



# HANDBOOK

## PROFESSIONAL VERSION

Instruction Manual | Biofeedback-Training | eSense-App

Version 5.6.1 | 27th of January 2022



Please read these operating instructions carefully before using the unit for the first time.

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## Note professional and private version

There are two versions of the eSense Muscle:

- A professional version at full price in which EMG measurements can be performed with 2 channels. Available is the web app, the mobile app for iOS and Android, all games and the oscilloscope.
- A private version at a reduced price with which EMG measurements can be performed with 1 channel. Available is the web app and the games.

While the professional version is aimed at professional biofeedback trainers, the private version is also intended for personal use at an affordable price.

## Features of the eSense Muscle

The eSense Muscle can measure and train electromyographic muscle activity and transmit it to your computer/smartphone/tablet via Bluetooth.

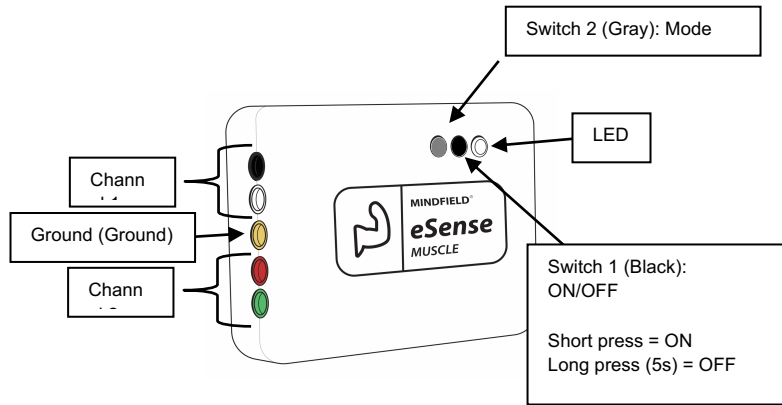
**The eSense Muscle with the eSense App offers you:**

- Mindfield® eSense Muscle Sensor incl. 1600mAh lithium polymer battery for approx. 12 hours of continuous operation
- Electrode cable set for connecting up to 5 electrodes
- USB-C charging cable and charger
- Bluetooth dongle for Windows, if your PC does not have Bluetooth (please refer to the enclosed instructions)
- 50 pieces of EMG surface electrodes
- 50 pieces of alcohol swabs for cleaning the skin
- eSense Muscle Web App from Mindfield, available at [www.esense-muscle.com](http://www.esense-muscle.com)
- Detailed instructions for effective biofeedback training.

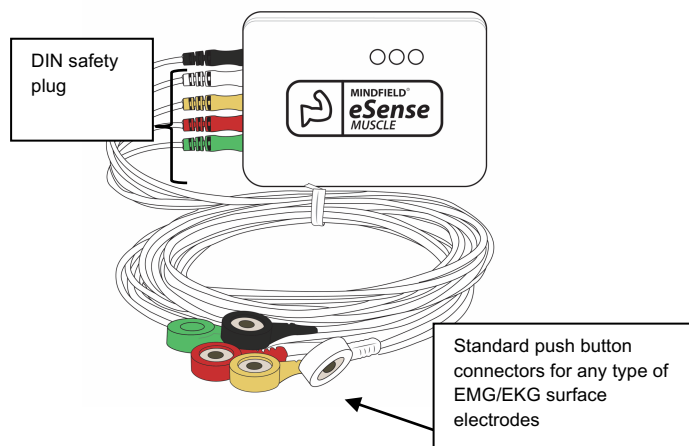


## Scope of delivery of the eSense Muscle:

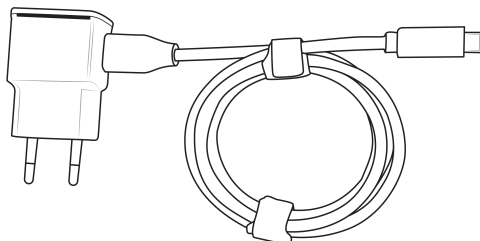
- Mindfield® eSense Muscle Sensor incl. 1600mAh Lithium Polymer battery for approx. 12 hours of continuous operation



- Electrode cable set for a connection of up to five electrodes



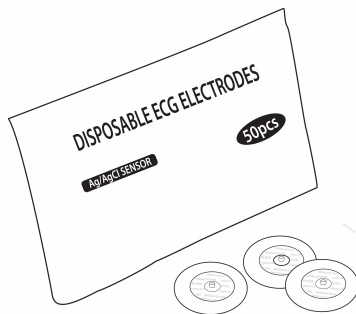
- USB-C charging cable and charger



Please only use the enclosed charger!

Fully charge the eSense Muscle before first use! Observe the notes in the manual!

- Bluetooth dongle for PCs that do not have Bluetooth (please refer to the enclosed instructions)
- 50 pieces EMG surface electrodes

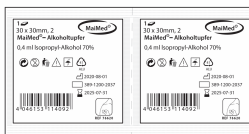


These are **disposable electrodes** for single use!

Please **always** close the package airtight so that the electrodes do not dry out.

First press the electrodes against the cables before sticking them to the skin.

- 50 pieces alcohol swabs for skin cleansing



Clean the skin before sticking on the EMG disposable electrodes. These alcohol swabs degrease the skin. This results in better signal quality.

- eSense Muscle Web App by Mindfield, available at [www.esense-muscle.com](http://www.esense-muscle.com)

First, read this Manual entirely before using the eSense Muscle Web!

## News

Besides the usual regular bug fixes and small improvements, we have integrated the eSense Muscle with the new version 5.6.1.

## General information on EMG (electromyography) biofeedback training

The musculature of the human being plays an essential role in the body. Our muscles are the largest energy consumer and are responsible for about 70- 80% of our body weight. Muscle activity is manifested along the fibers of a striated muscle in the form of permanent, electrical potential shifts. This electrical activity can be measured at the skin surface in the form of more considerable summation potentials. This form of measurement is called (surface) electromyography, and the result is an electromyogram.

The eSense Muscle can measure and train electromyographic muscle activity and transmit it to your computer/smartphone/tablet via Bluetooth.

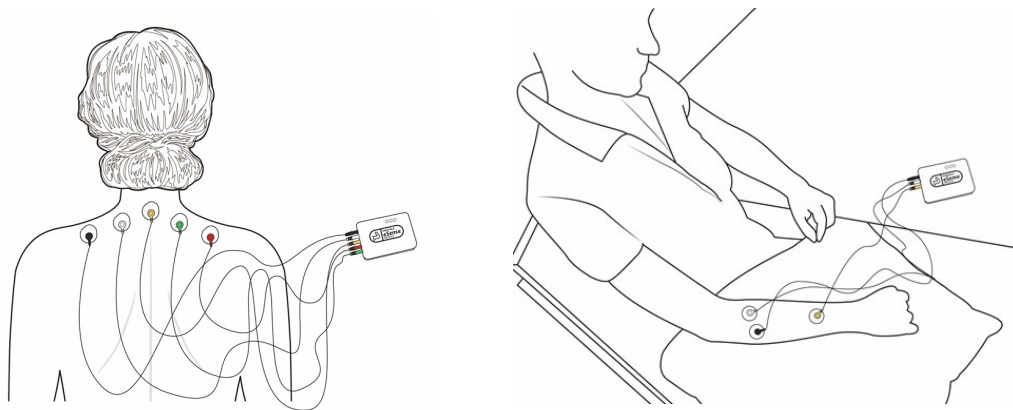
Transverse striated muscles are controlled by our somatic nervous system and are subject to voluntary control. Every volitional action of a muscle can therefore be observed in an electromyogram. Thus, the tension of a muscle on 27 which surface EMG electrodes are placed immediately leads to increased trace in the EMG signal.

However, involuntary reactions, such as stress, inner tension, and emotional experience, can also be measured as (tonic) activity in the EMG. EMG biofeedback can also report back the general psychophysiological tension.

The interplay between the autonomic and somatic nervous systems can be depicted particularly well in the EMG. Increased muscle tone is mainly based on an increase in sympathetic activity. A decrease can be attributed to more robust parasympathetic activation.

## Introduction to eSense Muscle

To reduce stress and its vegetative symptoms, an EMG biofeedback training can be performed by causing a reducing the muscle tone of certain "stress muscles" is aimed at. Typical stress muscles are the muscles of the forehead (M.Frontali), the jaw muscles (M.Masseter) and the shoulder muscles (M. Trapezius).



### Examples of possible EMG measurements

Through exercises that involve targeted tensing and relaxing (similar to the progressive muscle relaxation) these muscles can be lowered in their basic tone and thus reduce stress.

For muscle building and strengthening individual muscles or muscle groups, a variety of possible derivations can be used. The electrodes of a channel are placed closer to each other, the more precisely the underlying muscle is recorded. With increasing distance you reach the activity of larger muscle groups. During training you, then muscle tone increase maximum values and improve endurance. For this purpose, tension phases with progressive training being prolonged and increased. Pay attention however also make sure to always incorporate sufficient rest phases.

For coordination exercises and targeted separation of muscle groups (e.g. lifting the arm without "pulling up" the shoulder), channel 1 and channel 2 can be cleverly combined. For example, channel 1 can be applied to the muscle that is to be tensed, while channel 2 can be applied to an adjacent muscle. Muscle to be tensed, while channel 2 "monitors" an adjacent muscle so that is not tensed during the movement. Each muscle movement generates a characteristic pattern under an EMG measurement, which is pattern, which can be practiced and repeated in the software.

The possibilities of using EMG biofeedback are very diverse. Let a professional user assist you in this regard if you have any questions.

**Important:** If you are suffering from a medical condition, do not perform a treatment on your own and always consult a therapist. The eSense Muscle is not a medical device and may be used exclusively for stress reduction, muscle building, relaxation of tension and for coordination exercises to be used!

## The EMG signal

With EMG, we measure a voltage curve over time. We pay attention to the amplitude (the magnitude) of the signal and the frequency. Depending on the musculature, considerable differences become plain. An EMG signal from a small muscle; e.g. from a finger on the hand, is significantly lower in amplitude and frequency range than the signal from the large thigh muscle.

The eSense Muscle can measure the EMG raw signal and transmit it via Bluetooth, as well as already three preset bandpass signals (RMS) in the frequency ranges:

### **20 Hz to 950 Hz, 20 Hz to 300 Hz and 100 Hz to 200 Hz**

You can select and use these in the eSense web app and the mobile app. In biofeedback, we work exclusively **with these bandpass RMS signals**, as these are related to amplitude and applied muscle force. The amplitude ranges from a few  $\mu\text{V}$  (millionths of a volt) to several hundred  $\mu\text{V}$  in particularly strong muscles.

The frequency range of the EMG signal does not play a significant role in EMG biofeedback. It only emphasizes the signal part you want to look at. EMG activity has a broad frequency spectrum, from 10 Hz to 500 Hz, focusing between 25 and 300 Hz. Choose a wide filter (20-950 Hz) if you want to capture and feedback all components in the EMG and choose a narrow filter (100-200 Hz) if you're going to capture the majority and filter out possible sources of interference such as pulse artifacts or mains hum.

It is advisable to always **choose the narrowest filter (100-200 Hz) first** and to check whether the measured signal is represented sufficiently well with it. The filter should only be widened and set wider if the amplitude appears too small and not very reactive.



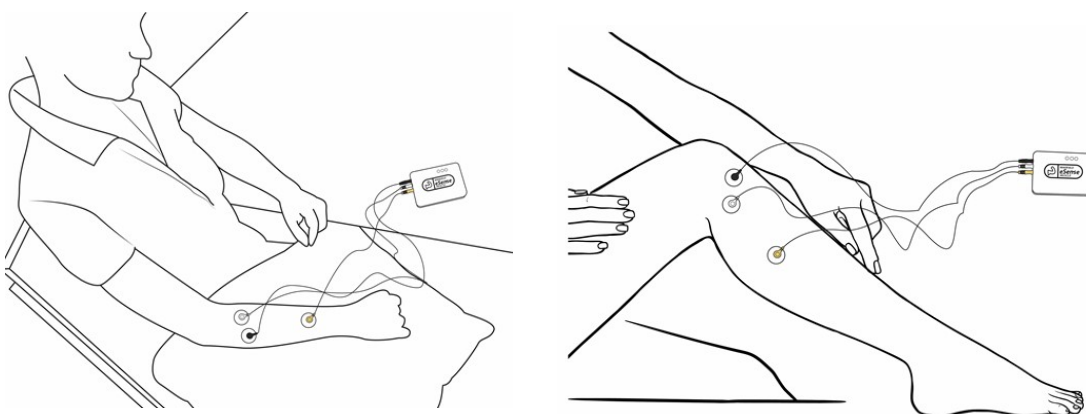
## Operating instructions for the eSense Muscle

1. Please remove all products from the packaging.
2. Recharging: Please fully charge the eSense Muscle before use. To do this, use the included USB-C cable and the charger. Then press once briefly on the black switch 1 on the top of the eSense Muscle. Then the LED should light up red. Charge the eSense Muscle until the LED turns green or goes out.
3. After the eSense Muscle is fully charged, you can start using it for the first time. A full charge can take up to five hours. During an ongoing charging process, the eSense Muscle cannot be used for measurement for safety reasons. If you plug in the charger during a running measurement, the running operation is terminated and the device switches to the charging mode.
4. Apply the electrode cables and electrodes:

Remove the electrode cable set from the package. There are five electrode cables included: black, white, yellow, red and green.

