BATLOGGER WE X

manual

Content

1 Safety Instructions and Notes

Before using the device, please read this manual carefully and keep it for future reference.

General safety instructions:
- Failure to observe the information associated with this warning symbol can result in serious injury or even death.
- Use the device only in its intended manner. Any other use may result in damage to the device or the surroundings of the device.
- Do not place the unit on or near a heat source (heating, fire, etc.). Protect the device from high temperatures and temperature fluctuations.
- Place the unit in such a way that it cannot become a hazard if it falls down, falls over, etc.
- The device must be kept out of the reach of (small) children.
- Do not allow foreign objects (coins, metal pins, insects, etc.) or liquids to enter the device.
- Only use the power supply specified for the device.
- When installing the device and the external cables (microphone, power supply, etc.), make sure that they cannot come into contact with other live objects. It must also be ensured that lightning, high voltage lines etc. cannot cause electric shock. Defective connections and damage to the cable can lead to electric shock or fire.
- Observe the electrical parameters of the inputs and outputs of the external IO plug! Too high voltages and too high switched currents can lead to malfunction and fire.
- When installing the device (especially in a wind turbine), it must be ensured that the device, accessories, fastening material or tools cannot endanger persons or animals.
- Secure yourself during installation so that you cannot fall or injure yourself through carelessness.
- Make sure that the use of this device is permitted in the country and in the desired environment. Use of the device can be dangerous and must be avoided in the following areas:
  - Where it can interfere with other electronic devices such as hospitals, airports, airplanes, etc.
  - Where there is a risk of explosion, such as petrol stations, oil refineries, etc.
- It is the user's responsibility to comply with country-specific regulations and ordinances.
- Do not use the unit when driving a vehicle (e.g. bicycle, motorcycle or car).
- Modification or alteration of the device impairs product safety. Attention Danger of injury!
- Never carry out repairs yourself.
- Handle the device carefully. It can be damaged by knocks, blows or falling from a low height.
- Avoid operation in the immediate vicinity of strong magnetic or electromagnetic fields, transmitting antennas, HF generators or near electronic devices such as mobile phones. This can impair operation.
- The stored data may be destroyed or deleted by operating errors, device malfunctions or repair measures. Therefore, it is always advisable to make a backup copy to the PC hard disk for important content.

External power supply: Disconnect the unit from the power outlet when it is not in use or if maintenance is required after turning it off with the power switch. The enclosed power supply unit may only be used indoors (0..40°C). Only use the supplied, undamaged power supply unit and the corresponding power supply cable to power the BATLOGGER. Before connecting the power supply, make sure that the values of the local power supply comply with the printed power supply specification. Do not use with damaged cable or plug. Do not try to open the power supply. Repairs may only be carried out by a qualified service centre. When disconnecting the AC adapter from the wall outlet, always pull on the plug of the cable itself and not on the cable.

If an external power supply other than the supplied power supply (e.g. photovoltaic panel) is used, it must be ensured that it is properly connected and protected from moisture, rain and other environmental influences.

WTG functionality: The BATLOGGER may only be installed in the WTG by trained and instructed personnel.

Make sure that you do not impair or damage the functions of the WTG when installing the unit. Mount it in a place where it can be easily removed and make sure that the openings in the gondola can be closed again later.

Ensure that both cables and equipment are safe for people and animals. Use cable ties to avoid tripping hazards, use locking screws to prevent vibrations and ensure that the safety of the environment is maintained.

Be careful when handling dangerous tools.

Do not connect the network interfaces of the BATLOGGER WE X with the system relevant IT infrastructure of the wind turbine. For the BATLOGGER, use access to the Internet that is disconnected from the operating and system IT infrastructure.

Operating conditions: The BATLOGGER WE X is suitable for operation in wind turbine interiors. It must not be used in other environments not intended for operation.

Microphone / ultrasonic sensor: An active electret microphone is used as the ultrasonic sensor. Make sure that the microphone is plugged in and screwed in correctly. The microphone itself can be damaged by water. It must therefore be protected from dirt, rain and extreme humidity and installed accordingly. A defective microphone can lead to unusable or incorrect data.

LTE antenna cable: For Germany:
The Federal Network Agency (BNetzA) specifies that the EIRP for LTE800 and LTE1800 must not exceed 25 dBm. If the customer connects an alternative antenna cable and/or another antenna to the BATLOGGER X, the customer is responsible for ensuring that the maximum legal transmission power of 25dBm for the LTE bands is not exceeded.
For other countries, the customer must comply with local regulations.

Measuring device: The BATLOGGER WE X is a very sensitive measuring device and must be treated as such. In order to obtain usable and reproducible results, you should consider some preparatory measures and familiarize yourself with the device. Basic knowledge of bats and ultrasound is required.

Maintenance and care: Clean the unit only with a lint-free cloth and do not use any aggressive cleaning agents. Make sure that no water penetrates into the unit.

Note on environmental protection: Electrical and electronic equipment and batteries must not be disposed of with household waste. The consumer is legally obliged to return electrical and electronic equipment and batteries at the end of their service life to the public collection points set up for this purpose or to the point of sale. Details are regulated by the respective national law. The symbol on the product, the instructions for use or the packaging refers to these regulations. With the recycling, material recycling or other forms of recycling of old appliances/batteries you make an important contribution to the protection of our environment.

