the protective cap is installed, the security mechanism must be reattached to ensure that the cap cannot be removed by unauthorized personnel.



Warning

It is essential to use a cable with appropriate connectors that has a security mechanism installed. Use of any other accessories may result in malfunctions or safety risks. It is crucial to use only these specified accessories in accordance with the manufacturer's guidelines. Failure to comply with the manufacturer's instructions may compromise the device's performance and safety. It is required that the security mechanism is always in place, either on the PushPull RJ45 connector or on the protective cap.

Wiring

The NEMOSENSE devices can be daisy-chained with any other Dewesoft EtherCAT device. The NEMOSENSE device features specific input and output connector specifications that ensure proper functionality in a daisy chain configuration. Below are the detailed requirements for connecting devices.

Parameter	Limit
Maximum current through RJ45 ports	1A
Connector Type	PushPull V4 plug, RJ45, Cat.6
Voltage range	12V - 48 V, Typically 48V (PoE)
Maximum cable length	100 m
Maximum number of devices in chain	Depends on power supply voltage, cable length, and AWG rating



Important

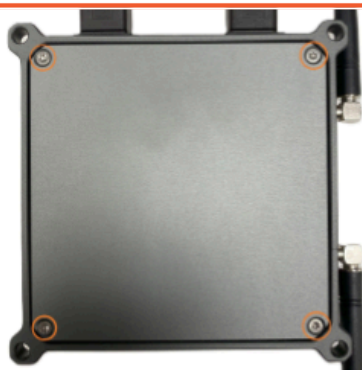
Devices can only be connected to the NEMOSENSE output using the specified PushPull RJ45 plug. For further details, refer to the section Instructions for connecting and disconnecting PushPull RJ45 plug. Additionally, any device connected to the output connector must provide reinforced insulation between accessible parts and those with hazardous voltages.

For NEMOSENSE-3xMEMS-ACC (without battery, mobile and GNSS modules) the following table applies for the reference:

Power supply voltage	Cable length device-to-device	Cable size	Max. number of devices from a single power supply
24 V	1 m	AWG 24	8
24 V	50 m	AWG 24	4
48 V	1 m	AWG 24	12
48 V	50 m	AWG 24	10

For further details regarding the power supply voltage limits, cable lengths, and wire diameter impacts, please refer to the manufacturer's documentation or contact them directly for assistance.

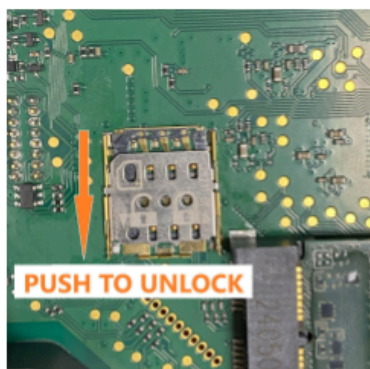
SIM card installation for standard 3xMEMS-ACC housing



1. Remove bottom cover

Use a TR10 screwdriver to unscrew the four screws on the bottom of the device.

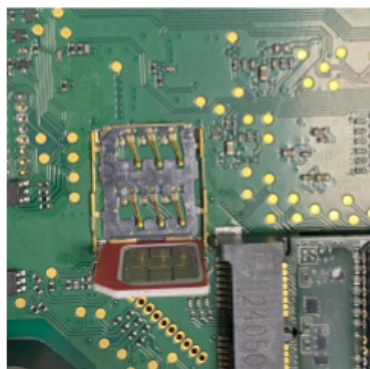
Carefully remove the bottom cover to access the internal components.



2. Locate the SIM card holder and unlock it

After removing the cover, locate the SIM card holder on the PCB

SIM card holder is initially locked. Gently push it downward to unlock the holder.



3. Insert SIM card

Once unlocked, lift the SIM card holder.

Card holder in this device is designed to be compatible with a micro SIM card.

Insert the SIM card into the holder, ensuring it follows the orientation indicated by the diagram.



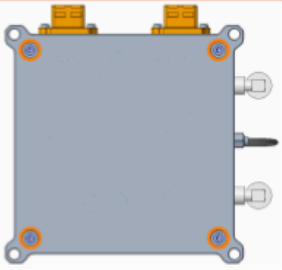
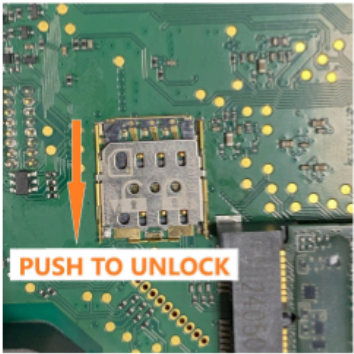
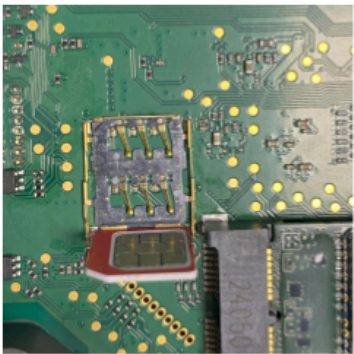
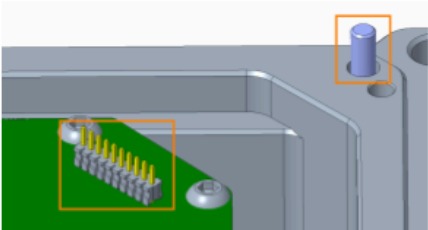
4. Lock the SIM card holder and reattach bottom cover

Return the holder to its original horizontal position.

Lightly push the holder in the locking direction until it clicks into place, securing the SIM card.

Before replacing bottom cover, ensure the gasket is correctly positioned in the designated groove on the casing.

SIM card installation for 3xMEMS-ACC-S variant housing

	1. Remove bottom cover Use a HEX2.5 screwdriver to unscrew the four screws on the bottom of the device. Carefully remove the bottom housing to access the internal components.
	2. Locate the SIM card holder and unlock it After removing the cover, locate the SIM card holder on the PCB. SIM card holder is initially locked. Gently push it downward to unlock the holder.
	3. Insert SIM card Once unlocked, lift the SIM card holder. Card holder in this device is designed to be compatible with a micro SIM card. Insert the SIM card into the holder, ensuring it follows the orientation indicated by the diagram. Lightly push the holder in the locking direction until it clicks into place, securing the SIM card.
	4. Lock the SIM card holder and reattach bottom cover Before replacing bottom housing, ensure the gasket is correctly positioned in the designated groove on the casing. When reinstalling the bottom part of the housing, make sure the PCB connectors and the 4 alignment pins align properly. Do not use force. Once the housing is correctly assembled, tighten the screws.