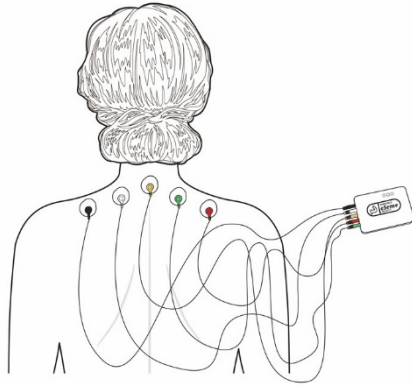
The yellow electrode cable is the ground electrode!

For a **1-channel measurement**, please use the electrodes black (channel 1+), white (channel 1-) and yellow (ground).



**Examples of a one-channel measurement**

For a **2-channel measurement**, please use the electrodes black (channel 1+), white (channel 1-), yellow (ground), red (channel 2+) and green (channel 2-).



**Example of a two-channel measurement**

5. Clean the skin areas where you want to place the electrodes with the enclosed alcohol swabs or isopropyl alcohol.
6. Take the appropriate number of EMG surface electrodes from the enclosed package. Clip the electrodes to the cable ends before placing them on cleansed skin.
7. Remove the protective film from the electrodes and stick them to the skin. If you have not already done so, plug the electrode cables into the matching colored sockets on the eSense Muscle.
8. **Necessary: close the package of the EMG surface electrodes airtight again! Otherwise, they will dry out in a short time and stop providing correct values.**
9. Now the eSense Muscle is ready for use and connected to the eSense (web) app. For more information, please refer to the corresponding chapter.

## Battery Information

The eSense Muscle uses an internal Lithium Polymer battery with 3.7V operating voltage. The eSense Muscle is charged with five volts via the included USB-C cable and USB charger.

You can read the current state of charge in the eSense (web) app. To save the battery, the device switches off after two minutes of inactivity; i.e., without Bluetooth connection or recording to SD card.

Changing the battery by the user is not provided. The manufacturer can only replace the battery.

- Never open the eSense Muscle. This is not provided for.

- Use the included charger to charge the eSense Muscle as other chargers may damage it.
- If you do not use the eSense Muscle for a more extended period, always store it in the enclosed case. Charge it fully first when you start it up again.

## Cleaning and Care

For cleaning and care, there are the following essential tips:

- Do not drop or use force on the eSense Muscle.
- Avoid exposing the eSense Muscle to hot temperatures or sunlight.
- If the eSense Muscle is stored near freezing, allow it to warm to room temperature before subsequent use.
- Do not try to open the housing of the eSense Muscle.
- Avoid dirt getting into the connection sockets.
- If you do not use the eSense Muscle for a long time, you must fully charge it before using it again.
- The enclosed EMG surface electrodes are disposable and should not be reused.

## Mindfield eSense Web App for Desktop Devices (Windows, Mac, Linux) (recommended)

For the first time, the eSense Muscle comes with new software—a web app that runs exclusively in a web browser.

You do not need to install any software. All you need is:

- A PC or notebook with Windows 10, Mac or Linux.
- A working Bluetooth connection in this PC or notebook
- A web browser that supports "Web Bluetooth" so you can connect to our eSense Muscle via Bluetooth. As of April 2021, these are:
  - Google Chrome
  - Microsoft Edge
  - Opera

**We recommend that you use the latest version of Google Chrome.**

Mozilla Firefox and Apple's Safari are NOT SUPPORTED!

So, if you have a computer with Bluetooth and one of the mentioned browsers, please go to the website:

<https://www.esense-muscle.com>

You can then launch the web application on this web page and get further instructions on how to use it (please watch the instruction video). You then connect directly to the (switched on) eSense Muscle via Bluetooth in your web browser.

You are offered different representations of the measurement (oscilloscope, different animations, different games, etc.)

We update the eSense Muscle Web App regularly.

## Mindfield eSense Web App for mobile devices (Android or iOS)

For the first time, the eSense Muscle comes with new software—a web app that runs exclusively in a web browser. This is also usable for mobile devices, but we recommend using the Mindfield eSense Mobile App once it supports the eSense Muscle.

To use the web app on mobile devices (smartphones or tablets), you need:

- A smartphone or tablet with iOS (version 12.5 or higher) or Android (version 7.0 or higher) and Bluetooth 4.0 or higher.
- A working Bluetooth function that is turned on.
- A web browser that supports "Web Bluetooth" so that you can connect to our eSense Muscle via Bluetooth.

On Android, you need to use "Google Chrome" for this. On iOS, Web Bluetooth is not supported by Safari. You need to download the app "eSense Muscle" from the Apple App Store, a minimal browser that supports Web Bluetooth. It will take you directly to our website after the start.

If you are using Google Chrome on Android or the "eSense Muscle" app on iOS, please navigate to:

<https://www.esense-muscle.com>

You can then launch the web application on this web page and get further instructions on how to use it (please watch the instruction video). You will then connect directly to the (switched on) eSense Muscle via Bluetooth in your Chrome browser on Android or the "eSense Muscle" browser app on iOS.

You are offered different representations of the measurement (oscilloscope, different animations, different games, etc.)

We update the eSense Muscle Web App regularly.

We recommend using the desktop version of the eSense Web App with a desktop PC, notebook with Windows, Mac or Linux. The mobile version of the web app comes with reduced content due to technical reasons.

## Features of the Mindfield eSense App



eSense includes the Mindfield eSense App, which you can download for free from the Google Play Store (Android) or the Apple App Store (iOS). **Simply search for “Mindfield eSense” in the relevant store.**

It offers a wealth of functions for effective biofeedback training in a modern design. Essential functions are the display of the measured values as a bar graph and oscilloscope, feedback via video, music, sound, vibration and now with light with the help of smart light bulbs (Magic Blue and Philips Hue). You receive a comprehensive evaluation after each measurement and can compare measurements with each other in the archive and export them as CSV files and PDF reports.

The app is available in the following languages: German, English, Spanish, French, Italian, Russian, Portuguese, Dutch, Turkish, Ukrainian, Japanese and Chinese. The respective language is automatically selected based on the language set in the smartphone or tablet.

### Download-Links:



iOS: <https://itunes.apple.com/us/app/mindfield-esense/id1141032160?mt=8>

Android: <https://play.google.com/store/apps/details?id=com.mindfield.boisystem.esense>

## General notes

- The data (that you can export as a csv-file from the eSense app) can also be evaluated with other software.
- If the text on your Android device is sometimes cut off the reason can be a larger font in the system settings (especially for Huawei). In the Android settings, there is usually a way to adjust the font size and display size. It's best to set this to "standard" or "default", otherwise it can cause problems with app.
- For data files which you can load as own media into the eSense App, the general limitations by Android and iOS apply. We have successfully tested the following:
  - Images: PNG and JPG (GIF can be loaded but isn't animated)
  - Audio: MP3, WMA and WAV (Android) and MP3, WAV and AAC (iOS)
  - Videos: MOV, MP4 and 3GP (Android) and MOV, MP4 and M4V (iOS)



- If your audios images are in other formats you simply can convert the files on your computer. Just use a free tool like [Free Audio Converter](#) or [Free Video Converter](#)
- An additional tip: You can also directly download videos from YouTube and save them in the correct format (MP4) with tools like <https://notube.net/en>

## Supported devices Android (may differ with regard to the mobile app & web app)

- **All Android Smartphones and Tablets from Android 7.0 (Nougat)**
- If you plan on purchasing a device for using the eSense, we suggest the [Nokia 2.4](#) as an affordable smartphone.

## Supported devices iOS

- **All iOS devices from version 12.5 or higher, which are (in part):**
- Apple® iPhone® 5S, iPhone® 6 / 6S, iPhone® SE / SE 2, iPhone® 7/7 +, iPhone® 8/8 +, iPhone® X, iPhone® XR, iPhone® XS, iPhone® 11/11 Pro, iPhone® 12/12 Pro
- Apple® iPad® from 5th generation (iPad Air) or newer, including all iPad Mini from 2nd generation
- Apple® iPad® Pro from 1st generation or newer
- Apple® iPod Touch® from 6th generation or newer

**Additional note Siri:** Please note that Siri can NOT be activated while you do a measurement with the eSense app (this applies to all eSense sensors). Otherwise a running measurement can be disturbed and your values be wrong therefore. You have to deactivate Siri YOURSELF (our app can't do this due to the settings of Apple).

In order to deactivate Siri go Settings -> (General ->) Siri and deactivate Siri (the exact steps can vary depending on the version of iOS).

## Notes before starting the eSense Mobile App

In the following course of the manual we will now go into the use of the mobile app. For an explanation of the use of the web app, please watch the videos at [www.mindfield-esense.com](http://www.mindfield-esense.com). The exact use of the web app is not described in a manual, but only in the form of videos on the website [www.esense-muscle.com](http://www.esense-muscle.com).

**Many of the instructions on how to proceed are congruent between the mobile app and the web app. Therefore, please always make yourself fully familiar with this manual, it conveys a lot of knowledge for a successful use of the eSense Muscle, regardless of the software application.**

There is also no cloud connection for the eSense Muscle. The creation of an account does not

bring any advantages for the use of the eSense Muscle.

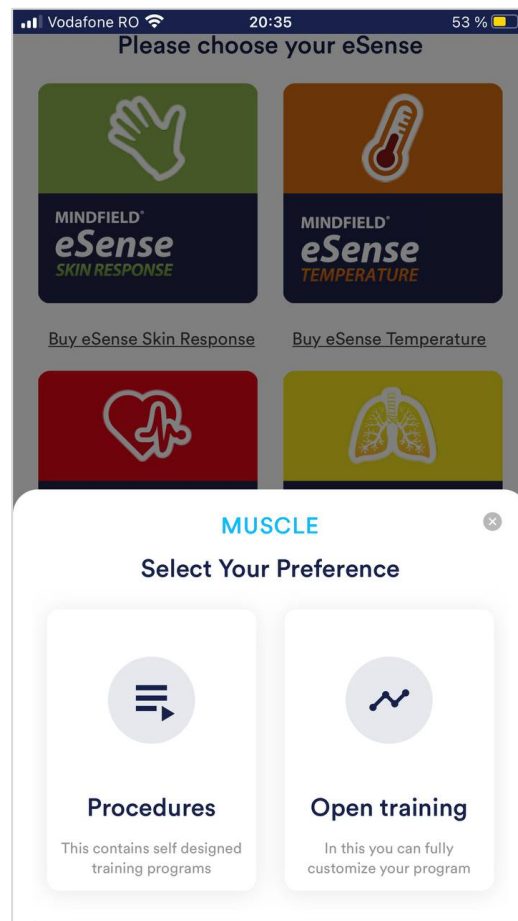
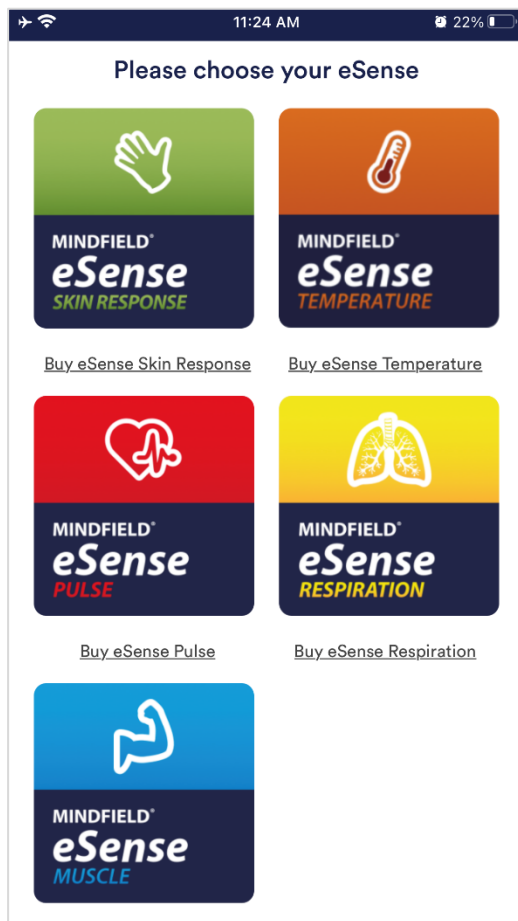
## Preparation and start of the app

Create the conditions needed for a successful training:

- find a quiet room (mobile phone etc. switched off)
- appropriate temperature of 20-22° C (68-72° F)
- convenient seating
- comfortable clothing

Strong physical activity before measurement should be avoided. In order to obtain comparable measurements, you should always **train under the same conditions**.