2   Overview
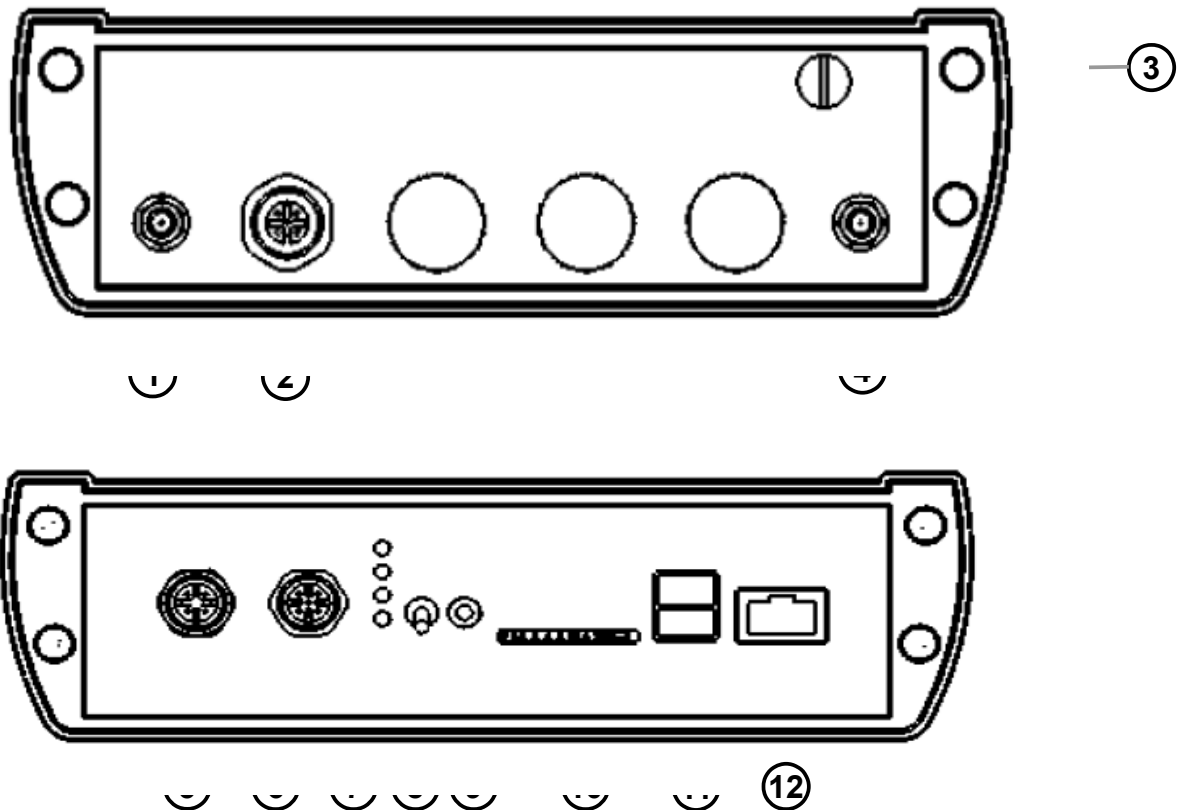
①	LTE antenna socket 1	⑦	Status LED
②	Microphone connector	⑧	Power switch
③	Grounding plug socket	⑨	Task button
④	LTE antenna socket 2	⑩	SD card holder
⑤	Power supply socket	⑪	USB connector 2x
⑥	External IO socket	⑫	Ethernet-RJ45 connector

2.1 General

The BATLOGGER WE X is used to record bat calls in the immediate vicinity of wind turbines (WTG).

With a real-time recording system, the ultrasonic signal is digitized directly without modification and at a high sampling rate. With the BATLOGGER WE X, the signal is continuously analysed and only stored if bat activity is detected. The read data is stored in an internal RAM memory and in a second step, based on various criteria, individual recordings (sequences) are written to the hard disk as a file.

In addition to the bat calls, which are saved as a so-called WAVE file, other data such as time, date, place of recording, temperature are saved in text format as an associated "*.xml" file.

In order to have an overview of the use of the BATLOGGER WE X, its operating status is continuously written to a "LOG" file.

The BATLOGGER WE X is especially suitable for autonomous operation and long-term monitoring.

2.2 Device variants

The BATLOGGER WE X is available in different versions, which differ in the number of microphones.

BATLOGGER WE X1: 1 microphone

BATLOGGER WE X2: 2 microphones

BATLOGGER WE X4: 4 microphones

2.3 Data storage

The individual acoustic recordings are written to the hard disk as.wav files. For each.wav file a.xml file is stored, which contains the set parameters, as well as date, time, position and temperature at the time of recording. The ultrasonic data of the microphone are first written to the internal "Random Access Memory" (RAM) of the BATLOGGER WE X. The individual recording sequences are then automatically transferred from the RAM memory to the hard disk after each recording.

External storage media: External hard drives, USB sticks or SD cards can be used as transport media.
Hard disks and USB sticks have higher priority when copying than SD cards. If both a hard disk and an SD card are available for copying, the hard disk is used. If there are several hard disks, the first hard disk/stick found is used.

The media must be formatted with FAT32 or EXT4. NTFS is currently not supported. This is no problem for USB sticks and SD cards. However, a large hard disk cannot be formatted with Windows FAT32 onboard tools. It requires freely available tools which can be found on the Internet.

The external media can be plugged in or removed at any time, unless a copy operation is in progress (green LED flashes). No explicit "ejection" is necessary. The system does this automatically as soon as a copy operation is completed on the external device.

2.4 Accessories

Article	Description	Part#
BATLOGGER X microphone	Microphone for BATLOGER X	216.004
BATLOGGER X sensor	Sensor incl. MC32, humidity, air pressure	216.005

3 Commissioning

⚠️ **Turn the unit off for commissioning/changing the microphone**: Make sure that the unit is switched off before connecting a microphone or changing the microphone.

⚠️ The unit must not be installed at a point in the WTG where **water or operating materials (such as oil)** can collect.

3.1 Installation

1. To connect the components, set the ON switch to the "Off" position.

2. All status LEDs are off.

3. Connect the microphone sensor cable on the back of the unit to the "Microphone 1" input.

4. Connect the earthing socket to a suitable earthing point of the wind turbine using a suitable cable in accordance with local regulations or, if necessary.

   Prior to installation, ask the operator of the wind turbine for any applicable regulations or grounding procedures.

5. Connect the external hard disk (optional) to a USB port on the front panel (it does not matter whether the lower or upper USB port is used).

6. Plug in the Ethernet cable at the "1Gbit Ethernet" input. The other end of the Ethernet cable can either be connected directly to a PC (e.g. laptop) or plugged into a switch or router. See chapter on establishing a connection.

7. Plug the power cable into the power supply and connect the power supply to the "Power" input on the front panel.

⚠️ **Protection against lightning strikes**: In order to reduce the risk of electric shock from lightning strikes, no installation or maintenance work may be carried out in the event of an acute risk of lightning strikes (thunderstorms).

3.2 Switching on

1. After the connections have been made, the BATLOGGER can be switched on.
2. Set the on/off switch to the "On" position.
3. The BATLOGGER starts now, which takes some time. The LEDs indicate different states (see below).

3.3 LED indicators during the boot process

1. Short flashing of the LEDs after pressing the switch:
   The power supply has been activated.

2. The yellow LED lights up:
   The device starts.

3. The yellow LED goes out and the green LED starts flashing:
   The device checks if it was started correctly.

4. The green LED lights up continuously:
   The blue LED flashes: The device tries to connect to the Internet.

5. The blue LED lights up continuously: The device has established a connection to the Internet.

4 First commissioning via BATLOGGER Connect

When delivered, the BATLOGGER is equipped with an activated mobile radio connection, which makes it possible to access and configure the BATLOGGER directly via the Internet.

To do this, create a customer account with the BATLOGGER Connect Service and then link your BATLOGGER WE to your customer account.

This is done in a few steps and is described in the following chapters.

If you should acquire further BATLOGGER WE devices, you can assign these directly to your customer account, without having to open a new customer account. This way they have all their devices in one central location in view.

4.1 Open a customer account and assign the BATLOGGER

To register with BATLOGGER Connect, please open the following address in your Internet browser:

https://cloud.batlogger.com/register

The following window opens:

BATLOGGER Connect Registration
Please fill in your details

Your Email Address

Enter email

Your Company Name

Enter company name

Your first Name

Enter first Name

Your last Name

Enter last Name

BATLOGGER Registration Code

Registration code

Questions? Contact BATLOGGER Connect Support.