About this document

This is the user's manual for the NEMOSENSE device family.

Legend

The following symbols and formats will be used throughout the document.



Important

It gives you important information about the subject.
Please read carefully!



Hint

It gives you a hint or provides additional information about a subject.



Example

Gives you an example of a specific subject.

Online versions

Device Technical Reference Manual

The most recent version of this manual can be downloaded from our homepage:

<https://downloads.dewesoft.com/manuals/dewesoft-nemosense-technical-reference-manual-en.pdf>

In the *Hardware Manuals* section click the download link for the *Device® technical reference manual*.

DEWESoftX User Manual

The DEWESoftX User Manual document provides basics and additional information and examples for working with DEWESoftX and certain parts of the program.

The latest version of the DEWESoftX tutorials can be found here:

<https://download.dewesoft.com/list/manuals-brochures/software-manuals>

In the Software Manuals section click the download link of the DEWESoftX User Manual entry.

Warranty information

Notice

The information contained in this document is subject to change without notice.

Note:

Dewesoft d.o.o. shall not be liable for any errors contained in this document. Dewesoft MAKES NO WARRANTIES OF ANY KIND WITH REGARD TO THIS DOCUMENT, WHETHER EXPRESS OR IMPLIED. DEWESOFT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Dewesoft shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit <https://dewesoft.com/support/distributors>.

Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: <http://www.dewesoft.com>
Email: Support@dewesoft.com

The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on <https://dewesoft.com/support/rma-service>.

Only **authorized personnel** are allowed to repair or service the device. After the repair, the device must be tested to ensure it is functioning correctly. Once all tests are passed, the device is confirmed to be in a safe, working condition and can be returned to the customer for use.

Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

Printing History

/

Copyright

Copyright © 2015-2023 Dewesoft d.o.o. This document contains information which is protected by copyright. All rights are reserved. Reproduction, adaptation, or translation without prior written permission is prohibited, except as allowed under the copyright laws. All trademarks and registered trademarks are acknowledged to be the property of their owners.

Trademarks

We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

Safety instructions

Your safety is our primary concern! Please be safe!

Safety symbols in the manual



Warning

Calls attention to a procedure, practice, or condition that could cause the body injury or death



Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

Safety symbols on the device



The device operates at 48 V DC. Ensure all accessible parts are properly insulated to prevent contact with hazardous voltage. Always consult the manual before installation. Improper use may impair the device protection and increase risk to the user.

IP67 The IP67 rating signifies that the device is completely protected against the ingress of dust and is protected against the effects of temporary immersion in water up to 1 meter depth for 30 minutes.

This makes the device suitable for environments where dust protection is needed, but water exposure should be avoided.



Symbol indicates that the device operates using direct current (DC) power. For this device, the operating voltage is 12 V - 48 V.

General Safety Instructions



Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

Environmental Considerations

Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.



This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.

- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.
- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- Lithium ion batteries are classified as not hazardous when used according to the recommendations of the manufacturer described in Battery Safety Data Sheet, which is available for download from [this link](#).
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.

- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.
- Protection impairment may occur if the device is used in a manner not specified by the manufacturer. Ensure all installation and operational instructions are strictly followed.

EN 61326-3-1:2008

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

Appendix 1 - MQTT topics and payloads

Valid from firmware version v4.x.x onwards

NEMOSENSE device can send data over MQTT to a specified broker. The topics and payloads are defined by the [SparkPlugB](#) specification. By the specification NEMOSENSE is defining strings for a groupId, nodeId and a deviceId. The groupId is fixed and is a string with the value "DewesoftIoT", the nodeId is also fixed and has a value of "NEMOSENSE". The last string for deviceId is set to the *serial number* of NEMOSENSE.

Default topics for the device with serial number DA12345678:

Publish topic:

- spBv1.0/DewesoftIoT/DBIRTH/NEMOSENSE/DA12345678
- spBv1.0/DewesoftIoT/DDATA/NEMOSENSE/DA12345678

Subscribe topics:

- STATE
- spBv1.0/DewesoftIoT/DCMD/NEMOSENSE/DA12345678

For sending data NEMOSENSE defines few metrics and all are of type DataSet. The following table describes the metrics and their type:

Metric name	Metric type	Description
ACC/X	DataSet	Acceleration X axis [g] data is sent when 100 samples are available. For example if you have set frequency to 25Hz the datapacket with 100 samples is sent every 4 seconds.
ACC/Y	DataSet	Acceleration Y axis metric data is sent when 100 samples are available. Unit: [g]
ACC/Z	DataSet	Acceleration Z axis metric Data is sent when 100 samples are available. Unit: [g]
ACC/TEMPERATURE	DataSet	Accelerometer sensor temperature [degC]. Value is updated once per second and samples are sent after the next following acceleration metric transfer is finished.
ACC/ROLL	DataSet	Device Roll [deg]

		Value is sent from all devices, while it is representative only on -INC types which include additional factory calibration. Value is updated once per second and samples are sent after the next following acceleration metric transfer is finished.
ACC/PITCH	DataSet	Device Roll [deg] Same notes apply as for Roll
VAR/DOUBLE	DataSet	Diagnostics, statuses, device information. See description below.
VAR/STRING	DataSet	Diagnostics, statuses, device information. See description below.
GNSS/LATITUDE	DataSet	When GNSS sync mode is enabled, position data is available [decimal degrees]. For firmware versions 4.7.2 and newer, the sending frequency is configurable from 1 second upwards.. Older versions have a fixed interval of 20 seconds.
GNSS/LONGITUDE	DataSet	Same notes apply as for GNSS/LATITUDE

Metric data sets are presented as tabular data. Each row represents a sample, with the columns structured as a Timestamp column followed by the actual data columns.