The **number of sessions** required for reliable success is relatively small compared to other biofeedback training sessions. Usually, six to ten sessions are sufficient. As far as the duration of a session is concerned, it depends on your ability to concentrate, but should not exceed 30 minutes. If you are experiencing severe fatigue, the training should be shorter and a higher number of sessions should be done.



## Home Screens

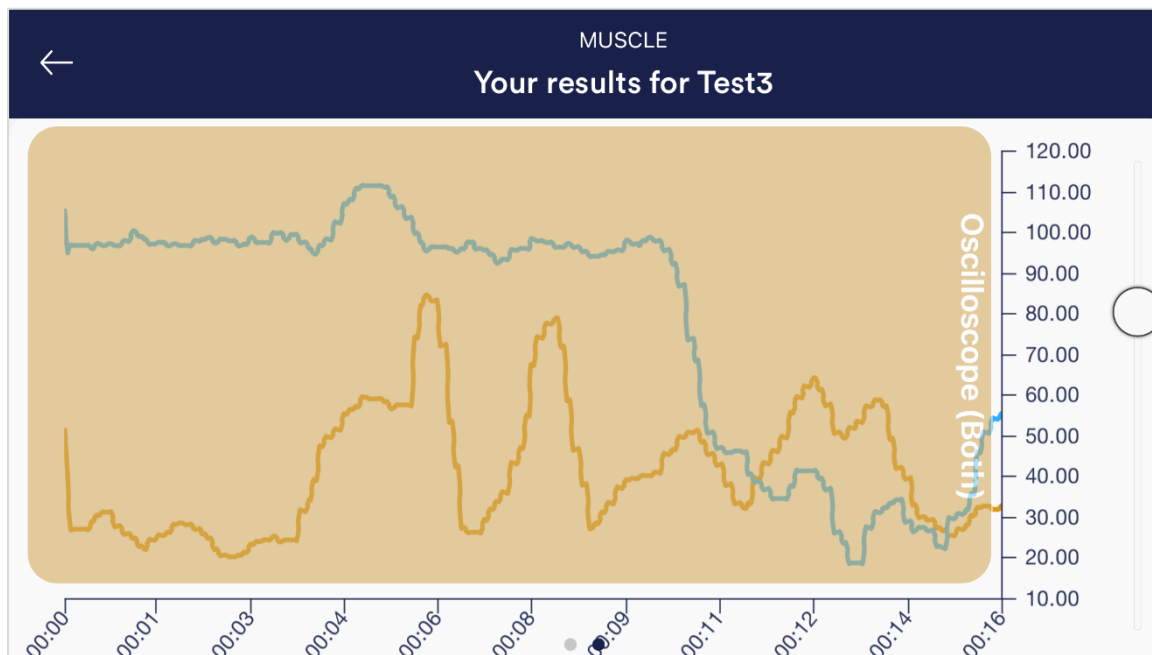
First tap on the logo of the eSense you want to use (here eSense Muscle) and then choose between procedures or free training.

The next step is to start the app. At the beginning you can choose between a free training and a procedure. We recommend that you start with a procedure. We present you both below.

## Procedures

A procedure consists of different modules. The procedures can be used, for example, to implement instructions for relaxation, a stress test, a defined biofeedback training session or tasks for research purposes.

The possibilities are manifold. During a procedure, your this electromyographic activity is recorded. At the end of a procedure, a summary is displayed, showing your readings for each module and the overall view.



**Overview after a procedure (in this example a 2 channel measurement with the oscilloscope module)**

We recommend that you **try the demo procedures** included in the app. These give you a guided overview of the different modules and functions.

The included procedures are also protected by a password in order that those can't be edited or deleted by accident. You can any time create a copy of those procedures without a password and change it as you wish.

We also explain in detail how you can create and edit your own procedures in the chapter procedures settings.

## Open Training

As a second option, you can also do free training. This differs from the procedures in that it is a little more complex. In the following we give you a few examples of how EMG biofeedback training with the eSense Muscle could look in different applications.

Please consider this only as a rough guide. There are a variety of options, this is just a brief overview. There is a lot of literature on the subject of EMG biofeedback, which gives further assistance on how to proceed.

## Preparation and start

1. Follow the first steps of preparation from the previous chapter and select a free workout in the selection screen after starting the app. Then switch to the settings and

connect the eSense Muscle there. Select the channel and filter you want. Go back to free practice.

2. Now start a free measurement (just press "Start" in the main screen) and take a first look at the measured values of your muscle signal. Let your muscles loose and try to tense them as much as possible. You should see a suitable response on the curve.
3. In order to achieve optimal comparability of sessions, you can define the time for a measurement in the settings of the eSense app and limit it to a value, e.g. 10 minutes. The measurement then stops automatically after this time has elapsed. In the standard setting of the eSense app, the measurement time for the eSense Muscle is a maximum of 30 minutes. If you want to exercise longer, you will need to split the exercise into two or more recordings. It is advisable to set a time after the first experiments and to set it in the settings, which corresponds to the desired, regular training duration. In this way you will receive an optimal evaluation and comparability of your training sessions later.
4. The choice of channels and filter settings is also essential for comparing measurements with one another. Obviously, you can only compare measurements with the same number of channels and the same filter settings. Test the available filter settings once and look for the filter that best represents the muscle signal. First choose the narrowest filter and only switch to a wider filter if you have the impression that the signal is only partially and inadequately displayed. Experimenting with the filters is useful and helpful in order to get an assessment of the muscle signal.
5. The filters have a further meaning when it comes to the assessment of the muscle signal with regard to the so-called "slow twitch" and "fast twitch" muscle fibers. While the fast fibers are responsible for strong and fast movements and their activity is mainly between 100-200 Hz, the slow fibers ensure that a basic muscular tension is maintained. The slow fibers are also more persistent and react to physical and emotional stress. Their frequency maximum is below 80 Hz and can be better captured with the 20-300 Hz filter. More on this in the following sections.

## Usual applications, for example muscle building training

1. In this example, the goal is to gradually increase electrical muscle activity and thus its muscle contraction force. Both the maximum achievable level of the amplitude (the strength of the tension) and the duration over which this can be maintained play a role.
2. A reduction in strength or a disorder of fine motor skills can be positively influenced by biofeedback EMG muscle building training. The special feature here is the fine



resolution of the measurement, i.e. even minimal muscle activity can be measured and made visible. Under certain circumstances, this can be a tension that is only visible in a slight increase in the measurement curve, not in a visible movement of the measured muscle.

3. The activity of the muscles can be increased bit by bit through targeted training. It is assumed that biofeedback training promotes the facilitation of neurophysiological reorganization processes.
4. In this example, 2-channel leads are often used. For example, if the left arm is weaker than the right arm, the 1st channel can be placed on the left arm and the 2nd channel on the right arm, on the same muscle. This allows the measured values of both arms to be compared with each other and a training goal can be to train the left arm to the same strength as the right arm. The side comparison is helpful in many situations. One canal can also be increased while the other canal should remain calm, i.e. one muscle should be tensed while the other muscle should NOT be specifically tensed.
5. The training of building and strengthening muscles can also be combined with aids such as sports equipment, dumbbells, etc. in order to achieve an additional training effect. The biofeedback measurement helps to measure the progress and to present a clear comparison of the measurements. As always, make sure that the electrodes, the filters and the training duration are positioned exactly the same and repeatedly.

## Common uses, for example muscle relaxation

1. There are different levels of application in the field of muscle relaxation / muscle relaxation:
  - a. To support psycho-education / self-awareness, e.g. to show how muscles react to stimuli such as negative thoughts, certain postures and certain everyday situations. Also to gain a conviction of control that control over the muscles can be exercised and observed
  - b. As general relaxation training in connection with progressive muscle relaxation, i.e. the repeated tensing and relaxing of muscles and observation by means of EMG measurement. The added value of EMG biofeedback is clearly in the increase in the efficiency of the training and the verification of success through the measured values
  - c. As a targeted technique to reduce bad posture, imbalances and increased muscle tension in response to stress.
2. Place the electrodes either directly on the muscles that you want to reduce tension or where you suspect increased tension. With relieving postures, increased muscle tension can occur in a completely different place, for example, because muscles are tensed there in order to spare other muscles.

3. Start the measurement and observe your measured values for a while. You can see your muscle activity in the form of a curve or bar. On the main screen of the app in portrait format, you can see the amplitude in the form of a bar. This is the most direct form of presentation. In landscape format you can see the muscle tension as a curve and numerical values.

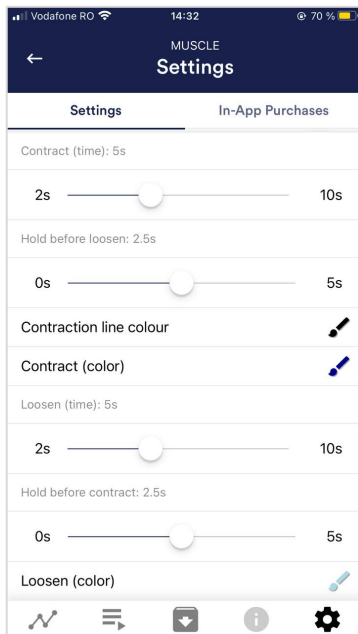


### Amplitude

Two images of the muscle tension bar in portrait format and the muscle signal curve in landscape format.

4. As an exemplary exercise, you can try to tense your muscles and then loosen them up as best you can. Repeat this a few times. While doing this, observe the measured values and see whether you are able to lower the measured value even further than at the beginning of the measurement. You can also have another person massage your tense muscles and see the effects that a relaxation massage has on the muscles. This is also often clearly visible in tense muscles.
5. Try how different postures (sitting, standing, lying) affect the muscles. For example, sitting and working at a desk can often be accompanied by poor posture that has negative effects on the muscles. Note that increased muscle tension does not always show when you measure with the eSense Muscle in a comfortable position, but sometimes only under certain problematic conditions, which you can then integrate into the measurement.

- Practice tension and relaxation using the contraction aid. You can activate the contraction aid in the settings of the app; it is not activated by default. Activate



this and start exercising at a usual frequency. Adjust the frequency according to your wishes and switch to landscape format during free training, where you can change the view by "swiping" and get to the oscilloscope + contraction aid. Practice the tension and relaxation phases for a few minutes and observe the curve and values.

