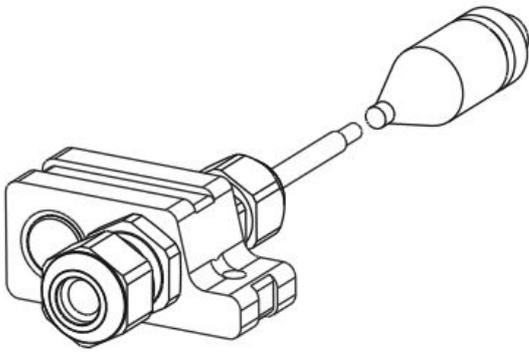


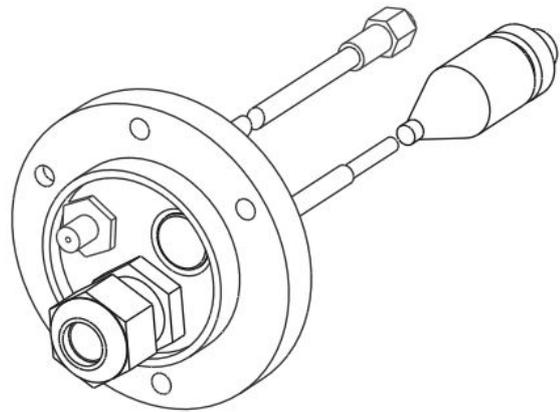


# MC32 / MC32W

## Manual

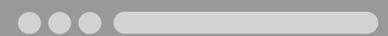


**MC32**



**MC32W**

**elekon**



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# Table of contents

1 Safety information and notes.....	3
2 Overview.....	5
2.1 MC32.....	5
2.2 MC32W.....	5
2.3 General.....	6
2.4 Compatibility.....	6
2.4.1 Devices.....	6
2.4.2 Microphones.....	6
3 Preparation.....	7
3.1 MC32.....	7
3.1.1 Inserting/Removing Microphone.....	7
3.1.2 Install and connect the device.....	8
3.2 MC32W.....	9
3.2.1 Inserting/Removing Microphone.....	9
3.2.2 Install external GSM antenna.....	9
3.2.3 Install and connect the device.....	10
4 General handling and operation.....	13
4.1 Manually test the microphone.....	13
4.2 Automatic periodic microphone testing.....	14
4.3 Test procedure.....	14
5 Recordings and Files.....	15
5.1 Test data file "MicTest.csv".....	15
5.2 The audio data file "xxxxxxx.wav".....	15
5.3 MicTest log file "MicTest.log".....	15
6 Interpreting test results.....	16
6.1 Measured parameters.....	16
6.1.1 Signal level (S).....	16
6.1.2 Noise level (N).....	16
6.1.3 Signal/Noise ratio (S/N).....	16
6.1.4 32kHz signal (S@32).....	16
6.1.5 32kHz ambient noise (N@32).....	16
6.1.6 32kHz Signal/Noise ratio (S/N@32).....	16
6.2 Recommended procedure.....	17
7 Troubleshooting.....	18
7.1 Checklist.....	18
8 Technical specifications.....	19
9 Exclusion of Warranty.....	20
10 Service and Support.....	20

# 1 Safety information and notes

Before operating the device, please read this manual thoroughly and retain it for reference.



## General safety information:

- Ignoring the associated information given under this symbol may result in serious injury or even death.
- Use the device only in its intended manner. Any other uses may lead to damage to the device or in the vicinity of the device.
- Do not place the device on or near a heat source (heating, fire, etc.). Protect it against high temperatures and temperature fluctuations
- Place the device so that it can not become a danger due to dropping, falling etc.
- The device must be kept out of reach of children.
- Make sure no foreign objects (coins, pins etc.) or liquids can enter the unit.
- When installing the device and the external cables it must be ensured that it can not come into contact with other live objects. Also, make sure that no electric shock caused by lightning, high-voltage power lines etc. can occur. Faulty connections and damaged cables can cause electric shock or fire.
- Be sure the use of this device is allowed in the country and in the environment required. The use of this device may be dangerous and has to be avoided in the following areas:
  - Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc.
  - Where there is risk of explosion such as gasoline stations, oil refineries, etc.
- It is responsibility of the user to enforce the country regulation and the specific environment regulation.
- An alteration or modification of the device affects the product safety. Caution: Risk of injury!
- Do not perform any repairs.
- Handle the device with care. It can be damaged through impact, hits or dropping even from low height.
- Avoid operation in close proximity of strong magnetic or electromagnetic fields transmitting antennas, RF generators or near electronic devices such as mobile phones. This may affect proper operation.



**Environmental conditions:** The MC32/MC32W is intended for outdoor use. However, weatherproofness is only ensured, if the device is properly closed and secured and if the microphone is mounted correctly. The cable is protected against moisture and rain only if the connector is properly connected.



**Mounting:** The device must be mounted correctly and securely for proper and safe operation. Read and obey the installation instructions in this manual to ensure functionality and safety.