The accelerometer measurements, for instance, are illustrated below. It is important to note that while this example uses JSON for clarity of representation, the actual data payload is encoded in a binary format.

```
{
  "timestamp": "0",
  "metrics": [
    {
      "name": "ACC/X",
      "alias": "16",
      "datatype": 16,
      "dataset_value": {
        "num_of_columns": "11",
        "columns": [
          "Timestamp",
          "V_0",
          "V_1",
          "V_2",
          "V_3",
          "V_4",
          "V_5",
          "V_6",
          "V_7",
          "V_8",
          "V_9"
        ],
        "types": [
          8,
          9,
          9,
          9,
          9,
          9,
          9,
          9,
          9,
          9,
          9
        ],
        "rows": [
          {
            "elements": [
              { "long_value": "1765023223703000" },
              { "float_value": 0.003404 },
              { "float_value": 0.003279 },
```

```
    { "float_value": 0.003586 },
    { "float_value": 0.00323 },
    { "float_value": 0.003657 },
    { "float_value": 0.003406 },
    { "float_value": 0.00371 },
    { "float_value": 0.003528 },
    { "float_value": 0.003291 },
    { "float_value": 0.003837 }
  ]
},
{
  "elements": [
    { "long_value": "1765023223713000" },
    { "float_value": 0.003657 },
    { "float_value": 0.002921 },
    { "float_value": 0.003766 },
    { "float_value": 0.003401 },
    { "float_value": 0.003711 },
    { "float_value": 0.004016 },
    { "float_value": 0.003648 },
    { "float_value": 0.003894 },
    { "float_value": 0.004134 },
    { "float_value": 0.003958 }
  ]
},
{
  "elements": [
    { "long_value": "1765023223723000" },
    { "float_value": 0.003711 },
    { "float_value": 0.003465 },
    { "float_value": 0.003464 },
    { "float_value": 0.003657 },
    { "float_value": 0.003347 },
    { "float_value": 0.003714 },
    { "float_value": 0.004072 },
    { "float_value": 0.00341 },
    { "float_value": 0.003474 },
    { "float_value": 0.003524 }
  ]
}
]
```

```
}
},
{
  "name": "ACC/Y",
  "alias": "17",
  "datatype": 16,
  "dataset_value": {
    "num_of_columns": "11",
    "columns": [
      "Timestamp",
      "V_0",
      "V_1",
      "V_2",
      "V_3",
      "V_4",
      "V_5",
      "V_6",
      "V_7",
      "V_8",
      "V_9"
    ],
    "types": [
      8,
      9,
      9,
      9,
      9,
      9,
      9,
      9,
      9,
      9,
      9
    ],
    "rows": [
      {
        "elements": [
          { "long_value": "1765023223703000" },
          { "float_value": -0.004467 },
          { "float_value": -0.004645 },
          { "float_value": -0.00459 }
        ]
      }
    ]
  }
}
```

```
    { "float_value": -0.004039 },
    { "float_value": -0.004107 },
    { "float_value": -0.004405 },
    { "float_value": -0.004412 },
    { "float_value": -0.004348 },
    { "float_value": -0.0041 },
    { "float_value": -0.004172 }
  ]
},
{
  "elements": [
    { "long_value": "1765023223713000" },
    { "float_value": -0.004047 },
    { "float_value": -0.004216 },
    { "float_value": -0.004654 },
    { "float_value": -0.004707 },
    { "float_value": -0.004411 },
    { "float_value": -0.004416 },
    { "float_value": -0.004589 },
    { "float_value": -0.004355 },
    { "float_value": -0.0046 },
    { "float_value": -0.004235 }
  ]
},
{
  "elements": [
    { "long_value": "1765023223723000" },
    { "float_value": -0.004351 },
    { "float_value": -0.004527 },
    { "float_value": -0.004527 },
    { "float_value": -0.004047 },
    { "float_value": -0.004343 },
    { "float_value": -0.004229 },
    { "float_value": -0.004599 },
    { "float_value": -0.004283 },
    { "float_value": -0.004103 },
    { "float_value": -0.004648 }
  ]
}
}
```

```
},
{
  "name": "ACC/Z",
  "alias": "18",
  "datatype": 16,
  "dataset_value": {
    "num_of_columns": "11",
    "columns": [
      "Timestamp",
      "V_0",
      "V_1",
      "V_2",
      "V_3",
      "V_4",
      "V_5",
      "V_6",
      "V_7",
      "V_8",
      "V_9"
    ],
    "types": [
      8,
      9,
      9,
      9,
      9,
      9,
      9,
      9,
      9,
      9,
      9
    ],
    "rows": [
      {
        "elements": [
          { "long_value": "1765023223703000" },
          { "float_value": 1.000292 },
          { "float_value": 1.000417 },
          { "float_value": 1.000789 },
          { "float_value": 1.000664 },
```

```
    { "float_value": 1.001098 },
    { "float_value": 1.00054 },
    { "float_value": 1.000291 },
    { "float_value": 1.000416 },
    { "float_value": 1.000913 },
    { "float_value": 1.000476 }
  ]
},
{
  "elements": [
    { "long_value": "1765023223713000" },
    { "float_value": 1.000849 },
    { "float_value": 1.00023 },
    { "float_value": 1.000478 },
    { "float_value": 1.00079 },
    { "float_value": 1.000788 },
    { "float_value": 1.000974 },
    { "float_value": 1.001224 },
    { "float_value": 1.000539 },
    { "float_value": 1.000788 },
    { "float_value": 1.000663 }
  ]
},
{
  "elements": [
    { "long_value": "1765023223723000" },
    { "float_value": 1.000477 },
    { "float_value": 1.000851 },
    { "float_value": 1.000541 },
    { "float_value": 1.000849 },
    { "float_value": 1.000851 },
    { "float_value": 1.000788 },
    { "float_value": 1.000664 },
    { "float_value": 1.001286 },
    { "float_value": 1.001161 },
    { "float_value": 1.000914 }
  ]
}
]
```

```
],  
  "seq": "229"  
}
```

Example of 'ACC/TEMPERATURE' is illustrated bellow:

```
{  
  "timestamp": "0",  
  "metrics": [  
    {  
      "name": "ACC/TEMPERATURE",  
      "alias": "1",  
      "datatype": 16,  
      "dataset_value": {  
        "num_of_columns": "2",  
        "columns": [  
          "ACC_TEMPERATURE_degC",  
          "Timestamp"  
        ],  
        "types": [  
          10,  
          8  
        ],  
        "rows": [  
          {  
            "elements": [  
              {  
                "double_value": 24.851388931274414  
              },  
              {  
                "long_value": "1765028236440000"  
              }  
            ]  
          }  
        ]  
      }  
    }  
  ],  
  "seq": "97"  
}
```