**5 seconds to tense, hold for 2.5s and 5 seconds to relax, let loose for 2.5s (= 4 contractions per minute)**

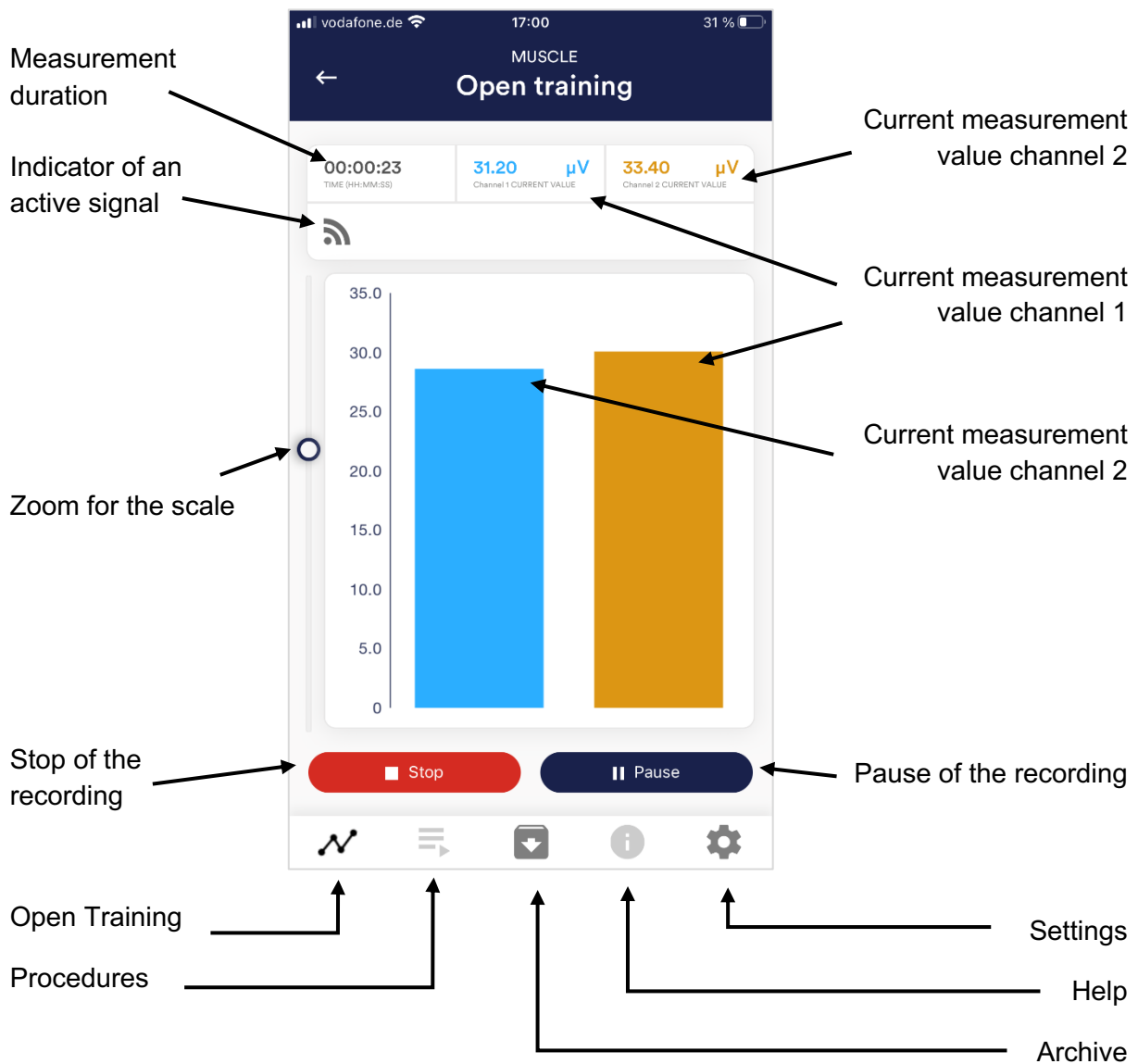
- Train with the help of the various biofeedback functions that the app offers you. In landscape format you have the contraction aid as a line and sphere. You have a freely selectable video, which changes in many ways to match the muscle tension. Use music and tones, which you can activate in the settings. The individual feedback functions are all described in more detail in the corresponding chapter of the app.
- Use the procedures provided!** This enables you to get to know the various functions of the app even better and to carry out standardized training. If you like, you can create your own, individual procedure with your favorite feedback variants.

## Usual applications, example stress test

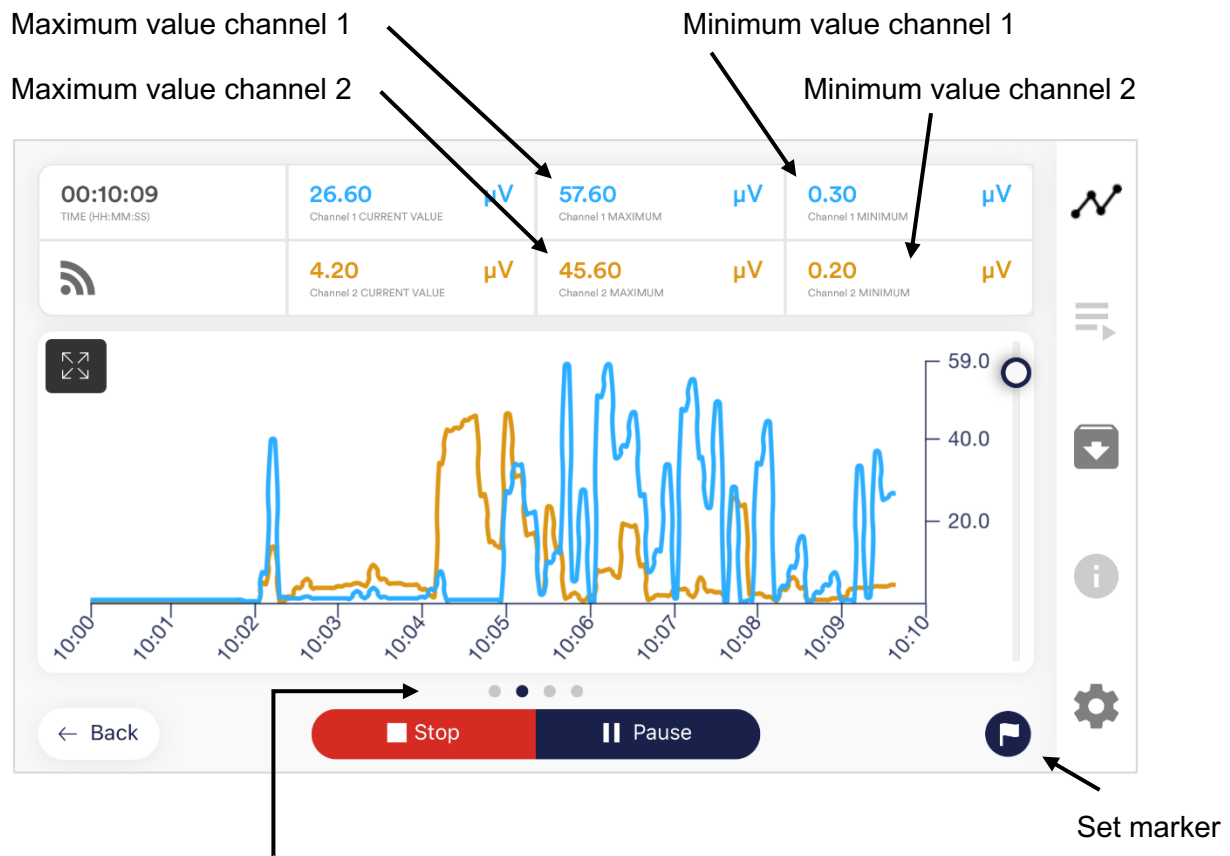
- Under certain circumstances, it makes sense to work more specifically with stress stimuli in order to train how to cope with stress. EMG biofeedback is well suited for the use of targeted provocation methods, as it shows a prompt and sensitive reaction to a stimulus, and this reaction is often proportional to the strength and significance of the stimulus.

2. Start the measurement and observe your measured values for a while. Then try to relax. The training begins with a rest period of a few minutes.
3. Now a stressor (stress stimulus) is to be used in a targeted manner. Examples are: negative thoughts, looking at emotionally charged images or objects as well as unpleasant noises. Tasks such as mental arithmetic, simulating an exam or uncomfortable situation over a certain period of time are also good stressors. As a rule, everyone knows things that cause tension and excitement. For example, if you are reluctant to speak in front of large crowds, try giving a speech spontaneously or trying to imagine the situation. If you are exposed to such a stressor, watch the readings and you will likely see an increase in muscle tension and a persistence at a higher level. Then try to let the curve drop again, loosen the muscles in a targeted manner and get back to a low starting level.
4. Within a training session you can alternate the phases of relaxation and stressors, about three to four times. Always end a session with a rest phase and do not overwhelm yourself. Do several training sessions, spread out over a longer period of time, until you feel like you are reacting less severely to stressors or recovering more quickly.

## General view & Open Training

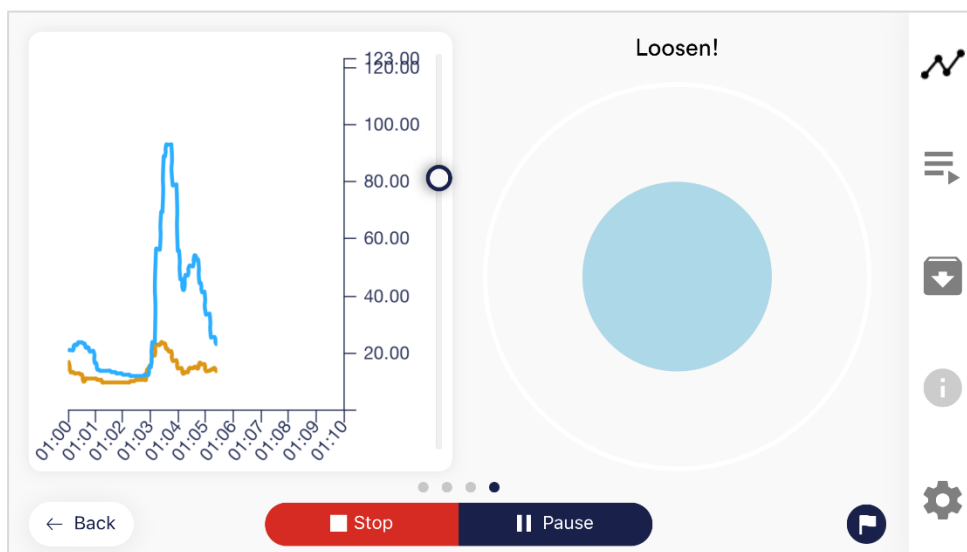






Swipe the screen to the left or right to switch between this main view and the other views. After the measurement, you can also switch to the pie charts.

## Contraction Helper

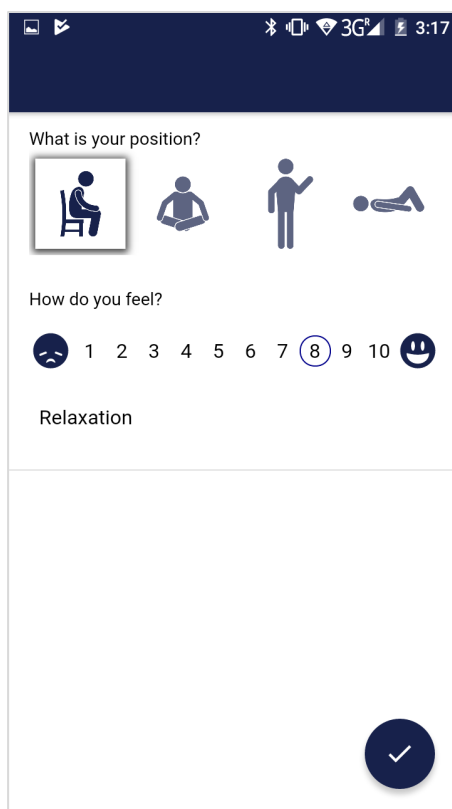


Contraction helper as sphere

You can activate the contraction aid in the general settings. Tighten and relax your muscles according to the expansion of the ball. Tense as the ball grows, relax as the ball shrinks.

## Survey (optional)

If you have activated this option in the general settings, a small survey will appear immediately after each measurement. This allows you to archive measurements that are reproducible in the long term or to document a change in your measurements. (If you for example start to use the eSense while lying down instead of sitting down).



### Your position during measurement

Choose between sitting, the "tailor's seat" or yoga seat, standing or lying down.

### How do you feel?

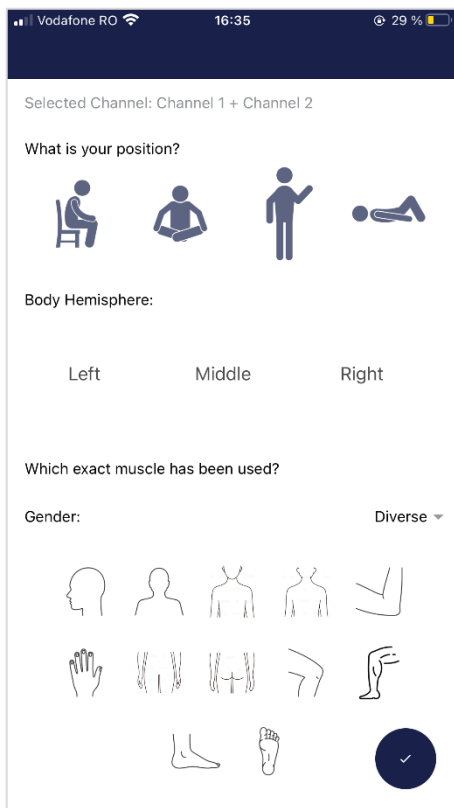
Here you can indicate your state of mind after the session. This gives you the opportunity to record your mood together with the measurement results over the long term.

### Body side

With the eSense Muscle you can note which muscle you trained on which side(s).

### What exact muscle was used?

To do this, you can tap the corresponding muscle and, if necessary, record the name of the muscle and a note.