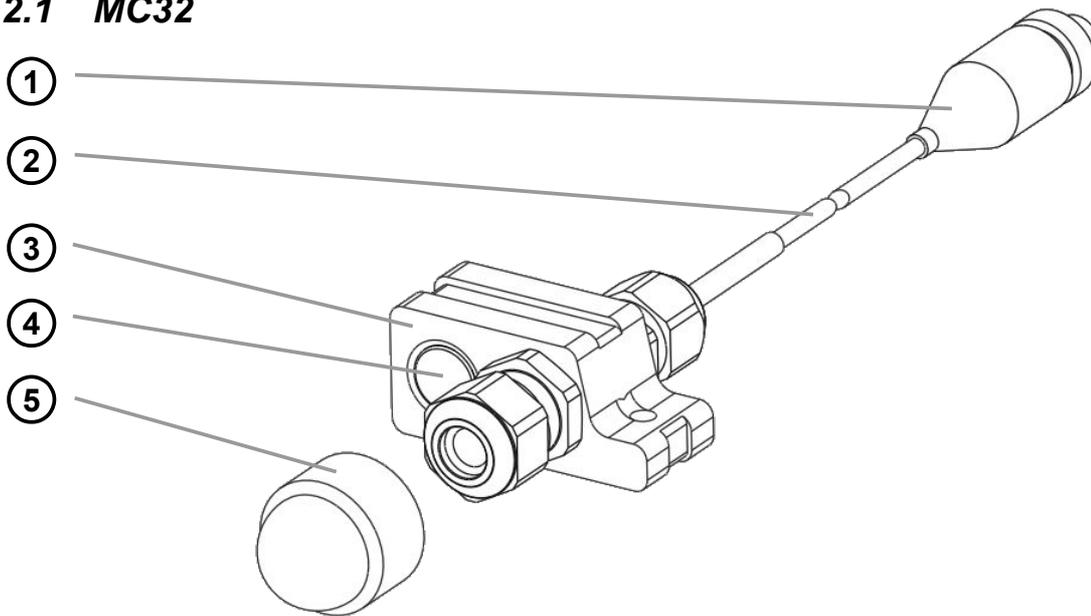
**Maintenance and care:** Only clean this device with a slightly damp, lint-free cloth and do not use aggressive cleaning agents. Ensure that no water intrudes the device.



**Note on environmental protection:** Electric and electronic devices as well as batteries must not be disposed of with household waste. Consumers are obliged by law to return electrical and electronic devices as well as batteries at the end of their service lives to the public collection points set up for this purpose or point of sale. Details to this are defined by national law of the respective country. This symbol on the product, the instruction manual or the package indicates that a product is subject to these regulations. By recycling, reusing the materials or other forms of utilising old devices/batteries, you are making an important contribution to protecting our environment.

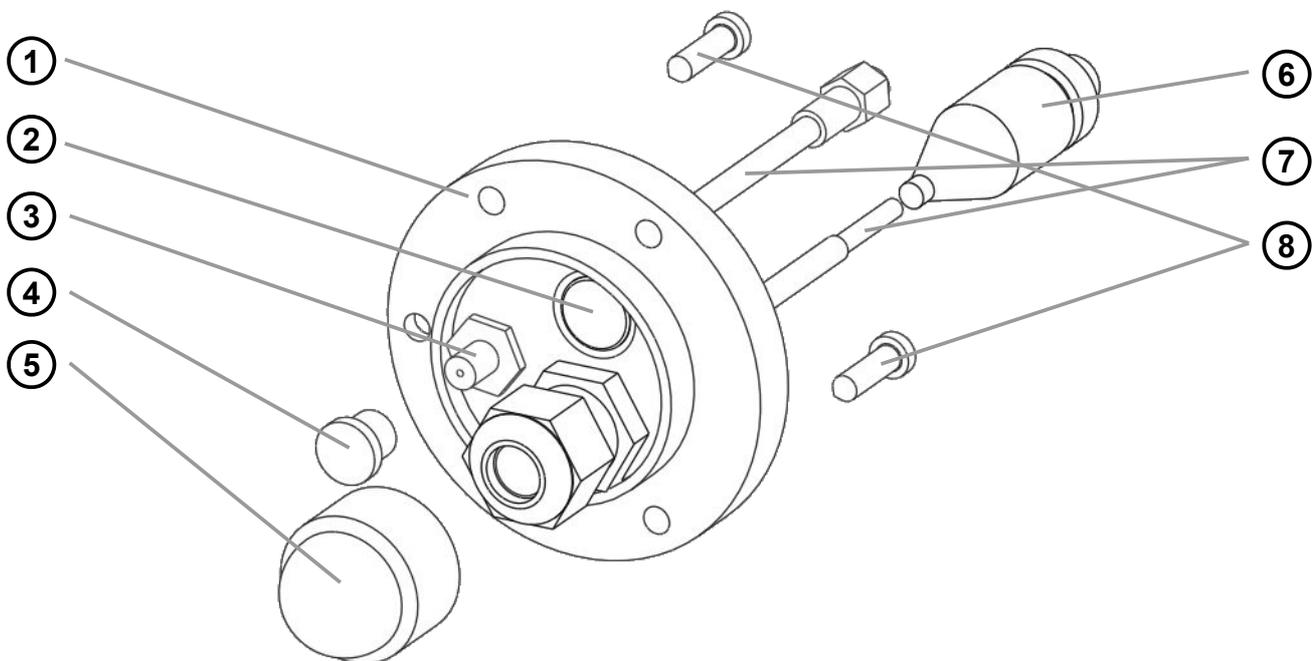
## 2 Overview

### 2.1 MC32



- ① Microphone connector
- ② Audio cable 2m
- ③ Housing
- ④ Test-tone generator
- ⑤ Protection cover

### 2.2 MC32W



- ① Housing
- ② Test-tone generator
- ③ External GSM antenna connector
- ④ SMS protection cover
- ⑤ Microphone protection cover
- ⑥ Microphone connector
- ⑦ Audio/GSM cable 5m
- ⑧ Tapping screws (ISO14585)

## **2.3 General**

The MC32/MC32W device is used to mount, protect and test the ultrasonic microphone of a BATLOGGER device. It is primarily built for long-term outdoor use and to monitor the microphone condition.