The following example show how the ROLL and PITCH metrics are sent:

```
{
  "timestamp": "0",
  "metrics": [
    {
      "name": "ACC/ROLL",
      "alias": "2",
      "datatype": 16,
      "dataset_value": {
        "num_of_columns": "2",
        "columns": [
          "ACC_ROLL_deg",
          "Timestamp"
        ],
        "types": [
          10,
          8
        ],
        "rows": [
          {
            "elements": [
              {
                "double_value": -0.2562829852104187
              },
              {
                "long_value": "1765028046440000"
              }
            ]
          }
        ]
      }
    }
  ],
  "seq": "196"
}
```

```
{
  "timestamp": "0",
  "metrics": [
```

```
{
  "name": "ACC/PITCH",
  "alias": "3",
  "datatype": 16,
  "dataset_value": {
    "num_of_columns": "2",
    "columns": [
      "ACC_PITCH_deg",
      "Timestamp"
    ],
    "types": [
      10,
      8
    ],
    "rows": [
      {
        "elements": [
          {
            "double_value": -0.20225200057029724
          },
          {
            "long_value": "1765028099440000"
          }
        ]
      }
    ]
  }
},
"seq": "164"
}
```

The VAR/DOUBLE and VAR/STRING metrics are utilized for diagnostic and informational purposes on the device.

The VAR/DOUBLE metric includes the following columns:

Category	Column Name	Description
Acceleration (ACC)	ACC_IS_SAMPLING_SESSION_ACTIVE	Indicates if an acceleration sampling session is active.
	ACC_SAMPLING_SESSION_START_TIME_us	Start time of the acceleration sampling session. [UNIX us]

	ACC_UNIX_TIMESTAMP_ERR_RAW_us	Raw error in the acceleration timestamp. [UNIX us]
	ACC_UNIX_TIMESTAMP_ERR_FILTERED_us	Filtered error in the acceleration timestamp. [UNIX us]
	ACC_SAMPLING_FREQ_TUNNING_VAL_ppm	Tunning value for the acceleration sampling frequency. [ppm]
	ACC_LOST_SAMPLES_COUNT	Number of lost acceleration samples.
Ethernet (ETH)	ETH_IS_CONNECTION_OK	Indicates if the Ethernet connection is OK.
	ETH_NO_CONNECTION_TIME_min	Duration of time the Ethernet connection has been down. [minutes]
FTP	FTP_IS_CONNECTION_OK	Indicates if the FTP connection is OK.
Logger (Read)	LOGGER_READ_DIR	Internal directory number of the storing file being read.
	LOGGER_READ_FILE	Internal file number of the storing file being read.
	LOGGER_READ_LINE	Sequential log entry within the current storing file being read.
	LOGGER_READ_POS	Sequential log entry within the internal logger structure being currently read. Restarts count to zero when memory is full, and the logger starts writing to directory 0 file 0 again.
	LOGGER_READ_ID	Unique sequential log entry of the log currently being read. Incremented since the last logger file system format/erase.
	LOGGER_READ_AVG_ms	Average read time. [ms]
	LOGGER_READ_MIN_ms	Minimum read time. [ms]
	LOGGER_READ_MAX_ms	Maximum read time. [ms]

Logger (Write)	LOGGER_WRITE_DIR	See LOGGER_READ_DIR
	LOGGER_WRITE_FILE	See LOGGER_READ_FILE
	LOGGER_WRITE_LINE	See LOGGER_READ_LINE
	LOGGER_WRITE_POS	See LOGGER_READ_POS
	LOGGER_WRITE_ID	See LOGGER_READ_ID
	LOGGER_WRITE_AVG_ms	Average write time. [ms]
	LOGGER_WRITE_MIN_ms	Minimum write time. [ms]
	LOGGER_WRITE_MAX_ms	Maximum write time. [ms]
Main System (MAIN)	MAIN_HEAP_CURRENT_SIZE_bytes	Current size of the main heap. [B]
	MAIN_HEAP_RESERVED_SIZE_bytes	Reserved size of the main heap. [B]
	MAIN_HEAP_ALLOCATION_FAIL_COUNT	Count of main heap allocation failures.
	MAIN_UP_TIME	System uptime. [s]
	MAIN_BOOT_COUNT	Number of system boots.
	MAIN_CURRENT_UNIX_TIME_sec	Current UNIX time. [s]
MQTT	MQTT_IS_CONNECTION_OK	Indicates whether the MQTT connection is active 1 = connected in MQTT mode 2 = connected in MQTTS mode
	MQTT_NUM_OF_LOGS_TO_SEND_AVAILABLE	Number of logs available to send via MQTT.
	MQTT_TIME_SINCE_LAST_NUM_OF_LOGS_SEND_OK_ms	Time since the last successful transmission of log count via MQTT. [ms]
Network Time Protocol (NTP)	NTP_IS_CONNECTION_OK	Indicates if the NTP connection is OK. 0 = no connection to NTP server 1 = connected to NTP server
Time Synchronization	TIME_SYNC_STATUS	Status of time synchronization. 0 = not synchronized

(TIME)		1 = synchronized to NTP 2 = synchronized to GNSS
	TIME_SYNC_RUNNING	Indicates if the time synchronization mechanism is currently running.
	TIME_LAST_SYNC_TIMESTAMP_us	Timestamp of the last successful time synchronization. [UNIX us]
Power (PWR)	PWR_VBUS_V	VBUS voltage. [V]
	PWR_3V3_LTE_V	3.3V LTE voltage. [V]
	PWR_5V_POE_V	5V PoE voltage. [V]
Global Navigation Satellite System (GNSS)	GNSS_FIX_QUALITY	GPS quality indicator. 0 = Fix not available or invalid 1 = GPS SPS mode, fix valid. 2 = Differential GPS, SPS mode, or Satellite Based Augmentation System (SBAS), fix valid. 6 = Estimated (dead reckoning) mode.
	GNSS_SATELLITES_TRACKED	Number of satellites being tracked.
Cellular	CELLULAR_RSSI	Received Signal Strength Indicator for cellular connection. [dB]
Battery (BAT)	BAT_FUEL_GAUGE_REPSOC	Reported State of Charge from the fuel gauge. [%]
	BAT_FUEL_GAUGE_REPCAP	Reported current capacity from the fuel gauge. [Ah]
	BAT_FUEL_GAUGE_FULLCAPNOM	Nominal Full Capacity from the fuel gauge. [Ah]
	BAT_FUEL_GAUGE_TTE	Time-to-Empty. [h]
	BAT_FUEL_GAUGE_TTF	Time-to-Full. [h]
	BAT_FUEL_GAUGE_CYCLES	Current number of full cell charge/discharge cycles.
	BAT_FUEL_GAUGE_AVGVCELL	Average cell voltage. [V]