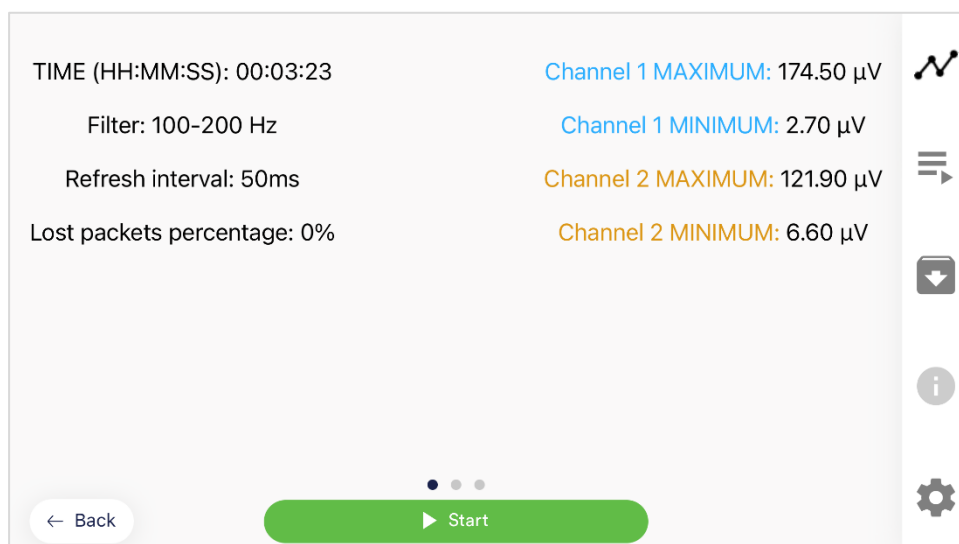


**Note function, optional** Here you can add a note to the measurement in the free text field. We recommend that you write down any special circumstances so that you can still classify measurements with a lot of stress or relaxation later.

## Analysis (after the measurement)

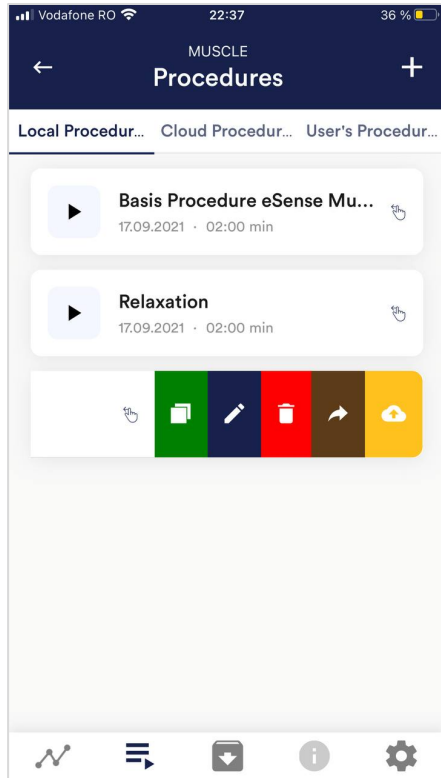
After the measurement (and optional questioning), in landscape format, a screen appears with an analysis: the measurement duration, the filter used, the refresh interval and the lost packets in percent. In addition, the minimum and maximum values of the channel(s) are displayed.

At this point, you can also swipe the screen to the left or right to switch between the analysis and the graph of the measurement.



## Analysis and overview after a measurement with 2 channels

### Procedures



#### Edit or delete procedure

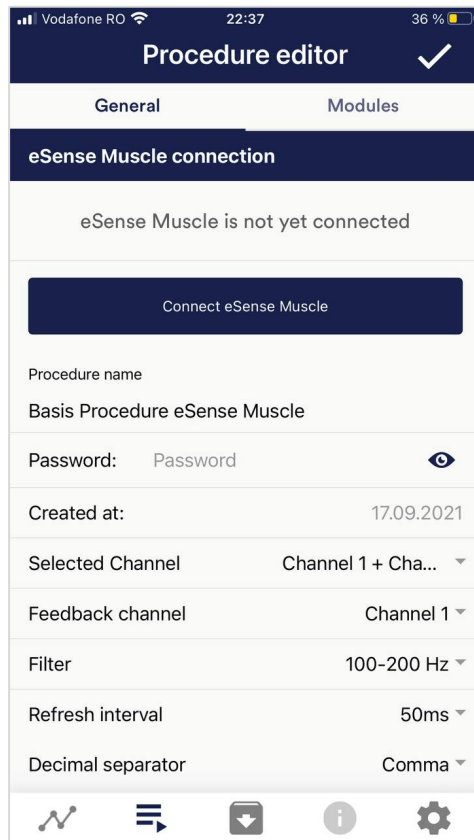
To edit a procedure, simply move it to the left in the overview.

You will then see the blue pencil icon for editing the module.

If you want to copy the procedure, tap the green copy icon.

With the red trash can symbol on the right, you can delete the procedure completely.

## Procedure Editor



The screenshot shows the 'Procedure editor' app interface. At the top, there's a status bar with 'Vodafone RO', '22:37', and '36 %'. Below the title bar, there are two tabs: 'General' (selected) and 'Modules'. Under the 'General' tab, there's a section titled 'eSense Muscle connection' with a message 'eSense Muscle is not yet connected' and a 'Connect eSense Muscle' button. Below this, there's a 'Procedure name' field with the value 'Basis Procedure eSense Muscle'. A 'Password' field is shown with a toggle icon. The 'Created at' field shows '17.09.2021'. There are three dropdown menus: 'Selected Channel' (showing 'Channel 1 + Cha...'), 'Feedback channel' (showing 'Channel 1'), and 'Filter' (showing '100-200 Hz'). There are also two more dropdowns: 'Refresh interval' (showing '50ms') and 'Decimal separator' (showing 'Comma'). At the bottom, there's a navigation bar with five icons: a line graph, a list, a download arrow, an information 'i' icon, and a settings gear icon.

### Procedures Name

Here you can give your procedure a suitable name (as an example in the picture, the name "Relaxation").

### Password (optional)

If you want, you can protect your procedure with a password.

### Selected channel (professional version)

Here you can select which channel (s) you want to use

### Feedback channel (professional version)

Determine which of the channels controls the feedback in the modules of the procedures

### Filter

Here you can set the filter for the procedure. More about the filters in the chapter "Preparation and start".

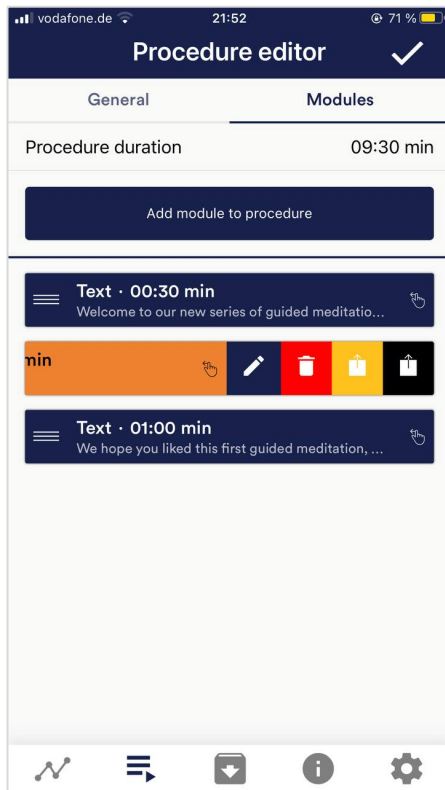
### Refresh interval

Set the interval at which the display should be updated. We recommend the preset 50ms.

### Decimal separator

You can choose between point or comma as separator of values in CSV export of procedures.

## Add new module



In the procedure editor, select the "Modules" tab.

### Add module to procedure

Click on this button to add another module.

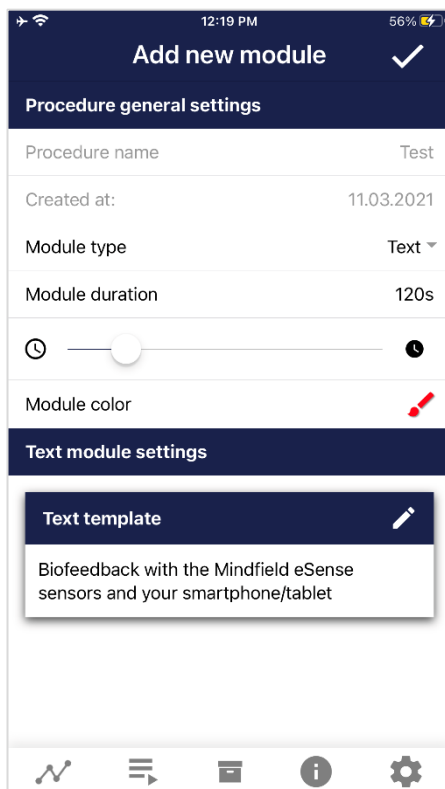
### Edit module

Slide the module to the left and tap on the blue pencil symbol to edit.

To delete a module, tap the red trash can icon.

To duplicate a module within the procedure, click on the yellow sharing symbol.

To duplicate a module to another procedure, click on the black sharing icon and select the procedure from the following popup.



### Module Type

You can choose between a text, a fixation cross, an image, a video, an audio file, an arrow, a bar graph, a smart bulb, an oscilloscope or a contraction helper.

### Module duration

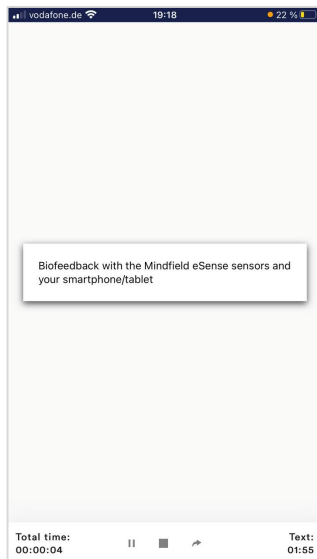
Set how long the module shall last. Simply swipe the slider to the left or right.

### Module color

Determine the color of the module in the procedure editor.

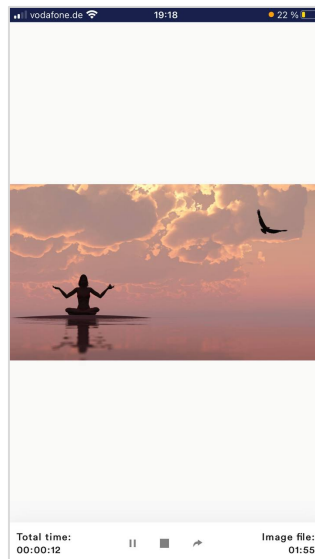


## Overview of the modules



### Text module

This module shows a text which you can edit.



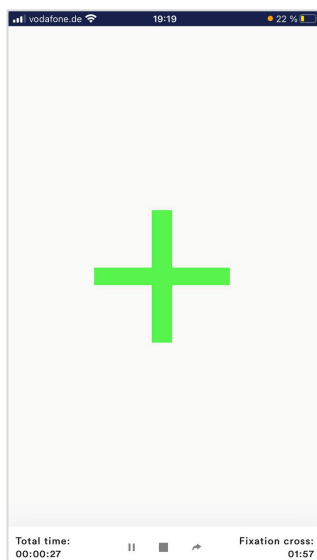
### Picture module

The picture module shows either a standard picture from the app or a picture from your gallery.



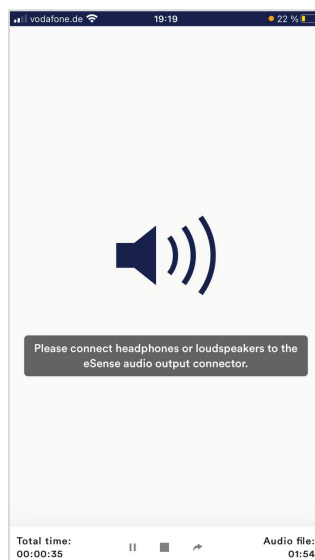
### Video module

In the video module, you can choose either the standard video from the app or use your own video.



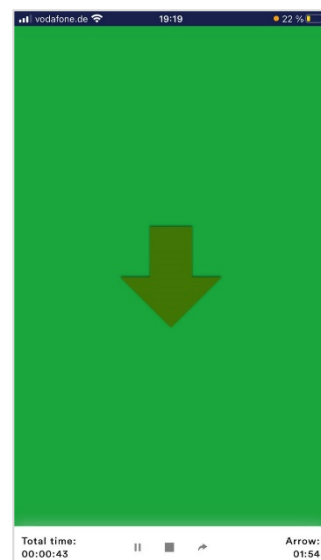
### Fixation cross module

The cross changes its color depending on the conductance and provides direct biofeedback.



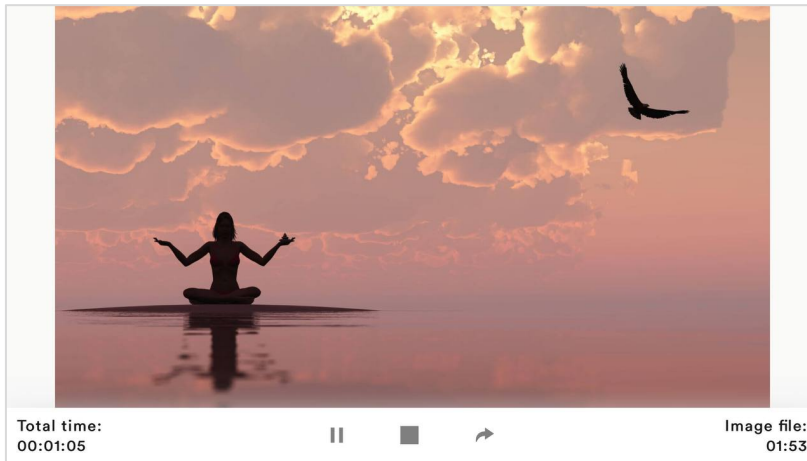
### Audio module

The audio module is playing a relaxing song. You can choose your own music.