With the MC32/MC32W it is possible to maintain a secure and reliable operation of the BATLOGGER in unattended mode and to ensure that no bat call recordings will be lost due to a defective microphone.

The MC32 device can be used for general operation and installations in the field, on measurement masts or other similar.

The MC32W device is intended to use in wind turbines. It provides easy mounting from the inside of the gondola and transmission of the microphone and GSM signal to the outside.

The integrated test function can emit a 32kHz signal that is then measured by the microphone. The signal/noise ratio gives a good indication about the microphone condition.

When using with a BATLOGGER C with SMS/Email notification, the microphone test result is included in the daily status message. This adds a further level of confidence to the monitoring of the unattended operation.

## **2.4 Compatibility**

### **2.4.1 Devices**

BATLOGGER A

BATLOGGER A+

BATLOGGER C

### **2.4.2 Microphones**

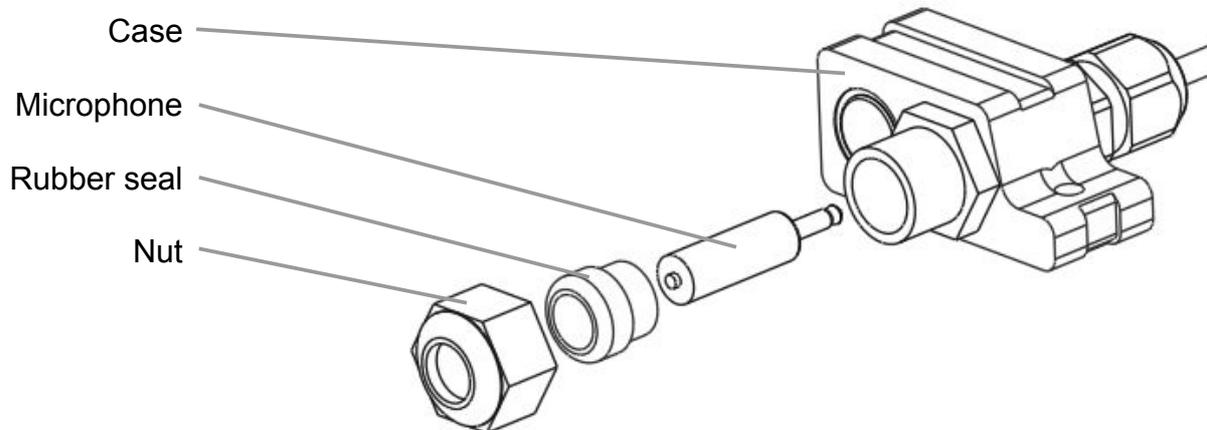
Ultrasonic microphone FG black

Ultrasonic microphone FG green

## 3 Preparation

### 3.1 MC32

#### 3.1.1 Inserting/Removing Microphone



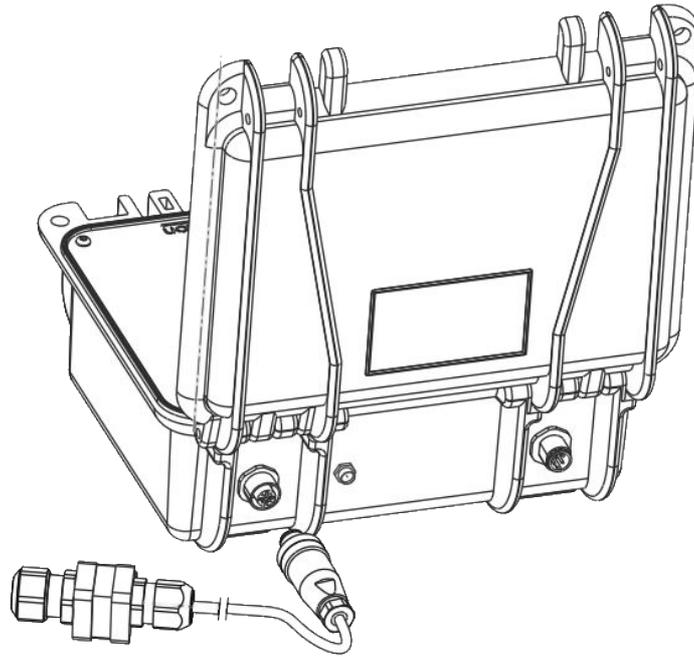
1. Make sure that the BATLOGGER device is turned off or disconnect the MC32 from the BATLOGGER device.
2. Remove the microphone case nut by unscrewing it counter-clockwise
3. Pull out the rubber seal
4. Pull out the microphone
5. Insert the microphone carefully. Avoid touching the microphones top (capsule). Make sure it is fully inserted until you hear a “click”.
6. Insert the rubber seal
7. Mount the microphone case nut by screwing it clockwise by hand (max. torque 3 Nm)



**Watertightness:** Make sure that the microphone is inserted properly and that the case nut is tightened correctly to ensure watertightness.

Keep in mind that the microphone capsule itself is not completely waterproof and must not be submersed at any time. Also the device should be mounted in a way that falling raindrops do not directly hit the capsule.