Sign Up

Please enter your contact details. Especially the email address is important. This is used as a user ID for the BATLOGGER Connect Service and serves to contact you, in particular to send you the access data for the service.

For the "BATLOGGER Registration Code" please enter the registration code of the BATLOGGER. This can be found next to the serial number on the type label of the BATLOGGER.

After you have entered all data and clicked the "Sign Up" button, your customer account will be created.

4.2   Confirmation mail and password assignment

Your data will be checked and after a while you will receive an email for logging in to the BATLOGGER Connect Service. You will then have the option of assigning a password for your access.

5   BATLOGGER Connect Service

5.1   Login

To log in to the BATLOGGER Connect Service, open the following address in your Internet browser:

https://my.batlogger.com/

Enter your username and password.

5.2 Overview page

The overview page gives you an overview of all your BATLOGGER WE X devices.

The map shows the locations of your devices, "Your Cloud Storage Access" allows you to access your recording data, "Manage your resources" allows you to add further devices or additional users and the "BLWEX devices" table provides an overview of your devices.

5.3 Status page of a device

To access the status page of a device, either click on the desired device on the map and then select "Open details".

Or you can select the device by clicking on it in the "BLWEX devices" table. This opens the respective status page of the device.
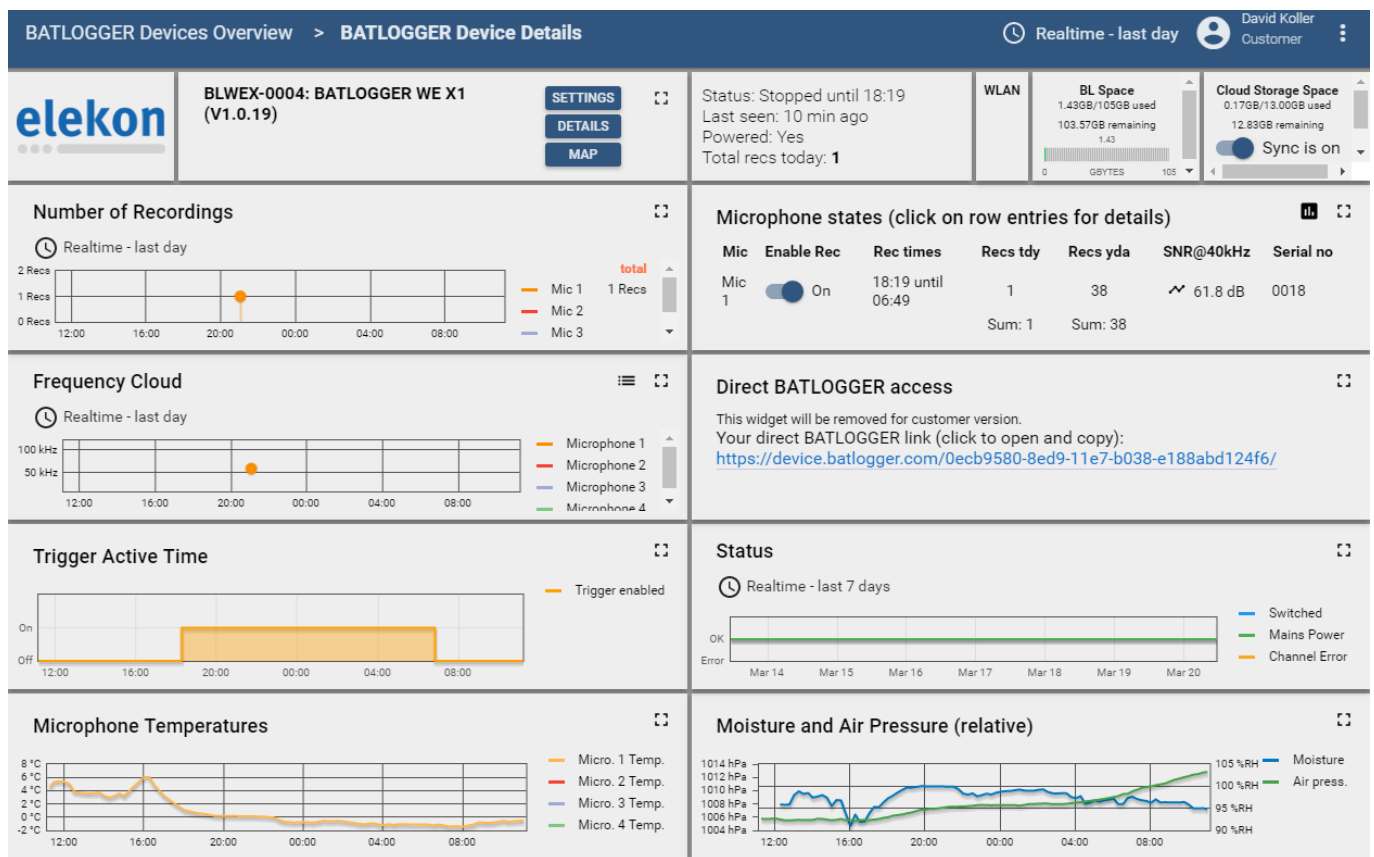
5.4 Assigning further BATLOGGERs

To assign further BATLOGGER to your user account, select "Add new device" on the overview page and enter the BATLOGGER registration key that you received with the device:

6 BATLOGGER Cloud Storage

To access the recordings of the BATLOGGER, BATLOGGER Connect provides a certain amount of storage space on the BATLOGGER Cloud Storage.

When synchronization is enabled for the device, the cloud storage synchronizes the files on the BATLOGGER at regular intervals.

Cloud Storage Space
0.17GB/13.00GB used
12.83GB remaining
Sync is on
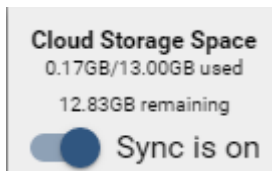
All recordings successfully stored on the cloud storage are automatically removed by the BATLOGGER.

When the cloud storage space is used up for the device, synchronization is suspended and the BATLOGGER stores the recordings on its internal hard disk.

Once you remove (cut or delete) files from the cloud storage and there is space in the cloud again, the device will synchronize the data back to the cloud storage.

6.1   Access to files via browser

Accessing the recordings via web browser is a quick way to view some selected files. Only recordings (and associated .xml files) can be downloaded with this method. However, this variant cannot be used for deletion.