### Arrow module

The arrow changes depending on relaxation and gives you direct biofeedback.

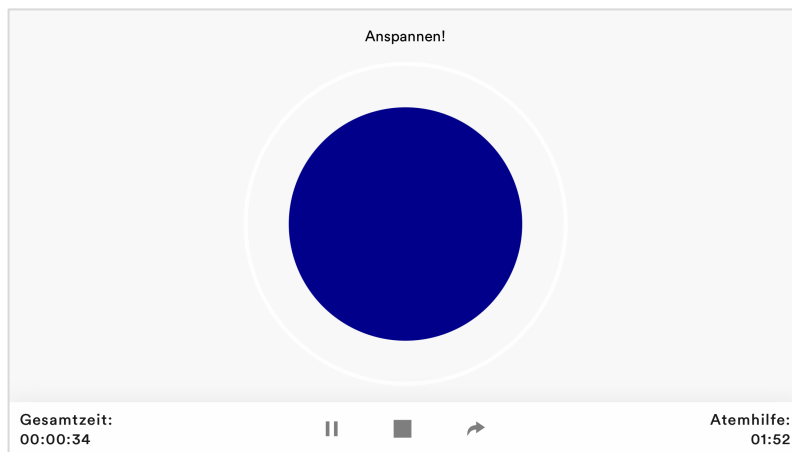


### Picture module in landscape format

Many modules can be displayed in landscape format as well.



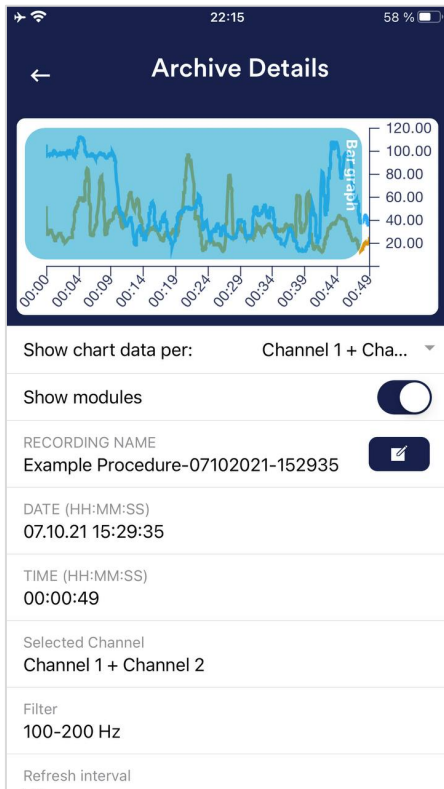
### Kontraktionshilfe (Typ Linie)



**Kontraktionshilfe (Typ Kugel)**



**Kontraktionshilfe (Typ Balken)**



### Procedure in the archive

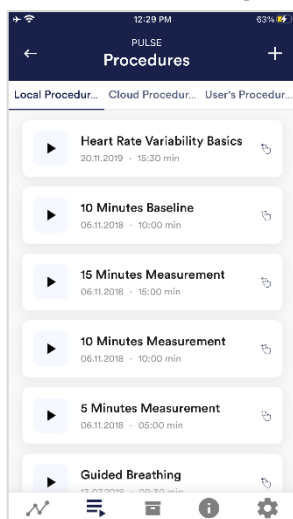
In the archive you can view procedures as well as normal measurements.

### Show modules

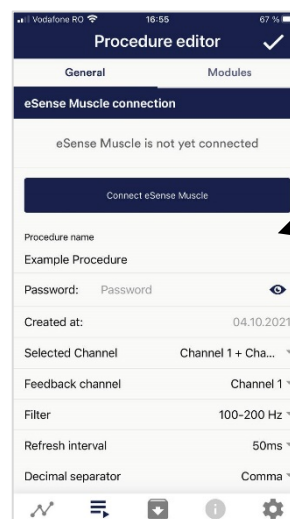
The only difference is that you can also display the modules for procedures in the archive (in this example a single bar graph module).

Especially in the case of longer procedures with several modules, you can display them all via the graph.

## Creation of a procedure

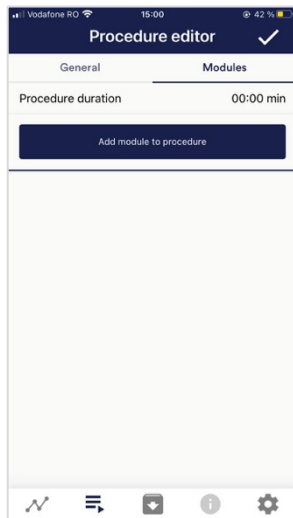


1) Tap on the plus icon to create a new procedure.

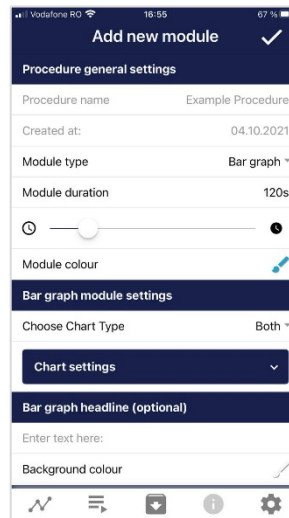


2) Give the procedure a name (here "Example Procedure").

You can simply accept all other default settings for this example.

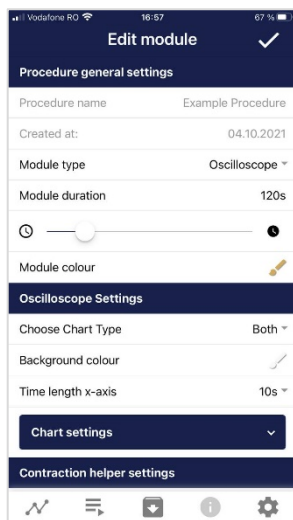


3) Select the upper tab "Module" and tap on the button "Add module".



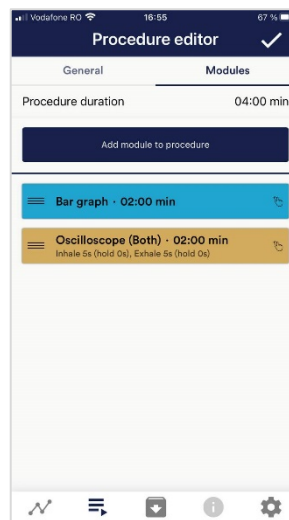
4) Select a bar graph module and tap the check mark.

Here, too, you can accept the default settings.

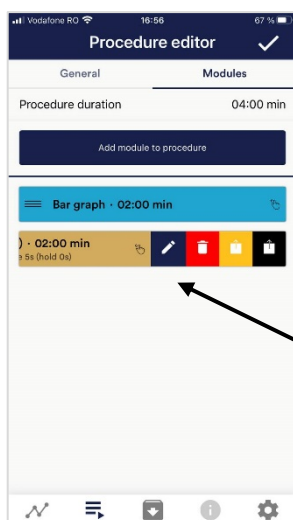


5) Then add an Oscilloscope and breath pacer module

Here, too, you can accept the default settings.

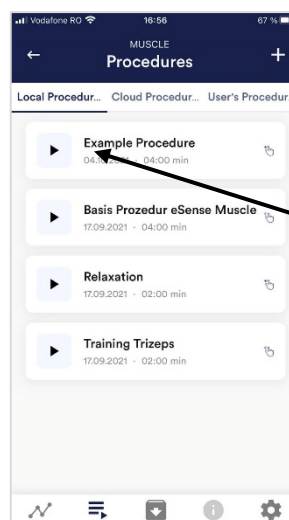


6) Your procedure should now look like this.



7) If you want to change something at a later date on one of the modules, you can swipe the corresponding module to the left and tap on the blue pencil symbol.

Otherwise you can now tap the tick at the top right.



8) Start the procedure by tapping the play button.

Have fun!

## Own media (photos, video and audio)

You can use your own pictures in the picture module, your own videos in the video module or your own music or melodies in the audio module in the procedures.

Android usually enables this without any further problems. As long as you allow the eSense app to access your files on your device, you can upload them to the eSense app.

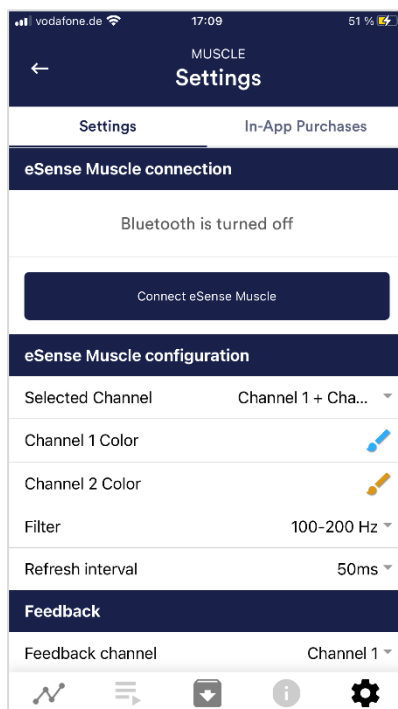
iOS is a bit more restrictive. As usual, you can use your pictures from your device in the iCloud for pictures and videos.

For audio files you need iTunes (or an alternative such as "CopyTrans Manager"). This is where your music or melody must be. You can find your music in iTunes (or CopyTrans Manager) under the tab "My Sound" and insert it into your procedures.

We have a detailed video at [https://www.youtube.com/watch?v=A\\_CRbmBeBBc](https://www.youtube.com/watch?v=A_CRbmBeBBc) where we show all the steps.

On **iOS**, the **power saving mode** must also be deactivated, otherwise the videos in the procedures cannot be played.

## General settings (overview)



### eSense Pulse Connection

Select the eSense Pulse you want to connect. You must perform this step before you can perform a measurement. With the connection test, you can test the connection and see the battery status.

### Selected channel

Here you can select which channel (s) you want to use

### Channel color

Change the color of the channels in the free practice graphs

### Filter

Here you can set the filter for the procedure. More about the filters in the chapter "Preparation and start".

### Refresh interval

Set the interval at which the display should be updated. We recommend the preset 50ms.

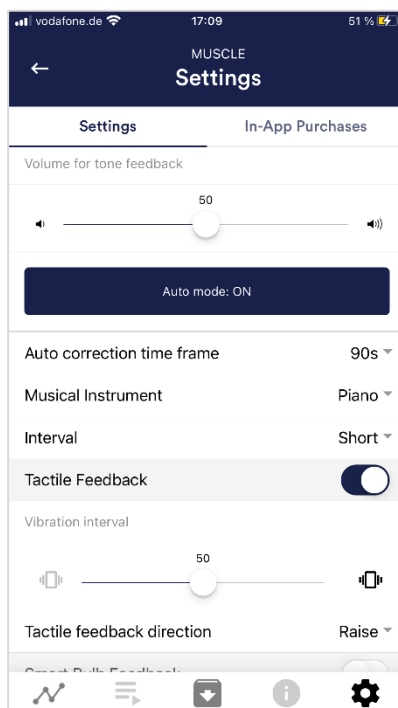
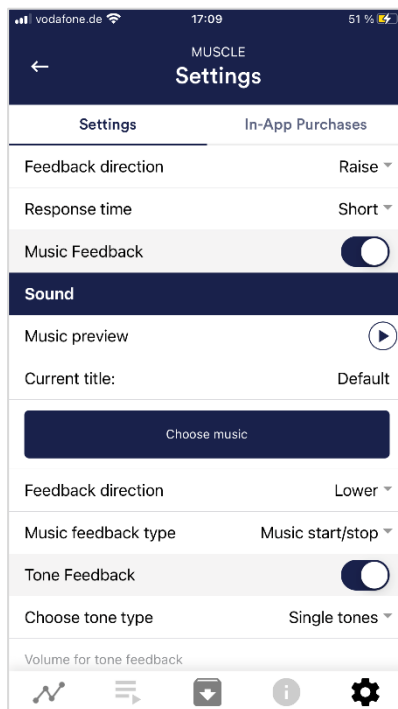
### Feedback channel

Determine which of the channels controls the feedback in free training

### Feedback direction

Select the direction in which you want the feedback to react to. It can respond either to an increase or decrease in the measured values.





### Response time

The default setting is "Short," which allows feedback to respond quickly to changes in readings. For longer measurements, we recommend "Medium" or "Long," then the reaction time will be slightly delayed and the eSense will no longer react to every small change in the measured values.

### Music Feedback

If the value moves in the unwanted direction (e.g. lower values), the music will become quieter or change its speed depending on the type of feedback you choose.