	BAT_FUEL_GAUGE_AVGCURRENT	Average cell current. [A]
	BAT_FUEL_GAUGE_AVGTA	Average cell temperature. [°C]
	BAT_CHARGER_STATUS	Status of the battery charger 0 = Not Charging 1 = Pre-charge (< 3 V) 2 = Charging 3 = Charge Termination Done
	BAT_CHARGER_FAULTS	Faults reported by the battery charger. Binary values: B7...6: not used B5: 0 = normal 1 = cell overvoltage protection B4...3: 00 = normal 01 = charger input voltage fault 10 = thermal shutdown 11 = charge safety timer expired B2...0: 110 = battery hot, charging prohibited 010 = battery warm, charging allowed with reduced voltage 000 = normal 011 = battery cool, charging allowed with reduced current 101 = battery cold, charging prohibited
	BATTERY_PACK_UPS_MODE	Indicates if the device is powered from battery - UPS mode
Trigger (TRIG)	TRIG_STORE_IS_ACTIVE	Indicates if the store trigger mechanism is active.
	TRIG_STORE_TRIG_TIME_IS_ACTIVE	Indicates if the time-based store trigger is active.
	TRIG_STORE_TRIG_DATA_1_IS_ACTIVE	Indicates if data trigger 1 for store is active.
	TRIG_STORE_TRIG_DATA_2_IS_ACTIVE	Indicates if data trigger 2 for store is active.

	TRIG_SEND_IS_ACTIVE	Indicates if the send trigger mechanism is active.
	TRIG_SEND_TRIG_TIME_IS_ACTIVE	Indicates if the time-based send trigger is active.
	TRIG_SEND_TRIG_DATA_1_IS_ACTIVE	Indicates if data trigger 1 for send is active.
	TRIG_SEND_TRIG_DATA_2_IS_ACTIVE	Indicates if data trigger 2 for send is active.
Timestamp	"Timestamp"	The record's timestamp. [UNIX us]

All columns listed above are of type **double precision**, with the exception of the final column, "Timestamp," which is of type **UINT64**.

The VAR/STRING metric comprises columns of type STRING, with the exception of the timestamp column, which is UINT64. The following values are included:

Category	Column Name	Description
ID	ID_SERIAL_NUMBER	Indicates the serial number of the device.
	ID_HW_MCU_UNIQUE_ID	Indicates the HW unique ID.
	ID_FW_NAME	Indicates the FW code name.
	ID_FW_VERSION	Indicates the actual FW version.
	ID_FW_BIN	Indicates the bin file used for this upgrade.
	ID_MAC	Indicates the MAC address of the device.
BATTERY	BATTERY_PACK_SERIAL	
DEVICE	DEVICE_TYPE	
	DEVICE_NAME	
	Timestamp	

An illustrative example of VAR/DOUBLE metric is provided below, using JSON for clarity, though the actual data payload is binary encoded:

```
{
  "timestamp": "0",
  "metrics": [
    {
      "name": "VAR/DOUBLE",
      "alias": "4",
      "datatype": 16,
      "dataset_value": {
        "num_of_columns": "65",
        "columns": [
          "ACC_IS_SAMPLING_SESSION_ACTIVE",
          "ACC_SAMPLING_SESSION_START_TIME_us",
          "ACC_UNIX_TIMESTAMP_ERR_RAW_us",
          "ACC_UNIX_TIMESTAMP_ERR_FILTERED_us",
          "ACC_SAMPLING_FREQ_TUNNING_VAL_ppm",
          "ACC_LOST_SAMPLES_COUNT",
          "ETH_IS_CONNECTION_OK",
          "ETH_NO_CONNECTION_TIME_min",
          "FTP_IS_CONNECTION_OK",
          "LOGGER_READ_DIR",
          "LOGGER_READ_FILE",
          "LOGGER_READ_LINE",
          "LOGGER_READ_POS",
          "LOGGER_READ_ID",
          "LOGGER_WRITE_DIR",
          "LOGGER_WRITE_FILE",
          "LOGGER_WRITE_LINE",
          "LOGGER_WRITE_POS",
          "LOGGER_WRITE_ID",
          "MAIN_HEAP_CURRENT_SIZE_bytes",
          "MAIN_HEAP_RESERVED_SIZE_bytes",
          "MAIN_HEAP_ALLOCATION_FAIL_COUNT",
          "MQTT_IS_CONNECTION_OK",
          "MQTT_NUM_OF_LOGS_TO_SEND_AVAILABLE",
          "MQTT_TIME_SINCE_LAST_NUM_OF_LOGS_SEND_OK_ms",
          "NTP_IS_CONNECTION_OK",
          "TIME_SYNC_STATUS",
          "TIME_SYNC_RUNNING",
          "TIME_LAST_SYNC_TIMESTAMP_us",
          "PWR_VBUS_V",
          "PWR_3V3_LTE_V",
```

```
"PWR_5V_POE_V",
"GNSS_FIX_QUALITY",
"GNSS_SATELLITES_TRACKED",
"CELLULAR_RSSI",
"LOGGER_READ_AVG_ms",
"LOGGER_READ_MIN_ms",
"LOGGER_READ_MAX_ms",
"LOGGER_WRITE_AVG_ms",
"LOGGER_WRITE_MIN_ms",
"LOGGER_WRITE_MAX_ms",
"BAT_FUEL_GAUGE_REPSOC",
"BAT_FUEL_GAUGE_REPCAP",
"BAT_FUEL_GAUGE_FULLCAPNOM",
"BAT_FUEL_GAUGE_TTE",
"BAT_FUEL_GAUGE_TTF",
"BAT_FUEL_GAUGE_CYCLES",
"BAT_FUEL_GAUGE_AVGVCELL",
"BAT_FUEL_GAUGE_AVGCURRENT",
"BAT_FUEL_GAUGE_AVGTA",
"BAT_CHARGER_STATUS",
"BAT_CHARGER_FAULTS",
"TRIG_STORE_IS_ACTIVE",
"TRIG_STORE_TRIG_TIME_IS_ACTIVE",
"TRIG_STORE_TRIG_DATA_1_IS_ACTIVE",
"TRIG_STORE_TRIG_DATA_2_IS_ACTIVE",
"TRIG_SEND_IS_ACTIVE",
"TRIG_SEND_TRIG_TIME_IS_ACTIVE",
"TRIG_SEND_TRIG_DATA_1_IS_ACTIVE",
"TRIG_SEND_TRIG_DATA_2_IS_ACTIVE",
"MAIN_UP_TIME",
"MAIN_BOOT_COUNT",
"MAIN_CURRENT_UNIX_TIME_sec",
"BATTERY_PACK_UPS_MODE",
"Timestamp"
],
"types": [
  10,
  10,
  10,
  10,
  10,
```



```
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
10,
8
],
"rows": [
  {
    "elements": [
      { "double_value": 1 },
      { "double_value": 1762956448000000 },
      { "double_value": 435 },
      { "double_value": 15.380577087402344 },
      { "double_value": 0.8297175168991089 },
      { "double_value": 49741 },
      { "double_value": 1 },
      { "double_value": 0 },
      { "double_value": 0 },
      { "double_value": 20 },
      { "double_value": 44 },
      { "double_value": 32600 },
      { "double_value": 1728790 },
      { "double_value": 2102232600 },
      { "double_value": 72 },
      { "double_value": 0 },
      { "double_value": 22400 },
      { "double_value": 1187860 },
```



```
        { "double_value": 0 },
        { "double_value": 2324010 },
        { "double_value": 182 },
        { "double_value": 1765282768 },
        { "double_value": 1 },
        { "long_value": "1765282768479000" }
    ]
}
]
}
"seq": "142"
}
```