To access the files, click on the link in your BATLOGGER Connect overview page:

Your Cloud Storage Access

Your WebDav link (click to open and copy):

Click on user name or password to copy to clipboard!
Username:
Password:

How to use WebDav   Legal Notice
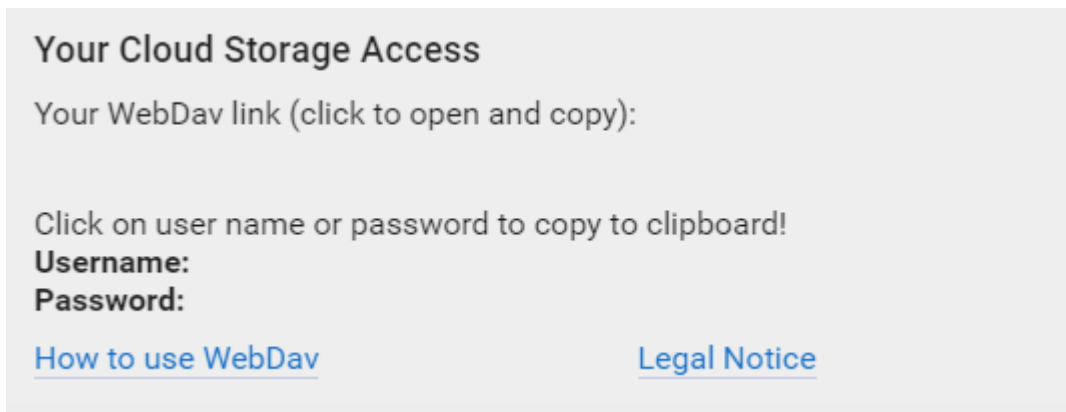
To copy username or password, simply click on it. After successful login, you will see the following page:

elekon

BATLOGGER Cloud Storage

Index of:

Name	Last modified	Size	Description
Parent Directory		–	
BLWEX-0001/	2018-01-09 16:34	–	
BLWEX-0004/	2017-11-24 20:44	–	

You can access your BATLOGGER Cloud Storage more easily using WebDav!
Instructions to use WebDav
Visit the BATLOGGER website

All devices assigned to the account have an entry here. Click on the desired device and to access the recordings and .xml files.

BATLOGGER Cloud Storage

Index of: BLWEX-0001/2018/01/BL20180102/

Name	Last modified	Size	Description
Parent Directory		-	
0001_2e202537_Test0001.wav	2018-01-02 20:25	858K	Recording
0001_2e202537_Test0001.xml	2018-01-02 20:25	1.6K	Recording info
0001_2e202848_Test0001.wav	2018-01-02 20:28	860K	Recording
0001_2e202848_Test0001.xml	2018-01-02 20:28	1.6K	Recording info
0001_2e204619_Test0001.wav	2018-01-02 20:46	856K	Recording
0001_2e204619_Test0001.xml	2018-01-02 20:46	1.6K	Recording info
BL20180102_Test0001.csv	2018-01-03 11:43	20K	

You can access your BATLOGGER Cloud Storage more easily using WebDav!
Instructions to use WebDav
Visit the BATLOGGER website

Here you can download the files.

6.2   Access to files via WebDav

If you have set up access via WebDav, you can access the files directly in your Explorer (Windows) or Finder (macOS). This allows you to open, copy and move these files as if they were saved on your computer.

6.2.1   WebDav for Windows 7

- Open the Explorer by pressing [Windows] and [E] keys simultaneously.
- In the toolbar, select "Connect network drive".
- Select "Connect to a website where you can save documents and images".
- Enter your WebDav link that is displayed in BATLOGGER Connect.
- Enter your user name and password, which are displayed in BATLOGGER Connect.

6.2.2   WebDav for Windows 10

- Open the Explorer by pressing [Windows] and [E] keys simultaneously.
- Find the item "This PC" in the bar on the left and click on it with the right mouse button.
- Select "Connect network drive".
- Select "Select a custom network address".
- Enter your WebDav link that is displayed in BATLOGGER Connect.
- Enter your user name and password, which are displayed in BATLOGGER Connect.

6.2.3   WebDav for macOS

- In the Finder, select "Go to", "Connect to server".
- GEnter your WebDav link that is displayed in BATLOGGER Connect.
- Enter your user name and password, which are displayed in BATLOGGER Connect.

7 Configuration of the BATLOGGER

All settings for the operation of the BATLOGGER are made by means of a PC via the network connection of the BATLOGGER.

The connection between the PC and the BATLOGGER can be established in different ways.

Besides the connection and configuration via the Internet and the BATLOGGER Connect Service, the BATLOGGER WE can also be configured via a direct, local connection.

The network interfaces of the BATLOGGER WE can also be configured via this direct connection, so that the BATLOGGER can be set for the most diverse application scenarios for local or networked operation.

7.1 Establishing a direct connection to the configuration

With the direct connection, a PC is connected directly to the BATLOGGER WE X1 via an Ethernet cable.

Connect the Ethernet socket of the BATLOGGER with the enclosed or another commercially available Ethernet cable (e.g. patch cable) and then connect it directly to the Ethernet socket of your PC or laptop.

This type of connection can be particularly important for the time of installation. You can configure the BATLOGGER on site (e.g. in the wind turbine) without an Internet connection. However, the rule is access via the Internet.

1. With this type of connection, the BATLOGGER is initially not connected to the Internet and the blue LED may flash.

2. To access the BATLOGGER settings page, call up an Internet browser on the PC and enter the IP address

    http://169.254.1.16/

3. The status and settings page of the BATLOGGER opens.

> **Establishing the connection:** It can take a while until the connection between PC and BATLOGGER is established (the PC first tries to get an address via DHCP). If the settings page does not open immediately, please try again after a while.

4. Login
    Username: blxuser
    Passwort: blx!WE?

    This is the initial login data. It is strongly recommended that you change the password to your own access password for security reasons.

7.2 Configuring access to the Internet

If an Internet connection is available, the BATLOGGER can be accessed via an Internet browser and the BATLOGGER Connect Service. Call up this page and log in to the BATLOGGER Connect Service with your customer account:

In order for the BATLOGGER to connect to the BATLOGGER Connect Service, the BATLOGGER needs access to the Internet.

To establish an Internet connection, the following connection types are available.

- LTE

  - Uses the internal LTE module and the SIM card installed there

- ETHERNET

  - Uses an Ethernet cable to connect the BATLOGGER to an existing network with Internet access. This could be an external DSL or LTE router, for example.

To set the desired connection type, click on "Settings" in the BATLOGGER settings page.

7.3 LTE Configuration

The SIM settings are factory-set. If the settings need to be changed, this can be done as follows:

- Connect to the device and select "Interface Settings".
- Maintain the "BL Connect" connection mode
- Select the interface "LTE".

Interface Settings ⑦

Configure the interface parameters

Connection Mode
BL Connect ▾

Interface
LTE ▾

Server Config.
Elekon ▾

LTE configuration

SIM PIN *
0

Enter PIN: 0000 - 99999999

APN *
web.vodafone.de

15 / 64

RELOAD   SAVE

- Adjust the SIM PIN and APN.

- Click on "SAVE".

- To activate the new settings, the BATLOGGER must be restarted. To do this, press "REBOOT" in the upper right corner.

REBOOT
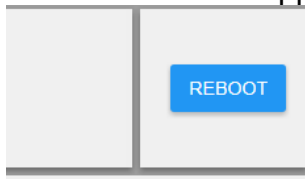
- The blue LED lights up if the connection of the BATLOGGER to the BATLOGGER Connect Service was successful.