### Music preview

Tap the Play button to listen to the selected song.

### Choose Music

You can use the default or your own music.

### Music feedback type

You can optionally choose between music start/stop, volume feedback or playback rate feedback. Note: For iOS are the options restricted.

### Tone Feedback

In the background, you can hear sounds from other apps.

### Choose tone type

You can choose between single or continuous tones.

### Auto mode

When this is activated, the range in which the sound changes is automatically adjusted. The minimum and maximum values of the set time window are automatically used for the lower and upper limits of the following interval.

### Value range from-to (Not visible when auto mode is enabled)

You can set the area in which the feedback is active. We recommend selecting the range wide at the beginning and to set it smaller over time if necessary. Alternatively, you can use the automatic mode.

### Auto correction time frame (Only visible when auto mode is enabled)

You can specify the time window in which the automatic mode adjusts itself each time.

### Musical instrument

You can choose from various preset instruments.

### Interval

Set an interval for the tone feedback.

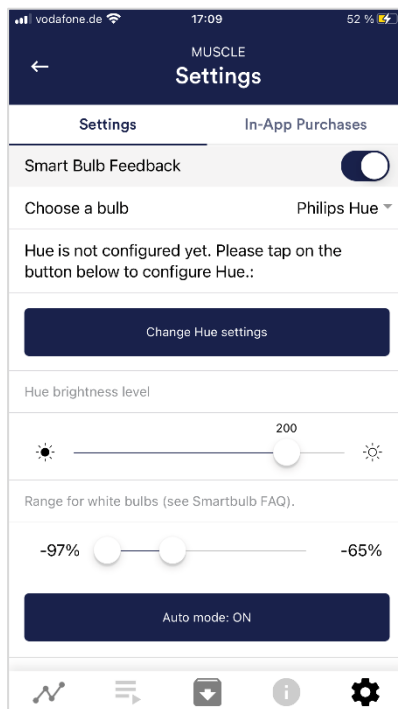
### Tactile Feedback

Your device will vibrate to provide feedback. Only smartphones support this feature, tablets do not have a vibration motor.

### Tactile feedback direction

Decide whether decreasing ("Decrease") or increasing ("Increase") tactile feedback values should be considered a success.

### Smart bulb feedback



The light bulb changes its color depending on the values.

#### Choose a bulb

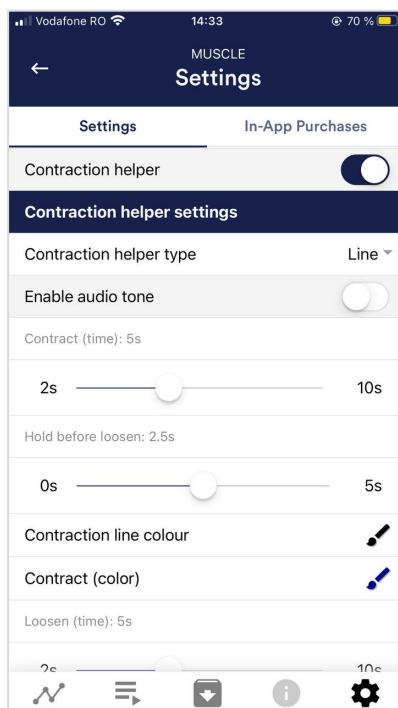
Choose between Magic Blue, Magic Blue V2 or Phillips Hue.

#### Connection test

With this option, the bulb changes color if the connection is successful.

#### Enable audio tone

Tones can also be added as auditory breathing aids.



#### Contract time / Loosen time

Select the seconds for each tension and relaxation that you want the contraction aid to display.

#### Hold before contract / Hold before loosening

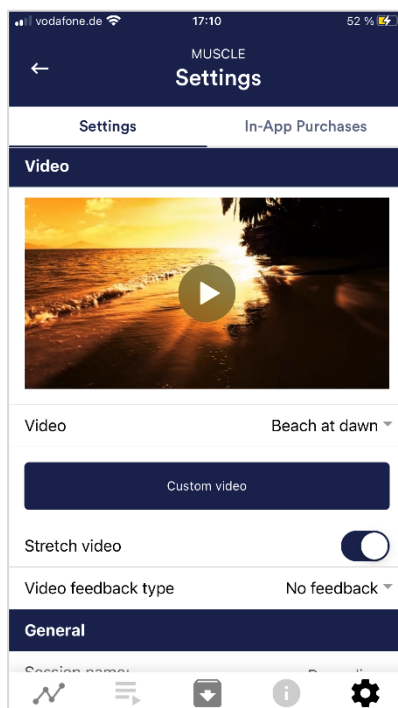
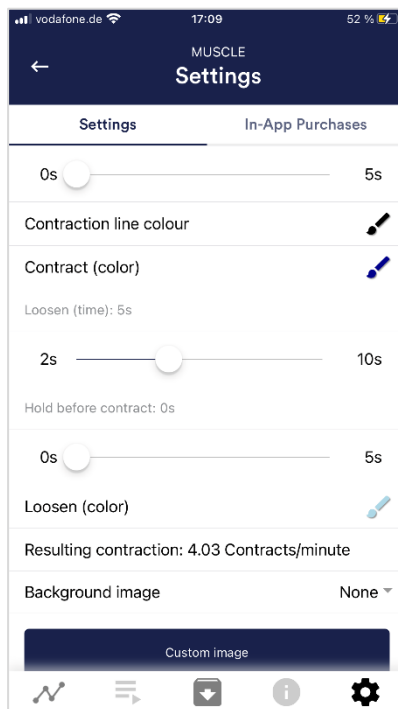
Choose the seconds between inhalation and exhalation.

#### Contract / Loosen color

Choose the color of the bar or sphere for inhalation and exhalation.

#### Background image

You can add a background image to aid in contraction.



### Video

Choice: In the dropdown menu, you can select from included videos and "Select your own video". You can select your own videos from your device.

### Video Feedback Type

Effects can be applied to the video as feedback. You can choose between Start/Stop, Sharpness, Brightness and Saturation.

### Session name

Enter the name of your session which will be displayed in the archive here.

### Session time length

You can automatically time-limit normal measurements.

### Time length X-Axis

You can set the time period displayed on the X-axis of the oscilloscope. We recommend 90 seconds.

### Decimal separator

You can choose between comma or dot.

### Survey after recording

Here you can activate/deactivate the survey (position, mood, notes) after each measurement.

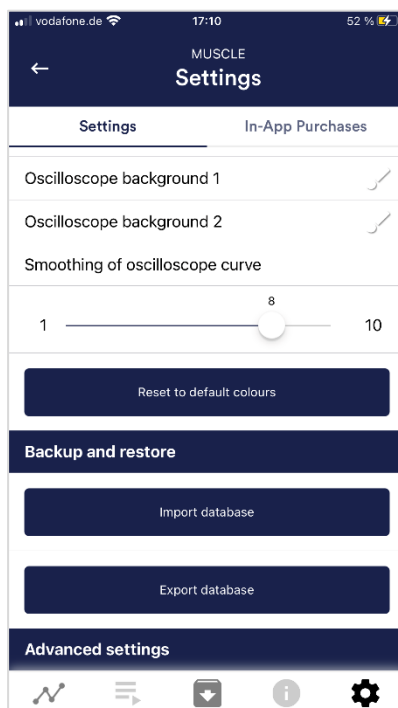
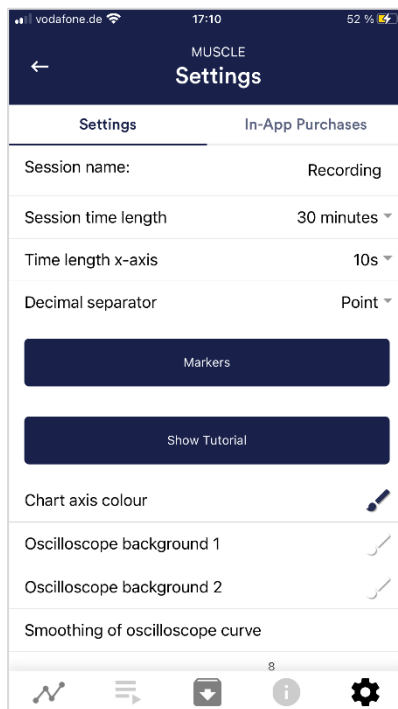
### Markers

If enabled, you can define markers by tapping the + button. These are the markers you can set during a measurement. (See also 'Set Marker' in Landscape mode of the general view above).

### Show tutorial

You can watch the tutorial again at any time from the first start of the app.

### Chart axis color



You can change the color of the chart axis in the main view.

### Oscilloscope background 1&2

You can change the background color of the oscilloscope in the main view.

### Reset to standard colors

You can restore the default colors for the graph at any time.

### Backup & Restore

You can export and import your procedures and measurements. More about this in our FAQ

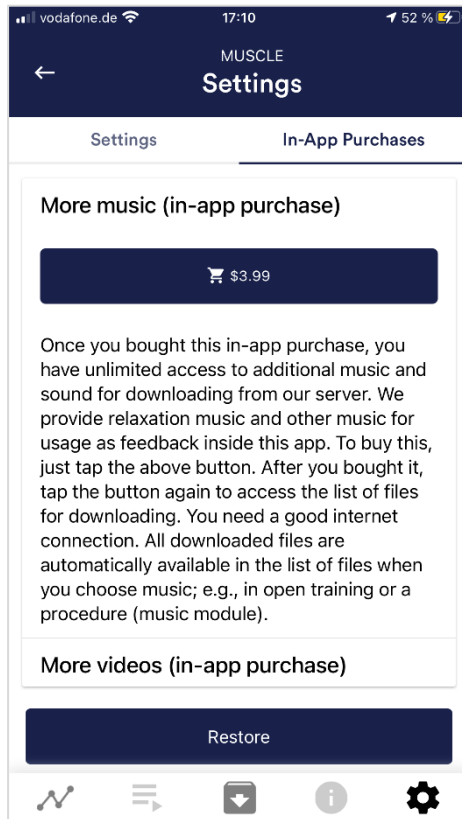
### Demo Mode

A saved measurement is played back automatically. A real sensor is not needed.

### Real time streaming to eSense Web App

This allows you to stream the data live to the eSense Web App.

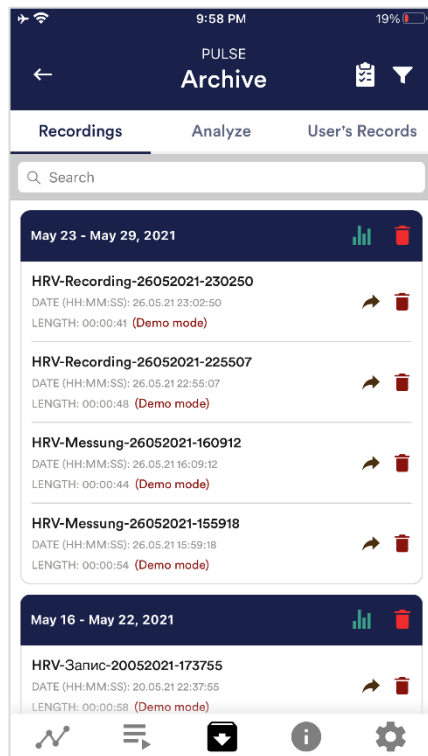
## In App Purchases



## In-App Purchases

Additional to the option to use your own music or videos in the eSense App you can also purchase additional music or videos. We regularly extend the offer.

## Archive (overview)



The app also contains an archive, in which you can save your measurements and export them as well. You can watch those in detail again, compare them to each other and export them individual or all together (as ZIP file).

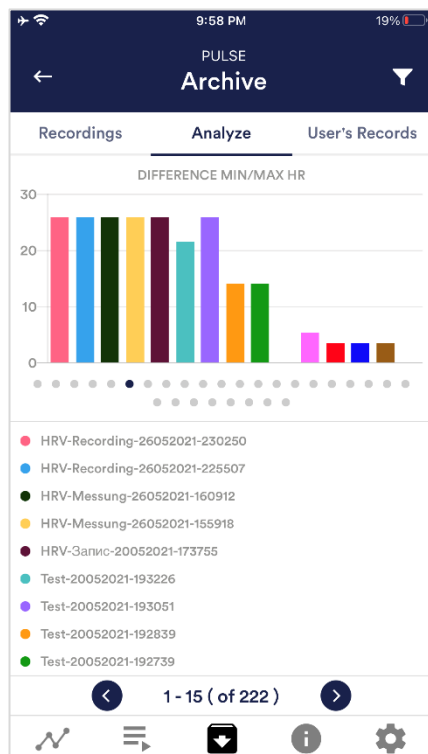
### Recordings

Here you can see your measurements listed. You can view a single measurement by tapping on it.

If you click on the clipboard symbol at the top right, you can mark one, several or all measurements. You can then export, analyze or delete the exported measurement (s).