Example of VAR/STRING string in JSON format for clarity is bellow:

```
{
  "timestamp": "0",
  "metrics": [
    {
      "name": "VAR/STRING",
      "alias": "5",
      "datatype": 16,
      "dataset_value": {
        "num_of_columns": "10",
        "columns": [
          "ID_SERIAL_NUMBER",
          "ID_HW_MCU_UNIQUE_ID",
          "ID_FW_NAME",
          "ID_FW_VERSION",
          "ID_FW_BIN",
          "ID_MAC",
          "BATTERY_PACK_SERIAL",
          "DEVICE_TYPE",
          "DEVICE_NAME",
          "Timestamp"
        ],
      },
      "types": [
        12,
        12,
```

```

12,
12,
12,
12,
12,
12,
12,
12,
8
],
"rows": [
  {
    "elements": [
      { "string_value": "DA25004219" },
      { "string_value": "203338484731501000250030" },
      { "string_value": "NemoFwStm32L4R9" },
      { "string_value": "4.7.1.2511120735.47f754b9dbed67c3f9d604be6f98ec144c8d1b98" },
      { "string_value": "2511120735_MDAQ-3-AF-28-1_NemoFwStm32L4R9_V4-7-1_47f754b.bin" },
      { "string_value": "00:80:E1:25:00:30" },
      { "string_value": "" },
      { "string_value": "NEMOSENSE 3xMEMS-ACC-8g-INC" },
      { "string_value": "" },
      { "long_value": "1765283633695000" }
    ]
  }
]
}
"seq": "98"
}

```

Finally examples for GNSS/LATITUDE and GNSS/LONGITUDE are as follows:

```

{
  "timestamp": "0",
  "metrics": [
    {
      "name": "GNSS/LATITUDE",
      "alias": "8",
      "datatype": 16,
      "dataset_value": {
        "num_of_columns": "2",

```

```
    "columns": [
      "GNSS_LATITUDE",
      "Timestamp"
    ],
    "types": [
      10,
      8
    ],
    "rows": [
      {
        "elements": [
          { "double_value": 46.1714973449707 },
          { "long_value": "1765314348223000" }
        ]
      }
    ]
  }
},
"seq": "73"
}
```

```
{
  "timestamp": "0",
  "metrics": [
    {
      "name": "GNSS/LONGITUDE",
      "alias": "9",
      "datatype": 16,
      "dataset_value": {
        "num_of_columns": "2",
        "columns": [
          "GNSS_LONGITUDE",
          "Timestamp"
        ],
        "types": [
          10,
          8
        ],
        "rows": [
          {
            "elements": [
```

```
        { "double_value": 15.05388069152832 },
        { "long_value": "1765314748543000" }
    ]
}
]
}
}
],
"seq": "86"
}
```

Legacy - MQTT payload valid for firmware older than v4.x.x

NEMOSENSE device can send data over MQTT to a specified broker. The topics and payloads are defined by the [SparkPlugB](#) specification. By the specification NEMOSENSE is defining strings for a groupID, nodeID and a deviceID. The groupID is fixed and is a string with the value "Dewesoft", the nodeID is also fixed and has a value of "NemoNode". The last string for deviceID is set to the *serial number* of NEMOSENSE.

An example of the topic that would be used for NEMOSENSE with serial number DA12345678 to send data would be: *spBv1.0/Dewesoft/DDATA/NemoNode/DA12345678*

For sending data NEMOSENSE defines 3 types of metrics and all three are of type Dataset. This simply just means that the data is sent as an encoded data table.

The first metric is for sending the accelerometer measurements of NEMOSENSE. As mentioned this metric is of type Dataset and sends data as a table with four columns called

- "ACC_X",
- "ACC_Y",
- "ACC_Z",
- "Timestamp"

The first three columns are the actual measurements of type double precision and the last one is the UTC timestamp from the moment when the measurement was taken, this value is of type UINT64.

Example of such a metric is shown below. Note that this example uses JSON for easier representation, but the actual payload is binary encoded:

```
{
  "timestamp": 1655984340,
  "metrics": [{
    "name": "Direct",
    "alias": 0,
    "timestamp": 1655984340,
    "dataType": "DataSet",
    "hasMetadata": false,
    "metadata": {
    }
    "dataset": {
      "numOfColumns": 4,
      "columns": [
        "ACC_X",
        "ACC_Y",
        "ACC_Z",
        "Timestamp"
      ],
      "types": [
        "Double",
        "Double",
        "Double",
```

```

        "UINT64"

    ],
    "rows": [[
        1.30,
        2.3,
        4.5,
        1655984320
    ], [
        1.30,
        2.3,
        4.5,
        1655984330
    ]]
    }
}
}],
"seq": 22
}

```

The second metric is used for sending diagnostics data from NEMOSENSE for this the following columns are used:

- "ACC_IS_SAMPLING_SESSION_ACTIVE",
- "ACC_SAMPLING_SESSION_START_TIME_us",
- "ACC_UNIX_TIMESTAMP_ERR_RAW_us",
- "ACC_UNIX_TIMESTAMP_ERR_FILTERED_us",
- "ACC_SAMPLING_FREQ_TUNNING_VAL_ppm",
- "ETH_IS_CONNECTION_OK",
- "ETH_NO_CONNECTION_TIME_min",
- "FTP_IS_CONNECTION_OK",
- "MAIN_HEAP_CURRENT_SIZE_bytes",
- "MAIN_HEAP_RESERVED_SIZE_bytes",
- "MQTT_IS_CONNECTION_OK",
- "MQTT_LAST_FILE_SENDING_TIME_sec",
- "NTP_IS_CONNECTION_OK",
- "NTP_LAST_RX_NTP_UNIX_TIME_us",
- "SD_NUM_OF_FILES",
- "Timestamp"

All these columns are of type double precision except the Timestamp which is UINT64.

Example of such a metric is shown. Note that this example uses JSON for easier representation but the actual payload is binary encoded:

```

{
  "timestamp": 1655984340,
  "metrics": [{

```



```
        "Double",
        "Double",
        "Double",
        "UINT64"
    ],
    "rows": [[
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1655984320
    ], [
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1.30,
        2.3,
        4.5,
        1655984330
    ]
  ]]
```

```
    }
  }
}],
"seq": 22
}
```

The last metric is used to send temperature measurements taken by NEMOSENSE. This metric contains only two columns: one for the temperature measurement called "ACC_TEMPERATURE_degC" and the second column for the timestamp in UTC when the measurement was taken.

Example of such a metric is shown below. Note that this example uses JSON for easier representation but the actual payload is binary encoded:

```
{
  "timestamp": 1655984340,
  "metrics": [{
    "name": "Direct",
    "alias": 0,
    "timestamp": 1655984340,
    "dataType": "DataSet",
    "hasMetadata": false,
    "metadata": {
    }
    "dataset": {
      "numOfCols": 4,
      "columns": [
        "ACC_X",
        "Timestamp"
      ],
      "types": [
        "Double",
        "UINT64"
      ],
      "rows": [[
        45.5,
        1655984320
      ]]
    }
  ]
},
"seq": 22
}
```

Appendix 2 - HTTP configuration mode API

A lightweight HTTP/1.1 server, embedded in the NEMOSENSE device firmware, that exposes device management, configuration, firmware-update, and diagnostics functions. It listens on port 80 and speaks plain HTTP with mostly JSON or plain-text bodies.

The server keeps per-connection session state (no cookies/tokens). It is automatically started a few seconds after device power-up with the IP address configured in the factory - 192.168.11.95 by default. If no command is received within 60 sec, HTTP configuration server will timeout and the device will proceed to the measurement mode, preceded with automatic FOTA check mode when enabled.

Access levels (low → high): default → admin → factory → internal. Each endpoint has an independent read/write access requirement and the available config parameters vary with the access level.

Note: this is a session tied to the underlying TCP connection — use a client that keeps the socket open (e.g. curl with --http1.1 against a persistent connection, or a raw socket client) for subsequent authenticated calls.

Response Conventions

- Successful calls return HTTP/1.1 200 OK, either with an empty body or a JSON payload.
- Structured data (config, battery, accelerometer, logger, network test) is returned as JSON.
- Simple values (firmware version, serial numbers) are returned as raw text.
- Errors use standard HTTP status lines with a short text reason:

Status	Meaning
200 OK	Success
400 Bad Request	Malformed request body / invalid parameter value
401 Unauthorized	Unknown user, wrong password, or insufficient access level for the endpoint
503 Service Unavailable	Device busy or subsystem (ACC, power, config) could not complete the action

Endpoint Reference

Session / Identity / Misc

Method & Path	Access	Description
GET /ping	<i>default</i>	Liveness check
GET /fw_ver	<i>default</i>	Return firmware version string
GET /user	<i>default</i>	Return current user's role
POST /user	–	Set user level (admin or default) - for 'admin' and higher, the password command must follow to complete login
POST /pass	–	Provide plain text password; access level is elevated if SHA256 matches
POST /stop	<i>default</i>	Stop the config server and go to measure mode

POST /stop_with_fw_up	<i>default</i>	Stop the config server and proceed with FOTA check before measure mode (regardless of “automatic fw update” parameter value)
POST /reset	<i>default</i>	Reset the device
POST /bootcnt/reset	<i>admin</i>	Reset the boot counter
POST /unlock	<i>default</i>	Unlock a protected action by a numeric code: 0 = FW upgrade to a version with different major revision, 1 = enable UPS dis-arming while device is battery-powered

Device Configuration

Method & Path	Access	Description
GET /config	-	Return all configuration parameters (values visible are filtered by caller's access level)
POST /config	-	Update one or more configuration parameters (JSON body)

Firmware Update

Method & Path	Access	Description
POST /fw_up/manifest	<i>admin</i>	Upload new FW update manifest
POST /fw_up/bin	<i>admin</i>	Upload firmware binary
POST /fota/available	<i>admin</i>	Trigger an immediate FOTA availability check — stop HTTP config mode, execute check, save result and reboot to HTTP config mode
GET /fota/available	<i>default</i>	Get result of the last FOTA availability check

Accelerometer Measurements

Method & Path	Access	Description
POST /acc/start	<i>default</i>	Start accelerometer sampling session
POST /acc/stop	<i>default</i>	Stop accelerometer sampling session
GET /acc/samples/raw/average/{n}	<i>default</i>	Average of the next n raw samples (must be actively sampling)
GET /acc/samples/raw/{n}	<i>default</i>	Next n raw samples
GET /acc/samples/{n}	<i>default</i>	Next n processed samples

Data Logger

Method & Path	Access	Description
GET /logger/metadata	<i>default</i>	Logger ring-buffer metadata (read/write/oldest pointers, sizing, CRC)
GET /logger/stored-range	<i>default</i>	Range of log IDs currently stored, with oldest/newest file paths

GET /logger/dir/{id}/file/{id}.{ext}/line/0	default	Fetch a single decoded log record (as JSON) from a specific stored file — only line=0 is currently supported
GET /logger/dir/{id}/file/{id}.{ext}	default	Download the raw contents of a specific stored log file (binary/CSV)
GET /logger/{idStart}-{idEnd}	default	Download a range of logs by ID (binary, max 100 logs per request)