7.4 ETHERNET Configuration

- Connect to the device and select "Interface Settings".

- Maintain the "BL Connect" connection mode

- Select the interface "Ethernet".

- Normally, select "DHCP" for "IP". Thus, the BATLOGGER is automatically provided with an IP address. Otherwise, a static IP can also be configured for the BATLOGGER.

Interface Settings ⑦

Configure the interface parameters

Connection Mode	Interface	Server Config.
BL Connect ▾	Ethernet ▾	Elekon ▾

Ethernet configuration

IP

Static IP ▾

IP Address *	Subnet mask *	Gateway IP *
0.0.0.0	255.255.255.0	0.0.0.0

RELOAD   SAVE

- Click on "SAVE".

- To activate the new settings, the BATLOGGER must be restarted. To do this, press "REBOOT" in the upper right corner.

REBOOT
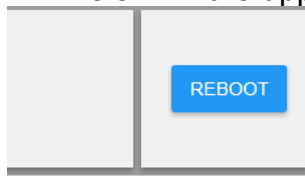
- The blue LED lights up if the connection of the BATLOGGER to the BATLOGGER Connect Service was successful.

8 Installation in the WTG

⚠️ **Turning the unit off for commissioning/changing the microphone:** Make sure that the unit is switched off before connecting a microphone or changing the microphone.

8.1 Attaching the microphone

To increase the life of the microphone, it should always be positioned with the opening downwards to a maximum horizontal position to prevent moisture accumulation inside.

Also pay attention to the surroundings of the microphone. Close objects or surfaces can reflect sound and distort the recorded bat cries.

1. Select a suitable location to place the microphone in the gondola. It is not possible to specify an exact location, as there are different types of wind turbines. In the WTG nacelle, the corresponding cut-outs or mounting holes should preferably be made at the bottom of the cladding. The noise from wind and turbine blades should also be included in the placement considerations.

2. Create the holes required for installation:

    1. Drill the main hole with a hole saw (Ø min.50mm max.56mm)

    2. Drill fixing holes, diameter depending on the screws to be used.

3. Fasten the microphone sensor holder in the main hole and secure it.

4. Route and secure the microphone sensor cable so that it is not parallel to the power lines of the generator.

9 Settings on the device

9.1 Use of push button and switch

Switch

Switch position	Power supply	Behaviour
Off	Off	Device is in "PowerDown" with lowest power consumption. Only the clock still runs with the help of the backup battery.
Off	On	The unit is switched off. The battery is monitored and recharged if necessary.
On	On	The unit is switched on. The battery is monitored and recharged if necessary.
On	Off	Device is running on battery reserve. Briefly pressing the button can wake a sleeping device. Long press on button (8 seconds) can put active device to sleep. If the battery is empty, the unit switches to "PowerDown". Reactivation is then only possible with power supply unit.

Push button

Long press: Press for more than 8 seconds

Switch position	Power supply	Taster	Verhalten
Off	On/Off	Short press	No function
		Long press	Hardware reset
On	On	Short press	Start file move function to external hard disk
		Long press	No function
On	Off	Short press	No function
		Long press	No function

10 Settings in Browser

10.1 Settings in BATLOGGER Connect

To make settings on your device, you can simply connect via BATLOGGER Connect and change the following settings there:

1. Set timezone

2. Set location

3. Set recording times

4. Set alias name

5. Set air pressure

6. Set recording event handling

7. Firmware update

10.2 Settings for direct connection

Establish a connection with the BATLOGGER.

Here you get an overview of the recording possibilities.

Select your desired settings in the "Settings" tab, adjust the recording times in "Recording Times" and confirm the changes by clicking "Save".

In the "Status" tab, set all desired microphones in the "Enable Rec" setting to "On" and start recording.

The unit will now record automatically during the set recording times.

11   Recordings and Files

11.1   Audio file "xxxx_xxxxxxx_xxx.wav"

After recording, a so-called WAVE file is saved to the internal hard disk under the file name "xxxxxxxxx.wav" in a standardized audio file. (Example 0001_2e170926_Test0001.wav)

- The first 4 digits are the serial number of the device.
  here: "„0001_"
- The next digit identifies the recording microphone number
  - here: "2" for channel / Mik 2
  - an "m" stands for manual recording
- The next letter indicates whether the picture was taken before midnight ("e" = Evening) or after midnight ("m" for Morning). This is mainly used for the meaningful alphabetical sorting of file names in directories.
  - here: „e" for Evening
- The next 6 digits indicate the recording time
  - here „17:09:26"
- The last part of the file name is the project ID configured by the user.
  - here „Test0001"
- The ".wav" extension identifies a WAVE file.

The *.wav file essentially contains the entire measured values as "raw data" (without compression) and a format-specific "header", which also contains the sampling frequency.

Simultaneously with these recording data, an information file (*.xml) with all recording data (metadata) is saved under the same file number (see below).

The recordings are stored in subfolders on the BATLOGGER.
The subfolders are sorted by year, month and day.
A new folder is created every night:
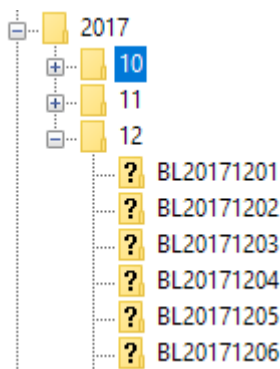
The *.wav files can be read with various audio programs or with bat-specific sound analysis software and displayed as time signal or spectrogram. The latter is the most reliable way to determine the species.

11.2   Recording information file "xxxxxxx.xml"

For each "xxxxxxxxx.wav" file stored, an additional information file "xxxxxxxxxx.xml" is stored with the same number with various metadata on recording time, date, location, temperature and device settings (parameters).