### 3.1.2 Install and connect the device



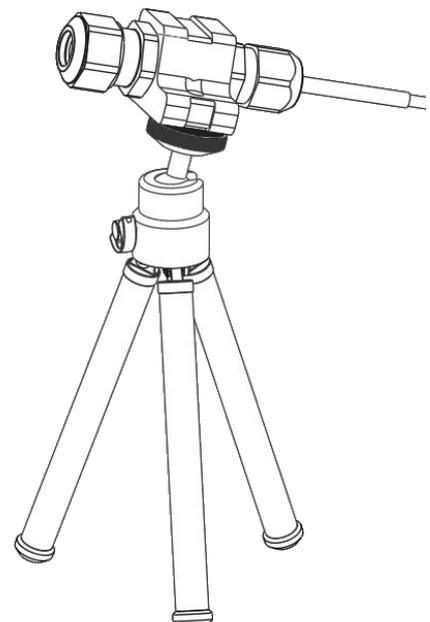
The microphone can be placed independently from the BATLOGGER device to ensure optimal acoustic reception, while allowing an inconspicuously placement.

To increase the life of your microphone, it should always be mounted with the opening facing ground up to a maximum horizontal position to prevent moisture accumulation inside. Use a tripod or similar to easily mount and direct the microphone as needed.

Also consider the surroundings of the microphone. Close objects or surfaces may reflect sound and distort recorded bat calls.

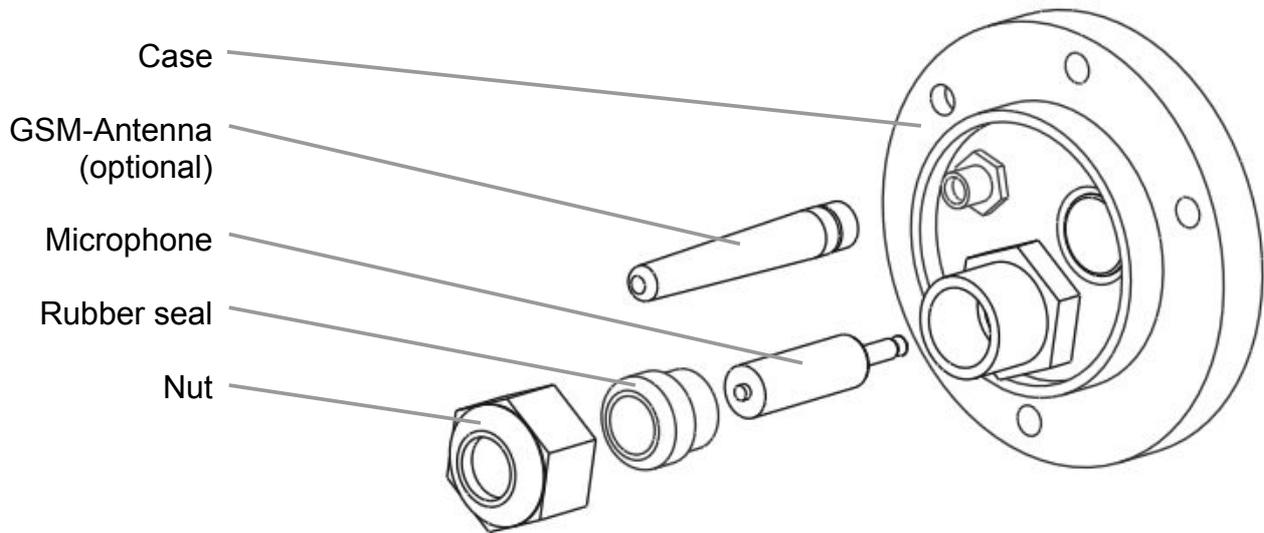


**Microphone mounting:** To properly place the microphone, use the tripod socket, the included strap or similar to mount it to sturdy object (tripod, post, branch, etc.).



## 3.2 MC32W

### 3.2.1 Inserting/Removing Microphone



1. Make sure that the BATLOGGER device is turned off or disconnect the MC32W from the BATLOGGER device.
2. Remove the microphone case nut by unscrewing it counter-clockwise
3. Pull out the rubber seal
4. Pull out the microphone
5. Insert the microphone carefully. Avoid touching the microphones top (capsule). Make sure it is fully inserted until you hear a “click”.
6. Insert the rubber seal
7. Mount the microphone case nut by screwing it clockwise by hand (max. torque 3 Nm)