On the filter symbol you can choose whether you want to sort the measurements by name, date, length in ascending or descending order.

If you want to delete a single measurement from this list, you can also tap on the trash can symbol to the right of the measurement.



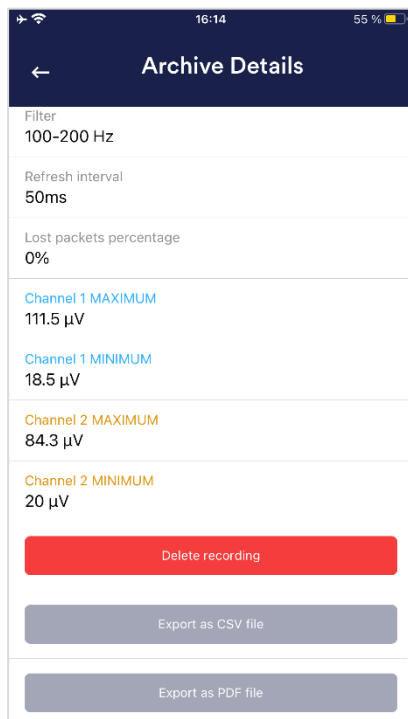
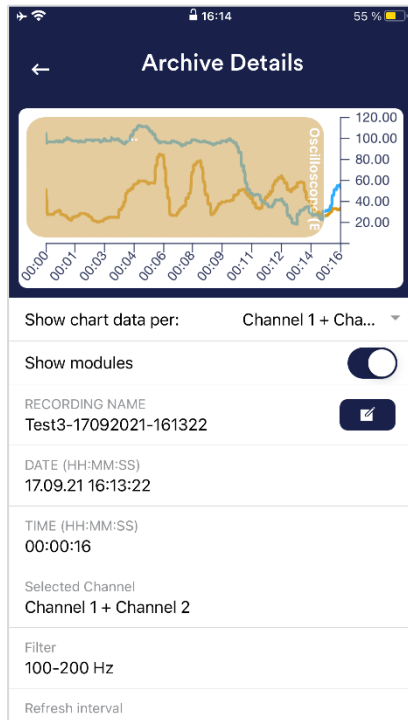
### Analyze

Here all measurements are listed according to time of measurement, minimum and maximum value of the recordings.

With this, you can recognize trends over time and over several measurements (if, for example, your minimum value is increasing over several trainings, you can see this here immediately).



## Archive (single view)



## Export data

By tapping on the export icon at the top right or the "Export as CSV file" at the bottom, you can export the recordings in .csv format with all common apps (e.g. send via Messenger, WhatsApp, email, etc.) or simply save them on your phone or to your cloud.

The data is exported as a .csv file (comma separated values). You can open this file format with Microsoft Excel™ or Open Office Calc (free alternative to Excel), and many other apps.

If you like to work with Google, Google Sheets™ (Google Tabellen™) can also be an alternative to Excel for you. You can also open and visualize your exported .csv files and access them easily from multiple devices via the cloud. Google Sheets™ has almost the same functions as Excel™ and a very similar handling.

**Note:** We have also compiled **detailed instructions for CSV export and processing of your data in a separate manual**. You can find it at the following link:

<http://mindfield.de/esense-csv-anleitung>

## Export as PDF File

You can export the measurement also as PDF alternatively. Note: This takes a moment



We have summarized this point and also provide a **detailed manual for CSV export and processing of your data**. You can find at under the following link:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	DESCRIPTION	VALUE																
2	RECORDING NAME	5 Minutes M																
3	DATE (HH:MM:SS)	09.12.18 14																
4	TIME (HH:MM:SS)	0:05:00																
5	MAXIMUM	101.9 HR																
6	MINIMUM	51.9 HR																
7	DIFFERENCE MIN/MAX	50.00 HR																
8	AVERAGE OF SESSION	64.94 HR																
9	Increase of HRV amplitude	0:02:32																
10	Steady of HRV amplitude	0:00:13																
11	Decrease of HRV amplitude	0:02:13																
12																		
13	SDNN	61.267 ms																
14	RMSDD	57.771 ms																
15	NN50	101																
16	pNN50	30.89%																
17	Stress Index	43.61																
18	AVERAGE RR	936.0 ms																
19	AVERAGE HR	64.1 HR																
20	Corrected HR values	1																
21	Corrected HR values in %	0.30%																
22																		

eSense Pulse Measurement

The graph displays heart rate variability (HRV) data over a 300-second period. The y-axis ranges from 50 to 110 HR. The data shows significant fluctuations, with a major peak occurring near the end of the recording at approximately 280 seconds, where the HRV reaches about 105 HR. Other smaller peaks are visible around 60, 100, and 200 seconds.

### Exported measurement in Excel

You can also set markers during the measurement. For example, if one of your biofeedback exercises involves quiet breathing, you can set a marker at that location during the measurement. Later, in the exported data, you will see where you breathed calmly. This is especially useful for longer measurements with several actions. The markers can also be displayed particularly well in Excel:



## Technical data about the Mindfield eSense Muscle

Bluetooth	
<b>Bluetooth version:</b>	5.0 Low Energy, downward compatible up to 4.0
<b>Frequency range:</b>	2402-2480 MHz
<b>Data rate (up to):</b>	2 Mbps
<b>Several channels:</b>	40
<b>Channel spacing:</b>	2 MHz
<b>Antenna type:</b>	Integrated antenna
<b>Antenna Gain:</b>	0.5dBi

### eSense Muscle:

- Two-channel EMG biofeedback device
- Bluetooth 5.0 transmission to PC or smartphone/tablet (Android and iOS)
- Fixed Li-Ion battery 1600mAh for up to 12h continuous operation
- Two bipolar EMG inputs (CH1+, CH1-, CH2+, CH2-); one Analog Ground
- Two multifunction buttons for using the device
- One RGB LED to show the operating status
- 24-bit ADC and preamplifier for each channel
  - A native sampling at 2 kHz per channel.
- Three bandpass filters (Bessel, 8th order) per channel. -3dB cut-off frequencies: BP1: 20..950Hz, BP2: 20..300Hz, BP3: 100..200Hz
- RMS calculation and moving average over 0.5 seconds. Decimation to 100 RMS samples per second
- 200mV differential measuring range per channel
- 0.024  $\mu$ V ADC resolution per LSB
- < 1.7  $\mu$ V RMS noise BP1
- < 1.3  $\mu$ V RMS noise BP2
- < 0.8  $\mu$ V RMS noise BP3
- Channel 1 and 2 CMRR at 50Hz and 60Hz: better -105dB
- Protection against electrostatic discharge (ESD) up to +-15kV according to the "Human Body Model," IEC 1000-4-2, Air-Gap Discharge
- HF filter
- Operating mode: continuous operation
- Measurement accuracy EMG amplifier / ADC
  - Reinforcement:  $\pm 5$  % basic accuracy,  $\pm 0.2$  % after calibration
  - The band passes lower and upper cut-off frequency:  $\pm 0.1$  %
  - Sampling frequency: better than  $\pm 0.1$  % (resonator)
- Operating range: 5-40 °C,  $\leq 95\%$  relative humidity

## Troubleshooting connection problems

In case of Bluetooth connection problems between the eSense Muscle and your end device, please check the following steps:

1. Is the eSense Muscle charged and ready to use? Is the blue LED lit? Turn the eSense Muscle off once (5s pressure on the black switch 1) and then, when the LED has gone out, turn it on again by briefly pressing switch 1. Wait approximately 15-20 seconds for the eSense Muscle to start entirely.
2. Is Bluetooth Low Energy (from Bluetooth 4.0) available on your end device? Check the technical data of your PC, smartphone and tablet.
3. Is Bluetooth switched on and ready for operation?
4. The connection between the eSense Muscle is **only** established within the eSense Web App or eSense Mobile App and **NOT** in the Bluetooth settings of your operating system. Please do **NOT** pair the eSense Muscle in the Bluetooth settings of Windows, iOS or Android, because then no access can be made through the web app or mobile app. If you have done so, disconnect entirely.
5. If you still have problems with the Bluetooth connection, please try another device to rule out general issues with your PC, smartphone, or tablet.

## EC Declaration of Conformity for the Mindfield eSense Muscle

**According to the following guidelines:**

2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on harmonizing the laws of the Member States relating to electromagnetic compatibility.

RoHS substance bans (2011/65/EU)

WEEE Waste Electrical and Electronic Equipment (2002/96/EC & 2008/34/EC)

**The manufacturer/distributor/authorized representative**

Mindfield Biosystems Ltd.  
Hindenburgring 4  
D-48599 Gronau  
Germany

WEEE-Reg.-Nr. DE 24465971

**hereby declares that the following product:**

"Mindfield® eSense Muscle"

**follows the provisions of the guidelines identified above and their amendments in force at the time of the declaration.**

**The following harmonized standards have been applied:**

DIN EN 62368-1:2016-05 Equipment for audio and video, information and communication technology - Part 1: Safety requirements

DIN EN 61326-1; VDE 0843-20-1:2013-07 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements (IEC 61326-1:2012); German version EN 61326-1:2013

DIN EN 61326-2-2; VDE 0843-20-2-2:2013-08 Electrical equipment for measurement, control, and laboratory use - EMC requirements - Part 2: Electrical equipment for measurement, control, and laboratory use  
Part 2-2: Particular requirements - Test arrangement, operating conditions and performance characteristics for the portable test, measurement and monitoring equipment for use in low-voltage power supply systems (IEC 61326-2-2:2012); German version EN 61326-2-2:2013

**Location: Gronau, 05 May 2021**

N. Rockensüß  
  
www.mindfield.de  
A Better State of Mind

Niko Rockensüß, Managing Director



According to legal requirements, the Mindfield eSense has to be recycled as electrical waste.

WEEE-Reg.-Nr. DE 24465971

## Privacy policy

The eSense App does not collect any personal data, such as name, gender, date of birth, etc..

Each recording of measurement data is done under a general prefix such as "measurement", supplemented by with the eSense sensor used, the current date and time of the measurement. The recorded measurement data cannot therefore be assigned to any person.

The prefix of a recording, e.g. "measurement", can be changed by the user in the settings and used for the assignment to a person. Users can decide whether to change this prefix to their name, for example. Then each measurement and also each CSV file exported from it contains the name of the user in the file name.

### Access rights within the eSense App

1. Access to media library: Access to photos, music, and videos is only required if you want to use your own photos, music, and/or videos in the eSense App. The eSense app should be used as feedback. It is also possible to use only the by the app supplied media.
2. Access to the location: The access to the location (activation of GPS) is only required for the Bluetooth connection to the Magic Blue bulb (optionally available) or the eSense Pulse. This is mandatory under Android and lies outside the possibilities of the publisher of the eSense App. No standard data is collected, the standard function is not used.
3. Access to Bluetooth: If the eSense app is used with the Magic Blue smart bulb to provide biofeedback by modifying the color and brightness of the light bulb, it needs to be connected via Bluetooth within the app. To do this, the Bluetooth function is used. For the eSense Pulse Sensor, Bluetooth is also required as it transmits the data via Bluetooth.

## Transmission of anonymous usage data and crash reports

In order to improve the technical stability of the eSense App and the detection of code errors, we use the Sentry service. Sentry serves these purposes alone and does not evaluate any data for advertising purposes. The transmission takes place anonymously and only with an existing internet connection.

### Processed data

Usage data, metadata (device ID, device data, IP address).

Special protective measures: IP masking, immediate deletion.

External Functional Software Disclosure: Functional Software Inc., Sentry, 132 Hawthorne Street, San Francisco, California 94107, USA.

Privacy Policy: <https://sentry.io/privacy/>.

Processing in third countries: USA

Warranty for processing in third countries: Privacy Shield, <https://www.privacyshield.gov/participant?id=a2zt0000000TNDzAAO&status=Active>.

Deletion of the data: Information on the device or time of error is collected anonymously and is not used for personal purposes and then deleted.

### Medical information

The Mindfield eSense sensors are not medical devices and may therefore only be used to reduce stress.

If you suffer from an illness, do not carry out any treatment on your own and always consult a therapist.



### Warranty by the manufacturer

The statutory warranty obligations apply to all our products. If you have any problems with our products, please contact us directly. See the "Contact" section of this manual.

## Contact

## Manufacturer

Mindfield® Biosystems Ltd. · Hindenburgring 4 · D-48599 Gronau · Germany

Tel: + 49 (0)2565 406 27 27 · Fax: + 49 (0)2565 406 27 28 · E-Mail: [info@mindfield.de](mailto:info@mindfield.de)

For questions, problems, and in case of warranty, please contact us via email or visit our website at [www.mindfield.de](http://www.mindfield.de) for more information.

Please do not send unsolicited packages to us. Unfree returns will not be accepted and cannot be processed.

## Your Notes

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