Example of the content of an *.xml info file:

```xml
<?xml version="1.0" encoding="utf-8"?>
<BatRecord>
 <Firmware>1.0.14</Firmware>                                    Firmware version
 <SN>1</SN>                                                     Serial number (last 4 digits)
 <SNfull>21621317290001</SNfull>                                Full serial number
 <Alias>Test0001 Michael, Lappach</Alias>                       Alias
 <ProjectID>Test0001</ProjectID>                                Project ID
 <Filename>0001_2e170926_Test0001.wav</Filename>                The file name of the WAVE file
 <DateTime>04.01.2018 17:09:26</DateTime>                       Recording date and time
 <Timezone>Europe/CET</Timezone>                                Set time zone
 <Duration>3 Sec</Duration>                                     Duration of recording in seconds
 <Samplerate>312500 Hz</Samplerate>                             Sample rate
 <Resolution>16 Bits</Resolution>                               Bits per sample
 <Temperature>4 C</Temperature>                                 Temperature
 <GPS>
  <Valid>yes</Valid>
  <Position>48.217819 12.113530</Position>                      GPS position
 </GPS>
 <TriggerSource>automatically triggered</TriggerSource>         Triggers
 <Microphone>                                                   Data of the recording microphone
  <WavTrackNo>1</WavTrackNo>                                    Track number in WAVE File
  <MicChannelNo>2</MicChannelNo>                                Microphone number (channel)
  <HasTriggered>1</HasTriggered>                                This microphone has triggered
  <Gain>12 dB</Gain>                                            Adjusted gain
  <MicConnected>Yes</MicConnected>                              Microphone was connected
  <SerNo>21651117290032</SerNo>                                 Serial no microphone
  <Manufactured>29/2017</Manufactured>                          Date of manufacture of the microphone
  <LastCalib>31/2017</LastCalib>                                Last calibration date
  <MicTemp>4 C</MicTemp>                                        Microphone temperature
 </Microphone>
 <TrgSettings>                                                  Trigger conditions settings
  <MinFreq>17000</MinFreq>                                      Minimum trigger frequency
  <MaxFreq>160000</MaxFreq>                                     Max trigger frequency
  <CrestFactor>8.00 (32, 0x20)</CrestFactor>                    Minimum crest factor
  <FFTVal>5.000 (320, 0x140)</FFTVal>                           Minimum FFT
  <PeriodTrig>1</PeriodTrig>                                    Max period trigger value
  <MinSoundLevel>1% (328, 0x148)</MinSoundLevel>                Minimum volume
  <PreTriggerTime>500</PreTriggerTime>                          Pre trigger in ms
  <PostTriggerTime>800</PostTriggerTime>                        Post trigger in ms
  <MaxGapTime>900</MaxGapTime>                                  Max gap between calls
  <MaxDuration>15000</MaxDuration>                              Max recording time in ms
 </TrgSettings>
 <TrgValues>                                                    Actual values that triggered triggers
  <PeakFreq>22265</PeakFreq>                                    Trigger frequency in Hz
  <CrestFactor>17.75 (71, 0x47)</CrestFactor>                   Crest factor at trigger
  <FFTVal>87.953 (5629, 0x15fd)</FFTVal>                        FFT at trigger
  <PeriodTrig>1</PeriodTrig>                                    Periode trigger value at trigger
  <MinSoundLevel>38% (12540, 0x30fc)</MinSoundLevel>            Sound level at trigger
  <FrameIndex>155648 (BlockIdx:152)</FrameIndex>                Frame in wav file
 </TrgValues>
</BatRecord>
```

11.3 Log file "BATREC.log"

When the device is operated, a log file (text file) called "BATREC.log" is automatically written to the user's main directory on the system hard disk. Each line of text entered is preceded by the serial number (SN) of the device that created the entry. The BATREC.log is continuously updated in the main directory of the user data.

Deleting.wav files in the logger does not affect the BATREC.log.

The "BATREC.log" lists all activities, especially error situations and statuses of the device chronologically.
Events are recorded with date and time if the system already has a system time available.

Example BATREC.log:

Log entry	Description
SN0001 01.01.1970 01:00:10 - INFO: ********************* START FROM BOOT ************************	Device #0001 was switched on
SN0001 01.01.1970 01:00:10 - INFO: BATLOGGER serial number: 21621317290001	Features of the device
SN0001 01.01.1970 01:00:10 - INFO: BATLOGGER ethernet MAC address: AC:1D:DF:D0:00:01	
SN0001 21.12.2017 17:20:57 - INFO: System time set by RTC	Time was set from built-in clock
SN0001 21.12.2017 17:20:57 - INFO: BATLOGGER Core software version: 1.0.14	Software versionen
SN0001 21.12.2017 17:20:57 - INFO: BATLOGGER PwrMgr version: 1.0.9, hardware version: 0	
SN0001 21.12.2017 17:20:57 - INFO: User root has successfully changed login password.	
SN0001 21.12.2017 17:20:57 - INFO: LTE Model: TOBY-L210	LTE hardware satus
SN0001 21.12.2017 17:20:57 - INFO: LTE firmware version: 15.63	
SN0001 21.12.2017 17:21:06 - INFO: System is up. Starting operation.	
SN0001 21.12.2017 17:21:06 - INFO: Create MQTT client.	Connection to BATLOGGER Connect Service
SN0001 21.12.2017 17:21:08 - INFO: Connection to MQTT server established	Connection successful
SN0001 21.12.2017 17:21:08 - INFO: Successfully subscribed to TB RPC calls	Time is synchronized with Internet time
SN0001 21.12.2017 17:21:09 - INFO: RTC set!	
SN0001 21.12.2017 17:21:09 - INFO: Initial data sent to MQTT server.	
SN0001 21.12.2017 17:21:09 - INFO: Battery voltage: 7841mV, current: 87mA	Status of the built-in battery
SN0001 21.12.2017 17:21:09 - INFO: Channel configuration:	Configuring the connected microphones
SN0001 21.12.2017 17:21:09 - INFO: Channel 1, device 1: Sensor: ID: 29498120000000B6 SerialNo: 21621017290001 FW-Vers.: 3 Hum:yes AirP:yes	and sensors
SN0001 21.12.2017 17:21:09 - INFO: Channel 1, device 2: Microphone: ID: 3B6D7E1F00000046 SerialNo: 21651117290033	
SN0001 21.12.2017 17:21:09 - INFO: Channel 2, device 1: Microphone: ID: 3B723028000000BC SerialNo: 21651117290032	
SN0001 21.12.2017 17:21:09 - INFO: End of configuration	
SN0001 21.12.2017 17:21:09 - INFO: Waiting now for commands from UI	Ready for operation
SN0001 21.12.2017 17:23:06 - INFO: UI authentication successful for user root.	
SN0001 22.12.2017 02:13:49 - ERROR: Connection to MQTT server lost!	Interruption of the BATLOGGER Connect connection
SN0001 22.12.2017 02:13:52 - INFO: Connection to MQTT server established	Connection re-established
SN0001 22.12.2017 02:13:52 - INFO: Initial data sent to MQTT server.	
SN0001 22.12.2017 02:13:52 - INFO: Successfully subscribed to TB RPC calls	
SN0001 22.12.2017 10:05:41 - INFO: RTC set!	Time synchronized with Internet...
SN0001 22.12.2017 10:05:41 - INFO: RTC (re-)set by time retrieved from internet.	

11.4 Daily user log file

Besides the system log file, the BATLOGGER writes a user log file daily. This is stored together with the recording files in the daily recording directory.

The name consists of the coded recording day (e.g. BL20180104 for 04.01.2018) and the project ID (see recording data).
Example:
    BL20180104_Test0001.csv

for the device with the project ID "Test0001" on 01/04/2018.

The file is stored in.csv format, so that the data contained can be easily captured and visualized in programs such as Microsoft Office or Libre Office.

The user log file contains information about boot processes, switching recording times (events) on and off, number of recordings made and environmental data such as temperature, humidity or air pressure (if sensors are installed).
Recording and environmental data are recorded every 15 minutes.

By this temporal rastering one can quite simply create a diagram in Excel, which shows the bat activity over the course of the night. These can then be correlated with the environmental data.