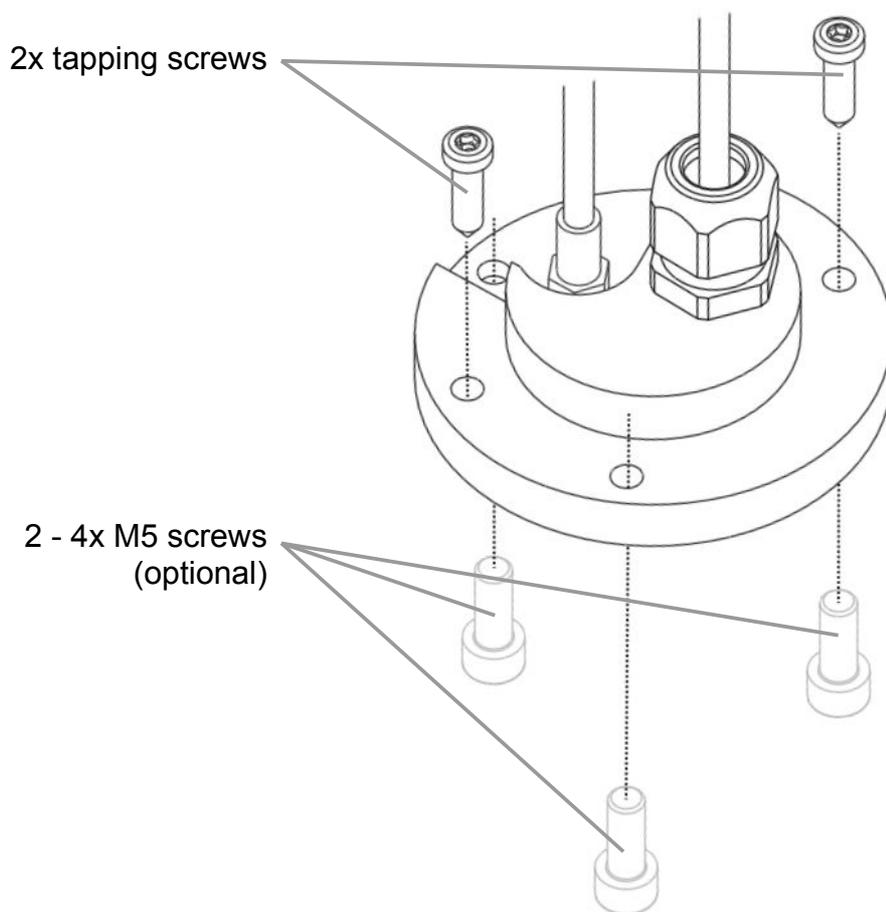
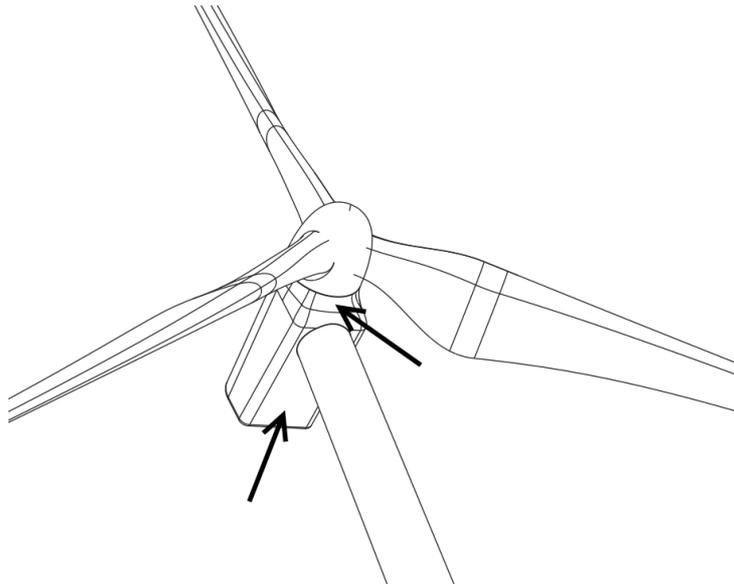


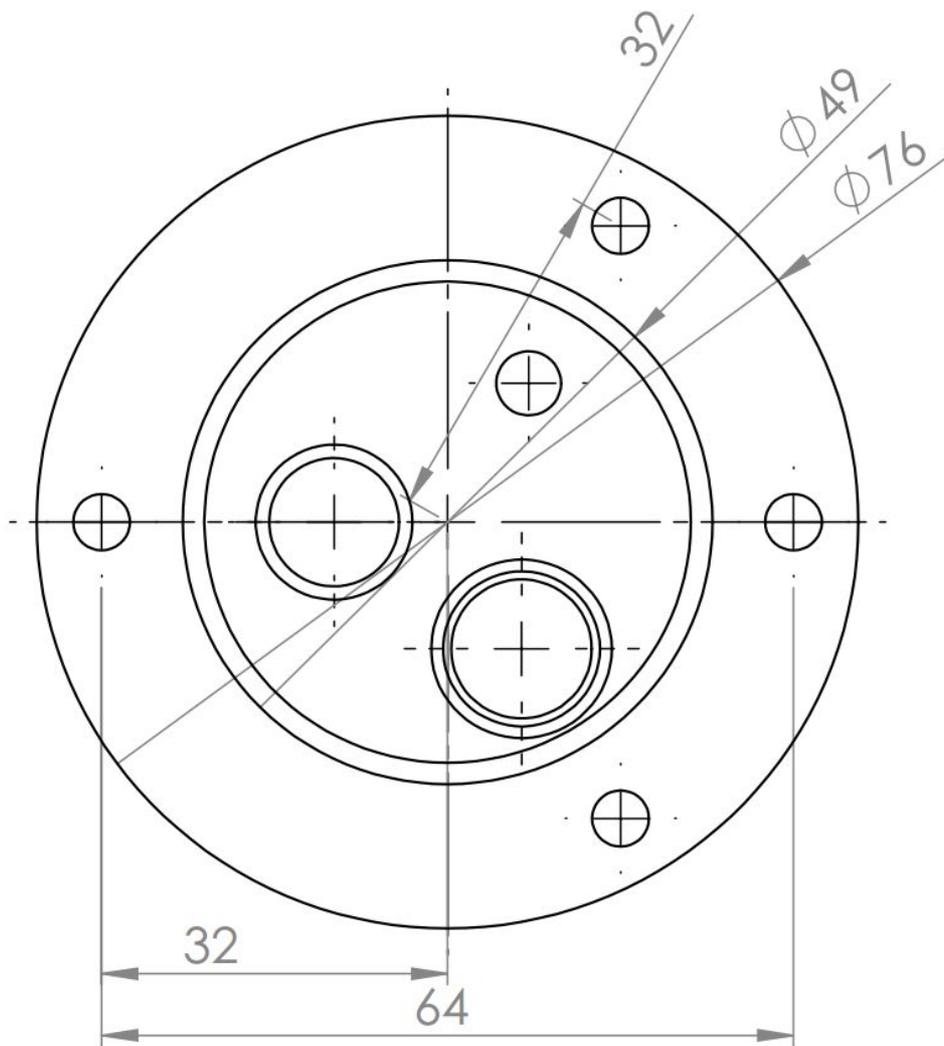
**Watertightness:** Make sure that the microphone is inserted properly and that the case nut is tightened correctly to ensure watertightness. Keep in mind that the microphone capsule itself is not completely waterproof and must not be submersed at any time. Also the device should be mounted in a way that falling raindrops do not directly hit the capsule.