Network Diagnostics

Method & Path	Access	Description
POST /nettest/start	default	Start a background network test — stop HTTP config mode, try to ping the selected data server, save report and reboot to HTTP config mode
GET /nettest/status	default	Get result of last network test
POST /nettest/cellular	default	Run a detailed cellular network test (SIM, registration, PDP, DNS, ping), return detailed report within command response; body = timeout in seconds (0–1200)
POST /nettest/cellpwr	admin	Power the cellular modem on/off
POST /nettest/at	admin	Send a raw AT command to the modem

Power & Battery

Method & Path	Access	Description
GET /battery_status	default	JSON battery telemetry: SOC, voltage, current, temperature, charging/UPS state
GET /serial_number_battery	default	Battery pack serial number (hex string)
POST /enable_charging	default	Enable/disable charging in HTTP config mode and set charge power (W)

MQTT / FTPS / FOTA Credentials

Method & Path	Access	Description
POST /mqtt/server_root_ca_cert	admin	Set MQTT broker root CA cert
POST /mqtt/client_cert	admin	Set MQTT client cert
POST /mqtt/client_private_key	admin	Set MQTT client private key
GET /ftps/server_root_ca_cert	admin	Read the currently stored FTPS server root CA cert
POST /ftps/server_root_ca_cert	admin	Set FTPS server root CA cert
POST /fw_up/server_root_ca_cert	admin	Set TLS root CA cert used for FW download

POST /fw_up/client_cert	<i>admin</i>	Set TLS client cert for FW download
POST /fw_up/client_private_key	<i>admin</i>	Set TLS client private key

Examples

GET /ping

```
curl -s http://192.168.11.95/ping
```

GET /fw_ver

```
curl -s http://192.168.11.95/fw_ver  
  
4.9.0
```

GET /user

```
curl -s http://192.168.11.95/user  
  
User: admin
```

POST /user

```
curl -s http://192.168.11.95/user -d "admin"
```

POST /pass

```
curl -s http://192.168.11.95/pass -d "MySecretPass123"
```

POST /unlock (allow upgrade to FW with a different major revision)

```
curl -s http://192.168.11.95/unlock -d "0"
```

GET /config

```
curl -s http://192.168.11.95/config  
  
{  
  "acc_sample_rate_hz": 31.25,  
  "fota_check_before_measure": true,  
  "pwr_charging_power": 2.5,  
  "pwr_ups_armed": false  
}
```

POST /config

```
curl -s -X POST http://192.168.11.95/config \  
-d '{"acc_sample_rate_hz": 100}'
```

200 OK on success; 400 Bad Request with an error detail if a value is out of range or the write requires a higher access level than the session currently has.

POST /fota/available

```
curl -s -X POST http://192.168.11.95/fota/available
```

GET /fota/available

```
curl -s http://192.168.11.95/fota/available
```

```
Firmware available: 4.9.0-2608181001
```

POST /mqtt/server_root_ca_cert

```
curl -s -X POST http://192.168.11.95/mqtt/server_root_ca_cert \  
--data-binary @mqtt_root_ca.pem
```

POST /mqtt/client_cert

```
curl -s -X POST http://192.168.11.95/mqtt/client_cert \  
--data-binary @mqtt_client_cert.pem
```

POST /mqtt/client_private_key

```
curl -s -X POST http://192.168.11.95/mqtt/client_private_key \  
--data-binary @mqtt_client_key.pem
```

POST /ftps/server_root_ca_cert

```
curl -s -X POST http://192.168.11.95/ftps/server_root_ca_cert \  
--data-binary @ftps_root_ca.pem
```

POST /logger/metadata

```
curl -s http://192.168.11.95/logger/metadata  
  
{  
  "magicNumber": 305419896,  
  "version": 1,  
  "numOfDir": 4,  
  "numOfFilesPerDir": 100,  
  "numOfLogsPerFile": 1000,  
  "read": { "id": 100032, "pos": 512, "line": 32, "file": 12, "dir": 0 },  
  "write": { "id": 115451, "pos": 128, "line": 51, "file": 44, "dir": 3 },  
    "oldest": { "id": 100032, "pos": 0, "line": 0, "file": 12, "dir": 0 },  
  "crc": 47802  
}
```

POST /logger/stored-range

```
curl -s http://192.168.11.95/logger/stored-range
```

```
{
  "numOfLogsToReadStored": 15420,
  "idOldest": 100032,
  "idNewest": 115451,
  "filePathOldest": "/0/12.log",
  "filePathNewest": "/3/44.log"
}
```

GET /logger/dir/{dirId}/file/{fileId}.{ext}/line/{lineId}

```
curl -s http://192.168.11.95/logger/dir/0/file/12.csv/line/0

{
  "desiredUnixTimestamp_us": 1735000000000000,
  "x_g": 0.001234,
  "y_g": -0.000456,
  "z_g": 0.998877
}
```

GET /logger/dir/{dirId}/file/{fileId}.{ext}

```
curl -s http://192.168.11.95/logger/dir/0/file/12.csv -o 12.csv
```

Returns the file as application/octet-stream.

POST /stop

```
curl -s -X POST http://192.168.11.95/stop
```

200 OK, then the connection is closed and the server stops.

POST /stop_with_fw_up

```
curl -s -X POST http://192.168.11.95/stop_with_fw_up
```

200 OK, then the connection is closed and the FW download begins.

Documentation version history

Version	Date	Notes
V22-1	2022-06-07	Initial version
V22-2	2022-08-29	Functional description, LEDs
V23-1	2023-01-23	Quick start guide, diagrams
V23-2	2023-02-22	MQTT topics added
V23-3	2023-12-12	Links to config tool, manual updated
V24-1	2024-06-01	Added B, M, G options
V24-2	2024-06-05	B temp range changed to -20..50 degC
V24-3	2024-11-13	
V25-1	2025-01-31	Supply Voltage – Power Supply for NEMOSENSE Device, IP40
V25-2	2025-02-27	Update of the Chapter: Configuration mode, ConfigAPP, Viewing data from NEMOSENSE device
V25-3	2025-09-29	Added Exd option
V25-4	2025-03-30	Config tool update
V25-5	2025-11-30	Specifications, Config Tool update and general review
V25-6	2025-12-11	Updated MQTT descriptions for firmware v4.x.x
V26-2	2026-08-25	Updated new features up to firmware version 4.9.0. Add HTTP API description-