Beispiel BATREC.log:

```
SN0001;04.01.2018 17:03:12;Event;---------- Starting from BOOT ----------
SN0001;04.01.2018 17:03:12;Recs today;0
SN0001;04.01.2018 17:03:12;Temp;Channel 1; 4.4
SN0001;04.01.2018 17:03:12;Temp;Channel 2; 4.4
SN0001;04.01.2018 17:03:12;Environment;Hum 100.0;Airp 998.4
SN0001;04.01.2018 17:03:12;Event;Recording is enabled;A-08:17
SN0001;04.01.2018 17:03:13;Environment;Hum 100.0;Airp 998.4
SN0001;04.01.2018 17:17:43;Recs today;3
SN0001;04.01.2018 17:17:43;Temp;Channel 1; 4.5
SN0001;04.01.2018 17:17:43;Temp;Channel 2; 4.4
SN0001;04.01.2018 17:17:43;Environment;Hum 100.0;Airp 998.1
SN0001;04.01.2018 17:32:43;Recs today;3
SN0001;04.01.2018 17:32:43;Temp;Channel 1; 4.7
SN0001;04.01.2018 17:32:43;Temp;Channel 2; 4.7
SN0001;04.01.2018 17:32:43;Environment;Hum 100.0;Airp 998.2
```

Device #0001 has been switched on
Parameter at 17:03 o'clock

Recordings have been turned on. The recording window runs until 08:17 the next day.

…

12 Getting data from the device

12.1 *Directly on the device via external medium*

External hard disk, USB sticks or SD cards can be used as transport media.

Hard disks and USB sticks have higher priority when copying than SD cards. If both a hard disk and an SD card are available for copying, the hard disk is used. If there are several hard disks, the first hard disk/stick found is used.

The media must be formatted with FAT32 or EXT4. NTFS is currently not supported. This is no problem for USB sticks and SD cards. However, a large hard disk cannot be formatted with FAT32 Windows board tools. Tools are necessary for this.

The external media can be plugged in or removed at any time, unless a copy operation is in progress (green LED flashes). No explicit "ejection" is necessary. The system does this automatically. Only the recording files are copied.

It is copied by directory (i.e. from day to day). If there is no more space on the target data carrier for the next directory, the copying process is terminated.

A recording directory is deleted from the BL X internal hard disk after it has been successfully copied to the destination disk.

Same files on the target disk are overwritten. However, no files are deleted from the target disk.

Process

1. Plug in/out hard disk, USB stick or SD card during operation. The green LED continues to light up continuously.
2. There is no confirmation from the system for the connection. The green LED continues to light up continuously.
3. Press the button briefly to start the copying process. The copying process starts.
4. The green LED flashes during the copying process.
5. Do not remove the storage medium while the green LED is flashing.
6. Depending on the amount of data and media type to be copied, copying may take longer (for 100 GBytes this can take several hours).
7. After everything has been copied, the green LED lights up again continuously. The medium can now be removed again.

If the copying process does not start:
The following problems may occur: There is no data to copy, there is not enough space available on the data carrier, the data carrier is not FAT32 or EXT4 formatted.

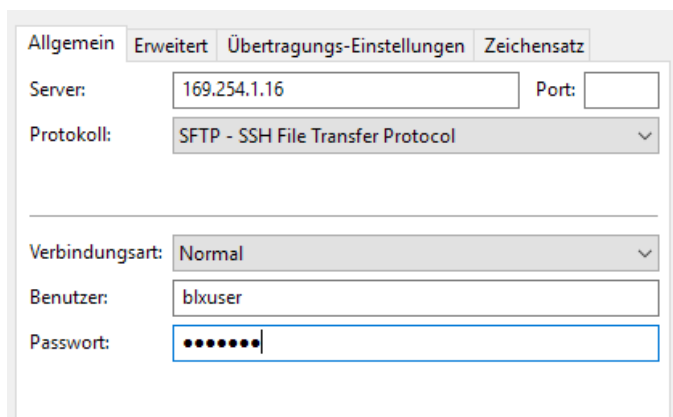## 12.2 *Directly on the device via direct Ethernet connection*

If there is a direct Ethernet connection between BATLOGGER WE X and PC, the recording data can be accessed via a secure FTP (SFTP) connection.

In order to use this protocol from a PC, the free program "FileZilla" is recommended as a client.

Other programs can of course also be used, here the setup is explained using the example of a FileZilla client.

12.2.1   Installation FileZilla

1. free download e.g. from
    https://filezilla-project.org/

2. Please download, install and start the "Client" version (the normal version, the "Pro" version is not required).

3. Use the "Servermanager-Button" (or „Servermanager) to open the server configurations. Click on "New Server" and enter a name of your choice for the connection.

4. Enter the following connection parameters:

As user name please use
    blxuser

Please enter either the default password
    blx!WE?

or, if you have already changed the password in the login screen of the settings page, please enter your own password.

5. Now you can establish the connection to the BATLOGGER via "Connect".

6. After establishing the connection, the BATLOGGER's recording directories are displayed. With "double click" you get to subdirectories, with "drag and drop" you can transfer files between the PC and the BATLOGGER

7. the recordings are stored in subdirectories per Jahr→ per month → per day. A directory 2017/07/BL20170807 contains the recordings of the night from August 7 to August 8, 2017. Here you will find the.wav files and the corresponding.xml files with metadata

13   Troubleshooting

13.1   Checklist

Problem	Reason	Correction
Unit does not switch on.	Power supply is not installed correctly.	Check power supply and install correctly.
Blue LED continues to	No network connection.	Check the connection. Cables? Is there

flash continuously after booting.		really internet access (check with PC on cable). Are there firewalls that could obstruct access to the Internet? Ask ELEKON.
Blue LED on, but no remote connection possible.	PC does not reach ELEKON Server.	PC behind firewall? Ask ELEKON.
A lot of noise is recorded.	Trigger settings not optimal.	Check and/or adjust trigger settings together with ELEKON
	Electromagnetic interference.	Check installation and external power supply. Earthing the housing if necessary.
	Noisy environment.	Change environment and/or microphone orientation. You could also do something by SW. Discuss with ELEKON.
No recordings are triggered.	Microphone is defective.	Test and/or replace microphone.
	Wrong trigger settings.	Check and/or adjust the trigger settings together with ELEKON.
Yellow LED lights up continuously yellow.	Boot problem.	Switch on/off to "Off" and wait at least 3 minutes until all LEDs are off. Then switch on again. Notify ELEKON.
Red LED flashes quickly, device beeps.	System failure	Notify ELEKON.

13.2   One Click Firmware Update

To update the firmware of your BATLOGGER remotely, open the settings page of your device in BATLOGGER Connect and select "Update Firmware".

13.3   Local Firmware Update

A local firmware update requires physical access to the BATLOGGER.

Proceed as follows:

1. You will receive a firmware file, e.g.:
       BLWE_1.0.15.upd

   The firmware version is included in the name. The file is encrypted and signed. Therefore, this file should neither be edited nor renamed, otherwise the update process will not work.