### 3.2.2 Install external GSM antenna

1. Make sure that the BATLOGGER device is turned off or disconnect the MC32W from the BATLOGGER device.
2. Remove the GSM antenna from the BATLOGGER device. See BATLOGGER C Manual chapter 11.5 (Install external GSM antenna) for detailed instructions.
3. Connect the GSM antenna to the SMA connector of the M32W by screwing it on clockwise carefully by hand (max. torque 0.5 Nm).

### 3.2.3 Install and connect the device





1:1

1. Choose an appropriate mounting place in the gondola. It is not possible to specify an exact place here, as there are a lot of different wind turbine types available. Generally it is recommended to place the microphone in the bottom of the gondola, facing towards the ground. This ensures a good sound reception and best protection from weather and environmental influences. The noise from wind and the turbine blades should also be considered when choosing a place.

Possible mounting positions are shown above.

2. Create the appropriate cutouts and/or mounting holes:
  1. Use a hole saw or similar to drill the main hole ( $\varnothing$  min.50mm max.56mm).
  2. Drill additional mounting holes depending on the screws to be used.
3. Mount the prepared (see above) MC32W housing in the main hole and secure it. Use the two included tapping screws (ISO14585) to fix the housing from the inside. Optionally use three M6 screws to fix it from the outside. A further option is to use silicon rubber or similar to fasten it to the gondola.
4. Arrange the cable and fix in a way that it does not interfere with the power cables of the generator not blocks any mechanical function of the turbine.
5. Place the BATLOGGER device at an easily accessible but protected place.
6. Connect the microphone connector to the device.
7. Connect the GSM connector to the device (optional).
8. Connect the power supply to the device (optional).



**Wind turbine functionality:** Make sure to not impact the functions of the wind turbine in any way by mounting the device. Mount it in a place where it can be removed easily and consider a method to reseal the openings made in the gondola if the device is removed in a later stage.

Make sure to install and secure the device and the cables in a way that no hazard for humans and animals may occur. For example use cable straps to minimize the risk of stumbling, use screw locking to guard against vibrations or take any other appropriate measure to maintain security of the facility.



**Watertightness:** Make sure to seal the openings made for the device to ensure that rain/moisture/water can no enter the gondola.

## 4 General handling and operation

### 4.1 Manually test the microphone

Place the microphone in a silent, open place.

Turn on the BATLOGGER device and navigate to the Setup-Menu 'Audio' (see BATLOGGER device manual).

```
Setup Audio
MICTEST_MODE:
Automatic <>
```

Set 'Microphone-Test mode' to 'Automatic' (1).  
Press  key to proceed to the next menu item.

```
Setup Audio
MIC_TEST:
Test Microphone>
```

Press  key to execute the 'Test Microphone' function.

```
Testing Mic
init...
```

Test is being initialised.

```
Testing Mic
OSC
Sampling...
```

Test is running.

```
Testing Mic
Calculating...
```

Test results are being calculated.

```
S@32kHz=14382
N@32kHz=79
S/N= 45.2 dB
```

Test results are displayed. See chapter 6 on how to interpret the results.

Press  key to proceed to the next menu item.

```
writing...
150625140633.wav
```

Test recording is being saved to the SD card.



**Ambient noise:** The microphone should be tested in a silent environment to get optimal and comparable results.

Keep in mind that there may be technical noise present that is not audible to the human ear. Any noise present during test may influence the result.



**Sound reflection:** Keep the device away from close objects like walls, trees and the like that may reflect the sound of the test tone and therefore influence the test result.

## 4.2 Automatic periodic microphone testing

The BATLOGGER device can test the microphone on a regular basis to record and monitor its condition and variation over time.

Set 'Microphone-Test mode' to 'Automatic' (1) to enable periodic testing. The test is then executed on every start of the recording mode. In unattended operating mode (Delayed recording), one or two test a day are run, depending on the configured time windows.

The result of the latest test is displayed on the BATLOGGER device and is included in the SMS/Email status notification to monitor the condition from afar.

See chapter 6 on how to interpret the results.

## 4.3 Test procedure

During the test, a recording of three seconds length is made. First, the test-signal generator is initialised and after one second the emitted signal is measured. Afterwards, the ambient noise is recorded.

Initialisation	Signal	Silent (Noise)
1s	1s	1s

The results are then calculated from the data recorded.

## 5 Recordings and Files

All microphone test data is stored on the SD card, in the Folder 'MicTestXXXX', where XXXX is the device serial number.

### 5.1 Test data file "MicTest.csv"

The data of each test event is written into a comma separated values (CSV) file. This file can directly be opened with common spreadsheet software (MS Excel, LibreOffice Calc etc.) and it allows you to easily draw a chart to monitor the microphone state over time.

Example MicTest.csv:

```
Date/Time,SN,WAV,S,N,S/N[dB],S@32kHz,N@32kHz,S/N@32kHz[dB]
20.08.2015 20:00:00,1052,150820200000.wav,0.342,0.066,14.4,4953.0,59.5,38.4
21.08.2015 20:00:00,1052,150821200000.wav,0.359,0.069,14.4,5225.9,62.0,38.5
22.08.2015 20:00:00,1052,150822200000.wav,0.425,0.124,10.7,6324.2,113.4,34.9
23.08.2015 20:00:00,1052,150823200000.wav,0.422,0.072,15.4,6232.6,66.1,39.5
24.08.2015 20:00:00,1052,150824200000.wav,0.183,0.067,8.7,2231.1,55.1,32.2
25.08.2015 20:00:00,1052,150825200000.wav,0.069,0.069,0.0,59.8,54.3,0.8
26.08.2015 20:00:00,1052,150826200000.wav,0.349,0.064,14.8,5319.8,56.4,39.5
27.08.2015 20:00:00,1052,150827200000.wav,0.366,0.074,13.9,5509.0,62.4,38.9
```

```
Header
MicTest results:
    Time-stamp
    Device serial number
    WAV filename
    Signal
    Noise
    Signal noise ratio
    Signal at 32kHz
    Noise at 32kHz
    Signal noise ratio at 32kHz
```

### 5.2 The audio data file "xxxxxxx.wav"

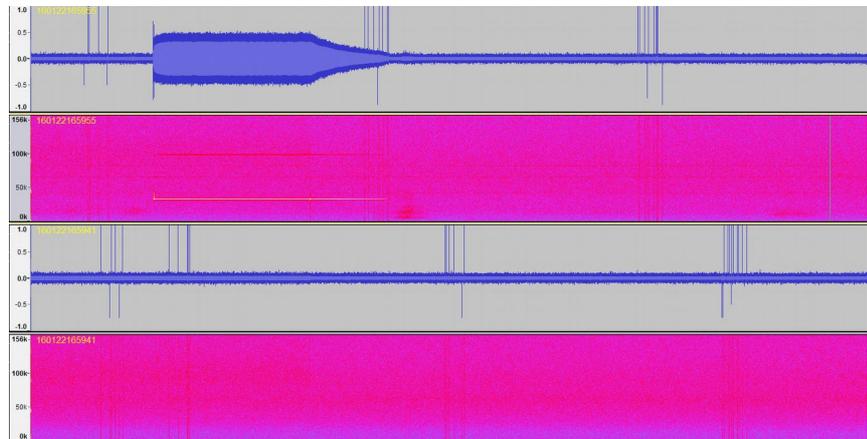
The raw data of the test recording is stored as standard audio WAVE file with the file name "YYMMDDhhmmss.wav". (Time-stamp of test execution e.g. 150823200000.wav).

The standard \*.wav files can be read and opened with general audio software or bat specific sound analysis programs. It may be displayed as time signal or spectrogram.

Testresult Good:

Waveform

Spectrogram



Testresult bad:

Waveform

Spectrogram

### 5.3 MicTest log file "MicTest.log"

A log file "MicTest.log" in text format with all microphone test data is written to the SD card. Every text line is preceded by the serial number (SN) of the device writing the log. In the file "MicTest.log", all microphone test activities are listed chronologically. Events like test events, spectrum data or errors are logged.

Example MicTest.log:

```
SN1052 21.08.2015 17:00:11 - 150821170011.wav (Manual)          Manual microphone test started
SN1052 21.08.2015 17:00:16 - Signal Spectrum:.,65,59,64,63,67,67,... Signal spectrum data, comma separated
SN1052 21.08.2015 17:00:19 - Noise Spectrum:.,32,29,41,49,56,67,... Noise spectrum data, comma separated
SN1052 21.08.2015 20:00:00 - 150821200000.wav (Auto)         Automatic microphone test started
SN1052 21.08.2015 20:00:08 - Signal Spectrum:.,32,28,30,31,32,33,...
SN1052 21.08.2015 20:00:16 - Noise Spectrum:.,31,25,29,30,30,31,
SN1052 22.08.2015 20:00:00 - 150822200000.wav (Auto)
SN1052 22.08.2015 20:00:08 - Signal Spectrum:.,29,23,24,28,27,27,
SN1052 22.08.2015 20:00:16 - Noise Spectrum:.,29,24,28,28,29,28,
```

## 6 Interpreting test results

The test depends on countless factors from which not all can be affected by the system or the user. Therefore the results must be interpreted with care and the test conditions must be considered. **A single bad result must not mean a defective microphone.**

The following procedure has proven a reliable information about the microphone condition.

### 6.1 Measured parameters

#### 6.1.1 Signal level (S)

Amplitude level during signal phase. Value range is 0..1. Higher values mean higher signal. In Optimal conditions this should be higher than 0.3. Keep in mind that this value includes sound at any frequency. So this could be sound from any source, even in audible range.

#### 6.1.2 Noise level (N)

Amplitude level during silent phase (Noise). Value range is 0..1. Lower values mean less noise. In silent conditions this should be lower than 0.1. Keep in mind that this value includes sound at any frequency. So this could be sound from any source, even in audible range.