2. Format an empty SD card with FAT32 as the file system. This can be done on a computer, for example.

3. Copy the firmware file directly into the root directory of the SD card. Make sure the file is completely copied, eject the SD card from your computer and remove the SD card.

4. Turn off the BATLOGGER using the ON/OFF switch.

5. Insert the SD card into the SD card holder in the BATLOGGER.

6. Make sure that the BATLOGGER has a power connection.

7. Switch on the BATLOGGER using the ON/OFF switch.

8. The BATLOGGER restarts and installs the new firmware automatically.

9. The yellow LED lights up for a few seconds.

10. The green LED also lights up.

11. It may happen that the BATLOGGER restarts several times during the update.

12. Do not interrupt this process. It may take several minutes to complete the update.

13. Do not remove the SD card while the green LED is flashing or the yellow LED is lit.

14. When the green LED stops flashing and lights up constantly, the update process is complete.

15. Now you can remove the SD card from the BATLOGGER.

16. The firmware has been completed. You can check the update by checking the firmware version in the BATLOGGER Connect Service.

17. If you want to update several BATLOGGER, you have to copy the file back to the SD card first.

13.4 Status LED

Displays during operation:

LED	Function	Off	Flashing	On
Red	Power	No Power	(Charging or) Battery operation/error (see below)	Power OK
Green	Status	Device off	Busy (Booting or Copying)	Bereit
Yellow	Alarm	No alarms. At least one recording time is defined for a channel.	The LED is activated during recording.	No recording time is defined! The BATLOGGER will not record. A microphone or sensor has failed during operation. The BlConnect service and the web interface show which channel is affected. Please check the microphone and sensor connections. The error is reset by a reboot.
Blue	Connection	No Internet	Internet but no BL Connect connection	Connected

Error red LED

Behaviour	Interpretation
Off	Everything OK
Flashing very slowly (1s on, 1s off)	Everything OK, battery charging in progress
Fast flashing with pause in between	Serious error situation. The LED lights up n times, then a short pause. A HW reset is triggered after a total of 10 passes. The number of flashes between pauses shows an error code.
Permanent on, one beep every 10s	Mains power failed, device runs on battery

Display during shutdown

- The yellow LED starts flashing, the green LED remains on: Shutdown is running.

- As soon as all LEDs are off, the shutdown is finished.

⚠️ **Voltage present:** Due to the battery, there are still voltages on the board even in the shutdown mode!

The LEDs on the Ethernet connector indicate the physical connection of the Ethernet cable. This can be useful to determine if the Ethernet cable to connect to the router is OK.

14 Technical Specifications

Housing, dimensions	
Dimensions (W x H x D)	10cm X 20cm x 25cm (upright with stand)
Weight	2.04kg
Protection class (closed device)	IP2X (except microphone capsule)
Operating conditions	0.. 45°C, 10..90 %RH (non-condensing) Charging mode: 0..+40°C
Storage conditions	20..+60 °C, 5..95 %RH (non-condensing)
Power supply	
Mains operation	Table power supply with 12 VDC 30W (100-240 VAC)
Audio	
Channels	1, 2 or 4 channels, fully synchronous recording possible
Sampling	312.5 kHz, 16-bit (optionally 500 kHz, 625 kHz, 16-bit or 24-bit)
Microphone	Ultrasonic microphone FG, waterproof Y-cable (sensor) 5 m
Sensitivity range	10 – 150 kHz
Recording time per file	0 - 20s, pre- and post-trigger adjustable
Trigger conditions (can be combined)	Manual, crest trigger, period trigger, FFT value, volume, frequency range
Recording in time windows	Two programmable time windows per day for recording, optional automatic sunrise/sunset consideration
Sensor	
Humidity	0 .. 100% RH relative humidity 3% RH (max), 0-80% RH
Air pressure	500 hPa .. 1100 hPa Measuring range absolute air pressure Calibratable to relative air pressure of the location Accuracy relative air pressure ±0.5 hPa (-10 .. 50°C)
Digital inputs and outputs	
Digital input	Potential-free via opto-coupler Observe polarity! 3.3V .... 40V DC/AC, max. 10Hz Requires up to 30mA input current min. 5mA at 3.3V input voltage
Digital output	Potential-free via relay. Load max. 50VACrms, 50VDC, 1A
Microphone test	
Sound converter	40kHz
Test Modes	Manuell, automatisch
Data storage	
File formats	*.wav, *.xml, *.log, *.csv
Storage medium	Internal hard disk (for approx. 100GByte user data) SD/SDHC/SDXC cards (SD 2.0), max. 128 GB, FAT32 formatted external hard disk via USB port, FAT32 or ext4 formatted USB stick formatted via USB port, FAT32 or ext4
Software	
Settings and configuration	Web Interface oder BATLOGGER Connect Service
Analysis and Identification	BatExplorer (WIN) BatScope (MAC)

Misc	
LTE	Integrated LTE module Supports 4G, 3G, 2G (up to six LTE bands) Up to 150 Mb/s download data rate Up to 50 Mb/s upload data rate Standard SIM card holder (internal) Two external antennas (MIMO) for optimal data throughput
Max. LTE Antenna output power	23dBm

15 Exclusion of liability

Elekon AG assumes no liability or warranty for damages resulting from improper installation, assembly and improper use of the product or non-observance of the operating instructions and/or the safety instructions.

16 Service and Support

Please do not hesitate to contact Elekon AG if you have any questions about the product:
+41 41 2504040 or batlogger@elekon.ch
For more support information, see: www.batlogger.com

17 Third-party software used

The BATLOGGER firmware contains software components from the following sources:

FreeRTOS

Copyright (C) 2015 Real Time Engineers Ltd.

Website	License
https://www.FreeRTOS.org	https://www.freertos.org/a00114.html

LibFLAC

Copyright (C) 2000-2009 Josh Coalson
Copyright (C) 2011-2016 Xiph.Org Foundation

Website	License
https://git.xiph.org	https://git.xiph.org/?p=flac.git;a=blob_plain;f=COPYING.Xiph

Mini-XML

Copyright 2003-2016 by Michael R Sweet

Website	License
http://www.msweet.org/mxml/	http://www.msweet.org/mxml/mxml.html#LICENSE

paho MQTT Client

Copyright IBM Corp. 2009, 2017
Copyright (c) 2007, Eclipse Foundation, Inc. and its licensors

Website	License
http://www.eclipse.org/paho/	https://www.eclipse.org/org/documents/edl-v10.php

cJSON

Copyright (c) 2009-2017 Dave Gamble and cJSON contributors

Website	License
https://github.com/DaveGamble/cJSON	https://github.com/DaveGamble/cJSON/blob/master/LICENSE

Angular JS Material

Copyright (c) 2014-2016 Google, Inc. http://angularjs.org

Website	License
https://material.angularjs.org/latest/	https://material.angularjs.org/1.1.5/license

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