#### 6.1.3 Signal/Noise ratio (S/N)

$S/N = S / N$  [dB]

Higher values mean better microphone sensitivity. This value depends directly on the conditions and values above. Generally it should stay roughly on the same level if conditions are comparable and the microphone is functional.

#### 6.1.4 32kHz signal (S@32)

Peak intensity on 32 kHz during signal phase. Higher values mean higher signal. In Optimal conditions this should be higher than 5000. However the signal strength depends on temperature, humidity and mounting of the device. Also sound reflections may influence the measurement in either amplifying or even cancelling out the signal by superimposing.

#### 6.1.5 32kHz ambient noise (N@32)

Peak intensity at 32kHz during silent phase. Lower values mean less noise. In silent conditions this should be lower than 100 In real world conditions this value can be higher due to noise and sounds from the surroundings e.g. it can make a difference if the wind turbine runs or stands still. Also rain and wind itself can lead to noise in this frequency band.

#### 6.1.6 32kHz Signal/Noise ratio (S/N@32)

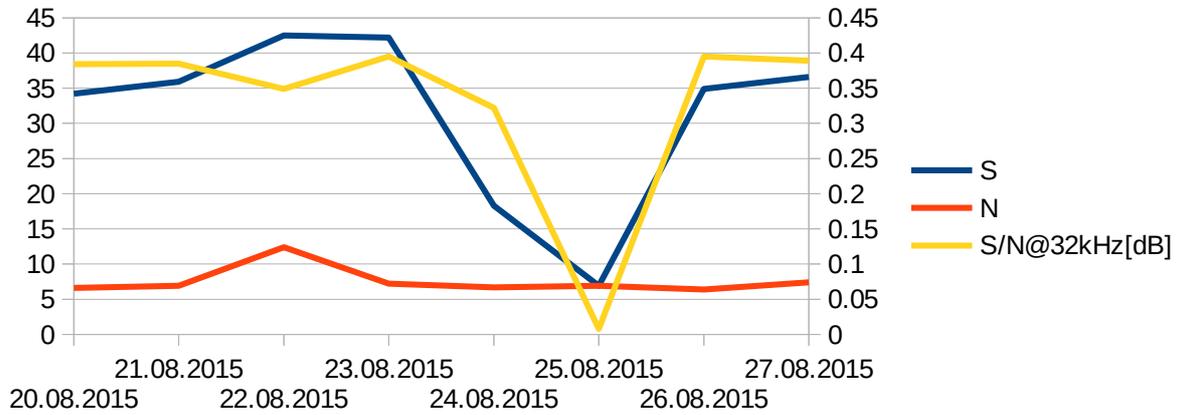
$S/N@32 = S@32 / N@32$  [dB]

Higher values mean better microphone sensitivity. In Optimal conditions this should be higher than 35dB. This value depends directly on the conditions and values above. Generally it should stay roughly on the same level if conditions are comparable and the microphone is functional. This value is less dependent on the surrounding conditions as the S/N value. It only takes signals at 32kHz into account.

## 6.2 Recommended procedure

The measured parameters (see above) should be locked at with care. For example, the microphone can be completely blocked with water due to heavy rain, but after a few hours without rain, after drying, function as normal. If the test was made during the rain, it can result in a bad signal/noise ratio but the microphone does still work without problems later that night. Therefore it is recommended to monitor the microphone parameters over multiple days and take environmental conditions into account when deciding over the microphones condition.

A real world example could look as follows:



On 22.08.2015 the noise level is significantly higher. This could be caused by some noise in the surroundings like wind.

On 24.08.2015 the signal is significantly lower. This reduced sensitivity could be caused by moisture or fog.

On 25.08.2015 the signal is equal to the noise. This could be caused by a temporary blocked microphone due to heavy rain.

However on 26.08.2015 the microphone is back alive again and seems to function normal after that.

## 7 Troubleshooting

### 7.1 Checklist

<i>Problem</i>	<i>Cause</i>	<i>Remedy</i>
"Mic damaged" message	No microphone inserted.	Insert microphone.
	Device or microphone defective.	Check/replace microphone and/or check device for damages.
Bad GSM reception (MC32W)	GSM antenna not connected.	Connect GSM antenna.
	GSM antenna gain too low.	Connect a better GSM antenna.
	GSM signal too low.	Check/change provider.

## 8 Technical specifications

<b>Case, dimensions</b>	
Size (B x H x T)	75×59×27 mm (MC32), Ø76×28 mm (MC32W), without cable
Weight	108 g (MC32), 442 g (MC32W)
Weather protection	IP67 (when mounted)
Operating conditions	-10..+50°C, 10..90%RH (non condensing)
Storage conditions	-20..+60°C, 5..95%RH (non condensing)
<b>Connection</b>	
Audio	2m (MC32) / 5m (MC32W), 5-pole connector
GSM (MC32W only)	5m, SMA connectors
<b>Microphone test</b>	
Transducer	32kHz
Modes	Manual, Automatic

## 9 Exclusion of Warranty

Elekon AG assumes no liability and provides no warranty for damage resulting from improper installation, mounting and improper use of the product or from failure to observe the operating instructions and/or safety notes.

## 10 Service and Support

Please contact Elekon AG if you have any questions about this product:

+41 41 2504040 or [mail@elekon.ch](mailto:mail@elekon.ch)

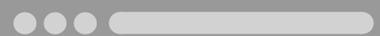
Further support information can be found on: [www.batlogger.com](http://www.batlogger.com)



Made in Switzerland  
February 2016

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